APPENDIX E

Updated Biodiversity Development Assessment Report

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
AUSTRALIAN RAIL TRACK CORPORATION

INLAND RAIL

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Glossary

Accredited person or assessor	A person accredited under section 6.10 of the Biodiversity Conservation Act 2016 to prepare reports in accordance with Biodiversity Assessment Method.
Affected species	A species that is likely to be affected through by direct and/or indirect impacts as a result of the proposal.
Area of outstanding biodiversity value (AOBV)	Under the BC Act an AOBV is an area with irreplaceable biodiversity values that is of state, national or global importance. AOBVs identify the most valuable sites for biodiversity conservation in NSW outside of the national reserve system.
Assessment area	The area of land in a buffer zone around the subject land. For a linear development a buffer of 500m is applied.
Avoid	Measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity.
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: • Genetic diversity – the variety of genes (or units of heredity) in any population • Species diversity – the variety of species • Ecosystem diversity – the variety of communities or ecosystems.
Biodiversity Assessment Method	The Biodiversity Assessment Method 2020
Biodiversity Assessment Method Calculator	The online computer program that provides decision support to assessors and proponents by applying the BAM and referred to as the BAM-C. The BAM-C contains biodiversity data from the BioNet Vegetation Classification and the Threatened Biodiversity Data Collection that the assessor is required to use in a BAM assessment. The BAM-C applies the equations used in the BAM, including those to determine the number and class of biodiversity credits required to offset the impacts of a development, or created at a biodiversity stewardship site.
Biodiversity credits	Biodiversity credits are generated from management actions that improve biodiversity values and are used to offset the loss of biodiversity values on development sites. Biodiversity credits consist of ecosystem and species credits.
Biodiversity credit report	The report produced by the Biodiversity Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site (Department of Planning Industry and Environment 2020a).
Biodiversity offsets	Biodiversity offsets are the gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development.

Biodiversity value	Are the following values: • vegetation integrity--being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state • habitat suitability--being the degree to which the habitat needs of threatened species are present at a particular site • biodiversity values, or biodiversity-related values, prescribed by the regulations.
Candidate species	A species credit species that is likely to have suitable habitat on the subject land. Referred to as 'candidate species credit species' in the BAM-C and require further assessment in accordance with subsection 5.2.3 of the BAM.
Critical habitat	The whole or any part or parts of an area or areas of land comprising the habitat of an endangered species, an endangered population or an endangered ecological community that is critical to the survival of the species, population or ecological community. Critical habitat is listed under the EPBC Act.
Development footprint	The area of land that is directly impacted by a proposed development, including access roads and areas used to store construction materials. The term is also taken to include clearing footprint, except where the reference is to a small area development or a major project development.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017. This includes impacts from activities related to the construction or operational phase of the proposal. (Department of Planning Industry and Environment 2020a).
Ecological community	An assemblage of species occupying a particular area.
Ecosystem credit	A measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site.
Ecosystem credit species	Ecosystem credit species are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. A targeted survey is not required to identify or confirm the presence of ecosystem credit species.
Environment, Energy and Science (EES) Group	The NSW Department of Planning and Environment which holds the Environment, Energy and Science Group replaced the NSW Department of Planning and Environment which held the Office of Environment and Heritage (OEH) effective 1 July 2019. This has now been replaced by the Environment and Heritage Group (EHG).

Environment and Heritage Group (EHG)	The Environment and Heritage Group (EHG) brings together a range of functions including national park management, biodiversity and conservation, climate change, sustainability, resilience and adaptation, renewable energy and energy security, waste management and resource recovery, and environment protection and mine safety regulation. The work of the Group is supported by centres of excellence in: science; policy and strategy; and data analytics and insights.
Environmental weed	Any plant that is not native to a local area that has invaded native vegetation.
Groundwater	Water found in the subsurface in the saturated zone below the water table or piezometric surface i.e. the water table marks the upper surface of groundwater systems.
Habitat	An area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community, including any biotic or abiotic components.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground. Trees must be examined from all angles.
IBRA region	A bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts.
Likely	Taken to be a real chance or possibility
Linear shaped development	Development that is generally narrow and extends across the landscape; for example, major roads, rail lines.
Locality	The area within 10km of the subject land.
Migratory species	Species protected as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999.* Listed migratory species are those listed in the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA) and Republic of Korea – Australia Migratory Bird Agreement (RoKAMBA). Listed migratory species also include any native species identified in an international agreement approved by the Minister. Capitalisation of the term 'Migratory' in this report refers to those species listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.
Minimise	A process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of the proposal on biodiversity values.

Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (Department of Planning industry and Environment 2018).
Mitigation	Action to reduce the severity of an impact (Department of Planning Industry and Environment 2020a).
Native vegetation	Means any of the following types of plants native to New South Wales: • trees (including any sapling or shrub or any scrub) • understorey plants • groundcover (being any type of herbaceous vegetation) • plants occurring in a wetland.
Patch size	An area of intact native vegetation that: • occurs on the subject land or biodiversity stewardship site • includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the subject land or biodiversity stewardship site.
PCT classification system	The system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification.
Plant community type	A NSW plant community type identified using the PCT classification system.
Population	A group of organisms, all of the same species, occupying a particular area.
Prescribed impact	Means the prescribed impacts identified in clause 6.1 of the BC Regulation. Prescribed impacts can be direct or indirect impacts.
Proposal	Proposal in this BDAR refers to the construction and operation of the Illabo to Stockinbingal section of Inland Rail. A proposal under the BAM includes any of the following: • development that requires consent under Part 4 of the EP&A Act • an activity that requires approval under Part 5, Division 5.1 (where the proponent has opted-in to the Biodiversity Offsets Scheme) of the EP&A Act • development that requires approval under Part 5, Division 5.2 of the EP&A Act • clearing that requires approval under Part 5A of the LLS Act; or a permit under the Vegetation SEPP • biodiversity certification of land and related development in the case of an application for biodiversity certification under the BC Act • a biodiversity stewardship site in the case of an application for a biodiversity stewardship agreement under the BC Act.
Region	A bioregion defined in a national system of bioregionalisation. For this study, this is the Inland Slopes and Lower Slopes as defined in the Interim Biogeographic Regionalisation for Australia, Version 7.0 (Thackway and Cresswell, 1995).
Scattered trees	Scattered trees are defined in Appendix B, Section B.1 of BAM.

Significant	Important, weighty, or more than ordinary (as defined by the Department of Environment and Climate Change, 2007).
Species credit	The class of biodiversity credit created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates.
Species credit species	Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. A targeted survey or an expert report is required to confirm the presence of these species on the subject land. Alternatively, a species may be assumed present within a subject land.
Stage 1: Biodiversity Assessment	Stage 1 of the Biodiversity Assessment Method. It establishes a single consistent approach to assessing the biodiversity values on land subject to the proposal.
Stage 2: Impact Assessment	Stage 2 of the Biodiversity Assessment Method. It provides for an impact assessment on biodiversity values on land subject to the proposal.
Stewardship site	Stewardship site proposed for conservation in accordance with the BAM to compensate for residual impacts associated with the proposal.
Subject land	Is land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the assessment area which surrounds the subject land (i.e. the area of land in a buffer zone around the subject land). This is consistent with the term proposal site used in the EIS.
Threatened biodiversity	Threatened species, populations or ecological communities, or their habitats as listed under the *Biodiversity Conservation Act 2016, Fisheries Management Act 1994* or the *Environment Protection and Biodiversity Conservation Act 1999*. Capitalisation of the terms 'Threatened' in this report refers to listing under the relevant State and/or Commonwealth legislation.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by EHG and accessible from the BioNet website at www.bionet.nsw.gov.au
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as Vulnerable, endangered or critically endangered (collectively referred to as Threatened) under the *Biodiversity Conservation Act 2016*, *Fisheries Management Act 1994* or the *Environment Protection and Biodiversity Conservation Act 1999*. Capitalisation of the terms 'threatened', 'vulnerable', 'endangered' or 'critically endangered' in this report refers to listing under the relevant state and/or Commonwealth legislation.
Vegetation class	A level of classification of vegetation communities defined in Keith (2004). There are 99 vegetation classes in NSW.
Vegetation formation	A broad level of vegetation classification as defined in Keith (2004). There are 16 vegetation formations and sub-formations in NSW.
Vegetation integrity	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.

Vegetation integrity score	The quantitative measure of vegetation condition.
Vegetation type	A NSW plant community type (PCT)
Vegetation zone	A relatively homogenous area of native vegetation that is the same PCT and broad condition state.
Viability	The capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.
Weeds of National Significance	Weeds regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts. This includes 32 weeds listed under the National Weeds Strategy. A list of 20 was endorsed in 1999 and a further 12 were added in 2012.

Abbreviations

ARTC	Australian Rail Track Corporation
BAM	NSW Biodiversity Assessment Method 2020
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community: an ecological community specified as critically endangered in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.
DCCEEW	Australian Government Department of Climate Change, Energy, the Environment and Water, formerly the Department of Agriculture, Water and the Environment
DPE	NSW Department of Planning and Environment, formerly Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
Ha	Hectare
I2S	Illabo to Stockinbingal
IRDJV	Inland Rail Design Joint Venture (WSP | MM JV legal entity)
MNES	Matters of National Environmental Significance listed under the *Environment Protection and Biodiversity Conservation Act 1999*.
NP&W Act	NSW *National Parks and Wildlife Act 1974*
WSP | MM	WSP Australia | Mott MacDonald Joint Venture trading as IRDJV
TEC	Threatened Ecological Community
TSC Act	NSW *Threatened Species Conservation Act 1995* repealed and replaced by the NSW *Biodiversity Conservation Act 2016* as of the 25 August 2017.

Executive summary

The Australian Government has committed to delivering a new piece of national transport infrastructure by constructing an inland railway between Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland. The Inland Rail project ('Inland Rail') is a major national project that will enhance Australia's existing national rail network and serve the interstate freight market.

Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the Illabo to Stockinbingal section of Inland Rail ('the proposal'), which is a new rail corridor and consists of a 39-kilometre (km) long single track standard gauge railway with one crossing loop to accommodate double stack freight trains up to 1,800 metres (m) long.

The Illabo to Stockinbingal proposal is a new rail corridor that will connect Illabo to Stockinbingal in New South Wales. The alignment branches out from the existing rail line north-east of Illabo and travel about 41km north to join the Stockinbingal to Parkes rail line west of Stockinbingal. The proposal passes through agricultural and rural properties in the Riverina region of NSW and generally follows the existing cadastral boundaries and roads between the towns of Illabo and Stockinbingal.

This Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the NSW Biodiversity Assessment Method 2020 (BAM) established under the *Biodiversity Conservation Act 2016* (BC Act) and provides an assessment of biodiversity values of the subject land for the Inland Rail – Illabo to Stockinbingal proposal (the proposal). The (then) Commonwealth Department of Agriculture, Water and the Environment (now the Department of Climate Change, Energy, the Environment and Water) (DCCEEW) confirmed that species and communities listed under the *Environment Protection and Biodiversity* Conservation Act 1999 (EPBC Act) can be assessed following the BAM methodology (Appendix B) as per the Bilateral Agreement.

This report has been updated since public exhibition of the EIS. An initial update was prepared to respond to comments provided by the DPE Biodiversity Conservation Division (BCD). The BDAR was updated to address comments on:

- additional survey, updated methodology and results
- additional surveys included targeted seasonal surveys for the Glossy-black Cockatoo, Key's Matchstick Grasshopper and Golden Sun Moth
- updated classification of vegetation zones
- inclusion of a Connectivity Strategy including revised mitigation measures
- recalculation of credit obligation.

Following the updated BDAR, ARTC prepared changes to the proposal site. The proposal site refinement has been made in response to the outcomes of landholder negotiations, reduce impacts to native vegetation and design refinements. The proposal site has decreased in certain locations and increased in others. This version of the BDAR assesses the revised impacts associated to the proposal site refinement, provides results of additional targeted flora surveys undertaken in October 2023 and provides credit calculations for threatened species assumed to be present in unsurveyed areas.

Comprehensive mapping and field surveys were supplemented by threatened species targeted surveys and scattered trees assessment. Surveys followed the BAM and relevant threatened species survey guidelines over twelve survey periods between 2018 and 2023 (October 2018, November 2018, December 2018, May 2019, July 2019, September 2019, September-October 2020, January 2021, October 2021, November 2022, December 2022 and October 2023.

This assessment identified the following plant community types:

- Plant Community Type (PCT) 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion.
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion.
- PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion.

Of these, six PCTs correspond with the following Threatened Ecological Communities (TEC):

- PCT 266, PCT 276, PCT 277 & PCT 347 correspond with White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland listed as Critically Endangered under the BC Act and EPBC Act.
- PCT 76 & PCT 80 correspond with Inland Grey Box Woodland listed as Endangered under the BC Act and the EPBC Act.

A total of 58 Class 1, Class 2 and Class 3 scattered trees were recorded, 41 of which were class 3 and contained hollows.

No threatened flora species have been recorded. However, not all areas of the subject land were able to be accessed for targeted flora surveys Figure 3.6. In these areas a precautionary approach was taken and candidate species were assumed to be present if associated PCTs had been mapped in those areas. A total of 19 threatened flora species were assumed to be present.

Twelve threatened fauna species were recorded during field surveys:

- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) listed as Vulnerable under the BC Act
- Brown Treecreeper (*Climacteris picumnus victoriae)* listed as Vulnerable under the BC Act
- Spotted Harrier (Circus assimilis) listed as Vulnerable under the BC Act.White-fronted Chat (Epthianura albifrons) listed as Vulnerable under the BC Act
- Black Falcon (*Falco subniger*) listed as Vulnerable under the BC Act
- Little Eagle (*Hieraaetus morphnoides*) listed as Vulnerable under the BC Act
- Square-tailed Kite *(Lophoictinia isura)* listed as Vulnerable under the BC Act
- Squirrel Glider (*Petaurus norfolcensis)* listed as Vulnerable under the BC Act
- Flame Robin (*Petroica phoenicea*) listed as Vulnerable under the BC Act
- Superb Parrot (*Polytelis swainsonii)* listed as Vulnerable under both the BC Act and EPBC Act
- Grey-Crowned Babbler (*Pomatostomus temporalis temporalis)* listed as Vulnerable under the BC Act
- Diamond Firetail (*Stagonopleura guttata)* listed as Vulnerable under the BC Act.

Of these, the Little Eagle, Squirrel Glider and Superb Parrot, are considered as species credit species as potential breeding habitat will be impacted by the proposal.

Two additional species credit species, Southern Myotis and Key's Matchstick Grasshopper, while not recorded, have been assumed as present. The assumed presence of Southern Myotis is based on presence of suitable habitat whilst the Key's Matchstick Grasshopper has been assumed on lands where suitable habitat occurs and land access for targeted surveys was unavailable.

The other six recorded threatened fauna species recorded as considered ecosystem credit species of which 41 have been identified within BAM-C to be associated with the proposal.

In accordance with the BAM, the proposal has been designed with the principles to avoid and minimise impact on native vegetation and habitat as far as practicable. This route selection and design process has resulted in impact to 77.17ha of native vegetation with over 80% (387.28ha) occurring in non-native vegetation. This process has also minimised impacts to scattered trees.

One Serious and Irreversible Impact (SAII) entity, White Box Yellow Box Blakely's Red Gum Woodland will be affected by the proposal. The final impact to this community is 38.98ha, this includes a 4.21 ha impact reduction achieved through a refinement of the proposal site.

The BAM Credit Calculator was used to provide a calculation of the number and class of biodiversity credits required to offset the biodiversity impacts associated with the proposal to ensure maintenance or improvement in biodiversity. The proposal will require a total of:

- 1,982 ecosystem credits for PCTs
- 53 ecosystem credits for scattered trees
- 3,460 fauna species credits
- 2,617 flora species credits based on assumed presence in unsurveyed areas.

Assessments of impact significance were conducted for biodiversity Matters of National Environmental Significance (MNES) including threatened species, populations and ecological communities considered likely to be affected by the proposal. Through these assessments, it was concluded that the proposal is likely to have a significant impact on two endangered ecological communities; Inland Grey Box Woodland and White Box Yellow Box Blakely's Red Gum Woodland.

Stage 1
Biodiversity assessment

1 Introduction

1.1 Overview

The Australian Government has confirmed that Inland Rail is an important project to meet Australia's growing freight task, improve road safety and help decarbonise the economy. Inland Rail will enhance our national freight and supply chain capabilities, connecting existing freight routes through rail, roads and ports, and supporting Australia's growth.

The proponent is seeking approval to construct and operate the proposal, which includes a new rail line. This section of Inland Rail would be about 42.5km in total, including 39km of new single-track standard-gauge railway, and connecting to 3.5km of existing rail. The rail line and associated facilities would be built to accommodate double-stacked freight trains up to 1,800m long and 6.5m high. The proposal is critical State significant infrastructure (CSSI) and is subject to approval by the NSW Minister for Planning under Division 5.2, Part 5 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

The proposal is also a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and requires approval from the Australian Government Minister for the Environment.

This report has been prepared by (Inland Rail Design Joint Venture (WSP/Mott Macdonald)) as part of the environmental impact statement (EIS) for the proposal. The EIS has been prepared to accompany the application for approval of the proposal and addresses the Secretary's Environmental Assessment Requirements (SEARs) from the Secretary of the (then) NSW Department of Planning, Industry and Environment (now the Department of Planning and Environment (DPE)), issued on 30 April 2021.

This report has been updated since public exhibition of the EIS. The updates are in response to comments provided by the DPE Biodiversity Conservation Division (BCD). A key focus of the updated assessment has been surrounding comments on:

- the presentation and assessment of native vegetation zones and scattered trees
- additional targeted survey of species, including Glossy-black Cockatoo, Key's Matchstick Grasshopper and Golden Sun Moth
- further explanation of the approach to mitigation
- further information in relation to impacts to fauna connectivity
- refinement of impacts and assessment consistent with the NSW Biodiversity Assessment Methodology
- species credit updates as per the BAM-C updates.

Revisions to the proposal site have been made to reduce impacts to SAII, to respond to refinement of the infrastructure design, submissions received on the proposal and consultation with landowners. Further identification of the changes is presented in Appendix I to the Response to Submissions Report.

1.2 The proposal

The proposal is located between Illabo and Stockinbingal within the Riverina region of NSW. The location of the proposal is shown in Figure 1.1.

1.2.1 Key features

The key features of the proposal include:

- a total extent of about 42.5km, including about 39km of new, greenfield railway between Illabo and Stockinbingal
- single-track standard-gauge railway on a combination of existing ground level, embankments and in cuttings

- eight new bridges at watercourses, two road overbridges and one grade-separated bridge (road-over-rail) at Burley Griffin Way
- one crossing loop and associated maintenance siding, located between chainage 9,200 and chainage 11,400
- construction of new level crossings and alterations of existing level crossings (at public roads and private accesses)
- stock underpasses to allow movement of livestock
- level crossings at grade for large farm equipment and vehicles across the rail line, and livestock where there is no nearby stock underpass
- one major drainage diversion to collect and transport stormwater away from the rail line
- large detention basin to control release and reduce peak flood levels
- installation and upgrade of about 88 cross drainage culverts below the rail formation and 27 longitudinal drainage culverts below level crossings
- upgrades to about 3.5km of existing track for the tie-in works to the existing Main South Line at Illabo, and the Stockinbingal to Parkes Line at Stockinbingal
- construction of about 1.7km of new track to maintain the existing connection of the Lake Cargelligo rail line either side of the proposal
- realignment of a 1.4km section of the Burley Griffin Way to provide a underbridge at Stockinbingal
- realignment of Ironbong Road to allow for safe sight lines at the new active level crossing
- one workforce accommodation camp.

1.2.2 Timing and operation

The proposal would form part of the rail network managed and maintained by ARTC. Train services would be provided by a variety of operators. The trains would be diesel powered, and would be a mix of grain, intermodal (freight), and other general transport trains. The EIS assesses the operational impacts of the use of the proposal as part of Inland Rail in EIS chapters 10 to 26. If business and market demands require increased capacity, consultation with relevant agencies would be undertaken, and approvals sought as required.

The proposal would enable the use of double-stacked trains along its entire length. Inland Rail would operate 24 hours per day and would accommodate double-stacked freight trains up to 6.5m high and up to 1,800m long. The approval would limit Inland Rail train operations to 1,800m, with rail infrastructure built having regard to that limitation.

ARTC would maintain the line during operations. While maintenance activities are part of the operational activity, they would be undertaken as controlled by the State Environmental Planning Policy (Transport and Infrastructure) 2021 and the ARTC operational Environment Protection Licence (EPL 3142). Maintenance would include standard activities such as; inspections and maintenance of bridges, culverts, and fauna connectivity structures,, rail grinding and track tamping, through to major maintenance, such as reconditioning of track and topping up of ballast as required.

Further information on the construction and operation of the proposal is in EIS Chapter 7: Proposal features and operation and EIS Chapter 8: Construction of the proposal.

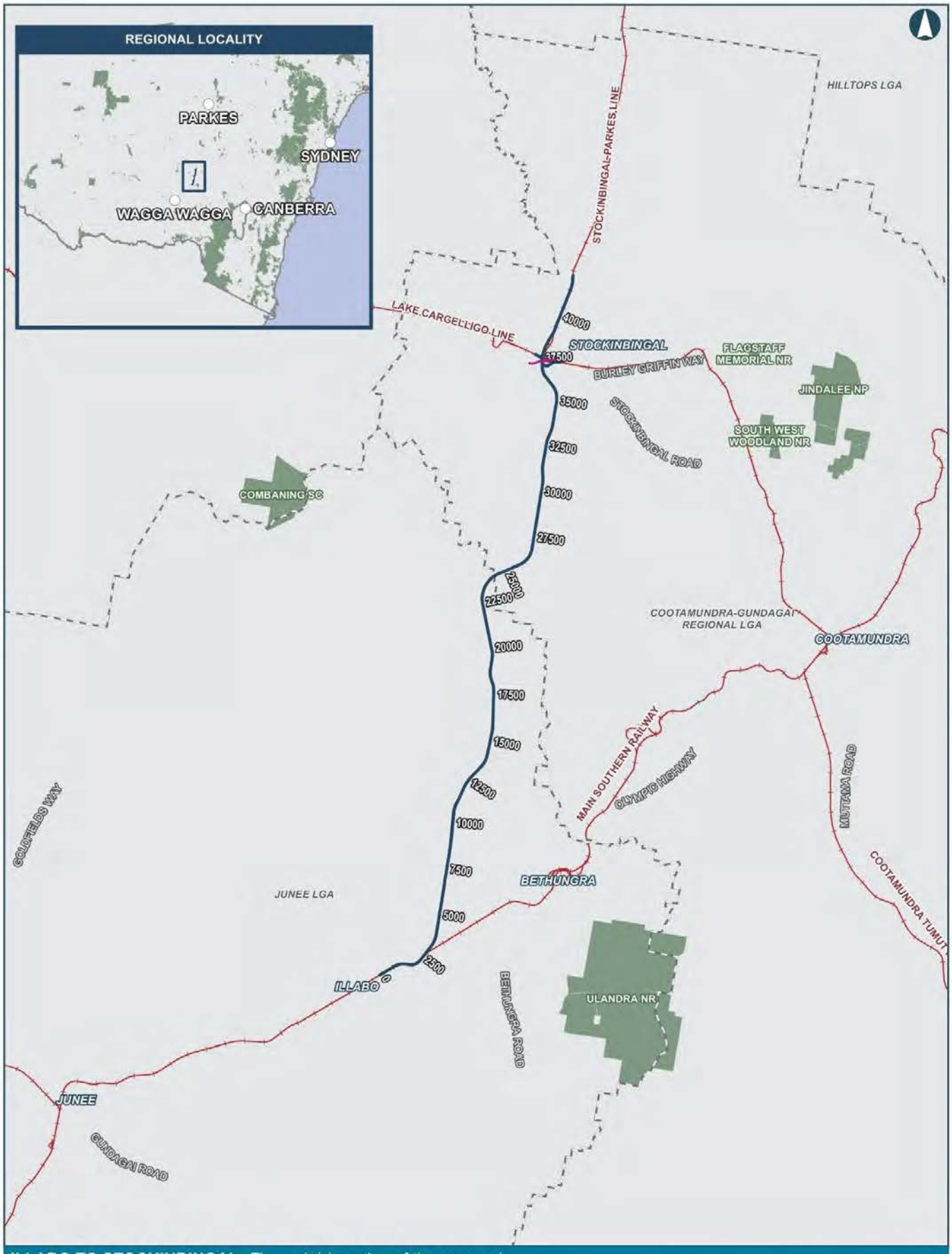
In response to the Independent Review of Inland Rail, the Australian Government has prioritised completing the sections of Inland Rail between Beveridge in Victoria and Narromine in NSW by 2027. In line with the Government's response to the review, ARTC is now taking a staged approach to Inland Rail, with a focus south of Parkes on construction and delivery to progressively unlock the benefits of Inland Rail ahead of end-to-end completion. North of Parkes, attention is on obtaining approvals, securing the route, and refining cost and delivery arrangements ahead of commitments for construction.

Subject to approval, further design and procurement, construction of the proposal is planned to start with early works in late-2024, with main works expected to take about 24 months. Construction is currently expected to be completed by 2027.

The proposal is expected to be operational as part of the Inland Rail Melbourne to Narromine section in 2027.

1.2.3 Updates since Public Exhibition

Since public exhibition of the EIS, ARTC undertook further investigations and is proposing a number of design refinements to the proposal. The aim of these refinements is to reduce impacts to SAIIto respond to refinement of the infrastructure design; issues raised since EIS exhibition. . The refinements were developed by considering consultation with the community and key stakeholders. Further details are provided Section 3.1 of the Response to Submissions report.



ILLABO TO STOCKINBINGAL Figure 1.1 Location of the proposal

0 2 4 6 km

Coordinate System: GDA 1994 MGA Zone 55

ARTC makes no representation or warranty and assumes no duty of care or other responsibility to any party as to the completeness, accuracy or suitability of the information contained in this GIS map. The GIS map has been prepared from material provided to ARTC by an external source and ARTC has not taken any steps to verify the completeness, accuracy or suitability of that material. ARTC will not be responsible for any loss or damage suffered as a result of any person whatsoever placing reliance upon the information contained within this GIS map.

Date: 9/6/2023 Paper: A3
Author: IRDJV Scale: 1:200,000

Data Sources: ARTC, NSWSS, ESRI

Key features of proposal

- Key features of proposal
- 40950 Chainage (distance in metres from southern limit of the proposal)
- Burley Griffin Way realignment

Existing features

- Local Government area boundary
- Existing rail
- Parks and reserves
- Sub-arterial road
- Arterial road

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

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1.3 Scope and purpose of report

This report has been prepared to specifically address the SEARs issued by the (then) Department of Planning, Industry and Environment on 30 April 2021. The SEARs relevant to biodiversity, and references to sections where they have been addressed in the report are presented below in Table 1.1.

Specifically, this includes the preparation of a Biodiversity Development Assessment Report (BDAR) in accordance with section 6 of the *Biodiversity Conservation Act 2016* (BC Act) and the NSW Biodiversity Assessment Methodology (BAM 2020). Specifically, this BDAR addresses matters outlined in Stage 1 and Stage 2 of the BAM and has been prepared in accordance with the reporting requirements set out in Appendix K of the BAM.

Impacts to relevant Matters of National Environmental Significance (MNES) under the EPBC Act are addressed as part of the assessment.

Table 1.1 Secretary's Environmental Assessment Requirements relevant to Biodiversity Development Assessment

SEAR Number	Requirement	Where addressed in this report
6. Biodiversity The project design considers measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. Offsets and/or supplementary measures are assured which are equivalent to any remaining impacts of project construction and operation.	a) Assess biodiversity impacts in accordance with s7.9 of the Biodiversity Conservation Act 2016 (BC Act), the Biodiversity Assessment Method (BAM), and be documented in a Biodiversity Development Assessment Report (BDAR).	This document is a BDAR and has been written in accordance with the BC Act and BAM.
	b) The BDAR must document the application of the avoid, minimise and offset framework in accordance with the BAM.	Chapter 9 and Chapter 13
	c) The BDAR must include information in the form detailed in s6.12 of the BC Act, cl6.8 of the Biodiversity Conservation Regulation 2017 and the BAM.	This report includes required information in the form detailed.
	d) The BDAR must be submitted with all digital spatial data associated with the survey and assessment as per Appendix 10 of the BAM.	Spatial data will be submitted as part of the EIS.
	e) 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 BC Act.	Section 1.6 and 1.7
	f) The BDAR must include details of the measures proposed to address offset obligations in accordance with the BAM.	Chapter 13
	g) The Proponent must assess any impacts on biodiversity values not covered by the BAM. This includes a threatened aquatic species assessment (Part 7A Fisheries Management Act 1994) to address whether there are likely to be any significant impact on listed threatened species, populations or ecological communities listed under the Fisheries Management Act 1994 (FM Act).	Refer to Technical Paper 2 – Aquatic biodiversity
	h) The Proponent must identify whether the project, or any component of the project, would be classified as a Key Threatening Process (KTP) in accordance with the listings in the BC Act, FM Act and the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).	Section 10.3.2 and Technical Paper 2 – Aquatic biodiversity

1.3.1 Changes to BDAR as a result of DPE Biodiversity Conservation Division submission

This BDAR has been updated since public exhibition of the EIS. The updates are in response to comments provided by the DPE Biodiversity Conservation Division (BCD) in the areas of:

- additional survey, updated methodology and results
- updated classification of vegetation zones
- inclusion of a Connectivity Strategy including revised mitigation measures
- recalculation of credit obligation
- further explanations of the changes and resultant impacts are provided under the headings below. The updated BDAR was resubmitted to DPE BCD in April 2023. This document was not publicly exhibited.

Survey methodology and results

Further survey was undertaken to address issues discussed with DPE BCD, including:

- gathering survey data including outside of dry conditions to supplement existing data which was undertaken in below average rainfall conditions
- applying dry benchmarks in BAM-C to adjust vegetation integrity scores for data collected during below average rainfall conditions
- access previously inaccessible properties
- survey covering new areas where design optimisation had resulted in impacts outside of previously assessed areas
- targeted surveys for the recently listed Key's Matchstick Grasshopper (*Keyacris scurra*).

The report was also updated to present information on survey techniques and data recorded, this has been included in Section 3 of the updated BDAR. These additions include:

- clarification and expansion on the discussion of the survey methodology
- presentation of survey effort and tracks for all target species survey
- updates to the candidate and predicted species considered and removal of excluded species (White Fronted Chat, Black Falcon and Glossy Black Cockatoo)
- updated species polygons based on latest survey results and assumption of presence of flora in unsurveyed areas.

Updated classification of vegetation zones

Section 5 of the BDAR has been updated to outline:

- reassessment and reclassification of scattered trees
- refined vegetation zone mapping, revised classification of native plantings and justifications for Plant Community Types identified within the study area
- updated map figures and the addition of detailed information on the vegetation integrity plots
- threatened ecological communities and serious and irreversible impact entities (SAII) were reviewed and updated to include poor condition areas. This has resulted in the report identifying impacts to an additional 38.98 of impacts to the SAII, refer to Table 1.2
- updated list of 11 species of high threat weeds with the potential to indirectly impact the project.

The updated mapping identifies an increase in the impacts to native vegetation and a reduction in non-native vegetation compared to the exhibited BDAR. Table 1.3 provides the specific changes.

Connectivity strategy

A draft fauna connectivity strategy has been provided as an Appendix L of this BDAR. The update provides a more detailed review and description of the current habitat connectivity and the landscape elements that provide it, identification of impacts, species requiring mitigation, types of connectivity structures and their general locations and outlines an approach to monitoring.

In addition, mitigation measures were updated to include a description regarding the risk and consequence of mitigation failure.

Credit calculation

Credit requirements for all species and communities requiring offsets have been re-calculated as per the updated BAM-C requirements (03/2023) and DPE dry benchmarks. Table 1.3 outlines the updated offset requirements for version of the BDAR submitted to DPE BCD.

1.3.2 Changes to BDAR as a result of Construction Impact Zone changes

Following the updated BDAR being submitted to DPE BCD, ARTC prepared changes to the proposal site. The changes have been made in response to the outcomes of landholder negotiations and to minimise impacts to native vegetation. The proposal site has been reduced in certain locations and expanded in others. Further identification of the changes is presented in Appendix L to the Response to Submissions Report.

This version of the BDAR has been prepared to assess the revised impacts as a result of the change in the proposal site. Table 1.2 presents the changes in impact to vegetation across the three different versions of the BDAR. Table 1.3 presents the changes to the credit requirement for the three different versions of the BDAR.

Table 1.2 Change in impacts to vegetation

Name	Impacts in exhibited BDAR (hectares)	Impacts in response to BCD comments (hectares)	Impacts as a result of updated proposal site and surveys (hectares)
Native vegetation	72.93	94.63	77.17
Non-native vegetation	316.16	294.46	387.28
Serious and Irreversible Impact (SAII) entity, White Box Yellow Box Blakely's Red Gum Woodland	19.93	43.19	38.98

Table 1.3 Change in credit requirement

Name	Exhibited BDAR	Response to BCD comments	Updated proposal site and additional surveys
Ecosystem credits (PCTs)	2,079	2,457	1,982
Species credits	4,875	4,748	6,077
Ecosystem credits (scattered trees)	53	59	53

1.4 Structure of report

The structure of this report is outlined below:

Stage 1 – Biodiversity assessment

- **Chapter 1 – Introduction:** Outlines the background and need for the proposal, and the purpose of this report.
- **Chapter 2 – Legislation and policy context:** Provides an outline of the key legislative requirements and policy guidelines relating to the proposal.
- **Chapter 3 – Methodology.** Outlines the methodology employed for native vegetation and threatened species.
- **Chapter 4 – Landscape context:** Provides information on a range of landscape features that occur in the subject land and broader locality.
- **Chapter 5 – Native vegetation:** Provides information on native vegetation including plant community type and vegetation zones.
- **Chapter 6 – Threatened species:** Provides information on threatened species listed under the BC Act.
- **Chapter 7 – Prescribed impacts:** Identifies potential prescribed biodiversity impacts on threatened entities listed under the BC Act.
- **Chapter 8 – Matters of national environmental significance:** Describes biodiversity matters relating to Commonwealth legislation under the EPBC Act.

Stage 2 – Impact assessment

- **Chapter 9 – Avoid and minimise:** Provides information on avoiding and minimising impacts on biodiversity values through the planning and design phase of the proposal.
- **Chapter 10 – Assessment of impact:** Describes the potential impacts associated with the proposal.
- **Chapter 11 – Mitigation and management of impacts:** Outlines the proposed mitigation measures for the proposal on biodiversity matters.
- **Chapter 12 – Impact summary – thresholds for assessment and offsetting impacts:** Outlines the impact thresholds and offset requirements for residual impacts to biodiversity values after the avoid, minimise and mitigate hierarchy has been applied.
- **Chapter 13 – Biodiversity credit report:** Applies the no net loss biodiversity standard as required under the BAM.
- **Chapter 14 – Conclusion:** Provides a conclusion of the potential impacts of the proposal on biodiversity.
- **Chapter 15 – Limitations:** Identifies the limitations and assumptions made when generating this report.
- **Chapter 16 – References:** Provides a list of resources referenced in this assessment.

The structure of this report was developed with reference to and broadly consistent with the BDAR template which is provided by the Department of Planning and Environment (2022) as an optional tool to assist with reporting.

1.5 Sources of information

The following information sources were used in preparation of this BDAR:

- aerial photographic imagery
- NSW Mitchell Landscapes 3.1 (Department of Planning Industry and Environment 2021b)
- Interim Biogeographic Regionalisation of Australia (IBRA version 7.0) (Department of the Environment and Energy 2018)
- Atlas of Groundwater Dependent Ecosystems (GDE) (Bureau of Meteorology 2021)
- Directory of Important Wetlands of Australia (Department of Agriculture Water and the Environment 2021c)
- Register of Declared Areas of Outstanding Biodiversity Value – Critical habitat declarations in NSW (Department of Planning Industry and Environment 2021a)
- BioNet Threatened Species Profile Database (Department of Planning industry and Environment 2021c)
- Commonwealth Species Profiles and Threats Database (Department of Agriculture Water and the Environment 2021e)
- State Vegetation Type Map: Central West/Lachlan Region Version 1.4. VIS_ID 4468 (Department of Planning Industry and Environment 2020c)
- Central Southern NSW vegetation mapping (ADS40_E_3884) (NSW Government 2021c).

1.6 Personnel

The contributors to the preparation of this paper, their qualifications and roles are listed in Table 1.4.

Table 1.4 Personnel

Name	Qualifications	Role	Years of experience
Alex Cockerill	Bachelor of Science (Hons), accredited BAM assessor BAAS17020	Principal Ecologist – technical review	22
Selga Harrington	Bachelor of Science (Hons), accredited BAM assessor BAAS17079	Principal Ecologist – ecology lead, technical input report preparation	23
Toby Lambert	Bachelor of Science (Hons), accredited BAM assessor BAAS17046	Principal Ecologist – technical input report preparation and review	25
Mark Stables	Bachelor of Science (Hons), accredited BAM assessor BAAS18097	Principal Ecologist – field surveys, report preparation	19
Tanya Bangel	Bachelor of Science (Hons), Diploma of Conservation and Land Management, accredited BAM assessor BAAS18076	Ecologist – field surveys and report preparation	12
Troy Jennings	Bachelor of Biodiversity and Conservation, Master of Wildlife Management, accredited BAM assessor BAAS18172	Ecologist – field surveys and report preparation	9
Nathan Cooper	Bachelor of Environmental Science, Graduate Diploma Ornithology, Diploma Applied Science, Environmental Technology,	Senior Ecologist – field surveys and assisted in report preparation	18
Allan Richardson	Bachelor of Environmental Science (Hons)	Senior Ecologist – field surveys and assisted in report preparation	16
Lauren Smith	Bachelor of Science (Resource and Environmental Management)	Ecologist – field surveys and assisted in report preparation	5

Name	Qualifications	Role	Years of experience
Alicia Palmer	Bachelor of Science (Resource and Environmental Management) (Hons)	Ecologist – assisted in report preparation	3
Andrea Tuckwell	Bachelor of Science (Information Technology); Postgrad Diploma in GIS	GIS Consultant – data management and map preparation	14
Isaac Augey	Bachelor of Environmental Science and Management	Graduate GIS Consultant – data management and map preparation	2
Ngai Ching Rebecca, Choi	Bachelor of Arts (Hons) (Geog), Master in Environmental Studies, Cgeog (GIS)	GIS Consultant	18
Paul Greenhalgh	Master of Science (Town and Country Planning); Bachelor of Science (Hons)	Report reviews	28
Kurtis Lindsay (Land Eco)	B. Science (Hons). Accredited BAM Assessor (BAAS18059)	Field Survey lead (October 2023 flora surveys)	15
Joseph Crane (Land Eco)	B. Science (Hons) B Commerce, Grad Cert. Env. Mgt.	Field Survey (October 2023 flora surveys)	4
Nick Henson (Land Eco)	B. Biodiversity Conservation	Field Survey (October 2023 flora surveys)	2
Giles Tennant (Land Eco)	B. Science (Hons), B. Environmental Biology, Cert III Conservation Land Management.	Field Survey (October 2023 flora surveys)	5
Elliot Lindsay (Land Eco)	B. Arts, B. Archaeology	Field Survey (October 2023 flora surveys)	3
Cameron Reid-Rowatt (Land Eco)	B Env. Sc. & Mgt (in progress), Cert II Captive Animals, Cert II Animal Studies	Field Survey Assistant (October 2023 flora surveys)	0.5
Serene White (Land Eco)	BSc (Zoology), B. Nat Sci (Animal Science), Cert III Conservation Land Management	Data Review of October 2023 flora surveys	2
Yogesh Nair (Niche Environment and Heritage)	Master of Science, Bachelor of Environment, Adv. Dip. Applied Environmental Management, Cert. III Conservation Land Management. Accredited BAM Assessor (BAAS 18144)	Coordination of October 2023 flora surveys	7
Dr. Cairo Forrest (Niche Environment and Heritage)	BSc (Hons), PhD (Ecology/Genetics). Accredited BAM Assessor (BAAS18024)	Oversight of October 2023 flora surveys.	15

1.7 Certification

I, Mark Stables (BAM Accredited Assessor BAAS18097), certify that this BDAR has been prepared on the basis of the requirements of (and information provided under) the current BAM dated (10 February 2023 (within 14 days of report being submitted)) available from https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/biodiversity-assessment-method.

2 Legislation and policy context

2.1 Commonwealth legislation

2.1.1 EPBC Act

The objective of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to protect and manage prescribed Matters of National Environmental Significance (MNES). Under the EPBC Act, proposed 'actions' that have the potential to significantly impact on MNES, the environment of Commonwealth land, or that are being carried out by an Federal Government agency, must be referred to the Federal Minister for the Environment for assessment.

As a result of the potential for impacts on protected matters, the proposal was referred to the (then) Australian Government Minister for the Environment in June 2018 (EPBC Referral No 2018/8233). On 6 August 2018, the (then) Australian Government Department of the Environment and Energy notified that the proposal is a controlled action, with the controlling provisions being 'listed threatened species and communities' (under section 18 & 18A of the EPBC Act).

Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. The nine MNES protected under the EPBC Act are:

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

Matters relating to biodiversity values under the EPBC Act has been considered in this assessment through:

- desktop review to determine the listed biodiversity matters that are predicted to occur within the locality of the proposal and hence could occur, subject to the habitats present
- targeted field surveys for listed threatened biota and migratory species
- assessment of potential impacts on threatened and migratory biota, including assessments of significance in accordance with the EPBC Act significant impact guidelines (Department of the Environment Water Heritage and the Arts 2013) where relevant
- identification of suitable impact mitigation and environmental management measures for threatened and migratory biota, where required.

2.1.1.1 Specific requirements issued for the proposal

Specific EPBC Act requirements were issued for Inland Rail – Illabo to Stockinbingal (EPBC 2018/8233, SSI 18_9406). Revised EPBC Act requirements were issued dated February 2021. A list of controlling provisions and Threatened entities likely to be affected by the proposal based on initial desktop assessment was issued by the Department and is provided at Attachment A in Appendix B.

The species and communities which the Department considered would likely be significantly impacted by the proposal included:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – Endangered

- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered
- Swift Parrot (*Lathamus discolor*) – Critically Endangered
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable.

The listed species and communities which the Department considered would possibly be significantly impacted included:

- Threatened flora:
  - *Ammobium craspedioides* (Yass Daisy) – Vulnerable
  - *Austrostipa wakoolica* (Spear Grass) – Endangered
  - *Prasophyllum petilum* (Tarengo Leek Orchid) – Endangered
  - *Caladenia concolor* (Crimson Spider-orchid) – Endangered.
- Threatened fauna:
  - Spot-tailed Quoll (south-eastern mainland population) (*Dasyurus maculatus maculatus*) – Endangered
  - Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable
  - Painted Honeyeater (*Grantiella picta*) – Vulnerable
  - Corben's Long-eared Bat, South-eastern Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable
  - Koala (*Phascolarctos cinereus*) – Endangered
  - Pink-tailed Worm-lizard (*Aprasia parapulchella*) – Vulnerable.

The provisions outline that for each EPBC Act-listed species affected by the proposed action the requirements outlined in Table 2.1 be applied. EPBC-listed species likely to be impacted by the proposed action were identified (Appendix C and Appendix D) and a detailed assessment was undertaken of each threatened entity with the results presented in this report.

Table 2.1 EPBC Act specific requirements issued for the proposal

Requirement	Section addressed
For each of the EPBC Act-listed species and ecological communities affected by the proposed action, the EIS must provide: **a)** survey results, including details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Commonwealth guidelines and policy statements **b)** a description of the habitat and habits (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, threat abatement plans and wildlife conservation plans; and **c)** maps displaying the above information (specific to EPBC matters) overlaid with the proposed action.	(a) Chapter 3, section 8.1 (b) Section 8.1 (c) Figure 8.1
The EIS must describe the nature, geographic extent, magnitude, timing and duration of any likely direct, indirect and consequential impacts on any relevant EPBC Act-listed species and communities. It must clearly identify the location and quantify the extent of all impact areas to each relevant EPBC Act-listed species or community.	Chapter 10 and 12
For each of the EPBC Act-listed species and communities that are likely to be affected by the development, the EIS must provide information on proposed avoidance and mitigation measures to deal with the impacts of the action, and a description of the predicted effectiveness and outcomes that the avoidance and mitigation measures will achieve.	Chapter 9
The EIS must identify each EPBC Act-listed species and community likely to be significantly affected by the proposed action. Where a significant impact is likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit, how offsets will be secured, and timing of protection.	Chapter 8, 10 and 12 and Appendix E

2.1.1.2 EPBC environmental offset policy

Biodiversity offset obligations for significantly affected MNES listed under the EPBC Act have been calculated using the BAM credit calculator. This approach is consistent with the controlled action decision on the assessment approach, being that the proposal will be assessed by an accredited assessment under Part 5, Division 5.2 (SSI) of the EP&A Act.

Additionally, on 20 March 2020, the Commonwealth and the State of NSW entered into Amending Agreement No. 1 to the Assessment Bilateral Agreement under section 45 of the EPBC Act (Bilateral Amendment Agreement). The Bilateral Amendment Agreement, among other things, updated the NSW Bilateral Agreement to "accredit" the regime under the BC Act (including the BOS), which replaced the former biobanking regime under the repealed TSC Act.

The Bilateral Amendment Agreement also recognises that the (then) Department of Agriculture, Water and the Environment (now DCCEEW) has endorsed the BOS for both NSW and Commonwealth-listed threatened species. The endorsement is recorded in the EPBC Act Condition-Setting Policy Department of Agriculture, Water and the Environment, 2020. Broadly speaking, the NSW Bilateral Agreement accredits the assessment of environmental impacts of specified development under the NSW planning regime to avoid the duplication of assessment at the Commonwealth level. It allows the Australian Government Minister for the Environment to rely on specified NSW environmental impact assessment processes in assessing actions under the EPBC Act.

In determining biodiversity offsets for MNES under the EPBC Act, consideration has been given to Attachment A of the SEARs (Appendix B) and have been based on the results of detailed targeted surveys and assessment as outlined in Chapter 3 and Appendix F of this report.

2.2 NSW legislation

2.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) establish a framework for the assessment and approval of developments in NSW. They also provide for the making of environmental planning instruments, including state environmental planning policies (SEPPs) and local environmental plans (LEPs), which determine the permissibility and approval pathway for development proposals and form a part of the environmental assessment process. In accordance with the provisions of the EP&A Act, the proposal is State Significant Infrastructure).

SSI may also be declared to be critical State significant infrastructure (CSSI) in accordance with section 5.13 of the EP&A Act, if it is of a category that, in the opinion of the NSW Minister for Planning, is essential for the State for economic, environmental or social reasons. The proposal was declared as CSSI in 2021.

Under section 5.14 of the EP&A Act, the approval of the NSW Minister for Planning is required for State significant infrastructure (including CSSI), and an EIS has been prepared under Division 5.2 of the EP&A Act.

2.2.2 BC Act

The *Biodiversity Conservation Act 2016* (BC Act) came into effect on the 25 August 2017, repealing the *Threatened Species and Conservation Act 1995* (TSC Act), *Native Vegetation Act 2003* and parts of the *National Parks and Wildlife Act 1974*. All threatened entities previously listed under the TSC Act have now been listed under the schedules of the BC Act.

The BC Act outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). The BOS creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity (Office of Environment and Heritage, 2017).

The Biodiversity Assessment Method (BAM) was established as a standard method to implement the aims of the BOS and to address the loss of biodiversity and threatened species. The scheme creates a market framework for the conservation of biodiversity values and the offsetting of development impacts. It also provides the mechanisms to offset impacts of development, clearing or biodiversity certification such that there is no loss of biodiversity values.

It should be noted that BAM 2020 replaced BAM 2017 on the 22 October 2020 to allow key improvements for use in assessing biodiversity values under the BC Act. Transitional arrangements allow BDARs being prepared for existing State significant infrastructure proposals to use BAM 2017 for a period of up to 12 months from the BAM 2020 commencement date (see clause 6.31 (2) of the Biodiversity Conservation Regulation 2017). This report does not rely on these transitional arrangements and has been prepared in accordance with BAM 2020 as directed in the SEARs. A reference in this BDAR to 'the BAM' is a reference to the BAM 2020.

In accordance with section 6.8 (3) of the BC Act, the BAM is to exclude the assessment of impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013*), other than any impacts prescribed by the regulations under section 6.3.

This BDAR has been prepared in accordance with the BAM (2020) and includes prescribed biodiversity matters under the *Biodiversity Conservation Regulation 2017*.

2.2.3 Biosecurity Act 2015

The *Biosecurity Act 2015* provides for risk-based management of biosecurity in NSW. It provides a statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds.

The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

In NSW, 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.

An assessment of biosecurity has been undertaken for the proposal (refer to Chapter 18 of the EIS). Priority weeds and Weeds of National Significance (WONS) recorded in the site are detailed in section 5.4.

2.2.4 Fisheries Management Act 1994

The key objects of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The Act provides for the listing of threatened species, populations and ecological communities, listing of ‘Key Threatening Processes’, and the requirements or otherwise for the preparation of a Species Impact Statement (SIS).

One of the objectives of the FM Act is to 'conserve key fish habitats ' which includes aquatic habitats that are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. To assist in the protection of key fish habitats, the Department of Primary Industries (DPI) has produced the Policy and guidelines for fish habitat conservation and management (DPI Fisheries 2013) and Fish Passage requirements for Waterway Crossings (Fairfull and Witheridge 2003). This policy applies to the following developments, works or activities, each of which can impact on key fish habitat:

- dredging or reclamation
- impeding fish passage
- damaging marine vegetation
- de-snagging.

A detailed aquatic biodiversity impact assessment has been undertaken for the proposal that will specifically address biodiversity values under the FM Act (see Technical Paper 2 – Aquatic biodiversity). This includes consideration of Aquatic Ecology in Environmental Impact Assessment – EIA guide (Smith 2003) and review of the Freshwater threatened species distribution maps.

2.2.5 Local Land Services Act 2013

The LLS Act was introduced to provide direction around programs and services associated with agricultural production, biosecurity, natural resource management and emergency management. It aims to ensure the proper management of natural resources in the social, economic and environmental interests of the State, consistent with the principles of ecologically sustainable development. One of the ways that it intends to achieve this is through the regulation of clearing of native vegetation.

Part 5A of the LLS Act sets out the ways in which the regulating of activities (in connection with land management) would occur and the areas of the State to which it would apply. Section 60A applies Part 5A to rural area including lands associated with the subject land although Section 60O of the LLS Act deals excludes clearing that is authorised under other legislation. Furthermore, under the provisions of section 60O of the LLS Act the clearing of native vegetation is authorised if the clearing was authorised by a State significant infrastructure approval under Division 5.2 of the EP&A Act.

Under the BC Act, section 6.8(3) regulates that the BAM is to exclude the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of LLS Act).

Category 1-exempt land is defined under the LLS Act (Part 5A Division 2 Section 60H) as:

- Land is to be designated as category 1-exempt land if the Environment Agency Head reasonably believes that:
  - the land was cleared of native vegetation as at 1 January 1990, or
  - the land was lawfully cleared of native vegetation between 1 January 1990 and the commencement of this Part.
- Land is to be designated as category 1-exempt land if the Environment Agency Head reasonably believes that:
  - the land contains low conservation value grasslands, or
  - the land contains native vegetation that was identified as regrowth in a property vegetation plan referred to in section 9 (2) (b) of the Native Vegetation Act 2003, or
  - the land is of a kind prescribed by the regulations as category 1-exempt land.

All other rural lands that do not meet category 1 definition form part of the assessment area subject to this BDAR.

The method for determining category 1 – exempt land for this proposal is outlined in section 3.3.2.

3 Methodology

3.1 Study area

The study area for survey was the proposal site. This includes the area that would be used for the construction and operation of the proposal and includes the location of construction worksites and operational infrastructure. It includes all enhancement sites. This is consistent with BAM definition of subject land.

3.2 Biodiversity Assessment Method Calculator (BAM-C)

The following BAM-C cases have been completed for this BDAR:

- BAM-C 00015331/BAAS18097/19/00015332 – Inland Rail I2S BDAR with parent case being 00015331
- BAM-C 00038141/BAAS18097/23/00038142 – Inland Rail I2S – Scattered Trees with parent case being 00038141

Both BAM-C cases were completed for the NSW South Western Slopes IBRA region and Inland Slopes IBRA subregion. Whilst it is acknowledged that the proposal spans two IBRA subregions (being Inland Slopes and Lower Slopes) the entire footprint occurs with a single IBRA region being the NSW South Western Slopes and the majority of impact to native vegetation (77.09ha) occurs in the Inland Slopes IBRA subregion with a negligible impact (0.1ha) occurring within the Lower Slopes IBRA subregion.

The selection of a single IBRA subregion for BMA-C calculation purpose is consistent with guidance provided in Section 2.2.1 of the Biodiversity Assessment Method 2020 Operational Manual – Stage 1 which states the following:

> *If the subject land is located within more than one IBRA subregion, the IBRA subregion selected should be the one within where the largest proportion of impact/area of BSA will occur, with justifications provided in the BAR.*
>
> *For linear-shaped developments that cross multiple IBRA subregions, the assessor must conduct separate habitat suitability assessments (refer to Part 3 of this Manual) for each IBRA subregion. However, vegetation zones may extend across each IBRA subregion. The BAM-C user guide provides instructions. This option can only be applied where the whole project is within a single IBRA region with one or more IBRA subregions. If the proposal crosses an IBRA boundary, a new case will be required in the BAM-C for each new IBRA region.*
>
> *The BAM uses IBRA subregions to:*
>
> - *filter for threatened species likely to use habitat on the subject land*
> - *filter for PCTs that may occur on the subject land*
> - *filter for TECs that occur on the subject land*
> - *identify where ecosystem credits can be sourced to offset the impacts of development*
> - *apply the variation rules under the BOS and as identified in section 6.4(1) of the BC Act.*
>
> *Additionally, the BAM uses IBRA regions to identify where alternative species credits can be sourced in accordance with the variation rules under the BOS (see section 6.4 of the BC Regulation 2017). Regional benchmarks used by the BAM-C are also established at the IBRA/vegetation class scale.*

Given the proposal occurs in a single IBRA region and most of the impact is restricted to a single IBRA subregion the approach taken to use a single IBRA subregion (Inland Slopes) is consistent with Section 2.2.1 of the Biodiversity Assessment Method 2020 Operational Manual – Stage 1.

In addressing potential threatened species habitat suitability assessment criteria for linear development that crosses multiple IBRA subregions, a BAM-C habitat assessment was conducted for the Lower Slopes IBRA subregion and this has resulted in the inclusion of three additional threatened species being *Eleocharis obicis* (A Spike Rush), *Falco hypoleucos* (Grey Falcon) and *Lepidium aschersonii* (Spiny Peppercress). These species are addressed further in Section 6 of this report.

3.3 Native vegetation methodology

3.3.1 Nomenclature

Names of vegetation communities used in this report are based on the PCT used in the NSW BioNet Vegetation Classification Database (NSW Government 2021b).

These PCT names are cross-referenced for equivalency with those used for threatened ecological communities listed under the BC Act and/or the EPBC Act. They are also cross-referenced with previous vegetation mapping (Office of Environment & Heritage 2016) using dominant species and structure of the community.

3.3.2 Native vegetation regulatory mapping – category 1 'exempt lands'

In accordance with section 6.8 (3) of the BC Act, the BAM excludes the assessment of impacts on category 1-exempt land (within the meaning of Part 5A of the Local Land Services Act 2013), other than any impacts prescribed by the regulations under section 6.3.

The LLS Act defines 'category 1-exempt land' as areas of the State to which Part 5A of the LLS Act applies, which are designated as category 1-exempt land on the 'native vegetation regulatory map', prepared and published under the LLS Act.

A transitional 'native vegetation regulatory map' has been published in NSW. However, the transitional 'native vegetation regulatory map' is currently incomplete and no category 1-exempt land has been mapped within NSW. Consequently, category 1-exempt land has not been mapped at the subject land.

Where an area has not been designated on a native vegetation map, section 60F of the LLS Act provides transitional requirements which, broadly speaking, require the relevant categorisation of land to be determined pursuant to section 60H of the LLS Act. Accredited assessors may determine the categorisation of land during this transitional period in accordance with section 60F. The method applied to determine the categorisation is provided below.

In determining the area of category 1–exempt land within the subject land, a desktop land characterisation methodology was developed that builds on the Revised Land Categorisation Process (ARTC 2019), which has previously been agreed with BCD (including by letter from BCD to ARTC dated 15 August 2019), and with reference to the Native Vegetation Regulatory Map: method statement (OEH 2017). In defining the area category 1 – exempt land, an initial analysis of the following spatial datasets has been undertaken:

- Land use: NSW Land Use 2017 v1.2, published June 2020. This dataset is used to classify areas as either cleared/highly disturbed, affected areas of native vegetation and undisturbed or protected areas of native vegetation.
- Woody vegetation: NSW Woody Vegetation Extent 2011, published 2015. This dataset is used to identify areas of extant remnant vegetation and cleared lands/non-woody vegetation.
- Transitional Native Vegetation Regulatory Map, version 3.0, published 26 March 2021.
- Sensitive regulated and vulnerable regulated lands on the Native Vegetation Regulatory Map portal. This dataset is used to identify areas mapped as category 1, 2 and excluded land.
- Zoning: EPI LEP LZN Land Zoning, current as at 23 April 2021.
- Travelling Stock Routes, LPI, supplied by ARTC 30 October 2020.
- State Vegetation Type Map.
- Aerial photos (to determine areas that were/are obviously under cultivation or improved pasture or otherwise disturbed).

Each of these datasets was used to determine whether native vegetation has been significantly disturbed or modified (and therefore cleared) in accordance with 60J of the LLS Act.

The steps in identifying category 1–exempt land included the following:

1. An initial inclusion of all land use classifications 3, 4 and most of 5 as mapped by the Land use: NSW Land Use 2017 v1.2, published June 2020 (consistent with figure 7 of the NVR method statement) (OEH 2017).
2. The land use classification was subsequently overlayed with the Transitional Native Vegetation Regulatory Map (version 3.0, published 26 March 2021). Subsequently, the Draft Native Vegetation Regulatory Map was reviewed (published 5 October 2022). Any areas of the subject land mapped as category 2 lands were excluded.
3. This was followed by the exclusion of areas of extant remnant vegetation as published within the Woody vegetation: NSW Woody Vegetation Extent 2011, (OEH, 2015) which were also included within the category 2 lands.
4. Additional analysis of historical aerial imagery as well as field verification during surveys was used to further classify areas as cleared/highly disturbed, resulting from significant disturbance associated with cultivation and/or improved pasture.
5. Exclusion of areas identified in State Vegetation Mapping areas of as derived grassland of the Critically Endangered White Box – Blakely's Red Gum Woodland community.

The approach is conservative and in accordance with the land categorisation method endorsed previously with BCD for Inland Rail.

The outcome of native vegetation regulatory mapping category 1-exempt land is presented in Figure 3.1. It should be noted that these areas have been identified through a combination of desktop modelling and field survey (where possible).

The categories mapped are as follows:

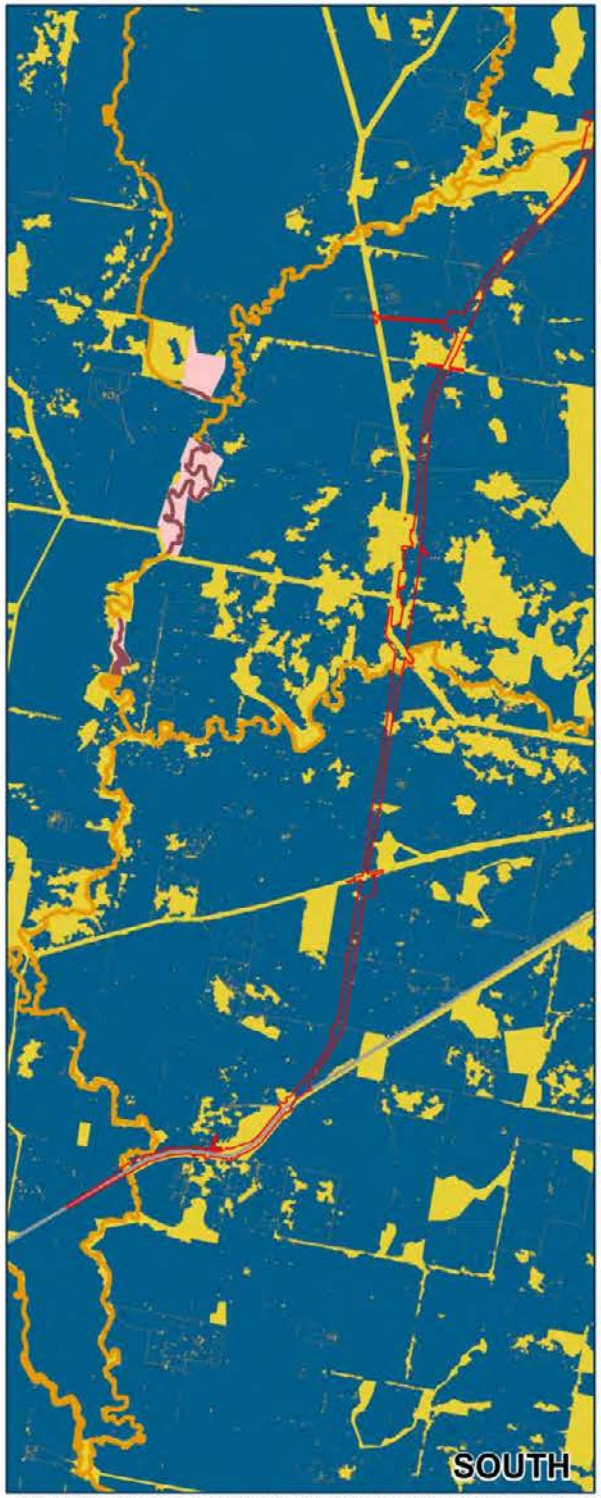
- Category 2 – Remnant Vegetation/Undisturbed (BAM applies, approvals required)
- Potential Category 1, conservatively categorised as Category 2 (BAM applies, approvals required)
- Category 1 (BAM does not apply except for prescribed impacts).

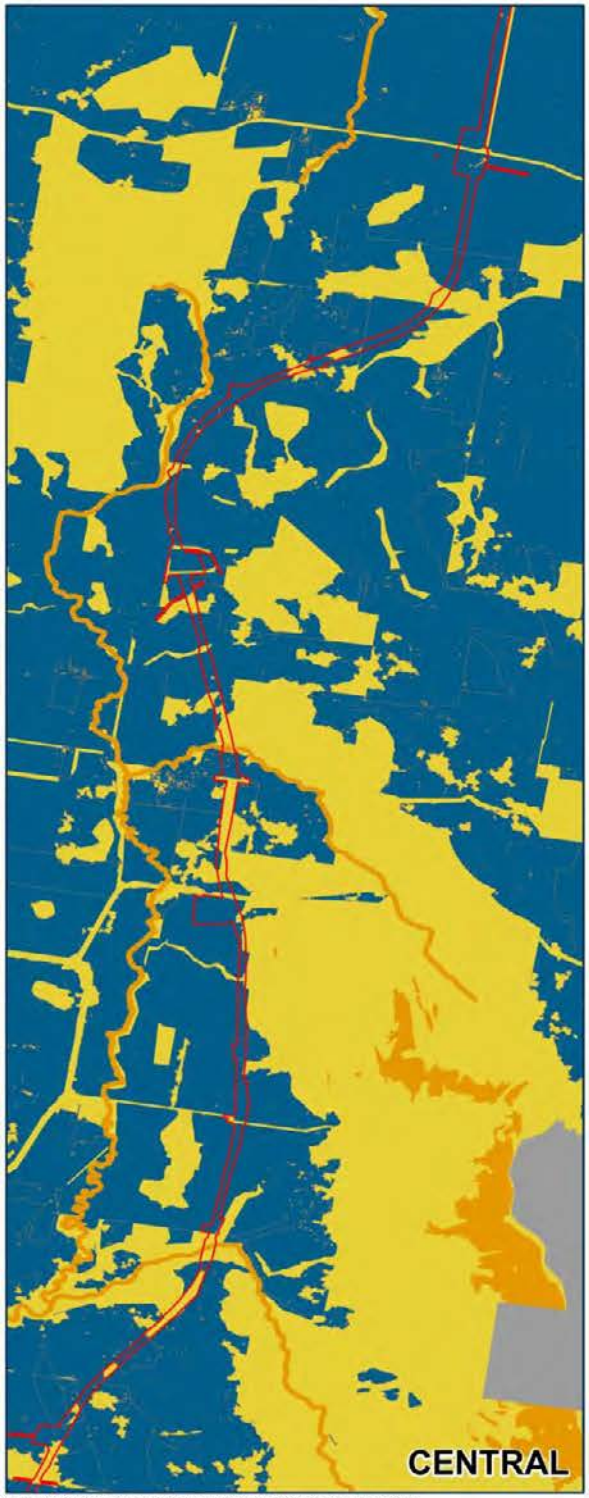
All category 1 lands identified within the subject land are exempt from BAM assessment and are not considered further in this BDAR, except for prescribed impacts (where relevant).

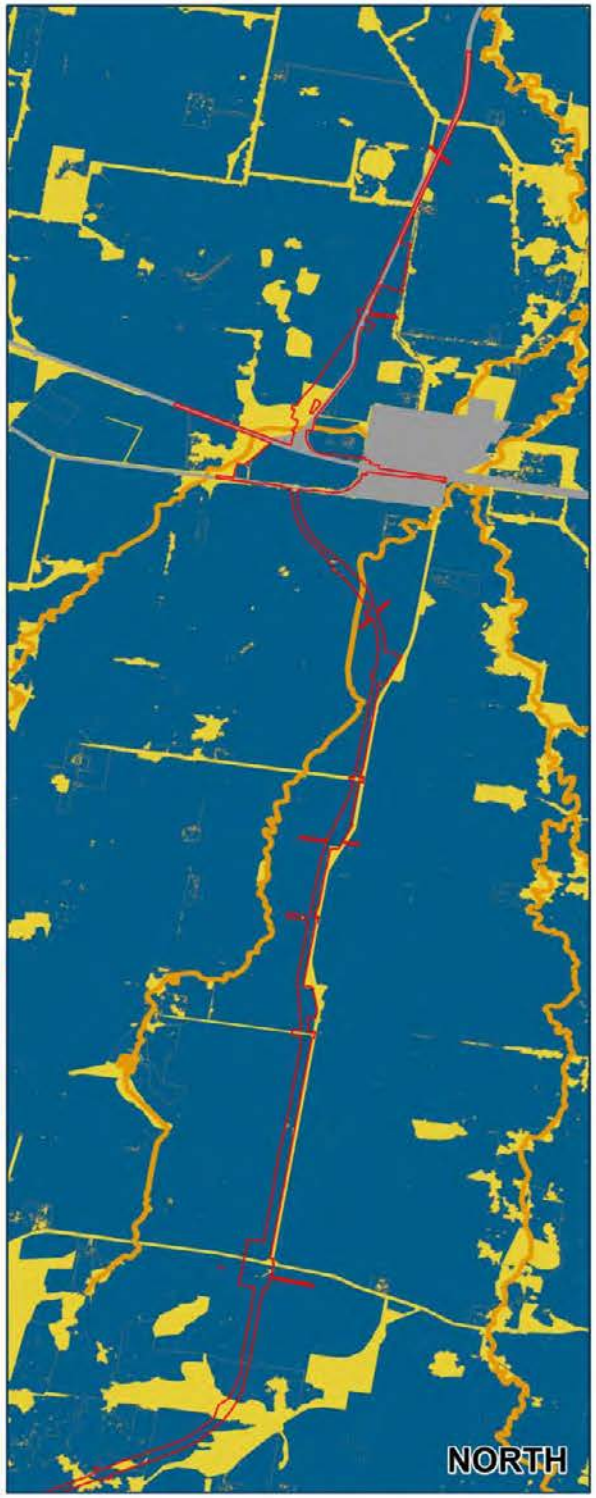
The land categorisation of areas not accessed for survey is presented in Table 3.1, illustrating that 75% of land not accessed has been identified as Category 1 land to which BAM does not apply (except for prescribed impacts). This was primarily through use of the land use mapping correlated by aerial photography.

Table 3.1 Land categorisation of areas not accessed for surveys

Category	Proposal site	Area not accessed
Category 1 land	334.3ha (72%)	81.3ha (75% of total area of land not accessed)
Category 2 land	130.1ha (28%)	27ha (25% of total area of land not accessed)
Grand Total	**464.4ha**	**108.3**







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ILLABO TO STOCKINBINGAL

Figure 3.1 Category 1 lands

Proposal Site

Native Vegetation Regulatory map land categories

- Category 1 - Exempt Land
- Category 2 - Regulated
- Category 2 - Vulnerable Regulated Land
- Category 2 - Sensitve Regulated Land
- Category 2 -Sensitve and Vulnerable Regulated Land Overlap
- Excluded Land

0 0.5 1 Km

Coordinate System: GDA 1994 MGA Zone 55

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Date: 13/11/2023
Author: IRDJV
Data Sources: IRDJV, ARTC, LPI

Paper: A3
Scale: 1:60,000

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3.3.3 Stratification – desktop analysis of vegetation

Mapping of native vegetation extent within the subject land is required under section 4.1 of the BAM with detailed requirements outlined in section 3.2 of the BAM 2020 Operational Manual. Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation. Analysis of the aerial photographs was used to identify areas of disturbance (e.g. buildings, vehicle tracks, dams and power lines), vegetation structure and likely native versus exotic species composition throughout the subject land. This provided an initial definition of vegetation Mapping of native vegetation zones.

3.3.4 Native vegetation survey methods

Native vegetation survey methods were undertaken were undertaken within the subject land during the following dates:

- 2–5 October 2018
- 19–23 November 2018
- 3–7 December 2018
- 13–15 May 2019
- 8–12 July 2019
- 2–4 September 2019
- 29 September–1 October 2020
- 31 January 2021
- 25–28 October 2021
- 25–29 November 2022
- 6–7 December 2022
- 17–24 October 2023.

3.3.4.1 Field verification of vegetation mapping and PCT allocation

Field validation (ground-truthing) of the existing vegetation classifications was completed based on random meander surveys and BAM vegetation integrity plots. Field verification was undertaken to confirm the vegetation structure, dominant and characteristic species of each stratum, landscape position, native diversity, condition, presence of threatened ecological communities and other diagnostic features. Field data was compared and analysed against the regional vegetation mapping key diagnostic species to confirm each vegetation type. Where a vegetation type did not strictly meet all characteristics of a single PCT the PCT which best fit the vegetation on site was allocated. Field verification of the vegetation type, class and formation was used to identify vegetation zones and conditions in accordance with the BAM and NSW BioNet Vegetation Classification Database (NSW Government 2021b). Vegetation (PCT) mapping including the location of vegetation integrity plots are shown in Figure 3.2.

The regional broadscale mapping used to assist in the field verification of PCT types, condition categories and extents included:

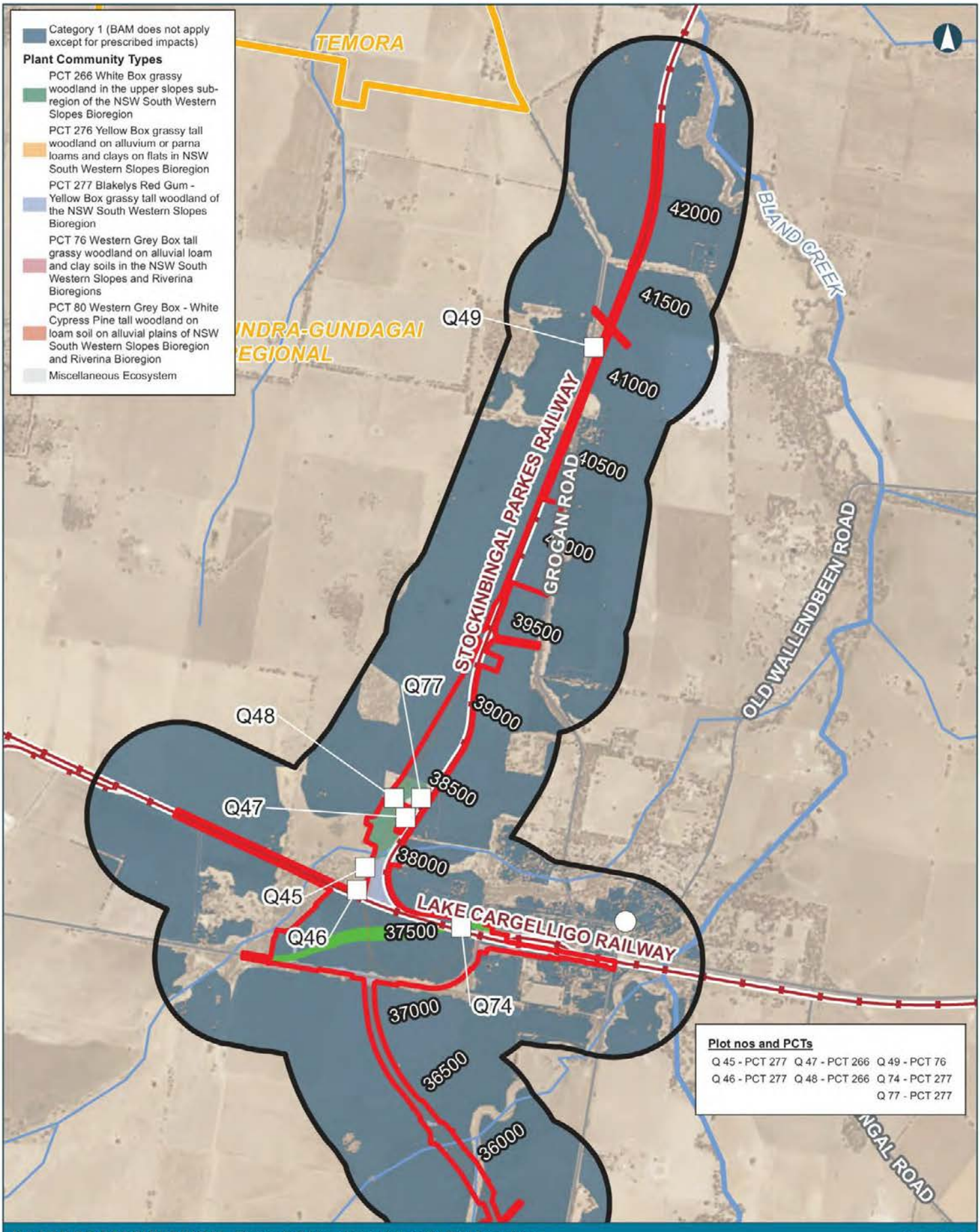
- State Vegetation Type Map: Central West/Lachlan Region Version 1.4. VIS_ID 4468 (DPIE 2020)
- NSW State Vegetation Type Map Release C1.1.M1 (DPE 2022).

Due to restricted land access and changes to design, not all areas of vegetation have been field validated. A total of 386.14ha (78%) of the proposal area was accessed while 107.62ha (28%) was not able to be accessed. A review of the NSW State Vegetation Type Map (SVTM (DPIE 2020 and DPE 2022)), field verified mapping in proximity to each location and aerial imagery was conducted to determine the most appropriate PCT and condition category in areas that were not accessed. Where there were discrepancies in SVTM and nearby field verified mapping, the field verified mapping was extrapolated with the assistance of aerial imagery as it was considered to be a more accurate representation of what is likely to occur due to use of local site specific information and data.

In regards to the native vegetation mapping, ARTC met with the NSW Biodiversity and Conservation Division (BCD) on 1 December 2020, seeking clarification regarding mapping of derived grassland communities, specifically PCTs 250 and 619. BCD confirmed that assessors must not identify native vegetation as derived communities and must instead identify the parent PCT from which the grassland was derived from. This advice is consistent with section 4.2.3 of the BAM 2020.

3.3.4.2 Random meander survey

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by (Cropper 1993), whereby the recorder walks in a random meander throughout the subject land recording dominant and key plant species (e.g. threatened species, noxious weeds), boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness. This survey technique was used to verify vegetation boundaries and stratification from the desktop analysis.



ILLABO TO STOCKINBINGAL Figure 3.2 Vegetation Integrity Plot Locations

MAP 1 OF 7

0 0.2 0.4 0.6 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 15/11/2023 Paper: A3
Author: IRDJV Scale: 1:20,000
Data Sources: IRDJV, ARTC, LPI

Key features of proposal

- New track/track upgrades
- Burley Griffin Way Road realignment
- Proposal Site
- BAM 2020 500m buffer
- Local Government Area
- Existing Rail
- Major Watercourse
- Minor Watercourse
- Vegetation integrity plot locations

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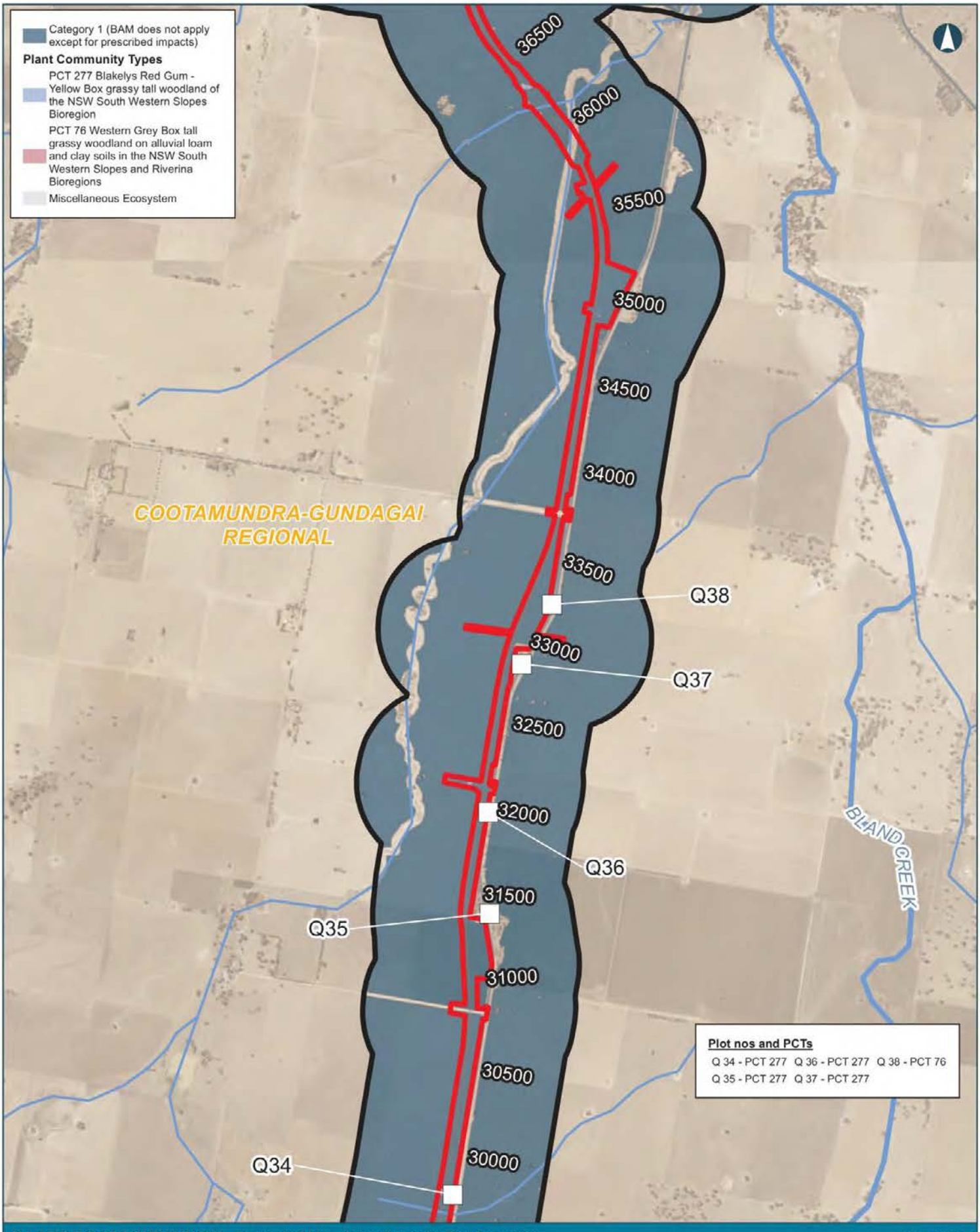

ILLABO TO STOCKINBINGAL Figure 3.2 Vegetation Integrity Plot Locations

MAP 2 OF 7

0 0.2 0.4 0.6 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 15/11/2023 Paper: A3
Author: IRDJV Scale: 1:20,000
Data Sources: IRDJV, ARTC, LPI

Key features of proposal

- New track/track upgrades
- Proposal Site
- BAM 2020 500m buffer
- Local Government Area
- Major Watercourse
- Minor Watercourse
- Vegetation integrity plot locations

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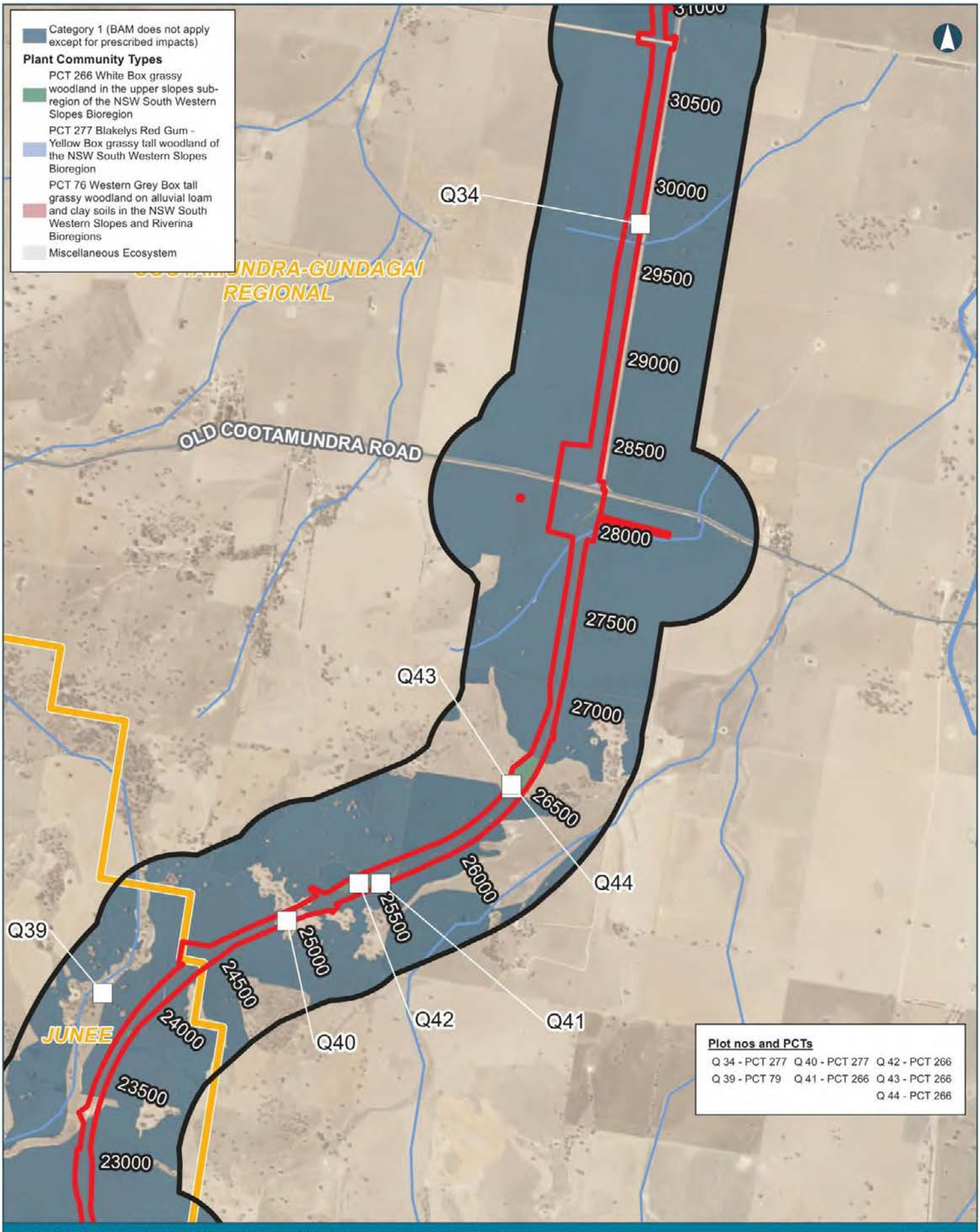

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MAP 3 OF 7

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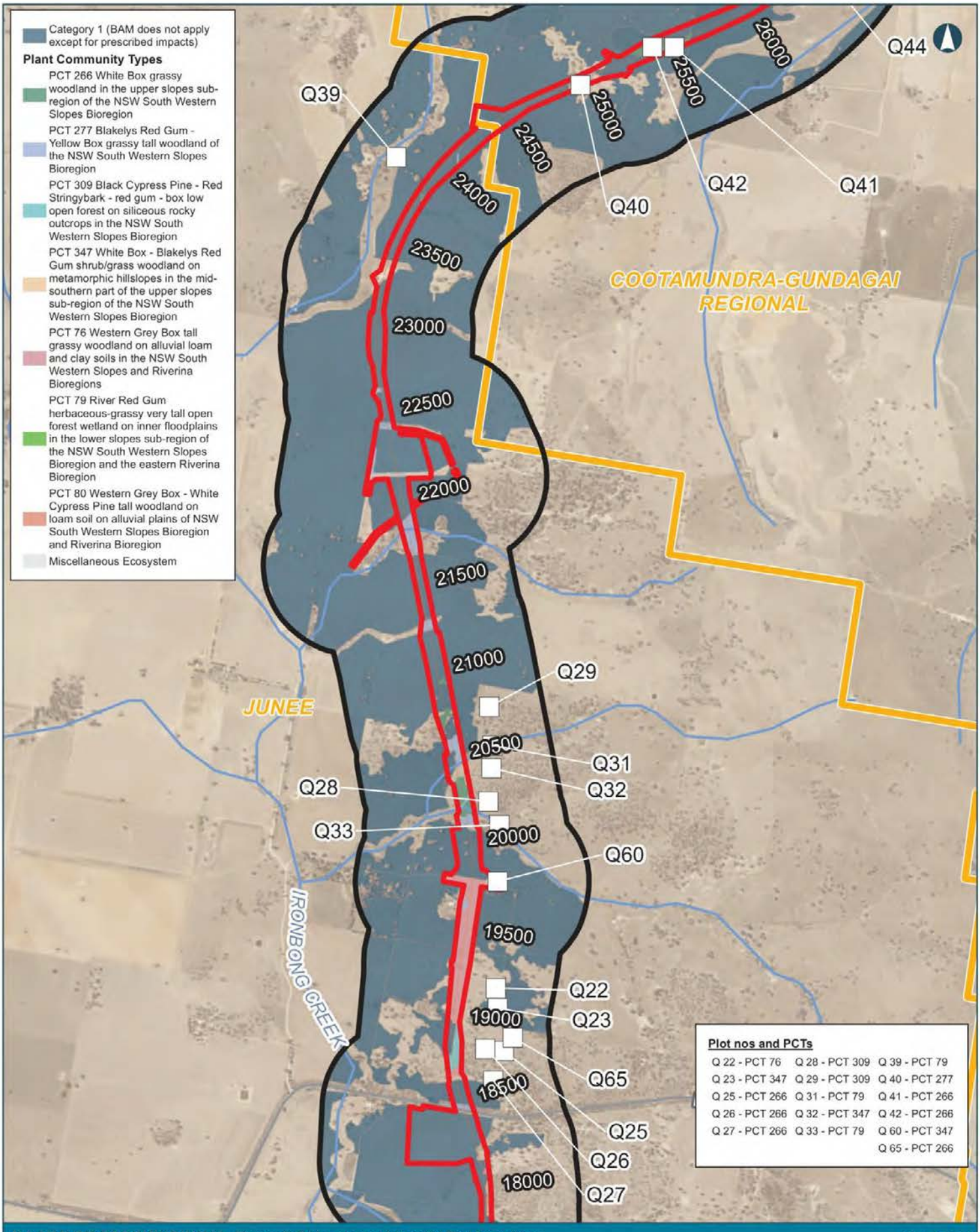

ILLABO TO STOCKINBINGAL Figure 3.2 Vegetation Integrity Plot Locations

MAP 4 OF 7

0 0.2 0.4 0.6 Kilometers

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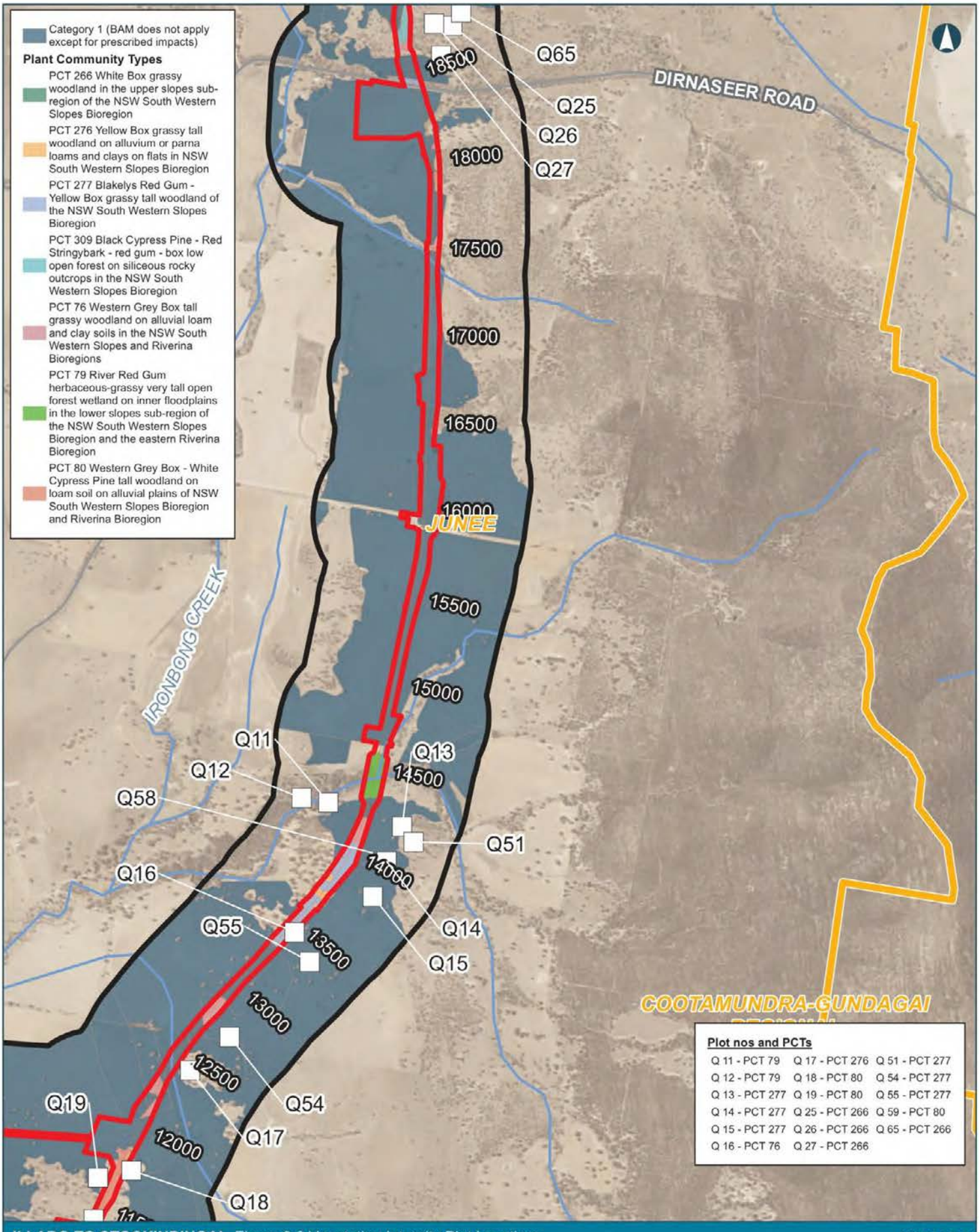

ILLABO TO STOCKINBINGAL Figure 3.2 Vegetation Integrity Plot Locations

MAP 5 OF 7

0 0.2 0.4 0.6 Kilometers

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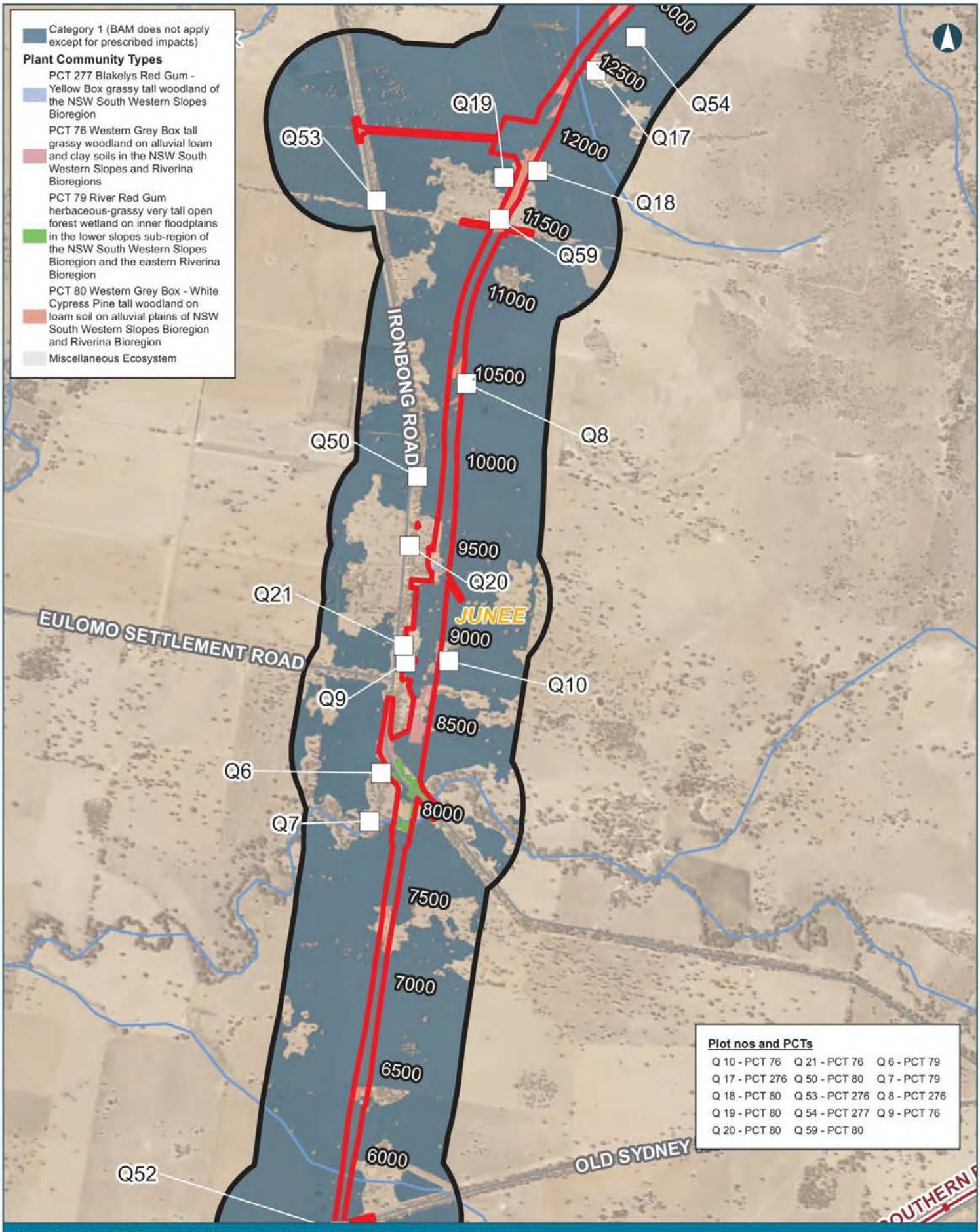

ILLABO TO STOCKINBINGAL Figure 3.2 Vegetation Integrity Plot Locations

MAP 6 OF 7

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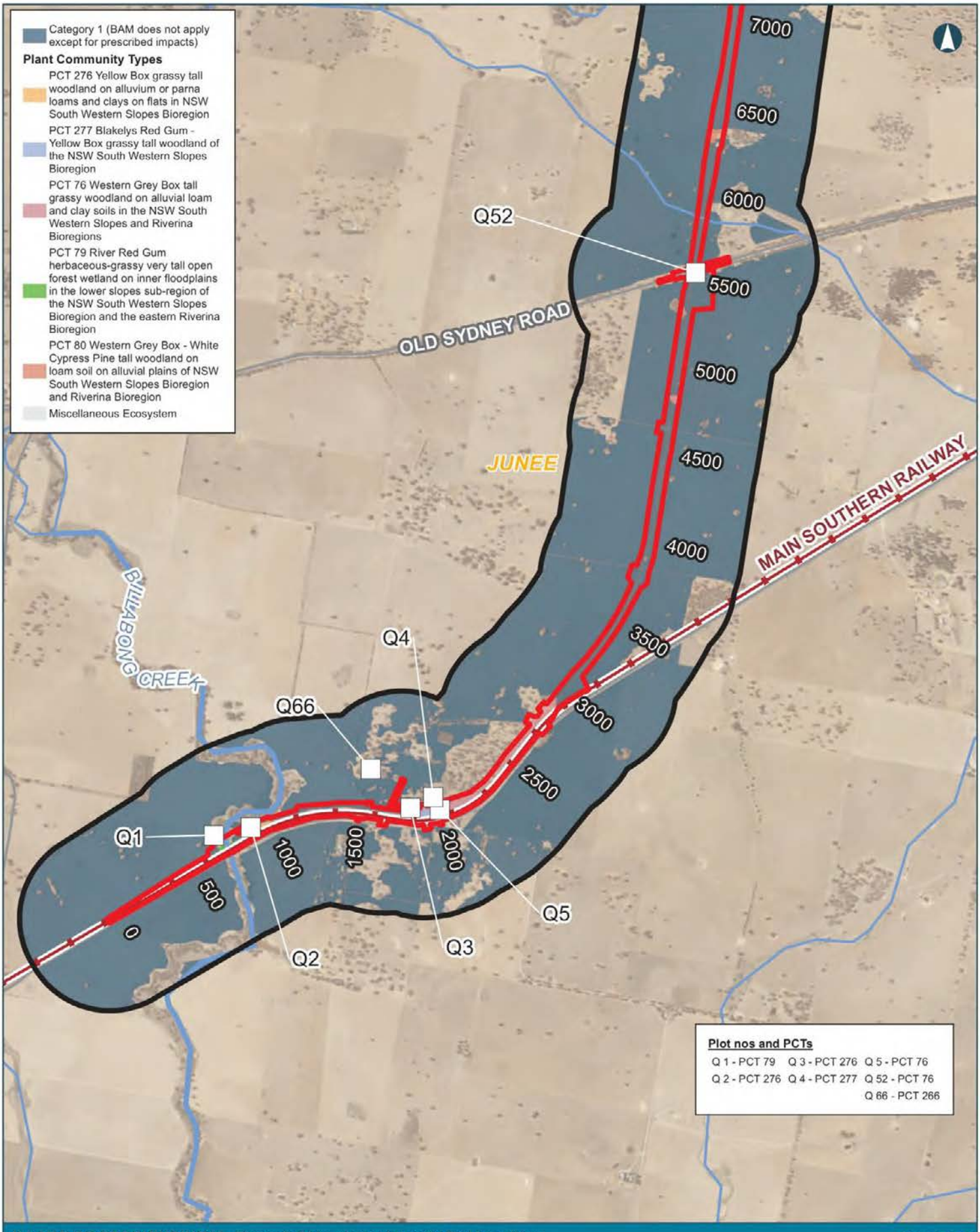

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3.3.4.3 Vegetation integrity plots

Vegetation integrity plot – survey effort

Vegetation integrity plots were undertaken following section 4.3.3 of the Biodiversity Assessment Method ((Department of Planning Industry and Environment 2020a) and as described below and illustrated in Figure 3.2.

A total of 78 vegetation integrity plots were undertaken. Table 3.2 compares the areas of each vegetation zone and number of plots completed and entered into the BAM-C to meet the minimum requirements of the BAM. A total of 59 BAM vegetation integrity plots were used in the BAM-C. The additional plots completed were collected to inform vegetation stratification and mapping. Table 3.2 outlines the co-ordinates, orientations and field verified plant community type for each plot completed. The location of each vegetation integrity plot is shown in Figure 3.2. Full vegetation integrity plot data is presented in Appendix G.

Table 3.2 Minimum number of vegetation integrity plots required per vegetation zone

Zone ID	Vegetation type and zone	Extent within subject land (ha)	Minimum plots required	Number plots completed
VZ1	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)	1	1	3 (Q5, Q49, Q52)
VZ2	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)	12.77	3	3 (Q21, Q22, Q38)
VZ3[1]	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Poor condition)	8.6	3	2 (Q9, Q10)
VZ4[2]	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Low – DNG)	1.65	1	1 (Q16)
VZ5	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)	1.35	1	2 (Q20, Q50)
VZ6	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)	4.96	2	3 (Q18, Q19, Q59)
VZ7	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	2.88	2	4 (Q25, Q26, Q47, Q65)
VZ8	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	4.77	2	3 (Q27, Q43, Q66)
VZ9	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low - DNG)	6.55	3	4 (Q41, Q42, Q44, Q48)
VZ10	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)	0.87	1	2 (Q3, Q53)

Zone ID	Vegetation type and zone	Extent within subject land (ha)	Minimum plots required	Number plots completed
VZ11	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Poor condition, canopy only)	0.62	1	3 (Q2, Q8, Q17)
VZ12	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	11.7	3	5 (Q4, Q13, Q45, Q46, Q51)
VZ13	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	2.23	2	5 (Q34, Q35, Q36, Q37, Q40)
VZ14	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low – DNG)	6.23	3	4 (Q14, Q15, Q54, Q55)
VZ15	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)	1.42	1	2 (Q28, Q29)
VZ16	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	0.14	1	2 (Q23, Q32)
VZ17	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	0.29	1	1 (Q60)
VZ18	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)	5.58	3	5 (Q1, Q11, Q12, Q31, Q33)
VZ19	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Poor condition)	0.8	1	3 (Q6, Q7, Q39)
VZ20	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Planted native vegetation)	2.7	2	2 (Q74, Q77)

(1) Duplicate of Q10 used in BAM-C to meet minimum BAM VI plot requirement in accordance with BAM-C. The total area of this vegetation zone was below threshold requiring three plots until minor readjustment of mapping as part of this report update in response to submissions resulted in 0.1ha above threshold requiring three plots. Q10 was best condition plot for this vegetation zone and was replicated as this best reflected the condition of the vegetation zone.

(2) PCT 76 – Low-DNG was not subject to BAM vegetation integrity plot sampling. This issue arose due to all derived grassland patches originally being allocated to the broad PCT 796 – Derived grassland of the NSW South Western Slopes. PCT 796 was selected under BAM2017, however with the update to BAM 2020, PCT 796 is unable to be selected. The use of this Q16 for VZ4 has been based of the derived grassland vegetation condition being homogenous throughout the local agricultural landscape.

Table 3.3 Location and orientation of BAM vegetation integrity plots

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q1	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)	79_moderate	571287	6149401	145	Inland slopes	No	Occurs within 30m of subject land within the same vegetation patch as occurs within the alignment, and under similar existing management. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land
Q2	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Poor condition)	276_moderate	571498	6149445	310	Inland slopes	Yes	Located within subject land in representative vegetation
Q3	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)	276_moderate	572410	6149556	170	Inland slopes	Yes	Located within subject land in representative vegetation
Q4	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	277_moderate	572540	6149618	260	Inland slopes	No	Occurs within 50m of subject land within the same vegetation patch as occurs within the alignment, and under similar existing management. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land
Q5	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)	76_good	572579	6149547	350	Inland slopes	Yes	Located within subject land in representative vegetation

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q6	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Poor condition)	79_poor	574273	6155224	210	Inland slopes	No	Occurs within 50m of subject land within the same vegetation patch as occurs within the alignment, and under similar existing management. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land
Q7	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Poor condition)	79_poor	574208	6154946	60	Inland slopes	No	Occurs within 140m of subject land within the same vegetation patch as occurs within the alignment, and under similar existing management. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land
Q8	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Poor condition)	276_poor	574761	6157447	80	Inland slopes	No	Occurs within 5m of subject land within the same vegetation patch as occurs within the alignment, and under similar existing management. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land. This vegetation patch is small, dominated by Yellow Box and surrounded by Category 1 mapped land
Q9	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Poor condition)	76_poor	574413	6155853	85	Inland slopes	No	Occurs within 80m of subject land within patch equivalent to that within the alignment (150m south), and under similar existing management. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q10	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Poor condition)	76_poor	574661	6155862	20	Inland slopes	No	Occurs within 60m of subject land within patch equivalent to that within the alignment (160m southwest), and under similar existing management. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land
Q11	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)	79_moderate	576289	6160764	210	Inland slopes	No	Occurs within 190m of subject land within the same vegetation patch as occurs within the alignment, and under similar existing management. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land
Q12	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)	79_moderate	576137	6160789	210	Inland slopes	No	Occurs within 350m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land, and under similar existing management.
Q13	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	277_moderate	576713	6160628	180	Inland slopes	No	Occurs within 180m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q14	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)	277_low	576623	6160426	270	Inland slopes	No	Occurs within 160m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q15	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)	277_low	576546	6160227	200	Inland slopes	No	Occurs within 190m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q16	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)	76_low	576098	6160021	90	Inland slopes	Yes	Located within subject land in representative vegetation. This plot has been used for PCT 76 Low-DNG as it is located in close proximity to this vegetation type and is considered homogeneous in grassland condition.
Q17	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Poor condition)	276_poor	575500	6159232	30	Inland slopes	No	Occurs within 60m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q18	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)	80_poor	575166	6158661	330	Inland slopes	No	Occurs within 30m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q19	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)	80_poor	574975	6158622	60	Inland slopes	No	Occurs within 50m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.
Q20	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)	80_moderate	574437	6156519	335	Inland slopes	No	Occurs within 70m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q21	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)	76_moderate	574401	6155950	180	Inland slopes	No	Occurs within 100m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.
Q22	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)	76_moderate	576955	6165561	260	Inland slopes	No	Occurs within 170m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q23	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	347_moderate	576964	6165446	350	Inland slopes	No	Occurs within 190m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q25	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	266_moderate	576999	6165202	210	Inland slopes	No	Occurs within 230m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q26	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	266_moderate	576894	6165215	165	Inland slopes	No	Occurs within 120m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q27	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	266_poor	576937	6165033	130	Inland slopes	No	Occurs within 140m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q28	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)	309_moderate	576911	6166628	80	Inland slopes	No	Occurs within 90m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.
Q29	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)	309_moderate	576916	6167167	170	Inland slopes	No	Occurs within 200m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q31	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)	79_moderate	576934	6166945	265	Inland slopes	No	Occurs within 170m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.
Q32	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	347_moderate	576929	6166817	240	Inland slopes	No	Occurs within 140m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q33	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)	79_moderate	576975	6166491	260	Inland slopes	No	Occurs within 120m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.
Q34	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	277_poor	579453	6174694	180	Inland slopes	Yes	Located within subject land in representative vegetation
Q35	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	277_poor	579664	6176300	160	Inland slopes	No	Occurs within 50m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q36	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	277_poor	579656	6176878	180	Inland slopes	No	Occurs within 5m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.
Q37	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	277_poor	579847	6177724	180	Inland slopes	No	Occurs within 5m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q38	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)	76_moderate	580020	6178064	0	Inland slopes	No	Occurs within 5m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.
Q39	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Poor condition)	79_poor	576384	6170305	10	Inland slopes	No	Occurs within 200m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q40	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	277_poor	577435	6170718	240	Inland slopes	Yes	Located within subject land in representative vegetation
Q41	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low – DNG)	266_low	577970	6170932	50	Inland slopes	Yes	Located within subject land in representative vegetation
Q42	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low – DNG)	266_low	577846	6170932	100	Inland slopes	Yes	Located within subject land in representative vegetation

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q43	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	266_poor	578717	6171477	105	Inland slopes	Yes	Located within subject land in representative vegetation
Q44	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low – DNG)	266_low	578716	6171496	90	Inland slopes	Yes	Located within subject land in representative vegetation
Q45	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	277_moderate	579490	6182484	80	Inland slopes	No	Occurs within 5m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.
Q46	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	277_moderate	579444	6182353	50	Inland slopes	Yes	Located within subject land in representative vegetation
Q47	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	266_moderate	579723	6182768	220	Inland slopes	No	Occurs within 30m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q48	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low – DNG)	266_low	579656	6182878	130	Inland slopes	Yes	Located within subject land in representative vegetation
Q49	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)	76_good	580796	6185450	345	Lower slopes	No	Occurs within 30m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q50	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)	80_moderate	574483	6156914	95	Inland slopes	No	Occurs within 130m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q51	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	277_moderate	576777	6160538	345	Inland slopes	No	Occurs within 270m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q52	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)	76_good	574038	6152610	60	Inland slopes	Yes	Located within subject land in representative vegetation

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q53	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)	276_moderate	574248	6158490	175	Inland slopes	No	Occurs within 5m of subject land within the same vegetation patch as occurs within the alignment. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to the occurrence within the subject land and is under similar existing management.
Q54	PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)	277_low	575727	6159424	65	Inland slopes	No	Occurs within 150m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q55	PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)	277_low	576185	6159853	350	Inland slopes		Occurs within 160m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q59	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)	80_poor	574948	6158383	116	Inland slopes	Yes	Located within subject land in representative vegetation
Q60	PCT 347 White Box – Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	347_poor	576963	6166168	95	Inland slopes	Yes	Located within subject land in representative vegetation

Plot ID	Plant Community Type (Condition)	Vegetation zone	Easting	Northing	Orientation (degrees)	IBRA subregion	Within Development footprint	Proximity to subject land and plot suitability
Q65	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	266_moderate	577050	6165278	330	Inland slopes	No	Occurs within 300m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q66	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	266_poor	572185	6149778	230	Inland slopes	No	Occurs within 180m of subject land. Located outside of subject land, due to realignment of impact area following vegetation surveys. PCT and vegetation condition within plot is equivalent to other occurrences of the PCT within the subject land and is under similar existing management.
Q74	PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (planted)	277_planted	580040	6182140	354	Inland Slopes	Yes	Located within subject land in representative vegetation. Occurs as a small linear windrow planting dominated by Blakely's Red Gum.
Q77	PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (planted)	277_planted	579811	6182880	16	Inland Slopes	Yes	Located just inside subject land in representative vegetation. Occurs as a small patch of native plantings dominated by Yellow Box and Blakely’s Red Gum.

Vegetation integrity plot – method

Vegetation integrity plots were completed in accordance with BAM. A schematic diagram illustrating the layout of each vegetation integrity plot is provided in Figure 3.3.

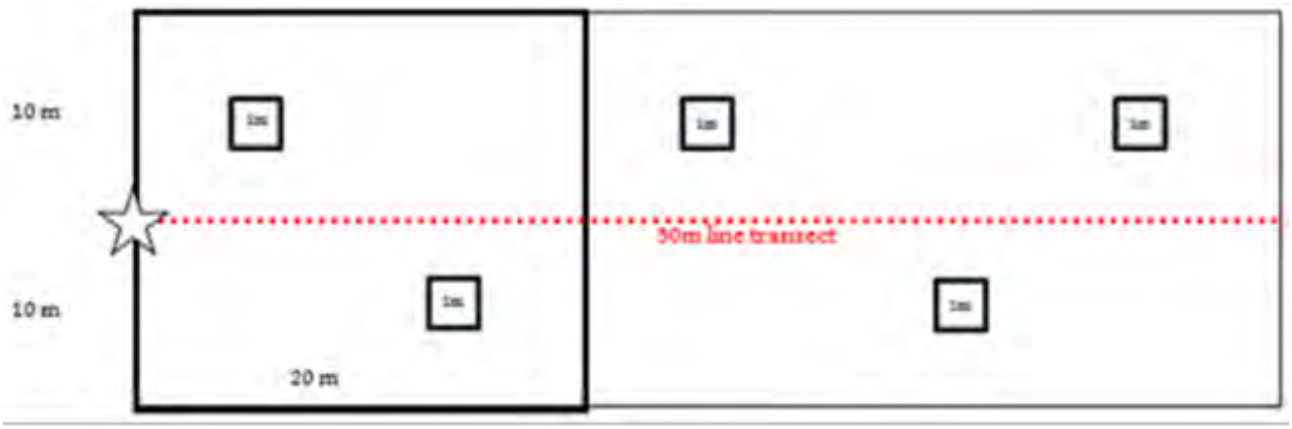

Figure 3.3 Schematic diagram illustrating the layout of the nested 20 x 50m, 20 x 20m and 1 x 1m sub-quadrants used for the assessment of condition attributes at each site

The following site attributes were recorded at each vegetation integrity plot location:

- **Location:** (easting – northing grid type MGA 94, Zone 56).
- **Vegetation structure and dominant species and vegetation condition:** Vegetation structure was recorded through estimates of percentage foliage cover, average height and height range for each vegetation layer.
- **Native and exotic species richness** (within a 400m squared quadrat): This consisted of recording all species by systematically walking through each 20m x 20m plot. The cover and abundance (percentage of area of quadrat covered) of each species was estimated. The growth form, stratum/layer and whether each species was native/exotic/high threat weed was also recorded.
- **Number of trees with hollows** (1000 metre squared quadrat): This was the frequency of hollows within living and dead trees within each 50m x 20m plot. A hollow was only recorded if (a) the entrance could be seen: (b) the estimated entrance width was at least five centimetres across: (c) the hollow appeared to have depth: (d) the hollow was at least one metre above the ground and the (e) the centre of the tree was located within the sampled quadrat.
- **Number of large trees and stem size diversity** (1000m squared quadrat): tree stem size diversity was calculated by measuring the diameter at breast height (DBH) (i.e. 1.3 metre from the ground) of all living trees (greater than five centimetre DBH) within each 50m x 20m plot. For multi-stemmed living trees, only the largest stem was included in the count. Number of large trees was determined by comparing living tree stem DBH against the PCTs benchmarks.
- **Total length of fallen logs** (1000m squared quadrat): This was the cumulative total of logs within each 50m x 20m plot with a diameter of at least 10cm and a length of at least 0.5m.
- **Litter cover:** This comprised estimating the average percentage groundcover of litter (i.e. leaves, seeds, twigs, branchlets and branches with a diameter less than 10cm which is detached from a living plant) from within five 1m x 1m sub-plots spaced evenly either side of the 50m central transect.
- **Evaluation of regeneration:** This was estimated as the presence/absence of overstorey species present at the site that was regenerating (i.e. saplings with a diameter at breast height less than or equal to 5cm).

Prior to establishing plot survey locations, vegetation stratification was undertaken to provide a representative vegetation zone for sampling. Stratification involved marking waypoints and bearings randomly to provide a representative assessment of the vegetation integrity of the vegetation zone in the subject land and establishing the required number of plots at some of these waypoints.

3.3.4.4 Mapping of native vegetation zones

Vegetation was firstly assigned to a PCT and then aligned to a vegetation zone which is defined in the BAM as *'an area of native vegetation…. that is the same PCT and has a similar broad condition state'*. A broad condition state infers that the vegetation has a similar tree cover, shrub cover, ground cover, weediness or combinations of these attributes which determine vegetation condition.

Due to restricted land access and changes to design, not all areas of vegetation have been field validated. Where the condition of vegetation was unable to be verified a review of the SVTM, field verified mapping in proximity to location and aerial imagery was conducted to determine the most appropriate condition category. Where no canopy cover was evident, native vegetation was assigned to Low (derived grassland) condition. Where tree canopy cover was present, the condition of adjoining field verified mapping was applied.

The vegetation broad condition states which were applied to vegetation are summarised in Table 3.4. These factors were defined by using factors such as levels of disturbance, weed invasion and resilience.

Table 3.4 Vegetation broad condition categories

Condition category	Description
Good	Vegetation still retains the species complement and structural characteristics. The vegetation displays resilience to weed invasion due to intact groundcover, shrub and canopy layers. Native species diversity is relatively high. Weeds may exist in this vegetation type but exhibit <5% foliage cover. Vegetation integrity scores ranged from 75–100.
Moderate	Vegetation has retained a native canopy, but the understorey and groundcover layers are generally co-dominated by exotic species that exhibit between 5–45% foliage cover. The mid and low stratums may have been structurally modified because of disturbances such as previous clearing or agricultural practices such as grazing of livestock.
Poor (canopy only)	Vegetation has retained a native canopy, or the canopy cover is showing signs of regeneration. The understorey and groundcover layers are generally dominated or co-dominated by exotic species that exhibit between 46–70% foliage cover. Native species diversity is generally relatively low, and the mid and low stratums have been structurally modified due to weed incursions, clearing, agricultural practises such as cropping or direct seeding.
Low (derived grassland)	Native vegetation generally lacking a native over-storey and mid stratum. For this proposal it includes PCTs that have changed to an alternative stable state as a consequence of land management practices since European settlement. Over-storey structural components of derived communities have either entirely been removed or are severely reduced (i.e. derived native grasslands). Derived grassland was assigned to patches of vegetation where native perennial cover was greater than 50%.

Note: These categories have been used to define vegetation zones in Chapter 5.

3.3.4.5 Planted native vegetation mapping

Planted vegetation was determined through visual inspection and included looking for evidence such as planting in rows, use of tree guards or stakes and through species selection (i.e. species either exotic or non-indigenous to the area).

Planted native vegetation was assigned to best-fit PCTs based on landscape position and nearest verified adjoining PCT (where possible) as advised by NSW BCD and assessed using the BAM. However, in some cases this was not possible where the planted species does not align to any PCT, e.g. species that do not naturally occur.

Planted native vegetation was recorded as rows of native canopy species such as *Eucalyptus microcarpa* (Western Grey Box), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus blakelyi* (Blakely's Red Gum) and *Eucalyptus sideroxylon* (Mugga Ironbark).

Planted vegetation was assigned to two separate types being:

- PCT 277 – native plantings
- Miscellaneous ecosystem – ornamental plantings.

When applying these planted vegetation types, the decision making key under Appendix D.1 of the BAM streamlined assessment module – planted native vegetation was applied.

For patches of planted vegetation that occurred containing a mosaic of planted and remnant native vegetation these patches were assigned to most reasonably associated PCT being PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion. This approach is consistent with the treatment of such planted vegetation in accordance with Appendix D.1 (1) of the BAM streamlined assessment module – planted native vegetation. Areas of planted native vegetation mapped:

- were not planted under an existing conservation obligation (State Government of NSW and Biodiversity Conservation Trust, 2023)
- did not consist of planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat (as outlined in Appendix D of BAM)
- were assessed for threatened species habitat (Appendix D.2 of BAM) because planting was either:
  - undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation
  - planted for functional, aesthetic, horticultural or plantation forestry purposes (predominantly des windbreaks in agricultural landscapes and roadside plantings.

Areas of planted native vegetation were surveyed and assessed for the suitability for use by threatened species, as outlined in section 3.4. Measures to minimise impacts to threatened species that may utilise these areas are outlined in Chapter 11.

3.3.4.6 Scattered trees assessment

The definition for Scattered Trees is outlined in Appendix B of the BAM. Vegetation meets the definition of scattered trees if:

- species in tree growth form group have a percent foliage cover that is less than 25% of the benchmark for tree cover for the most likely plant community type and are on category 2-regulated land and surrounded by category 1-exempt land on the Native Vegetation Regulatory Map under the LLS Act, or
- have a DBH of greater than or equal to 5cm and are located more than 50m away from any living tree that is greater than or equal to 5cm DBH, and the land between the scattered trees is comprised of vegetation that are all ground cover species on the widely cultivated native species list, or exotic species or human-made surfaces or bare ground, or
- are three or fewer trees that have a DBH of greater than or equal to 5cm and are within a distance of 50m of each other, that in turn, are greater than 50m away from the nearest living tree that is greater than or equal to 5cm DBH, and the land between the scattered trees is comprised of vegetation that are all ground cover species on the widely cultivated native species list, or exotic species or human-made surfaces or bare ground.

During field surveys scattered trees were visually inspected and measured to collect the following data:

- the genus and species of each Scattered Tree
- DBH
- presence of hollows
- presence of mistletoes
- surrounding plant community types
- any sightings or evidence of threatened species using the scattered trees.

PCTs were assigned to each scattered tree based on the species and proximity to identified PCT zones in the subject land or the dominant canopy species per the PCT description. The large tree benchmark from the assigned PCT was used to inform the Scattered tree class for each tree. Scattered tree classes are:

- **Class 1:** scattered trees that are ≤20cm DBH and are trees that meet the definition of trees with negligible biodiversity.
- **Class 2:** scattered trees that are ≥20cm DBH and less than the large tree benchmark for the most likely plant community type.
- **Class 3:** scattered trees that are greater than or equal to the large tree benchmark for the most likely plant community type.

The DBH of the tree was assessed and assigned a scattered tree class relevant to the large tree benchmark.

Due to restricted land access, not all scattered trees have been field validated. Where DBH was unable to be measured due to access restrictions a precautionary approach was adopted and scattered trees were assigned to Class 3. This approach was adopted for the presence of hollows whereby the presence of hollows was assumed for scattered trees unable to be accessed. In assigned PCTs, where individual tree species were not able to be determined due to restricted site access these trees have been assigned to PCTs associated with TEC and >90% cleared trading class.

Threatened species that would use the scattered trees are assumed to be the same threatened species that are returned by the BAM Calculator for the vegetation zones. Where targeted fauna surveys were required by the BAM Calculations, scattered trees were also included in the surveys.

3.4 Threatened species methodology

3.4.1 Nomenclature

Names of plants used in this document follow PlantNet (Royal Botanic Gardens and Domain Trust 2021). Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided. The names of introduced species are denoted with an asterisk (*).

For threatened species of plants, the names used in the BCD Threatened Species Website are also provided in Appendix C where these differ from the names used in the PlantNet database.

Names of vertebrate fauna follow the Australian Faunal Directory as maintained by the Department of Agriculture, Water and Environment (2021a). Common names are used in the report for species of animal. Both common and scientific names are provided in the appendices.

For threatened species of animals, the names used in the BioNet Threatened Species Website and NSW Department Primary Industries are provided.

3.4.2 Assessing habitat suitability for threatened species

In the BAM, threatened species are assessed as either ecosystem credit species, species credit species or a combination of the two (referred to as 'dual credit species'). The BAM defines these threatened species categories as follows:

- **ecosystem credit species (predicted)**: are those threatened species where the likelihood of occurrence and/or elements of its habitat can be confidently predicted by vegetation surrogates and landscape features
- **species credit species (candidate)**: are those threatened species that cannot be reliably predicted by habitat surrogates
- **dual credit species**: are those threatened species where part of the habitat is assessed as an ecosystem credit (e.g. foraging habitat) and part as a species credit (e.g. breeding habitat). In this report, dual credit species will be included in both ecosystem and species credit assessment.

The BAM sets out six steps for assessing habitat suitability for threatened species (ecosystem credit species and species credit species) in Section 5.2 of BAM. This includes identifying threatened species potentially occurring in the locality through desktop review, assessment of habitat and geographic constraints and likelihood of occurrence assessment to identify candidate species for targeted surveys. These methods are outlined in more detail in sections below.

3.4.2.1 Desktop review

The aim of the background research was to identify threatened flora and fauna species, populations and ecological communities, Commonwealth listed Migratory species or critical habitat recorded previously or predicted to occur in the locality.

This allowed for known habitat characteristics to be compared with those present within the subject land to determine the likelihood of occurrence of each species or populations. These results informed the identification of appropriate field survey effort and the groups likely to occur.

Records of threatened species, populations and ecological communities known or predicted to occur in the locality of the subject land were obtained from a range of databases as detailed in Table 3.5. These databases provide additional information on threatened biodiversity as required under section 6.1 of the BAM.

Table 3.5 Threatened species database searches

Database	Search date	Area searched	Reference
Bionet Atlas of NSW Wildlife	01/09/2023	30km x 30km centred on the subject land	(NSW Government 2023)
PlantNet – NSW flora online	01/09/2023	Cootamundra LGA Junee LGA	(Royal Botanic Gardens and Domain Trust 2023)
Register of Declared Areas of Outstanding Biodiversity Value	01/09/2023	N/A	(Department of Planning Industry and Environment 2023)
Protected Matters Search Tool	01/09/2023	25km buffer around subject land	(Department of Climate Change, Energy, the Environment and Water 2023a)

Other relevant documents, existing broad-scale vegetation mapping, aerial photographs including historic aerial photos and maps reviewed as part of this study are referenced throughout the report where appropriate.

All species identified in the database searches (Appendix C and D) were assessed for potential inclusion as species and/or ecosystem credit species under the BC Act or assessment under EPBC Act. This included:

- exclusions of any species credit species identified in the BAM-C based on geographic limitations or habitat constraints as identified in BioNet threatened species database, microhabitats or vagrancy
- inclusion of species to BAM-C assessment that were identified from databases and recorded or considered to have potential habitat within the subject land
- assessment of EPBC Act listed species and considered to have potential habitat and likely to occur within the subject land.

Field surveys were then undertaken:

- to confirm habitat suitability for candidate species and map areas of potential habitat
- including targeted surveys for candidate (species credit) species.

Survey methods are detailed below in section 3.4.3 and 3.4.4.

As noted in the guidance on Changes to the Biodiversity Assessment Method from 2017 to 2020 (DPE 2020), there is no change to BAR required to update from BAM 2017 to 2020 on Threatened species survey requirements. The fundamental requirements of data collection were not changed with BAM 2020 and all surveys and data collected was suitable to meet requirements of BAM 2020. The new survey guidelines did provide additional possible methods of survey (e.g. two-phase grid system for large projects) while still accepting parallel transects (as undertaken for I2S). Additional surveys were undertaken for the project in 2020 and 2021 in non-drought conditions and for newly listed species (e.g. Key's Matchstick Grasshopper).

3.4.3 Threatened flora surveys

Results of the threatened species database searches identified 44 threatened plant species listed under the BC Act as being known to occur or considered likely to occur within the subject land. A full list of species considered, their habitat/geographic restrictions, and potential habitat within subject land is provided in Appendix C.

Targeted surveys were completed for these candidate flora species. Several candidate flora species have seasonal survey requirements due to difficulty of detection except at specific times of the year, during its flowering period.

Random meander surveys were undertaken throughout the subject land to map boundaries of vegetation zones and identify species occurring in each vegetation zone. In addition to random meander surveys, parallel transects were undertaken targeting threatened species of plant (Department of Planning Industry and Environment 2020d). Parallel transects were spaced at 10-20m distances based on open vegetation type and were conducted with two field botanists.

Where restricted land access has limited field survey, these areas have been assessed based on sampling of adjacent representative PCT and condition class vegetation. In addition to surveys of accessible areas of the subject land, surveys extended to areas proximate to the subject land to determine the status of threatened species locally and to provide more information on the landscape's potential for supporting threatened species. This included survey within roadside reserves as these provide important habitat in a cleared agricultural landscape and edges of roads and other disturbed areas as some flora are adapted to disturbance.

The BAM outlines survey requirements for threatened species including requirements for seasonal surveys to maximize the likelihood of recording a species if present. Surveys for threatened flora were undertaken over nine survey sessions totalling approximately 620 person hours as outlined in Table 3.6 and illustrated in Figure 3.4.

Table 3.6 Survey timing for threatened flora (species credit) species

Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing	Survey effort estimate (total)
Acacia ausfeldii	Ausfeld's Wattle	V	–	Parallel transects in PCT 266; PCT 277 & PCT 276 (moderate condition) Vegetation integrity plots (Q3, Q4, Q13, Q17, Q25, Q26, Q45, Q46, Q47, Q51, Q53, Q56, Q57, Q58, Q65) Habitat assessment Random meanders	Any (flowering Aug-Oct)	2-5 October 2018 3-7 December 2018 13-15 May 2019 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021 17-24 October 2023	377 person hours
Ammobium craspedioides	Yass Daisy	V	V	Parallel transects in PCT 266; PCT 277 & PCT 276 (moderate condition) Vegetation integrity plots (Q3, Q4, Q13, Q17, Q25, Q26, Q45, Q46, Q47, Q51, Q53, Q56, Q57, Q58, Q65) Habitat assessment Random meanders	Sept – November	2-5 October 2018 2-4 September 2019 29-30 September 2020 1 October 2020 25-28 October 2021 17-24 October 2023	283 person hours
Austrostipa wakoolica	A spear-grass	E	E	Parallel transects in PCT 76 & PCT 80 (good and moderate condition) Vegetation integrity plots (Q5, Q10, Q20, Q21, Q22, Q38, Q49, Q50, Q52) Habitat assessment Random meanders	September to December	2-5 October 2018 3-7 December 2018 2-4 September 2019 29-30 September 2020 1 October 2020 25-28 October 2021 17-24 October 2023	183 person hours
Caladenia arenaria	Sand-hill Spider Orchid	E SAII	E	Parallel transects in PCT 76 (good and moderate condition) Vegetation integrity plots (Q5, Q10, Q21, Q22, Q38, Q49, Q52) Habitat assessment Random meanders	August – October	2-5 October 2018 29-30 September 2020 1 October 2020 25-28 October 2021 17-24 October 2023	117 person hours

Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing	Survey effort estimate (total)
Caladenia concolor	Crimson Spider Orchid	E SAII	V	Parallel transects in PCT 347 (moderate condition) Vegetation integrity plots (Q23, Q32) Habitat assessment Random meanders	August – October	2-5 October 2018 29-30 September 2020 1 October 2020 25-28 October 2021 17-24 October 2023	4 person hours
Cullen parvum	Small Scurf-pea	E	–	Parallel transects in PCT 347, PCT 277 & PCT 79 (moderate condition) Vegetation integrity plots (Q1, Q4, Q11, Q12, Q13, Q23, Q31, Q32, Q33, Q39, Q45, Q46, Q51, Q56, Q57, Q58) Habitat assessment Random meanders	December to February	3-7 December 2018 31 January 2021	148 person hours
Diuris tricolor	Pine Donkey Orchid	V	–	Parallel transects in PCT 76, PCT 80 & PCT 347 (good and moderate condition) Vegetation Integrity Plots (Q5, Q10, Q20, Q21, Q22, Q23, Q32, Q38, Q49, Q50, Q52, Q60) Habitat assessment Random meanders	September – October	2-5 October 2018 2-4 September 2019 29-30 September 2020 1 October 2020 25-28 October 2021 17-24 October 2023	163 person hours
Eleocharis obicis	Spike-rush	V	V	Parallel transects in PCT 76 (Lower Slopes IBRA subregion) Vegetation Integrity Plots (Q49) Habitat assessment Random meanders	October-November	2-5 October 2018, 25-28 October 2021 17-24 October 2023	59 person hours
Euphrasia arguta	–	CE SAII	CE	Parallel transects in PCT 266 & PCT 276 (moderate condition) Vegetation Integrity Plots (Q3, Q17, Q25, Q26, Q47, Q53, Q65) Habitat assessment Random meanders	None specified (flowering January to May)	2-5 October 2018, 3-7 December 2018 13-15 May 2019 31 January 2021 25-28 October 2021 17-24 October 2023	322 person hours

Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing	Survey effort estimate (total)
Grevillea wilkinsonii	Tumut Grevillea	CE SAII	E	Parallel transects in PCT 266 Vegetation Integrity Plots (Q25, Q26, Q27, Q43, Q47, Q65, Q66) Habitat assessment Random meanders	October	2-5 October 2018, 25-28 October 2021 17-24 October 2023 (a large spreading shrub- this species is not a cryptic and would also have been observable during other flora surveys, if present)	51 person hours (in October) (207 in all months)
Indigofera efoliata	Leafless Indigo	E SAII	E	Parallel transects in PCT 76 (good and moderate condition) Vegetation Integrity Plots (Q5, Q10, Q21, Q22, Q38, Q49, Q52) Habitat assessment Random meanders	All year	2-5 October 2018 3-7 December 2018 13-15 May 2019 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021 17-24 October 2023	146 person hours
Lepidium aschersonii	Spiny Peppercress	V	V	Parallel transects in PCT 76 (good and moderate condition) Vegetation Integrity Plots (Q5, Q10, Q21, Q22, Q38, Q49, Q52) Habitat assessment Random meanders	November to April	2-5 October 2018 3-7 December 2018 13-15 May 2019 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021	146 person hours

Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing	Survey effort estimate (total)
Leucochrysum albicans var. tricolor	Hoary Sunray	E	E	Parallel transects in PCT 347 Vegetation Integrity Plots (Q23, Q32, Q60) Habitat assessment Random meanders	September to April	2-5 October 2018 3-7 December 2018 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021	9 person hours
Prasophyllum petilum[4]	Tarengo Leek Orchid	E	E	Parallel transects in PCT 347, PCT 277, PCT 276 (moderate condition) Vegetation Integrity Plots (Q3, Q4, Q13, Q17, Q23, Q32, Q45, Q46, Q51, Q53, Q56, Q57, Q58) Habitat assessment Random meanders	October to December	2-5 October 2018 3-7 December 2018 2-4 September 2019 1 October 2020 25-28 October 2021 17-24 October 2023	186 person hours
Prasophyllum sp. *Wybong*[4]	Prasophyllum Wybong	– SAII	CE	Parallel transects in PCT 266, PCT 276, 277 (moderate condition) Vegetation Integrity Plots (Q25, Q26, Q47, Q65, Q3, Q53) Habitat assessment Random meanders	September to October	2-5 October 2018 2-4 September 2019 1 October 2020 25-28 October 2021 17-24 October 2023	38 person hours
Pultenaea humilis	Dwarf Bush-pea	V	–	Parallel transects in PCT 347 (moderate condition) Vegetation Integrity Plots (Q23, Q32) Habitat assessment Random meanders	October to December	2-5 October 2018 3-7 December 2018 2-4 September 2019 1 October 2020 25-28 October 2021	12 person hours

Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing	Survey effort estimate (total)
Senecio garlandii	Woolly Ragwort	V	–	Parallel transects in PCT 347 (moderate condition) Vegetation Integrity Plots (Q23, Q32) Habitat assessment Random meanders	All year	2-5 October 2018 3-7 December 2018 13-15 May 2019 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021	20 person hours
Swainsona murrayana	Slender Darling Pea	V	V	Parallel transects in PCT 76, PCT 80 (good and moderate condition) Vegetation Integrity Plots (Q5, Q10, Q20, Q21, Q22, Q38, Q49, Q50, Q52) Habitat assessment Random meanders	September	2-4 September 2019 29-30 September 2020 17-24 October 2023	87 person hours
Swainsona recta	Small Purple Pea	E	E	Parallel transects in PCT 277, PCT 76; PCT 266; PCT 276 (good and moderate condition) Vegetation Integrity Plots (Q3, Q4, Q5, Q10, Q13, Q17, Q21, Q22, Q25, Q26, Q38, Q45, Q46, Q47, Q49, Q51, Q52, Q53, Q56, Q57, Q58, Q65) Habitat assessment Random meanders	September – November	2-5 October 2018 2-4 September 2019 29-30 September 2020 1 October 2020 25-28 October 2021 17-24 October 2023	300 person hours
Swainsona sericea	Silky Swainson-pea	V	–	Parallel transects in PCT 76 (good and moderate condition) Vegetation Integrity Plots (Q5, Q10, Q21, Q22, Q38, Q49, Q52) Habitat assessment Random meanders	September – February	2-5 October 2018 3-7 December 2018 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021 17-24 October 2023	177 person hours

Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing	Survey effort estimate (total)
Tylophora linearis	–	V	E	Parallel transects in PCT 347 (moderate condition) Vegetation Integrity Plots (Q23, Q32) Habitat assessment Random meanders	September – May	2-5 October 2018 3-7 December 2018 13-15 May 2019 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021	12 person hours

(1) Listed as E- Endangered; V – Vulnerable; CE – Critically Endangered, SAII – Serious and Irreversible Impact species under the BC Act, – not listed

(2) Listed as E- Endangered; V – Vulnerable; CE – Critically Endangered under the EPBC Act, – not listed

(3) Survey requirements based on BAM calculator survey requirements and cross-referenced with BioNet database

(4) The NSW Herbarium considers *Prasophyllum* sp. Wybong (C. Phelps ORG5269) and *Prasophyllum petilum* to be synonyms (i.e. the same species).

ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

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Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

Key features of proposal

- New track/track upgrades
- Proposal Site
- BAM 2020 500m buffer
- Local Government
- Major Watercourse
- Minor Watercourse
- Existing Rail
- Category 1 (BAM does not apply except for prescribed impacts)

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ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 2 OF 14

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Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

Key features of proposal

- New track/track upgrades
- Proposal Site
- BAM 2020 500m buffer
- Land not surveyed
- Burley Griffin Way Road realignment
- Local Government Area
- Minor Watercourse
- Existing Rail
- Category 1 (BAM does not apply except for prescribed impacts)

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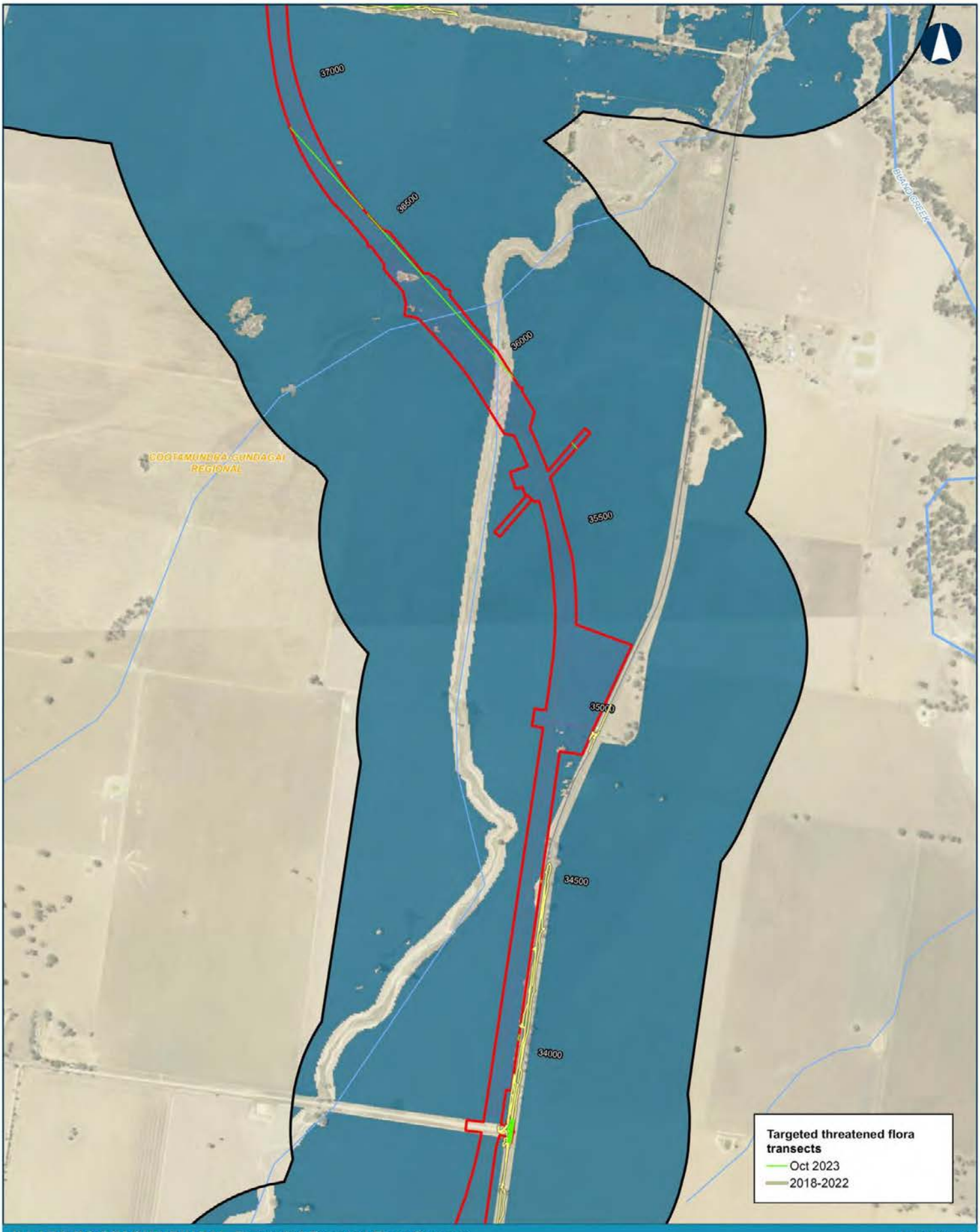

ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

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Paper: A3
Scale: 1:10,000

Key features of proposal

- New track/track upgrades
- Proposal Site
- BAM 2020 500m buffer
- Land not surveyed
- Local Government Area
- Major Watercourse
- Minor Watercourse
- Category 1 (BAM does not apply except for prescribed impacts)

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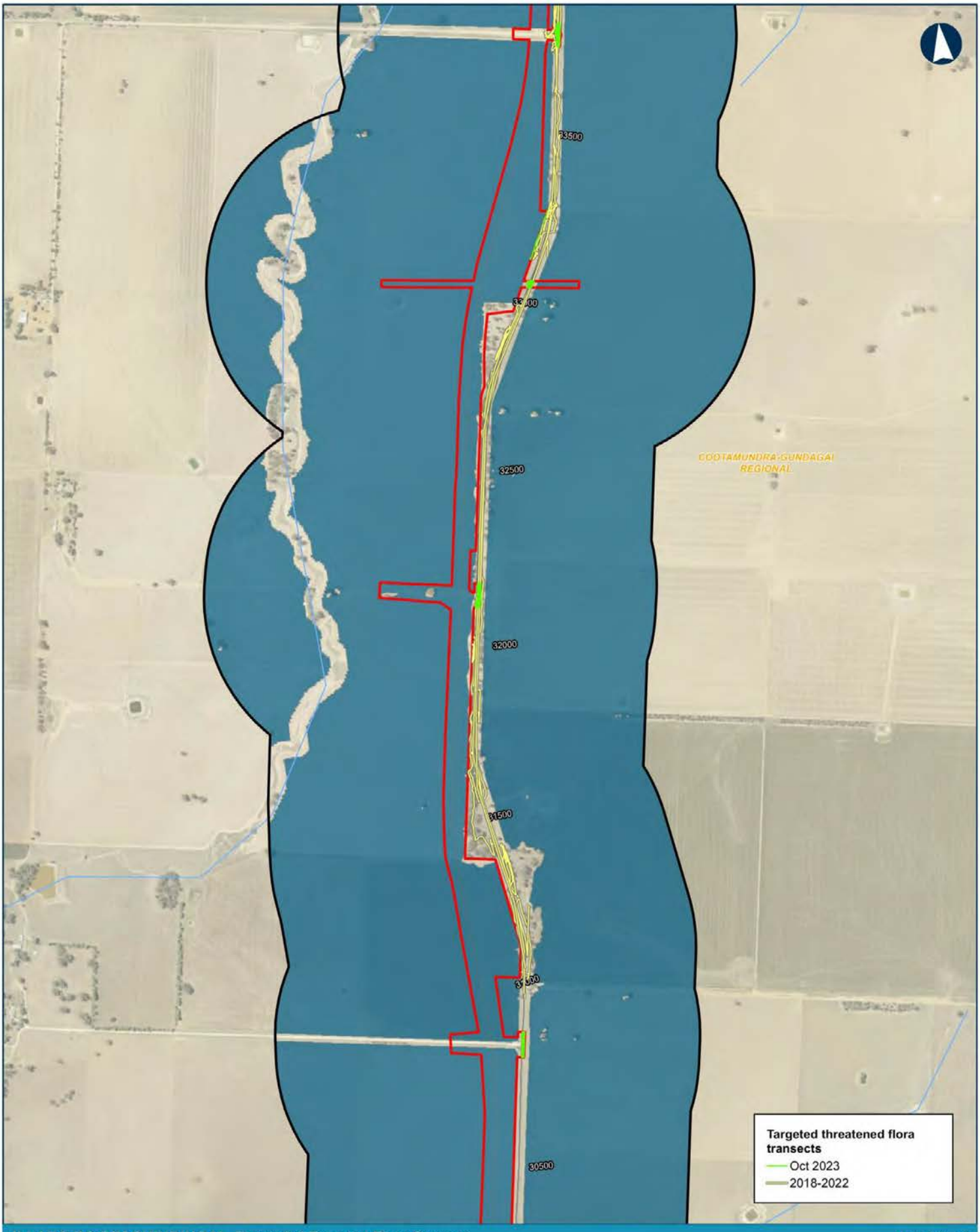

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MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

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Key features of proposal

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- Proposal Site
- BAM 2020 500m buffer
- Land not surveyed
- Local Government Area
- Minor Watercourse
- Category 1 (BAM does not apply except for prescribed impacts)

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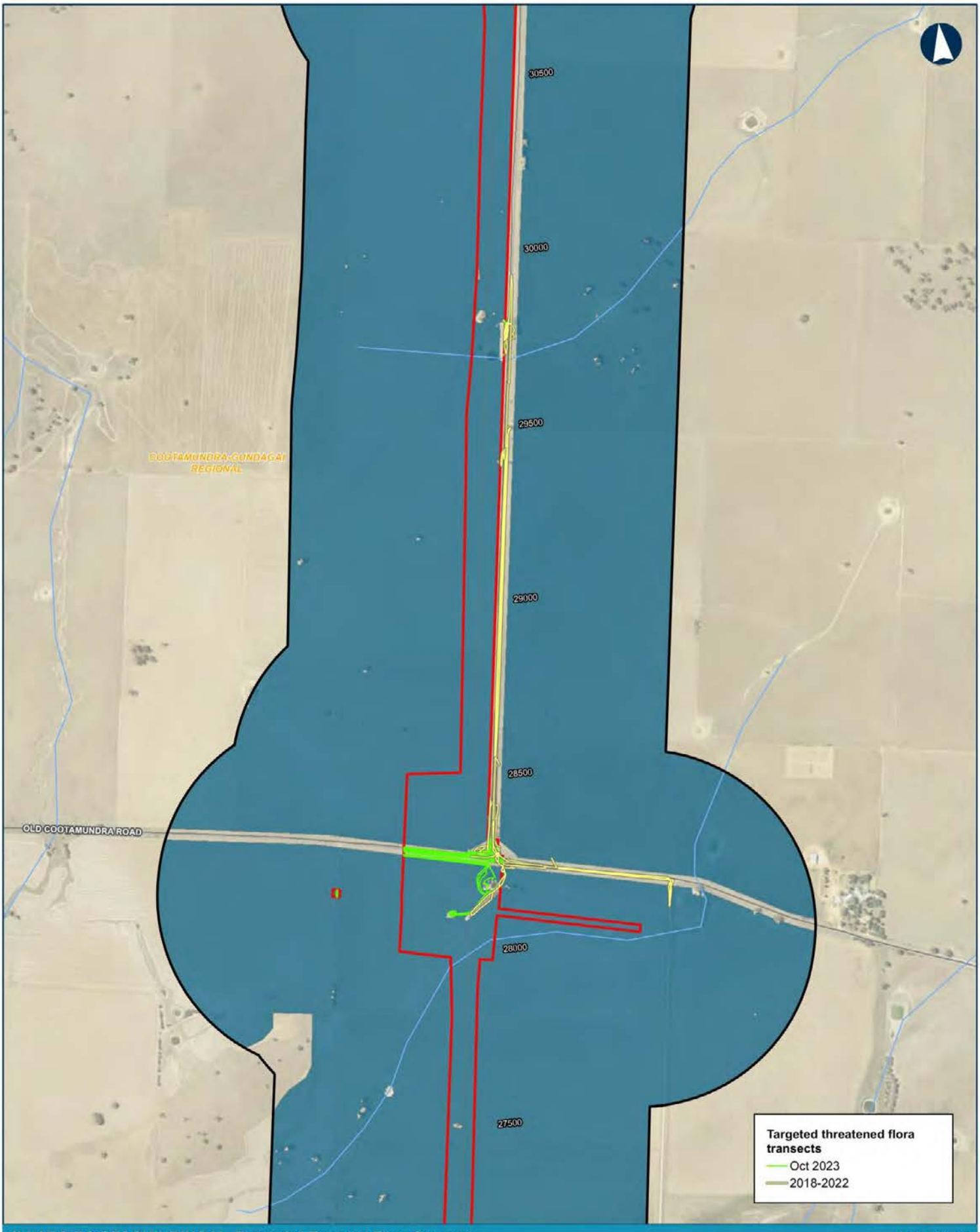

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MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

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- Proposal Site
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- Local Government Area
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MAP 6 OF 14

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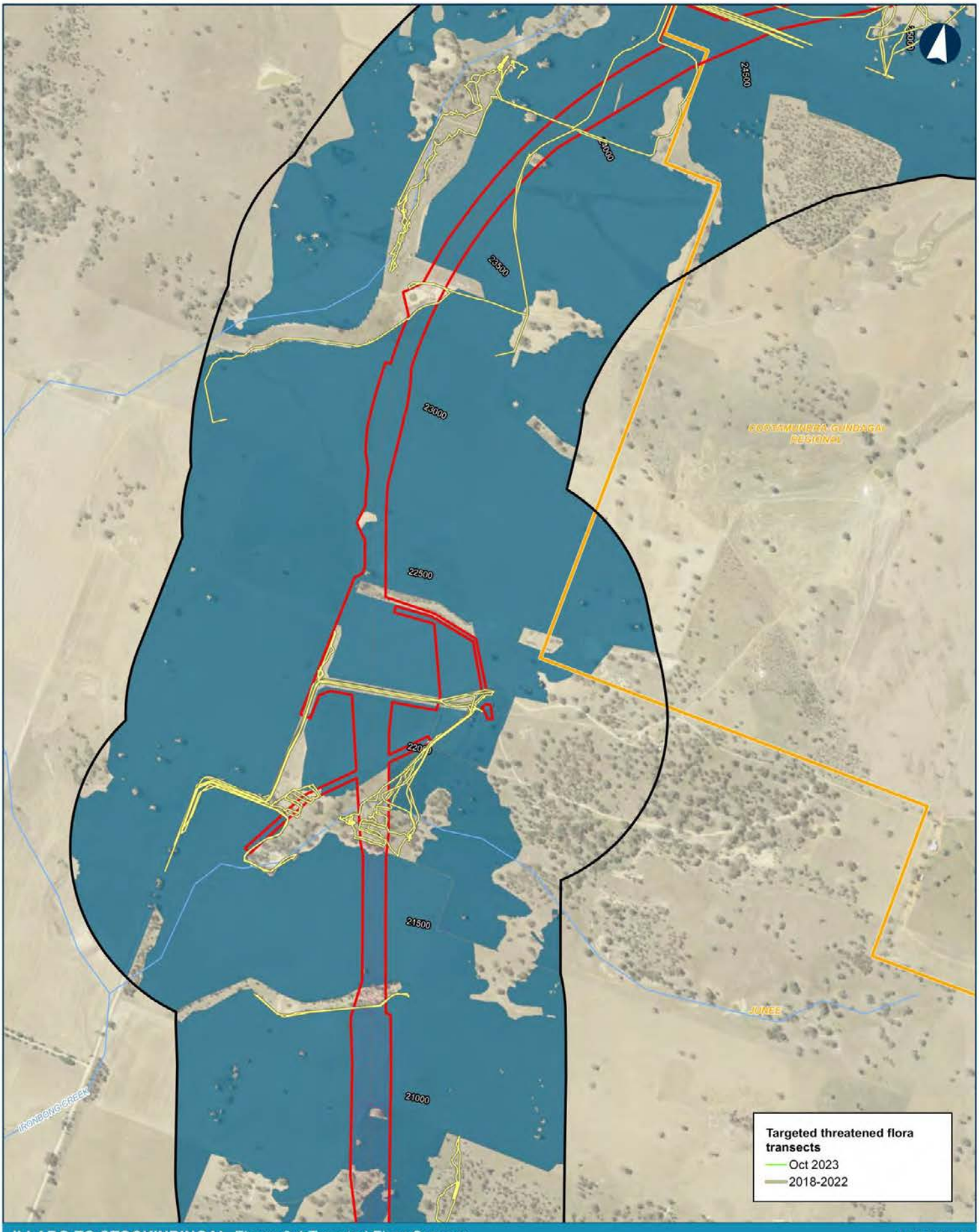

ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

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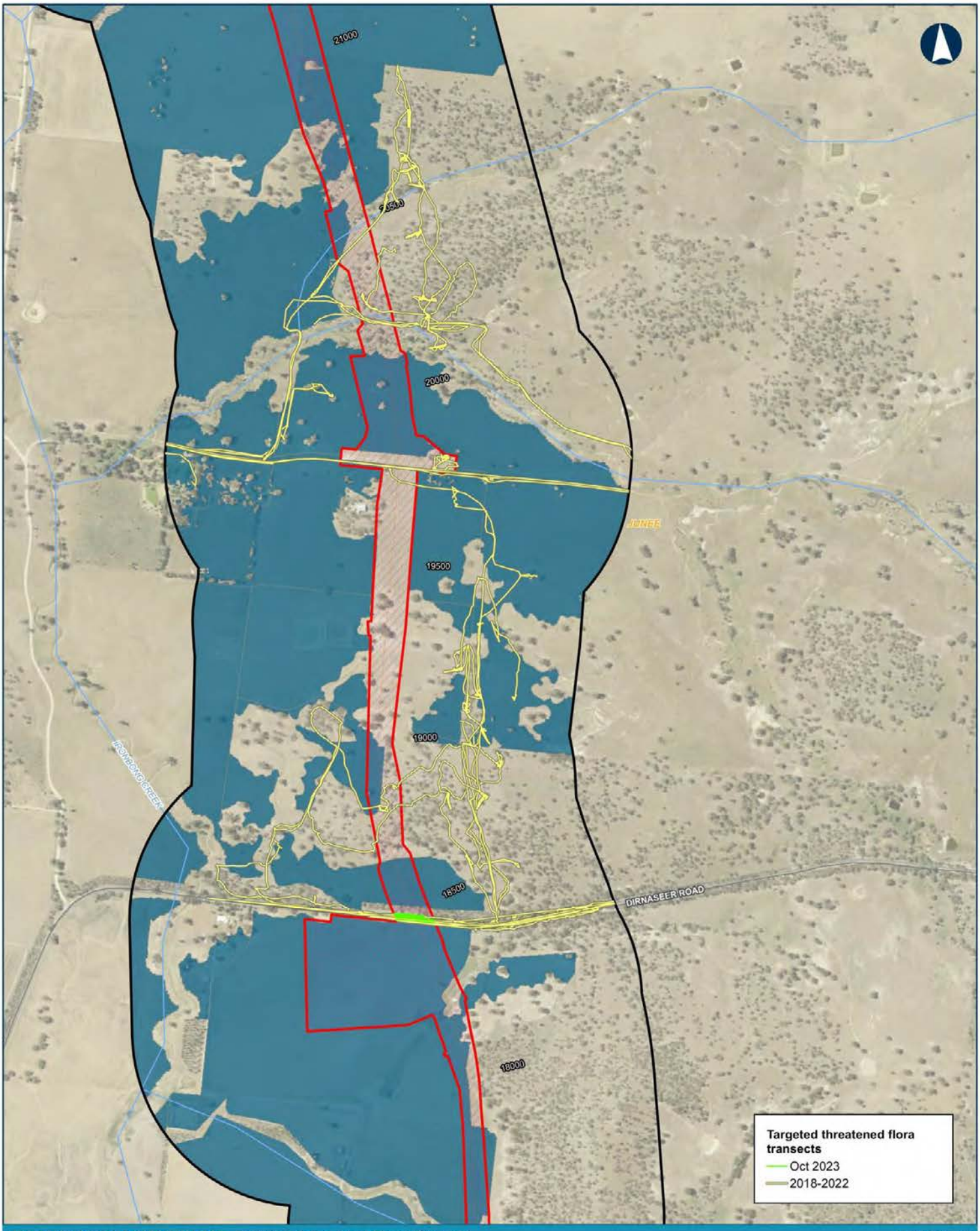

ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

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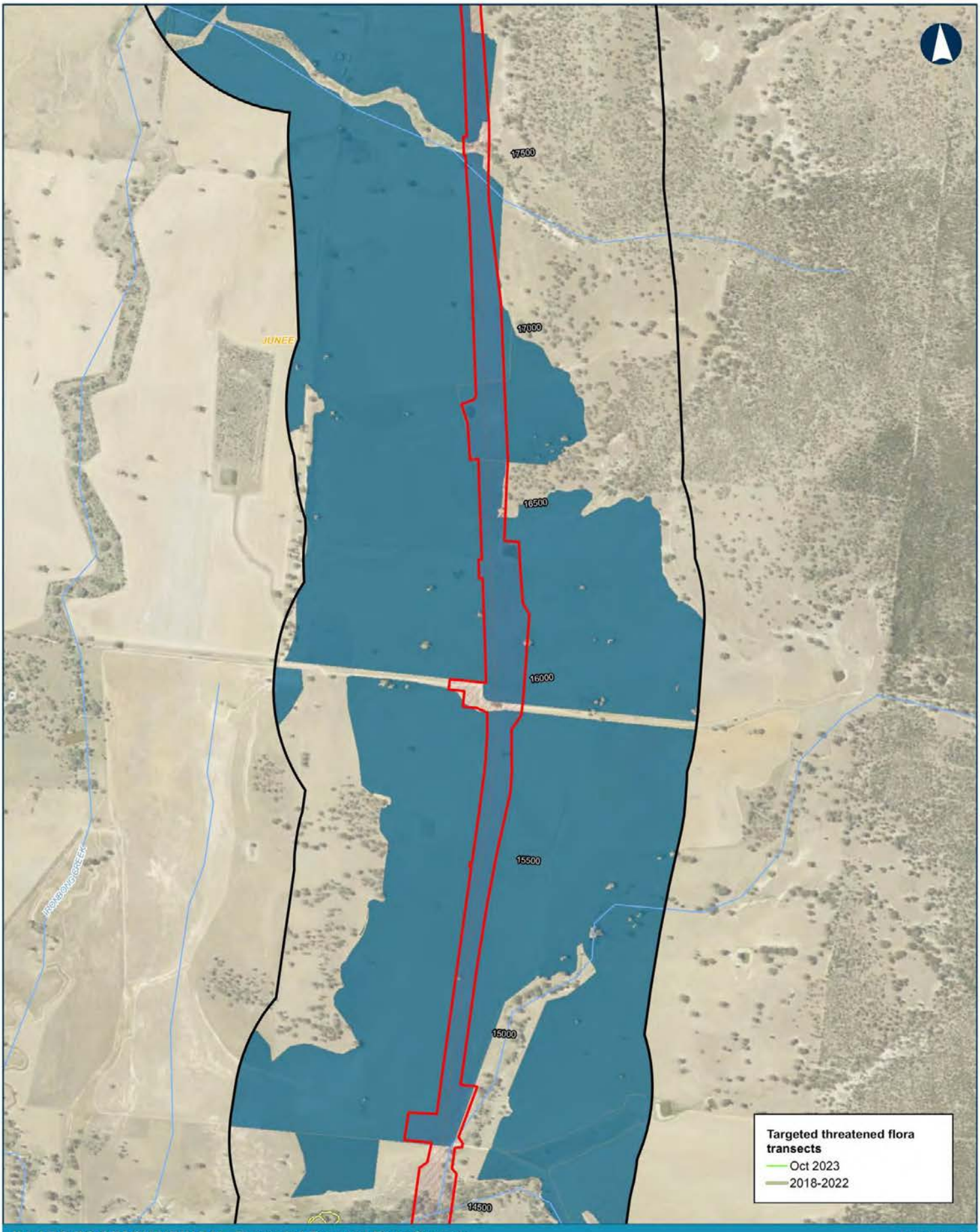

ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

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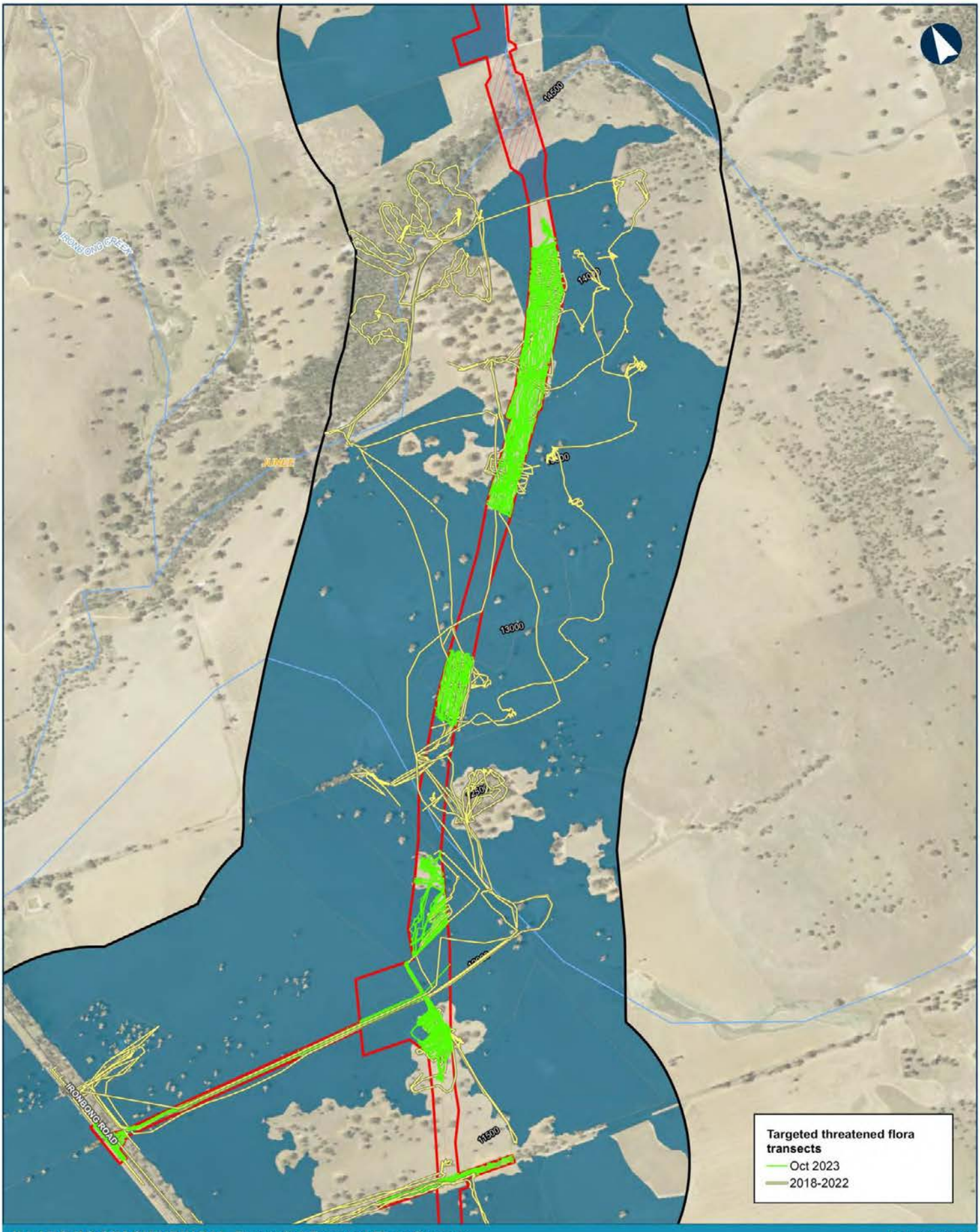

ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

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Data Sources: IRDJV, ARTC, LPI

Key features of proposal

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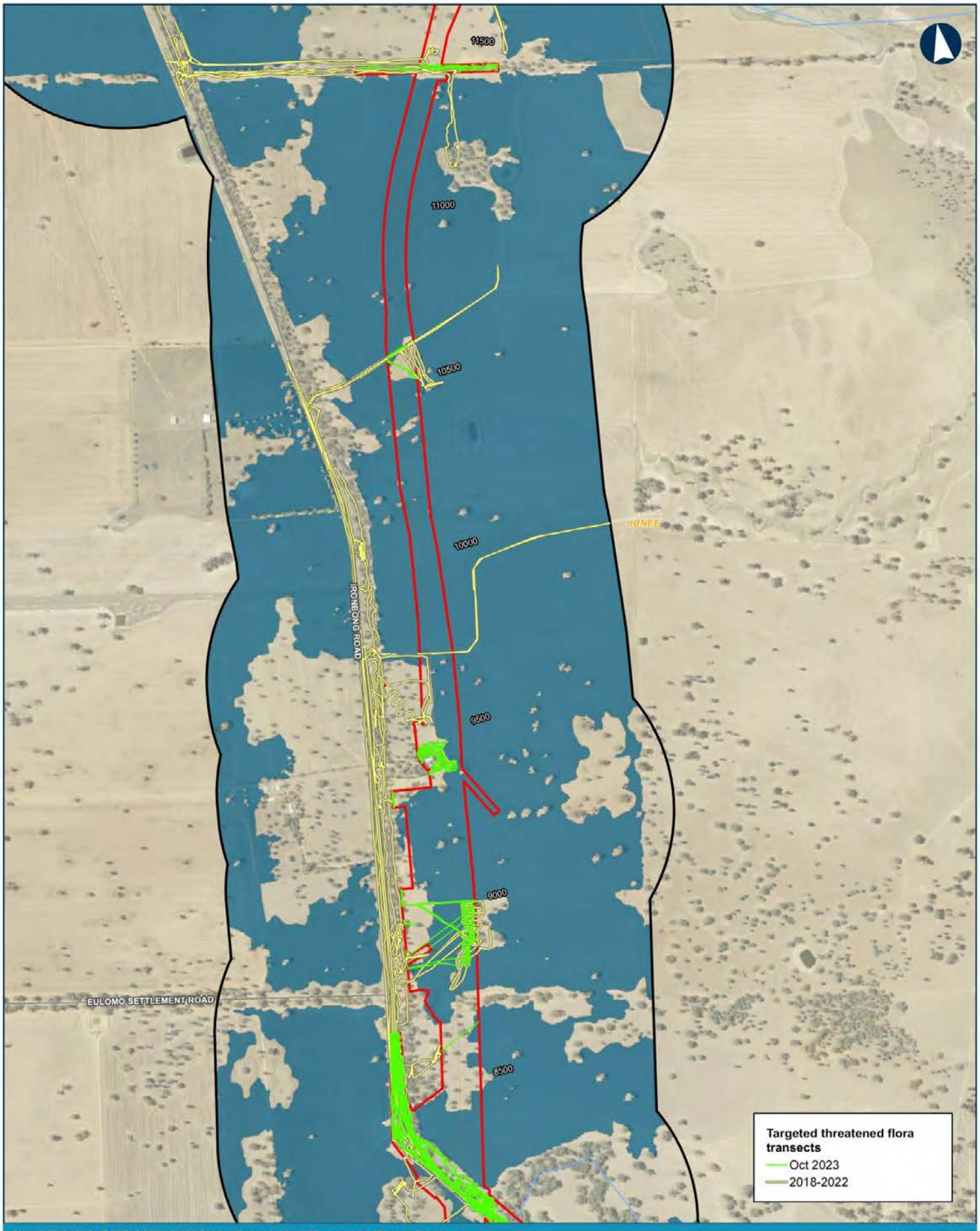

ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 13/11/2023 Paper: A3

Author: IRDJV Scale: 1:10,000

Data Sources: IRDJV, ARTC, LPI

Key features of proposal

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- Proposal Site
- BAM 2020 500m buffer
- Local Government Area
- Minor Watercourse
- Category 1 (BAM does not apply except for prescribed impacts)

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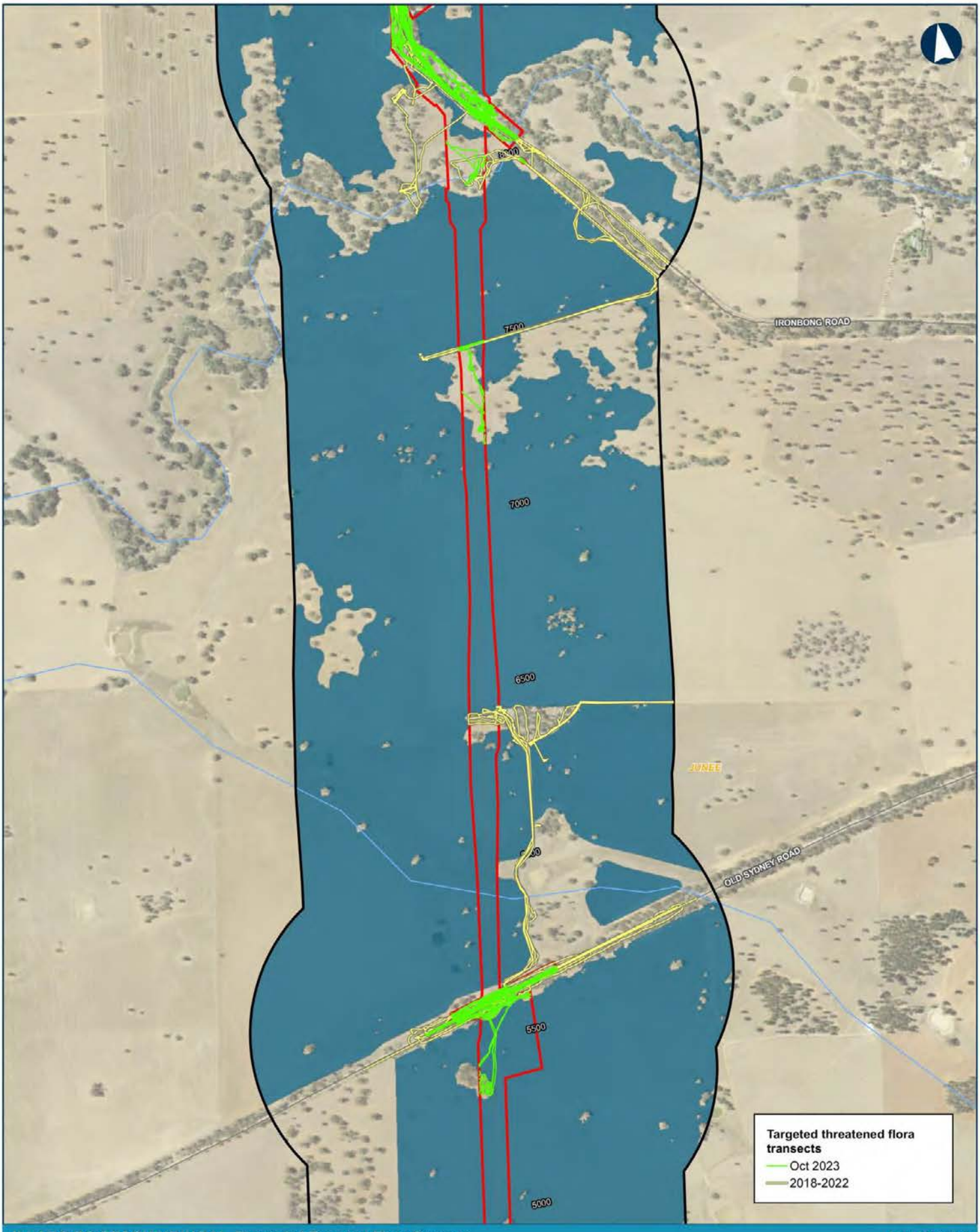

ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 13/11/2023
Author: IRDJV
Data Sources: IRDJV, ARTC, LPI

Paper: A3
Scale: 1:10,000

Key features of proposal

- New track/track upgrades
- Proposal Site
- BAM 2020 500m buffer
- Local Government Area
- Minor Watercourse
- Category 1 (BAM does not apply except for prescribed impacts)

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC) in partnership with the private sector

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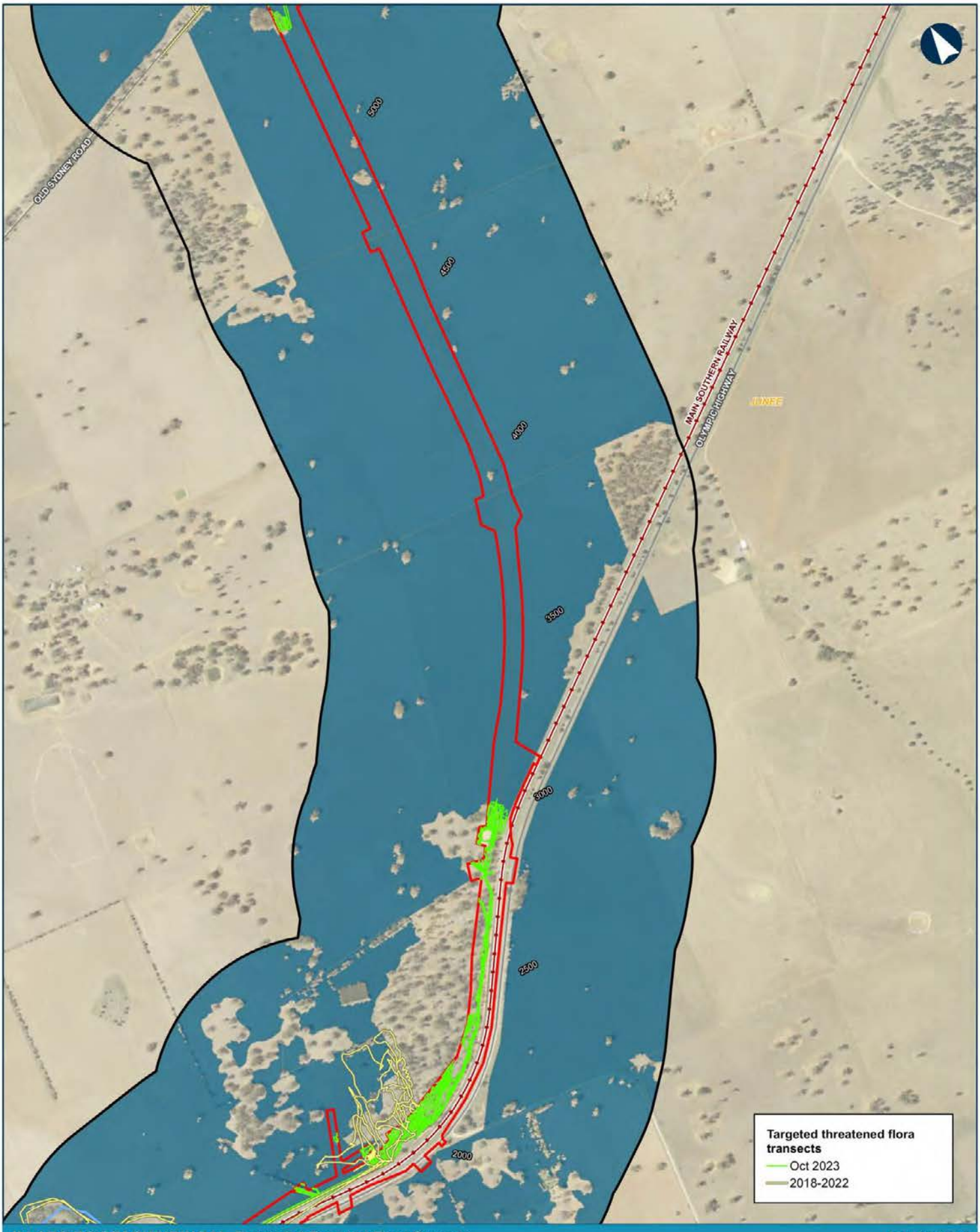

ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Key features of proposal

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ILLABO TO STOCKINBINGAL Figure 3.4 Targeted Flora Surveys

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

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3.4.4 Threatened fauna surveys

3.4.4.1 Habitat assessments

Fauna habitat assessments were undertaken across all habitats to assess the likelihood of threatened fauna (candidate species identified during desktop review) to occur within the subject land. Fauna habitat characteristics assessed included:

- dominant vegetation types present, including Box/Gum woodland types and riparian Red Gum forests
- structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources
- presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, birds and reptiles
- presence of the ground cover vegetation, leaf litter, rock outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles and amphibians
- scat, scratches, diggings, nest and track searches (Eg. Koala etc.)
- presence of waterways (ephemeral or permanent) and water bodies.

The following criteria were used to evaluate the condition of habitat values:

- **Good:** A full range of fauna habitat components are usually present (for example, old-growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact.
- **Moderate:** Some fauna habitat components are missing or greatly reduced (for example, old-growth trees and fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
- **Poor:** Many fauna habitat elements in low quality remnants have been lost, including old growth trees (for example, due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive clearing in the past.

Hollow-bearing tree locations were to assess fauna habitats and potential breeding opportunities for threatened arboreal mammals (e.g. Squirrel Glider), threatened hollow-dwelling microchiropteran bats (e.g. Corben's Long-eared Bat) and threatened woodland birds that use hollows for breeding purposes (e.g. Superb Parrot and Brown Treecreeper).

3.4.4.2 Opportunistic sightings

Opportunistic sightings of animals were recorded including diurnal birds and reptiles. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows, food scraps etc., was also noted. This provided indirect information on animal presence and activity.

The following habitat assessments informed seasonal surveys which targeted threatened fauna species. During these surveys, a hand-held GPS was used to record the locations of:

- hollow-bearing trees
- aquatic habitat
- rock outcrops
- habitat type boundaries.

3.4.4.3 Targeted seasonal surveys

The subject land occurs across a landscape dominated by agricultural and pastoral land uses, which has limited potential for supporting threatened fauna species. Key fauna habitat locations within the open nature of locality, include remnant native vegetation associated with drainage lines, roadside reserves, small areas on private property and occasional low rocky ridge lines.

The linear nature of the proposal and the linear nature of some remnant vegetation (e.g. along drainage lines and in road reserves) prevented the complete avoidance habitat. Targeted fauna surveys were focussed on areas of highest habitat quality and areas which intersected with wildlife corridors and larger areas of remnant vegetation.

Access was not available to all areas on private property for targeted fauna surveys. In addition to surveys of accessible areas of the subject land, areas proximate to the subject land were surveyed to determine the status of threatened species locally, to build a more assessable picture of the landscape's potential for supporting threatened fauna species. This included vegetation in roadside reserves as these provide important habitat in a cleared agricultural landscape.

Targeted seasonal surveys were completed for threatened fauna species, species credit species and EPBC Act listed species within potential habitat within the subject land. Threatened fauna surveys completed within the subject land were carried out as described below and where applicable, considering the methodology detailed in the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of Environment and Conservation 2004), the *Survey Guidelines for Australia's Threatened Birds* (Department of the Environment Water Heritage and the Arts 2010a), the *Threatened Species survey and assessment guidelines: field survey and methods for fauna-Amphibians* (Department of Environment and Climate Change 2009), *Survey guidelines for Australia's threatened frogs* (Department of the Environment Water Heritage and the Arts 2010b), 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (2018) and *Survey guidelines for Australia's threatened reptiles* (Department of Sustainability Environment Water Population and Communities 2011). The optimum survey period and dates surveyed for candidate fauna species are summarised in Table 3.7.

Targeted fauna surveys for threatened species were undertaken during November and December 2018, July 2019 and November 2022 during the optimal survey months as prescribed by the BAM Calculator. Survey methods are described below, and effort undertaken for each threatened species is summarised in Table 3.7. Locations of all targeted fauna surveys are illustrated in Figure 3.5 above. The weather conditions during surveys are discussed in section 3.5 below.

Bird surveys

Targeted bird surveys were conducted across the landscape both within and outside the subject land. Surveys outside the subject land provide information on populations occurring within the wider locality including threatened species.

In areas where natural ecosystems have been significantly removed and altered, such as the landscape where subject land occurs, formal 2ha 20-minute surveys are unable to return sufficient data within the time limitations of onsite survey effort. Their evaluative power is greatest when many repeat surveys are sufficient to pick up rarer species that occur in low densities across the landscape. As a consequence of such limitations on the data returned from such methodologies, a stratified approach is undertaken, where the landscape is evaluated to determine the distribution of high and low quality habitats and survey effort is allocated to those areas most likely to support higher levels of diversity. Therefore, formal 20-minute surveys represent a relatively small component of survey effort and assessment for birds, and more specifically threatened bird species. All movements within the subject land include searches for threatened bird species, and evaluate opportunities for them to occur, which through the process records all bird species encountered. The undertaking of all fauna survey works evaluates the landscape for the most suitable locations to undertake formal bird surveys.

Fifteen formal 20-minute diurnal bird searches were completed by two ecologists (totalling approximately 10 person hours). Bird surveys were completed by actively walking through the nominated site (approximately 1–2ha area) over a period of 20 minutes. All birds were identified to the species level, either through direct observation or identification of calls. Bird surveys were completed during different times of the day, but generally occurred during morning hours or evening. Birds were also recorded opportunistically during all other surveys and recorded as a bird observation point in Figure 3.5.

In addition to formal 20-minute diurnal bird surveys, the assessment included:

- Targeted winter bird surveys – targeted seasonal surveys for endangered blossom nomads (i.e. Regent Honeyeater and Swift Parrot) were undertaken during August to identify presence for blossoming eucalypts and nectar resources, along with potential habitat utilisation by threatened blossom nomads.
- Nocturnal surveys – nocturnal surveys were completed after dusk within a number of sites for approximately 1 hour at each survey site. Nocturnal surveys are described in more detail in following sections and included:
  - Stag watches – stag watches for owls were undertaken at dusk at suitable hollow-bearing trees identified within the subject land. Spotlighting was also undertaken.
  - Call playback – Call playback was undertaken to survey for nocturnal birds using standard methods (Kavanagh and Debus 1994, Debus 1995).
  - Spotlighting – Spotlighting was undertaken after stag watches and call playback.
- Stick nest searches – searches for stick nests in tree canopies were undertaken to identify potential breeding habitat for birds, particularly threatened species such as Little Eagle, Square-tailed Kite and Black-breasted Buzzard.
- Signs of feeding – active searches were undertaken for signs of feeding on *Casuarina* cones by Glossy Black-Cockatoo.
- Opportunistic sightings (section 3.4.4.2) – birds were recorded when undertaking other surveys within the subject land and surrounding areas.
- Habitat assessments (section 3.4.4.1) – wherever threatened bird species were absent from the site, habitat assessments were conducted to determine the likelihood that subject land might support those species that are known to occur in the region.

Microchiropteran bat surveys

Microchiropteran bat surveys have generally been conducted in accordance with the *'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method* (2018).

Culverts and bridges were inspected during surveys to identify if microchiropteran bat species were utilising these potential artificial rooting sites (Figure 3.5). Anabat and harp trapping was undertaken across the subject land and surrounding areas within PCT 76, PCT 79, PCT 80, PCT 266, PCT 277 and PCT 347.

Ultrasonic Anabat bat detection (Titley Electronics) was used to record and identify the echolocation calls of microchiropterans foraging across a number of native vegetation communities in areas of potential habitat including flyways and near water. Passive monitoring of these survey sites was achieved by setting Anabat bat detectors to record:

- continuously for approximately 1–2 hours at each survey site in November 2018
- record overnight at selected sites in July 2019.

Bat call analysis was completed by Nathan Cooper of WSP, with the presentation of data considering the guidelines of the Australasian Bat Society (Appendix H). Bat calls of New South Wales Sydney Basin region (Pennay, Law et al. 2004) was used as a reference collection for bat call identification.

Although many microchiropteran bat species are detectable through use of Anabat call detection methodologies, the vocal differences between some species are too subtle to reliably differentiate between the various species occurring in a particular locality (i.e. *Nyctophilus corbeni*). Therefore, targeted harp trapping was completed for capture and release of microchiropteran bats. Site selection for the setting of harp traps included a number of rationales, such as, targeting of those habitat areas where hollow-bearing trees provide potential roosting sites and where suitable flyways were detected. Harp traps were set at each location over a four-consecutive night period, with captured bats identified to species level, sexed, measured and weighed. Bats were released immediately after processing during dark conditions or held in a cool, dark and quite location until release in the dark was possible. This included placing bats in sections of hollow trees out of the sun near the capture sites, so they could remain secure until their night activities resumed.

Harp trapping effort targeted the highest quality habitats for microchiropteran bat species, including larger tracts of woodland vegetation in the subject land, on stony ridges to the north of Dirnaseer Road and within the largest patch of remnant vegetation which was associated with Run Boundary Creek (Figure 3.5). Open woodland setting prove difficult for harp trapping due to the wide open flyway areas that limit harp trap capture potential.

Other fauna survey methodologies undertaken as general arboreal mammal surveys were also used to determine the presence of microchiropteran bats, including nocturnal spotlighting and stag watches, both in natural hollow habitats and at potential artificial roosting sites.

Invertebrate active searches

Invertebrate surveys included survey for Key's Matchstick Grasshopper and Golden Sun Moth.

Invertebrate active searches were undertaken through warm periods of the day, when grasshopper and Golden Sun Moth detectability is maximised due to increased activity with temperature. Areas of the favoured habitat, were searched by criss-crossing the habitat patches slowly (i.e., ~3km/hour) with parallel transects to elicit fleeing behaviour from grassland insects. All moth or grasshopper species encountered that appeared to be similar to the target species were captured and photographed. Survey was particularly focused on areas of good quality habitat (i.e., areas of native understorey as described in the conservation advice (Threatened Species Scientific Committee 2022)).

Key's Matchstick Grasshopper survey was focussed in areas of potential habitat (open grassy woodlands and secondary grasslands containing larval food species, namely *Themeda triandra*, *Chrysocephalum apiculatum*.

Golden Sun Moth survey was focussed in areas of potential habitat (open grassy woodlands and secondary grasslands containing larval food species, namely Rytidosperma spp. (Department of Agriculture Water and the Environment 2021b)).

Spotlighting and stag watches

Spotlighting was used to target arboreal, flying and ground-dwelling mammals, as well as, nocturnal birds, reptiles and amphibians. Spotlighting was completed after dusk generally following the targeted nocturnal searches and were undertaken for at least 1 hour at each survey spot. Surveys were completed on foot using high-powered headlamps and hand torches. Sighted animals were identified to the species level.

Stag watches were undertaken at dusk in areas where hollow-bearing trees were identified within the subject land. The aim of dusk stag watches is to identify hollow dwelling fauna including owls, microbats and squirrel gliders are utilising any hollow-bearing trees within the subject land for breeding purposes. Following stag watches spotlighting transects were to be undertaken near known hollow-bearing trees.

Call playback

Call playback was undertaken to survey for nocturnal birds and frog species identified in Table 3.7 using standard methods (Kavanagh and Debus 1994, Debus 1995). Call playback in suitable habitat (as listed in Table 3.7) was conducted separately at different sites for Large Forest Owls, arboreal mammals (Squirrel Glider and Koala) and Sloane's Froglet. Nocturnal surveys were completed after dusk within a number of sites for approximately 1 hour at each survey site (Figure 3.5). Specific fauna searches were undertaken in areas of native vegetation, riparian areas and areas with important habitat features such as hollow bearing trees.

For each survey, an initial listening period of 10 to 15 minutes was undertaken. The calls of the target species would be then played intermittently for five minutes followed by a 10-minute listening period. After the listening period, 10 minutes of spotlighting surveys in the vicinity were undertaken to check for animals attracted by the calls, without vocalising. Calls from Stewart and Pennay were broadcast using a portable media player and megaphone.

Remote camera

Remote cameras were used as a non invasive method where animals attracted to the bait offered at a camera trap are photographed and unharmed. Cryptic animal species that cannot be identified by camera can then be targeted with traps at the specific locations where they have been recorded.

Remote motion sensing infra-red cameras were positioned across three locations to target Brush-tailed Phascogale, Eastern Pygmy-possum and Squirrel Glider in appropriate microhabitats (Figure 3.5). Combined survey effort for 18 cameras was 95 trap nights. Remote camera traps were set in trees and large shrubs (at minimum heights of 1.5–2m) with a suitable food source containing raw chicken necks and sardines for Brush-tailed Phascogale and rolled oats and peanut butter with honey and vanilla essence to target Eastern Pygmy-possum and Squirrel Glider in the appropriate microhabitat. Cameras were also used to target other animals occurring within survey locations including introduced species.

Herpetofauna active searches

Herpetofauna active searches during the day and at night, were undertaken and involved looking for active specimens and eye shine, turning over suitable ground shelter, such as fallen timber, sheets of iron and exposed rocks, raking debris, and peeling decorticating bark. Specimens were either identified visually, by aural recognition of call (frogs only) or were collected and identified.

Herpetofauna surveys were completed by one or two persons over a 30-minute period over an approximate 1–2ha area with all ground shelter returned to their original position. Herpetofauna active searches were completed in conjunction with diurnal and nocturnal surveys. Frogs and reptiles were also being surveyed opportunistically during all other surveys. Reptiles were surveyed in reference to *Survey guidelines for Australia's threatened reptiles* (Department of Sustainability Environment Water Population and Communities 2011). Frogs were surveyed in *Threatened species survey and assessment guidelines: field survey methods for fauna (Amphibians)* (Department of Environment and Climate Change 2009).

Table 3.7 Survey timing for threatened fauna (species credit and MNES) species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing	PCTs surveyed	Survey effort completed
Invertebrates								
Key's Matchstick Grasshopper	*Keyacris scurra*	E	–	Active search	March to May August to December	25-28 November 2022 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (266, 276, 277)	102 person hours
Golden Sun Moth	*Synemon plana*	V	V	Active search	November to December	19-23 November 2018 3-7 December 2018 6-7 December 2022 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (266, 276, 277)	142 person hours
Birds								
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Diurnal bird surveys	September to December	19-23 November 2018 29-30 September 2020 1 October 2020 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (79, 266, 276, 277, 347)	149 person hours and 40 minutes
Bush Stone-Curlew	*Burhinus grallarius*	E	–	Diurnal bird surveys Call playback	All year	19-23 November 2018 8-12 July 2019 29-30 September 2020 1 October 2020 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 80, 266, 276, 277, 347)	249 person hours and 40 minutes
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	E	Diurnal bird surveys	October to January	19-23 November 2018 1 October 2020 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (79, 266, 276, 277, 347)	117 person hours and 40 minutes

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing	PCTs surveyed	Survey effort completed
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V, EP	V	Diurnal bird surveys, searches for signs of feeding	January to September	13-15 May 2019 8-12 July 2019 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 266)	117 person hours and 40 minutes
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	–	Diurnal bird surveys Nest tree searches	July to December	19-23 November 2018 8-12 July 2019 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 80, 266, 276, 277, 309, 347)	117 person hours and 40 minutes
Little Eagle	*Hieraaetus morphnoides*	V	–	Diurnal bird surveys Nest tree searches	August to October	2-4 September 2019 8-12 July 2019 29-30 September 2020 1 October 2020 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 80, 266, 276, 277, 309, 347)	197 person hours and 40 minutes
Swift Parrot	*Lathamus discolor*	E	CE	Diurnal bird surveys	May to August	13-15 May 2019 8-12 July 2019	All associated PCTs (76, 79, 80, 266, 276, 277, 347)	128 person hours
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V	–	Diurnal bird surveys	September to December	19-23 November 2018 29-30 September 2020 1 October 2020 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 80, 347)	133 person hours and 40 minutes
Square-tailed Kite	*Lophoictinia isura*	V		Diurnal bird surveys Nest tree searches	September to December	19-23 November 2018 29-30 September 2020 1 October 2020 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 266, 276, 277, 347)	133 person hours and 40 minutes

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing	PCTs surveyed	Survey effort completed
Barking Owl	*Ninox connivens*	V		Spotlighting and stag watches Call playback	May- December	19-23 November 2018 29-30 September 2020 1 October 2020 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 80, 266, 276, 277, 347)	98 person hours
Superb Parrot	*Polytelis swainsonii*	V	V	Diurnal bird surveys	September to November	19-23 November 2018 29-30 September 2020 1 October 2020 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 80, 266, 276, 277, 347)	133 person hours and 40 minutes
Masked Owl	*Tyto novaehollandiae*	V		Spotlighting and stag watches Call playback	May to August	8-12 July 2019	All associated PCTs (76, 79, 80, 266, 276, 277)	48 person hours
Powerful Owl	*Ninox strenua*	V		Spotlighting and stag watches Call playback	May to August	8-12 July 2019	All associated PCTs (79)	48 person hours
White-throated Needletail	*Hirundapus caudacutus*		V	Diurnal bird surveys	October to March	19-23 November 2018 29-30 September 2020 1 October 2020 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 80, 266, 276, 277, 309, 347)	133 person hours and 40 minutes

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing	PCTs surveyed	Survey effort completed
Frogs								
Sloane's Froglet	*Crinia sloanei*	V		Fauna habitat assessment Herpetofauna active searches Call playback	July to August	8-12 July 2019	All associated PCTs (79, 76, 80, 276)	30 person hours
Booroolong Frog	*Litoria booroolongensis*	E	V	Fauna habitat assessment Herpetofauna active searches	November to December	19-23 November 2018	Marginal potential habitat (dams and ephemeral waterways). No associated PCTs recorded	16 person hours
Southern Bell Frog	*Litoria raniformis*	E	V	Fauna habitat assessment Herpetofauna active searches	October to January	19-23 November 2018 1 October 2020	Marginal potential habitat (dams and ephemeral waterways). No associated PCTs recorded	18 person hours
Reptiles								
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Fauna habitat assessment Herpetofauna active searches	September to November	19-23 November 2018 23-27 October 2023 30 October – 3 November 2023 25, 26, 27, 30, 31 October 2023 2 November 2023	All associated PCTs (266, 276, 277, 347)	34 person hours
Striped Legless Lizard	*Delma impar*	V	V	Fauna habitat assessment Herpetofauna active searches	September to December	19-23 November 2018 23-27 October 2023 30 October – 3 November 2023 25, 26, 27, 30, 31 October 2023 2 November 2023	All associated PCTs (277, 347)	34 person hours

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing	PCTs surveyed	Survey effort completed
Mammals								
Eastern Pygmy-possum	*Cercartetus nanus*	V		Remote camera Spotlighting	October to March	19-23 November 2018	All associated PCTs (80, 276, 277, 347)	814 camera trap nights 48 person hours
Squirrel Glider	*Petaurus norfolcensis*	V		Remote camera Spotlighting and stag watching Call-playback	All year	19-23 November 2018 8-12 July 2019 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 80, 266, 276, 277, 347)	814 camera trap nights 364 person hours
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Fauna habitat assessment	All year	19-23 November 2018	All associated PCTs (266, 276, 277)	80 person hours
Brush-tailed Phascogale	*Phascogale tapoatafa*	V		Remote camera Fauna habitat assessment Daytime searches for potential nesting sites Indirect evidence including scratches on trunks or scats Spotlighting and stag watching	All year	19-23 November 2018 8-12 July 2019 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 266, 276, 277)	814 camera traps nights 48 hours spotlighting
Koala	*Phascolarctos cinereus*	E	E	Fauna habitat assessment Spotlighting Call-playback Direct observation Indirect observation including scratches and scat searches	All year	19-23 November 2018 23-27 October 2023 30 October – 3 November 2023	All associated PCTs (76, 79, 80, 266, 276, 277, 309, 347)	107 person hours

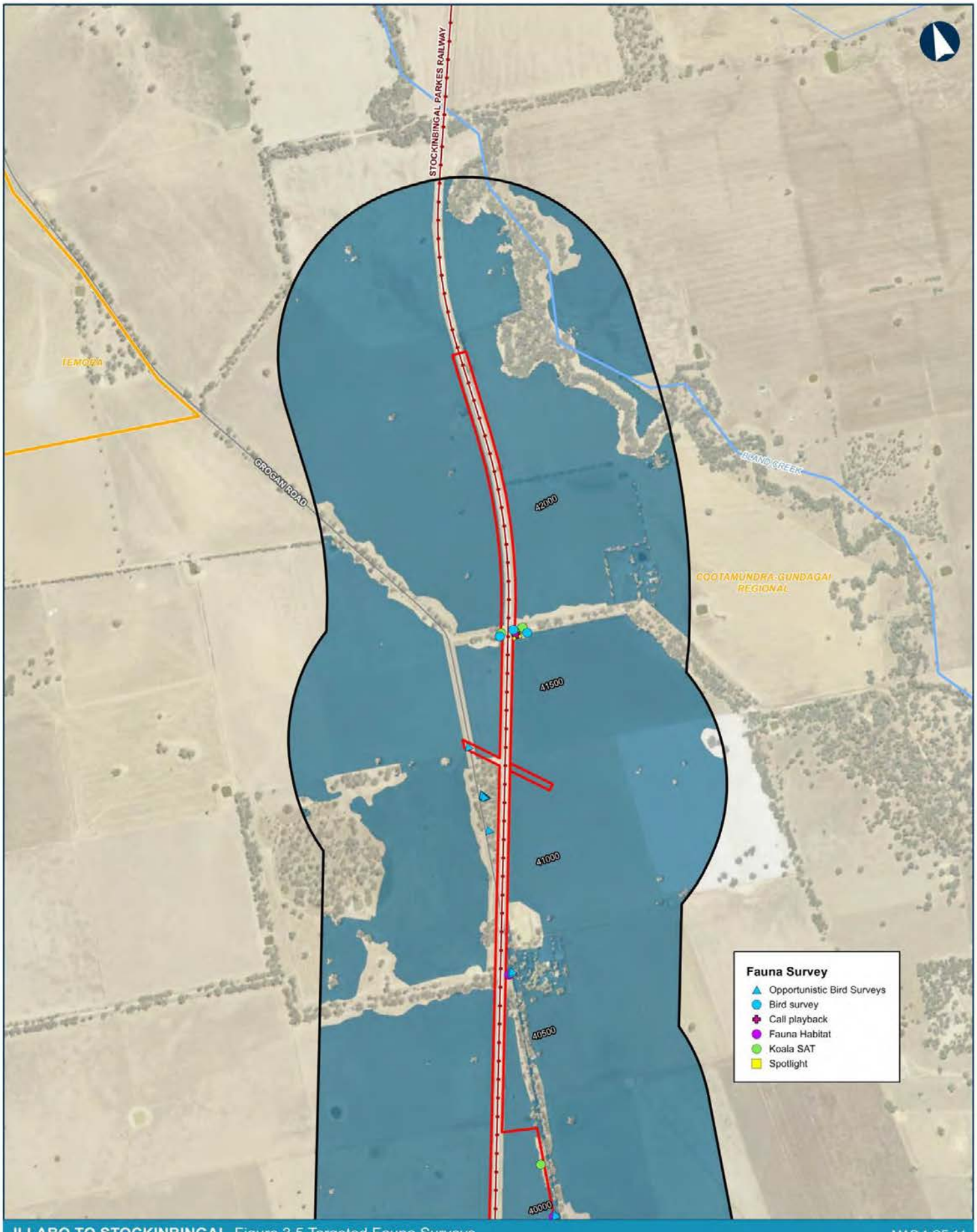
Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing	PCTs surveyed	Survey effort completed
Bats								
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Microchiropteran bat surveys (anabats & harp trapping)	November to January	19-23 November 2018 [8-12 July 2019 (Anabat only)]	All associated PCTs (277)	128 anabat hours 8 harp trap nights
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V		Microchiropteran bat surveys (anabats & harp trapping) Inspection of artificial structures	December to February	19-23 November 2018	All associated PCTs (266, 276, 277, 347)	128 anabat hours 8 harp trap nights
Southern Myotis	*Myotis macropus*	V		Microchiropteran bat surveys (harp traps & anabats) *harp traps were located near waterbodies and artificial structures were assessed for roosting potential	November to March	19-23 November 2018 Assumed habitat due to drought conditions	All associated PCTs (79, 276)	128 anabat hours 8 harp trap nights
Corben's Long Eared Bat[4]	*Nyctophilus corbeni*	V	V	Microchiropteran bat surveys (anabats & harp trapping)	October to April	19-23 November 2018	All associated PCTs (80, 266)	128 anabat hours 8 harp trap nights
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Direct observation Spotlighting	October to December	19-23 November 2018	All associated PCTs (76, 266, 276, 277)	96 person hours

(1) Listed as E – Endangered; V – Vulnerable; CE – Critically Endangered, SAII – Serious and Irreversible Impact species under the BC Act, – not listed

(2) Listed as E – Endangered; V – Vulnerable; CE – Critically Endangered under the EPBC Act, – not listed

(3) Survey requirements based on BAM calculator survey requirements and cross-referenced with BioNet database

(4) This species can only be positively identified through harp trapping and cannot be reliably identified through anabat call detection.



ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

Key features of proposal

- New track/track upgrades
- Existing Rail
- Major Watercourse
- Minor Watercourse
- Local Government Area
- Proposal Site
- BAM 2020 500m buffer
- Category 1 (BAM does not apply except for prescribed impacts)

INLAND RAIL ARTC

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ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

Key features of proposal

- New track/track upgrades
- Existing Rail
- Burley Griffin Way Road realignment
- Minor Watercourse
- Local Government Area
- Proposal Site
- BAM 2020 500m buffer
- Land not surveyed
- Category 1 (BAM does not apply except for prescribed impacts)

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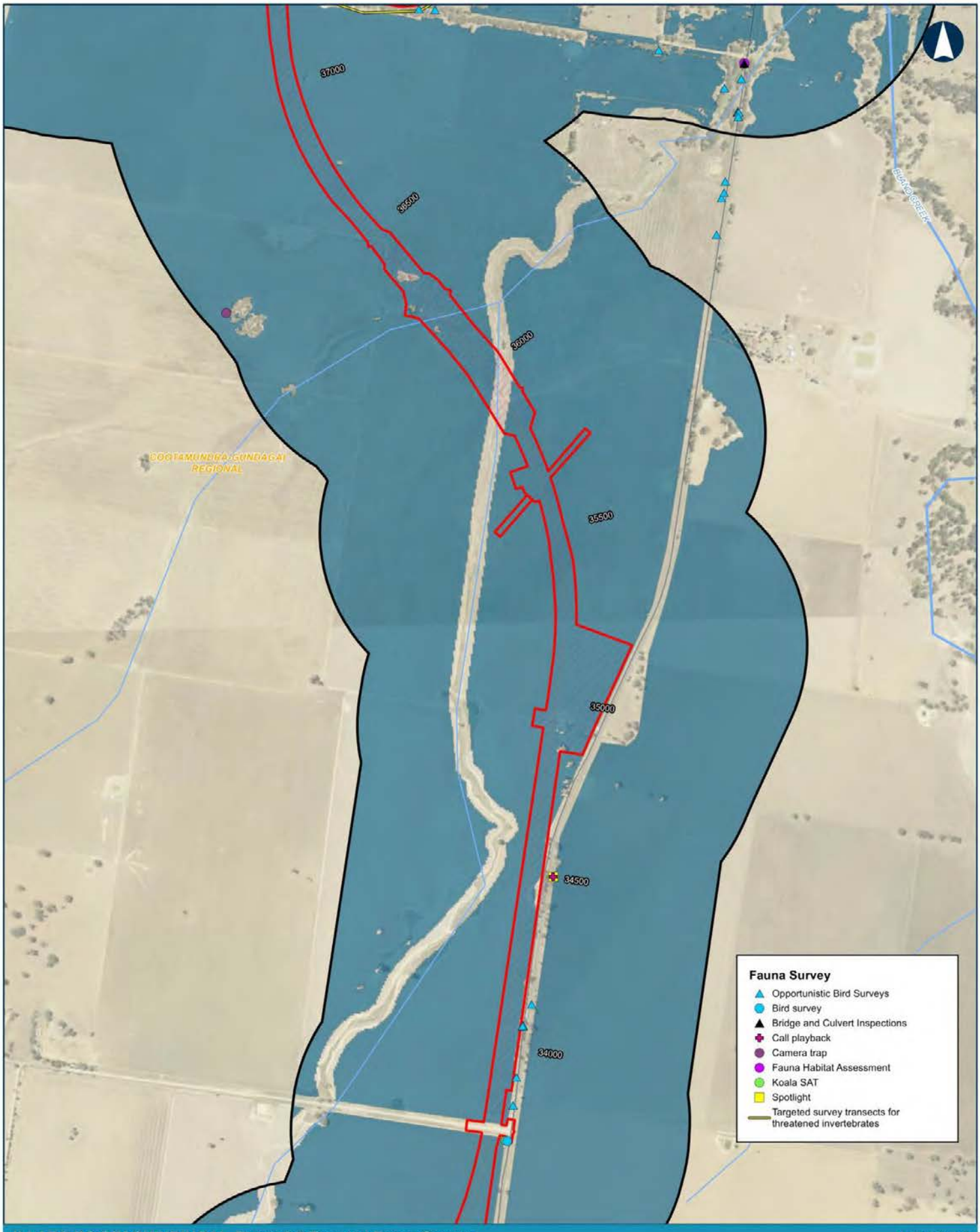

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

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- Proposal Site
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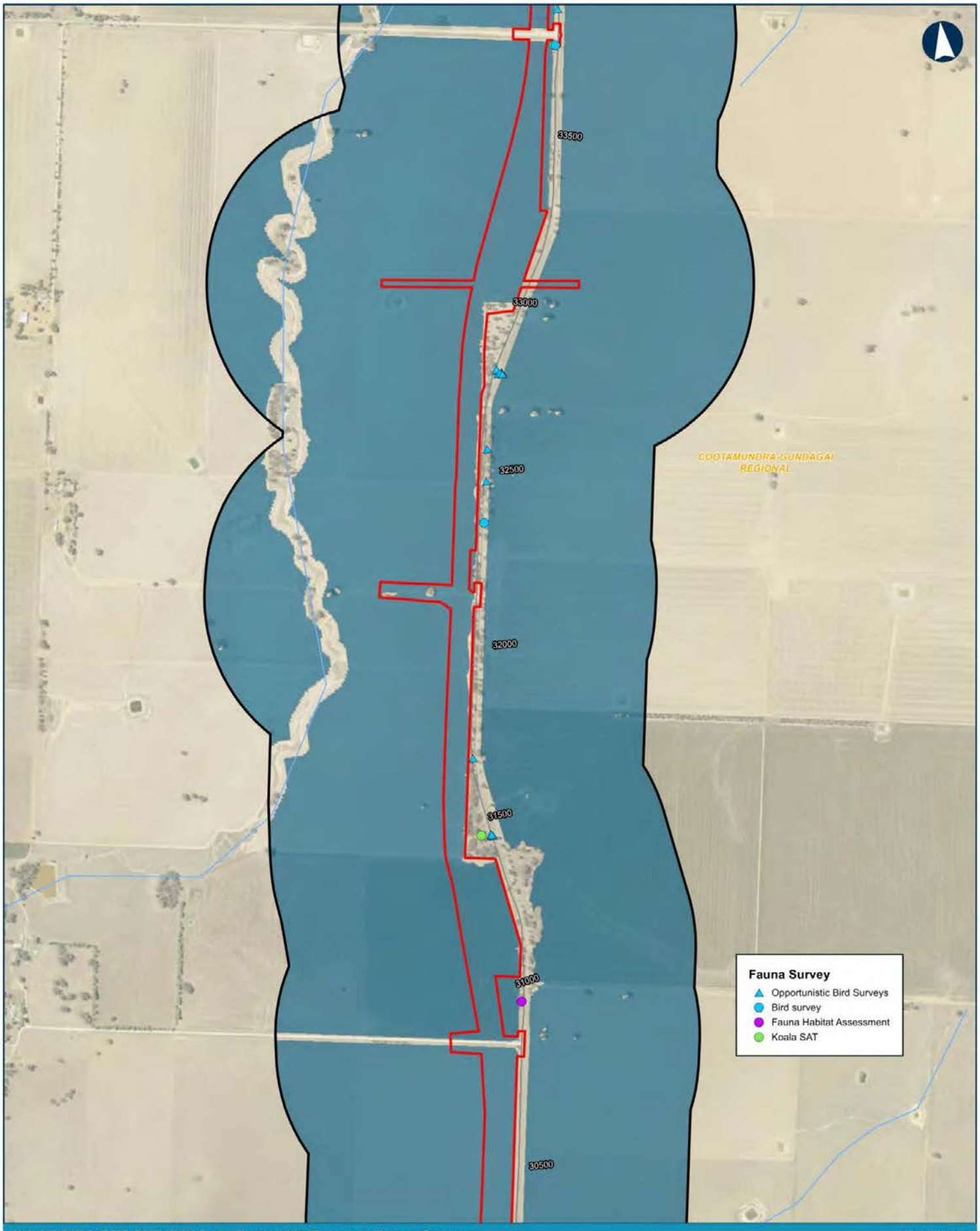

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

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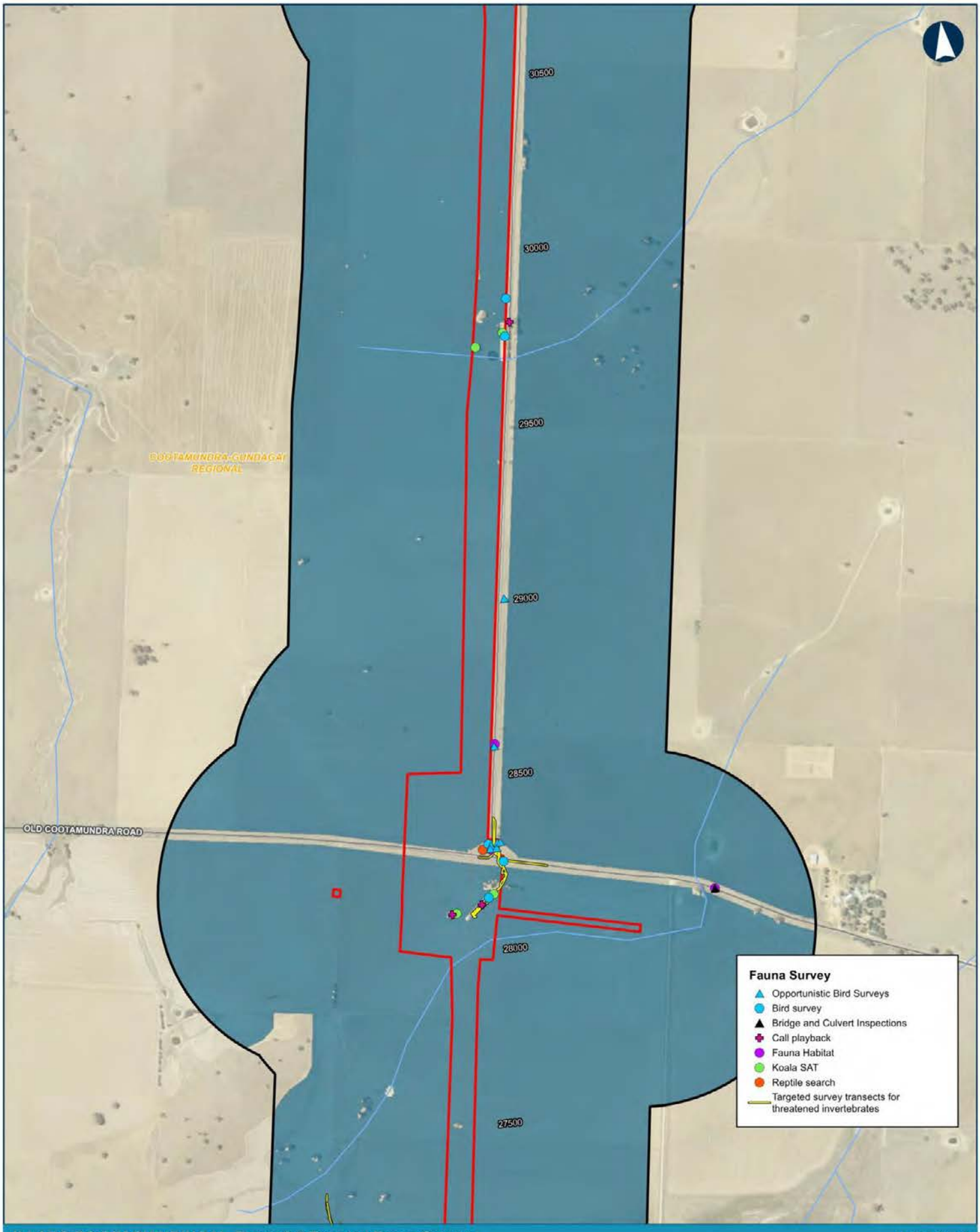

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

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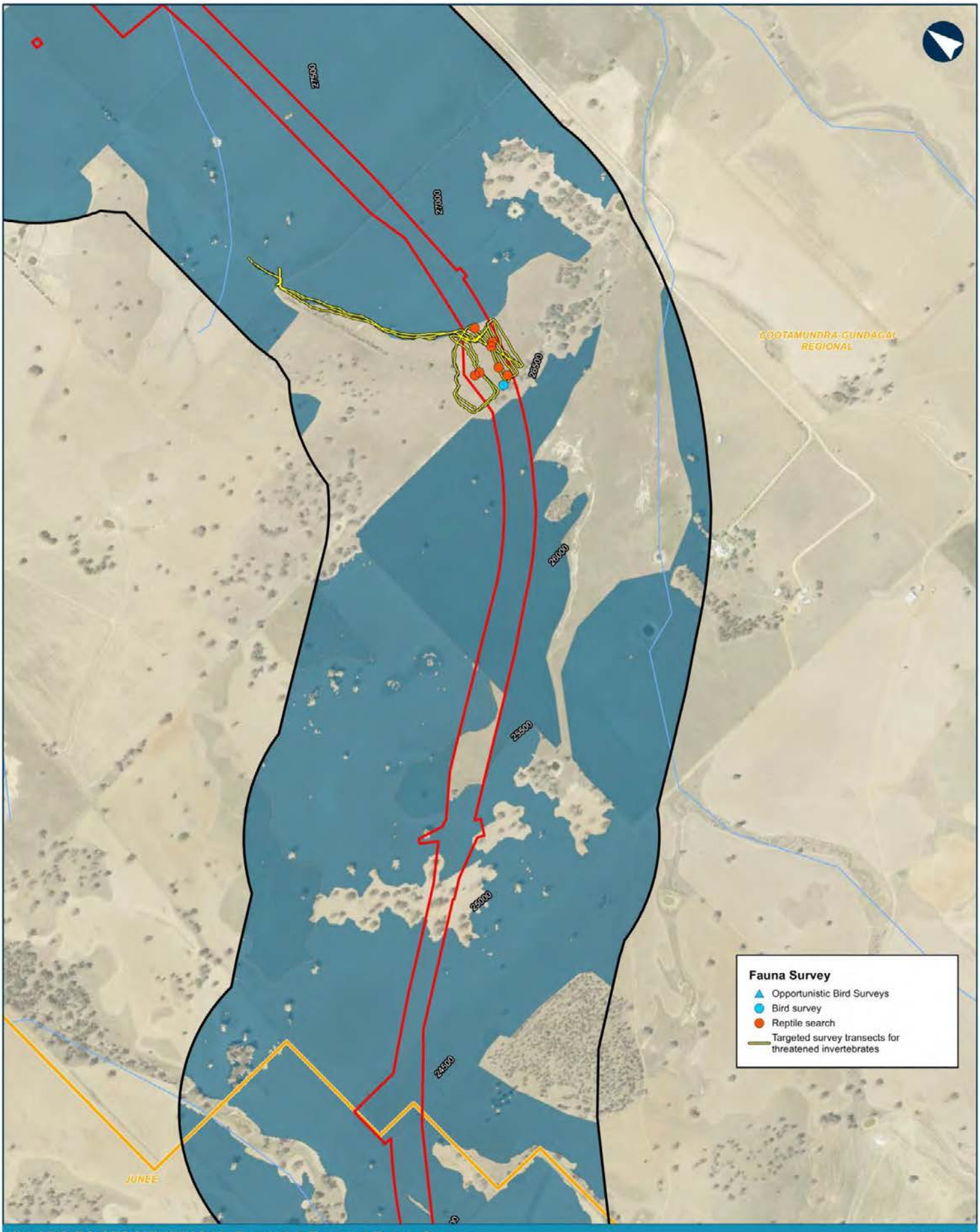

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

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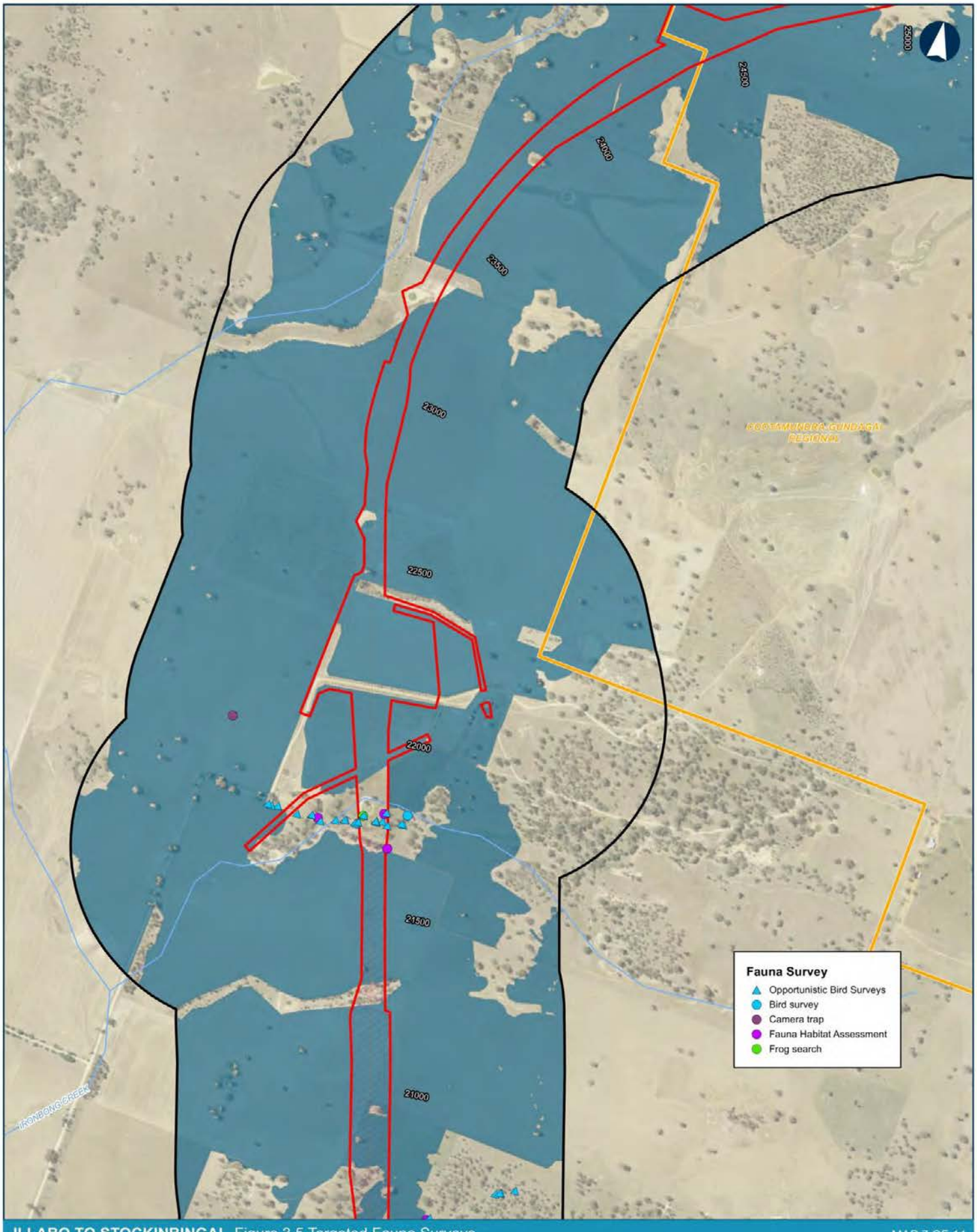

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

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Paper: A3
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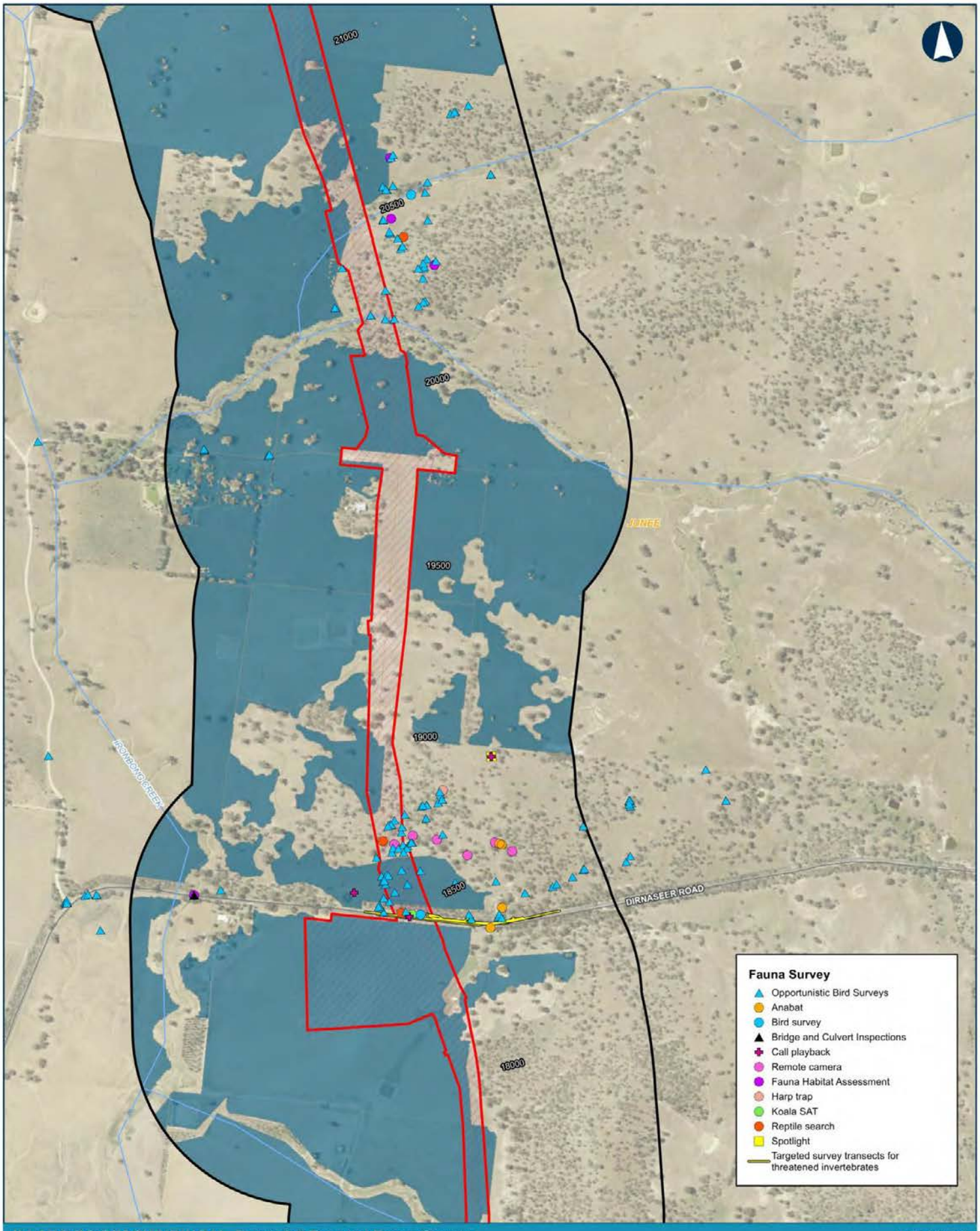

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

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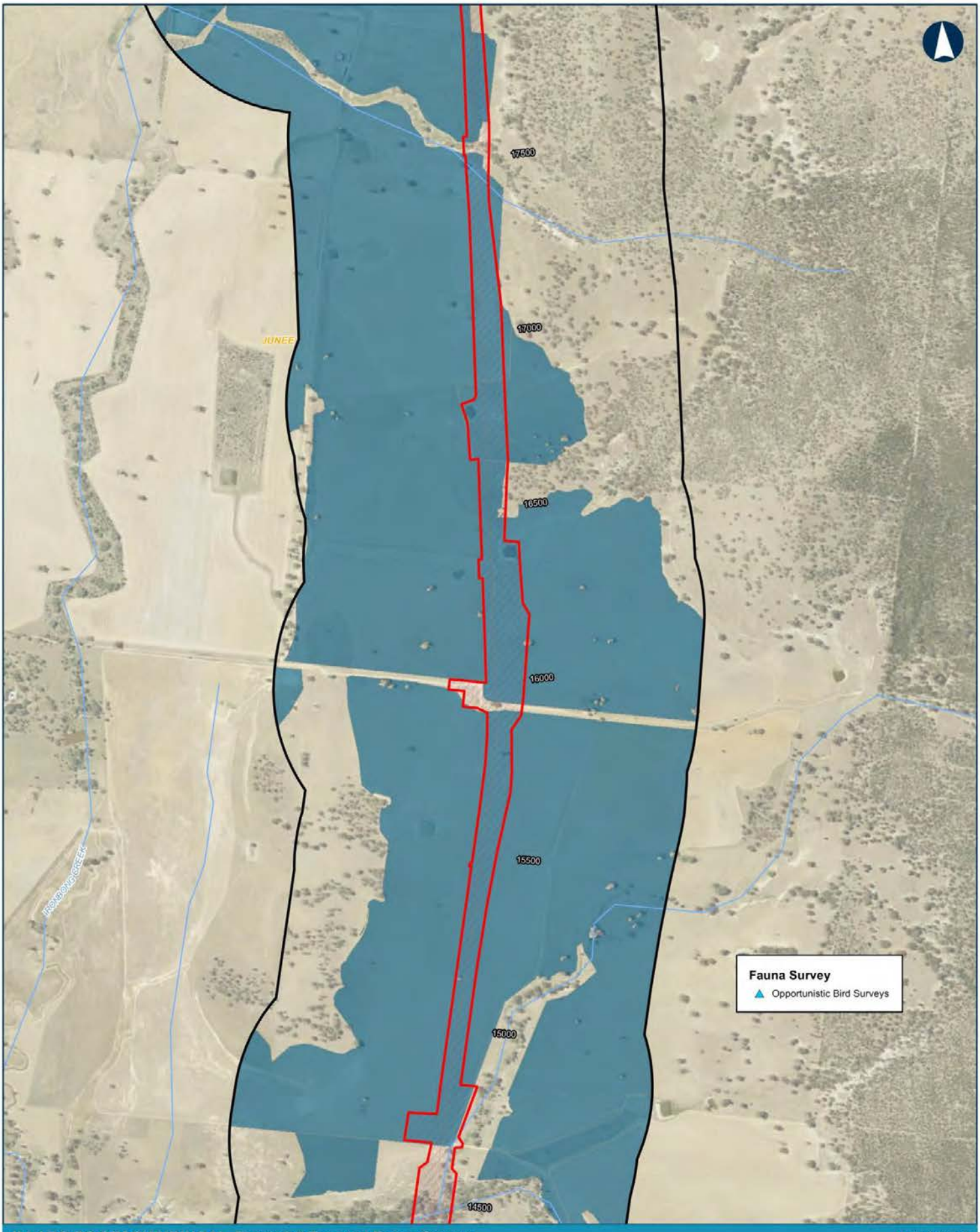

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

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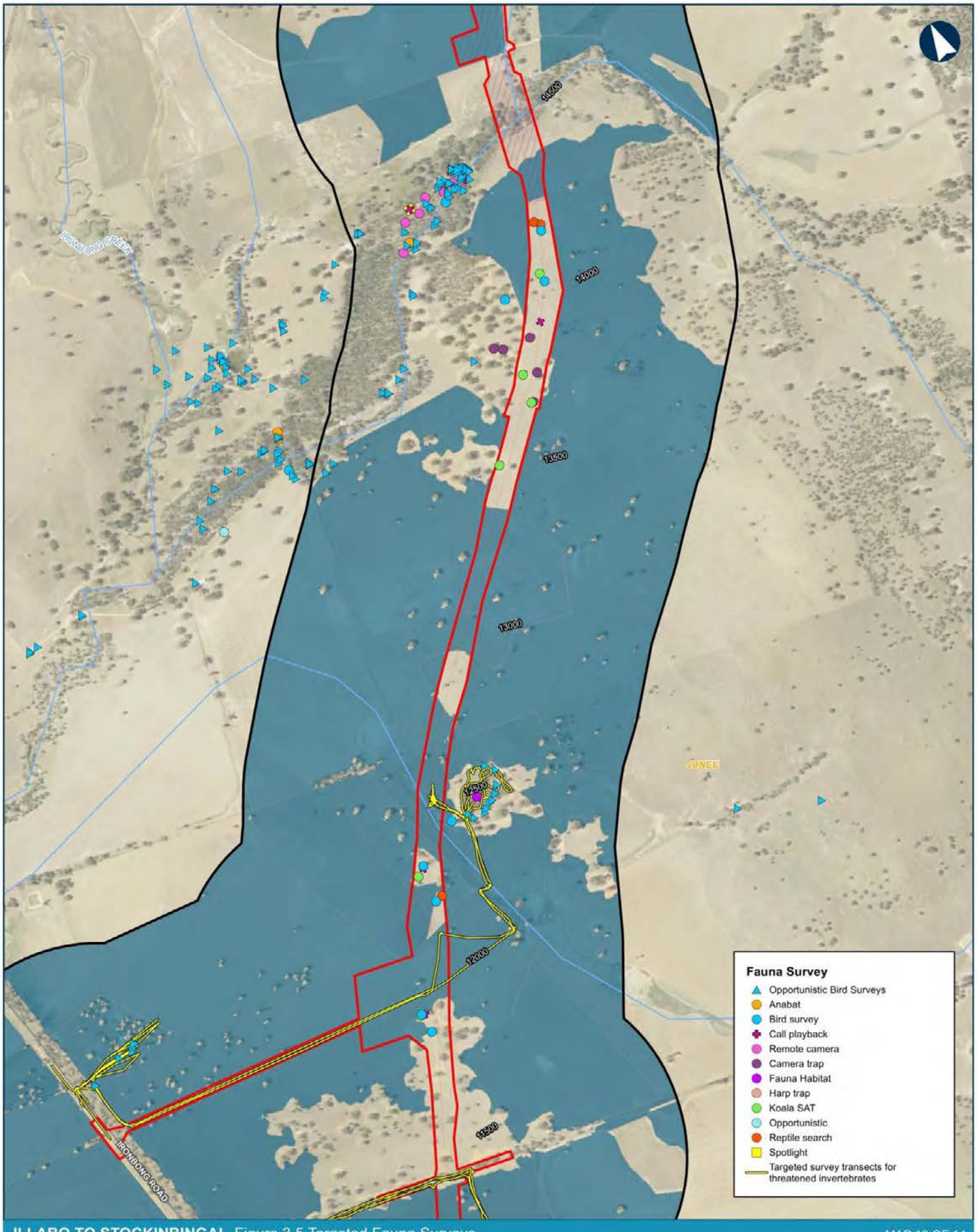

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

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Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

Key features of proposal

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- Local Government Area
- Proposal Site
- BAM 2020 500m buffer
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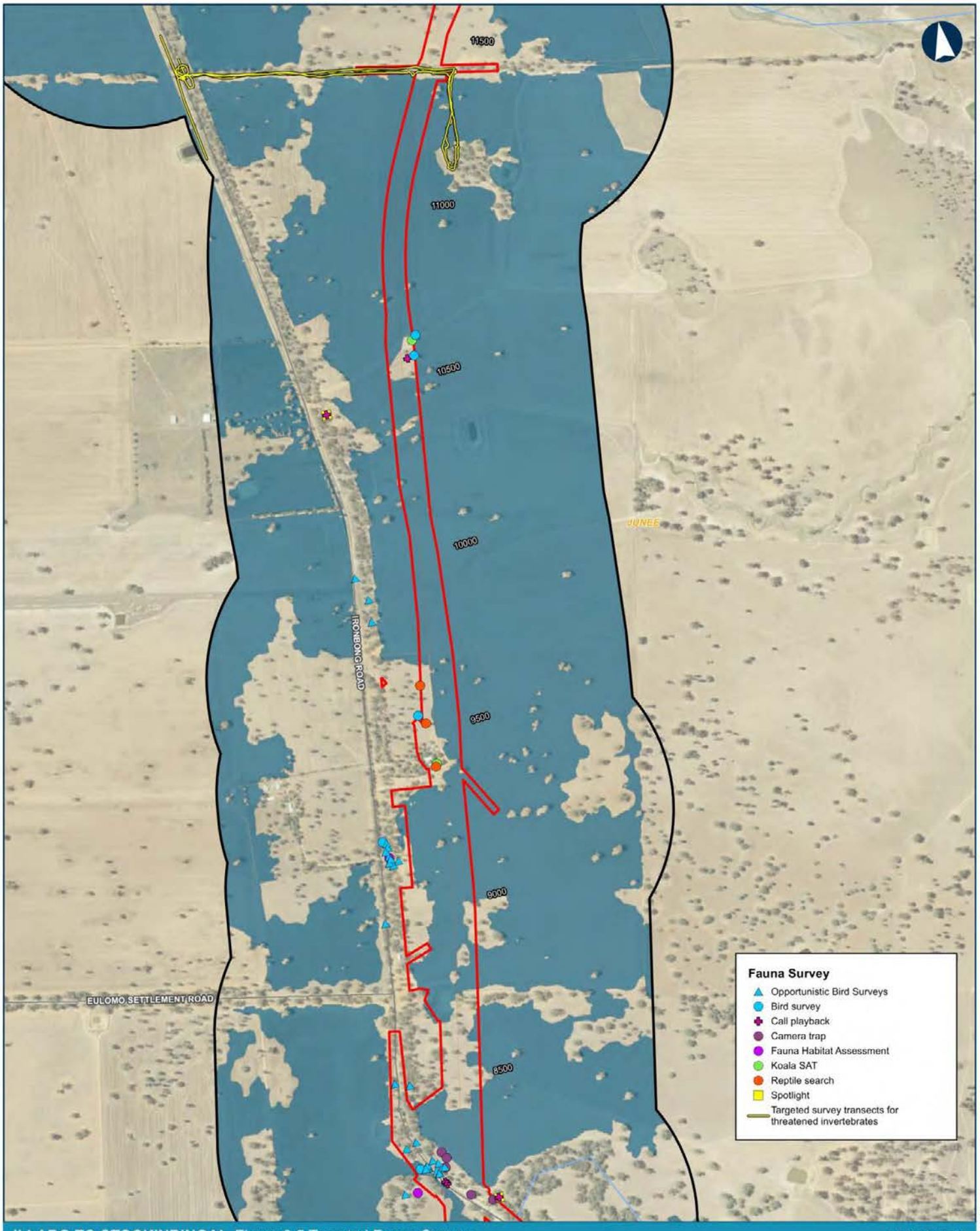

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

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Data Sources: IRDJV, ARTC, LPI

Key features of proposal

- New track/track upgrades
- Minor Watercourse
- Local Government Area
- Proposal Site
- BAM 2020 500m buffer
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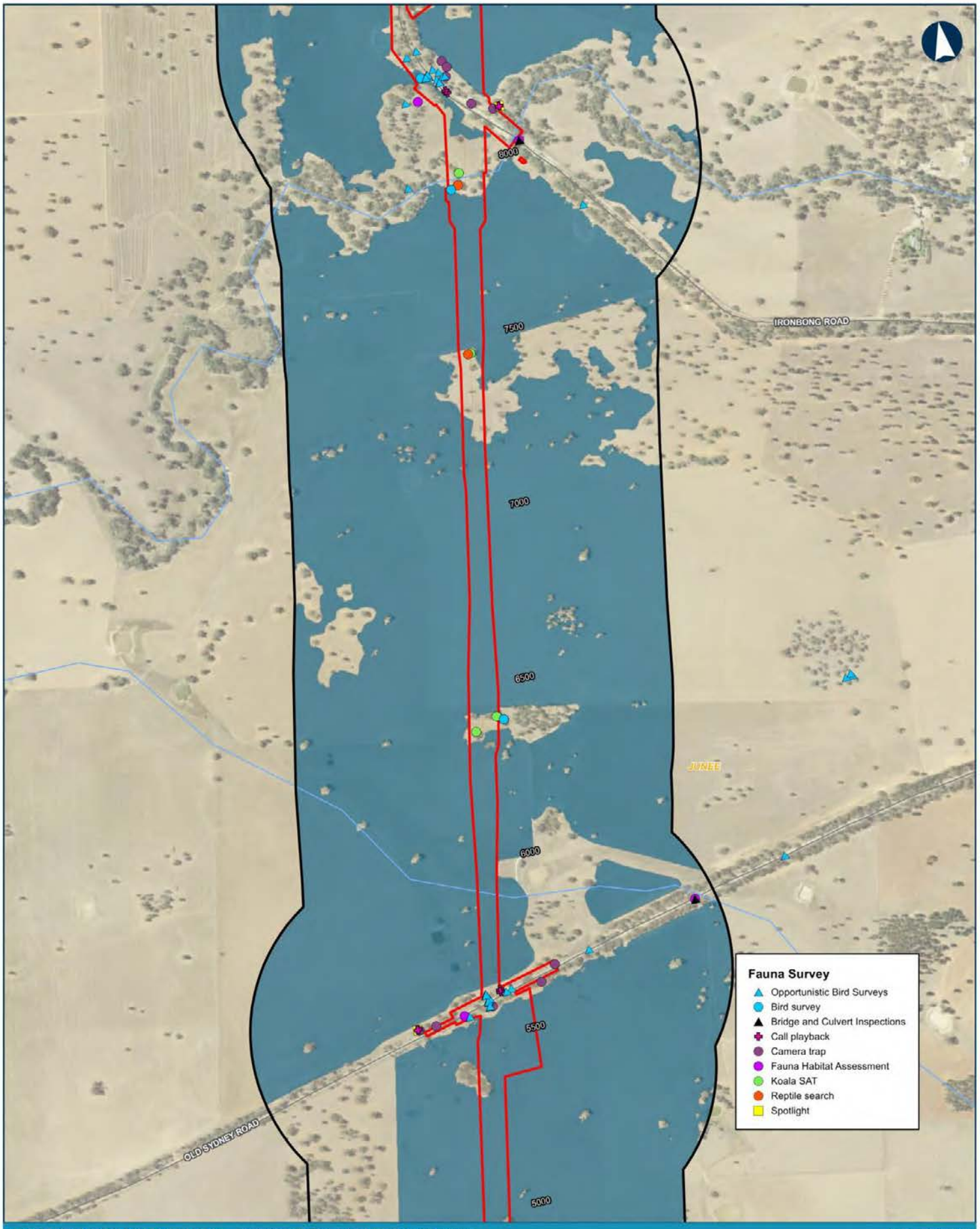

ILLABO TO STOCKINBINGAL Figure 3.5 Targeted Fauna Surveys

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

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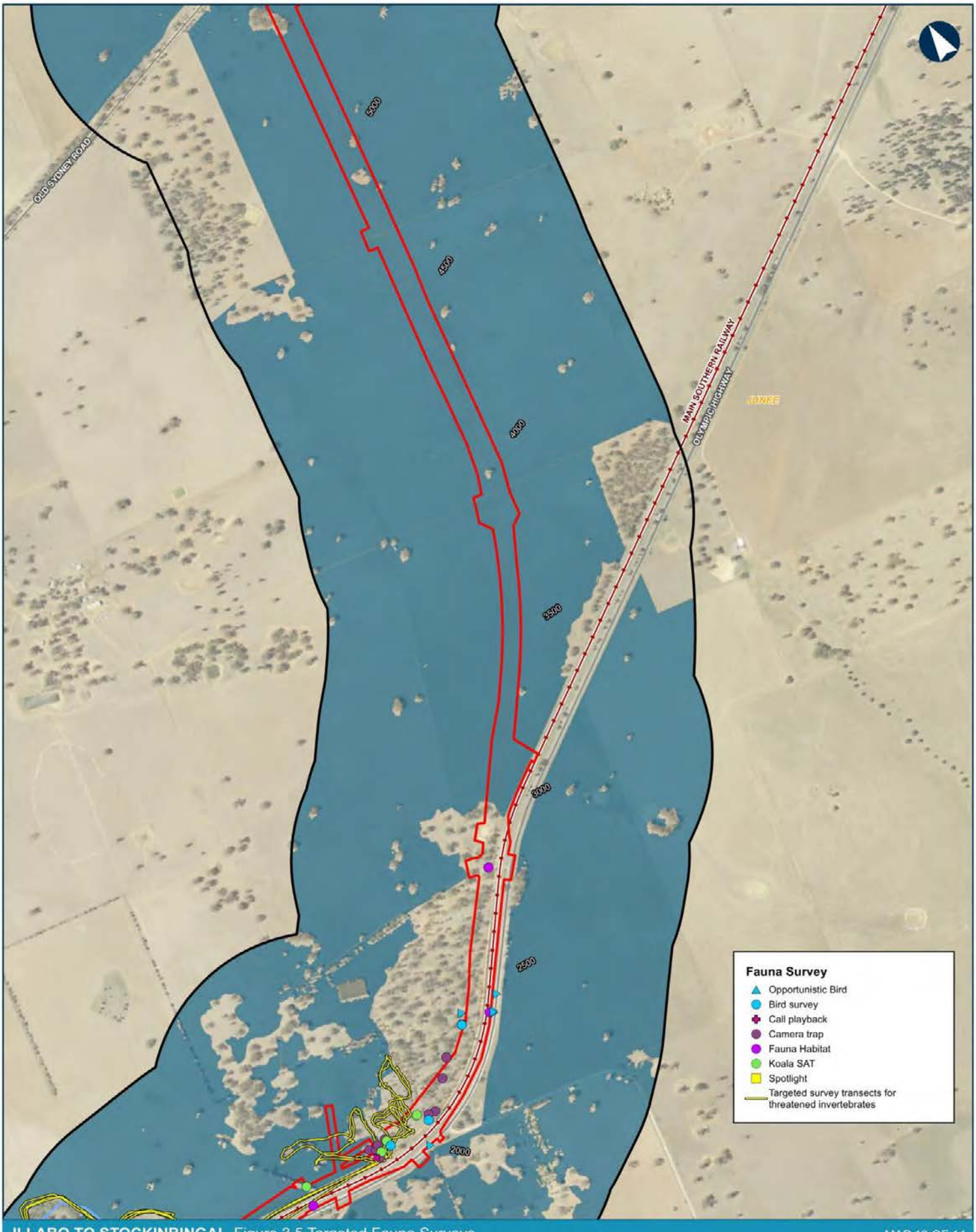

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MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

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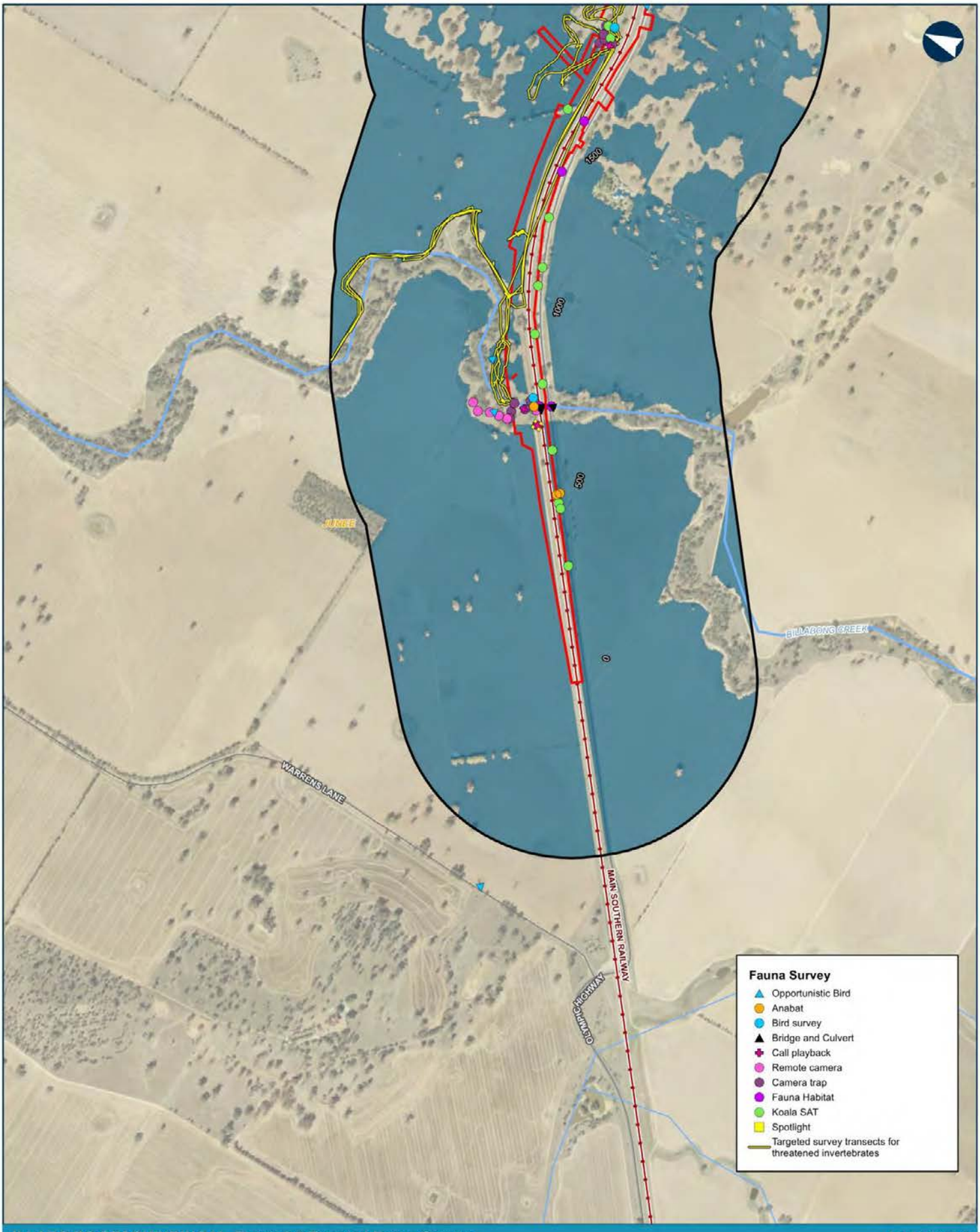

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MAP 14 OF 14

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3.5 Weather conditions

Field surveys were conducted over six survey periods: two survey periods in the spring of 2018 encompassing flora and fauna guilds, a summer survey session for flora in December 2018, a winter survey session for fauna in July 2019 and a further spring and summer survey sessions for threatened flora and fauna in September 2019, September/October 2020, January 2021 and December 2022 and October 2023.

During the survey periods conditions were mild to warm with a minimum temperature of -0.5°C and a maximum of 33°C. Low levels of rainfall was experienced during the survey period.

Weather conditions leading up and during the WSP survey period were dry in 2018 and 2019 with the Cootamundra regional area experiencing an abnormally low amount of rainfall and dry conditions. Weather conditions obtained from nearby Bureau of Meteorology Cootamundra Airport – station 073142 are summarised in Table 3.8. Table 3.8.

Weather conditions during the July 2019 fauna survey period, extending between 8 July and 12 July 2019, were very cool with overcast conditions week and some precipitation experienced throughout the survey. The relatively low rainfall did not ease the generally dry conditions that preceded the survey.

Weather conditions leading up and during the WSP survey period in 2018 and 2019 were dry with the Cootamundra regional area experiencing an abnormally low amount of rainfall. Despite some rain prior to these surveys, flooding of temporary pools and wetlands preferred by some species was not present at time of surveys. However, additional targeted surveys were completed in September/October 2020 and January 2021. following above average winter and early spring rainfall. At the time of survey, exotic annual weed cover was high and reflected the long history of agricultural disturbance within the subject land. Given the high levels of exotic weed cover and lack of representative targeted surveys, threatened plant populations are considered unlikely to persist within this landscape.

In conducting vegetation integrity assessments, it is noted that dry conditions were experienced during surveys completed in the 2018/2019 period. During dry conditions, persistent native perennial cover was recorded with low to near non-existent exotic cover. Conversely, non-dry surveys conducted in spring 2020 observed extremely high exotic annual and perennial weed cover with low native cover. Given the highly disturbed nature of the vegetation due to a long history of cropping and grazing, vegetation integrity was identified to be reduced during non-drought conditions. This was particularly evident with patches assigned to derived grassland where during non-dry conditions native cover was mostly non-existent with exotic species exceeding in most patches >90% cover.

Invertebrate active searches were conducted during warm days with light winds and no rainfall. These weather conditions were in accordance with species specific survey requirements.

Table 3.8 Weather condition during survey period

Date	Temperature (°C)		Rain (mm)[1]	Wind (km/hr) (direction)[2]
	Minimum	Maximum		
02/10/2018	1.5	27.4	0.0	4 (SE)
03/10/2018	10.5	17.2	3.4	9 WNW
04/10/2018	11.9	16.5	9.8	24 SSE
05/10/2018	11.5	19.6	0.2	56 SSE
19/11/2018	12.9	28.1	0.0	24 ESE
20/11/2018	14.5	31.6	0.0	24 ESE
21/11/2018	18.4	22.3	10.4	24 WSW
22/11/2018	8.6	17.1	5.8	44 WNW
23/11/2018	8.3	18.0	7.4	44 WNW

Date	Temperature (°C)		Rain (mm)[1]	Wind (km/hr) (direction)[2]
	Minimum	Maximum		
03/12/2018	7.8	24.9	0.0	33 WSW
04/12/2018	12.6	27.9	0.0	17 SSW
05/12/2018	15.8	29.6	0.0	33 ESE
06/12/2018	15.1	31.3	0.0	33 ESE
07/12/2018	17.4	33.0	0.0	24 NNE
13/05/2019	0.3	17.5	0.2	9 SSW
14/05/2019	1.6	18.0	0.0	4 SSE
15/05/2019	-1.5	17.7	0.0	9 ESE
08/07/2019	8.6	13.9	4.0	Calm
09/07/2019	1.4	12.9	1.2	9 WSW
10/07/2019	4.5	12.4	0.0	17 NNW
11/07/2019	5.7	12.3	0.3	19 WNW
12/07/2019	5.0	13.5	0.3	24 NNE
02/09/2019	0.8	27.1	0.0	24 ENE
03/09/2019	3.9	30.5	0.0	9 SE
04/09/2019	5.5	27.6	0.0	19 WNW
29/09/2020	-0.5	19.4	0.0	9 ESE
30/09/2020	7.4	17.0	0.0	9 NNE
01/09/2020	10.5	17.1	0.8	24 WNW
31/01/2021	14.6	31.1	0.0	17 ESE
25/11/2022	6.2	24.7	0.0	9 WNW
26/11/2022	7.1	27.1	0.0	9 SE
27/11/2022	11.8	25.6	0.1	9 ENE
28/11/2022	7.0	21.9	0.6	9 SSW
06/12/2022	13.7	31.0	0.0	44 WNW
07/12/2022	5.0	25.0	0.3	9 NNE
17/10/2023	0.1	19.3	2.8	17 ESE
18/10/2023	4.4	23.0	0	33 ESE
19/10/2023	10.0	25.0	0	33 E
20/10/2023	4.0	28.1	0	9 ESE
21/10/2023	7.5	32.1	0	9 SSE
22/10/2023	5.7	21.0	0	33 WSW
23/10/2023	3.3	22.5	0	17 SSW
24/10/2023	1.7	29	0	17 SSW
25/10/2023	10.8	17.7	0	44 WSW
26/10/2023	-1.2	19.0	0	17 SSW

Date	Temperature (°C)		Rain (mm)[1]	Wind (km/hr) (direction)[2]
	Minimum	Maximum		
27/10/2023	6.1	20.8	0	44 ESE
30/10/2023	11.0	23.7	0	44 NNW
31/10/2023	6.0	20.7	0	44 WSW
1/11/2023	-1.3		0	9 SSW
2/11/2023		26.4	0	
3/11/2023	9.9	28.2	0	44 ESE

** Source: Climate data obtained from Bureau of Meteorology (2021), Cootamundra Airport – station 073142;*
1) daily precipitation; 2) wind at 9am; N- north, E- East, S- South, W- West

3.5.1 Use of dry condition benchmarks

Given 57 (97%) of the BAM vegetation integrity plots were sampled during dry conditions in the 2018/2019 survey period and as such benchmark data in the BAM calculator has been adjusted and the use of dry benchmarks has been applied.

The dry benchmarks used for BAM calculations were those in IBRA region: NSW South West Slopes:

- PCT 76 <361mm benchmark
- PCT 79 <379mm benchmark
- PCT 80 <361mm benchmark
- PCT 266 <480mm benchmark
- PCT 276 <480mm benchmark
- PCT 277 <480mm benchmark
- PCT 309 <462mm benchmark
- PCT 347 <480mm benchmark.

The use of dry benchmarks takes a conservative approach to analysing data collected during dry conditions and ensure vegetation integrity scores are more reflective of local climatic conditions and is consistent with guidance set out in Section 3.4.5 of the Biodiversity Assessment Method 2020 Operational Manual – Stage 1.

3.6 Field survey limitations

Access restrictions during the survey period prevented targeted threatened species surveys from being conducted throughout the survey area (i.e. limited targeted flora and fauna surveys). As such, survey was limited to areas where access was available (78% of the proposal area) (refer to Figure 3.6). It is further noted that approximately 75% of the area unable to be surveyed is otherwise Category 1 vegetation (being 81.2ha of 108.3ha).

Where access was restricted or limited, but adjacent areas were accessible, vegetation community boundaries, condition and threatened flora and fauna habitat attributes were extrapolated from a distance with the aid of binoculars. Where the vegetation could not be viewed existing vegetation mapping of the area and aerial photo interpretation was used and a precautionary approach was adopted, including assuming threatened biodiversity was present based on best available information.

The proposal design has changed overtime due to implementing avoid and minimise principles and as such some survey effort occurs adjacent to the current impact design. Given the relative uniform vegetation types and conditions that occur within the subject land survey effort is considered representative of vegetation and habitat conditions within the proposal area.

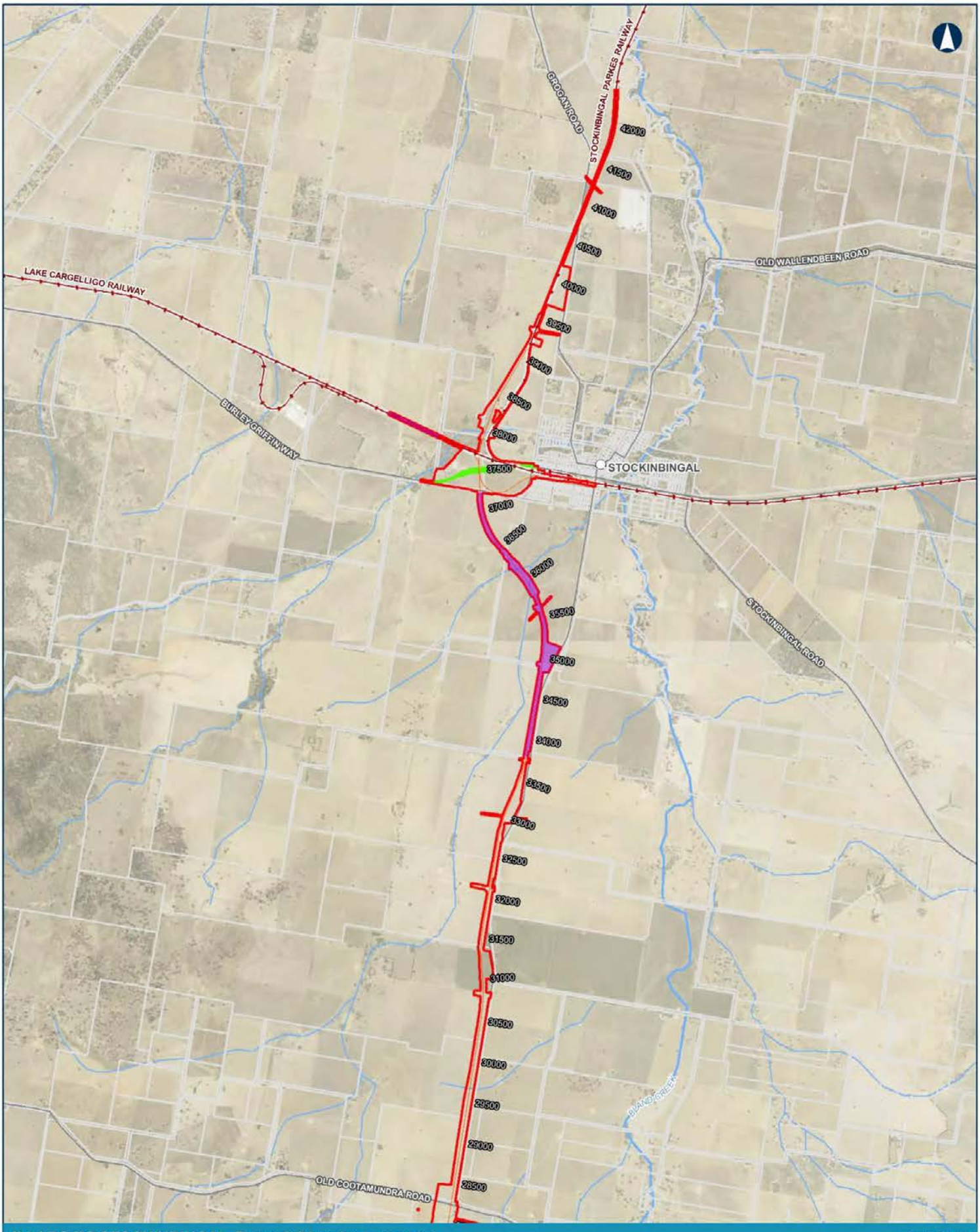
Habitat within the subject land has been highly modified from historic and ongoing agricultural activities. Given this, survey effort has been modified for certain species due to lack of quality habitat (eg. partially or full removed mid and ground stratum native vegetation for mammal and ground dwelling species).

Weather conditions have been variable over the years of survey, however given the degraded habitats present within the subject land it is considered unlikely that fluctuating weather conditions have adversely affected the outcome of field surveys or threatened species assessment that underpin this report.

No sampling technique can totally eliminate the possibility that a species is present. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present during surveys. The discovery of unknown populations of threatened species, even well outside their known range, is always possible. This applies particularly to cryptic species of plants and animals and plant species which can easily go undetected despite intensive survey.

Where survey effort gaps or land access was unavailable assumed presence for the species was adopted (refer Southern Myotis and flora).

The conclusions in this report are based upon data acquired during desktop review, field surveys and the known distribution and habitat preferences of species. The conclusions are, therefore, indicative of the likely biodiversity values, based on information available at the time of preparing the report, including the presence or otherwise of species.



ILLABO TO STOCKINBINGAL Figure 3.6 Land not surveyed

MAP 1 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 13/11/2023
Author: IRDJV
Paper: A3
Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

- New track/track upgrades
- Proposal Site
- Burley Griffin Way Road realignment
- Major Watercourse
- Minor Watercourse
- Existing Rail
- Land not surveyed

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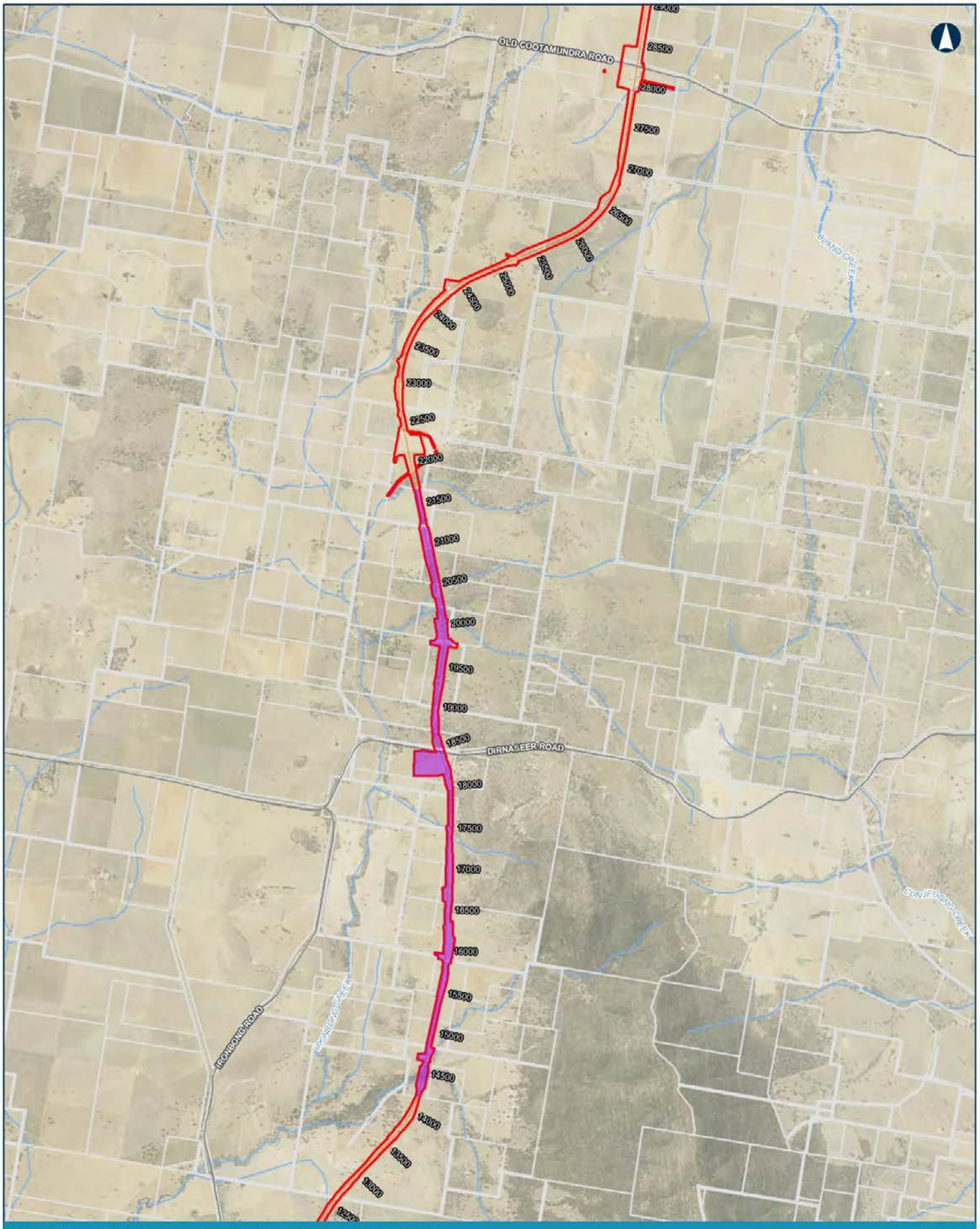

ILLABO TO STOCKINBINGAL Figure 3.6 Land not surveyed

MAP 2 OF 3

0 0.5 1 1.5 Kilometers

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Date: 13/11/2023 Paper: A3

Author: IRDJV Scale: 1:42,500

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New track/track upgrades

Proposal Site

Major Watercourse

Minor Watercourse

Land not surveyed

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ILLABO TO STOCKINBINGAL Figure 3.6 Land not surveyed

MAP 3 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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New track/track upgrades
Land not surveyed
Proposal Site
Major Watercourse
Minor Watercourse
Existing Rail

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4 Landscape context

This chapter address landscape context in accordance with Chapter 3 of the BAM and has been prepared in accordance with Part 1 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020b). It provides information on a range of landscape features that occur on the subject land and in surrounding areas. The landscape features outlined below are used to inform the habitat suitability of the subject land for threatened species and the potential movement of species across the landscape.

4.1 Landscape features

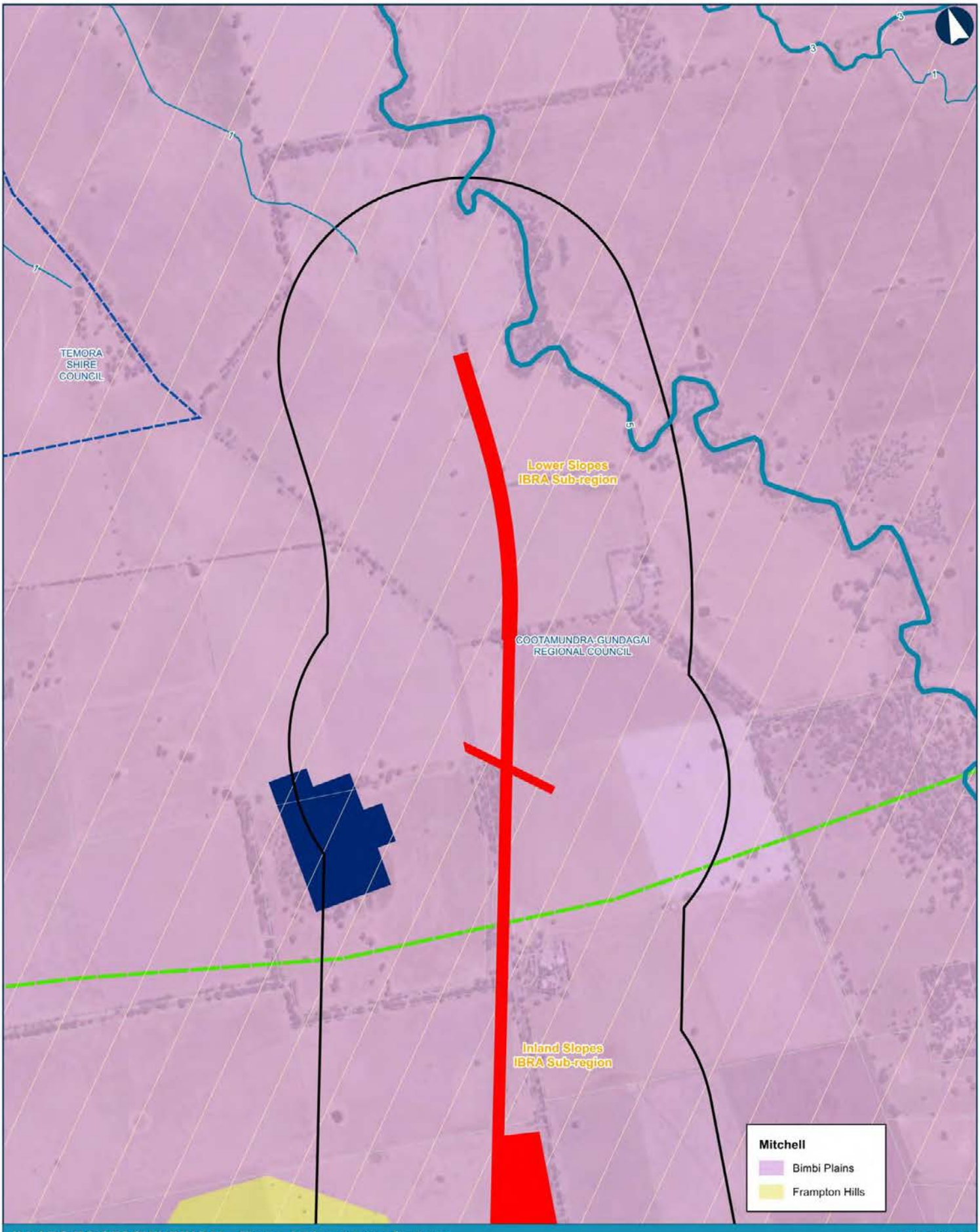
The subject land is characterised by relatively flat land. The subject land lies within the eastern part of the Lachlan Fold Belt which consists of a complex series of north to north-westerly trending folded bodies of Cambrian to Early Carboniferous sedimentary and volcanic rocks. The northern and southern sections of the subject land pass through Quaternary alluvium and colluvial deposits consisting of gravel, sand, silt and clay. The central section of the proposal passes through the Frampton Volcanics which consist of, rhyolite, rhyodacite, dacite, quartz, sandstone, siltstone and conglomerate. The soils found within the subject land are a combination of Brown Chromosols, Red Kandosols and Brown Sodosols which generally have a moderate erodibility and erosion hazard. The proposal is located within the Murrumbidgee River and Lachlan River catchments, which are sub-catchments within the Murray Darling Basin. The catchment divide lies closer to Stockinbingal and therefore most of the subject land is within the Murrumbidgee catchment.

The subject land crosses six named watercourses including Dudauman Creek, Ulandra Creek, Powder Horn Creek, Run Boundary Creek, Isobel Creek, Billabong Creek and numerous other crossings over small shallow ephemeral creeks and tributaries. All of these watercourses are at the top of the catchments for their respective valleys and are likely to only flow during rainfall events.

An overview of landscape features is presented in Table 4.1 and Figure 4.1.

Table 4.1 Summary of landscape features

Landscape feature	Occurrence in subject land
IBRA bioregions and subregions	• NSW South Western Slopes • Inland Slopes IBRA subregion (most of the subject land) • Lower Slopes IBRA subregion.
NSW landscape regions (Mitchell landscapes)	• Bimbi Plains • Frampton Hills (majority) • Murrumbidgee – Tarcutta Channels and Floodplains • Springdale Hills.
Local Government Area (LGA)	• Junee Shire Council (southern section) • Cootamundra-Gundagai Regional Council (northern section).
Rivers and streams	• Billabong Creek – 6th order stream • Ulandra Creek – 5th order stream • Run Boundary Creek – 3rd order stream • Isobel Creek – 3rd order stream • Powder Horn Creek – 3rd stream order • Dudauman Creek – 3rd order stream
Important and local wetlands	Bethungra Dam Reserve
Connectivity features	Overall the landscape has been heavily fragmented due to agricultural practices (i.e. cropping and clearing for livestock). The existing connectivity is limited but includes riparian corridors associated with watercourses (Billabong Creek, Ulandra Creek, Ironbong Creek, Run Boundary Creek) and road reserves of Old Sydney Road, Ironbong Road and Dirnaseer Road. These connectivity features link with the largest intact patch of remnant vegetation occurring to the east of the subject land in association with the nearby Bethungra and Ulandra Mountain range. Creeklines and associated riparian vegetation with the rivers and streams predominantly run from east to west and provide the remaining link to movement between Bethungra and Ulandra Mountain range to the east and areas to the west.
Areas of geological significance and soil hazard features	The subject land does not contain any areas of geological significance or soil hazard feature in relation to biodiversity.
Areas of outstanding biodiversity value	No declared areas of outstanding biodiversity value occur in or near the subject land.



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 14/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- BAM 2020 500m buffer
- Cadastre

Strahler Stream Order

- 1
- 3
- 4 - 6

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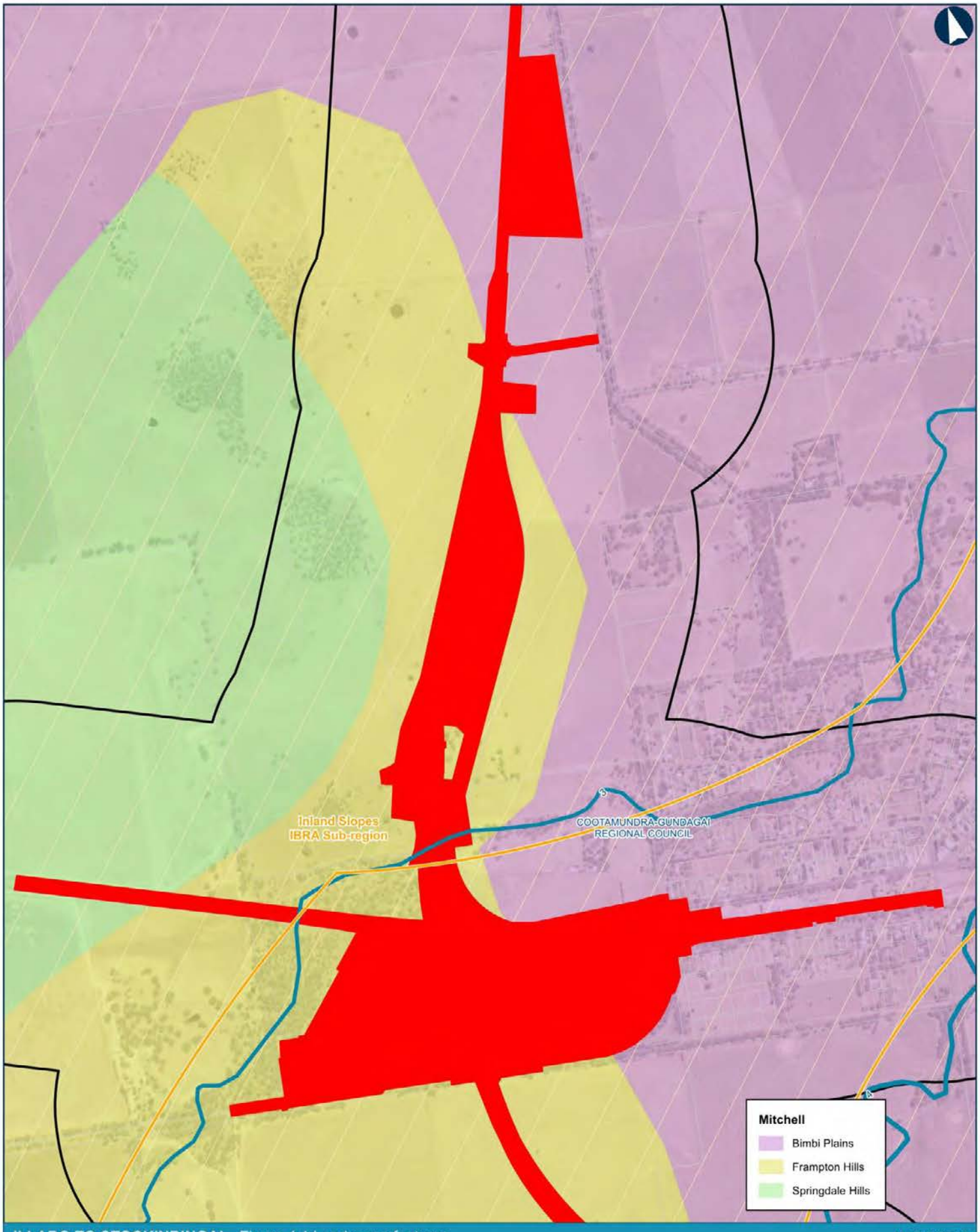

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

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IBRA Sub-Region
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Local Government Areas
BAM 2020 500m buffer
Cadastre
Habitat Connectivity

Strahler Stream Order
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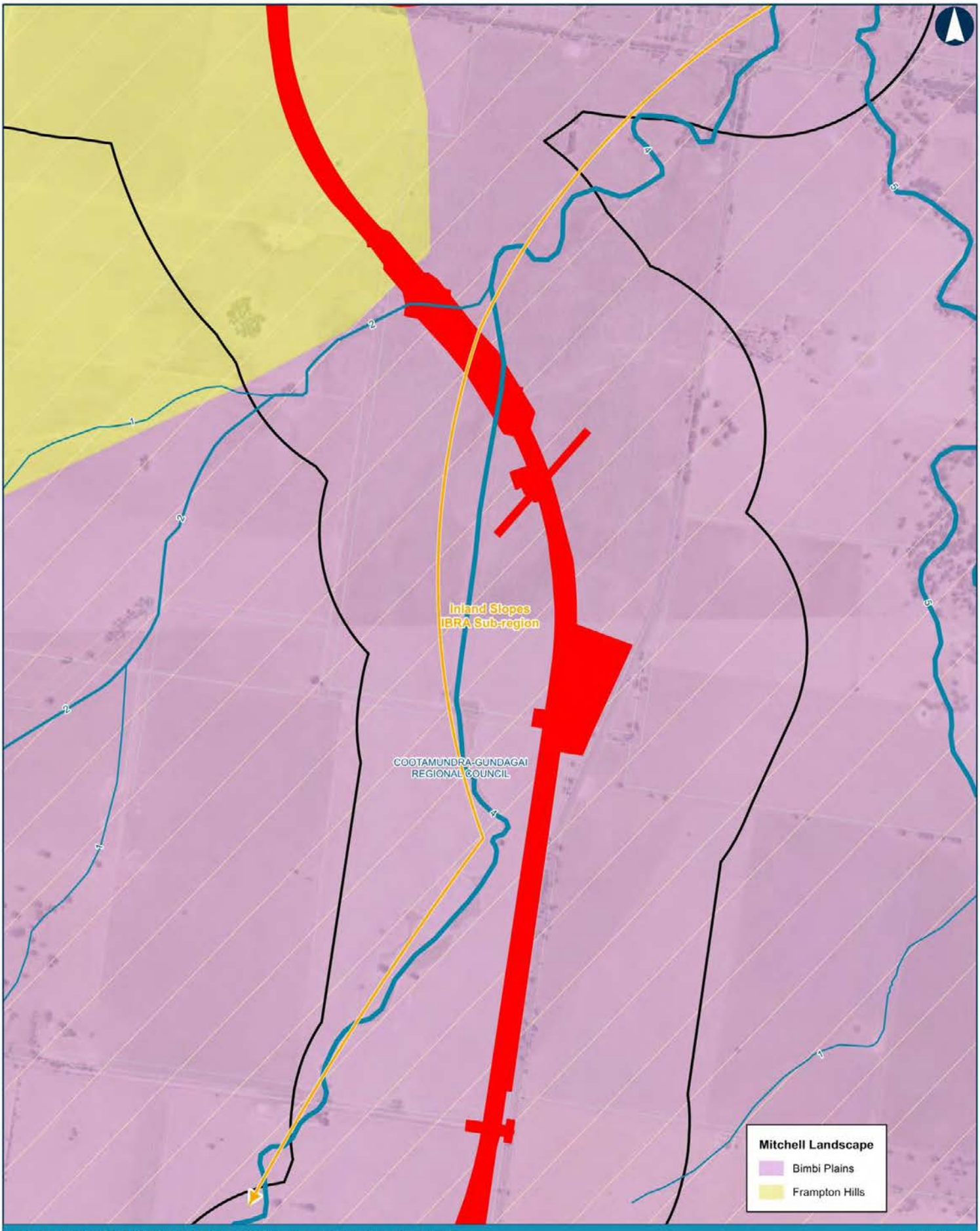

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

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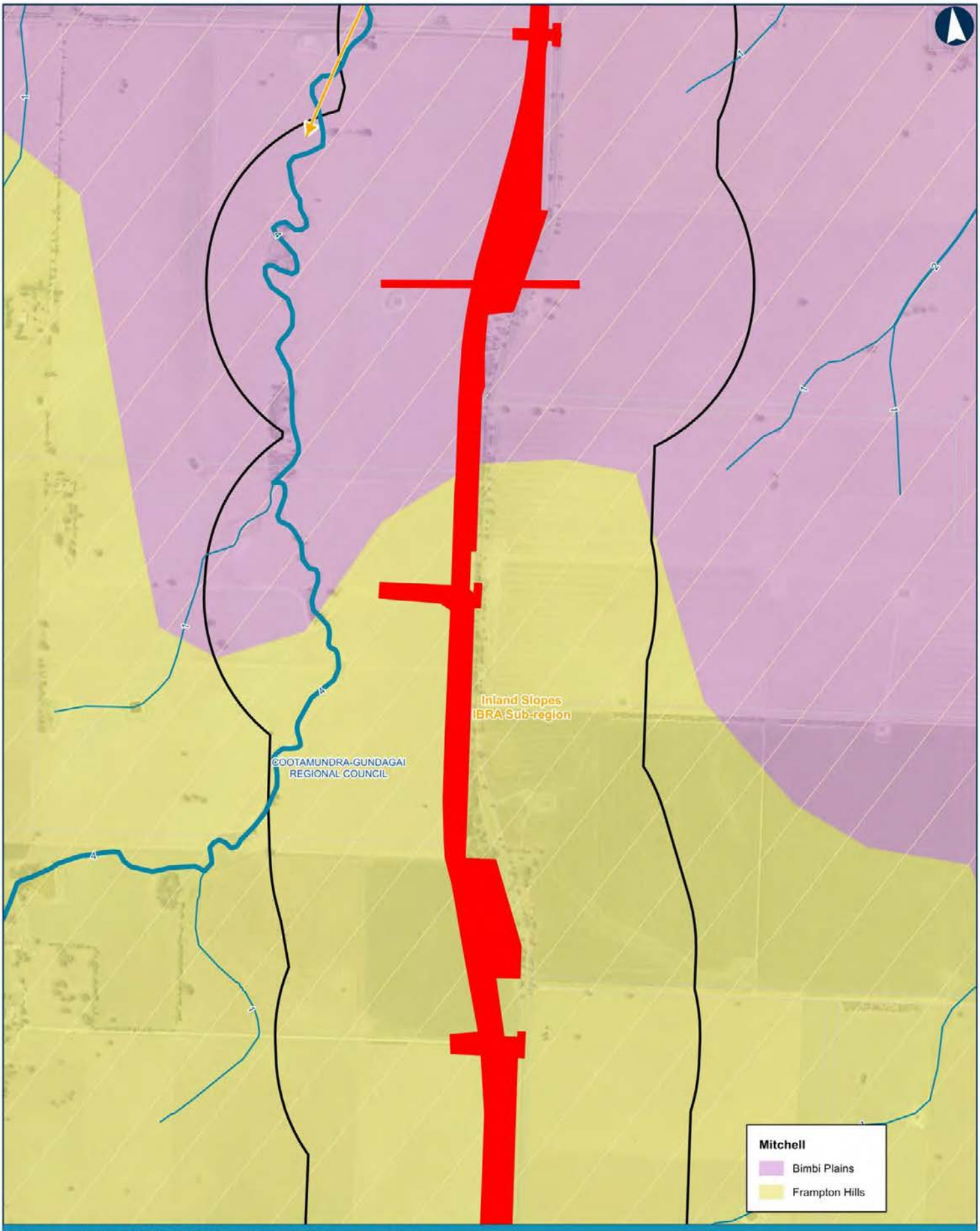

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

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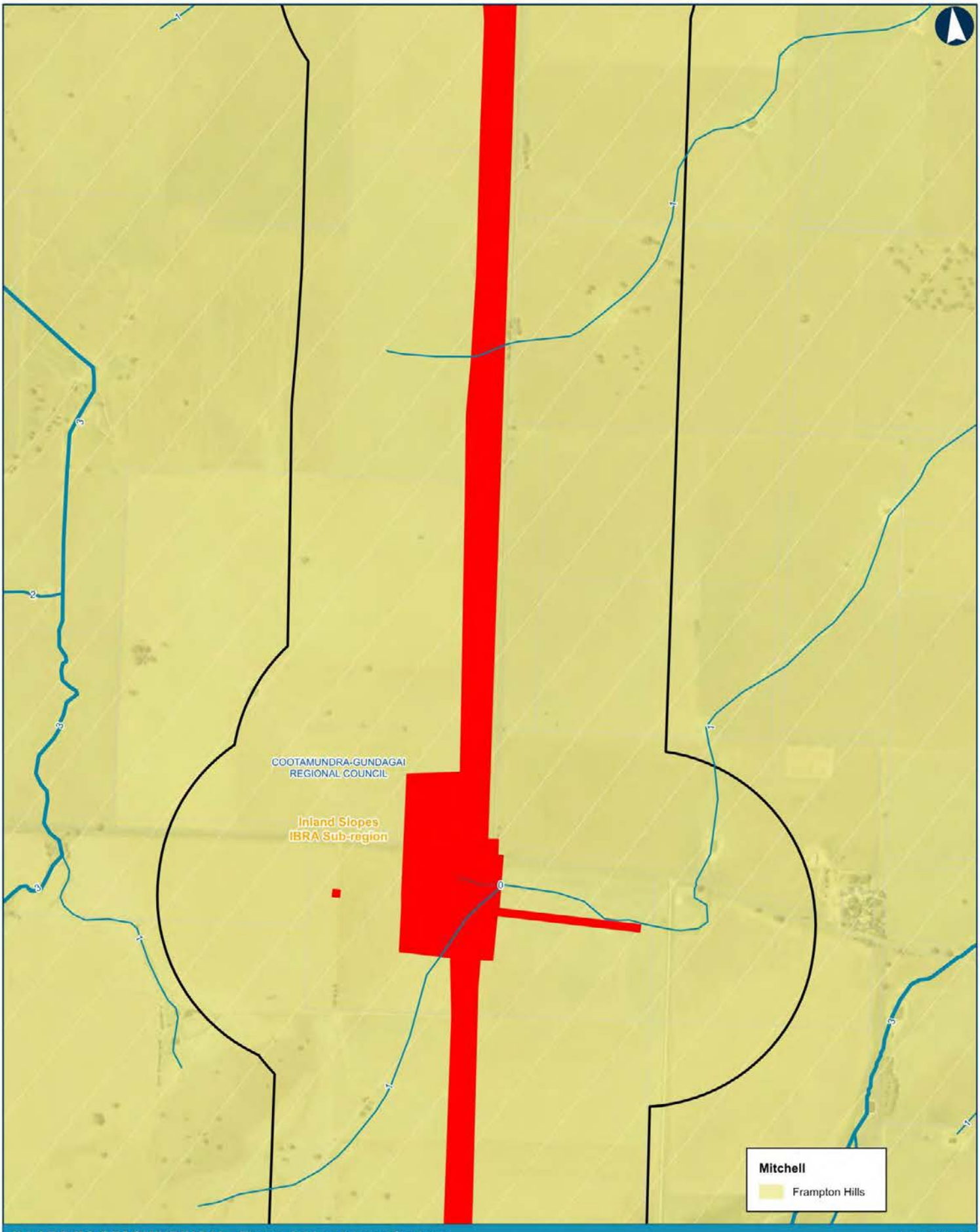

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

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Cadastre

Strahler Stream Order
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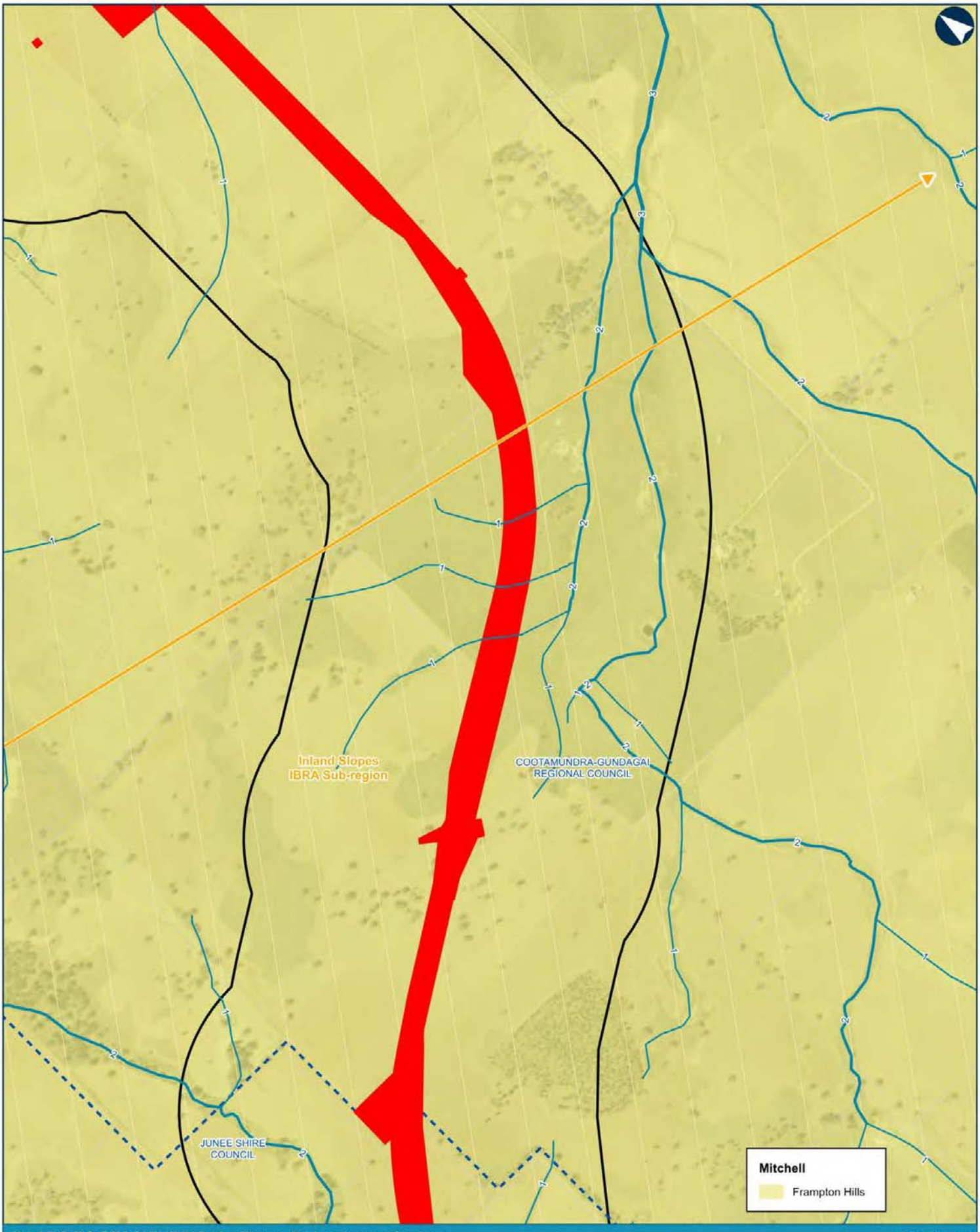

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

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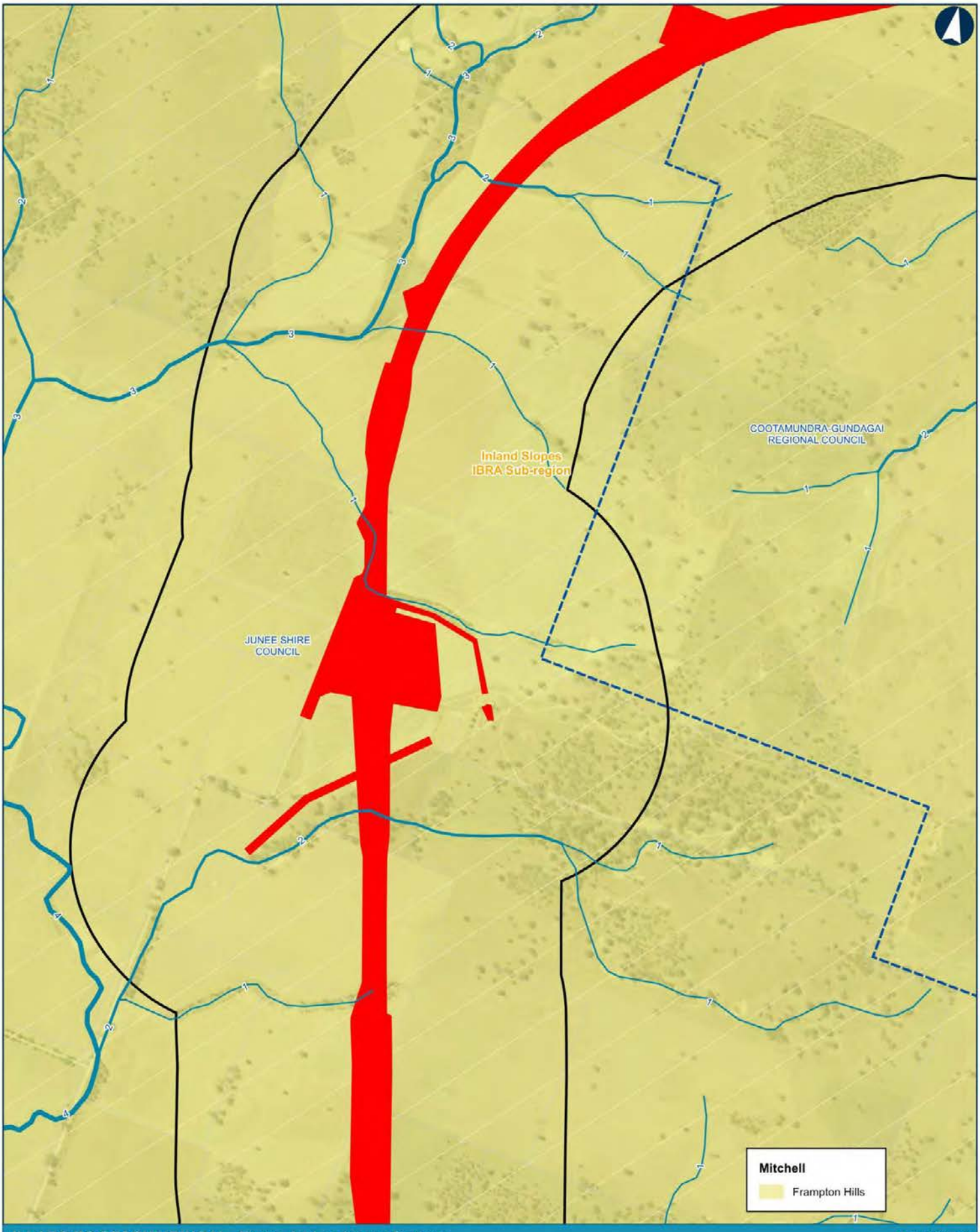

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

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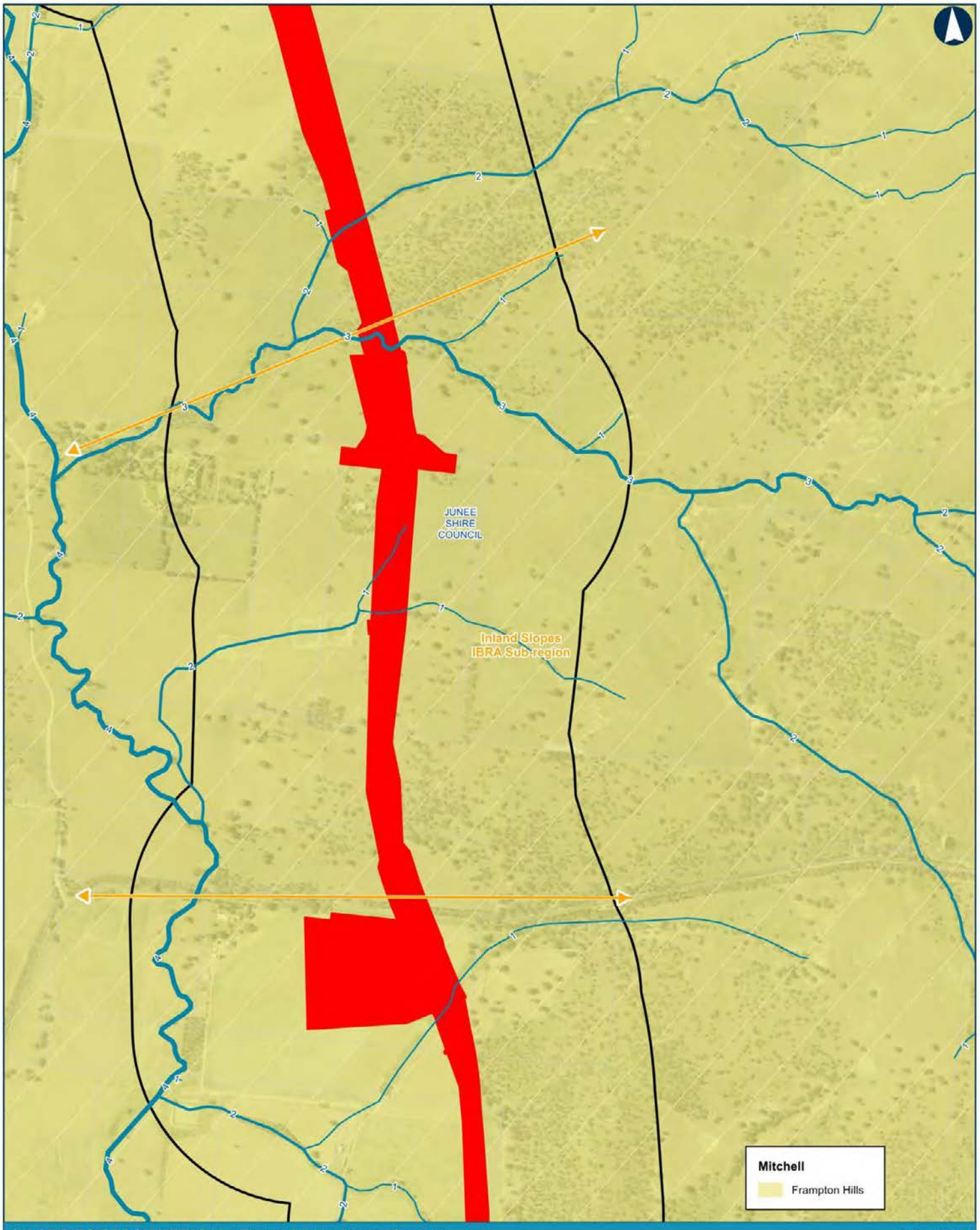

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

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- IBRA Sub-Region
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- Local Government Areas
- BAM 2020 500m buffer
- Cadastre
- Habitat Connectivity

Strahler Stream Order

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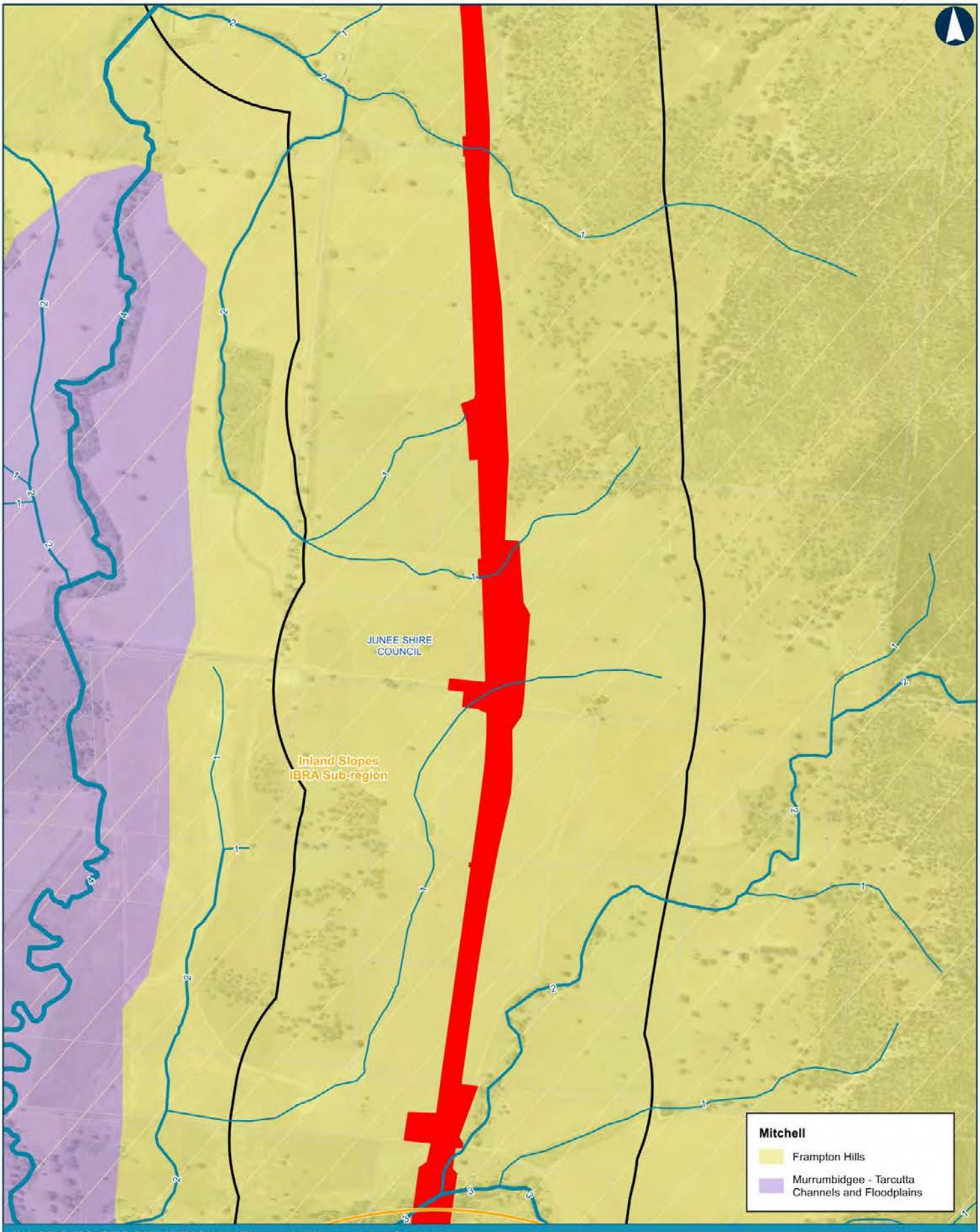

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

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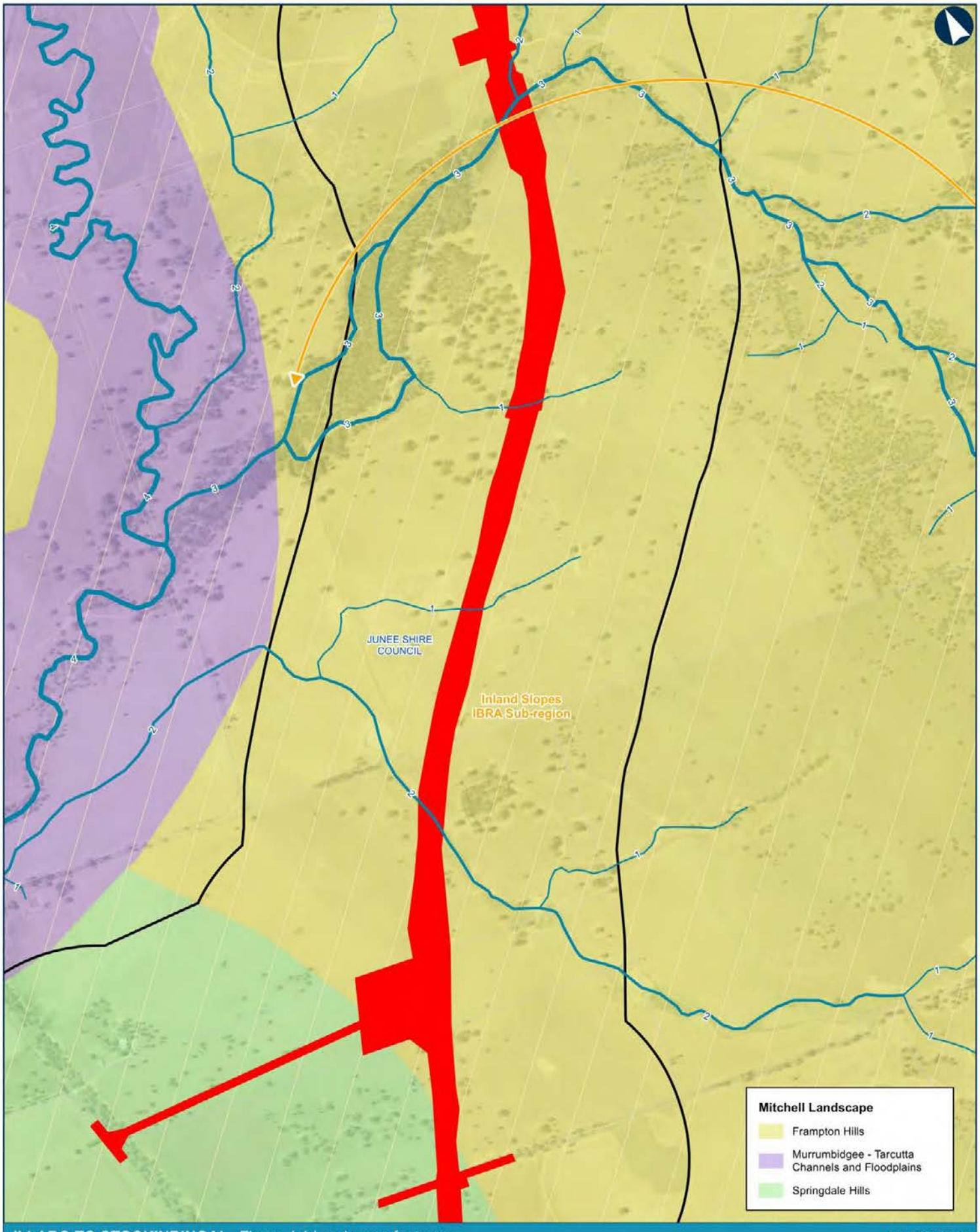

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

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0 0.1 0.2 0.3 Kilometers

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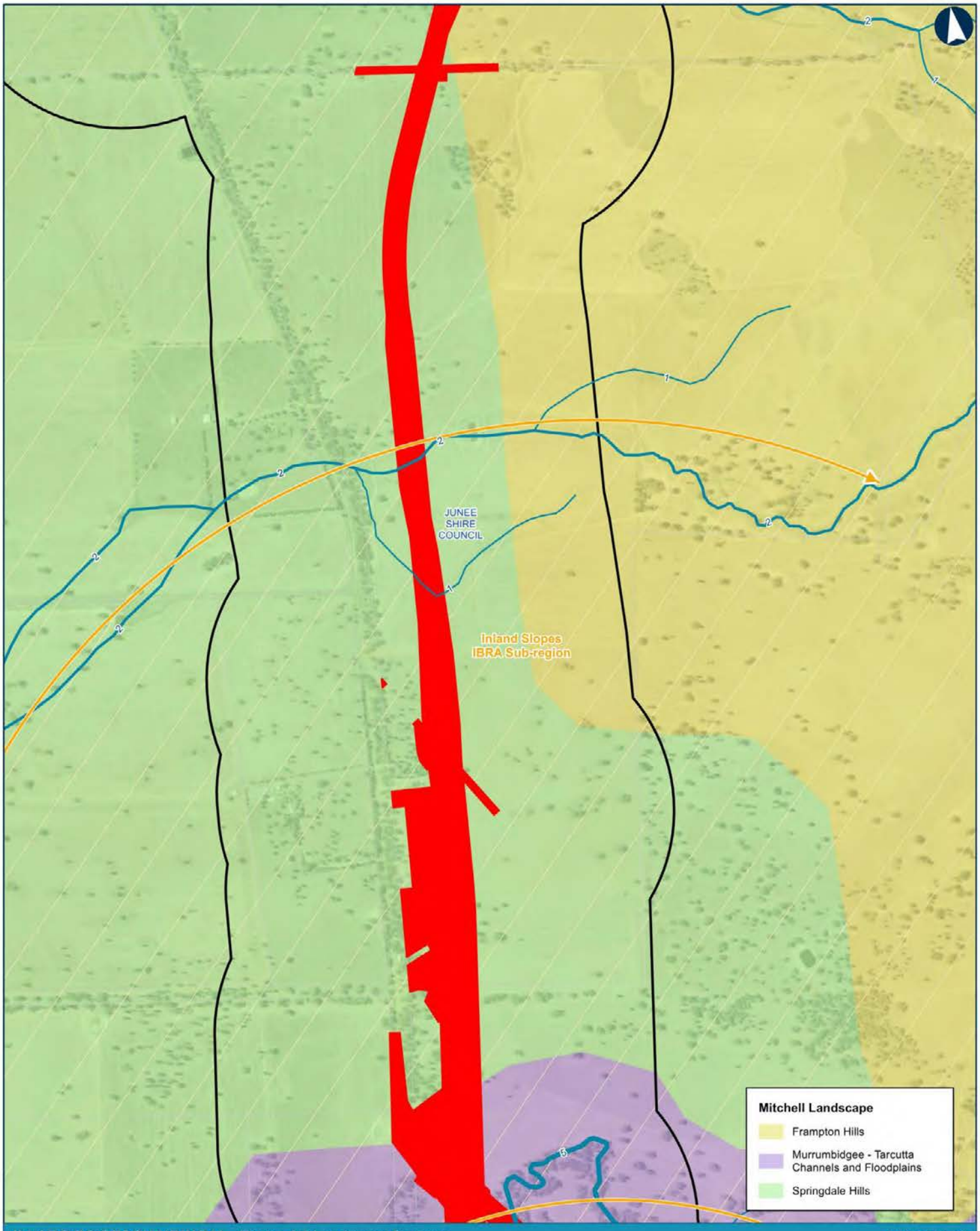

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

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0 0.1 0.2 0.3 Kilometers

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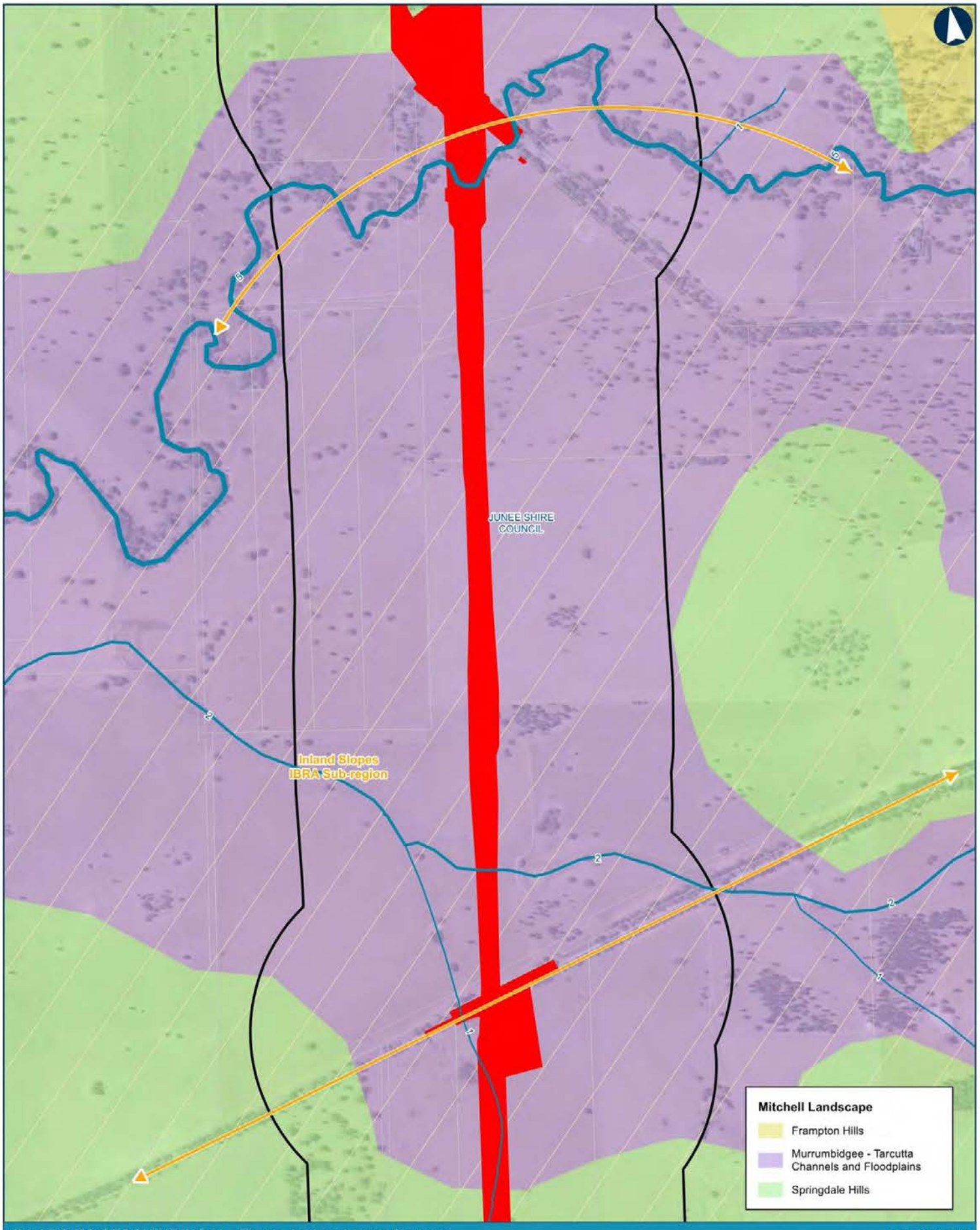

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

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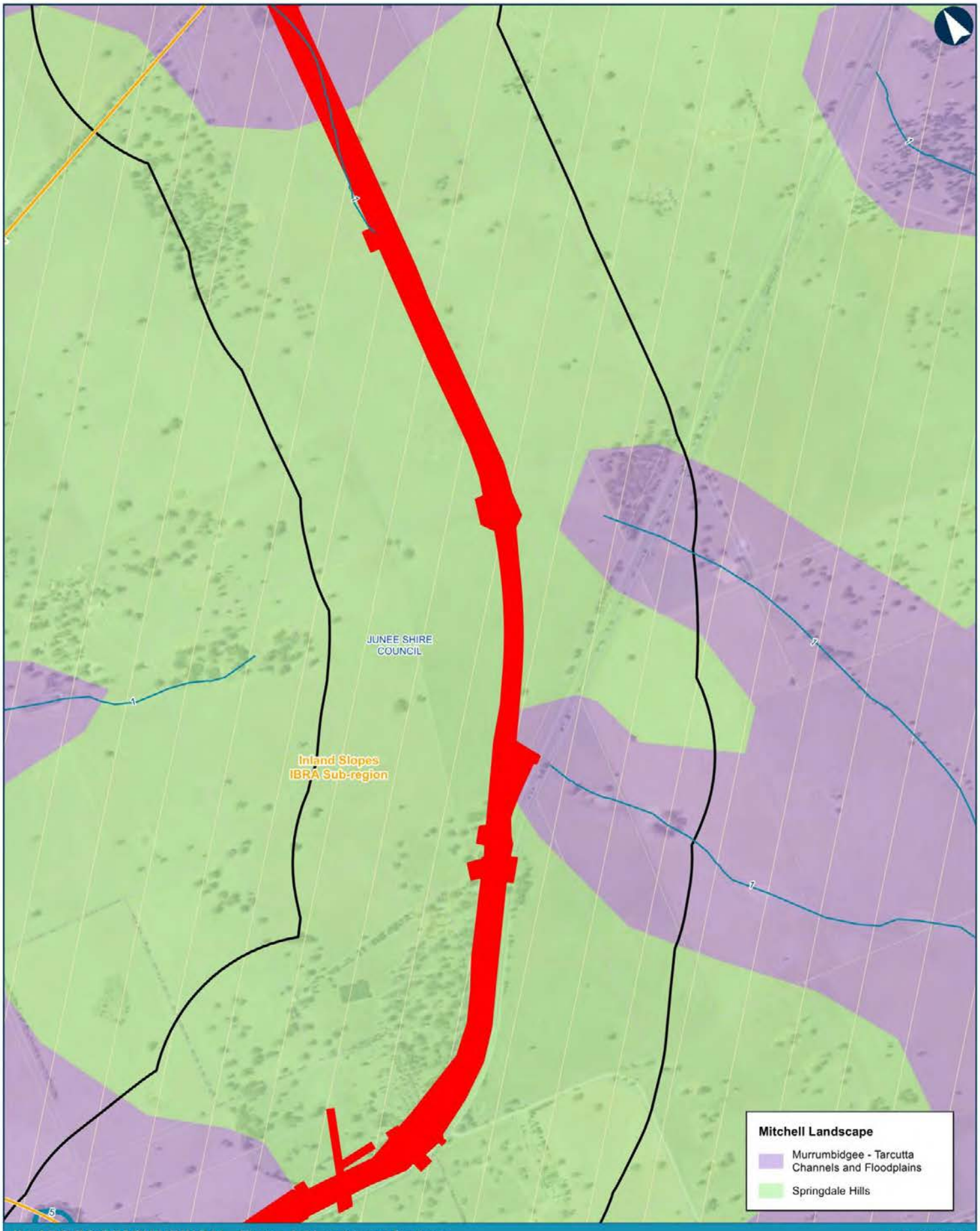

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

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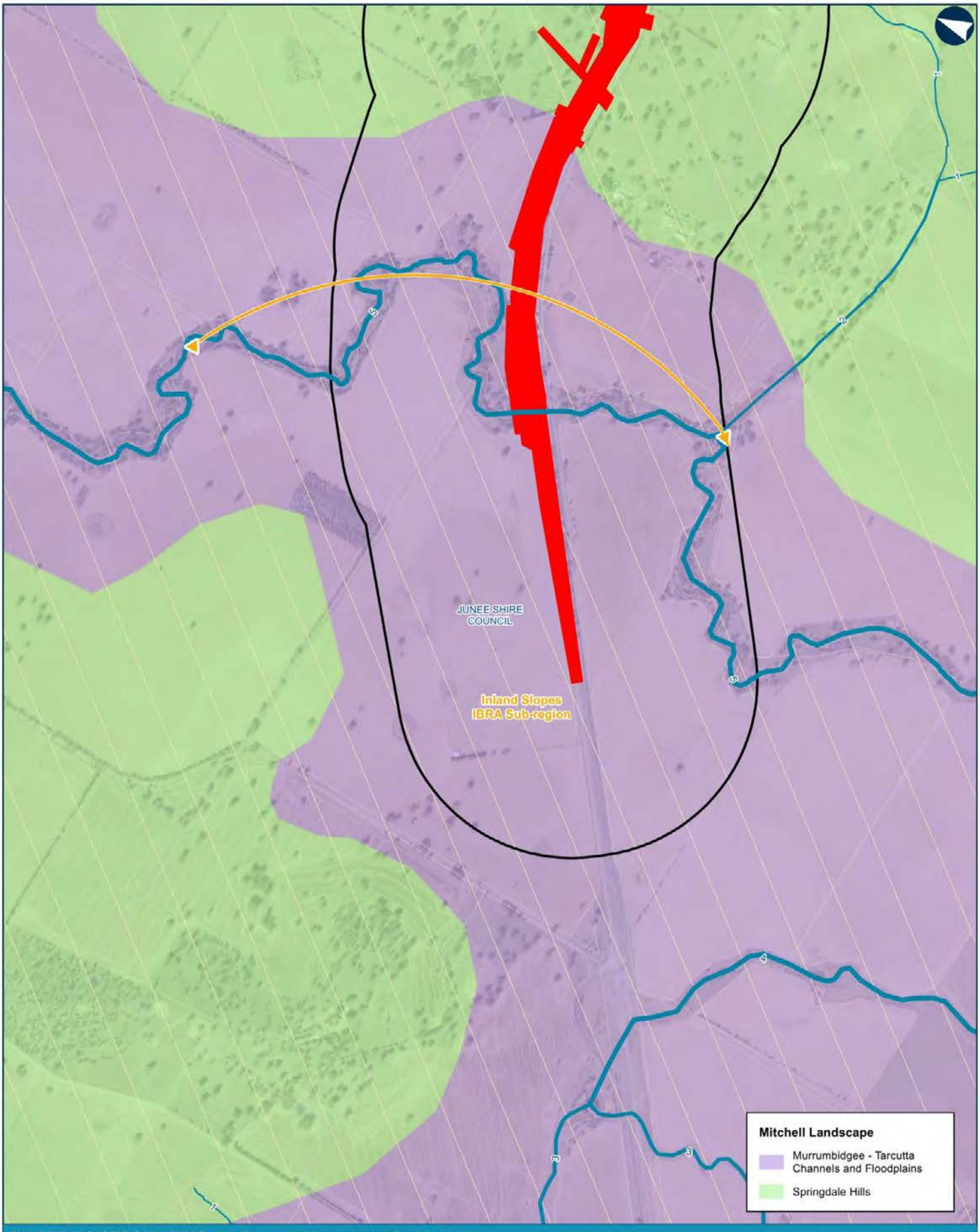

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MAP 14 OF 14

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5 Native vegetation

This chapter assesses native vegetation, threatened ecological communities and vegetation integrity within the subject land in accordance with Chapter 4 of the BAM and has been prepared in accordance with Part 2 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020b).

Native vegetation survey and assessment methodology is outlined in section 3.4.

5.1 Assessing native vegetation cover

Native vegetation cover has been assessed in accordance with Section 3.2 of the BAM. Due the linear shape of the proposal, a 500m buffer following the centre line of the proposal has been applied for native vegetation cover calculations. Percent native vegetation cover refers to the amount of native vegetation (woody and non-woody) that is estimated to be present in the landscape of the assessment area.

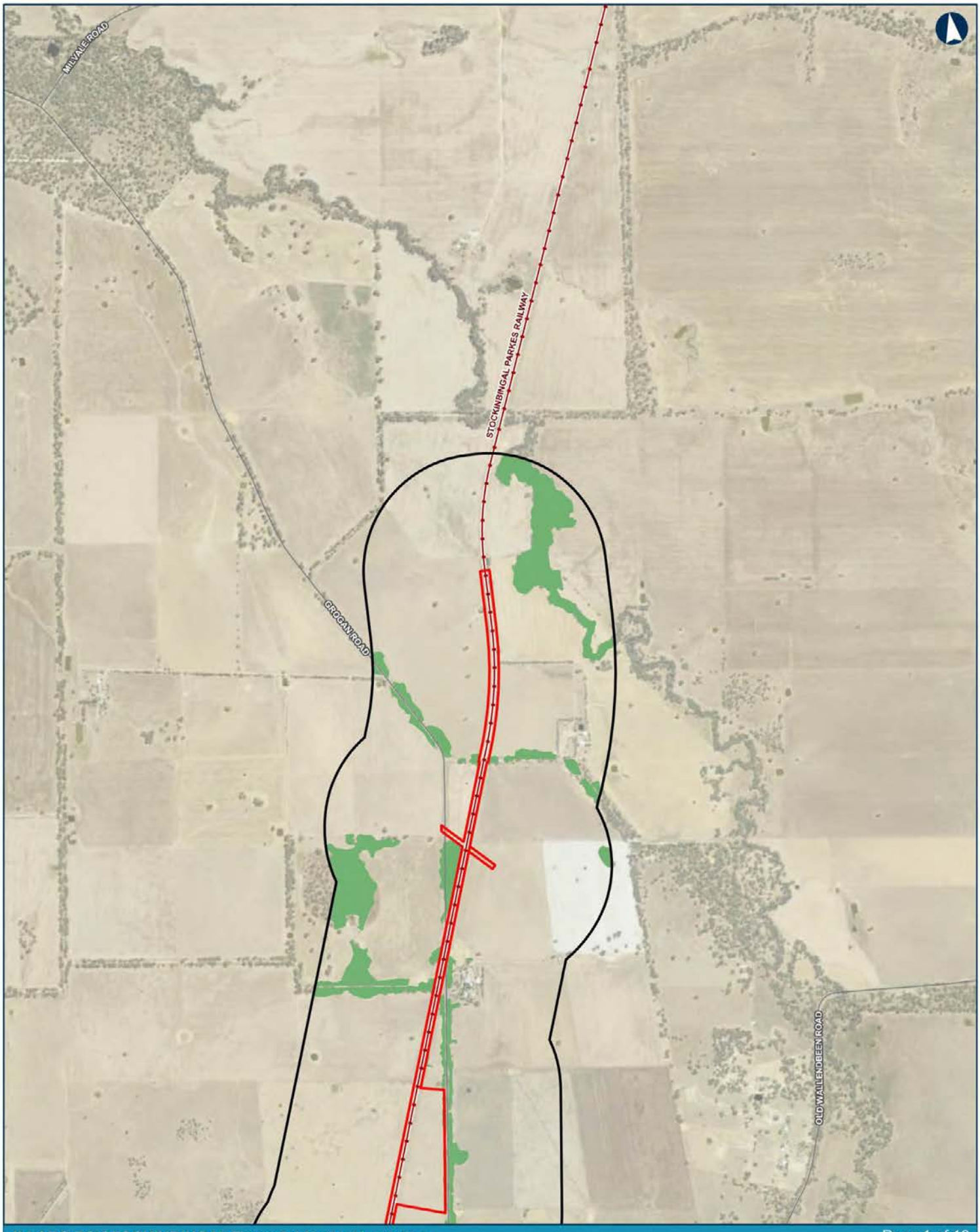
The percentage of native vegetation cover in the assessment area was assigned to one of the following classes:

- 0–10 per cent
- >10–30 per cent
- >30–70 per cent
- >70 per cent.

A summary of native vegetation cover is presented in Table 5.1 and Figure 5.1 illustrates the native vegetation cover. This area calculation includes remnant native vegetation as well as scattered native trees. Native vegetation was recorded to cover a total of 77.17ha (less than 80% per cent) of the subject.

Table 5.1 Assessment of native vegetation cover

Total assessment area (ha)	Area of native vegetation cover (ha)	Native vegetation cover	Cover class
5,500	951	17%	> 10–30%



ILLABO TO STOCKINBINGAL Figure 5.1 Native Vegetation

0 0.15 0.3 0.45 Kilometers

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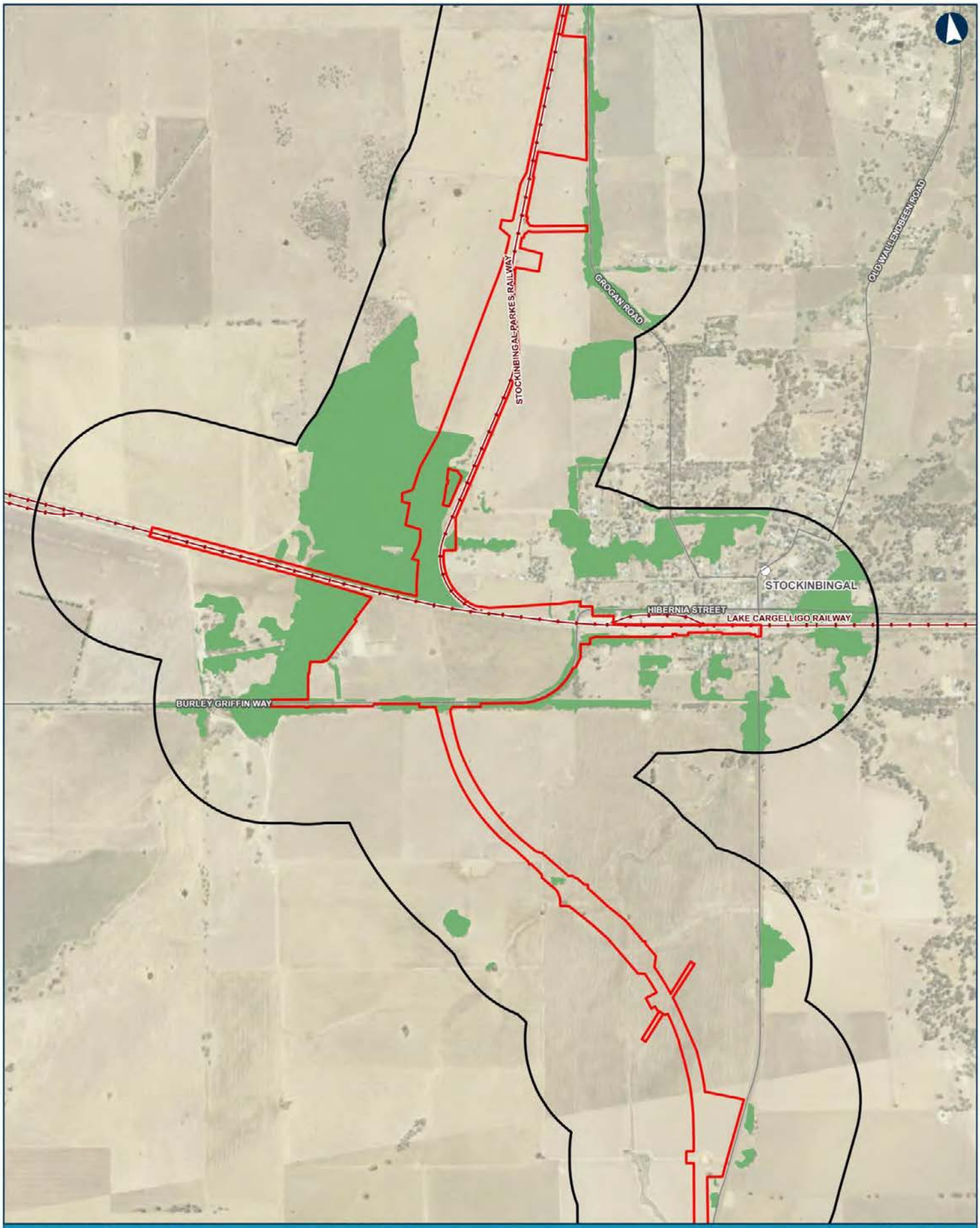

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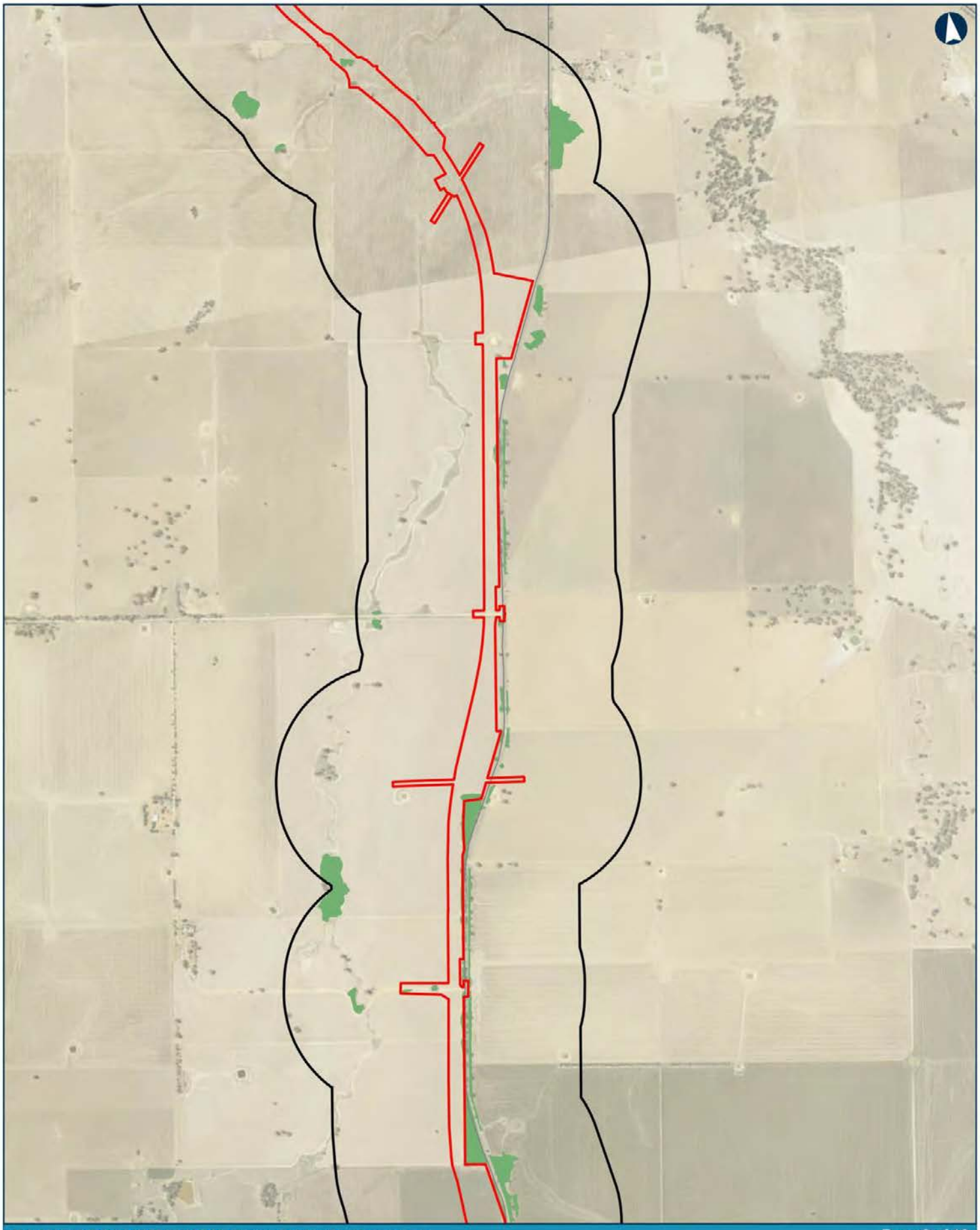

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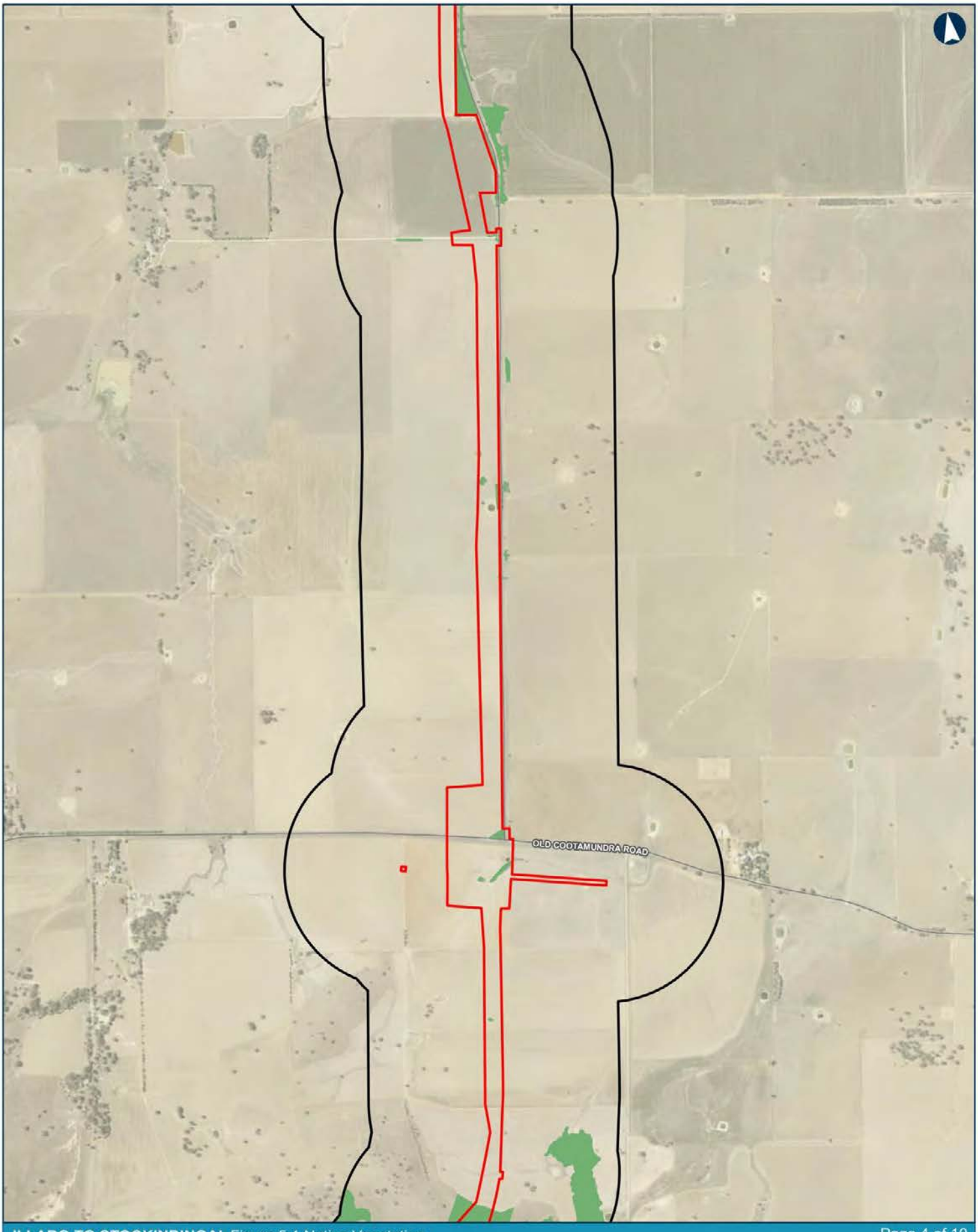

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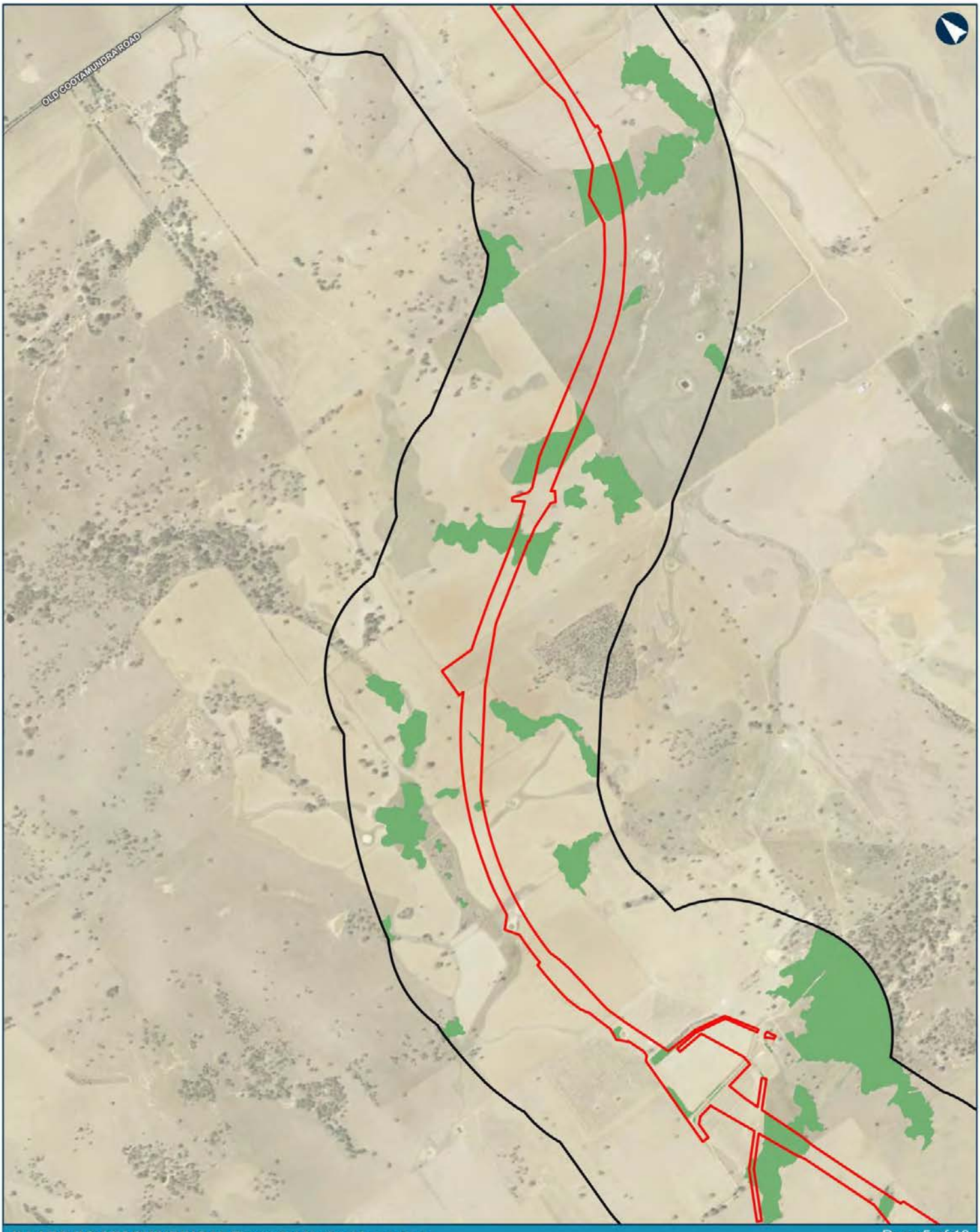

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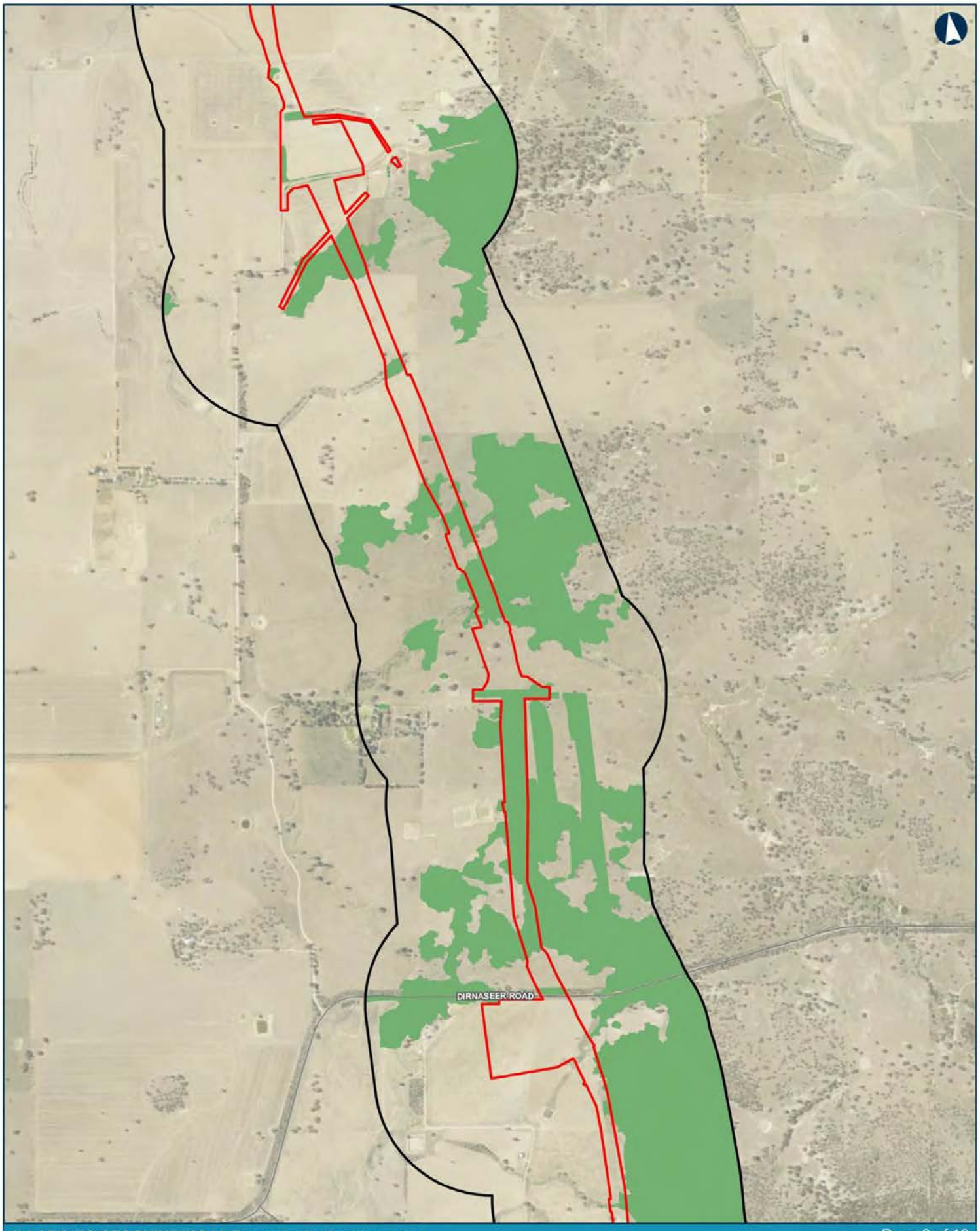

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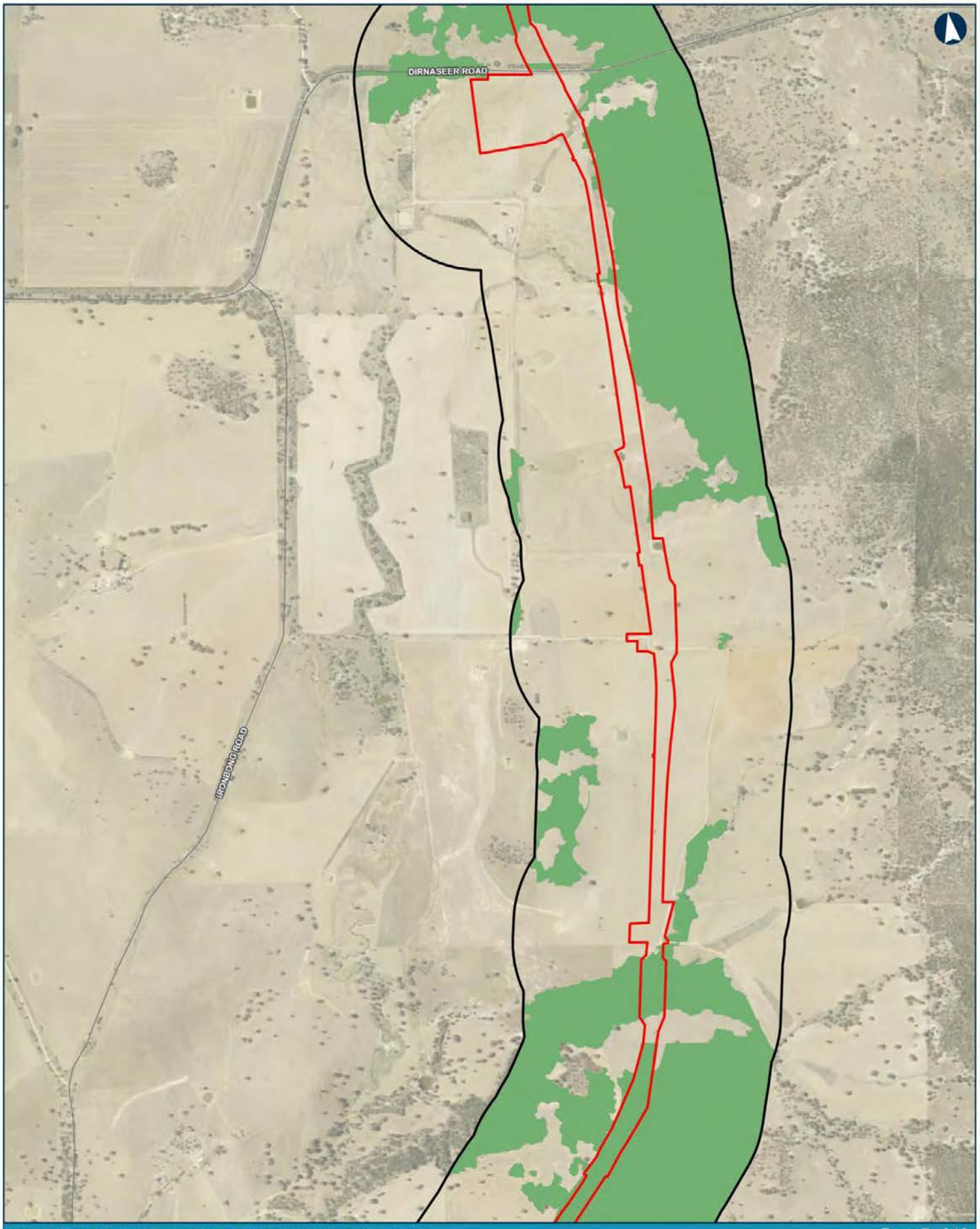

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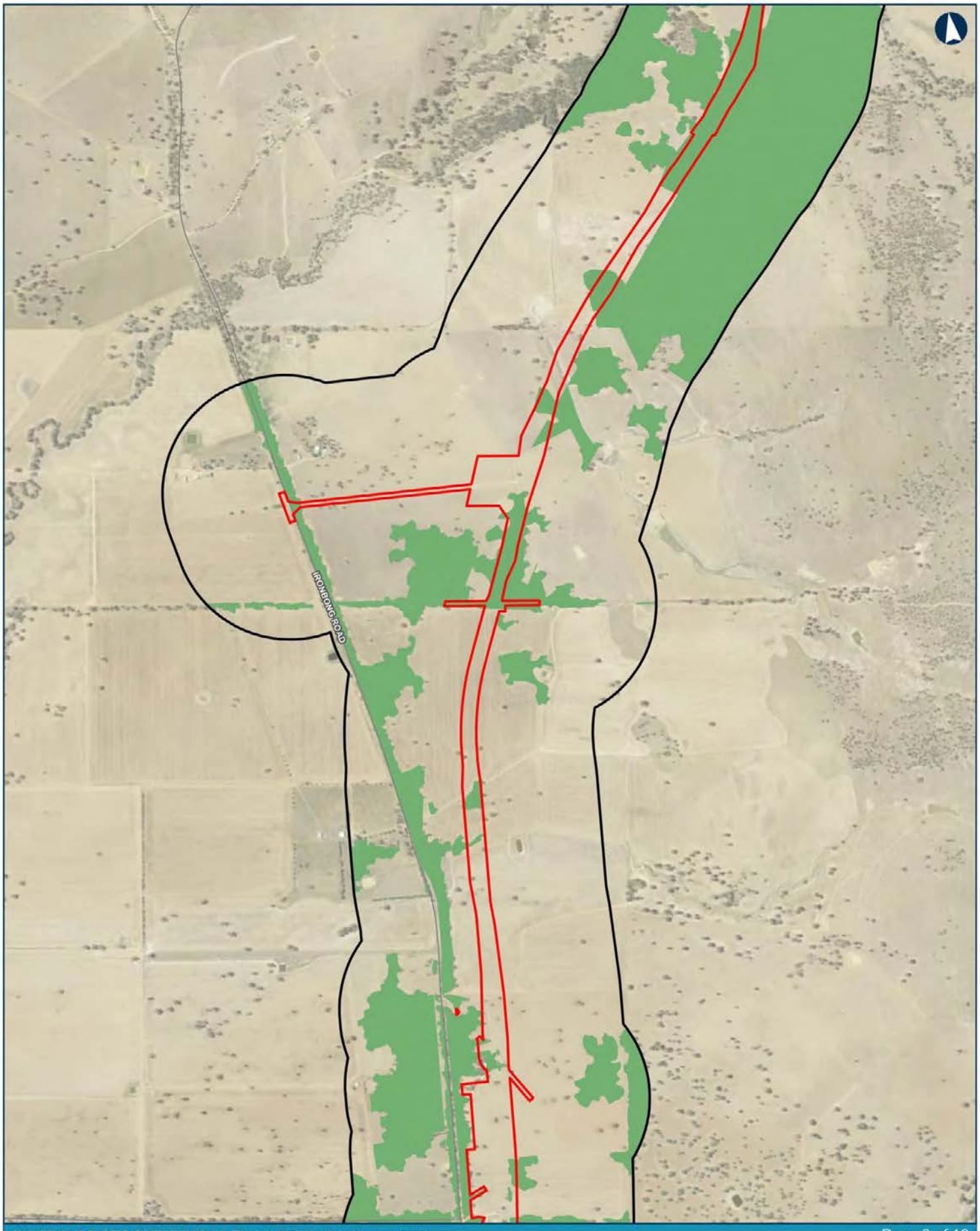

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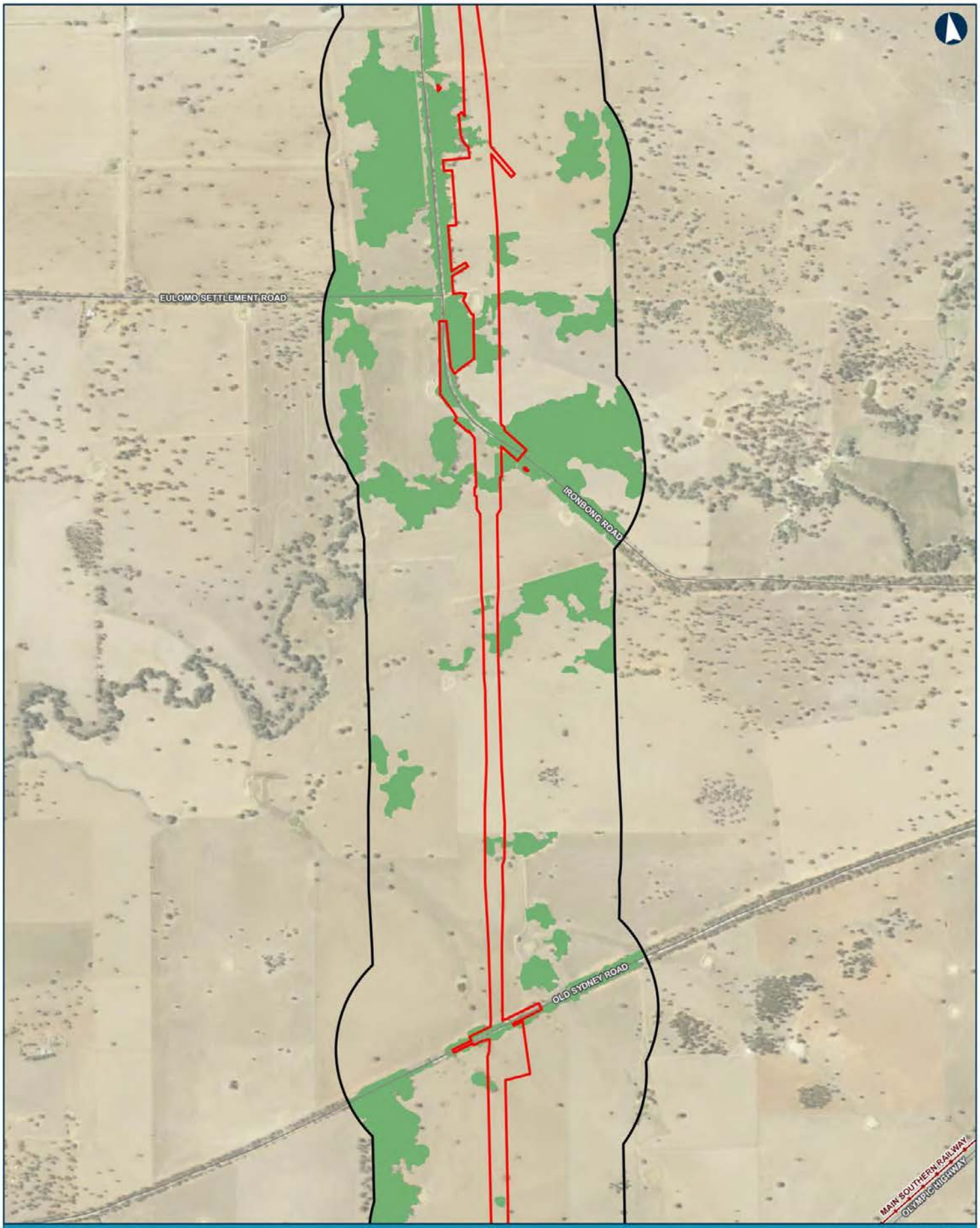

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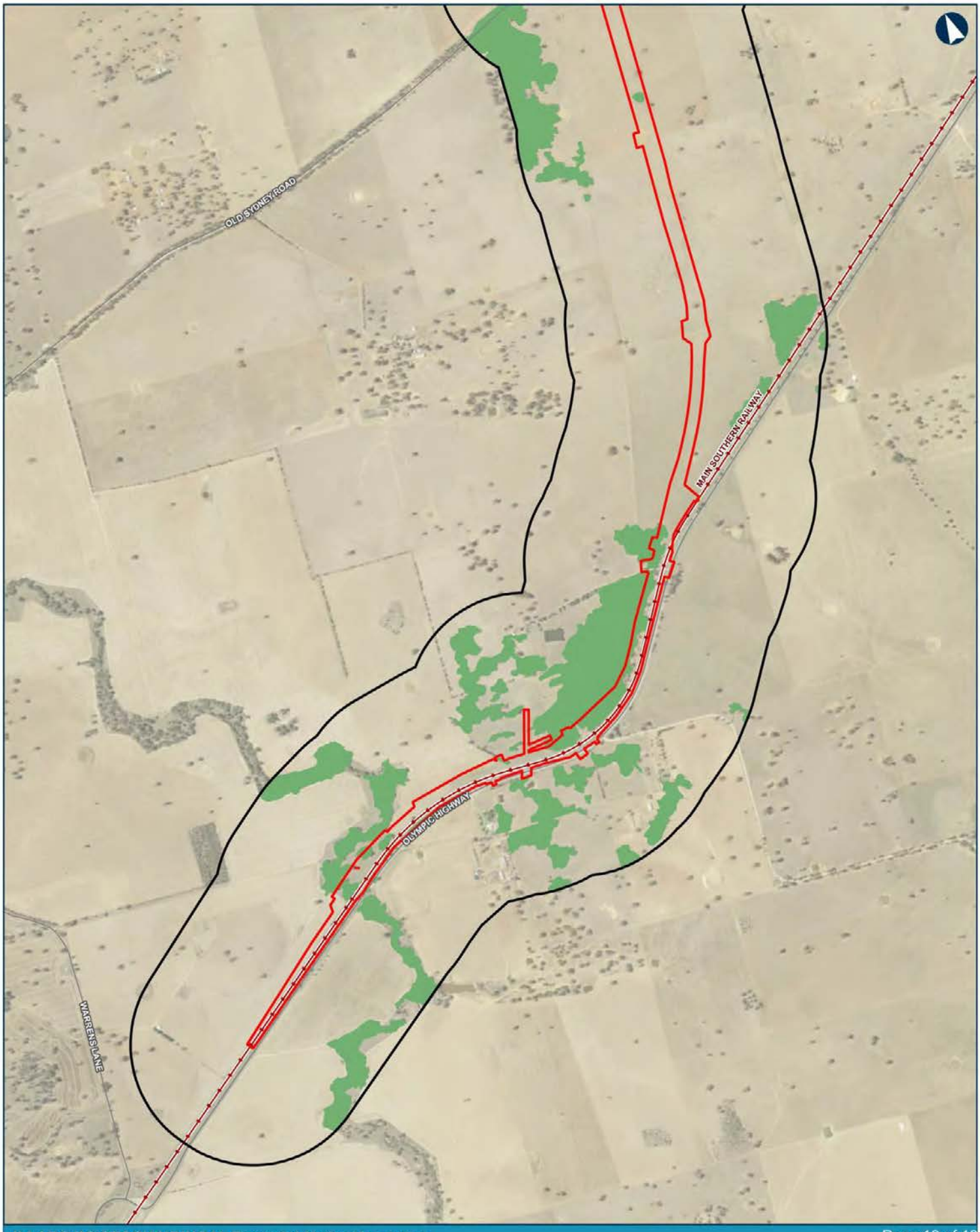

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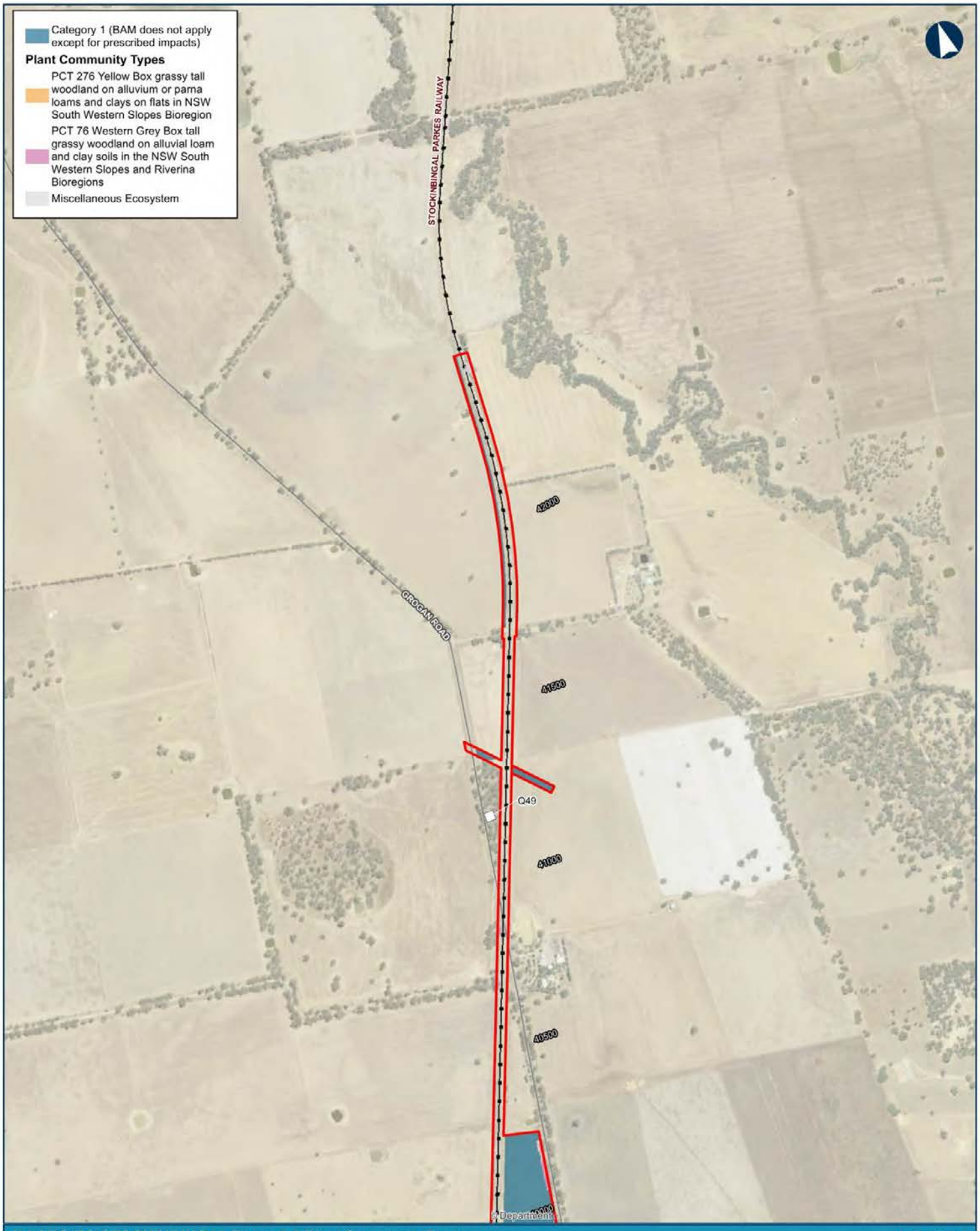

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4998 Chainage (distance in metres from southern limit of the proposal)
Vegetation integrity plot locations
Existing Rail
Proposal Site

INLAND RAIL ARTC

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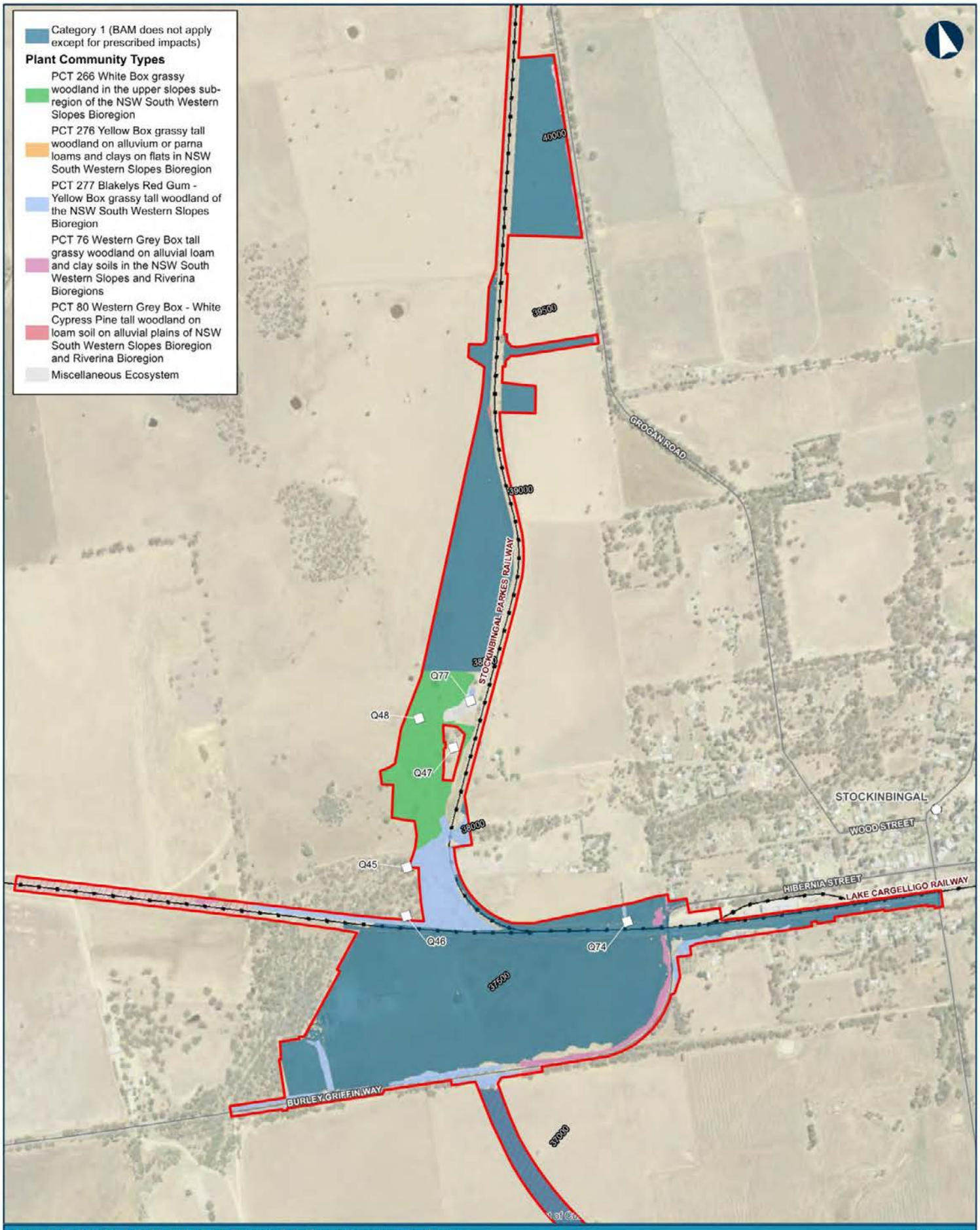

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Vegetation integrity plot locations

Existing Rail

Land not surveyed

Proposal Site

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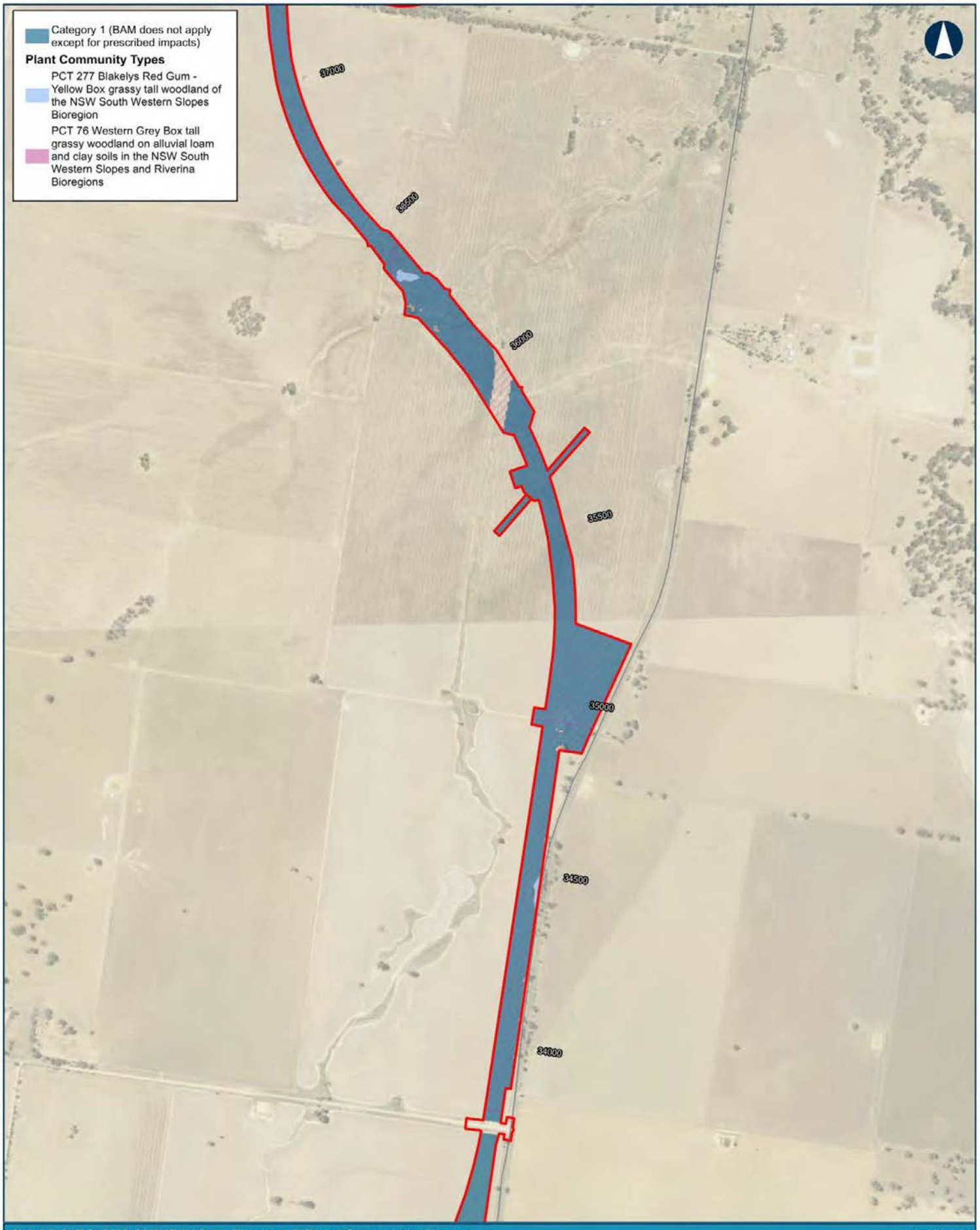

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Land not surveyed

Proposal Site

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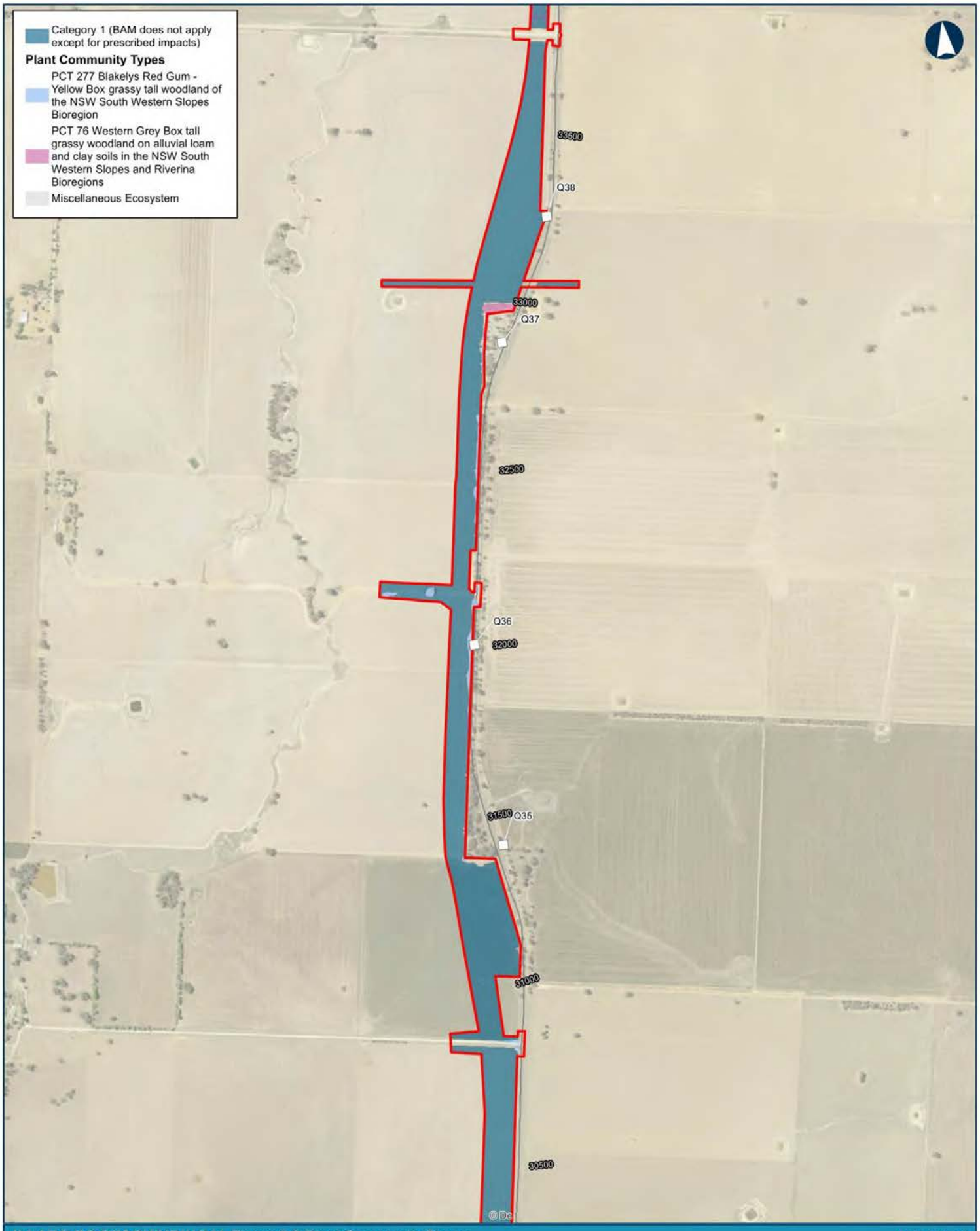

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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4998 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

Land not surveyed

Proposal Site

INLAND RAIL ARTC

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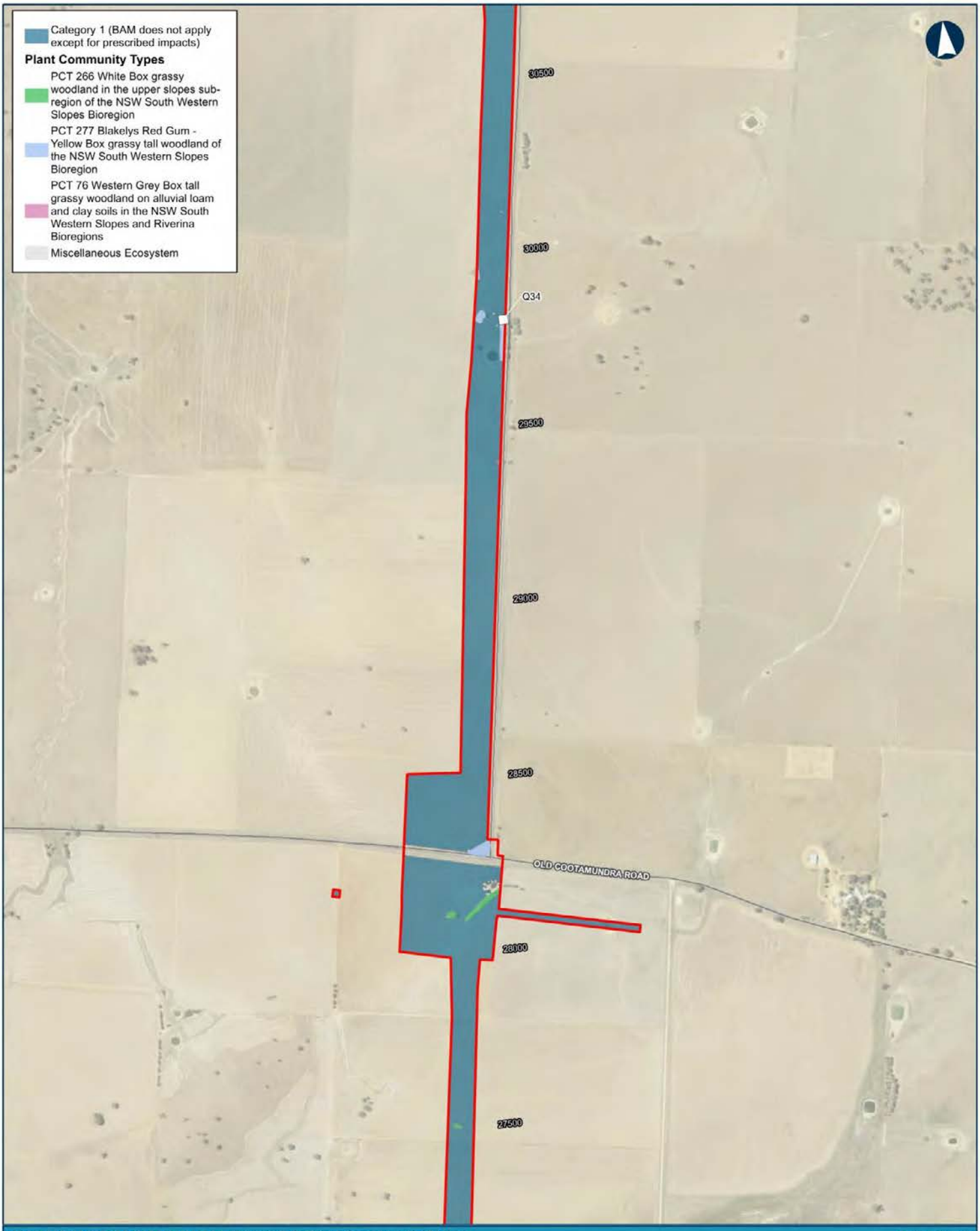

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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4988 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

Proposal Site

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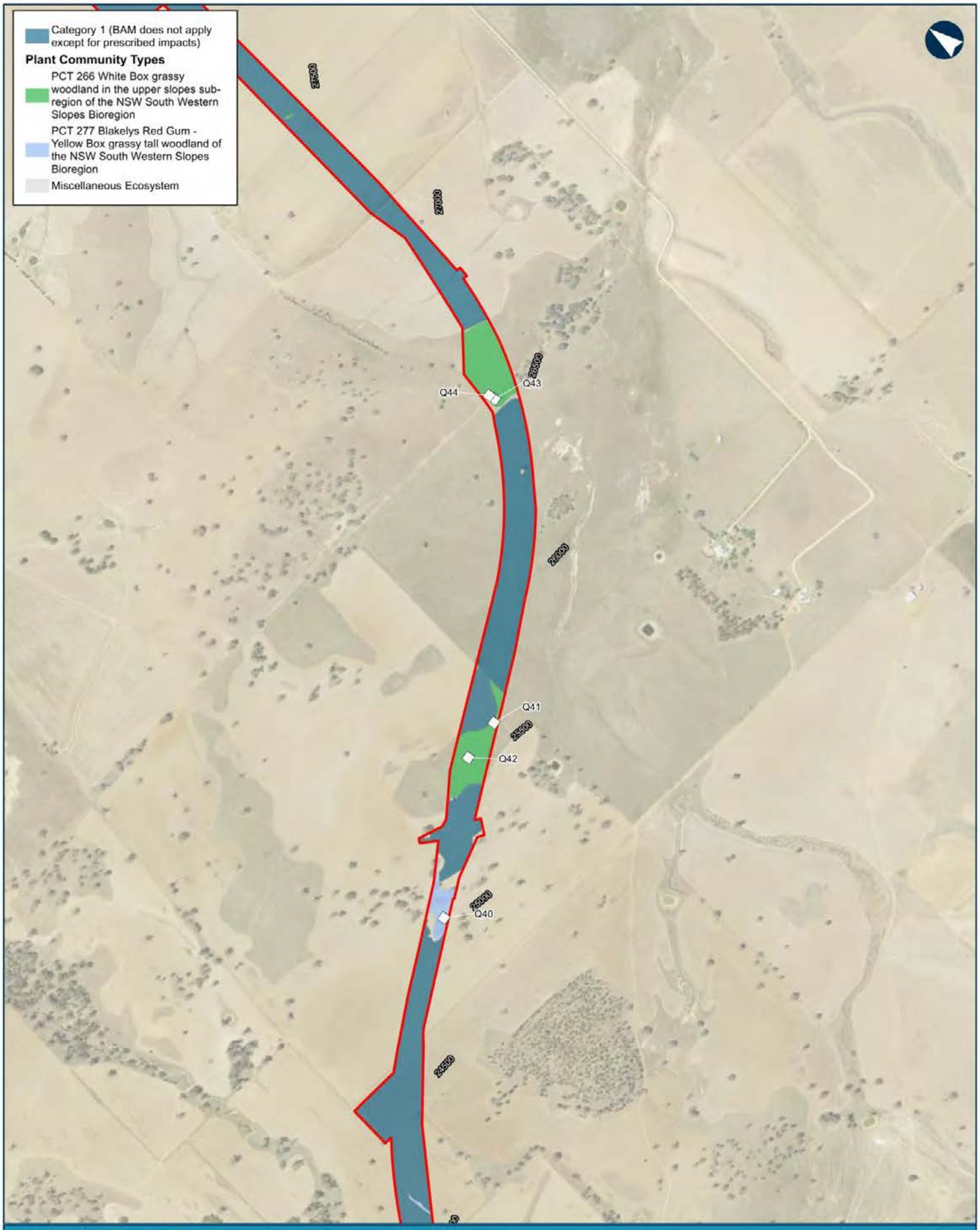

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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4998 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

Proposal Site

INLAND RAIL ARTC

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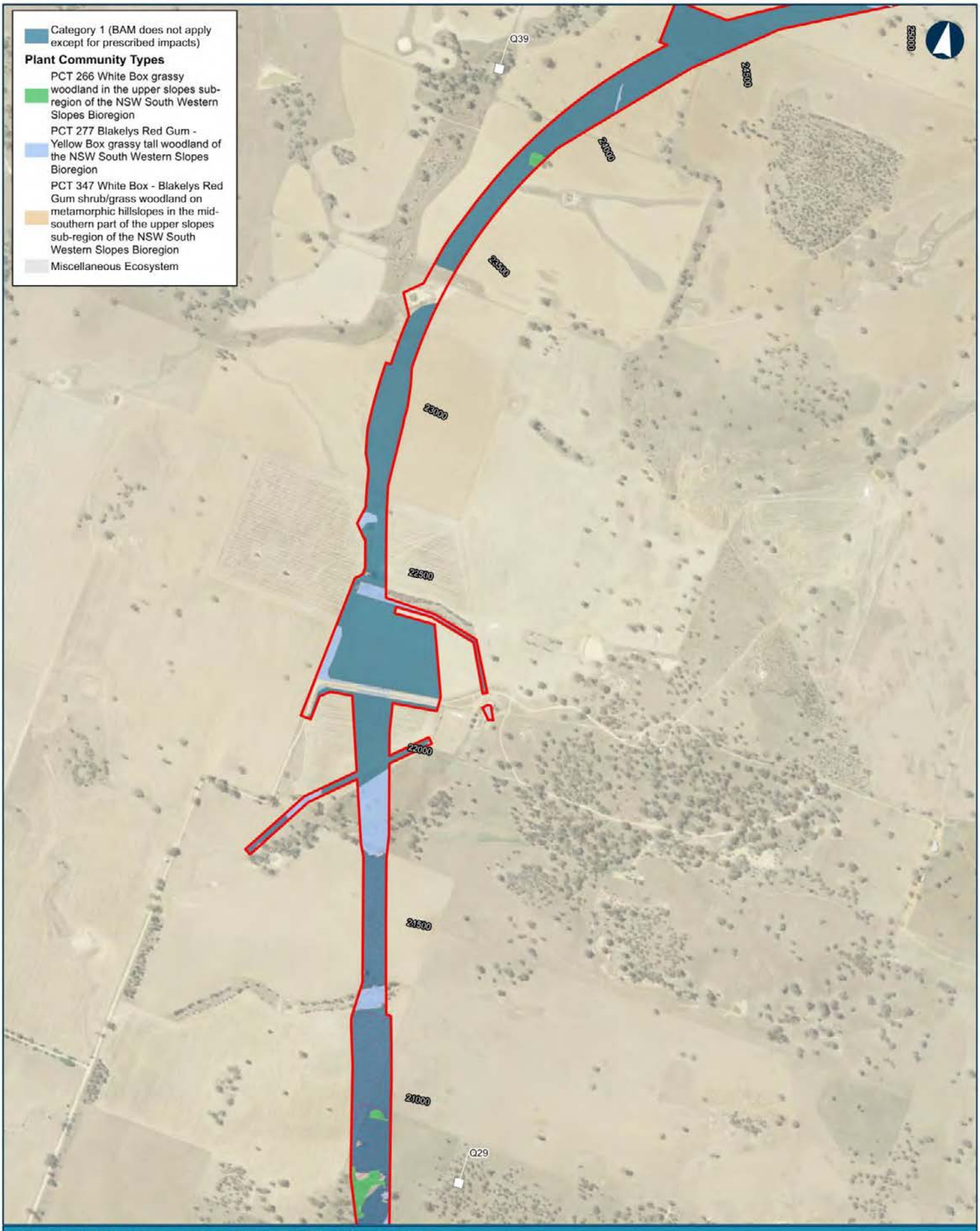

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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4988 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

Land not surveyed

Proposal Site

INLAND RAIL ARTC

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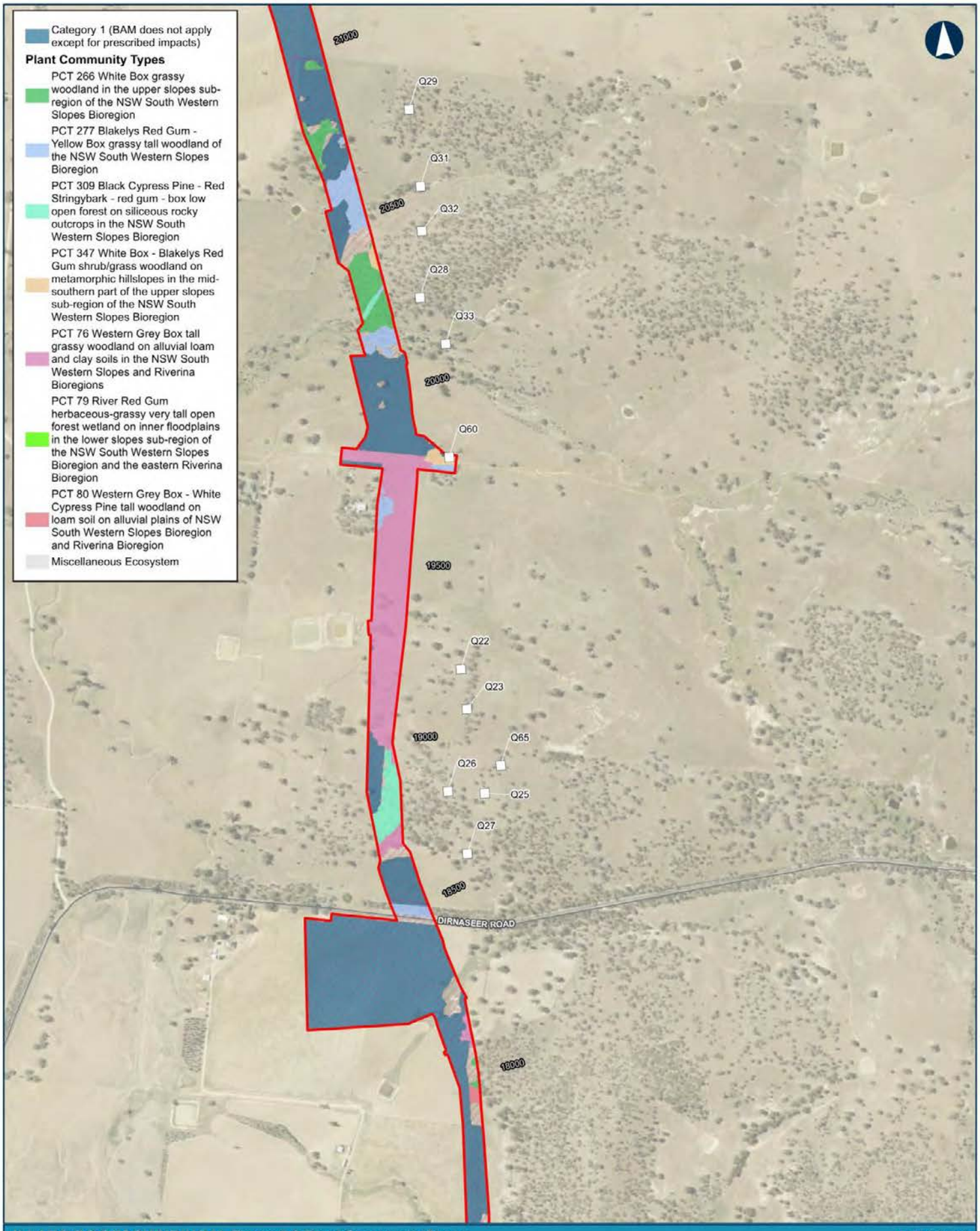

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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4998 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

Land not surveyed

Proposal Site

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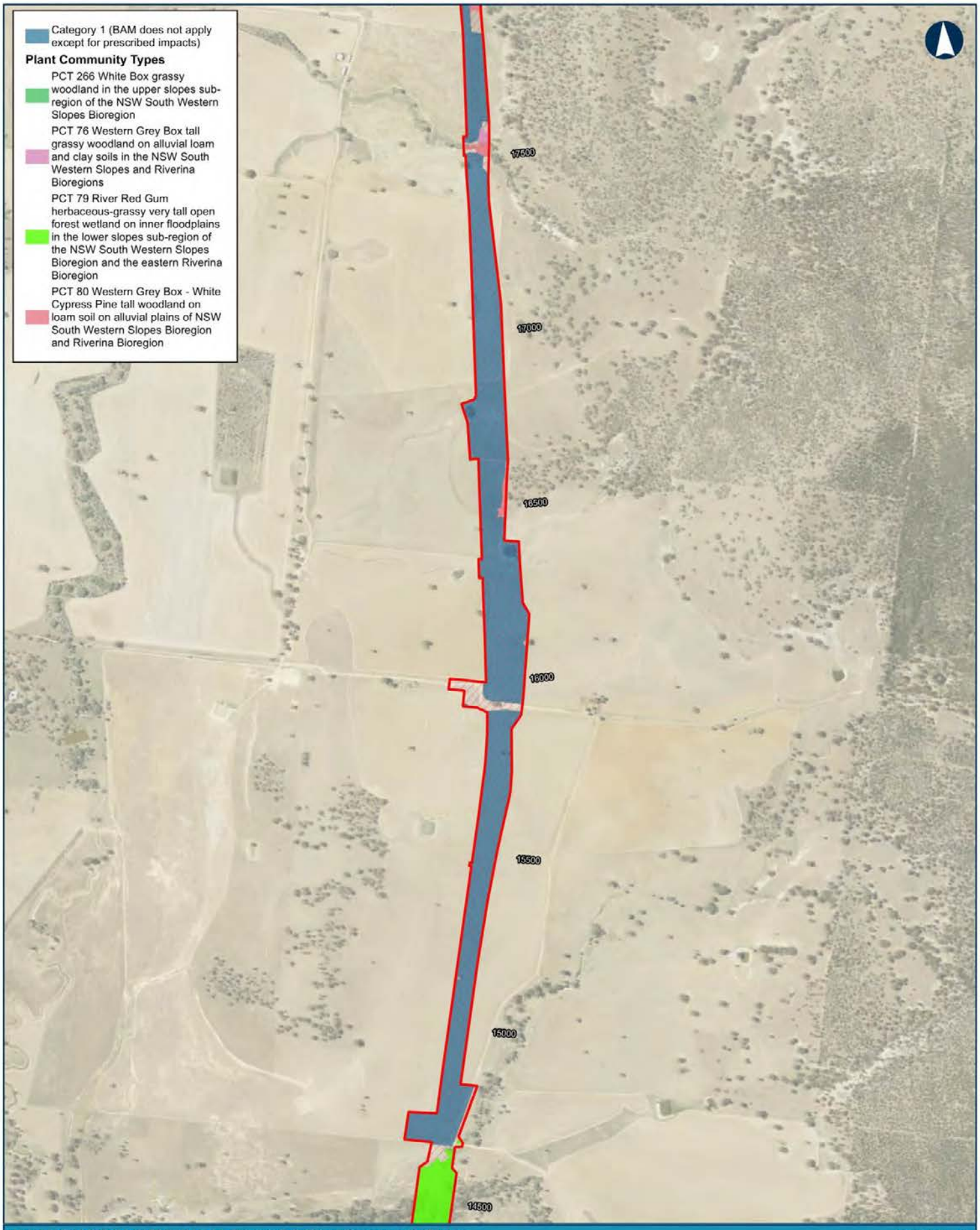

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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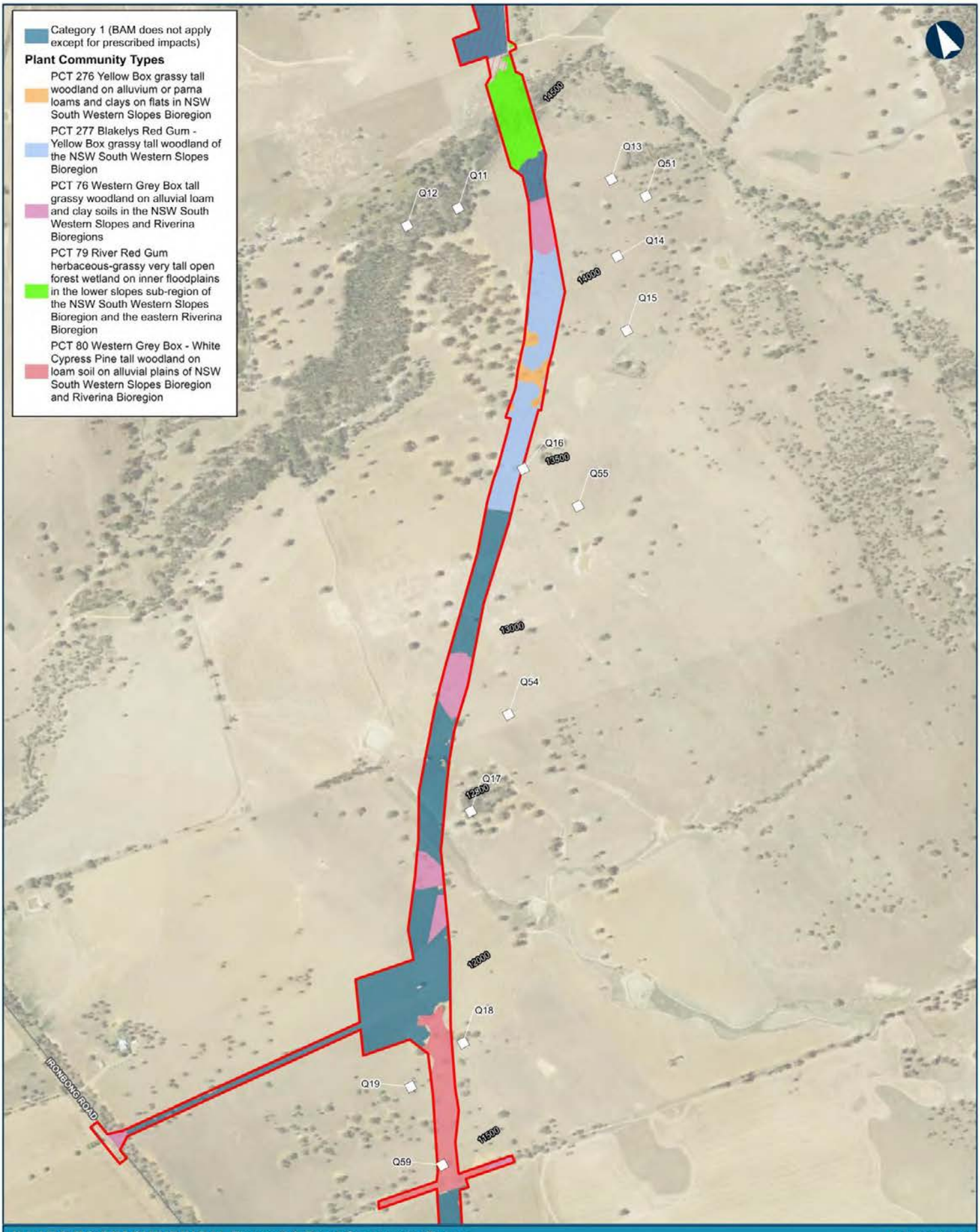

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

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4088 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

Land not surveyed

Proposal Site

INLAND RAIL ARTC

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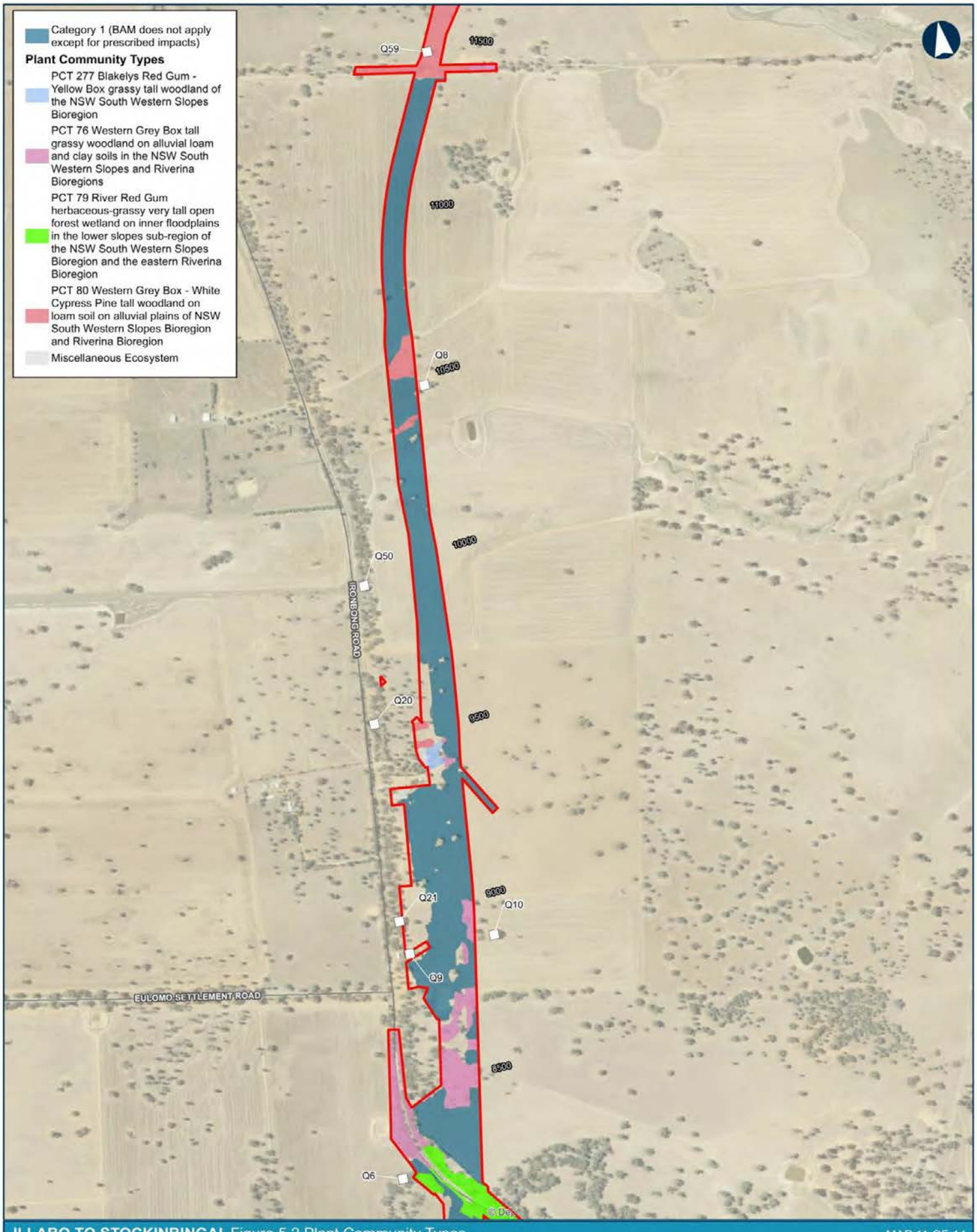

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Vegetation integrity plot locations

Proposal Site

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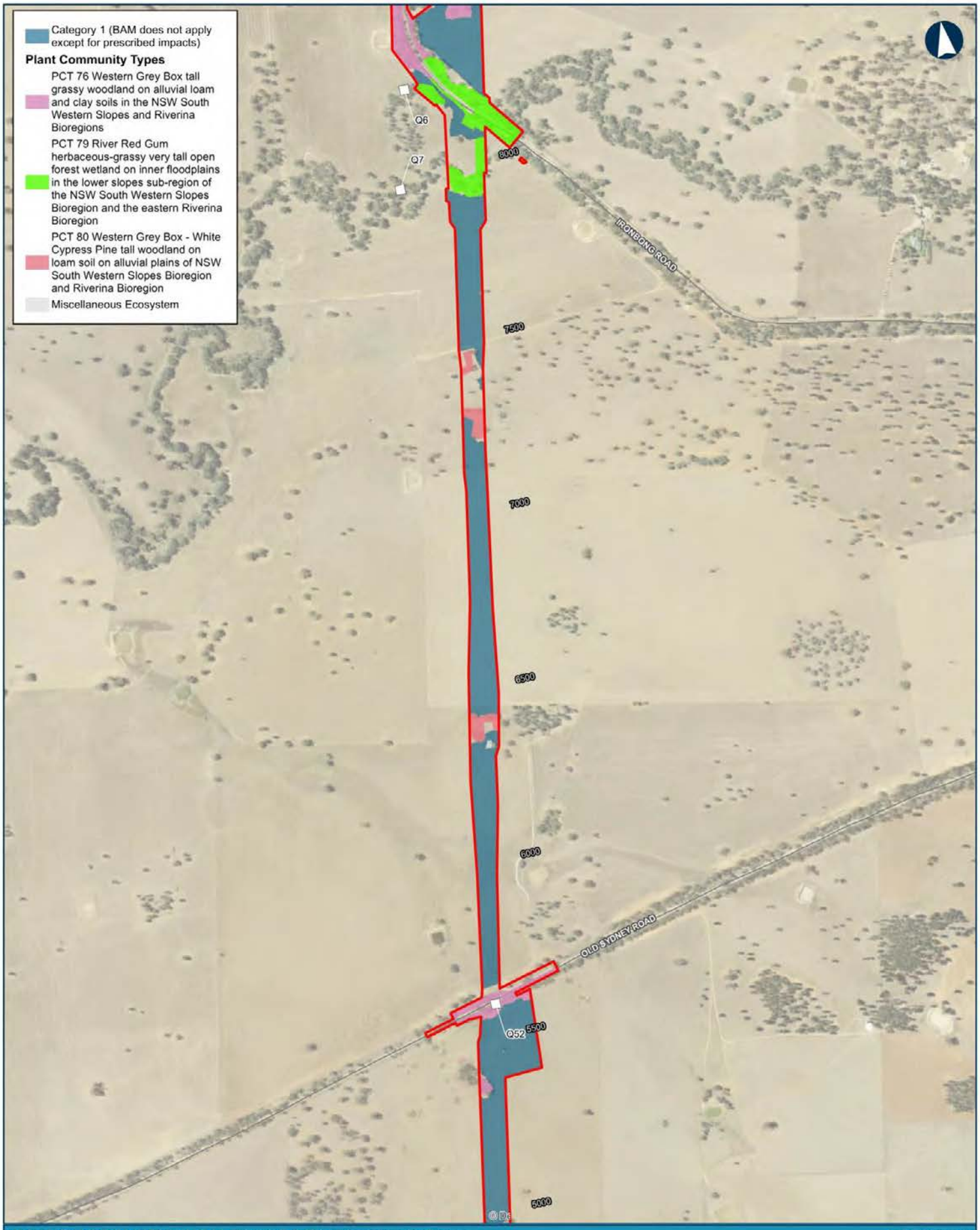

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Vegetation integrity plot locations

Proposal Site

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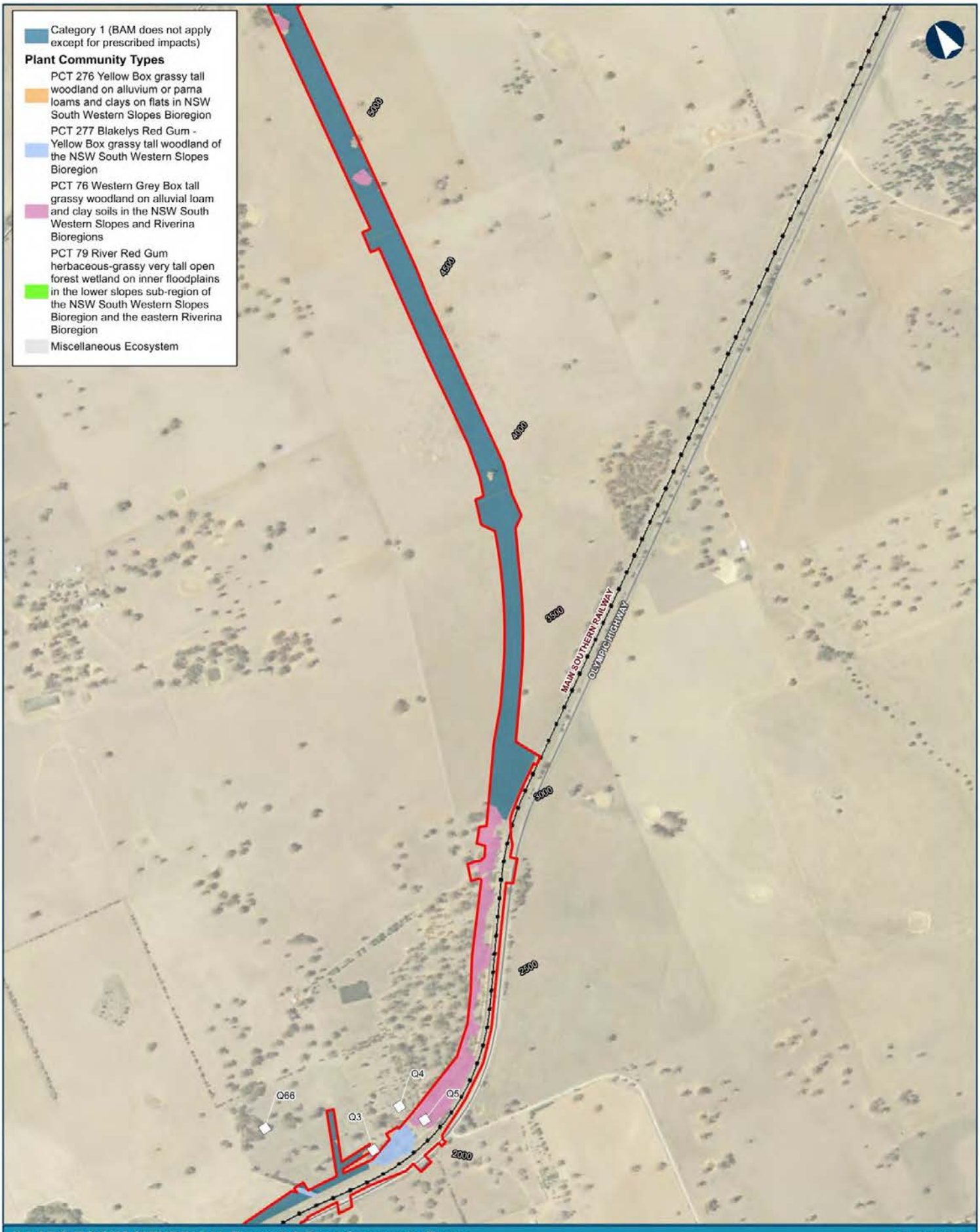

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

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4098 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

Existing Rail

Proposal Site

INLAND RAIL ARTC

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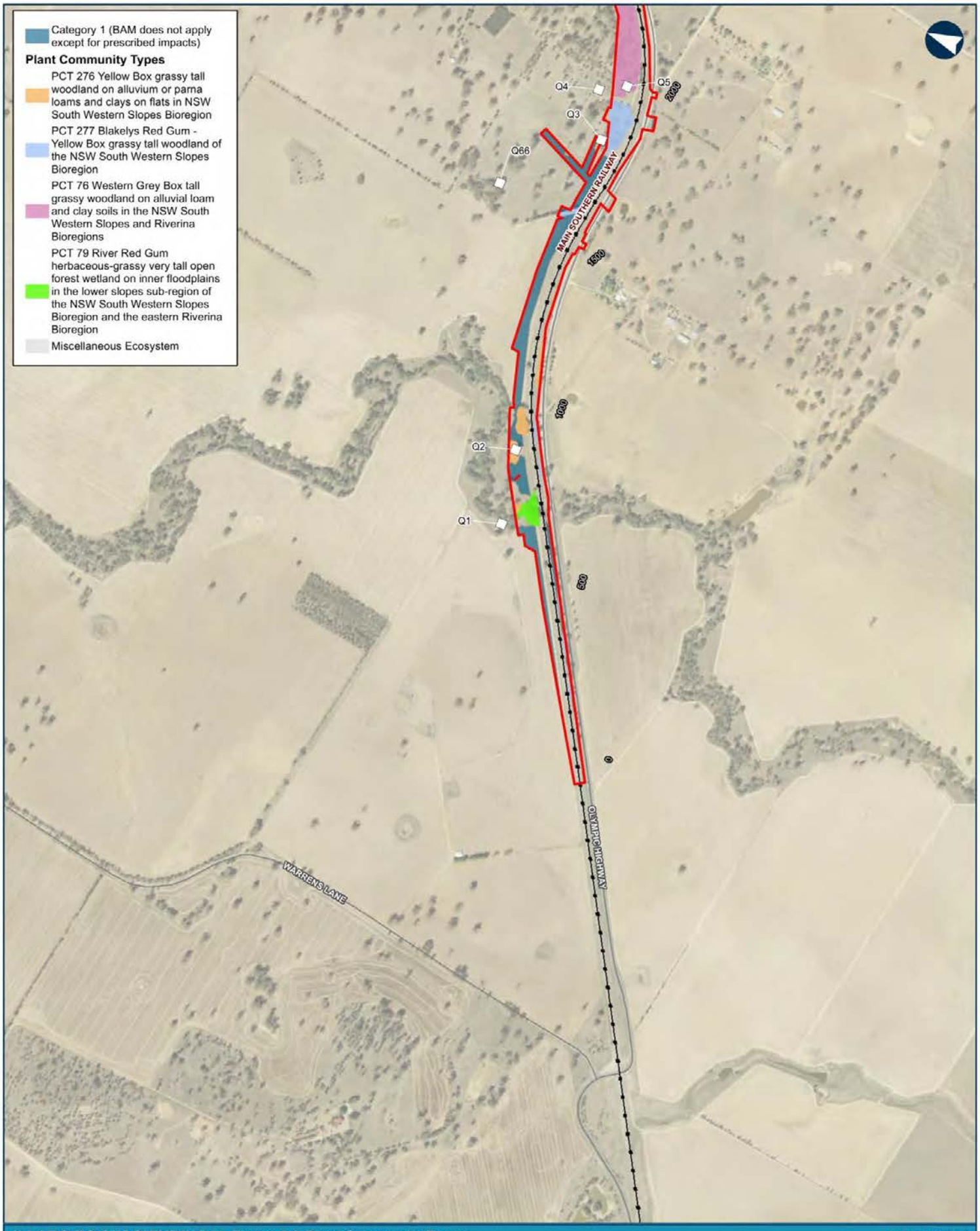

ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Vegetation integrity plot locations
Existing Rail
Proposal Site

INLAND RAIL ARTC

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Vegetation Zones

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Miscellaneous Ecosystem

42250
42000
41750
41500
41250
41000
40750
40500
40250
40000

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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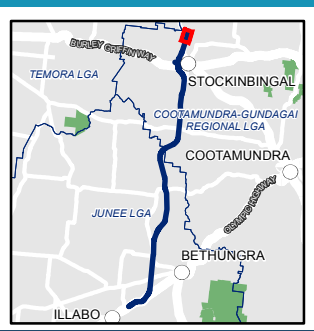
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary



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Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 9: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

40250
40000
39750
39500
39250
39000
38750
38500
38250
38000
37750
37500
37250
37000
36750

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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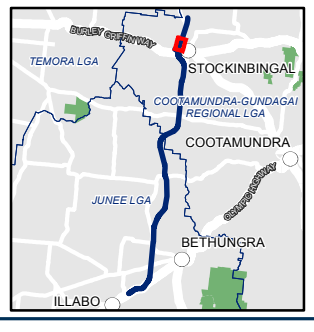
Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Land not surveyed



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Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor

37000
36750
36500
36250
36000
35750
35500
35250
35000
34750
34500
34250
34000
33750

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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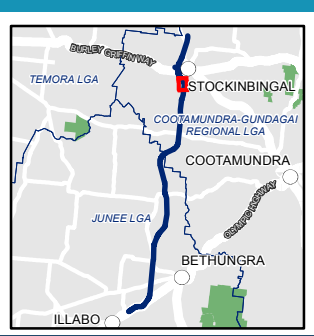
Proposal Site

Cadastral Boundary

Land not surveyed



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Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Miscellaneous Ecosystem

33750
33500
33250
33000
32750
32500
32250
32000
31750
31500
31250
31000
30750
30500

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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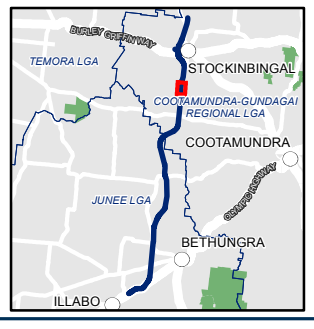
Proposal Site

Cadastral Boundary

Land not surveyed



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Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Miscellaneous Ecosystem

30500
30250
30000
29750
29500
29250
29000
28750
28500
28250
28000
27750
27500
27250

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

Cadastral Boundary

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Vegetation Zones

- Veg Zone 9: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Miscellaneous Ecosystem

27750
27500
27250
27000
26750
26500
26250
26000
25750
25500
25250
25000
24750
24500
24250

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Vegetation Zones

- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

25000
24750
24500
24250
24000
23750
23500
23250
23000
22750
22500
22250
22000
21750
21500
21250
21000
20750

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

Cadastral Boundary

Land not surveyed

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Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 15: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 17: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

21000
20750
20500
20250
20000
19750
19500
19250
19000
18750
18500
18250
18000
17750

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

Cadastral Boundary

Land not surveyed

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Vegetation Zones

- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate

17750
17500
17250
17000
16750
16500
16250
16000
15750
15500
15250
15000
14750
14500

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

Cadastral Boundary

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Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate

14750
14500
14250
14000
13750
13500
13250
13000
12750
12500
12250
12000
11750
11500

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Cadastral Boundary

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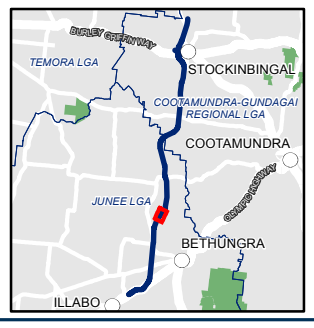

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Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 19: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Poor
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

11500
11250
11000
10750
10500
10250
10000
9750
9500
9250
9000
8750
8500
8250

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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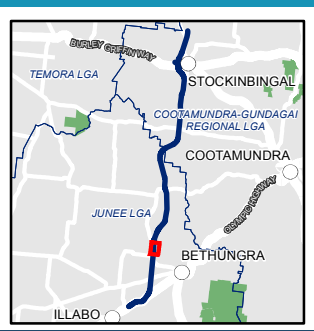
Proposal Site

Cadastral Boundary



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Vegetation Zones

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 19: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Poor
- Miscellaneous Ecosystem

8250
8000
7750
7500
7250
7000
6750
6500
6250
6000
5750
5500
5250
5000

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

Cadastral Boundary

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Vegetation Zones

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation

5250
5000
4750
4500
4250
4000
3750
3500
3250
3000
2750
2500
2250
2000
1750

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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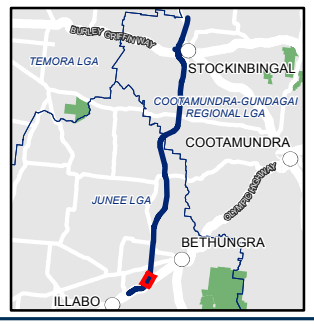
Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary



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Vegetation Zones

- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 11: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Poor
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

1750
1500
1250
1000
750
500
250
0

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Table 5.2 Overview of native vegetation types and zones identified within the subject land

Vegetation type	Threatened Ecological Community (BC Act)	Formation	Class	PCT % cleared	Zone	Patch size (ha)	Plots	Vegetation integrity score	Extent subject land (ha)
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Grassy Woodlands	Floodplain Transition Woodlands	92%	VZ1 – Good	101	Q5, Q49, Q52	83.6	1
					VZ2 – Moderate	101	Q21, Q22, Q38	69.8	12.77
					VZ3 – Poor	101	Q9, Q10	31.2	8.60
					VZ4 – Low (derived native grassland)	101	Q16	13.5	1.65
PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Grassy Woodlands	Floodplain Transition Woodlands	83%	VZ5 – Moderate	101	Q20, Q50	65.0	1.35
					VZ6 – Poor	101	Q18, Q19, Q59	38.6	4.96
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	94%	VZ7 – Moderate	101	Q25, Q26, Q47, Q65	69.3	4.77
					VZ8 – Poor (derived native grassland)	101	Q27, Q43, Q66	33.7	2.88

Vegetation type	Threatened Ecological Community (BC Act)	Formation	Class	PCT % cleared	Zone	Patch size (ha)	Plots	Vegetation integrity score	Extent subject land (ha)
					VZ9 – Low	101	Q41, Q42, Q44, Q48	2.1	6.55
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	90%	VZ10 – Moderate	101	Q3, Q53	70.9	0.87
					VZ11 – Poor	101	Q2, Q8, Q17	29.7	0.62
PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	94%	VZ12 – Moderate	101	Q4, Q13, Q45, Q46, Q51	70.0	11.70
					VZ13 – Poor	101	Q34, Q35, Q36, Q37, Q40	50.6	2.23
					VZ14 – Low (derived native grassland)	101	Q14, Q15, Q54, Q55	2.7	6.23
PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Not listed	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	15%	VZ15 – Moderate	101	Q28, Q29	52.6	1.42

Vegetation type	Threatened Ecological Community (BC Act)	Formation	Class	PCT % cleared	Zone	Patch size (ha)	Plots	Vegetation integrity score	Extent subject land (ha)
PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	63%	VZ16 – Moderate	101	Q23, Q32	52.5	0.14
					VZ17 – Poor	101	Q60	35.6	0.29
PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	Not listed	Forested Wetlands	Inland Riverine Forests	66%	VZ18 – Moderate	101	Q1, Q11, Q12, Q31 Q33	87.5	5.58
	Not listed				VZ19 – Poor	101	Q6, Q7, Q39	38.1	0.80
PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Not listed	Grassy Woodlands	Western Slopes Grassy Woodlands	n/a	VZ20 – Planted native vegetation	101	Q74, Q77	54.2	2.70
TOTAL									**77.17**

5.2 PCT justification and description

This assessment identified the following plant community types:

- PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion.
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion.
- PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- The native vegetation PCTs were assigned to 19 vegetation zones based on broad condition state.

An overview of native vegetation types and zones identified is presented in Table 5.2 and the extent of each PCT is shown in Figure 5.2.

A total of 166 flora species were recorded within the subject land, of which 109 were native (66 per cent) and 57 (34 per cent) were exotic. Species recorded were predominantly from Poaceae, Fabaceae and Asteraceae families. No threatened flora were recorded in the subject land. BAM plot data is presented in Appendix G. Location of Vegetation Integrity (BAM) plots used to define each PCT is illustrated in Figure 5.2.

5.2.1 PCT 79 – River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.1 to Photo 5.4. A profile of PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion is provided in Table 5.3 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.4.

Table 5.3 Summary of PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion

PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	
PCT Justification	The community occurred as a tall riparian woodland along watercourses which had been previously mapped by SVTM as PCT 79. The vegetation type was assigned to PCT 79 based on the dominance of tall stands of *Eucalyptus camaldulensis* (River Red Gum) in the upper stratum, the herbaceous/grassy structure and composition of the ground stratum, floristic composition of each stratum, occurrence on alluvial loam soils and its biogeographical location. PCT 2 and PCT 5 were also considered as candidates for this vegetation type although were dismissed based on the lack of sedge diversity, dominance of herbaceous-grassy cover in the ground stratum and it not being located along the Murrumbidgee River or Murray River systems. These characteristics are consistent with the BioNet profile for PCT 79.
Vegetation formation	Forested Wetlands
Vegetation class	Inland Riverine Forests
Conservation status	Not listed under BC Act or EPBC Act
SAII entity	No
Per cent cleared	66 per cent
Landscape position	This vegetation type was recorded along ephemeral drainage lines and creeks associated with tributaries of Ironbong and Bland Creek systems.
Species upper stratum	*Eucalyptus camaldulensis* (River Red Gum)
Species middle stratum	Mostly absent
Species ground stratum	*Carex appressa* (Tall sedge), *Cynodon dactylon* (Common Couch), *Microlaena stipoides* var. *stipoides* (Weeping Rice Grass), *Rumex brownii* (Swamp Dock) and *Rytidosperma caespitosum* (Ringed Wallaby Grass)
Vegetation condition	Moderate condition (vegetation integrity score 87.5): areas were generally dominated by native species although subject to ongoing grazing pressure that has reduced the ground stratum native species richness and cover. Exotic weed cover was generally low at <5% although it is considered that seasonal occurrences of dense exotic annual weed cover would occur. Poor condition (vegetation integrity score 38.1): occurred generally as canopy only with low species richness and cover in the ground stratum. Evidence of heavy grazing and high exotic weed cover (50–75 per cent).

Photo 5.1 PCT 79 – Moderate condition (Plot Q11)

Photo 5.2 PCT 79 – Moderate condition (Plot Q1)

Photo 5.3 PCT 79 – Moderate condition (Plot Q33)

Photo 5.4 PCT 79 – Poor condition (Plot Q39)

Table 5.4 Comparison of PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**2**	**2**	**6**	**8**	**0**	**0**	**48**	**0**	**26**	**4**	**0**	**0**	**62**	**44**	**4(50)**	**–**	**–**
Q1	1	0	8	4	0	1	35	0	10.8	1.3	0	0.4	14	78	5	1	1
Q6	1	0	0	0	0	0	35	0	0	0	0	0	47	56	9	9	8
Q7	2	0	1	0	0	0	31	0	0.5	0	0	0	62	72	8	5	35
Q11	2	0	7	4	0	0	34	0	73.4	4.6	0	0	48	34	2	0	2.1
Q12	1	0	7	4	0	0	45	0	59.2	1	0	0	154	78	7	2	3.5
Q31	1	0	8	5	0	1	50	0	6.4	0.8	0	0.2	8	85	5	2	4.3
Q33	1	0	11	5	0	1	40	0	15.2	2.7	0	0.1	16	50	3	1	0.4
Q39	1	0	3	1	0	0	35	0	7.6	3	0	0	20	66	5	1	0.5

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion (Benchmarks V1.2 – Dry Condition benchmarks <379mm); Vegetation Type – PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion; Keith Formation: Forested Wetlands; Keith Class: Inland Riverine Forests; source (NSW BioNet Vegetation Classification Benchmarks V1.2 accessed December 2022)

(2) Hollow bearing tree

(3) High threat weed

5.2.2 PCT 76 – Western Grey Box Tall Grassy Woodland on Alluvial Loam and Clay Soils in the NSW South Western Slopes and Riverina Bioregions

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.5 to Photo 5.8. A profile of PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions is provided in Table 5.5 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.6.

Table 5.5 Summary of PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	
PCT Justification	The community occurred as a tall open woodland in areas previously mapped by SVTM as PCT 76 or PCT 80. PCT 76 was assigned to patches of native vegetation dominated by *Eucalyptus microcarpa* (Western Grey Box) that exhibited a sparse shrub middle stratum and predominately grassy ground stratum. This vegetation type was predominately associated with floodplain areas, alluvial foot slopes and undulating lower to mid slopes of local hills associated with clay loam soils. PCT 76 grades into PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion where mature *Callitris glaucophylla* (White Cypress Pine) become co-dominate in the upper stratum. These characteristics are consistent with the BioNet profile for PCT 76.
Vegetation formation	KF_CH3 Grassy Woodlands
Vegetation class	Floodplain Transition Woodlands
Conservation status	Forms part of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Endangered – BC Act/ EPBC Act)
SAII entity	No
Per cent cleared	92 per cent
Landscape position	Occurs on alluvial foot slopes and undulating lower to mid slopes of local hills associated with clay loam soils.
Species upper stratum	*Eucalyptus microcarpa* (Western Grey Box), *Eucalyptus conica* (Fuzzy Box), *Allocasuarina luehmannii* (Buloke).
Species middle stratum	*Maireana microphylla* (Small-leaved Bluebush), *Salsola australis* and *Sclerolaena muricata* (Black Rolypoly).
Species ground stratum	*Austrostipa scabra* subsp. *scabra* (Speargrass), *Bothriochloa macra* (Red Grass), *Carex inversa, Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Enteropogon acicularis* (Windmill Grass), *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush), *Maireana enchylaenoides* (Wingless Bluebush), *Panicum decompositum* (Native Millet), *Paspalidium constrictum* (Knottybutt Grass), *Sida corrugata* (Corrugated sida), *Solanum esuriale* (Quena), *Rytidosperma caespitosum* (Ringed Wallaby Grass).

PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	
Vegetation condition	Good condition: the vegetation integrity score for the condition state was relatively high at 83.8 with high treat weed cover recorded at <5 per cent. Most patches had low middle stratum richness and cover although exhibited a relatively diverse native grass and forb ground stratum. Historic and ongoing grazing was evident in most patches and exotic annual weed cover was low due to drought and seasonality. Moderate condition (vegetation integrity score 69.8): exhibits large trees, hollows, fallen timber and leaf litter which has resulted in a vegetation integrity score of 68. The middle stratum in generally absent. The ground stratum is mostly comprised of native grasses and is relatively low in native species richness and cover in forb, fern and other natives. Poor condition (vegetation integrity score 31.2): these patches generally occur as canopy only with little to no middle or ground stratum present. Most patches of this condition class occur as sheep camps within paddocks and have little to no regeneration potential. Exotic annual weed cover was relatively low due to drought and seasonality although it is expected that following rain or during later winter/spring these patches would be dominated annual weeds. Low condition (vegetation integrity score 13.5): this vegetation type occurs as derived native grasses and lacks any woodland structure with the upper and middle stratums historically removed. Due to historic and ongoing grazing the ground stratum is relatively low in native species richness and cover in forb, fern and other natives.

Photo 5.5 PCT 76 – Good condition (Plot Q5)

Photo 5.6 PCT 76 – Moderate condition (Plot Q21)

Photo 5.7 PCT 76 – Poor condition (Plot Q10)

Photo 5.8 PCT 76 – Low (DNG) condition (Plot Q16)

Table 5.6 Comparison of PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**3**	**4**	**6**	**10**	**1**	**1**	**27**	**2**	**16**	**3**	**0**	**0**	**49**	**65**	**3(50)**	**–**	**–**
Q5	1	4	9	7	1	0	30	24.2	64	11.1	0.2	0	3	48	0	1	1
Q9	2	0	0	0	0	0	27	0	0	0	0	0	0	1	2	1	0
Q10	2	0	0	3	0	0	31	0	0	0.3	0	0	9	30	5	2	0
Q16	0	0	5	5	1	0	0	0	41.6	1.1	0.1	0	0	11	0	0	0
Q21	3	1	5	5	0	0	10	2	41.7	15.4	0	0	12	78	8	5	2.2
Q22	2	0	8	1	0	0	25	0	7	0.1	0	0	13	27	1	1	0
Q38	1	0	11	4	0	1	30	0	20.1	0.9	0	0.2	2	75	1	0	6.4
Q49	2	5	9	11	0	1	31	13.4	39.9	4	0	0.1	47	83	4	4	0.7
Q52	1	2	7	4	0	0	40	10	12.7	2.4	0	0	7	85	2	2	0.2

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion (Benchmarks V1.2 – Dry Condition benchmarks <361mm); Vegetation Type – PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions; Keith Formation Grassy Woodlands; Keith Class: Floodplain Transition Woodlands; source (NSW BioNet Vegetation Classification Benchmarks V1.2 accessed December 2022)

(2) Hollow bearing tree

(3) High threat weed

5.2.3 PCT 80 – Western Grey Box – White Cypress Pine Tall Woodland on Loam Soil on Alluvial Plains of NSW South Western Slopes Bioregion and Riverina Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.9 to Photo 5.12. A profile of PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion is provided in Table 5.7 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.8.

Table 5.7 Summary of PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	
PCT Justification	The selection of PCT 80 was assigned to vegetation patches where *Eucalyptus microcarpa* (Western Grey Box) and *Callitris glaucophylla* (White Cypress Pine) occurred as co-dominant canopy species on sandy loam to clay loam soils. This vegetation type intergrades with PCT 76 and was differentiated by the presence of large mature specimens of *Callitris glaucophylla* (White Cypress Pine) in the upper stratum. The occurrence of both PCT 80 and PCT 76 throughout this area is consistent with the SVTM. Further, these characteristics are consistent with the BioNet profile for PCT 80.
Vegetation formation	Grassy Woodlands
Vegetation class	Floodplain Transition Woodlands
Conservation status	Forms part of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Endangered – BC Act/ EPBC Act)
SAII entity	No
Per cent cleared	83 per cent
Landscape position	Occurs on alluvial foot slopes and undulating lower to mid slopes of local hills associated with clay loam soils.
Species upper stratum	*Eucalyptus microcarpa* (Western Grey Box) and *Callitris glaucophylla* (White Cypress Pine) with scattered specimens of *Eucalyptus albens* (White Box).
Species middle stratum	Absent due to historic and ongoing sheep grazing.
Species ground stratum	*Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Dianella longifolia* var. *longifolia* (Blue Flax-Lily), *Dysphania pumilio* (Small Crumbweed), *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Enteropogon acicularis* (Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Maireana enchylaenoides* (Wingless Bluebush), *Sida corrugata* (Corrugated sida), *Rytidosperma setaceum* (Smallflower Wallaby Grass).
Vegetation condition	Moderate condition (vegetation integrity score 65.0): the high threat weed cover recorded was at <10 per cent. Most patches had an absent middle stratum due to historic and ongoing grazing. Species richness and cover was generally recorded below benchmark although was mostly dominated by native species. The ground stratum is mostly comprised of native grasses and is relatively low in native species richness and cover in forb, fern and other natives. Poor condition (vegetation integrity score 38.6): these patches generally occur as canopy only with little to no middle or ground stratum present. Most patches of this condition class occur as heavily grazed paddocks and have little to no regeneration potential. Exotic annual weed cover was relatively low due to drought and seasonality although it is expected that following rain or during later winter/spring these patches would be dominated annual weeds.

Photo 5.9 PCT 80 – Moderate condition (Plot Q20)

Photo 5.10 PCT 80 – Moderate condition (Plot Q50)

Photo 5.11 PCT 80 – Poor condition (Plot Q18)

Photo 5.12 PCT 80 – Poor condition (Plot Q19)

Table 5.8 Comparison of PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**3**	**4**	**6**	**10**	**1**	**1**	**27**	**2**	**16**	**3**	**0**	**0**	**49**	**65**	**3(50)**	**–**	**–**
Q18	1	0	1	5	0	0	35	0	5	0.7	0	0	4	26	3	0	0
Q19	2	0	0	1	0	0	29	0	0	0.2	0	0	0	10	3	0	0
Q20	3	0	4	4	0	0	36	0	8.1	0.7	0	0	14	52	4	5	0
Q50	1	0	4	1	0	0	20	0	9.6	3	0	0	37	36	6	9	6
Q59	2	0	3	5	0	0	32	0	1.1	6.6	0	0	6	19.4	2	2	0

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion (Benchmarks V1.2 – Dry Condition benchmarks <361mm); Vegetation Type – PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion; Keith Formation: KF_CH3 Grassy Woodlands; Keith Class: Floodplain Transition Woodlands; source (NSW BioNet Vegetation Classification Benchmarks V1.2 accessed December 2022)

(2) Hollow bearing tree

(3) High threat weed

5.2.4 PCT 266 – White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.13 to Photo 5.16. A profile of PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion is provided in Table 5.9 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.10.

Table 5.9 Summary of PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	
PCT Justification	The community occurred as a medium to tall open grassy woodland dominated by *Eucalyptus albens* (White Box) largely in areas previously mapped by the SVTM as PCT 266, PCT 267, PCT 277, PCT 76 or PCT 80. Where SVTM mapping identified patches of this community as a PCT other than PCT 266 there were PCT 266 patches also mapped nearby. PCT 266 was assigned to this vegetation type based on the dominance of *Eucalyptus albens* (White Box) in the upper stratum often occurring with *Brachychiton populneus* subsp. *populneus* (Kurrajong), sparse midstorey and grassy understorey. This community was associated with undulating landforms on red to brown podsol soils (DPE 2021). These characteristics are consistent with the BioNet profile for PCT 266.
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Conservation status	PCT 266 broadly consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Endangered under BC Act and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as Critically Endangered under the EPBC Act.
SAII entity	Yes
Per cent cleared	94 per cent
Landscape position	Occurs on rocky slopes with shallow skeletal soils associated with the foothills of Bethungra Range.
Species upper stratum	*Eucalyptus albens* (White Box), *Eucalyptus blakelyi* (Blakely's Red Gum), *Eucalyptus macrorhyncha* (Red Stringybark), *Eucalyptus melliodora* (Yellow Box), *Brachychiton populneus* subsp. *populneus* (Kurrajong).
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Aristida behriana* (Bunch Wiregrass), *Aristida jerichoensis* var. *jerichoensis* (Jericho Wiregrass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass), *Enteropogon acicularis* (A Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Sida corrugata* (Corrugated sida), *Rytidosperma auriculatum* (Lobed Wallaby Grass).

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	
Vegetation condition	Moderate condition (vegetation integrity score 69.3): exhibited a sparse canopy dominated by *Eucalyptus albens* (White Box) with the middle stratum absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is predominately native with exotic cover <5 per cent. Poor condition (vegetation integrity score 33.7): This patch occurs as canopy only with little to no middle or ground stratum present. This patch was recorded in heavily grazed areas with little to no regeneration potential. Exotic annual weed cover was relatively low due to drought and seasonality although it is expected that following rain or during later winter/spring these patches would be dominated annual weeds. Low (DNG) condition (vegetation integrity score 2.1): occurs as derived native grassland with an absent upper and middle stratum. The ground stratum is mostly dominated by native species with exotic cover ranging from 5–25 per cent. This vegetation zone is subject to continued ongoing sheep grazing although no cropping or pasture improvements appear to have been undertaken.

Photo 5.13 PCT 266 – Moderate condition (Plot Q25)

Photo 5.14 PCT 266 – Poor condition (Plot Q43)

Photo 5.15 PCT 266 – Low (Plot Q41)

Photo 5.16 PCT 266 – Low (Plot Q44)

Table 5.10 Comparison of PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregions vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**4**	**3**	**8**	**9**	**1**	**1**	**18**	**1**	**30**	**6**	**0**	**0**	**34**	**35**	**2(50)**	**–**	**–**
Q25	1	0	8	10	0	1	15	0	10.3	2.7	0	0.2	6	10	0	0	0.5
Q26	2	0	9	6	0	1	35	0	12.7	1.8	0	0.1	71	30	2	0	0.6
Q27	1	0	2	0	0	0	35	0	1.1	0	0	0	14	16	3	0	4
Q41	0	0	10	6	0	1	0	0	36.9	0.9	0	0.1	0	0	0	0	1
Q42	0	0	9	4	0	1	0	0	25.7	0.8	0	0.1	0	2	0	0	1.6
Q43	1	0	2	2	0	0	4	0	2	0.6	0	0	14	36	6	5	6
Q44	0	0	6	3	0	0	0	0	28	0.5	0	0	0	2	0	0	0.1
Q47	1	0	6	8	0	0	30	0	4	6.6	0	0	16	42	3	2	0
Q48	0	0	5	2	0	0	0	0	14.3	0.4	0	0	0	0	0	0	0
Q65	1	0	6	3	1	0	15	0	30.2	0.4	0.4	0	48	22	0	3	25
Q66	2	0	0	4	0	0	17	0	0	15.5	0	0	26	23	0	2	1

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type - PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion; Keith Formation: Grassy Woodlands; Keith Class: Western Slopes Grassy Woodlands; source (NSW BioNet Vegetation Classification Benchmarks V1.2 accessed December 2022)

(2) Hollow bearing tree

(3) High threat weed

5.2.5 PCT 276 – Yellow Box Grassy Tall Woodland on Alluvium or Parna Loams and Clays on Flats in NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.17 to Photo 5.20. A profile of PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion is provided in Table 5.11 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.12.

Table 5.11 Summary of PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion

PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	
PCT Justification	The community occurred as a tall open grassy woodland dominated by *Eucalyptus melliodora* (Yellow Box) largely in areas previously mapped by the SVTM as PCT 276 or PCT 76. PCT 276 was assigned to this vegetation type based on the dominance of *Eucalyptus melliodora* (Yellow Box) in the upper stratum often occurring with *Eucalyptus microcarpa* (Western Grey Box). Further, the community occurred on flats and alluvial floodplains associated with alluvial soils. These characteristics are consistent with the BioNet profile for PCT 276.
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Conservation status	PCT 276 is broadly consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Endangered under BC Act and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as Critically Endangered under the EPBC Act.
SAII entity	Yes
Per cent cleared	90 per cent
Landscape position	Occurs on lower slopes and alluvial floodplain flats.
Species upper stratum	*Eucalyptus melliodora* (Yellow Box), *Eucalyptus microcarpa* (Western Grey Box)
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Aristida behriana* (Bunch Wiregrass), *Aristida jerichoensis* var. *jerichoensis* (Jericho Wiregrass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass) *Enteropogon acicularis* (A Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Sida corrugata* (Corrugated sida), *Rytidosperma auriculatum* (Lobed Wallaby Grass).
Vegetation condition	Moderate condition (vegetation integrity score 70.9): exhibited a sparse canopy dominated by *Eucalyptus melliodora* (Yellow Box) with the middle stratum absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is modified due to grazing with exotic weed cover recorded to about 25 per cent. Poor condition (vegetation integrity score 29.7): occurred generally as canopy only with low species richness and cover in the ground stratum. Evidence of heavy grazing and high exotic weed cover (74 per cent).

Photo 5.17 PCT 276 – Poor condition (Plot Q2)

Photo 5.18 PCT 276 – Moderate condition (Plot Q3)

Photo 5.19 PCT 276 – Poor condition (Plot Q8)

Photo 5.20 PCT 276 – Poor condition (Plot Q17)

Table 5.12 Comparison of PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**4**	**3**	**8**	**9**	**1**	**1**	**18**	**1**	**30**	**6**	**0**	**0**	**34**	**35**	**2(50)**	**–**	**–**
Q2	2	0	2	7	0	0	40	0	0.4	1.2	0	0	5	70	2	0	5
Q3	2	0	7	5	0	1	35	0	8.3	1	0	0.2	17	90	2	0	0
Q8	1	0	0	0	0	0	35	0	0	0	0	0	18	0	1	0	0
Q17	1	0	1	0	0	0	30	0	0.1	0	0	0	14	60	0	0	0
Q53	2	1	6	10	0	1	37	0.1	9.6	9	0	0.2	7	55	1	1	0

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type - PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion; Keith Formation: Grassy Woodlands; Keith Class: Western Slopes Grassy Woodlands; source (NSW BioNet Vegetation Classification Benchmarks V1.2 accessed December 2022)

(2) Hollow bearing tree

(3) High threat weed

5.2.6 PCT 277 – Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.21 to Photo 5.24. A profile of PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion is provided in Table 5.13 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.14.

Table 5.13 Summary of PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	
PCT Justification	The community occurred as a tall open grassy woodland dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *Eucalyptus melliodora* (Yellow Box) largely in areas previously mapped by the SVTM as PCT 277, PCT 276, PCT 76 or PCT 80. Where SVTM mapping identified patches of this community as a PCT other than PCT 277 there were PCT 277 patches also mapped nearby. PCT 277 was assigned to this vegetation type based on the dominance of *Eucalyptus blakelyi* (Blakely's Red Gum) in the upper stratum often occurring with *Eucalyptus melliodora* (Yellow Box) and scattered *Eucalyptus albens* (White Box). Within the subject land the community was largely associated with footslopes and undulating hills slopes on clay loam soils commonly integrating with PCT 266, PCT 276 and PCT 76. These characteristics are consistent with the BioNet profile for PCT 277.
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Conservation status	PCT 277 broadly consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Endangered under BC Act and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as Critically Endangered under the EPBC Act.
SAII entity	Yes
Per cent cleared	94 per cent
Landscape position	Occurs on lower slopes and gently undulating areas.
Species upper stratum	*Eucalyptus blakelyi* (Blakely's Red Gum), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus albens* (White Box), *Eucalyptus macrorhyncha* (Red Stringybark), *Brachychiton populneus* subsp. *populneus* (Kurrajong).
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Aristida behriana* (Bunch Wiregrass), *Aristida jerichoensis* var. *jerichoensis* (Jericho Wiregrass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass) *Enteropogon acicularis* (A Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Sida corrugata* (Corrugated sida), *Rytidosperma auriculatum* (Lobed Wallaby Grass).

PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	
Vegetation condition	Moderate condition (vegetation integrity score 70): exhibited a sparse canopy dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) with the middle stratum absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is predominately native with exotic cover <5 per cent. Poor condition (vegetation integrity score 50.6): occurred generally as canopy only with low species richness and cover in the ground stratum. Evidence of heavy grazing and high exotic weed cover. Low condition (vegetation integrity score 2.7): this vegetation type occurs as derived native grasses and lacks any woodland structure with the upper and middle stratums historically removed. Due to historic and ongoing grazing the ground stratum is relatively low in native species richness and cover in forb, fern and other natives. Planted native vegetation (vegetation integrity score 54.2): areas consisting of native tree plantings largely dominated by *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus blakelyi* (Blakey's Red Gum). The understorey was occurred predominantly of exotic pasture grasses or a co-dominate mix of native and exotic species.

Photo 5.21 PCT 277 – Moderate (Plot Q4)

Photo 5.22 PCT 277 – Poor (Plot Q34)

Photo 5.23 PCT 277 – Low (Plot Q14)

Photo 5.24 PCT 277 – Moderate (Plot Q45)

Table 5.14 Comparison of PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**4**	**3**	**8**	**9**	**1**	**1**	**18**	**1**	**30**	**6**	**0**	**0**	**34**	**35**	**2(50)**	**–**	**–**
Q4	2	2	8	5	1	2	18	11	36	2.8	0.2	1.2	1	50	0	0	10
Q13	1	0	10	4	0	0	0.3	0	43.4	0.7	0	0	0	2	0	0	0
Q14	0	0	9	7	0	0	0	0	38.7	1.7	0	0	0	2	0	0	0
Q15	0	0	8	7	1	0	0	0	8.9	12.1	0.3	0	0	0	0	0	0
Q34	2	0	3	1	0	0	42	0	2.7	0.2	0	0	4	86	4	2	3.3
Q35	2	0	1	3	0	0	11	0	0.1	0.5	0	0	0	77.2	2	0	17
Q36	1	1	4	2	0	1	35	12	8.6	0.6	0	0.2	2	68	3	1	6.3
Q37	1	0	11	3	0	1	19	0	15.6	1.1	0	0.2	0	68	0	0	13.3
Q40	1	0	1	2	0	0	40	0	2	0.5	0	0	29	54	5	4	18
Q45	5	2	10	6	1	2	40.5	2.2	12.5	2.5	0.1	0.2	19	89	3	4	3.3
Q46	3	0	6	6	0	0	21.1	0	9.9	1.3	0	0	2	88	2	2	2.1
Q51	1	0	7	4	0	0	25	0	21	0.5	0	0	0	20	1	0	0
Q74	2	0	4	2	0	0	25	0	35.1	1.1	0	0	0	10	1	0	28.7
Q77	0	1	0	0	0	0	0	70	0	0	0	0	0	20	0	0	99.2

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type – PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion; Keith Formation: Grassy Woodlands; Keith Class: Western Slopes Grassy Woodlands; source (NSW BioNet Vegetation Classification Benchmarks V1.2 accessed December 2022)

(2) Hollow bearing tree

(3) High threat weed

5.2.7 PCT 309 – Black Cypress Pine – Red Stringybark – Red Gum – Box Low Open Forest on Siliceous Rocky Outcrops in the NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.25 to Photo 5.26. A profile of PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion is provided in Table 5.15 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.16.

Table 5.15 Summary of PCT 309 Black Cypress Pine – Red Stringybark – Red Gum – Box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion

PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	
PCT Justification	The community occurred as a low to medium tall open forest dominated by *Eucalyptus macrorhyncha* (Red Stringybark) largely in areas previously mapped by the SVTM as PCT 309. PCT 309 was assigned to this vegetation type based on the dominance of *Eucalyptus macrorhyncha* (Red Stringybark) in the upper stratum often occurring with *Eucalyptus albens* (White Box). The community typically occurred on hillslopes with north/western aspects and were associated with brown loamy sand soils. These characteristics are consistent with the BioNet profile for PCT 309.
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Western Slopes Dry Sclerophyll Forests
Conservation status	Not listed under BC Act or EPBC Act
SAII entity	No
Per cent cleared	15 per cent
Landscape position	Occurs on rocky hills with shallow skeletal soils associated with the Bethungra Range.
Species upper stratum	*Eucalyptus albens* (White Box), *Eucalyptus macrorhyncha* (Red Stringybark), *Eucalyptus melliodora* (Yellow Box), *Brachychiton populneus* subsp. *populneus* (Kurrajong).
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Chloris truncata* (Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Panicum effusum* (Hairy Panicum), *Rytidosperma caespitosum* (Ringed Wallaby Grass), *Rytidosperma setaceum* (Smallflower Wallaby Grass).
Vegetation condition	Moderate condition (vegetation integrity score 52.6): exhibited an upper stratum dominated by *Eucalyptus macrorhyncha* (Red Stringybark) with canopy dieback evident. The middle stratum was mostly absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is predominately native with exotic cover <5 per cent.

Photo 5.25 PCT 309 – Moderate condition (Plot Q28)

Photo 5.26 PCT 309 – Moderate condition (Plot Q29)

Table 5.16 Comparison of PCT 309 Black Cypress Pine – Red Stringybark – Red Gum – Box low open forest on siliceous rocky outcrops on the NSW South Western Slopes Bioregion integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**5**	**7**	**7**	**13**	**1**	**2**	**71**	**7**	**23**	**8**	**0**	**0**	**101**	**59**	**3(50)**	**–**	**–**
Q28	2	0	5	2	0	1	35	0	7.1	0.2	0	0.1	38	59	1	0	0
Q29	1	0	5	0	0	0	35	0	9.2	0	0	0	52	67	0	2	0

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type – PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion; Keith Formation: Dry Sclerophyll Forests (Shrubby sub-formation); Keith Class: Western Slopes Dry Sclerophyll Forests; source (NSW BioNet Vegetation Classification Benchmarks V1.2 accessed December 2022)

(2) Hollow bearing tree

(3) High threat weed

5.2.8 PCT 347 – White Box – Blakely's Red Gum Shrub / Grass Woodland on Metamorphic Hillslopes in the Mid-Southern Part of the Upper Slopes Sub-Region of the NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.27 to Photo 5.28. A profile PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion is provided in Table 5.17 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.18.

Table 5.17 Summary of PCT 347 White Box – Blakely's Red Gum shrub / grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	
PCT Justification	PCT 347 occurred as a medium high open grassy woodland dominated by *Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) in areas previously mapped or nearby areas mapped by the SVTM as PCT 309. PCT 347 was assigned to this vegetation type based on the dominance of *Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) in the upper stratum occurring on hillslopes and undulating terrain associated with clay loam soils. These characteristics are consistent with the BioNet profile for PCT 347.
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Conservation status	PCT 347 broadly consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Endangered under BC Act and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as Critically Endangered under the EPBC Act.
SAII entity	Yes
Per cent cleared	63 per cent
Landscape position	Occurs on hillslopes and undulating terrain associated with the foot slopes and outcropping rocky slopes of the Bethungra Range.
Species upper stratum	*Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) with scattered occurrences of *Eucalyptus macrorhyncha* (Red Stringybark) and *Brachychiton populneus* subsp. *populneus* (Kurrajong).
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass), *Dichondra repens* (Kidney Weed), *Dysphania pumilio* (Small Crumbweed), *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Oxalis perennans*, *Panicum effusum* (Hairy Panicum), *Rytidosperma caespitosum* (Ringed Wallaby Grass), *Rytidosperma racemosum*, *Rytidosperma setaceum* (Smallflower Wallaby Grass).

PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	
Vegetation condition	Moderate condition (vegetation integrity score 52.5): exhibited a relatively intact upper stratum dominated by *Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum). The middle stratum was mostly absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is predominately native with exotic cover <5 per cent. Poor condition (vegetation integrity score 35.6): This patch occurs as canopy only with little to no middle or ground stratum present. This patch was recorded in heavily grazed areas with little to no regeneration potential. Exotic annual weed cover was relatively low due to drought and seasonality although it is expected that following rain or during later winter/ spring these patches would be dominated annual weeds.

Photo 5.27 PCT 347 – Moderate condition (Plot Q23)

Photo 5.28 PCT 347 – Moderate condition (Plot Q32)

Table 5.18 Comparison of PCT 347 White Box – Blakely's Red Gum shrub / grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**4**	**3**	**8**	**9**	**1**	**1**	**18**	**1**	**30**	**6**	**0**	**0**	**49**	**56**	**2(50)**	**–**	**–**
Q23	2	0	7	4	0	0	45	0	3.1	0.6	0	0	34	30	0	1	0
Q32	4	0	6	4	0	1	26	0	9.7	0.5	0	0.1	57	59	0	0	0.1
Q60	1	0	2	5	0	0	10	0	0.5	10.6	0	0	55	5.4	0	0	8

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type – PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion; Keith Formation: Grassy Woodlands; Keith Class: Western Slopes Grassy Woodlands; source (NSW BioNet Vegetation Classification Benchmarks V1.2 accessed December 2022)

(2) Hollow bearing tree

(3) High threat weed

5.3 Miscellaneous ecosystems

Vegetation identified within the subject land which was not able to be assigned to a recognised NSW Plant Community Type was assigned to a miscellaneous ecosystem (non-native vegetation) referred to as exotic species/native landscape plantings. This vegetation was predominately recorded has highly disturbed exotic grasslands with limited native vegetation and in some areas planted native vegetation. Dominant species identified in these areas included *Alternanthera pungens** (Khaki Weed), *Avena fatua** (Wild Oat), *Bromus spp.*, *Trifolium spp.*, *Paspalum dilatatum** (Paspalum) and (*Cucumis myriocarpus* subsp. *leptodermis**) Paddy melon.

Miscellaneous non-native vegetation also includes planted ornamental vegetation and water bodies (farm dams etc). These ecosystems provide limited habitat for threatened species although are considered further as prescribed matters in Chapter 7 of this report.

5.4 Patch size

Patch size is defined under the BAM as an area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100m from the next area native vegetation (or less than or equal to 30m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the subject land. Patch size area is assigned to each vegetation zone as a class, being less than 5 hectares, 5–24 hectares, 25–100 hectares or greater than or equal to 100 hectares. Patch size may extend onto adjoining land that is not part of the development site.

All vegetation zones within the subject land were recorded across several discontinuous patches which could be assigned to more than one patch size class (25–100ha or ≥ 100ha). A conservative approach was adopted for the purpose of candidate species and the largest patch size category for the PCT was assigned is outlined in Table 5.19 below. The location of each native vegetation zone within the subject land is illustrated in Figure 5.3. Patch sizes for each vegetation zone are illustrated in Figure 5.4.

Table 5.19 Patch sizes assigned to PCTs recorded

Vegetation type	Condition	Patch size class (ha)
PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	Moderate condition	101
	Poor condition	101
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good condition	101
	Moderate condition	101
	Poor condition	101
	Low condition – DNG	101
PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate condition	101
	Poor condition	101
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	101
	Poor condition	101
	Low condition – DNG	101
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate condition	101
	Poor condition – canopy only	101
	Moderate condition	101

Vegetation type	Condition	Patch size class (ha)
PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Poor condition	101
	Low condition – DNG	101
PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Moderate condition	101
PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	101
	Poor condition	101

5.5 Priority weeds and weeds of national significance

Of the introduced flora species recorded within the subject land, seven were listed as High Threat weeds under the BC Act. In addition, one recorded species, *Lycium ferocissimum*, was listed as Priority Weeds for the Riverina region under the *Biosecurity Act 2015* and listed as a Weed of National Significance (WoNS) (Department of Primary Industries 2021) as outlined below in Table 5.20. The biosecurity assessment provides further detailed assessment and all agricultural weeds (Chapter 18 of the EIS).

Table 5.20 Priority weeds identified within the subject land

Species name	Common name	BAM HTW[1]	Priority weeds	WONS
*Alternanthera pungens**	Khaki Weed	Yes	–	–
*Bromus diandrus**	Brome grass	Yes	–	–
*Hypericum perforatum**	St John's-wort	Yes	–	–
*Lycium ferocissimum**	African Boxthorn	–	Yes – Prohibition on dealings[2]	Yes
*Paspalum dilatatum**	Paspalum	Yes	–	–
*Romulea rosea var. australis**	Onion Grass	Yes	–	–
*Rosa rubiginosa**	Sweet Briar	Yes	–	–
*Xanthium spinosum**	Bathurst Burr	Yes	–	–

Note: (*) signify introduced species – non-native species

(1) High threat weed list (BAM-C list, last updated 22/10/20)

(2) Prohibition on dealings: Must not be imported into the State or sold

5.6 Scattered trees

A total of 58 Class 2 and Class 3 scattered trees were recorded during field surveys and desktop assessment. A breakdown of each scattered tree class and associated PCT is provided in Table 5.21. The scattered trees recorded are shown in Figure 5.4. Scattered trees with negligible biodiversity value are those trees identified as Class 1 scattered trees and these did not contain hollows.

Scattered Trees within the subject land were assigned to the following PCTs based on the dominant canopy tree species for each community as listed in the BAM credit calculator:

- PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion.
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.

The large tree benchmark for all PCTs assigned is >50cm DBH. This benchmark was used to determine the Class category for each scattered tree in accordance with Appendix B of the BAM. A description of each condition class is provided in section 5.2.

Assessment of scattered trees in areas not surveyed was based on best available information including existing vegetation mapping, aerial imagery, inspection from and of accessible areas including extrapolation of vegetation mapping and condition data from nearby areas. A precautionary approach was taken and scattered trees not surveyed were assigned to the highest category (Class 3 with hollows).

Table 5.21 Class 2 and Class 3 Scattered trees recorded

Class of scattered tree	Associated PCT	Number of scattered trees
Class 3 – with hollows	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	1
	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	29
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	3
	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	2
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	4
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2
Total Class 3 scattered trees with hollows		**41**

Class of scattered tree	Associated PCT	Number of scattered trees
Class 3 – with no hollows	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	3
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	3
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	1
Total Class 3 scattered trees with no hollows		**9**
Class 2 – with no hollows	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	1
	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	3
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2
Total Class 2 scattered trees with no hollows		**8**
Total Class 3, Class 2 and Class 1 scattered trees		**58**

Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good

Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate

Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate

Miscellaneous Ecosystem

42250
42000
41750
41500
41250
41000
40750
40500
40250
40000

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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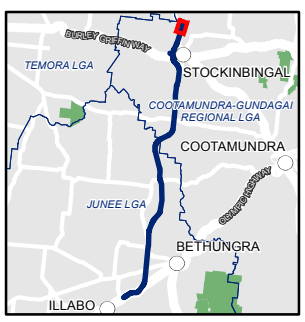
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

5m Contours

Paddock Trees

Class 3 - with hollows



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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 9: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

40250
40000
39750
39500
39250
39000
38750
38250
38000
37750
37500
37250
37000
36750

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

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4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

5m Contours

Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate

Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate

Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor

37000
36750
36500
36250
36000
35750
35500
35250
35000
34750
34500
34250
34000
33750

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

5m Contours

Paddock Trees

Class 3 - with hollows

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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Miscellaneous Ecosystem

33750
33500
33250
33000
32750
32500
32250
32000
31750
31500
31250
31000
30750
30500

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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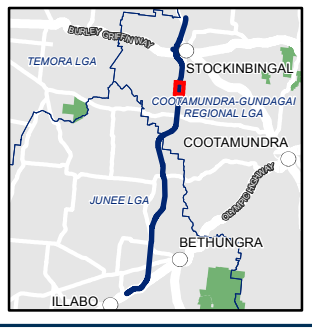
Proposal Site

5m Contours

Paddock Trees

Class 3 - with hollows



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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate

Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor

Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland

Miscellaneous Ecosystem

30500
30250
30000
29750
29500
29250
29000
28750
28500
28250
28000
27750
27500
27250

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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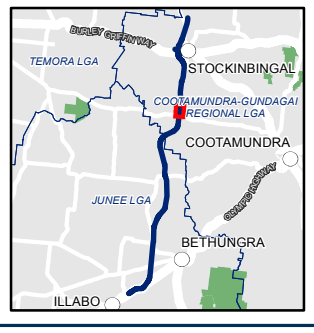
Proposal Site

5m Contours

Paddock Trees

Class 2 - no hollows

Class 3 - with hollows



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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 9: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

27500 27250 27000 26750 26500 26250 26000 25750 25500 25250 25000 24750 24500 24250

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

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4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

5m Contours

Paddock Trees

- Class 2 - no hollows
- Class 3 - with hollows

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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

25000
24750
24500
24250
24000
23750
23500
23250
23000
22750
22500
22250
22000
21750
21500
21250
21000
20750

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

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4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

5m Contours

Paddock Trees

Class 3 - with hollows

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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 15: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 17: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

21000
20750
20500
20250
20000
19750
19500
19250
19000
18750
18500
18250
18000
17750

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

5m Contours

Paddock Trees

Class 3 - with hollows

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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate

17750
17500
17250
17000
16750
16500
16250
16000
15750
15500
15250
15000
14750
14500

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

5m Contours

Paddock Trees

Class 3 - with hollows

INLAND RAIL ARTC

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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate

14500
14250
14000
13750
13500
13250
13000
12750
12500
12250
12000
11750
11500

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

5m Contours

Paddock Trees

Class 3 - with hollows

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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 19: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Poor
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

11500
11250
11000
10750
10500
10250
10000
9750
9500
9250
9000
8750
8500
8250

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

5m Contours

Paddock Trees

- Class 3 - no hollows
- Class 3 - with hollows

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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 19: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Poor
- Miscellaneous Ecosystem

8250
8000
7750
7500
7250
7000
6750
6500
6250
6000
5750
5500
5250
5000

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

5m Contours

Paddock Trees

- Class 2 - no hollows
- Class 3 - no hollows
- Class 3 - with hollows

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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 11: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Poor
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

5250 5000 4750 4500 4250 4000 3750 3500 3250 3000 2750 2500 2250 2000

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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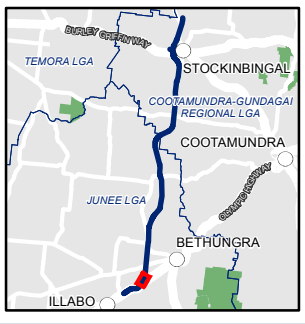
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

5m Contours

Paddock Trees

- Class 3 - with hollows



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Category 1 Land (BAM does not apply except for prescribed impacts)

Vegetation Zones

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 11: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Poor
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation
- Miscellaneous Ecosystem

1750 1500 1250 1000 750 500 250 0

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

5m Contours

Paddock Trees

- Class 2 - no hollows
- Class 3 - no hollows

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5.7 Threatened ecological communities

Native vegetation recorded within the subject land is considered to meet the final determination of two threatened ecological communities listed under the BC Act. These are:

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions.
- White Box Yellow Box Blakely's Red Gum 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.

A comparison of the final determination for each threatened ecological community and candidate PCT is provided in Table 5.22 to Table 5.23. Each element of the final determination including locality, species composition, characteristic species and resilience is compared to each condition class for candidate PCTs to determine if vegetation recorded within the subject land is consistent with the criterion.

A summary of each threatened ecological community, associated PCT and extent within the subject land is summarised in Table 5.24. The location of each threatened ecological community within the subject land is mapped in Figure 5.5.

Threatened Ecological Communities (BC Act)

- Status CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

STOCKINBINGAL PARKES RAILWAY

GROGAN ROAD

42000

41500

41000

40500

40000

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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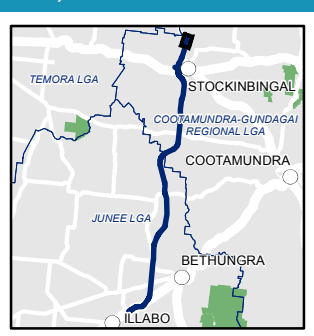
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail



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Threatened Ecological Communities (BC Act)

- Status CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

40000
39500
39000
38500
38000
37500
37000

STOCKINBINGAL PARKES RAILWAY
GROGAN ROAD
STOCKINBINGAL
WOOD STREET
HIBERNIA STREET
LAKE CARGELLIGO RAILWAY
BURLEY GRIFFIN WAY

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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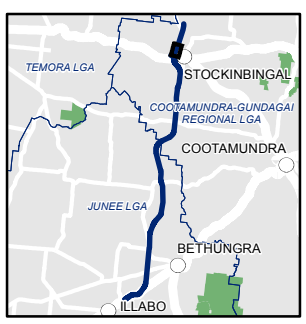
4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Existing Rail



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Threatened Ecological Communities (BC Act)

- Status CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

37000
36500
36000
35500
35000
34500
34000

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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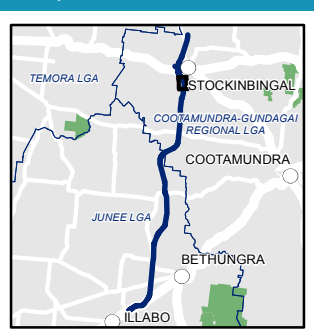
Proposal Site



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Threatened Ecological Communities (BC Act)

- Status CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

33500
33000
32500
32000
31500
31000
30500

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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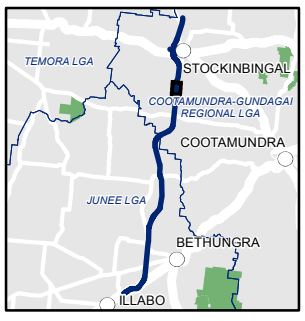
Proposal Site



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Threatened Ecological Communities (BC Act)

- Status CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

30500
30000
29500
29000
28500
28000
27500
OLD COOTAMUNDRA ROAD

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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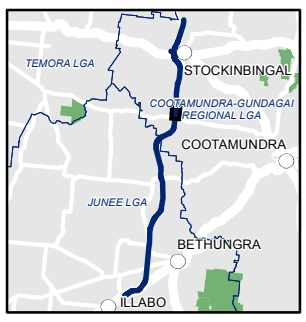
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site



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Threatened Ecological Communities (BC Act)

Status CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

27500
27000
26500
26000
25500
25000
24500

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

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Threatened Ecological Communities (BC Act)

Status CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

25000
24500
24000
23500
23000
22500
22000
21500
21000

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

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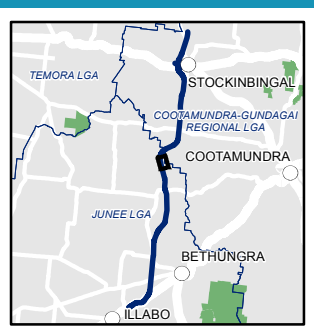

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Threatened Ecological Communities (BC Act)

- Status CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

21000
20500
20000
19500
19000
18500
18000
DIRNASEER ROAD

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

0 0.1 0.2 0.3 Kilometers

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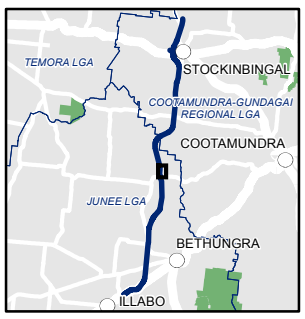

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17500
17000
16500
16000
15500
15000
14500

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

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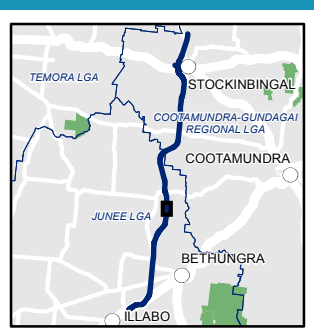

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Threatened Ecological Communities (BC Act)

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- Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

14500
14000
13500
13000
12500
12000
11500
IRONBONG ROAD

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

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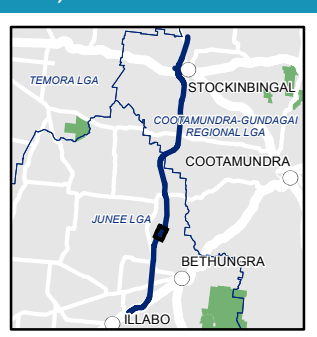

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Threatened Ecological Communities (BC Act)

Status CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

11500

11000

10500

10000

9500

9000

8500

IRONBONG ROAD

EULOMO SETTLEMENT ROAD

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

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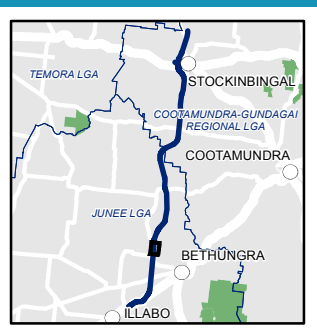

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Threatened Ecological Communities (BC Act)

Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

8000

IRONBONG ROAD

7500

7000

6500

6000

OLD SYDNEY ROAD

5500

5000

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

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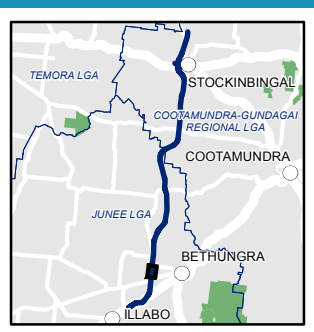

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Threatened Ecological Communities (BC Act)

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5000
4500
4000
3500
3000
2500
2000

MAIN SOUTHERN RAILWAY
OLYMPIC HIGHWAY

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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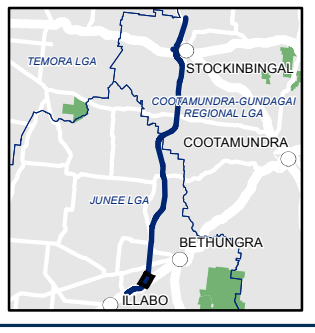
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail



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- Status E: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

1500
1000
500
0
OLYMPIC HIGHWAY
WARRENS LANE
MAIN SOUTHERN RAILWAY

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

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Proposal Site

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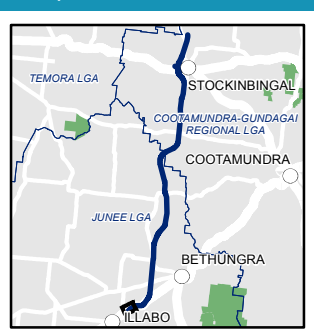

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5.7.1 Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions is listed as Endangered under BC Act.

The two following PCTs were considered candidates to form part of the BC Act listed Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.

To be considered consistent with the Endangered listing under the BC Act, the vegetation must be consistent with the final determination for Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (NSW Scientific Committee, 2007).

The assessment concluded that the following vegetation types and zones met the BC Act listing:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Good condition (VZ1).
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Moderate condition (VZ2).
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Poor condition (VZ3).
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Low condition (VZ4).
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Moderate condition (VZ5).
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Low condition (VZ6).

A comparison of PCT 76 and PCT 80 within the subject land against the final determination for the threatened Inland Grey Box ecological community is provided in Table 5.22.

Table 5.22 Comparison of Inland Grey Box EEC final determination against associated PCT 76 and PCT 80 recorded within the subject land

Inland Grey Box Woodland EEC final determination[1]	PCT 76				PCT 80	
	Good	Moderate	Poor	Low	Moderate	Poor
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions is the name given to the ecological community found on relatively fertile soils of the western slopes and plains of NSW in which *Eucalyptus microcarpa* (Inland Grey Box) is the most characteristic species.	*Eucalyptus microcarpa* (Inland Grey Box) was the most dominant species.			*Eucalyptus microcarpa* (Inland Grey Box) was absent	*Eucalyptus microcarpa* (Inland Grey Box) was the most dominant species.	
In NSW the community principally occurs within the Riverina and South West Slopes Bioregions.	Recorded in the NSW South Western Slopes IBRA bioregion					
Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species - *Eucalyptus microcarpa* - is often found in association with *Eucalyptus populnea* subsp. *bimbil* (Bimbil Box), *Callitris glaucophylla* (White Cypress-pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii* (Buloke) or *Eucalyptus melliodora* (Yellow Box), and sometimes with *Eucalyptus albens* (White Box).	*Eucalyptus microcarpa* (Inland Grey Box) was the most dominant species with scattered occurrences of *Callitris glaucophylla* (White Cypress-pine).			Canopy was not recorded in this vegetation zone.	*Eucalyptus microcarpa* (Inland Grey Box) was the most dominant species with *Callitris glaucophylla* (White Cypress-pine) often recorded. Scattered occurrences of *Eucalyptus albens* (White Box) were also recorded.	
Characteristic species for this EEC.	Characteristic species were recorded in Q5, Q49, Q52,	Characteristic species were recorded in Q21, Q22, Q38	Characteristic species were recorded in Q9, Q10	Characteristic species were recorded in Q16	Characteristic species were recorded in Q20, Q50	Characteristic species were recorded in Q18, Q19, Q59
Inland Grey Box Woodland may be found in the local government areas of … Cootamundra, Junee…	Recorded in Cootamundra-Gundagai Regional Council and Junee Shire Council Local Government Areas.					
Inland Grey Box Woodland can, in some regions, be differentiated from *Eucalyptus albens-E. melliodora* communities by grass species. *Themeda triandra* and *Poa sieberiana* characterise the latter community whereas *Austrostipa scabra, Austrodanthonia spp.* and *Enteropogon spp.* are more typically associated with *Eucalyptus microcarpa*, although disturbance weakens this correlation (Prober and Thiele 2004).	*Austrostipa scabra* subsp. *scabra, Rytidosperma auriculatum*, *Rytidosperma caespitosum, Rytidosperma setaceum*, and *Enteropogon acicularis* were frequently recorded in these plant communities. It should be noted that during the time of survey, the Cootamundra and Junee regions were experiencing drought conditions and majority of the survey area with native grasslands had experienced heavy grazing.					

Inland Grey Box Woodland EEC final determination[1]	PCT 76				PCT 80	
	Good	Moderate	Poor	Low	Moderate	Poor
On a statewide scale, Benson et al. (2006) described six communities as fitting within the definition of Inland Grey Box Woodland (ID76, ID80, ID81, ID82, ID110 and ID237). The nominated community belongs to 'Floodplain Transition Woodlands' vegetation class of Keith (2004) which also includes the *Eucalyptus conica* (Fuzzy Box) and *E. pilligaensis* (Pilliga Box) woodland communities where *E. microcarpa* rarely occurs.	PCT 76 belongs to the Floodplain Transition Woodlands vegetation class and is known to align to this EEC.				PCT 80 belongs to the Floodplain Transition Woodlands vegetation class and is known to align to this EEC.	
Some remnants of the community survive with trees partly or wholly removed. Conversely, often the remnants of the community survive with trees largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification.	Trees and ground layer partly intact	Trees and ground layer partly intact	Trees partly intact, ground soil seed bank not intact	Trees wholly removed, ground layer disturbed	Trees and ground layer partly intact	Trees partly intact, ground soil seed bank not intact
Disturbed remnants are considered to form part of the community including remnants where the understorey, overstorey or both would, under appropriate management, respond to assisted natural regeneration from the soil seed bank.	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration >90% native perennial understorey	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration
Outcome	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**

(1) NSW Scientific Committee (2007)

5.7.2 White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is listed as Critically Endangered under BC Act.

The four following PCTs were considered candidates to form part of the BC Act listed White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands:

- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion.

To be considered consistent with the Endangered listing under the BC Act, the vegetation must be consistent with the final determination for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (NSW Scientific Committee, 2004).

A comparison of PCT 266, PCT 276, PCT 277 and PCT 347 recorded against the final determination for the threatened White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community is provided in Table 5.23.

The assessment concluded that the following vegetation types and zones met the BC Act listing for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland:

- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ7).
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Poor condition (VZ8).
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Low condition (VZ9).
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ10).
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Poor condition (VZ11).
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ12).
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Poor condition (VZ13).
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Low condition (VZ14).
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Planted native vegetation condition (VZ20).
- PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ16).
- PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Poor condition (VZ17).

Table 5.23 Comparison of White Box Yellow Blakely's Red Gum Woodland CEEC final determination and associated PCT 266, PCT 276, PCT 277 and PCT 347 recorded

White Box Yellow Box Blakey's Red Gum Grassy Woodland and Derived Native Grassland[1]	PCT 266		PCT 276		PCT 277				PCT 347	
	Moderate	Poor	Moderate	Poor	Moderate	Poor	Low	Planted	Moderate	Poor
Paragraph 1: White Box Yellow Box Blakely's Red Gum Woodland (Box Gum Woodland) is found on relatively fertile soils on the tablelands and western slopes of NSW. The community occurs within the South Eastern Highlands and NSW South Western Slopes Bioregions.	These vegetation types were recorded on fertile soils of the NSW South Western Slopes Bioregion.									
Paragraph 2: Box Gum Woodland includes those woodlands where the characteristic tree species include one or more of the following species in varying proportions and combinations – *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) or *Eucalyptus blakelyi* (Blakely's Red Gum). Grass and herbaceous species generally characterise the ground layer. In some locations, the tree overstorey may be absent as a result of past clearing or thinning and at these locations only an understorey may be present. Shrubs are generally sparse or absent, though they may be locally common.	*Eucalyptus albens* (White Box) was the dominant. Shrubs are generally sparse or absent. Grass and herbaceous species generally characterise the ground stratum.	The tree overstorey in this vegetation is absent due to historic and ongoing agricultural activities and at these locations only a native ground stratum is present.	*Eucalyptus melliodora* (Yellow Box) was the dominant overstorey species. Shrubs are generally sparse or absent. Grass and herbaceous species generally characterise the ground stratum.	*Eucalyptus melliodora* (Yellow Box) was the dominant overstorey species. This vegetation occurs as canopy only with low species richness and cover in the ground stratum.	*Eucalyptus blakelyi* (Blakely's Red Gum) and scattered *Eucalyptus albens* (White Box) were the dominant trees. Shrubs are generally sparse or absent. Grass and herbaceous species generally characterise the ground stratum.	The tree overstorey in this vegetation is absent due to historic and ongoing agricultural activities and at these locations only a native ground stratum is present.	The tree overstorey in this vegetation is absent due to historic and ongoing agricultural activities and at these locations only a native ground stratum is present.	*Eucalyptus melliodora* (Yellow Box) and *Eucalyptus blakelyi* (Blakey's Red Gum) were the dominant trees planted. This vegetation occurs as canopy only with low species richness and cover in the ground stratum.	*Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) were the dominant trees. Shrubs are generally sparse or absent. Grass and herbaceous species generally characterise the ground stratum.	*Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) were the dominant trees. This vegetation occurs as canopy only with little to no middle or ground stratum present. This patch was recorded in heavily grazed areas with little to no regeneration potential

White Box Yellow Box Blakey's Red Gum Grassy Woodland and Derived Native Grassland[1]	PCT 266		PCT 276		PCT 277				PCT 347	
	Moderate	Poor	Moderate	Poor	Moderate	Poor	Low	Planted	Moderate	Poor
Paragraph 3: outlines the most characteristic species for this EEC.	Characteristic species were recorded in Q25, Q26, Q47, Q65	Characteristic species were recorded in Q41, Q42, Q44, Q48, Q66	Characteristic species were recorded in Q3, Q53	Characteristic species were recorded in Q2, Q8, Q17	Characteristic species were recorded in Q4, Q13, Q45, Q46, Q51, Q56, Q57, Q58	Characteristic species were recorded in Q14, Q15, Q54, Q55	Characteristic species were recorded in Q14, Q15, Q54, Q55	Characteristic species were recorded in Q74, Q77	Characteristic species were recorded in Q23, Q32	Characteristic species were recorded in Q60
Paragraph 4: Woodlands with *Eucalyptus albens* are most common on the undulating country of the slopes region while *Eucalyptus blakelyi* and *Eucalyptus melliodora* predominate in grassy woodlands on the tablelands. Drier woodland areas dominated by *Eucalyptus albens* often form mosaics with areas dominated by *Eucalyptus blakelyi* and *Eucalyptus melliodora* occurring in more moist situations, while areas subject to waterlogging may be treeless. *E microcarpa* is often found in association with *E. melliodora* and *E. albens* on the south western slopes.	PCT 266 was recorded in areas of higher elevation where surface rock was generally present and occurred as a grassy woodland.		PCT 276 was recorded in low-lying areas in the landscape subject to period flooding and occurred as a grassy woodland.		PCT 277 on low hills and undulations dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *Eucalyptus albens* (White Box)	PCT 277 on low-lying areas dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *Eucalyptus melliodora* (Yellow Box)	No overstorey species were recorded in this vegetation type.	PCT 277 on low-lying flats bordering roadsides and property boundaries dominated by *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus blakelyi* (Blakely's Red Gum)	PCT 347 occurs on mid slopes dominated by *Eucalyptus albens* (White Box)	

White Box Yellow Box Blakey's Red Gum Grassy Woodland and Derived Native Grassland[1]	PCT 266		PCT 276		PCT 277				PCT 347	
	Moderate	Poor	Moderate	Poor	Moderate	Poor	Low	Planted	Moderate	Poor
Paragraph 8: Further remnants of the community are degraded as a consequence of their disturbance history. Some remnants of these communities survive with the trees partly of wholly removed by post European activities, and conversely, often remnants of these communities survive with these tree species largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification.	Trees and ground layer mostly intact	Trees wholly removed, ground layer disturbed	Trees and ground layer mostly intact	Trees intact, ground layer disturbed	Trees and ground layer mostly intact	Trees wholly removed, ground layer disturbed	Trees intact, ground layer disturbed	Trees intact, ground layer disturbed	Trees and ground layer mostly intact	Trees intact, ground layer disturbed
Paragraph 10: The condition of remnants ranges from relatively good to highly degraded, such as paddock remnants with weedy understories and only a few hardy natives left. Some remnants of the community may consist of only an intact overstorey or an intact understorey but may still have high conservation value due to the flora and fauna they support.	Vegetation integrity score 62.9 – hollow trees recoded	Vegetation integrity score 2 – low habitat value	Vegetation integrity score 41.4 – hollow trees recoded	Vegetation integrity score 29.7	Vegetation integrity score 77.8 – hollow trees recoded	Vegetation integrity score 50.6 – hollow trees recorded	Vegetation integrity score 2.7 – low habitat value	Vegetation integrity score 54.2	Vegetation integrity score 46.9 – hollow trees recorded	Vegetation integrity score 35.6

White Box Yellow Box Blakey's Red Gum Grassy Woodland and Derived Native Grassland[1]	PCT 266		PCT 276		PCT 277				PCT 347	
	Moderate	Poor	Moderate	Poor	Moderate	Poor	Low	Planted	Moderate	Poor
Paragraph 11: Disturbed remnants are still considered to form part of the community including remnants where the vegetation, either understorey, overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact.	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Heavily grazed - unlikely to respond to assisted natural regeneration
Outcome	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**	**Meets listing**

5.7.3 Summary of threatened ecological communities

Table 5.24 provides a summary of the threatened ecological communities listed under the BC Act recorded and the extent and condition within the subject land. These are mapped in Figure 5.5.

Table 5.24 BC Act listed Threatened Ecological Communities recorded

Threatened ecological community	BC Act	Associated PCT within the subject land	Condition	Extent with subject land (ha)
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	E	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good	1
			Moderate	12.77
			Poor	8.60
			Low	1.65
		PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate	1.35
			Poor	4.96
Total area of Inland Grey Box Woodland				**30.33**
White Box Yellow Box Blakely's Red Gum Woodland	CE	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate	2.88
			Poor	4.77
			Low	6.55
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate	0.87
			Poor	0.62
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate	11.70
			Poor	2.23
			Low	6.23
			Planted	2.70
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate	0.14
			Poor	0.29
Total area of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland				**38.98**
Total area of all TECs listed under the BC Act				**69.31**

6 Threatened species

This chapter assesses the habitat suitability for threatened species in accordance with Chapter 5 of the BAM and has been prepared in accordance with the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020b).

Methods for threatened species survey and assessment are outlined in section 3.4.

6.1 Habitat suitability for ecosystem credit species

Ecosystem credit species are those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. Ecosystem credit threatened species have been assessed in conjunction with information about site context (Section 1 of the BAM), PCTs and vegetation integrity attributes (Chapter 4 of the BAM), and data from the NSW Threatened Biodiversity Data Collection (TBDC) (Department of Planning industry and Environment 2021c).

Ecosystem credit threatened species were assessed using information about site context, PCTs and vegetation integrity attributes collected during the field surveys, and data from the Threatened Biodiversity Data Collection (Department of Planning industry and Environment 2021c) as required by subsections 5.2.1 and 5.2.2 of the BAM and Part 3 of the BAM 2020 Operational Manual – Stage 1(Department of Planning Industry and Environment 2020b).

Initial desktop assessment to determine ecosystem (predicted) and species (candidate) credit species involved entering the identified vegetation types and zones into BAM-C. This allowed predicted and candidate species reports to be generated.

6.1.1 Predicted ecosystem credit species generated from BAM-C

A preliminary list of 41 predicted ecosystem credit species was generated from the BAM-C based on associated vegetation types. This predicted ecosystem credit species list is presented in Appendix J.

Ten of these predicted ecosystem credit species were recorded during the survey and are listed in Table 6.1.

Table 6.1 Threatened ecosystem species recorded

Scientific name	Common name	BC Act[1]	EPBC Act[1]	Credit type
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V		Ecosystem credit species
Climacteris picumnus victoriae	Brown Treecreeper	V	–	Ecosystem credit species
Circus assimilis	Spotted Harrier	V		Ecosystem credit species
Falco subniger	Black Falcon	V	–	Ecosystem credit species
Hieraaetus morphnoides	Little Eagle	V	–	Species credit species (breeding)/Ecosystem
Lophoictinia isura	Square-tailed Kite	V		Species credit species (breeding)/Ecosystem
Petroica phoenicea	Flame Robin	V	–	Ecosystem credit species
Polytelis swainsonii	Superb Parrot	V	V	Species credit species (breeding)/Ecosystem
Pomatostomus temporalis temporalis	Grey-Crowned Babbler	V	–	Ecosystem credit species
Stagonopleura guttata	Diamond Firetail	V	–	Ecosystem credit species

(1) V= Vulnerable

6.1.2 Justification for inclusion of any additional predicted ecosystem credit species

Two additional ecosystem credit species have been included in addition to the BAM-C predicted species list.

Table 6.2 Threatened ecosystem species recorded and manually added to BAM-C

Scientific name	Common name	BC Act[1]	EPBC Act[1]	Justification
Epthianura albifrons	White-fronted Chat	V	–	Recorded
Falco hypoleucos	Grey Falcon	E	V	Predicted to occur in PCT76 of lower slopes IBRA subregion.

(1) V= Vulnerable; E= Endangered

6.1.3 Justification of any exclusion of any predicted ecosystem credit species

No ecosystem credit species were excluded from the BAM-C predicted species list.

6.2 Habitat suitability for species credit species

Species credit species are threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits. Species credit species are those species for which the likelihood of occurrence, or elements of suitable habitat, cannot be confidently predicted by vegetation surrogates or landscape features (see section 3.4.2). Species credit species have been assessed in conjunction with information collected about the site context of the development site (Chapter 3 of the BAM), on PCTs and vegetation integrity attributes in (Chapter 4 of the BAM), and data obtained from the Threatened Biodiversity Data Collection (TBDC) (Department of Planning industry and Environment 2021c).

In accordance with Part 3 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020b), further assessment of candidate species credit species (Step 3) includes assessing microhabitats and targeted surveys to determine if a species is absent, or if present, whether a species and/or its habitats are degraded to the point that the species is unlikely to utilise the subject land (or specific vegetation zones).

Details of threatened species surveys methods employed for this report are presented in Chapter 3. Results of targeted surveys are presented in section 6.2 and 6.3 below.

6.2.1 Threatened flora species

Results of the threatened species database searches identified 21 threatened plant species listed under the BC Act as being known to occur or considered likely to occur within the subject land (Appendix C). This included the list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1).

6.2.1.1 Candidate threatened flora species credit species generated from BAM-C

A preliminary list of candidate threatened flora species was generated from the BAM-C based on associated vegetation types for each IBRA subregion. This preliminary candidate threatened flora species list is presented in Table 6.3.

Table 6.3 List of preliminary BAM-C candidate threatened flora species credit species

Scientific name	Common name	BC Act[1]	EPBC Act[1]	Habitat / geographic features	Associated PCTs
Acacia ausfeldii	Ausfeld's Wattle	V	–	–	PCT 266; PCT 277 & PCT 276
Ammobium craspedioides	Yass Daisy	V	V	–	PCT 266; PCT 277; PCT 276
Austrostipa wakoolica	A spear-grass	E	E	south of Narrandera	PCT 76 and PCT 80
Caladenia arenaria	Sand-hill Spider Orchid	E SAII	E	west of Lockhart and north of Rand	PCT 76
Caladenia concolor	Crimson Spider Orchid	E SAII	V	–	PCT 347
Cullen parvum	Small Scurf-pea	E	–	–	PCT 347, PCT 277, PCT 79
Diuris tricolor	Pine Donkey Orchid	V	–	–	PCT 76, PCT 80, PCT 347
Euphrasia arguta	Euphrasia arguta	CE SAII	CE	–	PCT 266, PCT 276
Grevillea wilkinsonii	Tumut Grevillea	CE SAII	E	Eastern part of sub-region from 10km west of the Hume Highway and north of the Snowy Mountains Highway	PCT 266
Indigofera efoliata	Leafless Indigo	E SAII	E	–	PCT 76
Leucochrysum albicans var. tricolor	Hoary Sunray	E	E	–	PCT 347
Prasophyllum petilum	Tarengo Leek Orchid	E	E	–	PCT 347, PCT 277, PCT 276
Prasophyllum sp. *Wybong*	Prasophyllum Wybong	– SAII	CE	–	PCT 266, PCT 276
Pultenaea humilis	Dwarf Bush-pea	V	–	–	PCT 347
Senecio garlandii	Woolly Ragwort	V	–	–	PCT 347
Swainsona murrayana	Slender Darling Pea	V	V	Western half of sub-CMA	PCT 76, PCT 80
Swainsona recta	Small Purple-pea	E	E	–	PCT 277, PCT 76; PCT 266; PCT 276
Swainsona sericea	Silky Swainson-pea	V	V	–	PCT 76
Tylophora linearis	*Tylophora linearis*	V	E	–	PCT 347

(1) Threat status: V = Vulnerable, E = Endangered, CE = Critically Endangered.

6.2.1.2 Justification for inclusion of any additional threatened flora species credit species

Two candidate threatened flora species were included in addition to the BAM-C preliminary candidate list (Table 6.4).

Table 6.4 List of additional threatened flora species credit species included in BAM-C

Common name	Species	BC Act[1]	EPBC Act[1]	Habitat requirements/ geographic restrictions[3]	Justification for inclusion
Eleocharis obicis	Spike-rush	V	V	Periodically waterlogged sites (including table drains and farm dams)	Associated habitat was recorded within the subject land within the lower slopes IBRA subregion (PCT 76).
Lepidium aschersonii	Spiny Peppercress	V	V		Associated habitat was recorded within the subject land within the lower slopes IBRA subregion (PCT 76).

(1) V= Vulnerable

6.2.1.3 Justification for exclusion of any additional threatened flora species credit species

No candidate threatened flora species were excluded from BAM-C preliminary candidate list.

6.2.2 Threatened fauna species

Results of the threatened species database searches identified 59 threatened fauna species listed under the BC Act as being known to occur or considered likely to occur within the subject land. This included the list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1). Threatened fauna species are presented in Figure 6.2.

6.2.2.1 Candidate threatened fauna species credit species generated from BAM-C

A preliminary list of candidate threatened fauna species was generated from the BAM-C based on associated vegetation types and is summarised in Table 6.5.

Table 6.5 List of preliminary BAM-C candidate threatened fauna species credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements/geographic restrictions[3]
Amphibians				
Sloane's Froglet	*Crinia sloanei*	V	–	Semi-permanent/ephemeral wet areas/containing relatively shallow sections with submergent and emergent vegetation, or within 500m of wet area/within 500m of swamps/within 500m of waterbody
Booroolong Frog	*Litoria booroolongensis*	E	V	–
Southern Bell Frog	*Litoria raniformis*	E	V	–

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements/geographic restrictions[3]
Birds				
Barking Owl	*Ninox connivens*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter and greater than 4m above the ground.
Black-breasted Buzzard	*Hamirostra melanosternon*	V	–	–
Bush Stone-curlew	*Burhinus grallarius*	E1	–	Fallen/standing dead timber including logs
Common Sandpiper	*Actitis hypoleucos*	–	M	–
Curlew Sandpiper	*Calidris ferruginea*	E1	CE; M	–
Eastern Curlew	*Numenius madagascariensis*	–	CE; M;	–
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	E	Hollow bearing trees; Eucalypt tree species with hollows greater than 9cm diameter
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	V	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. Presence of Allocasuarina and casuarina species
Little Eagle	*Hieraaetus morphnoides*	V	–	Nest trees – live (occasionally dead) large old trees within vegetation.
Major Mitchell's Cockatoo	*Callocephalon fimbriatum*	V	–	Hollow bearing trees; Living or dead tree with hollows greater than 10cm diameter
Masked Owl	*Tyto novaehollandiae*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.
Powerful Owl	*Ninox strenua*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	As per mapped areas
Square-tailed Kite	*Lophoictinia isura*	V	–	Nest trees: The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. It will be difficult to identify a Kite nest (there are lots of comparable sized stick nests built by other species), especially given Kites have large territories and other stick nesters will undoubtedly also be nesting where Kites might be recorded. Kites will need be in attendance to confirm breeding sites.
Superb Parrot	*Polytelis swainsonii*	V	V	Hollow bearing trees: 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.
Swift Parrot	*Lathamus discolor*	E1	CE	As per mapped areas
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	Ma	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements/geographic restrictions[3]
Mammals				
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	–	–
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines
Eastern Pygmy-possum	*Cercartetus nanus*	V	–	–
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Breeding camps
Koala	*Phascolarctos cinereus*	E	E	Other Presence of koala use trees - refer to Survey Comments field in TBDC
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Cliffs within 2km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels
Southern Myotis	*Myotis macropus*	V	–	Hollow bearing trees / Within 200m of riparian zone / Bridges, caves or artificial structures such as culverts within 200m of riparian zone
Squirrel Glider	*Petaurus norfolcensis*	V, EP	–	–
Reptiles				
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Rocky areas or within 50m of rocky areas
Striped Legless Lizard	*Delma impar*	V	V	–
Invertebrates				
Golden Sun Moth	*Synemon plana*	E	V	Wallaby grass (Rytidosperma sp), Chilean needlegrass (Nassella neesiana) or Serrated Tussock (Nassella trichotoma)
Key's Matchstick Grasshopper	*Keyacris scurra*	E	–	–

(1) V = Vulnerable, E = Endangered , EP=Endangered population as listed under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the EPBC Act

(3) Habitat requirements and geographic requirements were obtained from the BAM Credit Calculator (BCC)

6.2.2.2 Justification for inclusion of any additional threatened fauna species credit species

No candidate threatened fauna species were included in addition to the BAM-C preliminary candidate list.

6.2.2.3 Justification for exclusion of any additional threatened fauna species credit species

Justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) and exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) is provided in Appendix C.

One candidate threatened fauna species credit species was identified to be excluded to the BAM-C preliminary candidate species credit list (Table 6.6).

Table 6.6 Candidate threatened fauna species credit species excluded

Common name	Species	BC Act[1]	EPBC Act[2]	Habitat requirements/ geographic restrictions[3]	Justification for exclusion
Squirrel Glider	*Petaurus norfolcensis*	EP	–	Wagga LGA	Subject land is outside the geographic range of the Wagga LGA endangered population. Although the Endangered Population is excluded from assessment, the Squirrel Glider is also listed as a Vulnerable species and is considered further under its Vulnerable species listing.

Assumed habitats for threatened flora species

- *Ammobium craspedioides*
- *Austrostipa wakoolica*
- *Swainsona murrayana*
- *Caladenia arenaria*
- *Eleocharis obicis*
- *Indigofera efoliata*
- *Lepidium aschersonii*
- *Swainsona sericea*
- *Swainsona recta*

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 1 OF 10

0 0.035 0.07 0.105 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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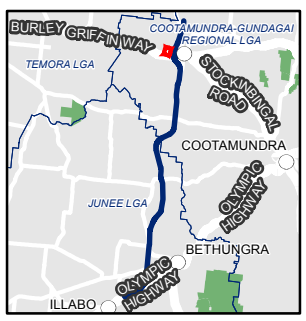
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Land not surveyed



INLAND RAIL ARTC

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Assumed habitats for threatened flora species

37500
37250
37000
36750
36500
36250
36000
35750

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 2 OF 10

0 0.06 0.12 0.18 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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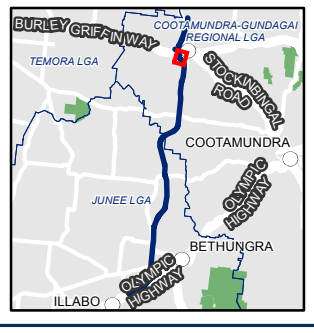
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Land not surveyed



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Assumed habitats for threatened flora species

36000
35750
35500
35250
35000
34750
34500

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 3 OF 10

0 0.06 0.12 0.18 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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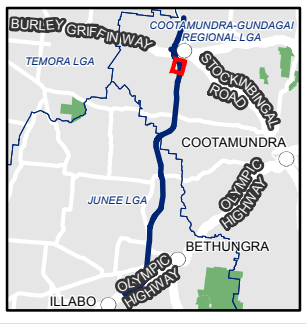
Proposal Site
Cadastral Boundary
Land not surveyed



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Assumed habitats for threatened flora species

34750
34500
34250
34000
33750
33500
33250

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 4 OF 10

0 0.06 0.12 0.18 Kilometers

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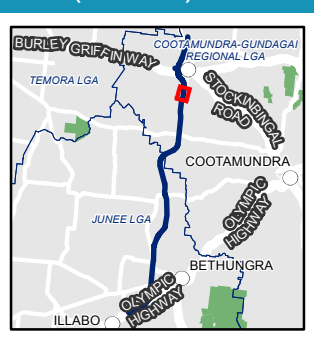
Proposal Site
Cadastral Boundary
Land not surveyed



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Assumed habitats for threatened flora species

- *Ammobium craspedioides*
- *Caladenia concolor*
- *Leucochrysum albicans var. tricolor*
- *Pultenaea humilis*
- *Senecio garlandii*
- *Tylophora linearis*
- *Euphrasia arguta*
- *Grevillea wilkinsonii*
- *Prasophyllum sp. Wybong*
- *Swainsona recta*

22000
21750
21500
21250
21000
20750
20500
20250

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 5 OF 10

0 0.06 0.12 0.18 Kilometers

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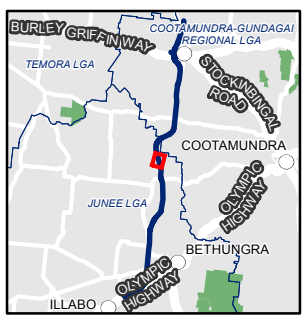
Proposal Site

Cadastral Boundary

Land not surveyed



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Assumed habitats for threatened flora species

- *Ammobium craspedioides*
- *Austrostipa wakoolica*
- *Swainsona murrayana*
- *Caladenia arenaria*
- *Eleocharis obicis*
- *Indigofera efoliata*
- *Lepidium aschersonii*
- *Swainsona sericea*
- *Caladenia concolor*
- *Leucochrysum albicans var. tricolor*
- *Pultenaea humilis*
- *Senecio garlandii*
- *Tylophora linearis*
- *Euphrasia arguta*
- *Grevillea wilkinsonii*
- *Prasophyllum sp. Wybong*
- *Swainsona recta*

20500
20250
20000
19750
19500
19250
19000

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 6 OF 10

0 0.06 0.12 0.18 Kilometers

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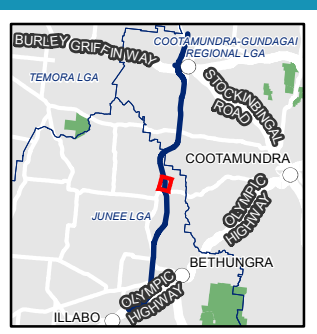
Proposal Site
Cadastral Boundary
Land not surveyed



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Assumed habitats for threatened flora species

- *Ammobium craspedioides*
- *Austrostipa wakoolica*
- *Swainsona murrayana*
- *Caladenia arenaria*
- *Eleocharis obicis*
- *Indigofera efoliata*
- *Lepidium aschersonii*
- *Swainsona sericea*
- *Euphrasia arguta*
- *Grevillea wilkinsonii*
- *Prasophyllum sp. Wybong*
- *Swainsona recta*

19000
18750
18500
18250
18000
17750
17500

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 7 OF 10

0 0.06 0.12 0.18 Kilometers

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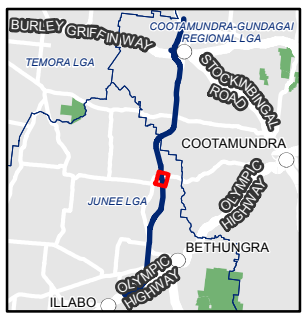
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Land not surveyed



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Assumed habitats for threatened flora species

- *Ammobium craspedioides*
- *Austrostipa wakoolica*
- *Swainsona murrayana*
- *Caladenia arenaria*
- *Eleocharis obicis*
- *Indigofera efoliata*
- *Lepidium aschersonii*
- *Swainsona sericea*
- *Euphrasia arguta*
- *Grevillea wilkinsonii*
- *Prasophyllum sp. Wybong*
- *Swainsona recta*

17500
17250
17000
16750
16500
16250
16000

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 8 OF 10

0 0.06 0.12 0.18 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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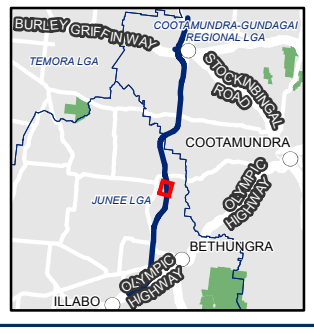
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Land not surveyed



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Assumed habitats for threatened flora species

- *Austrostipa wakoolica*
- *Swainsona murrayana*

16250

16000

15750

15500

15250

15000

14750

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 9 OF 10

0 0.06 0.12 0.18 Kilometers

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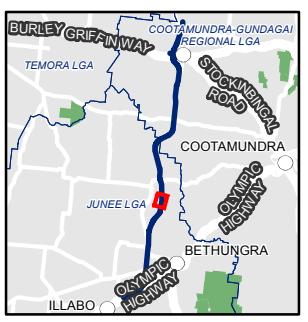
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Land not surveyed



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Assumed habitats for threatened flora species

15250

15000

14750

14500

14250

14000

13750

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 1 of 2) Threatened flora species (BC Act)

MAP 10 OF 10

0 0.06 0.12 0.18 Kilometers

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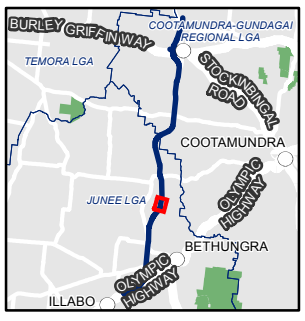
Proposal Site

Cadastral Boundary

Land not surveyed



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Assumed habitats for threatened flora species

- *Acacia ausfeldii*
- *Cullen parvum*
- *Diuris tricolor*
- *Prasophyllum petilum*

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 1 OF 10

0 0.035 0.07 0.105 Kilometers

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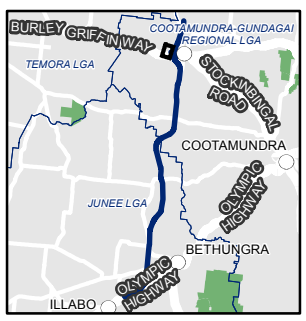
Proposal Site

Cadastral Boundary

Land not surveyed



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Assumed habitats for threatened flora species

37500
37250
37000
36750
36500
36250
36000
35750

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 2 OF 10

0 0.06 0.12 0.18 Kilometers

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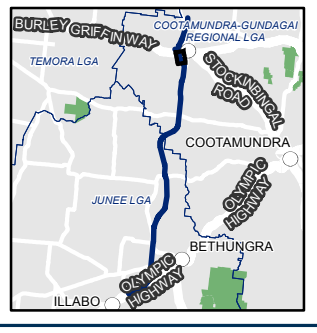
Cadastral Boundary
Land not surveyed



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Assumed habitats for threatened flora species

36000
35750
35500
35250
35000
34750
34500

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 3 OF 10

0 0.06 0.12 0.18 Kilometers

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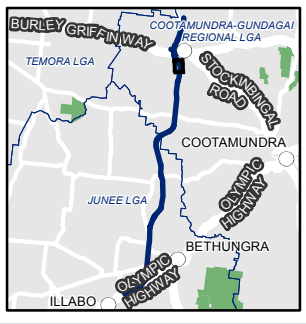
Cadastral Boundary
Land not surveyed



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Assumed habitats for threatened flora species

34750

34500

34250

34000

33750

33500

33250

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 4 OF 10

0 0.06 0.12 0.18 Kilometers

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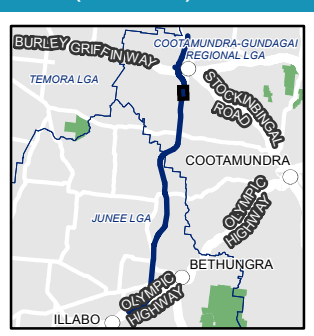
Proposal Site

Cadastral Boundary

Land not surveyed



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Assumed habitats for threatened flora species

- *Acacia ausfeldii*
- *Cullen parvum*
- *Diuris tricolor*
- *Prasophyllum petilum*

22000
21750
21500
21250
21000
20750
20500
20250

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 5 OF 10

0 0.06 0.12 0.18 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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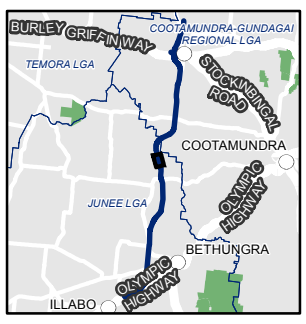
Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:5,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Land not surveyed



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Assumed habitats for threatened flora species

- *Acacia ausfeldii*
- *Cullen parvum*
- *Diuris tricolor*
- *Prasophyllum petilum*

20500
20250
20000
19750
19500
19250
19000

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 6 OF 10

0 0.06 0.12 0.18 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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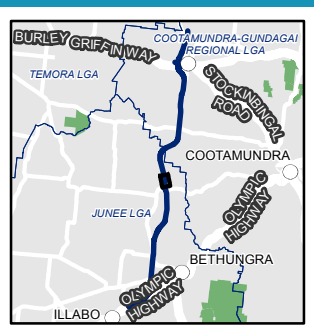
4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Land not surveyed



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Assumed habitats for threatened flora species

- *Acacia ausfeldii*
- *Cullen parvum*
- *Diuris tricolor*
- *Prasophyllum petilum*

19000
18750
18500
18250
18000
17750
17500

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 7 OF 10

0 0.06 0.12 0.18 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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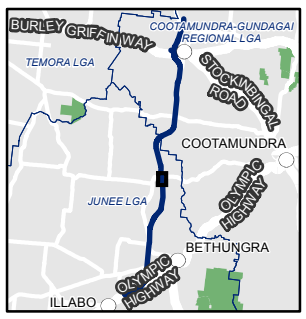
4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Land not surveyed



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Assumed habitats for threatened flora species

- *Acacia ausfeldii*
- *Diuris tricolor*

17500
17250
17000
16750
16500
16250
16000

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 8 OF 10

0 0.06 0.12 0.18 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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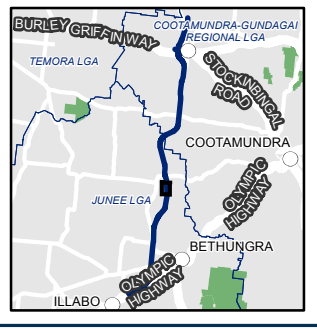
4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Land not surveyed



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Assumed habitats for threatened flora species

- *Diuris tricolor*

16250

16000

15750

15500

15250

15000

14750

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 9 OF 10

0 0.06 0.12 0.18 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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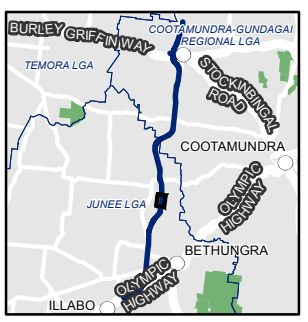
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Land not surveyed



INLAND RAIL

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Assumed habitats for threatened flora species

- *Cullen parvum*

15250

15000

14750

14500

14250

14000

13750

ILLABO TO STOCKINBINGAL Figure 6.1 (map series 2 of 2) Threatened flora species (BC Act)

MAP 10 OF 10

0 0.06 0.12 0.18 Kilometers

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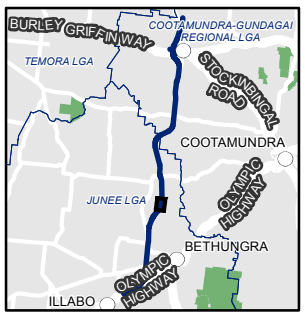
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Land not surveyed



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Threatened Fauna Species locations – BC Act

Superb Parrot

42250
42000
41750
41500
41250
41000
40750
40500
40250
40000
BLAND CREEK

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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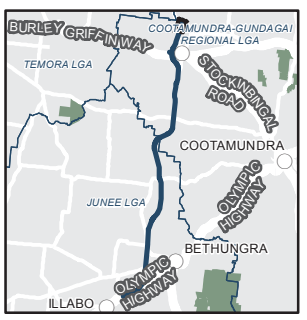
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Squirrel Glider habitat
Major Watercourse
Minor Watercourse



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Threatened Fauna Species locations – BC Act

- Grey-crowned Babbler
- Little Eagle
- Square-tailed Kite
- Superb Parrot
- Hollow bearing trees

40250
40000
39750
39500
39250
39000
38750
38500
38250
38000
37750
37500
37250
37000
36750

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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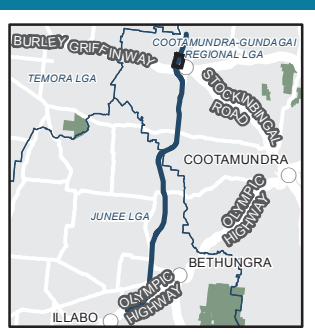
Date: 14/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- 4098 Chainage (distance in metres from southern limit of the proposal)
- Proposal Site
- Land not surveyed
- Cadastral Boundary
- Large-footed Myotis habitat
- Squirrel Glider habitat
- Superb Parrot breeding habitat
- Minor Watercourse



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Threatened Fauna Species locations – BC Act

37000
36750
36500
36250
36000
35750
35500
35250
35000
34750
34500
34250
34000
33750

BLAND CREEK

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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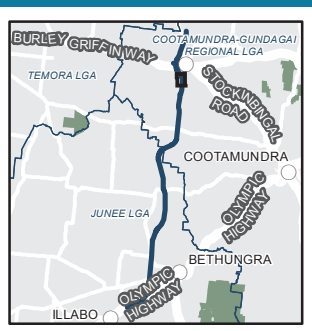
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Land not surveyed
Cadastral Boundary
Squirrel Glider habitat
Superb Parrot breeding habitat
Major Watercourse
Minor Watercourse



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Threatened Fauna Species locations – BC Act

- Spotted Harrier
- Spotted Harrier - Nest (Confirmed)
- Superb Parrot

33750
33500
33250
33000
32750
32500
32250
32000
31750
31500
31250
31000
30750
30500

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

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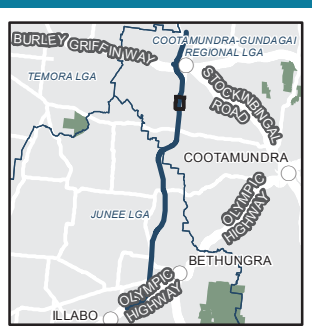
- 4098 Chainage (distance in metres from southern limit of the proposal)
- Proposal Site
- Land not surveyed
- Cadastral Boundary
- Squirrel Glider habitat
- Superb Parrot breeding habitat
- Minor Watercourse



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Threatened Fauna Species locations – BC Act

- Superb Parrot
- White-fronted Chat
- Hollow bearing trees

30500
30250
30000
29750
29500
29250
29000
28750
28500
28250
28000
27750
27500
27250

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

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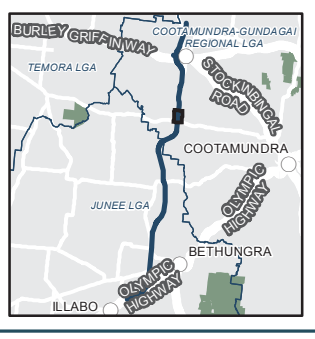
4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Superb Parrot breeding habitat
Minor Watercourse



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Threatened Fauna Species locations – BC Act

- Superb Parrot
- Hollow bearing trees

27750
27500
27250
27000
26750
26500
26250
26000
25750
25500
25250
25000
24750
24500
24250

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

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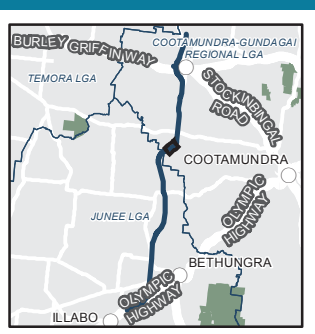
Proposal Site
Cadastral Boundary
Squirrel Glider habitat
Superb Parrot breeding habitat
Minor Watercourse



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Threatened Fauna Species locations – BC Act

Superb Parrot

25000
24750
24500
24250
24000
23750
23500
23250
23000
22750
22500
22250
22000
21750
21500
21250
21000
20750

IRONBONG CREEK

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

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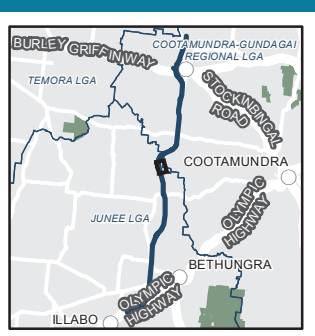
4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Land not surveyed
Cadastral Boundary
Squirrel Glider habitat
Superb Parrot breeding habitat
Minor Watercourse



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Threatened Fauna Species locations – BC Act

- Black Falcon
- Grey-crowned Babbler
- Superb Parrot
- Hollow bearing trees

21000
20750
20500
20250
20000
19750
19500
19250
19000
18750
18500
18250
18000
17750

IRONBONG CREEK

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 14/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- 4098 Chainage (distance in metres from southern limit of the proposal)
- Proposal Site
- Land not surveyed
- Cadastral Boundary
- Large-footed Myotis habitat
- Squirrel Glider habitat
- Superb Parrot breeding habitat
- Minor Watercourse

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Threatened Fauna Species locations – BC Act

17750
17500
17250
17000
16750
16500
16250
16000
15750
15500
15250
15000
14750
14500

IRONBONG CREEK

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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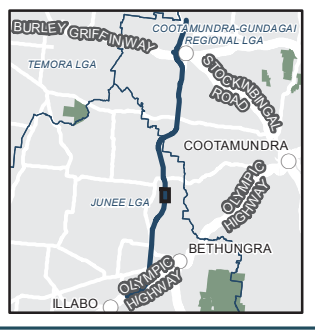
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Land not surveyed
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot breeding habitat
Minor Watercourse



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Threatened Fauna Species locations – BC Act

- Spotted Harrier
- Squirrel Glider
- Superb Parrot
- Hollow bearing trees

IRONBONG CREEK

14750
14500
14250
14000
13750
13500
13250
13000
12750
12500
12250
12000
11750
11500

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

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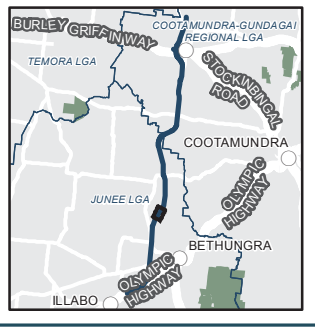
- Proposal Site
- Land not surveyed
- Cadastral Boundary
- Large-footed Myotis habitat
- Squirrel Glider habitat
- Superb Parrot breeding habitat
- Minor Watercourse



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Threatened Fauna Species locations – BC Act

- Brown Treecreeper
- Little Eagle
- Superb Parrot
- Hollow bearing trees

11500
11250
11000
10750
10500
10250
10000
9750
9500
9250
9000
8750
8500
8250

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

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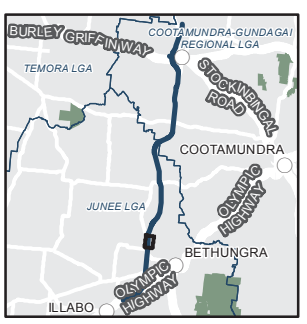
4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot breeding habitat
Minor Watercourse



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Threatened Fauna Species locations – BC Act

- Brown Treecreeper
- Little Eagle
- Squirrel Glider
- Superb Parrot
- Hollow bearing trees

8250
7750
7500
7250
7000
6750
6500
6250
6000
5750
5500
5250
5000

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

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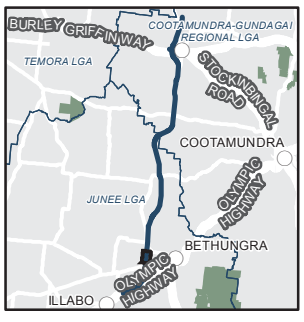
4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot breeding habitat
Minor Watercourse



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Threatened Fauna Species locations – BC Act

- Dusky Woodswallow
- Superb Parrot
- Hollow bearing trees

5250
5000
4750
4500
4250
4000
3750
3500
3250
3000
2750
2500
2250
2000
1750

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

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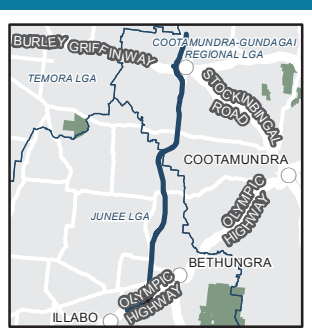
4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot breeding habitat
Little Eagle breading habitat
Major Watercourse



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Threatened Fauna Species locations – BC Act

- Brown Treecreeper
- Dusky Woodswallow
- Little Eagle
- Little Eagle - Nest (Confirmed)
- Squirrel Glider
- Superb Parrot
- Superb Parrot - Nesting
- Hollow bearing trees

2000
1750
1500
1250
1000
750
500
250
0

BILLABONG CREEK

ILLABO TO STOCKINBINGAL Figure 6.2 Threatened fauna species (BC Act)

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

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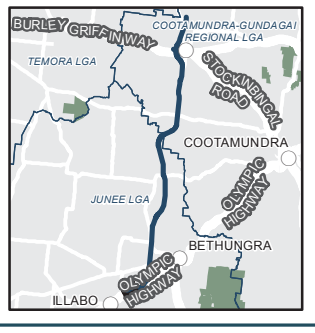
- Proposal Site
- Cadastral Boundary
- Large-footed Myotis habitat
- Squirrel Glider habitat
- Superb Parrot breeding habitat
- Little Eagle breading habitat
- Little Eagle nest 300m buffer
- Major Watercourse
- Minor Watercourse



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6.3 Species credit species survey results

In accordance with Part 3 section 4.4.4 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020b) , determine the presence of candidate species credit species (Step 4) includes the methods undertaken to determine if a species is absent, or if present, whether a species and/or its habitats are degraded to the point that the species is unlikely to utilise the subject site (or specific vegetation zones).

6.3.1 Determining the presence of flora species credit species

Targeted surveys were undertaken for candidate threatened flora species as outlined in section 3.4.3. Results and outcome of targeted candidate threatened flora species surveys undertaken for this report are presented in Table 6.7. Not all areas of the subject land were able to be accessed for targeted flora surveys. In these areas a precautionary approach was taken and species were assumed to be present if associated PCTs were mapped in those areas.

Table 6.7 Candidate threatened flora species assessment and determination of affected species listed under the BC Act

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Candidate species affected by of proposal?	
				Surveyed areas	Unsurveyed areas
Acacia ausfeldii	Ausfeld's Wattle	V	Associated species include *Eucalyptus albens, E. blakelyi* and *Callitris spp.,* with an understorey dominated by *Cassinia spp.* and grasses. No habitat constraints identified Vegetation types: PCT 266, PCT 276 & PCT 277	**No** – habitat suitability not present and no granite ridge areas occur. Targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW is from the Mudgee/Gulgong region in the Central Tablelands. A small population of *Acacia verniciflua* (Varnish Wattle) was recorded in the southern portion of the subject land. This was the only *Acacia* species to closely resemble Ausfeld's Wattle in both phyllode shape and viscosity of branchlets. Samples were collected and forwarded to the NSW National Herbarium although none were identified as *Acacia ausfeldii.*	Yes (assumed present in unsurveyed areas)
Ammobium craspedioides	Yass Daisy	V	Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. No habitat constraints identified Vegetation types: PCT 266, PCT 277 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. There are no records of this species in the locality with the closest record being historic (1825) to the west of Gundagai adjacent to Nungas Road. Most records of this species occur east of a line from near Crookwell in the north to Gundagai in the south with an outlier population about 30km to the south of Wagga Wagga in Livingstone National Park.	Yes (assumed present in unsurveyed areas)
Austrostipa wakoolica	A spear-grass	E	Floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils. Habitat constraint: Alluvial plains and plains Vegetation types: PCT 76 & PCT 80	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends from the Central West where this species has a stronghold to scattered records in the Riverina region. The nearest known occurrence of *Austrostipa wakoolica* is from a single record (1992) near Ardlethan and is located approximately 90km to the west of subject land.	Yes (assumed present in unsurveyed areas)

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Candidate species affected by of proposal?	
				Surveyed areas	Unsurveyed areas
Caladenia arenaria	Sand-hill Spider Orchid	E	Woodland with sandy soil, especially that dominated by *Callitris glaucophylla* (White Cypress Pine). No habitat constraints identified Vegetation types; PCT 76 & PCT 80	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The surveys focused on vegetation patches with intact understorey (PCT 76 Good & Moderate and PCT 80 Moderate). The nearest known occurrence of this species is from a single record (1990) to the east of the Bethungra Range near Frampton.	Yes (assumed present in unsurveyed areas)
Caladenia concolor	Crimson Spider Orchid	E	Known habitat is regrowth woodland on granite ridge country that has retained a high diversity of plant species, including other orchids. No habitat constraints identified Vegetation type: PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known records of this species to the subject land is to the east of the Bethrungra range in Ulandra Nature Reserve. The subject land is wholly located to the west of the Bethungra Range.	Yes (assumed present in unsurveyed areas)
Cullen parvum	Small Scurf-pea	E	Found in grassland, River Red Gum Woodland or Box-Gum Woodland, sometimes on grazed land and along watercourses. No habitat constraints identified Vegetation type: PCT 79, PCT 276, PCT 277 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The surveys focused on vegetation patches with intact understorey and/or grazed areas (PCT 79 Good & Moderate, PCT 276 Moderate, PCT 277 Moderate and PCT 347 Moderate). *Cullen parvum* (Small Scurf-pea) has a strong hold in suitable habitat to the north of Adelaide and Melbourne with scattered records between Albury and Young. The closest known records of this species are historic (1886) and located near Wagga Wagga with a more recent record (2011) being near Galgong 45km to the north-east.	Yes (assumed present in unsurveyed areas)

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Candidate species affected by of proposal?	
				Surveyed areas	Unsurveyed areas
Diuris tricolor	Pine Donkey Orchid	V	Sclerophyll forest among grass, often with native Cypress Pine (Callitris spp.). It is found in sandy soils, either on flats or small rises. No habitat constraints identified Vegetation types: PCT 76, PCT 80 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The survey focused on associated vegetation in Good and Moderate condition. The closest known records of this species to the subject land is 7km east of Stockinbingal (recorded in 2000) and a population near Coolamon (2011), 50km to the west of the subject land. A reference population along Cootamundra-Stockinbingal Road was recorded in flower during the survey period. This confirmed that any local population of *Diuris tricolor* (Pine Donkey Orchid) within the subject land was likely to be in flower.	Yes (assumed present in unsurveyed areas)
Eleocharis obicis	Spike-rush	V	Periodically waterlogged sites (including table drains and farm dams). Vegetation types: PCT 276, PCT 76	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. Known records are located to west of Condoblin and north of Hay.	Yes (assumed present in unsurveyed areas)
Euphrasia arguta	Euphrasia arguta	CE	Known to occur in eucalypt forest with a mixed grass and shrub understorey. No habitat constraints identified Vegetation type: PCT 266 & PCT 276	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known records of this species to the subject land is historic (1887) and located 10km to the west near Cootamundra with a more recent record (2014) located 40km to the South of the subject land near Tarcutta. *Euphrasia* species generally have poor seed dispersal capabilities usually within 20–30cm of the parent plant (Murphy & Downe, 2006).	Yes (assumed present in unsurveyed areas)

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Candidate species affected by of proposal?	
				Surveyed areas	Unsurveyed areas
Grevillea wilkinsonii	Tumut Grevillea	CE	Vegetation type: PCT 266	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The species is a large spreading shrub and is not cryptic. If present, it would have also been observable during other flora surveys outside the specified survey months. The Tumut Grevillea has a highly restricted distribution in the NSW South-west Slopes region. Its main occurrence is along a 6 km stretch of the Goobarragandra River approximately 20km east of Tumut where about 1,000 plants are known. The other occurrence is a small population that straddles the boundary of two private properties at Gundagai (Department of Agriculture Water and the Environment 2021e)Department of Planning Industry and Environment 2021).	Yes (assumed present in unsurveyed areas)
Indigofera efoliata	Leafless Indigo	E	Known to grow on slight rises amongst ironstone formation in stony red-brown sandy loam. No habitat constraints identified Vegetation type: PCT 76	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends between the Central West and Central Tablelands region. The closest known record of this species to the subject land is historic (1883) and is located approximately 200km to the north-east near Kerrs Creek. All other records are more than 250km from the subject land.	Yes (assumed present in unsurveyed areas)
Lepidium aschersonii	Spiny Peppercress	V		**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The species is known to occur on ridges of gilgai clays dominated by Brigalow (*Acacia harpophylla*), Belah (*Casuarina cristata*), Buloke (*Allocasuarina luehmanii*) and Grey Box (*Eucalyptus microcarpa*). In its southern distribution near West Wylong the species has been recorded growing in Bull Mallee (*Eucalyptus behriana*). These specific habitat features were not recorded within the subject land.	Yes (assumed present in unsurveyed areas)
Leucochrysum albicans var. tricolor	Hoary Sunray	E	E	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. A reference population on edge of Hume Highway to the north of the subject land was inspected during the survey period. This confirmed that if present within the subject land the species was likely to be detected.	Yes (assumed present in unsurveyed areas)

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Candidate species affected by of proposal?	
				Surveyed areas	Unsurveyed areas
Prasophyllum petilum	Tarengo Leek Orchid	E	Grows in open sites within Natural Temperate Grassland No habitat constraints identified Vegetation type: PCT 276 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends between the South-East, Central Tablelands and Hunter regions. The closest known records to the subject land are located near Boorowa (1995–2016), approximately 75km to the east.	Yes (assumed present in unsurveyed areas)
Pultenaea humilis	Dwarf Bush-pea	V	Found in isolated remnants of native woodland and forest communities that occur in extensively cleared agricultural landscapes. No habitat constraints identified Vegetation type: PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution for this species is centred in Victoria with scattered records in NSW predominately to the south-east of Wagga-Wagga. The closest known record of this species to the subject land is near Tumut (2002), approximately 70km to the south-east.	Yes (assumed present in unsurveyed areas)
Senecio garlandii	Woolly Ragwort	V	Known to occur on sheltered slopes of rocky outcrops. No habitat constraints identified Vegetation type: PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW is between Wagga Wagga and Albury. The closest known records of this species to the subject land are historic with one record in Ulandra Nature Reserve (1999) which is approximately 15km to the east and several records near Temora (1975–1999), located 30km north-west of the subject land. Senecio species rely on primarily on wind for seed dispersal. Given the proximity of known records to the subject land, it is considered unlikely that *Senecio garlandii* (Woolly Ragwort) would disperse to suitable habitat within the subject land.	Yes (assumed present in unsurveyed areas)

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Candidate species affected by of proposal?	
				Surveyed areas	Unsurveyed areas
Swainsona murrayana	Slender Darling Pea	V	Grows in a variety of vegetation types including grasslands or grassy woodlands that have been intermittently grazed or cultivated. Vegetation type: PCT 76 & PCT 80	**No –** targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known record to the subject land is historic (2001) and is located near Morangarell, approximately 40km to the north-west. During field surveys, a general lack of forb species was observed within the subject land. No *Swainsona* species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat.	Yes (assumed present in unsurveyed areas)
Swainsona recta	Small Purple Pea	E	Known to occur in the grassy understorey of woodlands and open-forests No habitat constraints identified Vegetation type: PCT 76, PCT 80, PCT 266, PCT 276 & PCT 277	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known record to the subject land is historic (1990) and is located near Wagga Wagga, approximately 50km to the south-west. A more recent record (2000) is located near Mandurama, approximately 130km to the north-east. During field surveys, a general lack on forb species was observed within the subject land. No *Swainsona* species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. A reference population in Mudgee was recorded in flower during the survey period. This confirmed that if present within the subject land the species was likely to be in flower.	Yes (assumed present in unsurveyed areas)

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Candidate species affected by of proposal?	
				Surveyed areas	Unsurveyed areas
Swainsona sericea	Silky Swainson-pea	V	Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. No habitat constraints identified Vegetation type: PCT 277 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. This species has been recorded across NSW with the main distribution between the North West, Central West and Riverina regions. The closest known record of this species is historic (1990) and is located to the west of Gundagai, approximately 40km south-east of the subject land. A more recent record (2005) is located near the Gundagai township. During field surveys, a general lack on forb species was observed within the subject land. No *Swainsona* species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. A reference population off Somerset Road Coolac was recorded in flower during the survey period. This confirmed that if present within the subject land the species was likely to be in flower.	Yes (assumed present in unsurveyed areas)
Tylophora linearis	-	V	Grows in dry scrub and open forest No habitat constraints identified Vegetation type: PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. This species has been recorded across NSW with the main distribution between the North West and Central West regions. The closest known record of this species is historic (1915) and is located near Temora, approximately 30km west of the subject land. A more recent record (2008) is located near the Bribbaree, approximately 45km to the north of the subject land.	Yes (assumed present in unsurveyed areas)

(1) Listed under the BC Act - CE = Critically Endangered, E1= Endangered, E2= Endangered Population, V= Vulnerable

(2) Listed under the EPBC Act - CE = Critically Endangered, E= Endangered, V= Vulnerable

(3) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.

(4) The NSW Herbarium considers *Prasophyllum* sp. Wybong (C. Phelps ORG5269) and *Prasophyllum petilum* to be synonyms (i.e. the same species).

6.3.2 Determining the presence of fauna species credit species

Targeted surveys were undertaken for candidate threatened fauna species as outlined in section 3.4.4. Three fauna species credit species were recorded during the surveys (Superb Parrot, Squirrel Glider and Little Eagle) and a fourth species (Southern Myotis) has been assumed as present despite targeted surveys not recording the species due to the presence of suitable habitat and drought conditions during surveys. A fifth species, being Key's Matchstick Grasshopper, has been assumed where suitable habitat was present although site access was unavailable for targeted surveys. The recorded and assumed species are listed in Table 6.8 described in sections below. Recorded threatened fauna and recorded and assumed candidate credit species polygons are illustrated in Figure 6.2.

Table 6.8 Species credit species

Scientific name	Common name	BC Act[1]	EPBC Act[2]	Recorded/assumed	Credit type
Hieraaetus morphnoides	Little Eagle	V	–	Recorded	Species credit species (breeding)/Ecosystem
Keyacris scurra	Key's Matchstick Grasshopper	E	–	Assumed	Species credit species
Myotis macropus	Southern Myotis	V	–	Assumed	Species credit species
Petaurus norfolcensis	Squirrel Glider	V	–	Recorded	Species credit species
Polytelis swainsonii	Superb Parrot	V	V	Recorded	Species credit species (breeding)/Ecosystem

(1) Listed under the BC Act - CE = Critically Endangered, E1= Endangered, E2= Endangered Population, V= Vulnerable

(2) Listed under the EPBC Act – CE = Critically Endangered, E = Endangered, V = Vulnerable

Results and outcome of targeted candidate threatened fauna species surveys undertaken for this report are presented in Table 6.9.

Table 6.9 Candidate threatened fauna species credit species

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Amphibians					
Crinia sloanei	Sloane's Froglet	V	Semi-permanent/ephemeral wet areas/containing relatively shallow sections with submergent and emergent vegetation, or within 500m of wet area/within 500m of swamps/within 500m of waterbody. Associated PCTs recorded: PCT 79, PCT 76, PCT 80, and PCT 276.	No (surveyed)	No – not recorded during targeted surveys undertaken following rain and during BAM prescribed survey period. This species is generally restricted in distribution to areas south of the proposal with a population strong hold in the Albury district.
Litoria booroolongensis	Booroolong Frog	E	Permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Associated habitat not recorded within the subject land. Dams and ephemeral waterways are present within the subject land, but would not be considered suitable for this species.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Litoria raniformis	Southern Bell Frog	E	Associated habitat not recorded within the subject land. Dams and ephemeral waterways are present within the subject land, but would not be considered suitable for this species.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	As per mapped areas.	No (surveyed)	No- subject land is not identified as 'Important habitat' or a breeding area for the species. A dual credit species, it is still considered as an ecosystem credit species. Potential to occur during seasonal movements and to forage on blossoming eucalypts.
Burhinus grallarius	Bush Stone-curlew	E	Fallen/standing dead timber including logs.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	Hollow bearing trees; Eucalypt tree species with hollows greater than 9cm diameter.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. Presence of Allocasuarina and casuarina species.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. *Casuarina* / *Allocasuarina* species occur at very low densities throughout the subject land.
Hamirostra melanosternon	Black-breasted Buzzard	V	No specific requirements or restrictions identified in BCC.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Hieraaetus morphnoides	Little Eagle	V	Nest trees – live (occasionally dead) large old trees within vegetation. Associated PCTs recorded: PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 309, PCT 347.	Yes (surveyed)	Yes – nesting Little Eagle was recorded in October 2023. A dual credit species, it is also considered as an ecosystem credit species.
Lathamus discolor	Swift Parrot	E1	Hollow bearing trees.	No (surveyed)	No – Not mapped as 'Important habitat' or recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Lophochroa leadbeateri	Major Mitchell's Cockatoo	V	Hollow bearing trees; Living or dead tree with hollows greater than 10cm diameter.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Lophoictinia isura	Square-tailed Kite	V	Nest trees: The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. It will be difficult to identify a Kite nest (there are lots of comparable sized stick nests built by other species), especially given Kites have large territories and other stick nesters will undoubtedly also be nesting where Kites might be recorded. Kites will need be in attendance to confirm breeding sites.	Yes (surveyed)	No – although species recordedduring targeted surveys undertaken during BAM prescribed survey period, no occupied nests have been recorded. A dual credit species, it is still considered as an ecosystem credit species.
Ninox connivens	Barking Owl	V	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter and greater than 4m above the ground.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Ninox strenua	Powerful Owl	V	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Polytelis swainsonii	Superb Parrot	V	Hollow bearing trees: 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. Associated PCTs recorded in good, moderate and poor condition: PCT 79 (in poor and moderate condition), PCT 76 (in poor, moderate and good condition), PCT 80 (in poor and moderate condition), PCT 266 (in poor and moderate condition), PCT 276 (in poor and moderate condition), PCT 277 (in poor and moderate condition) and PCT 347 (in poor and moderate condition).	Yes (surveyed)	**Yes** – recorded. Potential breeding habitat identified and one active nest site was identified in 2023 over 100m outside the proposal site. The subject land provides foraging and breeding habitat for the species. Species polygon includes all areas of associated PCTs containing hollows. Approximately 36 ha of associated PCTs without hollows and the 100 m buffer have been excluded from species breeding habitat.
Tyto novaehollandiae	Masked Owl	V	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Mammals					
Cercartetus nanus	Eastern Pygmy-possum	V	None. No specific requirements or restrictions identified in BCC.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. Habitat structure and foraging resources were lacking in the landscape.
Chalinolobus dwyeri	Large-eared Pied Bat	V	Cliffs within two km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two km of old mines or tunnels.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period and no rocky caves or suitable breeding habitat was observed.

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Chalinolobus picatus	Little Pied Bat	V	None. No specific requirements or restrictions identified in BCC.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Miniopterus orianae oceanensis	Large Bentwing-bat	V	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat with numbers of individuals >500.	No (surveyed)	No – not recorded during targeted surveys or inspection of human made structures. A dual credit species, it is still considered as an ecosystem credit species.
Myotis macropus	Southern Myotis	V	Associated PCTs (PCT 79 and PCT 276) with roosting habitat (hollow bearing trees, bridges, caves or artificial structures) within 200m of riparian zone or waterbodies.	Yes (assumed)	**Yes –** assumed present. Targeted surveys did not record this species, however, based on presence of suitable habitat this species has been included as a species credit species. Potential habitat mapped for associated PCTs within 200m of riparian zone or waterbodies.
Petaurus norfolcensis	Squirrel Glider	V	Associated PCTs recorded: PCT 79 (in poor and moderate condition), PCT 76 (in poor, moderate and good condition), PCT 80 (in poor and moderate condition), PCT 266 (in poor and moderate condition), PCT 276 (in poor and moderate condition), PCT 277 (in poor and moderate condition), and PCT 347 (in poor and moderate condition).	Yes (surveyed)	**Yes** – Targeted surveys undertaken, species recorded within remnant vegetation foraging in canopy trees. Associated PCTs not in derived grassland conditions have been mapped as species polygon. Areas of associated PCTs isolated from adjoining or connected patches of vegetation by more than 70m have been excluded from species polygon.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period and lack of suitable habitat occurs.
Phascogale tapoatafa	Brush-tailed Phascogale	V	None. No specific requirements or restrictions identified in BCC.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. Habitat within the subject land is highly fragmented and lacks connectivity and is considered highly unlikely to support a breeding population of this species.
Phascolarctos cinereus	Koala	E	Areas identified via survey as important habitat –Important' habitat is defined by the density of koalas and quality of abitat determined by on-site survey.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Pteropus poliocephalus	Grey-headed Flying-fox	V	Breeding camps	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. No breeding camps occur within the subject land. A dual credit species, it is still considered as an ecosystem credit species.
Reptiles					
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	Rocky areas or within 50m of rocky areas	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. Marginal habitat (rocky outcrops, scattered rocks) were recorded within the subject land. However, this species is unlikely to occur due to a lack of high quality groundcover habitats with sufficient natural features for cover and foraging, and lack of records within the locality. The species has a patchy distribution along south western slopes, with the closest records north-east of Tarcutta. Prefers habitat with dominant groundcover of native grasses (i.e. Themeda sp.); sparse or no tree cover and scattered small rocks embedded in the soil surface. These important habitat features were limited within the subject land, despite targeted searches (active searches) no individuals were recorded. It is unlikely that the subject land provides good quality habitat for the species, as majority of the subject land has been heavily disturbed due to agricultural practices.

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Striped Legless Lizard	*Delma impar*	–	-	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. Marginal habitat (rocky outcrops, scattered rocks) were recorded within the subject land. However, this species is unlikely to occur due to a lack of high quality groundcover habitats with sufficient natural features for cover and foraging, and lack of records within the locality. Given the agricultural landscape and lack of suitable habitat this species is not considered to occur within the subject land.
Invertebrates					
Golden Sun Moth	*Synemon plana*	E	Wallaby grass (*Rytidosperma sp*), Chilean needlegrass (*Nassella neesiana*) or Serrated Tussock (*Nassella trichotoma*)	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. Marginal habitat (lack of suitable grassland structure) were recorded within the subject land. However, this species is unlikely to occur due to a lack of high quality groundcover habitats with sufficient natural features for cover and foraging, and lack of records within the locality.
Key's Matchstick Grasshopper	*Keyacris scurra*	E	-	No (surveyed)	**Yes** (assumed) - not recorded during targeted surveys undertaken during BAM prescribed survey period. This species is known to be susceptible to grazing disturbances and given most the subject land has historically and currently subject to grazing habitat for this species are considered limited. Whilst limited habitat is available for this species patches of suitable habitat have been assumed where land access was unavailable for targeted surveys.

(1) Listed under the NSW Biodiversity Conservation Act 2016 – CE = Critically Endangered, E1 = Endangered, E2 = Endangered Population, V = Vulnerable

(2) Listed under the Commonwealth Environment Protection and Biodiversity Act 1999 - CE = Critically Endangered, E = Endangered, V = Vulnerable, M = Migratory

6.3.2.1 Superb Parrot

Superb Parrot is found throughout inland NSW. On the south-western slopes the species core breeding area is approximately bounded by Grenfell, Cootamundra and Coolac in the west and Cowra and Yass in the east. The subject land occurs within this core breeding area. Most of the birds breeding in this area migrate north in the winter and come back to breed between September and January. Here, the species is known to nest in open Box-Gum Woodland or isolated scattered trees.

During field surveys, Superb Parrots were observed in the subject land (refer to Figure 6.2) and broader investigation corridor. It is likely that the species occurs within the locality regularly throughout the breeding season and that hollows in large scattered trees or large trees in remnant stands of associated vegetation may represent breeding opportunities for individuals. Potential breeding habitat was identified within the subject land by the presence of 'habitat features and observed nest, or two or more birds seen on site' as described on the species Threatened Biodiversity Data Collection page.

Active breeding sites were recorded and are shown in Figure 6.2. The assessment of impacts to "potential breeding habitat" is based on the observed presence of two or more birds and of potential hollow-bearing tree habitat. Areas where surveys could not be undertaken due to access restrictions, were assumed to provide breeding habitat in associated PCTs.

Superb Parrots often occur in roadside vegetation and in agricultural land with little vegetative buffer (Christie 2004, Davey and Purchase 2004, Manning, Lindenmayer et al. 2004, Manning, Lindenmayer et al. 2007). The species is habituated to impacts associated with these roadside and agricultural areas including noise, dust and light. Key habitat attributes which have informed the species polygon include remnant patches of associated native vegetation which contain hollow-bearing trees or due to access issues are assumed to contain hollow bearing trees (including patches of PCTs 5, 76, 80, 266, 276, 277, and 347), it is currently estimated that approximately sixteen hollow-bearing trees would be affected by the proposal. In addition, while not utilised for the calculation of species credits, isolated hollow bearing scattered trees also provide potential breeding habitat for the species. Additionally, derived native grassland vegetation may also provide additional foraging habitat for the species which has been excluded from the species polygon.

6.3.2.2 Squirrel Glider

Squirrel Glider is distributed sparsely throughout eastern Australia, from northern Queensland to western Victoria. West of the Great Diving Range, the species is known to utilises mature or old growth Box but also utilises mix age forest/woodland. Most common vegetation is associated with, Box-Ironbark woodlands and River Red Gum forests. They generally have been observed to glide up to 70m over flatter or undulating terrain. Hollow-bearing scattered trees adjacent to preferred native vegetation can also provide potential habitat for the species in fragmented landscapes. They live primarily on insects (mainly caterpillars, beetles and stick insects) but also on pollen and nectar (mostly from eucalypts) (Australian Museum 2020). As a consequence of land clearing, remnant vegetation that support gliders often persist along linear patches associated with roadsides and watercourses where presence of hollow-bearing trees still persists.

Surveys undertaken in November 2018 recorded the species (refer to Figure 6.2) in the investigation corridor. Lack of records of the species during the July 2019 field surveys may be due to the reduced availability of resources for the species during the later survey period. The species polygon (Figure 6.2) has been developed to incorporate all associated vegetation within the subject land, which includes PCTs 5, 76, 80, 266, 276, 277, and 347 (excluding derived grasslands). Species polygon were excluded from patches of derived native grassland and patches with >70m separation where habitat utilisation is considered unlikely.

6.3.2.3 Southern Myotis

Southern Myotis is distributed across the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100km inland, except along major rivers. The species uses a range of roosting habitat including tree hollows, caves, mines, culverts, the underside of bridges and sometimes roofs or ceilings. Roosting habitat is often close to water. Typically, ten to fifteen bats, though sometimes up to 100 bats, roost together in a colony. Southern Myotis typically breeds between October and February. In NSW, females of the species typically breed once a year and produce one baby. Southern Myotis has disproportionately large feet (up to 8mm long) with long curved claws, which it uses for foraging. Southern Myotis forage over streams and pools, large lakes or reservoirs where they catch aquatic insects and small fish by raking their feet across the water surface (Australian Museum 2020, Department of Planning Industry and Environment 2020).

Movement of this species across the landscape is typically restricted to riparian corridors, due to the availability of roost sites (roosts for this species have only been located within 100m of waterbodies). Female dispersal distances are thought to be less than 30km with female-biased gene flow locally restricted. Gene flow between populations is dependent on males dispersing along riparian corridors. (Gorecki 2020). Targeted surveys did not record this species, however, based on presence of suitable habitat this species has been included as a species credit species. Associated PCTs (PCT 79 and PCT 276) within 200m of riparian zone or waterbodies have been mapped in the species polygon (Figure 6.2).

6.3.2.4 Little Eagle

The Little Eagle occurs as a single population throughout NSW but is found throughout the Australian mainland except the most densely forested parts of the Dividing Range escarpment. It typically occupies open eucalypt forests, woodlands or open woodlands and pastures. They have been observed utilising Sheoak or Acacia woodland and riparian woodlands of inland NSW, with a strong association to Yellow box – Red Gum Grassy Woodland and Derived Native Grassland. Little Eagles build their nests in tall, living trees within a remnant patch, where pairs build a large stick nest in winter. Adult breeding Little Eagles are resident in permanent home ranges for at least several consecutive years, individuals and juveniles however are quite dispersive and can travel up to 3000km away (Brawata et al. 2018; Rae et al. 2019).

Little Eagles are carnivorous, eating mainly rabbits, birds and reptiles (Emison et al. 1987). This species is heavily dependent on rabbits, which are in abundance in open pastures, grassland and woodland where Little Eagles are known to occupy regularly. Since the rabbit population in Australia has continued to decline, Little Eagles have become increasingly dependent on native prey. This places them in competition with other birds of prey particularly the Wedge-tailed Eagle, which is a common species found within the subject land. One of the largest threats facing Little Eagles is loss of breeding habitat and nest sites either by urbanisation, high-density rural subdivision, or clearing leading to competition with Wedge-tailed Eagles (Debus 2017, Larkin et al. 2020). Given the number of records historically, abundance of breeding and foraging habitat and prey species in the area, the Little Eagle is likely to utilise habitat found within the subject land either as a seasonal vagrant or permanent home range during breeding seasons.

Little Eagles were observed flying over the subject land and a large, occupied stick nest was found to west of Olympic Highway near Billabong Creek in October 2023 (Figure 6.2). A species polygon has been created with non-grassland PCTs within a 300m buffer of the nest in accordance with the TBDC.

7 Prescribed impacts

This chapter identifies potential prescribed biodiversity impacts on threatened entities in accordance with Chapter 6 of the BAM and has been prepared in accordance with the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020b). Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as part of the Biodiversity Offset Scheme, as per clause 6.1 of the BC Regulation. Prescribed biodiversity impacts are those which may be difficult to quantify, replace or offset, making avoiding and minimising these impacts critical to satisfy the requirements of Section 7 of the BAM (avoiding or minimising impact on biodiversity values).

Prescribed impacts (including direct and indirect impacts) are impacts:

- on the habitat of threatened entities including:
  - karst, caves, crevices, cliffs, rocks and other geological features of significance, or
  - human-made structures, or
  - non-native vegetation
- on areas connecting threatened species habitat, such as movement corridors
- that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)
- on threatened and protected animals from turbine strikes from a wind farm (not applicable so not addressed in this BDAR)
- on threatened species or fauna that are part of a TEC from vehicle strikes.

Table 7.1 identifies the prescribed impacts associated with the proposal and the threatened species which have the potential to utilise these features within the subject land.

Based on this assessment of prescribed impacts, no additional credits have been applied.

Table 7.1 Identified prescribed impacts

Feature	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependant on feature	Impact assessed
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No areas of geological significance are present. No karst, caves, cervices, cliffs, which may provide potential breeding habitat for threatened fauna (i.e. microchiropteran bats) were recorded. Rocky habitat in the area is patchy, with limited connectivity to better quality potential habitat. Some rock outcrops occur within and adjacent to the subject land, however no direct impacts of the proposal would impact threatened fauna species that occur in association with rocky habitats.			Not considered further
Occurrences of human-made structures	The proposal is located predominantly in agricultural land. No human made structures were identified in the subject land that would provide suitable habitat for any threatened species. Habitat features such as culverts are associated with existing road infrastructure and will not be impacted by the proposal. However, it is noted that, the proposal is likely to require removal of wooden fence posts and there also require removal of wooden telegraph posts. Wooden posts can be used by microbats including threatened species. Mitigation measures are recommended to minimise the risk of mortality of bats during vegetation clearing and the removal of structures.			Impact further addressed in section 10.3
Occurrences of non-native vegetation	Non-native vegetation occurs within and adjacent to the subject land. One non-native vegetation community was identified – 'Miscellaneous ecosystem' (non-native vegetation) referred to as exotic species/native landscape plantings (section 5.3). Some removal of non-native vegetation including, urban exotic/native landscape plantings may be impacted because of the proposal.		Although some threatened species may utilise non-vegetation for foraging purpose (for example raptors hunting prey), no threatened entity was identified to be dependent on non-native vegetation for part of their life cycle.	Not considered further
Corridors or other areas of connectivity linking habitat for threatened entities	Existing connectivity is limited to creeklines and road reserves. These connectivity features link with the largest intact patch of remnant vegetation occurring to the east of the subject land in association with the nearby Bethungra and Ulandra Mountain range. Creeklines and associated riparian vegetation with the rivers and streams mentioned in Table 4.1 above predominantly run from east to west and provide the remaining link to movement between Bethungra and Ulandra Mountain range to the east and areas to the west (Figure 1.1).	The proposal is likely to result in a reduction in vegetation patch sizes resulting in minor increases in localised fragmentation of the regional wildlife patches along the mentioned creeklines and road reserves. Due to the importance of connectivity, dispersal opportunities and habitat quality for species at a local scale, this impact has the potential to be negative to the dispersal of relatively sedentary species such as mammals, frogs, and reptiles.	The following threatened species have the potential to be impacted due to connectivity/fragmentation: Squirrel Glider	Impact further addressed in section 10.3

Feature	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependant on feature	Impact assessed
Water bodies or any hydrological processes that sustain threatened entities	**Partially** – Unmanaged construction activities in proximity to ephemeral watercourses or waterbodies could increase levels of turbidity and sediment deposition, decrease dissolved oxygen, and change pH levels in receiving environments. Other potential impacts on water quality could occur due to spills, leakages and disturbance of contaminated land.	The existing hydrological conditions of the subject land are already affected by altered landform because of surrounding land uses. The proposal may result in further alteration to the hydrology of the subject land due to changes in landform and the introduction of new infrastructure.	Although some threatened species may utilise waterbodies intermittently, no threatened entity was identified to be dependent on waterbodies for part of their life cycle.	Impact further addressed in section 10.3
Protected animals that may use the proposed wind farm development site as a flyway or migration route	Wind turbines do not occur within the subject land and are not associated with the proposal.			Not considered further
Proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	Vehicle strike has the potential to occur within the subject land in both construction and operation phases.	During construction the increase in construction vehicle movements, and increase in road use means potential vehicle strike to native fauna is likely to occur During operation, potential train strike to native fauna is likely to occur due to the increase in train movements and train height.	Potential train strike to native fauna may likely occur as a result of the proposal. Although no threatened entity was recognized to have a higher likelihood of vehicle strike as a result of the proposal and it is unlikely that the proposal would cause a significant increase in vehicle strike with the implementation of mitigation measures.	Impact further addressed in section 10.3

8 Matters of national environmental significance

This chapter describes Matters of National Environmental Significance (MNES) relating to Commonwealth legislation under the EPBC Act.

In addition to threatened entities listed under the BC Act, the BAM requires discussion of Threatened Ecological Communities and species listed under the EPBC Act. The SEARS also required that Matters of National Environmental Significance, listed under the EPBC Act, are considered.

A search of the EPBC Protected Matters Search Tool was completed for an area within 10km of the subject land. Results from database searches and field assessments are provided below.

8.1 Threatened species and ecological communities

8.1.1 Threatened ecological communities

Native vegetation recorded within the subject land was determined to align to two threatened ecological communities listed under the EPBC Act, including:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia – listed as Critically Endangered.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – listed as Critically Endangered

8.1.1.1 Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived grasslands of south-east Australia is listed as Endangered under EPBC Act.

The two following PCTs were considered candidates to form part of the EPBC Act listed Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived native grasslands of south-eastern Australia:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.

To be considered consistent with the Endangered listing under the EPBC Act, the vegetation must be consistent with the criteria outlined in the Commonwealth Listing Advice on Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Department of the Environment, 2010). These criteria include a required minimum 50 per cent perennial native cover, and assessment of the two PCTs against these criteria is provided in Appendix I.

The assessment concluded that the following vegetation types and zones met the EPBC Act listing for Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived grasslands:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Good condition (VZ1).
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Moderate condition (VZ2).

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Low condition (VZ4)
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Moderate condition (VZ5).

The native understory of poor condition vegetation has been modified to an extent that it does not meet the required minimum 50 percent perennial native cover to meet the condition requirements of the Commonwealth listed community, as such it has not been included in the MNES assessment. Whilst dry conditions were experienced during the survey period, poor condition vegetation has been subject to high levels of grazing with many areas that occurs as remnant trees with little to no native ground stratum structure. In many instances vegetation within this condition class has been the subject of sheep camps under shaded canopy that has resulted in a total modified ground stratum vegetation and does not meet EPBC Act condition thresholds.

An overview of Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia extent is provided in Table 8.1.

8.1.1.2 White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands is listed as Critically Endangered under EPBC Act.

The following four PCTs were considered candidates to form part of the EPBC Act listed White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands:

- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion.

To be considered consistent with the Critically Endangered listing under the EPBC Act, the vegetation must be consistent with the criteria outlined in the EPBC Act policy statement 3.5 – White box – Yellow box – Blakely's red gum grassy woodlands and derived native grasslands (Department of the Environment and Heritage, 2006). An assessment of the four PCTs against these criteria is provided in Appendix I.

The assessment concluded that the following vegetation types and zones met the EPBC Act listing for White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland:

- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ7).
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ10).
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ12).
- PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ16).

As stated above, poor condition vegetation has not been considered in this MNES assessment as the native understory has been modified to an extent that it does not meet the required minimum 50 per cent perennial native cover.

An overview of the extent of White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands is provided in Table 8.1.

Table 8.1 Threatened ecological communities listed under the EPBC Act recorded

Threatened ecological community	Status[1]	Associated PCT	Condition	Extent with subject land (ha)
Grey Box (*E. microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia	E	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good	1
			Moderate	12.77
			Low – derived native grassland	1.65
		PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate	1.35
Total				**16.77**
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate	4.77
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate	0.87
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate	11.7
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate	0.14
Total				**17.48**
Total area of all TECs listed under the EPBC Act:				**34.25**

(1) E = Endangered, CE = Critically Endangered as listed under the EPBC Act

8.1.2 Threatened flora species

A search of the EPBC Protected Matters Search Tool identified 18 flora species listed under the EPBC Act as being known to occur or considered likely to occur within the locality. Based on field surveys and assessment completed, a total of 11 are considered to have a moderate or higher likelihood of occurrence within or near the subject land and seven were considered unlikely to occur due to lack of suitable habitat and/or geographic range restrictions (Appendix C). These species became candidate species and subject to detailed targeted surveys and assessment. These candidate species were not recorded despite targeted surveys. Although species polygons and offset credits have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of these species within the subject land is considered unlikely in these unsurveyed areas based on the ongoing agricultural activities, lack of records in the subject land and the broader locality. No threatened flora species or their habitat, listed under EPBC Act, are likely to be affected by the proposal and are not considered further. A summary of the EPBC Act listed flora species considered is provided in Table 8.2.

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Table 8.2 Listed EPBC Act threatened flora considered for assessment

Scientific name	Common name	EPBC Act[1]	Habitat requirements[2]	Affected species?
Ammobium craspedioides	Yass Daisy	V	Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. No habitat constraints identified Vegetation types: PCT 266, PCT 277 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. There are no records of this species in the locality with the closest record being historic (1825) to the west of Gundagai adjacent to Nungas Road. Most records of this species occur east of a line from near Crookwell in the north to Gundagai in the south with an outlier population about 30km to the south of Wagga Wagga in Livingstone National Park. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.
Austrostipa wakoolica	A spear-grass	E	Floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils. Habitat constraint: Alluvial plains and plains Vegetation types: PCT 76 &PCT 80	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends from the Central West where this species has a stronghold to scattered records in the Riverina region. The nearest known occurrence of *Austrostipa wakoolica* is from a single record (1992) near Ardlethan and is located approximately 90km to the west of the subject land. This species is dispersed through wind, rain and flooding events. Given there is no local population, it is considered unlikely that this species would utilise potential habitat within the subject land. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.
Caladenia arenaria	Sand-hill Spider Orchid	E	Woodland with sandy soil, especially that dominated by Callitris glaucophylla (White Cypress Pine). No habitat constraints identified Vegetation types; PCT 76 & PCT 80	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The surveys focused on vegetation patches with intact understorey (PCT 76 Good & Moderate and PCT 80 Moderate). The nearest known occurrence of this species is from a single record (1990) to the east of the Bethungra Range near Frampton. The subject land is wholly located to the west of the Bethungra Range and given seed dispersal is wind dependent it is unlikely that this population could disperse to suitable habitat within the subject land. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.

Scientific name	Common name	EPBC Act[1]	Habitat requirements[2]	Affected species?
Caladenia concolor	Crimson Spider Orchid	E	Known habitat is regrowth woodland on granite ridge country that has retained a high diversity of plant species, including other orchids. No habitat constraints identified Vegetation type: PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known records of this species to the subject land is to the east of the Bethrungra range in Ulandra Nature Reserve. The subject land is wholly located to the west of the Bethungra Range. As Caladenia species rely on wind for their seed dispersal, it is considered unlikely that this population could disperse to suitable habitat within the subject land. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.
Euphrasia arguta	Euphrasia arguta	CE	Known to occur in eucalypt forest with a mixed grass and shrub understorey. No habitat constraints identified Vegetation type: PCT 266 & PCT 276	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known records of this species to the subject land is historic (1887) and located 10km to the west near Cootamundra with a more recent record (2014) located 40km to the South of the subject land near Tarcutta. *Euphrasia* species generally have poor seed dispersal capabilities usually within 20–30cm of the parent plant (Murphy & Downe, 2006). Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.
Indigofera efoliata	Leafless Indigo	E	Known to grow on slight rises amongst ironstone formation in stony red-brown sandy loam. No habitat constraints identified Vegetation type: PCT 76	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends between the Central West and Central Tablelands region. The closest known record of this species to the subject land is historic (1883) and is located approximately 200km to the north-east near Kerrs Creek. All other records are more than 250km from the subject land. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.

Scientific name	Common name	EPBC Act[1]	Habitat requirements[2]	Affected species?
Prasophyllum petilum	Tarengo Leek Orchid	E	Grows in open sites within Natural Temperate Grassland No habitat constraints identified Vegetation type: PCT 276 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends between the South-East, Central Tablelands and Hunter regions. The closest known records to the subject land are located near Boorowa (1995-2016), approximately 75km to the east. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.
Swainsona murrayana	Slender Darling Pea	V	Grows in a variety of vegetation types including grasslands or grassy woodlands that have been intermittently grazed or cultivated. Vegetation type: PCT 76 & PCT 80	**No –** targeted surveys were conducted during appropriate season requirements and no specimens were recorded. The closest known record to the subject land is historic (2001) and is located near Morangarell, approximately 40km to the north-west. During field surveys, a general lack on forb species was observed within the subject land. No *Swainsona* species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.
Swainsona recta	Small Purple Pea	E	Known to occur in the grassy understorey of woodlands and open-forests No habitat constraints identified Vegetation type: PCT 76, PCT 80, PCT 266, PCT 276 & PCT 277	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known record to the subject land is historic (1990) and is located near Wagga Wagga, approximately 50km to the south-west. A more recent record (2000) is located near Mandurama, approximately 130km to the north-east. During field surveys, a general lack on forb species was observed within the subject land. No *Swainsona* species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.

Scientific name	Common name	EPBC Act[1]	Habitat requirements[2]	Affected species?
Swainsona sericea	Silky Swainson-pea	V	Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. No habitat constraints identified Vegetation type: PCT 277 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. This species has been recorded across NSW with the main distribution between the North West, Central West and Riverina regions. The closest known record of this species is historic (1990) and is located to the west of Gundagai, approximately 40km south-east of the subject land. A more recent record (2005) is located near the Gundagai township. During field surveys, a general lack on forb species was observed within the subject land. No *Swainsona* species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.
Tylophora linearis	-	V	Grows in dry scrub and open forest No habitat constraints identified Vegetation type: PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. This species has been recorded across NSW with the main distribution between the North West and Central West regions. The closest known record of this species is historic (1915) and is located near Temora, approximately 30km west of the subject land. A more recent record (2008) is located near the Bribbaree, approximately 45km to the north of the subject land. Although species polygons have been provided for unsurveyed areas as assumed habitat under the BC Act, the occurrence of this species within the subject land is considered unlikely based on the ongoing agricultural activities and the survey of adjacent areas. Given the lack of records in the subject land and the broader locality, the species is not considered affected.

(1) V – Vulnerable, E – Endangered, CE – Critically Endangered under the EPBC Act

8.1.3 Threatened fauna species

A search of the EPBC Protected Matters Search Tool identified 25 species listed under the EPBC Act as being known to occur or considered likely to occur within the locality.

Based on desktop and field assessment, a total of ten candidate species became the focus of targeted threatened fauna surveys and assessment. This included one recorded species Superb Parrot (*Polytelis swainsonii*), and 4 additional species that were considered to have a moderate likelihood of occurring within the subject land based on presence of suitable habitat (Table 8.3, Figure 8.1 and Appendix D). In addition, Appendix A of the SEARs identifies an additional five candidate species that were also assessed.

Threatened fauna surveys completed were carried out as described in Chapter 3 and Table 3.7. The outcome of these targeted surveys and assessments for the ten threatened candidate fauna species listed under the EPBC Act are presented in Table 8.3.

Table 8.3 Listed EPBC Act threatened fauna considered for assessment

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Affected species?
Regent Honeyeater	*Anthochaera phrygia*	CE	PCT 79, PCT 266, PCT 276, PCT 277, PCT 347 Excludes Derived Native Grasslands	**Yes –** potential to occur during seasonal movements and to utilise blossoming eucalypts. subject land does not conform to high quality woodland habitats types that this species is dependent upon for foraging and breeding purposes. The subject land is not identified as a breeding area for the species. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. The subject land would only provide marginal foraging habitat for the species during seasonal movements to utilise blossoming eucalypts. It is unlikely that the subject land is relied upon by the species to forage or breed. The proposal has been identified to impact on about 37.96ha of potential foraging habitat. No important habitat has been mapped for this species.
Swift Parrot	*Lathamus discolor*	CE	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347 Excludes Derived Native Grasslands	**Yes –** potential to occur during seasonal movements and to utilise blossoming eucalypts. Dependent on winter flowering resources of which *Eucalyptus microcarpa* occurs widely within subject land. Small amount of records locally and local resources are sparse, so occurrences are likely to be rare but cannot be discounted. subject land is outside of species known breeding habitat. Subject land would form potential foraging habitat for the species during blossoming events. The proposal has been identified to impact on about 70.09ha of potential foraging habitat. No important habitat has been mapped for this species.
Superb Parrot	*Polytelis swainsonii*	V	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Yes –** recorded foraging on crop/agricultural land. Known widely within the locality and recorded within multiple locations within the subject land. No breeding activity was observed during targeted surveys, however, presence of breeding habitat (e.g. large hollow-bearing trees). Species likely to utilise the subject land for both foraging and breeding habitat. The proposal has been identified to impact on up to 92.96ha of potential foraging habitat, of which 70.09ha is potential breeding habitat.

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Affected species?
Spotted-tail Quoll	*Dasyurus maculatus maculatus*	E	PCT 79, PCT 266, PCT 276, PCT 277, PCT 309, PCT 347	**No** – the subject land lacks the important microhabitat (i.e. understorey structure of fallen timber, rocky outcrops, shrub layer etc.) and connectivity to extensive vegetation patches for the species to persist and be reliant for breeding and foraging purposes. Spotted-tailed Quoll records are generally confined to within 200km of the coast and prefers mature wet forest habitat which include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves. Individuals also require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage. It is more likely that the species relies more readily on remnant woodland patches to the east in association with Bethungra and Ulandra Mountain range. Based off habitat assessments, limited foraging habitat, and minimal records, it is considered that the species has a low likelihood of occurrence within the subject land.
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	PCT 79, PCT 76, PCT 266, PCT 276, PCT 277 Excludes Derived Native Grasslands	**Yes** – Not observed during nocturnal surveys but may visit the subject land when blossom resources are scarce in other regions. Records within the locality are scarce and no camps occur within the subject land nor are there any recorded on interactive Flying-fox web viewer within the locality. The species is distributed within 200km of the eastern coast of Australia and known to disperse and nomadically move based on seasonal resource abundances (i.e. blossom and fruiting events). Differencing patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years based of resource availability. Within inland areas the species is known to be uncommon, with occurrences based off abundance/availability of foraging resources. Within the subject land, the species would only intermittently occur when blossom resources are plentiful, however these would be irregular. No breeding camps occur within the subject land or were recorded during surveys. It is unlikely that the species relies on the subject land for foraging or breeding purposes. As a precautionary an EPBC assessment of significance was undertaken for the species. The proposal has been identified to impact on about 61.34ha of potential foraging habitat.

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Affected species?
Painted Honeyeater	*Grantiella picta*	V	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 309, PCT 347 Excludes Derived Native Grasslands	**No** – Marginal foraging habitat within remnant vegetation. A specialist feeder on mistletoes (*Amyema* spp.) which did not occur in high densities. The species is a specialist feeder of mistletoes growing on woodland eucalypts and acacias and occurs in Boree/Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. Throughout its range it occurs in low densities. The habitat within the subject land is marginal, often lacking the high densities of mistletoes within larger patches of intact Box-Ironbark Forests. It is more likely that the species relies more readily on remnant woodland patches to the east in association with Bethungra and Ulandra Mountain range. It is unlikely that the subject land supports a residential population or that the species is highly reliant on the subject land for foraging and breeding habitat. The subject land likely acts as a small part of foraging habitat within the larger home range of the species, and it is likely that the species may occur irregularly during nomadic movements. Targeted surveys including diurnal bird surveys did not identified any individuals nor large occurrences of mistletoes. Based off habitat assessments, limited foraging habitat, and minimal records, it is considered that the species has a low likelihood of occurrence within the subject land.
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	PCT 80, PCT 266 Excludes Derived Native Grasslands	**Yes –** Associated habitat in the form of box dominated woodlands, tree hollows and loose bark were recorded within the subject land. No previous records within the locality, however, presence of foraging habitat (i.e. box eucalypt dominated communities) and breeding habitat (hollow-bearing trees) identified. Targeted surveys including Anabat recordings and harp trapping did not capture any individuals, however, based on habitat assessments, identified microhabitats and known distribution it is considered that the species has a moderate – high likelihood of occurrence within the subject land. The subject land contains 13.77ha of potential habitat.

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Affected species?
Koala	*Phascolarctos cinereus*	E	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 309, PCT 347 Excludes Derived Native Grasslands	**No** – A lack of continuity between woodland patches, patch size and sufficient foraging resources suggest that this species does not form a residential population in the subject land. May occur randomly due to roaming movements. The subject land does not occur within known core koala population areas, the south-western slopes population is considered to occur in low densities. Due to the low number of records (two), low connectivity between large patches of good quality remnant habitat and the degraded nature of habitat within the subject land, it is unlikely a residential population occurs within subject land. Targeted surveys including, habitat assessments, SATs, spotlighting and opportunistic daytime surveys did not record individuals within the subject land.
Pink-tailed Worm-lizard	*Aprasia parapulchella*	V	PCT 266, PCT 276, PCT 277, PCT 347	**No** – Marginal habitat (rocky outcrops, scattered rocks) were recorded within the subject land. However, this species is unlikely to occur due to a lack of high quality groundcover habitats with sufficient natural features for cover and foraging, and lack of records within the locality. The species has a patchy distribution along south western slopes, with the closest records north-east of Tarcutta. Prefers habitat with dominant groundcover of native grasses (i.e. *Themeda* sp.); sparse or no tree cover and scattered small rocks embedded in the soil surface. These important habitat features were limited within the subject land, despite targeted searches (active searches) no individuals were recorded. It is unlikely that the subject land provides good quality habitat for the species, as majority of the subject land has been heavily disturbed due to agricultural practices.

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Affected species?
White-throated Needletail	*Hirundapus caudacutus*	V	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Yes –** Almost exclusively aerial. Occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings. May irregularly occur foraging over subject land. The habitats within the subject land are unlikely to constitute important habitat for this species. The habitat present is unlikely to support significant proportions of the population nor are the habitats critical to any life stage of the species. The species is likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. Because of this and this mobile nature, and the marginal habitat it is unlikely that the species relies on the subject land for foraging or breeding purposes. As a precautionary an EPBC assessment of significance was undertaken for the species. The proposal has been identified to impact on about 70.09ha of vegetation communities associated with aerial foraging habitat.
Key's Matchstick Grasshopper	*Keyacris scurra*	E	PCTs 266, 276, 277	**Yes** (assumed) - not recorded during targeted surveys undertaken during BAM prescribed survey period. This species is known to be susceptible to grazing disturbances and given most the subject land has historically and currently subject to grazing habitat for this species are considered limited. Whilst limited habitat is available for this species patches of suitable habitat have been assumed where land access was unavailable for targeted surveys.

(1) Listed under the EPBC Act – CE = Critically Endangered, E = Endangered, V = Vulnerable

8.2 Migratory species

Migratory species are protected under international agreements to which Australia are a signatory, including Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (RoKAMBA) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered MNES and are protected under the EPBC Act.

Based on desktop review 11 migratory fauna species were identified to potentially occur. No listed Migratory species were recorded within the subject land during surveys. However, based on habitat assessments a total of two migratory species have a moderate to high likelihood to occur within the subject land (Table 8.4, Appendix D). These species have been considered with reference to the *Draft referral guideline for 14 birds listed as migratory species under the EPBC Act* (Department of the Environment 2015a).

Table 8.4 Migratory species recorded or have a moderate potential to occur

Scientific name	Common name	EPBC Act[1]	Likelihood of occurrence
Apus pacificus	Fork-tailed Swift	M; Ma	**Moderate.** Almost exclusively aerial. Commonly recorded over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. Most observed over inland plains in Australia, but sometimes recorded over coastal cliffs and beaches as well as urban areas. Forages aerially for insects, sometimes in mixed feeding flocks with other aerial foragers. Believed to roost on the wing (Department of the Environment 2015a). May irregularly occur foraging over subject land.
Hirundapus caudacutus	White-throated Needletail	V; M	**Moderate**. Almost exclusively aerial though does roost in tree hollows and the foliage canopy. Occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings. Forages for insects on the wing, flying anywhere between “cloud level” and “ground level” and readily forms mixed feeding flocks with other aerial insectivores (Department of the Environment 2015a). May irregularly occur foraging over subject land.

(1) Listed under the EPBC Act – M = Migratory, Ma = Marine

These species (Table 8.4) have the potential to utilise a wide variety of habitats, including native vegetation communities found within the subject land.

While migratory species of bird may use the subject land and have records in the locality, the subject land is not considered to be of sufficient extent or quality to be critical for these species. The subject land would not be considered ‘important habitat’ for migratory birds as defined under the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines, in that the subject land does not contain:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
- habitat utilised by a migratory species which is at the limit of the species range
- habitat within an area where the species is declining.

The habitats within the subject land are unlikely to constitute important habitat for any of the mentioned species. The habitat present is unlikely to support significant proportions of the population of any migratory species nor are the habitats critical to any life stage of these species (neither identified species breed in Australia). These species are likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. Because of this and their mobile nature, these species are not considered to be significantly affected by the proposal and are not considered further in this report.

8.3 World and national heritage

No world or national heritage places were identified within the locality of the subject land.

8.4 Wetlands of national and international importance

Wetlands are important habitat for a diverse range of animals including waterbirds, amphibians, invertebrates and fish species as well as aquatic and water loving plants such as sedges and rushes. Tree species such as River Red Gum also rely on these environments. Wetlands are important provide strategic refuge during drought and frequently support threatened species. Most of the migratory bird species listed under international convention agreements with Australia may be found in these wetlands.

8.4.1 Nationally important wetlands

One wetland of national importance was identified within the locality– Bethungra Dam Reserve. Bethungra Dam Reserve occurs to the east of the subject land. It occurs upstream (approximately 12km) from the subject land and is wetland habitat created by the damming of Wandalybringle Creek. The wetland provides large stands of common reeds and cumbungi, it acts as important refuge habitat during drought conditions and provides habitat for a variety of birds and animals. The Bethungra Dam Reserve does not occur within the subject land and the proposal would not impact this nationally important wetland.

8.4.2 Wetlands of international importance (Ramsar wetlands)

Four international wetlands of importance (Ramsar) were identified in desktop searches, these are:

- Banrock Station wetland complex
- Hattah-kulkyne Lakes
- Riverland
- the Coorong, and Lakes Alexandrina and Albert wetland.

All these international wetlands of importance occur >400km from the subject land and are will not be affected by the proposal.

Threatened Ecological Communities (EPBC Act)

- Grey Box (E. microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

42250
42000
41750
41500
41250
41000
40750
40500
40250

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

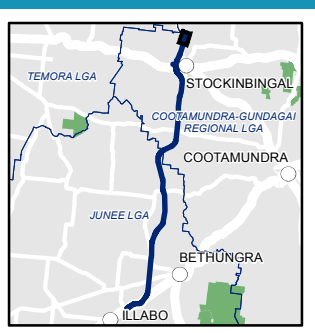
Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



INLAND RAIL ARTC

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Threatened Ecological Communities (EPBC Act)

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- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

40250
40000
39750
39500
39250
39000
38750
38500
38250
38000
37750
37500
37250
37000
36750

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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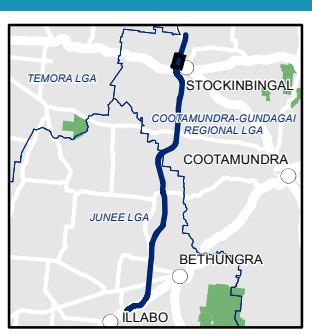
Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



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Threatened Ecological Communities (EPBC Act)

- Grey Box (E. microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

37000
36750
36500
36250
36000
35750
35500
35250
35000
34750
34500
34250
34000
33750

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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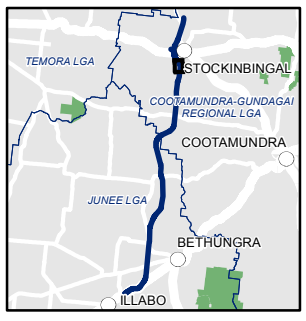
Proposal Site

Cadastral Boundary

Superb Parrot habitat



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Threatened Ecological Communities (EPBC Act)

- Grey Box (E. microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

33750
33500
33250
33000
32750
32500
32250
32000
31750
31500
31250
31000
30750
30500

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

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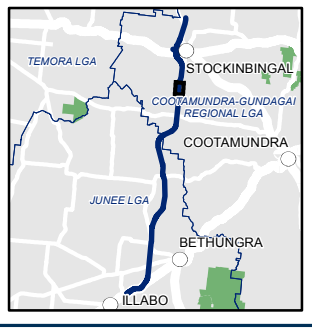
Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



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Threatened Ecological Communities (EPBC Act)

- Grey Box (E. microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

30500
30250
30000
29750
29500
29250
29000
28750
28500
28250
28000
27750
27500
27250

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

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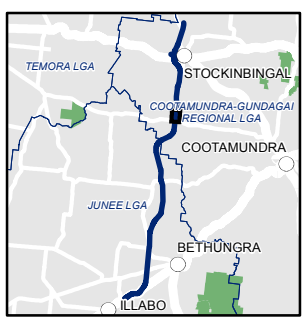
Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



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Threatened Ecological Communities (EPBC Act)

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

27500
27250
27000
26750
26500
26250
26000
25750
25500
25250
25000
24750
24500
24250

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

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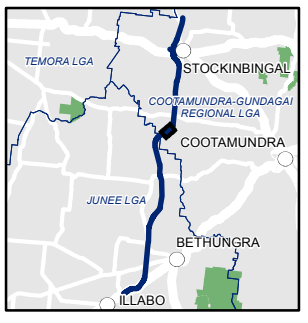
Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



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Threatened Ecological Communities (EPBC Act)

- Grey Box (E. microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

25000
24750
24500
24250
24000
23750
23500
23250
23000
22750
22500
22250
22000
21750
21500
21250
21000
20750

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

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4098 Chainage (distance in metres from southern limit of the proposal)

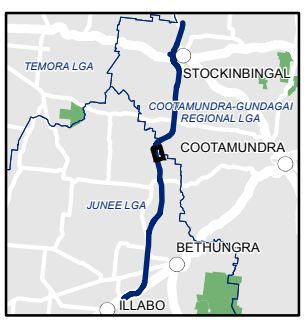
Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



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Threatened Ecological Communities (EPBC Act)

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- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

21000
20750
20500
20250
20000
19750
19500
19250
19000
18750
18500
18250
18000
17750

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

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4098 Chainage (distance in metres from southern limit of the proposal)

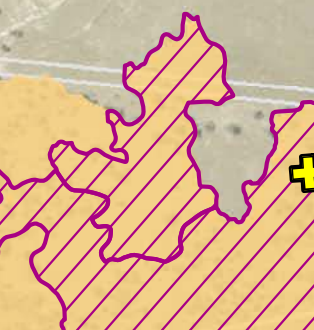
Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



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- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

17750
17500
17250
17000
16750
16500
16250
16000
15750
15500
15250
15000
14750
14500

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

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4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Superb Parrot habitat

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- Grey Box (E. microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

14500
14250
14000
13750
13500
13250
13000
12750
12500
12250
12000
11750
11500

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

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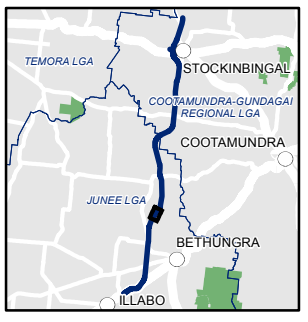
Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



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Threatened Ecological Communities (EPBC Act)

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- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

11500
11250
11000
10750
10500
10250
10000
9750
9500
9250
9000
8750
8500
8250

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

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Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record

INLAND RAIL

ARTC

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Threatened Ecological Communities (EPBC Act)

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- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

8250
8000
7750
7500
7250
7000
6750
6500
6250
6000
5750
5500
5250
5000

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

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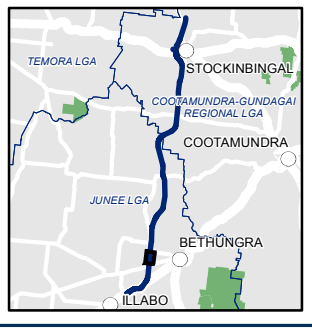
Proposal Site
Cadastral Boundary
Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



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5250 5000 4750 4500 4250 4000 3750 3500 3250 3000 2750 2500 2250 2000

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

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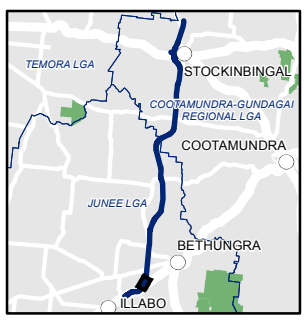
Proposal Site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record



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Threatened Ecological Communities (EPBC Act)

- Grey Box (E. microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

1750
1500
1250
1000
750
500
250
0

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

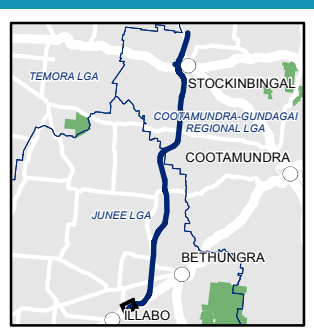
Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record

Superb Parrot nesting record



INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

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Stage 2
Impact assessment

9 Avoiding or minimising impacts on biodiversity values

The following provides information on avoiding and minimising impacts on biodiversity values through the planning and design phase of the proposal. This information is provided to directly address Chapter 7 of the BAM.

9.1 Avoid and minimise impacts on native vegetation and associated habitat

The principles in section 7.1 of the Biodiversity Assessment Method have been considered to avoid and minimise impacts on native vegetation and habitat, as far as reasonably practical, through the proposal development process. Chapter 6 of the EIS provides a detailed discussion of the alternative and options assessment which included:

- strategic alternatives – alternative freight transport solutions
- do nothing alternatives
- alternative route options
- options assessment process and development of preferred alignment
- siting of construction compounds and batch plants.

The approach to design development has included a focus on avoiding and/or minimising the potential for impacts during all key phases of the proposal. The proposal consistency with principles of the BAM to avoid and minimise impacts to biodiversity values as described in Table 9.1. This includes consideration of alternative options to avoid and minimise impacts on biodiversity values.

In order to effectively avoid and/or minimise the potential for impacts during all key phases of the proposal, significant constraints, risks and opportunities that the alignment should seek to avoid through design were identified. The specific design responses to avoid and minimise adverse impacts to terrestrial and aquatic biodiversity are identified in Chapter 6 of the EIS.

Further refinement would be made where practicable, to minimise the potential for biodiversity impacts as far as possible. The following tasks would be undertaken:

- surveys of previously inaccessible properties as soon as access is possible to better quantify impacts and identify site-specific mitigation measures
- narrowing of the construction impact zone where feasible in areas of higher biodiversity value (including chainage 8250 to 8750 near Ulandra Creek) during detailed design
- avoidance and minimisation of impacts during detailed design of all areas of listed Box-Gum Woodland CEEC, particularly in Stockingbingal area.
- retention of some groundcover and riparian vegetation may also present an opportunity for minimising impacts through the retention of structural layers.

Table 9.1 Efforts to avoid and minimise impacts on native vegetation and habitat during proposal design

Principles	Proposal consistency
Locating the proposal to avoid and minimise impacts on native vegetation, threatened species, threatened ecological communities and their habitat (section 7.1.1.3 of BAM)	
Locating the proposal in areas where there are no biodiversity values	Areas of biodiversity value could not be entirely avoided. Where practicable avoidance has been undertaken and the design with the lowest feasible biodiversity impact (i.e. lowest vegetation condition) has been undertaken Alternatives and options considered and how biodiversity was considered is outlined in Chapter 6 of the EIS.
Locating the proposal in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	The proposed alignment has utilised areas of existing disturbance (i.e. within agricultural lands or cropping areas) and areas of lower vegetation condition.
Locating the proposal in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT.	A multi criteria assessment was undertaken as part of the route selection process. A 250m corridor was assessed to inform the presence and condition of threatened ecological communities. This has resulted in a decrease in the direct impact to Inland Grey Box Woodland TEC and Box Gum Woodland TEC recorded. Avoidance of Inland Grey Box Woodland TEC along Ironbong Road and both Inland Grey Box Woodland and Box Gum Woodland TECs along Dudauman Road has significantly reduced the overall impact to TECs (see in Chapter 6 of the EIS (alternatives and proposal options).
Locating the Project outside of the buffer area around breeding habitat features such as nest trees or caves.	The proposal design has avoided areas which provide connectivity or feature breeding habitat in form of nest trees for threatened fauna species as far as practicable. Where the alignment cannot avoid impact to areas of breeding habitat or connectivity such as along Old Sydney Road, the implementation of connectivity mitigation measures will be considered (i.e. rope bridges, culverts etc.) and timing of work to minimise impacts during breeding season.
Consideration of alternatives (section 7.1.1.4 of the BAM)	
An analysis of alternative modes or technologies that would avoid or minimise impacts on biodiversity values	Design and construction works will, so far as practicable, avoid direct impacts to local creek lines and tributaries through appropriate bridge or culvert design (see Chapter 6 of EIS).
An analysis of alternative routes that would avoid or minimise impacts on biodiversity values *An analysis of alternative locations that would avoid or minimise impacts on biodiversity values* *An analysis of alternative sites within a property on which the proposal is proposed that would avoid or minimise impacts on biodiversity values*	Chapter 6 of the EIS provides a detailed discussion of the alternative and options assessment which included: • strategic alternatives – alternative freight transport solutions • do nothing alternatives • alternative route options • options assessment process and development of preferred alignment • siting of construction compounds and batch plants. The approach to design development has included a focus on avoiding and/or minimising the potential for impacts during all key phases of the proposal. The multi-criteria analysis undertaken during the option selection included consideration of environmental impacts. To further refine the preferred alignment, an environmental constraints workshop was held in January 2019 to identify significant constraints, risks and opportunities that the alignment should seek to avoid through design responses. The workshop provided an overview of the biodiversity (terrestrial and aquatic), heritage and agricultural constraints and suggested design responses. Multiple design options were analysed, and the provided design has minimised impacts to high biodiversity values (i.e. areas with highest vegetation integrity score, threatened ecological communities, Class 3 Scattered Trees and areas of potential habitat for threatened fauna).

Principles	Proposal consistency
	A summary of the specific design responses to avoid and minimise adverse impacts to biodiversity are identified in Chapter 6 of the EIS (alternatives and proposal options).
Designing a proposal to avoid and minimise impact on native vegetation, threatened species, threatened ecological communities and their habitat (section 7.1.2.1 of BAM)	
Reducing the proposal's clearing footprint by minimising the number and type of facilities	Detailed design may provide further opportunities for minimising the final subject land as far as practical. Ancillary facilities and temporary construction sites will be located within areas of low biodiversity values (i.e. cleared land) and avoid direct impacts to vegetation in high threat status or areas of high biodiversity value as far as practical. The current optimized design has further reduced native vegetation clearing including impacts to TECs This reduction has been achieved through reducing the overall proposal length and footprint as well as relocation to areas of non-native woody vegetation (cropping and pasture areas). Preliminary surveys to identify areas of lower biodiversity value have been undertaken to inform detailed design of ancillary facilities (i.e. areas dominated by exotic species, cropped areas).
Locating ancillary facilities in areas where there are no biodiversity values	
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	
Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC or is an entity at risk of a serious and irreversible impact (SAII)	
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.	Fauna passage opportunities will be investigated. This will include investigation of crossing structures (i.e. glider poles, culverts etc.) within the detailed design phase to enable the continuation of movement and genetic material across the landscape. Mitigation measures have been developed to address the direct and indirect impacts of the proposal including restoration and rehabilitation and are outlined in Chapter 11.

9.2 Avoid and minimise impacts on prescribed biodiversity

This section addresses prescribed biodiversity impacts that may be difficult to quantify, replace or offset, making avoiding and minimising impacts critical in accordance with Section 7.2.1 & 7.2.2 of the BAM. As advised by DPE (in their submission dated 25 October 2022), this has been assessed consistent with the approved assessment methodology used for Narromine to Narrabri BDAR. Prescribed biodiversity impacts relevant to the proposed have been identified in Table 9.2.

Table 9.2 Efforts to avoid and minimise impacts on prescribed biodiversity during proposal planning

Prescribed biodiversity impacts	Proposal planning
Designing a project location to avoid and minimise impact on prescribed biodiversity (section 7.2.1 of BAM)	
a) *locating the envelope of surface works to avoid direct impacts on the habitat features identified in Chapter 6*	Areas of habitat features could not be entirely avoided; however, the proposal has been designed to avoid impact to intact vegetation as much as practicable and where habitat features (i.e. culverts) are to be impacted, these features may be retained. Mitigation measures have been developed to address the direct and indirect impacts of the proposal to prescribed impacts.

Prescribed biodiversity impacts	Proposal planning
b) *locating the envelope of sub-surface works, both in the horizontal and vertical plane, to avoid and minimise operations beneath the habitat features, e.g. locating longwall panels away from geological features of significance or water dependent plant communities and their supporting aquifers*	The proposal has not been located in an area where subsurface works would impact geological features of significance. Detailed assessment of impacts to aquifers, hydrology, water quality and groundwater dependent ecosystems is provided in: • Technical Paper 4 – Hydrology and flooding • Technical Paper 5 – Water quality • Technical Paper 6 – Groundwater. Given that the majority of watercourses that cross the subject land are ephemeral, impacts to surface water hydrology and flow regimes as a result of construction would be limited in extent. The design of the proposal has been developed to avoid impacts to hydrology and flooding through design criteria. The proposed drainage scenario is designed to mimic existing waterway catchments, flows and flow paths and thus avoiding water quality impacts as a result of changes to flow regimes where practical. The flow paths of watercourses intersected by the proposal would not be altered and drainage infrastructure has been designed to maintain natural processes. The location of proposed culverts has been selected at topographical low points to match existing flow patterns. Ecosystems have been identified within the Subject land that rely on the subsurface presence of groundwater. This includes the following high potential ground water dependent ecosystems (GDEs): • three high potential aquatic (river) GDEs were identified intersecting the subject land, Billabong Creek, Dudauman Creek and Ulandra Creek • four high potential terrestrial (vegetation) GDEs were identified, Blakely's Red Gum, Yellow Box, Western Grey Box and White Cypress Pine. The impact of the Proposal on the underlying groundwater sources was assessed to contain a negligible to low risk to the groundwater environment during both construction and operation. This is principally due to the Proposals cut depths not anticipated to intersect the regional groundwater table for the Lachlan alluvial or Fracture rock groundwater sources. In addition, groundwater is currently not a preferred option to be used to support water supply for construction. The potential groundwater impacts were assessed against the minimal impact considerations of the NSW Aquifer Interference Policy, with the predicted impacts anticipated to be less than level 1 impact considerations. Any residual risk to the groundwater environment would be reduced by the implementation of appropriate groundwater mitigation and management measures.

Prescribed biodiversity impacts	Proposal planning
c) *locating the proposal to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths to important habitat or local movement pathways*	The proposal is located within rural area, and heavily disturbed agricultural settings. Wildlife corridors and landscape connectivity is limited, although some drainage lines associated with the subject land provide local connectivity for more mobile species of animal. The proposal will result in increased fragmentation and loss of connectivity for the movement of species between areas. The proposal design has avoided and minimised impacts to areas which provide connectivity as far as practicable. Where the alignment cannot avoid impact to areas of connectivity such as along Old Sydney Road, the implementation of connectivity mitigation measures will be considered, as outlined in the connectivity strategy (Appendix L). Detailed design is considering wildlife crossing structures that may enhance wildlife connectivity in association with the proposal and assist species movement between habitat patches. Areas where the proposal crosses 3rd order streams and above have been considered during design development to minimise impact on aquatic habitat. Creek crossings which require consideration of fish passage requirements comprise: • Dudauman Creek • Powder Horn Creek • Isobel Creek • Ulandra Creek; and • Billabong Creek. In response to this, bridges have been proposed to allow water from a watercourse to pass under the railway. To ensure that fish passage is maintained, watercourse crossing structures would be designed in accordance with the *Policy and Guidelines for Fish Habitat Conservation and Management Update 2013* (DPI Fisheries 2013). This is discussed in detail in Technical Paper 2 – Aquatic biodiversity.
d) *optimising proposal layout to minimise interactions with threatened entities*	The proposal has been designed to minimise impact to areas of TECs. A multi criteria assessment was undertaken as part of the route selection process. A large survey area was assessed to inform the presence and condition of threatened ecological communities. This has resulted in a decrease in the direct impact to Inland Grey Box Woodland TEC and Box Gum Woodland TEC recorded. Avoidance of Inland Grey Box Woodland TEC along Ironbong Road and both Inland Grey Box Woodland and Box Gum Woodland TECs along Dudauman Road has significantly reduced the overall impact to TECs. In addition, the layout was designed to minimise impacts to threatened species including Superb Parrot and Squirrel Glider which were recorded within the subject land. This included shifting alignment to avoid high quality habitat areas and minimising impacts to connectivity along old Sydney Road and Billabong Creek, Bethungra and Boundary Creek. large river red gums and hollow bearing trees at Ironbong Road and Ulandra Creek. This enabled the proposal layout to minimise interactions with threatened entities. A summary of the specific design responses to avoid and minimise adverse impacts to biodiversity are identified in Chapter 6 of the EIS (alternatives and proposal options) and shown in Figure 6.11 of the EIS.

Prescribed biodiversity impacts	Proposal planning
e) *locating the proposal to avoid direct impacts on water bodies or hydrological processes.*	The proposal will directly impact some mapped water bodies which occur within the existing rail corridor. The proposed drainage scenario is designed to mimic existing waterway catchments, flows and flow paths and thus avoiding water quality impacts as a result of changes to flow regimes where practical. There are no changes to flood afflux, velocity, or duration at the proposals sites and all subject lands achieve the required drainage immunity. As such there would be no changes to the local and regional flow regime that would cause impacts to the water quality to the surrounding environment. Detailed assessment of impacts to aquifers, hydrology, water quality and groundwater dependent ecosystems is provided in: • Technical Paper 4 – Hydrology and flooding • Technical Paper 5 – Water quality • Technical Paper 6 – Groundwater. Mitigation measures incorporating sedimentation and hydrology controls are outlined in Chapter 11.
Designing a project location to avoid and minimise impact on prescribed biodiversity (section 7.2.2 of BAM)	
a) *an analysis of alternative modes or technologies that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed mode or technology*	Chapter 6 of the EIS (alternatives and proposal options) provides a detailed discussion of the alternative and options assessment which included: • strategic alternatives – alternative freight transport solutions • do nothing alternatives • alternative route options • options assessment process and development of preferred alignment • siting of construction compounds and batch plants. The approach to design development has included a focus on avoiding and/or minimising the potential for impacts during all key phases of the proposal. The multi-criteria analysis undertaken during the option selection included consideration of environmental impacts. To further refine the preferred alignment, an environmental constraints workshop was held in January 2019 to identify significant constraints, risks and opportunities that the alignment should seek to avoid through design responses. The workshop provided an overview of the biodiversity (terrestrial and aquatic), heritage and agricultural constraints and suggested design responses. Multiple design options were analysed, and the provided design has minimised impacts to high biodiversity values (i.e. areas with highest vegetation integrity score, threatened ecological communities, Class 3 Scattered Trees and areas of potential habitat for threatened fauna). A summary of the specific design responses to avoid and minimise adverse impacts, including impacts to biodiversity, are identified in Table 6.7 and shown in Figure 6.11 of the EIS. Detailed design may provide further opportunities for minimising the final subject land as far as practical. Ancillary facilities and temporary construction sites will be located within areas of low biodiversity values (i.e. cleared land) and avoid direct impacts to vegetation in high threat status or areas of high biodiversity value as far as practical. Reduction to vegetation clearing has been achieved through reducing the footprint as well as relocation to areas of non-native woody vegetation (cropping and pasture areas). Ancillary facilities (i.e. areas dominated by exotic species, cropped areas). Mitigation measures have been developed to address the direct and indirect impacts of the proposal to prescribed impacts.
b) *an analysis of alternative routes that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed route*	
c) *an analysis of alternative locations that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed location*	
d) *an analysis of alternative sites within a property on which the proposal is proposed that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed site.*	

10 Assessment of impact

The following section describes a summary the potential impacts associated with the proposal in accordance with Chapter 8 of the BAM. This includes impacts during construction and operational phases of the proposal (Table 10.1).

Table 10.1 Summary of potential impacts to biodiversity

Impact	Construction phase	Operation phase
Native vegetation clearing	✓	
Clearing of threatened ecological communities	✓	
Direct impact on threatened flora	✓	
Direct impact on threatened fauna and their habitat	✓	
Clearing of scattered trees	✓	
Fauna injury and mortality	✓	✓
Edge effects	✓	✓
Weed invasion	✓	✓
Introduction of pathogens	✓	
Increased noise, dust and light	✓	✓
Loss of hollow-bearing tree breeding habitats	✓	
Loss of connectivity and/or increase in habitat fragmentation	✓	✓
Changes in hydrology	✓	✓

10.1 Assessment of direct impacts unable to be avoided

Assessment of direct impacts unable to be avoided is prepared in accordance with Section 8.1 of the BAM.

10.1.1 Impacts on native vegetation

The proposal will impact on a total of 77.17ha of native vegetation. The area of each PCT to be affected is shown in Table 10.2. Discussion of relevant key threatening processes related to direct impacts on vegetation is provided in section 10.3.2.

A total of 62.67ha of woodland habitat (which include 2.70ha of planted native vegetation) would be cleared for the proposal as well as 14.43ha of native grassland habitat.

Table 10.2 Direct impacts to native vegetation

Zone ID	PCT	Condition	Habitat type	Current vegetation integrity	Change in vegetation integrity	Future vegetation integrity	Direct impact (ha)
1	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good condition	Woodland	83.8	-83.8	0	1
2		Moderate condition	Woodland	69.8	-69.8	0	12.77
3		Poor condition	Woodland	31.2	-31.2	0	8.56
4		Low condition (Derived Native Grassland)	Grassland	13.5	-13.5	0	1.65
5	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate condition	Woodland	65.0	-65.0	0	1.35
6		Poor condition	Woodland	38.6	-38.6	0	4.96
7	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	Woodland	69.3	-69.3	0	2.88
8		Poor condition	Woodland	33.7	-33.7	0	4.77
9		Low condition (Derived Native Grassland)	Grassland	2.1	-2.1	0	6.55
10	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate condition	Woodland	70.9	-70.9	0	0.87
11		Poor condition	Woodland	29.7	-29.7	0	0.62
12	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate condition	Woodland	70.0	-70.0	0	11.7
13		Poor condition	Woodland	50.6	-50.6	0	2.23
14		Low condition (Derived Native Grassland)	Grassland	2.7	-2.7	0	6.23
15	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Moderate condition	Woodland	52.6	-52.6	0	1.42

Zone ID	PCT	Condition	Habitat type	Current vegetation integrity	Change in vegetation integrity	Future vegetation integrity	Direct impact (ha)
16	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	Woodland	52.5	-52.5	0	0.14
17		Poor condition	Woodland	35.6	-35.6	0	0.29
18	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	Moderate condition	Woodland	87.5	-87.5	0	5.58
19		Poor condition	Woodland	38.1	-38.1	0	0.80
20	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Planted native vegetation	Woodland	54.2	-54.2	0	2.80
Native vegetation directly impacted by the proposal (ha)							**77.17**

10.1.2 Impacts on threatened ecological communities

A total of 69.31ha of the native vegetation is consistent with a threatened ecological community listed under the BC Act. The proposal will have a direct impact on the following two threatened ecological communities:

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions, listed as Endangered under the BC Act.
- White Box Yellow Box Blakely's Red Gum 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, listed as Critically Endangered under the BC Act.

A summary of direct impacts on each threatened ecological community, associated PCT and VZ and extent within the subject land is summarised in Table 10.3.

Table 10.3 Direct impact on threatened ecological communities listed under the BC Act

Threatened ecological community	BC Act	Equivalent vegetation type (and vegetation zone)	Extent within subject land (ha)
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Endangered	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Good condition (VZ1)	1
		PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Moderate condition (VZ2)	12.77
		PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Poor condition (VZ3)	8.60
		PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Low condition (VZ4)	1.65
		PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Moderate condition (VZ5)	1.35
		PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Poor condition (VZ6)	4.96
Total			**30.33**
White Box Yellow Box Blakely's Red Gum Woodland	Critically Endangered	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ7)	2.88
		PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Poor condition (VZ8)	4.77
		PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Low condition (VZ9)	6.55

Threatened ecological community	BC Act	Equivalent vegetation type (and vegetation zone)	Extent within subject land (ha)
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ10)	0.87
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Poor condition (VZ11)	0.62
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ12)	11.70
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Poor condition (VZ13)	2.23
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Low condition (VZ14)	6.23
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Planted native vegetation (VZ20)	2.70
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ16)	0.14
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Poor condition (VZ17)	0.29
Total			**38.98**
Total direct impact on TECs listed under the BC Act			**69.31**

10.1.3 Impacts on candidate threatened species credit species

10.1.3.1 Impacts on threatened flora species

No threatened flora species were recorded within the subject land. . However, not all areas of the subject land were able to be accessed for targeted flora surveys (Figure 3.6). In these areas a precautionary approach was taken and species were assumed to be present if associated PCTs had been mapped in those areas. Based on the assumed presence in these unsurveyed areas, the table below outlines the worst case scenario for habitat clearance.

Table 10.4 Assumed impact on threatened flora species listed under the BC Act in unsurveyed areas

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Area (ha)
Acacia ausfeldii	Ausfeld's Wattle	V	Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	2.5
Acacia ausfeldii	Ausfeld's Wattle	V	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	0.13
Ammobium craspedioides	Yass Daisy	V	Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	2.5
Ammobium craspedioides	Yass Daisy	V	Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland	VZ14	Low – derived native grassland	0.34
Ammobium craspedioides	Yass Daisy	V	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	0.13
Austrostipa wakoolica	A spear-grass	E	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	4.38
Austrostipa wakoolica	A spear-grass	E	Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	0.01
Austrostipa wakoolica	A spear-grass	E	Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate	VZ5	Moderate condition	0.47
Caladenia arenaria	Sand-hill Spider Orchid	E (SAII)	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	4.38
Caladenia arenaria	Sand-hill Spider Orchid	E (SAII)	Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	0.01
Caladenia concolor	Crimson Spider Orchid	E (SAII)	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	0.14
Cullen parvum	Small Scurf-pea	E	Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	2.5

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Area (ha)
Cullen parvum	Small Scurf-pea	E	Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland	VZ14	Low – derived native grassland	0.34
Cullen parvum	Small Scurf-pea	E	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	0.14
Cullen parvum	Small Scurf-pea	E	Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate	VZ18	Moderate condition	2.85
Diuris tricolor	Pine Donkey Orchid	V	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	0.14
Diuris tricolor	Pine Donkey Orchid	V	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	4.38
Diuris tricolor	Pine Donkey Orchid	V	Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	0.01
Diuris tricolor	Pine Donkey Orchid	V	Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate	VZ5	Moderate condition	0.47
Eleocharis obicis	Spike-rush	V	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	4.38
Eleocharis obicis	Spike-rush	V	Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low- derived native grassland	0.01
Euphrasia arguta	Euphrasia arguta	CE (SAII)	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	0.13
Grevillea wilkinsonii	Tumut Grevillea	CE (SAII)	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	0.13

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Area (ha)
Indigofera efoliata	Leafless Indigo	E (SAII)	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	4.38
Indigofera efoliata	Leafless Indigo	E (SAII)	Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	0.01
Lepidium aschersonii	Spiny Peppercress	V	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	4.38
Lepidium aschersonii	Spiny Peppercress	V	Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	0.01
Leucochrysum albicans var. tricolor	Hoary Sunray	–	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	0.14
Prasophyllum petilum	Tarengo Leek Orchid	E	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	0.14
Prasophyllum petilum	Tarengo Leek Orchid	E	Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	2.5
Prasophyllum petilum	Tarengo Leek Orchid	E	Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland	VZ14	Low – derived native grassland	0.34
Prasophyllum sp. Wybong	Prasophyllum Wybong	– (CE under EPBC Act)	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	0.13
Pultenaea humilis	Dwarf Bush-pea	V	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	0.14
Senecio garlandii	Woolly Ragwort	V	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	0.14

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Area (ha)
Swainsona murrayana	Slender Darling Pea	V	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	4.38
Swainsona murrayana	Slender Darling Pea	V	Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low- derived native grassland	0.01
Swainsona murrayana	Slender Darling Pea	V	Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate	VZ5	Moderate condition	0.47
Swainsona recta	Small Purple Pea	E	Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	2.5
Swainsona recta	Small Purple Pea	E	Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland	VZ14	Low – derived native grassland	0.34
Swainsona recta	Small Purple Pea	E	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	4.38
Swainsona recta	Small Purple Pea	E	Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	0.01
Swainsona recta	Small Purple Pea	E	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	0.13
Swainsona sericea	Silky Swainson-pea	V	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	4.38
Swainsona sericea	Silky Swainson-pea	V	Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	0.01
Tylophora linearis	–	V	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	0.14

10.1.3.2 Impacts on threatened fauna species

Two candidate threatened fauna species credit species were recorded within the subject land and identified as affected by the proposal and one more was assumed to be present. Direct impacts to candidate threatened fauna species and their habitat are outlined in Table 10.5 below.

Table 10.5 Direct impact on threatened fauna species listed under the BC Act

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat to be affected (ha)
Little Eagle	*Hieraaetus morphnoides*	V	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ10	Moderate condition	0.05
				VZ11	Poor condition	0.40
			PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	VZ18	Moderate condition	0.39
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ20	Planted native vegetation	0.18
Total area affected						**1.02**
Key's Matchstick Grasshopper	*Keyacris scurra*	E	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate	VZ7	Moderate condition	0.13
			Veg Zone 12: PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate	VZ12	Moderate condition	2.5
			Veg Zone 14: PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Low – derived native grassland	VZ14	Low – derived native grassland	0.34
Total area affected						**2.97**
Southern Myotis	*Myotis macropus*	V	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	VZ18	Moderate condition	5.46
				VZ19	Poor condition	0.71
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ10	Moderate condition	0.76
				VZ11	Poor condition	0.57
Total area affected						**7.5**

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat to be affected (ha)
Squirrel Glider	*Petaurus norfolcensis*	V	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	VZ18	Moderate condition	5.58
				VZ19	Poor condition	0.80
			PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	VZ1	Good condition	1
				VZ2	Moderate condition	12.77
				VZ3	Poor condition	8.60
			PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	VZ5	Moderate condition	1.35
				VZ6	Poor condition	4.96
			PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ7	Moderate condition	2.88
				VZ8	Poor condition	4.77
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ10	Moderate condition	0.87
				VZ11	Poor condition	0.62
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ12	Moderate condition	11.70
				VZ13	Poor condition	2.23
				VZ20	Planted native vegetation	2.8
			PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ16	Moderate condition	0.14
				VZ17	Poor condition	0.29
Total area affected						**61.36**
Superb Parrot	*Polytelis swainsonii*	V	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	VZ18	Moderate condition	4.96
				VZ19	Poor condition	0.26
				VZ1	Good condition	0.88

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat to be affected (ha)
			PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	VZ2	Moderate condition	9.82
				VZ3	Poor condition	5.69
			PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	VZ5	Moderate condition	1.35
				VZ6	Poor condition	2.60
			PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ7	Moderate condition	1.71
				VZ8	Poor condition	4.11
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ10	Moderate condition	0.08
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ12	Moderate condition	9.28
				VZ13	Poor condition	0.37
				VZ20	Planted native vegetation	0.47
			PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ16	Moderate condition	0.14
				VZ17	Poor condition	0.10
Total area affected						**41.81**

10.1.3.3 Loss of hollow-bearing tree breeding habitats

The proposal will include the loss of hollow-bearing trees and has the potential to affect native animals such as:

- hollow-dependent bats (including Southern Myotis)
- hollow-nesting and canopy-nesting birds (including Superb Parrot, a candidate species)
- arboreal mammals (including Squirrel Glider, a candidate species)
- reptiles.

A total of 100 hollow-bearing trees have been recorded within the subject land as shown in Figure 5.4. The total number of hollow-bearing trees will be confirmed and quantified further during detailed design and pre-clearing surveys.

10.1.4 Clearing of scattered trees

A total of 75 Class 1, Class 2 and Class 3 scattered trees were recorded within the subject land. A breakdown of each scattered tree class and associated PCT is provided in Table 10.6.

Table 10.6 Direct impacts on Class 2 & Class 3 scattered trees and associated PCT

table	Associated PCT	Number of scattered trees
Class 3 – with hollows	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	1
	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	29
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	3
	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	2
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	4
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2
Total Class 3 scattered trees with hollows		**41**
Class 3 – with no hollows	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	3
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	3
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	1
Total Class 3 scattered trees with no hollows		**9**

table	Associated PCT	Number of scattered trees
Class 2 – with no hollows	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	1
	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	3
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2
Total Class 2 scattered trees with no hollows		**8**
Total scattered trees		**58**

10.1.5 Injury and mortality

Injury and mortality of fauna could occur during construction activities and during operation and are discussed in this section.

Injury and mortality may occur:

- prior to construction when vegetation and habitat is being cleared
- during construction when machinery and plant is moved to, from and on site
- during operation, as a result of train strike.

All roads and rail have potential to result in the mortality of native animals. Loss in connectivity and/or increase in habitat fragmentation as a result of the proposal may impact the Squirrel Glider, this species is limited by gliding distances between areas of habitat and the proposal is likely to result in an increased risk of train strike in particular due to the use of double-stacked containers (up to 6.5m high). In addition, entrapment of fauna in temporary excavations may also occur during construction.

The risk is higher where roads and rail:

- traverse areas of substantial animal habitat
- are located near natural or artificial water bodies
- contain food sources (e.g. Mown grass verges, nectar-producing shrubs) which attract animals to the road edge
- have high speed limits
- provide poor visibility of wildlife (e.g. due to bends, crests and poor lighting).

While it is not possible to eliminate the risk of roadkill and train strike occurring, it is possible to minimise this through consideration of the above factors in the design of roads/access routes, landscaping, fauna connectivity structures and infrastructure and the implementation of road signs and speed limits.

Minimising road-kill will be delivered in the concept and detailed design processes of the roads and rail infrastructure including fauna crossings and landscaping plans.

It is unlikely that the proposal would contribute significantly to vehicle strike to native fauna, and the consequences of impacts to species are likely to be negligible.

10.2 Assessment of indirect impacts unable to be avoided

The assessment of indirect impacts has been prepared in accordance with Section 8.2 of the BAM. Indirect impacts have been considered in terms of the nature, extent and duration of impacts on native vegetation, fauna habitats, threatened ecological communities and threatened species habitats likely to be affected. The assessment of indirect impacts is presented in Table 10.7.

The vegetation recorded within the subject land mostly occurred within a rural agricultural setting. Currently, edge effects from existing agricultural activities (i.e., cropping and livestock) impact native vegetation and habitat particularly through weed invasion. However, as the proposal involves clearing into good condition native vegetation indirect edge effects are likely to exacerbated. Mitigation measure to minimise the potential Indirect impacts have been developed (Chapter 11) With the application of these measures, the indirect impacts to vegetation and habitats is considered likely to be negligible and no additional credits are considered necessary.

Potential indirect impacts on threatened species habitats as a result of the proposal include habitat fragmentation, introduction and spread of weed and pest species and associated edge effects, introduction and spread of pathogens, noise light and dust impacts and water quality impacts (further detailed in Table 10.7 below). Controls will be put in place as part of the CEMP for the proposal and will include methods to mitigate and manage spread of introduced species, hydrological controls, pollution and sedimentation prevention, and controls to minimise spread of light, dust and noise pollution into the surrounding habitat areas. These impacts are likely to occur during construction and will be predominantly short-term impacts. Due to the generally low numbers of threatened species recorded and lack of active breeding or nesting habitat recorded within the subject land, indirect impacts on threatened species are likely to be negligible with the implementation of controls. The subject land currently occurs within a disturbed agricultural landscape, that is highly fragmented as a result of past and ongoing agricultural activities and vegetation removal as a result of the proposal is unlikely to increase fragmentation significantly for threatened species beyond that currently occurring in the landscape. Most threatened species with potential to occur in the subject land include bird and bat species which are highly mobile and likely to continue to move through the landscape as a contiguous area and cross all gaps created by the linear infrastructure. Habitat fragmentation impacts may present short-term localised barriers for less mobile species and connectivity measures outlined in the preliminary connectivity strategy (Appendix L) are proposed to mitigate any impacts on threatened species movements.

Squirrel Glider was recorded within the subject land and identified as a species potentially impacted by the proposal. No active breeding habitat for this species was identified during surveys, however, hollow-bearing trees with potential to be used by the species as denning habitat were recorded. The subject land currently occurs as a modified agricultural landscape, with remnant vegetation largely restricted to road or riparian corridors. Squirrel Gliders that occur within the subject land are likely accustomed to living with a certain level of disturbance in the agricultural matrix, including indirect impacts of noise, light and dust pollution associated with existing roads and farming practices, and it is likely that existing corridors are used primarily as connectivity for movement to areas of higher quality habitat. Mitigation measures to minimise indirect impacts to habitat areas would be outlined in the Construction Environmental Management Plan (CEMP) for the proposal and could include timing of works to avoid potential breeding habitat areas during key breeding periods. The primary impact from the proposal to Squirrel Glider is likely to be loss of connectivity and fragmentation of habitat patches which can impact the ability of the species to glide through the treeline and has the potential to negatively impact on populations. Connectivity measures, including the addition of connectivity structures and vegetation rehabilitation will be undertaken as part of the proposal to mitigate these impacts and are outlined further in the preliminary connectivity strategy (Appendix L). A species management plan would be also be developed for Squirrel Glider as part of the ongoing monitoring of construction and operational impacts on this species and will address any indirect impact to the species which may impact on local populations.

Superb Parrot was identified as a species that may be impacted by edge effect. Although potential breeding hollows are present, no breeding sites were identified in the survey of a broader corridor. Furthermore, the species often occurs in roadside vegetation and in agricultural land as well as urban areas with little vegetative buffer (Christie 2004, Davey and Purchase 2004, Manning, Lindenmayer et al. 2004, Manning, Lindenmayer et al. 2007). The species is habituated to living in roadside and agricultural areas including associated noise, dust and light. As such, the indirect impacts to potential breeding habitat for threatened Superb Parrot is likely to be negligible. Mitigation measure to minimise the potential Indirect impacts to breeding habitat would be outlined in the CEMP and could include timing of proposed works to avoid the breeding season within 100m of potential or confirmed nest trees. Based on this, the indirect impacts to potential breeding habitat is considered likely to be negligible and as such additional credit calculation for indirect impacts has not been undertaken.

Table 10.7 Assessment of indirect impacts

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Inadvertent impacts on adjacent habitat or vegetation	Construction	All PCTs All fauna Threatened species Threatened ecological communities Aquatic habitat	All PCTs Aquatic habitats associated with creeks and rivers	Short term	**Moderate**. Inadvertent impacts on adjacent vegetation can include a range of indirect impacts including soil disturbance, introduction of weeds, erosion, sedimentation, enriched run-off and water quality. Construction of the proposal has the potential to result in sedimentation and erosion and mobilisation of contaminants within the subject land and into adjoining native vegetation and ephemeral drainage lines, through soil disturbance and construction activities. Sediment laden runoff and spills affect water quality and adversely affect aquatic life particularly during construction near creek lines. The proposal will be designed (where practicable) to minimise impact to these sensitive environmental receivers. The mobilisation of sediments would be contained within the disturbance area as sediment containment measures would be implemented as part of mitigation measures.
Connectivity and habitat fragmentation	Construction/ operational	Native vegetation Threatened species All fauna	All PCTs	Long term	**Moderate**: The removal of native vegetation and splitting of habitat patches can result in habitat fragmentation which is 'physical dividing up of once continuous habitats into separate smaller 'fragments'. The proposal is considered unlikely to result in a large increase to landscape scale fragmentation and to further limit connectivity and movement corridors than what already exists in the subject land, as it occurs within an already highly fragmented landscape with limited large patches of remnant vegetation. The impacts from the proposal would largely involve small areas of disturbance of vegetation patches, which would not result in significant habitat fragmentation. Overall the habitat present within the landscape has been heavily fragmented due to agricultural practices (i.e. cropping and livestock use). Existing connectivity is limited to creeklines and road reserves. These connectivity features link with the largest intact patch of remnant vegetation occurring to the east of the subject land in association with Bethungra and Ulandra Mountain range. Creeklines and associated riparian vegetation, including Billabong Creek, Ulandra Creek, Ironbong Creek and Run Boundary Creek generally run from east to west and provide the remaining link to movement between Bethungra and Ulandra Mountain range to the east and areas to the west. Road reserve vegetation in association with Old Sydney Road, Ironbong Road and Dirnaseer Road are also considered to provide connectivity between remnant patches of woodland to the east and west of the subject land. Linear habitat patches associated with riparian areas and road reserves also create links to smaller isolated patches of habitat and scattered trees within the landscape.

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
					The proposal is likely to result in a reduction in vegetation patch sizes resulting in minor increases in localised fragmentation of the regional wildlife patches along the mentioned creeklines and road reserves. Due to the importance of connectivity, dispersal opportunities and habitat quality for species at a local scale, this impact has the potential to be negative to the dispersal of relatively sedentary species such as mammals, frogs, and reptiles. Loss in connectivity and/or increase in habitat fragmentation as a result of the proposal may impact the movement of Squirrel Glider, which is limited by gliding distances between areas of habitat. Fragmentation and increases in mortality may reduce gene flow and gene pool and lead to inbreeding depression in remnant populations of Squirrel Glider with greater risk of loss due to mortality and catastrophes (such as wildfires). For long-term viability of populations fragments must be functionally linked to large remnants or multiple smaller habitat patches. Habitat for the Squirrel Glider becomes fragmented once tree spacing becomes beyond their gliding capacity. Squirrel Gliders primarily move through their home range by gliding from tree to tree with an average glide length of 30–40m (van der Ree 2002). General locations for fauna connectivity have been identified and advice on design of fauna crossing structures provided which takes into consideration the height of remaining trees, gap between trees, train heights and the gliding angle of Squirrel Gliders and is considered to enable ongoing east-west corridor movements. Any proposed fencing in areas of biodiversity (e.g. woodlands including areas of connectivity), should conform to a native fauna-friendly design as outlined in the connectivity strategy (Appendix L). Fauna such as Squirrel Gliders, owls and flying foxes are known to become entangled on barbed wire fences and these should not be used in areas where the railway line intersects native vegetation. Implementation of connectivity structures and mitigation measures (as outlined in the connectivity strategy in Appendix L) would provide beneficial links to existing wildlife movement corridors and limited the effects of habitat fragmentation. The predicted level of fragmentation from the proposal is not expected to be enough to prevent the breeding and dispersal of plant pollinators or the dispersal of plant propagules (i.e. seed or other vegetative reproductive material) between habitat patches. The existing functional connectivity for many species (including small woodland birds and ecosystem credit species) would remain in the subject land and be alleviated with connectivity mitigation measures.

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Reduced viability of adjacent habitat due to edge effects	Construction/ operational	Native vegetation	All PCTs and habitats	Long term	**Minor:** Edge effects create vulnerable areas subject to degradation by the establishment and spread of weeds, enriched run-off from road pavement and dumping of rubbish and have the potential to reduce the viability of adjacent habitat long-term. It is listed as a Key Threatening Processes under BC Act. Currently, edge effects from existing agricultural activities (i.e. cropping and livestock) impact native vegetation particularly through weed invasion. However, as the proposal involves clearing into good condition native vegetation this impact is likely to exacerbated and introduce this impact into additional areas of native vegetation and habitat. The vegetation recorded within the subject land mostly occurred within a rural agricultural setting with some degree of weed invasion. Vegetation recorded in good and moderate condition and/or with connectivity to larger patches of vegetation is most vulnerable to edge effects.
Reduced viability of adjacent habitat due to noise, dust or light spill	Construction/ operational	Native vegetation Threatened species Threatened ecological communities	All PCTs	Short term	**Minor:** Noise, dust, light and contaminant pollution are indirect impacts that are likely to result from activities associated with the proposal. These impacts are likely to have cumulative effects. Noise, dust, light and contaminant pollution are likely to occur from all proposal activities, although will be greatest where activities take place near vegetated areas and during construction. During construction of the proposal, increased noise and vibration levels in the subject land and immediate surrounds are likely due to vegetation clearing, ground disturbance, machinery and vehicle movements, and general human presence. The noise and vibration from activities associated with the proposal would potentially disturb fauna and may disrupt foraging, reproductive, or movement behaviours. The impacts from noise emissions are likely to be temporary in nature and localised to the construction areas. They are not considered likely to have a significant, long-term impact on wildlife populations outside the area of impact. Assessment of noise and vibration impacts is provided in Technical papers 8, 9 and 10). Elevated levels of dust may be deposited onto the foliage of vegetation adjacent to the subject land activities. This has the potential to reduce photosynthesis and transpiration and cause abrasion and heating of leaves resulting in reduced growth rates and decreases in overall health of the vegetation. Dust pollution is likely to be greatest during periods of substantial earthworks, vegetation clearing, vehicle movements for construction and decommissioning activities and during adverse weather conditions. However, deposition of dust on foliage is likely to be highly localised, intermittent, and temporary and is therefore not considered likely to be a major impact of the proposal. Assessment of air quality vibration impacts is provided in Technical paper 15 – Air quality).

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
					Ecological light pollution is the descriptive term for light pollution that includes direct glare, chronic or periodic increased illumination, and temporary unexpected fluctuations in lighting (including lights from a passing trains), that can have potentially adverse effects on wildlife. Night works may be required during the construction phase of the proposal and will increase light pollution. The changes to light conditions associated with the construction phase of the proposal are temporary and would therefore be unlikely to have a significant impact on local fauna populations. Landscape and Visual Impact Assessment is provided in Technical Paper 13. During the construction phase localised release of contaminants (i.e. hydraulic fluids, oils, fluids, etc.) into the surrounding environment (including drainage lines) could accidentally occur. The most likely result of contaminant discharge would be the localised contamination of soil and potential direct physical trauma to flora and fauna that come into contact with contaminants. Any accidental release of contaminants is likely to be localised and would be unlikely to have a significant effect on the environments of the subject land, particularly due to the implementation of mitigation measures to immediately address any spills.
Transport of weeds from the site to adjacent vegetation	Construction/ operational	Native vegetation Threatened ecological communities	All PCTs	Long term	**Minor:** The clearing of native vegetation for the proposal, including earthworks would increase the potential for weed invasion into adjacent patches of native vegetation. Management measures would be required to minimise the risk of introduction and spread of weeds, particularly high threat weeds. A biosecurity assessment undertaken for the project provides further detailed assessment (Chapter 18 of the EIS). High threat weeds within the subject land include: • *Alternanthera pungens* • *Bromus diandrus* • *Chamaecytisus palmensis* • *Chloris gayana* • *Heliotropium amplexicaule* • *Hypericum perforatum* • *Lycium ferocissimum* • *Olea europaea* • *Paspalum dilatatum* • *Romulea rosea* var. *australis* • *Rosa rubiginosa* • *Schinus mole* • *Xanthium spinosum*

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Transport of pathogens from the site to adjacent vegetation	Construction	Native vegetation Threatened ecological communities	All PCTs	Short term	**Minor:** The proposal has the potential to increase the spread of pathogens that threaten native biodiversity values, such as the soil-borne pathogen *Phytophthora cinnamomi* (Phytophthora) and *Austropuccinia psidii* (Myrtle rust). Phytophthora infects root systems whereas Myrtle Rust deforms leaves and leads to heavy defoliation. Both pathogens are associated with damage and death to native plants and may be dispersed over large distances. Phytophthora can be spread through flowing water, such as storm runoff, or may be spread within a site via mycelial growth from infected roots to roots of healthy plants. Propagules of Phytophthora may also be dispersed by vehicles (e.g. cars and earth moving equipment), animals, walkers and movement of soil. Myrtle rust spores can be spread easily via contaminated clothing, hair, skin and personal items, infected plant material, equipment as well as by insect/animal movement and wind dispersal. The proposal construction activities are likely to lead to an increased risk of dispersal of Phytophthora and/or Myrtle Rust through works involving soil disturbance. This indirect impact corresponds to several Key Threatening Processes listed under BC Act: • infection of native plants by *Phytophthora cinnamomi* introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae. The construction and operation of the proposed modification may increase the risk of these KTPs however, this will be minimised through mitigation measures (see section 10.5 and Chapter 11).
Increased risk of starvation, exposure and loss of shade or shelter	Construction	All fauna species	All PCTs	Short term	**Minor.** Displacement of resident fauna species during native vegetation clearing is considered relatively low due to the extensive vegetation adjacent to the subject land. Given the clearing associated with the proposal would be small narrow areas across a 42km linear development and the relative mobile nature of most potential resident fauna species, the increased risk of starvation, exposure and loss of shade or shelter due to the proposal is likely to be low.

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Loss of breeding habitats	Construction	All fauna species	All PCTs	Long term	**Moderate.** The loss of breeding habitat such as hollow-bearing trees and fallen timber has the potential to affect native animals such as: • hollow-dependent mammals • hollow-nesting and canopy-nesting birds • arboreal mammals • reptiles. The loss of breeding habitats is unlikely to extend beyond the subject land. Impacts beyond this area would be avoided through mitigation and management measures.
Increase in predatory species populations	Construction/ operation	All fauna species	All PCTs	Long term	**Minor.** Predation by feral cats and the Fox are listed as key threatening processes under the BC Act and have potential to impact local fauna populations in adjacent habitat. It is unlikely that the proposal would further exacerbate the impact predator species populations than what currently exists within the locality.
Reduction in water quality	Construction/ operational	Hydrology	All PCTs Aquatic habitats associated with creeks and rivers	Long term	**Minor.** Unmanaged construction activities (such as earthworks, relocation of utilities and removal of vegetation) could result in: soil erosion, siltation and off-site movement of eroded sediments by stormwater, contributing to increased levels of turbidity and sediment deposition, decreased dissolved oxygen, and change pH levels in surrounding waterways. In addition, accidental fuel and chemical stills and contaminated runoff from construction vehicles, plant, equipment or chemical storage areas have the potential to reach waterbodies and streams within and adjacent to the subject land. Other possible sources of reduction in water quality would be disturbance of any contaminated land. An increase in impervious surfaces, although minor, may result in an increased volume of runoff, which would lead to increased scouring, erosion and sedimentation. Run-off may carry increased sediment loads and nutrients (such as nitrogen and phosphorus), surrounding waterbodies and streams within and adjacent to the subject land. Water quality is assessed in Technical Paper 5.

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Changes to geomorphology of watercourse	Construction/ operational	Hydrology	All PCTs Aquatic habitats associated with creeks and rivers	Long term	**Minor.** Small sections of mapped water bodies or streams will be crossed because of the proposal, these areas are small in extent and considered negligible, given the implementation of environmental safeguards. Loss of habitat would occur as a result of construction activities (such as earthworks and removal of vegetation). Works within the riparian zone would be minimised as far as practicable. All areas of retained native vegetation will be subject to vegetation management to enhance biodiversity values of adjacent stream and creeks. Temporary changes in creek flows and velocities downstream of waterbodies and creeks within the subject land may occur as a result of construction activities (such as earthworks, relocation of utilities and removal of vegetation). Implementation of water controls and runoff will be implemented to ensure any indirect impacts to creek flows and velocities are not significantly changed and to avoid any erosion and bed and bank stability impacts. Mobilised sediment could build up in the waterways in and downstream of the subject land. Impermeable surfaces created by the proposal are considered minor although may lead to increases in the volume and rate of runoff, which could cause erosion within the instream channel. Changes to the geomorphology of watercourses from surface water runoff during operation of the proposal is considered negligible, given the implementation of stormwater controls and environmental safeguards. Drainage works would be designed to prevent scouring of creeks and drainage lines. Hydrology and flooding Impact Assessment is provided in Technical Paper 4.

(1) Consequences follow risk criteria outlined in Appendix G of the EIS: Major – Considerable environmental damage – requiring remediation; Moderate – Localised/clustered environmental damage – requiring remediation; Minor – Isolated environmental damage – minimal remediation required

10.3 Assessment of prescribed biodiversity impacts

Assessment of prescribed impacts is prepared in accordance with Section 8.3 of the BAM and is outlined below.

10.3.1 Karst, caves, crevices, cliffs, rocks and other features of geological significance

No karst, caves, crevices, cliffs or other features of geological significance occur within the subject land or will be affected by the proposal.

Rocky habitat in the area is patchy, with limited connectivity to better quality potential habitat. Some rock outcrops occur within and adjacent to the subject land, however no direct impacts of the proposal would impact threatened fauna species that occur in association with rocky habitats. Indirect impacts will be mitigated and unlikely to lead to significant impact to associated species.

10.3.2 Connectivity

Clearing of vegetation can result in habitat fragmentation. Habitat fragmentation can result in reduced dispersal and reproductive success of biota within the fragment, a decline in populations resulting from increased predation by introduced species or native species that do not normally occur in the community, and an increased probability that stochastic events (e.g., fire) may reduce population numbers below critical levels required for their survival (Andrews 1990). Some species are at greater risk in fragmented landscapes than others as a result of their ecological requirements and/or behaviour. The threat posed by fragmentation is increased for species with large home ranges, which migrate or disperse over long distances, those that have specialised dietary or habitat requirements (Jackson 2000) and those with poor dispersal ability (Forman, Sperling et al. 2003, Niebuhr, Wosniack et al. 2015). In general, larger fragments are less susceptible to adverse impacts than are smaller fragments.

The proposal is located within a highly fragmented agricultural landscape that has already been highly fragmented through activities such as cropping and livestock use, with limited large patches of remnant vegetation. The largest patch of remnant vegetation within the vicinity of the subject land occurs to the east and encompasses the Ulandra Nature Reserve and surrounding Bethungra and Ulandra Mountain range (connected to the subject land largely by vegetated road and riparian corridors). This nature reserve is known to contain important reproductive and foraging resources for Superb Parrot and significant habitat for the Turquoise Parrot along with other regionally uncommon species (Department of Climate Change Energy the Environment and Water 2023). Key creeklines and associated riparian vegetation, generally run from east to west and link Bethungra and Ulandra Mountain range to the east and areas of habitat to the west including:

- Billabong Creek
- Ulandra Creek
- Ironbong Creek
- Run Boundary Creek.

In addition, road reserve vegetation also provides connectivity between remnant patches of woodland to the east and west of the subject land. Linear habitat patches associated with riparian areas and road reserves also create links to smaller isolated patches of habitat and scattered trees within the landscape. Key road reserves providing connectivity within the subject land include:

- Old Sydney Road
- Ironbong Road and
- Dirnaseer Road.

Stepping stone connectivity is also provided by:

- small, isolated patches of woodland within farmland
- paddock trees.

Habitat fragmentation as a result of the proposal would be largely localised, resulting in minor increases in fragmentation of the regional wildlife patches along the mentioned creeklines and road reserves. The residual impact following mitigation is considered negligible. A detailed assessment is provided in Table 10.8.

Table 10.8 Assessment of impacts to connectivity

Criteria	Discussion
(a) identify the area/s of connectivity joining different areas of habitat that may serve as movement corridors for threatened species	Within the subject land, connectivity is provided through: • densely vegetated areas along road corridors (i.e., Old Sydney Road, Ironbong Road) • vegetated strips along smaller roads, paper roads and travelling stock reserves • vegetated riparian corridors (i.e., Billabong Creek, Bethungra and Boundary Creek Ulandra Creek) particularly those containing large river red gums and hollow-bearing trees • stepping stone connectivity provided by: – small, isolated patches of woodland within farmland – paddock trees.
(b) identify the species and ecological communities likely to benefit from the connectivity	**Roadside remnants and travelling stock reserves** A diversity of taxa use these habitats including birds, arboreal mammals, reptiles and frogs. Threatened species such as Superb Parrots are likely to make use of these habitats for foraging and breeding, and Squirrel Gliders are likely to rely on remnants around Old Sydney Road and Ironbong Road for foraging and dispersal. **Riparian corridors** Riparian corridors provide critical landscape linkages for all native fauna including fish, small and large terrestrial animals such as reptiles, frogs, kangaroos, wallabies and more mobile arboreal species such as birds, possums, gliders and bats. These habitats provide important foraging resources for threatened species during local and regional movements such as Regent Honeyeater, Superb Parrot, Southern Myotis along with roosting and breeding resources, particularly in areas with large hollow-bearing trees and river red gums. **Stepping stone connectivity** Stepping stone connectivity is provided through the subject land by small patches of woodland vegetation retained in farmland, as well as isolated paddock trees. This vegetation type is often highly modified by grazing, clearing and other agricultural practices and depending on patch size and distance between remnants, these areas often lack critical functional attributes and connectivity required to support species for prolonged period or meet minimum home-range size. However isolated remnants are often critical 'stepping stone' features to allow movement of native fauna through predominantly cleared agricultural land. These areas are particularly important for mobile species such as birds and bats. Other species such as Squirrel Gliders may use isolated remnants for movements on occasion (depending on distance between trees).

Criteria	Discussion
(c) describe the nature, extent and duration of short and long-term impacts	Railways can have direct impacts to fauna connectivity through habitat loss and fragmentation and injury and mortality. **Habitat loss/fragmentation** Habitat loss and resultant fragmentation impacts from railways can have direct impacts on native fauna species by limiting genetic exchange between individuals, changing habitat condition along the railway corridor and immediate environment, creating disturbance to surrounding populations (i.e., through noise, lights, foot traffic and pollution impacts) and providing a direct barrier to individual movement. Barriers to wildlife from railways can be both behavioural (i.e., preventing movement due to perceived risk) and physical. Both individual and population-level impacts of habitat fragmentation vary considerably depending on the species. Species that have high mobility such as birds and bats and commonly occurring species are often less likely to be impacted by fragmentation effects at a population level, while rare or threatened species may be at high extinction risk if fragmentation impacts are unmitigated. Population level impact may not be able to be detected for many years and requires ongoing monitoring (Borda-de-Água, Barrientos et al. 2017). **Injury/mortality** Railways are known to result in mortality for a diversity of taxonomic groups (including birds, mammals, reptiles, amphibians) with existing data available from a variety of different continents (Van der Grift 1999, Forman, Sperling et al. 2003, Davenport and Davenport 2006, Dorsey, Olsson et al. 2015) and can have long-term impacts on population viability and genetic exchange, particularly for vulnerable species (rare/threatened species). Globally, collision impacts of rail projects have been scarcely studied in comparison to road impacts. However, rates of railway mortalities are often lower than roads, due to a combination of factors including lower travel frequency, often narrower corridor width increased vibration leading to warning of approach. However, impacts of rail collisions, frequently lead to mortality due to speed of travel and difficulties in stopping. Overall, rail traffic along the alignment, is generally predicted to be low. It is estimated that the Illabo to Stockinbingal section of Inland Rail would be trafficked by an average of 6 trains per day (both directions) in 2026, increasing to 11 trains per day (both directions) in 2040. This low traffic rate means rail-related wildlife mortalities are unlikely to be significantly increased beyond that currently occurring in the area, despite direct impacts often resulting in mortalities. Squirrel Glider is a species at a slightly higher risk from both rail-related habitat fragmentation and mortality, due to the increased gap created between suitable gliding habitat from the proposal and the substantial height of the proposed trains (up to 6.5m high for those carrying double-stacked containers) which may increase the likelihood of gliding into trains or infrastructure for the species. Superb Parrot may also have increased risk of mortality where potential foraging resources (i.e., grass seeds, spilt grain) occur near the rail corridor. However, there is likely to be very little habitat resources within the rail corridor itself (i.e., general lack of native grasses, cereal crops or spilt grain used for ground-foraging within the immediate corridor infrastructure). This, combined with the low rate of traffic along the alignment mean overall train-strike risk to Superb Parrot is considered to be low

Criteria	Discussion
(d) describe, with reference to relevant literature and other reliable published sources of information, the importance of the area of connectivity within the bioregion	Due to the modified agricultural landscape, connectivity within the bioregion is largely restricted to remaining patches of remnant vegetation, particularly along road and riparian corridors. The largest patch of remnant vegetation within the vicinity of the proposal occurs to the east and encompasses the Ulandra Nature Reserve and surrounding Bethungra and Ulandra Mountain range. This nature reserve is known to contain important reproductive and foraging resources for Superb Parrot and significant habitat for the Turquoise Parrot along with other regionally uncommon species (Department of Climate Change Energy the Environment and Water 2023). Within the bioregion there are a number of other patches of remnant vegetation both to the east and west of the subject land, though existing landscape fragmentation likely restricts regular movements to a lot of these areas for less mobile species. Some important habitat areas within the vicinity of the proposal include: • Combaning State Conservation Area • Flagstaff Memorial Nature Reserve • Jindalee National Park • South West Woodland Nature Reserve • Ingalba Nature Reserve. **Riparian corridors** Riparian corridors are a critical habitat type for a number of different species, providing crucial connectivity to adjacent habitats and often provide some of the few remaining good quality tracts of remnant vegetation for native fauna in modified agricultural landscapes. Even small, narrower corridors through agricultural land provide important habitat for movement of small woodland birds and wider roaming native species such as macropods (Johnson, Reich et al. 2007, Borchard, McIlroy et al. 2008). **Road reserves and travelling stock reserves** Like riparian corridors, vegetation along roadsides often constitutes a significant proportion of the remaining extent of native vegetation in agricultural landscapes. These areas can provide important refuges for populations of many native plants, particularly shrubs and understorey species which can constitute critical habitat for threatened birds and provide corridor linkages for small bird species (Spooner and Lunt 2004). **Isolated vegetation patches and paddock trees** Small patches and scattered trees are highly modified by grazing, clearing and other agricultural practices and depending on patch size and distance between remnants, these areas often lack critical functional attributes and connectivity required to support species for prolonged period or meet minimum home-range size. However isolated remnants are often critical ‘stepping stone’ features to allow movement of native fauna through predominantly cleared agricultural land. These areas are particularly important for mobile species such as birds and bats. Other species such as Squirrel Gliders may use isolated remnants for movements on occasion (depending on distance between trees).

Criteria	Discussion
e) predict the consequences of the impacts for the bioregional persistence of the suite of threatened species and communities currently benefitting from the connectivity with reference to relevant literature and other published sources of information and taking into consideration mobility, abundance, range and other relevant life history factors.	**Squirrel Glider** Operation of the rail line would affect movement of Squirrel Gliders. Family groups may have their habitat bisected, or different family groups may become isolated. This species has an average glide distance of 21.5 metres (range 9–47 metres) in a horizontal plane and mean glide angle of 28.5° (Goldingay and Taylor 2009). Based on the glide angle and glide distance, a tree-gap of 20 metres (i.e. a two-lane road) or 43 metres (i.e. a four-lane road) will need to have trees a least 13 metres and 25 metres tall, respectively, to enable animals to safely glide across the gap (Taylor and Goldingay 2009). Where taller trees are present along the rail line gliders would be able to cross the gap, although the gap created may be at or near the limit of the species gliding distance. This would be exacerbated by the height of trains, which may carry stacked containers, and could result in mortality of individuals through train strike. Given the low number of trains proposed, the risk of mortality from wildlife-train collision is relatively low. Impacts would be reduced by locating connectivity structures such as rope bridges where there is fragmentation of their habitat. The position would be determined during detailed design to ensure locations are appropriate. A draft connectivity strategy is provided in Appendix L. **Birds and Microchiropteran bats** Given the mobility of bird and bat species, linear nature of clearing, and large area of available habitat, the proposal is unlikely to fragment habitat to such a degree that these mobile species could not move across the landscape. However, the alignment may have a short-term localised impact for more smaller or less mobile species. These impacts would be reduced through connectivity and mitigation measures. A draft connectivity strategy is provided in Appendix L.

10.3.3 Movement of threatened species

Threatened species with particular movement patterns that occur in the subject land include the Superb Parrot, Regent Honeyeater, Swift Parrot and Large Bent-winged Bat. These species make long distance movements between foraging and breeding areas. The construction and operation of the proposal is unlikely to impact the movement patterns of these species. While habitat will be removed along the alignment, alternate foraging (and/or breeding) habitat will remain in adjacent areas. Construction of the proposal would not affect movement of these species, given their high mobility and ability to traverse large areas of cleared land. The residual impact is considered negligible. A detailed assessment is provided below in Table 10.9.

Table 10.9 Assessment of impacts to movement of threatened species

Criteria	Discussion
(a) identify movement patterns key to the life cycle of relevant threatened species that intersect with the subject land	Most threatened fauna species that have been identified as relevant to the proposal are resident in the area. Species that move for particular parts of their life cycle include: • Superb Parrot. At least part of the population of this species undertakes regular seasonal movements, vacating the breeding area after the conclusion of the breeding season, and then returning in spring. Most of the breeding population from the inland slopes appears to move to the eucalypt-pine woodlands on the plains of west-central and north-central NSW. Movements are said to occur when eucalypts flower, and when food becomes scarce due to drought and birds seek alternative sources of food (Higgins 1999). • Large Bent-winged Bat. This species breeds in specific maternity caves over summer, and disperse outside of this period over a distance of about 300 kilometres to other roosting habitat. • Regent Honeyeater. The Regent Honeyeater breeds at four main locations in NSW and disperses outside the breeding season to foraging habitat. Habitat loss would decrease availability of winter forage for individuals that may occur, but would not affect the ability of this species to move between foraging and breeding areas. No important foraging habitat for the species would be removed by the proposal. • Swift Parrot. The Swift Parrot breeds in Tasmania and migrates to the mainland outside the breeding season. Habitat loss would decrease availability of winter forage for individuals that may occur, but would not affect the ability of this species to move between foraging and breeding areas. No important foraging habitat for this species would be removed by the proposal.
(b) describe the nature, extent and duration of shortand long-term impacts	The construction and operation of the proposal is unlikely to impact the movement patterns of these species. While habitat will be removed along the alignment, alternate foraging (and/or breeding) habitat will remain in adjacent areas. Construction of the proposal would not affect movement of these species, given their high mobility and ability to traverse large areas of cleared land.
(c) describe, with reference to relevant literature and other reliable published sources of information, the importance of the movement of the threatened species to their life cycle	Movement of Large Bent-winged Bats is essential for their survival, as they rely on specific maternity caves for breeding, but forage and roost in a range of locations for the remainder of the year. Movement of the Superb Parrot is important for much of the population. This species relies on specific roost habitats for breeding, but disperses large distances outside the breeding season in search of seasonal foraging resources. Movement of the Regent Honeyeater and Swift Parrot are essential for their survival, as they are migratory/nomadic species and breeding and foraging habitat are located in different regions/areas and they rely on seasonal foraging resources.
(d) predict the consequences of the impacts for the bioregional persistence of the threatened species, with reference to relevant literature and other published sources of information	The ability of these species to move between their breeding and foraging areas will not be impacted by the rail line. As such, the proposal is unlikely to affect the bioregional persistence of species with reference to their movement patterns.

10.3.4 Vehicle strike

During construction the increase in construction vehicle movements and increase in road use means potential vehicle strike to native fauna is likely to occur.

While it is not possible to eliminate the risk of roadkill occurring, it is possible to minimise this through roads/access routes, and the implementation of road signs and speed limits.

However, due to the subject land being within a construction area it is likely that low speed limit zones will be established. Thus, it is unlikely that the subject land would result in significant levels of roadkill mortality of threatened species. Minimising vehicle strike will be delivered in the concept and detailed design processes of the roads.

During operation, potential train strike to native fauna is likely to occur due to the increase in train movements and train height. While it is not possible to eliminate the risk of train strike, minimising vehicle strike during operation will be delivered in the concept and detailed design processes of the rail infrastructure including fauna crossings and landscaping plans.

A range of fauna species are at risk of vehicle strike during construction and train strike during operation of the proposal. Given the low number of train movements proposed, risk of wildlife-train collisions are likely to be relatively low, although would occur on occasion. Fauna connectivity measures including bridges and culverts and mitigation measures such as barrier poles at bridges and fencing in agricultural areas are likely to reduce the risk of vehicle and train strike. Further adaptive management measures would be implemented if required as a result of monitoring during operation. The residual impact is considered minor.

10.3.5 Human made structures

The proposal is located predominantly in agricultural land, and few human-made structures of relevance to threatened fauna will be removed by the proposal.

Structures that may be of relevance include wooden fence posts and wooden telegraph poles. A number of microbat species, including threatened species are known to roost in posts and their removal has the potential to disturb roosting microbats, and could potentially result in mortality of individuals. These species may also roost in paddock trees and other hollow-bearing trees along the alignment, and would not rely on human-made structures.

Mitigation measures are recommended to minimise the risk of mortality of bats during the removal of structures. The residual impact is considered negligible.

10.3.6 Non-native vegetation

The proposal is located predominantly in agricultural land and as such a large proportion of the subject land comprises cleared or cropped land. Small areas of non-native plantings occur, predominantly associated with landscaping associated with property entrances or gardens These provide habitat for common fauna species. Mobile threatened species may occur on occasion, but are unlikely to rely on these areas for their survival in the locality. Terrestrial species such as kangaroos would forage in and move through cropped land. A discussion of impacts on connectivity and movement is provided in section 10.3.2 and 10.3.3.

All construction sites, compounds and access routes would be rehabilitated following construction. Site reinstatement and rehabilitation would be undertaken progressively within each construction works area during the works, and would include revegetation where required. The residual impact is considered negligible.

10.3.7 Water quality, water bodies and hydrological processes

Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities are assessed as prescribed impacts.

The proposal crosses four waterways, Billabong Creek, Ulandra Creek, Ironbong Creek and Run Boundary Creek.

No terrestrial threatened ecological communities that are associated with riparian or swamp habitats are present in the subject land. Riparian vegetation associated with these waterways provides habitat for a range of threatened fauna species. Riparian corridors provide critical landscape linkages for all native fauna including fish, small and large terrestrial animals such as reptiles, frogs, kangaroos, wallabies and more mobile arboreal species such as birds, possums, gliders and bats. These habitats provide important foraging resources for threatened species during local and regional movements such as Regent Honeyeater, Superb Parrot, Southern Myotis along with roosting and breeding resources, particularly in areas with large hollow-bearing trees and river red gums. A total of 4.94ha of native riparian vegetation would be impacted (Technical Paper 2 – Aquatic biodiversity). Farm dams and small areas of wetland vegetation may provide habitat for transient threatened or migratory waterbirds. Although some threatened species may utilise waterbodies intermittently, no threatened entity was identified to be dependent on waterbodies for part of their life cycle.

The existing hydrological conditions of the subject land are already affected by altered landform because of surrounding land uses. The proposal may result in further alteration to the hydrology of the subject land due to changes in landform and the introduction of new infrastructure. The addition of water crossing structures results in an increase in the number of impervious surfaces than was previously present in the landscape. This would cause an increase in the volume of runoff that is able to mobilise to the waterway, which can lead to increased erosion and sedimentation downstream. The increase in runoff may contain sediments and gross pollutant and could have elevated levels of heavy metals (from brake pads and track wear and points use) or organics due to minor oil, grease and diesel spills from locomotives operating along the track.

Small sections of mapped water bodies or streams will be crossed because of the proposal, these areas are small in extent and considered negligible, given the implementation of environmental safeguards. Loss of habitat would occur as a result of construction activities (such as earthworks and removal of vegetation). Works within the riparian zone would be minimised as far as practicable. All areas of retained native vegetation will be subject to vegetation management to enhance biodiversity values of adjacent stream and creeks.

Temporary changes in creek flows and velocities downstream of waterbodies and creeks within the subject land may occur as a result of construction activities (such as earthworks, relocation of utilities and removal of vegetation). Implementation of water controls and runoff will be implemented to ensure any indirect impacts to creek flows and velocities are not significantly changed and to avoid any erosion and bed and bank stability impacts.

Impermeable surfaces created by the proposal are considered minor although may lead to increases in the volume and rate of runoff, which could cause erosion within the instream channel. Mobilised sediment could build up in the waterways in and downstream of the subject land.

Changes to the geomorphology of watercourses from surface water runoff during operation of the proposal is considered negligible, given the implementation of stormwater controls and environmental safeguards. Drainage works and water crossings would be designed to ensure retention of existing flows and prevent scouring of creeks and drainage lines.

Water crossings will be designed to ensure retention of existing flows as much as practicable and include scour protection.

Given the generally ephemeral nature of the waterways in the subject land and proposed mitigation measures, changes to hydrology and water quality are likely to be minimal in the context of impacts on riparian habitat relevant to threatened species.

The residual impact is considered negligible.

10.4 Assessment of impacts on Matters of National Environmental Significance

10.4.1 Threatened ecological communities

Two threatened ecological communities listed under the EPBC Act would be impacted:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

10.4.1.1 Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia

An assessment of significance has been completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts 2013), and is provided in Appendix F. The outcome of this assessment is that the proposal is likely to have a significant impact on Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived grasslands of south-east Australia for the following reasons:

- The proposal would clear 16.76ha of the community, equivalent to approximately 0.003% of the remaining extent of the community.
- The proposal will fragment eight patches of the community and is likely to exacerbate fragmentation at a regional scale that is likely to be significant to the community given its already fragmented state.

10.4.1.2 White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

An assessment of significance has been completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts 2013), and is provided in Appendix F. The outcome of this assessment is that the proposal is likely to have a significant impact on White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands for the following reasons:

- The proposal would clear 17.48ha of the community in moderate to good condition.
- The proposal will create fragmentation in large patches and roadside remnants of Box-Gum Woodlands and increase fragmentation between smaller patches.
- Given the currently highly fragmented and degraded state of this ecological community, all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria should be considered critical to the survival of this ecological community. As such all occurrences of EPBC-listed Box-Gum Grassy Woodland within the subject land are considered habitat critical to the survival of this community.

10.4.2 Threatened species

No threatened flora species were recorded despite targeted surveys and are therefore unlikely to be impacted by the proposal.

One EPBC listed fauna species was recorded, Superb Parrot (*Polytelis swainsonii*), and five additional fauna species are considered to have a moderate likelihood of occurring within the subject land.

An assessment of significance has been completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts 2013), and is provided in Appendix F for threatened species listed under the EPBC Act with moderate or higher likelihood of occurrence. The assessments determined that the proposal is unlikely to lead to a significant impact on threatened fauna species or their habitat, listed under EPBC Act (Appendix F).

Table 10.10 Summary of assessment of impacts to EPBC Act listed fauna

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Likely impacts
Regent Honeyeater	*Anthochaera phrygia*	CE	PCT 79, PCT 266, PCT 276, PCT 277, PCT 347	**Not significant** The subject land would only provide marginal foraging habitat for the species during seasonal movements to utilise blossoming eucalypts. It is unlikely that the subject land is relied upon by the species to forage or breed. The proposal has been identified to impact on about 32.58ha of potential foraging habitat.
Swift Parrot	*Lathamus discolor*	CE	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Not significant** Occurrences are likely to be rare but cannot be discounted. Subject land is outside of species known breeding habitat. Subject land would form potential foraging habitat for the species during blossoming events. The proposal has been identified to impact on about 61.36ha of potential foraging habitat.
Superb Parrot	*Polytelis swainsonii*	V	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Not significant** Species likely to utilise the subject land for both foraging and breeding habitat. The proposal has been identified to impact on up to 75.69ha of potential foraging habitat, of which 41.81ha is potential breeding habitat.
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	PCT 79, PCT 76, PCT 266, PCT 276, PCT 277	**Not significant** Records within the locality are scarce and no camps occur within the subject land. It is unlikely that the species relies on the subject land for foraging or breeding purposes. As a precautionary an EPBC assessment of significance was undertaken for the species. The proposal has been identified to impact on about 54.52ha of potential foraging habitat.
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	PCT 80, PCT 266	**Not significant** Targeted surveys including Anabat recordings and harp trapping did not capture any individuals, however, based on habitat assessments, identified microhabitats and known distribution it is considered that the species has a moderate – high likelihood of occurrence within the subject land. The subject land contains 13.96ha of potential habitat.
White-throated Needletail	*Hirundapus caudacutus*	V	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Not significant** **Yes –** Almost exclusively aerial. May irregularly occur foraging over subject land. The habitats within the subject land are unlikely to constitute important habitat for this species. The habitat present is unlikely to support significant proportions of the population nor are the habitats critical to any life stage of the species. The species is likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. Because of this and this mobile nature, and the marginal habitat it is unlikely that the species relies on the subject land for foraging or breeding purposes. As a precautionary an EPBC assessment of significance was undertaken for the species. The proposal has been identified to impact on about 61.36ha of vegetation communities associated with aerial foraging habitat.

Assessments of significance have been completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts 2013), and is provided in Appendix F for threatened species listed under the EPBC Act with moderate or higher likelihood of occurrence. The assessments determined that the proposal is unlikely to lead to a significant impact on threatened fauna species or their habitat, listed under EPBC Act (Appendix F).

10.5 Key threatening processes

This section identified whether the proposed action of any component of the proposal would be classified as a Key Threatening Process (KTP) listed under the BC Act, EPBC Act or FM Act as required by the SEARS.

Any process that threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community is considered a KTP. KTPs listed in Schedule 4 of the BC Act and section 183 of the EPBC Act were individually assessed against the proposal to determine their relevance.

Two KTPs listed under the FM Act, 10 KTPs listed under the BC Act and five listed under the EPBC Act were considered relevant to the proposal and have been detailed in Table 10.11 below. Mitigation measures have been developed to minimise these Key Threatening Processes.

Table 10.11 Key threatening processes relevant to proposal

Key threatening process	Relevant legislation	Relevance to proposed action
Degradation of native riparian vegetation	FM Act	A total of 4.94ha of native riparian vegetation would be impacted (Technical Paper 2 – Aquatic biodiversity).
Removal of large woody debris (snags)	FM Act	A total of six streams would be impacted and may require removal of large woody debris (Technical Paper 2 – Aquatic biodiversity).
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	BC Act	A total of six streams were identified within the subject land, three of which are 3rd order. The proposal will impact on these waterways.
Bushrock removal	BC Act	Bushrock will be removed during the construction phase of the proposal.
Clearing of native vegetation/Land Clearance	BC Act / EPBC Act	Clearing of native vegetation is known to occur within the NSW South Western Slopes and is defined as the destruction of a sufficient proportion of one or more strata (layers) of vegetation within a stand or stands of native vegetation. The proposal will involve the clearing all strata layers of 77.17ha of native vegetation.
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	BC Act / EPBC Act	Psittacine Circoviral (beak and feather) Disease (PCD) affects parrots and associated species (psittacines birds),and is often fatal. It is caused by a virus that infects and kills the cells of the feather and beak, as well as cells of the immune system, leaving birds vulnerable to bacterial and other infections. Threatened species considered to have a high potential for being adversely impacted by PCD recorded within the proposal is the Swift Parrot. The construction and operation of the proposal is not considered likely to further increase risk of this key threatening process in the locality.
Infection of native plants by *Phytophthora cinnamomi*	BC Act / EPBC Act	Any activity that moves soil, water or plant material can spread or introduce *Phytophthora cinnamomi*. The construction and operation of the proposed modification may increase the risk of introducing or spreading *Phytophthora cinnamomi* as it will require the movement of soil, water and plant material (DP&E, 2015)
Infection of amphibians with chytrid fungus resulting in chytridiomycosis	EPBC Act	Chytridiomycosis is potentially fatal to all native species of amphibian. Fifty species of Australian frogs have been found infected with the chytrid fungus. In NSW, 22 species, more than one quarter of the total NSW amphibian fauna, have been diagnosed with the disease. The construction and operation of the proposed modification may increase the risk of introducing and/or spreading this pathogen as it will require the movement of soil, water and plant material.

Key threatening process	Relevant legislation	Relevance to proposed action
Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	BC Act	Exotic Rust Fungi is not currently known from the NSW South Western Slopes bioregion. Within the subject land, Myrtaceous species formed a dominant flora family. Spores of *Uredo rangelii* (Myrtle rust) are dispersed by wind, water, on plant material including seed, on equipment and clothing. The construction and operation of the proposal may increase the risk of introducing or spreading Exotic rust fungi through the movement of soil and water as well as the presence and movement of equipment.
Invasion and establishment of exotic vines and scramblers	BC Act	The invasion and establishment of exotic vines and scramblers, exotic perennial grasses and African Olive (*Olea europea**) is a potential indirect impact of the construction and operation of the proposal. The spread and establishment of African Olive (*Olea europea*),* exotic perennial grasses (i.e. *Paspalum dilatatum*)* and exotic vines and scramblers from surrounding areas may be facilitated through the movement of soils and machinery.
Invasion of native plant communities by exotic perennial grasses	BC Act	
Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.	BC Act	
Novel biota and their impact on biodiversity	EPBC Act	This process includes the competition, predation or herbivory and habitat degradation of vertebrate and invertebrate pests, terrestrial weeds, aquatic weeds and marine pests as well as the mortality, habitat loss and degradation caused by pathogens. This corresponds to the introduction of exotic vines and scramblers and exotic perennial grasses, introduction of Exotic Rust Fungi, *Phytophora cinnamomi,* and Chytrid fungus all of which are detailed individually in this table.
Loss of hollow-bearing trees	BC Act	Hollow-bearing trees were recorded during the vegetation integrity plot surveys and scattered tree assessments. A register of hollow-bearing tree loss will be recorded during the construction phase of the proposal. Biodiversity offsets will be included hollow-bearing trees.
Removal of dead wood and dead trees	BC Act	Dead wood and dead trees (stags) within the impact area will be removed during the construction phase of the proposal.

11 Mitigation and management of impacts

This section has been prepared in accordance with Chapter 8 of the BAM to address the potential impacts of the proposal on biodiversity as discussed in Chapter 10. This section identifies measures to mitigate or manage impacts in accordance with the recommendations in BAM Chapter 8.4 and 8.5 including:

- techniques, timing, frequency and responsibility
- identifying measures for which there is risk of failure
- evaluating the risk and consequence of any residual impacts
- documenting an adaptive management strategy.

11.1 Approach to mitigation

Environmental management for the proposal would be carried out in accordance with the approach detailed in Chapter 27 (Approach to environmental management and mitigation) of the EIS.

This would include a biodiversity sub-plan, prepared as part of the Construction Environmental Management Plan (CEMP) and an operational environmental management framework (EMF).

11.2 Mitigation measures

The proposed mitigation measures are detailed below in Table 11.1.

Table 11.1 Proposed mitigation measures

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-1	Impacts on fish passage	Watercourse crossing structures, both temporary and permanent in nature, would meet Inland Rail design standards and be designed in accordance with *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull, S. and Witheridge, G., 2003) and *Policy and Guidelines for fish habitat conservation and management* (DPI, 2013) and Guidelines for controlled activities on waterfront land: riparian corridors (Department of Industry, 2018) as far as practicable.	Detailed design/Pre-construction	ARTC Design contractor	High, known to be effective	Minor. Impacts to aquatic biodiversity reported in Technical Paper 2.	Low DPI design standards provide known effectiveness for mitigating impacts to fish passage. Risks are primarily related to the need to accurately follow guidelines for design monitoring and maintenance.	Major Barriers to fish passage may impede native fish breeding activity by restricting their ability to access breeding partners and spawning grounds (Fairfull and Witheridge 2003).	–

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-2	Fauna connectivity	A final fauna connectivity strategy would be prepared to guide detailed design, based on the draft fauna connectivity strategy provided in Appendix L.	Detailed design/Pre-construction	ARTC Design contractor	High, known to be effective	Moderate. Impacts to connectivity avoided and minimised as far as practicable, however, connectivity likely to be reduced with potential for higher predation. Impacts to connectivity discussed in Chapter 10.	Low. Informed detailed design of fauna crossing structures has been proven to restore connectivity and reduce vehicle mortality and can restore gene flow for impacted species such as Squirrel Gliders (Soanes, Taylor et al. 2018), provided design is suitably tailored to support target species requirements and site conditions (Smith, Van Der Ree et al. 2015).	Major Without a suitable connectivity strategy in place, direct vehicle mortality and fragmentation of habitat has the potential to lead to disruption of ecological processes and local population extinctions.	Superb Parrot Regent Honeyeater Swift Parrot Grey-headed Flying-fox Corben's Long-eared Bat White-throated Needletail White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-3	Managing the potential for biodiversity impacts during construction	Pre-clearing surveys would be undertaken prior to construction by a suitably qualified ecologist in accordance with the biodiversity management plan. Specific surveys would include: • surveys for roosting microbats and birds in structures, including telegraph poles and buildings that are proposed to be removed • searches for nest trees • identification of hollow-bearing trees and logs requiring fauna management during removal • aquatic fauna salvage in watercourses or residual pools within 50 metres of the subject land, and in areas that would be enclosed by silt curtains (e.g. piling locations).	Detailed design/Pre-construction	ARTC Construction contractor	High. Known to be effective.	Moderate. Mortality of animals low as a result of implementation of mitigation measure.	Low Pre-clearance surveys would be undertaken only by experienced ecologists and follow dedicated procedure as outlined in the biodiversity sub-plan. Pre-clearance surveys ensures that any species that were not located during initial assessments or moved into the impact area following assessments are protected from injury or mortality and relocated to suitable habitat nearby.	Major Lack of effective pre-clearance survey or inability to follow correct procedures for pre-clearance has the potential to impact on native species and may result in injury or mortality	Superb Parrot Regent Honeyeater Swift Parrot Grey-headed Flying-fox Corben's Long-eared Bat White-throated Needletail

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-4	Managing the potential for biodiversity impacts during construction	Clearing extents/site boundary/limit of works would be consistent with proposal extents defined in a condition of approval.	Detailed design/Pre-construction	ARTC Construction contractor	High. Known to be effective.	Moderate. Clearing of native vegetation and habitats avoided as far as practicable. Impact to native vegetation and habitats as reported in section 10.1.	Low Clearing impacts would be minimised through implementation of exclusion zones, clear maps identifying clearing boundaries and sensitive environmental areas to be avoided, and briefing of workers on environmental sensitivities and conditions, including updates as required.	Major Clearing outside of the construction impact zone may result in unintended damage to native vegetation and fauna habitats and contribute to invasion and spread of weeds and pathogens.	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions White Box Yellow Box Blakely's Red Gum Woodland Superb Parrot Regent Honeyeater Swift Parrot Grey-headed Flying-fox Corben's Long-eared Bat White-throated Needletail

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-5	Managing the potential for biodiversity impacts during construction	The clearing extents/site boundary/limit of works would be clearly defined with flagging or marking tape, signage or other suitable means to delineate no go areas. This delineation and marking process would align with the proposal flagging/marking tape process and specifications.	Detailed design/Pre-construction	ARTC Construction contractor	High. Known to be effective.	Moderate. Clearing of native vegetation and habitats avoided as far as practicable. Impact to native vegetation and habitats as reported in section 10.1.	Moderate Depending on the material used to delineate exclusion zones, low visibility may lead to exclusion markers being overlooked, or driven over in the case of earth bunding, and potential for confusion may arise between different types of exclusion markers (RTA 2011). This can be mitigated by tailoring exclusion markers to site conditions and construction activities and providing clear maps and briefings around designated impact areas.	Major Clearing outside of the construction impact zone may result in unintended damage to native vegetation and fauna habitats and contribute to invasion and spread of weeds and pathogens.	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions White Box Yellow Box Blakely's Red Gum Woodland Superb Parrot Regent Honeyeater Swift Parrot Grey-headed Flying-fox Corben's Long-eared Bat White-throated Needletail

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-6	Managing the potential for biodiversity (aquatic and riparian) impacts during construction	Direct impacts on in-stream vegetation and native vegetation on the banks of watercourses would be avoided as far as practicable by establishing appropriate setback distances.	Detailed design/Pre-construction	ARTC Construction contractor	High, known to be effective	Minor. Impacts to fish passage avoided and minimised as far as practicable. Impacts to aquatic biodiversity reported in Technical Paper 2.	Low Setback distances would be allocated according to DPI design standards. Risks are primarily related to the need to accurately follow guidelines for design monitoring and maintenance.	Major Lack of suitable setback distances may lead to unintended impacts on riparian and aquatic vegetation and water quality	Superb Parrot Regent Honeyeater Swift Parrot Grey-headed Flying-fox Corben's Long-eared Bat White-throated Needletail

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
ABD-1	Vegetation clearance management	The proposed access tracks in the northeast and southeast of the accommodation camp site would be located within existing disturbed areas/exotic grassland areas where possible. Surveys would be conducted within PCT 76 (Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions) during detailed design to ensure the siting of the access tracks avoids impacts on PCT 76 as far as possible. If impact on PCT 76 is unavoidable, tree clearing would be minimised by locating access tracks in vegetation gaps visible within aerial imagery, and the existing mapping and refined upon site inspection, targeting areas of previous disturbance/exotic grassland to minimise potential impacts to derived native grassland.	Construction	ARTC	High. Known to be effective.	Minor. Impacts to biodiversity avoided as far as practicable. Impacts to native vegetation and habitats as reported in section 10.1. Impacts to important habitat features avoided or minimised.	Low Selecting access tracks within existing disturbed areas/exotic grassland or within vegetation gaps minmises impacts to PCT 76. Risks are primarily associated with correct identification and protection around access tracks.	Major Lack of suitable control measures to protect PCT 76 will result in vegetation loss.	

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-7	Managing the potential for biodiversity impacts during construction	A biodiversity management plan would be prepared prior to construction and implemented as part of the CEMP. The plan would include measures to manage biodiversity and minimise the potential for impacts during construction. The plan would be prepared in accordance with relevant legislation, guidelines and standards. The plan would include, but not be limited to: • locations and requirements for pre-clearing surveys, including terrestrial and aquatic habitats • establishing protocols for the staged clearing of vegetation and safe tree felling and log removal to reduce the risk of fauna mortality • measures to avoid and minimise clearing of hollow-bearing trees and paddock trees where practicable	Construction	ARTC Construction contractor	High. Known to be effective.	Minor. Impacts to biodiversity avoided as far as practicable. Impacts to native vegetation and habitats as reported in section 10.1. Mortality of animals low as a result of implementation of mitigation measure. Impacts to important habitat features avoided or minimised.	Low Biodiversity management plans are a proven measure to avoid and mitigate potential impacts to biodiversity during construction and ensures the integration of site-specific biodiversity requirements into the construction approach. Risks are primarily associated with the need to incorporate all potential considerations into the plan and maintain compliance with these requirements during construction	Major Lack of suitable biodiversity management plan or lack of compliance with the plan during construction could have potentially catastrophic impacts on biodiversity, depending on the extent of resultant impact	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions White Box Yellow Box Blakely's Red Gum Woodland Superb Parrot Regent Honeyeater Swift Parrot Grey-headed Flying-fox Corben's Long-eared Bat White-throated Needletail Unexpected MNES

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
		• measures relating to the provision and management of nest boxes, including reuse of hollows and monitoring protocols • animal handling protocols, including relocation and emergency care • an unexpected finds protocol • measures to manage biosecurity risks (including livestock pests/ diseases such as Japanese encephalitis and foot & mouth disease) in accordance with the *Biosecurity Act 2015 (NSW)* • measures to manage high threat weeds • measures to reduce the risk of terrestrial and aquatic fauna mortality/injury • measures relating to the stripping, stockpiling and management of topsoil where it contains seedbank or weed material.							

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-8	Rehabilitation of vegetation subject to temporary disturbance	A rehabilitation strategy would be prepared to guide rehabilitation planning, implementation, monitoring and maintenance of disturbed areas once construction is complete. The strategy would include clear objectives for seed collection and rehabilitation of native vegetation in temporary disturbances areas and in riparian areas.	Construction	ARTC Construction contractor	High. Known to be effective.	Moderate. Impacts to biodiversity avoided as far as practicable. Impacts to native vegetation and habitats as reported in section 10.1. Outcome should be long term restoration, rehabilitation of native vegetation and habitat to similar condition or better.	Low Rehabilitation of native vegetation has known environmental benefits including visual screening, air quality, erosion and sediment control, carbon sequestration and can contribute to biodiversity offsetting and recovery. Risks are primarily associated with the need to incorporate all biodiversity requirements for rehabilitation and maintain compliance with these requirements during construction and operation	Major Lack of suitable rehabilitation efforts could substantially increase the proposal's overall impact to vegetation and fauna habitats, and along with landscape-scale impacts on connectivity and movement	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions White Box Yellow Box Blakely's Red Gum Woodland Superb Parrot Regent Honeyeater Swift Parrot Grey-headed Flying-fox Corben's Long-eared Bat White-throated Needletail

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-9	Managing the potential for biodiversity (aquatic) impacts during construction	Scheduling of construction activities to minimise time of works in or adjacent to drainage lines and waterfront land (watercourse bed and land within 40m of the highest bank of the watercourse (DPI, 2012), particularly during periods of flow	Construction	ARTC Construction contractor	High. Known to be effective.	Minor. Impacts to fish habitat and passage avoided and minimised as far as practicable. Impacts to aquatic biodiversity reported in Technical Paper 2.	Low Construction timing would be undertaken according to DPI *Policy and Guidelines for fish habitat conservation and management* (DPI, 2013). Risks are primarily related to the need to accurately follow guidelines for timing and consideration of the proximity of waterways	Major Lack of compliance with construction timing or consideration of watercourse impacts could have unintended consequences on waterways or dependent ecosystems (including riparian and freshwater aquatic vegetation) (DPI, 2013)	–

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-10	Managing the potential for biodiversity (aquatic) impacts during construction	Where it is not practicable to work in the dry, a sediment or silt curtain attached to the same sides of the bank and around the works area would be installed for erosion and sediment control and to maintain fish passage.	Construction	ARTC Construction contractor	High. Known to be effective.	Minor. Impacts to fish passage avoided and minimised as far as practicable. Impacts to aquatic biodiversity reported in Technical Paper 2.	Low Erosion and sediment control would be undertaken according to DPI Policy and Guidelines for fish habitat conservation and management (DPI, 2013). Risks are primarily related to the need to accurately follow guidelines for control design, timing and consideration of the proximity and condition of waterways	Major Lack of suitable control measures for sediment and erosion impacts could have unintended impacts on water quality and fish passage (DPI, 2013)	–

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
ABD-2	Light disturbance	Lighting of the accommodation camp would be designed in accordance with best practice design to limit impacts on wildlife and minimise light spill to woodland area, including AS/NZS 4282:2019 (Outdoor Lighting Obtrusive Effects). This would include the following measures: • orient lighting away from native vegetation patches where possible and focus light on intended area (avoid light spill into vegetated areas) • where light impacts to vegetation cannot be avoided, use lowest intensity lighting appropriate for the task or consider modifying spectral composition (i.e., reduced or filtered light of blue, violet or ultraviolet wavelengths) to reduce impact.	Construction	ARTC	High. Known to be effective.	Minor. Impacts to wildlife avoided as far as practicable. Impacts to native vegetation and habitats as reported in section 10.1. Impacts to important habitat features avoided or minimised.	Low Risks are primarily associated with incorrect design, siting and slection of lighting.	Minor Without suitable lighting impacts on wildlife will be experienced	

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-11	Weed management	Weed management protocols for the operational rail corridor and other ARTC facilities would be in accordance with the requirements of the *Biosecurity Act 2015* (Cth) and incorporated into the operational environmental management framework. These protocols would include: • site hygiene and waste-management procedures to deter pest animals • weed surveillance and treatment including high threat weeds during operation and maintenance activities • requirements in relation to pesticide and herbicide use, including any limitations on use. Restrictions may apply in proximity to watercourses, known areas of Matters of National Environmental Significance, or *Biodiversity Conservation Act 2016* (NSW) listed receptors, habitat or	Operation	ARTC Construction contractor	High. Known to be effective.	Minor. Impacts to biodiversity avoided as far as practicable. Impacts to native vegetation and habitats as reported in section 10.1. Outcome should control weeds and their spread to ensure native vegetation and habitat is maintained in similar condition or better.	Low Successful weed management is a proven measure to mitigate the overall impacts of the proposal on biodiversity, agricultural productivity and human health, and can assist to improve the condition of the immediate environment in certain circumstances. Risks are primarily associated with the need to undertake suitable site-specific control measures, incorporate necessary biodiversity considerations, maintain compliance with the requirements of the *Biosecurity Act 2015*	Major Without suitable weed management protocols in place, the proposal has high potential to introduce and promote the spread of weed species on the surrounding environment. This could have potentially far-reaching impacts on biodiversity, agriculture and health	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions White Box Yellow Box Blakely's Red Gum Woodland Superb Parrot Regent Honeyeater Swift Parrot Grey-headed Flying-fox Corben's Long-eared Bat White-throated Needletail

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
		land uses sensitive to spray-drift from the application of pesticides and herbicides • erosion and sediment control risks associated with broad-scale weed removal or treatment							
BD-12	Fauna connectivity	The operational performance of fauna connectivity measures (including impacts on fauna as a result of train operations) would be monitored in accordance with the fauna connectivity strategy (Appendix L). This would include recording of wildlife collisions with trains, and monitoring of use of crossing structures by target species (including the Squirrel Glider) and feral predators. Fencing and structures potentially influencing fauna connectivity will be in accordance with the fauna connectivity strategy (Appendix L) and having regard to the ARTC fencing strategy.	Operation	ARTC	Moderate. Known to maintain connectivity, however, increased risk of predation and mortality.	Moderate. Connectivity would be reduced from current connectivity. Residual risk includes mortality as a result of train collision and increased predation. Monitoring and adaptive management would be implemented to respond to issues identified.	Moderate Detailed monitoring measures for the fauna connectivity strategy are designed to maximise the success of and contribute to the adaptive management of connectivity measures. The connectivity strategy will be designed to minimise overall impact to native fauna and local and regional movement corridors. However, a residual increased risk of mortality and predation from the proposal is likely	Major Lack of suitable fauna connectivity measures would increase habitat fragmentation impacts from the proposal, increase rail-related wildlife mortality, and may impact on population viability and extinction risk for rare or threatened species.	Superb Parrot Regent Honeyeater Swift Parrot Grey-headed Flying-fox Corben's Long-eared Bat White-throated Needletail

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
		The need for additional measures or modifications to existing measures would be identified to respond to any issues identified.							
BD-13	Aquatic ecology	Culverts that provide for the flow of watercourses would be inspected and maintained in accordance with ARTC's standard operating procedures to address any issues that may contribute to the blockage of fish passage.	Operation	ARTC	High. Known to be effective.	Minor. Impacts to fish passage avoided and minimised as far as practicable. Impacts to aquatic biodiversity reported in Technical Paper 2.	Low. DPI design standards provide known effectiveness for mitigating impacts to fish passage. Risks are primarily related to the need to accurately follow guidelines for both DPI and ARTC operational monitoring and maintenance.	Major Barriers to fish passage may impede native fish breeding activity by restricting their ability to access breeding partners and spawning grounds (Fairfull and Witheridge 2003).	–

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact	Risk of failure	Potential consequence of failure	MNES (when relevant)
BD-14	Little Eagle nest and breeding habitat	Prior to construction commencing in the vicinity of CH 740 schedule construction activities to commence between January to July (outside the breeding season of the Little Eagle). Where this is not possible investigate potential options for relocation of an unoccupied nest to a suitable location determined by an appropriately qualified ecologist, with relocation to be complete before July.	Pre-Construction	ARTC Construction contractor	Medium	Minor. Impacts to biodiversity avoided as far as practicable. Impacts to native vegetation and habitats as reported in section 10.1. Impacts avoided during breeding season.	Low. Avoidance of work during breeding season is effective.	Major Clearing and construction within the breeding buffer area may result in abandonment of nest, disruption of breeding or loss of fledgling.	–

Notes: Consequence follows risk criteria outlined in Appendix G of the EIS: Major – Considerable environmental damage – requiring remediation; Moderate – Localised/clustered environmental damage – requiring remediation; Minor – Isolated environmental damage – minimal remediation required

12 Impact summary – Thresholds for assessment and offsetting impacts

This chapter sets out the impact thresholds for residual impacts to biodiversity values after avoid, minimise and mitigate measures have been applied. Thresholds for assessment and offsetting impacts are outlined in Chapter 9 of the BAM and include:

- impacts on biodiversity values at risk of a serious and irreversible impact
- impacts that require offsetting
- impacts which do not require offsetting
- impacts that do not require further assessment.

12.1 Serious and irreversible impacts

This section identifies every potential serious and irreversible impact (SAII) entity that are listed in the Guidance to assist a decision-maker to determine a serious and irreversible impact that would be impacted on by the subject land.

Impact assessment of potential entities of SAII impacts on biodiversity values are outlined under Chapter 9 of the BAM and addressed below.

12.1.1 Threatened ecological communities

To assist the determining authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact, the BDAR must contain details of the assessment of SAII, in accordance with the assessment criteria set out in the Biodiversity Assessment Method.

The following two threatened ecological communities are likely to be affected by the proposal.

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions.
- White Box Yellow Box Blakely's Red Gum Woodland.

One of these communities, White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland is identified as a candidate SAII entity in Appendix 3 of Guidance to assist a decision-maker to determine a serious and irreversible impact (Department of Planning Industry and Environment 2019).

An assessment of White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland was assessed against the serious and irreversible impacts on biodiversity values in accordance with section 9.1.1 of the BAM and is provided in Table 12.1. The distribution of this community throughout the subject land is illustrated in Figure 12.1.

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4089 Chainage (distance in metres from southern limit of the proposal)
Subject Land
Existing Rail

INLAND RAIL ARTC

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ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

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ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

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ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

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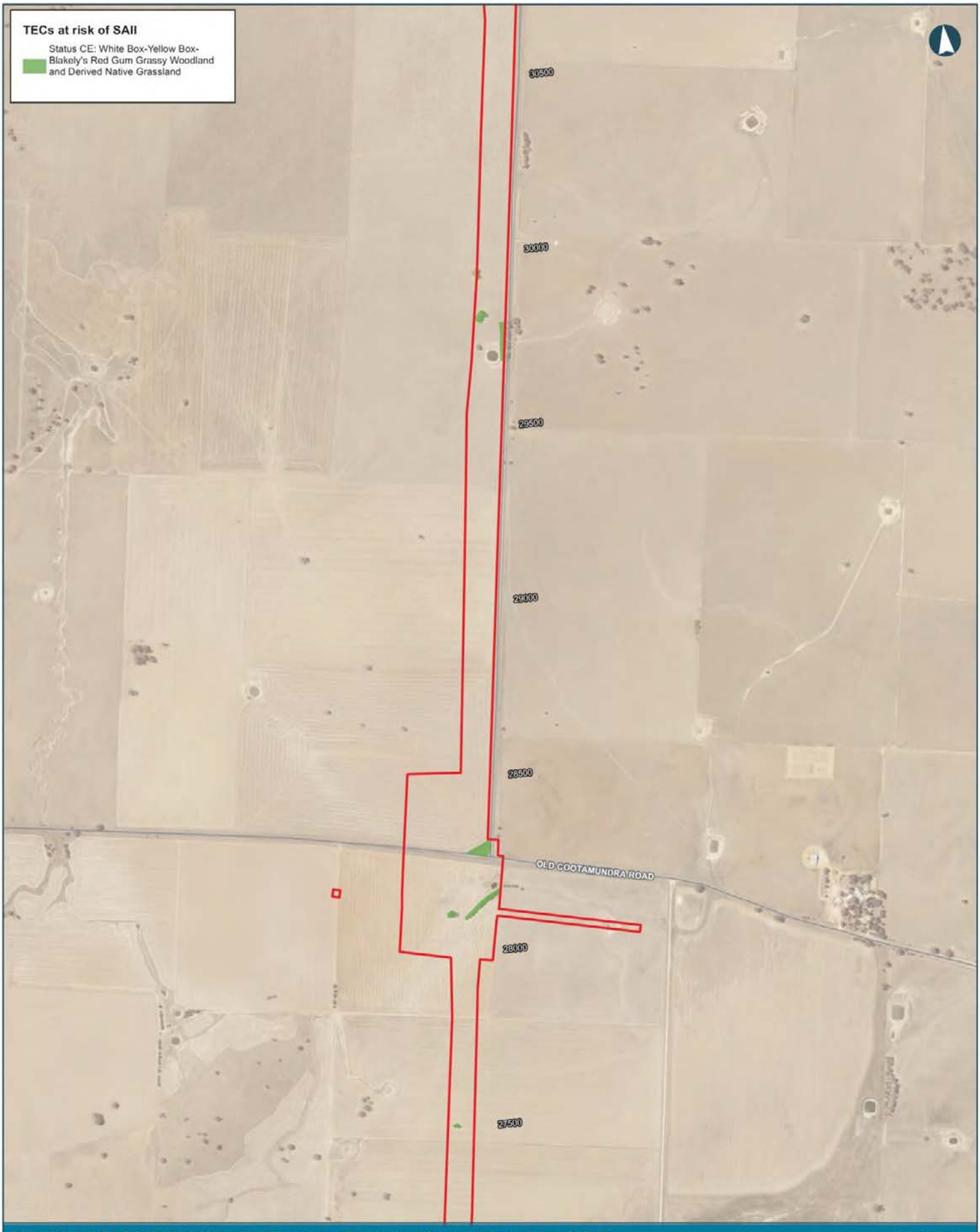

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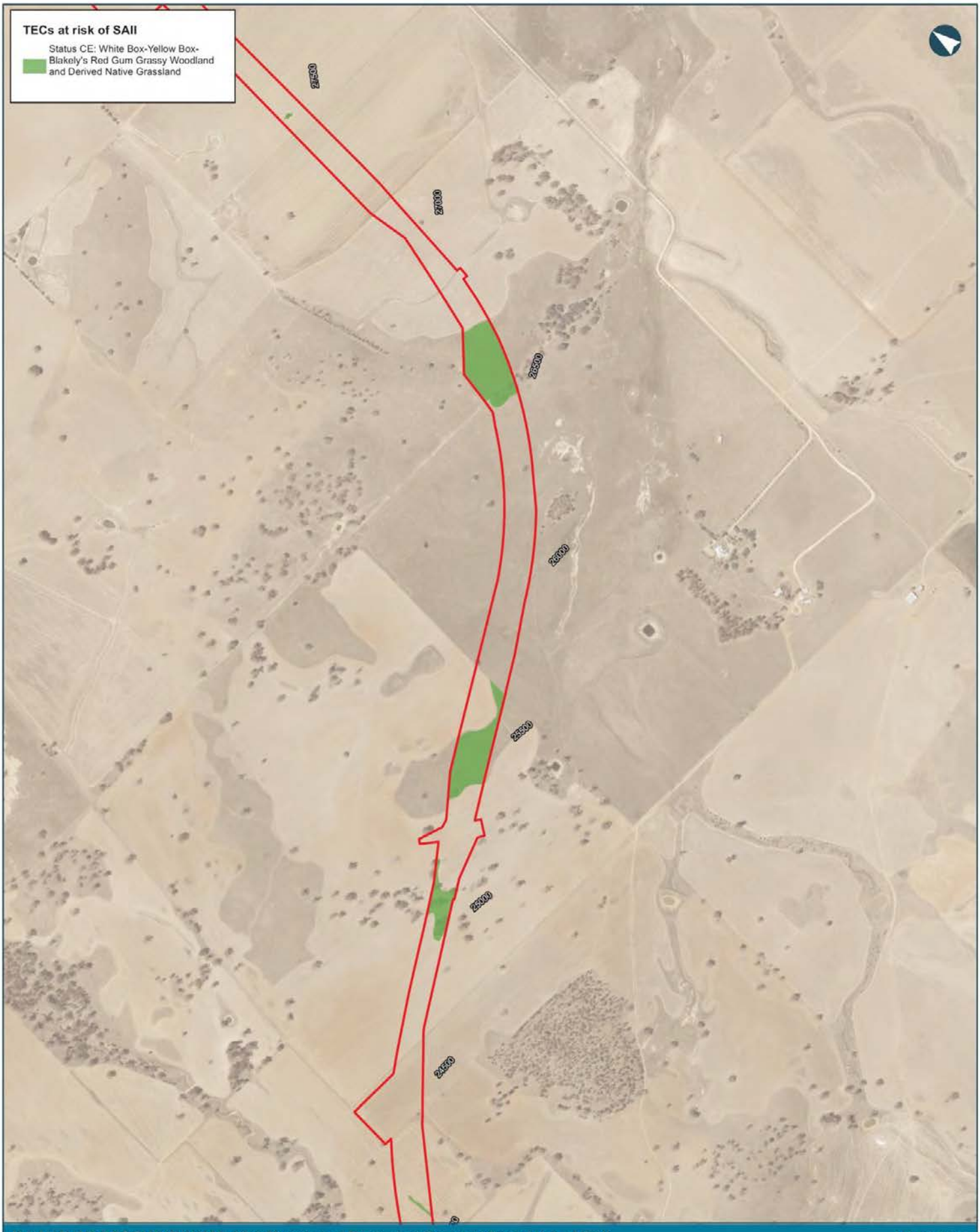

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

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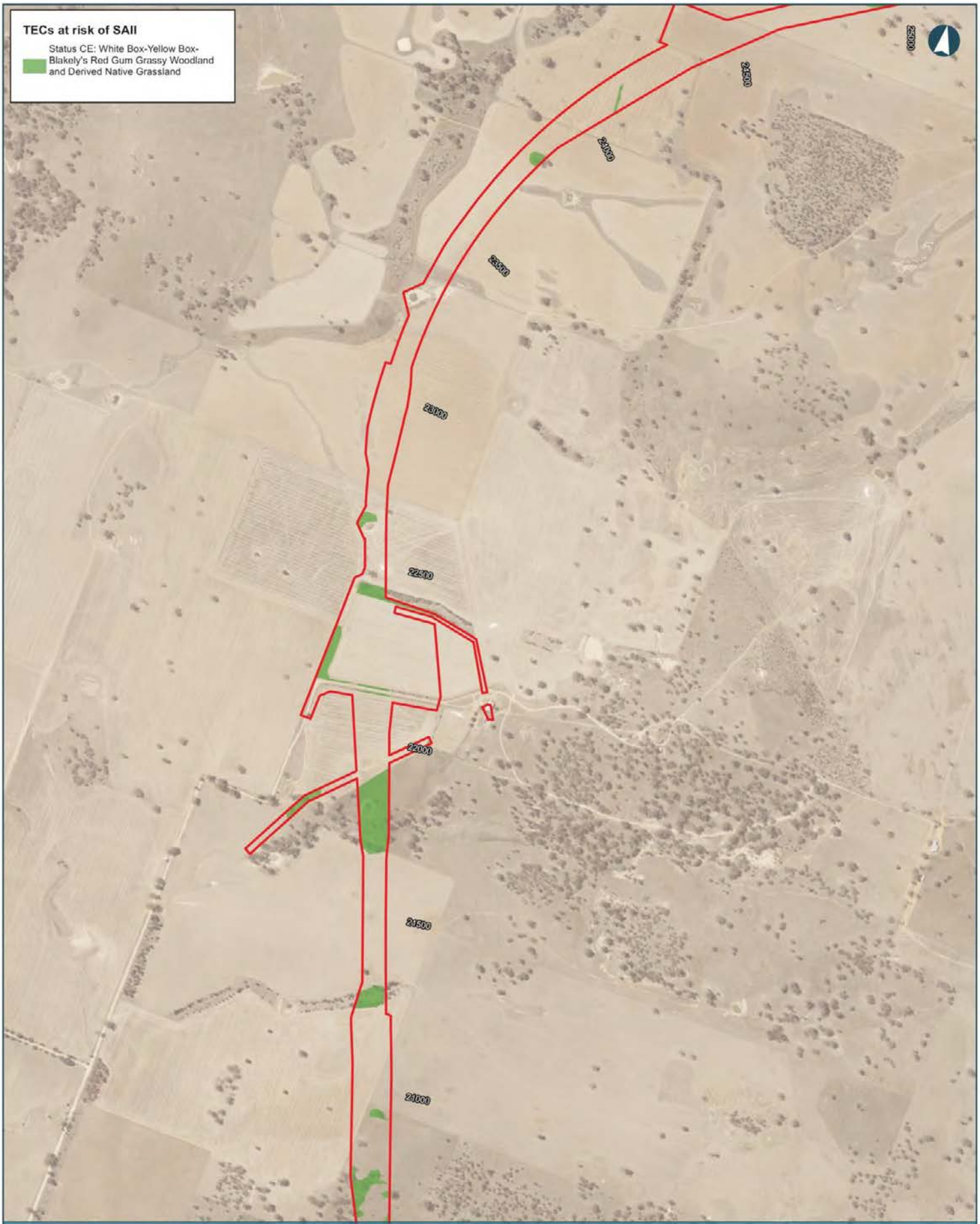

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

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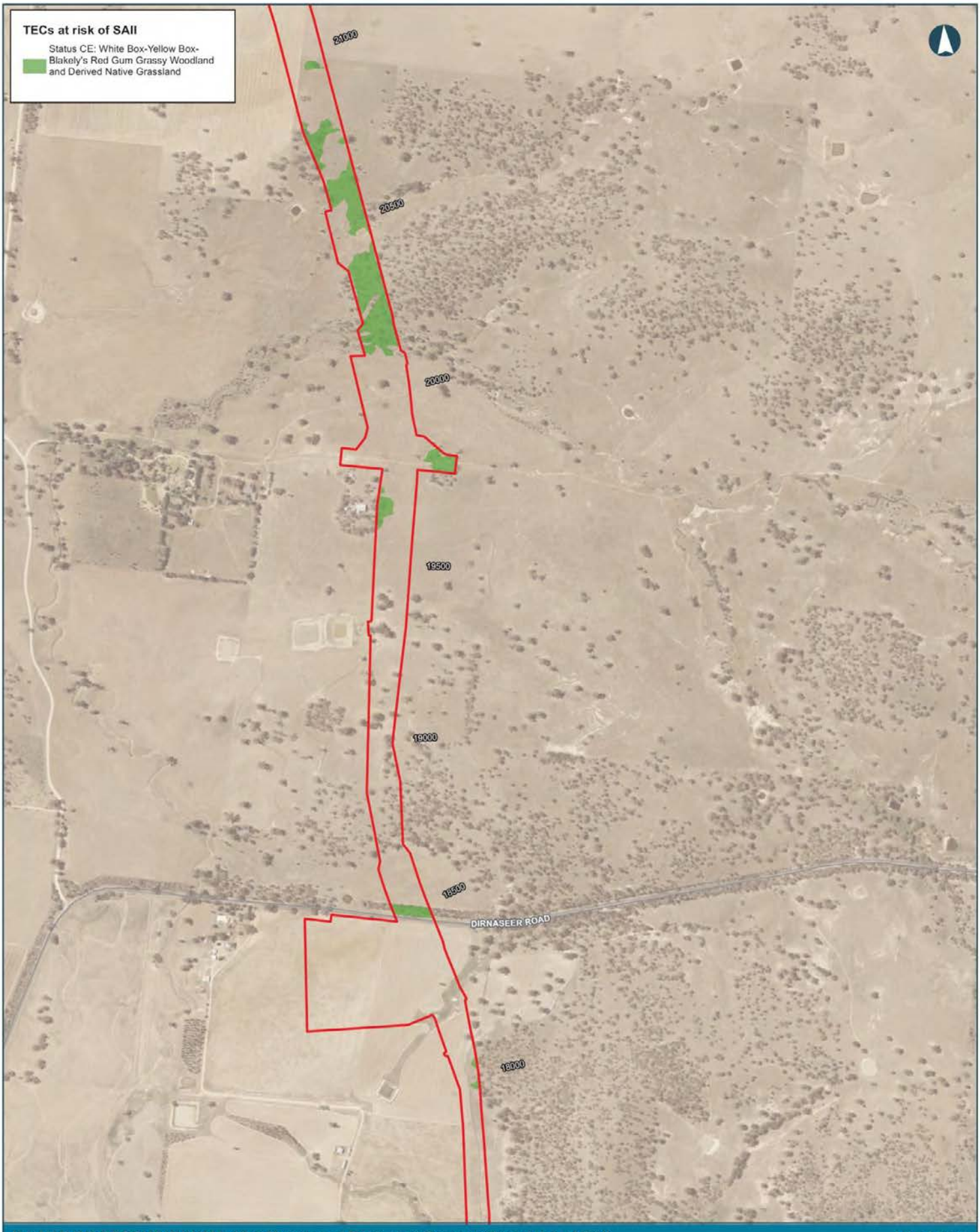

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

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ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

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ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

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ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

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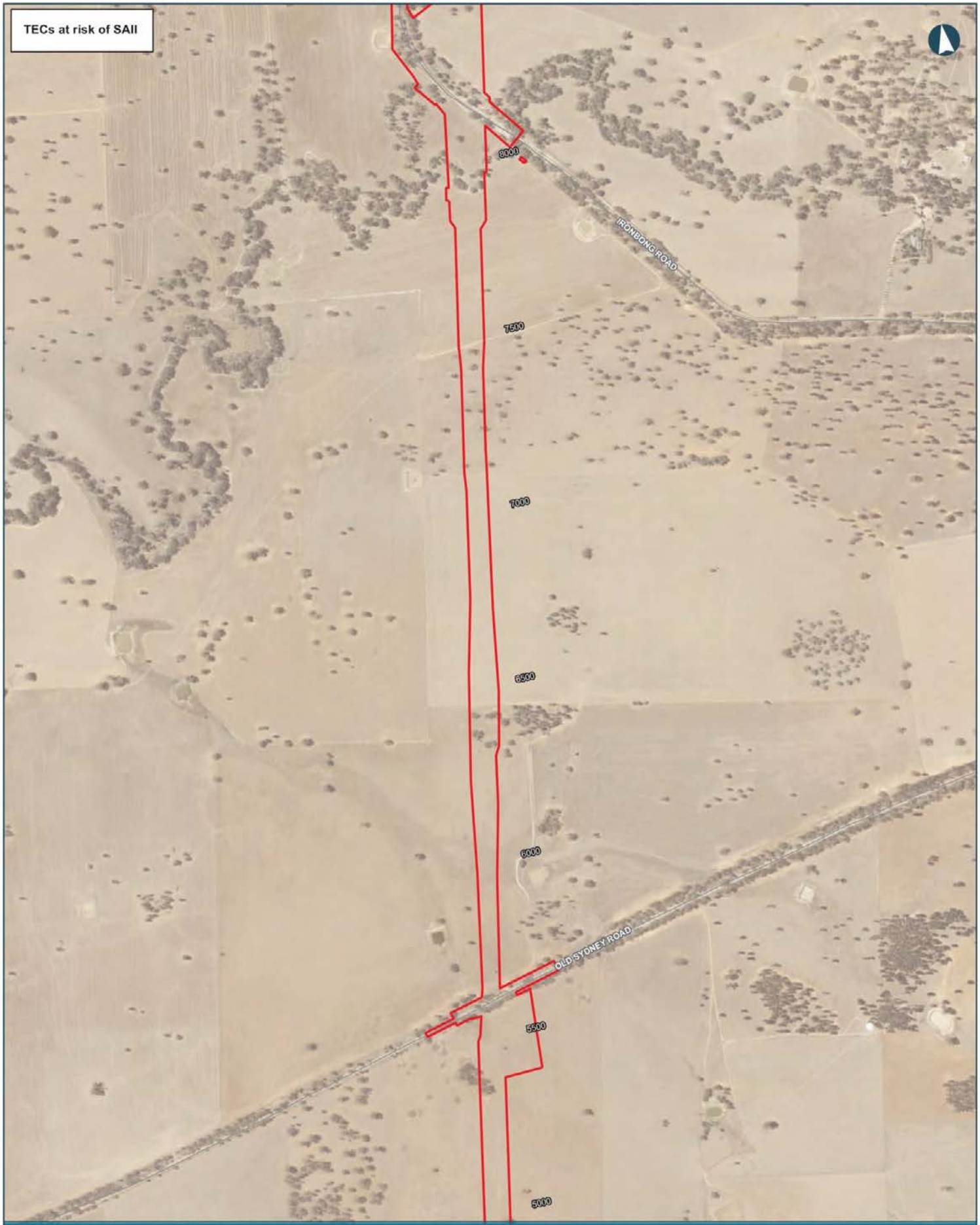

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

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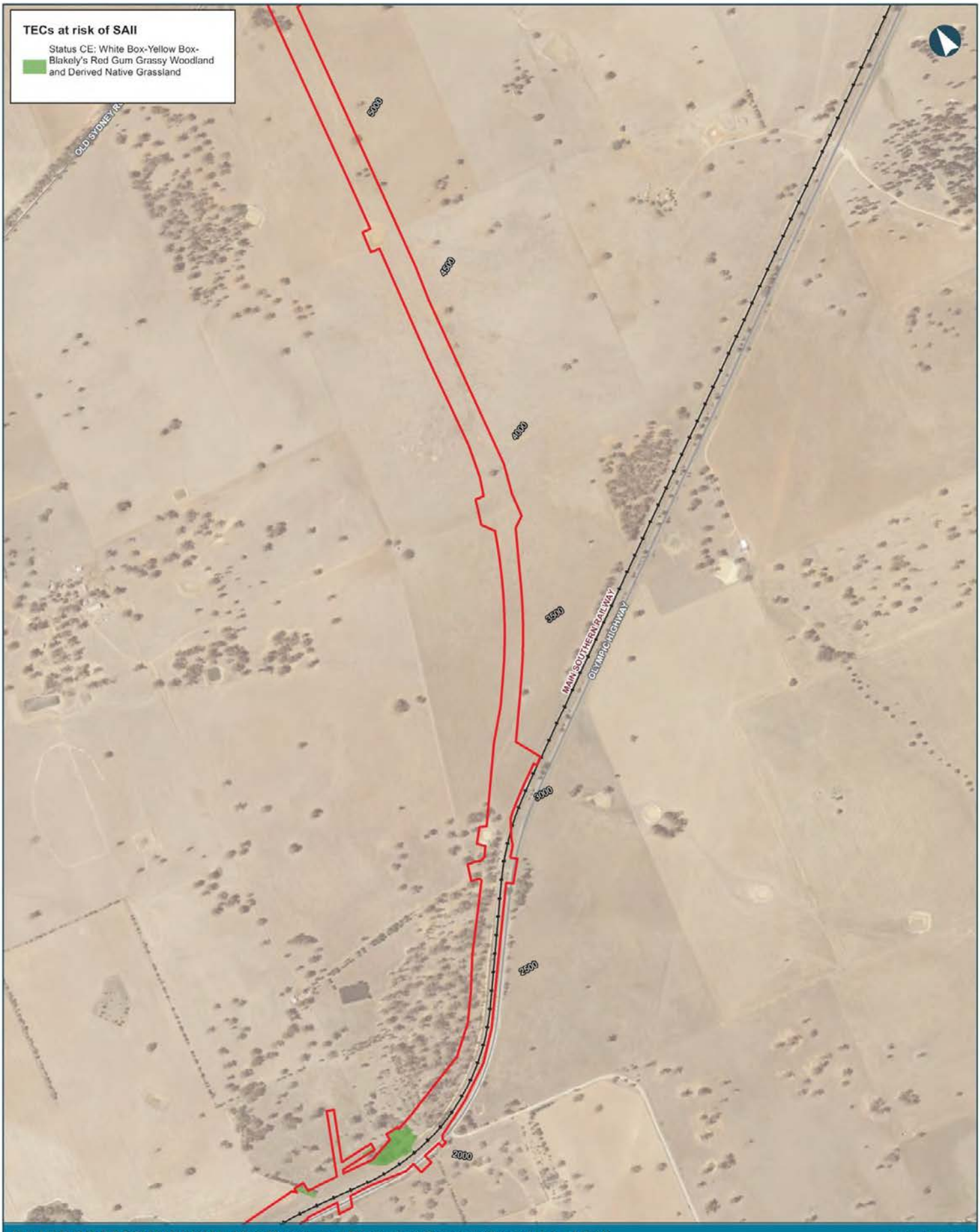

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

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ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

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Table 12.1 Extent of the SAII threatened ecological community White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland within the subject land

Threatened ecological community	BC Act	Equivalent vegetation type (and vegetation zone)	Extent within subject land (ha)
White Box Yellow Box Blakely's Red Gum Woodland	Critically Endangered SAII	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ7)	2.88
		PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Poor condition (VZ8)	4.77
		PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Low condition (VZ9)	6.55
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ10)	0.87
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Poor condition (VZ11)	0.62
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ12)	11.70
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Poor condition (VZ13)	2.23
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Low condition (VZ14)	6.23
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Planted native vegetation (VZ20)	2.70
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ16)	0.14
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Poor condition (VZ17)	0.29
			38.98

Table 12.2 SAII assessment for threatened ecological communities

Assessment requirements	White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland
1. The action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII	1 The direct impacts on White Box Yellow Box Blakely's Red Gum Woodland (Box Gum Woodland) have been avoided as far as practicable through design refinement. This proposal has explored three alignment options, (refer to EIS for detailed explanation) with the final design avoiding as many areas of ecological constraint (including Box Gum Woodland) as practical. Direct impact can be further reduced or managed through detailed design refinements – a total of 93.83ha of Box Gum Woodland was recorded in the 250m corridor applied to the subject land, of which 43.19ha was previously identified to be directly affected. Design refinement has further reduced this impact by 4.21ha to a total direct impact of 38.98ha. Of the 38.98ha of direct impact 17.48ha has been recorded in moderate condition that meets EPBC Act listing for Box Gum Woodland. The remaining impact is 6.02ha of poor condition, 12.78ha that occurs as derived native grassland and a further 2.70ha consists of native plantings. Indirect impacts will be managed through mitigation measures which are outlined in Chapter 11.
2. The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: a. evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal) b. extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: i. change in community structure ii. change in species composition iii. disruption of ecological processes iv. invasion and establishment of exotic species v. degradation of habitat, and vi. fragmentation of habitat.	2.a. the scientific determination for Box Gum Woodland lists the community as Critically Endangered with an estimated reduction in geographic distribution to less than 10% of its original distribution. The estimated reduction in geographic extent of the TEC since 1970 is unknown although the scientific determination for Box Gum Woodland estimates that the annual rate of loss for the TEC between the period 2009-2018 for the NSW South Western Slopes was 746ha. 2.b. The Box Gum Woodland recorded within the subject land occurs in Moderate, Poor and Low condition. The patches of Box Gum Woodland recorded within the subject land are subject to agricultural practices particularly the grazing of livestock. This has reduced the SAII entities overall biodiversity value and limits the successful pollination and regeneration of some flora species therein. The proposal is unlikely to result in substantial alteration of surface water flows or groundwater levels, fire or flooding regimes. The proposal would not include use of fertilisers or other pollutants which would inhibit or impact the community. Within the subject land, this community currently occurs in moderate condition. The proposal will impact on isolated patches and patches with limited connectivity subject to grazing and high edge effects from cropping. It is not considered to be habitat that would be important for the long-term survival of Box Gum Woodland. The proposal is unlikely to significantly increase fragmentation of the community within the region. Mitigation measures have been provided (Chapter 11) to minimise any potential indirect impacts to remaining areas of the community.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR.	3. Box Gum Woodland is not listed in the TBDC as a data deficient entity

Assessment requirements	White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland
4.a. the impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: i. in hectares, and ii. as a percentage of the current geographic extent of the TEC in NSW. 4.b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by: i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the subject land or equivalent area for other types of proposals ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by: • distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and • estimated maximum dispersal distance for native flora species characteristic of the TEC, and • other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s)	4.a.i. The direct impacts to this SAII entity is: • total direct impact of 38.98ha of Box Gum Woodland, this includes an impact of 15.48ha on derived native grassland and native plantings with the remaining 23.50ha on remnant vegetation in moderate or poor condition. Indirect impact will be managed through mitigation measures outlined in Chapter 11. 4.a.ii. in NSW the best estimate of the area of occupancy is 151,100km^2 or 15,110,000ha. The loss of 38.98ha as a result of the proposal would constitute a loss of less than 0.0003% of extent of the TEC in NSW. The removal of 38.98ha equates to a 0.4% reduction of this community within the locality (10km radius from Subject land). 4.b. Within the Subject land the TEC occurs a combination of large patches, small isolated stands and roadside remnants. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. There is an estimated 439ha of the community within 500m buffer of the subject land which would be retained. The proposed action will involve the removal of vegetation along a linear development. As such, the proposal will fragment large patches and roadside remnants of *Box-Gum Woodlands* in the locality and increase fragmentation between smaller patches. Proposal would involve clearing of moderate, poor and low condition vegetation consisting of: • PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ7) with a vegetation integrity score of 69.3 will be 2.88ha • PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Poor condition (VZ8) with a vegetation integrity score of 33.7 will be 4.77ha • PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Low condition (VZ9) with a vegetation integrity score of 2.1 will be 6.55ha • PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ10) with a vegetation integrity score of 70.9 will be 0.87ha • PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Poor condition (VZ11) with a vegetation integrity score of 29.7 will be 0.62ha • PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ12), with a vegetation integrity score of 70.0 will be 11.70ha; and • PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Poor condition (VZ13), with a vegetation integrity score of 50.6 will be 2.23ha; and

Assessment requirements	White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland
	• PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Low condition (VZ14), with a vegetation integrity score of 2.7 will be 6.23ha; and • PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Planted native vegetation (VZ20), with a vegetation integrity score of 54.2 will be 2.70ha; and • PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ16) with a vegetation integrity score of 52.5 will be 0.14ha; and • PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Poor condition (VZ17) with a vegetation integrity score of 35.6 will be 0.29ha. The proposal will impact on isolated patches and patches with limited connectivity subject to grazing and high edge effects from cropping. It is not considered to be habitat that would be important for the long-term survival of Box Gum Woodland. The proposal is unlikely to significantly increase fragmentation of the community within the region.
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	5. This BDAR does not provide any new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.

12.1.2 Threatened flora candidate SAII entities

No threatened flora listed under the BC Act are considered likely to occur within the surveyed areas of subject land affected.

Five threatened flora assumed to be present in unsurveyed areas are classified as SAII entities. If present these may be affected by the proposal (Table 12.3).

An assessment of these species was assessed against the serious and irreversible impacts on biodiversity values in accordance with section 9.1.1 of the BAM and is provided in sections 12.1.2.1–12.1.2.6.

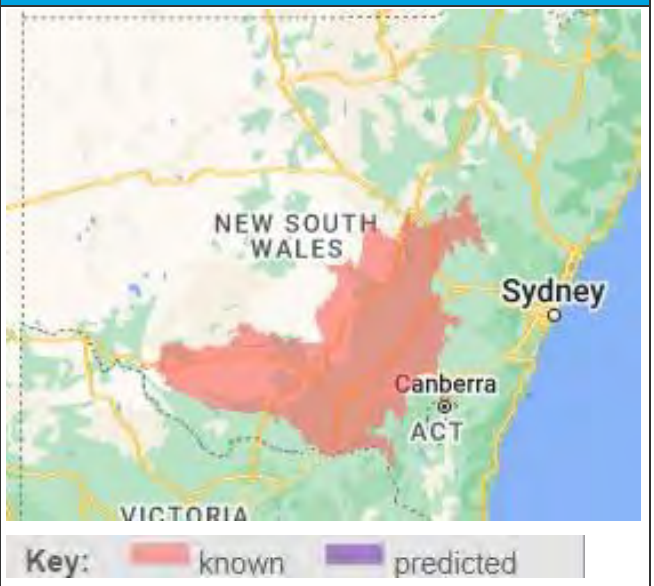
Table 12.3 Assumed extent of habitat for SAII threatened flora within unsurveyed areas

Scientific name	Common name	BC Act	Assumed habitat within the subject land (ha)
Caladenia arenaria	Sand-hill Spider Orchid	E	4.4
Caladenia concolor	Crimson Spider Orchid	E	0.14
Euphrasia arguta	Euphrasia arguta	CE	0.13
Grevillea wilkinsonii	Tumut Grevillea	CE	0.13
Indigofera efoliata	Leafless Indigo	E	4.4

12.1.2.1 Caladenia arenaria

Assessment requirements	*Caladenia arenaria*
1. The action and measures taken to avoid the direct and indirect impact on a species at risk of an SAII	1. The direct impacts on *Caladenia arenaria* assumed habitat have been avoided as far as practicable through design refinement. The direct impacts on threatened species have been avoided where possible through design refinement. This proposal has explored three alignment options, (refer to EIS for detailed explanation) with the final design avoiding as many areas of ecological constraint (including threatened species habitat) as practical. Direct impact on assumed habitat can be further managed or reduced through additional targeted surveys and detailed design refinement and through careful placement of construction zones if the species is recorded. Indirect impacts will be managed through mitigation measures which are outlined in Indirect impacts will be managed through mitigation measures which are outlined in Chapter 11.
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations	2a. *Caladenia arenaria* is not listed under this principle in TBDC. 2b *Caladenia arenaria* is not listed under this principle in TBDC. 2c. *Caladenia arenaria* is listed in TBDC as '*known from <= 3 locations and/or an AOO < 10 km^2 or EOO < 100 km^2*'. 2d. *Caladenia arenaria* is not listed under this principle in TBDC. The assumed habitat provides no new information on the current population of *Caladenia arenaria* that would alter the listing of the species as an SAII entity.

Assessment requirements	*Caladenia arenaria*
d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR.	3. *Caladenia arenaria* is not listed in TBDC as a data deficient species.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: a. the impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal b. impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species	4a. *Caladenia arenaria* was not recorded within the proposal study area although has been assumed on some properties due to access restrictions for adequate seasonal survey. Total impact on assumed habitat is 4.4 hectares. Within NSW potential associated habitat for *Caladenia arenaria* in the form of PCT 76 is recorded in BioNet Vegetation Classification as having the following estimated current extent: PCT 76 – 40,000 hectares Most of this potential habitat is unlikely to have been subject to targeted surveys for *Caladenia arenaria* and the likelihood of occurrence would be similar to the assumed habitat for this proposal. Given this the proposed impact of 4.4 hectares of assumed habitat for *Caladenia arenaria* would represent a reduction of 0.01% of potential available habitat for PCT 76 in NSW. It is also noted in TBDC that potential habitat for *Caladenia arenaria* is also associated with PCTs 28, 75 and 80 (totalling 228,000ha). 4b. *Caladenia arenaria* is currently only known to occur in the Riverina between Urana and Narranderra. (TBDC). The species is currently known from four 'priority management areas' in NSW under the SOS program. The extent of these areas are: • Yarranjerry – 1197.76 hectares • Buckingbong – 702.14 hectares • Urana West – 32.72 hectares • Lonesome Pine – 70.29 hectares. The total area of *Caladenia arenaria* habitat under priority management is 2.002.91 hectares. The impact to assumed habitat will not impact on any of these priority management areas or on the known geographic range or known areas of occupancy of this species. The geographical range of predicted habitat for *Caladenia arenaria* extends from Central West NSW to the Victoria/ NSW border and west to encompass the southern portion of the Hay Plain (see image below).

Assessment requirements	*Caladenia arenaria*
iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	 The proposed impact to assumed habitat will not impact on a known subpopulation or fragment known habitat for this species. Mitigation measures to minimise and manage impacts on biodiversity, native plants and vegetation communities are provided in Table 11.1.
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	5. This BDAR does not provide any new information that demonstrates that the principle identifying that the species is at risk of an SAII is not accurate.

12.1.2.2 Caladenia concolor

Assessment requirements	*Caladenia concolor*
1. The action and measures taken to avoid the direct and indirect impact on a species at risk of an SAII	1. The direct impacts on *Caladenia concolor* assumed habitat have been avoided as far as practicable through design refinement. This proposal has explored three alignment options, (refer to EIS for detailed explanation) with the final design avoiding as many areas of ecological constraint (including threatened species habitat) as practical. Direct impact on assumed habitat can be further managed or reduced through additional targeted surveys and detailed design refinement and through careful placement of construction zones if the species is recorded. Indirect impacts will be managed through mitigation measures which are outlined in Indirect impacts will be managed through mitigation measures which are outlined in Chapter 11.
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations	2a. *Caladenia concolor* is listed under in the TBDC as *'population reduction of >=80% in 10 years or three generations'*. 2b *Caladenia concolor* is not listed under this principle in TBDC. 2c. *Caladenia concolor* is listed in TBDC as '*known from <= 3 locations and/or an AOO < 10 km^2 or EOO < 100 km^2*'. 2d. *Caladenia concolor* is not listed under this principle in TBDC. The assumed habitat provides no new information on the current population of *Caladenia concolor* that would alter the listing of the species as an SAII entity.

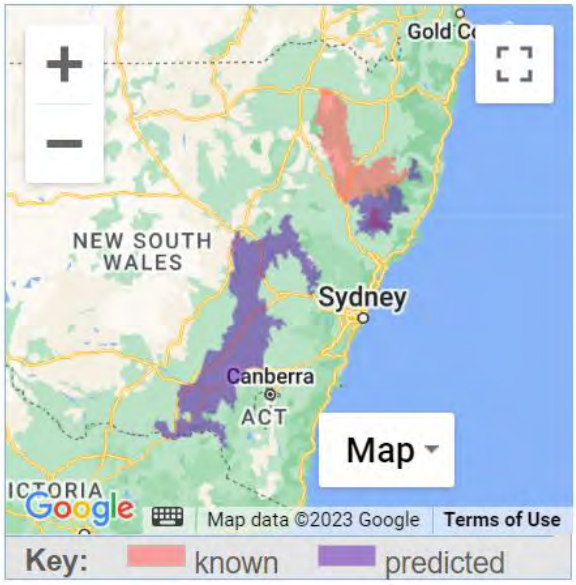
Assessment requirements	*Caladenia concolor*
d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR.	3. *Caladenia concolor* is not listed in TBDC as a data deficient species.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: a. the impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal b. impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species	4a. *Caladenia concolor* was not recorded within the proposal study area although has been assumed on some properties due to access restrictions for adequate seasonal survey. Total impact on assumed habitat is 0.14 hectares. Within NSW potential associated habitat for *Caladenia concolor* in the form of PCT 347 is recorded in BioNet Vegetation Classification as having the following estimated current extent: PCT 347 – 4,500 hectares Most of this potential habitat is unlikely to have been subject to targeted surveys for *Caladenia concolor* and the likelihood of occurrence would be similar to the assumed habitat for this proposal. Given this the proposed impact of 0.14 hectares of assumed habitat for *Caladenia concolor* would represent a reduction of 0.003% of potential available habitat for PCT 347 in NSW. It is also noted in TBDC that potential habitat for *Caladenia concolor* is also associated with PCTs 28, 75, 76 and 80 (totalling 728, 000 ha). 4b. *Caladenia concolor* is known from the Victori currently known from six 'priority management areas' in NSW under the SOS program. The extent of these areas are: • Bethungra – 363.38 hectares • Gundagai – 299.18 hectares • Burrinjuck – 5842.45 hectares • Benambra National Park – 837.82 hectares • Woomargama National Park – 24219.36 hectares • Albury – 40.20 hectares. The total area of *Caladenia concolor* habitat under priority management is 31,502.4 hectares. The impact to assumed habitat will not impact on any of these priority management areas or on the known geographic range or known areas of occupancy of this species. The geographical range of known and predicted habitat for *Caladenia concolor* extends from Central NSW to the Victoria/NSW border (see image below).

Assessment requirements	*Caladenia concolor*
iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	 The proposed impact to assumed habitat will not impact on a known subpopulation or fragment known habitat for this species. Mitigation measures to minimise and manage impacts on biodiversity, native plants and vegetation communities are provided in Table 11.1.
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	5. This BDAR does not provide any new information that demonstrates that the principle identifying that the species is at risk of an SAII is not accurate.

12.1.2.3 Euphrasia arguta

Assessment requirements	*Euphrasia arguta*
1. The action and measures taken to avoid the direct and indirect impact on a species at risk of an SAII	1. The direct impacts on *Euphrasia arguta* assumed habitat have been avoided as far as practicable through design refinement. This proposal has explored three alignment options, (refer to EIS for detailed explanation) with the final design avoiding as many areas of ecological constraint (including threatened species habitat) as practical. Direct impact on assumed habitat can be further managed or reduced through additional targeted surveys and detailed design refinement and through careful placement of construction zones if the species is recorded. Indirect impacts will be managed through mitigation measures which are outlined in Indirect impacts will be managed through mitigation measures which are outlined in Chapter 11.
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:	2a. *Euphrasia arguta* is not listed under this principle in TBDC. 2b *Euphrasia arguta* is not listed under this principle in TBDC. 2c. *Euphrasia arguta* is listed in TBDC as '*known from <= 3 locations and/or an AOO < 10 km^2 or EOO < 100 km^2*'. 2d. *Euphrasia arguta* is not listed under this principle in TBDC. The assumed habitat provides no new information on the current population of *Euphrasia arguta* that would alter the listing of the species as an SAII entity.

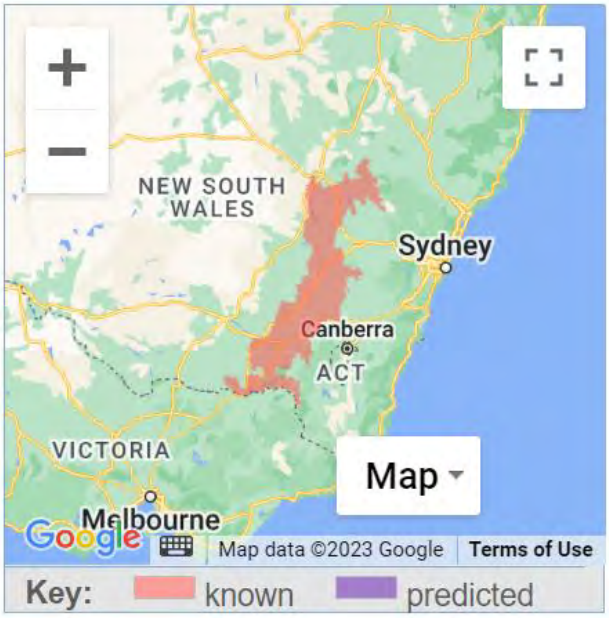
Assessment requirements	*Euphrasia arguta*
i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR.	3. *Euphrasia arguta* is not listed in TBDC as a data deficient species.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: a. the impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal b. impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites.	4a. *Euphrasia arguta* was not recorded within the proposal study area although has been assumed on some properties due to access restrictions for adequate seasonal survey. Total impact on assumed habitat is 0.13 hectares. Within NSW potential associated habitat for *Euphrasia arguta* in the form of PCT 266 is recorded in BioNet Vegetation Classification as having the following estimated current extent: PCT 266 – 800,000 hectares Most of this potential habitat is unlikely to have been subject to targeted surveys for *Euphrasia arguta* and the likelihood of occurrence would be similar to the assumed habitat for this proposal. Given this the proposed impact of 0.13 hectares of assumed habitat for *Euphrasia arguta* would represent a reduction of 0.0003% of potential available habitat for PCT 266 in NSW. It is also noted in TBDC that potential habitat for *Euphrasia arguta* is also associated with 68 additional PCTs in the TBDC. 4b. *Euphrasia arguta* is known only from the Nandewar Bioregion (subregion 4) of northern New South Wales, in the south-east section of Namoi NRM region. *Euphrasia arguta* is currently known from two 'priority management areas' in NSW under the SOS program. The extent of these areas are: • Big Oaky Creek – 100.60 hectares • Murder Dog – 1.52 hectares. The total area of *Euphrasia arguta* habitat under priority management is 102.12 hectares. The impact to assumed habitat will not impact on any of these priority management areas or on the known geographic range or known areas of occupancy of this species. The geographical range of known and predicted habitat for *Euphrasia arguta* extends from two patches in Central/Eastern NSW to and west of Sydney the Victoria/ NSW border (see image below).

Assessment requirements	*Euphrasia arguta*
Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	 The proposed impact to assumed habitat will not impact on a known subpopulation or fragment known habitat for this species. Mitigation measures to minimise and manage impacts on biodiversity, native plants and vegetation communities are provided in Table 11.1.
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	5. This BDAR does not provide any new information that demonstrates that the principle identifying that the species is at risk of an SAII is not accurate.

12.1.2.4 Grevillea wilkinsonii

Assessment requirements	*Grevillea wilkinsonii*
1. The action and measures taken to avoid the direct and indirect impact on a species at risk of an SAII	1. The direct impacts on *Grevillea wilkinsonii* assumed habitat have been avoided as far as practicable through design refinement. This proposal has explored three alignment options, (refer to EIS for detailed explanation) with the final design avoiding as many areas of ecological constraint (including threatened species habitat) as practical. Direct impact on assumed habitat can be further managed or reduced through additional targeted surveys and detailed design refinement and through careful placement of construction zones if the species is recorded. Indirect impacts will be managed through mitigation measures which are outlined in Indirect impacts will be managed through mitigation measures which are outlined in Chapter 11.
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations	2a. *Grevillea wilkinsonii* is not listed under this principle in TBDC. 2b. *Grevillea wilkinsonii* is not listed under this principle in TBDC. 2c. *Grevillea wilkinsonii* is listed in TBDC as '*known from <= 3 locations and/or an AOO < 10 km^2 or EOO < 100 km^2*'. 2d. *Grevillea wilkinsonii* is not listed under this principle in TBDC. The assumed habitat provides no new information on the current population of *Grevillea wilkinsonii* assumed that would alter the listing of the species as an SAII entity.

Assessment requirements	*Grevillea wilkinsonii*
d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR.	3. *Grevillea wilkinsonii* is not listed in TBDC as a data deficient species.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: a. the impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal b. impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species	4a. *Grevillea wilkinsonii* was not recorded within the proposal study area although has been assumed on some properties due to access restrictions for adequate seasonal survey. Total impact on assumed habitat is 0.13 hectares. Within NSW potential associated habitat for *Grevillea wilkinsonii* in the form of PCT 266 is recorded in BioNet Vegetation Classification as having the following estimated current extent: PCT 266 – 800,000 hectares Most of this potential habitat is unlikely to have been subject to targeted surveys for *Grevillea wilkinsonii* and the likelihood of occurrence would be similar to the assumed habitat for this proposal. Given this the proposed impact of 0.13 hectares of assumed habitat for *Grevillea wilkinsonii* would represent a reduction of 0.0003 % of potential available habitat for PCT 266 in NSW. It is also noted in TBDC that potential habitat for *Grevillea wilkinsonii* is also associated with associated with eight additional PCTs. 4b. *Grevillea wilkinsonii* has a highly restricted distribution in the NSW South-west Slopes region. *Grevillea wilkinsonii* is currently known from two 'priority management areas' in NSW under the SOS program. The extent of these areas are: • Gundagai – 104.94 hectares • Goobarragandra – 258.40 hectares. The total area of *Grevillea wilkinsonii* habitat under priority management is 363.34 hectares. The impact to assumed habitat will not impact on any of these priority management areas or on the known geographic range or known areas of occupancy of this species. The geographical range of known and predicted habitat for *Grevillea wilkinsonii* extends from Central NSW to the Victoria/NSW border (see image below).

Assessment requirements	*Grevillea wilkinsonii*
iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	 The proposed impact to assumed habitat will not impact on a known subpopulation or fragment known habitat for this species. Mitigation measures to minimise and manage impacts on biodiversity, native plants and vegetation communities are provided in Table 11.1.
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	5. This BDAR does not provide any new information that demonstrates that the principle identifying that the species is at risk of an SAII is not accurate.

12.1.2.5 Indigofera efoliata

Assessment requirements	*Indigofera efoliata*
1. The action and measures taken to avoid the direct and indirect impact on a species at risk of an SAII	1. The direct impacts on *Indigofera efoliata* assumed habitat have been avoided as far as practicable through design refinement. This proposal has explored three alignment options, (refer to EIS for detailed explanation) with the final design avoiding as many areas of ecological constraint (including threatened species habitat) as practical. Direct impact on assumed habitat can be further managed or reduced through additional targeted surveys and detailed design refinement and through careful placement of construction zones if the species is recorded. Indirect impacts will be managed through mitigation measures which are outlined in Indirect impacts will be managed through mitigation measures which are outlined in Chapter 11.
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations	2a. *Indigofera efoliata* is not listed under this principle in TBDC. 2b *Indigofera efoliata* is listed in TBDC as '*<50 individuals or <250 individuals where threats are known'*. 2c. *Indigofera efoliata* is listed in TBDC as '*known from <= 3 locations and/or an AOO < 10 km^2 or EOO < 100 km^2*'. 2d. *Indigofera efoliata* is not listed under this principle in TBDC. The assumed habitat provides no new information on the current population of *Indigofera efoliata* that would alter the listing of the species as an SAII entity.

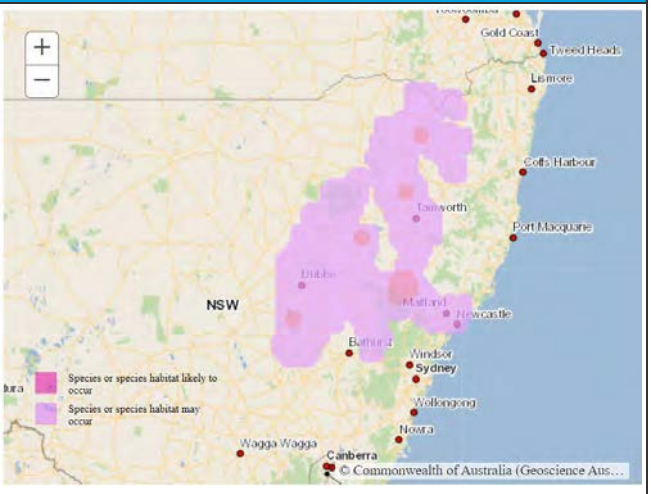
Assessment requirements	*Indigofera efoliata*
d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR.	3. *Indigofera efoliata* is listed in TBDC as a data deficient species.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: a. the impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal b. impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species	4a. *Indigofera efoliata* was not recorded within the proposal study area although has been assumed on some properties due to access restrictions for adequate seasonal survey. Total impact on assumed habitat is 4.4 hectares. Within NSW potential associated habitat for *Indigofera efoliata* in the form of PCT 76 is recorded in BioNet Vegetation Classification as having the following estimated current extent: • PCT 76 – 40,000 hectares Most of this potential habitat is unlikely to have been subject to targeted surveys for *Indigofera efoliata* and the likelihood of occurrence would be similar to the assumed habitat for this proposal. Given this the proposed impact of 4.4 hectares of assumed habitat for *Indigofera efoliata* would represent a reduction of 0.01% of potential available habitat for PCT 76 in NSW. It is also noted in TBDC that potential habitat for *Indigofera efoliata* is also associated with 33 additional PCTs in the TBDC. 4b. *Indigofera efoliata* is restricted to the the central western slopes of NSW, from Dubbo to Guerie. *Indigofera efoliata* is currently listed as a 'data deficient species and has no current priority management sites in NSW under the SOS program. The impact to assumed habitat will not impact on any priority management areas or on the known geographic range or known areas of occupancy of this species. The geographical range of predicted habitat for *Indigofera efoliata* extends from extends from Central NSW to the Victoria/NSW border (see image below).

Assessment requirements	*Indigofera efoliata*
iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	 The proposed impact to assumed habitat will not impact on a known subpopulation or fragment known habitat for this species. Mitigation measures to minimise and manage impacts on biodiversity, native plants and vegetation communities are provided in Table 11.1.
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	5. This BDAR does not provide any new information that demonstrates that the principle identifying that the species is at risk of an SAII is not accurate.

12.1.2.6 Prasophyllum sp. Wybong

Assessment requirements	*Prasophyllum* sp. *Wybong*
1. The action and measures taken to avoid the direct and indirect impact on a species at risk of an SAII	1. The direct impacts on *Prasophyllum sp. Wybong* assumed habitat have been avoided as far as practicable through design refinement. This proposal has explored three alignment options, (refer to EIS for detailed explanation) with the final design avoiding as many areas of ecological constraint (including threatened species habitat) as practical. Direct impact on assumed habitat can be further managed or reduced through additional targeted surveys and detailed design refinement and through careful placement of construction zones if the species is recorded. Indirect impacts will be managed through mitigation measures which are outlined in Indirect impacts will be managed through mitigation measures which are outlined in Chapter 11.
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:	2a. *Prasophyllum sp. Wybong* is not listed under this principle in TBDC. 2b *Prasophyllum sp. Wybong* is not listed under this principle in TBDC. 2c. *Prasophyllum sp. Wybong* is listed in TBDC as '*known from<= 3 locations and/or an AOO < 10 km^2 or EOO < 100 km^2*'. 2d. *Prasophyllum sp. Wybong* is not listed under this principle in TBDC. The assumed habitat provides no new information on the current population of *Prasophyllum sp. Wybong* that would alter the listing of the species as an SAII entity.

Assessment requirements	*Prasophyllum* sp. *Wybong*
i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR.	3. *Prasophyllum sp. Wybong* is not listed in TBDC as a data deficient species.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: a. the impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal b. impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites.	4a. *Prasophyllum sp. Wybong* was not recorded within the proposal study area although has been assumed on some properties due to access restrictions for adequate seasonal survey. Total impact on assumed habitat is 0.13 hectares. Within NSW potential associated habitat for *Prasophyllum sp. Wybong* in the form of PCT 266 is recorded in BioNet Vegetation Classification as having the following estimated current extent: • PCT 266 – 800,000 hectares Most of this potential habitat is unlikely to have been subject to targeted surveys for *Prasophyllum sp. Wybong* and the likelihood of occurrence would be similar to the assumed habitat for this proposal. Given this the proposed impact of 0.13 hectares of assumed habitat for *Prasophyllum sp. Wybong* would represent a reduction of 0.0003% of potential available habitat for PCT 266 in NSW. It is also noted in TBDC that potential habitat for *Prasophyllum sp. Wybong* is also associated with 138 additional PCTs. 4b. *Prasophyllum sp. Wybong* occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes IBRA Bioregions and the Border Rivers–Gwydir, Namoi, Hunter–Central Rivers and Central West Natural Resource Management Regions. The species total extent of occurrence (EOO) is estimated to be 4,800,000 hectares and the area of occupancy (AOO) is estimated to be 150 hectares. The impact to 0.13 hectares of assumed habitat represents 4.83 × 10-5 % of the current EOO and 1.55% of the known AOO (though the project does not occur within the known AOO). The geographical range of predicted habitat for *Prasophyllum sp. Wybong* extends from North Eastern NSW south past Canowindra and east toward Newcastle (see image below).

Assessment requirements	*Prasophyllum* sp. *Wybong*
Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	 The proposed impact to assumed habitat will not impact on a known subpopulation or fragment known habitat for this species. Mitigation measures to minimise and manage impacts on biodiversity, native plants and vegetation communities are provided in Table 11.1.
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	5. This BDAR does not provide any new information that demonstrates that the principle identifying that the species is at risk of an SAII is not accurate.

12.1.3 Threatened fauna candidate SAII entities

Two threatened fauna candidate species listed under the BC Act were recorded within the subject land; Superb Parrot and Squirrel Glider. These species are not classified as SAII entities and as such no SAII entities will be affected by the proposal.

12.2 Determining an offset requirement for impacts

Biodiversity offsetting for residual impacts on biodiversity values listed under the BC Act is mandatory for SSI developments being assessed under Part 7 of the BC Act and subject to a BDAR. Biodiversity offset obligations have been determined using the BAM credit calculator for impacts on native vegetation and threatened species (Appendix K) and impacts associated with scattered tree clearing (Appendix E). The required ecosystem and species credit offset obligations are outlined below.

12.2.1 Impacts on native vegetation and TECs (ecosystem credits)

In accordance with section 9.2.1 of the BAM, an offset is required for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

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

The areas of the subject land that are subject to a biodiversity offset are illustrated in Figure 12.2. The required ecosystem and species credit obligations are outlined below.

Impacts requiring offsets

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate

Areas not requiring offsets

- Miscellaneous Ecosystem

STOCKINBINGAL PARKES RAILWAY

GROGAN ROAD

42000

41500

41000

40500

40000

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

ARTC makes no representation or warranty and assumes no duty of care or other responsibility to any party as to the completeness, accuracy or suitability of the information contained in this GIS map. The GIS map has been prepared from material provided to ARTC by an external source and ARTC has not taken any steps to verify the completeness, accuracy or suitability of that material.
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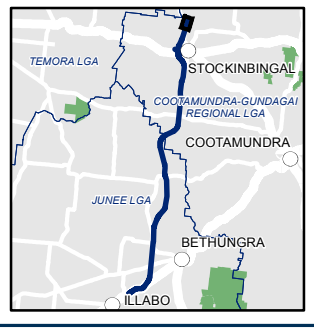
Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

U:\Projects\PS108286_Inland_Rail_Illab\4_WIP\GIS\AWS\PS108286_I2S\Tasks\220_0121_ENV_SubmissionsReport_PostEIS\Documents\Specialist\BDAR\02_PostARTCcomments\220_0121_BDAR_12_2ImpactSummary_r1v7.mxd

Impacts requiring offsets

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation

Impacts not requiring offsets

- Veg Zone 9: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Low - derived native grassland

Areas not requiring offsets

- Miscellaneous Ecosystem

40000
39500
39000
38500
38000
37500
37000
GROGAN ROAD
STOCKINBINGAL PARKES RAILWAY
STOCKINBINGAL
WOOD STREET
HIBERNIA STREET
LAKE CARGELLIGO RAILWAY
BURLEY GRIFFIN WAY

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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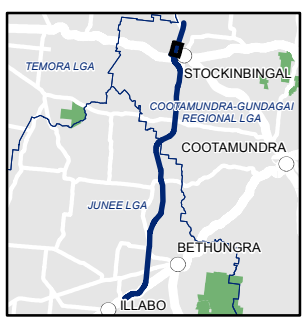
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail



INLAND RAIL

ARTC

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Impacts requiring offsets

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor

Areas not requiring offsets

- Miscellaneous Ecosystem

37000
36500
36000
35500
35000
34500
34000

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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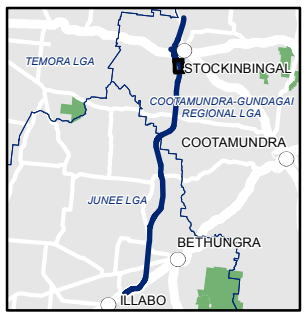
Proposal Site



INLAND RAIL ARTC

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Impacts requiring offsets

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor

Areas not requiring offsets

- Miscellaneous Ecosystem

33500
33000
32500
32000
31500
31000
30500

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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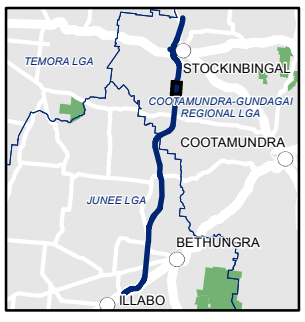
Proposal Site



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Impacts requiring offsets

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor

Impacts not requiring offsets

- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland

Areas not requiring offsets

- Miscellaneous Ecosystem

30500
30000
29500
29000
28500
28000
27500
OLD COOTAMUNDRA ROAD

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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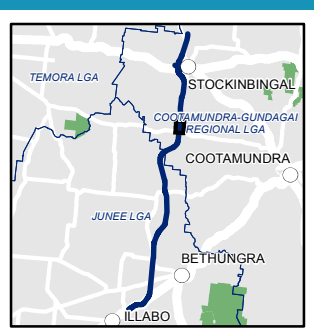

INLAND RAIL ARTC

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Impacts requiring offsets

- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation

Impacts not requiring offsets

- Veg Zone 9: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Low - derived native grassland
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland

Areas not requiring offsets

- Miscellaneous Ecosystem

27500
27000
26500
26000
25500
25000
24500

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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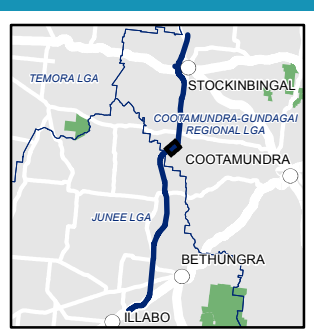
Proposal Site



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Impacts requiring offsets

- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 13: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation

Impacts not requiring offsets

- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland

Areas not requiring offsets

- Miscellaneous Ecosystem

25000
24500
24000
23500
23000
22500
22000
21500
21000

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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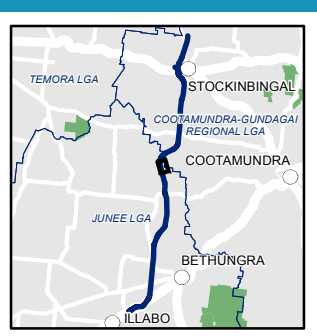

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Impacts requiring offsets

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 15: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 17: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Poor
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation

Impacts not requiring offsets

- Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland

Areas not requiring offsets

- Miscellaneous Ecosystem

21000
20500
20000
19500
19000
18500
18000
DIRNASEER ROAD

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Proposal Site

INLAND RAIL

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Impacts requiring offsets

- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate

Impacts not requiring offsets

- Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland

17500
17000
16500
16000
15500
15000
14500

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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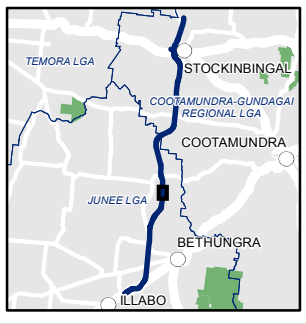

INLAND RAIL ARTC

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Impacts requiring offsets

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate

Impacts not requiring offsets

- Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland
- Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland

14500
14000
13500
13000
12500
12000
11500
IRONBONG ROAD

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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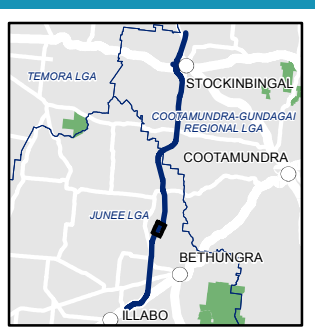

INLAND RAIL ARTC

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Impacts requiring offsets

- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 19: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Poor
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation

Areas not requiring offsets

- Miscellaneous Ecosystem

11500
11000
10500
10000
9500
9000
8500
IRONBONG ROAD
EULOMO SETTLEMENT ROAD

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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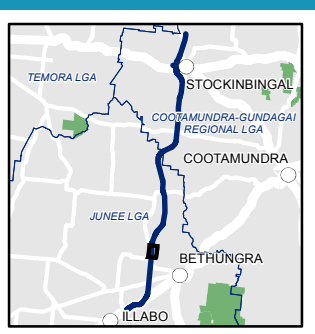

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Impacts requiring offsets

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate
- Veg Zone 6: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Poor
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 19: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Poor

Areas not requiring offsets

- Miscellaneous Ecosystem

8000
IRONBONG ROAD
7500
7000
6500
6000
OLD SYDNEY ROAD
5500
5000

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Date: 13/11/2023 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

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Impacts requiring offsets

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 3: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Poor
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 11: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Poor
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation

Areas not requiring offsets

- Miscellaneous Ecosystem

5000
4500
4000
3500
3000
2500
2000
MAIN SOUTHERN RAILWAY
OLYMPIC HIGHWAY

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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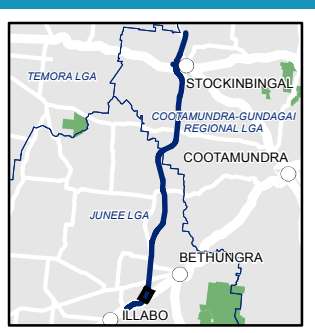
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail



INLAND RAIL ARTC

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Impacts requiring offsets

- Veg Zone 1: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Good
- Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate
- Veg Zone 10: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Moderate
- Veg Zone 11: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion - Poor
- Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate
- Veg Zone 20: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation

Areas not requiring offsets

- Miscellaneous Ecosystem

1500
1000
500
0
OLYMPIC HIGHWAY
WARRENS LANE
MAIN SOUTHERN RAILWAY

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

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Author: IRDJV Scale: 1:10,000
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4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

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12.2.2 Impacts requiring biodiversity offsets (ecosystem credits)

Impacts requiring biodiversity offset ecosystem credits are detailed in Table 12.4.

Table 12.4 Impacts requiring biodiversity offset ecosystem credits

Zone ID	PCT	Condition	TEC	SAII	Current Vegetation Integrity	Offset required
1	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good condition	Yes	No	83.8	Yes
2		Moderate condition	Yes	No	69.8	Yes
3		Poor condition	Yes	No	31.2	Yes
4		Low condition (Derived Native Grassland)	Yes	No	13.5	No
5	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate condition	Yes	No	65.0	Yes
6		Poor condition	Yes	No	38.6	Yes
7	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	Yes	Yes	69.3	Yes
8		Poor condition	Yes	Yes	33.7	Yes
9		Low condition (Derived Native Grassland)	Yes	Yes	2.1	No
10	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate condition	Yes	Yes	70.9	Yes
11		Poor condition	Yes	Yes	29.7	Yes
12	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate condition	Yes	Yes	70.0	Yes
13		Poor condition	Yes	Yes	50.6	Yes
14		Low condition (Derived Native Grassland)	Yes	Yes	2.7	No
15	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Moderate condition	No	No	52.6	Yes
16	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	Yes	Yes	52.6	Yes
17		Poor condition	Yes	Yes	35.6	Yes
18	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	Moderate condition	No	No	87.5	Yes
19		Poor condition	No	No	38.1	Yes
20	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Planted native vegetation	No	No	54.2	Yes

12.2.3 Impacts on threatened species and their habitat (species credits)

In accordance with section 9.2.2 of the BAM, an offset is required for all impacts on threatened species and their habitat where offsets are determined for the impacts of the proposal on threatened species that require species credits, identified in accordance with Chapter 5 of the BAM and as outlined in section 10.1.3 of this report.

12.2.4 Impacts requiring biodiversity offsets (species credits)

Impacts requiring biodiversity offset species credits are detailed in Table 12.6.

Table 12.5 Impacts requiring biodiversity offset flora species credits

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Habitat condition (vegetation integrity) loss	Area (ha)	Unit of measure in BAM-C (area or count)
Acacia ausfeldii	Ausfeld's Wattle	V	Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	70	2.5	Area
			Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	33.7	0.13	
Ammobium craspedioides	Yass Daisy	V	Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	70	2.5	Count
			Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland	VZ14	Low – derived native grassland	2.7	0.34	
			Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	33.7	0.13	

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Habitat condition (vegetation integrity) loss	Area (ha)	Unit of measure in BAM-C (area or count)
Austrostipa wakoolica	A spear-grass	E	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	69.8	4.38	Area
			Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	13.5	0.01	
			Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate	VZ5	Moderate condition	65	0.47	
Caladenia arenaria	Sand-hill Spider Orchid	E	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	69.8	4.38	Area
			Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	13.5	0.01	

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Habitat condition (vegetation integrity) loss	Area (ha)	Unit of measure in BAM-C (area or count)
Caladenia concolor	Crimson Spider Orchid	E	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	52.5	0.14	Area
Cullen parvum	Small Scurf-pea	E	Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	70	2.5	Area
			Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland	VZ14	Low – derived native grassland	2.7	0.34	
			Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	52.5	0.14	
			Veg Zone 18: PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate	VZ18	Moderate condition	87.5	2.85	

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Habitat condition (vegetation integrity) loss	Area (ha)	Unit of measure in BAM-C (area or count)
Diuris tricolor	Pine Donkey Orchid	V	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	52.5	0.14	Area
			Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	69.8	4.38	
			Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	13.5	0.01	
			Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate	VZ5	Moderate condition	65	0.47	
Eleocharis obicis	Spike-rush	V	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	69.8	4.38	Area

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Habitat condition (vegetation integrity) loss	Area (ha)	Unit of measure in BAM-C (area or count)
			Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	13.5	0.01	
Euphrasia arguta	Euphrasia arguta	CE	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	33.7	0.13	Area
Grevillea wilkinsonii	Tumut Grevillea	CE	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	33.7	0.13	Area
Indigofera efoliata	Leafless Indigo	E	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	69.8	4.38	Area
			Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	13.5	0.01	
Lepidium aschersonii	Spiny Peppercress	V	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	69.8	4.38	Area

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Habitat condition (vegetation integrity) loss	Area (ha)	Unit of measure in BAM-C (area or count)
			Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low – derived native grassland	13.5	0.01	
Leucochrysum albicans var. tricolor	Hoary Sunray	–	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	52.5	0.14	Count
Prasophyllum petilum	Tarengo Leek Orchid	E	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	52.5	0.14	Area
			Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	70	2.5	
			Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland	VZ14	Low – derived native grassland	2.7	0.34	

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Habitat condition (vegetation integrity) loss	Area (ha)	Unit of measure in BAM-C (area or count)
Prasophyllum sp. Wybong	Prasophyllum Wybong	– (SAII)	Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ8	Moderate condition	33.7	0.13	Area
Pultenaea humilis	Dwarf Bush-pea	V	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	52.5	0.14	Area
Senecio garlandii	Woolly Ragwort	V	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	52.5	0.14	Area
Swainsona murrayana	Slender Darling Pea	V	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	69.8	4.38	Area
			Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low- derived native grassland	13.5	0.01	

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Habitat condition (vegetation integrity) loss	Area (ha)	Unit of measure in BAM-C (area or count)
			Veg Zone 5: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion - Moderate	VZ5	Moderate condition	65	0.47	
Swainsona recta	Small Purple Pea	E	Veg Zone 12: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate	VZ12	Moderate condition	70	2.5	Area
			Veg Zone 14: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Low - derived native grassland	VZ14	Low- derived native grassland	2.7	0.34	
			Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	69.8	4.38	
			Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low- derived native grassland	13.5	0.01	
			Veg Zone 7: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ7	Moderate condition	33.7	0.13	

Scientific name	Common name	BC Act[1]	PCT	VZ	Condition	Habitat condition (vegetation integrity) loss	Area (ha)	Unit of measure in BAM-C (area or count)
Swainsona sericea	Silky Swainson-pea	V	Veg Zone 2: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Moderate	VZ2	Moderate condition	69.8	4.38	Area
			Veg Zone 4: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions - Low - derived native grassland	VZ4	Low- derived native grassland	13.5	0.01	
Tylophora linearis	-	V	Veg Zone 16: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate	VZ16	Moderate condition	52.5	0.14	Area

Table 12.6 Impacts requiring biodiversity offset fauna species credits

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat condition (vegetation integrity) loss	Area/count
Superb Parrot	*Polytelis swainsonii*	V	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	VZ18	Moderate condition	87.5	4.96
				VZ19	Poor condition	38.1	0.26
			PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	VZ1	Good condition	83.8	0.88
				VZ2	Moderate condition	69.8	9.82
				VZ3	Poor condition	31.2	5.67
			PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	VZ5	Moderate condition	65.0	1.35
				VZ6	Poor condition	38.6	2.60
			PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ7	Moderate condition	69.3	1.71
				VZ8	Poor condition	33.7	4.11
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ10	Moderate condition	70.9	0.08
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ12	Moderate condition	70.0	9.28
				VZ13	Poor condition	50.6	0.37
				VZ20	Planted native vegetation	54.2	0.61
			PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ16	Moderate condition	52.5	0.14
				VZ17	Poor condition	35.6	0.10
Total Superb Parrot habitat area affected							**41.81**

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat condition (vegetation integrity) loss	Area/count
Squirrel Glider	*Petaurus norfolcensis*	V	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	VZ18	Moderate condition	87.5	5.58
				VZ19	Poor condition	38.1	0.80
			PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	VZ1	Good condition	83.8	1
				VZ2	Moderate condition	69.6	12.77
				VZ3	Poor condition	31.2	8.60
			PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	VZ5	Moderate condition	65.0	1.35
				VZ6	Poor condition	38.6	4.96
			PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ7	Moderate condition	69.3	2.88
				VZ8	Poor condition	33.7	4.77
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ10	Moderate condition	70.9	0.87
				VZ11	Poor condition	29.7	0.62
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ12	Moderate condition	70.0	11.70
				VZ13	Poor condition	50.6	2.23
				VZ20	Planted native vegetation	54.2	2.70
			PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ16	Moderate condition	52.5	0.14
				VZ17	Poor condition	35.6	0.29
Total Squirrel Glider habitat area affected							**61.36**

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat condition (vegetation integrity) loss	Area/count
Southern Myotis	*Myotis macropus*	V	PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	VZ18	Moderate condition	87.5	5.46
				VZ19	Poor condition	38.1	0.71
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ10	Moderate condition	70.9	0.76
				VZ11	Poor condition	29.7	0.57
Total Southern Myotis habitat area affected (PCT 79 and PCT 276 within 200m of water)							**7.5**
Little Eagle	*Hieraaetus morphnoides*	V	PCT 79 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion - Moderate	VZ18	Moderate condition	87.5	0.39
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ10	Moderate condition	70.9	0.05
				VZ11	Poor condition	29.7	0.40
			PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Planted Native Vegetation	VZ20	Planted Native vegetation	54.2	0.18
			Miscellaneous	VZ0	Planted vegetation	–	0.02
Total Little Eagle habitat area affected (wooded habtiat within 300m buffer of nest)							**1.04**

(1) V – Vulnerable, E – Endangered, CE – Critically Endangered under the BC Act

12.2.5 Impacts that do not need further assessment

In accordance with Section 9.3 of the BAM the following impacts to non-native vegetation do not need further assessment and do not require a biodiversity offset:

- the impact of 2.29ha of miscellaneous ecosystem consisting of highly disturbed areas with no or limited native vegetation and constructed dams.

13 Biodiversity credit report

No net loss in biodiversity value is the standard that underpins the BAM. The standard is attained through ensuring that the amount of biodiversity offset credit required from an impact is proportional to the amount of credit generated through improvements in the condition of native vegetation or threatened species habitat at a biodiversity stewardship site. The application of no net loss standard is set out in Chapter 10 of the BAM.

13.1 Applying the no net loss standard

No net loss in biodiversity is achieved where:

- the impacts on biodiversity values from a proposal are avoided, minimised or mitigated through reasonable measures (refer Chapters 9 and 11)
- all residual direct impacts on biodiversity values from clearing native vegetation and habitat loss are offset by:
  - retiring the required number of biodiversity credits determined in Section 10.1 of the BAM, with a class of credit identified in Section 10.2 of the BAM that meets the 'like-for-like' or 'variation. rules required in clauses 6.3 and 6.4 of the BC Regulation 2017 respectively.

All residual impacts on biodiversity resulting from the proposal, after applying the avoid, minimise and mitigate hierarchy, have been outlined in Chapter 10 of this report. The ecosystem and species credit offset requirements calculated for these residual impacts are presented below.

All residual impacts on biodiversity resulting from the proposal, after applying the avoid, minimise and mitigate hierarchy, have been outlined in section 12.2 of this report. The ecosystem and species credit offset requirements calculated for these residual impacts are presented below.

13.2 Ecosystem credit offset requirement

The required ecosystem credit obligation, as determined using the BAM credit calculator, for impacts on native vegetation are provided in Table 13.1. The ecosystem credit species predicted to utilise these PCTs are listed in the BAM credit report in Appendix K.

Table 13.1 Ecosystem credits

Plant community type	Threatened ecological community	Area affected (ha)	Ecosystem credit
PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	Not listed	6.4	227
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	24	622
PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion		6.3	140
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	14.2	226
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion		1.5	51

Plant community type	Threatened ecological community	Area affected (ha)	Ecosystem credit
PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion		23	677
PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Not listed	1.4	28
PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	0.43	11
Total		**77.17**	**1982**

The like for like ecosystem credit class options for each biodiversity offset credit obligation is summarised in Table 13.2.

Table 13.2 Like for like trading ecosystem credit classes

Credit class PCT	Any PCT with the below TEC	Contains hollow bearing trees	In the below IBRA subregions
PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	Inland Riverine Forests. This includes PCTs: 9, 36, 78, 79, 112, 249, 356, 362 AND Inland Riverine Forests – >=50% and <70% cleared group (including Tier 3 or higher).	Yes	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions. This includes PCT's: 76, 80, 81, 82, 101, 110, 237, 248	Yes	
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	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 This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698	Yes	
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion		Yes	
PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion		Yes	
PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion		Yes	

Credit class PCT	Any PCT with the below TEC	Contains hollow bearing trees	In the below IBRA subregions
PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Western Slopes Dry Sclerophyll Forests (including PCTs 54, 110, 179, 217, 243, 255, 270, 273, 287, 291, 309, 321, 322, 323, 324, 325, 327, 330, 331, 333, 341, 343, 346, 348, 354, 358, 379, 387, 396, 398, 399, 401, 402, 403, 404, 405, 406, 407, 408, 409, 414, 415, 417, 419, 420, 423, 425, 430, 431, 440, 443, 449, 455, 456, 457, 459, 462, 463, 467, 468, 469, 470, 471, 472, 473, 476, 477, 478, 479, 480, 482, 515, 531, 532, 576, 577, 581, 592, 610, 617, 671, 673, 676, 712, 713, 714, 746, 863, 889, 940, 956, 1133, 1176, 1277, 1278, 1279, 1307, 1313, 1314, 1316, 1381, 1398, 1610, 1629, 1654, 1655, 1656, 1657, 1660, 1661, 1663, 1668, 1669, 1671, 1672, 1674, 1676, 1677, 1678, 1679, 1680, 1709, 1711, 1770, 1771) AND Western Slopes Dry Sclerophyll Forests – < 50% cleared group (including Tier 4 or higher).	Yes	

13.3 Species credit offset requirement

The required species credit obligation, as determined using the BAM credit calculator, for impacts on threatened species habitats are provided in Table 13.3.

In relation to like for like species credit trading options, the offset must be like for like species credits that can be sourced from anywhere in NSW.

Table 13.3 Species credits

Scientific name	Common name	BC Act	Area (hectares)	Species credits
Fauna				
Hieraaetus morphnoides	Little Eagle	V	1	22
Myotis macropus	Southern Myotis	V	7.5	288
Petaurus norfolcensis	Squirrel Glider	V	61.3	1788
Polytelis swainsonii	Superb Parrot	V	41.9	1269
Keyacris scurra	Key's Matchstick Grasshopper	E	3	93
Flora				
Acacia ausfeldii	Ausfeld's Wattle	V	2.5	151
Ammobium craspedioides	Yass Daisy	V	2.97*	6*
Austrostipa wakoolica	A spear-grass	E	4.9	169
Caladenia arenaria	Sand-hill Spider Orchid	E	4.4	230
Caladenia concolor	Crimson Spider Orchid	E	0.14	6
Cullen parvum	Small Scurf-pea	E	5.8	199
Diuris tricolor	Pine Donkey Orchid	V	5	130

Scientific name	Common name	BC Act	Area (hectares)	Species credits
Eleocharis obicis	Spike-rush	V	4.4	154
Euphrasia arguta	Euphrasia arguta	CE	0.13	121
Grevillea wilkinsonii	Tumut Grevillea	CE	0.13	121
Indigofera efoliata	Leafless Indigo	E	4.4	230
Lepidium aschersonii	Spiny Peppercress	V	4.4	154
Leucochrysum albicans subsp. *tricolor*	Hoary Sunray	E	0.14*	2*
Prasophyllum petilum	Tarengo Leek Orchid	E	3	76
Prasophyllum sp. *Wybong*[4]	Prasophyllum Wybong	– SAII	3	228
Pultenaea humilis	Dwarf Bush-pea	V	0.14	4
Senecio garlandii	Woolly Ragwort	V	0.14	3
Swainsona murrayana	Slender Darling Pea	V	4.9	169
Swainsona recta	Small Purple Pea	E	7.4	306
Swainsona sericea	Silky Swainson-pea	V	4.4	154
Tylophora linearis	-	V	0.14	4

*Notes: *Count of individuals required for BAM-C. As count not known since area not surveyed, this was entered as 1 in associated PCTs. Further consultation is required with BCD for estimating credits based on counts in assumed habitat.*

13.4 Ecosystem credit requirements for scattered tree clearing

The required ecosystem credit obligation, as determined using the BAM credit calculator, for scattered tree clearing are provided in Table 13.4.

Table 13.4 Ecosystem credits for scattered tree clearing

Plant community type	Threatened ecological community	Number of scattered trees	Ecosystem credits
PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	Not listed	1	1
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	33	32
PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	6	5

Plant community type	Threatened ecological community	Number of scattered trees	Ecosystem credits
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	3	3
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	10	8
PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	5	4
Total		**58**	**53**

The like for like scattered tree clearing ecosystem credit class options for each biodiversity offset credit obligation is summarised in Table 13.5.

Table 13.5 Like for like trading for scattered tree clearing ecosystem credit classes

Credit class PCT	Any PCT with the below TEC / class	Containing HBT	In the below IBRA subregions
PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion	Inland Riverine Forests AND Inland Riverine Forests – < 50% cleared trading group	Yes	Inland Slopes ,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. OR Any IBRA subregion that is within 100km of the outer edge of the affected site.

Source: Like for like trading credit classes as per the BAM credit report (Appendix K)

13.5 EPBC Act offset requirements for significantly affected MNES

The principles of avoiding and minimising impacts underpins the BDAR process. The proposal has been designed to avoid and minimise impact on native vegetation and habitat, including MNES, where possible, in accordance with BAM (see Chapter 9).

Biodiversity offset obligations for significantly affected MNES listed under the EPBC Act have been calculated using the BAM credit calculator. This approach is consistent with the controlled action decision on the assessment approach, being that the proposal will be assessed by an accredited assessment under Part 5, Division 5.2 (SSI) of the EP&A Act. It is also consistent with the (then) Department of Agriculture, Water and the Environment's (now DCCEEW) endorsement in March 2020 of the BOS for both NSW and Commonwealth-listed threatened species, as stated in the EPBC Act Condition-Setting Policy (Department of Agriculture Water and the Environment 2020). In determining biodiversity offsets for MNES under the EPBC Act, consideration has been given to Attachment A of the SEARs (Appendix B) and have been based on the results of detailed targeted surveys and assessment as outlined in Chapter 8 and Appendix F of this report. The significantly affected MNES listed under the EPBC Act that are to be offset for this proposal are:

- Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Section 7.14 (4) of the BC Act outlines that 'a condition to retire biodiversity credits is required to be complied with before any development is carried out that would impact on biodiversity values'. This approach is in line with the EPBC environmental offsets policy (2012) which outlines in section 7.7 that an offset should be implemented either before, or at the same point in time as, the impact arising from the action. The required ecosystem credit offset obligation, as determined using the BAM credit calculator, for impacts on significantly affected biodiversity values listed under the EPBC Act and associated native vegetation types and zones are provided in Table 13.6.

Table 13.6 EPBC Act offsets for significantly affected biodiversity values

Threatened ecological community	Equivalent vegetation type and zone	Extent within subject land (ha)	Ecosystem credits
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Good condition (VZ1)	1	42
	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Moderate condition (VZ2)	12.8	446
	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Low condition (VZ4)	1.7	0
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Moderate condition (VZ5)	1.4	44
Total		**16.9**	**532**
White Box Yellow Box Blakely's Red Gum Woodland	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ7)	2.9	125
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ10)	0.87	39
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ12)	11.7	512
	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ16)	0.14	5
Total		**15.61**	**681**
Total direct impact on TECs listed under the EPBC Act		**32.51**	**1213**

Note: Ecosystem credits for EPBC Act TECs are not additional offset requirements but form part of the overall ecosystem credit offset obligation for impacts on native vegetation (PCTs).

In addition to offsets for significantly impacted ecological communities, the proposal would provide offsets for EPBC Act listed species through offset credits as determined using the BAM credit calculator (Table 13.7).The extent of and impacts to these entities is discussed in Chapter 8.

Table 13.7 Offsets for species listed under EPBC Act

Common name	Scientific name	EPBC Act	Habitat	Credit type	Offset credits
Regent Honeyeater	*Anthochaera phrygia*	CE	PCT 79, PCT 266, PCT 276, PCT 277, PCT 347	Ecosystem	1192
Swift Parrot	*Lathamus discolor*	CE	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	Ecosystem	1954
Superb Parrot	*Polytelis swainsonii*	V	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	Species	1269
				Ecosystem	1954
Key's Matchstick Grasshopper	Keyacris scurra	E	PCTs 266, 276, 277	Species	93
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	PCT 79, PCT 76, PCT 266, PCT 276, PCT 277	Ecosystem	1803
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	PCT 80, PCT 266	Ecosystem	366
White-throated Needletail	*Hirundapus caudacutus*	V	PCT 79, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	Ecosystem	1992
Yass Daisy	*Ammobium craspedioides*	V	PCT 266, PCT 277 & PCT 347	Species	6 *
A spear-grass	*Austrostipa wakoolica*	E	PCT 76 & PCT 80	Species	169
Sand-hill Spider Orchid	*Caladenia arenaria*	E	PCT 76 & PCT 80	Species	230
Crimson Spider Orchid	*Caladenia concolor*	E	PCT 347	Species	6
Euphrasia arguta	*Euphrasia arguta*	CE	PCT 266 & PCT 276	Species	121
Leafless Indigo	*Indigofera efoliata*	E	PCT 76	Species	230
Tarengo Leek Orchid	*Prasophyllum petilum*	E	PCT 276 & PCT 347	Species	76
Slender Darling Pea	*Swainsona murrayana*	V	PCT 76 & PCT 80	Species	169
Small Purple Pea	*Swainsona recta*	E	PCT 76, PCT 80, PCT 266, PCT 276 & PCT 277	Species	247
Silky Swainson-pea	*Swainsona sericea*	V	PCT 277 & PCT 347	Species	154
Tylophora	*Tylophora linearis*	V	PCT 347		4

Notes: *Count of individuals required for BAM-C. As count not known since area not surveyed, this was entered as 1 in associated PCTs. Further consultation is required with BCD for estimating credits based on counts in assumed habitat.

13.6 Biodiversity offset approach

The biodiversity offset approach for this proposal would ensure that the credit requirements are met and would be secured in accordance with BC Regulation 2017 trading rules. This strategy includes the following:

- Offsets will primarily consist of land-based offsets that are strategically located within the impact and adjacent sub-regions to the Inland Rail corridor. Priority will be given to sites that maximise the co-location of ecosystem and species offset requirements across multiple NSW projects, and contain large enough areas to meet the predicted NSW requirements.
- Offset sites will be located and landholders assisted in the development of offset sites as Biodiversity Stewardship Sites, so that ARTC can purchase relevant credits created at those sites.
- ARTC may consider developing an offset site on residual lands acquired for the proposal (either by itself or as part of the transfer of the site to a third party).
- Where credits under the like-for-like rules cannot be reasonably sourced, ARTC will enact the Variation Rules (if the criteria can be met). Variation rules would not apply to any Matters of National Environmental Significance (MNES).
- Payments directly to the Biodiversity Conservation Fund may also be made to retire project approval credit obligations.
- Biodiversity offsets will be finalised prior to project construction impacts, or as required in the Planning Approval.

14 Conclusion

This report has been updated since public exhibition of the EIS. The updates are in response to comments provided by the DPE Biodiversity Conservation Division (BCD). A key focus of the updated assessment has been surrounding comments on:

- the presentation and assessment of native vegetation zones and scattered trees
- additional targeted survey of species, including Glossy-black Cockatoo, Key's Matchstick Grasshopper and Golden Sun Moth
- further explanation of the approach to mitigation
- further information in relation to impacts to fauna connectivity
- refinement of impacts and assessment consistent with the NSW Biodiversity Assessment Methodology
- species credit updates as per the BAM-C updates.

ARTC has also made changes to the proposal site since exhibition of the EIS. The aim of these refinements was to reduce impacts to SAII; to respond to refinement of the infrastructure design and issues raised since EIS exhibition. The refinements were developed by considering consultation with the community and key stakeholders. The proposal site has decreased in certain locations and increased in others. Further identification of the changes are presented in Appendix I to the Response to Submissions Report.

This BAM assessment concluded that the proposal will have a residual impact on 77.17ha of native vegetation comprised of ten native plant community types. This includes two threatened ecological communities listed under the BC Act and EPBC Act within the subject land:

- Inland Grey Box Woodland listed as Endangered under the BC Act and the EPBC Act (PCT 76 and PCT 80).
- White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland (PCT 266, PCT 276, PCT 277 and PCT 347) listed as Endangered under the BC Act and Critically Endangered under the EPBC Act. This community is also listed as an SAII entity affected.

No threatened flora species have been recorded or are considered affected by the proposal. However, not all areas of the subject land were able to be accessed for targeted flora surveysFigure 3.6. In these areas a precautionary approach was taken and species were assumed to be present if associated PCTs had been mapped in those areas.

Nine threatened fauna species and one migratory species were recorded during field surveys. Of these, the Superb Parrot, Squirrel Glider and Little Eagle are considered as species credit species as potential breeding habitat will be impacted by the proposal..

Two additional species credit species, Southern Myotis and Key's Matchstick Grasshopper, while not recorded, have been assumed as present. The assumed presence of Southern Myotis is based on presence of suitable habitat.Key's Matchstick Grasshopper has been assumed present on lands where suitable habitat occurs and land access for targeted surveys was unavailable, however this species was not identified in field surveys of accessible properties.

The other six recorded threatened fauna species and an additional 11 fauna species are considered as ecosystem credit species due to a moderate or higher likelihood of occurrence.

The proposal has been designed with the principles of avoid and minimise impact on native vegetation and habitat where possible in accordance with BAM. This process has resulted in the assessment of 279.06ha within a 250m corridor applied to the subject land and impact to 94.63ha of native vegetation under the previous design phase to only 77.17ha at the current optimised design phase.

The BAM Credit Calculator was used to provide a calculation of the number and class of biodiversity credits required to offset the biodiversity impacts associated with the proposal to ensure maintenance or improvement in biodiversity. The proposal will require a total of:

- 1,982 ecosystem credits for PCTs
- 53 ecosystem credits for scattered trees
- 3,460 fauna species credits
- 2,617 flora species credits based on assumed presence in unsurveyed areas.

The BAM credit calculator was also used to provide a calculation of the number and class of biodiversity credits required to offset scattered tree loss. A total of 58 scattered trees were recorded or assumed, 41 of which were class 3 and contained hollows. The proposal will require a total of 53 ecosystem credits for scattered trees.

Assessments of impact significance were conducted for all Matters of National Environmental Significance (MNES) threatened species, populations and ecological communities considered likely to be affected by the proposal. Through these assessments, it was concluded that the proposal is likely to have a significant impact on two endangered ecological communities; Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived grasslands of south-east Australia and White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands. Biodiversity offset obligations for MNES listed under the EPBC Act have been calculated using the BAM credit calculator.

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APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix A BAM requirements for a BDAR

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
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INLAND RAIL

Table A.1 Minimum information requirements for a BDAR (Table 24 and Table 25 of the BAM)

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Introduction	Introduction to the biodiversity assessment including: • brief description of the proposal • identification of subject land1 boundary, including: – operational footprint (if BDAR) – subject land indicating clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR) – land proposed for biodiversity certification (if BCAR) • general description of the subject land • sources of information used in the assessment, including reports and spatial data.	Chapter 1 Section 1.2 Section 1.5	• Map of the subject land boundary showing the final proposal footprint, including the subject land for any clearing associated with temporary/ ancillary construction facilities and infrastructure (if BDAR).	Chapter 1 Figure 1.1

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Landscape features	Identification of site context components and landscape features, including: • general description of subject land topographic and hydrological setting, geology and soils • percent native vegetation cover in the assessment area (as described in BAM Section 3.2) • IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.)) • rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E) • wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.)) • connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6)) • karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.) • areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.)) • any additional landscape features identified in any SEARs for the proposal.	Chapter 4	• Site Map – Boundary of subject land – Cadastre of subject land – Landscape features identified in BAM Subsection 3.1.3 • Location Map – Digital aerial photography at 1:1,000 scale or finer – Boundary of subject land – Assessment area, (i.e. the subject land and either 1500m buffer area or 500m buffer for linear development – Landscape features identified in BAM Subsection 3.1.3 – Additional detail (e.g. local government area boundaries) relevant at this scale • Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location map include: – IBRA bioregions and subregions – rivers, streams and estuaries – wetlands and important wetlands – connectivity of different areas of habitat – karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features – areas of outstanding biodiversity value occurring on the subject land and assessment area – any additional landscape features identified in any SEARs for the proposal • NSW (Mitchell) landscape on which the subject land occurs.	Chapter 4 Figure 1.1

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Native vegetation	Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3) and Subsection 4.1.1) • provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2) • review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1) • describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2 • where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A). For each PCT within the subject land, describe: • vegetation class • extent (ha) within subject land • evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.)) • plant species relied upon for identification of the PCT and relative abundance of each species • if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.)) • estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.)) Describe the vegetation integrity assessment of the subject land, including: • identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1) • assessment of patch size (as described in BAM Subsection 4.3.2) • survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.) • use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	Section 3.1 Chapter 5	• Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2) • Map of PCTs within the subject land (as described in BAM Section 4.2(1.)) • Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1) • Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries • Map of TEC distribution on the subject land and table of TEC listing, status and area (ha) • Patch size areas (as described in BAM Subsection 4.3.2) • Table of current vegetation integrity scores for each vegetation zone within the site and including: – composition condition score – structure condition score – function condition score • Presence of hollow bearing trees.	Section 3.1 and Chapter 5 Figure 5.1 Figure 5.2 Figure 5.3 Figure 5.5 Table 5.19 Table 5.2 Table 5.21 Figure 5.4

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Threatened species	Identify ecosystem credit species likely to occur on the subject land, including: • list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.)) • justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification for addition of any ecosystem credit species to the list Identify species credit species likely to occur on the subject land, including: • list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1) • justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or • vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) • justification for addition of any species credit species to the list. From the list of candidate species credit species, identify: • species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) • species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) • species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.)) • species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.)). Present the outcomes of species credit species assessments from: • threatened species survey (as described in BAM Section 5.2.4) • expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Section 5.2.4 and 5.3, Box 3).	Section 1.6 Section 3.4 Chapter 6 Appendix C Appendix D Appendix H	• Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and identifying: – the ecosystem credit species removed from the list – the sensitivity to gain class of each species • Table detailing species credit species in accordance with BAM section 5.2 and identifying: – the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present – the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map • Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4) • Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5).	Section 1.6 Section 3.4 Chapter 6 Appendix C Appendix D Appendix H Table 6.1 Table 6.2 Table 6.3 Table 6.4 Table 6.5 Table 6.6 Table 6.7 Table 6.8 Table 6.9 Figure 6.1 Figure 6.2

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
	Where survey has been undertaken include detailed information on: • survey method and effort, (as described in BAM Section 5.3) • justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published • timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys • survey personnel and relevant experience • describe any limitations to surveys and how these were addressed/overcome Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include: • justification of the use of an expert report • identify the expert, provide evidence of their expert credentials and Departmental approval of expert status • all requirements of Box 3 have been addressed in the expert report. Where use of local data is proposed (BAM Subsection 1.4.2): • identify relevant species • identify data to be amended • identify source of information for local data, e.g. published literature, additional survey data, etc. • justify use of local data in preference to VIS Classification or TBDC data • provide written confirmation from the decision-maker that they support the use of local data			

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
	Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that: • the unit of measure for each species is documented • for species assessed by area: – the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5) – a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied • for species assessed by counts of individuals: – the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.)) – the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken – the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land. Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4).			

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Prescribed impacts	• Identify potential prescribed biodiversity impacts on threatened entities, including: – karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) – occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) – corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) – water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4) – protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5) – where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6) • Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts • Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3).	Chapter 7	• Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Chapter 7

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Avoid and Minimise Impacts	• Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: – modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting – the proposed mode or technology – routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route – alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location – alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site • Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2) • Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Section 7.2.1(3.)).	Chapter 9	• Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility • Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation • Maps demonstrating indirect impact zones where applicable.	Chapter 9 Table 9.1 Table 9.2

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Assessment of Impacts	• Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1) • Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2): – description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal – documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications – reporting any limitations or assumptions, etc. made during the assessment – identification of the threatened entities and their habitat likely to be affected • Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including: assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with: – karst, caves, crevices, cliffs, rocks and other features of geological significance – human-made structures – non-native vegetation – connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range – movement of threatened species that maintains their life cycle – water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities • Assessment of the impacts of wind turbine strikes on protected animals • Assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC.	Chapter 10	• Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts.	Chapter 10 Section 10.3

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Mitigation and Management of Impacts	• Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including: – techniques, timing, frequency and responsibility – identify measures for which there is risk of failure – evaluate the risk and consequence of any residual impacts – document any adaptive management strategy proposed • Identification of measures for mitigating impacts related to: – displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) – indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)) – mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2) • Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5).	Chapter 11	• Table of measures to be implemented to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Chapter 11 Table 11.1

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Impact Summary	• Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including: – addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land – addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land – documenting assumptions made and/or limitations to information – documenting all sources of data, information, references used or consulted – clearly justifying why any criteria could not be addressed • Identification of impacts requiring offset in accordance with BAM Section 9.2 • Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.) • Identification of areas not requiring assessment in accordance with BAM Section 9.3. Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including: • future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) • change in vegetation integrity score (BAM Subsection 8.1.1) • number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 9) • number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3).	Chapter 12	• Map showing the extent of TECs at risk of an SAII within the subject land • Map showing location of threatened species at risk of an SAII within the subject land • Map showing location of: – impacts requiring offset – impacts not requiring offset – areas not requiring assessment • Table of PCTs requiring offset and the number of ecosystem credits required • Table of threatened species requiring offset and the number of species credits required.	Figure 12.1 Figure 12.2 Table 12.4 Table 12.6

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Biodiversity Credit Report	• Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2).	Chapter 13	• Table of credit class and matching credit profile.	Chapter 13 Table 13.1 Table 13.2 Table 13.3 Table 13.4 Table 13.5 Table 13.6

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix B Secretary's environmental assessment requirements

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
AUSTRALIAN RAIL TRACK CORPORATION

INLAND RAIL

Planning Secretary's Environmental Assessment Requirements

Section 5.16 of the *Environmental Planning and Assessment Act 1979*

Application Number	SSI-9406
Proposal	Inland Rail – Illabo to Stockinbingal
Location	Land generally in a new north-south corridor, from the Main South rail line north-east of Illabo to the Parkes to Stockinbingal rail line to the west of Stockinbingal
Proponent	Australian Rail Track Corporation
Date of Issue	30 April 2021

1. General SEARs

Desired Performance Outcome	Requirement	Current Guidelines
1. Environmental Impact Assessment Process The process for assessment of the project is transparent, balanced, well focussed and legal.	1. The Environmental Impact Statement must be prepared in accordance with Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation). 2. The project will impact matters of national environmental significance (MNES) protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be assessed under an Accredited Assessment. The Proponent must assess impacts to MNES protected under the EPBC Act. The assessment must be in accordance with the requirements listed in Attachment A. 3. Where the project requires approval under the EPBC Act and is being assessed under the Bilateral Agreement (pursuant to Amending Agreement No.1) the EIS must address: (a) consideration of any Protected Matters that may be impacted by the development where the Commonwealth Minister has determined that the project is a Controlled Action; (b) identification and assessment of those Protected Matters that are likely to be significantly impacted; (c) details of how significant impacts to Protected Matters have been avoided, mitigated and, if necessary, offset; and (d) consideration of, and reference to, any relevant conservation advices, recovery plans and threat abatement plans. 4. The onus is on the Proponent to ensure legislative requirements relevant to the project are met.	EPBC Act Environment Assessment Process (SEWPAC, 2010)
2. Environmental Impact Statement The project is described in sufficient detail to enable clear understanding that the project has been developed through an iterative process of impact identification and assessment and project refinement to avoid, minimise or offset impacts so that the project, on balance, has the least adverse environmental, social and economic	1. The EIS must include, but not necessarily be limited to, the following: (a) executive summary; (b) a description of the project, including key components and activities (including ancillary components and activities) required to construct and operate it including: - project overview; - site and route locations (including use of plans); - scope of works to construct the project, including key activities, description of	

impact, including its cumulative impacts.	methodologies, working hours, indicative plant and equipment to be used; - timing of key construction activities; - acquisition of privately owned, council and crown land; and - connections to adjacent Inland Rail sections; (c) a statement of the objective(s) of the project; (d) a summary of the strategic need for the project with regard to its critical State significance and relevant State Government policy; (e) an analysis of any feasible alternatives to the project; (f) a description of feasible options within the project; (g) a description of how alternatives to and options within the project were analysed to inform the selection of the preferred alternative / option. The description must contain sufficient detail to enable an understanding of why the preferred alternative to and options(s) within the project were selected; (h) a general description of different construction methods that were analysed and preferred methods; (i) a concise description of the general biophysical, social and economic environment that is likely to be impacted by the project (including offsite impacts). Elements of the environment that are not likely to be affected by the project do not need to be described; (j) a description of the trains that will operate under the project; (k) a demonstration of how the project design has been developed to avoid or minimise likely adverse impacts; (l) the identification and assessment of key issues as provided in the 'Assessment of Key Issues' performance outcome;		

(m)a statement of the outcomes the Proponent will achieve for each key issue;

(n) measures to avoid, minimise or offset impacts must be linked to the impact(s) they treat, so it is clear which measures will be applied to each impact;

(o) consideration of the interactions between measures proposed to avoid or minimise impact(s), between impacts themselves and between measures and impacts;

(p) an assessment of the relevant cumulative impacts of the project taking into account other projects that have been approved but where construction has not commenced, projects that have commenced construction, and projects that have recently been completed;

(q) statutory context of the project as a whole, including:

- how the project meets the provisions of the EP&A Act and EP&A Regulation; and
- a list of any approvals that must be obtained under any other Act or law before the project may lawfully be carried out;

(r) a chapter that synthesises the environmental impact assessment and provides:

- a succinct but full description of the project for which approval is sought;
- a description of any uncertainties that still exist around design, construction methodologies and/or operational methodologies and how these will be resolved in the next stages of the project;
- a compilation of the impacts of the project that have not been avoided;
- a compilation of the proposed measures associated with each impact to avoid or minimise (through design refinements or ongoing management during construction and operation) or offset these impacts;
- a compilation of the outcome(s) and criteria the proponent will achieve and how these will be monitored; and
- the reasons justifying carrying out the project as proposed, having regard to the biophysical, economic and social considerations, including ecologically sustainable

	development and cumulative impacts; and (s) relevant project plans, drawings, diagrams in an electronic format that enables integration with mapping and other technical software. 2. The EIS must only include data and analysis that is reasonably needed to make a decision on the project. Relevant information must be succinctly summarised in the EIS and included in full in appendices. Irrelevant, conflicting or duplicated information must be avoided.	
3. Assessment of Key Issues* Key issue impacts are assessed objectively and thoroughly to provide confidence that the project will be constructed and operated within acceptable levels of impact. * Key issues are nominated by the Proponent in the CSSI project application and by the Department in the SEARs. Key issues need to be reviewed throughout the preparation of the EIS to ensure any new key issues that emerge are captured. The key issues identified in this document are not exhaustive but are key issues common to most CSSI projects.	1. The level of assessment of likely impacts must be proportionate to the significance of, or degree of impact on, the issue, within the context of the project location and the surrounding environment. The level of assessment must be commensurate to the degree of impact and sufficient to ensure that the Department and other government agencies are able to understand and assess impacts. 2. For each key issue the Proponent must: (a) assess the issue (including modelling as relevant), and address and undertake the requirements specified in section 2; (b) describe the biophysical, social and economic environment, as far as it is relevant to that issue, including substantiated baseline data that is reflective of current guidelines where relevant; (c) describe the legislative and policy context, as far as it is relevant to the issue; (d) identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), the impacts of concurrent activities within the project and cumulative impacts (parallel and sequential) with other projects; (e) demonstrate how potential impacts have been avoided (through design, or construction or operation methodologies); (f) identify clear and quantifiable actions, outcomes and, where possible, performance criteria; (g) detail how likely impacts that have not been avoided through design will be minimised, and the predicted effectiveness of these measures (against performance criteria where relevant); (h) detail how residual impacts will be managed or offset, and the approach and effectiveness of these measures; and (i) measures to monitor the avoidance, minimisation and offsetting of impacts to ensure quantified outcomes and criteria are met. 3. Where multiple options to avoid or minimise impacts are available, they must be identified and considered, and the proposed measure justified taking into account the public interest.	
4.	1. The project must be informed by consultation, including with relevant local, State and	

Consultation The project is developed with meaningful and effective engagement during project design and delivery.	Commonwealth government agencies, infrastructure and service providers, special interest groups, local Aboriginal community groups, affected landowners, businesses and the community. The consultation process must be undertaken in accordance with the current guidelines. 2. The Proponent must document the consultation process and demonstrate how the project has responded to the inputs received. 3. The Proponent must describe the timing and type of community consultation proposed during the design and delivery of the project, the mechanisms for community feedback, the mechanisms for keeping the community informed, and procedures for complaints handling and resolution. 4. Where the Proponent establishes a Community Consultative Committee (CCC) for the project, the establishment and operation of the CCC must be in accordance with the Department's *Community Consultative Guidelines State Significant Projects (2019)*. The CCC must not be the only or primary method of engagement with the community on the project.	

2. Key Issue SEARs

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
1. Biodiversity The project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. he Offsets and/or supplementary measures are assured which are equivalent to any residual impacts of project construction and operation.	1. Biodiversity impacts in accordance with s7.9 of the *Biodiversity Conservation Act 2016* (BC Act), the Biodiversity Assessment Method (BAM), and be documented in a Biodiversity Development Assessment Report (BDAR). 2. The BDAR must document the application of the avoid, minimise and offset framework in accordance with the BAM. 3. The BDAR must include information in the form detailed in s6.12 of the BC Act, cl6.8 of the *Biodiversity Conservation Regulation 2017* and the BAM. 4. The BDAR must be submitted with all digital 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 2020 under s6.10 of the BC Act. 6. The BDAR must include details of the measures proposed to address offset obligations in accordance with the BAM and the EPBC Act, as follows: a) The total number and classes of biodiversity credits required to be retired for the development/project; b) The number of 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 make a payment to the Biodiversity Conservation Fund.	Biodiversity Assessment Method (DPIE 2020) BAM Accredited Assessor Resources (includes all current BAM survey guidelines) Biodiversity Assessment Method 2020 Operational Manual Stage 1 (DPIE 2020) Biodiversity Assessment Method Operational Manual Stage 2 (OEH, 2019) Significant Impact Guidelines 1.1 Matters of National Environmental Significance (DEWHA, 2013) Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013 (DPI, 2013) Threatened Species Survey and Assessment Guidelines Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries, 2003) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) Aquatic Ecology in Environmental Impact Assessment – EIA Guideline (Marcus Lincoln Smith 2003) Freshwater threatened species distribution maps ()

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	7. Impacts on biodiversity values not covered by the BAM. This includes a threatened aquatic species assessment (Part 7A *Fisheries Management Act 1994*) to address whether there are likely to be any significant impact on listed threatened species, populations or ecological communities listed under the *Fisheries Management Act 1994* (FM Act). 8. Identify whether the project, or any component of the project, would be classified as a Key Threatening Process (KTP) in accordance with the listings in the BC Act, FM Act and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).	
2. Protected and Sensitive Lands The project is designed, constructed and operated to avoid or minimise impacts on protected and sensitive lands. The project is designed, constructed and operated to avoid or minimise future exposure to coastal hazards and processes.	1. Assess the impacts of the project on environmentally sensitive land and processes (and the impact of processes on the project) including, but not limited to: (a) protected areas (including land and water) managed by DPIE BCD and/or DPI Fisheries under the *National Parks and Wildlife Act 1974* and the *Marine Estate Management Act 2014*; (b) Key Fish Habitat as mapped and defined in accordance with the FM Act; (c) waterfront land as defined in the *Water Management Act 2000;* (d) land or waters identified as Critical Habitat under the BC Act, FM Act or EPBC Act; and (e) biobank sites, private conservation lands and other lands identified as offsets.	Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water (DECCW, 2010) Revocation, Re-categorisation and Road Adjustment Policy (OEH, 2012) Guidelines for controlled activities on waterfront land (DPI 2012) Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013 (DPI, 2013) Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries, 2003)
3. Transport and Traffic Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts. The safety of transport system customers is maintained.	1. Construction transport and traffic (vehicle, pedestrian and cyclists) impacts, including, but not necessarily limited to: (a) the likely construction access routes (including haul routes) and the scheduling of construction vehicle movements; (b) the indicative number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements and track machines); (c) construction worker parking; (d) the nature of existing traffic (types and number of movements) on	Guide to Traffic Management – Part 3 Traffic Studies and Analysis (Austroads, 2007) Guide to Traffic Generating Developments Version 2.2 (RTA, 2002) Cycling Aspects of Austroads Guides (Austroads, 2014) NSW Bicycle Guidelines v 1.2 (RTA, 2005) Planning Guidelines for Walking and Cycling

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
Impacts on network capacity and the level of service are effectively managed. Works are compatible with existing infrastructure and future transport corridors.	construction access routes (including consideration of peak traffic times, movement of livestock, agricultural machinery, farm vehicles and other farm infrastructure) and assessment of traffic impacts on these routes including identifying traffic management measures to mitigate any issues; (e) provisions proposed to ensure safe access and egress to/from the classified road network; (f) the nature of any train paths (types and number of movements) and potential impact to these train paths due to additional track possession requirements; and (g) the need to close, divert or otherwise reconfigure elements of the road and cycle network associated with construction of the project and the duration of these changes. 2. Operational transport impacts of the project for both road and rail, including: (a) forecast travel demand and traffic volumes for the project (road and rail); (b) travel time analysis; (c) performance of key intersections and level crossings by undertaking a level of service analysis at key locations; (d) wider transport interactions (local and regional roads, cycling, movement of livestock or farm vehicles, intermodal hubs. public and freight transport and the broader NSW rail network); and (e) identification of traffic and transport measures to mitigate any impacts. The assessment must include the modelling of the operational impact of the project. 3. Assess the feasibility of level crossings (existing and proposed) and justify the safety and operational impacts and/or benefits of the proposed crossing type, taking into account the NSW Government's Construction of New Level Crossings Policy. 4. In the assessment of level crossings, the EIS must: (a) provide a safety assessment for each level crossing. The safety	(DIPNR, 2004) Construction of New Level Crossing Policy (TfNSW, 201) Future Transport Strategy 2056 (TfNSW, 2018) NSW Draft Freight and Ports Plan (TfNSW, 2018-2023) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) Australian Level Crossing Assessment Model (ALCAM, 2016) Railway Crossing Safety Series 2011, Plan: Establishing a Railway Crossing Safety Management Plan (RTA, 2011) Austroads (2016). Safe System Assessment Framework

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	assessment is to be consistent with ALCAM, and any Interface Agreements and related Safety Management Plans; (b) demonstrate how the risks identified in the So Far As Is Reasonably Practical (SFAIRP) process will be reduced in consultation with the relevant road authority and TfNSW. (c) assess potential short-stacking impacts; (d) confirm road approaches to level crossings are fit for purpose, safe and designed and constructed in accordance with Austroads Guide to Road Design; and account any rationalisation of private and public level crossings in line with the NSW Government's *Level Crossing Closure Policy*.	
4. Flooding, Hydrology and Geomorphology The project minimises changes to the existing flood regime's impacts on property, public safety and the environment resulting from alteration of the water flow characteristics of watercourses and overland flowpaths. Where feasible, the project includes remedial measures to mitigate any adverse water flow impacts or flood safety risks caused by the existing rail infrastructure within the project area. Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding,	1. Description of topographic and hydrological conditions of the site and surrounding area, including: (a) Assessment of the existing hydrology and flooding characteristics of all watercourses within and adjacent to the project area. This includes locating and assessing flowpaths emanating from existing culverts, pipes and bridges under the rail formation, or from overtopping of the existing formation in flood events. (b) Description of the existing and proposed topography in all areas that could be potentially affected by floodwaters. This includes the spatial location, and the horizontal and vertical dimensions of all spoil mounds. (c) Carrying out of investigations to assess the propensity for scour, erosion and geomorphological changes to occur within any watercourses or overland flowpaths affected by the project. 2. Design parameters and features, including: (a) Description and justification of quantitative flood management objectives for flooding, hydrological and geomorphological changes resulting from the project. These objectives are to consider land use and include afflux, velocity, extent, duration, hazard and scour potential.	NSW Government's Floodplain Development Manual (Department of Natural Resources, 2005) PS 07-003 New guideline and changes to section 117 direction and EP&A Regulation on flood prone land Practical Consideration of Climate Change - Flood risk management guideline (DECC, 2007) Floodplain Management Plans: https://www.industry.nsw.gov.au/water/plans-programs/healthyfloodplains-project/plans Change Impacts and Risk Management: A Guide for Business and Government, AGIC Guidelines for Climate Change Adaptation Australian Disaster Resilience Handbook 7 – Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia. (AIDR, 2017)

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
flooding hazards, or flooding induced by infrastructure failure.	(b) Description and justification of the proposed flood planning level (FPL) for the project including the annual exceedance probabilities (AEPs) of the floods which will overtop the formation and rail. When establishing the appropriate FPL, consider any impacts on adjacent infrastructure and any alteration works required to improve flood immunity of affected infrastructure. (c) Description of the location and size of all existing and proposed pipes, culverts and bridges, and the locations and AEPs of floods that overtop the existing formation and rail. (d) Preliminary engineering designs of the velocity dispersal velocity attenuation and other velocity mitigation works that are proposed to avoid adverse scouring on the land downstream of the project area, adjacent to locations where pipes, culverts or bridges are proposed or where the rail formation may be overtopped. (e) At locations along the rail route, identification of the width of land between the toe of the formation and the downstream boundary of the project area, that is available for the construction of these mitigation works. Where there is insufficient width of project land available for these works, clear identification of the extent of additional land beyond the project boundary area that may be required, including the locations where easements over land or acquisition of land may be required. 3. Operational phase impacts of the project on flood behaviour for a full range of flood events up to and including the PMF (including consideration of the impacts of climate change and differing storm durations), including: (a) utilisation of 2D hydrologic and hydraulic models that are consistent with ARR and current best practice and utilise topographic and infrastructure data that is of sufficient spatial coverage and accuracy to ensure the resultant models can accurately assess existing and proposed water flow characteristics; (b) Identification of allowance for blockage of all cross-drainage structures to be made in accordance with ARR; (c) having these models independently peer-reviewed with the review findings published in the EIS;	*Australian Rainfall and Runoff* (Commonwealth of Australia, Geoscience Australia, 2019) (ARR) *Floodplain Risk Management Guide - Incorporating [2016] Australian Rainfall and Runoff in studies* (OEH, 2019) AS/NZS 3100:2018 Risk Management – Principles and Guidelines

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	(d) assessing any changes to the potential flood affectation, scouring or geomorphological changes to other properties, assets and infrastructure, over a full range of flood durations and flood frequencies against the proposed quantitative flood management objectives; (e) assessing changes in upstream and downstream flowpaths (location, discharges and velocities, including overland flow); (f) where the existing rail infrastructure has an adverse flood impact on property or people, the flood assessment must consider the extent to which the project alleviates or exacerbates these existing impacts; (g) assessing impacts of extreme floods up to the probable maximum flood (PMF) including consideration of flood risks to people and property resulting from failure of the formation or washouts of ballast. (h) assessing the consistency (or inconsistency) with the applicable Council or DPIE Water floodplain management plans. The requirements of these plans must be discussed with DPIE Water and the relevant Council; (i) assessing whether each component of the project is compatible with the flood hazard of the land and the hydraulic functions of flow conveyance, floodway and flood storage; (j) assessing impacts on farm dams, agricultural infrastructure, crops and activities associated with altered hydrology including volumetric changes in water flows; (k) assessing any impacts that the project may have upon existing community emergency management arrangements for flooding. These matters must be discussed with the State Emergency Service and applicable Council; and (l) evaluating any social and economic impacts that the project may have on the community as a consequence of changes to flooding and hydrology including dividing or fragmentation of property and changes to property management which could lead to the loss of viability. 4. Construction impacts of the project including:	

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	(a) typical construction methodology and programming that may affect flood impacts; (b) structures and plant located on the floodplain during construction; (c) land uses and infrastructure in the vicinity of the project susceptible to flood impacts that may arise during the construction phase; (d) acceptable impacts having regard to the nature and duration of various construction activities within the floodplain, and the probabilities of a range of flood events occurring over the duration of the construction period; and (e) measures to mitigate risks of construction impacts occurring. 5. In the event that operational impacts do not comply with the nominated quantitative flood management objectives, provide measures to ensure the project's detailed design complies with the quantitative objectives. Alternatively: (a) demonstrate that design changes to meet objectives at a given project location are not practicable; and (b) describe how broad flooding objectives will still be met at a given location; and (c) detail procedures to ensure that the flood performance is acceptable to affected parties.	
5. Water – Hydrology Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where	1. Describe (and map) the existing hydrological regime for any surface and groundwater resource (including reliance by users and for ecological purposes) likely to be impacted by the project, including stream orders, as per the BAM. 2. Prepare a conceptual water balance for ground and surface water including the proposed intake and discharge locations, volume, frequency and duration, sources, security and licensing requirements. 3. Surface and groundwater hydrology impacts of the construction and operation of the project and any ancillary facilities (both built elements and discharges) on surface and groundwater hydrology in	Biodiversity Assessment Method (DPIE, 2020) Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008) NSW Aquifer Interference Policy (DPI, 2012) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) Risk assessment Guidelines for Groundwater Dependent Ecosystems (Office of Water, 2012)

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
values are achieved) or improved and maintained (where values are not achieved). Sustainable use of water resources.	accordance with the current guidelines, including: (a) natural processes within rivers, wetlands, estuaries, marine waters and floodplains that affect the health of the fluvial, riparian, estuarine or marine system and landscape health (such as modified discharge volumes, durations and velocities), aquatic connectivity and access to habitat for spawning and refuge; (b) impacts from any permanent and temporary interruption of groundwater flow, including the extent of drawdown, barriers to flows, implications for groundwater dependent surface flows, ecosystems and species, groundwater users and the potential for settlement; (c) changes to environmental water availability and flows, both regulated/licensed and unregulated/rules-based sources; (d) direct or indirect increases in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses; (e) minimising the effects of proposed stormwater and wastewater management during construction and operation on natural hydrological attributes (such as volumes, flow rates, management methods and re-use options) and on the conveyance capacity of existing stormwater systems where discharges are proposed through such systems; and (f) water take (direct or passive) from all surface and groundwater sources with estimates of annual volumes during construction and operation, including an assessment of the availability of water where water entitlement is required to be purchased. 4. Identification of any requirements for baseline monitoring of hydrological attributes.	Guidelines for Controlled Activities on Waterfront Land (NRAR, 2018) Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions (OEH and EPA, 2017) Relevant water sharing plans at https://www.mdba.gov.au/publications/all-publications
6. Water – Quality The project is designed, constructed and operated to protect the NSW Water Quality Objectives where they are currently being achieved, and contribute towards	1. Water quality impacts, including: (a) stating the ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the receiving waters relevant to the project, including the indicators and associated trigger values or criteria for the identified environmental values; (b) identifying and estimating the quality and quantity of pollutants	NSW Water Quality and River Flow Objectives at http://www.environment.nsw.gov.au/ieo/ Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006) Australian and New Zealand Guidelines for Fresh and

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
achievement of the Water Quality Objectives over time where they are currently not being achieved, including downstream of the project to the extent of the project impact including estuarine and marine waters (if applicable).	that may be introduced into the water cycle by source and discharge point and describe the nature and degree of impact that any discharge(s) may have on the receiving environment, including consideration of all pollutants that pose a risk of non-trivial harm to human health and the environment; (c) identifying the rainfall event that the water quality protection measures will be designed to cope with; (d) the significance of any identified impacts including consideration of the relevant ambient water quality outcomes; (e) demonstrating how construction and operation of the project will, to the extent that the project can influence, ensure that: - where the NSW WQOs for receiving waters are currently being met they will continue to be protected; and - where the NSW WQOs are not currently being met, activities will work toward their achievement over time; (f) justifying, if required, why the WQOs cannot be maintained or achieved over time; (g) demonstrating that all practical measures to avoid or minimise water pollution and protect human health and the environment from harm are investigated and implemented; (h) identifying sensitive receiving environments (which may include estuarine and marine waters downstream) and develop a strategy to avoid or minimise impacts on these environments; and (i) identifying proposed monitoring locations, monitoring frequency and indicators of surface and groundwater quality.	Marine Water Quality (ANZG, 2018) Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DECC, 2008) Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008) Guidelines for Controlled Activities on Waterfront Land (NRAR, 2018)
7. Soils The environmental values of land, including soils, subsoils and landforms, are protected. Risks arising from the disturbance and excavation of land and disposal of soil are minimised, including disturbance to acid sulfate soils and site contamination.	1. Assess whether the land is likely to be contaminated and identify if remediation of the land is required, having regard to the ecological and human health risks posed by the contamination in the context of past, existing and future land uses. Where assessment and/or remediation is required, the Proponent must document how the assessment and/or remediation would be undertaken in accordance with current guidelines. 2. Assess whether salinity is likely to be an issue and if so, determine the presence, extent and severity of soil salinity within the project area.	Managing Land Contamination: Planning Guidelines SEPP 55 –Remediation of Land, (DUAP & EPA, 1998) Guidelines for Consultants Reporting on Contaminated Sites (OEH, reprinted 2011) Guidelines for the NSW Site Auditor Scheme (DEC, 2006) Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	3. Assess the impacts of the project on soil salinity and how it may affect groundwater resources and hydrology. 4. Assess the impacts on soil and land resources (including erosion risk or hazard). Particular attention must be given to soil erosion and sediment transport consistent with the practices and principles in the current guidelines.	(EPA, 2015) Urban and regional salinity – guidance given in the Local Government Salinity Initiative booklets (http://www.environment.nsw.gov.au/salinity/solutions/urban.htm) which includes *Site Investigations for Urban* Salinity (DLWC, 2002) Landslide risk management guidelines presented in Australian Geomechanics Society (2007) Soil and Landscape Issues in Environmental Impact Assessment (DLWC 2000) Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008) Other guidelines made or approved under section 105 of the *Contaminated Land Management Act 1997*
8. Heritage The design, construction and operation of the project facilitates, to the greatest extent practicable, the long-term protection, conservation and management of the heritage and cultural significance of items of environmental heritage and Aboriginal objects and places. The design, construction and operation of the project avoids or minimises impacts, to the greatest extent practicable, on the	1. Direct and/or indirect impacts (including cumulative impacts) to the significance of: (a) Aboriginal places, objects and cultural heritage values, as defined under the *National Parks and Wildlife Act 1974* and in accordance with the principles and methods of assessment identified in the current guidelines; (b) Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan; (c) environmental heritage, as defined under the *Heritage Act 1977*; and (d) items listed on the State, National and World Heritage lists; (e) heritage items, areas of cultural significance and conservation areas identified in environmental planning instruments applicable to the project area; and	Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011) Aboriginal Cultural Heritage Consultation requirements for proponents (DECCW, 2010) Code of practice for archaeological investigation of Aboriginal objects in NSW (DECCW, 2010) NSW Skeletal Remains: Guidelines for Management of Human Remains (Heritage Office, 1998) Aboriginal site recording form Aboriginal site impact recording form Aboriginal Heritage Information Management System

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
heritage significance of environmental heritage and Aboriginal objects and places	(f) heritage items in relevant Section 170 Heritage and Conservation Registers. 2. Where impacts to heritage items are identified, the assessment must: (a) include a significance assessment, a statement of heritage impact for all heritage items and a historical archaeological assessment; (b) assess the consistency of the project against conservation policies of any relevant conservation management plan; (c) consider impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment, drainage infrastructure, contamination remediation and site compounds (as relevant); (d) outline measures to avoid and minimise those impacts during construction and operation in accordance with the current guidelines; and (e) be undertaken by a suitably qualified heritage consultant(s), cultural consultant(s) and/or historical archaeologist (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria). 3. Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, in accordance with section 1.6 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010). 4. Impacts to Aboriginal objects and/or places must be assessed and documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR). Consultation must be undertaken with Aboriginal people in accordance with the Aboriginal Cultural Heritage Consultation	site registration form Care agreement application form Criteria for the assessment of excavation directors (NSW Heritage Council, 2011) NSW Heritage Manual (Heritage Office and Department of Urban Affairs and Planning, 1996) Assessing Heritage Significance (NSW Heritage Office, 2001) The Australia ICOMOS Burra Charter

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	requirements for proponents (DECCW, 2010). The ACHAR must: (a) document the outcomes of consultation with Aboriginal people and outline measures proposed to mitigate impacts, and document the significance of cultural heritage values for Aboriginal people who have a cultural association with the land; (b) identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the project; (c) document the outcomes of the archaeological surface survey and test excavation to inform the need for targeted test excavations; (d) assess and document impacts on Aboriginal cultural heritage values and demonstrate attempts to avoid impacts upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the ACHAR must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to the AHIMS Register; and (e) outline procedures to be followed if Aboriginal objects, burials or skeletal material are found at any stage of the life of the project to formulate appropriate measures to manage unforeseen impacts.	
9. Noise and Vibration Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity. Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the	1. Construction and operational noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. 2. The assessment of construction noise and vibration must address: (a) the nature of construction activities and related noise characteristics; (b) the intensity and duration of noise (both air and ground borne) and vibration impacts. This must include consideration of extended construction impacts associated with ancillary facilities (and the like) and construction fatigue;	Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZECC, 1990) Assessing Vibration: a technical guideline (DEC, 2006) Interim Construction Noise Guideline (DECCW, 2009) Noise Policy for Industry (EPA, 2017) Construction Noise and Vibration Strategy (TfNSW,

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
project are effectively managed to protect the amenity and well-being of the community. Increases in noise emissions and vibration affecting environmental heritage as defined in the *Heritage Act 1977* during operation of the project are effectively managed.	(c) the identification and nature of receivers, existing and proposed, during the construction period; (d) the structural integrity and heritage significance of items (including Aboriginal places and items of environmental heritage). (e) the nature of the impact and the sensitivity of receivers, including but not limited to residential (permanent and short term), tourist and commercial uses, both existing and proposed, and level of impact including for out of hours works; (f) the need to balance timely conclusion of noise and vibration-generating works with periods of receiver respite, and other factors that may influence the timing and duration of construction activities (such as traffic management); (g) noise impacts of out-of-hours works (including utility works and works associated with the SSI including those undertaken under another assessment pathway), possible locations where out-of-hours works would be undertaken, the activities that would be undertaken, the estimated duration of those activities and justification for these activities in terms of the *Interim Construction Noise Guideline* (DECC, 2009); (h) sleep disturbance (including the number of noise-awakening events); (i) details and analysis of the predicted effectiveness of mitigation measures to adequately manage identified impacts, including impacts as identified in (h), (j) any potential residual noise and vibration impacts following application of mitigation measures; and (k) a description of how receiver feedback received during the preparation of the EIS has been taken into account (and would be taken into account post exhibition of the EIS) in the design of mitigation measures, including any tailored mitigation,	2018) Rail Infrastructure Noise Guideline (EPA, 2013) NSW Road Noise Policy (DECCW, 2011) Development Near Rail Corridors and Busy Roads – Interim guideline (DoP, 2008) Noise Mitigation Guideline (RMS, 2015) Noise Criteria Guideline (RMS, 2015) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) German Standard DIN 4150-3: Structural Vibration - effects of vibration on structures (2016)

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	management and communication strategies for sensitive receivers. 3. If blasting is required, demonstration that blast impacts can comply with current guidelines.	
10. Economic, Land Use and Agriculture The project minimises adverse economic impacts and capitalises on opportunities potentially available to affected communities. The project minimises impacts to property and business including agricultural enterprises and accommodation and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.	1. Economic impacts in accordance with the current guidelines. 2. Economic impacts from construction and operation on potentially affected properties, businesses, recreational users and land and water users, including property acquisitions/adjustments, access, amenity and relevant statutory rights. 3. Opportunities and processes to prioritise local industry participation practices to source construction goods and services, including training and employment targets within communities along or near the rail alignment. 4. Agricultural land use impacts in accordance with the current guidelines including: (a) current and potential Biophysical Strategic Agricultural Land and Class 1, 2 and 3 Agricultural land Classes, including land capability and agricultural productivity; (b) division or fragmentation of property and changes to property management which could lead to the loss of viability; (c) property access and the efficient and safe crossing of the rail corridor by machinery and livestock (d) impacts to changes in water regimes; (e) connectivity of property infrastructure severed by the rail corridor; and (f) livestock exclusion/management to minimise harm and losses. 5. Biosecurity risks and management measures relating to the potential for spread of pests, diseases or weeds along the length of the project alignment, in accordance with the 'general biosecurity duty' under the	Environmental Planning and Impact Assessment Practice Note: Socio-economic Assessment (RMS, 2013) New England North West Regional Plan 2036 (DPE, 2017) Infrastructure Proposals on Rural Land, Primefact 1063, second edition (DPI, 2013) NSW Invasive Species Plan 2018-202 (DPI, 2018) Land Use Conflict Risk Assessment (LUCRA) Guide (DPI, 2011) NSW Infrastructure Skills Legacy Program NSW Aboriginal Participation in Construction Policy 2018

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	Biosecurity Act 2015. 6. Economic impact of temporary accommodation for construction workers on communities near the project site. 7. The temporary and permanent interface with road reserves, Crown Land and Travelling Stock Routes and the use and management of these landholdings affected by the proposal.	
11. Social The project minimises adverse social impacts and capitalises on opportunities potentially available to affected communities.	1. Potential social impacts of the project from the points of view of the affected community/ies and other relevant stakeholders, i.e. how they expect to experience the project. 2. How potential environmental changes in the locality may affect people's (including, but not limited to): (a) community; (b) access to accommodation and housing; (c) access to and use of infrastructure, services, and facilities; (d) culture; (e) health and wellbeing; surroundings; (f) personal and property rights; (g) decision-making systems; and (h) fears and aspirations, as relevant and considering how different groups may be disproportionately affected. 3. Social actions and outcomes that address both negative and positive social impacts.	Draft Social Impact Assessment Guideline (DPIE, 2020) Social Impact Assessment Guideline (DPE, 2017) Social Impact Assessment Scoping Tool (DPE, 2017)

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
12. Visual Amenity The project minimises adverse impacts on the visual amenity of the built and natural environment (including public open space) and capitalises on opportunities to improve visual amenity.	1. Assess the visual impact of the project (including spoil mounds, formation, bridges, viaducts and overpasses) and any ancillary infrastructure on: (a) views and vistas; (b) streetscapes, key sites and buildings; (c) heritage items including Aboriginal places and environmental heritage; and (d) the local community. 2. Provide artist impressions and perspective drawings of the project to illustrate how the project has responded to the visual impact through urban design and landscaping.	AS4282-1997 Control of the obtrusive effects of outdoor lighting Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW (RMS, 2012) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) Technical guideline for Urban Green Cover in NSW (OEH, 2015)
13. Waste All wastes generated during the construction and operation of the project are effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values.	1. Assess predicted waste generated from the project during construction and operation, including: a) classification of the waste in accordance with the current guidelines; b) estimates / details of the quantity of each classification of waste to be generated during the construction of the project, including bulk earthworks and spoil balance; c) handling of waste including measures to facilitate segregation and prevent cross contamination; d) management of waste including estimated location and volume of stockpiles; e) waste minimisation and reuse; f) lawful disposal or recycling locations for each type of waste; and g) contingencies for the above, including managing unexpected waste volumes. 2. Assess potential environmental impacts from the excavation, handling, storage on site and transport of the waste particularly with relation to sediment/leachate control, noise and dust.	NSW Waste Avoidance and Resource Recovery Strategy 2014-21 (EPA 2014) *Waste Classification Guidelines – Part 1: Classification of Waste* (EPA 2014) Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008)
14. Climate Change and Sustainability The project reduces the NSW Government's operating costs and ensures the effective	1. Sustainability of the project in accordance with the Infrastructure Sustainability Council of Australia (ISCA) *Infrastructure Sustainability Rating Tool* and recommend an appropriate target rating for the project. 2. Sustainability of the project against the current guidelines including	Australian Government's Climate Change Impacts and Risk Management – A Guide for Business and Government (2006) ISO 31000:2018 Risk management – Guidelines

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
and efficient use of resources. Conservation of natural resources is maximised. The project is designed, constructed and operated to be resilient to the future impacts of climate change.	targets and strategies to improve Government efficiency in use of water, energy and transport. 3. The risk and vulnerability of the project to climate change in accordance with the current guidelines. 4. Climate change risks must be quantified with reference to the NSW Government's climate projections at 10km resolution (or lesser resolution if 10km projections are not available) or equivalent projection tool (such as the Climate Futures Tool from CSIRO and BoM (attenuated for project region)) and incorporate specific adaptation actions in the design.	AS 5334-2013 Climate change adaptation for settlements and infrastructure – A risk based approach Infrastructure Sustainability Rating Tool Scorecard relating to energy and carbon for large infrastructure projects, ISCA NSW Infrastructure Skills Legacy Programs' training and employment targets (DOI, 2017) Infrastructure Sustainability Rating Tool Scorecard relating to energy and carbon for large infrastructure projects, ISCA Technical Guide for Climate Change Adaptation for the State Road Network (RMS, in draft) Practical Consideration of Climate Change – Floodplain Risk Management Guideline (DECC, 2007)

ATTACHMENT A – EPBC Act Requirements

Inland Rail - Illabo to Stockinbingal (EPBC 2018/8233, SSI 18_9406)

The proposed action is being assessed for the purposes of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) under Part 5 Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This document is intended to assist NSW Department of Planning and Environment (NSW DPE) to manage the environmental impact assessment process. It is not legally binding and does not replace the requirements of the EPBC Act.

Proposed Action

To construct a rail line between Illabo and Stockinbingal, spanning approximately 37 km of new rail, as part of the Inland Rail Programme.

Matters of National Environmental Significance

The EPBC Act controlling provisions for the proposed action are:

- listed threatened species and communities (sections 18 and 18A)

All matters of national environmental significance (MNES) protected under the triggered controlling provisions are potentially relevant. The Department considers that the proposed action will have a significant impact on the following:

· White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered

· Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – Endangered

· Regent Honeyeater (*Anthochaera phrygia*) - Critically Endangered

· Swift Parrot (*Lathamus discolor*) – Critically Endangered

· Superb Parrot (*Polytelis swainsonii*) – Vulnerable

The Department further considers that the proposed action may have a significant impact on the following:

· *Austrostipa wakoolica* – Endangered

· Tarengo Leek Orchid (*Prasophyllum petilum*) – Endangered

· Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) (*Dasyurus maculatus maculatus* (SE mainland population)) - Endangered

· Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable

· Painted Honeyeater (*Grantiella picta*) – Vulnerable

· Corben's Long-eared Bat, South-eastern Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable

· Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT) – Vulnerable

· Crimson Spider-orchid, Maroon Spider-orchid (*Caladenia concolor*) – Vulnerable

· Yass Daisy (*Ammobium craspedioides*) – Vulnerable

- Pink-tailed Worm-lizard (*Aprasia parapulchella*) – Vulnerable

Note that this may not be a complete list and it is the responsibility of the proponent to ensure any protected matters under this controlling provision are assessed for the Commonwealth decision-maker's consideration.

Key Issues

- The proponent submitted a referral based on preliminary desktop and rapid assessments, and identified the action was a controlled action due to potential significant impacts to the Regent Honeyeater, Swift Parrot and Superb Parrot as well as White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia ecological communities. The Department has identified a longer list of species that may be impacted, for which the referral does not contain sufficient information to determine significance, as no detailed flora and fauna surveys have been completed. Consequently, the Department recommends engagement in Stage 2, before the draft EIS is exhibited, to consider the assessments of significance and determine which species are relevant to assessment of the action for EPBC Act purposes.

General Assessment Requirements

The EIS must address the matters outlined in Schedule 4 of the EPBC Regulations and the matters outlined below in relation to the controlling provisions.

1. For each of the EPBC Act-listed species and ecological communities impacted by the proposed action, the EIS must provide:

    a. Survey results, including details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Commonwealth guidelines and policy statements.

    b. A description of the habitat and habits (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, threat abatement plans and wildlife conservation plans; and

    c. Maps displaying the above information (specific to EPBC matters) overlaid with the proposed action

Note - It is acceptable, where possible, to use the mapping and assessment of Plant Community Types (PCTs) and the species surveys prescribed by the BAM as the basis for identifying EPBC Act-listed species and communities. The EIS must clearly identify which PCTs are considered to align with habitat for the relevant EPBC Act-listed species or community, and provided individual maps for each species or community.

2. The EIS must describe the nature, geographic extent, magnitude, timing and duration of any likely direct, indirect and consequential impacts on any relevant EPBC Act-listed species and communities. It must clearly identify the location and quantify the extent of all impact areas to each relevant EPBC Act-listed species or community.

3. For each of the EPBC Act-listed species and communities that are likely to be impacted by the development, the EIS must provide information on proposed avoidance and mitigation measures to deal with the impacts of the action, and a description of the predicted effectiveness and outcomes that the avoidance and mitigation measures will achieve.

4. The EIS must identify each EPBC Act-listed species and community likely to be significantly impacted by the proposed action. Where a significant impact is likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit, how offsets will be secured, and timing of protection.

Note - A number of offsets options under the NSW *Biodiversity Conservation Act 2016* will be acceptable for EPBC Act approval purposes. It is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action i.e. 'like for like'. Like-for-like includes protection of native vegetation that is the same EEC or habitat being impacted, or funding to provide a direct benefit to the matter being impacted i.e. threat abatement, breeding and propagation programs or other relevant conservation measures.

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix C Threatened flora database searches

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
AUSTRALIAN RAIL TRACK CORPORATION

INLAND RAIL

Threatened flora database searches

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Subject land	Outcome
Acacia ausfeldii	Ausfeld's Wattle	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat in the form of PCT 266; PCT 277 & PCT 276 was recorded within the subject land. Though not records exist within locality of the subject land, this species has been previously recorded to the north of Stockinbingal in Weddin Mountains National Park.	Candidate species credit species subject to targeted surveys
Ammobium craspedioides	Yass Daisy	V	V	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat in the form of PCT 266; PCT 277; PCT 276; recorded within the subject land. Though no records exist within locality of the subject land, an outlier population has been recorded about 30km to the south of Wagga Wagga in Livingstone National Park. This species was identified by DEE as a possible controlled provision.	Candidate species credit species subject to targeted surveys
Amphibromus fluitans	Floating Swamp Wallaby-grass	V	V	Periodically inundated sites (including table drains and farm dams), notably wetlands on riverine floodplain	0	PMST	Species identified in PMST search. Habitat requirements not present within Subject land. Associated PCTs not recorded within the subject land. Low likelihood of occurrence.	Not considered further
Austrostipa metatoris	A spear-grass	V	V	None. No specific requirements or restrictions identified in BCC	0	PMST	Species was identified in PMST search. Associated PCTs not recorded within the subject land. The subject land is considered outside of this species geographic distribution. No records within the locality of the alignment. Not recorded during surveys undertaken during its flowering season.	Not considered further

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Subject land	Outcome
Austrostipa wakoolica	A spear-grass	E	E	South of Narranderra	0	BCC, PMST	Associated habitat in the form of PCT 76 and PCT 80 was recorded. This species was identified by DEE as a possible controlled provision.	Candidate species credit species subject to targeted surveys
Brachyscome papillosa	Mossgiel Daisy	V	V	South and west of the Coolamon to Ardlethan Road, west of Lockhart and north of Rand	0	BCC (lower slopes IBRA subregion)	The subject land is outside the geographic limitations of this species	Not considered further
Caladenia arenaria	Sand-hill Spider Orchid	E	E	west of Lockhart and north of Rand	1	BCC, PMST, BioNet	The subject land is considered outside of this species known distribution. One record from 1990 exists near Bethungra Mountain. Associated habitat in the form of PCT 76 was recorded	Candidate species credit species subject to targeted surveys
Caladenia concolor	Crimson Spider Orchid	E	V	None. No specific requirements or restrictions identified in BCC	4	BCC, PMST, BioNet	Associated habitat in the form of PCT 347 was recorded. Though no recent records were in locality of the subject land, one record from 1991 exists near Bethungra Mountain. This species was identified by DEE as a possible controlled provision.	Candidate species credit species subject to targeted surveys
Caladenia tensa	Greencomb Spider-orchid	–	E	–	0	PMST	The subject land is considered outside of this species known geographic distribution. Associated habitat was not recorded within the subject land.	Not considered further
Cullen parvum	Small Scurf-pea	E	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat (PCT 347, PCT 277, PCT 79) was recorded within the subject land. Preferred habitat, grassland, River Red Gum Woodland or Box-Gum Woodland, sometimes on grazed land and along watercourses was recorded in moderate condition within the subject land.	Candidate species credit species subject to targeted surveys

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Subject land	Outcome
Diuris tricolor	Pine Donkey Orchid	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Associated habitat was widely recorded within the subject land (PCT 76, PCT 80 and PCT 347). Previously recorded in 2000, within locality of the subject land, west of Jundalee National Park.	Candidate species credit species subject to targeted surveys
Eleocharis obicis	Spike-rush	V	V	Periodically waterlogged sites (including table drains and farm dams)	0	BCC (lower slopes IBRA subregion)	Associated habitat (PCT 76) was recorded within the subject land within the lower slopes IBRA subregion.	Added as a candidate species credit species subject to targeted surveys
Euphrasia arguta	Euphrasia arguta	CE	CE	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat was recorded within the subject land (PCT 266 and PCT 276).	Candidate species credit species subject to targeted surveys
Grevillea wilkinsonii	Tumut Grevillea	CE	E	Eastern part of sub-region from 10km west of the Hume Highway and north of the Snowy Mountains Highway	0	BCC	Associated habitat was recorded within the subject land (PCT 266). Highly restricted population known from only two locations: east of Tumut and near Gundagai.	Candidate species credit species subject to targeted surveys
Indigofera efoliata	Leafless Indigo	E	E	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat in the form of PCT 76 was recorded. Though not previously recorded within locality of the subject land, this species is known to grow on slight rises amongst ironstone formation in stony red-brown sandy loam.	Candidate species credit species subject to targeted surveys
Lepidium aschersonii	Spiny Pepper-cress	V	V		0	PMST, BCC (lower slopes IBRA subregion)	. Associated habitat in the form of PCT 76 was recorded within the subject land, however, habitat requirements for the species, gilgai clays, were not recorded. Closest record to the west at Temora (in 1915). Species unlikely to occur.	Candidate species credit species subject to targeted surveys

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Subject land	Outcome
Leucochrysum albicans subsp. *tricolor*	Hoary Sunray	E	E	None. No specific requirements or restrictions identified in BCC	0	PMST	Species was identified in PMST search. Not recorded within the subject land during surveys. No records within the locality of the alignment. Species considered unlikely to occur.	Candidate species credit species subject to targeted surveys
Prasophyllum petilum	Tarengo Leek Orchid	E	E	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	The subject land is considered outside of this species known geographic distribution. Associated habitat in the form of PCT 347, PCT 277, PCT 276 was recorded. Though not previously recorded within locality of the subject land, this species is known to grow in open native grasslands. This species was identified by DEE as a possible controlled provision.	Candidate species credit species subject to targeted surveys
Pultenaea humilis	Dwarf Bush-pea	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat (PCT 347) was recorded within the subject land. This species is known to occur in isolated remnants of native woodland and forest communities that occur in extensively cleared agricultural landscapes.	Candidate species credit species subject to targeted surveys
Senecio garlandii	Woolly Ragwort	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Associated habitat in the form of PCT 347 was recorded. Closest record at Ulandra Nature Reserve (1999).	Candidate species credit species subject to targeted surveys
Swainsona recta	Small Purple-pea	E	E	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Associated habitat was recorded within the subject land (PCT 277, PCT 76; PCT 266; PCT 276). Though no records within the locality of the subject land, this species is known to occur in the grassy understorey of woodlands and open-forests.	Candidate species credit species subject to targeted surveys
Swainsona murrayana	Slender Darling Pea	V	V	Western half of sub-CMA	0	BCC	Associated habitat was recorded within the subject land (PCT 76, PCT 80).	Candidate species credit species subject to targeted surveys

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Subject land	Outcome
Swainsona sericea	Silky Swainson-pea	V	V	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat was recorded within the subject land (PCT 76). Though no records exist within the locality of the subject land, preferred habitat in Box-Gum Woodland in the South West Slopes was recorded.	Candidate species credit species subject to targeted surveys
Tylophora linearis	Tylophora linearis	V	E	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Associated habitat was recorded within the subject land (PCT 347). The closest known record of this species is historic (1915) and is located near Temora, approximately 30km west of the subject land.	Candidate species credit species subject to targeted surveys

(2) V = Vulnerable, E = Endangered as listed under the BC Act

(3) V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the EPBC Act

(4) Habitat and geographic requirements were obtained from the BAM Credit Calculator (BCC)

(5) BCC = BAM Credit Calculator, BioNet = Office of Environment and Heritage spatial search, PlantNet = Royal Botanic gardens spatial search, PMST = Protected Matters Search Tool (Department of Agriculture, Water and the Environment)

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix D Threatened fauna database searches

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
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INLAND RAIL

Threatened fauna database searches

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Amphibians (3)									
Sloane's Froglet	*Crinia sloanei*	V	–	Semi-permanent/ephemeral wet areas/Containing relatively shallow sections with submergent and emergent vegetation, or within 500m of wet area/ within 500m of swamps/ within 500m of waterbody	0	BCC	Species	Some potential associated habitats are likely to occur within the subject land. While no records occur within the locality, a precautionary approach has been taken which involved targeted surveys.	Targeted surveys undertaken
Booroolong Frog	*Litoria booroolongensis*	E	V	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Species	Associated habitat not recorded within the subject land. Dams and ephemeral waterways are present within the subject land, but would not be considered suitable for this species. No records within the locality of the subject land.	Targeted surveys undertaken
Southern Bell Frog	*Litoria raniformis*	E	V	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Species	Associated habitat not recorded within the subject land. Dams and ephemeral waterways are present within the subject land, but would not be considered suitable for this species. No records within the locality of the subject land.	Targeted surveys undertaken
Birds (54)									
Australasian Bittern	*Botaurus poiciloptilus*	–	E	None. No specific requirements or restrictions identified in BCC	0	PMST	Ecosystem	Species identified in PMST search. No records within the locality and not included in BAM-C list. Associated habitat, brackish or freshwater wetlands not recorded within the Subject land.	Not considered further

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Australasian Painted Snipe	*Rostratula australis*	E	E; Ma	None. No specific requirements or restrictions identified in BCC	0	PMST, BCC	Ecosystem	Associated habitat, fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber, not recorded within the subject land.	Ecosystem credit species
Barking Owl	*Ninox connivens*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter and greater than 4m above the ground.	0	BCC	Species/ Ecosystem	Subject land may be within the home range of local individuals, but local records are sparse and there are no records within 10km of subject land. The subject land provides marginal foraging habitat for this species, however unlikely to support an individual in isolation from much higher quality habitats.	Ecosystem/ species credit species Targeted surveys undertaken
Black-breasted Buzzard	*Hamirostra melanosternon*	V	–	None. No specific requirements or restrictions identified in BCC	1	BioNet	Species/ Ecosystem	Species was not identified in BAM-C however, a record in the locality was identified in Bionet search. The potential for this species to occur within the Subject land cannot be entirely discounted, however no associated PCTs occur within the Subject land (Department of Planning industry and Environment 2021), and there is only one record within the locality from 1997 (Department of Planning Industry and Environment 2021). Diurnal bird surveys during breeding season (September to November) did not identify large stick nests or any individuals.	Not considered further (Diurnal bird surveys during breeding season)

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Black Falcon	*Falco subniger*	V	–	None. No specific requirements or restrictions identified in BCC	3	BCC, BioNet	Ecosystem	Although not identified in BCC, species was recorded. The subject land may occur within the home-range of one or more individuals. The subject land's habitats are considered unlikely to support this species in isolation from habitats that are more productive in terms of prey species.	Inclusion of species as ecosystem credit species
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	–	None. No specific requirements or restrictions identified in BCC	6	BioNet, BCC	Ecosystem	The potential for this species to occur within the subject land cannot be entirely discounted, however it does not conform to high quality woodland habitats types that this species is dependent upon for foraging and breeding purposes, so its likelihood of occurrence is considered low.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Blue-billed Duck	*Oxyura australis*	V	–	None. No specific requirements or restrictions identified in BCC	1	BioNet	Ecosystem	Species was not identified in BAM-C however, a record in the locality was identified in Bionet search. Species occurs in large permanent wetlands and swamps with dense aquatic vegetation (Office of Environment & Heritage 2017). Associated habitat was not recorded within the Subject land. Although dams and ephemeral waterways are present within the Subject land, these would not be considered suitable to support this species. No associated PCTs (Department of Planning industry and Environment 2021) occur within the Subject land, and there is only one record within the locality from 1997 (Department of Planning industry and Environment 2021). Diurnal bird surveys did not identify this species within the site.	Species not considered further
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	–	East of Newell Highway – west is hybrid zone where intergrades with the arid zone subspecies of Brown Treecreeper (Climacteris picumnus picumnus), East of Newell Highway – west is hybrid zone with western subspecies, East of Walbundrie – west within hybrid zone with inland subspecies	60	BioNet, BCC	Ecosystem	Potential habitat in the form of open eucalypt forests and woodlands recorded within the subject land.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Bush Stone-curlew	*Burhinus grallarius*	E1	–	Fallen/standing dead timber including logs	0	BCC	Species	There is a lack of quality understorey habitat to support this species.	Targeted surveys undertaken
Common Sandpiper	*Actitis hypoleucos*	–	M	None. No specific requirements or restrictions identified in BCC		PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Species associated habitat, littoral and estuarine habitats, not recorded within the subject land. Low likelihood of occurrence.	Not considered further
Curlew Sandpiper	*Calidris ferruginea*	E1	CE; M	None. No specific requirements or restrictions identified in BCC	2	BioNet, PMST	Species/ Ecosystem	Species records within the locality and not included in BAM-C list. Species associated habitat, littoral and estuarine habitats, not recorded within the subject land.	Not considered further
Diamond Firetail	*Stagonopleura guttata*	V	–	None. No specific requirements or restrictions identified in BCC	13	BioNet, BCC	Ecosystem	Potential habitat in the form of open eucalypt forests and woodlands recorded within the subject land.	Ecosystem credit species
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	–	None. No specific requirements or restrictions identified in BCC	22	BioNet, BCC	Ecosystem	Species recorded. Associated habitat in the form of open eucalypt forests and woodlands recorded within the subject land.	Ecosystem credit species
Eastern Curlew	*Numenius madagascariensis*	–	CE; M;	None. No specific requirements or restrictions identified in BCC	0	PMST	Species/ Ecosystem	Species identified in PMST search. No records within the locality and not included in BAM-C list. Associated with sheltered coasts, estuaries, bays, harbours, inlets with intertidal mudflats. Species associated habitat was not recorded within the subject land. Species unlikely to occur.	Not considered further

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Flame Robin	*Petroica phoenicea*	V	–	None. No specific requirements or restrictions identified in BCC	19	BioNet, BCC	Ecosystem	Associated habitat, moist eucalypt forests, were not recorded within the subject land. However, the potential for this species to occur within the subject land cannot be entirely discounted, as the species is known to occur within the locality and may utilise the habitats present for marginal foraging.	Ecosystem credit species
Fork-tailed Swift	*Apus pacificus*	–	M; Ma	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Almost exclusively aerial. Commonly recorded over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. May irregularly occur foraging over subject land.	Not considered further (migratory species further discussed in report)
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	E	Hollow bearing trees; Eucalypt tree species with hollows greater than 9cm diameter	4	BCC, BioNet	Species	The subject land is outside of species distribution.	Targeted surveys undertaken
Gilbert's Whistler	*Pachycephala inornata*	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Ecosystem	Associated habitat, dense shrub layer in box-ironbark communities, was not recorded. Species known breeding habitat (dense foliage of plants such as wattles or cypress pines) was sparse within the subject land.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	V	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. Presence of Allocasuarina and casuarina species	0	BCC	Species/ Ecosystem	No Allocasuarina species observed on site upon which this species is dependent. Likely too distant from such resources to represent breeding sites in larger hollows on site. No records in locality.	Not considered further (targeted surveys were still undertaken)
Glossy Black-Cockatoo Riverina population	*Calyptorhynchus lathami*	EP		Occurs west of longitude 146° 40' E, within Cobar, Carrathool, Narrandera and Leeton Local Government Areas (NSW Scientific Committee, 1999)	0	BCC (lower slopes IBRA subregion)	Species	No. Subject land occurs outside the distribution of the population defined in the Final determination	Not considered further (targeted surveys were still undertaken)
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	–	None. No specific requirements or restrictions identified in BCC	50	BioNet, BCC	Ecosystem	Potential habitat in the form of open eucalypt forests and woodlands recorded within the subject land.	Ecosystem credit species
Grey Falcon	*Falco hypoleucos*	E	V	None. No specific requirements or restrictions identified in BCC	0	PMST, BCC (lower slopes IBRA subregion)	Ecosystem	Species identified in PMST search. No records within the locality Subject land is on the eastern fringes of range. Associated with PCT 76 in lower slopes IBRA subregion..	Ecosystem credit species
Gull-billed Tern	*Gelochelidon nilotica*	–	M; Ma	None. No specific requirements or restrictions identified in BCC	1	BioNet	–	Species identified in PMST search and not included in BAM-C list. Outside species regular distribution. May occur as rare nomadic/visitor within the locality.	Not considered further

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	–	None. No specific requirements or restrictions identified in BCC	3	BioNet, BCC	Ecosystem	Prefers good patches of woodland habitat with complex understorey diversity, which is limited in the subject land. The species is known in wider locality with associated with structural intact open eucalypt woodland.	Ecosystem credit species
Latham's Snipe	*Gallinago hardwickii*	–	M	None. No specific requirements or restrictions identified in BCC	7	BioNet, PMST	–	Inhabits open, freshwater wetlands with low, dense vegetation. Associated habitat not recorded within the subject land. Species unlikely to occur.	Not considered further
Little Eagle	*Hieraaetus morphnoides*	V	–	Nest trees – live (occasionally dead) large old trees within vegetation	10	BCC, BioNet	Species/ Ecosystem	Moderate. The subject land may occur within the home-range of one or more individuals. The subject lands habitats are considered unlikely to support this species in isolation from habitats that are more productive in terms of prey species.	Targeted surveys undertaken for species and one nest was identified. Ecosystem credit species Species credit species
Little Lorikeet	*Glossopsitta pusilla*	V	–	None. No specific requirements or restrictions identified in BCC	8	BioNet, BCC	Ecosystem	Moderate. Potential foraging and habitat within intact vegetation where presence of mature Eucalypts occur. May be an irregular visitor during abundance of blossoming eucalypts.	Ecosystem credit species
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V	–	Hollow bearing trees; Living or dead tree with hollows greater than 10cm diameter	1	BCC	Species/ Ecosystem	Low. Subject land is on the eastern fringes of range. Although it may occur rarely in the subject land habitats are unlikely to represent important foraging resources locally.	Targeted surveys undertaken Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Malleefowl	*Leipoa ocellata*	E1	V	None. No specific requirements or restrictions identified in BCC	0	PMST	Ecosystem	Low. Species was not identified in BCC. Associated PCTs do not occur within the subject land. Associated mallee habitat not recorded within the subject land.	Not considered further
Marsh Sandpiper	*Tringa stagnatilis*	–	M; Ma	None. No specific requirements or restrictions identified in BCC	7	BioNet	–	Species not identified in either PMST search or BAM-C list. Occurs in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. Associated habitat not recorded within the subject land. Species unlikely to occur.	Not considered further
Masked Owl	*Tyto novaehollandiae*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.	0	BCC	Species/ Ecosystem	Subject land may be within the home range of local individuals; however, this species is unlikely to occur due to the scarcity of local records and habitats within the subject land are of insufficient quality and size to support individuals.	Targeted surveys undertaken Ecosystem credit species
Painted Honeyeater	*Grantiella picta*	V	V	Mistletoes present at a density of greater than five mistletoes per hectare	3	BCC, PMST, BioNet	Ecosystem	Marginal foraging habitat within remnant vegetation. A specialist feeder on mistletoes (Amyema) which did not occur in high densities.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Powerful Owl	*Ninox strenua*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.		BCC	Species/ Ecosystem	Subject land may be within the home range of local individuals; however, this species is unlikely to occur due to the paucity of local records and habitats within the subject land are of insufficient quality to support individuals. Records occur further to the east in association with the Great Dividing Range and coastal habitats.	Targeted surveys undertaken Ecosystem credit species
Pectoral Sandpiper	*Calidris melanotos*	–	M	–	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Associated habitat not recorded within the subject land.	Not considered further
Pied Honeyeater	*Certhionyx variegatus*	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Ecosystem	Preferred habitat of wattle shrub, primarily Mulga (Acacia aneura), Mallee and spinifex not within the subject land.	Ecosystem credit species
Purple-crowned Lorikeet	*Glossopsitta pporphyrocephala*	V		None. No specific requirements or restrictions identified in BCC	0	BCC	Ecosystem	No records within the locality, however, potential habitat present.	Ecosystem credit species
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	As per mapped areas	2	BCC, BioNet, PMST	Species/ Ecosystem	Potential to occur during seasonal movements and to utilise blossoming eucalypts. Subject land does not conform to high quality woodland habitats types that this species is dependent upon for foraging and breeding purposes. The subject land is not identified as a breeding area for the species.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Rufous Fantail	*Rhipidura rufifrons*	–	M	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Mainly inhabits wet sclerophyll forests. During seasonal movements sometimes recorded in drier sclerophyll forests and woodlands. Associated habitat not found within the subject land.	Not considered further
Satin Flycatcher	*Myiagra cyanoleuca*	–	M	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands. During seasonal movements, occurs in coastal forests, woodlands, mangroves and drier woodlands and open forests. Preferred habitat not within subject land, rare occurrences during seasonal movements may occur.	Not considered further
Scarlet Robin	*Petroica boodang*	V	–	None. No specific requirements or restrictions identified in BCC	21	BioNet, BCC	Ecosystem	Prefers good patches of woodland habitat with complex understorey diversity, which is limited in subject land. The potential for this species to occur within the subject land cannot be entirely discounted, as the species is known to occur within the locality and may utilise the habitats present for foraging.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Sharp-tailed Sandpiper	*Calidris acuminata*	–	M	–	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. Associated habitat not within subject land.	Not considered further
Speckled Warbler	*Chthonicola sagittata*	V	–	None. No specific requirements or restrictions identified in BCC	42	BioNet, BCC	Ecosystem	Prefers good patches of woodland habitat with complex understorey diversity, which is limited in subject land. The potential for this species to occur within the subject land cannot be entirely discounted, as the species is known to occur within the locality and may utilise the habitats present for foraging.	Ecosystem credit species
Spotted Harrier	*Circus assimilis*	V	–	None. No specific requirements or restrictions identified in BCC	1	BioNet, BCC	Ecosystem	Potential foraging and roosting habitat within remnant vegetation.	Ecosystem credit species (recorded near the project)

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Square-tailed Kite	*Lophoictinia isura*	V	–	Nest trees: The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. It will be difficult to identify a Kite nest (there are lots of comparable sized stick nests built by other species), especially given Kites have large territories and other stick nesters will undoubtedly also be nesting where Kites might be recorded. Kites will need be in attendance to confirm breeding sites.	2	BioNet, BCC	Species/ Ecosystem	Potential foraging and roosting habitat within remnant vegetation.	Targeted surveys undertaken (species recorded, but no confirmed nests recorded) Ecosystem credit species
Superb Parrot	*Polytelis swainsonii*	V	V	Hollow bearing trees: 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.	124	BCC, BioNet, PMST	Species/ Ecosystem	The subject land provides foraging and breeding habitat for the species.	Species credit species Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Swift Parrot	*Lathamus discolor*	E1	CE	Hollow bearing trees	7	BCC, BioNet, PMST	Species/ Ecosystem	May occur within the subject land during seasonal movements and to utilise blossoming eucalypts. Dependent on winter flowering resources of which E.microcarpa occurs widely within subject land. No records locally and local resources are sparse, so occurrences are likely to be rare but cannot be discounted. Subject land is outside of species known breeding habitat.	Targeted surveys undertaken Ecosystem credit species
Turquoise Parrot	*Neophema pulchella*	V	–	None. No specific requirements or restrictions identified in BCC	6	BioNet, BCC	Ecosystem	Local records occur within areas of higher quality woodland. The subject land provides marginal foraging habitat.	Ecosystem credit species
Varied Sittella	*Daphoenositta chrysoptera*	V	–	None. No specific requirements or restrictions identified in BCC	13	BioNet, BCC	Ecosystem	Prefers good patches of woodland habitat with complex understorey diversity, which is limited in the subject land. The potential for this species to occur within the subject land cannot be entirely discounted, as the species is known to occur within the locality and may utilise the habitats present for foraging.	Ecosystem credit species
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	Ma	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	0	BCC	Species/ Ecosystem	Preferred breeding and foraging habitat was not recorded within the subject land. May occur as a vagrant.	Targeted surveys undertaken Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
White-browed Treecreeper population in Carrathool local government area south of the Lachlan River and Griffith local government area	*Climacteris affinis population*	EP	–	Occurs in Carrathool local government area south of the Lachlan River and Griffith local government area lies between the Murrumbidgee and Lachlan Rivers (NSW Scientific Committee, 2002)	0	BCC (lower slopes IBRA subregion)	Species	No. Subject land occurs outside the distribution of the population defined in the Final determination.	Not considered further
White-fronted Chat	*Epthianura albifrons*	V	–	None. No specific requirements or restrictions identified in BCC	4	BCC, BioNet	Ecosystem	The subject land provides marginal foraging habitat.	Ecosystem credit species
White-throated Needletail	*Hirundapus caudacutus*	–	V; M	None. No specific requirements or restrictions identified in BCC	1	BioNet, PMST	–	Almost exclusively aerial. Occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings. May irregularly occur foraging over the subject land.	Considered further in MNES section of report
Yellow Wagtail	*Motacilla flava*	–	M	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Occurs in open country near swamps, salt marshes and sewage ponds. Rare visitor to coastal areas. Associated habitat not within subject land. Unlikely to occur within the subject land.	Not considered further
Fish (3)									
Macquarie Perch	*Macquaria australasica*	–	E	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Suitable habitat not recorded within the subject land.	Not considered further

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Trout Cod	*Maccullochella macquariensis*	E	E	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Suitable habitat not recorded within the subject land.	Not considered further
Murray Cod	*Maccullochella peeli*	–	V	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Suitable habitat not recorded within the subject land. No records within the locality.	Not considered further
Mammals (14)									
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Species	Suitable habitat not recorded within the subject land. No records within the locality. Targeted surveys undertaken.	Targeted surveys undertaken
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	0	BCC	Species	Suitable habitat not recorded within the subject land. No records within the locality.	Targeted surveys undertaken
Corben's Long Eared Bat	*Nyctophilus corbeni*	V	V	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Ecosystem	Associated habitat in the form of box dominated woodlands, tree hollows and loose bark were recorded within the subject land.	Ecosystem credit species (targeted surveys completed)
Large Bentwing-bat	*Miniopterus orianae oceanensis*	V	–	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat with numbers of individuals >500	0	BCC	Species/ Ecosystem	Suitable habitat not recorded within the subject land. No records within the locality.	Ecosystem credit species (targeted surveys completed)

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Ecosystem	Suitable habitat not recorded within the subject land. No records within the locality.	Ecosystem credit species
Eastern Pygmy-possum	*Cercartetus nanus*	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Species	A lack of suitable patch size and quality in terms of understorey nectar-producing plants and shelter opportunities.	Targeted surveys undertaken
Grey-headed Flying-fox	*Pteropus poliocephalus*		V	Breeding camps	1	BCC, PMST, BioNet	Species/ Ecosystem	Not observed during nocturnal surveys, but may visit the subject land when blossom resources are scarce in other regions. Records within the locality are scarce and no camps occur nearby.	Targeted surveys undertaken Ecosystem credit species
Koala	*Phascolarctos cinereus*	E	E	Areas identified via survey as important habitat – Important' habitat is defined by the density of koalas and quality of habitat determined by on-site survey.	1	BCC, BioNet, PMST	Species/ Ecosystem	A lack of continuity between woodland patches, patch size and sufficient foraging resources suggest that this species does not occur in the subject land. May occur randomly due to roaming movements.	Targeted surveys undertaken Ecosystem credit species
Large-eared Pied Bat	*Chalinolobus dwyeri*	–	V	Cliffs within two km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two km of old mines or tunnels	0	BCC	Species	No suitable roosting habitats associated with the subject land or its vicinity – may rarely extend to the site during foraging movements but the subject land is likely to be of low importance to this species.	Targeted surveys undertaken
Little Pied Bat	*Chalinolobus picatus*	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Ecosystem	No suitable roosting habitats associated with the subject land or its vicinity – may rarely extend to the site during foraging movements but the subject land is likely to be of low importance to this species.	Targeted surveys undertaken

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Southern Myotis	*Myotis macropus*	V	–	Hollow bearing trees/Within 200m of riparian zone/ Bridges, caves or artificial structures within 200m of riparian zone	1	BCC, BioNet	Species	Preferred riparian foraging habitats and roosting locations are limited within the subject land, but it's presence cannot be discounted during local movements.	Species credit species (assumed) Although not recorded during targeted surveys following BAM seasonal requirements and survey guidelines, this species cannot be discounted and has been assumed as present.
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Ecosystem	The subject land is generally outside of species known distribution.	Ecosystem credit species
Squirrel Glider	*Petaurus norfolcensis*	V	–	None. No specific requirements or restrictions identified in BCC	6	BCC, BioNet	Species	Potential foraging and roosting habitat within remnant vegetation.	Species credit species (recorded)
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Ecosystem	Potential foraging and roosting habitat within remnant vegetation.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Reptiles (2)									
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Rocky areas or within 50m of rocky areas	0	BCC, PMST	Species	Marginal habitat (rocky outcrops, scattered rocks) were recorded within the subject land. However, this species is unlikely to occur due to a lack of high quality groundcover habitats with sufficient natural features for cover and foraging, and lack of records within the locality.	Targeted surveys undertaken
Striped Legless Lizard	*Delma impar*	–	V	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Species	Although elements of preferred habitat were recorded within the subject land, the subject land is on the boundary of this species known distribution and hasn't historically been recorded within locality.	Targeted surveys undertaken
Invertebrates (1)									
Key's Matchstick Grasshopper	*Keyacris scurra*	E	–	Species is generally reliant on an understorey of tussock grasses, typically *Themeda* for shelter and possibly food (unconfirmed), but may use similar grasses. Food sources include a range of dicotyledon species. Indicator species include the daisy *Chrysocephalum apiculatum.*	0	BCC	Species	Marginal understorey habitat in PCT's 266, 276 and 277 but not recorded during targeted surveys.	Targeted surveys undertaken and assumed habitat were surveys were unable to be conducted Species credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Subject land	Outcome
Golden Sun Moth	*Synemon plana*	E	V	Wallaby grass (*Rytidosperma* sp), Chilean needlegrass (*Nassella nessiana*) or Serrated Tussock (*Nassella trichotoma*)	0	BCC	Species	Preferred natural temperate grassland not present. No Serrated Tussock grass recorded and *Rytidosperma* spp. had low cover. Habitat requirement not met.	Not considered further – species excluded

(1) V = Vulnerable, E = Endangered as listed under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the EPBC Act

(3) Habitat requirements and geographic requirements were obtained from the BAM Credit Calculator (BCC)

(4) BCC = BAM Credit Calculator, BioNet = Office of Environment and Heritage spatial search, PlantNet = Royal Botanic gardens spatial search, PMST = Protected Matters Search Tool (Department of Agriculture, Water and the Environment)

(5) Credit types as prescribed by the BAM Credit Calculator

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix E BAM scattered tree report

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
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INLAND RAIL

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00015331/BAAS18097/23/00039309	Inland Rail I2S - Paddock trees	01/02/2023
Assessor Name	Report Created	BAM Data version *
Mark Stables	07/11/2023	57
Assessor Number	BAM Case Status	Date Finalised
BAAS18097	Open	To be finalised
Assessment Revision	Assessment Type	BOS entry trigger
0	Scattered Trees	Major Project

* 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.

Scattered Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion			
3	True	2.0	2
3	False	1.0	1
2	False	2.0	1
			4
79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion			
3	True	1.0	1
2	True	0.0	0
			1
80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion			
3	True	3.0	3
3	False	3.0	2
			5
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions			
3	True	29.0	29

3	False	2.0	2
2	False	2.0	1
			32
266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion			
3	True	2.0	2
2	False	1.0	1
			3
276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion			
3	True	4.0	4
3	False	3.0	2
2	False	3.0	2
			8
			53

Species credits for threatened species

Nil

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix F EPBC Act significance assessments

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

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F.1 Grey Box Grassy Woodlands and Derived Native Grasslands

Status

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Grey Box Woodlands) is listed as an Endangered Ecological Community under the EPBC Act (Department of the Environment 2016a). This is broadly equivalent to Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions listed as Endangered under the *Biodiversity Conservation Act 2016* (BC Act).

Description

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia (Grey Box Woodlands) occupy a position in the landscape that is transitional between the temperate woodlands and forests of the lower slopes and tablelands of south-eastern Australia, and the semi-arid communities further inland. The ecological community typically occurs in landscapes of low-relief on productive soils derived from alluvial or colluvial materials but may occur on a range of substrates. The ecological community tends to occupy drier sites of the belt of grassy woodlands in south-eastern Australia, within a rainfall zone of 375–700mm/year (Department of the Environment 2016a).

This community includes those woodlands in which the dominant tree species is *Eucalyptus microcarpa* (Inland Grey Box) and is often found in association with *E. populnea* subsp. *bimbil* (Bimble or Poplar Box), *Callitris glaucophylla* (White Cypress Pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii* (Bulloak) or *E. melliodora* (Yellow Box), and sometimes with *E. albens* (White Box). Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. The community generally occurs as an open woodland 15–25m tall, but in some locations the overstorey may be absent as a result of past clearing or thinning, leaving only an understorey (Department of the Environment 2016a).

Distribution

The Grey Box (*E. microcarpa*) Grassy Woodlands and Derived Native Grasslands of South Eastern Australia ecological community occurs from central-western NSW, through northern and central Victoria into South Australia. Occurring predominantly within the Riverina and South West Slopes regions of NSW down to the Victorian border (Department of the Environment 2016a).

Only 10 to 15 per cent of the original extent of this ecological community remains across its range (central New South Wales through northern Victoria and into South Australia) (Department of Sustainability Environment Water Population and Communities 2012). Commonwealth listing advice (Threatened Species Scientific Committee 2010) for this community states that within the NSW South Western Slopes and Riverina bioregion PCT 76 and PCT 80 have declined in extent by 92% and 82.5% respectively.

Specific impacts

Grey Box Woodlands within the subject land generally occur a combination of large patches, small isolated stands and roadside remnants. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. The proposed action will involve the removal of vegetation along a linear development which is 42.5km in length. The proposed action will result in the direct removal of up to 27.88ha of this EPBC listed ecological community. This is comprised of PCT 76 and PCT 80 recorded in good and moderate condition and derived native grasslands (low condition).

F.1.1 EPBC Act Significance Assessment

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia is listed as Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013).

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **Reduce the extent of an ecological community.**

The proposed action would result in a reduction of the extent of the Grey Box Woodlands within the subject land. A total of 16.76ha of the EPBC listed ecological community will be removed from 30 patches along the 42.5km route. The majority (15.11ha) is in moderate condition with the remaining 1.65ha occurring as low condition derived grassland.

In NSW an estimated 300 000 to 330 000ha of the community is thought to remain with an additional 400,000ha of derived grassland estimated (Threatened Species Scientific Committee 2010). The removal of this community associated with the proposed action, would represent 0.02 per cent of the remaining community within NSW. Within the subject land, this community is comprised of PCT 76 and PCT 80. The current extent of PCT 76 and 80 remaining in NSW is estimated to be 40,000ha and 140,000ha respectively (Threatened Species Scientific Committee 2010). Impacts on these PCTs within the subject land equates to the removal of approximately 0.04 per cent of the remaining extent of PCT 76, and removal of 0.001 per cent of the remaining extent of PCT 80 in NSW. In addition, the ecological community within the subject land exists as 30 patches in an agricultural landscape that are exposed and less resilient to edge effect disturbances. Larger, better condition remnants generally occur as narrow roadside remnants.

- **Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.**

Overall the habitat present within the landscape has been heavily fragmented due to agricultural practices (i.e. cropping and livestock use). Existing connectivity is predominantly limited to creeklines and road reserves.

Grey Box Woodlands within the subject land occurs as patches along the 42.5km route. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. The proposed action will involve the removal of vegetation along a linear development 42.5km in length. Of the 30 patches of *Grey Box Woodlands* within the subject land, eight would be fragmented.

The proposal is likely to result in a reduction in vegetation patch sizes resulting in increases in fragmentation of the regional wildlife patches along the mentioned creeklines and road reserves. Due to the importance of connectivity, dispersal opportunities and habitat quality for species at a local scale, this impact has the potential to be negative to the dispersal of relatively sedentary species such as mammals, frogs, and reptiles.

- **Adversely affect habitat critical to the survival of an ecological community**

No critical habitat has been listed for the *Grey Box Woodlands* ecological community under the *EPBC Act* (Department of Environment and Energy 2017).

Habitat critical to the survival of ecological communities also refers to 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, or
- for the reintroduction of populations or recovery of the species or ecological community.

Grey Box Woodlands recorded within the subject land currently occurs as fragmented patches. These areas are unlikely to be habitat critical for the community based on the above criteria given the current extent of the community. Furthermore, the proposal has avoided these areas where possible (i.e. along Ironbong Road) and indirect impacts will also be minimised through the implementation of mitigations measures.

- **Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.**

The proposal would clear of 16.76ha of *Grey Box Woodlands* and may require alterations to the topography of the land within the immediate subject land to ensure technical viability. The proposal will also cross over several creek lines including Dudauman Creek, Ironbong Creek, Ulandra Creek, Powderhorn Creek and numerous other crossings small shallow ephemeral creeks and drainage lines.

Any large-scale excavation that occurs in close proximity to the community or to marginal patches will involve mitigation measures to minimise sedimentation and hydrological impacts. Therefore, the proposal is considered unlikely to substantially modify or destroy these abiotic factors.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.**

The proposal will involve the clearing of 16.76ha of *Grey Box Woodlands.* The proposal would not result in increased burning or include fauna or fauna harvesting. Mitigation measures to minimise indirect impacts such as weed invasion including weed control will be enforced to ensure the proposal does not substantially change the species composition of an occurrence of this community outside of the impact area.

Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

Grey Box Woodlands within the subject land are currently subject to weed and pest invasion. Additionally, the majority of the subject land occurs on agricultural properties which are subjected to high disturbances relating to agricultural practices such as cropping, grazing, and the application of fertilisers. The proposal is unlikely to cause regular mobilisation of fertilisers, herbicides or other chemicals or pollutants. Mitigation measures would include standard spill control measures.

Due to current condition and land use, it is considered unlikely that the proposal would substantially reduce the quality or integrity of the community's occurrence or increase spread of invasive species. Additionally, mitigation measures will be implemented during construction to minimise the likelihood of spread of weeds or pathogens. These mitigation measures will aid in reducing potential impacts associated with the proposal that may otherwise result in the further reduction of the community's quality.

Interfere with the recovery of an ecological community

To date, no recovery plan has been developed by the Department of Agriculture, Water and Environment for *Grey Box Woodlands* (Department of the Environment 2016a). Conservation Advice on *Grey Box Woodlands* (Department of the Environment 2010) recognises the main ongoing threats to this ecological community to include:

- incremental clearance of vegetation for various purposes (e.g. cropping, infrastructure works and maintenance)
- inappropriate grazing regimes
- fragmentation into small remnants
- loss or decline of mature trees due to dieback or other causes
- lack of natural regeneration for understorey and canopy species
- invasion by exotic plants
- addition of fertilisers to improve sites
- inappropriate application of herbicides
- firewood collection
- salinity.

The proposal will contribute towards incremental clearance of vegetation by 16.76ha, increased fragmentation and loss of mature trees. The invasion of exotic plants and lack of natural regeneration are potential indirect impacts which will be managed through mitigation measures.

Conclusion

The vegetation recorded within the subject land is considered consistent with *Grey Box Woodlands,* occurred in good condition and moderate condition and as derived native grassland. The proposal will include clearing of 16.76ha of this community of which 15.11ha is in moderate condition with the remaining 1.65ha occurring as low condition derived grassland.

Though the proposal occurs in an agricultural landscape which is largely cleared and fragmented, the *Grey Box Woodlands* recorded were predominantly in moderate to good condition and included important roadside remnants.

This is likely to have a significant impact for the following reasons:

- The proposal would clear 16.76ha of the community, equivalent to approximately 0.002% of the remaining extent of the community.
- The proposal will fragment eight patches of the community and is likely to exacerbate fragmentation at a regional scale that is likely to be significant to the community given its already fragmented state.

Overall, the proposal is considered likely to have a significant impact on Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

F.2 White Box Yellow Box Blakely's Red Gum Woodland

Status

The White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland community is listed as a Critically Endangered Ecological Community under the EPBC Act (Department of Environment Climate Change and Water 2011). This is generally consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Critically Endangered under the BC Act.

Description

White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box *Eucalyptus albens*, Yellow Box *E. melliodora* and Blakely's Red Gum *E. blakelyi*. tree-cover is generally discontinuous and consists of widely-spaced trees of medium height (Department of Environment and Heritage 2006).

In its pre-1750 state, this ecological community was characterised by:

- a ground layer dominated by tussock grasses
- an overstorey dominated or co-dominated by White Box, Yellow Box or Blakely's Red Gum, or Grey Box in the Nandewar bioregion
- a sparse or patchy shrub layer.

The Australian Government listing of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is slightly different to the NSW listing. Areas that are part of the Australian Government listed ecological community must have either:

- an intact tree layer and predominately native ground layer
- an intact native ground layer with a high diversity of native plant species but no remaining tree layer.

Due to the ecological community's occurrence on fertile soils it has been extensively cleared for agriculture and intact remnants, including both trees and unmodified understorey, are now extremely rare. Clearing and fragmentation for urban, rural residential, agricultural and infrastructure development remain on-going threats to this ecological community, while degradation resulting from inappropriate management and weed invasion by introduced perennial grasses continues to erode the conservation value of remnant areas.

Distribution

Box-Gum Grassy Woodland occurs along the western slopes and tablelands of the Great Dividing Range from southern Queensland through New South Wales and the Australian Capital Territory to Victoria.

Specific impacts

Box-Gum Woodlands within the subject land generally occur a combination of large patches, small isolated stands and roadside remnants. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. The proposed action would result in a reduction of the extent of the *Box-Gum Woodlands* within the subject land by 17.48ha. This is comprised of PCT 266, PCT 276, PCT 277 and PCT 347 all of which were recorded in moderate condition.

F.2.1 EPBC Act Significance Assessment

White Box Yellow Box Blakely's Red Gum Woodland (*Box-Gum Woodlands)* community is Critically Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013).

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **Reduce the extent of an ecological community.**

Box-Gum Woodlands at a national level are thought to have lost more than 90% of its pre-European distribution. In addition, this has led to a critical loss of integrity, and only half of the remaining 10 per cent distribution is considered likely to meet the minimum condition criteria of the listed ecological community. Estimates reported in the 2011 National Recovery Plan (Department of Environment Climate Change and Water 2011) indicated that only 405,000ha of the ecological community remains in various conditions. The proposed action would result in a reduction of the extent of the *Box-Gum Woodlands* within the subject land by 17.48ha. This is comprised of PCT 266, PCT 276, PCT 277 and PCT 347 all of which were recorded in moderate condition. The removal of 17.48ha equates to a 0.7% reduction of this community within the locality (10km radius from subject land) and 0.004% nationally.

- **Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.**

Box-Gum Woodlands within the subject land generally occur a combination of large patches, small isolated stands and roadside remnants. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. The proposed action will involve the removal of vegetation along a linear development which is 42.5km in length. As such, the proposal will fragment large patches and roadside remnants of *Box-Gum Woodlands* in the locality and increase fragmentation between smaller patches.

- **Adversely affect habitat critical to the survival of an ecological community**

No critical habitat has been listed for the *Box-Gum Woodlands* ecological community under the *EPBC Act* (Department of Environment and Energy 2017).

The National Recovery Plan for Box-Gum Woodlands (Department of Environment, Climate Change and Water, 2010) states:

"…habitat critical to the survival of *Box-Gum Grassy Woodland* is on the moderate to highly fertile soils of the western slopes of NSW and Queensland, the northern slopes of Victoria, and the tablelands of the Great Dividing Range from southern Queensland through NSW and the ACT. Given the currently highly fragmented and degraded state of this ecological community, all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria outlined in section 3 should be considered critical to the survival of this ecological community" (Page 12).

Section 3 refers to the condition criteria for EPBC listed *Box-Gum Woodlands.* PCT 266, PCT 267, PCT 276, PCT 277 and PCT 347 in moderate condition were considered commensurate (refer to section 7 of main report).

As such all occurrences of EPBC-listed *Box-Gum Grassy Woodland* with the subject land are considered habitat critical to the survival of this community.

- **Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.**

The proposal is limited to the clearing of 17.48ha of *Box-Gum Woodlands.* Any large-scale excavation that occurs in close proximity to the community or to marginal patches will involve mitigation measures to minimise sedimentation and hydrological impacts. Therefore, the proposal is considered unlikely to substantially modify or destroy these abiotic factors.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.**

The proposal will involve the clearing of 17.48ha of Box-Gum Woodlands. Mitigation measures will be enforced to ensure the proposal does not substantially change the species composition of an occurrence of this community outside of the impact area.

Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

Box-Gum Woodlands within the subject land currently subject to weed and pest invasion. Additionally, the majority of the subject land occurs on agricultural properties which are subjected to high disturbances relating to agricultural practices such as cropping, grazing, and the application of fertilisers. Therefore, it is considered unlikely that the proposal would substantially reduce the quality or integrity of the community's occurrence or increase spread of invasive species.

Additionally, mitigation measures will be implemented during construction to minimise the likelihood of spread of weeds or pathogens. These mitigation measures will aid in reducing potential impacts associated with the proposal that may otherwise result in the further reduction of the community's quality.

Interfere with the recovery of an ecological community

The National Recovery Plan for Box-Gum Woodlands (Department of Environment Climate Change and Water 2011) outlines the following recovery actions in Table 3:

- 1.1 Establish agreed protocols across jurisdictions for the assessment of Box-Gum Woodland condition in Year 1 of the recovery plan implementation and apply these on an ongoing basis.
- 1.2 Share data and reporting between jurisdictions, government and nongovernment agencies.
- 1.3 Investigate the occurrence of Box-Gum Grassy Woodland in South Australia.
- 1.4 Collate existing survey and mapping data relating to Box-Gum Grassy woodland into a central, updatable repository for use by stakeholder government agencies in mapping extent, protected areas and priority areas. Update repository on an annual basis.
- 1.5 Identify gaps in survey and mapping data across the predicted distribution of Box-Gum Grassy Woodland and engage communities and conduct future surveys to fill these gaps.
- 1.6 Investigate the further use of remote sensing and other assessment techniques to assist with the preceding actions and with Actions 2.2, 2.3 and 2.4.
- 1.7 Establish and apply protocols for non-technical monitoring of remnant areas. These should include as many of the elements as possible of the condition assessment protocols developed in Action 1.1. These protocols are to reflect the condition assessment protocols developed under Action 1.1.

- 1.8 Identify gaps in current monitoring to ensure the geographic range and ecological variation within the ecological community is represented, and to coordinate implementation and analysis of all monitoring.
- 1.9 Improve baseline knowledge of condition and generate benchmark data against which sites can be assessed for management actions and cost effectiveness of revegetation ranked.

The proposal is unlikely to interfere with any of the recovery actions outlined.

Conclusion

The vegetation recorded within the subject land consistent with *Box-Gum Woodlands* occurred in moderate condition. Though the proposal occurs in an agricultural landscape which is largely cleared and fragmented, the *Box-Gum Woodlands* was recorded as large patches, roadside remnants and isolated smaller patches.

This is likely to have a significant impact for the following reasons:

- The proposal would clear 17.48ha of the community in moderate condition.
- The proposal will create fragmentation in large patches and roadside remnants of Box-Gum Woodlands and increase fragmentation between smaller patches.
- Given the currently highly fragmented and degraded state of this ecological community, all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria should be considered critical to the survival of this ecological community. As such all occurrences of EPBC-listed Box-Gum Grassy Woodland within the subject land are considered habitat critical to the survival of this community.

Overall, the proposal is considered likely to have a significant impact on White Box Yellow Box Blakely's Red Gum Woodland.

F.3 Swift Parrot

Status

Swift Parrot (*Lathamus discolor*) is listed as Critically Endangered under the EPBC Act and Endangered under the BC Act.

Distribution and habitat

Breeding occurs in Tasmania, majority migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW, but also south-eastern Queensland as far north as Duaringa. Until recently it was believed that in New South Wales, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region, but new evidence indicates that the forests on the coastal plains from southern to northern NSW are also extremely important. In mainland Australia is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering *Acacia pycnantha*, is indicated. Sites used vary from year to year. (Garnett, 2000; Swift Parrot Recovery Team, 2001).

Specific impacts

The proposed will impact approximately 61.36ha of potential foraging habitat for Swift Parrot. Habitat to be impact occurs predominately as vegetation limited to the margins of existing vegetation patches. EPBC Act Significance Assessment

The Swift Parrot is listed as Critically Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013).

An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of a population of a species**

Approximately 61.36ha of potential foraging habitat for Swift Parrot would be affected by the action proposed. While limited habitat in the subject land has the potential to be used by these species, it is not likely to be of high importance due to its relatively small area and the availability of equal or greater quality habitat within the locality and wider region. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 61.36ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. Any identified population of Swift Parrot in the area would not be restricted to habitat within the subject land. Due to the species' large home range and nomadic nature, similar foraging habitat can be accessed in the locality. Therefore, the action proposed is not considered likely to significantly contribute to a long-term decline in the size of a population for this species.

- **Reduce the area of occupancy of the species**

The action proposed is likely to affect approximately 61.36ha of potential foraging habitat for this species. Although the action proposed will result in the loss of potential foraging habitat, the incremental loss of a small area of potential habitat, only represents a small component of similar locally occurring resources accessible to these species. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 61.36ha of habitat for this species would be a loss of <1% of habitat when compared to

the remaining Box-Gum Woodland that is accessible to the species. Nevertheless, the removal of approximately 61.36ha of potential habitat is considered to be a small incremental loss of suitable habitat locally and as such has the potential to incrementally reduce the area of occupancy for the Swift Parrot during seasons when individuals of this species may be reliant on local resources.

- **Fragment an existing population into two or more populations**

Habitat connectivity is not likely to be affected by the action proposed. Approximately 61.36ha of potential foraging habitat is likely to be affected by the action proposed with vegetation removal largely limited to the margins of existing vegetation. As the subject land is small in nature, the proposed action would not further fragment or isolate any previously undisturbed patches of habitat than what already exists due to existing development land use. Furthermore, given that these species are highly mobile and nomadic, the action proposed would not present a significant barrier to these species. It is not considered likely that habitat would become further isolated or fragmented significantly beyond that currently existing in the subject land and locality.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat has been listed for the Swift Parrot to date. The subject land does not occur within the breeding areas (Tasmania) nor is the subject land the only limiting foraging area for this species, as such it is unlikely that this action proposed will adversely affect habitat critical to the survival of this species.

- **Disrupt the breeding cycle of a population**

Swift Parrots breed in Tasmania during spring and summer, migrating to south-eastern Australia during autumn and winter (Department of Environment and Conservation 2006). While Swift Parrots are dependent on flowering resources across a wide range of habitats (woodlands and forests) within their NSW wintering grounds, the removal of approximately 61.36ha of potential foraging habitat is unlikely to disrupt their movements to Tasmanian breeding grounds. As such the action proposed is unlikely to affect their breeding cycle.

- **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The action proposed would remove approximately 61.36ha of potential habitat for this species. The removal of approximately 61.36ha of potential foraging habitat is considered to be an incremental loss of suitable habitat locally. As such the removal of 61.36ha of potential foraging habitat for the Swift Parrot is unlikely to be at an extent in which these species are likely to decline.

- **Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species´ habitat**

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Swift Parrot would become further established as a result of the action proposed.

- **Introduce disease that may cause the species to decline**

No. It is unlikely that disease would be increased by the action proposed.

- **Interfere with the recovery of the species**

The *Action Plan for Australian Birds* (Garnett and Crowley 2000) notes pressure on Swift Parrot breeding areas from forestry and firewood collection in Tasmania. On the mainland though pressures relate to the loss of foraging habitats due to clearing for agriculture and residential development (Garnett and Crowley 2000).

A National Recovery Plan for the Swift Parrot (*Lathamus discolour)* was prepared in 2011 (Saunders 2011). Recovery actions outlined in this plan include:

- identify the extent and quality of habitat
- manage and protect swift parrot habitat at the landscape scale
- monitor and manage the impact of collisions, competition and disease
- monitor population and habitat.

Based on the impacts of the action proposed on the Swift Parrot, as discussed above, it is likely the action proposed would be in conflict with the second recovery action above, to manage and protect swift parrot habitat at the landscape scale. However, based on the relatively small extent of habitat to be removed it is unlikely that is would significant affect the recovery of the species.

Conclusion

The extent of native vegetation clearing and foraging habitat removal associated with the subject land is considered to be small in terms of available habitat for the species within region. The irregular distribution of blossom resources, which is a key driver of nomadism of these species, may cause this species to occasionally forage within the subject land. Although it is considered unlikely that the loss of potential foraging habitat will cause the local extinction of the Swift Parrot, the action proposed will remove habitat that may be utilised by this species under some intermittent seasonal contexts. The action proposed is not considered to fragment any locally occurring populations, affect habitat critical to their survival, disrupt their breeding cycles, or interfere with the recovery of these species. The action proposed therefore, is considered to represent an incremental loss of available local habitat, although it is not considered likely to have a significant impact as it is unlikely to affect the long-term viability of the species.

F.4 Regent Honeyeater

Status

Regent Honeyeater (*Anthochaera Phrygia*) is listed as Critically Endangered under both the EPBC Act and BC Act.

Distribution and habitat

Occurs mostly in box-ironbark forests and woodland and prefers wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with *Casuarina cunninghamiana* and *Amyema cambagei* are important for feeding and breeding. Spotted Gum and Swamp Mahogany forests are also important feeding areas in coastal areas. Important food trees include *Eucalyptus sideroxylon* (Mugga Ironbark), *E. albens* (White Box), *E. melliodora* (Yellow Box) and *E. leucoxylon* (Yellow Gum) (Garnett, 2000).

The Regent Honeyeater (*Anthochaera phrygia*) primarily occurs across the inland slopes of south-east Australia where it inhabits temperate woodlands and open forests. In some years, the species is also found in drier coastal woodlands and forests (Office of Environment & Heritage 2017b). Movements of the species through the landscape corresponds with the flowering of select eucalypt species (Department of the Environment and Energy 2019). The species range has contracted dramatically in the last 30 years, and now occurs between north-eastern Victoria and south-eastern Queensland. Three key breeding regions are known to remain, they include: north-eastern Victoria (Chiltern-Albury), and Capertee Valley and the Bundarra-Barraba regions in NSW. The species distribution in NSW is patchy but is mainly confined to the two main breeding areas, and their surrounding fragmented woodlands. Every few years, the species is recorded foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Additionally, birds are occasionally recorded on the south coast (Office of Environment & Heritage 2017b). Within the NSW South Western Slopes region, the species is known to occur within the Capertee Valley, Inland Slopes, and Lower Slopes sub-regions (Office of Environment & Heritage 2017c). Within the South Eastern Highlands, the species is known to occur in the Bathurst, Bondo, Bungonia, Capertee Uplands, Crookwell, Hill End, Kybeyan-Gourock, Monaro, Murrumbateman, Oberon, and Orange sub-regions. Additionally, it is predicted to occur in the Kanangra sub-region (Office of Environment & Heritage 2017a).

Specific impacts

The proposed will impact approximately 32.58ha of potential foraging habitat for Regent Honeyeater. Habitat to be impact occurs predominately as vegetation limited to the margins of existing vegetation patches.

EPBC Act significance assessment

The Regent Honeyeater is listed as Critically Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013).

An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of a population of a species**

Approximately 32.58ha of potential foraging habitat for Regent Honeyeater would be affected by the action proposed. While limited habitat in the subject land has the potential to be used by these species, it is not likely to be of high importance due to its relatively small extent, low quality, small patch size and the availability of equal or greater quality habitat within the locality and wider region. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 32.58ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is

accessible to the species. Any identified population of Regent Honeyeater in the area would not be restricted to habitat within the subject land. Due to the species' large home range and nomadic nature, similar foraging habitat can be accessed in the locality. Therefore, the action proposed is not considered likely to significantly contribute to a long-term decline in the size of a population for this species.

- **Reduce the area of occupancy of the species**

The action proposed is likely to affect approximately 32.58ha of potential foraging habitat for this species. Although the action proposed will result in the loss of potential foraging habitat, the incremental loss of a small area of potential habitat, only represents a small component of similar locally occurring resources accessible to these species. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 32.58ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. Nevertheless, the removal of approximately 32.58ha of potential habitat is considered to be a small incremental loss of suitable habitat locally and as such has the potential to incrementally reduce the area of occupancy for the Regent Honeyeater during seasons when individuals of this species may be reliant on local resources.

- **Fragment an existing population into two or more populations**

Habitat connectivity is not likely to be affected by the action proposed. Approximately 32 .58ha of potential foraging habitat is likely to be affected by the action proposed with vegetation removal largely limited to the margins of existing vegetation or on the edges of small vegetation patches. As the subject land will disturb a relatively small area of marginal habitat, the proposed action would not further fragment or isolate any previously undisturbed patches of habitat than what already exists due to existing development land use. Furthermore, given that these species are highly mobile and nomadic, the action proposed would not present a significant barrier to these species. It is not considered likely that habitat would become further isolated or fragmented significantly beyond that currently existing in the subject land and locality.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat has been listed for the Regent Honeyeater to date. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. The subject land does not occur within these breeding areas nor is the subject land the only limiting foraging area for this species, as such it is unlikely that this action proposed will adversely affect habitat critical to the survival of this species.

- **Disrupt the breeding cycle of a population**

Regent Honeyeaters are known to have three key breeding regions which include north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. The proposed action would not impact these known breeding areas. Furthermore, this species is highly mobile and is known to disperse widely (Higgins, Peter et al. 2001). The 32.58ha of potential marginal foraging habitat likely to be affected is a small area of habitat which the species would not only be restricted too. Therefore, the removal of about 32.58ha of potential marginal foraging habitat is unlikely to disrupt the breeding cycle of a population of Regent Honeyeater. As such the action proposed is unlikely to affect their breeding cycle.

- **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The action proposed would remove approximately 32.58ha of potential habitat for this species. The removal of approximately 32.58ha of potential foraging habitat is considered to be an incremental loss of suitable habitat locally, however would only constitute. As such the removal of 32.58ha of potential foraging habitat for the Regent Honeyeater is unlikely to be at an extent in which these species are likely to decline.

- **Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species´ habitat**

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Regent Honeyeater would become further established as a result of the action proposed.

- **Introduce disease that may cause the species to decline**

No. It is unlikely that disease would be increased by the action proposed.

- **Interfere with the recovery of the species**

For the Regent Honeyeater, the *Action Plan for Australian Birds* (Garnett and Crowley 2000) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific breeding requirements.

Recovery strategies outlined in Regent Honeyeater Recovery Plan (Department of the Environment 2016b) include:

- improve the extent and quality of regent honeyeater habitat
- bolster the wild population with captive-bred birds until the wild population becomes self-sustaining
- increase understanding of the size, structure, trajectory and viability of the wild population
- maintain and increase community awareness, understanding and involvement in the recovery program.

Based on the potential ecological impacts of the proposal on these species, as discussed above, it is likely that the proposal would be in conflict with the first objective above to a minor extent, by not improving the extent of habitat for the Regent Honeyeater. However, it is unlikely that the impact of small areas of marginal foraging habitat would cause significantly interfere with the recovery of the species.

Conclusion

The extent of native vegetation clearing and foraging habitat removal associated with the subject land is considered to be small in terms of available habitat for the species within region. The irregular distribution of blossom resources, which is a key driver of nomadism of the species, may cause this species to occasionally forage within the subject land. Although it is considered unlikely that the loss of potential foraging habitat will cause the local extinction of the Regent Honeyeater, the action proposed will remove habitat that may be utilised by this species under some intermittent seasonal contexts. The action proposed is not considered to fragment any locally occurring populations, affect habitat critical to their survival, disrupt their breeding cycles, or interfere with the recovery of the species. The action proposed therefore, is considered to represent an incremental loss of available local habitat, although it is not considered likely to have a significant impact as it is unlikely to affect the long-term viability of the species.

F.5 Superb Parrot

Status

Superb parrot (*Polytelis swainsonii*) is listed as Vulnerable under both the EPBC Act and BC Act.

Distribution and habitat

The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round.

The Superb Parrot mainly inhabits forests and woodlands dominated by eucalypts, especially River Red Gums and Box-Gums, but also occurs in Box-Cypress-pine and Boree Woodlands. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees.

Specific impacts

The proposed will impact approximately 75.69ha of foraging and 41.81ha potential nesting habitat for Superb Parrot. Habitat to be impact occurs predominately as vegetation limited to the margins of existing vegetation patches.

EPBC Act Significance Assessment

The Superb Parrot is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Is this part of an important population?

This species was recorded during the field surveys foraging within the subject land. There are previous records of these species within the locality. Potential habitat for this species occurred within the survey area as disjunct remnant patches of highly modified woodland, scattered across a fragmented landscape. The habitat has been previously disturbed by agricultural cropping and grazing.

It was estimated that the proposal will involve the removal of approximately 75.69ha of foraging habitat of which 41.81ha is potential nesting habitat for this species. This species is considered as one single population across its range (Department of the Environment and Energy 2017) with majority of breeding occurring in the Riverina and South-west Slopes of NSW. Local occurrences of this species are likely part of key source populations for breeding and dispersal. Therefore, individuals that occur within the area are considered as part of ‘an important population’.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- **Lead to a long-term decrease in the size of an important population of a species**

The proposal would impact approximately 75.69ha of foraging habitat, in the form of native disjunct remnant patches of highly modified woodland and derived native grassland, scattered across a fragmented landscape. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 7260ha of habitat associated with the species (i.e. PCT 266, 276, 277, 347, 79 & 76) has been mapped within the locality of the proposal, this habitat would be still be accessible to the species. The loss of 75.69ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining available mapped habitat in the locality. The extent of potential habitat to be removed is a small component of available habitat locally with an abundance of similar quality habitat and that of much higher quality in the greater locality, such as occurs in Bethungra and Ulandra Mountain range. It is unlikely that the disturbance of 75.69ha of potential habitat associated with the proposal would lead to a long-term decrease in the size of the population.

- **Reduce the area of occupancy of an important population**

The Superb Parrot is known to prefer forests and woodlands dominated by eucalypts including, River Red Gums (*Eucalyptus camaldulensis*), Yellow Box (*Eucalyptus melliodora*) and Grey Box (*Eucalyptus microcarpa*). In addition, it prefers large mature eucalypts typically close to watercourses and associated with extensive tracts of suitable foraging habitat (Department of the Environment and Energy 2017). Whilst the subject land has small occurrences of woodland (approximately 61.25ha) and derived native grassland (14.44ha) habitat these areas are isolated and fragmented within the landscape. Although it is likely that individuals may occur within the survey area on an intermittent basis, the availability of habitat within the survey area is unlikely to constitute important habitat, due to the marginal quality of survey area habitat resources. Therefore, it is considered unlikely that the disturbance of 75.69ha of potential habitat will reduce the area of occupancy of the population.

- **Fragment an existing important population into two or more populations**

The Superb Parrot is a highly mobile species able to transverse fragmented landscapes to isolated patches of vegetation. It is known that part of the population undertakes regular seasonal movements from breeding areas to foraging habitats across central and north-central NSW, often coinciding with flowering eucalypts (Department of the Environment and Energy 2017). In addition, it is also known that when Superb Parrots undertake local movements they prefer to move along wooded corridors and limit traversing extensive open areas (Department of the Environment and Energy 2017). As potential habitat within the survey area already occurs within a highly fragmented landscape, it is considered unlikely that the disturbance of habitat in the survey area would fragment the existing population into two or more populations.

- **Adversely affect habitat critical to the survival of a species**

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. No 'critical habitat' has been listed for the Superb Parrot under the *EPBC Act* (Department of Environment and Energy 2017).

Habitat critical to the survival of species also refers to 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 proposal will involve the removal of an estimated 75.69ha of potential foraging and roosting habitat, of which 41.81ha is potential nesting habitat for this species. This habitat differs in overall quality.

The habitat observed within the survey area was highly fragmented and of degraded condition, therefore the removal of 61.25ha of habitat is considered unlikely to be critical to the survival of this species.

- **Disrupt the breeding cycle of an important population**

Approximately 75.69ha potential habitat would be disturbed as part of the proposal. Superb Parrots nest in large hollow-bearing trees usually River Red Gums, Blakely's Red Gum and Box eucalypts. Approximately 4276ha of Red Gum woodland has been mapped within the locality, the impact of 41.81ha of preferred breeding habitat would be a loss of <2% of habitat when compared to the remaining preferred mapped habitat in the locality. Preferred nest trees are located along watercourses and within 10km of foraging habitat (Department of the Environment and Energy 2017). Whilst the survey area has the presence of hollow-bearing trees, the location of these do not occur within preferred breeding habitat (i.e. watercourse). Despite this, there is still potential for individuals to utilise hollow trees within the survey area. However, it is unlikely that the removal of 61.25ha of potential habitat would disrupt the breeding cycle of this population, as this would be a small proportion of available resources within the greater locality.

- **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The proposal will involve the removal of approximately 75.69ha of foraging habitat and 41.81ha of potential breeding habitat. Potential habitat occurred as disjunct remnant patches of highly modified woodland, scattered across a fragmented landscape. Potential habitat has been previously and/or currently disturbed by a long history of agricultural cropping and grazing.

The proposal generally exists within areas cleared of vegetation or on the edge of native vegetation. Although habitat within the proposal is of relatively low quality for the Superb Parrot, the proposal will decrease and modify available habitat for this species within the subject land. Considering the mobile nature of the Superb Parrot, this action is unlikely to isolate Superb Parrot habitat to an extent that will cause the species to decline. Given the highly modified nature of observed habitats, a long history of pastoral land-use practices over these areas (i.e., cropping and agricultural grazing) and the poor condition of woodland habitat observed, it is considered unlikely that the proposal will modify, destroy, remove or isolate habitat for this species to the extent that it may cause the species to decline locally.

- **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat**

Habitat for this species within the survey area is in highly disturbed condition and is subject to weed and pest invasion. In addition, the majority of the survey area occurs on agricultural properties which have been long subjected to high disturbances relating to agricultural practices such as cropping, grazing, burning and the application of fertilisers. Therefore, it is considered unlikely that the proposal would substantially reduce the quality or integrity of the community's occurrence or increase spread of invasive species. Additionally, mitigation measures will be developed to minimise the likelihood of an increase or establishment of invasive species into the habitat of this species.

- **Introduce disease that may cause the species to decline**

It is not considered likely that the proposal would introduce disease into the subject land.

Nevertheless, mitigation measures will be prepared to minimise the likelihood of spread of pathogens into potential Superb Parrot habitats within the survey area.

- **Will the action interfere with the recovery of the species?**

A national recovery plan for Superb Parrot has been developed by the Department of Environment (Baker-Gabb 2011). The recovery plan has outlined four recovery objectives for this species, which are outlined in Table F.1. The proposal will not impact upon any of the objectives of the national recovery plan for this species.

Table F.1 National recovery actions for Superb Parrot

Recovery objective	Affected by the proposal
Determine population trends	No
Increase knowledge of ecological requirements	No
Develop and implement threat abatement strategies	No
Increase community involvement and awareness of recovery program	No

Conclusion

The proposal traverses a highly fragmented and degraded landscape that contains potential foraging and roosting habitat for the Superb Parrot. Superb Parrots occurring on the South-west Slopes of NSW are part of a key breeding population and therefore considered an important population. While the proposal will remove 75.69ha of Superb Parrot habitat, the degraded nature of the habitat, and its subsequent low value to the species, is considered to render it as of low significance to the population as a whole. It is suggested that mitigation measures be implemented during the design, construction and operational phases of the proposal to minimise impacts on local Superb Parrot habitat, especially those areas that contain tree stands which may represent potential breeding habitat for the species.

For the following reasons the works are unlikely to significantly affect these species or their habitat:

- habitat affected is of marginal quality
- the habitat affected is a very small proportion of potential habitat for the species in the locality
- the works are unlikely to interfere with the recovery objectives of the species
- management measures would be implemented to minimise potential impacts during works. For example, pre-work/construction surveys for nesting birds.

The works are unlikely to contribute significantly to key threatening processes.

F.6 Corben's Long-eared Bat

Status

Corben's Long-eared Bat (*Nyctophilus corbeni*) is listed as Vulnerable under both the EPBC Act and BC Act.

Distribution and habitat

The south-eastern long-eared bat is found in southern central Queensland, central western New South Wales, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin (Duncan, Baker et al. 1999, Turbill and Ellis 2006). Most records are from inland of the Great Dividing Range.

The species occurs in a range of inland woodland vegetation types being most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer (Parnaby 1995, Ellis, Lumsden et al. 1999, Dominelli 2000, Turbill and Ellis 2006). Roosting and breeding habitat includes in tree hollows, crevices and under loose bark in arid and semi-arid Australia (Strahan 1995) and forages in the understorey of woodlands and open savannah and swamps (Churchill 1998).

Specific impacts

The proposed will impact approximately 13.96ha of potential foraging and roosting habitat (hollow-bearing trees) for Corben's Long-eared Bat.

EPBC Act Significance Assessment

The Corben's Long-eared Bat (*Nyctophilus corbeni*) is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

Is this part of an important population?

The Corben's Long-eared Bat occurs across a wide range of different vegetation contexts, including box eucalypt dominated communities west of the divide. Roosts in tree hollows, crevices, and under loose bark. The Corben's Long-eared Bat is found in southern central Queensland, central western New South Wales, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin (Threatened Species Scientific Committee 2015). The species occurs throughout much of inland New South Wales with at least 50% of the species' known distribution occurring in this state. The Pilliga scrub region is a known stronghold for this species (Threatened Species Scientific Committee 2015).

The site predominately provides foraging opportunities, due to the presence of insect attracting canopy foliage, such habitat occurs widely within the vicinity of the subject land and the wider locality. Consequently, foraging and roosting resources within the subject land are not considered critical to maintaining populations, breeding or dispersal. Potential occurrences of this species within the subject land are not at the limit of the species' distribution and as such the subject land can only be considered to represent a part of the foraging range of widely occurring individuals. For these reasons, if present within the subject land, individuals of this species would not be considered to be part of an important population.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of an important population of a species**

Not applicable. Corben's Long-eared Bat in the subject land is not part of an important population (refer to above).

- **Reduce the area of occupancy of an important population**

Not applicable. Corben's Long-eared Bat in the subject land is not part of an important population (refer to above).

- **Fragment an existing important population into two or more populations**

Not applicable. Corben's Long-eared Bat in the subject land is not part of an important population (refer to above).

- **Adversely affect habitat critical to the survival of a species**

No critical habitat is listed for this species under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they 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 (Department of Environment and Climate Change 2006).

The proposal would impact approximately 13.96ha of potential foraging habitat only for this species. The subject land contains potential roosting habitat (hollow bearing trees, dead trees/spouts, and under bark). This impact to potential foraging habitat will only constitute a small amount of available habitat for this species. As a result, it is unlikely that the removal of this potential foraging habitat would be classified as critical habitat for the species.

- **Disrupt the breeding cycle of an important population**

Not applicable. Corben's Long-eared Bat in the subject land is not part of an important population (refer to above).

- **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

A relatively small area of potential foraging and roosting habitat (13.96ha) will be affected. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 1430ha of habitat associated with the species (i.e. PCT 266) has been mapped within the locality of the proposal, this habitat would be still be accessible to the species. The loss of 13.96ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining available mapped habitat in the locality. The proposal would not impact habitat considered critical to the long-term survival of populations in the locality and is unlikely to further create a barrier to movement for these species. The proposal is not likely to significantly affect the availability of quality habitat for this species.

- **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

The proposal is not likely to increase the likelihood of an invasive species becoming established in the habitat.

- **Introduce disease that may cause the species to decline**

The proposal is not likely to increase the likelihood of a disease becoming established or proliferating in a local population that would result in a decline of this species.

- **Interfere substantially with the recovery of the species**

Due to the small amount of foraging habitat likely to be affect by the proposal (13.96ha) the proposal is not likely to interfere with the recovery of this species.

Conclusion

The Corben's Long-eared Bat forages and roosts across a wide range of woodland types, including those within the subject land. Although a relatively small area of potential foraging habitat will be removed, there is an abundance of similar and potentially higher quality habitat elsewhere within the wider locality. The loss of 13.96ha of habitat for this species would not be considered to be significant to this species considering the remaining available mapped habitat in the locality. Therefore, the action proposed is unlikely to lead to a significant impact on the Corben's Long-eared Bat.

F.7 Grey-headed Flying-fox

Status

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under both the EPBC Act and BC Act.

Distribution and habitat

The Grey-headed Flying-fox Occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly. At a regional scale, broad trends in the distribution of plants with similar flowering and fruiting times support regular annual cycles of migration. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, elsewhere, during spring, Grey-headed Flying-foxes are uncommon south of Nowra and widespread in other areas of their range. The species is widespread throughout their range in summer, whilst in autumn it occupies coastal lowlands and is uncommon inland. In winter, the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW (associated with flowering Spotted Gum Corymbia maculata) and on the northwest slopes (generally associated with flowering White Box *Eucalyptus albens* or Mugga Ironbark *E. sideroxylon*). Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Feed on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines.

Specific impacts

The proposed will impact approximately 54.52ha of potential foraging habitat for Grey-headed Flying-fox. Majority of the habitat to be impacted is associated with Box-Gum Woodland. Habitat to be impact occurs predominately as vegetation limited to the margins of existing small patches of vegetation across the entire alignment.

EPBC Act Significance Assessment

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

Is this part of an important population?

Grey-headed Flying-foxes occur across a range of wooded habitats where their favoured food, eucalypt blossom occurs. They set up roosting camps in association with blossom availability, which are usually situated in dense vegetation and associated with water. Grey-headed Flying-foxes can migrate up to 75km north during the winter and during this time young flying-foxes establish camps.

With reference to DoEE's National Flying-fox monitoring viewer, there are no recorded Flying-fox camps within the subject land (DoEE 2021). The closest recorded camps to the subject land include:

- Wagga Wagga (camp #641) – according to the National Flying Fox monitoring viewer this camp has last recorded Grey-headed Flying-fox between1-499 individuals in 2015.

Occurrences of this species within the subject land are not at the limits of the species' distribution, nor are any maternity camps present in the subject land, and as such the habitat within the subject land can only be considered to represent a part of the foraging range of widely occurring individuals. However, the Grey-headed Flying-fox has no separate or distinct populations (DoE 2014a). The species constantly exchanges genetic information between camps throughout its geographic range. Therefore, the species occurs as one population and therefore any individuals that occur in the subject land would be considered to form part of 'an important population'.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of an important population of a species**

The proposal would impact approximately 54.52ha of potential foraging habitat for Grey-headed Flying-fox. Habitat to be impact occurs predominately as vegetation limited to the margins of existing small patches of vegetation across the entire alignment. Due to the nomadic nature of Grey-headed Flying-fox and their ability to forage up to 50km from roost sites, the Grey-headed Flying-fox would not be restricted to habitat in the subject land. While limited habitat in the subject land has the potential to be used by these species, it is not likely to be of high importance due to its relatively small area and the availability of equal or greater quality habitat within the locality and wider region. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 54.52ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. Any identified population of Grey-headed Flying-fox in the area would not be restricted to habitat within the subject land. Due to the species' large home range and nomadic nature, similar foraging habitat can be accessed in the locality. Therefore, the action proposed is not considered likely to significantly contribute to a long-term decline in the size of a population for this species.

- **Reduce the area of occupancy of an important population**

The action proposed is likely to affect approximately 54.52ha of potential foraging habitat for this species. Although the action proposed will result in the loss of potential foraging habitat, the incremental loss of a small area of potential habitat, only represents a small component of similar locally occurring resources accessible to these species. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 54.52ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. Nevertheless, the removal of approximately 54.52ha of potential habitat is considered to be a small incremental loss of suitable habitat locally and as such has the potential to incrementally reduce the area of occupancy for the Grey-headed Flying-fox during seasons.

- **Fragment an existing important population into two or more populations**

Habitat connectivity is not likely to be affected by the action proposed. Approximately 54.52ha of potential foraging habitat is likely to be affected by the action proposed with vegetation removal largely limited to the margins of existing vegetation. As the subject land is small in nature, the proposed action would not further fragment or isolate any previously undisturbed patches of habitat than what already exists due to existing development land use. Furthermore, given that these species are highly mobile and nomadic, the action proposed would not present a significant barrier to these species. It is not considered likely that habitat would become further isolated or fragmented significantly beyond that currently existing in the subject land and locality.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat is listed for this species under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they 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 (Department of Environment and Climate Change 2006).

The foraging habitat within the subject land meets the DECCW (2009) criteria for habitat critical for the survival of Grey-headed Flying-fox due to its proximity to existing camps (within 50km) but removal of small proportion (<1% Box-Gum Woodland) of foraging habitat is unlikely to significantly impact on this species, given the abundance of higher quality myrtaceous foraging habitat within the greater locality.

- **Disrupt the breeding cycle of an important population**

No roost sites/camps occur within the subject land nor would the proposed action affect any roosts/camps in the locality. Therefore, it is unlikely that the proposed action would disrupt the breeding cycle of the population of Grey-headed Flying-fox.

- **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

No. The action proposed would only affect approximately <1% of suitable foraging habitat for this species. As this species is known to forage up to 50km from roost sites, the action proposed is unlikely to significantly affect the availability of quality habitat for this species.

- **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

It is not likely that invasive species (such as introduced predators) that are harmful to the Grey-headed Flying-fox would become further established as a result of the proposed action.

- **Introduce disease that may cause the species to decline**

No. There are no known diseases that are likely to increase in the area as a result of the proposed action.

Australian flying-foxes, including the Grey-headed Flying-fox, are natural reservoirs for at least three diseases- Australian Bat Lyssavirus (ABL), Hendra virus and Menangle virus. While injured and orphaned Grey-headed Flying-foxes have a higher chance of testing positive for ABL, it is unlikely the proposed action will introduce this disease.

White-nosed syndrome, a fungal disease causing widespread concern due to its impact upon bat populations in North America, has only been identified in microbats. The disease has not been identified in Australia

- **Interfere substantially with the recovery of the species**

Due to the relatively small foraging habitat likely to be affect by the proposed action (<1% Box-Gum Woodland) and as no roost camps are located in the subject land, the proposed action is not likely to interfere with the recovery of this species.

Conclusion

The extent of native vegetation clearing and foraging habitat removal associated with the subject land is considered to be small in terms of available habitat for the species within region. The irregular distribution of blossom resources, which is a key driver of nomadism of these species, may cause this species to occasionally forage within the subject land. Although it is considered unlikely that the loss of potential foraging habitat will cause the local extinction of the Grey-headed Flying-fox, the action proposed will remove habitat that may be utilised by this species under some intermittent seasonal contexts. There are no Grey-headed Flying-fox camps within the subject land. The action proposed is not considered to fragment any locally occurring populations, affect habitat critical to their survival, disrupt their breeding cycles, or interfere with the recovery of these species. The action proposed therefore, is considered to represent an incremental loss of available local habitat, although it is not considered likely to have a significant impact as it is unlikely to affect the long-term viability of the species.

F.8 White-throated Needletail

Status

The White-throated Needletail (*Hirundapus caudacutus*) is listed as Vulnerable and Migratory under the EPBC Act.

Distribution and habitat

The White-throated Needletail is widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. In Australia, White-throated Needletails almost always forage aerially, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats.

Specific impacts

This species previously recorded in aerial habitats in the proposal locality. The subject land only provides aerial foraging habitat for this species. The proposal has been identified to impact on about 70.09ha of vegetation communities associated with aerial foraging habitat. Majority of the habitat to be impacted is associated with Box-Gum Woodland. Habitat to be impact occurs predominately as vegetation limited to the margins of existing small patches of vegetation across the entire alignment.

EPBC Act Significance Assessment

The White-throated Needletail (*Hirundapus caudacutus*) is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013) and Draft Referral guideline for migratory species (Department of the Environment 2015b). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

Is this part of an important population?

The White-throated Needletail is a migratory species and occurs in Australia only between late spring and early autumn, but mostly in summer. This species is a non-breeding migrant with breeding taking place in Northern Asia (Birdlife Australia, 2020). The White-throated Needletail feeds on flying insects, such as termites, ants, beetles and flies. They catch the insects in flight in their wide gaping beaks. They have been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows. Probably recorded most often above wooded areas, including open forest and rainforest (Birdlife Australia, 2020). This species is not or near the limit of its range as it occurs over eastern and northern Australia and in Northern Asia (Birdlife Australia, 2020).

White-throated Needletail is almost exclusively aerial and although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps.

The subject land does not contain key resources for breeding or dispersal, does not occur at the limit of the species distribution range and is unlikely to be necessary for maintaining genetic diversity populations which may occur. However, the species is a migratory species and the individuals which migrate to Australia would be considered as one population and therefore any individuals within the subject land is considered to form part of an 'important population'. One hundred individuals would be considered internationally important, while ten individuals would be considered nationally important (Department of the Environment 2015b).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of an important population of a species**

The threshold for a significant impact nationally would be impacts to ten individuals (Department of the Environment 2015b). This species occurs widely within NSW and QLD whilst in Australia and suitable foraging resources could be accessed widely throughout the locality and beyond. Forage over most types of habitat, they are recorded most often above wooded areas, including habitat identified in the subject land. The species may use the subject land for aerial foraging on an intermittent basis but is not known to breed in Australia. It is unlikely that the impact of 61.36ha of vegetation communities associated with aerial foraging habitat, of which, occurs predominately as vegetation limited to the margins of existing small patches of vegetation across the entire alignment, would have a significant impact upon for this species to lead to a long-term decrease in the size of its population.

- **Reduce the area of occupancy of an important population**

The proposal will impact 61.36ha of vegetation limited to the margins of existing small patches, this represents potential aerial foraging habitat for this species. Majority of the habitat to be impacted is associated with Box-Gum Woodland. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 61.36ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. This species forages on the wing and the vegetation within the subject land is likely to provide aerial foraging habitat for this species. This species occurs widely within NSW and QLD whilst in Australia and suitable foraging resources could be accessed widely throughout the locality and beyond. It is unlikely that the impact of potential foraging habitat would significantly impact upon available resources for this species to the point that it would significantly reduce of the area of occupancy for the species.

- **Fragment an existing important population into two or more populations**

Habitat connectivity is not likely to be affected by the proposal. The majority of the subject land occurs within or adjacent to previously disturbed land (i.e., agriculture). Approximately 61.36ha of habitat is likely to be affected by the proposal with vegetation removal largely limited to a linear disturbance corridor. As the subject land is linear in nature and largely avoids significant vegetation, the proposal would not further fragment or isolate any previously undisturbed patches of habitat than what already exists in the subject land and locality. Furthermore, the White-throated Needletail is a highly mobile and aerial species able to transverse fragmented landscapes to isolated patches of vegetation. As potential habitat within the subject land already occurs within a highly fragmented landscape, it is considered unlikely that the disturbance of habitat in the subject land would fragment the existing population into two or more populations.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat is listed for this species under the EPBC Act. Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they 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, or
- for the reintroduction of populations or recovery of the species or ecological community.

The proposal will impact a relatively small proportion of potential aerial foraging habitat (<1%) for this species. The White-throated Needletail is a migratory species and breeds in northern Asia. This species forages on the wing and the vegetation within the subject land is likely to provide aerial foraging habitat for this species. This species occurs widely within NSW and QLD whilst in Australia and suitable foraging resources could be accessed widely throughout the locality and beyond. Therefore, this would not meet the above criteria and the subject land is not critical to the survival of the White-throated Needletail.

- **Disrupt the breeding cycle of an important population**

White-throated Needletail does not breed within Australia. The removal of approximately of potential foraging habitat is unlikely to disrupt their movements to Northern Asia breeding grounds. As such the proposal is unlikely to affect the breeding cycle of a population of White-throated Needletail.

- **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The proposal will impact a small proportion (<1%) of potential foraging habitat for the White-throated Needletail. The impact is predominately of vegetation limited to the margins of existing small patches, this represent potential aerial foraging habitat for this species. This species occurs widely within NSW and QLD whilst in Australia and suitable foraging resources could be accessed widely throughout the locality and beyond. It is unlikely that the impact of potential foraging habitat would significantly impact upon available resources for this species to the point that it would significantly isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

- **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

It is not likely that invasive species (such as introduced predators) that are harmful to the White-throated Needletail would become further established as a result of the proposal.

- **Introduce disease that may cause the species to decline**

No. There are no known diseases that are likely to increase in the area as a result of the proposal.

- **Interfere substantially with the recovery of the species**

As this species does not breed in Australia and forages on the wing and has the potential to occur intermittently within the locality, the proposal is not likely to interfere with the recovery of this species.

Conclusion

The threshold for a significant impact nationally would be impacts to ten individuals (Department of the Environment 2015b). The proposal will impact a small proportion (<1%) of potential foraging habitat for the White-throated Needletail. The impact is predominately of vegetation limited to the margins of existing small patches, this represent potential aerial foraging habitat for this species. No breeding occurring within Australia and therefore the proposal will not impact life-cycle for the species. The White-throated Needletail may use the subject land for aerial foraging on an intermittent basis and the proposal is not likely to have a significant impact upon available resources for this species in the vicinity of the subject land or its wider locality. Therefore, the habitat to be impacted is not considered important to the long-term survival of the White-throated Needletail.

BAM vegetation integrity plot data

Date: 3/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	571287
Q1: PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Northing	6149401
			21	14	1	0	8	4	0	1	7	1		Orientation	145
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum		**Plot size**	20x20x50
			52.6	**47.5**	35	0	10.8	1.3	0	0.4	**5.1**	1		**BAM Attributes 20x50m plot**	
Alternanthera denticulata	0.1	2	FG					0.1						**Stem classes**	
Bothriochloa macra	2	20	GG				2							**80+**	3
*Bromus diandrus**	1	10	HT									1		**50-79**	2
Carex appressa	4	40	GG				4							**30-49**	Yes
Carex inversa	0.1	3	GG				0.1							**20-29**	Yes
*Cirsium vulgare**	0.2	4	EX								0.2			**10-19**	No
Cynodon dactylon	3	60	GG				3							**5-9**	No
Digitaria divaricatissima	0.2	2	GG				0.2							**<5**	Yes
*Echium plantagineum**	0.5	20	EX								0.5			**Hollows**	1
Einadia nutans	0.1	3	FG					0.1						**Length logs (m)**	14
Enteropogon acicularis	0.2	2	GG				0.2								
Eucalyptus camaldulensis	35	5	TG		35									**BAM Attributes 1x1 plot (%)**	
Glycine tabacina	0.4	20	OG							0.4				**Litter (%)**	78
*Hordeum vulgare**	1	20	EX								1			**Bare Ground (%)**	17
Juncus usitatus	0.5	10	GG				0.5							**Vegetation (%)**	1
*Lactuca serriola**	0.2	4	EX								0.2			**Rock (%)**	4
*Lolium perenne**	2	30	EX								2				
Oxalis perennans	0.1	2	FG					0.1							
Rumex brownii	1	30	FG					1							
Rytidosperma setaceum	0.8	20	GG				0.8								
*Sonchus oleraceus**	0.2	10	EX								0.2				

Date: 3/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q2: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			28	11	2	0	2	7	0	0	17	1
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			65	41.6	40	0	0.4	1.2	0	0	23.4	5
*Avena barbata**	15	200	EX								15	
Boerhavia dominii	0.1	2	FG					0.1				
*Bromus diandrus**	5	100	HT									5
*Chondrilla juncea**	0.1	3	EX								0.1	
*Cirsium vulgare**	0.2	3	EX								0.2	
*Conyza spp.**	0.1	1	EX								0.1	
Cyperus gracilis	0.2	20	GG				0.2					
Dysphania pumilio	0.1	6	FG					0.1				
*Echium plantagineum**	0.2	20	EX								0.2	
Einadia nutans subsp. nutans	0.1	3	FG					0.1				
Erodium crinitum	0.1	10	FG					0.1				
Eucalyptus melliodora	35	1	TG		35							
Eucalyptus spp. (juvenile)	5	10	TG		5							
*Hordeum vulgare**	1	20	EX								1	
*Hypochaeris radicata**	0.1	10	EX								0.1	
Juncus continuus	0.2	3	GG				0.2					
*Lactuca serriola**	0.3	30	EX								0.3	
*Malva parviflora**	0.1	3	EX								0.1	
*Modiola caroliniana**	0.1	10	EX								0.1	
Rumex brownii	0.2	3	FG					0.2				
Senna barclayana	0.2	2	FG					0.2				
Sida corrugata	0.4	20	FG					0.4				
*Solanum nigrum**	0.2	10	EX								0.2	
*Sonchus oleraceus**	0.2	20	EX								0.2	
*Sorghum spp.**	0.5	2	EX								0.5	
*Tribulus terrestris**	0.1	1	EX								0.1	
*Trifolium arvense**	0.1	2	EX								0.1	
*Trifolium spp.**	0.1	2	EX								0.1	

Easting	571498
Northing	6149445
Orientation	310
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	0
30-49	No
20-29	No
10-19	No
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	5
Attributes 1x1 plot (%)	
Litter (%)	70
Bare Ground (%)	26
Vegetation (%)	4
Rock (%)	0

Date: 3/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q3: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			19	15	2	0	7	5	0	1	4	0
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			51.7	**44.5**	35	0	8.3	1	0	0.2	**7.2**	0
Alternanthera denticulata	0.1	1	FG					0.1				
Austrostipa scabra subsp. scabra	0.5	15	GG				0.5					
Austrostipa setacea	3	50	GG				3					
*Cirsium vulgare**	0.1	3	EX								0.1	
Cyperus gracilis	3	100	GG				3					
Dichondra repens	0.5	100	FG					0.5				
Enteropogon acicularis	0.1	5	GG				0.1					
Eucalyptus melliodora	15	16	TG		15							
Eucalyptus microcarpa	20	1	TG		20							
Glycine tabacina	0.2	4	OG							0.2		
*Lolium perenne**	5	150	EX								5	
Maireana enchylaenoides	0.1	1	FG					0.1				
Oxalis perennans	0.1	1	FG					0.1				
*Phalaris aquatica**	2	6	EX								2	
*Plantago lanceolata**	0.1	8	EX								0.1	
Rumex brownii	0.2	10	FG					0.2				
Rytidosperma caespitosum	0.5	15	GG				0.5					
Rytidosperma setaceum	1	40	GG				1					
Schoenus latelaminatus	0.2	5	GG				0.2					

Easting	572410
Northing	6149556
Orientation	170
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	1
30-49	Yes
20-29	No
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	17
Attributes 1x1 plot (%)	
Litter (%)	90
Bare Ground (%)	9
Vegetation (%)	1
Rock (%)	0

Date: 3/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q4: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			26	20	2	2	8	5	1	2	6	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			83	69.2	18	11	36	2.8	0.2	1.2	13.8	10
Acacia paradoxa	10	8	SG			10						
Acacia pycnantha	3	4	TG		3							
Acacia rubida	1	1	SG			1						
*Aira spp.**	0.3	20	EX								0.3	
Anthosachne scabra	3	50	GG				3					
Austrostipa densiflora	6	80	GG				6					
Austrostipa scabra subsp. scabra	10	150	GG				10					
Austrostipa setacea	15	200	GG				15					
*Avena barbata**	3	50	EX								3	
Bothriochloa macra	0.6	6	GG				0.6					
*Briza maxima**	0.2	15	EX								0.2	
Cheilanthes sieberi	0.2	10	EG						0.2			
Digitaria divaricatissima	0.3	3	GG				0.3					
*Echium plantagineum**	0.2	15	EX								0.2	
Eucalyptus blakelyi	15	2	TG		15							
*Euphorbia drummondii**	0.2	2	FG					0.2				
Glycine canescens	1	0.1	OG							1		
Glycine clandestina	0.2	40	OG							0.2		
*Hypericum perforatum**	10	60	HT									10
*Hypochaeris radicata**	0.1	15	EX								0.1	
Oxalis perennans	0.1	3	FG					0.1				
Rumex brownii	0.1	1	FG					0.1				
Rytidosperma auriculatum	0.7	50	GG				0.7					
Rytidosperma setaceum	0.4	30	GG				0.4					
Sida corrugata	2	80	FG					2				
Vittadinia gracilis	0.4	3	FG					0.4				

Easting	572540
Northing	6149618
Orientation	260
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	1
Attributes 1x1 plot (%)	
Litter (%)	50
Bare Ground (%)	26
Vegetation (%)	24
Rock (%)	0

Date: 03/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q5: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			28	22	1	4	9	7	1	0	6	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			133.3	129.5	30	24.2	64	11.1	0.2	0	3.8	1
Acacia buxifolia subsp. buxifolia	2	4	SG			2						
Acacia decora	15	9	SG			15						
Acacia implexa	7	3	SG			7						
Acacia verniciflua	0.2	1	SG			0.2						
Anthosachne scabra	0.3	10	GG				0.3					
Austrostipa densiflora	40	500	GG				40					
Austrostipa scabra subsp. scabra	0.6	20	GG				0.6					
Austrostipa setacea	20	200	GG				20					
*Avena barbata**	0.5	20	EX								0.5	
*Briza maxima**	2	50	EX								2	
Cheilanthes sieberi subsp. sieberi	0.2	4	EG						0.2			
*Chondrilla juncea**	0.1	4	EX								0.1	
Dianella revoluta var. revoluta	4	50	FG					4				
*Echium plantagineum**	0.1	10	EX								0.1	
Einadia nutans subsp. nutans	0.2	5	FG					0.2				
Eucalyptus microcarpa	30	13	TG		30							
Euphorbia drummondii	0.5	20	FG					0.5				
Goodenia hederacea subsp. hederacea	0.1	2	FG					0.1				
*Hypericum perforatum**	1	30	HT									1
*Hypochaeris radicata**	0.1	2	EX								0.1	
Lomandra bracteata	0.1	1	GG				0.1					
Lomandra filiformis subsp. filiformis	0.1	1	GG				0.1					
Lomandra multiflora subsp. multiflora	0.5	5	GG				0.5					
Panicum decompositum	0.4	10	GG				0.4					
Rytidosperma spp. (no fertile material)	2	60	GG				2					
Sida corrugata	6	90	FG					6				
Tricoryne elatior	0.1	3	FG					0.1				
Wahlenbergia gracilis	0.2	15	FG					0.2				

Easting	5725579
Northing	6149547
Orientation	350
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	No
50-79	No
30-49	No
20-29	Yes
10-19	Yes
5-9	Yes
<5	No
Hollows	1
Length logs (m)	3
Attributes 1x1 plot (%)	
Litter (%)	48
Bare Ground (%)	12
Vegetation (%)	32
Rock (%)	8

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	574273
Q6: PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Northing	6155224
			13	1	1	0	0	0	0	0	12	1		Orientation	210
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum		Plot size	20x20x50
			86.5	35	35	0	0	0	0	0	51.5	8		BAM Attributes 20x50m plot	
*Bromus catharticus**	6	80	EX								6			Stem classes	
*Bromus diandrus**	8	100	HT									8		80+	5
*Bromus molliformis**	1	10	EX								1			50-79	4
*Cirsium vulgare**	0.2	4	EX								0.2			30-49	Yes
Eucalyptus camaldulensis	35	5	TG		35									20-29	Yes
*Hordeum vulgare**	20	200	EX								20			10-19	No
*Lolium perenne**	6	100	EX								6			5-9	No
*Marrubium vulgare**	5	50	EX								5			<5	No
*Polygonum aviculare**	0.1	1	EX								0.1			Hollows	9
*Sisymbrium erysimoides**	2	30	EX								2			Length logs (m)	47
*Sonchus oleraceus**	0.1	2	EX								0.1				
*Trifolium pratense**	0.1	1	EX								0.1			BAM Attributes 1x1 plot (%)	
*Vulpia myuros**	3	50	EX								3			Litter (%)	56
														Bare Ground (%)	40
														Vegetation (%)	4
														Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	574208
Q7: PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Northing	6154946
			11	3	2	0	1	0	0	0	8	1		Orientation	60
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum		Plot size	20x20x50
			81.9	31.5	31	0	0.5	0	0	0	50.4	35		BAM Attributes 20x50m plot	
*Bromus catharticus**	1	20	EX								1			Stem classes	
*Bromus diandrus**	35	500	HT									35		80+	4
Cynodon dactylon	0.5	10	GG				0.5							50-79	4
Eucalyptus camaldulensis	25	3	TG		25									30-49	No
Eucalyptus melliodora	6	1	TG		6									20-29	No
*Hordeum vulgare**	1	40	EX								1			10-19	No
*Lolium perenne**	10	200	EX								10			5-9	No
*Marrubium vulgare**	3	30	EX								3			<5	No
*Sisymbrium erysimoides**	0.2	2	EX								0.2			Hollows	5
*Sonchus oleraceus**	0.1	1	EX								0.1			Length logs (m)	62
*Trifolium pratense**	0.1	2	EX								0.1				
														BAM Attributes 1x1 plot (%)	
														Litter (%)	72
														Bare Ground (%)	8
														Vegetation (%)	20
														Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q8: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			6	1	1	0	0	0	0	0	5	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			60.8	35	35	0	0	0	0	0	25.8	0
Eucalyptus melliodora	35	5	TG		35							
*Hordeum vulgare**	5	100	EX								5	
*Lolium perenne**	0.5	10	EX								0.5	
*Malva parviflora**	0.1	3	EX								0.1	
*Medicago sativa**	20	500	EX								20	
*Sisymbrium erysimoides**	0.2	5	EX								0.2	

Easting	574761
Northing	6157447
Orientation	80
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	No
Hollows	0
Length logs (m)	18
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	90
Vegetation (%)	10
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q9: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			9	2	2	0	0	0	0	0	7	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			56.1	27	27	0	0	0	0	0	29.1	0
Callitris glaucophylla	7	1	TG		7							
Eucalyptus microcarpa	20	1	TG		20							
*Hordeum vulgare**	5	200	EX								5	
*Lolium perenne**	3	50	EX								3	
*Malva parviflora**	1	50	EX								1	
*Medicago sativa**	15	500	EX								15	
*Sisymbrium erysimoides**	3	100	EX								3	
*Trifolium pratense**	0.1	1	EX								0.1	
*Vulpia myuros**	2	50	EX								2	

Easting	574413
Northing	6155853
Orientation	85
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	2
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	1
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	1
Bare Ground (%)	88
Vegetation (%)	11
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q10: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			13	5	2	0	0	3	0	0	8	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			62.1	31.3	31	0	0	0.3	0	0	30.8	0
Callitris glaucophylla	6	2	TG		6							
*Capsella bursa-pastoris**	0.1	1	EX								0.1	
Dysphania pumilio	0.1	20	FG					0.1				
*Echium plantagineum**	0.1	1	EX								0.1	
Eucalyptus microcarpa	25	4	TG		25							
*Hordeum vulgare**	15	500	EX								15	
*Lepidium africanum**	0.2	10	EX								0.2	
*Lolium perenne**	2	50	EX								2	
Maireana enchylaenoides	0.1	2	FG					0.1				
*Malva parviflora**	0.4	50	EX								0.4	
*Medicago sativa**	10	500	EX								10	
Oxalis perennans	0.1	3	FG					0.1				
*Sisymbrium erysimoides**	3	100	EX								3	

Easting	574661
Northing	6155862
Orientation	20
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	4
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	9
Attributes 1x1 plot (%)	
Litter (%)	30
Bare Ground (%)	60.6
Vegetation (%)	9.4
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	576289
Q11: PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Northing	6160764
			18	13	2	0	7	4	0	0	5	2		Orientation	210
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum		Plot size	20x20x50
			122.3	**112**	34	0	73.4	4.6	0	0	**10.3**	2.1		BAM Attributes 20x50m plot	
Alternanthera denticulata	0.1	2	FG					0.1						Stem classes	
Aristida behriana	0.1	1	GG				0.1							**80+**	1
*Bromus diandrus**	2	20	HT									2		**50-79**	1
Carex appressa	55	60	GG				55							**30-49**	Yes
Chloris truncata	3	40	GG				3							**20-29**	Yes
*Cirsium vulgare**	0.2	2	EX								0.2			**10-19**	Yes
Cynodon dactylon	4	40	GG				4							**5-9**	Yes
Dichondra repens	4	200	FG					4						**<5**	Yes
Enteropogon acicularis	1	10	GG				1							Hollows	0
Eucalyptus camaldulensis	30	5	TG		30									Length logs (m)	48
Eucalyptus microcarpa	4	2	TG		4										
*Hordeum vulgare**	5	100	EX								5			BAM Attributes 1x1 plot (%)	
Juncus spp. (grazed)	0.3	1	GG				0.3							**Litter (%)**	34
*Lolium perenne**	3	60	EX								3			**Bare Ground (%)**	40
*Lycium ferocissimum**	0.1	1	HT									0.1		**Vegetation (%)**	26
Microlaena stipoides var. stipoides	10	100	GG				10							**Rock (%)**	0
Oxalis perennans	0.3	20	FG					0.3							
Rumex brownii	0.2	2	FG					0.2							

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	576137
Q12: PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)			Count											Northing	6160789
			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Orientation	210
			19	12	1	0	7	4	0	0	7	2		Plot size	20x20
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum			
			118.6	**105.2**	45	0	59.2	1	0	0	**13.4**	3.5		BAM Attributes 20x50m plot	
Alternanthera denticulata	0.1	1	FG					0.1						Stem classes	
*Bromus diandrus**	3	50	HT									3		**80+**	4
Carex appressa	45	100	GG				45							**50-79**	3
Chloris truncata	5	60	GG				5							**30-49**	Yes
*Cirsium vulgare**	0.3	7	EX								0.3			**20-29**	Yes
Cynodon dactylon	3	40	GG				3							**10-19**	Yes
Dichondra repens	0.4	20	FG					0.4						**5-9**	Yes
Enteropogon acicularis	3	40	GG				3							**<5**	Yes
Eucalyptus camaldulensis	45	6	TG		45									Hollows	2
*Hordeum vulgare**	4	80	EX								4			Length logs (m)	154
Juncus usitatus	0.1	2	GG				0.1								
*Lactuca serriola**	0.3	10	EX								0.3			BAM Attributes 1x1 plot (%)	
*Lolium perenne**	5	100	EX								5			**Litter (%)**	78
*Lycium ferocissimum**	0.5	2	HT									0.5		**Bare Ground (%)**	5
Microlaena stipoides var. stipoides	3	50	GG				3							**Vegetation (%)**	17
Oxalis perennans	0.2	3	FG					0.2						**Rock (%)**	0
Rumex brownii	0.3	10	FG					0.3							
Rytidosperma caespitosum	0.1	2	GG				0.1								
*Sonchus oleraceus**	0.3	3	EX								0.3				

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q13: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			24	15	1	0	10	4	0	0	9	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			49.4	44.4	0.3	0	43.4	0.7	0	0	5	0
Anthosachne scabra	1	20	GG				1					
Aristida behriana	3	60	GG				3					
Austrostipa scabra subsp. scabra	0.2	5	GG				0.2					
Austrostipa setacea	6	100	GG				6					
*Avena barbata**	2	60	EX								2	
Bothriochloa macra	3	100	GG				3					
*Bromus molliformis**	1	20	EX								1	
Chloris truncata	6	200	GG				6					
*Echium plantagineum**	0.4	40	EX								0.4	
Enteropogon acicularis	4	100	GG				4					
*Erodium brachycarpum**	0.1	2	EX								0.1	
Erodium crinitum	0.1	2	FG					0.1				
Eucalyptus dwyeri	0.3	1	TG		0.3							
Euphorbia drummondii	0.2	15	FG					0.2				
*Hypochaeris radicata**	0.1	2	EX								0.1	
Juncus usitatus	0.2	2	GG				0.2					
Lomandra multiflora subsp. multiflora	5	100	GG				5					
*Polygonum aviculare**	0.1	1	EX								0.1	
Rumex brownii	0.2	4	FG					0.2				
Rytidosperma auriculatum	15	500	GG				15					
Sida corrugata	0.2	20	FG					0.2				
*Trifolium angustifolium**	0.1	1	EX								0.1	
*Trifolium spp.**	0.2	10	EX								0.2	
*Vulpia myuros**	1	20	EX								1	

Easting	576713
Northing	6160608
Orientation	180
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2
Bare Ground (%)	80
Vegetation (%)	16
Rock (%)	2

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q14: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			23	16	0	0	9	7	0	0	7	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			56.4	40.4	0	0	38.7	1.7	0	0	16	0
Alternanthera nana	0.1	2	FG					0.1				
Anthosachne scabra	0.2	10	GG				0.2					
Aristida behriana	0.1	3	GG				0.1					
Austrostipa scabra subsp. scabra	35	500	GG				35					
Austrostipa setacea	0.2	6	GG				0.2					
*Avena barbata**	15	200	EX								15	
Bothriochloa macra	0.7	20	GG				0.7					
*Bromus molliformis**	0.2	6	EX								0.2	
Chloris truncata	1	35	GG				1					
*Cucumis myriocarpus subsp. leptodermis**	0.1	1	EX								0.1	
Dysphania pumilio	0.1	3	FG					0.1				
*Echium plantagineum**	0.2	10	EX								0.2	
Enteropogon acicularis	0.1	2	GG				0.1					
*Erodium brachycarpum**	0.1	1	EX								0.1	
Erodium crinitum	0.2	30	FG					0.2				
Euphorbia drummondii	0.5	20	FG					0.5				
*Hypochaeris radicata**	0.3	15	EX								0.3	
Lomandra multiflora subsp. multiflora	0.4	15	GG				0.4					
*Polygonum aviculare**	0.1	2	EX								0.1	
Rumex brownii	0.4	8	FG					0.4				
Rytidosperma auriculatum	1	100	GG				1					
Sida corrugata	0.3	15	FG					0.3				
Vittadinia gracilis	0.1	2	FG					0.1				

Easting	576623
Northing	6160426
Orientation	270
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2
Bare Ground (%)	81
Vegetation (%)	17
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q15: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			21	16	0	0	8	7	1	0	5	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			46.8	21.3	0	0	8.9	12.1	0.3	0	25.5	0
Aira spp.	20	150	EX								20	
Aristida behriana	0.5	20	GG				0.5					
Austrostipa scabra subsp. scabra	1	30	GG				1					
Austrostipa setacea	0.4	15	GG				0.4					
*Avena barbata**	5	200	EX								5	
Bothriochloa macra	1	30	GG				1					
Cheilanthes sieberi subsp. sieberi	0.3	10	EG						0.3			
Chloris truncata	5	70	GG				5					
Dichondra repens	0.2	3	FG					0.2				
*Echium plantagineum**	0.3	6	EX								0.3	
Enteropogon acicularis	0.6	20	GG				0.6					
Erodium crinitum	0.2	15	FG					0.2				
Euphorbia drummondii	0.3	10	FG					0.3				
Gonocarpus elatus	10	80	FG					10				
*Hypochaeris radicata**	0.1	1	EX								0.1	
Lomandra multiflora subsp. multiflora	0.1	2	GG				0.1					
Oxalis perennans	1	50	FG					1				
Rytidosperma auriculatum	0.3	10	GG				0.3					
Sida corrugata	0.2	10	FG					0.2				
Tricoryne elatior	0.2	10	FG					0.2				
*Vulpia myuros**	0.1	1	EX								0.1	

Easting	576546
Northing	6160227
Orientation	200
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	72
Vegetation (%)	21
Rock (%)	7

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q16: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			15	11	0	0	5	5	1	0	4	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			44.5	42.8	0	0	41.6	1.1	0.1	0	1.7	0
Austrostipa scabra subsp. scabra	0.2	4	GG				0.2					
Bothriochloa macra	0.4	10	GG				0.4					
*Bromus molliformis**	0.4	20	EX								0.4	
Cheilanthes sieberi subsp. sieberi	0.1	1	EG						0.1			
Chloris truncata	1	80	GG				1					
Dichondra repens	0.1	5	FG					0.1				
*Echium plantagineum**	0.1	1	EX								0.1	
Enteropogon acicularis	20	200	GG				20					
Erodium crinitum	0.2	10	FG					0.2				
Euphorbia drummondii	0.5	40	FG					0.5				
*Lolium perenne**	0.9	20	EX								0.9	
Rumex brownii	0.1	1	FG					0.1				
Rytidosperma auriculatum	20	200	GG				20					
Sida corrugata	0.2	8	FG					0.2				
*Vulpia myuros**	0.3	10	EX								0.3	

Easting	576098
Northing	6160021
Orientation	90
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	11
Bare Ground (%)	58
Vegetation (%)	31
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q17: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			5	2	1	0	1	0	0	0	3	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			55.7	30.1	30	0	0.1	0	0	0	25.6	0
Enteropogon acicularis	0.1	1	GG				0.1					
Eucalyptus melliodora	30	8	TG		30							
Hordeum vulgare	25	500	EX								25	
*Lactuca serriola**	0.5	10	EX								0.5	
*Malva parviflora**	0.1	1	EX								0.1	

Easting	575500
Northing	6159232
Orientation	30
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	Yes
Hollows	0
Length logs (m)	14
Attributes 1x1 plot (%)	
Litter (%)	60
Bare Ground (%)	36
Vegetation (%)	4
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q18: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			13	7	1	0	1	5	0	0	6	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			50.2	40.7	35	0	5	0.7	0	0	9.5	0
*Cucumis myriocarpus subsp. leptodermis**	0.1	2	EX								0.1	
Dysphania pumilio	0.2	5	FG					0.2				
Eucalyptus microcarpa	35	3	TG		35							
*Hordeum vulgare**	3	80	EX								3	
*Lepidium africanum**	0.2	10	EX								0.2	
*Lolium perenne**	5	100	EX								5	
Maireana enchylaenoides	0.1	2	FG					0.1				
*Malva parviflora**	1	20	EX								1	
Oxalis perennans	0.1	2	FG					0.1				
Rumex brownii	0.1	1	FG					0.1				
Rytidosperma spp. (no fertile material)	5	100	GG				5					
*Sisymbrium erysimoides**	0.2	2	EX								0.2	
Urtica incisa	0.2	10	FG					0.2				

Easting	575166
Northing	6158661
Orientation	330
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	2
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	4
Attributes 1x1 plot (%)	
Litter (%)	26
Bare Ground (%)	71
Vegetation (%)	1
Rock (%)	2

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q19: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			7	3	2	0	0	1	0	0	4	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			51.5	29.2	29	0	0	0.2	0	0	22.3	0
Callitris glaucophylla	7	2	TG		7							
Dysphania pumilio	0.2	15	FG					0.2				
Eucalyptus microcarpa	22	1	TG		22							
*Hordeum vulgare**	20	500	EX								20	
*Lepidium africanum**	0.1	1	EX								0.1	
*Malva parviflora**	0.2	3	EX								0.2	
*Medicago sativa**	2	50	EX								2	

Easting	574975
Northing	6158622
Orientation	60
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	2
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	10
Bare Ground (%)	84
Vegetation (%)	6
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q20: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)			Count									
			# spp		Count	Count	Count	Count	Count	Count	Count	Count
			11	11	3	0	4	4	0	0	0	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			44.8	44.8	36	0	8.1	0.7	0	0	0	0
Austrostipa scabra subsp. scabra	1	30	GG				1					
Austrostipa setacea	6	60	GG				6					
Callitris glaucophylla	12	30	TG		12							
Dianella revoluta var. revoluta	0.3	2	FG					0.3				
Dichondra sp. A	0.1	1	FG					0.1				
Einadia nutans subsp. nutans	0.1	2	FG					0.1				
Eucalyptus albens	4	1	TG		4							
Eucalyptus microcarpa	20	4	TG		20							
Lomandra multiflora subsp. multiflora	0.1	1	GG				0.1					
Rytidosperma setaceum	1	20	GG				1					
Sida corrugata	0.2	20	FG					0.2				

Easting	574437
Northing	6156519
Orientation	335
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	2
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	5
Length logs (m)	14
Attributes 1x1 plot (%)	
Litter (%)	52
Bare Ground (%)	43
Vegetation (%)	5
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q21: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			22	14	3	1	5	5	0	0	8	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			72.2	69.1	10	2	41.7	15.4	0	0	3.1	2.2
Austrostipa scabra subsp. scabra	40	7	GG				40					
Austrostipa setacea	1	1	GG				1					
Brachychiton populneus subsp. populneus	4	5	TG		4							
*Bromus diandrus**	0.2	7	HT									0.2
Callitris glaucophylla	4	40	TG		4							
Dichondra repens	10	100	FG					10				
Dysphania pumilio	0.3	20	FG					0.3				
Einadia nutans subsp. nutans	0.1	1	FG					0.1				
Eucalyptus microcarpa	2	30	TG		2							
*Hordeum vulgare**	0.2	15	EX								0.2	
*Lolium perenne**	0.1	1	EX								0.1	
Lomandra multiflora subsp. multiflora	0.4	15	GG				0.4					
Maireana enchylaenoides	2	30	FG					2				
Maireana microphylla	2	40	SG			2						
*Malva parviflora**	0.2	2	EX								0.2	
*Marrubium vulgare**	0.2	5	EX								0.2	
*Olea europaea**	2	30	HT									2
Rumex brownii	3	70	FG					3				
Rytidosperma auriculatum	0.2	1	GG				0.2					
Rytidosperma caespitosum	0.1	1	GG				0.1					
*Sisymbrium erysimoides**	0.1	1	EX								0.1	
*Solanum nigrum**	0.1	1	EX								0.1	

Easting	574401
Northing	6155950
Orientation	180
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	6
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	5
Length logs (m)	12
Attributes 1x1 plot (%)	
Litter (%)	78
Bare Ground (%)	20
Vegetation (%)	2
Rock (%)	0

Date: 05/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q22: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			17	11	2	0	8	1	0	0	6	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			35.8	32.1	25	0	7	0.1	0	0	3.7	0
*Avena fatua**	0.1	1	EX								0.1	
Casuarina cristata	8	1	TG		8							
Chloris truncata	1	20	GG				1					
Cynodon dactylon	0.2	10	GG				0.2					
Cyperus gracilis	0.2	10	GG				0.2					
Dysphania pumilio	0.1	1	FG					0.1				
Eucalyptus microcarpa	17	1	TG		17							
*Hordeum vulgare**	0.5	50	EX								0.5	
Juncus spp. (grazed)	0.2	20	GG				0.2					
*Lepidium africanum**	1	25	EX								1	
*Lepidium bonariense**	0.1	1	EX								0.1	
*Lolium perenne**	1	30	EX								1	
Lomandra multiflora subsp. multiflora	0.2	10	GG				0.2					
Panicum effusum	0.2	8	GG				0.2					
*Polygonum aviculare**	1	25	EX								1	
Rytidosperma caespitosum	1	50	GG				1					
Rytidosperma racemosum	4	500	GG				4					

Easting	576955
Northing	6165561
Orientation	260
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	0
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	1
Length logs (m)	13
Attributes 1x1 plot (%)	
Litter (%)	27
Bare Ground (%)	72
Vegetation (%)	1
Rock (%)	0

Date: 5/12/2018			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q23: PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			21	13	2	0	7	4	0	0	8	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			50.6	48.7	45	0	3.1	0.6	0	0	1.9	0
Alternanthera nana	0.1	1	FG					0.1				
Austrostipa scabra subsp. scabra	0.5	15	GG				0.5					
Chloris truncata	0.2	6	GG				0.2					
*Cucumis myriocarpus subsp. leptodermis**	0.1	2	EX								0.1	
Dysphania pumilio	0.1	1	FG					0.1				
Eucalyptus albens	15	1	TG		15							
Eucalyptus blakelyi	30	11	TG		30							
*Hordeum vulgare**	0.9	30	EX								0.9	
Juncus spp.	0.1	2	GG				0.1					
*Lepidium africanum**	0.3	7	EX								0.3	
*Lolium perenne**	0.2	5	EX								0.2	
Lomandra multiflora subsp. multiflora	0.2	5	GG				0.2					
*Malva parviflora**	0.1	1	EX								0.1	
Oxalis perennans	0.2	10	FG					0.2				
Panicum effusum	0.6	10	GG				0.6					
*Polygonum aviculare**	0.1	1	EX								0.1	
Rumex brownii	0.2	5	FG					0.2				
Rytidosperma caespitosum	1	35	GG				1					
Rytidosperma racemosum	0.5	20	GG				0.5					
*Sonchus oleraceus**	0.1	1	EX								0.1	
*Vulpia myuros**	0.1	1	EX								0.1	

Easting	576964
Northing	6165446
Orientation	350
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	1
Length logs (m)	34
Attributes 1x1 plot (%)	
Litter (%)	30
Bare Ground (%)	68
Vegetation (%)	2
Rock (%)	0

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q25: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			30	20	1	0	8	10	0	1	10	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			30.9	28.2	15	0	10.3	2.7	0	0.2	2.7	0.5
Anthosachne scabra	3	50	GG				3					
Austrostipa scabra subsp. scabra	3	50	GG				3					
*Avena fatua**	0.5	10	EX								0.5	
Bothriochloa macra	0.5	10	GG				0.5					
*Bromus diandrus**	0.5	30	HT									0.5
Chloris truncata	1	10	GG				1					
*Cucumis myriocarpus subsp. leptodermis**	0.2	15	EX								0.2	
Desmodium varians	0.2	5	OG							0.2		
Dichondra repens	0.3	30	FG					0.3				
Dysphania pumilio	0.5	50	FG					0.5				
*Echium plantagineum**	0.4	20	EX								0.4	
Einadia nutans subsp. nutans	0.1	1	FG					0.1				
Erodium crinitum	0.3	30	FG					0.3				
Eucalyptus albens	15	1	TG		15							
Euphorbia drummondii	0.2	5	FG					0.2				
Geranium solanderi	0.1	1	FG					0.1				
Hypericum gramineum	0.2	5	FG					0.2				
*Lepidium africanum**	0.2	20	EX								0.2	
*Lolium perenne**	0.3	20	EX								0.3	
Lomandra multiflora subsp. multiflora	0.3	6	GG				0.3					
Oxalis perennans	0.2	10	FG					0.2				
Panicum effusum	0.2	10	GG				0.2					
*Polygonum aviculare**	0.1	2	EX								0.1	
Rumex brownii	0.5	30	FG					0.5				
Rytidosperma carphoides	0.3	20	GG				0.3					
Rytidosperma caespitosum	2	40	GG				2					
Sida corrugata	0.3	20	FG					0.3				
*Trifolium glomeratum**	0.1	1	EX								0.1	
*Vulpia myuros**	0.1	10	EX								0.1	
*Xanthium occidentale**	0.3	10	EX								0.3	

Easting	576999
Northing	6165202
Orientation	210
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	6
Attributes 1x1 plot (%)	
Litter (%)	10
Bare Ground (%)	73
Vegetation (%)	3
Rock (%)	14

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q26: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			26	18	2	0	9	6	0	1	8	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			52.8	49.6	35	0	12.7	1.8	0	0.1	3.2	0.6
Anthosachne scabra	0.2	20	GG				0.2					
Aristida behriana	0.3	4	GG				0.3					
Austrostipa scabra subsp. scabra	1	40	GG				1					
*Avena fatua**	0.5	20	EX								0.5	
Bromus diandrus	0.6	40	HT									0.6
Desmodium varians	0.1	2	OG							0.1		
Dysphania pumilio	0.5	10	FG					0.5				
Eucalyptus albens	15	1	TG		15							
Eucalyptus macrorhyncha	20	7	TG		20							
Euphorbia drummondii	0.2	4	FG					0.2				
Hordeum vulgare	0.2	10	EX								0.2	
*Hypochaeris radicata**	0.2	3	EX								0.2	
Juncus spp.	0.1	2	GG				0.1					
*Lolium perenne**	1	40	EX								1	
Lomandra multiflora subsp. multiflora	0.5	20	GG				0.5					
Oxalis perennans	0.3	20	FG					0.3				
Panicum effusum	0.2	15	GG				0.2					
Rumex brownii	0.4	6	FG					0.4				
Rytidosperma auriculatum	0.2	5	GG				0.2					
Rytidosperma carphoides	10	250	GG				10					
Rytidosperma setaceum	0.2	10	GG				0.2					
Stypandra glauca	0.2	1	FG					0.2				
Trifolium arvense	0.1	1	EX								0.1	
*Vulpia myuros**	0.5	25	EX								0.5	
Wahlenbergia gracilis	0.2	5	FG					0.2				
*Xanthium occidentale**	0.1	1	EX								0.1	

Easting	576894
Northing	6165215
Orientation	165
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	1
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	Yes
Hollows	0
Length logs (m)	71
Attributes 1x1 plot (%)	
Litter (%)	30
Bare Ground (%)	57.6
Vegetation (%)	0.4
Rock (%)	12

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q27: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			7	3	1	0	2	0	0	0	4	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			46.3	36.1	35	0	1.1	0	0	0	10.2	4
Austrostipa scabra subsp. scabra	0.1	1	GG				0.1					
*Bromus diandrus**	4	80	HT									4
Eucalyptus blakelyi	35	3	TG		35							
*Hordeum vulgare**	6	100	EX								6	
Juncus spp. (grazed)	1	8	GG				1					
*Polygonum aviculare**	0.1	3	EX								0.1	
*Vulpia myuros**	0.1	5	EX								0.1	

Easting	576937
Northing	6165033
Orientation	130
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	2
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	Yes
Hollows	0
Length logs (m)	14
Attributes 1x1 plot (%)	
Litter (%)	16
Bare Ground (%)	79
Vegetation (%)	0
Rock (%)	5

Date: 5/14/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q28: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			16	10	2	0	5	2	0	1	6	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			45.8	42.4	35	0	7.1	0.2	0	0.1	3.4	0
Anthosachne scabra	4	200	GG				4					
Austrostipa scabra subsp. scabra	0.5	10	GG				0.5					
*Avena fatua**	0.1	1	EX								0.1	
*Bromus molliformis**	1	30	EX								1	
Chloris truncata	0.2	10	GG				0.2					
*Chondrilla juncea**	0.2	10	EX								0.2	
Desmodium varians	0.1	2	OG							0.1		
Eucalyptus albens	10	1	TG		10							
Eucalyptus macrorhyncha	25	6	TG		25							
Geranium solanderi	0.1	1	FG					0.1				
*Hypochaeris radicata**	0.1	2	EX								0.1	
*Lolium perenne**	1	100	EX								1	
Lomandra multiflora subsp. multiflora	2	0.2	GG				2					
Rumex brownii	0.1	15	FG					0.1				
Rytidosperma caespitosum	0.4	30	GG				0.4					
*Vulpia myuros**	1	100	EX								1	

Easting	576911
Northing	6166628
Orientation	80
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	59
Attributes 1x1 plot (%)	
Litter (%)	38
Bare Ground (%)	30
Vegetation (%)	32
Rock (%)	0

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q29: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			10	6	1	0	5	0	0	0	4	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			47	44.2	35	0	9.2	0	0	0	2.8	0
Anthosachne scabra	2	100	GG				2					
Austrostipa scabra subsp. scabra	2	60	GG				2					
*Bromus molliformis**	0.2	10	EX								0.2	
Eucalyptus macrorhyncha	35	10	TG		35							
*Hordeum vulgare**	0.5	50	EX								0.5	
*Lolium perenne**	0.1	10	EX								0.1	
Panicum effusum	0.2	5	GG				0.2					
Rytidosperma caespitosum	1	30	GG				1					
Rytidosperma setaceum	4	100	GG				4					
*Vulpia myuros**	2	200	EX								2	

Easting	576916
Northing	6167167
Orientation	170
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	67
Attributes 1x1 plot (%)	
Litter (%)	52
Bare Ground (%)	46
Vegetation (%)	2
Rock (%)	0

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	576934
Q31: PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Northing	6166945
			31	15	1	0	8	5	0	1	16	3		Orientation	265
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum		Plot size	20x20x50
			76.4	57.4	50	0	6.4	0.8	0	0.2	19	4.3		BAM Attributes 20x50m plot	
Anthosachne scabra	1	30	GG				1							Stem classes	
Austrostipa scabra subsp. scabra	0.1	2	GG				0.1							80+	1
*Avena fatua**	0.1	2	EX								0.1			50-79	4
Bothriochloa macra	1	20	GG				1							30-49	Yes
*Bromus diandrus**	0.3	5	HT									0.3		20-29	Yes
*Bromus molliformis**	0.2	30	EX								0.2			10-19	Yes
Carex inversa	0.1	2	GG				0.1							5-9	No
*Cirsium vulgare**	0.2	2	EX								0.2			<5	Yes
Cynodon dactylon	0.5	10	GG				0.5							Hollows	2
Dichondra repens	0.1	20	FG					0.1						Length logs (m)	8
*Echium plantagineum**	0.1	1	EX								0.1				
Einadia nutans subsp. nutans	0.1	2	FG					0.1						BAM Attributes 1x1 plot (%)	
Eucalyptus camaldulensis	50	31	TG		50									Litter (%)	85
Geranium homeanum	0.1	1	FG					0.1						Bare Ground (%)	15
Glycine tabacina	0.2	10	OG							0.2				Vegetation (%)	0
*Hordeum vulgare**	0.5	10	EX								0.5			Rock (%)	0
Juncus spp.	3	20	GG				3								
*Lolium perenne**	0.5	10	EX								0.5				
Microlaena stipoides var. stipoides	0.5	10	GG				0.5								
*Modiola caroliniana**	0.2	15	EX								0.2				
*Onopordum acanthium subsp. acanthium**	2	100	EX								2				
Oxalis perennans	0.1	5	FG					0.1							
*Phalaris aquatica**	10	40	EX								10				
Rumex brownii	0.4	10	FG					0.4							
Rytidosperma auriculatum	0.2	10	GG				0.2								
*Schinus molle**	3	1	HT									3			
*Solanum nigrum**	0.1	1	EX								0.1				
*Sonchus oleraceus**	0.1	1	EX								0.1				
*Trifolium repens**	0.1	1	EX								0.1				
*Vulpia myuros**	0.6	50	EX								0.6				
*Xanthium spinosum**	1	5	HT									1			

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q32: PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			20	15	4	0	6	4	0	1	5	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			37.2	36.3	26	0	9.7	0.5	0	0.1	0.9	0.1
Anthosachne scabra	4	100	GG				4					
Austrostipa scabra subsp. scabra	2	50	GG				2					
Bothriochloa macra	0.6	20	GG				0.6					
Brachychiton populneus subsp. populneus	3	2	TG		3							
*Bromus diandrus**	0.1	5	HT									0.1
*Bromus hordeaceus**	0.1	5	EX								0.1	
*Chondrilla juncea**	0.1	2	EX								0.1	
Desmodium varians	0.1	2	OG							0.1		
Dichondra repens	0.1	20	FG					0.1				
Einadia nutans subsp. nutans	0.1	1	FG					0.1				
Eucalyptus albens	4	1	TG		4							
Eucalyptus blakelyi	15	5	TG		15							
Eucalyptus macrorhyncha	4	3	TG		4							
Euphorbia drummondii	0.1	1	FG					0.1				
*Lolium perenne**	0.4	50	EX								0.4	
Oxalis perennans	0.2	5	FG					0.2				
Panicum effusum	0.1	2	GG				0.1					
Rytidosperma caespitosum	2	50	GG				2					
Rytidosperma setaceum	1	50	GG				1					
*Vulpia myuros**	0.2	30	EX								0.2	

Easting	576929
Northing	6166817
Orientation	240
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	57
Attributes 1x1 plot (%)	
Litter (%)	59
Bare Ground (%)	18
Vegetation (%)	7
Rock (%)	16

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	576975
Q33: PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Northing	6166491
			33	18	1	0	11	5	0	1	15	2		Orientation	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum		Plot size	20x20
			62.2	58	40	0	15.2	2.7	0	0.1	4.2	0.4		BAM Attributes 20x50m plot	
Austrostipa scabra subsp. scabra	0.8	50	GG				0.8							Stem classes	
*Avena fatua**	0.2	20	EX								0.2			80+	2
Bothriochloa macra	1	15	GG				1							50-79	1
*Bromus diandrus**	0.2	6	HT									0.2		30-49	No
*Bromus molliformis**	0.1	1	EX								0.1			20-29	No
Carex inversa	0.1	10	GG				0.1							10-19	Yes
Carex spp.	0.2	13	GG				0.2							5-9	Yes
*Chondrilla juncea**	0.2	10	EX								0.2			<5	No
Cynodon dactylon	0.6	20	GG				0.6							Hollows	1
*Echium plantagineum**	0.1	2	EX								0.1			Length logs (m)	16
Eucalyptus camaldulensis	40	3	TG		40										
Geranium homeanum	0.2	3	FG					0.2						BAM Attributes 1x1 plot (%)	
Glycine tabacina	0.1	4	OG							0.1				Litter (%)	50
Juncus usitatus	0.2	1	GG				0.2							Bare Ground (%)	38
*Lactuca serriola**	0.1	1	EX								0.1			Vegetation (%)	12
*Lepidium africanum**	0.5	6	EX								0.5			Rock (%)	0
*Lolium perenne**	0.7	50	EX								0.7				
Lomandra filiformis subsp. filiformis	0.1	1	GG				0.1								
*Marrubium vulgare**	0.1	4	EX								0.1				
Microlaena stipoides var. stipoides	10	250	GG				10								
*Modiola caroliniana**	0.2	4	EX								0.2				
*Onopordum acanthium subsp. acanthium**	0.1	1	EX								0.1				
Oxalis perennans	1	100	FG					1							
Panicum effusum	1	50	GG				1								
*Phalaris aquatica**	1	6	EX								1				
*Romulea rosea var. australis**	0.2	40	HT									0.2			
Rumex brownii	0.4	6	FG					0.4							
Rytidosperma caespitosum	1	60	GG				1								
Rytidosperma setaceum	0.2	10	GG				0.2								
Sida corrugata	1	30	FG					1							
*Tribulus terrestris**	0.1	1	EX								0.1				
*Vulpia myuros**	0.4	20	EX								0.4				
Wahlenbergia communis	0.1	1	FG					0.1							

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q34: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			15	6	2	0	3	1	0	0	9	3
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			83.6	44.9	42	0	2.7	0.2	0	0	38.7	3.3
*Avena fatua**	15	200	EX								15	
Brachychiton populneus subsp. populneus	2	3	TG		2							
*Bromus catharticus**	0.4	5	EX								0.4	
*Bromus diandrus**	3	60	HT									3
Carex inversa	0.5	10	GG				0.5					
Eucalyptus blakelyi	40	18	TG		40							
*Hordeum vulgare**	0.8	30	EX								0.8	
Juncus usitatus	0.2	2	GG				0.2					
*Lactuca serriola**	0.2	3	EX								0.2	
*Lolium perenne**	4	100	EX								4	
Lomandra bracteata	2	15	GG				2					
*Paspalum dilatatum**	0.2	5	HT									0.2
*Phalaris aquatica**	15	60	EX								15	
Rumex brownii	0.2	4	FG					0.2				
*Xanthium spinosum**	0.1	1	HT									0.1

Easting	579453
Northing	6174694
Orientation	180
Plot size	10x40x100
Attributes 10x100m plot	
Stem classes	
80+	2
50-79	2
30-49	Yes
20-29	No
10-19	Yes
5-9	Yes
<5	Yes
Hollows	2
Length logs (m)	4
Attributes 1x1 plot (%)	
Litter (%)	86
Bare Ground (%)	1
Vegetation (%)	13
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q35: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			15	6	2	0	1	3	0	0	9	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			46	11.6	11	0	0.1	0.5	0	0	34.4	17
Alternanthera denticulata	0.1	1	FG					0.1				
*Avena fatua**	10	200	EX								10	
Bromus diandrus	2	50	HT									2
*Cucumis myriocarpus subsp. leptodermis**	0.1	1	EX								0.1	
Dysphania pumilio	0.2	20	FG					0.2				
*Echium plantagineum**	1	50	EX								1	
Eucalyptus blakelyi	2	1	TG		2							
Eucalyptus melliodora	9	4	TG		9							
*Hordeum vulgare**	1	50	EX								1	
*Lolium perenne**	5	200	EX								5	
Lomandra bracteata	0.1	2	GG				0.1					
*Malva parviflora**	0.2	5	EX								0.2	
*Paspalum dilatatum**	15	80	HT									15
Rumex brownii	0.2	2	FG					0.2				
*Sonchus oleraceus**	0.1	1	EX								0.1	

Easting	579664
Northing	6176300
Orientation	160
Plot size	10x40x100
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	2
30-49	No
20-29	Yes
10-19	Yes
5-9	No
<5	Yes
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	77.2
Bare Ground (%)	11
Vegetation (%)	11.8
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q36: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			21	9	1	1	4	2	0	1	12	5
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			87.8	**56.4**	35	12	8.6	0.6	0	0.2	**31.4**	6.3
Austrostipa setacea	4	40	GG				4					
*Avena fatua**	20	400	EX								20	
*Bromus diandrus**	3	50	HT									3
Carex inversa	0.4	3	GG				0.4					
*Chamaecytisus palmensis**	0.1	1	HT									0.1
Desmodium varians	0.2	3	OG							0.2		
Eucalyptus melliodora	35	8	TG		35							
*Hordeum vulgare**	0.3	5	EX								0.3	
*Hypericum perforatum**	0.1	1	HT									0.1
Juncus remotiflorus	0.2	1	GG				0.2					
*Lolium perenne**	4	100	EX								4	
Lomandra bracteata	4	30	GG				4					
*Marrubium vulgare**	0.3	1	EX								0.3	
*Medicago sativa**	0.1	1	EX								0.1	
*Paspalum dilatatum**	3	5	HT									3
Pultenaea blakelyi	12	2	SG			12						
*Romulea rosea var. australis**	0.1	1	HT									0.1
*Setaria palmifolia**	0.3	10	EX								0.3	
Sida corrugata	0.4	5	FG					0.4				
*Sonchus oleraceus**	0.1	3	EX								0.1	
Wahlenbergia communis	0.2	5	FG					0.2				

Easting	579656
Northing	6176878
Orientation	180
Plot size	10x40X100
Attributes 10x100m plot	
Stem classes	
80+	1
50-79	2
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	No
Hollows	1
Length logs (m)	2
Attributes 1x1 plot (%)	
Litter (%)	68
Bare Ground (%)	24
Vegetation (%)	7
Rock (%)	1

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q37: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			25	16	1	0	11	3	0	1	9	3
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			58.7	35.9	19	0	15.6	1.1	0	0.2	22.8	13.3
Anthosachne scabra	0.8	20	GG				0.8					
Aristida ramosa	0.8	15	GG				0.8					
Austrostipa scabra subsp. scabra	0.7	20	GG				0.7					
Austrostipa setacea	4	50	GG				4					
*Avena fatua**	5	60	EX								5	
Bothriochloa macra	2	30	GG				2					
*Bromus diandrus**	5	60	HT									5
Chloris truncata	0.8	10	GG				0.8					
Desmodium varians	0.2	2	OG							0.2		
Digitaria divaricatissima	5	60	GG				5					
*Echium plantagineum**	0.1	2	EX								0.1	
Eucalyptus melliodora	19	6	TG		19							
*Hypericum perforatum**	0.3	2	HT									0.3
*Lolium perenne**	1	30	EX								1	
Oxalis perennans	0.3	10	FG					0.3				
Panicum effusum	0.1	4	GG				0.1					
*Paspalum dilatatum**	8	60	HT									8
Rumex brownii	0.3	20	FG					0.3				
Rytidosperma auriculatum	0.4	5	GG				0.4					
Rytidosperma caespitosum	0.5	10	GG				0.5					
Rytidosperma setaceum	0.5	10	GG				0.5					
Setaria parviflora	3	50	EX								3	
Sida corrugata	0.5	40	FG					0.5				
*Sonchus oleraceus**	0.1	1	EX								0.1	
*Vulpia myuros**	0.3	15	EX								0.3	

Easting	579847
Northing	6177724
Orientation	180
Plot size	10x40x100
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	No
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	68
Bare Ground (%)	17
Vegetation (%)	12
Rock (%)	3

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q38: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			27	17	1	0	11	4	0	1	10	4
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			69	51.2	30	0	20.1	0.9	0	0.2	17.8	6.4
*Alternanthera pungens**	0.2	3	HT									0.2
Austrostipa scabra subsp. scabra	0.2	2	GG				0.2					
Austrostipa setacea	0.5	10	GG				0.5					
*Avena fatua**	8	180	EX								8	
Carex inversa	5	40	GG				5					
Chloris truncata	0.3	5	GG				0.3					
Cynodon dactylon	0.1	1	GG				0.1					
Desmodium varians	0.2	2	OG							0.2		
Einadia nutans subsp. nutans	0.3	1	FG					0.3				
Eucalyptus microcarpa	30	9	TG		30							
Euphorbia drummondii	0.1	1	FG					0.1				
*Hypericum perforatum**	0.2	6	HT									0.2
*Hypochaeris radicata**	0.1	1	EX								0.1	
Juncus remotiflorus	0.1	1	GG				0.1					
*Lolium perenne**	2	50	EX								2	
Lomandra bracteata	8	100	GG				8					
Lomandra filiformis subsp. coriacea	0.2	1	GG				0.2					
*Paspalum dilatatum**	2	20	HT									2
*Romulea rosea var. australis**	4	200	HT									4
Rumex brownii	0.3	6	FG					0.3				
Rytidosperma caespitosum	2	40	GG				2					
Rytidosperma setaceum	0.7	20	GG				0.7					
Rytidosperma spp. (no fertile material)	3	30	GG				3					
*Setaria parviflora**	1	30	EX								1	
Sida corrugata	0.2	3	FG					0.2				
*Solanum nigrum**	0.1	1	EX								0.1	
*Vulpia myuros**	0.2	20	EX								0.2	

Easting	580020
Northing	6178064
Orientation	0
Plot size	10x40x100
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	2
Attributes 1x1 plot (%)	
Litter (%)	75
Bare Ground (%)	18
Vegetation (%)	7
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	576384
Q39: PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Northing	6170305
			20	5	1	0	3	1	0	0	15	2		Orientation	10
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum		Plot size	20x20
			117.6	45.6	35	0	7.6	3	0	0	72	0.5		BAM Attributes 20x50m plot	
*Avena fatua**	2	40	EX								2			Stem classes	
Bothriochloa macra	0.1	2	GG				0.1							80+	0
*Bromus diandrus**	0.2	10	HT									0.2		50-79	5
*Bromus molliformis**	0.2	5	EX								0.2			30-49	Yes
Carex inversa	0.5	6	GG				0.5							20-29	Yes
*Cirsium vulgare**	1	6	EX								1			10-19	Yes
*Cucumis myriocarpus subsp. leptodermis**	0.1	1	EX								0.1			5-9	Yes
Cynodon dactylon	7	100	GG				7							<5	No
*Echium plantagineum**	0.1	1	EX								0.1			Hollows	0
Eucalyptus camaldulensis	35	8	TG		35									Length logs (m)	20
*Hordeum vulgare**	0.2	5	EX								0.2				
*Lolium perenne**	60	1000	EX								60			BAM Attributes 1x1 plot (%)	
*Modiola caroliniana**	0.4	16	EX								0.4			Litter (%)	66
*Phalaris aquatica**	5	4	EX								5			Bare Ground (%)	0
Rumex brownii	3	5	FG					3						Vegetation (%)	34
*Solanum nigrum**	0.2	4	EX								0.2			Rock (%)	0
*Sonchus oleraceus**	0.4	18	EX								0.4				
*Stellaria media**	0.9	30	EX								0.9				
*Vulpia myuros**	1	40	EX								1				
*Xanthium spinosum**	0.3	4	HT									0.3			

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q40: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			14	4	1	0	1	2	0	0	10	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			80.4	42.5	40	0	2	0.5	0	0	37.9	18
*Bromus diandrus**	15	500	HT									15
*Cirsium vulgare**	3	40	EX								3	
*Cucumis myriocarpus subsp. leptodermis**	0.2	4	EX								0.2	
*Echium plantagineum**	0.7	30	EX								0.7	
Eucalyptus melliodora	40	4	TG		40							
*Lolium perenne**	10	500	EX								10	
*Malva parviflora**	1	20	EX								1	
*Marrubium vulgare**	2	20	EX								2	
Panicum effusum	2	100	GG				2					
Rumex brownii	0.2	5	FG					0.2				
*Solanum nigrum**	1	40	EX								1	
Urtica incisa	0.3	10	FG					0.3				
*Vulpia myuros**	2	100	EX								2	
*Xanthium spinosum**	3	100	HT									3

Easting	577435
Northing	6170718
Orientation	240
Plot size	20x20X50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	4
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	4
Length logs (m)	29
Attributes 1x1 plot (%)	
Litter (%)	54
Bare Ground (%)	22
Vegetation (%)	24
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q41: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			29	17	0	0	10	6	0	1	12	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			62.8	37.9	0	0	36.9	0.9	0	0.1	24.9	1
Aristida behriana	0.5	20	GG				0.5					
Austrostipa scabra subsp. scabra	0.7	15	GG				0.7					
Austrostipa setacea	2	30	GG				2					
*Avena barbata**	10	500	EX								10	
Bothriochloa macra	6	80	GG				6					
*Bromus diandrus**	1	30	HT									1
*Bromus molliformis**	0.5	20	EX								0.5	
*Chondrilla juncea**	1	30	EX								1	
*Cirsium vulgare**	2	20	EX								2	
*Cucumis myriocarpus subsp. leptodermis**	0.3	1	EX								0.3	
Cynodon dactylon	3	30	GG				3					
Desmodium varians	0.1	1	OG							0.1		
Dysphania pumilio	0.1	5	FG					0.1				
*Echium plantagineum**	1	40	EX								1	
Erodium crinitum	0.1	1	FG					0.1				
Euphorbia drummondii	0.1	1	FG					0.1				
Geranium solanderi	0.1	6	FG					0.1				
*Hypochaeris radicata**	4	80	EX								4	
*Lolium perenne**	0.2	10	EX								0.2	
Lomandra bracteata	0.2	1	GG				0.2					
Lomandra filiformis subsp. filiformis	20	100	GG				20					
Oxalis perennans	0.3	15	FG					0.3				
Panicum effusum	1	30	GG				1					
Rumex brownii	0.2	3	FG					0.2				
Rytidosperma caespitosum	3	40	GG				3					
Rytidosperma setaceum	0.5	20	GG				0.5					
*Sonchus oleraceus**	0.8	20	EX								0.8	
*Trifolium spp.**	0.1	1	EX								0.1	
*Vulpia myuros**	4	200	EX								4	

Easting	577970
Northing	6170932
Orientation	50
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	14
Vegetation (%)	86
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q42: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			28	14	0	0	9	4	0	1	14	3
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			66.7	26.6	0	0	25.7	0.8	0	0.1	40.1	1.6
*Aira spp.**	0.2	1	EX								0.2	
Anthosachne scabra	2	30	GG				2					
Aristida behriana	1	20	GG				1					
Austrostipa scabra subsp. scabra	4	60	GG				4					
*Avena barbata**	10	300	EX								10	
Bothriochloa macra	8	100	GG				8					
*Bromus diandrus**	1	20	HT									1
*Bromus hordeaceus**	6	100	EX								6	
*Chondrilla juncea**	0.2	10	EX								0.2	
*Cirsium vulgare**	1	10	EX								1	
Desmodium varians	0.1	3	OG							0.1		
Dysphania pumilio	0.2	10	FG					0.2				
*Echium plantagineum**	1	30	EX								1	
*Hypericum perforatum**	0.4	5	HT									0.4
*Hypochaeris radicata**	11	100	EX								11	
*Lolium perenne**	0.4	10	EX								0.4	
Lomandra bracteata	0.6	15	GG				0.6					
Lomandra filiformis subsp. coriacea	0.1	1	GG				0.1					
Oxalis perennans	0.2	1	FG					0.2				
Panicum effusum	4	60	GG				4					
*Romulea rosea var. australis**	0.2	10	HT									0.2
Rumex brownii	0.3	4	FG					0.3				
Rytidosperma caespitosum	3	50	GG				3					
Rytidosperma spp. (no fertile material)	3	60	GG				3					
Trifolium arvense	0.6	10	EX								0.6	
*Trifolium spp.**	0.1	2	EX								0.1	
*Vulpia myuros**	8	500	EX								8	
Wahlenbergia communis	0.1	2	FG					0.1				

Easting	577846
Northing	6170932
Orientation	100
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2
Bare Ground (%)	24
Vegetation (%)	60
Rock (%)	14

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q43: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			19	5	1	0	2	2	0	0	14	3
Species	**Cover**	**Abundance**	Sum cover	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			38.9	6.6	4	0	2	0.6	0	0	32.3	6
*Alternanthera pungens**	1	50	HT									1
*Avena fatua**	10	300	EX								10	
*Bromus diandrus**	4	100	HT									4
*Bromus hordeaceus**	3	80	EX								3	
*Cucumis myriocarpus subsp. leptodermis**	0.4	10	EX								0.4	
Cynodon dactylon	1	10	GG				1					
Dysphania pumilio	0.1	5	FG					0.1				
*Echium plantagineum**	1	80	EX								1	
Erodium crinitum	0.5	20	FG					0.5				
Eucalyptus albens	4	30	TG		4							
*Hordeum vulgare**	3	300	EX								3	
*Lolium perenne**	4	200	EX								4	
*Malva parviflora**	0.5	20	EX								0.5	
*Marrubium vulgare**	1	6	EX								1	
Panicum effusum	1	20	GG				1					
*Solanum nigrum**	0.2	50	EX								0.2	
*Sonchus oleraceus**	0.2	10	EX								0.2	
*Vulpia myuros**	3	300	EX								3	
*Xanthium spinosum**	1	100	HT									1

Easting	578717
Northing	6171477
Orientation	105
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	3
50-79	3
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	Yes
Hollows	5
Length logs (m)	14
Attributes 1x1 plot (%)	
Litter (%)	36
Bare Ground (%)	34
Vegetation (%)	26
Rock (%)	4

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q44: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			17	9	0	0	6	3	0	0	8	1
Species	**Cover**	**Abundance**	Sum cover	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			47.7	28.5	0	0	28	0.5	0	0	19.2	0.1
Austrostipa scabra subsp. scabra	5	100	GG				5					
*Avena barbata**	10	500	EX								10	
Bothriochloa macra	15	80	GG				15					
*Bromus diandrus**	0.1	5	HT									0.1
*Bromus hordeaceus**	4	100	EX								4	
Chloris truncata	1	20	GG				1					
Dysphania pumilio	0.1	2	FG					0.1				
*Echium plantagineum**	0.5	20	EX								0.5	
Euphorbia drummondii	0.1	4	FG					0.1				
Hypericum gramineum	0.3	8	FG					0.3				
*Hypochaeris radicata**	0.5	20	EX								0.5	
*Lolium perenne**	1	40	EX								1	
Lomandra bracteata	1	50	GG				1					
Panicum effusum	3	100	GG				3					
Rytidosperma caespitosum	3	100	GG				3					
*Sonchus oleraceus**	0.1	1	EX								0.1	
*Vulpia myuros**	3	200	EX								3	

Easting	578716
Northing	6171496
Orientation	90
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2
Bare Ground (%)	24
Vegetation (%)	60
Rock (%)	14

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q45: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			36	26	4	3	10	6	1	2	10	3
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			63	58	40	2.7	12.5	2.5	0.1	0.2	5	3.3
Acacia baileyana	2	1	SG			2						
Acacia decora	0.5	1	SG			0.5						
Alternanthera denticulata	0.1	1	FG					0.1				
Aristida spp.	0.1	2	GG				0.1					
Asperula conferta	0.1	2	FG					0.1				
Austrostipa scabra subsp. scabra	5	100	GG				5					
*Avena barbata**	0.1	2	EX								0.1	
Bothriochloa macra	3	50	GG				3					
Brachychiton populneus subsp. populneus	6	4	TG		6							
Cheilanthes sieberi subsp. sieberi	0.1	10	EG						0.1			
Chloris truncata	0.2	2	GG				0.2					
Cynodon dactylon	0.3	10	GG				0.3					
Desmodium varians	0.1	1	OG							0.1		
Dichondra repens	0.1	10	FG					0.1				
Einadia nutans subsp. nutans	2	40	FG					2				
Eucalyptus albens	1	1	TG		1							
Eucalyptus blakelyi	30	12	TG		30							
Eucalyptus melliodora	3	1	TG		3							
Glycine tabacina	0.1	5	OG							0.1		
*Hedypnois rhagadioloides**	0.1	2	EX								0.1	
Hypericum perforatum	0.3	10	HT									0.3
*Hypochaeris radicata**	0.1	1	EX								0.1	
*Juncus tenuis**	1	5	EX								1	
Lissanthe strigosa subsp. subulata	0.2	1	SG			0.2						
Lomandra bracteata	0.1	1	GG				0.1					
*Lycium ferocissimum**	2	1	HT									2
*Marrubium vulgare**	0.2	1	EX								0.2	
Microlaena stipoides var. stipoides	3	20	GG				3					
Panicum effusum	0.1	2	GG				0.1					
*Rosa rubiginosa**	1	1	HT									1
Rytidosperma spp. (no fertile material)	0.2	5	GG				0.2					
Sida corrugata	0.1	10	FG					0.1				
*Sonchus oleraceus**	0.1	2	EX								0.1	
Sporobolus creber	0.5	10	GG				0.5					
*Vulpia myuros**	0.1	1	EX								0.1	
Wahlenbergia communis	0.1	3	FG					0.1				

Easting	579490
Northing	6182484
Orientation	80
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	4
Length logs (m)	19
Attributes 1x1 plot (%)	
Litter (%)	89
Bare Ground (%)	10
Vegetation (%)	1
Rock (%)	0

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q46: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			18	15	3	0	6	6	0	0	3	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			34.5	32.3	21.1	0	9.9	1.3	0	0	2.2	2.1
Austrostipa scabra subsp. scabra	4	180	GG				4					
Brachychiton populneus subsp. populneus	0.1	1	TG		0.1							
Chloris truncata	0.2	2	GG				0.2					
Dichondra repens	0.1	20	FG					0.1				
Einadia nutans subsp. nutans	0.1	5	FG					0.1				
Eucalyptus blakelyi	20	5	TG		20							
Eucalyptus melliodora	1	1	TG		1							
Hypericum gramineum	0.2	4	FG					0.2				
*Lolium perenne**	0.1	1	EX								0.1	
Lomandra bracteata	0.2	3	GG				0.2					
Oxalis perennans	0.1	2	FG					0.1				
Paspalidium constrictum	0.5	10	GG				0.5					
*Romulea rosea var. australis**	0.1	1	HT									0.1
*Rosa rubiginosa**	2	1	HT									2
Rumex brownii	0.2	15	FG					0.2				
Rytidosperma auriculatum	1	20	GG				1					
Rytidosperma setaceum	4	180	GG				4					
Sida corrugata	0.6	30	FG					0.6				

Easting	579444
Northing	6182353
Orientation	50
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	Yes
Hollows	2
Length logs (m)	2
Attributes 1x1 plot (%)	
Litter (%)	88
Bare Ground (%)	8
Vegetation (%)	3
Rock (%)	1

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q47: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			16	15	1	0	6	8	0	0	1	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			40.8	40.6	30	0	4	6.6	0	0	0.2	0
Austrostipa scabra subsp. scabra	0.5	40	GG				0.5					
Bothriochloa macra	2	80	GG				2					
Chloris truncata	1	20	GG				1					
Dichondra repens	5	2000	FG					5				
Dysphania pumilio	0.1	1	FG					0.1				
Einadia nutans subsp. nutans	0.1	1	FG					0.1				
Eragrostis brownii	0.1	1	GG				0.1					
Erodium crinitum	0.1	5	FG					0.1				
Eucalyptus albens	30	2	TG		30							
*Marrubium vulgare**	0.2	10	EX								0.2	
Oxalis perennans	0.1	3	FG					0.1				
Panicum effusum	0.1	2	GG				0.1					
Rumex brownii	0.1	2	FG					0.1				
Rytidosperma spp.	0.3	15	GG				0.3					
Sida corrugata	1	50	FG					1				
*Urtica incisa**	0.1	10	FG					0.1				

Easting	579723
Northing	6182768
Orientation	220
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	3
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	16
Attributes 1x1 plot (%)	
Litter (%)	42
Bare Ground (%)	57
Vegetation (%)	0.6
Rock (%)	0.4

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q48: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			10	7	0	0	5	2	0	0	3	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			15	14.7	0	0	14.3	0.4	0	0	0.3	0
Aristida spp.	1	20	GG				1					
Austrostipa scabra subsp. scabra	2	100	GG				2					
Bothriochloa macra	10	500	GG				10					
Chloris truncata	1	40	GG				1					
*Chondrilla juncea**	0.1	3	EX								0.1	
Euphorbia drummondii	0.1	2	FG					0.1				
*Hypochaeris radicata**	0.1	4	EX								0.1	
Juncus fockei	0.3	10	GG				0.3					
*Marrubium vulgare**	0.1	2	EX								0.1	
Sida corrugata	0.3	20	FG					0.3				

Easting	579656
Northing	6182878
Orientation	130
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	81
Vegetation (%)	17
Rock (%)	2

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q49: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			30	28	2	5	9	11	0	1	2	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			94.1	88.4	31	13.4	39.9	4	0	0.1	5.7	0.7
Acacia leucoclada	2	5	SG			2						
Anthosachne scabra	10	180	GG				10					
Austrostipa scabra subsp. scabra	10	180	GG				10					
*Avena fatua**	5	10	EX								5	
Brachyscome ciliaris	0.1	1	FG					0.1				
*Bromus diandrus**	0.7	20	HT									0.7
Callitris glaucophylla	6	20	TG		6							
Calotis cuneifolia	1	50	FG					1				
Cassinia uncata	5	10	SG			5						
Chenopodium desertorum	0.1	10	SG			0.1						
Dianella longifolia var. longifolia	1	5	FG					1				
Digitaria divaricatissima	0.5	10	GG				0.5					
Dodonaea viscosa subsp. cuneata	6	15	SG			6						
Einadia nutans subsp. nutans	0.6	20	FG					0.6				
Enteropogon acicularis	8	80	GG				8					
Eremophila debilis	0.3	3	SG			0.3						
Eucalyptus microcarpa	25	6	TG		25							
Glycine clandestina	0.1	1	OG							0.1		
Goodenia hederacea subsp. hederacea	0.2	2	FG					0.2				
Lomandra bracteata	0.1	2	GG				0.1					
Lomandra filiformis subsp. filiformis	2	10	GG				2					
Lomandra multiflora subsp. multiflora	0.3	2	GG				0.3					
Oxalis perennans	0.3	10	FG					0.3				
Rumex brownii	0.1	1	FG					0.1				
Rytidosperma caespitosum	3	50	GG				3					
Rytidosperma setaceum	6	100	GG				6					
Sida corrugata	0.3	20	FG					0.3				
Vittadinia gracilis	0.2	4	FG					0.2				
Wahlenbergia communis	0.1	5	FG					0.1				
Wahlenbergia gracilis	0.1	2	FG					0.1				

Easting	580796
Northing	6185450
Orientation	345
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	3
30-49	Yes
20-29	Yes
10-19	No
5-9	Yes
<5	No
Hollows	4
Length logs (m)	47
Attributes 1x1 plot (%)	
Litter (%)	83
Bare Ground (%)	3
Vegetation (%)	14
Rock (%)	0

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q50: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			9	6	1	0	4	1	0	0	3	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			48.6	32.6	20	0	9.6	3	0	0	16	6
Bromus diandrus	2	0.1	HT									2
Dianella longifolia var. longifolia	3	0.2	FG					3				
Eucalyptus microcarpa	20	40	TG		20							
Hordeum vulgare	10	0.2	EX								10	
Juncus spp.	7	0.41	GG				7					
Lomandra bracteata	1	0.1	GG				1					
Lomandra multiflora	0.6	-	GG				0.6					
*Lycium ferocissimum**	4	2	HT									4
Rytidosperma spp. (no fertile material)	1	0.1	GG				1					

Easting	574483
Northing	6156914
Orientation	95
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	5
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	9
Length logs (m)	37
Attributes 1x1 plot (%)	
Litter (%)	36
Bare Ground (%)	64
Vegetation (%)	0
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q51: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			15	12	1	0	7	4	0	0	3	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			49.6	46.5	25	0	21	0.5	0	0	3.1	0
Alternanthera nana	0.1	1	FG					0.1				
Aristida jerichoensis var. jerichoensis	1	20	GG				1					
Austrostipa scabra subsp. scabra	5	100	GG				5					
Austrostipa setacea	5	100	GG				5					
*Avena barbata**	1	20	EX								1	
Chloris truncata	2	40	GG				2					
Enteropogon acicularis	2	50	GG				2					
*Erodium brachycarpum**	0.1	2	EX								0.1	
Erodium crinitum	0.2	4	FG					0.2				
Eucalyptus dwyeri	25	2	TG		25							
Euphorbia drummondii	0.1	2	FG					0.1				
*Lolium perenne**	2	80	EX								2	
Lomandra multiflora subsp. multiflora	3	40	GG				3					
Rytidosperma auriculatum	3	100	GG				3					
Sida corrugata	0.1	1	FG					0.1				

Easting	576777
Northing	6160338
Orientation	345
Plot size	20 x 20
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	1
30-49	No
20-29	Yes
10-19	Yes
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	20
Bare Ground (%)	64
Vegetation (%)	14
Rock (%)	2

Date: 6/12/2018			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q52: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			16	14	1	2	7	4	0	0	3	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			67.7	65.1	40	10	12.7	2.4	0	0	2.6	0.2
Acacia montana	8	12	SG			8						
Austrostipa scabra subsp. scabra	5	180	GG				5					
Austrostipa setacea	4	100	GG				4					
*Avena barbata**	0.4	10	EX								0.4	
Chloris truncata	0.2	10	GG				0.2					
Dianella revoluta var. revoluta	2	5	FG					2				
Dodonaea viscosa subsp. cuneata	2	2	SG			2						
Eucalyptus microcarpa	40	22	TG		40							
Hibiscus sturtii	0.2	20	FG					0.2				
*Lolium perenne**	2	80	EX								2	
Lomandra bracteata	0.2	2	GG				0.2					
Maireana enchylaenoides	0.1	1	FG					0.1				
Poa sieberiana var. sieberiana	0.5	10	GG				0.5					
*Romulea rosea var. australis**	0.2	10	HT									0.2
Rytidosperma caespitosum	2	80	GG				2					
Rytidosperma setaceum	0.8	30	GG				0.8					
Sida corrugata	0.1	1	FG					0.1				

Easting	574038
Northing	6152610
Orientation	60
Plot size	10X40x100
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	2
30-49	Yes
20-29	No
10-19	Yes
5-9	Yes
<5	Yes
Hollows	2
Length logs (m)	7
Attributes 1x1 plot (%)	
Litter (%)	85
Bare Ground (%)	1
Vegetation (%)	14
Rock (%)	0

Date: 13/05/19			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q53: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			25	20	2	1	6	10	0	1	6	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			60.1	55.9	37	0.1	9.6	9	0	0.2	4.2	0
Alternanthera nana	0.5	3	FG					0.5				
Asperula cunninghamii	0.6	10	FG					0.6				
Atriplex semibaccata	0.1	2	SG			0.1						
Atriplex spinibractea	1	10	FG					1				
Austrostipa scabra subsp. scabra	1	25	GG				1					
Callitris glaucophylla	2	2	TG		2							
Dichondra repens	0.4	6	FG					0.4				
*Echium plantagineum**	0.8	9	EX								0.8	
Einadia polygonoides	3	25	FG					3				
Enteropogon acicularis	4	35	GG				4					
Eucalyptus melliodora	35	31	TG		35							
Glycine canescens	0.2	1	OG							0.2		
Goodenia hederacea subsp. hederacea	0.3	2	FG					0.3				
Lomandra filiformis subsp. coriacea	3	40	GG				3					
Maireana enchylaenoides	1	25	FG					1				
*Malva parviflora**	0.1	3	EX								0.1	
*Marrubium vulgare**	1	4	EX								1	
*Medicago polymorpha**	0.1	1	EX								0.1	
*Oxalis corniculata**	0.2	2	EX								0.2	
Oxalis perennans	0.2	4	FG					0.2				
Panicum decompositum	1	10	GG				1					
Panicum effusum	0.4	3	GG				0.4					
Rytidosperma spp.	0.2	1	GG				0.2					
Sida corrugata	1	20	FG					1				
*Triticum aestivum**	2	50	EX								2	
Wahlenbergia luteola	1	40	FG					1				

Easting	574248
Northing	6158490
Orientation	175
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	1
Length logs (m)	7
Attributes 1x1 plot (%)	
Litter (%)	55
Bare Ground (%)	48
Vegetation (%)	0
Rock (%)	0

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q54: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			25	16	0	0	7	9	0	0	10	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			79.5	67	0	0	53	14	0	0	12.5	1
Acaena novae-zelandiae	0.4	25	FG					0.4				
Austrostipa scabra subsp. scabra	5	120	GG				5					
Bothriochloa macra	35	200	GG				35					
Chloris truncata	5	120	GG				5					
Chondrilla juncea	0.1	1	EX								0.1	
Cucumis myriocarpus subsp. leptoderm	0.2	1	EX								0.2	
Cynodon dactylon	1	100	GG				1					
Dichondra repens	2	50	FG					2				
Dysphania pumilio	0.5	10	FG					0.5				
*Echium plantagineum**	3	90	EX								3	
Enteropogon acicularis	4	150	GG				4					
*Eragrostis cilianensis**	4	70	EX								4	
Erodium crinitum	5	250	FG					5				
Euphorbia drummondii	0.6	25	FG					0.6				
*Hypochaeris radicata**	0.4	6	EX								0.4	
Lepidium africanum	0.2	2	EX								0.2	
Lomandra filiformis subsp. coriacea	1	40	GG				1					
Oxalis perennans	3	80	FG					3				
Polygonum aviculare	0.5	16	EX								0.5	
Romulea rosea var. australis	1	25	HT									1
Rumex brownii	1	12	FG					1				
Rytidosperma caespitosum	2	50	GG				2					
Sida corrugata	1	40	FG					1				
Tribulus terrestris	0.1	2	EX								0.1	
*Trifolium repens**	3	50	EX								3	
Vittadinia gracilis	0.5	15	FG					0.5				

Easting	575727
Northing	6159424
Orientation	65
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2.6
Bare Ground (%)	54.8
Vegetation (%)	41.2
Rock (%)	1.4

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q55: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			17	13	0	0	6	6	1	0	5	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			62.1	57.5	0	0	53	4.3	0.2	0	4.6	1
Austrostipa scabra subsp. scabra	20	250	GG				20					
Bothriochloa macra	5	150	GG				5					
Chloris truncata	5	100	GG				5					
Cynodon dactylon	1	20	GG				1					
Dysphania pumilio	0.1	2	FG					0.1				
*Echium plantagineum**	1	40	EX								1	
Erodium crinitum	3	200	FG					3				
Euphorbia drummondii	0.4	6	FG					0.4				
*Hypochaeris radicata**	0.2	5	EX								0.2	
Lomandra filiformis subsp. coriacea	2	60	GG				2					
Oxalis perennans	0.1	1	FG					0.1				
Polygonum aviculare	0.4	5	EX								0.4	
Romulea rosea var. australis	1	35	HT									1
Rytidosperma caespitosum	20	250	GG				20					
Sida corrugata	0.5	10	FG					0.5				
Cheilanthes sieberi subsp. sieberi	0.2	15	EG						0.2			
*Medicago polymorpha**	2	200	EX								2	
Vittadinia muelleri	0.2	3	FG					0.2				

Easting	576185
Northing	6159853
Orientation	350
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	69.6
Vegetation (%)	30.4
Rock (%)	0

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q56: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			23	18	1	0	9	7	1	0	6	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			87.4	69.8	15	0	42.9	11.7	0.2	0	17.6	6
Alternanthera nana	0.1	1	FG					0.1				
Austrostipa scabra subsp. scabra	7	120	GG				7					
Bothriochloa macra	5	100	GG				5					
Cheilanthes sieberi subsp. sieberi	0.2	10	EG						0.2			
Chloris truncata	7	150	GG				7					
Cynodon dactylon	0.8	25	GG				0.8					
Dysphania pumilio	0.2	4	FG					0.2				
*Echium plantagineum**	2	60	EX								2	
Enteropogon acicularis	10	200	GG				10					
Eragrostis brownii	0.1	2	GG				0.1					
Erodium crinitum	8	200	FG					8				
Eucalyptus blakelyi	15	5	TG		15							
Euphorbia drummondii	0.4	10	FG					0.4				
*Hypochaeris radicata**	5	200	EX								5	
Lomandra filiformis subsp. coriacea	2	45	GG				2					
*Malva parviflora**	0.1	1	EX								0.1	
Oxalis perennans	1	20	FG					1				
Panicum effusum	1	15	GG				1					
Rapistrum rugosum	0.5	15	EX								0.5	
Romulea rosea var. australis	6	100	HT									6
Rumex brownii	1	15	FG					1				
Rytidosperma spp.	10	100	GG				10					
Sida corrugata	1	20	FG					1				
*Trifolium repens**	4	150	EX								4	

Easting	576196
Northing	6160018
Orientation	275
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	Yes
Hollows	0
Length logs (m)	160
Attributes 1x1 plot (%)	
Litter (%)	33.2
Bare Ground (%)	60.8
Vegetation (%)	2
Rock (%)	4

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q57: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			19	16	1	2	8	3	1	1	4	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			90	87.5	35	1.8	49.5	0.6	0.5	0.1	2.5	1
Acacia decora	0.8	1	SG			0.8						
Acacia spp.	1	1	SG			1						
Austrostipa scabra subsp. scabra	20	200	GG				20					
Bothriochloa macra	10	150	GG				10					
Cheilanthes sieberi subsp. sieberi	0.5	10	EG						0.5			
Cynodon dactylon	0.3	5	GG				0.3					
Desmodium varians	0.1	1	OG							0.1		
Dichondra repens	0.2	10	FG					0.2				
Enteropogon acicularis	4	80	GG				4					
Erodium crinitum	0.3	15	FG					0.3				
Eucalyptus blakelyi	35	33	TG		35							
*Hypochaeris radicata**	0.6	25	EX								0.6	
Juncus spp.	3	60	GG				3					
Lomandra filiformis subsp. coriacea	5	100	GG				5					
*Medicago polymorpha**	0.3	15	EX								0.3	
Oxalis perennans	0.1	3	FG					0.1				
Panicum effusum	0.2	4	GG				0.2					
Rapistrum rugosum	0.6	35	EX								0.6	
Romulea rosea var. australis	1	40	HT									1
Rytidosperma caespitosum	7	150	GG				7					

Easting	576542
Northing	6160131
Orientation	217
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	30
Bare Ground (%)	43
Vegetation (%)	29.4
Rock (%)	3

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q58: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			21	18	1	2	6	7	1	1	4	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			67.2	61.1	20	3.9	30	6.1	0.8	0.3	6.1	0
Acacia decora	3	10	SG			3						
Acacia spp.	0.9	1	SG			0.9						
Austrostipa scabra subsp. scabra	10	250	GG				10					
Cheilanthes sieberi subsp. sieberi	0.8	18	EG						0.8			
Chloris truncata	2	25	GG				2					
Dichondra repens	0.4	20	FG					0.4				
Dysphania pumilio	0.1	1	FG					0.1				
*Echium plantagineum**	1	60	EX								1	
Enteropogon acicularis	5	100	GG				5					
Eucalyptus blakelyi	20	4	TG		20							
Glycine clandestina	0.3	6	OG							0.3		
Gonocarpus elatus	1	12	FG					1				
*Hypochaeris radicata**	1	60	EX								1	
*Lolium perenne**	0.1	1	EX								0.1	
Lomandra filiformis subsp. coriacea	2	40	GG				2					
Lomandra multiflora	1	15	GG				1					
*Medicago polymorpha**	4	90	EX								4	
Oxalis perennans	3	100	FG					3				
Rumex brownii	0.5	5	FG					0.5				
Rytidosperma caespitosum	10	250	GG				10					
Sida corrugata	1	20	FG					1				
Vittadinia muelleri	0.1	2	FG					0.1				

Easting	576542
Northing	6160476
Orientation	300
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	Yes
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	15.4
Bare Ground (%)	51.4
Vegetation (%)	8.2
Rock (%)	25

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q59: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)			Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
			# spp	10	2	0	3	5	0	0	7	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			83.2	39.7	32	0	1.1	6.6	0	0	43.5	0
Austrostipa scabra subsp. scabra	0.2	8	GG				0.2					
Callitris glaucophylla	7	1	TG		7							
*Chenopodium album**	0.2	2	EX								0.2	
Dysphania pumilio	3	30	FG					3				
Einadia nutans subsp. nutans	2	30	FG					2				
Erodium crinitum	1	30	FG					1				
Eucalyptus microcarpa	25	3	TG		25							
*Hypochaeris radicata**	1	10	EX								1	
Maireana enchylaenoides	0.2	15	FG					0.2				
*Malva parviflora**	0.2	3	EX								0.2	
Medicago sativa	10	80	EX								10	
*Modiola caroliniana**	0.1	1	EX								0.1	
Panicum effusum	0.1	4	GG				0.1					
Rapistrum rugosum	2	40	EX								2	
Rytidosperma caespitosum	0.8	15	GG				0.8					
*Triticum aestivum**	30	500	EX								30	
*Urtica incisa**	0.4	15	FG					0.4				

Easting	574948
Northing	6158383
Orientation	116
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	1
50-79	1
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	6
Attributes 1x1 plot (%)	
Litter (%)	19.4
Bare Ground (%)	35.6
Vegetation (%)	45
Rock (%)	0

Date: 15/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q60: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			18	8	1	0	2	5	0	0	11	2
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			80.6	**21.1**	10	0	0.5	10.6	0	0	**59.5**	8
Acacia ixiifolia	8	150	FG					8				
Dysphania pumilio	1	100	FG					1				
Echium plantagineum *	4	25	EX								4	
Eragrostis cilianensis *	0.1	2	EX								0.1	
Erodium crinitum	1	25	FG					1				
Eucalyptus blakelyi	10	3	TG		10							
Heliotropium amplexicaule	1	10	HT									1
Lepidium africanum	0.5	8	EX								0.5	
Malva parviflora *	6	90	EX								6	
Panicum effusum	0.4	10	GG				0.4					
Paspalidium constrictum	0.1	1	GG				0.1					
Polygonum aviculare	0.3	6	EX								0.3	
Rapistrum rugosum	10	200	EX								10	
Rumex brownii	0.5	25	FG					0.5				
Solanum nigrum *	0.1	2	EX								0.1	
Tribulus terrestris	0.5	8	EX								0.5	
Triticum aestivum *	30	500	EX								30	
Xanthium spinosum *	7	30	HT									7
Zoleya galericulata subsp. australis	0.1	1	FG					0.1				

Easting	576362
Northing	6166168
Orientation	95
Plot size	20 x 20, 20 x 50
tributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	0
ength logs (t	55
tributes 1x1 plot (%)	
Litter (%)	5.4
Bare Ground	40.6
Vegetation (	53.6
Rock (%)	0.4

Date: 15/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q61: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			18	14	0	1	6	6	0	1	5	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			59.3	42	0	4	19.9	17.8	0	0.3	17.3	4
Acaena novae-zelandiae	1	40	FG					1				
Austrostipa scabra subsp. scabra	3	60	GG				3					
Bothriochloa macra	6	100	GG				6					
Cucumis myriocarpus subsp. leptodermis	0.2	1	EX								0.2	
Cynodon dactylon	0.4	10	GG				0.4					
Desmodium varians	0.3	8	OG							0.3		
Dichondra repens	5	90	FG					5				
*Eragrostis cilianensis**	0.1	1	EX								0.1	
Erodium crinitum	10	100	FG					10				
Lissanthe strigosa subsp. subulata	4	33	SG			4						
Lomandra filiformis subsp. coriacea	0.2	2	GG				0.2					
Lomandra multiflora subsp. multiflora	0.3	1	GG				0.3					
*Medicago polymorpha**	1	30	EX								1	
Oxalis perennans	0.5	10	FG					0.5				
Paspalidium constrictum	10	150	GG				10					
Rapistrum rugosum	12	150	EX								12	
Rumex brownii	0.4	6	FG					0.4				
Romulea rosea var. australis	4	60	HT									4
Sida corrugata	0.9	15	FG					0.9				

Easting	579336
Northing	6183280
Orientation	245
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	84.2
Vegetation (%)	12.4
Rock (%)	3.4

Date: 15/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q62: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			10	9	0	0	3	6	0	0	2	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			21.4	18.9	0	0	12	6.9	0	0	2.5	2
Acaena novae-zelandiae	0.4	10	FG					0.4				
Austrostipa scabra subsp. scabra	1	25	GG				1					
Bothriochloa macra	10	100	GG				10					
Dichondra repens	0.2	5	FG					0.2				
Erodium crinitum	4	250	FG					4				
*Medicago polymorpha**	0.5	42	EX								0.5	
Paspalidium constrictum	1	20	GG				1					
Rumex brownii	0.2	2	FG					0.2				
Romulea rosea var. australis	2	120	HT									2
Sida corrugata	2	38	FG					2				
*Urtica incisa**	0.1	1	FG					0.1				

Easting	579426
Northing	6183369
Orientation	218
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	88
Vegetation (%)	10.2
Rock (%)	1.8

Date: 3/9/19			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q63: Miscellaneous Ecosystem			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			10	2	0	0	1	1	0	0	9	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			84.5	2	0	0	1	1	0	0	82.5	0
*Avena barbata**	5	60	EX								5	
*Echium plantagineum**	3	34	EX								3	
*Erodium cicutarium**	0.5	18	EX								0.5	
Hordeum vulgare	35	500	EX								35	
*Malva parviflora**	1	40	EX								1	
*Lolium perenne**	20	200	EX								20	
Panicum effusum	1	20	GG				1					
*Arctotheca calendula**	15	200	EX								15	
Rumex brownii	1	9	FG					1				
*Trifolium repens**	1	15	EX								1	
*Xanthium occidentale**	2	15	EX								2	

Easting	576975
Northing	6166034
Orientation	320
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	1.5
Bare Ground (%)	8.5
Vegetation (%)	90
Rock (%)	0

Date: 3/9/19			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q65: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			16	11	1	0	6	3	1	0	6	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			75.22	46	15	0	30.2	0.4	0.4	0	29.22	25
Acaena novae-zelandiae	0.1	3	FG					0.1				
*Arctotheca calendula**	0.12	3	EX								0.12	
Aristida ramosa	8	40	GG				8					
Austrostipa scabra subsp. scabra	14	60	GG				14					
Cheilanthes sieberi subsp. sieberi	0.4	18	EG						0.4			
*Erodium cicutarium**	0.5	40	EX								0.5	
Eucalyptus albens	15	3	TG		15							
*Hypochaeris radicata**	3	25	EX								3	
Lomandra filiformis subsp. coriacea	2	16	GG				2					
Lomandra multiflora subsp. multiflora	0.2	1	GG				0.2					
*Medicago polymorpha**	0.4	10	EX								0.4	
*Nothoscordum gracile**	0.2	2	EX								0.2	
Oxalis perennans	0.1	1	FG					0.1				
Panicum effusum	5	65	GG				5					
Romulea rosea var. australis	25	250	HT									25
Rumex brownii	0.2	2	FG					0.2				
Rytidosperma spp.	1	40	GG				1					

Easting	577050
Northing	6165278
Orientation	330
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	Yes
Hollows	3
Length logs (m)	48
Attributes 1x1 plot (%)	
Litter (%)	22
Bare Ground (%)	30
Vegetation (%)	40
Rock (%)	8

Date: 3/9/19			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q66: PCT 267 White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			13	6	2	0	0	4	0	0	8	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			84.6	32.5	17	0	0	15.5	0	0	52.1	1
Acaena novae-zelandiae	0.1	2	FG					0.1				
*Arctotheca calendula**	4	100	EX								4	
*Avena fatua**	20	200	EX								20	
*Brassica napus**	0.8	20	EX								0.8	
*Echium plantagineum**	0.5	10	EX								0.5	
Einadia nutans subsp. nutans	0.2	3	FG					0.2				
*Erodium cicutarium**	0.4	20	EX								0.4	
Eucalyptus albens	12	6	TG		12							
Eucalyptus microcarpa	5	1	TG		5							
*Lolium perenne**	25	240	EX								25	
Romulea rosea var. australis	1	50	HT									1
Rumex brownii	0.2	6	FG					0.2				
*Stellaria media**	0.4	12	EX								0.4	
*Urtica incisa**	15	120	FG					15				

Easting	572185
Northing	6149778
Orientation	230
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	No
Hollows	2
Length logs (m)	26
Attributes 1x1 plot (%)	
Litter (%)	23
Bare Ground (%)	7
Vegetation (%)	70
Rock (%)	0

Date: 28/11/2022			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	580040
Q74: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (planted)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Northing	6182140
			18	8	2	0	4	2	0	0	11	0		Orientation	354
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum		Plot size	20 x 20, 20 x 50
			89.9	61.2	25	0	35.1	1.1	0	0	28.7	0		BAM Attributes 10x100m plot	
Austrostipa scabra	15	500	GG				15							Stem classes	
Avena fatua	5	200	EX								5			80+	N
Bromus hordeaceus	1	30	EX								1			50-79	Y (1)
Chloris truncata	0.1	10	GG				0.1							30-49	Y
Digitaria sanguinalis	0.1	30	EX								0.1			20-29	Y
Echium plantagineum	0.1	10	EX								0.1			10-19	Y
Einadia nutans subsp. nutans	0.1	5	FG					0.1						5-9	Y
Eleusine tristachya	1	50	EX								1			<5	Y
Eucalyptus blakelyi	5	1	TG		5									Hollows	N
Eucalyptus melliodora	20	3	TG		20									Length logs (m)	N
Hordeum leporinum	0.1	20	EX								0.1				
Hypochaeris radicata	10	500	EX								10			BAM Attributes 1x1 plot (%)	
Lolium perenne	10	500	EX								10			Litter (%)	10
Rytidosperma spp. 1	10	500	GG				10							Bare Ground (%)	N
Rytidosperma spp. 1	10	500	GG				10							Vegetation (%)	N
Sida corrugata	1	30	FG					1						Rock (%)	N
Trifolium repens	0.2	50	EX								0.2				
Trifolium spp.	0.2	50	EX								0.2				
Vulpia myuros	1	50	EX								1				

Date: 29/11/2022			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat	55	Easting	579811
Q77: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (planted)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count		Northing	6182880
			16	11	3	0	5	3	0	0	6	1		Orientation	16
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum		Plot size	20 x 20, 20 x 50
			132.1	64.9	56	0	5.4	3.5	0	0	67.2	5		BAM Attributes 10x100m plot	
Austrostipa scabra	5	500	GG				5							Stem classes	
Brachychiton populneus	3	1	TG		3									80+	Y (2)
Bromus diandrus	5	200	HT									5		50-79	N
Bromus hordeaceus	25	500	EX								25			30-49	Y
Carex inversa	0.1	30	GG				0.1							20-29	Y
Dichondra repens	1	300	FG					1						10-19	Y
Eucalyptus blakelyi	50	4	TG		50									5-9	N
Hordeum vulgare	20	750	EX								20			<5	N
Juncus spp.	0.1	10	GG				0.1							Hollows	N
Lolium perenne	15	750	EX								15			Length logs (m)	5
Melia azedarach	3	1	TG		3										
Rumex brownii	2	50	FG					2						BAM Attributes 1x1 plot (%)	
Rytidosperma spp.1	0.1	10	GG				0.1							Litter (%)	15
Rytidosperma spp.2	0.1	20	GG				0.1							Bare Ground (%)	N
Sida corrugata	0.5	100	FG					0.5						Vegetation (%)	N
Trifolium repens	0.2	50	EX								0.2			Rock (%)	N
Vulpia myuros	2	200	EX								2				

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix H Recorded fauna

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
AUSTRALIAN RAIL TRACK CORPORATION

INLAND RAIL

Fauna species recorded

Common name	Scientific name	BC Act listing[1]	EPBC Act listing[2]
Amphibians (5)			
Beeping Froglet	*Crinia parinsignifera*		
Giant Banjo Frog	*Limnodynastes interioris*		
Green Tree Frog	*Litoria caerulea*		
Peron's Tree Frog	*Litoria peronii*		
Spotted Grass Frog	*Limnodynastes tasmaniensis*		
Birds (79)			
Apostlebird	*Struthidea cinerea*		
Australasian Grebe	*Tachybaptus novaehollandiae*		
Australian (Richards) Pipit	*Anthus australis*		
Australian Hobby	*Falco longipennis*		
Australian Magpie	*Cracticus tibicen*		
Australian Raven	*Corvus coronoides*		
Australian Reed-warbler	*Acrocephalus australis*		
Australian Shelduck	*Tadorna tadornoides*		
Australian White Ibis	*Threskiornis molucca*		
Australian Wood Duck	*Chenonetta jubata*		
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		
Black Falcon	*Falco subniger*	V	
Black-fronted Dotterel	*Elseyornis melanops*		
Blue-faced Honeyeater	*Entomyzon cyanotis*		
Brown Falcon	*Falco berigora*		
Brown Goshawk	*Accipiter fasciatus*		
Brown Songlark	*Cincloramphus cruralis*		
Brown Treecreeper	*Climacteris picumnus victoriae*	V	
Cockatiel	*Nymphicus hollandicus*		
Common Blackbird*	*Turdus merula*		
Common Bronzewing	*Phaps chalcoptera*		
Common Starling*	*Sturnus vulgaris*		
Crested Pigeon	*Ocyphaps lophotes*		
Diamond Firetail	*Stagonopleura guttata*	V	
Dollarbird	*Eurystomus orientalis*		

Common name	Scientific name	BC Act listing[1]	EPBC Act listing[2]
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	
Eastern Rosella	*Platycercus eximius*		
Fairy Martin	*Hirundo ariel*		
Flame Robin	*Petroica phoenicea*	V	
Forest Raven	*Corvus tasmanicus*		
Fuscous Honeyeater	*Lichenostomus fuscus*		
Galah	*Cacatua roseicapilla*		
Great Cormorant	*Phalacrocorax carbo*		
Grey Butcherbird	*Cracticus torquatus*		
Grey Fantail	*Rhipidura albiscapa*		
Grey Shrike-thrush	*Colluricincla harmonica*		
Grey Teal	*Anas gracilis*		
Grey-Crowned Babbler	*Pomatostomus temporalis temporalis*	V	
House Sparrow*	*Passer domesticus*		
Jacky Winter	*Microeca fascinans*		
Laughing Kookaburra	*Dacelo novaeguineae*		
Leaden Flycatcher	*Myiagra rubecula*		
Little Corella	*Cacatua sanguinea*		
Little Eagle	*Hieraaetus morphnoides*	V	
Little Friarbird	*Philemon citreogularis*		
Little Pied Cormorant	*Phalacrocorax melanoleucos*		
Little Raven	*Corvus mellori*		
Magpie-lark	*Grallina cyanoleuca*		
Masked Lapwing	*Vanellus miles*		
Masked Woodswallow	*Artamus personatus*		
Nankeen Kestrel	*Falco cenchroides*		
Noisy Miner	*Manorina melanocephala*		
Pacific Black Duck	*Anas superciliosa*		
Peaceful Dove	*Geopelia striata*		
Pied Butcherbird	*Cracticus nigrogularis*		
Pied Currawong	*Strepera graculina*		
Rainbow Bee-eater	*Merops ornatus*		m
Red Wattlebird	*Anthochaera carunculata*		
Red-rumped Parrot	*Psephotus haematonotus*		

Common name	Scientific name	BC Act listing[1]	EPBC Act listing[2]
Rock Dove*	*Columba livia*		
Rufous Songlark	*Cincloramphus mathewsi*		
Rufous Whistler	*Pachycephala rufiventris*		
Sacred Kingfisher	*Todiramphus sanctus*		
Singing Bushlark	*Mirafra javanica*		
Southern Boobook	*Ninox novaeseelandiae*		
Southern Whiteface	*Aphelocephala leucopsis*		
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		
Spotted Harrier	*Circus assimilis*	V	
Spotted Pardalote	*Pardalotus punctatus*		
Square-tailed Kite	*Lophoictinia isura*	V	
Straw-necked Ibis	*Threskiornis spinicollis*		
Striated Pardalote	*Pardalotus striatus*		
Sulphur-crested Cockatoo	*Cacatua galerita*		
Superb Fairy-wren	*Malurus cyaneus*		
Superb Parrot	*Polytelis swainsonii*	V	V
Tawny Frogmouth	*Podargus strigoides*		
Weebill	*Smicrornis brevirostris*		
Welcome Swallow	*Hirundo neoxena*		
Western Gerygone	*Gerygone fusca*		
Whistling Kite	*Haliastur sphenurus*		
White-browed Woodswallow	*Artamus superciliosus*		
White-faced Heron	*Egretta novaehollandiae*		
White-fronted Chat	*Epthianura albifrons*	V	
White-necked Heron	*Ardea pacifica*		
White-plumed Honeyeater	*Ptilotula penicillata*		
White-winged Chough	*Corcorax melanorhamphos*		
White-winged Triller	*Lalage sueurii*		
Willie Wagtail	*Rhipidura leucophrys*		
Yellow Thornbill	*Acanthiza nana*		
Yellow-billed Spoonbill	*Platalea flavipes*		
Yellow-plumed Honeyeater	*Lichenostomus ornatus*		
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		

Common name	Scientific name	BC Act listing[1]	EPBC Act listing[2]
Mammals (11)			
Chocolate Wattle Bat^	*Chalinolobus morio*		
Common Brushtail Possum	*Trichosurus vulpecula*		
Common Ringtail Possum	*Pseudocheirus peregrinus*		
Cow*	*Bos taurus*		
Eastern Grey Kangaroo	*Macropus giganteus*		
Fox*	*Vulpes vulpes*		
Gould's Wattled Bat	*Chalinolobus gouldii*		
Gould's Wattled Bat^	*Chalinolobus gouldii*		
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		
Little Forest Bat	*Vespadelus vulturnus*		
Long-eared Bats^	*Nyctophilus* spp.		
Rabbit*	*Oryctolagus cuniculus*		
Sheep*	*Ovis aries*		
Squirrel Glider	*Petaurus norfolcensis*	V	
Vespadelus species^	*Vespadelus* spp.		
White-striped Free-tailed Bat^	*Austronomus australis*		
Reptiles (2)			
Bearded Dragon	*Pogona barbata*		
Lace Monitor	*Varanus varius*		

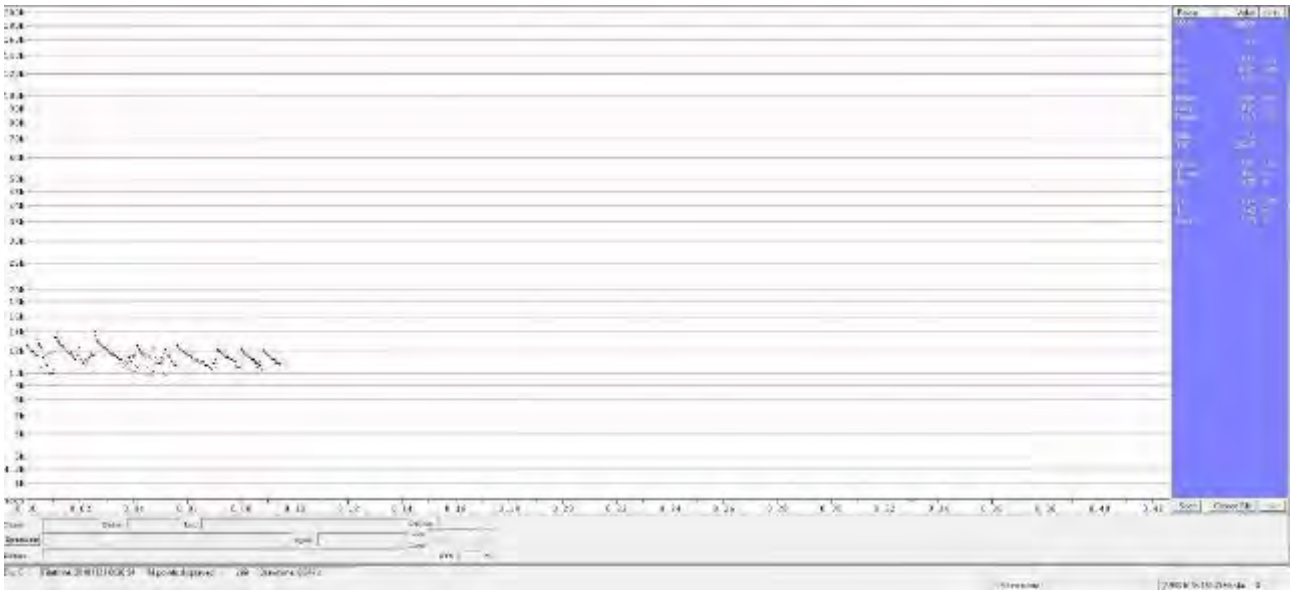
(1) V = Vulnerable, E = Endangered as listed under the BC Act

(2) V = Vulnerable, M = Migratory, m=marine listed under the EPBC Act

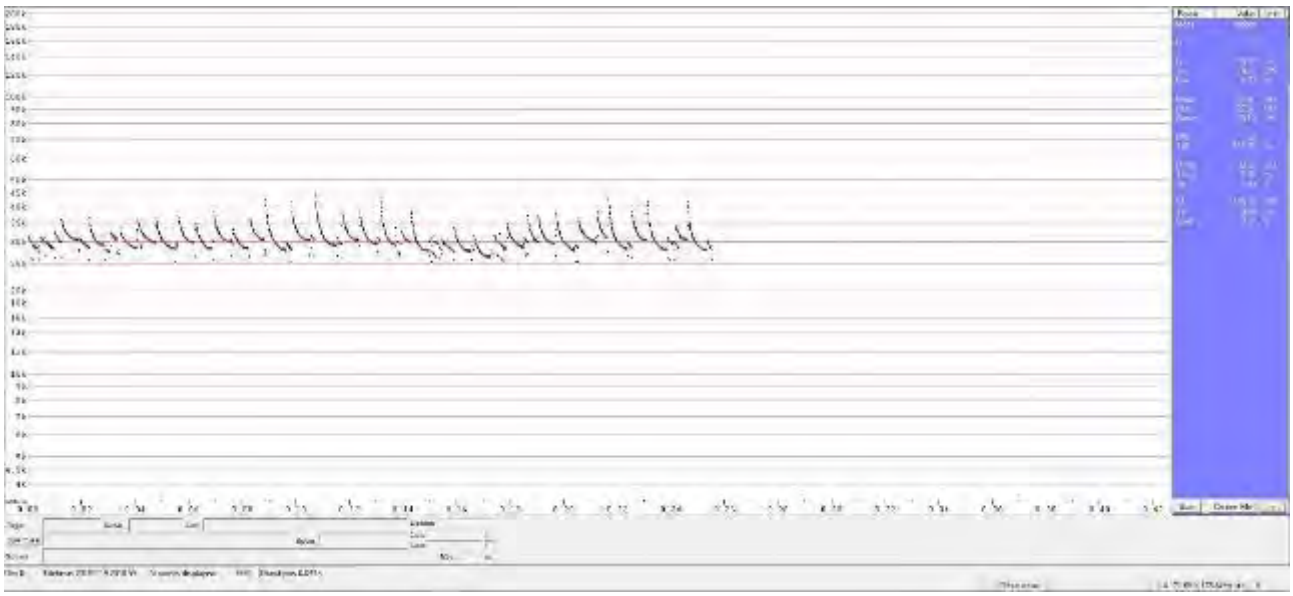
* Exotic species

^ Ultrasonic Anabat bat detection.

ANABAT sample calls

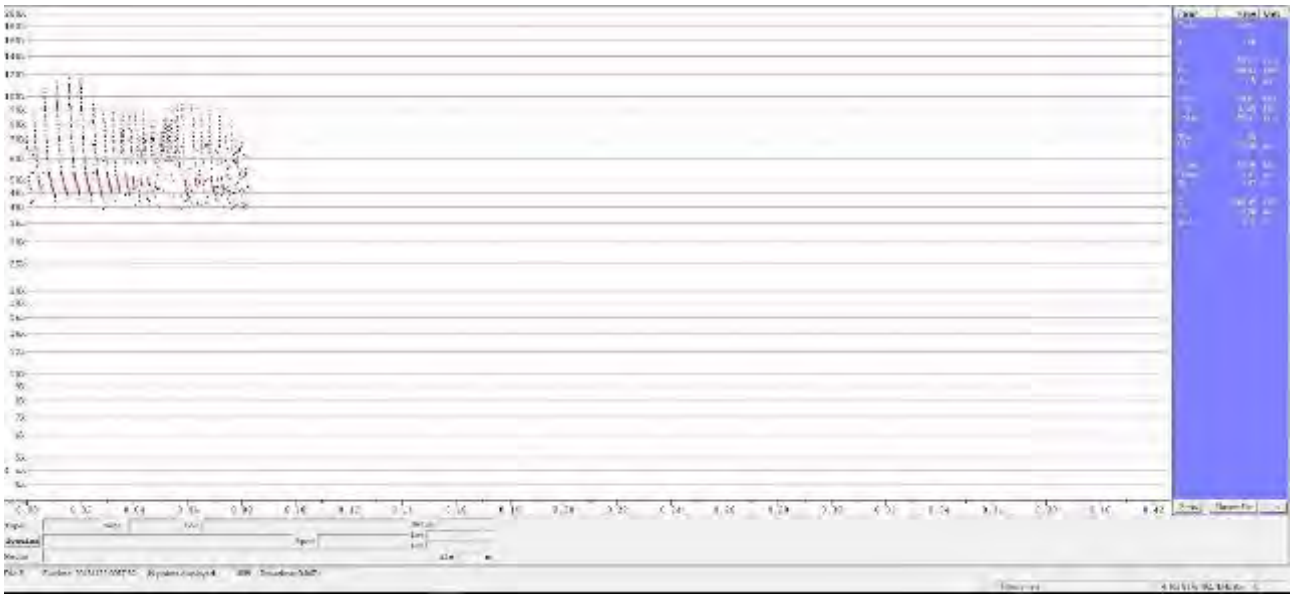


An example of *Austronomus australis* (White-striped Freetail-bat) recorded from the subject land

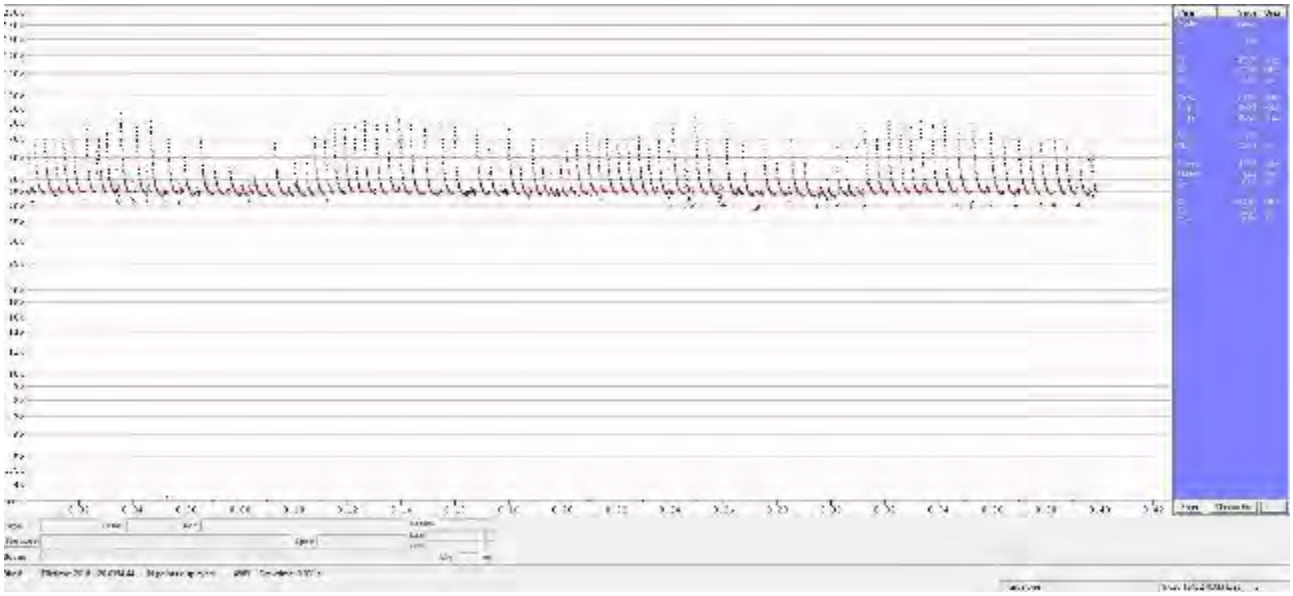


An example of *Chalinolobus gouldii* (Gould's Wattled Bat) recorded from the subject land

An example of *Chalinolobus morio* (Chocolate Wattled Bat) recorded from the subject land



An example of *Nyctophilus* spp. (Long-eared Bat) recorded from the subject land



An example of *Vespadelus vulturnus* (Little Forest Bat) recorded from the subject land

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix I EPBC Act threatened ecological community condition threshold assessment

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
AUSTRALIAN RAIL TRACK CORPORATION

INLAND RAIL

Table I.1 Native vegetation assessment against Grey Box (Eucalyptus Microcarpa) grassy woodlands and derived grasslands EPBC Act condition thresholds

Condition threshold	PCT 76				PCT 80	
	VZ3 Good	VZ4 Moderate	VZ5 Poor	VZ6 Low	VZ7 Moderate	VZ8 Poor
Criteria that are broadly applicable						
1a. The minimum patch size is 0.5ha; AND 1b. The canopy layer contains Grey Box (*E. microcarpa*) as the dominant or co-dominant tree species; AND 1c. The vegetative cover of non-grass weed species in the ground layer is less than 30% at any time of the year.	All patches within the subject land are considered to meet this criterion					
	Yes – canopy was dominated Grey Box (*E. microcarpa*)			No – Grey Box (*E. microcarpa*) was absent	Yes – canopy was dominated Grey Box (*E. microcarpa*)	
	Yes – The vegetative cover of non-grass weed species <30% Q5 – 3.8% Q49 – 5.7% Q52 – 2.6%	Yes – The vegetative cover of non-grass weed species <30% Q21 – 3.1% Q22 – 3.7% Q38 – 17.8%	No - The vegetative cover of non-grass weed species >30% Q9 – 29.1% (native 0%) >30% Q10 – 30.8% (native 0.3%) >30%		Yes – The vegetative cover of non-grass weed species <30% Q20 – 0% Q50 – 16%	No - The vegetative cover of non-grass weed species >30% Q18 – 9.5% (native 5.7%) > 30% Q19 – 22.3% (native 0.2%) >30% Q59 – 51.2% (native 7.7%) >30%
Outcome of step 1 criteria	Meets listing – additional steps do not apply	Meets listing – additional steps do not apply	Does not meet listing additional criteria applies	Does not meet listing additional criteria applies	Meets listing – additional steps do not apply	Does not meet listing additional criteria applies

Condition threshold	PCT 76				PCT 80	
	VZ3 Good	VZ4 Moderate	VZ5 Poor	VZ6 Low	VZ7 Moderate	VZ8 Poor
Additional criteria that apply to smaller patches (0.5 to <2ha in area) with tree crown cover >10%						
2a. At least 50% of the vegetative cover in the ground layer comprises perennial native species at any time of the year; AND 2b. 8 or more perennial native species are present in the mid and ground layers at any time of the year.	Criteria does not apply	Criteria does not apply	No – ground layer perennial native species cover <50% No Q9 – 0 native species Q10 – 3 native species	No – Canopy <10%	Criteria does not apply	No – ground layer perennial native species cover <50% No Q18 – 6 native species Q10 – 1 native species Q59 – 8 native species
Outcome of step 2 criteria	N/A	N/A	Does not meet listing additional criteria applies	Does not meet listing additional criteria applies	N/A	Does not meet listing additional criteria applies

Condition threshold	PCT 76				PCT 80	
	VZ3 Good	VZ4 Moderate	VZ5 Poor	VZ6 Low	VZ7 Moderate	VZ8 Poor
Additional criteria that apply to larger woodland patches with a well-developed canopy (2ha or more in area)						
3a. At least 8 trees/ha are hollow bearing or have a diameter at breast height of 60cm or more; AND 3b. at least 10% of the vegetative ground cover comprises perennial native grasses at any time of the year; OR 4a. At least 20 trees/ha have a diameter at breast height of 12cm or more; AND 4b. at least 50% of the vegetative cover in the ground layer comprises perennial native species.	Criteria does not apply	Criteria does not apply	No – Patches <2ha	No – Well developed canopy absent	Criteria does not apply	No – Patches <2ha
Outcome of step 3 & 4 criteria	N/A	N/A	Does not meet listing	Does not meet listing additional criteria applies	N/A	Does not meet listing

Condition threshold	PCT 76				PCT 80	
	VZ3 Good	VZ4 Moderate	VZ5 Poor	VZ6 Low	VZ7 Moderate	VZ8 Poor
Additional criteria that apply to patches where the canopy is less developed or absent (derived grassland) (≥0.5ha in area)						
5a. Woodland density does not meet criteria 3a or 4a, or is a derived grassland with clear evidence that the site formerly was a woodland with a tree canopy dominated or co-dominated by *E. microcarpa;* AND 5b. At least 50% of the vegetative cover in the ground layer is made up of perennial native species at any time of the year; AND 5c. 12 or more native species are present in the ground layer at any time of the year.	Criteria does not apply	Criteria does not apply	Criteria does not apply	Yes – formally a woodland dominated by Grey Box (*E. microcarpa*)	Criteria does not apply	Criteria does not apply
	Criteria does not apply	Criteria does not apply	Criteria does not apply	Yes - Q16 exhibits >50% perennial native cover Yes – Q16 recorded 11 native species under drought conditions (20x20m). It is assumed that 12 native species would be recorded during optimal conditions.	Criteria does not apply	Criteria does not apply
Outcome of step 5 criteria	N/a	N/A	N/A	Meets listing	N/A	N/A
Outcome	**Meets listing**	**Meets listing**	**Does not meet listing**	**Meets listing**	**Meets listing**	**Does not meet listing**

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix J BAM_C predicted species

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
AUSTRALIAN RAIL TRACK CORPORATION

INLAND RAIL

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00015331/BAAS18097/19/00015332	Inland Rail I2S	22/06/2023
Assessor Name	Report Created	BAM Data version *
Mark Stables	08/11/2023	61
Assessor Number	Assessment Type	BAM Case Status
BAAS18097	Major Projects	Open
Assessment Revision		Date Finalised
10		To be finalised

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

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

Common Name	Scientific Name	Vegetation Types(s)
Australian Painted Snipe	Rostratula australis	79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Barking Owl	Ninox connivens	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Barking Owl	Ninox connivens	79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Black Falcon	Falco subniger	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
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		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
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		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Corben's Long-eared Bat	Nyctophilus corbeni	80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Diamond Firetail	Stagonopleura guttata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion

Diamond Firetail	Stagonopleura guttata	277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Eastern False Pipistrelle	Falsistrellus tasmaniensis	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Flame Robin	Petroica phoenicea	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Gang-gang Cockatoo	Callocephalon fimbriatum	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion

Gilbert's Whistler	Pachycephala inornata	80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Grey Falcon	Falco hypoleucos	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
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Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
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		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
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		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion

Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Little Eagle	Hieraaetus morphnoides	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
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		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Little Eagle	Hieraaetus morphnoides	79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Little Lorikeet	Glossopsitta pusilla	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
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		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Little Pied Bat	Chalinolobus picatus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Major Mitchell's Cockatoo	Lophochroa leadbeateri	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Masked Owl	Tyto novaehollandiae	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

Masked Owl	Tyto novaehollandiae	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Painted Honeyeater	Grantiella picta	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Pied Honeyeater	Certhionyx variegatus	80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

Powerful Owl	Ninox strenua	79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Purple-crowned Lorikeet	Glossopsitta porphyrocephala	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Regent Honeyeater	Anthochaera phrygia	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Scarlet Robin	Petroica boodang	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Scarlet Robin	Petroica boodang	79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Speckled Warbler	Chthonicola sagittata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Spotted Harrier	Circus assimilis	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Spotted-tailed Quoll	Dasyurus maculatus	276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Square-tailed Kite	Lophoictinia isura	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Superb Parrot	Polytelis swainsonii	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

Superb Parrot	Polytelis swainsonii	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Swift Parrot	Lathamus discolor	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion

Turquoise Parrot	Neophema pulchella	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
Varied Sittella	Daphoenositta chrysoptera	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Varied Sittella	Daphoenositta chrysoptera	79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
White-fronted Chat	Epthianura albifrons	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion

White-fronted Chat	Epthianura albifrons	347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion
White-throated Needletail	Hirundapus caudacutus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
		79-River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion

Threatened species Manually Added

Common Name	Scientific Name
White-fronted Chat	Epthianura albifrons
Grey Falcon	Falco hypoleucos

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

Common Name	Scientific Name	Plant Community Type(s)
Glossy Black-Cockatoo	Calyptorhynchus lathami	80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

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

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix K BAM credit report

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
AUSTRALIAN RAIL TRACK CORPORATION

INLAND RAIL

BAM Credit Summary Report

Proposal Details

Assessment Id
00015331/BAAS18097/19/00015332

Proposal Name
Inland Rail I2S

BAM data last updated *
22/06/2023

Assessor Name
Mark Stables

Report Created
16/11/2023

BAM Data version *
61

Assessor Number
BAAS18097

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
11

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
Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion												
15	309_moderate	Not a TEC	52.6	52.6	1.4	PCT Cleared - 15%	High Sensitivity to Gain			1.50		28
											Subtotal	**28**

Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion												
12	277_moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	70	70.0	11.7	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	512

13	277_poor	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	50.6	50.6	2.2	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	70

14	277_low-DNG	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	2.7	2.7	6.2	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0

20	277_planted	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	54.2	54.2	2.8	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	95
											Subtotal	**677**
River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes Bioregion and western South Eastern Highlands Bioregion												
18	79_moderate	Not a TEC	87.5	87.5	5.6	PCT Cleared - 66%	High Sensitivity to Gain			1.75		214
19	79_poor	Not a TEC	38.1	38.1	0.8	PCT Cleared - 66%	High Sensitivity to Gain			1.75		13
											Subtotal	**227**

Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion												
5	80_moderate	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	65	65.0	1.4	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		44
6	80_poor	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	38.6	38.6	5	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		96
											Subtotal	**140**

Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions												
1	76_good	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	83.8	83.8	1	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		42
2	76_moderate	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	69.8	69.8	12.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		446
3	76_poor	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	31.2	31.2	8.6	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		134

4	76_low-DNG	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	13.5	13.5	1.6	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		0
											Subtotal	**622**
White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion												
16	347_moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	52.5	52.5	0.14	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	5

17	347_poor	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	35.6	35.6	0.29	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	6
											Subtotal	**11**

White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion												
7	266_moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	69.3	69.3	2.9	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	125

8	266_poor	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	33.7	33.7	4.8	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	101

9	266_low-DNG	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	2.1	2.1	6.6	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0
											Subtotal	**226**

Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion												
10	276_moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	70.9	70.9	0.87	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	39

11	276_poor	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	29.7	29.7	0.62	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	12
											Subtotal	**51**
											Total	**1982**

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
Acacia ausfeldii / Ausfeld's Wattle (Flora)									
266_moderate	69.3	69.3	2.3			Vulnerable	Not Listed	False	80
277_moderate	70.0	70.0	2			Vulnerable	Not Listed	False	71

								Subtotal	**151**
Ammobium craspedioides / Yass Daisy (Flora)									
266_moderate	N/A	N/A	1			Vulnerable	Vulnerable	False	2
277_moderate	N/A	N/A	1			Vulnerable	Vulnerable	False	2
277_low-DNG	N/A	N/A	1			Vulnerable	Vulnerable	False	2
								Subtotal	**6**
Austrostipa wakoolica / A spear-grass (Flora)									
76_moderate	69.8	69.8	4.4			Endangered	Endangered	False	153
76_low-DNG	13.5	13.5	0.01			Endangered	Endangered	False	1
80_moderate	65.0	65.0	0.47			Endangered	Endangered	False	15
								Subtotal	**169**
Caladenia arenaria / Sand-hill Spider Orchid (Flora)									
76_moderate	69.8	69.8	4.4			Endangered	Endangered	True	229
76_low-DNG	13.5	13.5	0.01			Endangered	Endangered	True	1
								Subtotal	**230**
Caladenia concolor / Crimson Spider Orchid (Flora)									
347_moderate	52.5	52.5	0.14			Endangered	Vulnerable	True	6
								Subtotal	**6**
Cullen parvum / Small Scurf-pea (Flora)									
277_moderate	70.0	70.0	2			Endangered	Not Listed	False	71
277_low-DNG	2.7	2.7	0.34			Endangered	Not Listed	False	1
347_moderate	52.5	52.5	0.14			Endangered	Not Listed	False	4
79_moderate	87.5	87.5	2.8			Endangered	Not Listed	False	123
								Subtotal	**199**

Diuris tricolor / Pine Donkey Orchid (Flora)									
76_moderate	69.8	69.8	4.4			Vulnerable	Not Listed	False	115
76_low-DNG	13.5	13.5	0.01			Vulnerable	Not Listed	False	1
80_moderate	65.0	65.0	0.47			Vulnerable	Not Listed	False	11
347_moderate	52.5	52.5	0.14			Vulnerable	Not Listed	False	3
								Subtotal	**130**
Eleocharis obicis / Spike-Rush (Flora)									
76_moderate	69.8	69.8	4.4	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Vulnerable	Vulnerable	False	153
76_low-DNG	13.5	13.5	0.01	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Vulnerable	Vulnerable	False	1
								Subtotal	**154**
Euphrasia arguta / Euphrasia arguta (Flora)									
266_moderate	69.3	69.3	2.3			Critically Endangered	Critically Endangered	True	121
								Subtotal	**121**
Grevillea wilkinsonii / Tumut Grevillea (Flora)									
266_moderate	69.3	69.3	2.3			Critically Endangered	Endangered	True	121
								Subtotal	**121**

Hieraaetus morphnoides / Little Eagle (Fauna)									
276_moderate	70.9	70.9	0.05			Vulnerable	Not Listed	False	1
276_poor	29.7	29.7	0.4			Vulnerable	Not Listed	False	4
79_moderate	87.5	87.5	0.39			Vulnerable	Not Listed	False	13
277_planted	54.2	54.2	0.18			Vulnerable	Not Listed	False	4
								Subtotal	**22**
Indigofera efoliata / Leafless Indigo (Flora)									
76_moderate	69.8	69.8	4.4			Endangered	Endangered	True	229
76_low-DNG	13.5	13.5	0.01			Endangered	Endangered	True	1
								Subtotal	**230**
Keyacris scurra / Key's Matchstick Grasshopper (Fauna)									
266_moderate	69.3	69.3	0.13	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	5
277_moderate	70.0	70.0	2.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	87
277_low-DNG	2.7	2.7	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	1
								Subtotal	**93**

Lepidium aschersonii / Spiny Peppercress (Flora)									
76_moderate	69.8	69.8	4.4	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	153
76_low-DNG	13.5	13.5	0.01	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1
								Subtotal	**154**
Leucochrysum albicans subsp. tricolor / Hoary Sunray (Flora)									
347_moderate	N/A	N/A	1			Endangered	Endangered	False	2
								Subtotal	**2**
Myotis macropus / Southern Myotis (Fauna)									
276_moderate	70.9	70.9	0.76			Vulnerable	Not Listed	False	27
276_poor	29.7	29.7	0.57			Vulnerable	Not Listed	False	8
79_moderate	87.5	87.5	5.5			Vulnerable	Not Listed	False	239
79_poor	38.1	38.1	0.71			Vulnerable	Not Listed	False	14
								Subtotal	**288**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
76_good	83.8	83.8	1			Vulnerable	Not Listed	False	42
76_moderate	69.8	69.8	12.8			Vulnerable	Not Listed	False	446
76_poor	31.2	31.2	8.6			Vulnerable	Not Listed	False	134
80_moderate	65.0	65.0	1.4			Vulnerable	Not Listed	False	44
80_poor	38.6	38.6	5			Vulnerable	Not Listed	False	96
266_moderate	69.3	69.3	2.9			Vulnerable	Not Listed	False	100

266_poor	33.7	33.7	4.8			Vulnerable	Not Listed	False	80
276_moderate	70.9	70.9	0.87			Vulnerable	Not Listed	False	31
276_poor	29.7	29.7	0.62			Vulnerable	Not Listed	False	9
347_moderate	52.5	52.5	0.14			Vulnerable	Not Listed	False	4
347_poor	35.6	35.6	0.29			Vulnerable	Not Listed	False	5
79_moderate	87.5	87.5	5.6			Vulnerable	Not Listed	False	244
79_poor	38.1	38.1	0.8			Vulnerable	Not Listed	False	15
277_moderate	70.0	70.0	11.7			Vulnerable	Not Listed	False	409
277_poor	50.6	50.6	2.2			Vulnerable	Not Listed	False	56
277_planted	54.2	54.2	2.7			Vulnerable	Not Listed	False	73
								Subtotal	**1788**
Polytelis swainsonii / Superb Parrot (Fauna)									
76_good	83.8	83.8	0.88			Vulnerable	Vulnerable	False	37
76_moderate	69.8	69.8	9.8			Vulnerable	Vulnerable	False	342
76_poor	31.2	31.2	5.7			Vulnerable	Vulnerable	False	89
80_moderate	65.0	65.0	1.4			Vulnerable	Vulnerable	False	44
80_poor	38.6	38.6	2.6			Vulnerable	Vulnerable	False	50
266_moderate	69.3	69.3	1.7			Vulnerable	Vulnerable	False	59
266_poor	33.7	33.7	4.1			Vulnerable	Vulnerable	False	69
277_moderate	70.0	70.0	9.3			Vulnerable	Vulnerable	False	325
277_poor	50.6	50.6	0.37			Vulnerable	Vulnerable	False	9
347_moderate	52.5	52.5	0.14			Vulnerable	Vulnerable	False	4
347_poor	35.6	35.6	0.1			Vulnerable	Vulnerable	False	2
79_moderate	87.5	87.5	5			Vulnerable	Vulnerable	False	217

79_poor	38.1	38.1	0.26			Vulnerable	Vulnerable	False	5
277_planted	54.2	54.2	0.61			Vulnerable	Vulnerable	False	17
								Subtotal	**1269**
Prasophyllum petilum / Tarengo Leek Orchid (Flora)									
277_moderate	70.0	70.0	2			Endangered	Endangered	False	71
277_low-DNG	2.7	2.7	0.34			Endangered	Endangered	False	1
347_moderate	52.5	52.5	0.14			Endangered	Endangered	False	4
								Subtotal	**76**
Prasophyllum sp. Wybong / Prasophyllum sp. Wybong (Flora)									
266_moderate	69.3	69.3	2.3			Not Listed	Critically Endangered	True	121
277_moderate	70.0	70.0	2			Not Listed	Critically Endangered	True	106
277_low-DNG	2.7	2.7	0.34			Not Listed	Critically Endangered	True	1
								Subtotal	**228**
Pultenaea humilis / Dwarf Bush-pea (Flora)									
347_moderate	52.5	52.5	0.14			Vulnerable	Not Listed	False	4
								Subtotal	**4**
Senecio garlandii / Woolly Ragwort (Flora)									
347_moderate	52.5	52.5	0.14			Vulnerable	Not Listed	False	3
								Subtotal	**3**
Swainsona murrayana / Slender Darling Pea (Flora)									
76_moderate	69.8	69.8	4.4			Vulnerable	Vulnerable	False	153
76_low-DNG	13.5	13.5	0.01			Vulnerable	Vulnerable	False	1

80_moderate	65.0	65.0	0.47			Vulnerable	Vulnerable	False	15
								Subtotal	**169**
Swainsona recta / Small Purple-pea (Flora)									
76_moderate	69.8	69.8	4.4			Endangered	Endangered	False	153
76_low-DNG	13.5	13.5	0.01			Endangered	Endangered	False	1
266_moderate	69.3	69.3	2.3			Endangered	Endangered	False	80
277_moderate	70.0	70.0	2			Endangered	Endangered	False	71
277_low-DNG	2.7	2.7	0.34			Endangered	Endangered	False	1
								Subtotal	**306**
Swainsona sericea / Silky Swainson-pea (Flora)									
76_moderate	69.8	69.8	4.4			Vulnerable	Not Listed	False	153
76_low-DNG	13.5	13.5	0.01			Vulnerable	Not Listed	False	1
								Subtotal	**154**
Tylophora linearis / Tylophora linearis (Flora)									
347_moderate	52.5	52.5	0.14			Vulnerable	Endangered	False	4
								Subtotal	**4**

APPENDIX

E

Updated Biodiversity Development Assessment Report

Appendix L Draft connectivity strategy

ILLABO TO STOCKINBINGAL RESPONSE TO SUBMISSIONS

INLAND RAIL IS A SUBSIDIARY OF
AUSTRALIAN RAIL TRACK CORPORATION

INLAND RAIL

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L.1 Proposal overview

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland. Inland Rail is a major national program that will enhance Australia's existing national rail network and serve the interstate freight market.

The Illabo to Stockinbingal section of Inland Rail ('the proposal') has a total extent of about 42.5 kilometres, and consists of about 39 kilometres of new, greenfield single track standard gauge railway and associated infrastructure between Illabo and Stockinbingal. The proposal includes new bridges at watercourses, stock underpasses, new and upgraded cross drainage culverts and additional upgrades to track infrastructure and associated roads.

L.1.1 Route design

Various options assessments have been undertaken during development of the proposal, and the preferred option was chosen based on the outcome of multi-criteria assessments and will be located east of Illabo, tracking north to Stockinbingal and connecting into the existing Forbes rail line. The proposal has been designed with the principles to avoid and minimise impact on native vegetation and habitat where possible. As a result, the chosen route has been largely located in disturbed areas and non-native vegetation and has significantly reduced impact to two recorded threatened ecological communities, Inland Grey Box Woodland and Box Gum Woodland by avoiding occurrences along Ironbong Road and Dudauman Road. The chosen route has also been located to avoid high quality habitat areas and minimising impacts to connectivity along old Sydney Road and Billabong Creek, Bethungra and Boundary Creek, as well as large river red gums and hollow bearing trees at Ironbong Road and Ulandra Creek.

The approach taken in developing the preferred route design regarding connectivity outcomes was to:

- minimise impact on threatened ecological communities
- minimise impact on key habitat areas
- minimise impact on local and regional fauna movement corridors.

L.1.2 Goals of preliminary fauna connectivity strategy

The goals of this Preliminary Fauna Connectivity Strategy are to:

- provide for continued movement of fauna species within regional, local and riparian corridors
- minimise the risk of train-strike as far as practicable
- allow for adaptive management and response to improve connectivity and reduce mortality.

L.1.3 Purpose of this report

The purpose of this report is to:

- describe the existing environment including current movement corridors
- identify key fauna species that would benefit from provision of fauna connectivity measures
- describe fauna connectivity structures and measures that are proposed
- identify recommended locations for fauna connectivity measures
- outline proposed monitoring and reporting.

L.2 Impacts of linear infrastructure

L.2.1 Habitat loss and fragmentation

Land clearance consists of the destruction of the above ground biomass of native vegetation and its substantial replacement by non-local species or by human artefacts, such as the rail line. Construction of the proposal would require the permanent removal of a woodland and forest habitat, shrubland, wetland and grassland areas, as well as land already cleared for crops. Clearing of this vegetation would permanently remove foraging and breeding resources for native fauna.

Clearing of vegetation also results in habitat fragmentation. Habitat fragmentation can result in reduced dispersal and reproductive success of biota within the fragment, a decline in populations resulting from increased predation by introduced species or native species that do not normally occur in the community, and an increased probability that stochastic events (e.g., fire) may reduce population numbers below critical levels required for their survival (Andrews 1990). Some species are at greater risk in fragmented landscapes than others as a result of their ecological requirements and/or behaviour. The threat posed by fragmentation is increased for species with large home ranges, which migrate or disperse over long distances, those that have specialised dietary or habitat requirements (Jackson 2000) and those with poor dispersal ability (Forman, Sperling et al. 2003, Niebuhr, Wosniack et al. 2015). In general, larger fragments are less susceptible to adverse impacts than are smaller fragments.

The proposal is located within an agricultural landscape that has already been highly fragmented through activities such as cropping and livestock use, with limited large patches of remnant vegetation. The largest patch of remnant vegetation within the vicinity of the subject land occurs to the east and encompasses the Ulandra Nature Reserve and surrounding Bethungra and Ulandra Mountain range subject land. The primary form of connectivity to this remnant vegetation is through vegetated road and riparian corridors. Habitat fragmentation as a result of the proposal would be largely localised, resulting in minor increases in fragmentation of the regional wildlife patches along the creeklines and road reserves outlined in section L.3.1, below.

The corridor width varies between about 40m and 130m along its length, in order to cater for large embankments and cuttings, respond to local topography and incorporate ancillary infrastructure (see EIS Ch. 1). As the corridor will run through a predominantly cleared, agricultural landscape, the associated clearing of this vegetation associated with the corridor is generally unlikely to significantly increase landscape fragmentation and limit movement corridors beyond that which currently exists in the subject land. The minor increases in localised fragmentation are also unlikely to significantly increase fragmentation for the majority of highly mobile threatened bird or bat species recorded or predicted to occur in the subject land, though dispersal may be impacted for more sedentary native fauna species such as mammals, frogs and reptiles. One threatened species, the Squirrel Glider may be negatively impacted by loss of connectivity due to limitations in gliding distances between areas of habitat. This impact is discussed further in section L.3.3.1, below.

The predicted level of fragmentation from the proposal is not expected to be enough to prevent the breeding and dispersal of plant pollinators or the dispersal of plant propagules (i.e., seed or other vegetative reproductive material) between habitat patches. The existing functional connectivity would remain in the subject land and be alleviated with connectivity mitigation measures.

L.2.2 Rail-related mortality

Railway-related mortality of wildlife can occur due to a number of factors including direct mortality from collision, electrocution, wire strikes and rail entrapment. Though comparatively little research has been undertaken into rail-related wildlife mortality in comparison to road mortality, railways are known to result in mortality for a diversity of taxonomic groups (including birds, mammals, reptiles, amphibians) with existing data available from a variety of different continents (Van der Grift 1999, Forman, Sperling et al. 2003, Davenport and Davenport 2006, Dorsey, Olsson et al. 2015). Little is known about population level impacts particularly for small-bodied species due to underreporting of impacts. Train mortality can have large impacts on mammal populations, particularly for rare species, species with large home ranges and low-density populations, and species with low reproductive rates (Borda-de-Água, Barrientos et al. 2017).

While road-related wildlife collision can be higher due to greater width, frequency of traffic and increased directionality of traffic, direct mortality rates of train strike are often higher than impact from road vehicles, due to the speed of trains and difficulty in stopping. Train speeds for Inland Rail are likely to reach 115 kilometres per hour. Freight trains cannot stop quickly when encountering animals on the rails, given their speed, mass and braking power. Infrastructure or trains with greater height (for example those carrying double-stacked containers as are proposed for Inland Rail (up to 6.5m high)) can also result in increased risk of injury and mortality of fauna that may fly or glide into the train, particularly where these heights exceed a species' normal range for flight or glides (Borda-de-Água, Barrientos et al. 2017). Nevertheless, rail traffic along the alignment, is generally predicted to be low. It is estimated that the Illabo to Stockinbingal section of Inland Rail would be trafficked by an average of six trains per day (both directions) in 2026, increasing to 11 trains per day (both directions) in 2040. This low traffic rate means rail-related wildlife mortalities are unlikely to be significantly increased beyond that currently occurring in the area, despite direct impacts generally resulting in mortalities.

The risk of train strike as a result of the proposal is higher where rail traverse areas of habitat, is located near natural or artificial water bodies, or areas containing food sources (e.g., mown grass verges, nectar-producing shrubs) which attract animals, have high speed limits or provide poor visibility of wildlife (e.g., due to bends, crests and poor lighting). Some areas of habitat with higher train-strike risk along the alignment include: remnant vegetation areas of west of Stockinbingal along Burley Griffin Way track to the north, larger remnant vegetation patches around Isobel Creek and Dirnaseer Rd, Run Boundary Creek, vegetated areas around Ironbong Road and Ulandra Creek, Old Sydney Road, remnant vegetation along Olympic Hwy (near Walbridge Lane) and Billabong Creek. As the speed and trajectory of a train cannot be changed to avoid collisions, mitigation measures must rely almost entirely on preventing the animals from entering or remaining on the train tracks (Borda-de-Água, Barrientos et al. 2017). Consequently, while it is not possible to eliminate the risk of roadkill and train strike occurring, it is possible to minimise this through consideration of design of roads/access routes, landscaping, implementation of fauna connectivity structures at key locations and the implementation of road signs and speed limits.

L.2.3 Railways as barriers

Railways can present barriers to wildlife in a variety of ways. These barriers to wildlife may be physical (i.e., when a species cannot cross the railway) or behavioural (when the species may be physically able to cross the barrier but does not do so because of unfavourable ambient conditions or perceived risk) (Borda-de-Água, Barrientos et al. 2017). Behavioural barriers are often more complex than physical barriers and may occur due to associated rail disturbances such as traffic noise, vibrations, chemical pollution, and human presence.

Barrier effects do not impact all species equally, for example smaller species (such as reptiles) may be more susceptible to physical barrier constraints such as the size of obstacles, causing them to become trapped between rails. Other species with specific habitat requirements may be less likely to attempt crossing of the rail due to the perceived potential risk of doing so (Borda-de-Água, Barrientos et al. 2017).

Fauna connectivity measures are often proposed as the best measure to mitigate the impacts of the barrier effect created by railways. Barriers along the railway such as exclusion fences are often proposed to reduce wildlife mortality and may be useful along areas of high wildlife collisions. However, fences may be less effective for species capable of climbing, jumping over, passing through, or digging under them and will not mitigate the longer-term population effects of loss of connectivity and gene-flow (Barrientos and Borda-de-Água 2017).

A number of measures to retain connectivity are proposed for this strategy, however crossing structures are the primary measure recommended to mitigate both the mortality and barrier effects the railway infrastructure (Dorsey, Olsson et al. 2015).

L.3 Landscape context

L.3.1 Key habitats and connectivity

Within the subject land, fauna connectivity is provided through:

- densely vegetated areas along road corridors (i.e., Old Sydney Road, Ironbong Road)
- vegetated strips along smaller roads, paper roads and travelling stock reserves
- vegetated riparian corridors (i.e., Billabong Creek, Bethungra and Boundary Creek Ulandra Creek) particularly those containing large river red gums and hollow-bearing trees
- small, isolated patches of woodland within farmland
- paddock trees.

L.3.1.1 Roadside remnants and travelling stock reserves

Within the subject land, key road reserves including Old Sydney Road, Ironbong Road and Dirnaseer Road are vegetated with remnant vegetation and providing key connectivity between remnant vegetation to the west of the proposal and habitat to the east, including important habitat associated with Ulandra Nature Reserve and surrounding Bethungra and Ulandra Mountain range. This nature reserve is known to contain important reproductive and foraging resources for Superb Parrot and significant habitat for the Turquoise Parrot along with other regionally uncommon species (Department of Climate Change Energy the Environment and Water 2023a). Linear habitat patches associated with riparian areas and road reserves also create links to smaller isolated patches of habitat and scattered trees within the landscape.

Areas of Crown Land (including Travelling Stock Reserves) also occur throughout the subject land. These mostly occur along road reserves, as well as along property boundaries or in association with creeks and rivers and can provide continuous linear strip or patches of vegetation. In some locations these connect to larger patches of vegetation elsewhere, providing increased connectivity in the landscape. A diversity of taxa use these habitats including birds, arboreal mammals, reptiles and frogs. Threatened species such as Superb Parrots are likely to make use of these habitats for foraging and breeding, and Squirrel Gliders are likely to rely on remnants around Old Sydney Road and Ironbong Road for foraging and dispersal.

L.3.1.2 Riparian corridors

Major riparian corridors in the subject land include Billabong Creek, Ulandra Creek, Ironbong Creek and Run Boundary Creek. Within the locality, these corridors generally run from east to west and link Bethungra and Ulandra Mountain range to the east and areas of habitat to the west.

Riparian corridors often provide some of the few remaining tracts of remnant vegetation for native fauna in modified agricultural landscapes. Even small, narrower corridors through agricultural land provide important habitat for movement of small woodland birds and wider roaming native species such as macropods. Riparian corridors provide critical landscape linkages for all native fauna including fish, small and large terrestrial animals such as reptiles, frogs, kangaroos, wallabies and more mobile arboreal species such as birds, possums, gliders and bats. These habitats provide important foraging resources during movement through the landscape for threatened species such as Superb Parrot, Southern Myotis along with roosting and breeding resources, particularly in areas with large hollow-bearing trees and river red gums.

L.3.1.3 Isolated vegetation patches and paddock trees

Stepping stone connectivity is provided through the subject land by small patches of woodland vegetation retained in farmland, as well as isolated paddock trees. This vegetation type is often highly modified by grazing, clearing and other agricultural practices and depending on patch size and distance between remnants, these areas often lack critical functional attributes and connectivity required to support species for prolonged period or meet minimum home-range size. However isolated remnants are often critical ‘stepping stone’ features to allow movement of native fauna through predominantly cleared agricultural land.

These areas are particularly important for mobile species such as birds and bats. Other species such as Squirrel Gliders may use isolated remnants for movements on occasion (depending on distance between trees).

L.3.2 Box Gum Woodland connectivity

White Box – Yellow Box Blakely's Red Gum Woodland ecological community (Critically Endangered under the BC Act) is a key threatened ecological community occurring within the subject land and has potential impacts in connectivity where the proposed action intersects patches. Within the subject land, this community currently occurs in an already fragmented state due to historic clearing for agricultural practices, with most remaining remnants of the community restricted to road corridors, isolated paddock trees and larger patches within farmland. Key patches of the community providing connectivity within the landscape to larger habitat remnants east and west of the subject land include a larger patch north of Burley Griffin Way, road reserve vegetation along Burley Griffin Way, Dudauman and Olympic Highway and scattered remnant paddock trees. Overall, occurrences of the community within the subject land provide limited connectivity, appearing as isolated patches and patches subject to high levels of disturbance from grazing and high edge effects from cropping.

Detailed design has explored a number of different alignment options, with the final design avoiding as many areas of ecological constraint (including Box Gum Woodland) as practical. As the proposal involves the removal of vegetation along a linear development, there will be marginal increases in fragmentation to large patches and roadside remnants of the community within the locality and increased distance between smaller patches. This clearing is likely to have a very marginal impact on native fauna connectivity, as the majority of fauna species (including threatened species) likely to utilise these habitats are highly mobile species such as birds and bats and are likely to be able to traverse large areas of cleared land as part of local movements. Where possible, design refinement has resulted in locating of impact in areas of lower condition vegetation (including areas with lower vegetation integrity score, such as those subject to historic canopy removal) and the much of the higher condition patches of Box Gum woodland within the locality have been avoided as part of this process. Detailed design would ensure ancillary facilities and temporary construction sites will be located within areas of low biodiversity values (i.e. cleared land) and avoid direct impacts to Box Gum Woodland as far as practical. Functional connectivity of the community (pollination, seed dispersal) is unlikely to be significantly reduced for the community within the locality, though there will be minor increases in edge effects (including weed invasion and disturbance) for adjacent patches. No areas of the community representing important foraging or breeding habitat for key threatened species would be removed by the proposal.

Connectivity between Box Gum woodland remnants for native fauna would be enhanced through the addition of connectivity measures outlined in section L.4, below including the addition of crossing structures, fencing and revegetation. Revegetation around key areas of the community such as Burley Griffin Way and Dirnaseer Road would be used to maintain consistency of native fauna movement across the corridor and enable the persistence of key habitat resources. Revegetation around areas of Box Gum woodland should reflect adjacent plant communities and plantings should be consistent with White Box – Yellow Box Blakely's Red Gum Woodland ecological community characteristic species wherever possible.

L.3.3 Threatened fauna

L.3.3.1 Threatened fauna recorded or likely to occur

Nine threatened or migratory fauna species listed under the Biodiversity Conservation Act 2016 (BC Act) and/or EPBC Act were recorded during surveys for the proposal. A number of additional threatened or migratory fauna species are likely to occur. These are identified in Table L.1. The gap threshold (gap above which the species is unlikely to cross) for these species is based on a review of literature. Species that require connectivity structures or mitigation (based on gap threshold or other ecological traits) are also identified.

Table L.1 Summary of threatened species identified in the subject land during survey or considered likely to occur and benefit from connectivity measures

Common name	Scientific name	BC Act status[1]	EPBC Act status[2]	Gap threshold (m)	Recorded during survey	Require connectivity structures or mitigation
Birds						
Australasian Painted Snipe	*Rostratula australis*	E	E	>250	No	No
Barking Owl	*Ninox connivens*	V		>250	No	No
Black Falcon	*Falco subniger*	V		>250	Yes	No
Brown Treecreeper	*Climacteris picumnus victoriae*	V		<60	Yes	Yes
Diamond Firetail	*Stagonopleura guttata*	V		<60	Yes	Yes
Flame Robin	*Petroica phoenicea*	V		<60	Yes	Yes
Fork-tailed Swift	*Apus pacificus*		M	>250	No	No
Grey-Crowned Babbler	*Pomatostomus temporalis temporalis*	V		<200	Yes	Yes
Gull-billed Tern	*Gelochelidon nilotica*		M	>250	No	No
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V		<60	No	No
Little Eagle	*Hieraaetus morphnoides*	V		>250	No	No
Little Lorikeet	*Glossopsitta pusilla*	V		>250	No	No
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V		<60	No	No
Painted Honeyeater	*Grantiella picta*	V	V	>250	No	No
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	V		>250	No	No
Rainbow Bee-eater	*Merops ornatus*		M	>250	Yes	Yes
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	>250	No	No
Satin Flycatcher	*Myiagra cyanoleuca*		M	>250	No	No
Scarlet Robin	*Petroica boodang*	V		<60	No	Yes
Speckled Warbler	*Chthonicola sagittata*	V		<60	No	Yes
Spotted Harrier	*Circus assimilis*	V		>250	No	No
Square-tailed Kite	*Lophoictinia isura*	V		>250	No	No
Superb Parrot	*Polytelis swainsonii*	V	V	>250	Yes	Yes
Swift Parrot	*Lathamus discolor*	E	CE	>250	No	No

Common name	Scientific name	BC Act status[1]	EPBC Act status[2]	Gap threshold (m)	Recorded during survey	Require connectivity structures or mitigation
Turquoise Parrot	*Neophema pulchella*	V		>250	No	No
Varied Sittella	*Daphoenositta chrysoptera*	V		<60	No	Yes
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	M	>250	No	No
White-fronted Chat	*Epthianura albifrons*	V		<60	Yes	Yes
White-throated Needletail	*Hirundapus caudacutus*		V; M	>250	No	No
Mammals						
Squirrel Glider	*Petaurus norfolcensis*	V		<70	Yes	Yes
Corben's Long Eared Bat	*Nyctophilus corbeni*	V	V	>250	No	No
Grey-headed Flying-fox	*Pteropus poliocephalus*		V	>250	No	No
Large-eared Pied Bat	*Chalinolobus dwyeri*		V	>250	No	No
Little Pied Bat	*Chalinolobus picatus*	V		>250	No	No
Southern Myotis	*Myotis macropus*	V		>250	No	No
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V		>250	No	No

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory as listed under the EPBC Act

L.3.3.2 Migratory species listed under the EPBC Act

No mapped important habitat for migratory waders is located within or close to the subject land. There is marginal habitat for two migratory species (Fork-tailed Swift and White-throated Needletail) that are predominately aerial and may forage within the subject land on occasion but are more likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. No migratory species that would benefit from connectivity structures are relevant to this strategy.

L.3.3.3 Key threatened species relevant to this strategy

Squirrel Glider

A total of three Squirrel Glider individuals were recorded in the subject land during spotlighting surveys in 2018, including one individual near Billabong Creek, and two individuals along Ironbong Road, north of Ulandra Creek. An additional 70.09ha of foraging (woodland) habitat for Squirrel Gliders was also mapped within the subject land as likely to be impacted by the proposal. Key areas of connectivity for Squirrel Gliders within the subject land include remnant vegetation corridors around Old Sydney Road and Ironbong Road, and along creeklines such as Billabong and Ulandra Creek. Squirrel Gliders are likely to use these areas on occasion for foraging and dispersal and as connectivity corridors to higher quality remnants to the east of the subject land.

Surveys did not record any hollow trees that were actively being used for denning habitat, however 41 hollow-bearing trees were recorded within the subject land and these trees have potential to be used by the species for denning on occasion, where they occur within habitat remnants.

Squirrel Glider is limited by gliding distances between areas of habitat. Fragmentation and increases in mortality may reduce gene flow and gene pool and lead to inbreeding depression in remnant populations of Squirrel Glider with greater risk of loss due to mortality and catastrophes (such as wildfires). For long-term viability of populations fragments must be functionally linked to large remnants or multiple smaller habitat patches. Habitat for the Squirrel Glider becomes fragmented once tree spacing becomes beyond their gliding capacity. Squirrel Gliders primarily move through their home range by gliding from tree to tree. Reports of average glide length varies from 21.5m (Goldingay and Taylor 2009) to 30–40m (van der Ree 2002) with a reported range of 9–47m in a horizontal plane and mean glide angle of 28.5°, with no differences between the sexes (Goldingay and Taylor 2009). Based on the glide angle and glide distance, a tree-gap of 20 metres or 43 metres will need to have trees a least 13 metres and 25 metres tall, respectively, to enable animals to safely glide across the gap (Goldingay and Taylor 2009). Where taller trees are present along the rail line gliders would be able to cross the gap, although the gap created may be at or near the limit of the species gliding distance. Where glider poles are used, height is an important consideration as one study reported that glides would be a maximum of only 25m for a pole crossbar height of 11.7m (Ball and Goldingay 2008). Additionally, although the species has been reported of making glides up to 70m in fragmented landscapes (van der Ree, Bennett et al. 2004), typical gliding distances are closer to 20-40 m (van der Ree, Bennett et al. 2004, van der Ree, Cesarini et al. 2010) and the likelihood of Squirrel Gliders crossing a gap decreases with increased gaps and absence of tall trees around the crossing (van der Ree, Cesarini et al. 2010). Additional measures such as rope bridges may be used along with trees and poles to encourage more regular movements across fragmented landscapes (Soanes and van der Ree 2009).

Small woodland birds

Small threatened woodland birds within the subject land are generally considered unlikely to be impacted at a population level by fragmentation impacts created by the rail corridor due to the paucity of records, avoidance of high-quality connectivity areas (at old Sydney Road, Billabong Creek, Bethungra and Boundary Creek, Ironbong Road and Ulandra Creek) and the species' mobile nature. Several threatened woodland bird species were recorded or considered likely to occur within the subject land on occasion (see Table L.1 for full list of species). Smaller bird species which are often less mobile and may find the impacts of the rail alignment, infrastructure and road upgrades present a barrier to localised movement in the short term. The risk of a disruption to population connectivity is also higher for smaller, less mobile species, or those which avoid crossing larger open areas. In general, many small woodland birds are unable to cross gaps of greater than 100m in more fragmented landscapes (i.e., where connectivity is provided through 'stepping stones' such as scattered trees), and some species will not move between larger habitat patches (i.e., >10ha) that are separated by more than 1100m, even where structural connectivity (such as paddock trees or small woodland patches) persist (Doerr, Doerr et al. 2011).

Species that predominantly forage on the ground are at highest risk of train strike, due to potential for foraging on or near the rail corridor or movement between understorey foraging habitat. These include species such as the Diamond Firetail, Flame Robin and Grey-crowned Babbler. Species that forage in the canopy or on trunks (such as the Brown Treecreeper), would have a lower risk of train-strike. Due to the avoidance of high-quality habitat corridors during proposal design, and low numbers of recorded individuals the risk of train strike at a population level is considered overall to be low for small, threatened woodland birds. However, these species may benefit from connectivity measures in areas where foraging habitat (particularly good-quality patches of mid and understorey habitat) is removed or fragmentated.

Parrots and cockatoos

One threatened parrot species (Superb Parrot) was recorded in the subject land (discussed in more details below) and a number of other parrot and cockatoo species were considered likely to occur due to the presence of potential habitat, including the Little Lorikeet, Major Mitchell's Cockatoo, Purple-crowned Lorikeet, Swift Parrot and Turquoise Parrot. These species may be at a slightly increased risk of injury and mortality from train strike during operation of the rail line if seed-eating species are drawn to feed in the open clearing of the rail alignment.

However, with the exception of Superb Parrot, the lack of records for these species within the subject land and highly mobile nature of the species, means there is unlikely to be any significant population level mortality or loss of connectivity, as the clearance area would not present a barrier to movement and the species would continue to utilise resources and move across the woodland as a single contiguous area.

Superb Parrot

Superb Parrot was recorded at a number of locations throughout the subject land, and is associated with areas of eucalypt woodlands, particularly River Red Gums (*Eucalyptus camaldulensis*) and box eucalypts such as Yellow Box (*Eucalyptus melliodora*) or Grey Box (*E. microcarpa*). Due to its highly mobile nature, Superb Parrot is presumed to be able to cross all gaps created by the rail corridor and associated infrastructure. However, the species often forages on the ground, eating grass seeds and understorey species, and is known to forage on spilt grain along roadsides, resulting in collisions with vehicles (Department of Climate Change Energy the Environment and Water 2023b). However, due to the low frequency of rail traffic (it is estimated that the Illabo to Stockinbingal section of Inland Rail would be trafficked by an average of 6 trains per day (both directions) in 2026, increasing to 11 trains per day (both directions) in 2040) and the limited habitat resources within the rail corridor (i.e., general lack of native grasses, cereal crops or spilt grain used for ground-foraging within the immediate corridor infrastructure), train-strike risk to this species is considered to be low.

Bats

No threatened bat species were recorded, however a number of threatened bat species were considered to have potential habitat in the subject land, including the Corben's Long Eared Bat, Grey-headed Flying-fox, Large-eared Pied Bat, Little Pied Bat, Yellow-bellied Sheathtail-bat. These threatened bat species may be at a slightly increased risk of train strike at night. However, all threatened bat species with potential to occur are highly mobile species which would be able to cross gaps created by the rail corridor and associated infrastructure, though artificial lights and noise may marginally increase risk of train mortality or alter foraging patterns for some species (Borda-de-Água, Barrientos et al. 2017).

Southern Myotis

Southern Myotis lives in most habitat types, provided they are near water (Churchill 2008). The species generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. They forage over streams and pools (preferring large pools over fast-flowing streams) catching insects and small fish by raking their feet across the water surface (Churchill 2008, Department of Planning Industry and Environment 2020). Habitat for this species within the subject land is mostly restricted to creeklines including Isobel Creek, Run Boundary Creek, Ulandra Creek and Billabong Creek. Southern Myotis may be at slight increased risk of train strike at night when foraging along waterways that intersect the proposal. However due to the lack of records, absence of preferred foraging habitat (large pools over fast-flowing streams) and highly mobile nature of the species the proposal is unlikely to have a significant impact on this species.

Raptors

One threatened raptor species (Black Falcon) was recorded within the subject land and a few additional species are considered likely to occur based on the presence of potential habitat including Barking Owl, Spotted Harrier and Square-tailed Kite. Birds of prey are often reported among railway bird mortalities globally, potentially due to their use of perches along trails and of railway verges when hunting. Birds of prey are also likely to forage for carcasses along the railway lines and train lights also increase the likelihood of owl kills when they become disoriented (Borda-de-Água, Barrientos et al. 2017).

Only one record was made of Black Falcon, outside of the subject land and no additional records for threatened raptors were made within the vicinity of the proposal. All raptor species with potential to occur are highly mobile and presumed to be able to cross all gaps created by the rail corridor and associated infrastructure.

Fish

No threatened fish species were recorded or considered likely to occur within the subject land. The proposal includes a number of bridges and culverts for waterways. Several waterways occur through the subject land which require consideration of fish passage. Structural barriers, including waterway crossings can impede natural flows and create physical and hydrological barriers to fish movement (DPI Fisheries 2013). To ensure that fish passage is maintained, watercourse crossing structures would be designed in accordance with Why do fish need to cross the road? Fish passage requirements for waterway crossings (Fairfull and Witheridge 2003) and the *Policy and Guidelines for Fish Habitat Conservation and Management Update 2013* (DPI Fisheries 2013).

L.4 Connectivity structures and measures

Due to the limited vegetation within the subject land and its occurrence either as scattered trees in agricultural land or as narrow strips along watercourses or roads, there are limited opportunities to provide connectivity structures. The key opportunities are:

- ensuring bridges are designed to provide dry passage for fauna
- avoiding in stream structures that may hinder fish passage
- ensuring culverts are designed to maintain passage for aquatic and terrestrial species
- minimising width of clearing in areas of native vegetation to maintain connectivity for mobile species such as birds and bats.

The precise locations of fauna connectivity measures would be determined during detailed design as part of the Final Fauna Connectivity Strategy and would take into account locations of suitable trees and vegetation, including consideration of height of remaining trees, gap between trees and the gliding angle of Squirrel Glider as well as engineering and safety requirements. Fauna connectivity measures will be incorporated into the design of the proposal. These comprise several dedicated fauna structures, including dedicated canopy bridges and drainage structures that would also be used by fauna, such as bridges and culverts. Fencing around connectivity areas and revegetation to the start of a crossing structure is important to encourage use while reducing predation risk. All fencing around vegetation connectivity and structures would conform to native fauna-friendly design standards and would not include barbed wire or other materials potentially hazardous to native fauna entanglement.

A summary of connectivity measures is provided in Table L.1 and discussed further in sections below. The proposed locations and target species for structures is provided in Table L.2.

Table L.1 Potential connectivity measures proposed

Category	Item	Description	Recommended for proposal?
Connectivity structure	Bridges/fauna underpass	Provision of dry passage to allow connectivity between patches of vegetation.	Yes – discussed in detail in following sections.
	Canopy bridges	Rope bridges strung between poles and tying into nearby trees to allow arboreal animals to cross above the rail corridor.	Yes – discussed in detail in following sections.
	Glider poles	Wooden pole structures with crossbars set either side of the rail to enable gliding species to cross above the rail corridor	No – these structures are generally not recommended for the proposal due to mortality risks (as gaps created by the rail corridor are generally at or beyond the gliding capacity of the Squirrel Glider). Canopy bridges are proposed as an alternative for this species and discussed in the following sections.
	Combined drainage/fauna culverts	Drainage culverts that are located in appropriate habitat and are of a size that may also be used by fauna.	No – I2S proposed culverts are not sufficiently large to enable passage for target species.
	Stock underpass/ fauna underpass	Stock underpasses that may be used as incidental fauna crossings. Dry passage provided all the time.	Yes – However, these structures are of small size and predominantly in cleared agricultural areas so not relevant to most native species. Where structures are located near fauna habitats they are recommended for connectivity measures and are discussed in detail the following sections.

Category	Item	Description	Recommended for proposal?
	Barrier poles or mesh fencing	Barriers installed on bridges in vegetated areas to prevent aerial species that are flying along creek corridors from flying into the side of trains. These structures are recommended for the proposal and are discussed in detail below.	Yes – discussed in detail in following sections.
	Ballast removal	Targeted removal of ballast between sleepers to allow movement of small terrestrial animals under the rail tracks.	No – not proposed for this project as there are no target species which would benefit from this measure.
Supporting measures	Fencing	Fencing specifically constructed to funnel fauna towards crossing structures but prevent access to the rail line. Design would conform to native fauna friendly standards.	Yes – discussed in detail in following sections.
	Revegetation	Revegetation near crossing structures and other locations to encourage fauna to move across the rail corridor.	Yes – discussed in detail in following sections.

Table L.2 Bridge crossings and suitability for fauna connectivity

Chainage	Location notes	Crossing type	Crossing length (m)	Approximate minimum height above ground (m)	Key threatened species	Other fauna	Design notes
711	Billabong Creek	Bridge underpass	56	3.2	Squirrel Glider Superb Parrot Southern Myotis	Terrestrial fauna (i.e., echidna, macropods, reptiles, possums, frogs) Fish	Revegetation surrounding and beneath bridge. Include fauna furniture
5600	Old Sydney Road	Rope bridge	N/a	N/a	Squirrel Glider	Arboreal fauna (possums, gliders)	Minimise width of clearing
7904	Ulandra Creek	Bridge underpass	56	3.5	Squirrel Glider Superb Parrot Southern Myotis Threatened birds and bats	Terrestrial fauna (i.e., echidna, macropods, reptiles, possums, frogs)	Revegetation surrounding bridge
8200	Ironbong Road	Rope bridge	N/a	N/a	Squirrel Glider	Arboreal fauna (possums, gliders)	Minimise clearing and revegetate surrounding area
12346	East of Ironbong Road	Stock underpass/culvert	12	3	N/a	Terrestrial fauna (i.e., echidna, macropods, reptiles, possums, frogs)	Minimise clearing and revegetate surrounding area Include fauna furniture if unobstructive to stock passage
13351	East of Ironbong Road	Stock underpass/culvert	12	3	N/a	Terrestrial fauna (i.e., echidna, macropods, reptiles, possums, frogs)	Minimise clearing and revegetate surrounding area Include fauna furniture if unobstructive to stock passage

Chainage	Location notes	Crossing type	Crossing length (m)	Approximate minimum height above ground (m)	Key threatened species	Other fauna	Design notes
14422	Run Boundary Creek	Bridge underpass	92	3.4	Squirrel Glider, Superb Parrot	Terrestrial fauna (i.e., echidna, macropods, reptiles, possums, frogs)	Minimise clearing and revegetate surrounding area Include fauna furniture. Include barrier poles
18441	Dirnaseer Road	Bridge underpass	69	5.3	N/a	Terrestrial disturbance-tolerant fauna only (e.g.., macropods)	Revegetate surrounding area
18750	North of Dirnaseer Road	–	N/a	N/a	Threatened birds and bats Superb Parrot Squirrel Glider	Birds and bats)	Minimise width of clearing
20111	Isobel Creek	Bridge underpass	69	9	Superb Parrot Squirrel Glider	Birds and bats Terrestrial fauna (i.e., echidna, macropods, reptiles, possums, frogs)	Minimise width of clearing at Isobel Creek and in vegetation north of creek Include barrier poles
20460	Isobel Creek	Bridge underpass	69	3.2	Superb Parrot Squirrel Glider	Birds and bats Terrestrial fauna (i.e., echidna, macropods, reptiles, possums, frogs)	Minimise width of clearing and revegetate surrounding area Include barrier poles
28232	Old Cootamundra Road	Bridge underpass	56	5.3	N/a	Terrestrial disturbance-tolerant fauna only (i.e., macropods, possums)	Revegetate surrounding area

Chainage	Location notes	Crossing type	Crossing length (m)	Approximate minimum height above ground (m)	Key threatened species	Other fauna	Design notes
35902	Powderhorn Creek	Bridge underpass	42	1.6	N/a	Terrestrial disturbance-tolerant fauna only (e.g., macropods)	
36189	Powderhorn Creek	Bridge underpass	42	3.1	N/a	Terrestrial disturbance-tolerant fauna only (e.g., macropods)	
37280	Burley Griffin Way	–	N/a	N/a	Threatened birds and bats Superb Parrot Squirrel Glider	Birds and bats	Minimise width of clearing and avoid clearing along southern side of Burley Griffin Way if feasible
37930	Dudauman Creek	Bridge underpass	28.8	1.7	Threatened birds and bats Superb Parrot Squirrel Glider	Birds and bats) Terrestrial fauna (i.e., echidna, macropods, reptiles, possums, frogs)	Minimise clearing and revegetate surrounding area

L.4.1 Connectivity structures

L.4.1.1 Bridges

The proposal includes the installation of eight new watercourse bridges. Bridges for I2S range in length from 26m to 92 metres. Clearance under bridges varies, however is designed to be typically above the 100-year flood level. Connectivity at bridges would be limited to varying degrees during rain or flood events but this disruption to connectivity would be relatively short-lived and infrequent. Given the ephemeral nature of the majority of creeks in the subject land all bridges would be considered to provide suitable dry passage for terrestrial fauna. Depending on the size and type of structure, bridge underpasses can provide safe passage a wide variety of native fauna including bats, birds, reptiles, amphibians, mammals and arboreal mammals (Abson and Lawrence 2003, Goosem, Weston et al. 2005). Structures can be particularly effective when combined with other measures such as revegetation under and around bridges and use of fauna furniture (Abson and Lawrence 2003, Goosem, Weston et al. 2005).

Connectivity at bridges would be enhanced through use of fauna furniture, where possible. Fauna furniture (e.g. horizontal wooden poles attached to appropriate piers) is recommended for bridges in riparian corridors (where height allows). A minimum height for fauna passage would be 1.5m. Minimum width of 1.5m should be provided for dry passage. It is recommended that bridges for microbats and woodland birds have over three metres average clearance (i.e., above, or equal to the height of surrounding native mid-storey trees and shrubs) to allow corridor movement.

L.4.1.2 Culvert underpasses

Culverts proposed for I2S include approximately 88 new and existing cross drainage culverts below the rail formation and about 27 longitudinal drainage culverts below level crossings. Proposed culverts are either round pipe or rectangular box culverts. All proposed box culverts are 1.65m or less in height (with majority being 0.9m high) and are less than 2.5m in width. Similarly, maximum diameter of pipe culverts is 1.35m, with most being smaller than this. These culverts may be considered incidental underpasses as they may provide some connectivity for common native fauna species (predominantly small mammals, reptiles or frogs that are tolerant to disturbance) and these culverts would be dry the majority of the time as most drainage lines in the region are subject to ephemeral flows only. However, threatened species and avian or arboreal species that are considered likely to occur in the subject land are generally unlikely to use these structures.

L.4.1.3 Culvert/stock underpasses

Eleven stock underpasses are proposed for I2S. These underpasses take the form of box culverts and are of a standard size (3m tall x 3m width). Although these underpasses provide dry passage under the railway line and could be considered suitable for native fauna species, the majority of these features are located in cleared agricultural land, containing non-native vegetation, and are unlikely to be used regularly by native fauna, with the exception of disturbance-tolerant species with broad home ranges such as macropods. Two stock underpasses are located in close proximately to native vegetation and fauna habitat, and have been recommended for inclusion as connectivity measures, as outlined in Table L.2, above. These underpasses may be used by threatened woodland birds or microbats and terrestrial fauna on occasion, during passage to higher quality habitats.

L.4.1.4 Canopy bridges and glider poles

Rope canopy bridges are a suitable measure to help reduce vehicle strike, enable habitat connectivity and reduce population isolation impacts for arboreal mammal species (Weston, Goosem et al. 2011, Goldingay, Rohweder et al. 2012). Canopy rope crossings have proven useful for a number of glider and possum species including the Feathertail Gliders, Common Ringtail Possums Common Brushtail Possums and the NSW-listed Vulnerable Squirrel Glider. In addition, glider poles (i.e., wooden poles) that are installed across gaps in tree cover have the potential to connect habitat patches for gliding mammals and allow dispersal through a fragmented landscape (Ball and Goldingay 2008).

Squirrel Gliders are able to use poles within a 70 metre clearing to traverse between habitat patches (Ball and Goldingay 2008). No glider poles are proposed as much of the rail corridor is at or beyond the gliding distance of the Squirrel Glider and there is a high risk of mortality due to double-stacked containers on trains. Canopy bridges are preferred to glider poles as they provide crossing opportunity for a greater range of species and use by several glider species has been confirmed in a highway setting (Goldingay, Rohweder et al. 2012, Sandpiper Ecological 2014). Canopy bridges also provide greater flexibility as they can be designed to fit the forest gap and ae therefore suitable at locations where gliding poles would be too far apart.

L.4.1.5 Barrier poles

Barrier poles, combined with flag elements have previously been used as an inexpensive mitigation measure for reducing bird collision with trains, as it can divert the flight of medium or large sized birds above the height of the poles (Jacobson 2005, Zuberogoitia, del Real et al. 2015, Borda-de-Água, Barrientos et al. 2017). Barrier poles should be investigated for use in I2S due to the height of trains (up to 6.5m high, double-stacked containers) to be set at regular intervals along either side of the bridge where the main gap in vegetation (i.e., the flyway) is located. Barrier poles are recommended for:

- Isobel Creek
- Run Boundary Creek.

L.4.2 Supporting measures

L.4.2.1 Fauna fencing

Fauna fencing can be an effective measure to reduce wildlife-vehicle collisions and funnel wildlife to crossing structures (Van Der Ree, Gagnon et al. 2015). Exclusion fencing is broadly considered to be the most effective means of restricting wildlife access to railways (Van der Grift 1999, Ito, Lhagvasuren et al. 2013) and can substantially reduce wildlife mortality (Dorsey, Olsson et al. 2015). However, fencing along railways can contribute to the barrier effects of the infrastructure on wildlife and are generally recommended only in areas of high collision potential (Borda-de-Água, Barrientos et al. 2017). In addition, fences can be less effective for species capable of climbing, jumping over, or digging under them, and escapes (i.e., one-way gates, return ramps) should be provided where fencing is used to avoid animals becoming trapped between fences on both sides of the railway (Jackson and Griffin 2000).

Standard stock fencing is proposed for I2S along the rail corridor, where it is located on, or adjoins, private land and where the rail corridor abuts an existing public road with stock movements. This fencing is unlikely to prevent access to the corridor by native fauna species which can jump over or climb under the fence. However, it is recommended that this fencing is be constructed using a native fauna friendly design. This includes the exclusion of materials such as barbed wire which can be potentially hazardous to species such as woodland birds, bats and arboreal mammals. Fauna fencing is also proposed, with the proposed standard fauna fences being about 2m in height (suitable to deter medium-sized mammals (e.g., kangaroos)) and buried 30 centimetres (cm) to prevent fauna species from digging under the fence. A floppy top could also be added to the fence to prevent fauna (i.e., possums and gliders) from climbing over.

Fencing is recommended on either side of bridges to direct fauna to the crossing location. Lengths of fencing should be further investigated in the Final Fauna Connectivity Strategy to allow a balance between fenced and unfenced sections, and the associated barrier effect of fencing, as well as to take into account risk of flooding and damage. Fencing must be carefully designed and integrated with crossing structures to avoid contributing an additional barrier to movement and potentially resulting in reduced migration, dispersal and gene flow (Van Der Ree, Gagnon et al. 2015). Fencing should be used to direct fauna towards crossing points and prevent access to the rail corridor around these locations.

The Final Fauna Connectivity Strategy will identify the type and location of fauna fencing and appropriate vegetation rehabilitation based on the detailed design of the proposal.

L.4.2.2 Revegetation

The focus of rehabilitation for the project will be around larger areas of connected vegetation along the alignment, at riparian corridors and within and around fauna crossing structures. The proposed rehabilitation plan will follow ARTC's landscape design specification notes that development within ecologically sensitive landscapes should consider the existing flora and fauna and take opportunities to enhance the quality of habitat for species within the rail corridor through rehabilitation (ARTC 2021).

Revegetation in designated areas (see Table L.2 above) would be undertaken on completion of construction. Revegetation under bridges and at the approaches to crossing structures would also assist with increasing the efficacy of these structures for connectivity.

The following guidelines should be taken into consideration for the vegetation rehabilitation plan:

- Revegetation around bridges and crossings must be commenced as soon as practicable after clearing of existing vegetation and construction of the structure.
- Revegetation to create habitat linkages will focus on key areas of connected vegetation where feasible and consistent with the safe operation and maintenance of the railway. Where possible, key habitat corridors within the alignment should be retained (as a first preference) or rehabilitated using the vegetation including trees, groundcovers, low shrubs and coarse woody debris. These areas of connected vegetation will aim to encourage movement of native woodland birds and terrestrial species across the rail corridor.
- Revegetation would be undertaken using flora species typical of the adjacent vegetation communities and target key species through use of foraging resources, particularly mid and understorey species that direct fauna to use dedicated structures and provide a linkage between surrounding areas of established vegetation.
- Entrances to fauna crossing structures should not be obscured as a result of vegetation rehabilitation.
- Where possible, vegetation should be planted under larger fauna crossing structures, to encourage movement through these areas. This should primarily be done using understorey species, to ensure vegetation does not provide an obstruction to fauna passage.
- Revegetation of disturbed areas should occur as soon as possible, to minimise habitat fragmentation impacts.

L.4.3 Fish passage

The subject land contains six named creeks including Dudauman Creek, Powder Horn Creek, Isobel Creek, Run Boundary Creek, Ulandra Creek and Billabong Creek. Most watercourses along the subject land are 1st or 2nd order streams (determined using the Strahler stream ordering method) classified as Class 4 unlikely key fish habitats and Type 3 minimally sensitive fish habitat in accordance with the DPI guidelines, so do not require consideration of fish passage. Five named watercourses are defined as s Class 3 Minimal key fish habitat and are Type 3 minimally sensitive fish habitat. These sites lack habitat features such as in-stream gravel bed, rocks, snags and contained limited to no refuge pools and aquatic vegetation was limited to exotic *Juncus acutus*. They did however contain riparian vegetation/shading and in some cases, associated farm dams that may provide refuge for aquatic fauna.

Table L.3 outlines the key fish habitat within the subject land and proposed crossing structures. Crossing structures would be designed in accordance with Why do fish need to cross the road? Fish passage requirements for waterway crossings (Fairfull and Witheridge 2003) and the Policy and Guidelines for Fish Habitat Conservation and Management Update 2013 (DPI Fisheries 2013). For Class 3 Minimal key fish habitat, the minimum recommended crossing type is a culvert or ford. The minimum design should use the "low flow design' procedures; however, "high flow design" and "medium flow design" should be given priority where possible. In all cases bridges are preferred to arch structures, culverts, fords and causeways (in that order) (Fairfull and Witheridge 2003). With the exception of one of the Dudauman Creek crossings, the proposal includes bridges across all five of the watercourses containing key fish habitat, which is the preferred structure. One Class 2 watercourse was identified within the subject land (Isobel Creek).

The minimum recommended crossing type is a bridge, arch structure, culvert or ford. The proposal includes a bridge at this location, which meets the minimum requirements (Fairfull and Witheridge 2003).

No monitoring of aquatic species is proposed. Maintenance of crossing structures would be undertaken as necessary.

A detailed analysis of impacts on aquatic biodiversity and fish habitat, mitigations and consistency with relevant policy and guidelines is provided in the Technical Paper 2 – Aquatic biodiversity.

Table L.3 Key fish habitat

Watercourse	Strahler stream order	Habitat sensitivity type	Classification of watercourse for fish passage	Crossing structure
Dudauman Creek	3	Type 3 – minimal	Class 3 – minimal	Bridge
Isobel Creek	3	Type 2 – moderate	Class 2 – moderate	Bridge
Run Boundary Creek	3	Type 3 – minimal	Class 3 – minimal	Bridge
Ulandra Creek	3	Type 3 – minimal	Class 3 – minimal	Bridge
Billabong Creek	3	Type 3 – minimal	Class 3 – minimal	Bridge

L.4.4 Monitoring

The objective of the monitoring program is to assess the effectiveness of the fauna connectivity measures to facilitate movement of target species and thus help to maintain stable populations. The monitoring program should be SMART: Specific, Measurable, Achievable, Realistic, and Timely.

Monitoring measures that will be considered for implementation (to be detailed further in the Final Fauna Connectivity Strategy) include:

- Before/After Control/Impact (BACI) assessment
- occupancy/population modelling
- monitoring of crossing structures through cameras
- train strike impacts.

The chosen monitoring methods require consideration of a number of factors when assessing their suitability and effectiveness for the intended outcomes. Monitoring impacts on threatened species can be hampered by the following:

- Detectability: Cryptic or rare species are difficult to observe and therefore difficult to obtain enough information to gain meaningful results. Detection variability, including seasonal variation has the potential to bias estimates and make it more difficult to detect trends in the data. In addition, trends in population and inferences from data collection are likely to be difficult due to low numbers. Therefore, detectability must be considered and accounted for when analysing results of a monitoring program.
- Environmental responsiveness: species that have variable movement patterns or irruptive behaviour are difficult to monitor because it is difficult to predict where the animals are to obtain a count, and difficult to know if variability in counts is due to true changes in the population or simply a result of the movement of portions of the population.
- Environmental and climatic variability: high variation or noise in monitoring results will diminish the ability to detect and estimate trends.
- Bias: bias in monitoring methods used can cause monitoring programs to reach false conclusions regarding the trajectory of those population changes (Freegard and Williams 2009).

Appropriate monitoring is required for the proposal in order to measure the efficacy of the crossing structures and to collect useful information on impacts on wildlife populations to allow adaptive management responses to be developed.

The connectivity monitoring approach for the Final Fauna Connectivity Strategy is likely to be relatively simple as the connectivity locations are small in number and complexity. As such the primary method proposed for monitoring use of wildlife crossing structures for I2S is the use of infrared cameras placed on either side of the crossings. Infrared cameras provide a non-invasive technique from monitoring a broad array of species and can provide further information on key movement corridors and target species for connectivity (Barrueto, Clevenger et al. 2013, Soanes, Vesk et al. 2015, Jumeau, Petrod et al. 2017). However, additional monitoring methods will be considered and investigated for potential inclusion, as discussed below. Monitoring of fauna usage would be undertaken in combination with ongoing monitoring of crossing structures and structural integrity to provide required maintenance and measures to enhance suitability as required.

L.4.4.1 Monitoring of crossing structures

Monitoring of crossing structures by infrared cameras is the primary monitoring method proposed for this project. Cameras are an effective monitoring mechanism for wildlife crossings as they can: provide a non-invasive method of detection; provide proof of species presence in an area; for some species allow photo-identification of individuals; estimate the abundance, density and relative abundance of animal populations; allow biodiversity estimation and; are a cost-effective long-term monitoring tool (Gužvica, Bošnjak et al. 2014). Notably, additional costs of maintenance for cameras may be required for monitoring arboreal crossings (i.e., canopy bridges) if licenced operators or traffic management is required for access (Soanes, Vesk et al. 2015). In addition, consideration of additional monitoring methods for structures (such as long-term monitoring through trapping of individuals or use of track pads) may be considered to account for shortfalls of camera trapping (i.e., camera detection may only be successful from a limited area of observation (field of view) (Ford, Clevenger et al. 2009), and may underestimate passage of smaller or more cryptic species (Gužvica, Bošnjak et al. 2014)).

Structures would generally require cameras on each side to enable confirmation of successful crossings. Multiple factors should be considered when evaluating the success of crossing structures and barrier poles and the effectiveness of the monitoring method used. Broadly, mitigation measures should aim to both maintain or reinstate connectivity and gene flow for target species and prevent wildlife mortality along the alignment. Notably, high use of crossing structures may not always be an indicator of success. Crossing structures may be used for more regular, home-range use reasons (which may entail frequent crossing, at least during certain periods, by an individual), but may also be used for occasional dispersal (which would be uncommon). Despite these two scenarios entailing very different use rates, they can both be considered “successful” if they achieve the required outcomes (i.e., enabling safe passage of individuals, and continuation of population dispersal and gene flow). In addition to monitoring usage of structures, monitoring of structural integrity of connectivity structures would also be required. This is discussed further in section L.4.5, below.

L.4.4.2 Train strike impacts

Mortality of fauna through train strike should be monitored to feed into assessments of the effectiveness of crossing structures, fencing and revegetation. Fauna mortalities as a result of train strike should be recorded wherever possible along the alignment, and include areas of mitigation treatments (i.e., fauna crossings and barrier poles). Surveys of railway mortalities should aim to be systematic and frequent enough to collect required data (for example small animals such as mammals reptiles and bats may require more frequent surveys due to lower carcass persistence time (Borda-de-Água, Barrientos et al. 2017). A variety of data collection methods may be employed for gathering train-strike records such as: walking or driving surveys next to railways (generally by expert personnel to identify mortality hotspots); incidental observations of mortalities by railway staff and non-expert citizens; and video surveillance data. Collision risks can also be modelled across geographic space with a conceptual analytical framework using existing sources of data, which may be beneficial for informing management and mitigation measures used (such as modification of speed limits) (Visintin, Golding et al. 2018). Where possible, consistent methods should be used and specialised personnel employed for data collection and collation, however a data may be combined to provide comprehensive analyses.

In general, railway mortality should be presented as an index, reflecting the number of casualties/km/year, and these results should include information on sampling effort and periodicity (Borda-de-Água, Barrientos et al. 2017). More detailed data is likely to be required to inform management and monitoring during the short-term.

L.4.4.3 BACI design

Before After/Control Impact (BACI) designs provide an effective approach to account for any natural or pre-existing differences between sites, and thus to estimate the "true" effect of an impact variable (i.e., the anthropogenic disturbance of rail infrastructure) between the control and the impacted site. Collecting both the before and after data for an impact allows researchers to differentiate between variation caused by differences in time elapsed or location (i.e., 'natural' changes) versus. the variability caused by the impact (Seger, Sousa-Lima et al. 2021).

A BACI monitoring program can be an effective mechanism to assess the impacts of linear infrastructure and the effectiveness of associated mitigation measures for connectivity, however, only when the program is well-designed (Lesbarreres and Fahrig 2012). For example, BACI designs require adequate pre-impact data to be collected, and that appropriate control sites are selected (Smokorowski and Randall 2017). In addition, time constraints and funding availability in relation to developments often mean that monitoring is too short in duration to properly assess the effectiveness of connectivity structures. The length of time needed to detect an effects of the structures on animal movements depends on the expected frequency of movements so rarer movement patterns take longer to estimate movement rate. This means that more years will be needed to document movement rates for species with low population densities (as recorded in this study). Some species also have a delayed reaction to the presence of connectivity structures (Smokorowski and Randall 2017).

In BACI design, success can be defined as showing similar or better outcomes (e.g., trends) at impact sites compared to control sites. However, randomization and replication of experimental units is difficult with studies of this type, and there are also many controlling or confounding factors to contend with even in a replicated study (Underwood 1992). Pre-mitigation data must be comparable to post-mitigation data, which can be difficult to gather with the time and budget constraints of projects and the environmental limitations (such as low population numbers) (Hardy, Clevenger et al. 2003).

These issues are particularly pertinent to the proposal. Based on monitoring of species to date, key fauna species are likely to occur in low densities and may go through changes in abundance and distribution as a result of other factors, including climate change, ongoing agricultural practices, wildfire, and drought, accurate measurements of population abundance before and after construction of the rail line will be difficult. Replication of impact and control sites could help to address issues with independence, however given the likely complications with finding adequate control sites and time needed to gather adequate pre-impact datasets, the likelihood of achieving meaningful results with this method is considered to be low. For these reasons, the use BACI design in monitoring of fauna connectivity is unlikely to be useful for the proposal at this stage.

L.4.4.4 Occupancy/population monitoring

In order for programs mitigating the impacts of linear infrastructure to provide useful and meaningful information, programs must have sufficient experimental design, suited to the project in question and collect adequate data both pre- and post-construction (Clevenger and Waltho 2003). One of the best ways to assess the impacts of the infrastructure on wildlife and inform management decisions is through long-term monitoring of species occupancy, abundance, or demography. Collecting such data on multiple species can also contribute to an analysis of ecosystem-level impacts, rather than single species studies only (Clevenger and Waltho 2003). The suitability of an area as habitat for a species is influenced by local- and landscape-level variables, and data from both spatial scales are usually required to evaluate the direct and indirect effects of linear infrastructure (Clevenger and Waltho 2003, Smith, Van Der Ree et al. 2015).
One study of multiple crossing structures recommends that monitoring is designed to evaluate crossing structure efficacy cover a period of at least four years and longer if possible, particularly in unprotected areas or areas with human disturbance, where adaptation periods would likely be longer (Clevenger and Waltho 2003).

Smith *et al*., (2015) recommend studies begin prior to construction and continue for 5 or even 10 years if the target species is significant (e.g. endangered or high profile) or if acceptance by wildlife is slow.

For species with low detection probabilities, as occurs for this project, it may be more feasible to do occupancy modelling (which would provide a detection estimate for a habitat patch). Occupancy models provide an unbiased estimation of the probability of occurrence of a species among sampled sites (Bailey and Adams 2005), while exploring hypotheses about factors that may influence the species' occurrence, such as microhabitats, environmental conditions, etc. Occupancy models estimate the probability that a species occurs in a grid cell, while accounting for variation in detectability. Methods such as remote cameras can provide appropriate presence/absence data for input to occupancy modelling, as data can simultaneously be collected on multiple species (Shannon, Lewis et al. 2014).

Increasing total sampling effort generally decreases error associated with the occupancy estimate but changing the number of sites or sampling duration can have very different results, depending on whether a species is spatially common or rare and easy or hard to detect when present (Shannon, Lewis et al. 2014). These factors will need to be considered when developing the survey design. If the goal of the study is to estimate the occupancy of a rare species that is difficult to detect, it may be necessary to employ multiple methods. For rare species with a low probability of detection, required survey effort generally includes maximizing the number of sites and the number of survey days, often to a level that may be logistically unrealistic and an alternative approach for these species may be to simply try to determine if the species is present in the area of interest (Shannon, Lewis et al. 2014). Regardless of the approach taken, effective monitoring using occupancy monitoring generally requires prior biological knowledge, defined objectives and detailed planning.

L.4.5 Structural integrity monitoring

ARTC would maintain the connectivity structures for the life of the proposal as part of regular rail line maintenance. Monitoring of connectivity structures would focus on presence of blockages (culverts and bridges) and structural integrity (particularly relevant to canopy bridges and glider poles). Integrity of fauna furniture in dedicated underpasses would also be monitored, and wooden structures may require occasional replacement.

Three levels of inspections are typically carried out for highway structures (Department of Transport and Main Roads 2016) and are considered appropriate for railway structures. These include the following:

- Level 1 inspection: A visual inspection to check the overall serviceability of the structure
- Level 2 inspection: Detailed visual inspections with condition assessments
- Level 3 inspection: Special inspections and investigations.

All inspections are to be carried out in a uniform and consistent manner in accordance with the relevant ARTC guidelines and practice. Requirements for maintenance work would be determined from inspection reports and incorporated into the ARTC Asset Management System documentation.

Frequency of monitoring would depend on structure type and risk of damage or blockage. A visual inspection of all connectivity structures should be undertaken on an annual basis as part of the standard railway maintenance inspection program or following severe weather events.

Bridges would normally have routine Level 1 maintenance inspections annually to determine if there are any issues that need to be remedied to keep the public safe. Any issues relating to fauna connectivity could be assessed at this time (e.g. bank erosion in dry passage areas, large woody debris blocking passage etc.).

Culverts would normally be inspected on a less frequent (or as required) basis however it is recommended that relevant stock underpasses are inspected at least annually.

Routine (level 1) inspections should be carried out on all structures (bridges, culverts, glider poles, pole barriers) following reports of impact damage, or following flood events or bush fires. Wooden structures, such as fauna furniture within dedicated structures and canopy bridge supports, would also be inspected on an annual basis.

ARTC would conduct periodic inspections and maintenance of fencing along with general rail corridor asset maintenance. The program would include ongoing inspections of the structures as part of the standard maintenance requirements for stability and damage and replacement where necessary. Clearing of vegetation from exclusion fencing during these inspections may also be necessary. Checks of fencing integrity would also be carried out should threatened fauna roadkill be observed during operation. Data collected will also be used to help assess effectiveness of fencing.

Level 2 inspections would be carried out on a 5 to 10 year cycle or if issues are found during the Level 1 inspection. Level 2 inspections comprise detailed visual inspections where all components are inspected closely (within 1.0 metre). These inspections would involve the collection of quantitative data on structures for use in engineering analyses. Any issues relating to fauna connectivity should also be assessed during these inspections.

Level 3 inspections are not scheduled but may be required due to concerns over a structure's safety, condition, load capacity or for structures subject to complex associated repair, strengthening or widening works. Any changes to rail design in the future would require re-evaluation of fauna crossing structures.

L.4.6 Monitoring phases

Examples of recommended monitoring in each phase of the proposal are provided below. The monitoring approach and program will be developed further with inputs from the threatened species management plans and documented in the Final Fauna Connectivity Strategy, in consultation with BCD.

L.4.6.1 Pre-construction monitoring

Adequate pre-construction surveys and/or monitoring is required to gain baseline information on key species. Examples of monitoring or surveys to be considered include:

- targeted trapping, spotlighting, cameras and/or hair tube surveys for Squirrel Glider to gain pre-construction distribution and population information. Genetic sampling could also be conducted at this time to feed into later studies
- Songmeter and Anabat surveys to get detailed baseline information on the use of creeklines and other habitat as flyways.

L.4.6.2 Effectiveness of connectivity structures and mitigation measures

Monitoring of fauna use of connectivity structures post-construction should consider the following:

- monitoring use of structures using infra-red cameras. The use of canopy bridges and bridge underpasses would require cameras on each side to enable confirmation of successful crossings
- monitoring the effectiveness of fauna mitigation such as barrier poles and fencing
- monitoring of fauna mortality. This would require comparison of areas with and without fauna connectivity and mitigation measures
- genetic studies to assess gene flow following the construction of the rail line to determine if genetic exchange has continued to occur.

The threatened species management plans will identify the suitable methods and duration of this monitoring.

L.4.6.3 Population impacts

The barrier effect of the rail corridor should be monitored following construction. This may include a combination of the following:

- occupancy modelling, based on trapping, survey, remote cameras results etc
- genetic assessments to assess population structure. In this case, genetic sampling would be required prior to construction, and on-going sampling would be required to determine if the rail line has altered the population structures of threatened species
- collection of life history data where possible, for inclusion in population viability analysis (PVA)
- computer simulations, such as PVA
- monitoring the impact of the rail line on resident fauna, such as small woodland birds
- monitoring the use of landscaping treatments to encourage movement of woodland birds and terrestrial mammals
- monitoring of wildlife-train collisions as part of the adaptive monitoring of fauna connectivity, and additional fencing may be required if high concentrations of wildlife-train collisions are recorded, including as train volumes increase.

The threatened species management plans will identify the suitable methods and duration of this monitoring.

L.4.6.4 Pilot studies

Pilot studies should be conducted to determine the effectiveness of newer technologies and untested methods. These studies would then feed into adaptive management, with successful methods to be employed elsewhere along the alignment. These would include:

- effectiveness of barrier poles or mesh on bridges. Remote cameras, thermal cameras and/or Anabats would be used to monitor these treatments given the limited scientific literature related to this measure.

L.4.7 Indicators of success and triggers for corrective actions

Potential indicators of success and thresholds for adaptive management for crossing structures and population impacts are outlined in Table L.4 and Table L.5. These would be developed and refined further in consultation with BCD and summarised in the Final Fauna Connectivity Strategy. Note that both success criteria and corrective actions may both require refinement as a result of adaptive management.

Table L.4 Examples of indictors of success and thresholds for monitoring of connectivity measures

Structure	Indicators of success	Thresholds for adaptive management	Corrective actions
Bridges and stock underpasses	Evidence of regular usage by general fauna (non-threatened species) within 1 year.	No evidence of usage in defined timeframe.	Review fauna furniture, fencing, and landscaping treatments. Provide enhancements or adjustments (i.e., remove barriers) if necessary.
	Use by cover-dependent species and species with low mobility (e.g., threatened woodland birds and microbats) within 2 years.	No evidence of usage in defined timeframe.	Review fencing, and landscaping treatments. Provide enhancements or adjustments (i.e., remove barriers) if necessary.
	Low usage by feral predators (e.g., less than 20 percent of fauna crossings).	Evidence of regular usage by feral predators (e.g., more than 20 percent of fauna crossings).	Targeted predator control as required.
Canopy bridges	Uptake by Squirrel Gliders (successful crossings) within 2 years of installation.	No evidence of usage in defined timeframe.	Undertake further surveys to determine local population occupancy, determine if more time is required, or additional measures required (e.g., additional structures such as glider poles, additional revegetation etc.)
Barrier poles/mesh fencing	Low incidence of evidence of train strike of owls or raptors at bridges with this treatment.	Similar incidence of train strike at bridges with this treatment compared to control sites. Avoidance of these sites due to presence of poles.	Review pole gaps or mesh design. Trial removal of poles if necessary.
	Evidence of changes in flight path observed, or evidence of bat or woodland bird activity under bridges.	Birds or bats not observed flying over or under barriers.	Review effectiveness of design and adjust if needed. Trial removal of poles if necessary.
Landscaping	Successful crossings of woodland birds and terrestrial mammals recorded within 2 years of rehabilitation.	No successful crossings recorded.	Review the need to apply additional landscaping treatments and/or provide additional treatments in other locations.
Fencing	Low evidence of mortality from train strike within 500m from crossing structures.	Regular evidence of mortality from train strike/similar evidence of train strike to non-fenced locations.	Review fencing requirements where mortality from train-strike is high. Consider adding additional fencing or improved structures.

Note that indicators of success of crossing structures would be developed during the preparation of the threatened species management plans for the construction and operation of the project and outlined in the Final Fauna Connectivity Strategy.

Table L.5 Examples of indicators of success and thresholds for monitoring of population impacts

	Indicators of success	Thresholds for adaptive management	Corrective actions
Various species	Population monitoring (i.e., through use of occupancy modelling) shows stable occupancy of populations at sites close to rail corridor or within locality over five years.	Population modelling shows reduction in occupancy of sites close to the rail corridor over five years.	Review opportunities for revegetation and habitat enhancement. Investigate whether natural factors may contribute to occupancy changes (e.g., post-fire succession). Investigate need for additional crossing structures or improving usage of existing structures.
Various species	DNA analysis (i.e., from trapped individuals) shows stable genetics of populations on either side of the rail corridor over ten years.	DNA analysis shows changes in population genetics on either side of the rail corridor.	Review opportunities for revegetation and habitat enhancement. Investigate need for additional crossing structures or improving usage of existing structures.
Woodland birds	Surveys show effect of rail line on species diversity and abundance not detectable over 70 metres from the rail corridor.	Surveys show rail line has a measurable change in species diversity and abundance up to 100 metres from the rail corridor.	Review opportunities for revegetation and habitat enhancement. Investigate possibility for improving usage of crossing structures by small woodland birds.
Feral animals	No increase in incidence along the rail corridor as compared to adjacent areas within two years.	Increased detection of predators using the rail corridor as compared to adjacent areas.	Targeted predator control as required.

Note that indicators of success for population studies and occupancy modelling etc would be further developed during the preparation of the threatened species management plans for the construction and operation of the project and outlined in the Final Fauna Connectivity Strategy.

L.4.8 Reporting and next steps

L.4.8.1 Preparation of management plans

The preparation of species-specific management plans for threatened fauna are required for construction and operation of the proposal. These would detail the relevant connectivity structures and measures and monitoring required at each phase for the key species.

L.4.8.2 Preparation of a final fauna connectivity strategy

A Final Fauna Connectivity Strategy would be prepared that would account for the detailed design for the proposal. Liaison with the designers during detailed design is required to ensure appropriate location and number and type of fauna connectivity measures, with a focus on including dedicated structures for fauna. These would be further refined and finalised in consultation with BCD.

L.4.8.3 Adaptive management

Reports would be prepared after each monitoring period and would be distributed to ARTC, DPE, BCD, and DCCEEW (as relevant). These reports would incorporate all the methods and results of the monitoring and recommend any additional measures (if deemed necessary) to facilitate the long-term survival of fauna populations in the locality. The adaptive management approach would include reporting of any changes to the monitoring and connectivity management program that may be identified by the threatened species specialists or agencies. If there is a lack of evidence of species using connectivity structures, the provision of additional structures or measures should be investigated.

L.4.8.4 Summary of next steps

As a summary, the following steps are proposed:

- project approval, with the preparation of the Final Fauna Connectivity Strategy as a condition of approval
- development of threatened species management plans in parallel with detailed design
- conduct pre-construction baseline surveys as detailed in the threatened species management plans
- prepare Final Fauna Connectivity Strategy, drawing on information from the threatened species management plans, detailed design and results of baseline surveys
- monitoring surveys continue through construction and operation, as detailed in the threatened species management plans
- preparation of monitoring reports
- consultation with agencies regarding results of monitoring surveys as necessary
- update of threatened species management plans if required for adaptive management
- continue monitoring as detailed in the threatened species management plans
- monitoring concludes (timing to be outlined in detailed in the threatened species management plans)
- preparation of final reports
- publication of results in peer-reviewed journals, where possible.

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