TECHNICAL PAPER 08

Biodiversity development assessment report

Part 1 of 2

ALBURY TO ILLABO ENVIRONMENTAL IMPACT STATEMENT

ARTC INLAND RAIL

ALBURY TO ILLABO (A2I) PROJECT

TECHNICAL PAPER 8 – BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

AUGUST 2022

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TABLE OF CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

CONTENTS (Continued)

CONTENTS (Continued)

CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (CONTINUED)

LIST OF TABLES (CONTINUED)

LIST OF TABLES (CONTINUED)

LIST OF TABLES (CONTINUED)

LIST OF FIGURES

LIST OF PHOTOGRAPHS

LIST OF APPENDICES

GLOSSARY

Active level crossing	At grade road crossing of the rail corridor which uses flashing lights and boom barriers for motorists, and automated gates for pedestrians. These devices are activated prior to and during the passage of a train through a level crossing.
Affected species	A species that is likely to be affected through by direct and/or indirect impacts as a result of the proposal.
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 (BAM)	The Biodiversity Assessment Method 2020
Biodiversity Assessment Method Calculator (BAM-C)	The web application that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Biodiversity credits	Ecosystem credits or species credits
Biodiversity Credit Report	The report produced by the Biodiversity Assessment Method Calculator (BAM-C) that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity offsets	Management actions that are undertaken to achieve a gain in biodiversity values 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 under the BC Act.
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.
Construction compound	An area used as the base for construction activities, usually for the storage of plant, equipment and materials and/or construction site offices and worker facilities.

Construction environmental management plan	A site-specific plan developed for the construction phase of a project, to ensure that all contractors and sub-contractors comply with the environmental conditions of approval for the project and manage environmental risks properly.
Construction footprint	The area that would be used for the construction of the proposal.
Culvert	A structure that allows water to flow under a road, railway, track, or similar obstruction.
Down line	Track within a dual-track section of corridor on which trains travel away from Sydney Central station.
Ecosystem credit	A measurement of the value of threatened species habitat for species that can be reliably predicted to occur with a PCT
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.
Enhancement site	Discrete sites within the A2I proposal area that are proposed for infrastructure enhancement. This includes the 24 enhancement sites as well as the signal gantries. Enhancement works at each of these discrete work sites may include raising, widening or replacing bridges, raising or replacing signal gantries, track slewing and lowering sections of track.
Gantry	An overhead metal structure with a frame supporting equipment such as a signals, lighting or cameras.
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.
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 5 centimetres; (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.
IBRA subregion	A subregion of a bioregion identified under the IBRA system.
Indirect impact	An impact on biodiversity values that occurs when development related activities affect threatened species, threatened species habitat, or ecological communities in a manner other than direct impact.
Inland Rail program	The Inland Rail program comprises the design and construction of a new Inland Rail connection between Melbourne and Brisbane, via Wagga, Parkes, Moree, and Toowoomba. The route for Inland Rail is about 1,700 km in length. Inland Rail will involve a combination of upgrades of existing rail track and the provision of new track.
Linear shaped development	Defined in the BAM as development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length.
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Locality	The area within 10 kilometres of the study area.

Loop line	Track which briefly leaves the main line and re-join to allow for train passing or access to minor locations.
Main line	Primary track on which trains travel within a sing track section of corridor.
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.
Mitigation	Action to reduce the severity of an impact.
Mitigation and management measure	A measure which is intended to achieve mitigation.
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.
Overbridge	A bridge over a railway or road. For the proposal, overbridges refer to those structures which allow a road to pass over the railway.
Passive level crossing	At grade road crossing of the rail corridor which uses stop or give way signs for motorists, and 'look for trains' signs for pedestrians.
Patch size	An area of intact native vegetation that: — occurs on the proposal site or biodiversity stewardship site — includes native vegetation that has a gap of less than 100 metres from the next area of moderate to good condition native vegetation (or ≤30 metres for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the proposal site or biodiversity stewardship site.
Pedestrian bridge	A bridge designed solely for pedestrians to cross a watercourse, rail corridor or road.
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.
Precinct	Groupings of enhancement sites in line with the LGAs including Albury, Greater Hume – Lockhart, Wagga Wagga and Junee.
(the) proposal	Proposed enhancement works to structures and sections of track along 185 kilometres of the existing operational standard gauge railway between Albury and Illabo for the purpose of meeting Inland Rail specifications.
(the) proposal site	The areas that enhancement works are required to operate the Albury to Illabo section of Inland Rail. It includes the location of construction worksites, operational rail infrastructure, new bridge structures (road and shared user) and other ancillary work. It is otherwise referred to as the construction footprint.
Rail corridor	The corridor within which the rail tracks and associated infrastructure are located.

Shared user	Descriptor of infrastructure of path designed to accommodate pedestrians and cyclist safety to cross a watercourse, rail corridor or road
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Species credit species	Threatened species that are assessed in accordance with section 6.4 of the BAM. 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 proposal site.
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.
Study area	The wider area assessed in this BDAR, including and surrounding the proposal site, with the potential to be directly or indirectly affected by the proposal.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by EES and accessible from the BioNet website at www.bionet.nsw.gov.au.
Threatened ecological community	Means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act or any additional ecological community listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.
Threatened species	Critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.
Track	The structure consisting of the rails, fasteners, sleepers and ballast, which conveys trains.
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.

ABBREVIATIONS

A2I	Albury to Illabo section of Inland Rail
BAM	Biodiversity Assessment Method 2020
BAM-C	Biodiversity Assessment Method Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BOM	Bureau of Meteorology
BOS	NSW Biodiversity Offset Scheme
CEMP	Construction Environment Management Plan
CSSI	Critical State Significant Infrastructure
EEC	Endangered Ecological Community
EES	Environment, Energy and Science Group – a division of the Department of Planning and Environment (DPE) (formerly NSW Office of Environment and Heritage)
EIS	Environmental impact statement
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment protection licence
GDE	Groundwater Dependent Ecosystems
IBRA	Interim Biogeographic Regionalisation of Australia
LGA	Local Government Area
MNES	Matters of National Environment and Significance
NSW	New South Wales
PCT	Plant Community Type
RMAR	Rail Maintenance Access Road
SAII	Serious and irreversible impact
SEARs	Secretary's Environmental Assessment Requirements
SSI	State Significant Infrastructure
TBCD	Threatened Biodiversity Data Collection: part of the BioNet database, published by the Department and accessible from the BioNet website at www.bionet.nsw.gov.au
TEC	Threatened Ecological Community
VIS	Vegetation information system (BioNet Vegetation Classification)

EXECUTIVE SUMMARY

This Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the *Biodiversity Conservation Act 2016* (BC Act), Biodiversity Conservation Regulation 2017 (BC Regulation 2017), Biodiversity Assessment Method 2020 (BAM) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It specifically:

- provides an assessment of biodiversity values within the study area and proposal disturbance area
- demonstrates the proposal's effort to avoid and minimise impacts on biodiversity values
- provides mitigation and management of impacts on biodiversity values
- calculates the offset requirement for impacts on biodiversity values that are unable to be avoided
- provides an assessment of significance on threatened species, ecological communities or their habitats listed under the EPBC Act.

THE PROPOSAL

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 would enhance Australia's existing national rail network and serve the interstate freight market.

Inland Rail has been divided into 13 projects, seven of which are located in NSW. Each of these projects can be delivered and operated independently with tie-in points on the existing railway.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') is seeking approval to construct and operate the Albury to Illabo section of Inland Rail ('the proposal').

The proposal involves enhancement works to structures and sections of track along 185 kilometres of the existing operational standard gauge railway between Albury and Illabo. Enhancement works are required to provide the increased vertical and horizontal clearances required for double-stacked freight trains.

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* (EP&A Act). This report has been prepared as part of the Environmental Impact Statement (EIS) for the proposal. The EIS has been prepared to support the application for approval of the proposal, and address the environmental assessment requirements of the Secretary of the then NSW Department of Planning, Industry and Environment (the SEARs), dated 14 October 2020.

LANDSCAPE FEATURES OVERVIEW

The proposal occurs within one IBRA bioregion that comprises of two IBRA subregions, being:

- NSW South Western Slopes Bioregion
  - Lower Slopes subregion
  - Inland Slopes subregion.

In accordance with the BAM, separate habitat suitability assessments have been undertaken for each IBRA subregion and to enable clarity on this issue separate cases in the Biodiversity Assessment Method Calculator (BAM-C) have been undertaken for this report.

SURVEY METHODOLOGY OVERVIEW

The following survey techniques and methods were undertaken to identify the biodiversity values and species that occur within the study area.

Field survey and assessment was undertaken over four survey periods being:

- biodiversity survey session 1 (11–19 November 2020)
- biodiversity survey session 2 (16–22 February 2021)
- biodiversity survey session 3 (12-15 May 2021)
- biodiversity survey session 4 (9-11 October 2021).

The following native vegetation and targeted threatened flora surveys and techniques were undertaken:

- native vegetation mapping and field verification
- parallel field transects and traverses
- rapid data point assessments
- BAM vegetation integrity plots
- random meanders and opportunistic observations.

The following targeted threatened fauna surveys were undertaken:

- fauna habitat assessments
- diurnal bird surveys
- microchiropteran bat surveys, including:
  - acoustic detection (Anabat recording)
  - harp trapping
  - artificial roost/habitat assessment
  - exit surveys and stagwatches
- spotlighting and stagwatches
- acoustic call playback
- remote camera traps
- herpetofauna active searches
- Koala spot assessment technique (SAT) surveys.

NATIVE VEGETATION OVERVIEW

Native vegetation recorded within the study area has been assigned to two NSW vegetation plant community types (PCTs), being:

- PCT 5 – 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
- PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.

One threatened ecological community, being White Box – Yellow Box – Blakely’s Red Gum grassy woodland and derived native grassland was recorded within the study area. This community is listed as Critically Endangered under both the NSW BC Act and Commonwealth EPBC Act.

THREATENED SPECIES OVERVIEW

In accordance with the BAM threatened species have been assessed as predicted or ecosystem credit species and species credit species.

A total of 30 threatened fauna species have been identified as predicted or ecosystem credit species within the study area. Of these, three were recorded during field surveys being:

- Spotted Harrier (*Circus assimilis*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Diamond Firetail (*Stagonopleura guttata*).

A total of nine threatened flora species were considered to have potential associated habitat within the study area and were the subject of targeted surveys. No threatened flora species were recorded during targeted surveys.

A total of 21 threatened fauna species have been identified as candidate species credit species within the study area. Of these, three were recorded during field surveys being:

- Little Eagle (*Hieraaetus morphnoides*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Superb Parrot (*Polytelis swainsonii*).

DESIGN REFINEMENTS

The proposal has been designed with the principles of avoid and minimise impact on native vegetation and habitat where possible in accordance with the BAM. The proposal has been designed to avoid and minimise impact to areas of mapped TECs where possible within the study area. A total of 6.84 hectares of TEC consistent with the BC Act listed White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grassland was recorded in the study area. Total impact to this TEC has been reduced to 2.81 hectares or 41% of its occurrence within the study area. This impact comprises:

- PCT 277 (moderate condition) 0.50 hectares with avoidance of 2.29 hectares or 83% of this vegetation type within the study area
- PCT 277 (derived condition) 2.34 hectares with avoidance of 1.74 hectares or 43% of this vegetation type within the study area.

IMPACT SUMMARY

Impacts unable to be avoided by the proposal have been assessed in accordance with Stage 2 of the BAM, the SEARs for the proposal and the EPBC Act *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Department of the Environment, 2013).

Impacts on biodiversity values resulting from the proposal are:

- The proposal will directly impact on two native vegetation PCTs (PCT 277 and PCT 5), including one threatened ecological community (PCT 277). Direct impacts on native vegetation because of the proposal will include:
  - Direct impacts on up to 4.44 hectares of native vegetation, which includes the removal of up to 2.84 hectares of threatened ecological community in the form of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, which is listed as Critically Endangered under the BC Act. This includes the removal of 0.50 hectares of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, which is listed as Critically Endangered under the EPBC Act.

- Impacts on threatened species have been determined in accordance with the BAM based on predicted or ecosystem credit species and species credit species. Impacts resulting from the proposal on threatened species includes:
  - a total of 30 threatened fauna species have been identified as predicted or ecosystem credit species
  - three threatened fauna species credit species have been identified as affected by the proposal. This includes impacts to:
    - 0.21 hectares of potential habitat for Sloane's Froglet (*Crinia sloanei*), which has been assumed present
    - 4.29 hectares of potential habitat for Key's Matchstick Grasshopper (*Keyacris scurra*), which has been assumed present
    - 1.84 hectares of habitat for Squirrel Glider (*Petaurus norfolcensis*)
    - 1.85 hectares of habitat for Superb Parrot (*Polytelis swainsonii*).
- The proposal is considered unlikely to lead to a significant impact on threatened aquatic species, ecological communities or their habitats.
- The proposal would directly impact 41.31 hectares of miscellaneous ecosystem types, including 39.91 hectares of highly disturbed areas with no or limited native vegetation and 1.40 hectares of ornamental plantings.

In terms of impacts on Matters of National Environmental Significance (MNES) the proposal would:

- impact 0.50 hectares of a White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed under EPBC Act
- not impact any threatened flora species listed under the EPBC Act
- impact on known or assumed habitat for seven threatened fauna species comprising of one amphibian, four birds, and two mammals listed under the EPBC Act
- impact on potential habitat for one migratory species listed under the EPBC Act.

The impact assessment outcomes for MNES conclude that the proposal is unlikely to lead to a significant impact on any threatened species or ecological community listed under the EPBC Act. A referral under the EPBC Act is not required.

MANAGEMENT AND MITIGATION

The specific performance outcomes for the proposal regarding biodiversity include:

- where possible avoiding or minimising impacts to threatened flora and fauna species, and ecological communities listed under the BC Act and EPBC Act
- mitigating impacts to threatened ecological communities and species.

A Construction Environmental Management Plan (CEMP) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor including sub-plans, and other supporting documentation for each specific environmental aspect.

Specific sub-plans from the CEMP that would be developed to address biodiversity values would include a biodiversity management sub-plan.

OFFSETTING BIODIVERSITY IMPACTS

Residual impacts that are not able to be managed through mitigation would be offset in accordance with BAM calculations for both ecosystem and species credits. The proposal offset obligation has been calculated to require the following biodiversity credits:

- 137 ecosystem credits
- 195 species credits.

The proposal offset obligations would be met through implementing one or more of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by the proposal
- making a payment into the Biodiversity Conservation Fund
- alternative strategic offset outcomes.

STAGE 1 – BIODIVERSITY ASSESSMENT

1 INTRODUCTION

1.1 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 would enhance Australia's existing national rail network and serve the interstate freight market.

The Inland Rail route, which is about 1,700 kilometres long, would involve:

- using the existing interstate rail line through Victoria and southern NSW
- upgrading about 400 kilometres of existing track, mainly in western NSW
- providing about 600 kilometres of new track in northern NSW and south-east Queensland.

Inland Rail has been divided into 13 projects, seven of which are located in NSW. Each of these projects can be delivered and operated independently with tie-in points on the existing railway.

Australian Rail Track Corporation Ltd (ARTC) ('the proponent') is seeking approval to construct and operate the Albury to Illabo section of Inland Rail ('the proposal').

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* (EP&A Act). This report has been prepared as part of the Environmental Impact Statement (EIS) for the proposal. The EIS has been prepared to support the application for approval of the proposal, and address the environmental assessment requirements of the Secretary of the then NSW Department of Planning, Industry and Environment (the SEARs) (now the Department of Planning and Environment (DPE)), dated 14 October 2020.

1.2 THE PROPOSAL

The proposal involves enhancement works to structures and sections of track along 185 kilometres of the existing operational standard gauge railway between Albury and Illabo. Enhancement works are required to provide the increased vertical and horizontal clearances required for double-stacked freight trains.

1.2.1 LOCATION

The proposal is generally within the existing active rail corridor between the town of Albury on the Victorian-NSW border and around three kilometres to the north-east of Illabo. The alignment passes through two major regional towns, Albury and Wagga Wagga, NSW, and several smaller regional towns. Works are proposed at 24 locations along the 'Main South Line' corridor, described as 'enhancement sites'.

The enhancement sites have been broken down into four precincts which align with the local government areas of Albury, Greater Hume – Lockhart, Wagga Wagga and Junee, as identified in Table 1.1 and shown in Figure 1.1.

Table 1.1 Enhancement sites

PRECINCT	ENHANCEMENT SITES
Albury	Murray River bridge
	Albury Station pedestrian bridge
	Albury Yard clearances
	Riverina Highway bridge
	Billy Hughes bridge
	Table Top Yard clearances
Greater Hume – Lockhart	Culcairn pedestrian bridge
	Culcairn Yard clearances
	Henty Yard clearances
	Yerong Creek Yard clearances
	The Rock Yard clearances
Wagga Wagga	Uranquinty Yard clearances
	Pearson Street bridge
	Cassidy Parade pedestrian bridge
	Edmondson Street bridge
	Wagga Wagga Station pedestrian bridge
	Wagga Wagga Yard clearances
	Bomen Yard clearances
Junee	Harefield Yard clearances
	Kemp Street bridge
	Junee Station pedestrian bridge
	Junee Yard clearances
	Olympic Highway underbridge
	Junee to Illabo clearances

1.2.2 KEY FEATURES

The key features of the proposal include:

- adjustments to approximately 44 kilometres of track across 14 enhancement sites to accommodate the vertical and horizontal clearances according to Inland Rail clearance specifications, comprising:
  - realignment of track within the rail corridor
  - lowering of track up to 1.6 metres at three enhancement sites
- changes to bridges and culverts at enhancement sites to accommodate vertical clearances and track realignment as follows:
  - replacement of two road bridges and adjustments to adjoining intersections
  - replacement of three pedestrian bridges
  - removal of two redundant pedestrian bridges
  - modifications to four rail bridges

- ancillary works, including adjustments to nine level crossings, modifications to drainage and road infrastructure, signalling infrastructure, fencing, signage, and services and utilities.

No additional works would be required outside the enhancement sites identified in Figure 1.1 as they meet the clearance requirement for the Inland Rail program.

1.2.3 TIMING

Subject to approval, further design and procurement, construction of the proposal is planned to start in early 2024 and is expected to take about 16 months. The proposal would be fully operational in 2025 with enhancement sites progressively commissioned on completion of construction. Inland Rail as a whole would be operational once all 13 sections are complete, which is estimated to be in 2027.

1.2.4 CONSTRUCTION

An indicative construction methodology has been developed based on the current design to be used as a basis for the environmental assessment process. Overall, the construction strategy is based on an approach of dividing the proposal into four construction packages which align with the precincts: Albury, Greater Hume – Lockhart, Wagga Wagga and Junee.

Construction would require:

- construction compounds, laydown areas and other areas needed to facilitate construction works
- temporary changes to the road network, including road closures to undertake works on road bridges and level crossings
- other ancillary works.

The proposal site (as defined in section 1.5) includes construction compounds and ancillary works as listed above. The proposal site is shown in Appendix E-1. These areas have been included in impact assessment for this proposal described in Chapter 9 of this report.

Construction within each precinct would generally involve the site establishment and enabling works, main construction works as relevant to the enhancement site and finishing works as outlined in Table 1.2.

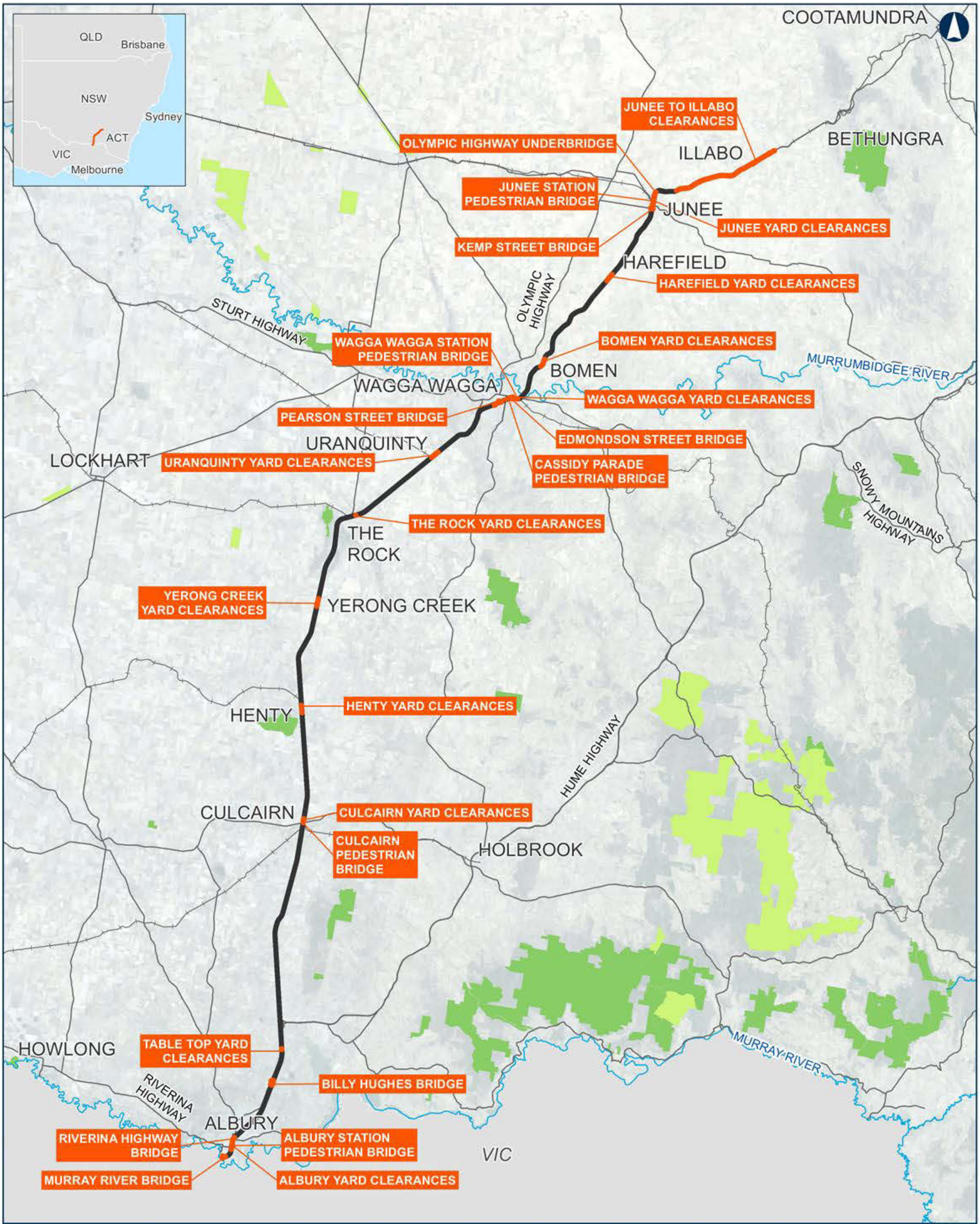
Further information on the construction of the proposal is provided in Chapter 8 of the EIS.

Table 1.2 Indicative construction activities

CONSTRUCTION STAGES	INDICATIVE ACTIVITIES
Site establishment and enabling works	— Establishment of key construction infrastructure, work areas, access points and other construction facilities — Installation of environmental controls, fencing and site services — Preliminary activities including clearing/trimming of vegetation.
Main Construction works	— Track works — Rail bridge works — Road bridge replacement — Pedestrian bridge works — Associated infrastructure works on level crossings, culverts and signalling.
Finishing works	— Testing and commissioning of the new and modified infrastructure — Demobilisation and removal of construction compounds and other construction infrastructure — Restoration of disturbed areas, as required, including revegetation and landscaping, where required.

Albury to Illabo

Figure 1.1 Enhancement sites of the proposal



0 10 20 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 4/11/2021 Paper: A3
Author: WSP Scale: 1:500,000
Data Sources: ARTC, NSWSS

- Proposal site
- Track alignment
- Existing railway
- Main road
- River
- National Park
- State Forest

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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1.2.5 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 proposal would enable the use of double stacked trains along its entire length. Inland Rail would operate 24 hours per day and would initially accommodate double-stacked freight trains up to 6.5 metres high and up to 1,800 metres in length. The possible future use of the railway between Albury and Illabo by freight trains up to 3,600 metres long would be subject to separate assessment. Freight train speeds would range from 60 to 115 kilometres per hour, which is consistent with current train speeds.

The average number of freight trains movements between Albury and Illabo would increase from a current average of up to 12 per day in 2021 to 18 per day in 2025, further increasing to about 20 per day in 2040.

ARTC would continue to maintain the Main South Line. This would typically involve minor maintenance works, such as bridge and culvert inspections, rail grinding and track tamping, through to major maintenance, such as reconditioning of track and topping up of ballast as required. Maintenance works and schedule are not proposed to change as a result of the proposal.

Further information on the operation of the proposal is in Chapter 7 of the EIS.

1.3 SCOPE AND PURPOSE OF THE REPORT

This report has been prepared by an accredited assessor in the employ of WSP Australia Pty Ltd as part of the EIS for the proposal to assess the impacts to terrestrial biodiversity.

This report has been prepared to address the SEARs issued for the proposal on 14 October 2020. In 2022, the department changed its name to the Department of Planning and Environment (DPE). The SEARs relevant to terrestrial biodiversity, and references to sections where they have been addressed in the report is presented in Table 1.3.

Specifically, this includes the preparation of a Biodiversity Development Assessment Report (BDAR) in accordance with section 6 of the NSW *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 10 and 12 of the methodology.

Impacts to relevant Matters of National Environmental Significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are addressed as part of the assessment.

Table 1.3 Secretary's Environmental Assessment Requirements relevant to Biodiversity Development Assessment

KEY ISSUE	ASSESSMENT REQUIREMENTS	REPORT REFERENCE
1. Environmental Impact Assessment Process	**1** It is the Proponent's responsibility to determine whether the project needs to be referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Proponent must contact DAWE immediately if it is determined that an approval is required under the EPBC Act, as supplementary environmental assessment requirements may need to be issued to ensure a streamlined assessment under the Accredited Assessment can be achieved.	Chapter 5

KEY ISSUE		ASSESSMENT REQUIREMENTS	REPORT REFERENCE
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.	**1**	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.
	2	The BDAR must document the application of the avoid, minimise and offset framework in accordance with the BAM.	Chapter 8, Chapter 11, Chapter 12
	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.	This report is in the form required under the BC Act and Biodiversity Conservation Regulation and is certified by an accredited assessor. The minimum information requirements for a BDAR are detailed in Appendix G.
	4	The BDAR must be submitted with all digital spatial data associated with the survey and assessment as per Appendix 10 of the BAM.	All spatial data shown in Appendix A, Appendix B and Appendix C will be submitted as part of the EIS lodgement
	5	The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the BC Act.	Section 1.6 and 1.7
	6	The BDAR must include details of the measures proposed to address offset obligations in accordance with the BAM.	Chapter 12
	7	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 9 – Aquatic Biodiversity Impact Assessment
	8	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 9.5 Technical Paper 9 – Aquatic Biodiversity Impact Assessment

1.4 STRUCTURE OF THIS REPORT

The structure and content of this report follows the BAM, which provides for a transparent, consistent and scientifically-based approach to the assessment of biodiversity values on a proposed development site. It provides guidance on how a proponent can avoid and minimise potential biodiversity impacts and a method for calculating the number and class of biodiversity credits that need to be offset to meet the standard of 'no net loss' of biodiversity.

Stage 1 (Biodiversity Assessment) establishes a consistent approach to assessing the biodiversity values of land and focuses on the assessment of the landscape context, the vegetation integrity of native vegetation, and habitat suitability for threatened species.

Stage 2 (Impact Assessment) outlines the guidance and requirements to apply the hierarchy of avoid, minimise and offset for assessing direct, indirect or prescribed impacts on biodiversity values arising from the proposed development. Stage 2 is used to determine the offset requirements for all residual impacts on biodiversity values at a proposed site. In general, these are measured as ecosystem credits and species credit. Stage 2 determines the number, class and offset trading group of biodiversity credits.

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 – Landscape context:*** Provides information on a range of landscape features in accordance with section 3 of the BAM that occur on the proposal study area and broader locality.
- ***Chapter 4 – Native vegetation:*** Provides information on native vegetation in accordance with section 4 of the BAM and matters relating to the BC Act.
- ***Chapter 5 – Threatened species:*** Provides information on threatened species in accordance with section 5 of the BAM and matters relating to the BC Act.
- ***Chapter 6 – Prescribed impacts:*** Identifies potential prescribed biodiversity impacts on threatened entities in accordance with section 6 of the BAM and matters relating to the BC Act.
- ***Chapter 7 – Matters on national environmental significance:*** Describes biodiversity matters relating to Commonwealth legislation under the EPBC Act.

Stage 2 – Impact assessment

- ***Chapter 8 – Avoid and minimise:*** Provides information on avoiding and minimising impacts on biodiversity values through the planning and design phase of the proposal in accordance with section 7 of the BAM.
- ***Chapter 9 – Assessment of impacts:*** Describes the potential impacts associated with the proposal in accordance with section 8 of the BAM.
- ***Chapter 10 – Mitigation and management:*** Outlines the proposed mitigation measures for the proposal on biodiversity matters.
- ***Chapter 11 – 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 as required under section 9 of the BAM.
- ***Chapter 12 – Impact summary – no net loss standard:*** Applies the no net loss biodiversity standard as required under section 10 of the BAM.
- ***Chapter 13 – Conclusion:*** Provides a conclusion of the potential impacts of the proposal on biodiversity.

Appendices to this report includes:

- **Appendix A** – Landscape context (mapping series of landscape attributes in accordance with Chapter of the BAM)
  - Appendix A-1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes
  - Appendix A-2 – Rivers, streams, wetlands and connectivity features
  - Appendix A-3 – Areas of geological significance and soil hazard features
  - Appendix A-4 – Assessing native vegetation cover
- **Appendix B** – Native vegetation (mapping series of native vegetation attributes in accordance with Chapter 4 of the BAM, vegetation integrity plot data, rapid data points)
  - Appendix B-1 – Native vegetation regulatory mapping category 1-exempt land
  - Appendix B-2 – Native vegetation types, zones and BAM integrity plots within the study area
  - Appendix B-3 – Threatened ecological communities (BC Act) within the study area
  - Appendix B-4 – BAM vegetation integrity plot data
  - Appendix B-5 – Rapid data points
- **Appendix C** – Threatened species (assessment of habitat suitability in accordance with Chapter 5 of the BAM, including threatened species likelihood of occurrence, mapping series of targeted survey effort, threatened species recorded and candidate threatened species polygons)
  - Appendix C-1 – Threatened flora habitat suitability
  - Appendix C-2 – Threatened fauna habitat suitability
  - Appendix C-3 – Targeted survey points
  - Appendix C-4 – Threatened fauna species recorded and candidate threatened fauna species polygons
  - Appendix C-5 – Sloane's Froglet habitat mapping
  - Appendix C-6 – Key's Matchstick Grasshopper habitat mapping
  - Appendix C-7 – Targeted microbat report / artificial structure assessment
- **Appendix D** – Matters of National Environmental Significance (mapping series of MNES recorded in the study area and Assessments of Significance for MNES with a moderate or higher likelihood of occurrence in the study area)
  - Appendix D-1 – Matters of National Environmental Significance – Figures
  - Appendix D-2 – Assessments of Significance
- **Appendix E** – Assessment of impacts (mapping series in accordance with Chapter 9 and Chapter 11 of this BDAR)
  - Appendix E-1 – Proposal site impact (construction and operation area)
  - Appendix E-2 – Serious and Irreversible Impacts (SAII)
  - Appendix E-3 – Impacts requiring a biodiversity offset (BC Act)
- **Appendix F** – Biodiversity credit report
  - Appendix F-1 – BAM credit report – Lower Slopes
  - Appendix F-2 – BAM credit report – Inland Slopes
- Appendix G – BAM information requirements for a BDAR.

1.5 REPORT TERMINOLOGY

The following terms are discussed throughout this report and are defined as:

- **Proposal** – Proposed enhancement works to structures and sections of track along 185 kilometres of the existing operational standard gauge railway between Albury and Illabo for the purpose of meeting Inland Rail specifications.
- **Proposal site** – The area required to construct and operate the Albury to Illabo section of Inland Rail (the proposal). The area also includes construction compounds and ancillary works. It is otherwise referred to as the construction footprint. Stage 2 (Impact Assessment) of the BAM has been applied to the proposal site for this report. This definition is consistent with the BAM definition of development footprint.
- **Study area** – The wider area, including and surrounding the proposal site, with the potential to be directly or indirectly affected by the proposal. Stage 1 (Biodiversity Assessment) of the BAM has been applied to the study area for this report.

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	ROLE	QUALIFICATIONS
Terrestrial biodiversity assessment		
Alex Cockerill	Ecology National Team Executive – Project Director and technical review	Bachelor of Science (Hons), BAM Accredited Assessor (BAAS17020)
Mark Stables	Principal Ecologist – Field survey and report preparation	Bachelor of Science (Hons), BAM Accredited Assessor (BAAS18097)
Toby Lambert	Technical Executive – Report preparation and review	Bachelor of Environmental Science, BAM Accredited Assessor (BAAS17046)
Nathan Cooper	Principal Ecologist – Technical lead and reporting	Bachelor of Environmental Science, Graduate Diploma Ornithology, and has completed the BAM training
Allan Richardson	Senior Ecologist – Field survey and report preparation	Bachelor of Environmental Science (Hons) and BAM Accredited Assessor (BAAS19072)
Troy Jennings	Ecologist – Field survey	Bachelor of Biodiversity and Conservation, Master of Wildlife Management, BAM Accredited Assessor (BAAS18172)
Devon Raiff	Ecologist – Field survey	Bachelor of Science, Certificate III Land Management and Conservation
Gavin Shelley	Ecologist – Field survey	Bachelor of Environmental Science
Sebastian Miller	Graduate Ecologist – Field survey	Bachelor of Marine Science

NAME	ROLE	QUALIFICATIONS
Emily Mitchell	Mapping and data management – GIS operator	Master of Information Technology, Bachelor of Development Studies, Certificate IV Spatial Information Services
Rob Gration	Principal Ecologist – Bat call analysis	Master Wildlife Management (Habitat), Post Graduate Certificate in Applied Science (Wildlife Ecology/Management)

Specific methodologies used for the assessment of native vegetation and threatened species are detailed in Chapter 4 and Chapter 5 of this report respectively.

All work was carried out under the appropriate licences, including scientific licences as required under Part 2 of the BC Act (License Number: SL100630) and an Animal Research Authority issued by the Department of Primary Industries (DPI) (Agriculture).

1.7 CERTIFICATION

As required under *Section 6.15 Currency of biodiversity assessment report* of the NSW BC Act, I, Mark Stables (BAAS18097), certify that this BDAR has been prepared on the basis of the requirements of (and information provided under) the Biodiversity Assessment Method (2020) as at 01/06/2022.

Mark Stables

2 LEGISLATION AND POLICY CONTEXT

2.1 COMMONWEALTH LEGISLATION

2.1.1 *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (COMMONWEALTH)*

The objective of the EPBC Act is to protect and manage prescribed 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 a Australian Government agency, must be referred to the Australian Minister for the Environment for assessment. 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 2013) where relevant
- identification of suitable impact mitigation and environmental management measures for threatened and migratory biota, where required.

Preliminary environmental investigations identified threatened species under the EPBC Act which have the potential to be impacted by the proposal. As a result of the potential for impacts on protected matters, the proposal was referred to the (then) Australian Minister for the Environment in June 2018 (EPBC Referral No 2020/8670). On 29 June 2020, the Australian Government Department of Agriculture, Water and the Environment (DAWE) notified that the proposal is a not controlled action. Based on detailed biodiversity survey work informing this report, no risks were identified that would warrant reconsideration of that conclusion. Therefore, approval under the EPBC Act is not required.

2.2 NSW LEGISLATION

2.2.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The 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.

The proposal has been declared as Critical State Significant Infrastructure (CSSI) and is subject to approval by the Minister for Planning under Division 5.2, Part 5 of the EP&A Act. An EIS has been prepared for the proposal to assess the impacts of the proposal in accordance with the SEARs. This technical paper supports the EIS.

2.2.2 BIODIVERSITY CONSERVATION ACT 2016 (NSW)

The 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 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.

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. The effect of the Local Land Services Act 2013 is addressed below in section 2.2.5.

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

In accordance with section 4.2 of the BAM (2020) and ARTC clarification from the Biodiversity Conservation Division of the DPE (1 December 2020), derived grassland communities (such as Plant Community Type (PCT) 796) have been identified from the parent PCT from which the derived grassland was derived from (section 4.4).

2.2.3 BIOSECURITY ACT 2015 (NSW)

The *Biosecurity Act 2015* (Biosecurity Act) 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.

Priority weeds recorded in the site and their control measures are detailed in section.

2.2.4 FISHERIES MANAGEMENT ACT 1994

The FM Act was introduced to conserve, develop and share the fishery resources of the State for the benefit of present and future generations, and applies to all waters within the area occupied by the proposal. Part 7 of the FM Act relates to the protection of fish and aquatic habitats with the objective of conserving the biodiversity of fish and aquatic vegetation. It provides for the management of certain works located on land that is permanently or intermittently submerged by water.

Pursuant to sections 201, 205 and 219 of the FM Act, works and activities such as those required for the proposal, may be undertaken under the authority of a permit.

The approval requirements in the FM Act do not apply to the proposal as it is CSSI under section 5.13 of the EP&A Act. In addition, under the provisions of section 5.23(3) of the EP&A Act, directions, orders or notices that could otherwise be issued under Division 7 of Part 7A of the FM Act cannot be issued for approved CSSI.

Nevertheless, Technical Paper 9 – Aquatic Biodiversity Impact Assessment addresses biodiversity matters relating to threatened aquatic entities listed under the FM Act.

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 areas, including lands associated with the proposal study area, although section 60O of the LLS Act 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.

Section 6.8(3) of the BC Act provides 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), other than any impacts prescribed by the regulations.

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.

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 proposal site.

Section 60H of the LLS Act provides that:

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.

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, except that a reference to the reasonable belief of the Environmental Agency Head about a particular matter is to be read as a reference to what a reasonable person would believe about the matter.

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 4.2.

3 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 (EES 2020a). It provides information on a range of landscape features that occur on the proposal site and in surrounding areas. The landscape features outlined below are used to inform the habitat suitability of the proposal site for threatened species and the potential movement of species across the landscape.

This chapter also provides an assessment of native vegetation cover that is used in BAM-C to predict threatened species likely to occur or use habitat on the proposal site.

3.1 LANDSCAPE FEATURES

3.1.1 *IDENTIFICATION OF IBRA REGIONS AND SUBREGIONS*

The proposal site occurs with one IBRA region that comprise of two IBRA subregions. A summary of each IBRA region and subregion is presented in Table 3.1 and an overview shown in Figure 3.1 with details presented in Appendix A-1.

Table 3.1 IBRA regions and subregions

IBRA REGION	IBRA SUBREGION
NSW South Western Slopes Bioregion	Lower slopes
	Inland slopes

3.1.2 *IDENTIFICATION OF LANDSCAPE FEATURES*

Landscape features has been identified for each IBRA subregion in accordance with section 3.2 of the BAM. A summary of landscape feature is presented in Table 3.2 and Table 3.3. An overview of these features is shown in Figure 3.2 and Figure 3.3 with details presented in Appendix A-2 and Appendix A-3.

Table 3.2 Summary of landscape features for the Lower Slopes IBRA subregion

LANDSCAPE FEATURE	OCCURRENCE IN STUDY AREA
NSW landscape regions (Mitchell landscapes)	The following five Mitchell landscape units have been recorded within the study area for the Lower Slopes IBRA subregion. — Albury – Oaklands Hills and Footslopes (5.47 hectares) — Brokong Plains (20.82 hectares) — Burrumbuttock Hills and Footslopes (2.32 hectares) — Junee Hills and Slopes (6.03 hectares) — Murrumbidgee – Tarcutta channels and floodplains (6.81 hectares). The largest extent of Mitchell landscape was used for BAM-C calculation purpose, being Brokong Plains. All Mitchell landscape units within the Lower Slopes IBRA subregion are shown in Figure 3.1.
Local Government Area (LGA)	City of Albury, Greater Hume Shire, Lockhart Shire, City of Wagga Wagga and Junee Shire

LANDSCAPE FEATURE	OCCURRENCE IN STUDY AREA
Rivers, streams and estuaries	A total of 24 streams have been identified and includes the following Strahler stream order 3 and above: — Eight Mile Creek (stream order 4) — Yerong Creek (stream order 6) — Sandy Creek (stream order 4) — Billabong Creek (stream order 7) — Bucks Creek (stream order 4) — Reedy Creek (stream order 4 and 5). All rivers and stream within the Lower Slopes IBRA subregion, including the Strahler order, are shown in Figure 3.2.
Important and local wetlands	The study area does not contain any important wetland although a local wetland at Henty being Doodle Comer Swamp occurs to the west of the study area.
Connectivity features	Connectivity feature associated with the study area are mostly riparian vegetation occurring along rivers and creeks. Connectivity features include: — Buckargingah Creek (just outside study area) at Henry Yard clearances connecting Doodle Comer Swamp — Eight Mile Creek at Billy Hughes bridge.
Areas of geological significance and soil hazard features	No geological significance and soil hazard features have been identified that relates to biodiversity. The underlying geology and soil landscape units within the Lower Slopes IBRA subregion are shown in Figure 3.3.
Areas of outstanding biodiversity value	No areas of outstanding biodiversity value have been declared for this area.

Table 3.3 Summary of landscape features for the Inland Slopes IBRA subregion

LANDSCAPE FEATURE	OCCURRENCE IN STUDY AREA
NSW landscape regions (Mitchell landscapes)	The following seven Mitchell landscape units have been recorded within the study area for the Inland Slopes IBRA subregion. — Albury – Oaklands Hills and Footslopes (18.90 hectares) — Brokong Plains (13.10 hectares) — Junee Hills and Slopes (35.06 hectares) — Murray Channels and Floodplains (21.75 hectares) — Murrumbidgee – Tarcutta Channels and Floodplains (23.30 hectares) — Springdale Hills (34.51 hectares) — Wonga Hills and Ranges (14.82 hectares). The largest extent of Mitchell landscape was used for BAM-C calculation purpose, being Junee Hills and Slopes. All Mitchell landscape units within the Inland Slopes IBRA subregion are shown in Figure 3.1.
Local Government Area (LGA)	City of Albury, Greater Hume Shire, Lockhart Shire, City of Wagga Wagga and Junee Shire

LANDSCAPE FEATURE	OCCURRENCE IN STUDY AREA
Rivers, streams and estuaries	The main river within the study area is the Murray River located in the Albury precinct. In addition, the study crosses a total of 54 stream of which most are of Strahler order 3 or less. Strahler stream order 3 and above are: — Murray River (stream order 9) — Burkes Creek (stream order 6) — Sandy Creek (stream order 6) — Jeralgambeth Creek (stream order 3 and 4) — Billabong Creek (stream order 5). All rivers and stream within the Inland Slopes IBRA subregion, including the Strahler order, are shown in Figure 3.2.
Important and local wetlands	The study area does not contain any important or local wetland.
Connectivity features	Connectivity features associated with the study area are mostly riparian vegetation occurring along rivers and creeks. Connectivity features include: — Sandy Creek at Uranquinty Yard clearances — Tributaries of Eight Mile Creek at Billy Hughes bridge — Murray River at Murray River bridge.
Areas of geological significance and soil hazard features	No area of geological significance have been identified that relates to biodiversity. Inland acid sulfate soil risk hazards are generally low to very low. They may be present beneath significant water bodies, in particularly in the banks and sediments of the Murray River. The underlying geology and soil landscape units within the Inland Slopes IBRA subregion are shown in Figure 3.3.
Areas of outstanding biodiversity value	No areas of outstanding biodiversity value have been declared for this area.

3.2 ASSESSING NATIVE VEGETATION COVER

Native vegetation cover has been assessed in accordance with section 3.2 of the BAM. Due to the linear shape of the proposal, which involves enhancement works to structures and sections of track along 185 kilometres of existing operational railway, a 500 metre buffer following the centre line of the proposal has been applied for native vegetation cover calculations.

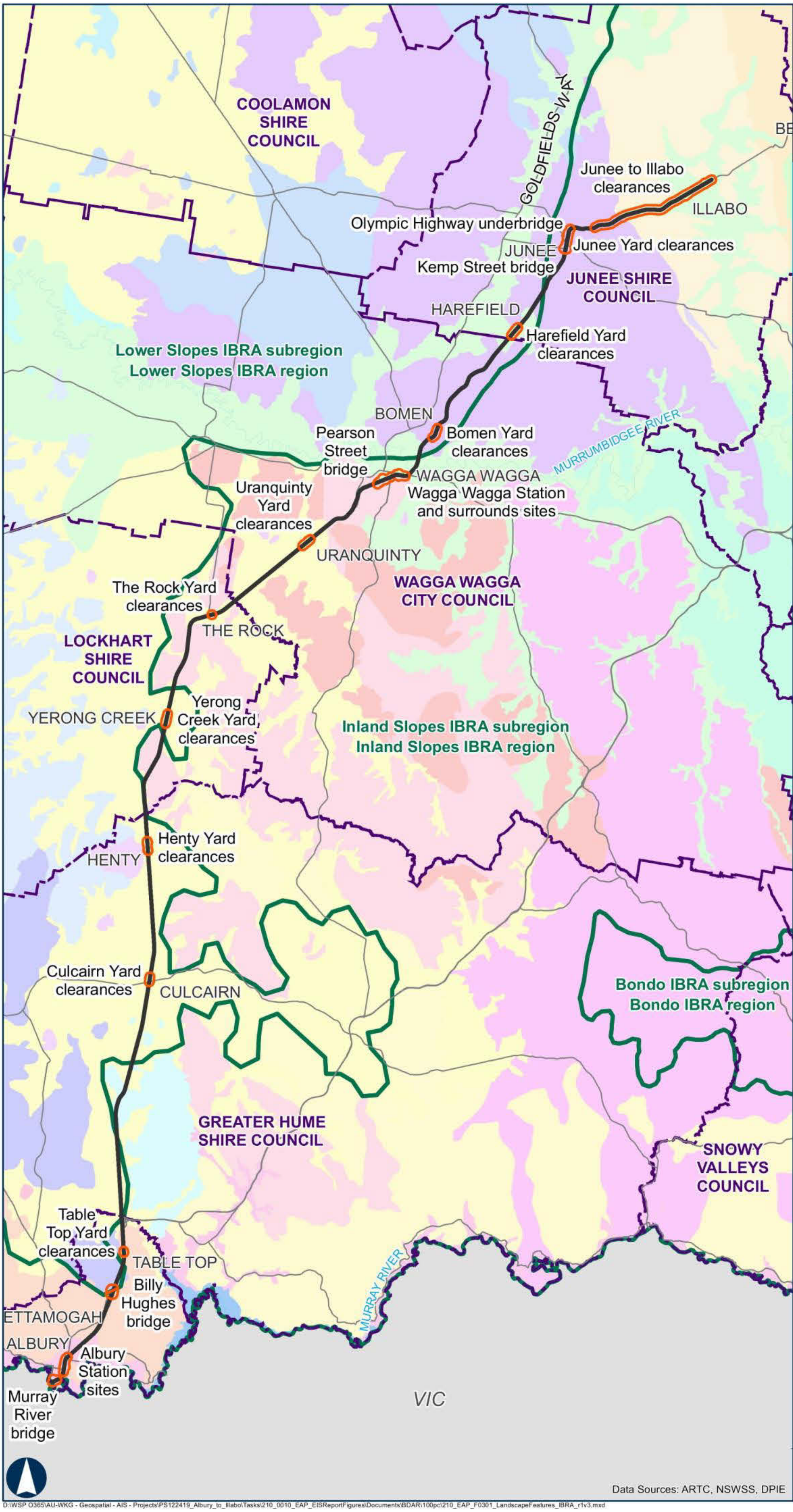
Native vegetation cover has been mapped using API informed by state vegetation mapping and field survey. The area of native vegetation, including wooded and non-wooded, in the assessment area has been calculated based on this mapping, which utilised to the following:

- aerial photographic imagery supplied by ARTC (AAM 2015)
- state vegetation type map: Riverina Region Version 1.2 – VIS ID 4469 (created in 2016)
- field verification through rapid data assessment points, plots and observations.

Native vegetation cover was calculated for both the Lower Slopes and Inland Slopes IBRA subregions. Non-woody, native vegetation mapping is limited to SVTM for the Riverina (VIS ID 4469) and field work carried out within the study area for this project. Areas of likely native woody vegetation within the assessment area (500m buffered area) that were not mapped by SVTM, were mapped by WSP for the purpose of the landscape assessment of native vegetation cover within the assessment area. A summary of native vegetation cover is presented in Table 3.4 and shown in Figure 3.4 with details presented in Appendix A-4.

Table 3.4 Assessment of native vegetation cover

IBRA SUB-REGION	ASSESSMENT AREA	TOTAL ASSESSMENT AREA (hectares)	AREA OF NATIVE VEGETATION COVER (hectares)		NATIVE VEGETATION PERCENTAGE COVER	BAM NATIVE VEGETATIO N COVER CLASS
			Non-woody	Woody		
Lower Slopes	500 metres along each side of the centre line of the proposed construction footprint	1,059	0.92	81.0	7.7%	0-10%
Inland Slopes		3,519	4.1	220.8	6.4%	0-10%



INLAND RAIL ARTC

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Albury to Illabo

Figure 3.1
Overview landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes

LEGEND

- Existing railway
- River
- Landscape assessment area
- Local Government Area
- IBRA subregion

Mitchell landscapes

- Adelong Granite Ranges
- Adrah Hills and Ranges
- Albury - Oaklands Hills and Footslopes
- Ardlethan Hills
- Brokong Plains
- Burrumbuttock Hills and Footslopes
- Carabost Hills and Ranges
- Cocoparra Ranges and Footslopes
- Coffin Rock Granite Hills
- Cootamundra - Tumut Serpentinite and Ultramafics
- Frampton Hills
- Junee Hills and Slopes
- Lockhart Hills and Footslopes
- Manitoba Hills and Footslopes
- Murray Channels and Floodplains
- Murray Lakes, Swamps and Lunettes
- Murrumbidgee - Tarcutta Channels and Floodplains
- Murrumbidgee - Tarcutta Lakes, Swamps and Lunettes
- Murrumbidgee - Tarcutta Source-bordering Dunes
- Springdale Hills
- Table Top Range
- Tipperary Hills Granites
- Ulandra - Narrabulla Hills and Slopes
- Water
- Wonga Hills and Ranges

NOT FOR PUBLICATION. FOR CONSULTATION PURPOSES ONLY.

0 10 20 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 31/10/2021 Paper: A3
Author: WSP Scale: 1:450,000

Albury to Illabo

Figure 3.2 Overview landscape features – Rivers, streams, wetlands and connectivity features

0 10 20 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 31/10/2021
Paper: A3
Author: WSP
Scale: 1:500,000
Data Sources: ARTC, NSWSS, DPIE

- Existing railway
- Watercourse
- Landscape assessment area
- Natural waterbody
- Artificial waterbody
- Floodplain wetlands and reservoirs

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Albury to Illabo Figure 3.3 Overview landscape features – Areas of soil hazard features

Coordinate System: GDA 1994 MGA Zone 55

Date: 31/10/2021 Paper: A3
Author: WSP Scale: 1:500,000
Data Sources: ARTC, NSWSS, DPIE

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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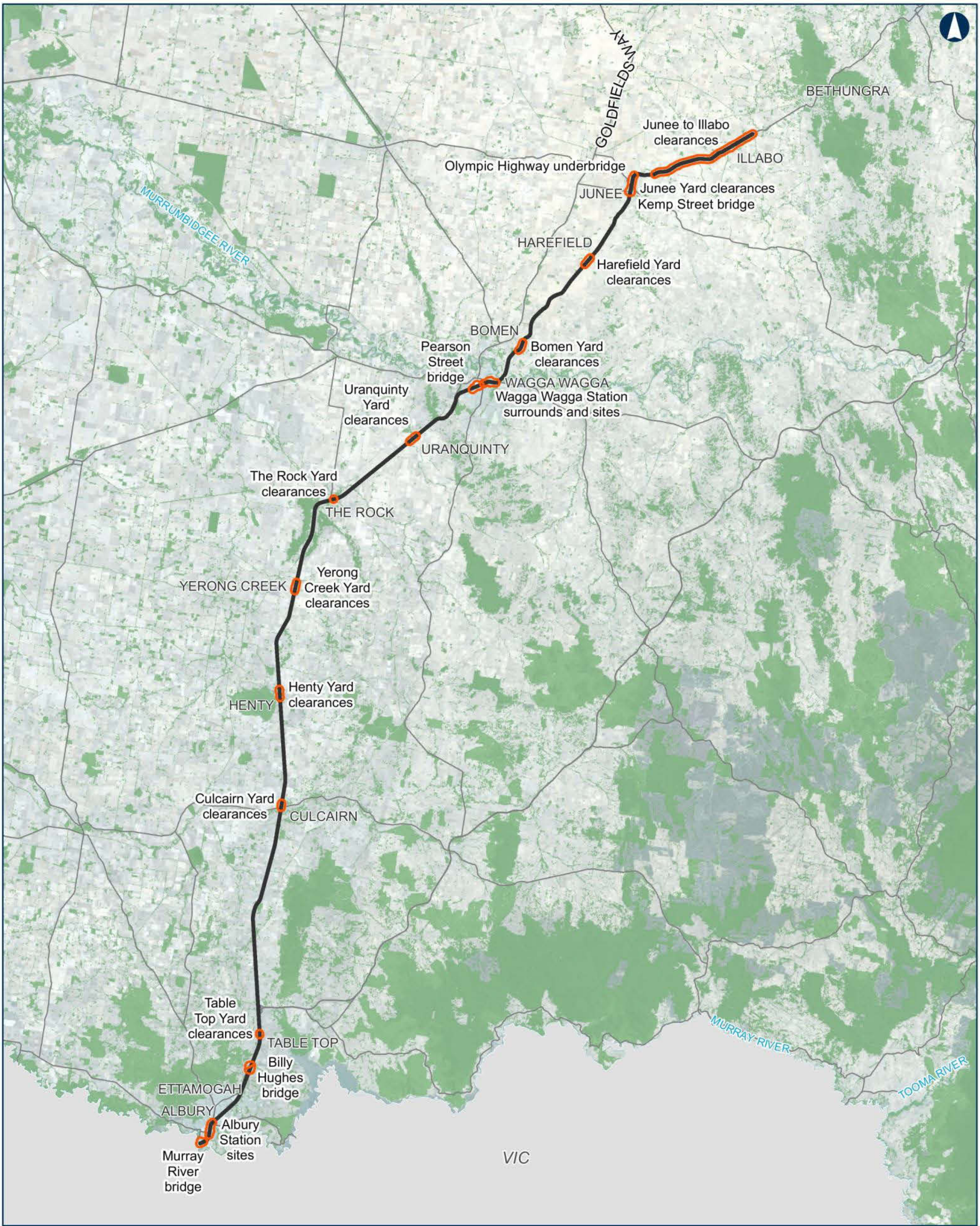


Albury to Illabo

Figure 3.4 Overview assessing native vegetation cover

0 10 20 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 31/10/2021
Author: WSP
Paper: A3
Scale: 1:500,000
Data Sources: ARTC, NSWSS, DPIE

- Existing railway
- River
- Landscape assessment area
- Native vegetation

INLAND RAIL

ARTC

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

4 NATIVE VEGETATION

This chapter assesses native vegetation, threatened ecological communities and vegetation integrity within the proposal site 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 (EES 2020a).

4.1 NOMENCLATURE

Names of vegetation communities used in this report are based on the Plant Community Type (PCT) used in the NSW BioNet Vegetation Classification Database (Environment Energy and Science, 2021c).

These names are cross-referenced with those used for threatened ecological communities listed under the BC Act final determinations and/or the EPBC Act listing advice.

Names of plants used in this document follow PlantNET (Royal Botanic Gardens, 2021) and VICFLORA (Royal Botanical Gardens Victoria 2021). Scientific names are used in this report for species of plant. The names of introduced species are denoted with an asterisk (*).

4.2 NATIVE VEGETATION REGULATORY MAPPING – CATEGORY 1 'EXEMPT LANDS'

Section 6.8(3) of the BC Act provides 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), other than any impacts prescribed by the regulations.

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.

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 proposal site.

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 proposal site, a desktop land characterisation methodology was developed that builds on the Revised Land Categorisation Process (ARTC 2019), which has previously been agreed with BCD, 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.
- Woody vegetation: NSW Woody Vegetation Extent 2011, published 2015.
- Transitional Native Vegetation Regulatory Map, version 3.0, published 26 March 2021.
- Zoning: EPI LEP LZN Land Zoning, current 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, and any areas of the proposal site 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. Finally, additional analysis of historical aerial imagery was used to further classify areas as cleared/highly disturbed, resulting from significant disturbance associated with cultivation and/or improved pasture.

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

The areas mapped as category 1–exempt land in the BDAR are largely outside of the proposal site. The exception to this are small areas of category 1–exempt land mapped at the following enhancement sites:

- Table Top Yard clearances
- Uranquinty Yard clearances
- Harefield Yard clearances
- Olympic Highway underbridge
- Junee to Illabo track clearances.

The categories mapped are as follows:

- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – Remnant Vegetation / Undisturbed (BAM applies, approvals required), Subcategories include:
  - conflicting data
  - regulated land
  - vulnerable regulated land
  - sensitive regulated land
  - both vulnerable and sensitive regulated land
- excluded land.

The outcome of native vegetation regulatory mapping category 1-exempt land is presented in Appendix B-1. All category 1 lands identified within the proposal site are exempt from BAM assessment and are not considered further in this BDAR, except for prescribed impacts (where relevant).

4.2.1 BIOCERTIFIED LAND

Section 60H(3) of the LLS Act outlines that land is to be designated as category 1– exempt land if the land is certified under Part 8 of the BC Act or under any Act repealed by that Act. The order conferring biodiversity certification on the Albury Local Environmental Plan 2010 was made under the (now repealed) *Threatened Species Conservation Act 1995* in February 2011. The biodiversity certification was amended in 2017 to only apply to certain land use zones (as zoned by that LEP prior to 2016).

Following consultation with the BCD on 2 September 2021, BCD advised they do '*not consider that land subject to the biodiversity certification of the Albury LEP 2010 can be mapped as category 1 land*.'

As such, areas of the study area within the Albury City Council Biodiversity Certification Area have not been included as category 1–exempt land. BCD further advised that the Albury City Council Biodiversity Certification Area should be assessed in accordance with the BAM.

4.3 NATIVE VEGETATION SURVEY METHODS

Native vegetation survey methods were undertaken within the proposal site during the following dates:

- 11–19 November 2020
- 12–15 May 2021
- 9–11 October 2021.

4.3.1 NATIVE VEGETATION EXTENT

Mapping of native vegetation extent within the proposal site is required under section 4.1 of the BAM with detailed requirements outlined in section 3.2 of the BAM 2020 Operational Manual.

In determining native vegetation extent within the proposal site, the following method was employed:

- aerial photographic imagery (AAM 2015)
- state vegetation type map: Riverina Region Version 1.2 – VIS ID 4469 (created in 2016)
- field verification through rapid data assessment points, plots and observations.

Using this information, a base preliminary native vegetation layer was established. Data on geology, dominant canopy species, native species richness, vegetation structure and condition was collected from areas during field surveys to validate and refine this preliminary native vegetation layer to determine associated PCT in accordance with the BioNet Vegetation Classification System (Environment, Energy and Science, 2021c).

In regard to assigning associated PCTs, ARTC met with the NSW Biodiversity Conservation Division (BCD) on 1 December 2020, seeking clarification regarding mapping of derived grassland communities, specifically PCTs 250, 619 and 796. PCT 796 was considered for patches of derived grassland vegetation within the proposal site. BCD confirmed that assessors must not identify native vegetation as derived communities and must identify the parent PCT from which the grassland was derived from. This advice is consistent with section 4.2 of BAM.

4.3.2 MAPPING OF NATIVE VEGETATION ZONES

The vegetation within the study area was firstly assessed to a PCT level and then aligned to a vegetation zone which is defined in the BAM as ‘an area of native vegetation on the proposal site that is the same PCT and has the same 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.

Broad condition state is used for stratifying areas of the same PCT into a vegetation zone for determining the vegetation integrity score. Broad condition states used for this report are outlined in Table 4.1.

Table 4.1 Native vegetation broad condition states

BROAD CONDITION STATE	DESCRIPTION
Moderate	Vegetation has retained a native canopy but the understorey and groundcover layers are generally co-dominated by exotic species. The mid and low stratums may have been structurally modified because of previous disturbance and subsequent weed incursions.
Poor	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. 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.

BROAD CONDITION STATE	DESCRIPTION
Derived	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 because 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 with or without scatted paddock trees). Derived grassland was assigned to patches of vegetation where native perennial cover was greater than 50%.
Native plantings	Vegetation has not retained a natural native canopy and has been supplemented with native tree plantings. The understorey and groundcover layers are generally dominated or co-dominated by exotic species. 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.

4.3.3 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 4.1.

Figure 4.1 Vegetation integrity plot layout

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 400-metre squared quadrat): This consisted of recording all species by systematically walking through each 20 metre x 20 metre 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 50 metre x 20 metre 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** (1000 metre 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 50 metre x 20 metre 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** (1000 metre squared quadrat): This was the cumulative total of logs within each 50 metre x 20 metre plot with a diameter of at least 10 centimetres and a length of at least 0.5 metre.
- **Litter cover:** This comprised estimating the average percentage groundcover of litter (i.e. leaves, seeds, twigs, branchlets and branches with a diameter less than 10 centimetre which is detached from a living plant) from within five 1 metre x 1 metre sub-plots spaced evenly either side of the 50-metre 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 five centimetres).

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 study area and establishing the required number of plots at some of these waypoints.

4.3.4 VEGETATION INTEGRITY PLOT SURVEY EFFORT

A total of 15 vegetation integrity plots were sampled using the method contained in section 3.3.3 of the BAM. The minimum number of vegetation integrity plots required per vegetation zone for each IBRA subregion is presented in Table 4.2 and Table 4.3 with plot locations details outlined in Table 4.4. Full vegetation integrity plot data is presented in Appendix B-4.

Table 4.2 Minimum number of vegetation integrity plots required per vegetation zone area and survey effort completed for the Lower Slopes IBRA subregion

VEG ZONE # (BAM-C)	VEG ZONE NAME (BAM-C)	NATIVE VEGETATION ZONE (PCT)	STUDY AREA (hectares)	# PLOTS REQUIRED	PLOTS SAMPLED
Forested Wetlands – Inland Riverine Forests					
1	5_poor	PCT 5 – 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 condition)	0.81	1	1 (Q3)
Grassy Woodlands – Western Slopes Grassy Woodlands					
2	277_poor	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (poor condition)	1.26	1	1 (Q14)

Table 4.3 Minimum number of vegetation integrity plots required per vegetation zone area and survey effort completed for the Inland Slopes IBRA subregion

VEG ZONE # (BAM-C)	VEG ZONE NAME (BAM-C)	NATIVE VEGETATION ZONE (PCT)	STUDY AREA (HECTARES)	# PLOTS REQUIRED	PLOTS SAMPLED
Forested Wetlands – Inland Riverine Forests					
1	5_poor	PCT 5 – 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 condition)	0.47	1	1 (Q1)
Grassy Woodlands – Western Slopes Grassy Woodlands					
2	277_moderate	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (moderate condition)	2.79	2	3 (Q9, Q11, Q13)
3	277_poor	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (poor condition)	10.72	3	3 (Q4, Q5, Q15)
4	277-derived	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived condition)	4.08	2	3 (Q7, Q10, Q12)
5	277_native plantings	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (native plantings)	2.00	1	1 (Q8)

Table 4.4 Location and orientation of BAM vegetation integrity plots

PLOT ID	VEGETATION ZONE	IBRA SUBREGION	EASTING	NORTHING	ORIENTATION (°)
Q1	PCT 5 – 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 condition)	Inland slopes	492155	6005115	273
Q2	Unassigned	–	–	–	–
Q3	PCT 5 – 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 condition)	Lower slopes	503525	6053260	348
Q4	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (poor condition)	Inland slopes	499090	6015257	216

PLOT ID	VEGETATION ZONE	IBRA SUBREGION	EASTING	NORTHING	ORIENTATION (°)
Q5	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (poor condition)	Inland slopes	522535	6105780	50
Q6	Unassigned	–	–	–	–
Q7	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived condition)	Inland slopes	567279	6146964	236
Q8	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (native plantings)	Inland slopes	553548	6142365	0
Q9	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (moderate condition)	Inland slopes	560649	6144733	63
Q10	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived condition)	Inland slopes	561139	6144867	235
Q11	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (moderate condition)	Inland slopes	561546	6144978	73
Q12	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived condition)	Inland slopes	556783	6143206	52
Q13	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (moderate condition)	Inland slopes	557187	6143404	49
Q14	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (poor condition)	Lower slopes	499077	6016005	208
Q15	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (poor condition)	Inland slopes	498981	6015472	36

Note: Co-ordinate GDA94 Zone 55.

4.4 NATIVE VEGETATION RECORDED

Native vegetation has been recorded by vegetation formation, class and associated PCT in accordance with the NSW BioNet Vegetation Classification System (Environment, Energy and Science, 2021c). The mapping of vegetation zones was based on the sampling of native vegetation broad conditions states as described in Table 4.1.

Vegetation integrity scores were calculated for each vegetation zone using representative vegetation integrity plots and BAM-C calculations.

Native vegetation was recorded to cover a total of 22.10 hectares of the study area and comprised of 2.07 hectares within the Lower Slopes IBRA subregion and 20.03 hectares in the Inland Slopes IBRA subregion. Native vegetation recorded within the proposal site has been assigned to two vegetation formations, classes and PCTs that occur within two IBRA subregions. The recorded PCTs are:

- PCT 5 – 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
- PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.

These two PCTs were assigned to five vegetation zones. A summary of each vegetation type and zone including the associated vegetation formation, class, vegetation integrity score and extent within the study area and proposal site, for each IBRA subregions, are presented in Table 4.5 and Table 4.6.

A detailed description of each PCT, including selection justification, floristic and structural composition along with representative photos and summary of BAM plot data against IBRA region benchmarks are provided in section 4.5.

Detailed figures of native vegetation types, zones and BAM integrity plots are presented in Appendix B-2.

Table 4.5 Summary of native vegetation types, zones and integrity recorded within the Lower Slopes IBRA subregion

BAM-C #	VEGETATION TYPE	VEGETATION CLASS	VEGETATION ZONE	PCT % CLEARED	TEC	PATCH SIZE CLASS (HECTARES)	COMPOSITION CONDITION SCORE	STRUCTURE CONDITION SCORE	FUNCTION CONDITION SCORE	VEGETATION INTEGRITY SCORE	STUDY AREA EXTENT (hectares)	PROPOSAL SITE EXTENT (hectares)
NSW Vegetation Formation: Forested Wetlands												
#2	PCT 5 – 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	Inland Riverine Forests	Poor condition (BAM-C 1)	40%	Not a TEC	<5	49.2	55	37.4	46.6	0.81	0.02
NSW Vegetation Formation: Grassy Woodlands												
#1	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	Poor condition (BAM-C 2)	94%	Not a TEC	< 5	3.8	32.8	62.2	19.8	1.26	0.13
Total extent of native vegetation											**2.07**	**0.15**

Table 4.6 Summary of native vegetation types, zones and integrity recorded within the Inland Slopes IBRA subregion

BAM-C #	VEGETATION TYPE	VEGETATION CLASS	VEGETATION ZONE	PCT % CLEARED	TEC	PATCH SIZE CLASS	COMPOSITION CONDITION SCORE	STRUCTURE CONDITION SCORE	FUNCTION CONDITION SCORE	VEGETATION INTEGRITY SCORE	STUDY AREA EXTENT (hectares)	PROPOSAL SITE EXTENT (hectares)
NSW Vegetation Formation: Forested Wetlands												
#1	PCT 5 – 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	Inland Riverine Forests	Poor condition	40%	Not a TEC	5–25ha	5.6	24.8	71.4	21.4	0.47	0.03
NSW Vegetation Formation: Grassy Woodlands												
#2	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Western Slopes Grassy Woodlands	Moderate condition	94%	Meets TEC[1]	5–25ha	67.7	62	77.9	68.9	2.79	0.50
#3			Poor condition		Not a TEC	5–25ha	17.9	33	84.6	36.8	10.72	1.16
#4			Derived		Meets TEC[1]	5–25ha	69	67.5	31.8	52.9	4.08	2.34
#5			Native plantings		Not a TEC	5–25ha	49.4	83.2	23.8	46.1	2.00	0.26
Total extent of native vegetation											**19.94**	**4.29**

(1) Meets the final determination criteria for the Critically Endangered listing of White Box – Yellow Box – Blakely's Red Gum grassy woodland (refer section 4.7).

4.5 PCT JUSTIFICATION AND DESCRIPTION

4.5.1 PCT 5 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

The occurrence of this vegetation type within the study area is illustrated in Appendix B-2 with photographic representation provided in Photo 4.1 and Photo 4.2. A summary of PCT 5 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 is provided in Table 4.7 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 4.8.

Table 4.7 Summary of PCT 5 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

PCT 5 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		
Vegetation formation	Forested Wetlands	
Vegetation class	Inland Riverine Forests	
Species relied upon for PCT identification	**Species name**	**Relative abundance**
	Eucalyptus camaldulensis (River Red Gum)	25
	Eleocharis pusilla (Small Spike-rush)	300
	Cynodon dactylon (Common Couch)	10
	Carex inversa (Knob Sedge)	5
	Juncus flavidus	5
	Oxalis perennans (Grassland Wood-sorrel)	3
Justification of evidence used to identify the PCT	Occurs of silty-sandy loam-clay soils on levees or other raised landform elements adjacent to rivers and wetlands. Two vegetation integrity plots (Q1 and Q3) were undertaken within this PCT. Overstorey is dominated by River Red Gum with a groundcover consisting of Small Spike-rush, Common Nardoo (*Marsilea drummondii)* and *Juncus australis.* Goosegrass (*Galium aparine)*, Wild Oats (*Avena fatua)*, Browntop Bent *(Agrostis capillaris*), Great Brome (*Bromus diandrus)*, Prairie Grass *(Bromus catharticus)* and Rye Grass (*Lolium rigidum*) are all common. While highly disturbed, the vegetation occurs along the Murray River and associated inner floodplains with a canopy dominated by River Red Gum and a grassy understory aligning it with PCT 5.	
TEC Status	Not listed	
Estimate of percent cleared within NSW	40%	

PCT 5 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	
Vegetation zone and extent within study area	Lower Slopes IBRA subregion – VZ1 – poor condition – associated with vegetation patches containing a modified over-, mid- and ground stratum. Examples include floodplain depressions at Culcairn Yard clearances (0.76 hectares) where there is a relatively intact overstory with a modified mid and ground stratum, and drainage channels at Harefield Yard clearances (0.05 hectares) where there is regrowth of overstorey species with a modified mid and ground stratum. Inland Slopes IBRA subregion – VZ1 – poor condition associated with vegetation patches containing a relatively intact overstorey but highly modified mid- and ground stratum. Examples include the inner floodplain of the Murry River at the Murray River bridge in Albury (0.19 hectares) where there is an intact overstorey with an exotic mid- and ground stratum, and at Sandy Creek floodplain at Uranquinty Yard clearances (0.28 hectares) where there is an intact overstorey, absent mid stratum and exotic ground stratum.

Photo 4.1 Example of PCT 5 Poor condition floodplain depression at Culcairn Yard clearances

Photo 4.2 Example of PCT 5 Poor condition at Murray River bridge

Photo 4.3 Example of PCT 5 Poor condition at the Murray River bridge

Table 4.8 Comparison of PCT 5 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 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**	**2**	**7**	**9**	**1**	**1**	**62**	**0**	**41**	**7**	**0**	**0**	**78**	**65**	**4(50)**	**–**	**–**
Q1	1	0	1	1	0	0	26	0	0.5	0.8	0	0	30	56	3	0	46.1
Q3	1	0	7	3	1	0	28	0	23.4	1.1	30	0	15	10	2	0	36.2

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type - PCT 5 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; Keith Formation: Forested Wetlands; Keith Class: Inland Riverine Forests; source (NSW BioNet Vegetation Classification database accessed February 2021 and cross referenced with BAM-C)

(2) Hollow-bearing tree

(3) High threat weed.

4.5.2 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 study area is illustrated in Appendix B-2 with photographic representation provided in Photo 4.4 to Photo 4.7. A summary of PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion is provided in Table 4.9 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 4.10.

Table 4.9 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		
Vegetation formation	Grassy Woodlands	
Vegetation class	Western Slopes Grassy Woodlands	
Species relied upon for PCT identification **(chosen as best representative plot)**	**Species name**	**Relative abundance**
	Eucalyptus blakelyi (Blakley's Red Gum)	3
	Eucalyptus melliodora (Yellow Box)	10
	Austrostipa bigeniculata	80
	Austrostipa scabra subsp. scabra (Speargrass)	80
	Bothriochloa macra (Red Grass)	60
	Carex inversa	10
	Chloris truncata (Windmill Grass)	50
	Sida corrugata (Corrugated Sida)	50
	Vittadinia cuneata	20
Justification of evidence used to identify the PCT	This vegetation type was recorded on fertile deep, loam or clay soils on flats, foot slopes and hillslopes mainly east of Wagga Wagga. Twelve (12) vegetation integrity plots were undertaken within this PCT. The overstorey was dominated by Blakely's Red Gum and Yellow Box with a groundcover consisting of Corrugated Sida, Red Grass, *Austrostipa bigeniculata*, Speargrass, Windmill Grass and *Vittadinia cuneata.*	
TEC Status	Moderate and derived condition patches meet the Critically Endangered BC Act final determination for – *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* Moderate condition patches meet the Critically Endangered EPBC Act listing advice for – *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*	
Estimate of percent cleared within NSW	94%	

PCT 277 – BLAKELY'S RED GUM – YELLOW BOX GRASSY TALL WOODLAND OF THE NSW SOUTH WESTERN SLOPES BIOREGION	
Vegetation zone and extent within study area	Inland Slopes IBRA subregion – VZ2 – Moderate condition – associated with patches of vegetation that contain an intact overstorey and modified mid- and ground layer. Mid- and ground layers contain moderate levels of high threat weeds but retain a high native species diversity and richness. Examples include sections of the Junee to Illabo dual track clearances (2.78 hectares).
	Lower Slopes IBRA subregion – VZ3 – Poor condition – associated with patches of vegetation that have a relatively intact overstorey with a modified mid- and ground layer. Examples can be found at Billy Hughes bridge (0.64 hectares), Bomen Yard clearances (0.16 hectares), Culcairn Yard clearances (0.14 hectares), Harefield Yard clearances (0.25 hectares) and Henty Yard clearances (0.07 hectares). Inland Slopes IBRA subregion – VZ3 – Poor condition – associated with patches of vegetation that have a relatively intact overstorey with a modified mid- and ground layer. Examples can be found at Billy Hughes bridge (4.84 hectares), Junee to Illabo dual track clearances (5.01 hectares), Olympic Highway underbridge (0.14 hectares), Pearson Street bridge (0.03 hectares), Table Top Yard clearances (0.01 hectares), The Rock Yard clearances (0.05 hectares) and Uranquinty Yard clearances (0.63 hectares).
	Inland Slopes IBRA subregion – VZ4 – Derived native grassland – associated with patches of vegetation that lack an overstorey but still contain an intact or partially intact lower stratum. Native vegetation ground cover must exceed 50% of perennial ground cover. Examples include patches along the Junee to Illabo dual track clearances (4.08 hectares).
	Inland Slopes IBRA subregion – VZ5 – Native plantings – associated with patches of native vegetation where the overstorey has been entirely planted or supplemented with native plantings for ecological reasons. Lower stratums may contain derived native grasslands or be highly modified. Examples include patches along the Junee to Illabo dual track clearances (1.31 hectares) and patches within the Olympic Highway underbridge (0.69 hectares).

Photo 4.4 PCT 277 moderate condition (Q11) this patch occurs in Junee to Illabo clearances

Photo 4.5 PCT 277 poor condition (Q13) along the Junee to Illabo dual track clearances

Photo 4.6 PCT 277 derived native grassland (Q10) this patch occurs in Junee to Illabo clearances

Photo 4.7 PCT 277 native plantings (Q8) along the Junee to Illabo dual track clearances

Table 4.10 Comparison of PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the 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)**	**–**	**–**
Q4	3	1	2	2	0	1	40	0.6	3.1	0.4	0	1	30	62	2	0	3
Q5	2	0	0	0	0	1	25	0	0	0	0	0.2	5	93	1	0	1
Q7	2	1	11	8	0	1	5	2	50.6	6.8	0	0.4	0	52	0	0	6
Q8	2	0	8	3	0	0	13	0	20.4	3.2	0	0	0	55	0	0	1.5
Q9	2	0	2	8	0	1	38	0	0.5	8.5	0	0.6	4	94	8	3	43
Q10	1	0	10	8	0	0	0.1	0	63.8	16.5	0	0	1	67	0	0	6.5
Q11	3	1	5	5	0	0	42	0.8	3.4	5.1	0	0	10	95	2	3	44
Q12	1	0	7	3	0	1	0.1	0	39.6	9.4	0	0.8	0	80	0	0	9
Q13	2	1	5	9	0	2	38.4	0.1	28.7	15.6	0	0.5	0	23	3	3	11.5
Q14	1	0	1	1	0	0	32	0	0.2	0.5	0	0	25	64	4	2	0
Q15	2	0	2	2	0	0	40	0	0.3	0.2	0	0	10	50	4	2	0.6

(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 database accessed February 2021 and cross referenced with BAM-C)

(2) Hollow-bearing tree

(3) High threat weed.

4.6 PRIORITY WEEDS AND WEEDS OF NATIONAL SIGNIFICANCE RECORDED

Two exotic flora species recorded within the study area during field surveys were listed under the Biosecurity Act as priority weeds for the Murray and Riverina region (Department of Planning, Industry and Environment, 2020). These two species are also listed as Weeds of National Significance (WONS) (Australian Weeds Committee, 2020). All priority weeds and weeds of National Significance are outlined below in Table 4.11.

Table 4.11 Priority weeds and weeds of National Significance recorded within the study area

SPECIES NAME	PRIORITY WEEDS	WONS
Asparagus asparagoides (Bridal Creeper)	**Prohibition on dealings** Must not be imported into the State or sold.	Yes
Rubus fruticosus agg. (Blackberry)	**Prohibition on dealings** Must not be imported into the State or sold	Yes

In addition to priority weeds and weeds of National Significance the following high threat weeds were also recorded:

- *Acer negundo* (Box-elder Maple)
- *Agrostis capillaris* (Browntop Bent)
- *Alternanthera pungens* (Khaki Weed)
- *Bromus diandrus* (Great Brome)
- *Cyperus eragrostis* (Umbrella Sedge)
- *Eragrostis curvula* (African Love Grass)
- *Fraxinus angustifolia* (Narrow-leaved Ash)
- *Hypericum perforatum* (St. John's Wart)
- *Ligustrum lucidum* (Large-leaved Privet)
- *Ligustrum sinense* (Small-leaved Privet)
- *Paspalum dilatatum* (Paspalum)
- *Romulea rosea* (Onion Grass)
- *Vinca major* (Greater Periwinkle).

A full inventory of weed species recorded within each BAM vegetation integrity plot is presented in Appendix B-4.

4.7 THREATENED ECOLOGICAL COMMUNITIES

Native vegetation recorded within the study area is considered to meet the final determination of one threatened ecological community listed under the BC Act being:

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

A comparison of the final determination for this threatened ecological community and candidate PCT is provided in Table 4.12. 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 study area is consistent with the criterion.

4.7.1 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 following recorded PCT was considered a candidate to form part of the BC Act listed White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland:

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

To be considered consistent with the Critically 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, 2020).

Vegetation recorded in poor condition and as native plantings were not considered to retain a diverse and functional understorey due to historic and ongoing disturbances. These patches were mostly fragmented, isolated from larger connected patches of native vegetation and considered unlikely respond to assisted natural regeneration. It is assumed in these conditions that the natural soil seed bank is not intact and is therefore, not considered further in meeting the final determination for the Critically Endangered listing for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

A comparison of PCT 277 recorded in all condition states and assessed 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 4.12.

The assessment concluded that the following vegetation types and zones meet the BC Act listing for Grassy Woodland and Derived Native Grassland:

- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ2).
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Derived condition (VZ4).

A summary of the extent of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland threatened ecological community within the study area is provided in Table 4.13.

Table 4.12 Correlation of PCT 277 against scientific determination criteria for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland threatened ecological community

FINAL DETERMINATION LISTING CRITERIA	PCT 277 – MODERATE CONDITION	PCT 277 – POOR CONDITION	PCT 277 – DERIVED CONDITION	PCT 277 – NATIVE PLANTINGS
Location: occurs within the Brigalow Belt South, Nandewar, New England Tableland, Sydney Basin, North Coast, South Eastern Highlands, South East Corner, South Western Slopes and Riverina IBRA Bioregions in NSW.	Yes, the study area occurs within the South Western Slopes Bioregion.			
Topography: it typically at low elevations in flat to hilly and undulating landscapes (generally occurs below 600–700m ASL however can occur at elevations to 1200m in some regions).	Yes, the study area occurs on flats and hilly undulating landscapes typically below 600 ASL.			
Geology: typically found on soils of moderate fertility derived from a range of lithologies, including alkaline and acid volcanics, granites, sediments, serpentinites and metamorphics.	Yes, geologically all condition states of PCT 277 occur on soils of moderate fertility derived from a range of lithologies listed in the scientific determination for this TEC.			
Structure: occurs as either a grassy open woodland or as derived native grasslands.	Yes, occurs as open grassy woodlands.	No, does not has a native grassy understory or occurs as derived native grasslands. Open woodland structure occurs in the upper stratum although the native shrub and ground stratum have been modified to the extent that they no longer function ecologically.	Yes, occurs as derived native grasslands.	No, does not occur as an open grassy woodland or occurs as derived native grasslands.
Floristic canopy composition: community is characterised by a canopy of *Eucalyptus albens* (White Box) although may be co-dominant or dominant by *E. melliodora* (Yellow Box) and/or *E. blakelyi* (Blakely's Red Gum) in localised areas such as along non-permanent water courses and in deeper soils associated with valley floors.	Yes, is dominated by *E. melliodora* (Yellow Box) and/*or E. blakelyi* (Blakely's Red Gum).	Yes, is dominated by *E. melliodora* (Yellow Box) and/*or E. blakelyi* (Blakely's Red Gum).	Yes, is dominated by *E. melliodora* (Yellow Box) and/*or E. blakelyi* (Blakely's Red Gum).	Yes, is dominated by *E. melliodora* (Yellow Box) and/*or E. blakelyi* (Blakely's Red Gum).

FINAL DETERMINATION LISTING CRITERIA	PCT 277 – MODERATE CONDITION	PCT 277 – POOR CONDITION	PCT 277 – DERIVED CONDITION	PCT 277 – NATIVE PLANTINGS
Floristic composition as detailed in Part 1 of the Scientific Determination.	Yes, a high number of the characteristic species identified in the scientific determination were recorded from Q9, Q11, Q13.	No, native species identified in the scientific determination are generally absent or with very low species richness and cover. Native species are mostly restricted to the upper stratum only (refer Q4, Q5, Q15).	Yes, a high number of the characteristic species identified in the scientific determination were recorded from Q7, Q10, Q12.	No, native species identified in the scientific determination are generally absent or with very low species richness and cover (refer Q8).
Meets the BC Act listing criteria of the threatened ecological community?	**Yes, meets TEC**	**No, does not meet TEC**	**Yes, meets TEC**	**No, does not meet TEC**

Table 4.13 Summary of White Box – Yellow Box – Blakely's Red Gum grassy woodlands within the study area and proposal site

THREATENED ECOLOGICAL COMMUNITY	VEGETATION TYPE AND ZONE	BC ACT	IBRA SUBREGION		STUDY AREA EXTENT (hectares)	PROPOSAL SITE EXTENT (hectares)
			LOWER SLOPES	INLAND SLOPES		
White Box – Yellow Box – Blakely's Red Gum grassy woodlands	PCT 277 – Moderate condition	Critically Endangered	0	2.79	2.79	0.50
	PCT 277 – Derived condition		0	4.08	4.08	2.34
Total extent of threatened ecological communities					**6.87**	**2.84**

5 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 Part 3 of the BAM 2020 Operational Manual – Stage 1 (EES 2020a).

5.1 NOMENCLATURE

For threatened species of plants, the names used in the BioNet Atlas (Environment, Energy and Science, 2021b) and Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d) were preferenced where these differ from the names used in the PlantNET (Royal Botanic Gardens, 2021) and VICFLORA (Royal Botanical Gardens Victoria 2021) databases.

Names of vertebrate fauna follow the Australian Faunal Directory maintained by the Department of Agriculture, Water and the Environment (Department of Agriculture, Water and the Environment, 2021a).

For threatened species of animals, the names used in the BioNet Atlas (Environment, Energy and Science, 2021b) and Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d) and threatened species final determination listing were preferenced over Australian Faunal Directory naming.

5.2 ASSESSING THE 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), these are:

- Ecosystem and species credit species (include dual species)
  - Step 1: Identify threatened species for assessment (BAM s. 5.2.1)
  - Step 2: Assess the habitat constraints and vagrant species on the subject land (BAM s. 5.2.2).
- Species credits species only (includes dual species)
  - Step 3: Further assessment of candidate species credit species (BAM s. 5.2.3)
  - Step 4: Determine the presence of a candidate species credit species (BAM s. 5.2.4)
  - Step 5: Determine the area or count, and location of suitable habitat for a species credit species (a species polygon) (BAM s. 5.2.5)
  - Step 6: Determine the habitat condition within the species polygon for species credit species assessed by area (BAM s. 5.2.6).

5.2.1 THREATENED SPECIES DATABASE SEARCHES

The BAM also requires the assessor to review additional information about threatened species to determining if any predicted or candidate species inclusions are applicable. This involved searches of threatened species databases and likelihood of occurrence assessments. A list of threatened species databases accessed for this report as presented in Table 5.1.

Table 5.1 Threatened species database searches

DATABASE	SEARCH DATE	AREA SEARCHES	REFERENCE
BioNet Atlas	10/03/2021	Albury to Illabo with a 10 kilometre buffer	(Environment, Energy and Science, 2021d)
PlantNET	10/03/2021	Albury LGA, Junee LGA, Lockhart LGA and Wagga Wagga LGA	(Royal Botanic Gardens, 2021)
EPBC Protected Matters Search Tool[1]	10/03/2021	Albury to Illabo with a 20 kilometre buffer[1]	(Department of Agriculture, Water and the Environment, 2021b)
BAM-C	05/03/2021	Search of candidate species predicted species using BAM data from vegetation within the study area	(Environment, Energy and Science, 2021a)
Atlas of Living Australia	19/03/2021	Spatial search of study area	(Atlas of Living Australia, 2021)

(1) A 20 kilometre buffer of the proposal was applied to this BDAR. Technical Paper 9 – Aquatic Biodiversity Impact Assessment applied a region search using Natural Resource Management Regions (Riverina and Murray).

5.2.2 LITERATURE REVIEW

In addition to threatened species database searches, a range of relevant documents and literature related to threatened biodiversity was also considered, including:

- Inland Rail Albury to Illabo Scoping Report (Inland Rail 2020), including the Albury to Illabo Project (A2I), Biodiversity Assessment Report (ERM 2020)
- NSW Sharing and Enabling Environmental Data (SEED) portal (DPI 2021)
- DAWE’s Directory of Important Wetlands (DAWE 2005)
- Sloane’s Froglet Breeding Habitat Mapping and Spatial Database Development (Cate Ewin Spatial Services, 2017).

5.2.3 LIKELIHOOD OF OCCURRENCE ASSESSMENT

Likelihood of occurrence assessments were undertaken for all threatened species, populations and migratory species identified through database searches. These assessments were conducted for both BC Act and EPBC Act listed species. Likelihood of occurrence assessments enabled justification for any identification of species inclusions for both ecosystem and species credit species. They also enabled identification of species considered MNES under the EPBC Act for further assessment in Chapter 7 of this report.

Criteria used to determine likelihood of occurrence for threatened flora species in outlined in Table 5.2 with criteria for determining threatened fauna species is outlined in Table 5.3.

Table 5.2 Likelihood of occurrence criteria for threatened flora species

LIKELIHOOD	CRITERIA
Known	The species was observed in the study area either during the current survey or during another survey less than one year prior.
High	A species has a high likelihood of occurrence if: — the study area contains or forms part of a large area of high-quality suitable habitat that has not been subject to recent disturbance (e.g. fire), the species is known to form a persistent soil seedbank and the species has been recorded recently (within 10 years) in the locality — the species is a cryptic flowering species that has been recorded recently (within 10 years) in the locality and has a large area of high-quality potential habitat within the study area that was not seasonally targeted by surveys.
Moderate	A species has a moderate likelihood of occurrence if: — the species has a large area of high-quality suitable habitat in the study area that has not been subject to recent disturbance (e.g. fire) — the species is known to form a persistent soil seedbank — the species has not been recorded recently (within 10 years) in the locality — the species has a small area of high-quality suitable habitat or a large area of marginal habitat in the study area that has not been subject to recent disturbance (e.g. fire) — the species is known to form a persistent soil seedbank — the species has been recorded recently (within 10 years) in the locality — the species is a cryptic flowering species, with a small area of high-quality potential habitat or a large area of marginal habitat within the study area, that was not seasonally targeted by surveys.
Low	A species has a low likelihood of occurrence if: — it is not a cryptic species, nor a species known to have a persistent soil seedbank species and was not detected despite targeted searches — the species is a cryptic flowering species, with a small area of high-quality potential habitat or a large area of marginal habitat within the study area, that was not seasonally targeted by surveys as the species has not been recorded within 50 years in the locality.
None	Suitable habitat is absent from the study area.

Table 5.3 Likelihood of occurrence criteria for threatened fauna species

LIKELIHOOD	CRITERIA
Known	The species was observed in the study area either during the current survey or during another survey less than one year prior.
High	A species has a high likelihood of occurrence if: — the study area contains or forms part of a large area of high-quality suitable habitat — important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the study area — the species has been recorded recently in similar habitat in the locality — the study area is likely to support resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration.
Moderate	A species has a moderate likelihood of occurrence if: — the study area contains or forms part of a small area of high-quality suitable habitat — the study area contains or forms part of a large area of marginal habitat — important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are sparse or absent within the study area — the study area is unlikely to support resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration but is likely to be used occasionally during seasonal movements and/or dispersal.
Low	A species has a low likelihood of occurrence if: — potentially suitable habitat exists but the species has not been recorded recently (previous 10 years) in the locality despite intensive survey (i.e. the species is considered to be locally extinct) — the species is considered to be a rare vagrant, likely only to visit the study area very rarely, e.g. during juvenile dispersal or exceptional climatic conditions (e.g. extreme drought conditions in typical habitat of inland birds).
None	Suitable habitat is absent from the study area.

5.3 IDENTIFYING HABITAT SUITABILITY FOR ECOSYSTEM CREDIT SPECIES

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 (EES, 2021) 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 (EES 2020a).

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 for the associated PCTs within the study area.

5.3.1 PREDICTED ECOSYSTEM CREDIT SPECIES GENERATED FROM BAM-C

A preliminary list of predicted ecosystem credit species was generated from the BAM-C based on associated vegetation types. This preliminary predicted ecosystem credit species list is presented in Table 5.4.

Table 5.4 List of BAM-C generated predicted ecosystem credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	ASSOCIATED NATIVE VEGETATION (PCT)	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Birds (28)						
Anthochaera phrygia	Regent Honeyeater	CE	Yes	PCT 5 and PCT 277	✓	✓
Artamus cyanopterus	Dusky Woodswallow	V	No	PCT 5	✓	✓
Callocephalon fimbriatum	Gang-gang Cockatoo	V	No	PCT 5 and PCT 277	✓	✓
Chthonicola sagittata	Speckled Warbler	V	No	PCT 277	✓	✓
Circus assimilis	Spotted Harrier	V	No	PCT 5 and PCT 277	✓	✓
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	No	PCT 277	✓	✓
Daphoenositta chrysoptera	Varied Sittella	V	No	PCT 5 and PCT 277	✓	✓
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	V	No	PCT 5	✓	✓
Glossopsitta pusilla	Little Lorikeet	V	No	PCT 5 and PCT 277	✓	✓
Grantiella picta	Painted Honeyeater	V	No	PCT 5 and PCT 277	✓	✓
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	No	PCT 5 and PCT 277	✓	✓
Hieraaetus morphnoides	Little Eagle	V	No	PCT 5 and PCT 277	✓	✓
Lathamus discolor	Swift Parrot	E	Yes	PCT 5 and PCT 277	✓	✓
Lophoictinia isura	Square-tailed Kite	V	No	PCT 5 and PCT 277	✓	✓
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	No	PCT 5 and PCT 277	✓	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	ASSOCIATED NATIVE VEGETATION (PCT)	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	No	PCT 5 and PCT 277	-	✓
Neophema pulchella	Turquoise Parrot	V	No	PCT 5 and PCT 277	✓	✓
Ninox connivens	Barking Owl	V	No	PCT 5	-	✓
Ninox strenua	Powerful Owl	V	No	PCT 5	-	✓
Pachycephala inornata	Gilbert's Whistler	V	No	PCT 5	-	✓
Petroica boodang	Scarlet Robin	V	No	PCT 5 and PCT 277	✓	✓
Petroica phoenicea	Flame Robin	V	No	PCT 5 and PCT 277	✓	✓
Polytelis swainsonii	Superb Parrot	V	No	PCT 5 and PCT 277	✓	✓
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	No	PCT 277	✓	✓
Rostratula australis	Australian Painted Snipe	E	No	PCT 5	✓	✓
Stagonopleura guttata	Diamond Firetail	V	No	PCT 5 and PCT 277	✓	✓
Stictonetta naevosa	Freckled Duck	V	No	PCT 5	✓	✓
Tyto novaehollandiae	Masked Owl	V	No	PCT 277	✓	✓
Mammals (7)						
Chalinolobus picatus	Little Pied Bat	V	No	PCT 5	✓	✓
Dasyurus maculatus	Spotted-tailed Quoll	V	No	PCT 5 and PCT 277	✓	✓
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	No	PCT 277	-	✓
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	Yes	PCT 277	-	✓
Phascolarctos cinereus	Koala	V	No	PCT 5 and PCT 277	✓	✓
Pteropus poliocephalus	Grey-headed Flying-fox	V	No	PCT 5 and PCT 277	✓	✓
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	No	PCT 5 and PCT 277	✓	✓

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) SAII – serious and irreversible impact.

5.3.2 JUSTIFICATION FOR INCLUSION OF ANY ADDITIONAL PREDICTED ECOSYSTEM CREDIT SPECIES

In identifying an ecosystem credit species list for further assessment, five additional species were included to the BAM- C for consideration (Table 5.5).

Table 5.5 Justification for inclusion of any additional predicted ecosystem credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	JUSTIFICATION FOR INCLUSION	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Birds (3)						
Certhionyx variegatus	Pied Honeyeater	V	No	Unlikely to be resident in the region but is known to occur (in Albury) during extended dry periods when arid country birds are forced toward areas where water and blossom are more reliable. May occur in study area under some climatic conditions.	✓	✓
Epthianura albifrons	White-fronted Chat	V	No	Likely to occur sparsely across open habitats associated with the study area. The study does not represent important foraging habitat for this species, but additional cover provided by unmanaged study area ground-cover layers may be desirable for nesting purposes.	✓	✓
Falco subniger	Black Falcon	V	No	Although likely to occur in relatively low numbers, this species occurs widely in open habitats including cropping lands where it preys upon open country birds. Trees within the study area may be used for perching, or rarely for breeding purposes.	✓	✓
Mammals (2)						
Scoteanax rueppellii	Greater Broad-nosed Bat	V	No	Likely that some parts of the study area represent part of the seasonal distribution of this species when occurring locally.	✓	✓
Vespadelus baverstocki	Inland Forest Bat	V	No	Recorded in the wider locality of the study area in the Rock Nature Reserve. Likely that some parts of the study area represent part of the seasonal distribution of this species when occurring locally.	✓	✓

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) SAII – serious and irreversible impact.

5.3.3 JUSTIFICATION OF ANY EXCLUSION OF ANY PREDICTED ECOSYSTEM CREDIT SPECIES

In refining the candidate ecosystem species list for further assessment, 11 ecosystem credit species predicted by the BAM-C were excluded from the BAM-C candidate list. A summary of the justification for these exclusions is provided in Table 5.6.

Table 5.6 Justification for exclusion of any predicted ecosystem credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	JUSTIFICATION FOR EXCLUSION	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Birds						
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	No	Relatively sparse regional records in suitable woodland habitats. Tends to occur in the largest woodland patches, as birds forage over large home ranges of at least 5 hectares (EES 2022). The study area does not hold suitable habitat of sufficient patch size (5–<25 hectares) to support this species.	-	✓
Neophema pulchella	Turquoise Parrot	V	No	Relatively sparse regional records in suitable woodland habitats. Lives on edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland (EES 2022). The study area does not hold suitable habitat of sufficient quality to support this species as most wooded areas in the study area adjoin disturbed land including the existing rail line and developed urban areas.	✓	✓
Chthonicola sagittata	Speckled Warbler	V	No	Sparsely distributed in higher quality woodlands in regions associated with the study area, but no records associated with the study area. This species requires large, relatively undisturbed remnants to persist in an area (EES 2022) and remnant habitat patches associated with the study area are not of sufficient quality for this species.	✓	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	JUSTIFICATION FOR EXCLUSION	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	No	Brown Treecreepers associated with the study area localities are not identifiable as the threatened eastern subspecies. The final determination for the listing of the eastern subspecies, notes (based on Schodde and Mason, 1999) that the subspecies *C. p. victoriae* occurs east of a line extending from Albury north through Wagga Temora and Young. An associated line of hybridisation, which cannot be identified as the threatened subspecies, with the more westerly nominate race, *C. p. picumnus*, occurring through those localities.	✓	✓
Pachycephala inornata	Gilbert's Whistler	V	No	Relatively sparse regional records in suitable woodland habitats. This species appears to require a dense shrub layer in a variety of habitats (EES 2022). The study area does not hold habitat of sufficient quality to support this species as vegetation in the study area is disturbed with a loss of a native understorey.	-	✓
Grantiella picta	Painted Honeyeater	V	No	No records associated with the study area. Remnant habitat patches associated with the study area do not contain micro-habitats preferred by this species nor are there large presence of mistletoes present (>5 mistletoes per hectare).	✓	✓
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	No	Generally, very sparse regional records in suitable woodland habitats. Requires structurally diverse habitats with mature eucalypts, saplings, small shrubs and a ground layer of moderately tall native grasses (EES 2022). Vegetation in the study area does not contain habitat of this nature to support this species. May rarely occur where more suitable habitat abuts the study area.	✓	✓
Rostratula australis	Australian Painted Snipe	V	No	Very marginal habitat opportunities for this species within the study area. Requires waterbodies associated with wetlands and muddy flats, these do not occur in the study area.	✓	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	JUSTIFICATION FOR EXCLUSION	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Tyto novaehollandiae	Masked Owl	V	No	A single record to the west of Albury in 2000 associated with extensive riparian vegetation. Considered unlikely to occur in the study area due to the lack of contiguous suitable habitats including eucalypt forest and woodlands (EES 2022).	✓	✓
Ninox strenua	Powerful Owl	V	No	Lack of records in the locality. Species is more prominent to the east associated with the Great Dividing Range. Requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well (EES 2022). Considered unlikely to occur in the study area due to the poor quality of fragmented habitats and lack of contiguous suitable riparian or moist forest types.	-	✓
Mammals						
Dasyurus maculatus	Spotted-tailed Quoll	V	No	Lack of records in the study area and locality. Uses hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites and is usually dependent on hollow-dependent prey (EES 2022), This habitat is not present within the study area. The habitats within the site are very open and exposed and not likely to be suitable for this species that requires large contiguous areas of intact forest.	✓	✓

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) SAII – serious and irreversible impact.

5.4 IDENTIFYING HABITAT SUITABILITY FOR SPECIES CREDIT SPECIES

5.4.1 *THREATENED FLORA SPECIES*

5.4.1.1 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 5.7.

Table 5.7 List of preliminary BAM-C candidate threatened flora species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	HABITAT FEATURES	LOWER SLOPES	INLAND SLOPES
Acacia ausfeldii	Ausfeld's Wattle	V	No	PCT 277	✓	✓
Ammobium craspedioides	Yass Daisy	V	No	PCT 277	–	✓
Cullen parvum	Small Scurf-pea	E	No	PCT 5 and PCT 277	✓	✓
Euphrasia arguta	Euphrasia arguta	CE	Yes	PCT 277	–	✓
Prasophyllum petilum	Tarengo Leek Orchid	E	No	PCT 277	–	✓
Swainsona recta	Small Purple-pea	E	No	PCT 277	✓	✓
Swainsona sericea	Silky Swainson-pea	V	No	PCT 277	✓	✓

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) SAII – serious and irreversible impact.

5.4.1.2 JUSTIFICATION FOR INCLUSION OF ANY ADDITIONAL THREATENED FLORA SPECIES CREDIT SPECIES

In identifying a candidate threatened flora species list for further assessment, the following inclusions to the BAM-C preliminary candidate list have been considered (refer to Table 5.8). Species inclusions were based on database searches and likelihood of occurrence assessments (refer to Appendix C-1).

Table 5.8 Justification for inclusion of any additional threatened flora species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	HABITAT FEATURES	LOWER SLOPES	INLAND SLOPES
Amphibromus fluitans	River Swamp Wallaby-grass	V	No	Recorded primarily in permanent swamps with seasonally fluctuating water levels that are moderately fertile and have some bare ground. Grows on hard clay soils in habitats including swamp margins in mud, dam and tank beds. Associated habitat PCT 5.	–	✓
Pilularia novae-hollandiae	Austral Pillwort	E	Yes	Occurs in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. Found near rail alignment in Doodle Comer Swamp west of Henty, NSW.	✓	–

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) SAII – serious and irreversible impact.

5.4.1.3 JUSTIFICATION FOR EXCLUSION OF ANY ADDITIONAL THREATENED FLORA SPECIES CREDIT SPECIES

No candidate threatened flora species credit species were identified to be excluded to the BAM-C preliminary candidate species credit list for consideration.

5.4.2 THREATENED FAUNA SPECIES

5.4.2.1 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 for each IBRA subregion. This preliminary candidate threatened fauna species list is presented in Table 5.9.

Table 5.9 List of BAM-C generated candidate species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Amphibians						
Crinia sloanei	Sloane's Froglet	V	No	Semipermanent/ephemeral wet areas containing relatively shallow sections with submergent and emergent vegetation, or within 500 metres of wet area OR within 500 metres of swamps/waterbody.	✓	✓
Litoria booroolongensis	Booroolong Frog	E	No	N/A[4]	–	✓
Birds						
Anthochaera phrygia	Regent Honeyeater	CE	Yes	Mapped important areas.	✓	✓
Burhinus grallarius	Bush Stone-curlew	E	No	Fallen/standing dead timber including logs.	✓	✓
Callocephalon fimbriatum	Gang-gang Cockatoo	V	No	Hollow bearing trees: *Eucalypt* tree species with hollows greater than nine centimetres diameter.	✓	✓
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	No	Breeding habitat: Living or dead mature trees within suitable vegetation within one kilometre of a rivers, lakes, large dams or creeks, wetlands and coastlines.	✓	✓
Hieraaetus morphnoides	Little Eagle	V	No	Breeding habitat: Nest trees – live (occasionally dead) large old trees within vegetation.	✓	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Lathamus discolor	Swift Parrot	E	Yes	Mapped important areas.	✓	✓
Lophoictinia isura	Square-tailed Kite	V	No	Breeding habitat: live large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy.	✓	✓
Ninox connivens	Barking Owl	V	No	Breeding habitat: living or dead trees with hollows greater than 20 centimetres diameter and greater than 4 metres above the ground.	–	✓
Ninox strenua	Powerful Owl	V	No	Breeding habitat: living or dead trees with hollows greater than 20 centimetres diameter.	–	✓
Polytelis swainsonii	Superb Parrot	V	No	Breeding habitat: living or dead *E. blakelyi*, *E. melliodora*, *E. albens*, *E. camaldulensis*, *E. microcarpa*, *E. polyanthemos*, *E. mannifera*, *E. intertexta* with hollows greater than five centimetre diameter; greater than four metres above ground or trees with a DBH of greater than 30 centimetres.	✓	✓
Tyto novaehollandiae	Masked Owl	V	No	Breeding habitat: living or dead trees with hollows greater than 20 centimetres diameter.	✓	✓
Mammals						
Cercartetus nanus	Eastern Pygmy-possum	V	No	N/A[4]	✓	✓
Chalinolobus dwyeri	Large-eared Pied Bat	V	Yes	Breeding habitat: study area within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	✓	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	Yes	Breeding habitat: cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding.	–	✓
Myotis macropus	Southern Myotis	V	No	Hollow bearing trees within 200 metres of riparian zone OR Bridges, caves or artificial structures within 200 metres of riparian zone.	✓	✓
Petaurus norfolcensis	Squirrel Glider	V	No	Relies on large old trees with hollows for breeding and nesting.	✓	✓
Petrogale penicillata	Brush-tailed Rock-wallaby	E	Yes	Land within one kilometre of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines.	–	✓
Phascogale tapoatafa	Brush-tailed Phascogale	V	No	N/A[4]	–	✓
Phascolarctos cinereus	Koala	V	No	Areas identified via survey as 'important habitat' – defined by the density of koalas and quality of habitat.	✓	✓
Pteropus poliocephalus	Grey-headed Flying-fox	V	No	Important habitat – breeding camps.	✓	✓
Reptiles						
Aprasia parapulchella	Pink-tailed Legless Lizard	V	No	Rocky areas, or within 50 metres of rocky areas.	✓	✓
Delma impar	Striped Legless Lizard	V	No	N/A[4]		✓
Insects						
Keyacris scurra	Key's Matchstick Grasshopper	E	No	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*.	–	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	IBRA SUBREGION	
					LOWER SLOPES	INLAND SLOPES
Synemon plana	Golden Sun Moth	E	Yes	Presence of Wallaby grass (*Rytidosperma* sp.), Chilean needlegrass (*Nassella nessiana*) or Serrated Tussock (*Nassella trichotoma*)	–	✓

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) SAII – serious and irreversible impact.
(3) Habitat constraints and geographical limitations as identified within the Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d).
(4) N/A = Not applicable. No habitat constraint identified within the Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d).

5.4.3 JUSTIFICATION FOR INCLUSIONS OF ANY ADDITIONAL CANDIDATE SPECIES CREDIT SPECIES

No additional candidate threatened species credit species were identified to be included to the BAM-C preliminary candidate species credit list for consideration.

5.4.4 JUSTIFICATION FOR EXCLUSIONS OF ANY CANDIDATE SPECIES CREDIT SPECIES

In refining the candidate threatened species list for further assessment, five candidate species generated by the BAM-C were excluded from the BAM-C candidate species credit list. A summary of the justification for this exclusion is provided in Table 5.10.

Table 5.10 Justification for exclusion of any candidate species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	JUSTIFICATION FOR EXCLUSION	IBRA SUBREGION	
						LOWER SLOPES	INLAND SLOPES
Birds							
Anthochaera phrygia	Regent Honeyeater	CE	Yes	Mapped important areas	No key breeding areas identified in the National Recovery Plan or other key mapped important breeding areas occur within locality of the study area. Given this species nomadic nature it cannot be entirely discounted. Foraging habitat spasmodically occurs for this species, but woodland habitats are generally small and isolated from large patches of higher quality habitats frequented by this species; therefore is unlikely to breed within the study area.	✓	✓
Lathamus discolor	Swift Parrot	E	Yes	Mapped important areas	The species is a winter migrant to NSW typically occurring on the Australian mainland between March and September. The study area does not occur within important mapped areas. Given this species is nomadic with respect to the temporal availability of blossom resources, Swift Parrot presence cannot be discounted, as foraging habitat occurs spasmodically within the study area. This species is only known to breed in Tasmania during spring and summer. The Swift Parrot is considered further as a predicted ecosystem species.	✓	✓
Mammals							
Chalinolobus dwyeri	Large-eared Pied Bat	V	Yes	Breeding habitat: study area within two km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two km of old mines or tunnels.	The study area does not provide important breeding habitat required by this species including caves and areas within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels (EES 2020). Due to the lack of the important breeding habitat features the species is not considered to be a candidate species.	✓	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	JUSTIFICATION FOR EXCLUSION	IBRA SUBREGION	
						LOWER SLOPES	INLAND SLOPES
Petrogale penicillata	Brush-tailed Rock-wallaby	E	Yes	Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines	The study area does not provide the important habitat of rocky escarpments, outcrops and cliffs indicated by EES (2022). No records of the species within the study area or locality. Due to the lack of the important breeding habitat features and lack of records the species is not considered to be a candidate species.	–	✓
Pteropus poliocephalus	Grey-headed Flying-fox	V	No	Lack of important habitat – i.e. breeding camps	The study area does not provide important breeding habitat, nor were any breeding camps identified in the study area through field survey. The species is predominantly known to occur within 200 kilometres of the coast, with some nomadic foraging movements west of the Great Dividing Range (EES 2022). In addition, the species prefers establishing breeding camps in vegetation with a dense canopy and close to water. Due to the lack of the important breeding habitat features the species is not considered to be a candidate species. However, may be recorded foraging in the locality.	✓	✓

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) SAII – serious and irreversible impact.
(3) Habitat constraints and geographical limitations as identified within the Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d).

5.5 SPECIES CREDIT SPECIES SURVEY METHODS

In accordance with Part 3 of the BAM 2020 Operational Manual – Stage 1 (EES 2020a), 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 study area (or specific vegetation zones).

Details of threatened species surveys methods employed for this report are presented below. Detailed locations of targeted surveys within the study area are presented in Appendix C-3.

5.5.1 SURVEY DATES AND WEATHER OBSERVATIONS

Field survey and assessment was undertaken over four survey periods being:

- biodiversity survey session 1 (11–19 November 2020)
- biodiversity survey session 2 (16–22 February 2021)
- biodiversity survey session 3 (12–15 May 2021)
- biodiversity survey session 4 (9–10 October 2021).

Field survey and assessment periods were undertaken to coincide with seasonality requirements of threatened entities from Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d) and the BAM-C candidate species output. Due to the Covid-19 pandemic and to avoid the potential spread of the virus to rural towns, a biodiversity survey session that was apportioned to Sloane's Froglet in August 2021 was aborted. Therefore, Sloane's Froglet is assumed to be present in areas of potentially suitable habitat, as detailed in section 5.6.2.1 and illustrated in Appendix C-5. Following the completion of surveys and the assessment (including a previous submission of the BAM-C), a new species requiring assessment was identified in a BAM-C update, being Key's Matchstick Grasshopper. Targeted surveys will be undertaken for this species in the future survey period for the species. Until the completion of the survey, this species is assumed to be present in areas of potentially suitable habitat (conservatively including poor condition).

Table 5.11 Weather conditions during survey period

SURVEY DATE	TEMPERATURE (°C)		RAINFALL (millimetres)	WIND DIRECTION/SPEED (kph)	
	Minimum	Maximum		9am	3pm
11/11/2020	13.0	31.4	0	SE 7	ENE 20
12/11/2020	17.3	28.4	6.8	ENE 9	W 17
13/11/2020	13.1	24.8	0	W 11	W28
14/11/2020	9.2	26.7	0	ENE 4	WNW 9
15/11/2020	10.5	32.8	0	ENE 9	NNE 28
16/11/2020	18.6	28.4	0.4	NW 15	WNW 22
17/11/2020	8.8	25.1	0	W 13	WNW 9
18/11/2020	9.5	28.3	0	ESE 9	SSE 13
19/11/2020	12.4	32.5	0	Calm	SE 13
16/02/2021	22.1	33.9	0	SE 17	N 9
17/02/2021	19.8	33.2	0	SE 13	ESE 7
18/02/2021	18.7	34.5	0	SE 11	NNW 24
19/02/2021	14.9	24.7	1.6	WNW 20	SW 28

SURVEY DATE	TEMPERATURE (°C)		RAINFALL (millimetres)	WIND DIRECTION/SPEED (kph)	
	Minimum	Maximum		9am	3pm
20/02/2021	9.5	28.2	0	SSE 6	WSW 13
21/02/2021	12.4	30.0	0	ENE 9	WNW 9
22/02/2021	14.2	31.9	0	SE 17	NW 17
12/05/2021	7.2	21.1	2.0	SE 11	SSE 11
13/05/2021	6.0	17.8	0	NNE 4	W 19
14/05/2021	4.3	12.9	0.2	WNW 11	W 17
15/05/2021	7.9	13.2	1.2	WSW 17	SW 28
9/10/2021	6.4	24.5	0	ESE 6	N 15
10/10/2021	11.4	18.2	0	SE 7	W 22

Source: Climate data obtained from Bureau of Meteorology (2021), AWS 072160.

5.5.2 THREATENED FLORA SURVEYS

Targeted surveys for candidate threatened flora species were completed in accordance with the 'Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method' (Department of Planning, Industry and Environment, 2020). Detailed locations of targeted surveys within the study area are presented in Appendix C-3.

5.5.2.1 PARALLEL FIELD TRAVERSES

Parallel field traverses were used in vegetation types which were considered the most suitable habitat for candidate threatened flora species. This involved two botanists walking on a fixed bearing in accordance with Table 1 (section 4.2) of the NSW survey guide for the BAM (Department of Planning, Industry and Environment, 2020). The separation distance of the parallel traverses was determined by the life form or habitat of the candidate threatened species.

Parallel field traverses mostly focused on higher vegetation integrity patches (PCT 277 moderate and derived condition) and larger patches of lower vegetation integrity (PCT 5 poor condition and PCT 277 poor condition).

5.5.2.2 RAPID DATA POINT ASSESSMENT

Rapid data point assessment (RDP) were undertaken to sample patches of vegetation to determine micro habitat suitability for threatened species. RDP assessment was used supplementary to parallel field traverses to allow an overall better detection for threatened flora species and their habitat within the study area. The location of RDP are shown in Appendix B-2.

5.5.2.3 VEGETATION INTEGRITY PLOTS

Vegetation integrity plot surveys were carried out in accordance with the BAM. At each vegetation integrity plot survey location, dedicated 20 minute searches were conducted for threatened species assessed as candidate species within each PCT and vegetation zone sampled. The number of plots completed for each identified PCT and vegetation zone is provided in Table 4.2 and Table 4.3 with the location of each vegetation integrity plot identified in Table 4.4 and shown in Appendix B-2.

5.5.2.4 RANDOM MEANDERS AND OPPORTUNISTIC OBSERVATIONS

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 study area recording dominant and key plant species (e.g. threatened species, priority 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.

Opportunistic sightings of threatened flora species were recorded during field surveys whilst completing other field surveys such as undertaking BAM vegetation integrity plots, vegetation type/condition validation etc. During these surveys, a hand-held GPS was used to record the locations of any threatened flora species observed.

5.5.2.5 SURVEY EFFORT SUMMARY

Targeted surveys were completed for candidate threatened flora species as outlined in Table 5.12. Several candidate flora species have seasonal survey requirements due to difficulty of detection except at specific times of the year, during its flowering period. The BAM and Threatened Species Data Collection outlines survey requirements for threatened flora species including requirements for seasonal surveys to maximize the likelihood of recording a species if present. Some species were not able to be fully surveyed in the correct seasonal period. Where this occurred, comments are made in Table 5.12 in relation to any deviations for survey requirements and whether this was reasonable.

Table 5.12 Survey timing for candidate threatened flora (species credit species)

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SURVEY TECHNIQUE	SEASONAL SURVEY REQUIREMENT	SURVEY TIMING
Acacia ausfeldii	Ausfeld's Wattle	V	–	Parallel transects in PCT 277 (moderate, poor and derived condition) Vegetation integrity plots (Q4, Q5, Q7, Q8, Q9, Q10, Q11, Q12 Q13, Q14 and Q15) RDP micro habitat assessment Random meanders	Aug – Oct General notes: Use flowers and/or pods to identify, as species can be confused with *A. verniciflua* (EES 2022) Although targeted survey was carried out outside the August to October period, all potential *Acacia* plants were closely examined for their potential to be *A. ausfeldii* and none were recorded and as such this species is not likely to be present.[3] Associated vegetation type: PCT 277	11–18 November 2020 16–22 February 2021 12–15 May 2021
Ammobium craspedioides	Yass daisy	V	V	Parallel transects in PCT 277 (moderate and derived condition) Vegetation integrity plots (Q4, Q5, Q7, Q8, Q9, Q10, Q11 and Q12) RDP micro habitat assessment Random meanders	Survey: use flower and seed to identify Optimal survey months are Sept – Nov. Associated vegetation type PCT 277	11–18 November 2021
Amphibromus fluitans	River Swamp Wallaby-grass	V	V	Vegetation integrity plots (Q1 and Q3) RDP micro habitat assessment Random meanders	Survey: use flower head to identify Optimal survey months are Dec – March	11–18 November 2020 16–22 February 2021

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SURVEY TECHNIQUE	SEASONAL SURVEY REQUIREMENT	SURVEY TIMING
Cullen parvum	Small Scurf-pea	E	–	Parallel transects in PCT 277 (moderate, poor and derived condition) Vegetation integrity plots (Q1, Q3, Q4, Q5, Q7, Q8, Q9, Q10, Q11 and Q12) RDP micro habitat assessment	Survey: use flowers or fruit to locate and identify. Optimal survey months are Dec – Jan. While survey was undertaken in late November (very close to the required survey period) prevailing weather conditions were very favourable for this species and it was not recorded.[3] Associated vegetation type: PCT 5 and PCT 277	11–18 November 2020
Euphrasia arguta	–	CE	CE	Parallel transects in PCT 277 (moderate and derived condition) Vegetation integrity plots (Q4, Q5, Q7, Q8, Q9, Q10, Q11 and Q12) RDP micro habitat assessment Random meanders	Survey: after rainfall or in areas with light enhancement (post fire, opening of canopy, on edges etc) to identify likely presence or absence. Optimal survey months are Nov – Mar.	11–18 November 2020 16–22 February 2021
Pilularia novae-hollandiae	Austral Pillwort	E	–	Vegetation integrity plots (Q1 and Q3) Table drains and roadsides around Henty area were inspected. RDP micro habitat assessment Random meanders	Survey: Survey Oct – Dec in drying mud after inundation. Survey in November followed rainfall of 6.8mm (12 Nov) and 0.4mm (16 Nov). Optimal survey months are Oct. – Dec. Associated vegetation type PCT 5 and associated table drains and wet soaks.	11–18 November 2020 16–22 February 2021

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SURVEY TECHNIQUE	SEASONAL SURVEY REQUIREMENT	SURVEY TIMING
Prasophyllum petilum	Tarengo Leek Orchid	E	E	Parallel transects in PCT 277 (moderate and derived condition) Vegetation integrity plots (Q4, Q5, Q7, Q8, Q9, Q10, Q11 and Q12) RDP micro habitat assessment Random meanders	Survey: south of Queanbeyan in Nov – Dec Optimal survey months are Nov – Dec. Associated vegetation type PCT 277	11–18 November 2020
Swainsona recta	Small Purple-pea	E	E	Parallel transects in PCT 277 (moderate and derived condition) Vegetation integrity plots (Q4, Q5, Q7, Q8, Q9, Q10, Q11 and Q12) RDP micro habitat assessment Random meanders	Optimal survey months are Sept – Nov Associated vegetation type: PCT 277	11–18 November 2020
Swainsona sericea	Silky Swainson-pea	V	–	Parallel transects in PCT 277 (moderate poor and derived condition) Vegetation integrity plots (Q4, Q5, Q7, Q8, Q9, Q10, Q11 and Q12) RDP micro habitat assessment Random meanders	Survey Sept – Oct in the Riverina. Associated vegetation type: PCT 277	11–18 November 2020 9-10 October 2021

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) Threat status under the EPBC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(3) Survey outside of seasonal requirements, see Table 5.15 for justification.

5.5.3 THREATENED FAUNA SURVEYS

This section outlines the fauna survey effort completed for candidate species that were predicted to have a moderate to high likelihood of occurrence within the study area based on database searches outlined in section 5.2.1. Threatened fauna surveys completed within the study area were carried out as described below and where applicable, considering the methodology detailed in:

- Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities – Working Draft 2004 (Department of Environment and Conservation, 2004)
- Survey Guidelines for Australia's Threatened Birds (Department of Environment, Water, Heritage and the Arts, 2010)
- 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, 2010)
- NSW Survey Guide for Threatened Frogs - A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (BAM) (Department of Planning Industry and Environment, 2020c)
- 'Species credit' threatened bats and their habitats – NSW survey guide for the Biodiversity Assessment Method (Office of Environment and Heritage, 2018)
- Survey guidelines for Australia's threatened reptiles (Department of the Environment Water Heritage and the Arts, 2011)
- Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d)

A summary of fauna surveys effort completed is presented in Table 5.13 with survey locations presented in Appendix C-3.

5.5.3.1 FAUNA HABITAT ASSESSMENT

Fauna habitat assessments were undertaken to assess the likelihood of threatened species of animal (candidate species identified in desktop review) occurring within the study area. Fauna habitat characteristics assessed included:

- 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
- 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.

5.5.3.2 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 etc., was also noted. This provided indirect information on animal presence and activity.

These 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.

5.5.3.3 TARGETED SEASONAL SURVEYS

Targeted fauna surveys for threatened species were undertaken during November 2020, February 2021 and October 2021 during the optimal survey months as prescribed by the BAM-C and the Threatened Biodiversity Data Collection. Where targeted seasonal survey timeframes could not be met and species habitat features were recorded in the study area (e.g. Sloane's Froglet), the species was assumed to be present for the purposes of the BAM. Survey methods are described below, and effort undertaken for each threatened species is summarised in Table 5.13 and illustrated in Appendix C-3. The weather conditions during surveys is provided in Table 5.11.

DIURNAL BIRD SURVEYS

Sixteen formal 20 minute diurnal bird searches were completed by two ecologists in November 2020 Appendix C-3. Bird surveys were completed by actively walking through the nominated site (transect of about 1–2ha) 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 (6am–10am) or evening (3pm–6pm). Birds were also recorded opportunistically during all other surveys.

Wherever threatened bird species were absent from the study area, habitat assessments were conducted to determine the likelihood that proposal site might support those species that are known to occur in the region.

An additional 13 (20 minute) diurnal bird searches were completed between 9–10 October 2021. These searches specifically targeted Little Eagle breeding habitat.

MICROCHIROPTERAN BAT SURVEY

ACOUSTIC DETECTION

Ultrasonic Anabat bat detection (Titley Scientific, Brendale QLD) was used to record and identify the echolocation calls of microchiropterans foraging across 38 locations along the study area Appendix C-3. Passive monitoring of these survey sites in November 2020 and February 2021 was achieved by setting Anabat bat detectors to record continuously during the sunset to late evening hours or overnight. Active monitoring of enhancement sites was completed during exit surveys, stag watches and walking (spotlight) transects, whereby an Anabat Walkabout device was used to track the animals and record their call during the same evening period.

Bat calls were analysed by Rob Gration using Titley Scientific software and with reference to 'Bat Calls of NSW: Region Based Guide to Echolocation Call of Microchiropteran Bats' (Pennay, Law, and Reinhold 2004) (Appendix C-7).

HARP TRAPPING

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. Therefore, where site suitability allowed sufficient trapping efficacy, 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 or Fairy Martin nests provide potential roosting sites and where suitable flyways were detected. One harp trap was set in one location for a single night, with captured bats identified to species level, sexed, measured and weighed (Appendix C-3). Bats were released immediately after processing, so they could resume their night activities.

ARTIFICIAL HABITAT ASSESSMENT

Habitat surveys were conducted between 16-22 February 2021, during the late summer period, when conditions are favourable for foraging microchiropteran bats and most Fairy Martins have vacated their nests leaving additional roosting opportunities available for microchiropteran bats.

Targeted searches for potential microchiropteran bat roosting habitat was undertaken to determine if potential roosting locations were present within existing rail infrastructure (Appendix C-7). The following infrastructure types were checked for a range of micro-habitat attributes, which may be used for shelter by roosting microchiropteran bats, including:

- bridges and culverts
  - drainage holes
  - Fairy Martin nests
  - fissures and joint crevices
- railside buildings
  - silos and sheds
    - fissures and joint crevices
    - drainage holes
    - Fairy Martin nests
    - bat accessible voids, including roofs.

All culverts, fissures and drains were assessed for their potential to contain roosting habitat features for microchiropteran bats (Appendix C-7). Where the size or condition of such culverts rendered them inaccessible, due to increased safety risk associated with their confined nature, or flooded condition, potential bat habitat was assessed from the entrance with high-powered torch light and binoculars where practicable.

Active monitoring of enhancement sites was completed during exit surveys and walking (spotlight) transects, whereby an Anabat Walkabout device was used to track the animals and record their call during the same evening period.

EXIT SURVEYS

Assessments of bat roosting status included visual and call-detected dusk exit surveys at specific locations where features were assessed as having a high likelihood of bat shelter and/or other habitat features, such as pools of water, which might provide foraging opportunities for targeted threatened species, such as Southern Myotis (*Myotis macropus*). The purpose of an exit survey was to observe any microbats leaving potential roost sites. Ecologists were positioned near the nominated structure and monitored for about 30 minutes prior to and after dusk.

Stationary Ultrasonic Anabat bat detection (Titley Scientific, Brendale QLD) were used through the sunset to late evening period at habitat locations assessed as having habitat potential for microchiropteran bats to capture bats exiting roosting locations (exit surveys). Mobile Anabat exit surveys were completed with a Walkabout Anabat device at other suitable locations and walking transects, during the same period.

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 search transects. At least one person hour of survey effort was typically undertaken per site on foot using high-powered headlamps and hand torches. Sighted animals were identified to the species level. A total of 28 person hours of spotlighting was completed in the study area (Table 5.13, Appendix C-3).

Stag watches were to be undertaken at dusk in areas where large hollow-bearing trees were identified within the study area. The aim of dusk stag watches is to identify if hollow-dwelling fauna including owls, microchiropteran bats and gliders are utilising any hollow-bearing trees within the proposal study area 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 5.13 using standard methods (Debus, 1995; Kavanagh and Debus, 1994). Call playback was completed after dusk within a number of sites targeting areas of native vegetation, riparian areas and areas with important habitat features such as hollow bearing trees (Appendix C-3).

For each survey, an initial listening period of 10 to 15 minutes would be undertaken, followed by a spotlight search for 10 minutes to detect any animals in the immediate vicinity. The calls of the target species would be then played intermittently for five minutes followed by a 10 minute listening period. After the calls are played, another 10 minutes of spotlighting would be done in the vicinity to check for animals attracted by the calls, but not vocalising. Calls from Stewart and Pennay were broadcast using a portable media player and megaphone.

REMOTE CAMERA TRAPS

Remote motion sensing infra-red cameras were positioned to target Squirrel Glider and Eastern Pygmy-possum in appropriate microhabitats for at least four consecutive nights. Remote camera traps were set in trees and large shrubs (about two metres above ground) with a suitable food source containing rolled oats and peanuts with honey and vanilla essence, secured in PVC bait tube. A honey/water mixture was also sprayed surrounding the bait tube (i.e. sprayed onto tree trunk) in order to provide further attraction to bait station. Remote cameras aimed to target Squirrel Glider and Eastern Pygmy-possum in the appropriate microhabitat identified within the study area. 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 in an approximate 1–2 hectare area with all ground shelter returned to their original position (Appendix C-3). 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 *Threatened species survey and assessment guidelines: field survey methods for fauna (reptiles)* (Department of Environment and Climate Change, 2009).

KOALA SPOT ASSESSMENT TECHNIQUE (SAT)

In addition to habitat assessment and spotlight transects, targeted searches for the Koala were completed at several locations in the study area in areas of suitable habitat (Appendix C-3). Koala feed trees observed in the study area predominately consisted of *Eucalyptus blakelyi* (Blakely's Red Gum), *Eucalyptus camaldulensis* (River Red Gum) and *Eucalyptus melliodora* (Yellow Box). At each sampling point, Spot Assessment Technique (SAT) methodology (Biolink Ecological Consultants, 2009) was employed, which involved actively searching for Koala faecal pellets for about one metre around the trunk of each of 30 trees; specifically targeting feed tree species where possible.

Table 5.13 Summary of candidate threatened fauna survey effort (species credit species)

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SURVEY TECHNIQUE	SEASONAL SURVEY REQUIREMENTS	SURVEY TIMING	IBRA SUBREGION	
							LOWER SLOPES	INLAND SLOPES
Amphibians								
Crinia sloanei	Sloane's Froglet	V	–	— 6 person hours active searches (Nov) — Habitat Assessments to determine habitat features	Jul – Aug	11–19 November 2020 Assumed present	✓	✓
Litoria booroolongensis	Booroolong Frog	E	E	— 6 person hours active searches (Nov) — Habitat Assessments to determine habitat features	Oct – Dec	11–19 November 2020		✓
Birds								
Callocephalon fimbriatum	Gang-gang Cockatoo	V	–	— 16 diurnal bird surveys (Nov) (10.6 person hours) — 8 days opportunistic surveys (Nov) — 13 diurnal bird surveys (Oct) (8.6 person hours) — 2 days opportunistic surveys (Oct) — Habitat Assessments to determine habitat features	Oct – Jan	11–19 November 2020 16–22 February 2021 9–10 October 2021	✓	✓
Burhinus grallarius	Bush Stone-curlew	V	–	— 16 diurnal bird surveys (Nov) (10.6 person hours) — 28 person hours spotlighting (Nov) — 8 days opportunistic surveys (Nov) — 7 afternoon/ nights opportunistic survey (Feb) — 13 diurnal bird surveys (Oct) (8.6 person hours) — 2 days opportunistic surveys (Oct) — Habitat Assessments to determine habitat features	All year	11–19 November 2020 16–22 February 2021 9–10 October 2021	✓	✓
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	Ma	— 16 diurnal bird surveys (Nov) (10.6 person hours) — 8 days opportunistic surveys (Nov) — 13 diurnal bird surveys (Oct) (8.6 person hours) — 2 days opportunistic surveys (Oct) — Habitat Assessments to determine habitat features	Jul – Dec	11–19 November 2020 9–10 October 2021	✓	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SURVEY TECHNIQUE	SEASONAL SURVEY REQUIREMENTS	SURVEY TIMING	IBRA SUBREGION	
							LOWER SLOPES	INLAND SLOPES
Hieraaetus morphnoides	Little Eagle	V	–	— 16 diurnal bird surveys (Nov) (10.6 person hours) — 8 days opportunistic surveys (Nov) — 13 diurnal bird surveys (Oct) (8.6 person hours) — 2 days opportunistic surveys (Oct) — Habitat Assessments to determine habitat features	Aug – Oct	11–19 November 2020 9–10 October 2021	✓	✓
Lophoictinia isura	Square-tailed Kite	V	–	— 16 diurnal bird surveys (Nov) (10.6 person hours) — 8 days opportunistic surveys (Nov) — 13 diurnal bird surveys (Oct) (8.6 person hours) — 2 days opportunistic surveys (Oct) — Habitat Assessments to determine habitat features	Sep – Jan	11–19 November 2020 9–10 October 2021	✓	✓
Ninox connivens	Barking Owl	V	–	— 7 nights stag watching hollow-bearing trees (Nov) — 28 person hours spotlighting (Nov) — Habitat Assessments to determine habitat features	May – Dec	11–19 November 2020		✓
Polytelis swainsonii	Superb Parrot	V	V	— 16 diurnal bird surveys (Nov) (10.6 person hours) — 8 days opportunistic surveys (Nov) — 13 diurnal bird surveys (Oct) (8.6 person hours) — 2 days opportunistic surveys (Oct) — Habitat Assessments to determine habitat features	Sep – Nov	11–19 November 2020 9–10 October 2021	✓	✓
Mammals								
Cercartetus nanus	Eastern Pygmy-possum	V	–	— 44 remote camera trap nights (Nov) — 7 nights stag watching hollow-bearing trees (Nov) — 28 person hours spotlighting (Nov) — 7 nights opportunistic survey (Feb) — Habitat Assessments to determine habitat features	Oct – Mar	11–19 November 2020 16–22 February 2021	✓	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SURVEY TECHNIQUE	SEASONAL SURVEY REQUIREMENTS	SURVEY TIMING	IBRA SUBREGION	
							LOWER SLOPES	INLAND SLOPES
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	–	— 13 Anabat recording nights (Nov) — 25 Anabat recording nights (Feb) — 7 artificial structure exit surveys (Feb) — Inspection of 73 infrastructure features (culverts, bridges) (Feb) — 1 harp trap night (Feb) — Habitat Assessments to determine habitat features	Dec – Feb	11–19 November 2020 16–22 February 2021		✓
Myotis macropus	Southern Myotis	V	–	— 13 Anabat recording nights (Nov) — 25 Anabat recording nights (Feb) — 7 nights stag watching hollow-bearing trees (Nov) — 7 artificial structure exit surveys (Feb) — Inspection of 73 infrastructure features (culverts, bridges) (Feb) — 1 harp trap night (Feb) — Habitat Assessments to determine habitat features	Oct – Mar	11–19 November 2020 16–22 February 2021	✓	✓
Petaurus norfolcensis	Squirrel Glider	V	–	— 44 remote camera trap nights (Nov) — 7 nights stag watching hollow-bearing trees (Nov) — 28 person hours spotlighting (Nov) — 7 nights opportunistic survey (Feb) — Habitat Assessments to determine habitat features	All year	11–19 November 2020 16–22 February 2021	✓	✓
Phascogale tapoatafa	Brush-tailed Phascogale	V	–	— 44 remote camera trap nights (Nov) — 7 nights stag watching hollow-bearing trees (Nov) — 28 person hours spotlighting (Nov) — 7 nights opportunistic survey (Feb) — Habitat Assessments to determine habitat features	Dec – Jun	11–19 November 2020 16–22 February 2021		✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	SURVEY TECHNIQUE	SEASONAL SURVEY REQUIREMENTS	SURVEY TIMING	IBRA SUBREGION	
							LOWER SLOPES	INLAND SLOPES
Phascolarctos cinereus	Koala	V	V	— SATs (Nov) — 28 person hours spotlighting (Nov) — 7 nights opportunistic survey (Feb) — Habitat Assessments to determine habitat features	All year	11–19 November 2020 16–22 February 2021	✓	✓
Reptiles								
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	— 8 person hours of active searches — 8 days of opportunistic surveys — Habitat Assessments to determine habitat features	Sep – Nov	11–19 November 2020	✓	✓
Delma impar	Striped Legless Lizard	V	–	— 8 person hours of active searches — 8 days of opportunistic surveys — Habitat Assessments to determine habitat features	Sep – Dec	11–19 November 2020		✓
Invertebrates								
Keyacris scurra	Key's Matchstick Grasshopper	E	–	Targeted surveys will be undertaken for this species in the future survey period for the species. Until the completion of the survey, this species is assumed to be present in areas of potentially suitable habitat (conservatively including poor condition).	Mar – May Aug – Dec	Assumed present		✓
Synemon plana	Golden Sun Moth	E	CE	— 8 hours of active searches — 8 days of opportunistic surveys — Habitat Assessments to determine habitat features	Oct – Dec	11–19 November 2020		✓

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) Threat status under the EPBC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered, Ma = Marine.

5.6 SPECIES CREDIT SPECIES SURVEY RESULTS

In accordance with Part 3 section 4.4.4 of the BAM 2020 Operational Manual – Stage 1 (EES 2020a), determining 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 proposal site (or specific vegetation zones).

5.6.1 DETERMINING THE PRESENCE OF A SPECIES CREDIT SPECIES

Results and outcome of targeted candidate threatened species surveys undertaken for this report are presented in Table 5.14, Table 5.15 and Table 5.16. Detailed figures for threatened fauna recorded and candidate species polygons are presented in Appendix C-4, Appendix C-6 and Appendix C-7.

Table 5.14 Threatened fauna recorded during surveys

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	CREDIT TYPE
Circus assimilis	Spotted Harrier	V	Predicted ecosystem credit species
Hieraaetus morphnoides	Little Eagle	V	Dual credit species
Petaurus norfolcensis	Squirrel Glider	V	Candidate species credit species
Polytelis swainsonii	Superb Parrot	V	Dual credit species
Pteropus poliocephalus	Grey-headed Flying-fox	V	Predicted ecosystem credit species
Stagonopleura guttata	Diamond Firetail	V	Predicted ecosystem credit species

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

Table 5.15 Summary results of targeted surveys completed for candidate threatened flora species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT REQUIREMENTS	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Acacia ausfeldii	Ausfeld's Wattle	V	No	✓	✓	Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. No habitat constraints identified[4] Associated habitat in the study area – PCT 277	No (surveyed)	**No** – targeted surveys were conducted for Ausfeld's Wattle and no specimens were recorded. Whilst targeted surveys are generally recommended when plants are in flower/seed (August to October) this species is an erect spreading shrub. During field surveys, no similar *Acacia* spp. were observed within the study area (no specimens of the similar looking species *Acacia verniciflua* (Varnish Wattle) were recorded). The main distribution of this species in NSW is from the Mudgee/Gulgong region in the Central Tablelands. Given targeted surveys did not locate this species and that the proposal site is located to the west of any known population, *Acacia ausfeldii* (Ausfeld's Wattle) is unlikely to be affected by the proposal and as such this species is not considered further.	Not considered further as a species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT REQUIREMENTS	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Ammobium craspedioides	Yass Daisy	V	No	–	✓	Associated habitat in the study area – PCT 277	No (surveyed)	**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 30 kilometres to the south of Wagga Wagga in Livingstone National Park. Given targeted surveys did not locate this species and that the proposal site is located to the west of any known population, *Ammobium craspedioides* (Yass Daisy) is unlikely to be affected by the proposal and as such this species is not considered further.	Not considered further as a species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT REQUIREMENTS	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Amphibromus fluitans	River Swamp Wallaby-grass	V	No	–	✓	*Amphibromus fluitans* grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. Associated habitat in the study area – PCT 5		**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. There are a small number of records of this species to the south of the rosed enhancement site near Billy Hughes bridge dated from 2005. These records appear to be associated with small dams and drainage depressions outside the study area. Given targeted surveys did not locate this species, *Amphibromus fluitans* (River Swamp Wallaby-grass) is unlikely to be affected by the proposal and as such this species is not considered further.	Not considered further as a species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT REQUIREMENTS	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Cullen parvum	Small Scurf-pea	E	No	✓	✓	Associated habitat in the study area – PCT 5 and PCT 277	No (surveyed)	**No** – targeted surveys were conducted outside of recommended months for survey; however, survey was timed during favourable conditions for this species (following rainfall in November 2020), which typically dies back in dry seasons and resprouts with rain in winter or spring (EES 2022). The surveys focused on vegetation patches with intact understorey (PCT 277 moderate and derived). Surveys also targeted patches of PCT 5. *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 and (1967) near Albury with a more recent record (2004) being northwest of Henty. Though flooding has been suggested as a possible seed dispersal mechanism, this species relies largely on self-fertilisation. As there is no local population, it is considered unlikely that this species would disperse to suitable habitat within the proposal site. Given targeted surveys did not locate these species, *Cullen parvum* (Small Scurf-pea) is considered unlikely to be affected by the proposal. This species is not considered further.	Not considered further as a species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT REQUIREMENTS	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Euphrasia arguta	Euphrasia arguta	CE	Yes	–	✓	*Euphrasia arguta* has an annual habit and has been observed to die off over the winter months, with active growth and flowering occurring between January and April. Associated habitat in the study area – PCT 277	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. *Euphrasia arguta* was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Historically, *Euphrasia arguta* has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha. This species has not been recorded from the NSW South Western Slopes Bioregion. Given targeted surveys did not locate this species and it is not known from the bioregion, *Euphrasia arguta* is unlikely to be affected by the proposal and as such this species is not considered further.	Not considered further as a species credit species
Pilularia novae-hollandiae	Austral Pillwort	E	Yes	✓	–	Associated habitat in the study area – possibly PCT 5 in damp depressions with drying mud after inundation.	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. A recent record of this species (2014) occurs from Doodle Comer Swamp west of Henty, NSW. Table drains and roadsides within the Henty study area were inspected. Given targeted surveys did not locate these species, *Pilularia novae-hollandiae* (Austral Pillwort) is considered unlikely to be affected by the proposal. This species is not considered further.	Not considered further as a species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT REQUIREMENTS	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Prasophyllum petilum[3] *Prasophyllum sp. Wybong* (EPBC Act)	Tarengo Leek Orchid	E	No	–	✓	Grows in open sites within Natural Temperate Grassland No habitat constraints identified[4] Associated habitat in the study area – PCT 277	No (surveyed)	**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 proposal site are located near Boorowa (1995–2016), about 75 kilometres to the east. Given targeted surveys did not locate this species and that the proposal site is located to the west of any known or likely habitat, *Prasophyllum petilum* (Tarengo Leek Orchid) is unlikely to be affected by the proposal and as such this species is not considered further.	Not considered further as a species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT REQUIREMENTS	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Swainsona recta	Small Purple-pea	E	No	✓	✓	Known to occur in the grassy understorey of woodlands and open-forests No habitat constraints identified[4] Associated habitat in the study area – PCT 277	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known record to the study area is historic (1900) and is located near Wagga Wagga, (1930) near Culcairn and (1887) near Wodonga. A more recent record (2000) is located near Mandurama, about 130 kilometres to the north-east. During field surveys, suitable habitat was mostly restricted to moderate and derived condition patches of PCT 277. Larger areas of poor condition PCT 277 were considered generally unsuitable to support a population of this species due to the highly modified nature of the ground stratum. Given targeted surveys did not locate this species and that the study area is not located near any current known or likely habitat, *Swainsona recta* (Small Purple Pea) is unlikely to be affected by the proposal and as such this species is not considered further.	Not considered further as a species credit species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT REQUIREMENTS	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Swainsona sericea	Silky Swainson-pea	V	No	✓	✓	Associated habitat in the study area – PCT 277	No (surveyed)	**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, about 40 kilometres south east of the Junee precinct. A more recent record (2005) is located near the Gundagai township. Given targeted surveys did not locate this species and that the proposal site is located about 40 kilometres from the nearest area of known or likely habitat, *Swainsona sericea* (Silky Swainson-pea) is unlikely to be affected by the proposal and as such this species is not considered further.	Not considered further as a species credit species

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) SAII = Serious and irreversible impact.
(3) The NSW Herbarium considers *Prasophyllum* sp. Wybong (C. Phelps ORG5269) and *Prasophyllum petilum* to be synonyms (i.e. the same species).
(4) As identified within the Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d).

Table 5.16 Summary results of targeted surveys completed for candidate threatened fauna species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Amphibians									
Crinia sloanei	Sloane's Froglet	V	No	✓	✓	Semi-permanent/ephemeral wet areas -containing relatively shallow sections with submergent and emergent vegetation, or within 500m of wet area OR within 500m of swamps/waterbody	Assumed present	**Yes.** To avoid the potential introduction of Covid-19 to rural towns, targeted seasonal survey was not apportioned to Sloane's Froglet in August 2021. Therefore, the species is assumed to be present. Records for the species occur in proximity to the study area; specifically, near Billy Hughes bridge and to the west of Culcairn Yard clearances.	**Species credit**
Litoria booroolongensis	Booroolong Frog	E	No		✓	N/A[4]	No (surveyed)	**No.** Habitat assessments determined that no suitable habitat is associated with the study area. Furthermore, targeted searches did not record this species. The species is restricted to the headwaters of western flowing streams of the NSW tablelands and slopes. Primary habitat requirements for the Booroolong Frog are extensive rock bank structures along permanent rivers. Its preferred habitat did not occur within the study area and lack of records of individuals within the locality suggests that the species does not persist in the study area or locality.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Birds									
Callocephalon fimbriatum	Gang-gang Cockatoo	V	No	✓	✓	Hollow bearing trees: *Eucalypt* tree species with hollows greater than nine centimetres diameter	No (surveyed)	**No**. Targeted surveys were undertaken during recommended survey months (Oct–Jan). Breeding habitat was recorded during habitat assessments. Diurnal surveys and opportunistic sightings did not record any individuals in study area and no individuals were recorded nesting or utilising hollow-bearing trees within the study area for breeding. As such, breeding habitat for this species is considered unlikely to be affected.	Not considered further as a species credit species.
Burhinus grallarius	Bush Stone-curlew	V	No	✓	✓	Fallen/standing dead timber including logs	No (surveyed)	**No**. Targeted surveys were conducted during appropriate seasonal requirements and no individuals were recorded. Habitat assessments determined that the study area did not contain preferred habitat and lacks more continuous woodland for suitable foraging and breeding habitat. Given targeted surveys did not locate this species, it is unlikely to be affected by the proposal and as such, this species is not considered further.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	No	✓	✓	Breeding habitat: Living or dead mature trees within suitable vegetation within one kilometre of rivers, lakes, large dams or creeks, wetlands and coastlines.	No (surveyed)	**No**. Targeted surveys were undertaken during recommended survey months (Jul–Dec). Breeding habitat was recorded during habitat assessments. Diurnal bird surveys and opportunistic sightings did not record any individuals in study area and no individuals were recorded nesting within the study area for breeding. As such, breeding habitat for this species is considered unlikely to be affected.	Not considered further as a species credit species.
Hieraaetus morphnoides	Little Eagle	V	No	✓	✓	Breeding habitat: Nest trees – live (occasionally dead) large old trees within vegetation.	Yes (surveyed)	**No**. Targeted surveys were completed during the recommended survey months (Aug–Oct). Although potential breeding habitat was recorded during habitat assessments and one individual was recorded during the breeding season adjacent to Billy Hughes bridge, no breeding activity or nests trees were observed in the study area. Given that targeted survey did not locate breeding activity or nest trees, breeding habitat for the Little Eagle is unlikely to be affected by the proposal, and as such, this species is not considered further.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Lophoictinia isura	Square-tailed Kite	V	No	✓	✓	Breeding habitat: live large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy.	No (surveyed)	**No**. Targeted surveys were undertaken during recommended survey months (Sept–Jan). Although potential breeding habitat was recorded during habitat assessments, diurnal bird surveys and opportunistic sightings did not record any individuals in study area and no individuals were recorded nesting in the study area for breeding. As such, breeding habitat for this species is considered unlikely to be affected.	Not considered further as a species credit species.
Ninox connivens	Barking Owl	V	No		✓	Breeding habitat: living or dead trees with hollows greater than 20 centimetres diameter and greater than four metres above the ground.	No (surveyed)	**No**. Targeted surveys were undertaken during recommended survey months (May–Dec). Breeding habitat was recorded during habitat assessments. Nocturnal surveys, stagwatches, call playback and opportunistic sightings did not record any individuals in study area and no individuals were recorded nesting or utilising hollow-bearing trees within the study area for breeding. As such, breeding habitat for this species is considered unlikely to be affected.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Tyto novaehollandiae	Masked Owl	V	No	✓	✓	Breeding habitat: living or dead trees with hollows greater than 20 centimetre diameter.	No (surveyed)	**No**. Habitat assessments determined that suitable habitat was not associated with the study area and targeted survey methods (call playback, spotlighting, stag watching) during the November survey period did not recorded the species. Although Masked Owls almost exclusively feed on terrestrial mammals, including rodents, which can be seasonally abundant in pastoral lands, it is essentially a woodland and forest species and is unlikely to persist in areas where patches of forest are reduced to small isolated fragments as are such habitats associated with the study area. Although surveys were carried out in November, outside of the recommended seasonal requirements, since preferred habitat did not occur in the study area and the records for Masked Owl in the regions through which the study area traverses are very scant, the species is not likely to persist in the study area.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Ninox strenua	Powerful Owl	V	No		✓	Breeding habitat: living or dead trees with hollows greater than 20 centimetres diameter.	No (surveyed)	**No**. Habitat assessments determined that suitable habitat was not associated with the study area and targeted survey methods (call playback, spotlighting, stag watching) during the November survey period did not recorded the species. Although surveys were carried out in November, outside of the recommended seasonal requirements, the Powerful Owl is essentially a forest and woodland species that requires large tracts of habitat and is unlikely to persist in the small isolated fragments associated with the study area. As preferred habitat did not occur in the study area and there are no records for Powerful Owl in the regions through which the study traverses indicate that the species is not likely to persist in the study area.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Polytelis swainsonii	Superb Parrot	V	No	✓	✓	Breeding habitat i.e. Living or dead *E. blakelyi*, *E. melliodora*, *E. albens*, *E. camaldulensis*, *E. microcarpa*, *E. polyanthemos*, *E mannifera*, *E. intertexta* with hollows greater than five centimetres diameter; greater than four metres above ground or trees with a DBH of greater than 30 centimetres.	**Yes** (surveyed)	**Yes**. Species was recorded during field surveys within the study area. Study area provides habitat features (i.e. hollow-bearing trees) that the species is likely to use. The study area will be utilised for both foraging and breeding purposes.	**Species credit**
Mammals									
Cercartetus nanus	Eastern Pygmy-possum	V	No	✓	✓	N/A[4]	No (surveyed)	**No**. Species was not recorded within the study area. Lack of preferred habitat of denser shrubby understorey and high density of nectar and pollen producing trees and shrubs. Unlikely that the species utilises the study area.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	Yes		✓	Breeding habitat: cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding.	No (surveyed)	**No**. Targeted surveys were conducted during appropriate seasonal requirements and no individuals were recorded. An inspection of 73 infrastructure features (culverts, bridges) (February 2021), including seven exit surveys, recorded two Lesser Long-eared Bat roosting in an abandoned Fairy Martin nest. Consequently, the study area was considered unlikely to contain breeding habitat for this species. Given targeted survey did not locate this species, it is unlikely to be affected by the proposal and as such, this species is not considered further.	Not considered further as a species credit species.
Myotis macropus	Southern Myotis	V	No	✓	✓	Hollow bearing trees within 200 metres of riparian zone OR Bridges, caves or artificial structures within 200 metres of riparian zone.	No (surveyed)	**No**. Targeted surveys were conducted during appropriate seasonal requirements and no individuals were recorded. An inspection of 73 infrastructure features (culverts, bridges) (February 2021), including seven exit surveys, recorded two Lesser Long-eared Bat roosting in an abandoned Fairy Martin nest. Consequently, the study area was considered unlikely to contain breeding habitat for this species. Given targeted survey did not locate this species, it is unlikely to be affected by the proposal and as such, this species is not considered further.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Petaurus norfolcensis	Squirrel Glider	V	No	✓	✓	Relies on large old trees with hollows for breeding and nesting.	**Yes** (surveyed)	**Yes**. Species was recorded during field surveys within the study area. Study area provides habitat features (i.e. hollow-bearing trees) that the species is likely to use. The study area will be utilised for both foraging and breeding purposes.	**Species credit**
Phascogale tapoatafa	Brush-tailed Phascogale	V	No		✓	N/A[4]	No (surveyed)	**No**. Habitat assessments determined that suitable habitat was not associated with the study area. Also, although targeted survey was not carried out in recommended survey months (December to June), appropriate survey methods (spotlighting, remote camera traps, stag watching) were carried out close to this period in mid-November and the species was not recorded. Opportunistic survey carried out within the recommended survey months also did not record the species. In NSW, the Brush-tailed Phascogale is mainly found east of the Great Dividing Range, with sparse records occurring to the west of the Great Dividing Range. The Brush-tailed Phascogale requires large tracts of habitat (females occupying 20–40 hectares and males up to 100 hectares) and is unlikely to persist in the small isolated fragments associated with the study area within a highly fragmented landscape.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
								The combination of negative targeted survey and opportunistic survey results, with the lack of suitable habitat, indicates that the species is unlikely to occur in the study area. Furthermore, there are no records for Brush-tailed Phascogale in the regions through which the study traverses. These facts indicate that the species is not likely to be affected by the proposal. As such, this species is not considered further.	
Phascolarctos cinereus	Koala	V	No	✓	✓	Areas identified via survey as 'important habitat' – defined by the density of koalas and quality of habitat.	No (surveyed)	**No.** The species was not recorded during targeted field surveys. Targeted surveys undertaken and database searches identified that the region has a low population density of Koala. In addition, the study area retained five Koala feed tree species, *E. albens*, *E. blakelyi*, *E. populnea*, *E. camaldulensis* and *E. microcarpa*. Due to the presence of small density of Koala feed tree species, poor quality habitat and lack of Koala activity, the study area did not provide 'important habitat' and it is unlikely that the species utilises the study area.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Aprasia parapulchella	Pink-tailed Legless Lizard	V	No	✓	✓	Rocky areas, or within 50 metres of rocky areas.	No (surveyed)	**No**. The species was not recorded during targeted field surveys. The study area lacked preferred habitat in the form of well-drained areas, with rocky outcrops or scattered, partially buried rocks and predominantly native grassy ground layers. Due to the lack of preferred habitat and not being recorded during targeted surveys, the species is not considered be a candidate species.	Not considered further as a species credit species.
Delma impar	Striped Legless Lizard	V	V		✓	N/A[4]	No (surveyed)	**No**. The species was not recorded during targeted field surveys. Habitat assessments concluded that the study area lacked preferred habitat. Additionally, no records associated with the study area or within the locality. Species' range occurs to the east of the study area in higher elevation native grasslands. Preferred habitat in the form of derived native grasslands with retention of suitable tussock-forming structures present in adequate cover (>20–50% cover) does not occur within the study area. Due no suitable amount of preferred habitat, lack of records within the locality and the species range occurring more predominately to the east of the study area (tablelands) in higher elevation native grasslands the species is not considered to be a candidate species.	Not considered further as a species credit species.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	IBRA SUBREGION		HABITAT CONSTRAINTS AND GEOGRAPHICAL LIMITATIONS[3]	SPECIES PRESENCE	AFFECTED SPECIES?	OUTCOME
				LOWER SLOPES	INLAND SLOPES				
Invertebrates									
Keyacris scurra	Key's Matchstick Grasshopper	E	No		✓	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*.	Assumed present	**Yes.** This species was identified in an update to the BAM-C following the completion of the survey and assessment. Therefore, the species is assumed to be present but will be subject to future targeted surveys.	**Species credit**
Synemon plana	Golden Sun Moth	E	Yes		✓	Presence of Wallaby grass (*Rytidosperma* sp), Chilean needlegrass (*Nassella nessiana*) or Serrated Tussock (*Nassella trichotoma*).	No (surveyed)	**No**. In NSW, populations are limited to habitats at high altitudes to the east of the study area (from Wagga Wagga), in association with native grasslands of the southern tablelands. Although isolated patches of *Rytidosperma* grass spp. occurred in the study area, there are no records for this species throughout a 10 kilometre buffer of habitats surrounding the combined study area. The closest Golden Sun Moth record (2000) occurs approximately 90 kilometre to the east of Uranquinty Yard clearances, near Tumut, NSW.	Not considered further as a species credit species.

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.
(2) SAII = serious and irreversible impact.
(3) Habitat constraints and geographical limitations as identified within the Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d).
(4) N/A = Not applicable. No habitat constraint identified within the Threatened Biodiversity Data Collection (Environment, Energy and Science, 2021d).

5.6.2 DETERMINING THE AREA OR COUNT, AND LOCATION OF SUITABLE HABITAT FOR A SPECIES CREDIT SPECIES

Table 5.17 outlines the habitat features suitable for a species credit species within the proposal site (BAM s. 5.2.5). Detailed figures for threatened fauna recorded and candidate species polygons are presented in Appendix C-4, Appendix C-6 and Appendix C-7.

Table 5.17 Candidate species suitable habitat and features within the proposal site

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII[2]	PCT AND HABITAT FEATURES	IBRA SUBREGION	
					LOWER SLOPES	LOWER SLOPES
Amphibians						
Crinia sloanei	Sloane's Froglet	V	No	PCT 5 (poor) and PCT 277 (poor and native plantings)[3]	✓	✓
Invertebrates						
Keyacris scurra	Key's Matchstick Grasshopper	E	No	PCT 5 (poor) and PCT 277 (poor, moderate, derived and native plantings)[3]	-	✓
Birds						
Polytelis swainsonii	Superb Parrot	V	No	PCT 5 (poor) and PCT 277 (poor and moderate)	✓	✓
Mammals						
Petaurus norfolcensis	Squirrel Glider	V	No	PCT 5 (poor) and PCT 277 (poor and moderate)	✓	✓

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered.
(2) SAII = serious and irreversible impact.
(3) The assessment relies on assumed presence for the Sloane's Froglet and Key's Matchstick Grasshopper

5.6.2.1 SLOANE'S FROGLET

Sloane's Froglet (*Crinia sloanei*) is listed as Vulnerable under BC Act and Endangered under the EPBC Act. This species has been recorded widely from scattered sites in association with floodplains of the Murray-Darling Basin, with most records derived from the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions. Sloane's Froglet is usually associated with periodically inundated areas in grassland, woodland and disturbed habitats.

Targeted seasonal survey was not apportioned to Sloane's Froglet due to the Covid-19 pandemic. Consequently, potential Sloane's Froglet breeding habitat was mapped using available imagery with consideration of a methodology described in *Sloane's Froglet Breeding Habitat Mapping and Spatial Database Development* (Cate Ewin Spatial Services, 2017), s3.1 (Mapping Specifications) and s3.4 (Develop Wetland Cluster Mapping), which includes buffering habitat to 15m. This mapping approach was supported by the BCD during a meeting between ARTC and BCD officers on 2 September 2021. In accordance with this mapping approach, potential habitat was determined by:

- digitising water extent from aerial imagery from two separate years, including:
  - proposal imagery covering the full extent of the proposal study area (captured in 2015)
  - NSW Six Maps imagery (captured February 2014)
  - Metromap imagery, where available in association with discrete enhancement sites (e.g. Billy Hughes bridge) (captured March 2021)
- buffering mapped water extent by 15 metres.

Sloane's Froglet species polygon will occur in the proposal site, where mapped potential habitat (including 15 metre buffer) occurs in association with a native vegetation community (PCT) and is not dissected by a road, rail corridor or urban development.

5.6.2.2 KEY'S MATCHSTICK GRASSHOPPER

Key's Matchstick Grasshopper (*Keyacris scurra*) is listed as Endangered under BC Act and is not listed under the EPBC Act. Key's Matchstick Grasshopper was originally distributed from Victoria to Orange (NSW) across the wheat/sheep belt, typically recorded in native grasslands and grassy woodland. All Bionet records are located to the east of Kosciuszko National Park and Yass, with a single record located south-east of Batlow. While the predicted distribution of the species reaches Albury and Wagga, in reality the closest actual record (near Batlow, recorded in 2012) is approximately 100km to the east of the proposal site.

Habitat is also described on the species profile as:

- in some reported locations there is an absence of *Themeda* and very few or no *Asteraceae*
- being flightless, this species does not disperse large distances (<10m) which suggests these observations are indicative of resident populations (rather than dispersing individuals)
- has been observed to feed on a range of species including *Aira caryophyllea* (Silver hairgrass), *Scirpus* sp. (sedges), *Wurmbea dioica* (Early Nancy), *Bulbine bulbosa* (Native Leek), *Calochilus paludosus* (Red Beard Orchid), *Rumex crispus* (Curled Dock), *Acetosella vulgaris/Rumex acetosella* (Sorrel), *Cerastium glomeratum* (Mouse-ear Chickweed), *Ranunculus lappaceus* (Common Buttercup), *Rosa rubiginosa* (Sweet Briar), *Acaena ovina* (Orchid), *Trifolium subterraneum* (Subterranean Clover), *Trifolium arvense* (Haresfoot Clover), *Poranthera microphylla*, *Stackhousia monogyna* (Creamy Candles), *Hibbertia sericea*, *Lavandula stoechas* (Lavender), *Salvia verbenaca* (Vervain), *Verbascum thapsus* (Great Mullein), *Sherardia arvensis* (Field Madder), *Galium tricornatum* (Rough Fruited Bedstraw), *Helichrysum apiculatum* (Common Everlasting), *Ozothamnus retusus* or *O. scaber* (Helichrysum bilobum), *Podolepis jaceoides* (*Podolepis acuminate*) (Showy Copper-wire Daisy) and *Craspedia uniflora*.

As a result of an update to the BAM-C following the completion of the survey and the assessment, the species is now predicted to occur within the Inland Slopes IBRA subregion. Targeted species will be completed in the next survey period to confirm presence. To enable the finalisation of this report, this species has therefore conservatively been assumed to be present within potential habitats (including disturbed habitats) as described in Bionet, being:

- PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains (poor) and
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland (poor, moderate, derived and native plantings).

Key's Matchstick Grasshopper species polygon (assumed presence) therefore occurs in the proposal site where these PCTs and zones are mapped as occurring within the Inland Slopes IBRA subregion as identified in the BAM-C.

5.6.2.3 SUPERB PARROT

The Superb Parrot (*Polytelis swainsonii*) is listed as Vulnerable under both the BC and EPBC Act. The species occurs eastern inland NSW on the western slopes, with its core breeding area predominately on the south-western slopes of NSW. Core breeding area is known to occur between Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the West (Environment, Energy and Science, 2021d). The Riverina region along watercourses of the Murray, Edward and Murrumbidgee Rivers also acts as important breeding areas for the species. During winter months the species is known to migrate north to the north western slopes region of Namoi and Gwydir Rivers(Environment, Energy and Science, 2021d). The species prefers Box-gum woodland, Box cypress-pine woodland and River Gum Forests. Birds nest in the hollows of large trees (dead or alive) mainly associated with tall riparian River Red Gum Forest or Woodland (Environment, Energy and Science, 2021d). The species also utilises nest trees in open Box-Gum Woodland or isolated paddock trees. Individuals can forage up to 10 kilometres from nest trees mainly utilising grassy woodlands, feeding on trees, understorey shrubs and grasses (Environment, Energy and Science, 2021d). Their diet consists mainly of grass seeds and herbaceous plants, but they will also feed on fruits, berries, nectar, buds, flowers, insects and grain.

The species was observed in several locations flying throughout the proposal site mainly utilising grassy woodland habitats (Appendix C-4). No individuals were recorded utilising hollow-bearing trees for breeding within the proposal site, however, the species is known to breed within the region and has the potential to utilise large hollow-bearing trees within the proposal site. The species is expected to occur throughout the proposal site and utilise native canopy and understorey of habitat associated with PCT 5 and 277 with potential to use any large hollow-bearing tree that may be recorded within these patches (Appendix C-4).

The Superb Parrot species polygon has been mapped using a precautionary principal where all available habitat for this species has been used to map species polygons, being all PCT 5 and 277 patches.

5.6.2.4 SQUIRREL GLIDER

The Squirrel Glider (*Petaurus norfolcensis*) is listed as Vulnerable under the BC Act and a separate endangered population listing occurs for Squirrel Gliders in the Wagga Wagga LGA. The species distribution occurs along eastern Australia from Queensland to western Victoria. In areas west of the Great Dividing Range, the species inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest. The species prefers woodland habitat with a shrubby understorey and presence of *Acacia* spp. Squirrel Gliders are known to have a varying diet consisting of *Acacia* gum, eucalypt sap, nectar, honeydew and manna, invertebrates and pollen. Hollow-bearing trees are required for breeding and shelter, in which the species is known to live in family groups of a single adult male and one or more adult females.

Individuals were observed foraging in the study area at two sites including, Bill Hughes bridge and woodland patches three kilometres north of Uranquinty Yard clearances (Appendix C-4). The species has also been recorded recently in intact woodland patches associated with Murray River and areas near Illabo. The species is likely to utilise intact patches of PCT 5 and 277 where remnant canopy and midstorey persist and hollow-bearing trees are present (Appendix C-4). Due to the highly fragmented landscape surrounding majority of the proposal, some intact PCT 5 and 277 habitat patches are likely to be too isolated for the utilisation of Squirrel Gliders. Where intact patches of PCT 5 and 277 are highly isolated from known occurrences of Squirrel Gliders or where intact patches of PCT 5 and 277 are lacking both midstorey and hollow-bearing trees these are also not optimal habitat.

The Squirrel Glider species polygon has been mapped using a precautionary principal where all available habitat for this species has been used to map species polygons, being all PCT 5 and 277 patches.

6 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 Part 4 of the BAM 2020 Operational Manual – Stage 1 (EES 2020).

6.1 IDENTIFYING PRESCRIBED IMPACTS ON THREATENED ENTITIES

Prescribed impacts are those that may affect biodiversity values in addition to, or instead of, impacts from clearing vegetation. These impacts may be difficult to quantify or offset as they often affect biodiversity values that are irreplaceable. Table 6.1 identified the prescribed impacts associated with the proposal and the threatened species which have the potential to utilise these features within the study area.

6.1.1 NON-NATIVE VEGETATION

A total of 173 rapid data points were completed within the proposal study area to aid vegetation mapping, identify areas of non-native vegetation and determine micro habitat suitability for threatened species (Appendix B-5).

6.1.1.1 MISCELLANEOUS ECOSYSTEM – HIGHLY DISTURBED AREAS WITH NO OR LIMITED NATIVE VEGETATION

This vegetation type does not align to any recognised plant community type in NSW due to its limited native vegetation and degraded condition. As such, it has been aligned to a miscellaneous ecosystem type of highly disturbed areas with no or limited native vegetation. These areas have a long history of disturbance due to agriculture and infrastructure (rail and road) that have modified the landscape. This vegetation is dominated by exotic species including *Paspalum dilatatum*, *Setaria parviflora*, *Avena* spp., *Phalaris* spp., *Hypericum perforatum* and *Acacia saligna*. Vegetation provides limited ecological function and covers an area of about 85.10 hectares within the study area. Photographic representation is provided in Photo 6.1 and Photo 6.2.

Photo 6.1 Miscellaneous ecosystem – Highly disturbed areas with no or limited native vegetation

Photo 6.2 Miscellaneous ecosystems – Highly disturbed areas with no or limited native vegetation

6.1.1.2 MISCELLANEOUS ECOSYSTEMS – ORNAMENTAL PLANTINGS

This vegetation type does not align to any recognised plant community type in NSW due to its limited native vegetation. As such, it has been aligned to miscellaneous ecosystems - ornamental plantings. This vegetation type was typically recorded as planted native and exotic species that have been planted for ornamental purpose and have limited ecological function. Examples include plantings at Albury Yard clearances, Culcairn Yard clearances, Henty Yard clearances, Uranquinty Yard clearances, Pearson Street bridge and Kemp Street bridge. This non-native vegetation type occupies about 6.55 hectares within the study area. Photographic representation is provided in Photo 6.3 and Photo 6.4.

Photo 6.3 Misc. Ecosystems – Ornamental plantings

Photo 6.4 Misc. Ecosystems – Ornamental plantings

Appendix D of the BAM (2020) was reviewed to determine if these ornamental plantings were suitable for assessment under this native vegetation streamlined assessment module. The decision-making key (D.1) in Appendix D of BAM 2020 was followed to point 5 (‘Is the native vegetation…planted for functional, aesthetic, horticultural or plantation forestry purposes?’) where the appropriate answer was ‘yes’. This indicated that the D.2 assessment should be carried out.

Assessment D.2 requires the assessor to assess the suitability of the planted native vegetation for use by threatened species and record any incidental sightings or evidence of threatened species credit species using, inhabiting or being part of the planted vegetation. Results of this assessment found that the ornamental plantings had very limited ecological value and are not being utilised by threatened species and are not threatened species. Therefore, these ornamental plantings were not considered further in the BDAR.

6.1.1.3 MISCELLANEOUS ECOSYSTEMS – ARTIFICIAL WATERBODIES

This vegetation type does not align to any recognised plant community type in NSW due to its artificial nature and relatively limited native vegetation. As such, it has been aligned to miscellaneous ecosystems – artificial waterbodies. Artificial waterbodies associated with the study area were in the form of artificial farm dams. Due to historic disturbance these aquatic habitats were in low condition. Some waterbodies have the presence of emergent vegetation, including *Phragmites* sp. (reeds) and *Eleocharis* sp.(sedges) (Photo 6.5). This non-native vegetation type occupies about 0.15 hectares within the study area.

Photo 6.5 Misc. Ecosystems – Artificial waterbody (near Billy Hughes bridge)

Table 6.1 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 or rocks, which may provide potential breeding habitat for threatened fauna (i.e. microchiropteran bats) were recorded.			Not considered further
Occurrences of human-made structures	A total of 73 human made structures (i.e. culverts and bridges) were identified in the proposal site that provide potential habitat for threatened species. Of the 73 structures assessed, the Billy Hughes bridge was identified as having microbats (Lesser Long-eared Bat) roosting in abandoned Fairy Martin nests secured underneath. A further 21 artificial structures were assessed as having a high (15) or moderate (6) potential for microbat habitation. The remaining 51 artificial structures were assessed with a low likelihood to represent roosting potential for microbats. A detailed assessment of artificial structures and microbat utilisation are presented in Appendix C-7.	73 human-made structures	Of the 73 artificial structures identified, 15 were assessed as a high likelihood to be utilised by microbats and potentially threatened entities. One structure, Billy Hughes bridge, was identified to have microbats present utilising abandoned Fairy Martin nest. The species identified (Lesser Long-eared Bat*)* is not listed as a threatened species. The following threatened species have the potential to use human-made structures: — Southern Myotis — Large Bent-winged Bat. The Southern Myotis and Large Bent-winged Bat were not recorded in the study area during targeted seasonal survey.	Impact further addressed in section 9.3

FEATURE	DESCRIPTION OF FEATURE CHARACTERISTICS AND LOCATION	POTENTIAL IMPACT	THREATENED SPECIES OR COMMUNITY USING OR DEPENDANT ON FEATURE	IMPACT ASSESSED
Occurrences of non-native vegetation	A total of 91.65 hectares of non-native vegetation (miscellaneous ecosystems) was recorded within the study area (across both IBRA subregions). This included: — Miscellaneous ecosystem – highly disturbed areas with no or limited native vegetation (85.10 hectares) — Miscellaneous ecosystem – ornamental plantings (6.55 hectares)	41.31 hectares of non-native vegetation (across both IBRA subregions)	Although some threatened species may utilise non-native vegetation for foraging purpose (i.e. raptors), no threatened entity was identified to be dependent on non-native vegetation for part of their life cycle.	Impact further addressed in section 9.3
Corridors or other areas of connectivity linking habitat for threatened entities	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 creek lines and road reserves.		The proposal is located within the existing rail corridor and impacts are located on the edge of existing cleared areas. Consequently, the proposal will not fragment any patches of habitat or cause further loss of connectivity for the movement of species between areas. The proposal will consider the construction of connectivity structures in association with the existing culverts to enable the continuation of species movement between habitat patches.	Impact further addressed in section 9.3
Water bodies or any hydrological processes that sustain threatened entities	A small number of artificial waterbodies which provide permanent and/or semi-permanent wet areas (0.15 hectares) were recorded within the study area. In addition, several drainage lines, including ephemeral creeks, occur within, or dissect, the existing rail corridor.	No artificial waterbodies will be impacted by the proposal. However, some drainage lines will be impacted by instream works required for temporary access roads and replacement of existing culverts.	The following species have the potential to utilise waterbodies: — Sloane's Froglet.	Impact further addressed in section 9.3

FEATURE	DESCRIPTION OF FEATURE CHARACTERISTICS AND LOCATION	POTENTIAL IMPACT	THREATENED SPECIES OR COMMUNITY USING OR DEPENDANT ON FEATURE	IMPACT ASSESSED
Protected animals that may use the proposed wind farm development site as a flyway or migration route	Wind turbines do not occur within the study area 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	During construction and operational phases of the proposal, potential train strike to native fauna is likely to occur due to the increase in train movements and potentially train height. While it is not possible to eliminate the risk of train strike, minimising vehicle strike during operation is being during the detailed design processes of the rail infrastructure including, connectivity enhancement structures and landscaping plans.		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 9.3

7 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

This chapter describes MNES relating to Commonwealth legislation under the EPBC Act.

7.1 THREATENED SPECIES AND ECOLOGICAL COMMUNITIES

7.1.1 THREATENED ECOLOGICAL COMMUNITIES

Based on broad-scale state vegetation mapping and database searches, a total of one candidate threatened ecological communities listed under the EPBC Act was considered likely to occur, being:

- White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grasslands.

A comparative assessment of native vegetation recorded within the proposal site against this EPBC Act listed threatened ecological community is provided below in section 7.1.1.1.

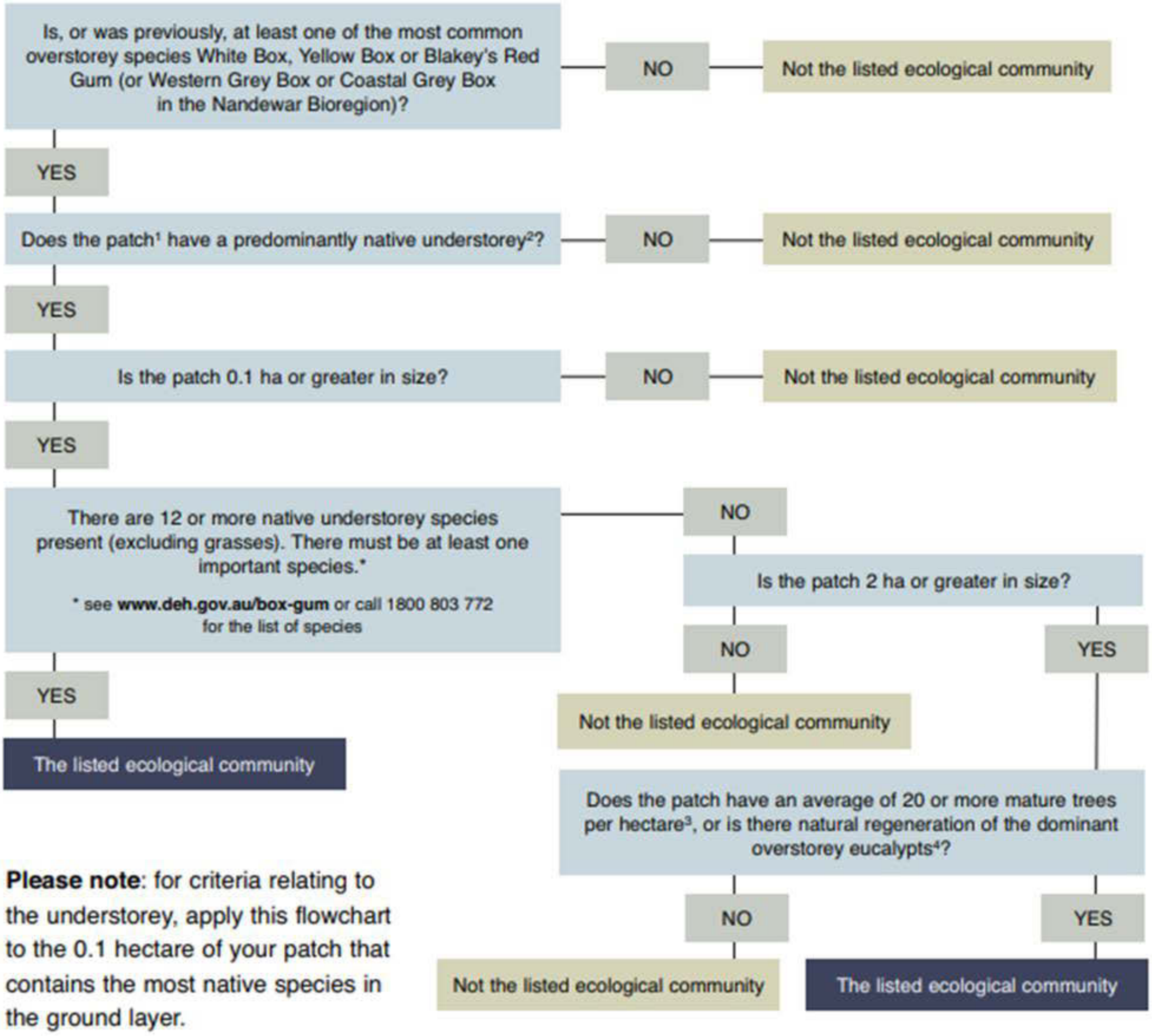
7.1.1.1 WHITE BOX – YELLOW BOX – BLAKELY’S RED GUM GRASSY WOODLAND AND DERIVED NATIVE GRASSLANDS

One PCT recorded in the proposal site was considered a candidate to form part of the ‘*White Box – Yellow Box – Blakely’s Red Gum Grassy Woodlands and Derived Native Grasslands’* threatened ecological community listed as Critically Endangered under the EPBC Act; being:

- PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland 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) and as summarised in Figure 7.1. An assessment of PCT 277 against these criteria is provided in Table 7.1.

The assessment concluded that only patches of moderate condition PCT 277 meet the criteria of the EPBC Act listing for White Box – Yellow Box – Blakely’s Red Gum Grassy Woodlands and Derived Native Grasslands (refer to Table 7.2).



1 Patch – a patch is a continuous area containing the ecological community (areas of other ecological communities such as woodlands dominated by other species are not included in a patch). In determining patch size it is important to know what is, and is not, included within any individual patch. The patch is the larger of:

- an area that contains five or more trees in which no tree is greater than 75 m from another tree, or
- the area over which the understorey is predominantly native.

Patches must be assessed at a scale of 0.1 ha (1000m^2) or greater.

2 A predominantly native ground layer is one where at least 50 per cent of the perennial vegetation cover in the ground layer is made up of native species. The best time of the year to determine this is late autumn when the annual species have died back and have not yet started to regrow. (At other times of the year, you can determine whether something is perennial or not is if it is difficult to pull out of the soil. Annual species pull out very easily.)

3 Mature trees are trees with a circumference of at least 125 cm at 130 cm above the ground.

4 Natural regeneration of the dominant overstorey eucalypts when there are mature trees plus regenerating trees of at least 15 cm circumference at 130 cm above the ground.

Figure 7.1 Criteria of Commonwealth White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands

Table 7.1 Assessment against White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands EPBC Act determining criteria

CRITERIA	PCT 277 – MODERATE CONDITION	PCT 277 – POOR CONDITION	PCT 277 – DERIVED CONDITION	PCT 277 – NATIVE PLANTINGS
Is, or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum?	Yes, canopy if dominated by Yellow Box or Blakely's Red Gum.	Yes, canopy dominated by either Yellow Box or Blakely's Red Gum.	Yes, canopy dominated by either Yellow Box or Blakely's Red Gum.	Yes, canopy dominated by either Yellow Box or Blakely's Red Gum.
Does the patch have a predominantly native understorey?	Yes, native groundcover is greater than 50% cover.	No, native groundcover is not greater than 50% cover.	Yes, native groundcover is greater than 50% cover.	Yes, native groundcover is greater than 50% cover.
Is the patch 0.1ha or greater in size?	Yes, patches are greater than 0.1 hectares in size.	Yes, patches are greater than 0.1 hectares in size.	Yes, patches are greater than 0.1 hectares in size.	Yes, patches are greater than 0.1 hectares in size.
There are 12 or more native understorey species present (excluding grasses). There must be at least one important species.	Yes, patches contain >12 native understory species and at least one important species.	No, patches do not contain >12 native understory species and at least one important species.	No, patches do not contain >12 native understory species and at least one important species.	No, patches do not contain >12 native understory species and at least one important species.
Meet EPBC Act listing criteria?	**Yes, meets EPBC Act listing criteria**	**No, does not meet EPBC Act listing criteria**	**No, does not meet EPBC Act listing criteria**	**No, does not meet EPBC Act listing criteria**

Table 7.2 Summary of EPBC Act listed threatened ecological communities within the study area and proposal site

THREATENED ECOLOGICAL COMMUNITY	VEGETATION TYPE AND ZONE	EPBC ACT[1]	STUDY AREA EXTENT (hectares)	PROPOSAL SITE EXTENT (hectares)
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands	PCT 277 – Moderate condition	CE	2.79	0.50
Total direct impact on EPBC Act threatened ecological communities			**2.79**	**0.50**

(1) Threat status under the EPBC Act: CE = Critically Endangered.

7.1.2 THREATENED FLORA SPECIES

A total of 18 EPBC Act listed threatened flora species are known to occur or are predicted to occur within the locality of the study area. Of these, four have been identified to have a moderate likelihood of occurrence based on previous records and availability of potential habitat (Table 7.3 and Appendix Table C-1.1).

Table 7.3 Listed EPBC Act threatened flora considered for assessment

SCIENTIFIC NAME	COMMON NAME	EPBC ACT	LIKELIHOOD OF OCCURRENCE AND ASSOCIATED HABITAT	AFFECTED SPECIES?
Ammobium craspedioides	Yass Daisy	V	**Moderate**. The Yass Daisy generally occurs in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. Suitable habitat within the proposal site occurs in the form of PCT 277 in moderate and derived condition. Targeted surveys for this species were conducted during suitable seasonal conditions in November 2020. Despite suitable conditions, no individuals of this species were recorded during targeted surveys. All known records of this species occur to the east of the proposal site. Considering this and given the highly fragmented and isolated nature of available habitat within the proposal site, a population of this species is considered unlikely to occur.	**No**. No individuals of this species were recorded during targeted surveys.
Amphibromus fluitans	River Swamp Wallaby-grass	V	**Moderate**. The River Swamp Wallaby-grass generally occurs primarily in permanent swamps with seasonally fluctuating water levels that are moderately fertile and have some bare ground. Grows on hard clay soils in habitats including swamp margins in mud, dam and tank beds. Suitable habitat within the proposal site occurs in the form of PCT 5. There are known records of this species from Doodle Comer Swamp at Henty and from around Ettamogah near Billy Hughes bridge. Targeted surveys for this species were conducted during suitable seasonal conditions in November 2020 and February 2021. Despite suitable conditions, no individuals of this species were recorded during targeted surveys. Considering this and given the highly fragmented and isolated nature of available habitat within the proposal site, a population of this species is considered unlikely to occur.	**No**. No individuals of this species were recorded during targeted surveys.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT	LIKELIHOOD OF OCCURRENCE AND ASSOCIATED HABITAT	AFFECTED SPECIES?
Prasophyllum petilum	Tarengo Leek Orchid	E	**Moderate**. The Tarengo Leek Orchid generally grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Suitable habitat within the proposal site occurs in the form of PCT 277 in moderate and derived condition. Targeted surveys for this species were conducted during suitable seasonal conditions in November 2020. Despite suitable conditions, no individuals of this species were recorded during targeted surveys. There are no known records of this species within a 25 kilometres radius of the proposal site. Considering this and given the highly fragmented and isolated nature of available habitat within the proposal site, a population of this species is considered unlikely to occur.	**No**. No individuals of this species were recorded during targeted surveys.
Swainsona recta	Small Purple-pea	E	**Moderate**. The Small Purple-pea generally occurs in the grassy understorey of woodlands and open-forests dominated by *Eucalyptus blakelyi* (Blakely's Red Gum), *E. melliodora* (Yellow Box), *E. rubida* (Candlebark Gum) and *E. goniocalyx* (Long-leaf Box). Suitable habitat within the proposal site occurs in the form of PCT 277 in moderate and derived condition. Targeted surveys for this species were conducted during suitable seasonal conditions in November 2020. Despite suitable conditions, no individuals of this species were recorded during targeted surveys. Several historic records of this species from the early 1900s occur from the Wagga Wagga and Culcairn areas although there are no known recent records of this species within a 25 kilometres radius of the proposal site. Considering this and given the highly fragmented and isolated nature of available habitat within the proposal site, a population of this species is considered unlikely to occur.	**No**. No individuals of this species were recorded during targeted surveys.

(1) Threat status under the EPBC Act: V = Vulnerable, E = Endangered.

7.1.3 THREATENED FAUNA SPECIES

Thirty-one EPBC Act listed threatened fauna species are known to occur or are predicted to occur within the locality of the study area. This comprised three species of amphibians, 12 birds, eight mammals, two reptiles, two invertebrates and four fish (Appendix C-2). Of these, six were identified to have a moderate or higher likelihood of occurrence based on previous records and availability of potential habitat (Table 7.4).

Two threatened fauna species listed under the EPBC Act, including Superb Parrot and Grey-headed Flying-fox, were recorded in the study area during targeted surveys (Table 7.4). Avoidance measures, proposed mitigation measures and residual impacts on these species are described in Chapter 8, 9 and 10.

Table 7.4 Listed EPBC Act threatened fauna considered for assessment

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	LIKELIHOOD OF OCCURRENCE AND ASSOCIATED HABITAT
Amphibian			
Crinia sloanei	Sloane's Froglet	E	**High** – Likely to occur where suitable habitat is associated with the study area, due to records in lands adjacent to the study area.
Bird			
Anthochaera phrygia	Regent Honeyeater	CE	**Moderate** – Potential habitat in association with remnant vegetation. May occur during seasonal movements.
Hirundapus caudacutus	White-throated needletail	V	**Moderate** – Potential habitat in association with remnant vegetation. May occur during seasonal movements.
Lathamus discolor	Swift Parrot	CE	**Moderate** – A mobile species that forages on canopy blossom and may occasionally use blossom resources associated with the study area when available.
Polytelis swainsonii	Superb Parrot	V	**Recorded** – Occurs widely throughout the regions in which the study area occurs and considered likely to forage and breed.
Mammal			
Phascolarctos cinereus	Koala	V	**Moderate –** Marginal habitat opportunities for this species within the study area, due to the very fragmented nature of woodland habitats associated with the study area. Limited access to woodlands associated closely with the study area due to a lack of connectivity to patches of high-quality habitat. Irregularly occurrences may occur in the study area where feed trees occur.
Pteropus poliocephalus	Grey-headed Flying-fox	V	**Recorded** – Foraging on blossom resources within study area vegetation. There are no known Flying-fox camps associated with the study area.

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

7.2 MIGRATORY SPECIES

Migratory species are protected under international agreements, to which Australia is a signatory, including JAMBA, CAMBA, 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.

A total of 14 EPBC Act listed migratory species are known or predicted to occur within the locality of the study area based on the results of database searches completed. One species, the White-throated Needletail, is considered to have a moderate likelihood of occurrence within the study area (Table 7.5).

Table 7.5 Migratory species with suitable habitat within the study area

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	LIKELIHOOD OF OCCURRENCE
Hirundapus caudacutus	White-throated Needletail	V; M	**Moderate.** Although local records are sparse, due to wide ranging habitats may occur in aerial habitats over the study area on a seasonal basis.

(1) Threat status under the EPBC Act: V = Vulnerable, M = Migratory.

With the exception of White-throated Needletail, and as defined by the 'Significant Impact Guidelines 1.1 – Matters of National Environmental Significance' (Department of the Environment, 2013), the proposal site would not be classed as 'important habitat' for terrestrial migratory and marine migratory species of bird that may potentially use the study area, as it did not contain habitat:

- utilised by a migratory species occasionally or periodically within a region that supports an ecological significant proportion of the population of the species
- utilised by a migratory species which is at the limit of the species range
- within an area where the species is declining.

As such, it is not likely that the proposal would significantly affect migratory species and therefore this group has not been considered further.

One species of migratory bird, the White-throated Needletail, is however listed as Vulnerable, and as such, the study area could be considered to contain potential habitat where this species is declining. As the White-throated Needletail is listed as migratory and threatened under the EPBC Act, an assessment of significance is carried out using the threatened species criteria (Appendix D-2). The outcome of the assessment of significance is detailed in section 9.4.2.2.

7.3 CRITICAL HABITAT

No EPBC Act listed critical habitat has been recorded or is considered likely to occur within the study area.

7.4 WORLD AND NATIONAL HERITAGE

Based on the PMST, no World Heritage Properties are located within or nearby the study area and therefore will not be impacted by the proposal.

One listed National Heritage property was identified in the PMST which included:

- Bonegilla Migrant Camp – Block 19.

Bonegilla Migrant Camp does not occur within the study area (located about 10km east of the Murry River bridge enhancement site) and as such will not be impacted by the proposal.

7.5 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.

7.5.1 NATIONALLY IMPORTANT WETLANDS

One nationally important wetland was identified by the PMST as occurring in proximity to the study area; being Doodle Comer Swamp. This wetland is located approximately 1 kilometre south-west of the enhancement site. The wetland is located 2.3 kilometres downstream of Buckaringah Creek, which is located about 150 metres north of the Henty Yard clearances enhancement site.

The proposed mitigation measures would ensure that no indirect downstream impacts would occur. Impacts on water quality, water bodies and hydrological processes are discussed in Stage 2 of this report (Chapter 9).

7.5.2 WETLANDS OF INTERNATIONAL IMPORTANCE (RAMSAR WETLANDS)

Seven Ramsar wetlands or Wetlands of International importance were identified by database searches completed within a 20 kilometre buffer of the proposal. These include:

- Banrock station wetland complex – located 600–700 kilometres upstream of the Murray River bridge enhancement site
- Barmah forest – located approximately 100–150 kilometres upstream of the Murray River enhancement site
- Gumbower forest – located approximately 150–200 kilometres upstream of the Murray River enhancement site
- Hattah-kulkyne lakes – located approximately 400–500 kilometres upstream of the Murray River enhancement site
- NSW central Murray state forests – located approximately 100 kilometres upstream of the Murray River enhancement site
- Riverland – located 500–600 kilometres upstream of the Murray River enhancement site
- The Coorong, and Lakes Alexandra and Albert wetland – located 500–600 kilometres from the Murray River enhancement site.

All these Wetlands of International Significance are located more than 100 kilometres from the study area and are unlikely to be directly or indirectly impacted by the proposal.

The implementation of proposed surface water management and mitigation measures (as described in Technical Paper 10 – Hydrology, Flooding and Water Quality and Technical Paper 9 – Aquatic Biodiversity Impact Assessment) will ensure that no indirect downstream impacts would occur. Impacts on water quality, water bodies and hydrological processes are discussed in Stage 2.

STAGE 2 – IMPACT ASSESSMENT

8 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 section 7 of the BAM.

8.1 AVOID AND MINIMISE IMPACTS ON NATIVE VEGETATION AND ASSOCIATED HABITAT

In accordance with section 7.1.1 of the BAM, efforts to avoid and minimise direct impact on native vegetation and habitat through proposal design are further addressed in Table 8.1.

Table 8.1 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)	

(a) *Locating the proposal in areas where there are no biodiversity values*	Areas of biodiversity value could not be entirely avoided as the proposal site comprises of an existing rail corridor, however, the impact of the proposal has been located mostly in areas where there are little to no biodiversity value.
	The study area has been mapped as having 22.04 hectares of native vegetation of which 4.44 hectares will be impacted by the proposal.
	The proposal site has been designed to avoid and minimise impacts on native vegetation with most of the proposal site being located within non-native miscellaneous ecosystem areas. The extent of impact of the proposal within these non-native vegetation areas are:
	— the impact of 39.91 hectares of miscellaneous ecosystem type of highly disturbed areas with no or limited native vegetation
	— the impacts of 1.40 hectares of miscellaneous ecosystems – ornamental plantings.
	The following specific avoidance and minimisation strategies were implemented during the design process:
	— Murray River bridge
	    — use of existing alternative access roads to reduce impact to PCT 5 (poor condition) in association with Oddies Creek
	    — laydown area positioned in existing disturbed rail corridor to limit impact to PCT 5 (poor condition) in association with the Murray River and Oddies Creek.
	— Billy Hughes bridge
	    — proposal site designed to specifically locate the Eastern compound, Western compound and associated access tracks to avoid impact to patches of PCT 277 (poor condition) adjacent to the rail corridor.

PRINCIPLES	PROPOSAL CONSISTENCY
	— Uranquinty Yard clearances — analysed the feasibility of alternative access routes to the bridge structure over Sandy Creek to avoid impact to a small patch of PCT 5 (poor condition) on the southern side of the rail corridor. It was determined that impact to the small patch of PCT 5 (poor condition) could not be avoided. — Pearson Street bridge — proposal site re-designed access routes and laydown areas to avoid impacts to PCT 277 (poor condition). — Bomen Yard clearances — proposal site and access track to rail corridor designed to avoid impact to PCT 277 (poor condition). — Junee to Illabo clearances — proposal site designed to avoid impact to PCT 277 (moderate condition) between the southern side of the rail corridor and Waterworks Road. PCT 277 (moderate condition) was consistent with a TEC under the EPBC Act and BC Act.
(b) 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 results of field survey and vegetation mapping were used to inform the design during preliminary stages. This enabled the proposal to be located in areas of poorest condition native vegetation and/or threatened species habitat (i.e. areas that have a lower vegetation integrity score). These avoidance measures included minimising impacts to PCT 277 in moderate and derived condition (vegetation integrity score 68.9 and 52.9 respectively).
(c) 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.	The proposal has been designed to avoid and minimise impact to areas of TECs. The results of field survey and vegetation mapping were used to inform the design during preliminary stages and has resulted in the location of the proposal to avoid areas of mapped TECs where possible within the study area. Total impact to TECs has been reduced to 2.81 hectares of White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grassland. This impact comprises: — PCT 277 (moderate condition): 0.50 hectares with avoidance of 2.29 hectares or 83% of this vegetation type within the study area — PCT 277 (derived condition): 2.34 hectares with avoidance of 1.74 hectares or 43% of this vegetation type within the study area.
(d) Locating the proposal outside of the buffer area around breeding habitat features such as nest trees or caves.	The proposal occurs within the existing rail corridor and impacts will be located on the edge of existing cleared areas and as a result, will not fragment any significant patches of habitat or cause further loss of connectivity for the movement of species between areas. In areas where vegetation is unable to be avoided, some reduction would occur. However, there may be opportunities for connectivity to be improved in some locations as part of the project outcomes.

PRINCIPLES	PROPOSAL CONSISTENCY
Consideration of alternatives (section 7.1.1.4 of the BAM)	
(a) *an analysis of alternative modes or technologies that would avoid or minimise impacts on biodiversity values*	Consideration of alternative routes, locations and sites is generally limited due to the proposal being a series of enhancements within the existing rail corridor. The proposal, which includes several rail track realignments and modifications to existing rail infrastructure at a number of enhancement sites relies on the existing rail corridor and avoids the need for a new green field track location in this vicinity. Through utilising the existing rail corridor (as opposed to constructing a new greenfield rail corridor), the proposal would avoid or minimise impacts on biodiversity values in the broader locality.
(b) *an analysis of alternative routes that would avoid or minimise impacts on biodiversity values*	
(c) *an analysis of alternative locations that would avoid or minimise impacts on biodiversity values*	
(d) *an analysis of alternative sites within a property on which the proposal is proposed that would avoid or minimise impacts on biodiversity values*	
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)	
(a) *Reducing the proposal's clearing footprint by minimising the number and type of facilities*	Ancillary facilities and temporary construction sites will be located within areas of no 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 practicable. The current design has been refined to avoid and minimise impacts on native vegetation clearing including impacts to TECs. This reduction has been achieved through reducing the overall proposal site in key areas (where practicable), as well as siting ancillary facilities to areas of non-native woody vegetation. 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).
(b) *Locating ancillary facilities in areas where there are no biodiversity values*	
(c) *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)*	
(d) *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)*	
(e) *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.*	The implementation of crossing structures (i.e. glider poles) will facilitate and enhance the continuation of animal 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 is outlined in Chapter 10.

8.2 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 and 7.2.2 of the BAM. Prescribed biodiversity impacts relevant to the proposed have been identified in Table 8.2.

Table 8.2 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 7.2.2.1 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 will be retained or replaced. Mitigation measures have been developed to address the direct and indirect impacts of the proposal to prescribed impacts.
(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 habitat features. 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 enhancement sites and all enhancement sites 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. In terms of groundwater impacts, the key issue identified for the proposal is the risk associated with permanent proposed cuts that intersect saturated and permanent aquifers. This risk occurs at the Riverina Highway bridge, Pearson Street Bridge and Billy Hughes bridge enhancement sites as the proposed works involve track lowering. Dewatering of cuts, whether temporary or permanent, for construction or during operational phases of the project have the potential to lower groundwater levels, reducing the availability of groundwater to nearby sensitive receptors such as native vegetation dependant on groundwater. Where bridge pilings or the construction of soil retaining walls are to occur, impedance to groundwater flow can also occur. This can result in changes to groundwater levels and quality. A groundwater mitigation and management sub-plan (GWMMP) would be prepared as part of the CEMP. The GWMMP would comply with the proposal conditions and be implemented to monitor the effectiveness of mitigation and management measures applied during the construction phase of the proposal. Therefore, the proposal is unlikely to directly or indirectly interference with subsurface or groundwater flows associated with any habitat feature or vegetation community.

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 an existing rail corridor and impacts are located on the edge of existing cleared areas. In addition, the proposal site is variously positioned in urban and rural residential areas, and heavily disturbed agricultural settings. Wildlife corridors and landscape connectivity is limited, although some drainage lines associated with the proposal site provide local connectivity for more mobile species of animal. The proposal will not fragment any significant patches of habitat or cause further loss of connectivity for the movement of species between areas. Detailed design was considering wildlife crossing structures (e.g. glider poles, canopy plantings, multi-use culverts) that may enhance wildlife connectivity in association with the proposal and assist species movement between habitat patches.
(d) *optimising proposal layout to minimise interactions with threatened entities*	The proposal is largely located in the existing rail corridor and impacts are located on the edge of existing cleared areas or to existing human made structures (i.e. culverts). The proposal has been designed to minimise impact to areas of TECs. The current design has resulted in the location of the proposal to avoid areas of mapped TECs where possible within the study area. Total impact to TECs has been reduced to 2.84 hectares of White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grassland. This impact comprises: — PCT 277 (moderate condition): 0.50 hectares with avoidance of 2.29 hectares or 83% of this vegetation type within the study area — PCT 277 (derived condition): 2.34 hectares with avoidance of 1.74 hectares or 43% of this vegetation type within the study area. In addition, the Squirrel Glider was recorded in the Billy Hughes bridge study area. Given this, the proposed siting of the eastern and western compounds along with associated access tracks were located to avoid impact to PCT 277 (poor condition) adjacent to the rail corridor. This enabled the proposal layout to minimise interactions with threatened entities.
(e) *locating the proposal to avoid direct impacts on water bodies or hydrological processes.*	The proposal will directly impact some mapped water bodies (including ephemeral creeks) which occur within, or dissect, the existing rail corridor. Water bodies may be impacted by construction of new rail infrastructure and associated ancillary activities, including instream works required for temporary access roads and replacement of existing culverts. Indirect impacts may also be experienced to water quality during bridge modification works. 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 proposal sites 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. Mitigation measures incorporating sedimentation and hydrology controls are outlined in Chapter 10.

<table>
<tr><th>PRESCRIBED BIODIVERSITY IMPACTS</th><th>PROPOSAL PLANNING</th></tr>
<tr><td colspan="2">Designing a project location to avoid and minimise impact on prescribed biodiversity (section 7.2.2.2 of BAM)</td></tr>
<tr><td>(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</td><td rowspan="4">Consideration of alternative routes, locations and sites is generally limited due to the proposal being associated with an existing rail corridor. The proposal, which includes several rail track realignments and modifications to existing rail infrastructure at a number of enhancement sites relies on the existing rail corridor.

Mitigation measures have been developed to address the direct and indirect impacts of the proposal to prescribed impacts.</td></tr>
<tr><td>(b) an analysis of alternative routes that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed route</td></tr>
<tr><td>(c) an analysis of alternative locations that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed location</td></tr>
<tr><td>(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.</td></tr>
</table>

9 ASSESSMENT OF IMPACTS

9.1 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.

9.1.1 IMPACTS ON NATIVE VEGETATION AND THREATENED ECOLOGICAL COMMUNITIES

The proposal will impact a total of 4.44 hectares of native vegetation, comprising 4.39 hectares of PCT 277 and 0.05 hectares of PCT 5. These impacts on native vegetation including each PCT, broad condition state, current and future vegetation integrity within the proposal site for each IBRA subregion is detailed below in Table 9.1 and Table 9.2, and illustrated in Appendix E-1.

Table 9.1 Direct impacts on native vegetation and change in vegetation integrity within the Lower Slopes IBRA subregion

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	CURRENT VEGETATION INTEGRITY	CHANGE IN VEGETATION INTEGRITY	FUTURE VEGETATION INTEGRITY	DIRECT IMPACT (hectares)
#1	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Poor condition	19.8	-19.8	0	0.13
#2	PCT 5 – 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 condition	52.3	-52.3	0	0.02
Total native vegetation impact						**0.15**

Table 9.2 Direct impacts on native vegetation and change in vegetation integrity within the Inland Slopes IBRA subregion

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	CURRENT VEGETATION INTEGRITY	CHANGE IN VEGETATION INTEGRITY	FUTURE VEGETATION INTEGRITY	DIRECT IMPACT (hectares)
#1	PCT 5 – 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 condition	21.4	-21.4	0	0.03

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	CURRENT VEGETATION INTEGRITY	CHANGE IN VEGETATION INTEGRITY	FUTURE VEGETATION INTEGRITY	DIRECT IMPACT (hectares)
#2	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate condition	68.9	-68.9	0	0.50
#3		Poor condition	36.8	-36.8	0	1.16
#4		Derived condition	52.9	-52.9	0	2.34
#5		Native plantings	46.1	-46.1	0	0.26
Total native vegetation impact						**4.29**

A detailed breakdown of impact to native vegetation for each IBRA subregion and the corresponding precinct and enhancement sites is outlined in Tables 9.3 and 9.4.

Table 9.3 Direct impacts on native vegetation within the Lower Slopes IBRA subregion and the corresponding precinct and enhancement sites

VEGETATION TYPE	VEGETATION ZONE	PRECINCT	ENHANCEMENT SITE	DIRECT IMPACT (hectares)
PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Poor condition	Albury	Billy Hughes bridge	0.01
		Wagga Wagga	Bomen Yard clearances	0.01
		Junee	Harefield Yard clearances	0.11
PCT 5 – 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 condition	Junee	Harefield Yard clearances	0.02
Total native vegetation impact				**0.15**

Table 9.4 Direct impacts on native vegetation within the Inland Slopes IBRA subregion and the corresponding precinct and enhancement sites

<table>
<tr><th>VEGETATION TYPE</th><th>VEGETATION ZONE</th><th>PRECINCT</th><th>ENHANCEMENT SITE</th><th>DIRECT IMPACT (hectares)</th></tr>
<tr><td rowspan="2">PCT 5 – 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</td><td rowspan="2">Poor condition</td><td>Albury</td><td>Murray River bridge</td><td>0.02</td></tr>
<tr><td>Wagga Wagga</td><td>Uranquinty Yard clearances</td><td>0.01</td></tr>
<tr><td rowspan="9">PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion</td><td>Moderate condition</td><td>Junee</td><td>Junee to Illabo clearances</td><td>0.50</td></tr>
<tr><td rowspan="5">Poor condition</td><td rowspan="3">Albury</td><td>Albury Yard clearances</td><td>0.01</td></tr>
<tr><td>Billy Hughes bridge</td><td>0.14</td></tr>
<tr><td>Tabletop Yard clearances</td><td>0.01</td></tr>
<tr><td rowspan="5">Junee</td><td>Olympic Highway underbridge</td><td>0.02</td></tr>
<tr><td>Junee to Illabo clearances</td><td>0.98</td></tr>
<tr><td>Derived condition</td><td>Junee to Illabo clearances</td><td>2.34</td></tr>
<tr><td rowspan="2">Native plantings</td><td>Junee to Illabo clearances</td><td>0.07</td></tr>
<tr><td>Olympic Highway underbridge</td><td>0.19</td></tr>
<tr><td colspan="4">Total native vegetation impact</td><td>4.29</td></tr>
</table>

9.1.2 IMPACTS ON THREATENED ECOLOGICAL COMMUNITIES

The proposal will impact on a total of 2.84 hectares of threatened ecological community in the form of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Direct impacts on threatened ecological communities due to the proposal for each IBRA subregion is outlined in Table 9.5.

Table 9.5 Direct impacts on threatened ecological communities due to the proposal for each IBRA subregion

<table>
<tr><th rowspan="2">THREATENED ECOLOGICAL COMMUNITY</th><th rowspan="2">VEGETATION TYPE AND ZONE</th><th rowspan="2">BC ACT[1]</th><th colspan="2">IBRA SUBREGION</th><th rowspan="2">DIRECT IMPACT (hectares)</th></tr>
<tr><th>LOWER SLOPES</th><th>INLAND SLOPES</th></tr>
<tr><td rowspan="2">White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland</td><td>PCT 277 – Moderate condition</td><td rowspan="2">CE</td><td>0</td><td>0.50</td><td>0.50</td></tr>
<tr><td>PCT 277 – Derived condition</td><td>0</td><td>2.34</td><td>2.34</td></tr>
<tr><td colspan="5">Total direct impact on threatened ecological communities</td><td>2.84</td></tr>
</table>

(1) CE = Critically Endangered under the BC Act.

9.1.3 IMPACTS ON THREATENED SPECIES

9.1.3.1 DIRECT IMPACTS ON PREDICTED ECOSYSTEM CREDIT SPECIES

Direct impacts on predicted ecosystem credit species due to the proposal is outlined in Table 9.6.

Table 9.6 Direct Impact on predicted ecosystem species

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	ASSOCIATED PCTS	IBRA SUBREGION	
				LOWER SLOPES	INLAND SLOPES
Anthochaera phrygia	Regent Honeyeater	CE	PCT 5 and PCT 277	✓	✓
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	PCT 5	–	✓
Callocephalon fimbriatum	Gang-gang Cockatoo	V	PCT 5 and PCT 277	✓	✓
Certhionyx variegatus	Pied Honeyeater	V	PCT 5 and PCT 277	✓	✓
Circus assimilis	Spotted Harrier	V	PCT 5 and PCT 277	✓	✓
Daphoenositta chrysoptera	Varied Sittella	V	PCT 5 and PCT 277	✓	✓
Epthianura albifrons	White-fronted Chat	V	PCT 5 and PCT 277	✓	✓
Falco subniger	Black Falcon	V	PCT 5 and PCT 277	✓	✓
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	V	PCT 5	-	✓
Glossopsitta pusilla	Little Lorikeet	V	PCT 5 and PCT 277	✓	✓
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	PCT 5 and PCT 277	✓	✓
Hieraaetus morphnoides	Little Eagle	V	PCT 5 and PCT 277	✓	✓
Lathamus discolor	Swift Parrot	E	PCT 5 and PCT 277	✓	✓
Lophoictinia isura	Square-tailed Kite	V	PCT 5 and PCT 277	✓	✓
Ninox connivens	Barking Owl	V	PCT 5	-	✓
Petroica boodang	Scarlet Robin	V	PCT 5 and PCT 277	✓	✓
Petroica phoenicea	Flame Robin	V	PCT 5 and PCT 277	✓	✓
Polytelis swainsonii	Superb Parrot	V	PCT 5 and PCT 277	✓	✓
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	PCT 277	✓	✓
Stagonopleura guttata	Diamond Firetail	V	PCT 5 and PCT 277	✓	✓
Stictonetta naevosa	Freckled Duck	V	PCT 5	-	✓
Chalinolobus picatus	Little Pied Bat	V	PCT 5	-	✓
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	PCT 277	-	✓
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	PCT 277	-	✓
Phascolarctos cinereus	Koala	V	PCT 5 and PCT 277	✓	✓
Pteropus poliocephalus	Grey-headed Flying-fox	V	PCT 5 and PCT 277	✓	✓

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	ASSOCIATED PCTS	IBRA SUBREGION	
				LOWER SLOPES	INLAND SLOPES
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	PCT 5 and PCT 277	✓	✓
Scoteanax rueppellii	Greater Broad-nosed Bat	V	PCT 5 and PCT 277	✓	✓
Vespadelus baverstocki	Inland Forest Bat	V	PCT 5 and PCT 277	✓	✓

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

9.1.3.2 DIRECT IMPACTS ON SPECIES CREDIT SPECIES

Direct impacts on species credit species due to the proposal are outlined in Table 9.7 and Table 9.8.

Table 9.7 Direct impacts on threatened species credit species within the proposal site for the Lower Slopes IBRA subregion

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII	ASSOCIATED NATIVE VEGETATION TYPES AND HABITAT FEATURES	DIRECT IMPACT (AREA / INDIVIDUALS)
Crinia sloanei	Sloane's Froglet	V	No	PCT 5 (poor condition) and PCT 277 (poor condition)	0.03 hectares
Petaurus norfolcensis	Squirrel Glider	V	No	PCT 5 (poor condition) and PCT 277 (poor condition)	0.15 hectares
Polytelis swainsonii	Superb Parrot	V	No	PCT 5 (poor condition) and PCT 277 (poor condition)	0.15 hectares

(1) Threat status under the BC Act: V = Vulnerable.

Table 9.8 Direct impacts on threatened species credit species within the proposal site for the Inland Slopes IBRA subregion

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	SAII	ASSOCIATED NATIVE VEGETATION TYPES AND HABITAT FEATURES	DIRECT IMPACT (AREA / INDIVIDUALS)
Crinia sloanei	Sloane's Froglet	V	No	PCT 5 (poor condition), PCT 277 (native plantings) and PCT 277 (poor condition)	0.18 hectares
Keyacris scurra	Key's Matchstick Grasshopper	E	No	PCT 5 (poor) and PCT 277 (poor, moderate, derived and native plantings)	4.29 hectares
Petaurus norfolcensis	Squirrel Glider	V	No	PCT 5 (poor) and PCT 277 (poor and moderate)	1.69 hectares
Polytelis swainsonii	Superb Parrot	V	No	PCT 5 (poor) and PCT 277 (poor, moderate)	1.69 hectares

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

9.1.4 INJURY AND MORTALITY

Injury and mortality of fauna could occur during construction activities and during operation. Injury and mortality may occur:

- during construction when vegetation and habitat is being cleared
- during construction when machinery and plant is moved to, from and on site
- during construction with open excavations
- during operation, as a result of train strike.

All roads and rail have potential to result in the mortality of native animals. In lieu of survey during appropriate seasonal contexts, potential habitat for Sloane's Froglet was mapped in the study area using a methodology detailed in *Sloane's Froglet Breeding Habitat Mapping and Spatial Database Development* (Cate Ewin Spatial Services, 2017). This species was considered to have a high likelihood of occurrence in the study area, particularly in association with Billy Hughes bridge, where several records occur in proximity to the study area. This species could be impacted during construction activities when potential breeding habitat is being cleared and from vehicle movements.

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. Additionally, the double-stacked containers also pose an increased risk of train strike for the Squirrel Glider.

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. Provision of fauna crossings such as gliding poles, incorporated into the design will reduce the likelihood of crossing attempts at inappropriate or dangerous locations and minimise train strike risk.

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.

9.2 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, threatened ecological communities and threatened species habitats likely to be affected. The assessment of indirect impacts is presented in Table 9.9, which finds that no threatened species are likely to be affected by indirect impacts, and as such additional credit calculation for indirect impacts are not considered to be required and have not been undertaken.

Additional consideration was made for the Superb Parrot. Although potential breeding hollows, such as for the Superb Parrot, are present in adjacent land to the project area, none would be directly impacted from the proposal, and indirect impacts are likely to be negligible as the hollow bearing trees would not be damaged by the proposal. Furthermore, the hollow dependent species in the local area do occur in linear and road or track side vegetation and in agricultural land as well as urban areas with little vegetative buffer (Manning et al, 2004, Manning et al 2007, Davey and Purchase, 2004, Christie, 2004). This species is habituated to roadside and agricultural areas including associated noise, dust and light. Mitigation measures to minimise the potential indirect impacts to Superb Parrot 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 is not considered to be required and has not been undertaken.

Table 9.9 Assessment of indirect impacts

INDIRECT IMPACT	CONSTRUCTION / OPERATIONAL	NATURE	EXTENT	DURATION	CONSEQUENCE
Inadvertent impacts on adjacent habitat or vegetation	Construction	All PCTs Threatened species Threatened ecological communities Aquatic habitat	All PCTs Aquatic habitats associated with creeks and rivers	Short term	**Low.** Inadvertent impacts on adjacent vegetation can include a range of indirect impacts including soil disturbance, introduction of weeds, noise and vibration, light spill, 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 proposal site 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 has been 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	**Low**. 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 proposal site, 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.

INDIRECT IMPACT	CONSTRUCTION / OPERATIONAL	NATURE	EXTENT	DURATION	CONSEQUENCE
					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 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 one threatened fauna species being the Squirrel Glider, which is limited by gliding distances between areas of habitat. Severe 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. 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 et al. 2003). Implementation of connectivity structures and mitigation measures at creeklines and road reserves 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 would remain in the proposal site and be alleviated with connectivity mitigation measures.

INDIRECT IMPACT	CONSTRUCTION / OPERATIONAL	NATURE	EXTENT	DURATION	CONSEQUENCE
Reduced viability of adjacent habitat due to edge effects	Construction/ operational	Native vegetation	All PCTs	Long term	**Negligible.** Edge effects refer to increased noise and light, erosion and sedimentation or the establishment and spread of weeds at the interface of intact vegetation and cleared areas. It is listed as a Key Threatening Processes under BC Act. Edge effects may result in impacts such as changes to vegetation type and structure, increased growth of exotic plants, increased predation of native fauna or avoidance of habitat by native fauna. Edge effects have the potential to reduce the viability of adjacent habitat long-term. The proposal site is a series of enhancement sites associated with an operational rail corridor in urban centres, rural townships and agricultural settings. The proposal site was subject to a high level of edge effects from the existing rail corridor, adjacent roads, townships and agricultural activities (e.g. cropping and livestock). Much of the study area was consistent with miscellaneous ecosystems and most patches of native vegetation were suffering from weed invasion and habitats that would be impacted by the proposal are edge habitats without any undisturbed core. However, as the proposal involves impact to a small area of moderate condition native vegetation (Junee to Illabo clearances), there is the potential for the proposal to exacerbate edge effects in this habitat.

INDIRECT IMPACT	CONSTRUCTION / OPERATIONAL	NATURE	EXTENT	DURATION	CONSEQUENCE
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	**Low.** 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 they will be greatest where activities take place near vegetated areas and during construction. Fauna are currently subject to varying levels of disturbance from noise, vibration and light as the proposal site mostly encompasses an existing operational rail corridor that is located adjacent to existing roads in urban centres, rural townships and agricultural settings. Thus, there would be some habituation of fauna to noise and vibration in the study area. During construction of the proposal, increased noise and vibration levels in the proposal site 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, and may result in fauna temporarily avoiding habitats adjacent to the proposal site. Nevertheless, given the proposal's ecological setting, the impacts from noise and vibration emissions are likely to be localised and are not considered likely to have a significant long-term impact on wildlife populations outside the area of impact. Indeed, noise levels at enhancement locations are unlikely to be noticeable at sensitive receiver locations and vibration generating construction works shall be temporary and only occur for a relatively short period of time (Technical Paper 6 – Noise and Vibration (Non-Rail)). Elevated levels of dust may be deposited onto the foliage of vegetation adjacent to the proposal site 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.

INDIRECT IMPACT	CONSTRUCTION / OPERATIONAL	NATURE	EXTENT	DURATION	CONSEQUENCE
					The risks of dust impacts from demolition, earthworks, construction and track out activities associated with the enhancement sites where sensitive receptors are located are negligible to high prior to mitigation. With site-specific mitigation measures in place, the residual dust impacts would be reduced to a negligible to low risk, ensure impacts on the receiving environment are minimised (Technical Paper 14 – Air Quality). Air quality impacts from operation of the proposal are expected to be low at the nearest sensitive receptors to the proposal (Technical Paper 14 – Air Quality). 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. 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 proposal site, 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	**Negligible.** 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.

INDIRECT IMPACT	CONSTRUCTION / OPERATIONAL	NATURE	EXTENT	DURATION	CONSEQUENCE
Transport of pathogens from the site to adjacent vegetation	Construction	Native vegetation Threatened ecological communities Threatened species	All PCTs	Long term	**Low**. 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 also has the potential to introduce or spread Amphibian Chytrid Fungus (Chytrid Fungus) (*Batrachochytrium dendrobatidis*). The accidental introduction or spread of Chytrid Fungus, has the potential to adversely affect frog populations. Chytrid Fungus is a lethal and highly contagious frog disease that is detrimental to frogs and tadpoles. Chytrid is a water-borne fungus that may be spread as a result of handling frogs or through cross contamination of water bodies, including through mud or moist soil. The proposal construction activities could lead to an increased risk of dispersal of Phytophthora, Myrtle Rust and Chytrid Fungus through works involving soil disturbance, importation of fill and through the movement of water. This indirect impact corresponds to several Key Threatening Processes listed under BC Act: — infection of native plants by *Phytophthora cinnamomic* — introduction and establishment of Exotic Rust Fungi of the order *Pucciniales* pathogenic on plants of the family *Myrtaceae* infection of frogs by amphibian Chytrid fungus causing the disease Chytridiomycosis.

INDIRECT IMPACT	CONSTRUCTION / OPERATIONAL	NATURE	EXTENT	DURATION	CONSEQUENCE
Increased risk of starvation, exposure and loss of shade or shelter	Construction	All fauna species	All PCTs	Short term	**Low.** Displacement of resident fauna species during native vegetation clearing is considered relatively low due to the extensive vegetation adjacent to the proposal site. Given the small-scale impact (22.01 ha) associated with the proposal and 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.
Loss of breeding habitats	Construction	All fauna species	All PCTs	Long term	**Low.** 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. Potential breeding habitat for Sloane's Froglet has been mapped in the study area in lieu of survey in appropriate seasonal contexts. This species was considered to have a high likelihood of occurrence in the study area; particularly in association with Billy Hughes bridge and Table Top Yard clearances. The loss of breeding habitats is unlikely to extend beyond the disturbance footprint. 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	**Low**. 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.

INDIRECT IMPACT	CONSTRUCTION / OPERATIONAL	NATURE	EXTENT	DURATION	CONSEQUENCE
Reduction in water quality	Construction / operational	Hydrology	All PCTs Aquatic habitats associated with creeks and rivers	Long term	**Low.** The existing hydrological conditions of the proposal site are already affected by altered landform because of surrounding land uses. Given the enhancement sites are located along an existing rail line, these are existing risks which are managed in line with ARTC's standard operating procedures. There would not be anticipated to be any additional impacts from operation of rolling stock along the rail line and as such there would be no change to the existing water quality condition as a result of the proposal. During construction – 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 proposal site. Implementation of appropriate soil and water construction management measures would minimise impacts to water quality impacts from erosion and sedimentation during construction of the proposal. Additionally, impacts would be limited to the duration of construction and would be a short term. As such construction of the proposal would not cause significant changes to the water quality environment. During operation – 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 proposal site.

INDIRECT IMPACT	CONSTRUCTION / OPERATIONAL	NATURE	EXTENT	DURATION	CONSEQUENCE
Changes to geomorphology of watercourse	Construction/ operational	Hydrology	All PCTs Aquatic habitats associated with creeks and rivers	Long term	**Low**. During construction – Temporary changes in creek flows and velocities downstream of waterbodies and creeks within the proposal site may occur. Mobilised sediment could build up in the waterways in and downstream of the proposal site. During operation – new infrastructure may cause changes to flow regimes by displacing flow or changing flow characteristics such as velocity which may increase runoff and sediment volumes to the receiving waterways. 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 proposal sites 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. 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.

9.3 ASSESSMENT OF PRESCRIBED BIODIVERSITY IMPACTS

Assessment of prescribed impacts is prepared in accordance with section 8.3 of the BAM and outlined in Table 9.10.

Assessments in Table 9.10 include specific consideration of prescribed impacts to the following threatened species:

- Sloane's Froglet
- Southern Myotis
- Large Bent-winged Bat.

Sloane's Froglet

Assessment of prescribed impacts to the Sloane's Froglet relates to impact on artificial waterbodies and impacts to streams by instream works. This includes proposed construction activities at Billy Hughes Bridge. This assessment found a low risk of prescribed impact to this species in the context of mitigative measures. This is further discussed in Table 9.10, row 7.

Southern Myotis and Large Bent-winged Bat

Assessment of prescribed impacts to the Southern Myotis and Large Bent-winged Bat relates to impact on 15 artificial structures (refer to Table 6.1). However, these species were not recorded in the study area during targeted seasonal survey and are therefore unlikely to be impacted by the proposal, either by direct, indirect or prescribed impacts, which is discussed further in Table 9.10 row 3.

Table 9.10 Prescribed biodiversity impacts

PRESCRIBED BIODIVERSITY IMPACT (BIODIVERSITY ASSESSMENT METHOD)		RELEVANCE TO CURRENT PROPOSAL
1	*Impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance*	**None** – no karst, caves, crevices, cliffs or other features of geological significance will be affected by the proposal.
2	*Impacts of development on the habitat of threatened species or ecological communities associated with rocks*	**None -** no areas of significant habitat associated with rocks are present which may provide potential breeding habitat for threatened fauna.
3	*Impacts of development on the habitat of threatened species or ecological communities associated with human made structures*	**Partially** – this will occur in construction phase. Bat habitat survey investigations across the proposal identified 15 human made structures (i.e. bridges and culverts) which provide a high likelihood of microbat utilisation (utilisation at least on a seasonal basis). Most structures that provided potential microbat habitat occurred within the Junee to Illabo clearances. Of these structures, the presence of Fairy Martin nests provided the most ideal habitat for microbats. Only one structure – Billy Hughes bridge was observed to be used by microbats during the survey period, with two Lesser Long-eared Bats (non-threatened) occupying a Fairy Martin nest under the bridge.

PRESCRIBED BIODIVERSITY IMPACT (BIODIVERSITY ASSESSMENT METHOD)		RELEVANCE TO CURRENT PROPOSAL
		Two threatened bats, the Southern Myotis and Large Bent-winged bat, could use these 15 structures. However, neither were recorded in the study area during targeted seasonal survey. Mitigative measures outlined below will minimise impact to these species if they utilise these structures in the future. Not all human made structures within the study area will be impacted or significantly disturbed due to the proposal. The Bill Hughes bridge structure is not anticipated to be impacted due to the proposal, as works are associated with track lowering and not bridge replacement. Works on human structures within the Junee to Illabo package are anticipated to be minor. Any works within structures identified as high likelihood of microbat utilisation will implement mitigation measures (i.e. microbat exclusion) to reduce the impact on species utilising these structures during construction. Importantly, there is no permanent removal of human made structures; rather, structures are being modified or replaced. No threatened species of microbat were recorded during targeted surveys informing this BDAR.
4	*Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation*	**Partially** – this will occur in both construction and operation phases. Non-native vegetation occurs within and adjacent to the proposal site. Two non-native vegetation communities were identified. Some removal of non-native vegetation including, urban exotic/native landscape plantings may result because of the proposal. It is unlikely that the removal of a small area of non-native vegetation patches will have a significant impact on native threatened fauna. Trees and shrubs associated with non-native vegetation offers foraging, nesting and sheltering habitat to locally occurring threatened birds. The removal of non-native vegetation will result in negligible direct and indirect impacts on these threatened species.
5	*Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range*	**Partially** – this will occur in both construction and operation phases. The proposal will not result in new fragmentation of habitat patches within the locality. The loss of habitat and native vegetation occurs within the existing rail corridor, however, the removal of the edges of these patches may partially affect the movement patterns of several terrestrial fauna species. However, it is unlikely to significantly affect the movement or life-cycle of species that occupy the proposal site.
6	*Impacts of the development on movement of threatened species that maintains their life cycle*	

PRESCRIBED BIODIVERSITY IMPACT (BIODIVERSITY ASSESSMENT METHOD)		RELEVANCE TO CURRENT PROPOSAL
7	*Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities*	**Partially** – this will occur in both construction and operation phases. Unmanaged construction activities in proximity to 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. Mitigation measures would be implemented to reduce the impact to these areas due to the proposal. Impact to Sloane's froglet breeding site downstream from Billy Hughes Bridge will be minimised through mitigative controls for preserving water quality, including sediment control. Work on access roads construction in drainage lines will also be timed to avoid the breeding season of the Sloane's froglet. Due to the minimal impact predicted, no additional credit requirements for prescribed impacts are considered necessary.
8	*Impacts of wind turbine strikes on protected animals*	**No** – no wind turbines are proposed as part of this proposal.
9	*Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC*	**Yes** – this will occur in both construction and operation phases. During construction the increase in construction vehicle movements, an increase in road use, 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 proposal site being within a construction area it is likely that low speed limit zones will be established. Thus, it is unlikely that the proposal site would result in significant levels of roadkill mortality of threatened species. 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 train strike during operation will be delivered in the concept and detailed design processes of the rail infrastructure including fauna crossings and landscaping plans.

9.4 ASSESSMENT OF IMPACTS ON MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Impacts on MNES listed under the EPBC Act are summarised in the sections below.

9.4.1 *IMPACTS ON THREATENED ECOLOGICAL COMMUNITIES*

One candidate threatened ecological communities listed under the EPBC Act was considered likely to occur, being:

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands.

Assessment of significance for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands was done in accordance with the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Appendix D-2) and a summary of the outcomes of these are provided in Table 9.11.

Table 9.11 Summary of EPBC Act listed threatened ecological communities and outcome of the significance assessment

THREATENED ECOLOGICAL COMMUNITY	VEGETATION TYPE AND ZONE	EPBC ACT[1]	DIRECT IMPACT (ha)	SIGNIFICANT IMPACT?
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands	PCT 277 – Moderate condition	CE	0.50	No – the proposal is considered unlikely to have a significant impact on this TEC.

(1) Threat status under the EPBC Act: CE = Critically Endangered.

9.4.2 *IMPACTS ON THREATENED SPECIES*

9.4.2.1 THREATENED FLORA SPECIES

No threatened flora species listed under the EPBC Act will be impacted by the proposal.

9.4.2.2 THREATENED FAUNA SPECIES

Seven EPBC Act listed threatened fauna are considered to have a moderate or higher likelihood of occurring within the proposal site based on the availability of habitat (Table 9.12).

A significance assessment has been completed for EPBC Act threatened fauna species considered to be impacted by the proposal in accordance with the EPBC Act *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Department of the Environment, 2013) (Appendix D-2). A summary of the outcomes of these are provided in Table 9.12. The residual adverse impacts likely to occur to these species after avoidance and mitigation have been calculated in accordance with the BAM (in the form of biodiversity species credits) are presented in section 11.2.2.

Table 9.12 Nationally threatened fauna recorded or with a moderate or higher likelihood of occurrence and impact summary

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	SIGNIFICANT IMPACT?
Amphibian			
Crinia sloanei	Sloane's Froglet	E	**No** –the removal of 0.21 hectares of potential habitat in association with an existing disturbed rail corridor is considered unlikely to have a significant impact on the species. Sloane's Froglet potentially using the study area are likely to use habitat that extends through the locality and due to the narrow and linear impact expected within an existing highly disturbed rail corridor, it is considered unlikely that a local population of Sloane's Froglet would be restricted to the study area. Therefore, the predicted impacts to the habitat for this species is likely to be minor given the species distribution in the locality, particularly around Thurgoona. The impacts to this species are not considered to be important in regard to the context and intensity.
Bird			
Anthochaera phrygia	Regent Honeyeater	CE	**No** – the proposal is considered unlikely to have a significant impact on the species. The removal of 1.84 hectares of vegetation (PCT 5 poor condition and PCT 277 moderate and poor condition), which contains potential foraging resources, could be used by this species intermittently during periods of seasonal blossom variation. Considering the mobility of this species, the proposal will not fragment or isolate any locally occurring population. The proposal site does not occur near a recognised breeding area and is unlikely to impact on breeding activity. Therefore, the proposal site would not constitute important habitat for the species and the impact of 1.84 hectares of potential habitat is unlikely to cause a significant impact to the species.
Hirundapus caudacutus	White-throated needletail	V; M	**No -** the proposal is considered unlikely to have a significant impact on the species. As the species is known to be an aerial forager and recorded most often above wooded areas, it is unlikely to rely on the terrestrial habitat available within the proposal site. As the White-throated Needletail breeds in the northern hemisphere and is regular summer migrant to Australia, the removal of 1.84 hectares of vegetation (PCT 5 poor condition and PCT 277 moderate and poor condition) is unlikely to have a significant impact on the species.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	SIGNIFICANT IMPACT?
Lathamus discolor	Swift Parrot	CE	**No** – the proposal is considered unlikely to have a significant impact on the species. The removal of 1.84 hectares of vegetation (PCT 5 poor condition and PCT 277 moderate and poor condition), which contains potential foraging resources, could be used by this species intermittently during periods of seasonal blossom variation. However, considering the abundance of high-quality foraging resources in surrounding landscape, the foraging habitat to be removed is considered marginal and small in terms of what is available locally to this species. Considering the mobility of this species, the proposal will not fragment or isolate any locally occurring population. In addition, the species does not breed in NSW and therefore no breeding habitat would be impacted due to the proposal.
Polytelis swainsonii	Superb Parrot	V	**No** – the proposal is considered unlikely to result in a significant impact to the Superb Parrot. About 1.84 hectares of potential habitat would be affected by the proposal. Superb Parrot's using the study area are likely to use habitat that extends through the locality and due to the narrow and linear impact expected within an existing highly disturbed rail corridor, it is considered unlikely that a local population of Superb Parrot would be restricted to the study area. Although hollow-bearing trees were present, no breeding activity was recorded during targeted survey. Therefore, the predicted impacts to the habitat for this species is likely to be minor given the mapped extent of similar vegetation in the locality. The impacts to this species are not considered to be important in regard to the context and intensity.
Mammal			
Phascolarctos cinereus	Koala	V	**No** – the proposal is considered unlikely to result in a significant impact to the Koala. Whilst, about 1.84 hectares of potential habitat would be affected by the proposal, the Koala was not recorded in the study area during the field surveys. Koalas potentially using the study area are likely to use habitat that extends through the locality and due to the narrow and linear impact expected within an existing highly disturbed rail corridor, it is considered unlikely that a local population of Koala would be restricted to the study area. Therefore, the predicted impacts to the potential habitat for this species is likely to be minor given the mapped extent of similar vegetation in the locality. The impacts to this species are not considered to be important regarding the context and intensity.

SCIENTIFIC NAME	COMMON NAME	EPBC ACT[1]	SIGNIFICANT IMPACT?
Pteropus poliocephalus	Grey-headed Flying-fox	V	**No –** the proposal is considered unlikely to have a significant impact on the species. The removal of 1.84 hectares of vegetation (PCT 5 poor condition and PCT 277 moderate and poor condition), which contained potential foraging resources, could be utilised by this species intermittently. Considering the mobility of this species, the proposal will not fragment or isolate any locally occurring population. In addition, no breeding habitat occurred in the study area.

(1) Listed under the Commonwealth EPBC Act - CE = Critically Endangered, E= Endangered, V= Vulnerable, M= Migratory.

9.4.3 IMPACTS ON MIGRATORY SPECIES

Based on EPBC Protected Matters Area Search Tool and other desktop database searches, one migratory species was considered to have suitable habitat within the study area (Table 9.13).

Table 9.13 Migratory species with suitable habitat within the study area

SCIENTIFIC NAME	COMMON NAME	EPBC STATUS[1]	HABITAT SUITABILITY
Hirundapus caudacutus	White-throated Needletail	V; M	**Moderate.** Although local records are sparse, due to wide ranging habitats may occur in aerial habitats over the study area on a seasonal basis.

(1) M = Migratory, Ma = Marine, V= Vulnerable listed under the EPBC Act.

The habitats within the study area are unlikely to constitute important habitat for White-throated Needletail. This species uses a variety of habitats, including disturbed/modified areas, and habitat present is unlikely to support an ecologically significant proportion of the population. Habitats associated with the proposal site are not considered critical to any life stage of this species. Due to their aerial and mobile nature, these species would use available habitats over a very large area. An assessment of significance concluded that the proposal is not likely to have a significant impact upon the White-throated Needletail (Appendix D-2).

9.4.4 IMPACTS ON WETLANDS OF NATIONAL AND INTERNATIONAL IMPORTANCE

One nationally important wetland was identified by the PMST as occurring in proximity to the study area; being Doodle Comer Swamp. This wetland is located approximately 2.3 kilometres downstream of Buckaringah Creek, which occurs approximately 175 metres north of the study area at Henty Yard clearances. Although Doodle Comer Swamp would not be directly impacted by the proposal, it may be indirectly impacted by the mobilisation of sediments. The proposed mitigation measures would ensure that no indirect downstream impacts would occur.

9.4.5 IMPACTS ON WORLD AND NATIONAL HERITAGE

No World Heritage Properties or National Heritage Places are located within or nearby the study area.

9.5 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 (refer to Section 1.3). All reference to FM Act KTP is addressed in Technical Paper 9 – Aquatic Biodiversity Impact Assessment.

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.

A total of nine 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 9.14 below. Mitigation measures have been developed to minimise these KTPs as far as practicable. In consideration of the KTPs relevant to the proposal, the relatively minor nature of impacts associated with enhancements to an existing brownfield rail corridor, indicate that the proposal is not likely to constitute a KTP.

Table 9.14 Key threatening processes relevant to the proposal

KEY THREATENING PROCESS	RELEVANT LEGISLATION	RELEVANCE TO 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 4.44 hectares 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)
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 proposal site, 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.

KEY THREATENING PROCESS	RELEVANT LEGISLATION	RELEVANCE TO THE PROPOSAL
Infection of frogs by amphibian chytrid causing the disease 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.
Invasion and establishment of exotic vines and scramblers	BC Act	The invasion and establishment of exotic vines and scramblers, and exotic perennial grasses is a potential indirect impact of the construction and operation of the proposal. The spread and establishment 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. Mitigation measures are recommended to effectively manage these key threatened processes.
Invasion of native plant communities by exotic perennial grasses	BC Act	
Loss of Hollow-bearing Trees	BC Act	The proposal would contribute towards these key threatening processes. The loss of breeding habitat such as hollow-bearing trees, dead trees and dead fallen timber has the potential to affect native animals such as: — hollow-dependent bats — hollow-nesting and canopy-nesting birds — arboreal mammals — reptiles. The loss of breeding habitats is unlikely to extend beyond the proposal site. Avoidance and minimisation of native vegetation and key habitat features have been considered, identified and refined during the proposal process, however, complete avoidance of removal of these habitat features is not practicable. Mitigation measures would be implemented during construction to manage the impacts of the proposal on habitat features and minimise the effect of these key threatening processes. Mitigation measures in relation to loss of hollow-bearing tree and removal of dead wood and dead trees are stated in Chapter 10. Whilst the proposal would contribute to these key threatening processes, with the implementation of the above mitigation measures and those in the biodiversity management sub-plan, it is unlikely that the proposal would significantly exacerbate these key threatening processes.
Removal of dead wood and dead trees	BC Act	

9.6 CUMULATIVE IMPACTS

9.6.1 OVERVIEW

For an EIS, cumulative impacts can be defined as the successive, incremental, and combined effect of multiple impacts, which may in themselves be minor but could become significant when considered together. The methodology for the cumulative impact assessment is provided in detail in the EIS (Chapter 26).

Projects identified in section 26.3 of the EIS were screened using the Department of Planning and Environment's Major Projects register and local council websites for planning approval documentation. Projects with sufficient planning approval information pertaining to biodiversity impact assessment were considered for assessment of potential cumulative impacts in association with the proposal. The following six projects were considered:

- Thurgoona Link Road
- Jindera Solar Farm
- Glenellen Solar Farm
- Walla Walla Solar Farm
- Culcairn Solar Farm
- Gregadoo Solar Farm
- Project EnergyConnect (East)
- Solar Farm (five MW) – Uranquinty
- Solar Farm (five MW) – Bomen
- Olympic Highway intersection upgrades, Wagga Wagga.

Projects have not been considered in this cumulative impact assessment where a biodiversity impact assessment is not publicly available (such as Illabo to Stockinbingal section of Inland Rail and HumeLink).

9.6.2 CUMULATIVE IMPACTS DURING CONSTRUCTION AND OPERATION

The most significant cumulative impact of multiple Inland Rail projects and other proposed developments is the continued loss of biodiversity in the region. The projects have the potential to contribute to the cumulative loss of habitat and will likely place further pressure on local threatened flora and fauna species and ecological communities. The cumulative impacts that are most likely to occur with these projects are the direct impacts on PCTs and threatened species habitat. The cumulative biodiversity impact assessment for both construction and operation is summarised in Table 9.15.

Clearing of native vegetation from the projects detailed in Table 9.15 is approximately 1,640 hectares, which includes a cumulative impact of up to 61.72 hectares of the TEC, White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, which is listed as Critically Endangered under the BC Act.

The proposal will impact an additional 4.44 hectares of mostly poor condition native vegetation, including 2.84 hectares of impact to White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. This comprised of 0.50 hectares of moderate condition vegetation and 2.34 hectares of derived native grassland.

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland has an estimated reduction in geographic distribution of 94%. Accordingly, in the locality of the proposal, it is likely that cumulative impact on up to 62.22 hectares of this TEC would be considered significant.

Within the proposal site, this TEC occurred in moderate and derived condition. The proposal will impact on isolated patches and patches with limited connectivity that are 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 the TEC. Additionally, the proposal is unlikely to significantly increase fragmentation of the community within the region.

In addition to the clearing of the abovementioned TEC, the cumulative loss of native vegetation and associated habitats would adversely affect native flora and fauna species, including threatened species. A cumulative impact of up 1,640 hectares of native vegetation and fauna habitat could be experienced, that may variously impact Superb Parrot, threatened woodland birds (Diamond Firetail, Varied Sittella, Dusky Woodswallow, etcetera), threatened microbats (Yellow-bellied Sheathtail-bat, Eastern False Pipistrelle etcetera), nomadic nectarivores (Swift Parrot, Regent Honeyeater, Little Lorikeet, Grey-headed Flying-fox), arboreal mammals (Squirrel Glider, Koala) and raptors (Little Eagle, Black Falcon, Spotted Harrier, Square-tailed Kite).

Operation of the proposal will not include further clearing of native vegetation or fauna habitats, but it has the potential to add cumulatively to existing connectivity impacts and increase the risk of fauna mortality. Although the proposal is associated with an existing operational rail corridor, increased train movements and double stacked trains may exacerbate existing connectivity impacts and increase the risk of fauna mortality through wildlife-train collisions. However, existing linear infrastructure have similar operational impacts; particularly where they pass through patches of native vegetation.

To manage biodiversity impacts, the proposal has been designed with the principles of avoid and minimise impact on native vegetation and habitat where possible in accordance with the BAM. In addition to environmentally sensitive design responses, biodiversity offsets will be provided for the proposal to address residual impact to biodiversity values following principles of the BAM. These measures when combined, would ensure that a net increase in conservation and protection of impacted species and PCTs.

Table 9.15 Cumulative impact assessment

PROJECT NAME	POTENTIAL IMPACT DURING CONSTRUCTION AND OPERATION
Thurgoona Link Road	Approximately 7.2 kilometres of proposed link roads and ancillary areas. Impact to 8.95 hectares of native vegetation, including up to 1.96 hectares of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland (PCT 268, PCT 277 and PCT 278), up to 0.63 hectares of Seasonal Herbaceous Wetlands CEEC (PCT 360). Removal and permanent fragmentation of habitat, disturbance through noise, light and vibration during construction and operation of the link road and ongoing impacts such as vehicle strikes during operation of the road.
Jindera Solar Farm	Impact to 17.41 hectares of native vegetation and habitat associated with permanent and temporary construction facilities. This includes 14.74 hectares of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland (PCT 277 – various condition classes).
Glenellen Solar Farm	Impact to 11.0 hectares of native vegetation and habitat, including 2.46 hectares of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland (PCT 277).
Walla Walla Solar Farm	Impact to 38.6 hectares of native vegetation and habitat. This includes 0.2 hectares of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland (PCT 277) and 37.14 hectares of Inland Grey Box Woodland EEC.
Culcairn Solar Farm	Impact to 0.61 hectares of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland (PCT 277) and removal of 99 paddock trees, including71 hollow-bearing trees. Assumed loss of 0.61 hectares of habitat for species credit species *Swainsona sericea*, *Swainsona recta* and *Cullen parvum*.
Gregadoo Solar Farm	Impact to 2.1 hectares of habitat, including 0.2 hectares White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland.

PROJECT NAME	POTENTIAL IMPACT DURING CONSTRUCTION AND OPERATION
Project EnergyConnect (East)	If approved and constructed, would impact 39 native vegetation PCTs and six threatened ecological community listed under the BC Act, and seven threatened ecological communities listed under the EPBC Act. This would include the following: Impact on 1,554.88 hectares of native vegetation, including up to 204.11 hectares of TECs comprising 5.18 hectares of *Acacia melvillei* Shrubland EEC, 2.93 hectares of *Allocasuarina luehmannii* Woodland EEC, 26.94 hectares of Inland Grey Box Woodland in the Riverina EEC, 101.20 hectares of Myall Woodland EEC, 26.42 hectares of Sandhill Pine Woodland EEC and 41.44 hectares of White Box Yellow Box Blakely's Red Gum grassy woodland and derived native grassland CEEC. Impact to potentially nine threatened flora species credit species including 71.17 hectares of habitat for *Brachyscome papillosa* (Mossgiel Daisy), 50.31 hectares of habitat for *Cullen parvum* (Small Scurf-pea), 7 hectares of habitat for *Lepidium monoplocoides* (Winged Peppercress), 15.32 hectares of habitat for *Leptorhynchos orientalis* (Lanky Buttons), 109.68 hectares of habitat for *Maireana cheelii* (Chariot Wheels), 8.62 hectares of habitat for *Pilularia novae-hollandiae* (Austral Pillwort), 1.70 hectares of habitat for *Pimelea serpyllifolia* subsp. *serpyllifolia* (Thyme Rice-Flower), 232.35 hectares of habitat for *Swainsona murrayana* (Slender Darling Pea) and 109.17 hectares of habitat for *Swainsona sericea* (Silky Swainson-pea). Impact to four threatened fauna species credit species including 32.36 hectares of habitat for *Lophochroa leadbeateri* (Major Mitchell's Cockatoo), 4.77 hectares of habitat for *Myotis macropus* (Southern Myotis), 0.41 hectares of habitat for *Pedionomus torquatus* (Plains-wanderer), 52.70 hectares of habitat for *Petaurus norfolcensis* (Squirrel Glider), 32.36 hectares of habitat for *Polytelis anthopeplus monarchoides* (Regent Parrot (eastern subspecies)) and 36.57 hectares of habitat for *Polytelis swainsonii* (Superb Parrot).
Solar Farm (five MW) – Uranquinty	Proposal to install solar panels on 16.67 ha of the 49.06ha property that is predominantly cleared, agricultural land. The Statement of Environmental Effects (SEE) (Habitat Planning 2022) concluded that the proposal would result in the removal of about 16.67ha of non-native vegetation. It concludes that the development does not trigger to Biodiversity Offset Scheme. The proposed development is not expected to have a significant adverse impact on a threatened species or ecological community.
Solar Farm (five MW) – Bomen	Proposal to install solar panels on 20ha on predominantly cleared land without waterways. The SEE (Wagga Wagga Solar Farm Nominee 2021) concludes that the proposal would not result in the removal of any native vegetation and would not have an impact on threatened species or native habitat. However, field survey for identification of PCTs and threatened species was not carried out for the SEE.
Olympic Highway intersection upgrades, Wagga Wagga	Impact to 2.96 ha of native vegetation including 0.11 hectares of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (PCT 277), and 17 hollow-bearing trees that are habitat for species credit species. Clearing for the construction footprint would result in removal of 1.48 ha of habitat for the Southern Myotis, Squirrel Glider and Superb Parrot breeding habitat. .

10 MITIGATION AND MANAGEMENT

This section has been prepared in accordance with section 8.4 of the BAM to address the potential impacts of the proposal on biodiversity as discussed in Chapter 9. Mitigation and management measures have been developed and would be implemented as part of the proposal, as described below.

10.1 APPROACH TO MITIGATION AND MANAGEMENT

Environmental management for the proposal would be carried out in accordance with the environmental management approach, as detailed in Chapter 27 (Approach to mitigation and management) and Appendix H (Construction environmental management plan outline) of the EIS.

Impacts of the proposal have been avoided, minimised and offset in accordance with section 8 of the BAM. The proposal has been designed to avoid and minimise impacts to biodiversity where possible, as discussed in section 8 of this report and Chapter 6 of the EIS. Where impacts have been unable to be avoided, the mitigation measures outlined in section 10.2 have been developed to minimise the impact of the proposal. Where impacts to species listed under the BC Act cannot be avoided or minimised to an appropriate level, offsets will be developed in accordance with the ARTC Biodiversity Offset Delivery Strategy – New South Wales.

Biodiversity impacts would be managed in accordance with the biodiversity management sub-plan, which would be prepared prior to construction and implemented as part of the Construction Environmental Management Plan (CEMP). The plan would include measures to avoid and minimise the potential for impacts during construction. The plan will include, but not be limited to:

- measures to manage impacts to terrestrial biodiversity, including:
  - locations and requirements for pre-clearing surveys, including breeding habitats (including burrows, trees, logs, existing culverts and structures, and potential Sloane’s Froglet breeding habitat)
  - procedures for excluding (i.e. allowing bats to exit unharmed, but not re-enter), or relocating microbats from culverts and structures prior to disturbance
  - the clearing extents/site boundary/limit of works is clearly defined with flagging or marking tape, signage or other suitable means to delineate no go areas
  - establishing protocols for the staged clearing of vegetation and safe tree felling and log removal to reduce the risk of fauna mortality
  - consideration of temporary frog exclusion fencing where construction compounds/ laydown areas occur adjacent to potential Sloane’s Froglet breeding habitat.
  - establish daily checks in machinery and excavations for presence of fauna to reduce the risk of fauna mortality
  - animal handling protocols, including relocation and emergency care
  - an unexpected find protocol
  - measures to manage biosecurity risks (weeds and pathogens) in accordance with the *Biosecurity Act 2015*

A rehabilitation strategy will be developed for the proposal, as a component of the CEMP. The strategy will be based on the Inland Rail Landscape and Rehabilitation Strategy, the Inland Rail Landscape and Rehabilitation Framework and property-specific reinstatement commitments. As a minimum it will establish the following:

- objectives for rehabilitation, reinstatement and/or stabilisation. Objectives will differ for within the rail corridor and outside of the rail corridor
- timeframes for rehabilitation and/or reinstatement/stabilisation works to be achieved
- details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the agreed objectives

- rehabilitation requirements such as:
  - milling and removal of bitumen pavement
  - removal of any decommissioned culverts
  - application of soil ameliorants
  - topsoiling and/or compost blanket
  - stabilisation and rehabilitation (e.g. planting and or seeding).
- consideration for maintenance or performance issues of rehabilitation e.g. vegetation that does not grow and obscure signals or impact the longevity of rail infrastructure
- procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas.

10.2 SUMMARY OF MITIGATION AND MANAGEMENT MEASURES

The mitigation measures to manage impacts to biodiversity from the proposal during detailed design/pre-construction, construction and operation are outlined in Table 10.1.

Table 10.1 Mitigation measures for detailed design/pre-construction

IMPACT TYPE	MITIGATION MANAGEMENT MEASURE	PROJECT PHASE
Avoiding impacts on biodiversity	Construction planning would avoid or minimise the need to impact or disturb native vegetation, fauna habitat and riparian habitat.	Detailed design/ pre-construction
Connectivity and fauna passage	During detailed design, provision of one glider pole on each side of the rail corridor will be further investigated to enhance habitat connection between patches of remnant vegetation for Squirrel Glider at the Billy Hughes Bridge enhancement site.	Detailed design/ pre-construction construction
Connectivity and fauna passage	A regional connectivity strategy will be prepared and implemented with reference to the Fauna Design Guidelines for the Inland Rail Project (2021) to consider further enhancements, including beyond the proposal site.	Detailed design/ pre-construction
Avoidance of fauna impacts	Pre-clearance surveys will be carried out prior to construction by a suitably qualified ecologist in accordance with the biodiversity management sub-plan. This would include: — inspections of structures that provide potential microbat habitat. If bats are identified roosting in these structures, individuals will be excluded from this habitat (meaning bats can exit the habitat unharmed during their nocturnal activity period, but not re-enter) — native aquatic fauna salvage in watercourses of residual pools directly impacted by construction. All salvaged aquatic fauna will be relocated to similar habitat nearby.	Pre-construction/ construction
Managing the potential for biodiversity impacts during construction	Exclusion areas will be established and maintained around native vegetation and riparian vegetation to be retained, particularly areas of biodiversity value adjoining the proposal site that are located in close proximity to work areas.	Pre-construction/ construction

IMPACT TYPE	MITIGATION MANAGEMENT MEASURE	PROJECT PHASE
Managing the potential for biodiversity impacts during construction	Construction workforce will be supplied with sensitive area maps (showing clearing boundaries and exclusion zones), including updates as required.	Pre-construction/ construction
Managing the potential for biodiversity impacts during construction	Temporary frog exclusion fencing will be considered where construction compounds/laydown areas occur adjacent to potential Sloane's Froglet breeding habitat.	Construction
Unexpected finds (biodiversity)	A species unexpected finds protocol will be implemented if threatened ecological communities, flora and fauna species not assessed in the biodiversity assessment, are identified in the proposal site. This would include stop work orders in the immediate area and notifying DPE.	Construction

10.3 PREDICTED EFFECTIVENESS OF THE MITIGATION AND MANAGEMENT MEASURES PROPOSED

The proposal was designed with the principles of avoid and minimise impact on native vegetation and habitat in accordance with the BAM. Accordingly, areas of mapped TECs and threatened species habitat were avoided or minimised where possible within the study area. Nevertheless, the proposal will have a residual impact on approximately 4.44 hectares of native vegetation. This residual impact to biodiversity values after avoid, minimise and mitigation measures have been applied, will be offset following principles of the BAM under the Biodiversity Offset Scheme, and in accordance with the ARTC Biodiversity Offset Delivery Strategy – New South Wales.

Standard pre-construction and construction related mitigation measures, such as delineating clearing extents and no-go areas, establishing protocols for staged clearing, animal handling protocols, and managing biosecurity risks, are consistent with best practice management of biodiversity values on large-scale linear infrastructure projects. They are considered to be effective in reducing the likelihood and/or consequence of short term or permanent impacts to biodiversity. Additionally, the preparation and implementation of a regional connectivity structure to consider enhancements at strategic locations beyond the proposal site would assist animal movement across existing landscape barriers.

11 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 (SAII)
- impacts that require offsetting
- impacts which do not require offsetting
- impacts that do not require further assessment.

11.1 SERIOUS AND IRREVERSIBLE IMPACTS

This section identifies every potential 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 proposal site.

Impact assessment of potential entities of SAII impacts on biodiversity values are outlined under Chapter 9 of the BAM and addressed below.

11.1.1 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 BAM.

The following threatened ecological communities are likely to be affected by the proposal:

- White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland.

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 (Office of Environment and Heritage 2017d). The extent to which this proposal impacts on this SAII TEC is provided in Table 11.1 and illustrated in in Appendix E-2.

Table 11.1 Extent of the SAII threatened ecological community White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland within the proposal site

THREATENED ECOLOGICAL COMMUNITY	VEGETATION TYPE AND ZONE	BC ACT	SAII	IBRA SUBREGION		DIRECT IMPACT (ha)
				LOWER SLOPES	INLAND SLOPES	
White Box – Yellow Box – Blakely's Red Gum grassy woodlands and Derived Native Grassland	PCT 277 – Moderate condition	Critically Endangered	Yes	0	0.50	0.50
	PCT 277 – Derived condition			0	2.34	2.34
Total direct impact on threatened ecological communities						**2.84**

An assessment of White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland was assessed against the SAII on biodiversity values in accordance with section 9.1.1 of the BAM and is provided in Table 11.2.

Table 11.2 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 and Derived Native Grassland (Box Gum Woodland) have been avoided where possible through design refinement. This proposal has utilised the existing rail alignment to avoid as many areas of ecological constraint (including Box Gum Woodland) as practical. Direct impact can be further avoided through detailed design and through careful placement of compound sites and construction zones. Indirect impacts will be managed through mitigation measures which are outlined in Chapter 10.
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 for PCT 277 of 94%. 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 746 hectares. 2.b. within the proposal site, this community currently occurs in moderate and derived 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.
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.
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.a.i. the direct impacts to this SAII entity is: — PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition will be 0.50 hectares — PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – derived condition will be 2.34 hectares.

ASSESSMENT REQUIREMENTS	WHITE BOX YELLOW BOX BLAKELY'S RED GUM WOODLAND AND DERIVED NATIVE GRASSLAND
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 development footprint 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) (section 4.2.1).	This equated to a total direct impact of 2.84 hectares of White Box – Yellow Box – Blakely's Red Gum grassy woodlands. Indirect impact will be managed through mitigation measures outlined in Chapter 10. 4.a.ii. in NSW the current geographic extent of PCT 277 Box Gum Woodland has been estimated to be 30,000 hectares. The loss of 2.84 hectares as a result of the proposal would constitute an additional loss of less than 0.01% to the current geographic extent of the TEC in NSW. 4.b. The proposed impacts to White Box – Yellow Box – Blakely's Red Gum grassy woodlands are restricted to small fragment isolated patches that occur in a highly modified environment. Because of this, the patches of this community within the proposal site have high edge area perimeter ratios and are isolated from any larger more intact areas of White Box – Yellow Box – Blakely's Red Gum grassy woodlands. The current extent of White Box – Yellow Box – Blakely's Red Gum grassy woodlands within 500 metres of the proposal site is unknown although it is estimated to be tiny and mostly comprise of highly modified very small, isolated patches along with the occurrence of scattered remnant trees in an agricultural landscape. It is assumed that the proposal, given it is an upgrading of existing rail track, 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. Mitigation measures have been provided (section 10) to minimise any potential indirect impacts to remaining areas of the community. In terms of recorded White Box – Yellow Box – Blakely's Red Gum grassy woodlands, the vegetation integrity scores are: — 68.9 – PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition — 52.9 – PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – derived condition.

ASSESSMENT REQUIREMENTS	WHITE BOX YELLOW BOX BLAKELY'S RED GUM WOODLAND AND DERIVED NATIVE GRASSLAND
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.

11.1.2 THREATENED FLORA CANDIDATE SAII ENTITIES

No threatened flora listed under the BC Act are considered likely to occur within the proposal site, as such no threatened flora SAII entity will be affected by the proposal.

11.1.3 THREATENED FAUNA CANDIDATE SAII ENTITIES

No SAII threatened fauna listed under the BC Act are considered likely to occur within the proposal site, as such no threatened fauna SAII entity will be affected by the proposal.

11.2 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.

11.2.1 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 proposal site that are subject to a biodiversity offset are illustrated in Appendix E-3. The required ecosystem and species credit obligations are outlined below.

11.2.2 IMPACTS REQUIRING BIODIVERSITY OFFSETS (ECOSYSTEM CREDITS)

Impacts requiring biodiversity offset ecosystem credits for both the Lower Slopes and Inland Slopes IBRA subregions are detailed in Table 11.3 and Table 11.4.

Table 11.3 Impacts requiring biodiversity offset ecosystem credits for the Lower Slopes IBRA subregion

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	TEC	SAII	SPECIES SENSITIVITY TO GAIN CLASS	VEGETATION INTEGRITY SCORE	OFFSET REQUIRED
#1	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Poor condition	Does not meet TEC	No	High Sensitivity to Potential Gain	19.8	Yes

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	TEC	SAII	SPECIES SENSITIVITY TO GAIN CLASS	VEGETATION INTEGRITY SCORE	OFFSET REQUIRED
#2	PCT 5 – 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 condition	Does not meet TEC	No	High Sensitivity to Potential Gain	52.3	Yes

Table 11.4 Impacts requiring biodiversity offset ecosystem credits for the Inland Slopes IBRA subregion

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	TEC	SAII	SPECIES SENSITIVITY TO GAIN CLASS	VEGETATION INTEGRITY SCORE	OFFSET REQUIRED
#1	PCT 5 – 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 condition	Does not meet TEC	No	High Sensitivity to Potential Gain	21.4	Yes
#2	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate condition	Meets TEC	Yes	High Sensitivity to Potential Gain	68.9	Yes
#3		Poor condition	Does not meet TEC	Yes	High Sensitivity to Potential Gain	36.8	Yes
#4		Derived condition	Meets TEC	Yes	High Sensitivity to Potential Gain	52.9	Yes
#5		Native plantings	Does not meet TEC	Yes	High Sensitivity to Potential Gain	46.1	Yes

11.2.3 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 9.1.3.2 of this report.

11.2.4 IMPACTS REQUIRING BIODIVERSITY OFFSETS (SPECIES CREDITS)

Impacts requiring biodiversity offset species credits for both the Lower Slopes and Inland Slopes IBRA subregions are detailed in Table 11.5 and Table 11.6.

Table 11.5 Impacts requiring biodiversity offset species credits for the Lower Slopes IBRA subregion

BAM-C VEGETATION ZONE NAME	SCIENTIFIC NAME	COMMON NAME	HABITAT CONDITION (VEGETATION INTEGRITY) LOSS	AREA / COUNT (hectares)	BIODIVERSITY RISK WEIGHTING	SAII	OFFSET REQUIRED
5_poor	*Crinia sloanei*	Sloane's Froglet	52.3	0.02	1.5	No	Yes
277_poor			19.8	0.01	1.5	No	Yes
277_poor	*Petaurus norfolcensis*	Squirrel Glider	19.8	0.13	2	No	Yes
5_poor			52.3	0.02	2	No	Yes
277_poor	*Polytelis swainsonii*	Superb Parrot	19.8	0.13	2	No	Yes
5_poor			52.3	0.02	2	No	Yes

Table 11.6 Impacts requiring biodiversity offset species credits for the Inland Slopes IBRA subregion

BAM-C VEGETATION ZONE NAME	SCIENTIFIC NAME	COMMON NAME	HABITAT CONDITION (VEGETATION INTEGRITY) LOSS	AREA / COUNT (hectares)	BIODIVERSITY RISK WEIGHTING	SAII	OFFSET REQUIRED
5_poor	*Crinia sloanei*	Sloane's Froglet	21.4	0.02	1.5	No	Yes
277_native plantings			46.1	0.05	1.5	No	Yes
277_poor			36.8	0.11	1.5	No	Yes
5_poor	*Keyacris scurra*	Key's Matchstick Grasshopper	21.4	0.03	2	No	Yes
277_native plantings			46.1	0.26	2	No	Yes
277_poor			36.8	1.2	2	No	Yes
277_moderate			68.9	0.50	2	No	Yes
277_derived			52.9	2.3	2	No	Yes
5_poor	*Petaurus norfolcensis*	Squirrel Glider	21.4	0.03	2	No	Yes
277_moderate			68.9	0.50	2	No	Yes
277_poor			36.8	1.16	2	No	Yes
5_poor	*Polytelis swainsonii*	Superb Parrot	21.4	0.03	2	No	Yes
277_moderate			68.9	0.50	2	No	Yes
277_poor			36.8	1.16	2	No	Yes

11.2.5 IMPACTS THAT DO NOT NEED FURTHER ASSESSMENT

In accordance with section 9.3 of the BAM the following impacts to non-native vegetation types do not need further assessment and do not require a biodiversity offset:

- the impact of 39.91 hectares of miscellaneous ecosystem type of highly disturbed areas with no or limited native vegetation
- the impacts of 1.40 hectares of miscellaneous ecosystems – ornamental plantings.

12 IMPACT SUMMARY – NO NET LOSS STANDARD

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.

12.1 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 7 and 10)
- 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 section 11.2 of this report. The ecosystem and species credit offset requirements calculated for these residual impacts are presented below.

12.2 ECOSYSTEM CREDIT OFFSET REQUIREMENT

The required ecosystem credit offset requirement, as determined using the BAM-C (version 1.3.0.00), for impacts on native vegetation for both the Lower Slopes and Inland Slopes IBRA subregions are provided in Table 12.1 and Table 12.2. The ecosystem credit species predicted to utilise these PCTs are listed in the BAM credit report in Appendix F.

Table 12.1 Impacts requiring biodiversity offset ecosystem credits for the Lower Slopes IBRA subregion

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	TEC	SAII	BIODIVERSITY RISK WEIGHTING	VEGETATION INTEGRITY LOSS	CONTAINS HOLLOW BEARING TREES	AREA (ha)	CREDITS REQUIRED
#1	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Poor condition	Does not meet TEC	No	2.5	-19.8	Yes	0.13	2

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	TEC	SAII	BIODIVERSITY RISK WEIGHTING	VEGETATION INTEGRITY LOSS	CONTAINS HOLLOW BEARING TREES	AREA (ha)	CREDITS REQUIRED
	PCT 5 – 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 condition	Does not meet TEC	No	1.5	-52.3	No	0.02	1
Total ecosystem credit obligation for Lower Slopes IBRA subregion									**3**

Table 12.2 Impacts requiring biodiversity offset ecosystem credits for the Inland Slopes IBRA subregion

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	TEC	SAII	BIODIVERSITY RISK WEIGHTING	VEGETATION INTEGRITY LOSS	CONTAINS HOLLOW BEARING TREES	AREA (ha)	CREDITS REQUIRED
#1	PCT 5 – 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 condition	Does not meet TEC	No	1.5	-21.4	No	0.03	1

BAM-C #	VEGETATION TYPE	VEGETATION ZONE	TEC	SAII	BIODIVERSITY RISK WEIGHTING	VEGETATION INTEGRITY LOSS	CONTAINS HOLLOW BEARING TREES	AREA (ha)	CREDITS REQUIRED
#2	PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate condition	Meets TEC	Yes	2.5	-68.9	Yes	0.50	22
#3		Poor condition	Does not meet TEC	No	2.5	-36.8	Yes	1.16	27
#4		Derived condition	Meets TEC	Yes	2.5	-52.9	No	2.34	77
#5		Native plantings	Does not meet TEC	No	2.5	-46.1	No	0.26	7
Total ecosystem credit obligation for Inland Slopes IBRA subregion									**134**

12.2.1 ECOSYSTEM CREDIT OPTIONS – LIKE FOR LIKE

The like for like ecosystem credit class options for each biodiversity offset credit requirement for both the Lower Slopes and Inland Slopes IBRA subregions are provided in Table 12.3.

Table 12.3 Like for like ecosystem credit classes and trading group options for the Lower Slopes IBRA subregion

CREDIT CLASS PCT	TRADING GROUP	CONTAINS HOLLOW BEARING TRES	IN THE BELOW IBRA SUBREGIONS
PCT 5 – 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			
Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 79, 112, 233, 234, 249, 356, 362	Inland Riverine Forests - < 50% cleared group (including Tier 4 or higher threat status).	No 5_poor	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion			
Western Slopes Grassy Woodlands This includes PCT's:201, 266, 276, 277, 282, 283, 337, 426, 441, 483, 847	Western Slopes Grassy Woodlands - ≥ 90% cleared group (including Tier 1 or higher threat status).	Yes 277_poor	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Table 12.4 Like for like ecosystem credit classes and trading group options for the Inland Slopes IBRA subregion

CREDIT CLASS PCT	TRADING GROUP	CONTAINS HOLLOW BEARING TRES	IN THE BELOW IBRA SUBREGIONS
Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 79, 112, 233, 234, 249, 356, 362	Inland Riverine Forests - < 50% cleared group (including Tier 4 or higher threat status)	No 5_poor	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.
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	TEC – White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Yes 277_moderate 277_poor No 277_derived 277_native plantings	Inland Slope, 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.

12.3 SPECIES CREDIT OFFSET REQUIREMENT

The species credit requirement, as determined using the BAM-C (version 1.3.0.00) for both the Lower Slopes and Inland Slopes IBRA subregions are detailed in Table 12.5 and Table 12.6.

Table 12.5 Biodiversity offset species credit obligation within the Lower Slopes IBRA subregion

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	VEGETATION ZONE	VI LOSS	BIODIVERSITY RISK WEIGHTING	SAII	AREA (hectares)	SPECIES CREDITS
Crinia sloanei	Sloane's Froglet	V	PCT 5 (poor)	-52.3	1.5	No	0.02	1
			PCT 277 (poor)	-19.8	1.5	No	0.01	1
Petaurus norfolcensis	Squirrel Glider	V	PCT 5 (poor)	-52.3	2	No	0.02	1
			PCT 277 (poor)	-19.8	2	No	0.13	1
Polytelis swainsonii	Superb Parrot	V	PCT 5 (poor)	-52.3	2	No	0.02	1
			PCT 277 (poor)	-19.8	2	No	0.13	1
Total species credits obligation for Lower Slopes IBRA subregion								**6**

(1) Listed under the BC Act – V = Vulnerable.

Table 12.6 Biodiversity offset species credit obligation within the Inland Slopes IBRA subregion

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	VEGETATION ZONE	VI LOSS	BIODIVERSITY RISK WEIGHTING	SAII	AREA (ha)	SPECIES CREDITS
Crinia sloanei	Sloane's Froglet	V	PCT 5 (poor)	-21.4	1.5	No	0.02	1
			PCT 277 (native plantings)	-46.1			0.05	1
			PCT 277 (poor)	-36.8			0.11	2
Keyacris scurra	Key's Matchstick Grasshopper	E	PCT 5 (poor)	-21.4	2	No	0.03	1
			PCT 277 (native plantings)	-46.1			0.26	6
			PCT 277 (poor)	-36.8			1.2	21
			PCT 277 (moderate)	-68.9			0.50	17
			PCT 277 (derived)	-52.9			2.3	62
Petaurus norfolcensis	Squirrel Glider	V	PCT 5 (poor)	-21.4	2	No	0.03	1
			PCT 277 (moderate)	-68.9			0.50	17
			PCT 277 (poor)	-36.8			1.16	21
Polytelis swainsonii	Superb Parrot	V	PCT 5 (poor)	-21.4	2	No	0.03	1
			PCT 277 (moderate)	-68.9			0.50	17
			PCT 277 (poor)	-36.8			1.16	21
Total species credits obligation for Inland Slopes IBRA subregion								**189**

(1) Listed under the BC Act – V = Vulnerable, E = Endangered

12.3.1 SPECIES CREDIT OPTIONS

In the case of impacts on threatened species that are species credit species, like-for-like biodiversity credits represent the same threatened species. Like for like species may be sourced from anywhere in NSW. In circumstances where like for like species credits options are not available, variations rules may be applied that include:

- if the impacted species is a plant-they represent a plant, and
- if the impacted species is an animal-they represent an animal, and
- they represent a species that has the same or a higher category of listing under Part 4 of the Act as a threatened species, and
- they represent a location that is in:
  - the same or an adjoining IBRA subregion as the impacted site, or
  - any such subregion that is within 100km of the outer edge of the impacted site.

12.4 BIODIVERSITY OFFSET APPROACH

12.4.1 OVERVIEW

The biodiversity offset approach for this project 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 project (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).
- 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.

12.4.2 PREFERRED APPROACH

ARTC proposes to meet the offset obligation for A2I through retirement of credits for White Box, Yellow Box, Blakely's Red Gum Grassy Woodland TEC and Squirrel Glider. Both credit types exist on the Biodiversity Offset Scheme's public register and ARTC is pursuing new BSA sites to create additional supply. Due to the absence of existing credits for Superb Parrot, Sloane's Froglet and Key's Matchstick Grasshopper on the public register and difficulties in creating viable quantities of credits, these obligations will likely be met through a payment into the Biodiversity Conservation Fund. However, ARTC may pursue opportunities to create new credits for either or both species, if available and viable.

Note that targeted surveys for Key's Matchstick Grasshopper will occur and if so the credit liability will be updated based on the results of those future surveys.

13 CONCLUSION

The proposal will have a residual direct impact on 4.44 hectares of native vegetation comprised of two native plant community types. This includes one threatened ecological community listed under the BC Act and EPBC Act within the proposal site:

- White Box Yellow Box Blakely's Red Gum Woodland (PCT 277) listed as Critically Endangered under the BC Act and EPBC Act. This community is also listed as an SAII entity affected.

No threatened flora species were recorded during targeted surveys.

Six threatened fauna species were recorded during field surveys. Of these, the Squirrel Glider and Superb Parrot are candidate species and will be affected by the proposal. Sloane's Froglet was assumed to have suitable habitat in the proposal site and is similarly a candidate species and would be affected by the proposal. Key's Matchstick Grasshopper was also assumed to be present due to its inclusion in the BAM-C following the completion of the survey and assessment. The other three species are ecosystem credit species.

The proposal has been designed with the principles of avoid and minimise impact on native vegetation and habitat where possible in accordance with BAM. The proposal has been designed to avoid and minimise impact to areas of TECs. The proposal has been designed to avoid areas of mapped TECs where possible within the study area. Total impact to TECs has been reduced to 2.84 hectares of White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grassland. This impact comprises:

- PCT 277 (moderate condition) 0.50 hectares with avoidance of 2.29 hectares or 83% of this vegetation type within the study area
- PCT 277 (derived condition) 2.34 hectares with avoidance of 1.74 hectares or 43% of this vegetation type within the study area.

The BAM-C 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:

- 137 ecosystem credits
- 195 species credits.

Assessments of impact significance were conducted for all 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 unlikely to have a significant impact on any EPBC Act listed threatened species, populations and ecological communities or their habitat or any other MNES relating to ecological matters. Accordingly, an EPBC Act Referral is not considered a requirement for the proposal.

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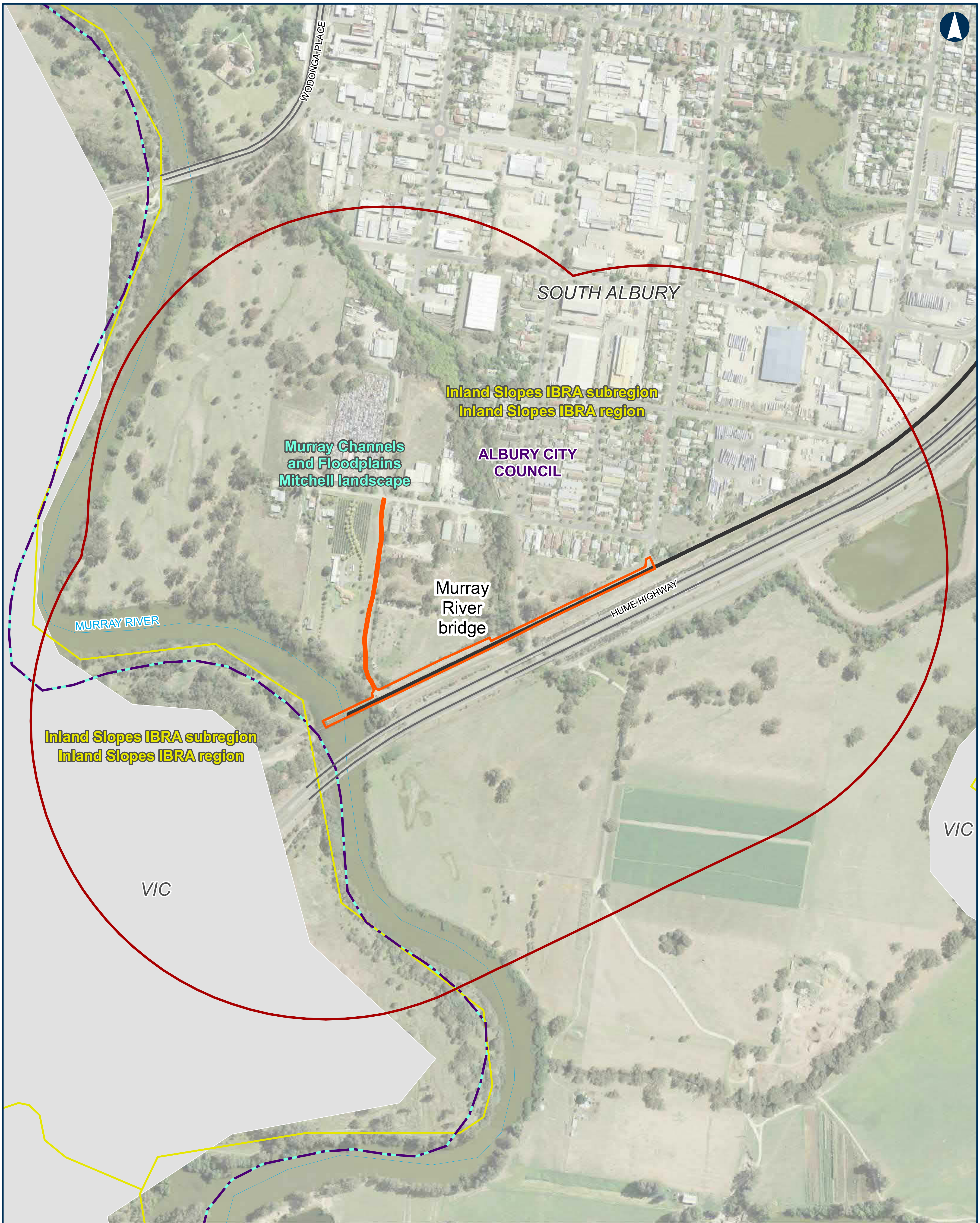
TECHNICAL PAPER 08

Biodiversity development assessment report

Appendix A Landscape context

ALBURY TO ILLABO ENVIRONMENTAL IMPACT STATEMENT

APPENDIX A-1
LANDSCAPE FEATURES – IBRA BIOREGION, SUBREGION, LGAS AND MITCHELL LANDSCAPES



Albury to Illabo

Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes

MAP 1 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:6,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse
- Local Government Area
- Landscape assessment area
- IBRA subregion
- Mitchell landscape

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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Albury to Illabo

Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes

MAP 2 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:8,500
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse
- Local Government Area
- Landscape assessment area
- IBRA subregion
- Mitchell landscape

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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Albury to Illabo

Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes

MAP 3 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:6,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Local Government Area
Landscape assessment area
IBRA subregion
Mitchell landscape

INLAND RAIL

ARTC

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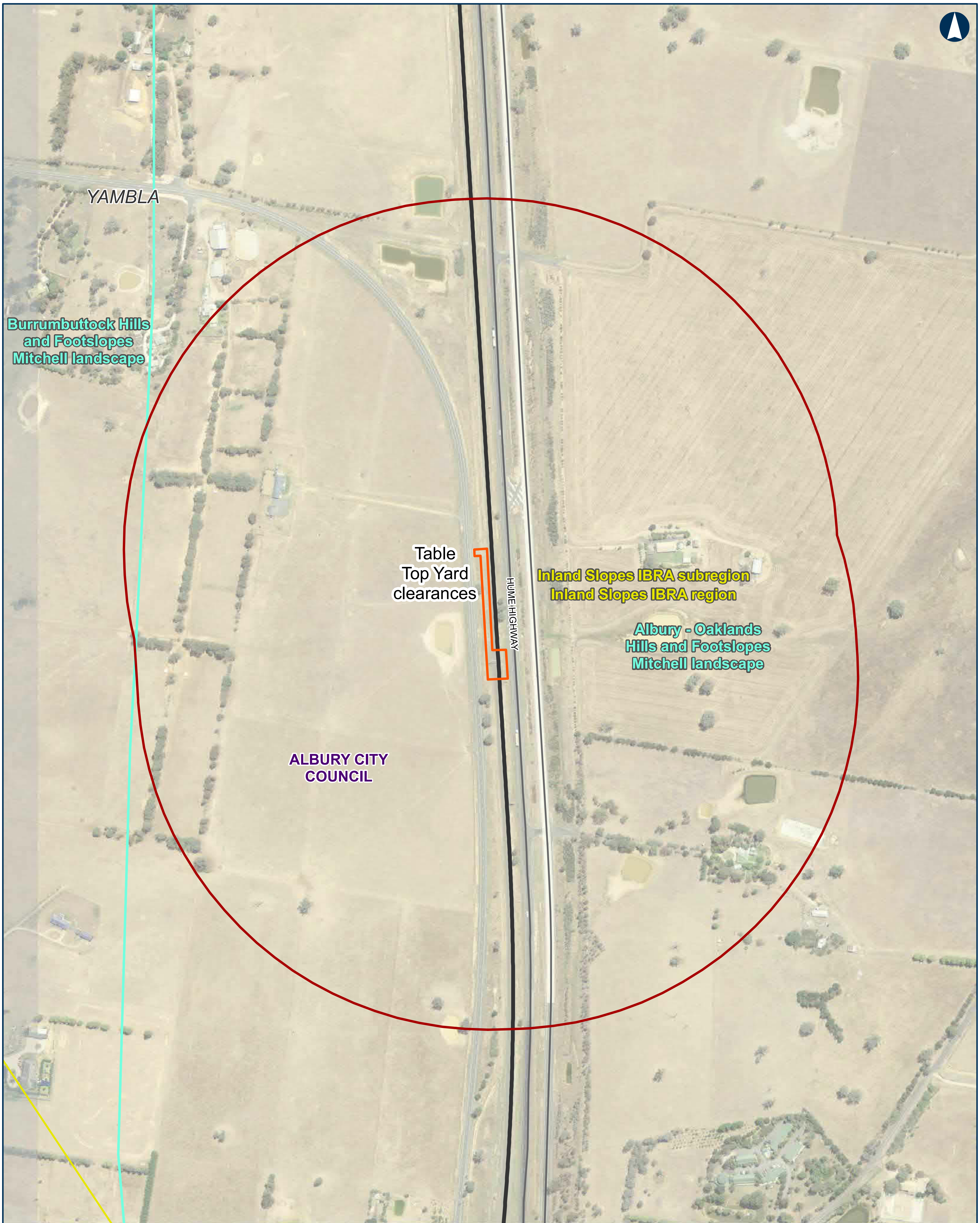

Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 4 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Local Government Area
- Landscape assessment area
- IBRA subregion
- Mitchell landscape

INLAND RAIL ARTC

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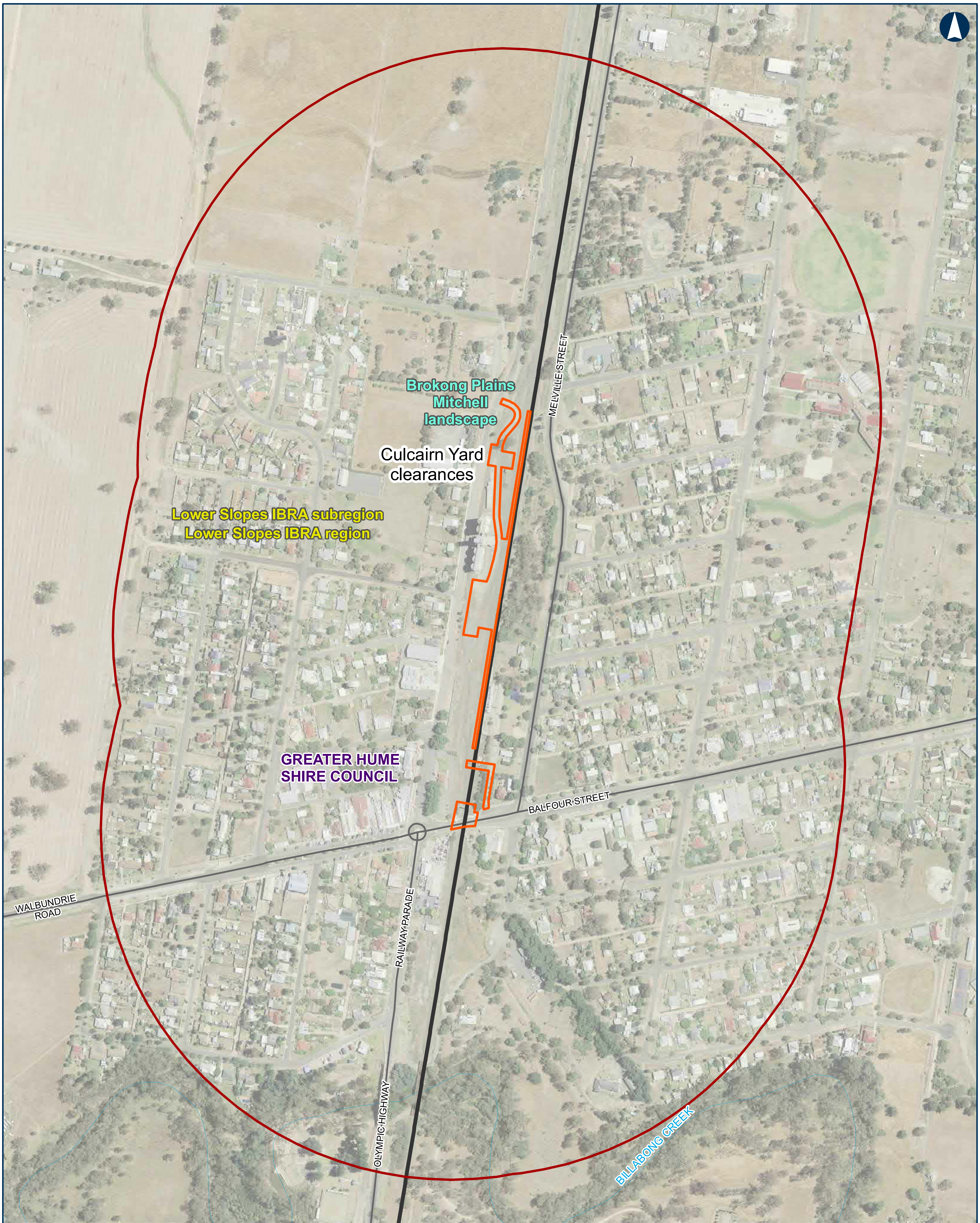
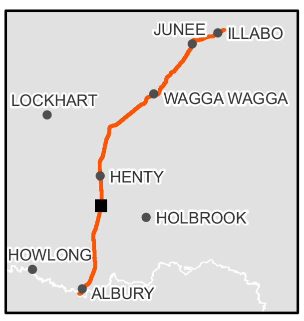


Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 5 OF 17



Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

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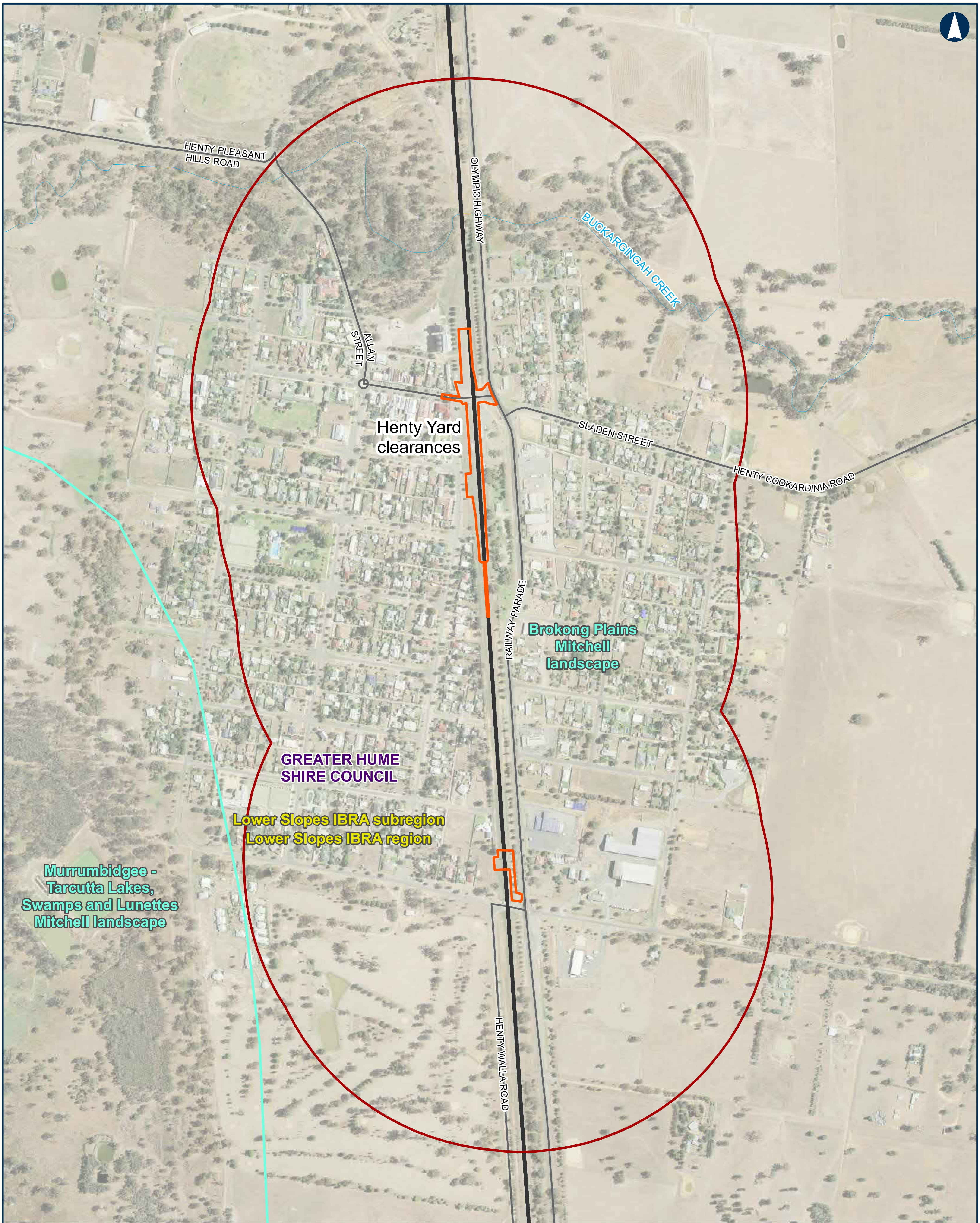

Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 6 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse
- Local Government Area
- Landscape assessment area
- IBRA subregion
- Mitchell landscape

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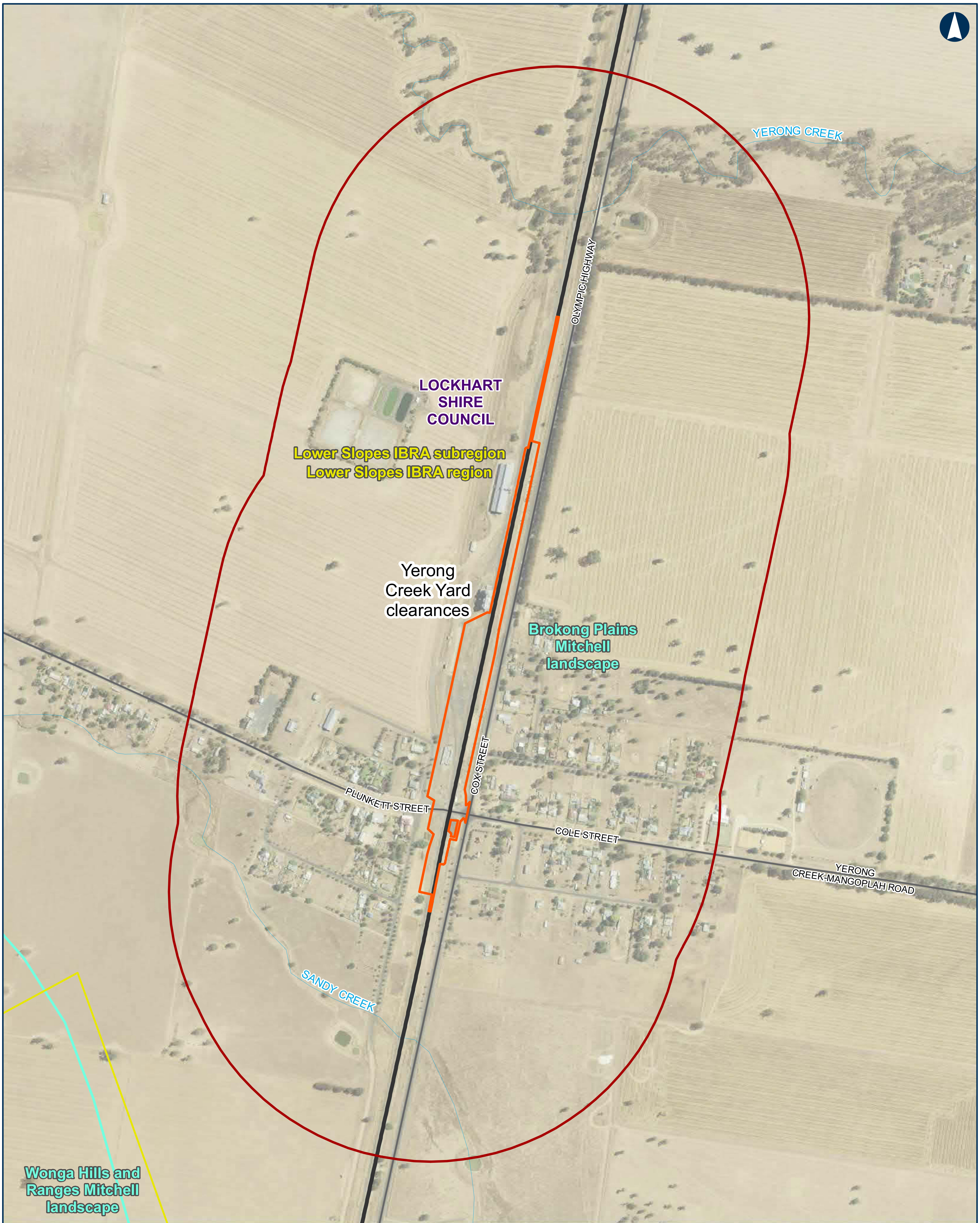

Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 7 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Local Government Area
Landscape assessment area
IBRA subregion
Mitchell landscape

INLAND RAIL ARTC

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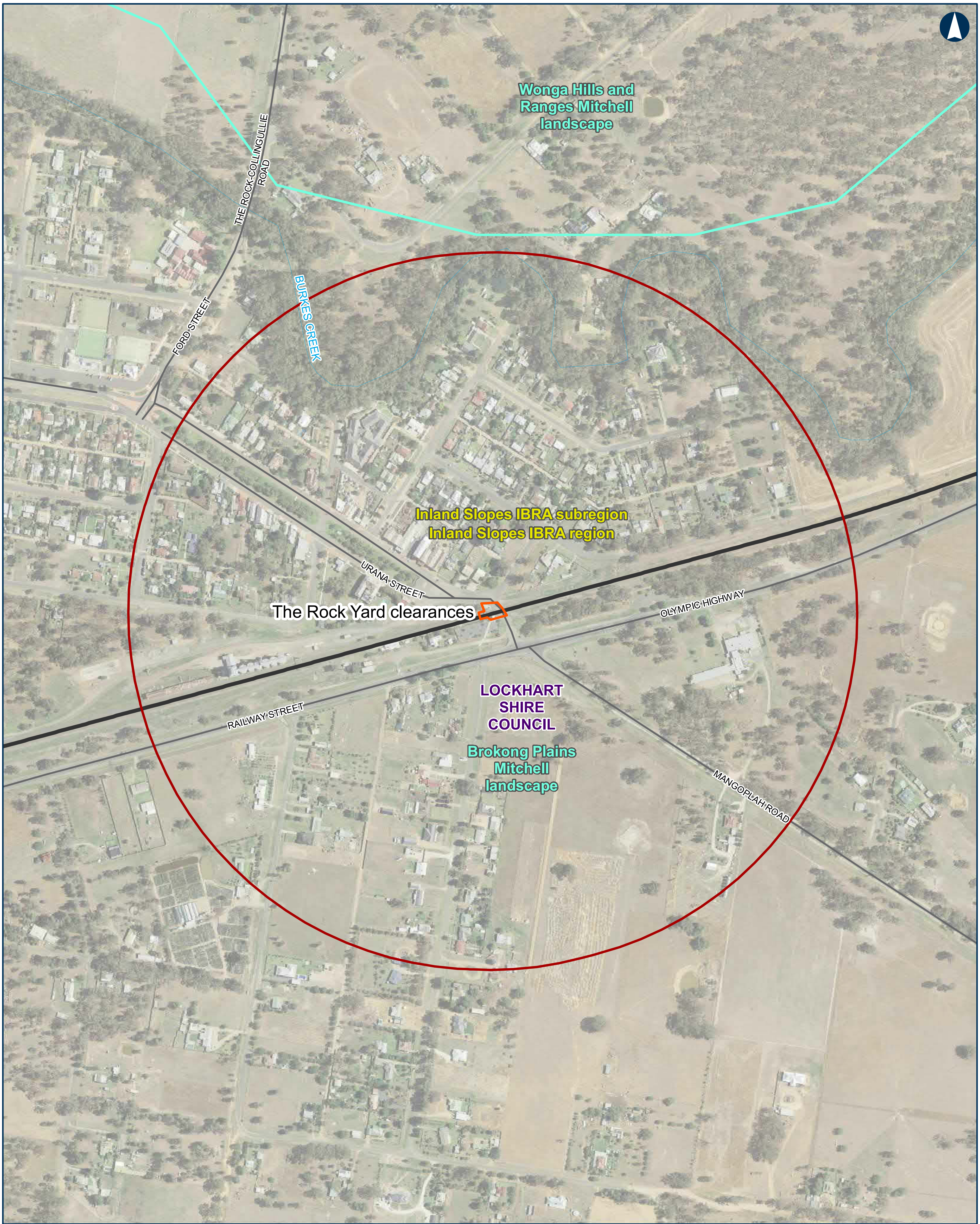

Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 8 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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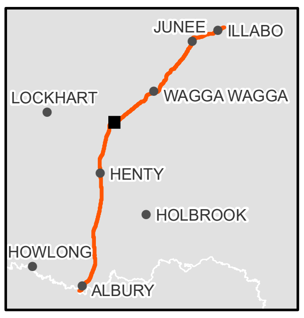
Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse
- Local Government Area
- Landscape assessment area
- IBRA subregion
- Mitchell landscape



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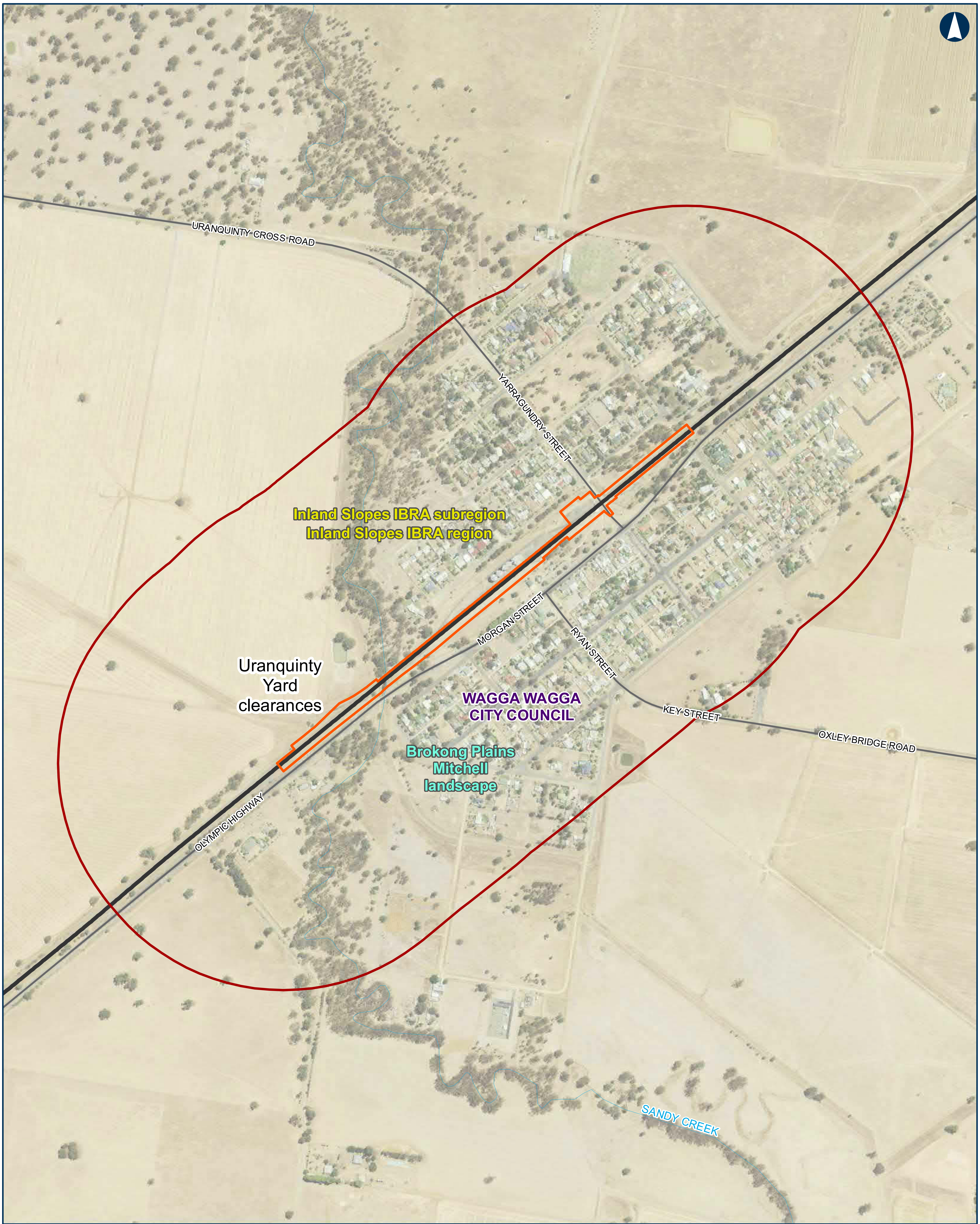
Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 9 OF 17



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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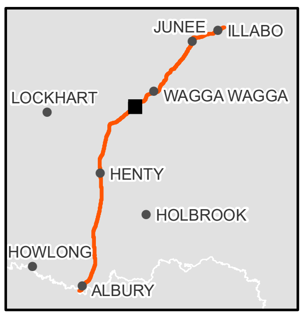
Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse
- Local Government Area
- Landscape assessment area
- IBRA subregion
- Mitchell landscape



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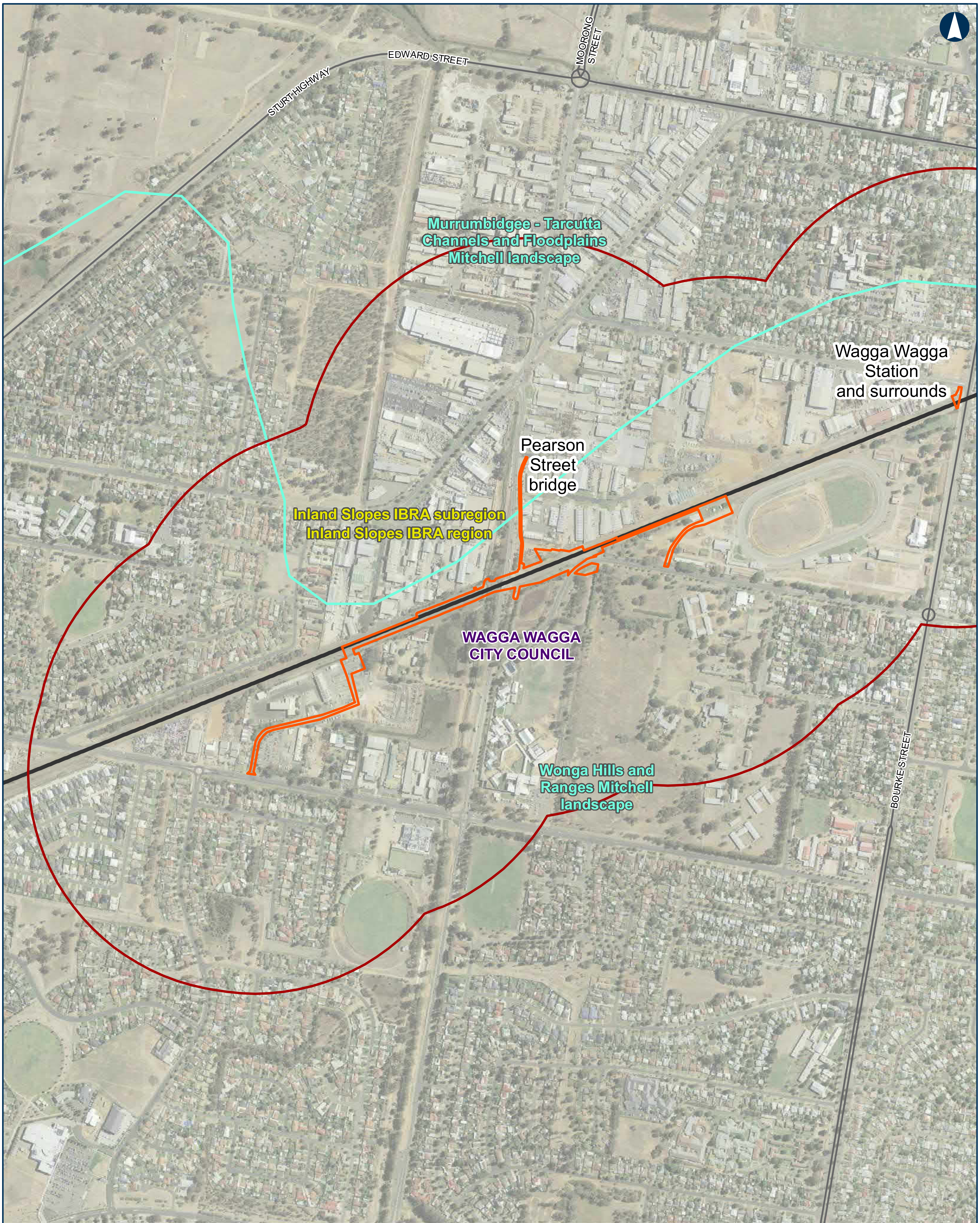

Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 10 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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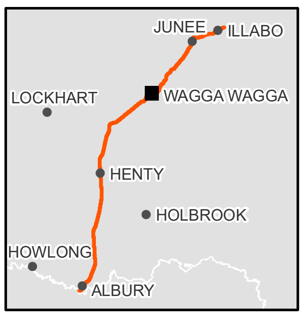
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Local Government Area
Landscape assessment area
IBRA subregion
Mitchell landscape



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Albury to Illabo

Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes

MAP 11 OF 17

0 100 200 m

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Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:11,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Local Government Area
Landscape assessment area
IBRA subregion
Mitchell landscape

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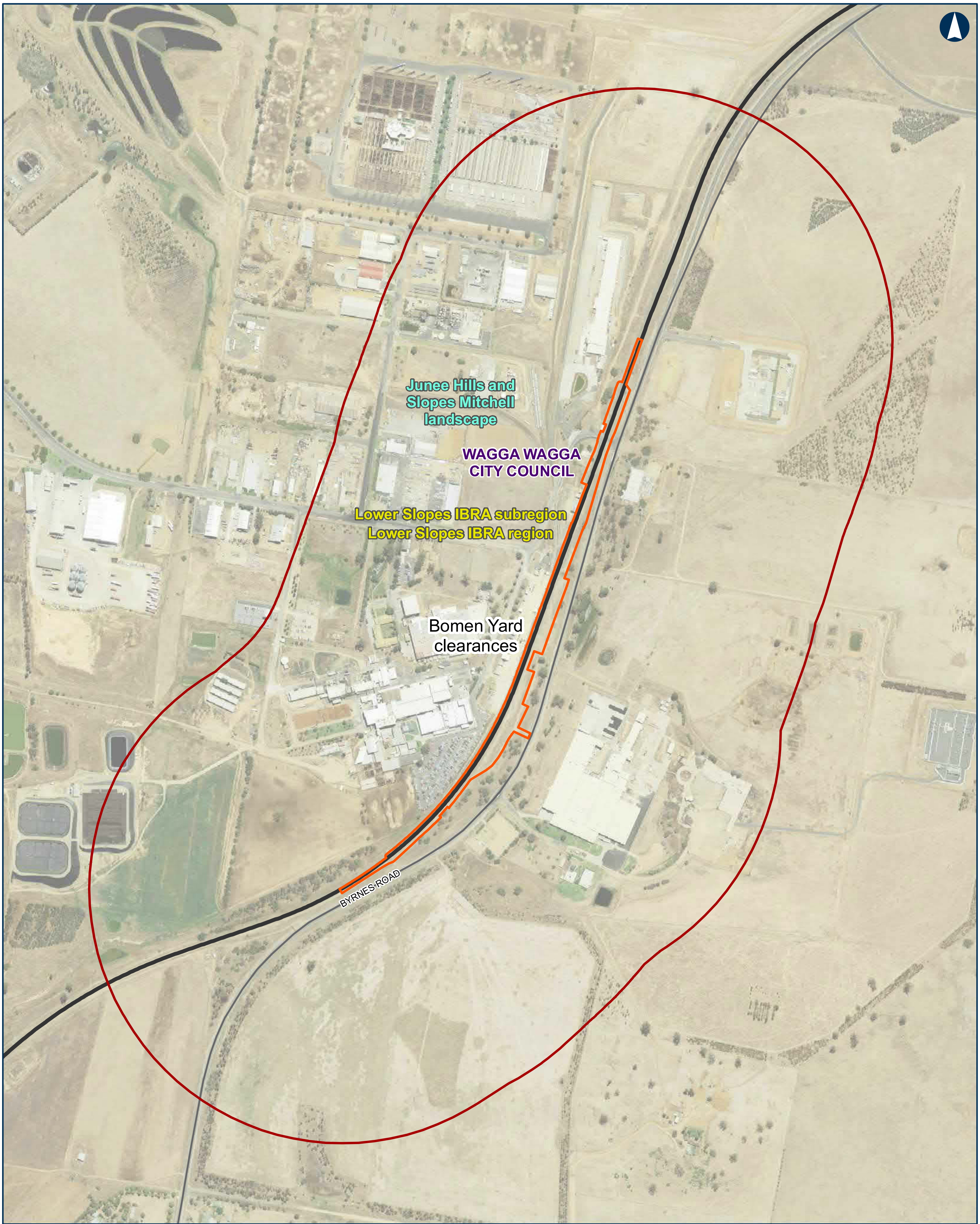


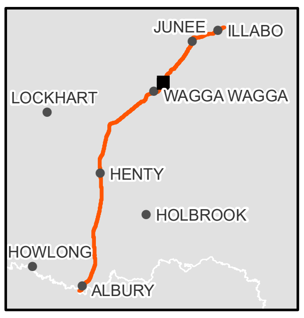
Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 12 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Local Government Area
- Landscape assessment area
- IBRA subregion
- Mitchell landscape



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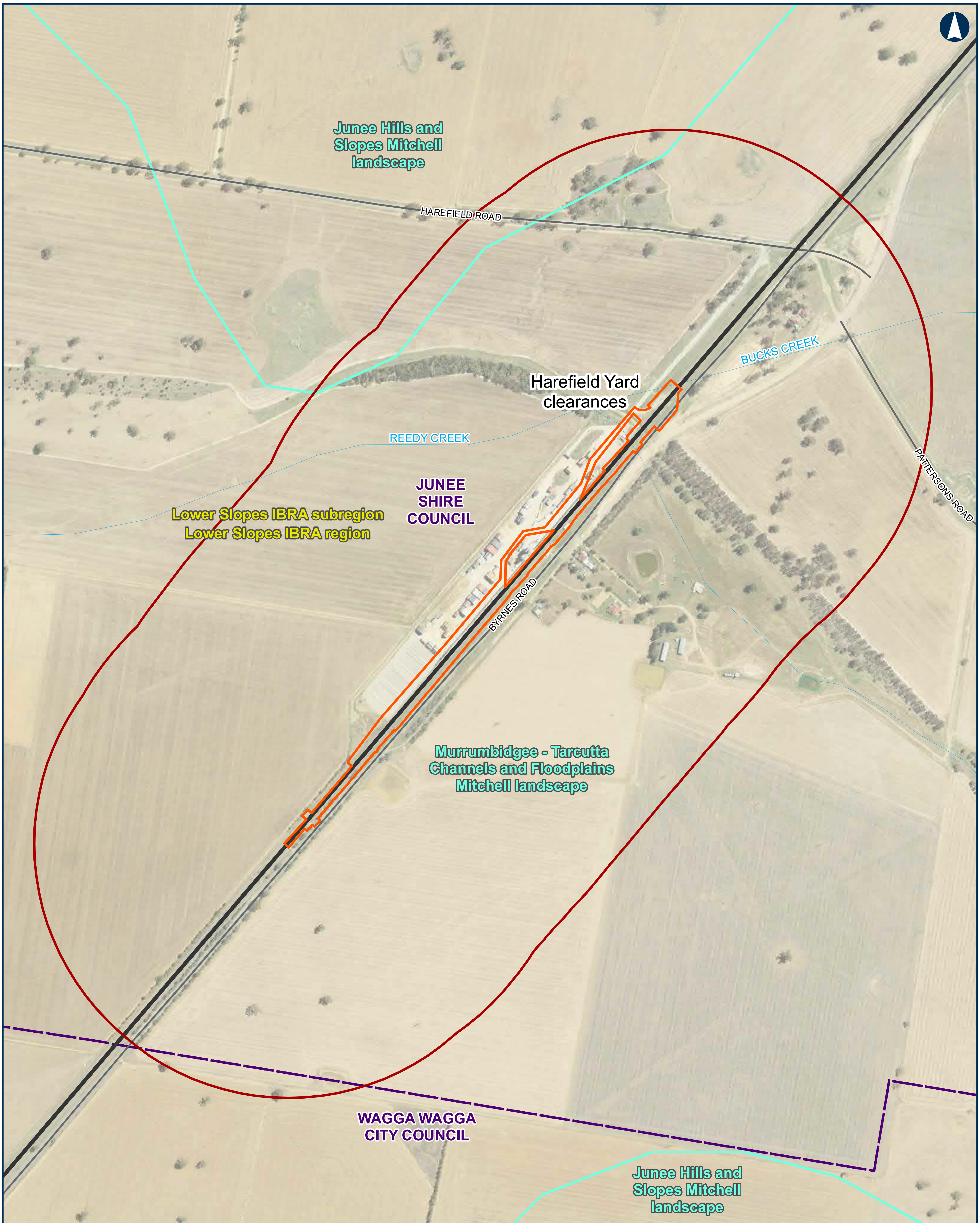

Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 13 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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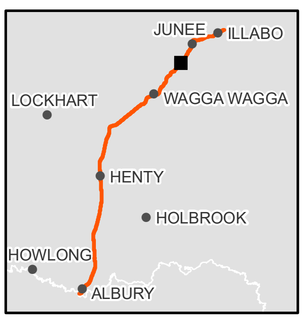
Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse
- Local Government Area
- Landscape assessment area
- IBRA subregion
- Mitchell landscape



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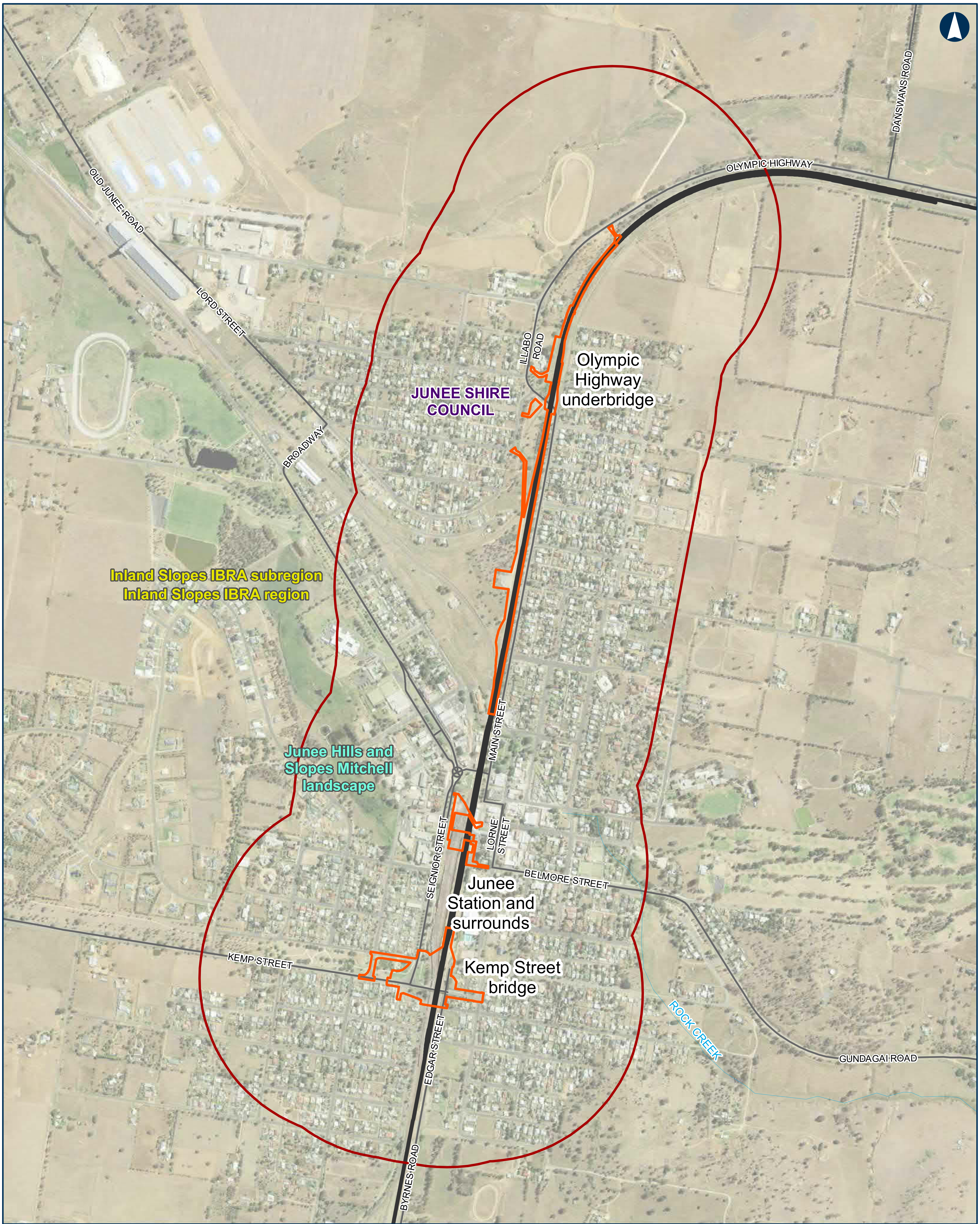

Albury to Illabo

Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes

MAP 14 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:11,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Local Government Area
Landscape assessment area
IBRA subregion
Mitchell landscape

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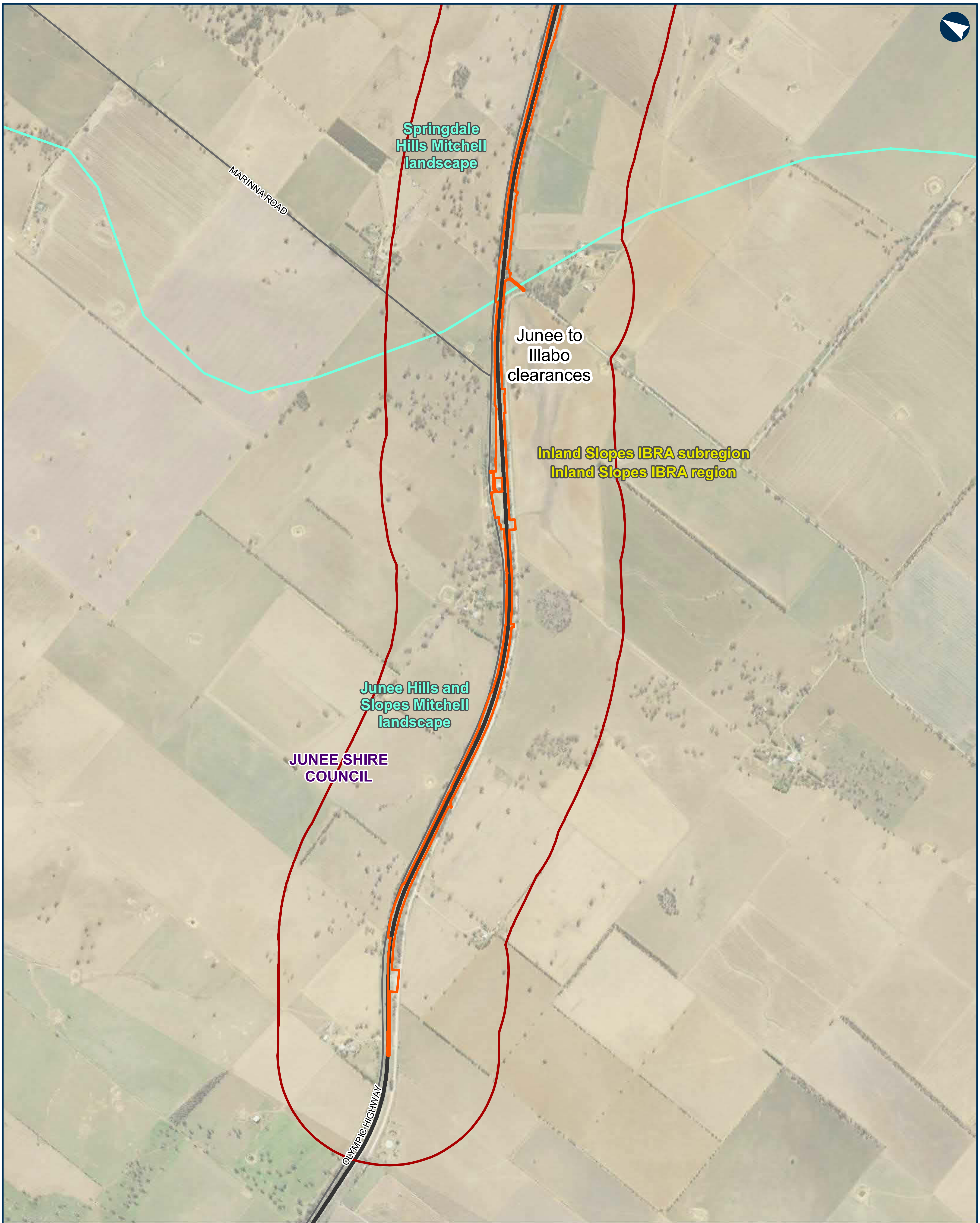

Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 15 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Local Government Area
Landscape assessment area
IBRA subregion
Mitchell landscape

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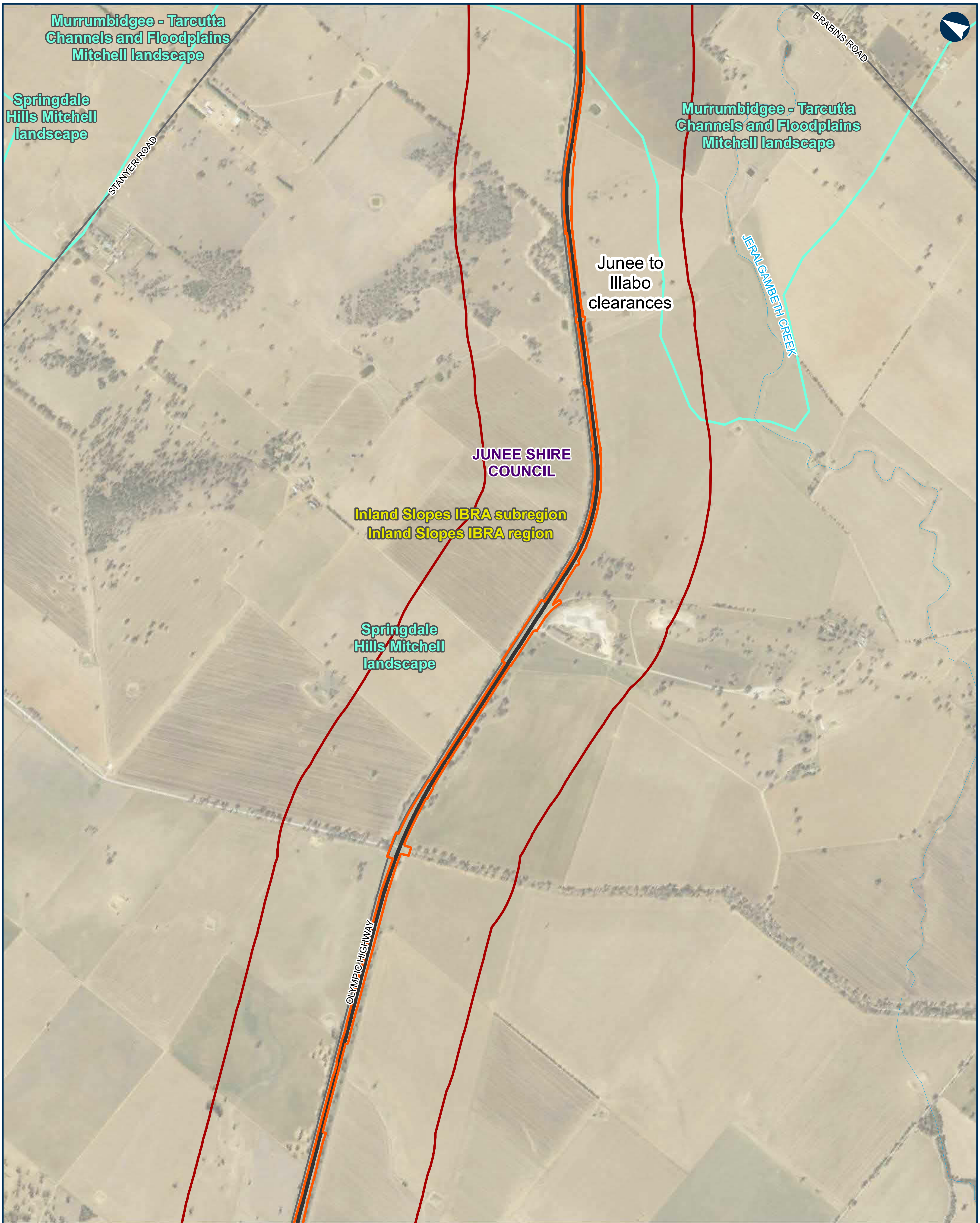

Albury to Illabo Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes MAP 16 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Local Government Area
Landscape assessment area
IBRA subregion
Mitchell landscape

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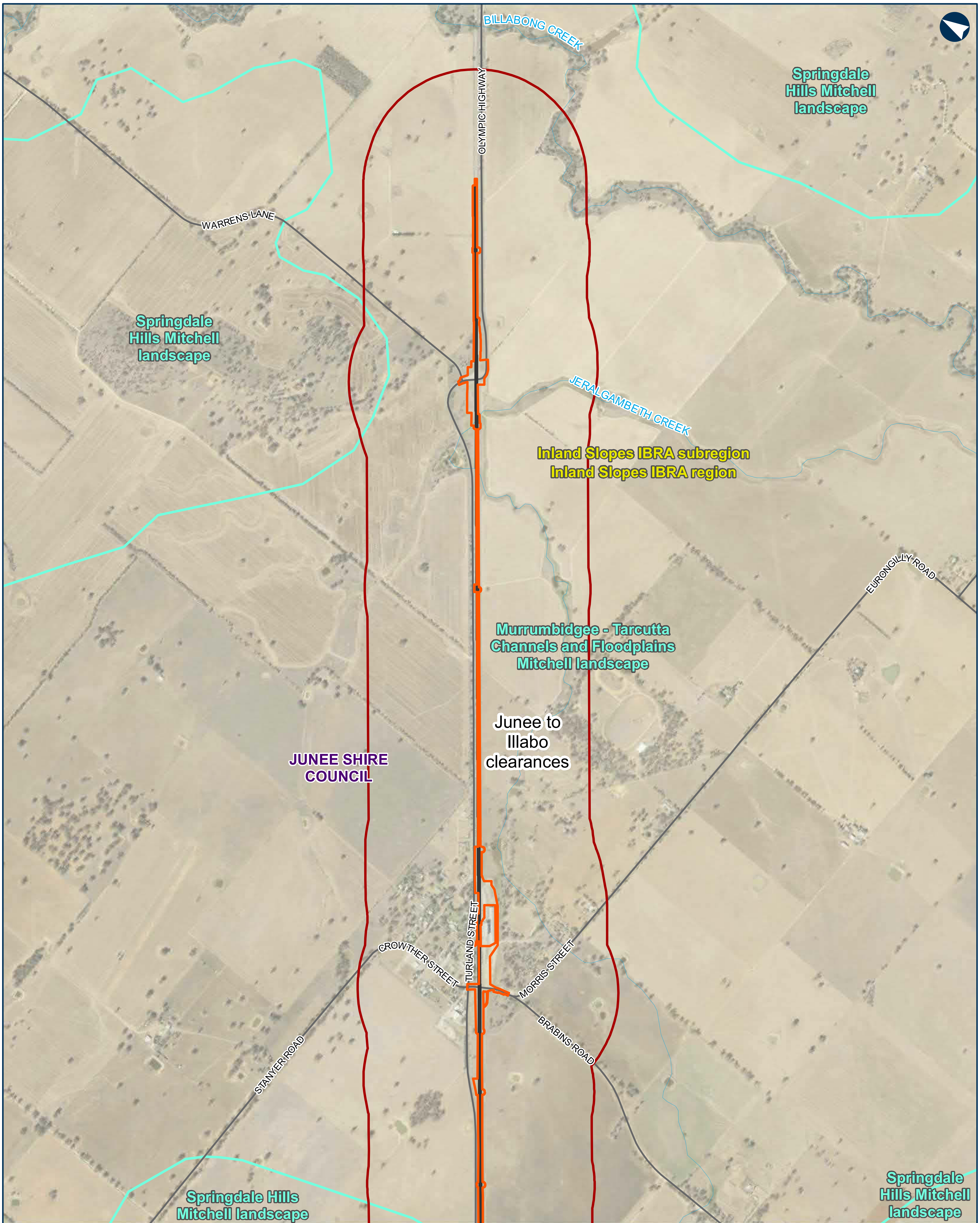

Albury to Illabo

Appendix A1 – Landscape features – IBRA bioregion, subregion, LGAs and Mitchell Landscapes

MAP 17 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:16,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse
- Local Government Area
- Landscape assessment area
- IBRA subregion
- Mitchell landscape

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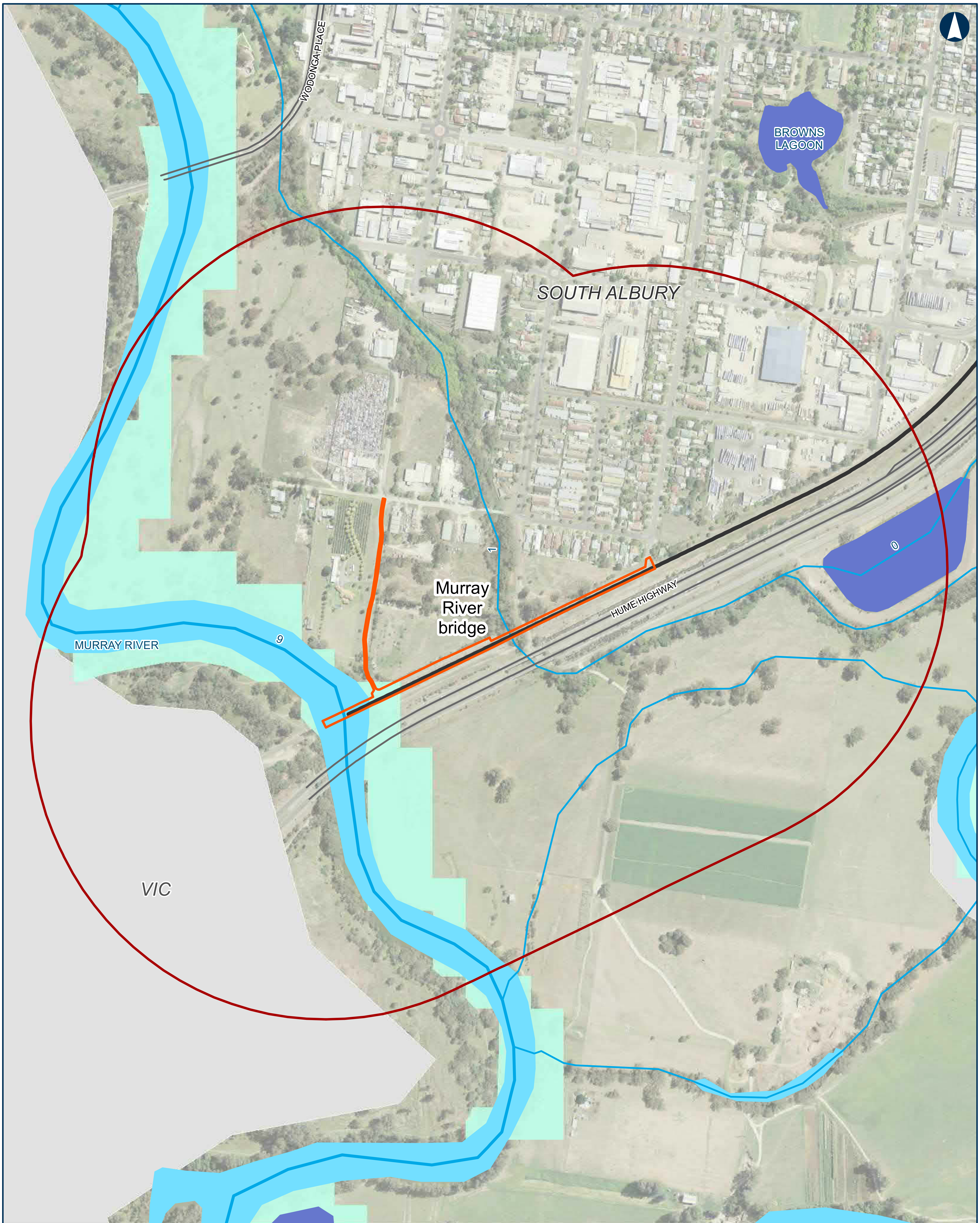
APPENDIX A-2
LANDSCAPE FEATURES – RIVERS, STREAMS, WETLANDS AND CONNECTIVITY FEATURES



Albury to Illabo Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features MAP 1 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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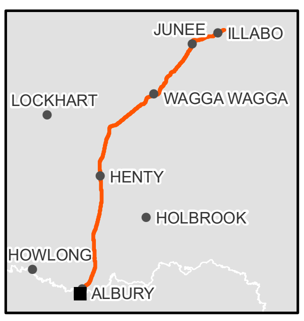
Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:6,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Landscape assessment area
- 9 Strahler stream order
- River
- Watercourse
- Natural waterbody
- Artificial waterbody
- Floodplain wetlands and reservoirs



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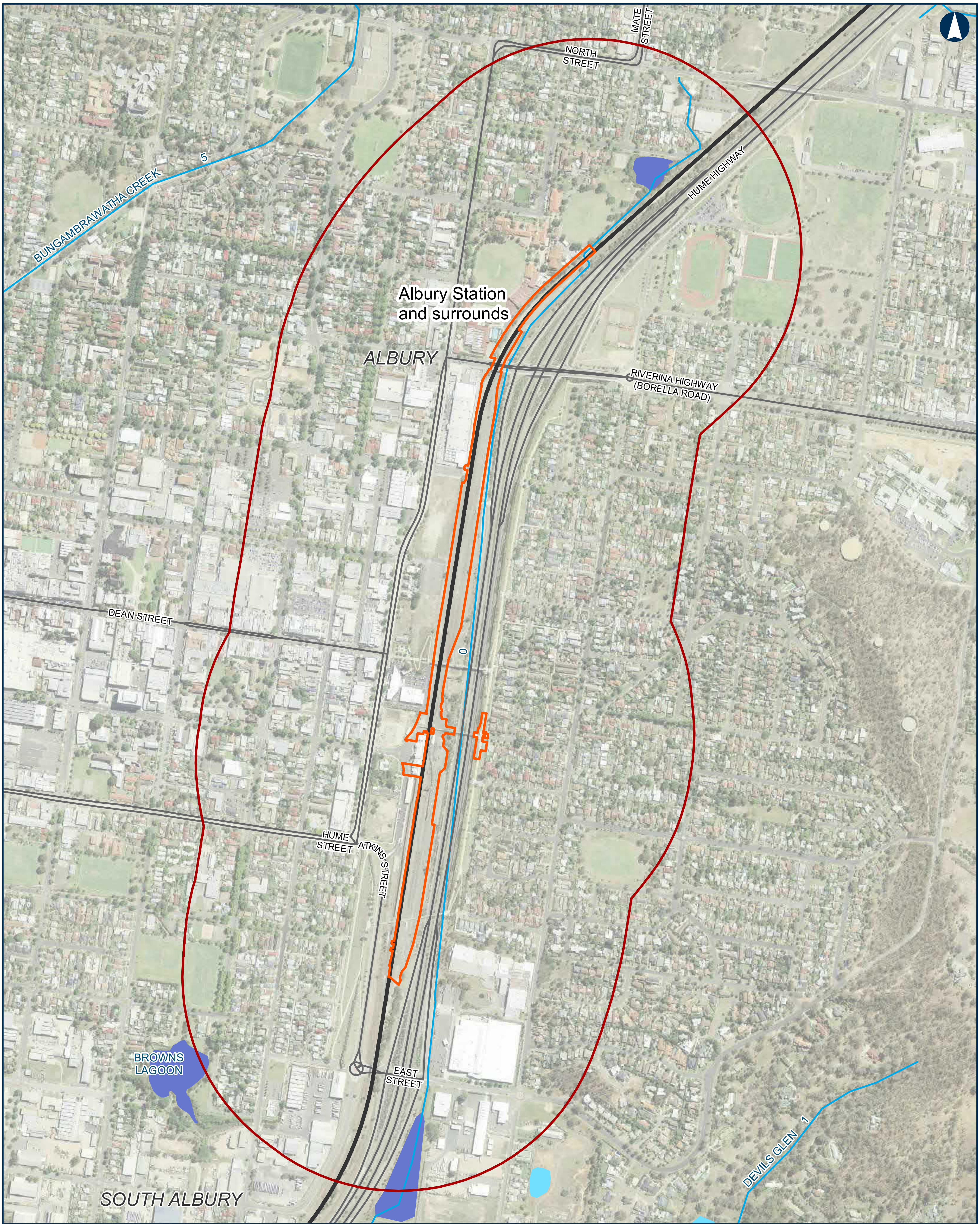

Albury to Illabo

Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features

MAP 2 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Author: WSP
Data Sources: ARTC, NSWSS, DPIE
Paper: A3
Scale: 1:8,500

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Natural waterbody
Artificial waterbody

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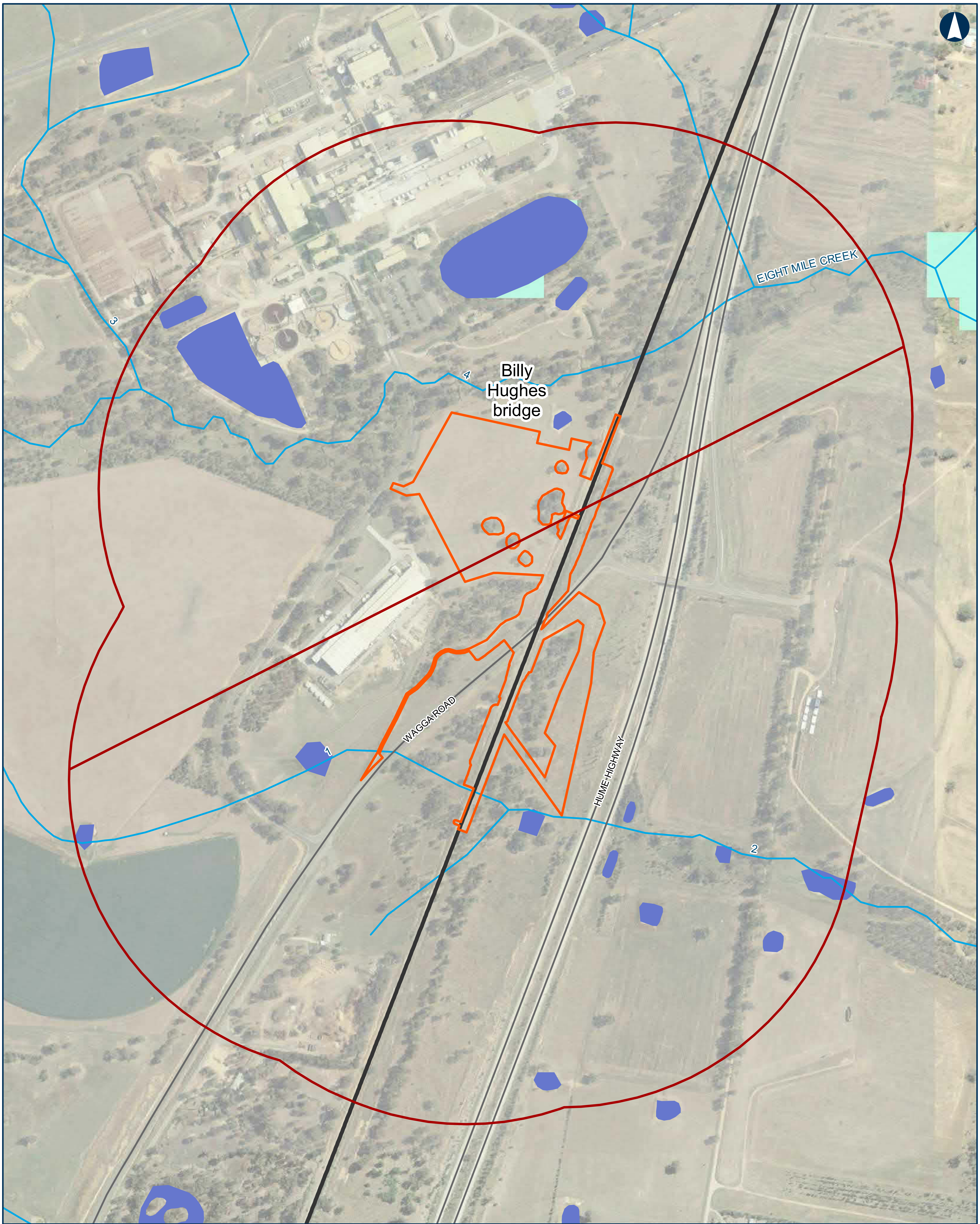

Albury to Illabo | Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features | MAP 3 OF 17

0 100 200 m

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Author: WSP Scale: 1:6,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Landscape assessment area
- 9 Strahler stream order
- Watercourse
- Artificial waterbody
- Floodplain wetlands and reservoirs

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Albury to Illabo | Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features | MAP 4 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Artificial waterbody

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Albury to Illabo Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features MAP 5 OF 17

0 100 200 m

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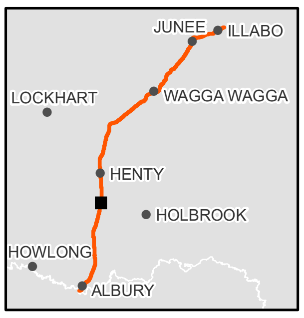
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse



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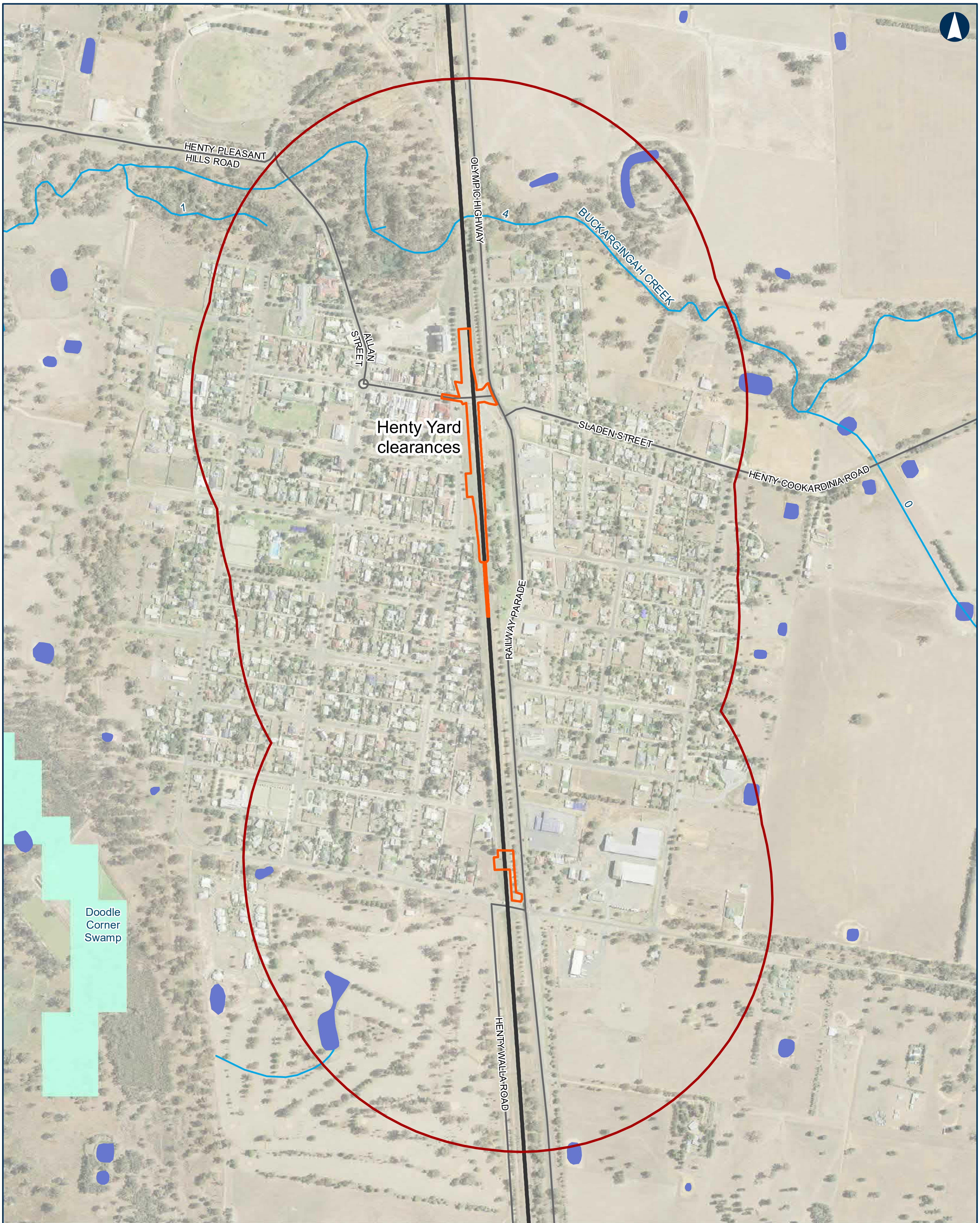

Albury to Illabo | Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features | MAP 6 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Landscape assessment area
- 9 Strahler stream order
- Watercourse
- Artificial waterbody
- Floodplain wetlands and reservoirs

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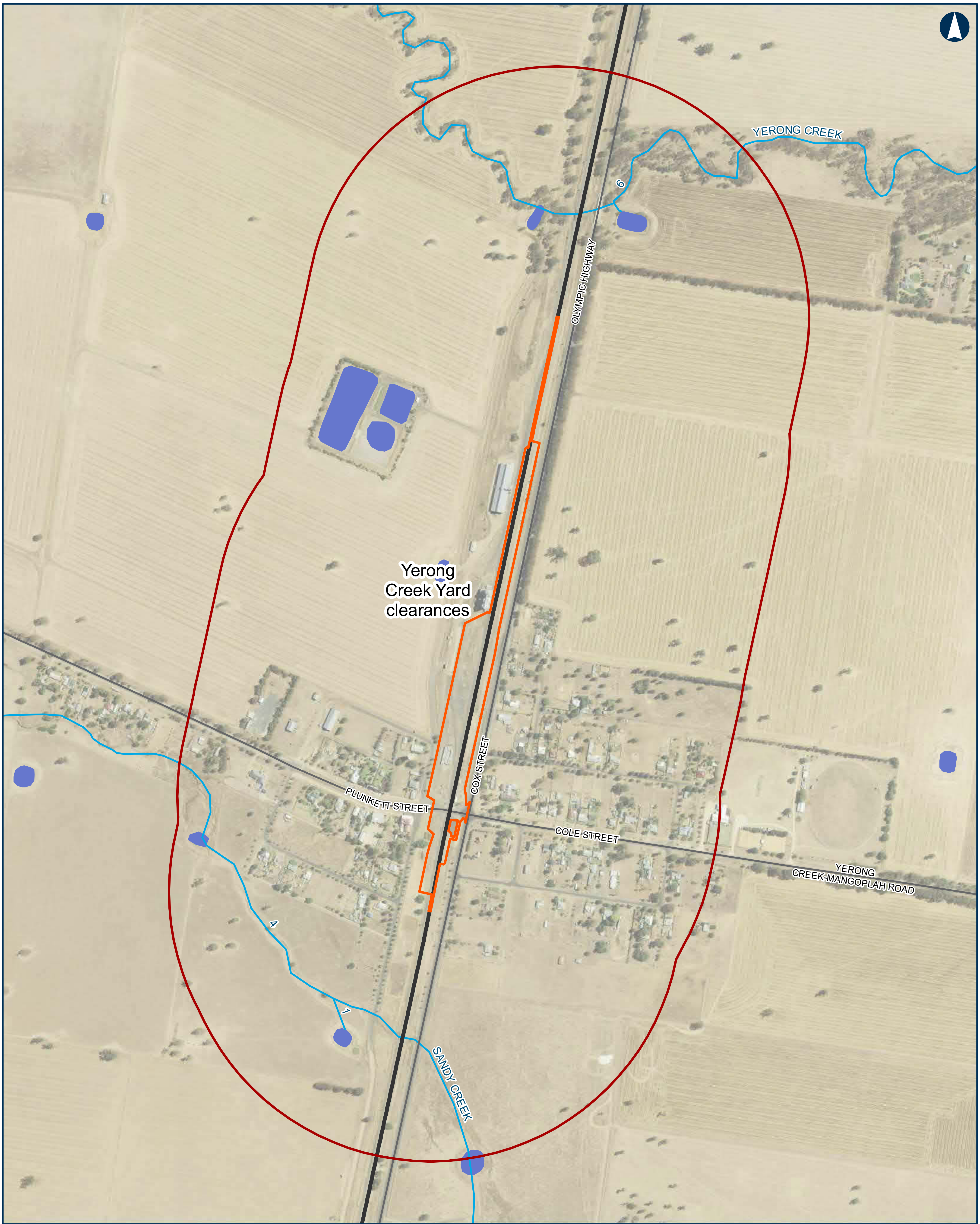

Albury to Illabo Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features MAP 7 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Artificial waterbody

INLAND RAIL ARTC

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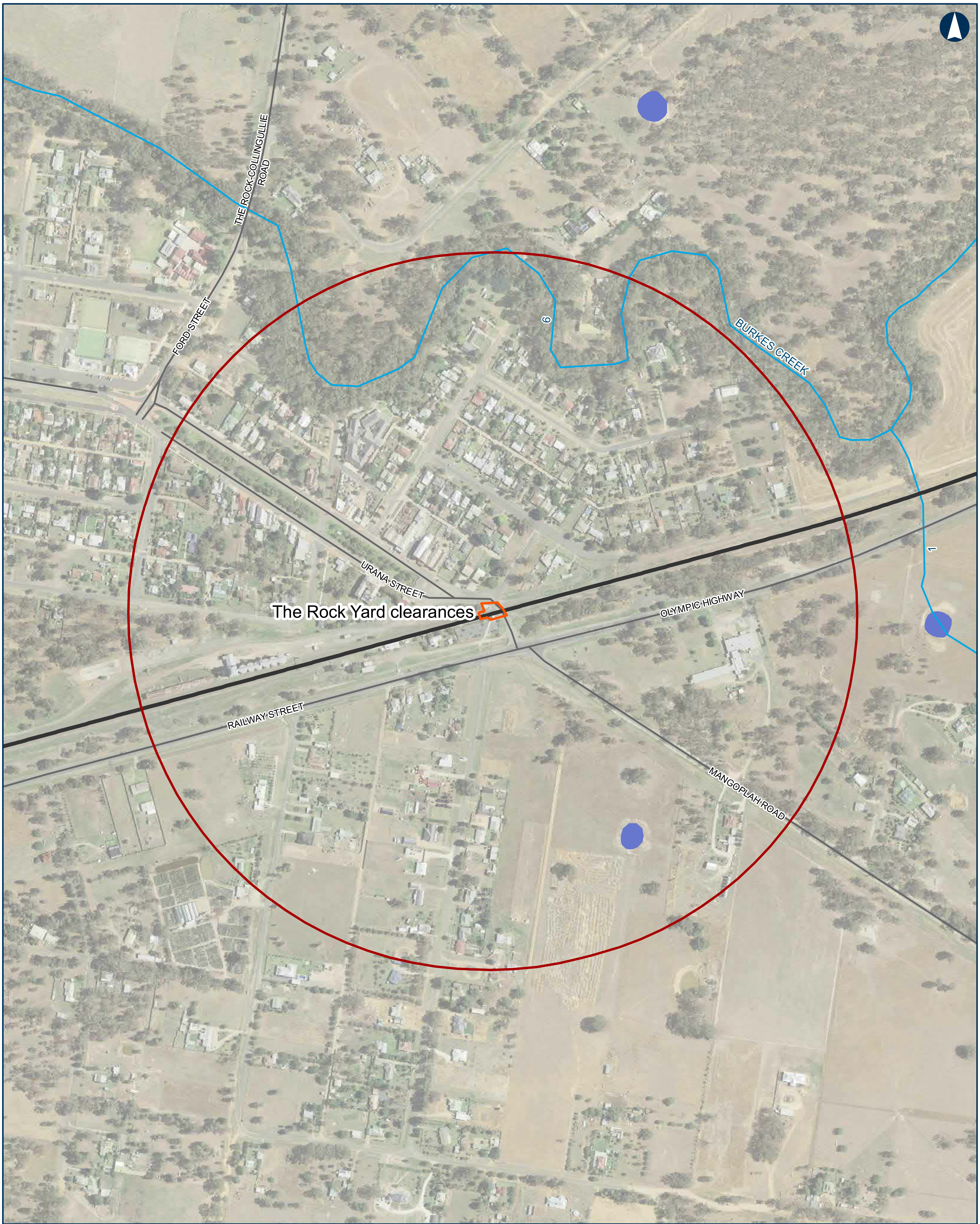


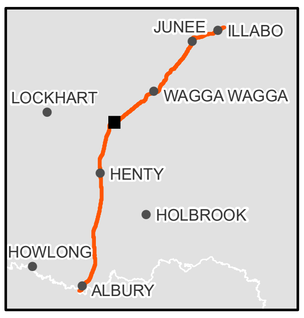
Albury to Illabo Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features MAP 8 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Artificial waterbody



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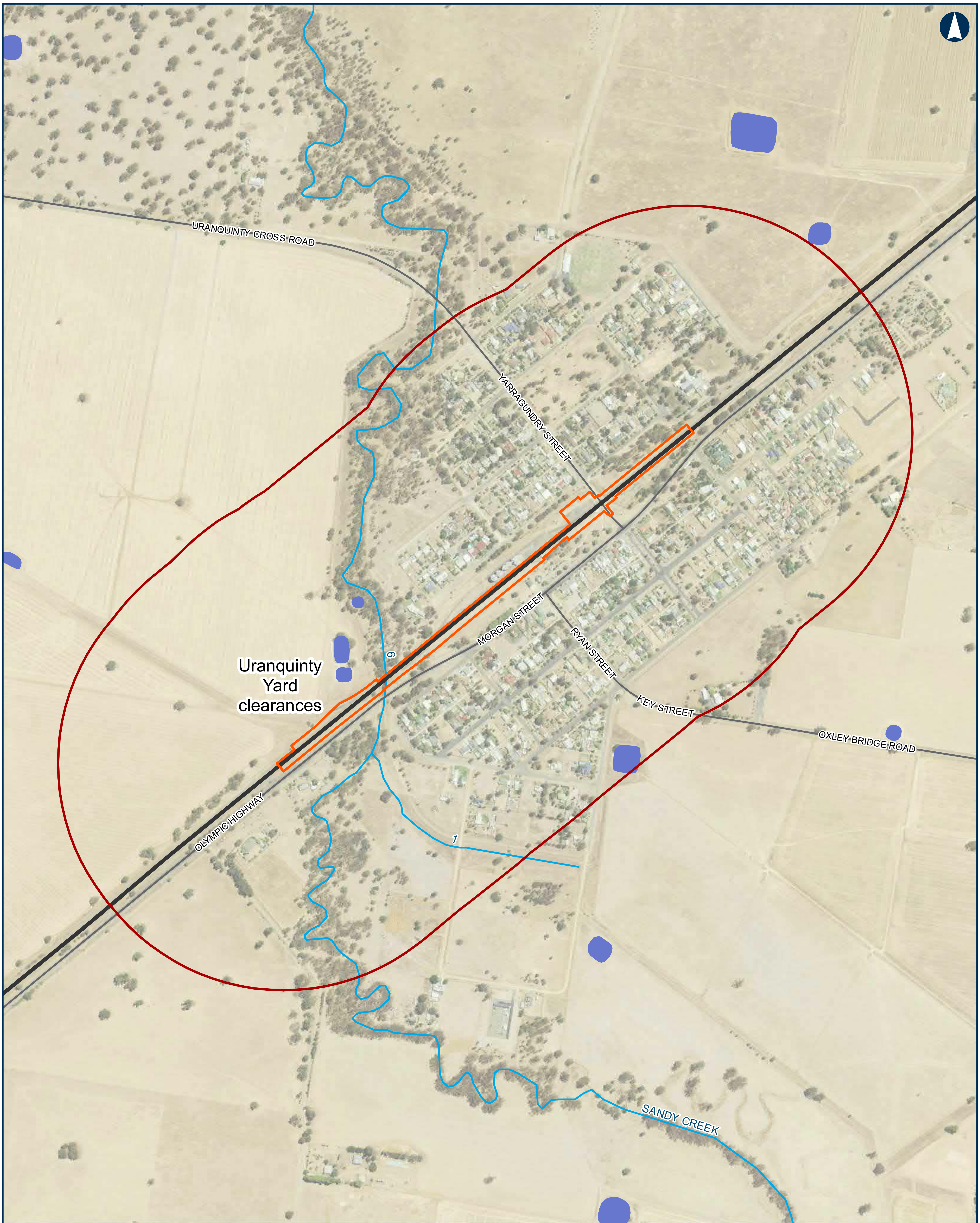


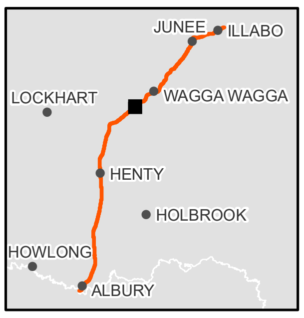
Albury to Illabo Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features MAP 9 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Artificial waterbody



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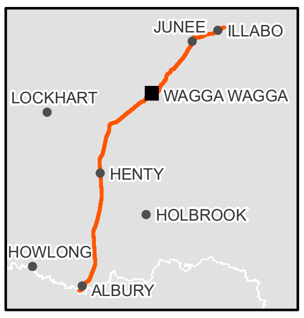
Albury to Illabo Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features MAP 10 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Artificial waterbody



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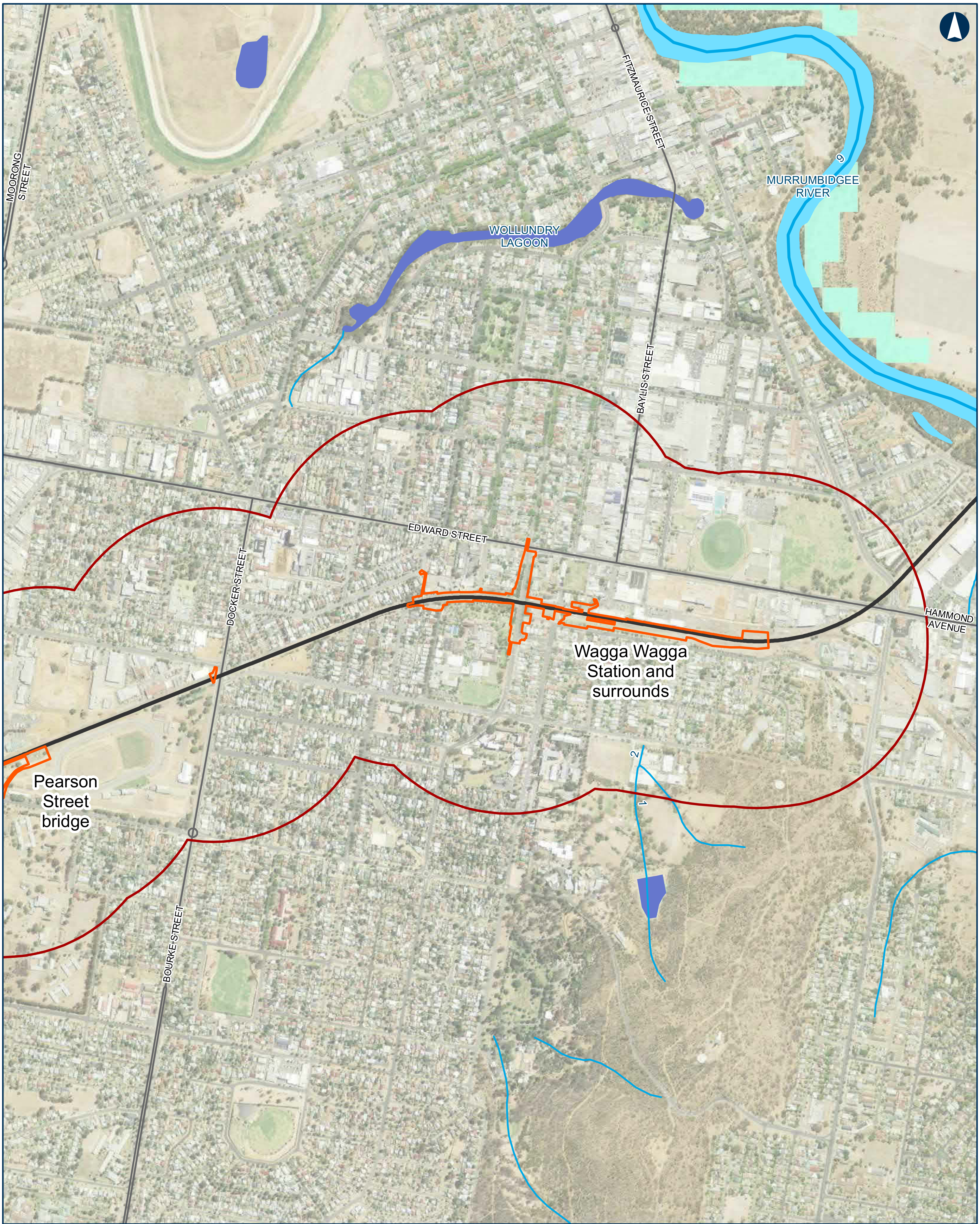

Albury to Illabo — Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features — MAP 11 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:11,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
River
Watercourse
Natural waterbody
Artificial waterbody
Floodplain wetlands and reservoirs

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Albury to Illabo

Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features

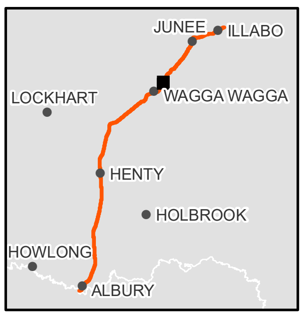
MAP 12 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Natural waterbody
Artificial waterbody



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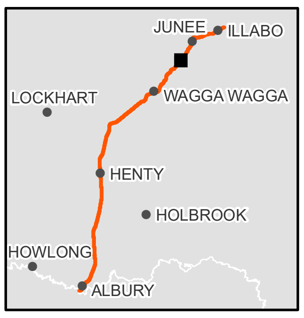
Albury to Illabo Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features MAP 13 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Artificial waterbody



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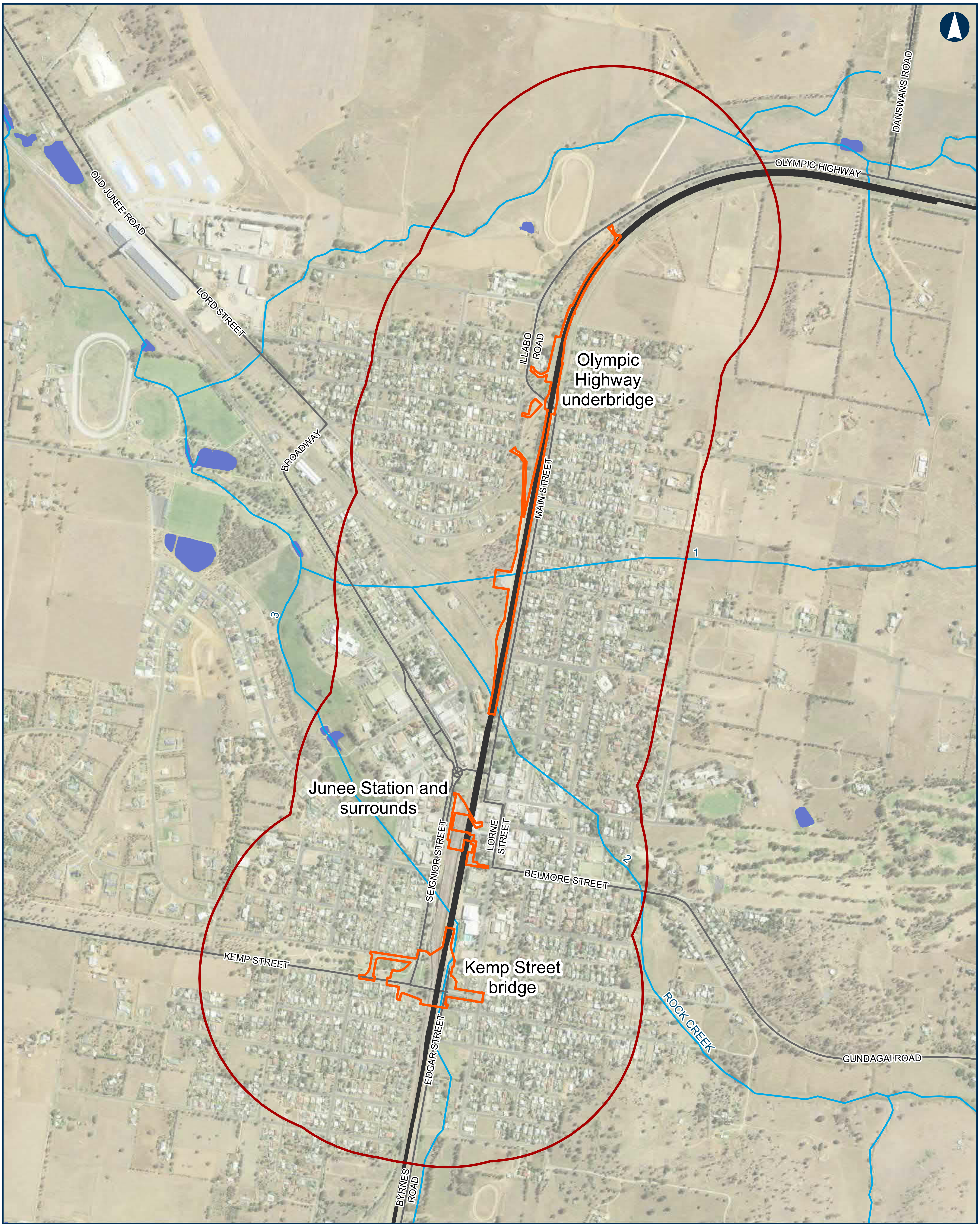

Albury to Illabo

Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features

MAP 14 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:11,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Artificial waterbody

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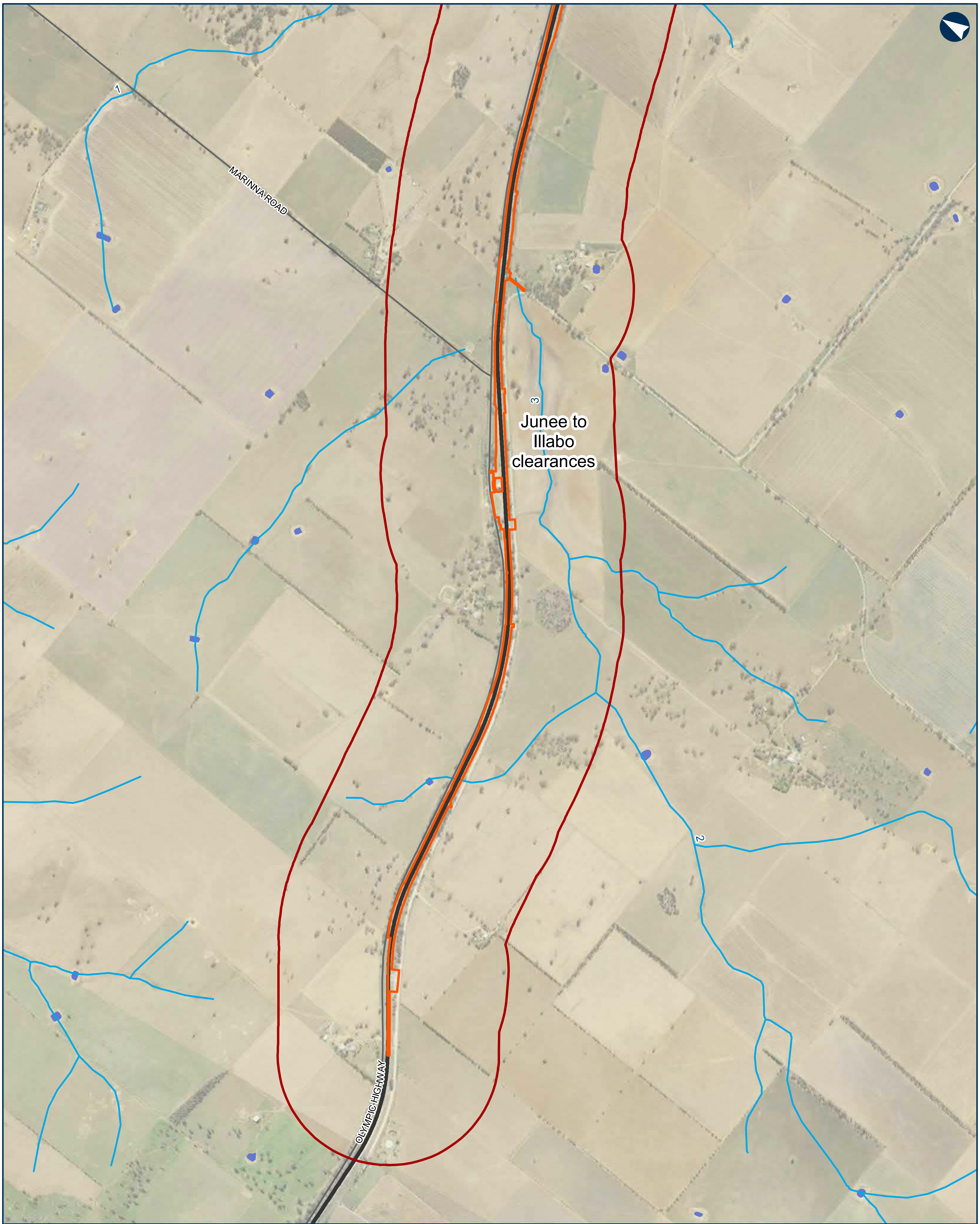

Albury to Illabo Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features MAP 15 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Artificial waterbody

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ARTC

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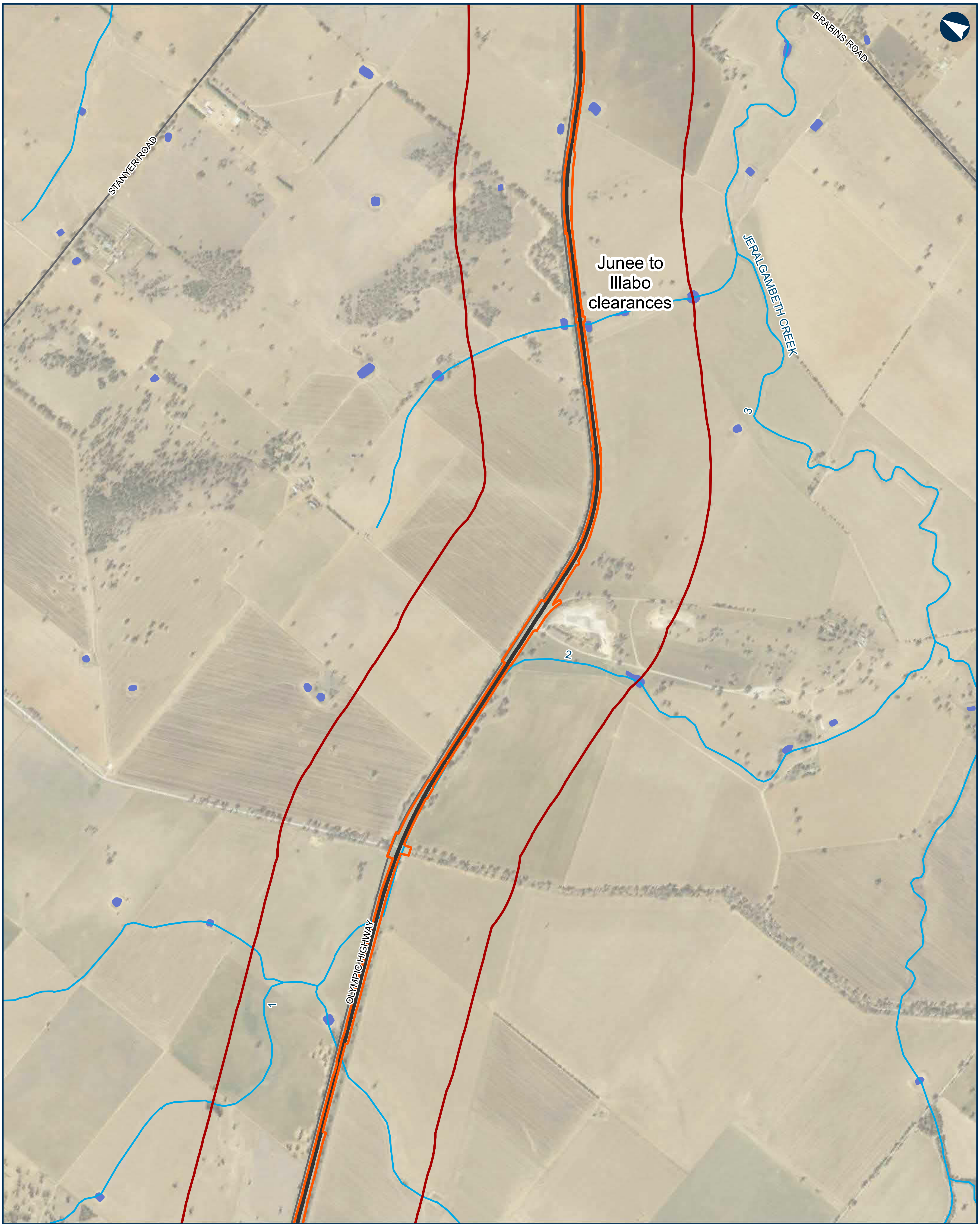

Albury to Illabo Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features MAP 16 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
9 Strahler stream order
Watercourse
Artificial waterbody

JUNEE ILLABO LOCKHART WAGGA WAGGA HENTY HOLBROOK HOWLONG ALBURY

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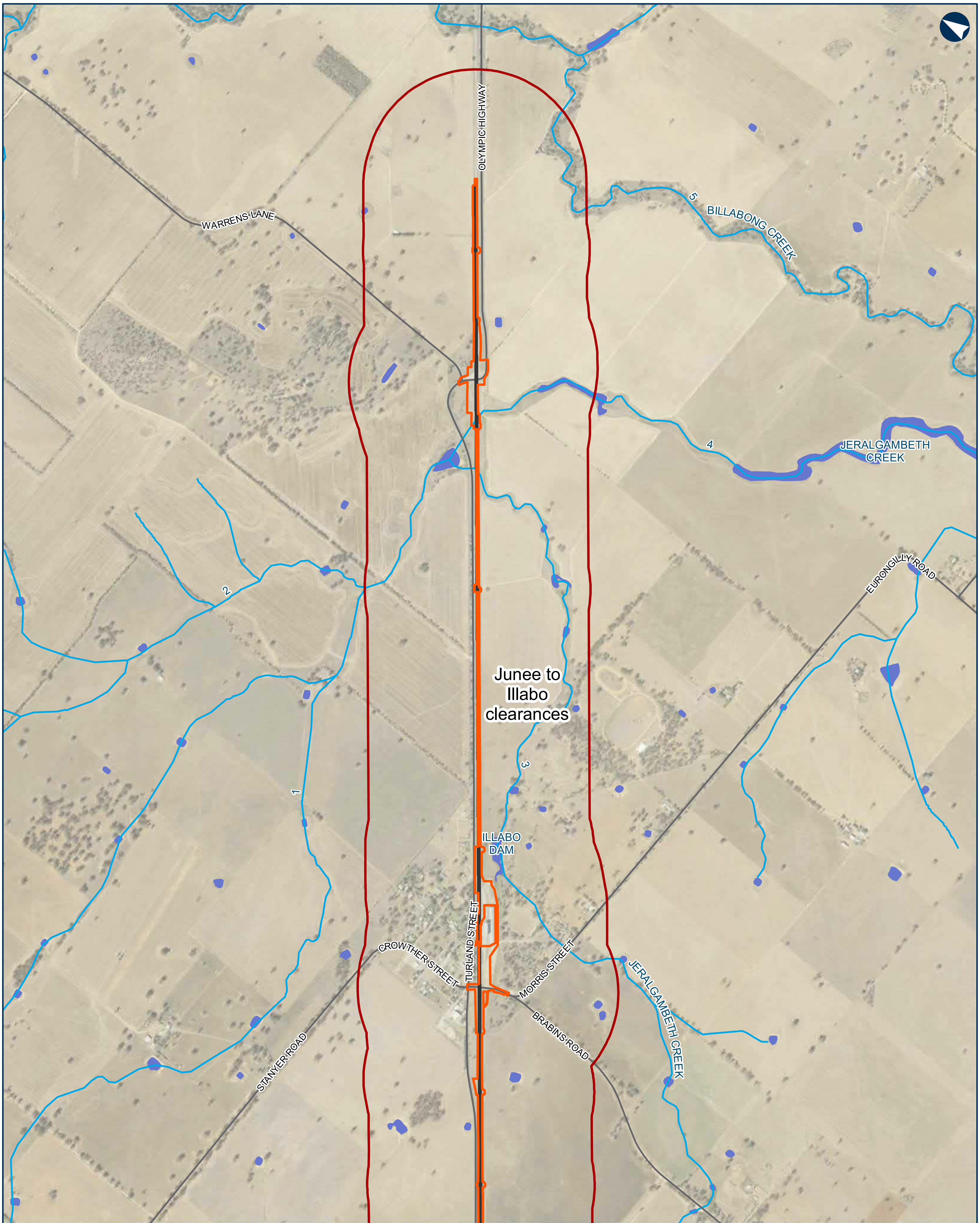

Albury to Illabo

Appendix A2 – Landscape features – Rivers, streams, wetlands and connectivity features

MAP 17 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Landscape assessment area
- 9 Strahler stream order
- Watercourse
- Artificial waterbody

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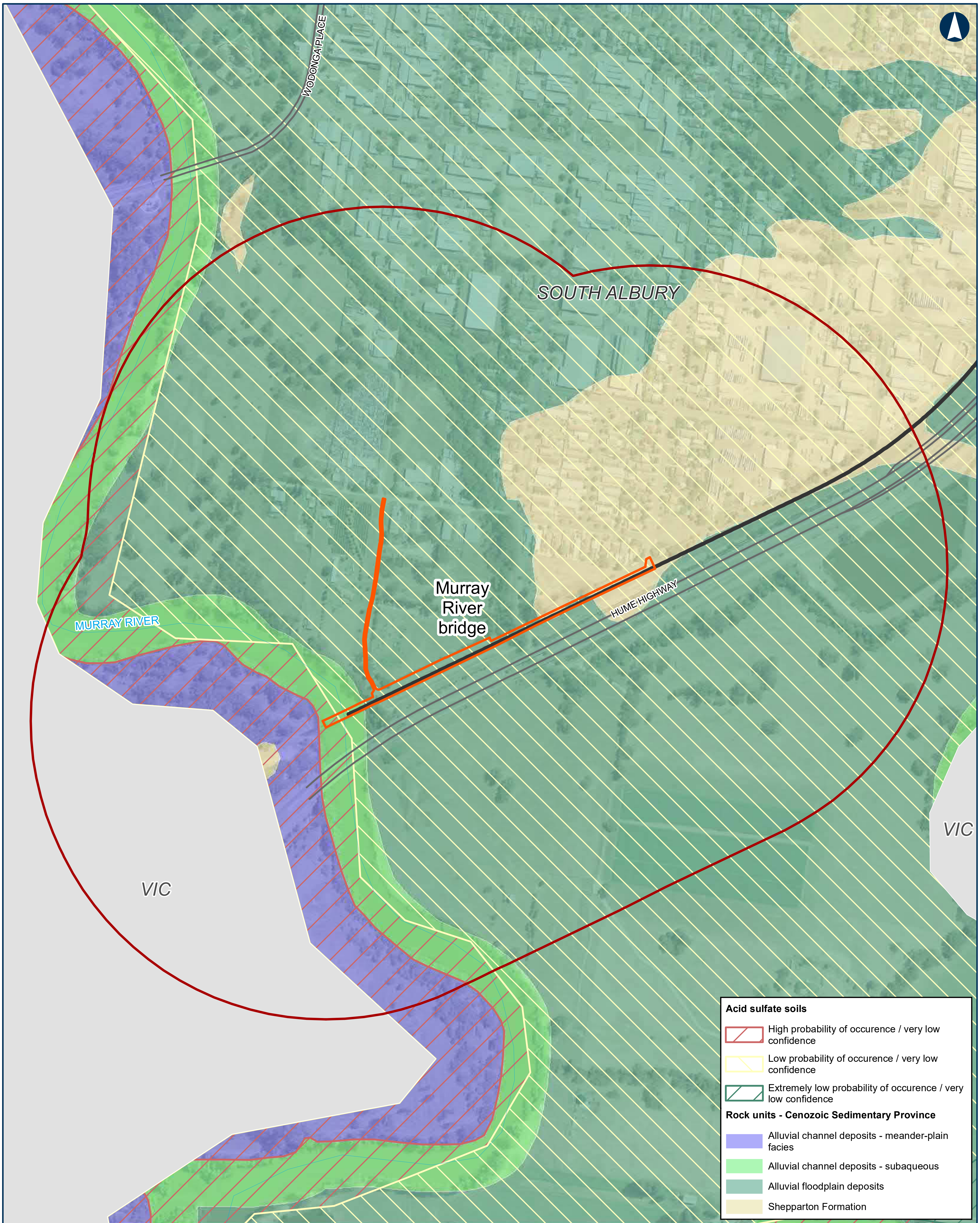
APPENDIX A-3
LANDSCAPE FEATURES – AREAS OF GEOLOGICAL SIGNIFICANCE AND SOIL HAZARD FEATURES



Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 1 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:6,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse

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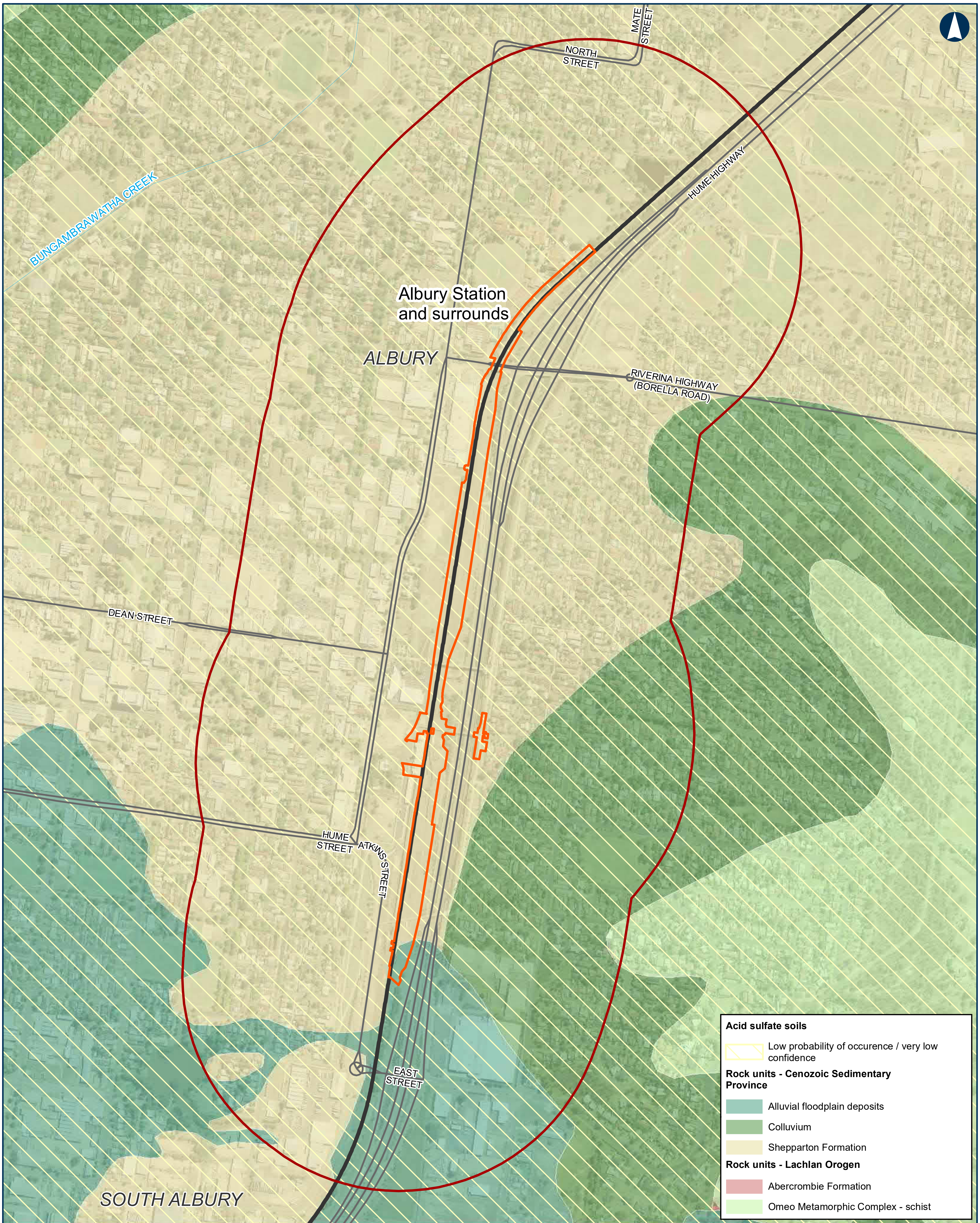


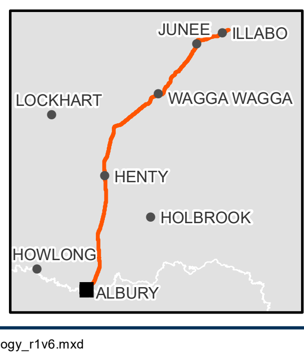
Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 2 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,500
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse



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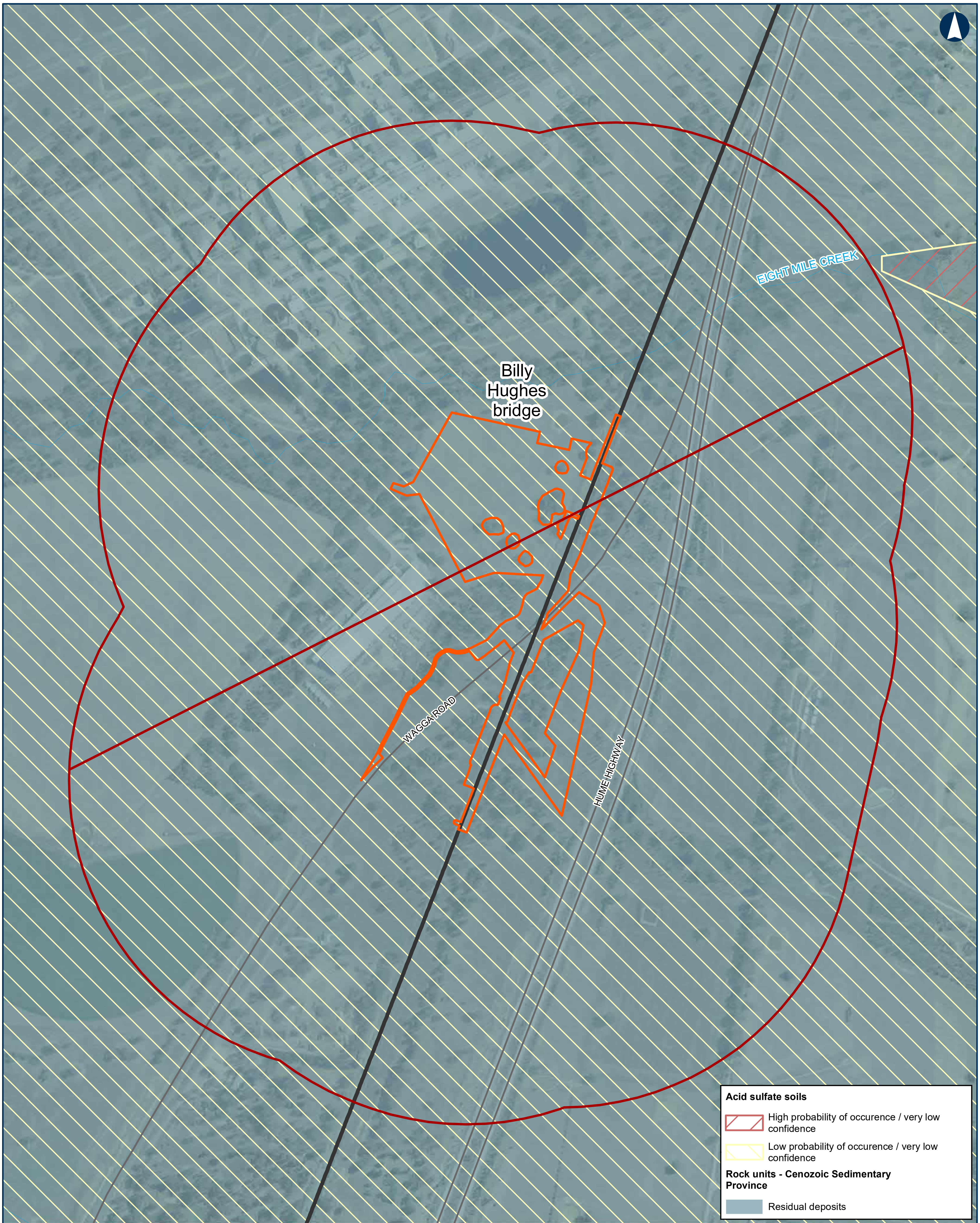
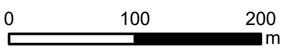


Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 3 OF 17



Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:6,000
Data Sources: ARTC, NSWSS, CSIRO

- Landscape assessment area
- Proposal site
- Existing railway
- Main road
- Watercourse

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Albury to Illabo

Appendix A3 – Landscape features – Areas of geological significance and soil hazard features

MAP 4 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road

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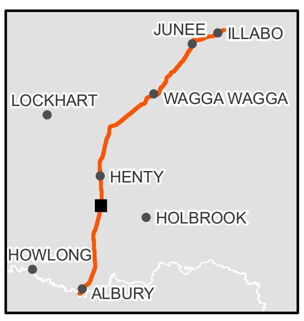
Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 5 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse



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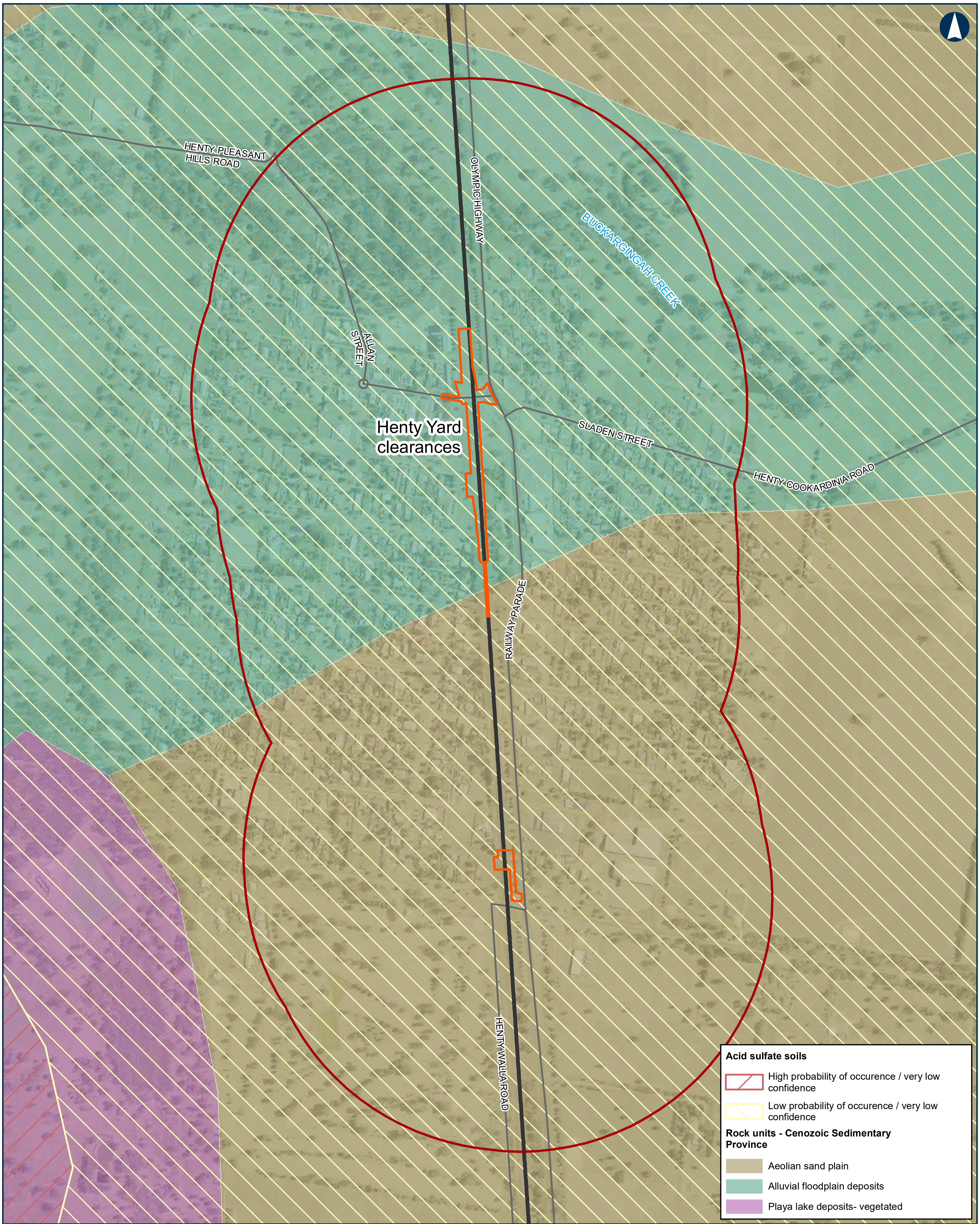

Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 6 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse

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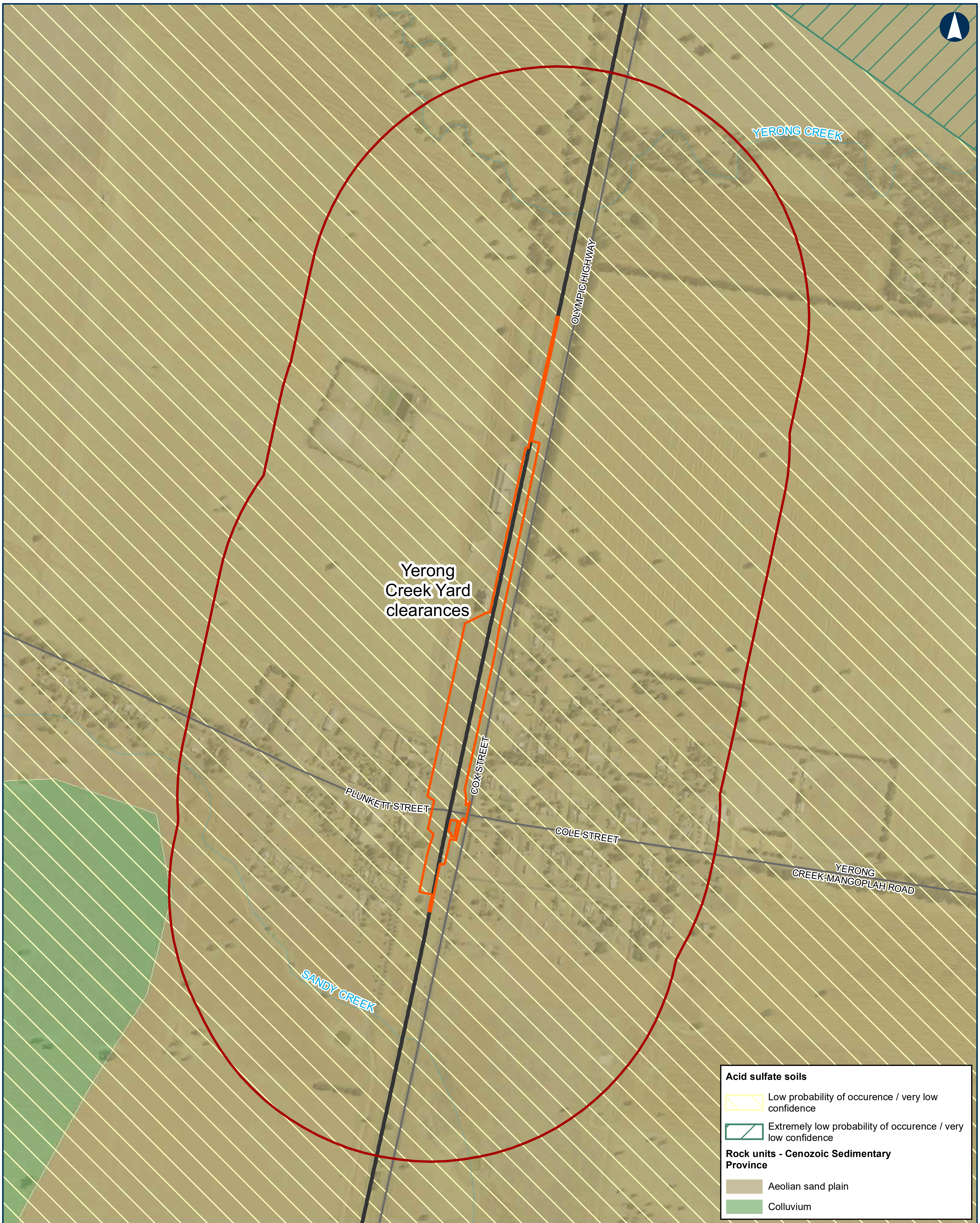

Albury to Illabo — Appendix A3 – Landscape features – Areas of geological significance and soil hazard features — MAP 7 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, CSIRO

- Landscape assessment area
- Proposal site
- Existing railway
- Main road
- Watercourse

INLAND RAIL ARTC

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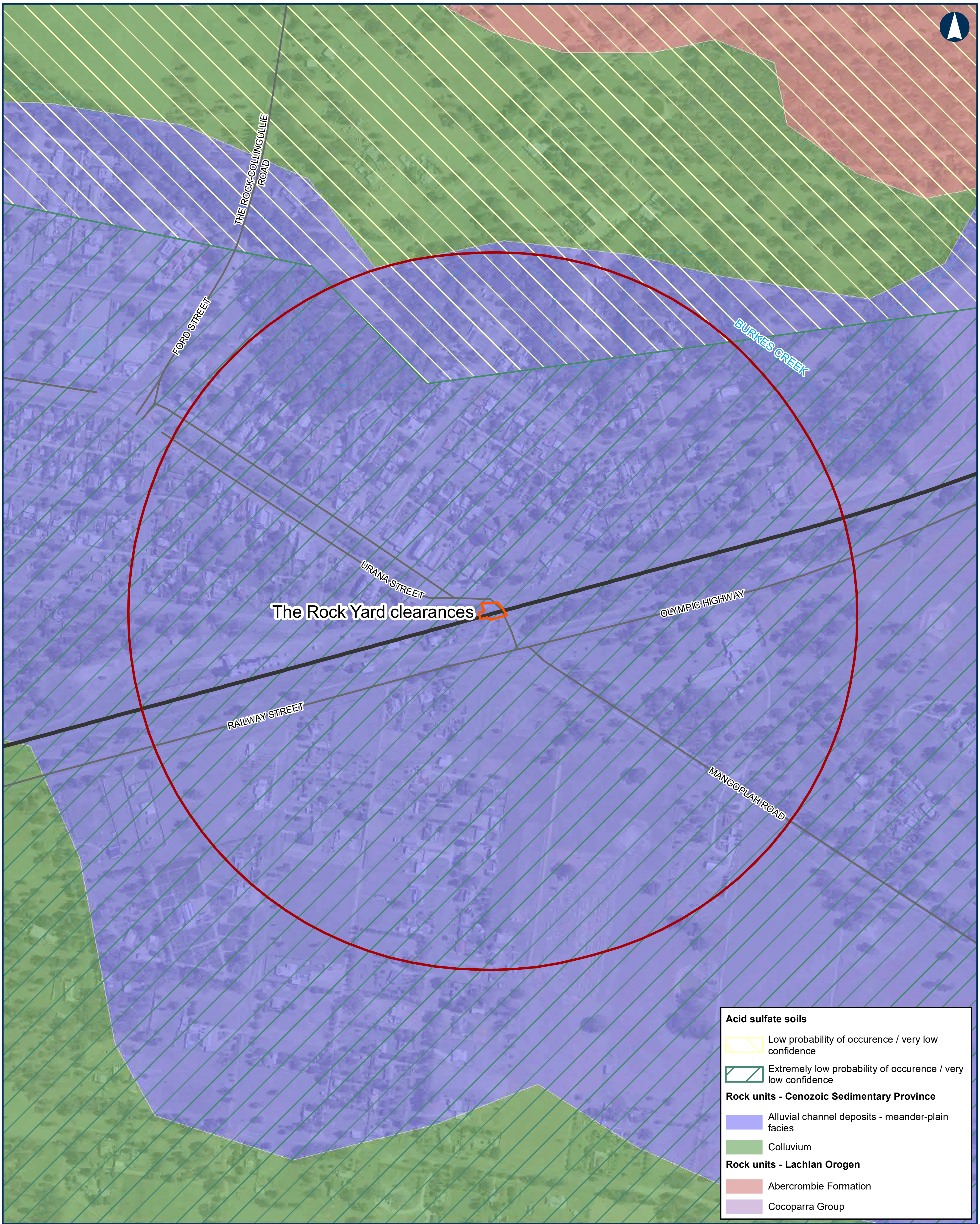
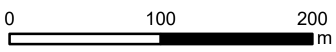


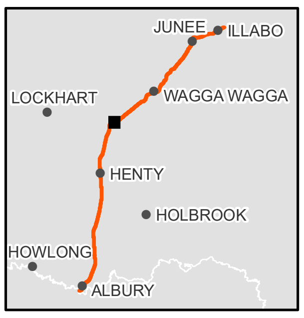
Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 8 OF 17



Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse



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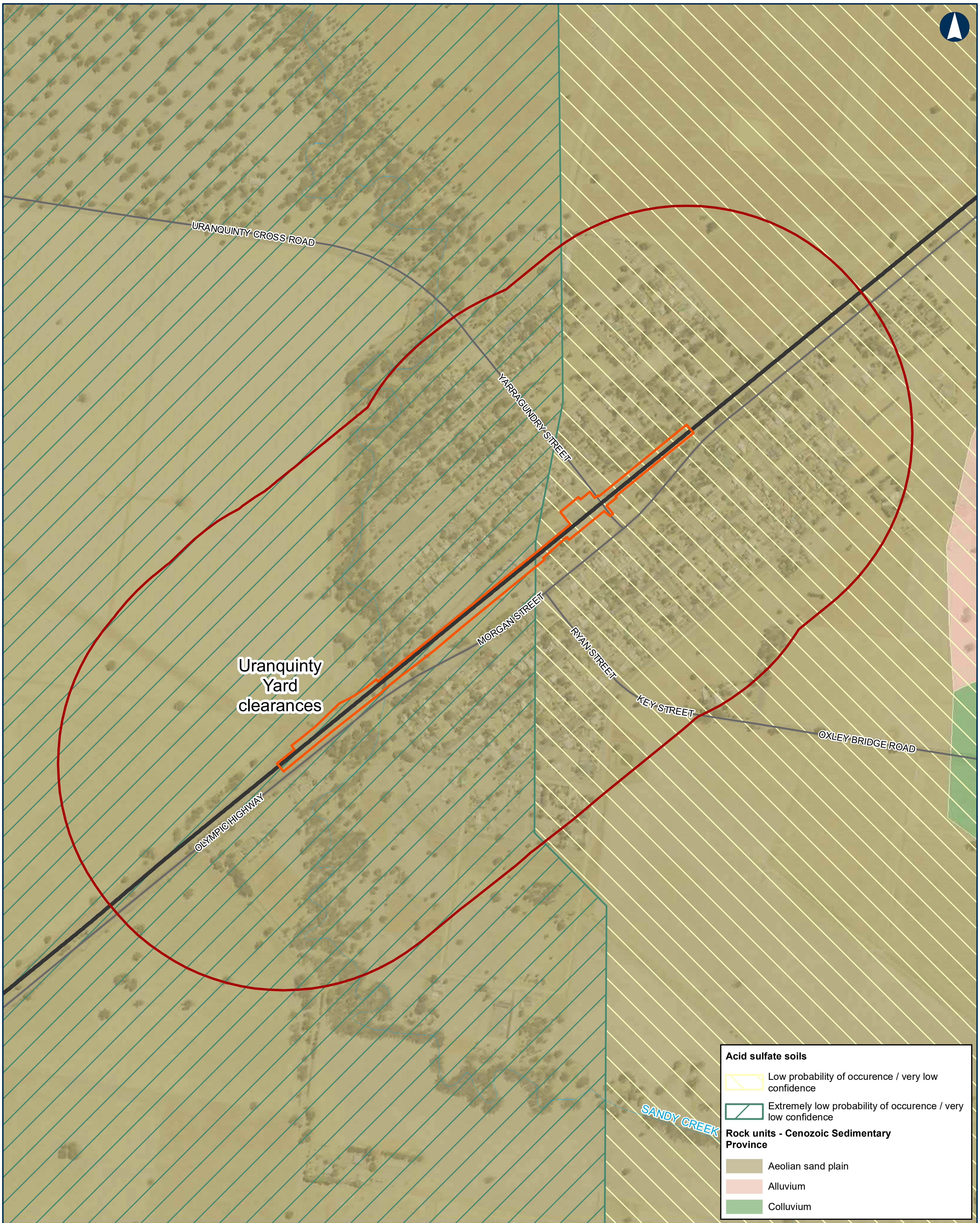


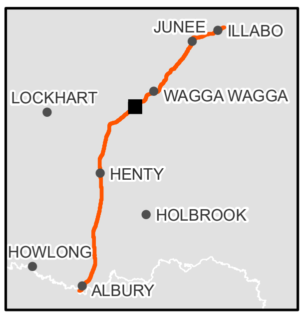
Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 9 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse



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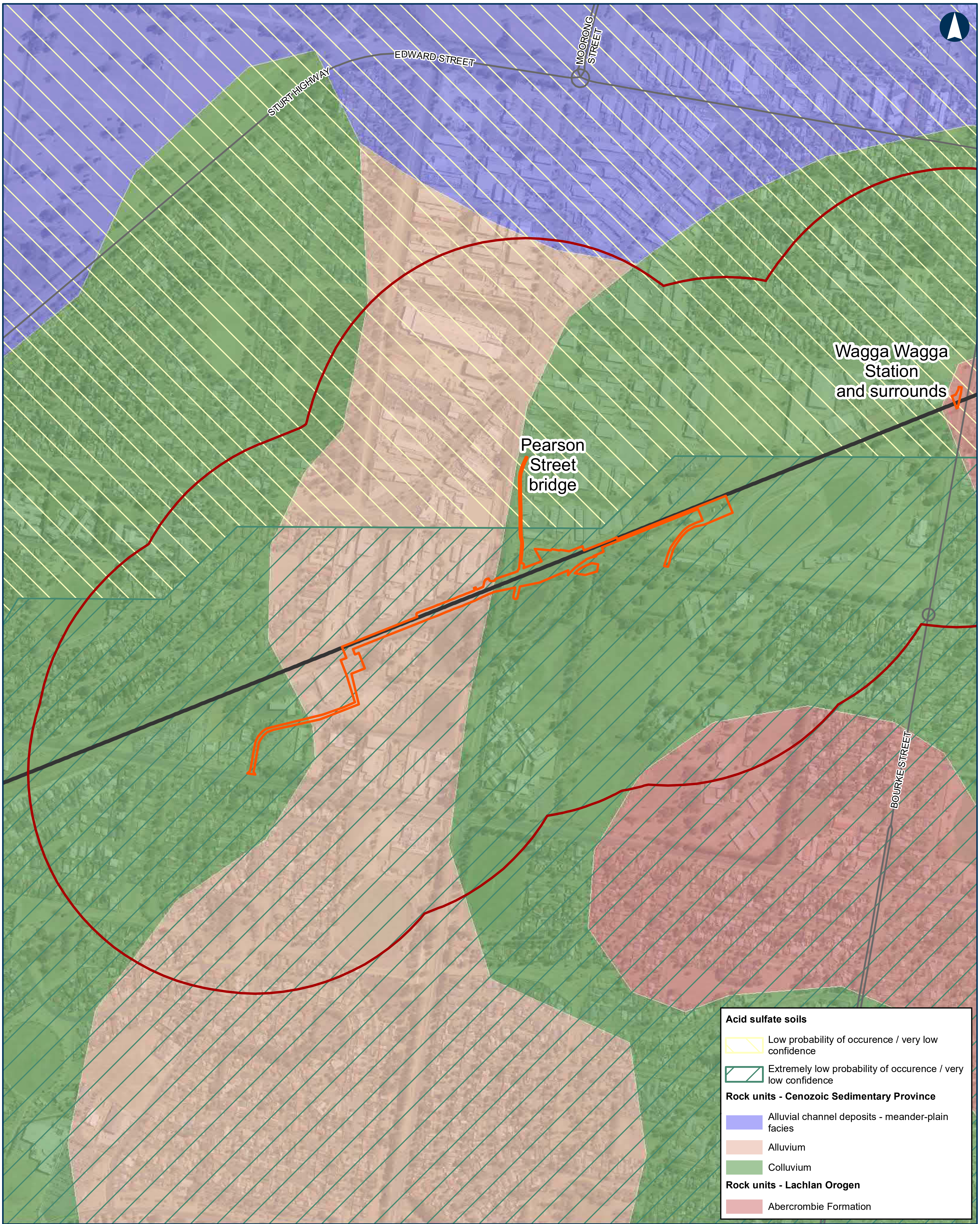

Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 10 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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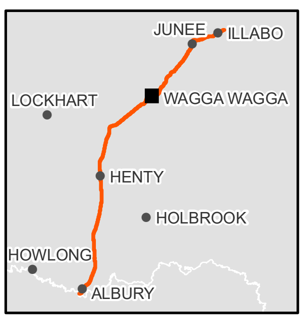
Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road



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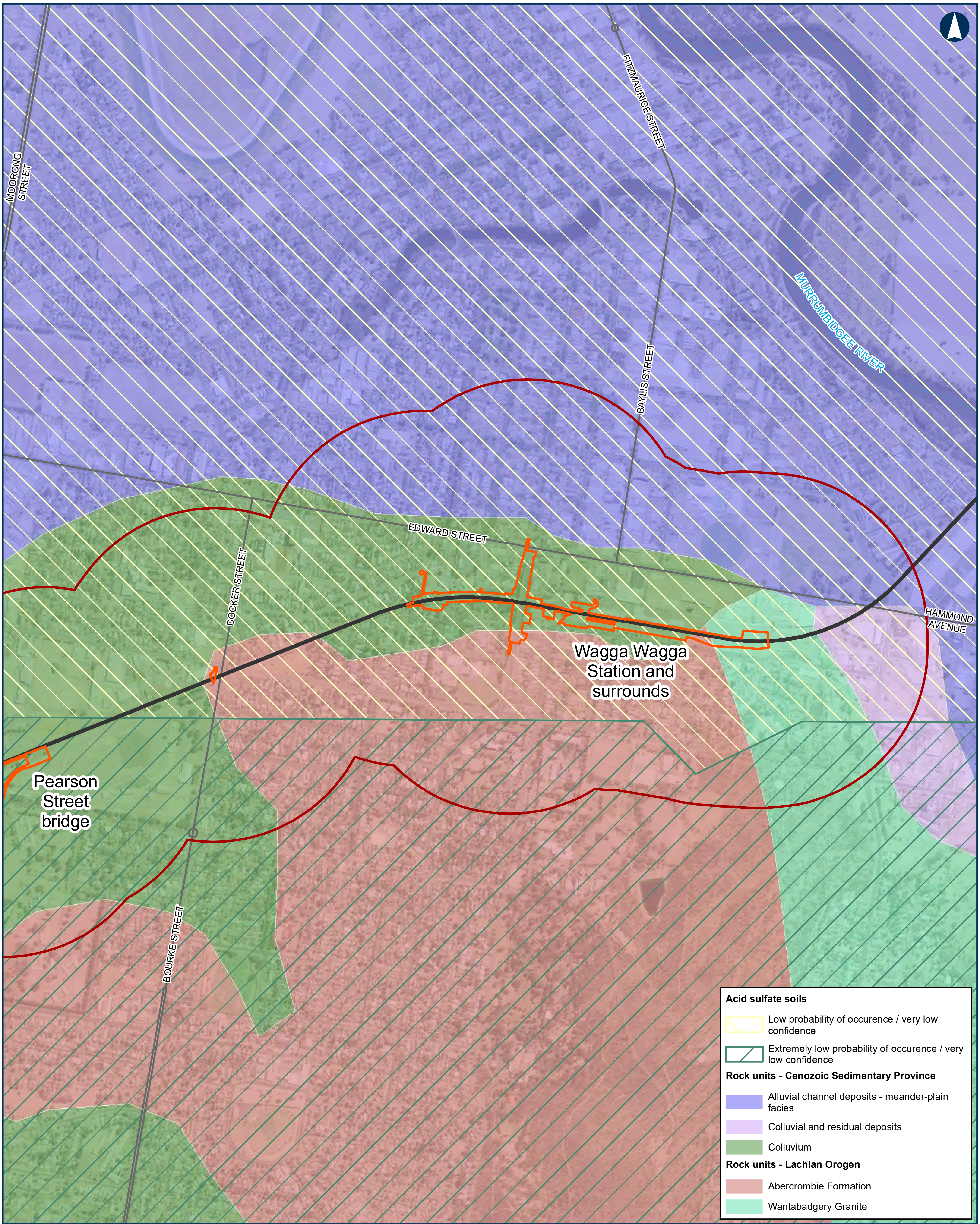
Albury to Illabo

Appendix A3 – Landscape features – Areas of geological significance and soil hazard features

MAP 11 OF 17



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse

INLAND RAIL
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Date: 25/05/2022
Author: WSP
Paper: A3
Scale: 1:11,000
Data Sources: ARTC, NSWSS, CSIRO

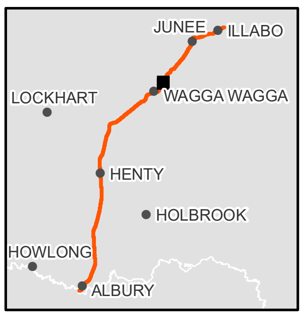
Albury to Illabo | Appendix A3 – Landscape features – Areas of geological significance and soil hazard features | MAP 12 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:7,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road



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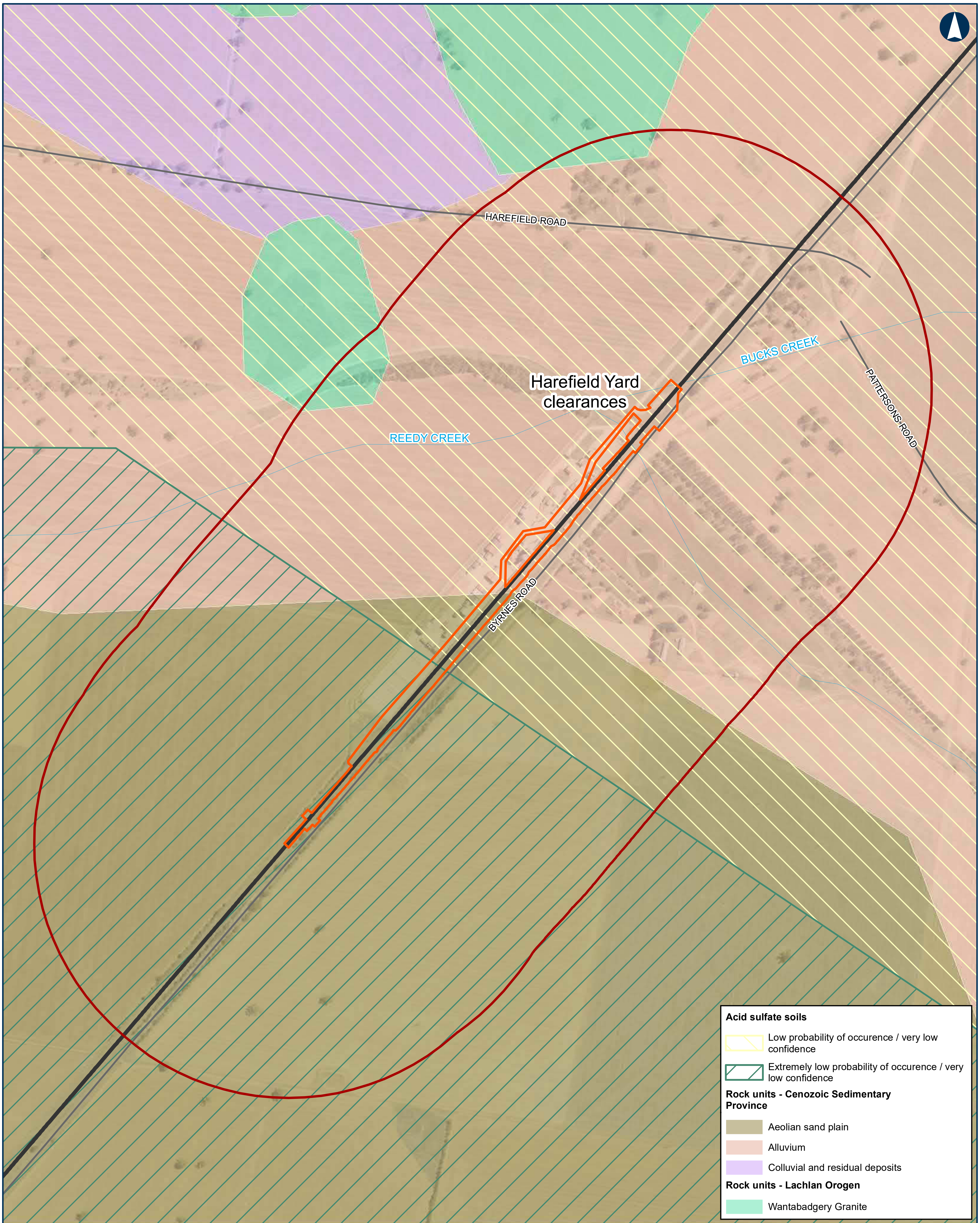


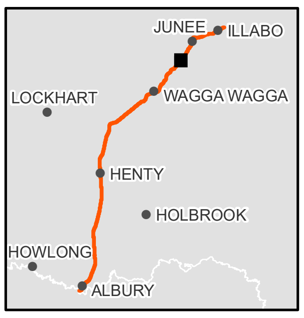
Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 13 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse



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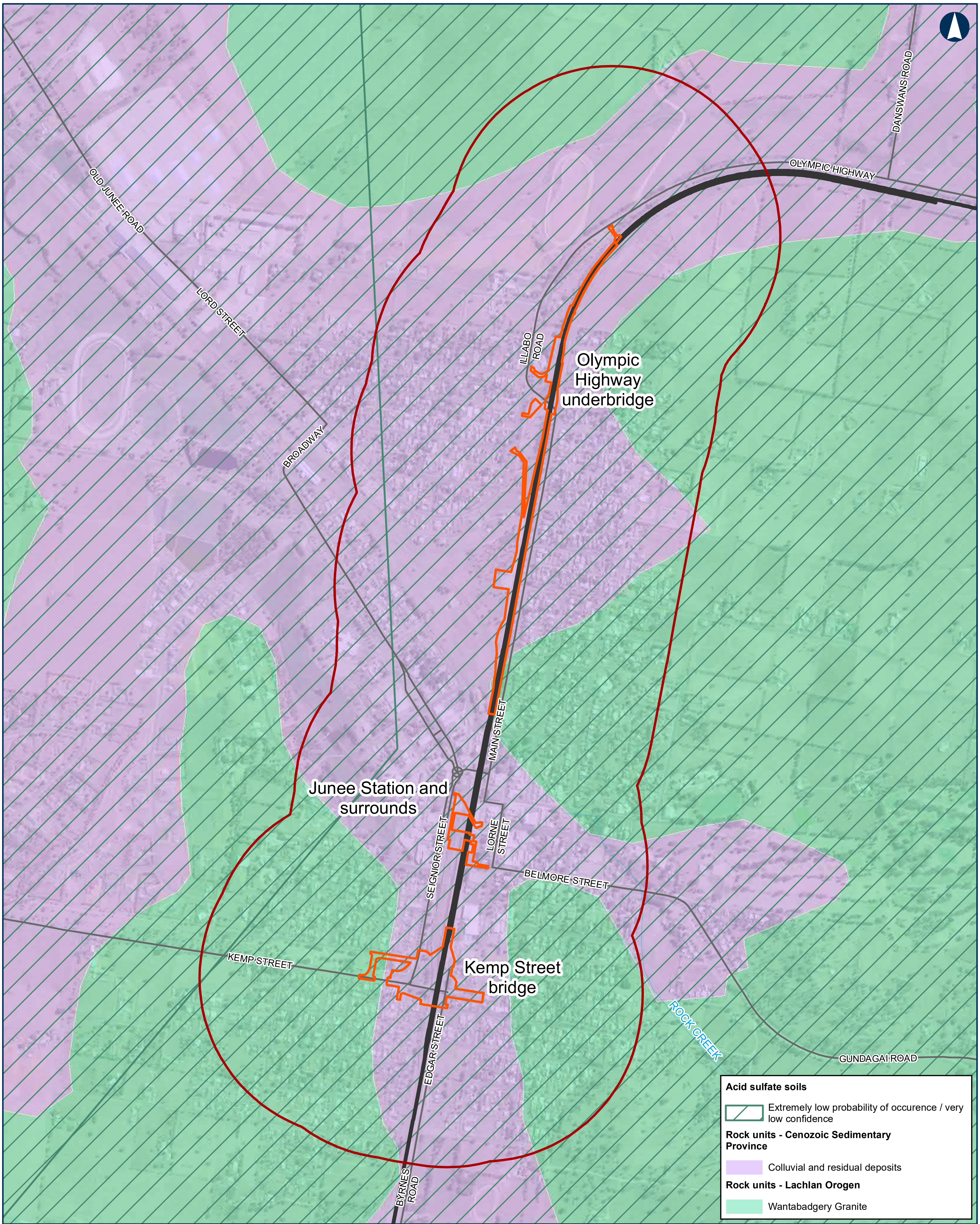

Albury to Illabo

Appendix A3 – Landscape features – Areas of geological significance and soil hazard features

MAP 14 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:11,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse

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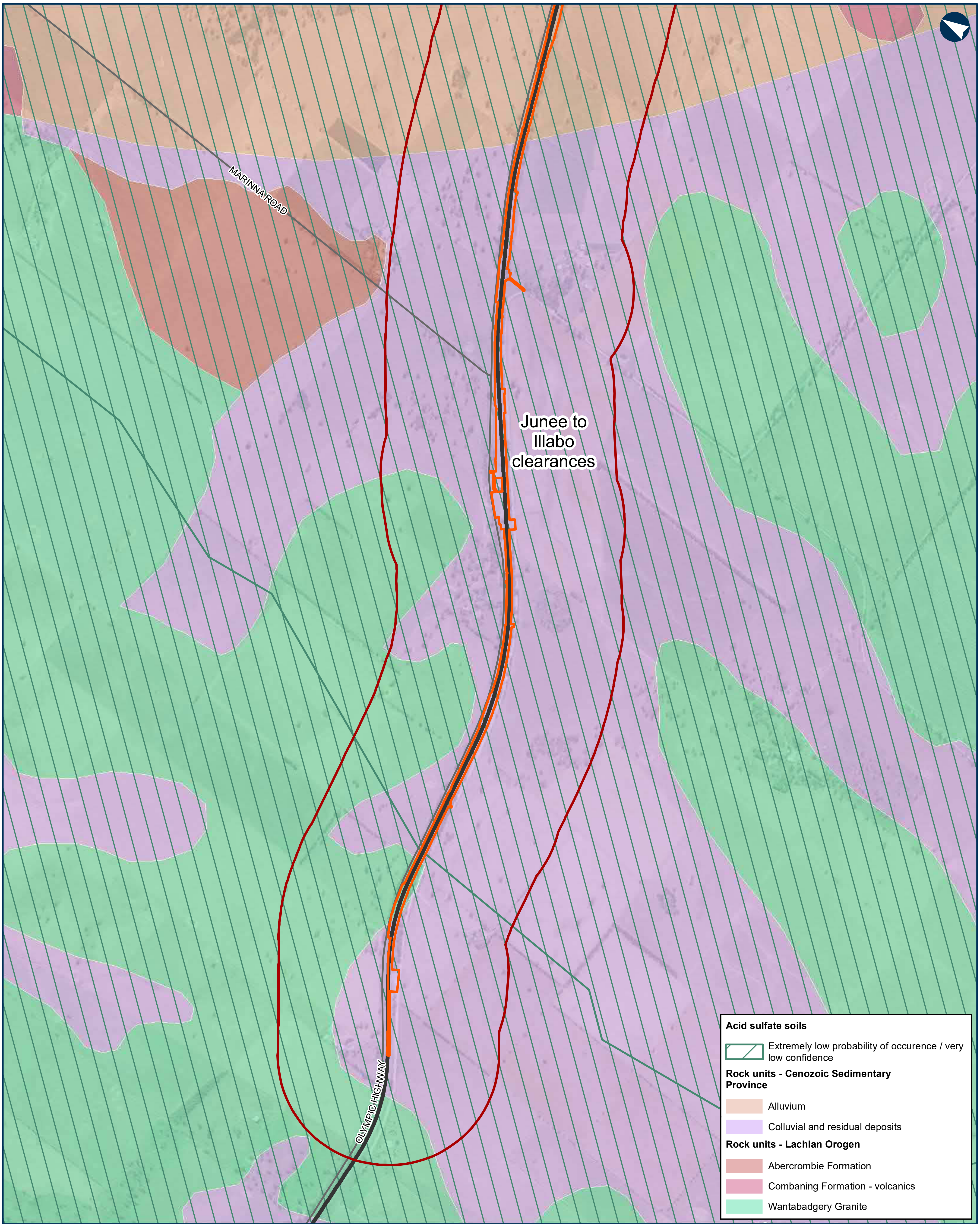

Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 15 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road

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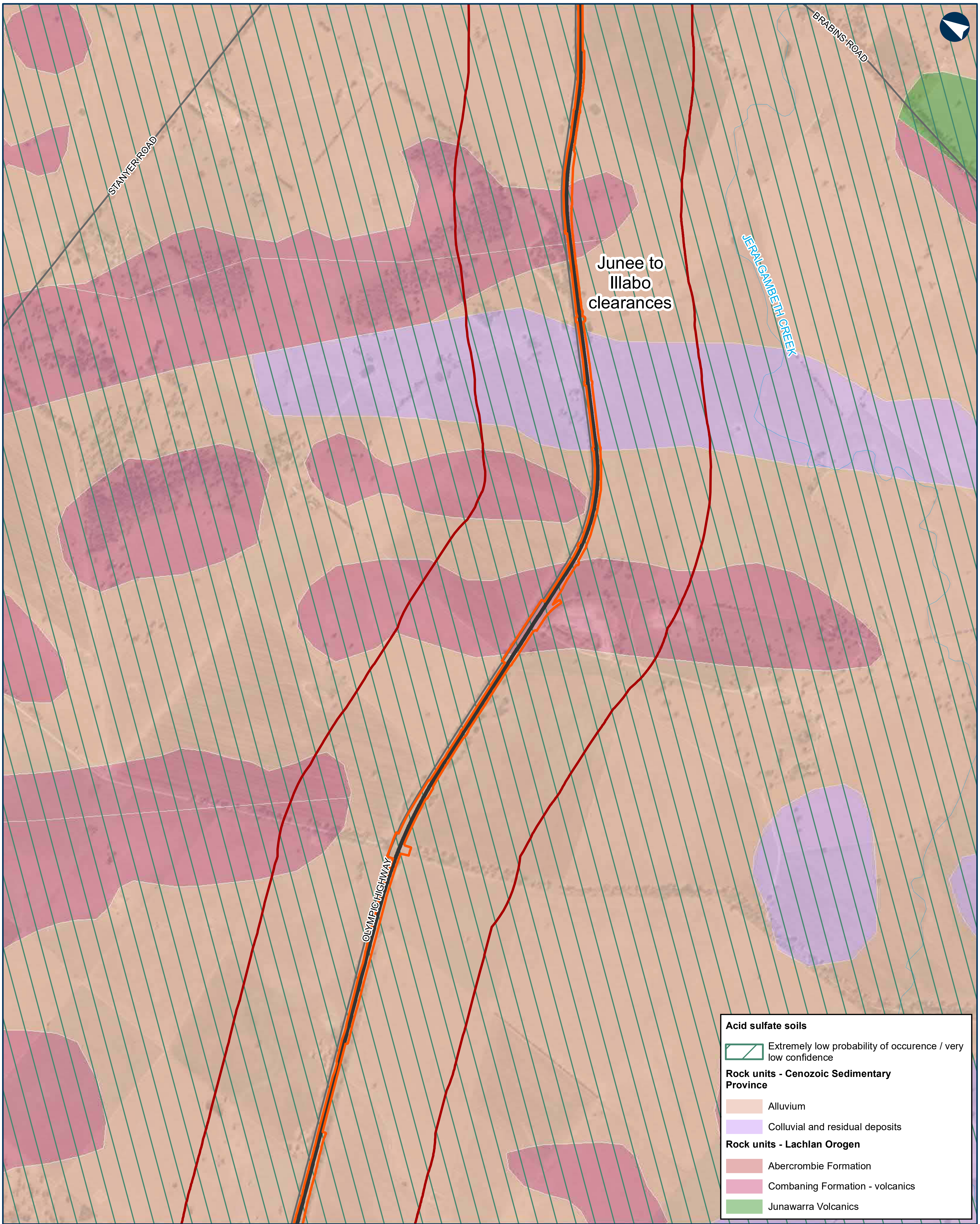

Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 16 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse

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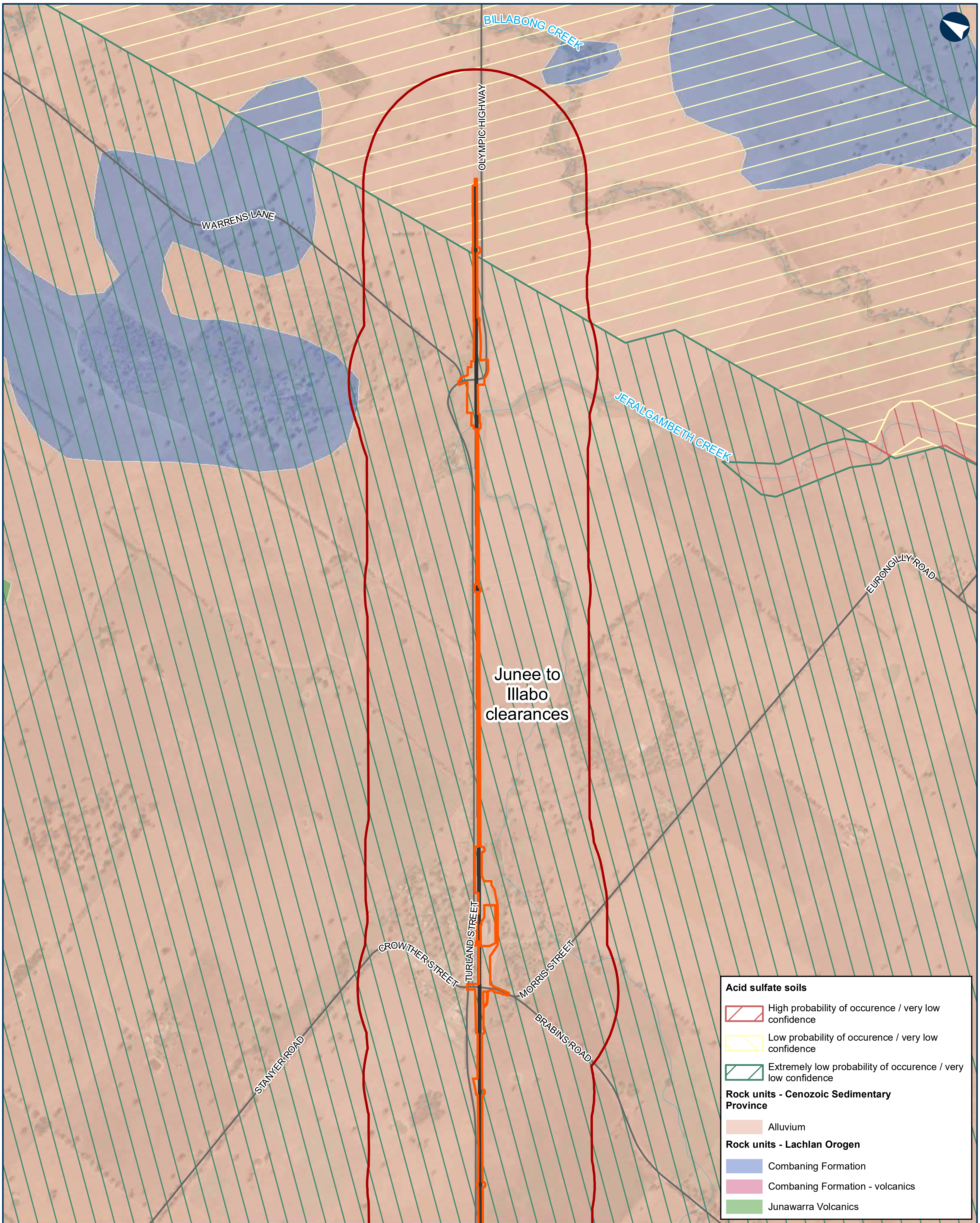

Albury to Illabo Appendix A3 – Landscape features – Areas of geological significance and soil hazard features MAP 17 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, CSIRO

Landscape assessment area
Proposal site
Existing railway
Main road
Watercourse

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APPENDIX A-4
ASSESSING NATIVE VEGETATION COVER

Albury to Illabo Appendix A4 – Assessing native vegetation cover MAP 1 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:6,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
NSW/VIC border
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

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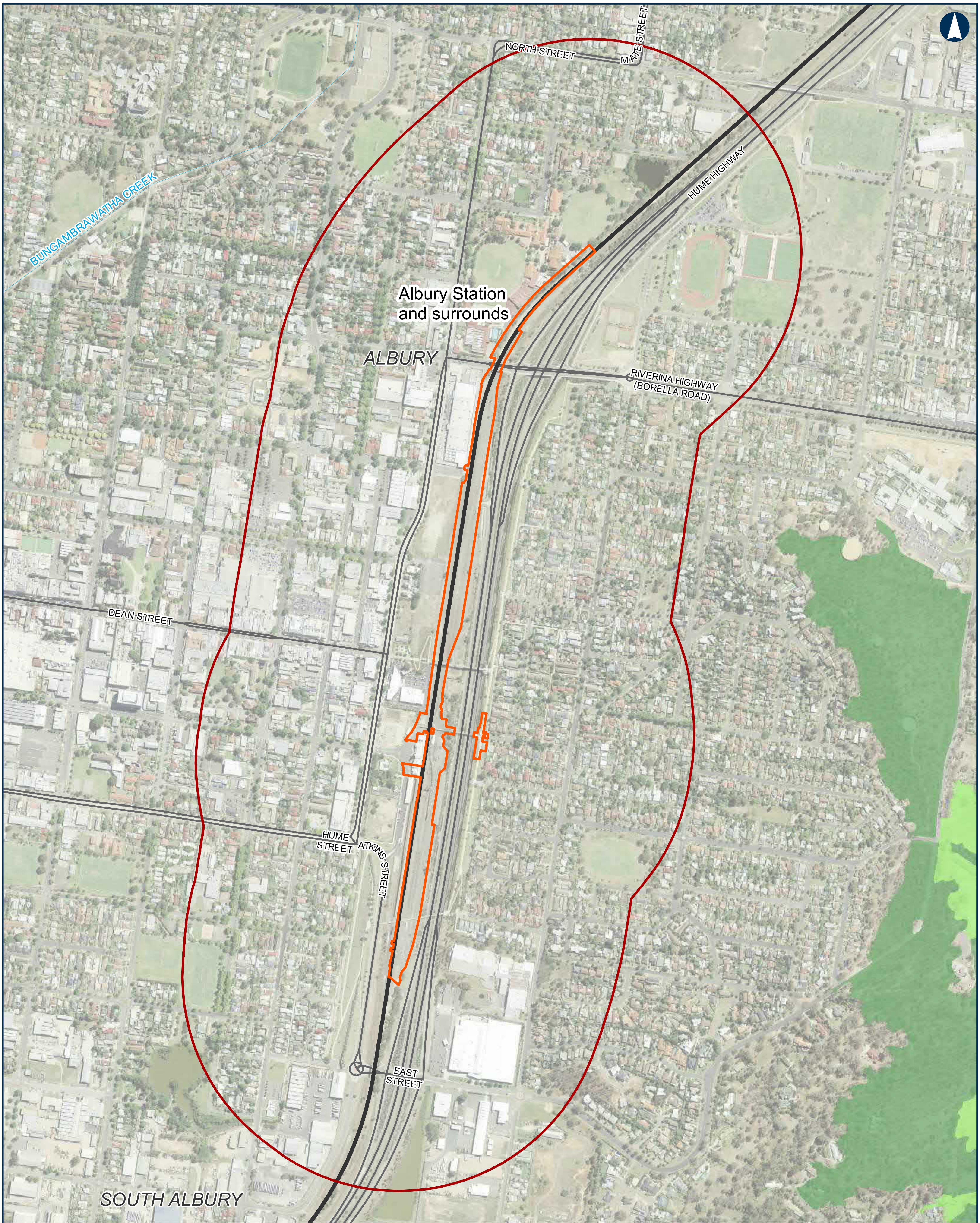

Albury to Illabo Appendix A4 – Assessing native vegetation cover MAP 2 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,500
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

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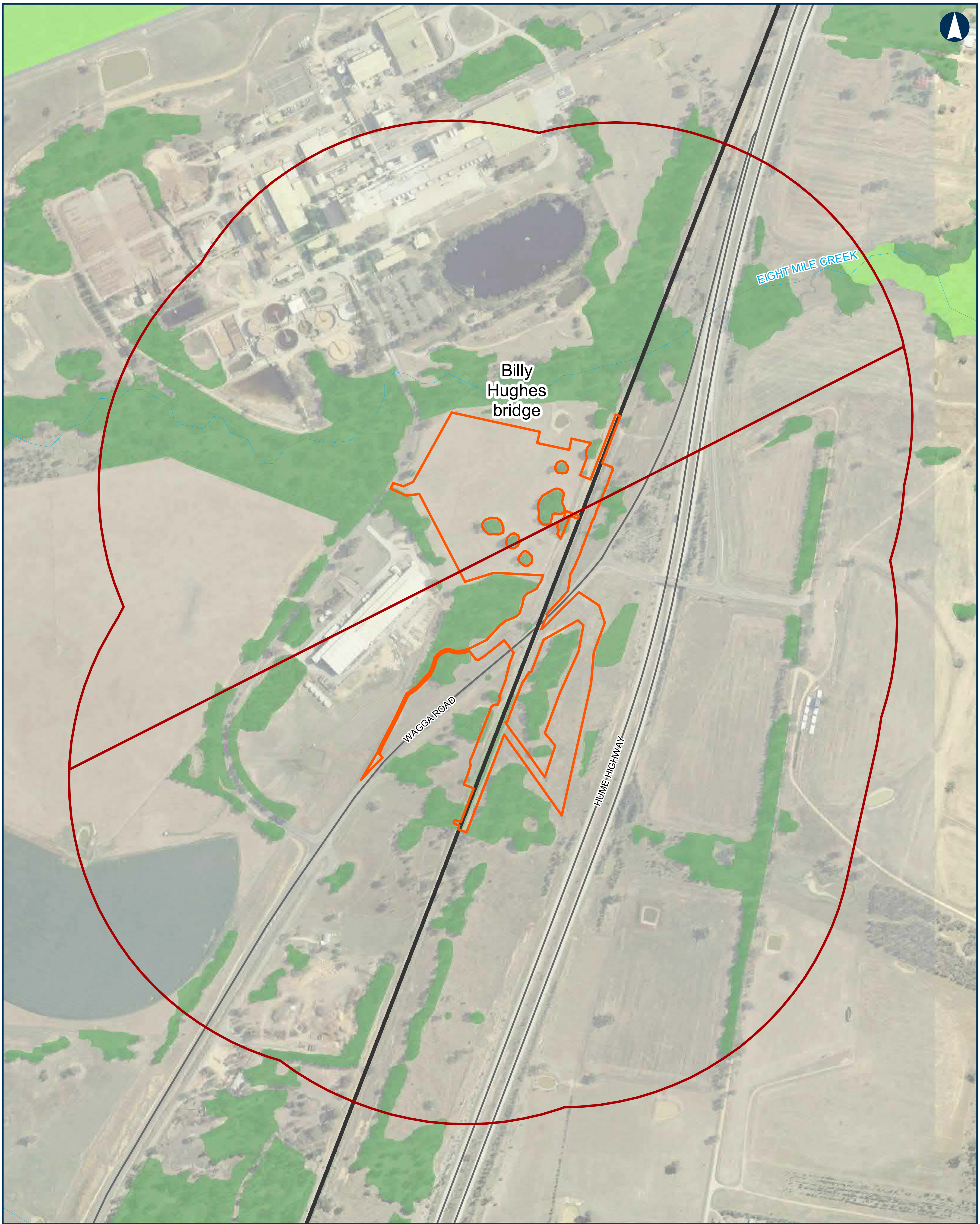

Albury to Illabo Appendix A4 – Assessing native vegetation cover MAP 3 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:6,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

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Albury to Illabo Appendix A4 – Assessing native vegetation cover MAP 4 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

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Albury to Illabo Appendix A4 – Assessing native vegetation cover MAP 5 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

JUNEE ILLABO LOCKHART WAGGA WAGGA HENTY HOLBROOK HOWLONG ALBURY

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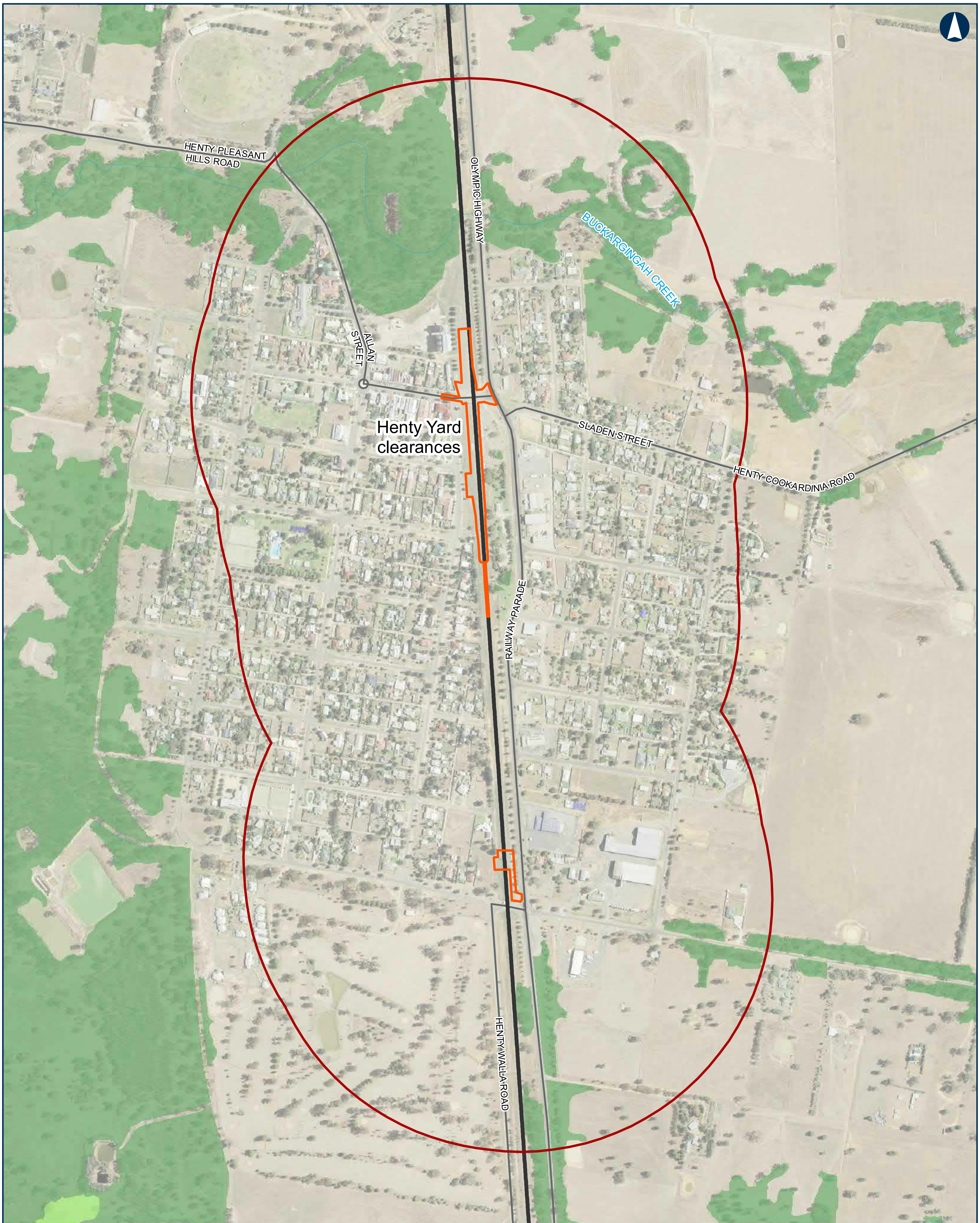

Albury to Illabo | Appendix A4 – Assessing native vegetation cover | MAP 6 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

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Albury to Illabo

Appendix A4 – Assessing native vegetation cover

MAP 7 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022
Author: WSP
Paper: A3
Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

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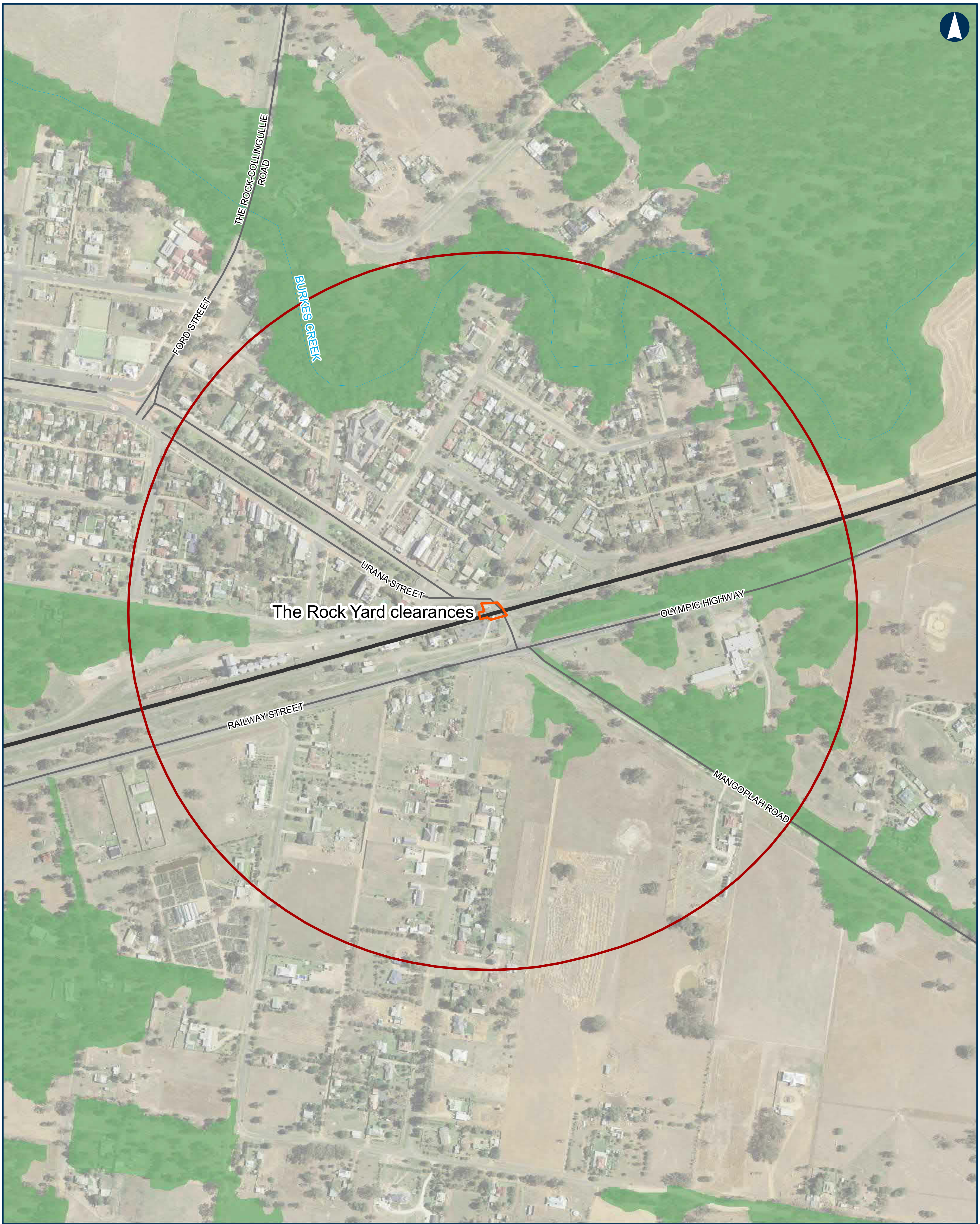


Albury to Illabo Appendix A4 – Assessing native vegetation cover

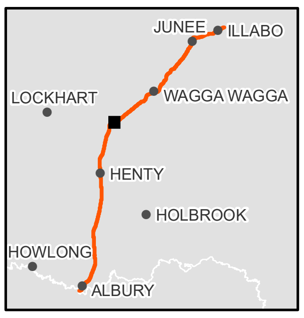
MAP 8 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation



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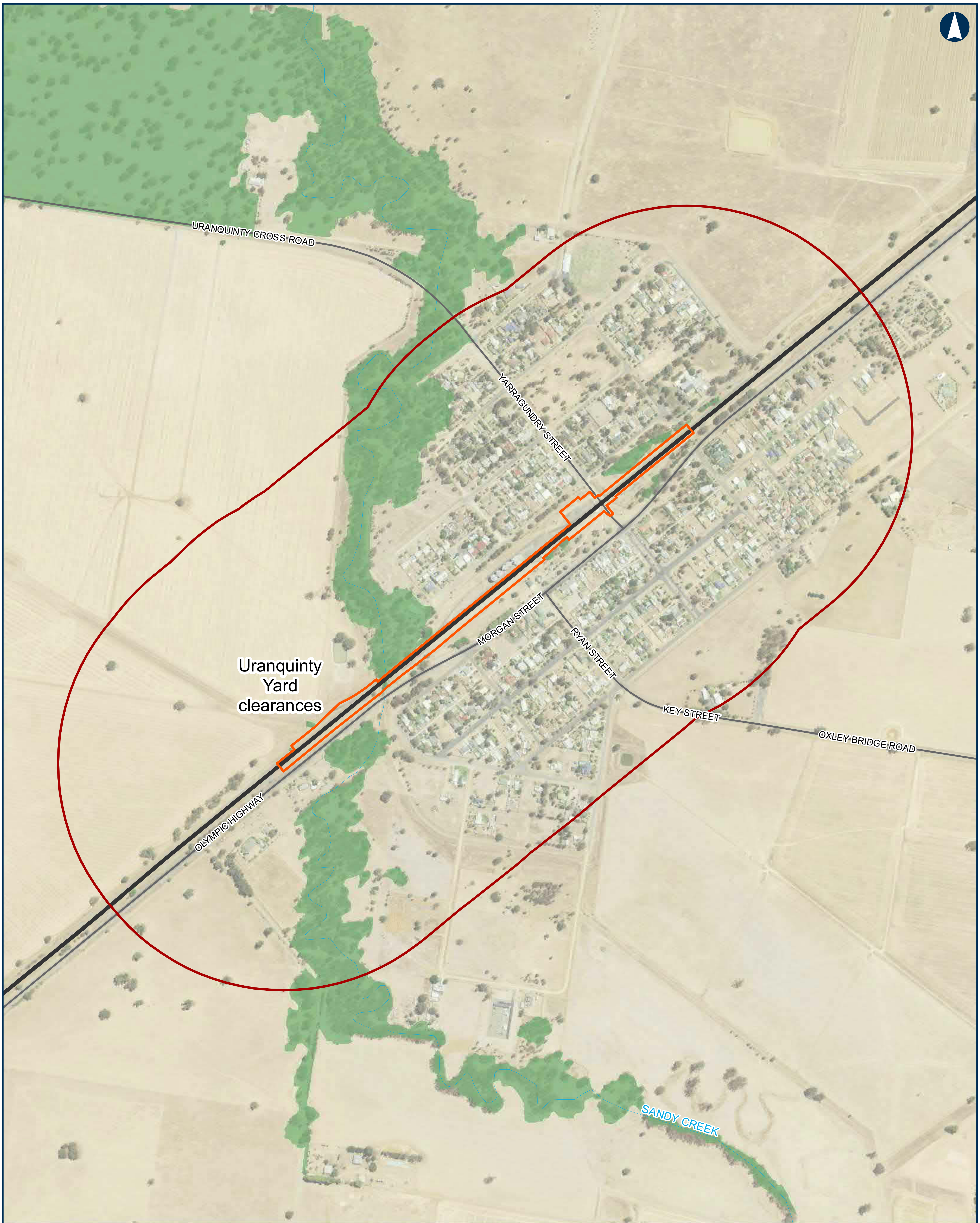

Albury to Illabo

Appendix A4 – Assessing native vegetation cover

MAP 9 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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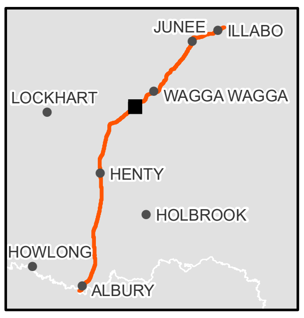
Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation



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Albury to Illabo Appendix A4 – Assessing native vegetation cover MAP 10 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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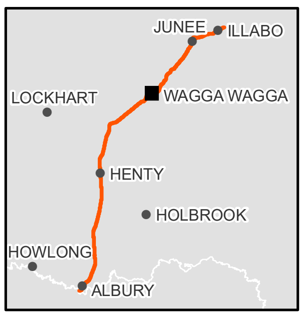
Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation



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Albury to Illabo Appendix A4 – Assessing native vegetation cover

MAP 11 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:11,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse
- Landscape assessment area

Native vegetation cover

- Woody vegetation
- Non-woody vegetation

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Albury to Illabo Appendix A4 – Assessing native vegetation cover

MAP 12 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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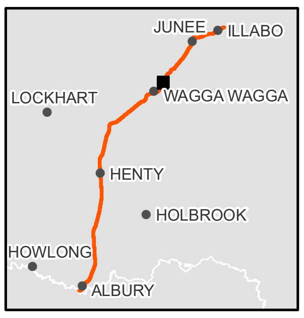
Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation



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Albury to Illabo

Appendix A4 – Assessing native vegetation cover

MAP 13 OF 17

0 100 200 m

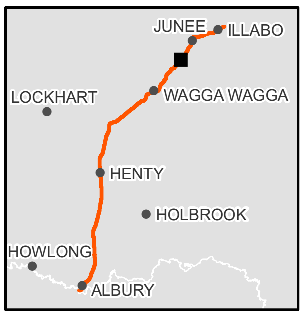
Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:7,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area

Native vegetation cover

Woody vegetation
Non-woody vegetation



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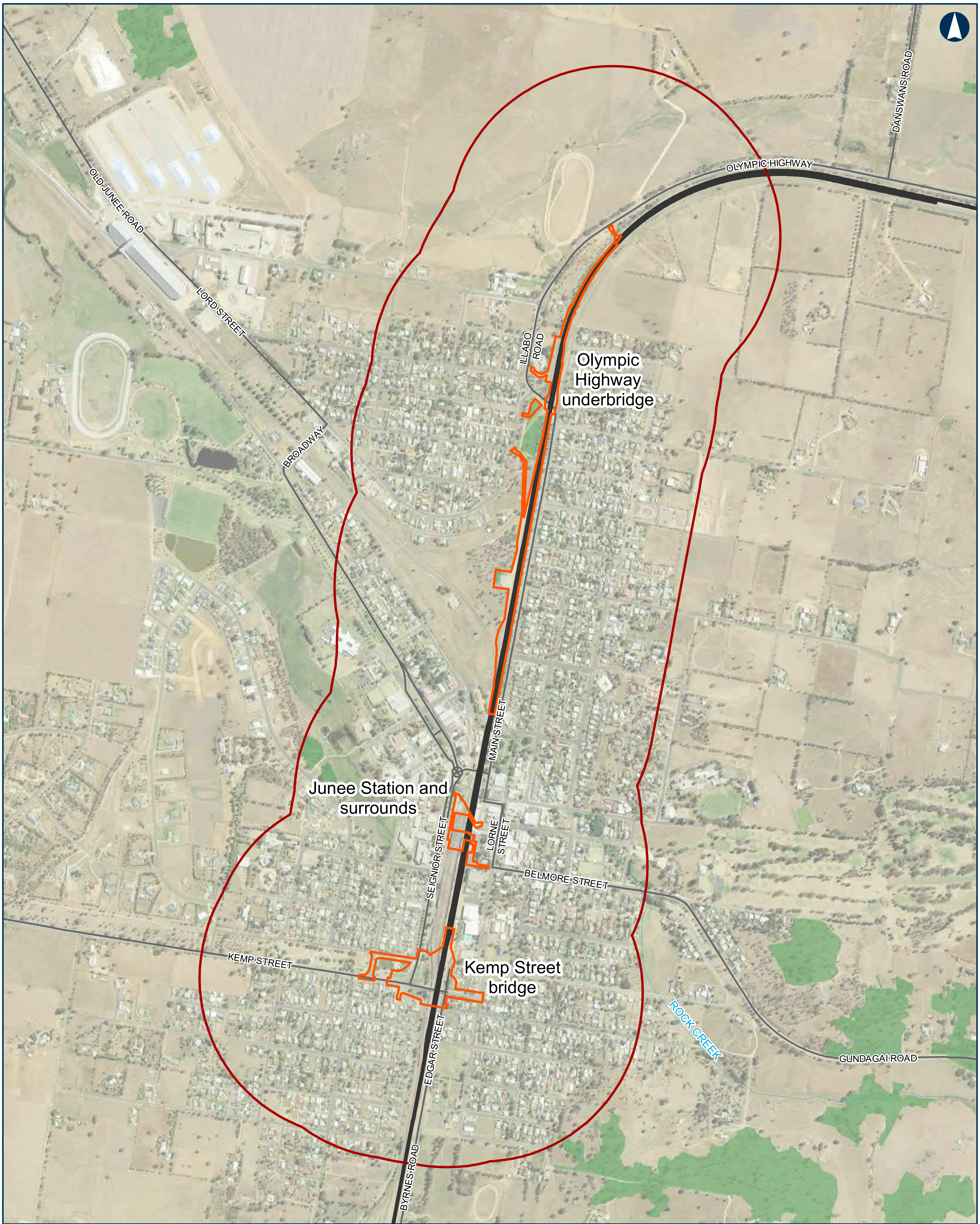

Albury to Illabo Appendix A4 – Assessing native vegetation cover MAP 14 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:11,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

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

Albury to Illabo

Appendix A4 – Assessing native vegetation cover

MAP 15 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:16,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

INLAND RAIL
ARTC

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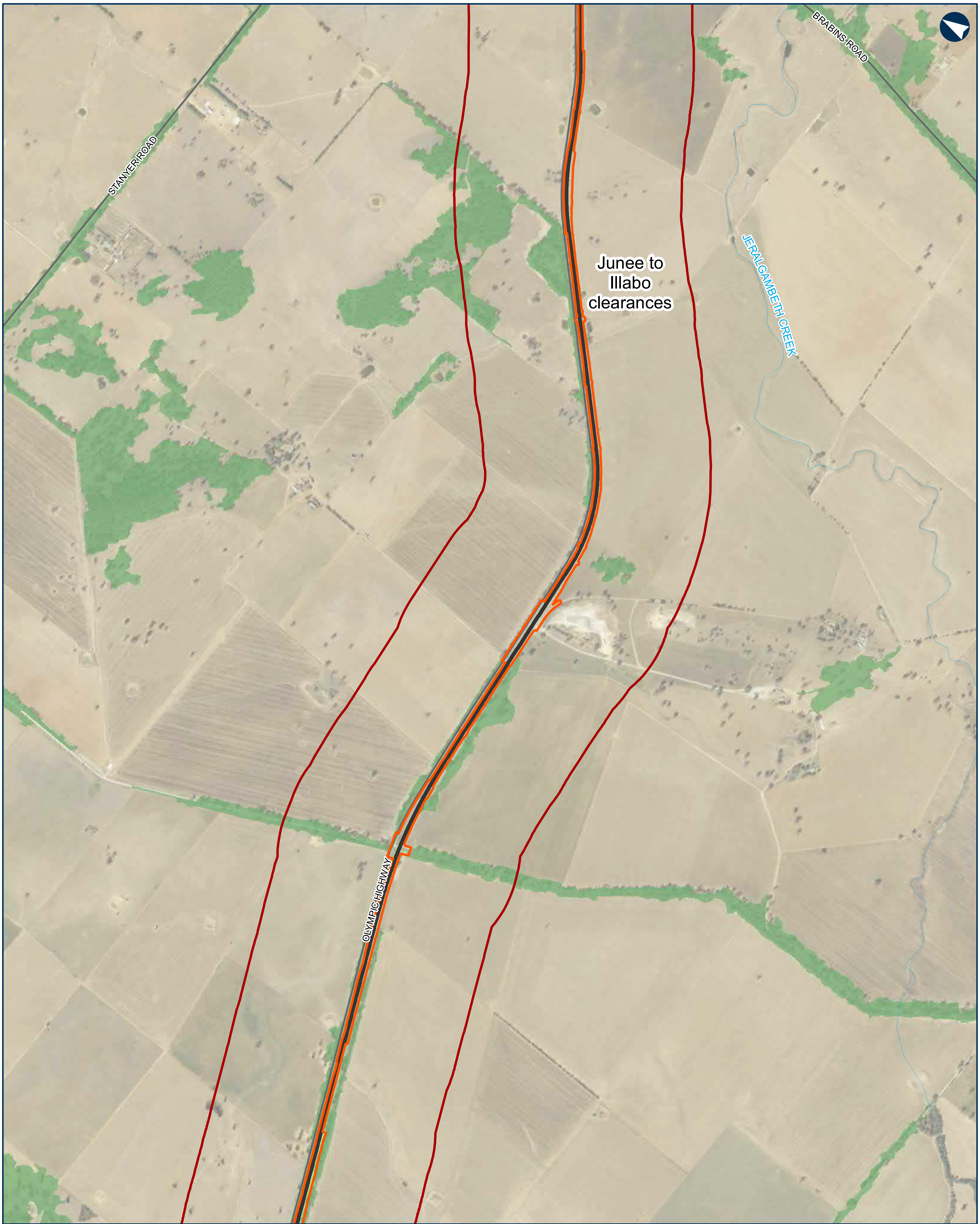


Albury to Illabo Appendix A4 – Assessing native vegetation cover MAP 16 OF 17

0 100 200 m

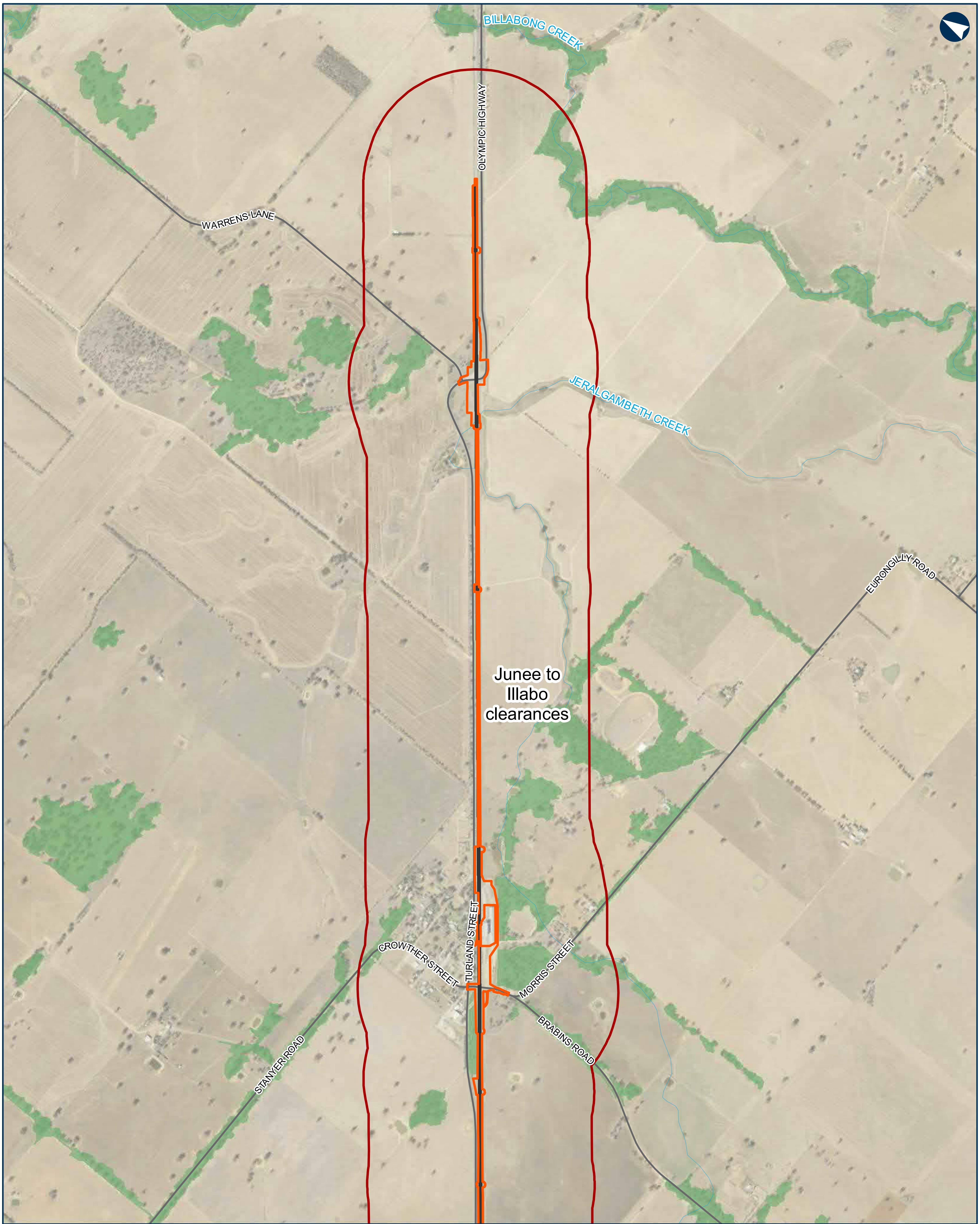
Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area
Native vegetation cover
Woody vegetation
Non-woody vegetation

INLAND RAIL
ARTC

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



Albury to Illabo

Appendix A4 – Assessing native vegetation cover

MAP 17 OF 17

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:16,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse
Landscape assessment area

Native vegetation cover

Woody vegetation
Non-woody vegetation

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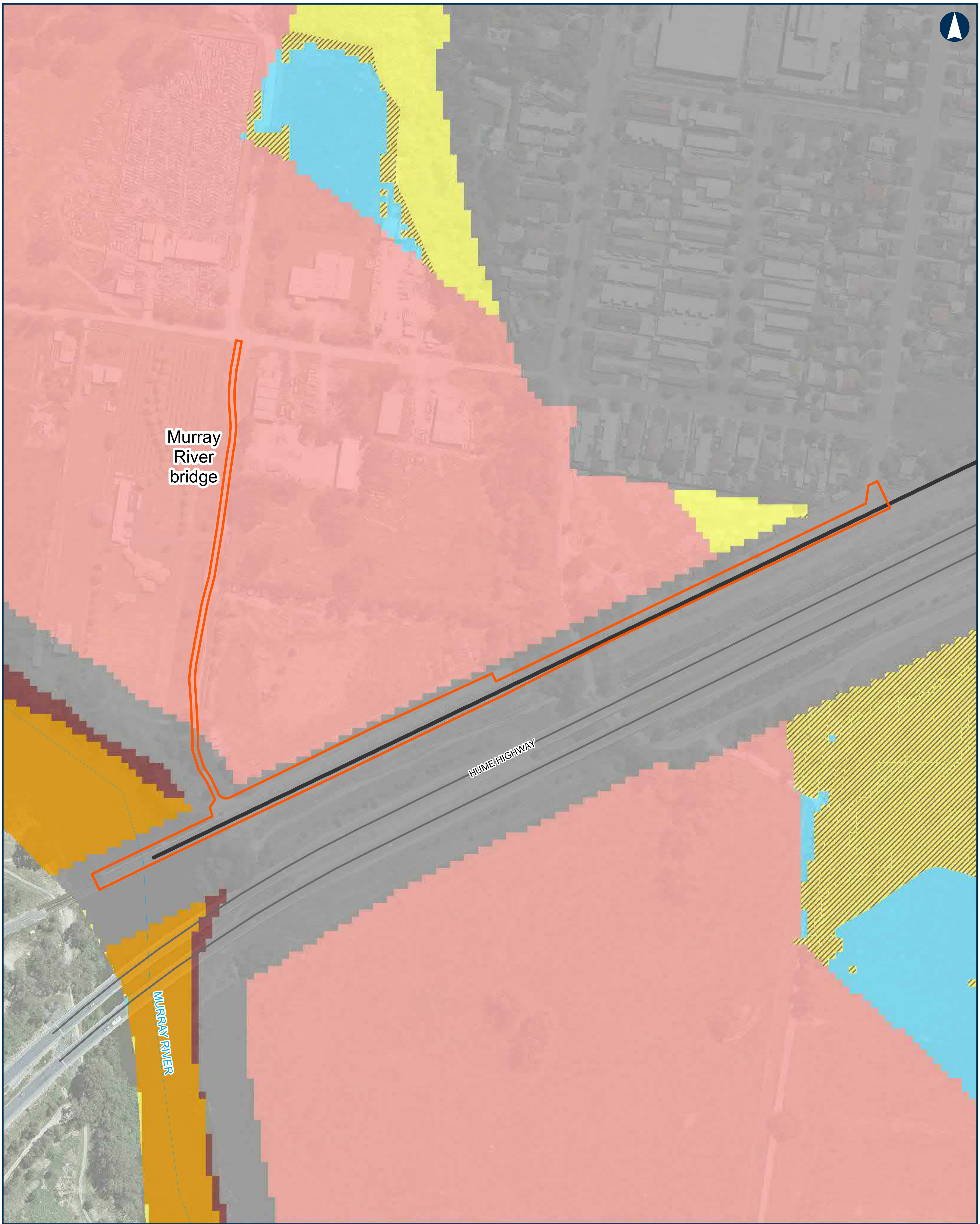
TECHNICAL PAPER 08

Biodiversity development assessment report

Appendix B Native vegetation

ALBURY TO ILLABO ENVIRONMENTAL IMPACT STATEMENT

APPENDIX B-1
NATIVE VEGETATION REGULATORY MAPPING CATEGORY 1-EXEMPT LAND



Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 1 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:2,500
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse

Native Vegetation Regulatory mapping

- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – conflicting data
- Category 2 – regulated land
- Category 2 – vulnerable regulated land
- Category 2 – sensitive regulated land
- Category 2 – both vulnerable and sensitive regulated land
- Excluded land

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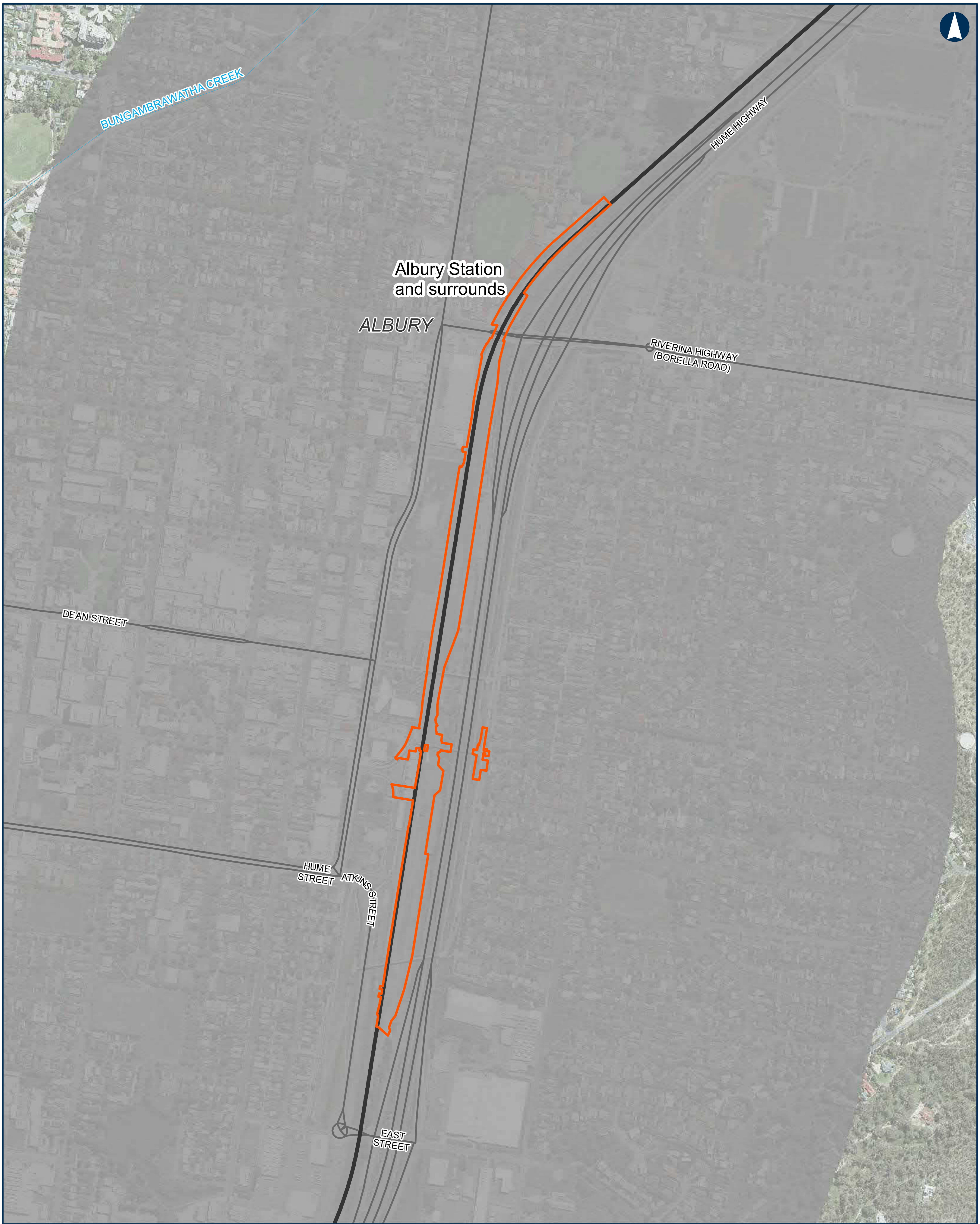
Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land



0 50 100
m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:7,500
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse

Native Vegetation Regulatory mapping

Excluded land

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Albury to Illabo Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 3 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:3,500
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse

Native Vegetation Regulatory mapping

- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – conflicting data
- Category 2 – regulated land
- Excluded land

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Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 4 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road

Native Vegetation Regulatory mapping

Category 1 (BAM does not apply except for prescribed impacts)
Category 2 – conflicting data
Excluded land

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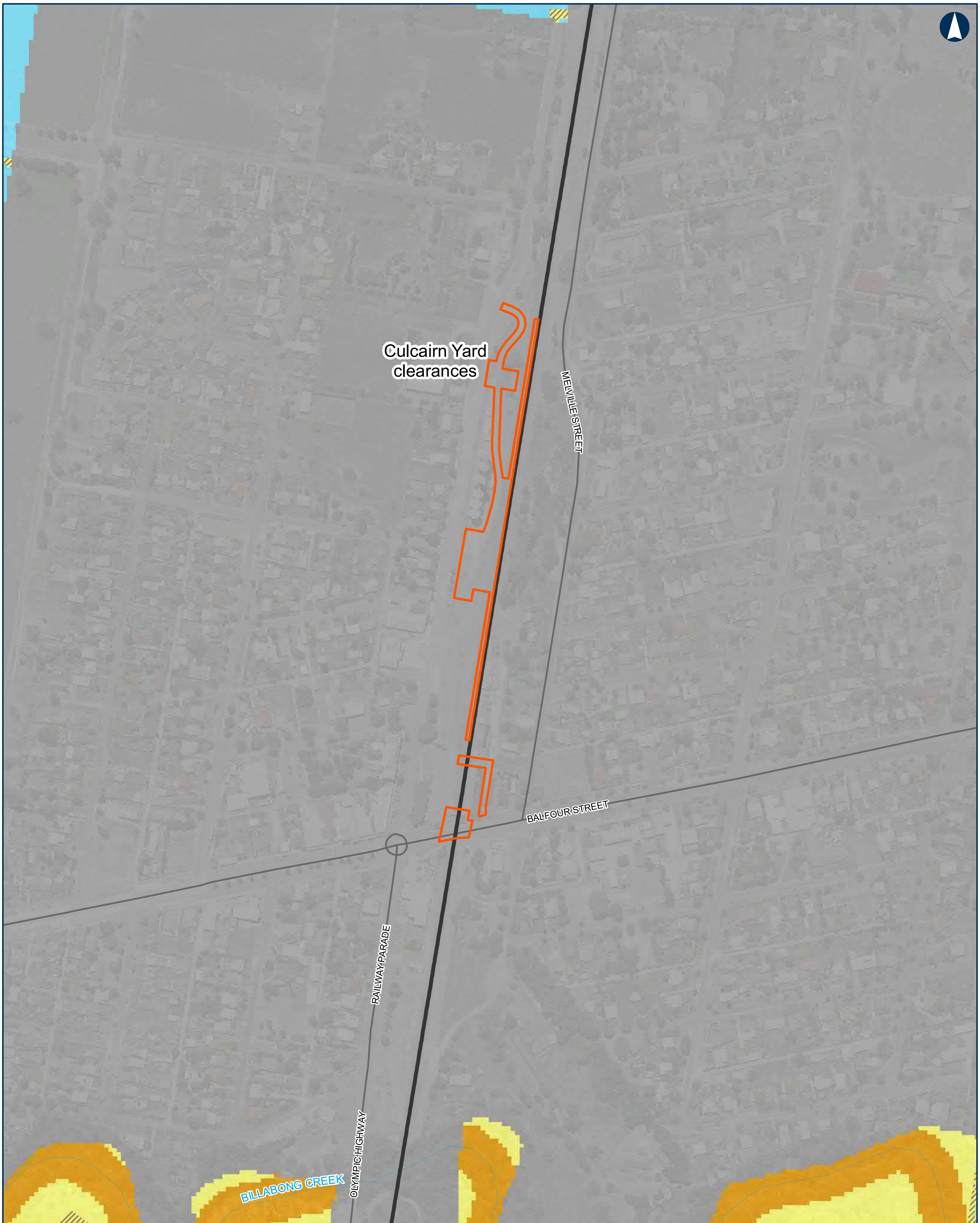
Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 5 OF 20



0 50 100 m

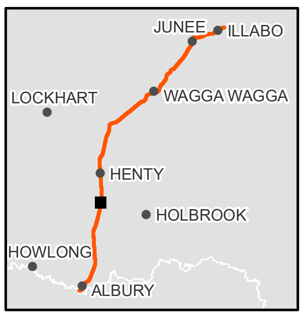
Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:4,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse

Native Vegetation Regulatory mapping

- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – conflicting data
- Category 2 – regulated land
- Category 2 – vulnerable regulated land
- Excluded land



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Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 6 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse

Native Vegetation Regulatory mapping
- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – conflicting data
- Category 2 – regulated land
- Category 2 – vulnerable regulated land
- Excluded land

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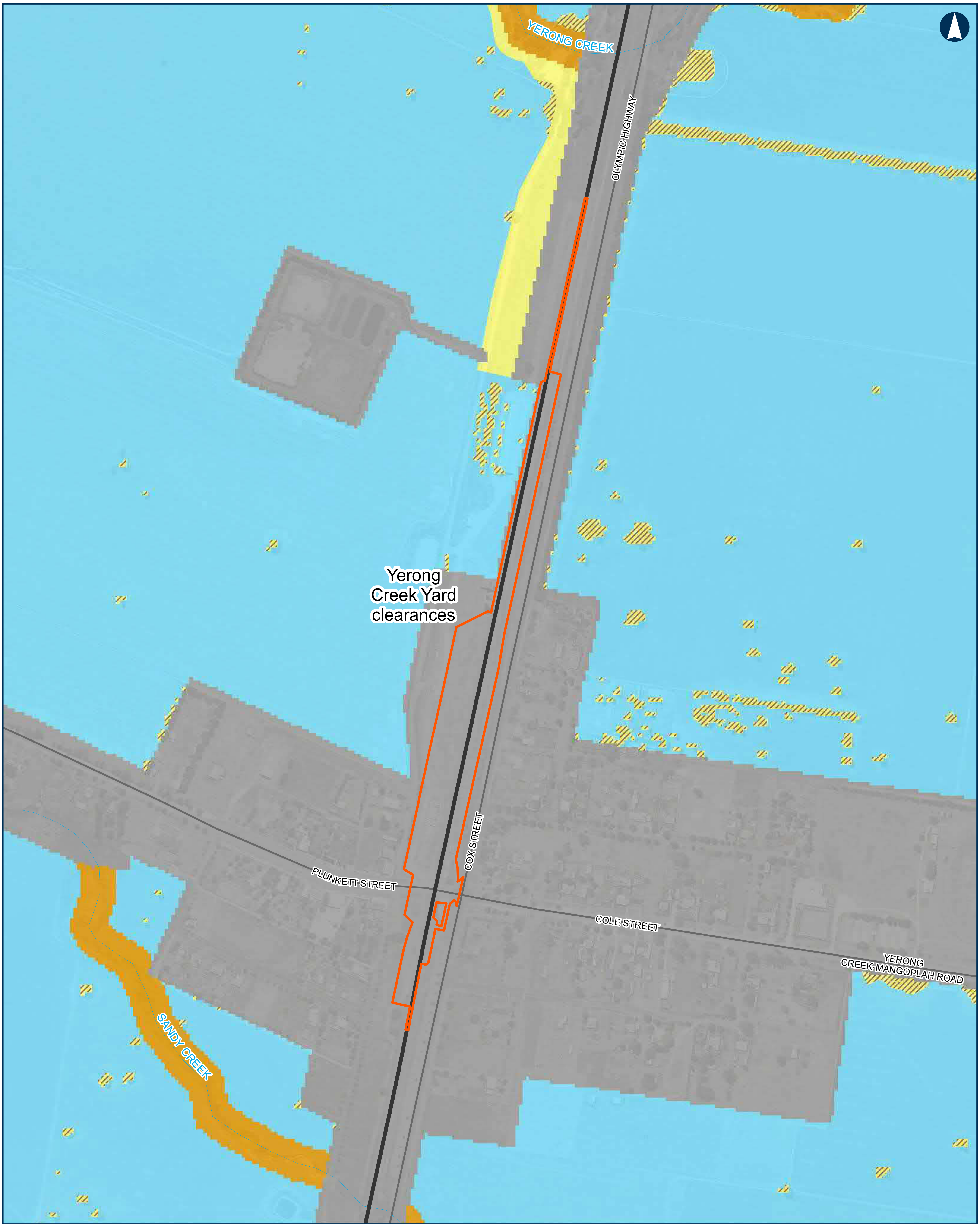

Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 7 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:5,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse

Native Vegetation Regulatory mapping

Category 1 (BAM does not apply except for prescribed impacts)
Category 2 – conflicting data
Category 2 – regulated land
Category 2 – vulnerable regulated land
Excluded land

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Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

0 50 100 m

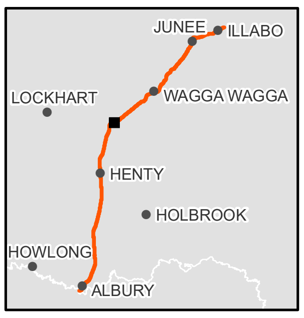
Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:2,500
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse

Native Vegetation Regulatory mapping

- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – conflicting data
- Category 2 – regulated land
- Category 2 – vulnerable regulated land
- Excluded land



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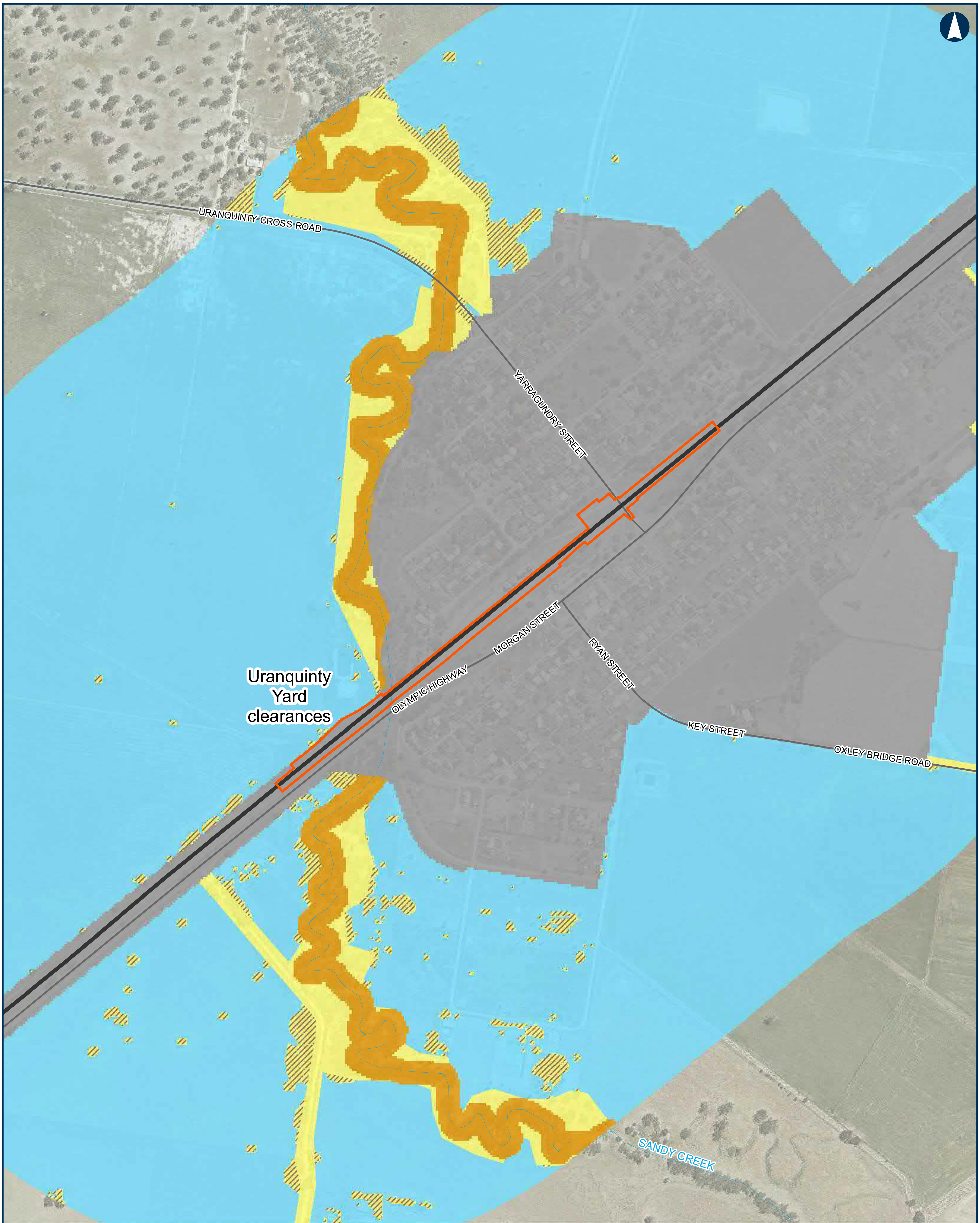


Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 9 OF 20

0 50 100 m

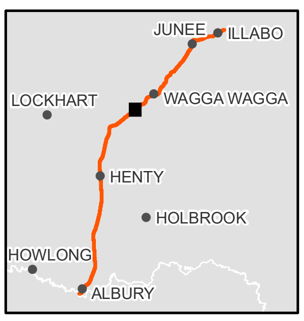
Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:7,500
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse

Native Vegetation Regulatory mapping

Category 1 (BAM does not apply except for prescribed impacts)
Category 2 – conflicting data
Category 2 – regulated land
Category 2 – vulnerable regulated land
Excluded land



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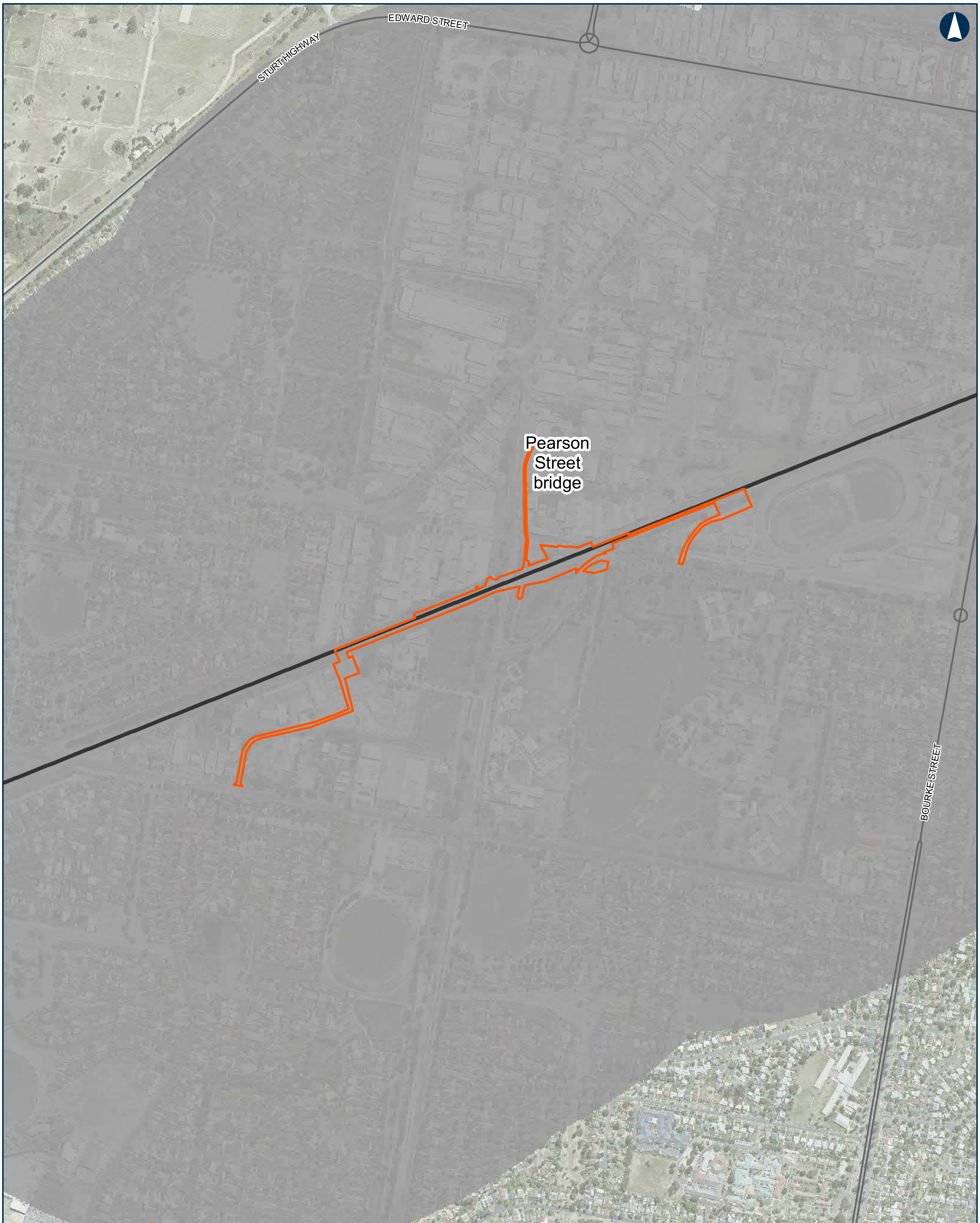

Albury to Illabo Appendix B1 – Native vegetation regulatory mapping category 1-exempt land MAP 10 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,500
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road

Native Vegetation Regulatory mapping
Excluded land

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Albury to Illabo Appendix B1 – Native vegetation regulatory mapping category 1-exempt land MAP 11 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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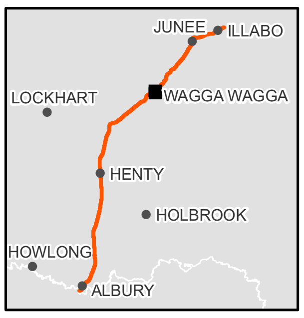
Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:7,500
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse

Native Vegetation Regulatory mapping
Category 2 – regulated land
Category 2 – vulnerable regulated land
Excluded land



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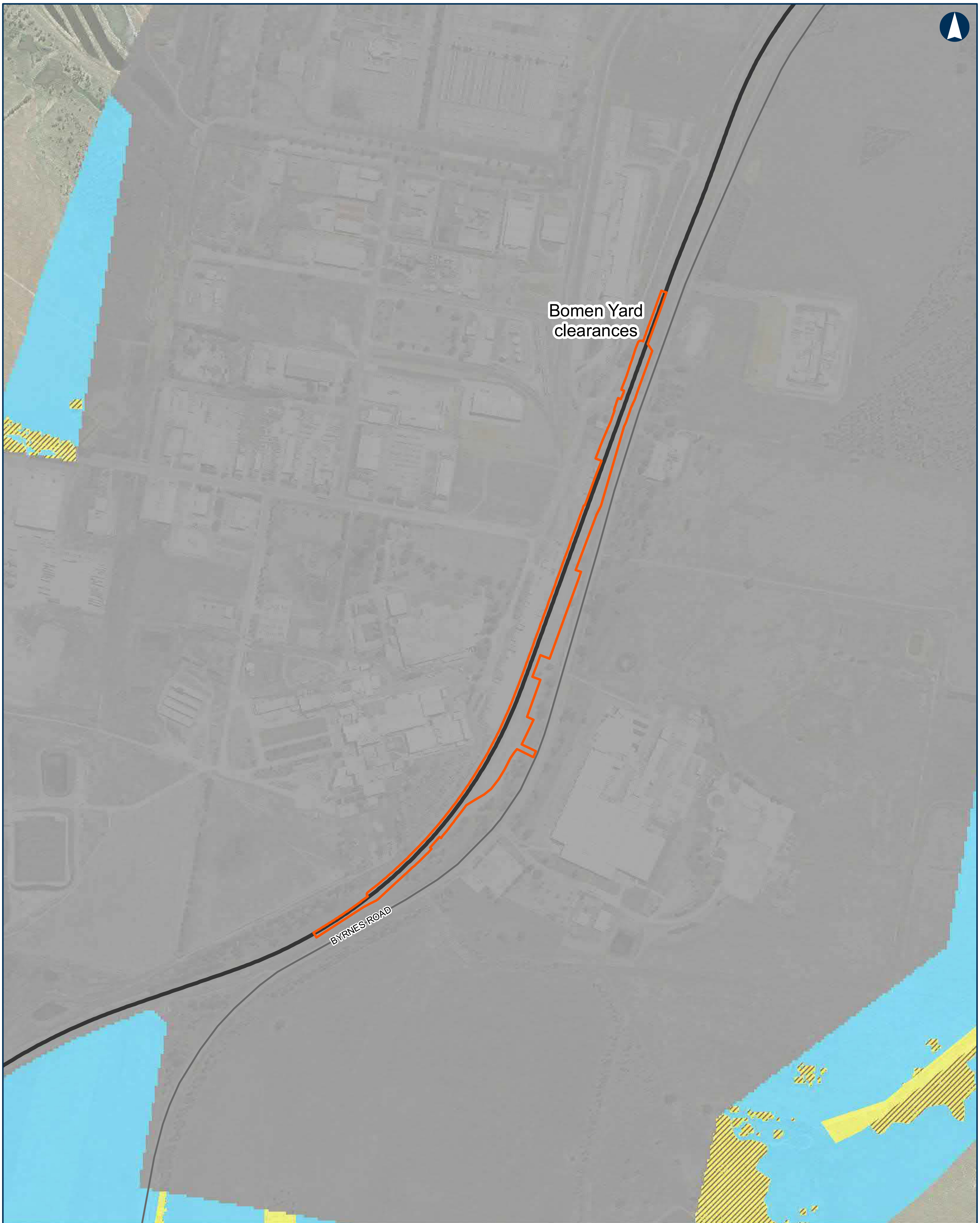

Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 12 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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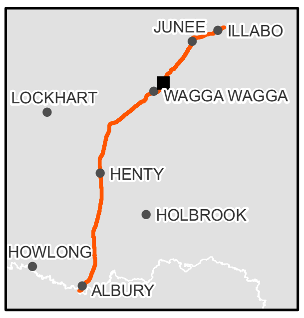
Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:6,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road

Native Vegetation Regulatory mapping

Category 1 (BAM does not apply except for prescribed impacts)
Category 2 – conflicting data
Category 2 – regulated land
Excluded land



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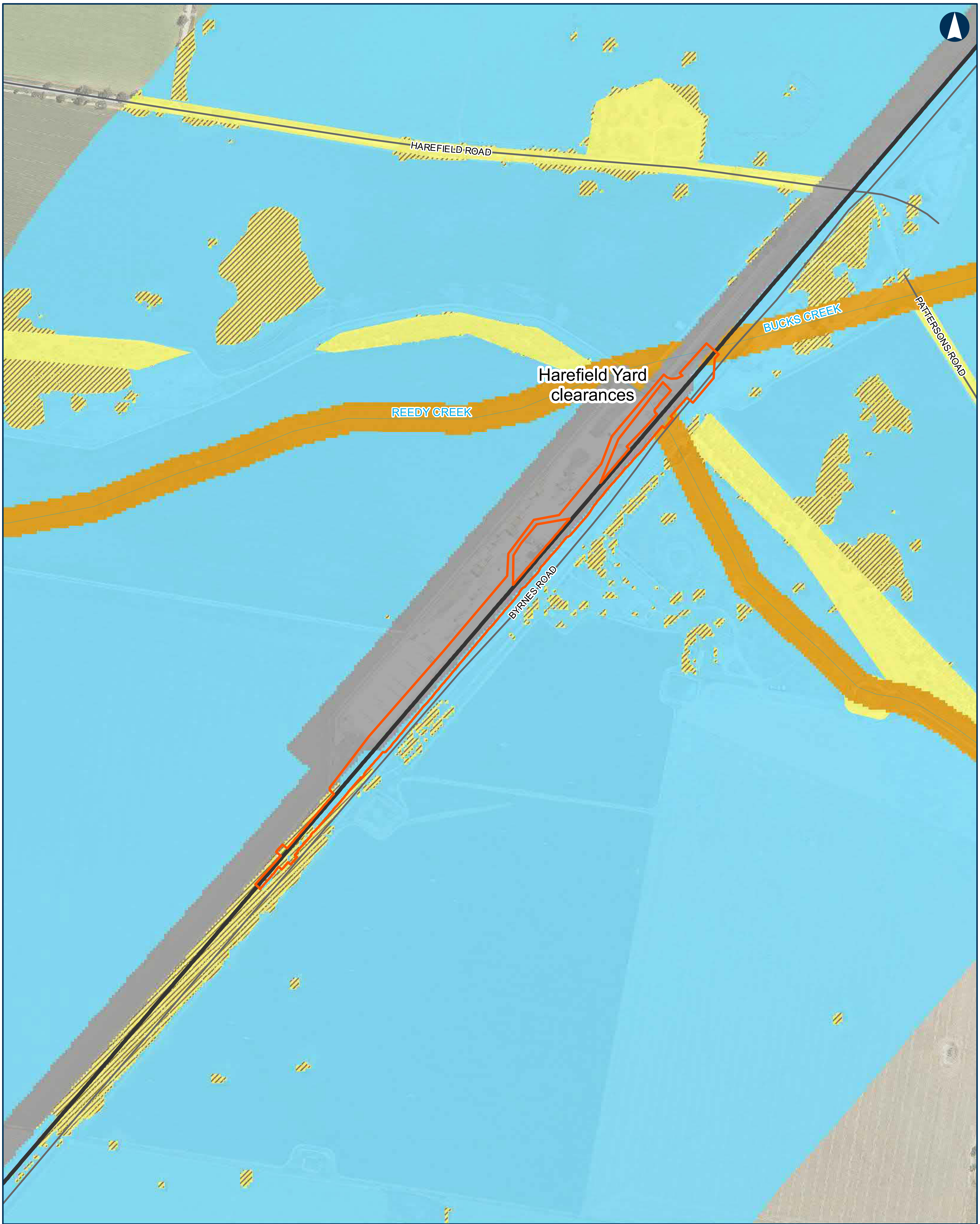


Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 13 OF 20

0 50 100 m

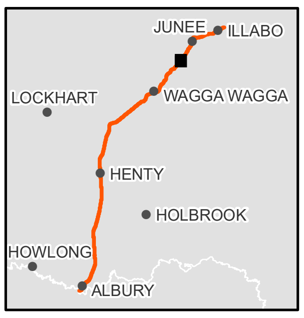
Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:6,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse

Native Vegetation Regulatory mapping

- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – conflicting data
- Category 2 – regulated land
- Category 2 – vulnerable regulated land
- Excluded land



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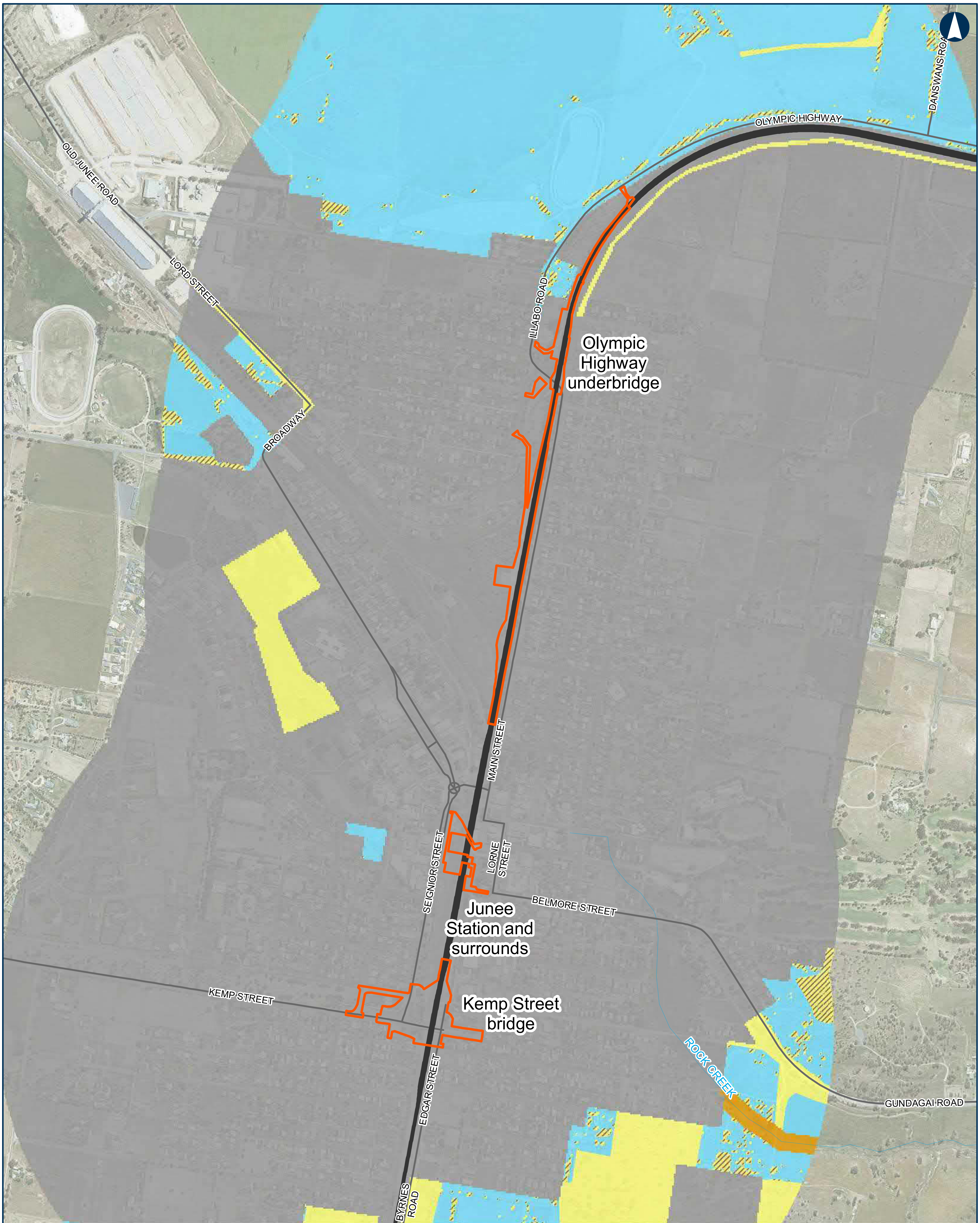

Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 14 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:10,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road
Watercourse

Native Vegetation Regulatory mapping

Category 1 (BAM does not apply except for prescribed impacts)
Category 2 – conflicting data
Category 2 – regulated land
Category 2 – vulnerable regulated land
Excluded land

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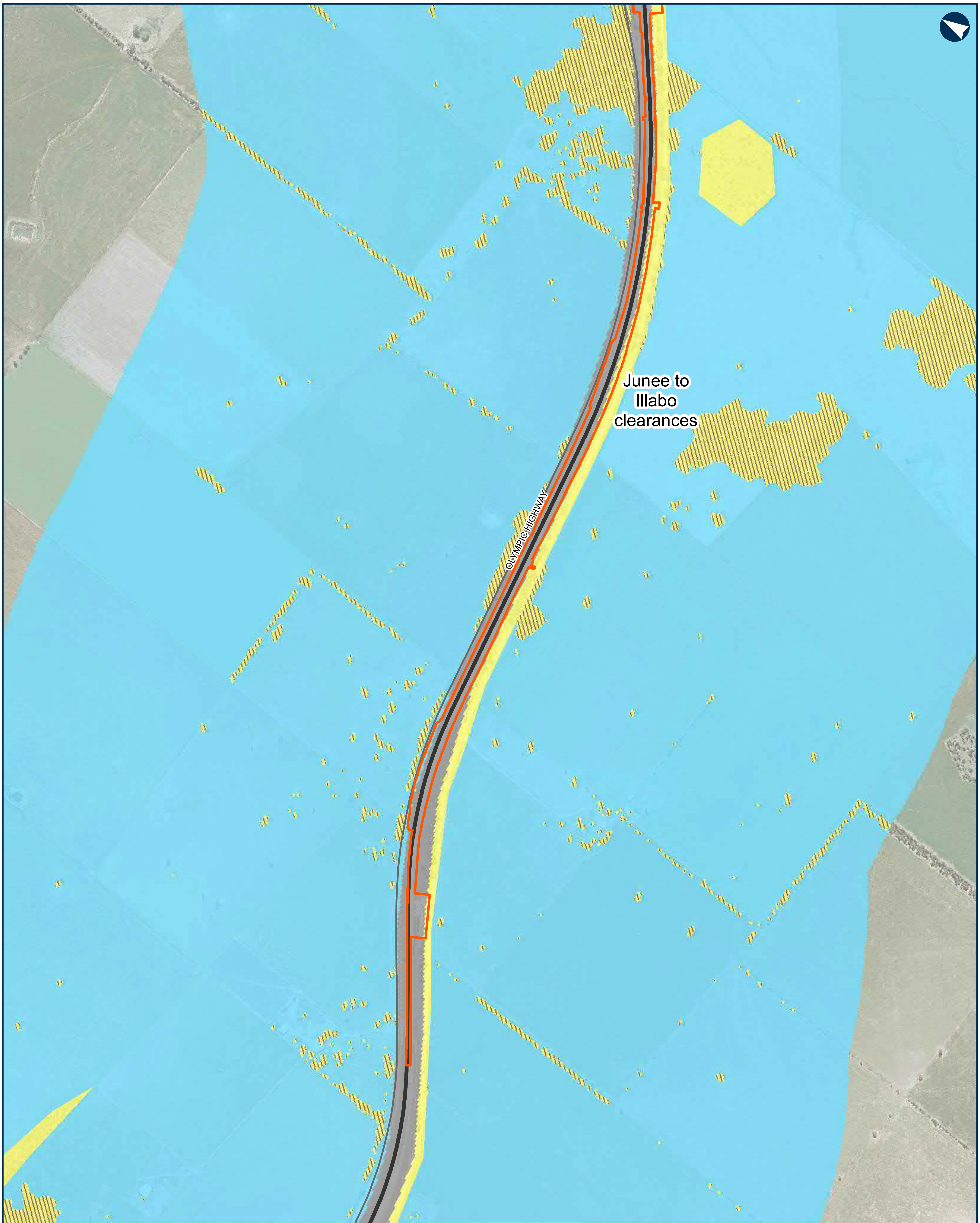

Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 15 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road

Native Vegetation Regulatory mapping

Category 1 (BAM does not apply except for prescribed impacts)
Category 2 – conflicting data
Category 2 – regulated land
Excluded land

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Albury to Illabo — Appendix B1 – Native vegetation regulatory mapping category 1-exempt land — MAP 16 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road

Native Vegetation Regulatory mapping
Category 1 (BAM does not apply except for prescribed impacts)
Category 2 – conflicting data
Category 2 – regulated land
Excluded land

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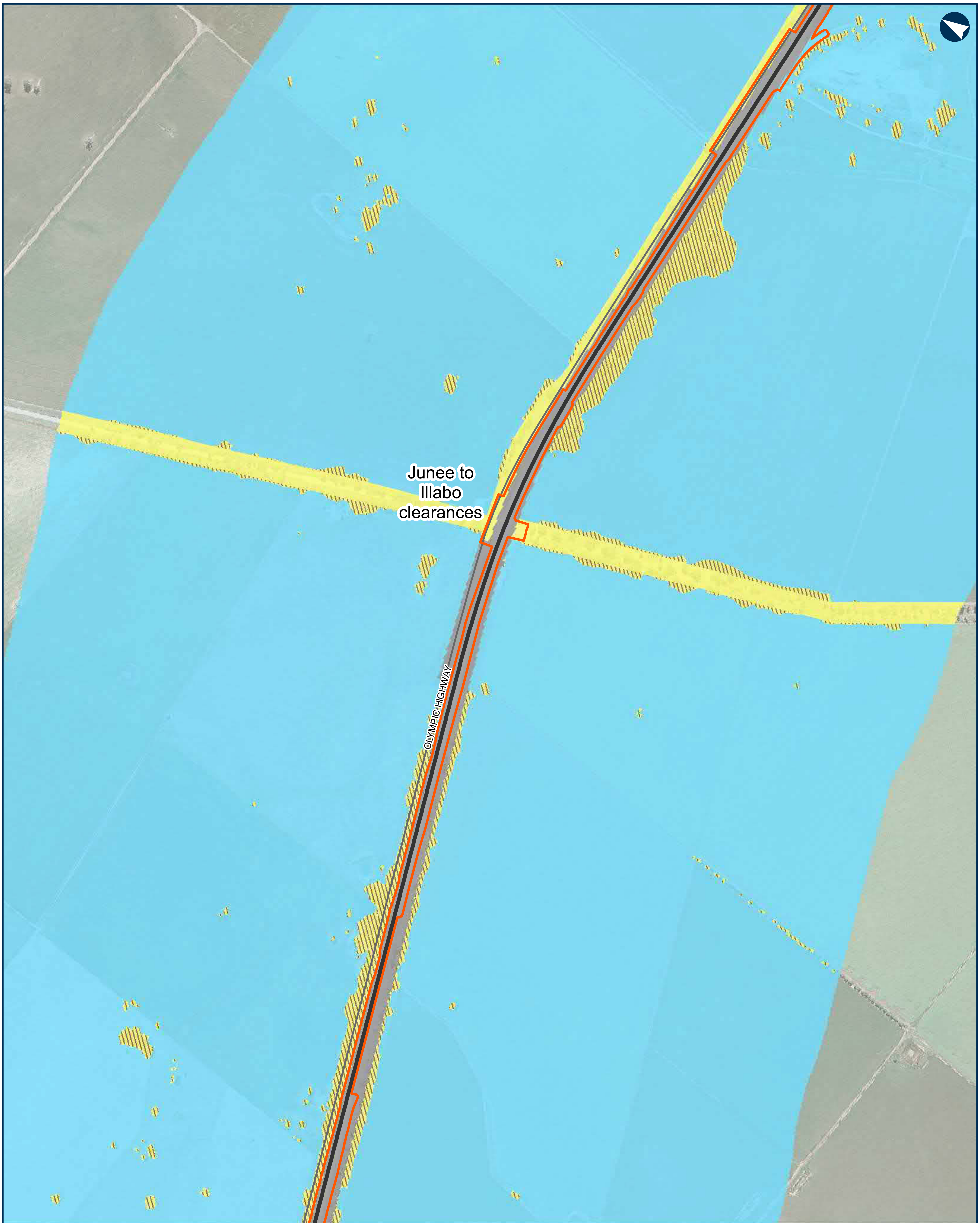

Albury to Illabo — Appendix B1 – Native vegetation regulatory mapping category 1-exempt land — MAP 17 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

Proposal site
Existing railway
Main road

Native Vegetation Regulatory mapping

Category 1 (BAM does not apply except for prescribed impacts)
Category 2 – conflicting data
Category 2 – regulated land
Excluded land

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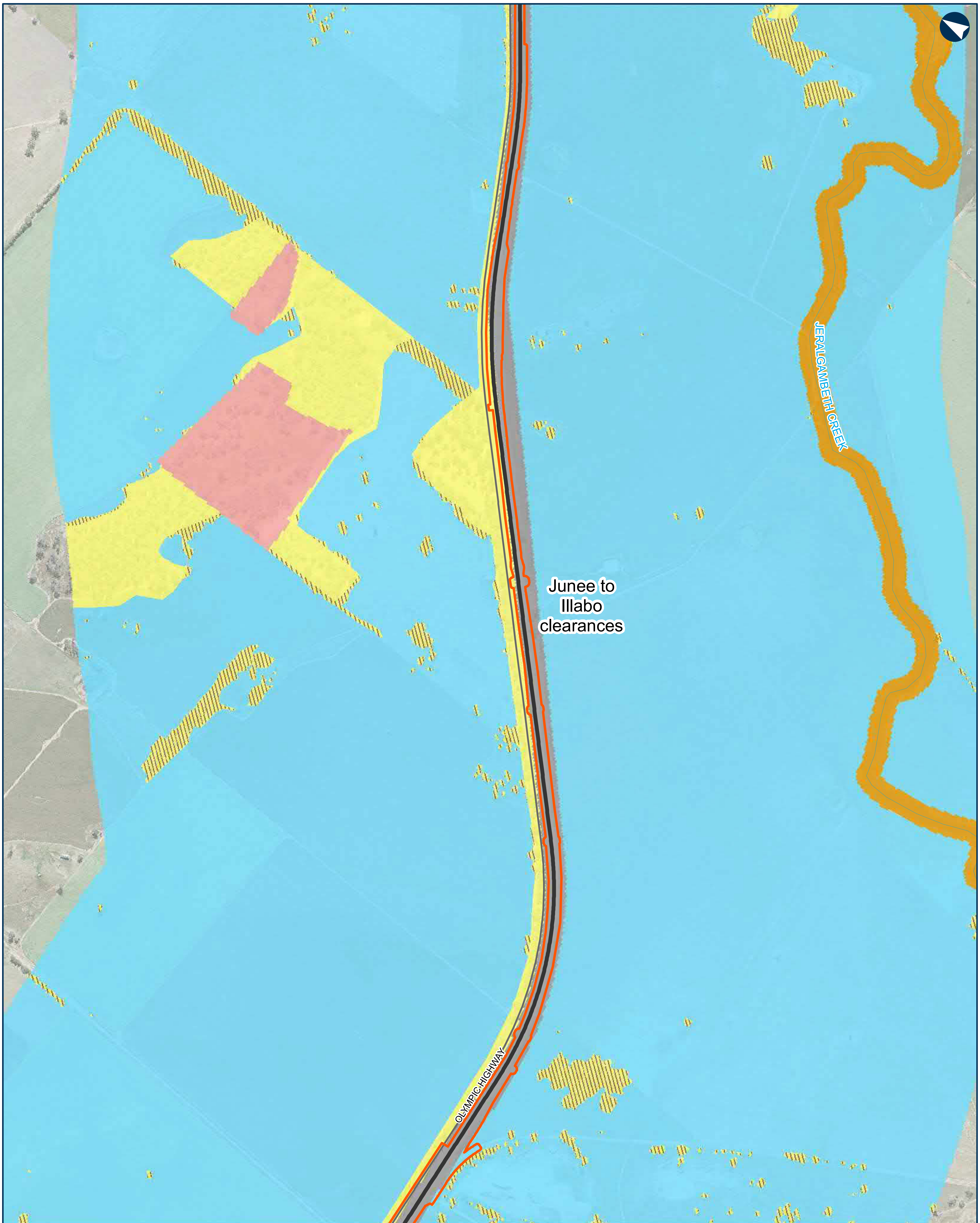

Albury to Illabo Appendix B1 – Native vegetation regulatory mapping category 1-exempt land MAP 18 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse

Native Vegetation Regulatory mapping

- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – conflicting data
- Category 2 – regulated land
- Category 2 – vulnerable regulated land
- Category 2 – sensitive regulated land
- Excluded land

INLAND RAIL ARTC

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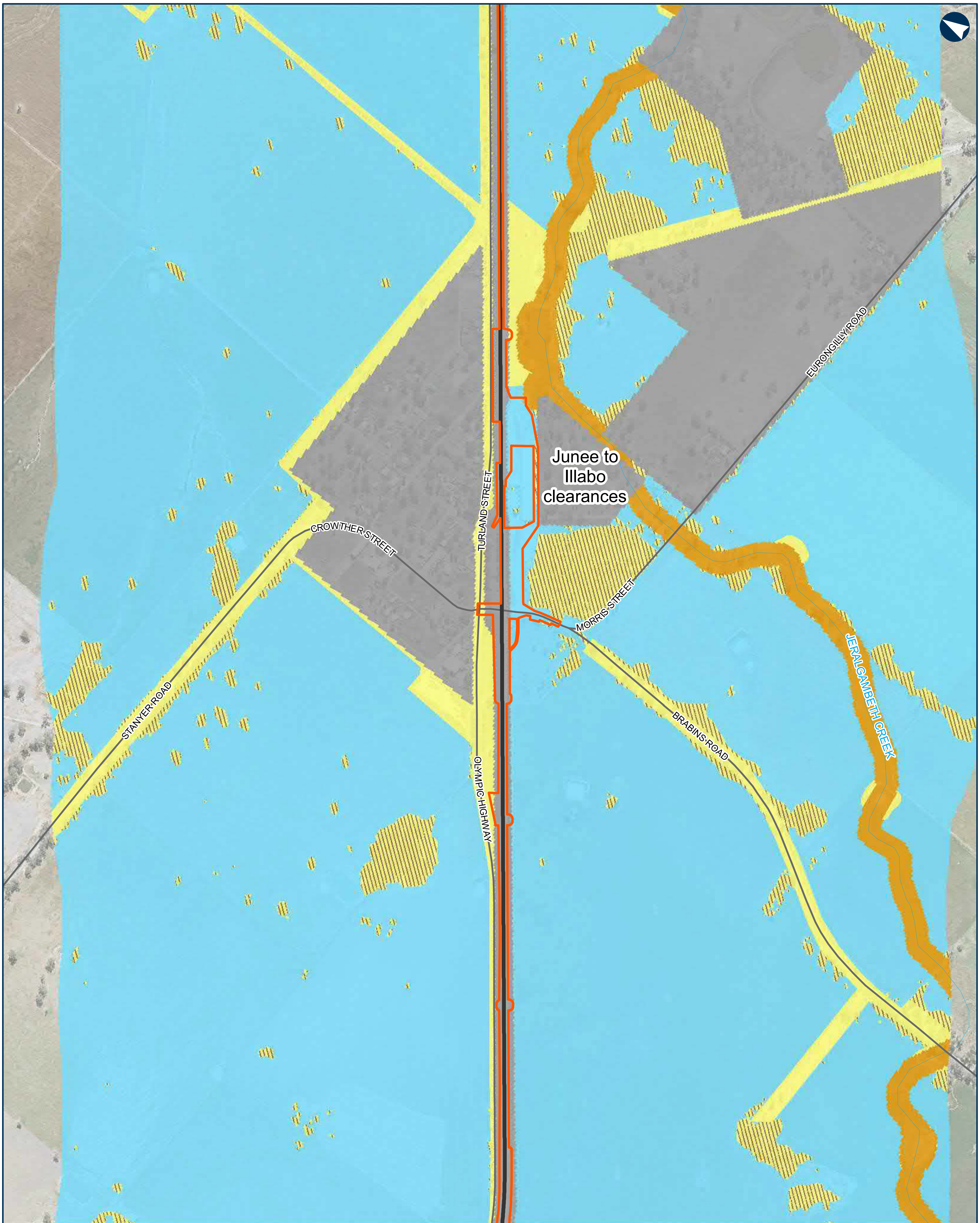
Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 19 OF 20



0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse

Native Vegetation Regulatory mapping

- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – conflicting data
- Category 2 – regulated land
- Category 2 – vulnerable regulated land
- Excluded land

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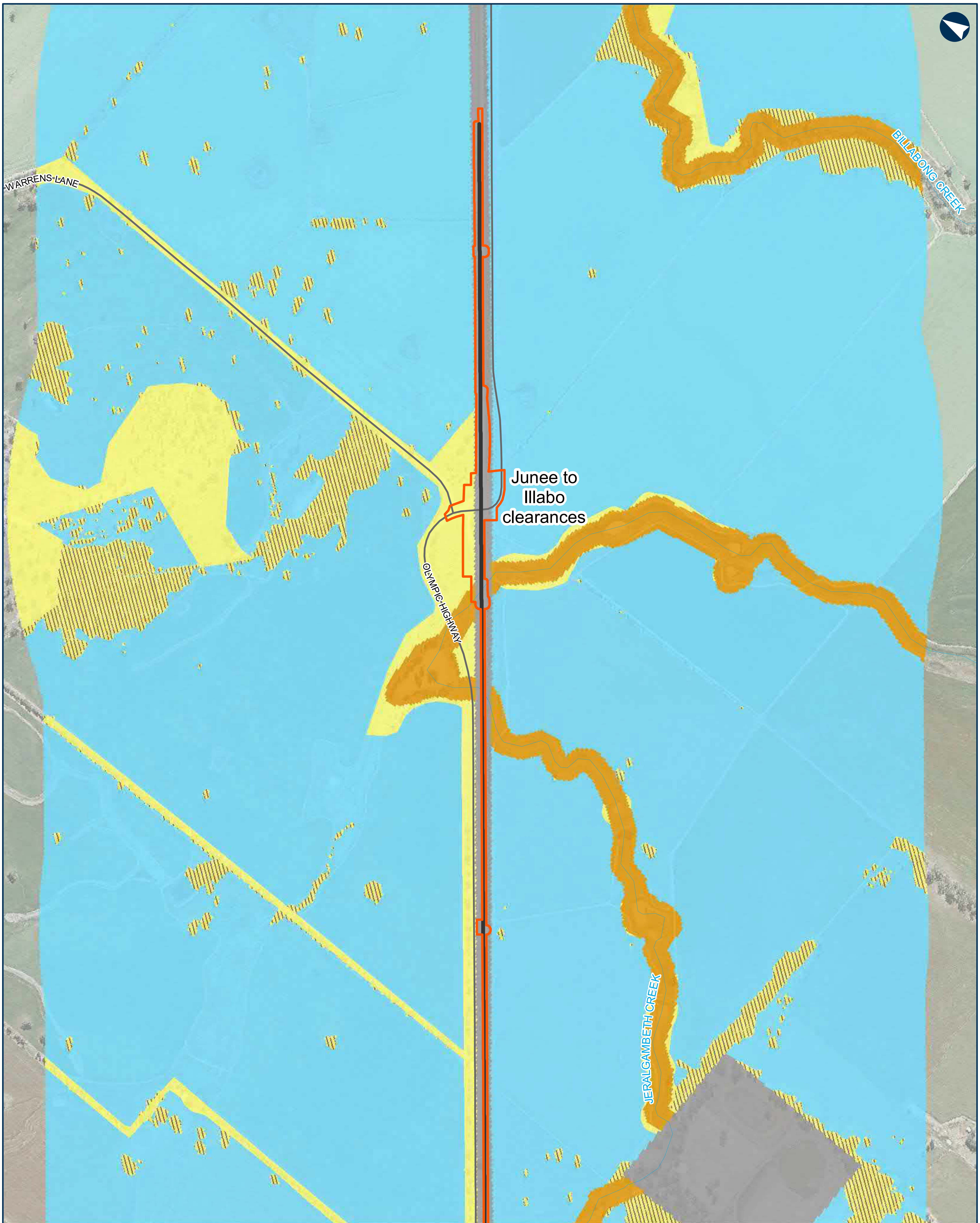

Albury to Illabo

Appendix B1 – Native vegetation regulatory mapping category 1-exempt land

MAP 20 OF 20

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:8,000
Data Sources: ARTC, NSWSS, DPIE

- Proposal site
- Existing railway
- Main road
- Watercourse

Native Vegetation Regulatory mapping

- Category 1 (BAM does not apply except for prescribed impacts)
- Category 2 – conflicting data
- Category 2 – regulated land
- Category 2 – vulnerable regulated land
- Excluded land

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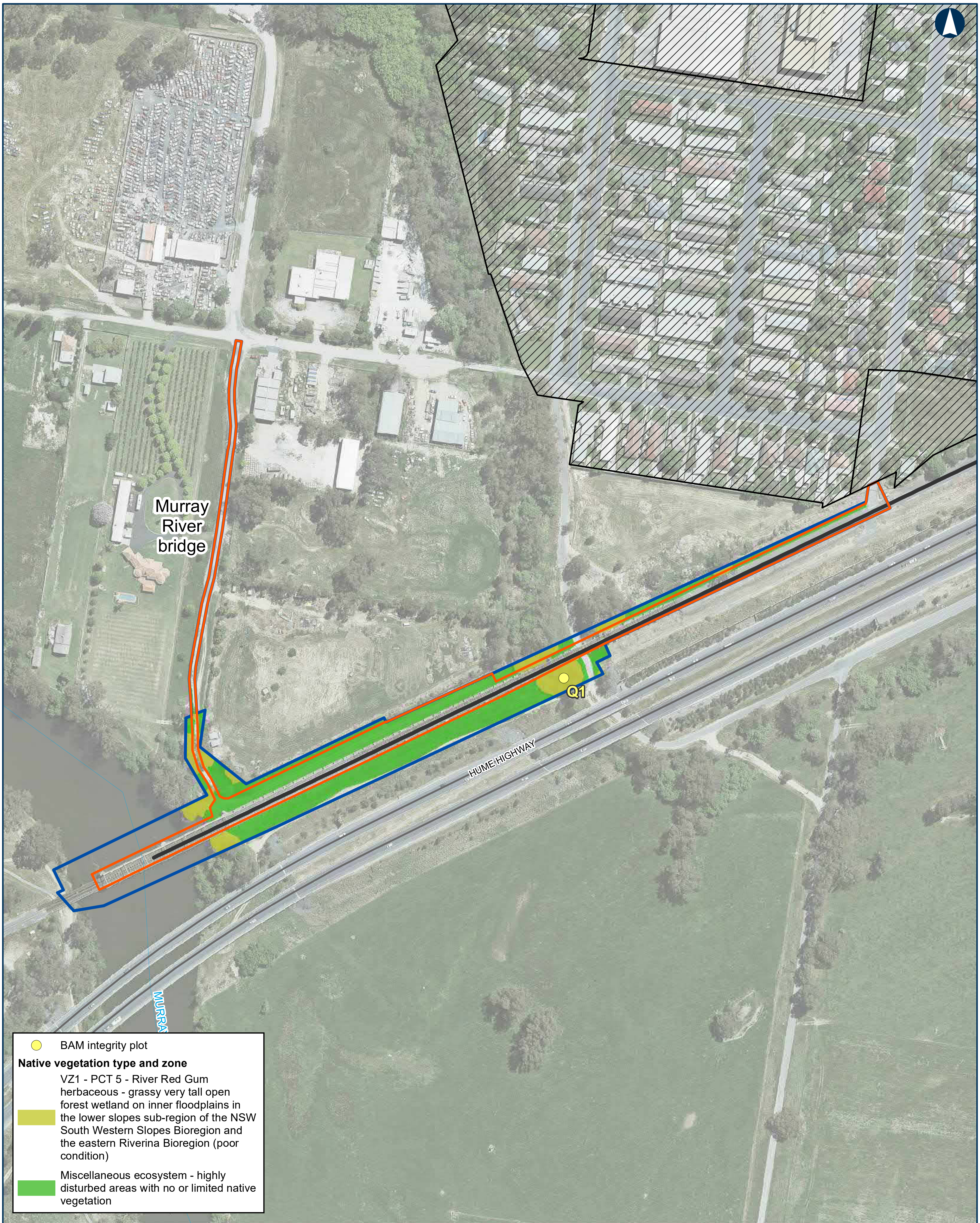
APPENDIX B-2
NATIVE VEGETATION TYPES, ZONES AND BAM INTEGRITY PLOTS WITHIN THE STUDY AREA



Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

MAP 1 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:2,500
Data Sources: ARTC, NSWSS

- Proposal site
- Study area
- Existing railway
- Main road
- Watercourse
- Certified land

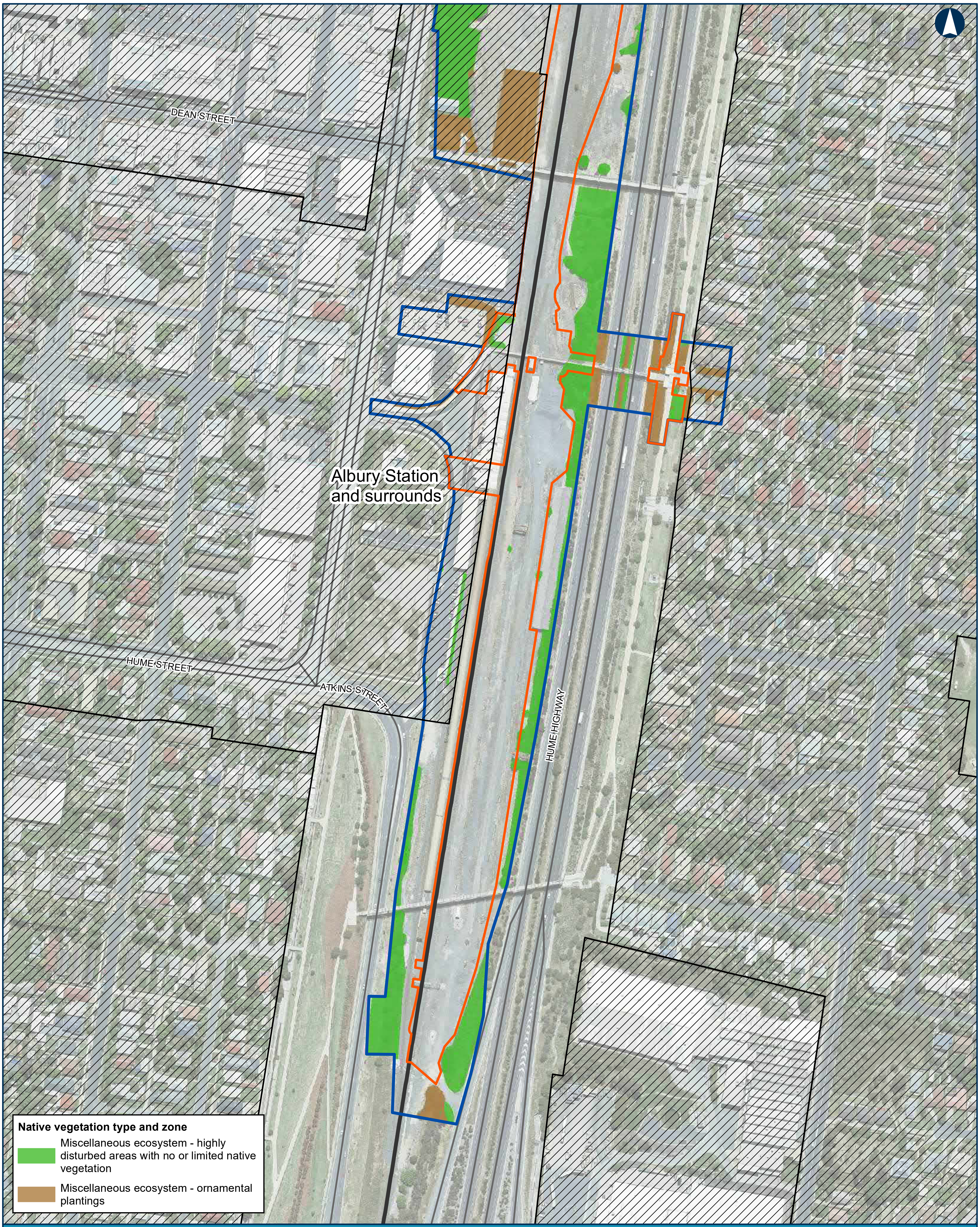
INLAND RAIL ARTC

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

Albury to Illabo

Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

MAP 2 OF 28



0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Author: WSP
Paper: A3
Scale: 1:3,000
Data Sources: ARTC, NSWSS

- Proposal site
- Study area
- Existing railway
- Main road
- Certified land

INLAND RAIL

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Albury to Illabo | Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area | MAP 3 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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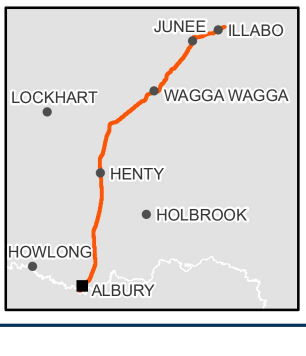
Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Certified land



INLAND RAIL ARTC

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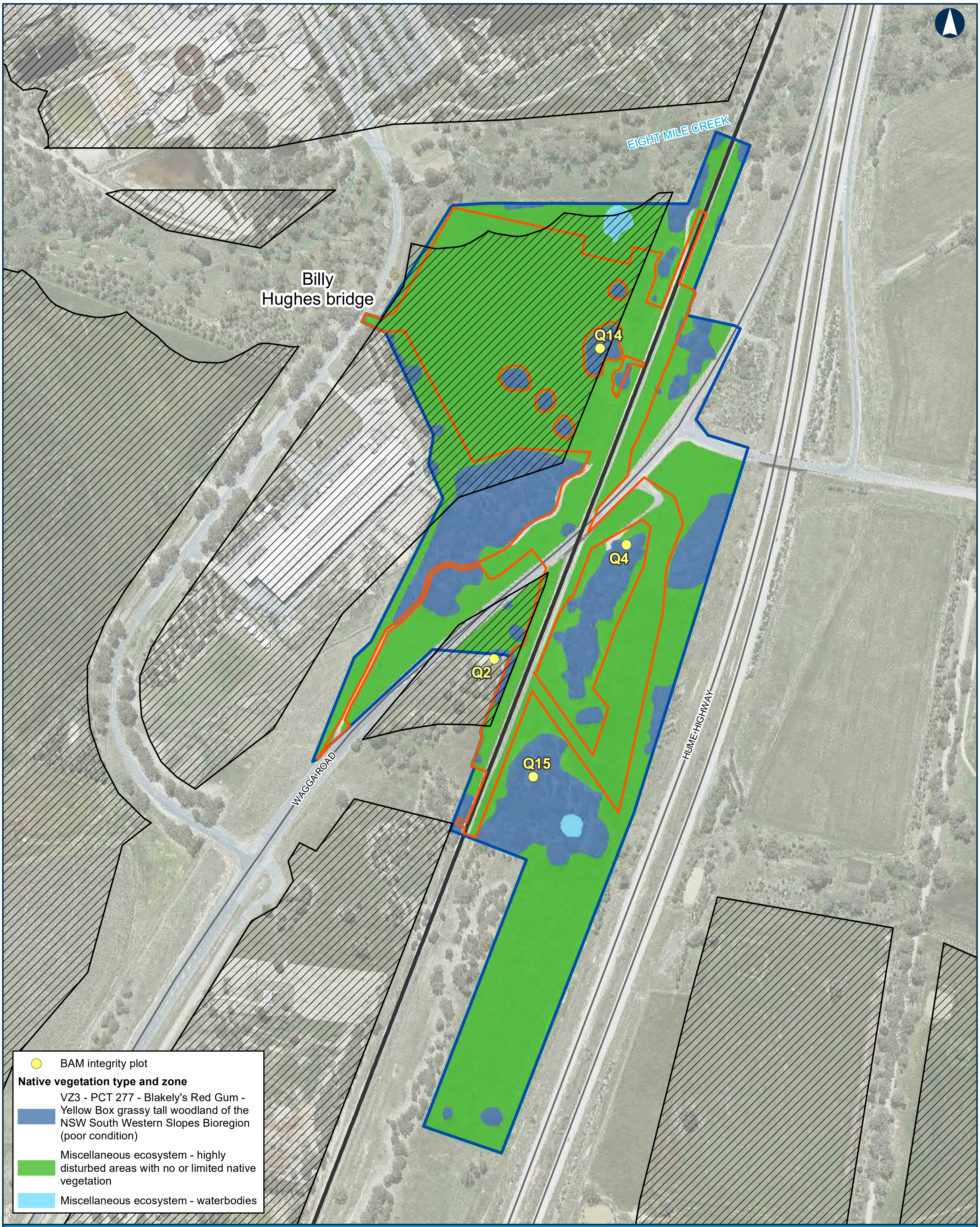

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 4 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:4,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Watercourse
Certified land

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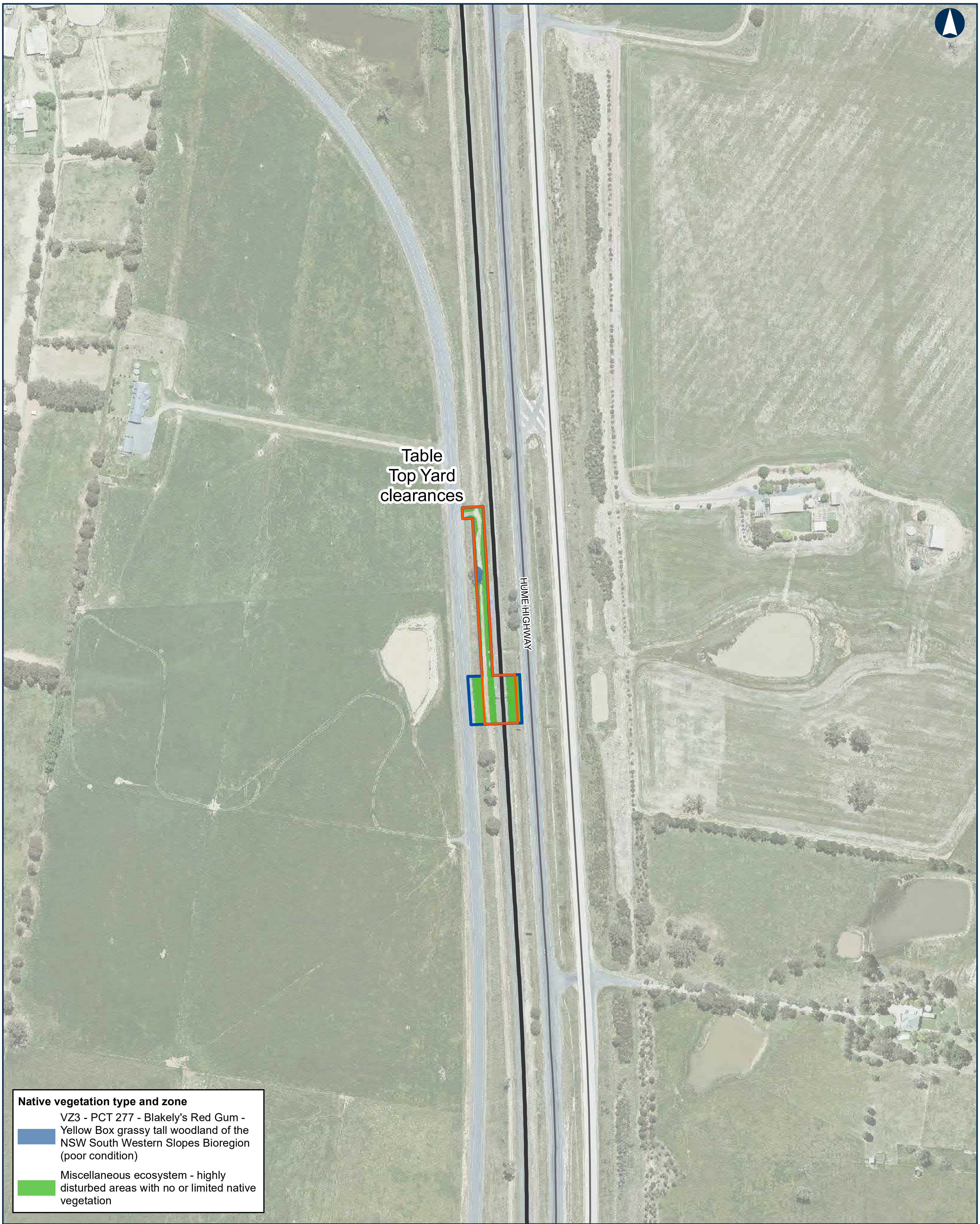

Albury to Illabo

Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

MAP 5 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

- Proposal site
- Study area
- Existing railway
- Main road

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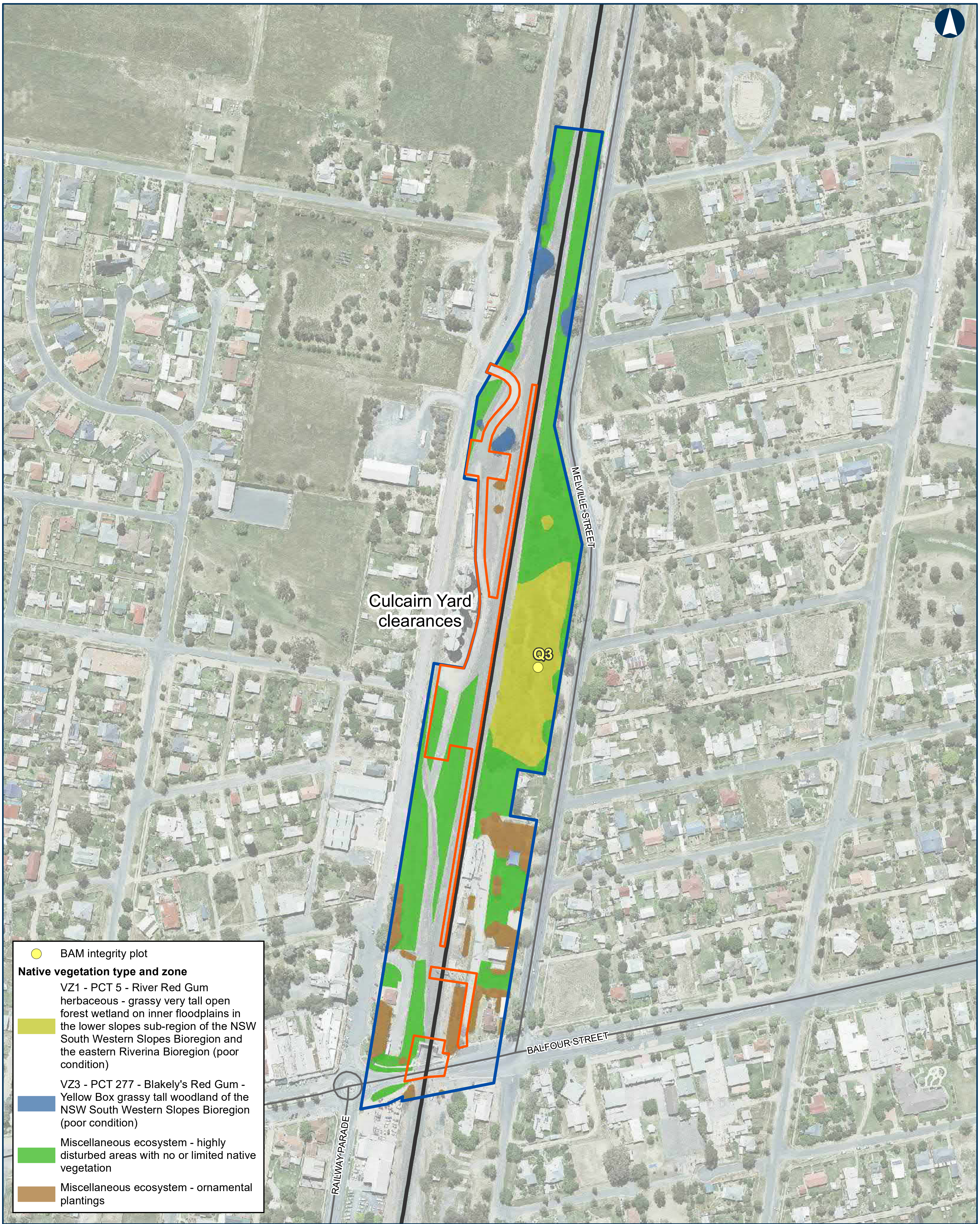


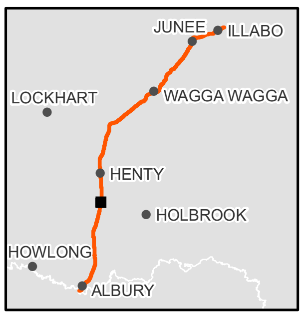
Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 6 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road



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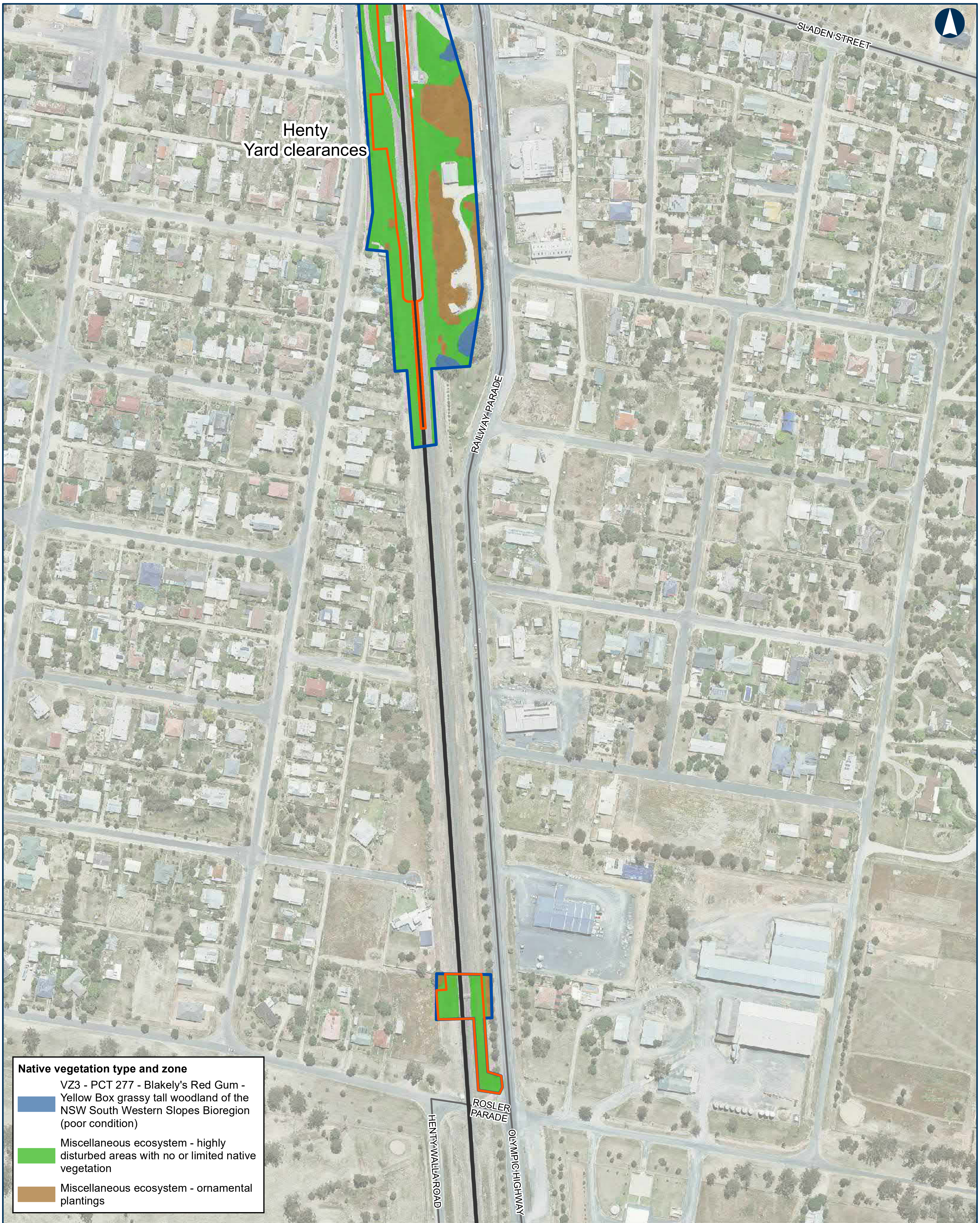

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 7 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road

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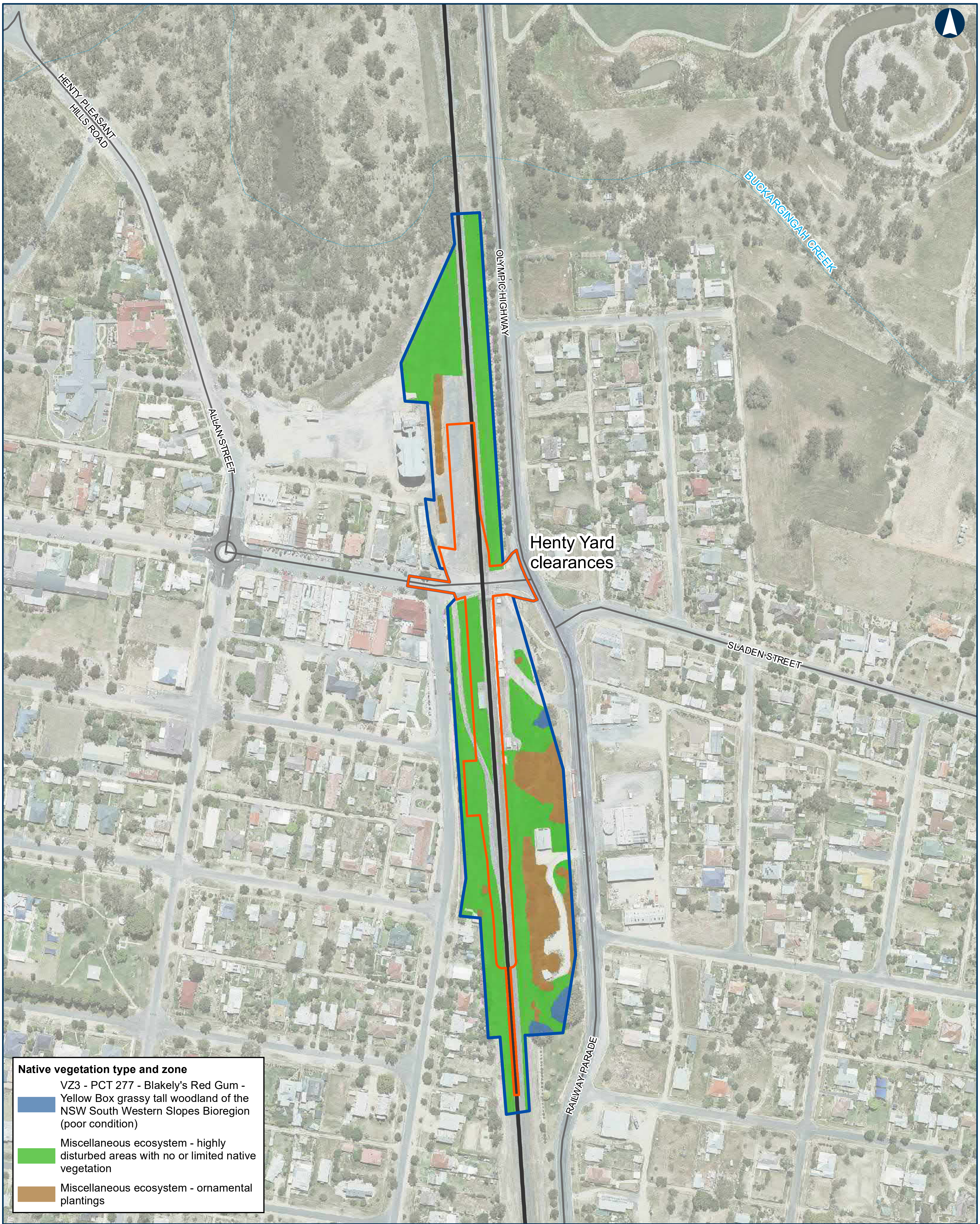

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 8 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Watercourse

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Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 9 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS

- Proposal site
- Study area
- Existing railway
- Main road
- Watercourse

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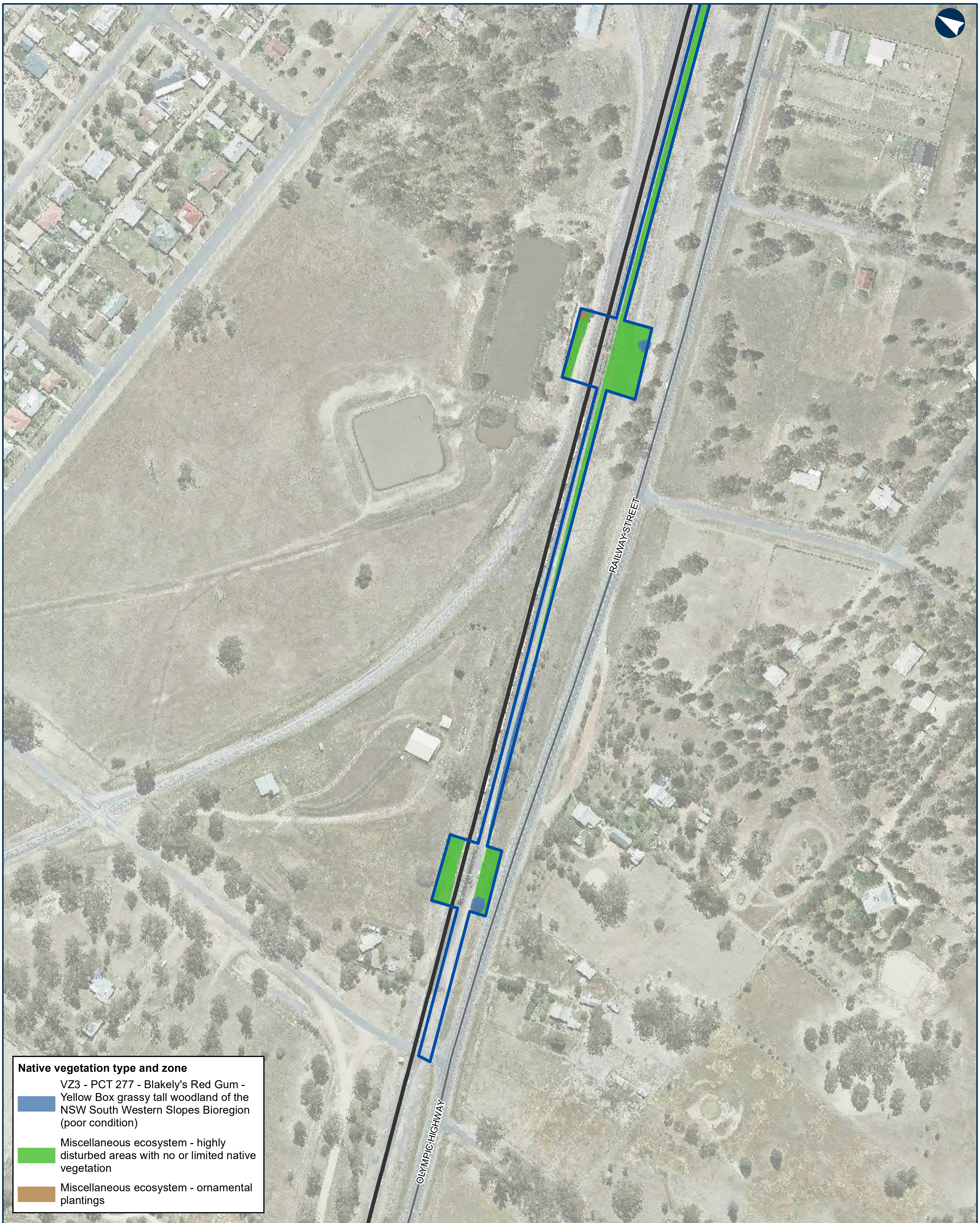


Albury to Illabo

Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

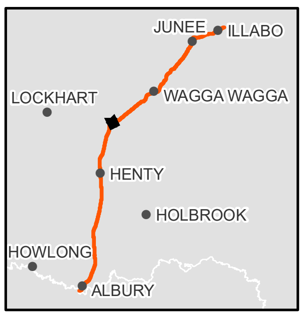
MAP 10 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Author: WSP
Data Sources: ARTC, NSWSS
Paper: A3
Scale: 1:2,500

Study area
Existing railway
Main road



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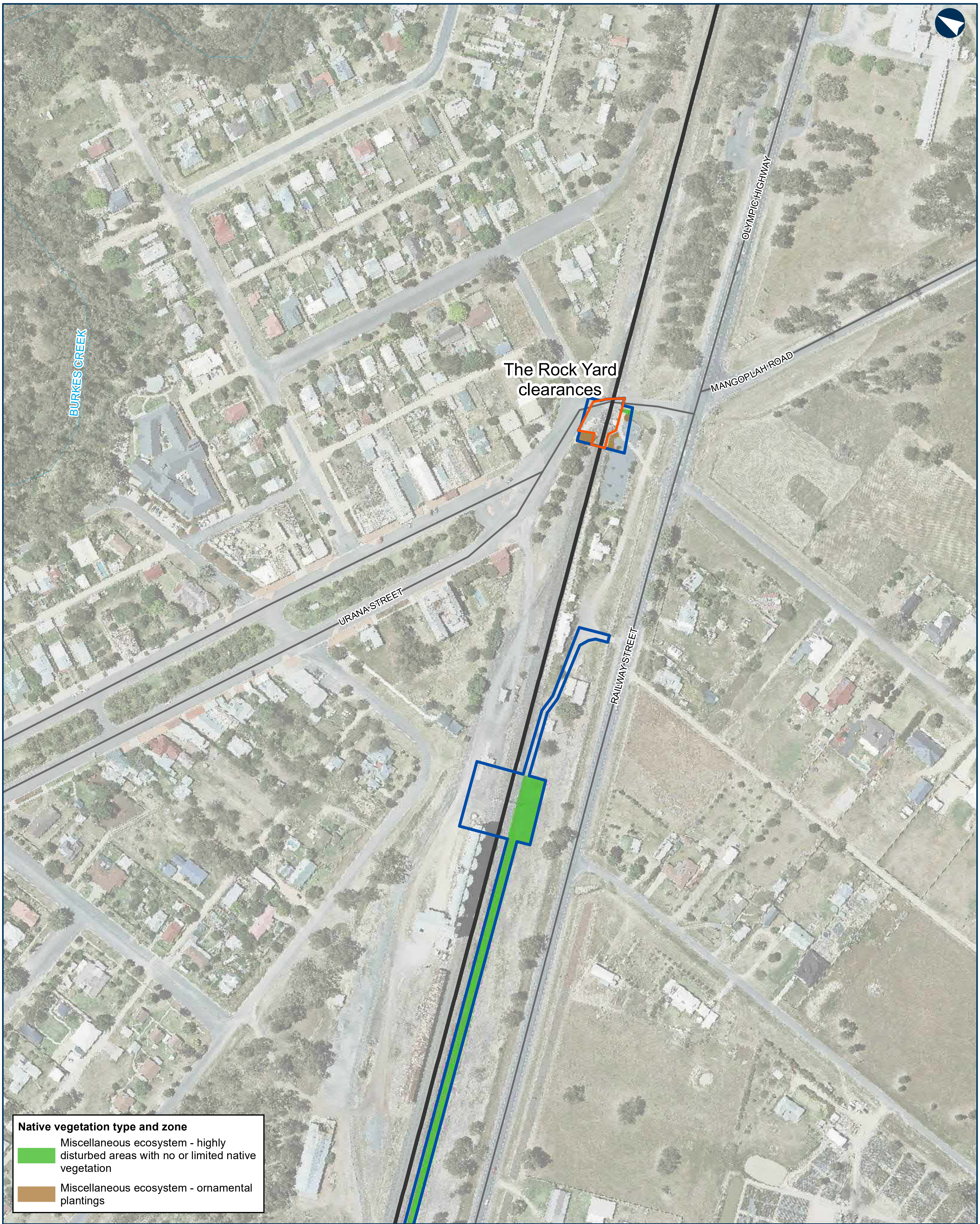


Albury to Illabo

Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

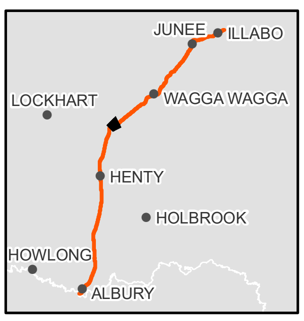
MAP 11 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:2,500
Data Sources: ARTC, NSWSS

- Proposal site
- Study area
- Existing railway
- Main road
- Watercourse



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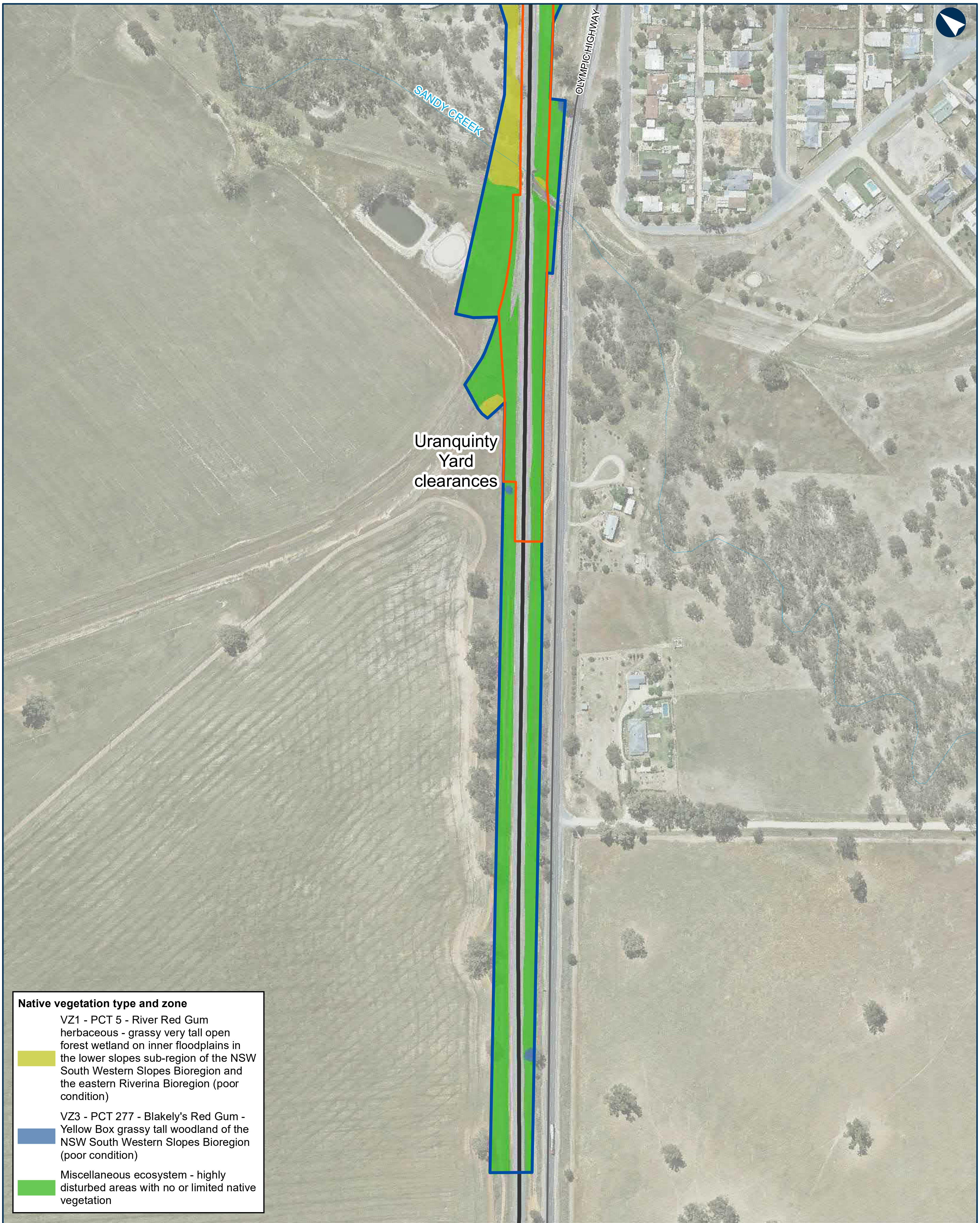


Albury to Illabo

Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

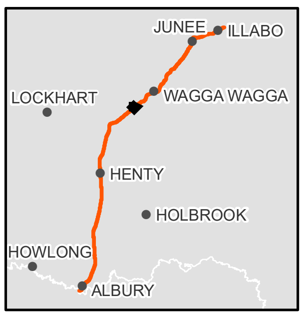
MAP 12 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:3,000
Data Sources: ARTC, NSWSS

- Proposal site
- Study area
- Existing railway
- Main road
- Watercourse



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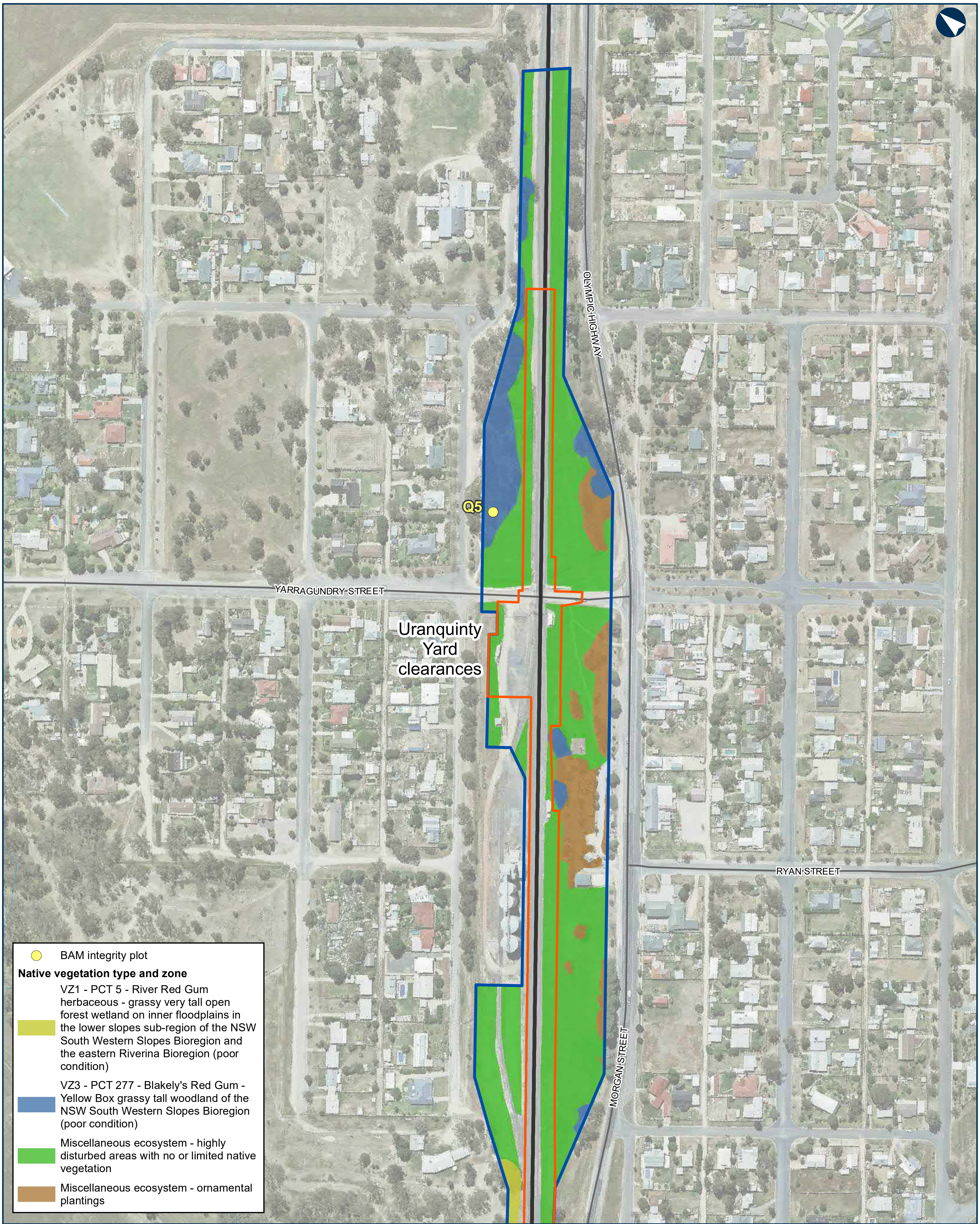


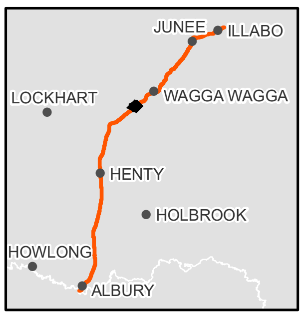
Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 13 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Watercourse



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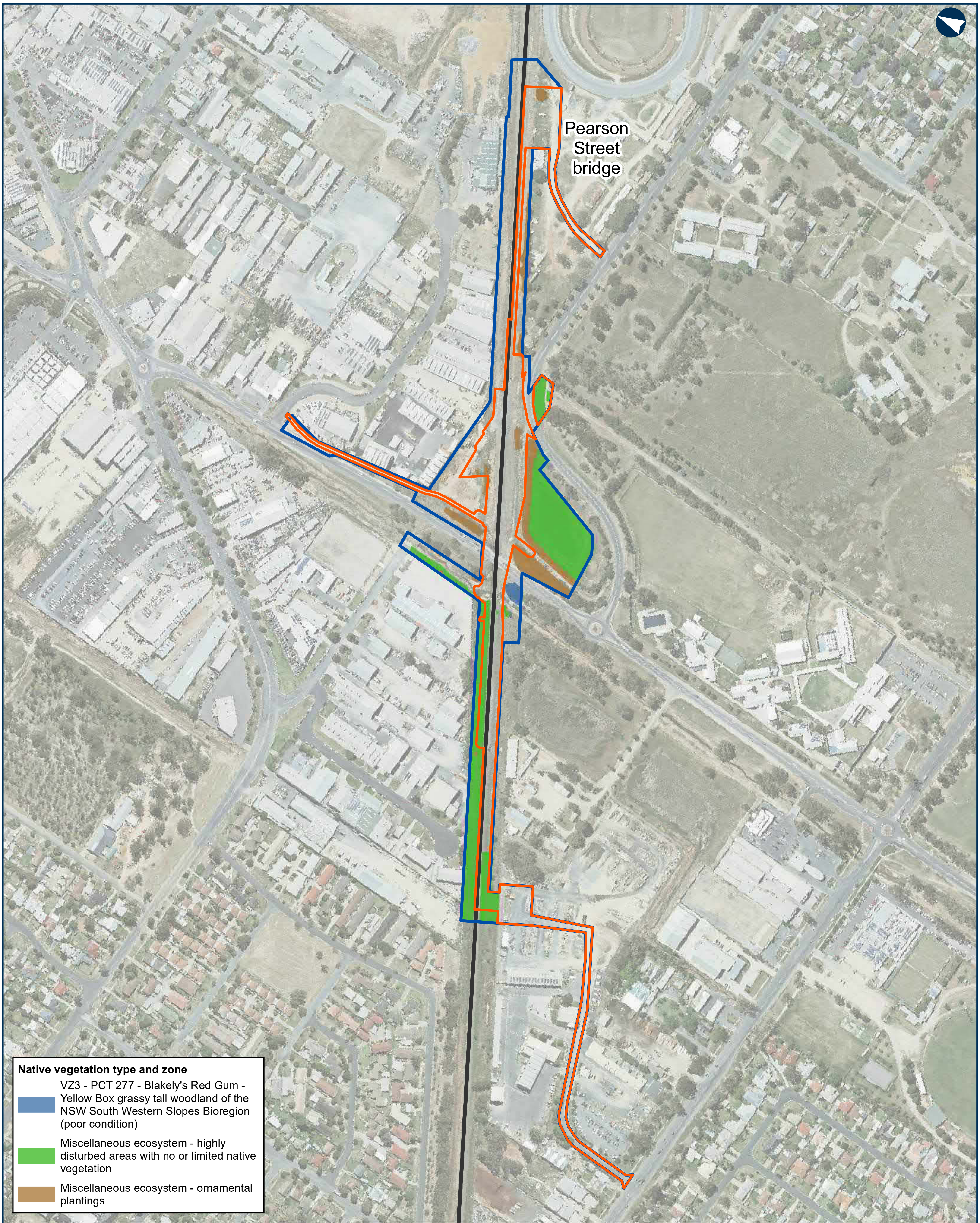

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 14 OF 28

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:4,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway

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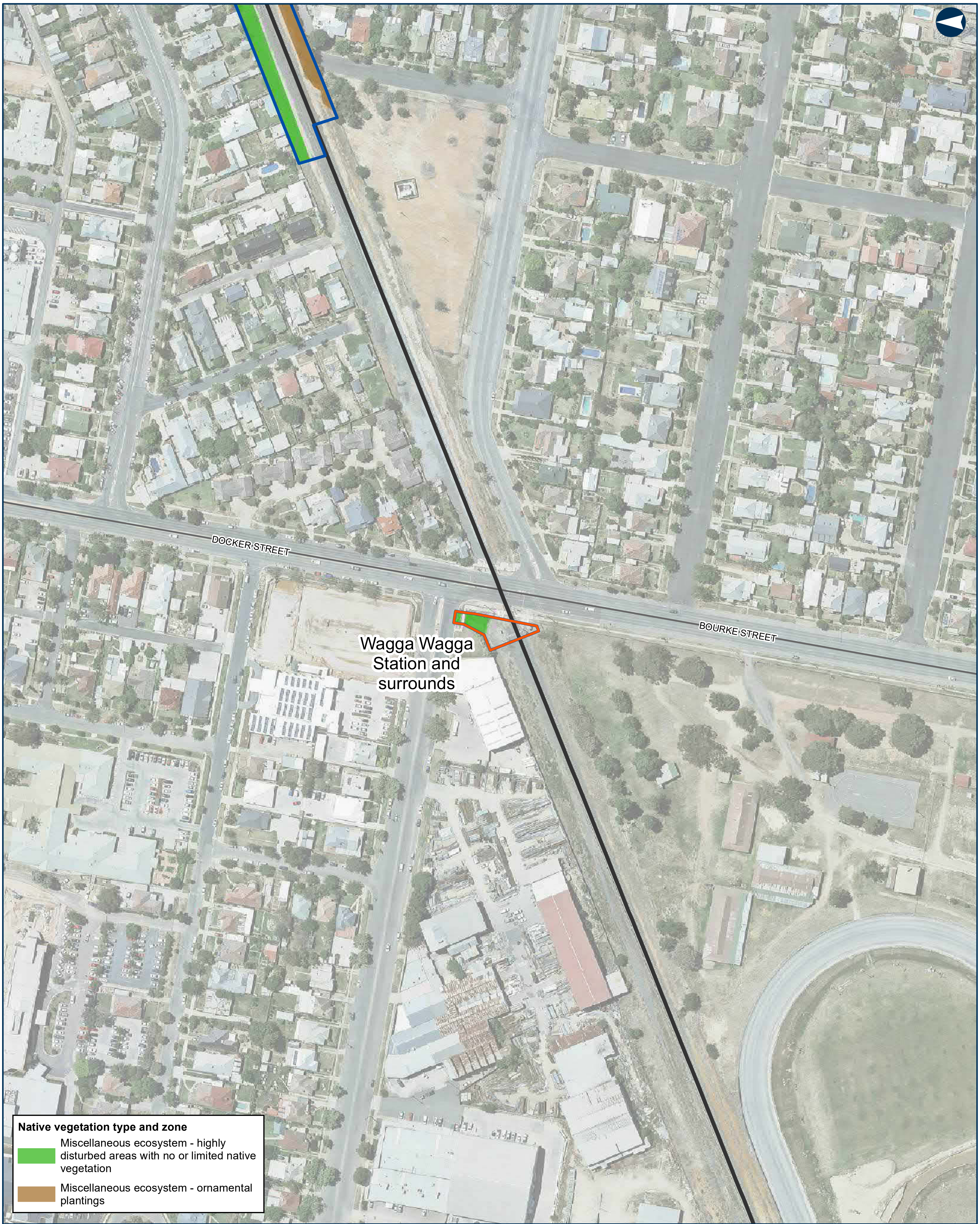


Albury to Illabo — Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

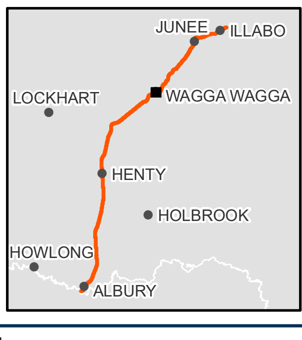
MAP 15 OF 28

0 50 100 m

Proposal site
Study area
Existing railway
Main road

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:2,000
Data Sources: ARTC, NSWSS



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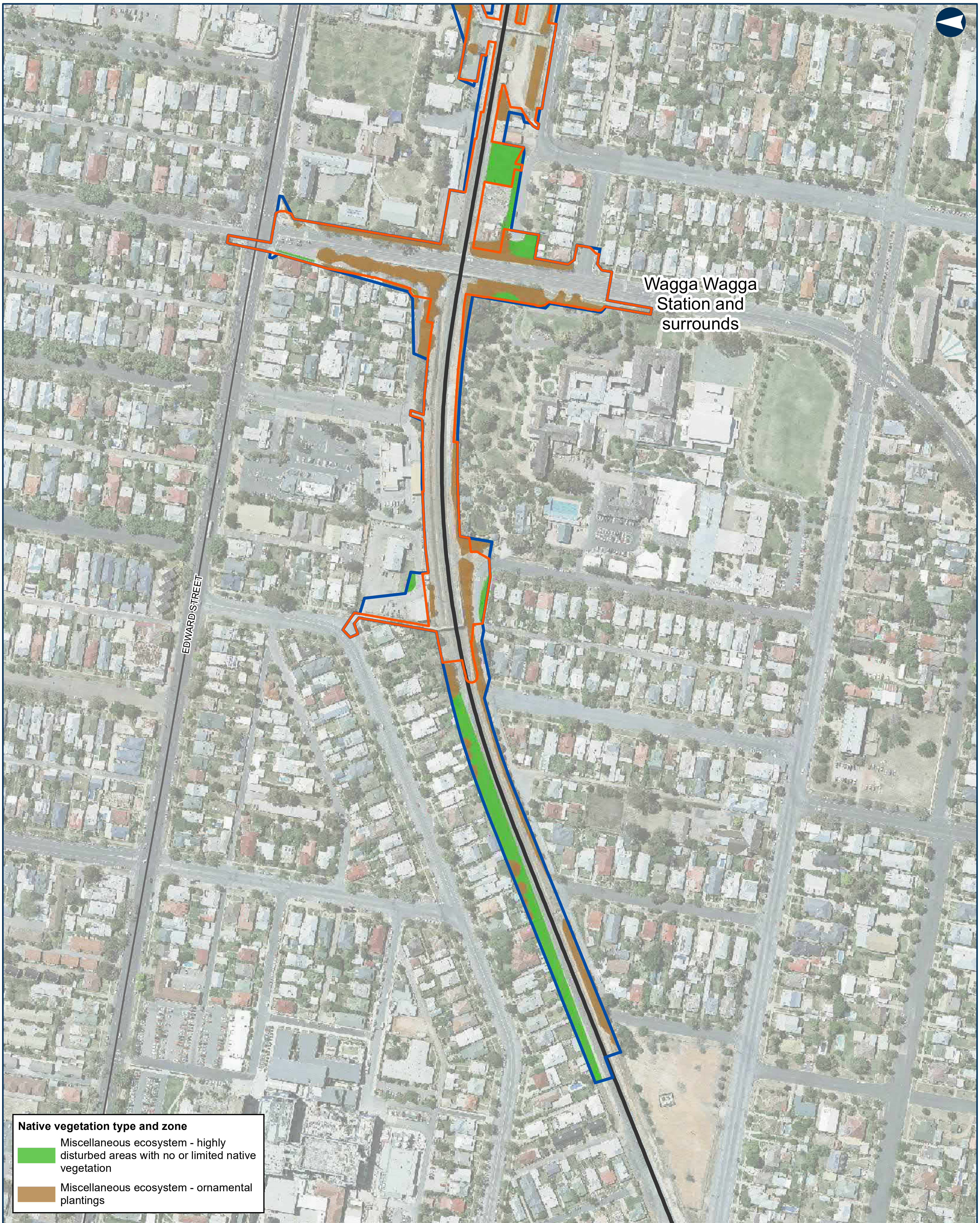

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 16 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road

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Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 17 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road

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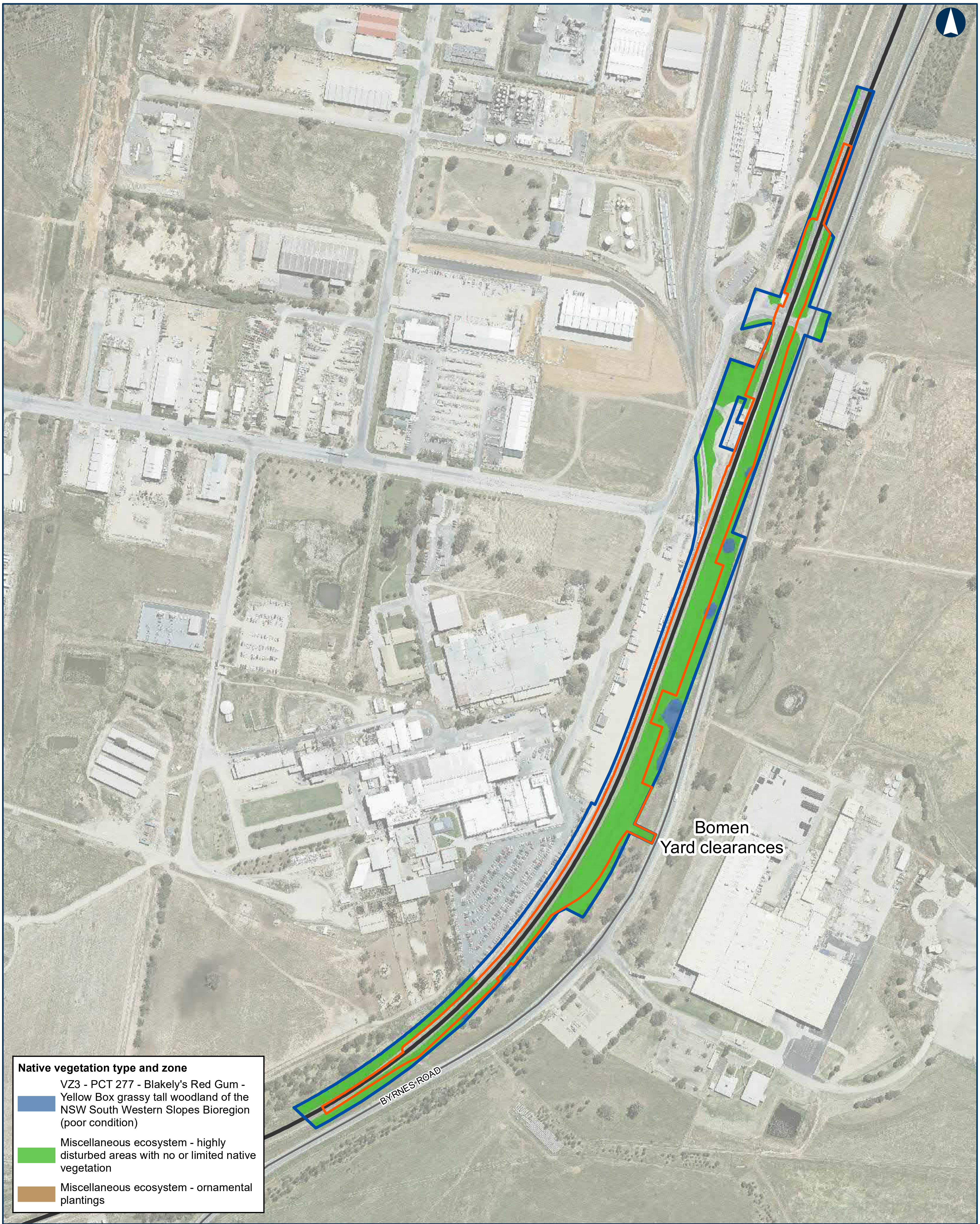


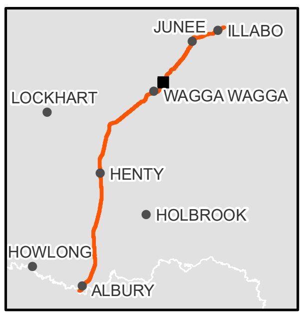
Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 18 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:4,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road



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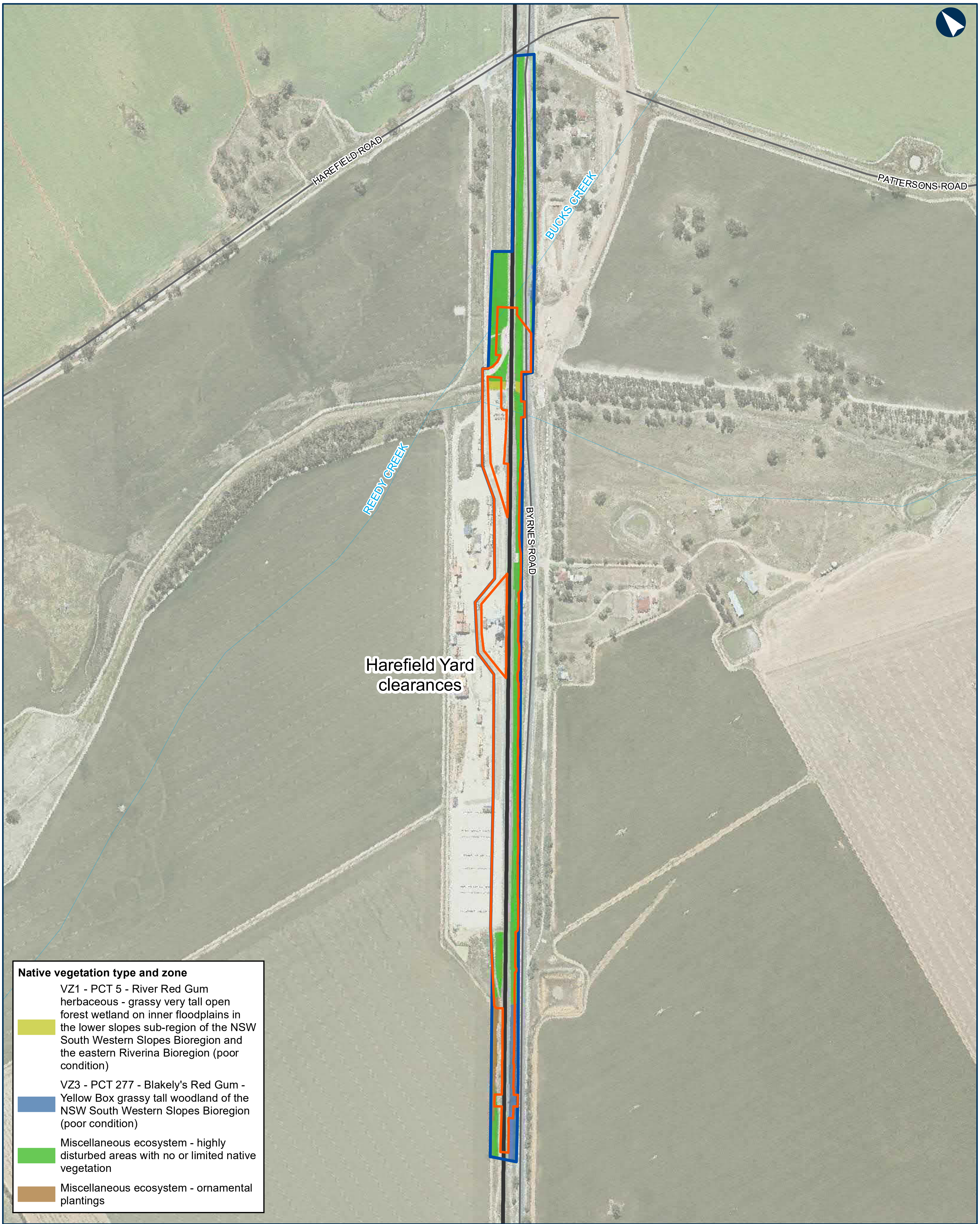

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 19 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:5,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Watercourse

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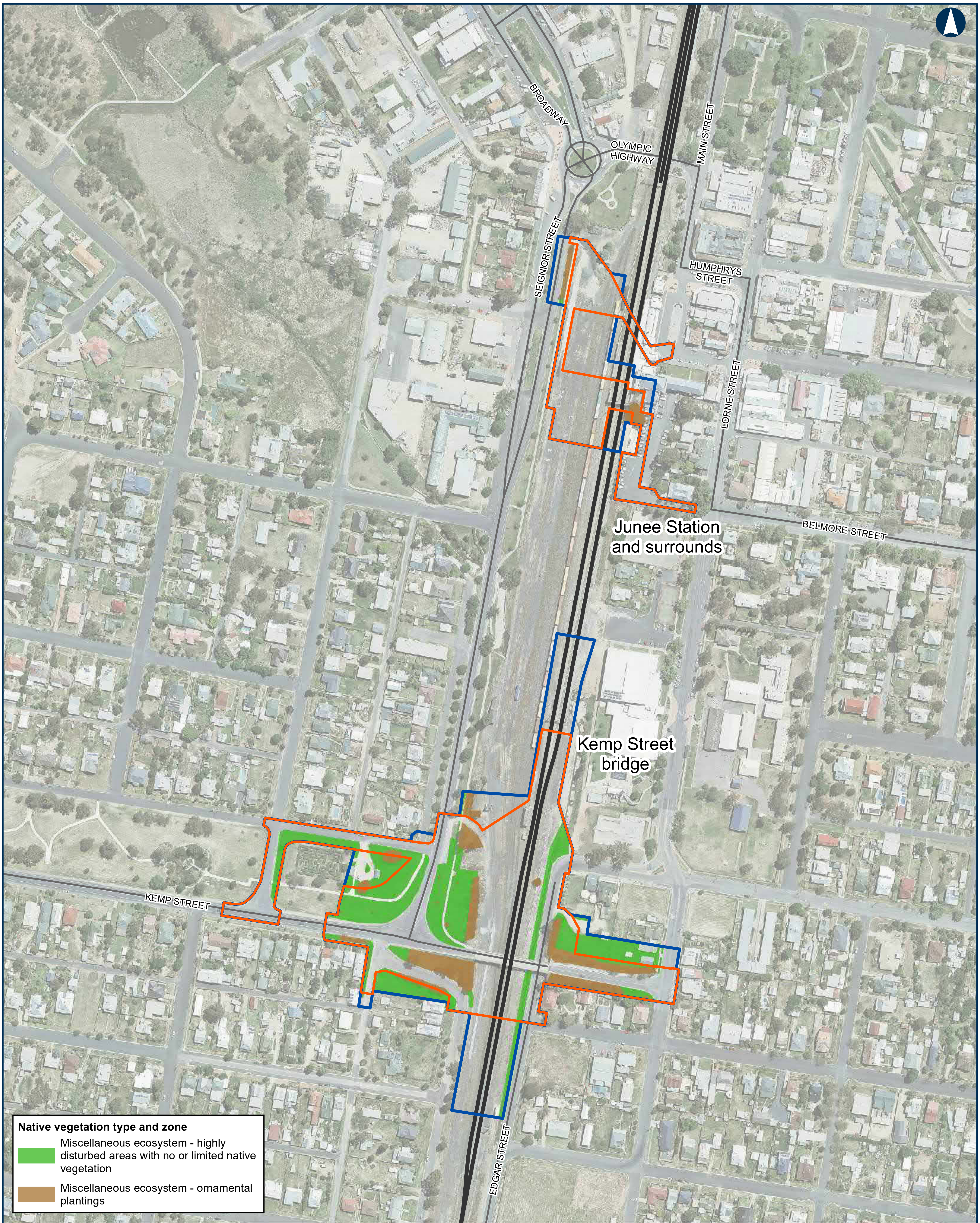

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 20 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Watercourse

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Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 21 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road

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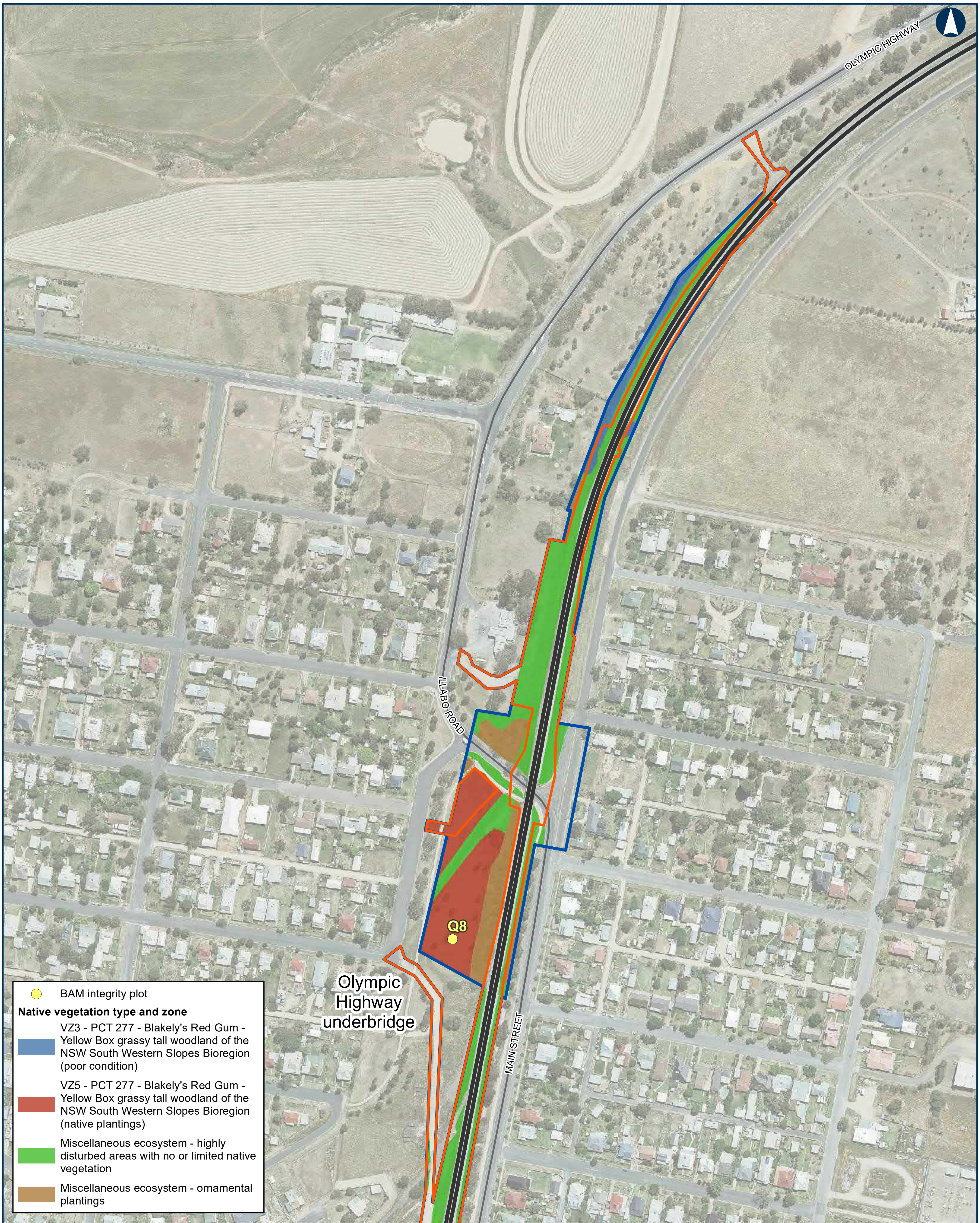

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 22 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:3,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road

INLAND RAIL ARTC

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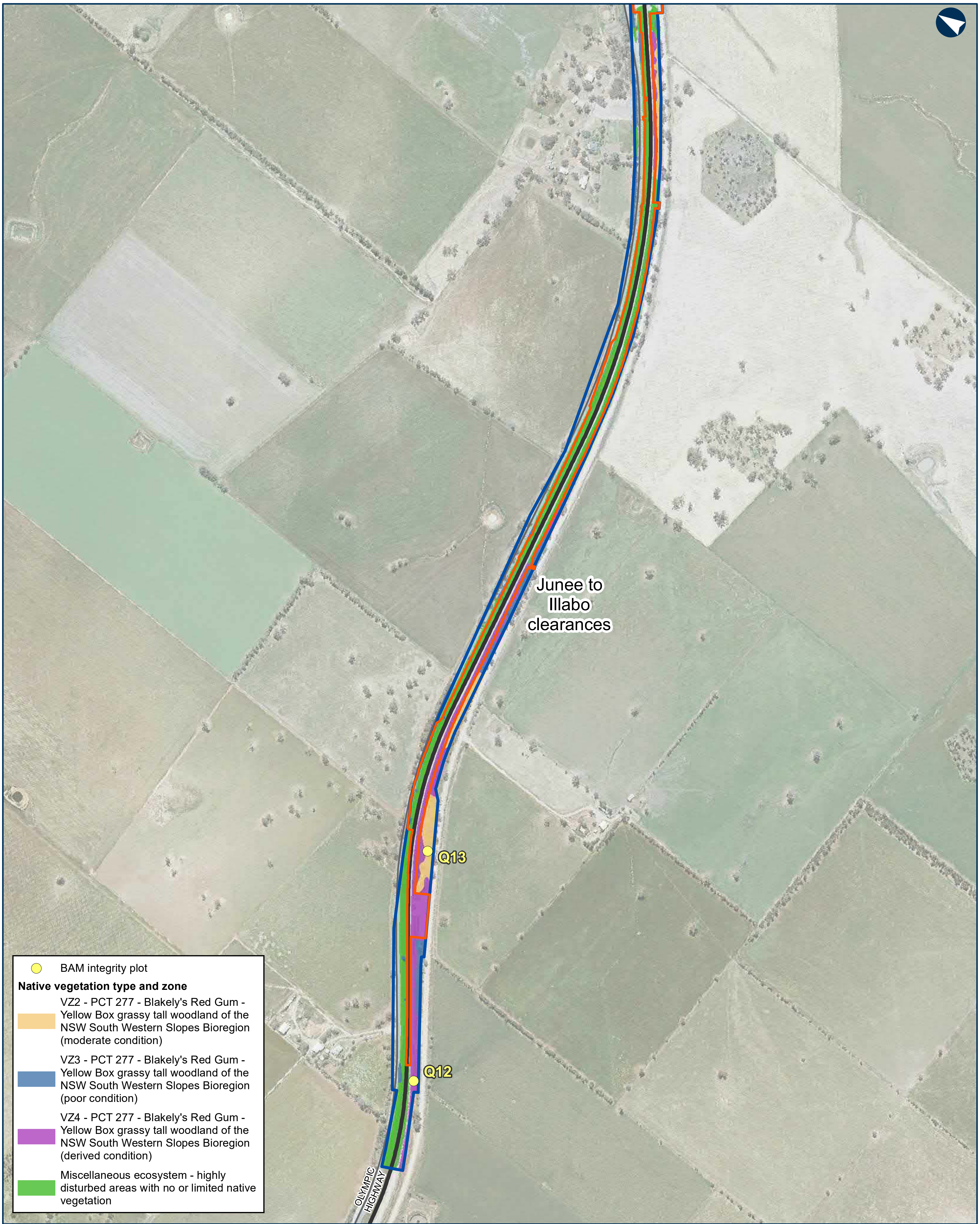

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

MAP 23 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road

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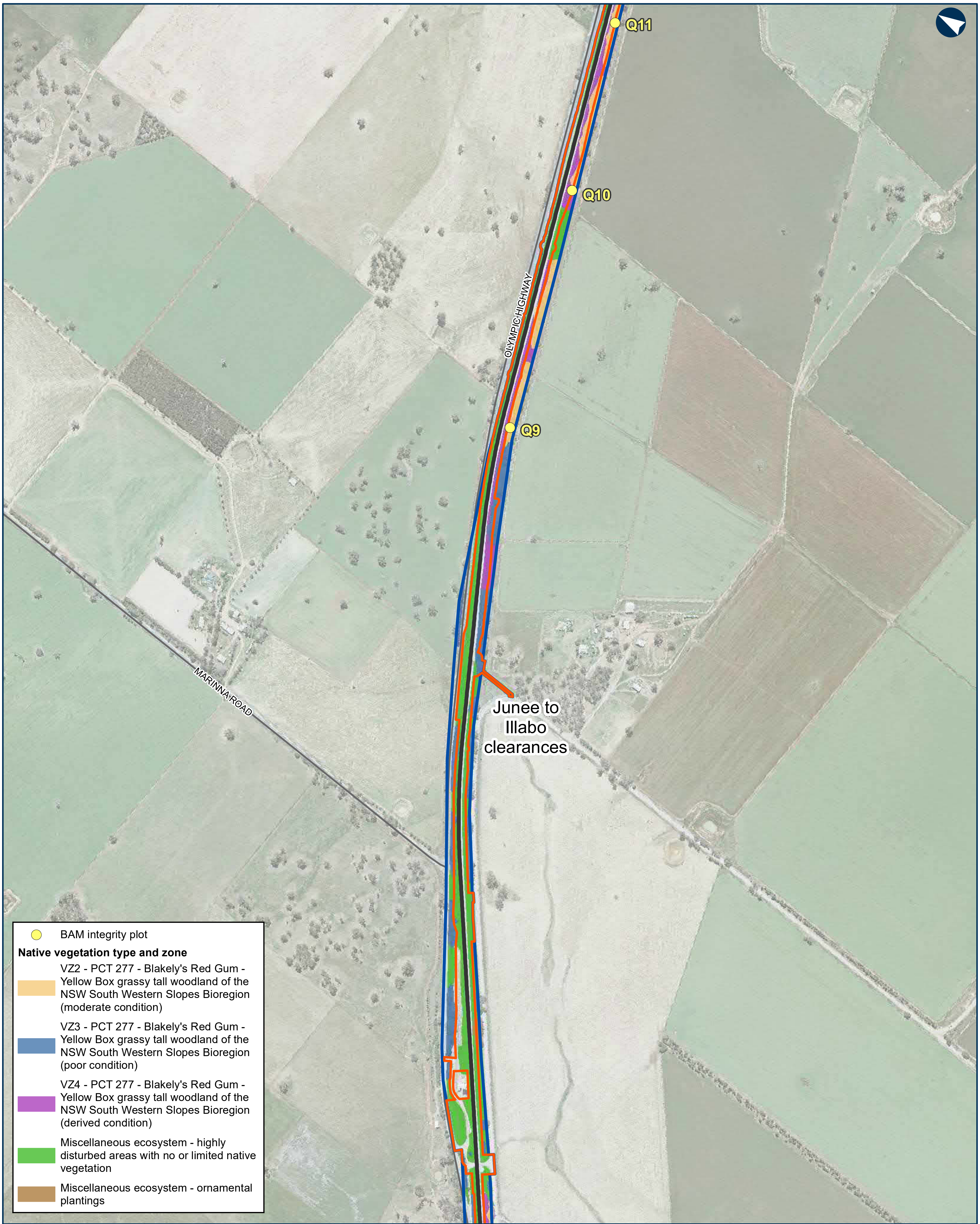

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

MAP 24 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road

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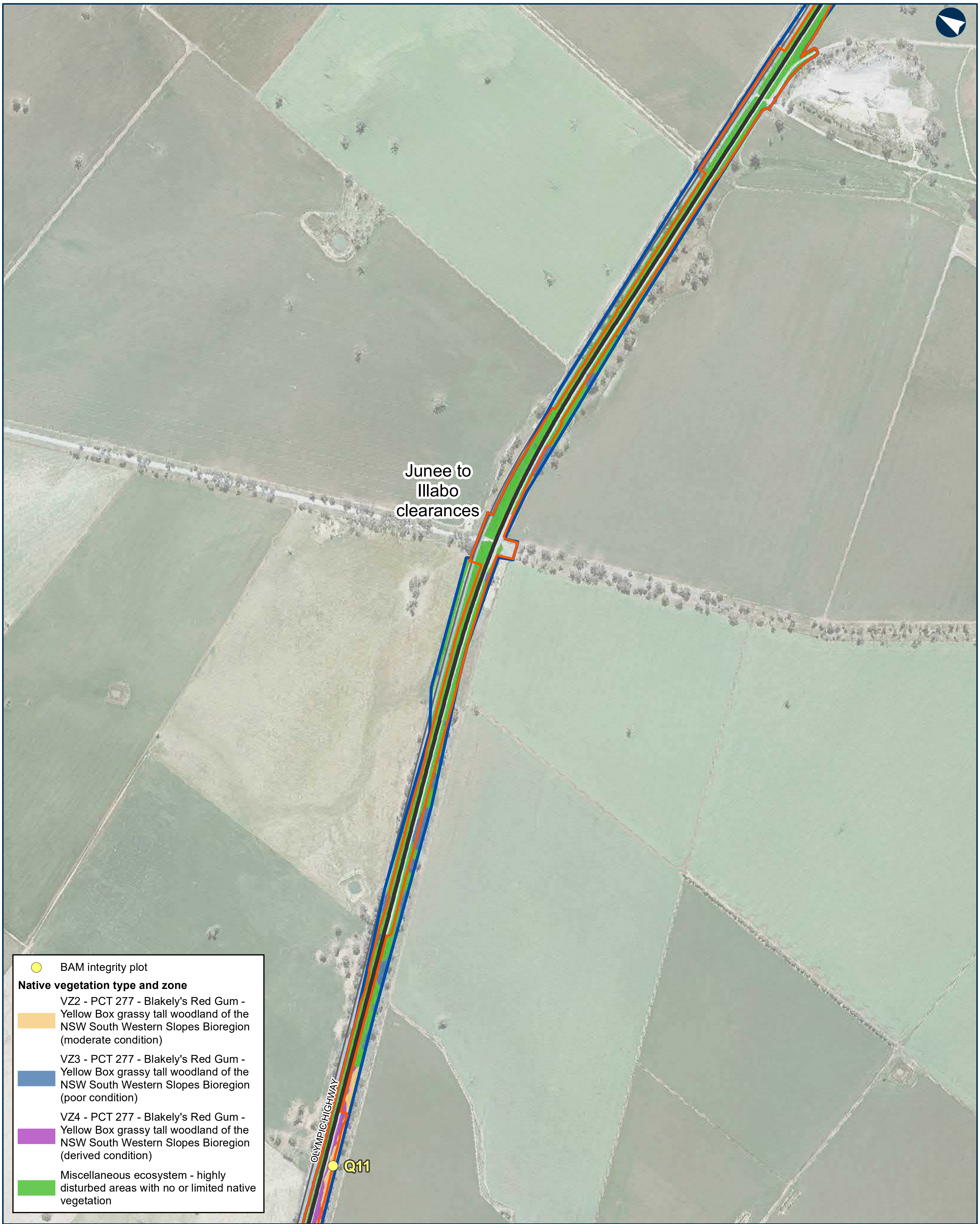

Albury to Illabo

Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

MAP 25 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:8,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road

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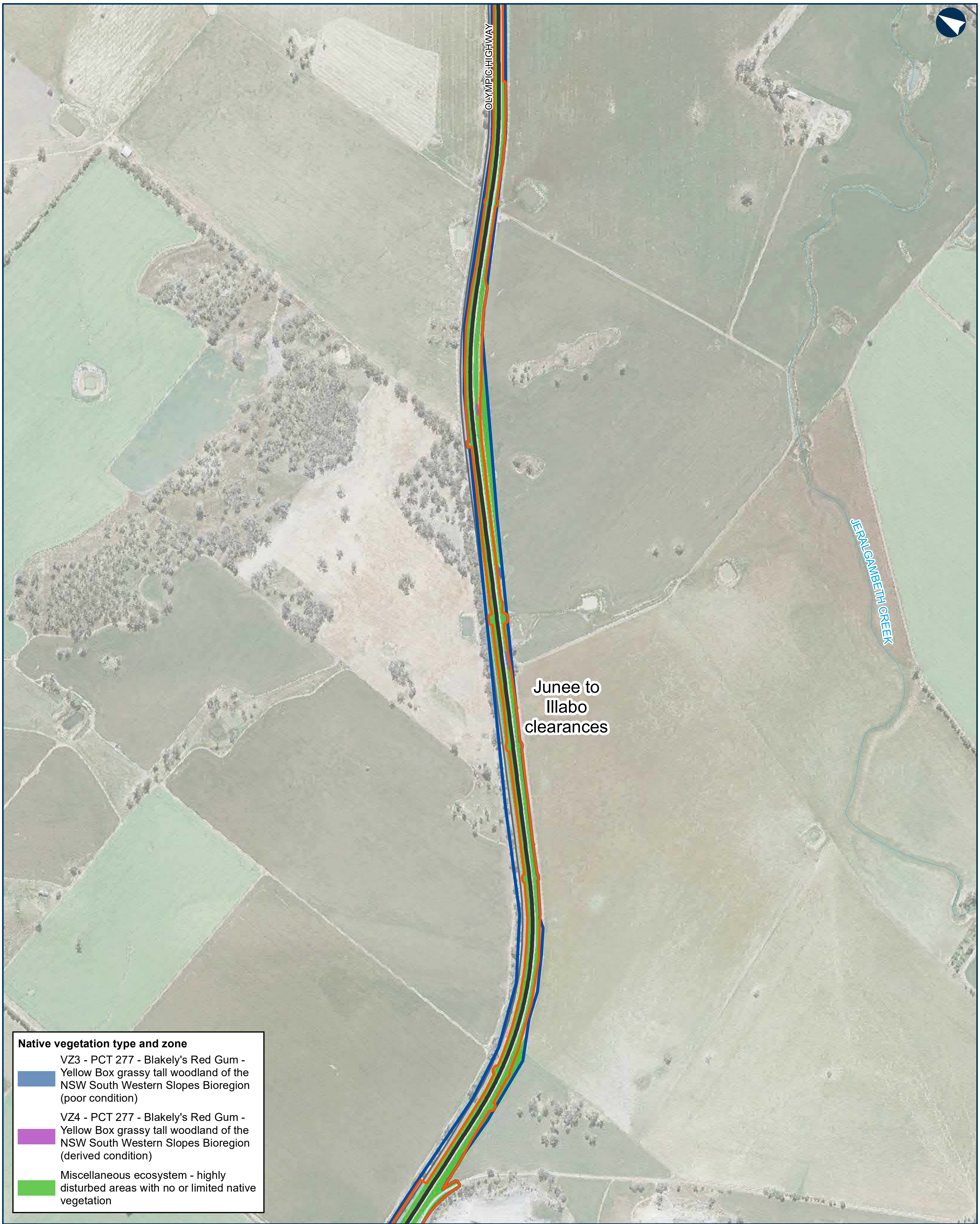

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 26 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Watercourse

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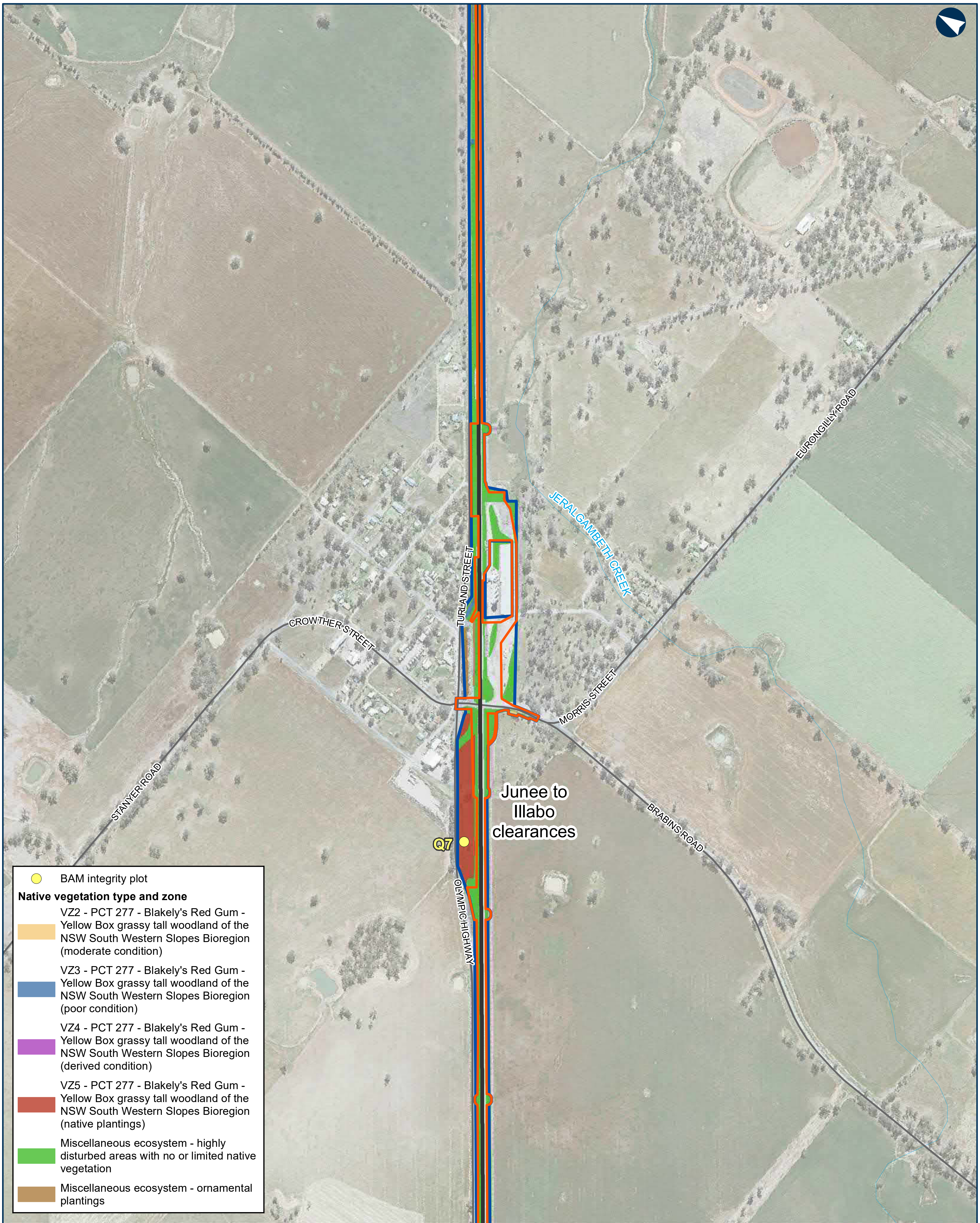

BAM integrity plot

Native vegetation type and zone

- VZ2 - PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (moderate condition)
- VZ3 - PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (poor condition)
- VZ4 - PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived condition)
- VZ5 - PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (native plantings)
- Miscellaneous ecosystem - highly disturbed areas with no or limited native vegetation
- Miscellaneous ecosystem - ornamental plantings

Albury to Illabo

Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area

MAP 27 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:8,000
Data Sources: ARTC, NSWSS

- Proposal site
- Study area
- Existing railway
- Main road
- Watercourse

JUNEE
ILLABO
LOCKHART
WAGGA WAGGA
HENTY
HOLBROOK
HOWLONG
ALBURY

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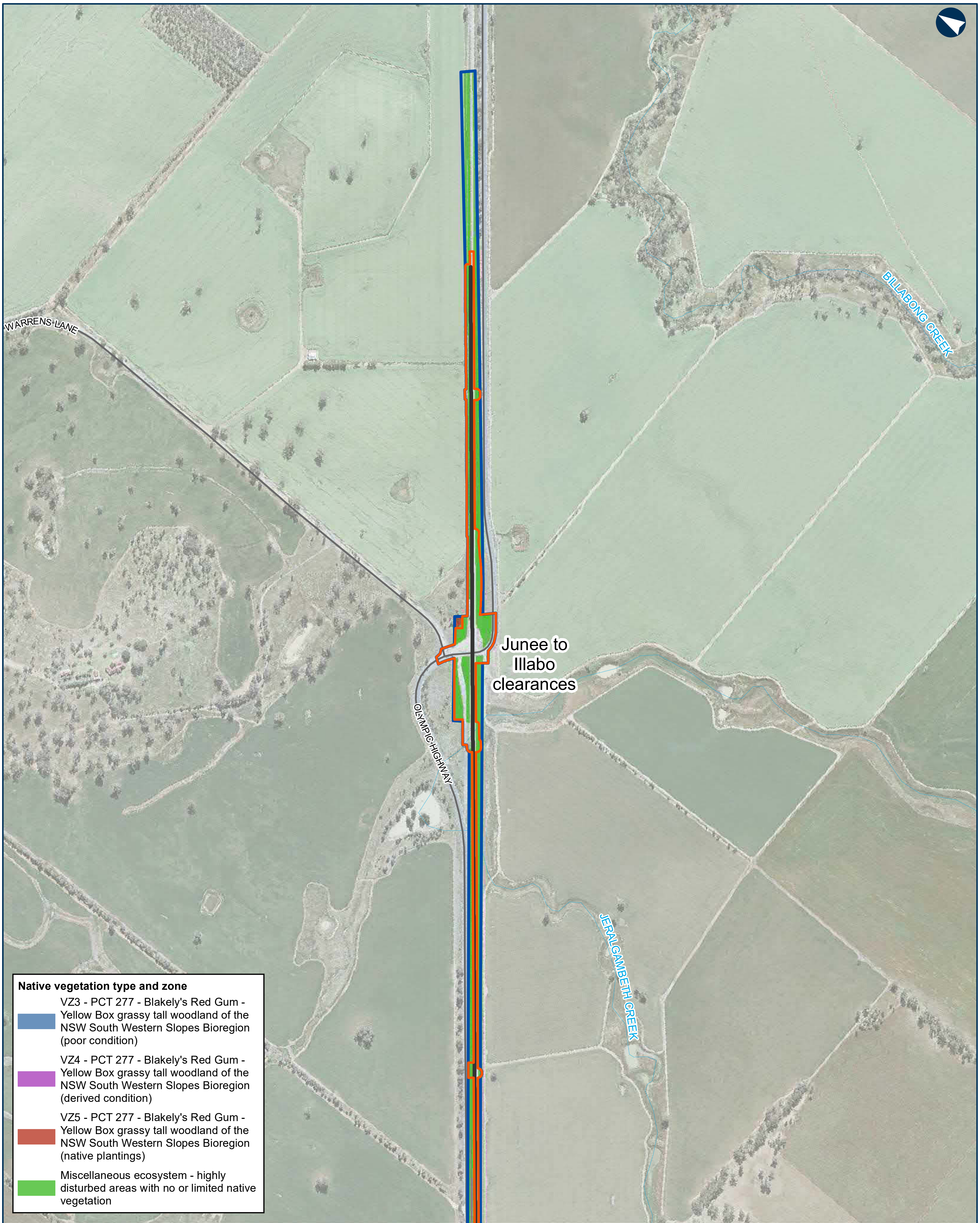

Albury to Illabo Appendix B2 – Native vegetation types, zones and BAM integrity plots within the study area MAP 28 OF 28

0 50 100 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Watercourse

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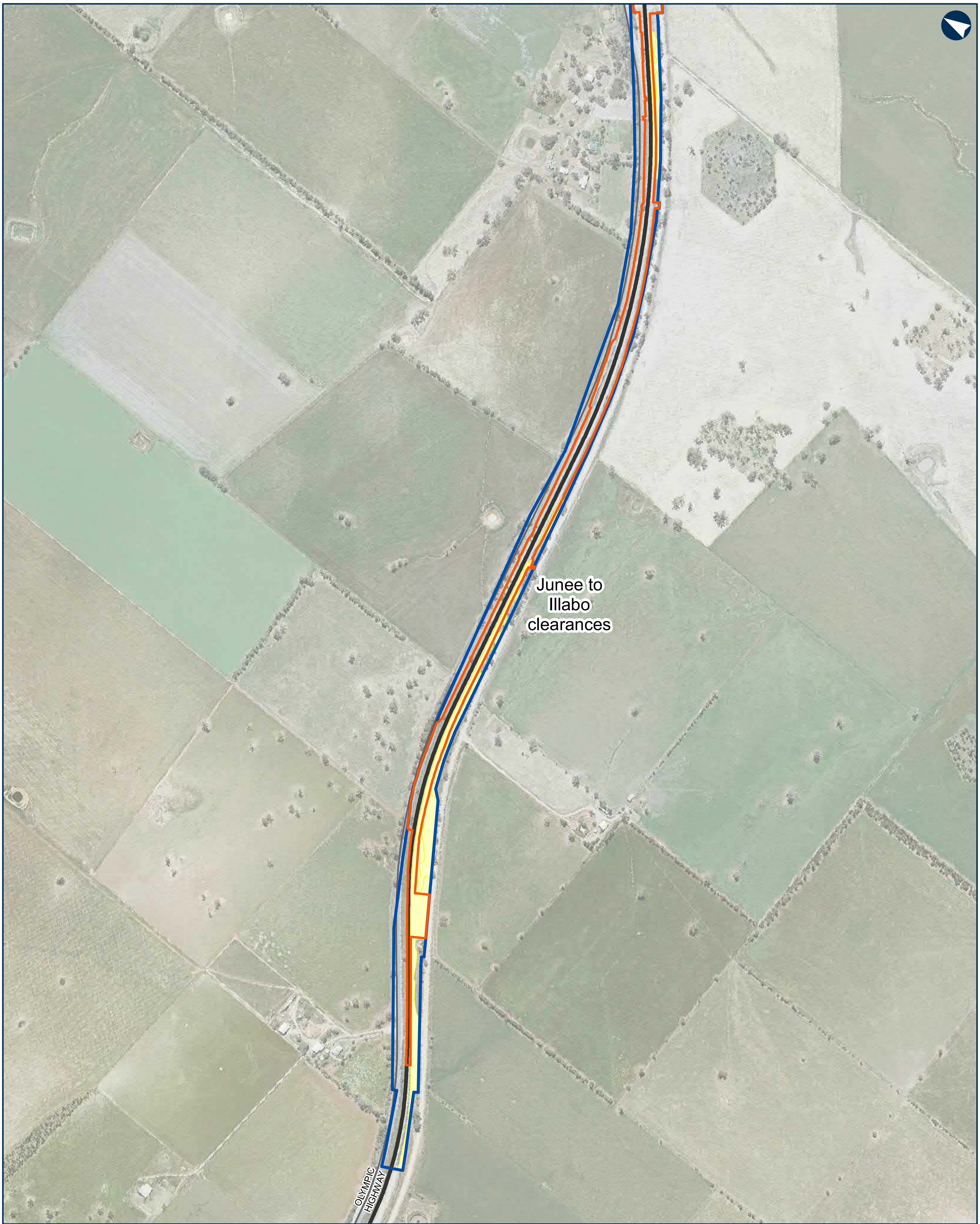
APPENDIX B-3
THREATENED ECOLOGICAL COMMUNITIES (BC ACT) WITHIN THE STUDY AREA



Albury to Illabo Appendix B3 – Threatened ecological communities (BC Act) within the study area MAP 1 OF 6

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
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Proposal site
Study area
Existing railway
Main road

Threatened Ecological Communities (BC Act)

BC Act - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered

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Albury to Illabo | Appendix B3 – Threatened ecological communities (BC Act) within the study area | MAP 2 OF 6

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS

- Proposal site
- Study area
- Existing railway
- Main road

Threatened Ecological Communities (BC Act)

- BC Act - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered

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Albury to Illabo Appendix B3 – Threatened ecological communities (BC Act) within the study area MAP 3 OF 6

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road

Threatened Ecological Communities (BC Act)

BC Act - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered

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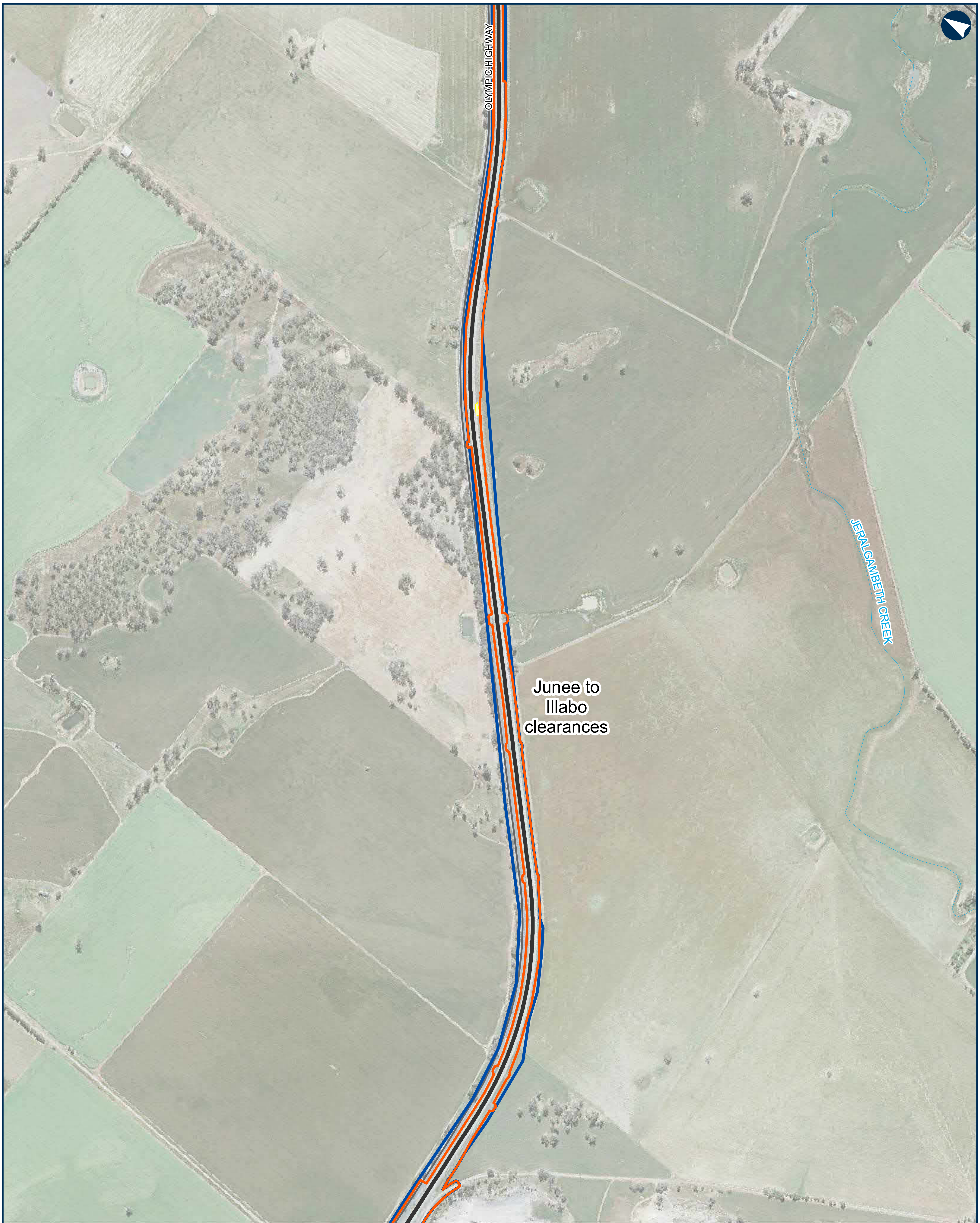

Albury to Illabo Appendix B3 – Threatened ecological communities (BC Act) within the study area MAP 4 OF 6

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Watercourse

Threatened Ecological Communities (BC Act)

BC Act - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered

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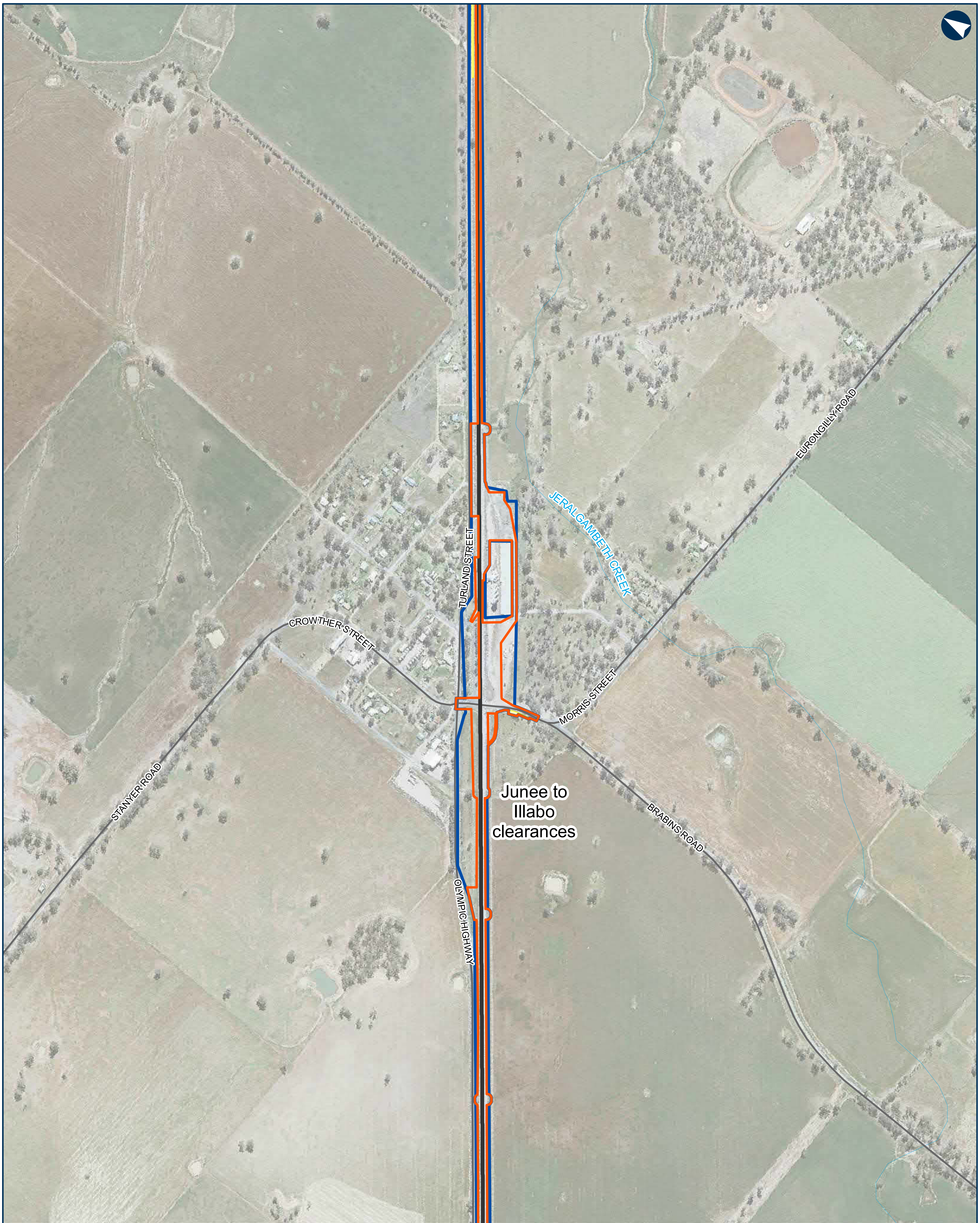

Albury to Illabo Appendix B3 – Threatened ecological communities (BC Act) within the study area

MAP 5 OF 6

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

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Date: 25/05/2022
Paper: A3
Author: WSP
Scale: 1:8,000
Data Sources: ARTC, NSWSS

- Proposal site
- Study area
- Existing railway
- Main road
- Watercourse

Threatened Ecological Communities (BC Act)

- BC Act - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered

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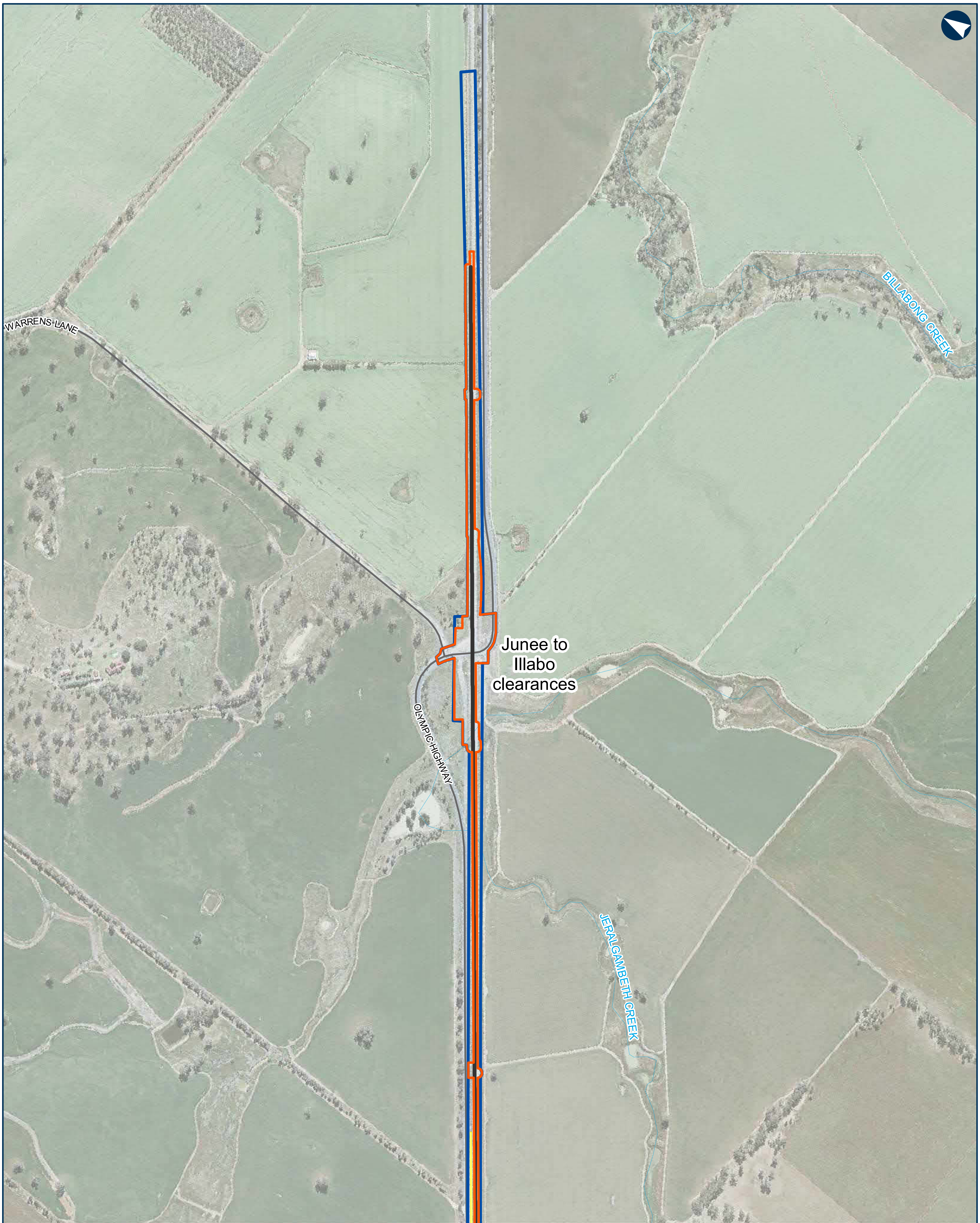

Albury to Illabo Appendix B3 – Threatened ecological communities (BC Act) within the study area MAP 6 OF 6

0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 25/05/2022 Paper: A3
Author: WSP Scale: 1:8,000
Data Sources: ARTC, NSWSS

Proposal site
Study area
Existing railway
Main road
Watercourse

Threatened Ecological Communities (BC Act)

BC Act - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered

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APPENDIX B-4
BAM VEGETATION INTEGRITY PLOT DATA

Table B-4.1 BAM vegetation integrity plot data

A2I Q1			**Covers**	**Native**	Trees	Shrubs	Grass	Forb	Fern	Other	**Exotic**	HighThreat
PCT 5- 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 eastern Riverina Bioregion (poor condition)			**# spp**	**Count**	Count	Count	Count	Count	Count	Count	**Count**	Count
Date: 12/11/20			**25**	**3**	1	0	1	1	0	0	**21**	7
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			157.1	**27.3**	26	0	0.5	0.8	0	0	**94.8**	46.1
Acer negundo	0.1	1	HT									0.1
Avena fatua	10	500	EX								10	
Bromus catharticus	15	100	EX								15	
Bromus diandrus	10	100	HT									10
Cynodon dactylon	0.5	10	GG				0.5					
Cyperus eragrostis	1	10	HT									1
Dactylis glomerata	3	40	EX								3	
Echium plantagineum	0.6	20	EX								0.6	
Ehrharta longiflora	2	50	EX								2	
Eucalyptus camaldulensis	26	3	TG		26							
Fraxinus angustifolia	15	40	HT									15
Galium aparine	35	500	EX									
Geranium homeanum	0.8	40	FG					0.8				
Hypochaeris radicata	2	30	EX								2	
Lactuca serriola	1	30	EX								1	
Ligustrum lucidum	15	50	HT									15
Ligustrum sinense	3	10	HT									3
Lolium rigidum	5	100	EX								5	
Phalaris canariensis	3	60	EX								3	
Plantago lanceolata	3	40	EX								3	
Polygonum arenastrum	0.1	5	EX								0.1	
Rubus fruticosus agg.	2	10	HT									2
Rumex crispus	2	40	EX								2	
Sonchus oleraceus	1	50	EX								1	
Verbena bonariensis	1	20	EX								1	

Easting	492155
Northing	6005115
Orientation	273
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	2
50-79	1
30-49	yes
20-29	no
10-19	no
5-9	no
<5	yes
Hollows	0
Length logs (m)	30
BAM Attributes 1x1 plot (%)	
Litter (%)	56

A2I Q3			**Covers**	**Native**	Trees	Shrubs	Grass	Forb	Fern	Other	**Exotic**	HighThreat
PCT 5- 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 eastern Riverina Bioregion (poor condition)			**# spp**	**Count**	Count	Count	Count	Count	Count	Count	**Count**	Count
Date: 13/11/20			**25**	**12**	1	0	7	3	1	0	**13**	7
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			130.5	**82.5**	28	0	23.4	1.1	30	0	**48**	36.2
Acer negundo	1	3	HT									1
Agrostis capillaris	25	500	HT									25
Asparagus asparagoides	0.3	10	HT									0.3
Avena barbata	3	50	EX								3	
Bromus diandrus	8	100	HT									8
Carex inversa	0.1	5	GG				0.1					
Cyperus eragrostis	0.4	10	HT									0.4
Eleocharis pusilla	15	300	GG				15					
Eucalyptus camaldulensis	28	25	TG		28							
Galium aparine	0.8	20	EX								0.8	
Hypericum perforatum	0.5	20	HT									0.5
Juncus australis	6	100	GG				6					
Juncus bufonius	0.8	30	GG				0.8					
Juncus flavidus	0.4	5	GG				0.4					
Ligustrum sinense	1	6	HT									1
Lythrum hyssopifolia	0.6	20	FG					0.6				
Marsilea drummondii	30	500	EG						30			
Microlaena stipoides	0.6	10	GG				0.6					
Oxalis perennans	0.1	3	FG					0.1				
Persicaria hydropiper	0.4	5	FG					0.4				
Phalaris canariensis	3	60	EX								3	
Plantago lanceolata	0.8	40	EX								0.8	
Rumex crispus	4	80	EX								4	
Rytidosperma caespitosum	0.5	10	GG				0.5					
Sonchus oleraceus	0.2	5	EX								0.2	

Easting	503525
Northing	6053260
Orientation	348
Plot size	20 x 20 x 50
BAM Attributes 20x50m plot	
Stem classes	
80+	1
50-79	1
30-49	yes
20-29	yes
10-19	yes
5-9	yes
<5	yes
Hollows	0
Length logs (m)	15
BAM Attributes 1x1 plot (%)	
Litter (%)	10

A2I Q4			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat		Easting	499090
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		**Northing**	6015257
11/14/2020			**24**	**9**	3	1	2	2	0	1	**15**	1		**Orientation**	216
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum		**Plot size**	20 X 20 X 50
			143.3	**45.1**	40	0.6	3.1	0.4	0	1	**98.2**	3		**BAM Attributes 20x50m plot**	
Acacia baileyana	0.6	1	SG			0.6								**Stem classes**	
Aira caryophyllea	0.8	40	EX								0.8			**80+**	0
Amyema miquelii	1	3	OG							1				**50-79**	2
Avena barbata	10	200	EX								10			**30-49**	yes
Briza maxima	10	300	EX								10			**20-29**	yes
Bromus diandrus	3	60	HT									3		**10-19**	yes
Carex inversa	0.1	5	GG				0.1							**5-9**	yes
Cirsium vulgare	0.1	1	EX								0.1			**<5**	yes
Dactylis glomerata	2	60	EX								2			**Hollows**	0
Dianella longifolia	0.1	3	FG					0.1						**Length logs (m)**	30
Dianella revoluta var. revoluta	0.3	5	FG					0.3							
Echium plantagineum	0.6	50	EX								0.6			**BAM Attributes 1x1 plot (%)**	
Ehrharta longiflora	55	1000	EX								55			**Litter (%)**	62
Eucalyptus blakelyi	8	1	TG		8										
Eucalyptus bridgesiana	26	12	TG		26										
Eucalyptus melliodora	6	1	TG		6										
Galium aparine	0.4	10	EX								0.4				
Hypochaeris radicata	2	80	EX								2				
Lolium perenne	5	100	EX								5				
Phalaris canariensis	3	50	EX								3				
Plantago lanceolata	0.5	20	EX								0.5				
Rytidosperma setaceum	3	80	GG				3								
Sonchus oleraceus	0.8	30	EX								0.8				
Vulpia myuros	5	90	EX								5				

A2I Q5			**Covers**	**Native**	Trees	Shrubs	Grass	Forb	Fern	Other	**Exotic**	HighThreat
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
Date: 14/11/2020			**14**	**3**	2	0	0	0	0	1	**11**	4
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			28.8	**25.2**	25	0	0	0	0	0.2	**3.6**	1
Amyema miquelii	0.2	2	OG							0.2		
Asparagus asparagoides	0.1	2	HT									0.1
Avena barbata	0.4	10	EX								0.4	
Bromus diandrus	0.4	5	HT									0.4
Eucalyptus blakelyi	7	2	TG		7							
Eucalyptus melliodora	18	7	TG		18							
Galium aparine	0.4	5	EX								0.4	
Hordeum leporinum	0.1	2	EX								0.1	
Hypericum perforatum	0.3	5	HT									0.3
Lactuca serriola	0.6	10	EX								0.6	
Lolium perenne	0.8	10	EX								0.8	
Solanum nigrum	0.1	1	EX								0.1	
Sonchus oleraceus	0.2	5	EX								0.2	
Vinca major	0.2	3	HT									0.2

Easting	522535
Northing	6105780
Orientation	50
Plot size	20 X 20 X 50
BAM 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)	5
BAM Attributes 1x1 plot (%)	
Litter (%)	93

A2I Q7			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived native grassland - with native plantings)			**# spp**	**Count**	Count	Count	Count	Count	Count	Count	**Count**	Count
Date: 15/11/2020			**35**	**23**	2	1	11	8	0	1	**12**	2
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			92.6	**64.8**	5	2	50.6	6.8	0	0.4	**27.8**	6
Arctotheca calendula	0.4	10	EX								0.4	
Atriplex semibaccata	2	50	SG			2						
Austrostipa bigeniculata	2	80	GG				2					
Austrostipa scabra subsp. scabra	3	70	GG				3					
Avena barbata	2	60	EX								2	
Bothriochloa macra	2	60	GG				2					
Bromus diandrus	2	60	HT									2
Carex inversa	0.6	10	GG				0.6					
Chloris truncata	1	50	GG				1					
Convolvulus angustissimus	0.4	5	OG							0.4		
Dichanthium sericeum	0.4	10	GG				0.4					
Dichopogon fimbriatus	0.1	5	FG					0.1				
Echium plantagineum	0.4	10	EX								0.4	
Einadia nutans	0.8	20	FG					0.8				
Enteropogon acicularis	25	300	GG				25					
Erodium crinitum	1	40	FG					1				
Eucalyptus albens	4	1	TG		4							
Eucalyptus populnea subsp. bimbil	1	2	TG		1							
Lactuca serriola	0.8	20	EX								0.8	
Lolium perenne	5	100	EX								5	
Lomandra filiformis subsp. coriacea	0.6	10	GG				0.6					
Maireana enchylaenoides	0.4	10	FG					0.4				
Medicago minima	3	80	EX								3	
Oxalis perennans	0.6	20	FG					0.6				
Paspalidium gracile	1	50	GG				1					
Plantago lanceolata	5	40	EX								5	
Polygonum aviculare	0.7	40	EX								0.7	
Romulea rosea	4	500	HT									4
Rytidosperma caespitosum	10	500	GG				10					
Rytidosperma pilosum	5	100	GG				5					
Sida corrugata	3	50	FG					3				
Solanum esuriale	0.1	3	FG					0.1				
Sonchus oleraceus	0.5	30	EX								0.5	
Trifolium arvense	4	100	EX								4	
Vittadinia cuneata	0.8	20	FG					0.8				

Easting	567279
Northing	6146964
Orientation	236
Plot size	20 x 20 x 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	yes
20-29	yes
10-19	yes
5-9	no
<5	no
Hollows	no
Length logs (m)	0
BAM Attributes 1x1 plot (%)	
Litter (%)	52

A2I Q8			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived native grassland - with native plantings)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
Date: 16/11/2020			26	13	2	0	8	3	0	0	13	3
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			92.6	36.6	13	0	20.4	3.2	0	0	56	1.5
Acacia saligna	1	3	EX								1	
Alternanthera pungens	0.1	10	HT									0.1
Arctotheca calendula	20	300	EX								20	
Aristida behriana	0.5	20	GG				0.5					
Austrostipa scabra subsp. scabra	1	40	GG				1					
Avena barbata	0.5	10	EX								0.5	
Bothriochloa macra	0.1	2	GG				0.1					
Bromus diandrus	0.4	10	HT									0.4
Chloris truncata	10	100	GG				10					
Cynodon dactylon	2	40	GG				2					
Echinochloa crus-galli	20	300	EX								20	
Echium plantagineum	5	80	EX								5	
Eleusine indica	0.8	30	EX								0.8	
Enteropogon acicularis	1	40	GG				1					
Eucalyptus albens	10	1	TG		10							
Eucalyptus blakelyi	3	2	TG		3							
Euphorbia drummondii	0.8	60	FG					0.8				
Lactuca serriola	0.2	5	EX								0.2	
Marrubium vulgare	1	30	EX								1	
Oxalis perennans	0.4	10	FG					0.4				
Romulea rosea	1	60	HT									1
Rytidosperma caespitosum	5	100	GG				5					
Rytidosperma setaceum	0.8	30	GG				0.8					
Sida corrugata	2	50	FG					2				
Trifolium arvense	4	100	EX								4	
Vulpia myuros	2	80	EX								2	

Easting	553548
Northing	6142365
Orientation	0
Plot size	20 x 20 x 50
BAM 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)	0
BAM Attributes 1x1 plot (%)	
Litter (%)	55

A2I Q9			**Covers**	**Native**	Trees	Shrubs	Grass	Forb	Fern	Other	**Exotic**	HighThreat
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
Date: 17/11/2020			**29**	**13**	2	0	2	8	0	1	**16**	3
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			159.3	**47.6**	38	0	0.5	8.5	0	0.6	**111.7**	43
Acaena novae-zelandiae	0.1	2	FG					0.1				
Avena barbata	55	1000	EX								55	
Bromus catharticus	3	80	EX								3	
Bromus diandrus	35	500	HT									35
Convolvulus erubescens	0.6	20	OG							0.6		
Dianella revoluta	2	50	FG					2				
Dichopogon fimbriatus	0.1	2	FG					0.1				
Echium plantagineum	1	20	EX								1	
Einadia nutans	3	40	FG					3				
Eucalyptus blakelyi	16	4	TG		16							
Eucalyptus melliodora	22	10	TG		22							
Fumaria muralis	4	70	EX								4	
Hypericum perforatum	5	60	HT									5
Hypochaeris radicata	0.5	20	EX								0.5	
Lactuca serriola	0.6	30	EX								0.6	
Lomandra multiflora	0.4	5	GG				0.4					
Marrubium vulgare	0.2	5	EX								0.2	
Phalaris canariensis	0.4	2	EX								0.4	
Plantago coronopus	2	40	EX								2	
Romulea rosea	3	100	HT									3
Rumex brownii	1	20	FG					1				
Rytidosperma caespitosum	0.1	5	GG				0.1					
Schinus molle var. areira	1	1	EX								1	
Sida corrugata	2	50	FG					2				
Sonchus oleraceus	0.1	5	EX								0.1	
Tragopogon porrifolius	0.8	15	EX								0.8	
Vicia sativa	0.1	3	EX								0.1	
Wahlenbergia gracilis	0.1	5	FG					0.1				
Wahlenbergia luteola	0.2	20	FG					0.2				

Easting	560649
Northing	6144733
Orientation	63
Plot size	20 x 20 x 50
BAM Attributes 20x50m plot	
Stem classes	
80+	4
50-79	4
30-49	yes
20-29	yes
10-19	yes
5-9	yes
<5	no
Hollows	3
Length logs (m)	4
BAM Attributes 1x1 plot (%)	
Litter (%)	94

A2I Q10			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived native grassland - type variant)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
Date: 17/11/2020			35	19	1	0	10	8	0	0	16	3
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			129	**80.4**	0.1	0	63.8	16.5	0	0	**48.6**	6.5
Acaena novae-zelandiae	5	100	FG					5				
Aira elegantissima	8	500	EX								8	
Arctotheca calendula	0.5	20	EX								0.5	
Aristida behriana	0.5	20	GG				0.5					
Austrostipa bigeniculata	3	80	GG				3					
Austrostipa scabra	5	90	GG				5					
Avena barbata	15	300	EX								15	
Bothriochloa macra	3	100	GG				3					
Bromus diandrus	4	80	HT									4
Carex inversa	0.1	5	GG				0.1					
Chloris truncata	0.8	40	GG				0.8					
Craspedia variabilis	8	100	FG					8				
Dactylis glomerata	1	40	EX								1	
Digitaria divaricatissima	0.4	20	GG				0.4					
Echium plantagineum	0.6	10	EX								0.6	
Elymus scaber	5	80	GG				5					
Eucalyptus blakelyi	0.1	2	TG		0.1							
Goodenia pinnatifida	0.6	20	FG					0.6				
Hypericum gramineum	0.4	10	FG					0.4				
Hypericum perforatum	0.5	30	HT									0.5
Hypochaeris radicata	1	50	EX								1	
Lactuca serriola	0.4	10	EX								0.4	
Lolium perenne	0.2	10	EX								0.2	
Marrubium vulgare	1	50	EX								1	
Medicago minima	1	50	EX								1	
Romulea rosea	2	100	HT									2
Rytidosperma setaceum	6	80	GG				6					
Sida corrugata	1	40	FG					1				
Sonchus oleraceus	0.6	20	EX								0.6	
Themeda triandra	40	500	GG				40					
Trifolium arvense	12	200	EX								12	
Vittadinia cuneata	0.4	20	FG					0.4				
Vulpia myuros	0.8	60	EX								0.8	
Wahlenbergia gracilis	0.1	10	FG					0.1				
Wahlenbergia luteola	1	100	FG					1				

Easting	561139
Northing	6144867
Orientation	235
Plot size	20 x 20 x 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	Yes
Hollows	0
Length logs (m)	1
BAM Attributes 1x1 plot (%)	
Litter (%)	67

A2I Q11			**Covers**	**Native**	Trees	Shrubs	Grass	Forb	Fern	Other	**Exotic**	HighThreat
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
Date: 17/11/2020			**26**	**14**	3	1	5	5	0	0	**12**	3
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			145.4	**51.3**	42	0.8	3.4	5.1	0	0	**94.1**	44
Acaena novae-zelandiae	2	50	FG					2				
Austrostipa bigeniculata	0.8	20	GG				0.8					
Avena barbata	35	500	EX								35	
Bromus diandrus	25	300	HT									25
Dianella revoluta	1	20	FG					1				
Dichopogon fimbriatus	0.6	30	FG					0.6				
Eremophila debilis	0.8	10	SG			0.8						
Eucalyptus blakelyi	8	3	TG		8							
Eucalyptus melliodora	18	3	TG		18							
Eucalyptus microcarpa	16	10	TG		16							
Hypericum perforatum	15	100	HT									15
Hypochaeris radicata	0.6	20	EX								0.6	
Lactuca serriola	1	60	EX								1	
Lolium perenne	3	80	EX								3	
Lomandra multiflora	0.4	3	GG				0.4					
Marrubium vulgare	5	80	EX								5	
Plantago coronopus	1	40	EX								1	
Poa sieberiana	0.4	5	GG				0.4					
Romulea rosea	4	100	HT									4
Rytidosperma caespitosum	0.8	30	GG				0.8					
Rytidosperma setaceum	1	20	GG				1					
Sida corrugata	1	50	FG					1				
Sonchus oleraceus	0.5	10	EX								0.5	
Trifolium arvense	2	100	EX								2	
Vicia sativa	2	80	EX								2	
Wahlenbergia luteola	0.5	40	FG					0.5				

Easting	561546
Northing	6144978
Orientation	73
Plot size	20 x 20 x 50
BAM Attributes 20x50m plot	
Stem classes	
80+	2
50-79	0
30-49	yes
20-29	yes
10-19	yes
5-9	yes
<5	yes
Hollows	3
Length logs (m)	10
BAM Attributes 1x1 plot (%)	
Litter (%)	95

A2I Q12			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived native grassland - type variant)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
Date: 17/11/2020			25	12	1	0	7	3	0	1	13	2
Species	Cover	Abundance	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			121.9	49.9	0.1	0	39.6	9.4	0	0.8	72	9
Acaena novae-zelandiae	8	100	FG					8				
Austrostipa scabra	0.8	20	GG				0.8					
Avena barbata	30	500	EX								30	
Bromus diandrus	5	100	HT									5
Callitris glaucophylla	0.1	1	TG		0.1							
Convolvulus arvensis	4	100	EX								4	
Convolvulus erubescens	0.8	20	OG							0.8		
Craspedia variabilis	1	50	FG					1				
Dianella revoluta	0.4	10	FG					0.4				
Echium plantagineum	1	20	EX								1	
Elymus scaber	0.6	20	GG				0.6					
Enteropogon acicularis	5	80	GG				5					
Lolium perenne	5	100	EX								5	
Marrubium vulgare	2	50	EX								2	
Medicago minima	3	60	EX								3	
Phalaris canariensis	2	40	EX								2	
Plantago lanceolata	0.5	20	EX								0.5	
Poa sieberiana var. sieberiana	0.2	5	GG				0.2					
Romulea rosea	4	100	HT									4
Rytidosperma caespitosum	5	100	GG				5					
Rytidosperma setaceum	3	70	GG				3					
Sonchus oleraceus	0.5	10	EX								0.5	
Themeda triandra	25	200	GG				25					
Trifolium arvense	5	100	EX								5	
Vulpia myuros	10	100	EX								10	

Easting	556783
Northing	6143206
Orientation	52
Plot size	20 x 20 x 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	0
BAM Attributes 1x1 plot (%)	
Litter (%)	80

A2I Q13			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
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
Date: 13/05/21			**36**	**19**	2	1	5	9	0	2	**17**	4
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			135.7	**83.3**	38.4	0.1	28.7	15.6	0	0.5	**52.4**	11.5
Eucalyptus melliodora	38	15	TG		38							
Themeda triandra	10	100	GG				10					
Schinus molle var. areira	0.4	1	EX								0.4	
Brachychiton populneus	0.4	1	TG		0.4							
Lactuca serriola	0.8	40	EX								0.8	
Dianella revoluta	7	80	FG					7				
Acaena novae-zelandiae	2	60	FG					2				
Panicum effusum	10	100	GG				10					
Wahlenbergia communis	0.5	50	FG					0.5				
Cirsium vulgare	0.4	10	EX								0.4	
Echium plantagineum	0.1	5	EX								0.1	
Rytidosperma pilosum	8	100	GG				8					
Einadia nutans	0.5	10	FG					0.5				
Sida corrugata	0.8	60	FG					0.8				
Trifolium arvense	2	50	EX								2	
Marrubium vulgare	2	40	EX								2	
Chrysocephalum apiculatum	4	100	FG					4				
Convolvulus erubescens	0.4	30	OG							0.4		
Acacia decora	0.1	1	SG			0.1						
Bromus diandrus	10	200	HT									10
Solanum nigrum	0.6	10	EX								0.6	
Avena barbata	15	400	EX								15	
Exotic peach	0.5	2	EX								0.5	
Phalaris canariensis	8	100	EX								8	
Romulea rosea	0.5	50	HT									0.5
Vicia sativa	0.1	5	EX								0.1	
Paspalum dilatatum	0.8	60	HT									0.8
Hypericum perforatum	0.2	10	HT									0.2
Bothriochloa macra	0.6	40	GG				0.6					
Lomandra multiflora	0.1	5	GG				0.1					
Lolium perenne	5	100	EX								5	
Glycine canescens	0.1	1	OG							0.1		
Oxalis perennans	0.3	20	FG					0.3				
Wahlenbergia gracilis	0.1	5	FG					0.1				
Setaria parviflora	6	100	EX								6	
Trachymene incisa	0.4	10	FG					0.4				

Easting	557187
Northing	6143404
Orientation	49
Plot size	20 X 20 X 50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	2
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	3
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	23

A2I Q14			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
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
Date: 15/05/21			11	3	1	0	1	1	0	0	8	0
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			55	32.7	32	0	0.2	0.5	0	0	22.3	0
Eucalyptus melliodora	32	4	TG		32							
Echium plantagineum	3	40	EX								3	
Cucumis myriocarpus	1	30	EX								1	
Malva parviflora	2	50	EX								2	
Solanum nigrum	0.8	30	EX								0.8	
Phalaris minor	0.4	20	EX								0.4	
Chenopodium album	10	100	EX								10	
Panicum decompositum	0.2	20	GG				0.2					
Lolium perenne	5	100	EX								5	
Dysphania sp.	0.5	15	FG					0.5				
Brassica rapa	0.1	20	EX								0.1	

Easting	499077
Northing	6016005
Orientation	208
Plot size	20 X 20 X 50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	2
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	25
Attributes 1x1 plot (%)	
Litter (%)	64

A2I Q15			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
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
Date: 15/05/21			18	6	2	0	2	2	0	0	12	3
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			112.3	40.5	40	0	0.3	0.2	0	0	71.8	0.6
Eucalyptus melliodora	18	10	TG		18							
Eucalyptus blakelyi	22	16	TG		22							
Avena barbata	45	500	EX								45	
Hypochaeris radicata	2	50	EX								2	
Echium plantagineum	8	100	EX								8	
Lysimachia arvensis	15	100	EX								15	
Cirsium vulgare	0.1	1	EX								0.1	
Solanum nigrum	0.4	40	EX								0.4	
Lolium perenne	0.5	100	EX								0.5	
Rumex brownii	0.1	10	FG					0.1				
Romulea rosea	0.1	10	HT									0.1
Carex appressa	0.2	20	GG				0.2					
Galium aparine	0.1	10	EX								0.1	
Panicum decompositum	0.1	20	GG				0.1					
Oxalis pes-caprae	0.1	10	EX								0.1	
Bromus diandrus	0.1	10	HT									0.1
Eragrostis curvula	0.4	5	HT									0.4
Hypericum gramineum	0.1	5	FG					0.1				

Easting	498981
Northing	6015472
Orientation	36
Plot size	20 X 20 X 50
Attributes 20x50m plot	
Stem classes	
80+	3
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	2
Length logs (m)	10
Attributes 1x1 plot (%)	
Litter (%)	50

APPENDIX B-5
RAPID DATA POINTS

Table B-5.1 Rapid data points

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
November 2020 survey					
RDP 01	-36.078191	146.925254	Albury station	Miscellaneous ecosystem – exotic grassland Oats, Bromus	
RDP 02	-36.077821	146.92576	Albury station	Exotic tree - Birch	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 03	-36.08139	146.924306	Albury Station	Street tree – Kurrajong	
RDP 04	-36.079861	146.92589	Albury Station	Dead *Acacia saligna*	
RDP 05	-36.003147	146.989544	Billy Hughes bridge	PCT 277 poor, Photos from nearby BAM plot Q2	 

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 06	-36.004926	146.988711	Billy Hughes bridge	PCT 277 poor	
RDP 07	-36.004188	146.988596	Billy Hughes bridge	Miscellaneous ecosystem – exotic grassland	
RDP 08	-36.001345	146.990088	Billy Hughes bridge	Miscellaneous ecosystem – exotic grassland	
RDP 09	-36.000599	146.990807	Billy Hughes bridge	PCT 277 poor	
RDP 10	-35.959843	147.004015	Table Top	Miscellaneous ecosystem – exotic grassland	
RDP 11	-35.665869	147.038603	Culcairn	Ornamental Plantings	
RDP 12	-35.663531	147.039127	Culcairn	Miscellaneous ecosystem – exotic grassland Exotic Weeds	
RDP 13	-35.660631	147.0394	Culcairn	*Eucalyptus blakelyi* C2NH	
RDP 14	-35.663131	147.038531	Culcairn	Ornamental plantings	
RDP 15	-35.66332	147.038513	Culcairn	Ornamental plantings (Date Palm)	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 16	-35.517865	147.035687	Henty	*Eucalyptus melliodora* C3NH	
RDP 17	-35.518193	147.035752	Henty	*Eucalyptus melliodora* C3H	
RDP 18	-35.518413	147.035751	Henty	*Eucalyptus melliodora* C3H	
RDP 19	-35.389763	147.058704	Yerong Creek	*Allocasaurina leuahmanii* C2NH	
RDP 20	-35.389273	147.058917	Yerong Creek	Weed	
RDP 21	-35.271427	147.120203	The Rock	Ornamental plantings	
RDP 22	-35.271479	147.119965	The Rock	Ornamental plantings	
RDP 23	-35.271257	147.119888	The Rock	Ornamental plantings	
RDP 24	-35.271419	147.120048	The Rock	Ornamental plantings	
RDP 25	-35.271419	147.119948	The Rock	Ornamental plantings	
RDP 26	-35.273456	147.111788	The Rock	Weed	
RDP 27	-35.077878	147.411517	Bomen	PCT 277 poor	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 28	-35.076907	147.412504	Bomen	Miscellaneous ecosystem – exotic grassland Exotic Weeds – has been poisoned as part of existing rail infrastructure maintenance	
RDP 29	-35.074066	147.414125	Bomen	BRC2NH	
RDP 30	-35.073404	147.414359	Bomen	Kurrajong C2NH	
RDP 31	-35.072628	147.414631	Bomen	*Eucalyptus melliodora* C2NH	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 32	-35.070938	147.415307	Bomen	Weed exotic	
RDP 33	-35.079297	147.409387	Bomen	Weed exotic	
RDP 34	-34.963554	147.51709	Harefield	-	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					 
RDP 35	-35.194312	147.243578	Uranquinty	*Eucalyptus microcarpa*	
RDP 36	-35.193706	147.244217	Uranquinty	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 37	-35.192474	147.245817	Uranquinty	EBC3NH	
RDP 38	-35.192235	147.246187	Uranquinty	*Eucalyptus melliodora* C3NH	
RDP 39	-35.193271	147.245005	Uranquinty	Exotic plantings	
RDP 40	-35.194092	147.242757	Uranquinty	PCT 5 poor	
RDP 41			North of Uranquinty – site removed	Exotic Fraxinus sp.	

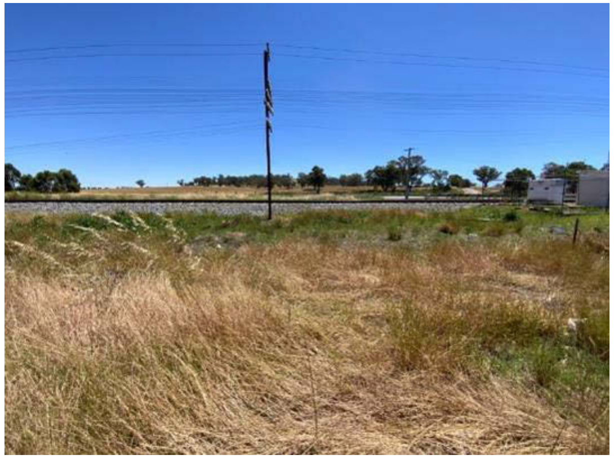
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 42	-34.815367	147.739726	Junee to Illabo (Illabo shops)	Native plantings	
RDP 43	-34.81551	147.739913	Junee to Illabo (Illabo shops)	Native plantings	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 44	-34.816008	147.738956	Junee to Illabo (near Illabo shops)	Miscellaneous ecosystem – exotic grassland	
RDP 45	-34.81629	147.737952	Junee to Illabo (near Illabo shops)	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 46	-34.816841	147.736667	Junee to Illabo (near Illabo shops)	WBC3NH	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 47	-34.814806	147.741354	Junee to Illabo (near Illabo shops)	GBC1NH	
RDP 48	-34.814628	147.741676	Junee to Illabo (near Illabo shops)	GBC2NH	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 49	-34.814529	147.741965	Junee to Illabo (near Illabo shops)	Miscellaneous ecosystem – exotic grassland Lollium	
RDP 50	-34.798877	147.774406	Junee to Illabo – northern section	PCT 277 poor	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 51	-34.80043	147.771191	Junee to Illabo – northern section	Miscellaneous ecosystem – exotic grassland Oats, Rye, Patterson's Curse, *plantago lanceolata*	
RDP 52	-34.802946	147.766153	Junee to Illabo – northern section	Miscellaneous ecosystem – exotic grassland	
RDP 53	-34.803637	147.764657	Junee to Illabo – northern section	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 54	-34.805147	147.761143	Junee to Illabo – northern section	Miscellaneous ecosystem – exotic grassland	
RDP 55	-34.806191	147.759026	Junee to Illabo – northern section	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 56	-34.807346	147.756693	Junee to Illabo – northern section	Miscellaneous ecosystem – exotic grassland Oats, Rye, Paspalum	
RDP 57	-34.80861	147.754027	Junee to Illabo – northern section	Derived native grassland – Curly windmill grass mixed with Oats, Rye	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 58	-34.809664	147.751851	Junee to Illabo – northern section	Miscellaneous ecosystem – exotic grassland	
RDP 59	-34.810147	147.750789	Junee to Illabo – northern section	WBC2NH	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 60	-34.818785	147.733278	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 61	-34.821298	147.728039	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 62	-34.82314	147.7237	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 63	-34.832207	147.701836	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 64	-34.832407	147.704636	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 65	-34.83106	147.710029	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 66	-34.828637	147.713968	Junee to Illabo	WPC2NH	
RDP 67	-34.830335	147.711247	Junee to Illabo	WBC2NH	
RDP 68	-34.81716	147.736978	Junee to Illabo – Near Illabo	Grass water species	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
					

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 69	-34.818011	147.735204	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 70	-34.829491	147.712156	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 71	-34.831974	147.700851	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 72	-34.83183	147.688698	Junee to Illabo – next to broken crossing	Miscellaneous ecosystem – exotic grassland soak	
RDP 73	-34.832388	147.685347	Junee to Illabo	EBC2NH	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 74	-34.833575	147.680357	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 75	-34.834641	147.676038	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 76	-34.835322	147.673091	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 77	-34.840314	147.655936	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 78	-34.836905	147.667415	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 79	-34.834325	147.678428	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 80	-34.83393	147.680019	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 81	-34.832791	147.684629	Junee to Illabo	Miscellaneous ecosystem – exotic grassland	
RDP 82	-35.125224	147.343313	Pearson Street bridge	Miscellaneous ecosystem – exotic grassland	
RDP 83	-35.126931	147.340391	Pearson Street bridge	Miscellaneous ecosystem – exotic grassland	
RDP 84	-35.12531	147.345864	Pearson Street bridge	Exotic species	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 85	-34.844652	147.647018	Junee to Illabo – southern section	Miscellaneous ecosystem – exotic grassland	
RDP 86	-34.846737	147.643475	Junee to Illabo – southern section	Miscellaneous ecosystem – exotic grassland	
RDP 87	-34.848405	147.636427	Junee to Illabo – southern section	Miscellaneous ecosystem – exotic grassland	

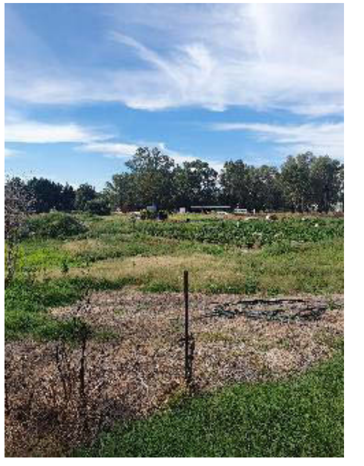
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 88	-34.850547	147.624051	Junee to Illabo – southern section	Miscellaneous ecosystem – exotic grassland	
RDP 89	-34.845777	147.644982	Junee to Illabo – southern section	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 90	-34.848048	147.639041	Junee to Illabo – southern section	Miscellaneous ecosystem – exotic grassland	
RDP 91	-34.848752	147.631053	Junee to Illabo – southern section	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 92	-34.85128	147.621705	Junee to Illabo – southern section	Miscellaneous ecosystem – exotic grassland	
RDP 93	-34.857612	147.586545	Olympic Highway underpass	Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
February 2021					
RDP 94	-36.076215	146.926724	Albury Station	Native plantings	
RDP 95	-36.099212	146.909892	Murray River bridge	*Eucalyptus camaldulensis* canopy with weeds	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
					

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 96	-36.099129	146.910328	Murray River bridge	Exotic grasses and vegetable gardens	
RDP 97	-36.09883	146.909779	Murray River bridge	Few *Eucalyptus camaldulensis* with weeds	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 98	-36.002084	146.988577	Billy Hughes bridge	Hollows present. Potential PCT 277. *Eucalyptus blakelyi, Eucalyptus sideroxylon.* Sparse ground cover Few shrubs	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
					

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 99	-36.005518	146.988374	Billy Hughes bridge	*Eucalyptus blakelyi* possible PCT 277	 

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 100	-36.006132	146.98776	Billy Hughes bridge	*Eucalyptus blakelyi*	 

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 101	-36.007683	146.98754	Billy Hughes bridge	*Eucalyptus blakelyi* *Eucalyptus melliodora* *Eucalyptus bridgesiana* Non-native grasses	 

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 102	-36.082886	146.924366	Albury Station	Trees have been removed	
RDP 103	-35.069938	147.415693	Bomen	Potential derived native grassland Between fence and road derived native grassland Between track and fence potentially derived native grassland *Themeda australis, tricoryne elatior, sida corrugate, bothriocloa macra, sonchus olearacius, Avena barbata, Paspalum dilatatum, Conyza* sp., *Digitaria divar*., *Poa* sp., *Rytisperma* sp.	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
					
RDP 104	-35.071099	147.414716	Bomen	Miscellaneous ecosystem – exotic grassland Weed infestation	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 105	-35.072142	147.414283	Bomen	Miscellaneous ecosystem – exotic grassland Weed infestation - *Eragrostis* sp., Rhodes Grass	
					

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 106	-35.120068	147.362704	Pearson Street bridge	*Melaleuca styphelioides* and other ornamentals	 

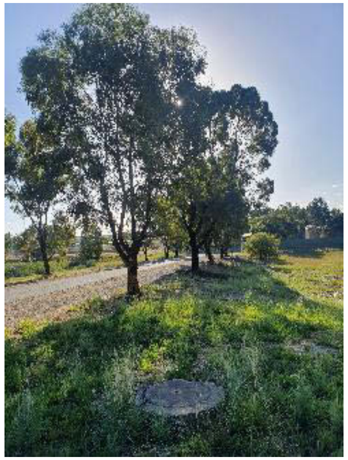
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 107	-35.119852	147.362196	Pearson Street bridge	Weed invasion	
RDP 108	-35.119261	147.365561	Pearson Street bridge	Ornamental Plantings	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 109	-35.120212	147.365643	Pearson Street bridge	Cleared vegetation area with ornamental plantings	
RDP 110	-35.120126	147.365437	Pearson Street bridge	Weed infestation – White Cedars	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 111	-35.119813	147.365781	Pearson Street bridge	*Eucalyptus camaldulensis* - single tree with weed infestation.	 

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 112	-35.12072	147.369633		Existing rail track	
RDP 113	-35.127896	147.342724	Pearson Street bridge	*Eucalyptus melliodora* dominated PCT 277	

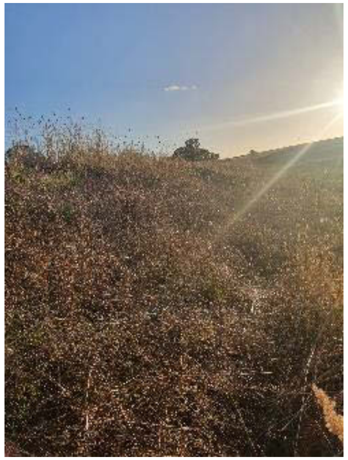
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
					

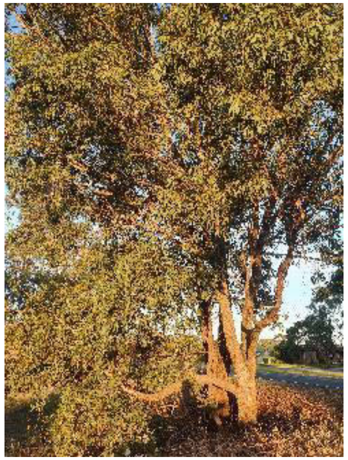
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 114	-35.127549	147.342226	Pearson Street bridge	Soak. Typha dominated	
RDP 115	-35.128026	147.342272	Pearson Street bridge	Native plantings	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 116	-35.127588	147.341708	Pearson Street bridge	*Eucalyptus melliodora*	
RDP 117	-35.126272	147.343128	Pearson Street bridge	One *Eucalyptus melliodora*. One Fraxinus.	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 118	-35.12593	147.345005	Pearson Street bridge	Miscellaneous ecosystem – exotic grassland Weedy grasses	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 119	-35.19489	147.241574	Uranquinty	*Eucalyptus camaldulensis* No shrub layer Weedy ground layer PCT 5 poor	
RDP 120	-35.195081	147.241054	Uranquinty	Paddock with dam	

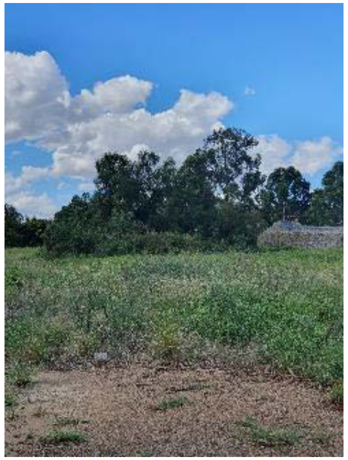
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 121	-35.195157	147.241339	Uranquinty	Miscellaneous ecosystem – exotic grassland Exotic grasses, *Phlaris*	
RDP 122	-35.195095	147.241759	Uranquinty	*Eucalyptus camaldulensis* Small patch Weedy ground layer	
RDP 123	-35.19532	147.241395	Uranquinty	Pepper tree	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 124	-35.194868	147.242396	Uranquinty	*Eucalyptus microcarpa* flowering	
RDP 125	-34.863882	147.584903	Olympic Highway Underpass	Native plantings with mostly weedy ground layer. *Eucalyptus blakelyi*, *Eucalyptus albans*, *Panicum effusum*, feather top rhodes, *Digitaria* weed sp. (summer grass), *Eragrostis cilliansis*, *Setaria* weed sp. (pigeon grass), *Conyza* sp.	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 126	-34.864011	147.585345	Olympic Highway Underpass	*Corymbia citriodora*	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 127	-34.861539	147.585341	Olympic Highway Underpass	Kurragong (no hollow) on west side track pepper tree on east	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 128	-34.860745	147.585437	Olympic Highway Underpass	*Rytidosperma* sp., *Eriochloa psuedo*, *Sida corrugata*, *Bothriocloa macra*, *Austrostipa scabra*, *Cydon dactyl*, *Setaria* sp., *Aira* sp, *Eragrostis cilliansis*, *Paspalum* sp. weed, summer grass, feather top rhodes, khaki weed, *Hypocharis radicata*, *Echium*	
RDP 129	-34.860833	147.585245	Olympic Highway Underpass	Derived native grassland with native plantings. *Chloris truncata*. Derived native grassland extends into open field to east.	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 130	-34.86117	147.585173	Olympic Highway Underpass	Exotics with a few native grasses. Photo looking south.	
RDP 131	-34.86026	147.585707	Olympic Highway Underpass	Peppertree surrounded by weed grasses	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 132	-34.859964	147.585758	Olympic Highway Underpass	Exotic trees	
RDP 133	-34.958141	147.523344	Harefield	Weedy convolvus Khaki weed Yellow box Saffron thistle Spear thistle	

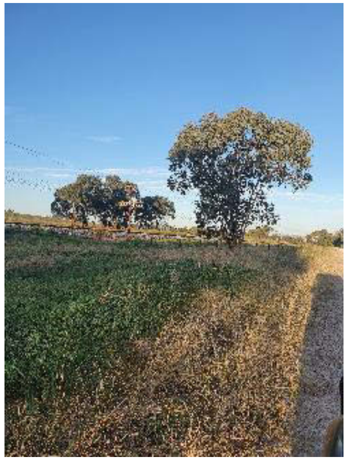
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 134	-34.957849	147.523406	Harefield	*Panicum effusion* *Eragrotis ciliansis* Khaki weed *Digitaria* - summer grass	
RDP 135	-34.961009	147.520128	Harefield	*Cydon dactylon* Single small juvenile euc. Single Bathurst burr small patch just in drainline? Banks are weedy - Convolvus, Digitaria, Setaria, feather top rhodes,	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 136	-34.968479	147.512467	Harefield	Mostly *Acacia* A few *Eucalyptus blakelyi*	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 137	-34.967503	147.513542	Harefield	*Acacia* Exotic grassland in between trees St. John's Wart	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 138	-35.127802	147.342638		*Eucalyptus melliodora*	
RDP 139	-34.850145	147.625512	Junee to Illabo	Extend vegetation zone to road. PCT 277 poor	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 140	-34.849241	147.629427	Junee to Illabo	Extend PCT 277 poor to road	
RDP 141	-34.848853	147.633824	Junee to Illabo	*Eucalyptus blakelyi* No hollow Derived native grassland between two patches	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 142	-34.848772	147.635249	Junee to Illabo	*Eucalyptus albens* Potential derived native grassland	
RDP 143	-34.848688	147.636326	Junee to Illabo	Exotic grasses with natives	

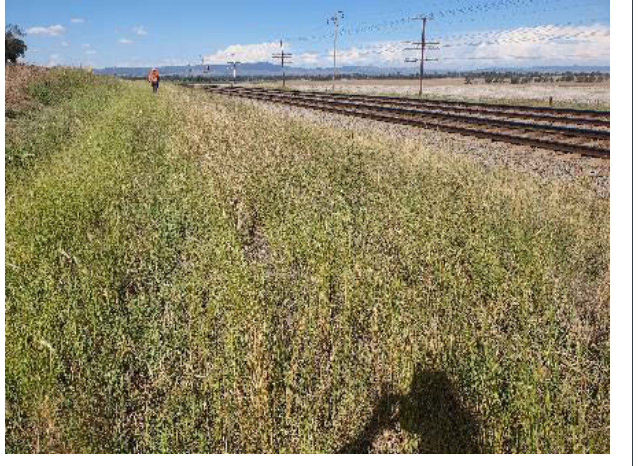
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 144	-34.848592	147.637251		Acacia regrowth	
RDP 145	-34.960404	147.520259	Harefield	*Cydon dactlyon*, feather top *Rhodes*, *Setaria*, *Eragrostis ciliansis*, paspalum weed, *Panicum effusion*, rye grass sample, *Enichloa* sp., *Convolvus* sp., *Conyza* sp. Southern section past bridge also exotic. Single *Eucalyptus camaldulensis* at bridge	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 146	-34.959918	147.520813		Miscellaneous ecosystem – exotic grassland Exotic grassland	

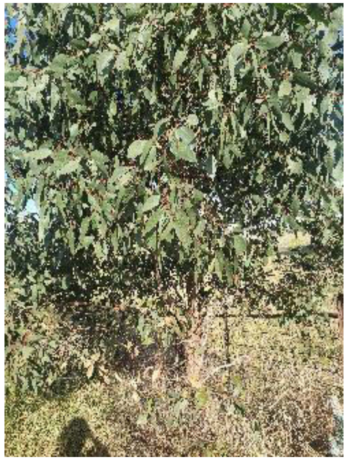
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 147	-34.968258	147.512293	Harefield	Bluegrass sp. Acacia regrowth same acacia as roadside, *Digitaria divaricatissima*, possible derived native grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 148	-34.967345	147.513361	Harefield	Potential derived native grassland with Acacia regrowth	

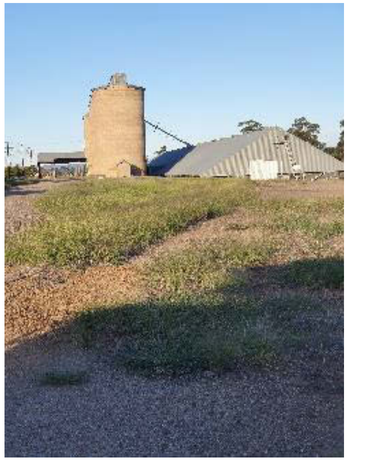
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 149	-34.829453	147.712233		Potential derived native grassland with summer grasses.	
RDP 150	-34.832077	147.704152		*Bothriocloa,* Queensland blue grass	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 151	-34.831843	147.707461	Junee to Illabo	*Bothriocloa*, bluegrass, *Enichloa*, *Digitaria diver*	
RDP 152	-34.832345	147.688581	Junee to Illabo	*Chloris truncata*, *Austrostipa Scabra*, bluegrass, saffron thistle,	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
					

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 153	-34.832025	147.689076	Junee to Illabo	Miscellaneous ecosystem – exotic grassland Exotic grassland	
RDP 154	-34.831897	147.691307	Junee to Illabo	juvenile *Eucalyptus blakelyi* or *Eucalyptus camaldulensis*	

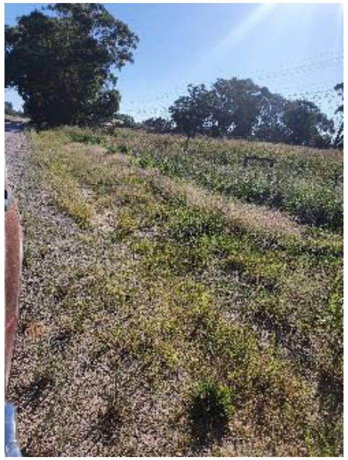
RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 155	-34.832043	147.691969	Junee to Illabo	*Austrostipa scabra*	
RDP 156	-34.831949	147.692477	Junee to Illabo	Miscellaneous ecosystem – exotic grassland Exotic grassland	
RDP 157	-34.83206	147.696373	Junee to Illabo	Miscellaneous ecosystem – exotic grassland Exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 158	-34.815877	147.740276	Junee to Illabo	Miscellaneous ecosystem – exotic grassland Exotic grassland	
RDP 159	-34.814576	147.743787	Junee to Illabo	Native wetland	
RDP 160	-34.814278	147.742864	Junee to Illabo	Miscellaneous ecosystem – exotic grassland Exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 161	-34.802947	147.765126	Junee to Illabo	Miscellaneous ecosystem – exotic grassland Exotic grassland	
RDP 162	-34.803439	147.763952	Junee to Illabo	Miscellaneous ecosystem – exotic grassland Exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 163	-34.852706	147.618885	Junee to Illabo	Derived native grassland - *Themeda* and *Bothriochloa*	
RDP 164	-34.852596	147.619606		*Eucalyptus melliodora* patch	
RDP 165	-34.848022	147.640183		Miscellaneous ecosystem – exotic grassland	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 166	-34.847194	147.642624		Miscellaneous ecosystem – exotic grassland	
RDP 167	-34.845318	147.646383		Miscellaneous ecosystem – exotic grassland	
RDP 168	-34.844822	147.6473		White Cedars	
RDP 169	-34.844529	147.647796		Weed trees. oak, White Cedar, *Metrosideros* (New Zealand Christmas Bush)	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
RDP 170	-34.842927	147.650645	Junee to Illabo	Miscellaneous ecosystem – exotic grassland Exotic grassland	
RDP 171	-34.842419	147.651612		Potential derived native grassland - *Themeda*, *Rytidosperma*, *Panicum effusum*, Weeds - *Setaria, Paspalum* and *Sorghum*	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
					
RDP 172	-34.839108	147.659535		*Panicum, Bothriocloa macra, Digitaria, Austrostipa scabra*	

RDP NUMBER	COORDINATES		GENERAL LOCATION	GENERAL DESCRIPTION	PHOTOS
	Latitude	Longitude			
May 2021					
RDP 173	-35.194985	147.241284	Uranquinty	Category 1-exempt land