

# TECHNICAL PAPER 14

## Air quality

ALBURY TO ILLABO ENVIRONMENTAL IMPACT STATEMENT



ARTC INLAND RAIL

JUNE 2022

# ALBURY TO ILLABO (A2I) PROJECT

2-0008-210-EAP-00-RP-0013

## TECHNICAL PAPER 14 – AIR QUALITY





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# GLOSSARY AND ABBREVIATIONS

A2I	Albury to Illabo section of Inland Rail
AAQMS	Ambient air quality monitoring station
ACT	Australian Capital Territory
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.
AHD	Australian height datum
Air NEPM	<i>National Environment Protection (Ambient Air Quality) Measure</i>
Air Toxics NEPM	<i>National Environment Protection (Air Toxics) Measure</i>
AMO	Aeronautical Meteorological Observatory
AQIA	Air Quality Impact Assessment
AQMP	Air Quality Management Plan
ARTC	Australian Rail Track Corporation
AWS	Automatic Weather Station
BoM	Bureau of Meteorology
BRD	Botany Rail Duplication
BTEX	Benzene, toluene, ethylbenzene and xylene isomers
CEMP	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.
CO	Carbon monoxide
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 footprint	The area that would be used for the construction of the proposal
CSSI	Critical State Significant Infrastructure
Culvert	A structure that allows water to flow under a road, railway, track, or similar obstruction.
Cumulative impacts	Impacts that, when considered together, have different and/or more substantial impacts
Down line	Track within a dual-track section of corridor on which trains travel away Sydney Central station
DPE	NSW Department of Planning and Environment
DPIE	(former) NSW Department of Planning, Industry and Environment

DS	Dust soiling
Dust deposition	The removal of particles by dry deposition through gravity, impaction and diffusion or wet deposition in or below clouds.
EIS	Environmental Impact Statement
EMP	Environmental management plan
Enhancement site	Discrete sites within the A2I proposal site that are proposed for infrastructure enhancement. Enhancement works at each of these discrete work sites may include raising, widening or replacing bridges, raising or replacing signal gantries, and lowering sections of track.
EPA	NSW Environment Protection Authority
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
Gantry	An overhead metal structure with a frame supporting equipment such as a signals, lighting or cameras.
GLC	Ground level concentrations
HDVs	Heavy duty vehicle
HEMV	Heavy earth moving vehicles
HH	Human health
IAC	Impact assessment criteria
IAQM guidance	Guidance on the assessment of dust from demolition and construction 2014
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 1,700km in length. Inland Rail will involve a combination of upgrades of existing rail track and the provision of new track.
LEP	Local environmental plan
LGA	Local government 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
N2N	Narromine to Narrabri section of the Inland Rail alignment
N2NS	Narrabri to North Star section of the Inland Rail alignment
NO	nitrogen monoxide
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Oxides of nitrogen
NPI	National Pollutant Inventory

NS2B	North Star to NSW/Queensland Border section of the Inland Rail alignment
NSFC	North Strathfield Freight Corridor
NSW	New South Wales
Operational footprint	Area occupied by permanent infrastructure and required for the operation of the proposal.
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.
PAHs	Polycyclic Aromatic Hydrocarbons
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.
PCDD	Polychlorinated dibenzodioxins
PCDF	Polychlorinated dibenzofurans
Pedestrian bridge	A bridge designed solely for pedestrians to cross a watercourse, rail corridor or road.
PM	Particulate matter
PM <sub>10</sub>	Particulate Matter less than 10 micrometres in aerodynamic diameter
PM <sub>2.5</sub>	Particulate Matter less than 2.5 micrometres in aerodynamic diameter
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
Precinct	Groupings of enhancement sites in line with the LGAs within the A2I section of Inland Rail including Albury, Greater Hume – Lockhart, Wagga Wagga and Junee.
Rail corridor	The corridor within which the rail tracks and associated infrastructure are located
RH	Relative humidity
RMAR	Rail maintenance access road
SEARs	Secretary's Environmental Assessment Requirements
Shared user	Descriptor of infrastructure of path designed to accommodate pedestrians and cyclists safely to cross a watercourse, rail corridor or road.
SO <sub>2</sub>	Sulphur dioxide
SSI	State Significant Infrastructure
Study Area	The wider area, including and surrounding the proposal site, with the potential to be directly or indirectly affected by the proposal. The extent of the study area varies according to the requirements of each assessment and the potential for impacts.
SVOCs	Semi-volatile organic compounds
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
Track	The structure consisting of the rails, fasteners, sleepers and ballast, which conveys trains.
TSP	Total suspended particulates are particles of less than 100 micrometres in diameter
VOCs	Volatile organic compounds
WSP	WSP Australia Proprietary Limited

### ***Units***

°C	Degrees Celsius
g/s	Grams per second
km	Kilometre
km/hr	Kilometres per hour
m	Metre
mAHD	Metres in Australian Height Datum
mm	Millimetre
m <sup>3</sup>	Cubic metres
m/s	Metres per second
mg/m <sup>3</sup>	Milligrams per cubic metre
ng/m <sup>3</sup>	Nanograms per cubic metre
t	Tonne
µg/m <sup>3</sup>	Micrograms per cubic metre
µm	Micrometre
pphm	Parts per hundred million
ppm	Parts per million
%	Per cent

# EXECUTIVE SUMMARY

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

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'). WSP was engaged by ARTC to complete an air quality assessment to support the Environment Impact Statement (EIS) for the proposal.

The existing air quality for the study area was characterised using the following publicly available information:

- Junee ambient air quality monitoring station (AAQMS) [Total suspended particulates]
- Albury AAQMS (PM<sub>10</sub> and PM<sub>2.5</sub>)
- Wagga Wagga North AAQMS (PM<sub>10</sub> and PM<sub>2.5</sub>)
- Florey AAQMS (nitrogen dioxide (NO<sub>2</sub>) and carbon monoxide [CO])
- Bargo AAQMS (sulphur dioxide [SO<sub>2</sub>]).

The air quality in the towns along the proposal e.g., Junee, Henty, Illabo, is expected to be similar to that measured at the Albury and Wagga Wagga AAQMS. At the rural and regional sections of the proposal, air quality within the study area is likely to be of better quality in general than the air quality measured at the above listed AAQMS.

The meteorology of the local area was characterised using data collected at the Bureau of Meteorology (BoM) stations at Albury Airport Automatic Weather Station (AWS) and Wagga Wagga Airport AWS. The following parameters were analysed and reported: wind speed and direction, temperature, relative humidity, and precipitation.

Sensitive receptors were identified within 350 metres (m) of each enhancement site and 50m of the route(s) used by construction vehicles on public roads up to 500m from the site entrance(s) were identified. The assessment of operational impacts of the proposal considered sensitive receptors located 100m from the proposal for each enhancement site.

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## CONSTRUCTION ASSESSMENT

Dust impacts associated with construction of the proposal was conducted in accordance with the risk-based approach detailed in the *Guidance on the assessment of dust from demolition and construction 2014* published by the Institute of Air Quality Management (IAQM guidance).

Gaseous and odour emissions from construction works and any dust related construction works 'screened out' by the IAQM guidance criteria were assessed qualitatively.

The risk of dust impacts prior to mitigation measures are summarised as follows:

Demolition works at:

- The Albury Yard clearances, Cassidy Parade pedestrian bridge, Edmondson Street bridge and Kemp Street bridge enhancement sites would have a medium risk of human health effects from dust and a low risk of dust soiling arising from the deposition of dust.
- All other enhancement sites (Culcairn Yard clearances, Wagga Wagga Station pedestrian bridge and Junee Station pedestrian bridge) would have a negligible risk of adverse impact on dust soiling arising from the deposition of dust and a low risk to human health effects from dust.

Earthworks at:

- The Olympic Highway underbridge and Junee to Illabo clearances enhancement sites would have a high risk of human health effects from dust.
- The Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Henty Yard clearances, Uranquinty Yard clearances, Pearson Street bridge, and Wagga Wagga Yard clearances and Junee Yard clearances enhancement sites would have medium risk of human health effects from dust.
- The Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Henty Yard clearances, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances enhancements sites would have medium risk of dust soiling.
- All other enhancement sites would have a low to negligible impact on dust soiling and human health effects from dust.

Constructions works at:

- Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Henty Yard clearances, Wagga Wagga Yard clearances, Junee Yard clearances Olympic Highway underbridge, and Junee to Illabo clearances would have a medium risk of human health effects from dust and from dust soiling.
- All other enhancement sites would have a low to negligible impact on dust soiling and human health effects from dust.

Track out from heavy duty vehicles (HDVs) at:

- Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances would have a high risk of human health effects from dust.
- Enhancement sites at Culcairn Yard clearances, Henty Yard clearances, and Pearson Street bridge would have medium risk of human health effects from dust.
- Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances would have medium risk of dust soiling.
- All other enhancement sites would have a low to negligible impact on dust soiling and human health effects.

With site-specific mitigation measures in place, the residual risk of dust impacts is expected to be low and not of significance.

Gaseous and odour emissions generated during the construction phase would be minimised with mitigation measures in place and impacts would not be significant.

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## OPERATION ASSESSMENT

During operations, particulate matter (of varying size fractions) and combustion emissions (e.g. nitrogen dioxide [NO<sub>2</sub>], carbon monoxide (CO), Sulphur dioxide (SO<sub>2</sub>), volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs)) would be generated.

Considering the low frequency of projected train movements and the small increase in projected train movement in 2025 and 2040 air dispersion modelling for operational emissions was not conducted. Consequently, air quality impacts of potential emissions from the operational phase were assessed qualitatively by comparing the project to four similar rail projects in New South Wales (NSW). The projects comprised:

- Northern Sydney Freight Corridor Strathfield Rail Underpass (NSFC) Project
- Botany Rail Duplication Project (BRD)
- Narromine to Narrabri Project (N2N)
- North Star to NSW/Queensland Border (NS2B) Project.

Train movements projected for the proposal are lower than that for two of the rail projects discussed in section 5.2.1 and similar to that of the N2N project. Potential impacts associated with the operation of the proposal are expected to be lower or of similar magnitude than that of the reference projects. Air dispersion modelling conducted for both the NSFC Project and the BRD Project demonstrated compliance with the relevant impact assessment criteria (IAC) for all assessed pollutants. Potential air quality impacts from idling trains at Junee (Olympic Highway) are expected to be of similar magnitude to the predicted concentrations for the N2NB Project. All pollutants modelled were below their respective IAC. It is expected that ground level pollutant concentrations from idling train emissions at Junee (Olympic Highway) would also be below relevant IACs.

The proposal is projected to increase the average number of freight train movements between Albury and Illabo from a current average of up 12 per day in 2021 to 18 per day in 2025, further increasing to about 20 per day in 2040. The increase in freight train movements may cause an increase in combustion emissions. However, the future train movements are lower or similar to those for the NSFC and BRD projects where dispersion modelling outcomes demonstrated compliance with relevant IACs. Air quality impacts from train movements along the proposal in 2025 and 2040 would not exceed the relevant IAC pollutant criteria.

Air quality impacts during operations would be managed at source through diesel fuel standards, locomotive maintenance, and emissions testing.

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## CONCLUSIONS

In summary, air quality impacts during construction are not expected to be of significance with management measures in place. Air quality impacts during operation are expected to be low at the nearest sensitive receptors due to the small increase in the projected frequency of trains using the proposal in 2025 and 2040.

# 1 INTRODUCTION

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## 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 (km) long, would involve:

- using the existing interstate rail line through Victoria and southern NSW
- upgrading about 400km of existing track, mainly in western NSW
- providing about 600km 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), dated 14 October 2020.

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## 1.2 THE PROPOSAL

The proposal involves enhancement works to structures and sections of track along 185km 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 km 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 (LGA) 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

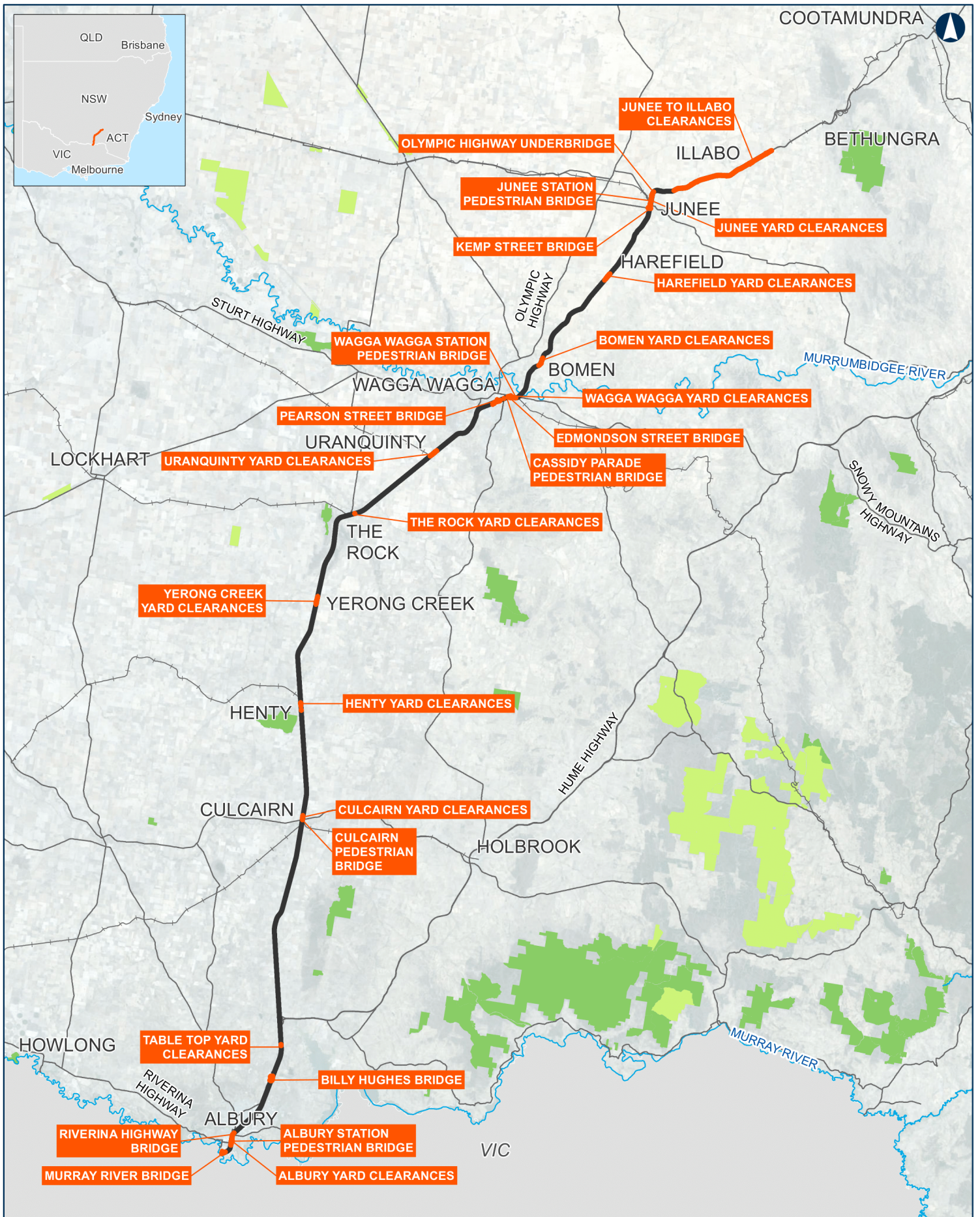
PRECINCT	ENHANCEMENT SITES
<b>Albury</b>	Murray River bridge
	Albury Station pedestrian bridge
	Albury Yard clearances
	Riverina Highway bridge
	Billy Hughes bridge
	Table Top Yard clearances
<b>Greater Hume – Lockhart</b>	Culcairn pedestrian bridge
	Culcairn Yard clearances
	Henty Yard clearances
	Yerong Creek Yard clearances
	The Rock Yard clearances
<b>Wagga Wagga</b>	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
<b>Junee</b>	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 44km 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 1.6m 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.



**Albury to Illabo**

Figure 1.1 Enhancement sites of the proposal

0 10 20 km

Coordinate System: GDA 1994 MGA Zone 55

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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



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

### 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 of the proposal 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.

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	<ul style="list-style-type: none"><li>— Establishment of key construction infrastructure, work areas, access points and other construction facilities</li><li>— Installation of environmental controls, fencing and site services</li><li>— Preliminary activities including clearing/trimming of vegetation</li></ul>
Main construction works	<ul style="list-style-type: none"><li>— Track works</li><li>— Rail bridge works</li><li>— Road bridge replacement</li><li>— Pedestrian bridge works</li><li>— Associated infrastructure works on level crossings, culverts and signalling</li></ul>
Finishing works	<ul style="list-style-type: none"><li>— Testing and commissioning of the new and modified infrastructure</li><li>— Demobilisation and removal of construction compounds and other construction infrastructure</li><li>— Restoration of disturbed areas, as required, including revegetation and landscaping, where required</li></ul>

### 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 6.5m high and up to 1,800m in length. The possible future use of the railway between Albury and Illabo by freight trains up to 3,600m long would be subject to separate assessment. Freight train speeds would range from 60 to 115 kilometres per hour (km/hr), 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.

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## 1.3 PURPOSE AND SCOPE OF THIS REPORT

This report has been prepared by WSP Australia Pty Ltd (WSP) as part of the Environmental Impact Statement (EIS) for the proposal to assess potential air quality impacts during construction and operation. The scope of works for the proposal is as follows:

- characterise the existing ambient air quality and meteorology using publicly available information
- identify relevant ambient air quality impact assessment criteria
- assess construction air quality impacts (qualitative) and operational air quality impacts (qualitative)
- review of potential cumulative impacts from other projects in the local area
- propose management and mitigation measures to minimise potential air quality impacts.

This report addresses the relevant SEARs issued by the Secretary of the former NSW Department of Planning Industry and Environment (DPIE) (now the Department of Planning and Environment) for the proposal on 14 October 2020. The SEARs relevant to the assessment of air quality are presented in Table 1.3. The SEARs refers to the Scoping Report (ARTC, 2020a) for the requirements for assessment of air quality impacts for the proposal.

Table 1.3 Secretary's Environmental Assessment Requirements relevant to air quality

KEY ISSUE AND DESIRED PERFORMANCE OUTCOME	ASSESSMENT REQUIREMENT	REPORT REFERENCE
13. Other Issues	<p><b>1</b> Assess the following issues in accordance with the commitments made in Chapter 6 of the Scoping Report:</p> <p><b>a</b> Air Quality</p> <p>The scoping report identified the following requirements relevant to the assessment of air quality:</p> <p><i>A specialist air quality impact assessment would be undertaken as part of the EIS. The air quality impact assessment would include:</i></p>	<p>The requirements in the scoping report are outlined below.</p> <p>These requirements are addressed in Chapter 5.</p>
	<p>— <i>identification of sensitive receivers and place with potential for impact</i></p>	Section 4.2
	<p>— <i>documenting key design, construction, operating and modelling assumptions</i></p>	Chapter 3
	<p>— <i>identifying relevant meteorological conditions</i></p>	Section 4.4
	<p>— <i>justifying the modelling approach</i></p>	Chapter 5
	<p>— <i>documenting the characteristics of emissions and their effect on local and regional air quality conditions.</i></p>	Chapter 5

The methodology for preparation of the Air Quality Technical Paper is outlined in Chapter 3.

## 1.4 STRUCTURE OF THIS REPORT

The structure and content of this report is as follows:

- **Chapter 1 – Introduction** (this chapter).
- **Chapter 2 – Legislation and policy context** – describes the legislation and policy context for the assessment and relevant guidelines.
- **Chapter 3 – Methodology** – outlines the construction and operational approach adopted for this assessment.
- **Chapter 4 – Existing environment** – describes the local setting, sensitive receptors, topography, local meteorology and ambient air quality.
- **Chapter 5 – Impact assessment** – describes the potential construction and operational impacts associated with the proposal.
- **Chapter 6 – Cumulative impacts** – discusses the potential cumulative impacts with respect to other known developments within the vicinity of the proposal.
- **Chapter 7 – Mitigation and management measures** – details recommended mitigation and management measures to minimise air quality impacts.
- **Chapter 8 – Conclusion** – overview of the key findings of the report.
- **Chapter 9 – References.**

## 2 LEGISLATION AND POLICY CONTEXT

Key pollutants expected to be emitted during construction and operation of the proposal are outlined below. The relevant legislative considerations and advisory documents relevant to these pollutants are detailed below.

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### 2.1 POLLUTANTS OF INTEREST

The air pollutants expected to be emitted during construction and operation of the proposal are:

- total suspended particulates (TSP)
- deposited dust
- particulate matter with an equivalent aerodynamic diameter less than 10 micrometres (PM<sub>10</sub>)
- particulate matter with an equivalent aerodynamic diameter less than 2.5 micrometres (PM<sub>2.5</sub>)
- oxides of nitrogen (NO<sub>x</sub>, primarily comprising of nitrogen monoxide [NO] and nitrogen dioxide [NO<sub>2</sub>])
- carbon monoxide (CO)
- sulphur dioxide (SO<sub>2</sub>)
- volatile organic compounds (VOCs) (e.g. benzene, toluene, ethylbenzene and xylene isomers (BTEX))
- semi-volatile organic compounds (SVOCs) (e.g. polycyclic aromatic hydrocarbons (PAHs) as benzo(a)pyrene equivalents)
- odour.

Legislative requirements for these pollutants are discussed in further detail in the following sections.

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### 2.2 COMMONWEALTH LEGISLATION AND POLICY

#### 2.2.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

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

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 2020 (EPBC Referral No 2020/8670). On 29 June 2020, the Australian Government Department of Agriculture, Water and the Environment notified that the proposal is a not controlled action.

## 2.2.2 NATIONAL ENVIRONMENT PROTECTION (AIR QUALITY) MEASURE 2021

Key pollutants commonly found in ambient air are nationally regulated under the National Environment Protection (Ambient Air Quality) Measure (Air NEPM) and National Environment Protection (Air Toxics) Measure (Air Toxics NEPM).

The Air NEPM outlines standards and goals for key pollutants that are required to be achieved nationwide, with due regard to population exposure. The national environment protection standards of this measure are presented in Table 2.1.

Changes in concentration standards (NO<sub>2</sub> and SO<sub>2</sub> only) and maximum allowable exceedances for NO<sub>2</sub>, SO<sub>2</sub> and CO came into law on 15 April 2021 and are presented in Table 2.1 together with standards applicable up to this date. There were no changes to concentration standards for PM<sub>10</sub> and PM<sub>2.5</sub>. In addition, Commonwealth, State and Territory Environment Ministers have flagged an objective to move to a PM<sub>2.5</sub> standard of 20µg/m<sup>3</sup> (1-day average) and 7µg/m<sup>3</sup> (1-year average) by 2025 as prescribed in the Air NEPM 2016 amendment.

These standards are not relevant to air emissions from individual sources, specific industries or roadside locations. Air NEPM standards are intended to be applied at performance monitoring locations that represent air quality for a region or sub-region of 25,000 people or more. These performance monitoring stations are operated by the relevant environmental regulatory authority in each State and Territory.

Table 2.1 Air NEPM standards and goals

POLLUTANT	AVERAGING PERIOD	AIR QUALITY STANDARD <sup>1, 2, 3</sup>	MAXIMUM ALLOWABLE EXCEEDANCES <sup>4</sup>
PM <sub>10</sub>	1 day	50µg/m <sup>3</sup>	None
	1 year	25µg/m <sup>3</sup>	None
PM <sub>2.5</sub>	1 day	25µg/m <sup>3</sup>	None
		20µg/m <sup>3</sup> (2025)	
	1 year	8µg/m <sup>3</sup>	None
		7µg/m <sup>3</sup> (2025)	
CO	8 hours	9.0ppm (up to 15 April 2021)	1 day a year
		9.0ppm (from 15 April 2021)	None
NO <sub>2</sub>	1 hour	0.12ppm (up to 15 April 2021)	1 day a year
		0.08ppm (from 15 April 2021)	None
	1 year	0.03ppm (up to 15 April 2021)	None
		0.015ppm (from 15 April 2021)	None
SO <sub>2</sub>	1 hour	0.20ppm (up to 15 April 2021)	1 day a year
		0.10ppm (from 15 April 2021)	None
	1 day	0.08ppm (up to 15 April 2021)	1 day a year
		0.02ppm (from 15 April 2021)	None
	1 year	0.02ppm (up to 15 April 2021)	None
		No standard (from 15 April 2021)	None

- (1) Defined as a standard that consists of quantifiable characteristics of the environment against which environmental quality can be assessed
- (2) µg/m<sup>3</sup> – unit of measurement for particulate matter expressed as micrograms per cubic metre
- (3) ppm – unit of measurement for gaseous species expressed as parts per million
- (4) The number of allowed exceedances of the relevant Air NEPM standard per year

### 2.2.3 NATIONAL ENVIRONMENT PROTECTION (AIR TOXICS) MEASURE 2011

The objective of the Air Toxics NEPM is to improve knowledge regarding ambient air toxic pollutants within areas containing sensitive receptors that are likely to be impacted by elevated concentrations to facilitate development of standards that will allow for the protection of human health and well-being.

The standards for specific air toxics are presented in Table 2.2.

Table 2.2 Air toxics NEPM standards and goals

POLLUTANT	AVERAGING PERIOD	AIR QUALITY STANDARD	MAXIMUM ALLOWABLE EXCEEDANCES
Benzene	1 year	0.003ppm	None
Benzo(a)pyrene <sup>1</sup>	1 year	0.3ng/m <sup>3</sup>	None
Toluene	24 hours	1ppm	None
	1 year	0.1ppm	None
Xylene isomers	24 hours	0.25ppm	None
	1 year	0.2ppm	None

(1) Benzo(a)pyrene as a marker for polycyclic aromatic hydrocarbons

(2) ppm – unit of measurement for gaseous species expressed as part per million

(3) ng/m<sup>3</sup> – unit of measurement for benzo(a)pyrene expressed as nanograms per cubic metre

## 2.3 NSW LEGISLATION AND POLICY

### 2.3.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

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

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

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

### 2.3.2 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT

The *Protection of the Environment Operations Act 1997* (POEO Act) provides the legislative framework for the protection and enhancement of air quality in NSW. Its primary objectives are to reduce risks to harmless levels through pollution prevention, cleaner production, application of waste management hierarchy, continual environmental improvement and environmental monitoring. Sections 124 to 126 and 128 of the POEO Act refer to air pollution related activities of relevant to this proposal.

An environment protection licence (EPL) is required under Chapter 3 of the POEO Act to undertake a scheduled activity or scheduled development work. The proposal meets the definitions of scheduled activities provided in *Schedule 1: railway activities—railway infrastructure construction (clause 33) and railway activities—railway infrastructure operations (clause 33A)*.

ARTC operates its rail network in accordance with an Environment Protection Licence (EPL), specifically EPL 3142. While EPL 3142 covers some elements of construction, the construction of a new section of track would fall outside the existing EPL. Once the proposal is operational, it is anticipated that EPL 3142 would be modified to incorporate the proposal. Rolling stock operators are responsible for obtaining an EPL for their activities.

For construction activities, a separate EPL would be obtained by the construction contractor in consultation with the Environment Protection Authority (EPA).

### 2.3.3 APPROVED METHODS FOR THE MODELLING AND ASSESSMENT OF AIR QUALITY IN NSW (2016)

Pursuant to the POEO Act, the *Approved Methods for Modelling and Assessment of Air Quality in NSW 2016* (Approved Methods) prescribes the statutory methods for modelling and assessing air emission sources in NSW.

The Approved Methods lists impact assessment criteria (IAC) for a range of pollutants against which emissions from an activity is to be assessed. The IAC for the principal pollutants expected to be emitted during operation is presented in Table 2.3.

Table 2.3 NSW impact assessment criteria

POLLUTANT	AVERAGING PERIOD	AIR QUALITY STANDARD	SOURCE
PM <sub>10</sub>	24 hours	50µg/m <sup>3</sup>	Approved Methods
	Annual	25µg/m <sup>3</sup>	
PM <sub>2.5</sub>	24 hours	25µg/m <sup>3</sup>	Approved Methods
	Annual	8µg/m <sup>3</sup>	
CO	15 minutes	87ppm	Approved Methods
	1 hour	25ppm	
	8 hours	9ppm	
NO <sub>2</sub>	1 hour	0.12ppm	Approved Methods
	Annual	0.3ppm	
SO <sub>2</sub>	10 minutes	0.25ppm	Approved Methods
	1 hour	0.20ppm	
	24 hours	0.08ppm	
	Annual	0.02ppm	
Benzene	1 hour	29µg/m <sup>3</sup>	Approved Methods

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## 2.4 POLICY AND GUIDELINES

The air quality impact assessment was undertaken with consideration of relevant guidelines, including:

- *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2016)
- *Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management Version 1.1, 2014 (IAQM guidance)*.

# 3 METHODOLOGY

The air quality assessment methodology for the construction and operation of the proposal includes the following steps:

- desktop review of publicly available information to characterise the existing ambient air quality and meteorology using:
  - ambient air monitoring data collected and managed by the EPA which sits within the NSW Environment, Energy and Science Group with DPE.
  - meteorological data collected at the Bureau of Meteorology (BoM)
  - industrial facilities that report to the National Pollutant Inventory (NPI) website
- identify existing sensitive receptors within the study area
- review the legislative and regulatory framework for the proposal as it relates to air quality
- identify the main sources of air emissions during construction and operation, with consideration of the future freight train volumes
- conduct a semi-quantitative risk-assessment of air quality impacts during construction
- conduct a qualitative assessment of air quality impacts during operation
- consider cumulative impacts from other projects in the local area
- identify management and mitigation measures to minimise or manage potential impacts to air quality.

As the nature of activities during the construction and operation phases vary, the assessment methodology used for two phases are discussed separately.

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## 3.1 STUDY AREA

For construction of the proposal, the study area considers potential air quality impacts within 350m of the proposal site and 50m of the haulage route(s) used by construction vehicles on public roads up to 500m from the access points at each enhancement site. The risk-based approach is adopted from the *Guidance on the assessment of dust from demolition and construction* published by the Institute of Air Quality Management (IAQM) in 2014 (IAQM guidance).

For operations, the study area considers potential air quality impacts within 100m of the rail track. Beyond 100m of the track, emissions from freight trains are anticipated to have low impact on the receiving environment and are not expected to be of significance.

A review of the NPI database for the 2019/2020 reporting year was conducted to identify existing industrial emission sources within local government areas (LGAs) relevant to the study area. These industrial emissions will contribute to the local airshed and recorded at the ambient air quality monitoring stations in Albury, Junee and Wagga Wagga.

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## 3.2 EXISTING ENVIRONMENT

The existing environment relevant to air quality was characterised using the following aspects:

- sensitive receptors
- topography
- local meteorology
- ambient air quality.

Sensitive receptors within 350m of the proposal site boundary for each enhancement site were identified using aerial imagery and information provided from other assessments including Technical Paper 6 – Construction noise and vibration and Technical Paper 7 – Operational noise and vibration (rail).

The Approved Methods for the Modelling and Assessment of Air Quality in NSW (Approved Methods) (EPA, 2016) describes a sensitive receptor as *‘A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area. An air quality impact assessment should also consider the location of any known or likely future sensitive receptor.’*

There are no ecological areas of sensitivity within the study considered to be more sensitive to impacts from air quality than those identified as residential and other land uses (refer to Technical paper 8 – Biodiversity development assessment report and Technical Paper 9 – Aquatic ecology for further discussion). Consequently, ecological receptors were considered through assessment of other receptors, and management and mitigation measures are considered adequate.

The topography of the area was described and characterised using data obtained from Geoscience Australia.

The type of soil at each enhancement site was reviewed using information provided in Technical Paper 13 – Contamination.

The local meteorology was characterised using information obtained from the BoM. The key meteorological parameters used include hourly records of wind speed, wind direction, temperature, rainfall and relative humidity. There are two weather stations near the proposal that characterises the local climate using the most recent long-term datasets. These are:

- Albury Airport automatic weather station (AWS) [Station number: 072160], located approximately one km east, at the southern extent of the proposal. It is situated at an elevation of 164m on flat plains. This AWS commenced operation in 1993.
- Wagga Wagga Airport Aeronautical Meteorological Observing (AMO) station (Station number: 072150), located approximately nine km to the south-east and near the northern extent of proposal. It is situated at an elevation of 212m on flat plains. This AMO commenced operation in 1941.

The recorded meteorological data has been analysed and is considered in further detail in section 4.4. Both AWS are broadly representative of the local climate given their proximity to the proposal, although there may be variances due to local topography.

The local air quality was characterised using ambient air quality data collected at the nearest and/or most representative ambient air quality monitoring stations (AAQMS) operated by relevant regulatory authorities in NSW and the ACT. Ambient air quality data collected at the following AAQMS has been considered:

- Junee (TSP)
- Albury (PM<sub>10</sub> and PM<sub>2.5</sub>)
- Wagga Wagga North (PM<sub>10</sub> and PM<sub>2.5</sub>)
- Florey (ACT) (NO<sub>2</sub>, CO)
- Bargo (SO<sub>2</sub>).

The ambient air quality data collected at the AAQMS is considered to be broadly representative of the air quality along the proposal alignment due to their location and setting. The rural locations along the proposal alignment are anticipated to have cleaner air quality due to fewer emission sources e.g. traffic and industrial.

A review of the NPI database for the 2019/2020 reporting year was also conducted to identify existing industrial emission sources in the study area.

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## 3.3 IMPACT ASSESSMENT

### 3.3.1 CONSTRUCTION

The main air pollution and amenity considerations at enhancement sites are:

- annoyance due to dust deposition and visible dust plumes
- elevated airborne particulate concentrations due to on-site dust-generating activities
- increased concentrations of airborne particulate matter and NO<sub>2</sub> due to exhaust emissions from on-site diesel-powered vehicles and construction equipment.

The dust or particulate emissions associated with the construction of the proposal have been assessed in accordance with IAQM guidance. The IAQM guidance provides a risk-based approach with the aim to identify risks and to recommend appropriate mitigation measures, and involves the following steps:

- Step 1: Screen the need for a more detailed assessment. The IAQM guidance document recommends that a risk assessment is undertaken when sensitive receptors are located within 350m of the proposal site boundary or 50m of the route (s) used by construction vehicles on public roads up to 500m from the site entrance(s). For construction works screened out for a detailed risk assessment (in Step 1), the IAQM guidance indicates that it can be concluded that the level of risk is “negligible” and any effects would not be of significance.
- Step 2: Assess the risk of dust impacts. This is done separately for each type activity including demolition, earthworks, general construction and track out by heavy vehicles (i.e., haulage activities).
  - Step 2A: Determine the potential dust emission magnitude (large, medium or small) of the works depending on the type of activity. For demolition, the dust magnitude is classified as large, medium or small depending on the total building volume demolished, type of construction material e.g. concrete, metal, on-site crushing and screening, and height of demolition activities above ground level. For earthworks, the total site area, and soil type are the main determining factors. For general construction works, the total building volume, on-site concrete batching and sandblasting determine the dust emission magnitude. For track out, the number of heavy vehicle outward movements in any given day, type of surface material and the unpaved road length are key determinants.
  - Step 2B: Determine the sensitivity (high, medium, or low) of the area to dust soiling and human health (Table 3.1 and Table 3.2). Several factors are considered including the number of receptors and their proximity to the works, specific receptor sensitivities, existing background concentrations and site specific factors that may reduce impacts (e.g. trees that may reduce wind-blown dust).
  - Step 2C: Define the risk of dust impacts on dust soiling and human health by combining the dust emission magnitudes (large, medium or small) for earthworks, general construction and track out (Step 2A) with the sensitivity of the area (high, medium or low) (Step 2B). Table 3.3 to Table 3.5 present the risk of dust impacts from demolition, earthworks, general construction and track out respectively.
- Step 3: Determine the site-specific mitigation measures for the proposal.
- Step 4: Examine the residual effects and determine whether these are significant.

To address other potential sources of emissions during construction, gaseous pollutants (e.g. NO<sub>2</sub>, CO, SO<sub>2</sub>, benzene) were addressed qualitatively due to the intermittent nature of these emissions. Air emissions from traffic diversions during construction works at several enhancement sites were assessed qualitatively.

Table 3.1 Sensitivity of the area to dust soiling

RECEPTOR SENSITIVITY	NUMBER OF RECEPTORS	DISTANCE FROM THE SOURCE (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10–100	High	Medium	Low	Low
	1–10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	<1	Low	Low	Low	Low

Table 3.2 Sensitivity of the area to human health impacts

RECEPTOR SENSITIVITY	ANNUAL MEAN PM <sub>10</sub> CONCENTRATION <sup>1</sup>	NUMBER OF RECEPTORS	DISTANCE FROM THE SOURCE (m)				
			<20	<50	<100	<200	<350
High	>25µg/m <sup>3</sup>	>100	High	High	High	Medium	Low
		10–100	High	High	Medium	Low	Low
		1–10	High	Medium	Low	Low	Low
	<25µg/m <sup>3</sup>	>100	High	Medium	Low	Low	Low
		10–100	High	Medium	Low	Low	Low
		1–10	Medium	Low	Low	Low	Low
Medium	>25µg/m <sup>3</sup>	>10	High	Medium	Low	Low	Low
		1–10	Medium	Low	Low	Low	Low
Low	<25µg/m <sup>3</sup>	≥1	Low	Low	Low	Low	Low

(1) The annual mean PM<sub>10</sub> concentration ranges were adjusted to reflect the annual mean Air NEPM standard of 25µg/m<sup>3</sup>

Table 3.3 Risk of dust impacts for demolition

SENSITIVITY OF AREA	DUST EMISSION MAGNITUDE		
	Large	Medium	Small
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible risk

Table 3.4 Risk of dust impacts for earthworks and construction

SENSITIVITY OF AREA	DUST EMISSION MAGNITUDE		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Table 3.5 Risk of dust impact from track out<sup>1</sup> from trucks

SENSITIVITY OF AREA	DUST EMISSION MAGNITUDE		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low risk	Negligible
Low	Low risk	Low risk	Negligible

(1) Track out refers to dirt, mud or other materials tracked onto a paved public roadway by a vehicle leaving a construction site

### 3.3.2 OPERATION

The potential operational impacts to air quality were assessed through comparative analysis of air quality impact assessment reports prepared for four similar rail projects in NSW. The number of train movements, train speed, distance to sensitive receptors and local setting for reference projects were compared with the proposal to qualitatively evaluate the potential air quality impacts of the proposal. These projects are:

- Northern Sydney Freight Corridor (NSFC) Strathfield Rail Underpass Project (normal operation)
- Botany Rail Duplication (BRD) Project (normal operation and idling trains)
- Narromine to Narrabri (N2N) Project (idling trains)
- North Star to NSW/Queensland Border (NS2B) Project (idling trains).

Operational air quality impacts were assessed qualitatively for PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, CO, SO<sub>2</sub>, and VOCs. These are the principal air emissions from operation of the diesel locomotives.

No additional passing loops are included for the proposal. Potential changes in train idling locations (e.g. at Junee) due to other operational changes, were assessed through qualitative consideration of the difference from existing projects to the proposal, relative proximity to sensitive receptors, and principles considered in modelling completed for the projects detailed above.

During operation of the proposal, there will be minimal increases in road traffic emissions due to changes to the road network. Additionally, it is anticipated there will be minor increases in road traffic due to maintenance activities and operational requirements including staff changeovers associated with additional rail services. These increases are expected to be in the range of one or two vehicles per day. Consequently, there will be minimal increases in vehicular emissions from operational activities and changes in the road network with no significant contribution to future background concentrations anticipated. As such, emissions from vehicular traffic have not been considered further in this Technical Paper.

### 3.3.3 CUMULATIVE IMPACTS

The cumulative impact assessment considered other nearby development projects together with the proposal during both construction and operation where cumulative air quality impacts could arise. Nearby developments to the proposal were identified and the cumulative impacts with the proposal were assessed qualitatively.

# 4 EXISTING ENVIRONMENT

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## 4.1 LOCAL AND REGIONAL SETTING

The proposal site is located within five LGAs, Albury, Greater Hume, Lockhart, Wagga Wagga and Junee. All five LGAs comprise a mix of urban and rural land uses such as housing, industrial and agricultural/grazing in addition to major road and rail infrastructure. The Albury and Illabo townships are situated at the southern and northern extents of the proposal, and the proposal includes enhancement sites covering 35km of the 185km of the section of railway in this section. The township of Wodonga in Victoria lies approximately 2.2km south of Wagga Wagga located outside of the study area.

The study area includes two major urban centres of Albury and Wagga Wagga. Other townships within the study area include Culcairn, Henty, The Rock, Uranquinty, Junee and Illabo.

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## 4.2 SENSITIVE RECEPTORS

The Approved Methods describes a sensitive receptor as:

*‘A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area. An air quality impact assessment should also consider the location of any known or likely future sensitive receptor’.*

Sensitive receptors were identified at each enhancement site for construction and operation of the proposal. The study area for considering potential air quality impacts during construction and operation are different and were considered separately in Section 4.2.1 and 4.2.2. There are 248 sensitive receptors within 50m from the rail track (across 14 enhancement sites). Of these receptors, 80 are residential which are located around 20 to 30m from the rail track.

### 4.2.1 SENSITIVE RECEPTORS RELEVANT TO CONSTRUCTION

Sensitive receptors, within the following distances, were identified in accordance with the IAQM guidance:

- 350m of the proposal site
- 50m of the routes used by construction vehicles on public roads, up to 500m from access points.

These sensitive receptors are summarised in Table 4.1 and Table 4.2 and illustrated in the sensitive receptor figures included in Appendix A.

Table 4.1 Sensitive receptors within 350m of proposal site

PRECINCT	ENHANCEMENT SITE	PROPOSAL CHAINAGE	NUMBER OF RECEPTORS	TYPE OF RECEPTOR
Albury	Murray River bridge	647600 to 648500	103	Residential
			2	Mixed Use
			9	Industrial
	Albury Yard clearances Albury Station pedestrian bridge Riverina Highway bridge	644400 to 646900	728	Residential
			16	Educational
			9	Recreational
			6	Mixed use
			169	Commercial
			17	Industrial
	Billy Hughes bridge	634200 to 635700	1	Residential
			18	Industrial
	Top Table Yard clearances	629500 to 630300	2	Residential
	Greater Hume – Lockhart	Culcairn Yard clearances Culcairn pedestrian bridge	596000 to 597300	275
10				Educational
1				Recreational
3				Place of worship
3				Medical
12				Industrial
Henty Yard clearances		579700 to 581500	295	Residential
			2	Educational
			5	Recreational
			5	Place of worship
			1	Medical
			18	Commercial
			13	Industrial
Yerong Creek Yard clearances		563900 to 565800	53	Residential
			1	Educational
			2	Place of worship
			2	Commercial
			6	Industrial

PRECINCT	ENHANCEMENT SITE	PROPOSAL CHAINAGE	NUMBER OF RECEPTORS	TYPE OF RECEPTOR
	The Rock Yard clearances	549800 to 550500	93	Residential
			1	Recreational
			13	Commercial
			5	Industrial
Wagga Wagga	Uranquinty Yard clearances	534900 to 536800	259	Residential
			6	Educational
			6	Place of worship
			89	Commercial
			5	Industrial
	Pearson Street bridge	522600 to 524500	367	Residential
			8	Educational
			19	Recreational
			42	Commercial
			141	Industrial
	Wagga Wagga Yard clearances Cassidy Parade pedestrian bridge Edmondson Street bridge Wagga Wagga Station pedestrian bridge	520200 to 522100	730	Residential
			26	Educational
			7	Recreational
			4	Place of worship
			4	Medical
89			Commercial	
Bomen Yard clearances	513000 to 515000	55	Industrial	
Junee	Harefield Yard clearances	496900 to 498900	5	Residential
			5	Industrial
	Junee Yard clearances Junee Station pedestrian bridge Kemp Street bridge Olympic Highway underbridge	483400 to 486500	914	Residential
			9	Educational
			2	Recreational
			3	Place of worship
			61	Commercial
19	Industrial			

PRECINCT	ENHANCEMENT SITE	PROPOSAL CHAINAGE	NUMBER OF RECEPTORS	TYPE OF RECEPTOR
	Junee to Illabo clearances	464900 to 481000	42	Residential
			10	Educational
			1	Commercial
			17	Industrial

Table 4.2 Sensitive receptors within 50m of haulage routes up 500m from access points

PRECINCT	ENHANCEMENT SITE	PROPOSAL CHAINAGE	NUMBER OF RECEPTORS	TYPE OF RECEPTOR
Albury	Murray River bridge	647600 to 648500	37	Residential
			1	Mixed use
			4	Industrial
	Albury Yard clearances Albury Station pedestrian bridge Riverina Highway bridge	644400 to 646900	12	Residential
			30	Commercial
			1	Industrial
	Billy Hughes bridge	634200 to 635700	0	Residential
Top Table Yard clearances	629500 to 630300	0	Residential	
Greater Hume – Lockhart	Culcairn Yard clearances Culcairn pedestrian bridge	596000 to 597300	17	Residential
			3	Commercial
			6	Industrial
	Henty Yard clearances	579700 to 581500	17	Residential
			1	Recreational
			2	Place of worship
			9	Commercial
			6	Industrial
			6	Residential
	Yerong Creek Yard clearances	563900 to 565800	2	Place of worship
			3	Industrial
			6	Residential
	The Rock Yard clearances	549800 to 550500	5	Residential
			1	Commercial
			3	Industrial

PRECINCT	ENHANCEMENT SITE	PROPOSAL CHAINAGE	NUMBER OF RECEPTORS	TYPE OF RECEPTOR
Wagga Wagga	Uranquinty Yard clearances	534900 to 536800	28	Residential
			2	Place of worship
			4	Commercial
	Pearson Street bridge	522600 to 524500	14	Residential
			4	Industrial
	Wagga Wagga Yard clearances Cassidy Parade pedestrian bridge Edmondson Street bridge Wagga Wagga Station pedestrian bridge	520200 to 522100	94	Residential
			2	Educational
			1	Medical
			15	Commercial
			8	Industrial
	Bomen Yard clearances	513000 to 515000	3	Industrial
Junee	Harefield Yard clearances	496900 to 498900	1	Residential
	Junee Yard clearances Junee Station pedestrian bridge Kemp Street bridge Olympic Highway underbridge	483400 to 486500	42	Residential
			1	Educational
			1	Recreational
			1	Commercial
			2	Industrial
	Junee to Illabo clearances	464900 to 481000	9	Residential
			1	Educational
			4	Industrial

- (1) There are no receptors within 50m of haulage routes up to 500m from the site access points at Billy Hughes bridge and Table Top Yard clearances

## 4.2.2 SENSITIVE RECEPTORS RELEVANT TO OPERATION OF THE PROPOSAL

Sensitive receptors affected by operational emissions are measured from the approximate centre of the rail track rather than the proposal site boundary, to account for the location of emission from the operation of trains. The chainage range of each site in Table 4.3 indicates the extent of each identified site.

Table 4.3 Sensitive receptors within 100m of the proposal

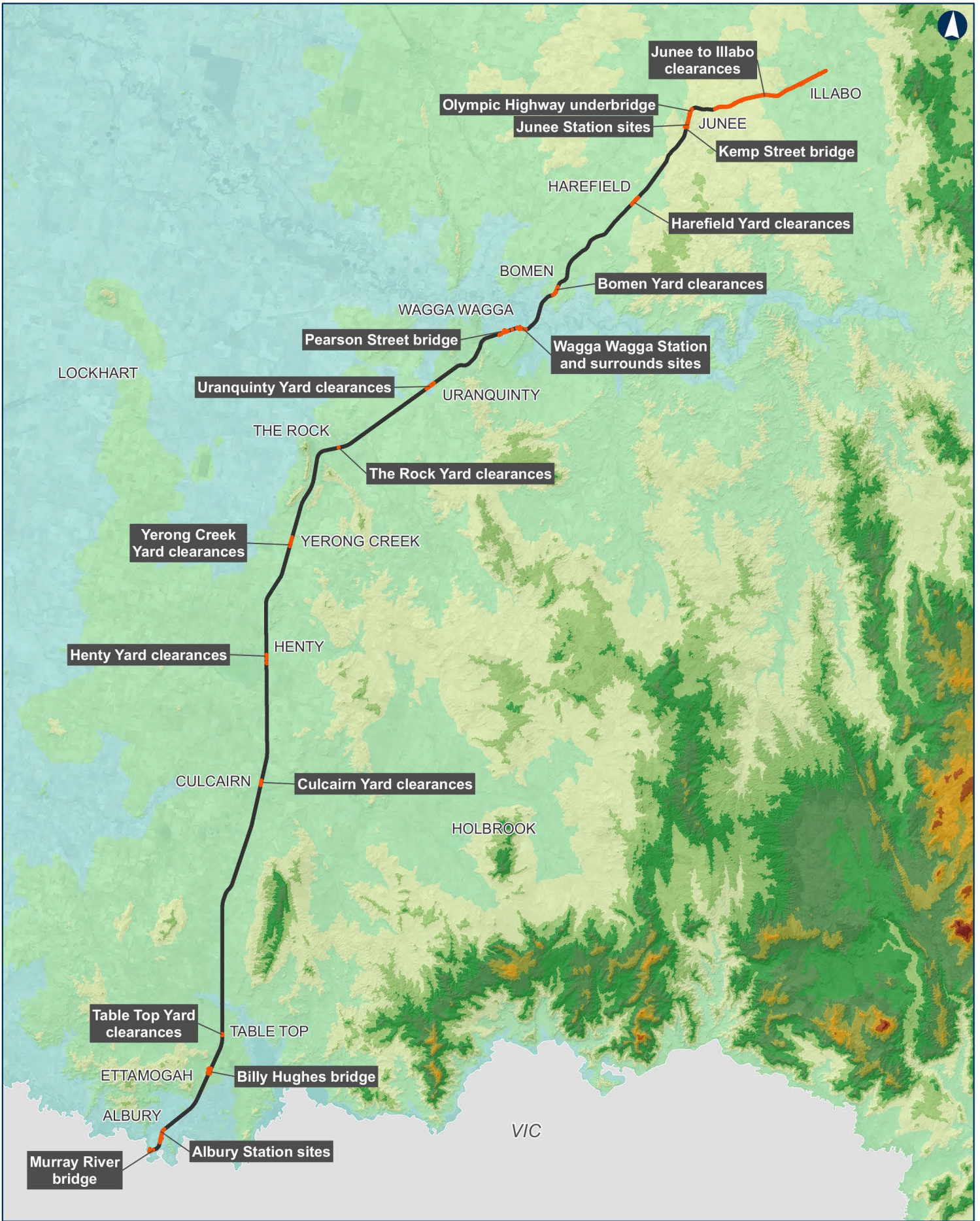
PRECINCT	ENHANCEMENT SITE	PROPOSAL CHAINAGE	NUMBER OF RECEPTORS	TYPE OF RECEPTOR
Albury	Murray River bridge	647600 to 648500	16	Residential
			3	Industrial
	Albury Yard clearances Albury Station pedestrian bridge Riverina Highway bridge	644400 to 646900	8	Residential
			1	Educational
			1	Commercial
			6	Industrial
	Billy Hughes bridge	634200 to 635700	0	Residential
Top Table Yard clearances	629500 to 630300	0	Residential	
Greater Hume – Lockhart	Culcairn Yard clearances Culcairn pedestrian bridge	596000 to 597300	39	Residential
			1	Recreational
			8	Commercial
			12	Industrial
	Henty Yard clearances	579700 to 581500	51	Residential
			1	Recreational
			3	Place of worship
			13	Commercial
			9	Industrial
	Yerong Creek Yard clearances	563900 to 565800	9	Residential
			1	Educational
			2	Place of worship
			1	Commercial
			6	Industrial
	The Rock Yard clearances	549800 to 550500	19	Residential
			3	Commercial
5			Industrial	

PRECINCT	ENHANCEMENT SITE	PROPOSAL CHAINAGE	NUMBER OF RECEPTORS	TYPE OF RECEPTOR	
Wagga Wagga	Uranquinty Yard clearances	534900 to 536800	45	Residential	
			1	Educational	
			5	Place of worship	
			4	Commercial	
			5	Industrial	
	Pearson Street bridge	522600 to 524500	60	Residential	
			6	Recreational	
			51	Industrial	
	Wagga Wagga Yard clearances Cassidy Parade pedestrian bridge Edmondson Street bridge Wagga Wagga Station pedestrian bridge	520200 to 522100	148	Residential	
			8	Educational	
			20	Commercial	
			21	Industrial	
	Bomen Yard clearances	513000 to 515000	7	Industrial	
	Junee	Harefield Yard clearances	496900 to 498900	3	Residential
				5	Industrial
Junee Yard clearances Junee Station pedestrian bridge Kemp Street bridge Olympic Highway underbridge		483400 to 486500	94	Residential	
			1	Educational	
			2	Recreational	
			36	Commercial	
			6	Industrial	
Junee to Illabo clearances		464900 to 481000	8	Residential	
			4	Educational	
			1	Commercial	
			9	Industrial	

## 4.3 TOPOGRAPHY

The topography of the area surrounding the proposal is illustrated in Figure 4.1. Terrain within the study area is generally includes gently undulating topography. The terrain elevation ranges from 160m Australian Height Datum (mAHD)<sup>1</sup> in Albury to 365m to the north of Junee. The surrounding elevation is relatively flat with terrain greater than 550m in height approximately 20km west of the southern end of the proposal (i.e., Table Top) with higher topographical areas further west.

<sup>1</sup> All elevations presented in this report are in Australian Height Datum



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## 4.4 CLIMATE AND LOCAL METEOROLOGY

Meteorological conditions are important for determining the direction and rate at which emissions from a source would disperse. Concentrations of pollutants within an airshed may build up during calm conditions (wind speeds of less than 0.5 metres per second (m/s)) and dispersion is poor whereas pollutants tend to disperse quickly during periods of strong winds, resulting in lower pollutant concentrations. The key meteorological requirements for an air quality impact assessment are typically hourly records of wind speed, wind direction, temperature, rainfall and relative humidity. The following section discusses the climatic and meteorological conditions near the proposal.

### 4.4.1 CLIMATIC CONDITIONS

The BoM collects meteorological data at automatic weather stations (AWS) across Australia and can be used for determining climate statistics over standard periods, such as 30 years, known as climate normals.

There are two weather stations near the proposal that characterises the local climate using the most recent long-term datasets. These are:

- Albury Airport AWS
- Wagga Wagga Airport AMO Table 4.4 presents a summary of the climatic statistical data at the Albury AWS and Wagga Wagga AMO.

The local climate data around Albury AWS is characterised by:

- average maximum temperature of 32.5 degrees Celsius in January
- average minimum temperature of 3.2 degrees Celsius in July
- annual average rainfall of 610 millimetres (mm) and annual average of 71.7 rainy days ( $\geq 1$ mm)
- average maximum 9am relative humidity of 90 per cent in July
- average minimum 3pm relative humidity of 28 per cent in January.

The local climate data around Wagga Wagga AMO is characterised by:

- average maximum temperature of 33 degrees Celsius in January
- average minimum temperature of 3.1 degrees Celsius in July
- annual average rainfall of 558mm and annual average of 66.8 rainy days ( $\geq 1$ mm)
- average maximum 9am relative humidity of 86 per cent in July
- average minimum 3pm relative humidity of 26 per cent in January.

Table 4.4 Climate data for Albury Airport AWS and Wagga Wagga Airport AMO

PARAMETER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
<b><i>Albury Airport AWS</i></b>													
Mean maximum temperature (°C) <sup>1</sup>	32.5	31.3	27.8	22.6	17.5	14.0	13.2	14.8	18.1	22.0	26.3	29.6	28
Mean minimum temperature (°C) <sup>1</sup>	16.7	16.3	13.0	8.5	5.5	3.6	3.2	3.5	5.6	8.1	11.8	14.1	9.2
Mean rainfall (mm) <sup>2</sup>	39.3	44.4	43.4	42.4	51.5	60.9	64.0	65.9	53.8	47.4	59.7	42.5	609.9
Mean number of days of rain (≥ 1mm) <sup>2</sup>	4.3	3.8	3.4	4.5	6.0	8.2	9.8	8.9	6.6	5.8	5.7	4.7	71.7
Mean 9am relative humidity (%) <sup>3</sup>	53	59	63	69	83	89	90	83	75	65	62	55	71
Mean 3pm relative humidity (%) <sup>3</sup>	28	33	34	41	54	64	64	57	53	45	39	30	45
<b><i>Wagga Wagga Airport AMO</i></b>													
Mean maximum temperature (°C) <sup>4</sup>	33.0	31.5	28.0	23.2	18.1	14.3	13.3	14.9	18.4	22.8	26.9	30.1	22.9
Mean minimum temperature (°C) <sup>4</sup>	17.2	16.8	13.4	9.1	5.7	4.0	3.1	3.3	5.2	8.0	11.8	14.4	9.3
Mean rainfall (mm) <sup>4</sup>	38.3	45.2	47.7	32.2	38.5	57.4	50.4	47.1	49.7	48.1	53.9	49.3	558.3
Mean number of days of rain (≥ 1mm) <sup>4</sup>	4.1	4.0	3.8	3.8	4.7	7.6	8.5	7.5	6.2	5.8	5.9	4.9	66.8
Mean 9am relative humidity (%) <sup>5</sup>	51	57	60	64	78	85	86	81	74	62	57	51	67
Mean 3pm relative humidity (%) <sup>5</sup>	26	31	32	37	50	62	63	56	51	41	33	28	43

- (1) Data recorded for the period 1993 to 2021
- (2) Data recorded for the period 1994 to 2021
- (3) Data recorded for the period 1993 to 2010
- (4) Data recorded for the period 1991 to 2020
- (5) Data recorded for the period 1991 to 2010

#### 4.4.2 WIND SPEED AND DIRECTION

One minute average wind speed and direction data are recorded at the BoM Albury AWS and Wagga Wagga AMO and provides a detailed characterisation of the wind fields at each location Figure 4.2 and Figure 4.3 presents the seasonal and annual wind roses for the period 2016 to 2020 inclusive.

At the Albury AWS, the wind conditions are summarised as follows:

- The most frequent wind direction is south-easterly followed by westerly (annual wind rose) with an average wind speed of 2.5m/s and calm wind (wind speeds of less than 0.5m/s) conditions of 18.7 per cent.
- During spring, westerly winds predominate followed by south-easterlies with a mean wind speed of 2.8m/s.
- In summer, the wind direction shifts to mainly south easterlies followed by westerlies with a mean wind speed of 3.0m/s.
- In autumn, south-easterly wind dominate recording a mean wind speed of 2.2m/s and calm winds of 24 per cent.
- During winter, north-westerly and westerly winds prevail with a wind speed of 2.0m/s and high calms of 23.9 per cent.
- Wind from the north, north-east and south-west occur infrequently.
- Overall wind speeds are highest during summer (3.0m/s) and lowest in winter (2.0m/s).

At the Wagga Wagga AMO, the wind conditions are summarised as follows:

- The most frequent wind direction is easterly followed by east north-easterly (annual wind rose) with an average wind speed of 3.5m/s and calm wind conditions of 6.1 per cent.
- In spring, easterlies predominate followed by east north-easterlies with a mean wind speed of 3.8m/s.
- During summer, the wind direction shifts to mainly east north-easterly followed by easterlies with a mean wind speed of 4.1m/s.
- In autumn, easterly winds dominate followed by east north-easterlies recording a mean wind speed of 2.2m/s and calm winds of 24 per cent.
- During winter, easterly winds prevail with a wind speed of 3.0m/s and high calms of 9.8 per cent.
- Northerly and southerly winds occur infrequently across all seasons.
- Overall wind speeds are highest during summer (4.1m/s) and lowest in winter (3.0m/s).

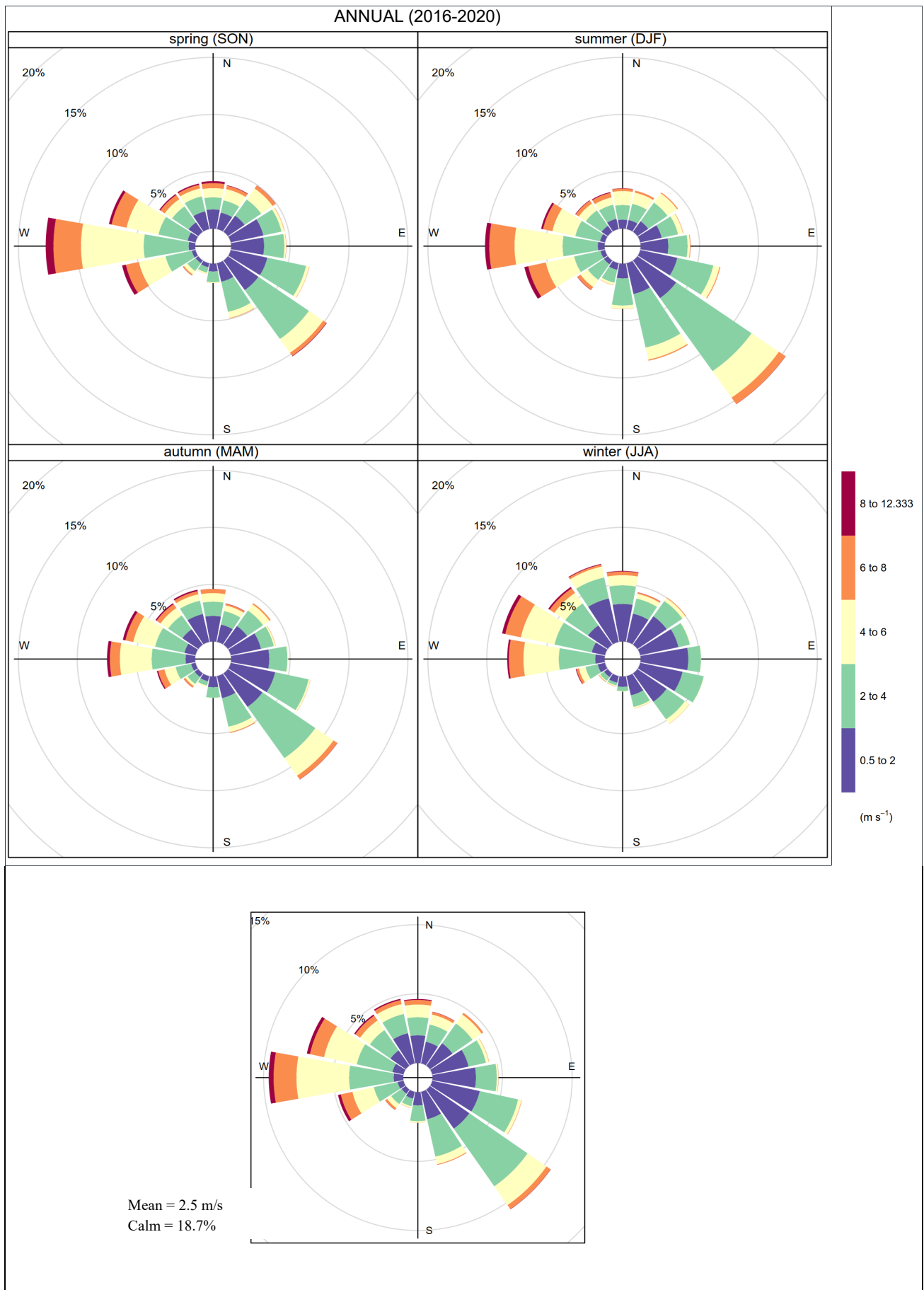


Figure 4.2 Albury Airport AWS seasonal and annual wind roses (2016–2020)

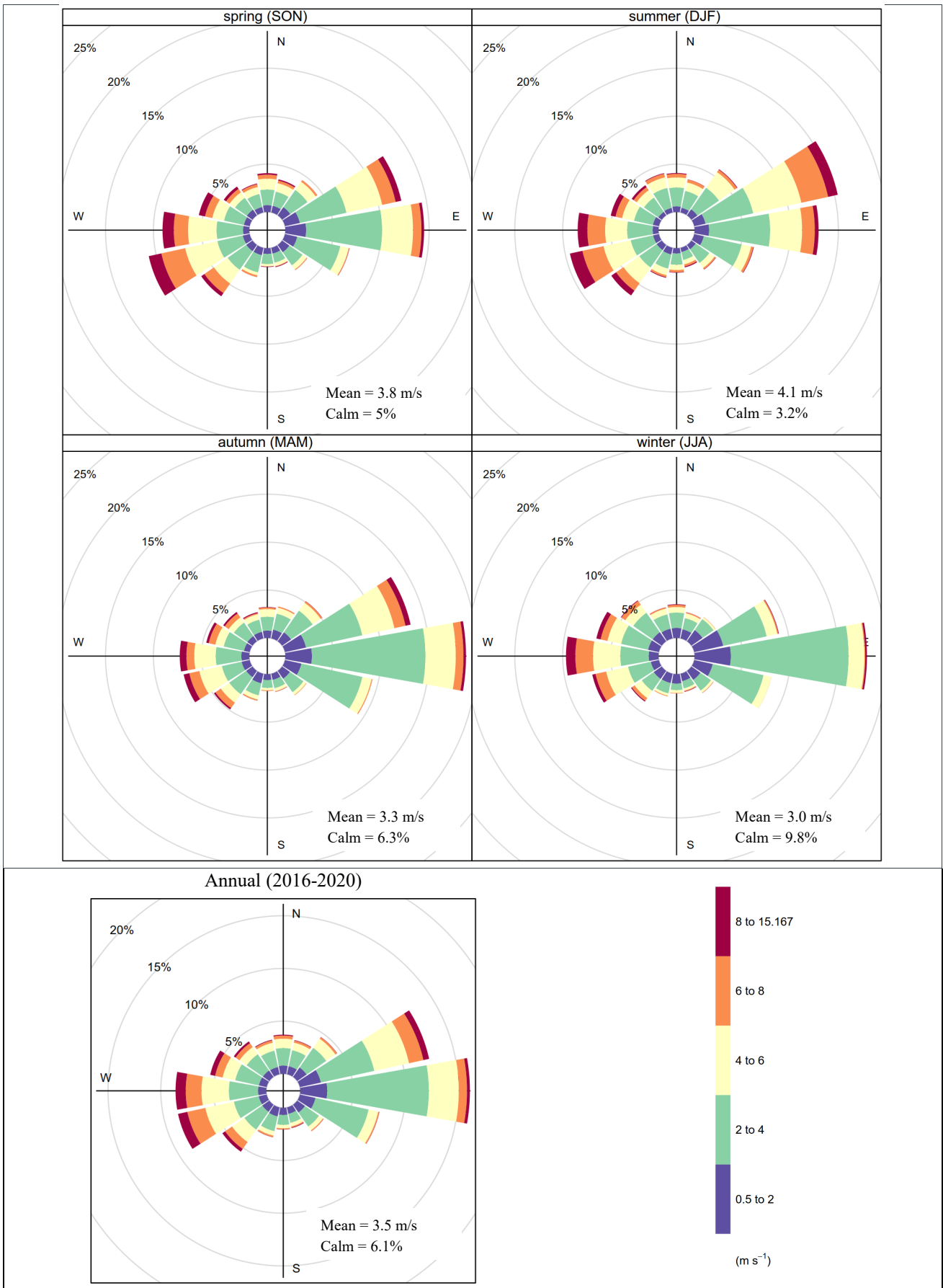


Figure 4.3 Wagga Wagga AMO seasonal and annual wind roses (2016–2020)

## 4.5 EXISTING AIR QUALITY

### 4.5.1 EXISTING SOURCES OF EMISSIONS

Table 4.5 presents the industrial facilities and their types of emissions within 10km of the proposal that reported to the NPI database for 2019/2020. Air emissions from these facilities will contribute to the local airshed.

In addition to the industrial facilities listed in Table 4.5, non-industrial air emission sources contributing to the local air shed include:

- traffic using the local road networks
- railway operation using the existing rail line adjoining the proposal at its southern and northern extents
- domestic solid and liquid fuel burning
- dust from paved and unpaved roads
- agricultural and farming activities.

These sources give rise to emissions of pollutants relevant to the proposal including particulate matter fractions (TSP, PM<sub>10</sub> and PM<sub>2.5</sub>), NO<sub>x</sub> (comprising NO<sub>2</sub> and NO), CO, SO<sub>2</sub>, VOCs, SVOCs and odour.

Table 4.5 Nearest facilities reporting to the NPI database for the 2019/2020 period

FACILITY	ADDRESS	MAIN ACTIVITY	REPORTED POLLUTANT (EMISSION TO AIR)	DISTANCE TO PROPOSAL (km)
Albury Renewable Energy	Mudgee Street, Hamilton Valley	Electricity generation using landfill gas	PM <sub>10</sub> , PM <sub>2.5</sub> , Heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs Polychlorinated dibenzodioxins & furans (PCDD / PCDF)	4.5
Norske Skog paper mills	117 R W Henry Drive, Ettamogah	Pulp, paper and paperboard manufacturing	PM <sub>10</sub> , PM <sub>2.5</sub> , heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs Hydrochloric acid (HCl) Fluoride compounds Chlorine & compounds PCDD & PCDF	0.47
Overall Forge	70 R W Henry Drive, Ettamogah	Iron and steel forging	PM <sub>10</sub> , PM <sub>2.5</sub> , heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs, HCL Fluoride compounds Chlorine & compounds PCDD & PCDF	0.23
World Fuel Service Aviation Albury	Ogden Place, Albury Airport	Bulk petroleum storage	VOCs	1.5
Culcairn Compressor Station	Culcairn Road, Culcairn	Gas supply	PM <sub>10</sub> , PM <sub>2.5</sub> NO <sub>x</sub> , CO, SO <sub>2</sub>	1

FACILITY	ADDRESS	MAIN ACTIVITY	REPORTED POLLUTANT (EMISSION TO AIR)	DISTANCE TO PROPOSAL (km)
Boral Culcairn quarry	Weeamera Road, Culcairn	Extraction	PM <sub>10</sub> , PM <sub>2.5</sub> , Heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs Fluoride compounds Polycyclic aromatic hydrocarbons (PAHs)	<50
Uranquinty Meter Station	Uranquinty Cross Road, Uranquinty	Gas supply	VOCs	2.5
Wagga Wagga Meter Station	Byrnes Road, Bomen	Gas supply	VOCs	0.5
Air BP Wagga Wagga	Wagga Wagga Airport Don Kendell Drive	Petroleum wholesaling	VOCs	8.6
Enirgi Power Storage Recycling	509 Byrnes Road, Wagga Wagga	Metal smelting and refining	PM <sub>10</sub> , PM <sub>2.5</sub> , Heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs Sulphuric acid PCDD & PCDF, PAHs	0.12
Heinz Wagga Wagga	Bomen Road, Wagga Wagga	Meat processing	PM <sub>10</sub> , PM <sub>2.5</sub> , heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs PCDD & PCDF, PAHs	0.6
Wagga Wagga Quarry	Roach Road, Moorong	Gravel and sand quarrying	Heavy metals Fluoride compounds	4
Origin Energy Uranquinty Power Pty Ltd	Uranquinty Cross Road, Uranquinty	Fossil fuel electricity generation	PM <sub>10</sub> , PM <sub>2.5</sub> , heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs PCDD & PCDF, PAHs	2.5
Riverina Oils and Bio Energy	177 Trahairs Road, Wagga Wagga	Oilseed crushing and refining	PM <sub>10</sub> , PM <sub>2.5</sub> , heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs Fluoride compounds, HCl PCDD & PCDF, PAHs	0.80
Southern Oil Refining Pty Ltd	Lewington Street, Bomen	Waste oil refining	PM <sub>10</sub> , PM <sub>2.5</sub> , heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs Fluoride compounds, HCl Hydrogen sulphide PCDD & PCDF, PAHs,	1.2
TASCO Bomen Depot	34 Lewington Street, Bomen	Petroleum storage	Lead & compounds VOCs	1.4

FACILITY	ADDRESS	MAIN ACTIVITY	REPORTED POLLUTANT (EMISSION TO AIR)	DISTANCE TO PROPOSAL (km)
Teys Australia Pty Ltd	Dampier Street, Wagga Wagga	Meat processing	PM <sub>10</sub> , PM <sub>2.5</sub> , heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs PCDD & PCDF, PAHs	2
Wagga Wagga Landfill Flare	132 Ashfords Road, Wagga Wagga	Landfill flare	PM <sub>10</sub> , PM <sub>2.5</sub> , heavy metals NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs, PAHs	10.7
Burnt Creek Meter Station	Burnt Creek Lane, Junee	Gas supply	VOCs	4.8
Illabo Meter Station	Brabins Road, Illabo	Gas supply	VOCs	2
Junee Abattoir	Harefield Road, Junee	Meat processing	Ammonia PM <sub>10</sub> , PM <sub>2.5</sub> , NO <sub>x</sub> , CO, SO <sub>2</sub> , VOCs, PAHs	0.3

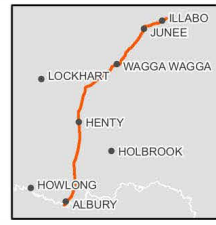
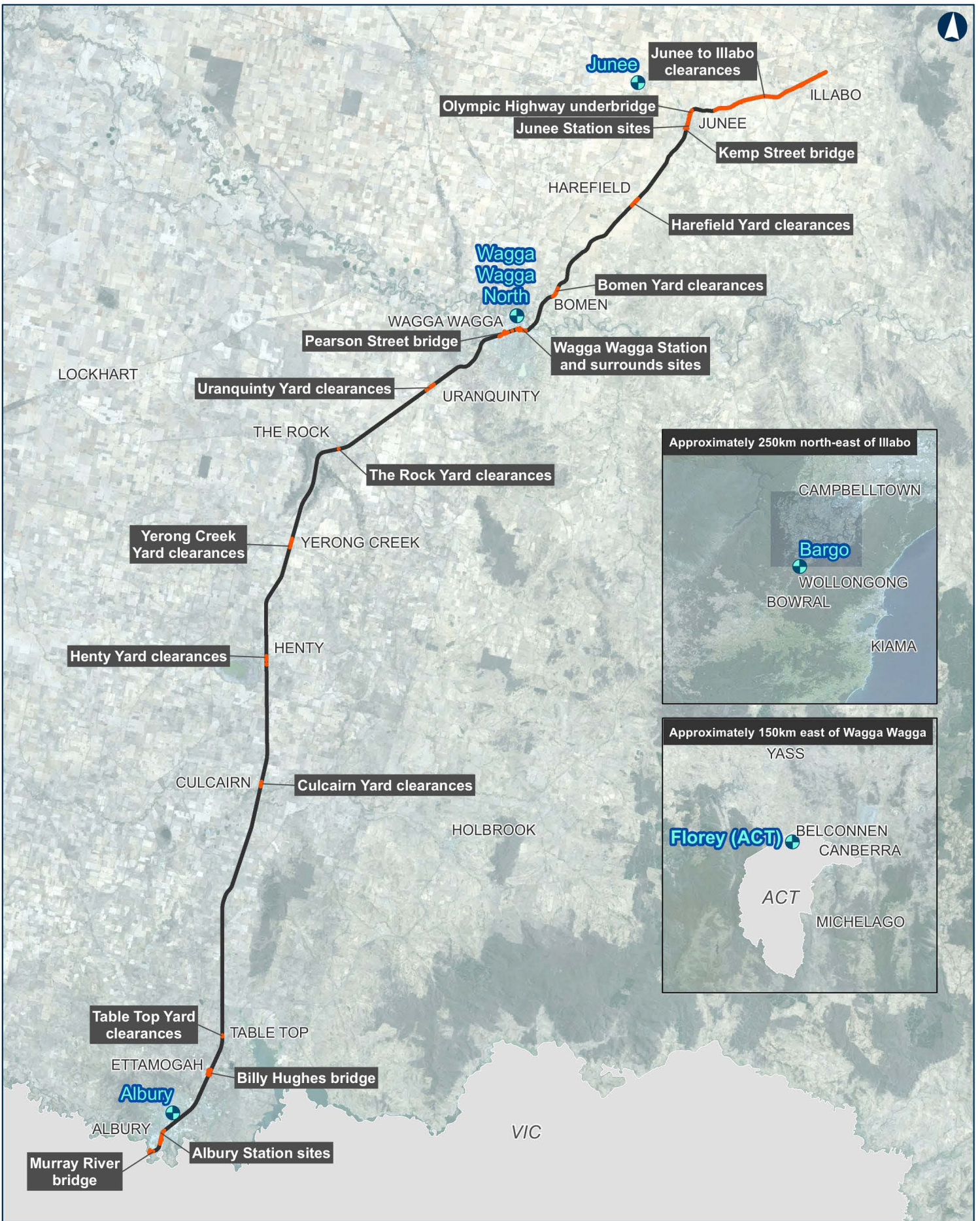
#### 4.5.2 OVERVIEW OF HISTORICAL AMBIENT AIR QUALITY MONITORING STATIONS (AAQMS) DATA

The NSW Government monitors air quality at 47 AAQMS in metropolitan and regional centres and at 36 rural AAQMS. The Australian Capital Territory (ACT) Government operates three AAQMS. Given the relative proximity of the ACT to the proposal site, they were considered in terms location and representation of local air quality.

Ambient air quality data collected at the following AAQMS is broadly representative of the air quality at the proposal site. Details of each AAQMS are summarised in Table 4.6.

- Junee
- Albury
- Wagga Wagga North
- Florey (ACT)
- Bargo.

Figure 4.4 shows the location of the nearest AAQMS to the proposal site.



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

The Junee AAQMS is located in a private property approximately 8.4km to the north-west of the proposal (Figure 4.4) and continuously measures TSP using a DustTrak. This AAQMS is not a NEPM performance monitoring station and the equipment (DustTrak) used does not conform to the relevant Australian monitoring standard. As such, the data should be viewed as indicative and for information purposes. A performance monitoring station is a AAQMS used to measure achievement against goals and standards specified in the Air NEPM. These stations are required to be accredited by the National Association of Testing Authorities (NATA) and to the extent possible should be sited in accordance with the requirements for Australian Standard (AS/NZS) 3580.1: 2007 *Methods for the sampling and analysis of ambient air – Guide to siting air monitoring equipment*.

The two closest AAQMS to the proposal are located at Jelbert Park in Albury and the Wagga Wagga Racecourse at Wagga Wagga North. Both are NEPM performance monitoring stations and continuously record PM<sub>10</sub> and PM<sub>2.5</sub> data. Overall the data collected at both stations are broadly representative of particulate levels in urban centres in regional settings. The rural areas are expected to experience lower PM levels except during events such as dust storms, bushfires and intense agricultural activities during dry and windy conditions.

Given the rural location of the proposal there are no AAQMS that monitor for NO<sub>2</sub> and CO in the vicinity of the study area. The nearest EPA AAQMS that monitors for NO<sub>2</sub> and CO is located in a residential area at Neumann Place, Florey in the ACT, approximately 150km to the east. The NO<sub>2</sub> and CO levels are expected to be of a similar magnitude to levels experienced in the urban centres of Albury and Wagga Wagga but lower in the rural sections of the proposal.

The most representative EPA AAQMS that monitors SO<sub>2</sub> is situated in Bargo in a rural setting on Silica Road approximately 268km to the north-east of the proposal site. Given its location, SO<sub>2</sub> levels are anticipated to be lower than those in Albury and Wagga Wagga and of similar magnitude in the rural areas of the proposal.

There is no publicly available ambient air quality monitoring data for VOCs or SVOCs (e.g., PAHs). Existing ambient concentrations are anticipated to be low along the proposal including at the urban centres of Albury and Wagga Wagga and the contribution of VOCs and PAHs from the proposal during construction and operation is not expected to be of significance.

Table 4.6 Summary of EPA AAQMS

AAQMS NAME	LOCATION	DISTANCE TO (km)	DIRECTION FROM PROPOSAL	POLLUTANTS MONITORED	REVIEWED
Junee	34.825°S, 147.510°E	8.4	North-west	TSP	TSP
Albury	36.052°S, 146.974°E	1.2	East	PM <sub>10</sub> , PM <sub>2.5</sub>	PM <sub>10</sub> , PM <sub>2.5</sub>
Wagga Wagga North	35.117°S, 147.376°E	0.4	West	PM <sub>10</sub> , PM <sub>2.5</sub> , O <sub>3</sub>	PM <sub>10</sub> , PM <sub>2.5</sub>
Florey (ACT)	35.221°S, 149.043°E	150	East	NO <sub>2</sub> , CO	NO <sub>2</sub> , CO
Bargo	34.308°S, 150.581°E	268	North-east	NO <sub>2</sub> , SO <sub>2</sub> , O <sub>3</sub> , PM <sub>10</sub> , PM <sub>2.5</sub>	SO <sub>2</sub>

Ambient air quality monitoring data for the stations listed were reviewed and the maximum concentrations reported for the period 2016 to 2020. The data is presented in Table 4.7 and Air NEPM exceedances are highlighted in bold. The monitoring data is summarised as follows:

- Except for 2017, 24-hour PM<sub>10</sub> and PM<sub>2.5</sub> concentrations at the Albury AAQMS exceeded the Air NEPM standard for all five years. The exceedances in 2019 and 2020 were due to bushfire smoke.
- The annual PM<sub>10</sub> concentrations at Albury AAQMS were below the Air NEPM standard for all years.
- The annual PM<sub>2.5</sub> concentrations exceeded the Air NEPM standard in 2019 and 2020.
- 24-hour PM<sub>10</sub> and PM<sub>2.5</sub> and annual PM<sub>2.5</sub> concentrations at the Wagga Wagga North AAQMS exceeded the Air NEPM standard for all five years. The exceedances in 2019 and 2020 were due to bushfire smoke.

- The annual PM<sub>2.5</sub> concentrations exceeded the Air NEPM standard in 2019 and 2020.
  - The 8-hour CO and one-hour NO<sub>2</sub> concentrations were below their respective Air NEPM standard for all years except for 2020. The exceedances were likely due to bushfire smoke.
  - The annual NO<sub>2</sub> concentrations were below the Air NEPM standards for all years.
  - One-hour, 24 hour and annual SO<sub>2</sub> concentrations were below the relevant Air NEPM standard for all years.
- A variation to the Air NEPM came into law on 15 April 2021 and introduced more stringent standards for NO<sub>2</sub> and SO<sub>2</sub> (section 2.2.2). The new standards are not retrospective, and the Air NEPM 2016 amendment concentration standards are applicable for comparison to the ambient air quality monitoring data (Table 4.7) collected at all AAQMS for the years 2016 to 2020 inclusive.

Table 4.7 Summary of ambient air quality data at each AAQMS

POLLUTANT	AVERAGING PERIOD	UNIT	MAXIMUM CONCENTRATIONS					AIR NEPM STANDARD	NO. OF EXCEEDANCES	SOURCE
			2016	2017	2018	2019	2020			
TSP <sup>1</sup>	Annual	µg/m <sup>3</sup>	<b>292</b>	<b>358</b>	<b>1,331</b>	<b>3,523</b>	<b>9,018</b>	90 <sup>1</sup>	5	Junee AAQMS <sup>2</sup>
PM <sub>10</sub>	24-hour	µg/m <sup>3</sup>	<b>51</b>	48.8	<b>107.8</b>	<b>222.4</b>	<b>298.3</b>	50	1 (2016) 7 (2018) 25 (2019) 19 (2020)	Albury AAQMS <sup>5</sup>
	Annual	µg/m <sup>3</sup>	14.9	15.6	19.4	23.2	19.7	25	0	
	24-hour	µg/m <sup>3</sup>	<b>114.7</b>	<b>171.6</b>	<b>127.2</b>	<b>251.7</b>	<b>259.4<sup>4</sup></b>	50	16 (2016) 10 (2017) 34 (2018) 60 (2019) 23 (2020)	Wagga Wagga North <sup>5</sup>
	Annual	µg/m <sup>3</sup>	20.7	20.4	<b>26.9</b>	<b>34.7</b>	21.9	25	2	
PM <sub>2.5</sub>	24-hour	µg/m <sup>3</sup>	<b>28.1</b>	18.7	<b>30.4</b>	<b>167.1</b>	<b>275</b>	25	2 (2016) 2 (2018) 19 (2019) 17 (2020)	Albury AAQMS <sup>5</sup>
	Annual	µg/m <sup>3</sup>	7.4	7.2	7.3	<b>10.1</b>	<b>11.4</b>	8	2	
	24-hour	µg/m <sup>3</sup>	No data <sup>3</sup>	<b>40.8</b>	<b>90.2</b>	<b>129.4</b>	<b>559.5<sup>4</sup></b>	25	7 (2017) 3 (2018) 20 (2019) 32 (2020)	Wagga Wagga North <sup>5</sup>
	Annual	µg/m <sup>3</sup>		<b>8.5</b>	<b>8.9</b>	<b>11.0</b>	<b>12.9</b>	8	4	
CO	8-hour	ppm	1.9	1.8	1.5	8.6	<b>13.4</b>	9	20 (2020)	Florey AAQMS <sup>6</sup>
NO <sub>2</sub>	1-Hour	ppm	0.034	0.033	0.039	0.062	<b>0.17</b>	0.12	2 (2020)	
	Annual	ppm	0.004	0.005	0.005	0.005	0.004	0.03	0	

POLLUTANT	AVERAGING PERIOD	UNIT	MAXIMUM CONCENTRATIONS					AIR NEPM STANDARD	NO. OF EXCEEDANCES	SOURCE
			2016	2017	2018	2019	2020			
SO <sub>2</sub>	1-Hour	ppm	0.01	0.01	0.01	0.02	0.012	0.2	0	Bargo AAQMS <sup>5</sup>
	24-hour	ppm	0.004	0.002	0.002	0.006	0.003	0.08	0	
	Annual	ppm	0.0004	0.0004	0.0004	0.0004	0.0003	0.02	0	

- (1) TSP monitoring data for 2016 to 2020 provided by NSW EPA
- (2) NSW Approved Methods TSP impact assessment criterion
- (3) Continuous PM<sub>2.5</sub> monitoring commenced on 7 February 2017
- (4) The maximum 24 hour PM<sub>10</sub> and PM<sub>2.5</sub> concentrations occurred on different days
- (5) Monitoring data for 2016 to 2020 at Albury, Wagga Wagga North and Bargo AAQMS were downloaded from <https://www.dpie.nsw.gov.au/air-quality/air-quality-data-services/data-download-facility>
- (6) Monitoring data for 2016 to 2020 at the Florey AAQMS were downloaded from <https://www.accessscanberra.act.gov.au>
- (7) Bold data indicates an exceedance of the relevant Air NEPM standard or NSW EPA impact assessment criterion

## 4.6 SOIL TYPE

The quantity of dust emitted from construction activities is related to a number of factors including the silt content of the soil (particles smaller than 75 micrometres[ $\mu\text{m}$ ]). Some soil types such as clay are more prone to suspension during dry conditions due to the smaller particle and have a greater impact on dust soiling and human health impacts.

The soil types at each enhancement site were identified following a review of Technical Paper 13 – Contamination Assessment. These are presented in Table 4.8.

Table 4.8 Soil type at each enhancement site

PRECINCT	ENHANCEMENT SITE	SOIL TYPE	DUST MAGNITUDE
Albury	Murray River bridge	Sandy/clay	Large
	Albury Yard clearances	Sandy/clay	Large
	Albury Station pedestrian bridge		
	Riverina Highway bridge		
	Billy Hughes bridge	Sandy/clay	Large
	Table Top Yard clearances	Not known	
Greater Hume – Lockhart	Culcairn Yard clearances	Sandy/Clay	Large
	Culcairn pedestrian bridge		
	Henty Yard clearances	Sandy/clay	Large
	Yerong Creek Yard clearances	Silty/sandy	Medium
	The Rock Yard clearances	Silty/sandy	Medium

PRECINCT	ENHANCEMENT SITE	SOIL TYPE	DUST MAGNITUDE
Wagga Wagga	Uranquinty Yard clearances	Sandy/clay	Large
	Pearson Street bridge	Sandy/clay	Large
	Wagga Wagga Yard clearances Cassidy Parade pedestrian bridge Edmondson Street bridge Wagga Wagga Station pedestrian bridge	Sandy/clay	Large
	Bomen Yard clearances	Clay	Large
	Harefield Yard clearances	Sandy/clay	Large
Junee	Junee Yard clearances Junee Station pedestrian bridge Kemp Street bridge Olympic Highway underbridge	Sandy/clay	Large
	Junee to Illabo clearances	Sandy/clay	Large

# 5 IMPACT ASSESSMENT

## 5.1 CONSTRUCTION

### 5.1.1 CONSTRUCTION SCHEDULE

Subject to planning approval construction is planned to commence in early 2024 and would be completed by mid-2025 with operation to commence in 2025.

Construction at each enhancement site would generally involve the following main work phases:

- pre-construction activities
- site-establishment and preliminary activities
- demolition works, where relevant
- main construction works
- testing and commissioning.

An indicative construction program for the proposal is presented in Table 5.1 to Table 5.4.

Table 5.1 Construction schedule at the Albury enhancement sites

PRECINCT	ENHANCEMENT SITE	START	FINISH	DURATION (WORKING DAYS)
Albury	Murray River bridge	January 2024	May 2024	82
	Albury Station pedestrian bridge	January 2024	April 2024	60
	Albury Yard clearances	February 2024	April 2024	120
	Riverina Highway bridge	January 2024	October 2024	195
	Billy Hughes bridge	January 2024	April 2024	324
	Table Top Yard clearances	February 2024	February 2024	5

Table 5.2 Construction schedule at the Greater Hume – Lockhart enhancement sites

PRECINCT	ENHANCEMENT SITE	START	FINISH	DURATION (WORKING DAYS)
Greater Hume – Lockhart	Culcairn pedestrian bridge	January 2024	April 2024	56
	Culcairn Yard clearances			
	Henty Yard clearances	January 2024	April 2024	61
	Yerong Creek Yard clearances	January 2024	April 2024	60
	The Rock Yard clearances	February 2024	February 2024	15

Table 5.3 Construction schedule at the Wagga Wagga enhancement sites

PRECINCT	ENHANCEMENT SITE	START	FINISH	DURATION (WORKING DAYS)
Wagga Wagga	Uranquinty Yard clearances	February 2024	April 2024	54
	Pearson Street bridge	January 2024	October 2024	205
	Cassidy Parade pedestrian bridge	February 2024	July 2024	120
	Edmondson Street bridge	February 2024	January 2025	231
	Wagga Wagga Station pedestrian bridge	January 2024	July 2025	120
	Wagga Wagga Yard clearances	February 2024	April 2024	54
	Bomen Yard clearances	January 2024	April 2024	65

Table 5.4 Construction schedule at the Junee enhancement sites

PRECINCT	ENHANCEMENT SITE	START	FINISH	DURATION (WORKING DAYS)
Junee	Harefield Yard clearances	January 2024	April 2024	94
	Kemp Street bridge	February 2024	November 2024	287
	Junee Station pedestrian bridge	February 2024	April 2024	64
	Junee Yard clearances	January 2024	April 2024	94
	Olympic Highway underbridge	January 2024	April 2024	79
	Junee to Illabo clearances	January 2024	May 2024	112

### 5.1.2 CONSTRUCTION STAGES

Key construction stages at each enhancement site with the four precincts are summarised in Table 5.5.

Table 5.5 Summary of construction stages

PRECINCT	ENHANCEMENT SITE	CONSTRUCTION ACTIVITIES
Albury	Murray River bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Rail bridge structure modifications</li> <li>— Demobilisation and landscaping</li> </ul>
	Albury Station pedestrian bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Pedestrian bridge removal with crane</li> <li>— Pedestrian bridge replacement</li> <li>— Demobilisation and landscaping</li> </ul>
	Albury Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track realignment (&gt;300m and/or track formation replacement)</li> <li>— Gantry replacement</li> <li>— Demobilisation and landscaping</li> </ul>

PRECINCT	ENHANCEMENT SITE	CONSTRUCTION ACTIVITIES
	Riverina Highway bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track lowering</li> <li>— Demobilisation and landscaping</li> </ul>
	Billy Hughes bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track lowering</li> <li>— Track realignment (&gt;300m and/or track formation replacement)</li> <li>— Demobilisation and landscaping</li> </ul>
	Table Top Yard clearance	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Gantry removal</li> <li>— Demobilisation and landscaping</li> </ul>
Greater Hume – Lockhart	Culcairn pedestrian bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Pedestrian bridge removal</li> <li>— Demobilisation and landscaping</li> </ul>
	Culcairn Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Gantry modifications</li> <li>— Pedestrian bridge removal/relocation with crane</li> <li>— Demobilisation and landscaping</li> </ul>
	Henty Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track realignment (&lt; 300mm)</li> <li>— Gantry modification</li> <li>— Level crossing modification</li> <li>— Demobilisation and landscaping</li> </ul>
	Yerong Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track realignment (&lt; 300mm)</li> <li>— Track realignment (&gt; 300mm and/or track formation replacement)</li> <li>— Level crossing modification</li> <li>— Demobilisation and landscaping</li> </ul>
	The Rock Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track lowering</li> <li>— Gantry modifications</li> <li>— Demobilisation and landscaping</li> </ul>
Wagga Wagga	Uranquinty Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track realignment (&gt; 300mm and/or track formation replacement)</li> <li>— Level crossing modification</li> <li>— Rail underbridge modifications</li> <li>— Gantry removal</li> <li>— Demobilisation and landscaping</li> </ul>
	Pearson Street bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track lowering</li> <li>— Demobilisation and landscaping</li> </ul>
	Cassidy Parade pedestrian bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Pedestrian bridge replacement works</li> <li>— Demobilisation and landscaping</li> </ul>

PRECINCT	ENHANCEMENT SITE	CONSTRUCTION ACTIVITIES
	Edmondson Street bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track realignment (&lt; 300mm)</li> <li>— Road bridge replacement</li> <li>— Demobilisation and landscaping</li> </ul>
	Wagga Wagga Station pedestrian bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Pedestrian bridge replacement works</li> <li>— Demobilisation and landscaping</li> </ul>
	Wagga Wagga Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track realignment (&gt; 300mm and/or track formation replacement)</li> <li>— Gantry removal at Docker Street</li> <li>— Gantry modifications</li> <li>— Demobilisation and landscaping</li> </ul>
	Bomen Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track realignment (&gt; 300mm and/or track formation replacement)</li> <li>— Demobilisation and landscaping</li> </ul>
Junee	Harefield Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Gantry replacement</li> <li>— Track realignment (&gt; 300mm and/or track formation replacement)</li> <li>— Demobilisation and landscaping</li> </ul>
	Kemp Street bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Traffic diversion works</li> <li>— Road bridge replacement</li> <li>— Demobilisation and landscaping</li> </ul>
	Junee Station pedestrian bridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Pedestrian bridge removal or relocation works</li> <li>— Demobilisation and landscaping</li> </ul>
	Junee Yard clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Gantry removal</li> <li>— Track realignment (&gt; 300mm and/or track formation replacement)</li> <li>— Demobilisation and landscaping</li> </ul>
	Olympic Highway underbridge	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track realignment (&lt; 300mm)</li> <li>— Rail bridge track work</li> <li>— Demobilisation and landscaping</li> </ul>
	Junee to Illabo clearances	<ul style="list-style-type: none"> <li>— Site establishment</li> <li>— Track realignment (&lt; 300mm)</li> <li>— Track realignment (&gt; 300mm and/or track formation replacement)</li> <li>— Level crossing modification</li> <li>— Extension or replacement of culverts</li> <li>— Demobilisation and landscaping</li> </ul>

### 5.1.3 CONSTRUCTION HOURS

Air emissions during construction would mainly be generated during working hours. Outside of the working hours, most air emission generating activities would not occur except for wind erosion from stockpiles and other exposed areas.

Proposed working hours during construction are as follows:

- Monday to Friday: 6.00am to 6.00pm
- Saturday: 6.00am to 6.00pm (concluding at 1.00pm every second weekend)
- Sunday and public holidays: 6.00am to 6.00pm (not occurring on every second Sunday).

Works that would be undertaken outside of the above hours or during rail possessions include:

- track realignment and lowering
- connecting tracks
- bridge deck works (including demolition)
- abutment/pier works and some finishing works
- delivery of over-sized plant or structures where required by the police or other authorities for safety reasons
- large concrete pours for new bridges, to allow it to be completed in one pour and avoid high temperatures during the daytime
- girder/bridge deck installation at bridges on selected public roads, to minimise impacts on road users and workers
- utility works (such as connections) to minimise disruption to customers.

These activities have the potential to generate air emissions during out of hours works.

### 5.1.4 DUST EMISSIONS

Dust impacts depend on the quantity and drift potential of the particles in the atmosphere. Larger particles (the larger particle fractions of TSP) settle out closer to the source due to their larger mass. The deposition of the particles can cause nuisance and aesthetic impacts on the receiving environment. Finer particles (PM<sub>10</sub> and PM<sub>2.5</sub>) remain entrained longer and therefore dispersed at greater distances from the source. The fine nature of these particles also has the potential for human health impacts if not adequately controlled.

This section assesses the potential dust impacts associated with the proposal. For construction works that are ‘screened in’ (i.e. included in the risk assessment) for a detailed risk assessment are analysed in section 5.1.5 and for those activities ‘screened out’ (not included) are qualitatively addressed in section 5.1.5.7.

### 5.1.5 RISK ASSESSMENT

#### 5.1.5.1 STEP 1 – SCREENING TO ESTABLISH THE NEED FOR A DETAILED ASSESSMENT

The IAQM guidance recommends that a risk assessment of potential dust impact from construction activities is undertaken for sensitive receptors located with the distances specified in section 4.2.1.

Where sensitive receptors are identified within these distances, construction works are ‘*screened in*’ (i.e., included in the risk assessment) for a detailed assessment. Where there are sensitive receptors located outside these distances, the requirement for a more detailed assessment is ‘*screened out*’ (i.e. not included in the risk assessment). The level of risk is considered to be negligible and any impacts would not be of significance.

Due to the nature of the proposal, the construction areas are divided into four separate packages (‘precincts’) defined and further sub-divided into enhancement sites based on the location of the construction works and the presence of sensitive receptors (Appendix A). 15 sites and associated haulage routes are presented in Table 4.1 and Table 4.2. A detailed risk assessment was triggered for the proposal construction works and these are discussed in section 5.1.5.2 to 5.1.5.6.

All other areas where no receptors are located within the distances described above were ‘screened out’ for a detailed risk assessment and not assessed individually. However, to minimise the impacts on the environment from proposal construction activities, potential emissions sources from these areas were qualitatively addressed in section 5.1.5.7.

### 5.1.5.2 STEP 2A – DETERMINE THE POTENTIAL DUST EMISSION MAGNITUDE

The potential dust emission magnitude for demolition, earthworks, construction and vehicle track out activities were evaluated in this section.

The IAQM guidance (2014) classifies potential large, medium or small dust emission magnitude and provides examples presented in Table 5.6. The dust magnitude of the proposal is considered in the following sections.

Table 5.6 Example definitions for large, medium and small dust magnitude

ACTIVITY	LARGE	MEDIUM	SMALL
Demolition	<ul style="list-style-type: none"> <li>— Total building volume &gt; 50,000m<sup>3</sup></li> <li>— Potentially dusty material e.g. concrete</li> <li>— On-site crushing &amp; screening</li> <li>— Demolition activities 10–20m above ground level</li> </ul>	<ul style="list-style-type: none"> <li>— Total building volume &gt; 20,000–50,000m<sup>3</sup></li> <li>— Potentially dusty material e.g. concrete</li> <li>— Demolition activities 10–20m above ground level</li> </ul>	<ul style="list-style-type: none"> <li>— Total building volume &lt; 50,000m<sup>3</sup></li> <li>— Low dust potential e.g. metal cladding or timber</li> <li>— Demolition activities &lt; 10m above ground level</li> <li>— Demolition during wetter months</li> </ul>
Earthworks	<ul style="list-style-type: none"> <li>— Total site area &gt;10,000m<sup>2</sup></li> <li>— Potential dusty soil type (e.g. clay)</li> <li>— &gt; 10 heavy earth moving vehicles at any one time</li> <li>— Formation of bunds &gt; 8m</li> <li>— Total material moved &gt; 100,000 tonne (t)</li> </ul>	<ul style="list-style-type: none"> <li>— Total site area: 2,500–10,000m<sup>2</sup></li> <li>— Moderately dusty soil type (e.g. silt)</li> <li>— 5–10 heavy earth moving vehicles at any one time</li> <li>— Formation of bunds 4–8m</li> <li>— Total material moved: 20,000t–100,000t</li> </ul>	<ul style="list-style-type: none"> <li>— Total site area: &gt;2,500m<sup>2</sup></li> <li>— Soil type with large grain size (e.g. sand)</li> <li>— &lt; 5 heavy earth moving vehicles at any one time</li> <li>— Formation of bunds &lt;4m</li> <li>— Total material moved: &lt;20,000t</li> <li>— Earthworks during wetter months</li> </ul>
Construction	<ul style="list-style-type: none"> <li>— Total building volume &gt; 100,000m<sup>3</sup></li> <li>— On-site concrete batching</li> <li>— Sandblasting</li> </ul>	<ul style="list-style-type: none"> <li>— Total building volume 25,000–100,000m<sup>3</sup></li> <li>— On-site concrete batching</li> <li>— Potentially dusty construction material (e.g. concrete)</li> </ul>	<ul style="list-style-type: none"> <li>— Total building volume &lt;25,000m<sup>3</sup></li> <li>— Construction material with low potential for dust release (e.g. metal cladding or timber)</li> </ul>
Track out <sup>1</sup>	<ul style="list-style-type: none"> <li>— &gt; 50 HDV (&gt;3.5t) outward movements in any one day</li> <li>— Potential dusty surface material (e.g. high clay content)</li> <li>— Unpaved road length &gt; 100m</li> </ul>	<ul style="list-style-type: none"> <li>— 10–50 HDV (&gt;3.5t) outward movements in any one day</li> <li>— Moderately dusty surface material (e.g. high clay content)</li> <li>— Unpaved road length 50–100m</li> </ul>	<ul style="list-style-type: none"> <li>— &lt;10 HDV (&gt;3.5t) outward movements in any one day</li> <li>— Surface material with low potential for dust release</li> <li>— Unpaved road length &lt;50m</li> </ul>

(1) Track out is dirt, mud or other materials tracked onto a paved public roadway by a vehicle leaving a construction site.

(2) HDV – heavy duty vehicle

## DEMOLITION

It is anticipated that construction of the proposal would require the demolition of bridges and structures and removal of existing road and rail infrastructure. Some demolition would occur in the enabling works phases before main construction works begin. This would allow the timely mobilisation of sites designated to be used as construction compounds during main construction works prior to the construction of their specific final uses.

The following bridges and structures would be demolished and have been considered in this category:

- Albury Station pedestrian bridge
- Culcairn pedestrian bridge
- Wagga Wagga Station pedestrian bridge
- Cassidy Parade pedestrian bridge
- Edmondson Street bridge
- Kemp Street bridge
- Junee Station pedestrian bridge.

The dust emission magnitude was assessed at enhancement sites where demolition works would occur based on the building volume, construction material being demolished, the presence of a crushing/screening plant and the height of the demolition activity in Table 5.7.

Table 5.7 Demolition emission magnitude at relevant enhancement sites

ENHANCEMENT SITE	BUILDING/ STRUCTURE/ VOLUME	CONSTRUCTION MATERIAL	ON-SITE CRUSHING / SCREENING	ACTIVITIE S ABOVE GROUND LEVEL	EMISSION MAGNITUDE
Albury Station pedestrian bridge	<20,000m <sup>3</sup>	Steel/concrete	No	<10m	Medium
Culcairn pedestrian bridge	<20,000m <sup>3</sup>	Steel	No	<10m	Small
Wagga Wagga Station pedestrian bridge	<20,000m <sup>3</sup>	Steel	No	<10m	Small
Cassidy Parade pedestrian bridge	<20,000m <sup>3</sup>	Steel/concrete	No	<10m	Medium
Edmondson Street bridge	<20,000m <sup>3</sup>	Steel/concrete	No	<10m	Medium
Kemp Street bridge	<20,000m <sup>3</sup>	Steel/concrete/brick	No	<10m	Medium
Junee Station pedestrian bridge	<20,000m <sup>3</sup>	Steel	No	<10m	Small

## EARTHWORKS

Earthworks primarily involve excavating material, haulage, tipping and stockpiling (the IAQM Guidance). For this proposal, earthworks would be required for:

- track lowering
- track realignment
- drainage modifications
- culvert extensions/replacements
- piling
- ground stabilisation.

The dust emission magnitude for earthworks at each enhancement site was assessed separately based on the following parameters: site area, soil type, number of heavy-duty vehicles (HDVs), the total material excavated and filled. These are summarised in Table 5.8.

For this assessment, the site area is the same as the enhancement site which includes earthworks, construction compounds, laydown areas and ancillary activities where relevant. Construction compounds would generally accommodate stockpiles, laydown area, site offices and fuel storage. Site layout information would be further developed at the detailed design stage. This assessment has conservatively assumed earthworks would occur within the whole proposal site.

Table 5.8 Earthworks emission magnitude summary for each enhancement site

ENHANCEMENT SITE	SITE AREA (m <sup>2</sup> )	SOIL TYPE <sup>4</sup>	NUMBER OF HEMVs <sup>3</sup>	MATERIAL HANDLED <sup>2</sup>		EMISSION MAGNITUDE
				m <sup>3</sup>	Tonnes <sup>1</sup>	
Murray River bridge	9,900	Sandy/clay	<5	<2,500	<13,775	Small
Albury Yard clearances Albury Station pedestrian bridge Riverina Highway bridge	84,208	Sandy/clay	<10	25,985	143,177	Medium
Billy Hughes bridge	102,750	Sandy/clay	<10	20,458	112,872	Medium
Table Top Yard clearances	2,625	Sandy/clay	<5	<2,500	<13,775	Small
Culcairn Yard clearances Culcairn pedestrian bridge	9,987	Sandy/clay	<10	<2,500	<13,775	Small
Henty Yard clearances	15,378	Sandy/clay	<10	4,200	23,142	Medium
Yerong Creek Yard clearances	44,709	Silty/sandy	<10	17,428	96,028	Medium
The Rock Yard clearances	663	Silty/sandy	<5	<2,500	<13,775	Small
Uranquinty Yard clearances	34,949	Sandy/clay	<10	12,698	69,966	Medium
Pearson Street bridge	29,907	Sandy/clay	<10	15,662	86,298	Medium
Wagga Wagga Yard clearances Cassidy Parade pedestrian bridge Edmondson Street bridge Wagga Wagga Station pedestrian bridge	52,954	Sandy/clay	>10	6,776	37,336	Medium
Bomen Yard clearances	32,056	Clay	5 – 10	16,877	92,992	Medium
Harefield Yard clearances	38,309	Sandy/clay	<10	16,412	90,430	Medium
Junee Yard clearances Junee Station pedestrian bridge Kemp Street bridge Olympic Highway underbridge	86,979	Sandy/clay	>10	10,315	56,836	Medium
Junee to Illabo clearances	451,323	Sandy/clay	<10	199,595	1,099,768	Large

- (1) Assuming earth density of 5,510kg/m<sup>3</sup>
- (2) Total volume of excavated and filled material including cut fill, imported structural fill, general fill, spoil, topsoil for track formation and earthworks
- (3) Estimated number of heavy earth moving vehicles (HEMV)
- (4) Technical Paper 13 – Contamination

## CONSTRUCTION

The key issues when determining the potential dust emission magnitude during the construction phase include the size of the infrastructure, method of construction, construction materials, and duration of build. Table 5.6 provides examples of small, medium and large dust emission magnitudes.

A summary of construction information for each site and dust emissions magnitude is presented in Table 5.9.

Table 5.9 Construction emission magnitude for each enhancement site

ENHANCEMENT SITE	CONSTRUCTION WORKS	CONSTRUCTION MATERIAL	ON-SITE CONCRETE BATCHING	SAND-BLASTING	EMISSION MAGNITUDE
Murray River bridge	Bridge upgrade, install new members, new walkway, sandblasting	Hard stand, lead paint, corrosion protection	No	Yes	Small
Albury Yard clearances Albury Station pedestrian bridge Riverina Highway bridge	Track diversion and slew, bridge replacements, piling, track lowering, drainage installation, gantry replacement	Structural fill material, concrete, ballast, sleepers, bearing blocks, reinforced steel, concrete	No	No	Medium
Billy Hughes bridge	Piling, track lowering, drainage installation	Pre-cast pipes, concrete, reinforced steel, ballast	No	No	Small
Table Top Yard clearances	Gantry removal	Backfill material, concrete	No	No	Small
Culcairn Yard clearances Culcairn pedestrian bridge	Track realignment, removal and relocation of pedestrian bridge, gantry modifications	Structural fill, ballast	No	No	Medium
Henty Yard clearances	Track realignment, removal of silo siding and gantry modification	Structural fill, ballast	No	No	Medium
Yerong Creek Yard clearances	Track realignment, removal of platform and hut	Structural fill, ballast	No	No	Small
The Rock Yard clearances	Gantry modification	Concrete	No	No	Small
Uranquinty Yard clearances	Track realignment, installation of pre-cast troughs, gantry removal	Structural fill, ballast, sleepers, bearing blocks, quarry material	No	No	Small

ENHANCEMENT SITE	CONSTRUCTION WORKS	CONSTRUCTION MATERIAL	ON-SITE CONCRETE BATCHING	SAND-BLASTING	EMISSION MAGNITUDE
Pearson Street bridge	Track lowering, piling, drainage structure installation	Pre-cast pipes, concrete, reinforced steel, ballast	No	No	Small
Wagga Wagga Yard clearances Cassidy Parade pedestrian bridge Edmondson Street bridge Wagga Wagga Station pedestrian bridge	Track realignment, piling, removal and replacement of gantry	Structural fill, ballast, sleepers, concrete, reinforced steel, quarry materials	No	No	Medium
Bomen Yard clearances	Track realignment of main line and loop	Structural fill, ballast, sleepers and rail	No	No	Small
Harefield Yard clearances	Track realignment, gantry removal and replacement, culvert extension	Structural fill, ballast, quarry materials	No	No	Small
Junee Yard clearances Junee Station pedestrian bridge Kemp Street bridge Olympic Highway underbridge	Track realignment, replacement of Kemp Street bridge and Junee pedestrian bridge installation of new turnout, piling	Structural fill, ballast, sleepers, quarry materials, concrete, asphalt	No	No	Medium
Junee to Illabo clearances	Track widenings and realignments, culvert extensions/ replacements	Structural fill, ballast, quarry materials	No	No	Medium

(1) No construction works would be conducted within construction compounds

### TRACKOUT

Track out is defined as ‘the transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when HDVs leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site’ (the IAQM Guidance).

Heavy vehicles required for construction include articulated dump trucks, hydrema dump trucks, truck and dogs, tip trucks delivering concrete and other materials.

Vehicles would travel on construction sites and onto public roads through access points shown in the sensitive receptor figures in Appendix A.

Table 5.10 Track out emission magnitude for each enhancement site

ENHANCEMENT SITE	DAILY HEAVY VEHICLE OUTWARD MOVEMENTS	SURFACE MATERIAL <sup>1</sup>	UNPAVED ROAD LENGTH (m)	EMISSION MAGNITUDE
Murray River bridge	<10	Sandy/clay	>100	Small
Albury Yard clearances Albury Station pedestrian bridge Riverina Highway bridge	>50	Sandy/clay	50–100	Large
Billy Hughes bridge	10–50	Sandy/clay	>100	Small
Table Top Yard clearances	<10	Not known	<50	Small
Culcairn Yard clearances Culcairn pedestrian bridge	10–50	Sandy/Clay	<50	Medium
Henty Yard clearances	10–50	Sandy/clay	<50	Medium
Yerong Creek Yard clearances	10–50	Silty/sandy	<50	Small
The Rock Yard clearances	<10	Silty/sandy	<50	Small
Uranquinty Yard clearances	<10	Sandy/Clay	<50	Small
Pearson Street bridge	10–50	Sandy/Clay	50–100	Medium
Wagga Wagga Yard clearances Cassidy Parade pedestrian bridge Edmondson Street bridge Wagga Wagga Station pedestrian bridge	>50	Sandy/clay	>100	Large
Bomen Yard clearances	<10	Clay	20–100	Medium
Harefield Yard clearances	10–50	Sandy/clay	50–100	Small
Junee Yard clearances Junee Station pedestrian bridge Kemp Street bridge Olympic Highway underbridge	>50	Sandy/clay	>100	Large
Junee to Illabo clearances	10–50	Sandy/clay	>100	Medium

(1) Technical Paper 13 – Contamination, 2021

### 5.1.5.3 STEP 2B – DETERMINE THE SENSITIVITY OF THE AREA

The sensitivity of the surrounding land uses takes account of several factors. These are:

- the specific sensitivities of receptors
- the number of receptors and their proximity to the site
- local background PM<sub>10</sub> concentrations
- site-specific factors that may reduce the risk of wind-blown dust (e.g. trees).

The majority of sensitive receptors identified in this assessment are residential in nature. Educational, place of worship, recreational, commercial and industrial receptors are also included. Residential and educational receptors are *high* sensitivity receptors to dust soiling and health effects. Commercial and industrial receptors are categorised as medium sensitivity receptors. Place of worship and recreational areas are low sensitivity receptors where exposure is transient.

The PM<sub>10</sub> annual average concentration monitored at Wagga Wagga North AAQMS was above Air NEPM standard of 25µg/m<sup>3</sup> in 2018 and 2019 while below the standard in other years (2016, 2017 and 2020). The background annual PM<sub>10</sub> concentration was conservatively assumed to be above the standard for the purposes of this risk assessment.

The matrices for determining the sensitivity of the study area to dust soiling and human health effects are presented in Table 3.1 and Table 3.2. These matrices together with the sensitive receptors identified in Table 4.1 and Table 4.2, the sensitivity of the surrounding area to human health effects and dust soiling is summarised in Table 5.11.

Table 5.11 Summary of the sensitivity of the surrounding area

ENHANCEMENT SITE	DEMOLITION		EARTHWORKS		CONSTRUCTION		TRACK OUT	
	DS <sup>1</sup>	HH <sup>2</sup>	DS <sup>1</sup>	HH <sup>2</sup>	DS <sup>1</sup>	HH <sup>2</sup>	DS <sup>1</sup>	HH <sup>2</sup>
Murray River bridge	NA	NA	Low	Low	Low	Low	Medium	High
Albury Yard clearances Albury Station pedestrian bridge Riverina Highway bridge	Low	Medium	Medium	Medium	Medium	Medium	Medium	High
Billy Hughes bridge	NA	NA	Low	Low	Low	Low	Low	Low
Table Top Yard clearances	NA	NA	Low	Low	Low	Low	Low	Low
Culcairn Yard clearances Culcairn pedestrian bridge	Low	Low	Low	Low	Low	Low	Medium	High
Henty Yard clearances	NA	NA	Medium	Medium	Medium	Medium	Medium	High
Yerong Creek Yard clearances	NA	NA	Low	Low	Low	Low	Low	Medium
The Rock Yard clearances	NA	NA	Low	Low	Low	Low	Low	Medium
Uranquinty Yard clearances	NA	NA	Low	Medium	Low	Medium	Medium	High
Pearson Street bridge	NA	NA	Low	Medium	Low	Medium	Medium	High
Wagga Wagga Yard clearances	NA	NA	Medium	High	Medium	High	Medium	High
Wagga Wagga Station pedestrian bridge	Low	Low	NA	NA	NA	NA	NA	NA
Cassidy Parade pedestrian bridge	Low	Medium	NA	NA	NA	NA	NA	NA
Edmondson Street bridge	Low	Medium	NA	NA	NA	NA	NA	NA
Bomen Yard clearances	NA	NA	Low	Low	Low	Low	Low	Low
Harefield Yard clearances	NA	NA	Low	Low	Low	Low	Low	Low
Junee Yard clearances	NA	NA	Medium	High	Medium	High	Medium	High
Kemp Street bridge	Low	Medium	NA	NA	NA	NA	NA	NA
Junee Station pedestrian bridge	Low	Low	NA	NA	NA	NA	NA	NA
Olympic Highway underbridge	NA	NA	Medium	High	Medium	High	Medium	High
Junee to Illabo clearances	NA	NA	Medium	High	Medium	High	Medium	High

- (1) Dust soiling
- (2) Human health
- (3) NA: Not applicable

#### 5.1.5.4 STEP 2C – DEFINE THE RISK OF IMPACTS

The dust emission magnitudes for demolition, earthworks, construction and track out were combined with the sensitivity of the area to determine the risk of dust impacts. The matrices providing the thresholds for the risk of dust impacts are presented in Table 3.3, Table 3.4, and Table 3.5. These matrices together with the sensitivity of the surrounding area presented in Table 5.11, the dust risks from earthworks, construction and track out activities are summarised in Table 5.12.

Table 5.12 Summary of dust risks

ENHANCEMENT SITE	DEMOLITION		EARTHWORKS		CONSTRUCTION		TRACK OUT	
	DS <sup>1</sup>	HH <sup>2</sup>	DS <sup>1</sup>	HH <sup>2</sup>	DS <sup>1</sup>	HH <sup>2</sup>	DS <sup>1</sup>	HH <sup>2</sup>
Murray River bridge	NA	NA	Negligible	Negligible	Negligible	Negligible	Negligible	Low
Albury Yard clearances	Low	Medium	Medium	Medium	Medium	Medium	Medium	High
Albury Station pedestrian bridge	Low	Medium	Medium	Medium	Medium	Medium	Medium	High
Riverina Highway bridge	Low	Medium	Medium	Medium	Medium	Medium	Medium	High
Billy Hughes bridge	NA	NA	Low	Low	Low	Low	Low	Low
Table Top Yard clearances	NA	NA	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Culcairn Yard clearances	Negligible	Negligible	Negligible	Negligible	Low	Low	Low	Medium
Culcairn pedestrian bridge								
Henty Yard clearances	NA	NA	Medium	Medium	Medium	Medium	Low	Medium
Yerong Creek Yard clearances	NA	NA	Low	Low	Negligible	Negligible	Negligible	Negligible
The Rock Yard clearances	NA	NA	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Uranquinty Yard clearances	NA	NA	Low	Medium	Negligible	Low	Low	Low
Pearson Street bridge	NA	NA	Low	Medium	Negligible	Low	Low	Medium
Wagga Wagga Yard clearances	NA	NA	Medium	Medium	Medium	Medium	Medium	High
Wagga Wagga Station pedestrian bridge	Negligible	Negligible	NA	NA	NA	NA	NA	NA
Cassidy Parade pedestrian bridge	Low	Medium	NA	NA	NA	NA	NA	NA
Edmondson Street bridge	Low	Medium	NA	NA	NA	NA	NA	NA
Bomen Yard clearances	NA	NA	Low	Low	Negligible	Negligible	Low	Low
Harefield Yard clearances	NA	NA	Low	Low	Low	Low	Low	Low
Junee Yard clearances	NA	NA	Medium	High	Medium	Medium	Medium	High
Kemp Street bridge	Low	Medium	NA	NA	NA	NA	NA	NA
Junee Station pedestrian bridge	Negligible	Negligible	NA	NA	NA	NA	NA	NA
Olympic Highway underbridge	NA	NA	Medium	High	Medium	Medium	Medium	High
Junee to Illabo clearances	NA	NA	Medium	Medium	Medium	Medium	Medium	Medium

- (1) DS: Dust soiling
- (2) HH: Human health
- (3) NA: Not applicable

The outcomes of the dust risk assessment are summarised below.

- Demolition:
  - Enhancement sites at Albury Yard clearances, Cassidy Parade pedestrian bridge, Edmondson Street bridge and Kemp Street bridge would have medium risk of human health effects from dust and a low risk of dust soiling arising from the deposition of dust.
  - All other enhancement sites assessed (Culcairn Yard clearances, Wagga Wagga Station pedestrian bridge and Junee Station pedestrian bridge) would have a negligible risk of adverse impact on dust soiling arising from the deposition of dust and human health effects.
- Earthworks:
  - Enhancement sites at Olympic Highway underbridge and Junee to Illabo clearances would have a high risk of human health effects from dust.
  - Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Henty Yard clearances, Uranquinty Yard clearances, Pearson Street bridge, Wagga Wagga Yard clearances and Junee Yard clearances would have medium risk of human health effects from dust.
  - Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Henty Yard clearances, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances would have medium risk of dust soiling.  
All other enhancement sites would have a low to negligible impact on dust soiling and human health effects from dust.
- Construction works:
  - Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Henty Yard clearances, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances would have a medium risk of human health effects from dust and from dust soiling
  - All other enhancement sites would have a low to negligible impact on dust soiling and human health effects from dust.
- Track out:
  - Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge and Junee to Illabo clearances would have a high risk of human health effects from dust.
  - Enhancement sites at Culcairn Yard clearances, Henty Yard clearances, and Pearson Street bridge would have medium risk of human health effects from dust.
  - Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances would have medium risk of dust soiling.
  - All other enhancement sites would have a low to negligible impact on dust soiling and human health effects.

#### 5.1.5.5 STEP 3 – SITE-SPECIFIC MITIGATION

Risks are described in terms of a negligible, low, medium or high risk. Where there are low, medium or high risks of an impact, then site-specific mitigation is required based on the risk level. For cases where the risk category is negligible, no mitigation measures beyond those required by legislation is required. For general mitigation measures, the highest risk category was applied. To minimise the dust impacts associated with the proposal, site-specific mitigation measures are presented in Chapter 7.

#### 5.1.5.6 STEP 4 – DETERMINE SIGNIFICANCE OF RESIDUAL IMPACTS

For all construction activities, the aim is to prevent significant impacts on receptors through effective mitigation. The IAQM Guidance (2014) indicates this is normally possible. Therefore, with the implementation of site-specific mitigation measures detailed in Chapter 7, residual dust impacts would low in terms of dust soiling and health effects. Residual impacts are further discussed in section 7.3.

#### 5.1.5.7 QUALITATIVE ASSESSMENT

Where there are no sensitive receptors within 350m of the proposal and within 50m of haulage roads up to 500m of the access points and where specific activities are not covered in sections 5.1.5.1 to 5.1.5.4 a detailed risk assessment of dust impacts was 'screened out'. The IAQM Guidance (2014) indicates the level of risk to dust impacts on sensitive receptors would be negligible and any effects would not be of significance.

Nevertheless, potential dust sources not included in the risk assessment are addressed in this section to assist with developing site-specific mitigation measures for managing potential generation of dust emissions.

These sources include:

- site clearance and construction site establishment
- re-contouring of land and soil exposure for reseeded
- construction of surface roads, under bridges and culverts
- construction and installation of above ground infrastructure (e.g. new tracks)
- relocation of utility services.

These dust sources are minor and with appropriate on-site management measures (Chapter 7) potential impacts should be minimal and not of significance.

### 5.1.6 GASEOUS EMISSIONS

Gaseous emissions including PM<sub>10</sub>, PM<sub>2.5</sub>, CO, NO<sub>x</sub>, SO<sub>2</sub>, VOCs and SVOCs would be generated from vehicles and fugitive sources during construction.

#### 5.1.6.1 VEHICLE EMISSIONS

##### *ON-SITE PLANT AND MACHINERY*

Diesel fuel combustion from vehicle movements and on-site plant and machinery operation would generate, CO, NO<sub>x</sub>, SO<sub>2</sub> and trace amounts of non-combustible hydrocarbons (i.e., VOCs and SVOCs) in addition to PM<sub>10</sub> and PM<sub>2.5</sub>. The emission rates and potential impact on surrounding areas would depend on the number and power output of the combustion engines, the quality of fuel used, the condition of the engines and the intensity of use.

During construction, equipment, materials and works would be transported to the enhancement sites using heavy vehicles (haulage and delivery trucks) and light vehicles (cars and utility vehicles). The type and number of vehicles will vary at each enhancement site and at each stage of construction.

The plant and machinery involved in the proposal construction include excavators, rollers, dozers, graders, compactors, rigid tippers, articulated dump trucks, water carts, road cranes, franna cranes, scrapers, front end loaders, hydrema dumpers, backhoes, piling rigs and concrete trucks.

Fuel combustion emissions from plant and equipment along the proposal would be intermittent and transient. Given the anticipated duration of works at any given location, the likely numbers of emission sources, and scheduling of activities (i.e. not all machinery would be operating at the same location simultaneously), gaseous emissions are not anticipated to significantly influence local air quality. Exhaust emissions generated during construction would be temporary and would not significantly contribute to the local airshed based on the likely number of machinery, intermittent operation of the plant and equipment, their duration and intensity. Emissions would also be adequately managed through the implementation of mitigation measures.

## DIVERSIONS AND CHANGED TRAFFIC FLOW

Table 5.13 presents the details of the traffic diversions for the following enhancement sites:

- Henty Yard clearances
- Edmondson Street bridge
- Kemp Street bridge.

These traffic diversions have the potential to impact on sensitive receptors. Details of the traffic diversions are presented in Technical Paper 1 – Transport and traffic.

Table 5.13 Traffic diversions at enhancement sites

ENHANCEMENT SITE	TRAFFIC DIVERSION DETAILS	DURATION
Henty Yard clearances	Closure of Sladen Street level crossing and traffic diversion via Rosler Parade/Yankee Crossing Road via the Olympic Highway on the western side of the rail line and via Allan Street on the eastern side of the railway line.	60 hours
Edmondson Street bridge	Mitchelmore Street/Edmondson Street traffic rerouted via Urana Street, Docker Street, Bourke Street, and Edward Street.  Local traffic currently using Erin Street to be diverted to Coleman Street.	9 months
Kemp Street bridge	Olympic Highway traffic rerouted via Joffre Street and Pretoria Avenue.	2 months
	Kemp Street bridge traffic rerouted via the level crossing on Olympic Highway to the north and diverted via Seigneur Street, Main Street, Humphrys Street and Lorne Street.  Local traffic currently turning right on Railway Parade will be diverted to Harold Street.	8 months

### HENTY YARD CLEARANCES

The closure of Sladen Street at the Henty Yard clearance enhancement site will incur an additional 2.7km (5 minutes) travel distance. Sensitive receptors along Rosler Parade/Yankee Crossing Road and Allan Street may potentially be impacted by the increase in construction vehicles particularly during peak hours. 39 construction vehicles during peak hour one-way along Rosler Parade are projected in 2024 and 51 non-construction related vehicles on Rosler Parade and Allan Street (peak hour one-way). While an increase in emissions from vehicular emissions is expected to occur during the 60-hour duration, potential impacts would be short lived and temporary.

### EDMONDSON STREET BRIDGE

The Edmondson Street bridge construction works diversion would take approximately six minutes (3.6km) of additional travel time during peak periods over a nine-month period. The diversion routes were selected to minimise impacts to the road network by using higher order roads for diverted traffic. A link capacity assessment of the diversion route indicates an increase of diversion peak hour one-way traffic along Edward Street, Docker Street, Bourke Street and Urana ranging from 40 per cent (Edward Street) to 83 per cent (Urana Street) in 2024. This includes 39 peak one-way construction vehicles. It is anticipated that non-peak diversion traffic would be much lower. Emissions from vehicular traffic would increase along these roads, particularly during peak hours. However, given the relatively projected low volume of traffic (less than 2,000 peak hour vehicles) along these roads, sensitive receptors are not likely to be adversely affected by the increase in vehicular emissions. It is also expected that given the nine-month diversion period, a proportion of diverted traffic would seek alternative routes to the proposed diversions across the broader network such as via Coleman Street (as opposed to Urana Street for an east-west connection) and Macleay Street, Railway Street, and Lake Albert Road (as opposed to Bourke Street/Docker Street for a north-south connection). This would have the effect of redistributing vehicle emissions and reducing the potential air quality impacts on the diverted roads.

## *KEMP STREET BRIDGE*

The Kemp Street bridge enhancement site construction works diversion would take approximately three minutes (1.4km) of additional travel time during peak periods over an eight-month period. A link capacity assessment of the diversion route indicates 173 diverted one-way peak hour volume traffic and 27 one-way peak hour construction vehicles in 2024 along Seignior Street, Olympic Highway Level Crossing, Humphry's Street, Lorne Street, Joffre Street and Pretoria Avenue. This represents a more than doubling of peak hour traffic volumes on some streets. It is anticipated that non-peak diversion traffic would be much lower. Emissions from vehicular traffic would increase along these roads, particularly during peak hours. However, given the relatively projected low volume of traffic (less than 500 peak hour vehicles) along these roads, sensitive receptors are not likely to be adversely affected by the increase in vehicular emissions. Furthermore, the diversion would occur over a short two-month period.

In summary, potential air quality impacts along the diversion roads are expected to be minor.

### 5.1.6.2 FUGITIVE EMISSIONS

Diesel and petrol fuel, lubricating and hydraulic oils and greases, acids and disinfectant would also be stored at multiple compounds. Fuel, oils, and greases would be stored in a bunded area within drums, and refuelling would be conducted in the bunded area. Acids and disinfectant would be stored within immediate bulk containers within a bunded area.

Fuel storage, plant, machinery, and vehicles refuelling, chemicals storage and handling have the potential to generate fugitive emissions. Typically, low volumes of potentially hazardous materials would be stored onsite. The volume required to be stored onsite would largely depend on the anticipated rates of consumption, with deliveries of dangerous goods coordinated to match consumption rates. This could be about one delivery per day, if needed, to minimise volumes stored onsite. Enhancement sites would be planned so that hazardous materials are stored appropriately and at a suitable distance from sensitive receptors. Environmental hazards associated with the onsite storage, use and transport of chemicals, fuels and materials would be managed through standard mitigation measures to be developed as part of the construction environmental management plan for the proposal. Refuelling would occur intermittently dependent on demand.

Given the low number of plant and machinery at each enhancement site, and the expected volume of fuel and chemicals stored, handled and refuelled, fugitive emissions are expected to be minor and readily dispersed under normal conditions.

In an event of a leakage or spillage, local air quality is likely to be adversely impacted for a short period. However, these events are rare or may never happen during construction with proper management and handling procedure in place and strictly followed.

In summary, with appropriate handling and storage, air quality impacts from these fugitive sources are not considered to be of significance.

### 5.1.6.3 ODOUR EMISSIONS

The proposal would not result in odour emissions directly, however odours have the potential to be generated during construction through excavation of contaminated materials or odorous soils. A review of Technical Paper 13 – Contamination has not identified any significant risks of odour arising from excavation of contaminated materials or soils.

In an event that contaminated materials are encountered, work in the affected area would cease immediately and the unexpected finds protocol would be implemented. Odour emissions would be effectively controlled and not cause adverse impacts on nearby sensitive receptors.

### 5.1.7 ECOLOGICAL RECEPTORS

There are no ecological areas of sensitivity within the study considered to be more sensitive to impacts from air quality than those identified as residential and other land uses (refer to Technical paper 8 – Biodiversity development assessment report and Technical Paper 9 – Aquatic ecology for further discussion).

Predominantly, impacts to ecological receptors would occur from dust, which may deposit on surrounding vegetation or watercourses resulting in impacts to aquatic ecology.

Consequently, ecological receptors were considered through assessment of other receptors, and management and mitigation measures are considered adequate.

To minimise the dust impacts associated with the proposal, site-specific mitigation measures are presented in Chapter 7.

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## 5.2 OPERATION

### 5.2.1 RAIL

#### 5.2.1.1 OPERATIONAL SOURCES AND CHARACTERISTICS

Operation of the proposal would include Inland Rail trains, which includes a mix of grain, bulk freight, and other general transport trains. Train speeds would vary according to axle loads and range from 60 to 115km/hr. Diesel locomotives traversing through the proposal would generate the following air emissions:

- Particulate matter
- NO<sub>x</sub>, CO and SO<sub>2</sub>  
VOCs and SVOCs.

The projected daily train volumes which indicates an average of 18 trains per day in 2025 and up to 20 trains per day (peak) in 2040. The projected increase in freight trains per day along the route in 2025 and 2040 is considered small with increases in air emissions and impacts on the receiving environment minor. Considering the low frequency increase of train movements and location of the proposal, air dispersion modelling was not considered to be required.

Instead, a review of potential air quality assessments for several similar rail projects in NSW was undertaken and discussed in the following sections to assess the potential impacts for the proposal.

#### 5.2.1.2 COMPARISON OF AIR QUALITY IMPACTS FOR THE PROPOSAL WITH OTHER PROJECTS DURING NORMAL OPERATIONS

##### *NORTHERN SYDNEY FREIGHT CORRIDOR – STRATHFIELD RAIL UNDERPASS PROJECT*

The Air Quality Impact Assessment Report (Parsons Brinckerhoff, 2012) for the Northern Sydney Freight Corridor – Strathfield Rail Underpass (NSFC) project was reviewed with respect to potential air quality impacts of operational freight trains on the receiving environment.

The assessment included modelling of emissions from three classes of diesel locomotives (81, 82 and 90) at 75km/hr for 31 movements per day in each direction in 2026. Modelling results showed that for all pollutants assessed (PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, CO, SO<sub>2</sub> and benzene), predicted pollutant (incremental and cumulative) ground level concentrations (GLCs) for 2026 were below the relevant NSW IAC 50m from the track.

A comparison between NSFC project and the proposal is presented in Table 5.14. Maximum predicted incremental ground level concentrations of the NSFC project are presented in Table 5.15. The proposal would have less train movements than the NSFC project. As such, air quality impacts from the proposal are expected to be lower than that from the NSFC project and sensitive receptors are not anticipated to be adversely impacted by the proposal.

Table 5.14 Comparison between the Northern Sydney Freight Corridor – Strathfield Rail Underpass project and the proposal

ITEM	NORTH STRATHFIELD FREIGHT CORRIDOR PROJECT	ALBURY TO ILLABO
Train movements (per day)	31 in each direction	20 (2040 peak)
Train speed (km/hr)	75	60–115
Nearest receptor location	Adjacent to corridor	Adjacent to corridor
Locality setting	Urban	Rural and regional
Predicted impacts	Predicted incremental (refer to Table 5.15) and cumulative concentrations for all monitored pollutants were below relevant NSW impact assessment criteria at all modelled distances (smallest distance was 50m).	Incremental concentrations expected to be lower than those presented in Table 5.15 and below relevant impact assessment criterion.  Given some background data (i.e. PM <sub>10</sub> and PM <sub>2.5</sub> ) exceeded criteria, cumulative concentrations would be dominated by background concentrations with the contribution from the proposal expected to be low.
Impacts on receptors	Predicted cumulative concentration were below NSW IAC at all locations as illustrated on the contour plots. Sensitive receptors would not be adversely impacted were concluded.	Not expected to be adversely impacted.

Table 5.15 Maximum predicted incremental ground level concentrations at all modelled distances of the Northern Sydney Freight Corridor – Strathfield Rail Underpass project

POLLUTANT	AVERAGING PERIOD	MAXIMUM CONCENTRATION AT ALL DISTANCES AND ALL MODELLED YEARS (µg/m <sup>3</sup> )	PERCENTAGE OF CRITERION	CRITERION (µg/m <sup>3</sup> )
NO <sub>2</sub>	1 hour	217 <sup>2</sup>	NA <sup>1</sup>	246
	Annual	35 <sup>2</sup>	NA <sup>1</sup>	62
CO	15 minutes	27	0.03%	100,000
	1 hour	20	0.07%	30,000
	8 hours	19	0.19%	10,000
PM <sub>10</sub>	24 hours	0.06	0.12%	50
	Annual	0.009	0.04%	25
PM <sub>2.5</sub>	24 hours	2.0	8.0%	25
	Annual	0.3	3.8%	8

POLLUTANT	AVERAGING PERIOD	MAXIMUM CONCENTRATION AT ALL DISTANCES AND ALL MODELLED YEARS ( $\mu\text{g}/\text{m}^3$ )	PERCENTAGE OF CRITERION	CRITERION ( $\mu\text{g}/\text{m}^3$ )
SO <sub>2</sub>	10 minutes	28.4	4.0%	712
	1 hour	19.9	3.5%	570
	24 hours	10.0	4.4%	228
	Annual	1.6	2.7%	60
VOCs (as benzene)	1 hour	3.19	11.0%	29
	Annual	0.3	3.1%	9.7

- (1) NA: Not applicable
- (2) Only cumulative concentrations were provided in the NSFC Project report due to the application of the ozone limiting method conversion.

### BOTANY RAIL DUPLICATION PROJECT

The Botany Rail Duplication (BRD) project involves the construction and operation of a new second track within the existing Botany Line rail corridor between Mascot and Botany. Outcomes of the Air Quality Impact Assessment Report (ARTC, 2019) with respect to the potential impacts of operational phase for the BRD project were reviewed.

A dispersion modelling assessment of air emissions (NO<sub>2</sub>, CO, SO<sub>2</sub>, benzene, PM<sub>10</sub> and PM<sub>2.5</sub>) from diesel freight trains (NR class locomotives (NR121) and 93 class locomotives (9317)) was undertaken for five scenarios (S1 to S5): the existing situation (2019) to the ten-year future build scenario (2034). Projected average daily locomotives travelling to and from Port Botany for the five scenarios ranged from 40 (2019 existing) to 112 (2034 future build) respectively.

The modelling indicated that for all pollutants modelled, predicted pollutant GLCs were below the relevant IAC at all sensitive receptors and for all averaging periods. As expected, the highest predicted concentrations occurred for Scenario five, for which the maximum number of trains are projected to occur.

A comparison between the BRD project and the proposal is presented in Table 5.16. Maximum predicted incremental ground level concentrations of the BRD project are presented in Table 5.17. The proposal is estimated to have less train movements than the BRD project. As such, air quality impacts from the proposal are expected to be lower than that from the BRD project and sensitive receptors are not anticipated to be adversely impacted by the proposal.

Table 5.16 Comparison between Botany Rail Duplication project and the proposal

ITEM	BOTANY RAIL PROJECT	ALBURY TO ILLABO
Train movements (per day)	40–112	20 (2040 peak)
Train speed (km/hr)	30–45	60–115
Nearest receptor location	Adjacent to corridor	Adjacent to corridor
Locality setting	Urban	Rural and regional

ITEM	BOTANY RAIL PROJECT	ALBURY TO ILLABO
Predicted impacts	Predicted incremental (refer to Table 5.17) and cumulative concentrations for all monitored pollutants were below relevant NSW impact assessment criteria at all receptors	Incremental ground level concentrations expected to be lower than that presented in Table 5.17 and below relevant impact assessment criteria.  Given some background data exceeded criteria, cumulative ground level concentrations would be dominated by background concentrations and the contribution from the proposal is expected to be low.
Impacts on receptors	Sensitive receptors would not be adversely impacted.	Not expected to be adversely impacted.

Table 5.17 Maximum predicted incremental ground level concentrations at all modelled distances and scenarios of the Botany Rail Duplication project

POLLUTANT	AVERAGING PERIOD	MAXIMUM CONCENTRATION AT ALL DISTANCES AND ALL MODELLED YEARS ( $\mu\text{g}/\text{m}^3$ )	PERCENTAGE OF CRITERION	CRITERION ( $\mu\text{g}/\text{m}^3$ )
NO <sub>2</sub>	1 hour	163	66%	246
	Annual	25	40%	62
CO	15 minutes	128	0.1%	100,000
	1 hour	97	0.3%	30,000
	8 hours	25	0.3%	10,000
PM <sub>10</sub>	24 hours	0.7	1.4%	50
	Annual	0.2	0.8%	25
PM <sub>2.5</sub>	24 hours	0.7	3%	25
	Annual	0.2	3%	8
SO <sub>2</sub>	10 minutes	125	18%	712
	1 hour	87	15%	570
	24 hours	5	2%	228
	Annual	2	3%	60
VOCs (as benzene)	1 hour	0.3	1%	29

## POTENTIAL IMPACTS WITHIN 50M OF THE PROPOSAL RAIL TRACK

The reference projects discussed in section 5.2.1.2 for normal operations did not include assessing impacts within 50m of the rail track. This section discusses potential air quality impacts from freight train emissions within 50m of the proposal rail track.

248 sensitive receptors are located within 50m of the proposal rail track across 14 enhancement sites. Receptor types include residences, recreational areas, place of worship, educational establishments, commercial and industrial premises. Of these receptors, 80 are residences.

Comparison of air quality impacts for the proposal with the NSFC and BRD projects was undertaken for normal operations. Modelling of air emissions from freight trains on NSFC corridor showed that for all pollutants assessed (PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, CO, SO<sub>2</sub> and benzene), predicted pollutant (incremental and cumulative) ground level concentrations (GLCs) for 2026 were below the relevant NSW IAC at 50m and beyond from the track and for the pollutant (24-hour PM<sub>2.5</sub>) impacting receptors the most, are no more than 8% of the criterion. Projected train movements on the NSFC corridor (31 in each direction in 2026) are higher than that for the proposal (20 in 2040). Consequently, potential air quality impacts at 50m of the rail track are expected to be lower than NSFC predictions and within the relevant IAC.

There is no modelling data available for assessing air quality impacts within 50m of the rail track. There is the potential for air quality impacts from existing operations at sensitive receptors within 50m of the rail track given the proximity to the emission source. The magnitude of these impacts is not known, however, based on the NSFC model results at 50m, impacts may be below relevant assessment criteria for receptors within 50m. Additionally, the proposal is expected to generate an increase of six trains per day along the route above existing levels in 2025 and up to eight trains in 2040. The projected train increases in 2025 and 2040 are below the projected train movements on the NSFC corridor (31 in each direction in 2026). The potential increase in air emissions from the proposal is expected to be low and not significantly increase air quality impacts from current levels experienced at sensitive receptors within 50m of the rail track.

### 5.2.1.3 COMPARISON OF AIR QUALITY IMPACTS WITH OTHER PROJECTS DUE TO TRAIN IDLING

#### IMPACTS FROM THE PROPOSAL

Idling of trains will occur at the Olympic Highway underbridge, where the rearranged track will change from double to single (north or south of the Olympic Highway underbridge) causing trains to wait (idle) with the potential to generate air emissions. The nearest sensitive receptors (residences) are situated about 40m from the track at this location.

Air dispersion modelling of train idling emissions for the proposal was not undertaken. Instead, a review of the following three NSW rail projects was undertaken in consideration of potential air quality impacts from idling:

- Botany Rail Duplication (BRD) project
- Narromine to Narrabri (N2N) project
- North Star to NSW/Queensland Border (NS2B) project.

#### BOTANY RAIL DUPLICATION (BRD) PROJECT

The BRD project Air Quality Assessment Report (ARTC, 2019) estimated emission rates for different operating notches including idling. The air emission rates for trains in the idle mode are much lower than in operating mode as shown in Table 5.18. Although no specific modelling was conducted at the crossing loop for the BRD Project, the total contributions from the project are expected to be close to the data presented in section 5.2.1.1, given the low emissions from idling trains.

The estimated train movements for the proposal (Table 5.16) are much lower than for the BRD project. It follows that emissions from idling trains at Junee (Olympic Highway) are anticipated to be low and ground level pollutant concentrations from these emissions would be below relevant impact assessment criteria.

Table 5.18 Pollutant emission rates for the Botany Rail Duplication Project

<b>OPERATING NOTCH</b>	<b>NO<sub>x</sub> (g/hour)</b>	<b>CO (g/hour)</b>	<b>HYDROCARBON (as benzene) (g/hour)</b>	<b>SO<sub>2</sub> (g/hour)</b>	<b>PM<sub>10</sub> (g/hour)</b>	<b>PM<sub>2.5</sub> (g/hour)</b>
Idle	317	42	0	7	6	6
1 to 8	3,762–32,612	193–3,146	2–11	221–3,602	40–237	38–230

**NARROMINE TO NARRABRI (N2N) PROJECT**

The N2N Project modelled NO<sub>2</sub> emissions only from locomotives idling at a crossing loop. Chapter B10 Air Quality of the EIS report (ARTC, 2020b) indicates that based on the assumption that air emissions from the freight trains at crossing loops are assumed to be equivalent of two adjacent locomotives at idle notch (NO<sub>2</sub> emission rate of 0.18 grams per second (g/s)), the modelling predicted compliance with the one-hour NO<sub>2</sub> impact assessment criterion at approximately 25m from the emission source with a background concentration of 70µg/m<sup>3</sup> (0.035ppm).

Given the short duration of trains in the idling mode and the distance to the nearest sensitive receptor (a residence approximately 40m from the proposal), air quality impacts from trains idling at Junee (Olympic Highway) are anticipated to not be of significance.

**NORTH STAR TO NSW/QUEENSLAND BORDER (NS2B) PROJECT**

The Appendix L of the EIS – Air Quality Technical Report (ARTC, 2020b) for the NS2B Project included modelling of emissions during train idling. The assumptions for the modelling included:

- locomotive type and configuration
- an average of 17 trains per day
- 75 per cent of journey time to include travel time, and the remaining 25 per cent of journey time where trains are stationary and producing idling emissions.

The pollutant emission rates estimated in the report are presented in Table 5.19. The emission rates for idling trains are less than one per cent of the total emissions.

The maximum predicted GLCs are presented in Table 5.20. The predicted pollutant GLCs demonstrated compliance with the relevant impact assessment criteria for the scenario modelled which take into account idling emissions. It is noted that the highest predicted impacts occur across the entire proposal at the nearest sensitive receptor. Predicted impacts at the nearest sensitive receptor to the crossing loop would be lower and below the relevant IAC.

With similar train movements for the proposal, the potential impacts due to idling are expected to be similar.

Table 5.19 Modelled emission rates for the N2NB Project

<b>POLLUTANT</b>	<b>EMISSION RATES FOR NORMAL OPERATIONS (g/s)</b>	<b>EMISSION RATES FOR IDLING (g/s)</b>
TSP	0.330	0.00089
PM <sub>10</sub>	0.322	0.00087
PM <sub>2.5</sub>	0.309	0.00083
NO <sub>x</sub>	5.366	0.03556
CO	2.138	0.00621
SO <sub>2</sub>	0.0015	0.0000042
Total VOCs	0.654	0.00379

Table 5.20 Maximum predicted incremental ground level concentrations at sensitive receptors

POLLUTANTS	AVERAGING PERIOD	MAXIMUM PREDICTED CONCENTRATION ( $\mu\text{g}/\text{m}^3$ )	CRITERION ( $\mu\text{g}/\text{m}^3$ )
TSP	Annual	0.5	90
PM <sub>10</sub>	24 hour	48.1 <sup>1</sup>	50
	Annual	17.0 <sup>1</sup>	25
PM <sub>2.5</sub>	24 hour	2.5	25
	Annual	0.4	8
NO <sub>2</sub>	1 hour	168 <sup>1</sup>	246
	Annual	28.2 <sup>1</sup>	62
VOCs (as benzene)	1 hour	1.2	29

(1) A cumulative contemporaneous assessment was conducted, and only cumulative ground level concentrations were presented

#### 5.2.1.4 SUMMARY

Train movements projected for the proposal are lower than for two of the rail projects discussed in this section. Potential impacts associated with the operation of the proposal are expected to be lower or of similar magnitude than that of the reference projects. Air dispersion modelling conducted for both the NSFC Project and the BRD Project demonstrated compliance with the relevant IAC for all assessed pollutants.

The proposal is projected to increase the average number of freight train movements between Albury and Illabo from a current average of up 12 per day in 2021 to 18 per day in 2025, further increasing to about 20 per day in 2040. This may cause an increase in combustion emissions from the diesel freight trains. However, the total future train movements are lower or similar to those for the NSFC and BRD Projects. Air quality impacts from train movements along the proposal in 2025 and 2040 would not exceed the relevant IAC pollutant criteria. It is noted that there are challenges in comparing air quality impacts from different projects due to a range of inputs specific to each project. Notwithstanding, the frequency and number of freight trains are key factors in addressing potential impacts on the receiving environment.

Potential air quality impacts from idling trains at Junee (Olympic Highway) are expected to be of similar or lower magnitude to the predicted ground level concentrations for the N2N and N2NB projects. All pollutants modelled were below their respective IAC. It follows that pollutant ground level concentrations from idling train emissions at Junee (Olympic Highway) would also be below their IACs and have minimal impact at the nearest sensitive receptors.

In summary, air quality impacts from the operation of the proposal (normal train operation and train idling) are expected to be low at the nearest sensitive receptors to the proposal.

# 6 CUMULATIVE IMPACTS

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## 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 with sufficient information to undertake assessment of potential cumulative impacts from the proposal are shown in Figure 6.1, and include:

- Adjacent sections of Inland Rail, including:
  - Tottenham to Albury (Victoria)
  - Illabo to Stockinbingal.
- Other projects, including:
  - Thurgoona Link Road
  - Nexus Industrial Precinct
  - Jindera Solar Farm
  - Glenellen Solar Farm
  - Walla Walla Solar Farm
  - Culcairn Solar Farm
  - Uranquinty Solar Farm
  - Sandy Creek Solar Farm
  - Gregadoo Solar Farm
  - Solar farm (5 megawatts) at Uranquinty
  - Solar farm (5 megawatts) at Bomen
  - Wagga Wagga Special Activation Precinct
  - Riverina Intermodal Freight and Logistics Hub
  - Olympic Highway intersection upgrades
  - Project EnergyConnect (NSW – Eastern Section)
  - HumeLink
  - Junee Station Upgrade
  - Junee to Griffith Line Upgrade
  - Illabo Solar Farm
  - A grade separation road interface proposal.

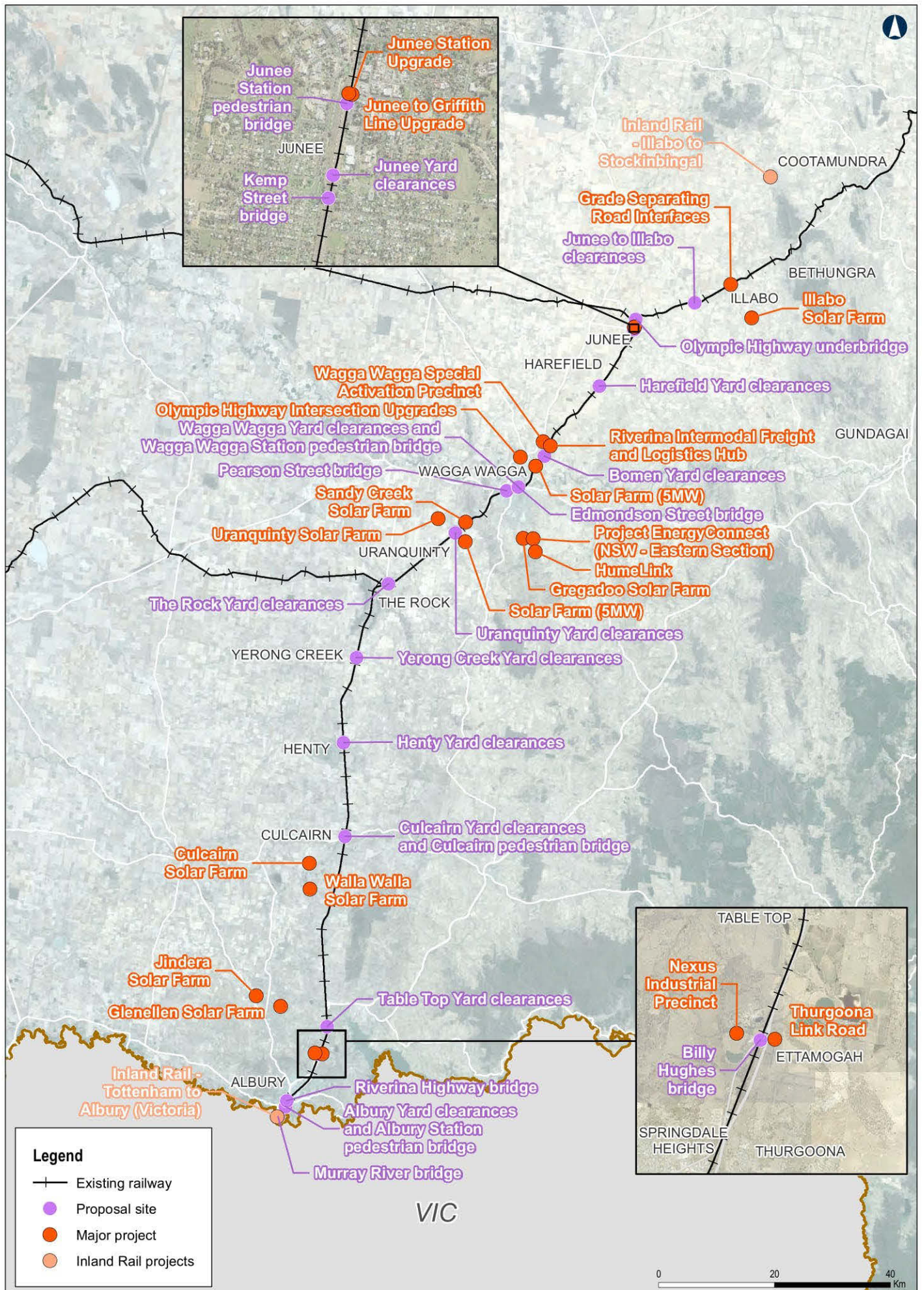


Figure 6.1 Major projects in the vicinity of the proposal

Data Sources: ARTC, NSWSS

## 6.2 CUMULATIVE IMPACTS DURING CONSTRUCTION AND OPERATION

Projects within 5km of the proposal that have the potential for cumulative impacts with the proposal were identified and summarised in Table 6.1. Given their proximity, the projects listed were considered to have greater potential to impact on air quality at the proposal site.

Table 6.1 Cumulative impacts

PROJECT	DISTANCE TO PROPOSAL	CUMULATIVE IMPACTS
Thurgoona Link Road	1–5km	<p>Cumulative impacts to air quality due to combined emissions during construction may occur.</p> <p>With appropriate management measures in place for both developments cumulative impacts are expected to be low.</p> <p>Cumulative impacts during operation are likely to minimal and not of significance</p>
Sandy Creek Solar Farms (Sandy Creek, Uranquinty (5MW) and Bomen (5MW))	1–5km	<p>Should construction overlap with the proposal, cumulative impacts during construction (primarily from dust) are likely to be negligible, given the projects location.</p> <p>With appropriate dust control measures implemented for both developments no substantial cumulative impacts would be expected.</p> <p>There are no cumulative impacts anticipated during operation of the proposal.</p>
Wagga Wagga Special Activation Precinct	1–5km	<p>Cumulative impacts during construction (primarily from dust) are likely to be negligible, given the projects location</p> <p>With appropriate dust control measures implemented for both developments no substantial cumulative impacts would be expected.</p> <p>There is the potential for cumulative impacts during operation. However, the impacts are expected to minor.</p>
Riverina Intermodal and Logistics Hub	1–5km	<p>Cumulative impacts during construction would not occur as construction is not expected to overlap with the proposal.</p> <p>Cumulative impacts during operation are likely to minimal and not of significance.</p>
Olympic Highway intersection upgrades	3–4km	<p>In the event that construction overlaps with the proposal, cumulative impacts during construction (primarily from dust) are likely to be negligible, given the projects location.</p> <p>With appropriate dust control measures implemented for both developments no significant cumulative impacts would be expected.</p> <p>There are no cumulative impacts anticipated during operation of the proposal.</p>
Project EnergyConnect (NSW— Eastern Section)	3–7km	<p>Cumulative impacts during construction (primarily from dust) are likely to be negligible, given the projects location</p> <p>With appropriate dust control measures implemented for both developments no significant cumulative impacts would be expected.</p> <p>Cumulative impacts during operation are not expected given the nature of the EnergyConnect project i.e., emissions during operation would be negligible.</p>

PROJECT	DISTANCE TO PROPOSAL	CUMULATIVE IMPACTS
Junee to Griffith Line Upgrade	Adjacent	Construction of this project is not scheduled to overlap with the proposal. Cumulative impacts to air quality due to combined emissions may occur. Any impacts are expected to be minor.
Inland Rail – Illabo to Stockinbingal	Adjacent	Cumulative impacts to air quality due to combined emissions may occur. With appropriate management measures in place for both developments cumulative impacts are expected to be low. Cumulative impacts during operation are likely to minimal and not of significance.
Grade separating road interfaces	Within and adjacent	Cumulative impacts to air quality may occur during construction and/or operation. However the program for this proposal is not known and the impact assessment for this project is ongoing.

# 7 MITIGATION AND MANAGEMENT MEASURES

## 7.1 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 of the EIS (Approach to mitigation and management).

This would include an air quality management sub-plan, prepared as part of the Construction Environmental Management Plan (CEMP). The sub-plan would include (but is not limited to) the following management measures for controlling impacts to air quality:

- undertake daily on-site and off-site inspections to monitor dust and record inspection results
- strictly limit vehicle movement to designated areas
- turn off idling plant and trucks when not in use
- apply water sprays during earthworks, as required
- stabilise all disturbed areas and stockpiles as soon as is practicable
- limit clearing extents to the minimum required for construction works
- use water sprays or carts to manage dust during the handling of ballast materials
- maintain and operate all equipment and vehicles in accordance with the manufacturer’s instructions.

## 7.2 SUMMARY OF MITIGATION AND MANAGEMENT MEASURES

The mitigation measures to manage impacts to air quality from the proposal during detailed design / pre-construction, construction and operation are outlined in Table 7.1.

Table 7.1 Summary of mitigation and management measures

<b>IMPACT TYPE</b>	<b>MITIGATION AND MANAGEMENT MEASURES</b>	<b>PROJECT PHASE</b>
All dust generating activities	Where visible dust is generated from on-site activities, watering (water cart or water sprays) and/or other appropriate measures will be implemented.	Construction

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## 7.3 EXPECTED EFFECTIVENESS OF THE MITIGATION MEASURES PROPOSED

The mitigation measures specified in Chapter 7 are anticipated to reduce the likelihood and/or consequence of the identified risks. Where an identified issues/risk is reduced but not eliminated, it would be assessed further through all project stages to determine if further action is required.

### 7.3.1 CONSTRUCTION

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.

The dust impacts associated with the construction sites where no sensitive receptors are located within 350 m are not of significance prior to mitigation. With further mitigation measures in place, the residual dust impacts would be further reduced and minimised.

The proposed measures for controlling dust are expected to be effective in ensuring residual impacts on the receiving are low. These are standard measures used on construction sites in NSW. The effectiveness of the dust controls would be demonstrated through the implementation of an air quality management sub-plan and an air quality monitoring plan.

Gaseous and odour emissions generated from vehicles and fugitive sources during the construction phase would be minimised with mitigation measures in place and air quality impacts would not be of significance.

### 7.3.2 OPERATION

During the operation phase, air quality impacts from the proposed operation of the proposal are expected to be low at the nearest sensitive receptors and below the relevant IAC for both 2025 and 2040 prior to mitigation. With further mitigation measures in place, operational impacts would not be of significance.

# 8 CONCLUSION

Air quality impacts during construction and operation were assessed for the proposal. This section discusses the outcomes of the assessment conducted.

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## 8.1 CONSTRUCTION

Dust impacts associated with construction of the proposal was conducted in accordance with the risk-based approach detailed in the IAQM guidance.

Gaseous and odour emissions from construction works and any dust related construction works ‘screened out’ by the IAQM guidance criteria was assessed qualitatively.

The risk of dust impacts prior to mitigation are as follows:

Demolition works:

- Enhancement sites at Albury Yard clearances, Cassidy Parade pedestrian bridge, Edmondson Street bridge and Kemp Street bridge would have medium risk of human health effects from dust and a low risk of dust soiling arising from the deposition of dust.
- All other enhancement sites assessed (Culcairn Yard clearances, Wagga Wagga Station pedestrian bridge and Junee Station pedestrian bridge) would have a low to negligible risk of adverse impact on dust soiling arising from the deposition of dust and human health effects from dust.

Earthworks:

- Enhancement sites at Olympic Highway underbridge, and Junee to Illabo clearances would have a high risk of human health effects from dust.
- Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Henty Yard clearances, Uranquinty Yard clearances, Pearson Street bridge, Wagga Wagga Yard clearances and Junee Yard clearances would have medium risk of human health effects from dust.
- Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Henty Yard clearances, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances would have medium risk of dust soiling.
- All other enhancement sites would have a low to negligible impact on dust soiling and human health effects from dust.

Constructions works:

- Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Henty Yard clearances, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances would have a medium risk of human health effects from dust and a medium risk from dust soiling. All other enhancement sites would have a low to negligible impact on dust soiling and human health effects from dust.

Track out from heavy duty vehicles (HDVs):

- Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances would have a high risk of human health effects from dust.
- Enhancement sites at Culcairn Yard clearances, Henty Yard clearances, and Pearson Street bridge would have medium risk of human health effects from dust.
- Enhancement sites at Albury Yard clearances, Albury Station pedestrian bridge, Riverina Highway bridge, Wagga Wagga Yard clearances, Junee Yard clearances, Olympic Highway underbridge, and Junee to Illabo clearances would have medium risk of dust soiling.
- All other enhancement sites would have a low to negligible impact on dust soiling and human health effects.

For enhancement sites where no sensitive receptors are located within 350m of the proposal site boundary, haulage routes where no receptors within 50m of haulage roads up to 500m of the access points, and where specific activities are not covered in sections 5.1.5.1 to 5.1.5.4, appropriate management measures would be put in place to ensure dust emissions are minimised.

Gaseous and odour emissions generated during the construction phase would be minimised with mitigation measures in place and air quality impacts would not be significant.

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## 8.2 OPERATION

During operations, particulate matter (of varying size fractions) and combustion emissions (e.g. NO<sub>2</sub>, CO, SO<sub>2</sub>, VOCs and SVOCs) would be generated. Air quality impacts of potential emissions from the operation phase and during train idling were assessed qualitatively by comparing train movements for rail projects in NSW. The projects included:

- Northern Sydney Freight Corridor – Strathfield Rail Underpass (NSFC) Project (normal operations)
- Botany Rail Duplication (BRD) Project (normal operations and train idling)
- Narramine to Narrabri (N2N) Project (train idling)
- North Star to NSW/Queensland Border (NS2B) Project (train idling).

Train movements projected for the proposal are lower than that for two of the rail projects discussed in section 5.2 and similar to that of the N2N Project. Potential impacts associated with the operation of the proposal are expected to be lower or of similar magnitude than that of the reference projects. Air dispersion modelling conducted for both the NSFC Project and the BRD Project demonstrated compliance with the relevant IAC for all assessed pollutants. Potential air quality impacts from idling trains at Junee are expected to be of similar magnitude to the predicted concentrations for the N2NB Project. All pollutants modelled were below their respective impact assessment criteria. It is expected that ground level pollutant concentrations from idling train emissions at Junee (Olympic Park) would also be below their IACs.

The proposal is projected to increase the average number of freight train movements between Albury and Illabo from a current average of up 12 per day in 2021 to 18 per day in 2025, further increasing to about 20 per day in 2040. This may cause an increase in combustion emissions from the diesel freight trains. However, the future train movements are lower or similar to those for the NSFC and BRD Projects. Air quality impacts from train movements along the proposal alignment in 2025 and 2040 would not exceed the relevant IAC pollutant criteria.

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## 8.3 CONCLUSIONS

In summary, air quality impacts from the operation of the proposal are expected to be low at the nearest sensitive receptors to the proposal. Proposed mitigation and management measures implemented during construction of the proposal would ensure impacts on the receiving environment are minimised. Emissions from diesel locomotives during operation would be managed air through conditions specified in the environment protection licence and through diesel fuel standards, locomotive maintenance, and emissions testing.

## 9 REFERENCES

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# TECHNICAL PAPER

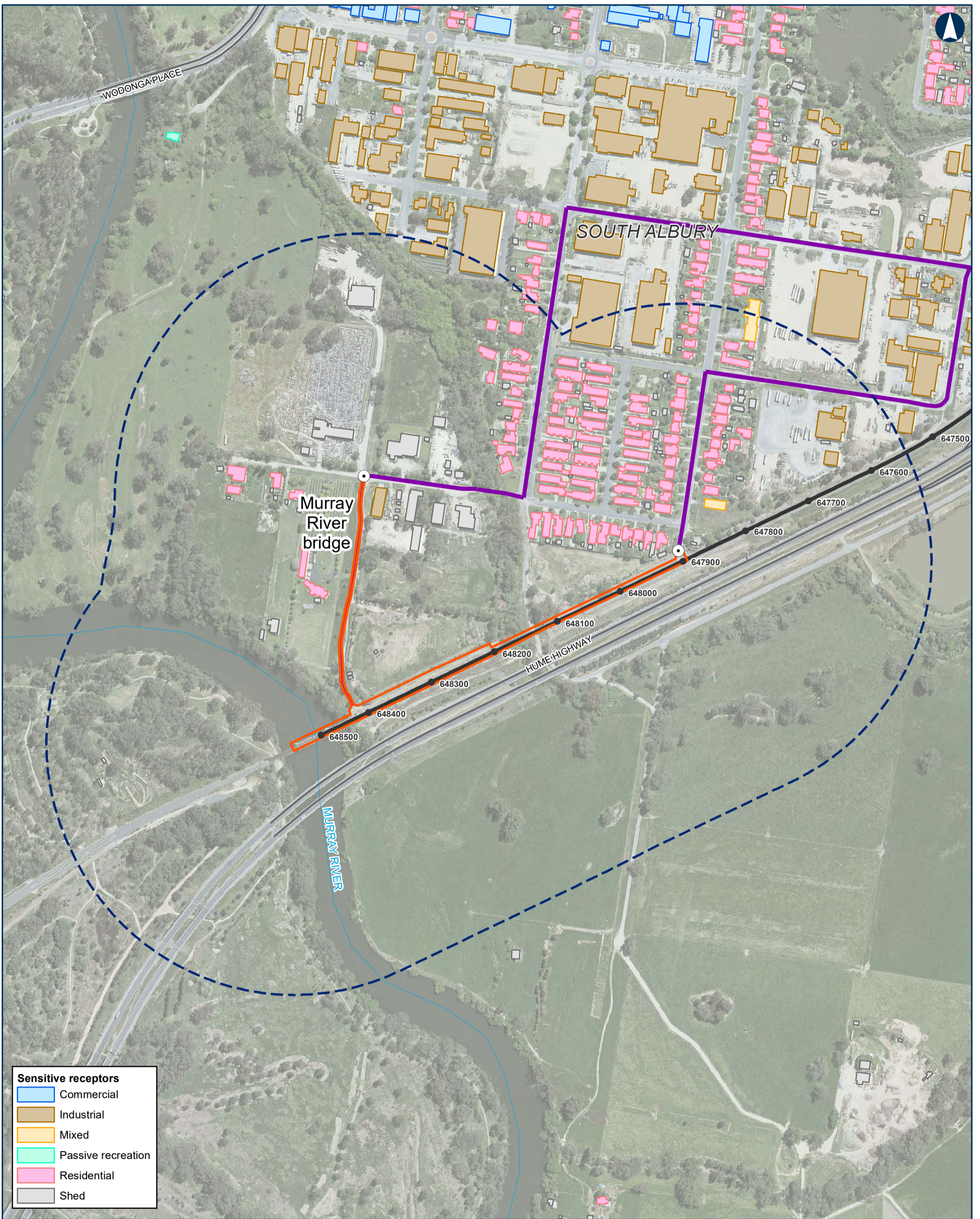
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Air quality

## Appendix A Sensitive receptor figures

ALBURY TO ILLABO ENVIRONMENTAL IMPACT STATEMENT





**Albury to Illabo**

**Appendix A - Sensitive receptors**

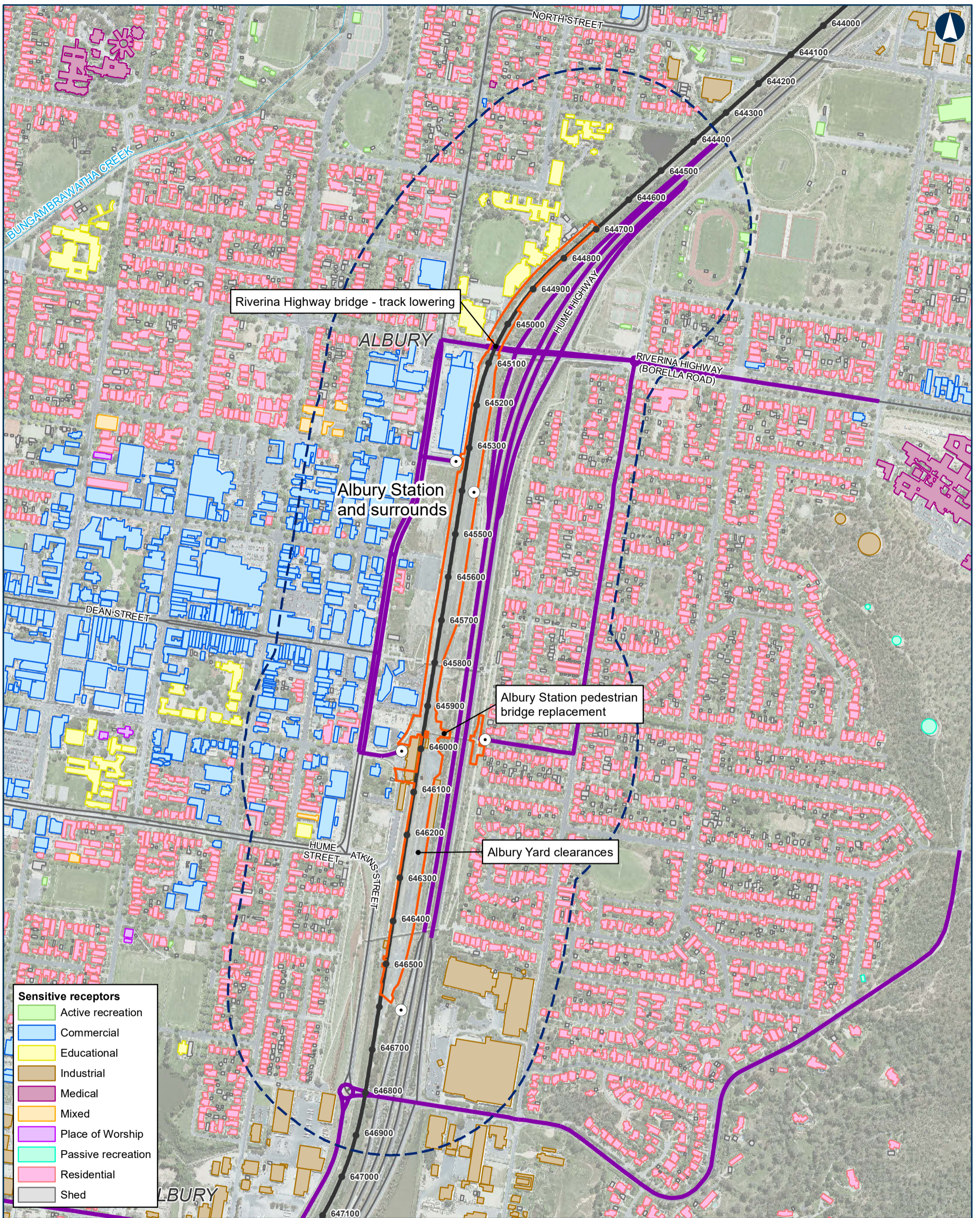
MAP 1 OF 17

0 100 200 m  
 Coordinate System: GDA 1994 MGA Zone 55  
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 Author: WSP Scale: 1:5,000  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Construction site access point
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Haulage route



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



**Albury to Illabo**

**Appendix A - Sensitive receptors**

MAP 2 OF 17

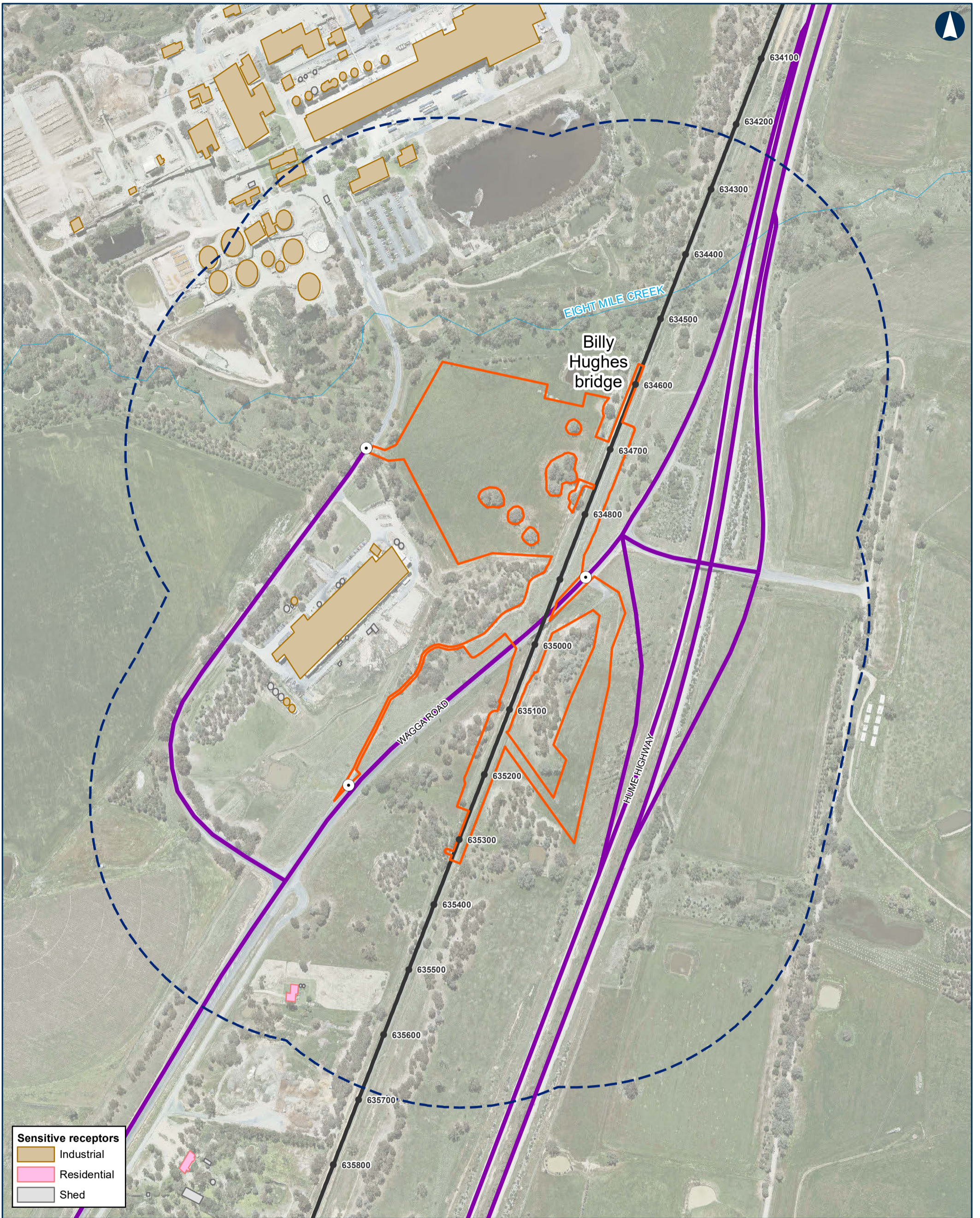
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 Author: WSP Scale: 1:8,000  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
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- Existing railway
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**Albury to Illabo**

**Appendix A - Sensitive receptors**

0 100 200 m

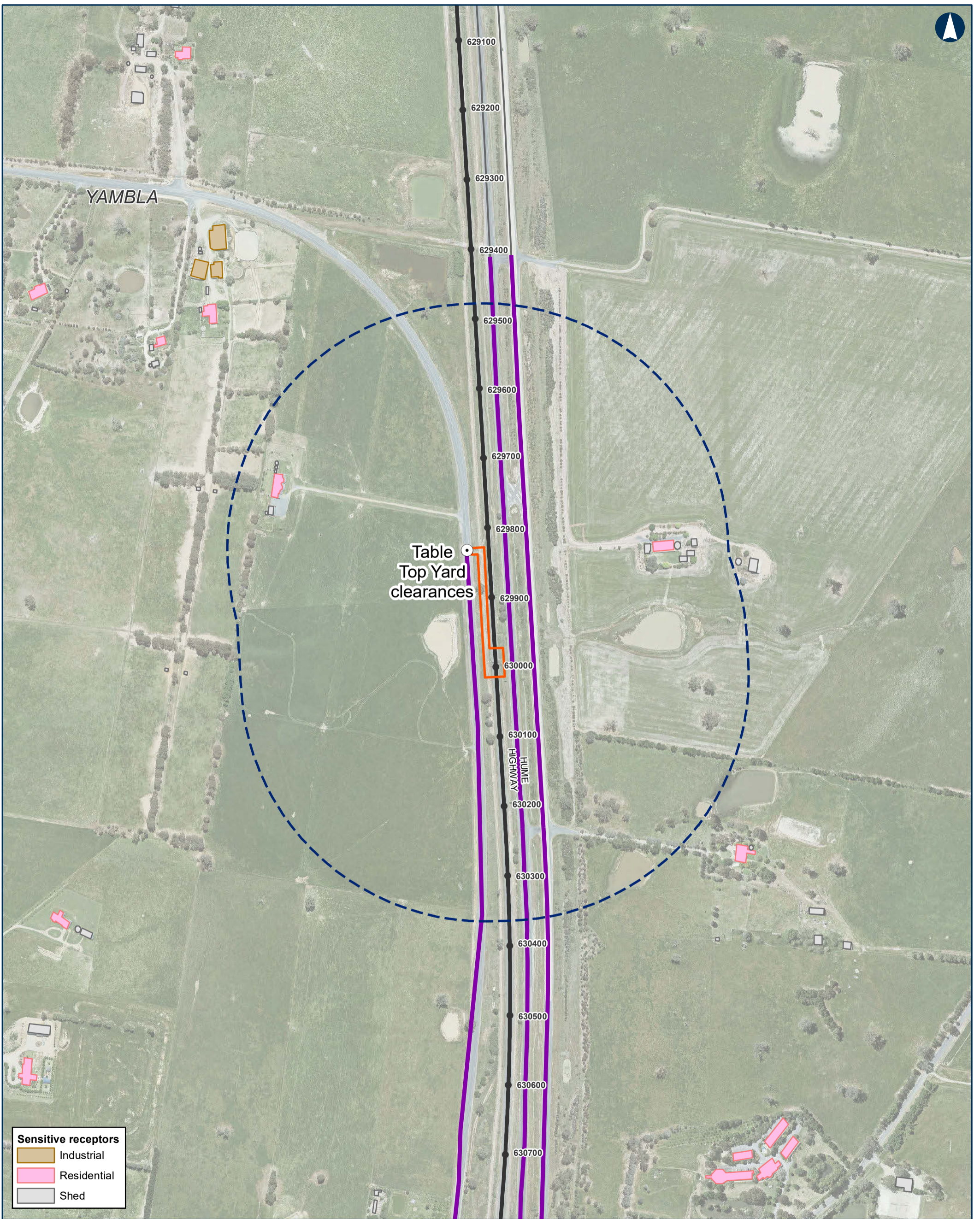
Coordinate System: GDA 1994 MGA Zone 55

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Date: 17/06/2022 Paper: A3  
 Author: WSP Scale: 1:5,000  
 Data Sources: ARTC, NSWSS, DPIE



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



**Albury to Illabo**

**Appendix A - Sensitive receptors**

MAP 4 OF 17

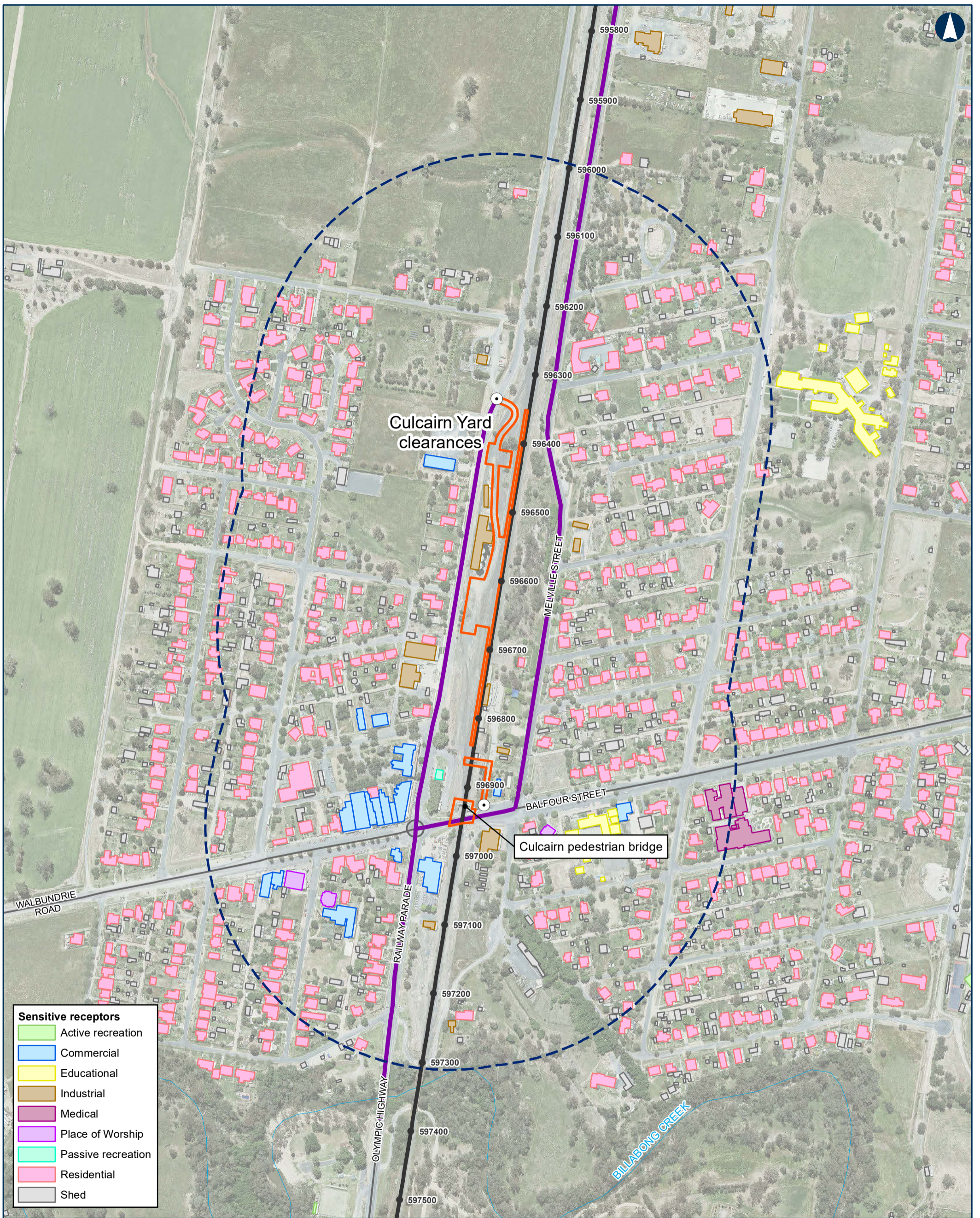
0 100 200 m  
 Coordinate System: GDA 1994 MGA Zone 55  
 ARTC makes no representation or warranty and assumes no duty of care or other responsibility to any party as to the completeness, accuracy or suitability of the information contained in this GIS map. The GIS map has been prepared from material provided to ARTC by an external source and ARTC has not taken any steps to verify the completeness, accuracy or suitability of that material. ARTC will not be responsible for any loss or damage suffered as a result of any person whatsoever placing reliance upon the information contained within this GIS map.

Date: 17/06/2022 Paper: A3  
 Author: WSP Scale: 1:5,000  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Construction site access point
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Haulage route



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**Sensitive receptors**

Green	Active recreation
Blue	Commercial
Yellow	Educational
Brown	Industrial
Purple	Medical
Pink	Place of Worship
Light Green	Passive recreation
Pink	Residential
Grey	Shed

**Albury to Illabo**

**Appendix A - Sensitive receptors**

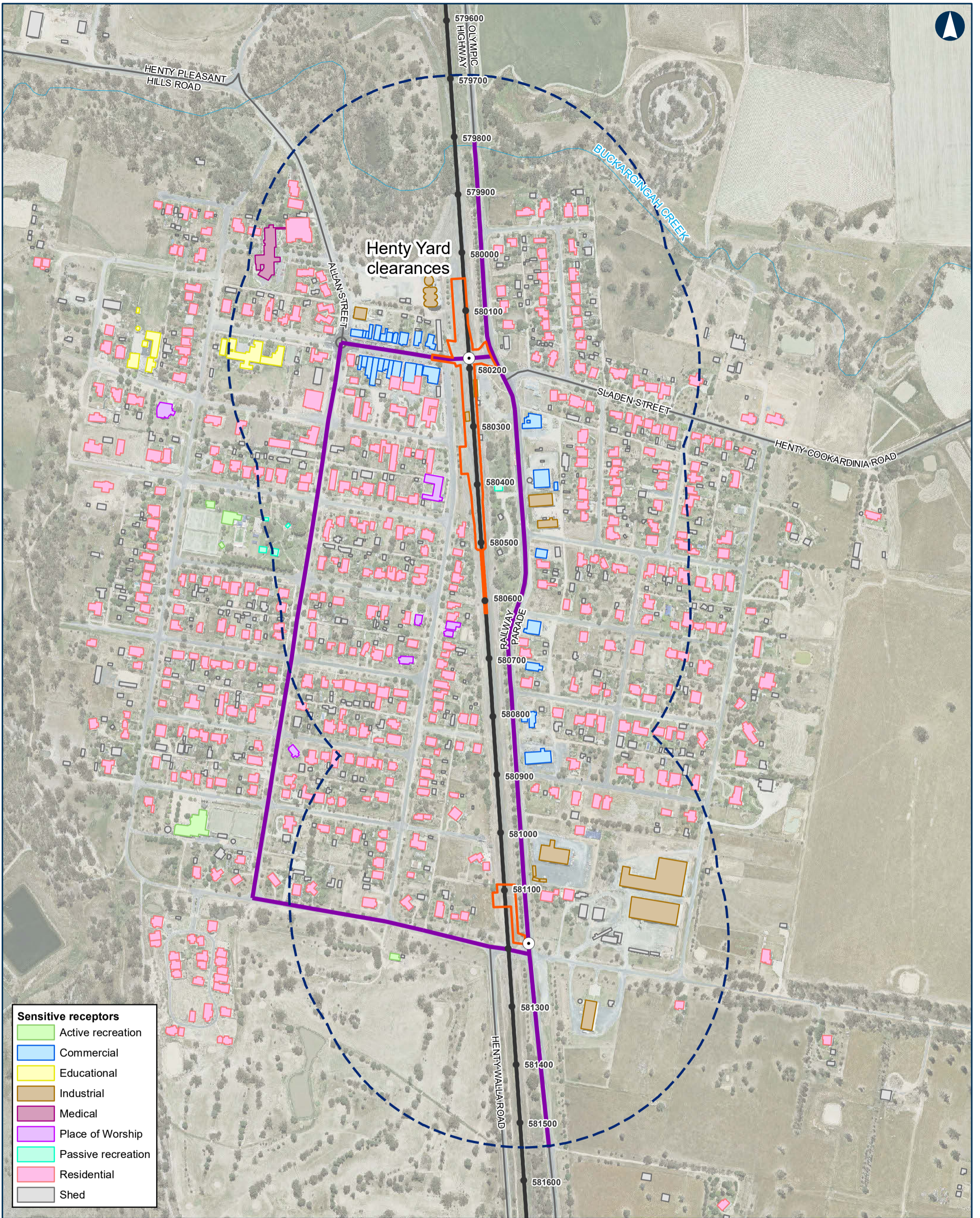
MAP 5 OF 17

0 100 200 m  
 Coordinate System: GDA 1994 MGA Zone 55  
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 Date: 17/06/2022 Paper: A3  
 Author: WSP Scale: 1:5,000  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Construction site access point
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Haulage route



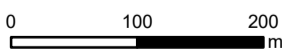
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**Albury to Illabo**

**Appendix A - Sensitive receptors**

MAP 6 OF 17



Coordinate System: GDA 1994 MGA Zone 55

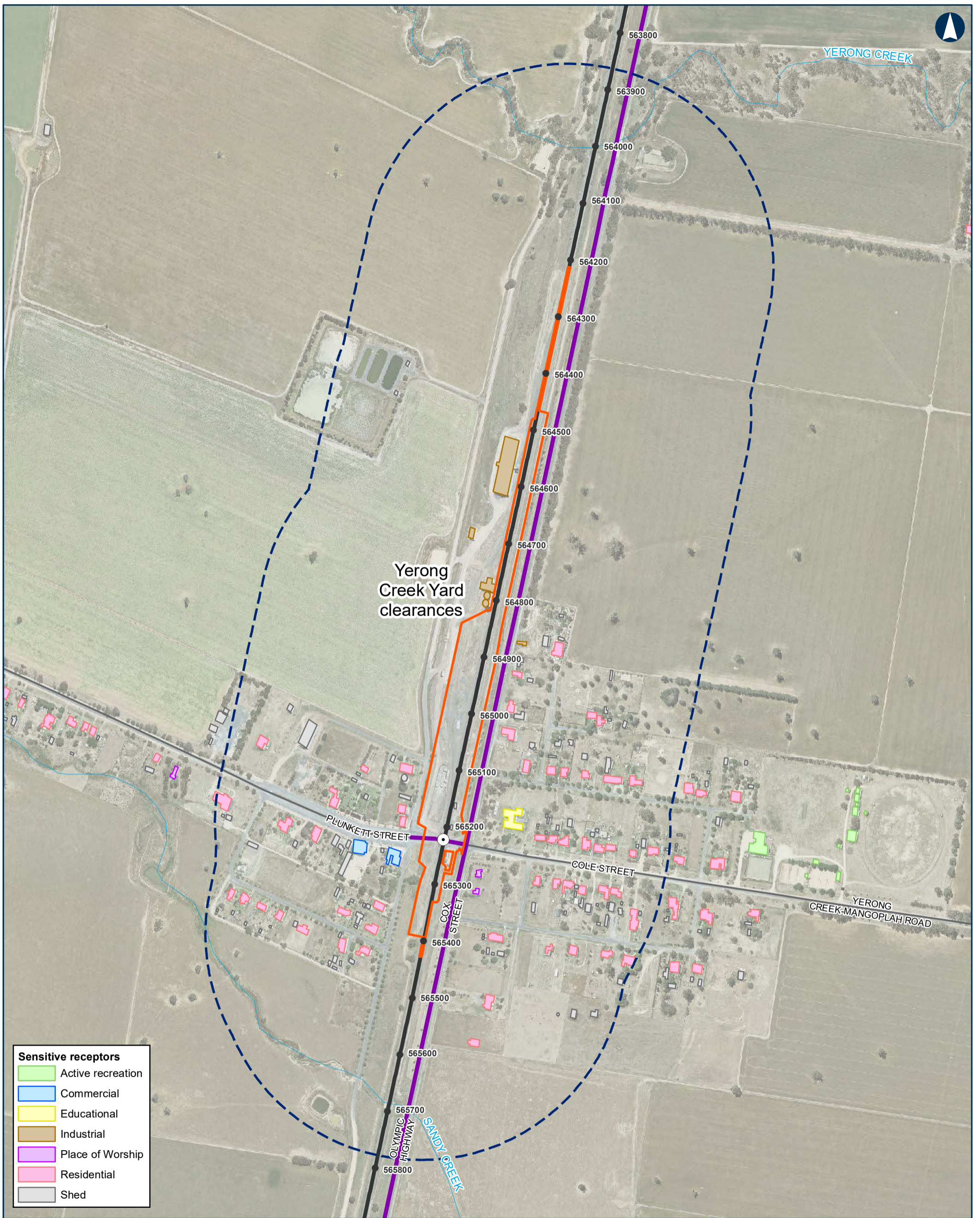
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Date: 17/06/2022 Paper: A3  
 Author: WSP Scale: 1:6,000  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Construction site access point
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Haulage route



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**Sensitive receptors**

Active recreation
Commercial
Educational
Industrial
Place of Worship
Residential
Shed

**Albury to Illabo**

**Appendix A - Sensitive receptors**

MAP 7 OF 17

0 100 200  
m

Coordinate System: GDA 1994 MGA Zone 55

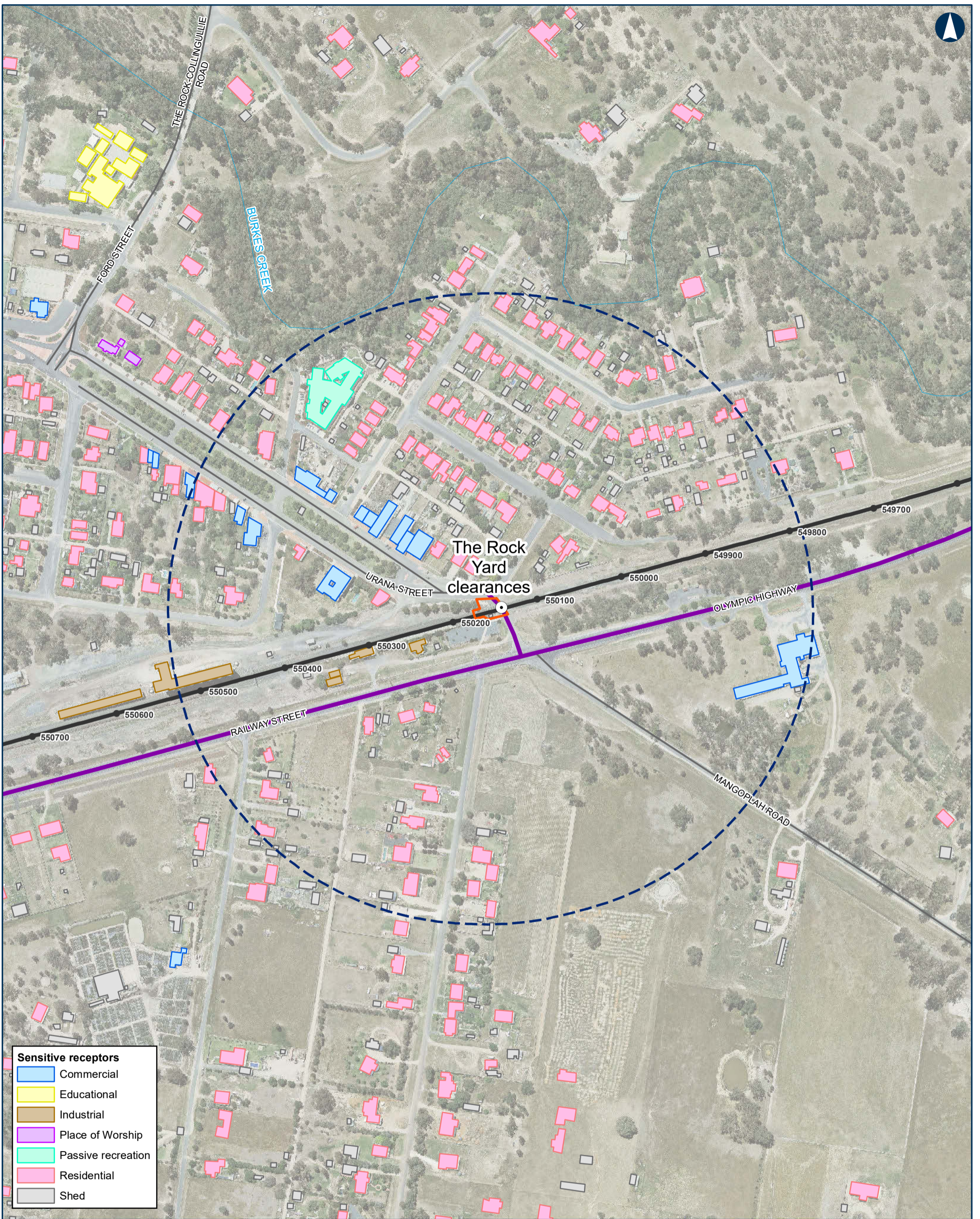
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Date: 17/06/2022 Paper: A3  
Author: WSP Scale: 1:6,000  
Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Construction site access point
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Haulage route



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**Sensitive receptors**

	Commercial
	Educational
	Industrial
	Place of Worship
	Passive recreation
	Residential
	Shed

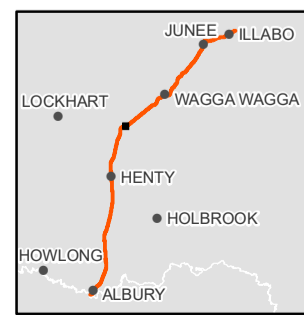
**Albury to Illabo**

**Appendix A - Sensitive receptors**

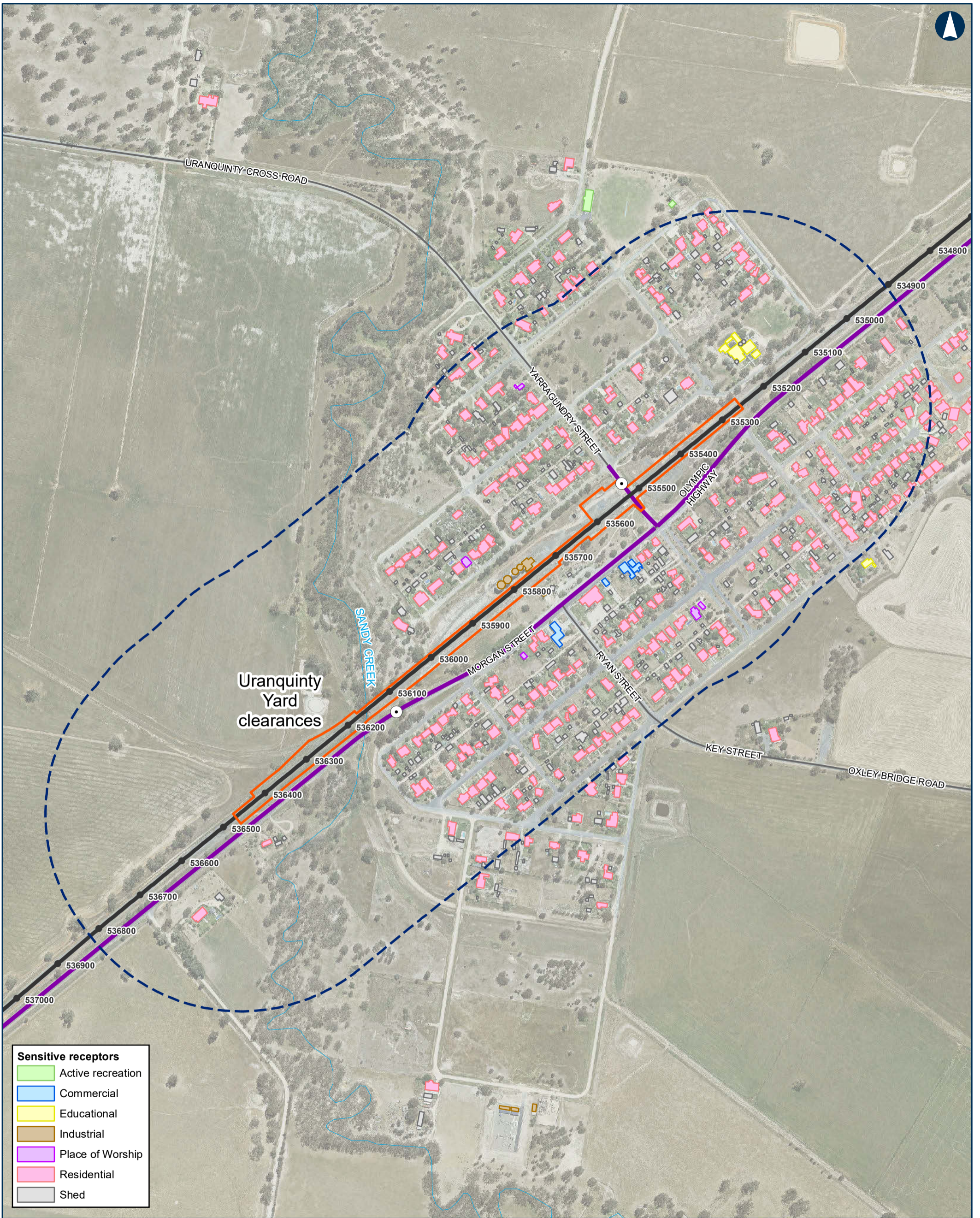
MAP 8 OF 17

0 100 200 m  
 Coordinate System: GDA 1994 MGA Zone 55  
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 Date: 17/06/2022 Paper: A3  
 Author: WSP Scale: 1:4,000  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Proposal site
- Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Construction site access point
- Haulage route



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**Sensitive receptors**

Active recreation	Green
Commercial	Blue
Educational	Yellow
Industrial	Orange
Place of Worship	Purple
Residential	Pink
Shed	Grey

**Albury to Illabo**

**Appendix A - Sensitive receptors**

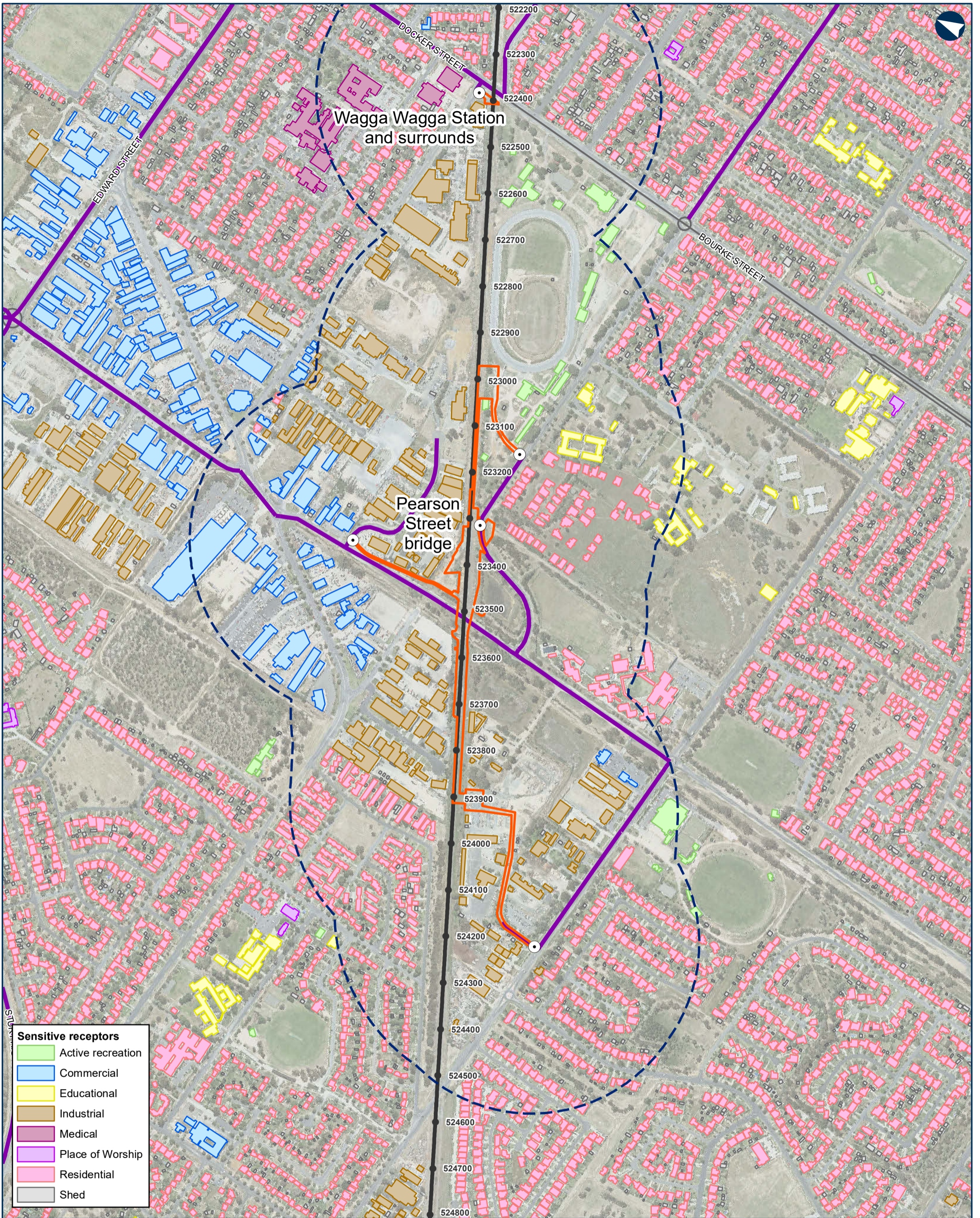
MAP 9 OF 17

0 100 200 m  
 Coordinate System: GDA 1994 MGA Zone 55  
 ARTC makes no representation or warranty and assumes no duty of care or other responsibility to any party as to the completeness, accuracy or suitability of the information contained in this GIS map. The GIS map has been prepared from material provided to ARTC by an external source and ARTC has not taken any steps to verify the completeness, accuracy or suitability of that material. ARTC will not be responsible for any loss or damage suffered as a result of any person whatsoever placing reliance upon the information contained within this GIS map.  
 Date: 17/06/2022 Paper: A3  
 Author: WSP Scale: 1:6,500  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Construction site access point
- Haulage route



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**Sensitive receptors**

Green	Active recreation
Light Blue	Commercial
Yellow	Educational
Orange	Industrial
Purple	Medical
Pink	Place of Worship
Red	Residential
Grey	Shed

**Albury to Illabo**

**Appendix A - Sensitive receptors**

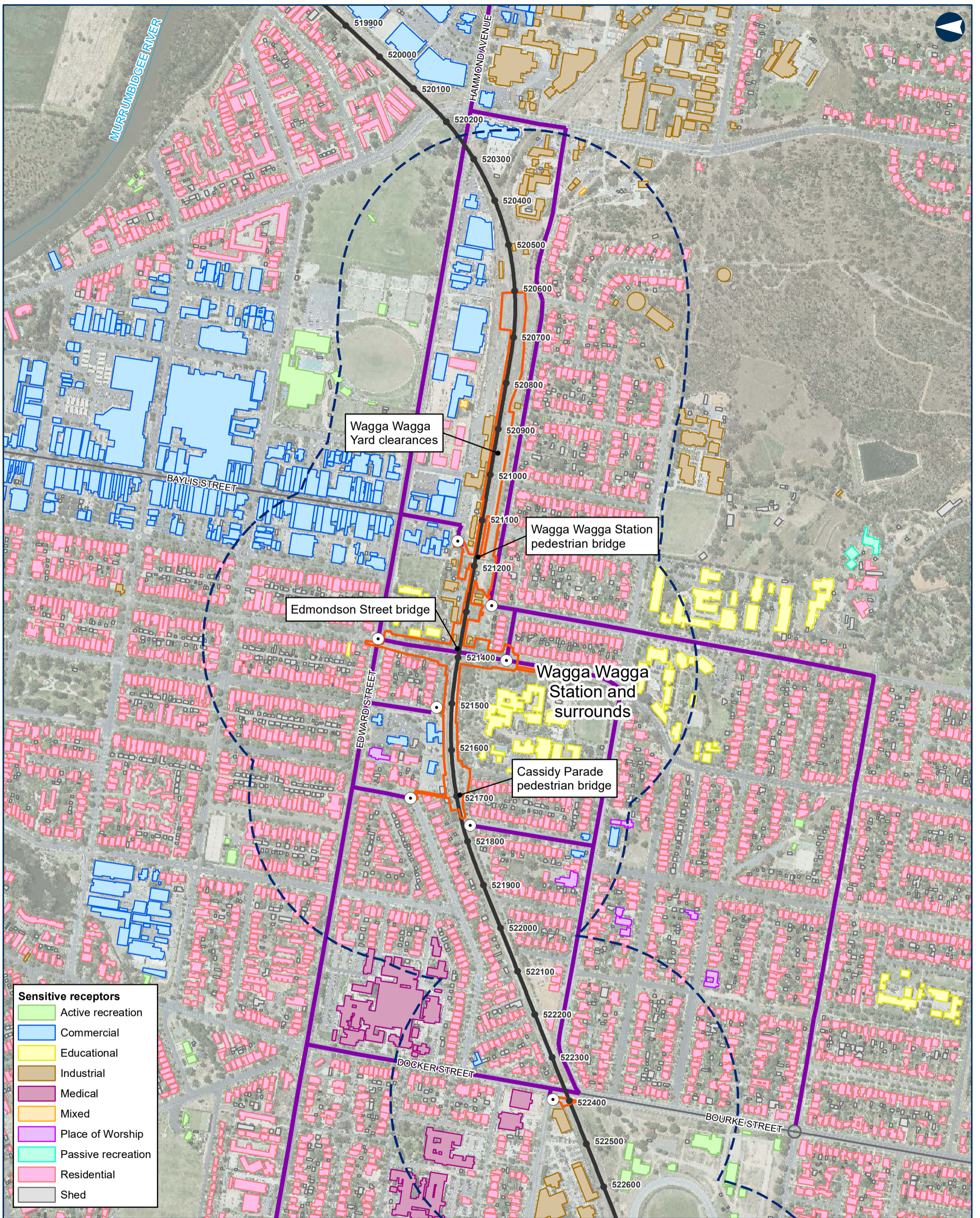
MAP 10 OF 17

0 100 200 m  
 Coordinate System: GDA 1994 MGA Zone 55  
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 Date: 17/06/2022 Paper: A3  
 Author: WSP Scale: 1:7,500  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Construction site access point
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Haulage route



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**Albury to Illabo**

**Appendix A - Sensitive receptors**

0 100 200  
m

Coordinate System: GDA 1994 MGA Zone 55

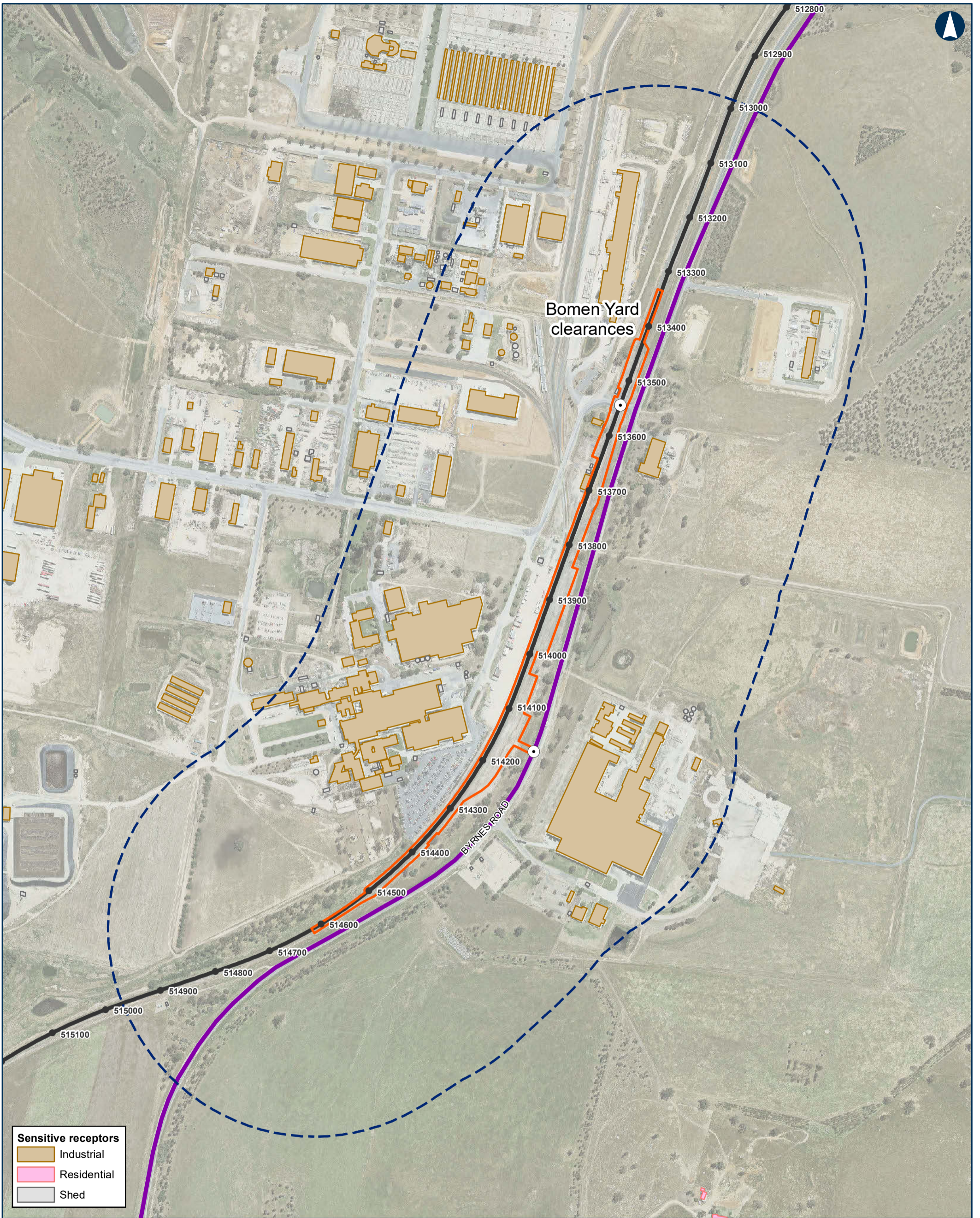
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Date: 17/06/2022 Paper: A3  
Author: WSP Scale: 1:7,500  
Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Construction site access point
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Haulage route



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**Sensitive receptors**

	Industrial
	Residential
	Shed

**Albury to Illabo**

**Appendix A - Sensitive receptors**

MAP 12 OF 17

0 100 200 m  
 Coordinate System: GDA 1994 MGA Zone 55  
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 Date: 17/06/2022 Paper: A3  
 Author: WSP Scale: 1:6,000  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Construction site access point
- Proposal site
- Within 350m of proposal site
- Existing railway
- Main road
- Haulage route



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**Sensitive receptors**

	Industrial
	Residential
	Shed

**Albury to Illabo**

**Appendix A - Sensitive receptors**

MAP 13 OF 17

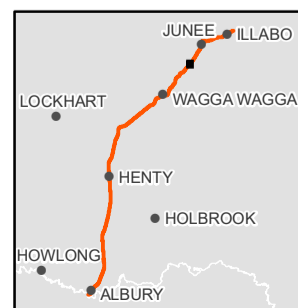
0 100 200  
m

Coordinate System: GDA 1994 MGA Zone 55

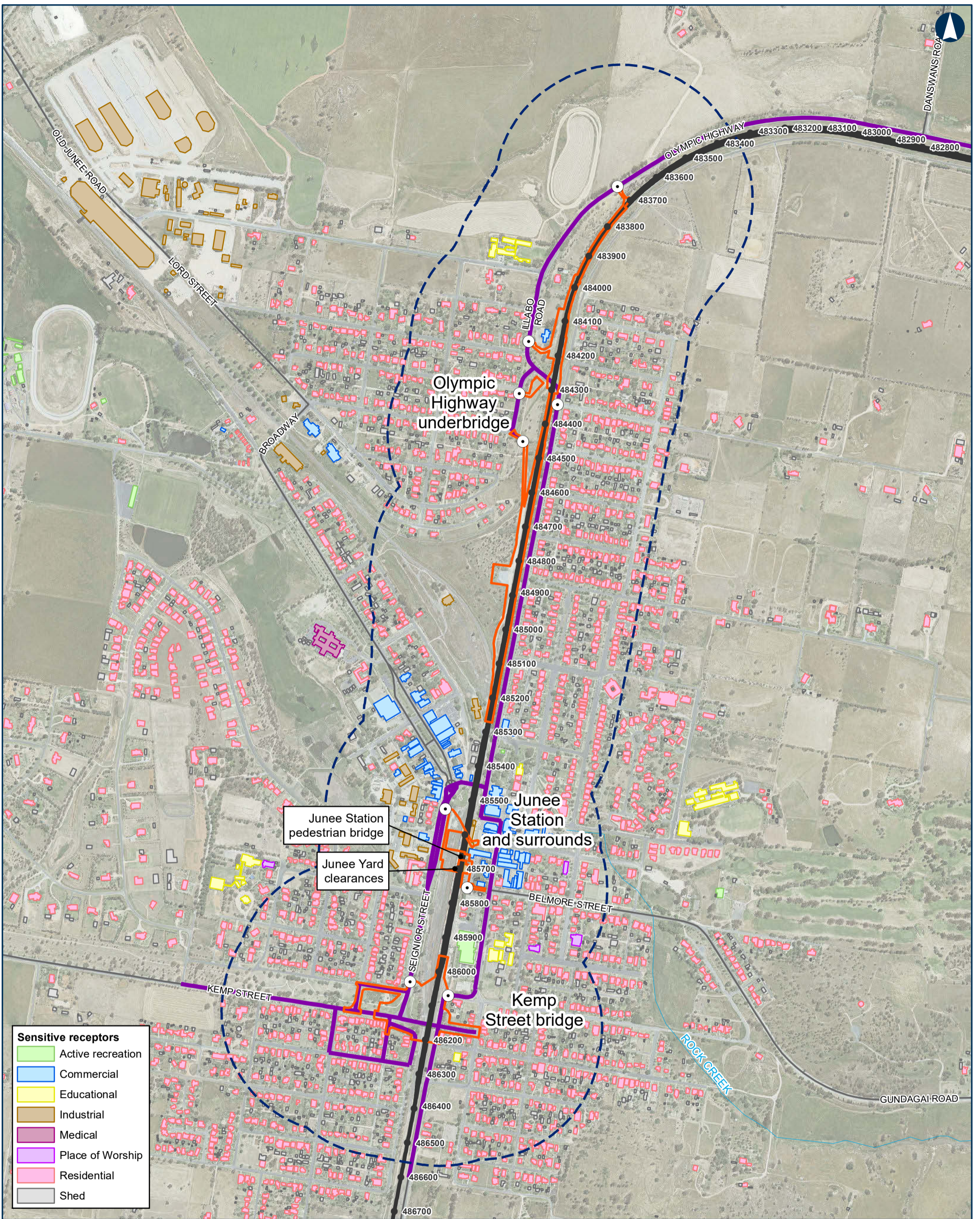
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Date: 17/06/2022 Paper: A3  
Author: WSP Scale: 1:6,000  
Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Proposal site
- Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Construction site access point
- Haulage route



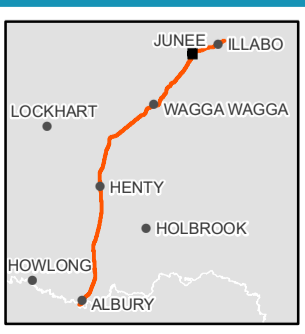
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Albury to Illabo Appendix A - Sensitive receptors MAP 14 OF 17

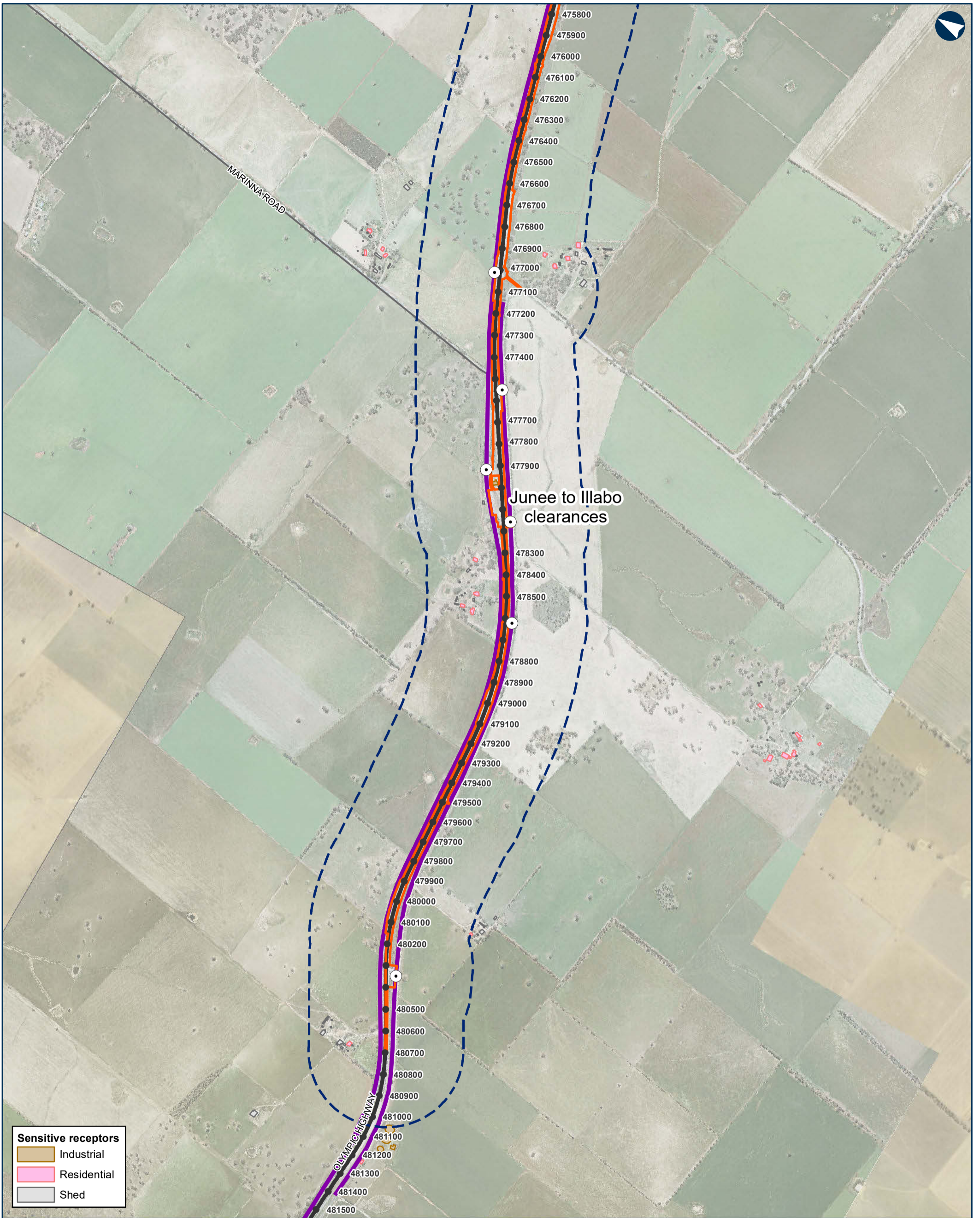
0 100 200 m  
 Coordinate System: GDA 1994 MGA Zone 55  
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 Date: 17/06/2022 Paper: A3  
 Author: WSP Scale: 1:10,000  
 Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Construction site access point
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Haulage route



**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**

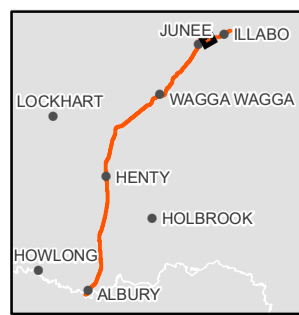
**Appendix A - Sensitive receptors**

0 100 200  
m

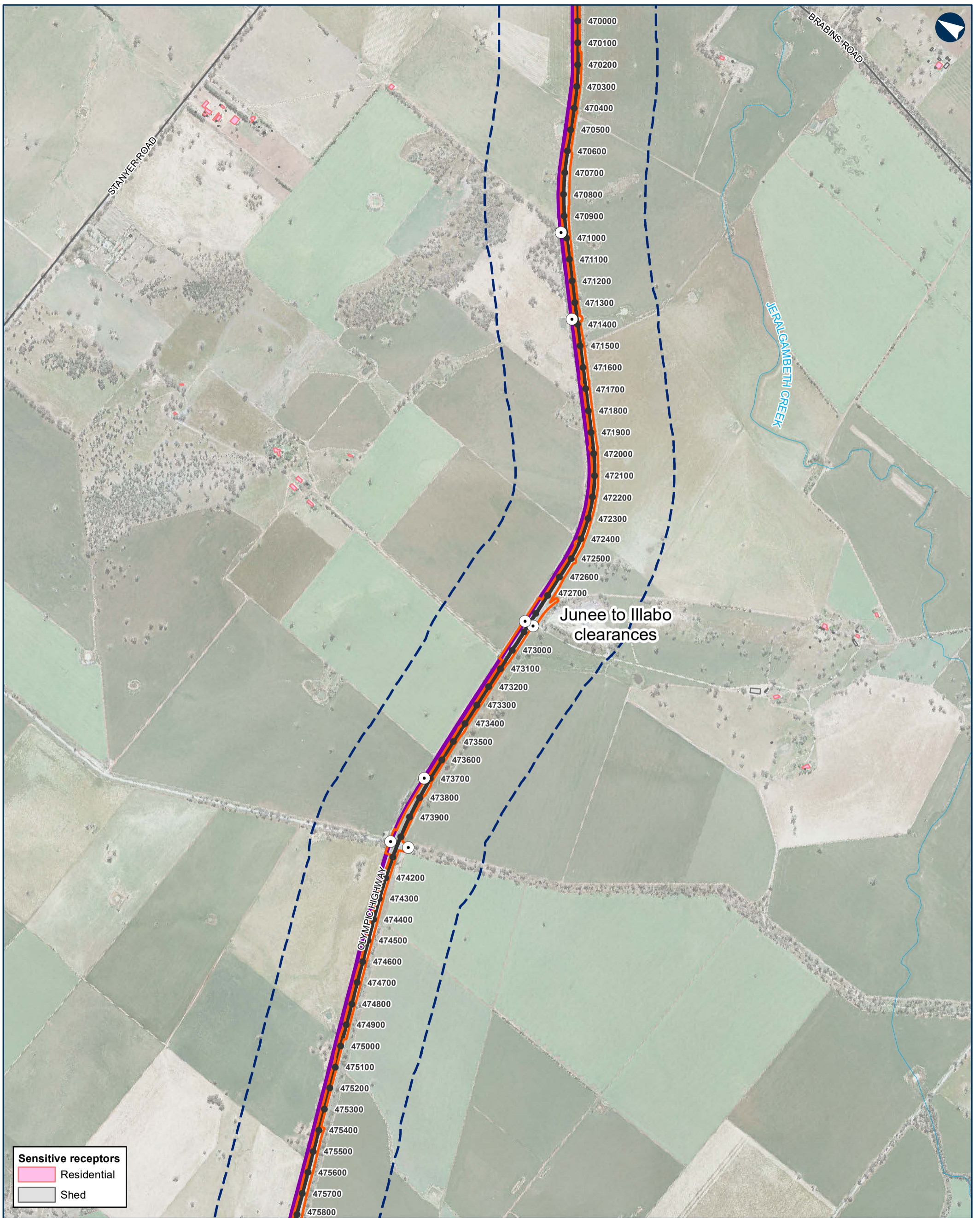
Coordinate System: GDA 1994 MGA Zone 55

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Date: 17/06/2022      Paper: A3  
Author: WSP            Scale: 1:16,000  
Data Sources: ARTC, NSWSS, DPIE



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**Albury to Illabo**

**Appendix A - Sensitive receptors**

0 100 200  
m

Coordinate System: GDA 1994 MGA Zone 55

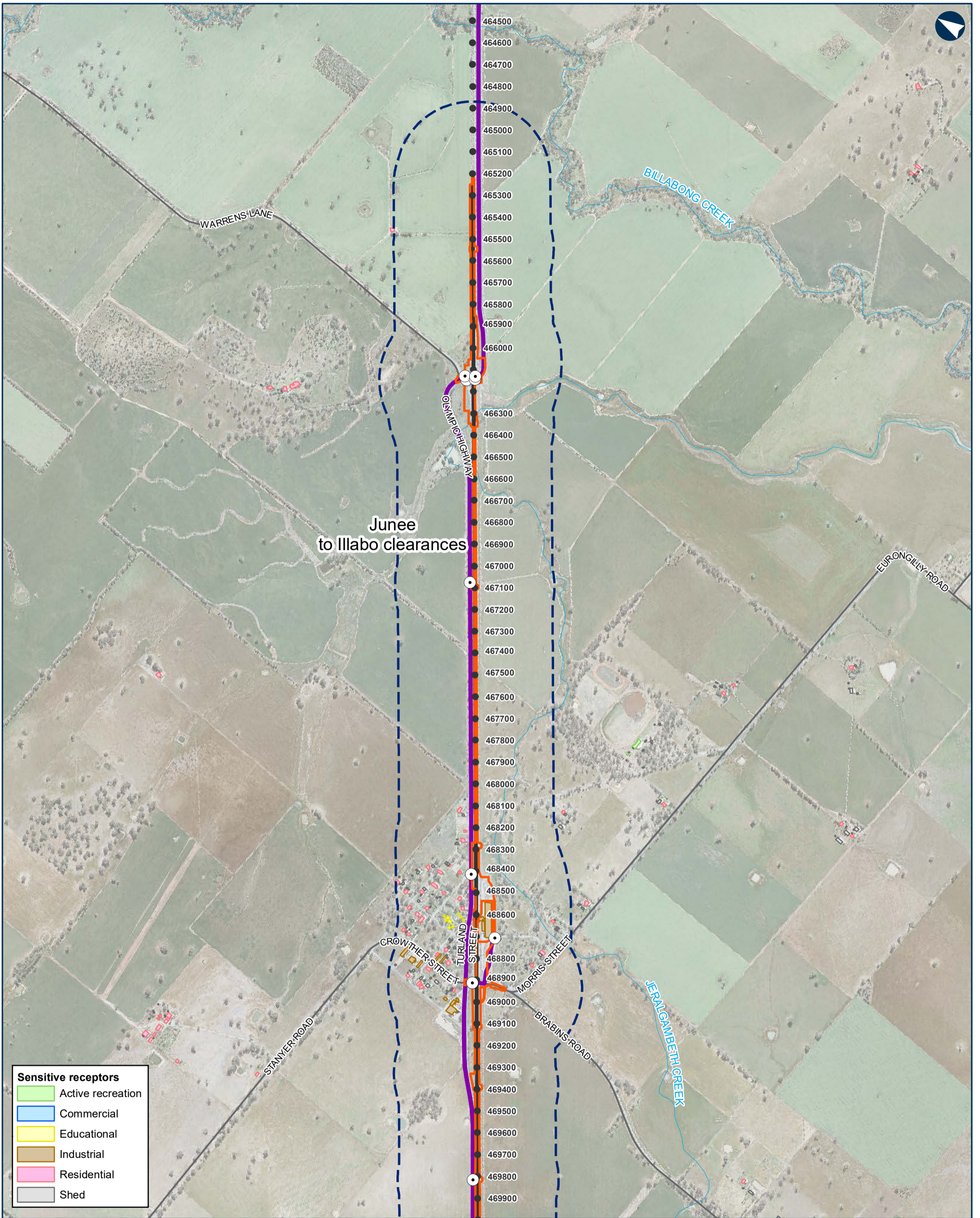
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Date: 17/06/2022      Paper: A3  
Author: WSP            Scale: 1:16,000  
Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- ▭ Proposal site
- ▭ Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Construction site access point
- Haulage route



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



Junee to Illabo clearances

Sensitive receptors	
<span style="color: green;">■</span>	Active recreation
<span style="color: blue;">■</span>	Commercial
<span style="color: yellow;">■</span>	Educational
<span style="color: brown;">■</span>	Industrial
<span style="color: pink;">■</span>	Residential
<span style="color: grey;">■</span>	Shed

**Albury to Illabo**

**Appendix A - Sensitive receptors**

MAP 17 OF 17

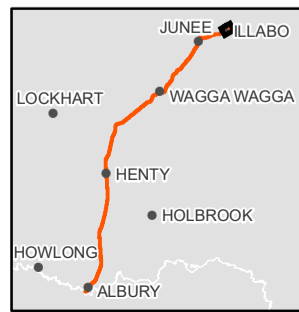
0 100 200  
m

Coordinate System: GDA 1994 MGA Zone 55

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Author: WSP            Scale: 1:16,000  
Data Sources: ARTC, NSWSS, DPIE

- 100m chainages
- Proposal site
- Within 350m of proposal site
- Existing railway
- Main road
- Watercourse
- Construction site access point
- Haulage route



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