CHAPTER 24

Air quality

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

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24. Air quality

This chapter provides the air quality impact assessment undertaken for the Inland Rail—Illabo to Stockinbingal (I2S) project (the proposal). It describes the existing environment, assesses the impacts from construction and operation of the proposal, and provides recommended mitigation and management measures. The full assessment is in Technical Paper 15: Air quality (Technical Paper 15).

24.1 Overview

Potential air quality impacts have been avoided by locating the alignment to avoid being close to residential receivers, where practicable, and minimising the extent of earthworks (a primary source of dust emissions) through avoiding areas of steep topography and minimising cuts and embankments. No specific issues relating to air quality were raised during stakeholder and community consultation.

Most of the proposal traverses a rural area with only five permanent sensitive receivers located within 100 metres (m) of the proposal, all of which are located in Stockinbingal. No other permanent sensitive receivers are located within 100 m of other parts of the proposal.

During construction, the key potential impacts are:

- The generation of dust from construction works and the movement of equipment and machinery.
- The generation of particulate matter (PM) from stockpiles and exposed surfaces under certain meteorological conditions, e.g. during dry and high winds.

Proposed measures to minimise these impacts on surrounding sensitive receivers include:

- implementing road watering and/or other stabilising approaches as required
- not undertaking blasting if prevailing wind conditions are likely to transport dust emissions towards the nearest sensitive receivers
- implementing specific measures for spoil handling, stockpile management, haulage dust suppression and dust monitoring under an air quality management sub-plan as part of the Construction Environment Management Plan (CEMP).

During operation, the key potential impacts are from diesel-operated freight trains using the corridor and generating pollutants, including particulate matter and other gaseous pollutants, such as nitrogen dioxide (NO_2) and sulfur dioxide (SO_2). The level of train activity for the proposal would be lower than several reference rail projects in NSW and the proposal would traverse a rural area (with better air quality) compared to the urban area of the reference rail projects. As these reference rail projects demonstrated compliance with relevant impact assessment criteria (IAC) for all assessed air pollutants, air quality impacts from the proposal are expected to be below IAC; therefore, air quality impacts from pollutants at the nearest sensitive receivers, including at Stockinbingal, are not anticipated to be of significance.

To address any impacts, the proposal would be managed in accordance with the air quality management requirements specified in the rollingstock operator environment protection licences (EPLs) and through diesel fuel standards, locomotive maintenance and emissions standards.

24.2 Approach

A summary of the approach to the assessments is in this section, including the legislation, guidelines and policies driving the approach and the methodology used to undertake the assessments. A more detailed description of the approach and methodology is in Technical Paper 15.

24.2.1 Legislative and policy context to the assessment

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.

The *Protection of the Environment Operations Act 1997* (NSW) (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 specifically refer to air pollution.

Under Schedule 1 of the POEO Act, Scheduled activities, Part 1 Premises-based activities, Clause 33, 'railway infrastructure construction', is taken to be an activity for which a licence is required. Clause 33A refers specifically to the operations of railway infrastructure, including operations or onsite repair, maintenance or replacement of existing railway infrastructure, which is declared to be a scheduled activity for a length of track greater than 30 kilometres (km) and operated by the same person.

The Protection of Environment Operations (Clean Air) Regulation 2021 (POEO (Clean Air) Regulation) (NSW) provides measures for the control of air emissions from sources including industry, motor vehicles, fuels, wood heaters and open burning. Under Schedule 4, concentration standards for specific pollutants are prescribed for scheduled activities for general activities and plant. The POEO Act, together with the POEO (Clean Air) Regulation, provides a comprehensive framework for regulating activities to minimise their impact on air quality.

Environment protection licences (EPLs) for licensed railway systems activities currently include conditions that all plant and equipment used on licensed premises must be operated properly and efficiently. Further information on the EPL requirements relating to air quality impacts is provided in Chapter 3: Statutory context.

Key pollutants commonly found in ambient air are nationally regulated under the *National Environment Protection (Ambient Air Quality) Measure 2021* (NEPM, 2021) (Air NEPM) and *National Environment Protection (Air Toxics) Measure 2011* (NEPM, 2011) (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.

24.2.2 Secretary's Environmental Assessment Requirements

There are no specific Secretary's Environmental Assessment Requirements (SEARs) relating to air quality; however, a qualitative assessment has been undertaken as follows.

24.2.3 Methodology

24.2.3.1 Study area

For construction, the study area for the assessment is the proposal site, which includes the proposal and construction footprint, as described in Chapter 8: Proposal description—construction and a 350 m wide buffer around the proposal site to capture the potential for air quality impacts on nearby sensitive receivers. The study area also includes 50 m of the routes used by construction vehicles on public roads up to 500 m from the site access points.

For operation, the study area considers potential air quality impacts within 100 m of the rail track. Beyond 100 m from the track, emissions from freight trains are not expected to impact on the receiving environment.

24.2.3.2 Key tasks

The air quality assessment involved:

- reviewing the legislative framework for the proposal as it relates to air quality and proposing assessment criteria
- identifying the existing neighbouring land uses and sensitive receiver locations
- establishing appropriate background concentrations for specific pollutants
- identifying the main sources of air emissions during construction and operation
- characterising the local air quality using publicly available information e.g. ambient air monitoring data collected and managed by the Environment Protection Authority (EPA), which sits within the Environment, Energy and Science Group within the NSW Department of Planning and Environment
- characterising the local meteorology for the proposal site using publicly available information e.g. data collected at the Bureau of Meteorology (BoM)
- conducting a detailed risk assessment of potential air quality impacts during construction
- conducting a qualitative review of potential air quality impacts during operation

- recommending management and mitigation measures to minimise emissions to air for the construction and operational phases.

Sensitive receivers

The *Approved Methods for Modelling and Assessment of Air Quality in NSW* (Approved Methods) (NSW EPA, 2016) describes a sensitive receiver 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 receiver*'.

The level of sensitivity for each sensitive receiver was assessed using the 'dust soiling' and 'human health impact' matrix developed by the *Guidance on the assessment of dust from demolition and construction* published by the Institute of Air Quality Management (IAQM) in 2014 (IAQM guidance).

There is the potential for dust to be deposited onto the foliage of vegetation in proximity to the proposal site activities. However, deposition on dust foliage is likely to be highly localised, intermittent and temporary and not considered to impact significantly on the proposal. Consequently, ecological receivers were not considered in the dust risk assessment.

Construction of the proposal

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

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

Due to the nature of the proposal, the proposal site was divided into separate sites based on the presence of sensitive receivers. Where a sensitive receiver is located within 350 m of the proposal site, the whole segment within a 350m range of the receiver was considered to be a separate construction site. Burley Griffin Way realignment construction is conservatively considered as one site, although not all receivers would be affected equally by the construction works.

Haulage routes were assessed individually based on the presence of sensitive receivers and distance to nearest access point. Where a haulage route was located within 500 m of an access point and had sensitive receivers within 50 m of the route, the whole route segment within a 50 m range of the receiver and a 500 m radius of an access point was considered a separate route.

Operation of the proposal

Sensitive receivers affected by operational emissions were measured from the edge of the proposal's operational boundary rather than from the edge of the proposal site. This included all sensitive receivers within 100 m of the rail track.

Relevant pollutants

Table 24-1 provides the key pollutants of interest and relevance to the construction and operation stages of the proposal.

TABLE 24-1: KEY POLLUTANTS OF INTEREST

Pollutant	Construction	Operation
Total suspended particulates (TSP)	✓	–
Particulate matter with an equivalent aerodynamic diameter less than 10 micrometres (PM_{10})	✓	✓
Particulate matter with an equivalent aerodynamic diameter less than 2.5 micrometres ($PM_{2.5}$)	✓	✓
Oxides of nitrogen (NO_X) comprising of nitrogen dioxide (NO_2) and nitrogen monoxide (NO)	✓	✓
Carbon monoxide (CO)	✓	✓
Sulphur dioxide (SO_2)	–	✓
Volatile organic compounds (VOCs) e.g. benzene	–	✓
Semi-volatile organic compounds (SVOCs) e.g. polycyclic aromatic hydrocarbons (PAHs) as benzo(a)pyrene equivalents	✓	✓

Construction risk-based assessment

The assessment methodology adopted was:

- conduct a risk-based assessment in accordance with the IAQM guidance for potential dust impacts associated with the proposal construction:
  - Step 1: initial screening to identify the sensitive receivers to be assessed in a detailed risk assessment
  - Step 2: assess the risk of dust impacts. This is done separately for each type activity including earthworks, general construction and trackout activities
    - Step 2A: determine the potential dust emission magnitude
    - Step 2B: determine the sensitivity of the area using the matrices in Table 24-2 and Table 24-3
    - Step 2C: assess the risk by combining the factors in Step 2A and Step 2B using the matrices in Table 24-4 and Table 24-5
  - Step 3: determine the site-specific mitigation
  - Step 4: examine the residual effects and determine whether these are significant
- 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. To minimise the impacts on the environment from the proposal construction activities and implement best practices, the potential emissions from these construction site activities were qualitatively assessed
- qualitatively address gaseous and odour emissions generated during proposal construction
- develop site-specific mitigation measures for construction
- assess the residual construction impacts after the implementation of mitigation measures.

TABLE 24-2: SENSITIVITY OF THE AREA TO DUST SOILING

Receiver sensitivity	Number of receivers	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

Note: As only high and medium receiver sensitivity types are involved in this proposal, the assessment matrices for these two types are outlined in the table.

TABLE 24-3: SENSITIVITY OF THE AREA TO HUMAN HEALTH IMPACTS

Receiver sensitivity[1]	Annual mean PM_{10} concentration[2]	Number of receivers	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m^3	>100	High	High	High	Medium	Low
		10–100	High	High	Medium	Low	Low
		1–10	High	Medium	Low	Low	Low
Medium	>25 µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low

Note:
1. As only high and medium receiver sensitivity types are involved in this proposal, the assessment matrices for these two types are provided in the table.
2. The annual mean PM_{10} concentration ranges was adjusted in accordance with the annual mean Air NEPM standard of 25 micrograms per cubic metre (µg/m^3).

TABLE 24-4: 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 24-5: RISK OF DUST IMPACTS FOR TRACKOUT

	Dust emission magnitude		
Sensitivity of area	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low risk	Negligible
Low	Low risk	Low risk	Negligible

Assessment of construction dust emissions

As part of the detailed risk assessment (discussed in section 24.2.4), the potential dust emission magnitudes for earthworks, general construction and vehicle trackout activities were evaluated in accordance with the IAQM guidance. The IAQM guidance classifies potential 'large', 'medium' or 'small' dust emission magnitude. This assessment was undertaken for construction sites and haulage routes with sensitive receivers located nearby.

The dust emission magnitude from earthworks for each construction site was assessed separately based on the following parameters—site area, soil type, number of heavy-duty vehicles (HDV) and the total material excavated and filled, and the likelihood of blasting occurring. The dust emission magnitude from earthworks was assigned based on the highest category a site can fall into by assessing against each determining parameter.

For general construction, the size of the infrastructure, method of construction, construction materials, and duration of build was assessed for each construction site. Dust emission magnitude for construction activities was assigned based on the highest category a site can fall into by assessing against each determining parameter.

According to the IAQM guidance, trackout is defined as *'the transport of dust and dirt from the construction site onto the public road network. This arises when HDVs leave the construction site with dusty materials which may spoil onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site'*. Factors determining the dust emission magnitude include vehicle size, vehicle speed and vehicle numbers. Dust emission magnitude for trackout was assigned based on the highest category a site can fall into by assessing against each determining factor.

To determine the risk of dust impact for the seven construction sites and three haulage routes, the sensitivity of each surrounding area was assessed. The sensitivity of the surrounding land uses takes account of a number of factors. These are:

- the specific sensitivities of receivers
- the number of receivers and their proximity to the site
- local background PM_{10} concentrations
- site-specific factors that may reduce the risk of wind-blown dust (e.g. trees).

The receiver sensitivity, PM_{10} concentration and distance from the construction site or haulage route was assessed to determine the overall sensitivity of the surrounding area to dust soiling and human health effects.

Operation

Given the low frequency of train movements and rural setting of the proposal, air dispersion modelling for operational emissions was not conducted.

To provide a qualitative assessment of operational emissions, air quality impact assessment reports for five rail projects in NSW were reviewed. The five projects are:

- Northern Sydney Freight Corridor Strathfield Rail Underpass project
- Botany Rail Duplication project
- Narrabri to North Star (N2NS) project
- Narromine to Narrabri (N2N) project
- North Star to NSW/Queensland Border (NS2B) project.

The number of train movements, train speed, distance to sensitive receivers and locality setting for these reference projects were compared with the I2S proposal to benchmark the potential air quality impacts from the operation of the I2S proposal. These reference projects predicted incremental and cumulative concentrations for all monitored pollutants below the relevant NSW impact assessment criteria. If the predicted pollutant concentrations for the operation of the I2S proposal are below those from the reference projects, it can be concluded that the proposal would comply with the relevant NSW impact assessment criteria.

24.2.3.3 Assessment criteria

Pursuant to the POEO Act, the Approved Methods prescribes the statutory methods for modelling and assessing air emission sources in NSW. This document provides impact assessment criteria for a range of pollutants against which emissions from an activity are required to be assessed. The construction and operation impact assessment criteria are provided in Table 24-6.

TABLE 24-6: NSW AIR QUALITY IMPACT ASSESSMENT CRITERIA

Pollutant	Averaging period	Air quality standard	Source[1,2]
TSP	Annual	90µg/m^3	Approved Methods
PM_{10}	24 hours	50µg/m^3	Approved Methods
	Annual	20µg/m^3	
$PM_{2.5}$	24 hours	25µg/m^3 20µg/m^3 (2025)	Approved Methods
	Annual	8µg/m^3 7µg/m^3 (2025)	
CO	15 minutes	100mg/m^3	Approved Methods
	1 hour	30mg/m^3	
	8 hours	10mg/m^3	
NO_2	1 hour	246µg/m^3	Approved Methods
	Annual	62µg/m^3	
SO_2	10 minutes	712µg/m^3	Approved Methods
	1 hour	570µg/m^3	
	24 hours	228µg/m^3	
	Annual	60µg/m^3	
Benzene	1 hour	29µg/m^3	Approved Methods
	Annual	9.7µg/m^3	Air Toxics NEPM
PAHs (as benzo(a)pyrene equivalents	1 hour	0.0004mg/m^3	Approved Methods
	Annual	0.3µg/m^3	Air Toxics NEPM

1. *Approved Methods: Approved Methods for Modelling and Assessment of Air Quality in NSW* (EPA, 2016)
2. *Air Toxics NEPM: National Environment Protection (Air Toxics) Measure* (NEPM, 2011)

24.2.4 Risk identified

The environmental risk assessment for the proposal (summarised in Appendix G) included an assessment of the potential air quality risks. The assessed risk level for the majority of potential risks to air quality was between low and medium. Risks with an assessed level of medium or above include:

- generation of dust during construction (from exposed soil/stockpiles, excavation, and vehicle movements)
- emissions from vehicles or plant during construction
- impacts to local air quality due to a new train operation between Illabo and Stockinbingal.

Section 24.2.3.2 determine the risk of dust impact for seven construction sites and three haulage routes where sensitive receivers were identified within the above distance.

The air quality assessment considered the potential risks identified by the environmental risk assessment, in addition to potential risks and impacts identified in Technical Paper 15, the SEARs and relevant guidelines and policies.

24.2.5 How potential impacts have been avoided/minimised

In general, potential air quality impacts have been avoided by:

- locating the alignment to avoid being close to residential receivers, where practicable
- providing a rail maintenance access road with suitable foundation and gravel layer (if required) within the proposal site (to be used initially as a construction haul route)
- minimising the extent of earthworks (a primary source of dust emissions) through avoiding areas of steep topography and minimising cuts and embankments.

24.3 Existing environment

24.3.1 Sensitive receivers

24.3.1.1 Sensitive receivers in the vicinity of the construction boundary

A total of 108 sensitive receivers were identified within 350 m of the proposal site, 19 of which are also located within 50 m of haulage routes up to 500 m from site access points. The majority of sensitive receivers are located in Stockinbingal. South of Stockinbingal, sensitive receivers are typically present as isolated rural dwellings within open farmland.

Figure 24-1 shows the location of sensitive receivers within proximity to the proposal.

Most receivers located in Stockinbingal are residential dwellings. An educational facility and place of worship are also located in Stockinbingal, along with several receivers used for commercial and active recreation purposes. The minimum distance to the nearest residential property has been identified as a receiver on Troy Street, located about 50 m from the proposal site. Figure 24-2 shows the types of sensitive receivers within proximity to the proposal.

Seven construction sites (sites 1 to 7) and three haulage routes were identified where sensitive receivers are located nearby, outlined in Table 24-7 and Table 24-8 and in Appendix A of Technical Paper 15. Chapter 8: Proposal description—construction provides more information on the construction compounds and haulage routes required for the proposal.

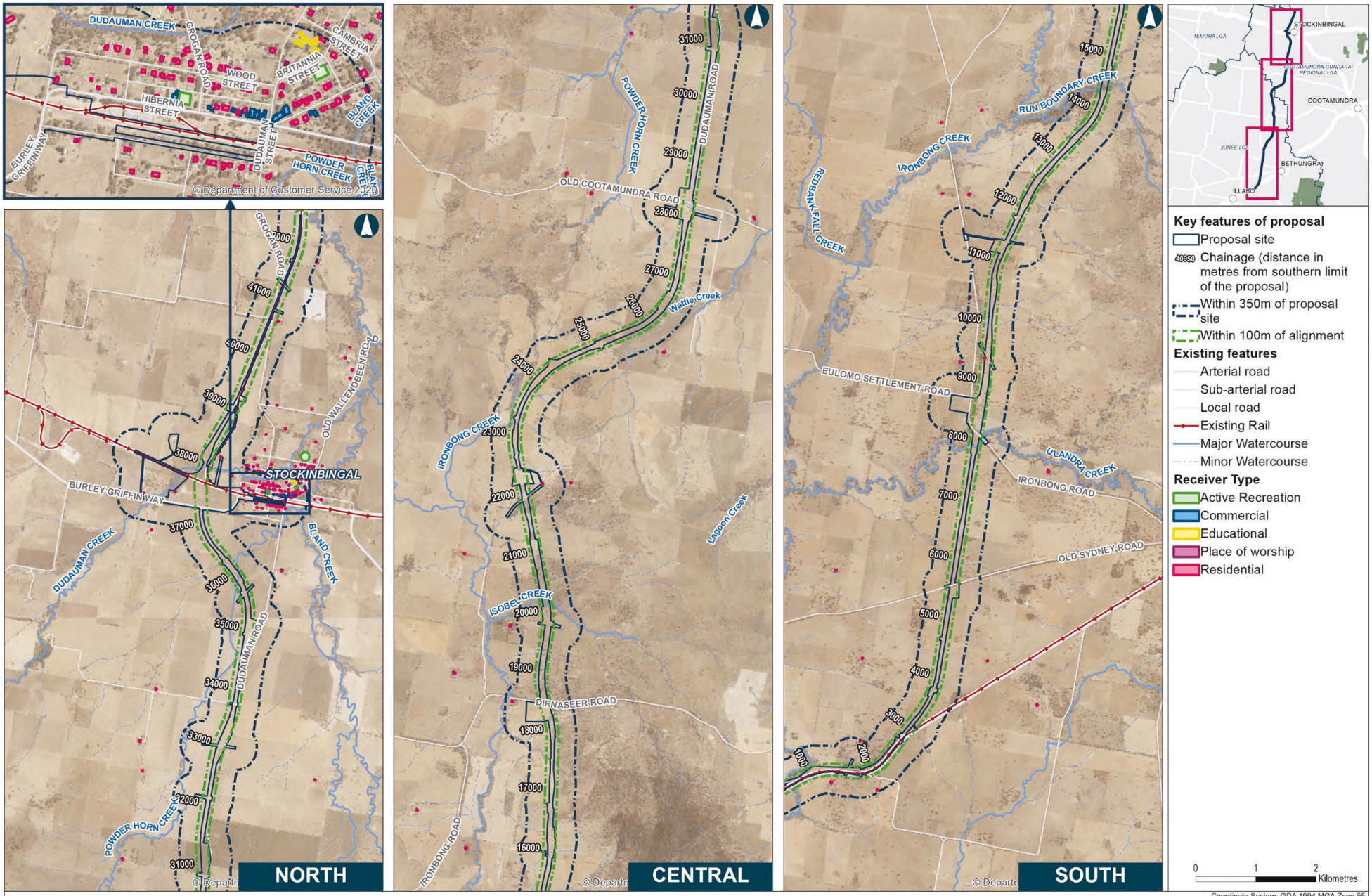
TABLE 24-7: SENSITIVE RECEIVERS IDENTIFIED WITHIN 350 M OF CONSTRUCTION SITES

Site ID	Site type	Chainage range (m)	Receiver number	Receiver type	Distance to site (m)
Site 1	Construction site and No.3 Construction compound	1050–1750	R226614	Residential	160
Site 2	Construction site	1750–2200	R226610 and R226616	Residential	298 and 327
Site 3	Construction site	2100	R226702	Residential	331
Site 4	No.11 Construction compound	18200–18450	R226777	Residential	220
Site 5	Burley Griffin Way Construction site and No. 25–28 Construction compounds	37250–37750	101 receivers in total	75 residential receivers 15 commercial receivers 8 educational receivers 2 recreational receivers	<20: 9 receivers (including 2 commercial) <50: 20 receivers (including 4 commercial) <100: 44 receivers <200: 69 receivers <350: 101 receivers
Site 6	No.29 Construction compound	39200–39300	R321487	Residential	347
Site 7	Construction site	40350–41000	R226994	Residential	110

Note: R226696, R226828 and R226929 are located within the proposal site and therefore were not assessed in this chapter.

TABLE 24-8: SENSITIVE RECEIVERS IDENTIFIED WITHIN 50 M OF HAULAGE ROUTES UP TO 500 M FROM ACCESS POINTS

Route ID	Chainage (m)	Access point	Receiver number	Distance to haulage road (m)
Route 1	18500	Dirnaseer Road	R226777	40
Route 2	37300	Burley Griffin Way (west)	R226926	48
Route 3	37750	Hibernia Street	17 receivers (including 10 residential, 6 commercial and 1 park)	<50



24.1 Location of sensitive receivers

Coordinate System: GDA 1994 MGA Zone 55
Paper size: A3 Scale: 1:60,000
Date: 11/12/2021

Data Sources: ####

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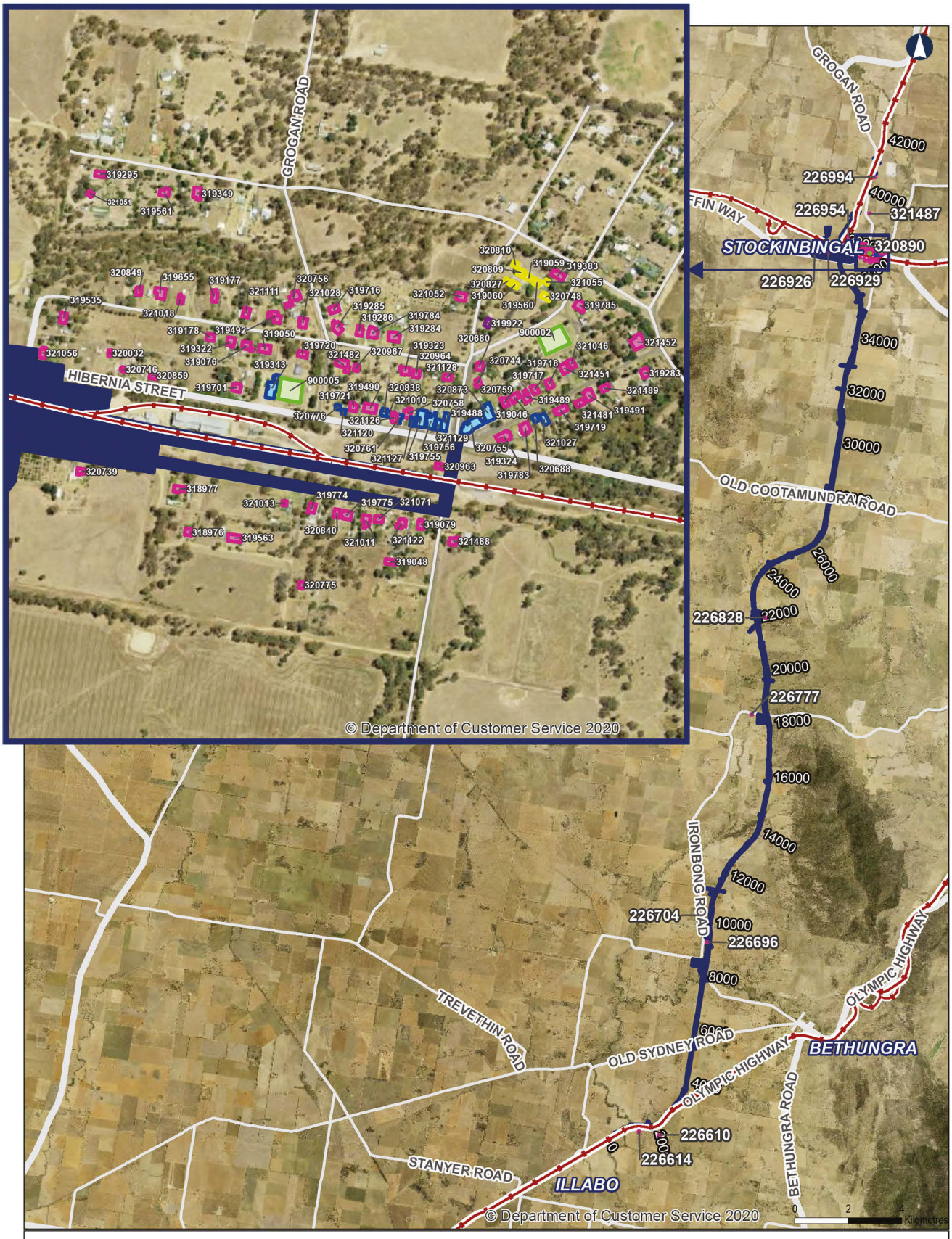

Key features of proposal

- Proposal site
- 40950 Chainage (distance in metres from southern limit of the proposal)

Existing features

- Sub-arterial road
- Arterial road
- Existing Rail

Receiver type

- Active Recreation
- Commercial
- Educational
- Place of worship
- Residential

24.2 Identified types of sensitive receivers

Coordinate System: GDA 1994 MGA Zone 55
Date: 8/25/2021 Paper size: A4 Scale: 1:200,000

Illabo to Stockinbingal Data Sources: LPI, IRDJV, ARTC

220_0115_EIS_24_2_IdentifiedSR_r1v1.mxd

24.3.1.2 Sensitive receivers in the vicinity of the proposal site

Sensitive receivers located in proximity to the proposal site (the operational boundary) were measured from the proposal, as opposed to the proposal site.

There are five sensitive receivers located within 100 m of the proposal, all of which are in Stockinbingal. These sensitive receivers are outlined in Table 24-9.

TABLE 24-9: SENSITIVE RECEIVERS WITHIN 100 M OF THE PROPOSAL

Receiver ID	Chainage (m)	Type	Distance to proposal (m)
R320746	37600 (crossing loop at Stockinbingal)	Residential	92
R320859		Residential	88
R319076		Residential	88
R320739		Residential	78
R318977		Residential	89

24.3.2 Local meteorology

Climate data was obtained from the Bureau of Meteorology (BoM) Cootamundra Airport site (site number 073142) and the Temora Airport site (site number 073151). These automatic weather station sites are located near to the proposal and characterises the local meteorology using the most recent long-term dataset available.

Temperature statistics from Cootamundra Airport and the Temora Airport site exhibit a climate of hot and dry summers and cold winters. The hottest month is January, with a mean maximum temperature of 32.3 degrees Celsius (°C) and 34.3 °C respectively. In the coldest month of July, mean minimum and maximum temperatures range between 1.1 °C and 13 °C at Cootamundra Airport, and 2.2 °C and 13.8 °C at Temora Airport.

The Cootamundra Airport site receives and average of 583.3 millimetres (mm) of rainfall per year, while the Temora Airport site receives an average of 471.5 mm per year. For both locations, autumn is the driest season of the year with the driest month occurring in April, having the lowest mean rainfall annually.

The BoM provides detailed wind conditions data at Temora Airport Automatic Weather Station, including 1 minute average wind speed. The seasonal and annual wind rose plots are presented in Figure 24-3 for the five years (from 2016 to 2020). Typical winds at Temora Airport most frequently come from the east and south-westerly directions and rarely from the southeast. The average windspeed was 3.6 m/s over the five years, with calm winds of 8.3 %.

FIGURE 24-3: TEMORA AIRPORT AUTOMATIC WEATHER STATION SEASONAL AND ANNUAL WIND ROSES (2016–2020)

24.3.3 Existing air quality

24.3.3.1 Local air emission sources

The main industrial and non-industrial air emission sources contributing to the local airshed include:

- traffic using the local road networks
- railway operations on the existing rail line adjoining the proposal at its northern and southern extents
- fuel storage facilities
- gas metering stations
- domestic solid and liquid fuel burning
- dust from paved and unpaved roads
- residential activities e.g. barbecues
- agricultural activities.

These pollutant sources give rise to emissions of pollutants relevant to the proposal including particulate matter fractions (TSP, PM_{10} and $PM_{2.5}$), NO_x comprising NO_2 and NO, CO, SO_2, VOCs and SVOCs e.g. PAHs.

24.3.3.2 National Pollutant Inventory

Information regarding local air emission sources is collated by the National Pollutant Inventory (NPI). The NPI is an online database that provides public information about the estimated emissions of 93 substances in Australia, together with the sources and location of these emissions. The NPI also includes estimated emissions data for non-industrial (diffuse) sources such as motor vehicle exhausts, wood heaters, lawn mowers and barbecues.

A review of the NPI database for the 2019/2020 reporting year was undertaken to identify and quantify industrial emissions in the local government areas the proposal is located in—Junee and Cootamundra–Gundagai.

Table 24-10 presents the industrial facilities that reported to the NPI database for 2019/2020. Emissions from these facilities will contribute to the local airshed.

TABLE 24-10: INDUSTRIAL FACILITIES REPORTING TO THE NATIONAL POLLUTANT INVENTORY DATABASE FOR THE 2019/2020 PERIOD

Facility	Address	Main activity	Reported pollutant
Junee			
Burnt Creek Meter Station	Burnt Creek Lane, Junee, NSW 2663	Gas supply	VOCs
Illabo Meter Station	Brabins Road, Illabo, NSW 2590	Gas supply	VOCs
Junee Abattoir	Harefield Road, Junee, NSW 2663	Meat processing	PM_{10}, $PM_{2.5}$ NO_x, CO, SO_2 VOCs, PAHs
Cootamundra-Gundagai Regional Shire			
Cootamundra meter station	Hogans Lane, Cootamundra, NSW 2590	Gas supply	VOCs
Aero Refuellers Cootamundra	Airport Cootamundra, NSW 2590	Petroleum product wholesaling	VOCs
Mt Hercules Pastoral Company	Cherrygrove Lane Wallendbeen, NSW 2588	Sheep, beef cattle and grain farming	Ammonia, PM_{10}
Pacific National Cootamundra	Victoria Parade, Cootamundra, NSW 2590	Rail freight transport	VOCs, Xylene isomers Cumene
Cootamundra Depot	30 Hovell Street, Cootamundra, NSW 2590	Mineral, metal and chemical wholesaling	VOCs, Lead and compounds

24.3.3.3 Historical ambient air quality data

The NSW Government monitors air quality at 47 ambient air quality monitoring stations (AAQMSs) in metropolitan and regional centres and 36 rural AAQMS. In addition, the Australian Capital Territory (ACT) Government also operates three AAQMSs, which were also reviewed due to the proximity to the proposal.

The two nearest AAQMSs to the proposal site are Junee AAQMS and Temora AAQMS, 14 kilometres and 34 kilometres to the proposal respectively, but only TSP was monitored at both sites.

Due to the remoteness of the proposal site, the presence of AAQMS in the surrounding area was limited. The following datasets from other AAQMS were therefore adopted for use as background air quality:

- PM_{10} and $PM_{2.5}$ at Wagga Wagga AAQMS (NSW): 40 kilometres south-west of the proposal
- CO and NO_2 data at Florey AAQMS (ACT): 125 kilometres south-east of the proposal
- SO_2 data at Bargo AAQMS (NSW) 245 kilometres east of the proposal.

Both Florey and Bargo AAQMSs are located in more densely populated areas than the proposal site. As such, NO_2, CO and SO_2 concentrations are likely to be higher than at the proposal site primarily due to higher vehicular traffic emissions.

There is currently no available air quality monitoring data of VOCs, such as benzene or PAHs at any of the nearby AAQMS. The contribution of VOCs and PAHs from the proposal is anticipated to be minor and background concentrations are likely to be low. Consequently, incremental impacts of VOCs (as benzene) and PAHs were assessed incrementally i.e. from the proposal only.

The ambient air quality at each of the AAQMSs is summarised in Table 24-11 for the years 2016 to 2020. The monitoring results indicate that:

- annual average TSP data were below the assessment criterion as prescribed in the Approved Methods
- 24-hour and annual average PM_{10} and $PM_{2.5}$ concentrations exceeded the relevant Air NEPM standards in some of the five years
  - these exceedances were likely caused by dust storms or local dust events occurring at the Wagga Wagga AAQMS. Traffic on the local road network and domestic activities may also contribute to the elevated concentrations. PM concentrations at the proposal site are expected to be similar or lower than that at Wagga Wagga North, given its more remote location
- SO_2 concentrations were compliant with the Air NEPM standards for all five years
- CO and NO_2 concentrations were compliant with relevant Air NEPM standards for 2016 to 2019, but exceeded the Air NEPM standards in 2020. Exceedances in 2020 were likely caused by the severe bushfires in early 2020.

TABLE 24-11: SUMMARY OF AMBIENT AIR QUALITY AT THE AAQMS

Pollutant	Averaging period	Unit	Maximum concentrations					NEPM standard	Source
			2016	2017	2018	2019	2020		
TSP	Annual	µg/m³	13.7	12.8	12.5	26.9	30.0	90 *	Junee AAQMS^
PM_{10}	24-hour	µg/m³	**114.7**	**171.6**	**127.2**	**420.0**	**259.4**	50	Wagga Wagga North AAQMS#
	Annual	µg/m³	20.6	20.6	**27.4**	21	21.9	25	
$PM_{2.5}$	24 hours	µg/m³	**28.1**	**32.5**	23.8	**386.5**	**559.5**	25	
	Annual	µg/m³	7.4	**8.1**	**8.4**	**12.2**	**12.9**	8	
CO	8 hours	Ppm∞	1.9	1.8	1.5	8.6	**14.6**	9	Florey AAQMS†
NO_2	1 hour	ppm	0.034	0.033	0.039	0.062	**0.17**	0.12◊	
	Annual	ppm	0.004	0.005	0.005	0.005	0.004	0.03◊	
SO_2	1 hour	ppm	0.01	0.01	0.01	0.002	0.012	0.2◊	Bargo AAQMS+
	24 hours	ppm	0.004	0.002	0.002	0.006	0.003	0.08◊	
	Annual	ppm	0.0003	0.0003	0.0004	0.0004	0.0003	0.02◊	
VOCs (e.g. Benzene)	Annual	No background data available							

Pollutant	Averaging period	Unit	Maximum concentrations 2016	2017	2018	2019	NEPM standard 2020	Source
SVOCs (e.g. PAHs (as benzo(a)pyrene equivalents))	Annual		No background data available					

* In the absence of a TSP ambient air quality standard in the Air NEPM, the impact assessment criterion prescribed in the NSW Approved Methods was adopted.
^ Monitoring data at Junee AAQMS was provided by NSW DPIE.
# Monitoring data at Wagga Wagga North AAQMS from 2015 to 2018 was from DPE (2018). Monitoring data for 2019 was provided by NSW DPIE.
∞ Ppm: parts per million
† Monitoring data at Florey AAQMS was from ACT EPA (2020) ACT Air Quality Report 2019 (https://www.accesscanberra.act.gov.au/ci/fattach/get/553912/1593570007/redirect/1/filename/ACT+Air+Quality+Report+2019.pdf).
+ Monitoring data at Bargo AAQMS from 2015 to 2018 were from New South Wales Annual Compliance Report 2018 (https://www.environment.nsw.gov.au/research-and-publications/publications-search/new-south-wales-annual-compliance-report-2018). Monitoring data for 2019 were downloaded from https://www.dpie.nsw.gov.au/air-quality/air-quality-data-services/data-download-facility
◊ Concentration standards as prescribed in the Air NEPM Variation 2016.

24.4 Impact assessment—construction

There is potential for construction to impact air quality through emissions of PM, odour and combustion emissions. These are discussed further in the following sections.

24.4.1 Generation of particulate matter

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_{10} and $PM_{2.5}$) 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.

The potential dust emission magnitudes for earthworks, construction and vehicle trackout activities were evaluated in this section. Demolition is not assessed in this section as no major demolition works are expected to be involved in the proposal construction aside from some minor works, including removal of a section of the Lake Cargelligo Line and Stockinbingal to Parkes Line located at the Burley Griffin Way realignment site, as well as the demolition of a number of non-residential buildings.

The IAQM guidance classifies potential 'large', 'medium' or 'small' dust emission magnitude, with examples of each magnitude outlined in Table 24-12.

TABLE 24-12: EXAMPLE DEFINITIONS FOR LARGE, MEDIUM AND SMALL DUST EMISSION MAGNITUDE

Activities	Large	Medium	Small
Earthworks	▸ total site area >10,000 m^2 ▸ potential dust soil type (e.g. clay) ▸ >10 heavy earth moving vehicles active at any one time ▸ formation of bounds >8 m in height ▸ total material moved >100,000 t	▸ total site area 2,500-10,000 m^2 ▸ moderately dusty soil type (e.g. silt) ▸ 5–10 heavy earth moving vehicles active at any one time ▸ formation of bounds 4–8 m in height ▸ total material moved 20,000 t– 100,000 t	▸ total site area <2,500 m^2 ▸ soil type with large grain size (e.g. sand) ▸ <5 heavy earth moving vehicles active at any one time ▸ formation of bounds <4 m in height ▸ total material moved <20,000 t ▸ earthworks during wetter months
Construction	▸ total building volume >100,000m^3 ▸ onsite concrete batching ▸ sandblasting	▸ total building volume 25,000–100,000m^3 ▸ on-site concrete batching ▸ potentially dusty construction material (e.g. concrete)	▸ total building volume <25,000 m^3 ▸ construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout	▸ >50 HDV,>3.5t) outward movements in any one day ▸ potential dusty surface material (e.g. high clay content) ▸ unpaved road length >100m	▸ 10–50 HDV (>3.5t) outward movements in any one day ▸ moderately dusty surface material (e.g. high clay content) ▸ unpaved road length 50-100m	▸ <10 HDV (>3.5 t) outward movements in any one day ▸ surface material with low potential for dust release ▸ unpaved road length <50m

24.4.1.1 Earthworks

Earthworks primarily involve excavating material, haulage, tipping and stockpiling (IAQM, 2014). For this proposal, earthworks would be required to:

- create embankments and cuttings to minimise the extent of elevation gain along the proposal and maintain rail gradients in accordance with adopted design requirements
- construct the new crossing loop
- construct culverts and bridges
- construct the ancillary infrastructure and undertake the ancillary works associated with the proposal.

Construction of the proposal involves earthworks, construction compounds and ancillary activities. Construction compounds would generally accommodate stockpiles, laydown area, site offices, a concrete batching plant (for some compounds) and fuel storage. This assessment has conservatively assumed earthworks would occur across the entire proposal site.

Blasting is potentially required for hard rock excavation below two metres. Table 24-13 provides a summary of earthworks at Site 1 to 7 with potential to generate dust emissions, while Table 8.3 in Technical Paper 15 identifies locations where blasting is proposed. Dust is anticipated to be generated during a blasting event.

TABLE 24-13: SUMMARY OF EARTHWORK ACTIVITIES AT EACH SITE

Site Number	Chainage (m)	Site area (m^2)	Soil type	Number of HV**	Material handled#	
					(m)	(t)
Site 1^	1050–1750	**73,620**+	Clay or sandy soil	<5	11,077	61,034
Site 2	1750–2200	**46,200**+		<5	31,150	**171,637**+
Site 3	10280–10520	**22,835**+		<5	9,136	50,339
Site 4^	18200–18450	**93,017**+		<5	60,798	**334,997**+
Site 5^	37250–37750	**678,310**+		**≤36**+	14,382	79,245
Site 6[2]^	39200–39300	8,799		<5	586	3,229
Site 7	40350–41000	**21,712**+		<5	2,766	15,241

* Assuming earth density of 5,510kg/m^3.
^ Sites containing construction compounds.
# Total volume of excavated and filled material.
** Number of heavy earth moving vehicles active at any one time.
+ Magnitude determining parameter is highlighted in bold.

24.4.1.2 Other construction activities

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 24-14 outlines the construction activities at Site 1 to 7 with potential to generate dust emissions.

It is noted that:

- concrete batching plants would be located in No.11 and No.25 construction compounds, which would be within Sites 4 and 5 respectively
- mobile concrete batching plants may also be used during construction and would be wholly located within the proposal site
- the materials to be used during construction include ballast, concrete sleeper, steel rail, precast culverts and precast bridge girders are considered to have low potential for dust release.

TABLE 24-14: SUMMARY OF CONSTRUCTION ACTIVITIES

Site number	Chainage (m)	Construction works	Construction material	Onsite concrete batching	Sandblasting
Site 1[2]	1050–1750	Track upgrade, culvert	Ballast, concrete sleeper, steel rail and precast culverts	No	No
Site 2	1750–2200	Track upgrade, culvert		No	No
Site 3	10280–10520	New Track	Ballast, concrete sleeper, steel rail	No	No
Site 4[2]	18200–18450	N/A[1]	N/A	**Yes**[3]	No
Site 5[2]	37250–37750	New Track, level crossing, bridge, culvert, road modification	Ballast, concrete sleeper, steel rail, precast culverts and precast bridge girders	**Yes**[3]	No
Site 6[2]	39200–39300	N/A[1]	N/A	No	No
Site 7	40350–41000	New Track	Ballast, concrete sleeper, steel rail	No	No

1. No construction works would be conduct within construction compounds.
2. Sites where construction compounds are included.
3. Magnitude determining parameter is highlighted in bold.

24.4.1.3 Trackout from haulage routes

HDVs would arrive and depart construction sites and from/onto public roads via several site access points. Sensitive receivers near the three site access points identified in section 24.3.1 have the potential to be affected by trackout dust. Peak traffic movements per day for each section are as follows:

- 319 for HDVs including haulage and delivery trucks
- 18 for water tanks
- 80 for light vehicles (cars and utility vehicles).

The total length that HDVs could travel on unpaved roads before reaching access points is expected to be longer than 100 metres. The soil type at all the site access points is sandy/clay with a high potential for dust generation on public roads.

24.4.1.4 Assessment of dust emissions (magnitude and sensitivity)

In summary, the assessment found the following magnitude of dust emissions for earthworks, other construction activities and trackout:

- magnitude of dust emissions from earthworks on sites 2, 4 and 5 are assigned a ‘Large’ category, sites 1, 3 and 7 are assigned a ‘Medium’ category and site 6 is assigned a ‘Small’ category
- dust emission magnitude from sites 4 and 5 are assigned as ‘Large’ and the rest of the sites are ‘Small’
- in consideration of the number of daily truck movements, the haulage route length and the type of soil at the construction sites, the dust emission magnitude for trackout at all three routes is conservatively considered to be in the ‘Large’ category.

The majority of sensitive receivers identified in this assessment are residential in nature, while a few are educational, commercial and recreational receivers. In accordance with the IAQM guidance, residential and educational receivers are considered to be ‘high’ sensitivity receivers to dust soiling and health effects. Commercial and recreational receivers are considered to be ‘medium’ sensitivity receivers.

PM_{10} annual average concentrations monitored at Wagga Wagga North AAQMS were above NEPM standard of 25$\mu g/m^3$ in 2018 while below the standard in other years (2015 to 2017 and 2019). The background annual PM_{10} concentration was conservatively assumed to be above standard in this risk assessment.

Table 24-15 summarises the dust emissions magnitude for earthworks, general construction and trackout activities for each construction site and haulage route, as well as the sensitivity of the area in terms of dust soiling and human health.

TABLE 24-15: DUST EMISSIONS MAGNITUDE AND SENSITIVITY OF THE AREA FOR EARTHWORKS, GENERAL CONSTRUCTION AND TRACKOUT ACTIVITIES FOR EACH SITE (IN ACCORDANCE WITH THE IAQM GUIDANCE)

		Emissions magnitude			Sensitivity	
Site ID	Chainage range (m)	Earthworks	General construction	Trackout	Dust soiling	Human health
Construction site						
Site 1	1050–1750	Medium	Small	–	Low	Low
Site 2	1750–2200	Large	Small	–	Low	Low
Site 3	10280–10520	Medium	Small	–	Low	Low
Site 4	18200–18450	Large	Large	–	Low	Low
Site 5	37250–37750	Large	Large	–	Medium	High
Site 6	39200–39300	Small	Small	–	Low	Low
Site 7	40350–41000	Medium	Small	–	Low	Low
Haulage route						
Route 1	18500	–	–	Large	Low	Medium
Route 2	37300	–	–	Large	Low	Medium
Route 3	37750	–	–	Large	Medium	High

Based on the dust emission magnitudes and sensitivity of the surrounding areas in Table 24-15 and determining matrices in section 24.2.3, overall dust risks from earthworks, construction and trackout activities associated with the proposal are summarised below and in Table 24-16.

Based on the dust emission magnitudes, the sensitivity of the surrounding areas and determining matrices, dust risks from earthworks, construction and trackout activities associated with the proposal are summarised below.

Earthworks on:

- Site 5 would have medium risk of dust soiling and high risk of human health impacts
- Site 1 to site 4 and site 6 to site 7 would have low risk of dust soiling and human health impacts.

General construction works on:

- Site 4 would have low risk of dust soiling and human health impacts
- Site 5 would have medium risk of dust soiling and high risk of human health impacts
- Sites 1, 2, 3, 6 and 7 would have negligible risk of dust soiling and human health impacts.

Trackout activities on:

- Route 3 would have medium risk of dust soiling and high risk of human health impacts
- Route 1 and 2 would have low risk of dust soiling and medium risk of human health impacts.

TABLE 24-16: SUMMARY OF OVERALL DUST RISKS

Site ID	Earthworks		Other construction activities		Trackout	
	Dust soiling	Human health	Dust soiling	Human health	Dust soiling	Human health
Construction activities						
Site 1	Low	Low	Negligible	Negligible	N/A	N/A
Site 2	Low	Low	Negligible	Negligible	N/A	N/A
Site 3	Low	Low	Negligible	Negligible	N/A	N/A
Site 4	Low	Low	Low	Low	N/A	N/A
Site 5	Medium	High	Medium	High	N/A	N/A
Site 6	Low	Low	Negligible	Negligible	N/A	N/A
Site 7	Low	Low	Negligible	Negligible	N/A	N/A
Haulage routes						
Route 1	N/A	N/A	N/A	N/A	Low	Medium
Route 2	N/A	N/A	N/A	N/A	Low	Medium
Route 3	N/A	N/A	N/A	N/A	Medium	High

More detail on the dust emissions magnitude and sensitivity of the area for earthworks, general construction and trackout activities can be found in Technical Paper 15.

24.4.1.5 Qualitative assessment

A qualitative assessment was conducted for all areas of the proposal site that were initially 'screened out' of the detailed risk assessment, and were therefore excluded from sections 24.4.1.1 to 24.4.1.4. These areas did not have sensitive receivers within 350 m of the proposal site or 50 m of haulage routes within 500 m of access points, therefore the level of risk of dust impacts was considered to be 'negligible' under the IAQM guidance. Nevertheless, the potential dust emissions for these areas were assessed below to assist with developing site-specific mitigation measures in section 24.6.

The main air quality impacts during construction of the proposal would be associated with airborne particulate matter (PM) of varying size fractions including deposited dust (particles removed by dry deposition through gravity, impaction and diffusion or wet deposition in or below clouds), TSP (particles of less than 100 micrometres), PM_{10} and $PM_{2.5}$. Table 24-17 provides detail of the main dust emission sources and associated activities for the proposal.

TABLE 24-17: EMISSION SOURCES AND CONSTRUCTION ACTIVITIES

Stage of works	Activities which may generate dust
Site establishment and enabling works	▸ Property access modifications along the proposal including relocation of existing facilities ▸ Demolition of buildings and other structures ▸ Establishing ancillary facilities and construction sites ▸ Vegetation removal ▸ Erecting temporary fencing ▸ Establishing site access roads where required ▸ Utility relocations as required ▸ Delivering and stockpiling materials including rail, sleepers, ballast, culverts and structural fill.
Earthworks and drainage	Earthworks: ▸ tracks—excavation or blasting for the earth formation ▸ culverts and underbridges: excavation to the required depth ▸ crossing loops: excavation beside the new track for the length of the crossing loop ▸ turnouts: construction of turnouts ▸ level crossings: earthworks to the road to suit the new rail level height, road pavement construction ▸ road modifications and new bridges: earthworks as required ▸ new alignment areas: earthworks as required ▸ embankment and cuttings; earthworks as required ▸ construction of ancillary infrastructure: earthworks as required. Drainage: ▸ excavation of earth material from the side of the existing track formation, and trim and compact base and sides of the drain.

Stage of works	Activities which may generate dust
Track works	The installation of: ▸ tracks: trim formation, place ballast and concrete sleepers ▸ culverts: place ballast, sleepers and rails on top of the culvers ▸ crossing loops: place and compact formation material, place ballast, sleepers and rails ▸ turn outs: place ballast, sleepers and rails ▸ level crossings: installation of concrete or steel top level crossing, road pavement construction ▸ new bridges construction.
Rail maintenance access road	▸ Clearing of vegetation ▸ Placing gravel layer surfacing.
Road modifications	Road modifications will be conducted at Burley Griffin Way, Corbys Lane, Old Sydney Road, Ironbong Road, Dirnaseer Road, Old Cootamundra Road, and a number of unformed roads and private access tracks: ▸ relocation of existing services ▸ earthworks ▸ installation of bridges, culverts and level crossings.
Finishing and landscaping	▸ Demobilising site compounds and facilities ▸ Removing all materials, waste and redundant structures from the works sites ▸ Removing of temporary fencing ▸ Establishment of permanent fencing ▸ Decommissioning of site access roads that are no longer required ▸ Restoration of disturbed areas as required, including revegetation where required.
Concrete batch plants	Two concrete batching plants at construction compounds 11 and 25 and proposed mobile concrete batching plants at other compounds will supplement supply from existing ready-mix plants to be used for construction drainage and bridges. Dust may generate from: ▸ sand and aggregate unloading and transferring to elevated bins ▸ fugitive emission from conveyers ▸ weigh hopper loading and mixer loading ▸ sand and aggregate spillage on the road and within the yard ▸ wind erosion from stockpiles, bunkers and other exposed surface.

24.4.2 Odour emissions

There is potential for odour emissions from some construction activities, including excavation works of potentially contaminated soil and asphalt laying during road modification works.

Chapter 20: Soils and contamination and Technical Paper 14: Contaminated Land Assessment indicated there are no contaminated sites listed in the NSW EPA Contaminated Land Record Database within 1 km of the proposal site. A site walkover also indicated no obvious signs of contamination were observed. The contamination assessment identified a number of areas of environmental concern, the majority of which were considered to pose a low to medium risk. If present, the contamination is likely to be localised and manageable through the implementation of mitigation measures during construction.

In the 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 sensitive receivers.

Road modification works are proposed at Old Sydney Road, Ironbong Road, Dirnaseer Road, Old Cootamundra Road, Corbys Lane and Burley Griffin Way, as well as at several unformed roads and private access tracks. Given the short length that each road needs to be modified and the transient nature of the odour emissions from asphalt road laying, odour impact from asphalt laying during road modification works is not of significance.

24.4.3 Gaseous emissions

24.4.3.1 Vehicle emissions

Diesel fuel combustion from vehicle movements and on-site plant and machinery operation would generate, CO, NO_x, SO_2 and trace amounts of non-combustible hydrocarbons (i.e. VOCs and PAHs) in addition to PM_{10} and $PM_{2.5}$. 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 the construction phase, equipment, materials and workers would be transported to the proposal construction site along the proposal and construction compounds on haulage roads and rail maintenance access roads.

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. Emissions would be adequately manageable through the implementation of mitigation measures in section 24.6.

24.4.3.2 Fugitive emissions

Fuel storage, plant, machinery and vehicles refuelling, chemicals storage and handling have the potential to generate fugitive emissions. These emissions are expected to be minor and readily dispersed under normal conditions. In an event of leaking or spilling, local air quality is likely to be adversely impacted for a short period. However, these events are rare or may never happen during construction if proper management (refer to section 24.6) and handling procedures are in place and strictly followed (including bunding of fuel, oil and greases), which would ensure that air quality impacts would be localised in the event of a spill.

Diesel and petrol fuel would be stored at No.11, 18 and 25 construction compounds at volumes of 5 litres to 10,000 litres. 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.

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

24.4.4 Ecological sensitivity

As part of the assessment of potential air quality impacts on the receiving environment, ecological receivers within the proposal were considered. An ecological receiver refers to any sensitive habitat affected by dust soiling. Elevated levels of dust settling on nearby vegetation have potential to reduce photosynthesis and transpiration, leading to reduced growth rates and decreased overall health of the vegetation.

Deposition on dust foliage is likely to be highly localised, intermittent and temporary, and not considered to impact significantly on the proposal. The management measures outlined in section 24.6 will help to ensure dust impacts from construction works are minimised.

24.5 Impact assessment—operation

The Inland Rail trains would be a mix of grain, bulk freight, and other general transport trains. Diesel locomotives traversing through the proposal site would generate the following air emissions:

- PM_{10} and $PM_{2.5}$
- NO_x, CO and SO_2
- VOCs and SVOCs (e.g. PAHs).

Operation of the proposal would result in the introduction of air emissions from the diesel locomotives as they traverse along the proposal. The proposed train volumes assume an average of 6 trains per day in 2026 and 11 trains per day in 2040.

Considering the low frequency of train movements and remoteness of the proposal, air dispersion modelling for operational emissions was not conducted.

A review of potential air quality impacts from several rail projects in NSW was undertaken and discussed in this section to assess the potential impacts for the proposal.

24.5.1 Comparison with other NSW rail projects

The modelling results for the Northern Sydney Freight Corridor Project, Botany Rail Duplication Project and Inland Rail North Star to NSW/Queensland Border Project showed that for all pollutants assessed, predicted pollutant ground level concentrations were below, and therefore compliant with, the relevant NSW impact assessment criteria at all sensitive receivers.

The EIS for the Inland Rail Narrabri to North Star project justified not conducting air dispersion modelling of potential emissions during operation of diesel locomotives, as the levels of operational rail traffic along that proposal site are to be lower than for the Northern Sydney Freight Corridor, and therefore operational emissions would be much lower.

The Inland Rail-Narromine to Narrabri Project (N2N) modelled emissions of locomotives idling at the crossing loop. The modelling predicted compliance with the 1 hour NO_2 criterion. Given that the distance between sensitive receivers and the proposal is greater than for N2N, and that trains would be idling for a short duration, air quality impacts from trains idling at the crossing loop are anticipated to not be significant.

From this review, it was determined that train activity for the proposal would be lower than these rail projects. In addition, both the Botany Rail Duplication project and southern part of the Northern Sydney Freight Corridor project are in relatively urban areas with potentially poorer existing air quality, while most of the proposal traverses a rural area with only five sensitive receivers located within 100 m of the proposal. These two factors are key determinants of air quality compliance with criteria, and as a result, the air quality impacts for the proposal are expected to be lower and therefore below relevant pollutant impact assessment criteria as train activity is a primary source of operational air quality emissions.

Refer to Technical Paper 15 for the full review of the potential air quality impacts for other NSW rail projects.

24.5.2 Road modifications

Potential changes in air quality due to realignment of Burley Griffin Way and Ironbong Road, are not considered to be of significance.

During operation of the proposal, 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 a minimal increase in vehicular emissions from operational activities with no significant contribution to future background concentrations anticipated.

24.5.3 Assessment of operational impacts from the proposal

While the potential for air quality impacts on the receiving environment during operation of the proposal are anticipated to be higher in the town of Stockinbingal, due to the higher density of sensitive receivers near the proposal, impacts are still anticipated to be low. There is also the potential for the generation of combustion emissions from idling diesel locomotives at the crossing loop near Stockinbingal, although emissions are expected to be low, of short duration and not expected to impact on the few nearby sensitive receivers.

Given the short duration of trains in the idling mode and the distance to sensitive receivers (the nearest receiver is 78 m from the crossing loop and five receivers in total within 100 m), air quality impacts from trains idling at the crossing loop are not anticipated to be significant.

In summary, air quality impacts from the proposed operation of the proposal are expected to be low at the nearest sensitive receivers and are not anticipated to be of significance.

24.6 Mitigation and management

24.6.1 Approach to mitigation and management

The assessment identified that the main potential for air quality impacts would be during construction, when there would be the potential for dust impacts if works are not effectively managed. These impacts would be limited to sensitive receivers located within the separation distances identified within the assessment.

The key approach to managing the identified air quality impacts during construction, including dust and emissions from construction plant, would involve preparing an air quality management plan, which would be implemented as part of the CEMP. The plan would define the processes, responsibilities and management measures that would be implemented to minimise potential impacts on air quality. The air quality and dust management sub-plan would ensure that dust and emissions are managed in an environmentally sound manner, and in accordance with statutory requirements.

For all construction activities, the aim is to prevent significant impacts on receivers through effective mitigation. As stated in the IAQM guidance, this is normally possible. Therefore, with the implementation of site-specific mitigation measures detailed in this section, residual dust impacts would not be of significance in terms of dust soiling and health effects.

The operation of the proposal would be managed in accordance with:

- the air quality management requirements specified in the rolling stock operator environment protection licences
- through diesel fuel standards, locomotive maintenance and emissions standards. The most effective approach to addressing air emissions from diesel locomotives is through NSW- and Commonwealth-based policies such as progressive tightening of emission standards, in-service inspections and the integration of transport and land-use planning.

24.6.2 Interactions between measures

Mitigation measures to control air quality impacts may overlap with the measures proposed for the control of erosion and sedimentation (described in Chapter 10: Biodiversity, Chapter 13: Water quality and Chapter 20: Soils and contamination, as the major pollutant of concern is dust.

All mitigation measures for the construction of the proposal would be consolidated and described in the CEMP. The CEMP would identify measures that are common between different aspects. Common impacts and common mitigation measures would be consolidated to ensure consistency and implementation.

24.6.3 Expected effectiveness

Ambient weather conditions, such as wind speed and direction, soil moisture and rainfall or dew, would substantially influence the day-to-day potential for dust generation during construction. Accordingly, construction personnel would need to routinely observe weather conditions to ensure appropriate mitigation measures are implemented or proposed to be in place when conditions change. The proposed measures for dust control are routinely employed as 'good practice' on construction sites in NSW and are therefore expected to be effective in controlling dust generation.

24.6.4 Recommended mitigation measures

The mitigation measures outlined in Table 24-18 would be implemented to manage and mitigate the potential impacts to air quality from the proposal.

TABLE 24-18: SUMMARY OF AIR QUALITY MITIGATION MEASURES

Ref	Impact	Mitigation measure	Timing
AQ-1	General air quality management	An air quality management plan would be prepared and implemented as part of the CEMP. It would include measures to minimise the potential for air quality impacts on the local community and environment, and would address all aspects of construction, including: ▸ spoil handling ▸ machinery operating procedures ▸ soil treatments ▸ stockpile management ▸ haulage dust suppression ▸ monitoring.	Construction
AQ-2	Construction activities and earthworks that may cause dust impacts	Where sensitive receivers are located within the study area (350 m from the construction footprint and within 50 m of the routes used by construction vehicles on public road, up to 500 m from the site access points) determined for each key activity, or visible dust is generated from vehicles using unsealed access roads, road watering and/or other stabilising approaches would be implemented.	Construction
AQ-3	Blasting management	Blasting will not be undertaken if the prevailing wind conditions are likely to transport dust emissions towards the nearest sensitive receivers.	Construction
AQ-4	Impacts on sensitive receivers (communications)	Where sensitive receivers are located in close proximity to construction sites, especially sites 4 and 6: ▸ implement the Inland Rail Communications and Engagement Strategy, which would include community engagement before work commences on site ▸ display the name and contact details of persons accountable for air quality and dust issues on the site boundary ▸ display the head or regional office contact information.	Construction

Ref	Impact	Mitigation measure	Timing
AQ-5	Locomotive emissions	Locomotive emissions would be managed in accordance with the air quality management requirements specified in the rolling stock operator's environment protection licence.	Operation
AQ-6	Impacts during track maintenance	Maintenance service vehicles and equipment would be maintained and operated in accordance with the manufacturer's specifications.	Operation

24.6.5 Managing residual impacts

Residual impacts are impacts of the proposal that may remain after implementation of:

- design and construction planning measures to avoid and minimise impacts (refer to section 24.2.5)
- specific measures to mitigate and manage identified potential impacts (refer to section 24.6.1).

The key potential air quality issues and impacts originally identified by the environmental risk assessment (refer to Appendix G) are listed in Table 24-19. The (pre-mitigation) risks associated with these impacts, which were identified by the environmental risk assessment, are provided. Further information on the approach to the environmental risk assessment, including descriptions of criteria and risk ratings, is provided in Appendix G.

The potential issues and impacts identified by the environmental risk assessment were considered as part of the air quality assessment, summarised in sections 24.4 and 24.5. The mitigation and management measures (listed in Table 24-18 that would be applied to manage these impacts are also identified. The significance of potential residual impacts (after application of these mitigation measures) is rated using the same approach as the original environmental risk assessment.

Provided the mitigation measures are implemented, the proposal poses a negligible to low risk of impacting air quality as identified by the risk assessment in Table 24-19.

TABLE 24-19: RESIDUAL IMPACT ASSESSMENT—AIR QUALITY

Key issue (SEARS)	Phase	Potential impacts	Pre-mitigated risk			Mitigation measures (refer to Table 24-18)	Residual risk			How residual impacts would be managed
			Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating	
Air quality	Construction	▸ Emissions from vehicles or plant during construction.	Likely	Minor	Medium	AQ-1 to AQ-2	Unlikely	Minor	Low	n/a
		▸ Generation of dust during construction (from exposed soil/stockpiles, excavation and vehicle movements) and impacts on sensitive receivers.	Likely	Minor	Medium	AQ-1 to AQ-5	Unlikely	Minor	Low	n/a
	Operation	▸ Impacts on local air quality during operation from train emissions including idling trains at crossing loop locations.	Possible	Moderate	Medium	AQ-5 to AQ-6	Unlikely	Minor	Low	n/a