CHAPTER 22

Air quality

ALBURY TO ILLABO ENVIRONMENTAL IMPACT STATEMENT

ARTC

INLAND RAIL
An Australian Government Initiative

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22.1 Summary

During construction, the proposal has the potential to generate dust emissions from construction works and the movement of construction vehicles. Without mitigation, this could potentially result in visible dust emissions, annoyance to sensitive receivers due to dust deposition and elevated airborne particulate matter concentrations. Potential dust impacts would be temporary and would be substantially reduced with the implementation of standard mitigation measures.

During operation, the increase in diesel-operated freight trains using the corridor has the potential to increase levels of pollutants such as nitrogen oxides and particulate matter. The air quality impact assessment considered the potential increases and concluded that the emissions are expected to be below the relevant impact assessment criteria.

22.2 Approach

This chapter provides a summary of the potential air quality impacts of the Albury to Illabo (A2I) section of the Inland Rail program (the proposal). A full copy of the assessment is provided in Technical Paper 14: Air quality.

22.2.1 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements (SEARs) related to air quality, and where in the environmental impact statement (EIS) these have been addressed, are detailed in Appendix A: Secretary's Environmental Assessment Requirements.

22.2.2 Relevant legislation, policies and guidelines

The assessments were undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

- *Environmental Planning and Assessment Act* 1979 (NSW) (EP&A Act) and the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act)
- National Environment Protection (Air Toxics) Measure 2011 (NEPC, 2011)
- National Environment Protection (Ambient Air Quality) Measure 2021
- *Approved Methods for Modelling and Assessment of Air Quality in NSW 2016* (Approved Methods) (NSW Environment Protection Authority (EPA), 2016)
- Institute of Air Quality Management (IAQM) *Guidance on the assessment of dust from demolition and construction Methodology* (IAQM, 2014).

22.2.3 Methodology

Study area

For construction of the proposal, the study area considers potential air quality impacts within 350 metres (m) of the proposal site and 50 m of the haulage route(s) used by construction vehicles on public roads up to 500 m from the access points at each enhancement site.

For operation, the study area considers areas within 100 m of the rail alignment to be within the proposal site. Beyond 100 m, emissions from freight trains are anticipated to have a low impact on the receiving environment due to pollutant dispersion (as discussed in section 22.5 of this EIS).

Key tasks

The assessment involved:

- reviewing existing regional ambient air quality and meteorology, including:
  - local meteorology characterised using data obtained from the Bureau of Meteorology (BoM) at Albury Airport automatic weather station and Wagga Wagga Airport Aeronautical Meteorological Observing (AMO) station
  - local 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, located at Junee, Albury, Wagga Wagga North, Florey and Bargo

- the National Pollutant Inventory (NPI) maintained by the Australian Department of Climate Change, Energy, the Environment and Water (DCCEEW), to identify any facilities that may be contributing to local/regional air quality conditions

- identifying appropriate air quality criteria based on relevant guidelines
- identifying air quality sensitive receivers with the potential to be adversely affected by the proposal
- assessing potential air quality impacts during construction of the proposal
- qualitatively assessing the potential for air quality impacts during operation of freight trains
- recommending mitigation and management measures.

Methodology for assessing dust impacts

The potential for dust-related impacts was evaluated in accordance with the *Guidance on the assessment of dust from demolition and construction* published by the IAQM in 2014 (IAQM, 2014). The IAQM guidance provides a risk-based approach with the aim to identify risks and to recommend appropriate mitigation measures. This approach involves:

- estimating the magnitude (large, medium or small) of potential dust emissions associated with each of the relevant construction activities, including demolition, earthworks, construction and track out (or transport-related handling activities). Earthworks are assumed to occur across the proposal site to present a worst-case assessment.
- classifying the sensitivity of the surrounding human environment, taking into account the proximity and density of the human receivers within the study area. The sensitivity of the surrounding receiver area is identified for both nuisance impacts (such as dust soiling) and human health impacts. It also factors in the density of sensitive receivers relative to the distance to the source.

The IAQM method assigns a risk rating for each type of construction activity without mitigation. This risk rating is then used to determine what mitigation and management measures are required to effectively manage these risks.

Methodology for assessing operational air quality impacts

A qualitative assessment was carried out for operational air quality impacts from freight trains, which involved a comparison of previous air quality assessments for several similar rail projects in NSW to the proposal. This included consideration of the number of trains, train speed, distance to sensitive receivers and local setting of the proposal, and the comparison projects. Key pollutants associated with diesel freight train operations was considered, being particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide, carbon monoxide, sulphur dioxide and benzene. Given the proposal would not include any new crossing loops, and there is a small change in projected train movements in 2025 and 2040, air dispersion modelling for operational emissions was not conducted.

22.2.4 Key risks

An environmental risk assessment was undertaken for the proposal (refer Appendix E: Environmental risk assessment). Potential impacts on air quality with an assessed risk rating of medium or above are:

- generation of dust during construction (from exposed soil/stockpile, excavation and vehicle movements)
- emissions from vehicles or plant during construction
- impact on local air quality from train emissions during operation.

The air quality assessment considered the potential risks identified by the environmental risk assessment in addition to potential risks and impacts identified by the scoping report, the SEARs and relevant guidelines and policies (as appropriate).

22.3 Existing environment

22.3.1 Climate and 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

Long-term records from the automatic weather station (AWS) at the Albury Airport AWS and the Wagga Wagga Airport Aeronautical Meteorological Observing (AMO) station were reviewed to understand the meteorological conditions near the proposal site. Albury Airport AWS is located approximately 1 kilometre (km) east, at the southern extent of the proposal and the Wagga Wagga AMO is located approximately 9 km to the south-east, near the northern extent of proposal. 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 most recent long-term meteorological data collected at the above two weather stations near the proposal characterises the local climate.

The data indicates that the proposal site experiences warm dry summers, with average maximum temperatures around 33 degrees Celsius (℃). Months in winter are the coldest with an average mean daily maximum temperature of around 13℃. Months through summer and autumn were measured to be the driest, with the lowest average monthly rainfall recorded in January (around 39 millimetres (mm)) at Albury and in April (around 32 mm) in Wagga Wagga.

Overall, wind speeds are highest during summer (around 3 m/s recorded at Albury, and 4.1 m/s recorded at Wagga Wagga), and lowest in winter (around 2 m/s, and 3 m/s at Albury and Wagga, respectively). The most frequent wind condition at Albury is south-easterly followed by westerly. At Wagga Wagga, the most frequent wind direction is easterly followed by east north-easterly.

22.3.2 Air quality

Regional air quality is mainly influenced by rural activities, industrial activities, vehicle emissions, railway operations, power generation, waste management and extraction activities. Dust from paved and unpaved roads, and domestic solid and liquid fuel burning in the region, also contribute to the local air shed.

A search of the National Pollutant Inventory list (for 2019/2020) identifies 25 sources of emissions that would contribute emissions to the local air shed. This includes manufacturing, processing and power-generating industries in the vicinity of Ettamogah, Uranquinty, Wagga Wagga, Bomen and Junee.

Background air quality

Air quality data sourced from monitoring stations at Albury, Wagga Wagga North and Junee are summarised in Table 22-1, alongside the air quality impact assessment criterion for each pollutant specified in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2016).

Florey (within the Australian Capital Territory (ACT)) and Bargo have been included to provide coverage of pollutants not covered by monitoring stations that are closer to the proposal site, as both these sites contain the most representative data sets available. Carbon monoxide and nitrogen dioxide measured at Florey (a residential area) is expected to be similar to levels in Albury and Wagga Wagga given their similar urban environments but lower in the rural sections of the proposal site. For sulphur dioxide, levels measured at Bargo (a rural area) are likely to be lower than levels in Albury and Wagga Wagga (regional urban areas) but similar to levels in the rural sections of the proposal site. The data shows that:

- for particulate matter (PM), the 24-hour average criterion (PM_{10} and $PM_{2.5}$) and the annual average criterion ($PM_{2.5}$ only) is exceeded across multiple years at both locations. For PM_{10}, exceedances of the annual average criterion were only observed in Wagga Wagga; in 2019 and 2020, these exceedances were strongly influenced by bushfire smoke
- carbon monoxide (maximum 8-hour average) and nitrogen dioxide (maximum 1-hour average) concentrations exceeded their respective criteria in 2020 (Florey AAQMS)—this was largely attributed to bushfire smoke
- concentrations of total suspended particulates (TSP) exceeds the impact assessment criterion for all years (2016 to 2020) at the Junee AAQMS.

There is no publicly available ambient air quality monitoring data for volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs) (e.g. polycyclic aromatic hydrocarbons (PAHs)). Ambient concentrations are anticipated to be low in the vicinity of the proposal site, including the urban centres of Albury and Wagga Wagga.

TABLE 22-1 SUMMARY OF AMBIENT AIR QUALITY DATA

Station	Pollutant	Averaging period	Air quality impact assessment criteria	Year[2]				
				2016	2017	2018	2019	2020
Junee[1]	Total suspended particles (□g/m^3)	Annual	90	**292**	**358**	**1,331**	**3,523**	**9,018**
Albury	PM_{10} (□g/m^3)	Maximum 24-hour	50	**51**	48.8	**107.8**	**222.4**	**298.3**
		Annual	25	14.9	15.6	19.4	23.2	19.7
	$PM_{2.5}$ (□g/m^3)	Maximum 24-hour	25	**28.1**	18.7	**30.4**	**167.1**	**275**
		Annual	8	7.4	7.2	7.3	**10.1**	**11.4**
Wagga Wagga	PM_{10} (□g/m^3)	Maximum 24-hour	50	**114.7**	**171.6**	**127.2**	**251.7**	**259.4**

Station	Pollutant	Averaging period	Air quality impact assessment criteria	Year[2] 2016	2017	2018	2019	2020
		Annual	25	20.7	20.4	**26.9**	**34.7**	21.9
	$PM_{2.5}$ (□g/m^3)	Maximum 24-hour	25	–	**40.8**	**90.2**	**129.4**	**559.5**
		Annual	8	–	**8.5**	**8.9**	**11.0**	**12.9**
Florey	Carbon monoxide (ppm)	Maximum 8-hour	9	1.9	1.8	1.5	8.6	**13.4**
	Nitrogen dioxide (ppm)	Maximum 1-hour	0.12	0.034	0.033	0.039	0.062	**0.17**
		Annual	0.03	0.004	0.005	0.005	0.005	0.004
Bargo	Sulphur dioxide (ppm)	Maximum 1-hour	0.2	0.01	0.01	0.01	0.02	0.012
		Maximum 24-hour	0.08	0.004	0.002	0.002	0.006	0.003
		Annual	0.02	0.0004	0.0004	0.0004	0.0004	0.0003

1. The Junee air quality monitoring station only measures TSP (DustTrak). It is not a National Environment Protection Measure (NEPM) performance monitoring station and does not conform to Australian Standards. Levels should be viewed as indicative only.
2. Exceedances of the air quality assessment criteria are shown in **bold**.

22.3.3 Sensitive receivers

Sensitive receivers are locations where people are likely to work or reside; this may include a dwelling, school, hospital, office or recreational areas. Sensitive receivers are located along the proposal site and are concentrated in the main urban centres of Albury, Wagga Wagga and Junee. There are 248 sensitive receivers within 50 m of the rail track (across 14 enhancement sites). Of these, 80 are residential. The sensitive receivers within 350 m are shown in Appendix A of Technical Paper 14: Air quality. A description of the land use patterns and sensitive receivers surrounding the proposal site (up to 2 km) is provided in Chapter 12: Land use and property and Chapter 15: Noise and vibration.

22.4 Impact assessment—construction

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

- annoyance due to dust deposition and visible dust plumes
- elevated airborne particulate matter concentrations due to onsite dust-generating activities or dust emissions from exposed, disturbed soil surfaces under high wind speeds
- increased concentrations of airborne particulate matter and NO_2 due to exhaust emissions from onsite diesel-powered vehicles and construction equipment.

22.4.1 Dust emissions

Dust impacts depend on the quantity and drift potential of the particles in the atmosphere. Larger particles (the larger particle fractions of total suspended particles (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 suspended in the air for longer and are 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 following activities have the potential to generate dust during construction:

- vegetation clearing and grubbing
- installation of temporary infrastructure and compounds
- earthworks such as rail formation works
- civil works at road and pedestrian bridges
- dirt, mud, or other materials tracked onto a paved public roadway by a vehicle leaving a construction site (generally referred to as egress)
- erosion of unsealed surfaces
- materials handling and loading at laydown areas, and vehicle movements on unsealed roads/surfaces.

Risk of impact from dust emissions

Construction activities at several enhancement sites were identified as having an overall medium- or high-risk rating (unmitigated) for certain activities due to the sensitivity of the surrounding receivers and the magnitude of the construction activities. These enhancement sites are:

- Albury Station and surrounds (Albury Station Yard clearances, pedestrian bridge, and Riverina Highway bridge sites) during demolition, earthworks and construction (all three of medium magnitude), as well as due to the potential for track-out by construction vehicles (large magnitude)
- Billy Hughes bridge during earthworks (medium magnitude)
- Culcairn Yard clearances due to the potential for track-out by construction vehicles (medium magnitude)
- Henty Yard clearances during earthworks and construction (both of medium magnitude), as well as due to the potential for track-out by construction vehicles (medium magnitude)
- Uranquinty Yard clearances during earthworks (medium magnitude)
- Pearson Street bridge during earthworks (medium magnitude) and due to the potential for track-out by construction vehicles (medium magnitude)
- Wagga Wagga Station and surrounds (sites between Docker Street and the western extent of the Wagga Wagga Yard) during demolition, earthworks and construction (all three of medium magnitude), as well as due to the potential for track-out by construction vehicles (large magnitude)
- Harefield Yard clearances during earthworks (medium magnitude)
- Junee Station and surrounds (Kemp Street bridge, Junee Yard clearances and Junee Station pedestrian bridge sites) during demolition, earthworks and construction (medium magnitude) and potential for track-out by construction vehicles (large magnitude)
- Junee to Illabo clearances during earthworks) and construction and potential for track-out by construction vehicles (all three of medium magnitude).

The volume of dust potentially generated during a typical workday would vary depending on the types of activities occurring at each construction site, the prevailing weather conditions (e.g. dry windy conditions increase the potential for wind erosion) and the controls that are implemented to reduce these emissions. Potential dust impacts would be temporary in nature and would be substantially reduced with the implementation of standard mitigation measures, as identified in section 22.6.

22.4.2 Other emissions to air

Vehicle emissions

Exhaust emissions generated during construction would be temporary and would not significantly contribute to emissions in the local area based on the likely number of machinery in use simultaneously, intermittent operation of the plant and equipment, their duration and intensity. Emissions would be adequately managed through the implementation of mitigation measures as detailed in section 22.6; as such, no long-term adverse impacts to air quality are anticipated.

Diesel fuel combustion from vehicle movements and onsite plant and machinery operation would generate carbon monoxide, nitrogen dioxide, sulphur dioxide and trace amounts of non-combustible hydrocarbons (i.e. VOCs and SVOCs) 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. Emissions generated from vehicles during the construction phase could be adequately and effectively managed through standard construction practices.

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

Fuel combustion emissions from plant and equipment within the enhancement sites would be intermittent and transient. Given the indicative 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), combustion emissions are not anticipated to significantly impact local air quality. Emissions could be adequately managed using standard management and mitigation measures that are proven to be effective

Detours for general traffic would be required for certain works, notably Edmondson Street, Wagga Wagga and Kemp Street, Junee. This would temporarily increase vehicle emissions along these roads, particularly during peak hours; however, adverse impacts are not expected given the estimated increase in traffic volumes along these roads (refer to section 5 of Technical Paper 14: Air quality for further detail).

Fugitive emissions

Fuel and some materials during handling and storage would 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. Given the low number of plant and machinery at each enhancement site, the expected volume of fuel and chemicals stored, handled and refuelled, fugitive emissions are expected to be minor and readily dispersed. In the event of a leak or spill, adverse impacts could occur for a short period of time depending on the material, volume and distance to sensitive receivers. These events are rare or may not occur during construction with the implementation of proper management and handling procedures.

Odour emissions

Odour emissions have the potential to be generated during excavation works if contaminated materials are found. 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 sensitive receivers.

22.5 Impact assessment—operation

22.5.1 Operational sources and characteristics

During operation, there would be an increase in the number of freight trains travelling through the enhancement sites. It is estimated that the average daily movement of freight trains would increase from 12 trains in 2020 up to 18 trains in 2025 and 20 trains in 2040. Diesel locomotives emit particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide, carbon monoxide, sulphur dioxide, VOCs and SVOCs. Air pollution from road and rail transport corridors decreases significantly with distance. The potential for air quality impacts due to this proposal would be greater where sensitive receivers are located adjacent to the rail alignment, such as in Albury, Wagga Wagga and Henty where private properties adjoin the rail corridor. In the vicinity of the enhancement sites, around 80 residential receivers are located within 50 m of the track (around 20 to 30 m from the rail track).

22.5.2 Normal operation emissions

The results of the Northern Sydney Freight Corridor Strathfield Rail Underpass Air Quality Assessment (Parsons Brinckerhoff, 2012) and the *Botany Rail Duplication Project Air Quality Assessment* (ARTC, 2019) were reviewed with respect to the potential air quality impacts of freight trains on the receiving environment. These studies have a range of key inputs specific to each project. The frequency and number of freight trains are key factors in addressing potential impacts on the receiving environment for this assessment.

The Northern Sydney Freight Corridor (NSFC) assessment included air quality modelling of a mix of 81 class, 82 class and 90 class diesel locomotives undertaking a minimum of 31 movements per day in each direction at 75 kilometres per hour (km/hr). The results of modelling indicated that the predicted levels for all assessed pollutants (nitrogen dioxide, sulphur dioxide, carbon monoxide, PM_{10}, $PM_{2.5}$ and benzene) were significantly below the impact assessment criteria at a distance of 50 m from the track. For particulate matter, the predicted increment at sensitive receivers for the 24-hour average for PM_{10} was 0.06μg/m^3 and $PM_{2.5}$ was 2μg/m^3, which represented 0.12 per cent and 8 per cent of the relevant assessment criteria (being 50μg/m^3 and 25μg/m^3, respectively).

The Botany Rail Duplication assessment included air quality modelling of a mix of diesel freight trains (NR class locomotives, (NR121) and 93 class locomotives) for five scenarios in 2019 and 10 years after opening (2034). The projected average daily locomotives travelling to and from Port Botany for the five scenarios ranged from 40 (2019) to 112 movements (by 2034), with trains speeds of 30 to 45 km/hr. The results of modelling indicated that the predicted levels for all assessed pollutants (nitrogen dioxide, sulphur dioxide, carbon monoxide, PM_{10}, $PM_{2.5}$ and benzene) were below the impact assessment criteria. For particulate matter, the predicted increment at sensitive receivers for the 24-hour average for PM_{10} and $PM_{2.5}$ was 0.07μg/m^3, which represented 1.4 per cent and 3 per cent of the assessment criteria (being 50μg/m^3 and 25μg/m^3 , respectively).

As the frequency of train movements in the assessment for both projects is greater than the total number of trains operating on the proposal, the increment concentrations from the proposal are expected to be lower and a smaller proportion of the relevant impact assessment criteria at receivers beyond 50 m from the rail corridor.

Currently, there is the potential for air quality impacts from existing operations at sensitive receivers within 50 m of the rail track given the proximity to the emission source. As outlined above, the NSFC modelling at 50 m indicated that the ground level concentrations for all assessed pollutants (incremental and cumulative) were below the relevant assessment criteria, with the highest contribution being eight per cent of the criterion (24-hour average for $PM_{2.5}$). Based on the results of the NSFC modelling at 50 m, it is predicted that impacts would be below the relevant assessment criteria for receivers within 50 m. Additionally, the proposal is projected to generate an increase of six freight trains per day along the route above existing levels in 2025 and up to eight freight trains in 2040. The projected freight train increases in 2025 and 2040 are below the projected freight train movements on the NSFC corridor (31 in each direction in 2026). Given the small increase in train movements in 2025 and 2040, 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 receivers within 50 m of the rail track.

The cumulative concentration for some pollutants (being the proposal plus background) would be dominated by background concentrations (i.e. PM_{10} and $PM_{2.5}$). The contribution from the proposal to the local air shed would be very low and would not adversely affect the local air quality environment. Overall, while the emissions associated with using existing rail line would increase due to the proposal, the concentrations would be low and below the relevant criteria as the total future train movements of the proposal is lower or similar to those for the above reference projects.

22.5.3 Train idling emission

Idling (waiting) of trains has the potential to generate air emissions. Idling of trains would occur at the Olympic Highway underbridge near Junee, where the rearranged track would change from double to single (north or south of the Olympic Highway underbridge). The nearest sensitive receiver (residence) is situated about 40 m north of the track at this location. The outcome of the review of the reference projects is:

- the Botany Rail Duplication (BRD) project Air Quality Assessment Report (ARTC, 2019) indicates that estimated emission rates for trains in the idle mode are much lower than in operating mode. As the estimated train movements for the proposal are much lower than the BRD project, emissions from the idling trains would also be lower. As such, pollutant ground level concentrations (GLCs) from these emissions are likely to be below relevant impact assessment criteria
- modelling completed as part of the Narromine to Narrabri Project (N2N) air quality assessment (ARTC, 2020c) indicates that one-hour NO_2 GLCs from emissions of two idling freight trains would comply with the one-hour NO_2 impact assessment criterion at a distance of approximately 25 m from the emission source. The closest sensitive receiver building to this section of track in Junee is located beyond 25 m to the track alignment, approximately 40 m from the track. As such, one-hour NO_2 impacts from the proposal would be expected to be lower than the N2N Project and below its assessment criterion
- modelling completed as part of the North Star to NSW/Queensland Border (NS2B) Air Quality Technical Report (ARTC, 2020d) indicates that the pollutant emission rates for idling trains (PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, and total VOCs) are less than one per cent of the total emissions and the predicted pollutant GLCs would comply with the relevant criteria for the scenario accounting for idling emissions. The NS2B modelling also included an assumption of average 17 trains per day, similar to or higher than the projected train volumes for the proposal.

Potential air quality impacts from idling trains at Junee are expected to be of similar or lower magnitude than the predicted ground level concentrations for the N2N and N2NB projects. All pollutants modelled were below their respective impact assessment criteria. In summary, the pollutant GLCs from idling train emissions at Junee are likely to be below their relevant impact assessment criteria and have minimal impact at the nearest sensitive receivers.

22.5.4 Road traffic emission

Standard ARTC maintenance activities would be undertaken during operations and there would be no change to the maintenance schedule as a result of the proposal. As such, there would be no change to the potential emissions to air from maintenance vehicles or emissions to air due to maintenance activities.

22.6 Mitigation and management

22.6.1 Approach to mitigation and management

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

22.6.2 Mitigation measures

Measures that would be implemented to address potential impacts on air quality are listed in Table 22-2.

TABLE 22-2 AIR QUALITY MITIGATION MEASURES

Stage	Ref	Impact/issue	Mitigation measure
Construction	AQ1	All dust-generating activities	Where visible dust is generated from onsite activities, watering (water cart or water sprays) and/or other appropriate measures will be implemented.

Effectiveness of mitigation measures

The proposed measures detailed in section 22.6.1 and section 22.6.2 are routinely employed on construction sites in NSW and are therefore expected to be effective in controlling emissions during construction. Ambient weather conditions, such as wind speed and direction and rainfall, would influence the potential for dust generation during construction. Weather conditions would be routinely observed to ensure appropriate mitigation measures are implemented or proposed to be in place when conditions change.

22.6.3 Interactions between mitigation measures

Mitigation measures in other chapters that are relevant to the management of air quality impacts include:

- Chapter 20: Soils and contamination, specifically details measures that address the management of soil erosion and any potential contaminated soils during construction
- Chapter 23: Waste management and resource use, specifically details measures that address appropriate handling and management of construction materials, hazardous materials or asbestos

Together, these measures would minimise the potential for air quality impacts of the proposal. There are no mitigation measures identified in the assessment of other environmental aspects that are likely to affect the assessment of air quality impacts.

22.6.4 Residual risk

Residual impacts are impacts of the proposal that may remain after implementation of the management and mitigation measures identified in Section 22.6.1 and Table 22-2.

The risks of dust impacts from demolition, earthworks, construction and track out activities associated with the enhancement sites where sensitive receivers 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 receivers 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.

Further information on the approach to the environmental risk assessment, including descriptions of criteria and risk ratings, is provided in Appendix E: Environmental risk assessment.

TABLE 22-3 RESIDUAL RISK MANAGEMENT

Stage	Potential impact	Pre-mitigated Rating	Mitigation measures[1]	Residual risk rating	Residual risk management[2]
Construction	Potential temporary impacts to local air quality due to emissions from vehicles or plant during construction, and the increase in vehicle movements during construction	Medium	CEMP	Low	N/A
Construction	Potential temporary impacts on local air quality due to dust generation (from exposed soil/stockpiles, excavation and vehicle movements)	High	AQ1, CEMP	Low	N/A

Stage	Potential impact	Pre-mitigated Rating	Mitigation measures[1]	Residual risk rating	Residual risk management[2]
Construction	Odours/emissions from disturbance of contaminated soils or other sources such as asphalt laying during road modification works	Low	CEMP	Low	N/A
Construction	Potential air quality impacts due to fugitive emissions (e.g. VOCs) from fuel/chemicals storage and handling.	Low	CEMP	Low	N/A
Operation	Increase in impacts on local air quality during operation from train emissions including idling trains	Low	N/A	Low	N/A
Operation	Temporary impacts during maintenance works due to emissions from vehicles or plant and generation of dust.	Low	Managed in accordance with ARTC procedures	Low	N/A

1. As described in Table 22-2.
2. Only residual risk rated medium and above to require management.