PART B

Impact assessment proposal infrastructure

INLAND RAIL

# CHAPTER B10

# Air quality

**Narromine to Narrabri**

Environmental Impact Statement

ARTC

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

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# B10. Air quality

This chapter provides the air quality impact assessment of the Narromine to Narrabri project (the proposal). It describes the existing environment, assesses the impacts of construction and operation on air quality, and provides mitigation measures.

## B10.1 Approach

A summary of the approach to the assessment is provided in this section, including the legislation, guidelines and/or policies driving the approach and the methodology used to undertake the assessment.

### B10.1.1 Legislative and policy context to the assessment

#### Relevant legislation, policies and guidelines

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

- The EP&A Act, POEO Act and the *Protection of the Environment Operations (Clean Air) Regulation 2010* (NSW) (the Clean Air Regulation)
- *National Environment Protection (Ambient Air Quality) Measure* (the Air NEPM)
- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2016) (the Approved Methods)
- *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (DEC, 2007)
- *Technical Framework—Assessment and Management of Odour from Stationary Sources in NSW* (DEC, 2006b)
- *1191: Protocol for Environmental Management: Mining and extractive Industries* (EPA Victoria, 2007).

#### Secretary's Environmental Assessment Requirements

The SEARs relevant to air quality, together with a reference to where they are addressed in the EIS, are provided in Appendix A.

### B10.1.2 Methodology

#### Study area

The study area for the assessment is the proposal site, as described in chapter A2, and a 3-kilometre (km) wide buffer around the proposal site to capture the potential for regional air quality impacts.

#### Key tasks

The assessment involved:

- Reviewing existing regional ambient air quality and meteorology, including:
  - Air quality data sourced from the NSW Department of Planning, Industry and Environment's air quality monitoring stations, located at Narrabri and Gunnedah, which are the closest stations to the proposal site
  - The National Pollutant Inventory maintained by the Australian Department of Agriculture, Water and the Environment, to identify any facilities that may be contributing to local/regional air quality conditions.
- Identifying appropriate air quality criteria based on relevant guidelines
- Undertaking a quantitative screening level construction air quality impact assessment, which involved:
  - Determining the separation distances from each key construction activity required to comply with the nominated air quality criteria
  - Identifying sensitive receivers near the proposal site that may be located within the separation distance.
- Qualitatively assessing the potential for air quality impacts during operation of freight trains
- Quantitatively assessing the potential for air quality impacts associated with idling of locomotives at crossing loops
- Recommending mitigation and management measures.

## Relevant pollutants

Air quality may be affected by a number of pollutants, each of which has different emission sources and effects on human health and the environment. The air quality assessment focused on the highest risk impacts with the potential to occur during construction and operation. During construction, there is the potential for impacts as a result of airborne particulate matter and dust deposition.

Fine particles associated with exhaust emissions from vehicles and plant used during construction activities are accounted for in the emission factors for earthmoving and handling used in the air quality assessment. Exhaust emissions during construction are expected to be discontinuous, transient and mobile.

Total suspended particulates and dust deposition are usually assessed against annual criteria; however, these criteria are less relevant to the proposal as construction works would be transient. As such, air quality was assessed in terms of distances at which relevant criteria are achieved at any time.

During operation, the highest-risk impacts are likely to occur from rail exhaust emissions as a result of locomotives idling on the crossing loops, with the main emissions for consideration being oxides of nitrogen and particulate matter.

## Assessment criteria

The air quality impact assessment criteria for the proposal are provided in Table B10.1 and have been derived from the approved methods. The criteria for particulate matter ($PM_{10}$), which has a 24-hour assessment criteria, is most relevant for assessing potential construction impacts. Dust deposition criteria are mainly used to assess the potential for amenity impacts. These criteria should be met at existing or future offsite sensitive receptors. Particulate and dust deposition levels are provided as cumulative local impacts, where the predicted impact of the proposal is added to the adopted background levels. The assessment has assumed that where the predicted cumulative impacts comply with criteria at a local level, the cumulative local and regional impacts would also comply.

Assessment criteria potentially relevant to operation (sulphur dioxide ($SO_2$), nitrogen dioxide ($NO_2$), $PM_{10}$, $PM_{2.5}$, carbon monoxide (CO), and benzene) are also provided in Table B10.1.

**TABLE B10.1 ADOPTED AIR QUALITY ASSESSMENT CRITERIA**

| Pollutant | Averaging period | Assessment criteria (µG/M$^3$) |
|---|---|---|
| Total suspended particulates | Annual | 90 |
| $PM_{10}$ | 24 hour | 50 |
| | Annual | 25 |
| $PM_{2.5}$ | 24 hour | 25 |
| | Annual | 8 |
| Deposited dust | Annual | 2 g/m$^2$/month[2] |
| CO | 15 minute | 100,000 |
| | 1 hour | 30,000 |
| | 8 hour | 10,000 |
| $NO_2$ | 1 hour | 246 |
| | Annual | 62 |
| $SO_2$ | 10 minute | 712 |
| | 1 hour | 570 |
| | 24 hour | 228 |
| | Annual | 60 |
| Benzene | 1 hour | 29 |

### B10.1.3 Risks identified

The environmental risk assessment for the proposal (see Appendix E) included consideration of potential air quality risks. Air quality risks with an assessed level of medium or above, identified by the environmental risk assessment, included:

- Emissions from vehicles or plant during construction
- Generation of dust during construction (from exposed soil/stockpiles, excavation and vehicle movements)
- Impacts on local air quality during operation from train emissions including idling trains at crossing loop locations
- Emissions from vehicles or plant and generation of dust during maintenance works.

This chapter considers these potential risks.

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 (see section A9.1), the SEARs and relevant guidelines and policies (as appropriate).

### B10.1.4 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 high-quality construction access road within the proposal site
- Minimising the area of disturbance.

## B10.2 Existing environment

### B10.2.1 Ambient (background) air quality

Regional air quality within the study area is mainly influenced by rural activities, vehicle emissions, mining and exploration activities. The National Pollutant Inventory lists seven sources of emissions within about 25 km of the proposal site. These facilities are listed in Table B10.2.

**TABLE B10.2 FACILITIES WITH EMISSIONS REPORTED TO THE NATIONAL POLLUTANT INVENTORY**

| Facility name | Address | Type of industry | Location in relation to proposal site |
|---|---|---|---|
| Narrabri CSG Project | 300 Yarrie Lake Road, Narrabri | Oil and gas extraction | Located directly adjacent |
| Wilga Park Power Station | Kiandool Lane, Narrabri | Electricity generation | About 6 km west |
| Cargill Processing Narrabri | Baranbar Street, Narrabri West | Oil and fat manufacturing | Less than 1 km east |
| Boland Petroleum Narrabri Depot | James Street, Narrabri | Mineral, metal and chemical wholesaling | About 2.5 km east |
| Lowes Petroleum Narrabri Depot | 8 Reid Street, Narrabri | Mineral, metal and chemical wholesaling | About 2 km east |
| Boral Narrabri Quarry | 939 Wave Hill Road, Eulah Creek | Construction material mining | About 25 km east |
| Narrabri Coal Mine—Baan Baa | Kurrajong Creek Road, Baan Baa | Coal mining | About 17 km east |

The nearest air quality monitoring stations that provide publicly available data are operated by the Department of Planning, Industry and Environment at Narrabri (about 5 km east of the proposal site) and Gunnedah (about 70 km east of the proposal site). Particulate concentrations ($PM_{10}$ and $PM_{2.5}$) are measured at both stations. Ambient air quality monitoring commenced at both stations in December 2017. As a result, only 2018 and 2019 provide complete years of data for each station; however, due to widespread fires throughout NSW in 2019, this year is not considered representative of background air quality for the region and ambient pollutant concentrations from 2018 have been used.

Background air quality values are provided in Table B10.3.

**TABLE B10.3 AMBIENT POLLUTANT CONCENTRATIONS MEASURED AT NARRABRI AND GUNNEDAH MONITORING STATIONS—2018**

| | | Pollutant concentration (µg/m$^3$) | |
|---|---|---|---|
| **Pollutant** | **Averaging period** | **Narrabri** | **Gunnedah** |
| $PM_{10}$ | 70th percentile 24-hour average | 14 | 20 |
| | Annual average | 14 | 19 |
| $PM_{2.5}$ | 70th percentile 24-hour average | 5.2 | 9.9 |
| | Annual average | 4.9 | 9.0 |
| $NO_2$ | 100th percentile 1-hour average | - | 70 |

A conservative approach was adopted for the assessment, and the 70th percentile $PM_{10}$ value was used to represent background air quality. This approach is in accordance with that adopted by the Victorian EPA's *1191: Protocol for Environmental Management: Mining and Extractive Industries* (2007), which uses a 70th percentile $PM_{10}$ 24-hour average to represent background levels when adding to a 24-hour average criteria. This approach is considered appropriate in the absence of a site-representative annual meteorological data set, which would have made hour-by-hour assessment of cumulative impacts possible.

The proposal site is located inland, significantly away from any concentrated sources of emissions such as those from major transport or industrial land uses. Additionally, $SO_2$ and CO are not measured routinely at Narrabri station, indicating that these are not considered key pollutants within the Narrabri air shed; therefore, due to the availability and quality of data as well as the location of the proposal site, the ambient background levels of gaseous pollutants (such as $SO_2$ and CO) were considered to be negligible, at a level of zero.

### B10.2.2 Local meteorology

Climate data was obtained from the Bureau of Meteorology (BoM) Narrabri Airport site (site number 054038) Coonabarabran Airport site (ID: 064017) and Dubbo Airport site (ID: 065070), which are about 5 km, 10 km and 30 km from the proposal site, respectively.

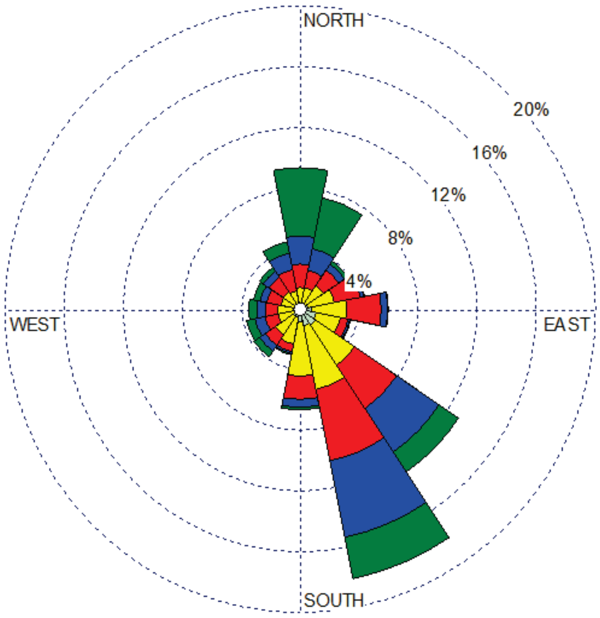
The data indicates that the study area has a warm temperate climate, with significant temperature variations between summer and winter. January is the hottest month at all sites, with a mean maximum temperature of 34.7 degrees Celsius at Narrabri, 31 degrees Celsius at Coonabarabran, and 33.3 degrees Celsius at Dubbo. The temperature drops to 18.0, 14.1 and 15.6 degrees Celsius in July in Narrabri, Coonabarabran and Dubbo, respectively. Most of the annual rainfall (572 mm in Narrabri, 684 mm in Coonabarabran and 583 mm in Dubbo) occurs in summer, with winter usually being drier.

Local meteorology depends on local topography, land use, vegetation, and watercourses and would vary along the proposal site. To conduct a conservative assessment, worst-case meteorology was assumed for dust dispersion, based on all possible wind directions and speeds.

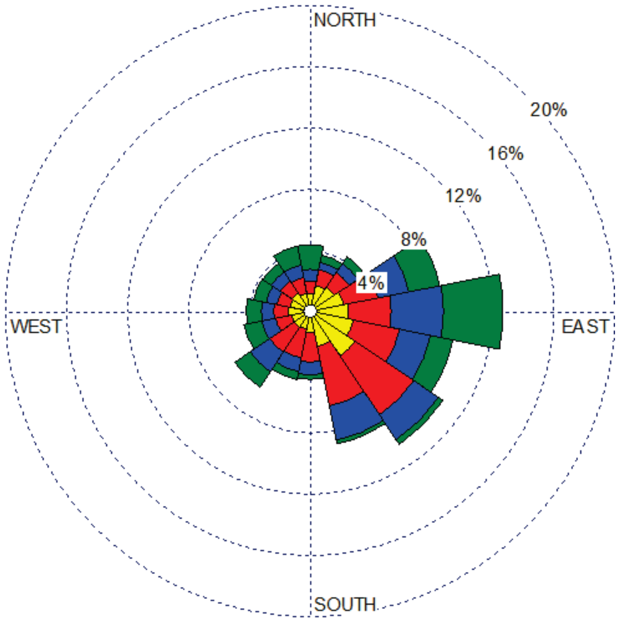
Five-year wind roses from the period of 2014 to 2018 were sourced for the study area for Narrabri, Coonabarabran and Dubbo airports. As shown in Figure B10.1, the five-year wind rose for Narrabri Airport shows calm, light, gentle and moderate winds occur for nearly 85 per cent of the time, with 15 per cent of wind above 6 m/s. High-speed wind conditions (greater than 6 m/s) are likely to lead to the highest rate of fugitive dust emissions or nuisance dust during construction, and are also those where pollutants are readily dispersed after emission. Most high winds occur from the north and south-east quadrants, suggesting that dust impacts would be more likely to occur opposite to these directions.

The five-year wind rose for Dubbo Airport shows that calm, light, gentle and moderate winds occur for nearly 82 per cent of the time, with 18 per cent of wind above 6 m/s. Most high winds occur from the east quadrant, suggesting that dust impacts would be more likely to occur opposite to this direction.

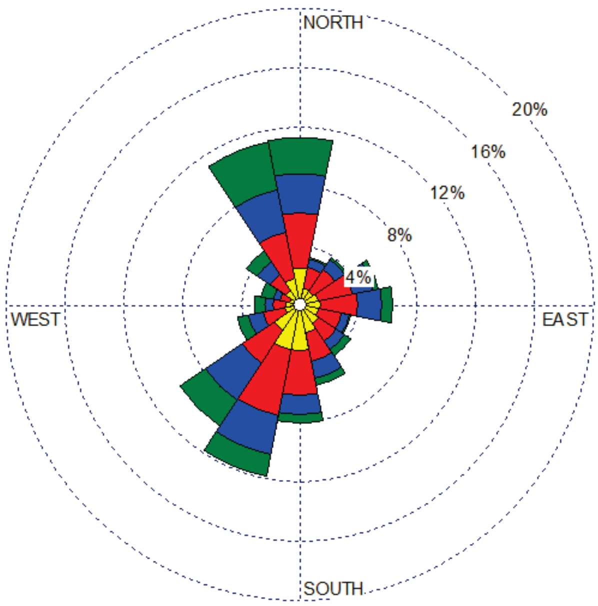
The five-year wind rose for Coonabarabran Airport shows that calm, light, gentle and moderate winds occur for nearly 85 per cent of the time, with 15 per cent of wind above 6 m per second (m/s). Most high winds occur from the north and south quadrants, suggesting that dust impacts would be more likely to occur opposite to these directions.




Wind rose for Narrabri Airport




Wind rose for Dubbo Airport




Wind rose for Coonabarabran Airport

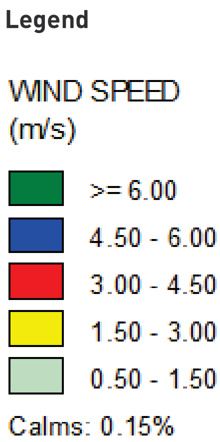



**FIGURE B10.1 WIND ROSES FOR NARRABRI, COONABARABRAN AND DUBBO AIRPORT BOM SITES (FIVE-YEAR AVERAGE)**

### B10.2.3 Sensitive receivers

Sensitive receivers are locations where people live and work that would be sensitive to changes in air quality for reasons of human health or amenity. Some environmental features, such as wetlands, may also be considered sensitive to changes in air quality, particularly dust.

Residences, schools, sports grounds, hospitals, offices and public recreational areas are considered to be sensitive receivers in relation to the potential health and amenity impacts of dust. Most of the proposal site traverses sparsely settled rural land but the northern part of the proposal site is surrounded by a number of large reserves. The potential for indirect impacts on biodiversity as a result of dust generation are considered in chapter B1. In some areas, the proposal site would be located within/close to towns and residences.

Sensitive receivers within 3 kms of the proposal site were initially identified using aerial imagery and geospatial information and included the location of the temporary workforce accommodation. The list of sensitive receivers was then refined based on the outcome of the dispersion modelling, which determined the separation distances that needed to be applied for each type of activity. Therefore, sensitive receivers with the potential to be impacted due to the proposal are those located within the separation distances. This is discussed further in sections B10.3 and B10.4.

Sensitive receivers are shown on the maps in Part E Map Book: Environmental baseline.

## B10.3 Impact assessment—construction

The emission of particulate matter and the subsequent impact on sensitive receivers has been identified as the key risk to air quality associated with construction. The processes that have the potential to generate particulate matter during construction are:

- Mechanical disturbance—dust emissions as a result of the operation/movement of construction vehicles and equipment
- Wind erosion—dust emissions from exposed, disturbed soil surfaces under high wind speeds.

Fine particle emissions associated with exhausts from mobile plant and stationary engines used during construction activities were accounted for in the study's dust emission factors for earthmoving and handling.

Construction of the proposed road and rail infrastructure would consist of relatively similar tasks such that the appropriate separation distance from each feature would be the same.

### B10.3.1 Dust dispersion modelling

A screening level assessment was undertaken with consideration of the approved methods. An emissions inventory for potential particulate sources was derived for the proposal and is provided in Appendix M. Table B10.4 summarises the estimated total dust emissions from construction of the road and rail infrastructure, including the following scenarios:

- Fixed batching plants at the following locations:
  - Structure compounds at the Macquarie River, Castlereagh River and Narrabri Creek/Namoi River bridges
  - The general compound at the crossing of Gwabegar Road, given its remoteness to the other sites.
- Mobile batching plants at general compounds.

The locations of the fixed and mobile batching plants are shown in Figure B10.2.

The estimated dust emissions associated with the key construction infrastructure (such as borrow pits and fixed concrete plants in multi-function compounds) are provided in Part C.

The predicted worst-case 24-hour $PM_{10}$ and $PM_{2.5}$ concentrations are presented in Appendix M as concentration versus distance graph for construction of the road and rail infrastructure.

TABLE B10.4 ESTIMATED EMISSIONS DURING CONSTRUCTION

| Proposal component—Source of emission | Assumed dimensions for the purposes of the assessment | Total emissions of $PM_{10}$ (grams per second) | Total emissions of $PM_{2.5}$ (grams per second) | Separation distances |
|---|---|---|---|---|
| Construction of rail and road infrastructure | 40 x 100 m | 0.00000951 | 0.00000095 | 50 m |
| Fixed concrete batching plants (200 $m^3$/hour) | 100 x 100 m | 1.9 | 0.19 | 375 m |
| Mobile concrete batching plants (50 $m^3$/hour) | 60 x 60 m | 0.38 | 0.038 | 125 m |

There is some potential for overlapping impacts from various activities that would be carried out at similar locations at similar times; however, this risk would only apply when the activities being undertaken are close enough to each other such that a sensitive receiver location is located downwind of both. This would only be relevant to sensitive receivers within close proximity to the sources of interest. Given the low number of sensitive receivers within close proximity to the proposal, the risk of cumulative impacts during construction is considered to be low.

### B10.3.2 Modelling results

#### Construction of rail and road infrastructure

The results show that:

- The criteria of 50 µg/m3 for $PM_{10}$ may be exceeded at a distance of up to 50 m from the proposal site
- The criteria of 25 µg/m3 for $PM_{2.5}$ may be exceeded at a distance of up to 10 m from the proposal site, under worst-case conditions.

As a result, a 50 m separation distance from work sites is considered appropriate for the protection from adverse air quality impacts. There are 25 sensitive receivers located within 50 m of where the road and rail infrastructure would be constructed, as shown in Figure B10.2.

Potential impacts along the proposal site would generally be short term, as construction works would move along the proposal site, limiting the duration of potential impacts at any one location.

#### Use of the fixed concrete batching plants

The results show that:

- The criteria of 50 µg/$m^3$ for $PM_{10}$ may be exceeded at a distance of up to 475 m from the location of fixed concrete batching plants
- The criteria of 25 µg/$m^3$ for $PM_{2.5}$ will not be exceeded at any location due to operation of fixed concrete batching plants.

As a result, a 375 m separation distance from fixed concrete batching sites is considered appropriate for the protection from adverse air quality impacts. There are no sensitive receivers located within 375 m of where the fixed concrete batching plants would be located.

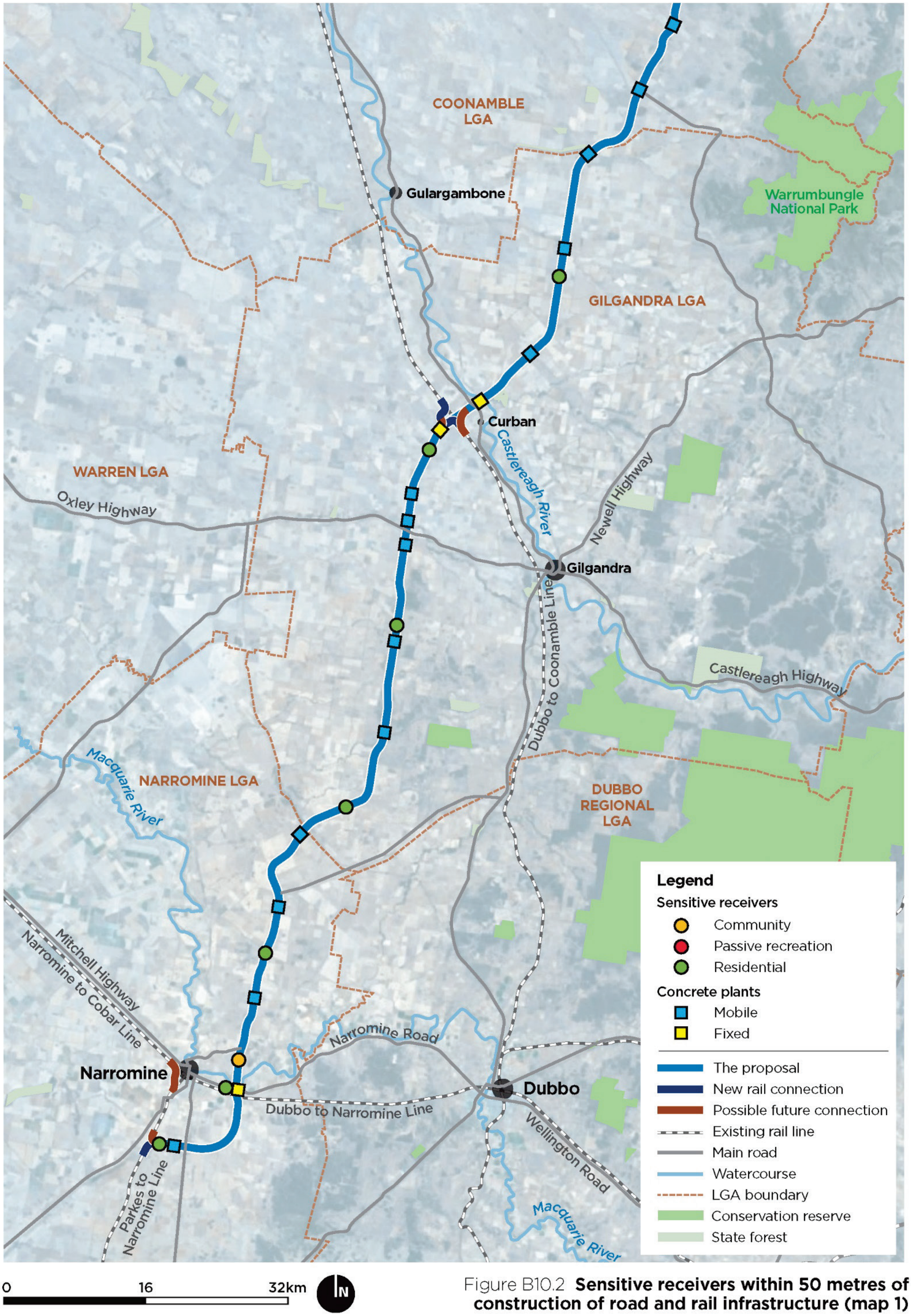



Figure B10.2 **Sensitive receivers within 50 metres of construction of road and rail infrastructure (map 1)**

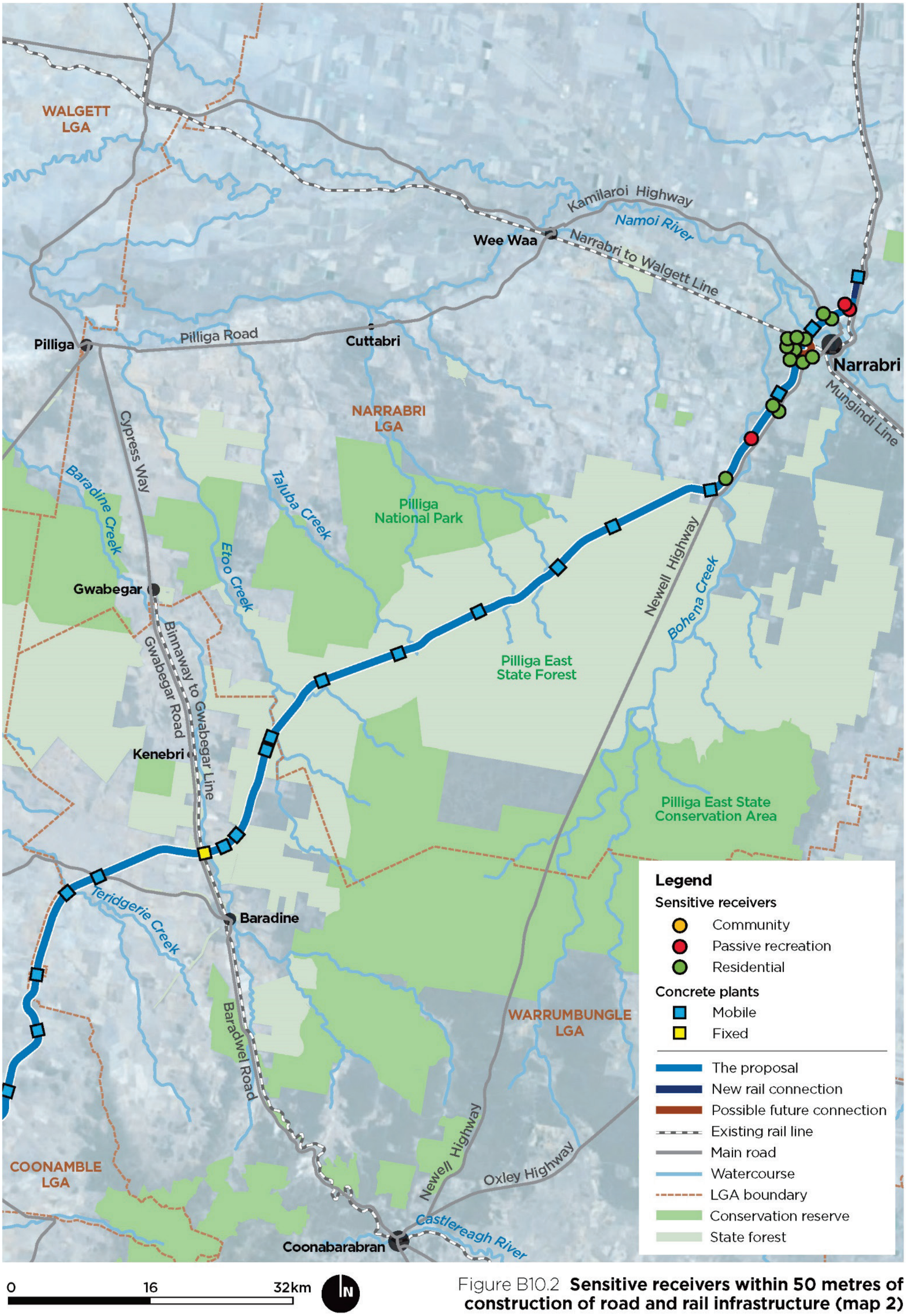



Figure B10.2 **Sensitive receivers within 50 metres of construction of road and rail infrastructure (map 2)**

### Use of the mobile concrete batching plants

The results show that:

- The criteria of 50 μg/$m^3$ for $PM_{10}$ may be exceeded at a distance of up to 125 m from the location of mobile concrete batching plants within the proposal site
- The criteria of 25 μg/$m^3$ for $PM_{2.5}$ would not be exceeded at any location due to operation of mobile concrete batching plants within the proposal site.

As a result, a 125 m separation distance from mobile concrete batching sites is considered appropriate for protection from adverse air quality impacts. There are no receivers located within 125 m of the mobile batching plants located at general compounds.

Where receivers have been identified as potentially impacted by construction of the rail and road infrastructure, including use of the concrete batching plants, the mitigation and management measures identified in section B10.5 would be implemented.

Given the small scale of the local exceedances, and with implementation of the proposed mitigation measures, cumulative local and regional impacts are not anticipated.

## B10.4 Impact assessment—operation

During operation, there would be an increase in the number of freight trains travelling in the vicinity of the towns of Narromine and Narrabri. Operation would also result in freight trains operating along the new rail corridor in areas that are currently mainly used for rural purposes. It is estimated that Inland Rail would be trafficked by an average of 10 trains per day (both directions) in 2025, increasing to about 14 trains per day (both directions) in 2040. This rail traffic would be in addition to the existing rail traffic using other lines that the proposal interacts with (see section A2.3).

Diesel locomotives, like trucks and cars, emit nitrogen oxides and particulate matter to the air. Air quality impacts from busy rail corridors are generally only an issue in densely populated areas with poor outdoor air circulation. *Development near rail corridors and busy roads—interim guideline* (Department of Planning, 2008) suggests that air quality should be a design consideration within 20 m of a freeway or main road with moderate congestion levels. The guideline provides no specific reference to a distance from rail corridors; however, it is noted that air pollution from transport corridors decreases significantly with distance.

The majority of the proposed rail corridor traverses a rural area with few sensitive receivers and low background emission levels compared to other transport corridors in NSW. The potential for air quality impacts would be greater near the towns of Narromine and Narrabri, which have the greatest density of sensitive receivers close to the new corridor.

The results of the *Northern Sydney Freight Corridor Strathfield Rail Underpass Air Quality Assessment* (Parsons Brinckerhoff, 2012) were reviewed with respect to the potential air quality impacts of freight trains. The assessment included air quality modelling of a mix of 81 class, 82 class and 90 class diesel locomotives undertaking a minimum of 32 movements per day (16 in each direction) at 75 km per hour. The results of modelling indicated that for all assessed pollutants ($NO_2$, $SO_2$, CO, $PM_{10}$, $PM_{2.5}$ and benzene) the predicted levels were significantly below the impact assessment criteria at a distance of 50 m from the track.

The predicted increment of $PM_{2.5}$ was 2 μg/$m^3$, which complied with the assessment criteria at all sensitive receivers. The frequency of train movements in the assessment was substantially greater than for the proposal. Additionally, the annual average background concentrations of particulate matter in Narrabri, and maximum measured $NO_2$ concentration in Gunnedah described in section B10.2.1, were both lower than the background levels referred to in the 2012 reference study. As such, the findings apply to the proposal as a conservative overestimate.

As the levels of operational rail traffic along the proposal site would be much lower than for the Northern Sydney Freight Corridor, the operational emissions are expected to be much lower. The emissions associated with using existing rail corridors would increase as a result of the increase in the number of trains travelling along the corridor; however, the concentrations are still expected to be below the relevant impact assessment criteria.

The proposal may result in an overall improvement to air quality within the study area as decreasing the number of heavy vehicles using major transport routes, such as the Newell Highway, would reduce air pollution for receivers along these routes.

A quantitative assessment (see Appendix M) was carried out for potential impacts associated with the idling of freight trains at crossing loop locations within the proposal. Air dispersion modelling was carried out based on $NO_2$ emissions from two locomotives idling at each crossing loop. The modelling predicted compliance with the $NO_2$ criteria at a distance of approximately 25 m from the emission source. An assessment of separation distances was carried out and did not identify any receivers within 25 m of the proposed crossing loop locations. As such, operational impacts associated with trains idling at crossing loops are considered negligible.

No significant air quality impacts are predicted as a result of the proposed road realignments and other road changes, as no major changes to traffic conditions are expected. Emissions from road are expected to remain similar to the existing situation.

## B10.5 Mitigation and management

### B10.5.1 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. Further information on the CEMP is provided in chapter D5. The requirements for the air quality management plan are discussed in the CEMP outline provided in Appendix I.

The estimated water requirements (described in section A8.10.2) have considered the use of water for dust suppression during construction; however, further consideration would be undertaken during detailed design regarding potential dust suppression methods that minimise the use of water. This could include reusing water from the proposal site (e.g. sedimentation basins) or the use of alternative dust suppression methods.

During operation, air quality would be managed to achieve compliance with the operational environment protection licence.

With implementation of the management approach noted above and the mitigation measures provided in Table B10.5, the proposal is expected to comply with the relevant regulatory framework, specifically the POEO Act and the Protection of the Environment Operations (Clean Air) Regulation (2010).

#### 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.

#### Interaction between measures

Mitigation measures to control air quality impacts may overlap with the measures proposed for the control of erosion and sedimentation (described in chapters B4 and B5), as the major pollutant of concern is dust.

All mitigation measures for 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.

### B10.5.2 List of mitigation measures

Measures that will be implemented to address potential impacts on air quality are listed in Table B10.5.

**TABLE B10.5 AIR QUALITY MITIGATION MEASURES**

| Stage | Ref | Impact/issue | Mitigation measures |
|---|---|---|---|
| Construction | AQ1 | *General air quality impacts* | An air quality management plan would be prepared and implemented as part of the CEMP. It would include measures, processes and responsibilities to minimise the potential for air quality impacts on the local community and environment during construction. |
| Construction [continued] | AQ2 | *Construction activities and earthworks that may cause dust impacts* | Where sensitive receivers are located within the separation distances 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. |
| Operation | AQ3 | *Locomotive emissions* | The proposal would be managed in accordance with the air quality management requirements specified in the environmental protection licences. |
| | AQ4 | *Impacts during track maintenance* | Maintenance service vehicles and equipment would be maintained and operated in accordance with the manufacturer's specifications. |

### B10.5.3 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 (see sections A7.2 and A8.1)
- Specific measures to mitigate and manage identified potential impacts (see sections B10.5.1 and B10.5.2).

The key potential air quality issues and impacts originally identified by the environmental risk assessment (see chapter A9) these mitigation measures) is rated using the same approach as the original environmental risk assessment (see section A9.1) are listed in Table B10.6. 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 section A9.1.

The potential issues and impacts identified by the environmental risk assessment were considered as part of the air quality impact assessment, summarised in sections B10.3 and B10.4. The mitigation and management measures (listed in Table B10.5) 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. The approach to managing significant residual impacts (considered to be those rated medium or above) is also described.

**TABLE B10.6 RESIDUAL IMPACT ASSESSMENT—AIR QUALITY**

| Assessment of Pre-mitigated risk (see section A9.1 and Appendix E) | | | | | Mitigation measure (see Table B10.5) | Residual impact assessment | | | |
|---|---|---|---|---|---|---|---|---|---|
| Phase | Potential impacts | Likelihood | Consequence | Risk rating | | Likelihood | Consequence | Risk rating | How residual impacts will be managed[1] |
| Construction | Emissions from vehicles or plant during construction | Likely | Minor | Medium | AQ1 | 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 | AQ1 and AQ2 | Unlikely | Minor | Low | n/a |
| Operation | Impacts on local air quality during operation from train emissions including idling trains at crossing loop locations | Possible | Minor | Medium | AQ3 | Unlikely | Minor | Low | n/a |
| | Emissions from vehicles or plant and generation of dust during maintenance works | Likely | Minor | Medium | AQ4 | Unlikely | Minor | Low | n/a |

Note: 1. For residual impacts with a significance of medium or above.