# 16 Air Quality

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## 16.1 Introduction

The purpose of this chapter is to assess air quality impacts associated with the project. This chapter outlines the existing air environment surrounding the project in relation to local air quality, followed potential impacts from the construction, operation and maintenance of the project and a discussion of proposed mitigation measures.

The project passes within 200 metres of a number of residential dwellings and sensitive receptors.

Air pollutants considered in this assessment include nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), fine particles ($PM_{10}$) and nuisance dust.

Greenhouse gas emissions are considered in this chapter separately to other local air pollutants. There are strong linkages between this Chapter and **Chapter 17, Climate and natural disasters.**

### 16.1.1 Aims

The aim of this chapter is to describe the existing air environment, particularly in relation to nuisance dust, fine particulate matter ($PM_{10}$) and oxides of nitrogen (NOx), and consider potential changes in air quality during the construction and operation of the project.

The potential effects of air emissions to local air quality throughout construction and operation are examined. A qualitative assessment has been made of likely effects at potentially sensitive receptors such as residential, industrial and agricultural properties considered particularly sensitive to air emissions. The discussion of potential impacts comprises both normal and worst-case conditions.

## 16.2 Relevant legislation and policy

### 16.2.1 National Environment Protection Measures

National Environment Protection Measures (NEPMs) are broad framework-setting statutory instruments defined in the *National Environment Protection Council (Queensland) Act 1994*. NEPMs outline agreed national objectives for protecting or managing particular aspects of the environment. There are two NEPMs relevant to this project, comprising:

- Ambient Air Quality NEPM
- National Pollutant Inventory NEPM.

#### Ambient Air Quality NEPM

The National Environment Protection (Ambient Air Quality) Measure (Air NEPM) sets out national air quality standards and goals for six different pollutants. These standards aim to ensure ambient air quality that allows for the adequate protection of human health.

The Air NEPM is a regulatory requirement similar to the environmental policies under the *Queensland Environmental Protection and Biodiversity Act 1994.*

The key pollutants of concern in the Air NEPM are:

- carbon monoxide (CO)
- nitrogen dioxide ($NO_2$)
- photochemical oxidants (as ozone) ($O_3$)
- sulfur dioxide ($SO_2$)
- lead (Pb)
- fine particles as $PM_{10}$ (particles of 10µm equivalent aerodynamic diameter or less).

Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect human health (i.e. effects occur after a period of prolonged exposure to elevated concentrations) and others have standards expressed as 24- hour, eight-hour, four-hour and one-hour average concentrations due to the acute way in which they affect health (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations (e.g. nitrogen dioxide and photochemical oxidants).

Particles as $PM_{2.5}$ (particles of 2.5µm equivalent aerodynamic diameter or less) have advisory standards and goals (shown in **Table 16.2.1a**) as sufficient data needs to be gathered nationally to enable a review of the potential health impacts of $PM_{2.5}$ and the suitability of the proposed standards.

**Table 16.2.1a** and **16.2.1b** Advisory reporting standards and goal for particles as $PM_{2.5}$ set out the national air quality standards for the pollutants relevant to this chapter.

*Table 16.2.1a: Relevant standards and goal for pollutants other than particles as PM2.5*

| Pollutant | Averaging period | Maximum concentration | Goal within 10 years* maximum allowable exceedences |
|---|---|---|---|
| Carbon monoxide | 8 hours | 9.0 ppm | 1 day per year |
| Nitrogen dioxide | 1 hour | 0.12 ppm | 1 day per year |
| | 1 year | 0.03 ppm | None |
| Sulphur dioxide | 1 hour | 0.20 ppm | 1 day per year |
| | 1 day | 0.08 ppm | 1 day per year |
| | 1 year | 0.02 ppm | None |
| Particles as $PM_{10}$ | 1 day | 50 µg/m³ | 5 days per year |

*Table 16.2.1b: Advisory reporting standards and goal for particles as PM2.5*

| Pollutant | Averaging period | Maximum concentration | Goal |
|---|---|---|---|
| Particles as $PM_{2.5}$ | 1 day<br>1 year | 25 µg/m³<br>8 µg/m³ | Goal is to gather sufficient data nationally to facilitate a review of the Advisory Reporting Standards as part of the review of this measure which has commenced. |

#### National Pollutant Inventory (NPI) NEPM[1]

The National Environment Protection goals established by the NPI NEPM are to assist in the reduction of existing and potential impacts of emissions of pollutants. They are also in place to assist government, industry and the community in achieving the desired environmental outcomes of the NEPM by providing a basis for:

- the collection of a broad base of information on emissions of substances to air, land and water on the publicly available reporting list
- the dissemination of information collected to all sectors of the community in an accessible and transparent form.

The NEPM requires industrial facilities to report emissions of 90 different substances when emissions are deemed to be above threshold levels. Individual substance emissions are reported as total mass of pollutant emitted on an annual basis. The reported emissions from each facility are compared against the maximum emission of that substance from all of the facilities reported on the NPI, on a scale of one to 100 (from lowest to highest). If the total emissions of a substance is 10 percent of the maximum reported to the NPI, the emission ranking would be 10; if the total emission is 95 percent of the maximum, the ranking would be 95. A score of 100 would mean that the facility in question is the highest facility emitter of that substance.

### 16.2.2 Environmental nuisance laws[2]

In 2000, the Environment Protection Regulation 1998 (Qld) (EP Regulation) was amended to include part 2A, Environmental Nuisance, which includes offences for release of dust from construction of clearing activities and provisions for serving nuisance abatement notices on parties creating nuisance dust.

#### Environmental Protection (Air) Policy 2008

The Environmental Protection (Air) Policy 2008 (EPP (Air)) sets out a schedule of maximum ambient pollutant concentrations (schedule 1, section 8) consistent with the National Environment Protection (Ambient Air Quality) Measure (Air NEPM) for various substances and their associated environmental values (as per Part 3, section 7). These substances include oxides of nitrogen (NOx), particulates (PM10), sulfur dioxide (SO2), carbon monoxide (CO), ozone (O3) and lead (Pb).

The purpose of this policy is to:

- identify environmental values to be enhanced or protected
- and indicators and air quality objectives for enhancing or protecting environmental values
- provide a framework for making consistent, equitable and informed decisions about the air environment.

Emissions of these pollutants are required to be controlled to ensure the standards are not breached. Discharges to atmosphere are administered through licence conditions for Environmentally Relevant Activities under the EP Regulation.

Emissions of pollutants not covered by this policy are covered by the Air NEPM. From January 2007, however, air pollutant concentrations in central Queensland have been measured against the Air NEPM.

#### Air Toxics NEPM[3]

The Air Toxics NEPM is primarily concerned with the collection of data on ambient levels of formaldehyde, toluene, xylene, benzene and polycyclic aromatic hydrocarbons (PAH) at locations where elevated levels are expected to occur and there is a likelihood that significant population exposure could occur including clusters of industrial sites, heavily trafficked or congested roads, and areas affected by wood smoke.

The NEPM includes monitoring investigation levels for the five air toxics to assist jurisdictions in the interpretation of monitoring data as presented in **Table 16.2.2**. It should be noted that the monitoring investigation levels do not apply as design criteria or emission limits for individual point sources. They have been established for use in assessing the significance of the monitored levels of air toxics with respect to protection of human health.

1 *National Environment Protection (National Pollutant Inventory) Measure, as varied June 20 2000, National Environment Protection Council, June 2000*

2 *Part 2A Environmental Nuisance, Environmental Protection Regulation 1998, Environmental Protection Act 1994, Reprint No 6B, Queensland Government, Reprinted as in force 1 July 2007*

3 *National Environment Protection (Air Toxics) Measure, National Environment Protection Council, December 2004*

*Table 16.2.2: Air Toxics NEPM monitoring investigation levels*

| Pollutant | Averaging period | Monitoring investigation level |
|---|---|---|
| Benzene | Annual | 0.003 ppm |
| Benzo(a)pyrene (as a marker for Polycyclic Aromatic Hydrocarbons) | Annual | 0.3 ng/$m^3$ |
| Formaldehyde | 24 hr | 0.04 ppm |
| Toluene | 24 hr<br>Annual | 1 ppm<br>0.1 ppm |
| Xylene (as total or ortho, meta and para isomers) | 24 hr<br>Annual | 0.25 ppm<br>0.2 ppm |

#### State Interest Planning Policy for Air Quality in Planning Schemes

The State Interest Planning Policy for Air Quality in Planning Schemes (Air Quality SIPP) outlines the Department of Environment and Resource Management's interests in terms of air quality as a planning matter in Queensland. The Air Quality SIPP interprets existing legislation, policies, strategies and plans in planning terms.

The key aim of the Air Quality SIPP is to 'protect or enhance Queensland's air quality while allowing for ecologically sustainable development'. The objectives of the Air Quality SIPP are to ensure that valuable features of the air environment are identified in planning schemes and to protect and enhance the air environment through the setting of objectives and assessment provisions in planning schemes.

#### Exposure standards for atmospheric contaminants in the occupational environment[4]

There are currently no standards relating to nuisance dust in Queensland or Australia, aside from occupational exposure limits. The recommended exposure standard for dust in general is set at 10 mg/m3 TWA[5] in an occupational setting.

## 16.3 Methodology

### 16.3.1 Review of existing information

An assessment of the baseline or existing air quality in the project area has been based on a desktop review of the following:

- local climatic conditions data from the Bureau of Meteorology
- regional air quality data from the former Environmental Protection Agency's South East Queensland Regional Air Quality Strategy
- air quality monitoring data from the former Environmental Protection Agency's monitoring station located at Mountain Creek
- air quality data for Caloundra City Council (now the Sunshine Coast Regional Council) local government area obtained from the National Pollutant Inventory
- relevant policy and legislation.

#### Information review (existing reports)

A number of reports pertaining to the project and surrounds were assessed for relevance and used for general background information, including:

- SEQ *Infrastructure Plan and Program* 2008 – 2026
- *Rail Network Strategy for Queensland* 2001 – 2011
- Caboolture to Beerburrum Community Infrastructure Designation, Final Assessment Report (QR Limited, 2006)

#### Spatial data (mapping)

Mapping of the route was reviewed in order to assess the nature and proximity of the nearest sensitive receptors to the project.

#### Databases

The following publically available data sources were reviewed for the purposes of this assessment:

- Department of Environment and Resource Management website
- Ambient Air Quality Monitoring in Queensland: 2005 Annual Summary and Trend Report
- Queensland 2007 Air Monitoring Report (July 2008)
- Queensland 2006 Air Monitoring Report
- Queensland 2005 Air Monitoring Report
- Queensland 2004 Air Monitoring Report
- Queensland 2003 Air Monitoring Report
- National Pollutant Inventory website[6]
- Bureau of Meteorology website[7]

4 *Guidance Note on the Interpretation of Exposure Standards for Atmospheric Contaminants in the Occupational Environment, NOHSC 2008 (1995), 3rd Edition.*

5 *TWA = time weighted average; average exposure over a five (x5) eight hour working days*

6 *www.npi.gov.au*

7 *www.bom.gov.au*

### 16.3.2 Limitations of study

This assessment has been based on the following assumptions and limitations:

- Air dispersion modelling has not been carried out as part of this assessment, as given the nature of the project, it is assumed that the most noticeable air quality impacts will be relatively short-lived impacts associated with the construction phase of the project. This being said, emission factors for diesel locomotives for CO, NOx¬, PM10 and SO2 are considered unreliable[8] therefore it not possible to precisely model the operational air quality impacts of the project.
- Broad estimates of the types and approximate number of vehicles required in relation to the construction and operation of the project have been made. These have been used in the process of estimating the likely impact on the air environment from the project.
- It is assumed that locomotives on the project will be electric locomotives (CityTrain and some TiltTrain passenger services) and diesel locomotives for freight services, TravelTrain services and some TiltTrain services.
- The Climate Change Impact Statement Working Paper summaries the limitations and assumptions relevant to the Greenhouse gas, (GHG) calculation methods applied for this project.

### 16.3.3 Assessment of impacts

Potential air quality impacts have been assessed using significance criteria as outlined in **Table 16.3.3**.

*Table 16.3.3: Air quality significance criteria*

| Significance | Criteria |
|---|---|
| High Adverse | These effects are likely to be important considerations at a regional or local scale and are also potential concerns to the project, depending upon the relative importance attached to the air quality during the decision-making process.<br><br>Mitigation measures and detailed design for construction work are unlikely to remove all of the effects upon the affected communities or interest.<br><br>Major detrimental effect on local air quality, in relation to short-term and long-term local air quality standards (National Environment Protection (Ambient Air Quality) Measure (Air NEPM) and Qld Air Quality Goals as set out in EPP (Air) 2008), i.e. exceedence of standards. |
| Moderate Adverse | These effects, while important on a local scale, are not likely to be key decision-making issues. They represent issues where effects will be experienced, but mitigation measures and detailed design for construction work may ameliorate/enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.<br><br>Moderate detrimental effect on local air quality, in relation to short-term and long-term local air quality standards (Air NEPM and Qld Air Quality Goals).<br><br>Within 10% of standard, or increase in ambient pollutant levels by greater than 10%. |
| Low Adverse | These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Are of relevance in the detailed design for construction phase of the project, however, and consideration of mitigation or compensation measures.<br><br>Minor detrimental effect on local air quality, in relation to short-term and long-term local air quality standards (Air NEPM and Qld Air Quality Goals). |
| Negligible | No appreciable impact on local air quality with effects beneath levels of perception, within normal bounds of variation or within the margin of forecast error. |
| Beneficial | Beneficial effect on local air quality in relation to short term and long term local air quality. Predicted ambient air quality concentrations with the project are result in a reduction of pollutant levels compared to the 'do nothing scenario'. |

Initial impacts have been identified and described based on the absence of mitigation or management (**potential impacts**). Suitable mitigation or management measures have then been noted (**proposed design/ mitigation/management measures**) and the **residual impacts** have been described and assessed based on the significance criteria.

## 16.4 Description of environmental conditions

This section defines the baseline air quality environment for the assessment provides a review of:

- existing air pollution sources in the area
- local meteorological conditions
- background monitoring data for the area
- sensitive receptors that may potentially be impacted by the project.

Existing or baseline ambient air quality refers to the concentration of relevant substances that are already present in the environment. These substances come from various sources, such as industrial processes, commercial and domestic activities, traffic and natural sources.

8 *Emissions Estimation Technique Manual for Aggregated Emissions from Railways*

### 16.4.1 Air pollution sources

The National Pollutant Inventory (NPI) database was reviewed for relevant pollutant emissions. A search of the NPI for postcode 4550, Landsborough, (for the reporting period 2006 – 2007) indicates that the top source of pollutant emissions in the area is from food product manufacturing (approximately 25%), with the top pollutant emissions in the area being CO (approximately 2,000,000 kg/year), primarily from motor vehicles. This is followed by total emissions of total Volatile Organic Compounds (approximately1,000,000 kg/ year) primarily from biogenics (or emissions from plant sources), approximately 380,000 kg/ year of NOx primarily from motor vehicles and approximately 160,000 kg/ year of PM10 primarily from food product manufacturing.

For the 4553 postcode, which includes Mooloolah, the NPI indicates that there are a range of sources of pollutant emissions in the area, with approximately 22% coming from motor vehicles. The top pollutant emissions in the area are reported as being:

- CO (approximately 2,800,000 kg/ year), primarily from motor vehicles
- NOx (approximately 440,000 kg/ year) primarily from motor vehicles
- PM10 (approximately 54,000 kg/ year) primarily from burning activities and wildfire.

For the 4554 postcode, which includes Eudlo, the NPI indicates that there are also a range of sources of pollutant emissions in the area, with approximately 24% coming from motor vehicles. The top pollutant emissions in the area are reported as being:

- Total Volatile Organic Compounds (approximately 790,000 kg/ year), primarily from biogenics
- CO (approximately 390,000 kg/ year), primarily from motor vehicles
- NOx (approximately 62,000 kg/ year), primarily from motor vehicles.

For the 4555 postcode, which includes Palmwoods, the NPI indicates that the top source of pollutant emissions in the area is from motor vehicles (approximately 26% of emissions). The top pollutant emissions in the area are reported as being:

- CO (approximately 1,100,00 kg/ year), primarily from motor vehicles
- Total Volatile Organic Compounds (approximately 830,000 kg/ year), primarily from biogenics
- Ammonia (approximately 23,000 kg/ year), all from livestock.

For the 4559 postcode, which includes Woombye, the NPI indicates that there are a range of sources of pollutant emissions in the area, with approximately 24% coming from motor vehicles. The top pollutant emissions in the area are reported as being:

- Total Volatile Organic Compounds (approximately 830,000 kg/ year), primarily from biogenics
- NOx (approximately 220,000 kg/ year), primarily from motor vehicles
- Ammonia (approximately 18,000 kg/ year), primarily from livestock.

For the 4560 postcode, which includes Nambour, the NPI indicates that there are a range of sources of pollutant emissions in the area, with approximately 21% coming from motor vehicles. The top pollutant emissions in the area are reported as being:

- CO (approximately 4,900,00 kg/ year), primarily from motor vehicles
- Total Volatile Organic Compounds (approximately 3,700,000 kg/ year), primarily from biogenics
- NOx (approximately 720,000 kg/ year), primarily from motor vehicles
- ammonia (approximately 99,000 kg/ year), primarily from livestock
- PM10 (approximately 98,000 kg/year), primarily from construction material mining.

Environmental factors such as fire management, physical landform, local vegetation, geology and soil types, hydrology and meteorology will also influence the air quality in the area surrounding the project.

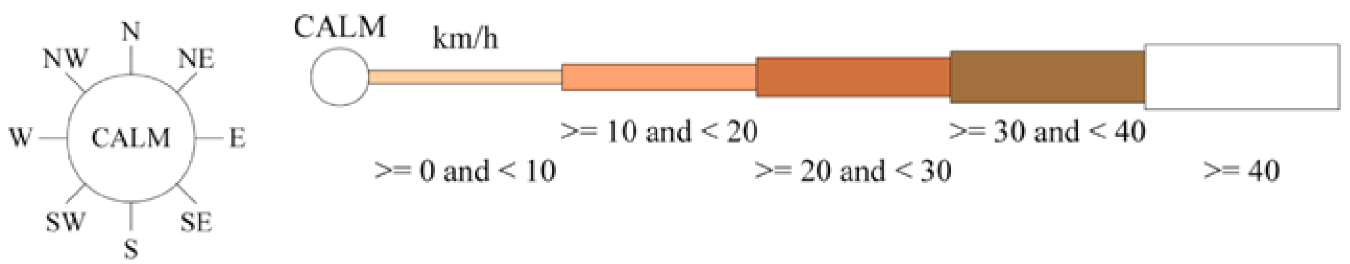
### 16.4.2 Meteorological conditions

The project is within an area characterised by a subtropical climate with very humid and very warm summers with mild and dry winters. Average annual meteorological conditions have been noted based on a review of data from the Caloundra signal station, which is the closest weather station to the project. This is shown in **Table 16.4.2a**. This data has been obtained from the Bureau of Meteorology.

*Table 16.4.2a: Meteorological data*

| | |
|---|---|
| Temperature | Mean daily max. temperature: 23.8°C<br>Mean daily min. temperature: 16.5°C |
| Humidity | Mean annual relative humidity:<br>At 9am: 73%<br>At 3pm: 67% |
| Rainfall | Mean Annual rainfall: 1578.1 mm<br>Highest rainfall is in March, lowest in September.<br>Highest rainfall is in summer, lowest in winter<br>Mean number of clear days per annum: 101.5<br>Mean number of rainy days (rain ≥ 1mm) per annum: 65.1 |
| Wind | At 9am, the prevailing synoptic winds blow from the south-east and south-west in summer and winter respectively.<br>At 9am approximately:<br>30% of days blow at 0 -10 km/h<br>30% of days blow at 10 - 20 km/h<br>30% of days blow at 20 - 30 km/h<br>5% of days blow at 30 – 40 km/h<br>5% of days blow at more than 40 km/h<br>At 3pm, the prevailing synoptic winds blow from the north-east and south-east in summer and winter respectively.<br>At 3pm approximately:<br>7% of days blow at 0 -10 km/h<br>25% of days blow at 10 - 20 km/h<br>50% of days blow at 20 - 30 km/h<br>13% of days blow at 30 - 40 km/h<br>5% of days blow more than 40 km/h |

Figure 16.4a: Key to Figure 16.4b




The wind roses presented in **Figure 16.4b** indicate the available data on wind from the Bureau of Meteorology. Two reference points have been presented, namely, Caloundra signal station and Maroochydore aero.

Details of these sites are presented below:

- **Site name:** Caloundra signal station

  **Site number:** 040040, Latitude: 26.80 °S Longitude: 153.15 °E, Elevation: 46 m Commenced: 1899 Status: Closed 02 Dec 1992

  **Latest available data:** 31 Dec 1992

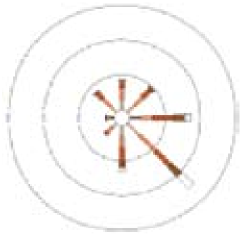
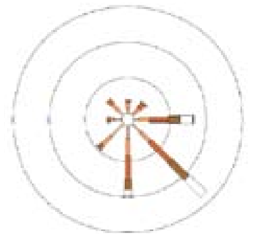
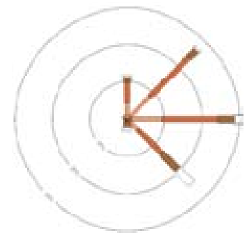
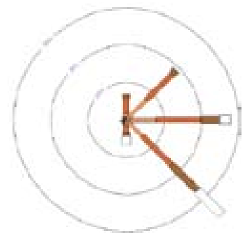
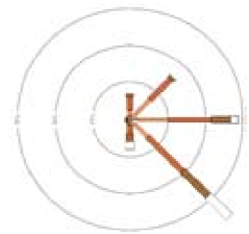
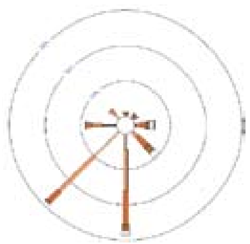
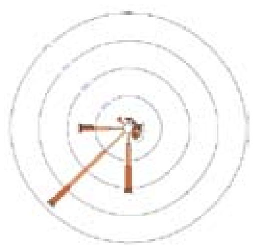
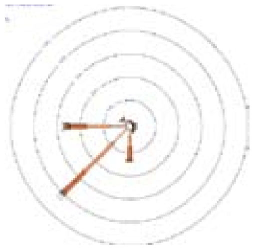
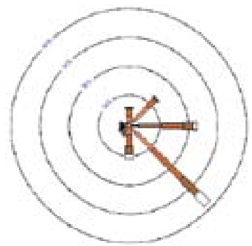
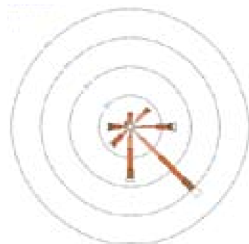
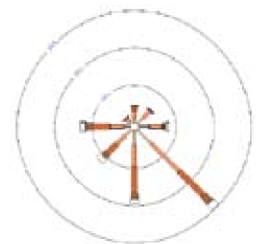
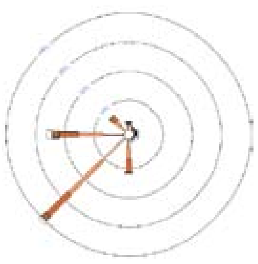
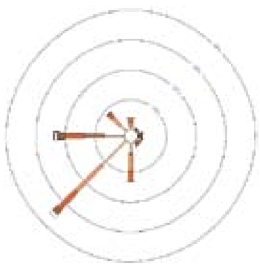
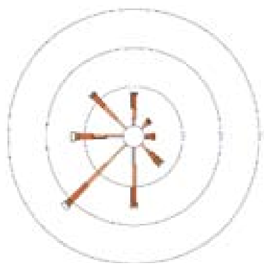
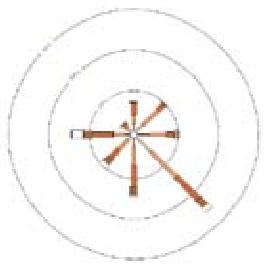
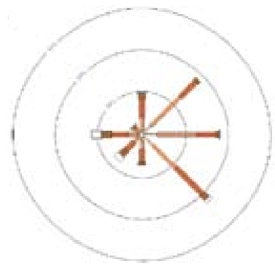
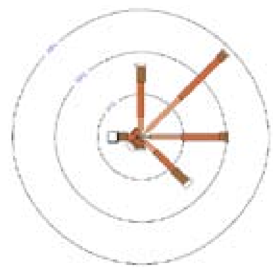
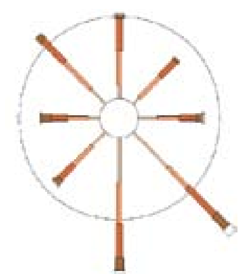
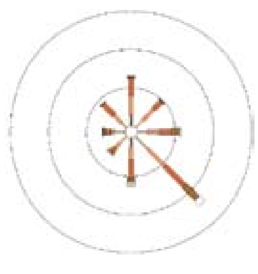
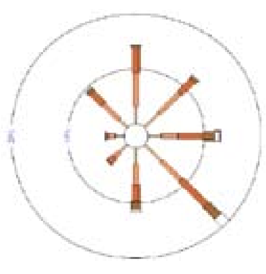
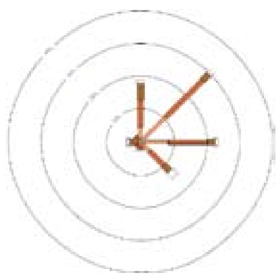
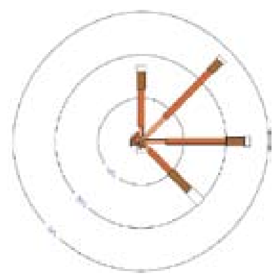
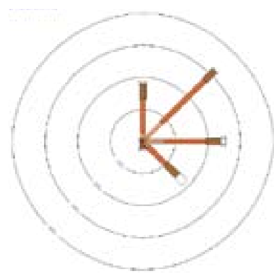
- **Site name:** Maroochydore aero

  **Site number:** 040861, Latitude: 26.60 °S Longitude: 153.09 °E, Elevation: 3 m

  **Commenced:** 1994 Status: Open

  **Latest available data:** 06 Mar 2008

*Table 16.4b Caloundra Signal Station – Wind Roses*

| 9am January: Calm 11%<br>*675 Observations* | 9am February: Calm 9 %<br>*622 Observations* | 9am March: Calm 12 %<br>*682 Observations* | 3pm January: Calm<br>*675 Observations* | 3pm February: Calm 1%<br>*621 Observations* | 3pm March: Calm 1%<br>*682 Observations* |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| 9am April: Calm 13%<br>*660 Observations* | 9am May: Calm 8%<br>*682 Observations* | 9am June: Calm 7%<br>*660 Observations* | 3pm April: Calm 3%<br>*658 Observations* | 3pm May: Calm 5%<br>*682 Observations* | 3pm June: Calm 6%<br>*660 Observations* |
|  |  |  |  |  |  |
| 9am July: Calm 9%<br>*675 Observations* | 9am August: Calm 11%<br>*682 Observations* | 9am September: Calm 14%<br>684 Observations | 3pm July: Calm 5%<br>*678 Observations* | 3pm August: Calm 3%<br>*682 Observations* | 3pm September: Calm 1%<br>*683 Observations* |
|  |  |  |  |  |  |
| 9am October: Calm 12%<br>713 Observations | 9am November: Calm 8%<br>690 Observations | 9am December: Calm 11%<br>651 Observations | 3pm October: Calm 2%<br>713 Observations | 3pm November: Calm 1%<br>690 Observations | 3pm December: Calm<br>652 Observations |
|  |  |  |  |  |  |

### 16.4.3 Background monitoring data – regional data

The Department of Environment and Resource Management, as part of its ongoing air quality monitoring, has a monitoring station at Mountain Creek (Mountain Creek Primary School) which records ozone, $PM_{10}$, nitrogen oxides and meteorological conditions. Although it is approximately 13 km to the east of the project, it is the closest air quality monitoring station and provides an indicative assessment of the ambient air quality in the project area.

A review of the air quality monitoring data (www.epa.qld.gov.au/projects/air/) on October 8th 2008 showed that air quality was classified as 'fair'. There are, however, specific trends throughout the year for each of the detected pollutants. These trends may be a result of pollutants or climatic factors i.e. the position of the Mountain Creek Monitoring Station relative to the prevailing winds. The following is a summary of each pollutant:

- **Ozone:** 2002 – 2007 data on the maximum monthly level of ozone 1 hour average was used to describe levels of ozone. Ozone ranges from 0.03 ppm during early in the year to a peak of around 0.06 ppm in September and October. The guideline has been set at 0.1 ppm over 1 hour and therefore the air quality ranges throughout the year from 'very good' to 'good'.
- $PM_{10}$: a study of the maximum monthly particle PM10 24 hour average data between 2002 and 2007 shows that Particulate matter generally peaks late in the year (generally August to December), sometimes exceeding the guideline $50ug/m^3$. However, between this late-year period the max monthly particle $PM_{10}$ 24 hour average generally exists between 20 and 30 $ug/m^3$ throughout the year. This air quality is considered 'good'.
- **Nitrogen dioxide:** a study of the maximum monthly levels of nitrogen dioxide one hour average data from 2002 to 2007 indicates that nitrogen dioxide levels range from approximately 0.005 ppm to just over 0.04 ppm and generally peak around the winter months. The guideline is set at 0.12 ppm over one hour and therefore the air quality has been deemed as 'very good'.

### 16.4.4 Potentially sensitive receptors

**Figure 16.4d** depicts potentially sensitive receptors within 500 metres of the project. Impact upon these depends not only on their distance from the work site and project, but also on prevailing meteorological conditions and local topography.

These include:

- dwellings, permanent or impermanent (hotels, motels, holiday accommodation, caravans, camping sites)
- child care institutions (child care centre, kindergartens, schools, or other educational institution
- medical facilities including medical centres, nursing homes
- places of worship (churches etc).

Commercial receptors, including shops, businesses (excluding childcare centres and medical facilities), industrial and other commercial premises, are also considered.

*Figure 16.4d: Sensitive Receptors*

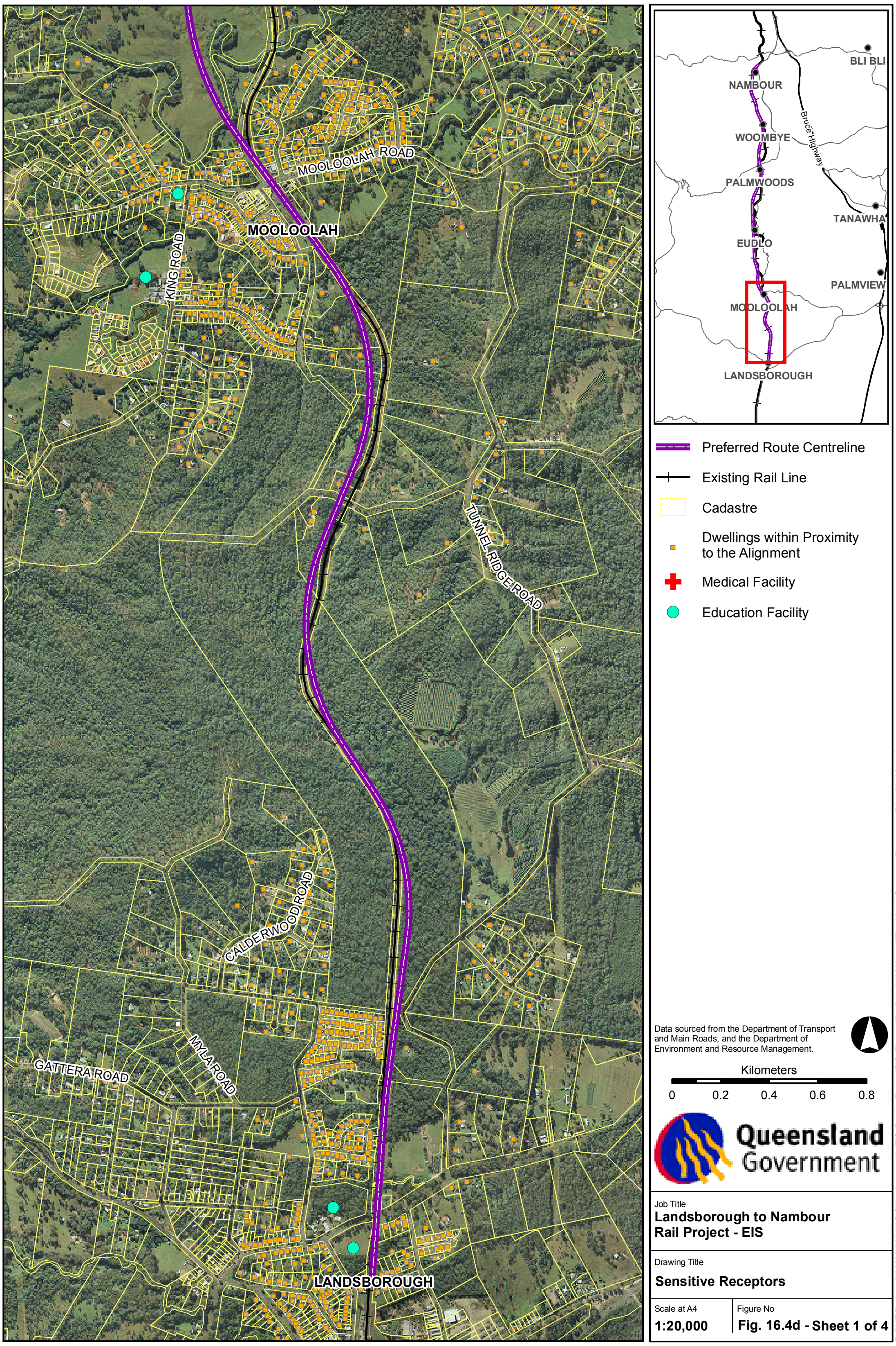
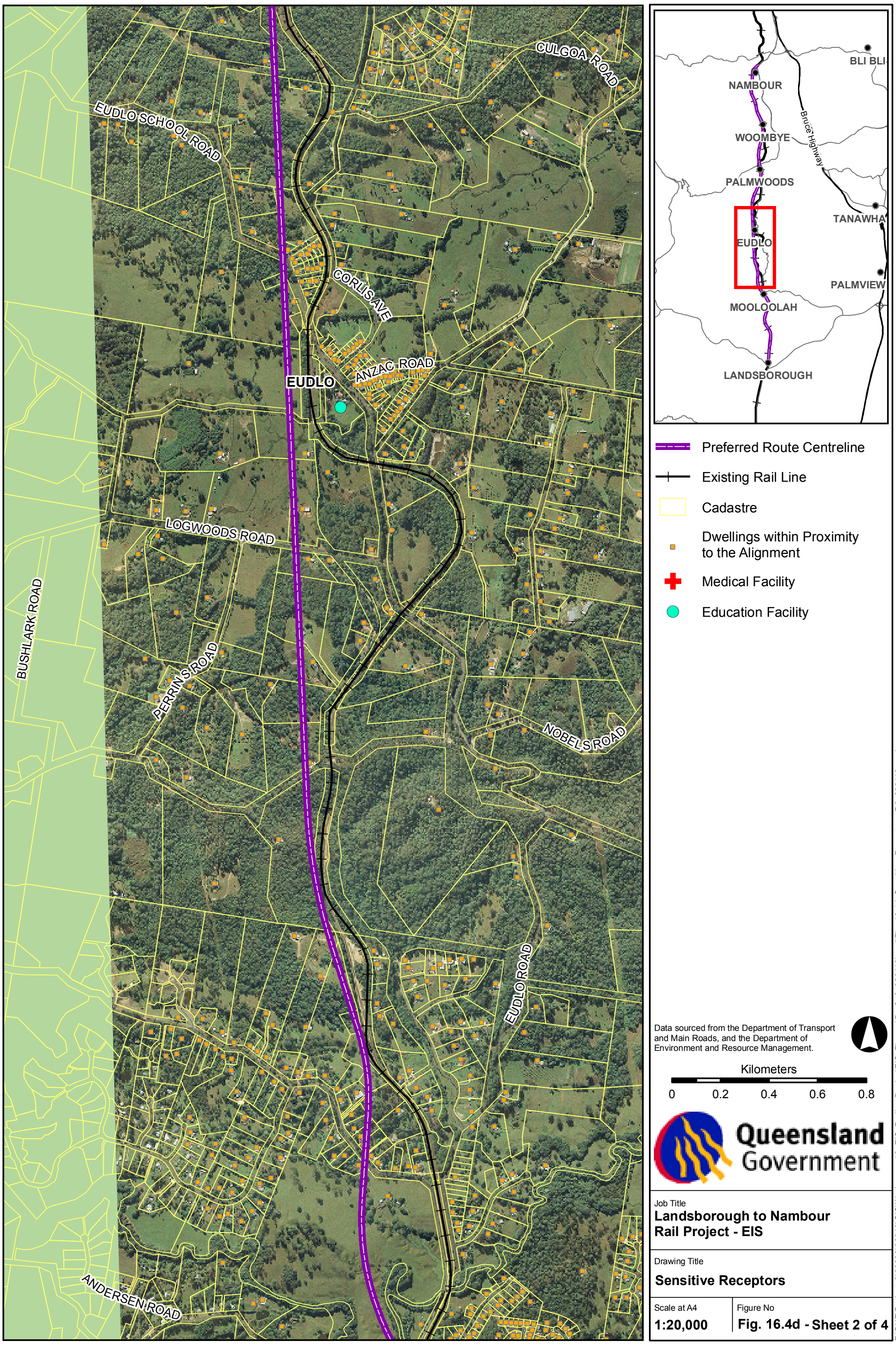


*Figure 16.4d: Sensitive Receptors*




Whilst every care has been taken to ensure the accuracy of this data, the Department of Transport and Main Roads makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) and costs which might be incurred as a result of the plan being inaccurate or incomplete in any way and for any reason.

*Figure 16.4d: Sensitive Receptors*

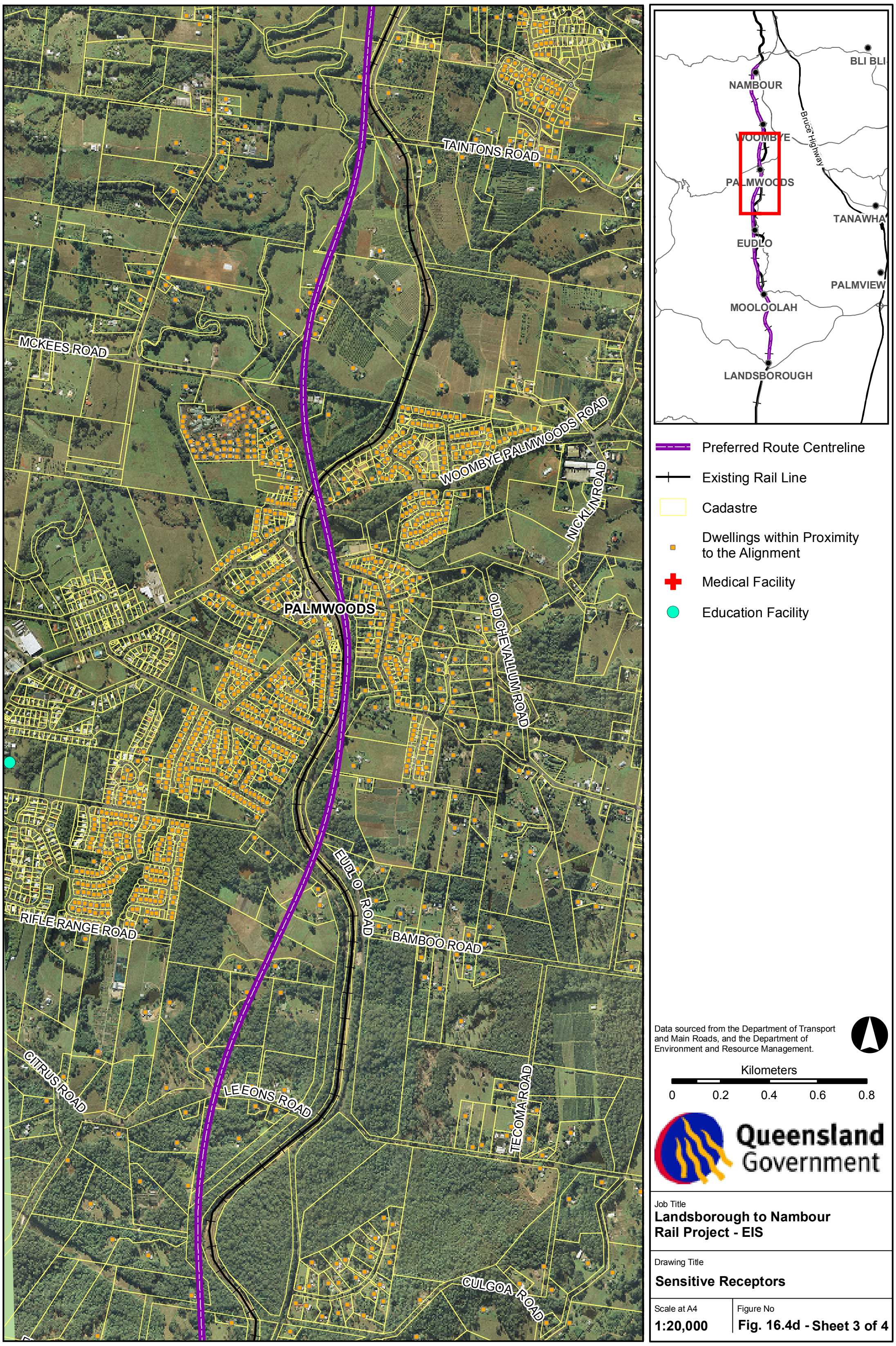



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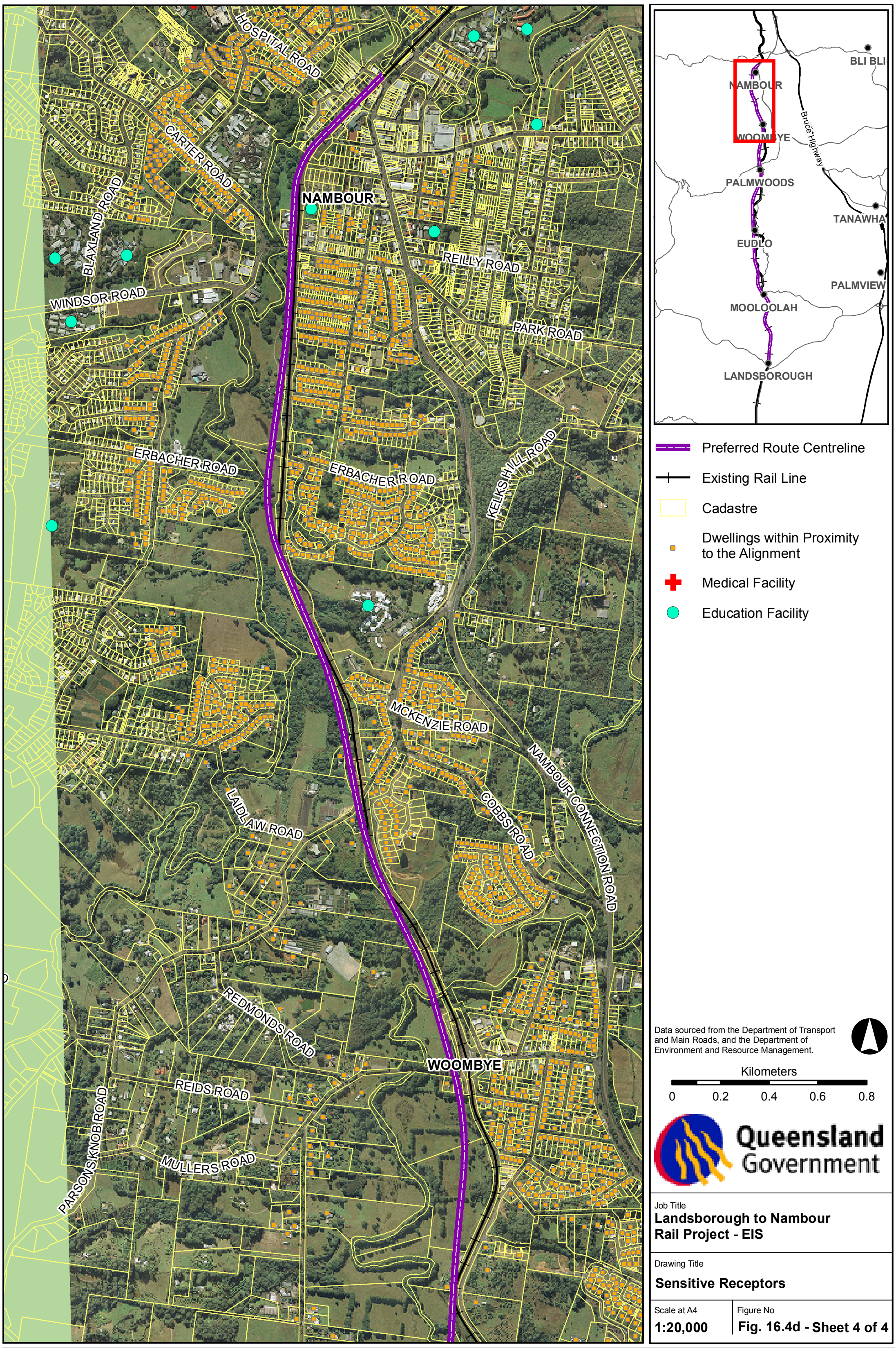
*Figure 16.4d: Sensitive Receptors*

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## 16.5 Assessment of potential impacts and mitigation measures

The project has the potential to cause impacts to local air quality during both construction and operational phases. In alignment with the Environmental Protection (Air) Policy 2008 (EPP (Air)) Part 3 Section 7, the environmental values to be protected under the policy are:

a) the qualities of the air environment that are conducive to protecting the health and biodiversity of ecosystems

b) the qualities of the air environment that are conducive to human health and wellbeing

c) the qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property

d) the qualities of the air environment that are conducive to protecting agricultural use of the environment.

This section outlines the potential impacts on the identified sensitive receptors and describes any relevant mitigation and management measures. Mitigation measures are in accordance, where possible, with the Environmental Protection (Air) Policy 2008 (EPP (Air)) Management hierarchy for air emissions (Part 4, section 9).

### 16.5.1 Potential impact - construction

Atmospheric emissions from construction-related activities will be dependant on a combination of the type of activities carried out, prevailing weather conditions and the effectiveness of any control measures put in place.

There are two emission sources that will need to be controlled to minimise the potential for adverse impacts to local air quality. These are:

- exhaust emissions from site plant, equipment and vehicles
- fugitive dust emissions from site activities.

The operation of vehicles and equipment powered by internal combustion engines results in the emissions of exhaust gases containing the pollutants $NO_x$, $PM_{10}$, VOCs and CO. The quantities emitted depend on factors such as engine type, service history, pattern of usage and composition of fuel. While the operation of site equipment, vehicles and machinery would result in emission to air of unquantified levels of exhaust gases, such emissions are not likely to be significant. When the amount and type of construction equipment is known, the potential impacts of these emissions will be fully assessed and mitigation measures provided.

The effect of construction-related traffic would be along existing public roads and traffic routes used by construction vehicles, personnel and haulage vehicles. The construction activities with transportation implications include:

- delivery and movement of materials
- delivery of heavy plant
- earthworks activities
- movement of heavy plant and equipment
- movement of personnel to and from site
- delivery of fuel to site
- removal of cleared vegetation
- removal of earth/ topsoil
- delivery of sleepers and steel for tracks
- grading of temporary access roads and tracks
- grading of permanent access roads
- delivery of concrete (premix) for construction of stations
- delivery of scaffolding, timber and other materials for construction of stations (assumed by road, but the potential for rail transport for materials should be examined).

The key air quality impact during construction of the project will be the generation of dust. Fugitive dust emissions from construction activities are likely to be variable and would depend on the type and extent of activity being carried out, soil conditions (soil type and moisture), road surface condition and weather conditions. Conditions, and therefore soils, tend to be drier in the winter months in SEQ and periods of dry weather combined with higher than average winds have the potential to generate the most dust. Conversely, wet weather periods have the greatest potential to destabilise earthworks through erosion, and impact waterways through sediment transport.

The construction activities with the greatest potential for the generation of fugitive emissions are:

- existing soils disturbed by the wind during removal of vegetation (including areas of contamination within the existing rail corridor)
- topsoil disturbance due to vehicle (graders, excavators and haulage trucks) movement
- new materials being brought to site and stockpiled
- dust from vehicles travelling on unsealed roads
- transport, unloading, storage and use of dry and dusty materials (such as cement powder and sand)
- movement of vehicles over surfaces contaminated by muddy or dusty materials brought off the site over public roads
- delivery of concrete (premix) for construction
- delivery of scaffolding, timber and other materials for construction of the stations
- removal of rock (blasting would increase the likelihood of dust nuisance if it was required).

Entry to the construction site for labour and vehicles will be by dedicated access points only. Dust from construction traffic could have an impact on neighbouring or nearby occupiers, if not properly controlled, but appropriate mitigation measures will be able to reduce these impacts.

Fugitive dust arising from construction activities is generally of particle size greater than $PM_{10}$ (the human-health based, respirable size). Fugitive dust relates to the amount of dust falling onto and soiling surfaces (or rate of dust deposition) and $PM_{10}$ to the concentration of dust in suspension in the atmosphere.

Fugitive dust has a limited ability to remain airborne and readily drops from suspension as a deposit. Research undertaken for the United States Environmental Protection Agency (US EPA) concluded that large particulate matter (particles over 30µm in diameter), return to the surface quite rapidly. Under generally accepted average wind conditions (mean wind speed of 2 to 6 m/sec or approximately 7 to 21 km/h), these particles, which comprise around 95 percent of total dust emissions were found to return to the surface within 60 to 90 metres of the emission source (Cowheard 1990).

If not effectively controlled, fugitive dust emissions can lead to dust nuisance. Most of the dust emitting activities outlined above respond well to appropriate dust control. Adverse effects can be greatly reduced or eliminated through the application of such measures. Potential dust impacts are likely to be short-term and will be minimised through the implementation of appropriate dust control measures.

The sensitivity of different land uses and facilities to dust can be categorised from low to high. Examples are shown in **Table 16.5.1**.

*Table 16.5.1: Examples of dust sensitive land uses*

| High sensitivity | Medium sensitivity | Low sensitivity |
|---|---|---|
| ▪ Hospitals and clinics<br>▪ Hi-tech industries<br>▪ Painting and finishing<br>▪ Food processing | ▪ Schools<br>▪ Residential areas<br>▪ Food retailers<br>▪ Greenhouses and nurseries<br>▪ Horticultural land<br>▪ Offices | ▪ Farms<br>▪ Light and heavy industry<br>▪ Outdoor storage |

In determining the significance of the construction effects on the air environment, there are a number of factors to be considered. These can assist in determining the level of risk of exposure to pollutants associated with the proposed site construction activities. These are considered below.

#### Scale of construction activity

Construction activity will mainly affect the project area, although transport movements are expected to affect the local road network. Construction related transport movements will be of limited duration. Possible staging and construction timeframes are discussed in **Chapter 2, Description of the project.**

#### Potential for mobilisation of airborne contaminants from contaminated land

**Chapter 3, Land use and infrastructure** identifies the properties affected by the project that are listed on the Department of Environment and Resource Management EMR. Further contaminated land investigations will be required prior to construction, and mitigation measures may include the removal or treatment of these areas, subject to the nature and degree of contamination. For areas that are identified as actually contaminated, strict controls will be required to ensure airborne transport of contaminants does not occur.

#### Potential for fugitive emissions

There is a significant possibility for fugitive emissions to be generated from the construction process due to the type of works carried out and the current dry conditions. These will be managed through the implementation of environmental management plans for construction, as outlined in **Chapter 22, Environmental management plans.**

#### Potential for construction site traffic emissions

The operation of construction vehicles and plant during the construction phase will generate emissions, however the number of vehicles involved in construction are not expected to have a significant impact on local air quality. Estimate of Greenhouse gas emissions associated with construction activities is included in **Section 16.6.**

#### Potential for off-road plant emissions

The project is not likely to generate a significant level of off-road plant emissions, as a result of generators or other plant at the site. This may include generators, though this is subject to future construction planning and management.

#### Potential for discharge of toxic fumes or dangerous substances

The storage of fuels and construction materials could result in the potential for discharge of toxic fumes or dangerous substances (e.g. fuels, explosives). An environmental management plan will be required for the construction phase to address these potential occurrences.

#### Prevailing meteorology

Dust nuisance can arise if there is a source of dust emissions and an exposure pathway to receptors. Nuisance is more likely to occur during high wind speed conditions (wind speeds of greater than 5 m/s or approximately 18 km/h) as dust from a stationary source is more likely to become airborne during strong winds with turbulence and remain airborne over greater distances with the potential to reach sensitive locations.

#### Flora and fauna

Nuisance dust can also impact upon flora, fauna and their habitats, affecting feed sources. There are a number of sensitive habitats in the vicinity of the project, as discussed in **Chapters 11, Nature conservation: Terrestrial flora, 12, Nature conservation: Terrestrial fauna and 13, Nature conservation: Aquatic biology**.

### 16.5.2 Operation

In terms of emissions from locomotives, passenger rail transport typically has lower emissions of particulates than road travel, except where older diesel locomotives are used. Some passenger and rail freight locomotives can be more polluting in terms of sulphur dioxide than road travel. QR Limited has made a commitment to continual improvement with regard to Greenhouse gas emissions, so the introduction of new generation locomotives is anticipated to occur during the lead up to construction.

Emissions from locomotives are dependant on the type and age of locomotive. Older locomotives are more likely to have higher emissions than newer locomotives. Load or frequency of rail use can also have an impact on emissions. If a passenger rail service attracts relatively few road users it is possible there may be a net increase in pollutant emissions into the local air shed. There are usually no specific emission control devices or equipment fitted to railway locomotive engines. Methods for reducing emissions can however include:

*Abatement equipment and emission control technologies include baghouses, cyclones and afterburners on industrial equipment and oxidation catalysts, diesel particulate filters (DPFs) and selective catalytic reduction (SCR) on locomotives. These can be used to reduce emissions.*

http://www.npi.gov.au/handbooks/approved_handbooks/pubs/railway.pdf

Further to reducing emissions from locomotive engines, it can be argued that emissions will be offset by the removal of passenger vehicles and freight traffic from roads. For every passenger train trip, approximately 500 vehicle trips and 0.47tCO2e are avoided. Over a year, this equates to a saving of 88,000t CO2e from removing passenger vehicles from the road transport system. For every freight trip, 160 heavy goods vehicles are removed from the road network, equating to an annual saving of 20,000t CO2e.

The operation of the railway is likely to generate localised dust emissions resulting from the movement of passenger and freight trains within the corridor.

### 16.5.3 Decommissioning of existing railway

Emissions from the decommissioning of the existing railway are likely to be limited and of a similar nature as those for the construction of the project, as outlined above. However, as noted above, should areas of contaminated land be encountered, specific treatment methods or removal of these areas is recommended, to reduce the potential for air borne contaminants leaving these areas.

### 16.5.4 Proposed mitigation

According to the Environmental Protection (Air) Policy 2008 Part 4 Management hierarchy for air emissions, an activity involving air emissions is required, where reasonable to do so, to deal with air emissions in the following order of preference:

1) avoid – using technology that avoids air emissions
2) recycle – re-using air emissions in another industrial process
3) minimise – treating air emissions before disposal
4) manage – locating a thing that releases air emissions in a suitable area to minimise the impact of the air emissions.

Mitigation measures will be prioritised in terms of this order of preference where reasonable to do so.

#### Construction

Prior to commencement of construction activities, a Construction EMP will be required. This is to ensure the potential for adverse environmental effects on local receptors is avoided. The Construction EMP should include the following air quality/dust nuisance mitigation measures (which are included in **Chapter 22, Environmental management plans**):

- AVOID: planning to prevent dust emissions where possible, in the first instance, rather than applying dust suppression methods
- MINIMISE: identifying appropriate water sources for dust suppression purposes.

Water used should not lead to soil contamination (e.g. saline groundwater or contaminated waste water). Where water resources are scarce, dust stabilisers could be used.

- AVOID: damping down of site haul roads during prolonged dry periods
- AVOID: ensuring surfaces of haul roads are of an appropriate material to minimise dust
- AVOID: restricting vehicle speeds on haul roads and other unsurfaced areas of the site
- AVOID: if all available dust suppression methods fail to adequately prevent or suppress nuisance dust resulting in unacceptable impacts, cessation of construction activities until conditions generating dust have subsided
- MINIMISE: regular cleaning of hard-surfaced site entrance roads
- MINIMISE: ensuring that dusty materials are transported appropriately (e.g. sheeting of vehicles carrying spoil and other dusty materials – ‘covered loads’)

- MINIMISE: hoarding and gates to prevent dust breakout
- MANAGE: appropriate dust site monitoring within the site management practices to inform site management of the success of dust control measures used
- MANAGE: construction within the existing rail corridor or decommissioning involving earthworks to address the potential for airborne contaminants to leave the area
- MANAGE: ensuring that dusty materials are stored and handled appropriately (e.g. wind shielding or complete enclosure, storage away from site boundaries, restricting drop heights of materials, using watersprays where practicable to reduce dust emissions)
- MANAGE: confining vehicles to designated haul routes within the site.

These measures would enable construction activities to be controlled to reduce as far as possible the potential environmental impacts, thus limiting residual impacts.

On hot, dry and windy days the amount of dust potentially generated can be high. It is possible that some extreme conditions may require construction to be halted or relocated to areas away from sensitive receptors.

Dust will be controlled through the following methods:

- AVOID: use of water as a dust suppressant, preferably recycled water, utilising the latest technologies available
- AVOID: if conditions allow, water to be used as a dust suppressant on material stockpiles and unsealed access tracks to reduce the risk of airborne dust

Consideration should be given to establishing rain water storage on site.

- vegetation
  - AVOID: minimised vegetation removal; cleared areas to be reshaped and rehabilitated as soon as practical after the completion of works
  - MINIMISE: mulching of timber and cleared vegetation on site
  - MINIMISE: the inclusion and retention of vegetated buffers or wind screens at the nearest surrounding sensitive receptors
- stockpiles
  - MINIMISE: minimised soil and fill stockpile heights
  - MINIMISE: for material stockpiles that are not to be used in less than six months, a cover crop or other suitable capping to be established to minimise aeolian dust generation
- trucks
  - AVOID: haul truck loads to be covered
  - AVOID: installation of temporary wheel washers at construction exits for haul trucks leaving the site (as per Institutions of Engineers of Australia (IEA) Soil Erosion and Sediment Control Guidelines)
- access tracks
  - MINIMISE: the number of unsealed service roads to be kept to a minimum and kept compacted to reduce the generation of dust
- monitoring
  - MANAGE: visual observation of the impacts of dust to determine appropriate management.

#### Operation

Given that only relatively small effects on local air quality are anticipated from the operational traffic associated with the project, and that the effect of the project itself on local air quality is negligible, no mitigation measures are proposed with respect to operational traffic.

### 16.5.5 Residual impact

With appropriate mitigation measures in place, the impacts from the construction of the project on air quality should be negligible to minor adverse. In balance, the impacts of the operation of the railway are considered negligible.

*Table 16.5.5: Summary of impacts and mitigation (air quality)*

| Potential impact | Mitigation strategy | Residual impact significance |
|---|---|---|
| Construction | Construction EMP | Negligible to low adverse |
| Operation | No mitigation proposed | Negligible |

## 16.6 Greenhouse gas emissions

### 16.6.1 Relevant legislation and policy

#### Climate Change Impact Statements (CCIS) (2008)

The CCIS became a standard inclusion in all submissions to Queensland Cabinet from 1 July 2008. Projects that will contribute to GHG emissions and are affected by the impact of climate change must include a statement of mitigation and adaptation. The level of detail required for a CCIS will be phased in to allow agencies time to understand the scope of reporting.

#### Climate Smart 2050 (2007)

- reinforces Queensland's commitment to contribute to national targets to reduce GHG emissions by 60% from 2000 levels by 2050
- establishes long term goals to meet the national GHG emissions reduction target and provides a platform to work towards a low carbon future

- provides $414 million investment to deliver the next steps in Queensland's climate change response.

**Climate Smart Adaptation 2007-2012 (2007)**

- provides an action plan for managing the impacts of climate change
- builds on results from the public discussion paper of 2005 'What does climate change mean for you?'
- presents a case for early action as a cost effective focus to 'enhance Queensland's resilience to the impacts of climate change'
- targets sectors by prioritising their vulnerability and ability to adapt to the impacts of climate change.

**Caloundra City Council Greenhouse Action Strategy (2005)**

Caloundra City Council (now the SCRC) has prepared a Greenhouse Strategy (2005) to outline possible management for Greenhouse gas emissions within the city. The council aims to reduce Greenhouse gas emissions by 20% per person by 2010.

**Cities for Climate Protection Milestone 5 Report (2007)**

The Milestone 5 Report provides an update on the progress towards reduction goals and reassesses the strategic direction of the 2005 Greenhouse Action Plan.

The report included a re-inventory on the GHG Emissions inventory undertaken in 2000 and quantification of GHG reduction activities identified in the 2005 Greenhouse Action strategy.

**Maroochy Shire Council Energy Management Strategy (2007)**

- details actions for Council's involvement in the Cities for Climate Protection Program and its commitment to reducing Greenhouse gas emissions both within the community and its own operations.

### 16.6.2 Methodology

Calculations of GHG emissions have been prepared based on information from the following sources:

- anticipated construction and operational activities provided by the Department of Transport and Main Roads
- travel time, energy consumption and capacity analysis for the EIS undertaken jointly by Arup, Systemwide and the Department of Transport and Main Roads
- unpublished data from previous Australian rail projects has been used to estimate typical construction activities and materials
- technical advice from Arup civil and structural engineers (who have considerable experience regarding likely construction methods and design requirements).

### 16.6.3 Assessment of impacts

Potential GHG impacts have been assessed using EIS significance criteria as described in **Chapter 1, Introduction** and **Chapter 2, Description of the project**. These criteria allow for a standard assessment process across all topics covered in the EIS and provide a context for describing the significance of the impact. Significance criteria used for air quality are described in **Table 16.6.3**.

*Table 16.6.3: Significance criteria: Greenhouse gases*

| Significance | Criteria |
|---|---|
| High Adverse | Emissions significant in comparison to national emissions[1] . Mitigation measures and detailed design work are unlikely to remove all of the significant effects. |
| Moderate Adverse | Emissions are significant in comparison to State emissions[2] . Some recovery is anticipated following completion of the works concerned. Mitigation Measures anticipated to alleviate some impacts. |
| Low Adverse | Emissions are significant in comparison to State Transport Sectoral emissions[3]. Close to full recovery is anticipated following completion of the works concerned. Mitigation Measures anticipated to alleviate close to all impacts. |
| Negligible | Emissions are within the normal bounds of variation or within the margin of forecasting error for the State Transport Sectoral emissions[3] |
| Beneficial | The project results in net reduction of emissions. |

*Table Notes:*
*1. Australia's total National emissions 559,000 kt/annum*
*2. State of Queensland total emissions 157,000 kt/annum*
*3. Transport sector within Queensland 18,700 kt/annum*
*Source: NGGI 2005*

Initial impacts have been identified and described based on the absence of mitigation or management (**potential impacts**). Suitable mitigation or management measures have then been noted (**proposed design/mitigation/management measures**) and the **residual impacts** have been described and assessed based on the significance criteria.

### 16.6.4 Limitations

It is noted that construction of the railway will contribute to an increase in GHG emissions. The quantities of these emissions can be estimated in a theoretical manner based on the likely quantities of petrol/diesel/LPG and electrical power used during construction. A similar exercise can be carried out for the estimation of the extent of change to the carbon sink as a result of the vegetation removal.

The GHG calculations provided in this section are based on estimations of construction methodology, however a detailed program is not available at this stage. Calculations are preliminary only, and will require revision once the construction methodology is known.

### 16.6.5 Existing conditions - GHG

The Greenhouse effect is a term used to describe the process whereby outgoing radiation from the earth is absorbed and re-radiated by water vapour droplets and Carbon Dioxide ($CO_2$) and other Greenhouse gases in the atmosphere. The enhanced Greenhouse effect has been brought on by the emissions of Greenhouse gases including $CO_2$, nitrous oxide ($N_2O$) and methane ($CH_4$) from human activities which magnifies the natural process. This effect traps more heat in the atmosphere, leading to a change in climate.

Potential impacts of climate change include rises in sea level and temperature. The major contributors to GHG emission in Queensland are land clearing, electricity generation, agriculture and transport (Department of Environment and Resource Management, 2003).

The dominant GHG associated with traffic air emissions is $CO_2$.

QR Limited has undertaken a comprehensive inventory of its Greenhouse gas emissions associated with the operation of a railway. In QR Limited's Greenhouse Challenge Cooperative Agreement, QR Limited's energy usage has been recorded and reported back to the year 1990. QR Limited's total GHG emissions for the 1998/99 financial year were approximately 1.2 million tonnes of $CO_2$ equivalent[9].

However, this is the total emissions associated with QR Limited operations only and does not take into account the reduction of greenhouse gas emissions that are associated with the modal shift from road to rail transportation of people or freight. In addition, it is likely that the expansion of railway operations since the 1998/1999 financial year has increased this figure. No other published data was available at the time of publishing.

### 16.6.6 Potential impact – greenhouse issues during construction

The following activities will be undertaken during construction and may have an impact on GHG emissions:

- vegetation removal along the corridor alignment within the areas of direct impact
- installation of construction compound/s and establishment of stockpile areas
- relocation and/or adjustment of affected utilities, services and signage
- flood mitigation and bridge excavation works and landform shaping
- construction of a double rail track with associated infrastructure (overhead electrical system, signalling etc.)
- construction and refurbishment of rail stations
- bulk earthworks (cutting, embankments, topsoil stripping, stockpiling)
- progressive revegetation and landscaping.

It is estimated that GHG emissions from the construction process will be 107kt $CO_{2e}$ over the construction period.

### 16.6.7 Proposed mitigation - Greenhouse issues during construction

The following mitigation measures will be implemented during construction:

- emissions from all construction vehicles to comply with the appropriate standards and regulations
- vehicle kilometres during construction to be minimised where possible by encouraging use of local materials, reusing materials etc. (see **Chapter 22**, Environmental management plans)
- on-site power usage to be limited and subject to auditing where possible
- vegetation clearing and soil disturbance should be minimised as discussed in **Chapter 11, Nature conservation: Terrestrial flora.**

### 16.6.8 Residual impact – Greenhouse issues during construction

The construction activities will contribute to GHG emissions although the volume will not be significant compared to and or national inventories. The residual impact of GHG emissions once mitigation measures have been applied are estimated to be a minimum of 100kt. Further saving may be achieved once the construction program and methodology is known. It has therefore been assessed as **low adverse**.

### 16.6.9 Potential impact – greenhouse issues during operation

The following activities will be typical of the project during the operational phase and would contribute to emissions:

- provision of traction power for passenger rollingstock
- electrical and mechanical use of overhead electrical systems and lighting
- electricity use in stations
- electricity use on trains for air conditioning/lighting etc
- station and car park lighting
- use of vending machines on station platforms by passengers and staff
- other station amenity use.

It is estimated that GHG emissions from the operation of the project will be 24kt $CO_{2e}$ per annum.

9 *It was estimated in 2004 that rail only provide approximately 0.3 million tonnes (about 0.2%) of Queensland's Greenhouse emissions (Queensland Greenhouse Strategy, 2004)*

### 16.6.10 Proposed mitigation and residual impact – Greenhouse gas issues during operation

This project will result in increased operational energy efficiency for rail services due to improved alignments and passing opportunities. The removal of vehicles from the road network will also assist to reduce GHG emissions from present levels.

Potential mitigation measures to further minimise GHG emissions associated with the operational phase of works are detailed below:

- review alternative traction power sources that use less energy
- design rail and stations to minimise maintenance requirements
- develop a staff education program on energy efficiency in stations
- conduct driver training in energy efficient operation of trains
- monitor power use and publicise results
- improve the energy efficiency of new/refurbished stations through measures such as passive design, providing natural daylight, efficient lighting, efficient hot water supply and alternative energy supply (e.g. PV cells)
- maximise passenger numbers through initiatives such as Travel Smart programs, appropriate timetabling and suitable facilities for all passengers
- rehabilitate vegetated areas to open eucalypt forest to restore the ecosystem's carbon cycle and allow storage of carbon in the soil through breakdown and encapsulation of plant debris
- provide appropriate waste receptacles for staff and passengers with adequate signage for general and recyclable waste
- implement a staff awareness program on waste minimisation and recycling.

During operation, once mitigation measures are applied, annual GHG emissions are anticipated to be less than 23kt $CO_{2e}$ per annum. Further reductions are likely to be identified closer to the operational phase.

These construction and operation emissions will likely be offset by the removal of passenger vehicles from roads. Emissions generated by the project will be offset by the transport modal shift of car passengers to rail. Therefore the overall operation of the project could reduce GHG emissions in Queensland by approximately 42kt $CO_{2e}$ every year (once construction emissions are offset – a period of approximately 1.5-2 years). Savings are anticipated to increase further over time as patronage levels increase. Overall, there it is expected there will be a net Greenhouse gas benefit over the life of the project resulting in a **beneficial** impact in terms of Greenhouse gases.

## 16.7 Summary and conclusions

One of the aims of the proposed rail project is to increase the number of train trips available on an existing route and provide an alternative to motor vehicle transportation. Considering that emissions from motor vehicles have been identified by the NPI as the main air pollutant in the local air-shed, it is likely that the operation of the railway line will result in an saving in Greenhouse gas emissions and no net decrease in air quality to the 'do nothing scenario'.

A summary of the impact significance, proposed mitigation, relevant management plans and residual impact post mitigation is shown in **Table 16.7**.

*Table 16.7: Summary of impacts and mitigation*

| Potential impact | Main mitigation strategies | Management plans | Residual impact |
|---|---|---|---|
| Greenhouse Gases during Construction<br><br>Increased generation of Greenhouse gases from increased vehicles km, on-site electricity use and vegetation clearance | ▪ Emissions from all construction vehicles will comply with the appropriate standards and regulations.<br>▪ Vehicle kilometres during construction will be minimised where possible<br>▪ On-site power usage will be limited where possible<br>▪ Land clearing will be minimised as discussed in **Chapter 11, Nature conservation: Terrestrial flora.** | Environmental Management Plan<br><br>Vegetation Management Plan | Negligible |
| Greenhouse Gases during Operation<br><br>Net reduction in $CO_2$ emissions | ▪ undertaking vegetation rehabilitation<br>▪ designing energy efficient rail stations<br>▪ Providing staff training in energy efficient practices<br>▪ Exploring opportunities for traction power supply that maximise energy efficiency. | Operational Management Plan | Beneficial |

**The key matters from the assessment of air quality are:**

- Existing Department of Environment and Resource Management monitoring data (Mountain Creek) shows that air quality indicators within the vicinity of the project area are all classified as good to very good.
- Potential impacts on air quality associated with the project will be from both the construction and operational phases.
- Construction impacts are generally short-term. Main impacts to air quality are from dust generation which will be managed through environmental management practices which are detailed in the EMP.

**The key matters from the assessment of Greenhouse gases are:**

- Potential impacts on Greenhouse gases for the project will be from both the construction and operational phases.

**Benefits of this project**

- The transition of users from vehicles to train will mean that the project provides an overall potential saving of Greenhouse gas emissions of 42kt $CO_{2e}$ annually during operation of the railway.
- Energy efficiency will be increased for rail services due to improved alignments and passing opportunities.