10.4 Air quality

10.4.1 Existing air quality and meteorological conditions

The project is located in a rural environment dominated by the Hume Highway. Potential sources of air pollution include vehicle emissions, solid fuel fires, waste (animal manure), herbicides and pesticides, and wind erosion from exposed soils.

A search of the Department of the Environment, Water, Heritage and the Arts pollution inventory database on 18 May 2009 did not identify any industrial sources that report emissions to the local airshed. The closest industrial facility to report emissions, Holbrook Softwood Mill (Hyne & Son Pty Ltd), is located approximately 16 kilometres north of the project.

The closest DECCW air quality monitoring station to the study area is in Albury, approximately 37 kilometres to the south-west of the project. Analysis of the DECCW quarterly air monitoring reports from 2003 to 2007 for PM_{10} (particulate matter less than or equal to 10 micrometres in aerodynamic diameter) indicated exceedances of the National Environmental Protection (ambient air quality) goal. As many of the exceedances occur from late spring to mid autumn, it is likely that pile burning and bushfires are the primary source of emissions.

The nearest Bureau of Meteorology meteorological stations to the project are the Holbrook station (Bureau of Meteorology Station 072022 — records rainfall) and Hume Reservoir station (Bureau of Meteorology Station 072023 — records rainfall and other weather data). These stations are located approximately 14 kilometres and 35 kilometres from the project respectively. Data collated from these stations indicates that the average annual rainfall is around 690 millimetres. The Hume Reservoir station data indicated a temperate climate with cold winters and warm summers. The average monthly maximum temperatures range from approximately 12.2°C in the winter up to 30.7°C in the summer. The average monthly minimum temperatures range from 3.9°C in the winter to around 16.4°C in the summer. The project is likely to experience similar meteorological conditions to those recorded at the Holbrook and Hume Reservoir stations, with minor variances due to local topography.

10.4.2 Construction air quality impacts

Dust and particulate matter

During construction of the project, the generation of dust and particulate matter may affect the local ambient air environment. Dust generating activities during construction may include traffic on paved and unpaved roads, clearing of vegetation, earthmoving activities, the transporting or stockpiling of spoil, aggregate and construction materials, and operation of the proposed concrete batch plants (refer Section 6.6). The impact of dust-generating activities would be dependent on local soil properties and meteorological conditions. During dry and windy conditions, dust emissions may be higher.

The impact of dust on receivers would be expected to decrease significantly with increased distance from dust-generating activities. Given the low density of sensitive receivers close to the project (see Figure 10-7), the distance of the existing highway road user receivers from the majority of the length of the project, and the transient and relatively short-term nature of the proposed construction works, dust impacts are not anticipated to be substantial. Generation of dust and particulate matter would be effectively managed through implementation of standard measures (see Section 10.4.4).

Two residences are located within the proposed construction boundary area and close to the proposed batch plant facilities (refer Figure 6-3). During construction these residences would not be occupied so they would not be sensitive air quality receivers during construction. The non-residential use of these houses would be via an agreement with the affected landowners (which may include the purchase of these residences). Discussions with these landowners are currently ongoing.

Vehicle emissions

Emissions from heavy vehicles and construction equipment may also affect the local ambient air environment during construction of the project. These vehicle emissions would likely be associated with both diesel-fuelled and petroleum-fuelled vehicles and would include carbon monoxide, oxides of nitrogen, sulfur dioxide, particulate matter (including PM_{10}), volatile organic compounds (VOCs) and trace amounts of non-combustible hydrocarbons. Emission rates and impact potential would depend on the power output of the combustion engines, the quality of fuel and the condition of the combustion engines.

Emissions from construction vehicles are unlikely to result in adverse air quality impacts. Vehicle emissions would be effectively minimised through implementation of standard measures (see Section 10.4.4).

10.4.3 Operational air quality impacts

Traffic volumes in and around the project are predicted to increase (refer Section 9.6). The project would result in passing traffic being located closer to some residences (see Figure 10-7). The nearest residence is about 250 metres from the project. The change in distance to traffic is not expected to result in air quality impacts as traffic emission concentrations fall off rapidly with distance from the roadside (ie with distances greater than 50 metres). Sensitive air quality receivers would not be impacted by the operation of the project.

The reduction of traffic on the existing highway would provide some air quality benefits and a positive impact for residences in Woomargama village.

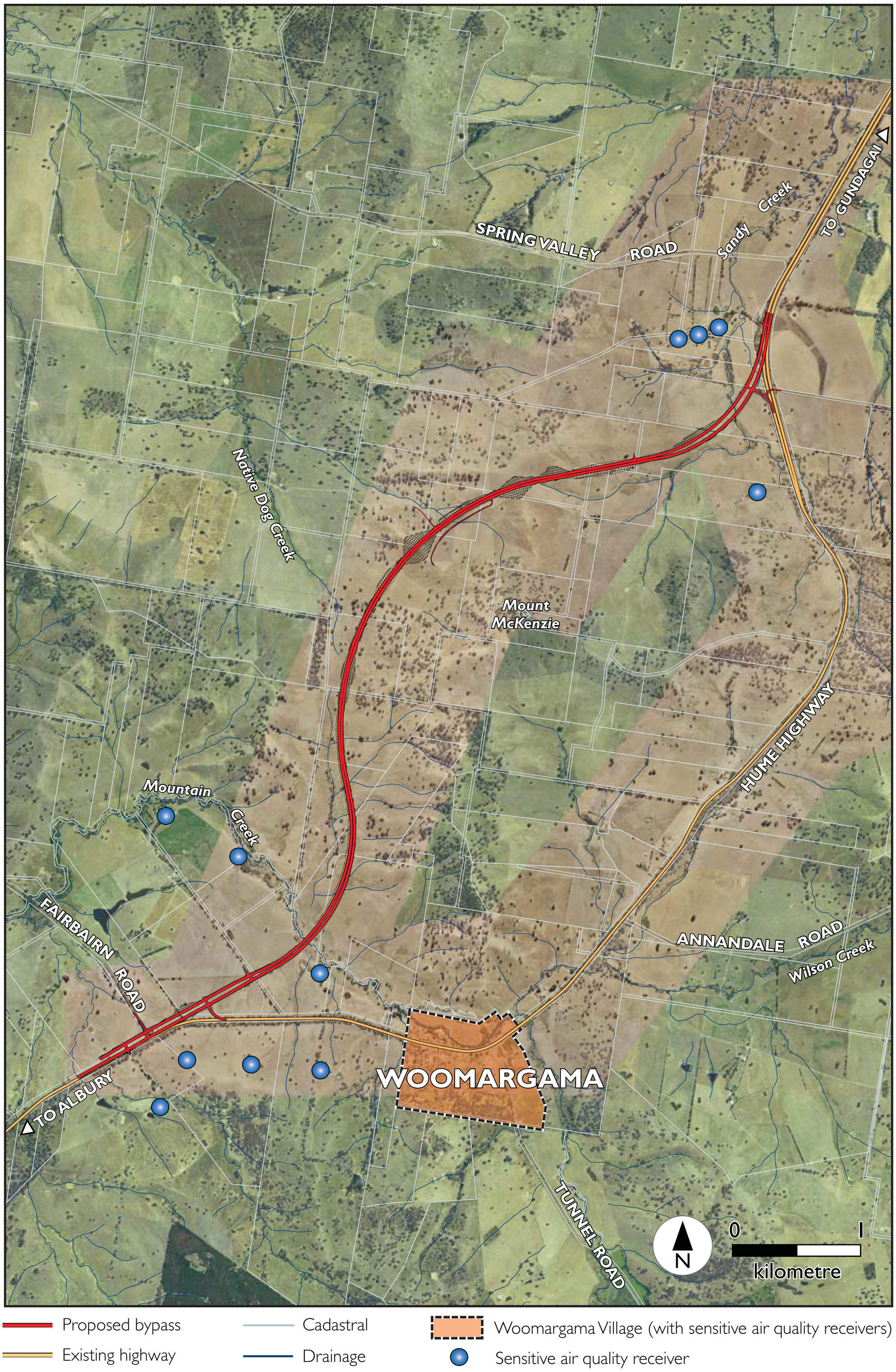

Figure 10-7 **Sensitive air quality receivers in the assessment area**

10.4.4 Management of air quality impacts

Table 10-8 identifies mitigation and management measures that would be implemented for construction air quality impacts. These measures have been incorporated into the draft statement of commitments in Chapter 11.

No project-specific operational mitigation measures have been identified as vehicle impacts on air quality are effectively managed at-source via improved engine technology, fuel standards, and vehicle maintenance and emissions testing.

Table 10-8 Air quality mitigation and management measures

Potential impact	Mitigation and management measure
Construction	
Reduction in local air quality due to airborne dust and particulate matter.	▪ Implement standard dust and emission control measures to manage construction air quality impacts at sensitive receivers. ▪ Regularly undertake visual dust monitoring. Where impacts on sensitive receivers are identified, implement standard measures to minimise the generation of dust. ▪ Install dust deposition gauges at the closest sensitive receivers to dust-generating construction activities (include control site). Undertake monthly monitoring to assess the effectiveness of the air quality mitigation and management measures. Develop additional feasible and reasonable mitigation and management measures where required.
Reduction in local air quality due to emissions from construction vehicles, plant and equipment.	▪ Regularly maintain all construction vehicles, plant and equipment to ensure they are kept in good operating condition.

10.5 Hazards and risk

10.5.1 Construction hazards and risk

Hazards and risks associated with construction of the project would include:

- Environmental and occupational health and safety hazards, including environmental and social impacts if spills of hazardous materials occur, and dangers to construction workers and the public.
- Transport of hazardous materials.
- Handling and storage of hazardous materials.

Sensitive environmental receivers such as watercourses and water bodies and flora and fauna may be impacted by hazardous materials during construction of the project if appropriate environmental management measures are not implemented.

Dangerous goods and hazardous materials that may be used during construction include diesel fuels, oils, greases and lubricants, petrol, gases (oxy-Acetylene), bitumen, paints and epoxies, curing compounds, herbicides and hydrated lime. Some of these hazardous materials would need to be stored at the construction work sites shown in Figure 6-3. The storage, handling and use of the materials would be undertaken in accordance with the *Occupational Health and Safety Act 2000* and the WorkCover guideline *Storage and Handling of Dangerous Goods* (2005). The quantities required are not expected to pose a significant off-site risk. Potential risks would be further mitigated by placing restrictions on storage of hazardous materials (see management measures in Section 10.5.3).

Construction activities may present occupational health and safety hazards for construction workers and members of the public. The standard mitigation measures identified in Section 10.5.3 would reduce these risks.

10.5.2 Operation hazards and risk

During operation there is the potential for contaminants arising from normal operation of the project (tyre and brake wear, engine oil leaks, litter), or chemicals from accidental spillages to adversely affect the quality of the local environment. The main route for these contaminants to the environment would be via surface run-off. The installation of permanent spill containment basins would reduce this risk (refer Section 10.2.5).

Risks to members of the public during operation would relate to incidents involving the release of dangerous goods. The Hume Highway is a designated dangerous goods route. Dangerous goods that might be transported in significant quantities on the Hume Highway include:

- Flammable and combustible petroleum products (petrol and diesel).
- Liquefied petroleum gas.
- Liquefied toxic gases (including ammonia and chlorine).
- Corrosive materials (acids and alkalis).
- Other toxic materials (such as pesticides).
- Nitrogen-based fertilisers or bulk explosives.

Crashes involving vehicles transporting chemicals and/or other dangerous goods would generally affect only a small area, with hazards relating to toxic effects, fire and explosions. Most incidents would have limited potential to affect those not directly involved in a crash or incident. In the event of an incident involving dangerous goods, emergency services equipped to deal with chemical spillages are located in Holbrook, Albury and Wagga Wagga. Emergency response times from Holbrook, Albury and Wagga Wagga would not change as a result of the project.

The project would meet relevant design guidelines for highways and would contribute to an overall improvement in driving conditions. The project would reduce the likelihood of hazardous goods incidents and serious head-on collisions through separation of the carriageways.

10.5.3 Management of hazards and risk

Table 10-9 identifies mitigation and management measures that would be implemented for hazards and risk associated with the project. These measures have been incorporated into the draft statement of commitments in Chapter 11.

Table 10-9 Hazards and risk mitigation and management measures

Potential impact	Mitigation and management measure
Construction	
Environmental hazards and risks to community and environment.	▪ Identify potential environmental hazards and risks associated with construction activities prior to construction. Implement standard management measures and contingency plans during construction through the CEMP for the project. ▪ Store hazardous materials in bunded areas within the construction site boundary in accordance with Australian Standards and DECCW guidelines. Hazardous materials will not be stored on the floodplain below the 1 in 20 year average recurrence interval (ARI) flood level. ▪ Conduct potentially hazardous and contaminating activities and activities with the potential for spillage in bunded areas or in other areas where suitable containment measures are in place to prevent discharge into watercourses.
Occupational health and safety hazards	▪ Prepare and implement a site-specific safety management plan and safe work methods statements for the project. Identify hazards associated with work on the site and hazard control measures to ensure that people are adequately protected from risk of injury or illness.
Operation	
Spills/leaks of hazardous materials from crashes or other incidents	▪ Incorporate operational spill control measures/facilities near sensitive environments during detailed design.

10.6 Contaminated land

10.6.1 Existing environment

A Phase 1 Environmental Site Assessment was undertaken for the project to determine the potential for existing contamination from past and present land uses, identify the need for further investigation prior to the commencement of construction and determine mitigation measures for any contamination issues.

Sensitive environmental receptors in the assessment area include:

- Mountain Creek, which intersects the project to the west of Woomargama village.
- Sandy Creek, which intersects the project near the northern end.
- Local dams.
- Underlying groundwater on and surrounding the site.
- Surrounding rural residences.

The DECCW contaminated land register indicated that no notices were on record for the assessment area. A search of the *Protection of the Environment Operations Act 1997* public register indicated that no licences or notices were on record for the assessment area.

A review of past and present aerial photography indicated that since 1961 the locality has mostly been undeveloped rural grazing land and that the current Hume Highway has remained unchanged. There has only been very minor development in the form of rural/residential buildings.

Possible contamination sources in the construction site boundary include the use of herbicides and pesticides from farming/grazing activities. Potential sources of off-site derived contamination include surrounding residential buildings and atmospheric deposition from road emissions and the use of farm equipment and machinery.

One site of potential contamination was identified in the assessment area. A stockpile site is located on the western side of the existing Hume Highway road reserve at the northern end of the project (see Figure 10-8). The stockpile includes multiple types of road fill and is around 3500 square metres in size. Stockpiles are up to three metres high.

No visual signs of vegetation stress were observed in the assessment area.

10.6.2 Potential land impacts

Disturbance of the ground surface in contaminated areas would have the potential to disperse contaminated materials into the surrounding receiving environments, including air and water.

The stockpile site would likely be impacted by construction.

There is potential for construction activities to result in contamination of soil and/or water associated with leaks and spills of potentially contaminating materials. These impacts are addressed in Sections 10.2 and 10.5.

10.6.3 Management of impacts

Table 10-10 identifies mitigation and management measures that would be implemented for contaminated land impacts. These measures have been incorporated into the draft statement of commitments in Chapter 11.

Table 10-10 Contaminated land mitigation and management measures

Potential impact	Mitigation and management measure
Construction	
Land contamination during construction activities	▪ Include standard contingency measures in the CEMP (including for unknown contaminants) to allow for further investigation and treatment/disposal as appropriate. ▪ Classify all potentially contaminated waste (including known road base stockpile) according to *Waste Classification Guidelines: Parts 1 and 2* (DECC 2008a). Dispose of to a suitably licensed disposal facility or reuse in construction as appropriate.

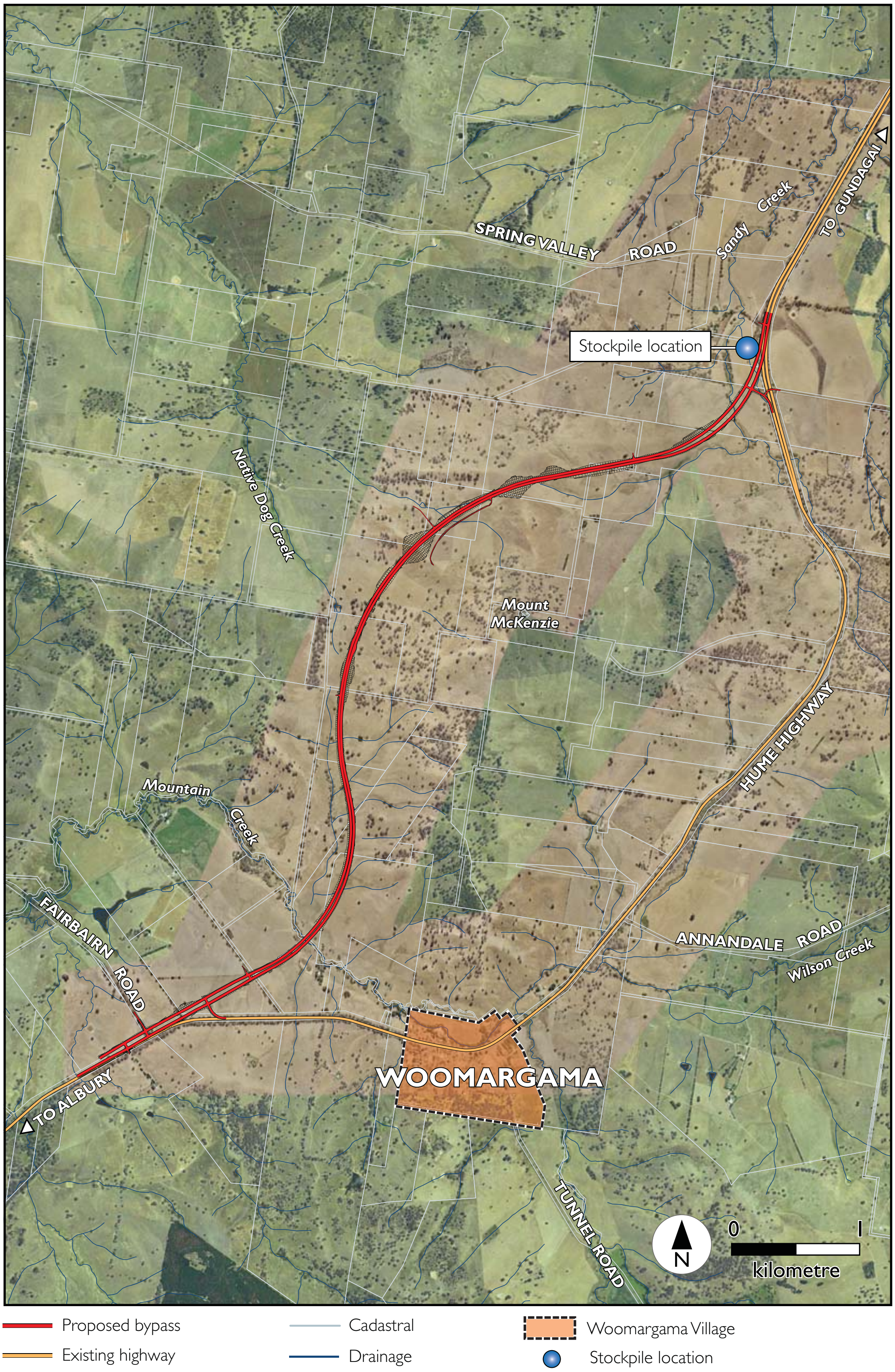

Figure 10-8 **Stockpile location**

10.7 Sustainable management

The RTA is committed to ensuring that projects are consistent with the principles of ecologically sustainable management (ESD). These principles have been an integral part of the development of the project (and of the Hume Highway duplication as a whole), and in the assessment of its adverse and beneficial effects. The consistency of the project with the principles of ESD is discussed in Chapter 11.

The following sections assess the sustainability of the project in relation to the emission of greenhouse gases, energy use, and waste generation and management.

10.7.1 Greenhouse gases and energy use

A quantitative assessment of the likely greenhouse gas emissions during construction and operation of the project was undertaken in accordance with the draft *Energy and Greenhouse Guidelines for Environmental Impact Assessment* (DIPNR 2002), the draft *Greenhouse Gas Assessment Guide* (RTA 2008f) and the *National Greenhouse Accounts (NGA) Factors* (DCC 2009a). Greenhouse gas emissions generated by the project were estimated as tonnes of carbon dioxide equivalent (t CO_2-e).

The sources of greenhouse gas emissions related to the project can be classified as:

- Scope 1 emissions — emissions directly caused by construction/operation of the project, such as the combustion of fuel in plant/vehicles and the clearing of vegetation (WRI and WBCSD 2005).
- Scope 2 emissions — emissions to supply energy purchased for an activity, that is external generation of electricity used on site (WRI and WBCSD 2005).
- Scope 3 emissions — indirect emissions, such as those to produce materials used for construction or operation of the project (WRI and WBCSD 2005).

While Scope 3 emissions are outside of the RTA's operational control, they are considered in this assessment to illustrate the potential broader impact of the project.

Emissions during construction

Energy consuming activities during construction of the project would be extensive and would occur over approximately two years. Plant and equipment used during this time would be diverse, ranging from large, heavy machinery through to hand tools and small equipment. The energy used during construction would be in the form of fuel (petrol and diesel) and electricity. This energy use, and other construction activities, as identified below, would result in the emission of greenhouse gases:

- Combustion of fuel in construction plant and equipment (direct emissions).
- Vegetation clearing (direct emissions).
- Electricity used at site compounds (electricity indirect emissions).
- Use of explosives (direct emissions).
- Transport of materials to the site (indirect emissions assuming that vehicles used are non-RTA owned).
- Disposal of waste from construction staff and site compounds (indirect emissions).
- Indirect emissions embodied in key construction materials, including cement, steel, aggregates and bitumen.

The total greenhouse gases that would be emitted as a result of the construction of the project are estimated to be 42,600 t CO_2-e (see Table 10-11).

Table 10-11 Construction quantity estimates and associated greenhouse gas emissions

Source	Quantity[1,2]	Greenhouse gas emissions (t CO_2-e)[2]				Assumptions
		Scope 1	Scope 2	Scope 3	Total	
Construction						
Diesel fuel (site vehicles and plant)	5300 kL	13,400	–	1000	14,400	Only diesel-fuelled vehicles, plant and equipment would be used during construction.
Vegetation clearing	8 ha	800	–	–	800	Quantity includes 6 ha of Box-Gum Woodland, 1 ha of riparian woodland and 1 ha of other tree cover. All vegetation assumed to be a grassy woodland formation. All vegetation will be reused on site. Area calculated includes all vegetation within the construction site boundary, which may be revegetated after construction of the project.
Electricity	139,000 kWh	–	83	17	100	One hundred per cent of electricity used would be sourced from the local electricity grid.
Explosives (heavy ANFO)[1]	600 t	100	–	–	100	
Waste disposal	4400 t	–	–	4800	4,800	One hundred per cent of waste would comprise mixed-office and commercial waste types, all of which would be disposed of at a landfill.
Contracted material deliveries (diesel fuel use)	350 kL	–	–	900	900	Only diesel-fuelled vehicles would be for material deliveries.
Embodied emissions in materials	Refer assumptions	–	–	21,100	21,100	Cement = 15,000 t (12,000 t CO_2-e); Steel[3] = 1,500 (4,000 t CO_2-e); Aggregates = 245,000 t (4,200 t CO_2-e); Bitumen = 2,000 (900 t CO_2-e).
Total construction emissions	**–**	**14,300**	**83**	**27,800**	**42,200**	

Source	Quantity[1,2]	Greenhouse gas emissions (t CO_2-e)[2]				Assumptions
Operation						
Use of the road	See Table 10-12	-	-	-	See Table 10-12	
Road lighting	17,520 kWh	19			19	Assumes 12 high pressure sodium vapour lamps are operated 10 hours a day and 100 per cent of electricity is sourced from the local electricity grid.
Maintenance	-	n/a	n/a	n/a	n/a	Assumed to be negligible for this project.

Note: 1. kL = kilolitres; ha = hectares; kWh = kilowatts per hour; t = tonne; ANFO = Ammonium Nitrate Fuel Oil.

2. All figures are estimates, which have been rounded.

3. Assumes structural steel manufactured with no recycled content.

Emissions during operation

Greenhouse gas emissions during operation of the project would relate primarily to use of the road (indirect emissions) and maintenance and lighting (direct emissions).

To quantify this impact, a comparison of a 'base case' (no project) was made against the operation of the network, should the project proceed. The 'base case' scenario comprised vehicle emissions from the use of the existing highway without the project. The project scenario comprised emissions from traffic predicted to use both the project and the existing highway. Greenhouse gas emissions were calculated for the base case and project scenarios during year 2011 (Year 1 of operation). These were extrapolated through to 2041 (30 years from opening), using the RTA's *draft Greenhouse Gas Assessment Guide* (2008f), in a manner consistent with that used for the project traffic model (see Technical Paper 6 (Volume 2)). It does not account for any induced traffic demand. The results are shown in Table 10-12.

Table 10-12 Estimated greenhouse gas emissions, operational phase

Option	Annual greenhouse gas emissions 2011 (t CO_2-e)[1]	Annual greenhouse gas emissions 2041 (t CO_2-e)[1]
Base case (no project)	12,600	29,900
Project	12,000	30,100

Note 1: Estimated greenhouse gas emissions have been rounded to the nearest hundred

As shown in Table 10-12, the project is anticipated to decrease annual greenhouse gas emissions by around 600 t CO_2-e in 2011. However, by 2041, the project is expected to increase annual greenhouse emissions by around 200 t CO_2-e.

The project is likely to decrease vehicle kilometres travelled for all vehicles by around 10 per cent. This decrease would occur because most motorists are likely to use the project rather than the existing highway. Given the initial traffic volumes, the shorter distance results in lower greenhouse gas emissions for the project in 2011. While the project is expected to reduce the total travel distance by 11 per cent, it enables faster travel speeds enabled from the project result in less efficient fuel consumption, particularly for heavy vehicles. In 2041, the higher speeds and associated fuel efficiency outweigh the savings in distance, with the project anticipated to result in a modest increase in greenhouse gas emissions relative to the base case.

The cumulative greenhouse gas impact of the project (construction and operation) over the assessed timeframe (2011 to 2041) is estimated to be a net increase of 37,900 t CO_2-e.

Road lighting for the project is estimated to consume 17,520 kWh, resulting in total greenhouse gas emissions of 19 t CO_2-e per annum (refer Table 10-11 for assumptions). This is not considered significant. Greenhouse gas emissions generated by maintenance activities would also not be significant.

10.7.2 Waste

Construction waste

Construction of the project would involve the production of various waste streams. Potential sources include:

- Asphalt and concrete from the existing highway may be removed.
- Clearance of approximately eight hectares of native vegetation (refer Section 9.1).

Other waste-generating activities during construction would include earthworks, drainage works, restoration works on existing pavement, equipment maintenance and work site office activities. Construction waste would include:

- Concrete, reclaimed asphalt and scrap metal.
- Green mulch and vegetation.
- Waste fuels, oils, liquids and chemicals.
- General garbage and sewage from work compound sites.
- Packaging waste such as cardboard, paper, plastic and glass.

As identified in Section 10.7.1, this waste would contribute to the emission of greenhouse gases during construction of the project.

Operational waste

Limited operational waste would be expected from the project from road maintenance and road users. Wastes would likely include vehicle oils and greases and green waste. Litter generated by road users along the highway would also form part of operational waste. There is the potential for land contamination to occur as a result of fuel spills or leaks.

10.7.3 Management of greenhouse gases, energy and waste

Table 10-13 identifies mitigation and management measures that would be implemented for greenhouse gases, energy and waste. These measures have been incorporated into the draft statement of commitments in Chapter 11.

Management measures to reduce greenhouse gas emissions would specifically be targeted at Scope 1 and 2 emissions. Measures to reduce Scope 3 emissions are limited as such emissions, while occurring as a result of the project, would be outside the RTA's operational control.

Table 10-13 Greenhouse gases, energy and waste mitigation and management measures

Potential impact	Mitigation and management measure
Construction	
Greenhouse gas emissions and energy use during construction	▪ Implement energy efficient work practices including: ‣ Energy efficient design of site buildings. ‣ Design of site compounds and the batch plant to minimise unnecessary vehicle movement. ‣ Regular servicing of site plant and equipment. ‣ Training of construction personnel in energy efficient plant operation. ‣ The use of accredited GreenPower. ‣ Use of locally sourced materials where available and of suitable quality. ‣ Use of recycled materials, such as replacement of cement with fly ash, recycled aggregate, and recycled content in steel, where possible.
Waste generation during construction	▪ Apply the waste hierarchy (avoid, minimise, reuse/recycle, dispose) during construction and implement through the CEMP. ▪ Where disposal is required, classify, handle, store and dispose of waste in accordance with the *Waste Classification Guidelines: Parts 1 and 2* (DECC 2008a). ▪ Prepare and maintain a waste management system (including recycling). ▪ Trees to be removed would be considered for their value as millable timber.