19. Air quality

This chapter provides a summary of the Air Quality Assessment undertaken for the Project. A full copy of the report is included in Appendix L.

19.1 Methodology

The following methodology was used to assess the potential impacts from that the construction and operation of the Project may have on local air quality:

- Describe the existing air environment.
- Compile an emission inventory of the types and sources of air pollution associated with the Project and assess the potential for impacts to air quality.
- Recommend air pollution mitigation measures.

19.2 Existing environment

19.2.1 Sensitive receptors

A number of sensitive receptors are located along the pipeline corridor, which are primarily residential premises.

Sensitive receptors are located along the proposed pipeline route at varying distances from the corridor. See Figure 16.1, Land use, Chapter 16 for the location of sensitive receptors within 100 m of the pipeline alignment.

19.2.2 Ambient Air Quality

The existing air quality along the pipeline route is influenced by regional air pollutant sources with minor contributions from local sources such as dust from agricultural activities, smoke from wood heaters and vehicle exhaust emissions from nearby road and rail networks.

Local air quality monitoring data were not available for this assessment. However, given the rural nature of the project area, it is considered reasonable to assume that that local air quality is generally below the DECCW air quality goals.

19.2.3 Local Meteorology

The transport and dispersion of the air emissions from the construction and operation of the proposed Project would be influenced by the prevailing wind climate.

On an annual basis the prevailing winds at Goulburn, as recorded at the local Bureau of Meteorological automated weather station (AWS) are from the northwest and to a lesser extent from the west and southeast. Higher speed winds are typically associated with northwesterly synoptic flows. On a seasonal basis, southeasterly winds occur more frequently during summer, while north-westerly winds dominate during the other seasons, in particular during winter.

19.2.4 Dust

Airborne dust (as particulate matter) is typically less than 100 microns (μm) in aerodynamic diameter and is referred to as total suspended particulates (TSP). The fraction of these particles that are less than 10 μm in equivalent aerodynamic diameter is referred to as PM_{10}. The impact of dust emissions principally relates to the potential effect on human health on inhalation of particles in the air column, and it is the finer fraction that has the greater potential to cause respiratory health effects. A secondary effect relates to the deposition of the course fraction of dust onto surfaces (soiling of material surfaces), which is an impact on amenity. Typical, depositions effects are confined to short ranges, as the settling velocity of the course particles is significant and drop out from the dust plume is local only.

19.3 Impact assessment

Emissions to air during the construction phase would primarily consist of dust emissions from both the mechanical disturbance and wind erosion of crustal material, with minor contributions of exhaust emissions from the range of motor vehicle and mobile plant required for the Project.

During dry conditions, the following construction activities have the greatest potential to generate dust:

- Clearance of vegetation, rock and soil material;
- General surface earthworks and excavation works;
- Pneumatic rock-breaking and blasting, where required;
- Top soil and soil handling (stockpiling, loading, dumping);
- Leveling and grading of disturbed soil surfaces;
- Passage of construction and administrative vehicles over unsealed sections of road or localised unconsolidated soil surfaces; and
- Wind erosion of unstable/uncovered surfaces and stockpiles and other unconsolidated surfaces.

The dominant sources of dust emissions during the construction works would activities that cause large mechanical disturbances during their operations, such as earth moving operations such as a grader or excavator.

Earthmoving activities and wind erosion of disturbed areas typically give rise to dust emissions that are predominantly in the coarser fraction of the particle size range (*i.e.* larger than PM_{10}). The impacts associated with coarser dust fractions are frequently more significant in terms of nuisance and amenity rather than health. Both fine and coarse particles give rise to nuisance impacts, such as soiling of surfaces, and the creation of deposits in rainwater tanks, swimming pools, cars and other such undesirable effects.

Air emissions from engine exhausts from various vehicles and mobile plant would be confined to the local area around the sources and therefore, are best managed through maintenance regimes.

19.3.1 Potential for fugitive dust impact

There are approximately 16 houses located within 50 m of the proposed pipeline construction area. It is likely that these houses would be the most impacted by dust emissions from the construction works; however; most of the construction activities would occur for a limited period at any location along the pipeline route so emissions to air would be transient.

Analysis of the local wind climate at Goulburn indicates a higher occurrence of wind from the northwest and west, which means sensitive receptors to the southeast and east of the Project corridor would have a higher frequency of exposure to dust potentially emitted from the Project.

The potential for air quality impact is greatest at receptors located at the edge of the Project corridor or construction areas with the level of impact decreasing with distance from the construction areas. Based on previous experience with similar construction projects, sensitive land uses located less than approximately 200 to 500 m should be considered in the application of standard mitigation measures, with particular attention given to receptors located within approximately 100 to 200 m.

19.3.2 Operation emissions

The operation of the pipeline would not result in significant emissions to the atmosphere. The main activities resulting in air pollutant emissions would involve maintenance activities such as the vehicles used to check and maintain the pipeline route which may stir up dust as they travel along the easement.

Additionally, there is potential for odour emissions to occur along the pipeline, particularly during the release of air and scour valves, from water that has been sitting in the pipeline for a long period of time. This is unlikely to occur however with the implementation of regular maintenance and checking of the pipeline.

Greenhouse gas emissions from the operation of the pipeline are discussed in Chapter 20.

19.4 Summary of results

Construction dust and vehicular emissions are unlikely to cause long-term loss of amenity during construction of the Project as impacts on amenity (dust deposition) would be confined locally and would only be temporary as the construction activity would move along the pipeline alignment. While potential temporary adverse impacts on existing air quality can potentially result from construction activities, it is anticipated that the application of standard mitigation measures to reduce dust generation and vehicular emissions during construction would provide adequate protection to the amenity of nearby sensitive receptors.

Air pollutant emissions during pipeline operation should be very low, mainly relating to maintenance activities. Inspections should be carried out on a regular basis to ensure that dust and odour emissions from sources along the pipeline corridor are minimal. Equipment used on the site would be appropriately operated and maintained to ensure that air pollutant emissions are minimised.

19.5 Mitigation measures

Standard mitigations for construction dust management are as follows:

- Site managers would be provided with daily weather updates that would contain warnings of the onset of strong winds. The site manager would then take steps to pre-water construction areas and stockpiles before they are disturbed and continue watering during any activities where fugitive dust may be produced. Earthmoving activities would be suspended during times of high winds, particularly when dust plumes are directed towards sensitive receptors;
- Dry material would be watered prior to it being loaded for haulage;

- Physical barriers would be constructed to act as windbreaks for the construction site or for stockpile areas where practicable;
- Dust screens would be installed on construction site boundaries that are adjacent to sensitive receptors where practicable;
- Storage piles would be placed in areas protected from the wind and away from public places where possible. Spoil stockpiles would be water sprayed regularly and dry material stockpiles would be covered;
- Existing vegetation would be retained where possible. Cleared areas would be rehabilitated as quickly as practicable following completion of work;
- Construction traffic would be controlled by designating specific routes for haulage and access. Vehicle speeds would be limited to 20 km/hr;
- All trucks hauling dirt, sand, soil or other loose materials to and from the construction site would be covered;
- Material spillage on roads and pathways would be cleaned up immediately;
- All construction vehicles, mobile plant and machinery would be maintained and operated in accordance with the manufacturers' specifications to minimise exhaust emissions; and
- A line of communication would be established between the construction contractor and the local community prior to the start of construction as part of a complaints management system. All complaints lodged by nearby residents would be recorded on a complaints register, which would also document the investigation into the source of the emission giving rise to the complaint and any corrective actions taken to rectify the cause of complaint.

The site manager would establish contact with the local residents and communicate the construction program and progress and in particular to provide advance warning of significant dust generating activities being undertaken in close proximity to sensitive receptors.

20. Greenhouse gas assessment

This chapter provides a summary of the Greenhouse Gas Assessment undertaken for the Project. A copy of the full assessment is included in Appendix M.

20.1 Methodology

The greenhouse gas (GHG) assessment was conducted in accordance with the general principles of:

- *The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard* developed by the World Resources Institute and World Business Council for Sustainable Development (March 2004);
- Life Cycle Assessment principles (ISO 14040 series); and
- The Commonwealth Department of Climate Change *National Greenhouse Accounts Factors*, (June 2009).

The DoP's Draft Guidelines *Energy and Greenhouse in EIA* (Guidelines) indicate two possible levels of assessment:

7. Level 1 Assessment – A simplified assessment based on a limited number of energy sources and methane generation potential.
8. Level 2 Assessment – A more detailed assessment including all Scope 1 and 2 emissions and 'upstream' and 'downstream' emissions.

A Level 1 assessment was carried out with additional, more detailed information included only where sufficient Project data was available.

20.2 Scope 1, 2 and 3 emissions

The potential emissions from the construction and operation phases of the Project were investigated to estimate the greenhouse gas emissions for the proposed Project.

Scope 1, 2 and 3 emissions are defined in the *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* developed by the World Business Council for Sustainable Development and the World Resources Institute. The concept of scope 1, 2 and 3 emissions has been carried over into Australian publications, such as those produced by the Department of Climate Change (DCC) and the draft guidelines that are applicable to the GHG assessment for this project. These guidelines specifically require emissions to be expressed in terms of Scope 1, 2 and 3.

Each of the GHG emissions sources were separated into Scopes 1, 2 and 3 in accordance with the *Greenhouse Gas Protocol* (WRI & WBCSD, 2004). For this assessment the scopes are defined as follows:

- Scope 1: Emissions created directly by a person or business from sources that are owned or controlled by that person or business.
- Scope 2: Emissions created as a result of the generation of electricity, heating, cooling or steam that is purchased and consumed by a person or business. These are indirect emissions as they arise from sources that are not owned or controlled by the person or business that consumes the electricity.

- Scope 3: Emissions that are generated in the wider economy as a consequence of a person or business's activities. These are indirect emissions as they arise from sources that are not owned or controlled by that person or business but they exclude Scope 2. This includes embodied energy in raw materials.

Scope 1 emissions are produced by the combustion of fuels such as diesel and natural gas, at the project site, by vehicles and plant equipment, which the Proponent owns and has operational control. Note that only the direct combustion of the fuels is considered as Scope 1. Scope 2 emissions arise from the consumption of electricity at project site, in plant equipment that is owned and operated by the Proponent.

All other emissions associated with the project are defined as Scope 3, since they are produced outside the project site, and the Proponent does not have operational control of the facilities from which they originate. The Proponent does not own or operate any of the vehicles that transport raw materials to the site. As such, the emissions resulting from the combustion of fuels for this transportation are classified as Scope 3.

Further information relating the emissions calculations and assumptions can be found in the *Greenhouse Gas Assessment Report* in Appendix M.

20.3 Existing environment

The latest overview of GHG emissions estimates for Australia was published by the DCC in October 2009. The annual estimates for the four quarters to June quarter 2009 are summarised in Table 20.1. This summary does not include emissions associated with land use, land use change and forestry.

Table 20.1 2007 Australian GHG emissions estimate (DCC, 2009a)

Category	Emissions ($Mt\ CO_2$-e)	Percentage of total (%)
Energy - Electricity	204	38
Energy – Stationary energy excluding electricity	90	17
Energy – Transport	79	15
Energy – Fugitive emissions	39	7
Industrial processes	29	5
Waste	15	3
Agriculture	89	16
Inventory Total	**545**	**100**

The latest summary of NSW GHG emissions was produced in 2009 for the 2007 inventory year (DECC, 2009b). This summary is shown in Table 20.2 .

Table 20.2 2007 Annual NSW GHG emissions estimate (DCC, 2009b)

Category	Emissions ($Mt\ CO_2$-e)	Percentage of total (%)
Energy	117	72
Industrial processes	12	7
Waste	5	3
Agriculture	18	11
Land Use, Land Use Change and Forestry	11	7
Inventory Total	**163**	**100**

20.4 Potential impact

20.4.1 Construction

The main sources of GHG emissions from the construction phase of this type of project are outlined in Figure 20.1 below.

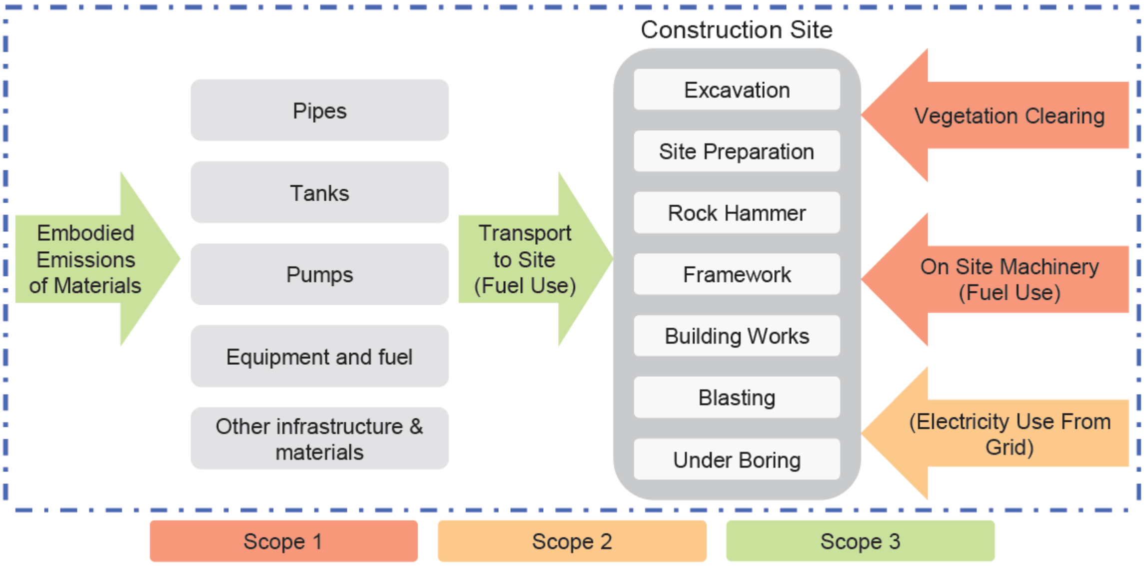

Figure 20.1 Potential GHG emission sources during construction phase

The main Scope 1 emissions are expected to be from the combustion of fuels such as petrol or diesel by construction equipment and any clearing of land on the pipeline easement.

Scope 2 emissions associated with any use of electricity from the grid during the construction phase have not been included in the scope of this investigation as they were considered not material on the context of the assessment. Scope 3 emissions from the transportation of fuel and materials, and embodied emissions of construction materials are likely to be a significant source of emissions and have been included in the assessment.

Total emissions due to construction were estimated to be **27 400** t CO_2-e. This was estimated from four sources of emissions (Table 20.3).

Table 20.3 GHG emissions associated with pipeline construction

Emissions source – construction phase	t CO_2-e	Proportion of emission (%)
Embodied emissions in pipeline material	19 000	69
Permanent clearing of forest	3 800	14
Onsite diesel use by machinery	3 200	12
Diesel use to transport materials to site	1 400	5
Total	**27 400**	**100**

Based on these calculations, the annual emissions associated with the construction phase of this project will equate to approximately 0.02 per cent of total annual emissions for NSW, (based on *DCC State and Territory Greenhouse Gas Inventories 2007* (DCC, 2009b)).

20.4.2 Operation

The main sources of GHG emissions from the operation phase of this type of project are outlined in Figure 20.2 below.

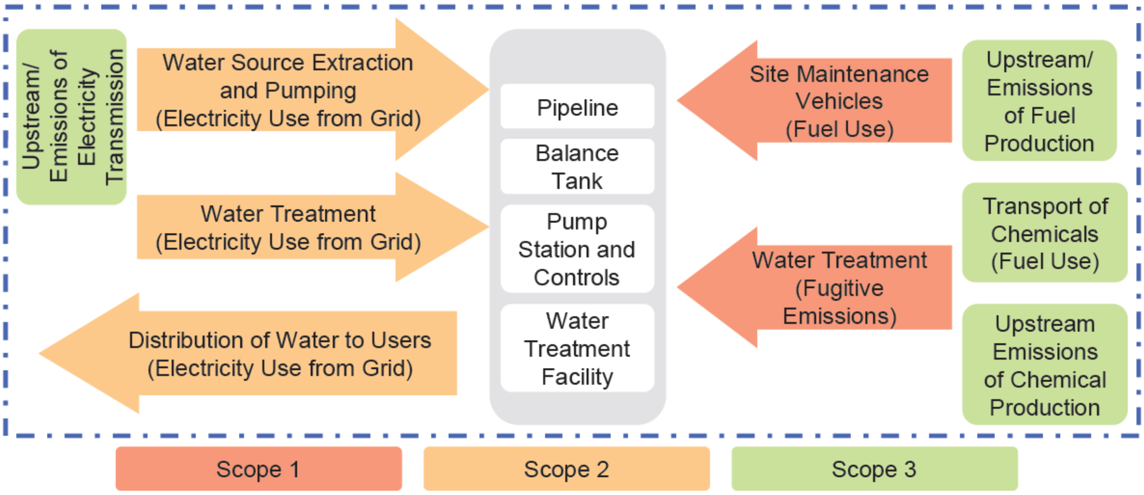

Figure 20.2 Potential GHG emission sources during operation phase

Total operational emissions were estimated to be 1 000 t CO_2-e per year. This is based on electricity consumption for water pumping and water treatment (Scope 2 and 3 emissions). No Scope 1 emissions are associated with the operation of the Project.

Based on these calculations, the annual emissions associated with the operation phase of this project will equate to approximately 0.001 per cent of total annual emissions for NSW, (based on DCC *State and Territory Greenhouse Gas Inventories 2007*).

Over the first 30 years of this Project, approximately 30 000 t CO_2-e of operational emissions will be produced.

The GHG emissions associated with electricity use during the operation phase of this project was estimated based on consumption of electricity for:

- Water extraction and pumping; and
- Water treatment.

Energy use for water extraction and pumping was estimated to be 2 400 kWh per day, and water treatment was estimated to be 162 kWh per day.

Table 20.4 Operational greenhouse gas emissions

Emissions source – operation phase	t CO_2-e/year	Proportion of emission (%)
Raw water pumping	937	93.7
Water treatment	63	6.3
Total	**1 000**	**100**

Calculations undertaken for the IWCM Evaluation Strategy suggests that there the energy required to transfer a mega litre from Wingecarribee Reservoir is only slightly higher than that required to transfer it from Rossi Weir.

20.5 Summary of results

The major sources of emissions during construction would be diesel for manufacturing of pipes and pipe material, construction vehicles and vegetation clearance. Emissions associated with the consumption of electricity were estimated to contribute 100 per cent of the total emissions during operation of the proposed pipeline and pump station.

The total construction emissions were estimated to be 27 190 tonnes of CO_2-e over the construction period. The annual emissions equate to 0.02 per cent of total emissions for NSW, based on *DCC State and Territory Greenhouse Gas Inventories 2007.*

The total emissions for the first thirty years of operations are estimated to be 30 060 tonnes CO_2-e (refer Figure 20.3).

The total emissions for the first thirty years of operations are estimated to be 30 060 tonnes CO_2-e. While these emissions are only a small fraction of the Australian and NSW total emissions, there remain opportunities to take-up environmentally and economically appropriate measures to reduce greenhouse gas emissions.

Scope 1, 2 and 3 emissions from the project are presented in Table 20.5. These emissions are categorised as either occurring during the construction period or as an operational emission (annual basis).

Table 20.5 Summary of Scope 1, 2 and 3 emissions for the project

	Quantity (t CO_2-e)[7]
Construction	
Scope 1	8 000
Scope 2	0
Scope 3	19 400
Total construction	27 400
Annual operating emissions	
Scope 1	0
Scope 2	1 000
Scope 3	0
Total operation	1 000

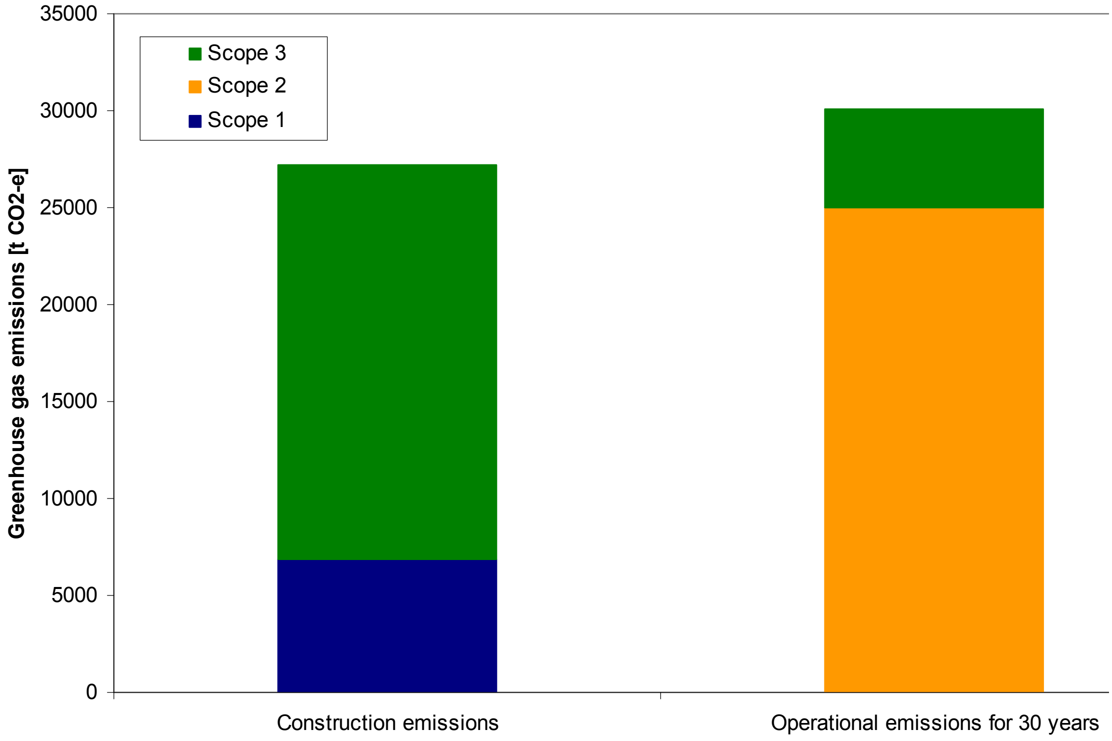

Figure 20.3 Summary of emissions associated with the project

[7] Emissions figures have been rounded

20.6 Mitigation measures

20.6.1 Construction phase

The main sources of GHG emissions during the construction phase of this project identified in this assessment were from the combustion of fuel in worksite equipment (12 per cent), the transportation of materials to the site (5 per cent), the clearing of vegetation (14 per cent), and the embodied emissions of the materials used (70 per cent). Potential mitigation measures for each of these emissions sources are outlined below.

Fuel use on site – mitigation options

- *Use of biodiesel*

The use of biodiesel (blended with regular diesel) in construction vehicles has the potential to reduce GHG emissions during construction. The reduction in emissions is dependent on the type of feedstock and its processing location. The Project could conduct a feasibility assessment for the use of biodiesel during construction. This assessment should include consideration of the biodiesel feedstock and associated GHG emission reduction, environmental impacts of biodiesel feedstocks, fuel characteristics in relation to climatic conditions at the site (*e.g.,* requirement for winter blends) and the suitability of using biodiesel blends in construction equipment.

Materials transportation – mitigation options

- *Sourcing materials from closest possible location*

The distance needed to transport materials to the construction site should also be taken into account in the selection process.

Embodied emissions – mitigation options

- *Using lowest energy demanding design (minimise pipeline length)*
- *Consider pipeline components with lowest embodied emissions*

Other construction mitigation options and offsets

Other construction phase GHG mitigation options could include:

- Select new site vehicles based on energy consumption (For more information: www.greenvehicleguide.gov.au);
- Explore opportunities to backload on trucks; and
- Develop a GHG emissions minimisation strategy for the remainder of the design and construction phases to encourage use of renewable, recycled and recyclable materials and resources.

20.6.2 Operation phase mitigation measures

The main sources of GHG emissions from the operation phase of this project were identified as Scope 2 emissions from electricity use to pump (93.7 per cent) and treat the water (6.3 per cent).

Electricity use - mitigation options

- Use less emissions intensive sources of electricity where possible