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.

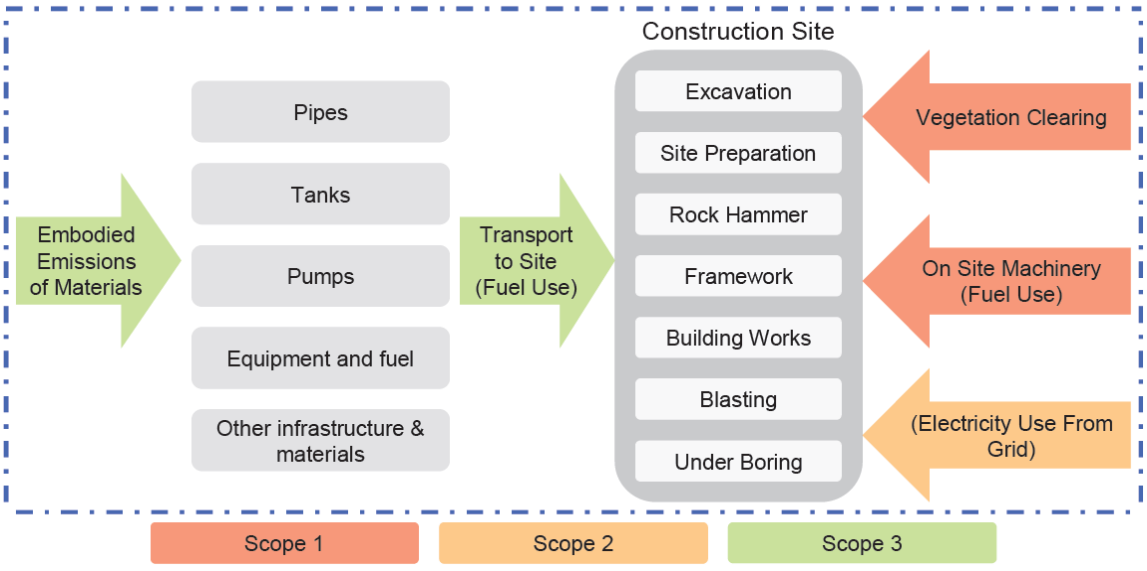

Figure 20.1 Potential GHG emission sources during construction phase

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.

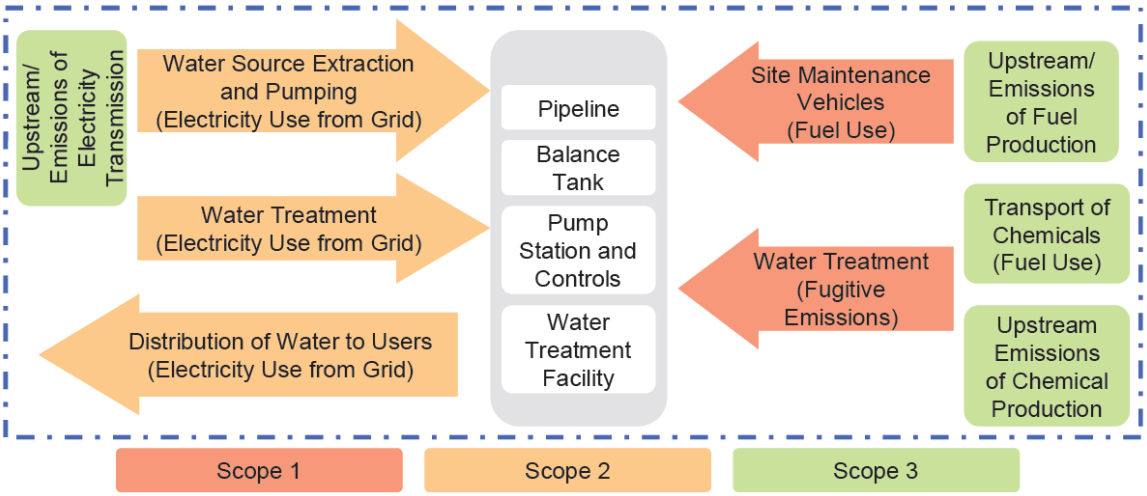

Figure 20.2 Potential GHG emission sources during operation phase

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

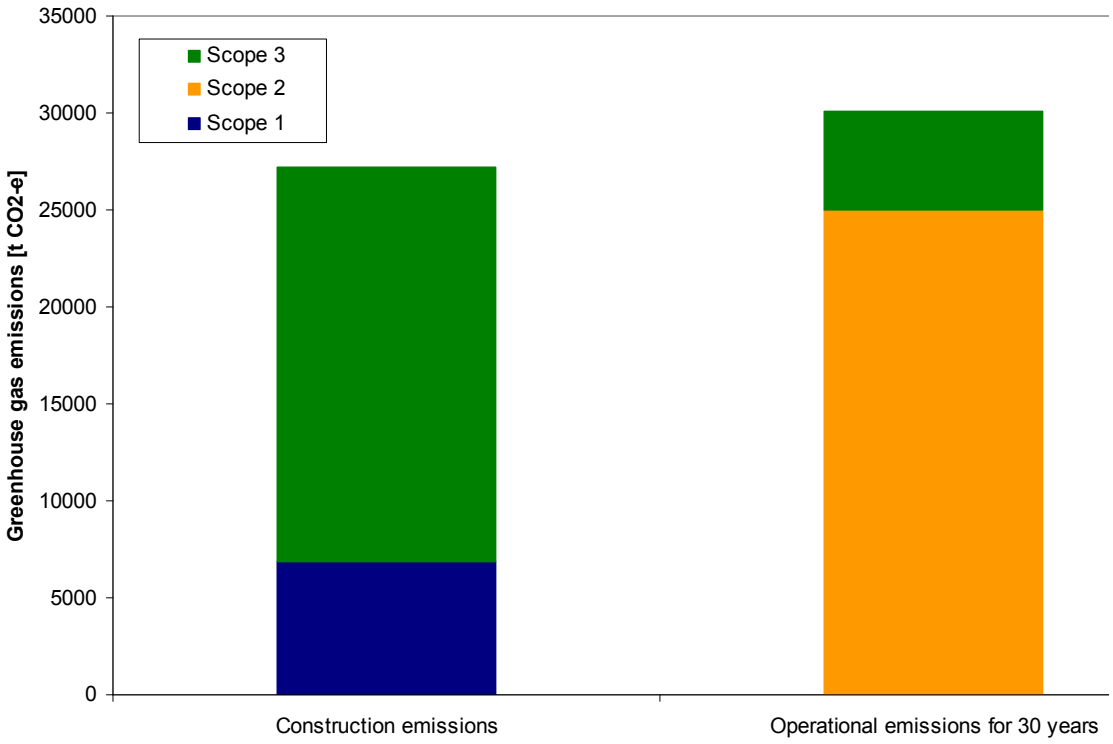

Figure 20.3 Summary of emissions associated with the project

[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