22 Greenhouse gases

22.1 Introduction

The greenhouse effect is a naturally occurring process where some of the heat reflected from the earth's suface is absorbed by water vapour, carbon dioxide and other gases in the atmosphere and radiated back to the surface. This process is essential for life on earth as it maintains the climate at a habitable temperature.

As a result of human activities however, the greenhouse effect has become enhanced resulting in the heating of the planet, commonly referred to as global warming or climate change.

Climate change as a result of increased emissions of greenhouse gases has become one of the dominant environmental concerns facing governments around the world. As scientific assessments have become more sophisticated, the predicted effects of climate change have become more precise. It is expected that climate change will affect on South Australia in the following ways:

- temperature increase of between 0.2°C and 1.8°C by 2030 (depending on distance from the coast)
- temperature increase of between 0.5°C and 5.5°C by 2070 (depending on distance from the coast)
- generally decreased rainfall throughout the State, with a reduction of 45% likely in some areas by 2070 (other areas may experience up to 25% increased rainfall).

It is likely that South Australia will be further affected by climate change impacts in neighbouring states, with a reduction in run-off in the already stressed Murray-Darling Basin of up to 25% by 2050.

22.2 Legislative requirements

22.2.1 State

South Australia's Strategic Plan has a target of reducing greenhouse gas emissions to 108% of 1990 levels during 2008–2012. This is a first step towards reducing emissions by 60% (to 40% of 1990 levels) by 2050. A draft greenhouse strategy was released in January 2006; *Tackling climate change – South Australia's draft greenhouse strategy* (the Greenhouse Strategy).

In relation to the greenhouse effects of transport, the Greenhouse Strategy contains a goal that South Australia *will substantially reduce transport-related greenhouse emissions while maintaining accessibility*.

Under this goal, the objectives to be implemented are to:

- reduce trip lengths and the need for motorised travel through integrated land use and transport planning
- achieve more sustainable travel behaviour
- improve vehicle and fuel emissions
- shift transport towards low-emission modes.

All of these objectives are relevant to the development of the Northern Expressway. The first objective is particularly relevant. To achieve this, the South Australian Government intends to implement a range of strategies, including:

- ensuring planning policies are consistent in supporting reductions in greenhouse emissions from transport and the built environment
- encouraging more compact metropolitan and regional town development.

22.3 Assessment of operational effects

22.3.1 Introduction

To assess the effects of the Northern Expressway in relation to greenhouse gas emissions, an assessment of energy consumption and greenhouse emissions from the project before and after completion will be conducted.

The following sections outline the proposed methodology for the assessment, qualitatively discuss the issues that will need to be considered as part of the assessment, and outline potential management measures that may be implemented to limit the greenhouse impacts of the project. The assessment will be included in the Supplement document.

22.3.2 Proposed methodology

The method used to determine the greenhouse gas emissions associated with the use of vehicles on the Northern Expressway will be based on the method contained within the AGO Factors and Methods Workbook (the Workbook). Based on the methodology within the Workbook, the greenhouse gas emissions from a vehicle are equal to the quantity of fuel used (in kilolitres) multiplied by an emission factor.

To determine the potential positive and negative effects of the Northern Expressway, two different scenarios will be examined:

- No Build Option (without Expressway) – greenhouse gas emissions from traffic in the area if the project did not go ahead
- Build Option (with Expressway) – greenhouse gas emissions from traffic in the area if the Northern Expressway is built.

For each of these two options the vehicle kilometres travelled will be calculated based on traffic modelling. These will then be multiplied by the standard emissions factors contained within the Workbook to determine the greenhouse gas emissions.

22.3.3 Issues to be addressed

It is anticipated that the effect of the Northern Expressway will be to remove some of the vehicles travelling on the surrounding roads and provide them with a more direct and efficient travel route to Port Adelaide from the Gawler area. As a result of this, it is anticipated that the following trends will be observed in the traffic data:

- The No Build Option will involve traffic numbers similar to the current level with increases in time due to population growth and any increased freight activities.
- The Build Option will result in decreased traffic volumes on the existing road network with the Northern Expressway carrying a portion of this traffic. These traffic loads (on both the Expressway and

surrounding roads) will also increase over time due to population growth and any increased freight activity in the area.

Although these effects are relatively straightforward, the following, more complicated issues need to be incorporated into the greenhouse gas assessment:

- Due to high traffic volumes, congestion and traffic stoppages (i.e. traffic signals) on the existing road network, the greenhouse gas emissions of traffic using these roads may not be simply a function of the distance the vehicles travel but also the length of time the cars are running.
- As traffic shifts from the existing road network to the Northern Expressway, the travel times on the Northern Expressway may increase resulting in the greenhouse gas emissions from vehicles using this road to also become a result of travel time.

22.4 Assessment of construction effects

In addition to the greenhouse gas emissions associated with the use of the Northern Expressway, there will also be emissions from construction activities. Although it is not practical to quantify the level and sources of emissions at this stage, the sources and potential management measures can be assessed.

Sources of emissions from construction activities will include:

- emissions from vehicle use including excavation and haulage of equipment, materials and waste
- lighting during any night works
- emissions associated with the production of materials used (embodied energy)
- emissions from mobile equipment and plant.

22.5 Management measures

22.5.1 Measures to minimise effects during planning and design

Measures that can be implemented to reduce the greenhouse gas emissions associated with the use of roads include:

- choosing the shortest route possible, including minimising additional distances associated with bends in the road
- choosing the route with minimal inclines as vehicles consume more fuel travelling up hills
- minimising any stoppages including those associated with traffic lights and intersections
- minimising accidents and therefore congestion associated with accidents
- minimising congestion by allowing smooth transition between the proposed Expressway and other roads
- avoiding the removal of significant amounts of vegetation.

Although these measures can be easily applied in theory, in practice they are not so easily applied due to conflicts with other decision-making factors, such as land acquisition, cost of construction and safety.

The Northern Expressway incorporates many of these design principles. The road is reasonably direct from start to finish and passes through relatively flat terrain. As the area is highly developed for agricultural purposes, the route does not require the removal of large areas of vegetation and, in fact, provides opportunities for additional vegetation. The Expressway also does not have any traffic lights or level intersections (until it reaches Port Wakefield Road), and avoids several intersections known to be the sites of many accidents.

22.5.2 Measures to minimise effects during construction

The easiest and most cost-effective way to reduce greenhouse gas emissions during the construction phase is by minimising the number of vehicle trips and use of resources associated with time delays and mistakes.

Measures that use fuel efficiently also minimise greenhouse emissions. Such measures include:

- correct maintenance and servicing of all vehicles and equipment to ensure that they are operating at their maximum level of efficiency
- use or purchase of efficient equipment
- locating any pick-up or drop-off points close to the point of construction
- use of alternative or low emission fuels, including biodiesel or LPG
- transporting waste and materials only when there is enough for a full load
- aiming to transport materials, equipment and waste during off-peak periods.

22.6 Reducing greenhouse gas emissions

The common means of offsetting transport emissions in Australia is via the planting of trees through programs such as Greenfleet. Due to the potentially large quantity of emissions associated with the use of the Northern Expressway, it may not be practical for all of these emissions to be offset through vegetation planting. Some of the emissions could be offset through the revegetation of areas adjacent to the roadway. Emissions from fleet vehicles used for the maintenance of the Expressway could also be offset in this way.

The South Australian Government is currently implementing the following initiatives to reduce its greenhouse gas emissions:

- increasing the generation of renewable electricity to 20% of all electricity generated in the State by 2014
- increasing the State's consumption of renewable electricity to 70% of the total by 2014.

The South Australian Government is actively involved in national processes for developing transport, vehicle or infrastructure standards or guidelines relating to greenhouse gas emissions.