West Gate Tunnel Project

Greenhouse Gas Assessment

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AECOM

Study objectives

Greenhouse gas impact assessment objectives:

- understand the greenhouse gas emissions from the construction and operational phases of the project
- assess the greenhouse gas risks and potential impacts associated with the project
- demonstrate compliance with the *Environment Protection Act 1970* (Vic) including SEPP (Air Quality Management)
- develop performance requirements for greenhouse gas emissions management that specify the limits and processes that must be followed to achieve an acceptable outcome

Method

1. Established existing conditions by estimating transportation greenhouse gas emissions for Australia, Victoria and Melbourne's western suburbs
2. Undertook an initial risk assessment to determine the key issues upon which to focus the impact assessment
3. Undertook the impact assessment including:
   - estimating emissions from construction and operational phases (Carbon Gauge and National Greenhouse Accounts) – AECOM
   - estimating emissions from vehicle traffic (Zenith Transport Model Economic Assessment Model) – VLC

Legislation and Policy

National

- *National Greenhouse and Energy Reporting Act 2007*
- 2017 Review of Climate Change policies, to ensure its policies remain effective in achieving Australia's 2030 emissions reduction target of 26-28 per cent below 2005 levels, and commitments under the Paris Agreement.

State

- *Climate Change Act 2017*, including the 2050 net zero emissions target
- *SEPP Air Quality Management (AQM) 2001* and the *Protocol for Environmental Management (PEM): Greenhouses Gas Emissions and Energy Efficiency in Industry*
- *Victoria's Climate Change Framework* including the goal of limiting warming to 1.5°C above pre-industrial levels while safeguarding Victoria's economic competitiveness

Legislation and Policy

Local

- Local council emission reduction and climate change policies and strategies
- Western Alliance Greenhouse Action's (WAGA) *Low Carbon West Project*,

Other standards and guidelines

- *Greenhouse Gas Assessment Workbook for Road Projects* and the *Carbon Gauge* calculator
- Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability (IS) Tool

Key issues

Activities relevant to the construction and operation of the West Gate Tunnel that cause the release of greenhouse gasses into the atmosphere include:

- burning fossil fuels in vehicles, plant and equipment
- the production of electricity from burning fossil fuels (e.g. coal or natural gas)
- manufacturing processes associated with materials used in the asset (e.g. the manufacture of cement)
- vegetation clearance

Greenhouse gas considerations in the design

- Committed to an ‘Excellent’ IS rating
- Targeting Ene-1 (Level 2.7), above the minimum project requirement of Level 2.
  - A 25% reduction in GHG emissions compared to approximately 15% under Level 2
- Actions that would be implemented to improve sustainability outcomes of the project include:
  - Reducing the total number of bridge piers and roadway length to be laid
  - Use of hybrid-diesel generators and solar powered lighting during construction
  - Re-use of all reusable road base for the West Gate Freeway
  - Utilisation of steel fibre reinforcement within the precast tunnel lining reducing steel use
  - Use of ‘eco mixes’ where appropriate, rather than Portland cement
  - Use of low static fans and variable speed drives for the tunnel ventilation systems
  - Use of light emitting diode (LED) throughout the vehicle and access tunnels and all buildings and proximity LED lighting within the service tunnels

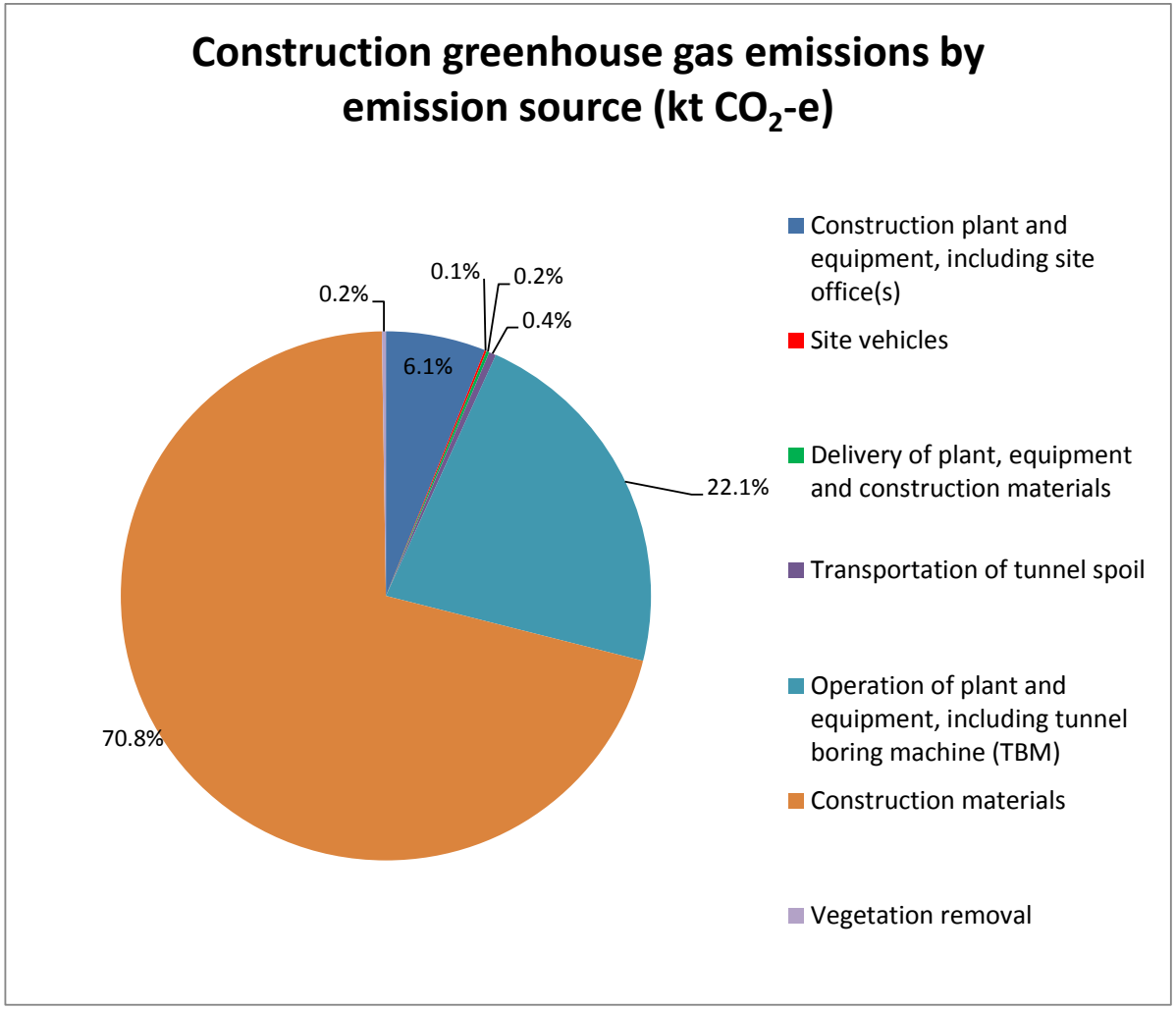
Greenhouse gas considerations in the design continued

- Additional potential opportunities identified by the Project Co that may be implemented to improve sustainability outcomes of the project include:
  - Use of hybrid cars
  - Use of energy efficient crib (site) huts
  - Optimising construction timeframes to reduce energy use for dust suppression activities.
  - Use of lower embodied energy materials such as warm mix asphalt, best practice PVC pipes, and Forestry Standard Certified or reused timber.

Calculating construction emissions

Category	Emission source	Data Source	Calculation approach
Fuel use	Construction plant and equipment	Direct request to Project Co	Carbon Gauge version 01.8
	Site vehicles		Carbon Gauge version 01.8
	Delivery of plant, equipment and construction materials		Carbon Gauge version 01.8 Manual calculation based on materials, plant and equipment delivery estimations provided by Project Co
	Transportation of tunnel spoil	Project Contamination and spoil management plan	Manual calculation based on cut to spoil estimations provided by Project Co
Electricity consumption	Operation of plant and equipment, including tunnel boring machine (TBM)	Project Tunnel power supply plan Direct request to Project Co	Manual calculation based on power estimate provided by Project Co for the tunnel boring machine (TBM) and other site plant and equipment
	Operation of site office(s)	Direct request to Project Co	Manual calculation based on site office power estimations provided by Project Co
Materials	Construction materials (excluding non-pavement materials for tunnel construction)	Direct request to Project Co	Carbon Gauge version 01.8
	Construction materials for tunnel		Manual calculation based on estimation of tunnel material quantities by Project Co
Land use changes	Vegetation removal	Direct request to Project Co	Carbon Gauge version 01.8

Findings – Construction



Total Scope 1, 2 and 3 greenhouse gas emissions from construction :

- 457 kt CO_2-e

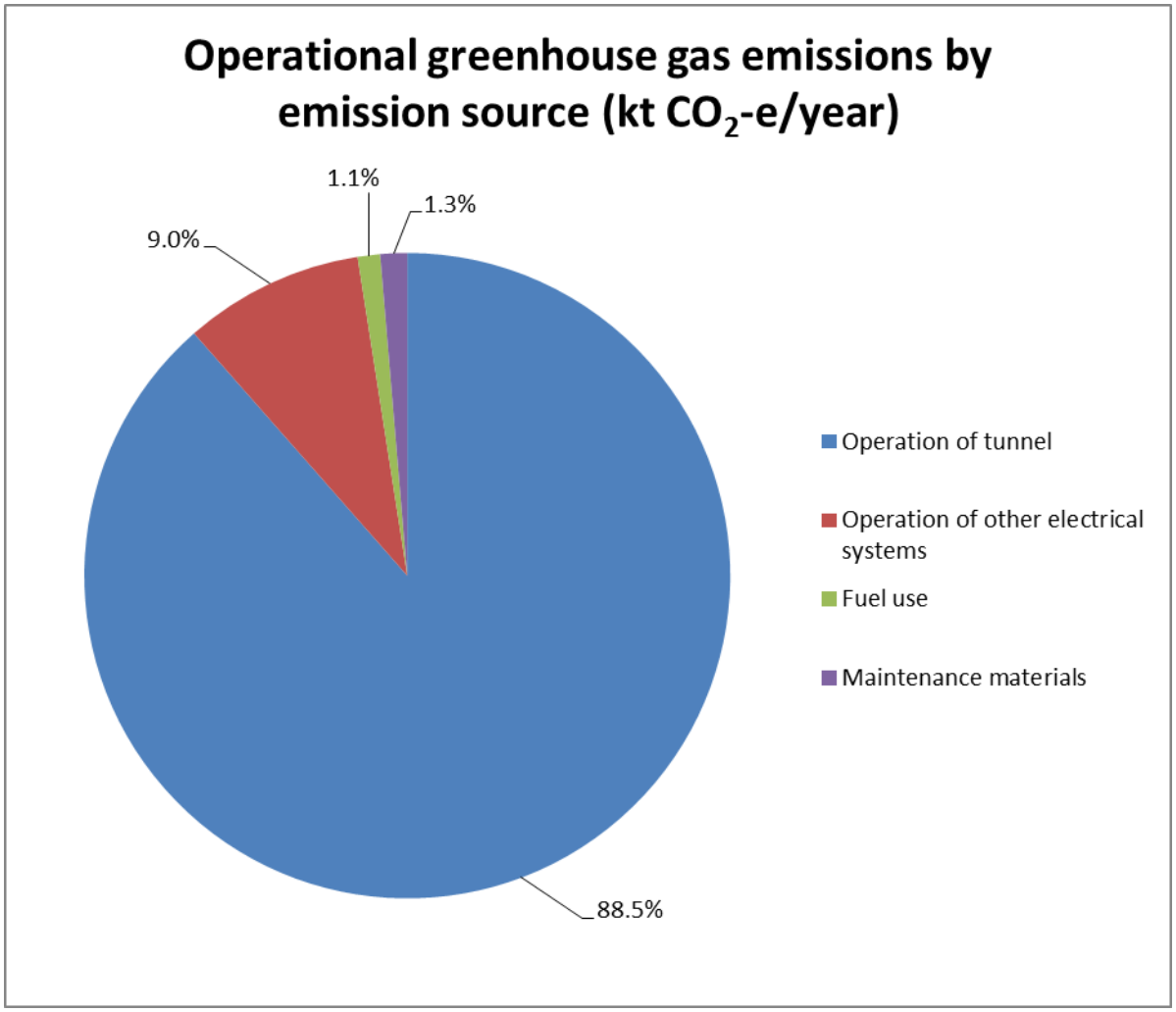
This equates to:

- 114.3 kt CO_2-e / pa for 4 years
- ~0.10 % of Victoria's total annual emissions (2014)

Calculating operation & maintenance emissions

Emission source category	Emission source		Calculation approach
Operation			
Electricity consumption	Tunnel pumps, lighting and ventilation	Tunnel power supply plan Direct request to Project Co	Manual calculation based on tunnel power estimate provided by Project Co
	Electrical systems (e.g. FCC, signalling and toll gantries)	Project road alignment drawings	Carbon Gauge version 01.8
Maintenance			
Fuel Use	Plant and equipment	Direct request to Project Co	Carbon Gauge version 01.8
	Site vehicles		Carbon Gauge version 01.8
	Delivery of maintenance materials		Carbon Gauge version 01.8
Materials	Maintenance materials	Direct request to Project Co	Carbon Gauge version 01.8

Findings – Operation & maintenance



Total Scope 1, 2 and 3 greenhouse gas emissions from the project's operation:

- 18.9 kt CO_2-e / pa
- ~0.10 % of Victoria's annual transportation emissions (2014)
- ~0.02 % of Victoria's total 2014 emissions

Calculating vehicle traffic emissions

Category	Emission source	Data Source	Calculation approach
Traffic	Operation of vehicles	VLC traffic model	Estimated by VLC using the Zenith Economics Assessment Model (refer to Appendix D)

Calculating vehicle traffic emissions – background

- Vehicle traffic greenhouse gas emissions are one of the outputs of VLC's Zenith Transport Model Economic Assessment Model (EAM)
- It generates GHG emissions for:
  - a base, 'no project' scenario
  - a 'with project' scenario
- The model includes consideration of induced demand…

Calculating vehicle traffic emissions – induced demand

- The Victorian Auditor General (VAGO, 2011), identifies 6 ways people/businesses respond to a road improvement:
  1. Changing route
  2. Changing destination
  3. Changing mode
  4. Changing time of travel
  5. Making additional journeys
  6. Relocated trips
- VLC states that their model adequately addresses 1-3

Calculating vehicle traffic emissions – induced demand

- **4. Changing time of travel**. VLC states that this is "*difficult to model but probably has fairly minimal effect on GHG assessment* [sic]"

- **5. Making additional journeys**. VLC states that the "…*jury is out on whether this actual* [sic] *occurs to a scale that has any material impact on the capacity consumption of roads and/or economic benefit assessments. Needs further research to resolve. VLC believes it will not have a significant impact.*"

Calculating vehicle traffic emissions – induced demand

- **Relocated Trips.**
  - VAGO (2011) states that the redirection of development resulting from a major road investment will "*...significantly underestimate traffic and overestimate the economic benefit"*.
  - VLC states that "*Current models do not currently predict this phenomenon"* but that it is "…*more likely that traffic in the vicinity of the new road will increase, and that traffic remote from the road will reduce relative to the base case…* "

Calculating vehicle traffic emissions – method

- Three vehicle classification were used
  - Cars
  - Light Commercial Vehicles (LCV)
  - Heavy Commercial Vehicles (HCV)
- Traffic Model outputs were used to calculate fuel consumption on each road link ,for each vehicle type, and for each scenario :
  - as a function of average daily link speed
  - using a formula provided by Austroads (2005)
- National Greenhouse Accounts conversion factors were then used to calculate GHG emissions, assuming that the proportion of:
  - Cars, LCVs and HCVs in both modelled scenarios is the same as in the national fleet
  - Petrol and diesel vehicles is the same in both modelled scenarios as in the national fleet

Key findings – Vehicle traffic

Estimated total annual greenhouse gas emissions from road traffic on the Metropolitan Melbourne road network

	GHG emissions (kt CO_2-e per annum)	
	2021	2031
No-project	17,205	20,757
West Gate Tunnel	17,245	20,765
Difference from 'no project' (kt CO_2-e)	+ 40	+ 8
Difference from 'no project' (%)	+0.23%	+0.04%

Environmental Performance Requirements (EPRs)

- Integrate sustainable design practices into the design process to minimise greenhouse gas emissions arising from construction, operations and maintenance
- Compliance with PEM (Greenhouse Gas Emissions and Energy Efficiency in Industry) for selection of best practice energy usage for the tunnel ventilation and lighting systems
- In detailed design consider the selection of materials and monitor energy and carbon during construction, to target reductions for GHG emission impacts of materials and energy consumption in accordance with Mat-1 (Level 2) and Ene-1 (Level 2) credits of the Infrastructure Sustainability (IS) rating tool (v1.2)

Public submissions

The submissions raised the following issues:

- Inadequacies of the assessment of operational greenhouse gas emissions from vehicle traffic
- Challenging the significance of the vehicle traffic emissions
- Inadequate assessment against the requirements of the *Transport Integration Act 2010*
- The assessment has not considered the greenhouse gas impacts in comparison to alternative public transport based projects

No further work or changes to the original findings were required.

Thank You

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