



**Public Transport
Authority**

Malaga to Ellenbrook Rail Works

Environmental Review Document – Greenhouse Gas Assessment Addendum Report

21 September 2020

Assessment Number 2238

For more information contact Public Transport Authority

Public Transport Centre, West Parade, Perth WA 6000

PO Box 8125, Perth Business Centre, Perth WA 6849

Telephone: (08) 9326 2000

Email: enquiries@pta.wa.gov.au

www.pta.wa.gov.au

Contents

| | |
|--|----------|
| Introduction..... | 3 |
| 1 Greenhouse gases..... | 3 |
| 1.1 Construction emissions..... | 3 |
| 1.2 Land clearing emissions | 3 |
| 1.3 Traffic emissions..... | 4 |
| 1.4 Operational emissions | 4 |
| 1.5 Net Outcome | 4 |
| Appendix A - Greenhouse Gas Assessment..... | 5 |

Introduction

The Malaga to Ellenbrook Rail Works Proposal (the Proposal) was referred to the Environmental Protection Authority (EPA) on 24 December 2019. The EPA determined the Proposal would be formally assessed under the Environmental Protection Act (EP Act), with the level of assessment set as Public Environmental Review (PER) (Assessment No. 2238). When the Environmental Review Document (ERD) was provided to the EPA on 27 July 2020 there was inadequate information to assess greenhouse gas emissions. Further information was needed to estimate the fuel burn, electricity consumption and embodied emissions within the materials used during the construction. The construction related quantities are further detailed and have been deemed suitable for the completion of modelling to:

- Estimate construction related greenhouse gas impacts, and
- Refine station energy use.

The information provided below contains the updated greenhouse gas impacts and incremental greenhouse gas savings in tonnes needed to assess the Proposal.

1 Greenhouse gases

The Government of Western Australia recognises that climate change is the result of the 'enhanced greenhouse effect' caused by increased levels of greenhouse gases in the atmosphere which, in turn, result in more heat being trapped in the Earth's atmosphere. In August 2019, the Government of Western Australia released its *Greenhouse Gas Emissions Policy for Major Projects*. The policy supports proponents of projects that may emit significant emissions to detail their contribution towards achieving net zero emissions by 2050.

The government's approach aims to facilitate flexible solutions to greenhouse gas reduction that promote innovation, new technologies and new opportunities for Western Australia.

An assessment of Proposal's greenhouse gas emissions and its contribution towards the State's aspiration of net zero by 2050 was undertaken using two scenarios: Base case (no Proposal) and Project case (MEL Project between 2021 through to 2074). The assessment identifies four distinct contributions; construction, land clearing, traffic, and operational emissions.

1.1 Construction emissions

Construction emissions were calculated for two distinct project phases:

1. During construction, considering the fuel burn, electricity consumption and embodied emissions within the materials used; and
2. During operational maintenance, considering the fuel burn, electricity consumption and embodied emissions within the materials used associated with component replacement and maintenance. Component maintenance and replacement is periodic in nature and based on component design life.

Emission factors associated with fuel and electricity were taken from Department of Environment and Energy, 2019 (DoEE 2019) - National Greenhouse Accounts Factors. Material embodied carbon factors were sourced from Australian National Life Cycle Inventory Database (AusLCI) or AusLCI associated shadow databases.

1.2 Land clearing emissions

Land clearing emissions factors were sourced from the Greenhouse Gas Assessment Workbook (TAGG, 2013) and based on Biomass Class 2 and Vegetation Class D.

1.3 Traffic emissions

Traffic emissions were calculated based on the Department of Transport's Strategic Transport Evaluation Model (STEM). The STEM estimated fuel consumption calculated for the base and project case. The fuel consumption for both base and project case are calculated based on a vehicle operating cost (VOC) model for interrupted flow in urban areas outlined in ATAP PV2, 2016 – Road Parameter Values. The equations provided in the model help estimate the fuel consumption, based on modelled speed of every single link of the road network. The STEM takes into consideration population growth, land use planning, location of jobs/educational facilities/services, population demographics and use of different transport types including private vehicles, buses, trains, walking and cycling. Ride share and uptake of hybrid and electric cars have also been factored into the model.

1.4 Operational emissions

Operational emissions were based on the Public Transport Authority's PTA's average rail station electricity use and average track kilometre (km) electric use for rail car operation. Emission factors associated with electricity use were taken from DoEE, 2019 - National Greenhouse Accounts Factors. No decarbonisation of the grid has been considered as part of the modelling.

1.5 Net Outcome

The annual savings in greenhouse gas emissions from the operation of MEL are summarised in **Table 1**. The operation of MEL will result in significant savings of greenhouse gas emissions, with an estimate of over 1,095,328 tonnes of CO₂ equivalents saved over the modelled life of the asset. Incremental greenhouse gas emissions and savings across the modelled lifecycle is provided in Appendix A.

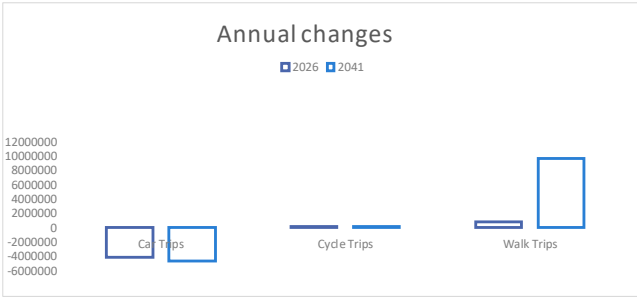
Table 1: Greenhouse gas emissions savings estimated for operation of the Proposal

| Net Outcome | 2021 | 2026 | 2041 | Whole of Life |
|--|----------------|----------------|----------------|------------------|
| Fuel CO₂ Emission savings (tonnes) | 0 | 15,822 | 32,444 | 2,193,151 |
| Construction CO₂ Emissions (tonnes) | -21,338 | 0 | -12 | -234,718 |
| Land Clearing CO₂ Emissions (tonnes) | -12,715 | 0 | 0 | -31,788 |
| Operational CO₂ Emissions (tonnes) | 0 | -13,474 | -17,056 | -831,317 |
| CO₂ Emission savings (tonnes) | -34,053 | 2,348 | 15,376 | 1,095,328 |

Appendix A - Greenhouse Gas Assessment

| METRONET- CO ₂ Emission savings MEL | | | | | | | | | | | | | | | | |
|--|--------------|-----------|-----------|-----------|-----------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|--|
| Calendar Year | Construction | | | | | Operation | | | | | | | | | | |
| | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | |
| Financial Year From | 1-Jul-20 | 1-Jul-21 | 1-Jul-22 | 1-Jul-23 | 1-Jul-24 | 1-Jul-25 | 1-Jul-26 | 1-Jul-27 | 1-Jul-28 | 1-Jul-29 | 1-Jul-30 | 1-Jul-31 | 1-Jul-32 | 1-Jul-33 | 1-Jul-34 | |
| Financial Year To | 30-Jun-21 | 30-Jun-22 | 30-Jun-23 | 30-Jun-24 | 30-Jun-25 | 30-Jun-26 | 30-Jun-27 | 30-Jun-28 | 30-Jun-29 | 30-Jun-30 | 30-Jun-31 | 30-Jun-32 | 30-Jun-33 | 30-Jun-34 | 30-Jun-35 | |
| | | | | | | | | | | | | | | | | |
| Morley - Ellenbrook Line (MEL) - Annual Savings | | | | | | | | | | | | | | | | |
| GHG Savings - Incremental | | | | | | | | | | | | | | | | |
| Fuel CO ₂ Emission savings (tonnes) | 0 | 0 | 0 | 0 | 0 | 15,822 | 19,813 | 21,684 | 22,511 | 23,339 | 24,167 | 24,994 | 25,822 | 26,650 | 27,478 | |
| Construction CO ₂ Emissions (tonnes) | -21,338 | -42,676 | -64,014 | -64,014 | -21,338 | 0 | -1 | 0 | -12 | -361 | -1 | -1 | -12 | 0 | -564 | |
| Land Clearing CO ₂ Emissions (tonnes) | -12,715 | -14,305 | -4,768 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Operational CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | -13,474 | -16,204 | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 | |
| Estimated Total CO ₂ Emissions (tonnes) | -34,053 | -56,981 | -68,782 | -64,014 | -21,338 | 2,348 | 3,609 | 4,628 | 5,444 | 5,922 | 7,109 | 7,937 | 8,754 | 9,594 | 9,857 | |
| | | | | | | | | | | | | | | | | |
| Base Case | | | | | | | | | | | | | | | | |
| Construction CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Operational Energy Consumption (kWH) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Fuel Consumption (lt) yearly - Base | 0 | 0 | 0 | 0 | 0 | 1,651,055,420 | 2,036,404,747 | 2,197,224,318 | 2,250,864,693 | 2,304,505,067 | 2,358,145,441 | 2,411,785,815 | 2,465,426,190 | 2,519,066,564 | 2,572,706,938 | |
| | | | | | | | | | | | | | | | | |
| Project Case | | | | | | | | | | | | | | | | |
| Construction CO ₂ Emissions (tonnes) | 21,338 | 42,676 | 64,014 | 64,014 | 21,338 | 0 | 1 | 0 | 12 | 361 | 1 | 1 | 12 | 0 | 564 | |
| Land Clearing CO ₂ Emissions (tonnes) | 12,715 | 14,305 | 4,768 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Operational Energy Consumption (kWH) | 0 | 0 | 0 | 0 | 0 | 18,208,592 | 21,897,195 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | |
| Fuel Consumption (lt) yearly - Project | 0 | 0 | 0 | 0 | 0 | 1,645,069,646 | 2,028,909,197 | 2,189,021,143 | 2,242,348,394 | 2,295,675,645 | 2,349,002,896 | 2,402,330,147 | 2,455,657,398 | 2,508,984,649 | 2,562,311,900 | |

| | | |
|--------------------|------------|------------|
| Other Benefits | | |
| | | |
| Incremental/daily | 2026 | 2041 |
| Car Trips | -12,393 | -13,781 |
| Cycle Trips | 246 | 345 |
| Walk Trips | 2,074 | 28,344 |
| Incremental/annual | 2026 | 2041 |
| Car Trips | -4,188,834 | -4,657,978 |
| Cycle Trips | 83,020 | 116,749 |
| Walk Trips | 700,850 | 9,580,252 |



METRONET- CO₂ Emission savings MEL

| Calendar Year | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 |
|--|---------------|---------------|---------------|---------------|---------------|---------------|
| Financial Year From | 1-Jul-35 | 1-Jul-36 | 1-Jul-37 | 1-Jul-38 | 1-Jul-39 | 1-Jul-40 |
| Financial Year To | 30-Jun-36 | 30-Jun-37 | 30-Jun-38 | 30-Jun-39 | 30-Jun-40 | 30-Jun-41 |
| | | | | | | |
| Morley - Ellenbrook Line (MEL) - Annual Savings | | | | | | |
| GHG Savings - Incremental | | | | | | |
| Fuel CO ₂ Emission savings (tonnes) | 28,305 | 29,133 | 29,961 | 30,788 | 31,616 | 32,444 |
| Construction CO ₂ Emissions (tonnes) | 0 | -80 | 0 | -2 | -1,873 | -12 |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Operational CO ₂ Emissions (tonnes) | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 |
| Estimated Total CO ₂ Emissions (tonnes) | 11,249 | 11,997 | 12,904 | 13,730 | 12,687 | 15,376 |
| Base Case | | | | | | |
| Construction CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Operational Energy Consumption (kWH) | 0 | 0 | 0 | 0 | 0 | 0 |
| Fuel Consumption (lt) yearly - Base | 2,626,347,312 | 2,679,987,686 | 2,733,628,061 | 2,787,268,435 | 2,840,908,809 | 2,894,549,183 |
| Project Case | | | | | | |
| Construction CO ₂ Emissions (tonnes) | 0 | 80 | 0 | 2 | 1,873 | 12 |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Operational Energy Consumption (kWH) | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 |
| Fuel Consumption (lt) yearly - Project | 2,615,639,151 | 2,668,966,402 | 2,722,293,653 | 2,775,620,904 | 2,828,948,155 | 2,882,275,406 |

METRONET- CO₂ Emission savings MEL

| Calendar Year | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 |
|--|---------------|---------------|---------------|---------------|---------------|---------------|
| Financial Year From | 1-Jul-50 | 1-Jul-51 | 1-Jul-52 | 1-Jul-53 | 1-Jul-54 | 1-Jul-55 |
| Financial Year To | 30-Jun-51 | 30-Jun-52 | 30-Jun-53 | 30-Jun-54 | 30-Jun-55 | 30-Jun-56 |
| Morley - Ellenbrook Line (MEL) - Annual Savings | | | | | | |
| GHG Savings - Incremental | | | | | | |
| Fuel CO ₂ Emission savings (tonnes) | 42,846 | 44,054 | 45,296 | 46,574 | 47,887 | 49,237 |
| Construction CO ₂ Emissions (tonnes) | -1 | -44 | -440 | -6 | -9,776 | -30 |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Operational CO ₂ Emissions (tonnes) | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 |
| Estimated Total CO ₂ Emissions (tonnes) | 25,789 | 26,953 | 27,800 | 29,511 | 21,054 | 32,151 |
| Base Case | | | | | | |
| Construction CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Operational Energy Consumption (kWh) | 0 | 0 | 0 | 0 | 0 | 0 |
| Fuel Consumption (lt) yearly - Base | 3,822,583,041 | 3,930,379,882 | 4,041,216,595 | 4,155,178,903 | 4,272,354,948 | 4,392,835,358 |
| Project Case | | | | | | |
| Construction CO ₂ Emissions (tonnes) | 1 | 44 | 440 | 6 | 9,776 | 30 |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Operational Energy Consumption (kWh) | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 |
| Fuel Consumption (lt) yearly - Project | 3,806,374,115 | 3,913,713,865 | 4,024,080,596 | 4,137,559,669 | 4,254,238,852 | 4,374,208,387 |

METRONET- CO₂ Emission savings MEL

| Calendar Year | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 |
|--|---------------|---------------|---------------|---------------|---------------|-------------|
| Financial Year From | 1-Jul-65 | 1-Jul-66 | 1-Jul-67 | 1-Jul-68 | 1-Jul-69 | 1-Jul-70 |
| Financial Year To | 30-Jun-66 | 30-Jun-67 | 30-Jun-68 | 30-Jun-69 | 30-Jun-70 | 30-Jun-71 |
| | | | | | | |
| Morley - Ellenbrook Line (MEL) - Annual Savings | | | | | | |
| GHG Savings - Incremental | | | | | | |
| Fuel CO ₂ Emission savings (tonnes) | 65,023 | 66,857 | 68,743 | 70,681 | 72,674 | 74,724 |
| Construction CO ₂ Emissions (tonnes) | 0 | -3 | -624 | -724 | -1,917 | -1 |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Operational CO ₂ Emissions (tonnes) | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 | -17,056 |
| Estimated Total CO ₂ Emissions (tonnes) | 47,967 | 49,798 | 51,063 | 52,901 | 53,701 | 57,667 |
| Base Case | | | | | | |
| Construction CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Operational Energy Consumption (kWh) | 0 | 0 | 0 | 0 | 0 | 0 |
| Fuel Consumption (lt) yearly - Base | 5,801,241,187 | 5,964,836,188 | 6,133,044,569 | 6,305,996,425 | 6,483,825,525 | 6,666,669,4 |
| Project Case | | | | | | |
| Construction CO ₂ Emissions (tonnes) | 0 | 3 | 624 | 724 | 1,917 | 1 |
| Land Clearing CO ₂ Emissions (tonnes) | 0 | 0 | 0 | 0 | 0 | 0 |
| Operational Energy Consumption (kWh) | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,850 | 23,048,85 |
| Fuel Consumption (lt) yearly - Project | 5,776,642,143 | 5,939,543,451 | 6,107,038,577 | 6,279,257,065 | 6,456,332,114 | 6,638,400,6 |