Environment
Effects Statement

Technical Report B
Air quality

GOLDER

REPORT

North East Link Project

North East Link Environment Effects Statement

Technical report B – Air Quality

Prepared for: North East Link

GHD

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1897019-007-R-FINAL

April 2019

Executive Summary

This technical report is an attachment to the North East Link Environment Effects Statement (EES). It has been used to inform the EES required for the project and defines the Environmental Performance Requirements (EPRs) necessary to meet the EES objectives.

Overview

North East Link ('the project') is a proposed new freeway-standard road connection that would complete the missing link in Melbourne's ring road, connecting the M80 Ring Road (otherwise known as the Metropolitan Ring Road) to the Eastern Freeway, including works along the Eastern Freeway from near Hoddle Street to Springvale Road.

The Major Transport Infrastructure Authority (MTIA) is the proponent for North East Link. The MTIA is an administrative office within the Victorian Department of Transport with responsibility for overseeing major transport projects.

North East Link Project (NELP) is an organisation within MTIA that is responsible for developing and delivering North East Link. NELP is responsible for developing the reference project and coordinating development of the technical reports, engaging and informing stakeholders and the wider community, obtaining key planning and environmental approvals and coordinating procurement for construction and operation.

On 2 February 2018, the Minister for Planning declared North East Link to be 'public works' under Section 3(1) of the *Environment Effects Act 1978*, which was published in the Victorian Government Gazette on 6 February 2018 (No. S 38 Tuesday 6 February 2018). This declaration triggered the requirement for the preparation of an EES to inform the Minister's assessment of the project and the subsequent determinations of other decision-makers.

The EES was developed in consultation with the community and stakeholders and in parallel with the reference project development. The EES allows stakeholders to understand the likely environmental impacts of North East Link and how they are proposed to be managed.

Golder Associates Pty Ltd (Golder) was commissioned to undertake the air quality impact assessment for the purposes of the EES.

Air quality context

The scoping requirements for the EES issued by the Minister for Planning describe the specific environmental matters to be investigated and documented in the project's EES, informing the scope of the EES technical studies. The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of constructing and operating the project. The following evaluation objective relates to the air quality impact assessment:

- to minimise adverse air quality, noise and vibration effects on the health and amenity of nearby residents, local communities and road users during both construction and operation of the project.

A summary of the key assets, values or uses potentially affected by the project and the associated impact assessment are summarised below.

Characterisation of existing environment

North East Link would be located within a highly urbanised area of Melbourne that includes long-established residential areas, shopping and commercial centres, industrial precincts, parks and reserves and community and recreational facilities.

Existing air quality in the vicinity of North East Link is typical for this urban context. Emissions sources contributing to the local airshed include:

- traffic using the road network, including the M80 Ring Road and Eastern Freeway
- industrial and food manufacturing industries
- domestic fuel burning (gas, liquid and solid)
- residential activities (eg lawn mowers and barbecues).

The landform surrounding the M80 Ring Road is undulating with the Plenty Gorge Parklands ranging in elevation between approximately 100 metres and 50 metres above sea level. Similarly, the landscape around the Plenty River and Partington Flats in Greensborough has hills and flats with the lowest elevations occurring along the course of the river. Moving south, Watsonia North, Watsonia and Yallambie are approximately 80 metres above sea level. The land gently slopes towards the Warringal Parklands and Yarra Flats where the elevation can be as low as 10 metres.

The Eastern Freeway is also located at low elevations; ranging between 20 metres at the intersection with Bulleen Road and 40 metres at the intersection with Doncaster Road, continuing to increase to 80 metres at the intersection with Springvale Road. The land either side of the freeway increases in elevation, with the road located in low lying lands between the hills of Doncaster and Box Hill.

EPA Victoria's Alphington ambient air quality monitoring station (AAQMS) provides the most comprehensive datasets for particulate matter less than 10 microns and 2.5 microns (PM_{10} and $PM_{2.5}$), carbon monoxide (CO) and nitrogen dioxide (NO_2) concentrations in the vicinity of the project, which have therefore been used to represent background air quality for the air quality impact assessment.

Analysis of the five most recent calendar years of data (2013 to 2017) demonstrated that:

- CO daily maximum eight hour average concentrations ranged from 0.017 to 0.30 parts per million, complying with the State Environment Protection Policy (Ambient Air Quality) [SEPP(AAQ)] environmental quality objective (EQO).
- NO_2 concentrations ranged from 0.001 to 0.064 parts per million, complying with the one hour average SEPP(AAQ) EQO. Annual average results complied with the SEPP(AAQ) EQO.
- PM_{10} 24 hour average concentrations ranged from 2.1 to 64 micrograms per cubic metre, with a total of four exceedances of the SEPP(AAQ) EQO recorded. Annual average results complied with the SEPP(AAQ) EQO.
- $PM_{2.5}$ 24 hour average concentrations ranged from 0.8 to 45 micrograms per cubic metre (2014 to 2017 only), with a total of 19 exceedances of the SEPP(AAQ) EQO recorded. The exceedances were principally attributed to bushfires, planned burns and urban sources, including smoke from wood heaters. The current $PM_{2.5}$ annual average SEPP(AAQ) EQO was exceeded in 2014, 2015 and 2017.

Long-term (2005 to 2017) concentrations for Alphington AAQMS were examined for CO, NO_2, PM_{10} and $PM_{2.5}$, showing similar trends to the period 2013 to 2017.

While it is recognised that exceedances of the $PM_{2.5}$ and PM_{10} objectives occurred during the modelled years, air quality at the EPA Victoria Alphington AAQMS is generally considered good.

Impact assessment

Construction impacts

There is the potential for air quality impacts on the receiving environment during construction works, primarily in the form of the various particulate matter size fractions (deposited dust, total suspended particulate matter, PM_{10} and $PM_{2.5}$), possibly odour and, to a lesser extent, products of combustion. A range of engineering, planning and operational controls were identified that could be adopted to manage potential air quality impacts during North East Link construction.

It is considered that the potential impacts from construction works would be localised, of short duration and intermittent in nature and could be appropriately managed through implementation of a Construction Environmental Management Plan and Dust and Air Quality Management and Monitoring Plan to manage and assess particulate matter impacts during the construction phase.

Tunnel ventilation system

The tunnels are a key feature of North East Link. The reference project includes twin tunnels of approximately six kilometres in length, with ventilation structures approximately 40 metres in height located near the exits of each tunnel. The ventilation structures are intended to disperse emissions captured by the tunnel ventilation system. Impacts of emissions from the ventilation structures were assessed through the use of air dispersion modelling. Air dispersion modelling was conducted using the Victorian regulatory model, AERMOD, in accordance with the requirements of the State Environment Protection Policy (Air Quality Management) [SEPP(AQM)], to predict ground level concentrations of the following pollutants:

- PM_{10} and $PM_{2.5}$
- NO_2
- CO
- benzene, toluene, ethylbenzene, xylene (BTEX), 1,3 butadiene, formaldehyde and polycyclic aromatic hydrocarbons as benzo(a)pyrene toxic equivalents (PAH as B(a)P TEQ).

For each pollutant, the following scenarios were modelled:

- Scenario A1 and A2 – projected traffic volumes and fleet mix for 2026 (normal operation)
- Scenarios B1 and B2 – projected traffic volumes and fleet mix for 2036 (normal operation).

Vehicle emission factors used in Scenarios A1 and B1 were conservatively assumed to remain at levels predicted for 2020. In order to conduct a sensitivity analysis which provides a more realistic indicator of future emissions, vehicle emission factors used in Scenarios A2 and B2 were assumed to remain at levels predicted for 2025.

The assessment used a range of conservative assumptions, including:

- Background pollutant concentrations for the modelled years of 2026 and 2036 were assumed to remain at levels recorded for the period 2013 to 2017.

  EPA Victoria predicts a significant reduction in CO and NO_2 concentrations over the next 20 years through cleaner exhaust emissions from petrol, diesel and LPG engines and improvements in national motor vehicle emission standards. Similarly, a significant reduction in particle emissions ($PM_{2.5}$) from diesel vehicle engines is expected by 2030.

Concentrations of these pollutants in 2026 and, in particular, 2036, are expected to be lower than those used as background levels in the air quality impact assessment. Background concentrations used in this assessment are therefore considered conservative.

- The adopted background concentrations for PM_{10}, $PM_{2.5}$, CO and NO_2 include exceptional events (as defined by EPA Victoria) such as bushfires, controlled burns and dust storms. During these periods, concentrations of particulate matter (PM_{10} and $PM_{2.5}$) can reach extremely high levels. Inclusion of data during these periods as representative background concentrations for the project is highly conservative contributing a significant proportion of the overall impact (background plus predicted).
- Vehicle emission factors used in the air quality impact assessment are considered conservatively high because there is a general trend towards lower emission vehicles (older technology vehicles being replaced over time with newer, improved technology vehicles), with expected improvements in vehicle technology beyond 2020 (Scenarios A1 and B1) and 2025 (Scenarios A2 and B2) not accounted for.
- Hybrid and electric vehicles were not considered in the fleet mix. The percentages of these lower emission and zero emission vehicles in the Victorian vehicle fleet are expected to increase significantly in future years.
- The upper limit of the predicted traffic volume range provided for all roads was selected for use in the modelling.
- Acoustic barriers were not considered to have any effect on pollutant concentrations downwind. There is a significant body of evidence to suggest that acoustic barriers reduce pollutant concentrations immediately downwind of roadways at the most impacted sensitive receptors.

Emissions from the North East Link ventilation system were calculated using adjusted COPERT Australia vehicle emission factors for the 2010 Victorian fleet and projected diurnal weekday traffic conditions. Scenarios A1 and B1 were modelled based on the 2010 COPERT factors adjusted by World Road Association (PIARC) factors that account for the future year 2020 and road gradient. Scenarios A2 and B2 were modelled based on the 2010 COPERT factors adjusted by the relative factors for the Brisbane vehicle fleet in 2010 and 2025 and PIARC road gradient factors.

SEPP(AQM) requires modelling to be conducted based on the worst case scenario during normal operation, which is considered to be reflected in the modelled scenarios for 2026 and 2036. Preliminary modelling established that meteorological data for 2017 gave the highest ground level concentration (GLC) predictions for the period 2013 to 2017. Consequently, 2017 meteorological and background datasets were used for all subsequent modelling of ventilation system emissions to air.

A. Scenario A1 (2026 traffic volumes and fleet mix; 2020 emission factors)

Hourly PM_{10} and $PM_{2.5}$ background concentrations at the Alphington AAQMS exceeded the one hour average SEPP(AQM) design criteria on multiple occasions in 2017. This effectively imposes exceedances before the additional impact of the tunnel ventilation system is considered.

Analysis of the hourly PM_{10} background concentrations showed that exceedances of the 80 micrograms per cubic metre design criterion occurred on 8 occasions during 2017 without any contribution from the project. Project ventilation system emissions result in no additional exceedances.

The air quality impact assessment indicated that while the one hour average PM_{10} design criterion was exceeded in 2026, the tunnel ventilation system emissions only contributed 0.087 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.22 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration.

The hourly background concentrations for $PM_{2.5}$ at the Alphington AAQMS exceeded the one hour average 50 micrograms per cubic metre design criterion on 20 occasions during 2017. Project ventilation system emissions result in one additional exceedance with a project contribution of less than 0.7 micrograms per cubic metre and a corresponding background concentration of 49.8 micrograms per cubic metre.

The assessment indicated that while the one hour average $PM_{2.5}$ design criterion was exceeded in 2026, the tunnel ventilation system emissions only contributed 0.08 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.13 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration.

Predicted CO, NO_2, BTEX, 1,3-butadiene, formaldehyde and PAH [as B(a)P TEQ] concentrations comply with the applicable design criteria in 2026.

B. Scenario A2 (2026 traffic volumes and fleet mix; 2025 emission factors)

Project ventilation system emissions result in no additional exceedances of the PM_{10} design criterion.

The air quality impact assessment indicated that while the one hour average PM_{10} design criterion was exceeded in 2026, the tunnel ventilation system emissions only contributed 0.065 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.16 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration.

Project ventilation system emissions result in one additional exceedance of the $PM_{2.5}$ design criterion with a project contribution of less than 0.3 micrograms per cubic metre and a corresponding background concentration of 49.8 micrograms per cubic metre.

The assessment indicated that while the one hour average $PM_{2.5}$ design criterion was exceeded in 2026, the tunnel ventilation system emissions only contributed 0.037 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.055 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration.

Predicted NO_2 concentrations comply with the applicable design criteria in 2026.

The 2025 emission factors sensitivity analysis demonstrated that, while the project contribution to the maximum predicted GLC could decrease significantly, there was relatively little change in the maximum predicted GLCs (project plus background) due to the relatively low project contribution.

C. Scenario B1 (2036 traffic volumes and fleet mix; 2020 emission factors)

Project ventilation system emissions result in no additional exceedances of the PM_{10} design criterion.

The assessment indicated that while the one hour average PM_{10} design criterion was exceeded in 2036, the tunnel ventilation system emissions only contributed 0.11 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.27 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration.

Project ventilation system emissions result in one additional exceedance of the $PM_{2.5}$ design criterion with a project contribution of less than 0.7 micrograms per cubic metre and a corresponding background concentration of 49.8 micrograms per cubic metre.

The assessment indicated that while the one hour average $PM_{2.5}$ design criterion was exceeded in 2036, the tunnel ventilation system emissions only contributed 0.11 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.17 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration.

Predicted CO, NO_2, BTEX, 1,3-butadiene, formaldehyde and PAH [as B(a)P TEQ] concentrations comply with the applicable design criteria in 2036.

D. Scenario B2 (2036 traffic volumes and fleet mix; 2025 emission factors)

Project ventilation system emissions result in no additional exceedances of the PM_{10} design criterion.

The assessment indicated that while the one hour average PM_{10} design criterion was exceeded in 2036, the tunnel ventilation system emissions only contributed 0.081 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.20 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration.

Project ventilation system emissions result in one additional exceedance of the $PM_{2.5}$ design criterion with a project contribution of less than 0.7 micrograms per cubic metre and a corresponding background concentration of 49.8 micrograms per cubic metre.

The assessment indicated that while the one hour average $PM_{2.5}$ design criterion was exceeded in 2036, the tunnel ventilation system emissions only contributed 0.049 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.073 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration.

Predicted NO_2 concentrations comply with the applicable design criteria in 2036.

The 2025 future year adjusted vehicle emission rate analysis demonstrated that, while the project contribution to the maximum predicted GLC could decrease significantly, there was relatively little change in the maximum predicted GLCs (project plus background) due to the relatively low project contribution.

E. Sensitivity analyses

Additional sensitivity analyses were undertaken to evaluate the impact of:

- the North East Link tunnels operating at maximum capacity (24 hours a day, 365 days a year)
- emissions occurring at in-tunnel air quality limits (24 hours a day, 365 days a year)
- increased diesel to petrol fuelled passenger car ratios
- alternative ventilation structure locations within potential construction footprints.

The maximum capacity, in-tunnel air quality limits and increased diesel passenger car ratio sensitivity analyses demonstrated that, while the project contribution to the maximum predicted GLC could increase significantly, there was relatively little change in the maximum predicted GLCs (project plus background) due to the relatively low project contribution.

Modelling of alternative ventilation structure locations indicated there was minimal change in the maximum predicted contributions to the $PM_{2.5}$ GLC (no background), with the northern and southern ventilation structure options differing by less than 1.0 per cent and 3.0 per cent respectively.

F. Summary

With the exception of PM_{10} and $PM_{2.5}$, compliance with all applicable SEPP(AQM) design criteria was demonstrated for the proposed North East Link ventilation system under normal operating conditions. The PM_{10} and $PM_{2.5}$ exceedances were due to existing high background concentrations.

Surface roads

Modelling was conducted to assess the air quality impacts of proposed or realigned roads associated with North East Link, together with those existing roads predicted to be significantly affected by the project.

Twenty five roads were assessed, with impacts considered at locations such as residential property boundaries or other sensitive receptors such as schools, community facilities and recreational areas.

Preliminary modelling established that meteorological data for 2016 gave the highest predictions for the period 2013 to 2017. Maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations were consequently predicted at the identified receptors along each road for 2026 and 2036, using meteorological data from 2016. Background concentrations were not included, as the objective of the assessment was to establish the incremental impact of the project.

Predicted decreases in traffic volumes on the following 16 roads due to North East Link mean that air quality impacts are reduced for all assessed pollutants and averaging periods:

- Albert Street
- Banksia Street
- Bell Street
- Bolton Street
- Broadway
- Chandler Highway
- Fitzsimons Lane
- Grange Road
- High Street
- Lower Plenty Road
- Main Road
- Plenty Road
- Reynolds Road
- Rosanna Road
- Station Street
- Williamsons Road.
- Plenty Road
- Reynolds Road
- Rosanna Road
- Station Street
- Williamsons Road.

Predicted increases in traffic volumes on the following eight roads due to North East Link mean that air quality impacts are increased for all assessed pollutants and averaging periods:

- Bulleen Road
- Dalton Road
- Eastern Freeway
- Grimshaw Street
- Keon Parade
- M80 Ring Road
- Middleborough Road
- Greensborough Road (North East Link).

For Manningham Road there is a mix of changes with PM_{10}, $PM_{2.5}$ and annual average NO_2 concentrations decreasing by 24 to 30 per cent in 2026 and 2036 respectively compared with the without project scenario. However, one hour average NO_2 concentrations show an increase of three per cent with the project in 2026 and a decrease of five per cent in 2036.

The decreases in maximum PM_{10}, $PM_{2.5}$ and annual average NO_2 concentrations are due to an approximate 70 per cent decrease in heavy commercial vehicles and a 25 per cent decrease in total vehicles on Manningham Road, with the project scenario compared with the without project scenario. The slight changes in one hour average NO_2 concentrations are due to increased traffic volumes on parts of the Eastern Freeway and Eastern Freeway – North East Link interchange, resulting in the maximum concentrations with and without the project varying by location, time and meteorological conditions.

Maximum concentrations along each road generally occur near intersections, where contributions from several sources impact a single receptor, with the largest increases occurring along the North East Link alignment between Yallambie Road and the M80 Ring Road interchange.

Receptors along the North East Link corridor from Lower Plenty Road to M80 Ring Road are impacted by the combined impacts from Greensborough Road and North East Link due to their close proximity.

Vehicle emission factors used for the surface road emissions inventories for 2026 and 2036 were conservatively assumed to remain at levels predicted for 2020 (Scenarios A1 and B1). Additional modelling was subsequently conducted for 2036 utilising the vehicle emission factors for 2025 described previously (Scenario B2).

A comparison of modelling predictions using the 2020 (Scenario B1 project case) and 2025 (Scenario B2 project case) emission factors at the most impacted sensitive receptor adjacent to North East Link/Greensborough Road, shows the maximum GLCs decrease by 28 per cent for 24 hour and annual average PM_{10}, 47 per cent for 24 hour and annual average $PM_{2.5}$, 57 per cent for one hour average NO_2 and 62 per cent for annual average NO_2 with the 2025 factors.

For all modelled surface roads, application of 2025 emission factors reduces the average predicted 24 hour average PM_{10} concentration project contribution (without background) by seven per cent compared with that predicted using the 2020 emission factors, with a maximum decrease of 29 per cent occurring on North East Link. For 24 hour average $PM_{2.5}$, the average reduction using 2025 emission factors compared with 2020 emission factors across all modelled roads is 30 per cent with a maximum decrease of 46 per cent occurring on North East Link. For one hour average NO_2, the average reduction across all modelled roads is 70 per cent with a maximum decrease of 76 per cent occurring on the Eastern Freeway.

Combined impacts

The maximum predicted PM_{10}, $PM_{2.5}$ and NO_2 concentrations resulting from the tunnel ventilation system and surface roads emissions for Scenarios A1, A2, B1 and B2 were added to 2016 background concentrations to determine the combined impacts at one receptor in the north part of the study area and one receptor in the south part of the study area:

- North – a residence approximately 450 metres north of the northern ventilation structure on Watson Street
- South – a residence approximately 280 metres south east of the southern ventilation structure on Ben Nevis Grove.

The 2016 meteorological data file was used as it resulted in the highest surface road contributions to the combined impacts, which were significantly higher than the contributions from the road tunnel ventilation system at the selected receptors. Time-series plots of PM_{10}, $PM_{2.5}$ and NO_2 concentrations confirm that vehicle emissions on surface roads contribute significantly more than the ventilation system.
Comparisons have been made with the SEPP(AAQ) EQOs, however, it should be emphasised they have no regulatory status.

The combined impacts of surface road and ventilation system emissions are less than the PM_{10} and NO_2 SEPP(AAQ) EQOs for all applicable averaging periods at both north and south receptors. The revised (2025) 24 hour and annual average $PM_{2.5}$ SEPP(AAQ) EQOs were not met at either receptor, primarily because the background concentration(s) exceeds the objectives. The revised objectives for $PM_{2.5}$ reflects the supposition that changes and improvements in technology will drive a future reduction in anthropogenic emissions, thereby improving air quality. A projected reduction in background concentrations has not been allowed for in any of the modelling undertaken for North East Link.

Similar to the outcomes from the ventilation system and surface roads modelling, the combined impacts of the surface road and ventilation system emissions are predicted to significantly reduce when the more realistic 2025 emission factors are considered (Scenarios A2 and B2). For 2036, this results in the project contribution to the maximum 24 hour average $PM_{2.5}$ concentration in the north part of the study area reducing from approximately five per cent (for Scenario B1) to three per cent (for Scenario B2) of the combined project and background predicted concentration. In the south part of the study area there is a corresponding reduction from three per cent to two per cent. Annual average $PM_{2.5}$ concentrations reduce from 14 per cent to 8 per cent in the north and 7 per cent to 4 per cent in the south.

EES Structure

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Technical reports

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Attachments

I. Sustainability approach
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EES Map Book

Abbreviations

AAQMS	Ambient air quality monitoring station
Air NEPM	National Environment Protection (Ambient Air Quality) Measure
Air Toxics NEPM	National Environment Protection (Air Toxics) Measure
AS	Australian Standard
AS/NZS	Australian/New Zealand Standard
AWS	Automatic weather station
BAM	Beta attenuation monitor
B(a)P (TEQ)	Benzo(a)pyrene (toxic equivalents)
BoM	Bureau of Meteorology
BTEX	Benzene, toluene, ethyl benzene and xylene isomers
CO	Carbon monoxide
EPA Victoria	Environment Protection Authority Victoria
EQO	Environmental quality objective
ESL	Effects screening levels
EV	Electric vehicle
GLC	Ground level concentration
LGA	Local Government Areas
MILs	Monitoring investigation levels
MTIA	Major Transport Infrastructure Authority
NA	Not applicable
ND	Not detected
NELP	North East Link Project
NEPC	National Environment Protection Council
NM	Not monitored
NO	Nitric oxide
NO_x	Oxides of nitrogen
NO_2	Nitrogen dioxide
NPI	National Pollutant Inventory
NSW EPA	New South Wales Environment Protection Authority
PAH	Polycyclic aromatic hydrocarbons

PM_{10}	Particulate matter with an equivalent aerodynamic diameter less than 10 microns
$PM_{2.5}$	Particulate matter with an equivalent aerodynamic diameter less than 2.5 microns
TCEQ	Texas Commission on Environmental Quality
TEOM	Tapered element oscillating microbalance
SEPP(AAQ)	State Environment Protection Policy (Ambient Air Quality)
SEPP(AQM)	State Environment Protection Policy (Air Quality Management)
VOCs	Volatile organic compounds

Units

%	Per cent
˚C	Degrees Celsius
km/h	Kilometres per hour
m	Metres
mg/m^3	Milligrams per cubic metre
$\mu g/m^3$	Micrograms per cubic metre
mm	Millimetres
MJ/m^2	Megajoules per square metre
m/s	Metres per second
ng/m^3	Nanograms per cubic metre
ppb	Parts per billion by volume
ppm	Parts per million by volume

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1.0 INTRODUCTION

1.1 Purpose of this report

North East Link ('the project') is a proposed new freeway standard road connection that would complete the missing link in Melbourne's ring road, giving the city a fully completed orbital connection for the first time. North East Link would connect the M80 Ring Road (otherwise known as the Metropolitan Ring Road) to the Eastern Freeway, and include works along the Eastern Freeway from near Hoddle Street to Springvale Road.

The Major Transport Infrastructure Authority (MTIA) is the proponent for North East Link. The MTIA is an administrative office within the Victorian Department of Transport with responsibility for overseeing major transport projects.

North East Link Project (NELP) is an organisation within MTIA that is responsible for developing and delivering North East Link. NELP is responsible for developing the reference project and coordinating development of the technical reports, engaging and informing stakeholders and the wider community, obtaining key planning and environmental approvals and coordinating procurement for construction and operation.

On 2 February 2018 the Minister declared the works proposed for North East Link as Public Works and issued a decision confirming that an Environment Effects Statement (EES) is required for the project due to the potential for significant environmental effects.

Similarly, the project was referred to the Australian Government's Department of the Environment and Energy on 17 January 2018. On 13 April 2018 the project was declared a 'controlled action', requiring assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Separate to the EES, a Public Environment Report (PER) is required to be prepared to satisfy the EPBC Act requirements, and assess the impacts of the project on Commonwealth land and matters of national environmental significance (MNES).

The purpose of this report is to assess the potential air quality impacts associated with North East Link and to define the Environmental Performance Requirements (EPRs) necessary to meet the EES objectives.

1.2 Why understanding air quality is important

Air quality is an important environmental issue in urban Australia, with pollutant emissions from industry and transport a potential risk to human health and public amenity.

North East Link would be located within a highly urbanised area of Melbourne that includes long-established residential areas, shopping and commercial centres, industrial precincts, parks and reserves and community and recreational facilities.

Existing air quality in the vicinity of North East Link is typical for this urban context. Emissions sources contributing to the local airshed include:

- traffic using the road network, including the M80 Ring Road and Eastern Freeway
- industrial and food manufacturing facilities
- domestic fuel burning (gas, liquid and solid)
- residential activities (eg lawn mowers and barbecues)
- railway operations.

Given the proximity of sensitive receptors such as residential areas and community facilities to the project, potential air quality impacts during construction and operation were evaluated.

Potential air quality impacts associated with project construction primarily relate to:

- particulate matter emissions from construction activities, which may include mechanically generated dust due to vehicle movements on both paved and unpaved surfaces, wind generated particulate matter from disturbed soil or stockpiles and emissions to air from asphalt and concrete batching plants
- odours due to asphalt sealing of constructed roads and from exposed contaminated soils during excavation and spoil management
- emissions from diesel fuelled construction vehicles and earth moving machinery.

Potential air quality impacts associated with project operation primarily relate to:

- emissions from vehicles using North East Link and changes to traffic volumes and fleet mix in surrounding areas (both positive and negative impacts)
- vehicle emissions discharged from the road tunnel ventilation system.

Air quality impacts associated with these activities were assessed, with guidance from relevant Victorian Government legislation. The study area includes the full project alignment, selected existing surface roads and the road tunnel ventilation system.

2.0 EES SCOPING REQUIREMENTS

2.1 Evaluation objectives

The scoping requirements for the EES issued by the Minister for Planning set out the specific environmental matters to be investigated and documented in the project's EES, which in turn informs the scope of the EES technical studies. The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of constructing and operating the project. The following evaluation objective is relevant to the air quality impact assessment:

- to minimise adverse air quality, noise and vibration effects on the health and amenity of nearby residents, local communities and road users during both construction and operation of the project.

2.2 Scoping requirements

The aspects from the scoping requirements relevant to the air quality evaluation objectives are shown in Table 1, as well as the location where these items have been addressed in this report.

Table 1: Scoping requirements – air quality

Aspect	Scoping requirement	Section addressed
Key Issues	Adverse effects on air quality near residential and other sensitive land uses due to dust, odour or other emissions from construction activities.	Section 8.0
	Effects on air quality near residential and other sensitive land uses of the project operations associated with changes in emissions from traffic on surface roads (including implications of changes in the distribution of vehicle types or brake and tyre wear dust) and from fixed plant, especially ventilation discharges from the tunnels.	Section 10.0 and 11.0
Priorities for characterising the existing environment	Identify residences (including sites that are the subject of current planning permit applications or planning scheme amendments), urban developments (where development proposals are identified in the planning scheme or form part of a seriously entertained planning proposal) and land uses (schools, hospitals, outdoor recreation sites, etc.) that require a particular focus on protecting the beneficial uses of the air and noise environment relating to human health and wellbeing, local amenity and aesthetic enjoyment. Collect local air quality data to characterise the expected affected area and compare with long-term urban datasets to ascertain if the long-term datasets are representative of the local air quality conditions. Assess existing air quality and compare with relevant SEPP standards.	Section 6.0
Design and mitigation measures	Propose siting, design, mitigation and management measures to control emissions of dust or other air pollutants and noise from construction activities.	Section 8.0
	Propose siting, design, mitigation and management measures to prevent air quality impacts during operations, including on existing and future residential areas (including sites that are the subject of current planning permit applications or planning scheme amendments or where development proposals are identified in the planning scheme of form part of a seriously entertained planning proposal) in the vicinity of existing and new elevated and surface roads, tunnel ventilation systems, Eastern Freeway and M80 widening works and any other roads where air quality is predicted to be affected due to the project's operation.	Section 10.0 and 11.0

Aspect	Scoping requirement	Section addressed
Assessment of likely effects.	Analyse the risk to sensitive uses associated with dust, odour or other emissions from construction works with respect to the EPA Publication 480 Guidelines for Major Construction Sites.	Section 8.0
	Analyse risk of project emissions exceeding the relevant SEPP standards for surface roads and Schedule A Design Criteria for the tunnel ventilation system describing sources both in isolation and in addition to background levels of air pollution and assessing their cumulative impact on air quality and human health.	Section 10.0, 11.0 and 12.0
	Predict any improvements to air quality or noise levels due to project operation.	Section 11.0
	Evaluate any changes to air quality and noise conditions for nearby residents and local communities that the project will deliver, particularly through redistribution or management of heavy vehicle traffic or altered road and traffic conditions and the implications of these for human health and amenity.	Section 10.0 and 11.0
Approach to manage performance	Describe the environmental performance requirements to set air quality, traffic noise and vibration outcomes that the project must achieve.	Section 14.0

2.3 Linkages to other reports

This report relies on or informs the technical assessments as indicated in Table 2.

Table 2: Linkages to other technical reports.

Specialist Report	Relevance to this impact assessment
Technical Report A, Traffic and transport	The traffic volumes and fleet mix projections for North East Link were used in the estimation of emissions from surface roads and tunnel ventilation system for the air quality impact assessment.
Technical Report I, Social	Outputs from the air quality impact assessment were used in this report.
Technical Report J, Human health	Outputs from the air quality impact assessment were used in this report.

3.0 PROJECT DESCRIPTION

The North East Link alignment and its key elements assessed in the EES include:

- **M80 Ring Road to the northern portal** – from the M80 Ring Road at Plenty Road, and the Greensborough Bypass at Plenty River Drive, North East Link would extend to the northern portal near Blamey Road utilising a mixture of above, below and at surface road sections. This would include new road interchanges at the M80 Ring Road and Grimshaw Street.
- **Northern portal to southern portal** – from the northern portal the road would transition into twin tunnels that would connect to Lower Plenty Road via a new interchange, before travelling under residential areas, Banyule Flats and the Yarra River to a new interchange at Manningham Road. The tunnel would then continue to the southern portal located south of the Veneto Club.
- **Eastern Freeway** – from around Hoddle Street in the west through to Springvale Road in the east, modifications to the Eastern Freeway would include widening to accommodate future traffic volumes and new dedicated bus lanes for the Doncaster Busway. There would also be a new interchange at Bulleen Road to connect North East Link to the Eastern Freeway.

These elements are illustrated in Figure 1.

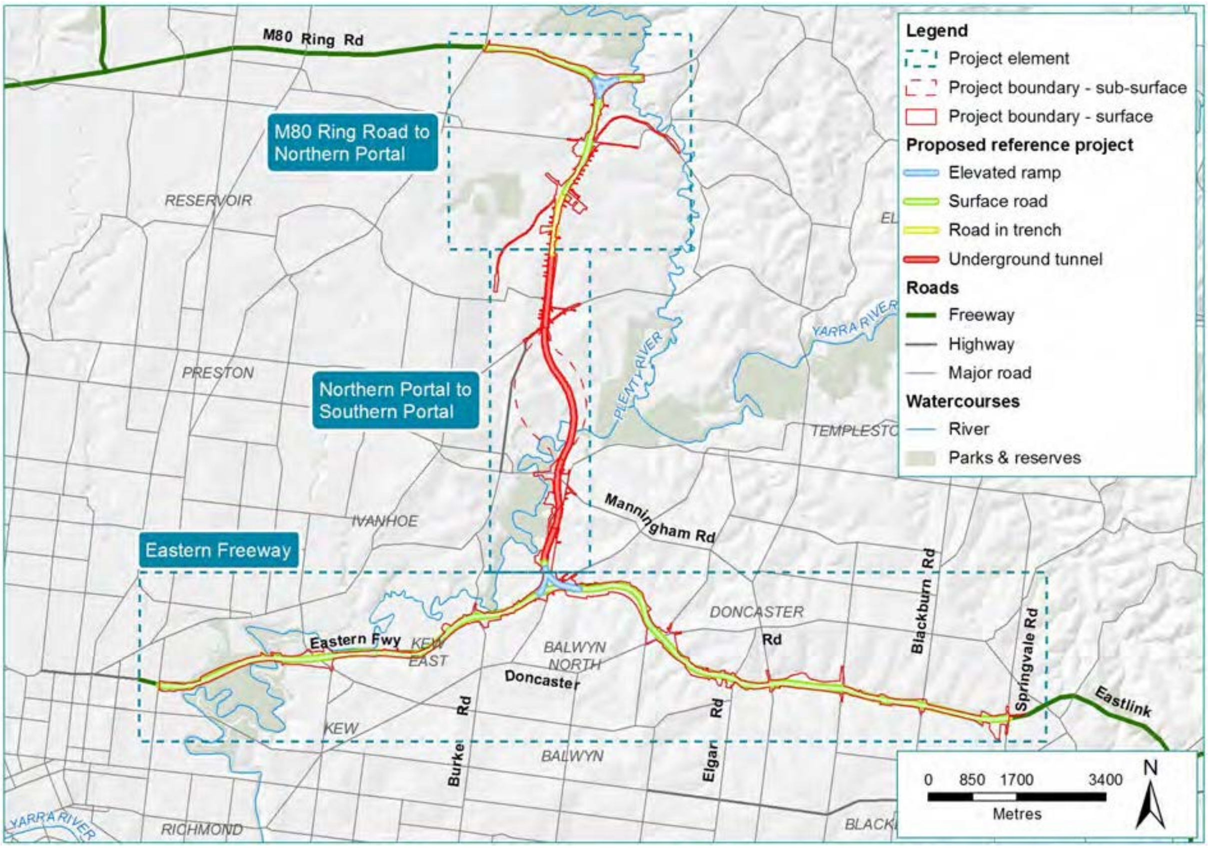


Figure 1: Overview of North East Link (Source: NELP)

The project would also improve existing bus services from Doncaster Road to Hoddle Street through construction of the Doncaster Busway as well as improve pedestrian connections and the bicycle network with connected shared use and walking paths from the M80 to the Eastern Freeway.

For a detailed description of the project, refer to EES Chapter 8 – Project description.

3.1 Construction

Key construction activities for North East Link would include:

- general earthworks including topsoil removal, clearing and grubbing vegetation
- relocation, adjustment or installation of new utility services
- construction of retaining walls and diaphragm walls including piling
- ground treatment to stabilise soils
- tunnel portal and dive shaft construction
- storage and removal of spoil
- construction of cross passages, ventilation structures and access shafts
- installation of drainage and water quality treatment facilities
- installation of a Freeway Management System
- tunnel construction using tunnel boring machines, mining and cut and cover techniques
- installation of noise barriers
- restoration of surface areas.

3.2 Operation

Following construction of North East Link, the key operation phase activities would include:

- operation and maintenance of new road infrastructure
- operation and maintenance of the Freeway Management System
- operation of the North East Link motorway control centre
- operation and maintenance of the tunnel ventilation system
- operation and maintenance of water treatment facilities
- operation and maintenance of the motorways power supply (substations)
- maintenance of landscaping and stormwater management features using water sensitive urban design principles.

4.0 LEGISLATION, POLICY, GUIDELINES AND CRITERIA

The legislative context for the North East Link air quality impact assessment is described below, including details of air quality criteria used to assess the impact of pollutant emissions resulting from project operation.

4.1 Commonwealth legislation

The National Environment Protection Council (NEPC) was established under the *National Environment Protection Council Act 1994* with the primary function of:

- developing National Environment Protection Measures (NEPMs)
- assessing and reporting on the implementation and effectiveness of the NEPMs in each State and Territory.

4.1.1 National Environment Protection (Ambient Air Quality) Measure

The *National Environment Protection (Ambient Air Quality) Measure* (Air NEPM) contains standards and goals for key pollutants that are required to be achieved nationwide, with due regard to population exposure. Table 3 presents the standards for pollutants relevant to North East Link: particulate matter with equivalent aerodynamic diameters less than 10 microns (PM_{10}) and 2.5 microns ($PM_{2.5}$) and nitrogen dioxide (NO_2).

Air NEPM standards apply at performance monitoring locations, with each station located in such a manner that it obtains a representative measure of air quality likely to be experienced by the general population in a region or sub-region of 25,000 people or more. The Alphington AAQMS is a performance monitoring station in accordance with Environment Protection Authority (EPA) Victoria's Ambient Air Quality NEPM Monitoring Plan for Victoria (EPA Victoria, 2001).

The standards are not applied as modelling criteria for assessing air emissions from individual sources, specific industries or roadside locations.

Table 3: Ambient air quality standards and goals

Pollutant	Averaging period	Air quality standard[1,2]	Maximum allowable exceedances
Particles as PM_{10}	1 day 1 year	50 µg/m^3 25 µg/m^3	None
Particles as $PM_{2.5}$ (2025)	1 day 1 year	20 µg/m^3 7 µg/m^3	None
NO_2	1 hour 1 year	0.12 ppm 0.03 ppm	1 day a year None

Notes:
1 Defined as a standard that consists of quantifiable characteristics of the environment against which environmental quality can be assessed.
2 100th percentile.

4.1.2 National Environment Protection (Air Toxics) Measure

The aim of the *National Environment Protection (Air Toxics) Measure* (Air Toxics NEPM) is to gain a greater understanding of the levels of air toxics at specific locations where elevated concentrations are likely to occur and where the potential for significant human exposure exists.

The Air Toxics NEPM established monitoring investigation levels (MILs) for benzene, toluene, xylene isomers, formaldehyde and benzo(a)pyrene [B(a)P] as a marker for polycyclic aromatic hydrocarbons (PAH).
The MILs presented in Table 4 were established to assess the significance of monitored air toxics levels on human health.

Table 4: Monitoring investigation levels

Pollutant	Averaging period	Monitoring investigation level[1, 2]	Goal[3]
Benzene	Annual	0.003 ppm	Eight year goal was to gather sufficient data nationally to facilitate development of a standard
Toluene	24 hour Annual	1 ppm 0.1 ppm	
Xylene isomers (as total of ortho, meta and para isomers)	24 hour Annual	0.25 ppm 0.2 ppm	
Formaldehyde	24 hour	0.04 ppm	
B(a)P as a marker for PAH	Annual	0.3 ng/m^3	

Notes:
1 The concentration of an air toxic which if exceeded requires an appropriate form of further investigation and evaluation.
2 100th percentile.
3 The Air Toxics NEPM was passed into legislation in 2004, consequently the goal date has passed.

4.2 Victorian legislation

The *Environment Protection Act 1970* (EP Act) is the primary legislative instrument that governs protection of the environment in Victoria. It sets environmental objectives for air, water and land and regulates the discharge of emissions of these elements to the environment. Pursuant to the EP Act, beneficial uses of the air quality environment are principally protected by the following subordinate regulations and policies:

- *Environment Protection (Scheduled Premises and Exemptions) Regulations 2017*
- *State Environment Protection Policy (Ambient Air Quality)* [SEPP(AAQ)] as amended in July 2016 to incorporate changes to the Air NEPM particle standards (February 2016)
- *State Environment Protection Policy (Air Quality Management)* December 2001 [SEPP(AQM)].

4.2.1 Environment Protection (Scheduled Premises) Regulations

Facilities with the potential to significantly impact on the environment are subject to an EPA Victoria Works Approval (WA) for construction as well as an EPA Victoria licence to operate, which may include conditions relating to discharge limits, monitoring and reporting requirements.

Schedule 1 of the *Environment Protection (Scheduled Premises) Regulations 2017* prescribe the premises that are subject to these requirements. Schedule 1 and L03 (Tunnel Ventilation Systems) provides that an application for WA would be required for construction of the North East Link tunnel ventilation system, and an EPA Victoria licence would be required to operate the North East Link tunnel ventilation system.

4.2.2 State Environment Protection Policy (Ambient Air Quality)

In general, the *State Environment Protection Policy (Ambient Air Quality)* [SEPP(AAQ)] adopts the requirements of the Air NEPM, with environmental quality objectives (EQOs) for carbon monoxide (CO), NO_2, photochemical oxidants (as ozone), sulphur dioxide (SO_2), lead, PM_{10} and $PM_{2.5}$, together with an additional objective for visibility reducing particles. The SEPP(AAQ) EQOs apply to air quality within a region or sub-region considered to be representative of exposure of the general population in Victoria.

In accordance with the amended Air NEPM (February 2016), the SEPP(AAQ) includes $PM_{2.5}$ objectives of 7 micrograms per cubic metre (annual average) and 20 micrograms per cubic metre (24 hour average) to be implemented by 2025. A factor in this change is the expected improvement in background air quality resulting from improved vehicle emission control technologies.

As distinct from the Air NEPM, SEPP(AAQ) adopts a more stringent PM_{10} annual average objective of 20 micrograms per cubic metre.

Although they have no regulatory status in this regard, SEPP(AAQ) EQOs were used for comparison with air quality modelling predictions for the project's combined impacts (refer to Section 9.4), an approach which was agreed to by EPA Victoria.

4.2.3 State Environment Protection Policy (Air Quality Management)

The *State Environment Protection Policy (Air Quality Management)* [SEPP(AQM)] sets out legislative requirements for managing and assessing air emissions in Victoria. The aim of the SEPP(AQM) is to:

- ensure that prescribed air quality objectives are met
- drive continual improvement in air quality, whist having regard to the social and economic development of Victoria
- support the Victorian Government's other environmental goals.

The SEPP(AQM) identifies the following beneficial uses of the air environment:

- life, health and well-being of humans
- life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity
- local amenity and aesthetic enjoyment
- visibility
- the useful life and aesthetic appearance of buildings, structures, property and materials
- climate systems that are consistent with human development, the life, health and well-being of humans and the protection of ecosystems and biodiversity.

Part II of the SEPP(AQM) classifies air pollutants as Class 1, 2 or 3 air quality indicators according to their potential to adversely affect the beneficial uses of the air environment:

- Class 1 air quality indicators are common or widely distributed air pollutants that may threaten the beneficial uses of local and regional air environments
- Class 2 air quality indicators are hazardous substance that may threaten the beneficial uses of the air environment by virtue of their toxicity, bio-accumulation or odorous characteristics
- Class 3 air quality indicators are extremely hazardous substances that are carcinogenic, mutagenic, teratogenic, highly toxic or highly persistent, which may threaten the beneficial uses of the air environment
- unclassified air quality indicators have the potential to affect the beneficial uses of local amenity and aesthetic enjoyment, namely odour and total suspended particulates (nuisance dust).

The SEPP(AQM) does not contain guidance, nor specific criteria, for the assessment of impacts from transport corridors. However, Schedule A of the SEPP(AQM) lists Class 1, 2 and 3 air quality indicators and their design criteria '*to be used in the assessment of the design of new or expanded sources of emissions*'. These criteria apply to the modelling of emissions from the proposed North East Link tunnel ventilation system.

Schedule B lists intervention levels '*used to assess air quality monitoring data*'. An intervention level is '*numerically greater than the design criteria for a given pollutant as it does not apply to an individual source but to all sources of the pollutant within a defined area*'. These criteria have previously been used in assessing surface road modelling predictions, however EPA Victoria has indicated that this is no longer considered acceptable. These criteria have therefore not been applied to the modelling of emissions from existing and proposed surface roads impacted by North East Link.

Schedule C describes the requirements for conducting air dispersion modelling assessments for new or modified sources of emissions to air in Victoria.

SEPP(AQM) Clause 19(1) states that a generator of a new source of air emissions '*must apply best practice to the management of those emissions*'.

Best practice is defined as '*the best combination of eco-efficient techniques, methods, processes or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector or activity*'. Eco-efficient is defined as '*producing more goods with less energy and fewer natural resources, resulting in less waste and pollution*'.

Additionally, SEPP(AQM) Policy Principles under 7(1)(c) states that '*the measures adopted should be cost-effective and in proportion to the significance of the environmental problems being addressed*'.

4.2.4 Construction

There are currently no Victorian regulations or policies that specifically govern air quality during North East Link construction.

The general provisions of the EP Act, including the offence provisions regarding air pollution (Section 41), are applicable to construction activities. The nuisance provisions of the *Public Health and Wellbeing Act 2008* also apply. The *Public Health and Wellbeing Act* applies to nuisances arising from a number of sources, including any state, condition or activity, which is, or is liable to be, dangerous to health or offensive.

The EPA Victoria Environmental Guidelines for Major Construction Sites (EPA Victoria 1996) will apply to North East Link during construction.

Measures described in the guidelines include:

- minimising the area of land cleared during drier months
- the application of water to unpaved roads, stockpiles and other surfaces that can generate dust, including the possible use of environmentally appropriate dust suppression chemicals
- construction of wind fences, as appropriate
- minimising the size and number of stockpiles, with the stockpile slope not to exceed 2 to 1
- stabilising stockpiles and batters that will remain bare for more than 28 days through covering with mulch, anchored fabrics or seeding with sterile grass
- ensuring that all vehicles and machinery are fitted with appropriate emission control equipment and maintained and serviced to manufacturers' specifications.

VicRoads released the sustainability rating tool for road projects, INVEST, in 2011. This contained a number of additional measures for controlling dust during road construction, such as:

- compacting exposed surfaces
- reducing vehicle speeds and minimising idling and queuing
- fencing stockpiles
- minimising soil or aggregate drop heights
- minimising the number of vehicle movements and using tarpaulins on haul trucks
- preventing mud and soil tracking onto paved roads
- evaluating vehicle routes to minimise the time spent on unpaved surfaces and near sensitive receptors
- installing dust filters on diesel fuelled equipment (greater than 35 kW), with exhausts not directed toward the ground.

4.3 Local government areas

The Banyule, Boroondara, Manningham, Nillumbik, Whitehorse and Yarra City Councils have no policies, strategies or plans with specific requirements that address air quality relating to operation of North East Link.

4.4 Other guidance documents

Other guidelines referenced during preparation of the air quality impact assessment include:

- ‘Road Tunnels: Vehicle Emissions and Air Demand for Ventilation’ [World Road Association (PIARC) 2012]
- ‘Guidance on the Assessment of Dust from Demolition and Construction’ [Institute of Air Quality Management (IAQM) 2014]
- ‘Future Air Quality in Victoria – Final Report’ (EPA Victoria 2013a)
- ‘Demonstrating Best Practice’ (EPA Victoria 2013c).

4.5 Assessment criteria

Pollutant impacts from the North East Link tunnel ventilation system will be assessed against SEPP(AQM) Schedule A design criteria, as presented in Table 5.

Table 5: SEPP(AQM) design criteria

Pollutant	Criterion (mg/m^3)[1, 2]	Averaging period
PM_{10}	0.08	1 hour
$PM_{2.5}$	0.05	1 hour
NO_2	0.19	1 hour
CO	29	1 hour
Benzene	0.053	3 minute
Toluene	0.65 (odour)	3 minute
Ethylbenzene	14.5	3 minute
Xylene isomers	0.35 (odour)	3 minute
Formaldehyde	0.04	3 minute
1,3 Butadiene	0.073	3 minute
PAH [as B(a)P toxic equivalent]	0.00073	3 minute

Notes:
1 Design criteria are to be used in assessing the design of new or expanded sources of emissions such as industrial premises
2 Assessment criteria based on 99.9th percentile as determined by modelling in accordance with Schedule C of SEPP(AQM)

Comparisons are also made with the SEPP(AAQ) EQOs for relevant pollutants (Table 6), however, it should be emphasised they have no regulatory status. They have been used for comparative rather than compliance purposes for the combined impacts assessment (surface road vehicle and tunnel ventilation system emissions and background air quality) which evaluates the potential impact of North East Link on the receiving environment.

Table 6: SEPP(AAQ) objectives

Pollutant	Objective[1]	Units	Averaging period
PM_{10}	50 20	$\mu g/m^3$	24 hour Annual
$PM_{2.5}$ (2025)	20 7	$\mu g/m^3$	24 hour Annual
NO_2	0.12 0.03	ppm	1 hour Annual

Note:
1 Assessment criteria based on the 100th percentile for all averaging periods.

Regulatory criteria are not prescribed for assessing the impact of vehicle emissions from surface roads. Modelling predictions are therefore focussed on demonstrating the incremental change in air quality resulting from the project over the base (no project) scenario.

5.0 METHODOLOGY

This section describes the methods used to assess the potential impacts of North East Link. A risk-based approach was applied to prioritise the key issues for assessment and inform measures to avoid, minimise and offset potential effects. Figure 2 shows an overview of the assessment method.

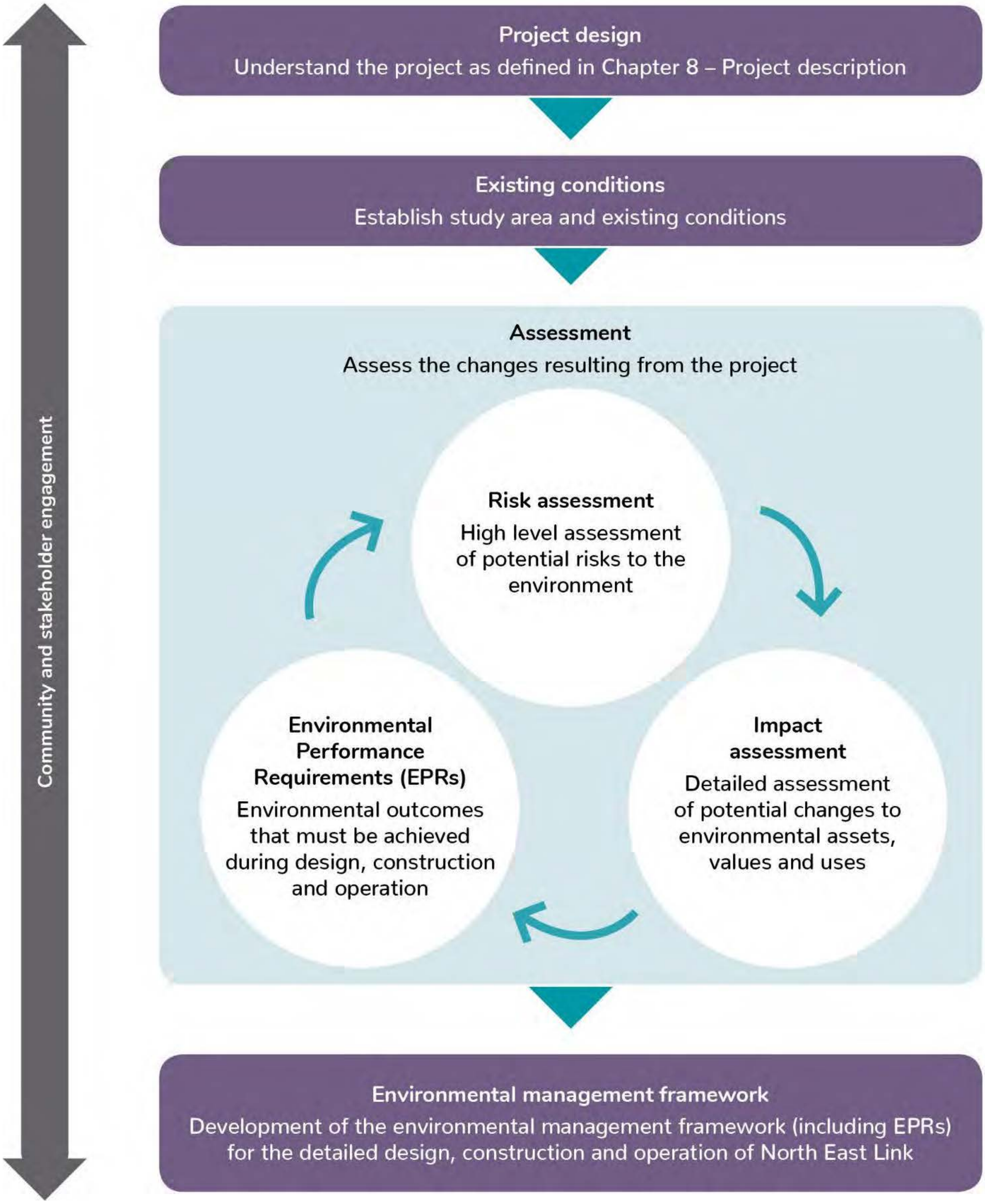


Figure 2: Overview of assessment method

The following sections describe the methodology adopted for the air quality impact assessment.

5.1 Rationale

The underlying rationale for the methodology is to undertake an assessment of the impacts consistent with the objectives, requirements and guidance provided by the statutory framework as described in Section 2.0 of this report.

Victoria has an established framework for assessing air quality impacts associated with the project that includes:

- EQOs and modelling design criteria
- an approved air dispersion model for predicting the impacts of emissions
- existing air quality data
- guidance covering the management of construction related impacts.

Pollutants for which no regulatory objectives are established or proposed to be established in Victoria, or for which no Victorian air quality data is available, have not been considered.

North East Link ventilation system modelling predictions were assessed against SEPP(AQM) Schedule A modelling design criteria.

Regulatory criteria are not prescribed for assessing the impact of vehicle emissions from surface roads. Modelling predictions are therefore focussed on demonstrating the incremental change in air quality resulting from the project over the no project scenario.

For the combined impacts assessment (surface road vehicle emissions, tunnel ventilation system emissions and background air quality) comparisons have been made with the SEPP(AAQ) EQOs for the pollutants assessed. However, it should be emphasised the objectives have no regulatory status.

5.2 Study area

For the purposes of the air quality impact assessment the study area includes the full project alignment (including the road tunnel ventilation structures) and selected existing surface roads where traffic volumes are impacted by North East Link, together with areas in the vicinity of the project potentially impacted by emissions from these sources.

The areas potentially affected vary according to the source of the emissions (ventilation system and surface roads). The assessment of impacts associated with surface roads focusses on sensitive receptors in close proximity to the roads (as this is where the maximum impacts would occur) whereas the assessment of emissions from the ventilation system considers receptors in both close proximity and remote from the sources to ensure that maximum impacts are included.

In addition to the roads forming part of the project, existing roads were included in the assessment based on predicted changes in traffic volumes or fleet mix due to North East Link. In summary, existing roads were selected based on the total number of vehicles using the road and the predicted percentage change in the number of total vehicles or heavy commercial vehicle (HCVs). Further detail is contained in Section 11.1.

5.3 Characterisation of existing environment

The North East Link receiving environment was described, including topography, meteorology and existing air quality. The receiving environment was characterised by:

- identifying relevant sources of existing information (eg Bureau of Meteorology and EPA Victoria monitoring station locations)
- extracting data relevant to the study area and presenting it over a representative time period
- collating relevant data into a form to support the impact assessment (eg in dispersion modelling).

5.4 Pollutants considered

Air pollutants of relevance to both construction and operation of North East Link are:

- particulate matter
- NO_2
- CO
- benzene, toluene, ethylbenzene and xylene isomers (BTEX), formaldehyde and 1,3-butadiene
- PAH as B(a)P toxic equivalents (TEQ).

These air pollutants are considered the principal emissions from vehicle traffic and mobile plant machinery associated with North East Link construction. Effective on-site management measures implemented during construction would, however, minimise the emission of these air pollutants and their resultant impacts.

All listed pollutants were considered when evaluating emissions to air from the North East Link ventilation system in accordance with EPA Victoria guidance and SEPP(AQM) requirements.

The outcomes of West Gate Tunnel combined impacts modelling clearly demonstrated that surface roads represented the major contributor to the predicted ground level concentrations (GLCs) at the most impacted sensitive receptors. A review of the modelled outcomes from this project showed the major pollutant impacts were PM_{10}, $PM_{2.5}$ and NO_2, based on comparisons between the modelled outcomes and SEPP(AAQ) EQOs. The maximum percentage of the SEPP(AAQ) EQO predicted for CO and the various air toxics, ranged from only 2.5 to 60 per cent, depending on the pollutant and averaging period, whereas percentage comparisons for PM_{10}, $PM_{2.5}$ and NO_2 ranged from 62 to 130 per cent. For North East Link it was consequently agreed with EPA Victoria that surface roads and combined impacts modelling would be limited to the major pollutants, particulate matter and NO_2.

The following section describes the evaluation of which particulate matter size fractions should be considered, in particular whether it is appropriate to consider ultrafine particles in addition to PM_{10} and $PM_{2.5}$.

5.4.1 Particulate matter size fractions

Public submissions on impact assessments undertaken for other major road projects (eg West Gate Tunnel) have raised concerns regarding the impact of ultrafine particles. The following provides the rationale for the particulate matter pollutants considered in this assessment.

Particulate matter (solid and liquid) suspended in ambient air can range in size from nanometres to typically 100 micrometres (microns). PM_{10} and $PM_{2.5}$ are defined as the particle size fractions with equivalent aerodynamic diameters less than 10 microns and 2.5 microns respectively.

Figure 3 shows a typical particle size distribution for ambient air on both a volume and number basis (Solomon 2012). The majority of the particle volume and consequently mass is in the 0.1 to 10 microns size range, however the majority of particles by number are less than 0.1 microns in size.

Ultrafine particles (UFPs) have been defined in a number of ways, but typically as particles less than 0.1 microns (based on physical size, diffusivity or electrical mobility). They are formed by nucleation-condensation of low vapour pressure compounds formed by high temperature vaporisation or by chemical reactions in the atmosphere to form very small particles. Therefore, in addition to being emitted as primary particles, UFPs are produced by the nucleation of sulphuric acid and water vapour and possibly ammonia and certain organic compounds.

Particulate matter contained in diesel exhaust is almost pure carbon in the form of ultrafine carbon spheroid aggregates with aerodynamic diameters of approximately 0.1 microns. Particles in the nucleation mode subsequently grow by condensation or coagulation mechanisms up to approximately 1 micron.

UFP formation has been observed in environments ranging from relatively unpolluted marine and continental environments to polluted urban areas as an ongoing background process and during nucleation events. However, a large percentage of UFPs come from combustion-related sources such as motor vehicles.

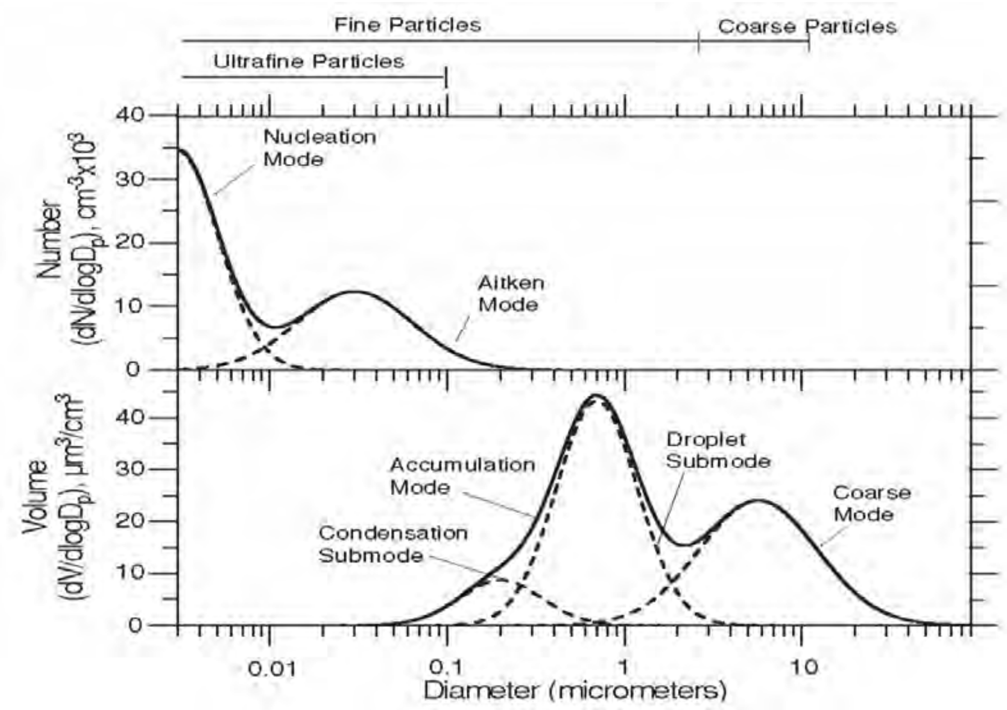


Figure 3: Particle size distribution in ambient air

The World Health Organization (WHO 2006) suggests that particle number concentrations in urban background environments range from a few thousand to approximately 2 x 10^4 particles per cubic centimetre, whereas concentrations close to roads or in tunnels can reach or exceed 10^5 particles per cubic centimetre.

UFP chemical composition varies by location, with organic carbon, sulphate, elemental carbon and sometimes ammonium and nitrate comprising the bulk of material (Solomon 2012).

Several studies indicate that UFP mass and number concentrations correlate poorly and that both UFP metrics correlate poorly with $PM_{2.5}$ or PM_{10} mass concentration (Solomon 2012). WHO also concluded that $PM_{2.5}$ mass concentration and UFP number concentrations are only moderately correlated.

WHO and United States Environmental Protection Agency (USEPA 2009) do, however, note that UFP concentrations decrease rapidly at increasing distances from roadways in comparison with accumulation mode particle numbers.

Standardised methods for instrumentation or techniques for measuring UFPs in ambient air are not available, with neither Standards Australia, International Organization for Standardization (ISO), USEPA or the European Union publishing methodology. Consequently, UFP monitoring has been principally restricted to research studies, with most countries not conducting routine monitoring. The problems associated with the lack of a standardised method is supported by Morawska, L. et al (2004), which notes the difficulty in comparing the results reported by different studies as a consequence.

Condensation particle counters have however been used in the majority of studies that evaluate UFP particle number concentrations, detecting particle sizes down to 0.01 or 0.003 microns, depending on the instrument. UFPs can be separated by their electrical mobility, consequently electrical mobility diameter is often used to describe the UFP size distribution, requiring the development of a number of techniques to enable conversion to aerodynamic diameters.

The European Union has incorporated particle number emission limits and measurement methods into current vehicle emission standards (for particles above 0.023 microns), however there are no ambient air quality criteria for UFPs in Europe or elsewhere. In addition, there are no readily available UFP emission factors for various classes and ages of vehicles, with COPERT, COPERT Australia, PIARC and USEPA MOVES focussed on the $PM_{2.5}$ and PM_{10} size fractions.

WHO (2006) refers to there only being a limited number of studies on the association of UFPs with risk of adverse health effect. In this publication WHO conclude that '*while there is considerable toxicological evidence of potential detrimental effects of ultrafine particles on human health, the existing body of epidemiological evidence is insufficient to reach a conclusion on the exposure–response relationship to ultrafine particles. Therefore no recommendations can be provided at present as to guideline concentrations of ultrafine particles*'.

Subsequently, WHO (2013) concluded that '*although there is considerable evidence that ultrafine particles can contribute to the health effects of PM, for ultrafine particles (measured by the number of particles) the data on concentration–effect functions are too scarce to evaluate and recommend an air quality guideline*'. Critical data gaps were identified as:

- lack of epidemiological evidence on the effect of UFPs on health, with only a handful of studies published on this topic
- insufficient understanding of whether the effects of UFPs are independent of those of $PM_{2.5}$ and PM_{10}
- evidence of which UFP physical or chemical characteristics are most significant to health. There is a lack of data on the effects of short-term exposures to UFPs, and there are no epidemiological studies of long-term exposure to UFPs.

These conclusions are similar to those reached by the USEPA in the Integrated Science Assessment (ISA) for particulate matter (USEPA 2009). When examining causality, USEPA concluded the available evidence for UFPs is suggestive of short-term cardiovascular and respiratory effects and inadequate evidence for all remaining short and long-term outcomes examined. In contrast, the available evidence for $PM_{2.5}$ exposure suggests a causal relationship for short and long-term cardiovascular effects and mortality, with short and long-term respiratory effects also likely to be causal. The evidence for $PM_{2.5}$ is also suggestive of long-term reproductive and developmental effects, cancer, mutagenicity and genotoxicity.

In December 2012, USEPA published a provisional assessment of studies on health effects of particulate matter published since the 2009 ISA, however this was principally focussed on the $PM_{2.5}$ and $PM_{10-2.5}$ size fractions.

In 2013 the Health Effects Institute (HEI) conducted a review of the scientific literature on ambient UFPs and their role in adverse health effects associated with ambient air pollution. The report concluded that, despite concerns raised about the potential toxicity of UFPs and the considerable body of research conducted, '*toxicologic studies in animals, controlled human exposure studies, and epidemiologic studies to date have not provided consistent findings on the effects of exposures to ambient levels of UFPs, particularly in human populations. The current evidence does not support a conclusion that exposures to UFPs alone can account in substantial ways for the adverse effects that have been associated with other ambient pollutants such as $PM_{2.5}$*'.

At a subsequent USEPA workshop (USEPA 2015) the HEI Principal Scientist cited a number of limitations in the experimental and epidemiological literature that make inferences about the specific role of UFPs difficult:

- differing definitions and measurements of UFP exposures, including use of near-road or traffic as proxies
- limited consideration of confounding by co-pollutants
- limited statistical power of small study designs; studies primarily examining only short-term UFP exposures
- limited coherence in the choice of and findings on various biological markers of health outcomes.

In its submission to the West Gate Tunnel Project Environment Effects Statement Inquiry and Advisory Committee, EPA Victoria (2017) noted that '*there is clear evidence of health impacts from exposure to elevated concentrations of PM_{10} and $PM_{2.5}$. The science on the health impacts and interactions in air of ultrafine particles continues to evolve. Given the limitation of the science at present, there is no air quality standard for ultrafine particles and no regulatory air monitoring of ultrafine particles in Australia. Any air monitoring undertaken is for research purpose*'.

Given the lack of UFP emission factors, standardised measurement methods and ambient air quality criteria, the North East Link air quality impact assessment focuses on the particulate matter size fractions where this information is available, namely $PM_{2.5}$ and PM_{10}. This is also consistent with the requirements of the EES scoping requirements which require the analysis of '*risk of project emissions exceeding the relevant SEPP standards for surface roads and Schedule A Design Criteria for the tunnel ventilation system*'. As noted, there are no SEPP standards relating to UFPs.

5.5 Impact assessment

The study assessed air quality impacts on the assets and values to be protected during North East Link construction and operation. The methodology for the impact assessment is summarised below.

5.5.1 Construction

Construction emissions for large road and tunnel projects are complex due to the range, type and number of activities, the geographical extent over which these activities occur and the intensity and duration. Air quality impacts associated with construction activities have therefore been addressed qualitatively. Where information was available, the nature of the proposed works and potential emission sources were described.

Risks associated with construction of the project were identified, and management and mitigation measures proposed to reduce the potential for adverse impacts on local air quality and the receiving environment.

5.5.2 Operation

The assessment of potential air quality impacts resulting from North East Link operation involved:

- use of air dispersion modelling techniques to assess the impacts of air emissions from the tunnel ventilation system
- use of air dispersion modelling techniques to assess the base (no project) and project impacts of vehicle emissions on sensitive receptors adjacent to major surface roads, where the project is expected to cause significant changes in traffic volumes or fleet mix
- evaluating the combined impact of background air quality and emissions from the tunnel ventilation system and surface roads at selected receptors in the receiving environment.

Figure 4 presents a schematic of the approach to the air quality impact assessment.

The dispersal of pollutant emissions to air from the North East Link tunnel ventilation system and from new or significantly impacted surface roads were modelled using AERMOD, the Victorian regulatory model under the SEPP(AQM). The AERMOD urban option was used, in accordance with USEPA guidance and approval from EPA Victoria.

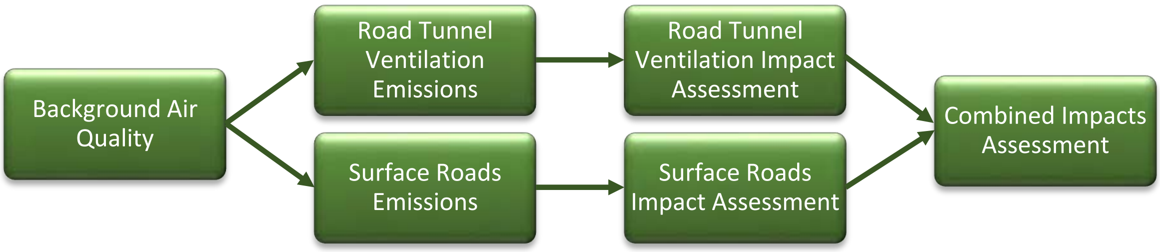


Figure 4: Schematic of air quality impact assessment approach

AERMOD requires a range of inputs to describe the project environment:

- topographical data
- meteorological data
- background pollutant concentrations.

The sources of the required data are summarised in Table 7.

Table 7: Air quality model input data

Item	Source	Description
Topographical data	Department of Environment, Land, Water and Planning	2015 Vicmap elevation data (metro 1 to 5 metre contours)
Meteorological data	Viewbank (Bureau of Meteorology) Essendon Airport Melbourne Airport	Wind speed, wind direction, temperature and sigma theta (2013 to 2017) Cloud cover (2013 to 2017) Twice daily weather balloon radiosonde data (2013 to 2017)

Item	Source	Description
Background pollutant concentrations	Alphington (EPA Victoria) Various sites (EPA Victoria)	PM_{10}, $PM_{2.5}$, CO and NO_2 (2013 to 2017; $PM_{2.5}$ 2014 to 2017 only) PAH [benzo(a)pyrene], benzene, toluene, ethyl benzene, xylene isomers, formaldehyde and 1,3 butadiene

Impacts were assessed based on the Victorian legislative framework for the protection of air quality.

The risk assessment has identified where control measures are to be applied to minimise air quality impacts. These measures inform the development of project Environmental Performance Requirements (EPRs) pertaining to air quality.

5.6 Risk assessment

An environmental risk assessment has been completed to identify environmental risks associated with construction and operation of North East Link. The risk-based approach is integral to the EES as required by Section 3.1 of the Scoping Requirements and the Ministerial guidelines for assessment of the environmental effects under the *Environment Effects Act 1978*.

Specifically, the EES risk assessment aimed to:

- systematically identify the interactions between project elements and activities and assets, values and uses
- focus the impact assessment and enable differentiation of significant and high risks and impacts from lower risks and impacts
- inform development of the reference project to avoid, mitigate and manage environmental impacts
- inform development of EPRs that set the minimum outcomes necessary to avoid, mitigate or manage environmental impacts and reduce environmental risks during delivery of the project.

This section presents an overview of the EES risk assessment process. EES Attachment III – Environmental risk report describes each step in the risk assessment process in more detail and contains a consolidated risk register.

This technical report describes the risks associated with the project on air quality. Wherever risks relating to this study are referred to, the terminology ‘risk XX01’ is used. Wherever EPRs relating to this study are referred to, the terminology ‘EPR XX1’ is used. The risk assessment completed for this study is provided as APPENDIX A.

5.6.1 Risk assessment process

The risk assessment process adopted for North East Link is consistent with Australian Standard AS/NZS ISO 31000:2009 ‘Risk Management Process’. The following tasks were undertaken to identify, analyse and evaluate project risks:

- use existing conditions and identify applicable legislation and policy to establish the context for the risk assessment
- develop likelihood and consequence criteria and a risk matrix
- consider construction and operational activities in the context of existing conditions to determine risk pathways

- identify standard controls and requirements (EPRs) to mitigate identified risks
- assign likelihood and consequence ratings for each risk to determine risk ratings considering design, proposed activities and standard EPRs.

While there are clear steps in the risk process, it does not follow a linear progression and requires multiple iterations of risk ratings, pathways and EPRs as the technical assessments progress. Demonstrating this evolution, a set of initial and residual risk ratings and EPRs are produced for all technical reports. Figure 5 shows this process.

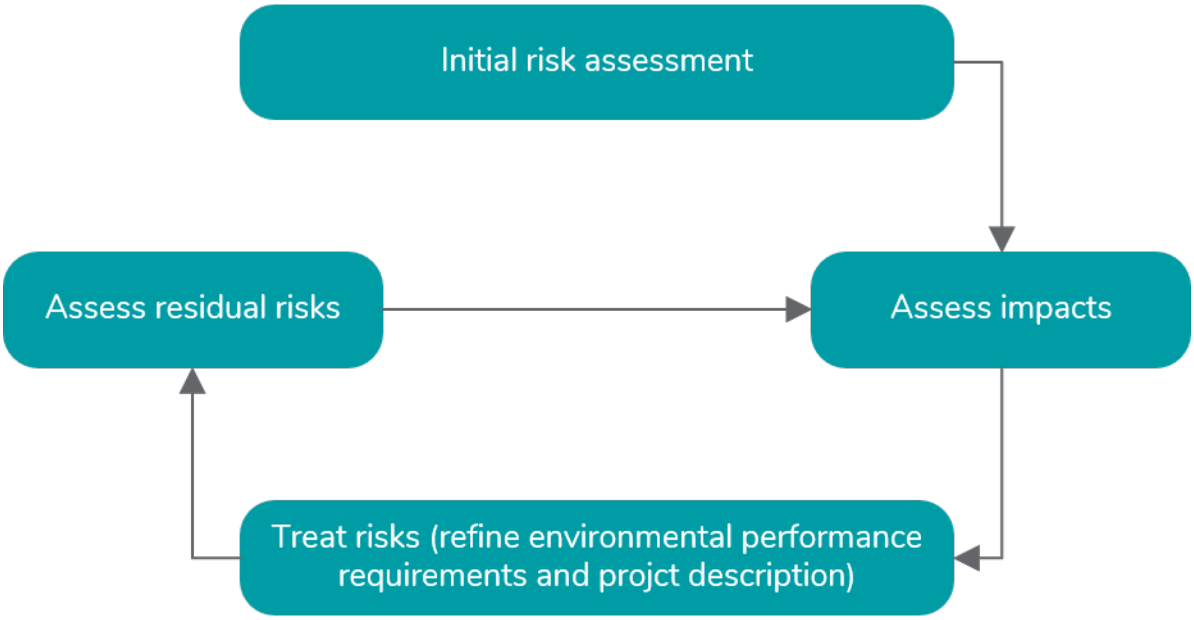


Figure 5: Risk-based approach

Rating risk

Risk ratings were assessed by considering the consequence and likelihood of an event occurring.
In assessing the consequence, the extent, severity and duration of the risks were considered. These are discussed below.

Assigning the consequences of risks

'Consequence' refers to the maximum credible outcome of an event affecting the objectives in relation to an asset, value or use. Consequence criteria were developed for the North East Link EES to enable a consistent assessment of consequence across the range of potential environmental effects. Consequence criteria were assigned based on the maximum credible consequence of the risk pathway occurring. When there was uncertainty or incomplete information, a conservative assessment was made on the basis of the maximum credible consequence.

Consequence criteria have been developed to consider the following characteristics:

- extent of impact
- severity of impact
- duration of threat.

Severity has been assigned a greater weighting than extent and duration as this is considered the most important characteristic.

Each risk pathway was assigned a value for each of the three characteristics, which were added together to provide an overall consequence rating.

Further detail on the consequence criteria are provided Chapter 4 – EES assessment framework.

Assigning the likelihood of risks

'Likelihood' refers to the chance of an event happening and the maximum credible consequence occurring from that event. The likelihood criteria are presented below;

Likelihood	Criteria
Planned	The event is certain to occur
Almost certain	The event is almost certain to occur one or more times a year
Likely	The event is likely to occur several times within a five year timeframe
Possible	The event may occur once within a five year timeframe
Unlikely	The event may occur under unusual circumstances but is not expected (ie once within a 20 year timeframe)
Rare	The event is very unlikely to occur but may occur in exceptional circumstances (ie once within a 100 year timeframe)

Risk matrix and risk rating

Risk levels were assessed using the matrix presented below;

	Consequence				
Likelihood	Negligible	Minor	Moderate	Major	Severe
Rare	Very low	Very low	Low	Medium	Medium
Unlikely	Very low	Low	Low	Medium	High.
Possible	Low	Low	Medium	High.	High.
Likely	Low	Medium	Medium	High.	Very high
Almost certain	Low	Medium	High.	Very high	Very high
Planned	Planned (negligible consequence)	Planned (minor consequence)	Planned (moderate consequence)	Planned (major consequence)	Planned (severe consequence)

Planned events

North East Link would result in some planned events, being events with outcomes that are certain to occur (ie planned impacts such as land acquisition), as distinct from risk events where the chance of the event occurring and its consequence is uncertain. Although planned events are not risks, these were still documented in the risk register as part of Attachment III – Risk report for completeness and assigned a consequence level in order to enable issues requiring further assessment or treatment to be prioritised.

These planned events were assessed further through the impact assessment process.

Risk evaluation and treatment

The risk assessment process was used as a screening tool to prioritise potential impacts and the subsequent level of assessment undertaken as part of the impact assessment. For example, an issue that was given a risk level of medium or above or was identified as a planned event with a consequence of minor or above, would go through a more thorough impact assessment process than a low risk.

Where initial risk ratings were found to be 'medium' or higher or were planned events with a consequence of 'minor' or higher, options for additional or modified EPRs or design changes were considered where practicable. It should be noted that the consequence ratings presented in the risk register are solely based on the consequence criteria presented in Attachment III – Risk report. Further analysis and evaluation of the impacts potentially arising from both risks and planned events and information on how these would be managed is provided in Sections 8.0, 10.0 and 11.0

5.7 Stakeholder engagement

Stakeholders and the community were consulted to support preparation of the North East Link EES and to inform the understanding of potential impacts. Table 8 lists specific engagement activities that have occurred in relation to air quality, with more general engagement activities occurring at all stages of the project. Feedback received during community consultation sessions is summarised in Section 5.8.

Table 8: Stakeholder engagement

Activity	When	Matters discussed	Outcome
Meeting with EPA Victoria	30 November 2017	Air quality monitoring	Confirmation of proposed air quality monitoring locations.
Meeting with EPA Victoria	16 January 2018	Approvals and approach to air dispersion modelling.	NELP to develop modelling approach and submit to EPA.
Meeting with EPA Victoria	13 February 2018	Approvals and approach to air dispersion modelling.	EPA Victoria provided progress update.
Meeting with EPA Victoria	3 April 2018	Approach to modelling of emissions and assessment of impacts.	Confirmation of model to be used and key elements of project design.
Meeting with EPA Victoria	5 June 2018	Approach to modelling of emissions and assessment of impacts.	Confirmation of general approach to assessment and modelling, identification of technical issues to further develop and resolve.
Meeting with EPA Victoria	31 July 2018	Information needs regarding assessment methodology.	Clarification and conformation of required information.

In addition, community information sessions were held at Rosanna Bowling Club (22 April 2018), VicRoads, Exhibition Street, Melbourne (24 April 2018), New Hope Baptist Church, Blackburn (24 April 2018), Veneto Club, Bulleen (26 April 2018)., Melbourne Polytechnic, Greensborough (28 April 2018), Manningham Council Square (29 April 2018), Kew RSL (1 May 2018) and Bulleen (22 September 2018), with Golder air quality technical specialists attending each session to respond to questions from the community and collate information on their concerns.

5.8 Community feedback

In addition to consultation undertaken with specific stakeholders, consultation has been ongoing with the community throughout development of the project design and the EES process. Feedback relevant to the air quality impact assessment is summarised in Table 9, together with where and how the topics have been addressed in this report.

Table 9: Community feedback addressed by air quality impact assessment

Issues raised during community consultation	How it's been addressed
Increases in traffic-related air pollutants and dust at ground level along the immediate project alignment: ■ In residential areas ■ Near schools, sports fields and parklands ■ Next to recreational and commuter shared paths ■ Near other community buildings along the project alignment.	The EES assessment considers the current air quality in the alignment of the project (Section 6) and how this may be impacted by traffic related emissions from tunnel ventilation system (Section 10) and roads (Section 11). The assessment considers roads that would be built or modified as part of the project (eg Eastern Freeway) and other roads where traffic volumes (total vehicles and heavy commercial vehicles) would change significantly as a result of the project. The assessment considers impacts on a range of sensitive receptors including residential areas, public open space and schools.
Predicted changes to air quality at ground level along the immediate project alignment.	The EES assessment considers the current air quality in the alignment of the project (Section 6) and how this may be impacted by traffic related air emissions from tunnel ventilation system (Section 10) and roads (Section 11). The assessment considers roads that would be built or modified as part of the project (eg Eastern Freeway) and other roads where traffic volumes (total vehicles and heavy commercial vehicles) would change significantly as a result of the project. The assessment considers impacts on a range of sensitive receptors including residential areas, public open space and schools.
Increased pollution from more trucks using the Eastern Freeway.	The EES assessment considers the current air quality in the alignment of the project (Section 6) and how this may be impacted by traffic related air emissions (Section 11). The assessment considers impacts from traffic using the Eastern Freeway and takes into account projected changes in vehicle numbers (including trucks) resulting from the project.
Emissions concentrating in and near the trenched section of North East Link between Blamey Road and Watsonia Road and in and near tunnel entry and exit ramps at Manningham Road.	The EES assessment considers the current air quality in the alignment of the project (Section 6) and how this may be impacted by traffic related air emissions (Section 11). The assessment considers impacts from traffic using the 'trench' section of North East Link between Blamey Road and Watsonia Road and in and near tunnel entry and exit ramps at Manningham Road. The assessment takes into account projected changes in vehicle numbers (including trucks) associated with the project.
Emissions from ventilation system and how air quality would be monitored in the local area.	The EES assessment considers the current air quality in the alignment of the project (Section 6) and how this may be impacted by traffic related emissions from tunnel ventilation system (Section 10). The assessment considers the potential impact of ventilation system emissions over a large area and a number of potential future emissions scenarios. An ambient air quality program would be established in consultation with EPA to measure the air quality impacts of North East Link Project, including monitoring before operation, and post opening of the North East Link.
Emissions from tunnel ventilation system drifting and settling in low lying areas – particularly Banyule Flats and the Koonung Creek valley – and for meteorology and topography to be considered in impact assessments.	The EES assessment considers the current air quality and the topography in the alignment of the project (Section 6) and how this may be impacted by traffic related emissions from tunnel ventilation system (Section 10). The assessment considers the potential impact of ventilation system emissions over a large area and a number of potential future emissions scenarios. The assessment takes into account the effect of the topography of the region on ventilation system emissions including Banyule Flats and the Koonung Creek valley. Five years of meteorological data collected from a local Bureau of Meteorology weather station have been used to assess the impacts of emissions.

Issues raised during community consultation	How it's been addressed
Emissions from tunnel entry and exit portals.	The ventilation system for the tunnels would be designed to prevent emissions from tunnel portals (Section 10).
Ground level pollutants being dispersed by wind beyond the immediate road corridor.	The EES assessment considers the current air quality in the alignment of the project (Section 6) and how this may be impacted by traffic related emissions from the tunnel ventilation system (Section 10) and roads (Section 11). The assessment considers the potential impact of ventilation system emissions over a large area well beyond the road corridor. The surface road impacts are assessed at the sensitive receptors nearest the roadway, as these represent the worst case, with receptors further away experiencing lower pollutant concentrations.
Pollutants and dust from vehicles settling on parklands and the exterior of homes along the Eastern Freeway.	The EES assessment considers the current air quality in the alignment of the project (Section 6) and how this may be impacted by traffic related air emissions (Section 11). The assessment considers impacts from traffic using the Eastern Freeway. The assessment considers impacts on a range of sensitive receptors including residential areas, public open space and schools. Particulate matter emissions from vehicles are principally smaller particles (PM_{10} and $PM_{2.5}$) which impact on human health. Consequently, this has been the focus of the North East Link air quality impact assessment. The impact of larger particles due to earthmoving activities during construction would be considered during the development of the Dust and Air Quality Management and Monitoring Plan.
Increases in ultrafine particles and requests for these to be considered in impact assessments.	The North East Link air quality impact assessment focuses on the particulate matter size fractions ($PM_{2.5}$ and PM_{10}) where ambient air quality criteria, emission factors and standardised measurement methods are available. Currently this information is not available for ultrafine particles and they have not been included in the assessment. This is consistent with advice from the EPA regarding the West Gate Tunnel Project that '*there is clear evidence of health impacts from exposure to elevated concentrations of PM_{10} and $PM_{2.5}$. The science on the health impacts and interactions in air of ultrafine particles continues to evolve. Given the limitation of the science at present, there is no air quality standard for ultrafine particles and no regulatory air monitoring of ultrafine particles in Australia*'. This issue is discussed in Section 5 of the report.
Dust impacts during construction and how this would be managed.	The contractor would be required to develop and implement a Construction Environmental Management Plan and a Dust and Air Quality Management and Monitoring Plan. The assessment considers management measures that could be incorporated into these plans to ensure that impacts on the receiving environment are minimised. Construction impacts are considered in Section 8 of the report.
Reliability of air quality monitoring during operation and compliance with EPA guidelines.	An ambient air quality monitoring program would be established in consultation with EPA to measure the air quality impacts of North East Link Project, including monitoring before operation and post opening of North East Link. The air quality monitoring program would be undertaken in accordance with EPA guidelines.

5.9 Peer Review

This assessment has been independently peer reviewed by Alison Radford and Kirsten Lawrence of SLR Consulting Australia Pty Ltd. The peer reviewers reviewed and provided feedback on drafts of this report, as well as the methodology, approach, assumptions and assessment criteria applied to the assessment.

The peer reviewer's methodology is set out in their peer review report, which also addresses whether there were any additional matters which should be considered as part of the impact assessment in order to satisfy the EES scoping requirements or to otherwise adequately assess the likely impacts of the project relevant to this assessment or the management of those impacts. The peer reviewer also considered whether there were any gaps or matters in this assessment which they disagreed with. The final peer review report is attached as APPENDIX B of this report.

In relation to the recommendations made by the peer reviewers, the following responses are provided:

- The peer reviewers stated that: Golder has stated in their response to SLR's review comments on previous drafts of the AQIA that 'in the absence of specific criteria for assessment of surface road impacts, use of SEPP(AAQ) objectives for comparative purposes is based on agreement with Environment Protection Authority (EPA).' SLR believes a statement should be included in the report to reflect EPA Victoria agreement with this approach.

  Section 4.2.2 of this report now includes a statement that EPA Victoria has agreed with this approach.

- The peer reviewers stated that: SLR believes that even if a model is the regulatory model, a discussion of the model selection is warranted, including any limitations and benefits of applying the selected model in the project specific circumstances.

  AERMOD, as developed and refined by USEPA, is the approved regulatory model for use in Victoria. Golder consider that there are no project specific meteorological, topographical or emission characteristics that warrant use of an alternative model, consequently further consideration of model selection is not justified.

6.0 CHARACTERISATION OF EXISTING ENVIRONMENT

The receiving environment describes the physical features, meteorology and existing air quality of the project location. The following sections discuss the receiving environment and identify selected discrete sensitive receptors located within the study area. Air quality impacts from the ventilation system and constructed and upgraded roads are not considered significant beyond this distance.

6.1 Local setting

North East Link would extend from Greensborough through to Bulleen, with the Eastern Freeway upgrade extending the project to Nunawading and Donvale. Works associated with the Doncaster Busway extend west of Doncaster through to the Eastern Freeway terminus in Collingwood.

The section of the M80 Ring Road to be upgraded is in the suburb of Greensborough, adjoining Bundoora and Watsonia North. North of the M80 Ring Road are special use and residential zones with the area consisting of commercial activities and housing. South of the M80 Ring Road, housing abuts the road reserve within the suburbs of Bundoora and Watsonia North. This area also has several parks and recreation facilities including Plenty Gorge Parklands and Maroondah Aqueduct Reserve to the north and Garvey Oval, Edmund Rice Parade Reserve and Plenty River Trail to the south.

Moving south from Greensborough, North East Link will pass through Watsonia, Macleod, Rosanna and Yallambie to the intersection with Lower Plenty Road. The land alongside the project alignment in these suburbs is mostly residential interspersed with public park and recreation zones, with the exception of Simpson Barracks, located on Commonwealth land in Yallambie.

South of Lower Plenty Road, North East Link would pass through and under Rosanna, Viewbank, Heidelberg and Bulleen. Lower Templestowe in the west and Eaglemont and East Ivanhoe on the eastern side are within one kilometre of North East Link. This section has extensive parks surrounding the Yarra River including the Warringal Parklands, Banksia Park, Yarra Flats Park, Bulleen Park and various bike/walking tracks including the Main Yarra Trail. The parks are a mixture of public recreation and conservation zones as well as land designated as Urban Floodway. The Trinity Grammar School Sporting Complex and Marcellin College sporting grounds in Bulleen are zoned special use. Additionally, there are residential areas and a small industrial centre near Banksia Street.

The project would connect with the Eastern Freeway at Bulleen Road, with the upgraded freeway works extending to Springvale Road and transecting with the suburbs of Bulleen, Balwyn North, Doncaster, Mont Albert North, Box Hill North, Blackburn North, Doncaster East, Donvale and Nunawading. The study area also includes sections of Mont Albert, Box Hill, Blackburn and Mitcham. The land within one kilometre of the upgraded freeway is predominantly residential with public park and recreational reserves including the Koonung Creek Linear Park and Koonung Creek Trail which follow the freeway alignment to Springvale Road.

Works associated with the Doncaster Busway would extend between Doncaster and the Eastern Freeway terminus. The freeway is adjacent to parks and recreation and special use zones which covers golf courses and park lands between Bulleen Road and Chandler Highway. Housing and commercial activities characterise the area to the south of the proposed busway, whilst the Main Yarra Trail interweaves with the road through this section. At the city end, the land is mixed use including residential, parks and recreation, commercial and special use. In particular, the freeway passes alongside Yarra Bend Park and associated amenities including the Collingwood Children’s Farm, bike tracks and Dights Falls. Suburbs within one kilometre of the project between Bulleen Road and Hoddle Street are Bulleen, Ivanhoe East, Ivanhoe, Balwyn North, Kew, Kew East, Alphington, Abbotsford, Fairfield, Fitzroy North, Clifton Hill, Collingwood, Fitzroy and Northcote.

6.2 Sensitive receptors

Schedule C, Part B, 5(c) of SEPP(AQM) describes a sensitive location as '*hospitals, schools or residences'*.

EPA Victoria Publication No. 1518 (EPA Victoria 2013) defines a sensitive land use as '*any land uses which require a particular focus on protecting the beneficial uses of the air environment relating to human health and wellbeing, local amenity and aesthetic enjoyment, for example residential premises, childcare centres, pre-schools, primary schools, education centres or informal outdoor recreation sites*'.

A list of discrete receptor locations, selected from those used for the EES social impact assessment is provided in APPENDIX C. This list includes, but is not limited to, schools, kindergartens, aged care facilities, hospitals, childcare centres and recreational areas.

6.3 Topography

The landform surrounding the M80 Ring Road is relatively undulating with the Plenty Gorge Parklands ranging in elevation between approximately 50 metres and 100 metres above sea level. Similarly, the undulating landscape around the Plenty River and Partington Flats in Greensborough has hills and flats with the lowest elevations occurring along the course of the river. Moving south, Watsonia North, Watsonia and Yallambie are approximately 80 metres above sea level. The land gently slopes towards the Warringal Parklands and Yarra Flats where the elevation can be as low as 10 metres.

The Eastern Freeway is also located at low elevations; ranging from 20 metres at the intersection with Bulleen Road to 40 metres at Doncaster Road, continuing to increase to 80 metres at the intersection with Springvale Road. The land either side of the freeway increases in elevation with the road located in low lying lands between the hills of Doncaster and Box Hill.

The Doncaster Busway between Bulleen Road and Hoddle Street would be located on consistent elevations in the order of 20 metres. The land adjoining the freeway increases in elevation on either side, except for Yarra Bend Park and the area between Chandler Highway and Burke Road where the land to the north of the road is golf courses and river flats.

A topographical map of the area surrounding North East Link is shown in Figure 6.

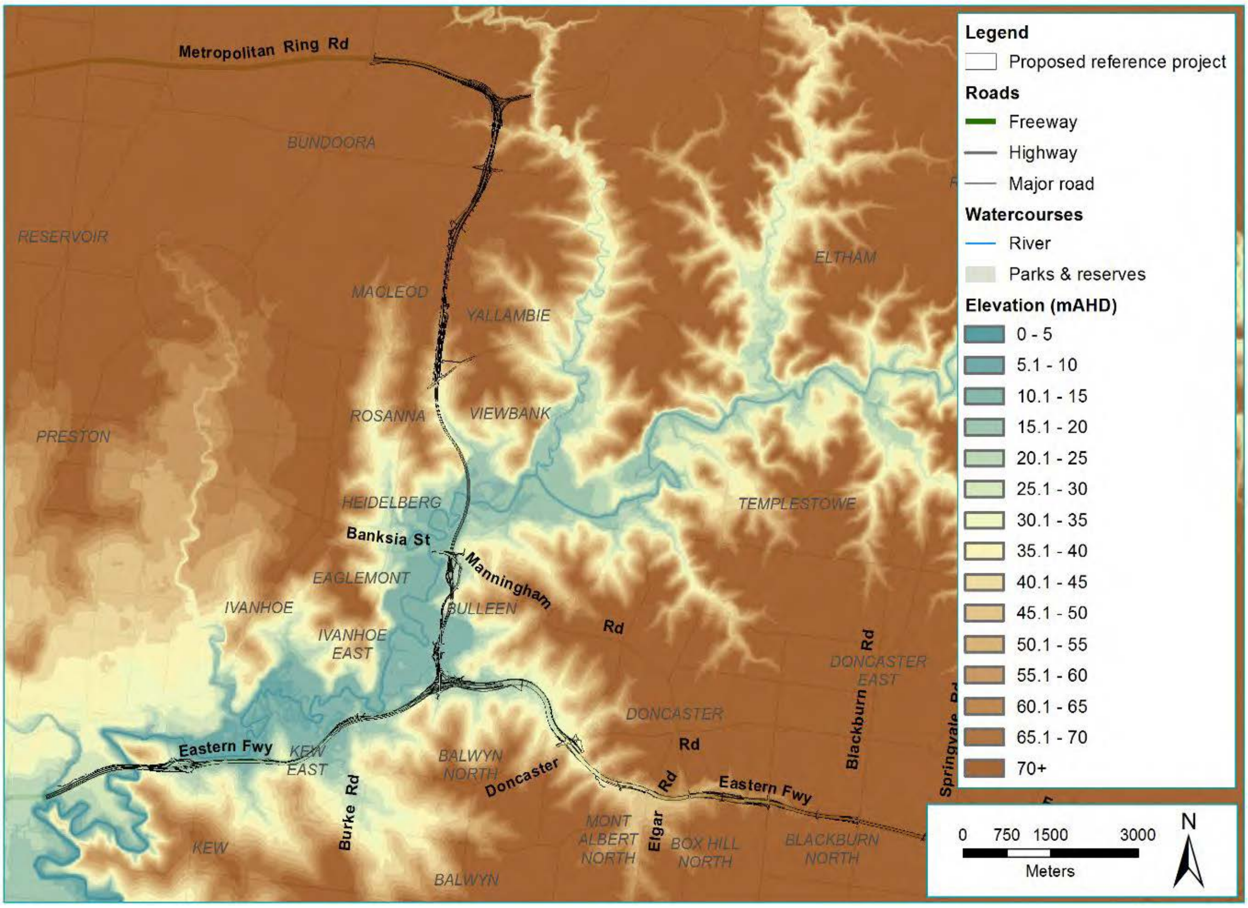


Figure 6: North East Link topography (Source: NELP)

6.4 Meteorology

Air quality impacts are influenced by regional meteorological conditions, primarily in the form of wind flow regimes, and by local conditions generally driven by topographical features in the form of drainage flows. Topography, wind speed and wind direction affect the dispersal and transport of pollutants.

The Bureau of Meteorology (BoM) collects meteorological data at Automatic Weather Stations (AWSs) across Australia. The closest meteorological monitoring station to the North East Link tunnel ventilation structures is operated by BoM within the Banyule Flats Reserve at Viewbank. The station is located approximately 1.6 kilometres west of North East Link, near Banyule Road.

The station details are summarised in Table 10. The station location is displayed in Figure 7.

Table 10: BoM Viewbank AWS

Station name	Viewbank
Type	AWS
Number	086068
Year opened	1999
Location (Latitude, Longitude)	-37.74˚, 145.100˚
Height above sea level	66.1 m
Parameters recorded	Temperature, humidity, wind, pressure and rainfall

Station name	Viewbank
Data completeness (wind speed and direction)	2013: 8754 hours (99.9%) 2014: 8748 hours (99.9%) 2015: 8753 hours (99.9%) 2016: 8751 hours (99.6%) 2017: 8694 hours (99.2%)

Source: (Bureau of Meteorology, 2017)

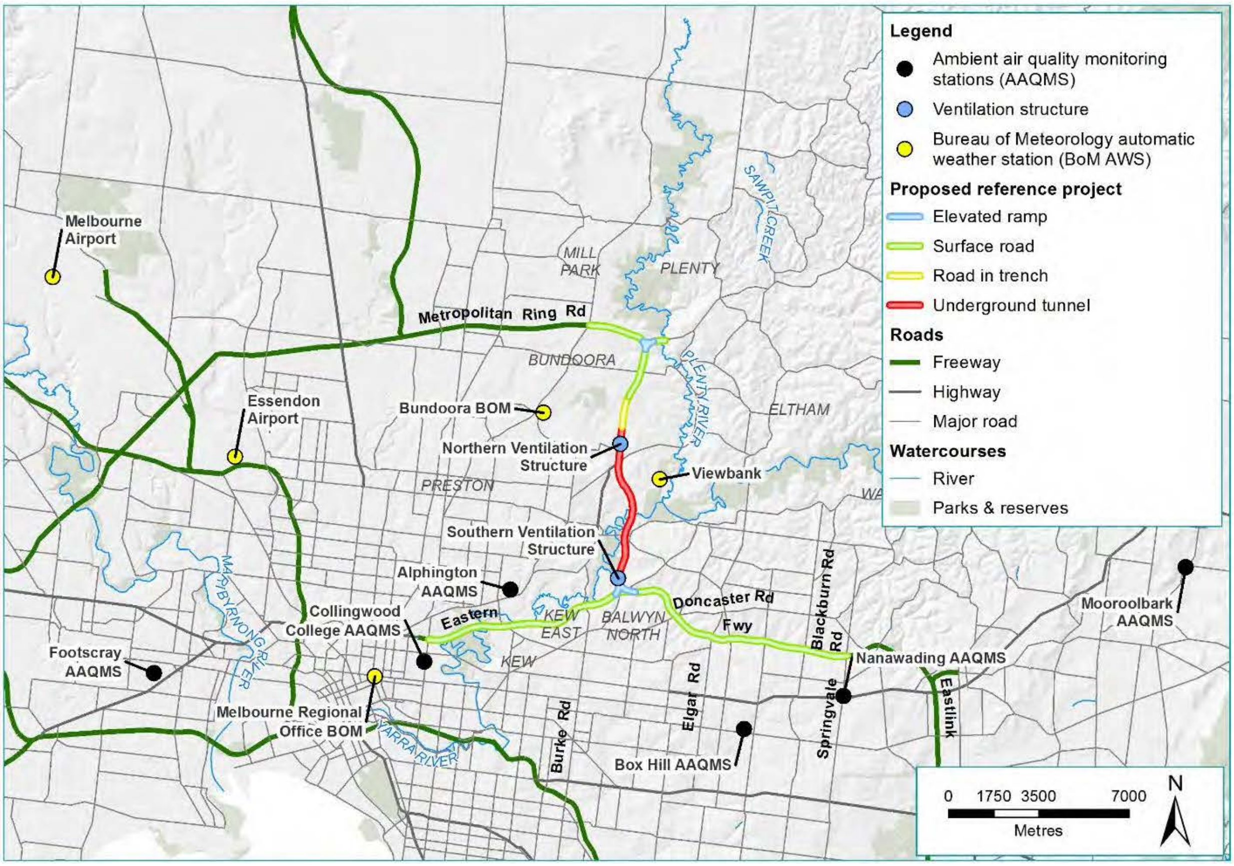


Figure 7: North East Link proximity to BoM AWS and EPA Victoria AAQMS (Source: NELP)

Other meteorological datasets are available for the EPA Victoria Alphington Ambient Air Quality Monitoring Station (AAQMS), BoM Bundoora (Latrobe University) AWS, BoM Melbourne AWS and BoM Scoresby Research Institute AWS. However, the Viewbank AWS best reflects meteorology nearest the North East Link tunnel ventilation structures due to its proximity to the proposed road alignment and is considered broadly representative of the larger study area. Consequently, Viewbank AWS data has been used to characterise existing meteorology in the receiving environment and to generate meteorological data files for air dispersion modelling.

Data from the five most recent calendar years (2013 to 2017) were analysed, with the results displayed in wind rose plots in Figure 8 and Figure 9 and the monthly temperature profile in Figure 10.

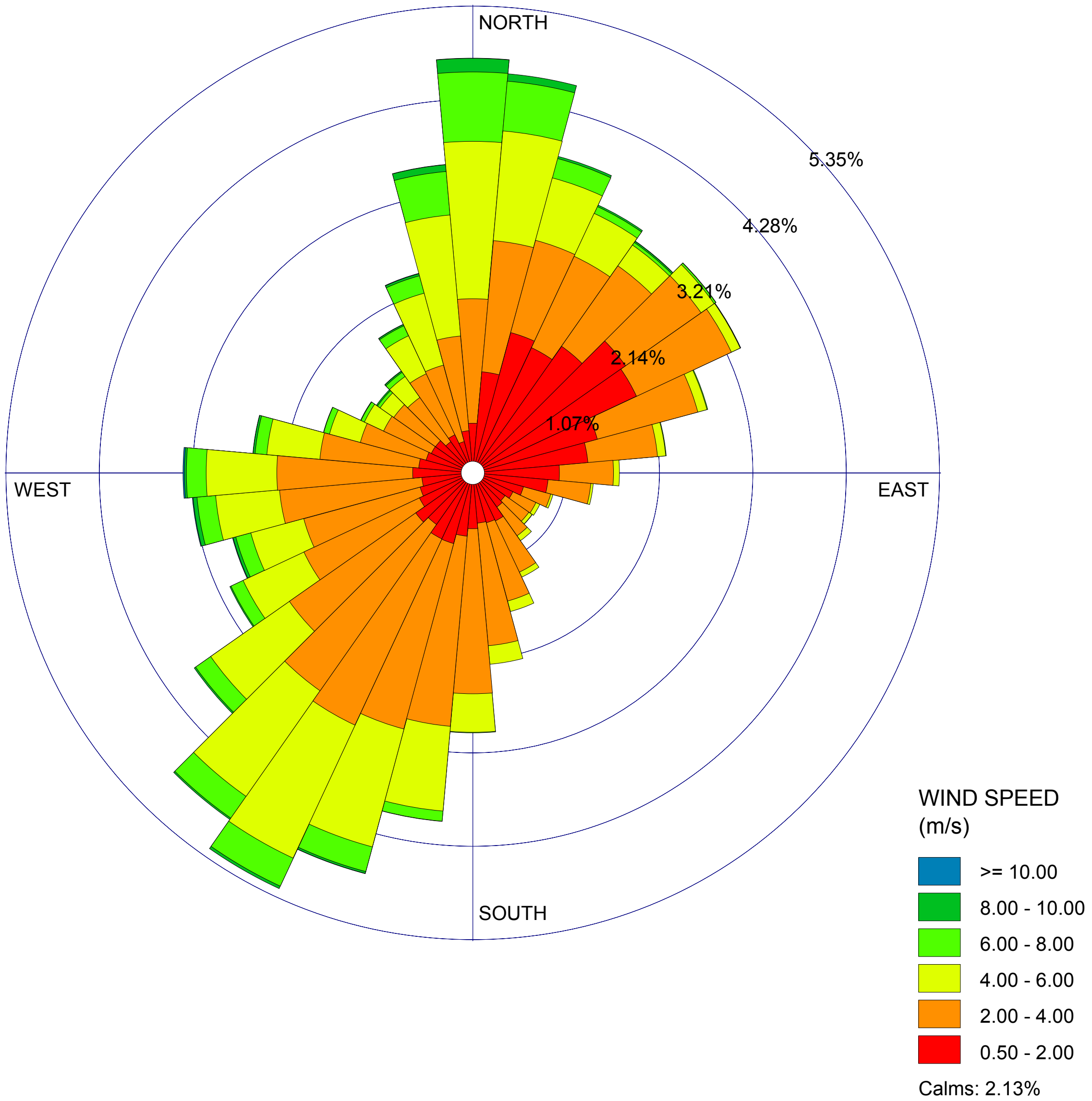


Figure 8: Viewbank AWS wind rose (2013–2017)

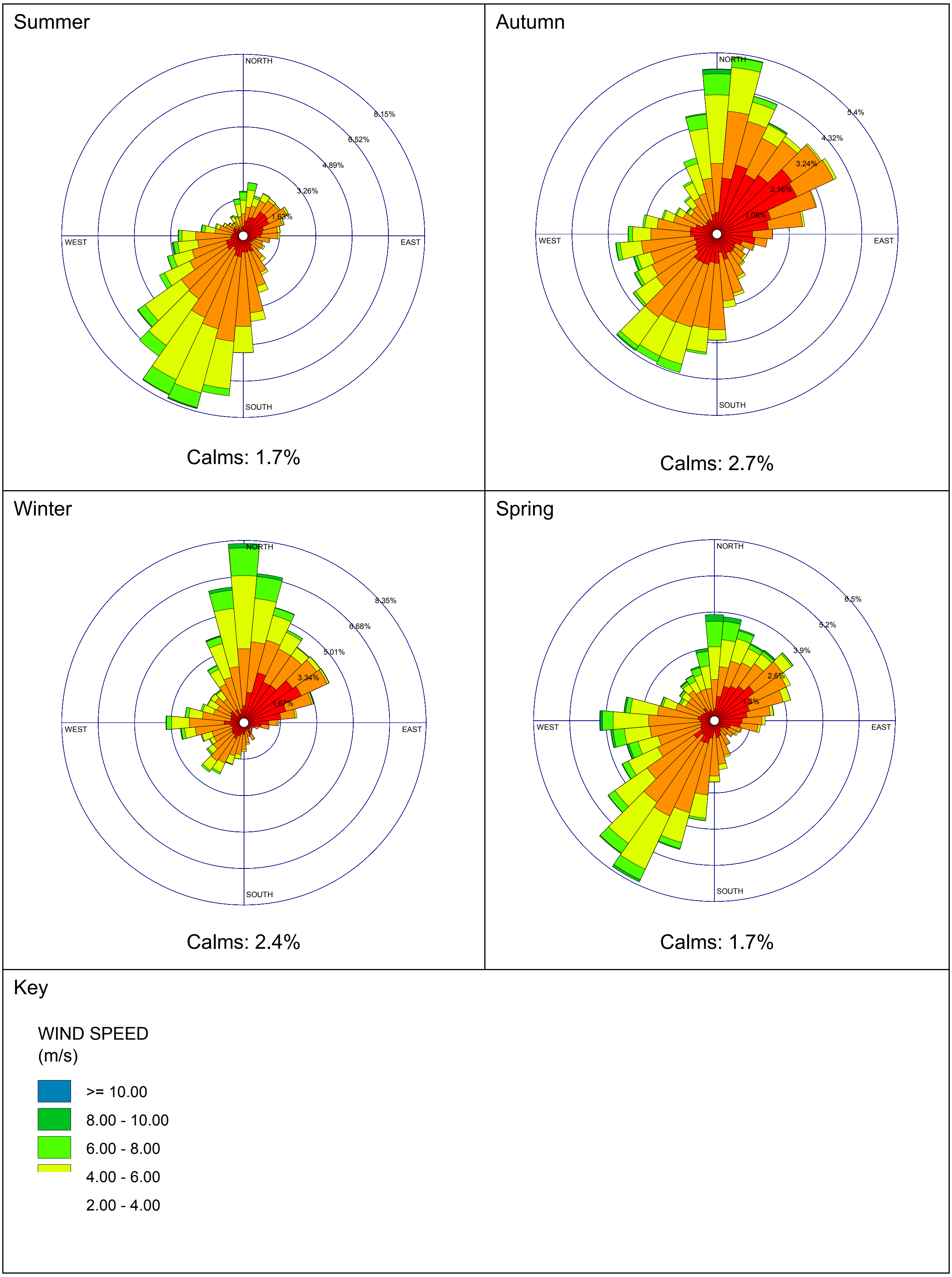


Figure 9: Viewbank AWS seasonal wind roses (2013–2017)

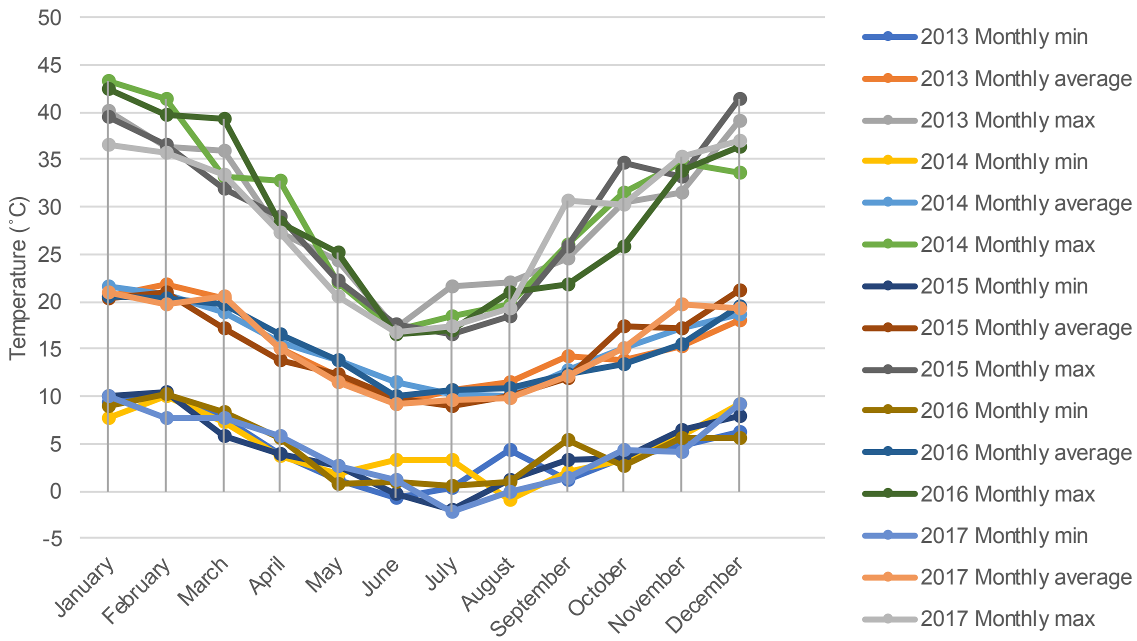


Figure 10: Viewbank AWS monthly temperature profile (2013–2017)

The wind rose plots illustrate that wind most commonly blows from either the south-south-west or north-north-east quadrants, with the summer months particularly dominated by winds from the south-south-west. Autumn had the highest frequency of calm conditions, defined as wind speed less than 0.5 metres per second. Overall the 2013 to 2017 wind observation dataset can be summarised as follows:

- the most frequent wind class is two to four metres per second
- less than six per cent of winds exceed six metres per second
- the average wind speed is 3.1 metres per second
- low wind speeds (less than two metres per second) occurred most frequently in autumn and winter
- south-south-west winds predominate in summer and are uncommon in winter
- north and north-north-east winds predominate in winter and are uncommon in summer
- Spring and autumn conditions are similar to the annual average.

The temperature trends displayed in Figure 10 show the monthly averages ranging between 22 degrees Celsius in January to 9 degrees Celsius in June/July/August dependent on the year. The highest maximum was 43 degrees Celsius in January 2014 whilst the lowest minimum was -2 degrees Celsius in July 2015.

6.4.1 Data comparison

Data from the Alphington AAQMS for 2013 to 2017 have been compiled for comparison with the Viewbank dataset.

Wind rose plots are presented in Figure 11 and Figure 12 and the monthly temperature profile in Figure 13.

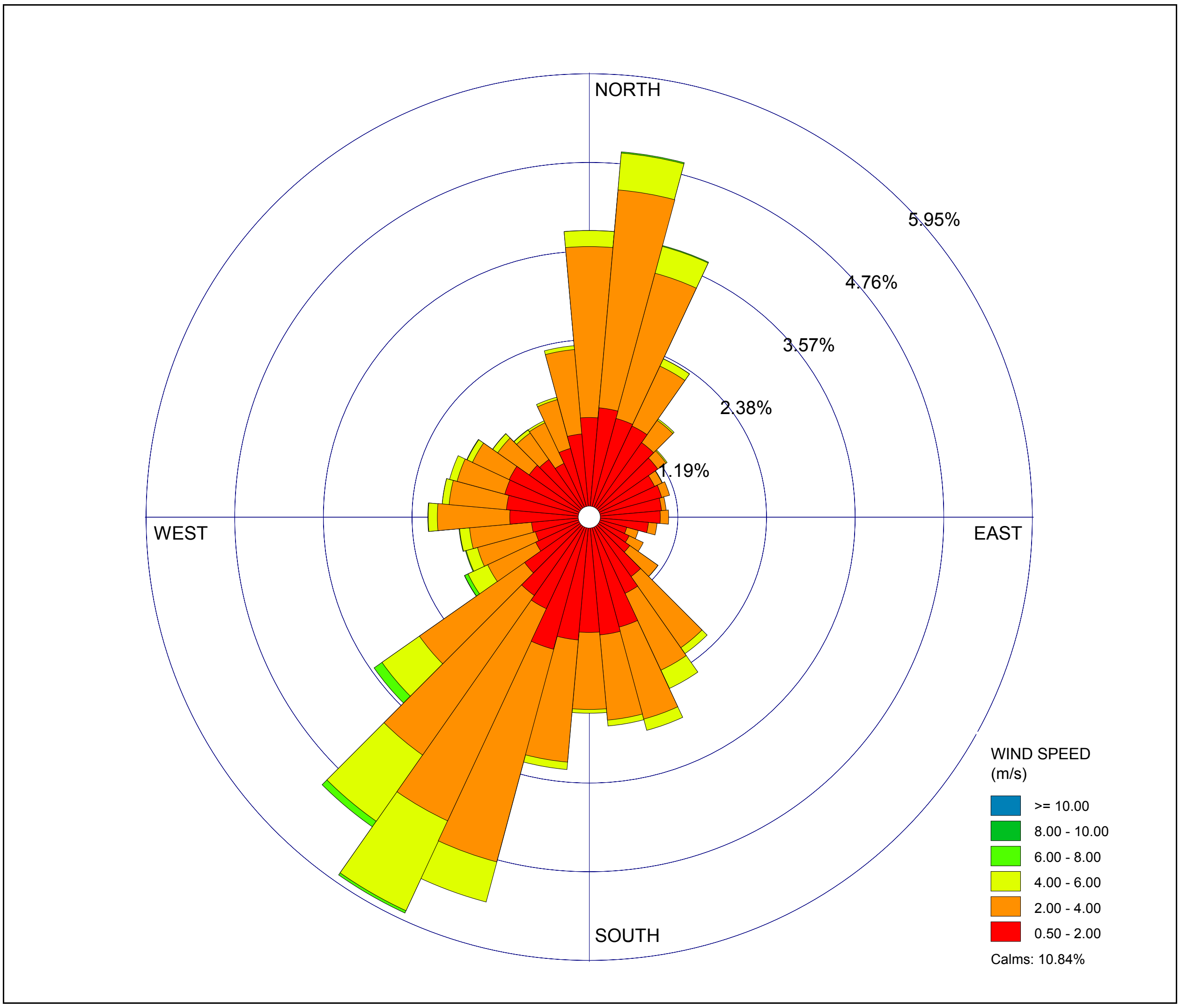


Figure 11: Alphington AAQMS wind rose (2013–2017)

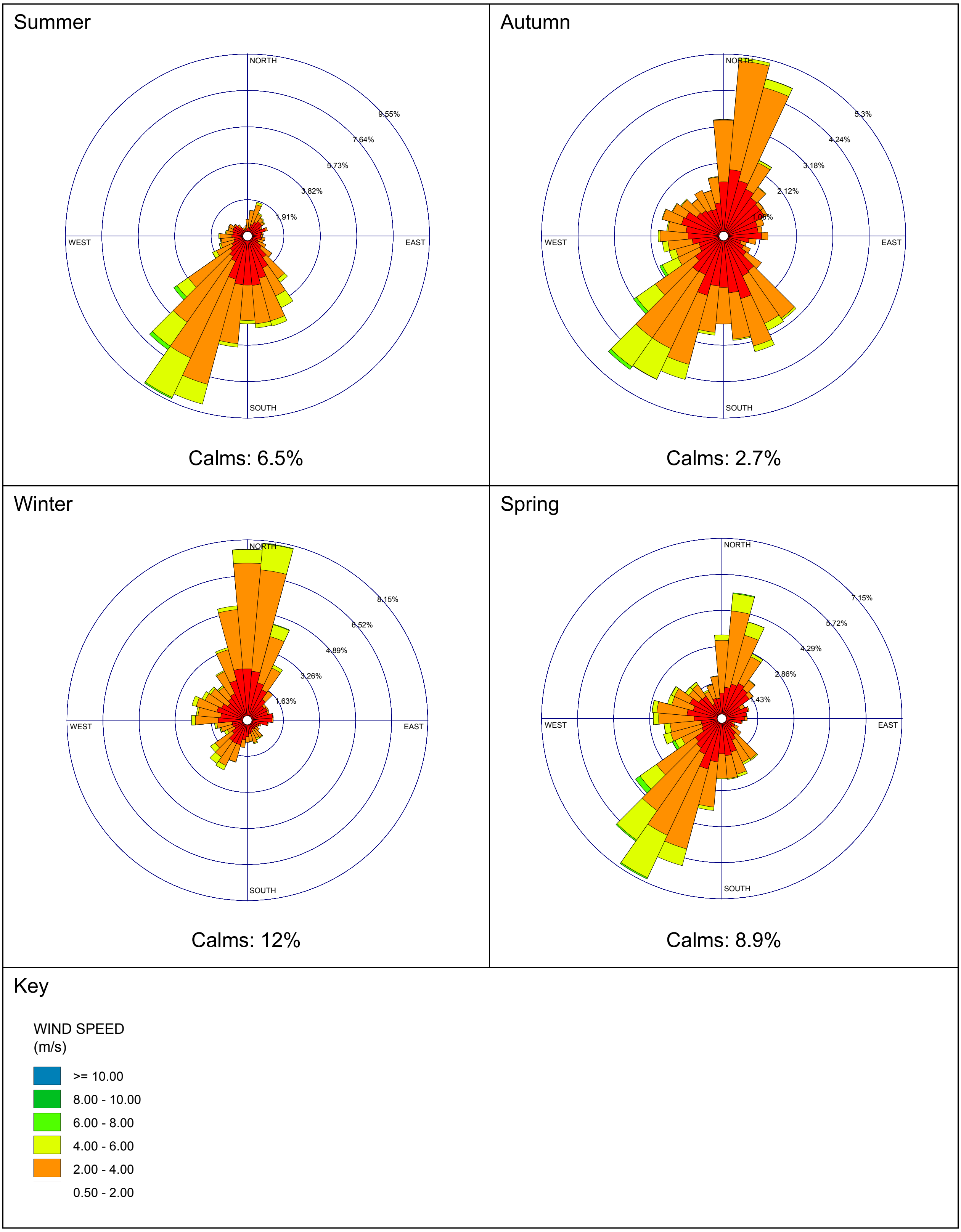


Figure 12: Alphington AAQMS seasonal wind roses (2013–2017)

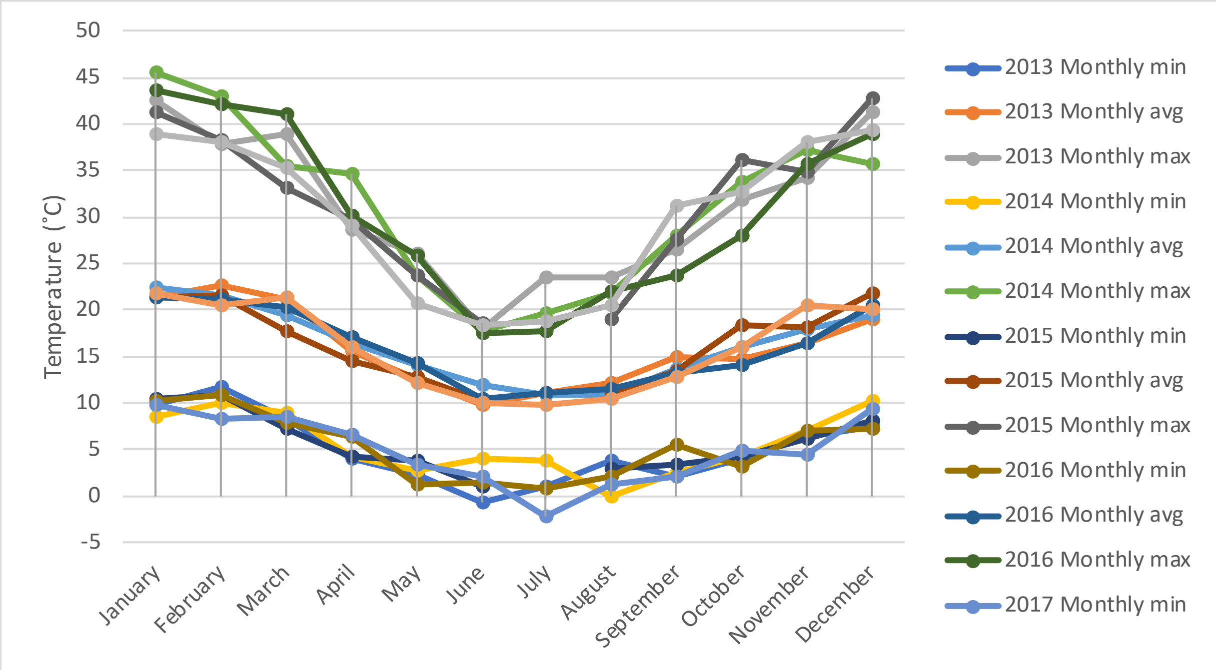


Figure 13: Alphington AAQMS monthly temperature profile (2013–2017)

The Alphington AAQMS wind data shows a similar seasonal distribution to the Viewbank AWS, with southerly winds most common in summer, northerly winds most common in winter and the spring and autumn distributions similar to the annual wind rose. The wind speed profile is different, with Alphington exhibiting a higher proportion of calms and low winds compared with Viewbank. This is probably due to the trees and shrubs within the immediate vicinity of the Alphington AAQMS, with EPA Victoria previously noting non-compliance with Australian Standard AS 3580.1.1 siting guidelines (EPA Victoria 2001).

The surface temperature profile at Alphington is very similar to that measured at Viewbank, with both datasets exhibiting the same trends and comparable summary statistics.

Table 11 provides a summary of the wind profiles for both sites, together with temperatures recorded at each station for the investigation period.

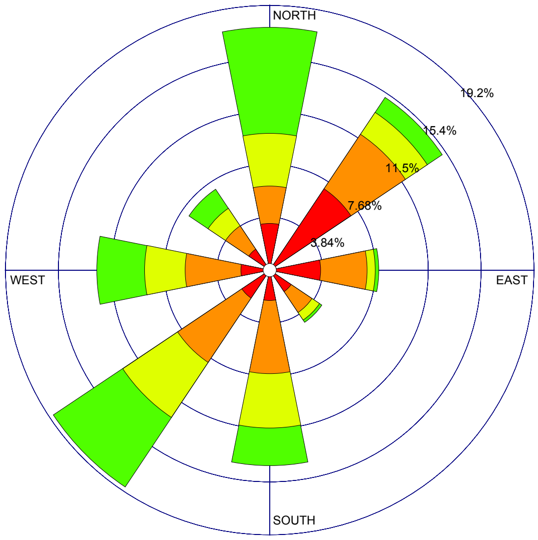
Table 11: Meteorological data comparison 2013–2017

Parameter	Description	Viewbank AWS	Alphington AAQMS
Wind speed	Calms (<0.5 m/s)	2.1%	11%
	Proportion of low wind speeds (0.5 – 2.0 m/s)	31%	40%
	Proportion of medium wind speeds (2.0 – 6.0 m/s)	61%	43%
	Proportion of high wind speeds (>6 m/s)	5.8%	0.4%
	Average wind speed	3.0 m/s	1.9 m/s
Wind direction	Most common wind direction	South-south-westerly	South-south-westerly
	Least common wind direction	South easterly	East-south easterly

Parameter	Description	Viewbank AWS	Alphington AAQMS
Temperature	Highest monthly average	22˚C (February 2013, January 2014)	23˚C (February 2013)
	Lowest monthly average	9˚C (June 2013, July 2015, July 2017)	10˚C (June 2013, June 2015, June 2017)
	Highest annual average	16˚C (2014)	17˚C (2015)
	Lowest annual average	15˚C (2013, 2015, 2016, 2017)	16˚C (2013, 2014, 2016, 2017)

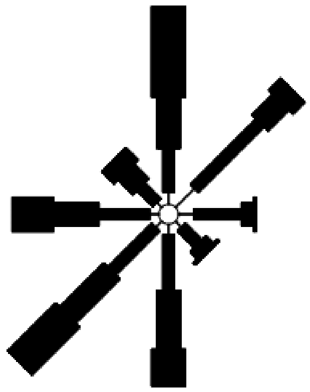
The meteorology comparison indicates that the Viewbank AWS (2013 – 2017) dataset is similar to the Alphington AAQMS data for wind direction and surface temperature profile. Measured wind speeds are typically lower at Alphington AAQMS.

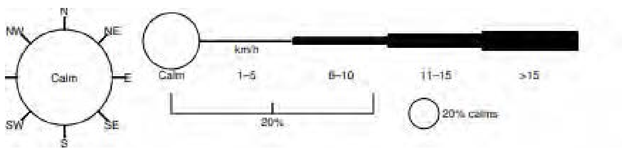
The Viewbank AWS project dataset was also compared with the larger historical record. Figure 14 presents a BoM wind rose for all available three-hourly observations together with the Viewbank 2013–2017 annual wind rose. The wind rose comparison shows agreement between the five year dataset and all available observations, with the same pattern of wind distribution and a similar wind speed profile.



WIND SPEED
(km/h)
- >=15
- 11 - 15
- 6 - 11
- 1 – 6

Wind rose 2013–2017





Wind rose 1999–2018

This material is sourced from the Bureau of Meteorology

Figure 14: Viewbank AWS time period comparison

6.5 Air emission sources

The main industrial and non-industrial air emission sources contributing to the local airshed include:

- traffic using the road network, including the M80 Ring Road and Eastern Freeway
- industrial and food manufacturing industries
- domestic fuel burning (gas, liquid and solid)
- residential activities (eg lawn mowers and barbecues)
- railway operations.

These sources give rise to emissions of key pollutants relevant to North East Link, including:

- CO
- oxides of nitrogen [NO_x comprising NO_2 and nitric oxide (NO))]
- PM_{10}
- $PM_{2.5}$
- PAH
- volatile organic compounds (VOCs):
  - benzene
  - ethyl benzene
  - toluene
  - xylene isomers
  - formaldehyde
  - 1, 3-butadiene.

Local air emission sources are collated in the National Pollutant Inventory (NPI). The NPI is an online database that provides information to the public regarding estimated emissions of 93 substances in Australia, together with the source and location of these emissions. The NPI is implemented co-operatively by the Australia Government and, in Victoria, EPA Victoria.

The NPI contains 19 years of emissions data from more than 4,000 industrial facilities nationwide. Only facilities for which an NPI pollutant reporting threshold has been exceeded are required to report to the NPI. The NPI guide provides further direction on reporting requirements.

The NPI also includes estimated emissions data for non-industrial (diffuse) sources such as motor vehicle exhausts, wood heaters, lawn mowers and commercial and leisure boating.

The NPI database was used to identify and quantify industrial and diffuse source emissions for the most recent reporting period, 2016/2017. The analysis was based on the following Local Government Areas (LGA) associated with the project:

- City of Banyule, which includes Bundoora, Watsonia North, Greensborough, Watsonia, Macleod, Yallambie, Viewbank and Rosanna

- City of Boroondara, which includes Balwyn North, Kew East and Kew
- City of Manningham, which includes Bulleen, Doncaster, Doncaster East, Donvale and Nunawading
- City of Whitehorse, which includes Mont Albert North, Box Hill North and Blackburn North
- City of Nillumbik, which includes Greensborough
- City of Yarra, which includes Fairfield.

Some of the suburbs listed above are governed by several LGAs. These include Bundoora (City of Banyule, City of Darebin and City of Whittlesea), Greensborough (City of Banyule and Shire of Nillumbik), Macleod (City of Banyule and City of Darebin), Fairfield (City of Darebin and City of Yarra) and Nunawading (City of Manningham and City of Whitehorse).

Other suburbs which lie adjacent to North East Link include Heidelberg (City of Banyule LGA), Eaglemont (City of Banyule LGA), Ivanhoe East (City of Banyule LGA), Alphington (City of Darebin and City of Yarra LGAs), Abbotsford (City of Yarra LGA), Northcote (City of Darebin LGA), Clifton Hill (City of Yarra LGA) and Ivanhoe (City of Banyule LGA).

Emissions reported for the City of Melbourne LGA have been included for comparative purposes.

The NPI analysis for industrial, diffuse motor vehicle emissions and all emissions sources in the identified LGA are presented in the following sub-sections.

6.5.1 Industrial

Facility emissions reported to the NPI within the identified LGAs included the following industries:

- plastics manufacturing
- packaging manufacturing
- pulp, paper and paperboard manufacturing
- grain manufacturing
- ceramic product manufacturing
- manufacture and storage of gases
- textile floor covering manufacturing
- foam manufacturing
- adhesive manufacturing
- brick manufacturing
- metal alloy and foil making manufacturing
- concrete additives manufacturing
- food processing and manufacturing
- poultry processing
- quarrying
- landfilling activities

- gas compressor facility
- paper recycling plant
- hospitals
- laundry facilities
- sewage treatment plants.

The facility locations and number of pollutants reported is summarised in Table 12. Table 13 presents the aggregate emissions for the key pollutants identified in Section 4.5.

Table 12: NPI industrial emission summary by area

LGA areas	Number of facilities 2016/2017	Number of pollutants 2016/2017
City of Banyule	3	22
City of Boroondara	0	0
City of Manningham	0	0
City Whitehorse	6	25
City of Yarra	4	18
City of Nillumbik	1	0
City of Melbourne (comparison)	21	42

Table 13: NPI reported industrial emissions (2016/2017)

Pollutant	Emitted to air (kg)						
	Banyule	Boroondara	Manningham	Whitehorse	Yarra	Nillumbik	Melbourne (comparison)
CO	12,000	0	0	60,000	36,600	Not reported	300,500
NO_x	7,000	0	0	74,500	66,400	Not reported	289,600
PM_{10}	1,000	0	0	5,600	2,400	Not reported	35,700
$PM_{2.5}$	1,000	0	0	3,800	2,400	Not reported	20,300
PAHs [B(a)P TEQ]	0.089	0	0	0.33	0.34	Not reported	20
Benzene	0	0	0	0	0	Not reported	7
Toluene	0	0	0	0	0	Not reported	5
Ethylbenzene	0	0	0	0	0	Not reported	2
Xylene isomers	0	0	0	0	0	Not reported	5
Formaldehyde	0	0	0	0	0	Not reported	1,500
1,3 Butadiene	0	0	0	0	0	Not reported	0

6.5.2 Motor vehicles

Diffuse motor vehicle emissions are also reported by the NPI for the identified LGAs. It should be noted, however, that NPI emission estimates for diffuse sources (including motor vehicles) still rely on data from 1999. Table 14 displays the estimated emissions for the key pollutants.

Table 14: NPI reported motor vehicle emissions (1999)

Pollutant	Emitted to air (kg)						
	Banyule	Boroondara	Manningham	Whitehorse	Yarra	Nillumbik	Melbourne (comparison)
CO	10,000,000	19,000,000	12,000,000	18,000,000	9,600,000	7,300,000	21,000,000
NO_x	2,000,000	4,100,000	2,400,000	2,400,000	2,100,000	1,400,000	4,400,000
PM_{10}	69,000	140,000	83,000	120,000	72,000	46,000	150,000
$PM_{2.5}$	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
PAHs [B(a)P TEQ]	860	1,800	1,000	1,500	890	570	1,900
Benzene	56,000	100,000	66,000	97,000	52,000	40,000	110,000
Toluene	84,000	160,000	100,000	150,000	77,000	60,000	170,000
Ethylbenzene	11,000	20,000	13,000	18,000	9,800	7,600	21,000
Xylene isomers	54,000	100,000	65,000	94,000	50,000	39,000	110,000
Formaldehyde	19,000	20,000	13,000	19,000	9,900	7,700	22,000
1,3 Butadiene	5,700	11,000	6,800	9,900	5,300	4,100	11,000

6.5.3 All sources

Air emissions from all sources (industrial and diffuse) within the listed LGAs for the 2016/2017 NPI reporting period are summarised in Table 15.

In addition to emissions from motor vehicles and industrial reporting facilities, emissions from a range of other sources are included in the data. These include, but are not limited to:

- fuel combustion (sub reporting threshold facilities)
- lawn mowing
- domestic solid and liquid fuel burning
- barbeques
- paved and unpaved roads
- windblown dust
- burning (fuel reduction, regeneration, agricultural)/wildfires
- backyard incinerators
- railways
- service stations

- animal and grain farming
- commercial shipping/boating
- rail freight transport.

Table 15: NPI reported emissions for all sources (2016/2017)

Pollutant	Emitted to air (kg)						
	Banyule	Boroondara	Manningham	Whitehorse	Yarra	Nillumbik	Melbourne (comparison)
CO	12,500,000	21,900,000	14,400,00	20,000,000	10,000,000	12,000,000	22,300,000
NO_x	2,400,000	4,587,000	2,837,000	4,058,000	2,300,000	1,700,000	5,200,000
PM_{10}	243,000	390,000	265,000	353,000	180,000	350,000	406,600
$PM_{2.5}$	1,000	0	0	3,800	2,300	Not reported	20,300
PAHs [B(a)P TEQ]	4,300	6,700	4,800	6,100	2,800	5,200	4,400
Benzene	77,500	134,000	91,100	134,700	61,000	64,000	130,800
Toluene	152,700	259,000	179,000	249,000	130,000	110,000	245,200
Ethylbenzene	13,600	23,500	16,000	24,000	11,000	10,000	23,900
Xylene isomers	111,400	179,000	128,000	174,000	85,000	76,000	160,000
Formaldehyde	33,500	52,000	38,300	60,100	17,000	41,000	38,200
1,3 Butadiene	10,300	17,000	12,000	18,200	6,900	10,000	14,500

6.5.4 NPI summary

The City of Melbourne reports the highest emissions of key pollutants from industry due to this municipality having the highest number of reporting premises. By comparison the City of Whitehorse LGA has the second highest. Emissions from the other LGAs are either relatively low or there are no emissions from industrial facilities. Only a small section of the southern boundary of the City of Whittlesea LGA abuts the western section of the M80 Ring Road upgrade.

The City of Melbourne LGA reports the highest motor vehicle emissions, dominated by higher levels of vehicular traffic in the city centre. The City of Boroondara LGA has the second highest vehicular emissions arising from its large jurisdictional area within an inner city urbanised environment.

The total overall individual emissions are highest in either the City of Melbourne LGA or the City of Boroondara LGA depending on the pollutant.

6.6 Ambient air quality

EPA Victoria conducts long-term ambient air quality monitoring at performance monitoring stations to meet its obligations under the Air NEPM. The results are compared with SEPP(AAQ) EQOs.

The closest EPA Victoria performance monitoring station to North East Link is the Alphington AAQMS, located approximately 1.5 kilometres from the Eastern Freeway. Performance monitoring stations are also located in Footscray, approximately 11 kilometres from the city end of the Eastern Freeway and Mooroolbark, located approximately 14 kilometres from the Donvale end of the Eastern Freeway. A new performance monitoring station has recently been established in the Melbourne CBD, replacing the Richmond and RMIT University stations. The new station was commissioned in 2017 and hence cannot provide sufficient data to establish a historical ambient air quality record.

EPA Victoria also monitors air quality for the AirWatch program, an online map showing hourly data. AirWatch reports data from both performance and other monitoring stations, including Box Hill, approximately 3.5 kilometres from the Eastern Freeway.

EPA Victoria also conducts air quality monitoring to investigate local air quality issues or during major pollution events. Of relevance to North East Link, monitoring was undertaken in 2003/2004 in Nunawading to '*assess the level of motor derived air pollutants at a heavily trafficked intersection that might represent worst-case exposure for people working or living in a similar location*' (EPA Victoria 2004). The monitoring site was approximately 1.6 kilometres south of the Eastern Freeway intersection with Springvale Road. The study concluded that, like other roadside monitoring, the ambient air quality objectives were met for the parameters measured.

Neighbourhood air quality monitoring was also conducted in 2001 in the playground of Collingwood College, less than one kilometre from the city end of the Eastern Freeway. The monitoring program consisted of PM_{10}, NO_2, CO and SO_2 measurement in the College playground adjacent to Hoddle Street. This monitoring campaign also concluded that measured pollutants were below the SEPP(AAQ) objectives (EPA Victoria 2002).

A summary of relevant monitoring stations is presented in Table 16. Monitoring locations are displayed in Figure 7.

Table 16: Ambient air quality monitoring near North East Link

Station name	Description	Location in relation to North East Link	Key pollutants monitored	
Alphington	Performance monitoring station classified as 'residential/light industrial'	Approximately 1.5 km north of the Eastern Freeway and 4 km east of North East Link tunnel alignment	CO	✓
			NO_2	✓
			PAH	×
			PM_{10}	✓
			$PM_{2.5}$	✓
			VOCs	×
Collingwood College	Campaign monitoring during August to October 2001	Collingwood College playground, adjacent to Hoddle Street, less than 1 km from the Eastern Freeway terminus	CO	✓
			NO_2	✓
			PAH	×
			PM_{10}	✓
			$PM_{2.5}$	×
			VOCs	×
Box Hill	AirWatch station located in a residential area near to parks and industrial activity	Approximately 3.5 km south of the Eastern Freeway	CO	×
			NO_2	×
			PAH	×
			PM_{10}	✓
			$PM_{2.5}$	×
			VOCs	×
Footscray	Performance monitoring station classified as 'industrial/residential'	Approximately 11 km from the city end of the Eastern Freeway	CO	✓
			NO_2	✓
			PAH	×
			PM_{10}	✓
			$PM_{2.5}$	✓
			VOCs	×
Mooroolbark	Performance monitoring station classified as 'residential'	Approximately 14 km from the Donvale end of the Eastern Freeway	CO	×
			NO_2	×
			PAH	×
			PM_{10}	✓
			$PM_{2.5}$	×
			VOCs	×

Station name	Description	Location in relation to North East Link	Key pollutants monitored	
Nunawading	Campaign monitoring in October 2003 to February 2004	Intersection of Whitehorse Road and Springvale Road, approximately 1.6 km from the Donvale end of the Eastern Freeway.	CO	✓
			NO_2	✓
			PAH	×
			PM_{10}	✓
			$PM_{2.5}$	✓
			VOCs	✓

Note: Indicative $PM_{2.5}$ monitoring has not been included

Consideration of Table 16 indicates that Alphington and Footscray AAQMS cover the largest number of key pollutants with Alphington being the closest to the study area. The Alphington station setting also mirrors the North East Link receiving environment. The station is located in Wingrove Street, Fairfield, adjacent to the Hurstbridge rail line and Alphington train station. The surrounding area is a mix of residential houses, commercial properties and parklands. As discussed in Section 6.1, the North East Link receiving environment consists of large tracts of residential land, parklands and commercial activities. Industrial facilities comprise a small portion of the receiving environment.

Therefore, data from the Alphington AAQMS is considered to best represent air quality for North East Link. Data for the key pollutants CO, NO_2, PM_{10} and $PM_{2.5}$ represent the time varying concentrations for the air quality impact assessment. An analysis of the most recent five calendar years for this site is presented in Sections 6.6.1 to 6.6.4. Long-term data (2005 to 2015) for Alphington AAQMS is presented in Section 6.6.5 for comparative purposes.

Air toxics monitoring for PAH and VOCs does not form part of the Alphington AAQMS dataset. Instead, historical air toxics monitoring has been campaign based, conducted at hot spots and to assess compliance with the Air Toxics NEPM. A summary of PAH and VOC monitoring conducted across metropolitan Melbourne is presented in Section 6.6.6.

Five temporary ambient air quality monitoring stations have been established in the vicinity of North East Link to support the project assessment. Air quality data collected at these stations will be presented at the EES Panel Hearing to enable comparison with EPA Victoria Alphington AAQMS data.

Note: The reported CO, NO_2, PM_{10} and $PM_{2.5}$ results are based on data provided by EPA Victoria for characterising existing air quality and resolving background concentrations for North East Link. The results may differ from historical EPA Victoria reported exceedance concentrations or summary statistics due to new data validation techniques being applied to the Victorian air quality monitoring database.

6.6.1 Carbon monoxide

CO monitoring at Alphington AAQMS is conducted in accordance with Australian Standard AS 3580.7.1 (Standards Australia 2011). Results from this continuous method are compared with the SEPP(AAQ) EQO of 9.0 parts per million, over an eight hour averaging period, with the maximum daily eight hour average reported. Averages were only calculated if a minimum of 75 per cent data capture for the averaging period was attained.

Eight hour average CO daily maxima for 2013 to 2017 are presented in Figure 15 and summarised in Figure 17.

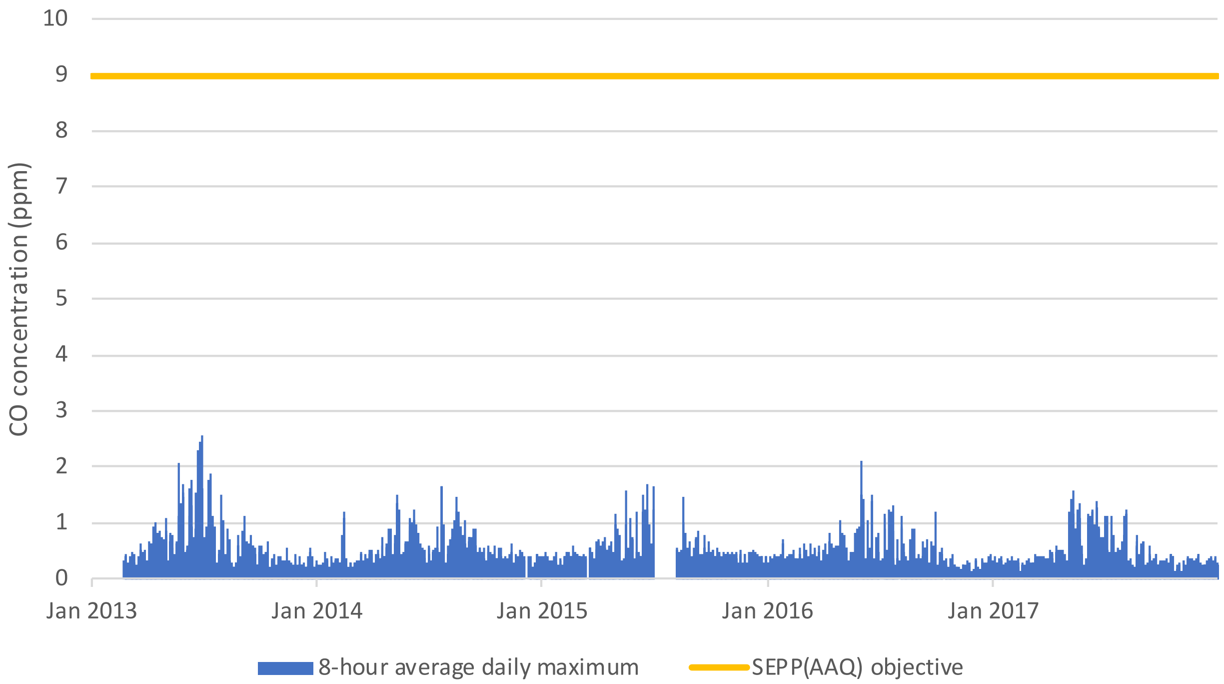


Figure 15: Alphington AAQMS CO: 2013–2017 (8 hour average daily maximum)

Table 17: Alphington AAQMS CO results summary (2013–2017)

Period	Daily maxima (8 hour average) (ppm)			
	Minimum	Average	Maximum	Standard deviation
2013	0.10	0.50	2.6	0.42
2014	0.060	0.44	1.7	0.26
2015	0.12	0.47	1.7	0.30
2016	0.043	0.41	2.1	0.28
2017	0.017	0.38	1.6	0.28
2013–2017	0.017	0.43	2.6	0.30

Alphington CO data indicates compliance with the SEPP(AAQ) EQO of 9.0 parts per million for the period 2013 to 2017. The daily maxima are consistently less than 3 parts per million (eight hour average) with a standard deviation less than 0.5 parts per million.

6.6.2 Nitrogen dioxide

NO_2 monitoring at Alphington AAQMS is conducted in accordance with Australian Standard AS 3580.5.1 (Standards Australia 2011). The results are compared with the following SEPP(AAQ) EQOs:

- one hour averaging period: 0.12 parts per million
- annual averaging period: 0.03 parts per million.

The NO_2 concentration results for 2013 to 2017 are presented in Figure 16 and Figure 17 and summarised in Table 18.

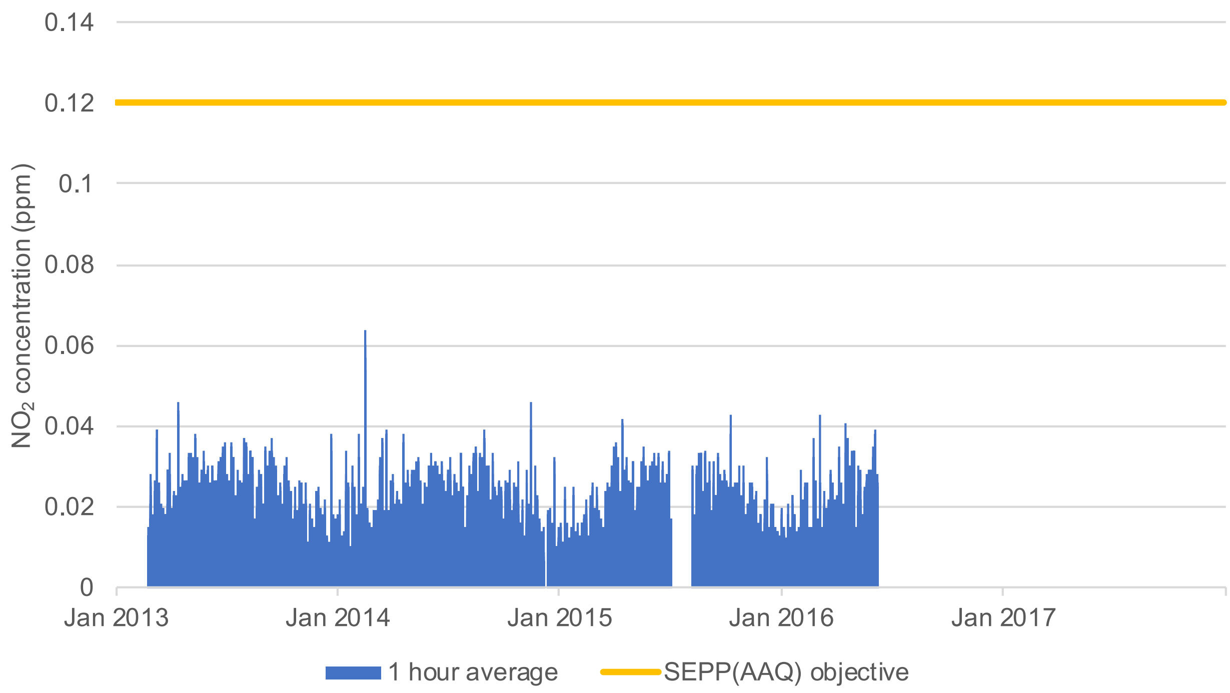


Figure 16: Alphington AAQMS NO_2: 2013–2017 (1 hour average)

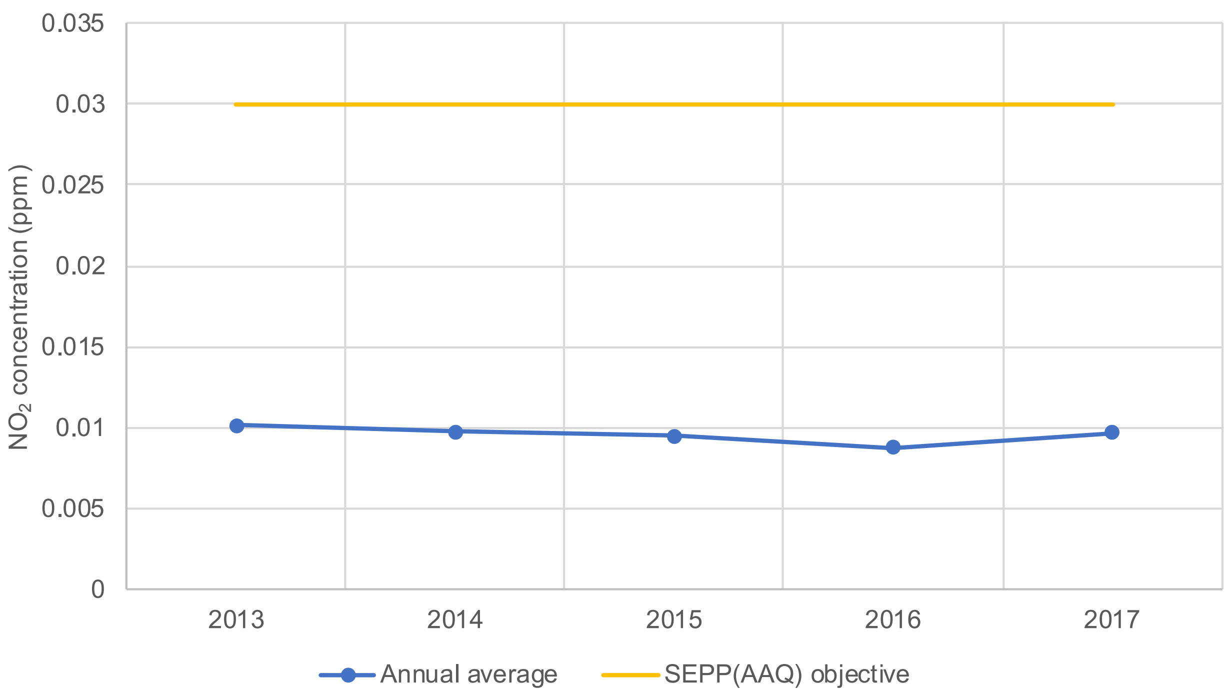


Figure 17: Alphington AAQMS NO_2: 2013–2017 (annual average)

Table 18: Alphington NO_2 results summary (1 hour average)

Period	Minimum (ppm)	Average (ppm)	Maximum (ppm)	Standard deviation (ppm)
2013	0.001	0.01	0.05	0.007
2014	0.001	0.01	0.06	0.007
2015	0.001	0.009	0.04	0.007
2016	0.001	0.009	0.04	0.007
2017	0.001	0.01	0.06	0.007
2013–2017	0.001	0.01	0.06	0.007

The Alphington NO_2 results for 2013 to 2017 demonstrate compliance with the SEPP(AAQ) one hour and annual average criteria. The maximum measured one hour average concentration was 0.06 parts per million on 13 February 2014. This value is approximately 50 per cent of the criterion. Average results for the period were less than 10 per cent of the one hour average criterion.

6.6.3 PM_{10}

PM_{10} sampling at Alphington AAQMS is conducted using a tapered element oscillating microbalance (TEOM) in accordance with Australian Standard AS3580.9.8 (Standards Australia 2008). TEOM data has been adjusted in accordance with National Environment Protection Council (NEPC) requirements (NEPC 2001).

PM_{10} results are compared with the following SEPP(AAQ) EQOs:

- 24 hour averaging period: 50 µg/m^3
- Annual averaging period: 20 µg/m^3.

The 24 hour average results for the period 2013 to 2017 are presented in Figure 18 and Table 19. Results with less than 75 per cent data capture were not included in the graph or summary statistics. Annual average results are displayed in Figure 19.

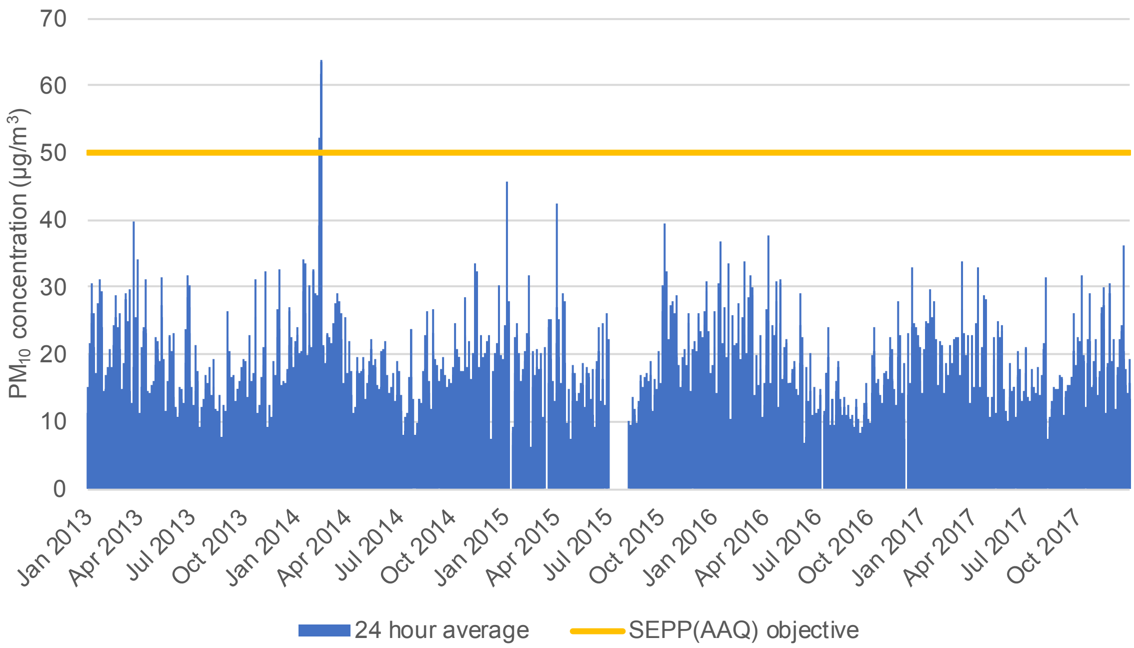


Figure 18: Alphington AAQMS PM_{10}: 2013–2017 (24 hour average)

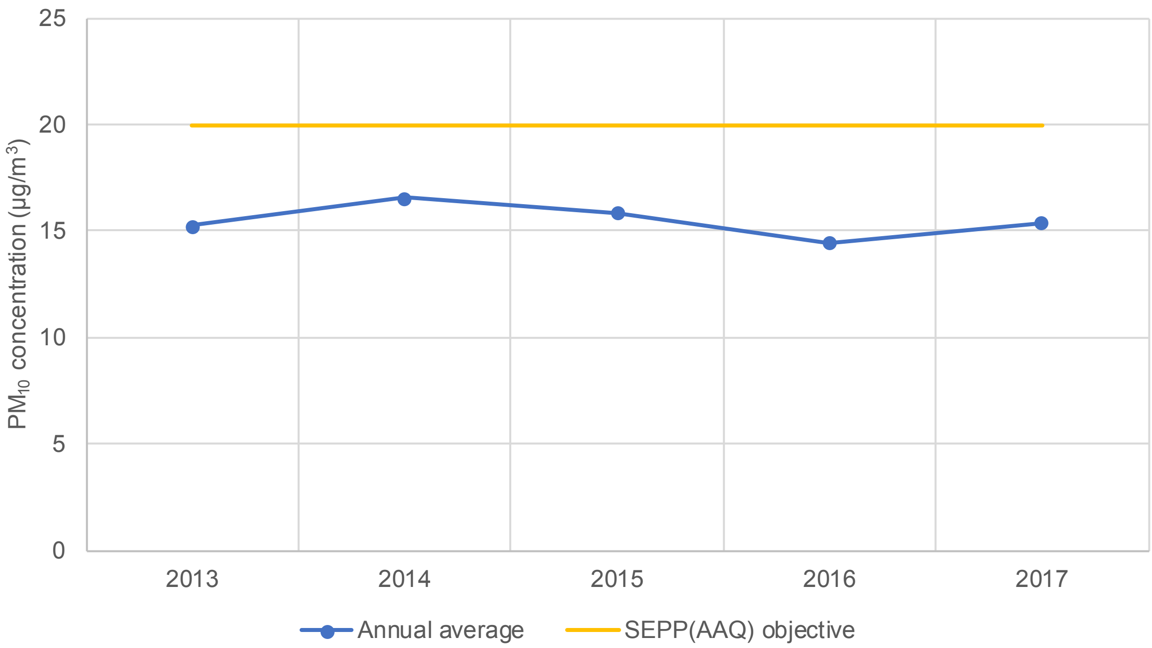


Figure 19: Alphington AAQMS PM_{10}: 2013–2017 (annual average)

Table 19: Alphington PM_{10} results summary (24 hour average)

Period	Minimum (µg/m^3)	Average (µg/m^3)	Maximum (µg/m^3)	Standard deviation (µg/m^3)
2013	2.1	16	44	6.8
2014	4.1	17	64	7.6
2015	4.1	16	46	6.4
2016	2.2	15	38	6.5
2017	4.1	16	44	6.1
2013–2017	2.1	16	64	6.7

The PM_{10} results for Alphington show four instances where the 24 hour average exceeded the SEPP(AAQ) EQO:

- 11 February 2014: 52 µg/m^3
- 12 February 2014: 62 µg/m^3
- 13 February 2014: 63 µg/m^3
- 14 February 2014: 64 µg/m^3.

EPA Victoria attribute the February 2014 results to bushfires which occurred in many parts of Victoria. Smoke from these events is visible on images captured on the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite (NASA 2014).

Annual average PM_{10} concentrations demonstrate compliance with the SEPP(AAQ) EQO for 2013 to 2017.

PM_{10} data is also available for EPA Victoria AAQMSs at Box Hill and Mooroolbark. EPA Victoria provide spreadsheet results summaries with monthly averaged results for these stations and Alphington for 2013, 2014 and 2015 (EPA Victoria 2017). The results are reproduced in Figure 20. This figure indicates that results for Alphington are similar to Box Hill and Mooroolbark and follow the same trends. The results also show that where data is available for multiple stations within the vicinity of North East Link, the results are comparable. Consequently, the use of the Alphington dataset to represent existing background air quality across the project modelling domain is considered reasonable.

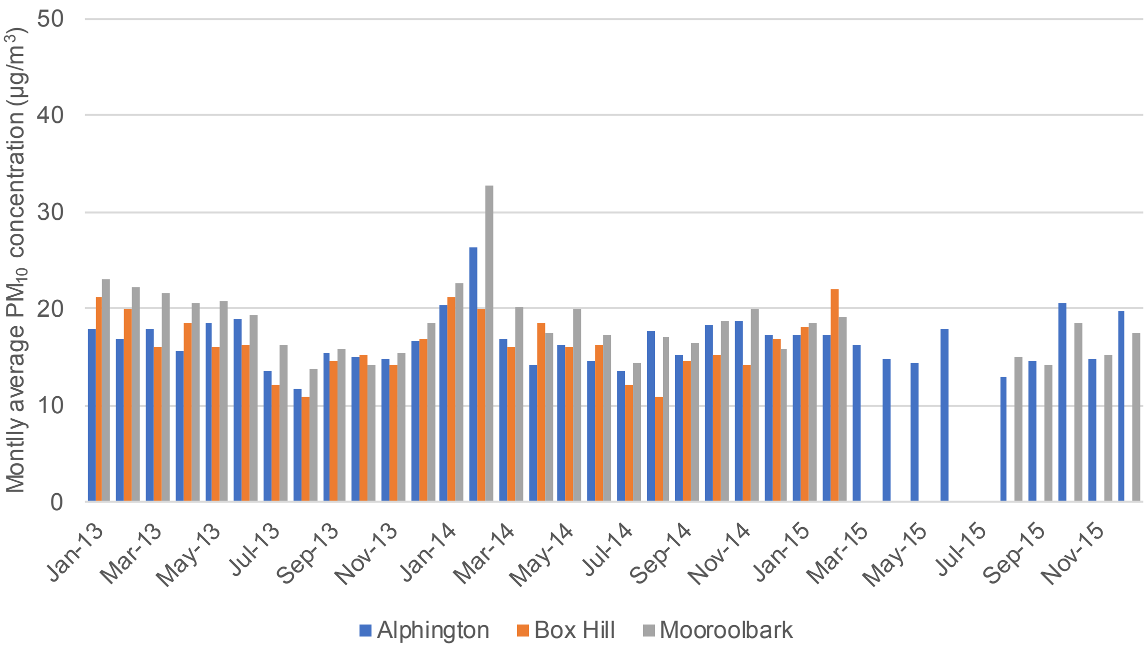


Figure 20: Comparison of PM_{10} results from three monitoring stations 2013–2015

6.6.4 $PM_{2.5}$

$PM_{2.5}$ monitoring at Alphington AAQMS is conducted using a gravimetric method [a low volume sampler (LVS)] and a continuous monitoring method [a beta attenuation monitor (BAM)]. The BAM was installed in January 2014. The applicable methods are as follows:

- LVS: Australian Standard AS3580.9.10 (Standards Australia 2017)
- BAM: Australian Standard AS 3580.9.12 (Standards Australia 2013).

$PM_{2.5}$ determination by LVS provides discrete 24 hour average results every three days. BAM sampling is a continuous technique enabling calculation of multiple averaging periods with data collected every hour of every day. The results from the continuous BAM method have been selected for presentation and analysis for North East Link due to the greater data coverage; with results available for most days of the period 2014 to 2017.

The SEPP(AAQ) $PM_{2.5}$ EQOs are:

- 24 hour averaging period: 25 μg/m^3
- Annual averaging period: 8 μg/m^3.

The SEPP(AAQ) contains additional $PM_{2.5}$ objectives for the year 2025 and beyond. The future SEPP(AAQ) EQOs are:

- 24 hour averaging period: 20 μg/m^3
- Annual averaging period: 7 μg/m^3.

The 24 hour average $PM_{2.5}$ concentrations for 2014 to 2017 are presented in Figure 21 and summarised in Table 20. Results with less than 75 per cent data capture were not included in the graph or summary statistics. Annual average results are displayed in Figure 22.

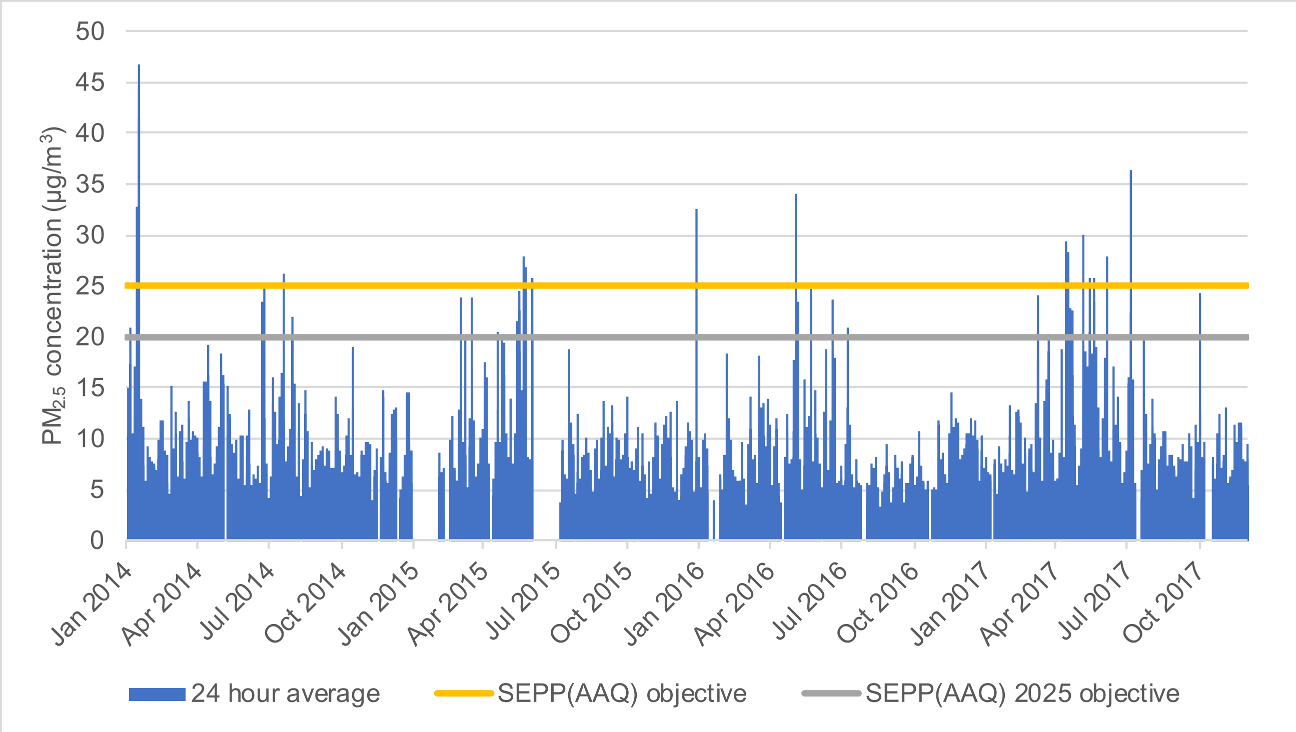


Figure 21: Alphington AAQMS $PM_{2.5}$: 2014–2017 (24 hour average)

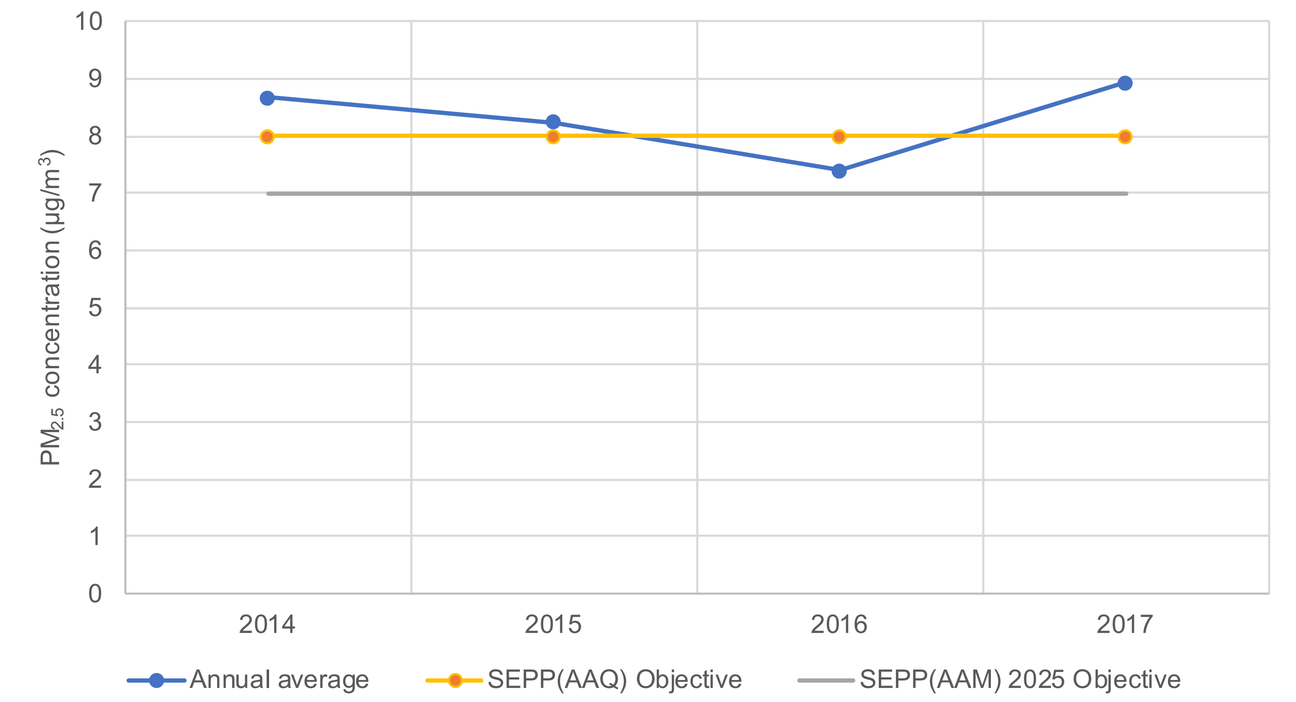


Figure 22: Alphington AAQMS $PM_{2.5}$: 2014–2017 (annual average)

Table 20: Alphington AAQMS: $PM_{2.5}$ results summary (24 hour average)

Period	Minimum ($\mu g/m^3$)	Average ($\mu g/m^3$)	Maximum ($\mu g/m^3$)	Standard deviation ($\mu g/m^3$)
2014	0.71	8.7	47	5.4
2015	2.0	8.3	28	4.5
2016	1.5	7.4	34	4.4
2017	1.8	8.9	36	5.3
2014–2017	0.71	8.3	47	5.0

There were 19 days in the period 2013 to 2017 where the $PM_{2.5}$ 24 hour average concentration exceeded the SEPP(AAQ) EQO. These are displayed in Table 21.

Table 21: Alphington AAQMS: $PM_{2.5}$ exceedances 2014–2017

Year	Date	$PM_{2.5}$ concentration 24 hour average ($\mu g/m^3$)
2014	11 February	33
	12 February	41
	13 February	45
	14 February	47
	16 August	26
2015	20 June	28
	21 June	27
	30 June	26
2016	26 January	33
	2 June	34
2017	11 May	28
	12 May	29
	14 May	26
	15 May	28
	4 June	30
	11 June	26
	17 June	26
	2 July	28
	3 August	36

The 2014 February exceedances were due to Victorian bushfires which also caused PM_{10} exceedances during the same period. The August 2014 exceedance is attributed to '*urban sources, likely including the wood heater contribution, due to the calm cold conditions*' (EPA Victoria, 2015). The exceedances in 2015 and 2016 follow a similar pattern, either occurring in summer and attributable to bushfires and planned burns or during colder months and attributed to urban sources such as domestic wood heaters. 2017 has the largest number of exceedances, with nine days exceeding the SEPP(AAQ) EQO. The May 2017 results align with an EPA Victoria statement released to news outlets in Melbourne indicating that '*the poor air quality is caused by stable weather conditions resulting in a build-up of $PM_{2.5}$ and smoke from activities such as domestic wood heater usage, motor vehicles and other urban sources*' (Smith & Meehan 2017).

The annual average $PM_{2.5}$ results also exceed the SEPP(AAQ) EQO, with 2016 the only year in the dataset below the criterion.

The representativeness of the continuous BAM $PM_{2.5}$ dataset was assessed through comparison with LVS $PM_{2.5}$ concentrations. The comparison was conducted for 2014 and 2015 as this is the only period where EPA Victoria reported data for both measurement techniques. The monthly average results for 2014 and 2015 were compiled into a statistical box and whisker plot, with the results displayed in Figure 23. The results indicate there is general agreement between the two measurement techniques, with BAM results generally higher. The BAM $PM_{2.5}$ concentrations are therefore considered a conservative assessment of existing air quality for North East Link.

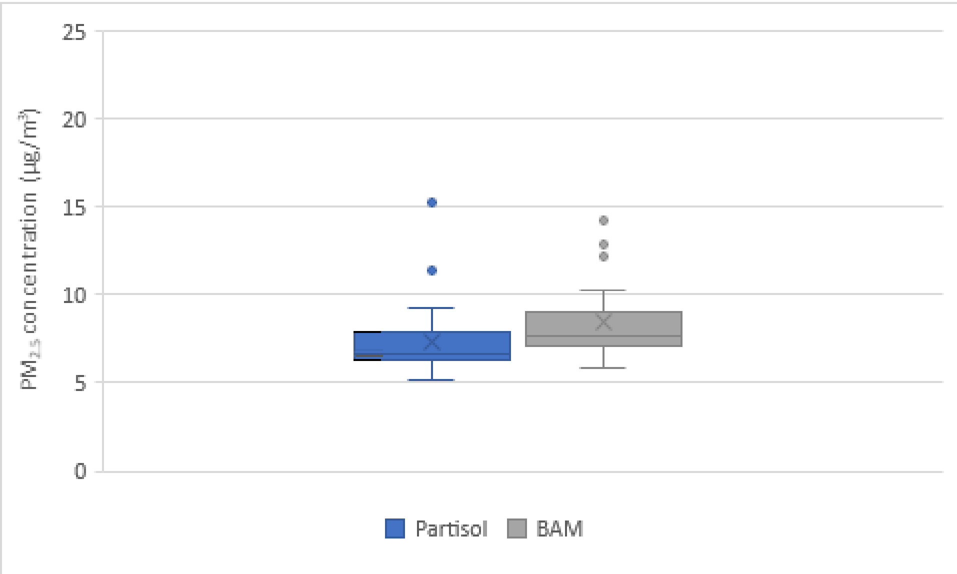


Figure 23: $PM_{2.5}$ Measurement technique comparison (2014 and 2015)

6.6.5 Long-term Alphington data

CO and NO_2 concentrations measured from 2005 to 2017 were below SEPP(AAQ) EQOs. PM_{10} concentrations exceeded the SEPP(AAQ) 24 hour average EQO on several occasions during this period, with the PM_{10} annual average EQO exceeded in 2006 and 2009. $PM_{2.5}$ concentrations also exceeded the SEPP(AAQ) 24 hour average objective on several occasions, with the $PM_{2.5}$ annual average EQO exceeded in 2005, 2006, 2007, 2009, 2014, 2015 and 2017.

Annual average PM_{10} concentrations would appear to be declining. For $PM_{2.5}$ EPA has stated (EPA 2018) that '*the data indicates that there has been little change in $PM_{2.5}$ concentrations in recent years, although the increase in $PM_{2.5}$ events in 2017 could signal an increase in the future'.*

A summary of Alphington AAQMS data from 2005 to 2017 against SEPP(AAQ) objectives is provided in Table 22. The pattern of PM_{10} and $PM_{2.5}$ exceedances is similar to the 2013/14 to 2017 datasets, with exceedances caused by exceptional events such as bushfires, planned burns and dust storms in rural Victoria.

The 2013/14 to 2017 datasets compare well with the long-term trends and are considered an appropriate representation of ambient air quality in the existing environment.

Table 22: Alphington AAQMS exceedances, 2005–2017

	CO	NO_2	PM_{10} [1]	$PM_{2.5}$ [1]
Year	8 hour	1 hour	24 hour	24 hour
2005	0	0	0	3 (3)
2006	0	0	8 (0)	6 (3)
2007	0	0	2 (0)	3 (1)
2008	0	0	3 (0)	4 (0)
2009	0	0	6 (0)	2 (0)
2010	0	0	0	3 (0)
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	1 (0)
2014	0	0	4 (4)	3 (3)
2015	0	0	0	0
2016	0	0	0	2 (2)
2017	0	0	0	8 (7)

Note:

1 Values in parentheses exclude exceptional events as reported in EPA Victoria Publications 1140 (2006), 1231 (2007), 1282 (2008), 1331 (2009), 1390 (2010), 1483 (2011), 1536 (2012), 1569 (2013), 1604 (2014), 1632 (2015), 1663 (2016) and 1703 (2017)

Alphington air quality data for the period 2005 to 2017 are presented in in Figure 24 to Figure 30.

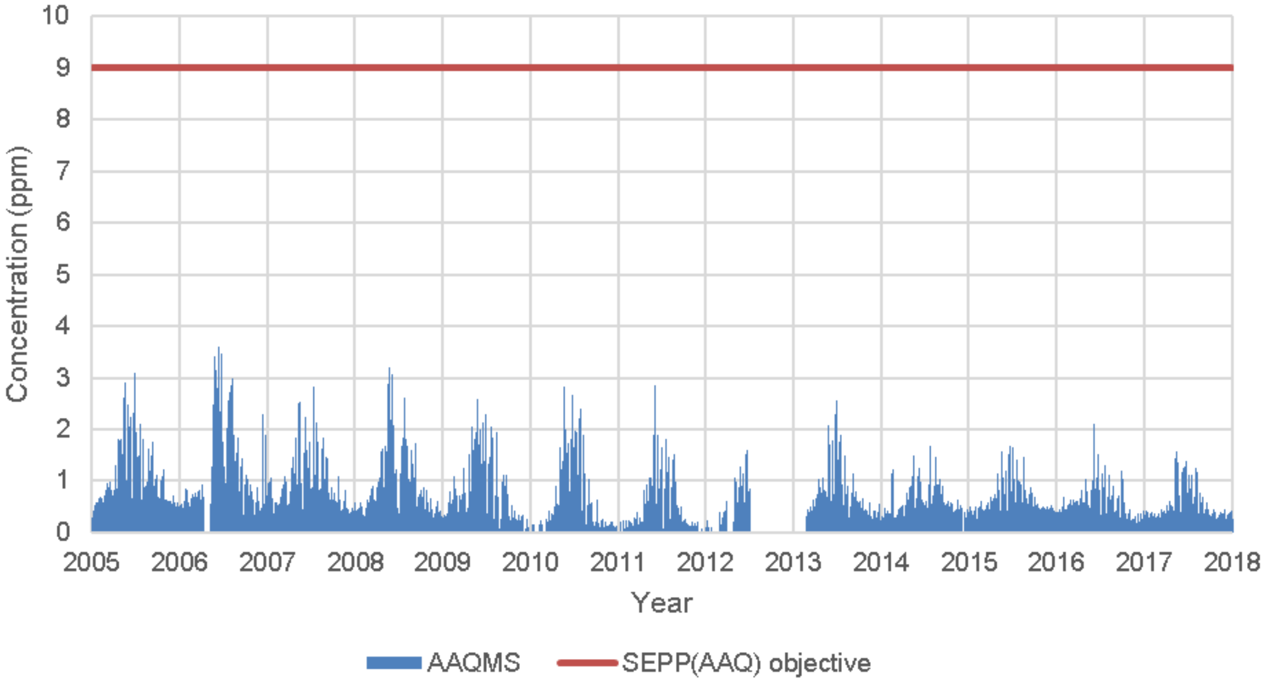


Figure 24: Alphington AAQMS CO: 2005–2017 (8 hour average)

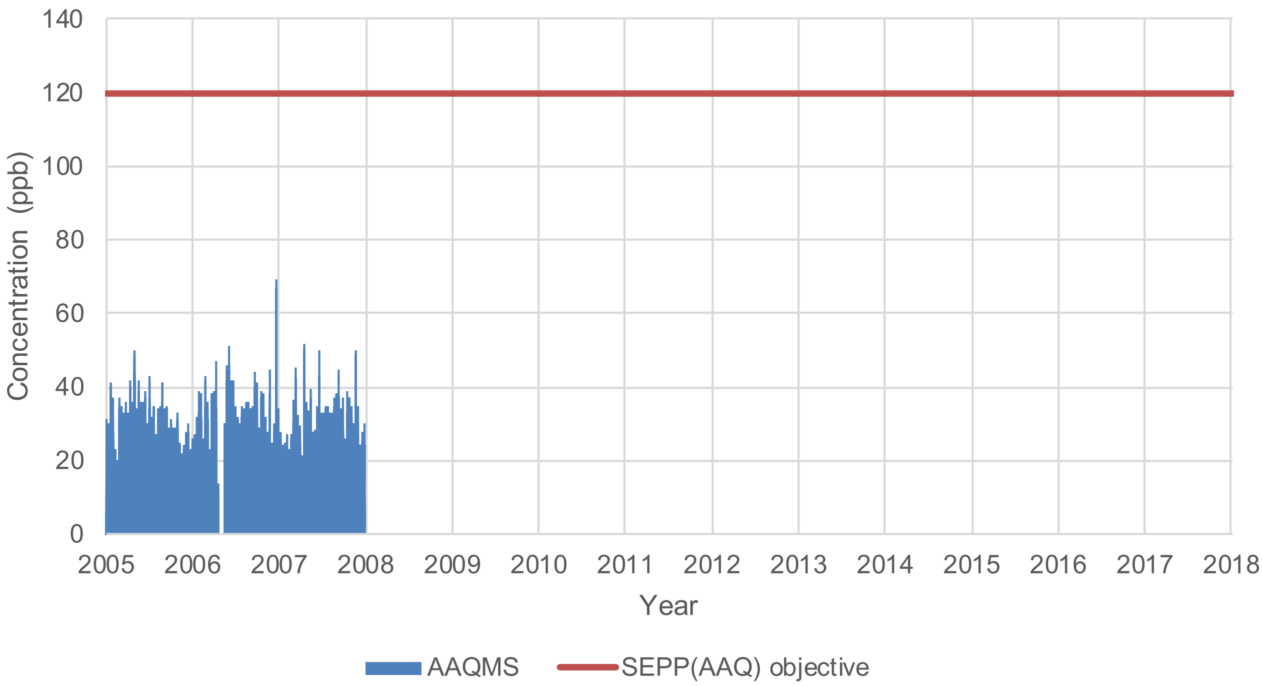


Figure 25: Alphington AAQMS NO_2: 2005–2017 (1 hour average)

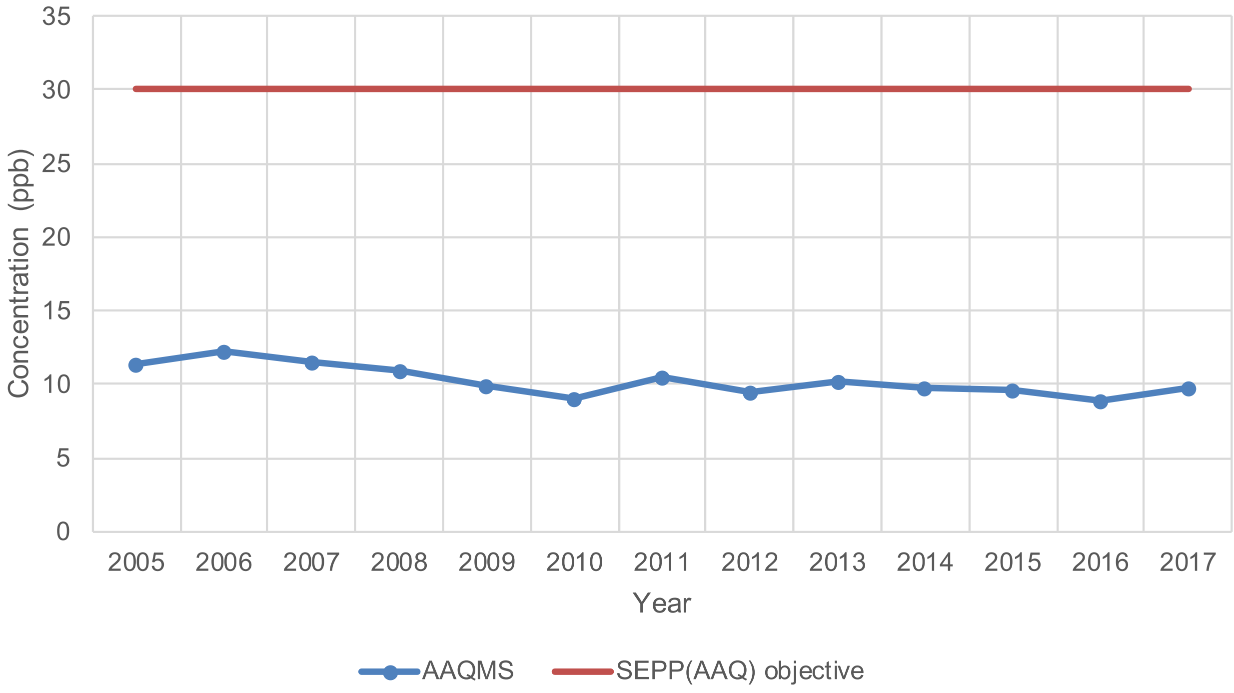


Figure 26: Alphington AAQMS NO_2: 2005–2017 (annual average)

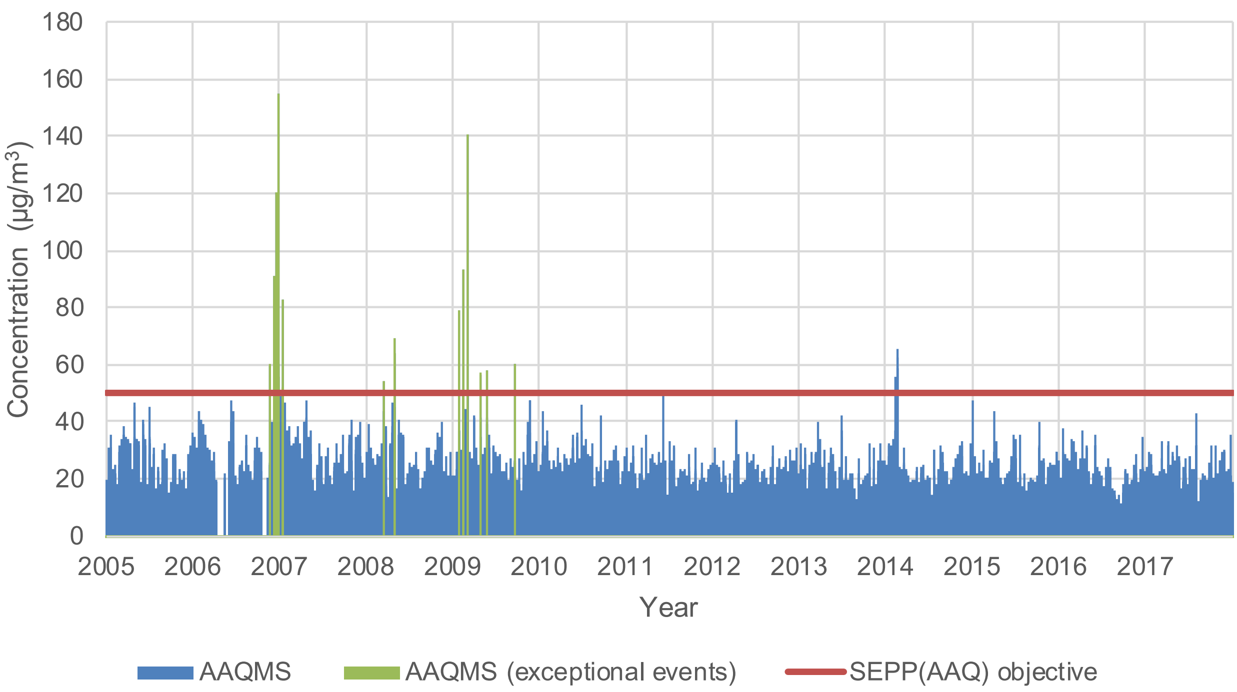


Figure 27: Alphington AAQMS PM_{10}: 2005–2017 (24 hour average)

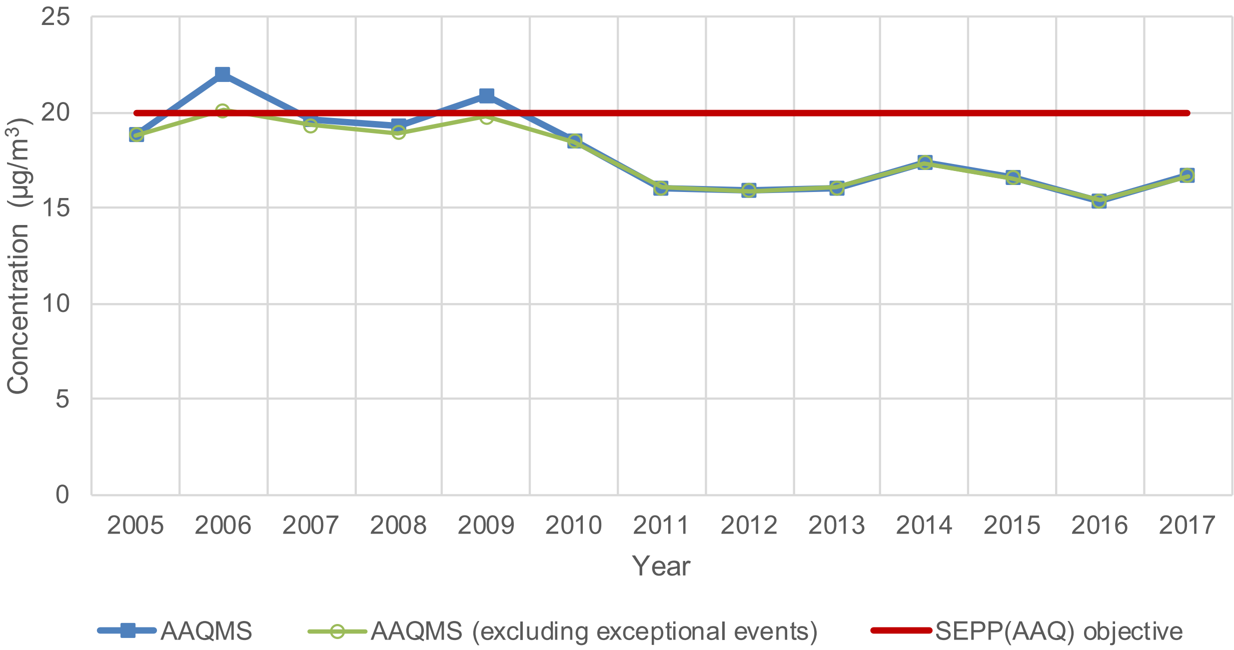


Figure 28: Alphington AAQMS PM_{10}: 2005–2017 (annual average)

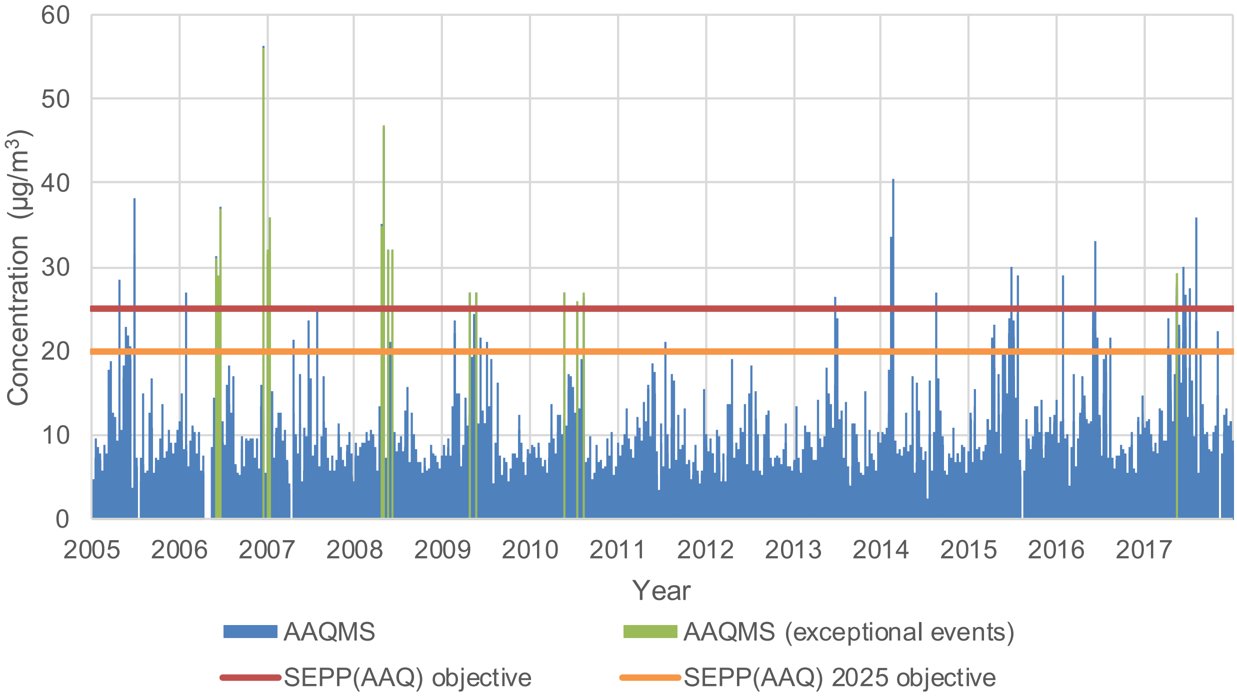


Figure 29: Alphington AAQMS $PM_{2.5}$: 2005–2017 (24 hour average)

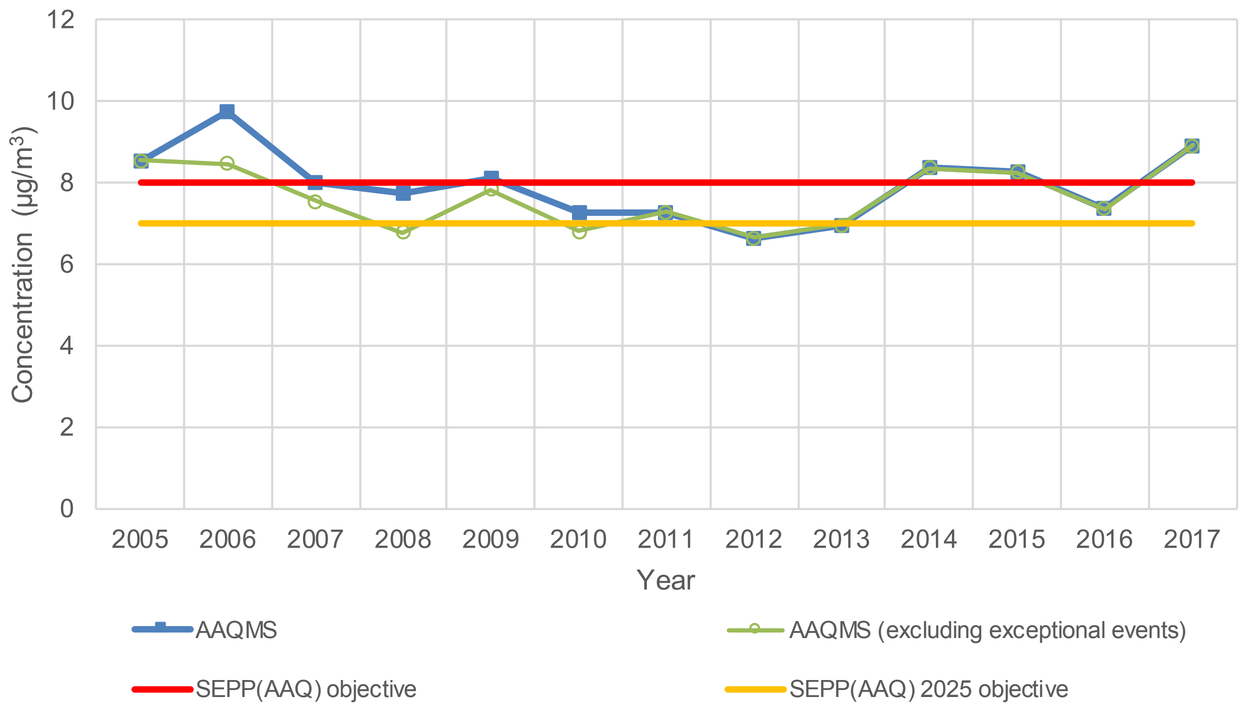


Figure 30: Alphington AAQMS $PM_{2.5}$: 2005–2017 (annual average)

6.6.6 PAH and VOCs

EPA Victoria has conducted air toxics monitoring at various locations across the Melbourne metropolitan area from 1996 to 2013. The results are compared with the Air Toxics NEPM MILs for benzene, toluene, xylene isomers, PAH (benzo(a)pyrene) and formaldehyde.

The Air Toxics NEPM does not specify a MIL for ethyl benzene or 1,3 butadiene so the Texas Commission for Environmental Quality (TCEQ) long-term effects screening levels (ESLs) were included for comparison.

The results are presented in Table 23 to Table 26.

Table 23: Air toxics monitoring data summary 1996–2004

Pollutant	Statistic	Units	Concentration (24 hour averages)							Air Toxics NEPM MIL		TCEQ
			West Gate Freeway 1996/1997	Francis Street, Yarraville 2002	Alphington 2003	Paisley (Altona North) 2003	Francis Street, Yarraville 2003	Nunawading (Springvale Road) 2003/2004	West Gate Freeway 2004	24 hour average	Annual	Long-term ESL
Benzene	Maximum	ppb	4.5	NM	NA	NR	NR	NR	2.3	NA	3	NA
	Average		1.7		0.6	0.6	0.4	1.7	0.8			
Toluene	Maximum	ppb	19.3	NM	NA	NR	NR	NR	11.5	1,000	100	NA
	Average		4.4		2.1	2.1	1.2	3.1	6.0			
Ethylbenzene	Maximum	ppb	1.8	NM	NM	NM	NM	NM	1.1	NA	NA	135
	Average		0.4						0.5			
m,p-Xylenes	Maximum	ppb	7.6	NM	NA	NR	NR	NM	3.5	250	200	NA
	Average		1.3		1.4	1.4	1.3		1.1			
o-Xylenes	Maximum	ppb	2.2	NM	Not specified	Not specified	Not specified	NM	1.2			
	Average		0.4						0.5			
Formaldehyde	Maximum	ppb	NM	NM	NM	NM	NM	NM	NM	40	NA	NA
	Average		NM									
1,3-Butadiene	Maximum	ppb	ND	NM	NM	NM	NM	NM	<0.2 <0.2	NA	NA	4.5
	Average		ND									
Benzo(a)pyrene	Maximum	ng/m^3	NM	3.7	NA	NM	NM	NM	0.8	NA	0.3	NA
	Average		NM	1.2	0.2	0.1		0.1	0.2			

NM Not monitored
ND Not detected

Table 24: Air toxics monitoring data summary 2004–2007

			Concentration (24 hour averages)						Air Toxics NEPM MIL		TCEQ
Pollutant	**Statistic**	**Units**	**Corio 2004/2005**	**Eltham 2005/2006**	**Carlton 2006/2007**	**Newport 2006/2007**	**Spotswood 2006/2007**	**South Melbourne 2006/2007**	**24 hour average**	**Annual**	**Long-term ESL**
Benzene	Maximum	ppb	NR	1.7	1.9	2.6	2.5	1.4	NA	3	NA
	Average		0.5	0.5	0.7	1.0	0.8	0.5			
Toluene	Maximum	ppb	NR	4.9	7.0	15.1	16.6	5.1	1,000	100	NA
	Average		1.0	1.8	2.4	4.3	4.4	1.6			
Ethylbenzene	Maximum	ppb	NM	NM	NM	NM	NM	NM	NA	NA	135
	Average										
m,p-Xylenes	Maximum	ppb	NR	2.0	3.4	6.6	6.6	2.4	250	200	NA
	Average		0.5	0.7	1.0	1.0	1.0	0.5			
o-Xylenes	Maximum	ppb	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified			
	Average										
Formaldehyde	Maximum	ppb	NM	28.4	4.0	NM	NM	NM	40	NA	NA
	Average			2.6	2.2						
1,3-Butadiene	Maximum	ppb	NM	NM	NM	NM	NM	NM	NA	NA	4.5
	Average										
Benzo(a)pyrene	Maximum	ng/m^3	NM	NM	3.2	NM	NM	NM	NA	0.3	NA
	Average		0.1		0.2						

NM Not monitored
ND Not detected

Table 25: Air toxics monitoring data summary 2007–2013

<table>
<tr><th rowspan="2">Pollutant</th><th rowspan="2">Statistic</th><th rowspan="2">Units</th><th colspan="4">Concentration (24 hour averages)</th><th colspan="2">Air Toxics NEPM MIL</th><th>TCEQ</th></tr>
<tr><th>Mooroolbark 2007/2008</th><th>Traralgon 2007/2008</th><th>Campbellfield 2008/2009</th><th>Yarraville 2012/2013</th><th>24 hour average</th><th>Annual</th><th>Long-term ESL</th></tr>
<tr><td rowspan="2">Benzene</td><td>Maximum</td><td rowspan="2">ppb</td><td rowspan="2">NM</td><td>0.4</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="2">NA</td><td rowspan="2">3</td><td rowspan="2">NA</td></tr>
<tr><td>Average</td><td>0.2</td></tr>
<tr><td rowspan="2">Toluene</td><td>Maximum</td><td rowspan="2">ppb</td><td rowspan="2">NM</td><td>1.2</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="2">1,000</td><td rowspan="2">100</td><td rowspan="2">NA</td></tr>
<tr><td>Average</td><td>0.3</td></tr>
<tr><td rowspan="2">Ethylbenzene</td><td>Maximum</td><td rowspan="2">ppb</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="2">NA</td><td rowspan="2">NA</td><td rowspan="2">135</td></tr>
<tr><td>Average</td></tr>
<tr><td rowspan="2">m,p-Xylenes</td><td>Maximum</td><td rowspan="2">ppb</td><td rowspan="2">NM</td><td>0.5</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="4">250</td><td rowspan="4">200</td><td rowspan="4">NA</td></tr>
<tr><td>Average</td><td>0.2</td></tr>
<tr><td rowspan="2">o-Xylenes</td><td>Maximum</td><td rowspan="2">ppb</td><td rowspan="2">NM</td><td rowspan="2">Not specified</td><td rowspan="2">NM</td><td rowspan="2">NM</td></tr>
<tr><td>Average</td></tr>
<tr><td rowspan="2">Formaldehyde</td><td>Maximum</td><td rowspan="2">ppb</td><td rowspan="2">NM</td><td>4.1</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="2">40</td><td rowspan="2">NA</td><td rowspan="2">NA</td></tr>
<tr><td>Average</td><td>1.5</td></tr>
<tr><td rowspan="2">1,3-Butadiene</td><td>Maximum</td><td rowspan="2">ppb</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="2">NM</td><td rowspan="2">NA</td><td rowspan="2">NA</td><td rowspan="2">4.5</td></tr>
<tr><td>Average</td></tr>
<tr><td rowspan="2">Benzo(a)pyrene</td><td>Maximum</td><td rowspan="2">ng/m^3</td><td>1.1</td><td>0.8</td><td>0.6</td><td>0.55</td><td rowspan="2">NA</td><td rowspan="2">0.3</td><td rowspan="2">NA</td></tr>
<tr><td>Average</td><td>0.1</td><td>0.1</td><td>0.1</td><td>0.14</td></tr>
</table>

NM Not monitored

Table 26: Air toxics monitoring data summary for Dandenong 2011/2012

Pollutant	Statistic	Units	Concentration (24 hour averages)					Air Toxics NEPM MIL		TCEQ
			Dandenong (Bangholme) 2011/2012	Dandenong (Lynbrook) 2011/2012	Dandenong (Hampton Park) 2011/2012	Dandenong (Doveton) 2011/2012	Dandenong (Dandenong South) 2011/2012	24 hour average	Annual	Long-term ESL
Benzene	Maximum	ppb	3.3	1.1	1.0	1.2	1.3	NA	3	NA
	Average		BDL	BDL	BDL	BDL	BDL			
Toluene	Maximum	ppb	5.4	14.4	5.3	5.0	7.1	1,000	100	NA
	Average		1.2	1.5	1.2	1.5	1.8			
Ethylbenzene	Maximum	ppb	0.6	0.6	0.6	0.6	0.9	NA	NA	135
	Average		BDL	BDL	BDL	BDL	BDL			
m,p-Xylenes	Maximum	ppb	4.1	2.5	3.2	4.2	3.6	250	200	NA
	Average		0.6	0.7	0.6	0.7	0.9			
o-Xylenes	Maximum	ppb	0.9	0.9	0.9	0.8	1.3			
	Average		BDL	BDL	BDL	BDL	BDL			
Formaldehyde	Maximum	ppb	NM	NM	NM	NM	NM	40	NA	NA
	Average									
1,3-Butadiene	Maximum	ppb	ND	ND	ND	ND	ND	NA	NA	4.5
	Average									
Benzo(a)pyrene	Maximum	ng/m^3	NM	NM	NM	NM	NM	NA	0.3	NA
	Average									

BDL Below detection limit
NM Not monitored
ND Not detected

6.6.7 Background data

Background air quality data is used to quantify existing air quality in the assessment of air quality impacts from the proposed tunnel ventilation system and combined impacts. The process is depicted in Figure 4.

Schedule C, Part B of the SEPP(AQM) requires proponents to include appropriate hourly background data or '*the 70th percentile of one year's observed hourly concentrations as a constant value*' where no appropriate hourly data exists [SEPP(AQM) 2001].

The preceding sections have demonstrated that Alphington AAQMS results are a good indicator of existing air quality within the project domain, therefore this time varying dataset has been adopted to represent background air quality for CO, NO_2, PM_{10} and $PM_{2.5}$.

Details of the adopted background concentrations are provided in Table 27.

Table 27: Background air quality for CO, NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Units	Averaging period[1]	Background concentration	Period	Source
CO	mg/m^3	1 hour	Time-varying	2013–2017	Alphington AAQMS
NO_2	µg/m^3	1 hour and annual	Time-varying	2013–2017	
PM_{10}	µg/m^3	1 hour, 24 hour and annual	Time-varying	2013–2017	
$PM_{2.5}$	µg/m^3	1 hour, 24 hour and annual	Time-varying	2014–2017	

Note:
1 24 hour and annual average PM_{10} and $PM_{2.5}$ concentrations and annual average NO_2 concentrations only apply to the combined impacts assessment

EPA Victoria has recommended background air quality values for PAH and VOCs which are presented in Table 28. The values are considered conservative for most pollutants as their concentrations in ambient air are decreasing in-line with international trends and continuing improvements in vehicle fleet emissions. The maximum 24 hour average air toxics concentrations have been used for the SEPP(AQM) Schedule A design criteria modelling. EPA Victoria has confirmed that these background concentrations are appropriate for the air quality modelling described in Section 10.0, for all averaging periods.

Table 28: Background air quality for PAH and VOCs

Pollutant	Average concentration		Units	Source
	Maximum 24 hour	Annual		
PAH (benzo(a)pyrene)	0.55	0.14	ng/m^3	Yarraville, Francis Street, May 2012 to May 2013 (EPA Victoria, 2013)
Benzene	2.3	0.8	ppb	West Gate Freeway (Brooklyn) 2004 (EPA Victoria, 2004)
Toluene	11.5	6.0	ppb	West Gate Freeway (Brooklyn) 2004 (EPA Victoria, 2004)
Ethylbenzene	1.1	0.5	ppb	West Gate Freeway (Brooklyn) 2004 (EPA Victoria, 2004)

Pollutant	Average concentration		Units	Source
	Maximum 24 hour	Annual		
m&p Xylenes	3.5	1.1	ppb	West Gate Freeway (Brooklyn) 2004 (EPA Victoria, 2004)
o-Xylene	1.2	0.5	ppb	West Gate Freeway (Brooklyn) 2004 (EPA Victoria, 2004)
Formaldehyde	4.0	2.2	ppb	Carlton 2006 (EPA Victoria, 2014)
1,3-Butadiene	0.2	0.1	ppb	West Gate Freeway (Brooklyn) 2004 (EPA Victoria, 2004)

6.7 Overview

The North East Link receiving environment is a large area extending from Greensborough in the north to Collingwood in the west and Donvale in the east. The project would intersect with numerous suburbs encompassed by the following local municipalities; Cities of Banyule, Boroondara, Manningham, Whitehorse, Yarra, Whittlesea and the Shire of Nillumbik.

The North East Link environment was characterised using meteorological data from the BoM Viewbank AWS and historical air quality data from the EPA Victoria AAQMS at Alphington. The five most recent calendar years of data (2013 to 2017) were analysed with the results demonstrating that:

- wind mostly blows from either the south to south west or north to north east quadrants. The five year period has an average wind speed of 3.1 metres per second.
- CO daily maximum eight hour average concentrations ranged from 0.017 to 0.30 parts per million, complying with the SEPP(AAQ) EQO.
- NO_2 concentrations ranged from 0.001 to 0.064 parts per million, complying with the one hour average SEPP(AAQ) EQO. Annual average results complied with the SEPP(AAQ) EQO.
- PM_{10} 24 hour average concentrations ranged from 2.1 to 64 micrograms per cubic metre with a total of four exceedances of the SEPP(AAQ) EQO exceedances recorded. Annual average results complied with the SEPP(AAQ) EQO.
- $PM_{2.5}$ 24 hour average concentrations ranged from 0.8 to 45 micrograms per cubic metre (2014 to 2017 only), with a total of 19 exceedances of the SEPP(AAQ) EQO recorded. The exceedances were principally attributed to bushfires, planned burns and urban sources, including smoke from wood heaters. The current $PM_{2.5}$ annual average SEPP(AAQ) EQO was exceeded in 2014, 2015 and 2017.

Long-term results for Alphington AAQMS were presented for CO, NO_2, PM_{10} and $PM_{2.5}$. The long-term datasets showed similar trends to the period 2013 to 2017.

Background air quality data was designated as the Alphington AAQMS 2013 to 2017 time varying datasets for CO, NO_2, PM_{10} and $PM_{2.5}$. PAH and VOCs background data were based on a conservative assessment of air toxics concentrations measured by EPA Victoria during campaign monitoring events.

In general, air quality at EPA Victoria's monitoring stations (including Alphington) has been in the 'good' to 'very good' air quality categories at least 75 per cent of the time, meaning air quality is typically good (EPA Victoria 2018).

7.0 RISK ASSESSMENT

A risk assessment of project activities was performed in accordance with the methodology described in Section 5.6. The risk assessment has been used as a screening tool to prioritise the focus of the impact assessments and development of EPRs. The risk pathways link project activities (causes) to their potential effects on the environmental assets, values or uses that are considered in more detail in the impact assessment. Risks were assessed for the construction and operation phases of the project.

The identified risks and associated residual risk ratings are listed in Table 29. The likelihood and consequence ratings determined during the risk assessment process and the adopted EPRs are presented in APPENDIX A

Table 29: Air quality risks

Risk ID	Potential threat and effect on the environment	Risk rating
Risks to air quality during construction – North East Link (surface roads)		
Risk AQ01	Site clearance and construction site establishment. Deposition of larger dust particles causing aesthetic impacts on buildings and vehicles at sensitive receptor locations.	Low
Risk AQ02	Earthworks. Deposition of larger dust particles causing aesthetic impacts on buildings and vehicles at sensitive receptor locations.	Medium
Risk AQ03	Earthworks. Generation of PM_{10} and $PM_{2.5}$ from soil disturbance causing health impacts at sensitive receptor locations.	Low
Risk AQ04	Earthworks. Generation of odour due to exposure, stockpiling and transportation of contaminated or anaerobic soil, with resultant aesthetic impacts on sensitive receptor locations.	Low
Risk AQ05	Earthworks. Products of combustion [including PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs and semi-volatile organic compounds (SVOC)] resulting from operation of diesel fuelled heavy equipment impacting on sensitive receptor locations.	Low
Risk AQ06	Construction of surface roads and other civil infrastructure. Deposition of larger dust particles causing aesthetic impacts on buildings and vehicles at sensitive receptor locations.	Medium
Risk AQ07	Construction of surface roads and other civil infrastructure. Generation of PM_{10} and $PM_{2.5}$ from soil and rock handling causing health impacts at sensitive receptor locations.	Medium
Risk AQ08	Construction of surface roads and other civil infrastructure. Generation of odour due to laying of asphalt with resultant aesthetic impacts on sensitive receptor locations.	Medium
Risk AQ09	Construction of surface roads and other civil infrastructure. Products of combustion (including PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOC and SVOC) resulting from operation of diesel fuelled heavy equipment impacting on sensitive receptor locations.	Low
Risks to air quality during construction – tunnels		
Risk AQ10	Site clearance and construction site establishment. Deposition of larger dust particles causing aesthetic impacts on buildings and vehicles at sensitive receptor locations.	Low
Risk AQ11	Dive structure/portal and tunnel construction. Generation of odour and dust from tunnel ventilation during tunnel boring operation.	Medium
Risk AQ12	Precast plant construction and manufacturing of precast units. Potential impact on air quality due to dust, odour or other emissions for plant affecting sensitive receptor locations. This activity is, however, unlikely to occur due to current construction layout constraints.	Low
Risk AQ13	Tunnelling activities. Generation of odour from tunnel ventilation during tunnel boring operation and exposure, stockpiling and transportation of contaminated or anaerobic soil, with resultant aesthetic impacts on sensitive receptor locations.	Low

Risk ID	Potential threat and effect on the environment	Risk rating
Risks to air quality during operation – North East Link (surface roads)		
Risk AQ14	Eastern Freeway and North East Link operation. Adverse impact on sensitive receptors from air quality changes associated with operation and maintenance of project (taking into account ventilation system and surface road emissions) and compared to no project situation, based on traffic volume projections	Low
Risk AQ15	Eastern Freeway and North East Link operation. Underestimation of traffic volumes resulting in higher than anticipated ambient air quality impacts on sensitive receptors.	Medium
Risks to air quality during operation – tunnel		
Risk AQ16	Tunnel operation. Impact on sensitive receptors due to NO_2, PM_{10} and $PM_{2.5}$ emissions to air from the tunnel portals and ventilation system.	Low
Risk AQ17	Tunnel operation. Impact on sensitive receptors due to emissions to air of pollutants other than NO_2, PM_{10} and $PM_{2.5}$ from the tunnel portals and ventilation system.	Low
Risk AQ18	Tunnel operation. Potential impact on road users due to in-tunnel air quality.	Low
Risk AQ19	Tunnel operation. Underestimation of traffic volumes resulting in higher than anticipated ambient air quality impacts on road tunnel users and sensitive receptors.	Low

8.0 CONSTRUCTION IMPACTS

This section describes the potential for impacts to air quality beneficial uses resulting from construction of North East Link.

8.1 Tunnelling

Tunnelling works would mainly be conducted using tunnel boring machines (TBMs), road headers, cut and cover techniques, tunnel portal excavations and the construction of emergency ventilation and TBM retrieval shafts. The removal, transport and disposal of contaminated or acid sulfate soils may give rise to particulate matter and odorous emissions.

North East Link includes two options for the location of primary administration and construction for the tunnelling works:

- Lower Plenty Road extending north to Blamey Road and described as the northern TBM launch site
- Bridge Street extending south to Golden Way and described as the southern TBM launch site.

For both sites spoil from the tunnel excavation would be loaded from the road header directly into a 1.5 metre wide conveyor system that transports the spoil to stockpile ready to be loaded onto trucks and removed from site. Access facilities would include truck wheel wash facilities and a security personnel office.

Northern TBM launch site

The northern TBM launch site would include primary workshops and storage facilities for the works, with access to the northern TBM launch site through Blamey Road to the north and Erskine Road to the south. Segment lining would be delivered from offsite through site access at Lower Plenty Road to a laydown area north of the site. A satellite site facility would be established adjacent to the southern TBM retrieval site north of Banksia Street in Banksia Park within the construction area footprint. An acoustic shed would be placed adjacent to Moorwatha Street.

Southern TBM launch site

The southern TBM launch site would include primary workshops and storage facilities for the works, with access via a dedicated entrance at Bulleen Road. A satellite site facility would be established adjacent to the northern TBM retrieval site within the construction area footprint, with access from Greensborough Road. An acoustic shed would be placed west of Mangan Street.

The main tunnel cut and cover sections are between Windsor Street and Lower Plenty Road, Bridge Street and Golden Way and Rocklea Street and the Eastern Freeway.

For North East Link, the mined tunnel section would be adjacent to Bulleen Road between Avon Street and just south of Rocklea Road. Two road headers would be used, with an average production of 1,500 cubic metres per day per road header, with canopy tubes installed the full length of the tunnel during mining, progressing at an estimated rate of up to 10 metres per week.

Spoil from the mined tunnel excavation would be transported from the road header by truck to the spoil management area at the main TBM launch construction compound for removal.

The estimated amount of spoil generated by tunnelling is 3,186,000 cubic metres.

The TBMs would be driven from south to north before being dismantled at the northern portal site. The TBMs would be in operation 24 hours per day, seven days per week, progressing at an estimated average rate of 60 metres per week and producing an average 23,000 cubic metres per week.

Other potential sources of particulate matter include exposed soil surfaces and stockpiles and wheel generated material, principally caused by truck movements on unpaved roads.

8.2 Surface works

The main air quality impacts resulting from North East Link construction are associated with airborne particulate matter of various size fractions [deposited dust, total suspended particulate matter (TSP), PM_{10} and $PM_{2.5}$] generated by:

- site clearance and construction site establishment
- vehicle movements on paved and unpaved roads
- erosion of stockpiles and freshly exposed areas
- handling, transfer and storage of materials
- handling, transfer and stockpiling of spoil material
- operation of heavy earthworks machinery
- movement of on-site machinery
- re-contouring of land resulting in soil exposure for reseeding
- operation of concrete batching and mobile asphalt plants
- precast plant construction and manufacturing of precast units
- fuel combustion in HCVs and mobile plant
- demolition of existing roadways and milling of existing asphalt pavement
- construction of surface roads, bridges, pavements and viaducts
- construction and installation of above ground infrastructure including substations, staging areas and ventilation structures
- relocation of utility services.

Odours may also result from a number of these activities, depending on the materials handled.

Construction equipment is likely to include, but not be limited to, trucks (delivery, dump and concrete), dozers, graders and excavators. The actual number and type of equipment used during construction would depend on availability and the contractor’s preferred working method.

Spoil would also be generated from excavation activities:

- approximately 1,541,000 cubic metres of spoil between the M80 Ring Road and the northern tunnel portal
- approximately 374,00 cubic metres of spoil on the Eastern Freeway.

During construction, the generation of airborne dust could affect ambient air quality in the local environment. Particulate matter generated from open sources (exposed surfaces, unpaved roads and stockpiles) is termed ‘fugitive’ dust.

Fugitive dust emissions are caused by surface materials being pulverised and abraded by application of mechanical force through the use of implements (wheels and blades), followed by entrainment of particles by the action of turbulent air currents.

Impacts would depend on the quantity and drift potential of the particles in the atmosphere, with larger particles (deposited dust and the larger particle fraction of TSP) settling out close to the source due to their larger mass. The deposition of dust can cause nuisance and aesthetic impacts on the receiving environment. Finer particles (PM_{10} and $PM_{2.5}$) remain entrained much longer and are therefore dispersed at greater distances from the source. The fine nature of these particles also has the potential for human health impacts if not adequately controlled.

The combustion of diesel fuel and petrol in HCVs and mobile plant would result in emissions of CO, NO_x, SO_2, particulate matter fractions (PM_{10} and $PM_{2.5}$), VOCs, semi-volatile organic compounds (SVOCs including PAH) and trace levels of heavy metals. Emission rates and impacts would depend on the number and power outputs of the combustion engines, the quality of the fuel and engine maintenance. Notwithstanding, these sources are considered to be minor given their intermittent nature, duration and the geographical extent over which emissions would occur.

Ancillary services such as pre-cast manufacturing and concrete batching plants with the potential to generate particulate matter emissions would be required for the construction of hardstand areas, footpaths, bridge and tunnel segments and other concrete surfaces. Mobile asphalt plants can also emit particulate matter from the dryers, hot bins and mixers.

Odorous emissions can also be generated during the construction phase. Excavation works may involve the removal of potentially contaminated or acid sulfate soils from within the project footprint. When contaminated soils are exposed to ambient air there is the potential for some odours (principally VOCs and SVOCs), which may be detectable close to the emission source.

A number of construction compounds would be required to ensure works are conducted in a safe, efficient and environmentally responsible manner. Activities in these compounds would be subject to the requirements of the Dust and Air Quality Management and Monitoring Plan.

In summary, there is the potential for air quality impacts during construction works, primarily in the form of particulate matter, odour and products of combustion. Notwithstanding, the impacts are expected to be localised, of short duration and intermittent in nature. Proposed management measures presented in Section 8.4 would ensure impacts on the receiving environment are minimised.

8.3 Environmental performance requirements

EPRs applicable to the mitigation of risks to air quality during North East Link construction are summarised in Table 30.

Table 30: Environmental performance requirements

Asset	Environmental performance requirements
Air quality impacts during construction	EPR EMF2 – **Deliver project in accordance with an Environmental Strategy and Environmental Management Plans** Prepare and implement an Environmental Strategy, Construction Environmental Management Plan (CEMP), Worksite Environmental Management Plans (WEMPs), Operation Environmental Management Plan (OEMP) (operator only) and other plans as required by the Environmental Performance Requirements (EPRs) and in accordance with the Environmental Management Framework (EMF). The Environmental Strategy, CEMP, WEMPs and OEMP must be developed in consultation with relevant stakeholders as listed in the EMF and as required by NELP or under any statutory approvals.

Asset	Environmental performance requirements
	The CEMP must be prepared with reference to EPA Victoria Publication 480, Best Practice Environmental Management: Environmental Guidelines for Major Construction Sites.
Air quality impacts during construction	EPR AQ1 **– Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction** Prepare and implement a Dust and Air Quality Management Plan(s), which sets out measures to minimise and monitor impacts on air quality during construction. The plan(s) must: ■ Set out how the project will control the emission of smoke, dust, fumes, odour and other pollution into the atmosphere during construction in accordance with the *State Environment Protection Policy (Air Quality Management)* and with reference to EPA Victoria publication 480 Environmental Guidelines for Major Construction Sites ■ Identify the main sources of dust and airborne pollutants, and the location of sensitive land uses ■ Describe the proposed air quality and dust management and monitoring requirements ■ Describe the mitigation measures that will be implemented to ensure compliance with air quality criteria ■ Describe monitoring requirements for key sensitive receptors.
Air quality impacts during construction	EPR CL1 – **Implement a Spoil Management Plan** Prepare and implement a Spoil Management Plan (SMP) in accordance with relevant regulations, standards or best practice guidelines. The SMP must be developed in consultation with EPA Victoria and include processes and measures to manage spoil. The SMP must define roles and responsibilities and include requirements and methods for: ■ Complying with applicable regulatory requirements. ■ Completing a detailed site investigation (in accordance with AS 4482.1-2005 *Guide to the investigation and sampling of sites with potentially contaminated soil* and the EPA Victoria Industrial Waste Resource Guidelines) prior to any excavation of potentially contaminated areas to identify location, types and extent of impacts and to characterise spoil to inform spoil and waste management. ■ Identifying the nature and extent of spoil (clean fill and contaminated spoil). ■ Storage, handling, transport and disposal of spoil in a manner that protects human health and the environment and is consistent with the transport management plan(s) required by EPR T2. This includes methods and requirements for the appropriate treatment/remediation of any contaminated excavated spoil and contaminated residual material left on site. ■ Design and management of temporary stockpile areas ■ Minimising impacts and risks from disturbance of acid sulfate soils (as per EPR CL2), odour (as per EPR CL3) and vapour and ground gas intrusion (as per EPR CL4) ■ Management of hazardous substances, including health, safety and environment procedures that address risks associated with exposure to hazardous substances for visitors and general public; contain measures to control exposure in accordance with relevant regulations, standards and best practice guidance and to the requirements of WorkSafe and EPA Victoria; and include method statements detailing monitoring and reporting requirements ■ Identifying where any contaminated or hazardous material is exposed during construction (notably through former landfills, service stations and industrial land) and how it will be made safe for the public and the environment. Beneficial uses of land and *National Environment Protection (Assessment of Site Contamination) Measure 2013* guidance on criteria protective of those beneficial uses must be considered for the land uses in these areas. This must include methods for: ▪ Construction of appropriate cover (soil, concrete, geofabric etc.) such that no contamination is left exposed at the surface or where it may be readily accessed by the public and such that it cannot generate runoff or leachate during rain events. ▪ Maintenance of the cover ▪ Identification of the nature and depth of the contaminants ▪ Mitigating impacts during sub-surface works in those areas, eg drilling and excavation

Asset	Environmental performance requirements
	■ Monitoring and reporting ■ Identifying locations and extent of any prescribed industrial waste (PIW), other waste, and the method for characterising PIW and other waste spoil prior to excavation ■ Identifying and managing potential sites for re-use, management or disposal of any spoil in accordance with the *Environment Protection Act 1970* waste management hierarchy ■ Identifying suitable sites for disposal of any waste. This includes identifying contingency arrangements for management of waste, where required, to address any identified capacity issues associated with the licensed landfills' ability to receive PIW and other waste.
Air quality impacts during construction	EPR CL3 – **Minimise odour impacts during spoil management** The SMP referenced in EPR CL1 must include requirements and methods for odour management (in accordance with EPA Victoria requirements) during the excavation, stockpiling and transportation of contaminated material including: ■ Identifying the areas of contamination that may pose an odour risk ■ Monitoring of the excavated material for possible odour risk ■ Management measures to minimise odour.

8.4 Mitigation and management measures

This section presents mitigation and management measures identified during preparation of the air quality impact assessment.

The identified risks associated with construction activities are:

- surface roads – Risks AQ01, AQ02, AQ03, AQ04, AQ06, AQ07, AQ08, AQ09
- tunnelling – Risks AQ10, AQ11, AQ12, AQ13.

Best practice management measures implemented through the Dust and Air Quality Management and Monitoring Plan are intended to address identified risks. This would ensure that potential emissions to air (particulate matter, odour and products of combustion) are minimised. The construction schedule, site activities and management measures required to meet the EPRs would be incorporated into the Dust and Air Quality Management and Monitoring Plan.

The following management measure categories would be included in the Dust and Air Quality Management and Monitoring Plan:

- engineering controls such as dust extraction/filtration systems for temporary underground tunnel ventilation structures
- planning controls such as location of stockpiles, scheduling known dust generating activities during favourable meteorological conditions (risk AQ10)
- operational controls such as wetting of stockpiles and unsealed roads (risks AQ10 and AQ11).

Potential air quality impacts during surface works would be localised and occur over a defined period. The implementation of appropriate management practices would ensure that impacts on nearby sensitive receptors and the receiving environment are minimised.

The mitigation measures presented in Table 31 to Table 33 are examples of the types of controls used to address the relevant risk.

Table 31: Engineering controls

Aspect	Possible mitigation measure
Underground tunnel ventilation structures (temporary)	Extraction and filtration system to remove particulate matter during extraction of spoil to the surface during underground excavations. (risk AQ11).
HCVs	Diesel fuelled equipment would be fitted with particulate filters and serviced in accordance with manufacturer's instructions (risk AQ05).

Table 32: Planning controls

Aspect	Possible mitigation measure
Underground tunnel ventilation structures (temporary)	Tunnel ventilation structures to be sited, where possible, at locations away from sensitive receptors (risk AQ11).
Pre-construction works	Dust minimisation measures would be developed and implemented prior to commencement of construction based on the key air quality risks identified for the project, prepared as part of the EES risk assessment process (risk AQ01).
Site entry/exits	Site exits would be fitted with hardstand material, rumble grids or other appropriate measures to limit the tracking of material off-site (risks AQ 01, AQ02 and AQ03).
Site barriers	Physical barriers would be erected at work/site compounds, where appropriate, using screens or wind breaks (risks AQ01, AQ02, AQ03, AQ06 and AQ10).
During and prior to daily commencement of construction works	Methods for the management of emissions, particularly particulate matter and odour, would be incorporated into project inductions, training and tool-box talks (risks AQ01, AQ02, AQ03, AQ04, AQ05, AQ06, AQ07, AQ08, AQ09, AQ10 and AQ13).
Location of dust generating activities	Where possible, dust generating activities would be located as far as practicable from sensitive receptors (risks AQ01, AQ02, AQ03, AQ06 and AQ07).
Adverse meteorological conditions	Dust generating activities would be curtailed under adverse meteorological conditions (for example high winds associated with extended dry periods) (risks AQ01, AQ02, AQ03, AQ06 and AQ07).
Land clearing	The size of land clearing areas and the duration the land remains cleared would be minimised (risk AQ01).
Vehicle movements	All vehicle movements would be strictly limited to designated entries and exits, haulage routes and parking areas (risks AQ05 and AQ06)
Stockpiles	Stockpiles would be minimised and located away from sensitive receptors, where practicable (risks AQ01, AQ02, AQ03, AQ04 and AQ07).
Exposed surfaces	Exposed soil surfaces would be revegetated, as soon as practicable (risk AQ01).
Fuels/chemicals	All chemicals and fuels would be stored in sealed containers as per relevant regulations and guidelines (risk AQ05).

Table 33: Operational controls

Aspect	Possible mitigation measure
Vehicle speed limits	Speed limits would be imposed on all construction vehicles while on site (risk AQ02, AQ03).
Vehicle loads	All trucks containing entrained material entering/leaving the construction sites would be covered (risks AQ02 and AQ03).
Truck tailgates	Tailgates of road transport trucks would be securely fixed prior to loading and immediately after unloading (risks AQ02 and AQ03).
Road washers/sweepers	Road washers or street sweepers would be used when mud and dirt has been tracked onto sealed road surfaces (risks AQ02 and AQ03).
Watering	Water would be applied to unsealed roads and work areas using a water cart. Application rates would be related to atmospheric conditions and the intensity and duration of construction activities (risks AQ02 and AQ03).
Water sprays/dust suppression	Water sprays or dust suppressants would be applied to stockpiles, as appropriate. Alternatively, stockpiles maybe covered with tarpaulins or high density polyethylene sheeting or hydro mulched if left standing for extended periods (risks AQ01, AQ02, AQ03, AQ04 and AQ07).
Vehicle maintenance	All vehicles and plant machinery would be maintained in good working order (risk AQ05).
Truck idling	Idling engines would be either switched off or throttled down to a minimum when not in use for more than 15 minutes (risk AQ05).
Truck emissions	Emissions from trucks would be regulated in accordance with the requirements of the Diesel Vehicle Emissions NEPM (NEPM 2001) (risk AQ05).
Temporary concrete batching plant	Particulate matter emissions from the concrete batching plant would be minimised by: ▪ wetting of feed material (aggregate) ▪ enclosure of conveyors ▪ installation of filtration apparatus on cement storage silos to control emissions during filling ▪ installation of filtration apparatus to control emissions from the weigh hopper and truck loading. All emission sources would be controlled and managed in accordance with the requirements of EPA Victoria Environmental Guidelines for the Concrete Batching Industry (EPA Victoria 2008) (risk AQ12). Potential impacts could also be mitigated through appropriate siting of plant with regard to the location of sensitive receptors.
Temporary asphalt plant	Air quality emissions (particulate matter and odour) from the mobile asphalt plant would be minimised by: ▪ wetting feed material ▪ ensuring that baghouse (and/or other appropriate control technology) is operating efficiently. (risk AQ08) Potential impacts could also be mitigated through appropriate siting of plant with regard to the location of sensitive receptors.

Aspect	Possible mitigation measure
Ambient air quality monitoring	An ambient air quality monitoring programme would be implemented as part of the Dust and Air Quality Management and Monitoring Plan, consisting of dust deposit gauges, directional dust gauges and real time PM_{10} and $PM_{2.5}$ instruments to determine the effectiveness of management measures (risks AQ02, AQ03, AQ06 and AQ07).
Daily odour/dust inspections	Daily inspections would be conducted to assess the effectiveness of odour and dust control measures with the outcomes reported. Further inspections may be required in response to community complaints (risks AQ01, AQ02, AQ03, AQ06 and AQ07).
Reactive air quality management system	A reactive air quality management system would be implemented to modify (ie reduce, suspend or cease) dust generating activities under forecast adverse meteorological conditions (for example high winds and prolonged dry periods) (risks AQ02, AQ03, AQ06 and AQ07).
Trigger Response Levels (TRLs)	TRLs (1 hour and rolling 24 hour average PM_{10} and $PM_{2.5}$ concentrations) would be established for construction works. TRLs would be a key tool in assessing impact potential and establishing an early warning system, thereby reducing complaint potential and non-compliances with ambient air quality criteria. The real-time ambient air quality monitoring program would be linked to the TRLs and associated control measures and documented in the Dust and Air Quality Management and Monitoring Plan (risks AQ02, AQ03, AQ06 and AQ07).
Complaints procedures	A mechanism for dealing with complaints would be established for the duration of the construction phase (risks AQ01 – AQ13).
Continuous improvement	A continuous improvement program for the management of particulate matter emissions would be incorporated into the Dust and Air Quality Management and Monitoring Plan (risks AQ02, AQ03, AQ06 and AQ07).

9.0 DISPERSION MODELLING APPROACH

The American Meteorological Society (AMS)/USEPA Regulatory Model (AERMOD Version 15181) was specifically designed to support the USEPA's regulatory programs. It is also the Victorian regulatory model, as defined under the SEPP(AQM). AERMOD is a steady-state plume modelling system with three components: AERMOD (dispersion model), AERMAP (terrain data pre-processor) and AERMET (meteorological data pre-processor).

AERMOD was used to predict pollutant ground level concentrations resulting from North East Link tunnel ventilation system emissions to air and vehicle emissions on project surface roads and a selection of existing roads.

When modelling sources in urban areas, AERMOD's urban option uses algorithms designed to enhance turbulence levels during night time stable conditions, to account for the urban heat island effect. The urban dispersion option was utilised for the assessment based on consultation with EPA Victoria, Akula Venkatram[1] and Lakes Environmental[2]. The urban option defaults to a surface roughness length of one metre, in accordance with USEPA regulatory guidance.

AERMOD requires a range of inputs:

- topography
- meteorology
- background pollutant concentrations
- vehicle emissions.

These inputs are discussed in the following sections.

9.1 Topography

Shuttle Radar Topography Mission (SRTM) one arc-second (approximately 30 metres) global digital surface model data is commonly used for plume dispersion modelling purposes. However, raw SRTM data cannot distinguish between ground surface topography and other elevated features such as tree canopies and buildings and is therefore subject to editing and processing, such as: delineating and flattening water bodies, better defining coastlines, removing spikes and wells and filling small voids. For this reason, the topographical dataset input into the model was developed from *Department of Environment, Land, Water and Planning (DELWP), 2015: Metro Contour 1-5 Metre – Vicmap Elevation* data, which contains relief features represented at one metre intervals with some areas at five metre intervals.

The topography for the study area is illustrated in Figure 6 and described in Section 6.2.

9.2 Meteorology

Meteorological input files were developed in accordance with guidelines provided in EPA Victoria Publication No. 1550 (EPA Victoria 2014), for meteorological pre-processing using USEPA formulae.

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[1] Professor of Mechanical Engineering at University of California Riverside who formulated the AERMOD urban option equations and was a member of the American Meteorological Society and US EPA Regulatory Model Improvement Committee (AERMIC) which developed. AERMOD Personal communication, A. Venkatram, University of California Riverside, 23 June 2018.

[2] Developers of air quality modelling software that utilises AERMOD. Personal communication, M. Hammer, Lakes Environmental, 21 June 2018

Meteorological data sources described in Table 34 were used in conjunction with AERMET to generate five 12 month meteorological data files for 2013 to 2017. These years were considered representative of meteorology for the local area and correspond to the period selected for background air quality data. The meteorological stations were chosen such that each of the required parameters for meteorological pre-processing were sourced from stations nearest to the study area. Cloud cover and sonde data are not measured at the nearest meteorological station, Viewbank, and were therefore sourced from Essendon Airport and Melbourne Airport respectively.

Table 34: Meteorological data

Meteorological station	Meteorological parameters	Approximate distance and direction from project [1]	Data source
Viewbank	Wind speed [2] Wind direction [3] Temperature [2] Sigma theta [2]	2.0 km north-east	Bureau of Meteorology
Essendon Airport	Cloud cover [4]	15 km west	Bureau of Meteorology
Melbourne Airport	Twice daily sonde data [5]	24 km west-north-west	Bureau of Meteorology

Notes:

1 Approximate centre of North East Link tunnel alignment
2 Scalar 1-hour averages
3 Vector 1-hour averages
4 Average of two 30-minute ceilometer means for each hour
5 Pressure, height, temperature, dew point, wind direction and wind speed

Table 35 provides surface characteristics for the meteorological site used to develop the model input meteorological files, determined in accordance with EPA Victoria 2014, in conjunction with aerial imagery maps.

Table 35: Meteorological modelling surface characteristics

Surface characteristic	Sector dependency	Sector	Summer	Autumn	Winter	Spring
Albedo	No	NA	0.16	0.16	0.18	0.16
Bowen ratio	No	NA	0.8	1.0	1.0	0.8
Surface roughness (m)	Yes	0–30	0.7	0.7	0.5	0.6
		30–60	0.6	0.6	0.5	0.6
		60–90	0.5	0.5	0.4	0.5
		90–120	0.4	0.4	0.3	0.4
		120–150	0.4	0.4	0.3	0.4
		150–180	0.4	0.4	0.3	0.4
		180–210	0.4	0.4	0.3	0.4
		210–240	0.3	0.3	0.3	0.3
		240–270	0.3	0.3	0.3	0.3
		270–300	0.3	0.3	0.3	0.3
		300–330	0.7	0.7	0.5	0.7
		330–0	0.7	0.7	0.5	0.7

Figure 31 illustrates the relative locations of the Viewbank, Essendon Airport and Melbourne Airport meteorological stations.

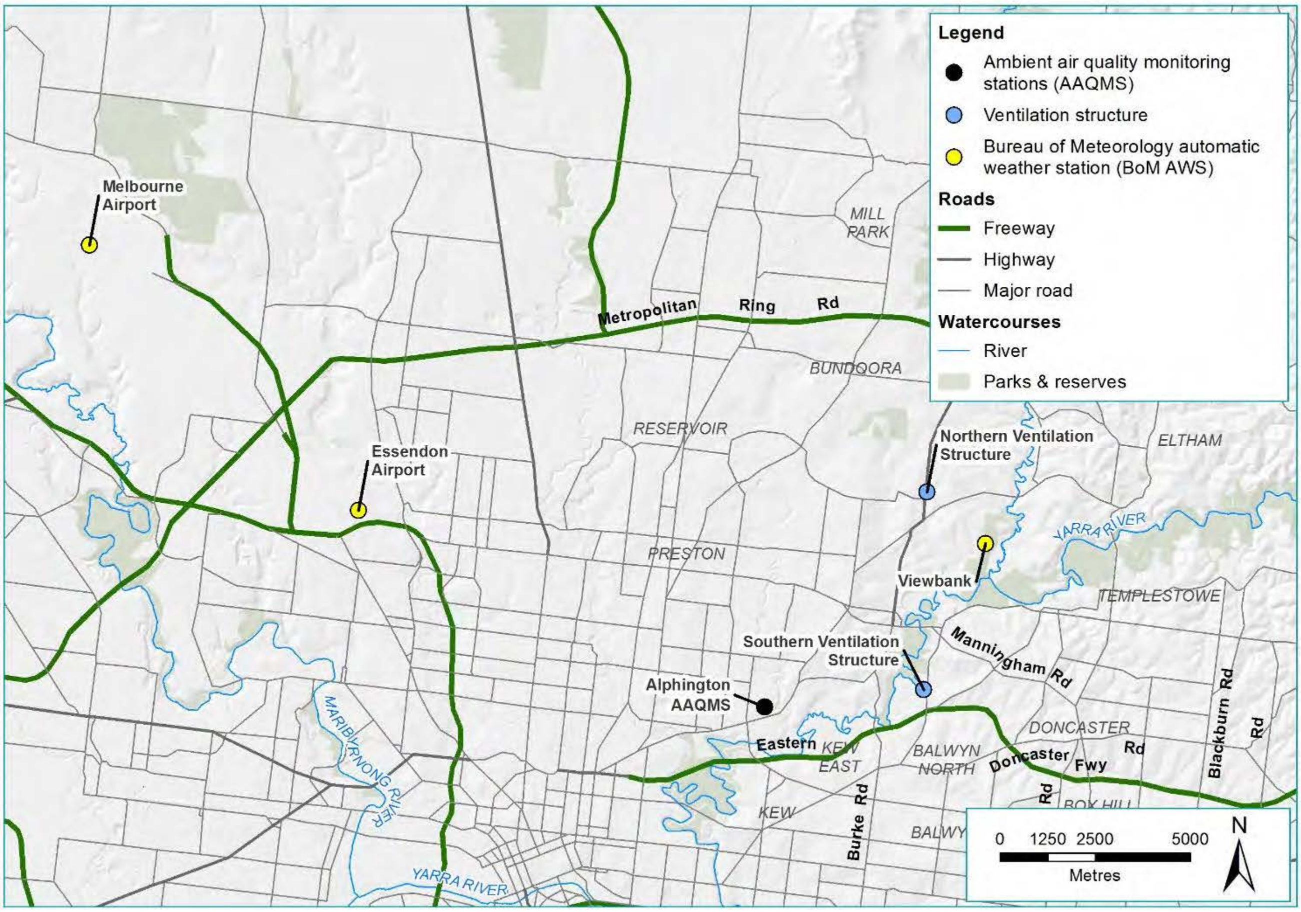


Figure 31: Viewbank, Essendon Airport and Melbourne Airport AWS locations (Source: NELP)

Calm winds (less than 0.3 metres per second), and hours where there is insufficient data between each of the three meteorological stations for AERMET to generate valid meteorological data, are not considered by AERMOD. Summary statistics of the meteorological files produced by AERMET for use in AERMOD are provided in Table 36.

Table 36: AERMOD meteorological file summary statistics

Year	Total hours	Calm hours [1]	Missing hours [2]	Modelling hours
2013	8,760	210	75	8,475 (96.7%)
2014	8,760	285	114	8,361 (95.4%)
2015	8,760	396	40	8,324 (95.0%)
2016	8,784	400	94	8,290 (94.4%)
2017	8,760	542	124	8,094 (92.4%)

Notes:
1 Wind speed less than 0.3 m/s
2 No data available from meteorological station

9.3 Background pollutant concentrations

Schedule C of SEPP(AQM) requires a modelling assessment to consider background air quality in order to conduct a cumulative assessment (background plus project incremental impact). Where available, time-varying hourly background concentrations should be added to hourly predicted GLCs to present a contemporaneous assessment.

EPA Victoria's Alphington AAQMS provides the most comprehensive datasets for PM_{10}, $PM_{2.5}$, CO and NO_2 in the vicinity of the project and has therefore been used to represent background air quality for the air quality impact assessment. There is, however, no hourly average $PM_{2.5}$ data available for the year 2013.

Air toxics background concentrations for the project were as recommended by EPA Victoria.

Details of the background concentrations incorporated in the assessment are discussed in Section 6.6.7.

9.4 Vehicle emissions

Traffic modelling was undertaken by VLC and Smedtech to predict traffic volumes and fleet mixes [passenger cars (PC), light commercial vehicles (LCV) and HCVs] for the years 2026 and 2036 for the purposes of the EES. These years are understood to be generally representative of the 'expected year of opening' and 'ten years following project opening'. This traffic data formed the basis for the air quality impact assessment.

The upper limit of the predicted traffic volume range provided was conservatively selected.

9.4.1 Diesel passenger cars

Traffic modelling did not distinguish between petrol and diesel fuelled passenger cars.

The Australian Bureau of Statistics motor vehicle census data for 2017 indicates the Australian passenger car fleet consisted of approximately 13 per cent diesel vehicles, up from 12 per cent in 2016 and 7.7 per cent in 2012. Data suggests the rise in sport utility vehicle sales (32 per cent diesel) has balanced a decline in diesel sales in other passenger car classes.

In the absence of other data, passenger car traffic for North East Link has been assumed to be 15 per cent diesel and 85 per cent petrol fuelled cars. In general terms, a higher percentage of diesel fuelled cars would mean lower CO emissions and higher particulate matter (PM_{10} and $PM_{2.5}$) and NO_2 emissions. Improvements in emission control technology in the intervening period may offset this potential increase in particulate matter and NO_2 emissions. The effect of the assumed ratio of diesel to petrol fuelled cars on modelled outcomes is discussed further in Section 10.4.3.

9.4.2 Hybrid and electric vehicles

Consistent with the conservative approach to estimating emissions, hybrid and electric vehicles (EVs) were not considered in the impact assessment. However, they are likely to have a significant effect in reducing Victorian fleet emissions by 2036, as described below.

The proportion of EVs in fleets worldwide is predicted to increase dramatically during the next two decades, due to a broad range of factors which include:

- decreased purchase costs compared with internal combustion engine (ICE) vehicles, driven by the decrease in battery production costs, manufacturing economies of scale, higher levels of automation and lower labour intensity
- lower operating costs, due to electricity versus fuel costs and lower repair and maintenance costs associated with a less complex powertrain
- increased availability of charging infrastructure, together with decreased charging times

- increased driving range before charging is required
- government intervention, through regulation, taxes and subsidies.

Europe currently has approximately 25 per cent of global passenger vehicle production. ING Economics Department predicts that 100 per cent of European new passenger vehicle registrations will be electric by 2035 (ING 2017).

Volvo has announced plans to build only electric and hybrid vehicles from 2019, with Porsche predicting that 50 per cent of production will be electric by 2023. Other European manufacturers are expected to make similar adjustments.

Approximately 30 per cent of all passenger vehicles produced globally are from China, with the Chinese market representing 43 per cent of global EV sales in 2016 (ING 2017).

The Californian Zero Emissions Vehicle (ZEV) regulation requires manufacturers to increase EV sales to approximately 15 per cent by 2025 (Sperling & Brown, 2018). The California Air Resources Board manages the ZEV programme, however it has also been adopted by nine other US States (Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island and Vermont).

The Victorian Automobile Chamber of Commerce (VACC) made a submission to Infrastructure Victoria in response to an inquiry on automated and zero emission vehicle infrastructure (VACC 2018). VACC note that EVs are forecast to reach price parity with ICE vehicles around 2025 to 2026, with the cost continuing to decrease such that EVs may be 15 per cent cheaper than equivalent ICEs by 2030.

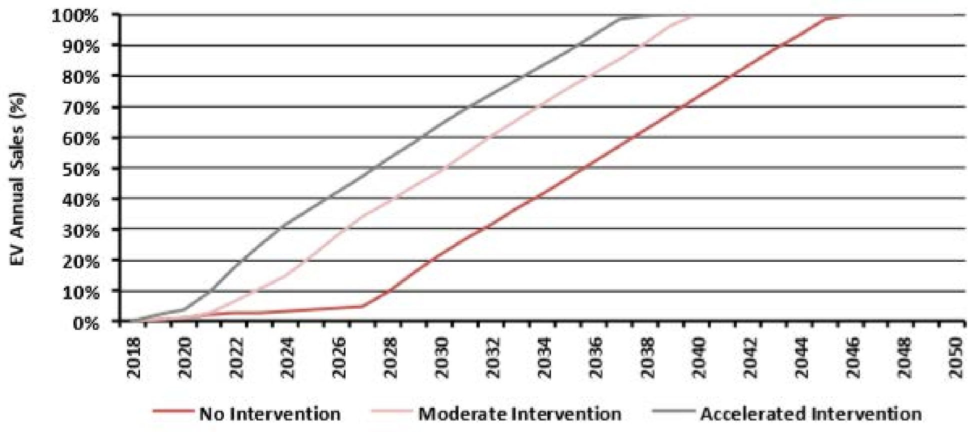
The submission focussed on the anticipated effects of both high and low level EV uptake in Victoria. The low uptake scenario examined assumes a one per cent adoption rate in 2021, rising to 10 per cent by 2030, with the high up-take scenario assuming two per cent in 2021 and 20 per cent by 2030. However, the basis of these assumptions is not described.

In 2017 the Australian Renewable Energy Agency and the Clean Energy Finance Corporation engaged Energeia to undertake an Electric Vehicle Market Study (Energeia 2018). The study noted that previous research had indicated the uptake of Plug-in Electric Vehicles (PEV) is dependent on purchase premiums and model availability, with future drivers including:

- PEV driving ranges expected to reach parity with ICE vehicles by 2024
- PEV refuelling times expected to reach parity with ICE vehicles by 2020 at current battery sizes
- stationary wireless charging technology to become standard within 10 years
- manufacturers reporting production of over 165 new PEV models by 2030.

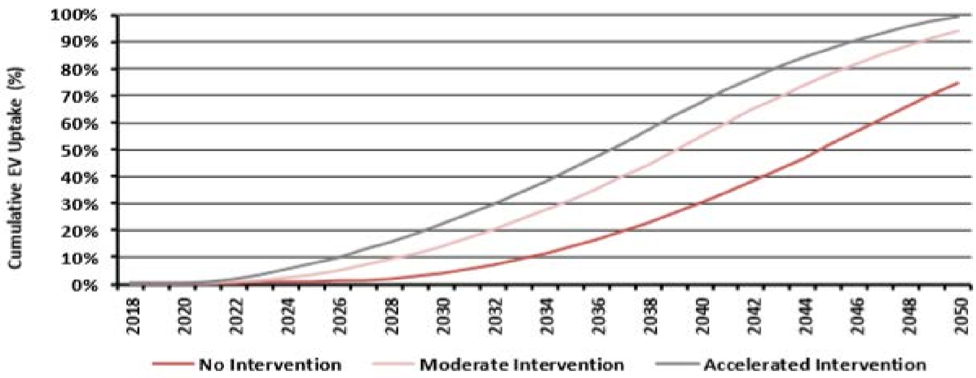
The possibility of fuel cell EVs supplanting PEVs during the next 20 to 30 years is considered remote, given the slow rate of technological development and limited model availability.

Energeia conducted modelling to predict the percentage of PEV sales and fleet percentages, with the results for Australia reproduced in Figure 32 and Figure 33.



Source: Energeia Modelling

Figure 32: PEV sale projections



Source: Energeia Modelling

Figure 33: PEV fleet percentage

The no intervention scenario assumes there is no additional action by any stakeholder in Australia, with PEV uptake driven solely by economic considerations. The moderate intervention scenario assumes a mix of policy support from federal, state and local governments, with no long-term decarbonisation target. The accelerated intervention scenario assumes that policy intervention occurs earlier with a higher level of support, together with the additional assumption that ICE vehicle sales will be banned toward the end of the period evaluated.

The PEV forecasts account for passenger cars, SUV, light commercial (vans and trucks), buses and rigid vehicles, but exclude hybrid EVs, articulated trucks and speciality vehicles such as bucket trucks.

In 2016 the PEV share of vehicle sales in Australia was 0.1 per cent, compared with 28.8 per cent for Norway and 6.4 per cent for the Netherlands. Based on the moderate intervention scenario the PEV share of vehicle sales in Victoria is predicted to increase to 28 per cent in 2026 and 80 per cent in 2036.

9.4.3 Emission factors

PIARC publishes country-specific emission factors that are widely used to estimate pollutant emission rates generated in tunnels and assess ventilation requirements to maintain acceptable in-tunnel air quality and visibility. PIARC published Australian specific road tunnel emission factors in 2012, based on vehicle fleet composition, vehicle speed and road gradient (PIARC 2012).

The PIARC base year is 2010, with emission factors for future years (up to 2020) adjusted by reduction factors, accounting for improvements in average engine performance. Emission factors for CO, NO_x and visibility are provided for petrol PCs (PCPs, CO and NO_x only), diesel PCs (PCDs), LCVs and HCVs at various speeds and gradients between minus six per cent and plus six per cent, with a factor provided for converting visibility factors to $PM_{2.5}$.

However, PIARC does not provide visibility ($PM_{2.5}$) emission factors for PCP, nor PM_{10}, NO_2, VOCs or PAH emission factors for any vehicle class.

Vehicle emission factors were therefore based on those contained in the COPERT Australia road transport air pollutant emission inventory model. COPERT is used primarily for developing emission inventories at a city, state or national network level, processing a variety of additional and more detailed inputs than those required for PIARC. The software has been adopted by the NPI as the recommended model for motor vehicle emission inventories.

While PIARC provides base emission factors for four classes of vehicle and addresses reductions in emissions due to improvements in technology, using reduction factors for future years, COPERT Australia includes emission factors for vehicles meeting various Australian vehicle emission standards.

This approach permits a more accurate representation of the fleet mix but requires a greater level of detail to be provided in the first instance, including the mix of PCPs, PCDs, LCVs and HCVs, as well as the mix of vehicle types within each of these classes. For example, COPERT Australia classifies PCPs as small, medium and large, with each of these sub-classes divided into 10 vehicle emission standards (including ADR27; ADR37-00; ADR37-01; ADR79-00).

In total, COPERT Australia includes 226 individual vehicle classes. The mean fleet mileage of each of these sub-classes is also taken into consideration to estimate the effect of engine degradation on emissions, together with fuel quality and climate.

In the absence of this level of detail, the North East Link model was configured on a state based level, including vehicle fleet mix and mean fleet mileage statistics for Victoria in 2010. This information was developed as part of the NPI Australian Motor Vehicle Emissions Inventory (MVEI) and compiled in a COPERT Australia input file.

By modifying the input file to suit [such as setting all vehicle class populations (PCP, PCD) to zero except for the one of interest] and specifying all vehicles travelling at 80 kilometres per hour for Scenarios A1, A2, B1 and B2 (as described in the following section), emission factors for that class in grams per vehicle kilometre travelled (g/VKT) were calculated by dividing the model output annual emissions (in tonnes per year) by the annual mileage of that vehicle class.

A (partial) validation study (Smit et al 2015) of COPERT Australia with in-ventilation system monitoring data from Brisbane's Clem Jones Tunnel (CLEM7) suggests that COPERT Australia is generally accurate at fleet level for PM_{10}, $PM_{2.5}$, CO and NO_X. COPERT was found to underestimate emissions by between 7 per cent and 37 per cent for the particular characteristics of CLEM7 and the fleet mix observed within. The results indicate that overall underestimation for particulate matter emissions are small, but more significant for HCVs, with the study concluding that, given the range of factors that complicate validation for particulate matter, the results show a remarkably good performance for COPERT Australia. Golder undertook a similar, smaller scale, study on another Australian road tunnel ventilation system. As noted by Smit el al. (2015), hours of the day with small traffic volumes can be significantly impacted by potential errors in estimated background concentration levels. Golder's study found that for peak traffic hours (6 am to 9 am and 4 pm to 7 pm), COPERT Australia represented the tunnel data reasonably (and more closely than PIARC), with a comparative factor (ratio of COPERT emissions to observed emissions) of between 0.9 and 3.3 for PM_{10}, and between 1.0 and 3.9 for $PM_{2.5}$.

For the purposes of this assessment, the conservative assumptions included in the estimation of the emission rates (refer Section 9.5) are considered to compensate for any potential underestimation by COPERT Australia.

Scenarios A1 and B1

In the absence of current (2018) or future year Victorian vehicle fleet mix and mean fleet mileage statistics with which to configure COPERT Australia, adjustments to the Victoria 2010 derived emission factors were subsequently made based on PIARC future year factors for PM_{10}, $PM_{2.5}$, CO and NO_x in 2020 (refer to Table 37) and the following equation:

2020 emissions factors = 2010 assessment emission factors x 2020 future year factor

Table 37: 2020 future year factors for adjusting 2010 emission factors

Pollutant	Vehicle class			
	PCP	PCD	LCD	HCV
PM_{10}	0.37	0.37	0.41	0.49
$PM_{2.5}$	0.37	0.37	0.41	0.49
CO	0.42	0.43	0.51	0.50
NO_x	0.31	0.61	0.48	0.52

Scenarios A2 and B2

Composite vehicle emission factors for Brisbane for the years 2010 and 2025 (Brisbane City Council 2016) developed using COPERT Australia were used to estimate future year factors with which to adjust the PM_{10}, $PM_{2.5}$ and NO_2 assessment emission factors out to 2025:

2025 emissions factors = 2010 assessment emission factors x 2025 future year factor

The derived 2025 factors are provided in Table 38.

Table 38: 2025 factors for adjusting 2010 emission factors

Pollutant	Vehicle class			
	PCP	PCD	LCD	HCV
PM_{10}	0.4	0.4	0.4	0.21
$PM_{2.5}$	0.31	0.31	0.31	0.16
NO_2	0.15	0.15	0.15	0.18

The resultant 2025 emission rates are significantly below the 2020 emission rates, with diurnal PM_{10} emissions 22 to 47 per cent lower, $PM_{2.5}$ emissions 40 to 57 per cent lower and NO_2 emissions approximately 67 per cent lower.

It is noted that Brisbane City Council vehicle emission factors also do not take into account the expected increase in EVs in the future fleet mix, which would reduce these factors further.

COPERT Australia does not include ethylbenzene emission information for HCVs. For this compound, an emission factor was derived from the HCV benzene emission factor, scaled using the PCD benzene to PCD ethylbenzene ratio.

It is noted that COPERT Australia emission factors are not gradient dependent and the PAH emission factors are not speed dependent. In the absence of gradient dependencies, adjustments informed by the gradient dependencies described by PIARC were made for PM_{10}, $PM_{2.5}$, CO and NO_2 as provided in Table 39. No adjustments were made for VOCs or PAH.

Table 39: Gradient scaling for emission factors

Vehicle class	Vehicle speed (kph)	Gradient (%)														
		PM_{10} and $PM_{2.5}$					CO					NO_2				
		-4	-2	0	+2	+4	-4	-2	0	+2	+4	-4	-2	0	+2	+4
PCP	20	28	34	100	154	205	79	90	100	115	132	42	48	100	135	165
	40	17	32	100	155	216	61	77	100	128	167	30	46	100	146	209
	50	16	31	100	163	231	55	74	100	136	189	28	39	100	160	240
	60	14	28	100	169	238	50	71	100	144	206	25	41	100	176	264
	80	9	40	100	160	218	41	62	100	163	253	17	46	100	174	256
	100	6	50	100	148	196	35	56	100	191	363	11	46	100	163	237
PCD	20	28	34	100	154	205	87	89	100	108	102	42	48	100	135	165
	40	17	32	100	155	216	80	84	100	103	111	30	46	100	146	209
	50	16	31	100	163	231	83	87	100	119	94	28	39	100	160	240
	60	14	28	100	169	238	86	91	100	118	79	25	41	100	176	264
	80	9	40	100	160	218	79	93	100	72	65	17	46	100	174	256
	100	6	50	100	148	196	98	117	100	80	100	11	46	100	163	237
LCV	20	21	39	100	150	200	32	49	100	89	50	29	44	100	110	115
	40	13	43	100	151	205	48	118	100	91	204	30	78	100	109	181
	50	11	41	100	157	214	64	169	100	193	436	34	96	100	166	276
	60	9	44	100	157	212	62	204	100	318	696	31	115	100	211	342
	80	6	53	100	146	193	19	72	100	262	418	15	56	100	136	265
	100	25	62	100	137	174	21	31	100	172	258	20	47	100	154	214
HCV	20	52	74	100	123	148	46	81	100	112	133	24	70	100	141	199
	40	41	76	100	134	183	39	82	100	130	172	17	62	100	167	255
	50	36	71	100	148	203	35	77	100	143	189	13	55	100	188	282
	60	31	64	100	161	221	29	68	100	155	204	9	43	100	203	302
	80	21	53	100	169	236	21	58	100	158	215	6	33	100	198	289
	100	21	51	100	155	215	20	55	100	147	201	6	35	100	171	242

Overall, the emission factors representing the year 2020 (Scenarios A1 and B1) are considered conservatively high because there is a general trend towards lower emission vehicles, with potential improvements in vehicle technology, and consequently vehicle fleet emission reductions beyond 2020 are not accounted for. The 2025 emission factors (Scenarios A2 and B2) are considered more realistic for 2026 and are likely to be conservative for 2036, assuming further improvements in the vehicle fleet, including the increased adoption of electric vehicles.

9.5 Summary of modelling conservative assumptions

The assessment used a range of conservative assumptions, including:

- Five years of meteorological data were assessed such that years corresponding to the greatest predicted impact from the ventilation system and surface roads were selected for the air quality impact assessment.
- Background pollutant concentrations for the modelled years (2026 and 2036) were assumed to remain at levels recorded for the period 2013 to 2017. EPA Victoria predicts a significant reduction in CO and NO_2 concentrations over the next 20 years through cleaner exhaust emissions from petrol, diesel and LPG engines and improvements in national motor vehicle emission standards. Similarly, a significant reduction in particle emissions ($PM_{2.5}$) from diesel vehicle engines is expected by 2030. Concentrations of these pollutants in 2026 and, in particular, 2036, will therefore be lower than those used as background levels in the air quality impact assessment.
- The upper limit of the predicted traffic volume range provided for all roads was selected.
- The adopted background concentrations for PM_{10}, $PM_{2.5}$, CO and NO_2 include exceptional events [as defined in the SEPP(AAQ)] such as bushfires, controlled burns and dust storms. During these periods, concentrations of particulate matter (PM_{10} and $PM_{2.5}$) can reach extremely high levels. Inclusion of data during these periods as representative background concentrations for the project can be highly conservative, contributing a significant proportion of the overall impact (background plus predicted).
- Vehicle emission factors used in Scenarios A1 and B1, representing 2026 and 2036 traffic, were assumed to remain at levels predicted for 2020. Vehicle emission factors used in Scenarios A2 and B2 were assumed to remain at levels predicted for 2025. Emission factors used for this assessment are considered conservatively high because there is a general trend towards lower emission vehicles (older technology vehicles being replaced over time with newer, improved technology vehicles) and expected improvements in vehicle technology beyond 2020 and 2025, which are not accounted for in the air quality impact assessment.
- Hybrid and EVs were not considered in the fleet mix. The percentages of lower emission and zero emission vehicles in the Victorian vehicle fleet are expected to increase in future years.
- Acoustic barriers were not considered to have any effect on pollutant concentrations downwind. There is a significant body of evidence to suggest that acoustic barriers reduce pollutant concentrations immediately downwind of roadways at the most impacted sensitive receptors (Section 13.2.2).

10.0 VENTILATION SYSTEM IMPACTS

Emissions from vehicles travelling through the tunnels are discharged through the ventilation system and dispersed into the atmosphere. Dispersion modelling techniques are used to predict pollutant GLCs, which are subsequently added to background levels and assessed against applicable air quality criteria.

10.1 Ventilation system design

Tunnel ventilation systems are designed to provide adequate in-tunnel air quality during normal operation, in addition to supporting self evacuation and rescue efforts during emergency incidents. The ventilation system design capacity is based on the air demand required to maintain acceptable in-tunnel visibility, together with CO and NO_2 concentrations.

The required volume of fresh air for a given tunnel traffic condition depends on the number of vehicles in the tunnel, the average pollutant emission per vehicle, the allowable in-tunnel concentration and the ambient concentration.

Fresh air entering the tunnel through the entry portal is drawn through the tunnel due to the movement of vehicles (piston effect) and the action of jet fans installed along the length of the tunnel. Prior to the tunnel exit portal, air is withdrawn from the tunnel into a ventilation structure and discharged to atmosphere. Additional jet fans are installed immediately prior to the exit portal to reverse the air flow and prevent emissions of pollutants from the portal.

The North East Link air quality impact assessment has assumed there are no emissions from the tunnel portals and that all vehicle emissions occurring within the tunnels are discharged via the ventilation structures.

10.2 Assessment approach

Plume dispersion modelling was used to predict pollutant GLCs resulting from the tunnel ventilation system emissions to air.

The modelling assessment was conducted in accordance with the requirements of Schedule C of the SEPP(AQM), using the regulatory model, AERMOD. The model was prepared in accordance with EPA Victoria guidelines (EPA Victoria 2015), with the exception being use of the AERMOD urban option, as discussed in Section 9.2.

Consistent with risk AQ16 and AQ17 identified in Section 7.0, the impacts of emissions from the ventilation system were also assessed at identified discrete receptors.

10.3 Model inputs

In addition to the inputs described in Section 9.0, AERMOD requires modelling domain receptors and source emission characteristics. These inputs are discussed in the following sections.

10.3.1 Model domain and receptors

A 10 kilometre by 15 kilometre model domain centred on the project (half-way between the tunnel ventilation structures) was included in the model. Within this domain, three uniform Cartesian receptor grids with the following characteristics were included:

- an outer grid measuring 10 kilometres by 16 kilometres (160 square kilometres) centred on the project with a 100 metre resolution
- an inner grid measuring 2.5 kilometres by 2.5 kilometres (6.25 square kilometres) centred on the northern ventilation structure with a 25 metre resolution

- an inner grid measuring 2.5 kilometres by 2.5 kilometres (6.25 square kilometres) centred on the southern ventilation structure with a 25 metre resolution.

All gridded receptor points were input at ground level. Discrete receptors (refer Section 6.2) were also used within the model domain. All discrete receptor points were input at ground level.

Figure 34 shows the inner and outer grid of the model domain.

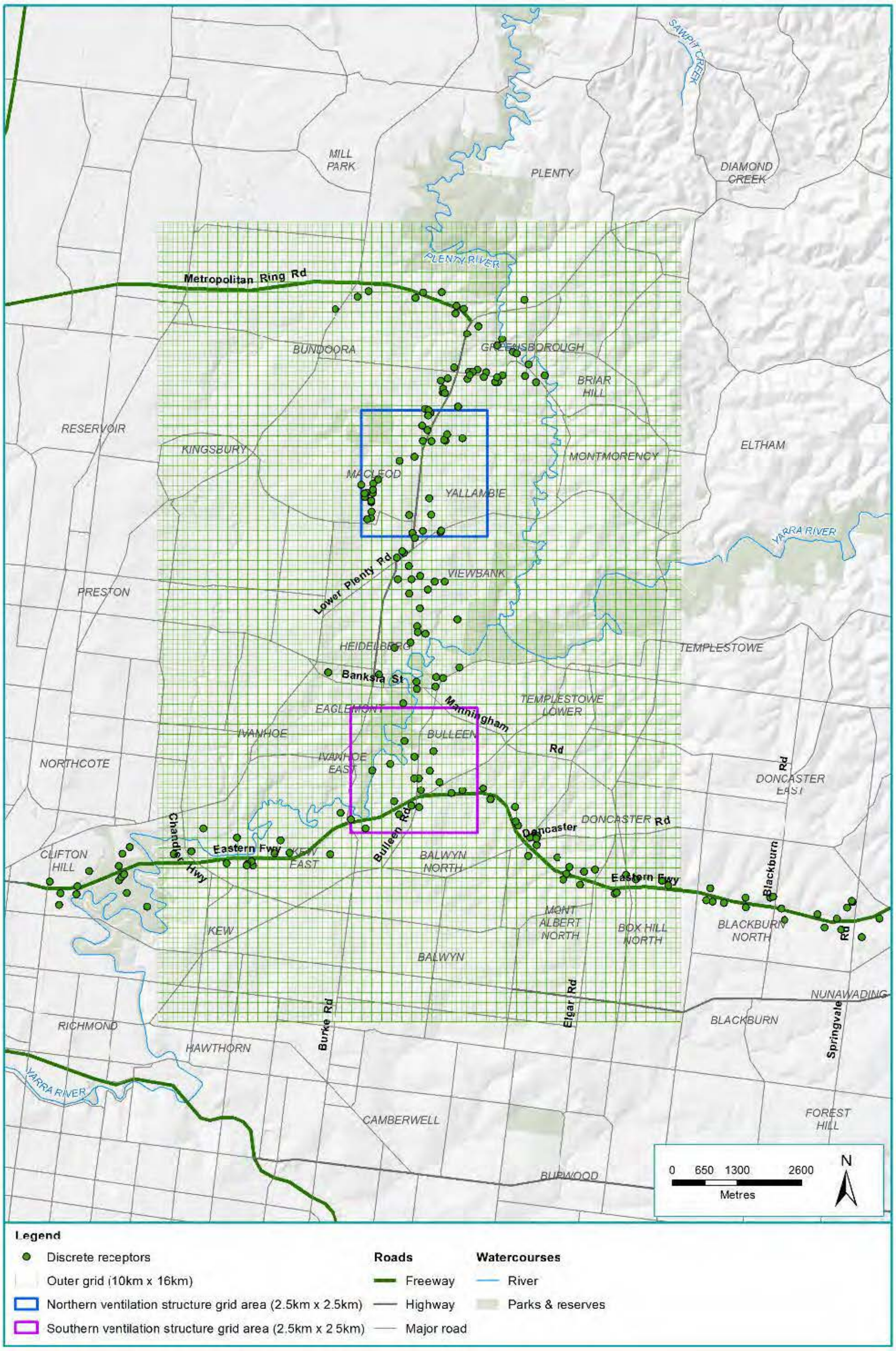


Figure 34: Model domain gridded and discrete receptors

10.3.2 Emission sources

North East link design includes duty fans serving each tunnel ventilation structure, the speeds of which are controlled such that vitiated air flowing through the tunnel in the direction of traffic, plus incoming air from the downstream portal, is captured and dispersed. Due to the increase in elevation to the north, traffic emissions from the northbound tunnel are predicted to be greater than those from the southbound.

The ventilation system is designed to account for this with a larger diameter northern ventilation structure permitting higher ventilation rates.

Each ventilation structure consists of a primary and secondary vent. Utilising the primary and secondary vents in combination enables the exhaust air velocity to be maintained between approximately 18 and 22 metres per second, with combined ventilation rates of approximately 590 to 970 cubic metres per second in the southern structure and 740 to 1,290 cubic meters per second in the northern structure. The primary vent of each ventilation structure would operate at all times, with use of the secondary vent dependent on the time of day, vehicle volumes, in-tunnel air quality and maintenance schedules. For the purposes of modelling, the primary and secondary vent configurations of each ventilation structure have been represented by two discharge points. The southern ventilation structure vent diameters are 6.5 metres and 4.7 metres (corresponding to cross sectional areas of 33 and 17 square metres) respectively, and the northern ventilation structure diameters are 7.1 and 5.0 meters (corresponding to cross sectional areas of 40 and 20 square metres) respectively.

In the absence of other information, ventilation structure exhaust temperatures have been assumed to be equal to ambient temperatures (as determined from the modelling meteorological file). In reality, the exhaust temperature would be greater than the ambient temperature under most circumstances, due to the heat generated from vehicles inside the tunnel.

The tunnel structure itself, having a large thermal mass, remains at a relatively constant temperature (closely linked to the surrounding ground temperature) and either heats or cools the ventilation air depending on the relative temperatures.

The heat input from vehicles is significant and in a form (exhaust and radiator rejected heat) that is readily mixed with tunnel ventilation air. The result is a degree of heating positively related to traffic load and negatively related to ventilation rate. The net effect is to raise the ventilation structure exhaust temperature above ambient levels.

A ventilation structure temperature greater than ambient results in a more buoyant plume, thereby increasing dispersal. Consequently, by modelling the exhaust temperature equal to ambient, model predictions are considered conservatively high.

Based on the ventilation system design, the northbound and southbound tunnel ventilation structures are represented in the model as point sources, as described in Table 40.

Other pollutant sources within the model domain were not assessed, however, background concentrations representative of the local area have been included. In addition, the local impact of North East Link surface roads and selected existing surface roads has been considered in Section 7.0.

Table 40: Ventilation structure parameters

Vent parameter	Northern	Southern
Location (UTM coordinates; m): Primary Secondary	 330961 E, 5823137 S 330962 E, 5823147 S	 330740 E, 5817394 S 330749 E, 5817394 S
Release height above ground level (m)	40	40
Base elevation (m)	71	15
Exhaust temperature (°C)	Ambient	Ambient
Vent diameter (m) Primary Secondary	 7.1 5.0	 6.5 4.7

The magnitude of pollutant emission rates from the ventilation structures depends on the type and volume of vehicles using the tunnels. The predicted vehicular traffic through the tunnels in conjunction with vehicle specific emission factors (Section 9.4.3) and tunnel gradients were used to generate hourly ventilation structure emission inventories.

10.3.3 Traffic data

Predicted traffic volumes and fleet mixes for 2026 and 2036 were used as the basis for the air quality impact assessment:

- Scenarios A1 (2020 emission factors) and A2 (2025 emission factors) –projected traffic volume and fleet mix for 2026 under normal operating conditions
- Scenarios B1 (2020 emission factors) and B2 (2025 emission factors) – projected traffic volume and fleet mix for 2036 under normal operating conditions.

Traffic modelling provided the volumes of passenger cars (PC), light commercial vehicles (LCV) and heavy commercial vehicles (HCV) for the northbound and southbound tunnels for 2026 and 2036 between Blamey Road and Manningham Road (herein the ‘north section’) and between Manningham Road and Bulleen Oval (herein the ‘south section’).

Hourly traffic fleet mix developed from the traffic data for PCP, PCD, LCV and HCV for Scenarios A1, A2, B1 and B2 are presented in Figure 35 to Figure 42. Hourly traffic fleet composition data are provided in APPENDIX D.

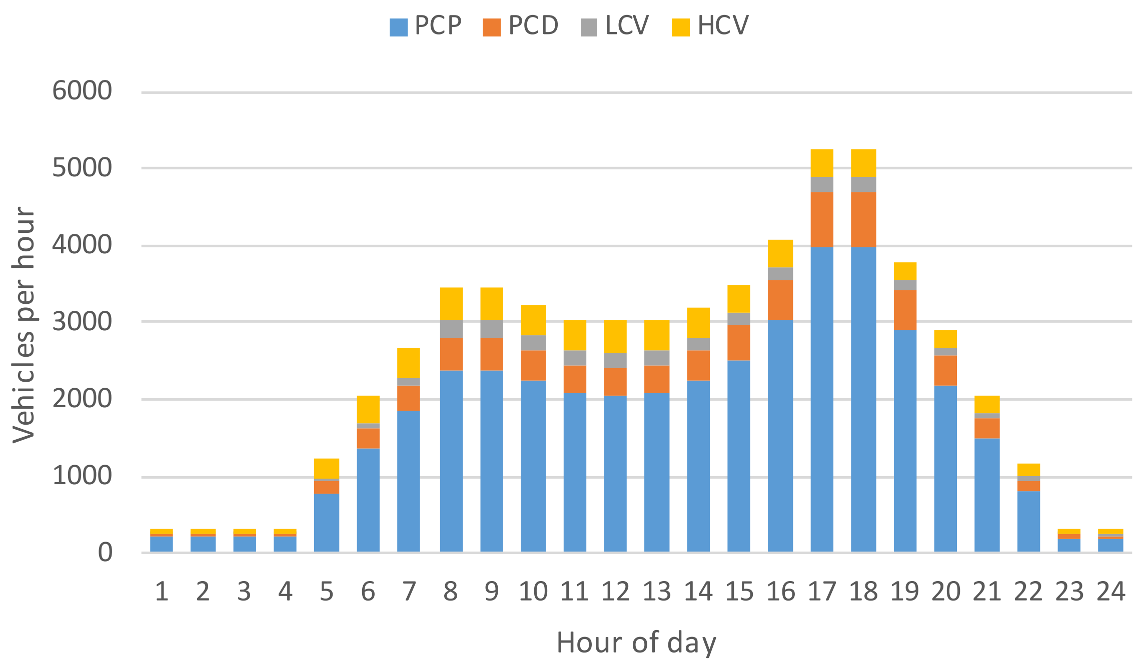


Figure 35: Scenarios A1 and A2 northbound traffic – north section

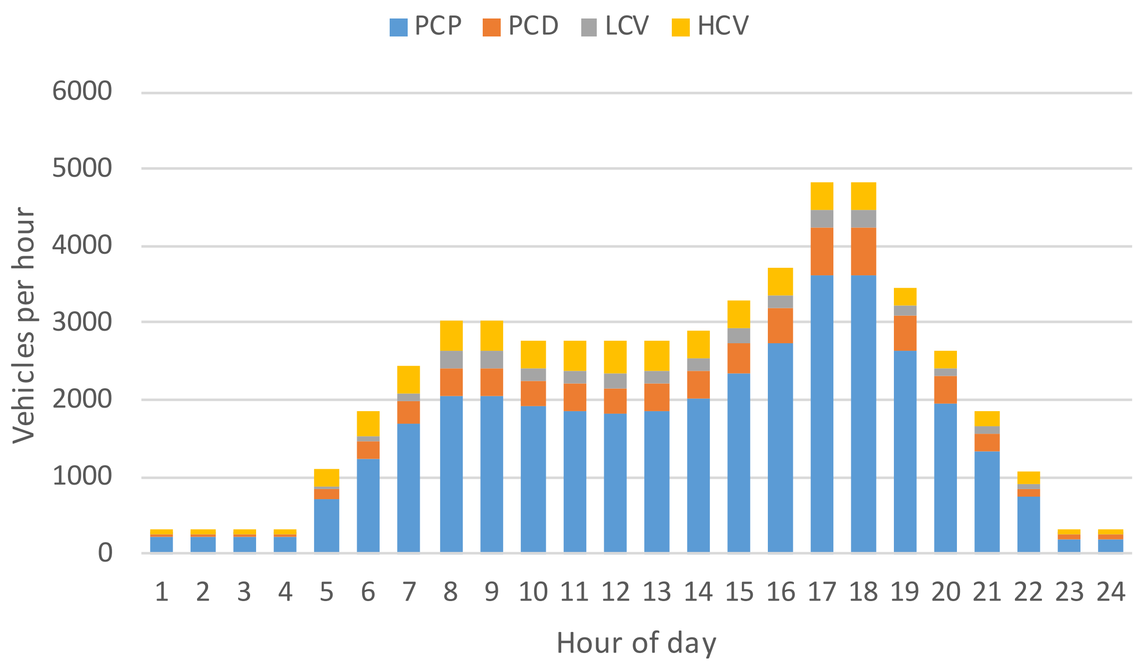


Figure 36: Scenarios A1 and A2 northbound traffic – south section

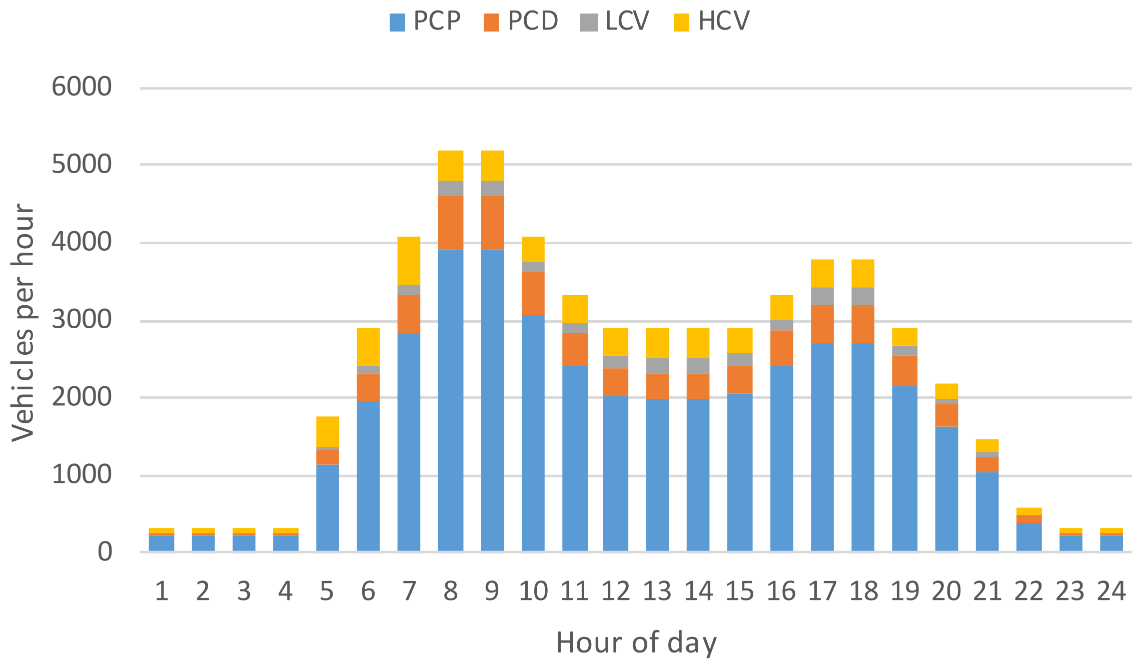


Figure 37: Scenarios A1 and A2 southbound traffic – north section

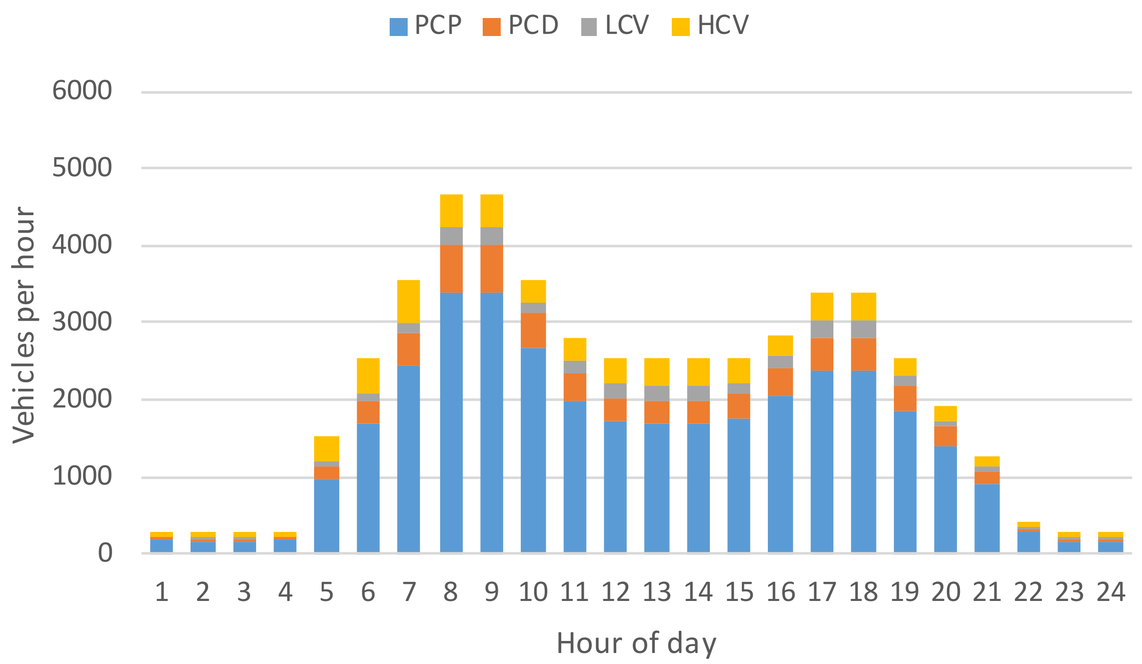


Figure 38: Scenarios A1 and A2 southbound traffic – south section

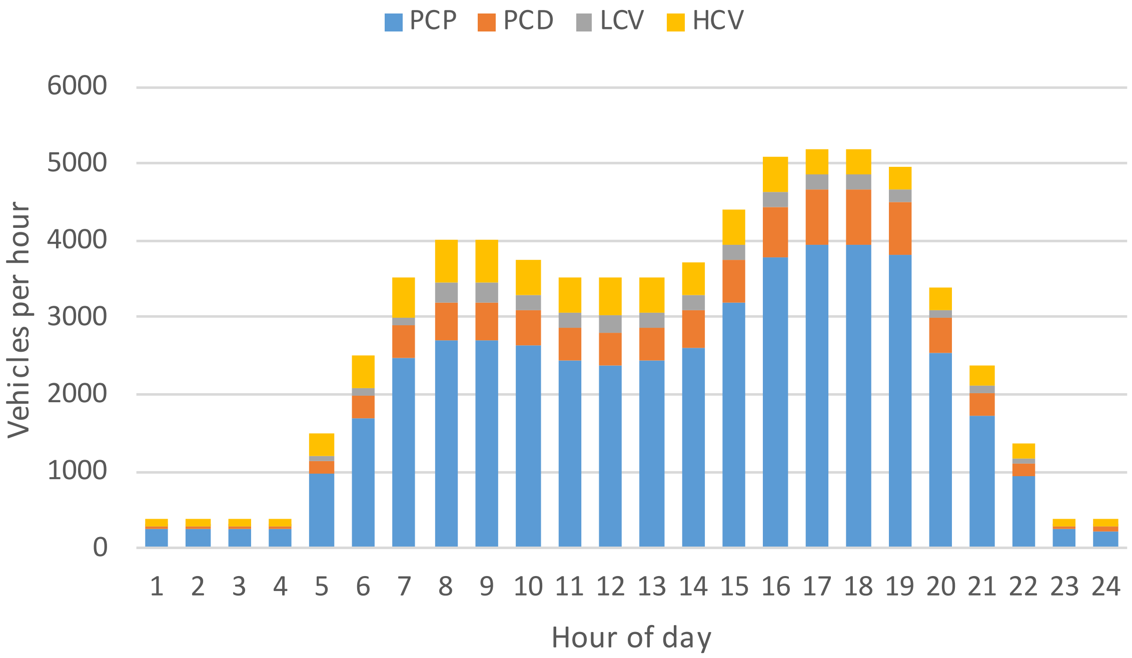


Figure 39: Scenarios B1 and B2 northbound traffic – north section

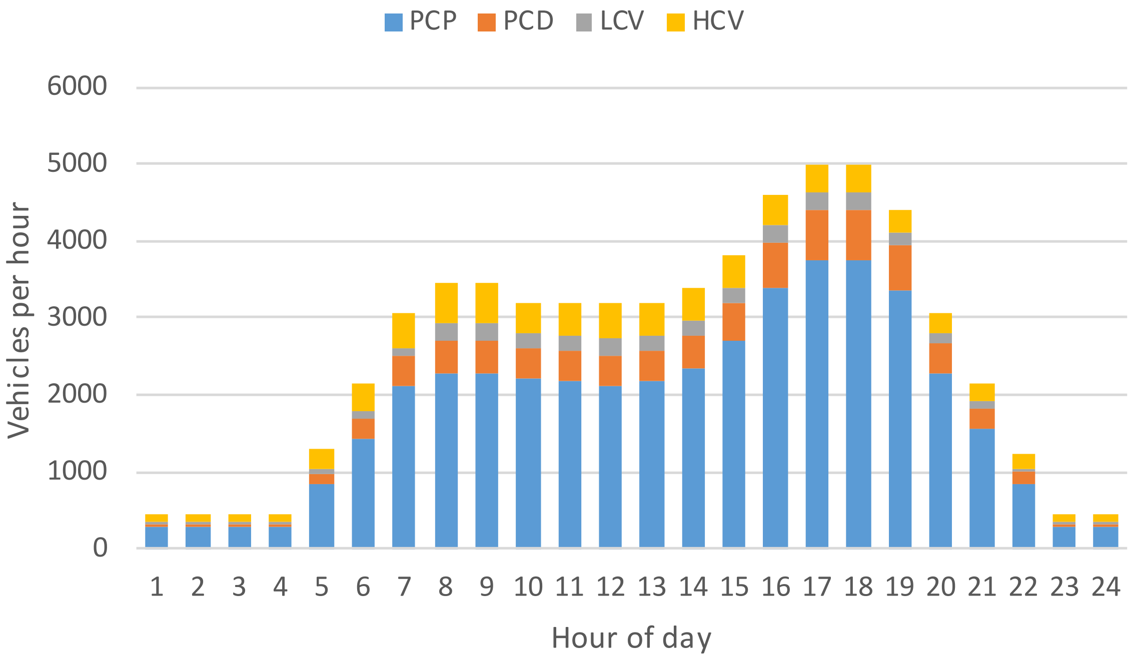


Figure 40: Scenarios B1 and B2 northbound traffic – south section

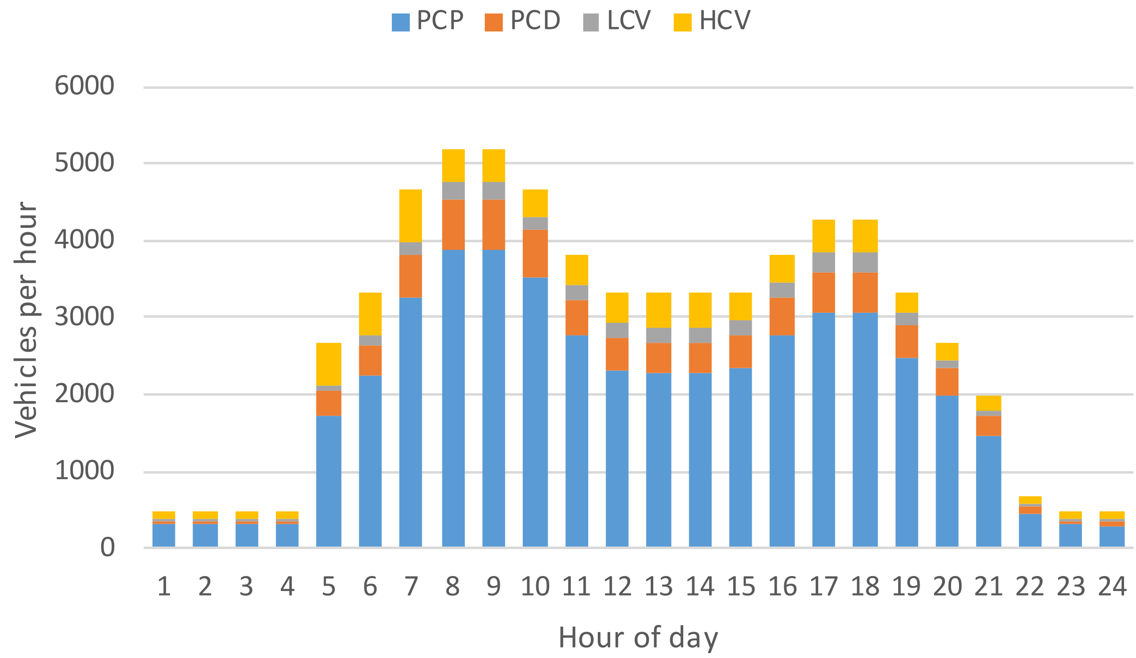


Figure 41: Scenarios B1 and B2 southbound traffic – north section

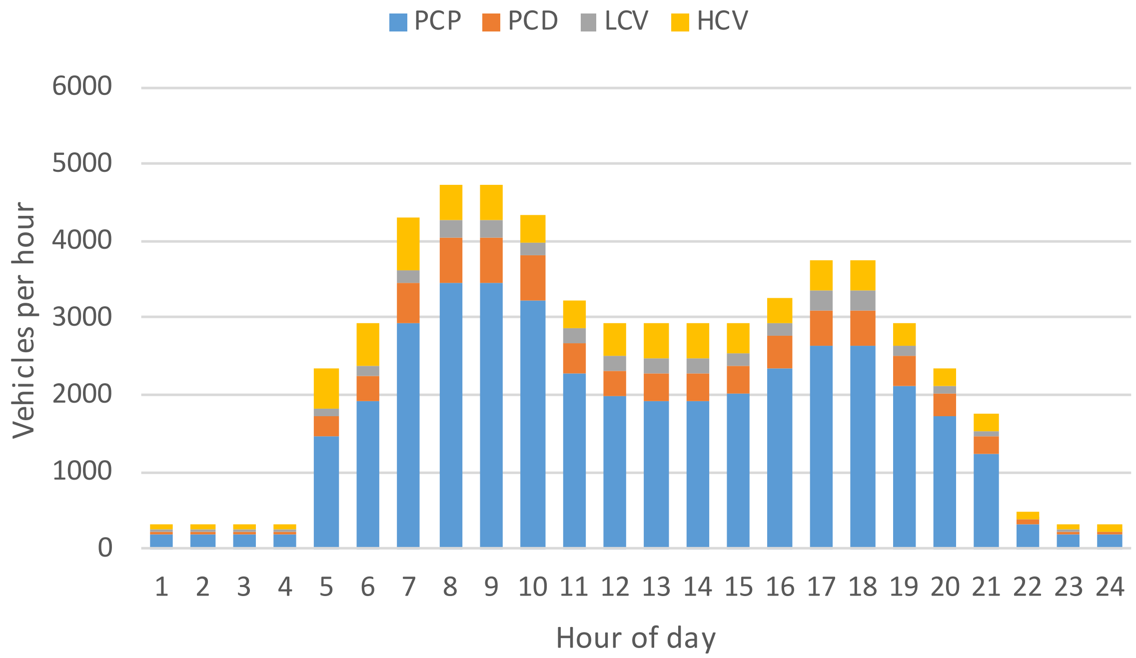


Figure 42: Scenarios B1 and B2 southbound traffic – south section

10.3.4 Tunnel gradients

For the purposes of calculating emission factors, the North East Link tunnel gradients were approximated, as presented in Table 41.

Table 41: Tunnel gradients and lengths

Tunnel	Section length at gradient (km)							Total length (km)
	-6°	-4°	-2°	0°	+2°	+4°	+6°	
Northbound	0	0.84	1.0	0.23	2.5	1.5	0	6.1
Southbound	0	1.5	2.5	0	1.3	0.84	0	6.1

10.3.5 Emissions inventories

The emissions inventories developed from the Scenario A1 and B1 traffic fleet mixes and 2020 emission factors are summarised in Figure 43 to Figure 46.

Scenarios A2 and B2 (2025 emission factors) northbound and southbound emissions inventories (PM_{10}, $PM_{2.5}$ and NO_2) are summarised and compared with the corresponding Scenario A1 and B1 inventories in Figure 47 to Figure 50.

The emission inventory data is provided in APPENDIX D.

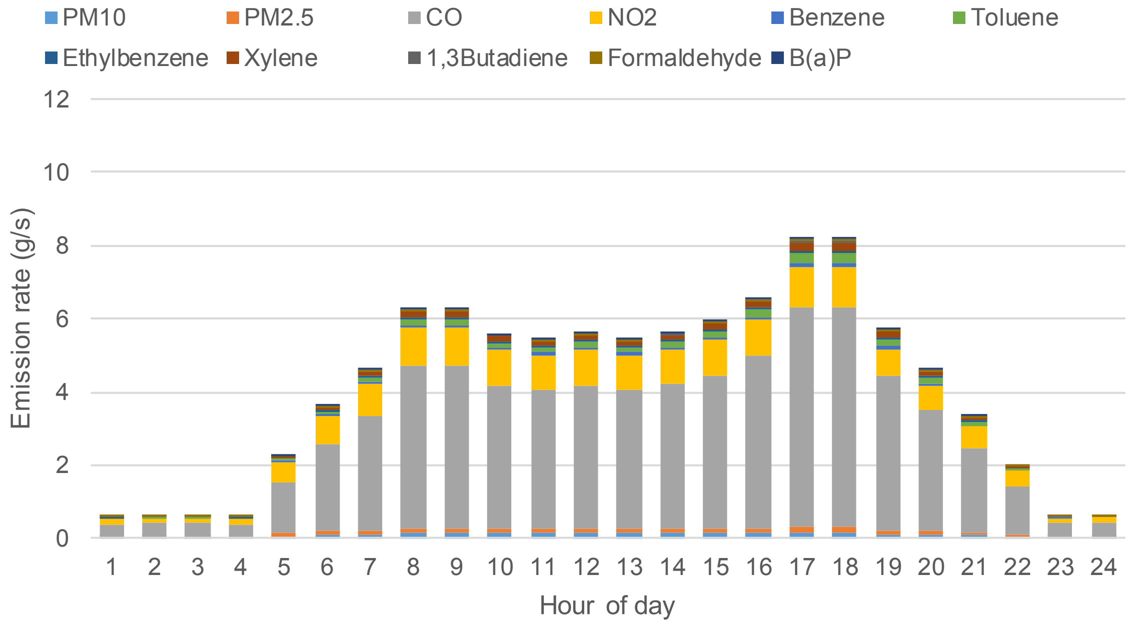


Figure 43: Scenario A1 northbound traffic emission rates

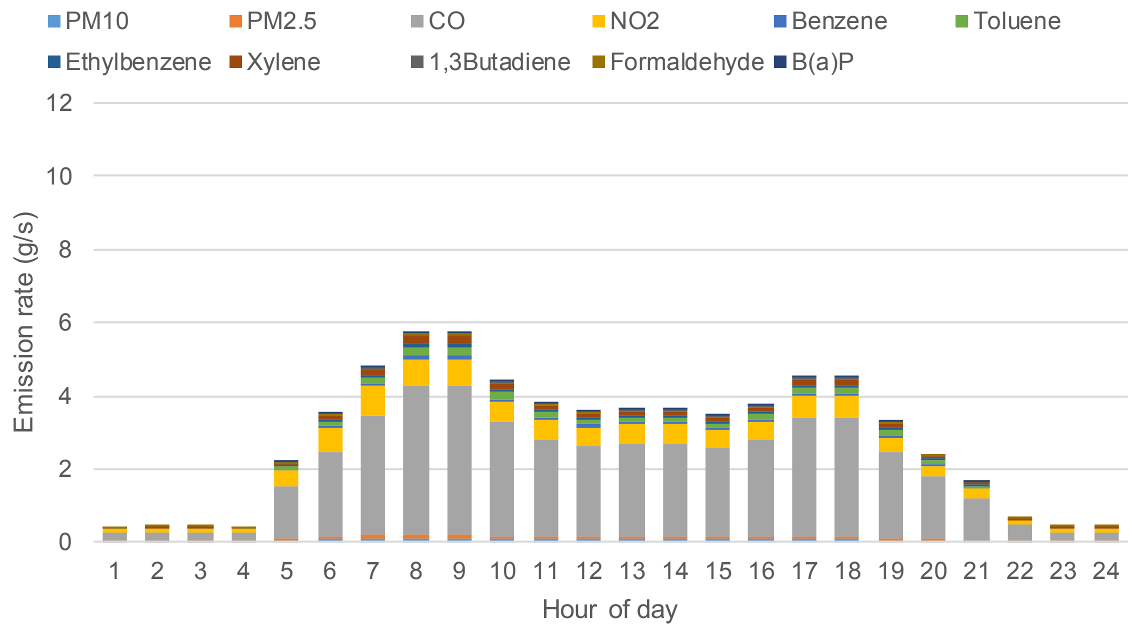


Figure 44: Scenario A1 southbound traffic emission rates

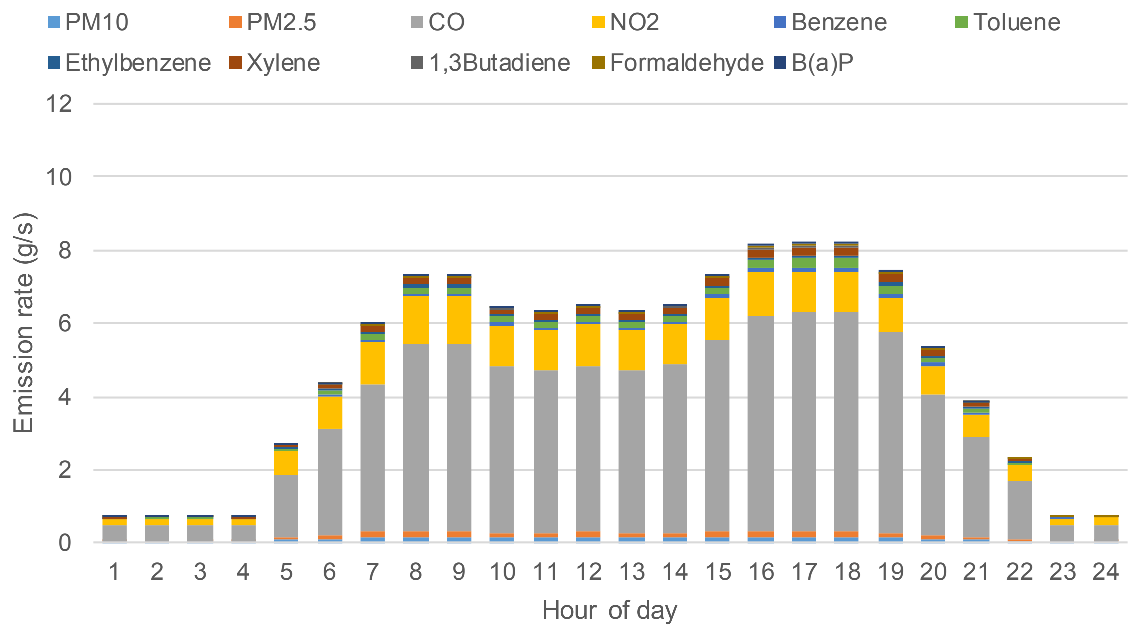


Figure 45: Scenario B1 northbound traffic emission rates

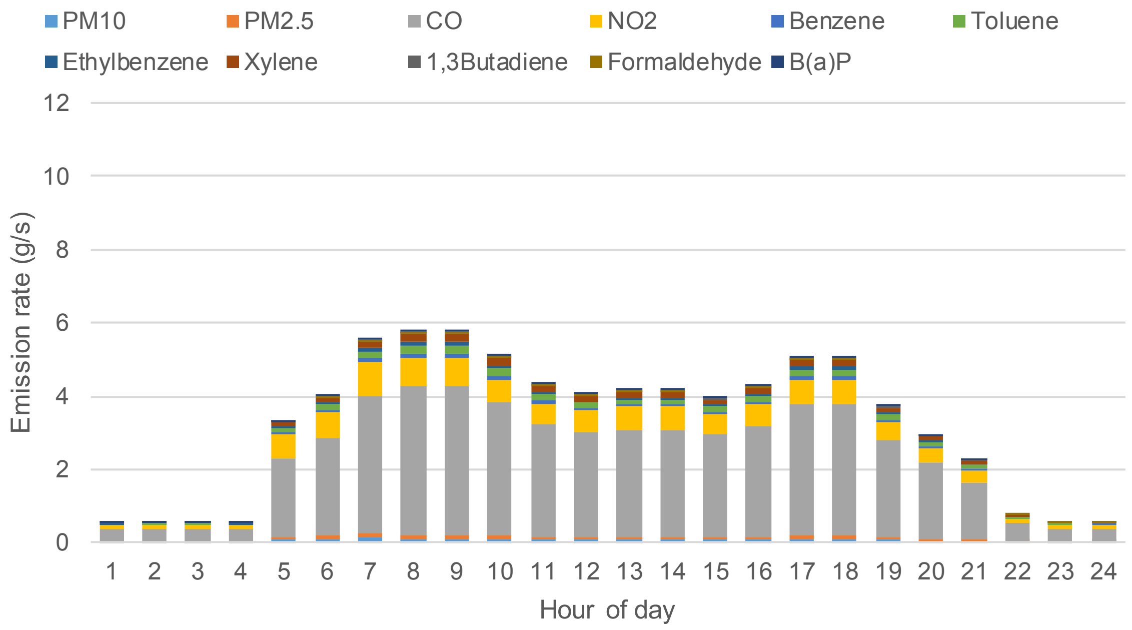


Figure 46: Scenario B1 southbound traffic emission rates

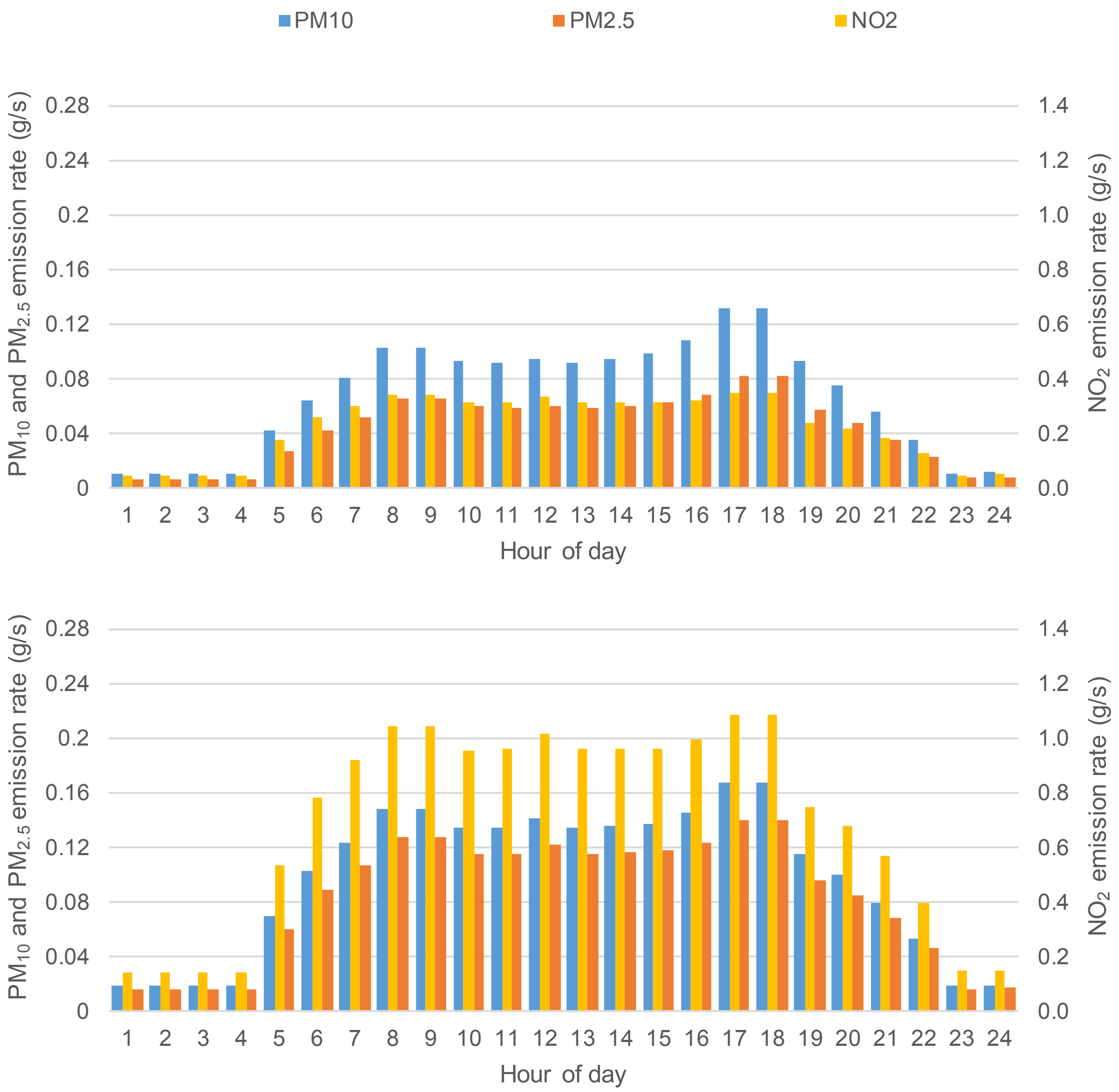


Figure 47: Scenario A2 northbound emissions (top) and Scenario A1 northbound emissions (bottom)

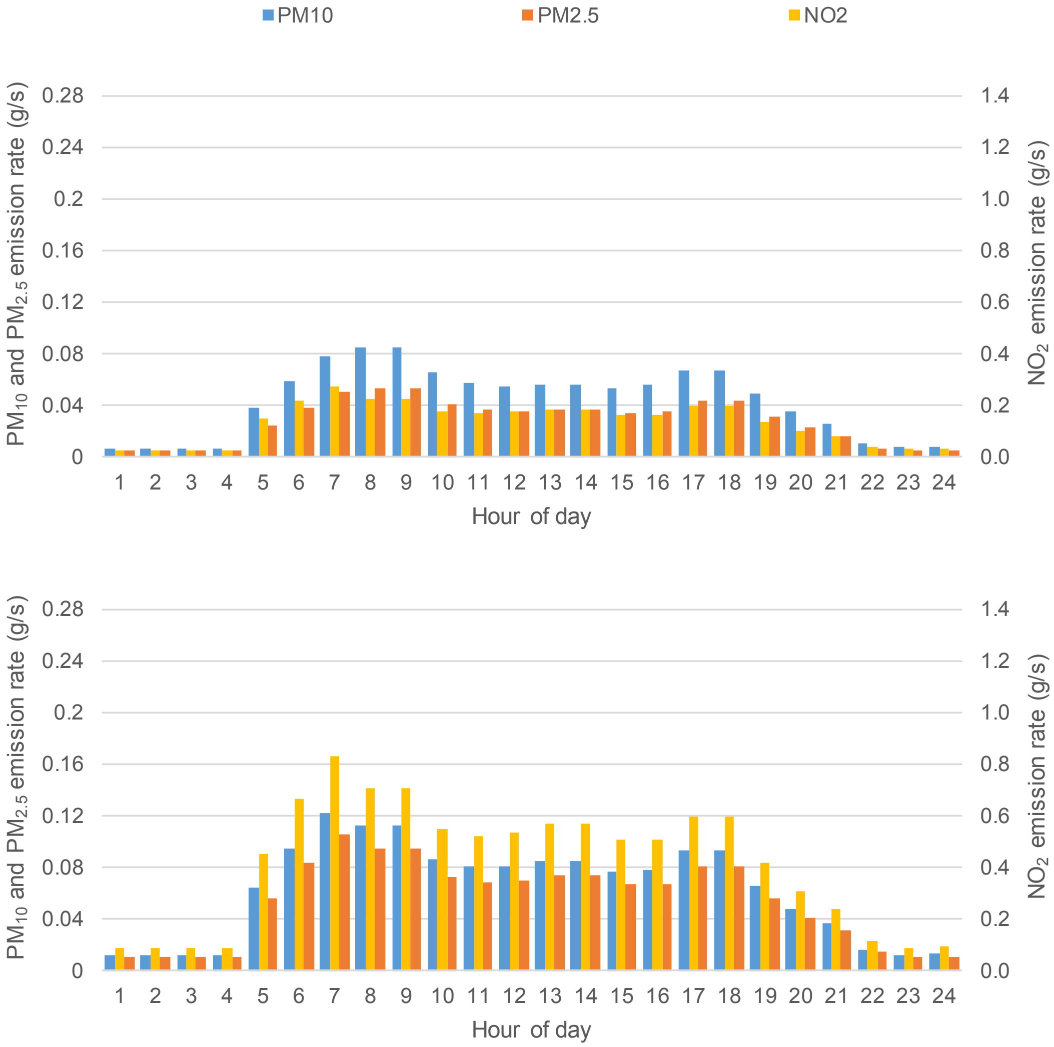


Figure 48: Scenario A2 southbound emissions (top) and Scenario A1 southbound emissions (bottom)

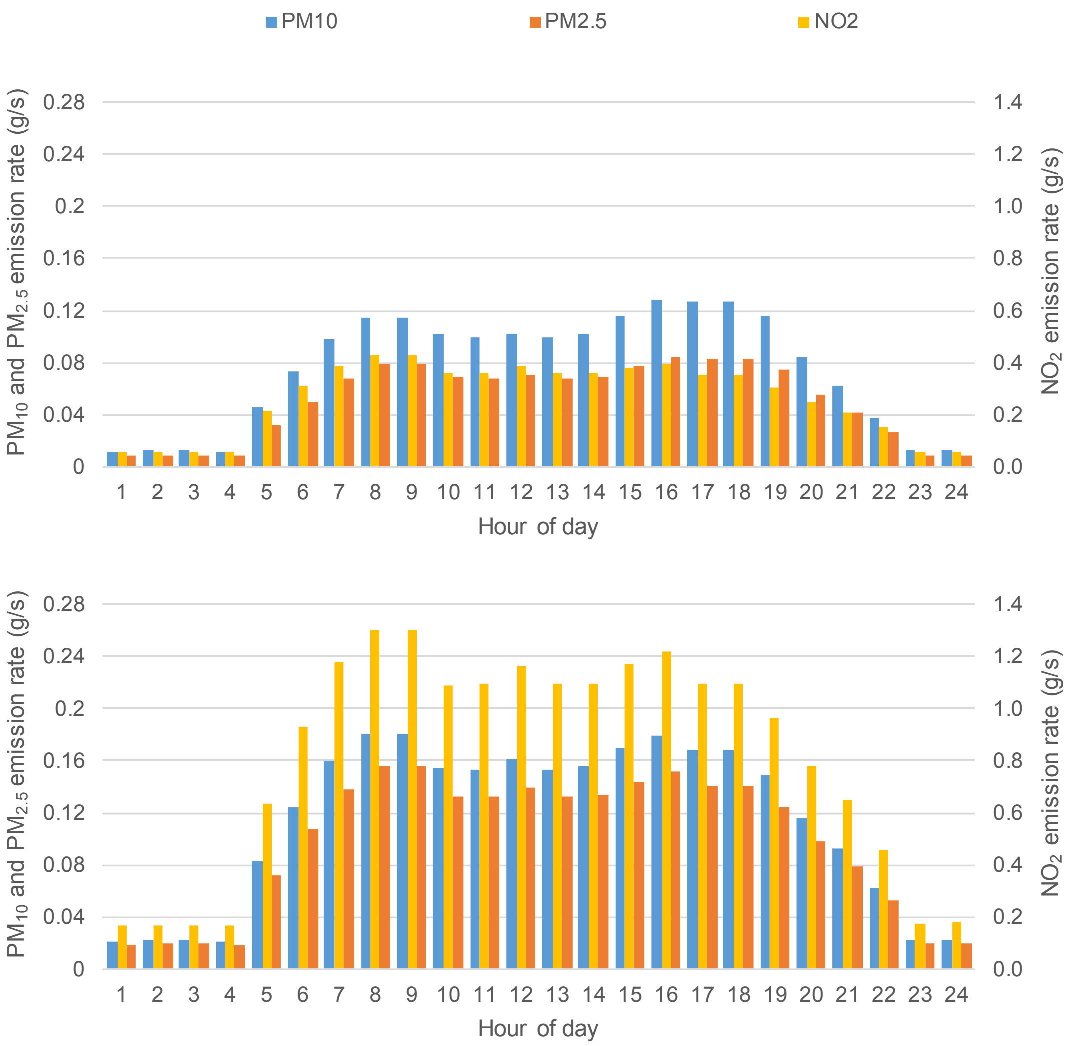


Figure 49: Scenario B2 northbound emissions (top) and Scenario B1 northbound emissions (bottom)

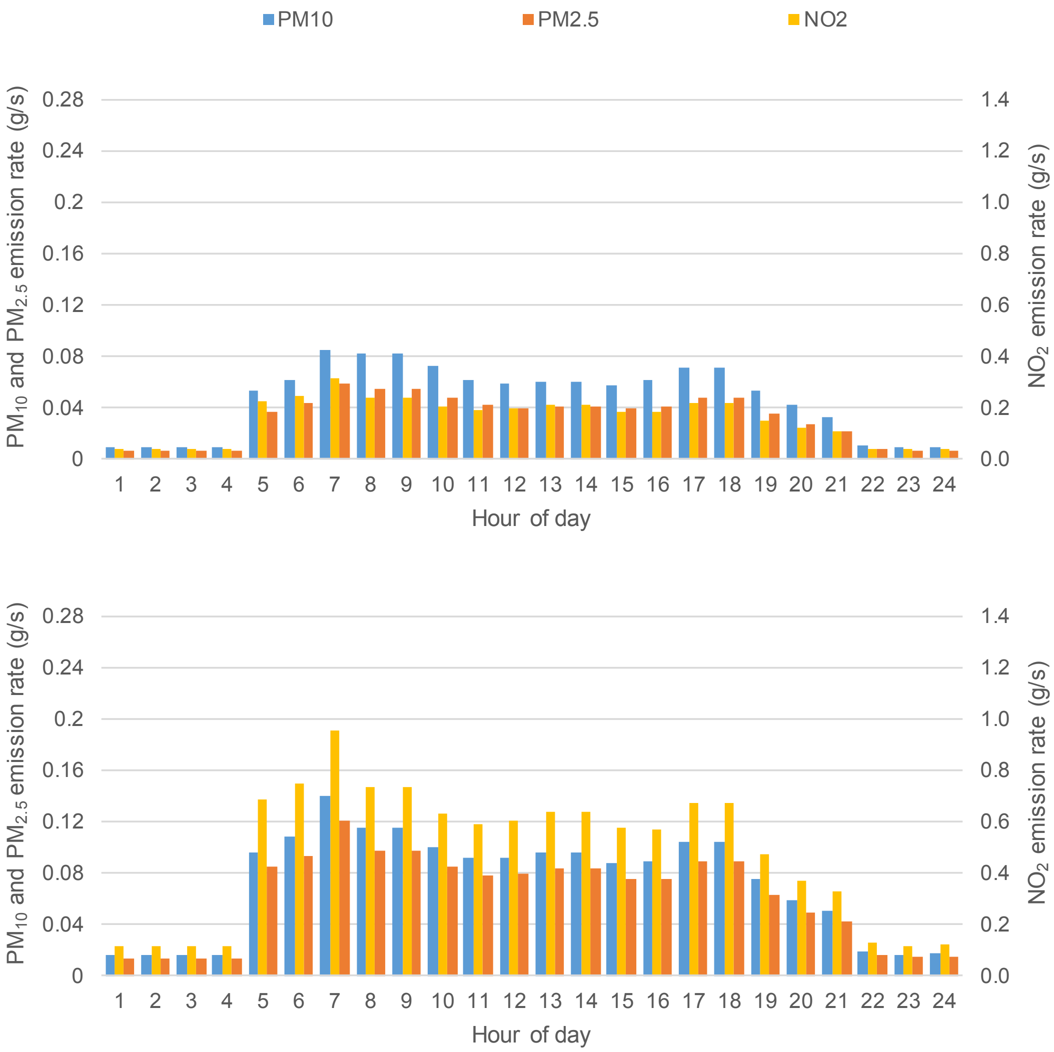


Figure 50: Scenario B2 southbound emissions (top) and Scenario B1 southbound emissions (bottom)

10.3.6 Ventilation structure flow rates

Hourly ventilation structure flow rates provided by GHD for Scenarios A1 and A2 and Scenarios B1 and B2 are presented in Figure 51 and Figure 52, respectively.

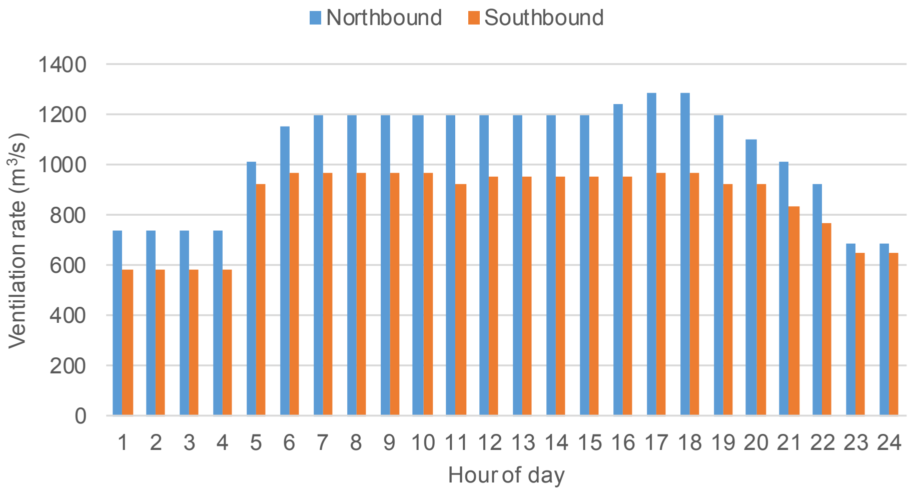


Figure 51: Scenarios A1 and A2 ventilation structure flow rates

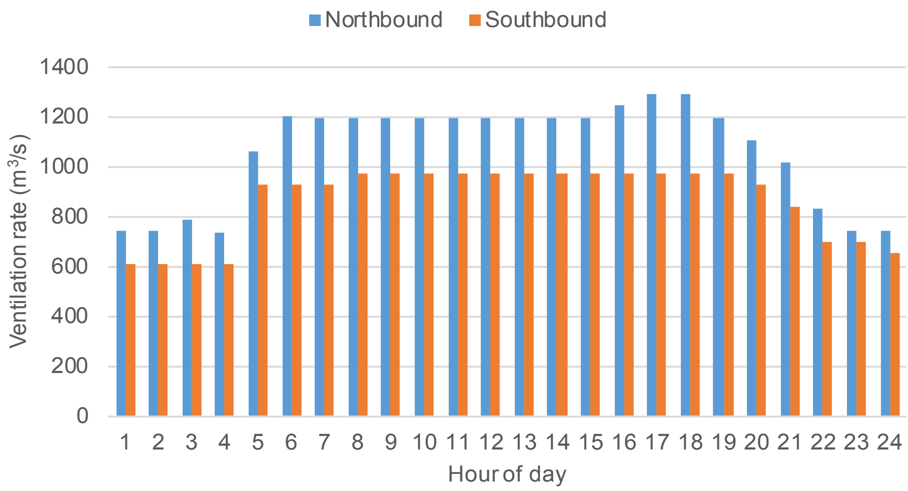


Figure 52: Scenarios B1 and B2 ventilation structure flow rates

10.4 Sensitivity analyses

In addition to the sensitivity analysis which considers more realistic emission factors for 2025 (Scenarios A2 and B2), a number of additional sensitivity analyses were considered:

- the North East Link tunnels operating at maximum capacity (24 hours a day, 365 days a year)
- emissions occurring at in-tunnel air quality limits (24 hours a day, 365 days a year)
- increased diesel to petrol fuelled passenger car ratios
- alternative ventilation structure locations within potential construction footprints.

The results of the additional sensitivity analyses are presented in Section 10.6.2 and discussed in Section 10.7.2.

10.4.1 Maximum tunnel capacity, 24 hours a day, 365 days a year

Consistent with risk AQ19 identified in Section 7.0, the impact of emissions from the ventilation system under worst case (maximum tunnel capacity) traffic conditions was assessed. The lane capacity of the tunnels is defined as the maximum traffic density that tunnels can support before traffic flow breaks down. Lane capacity is fleet mix dependent, with the slowing down of HCVs on the up-gradient section of tunnels primarily responsible for the breakdown in traffic flow. In general, the lane capacity of a road tunnel is considered to be approximately 2,000 vehicles per hour.

Dispersion modelling was conservatively undertaken for maximum lane capacity conditions with a 2036 fleet mix, travelling at 40 kilometres per hour in three lanes in each direction, 24 hours a day and 365 days a year. This is an unrealistic scenario that has not occurred in any Australian road tunnel and is highly unlikely to occur in the future.

Hourly traffic volume and fleet mix distributions for the northbound and southbound tunnels are presented in Figure 53 to Figure 56. Hourly traffic fleet composition data are provided in APPENDIX D.

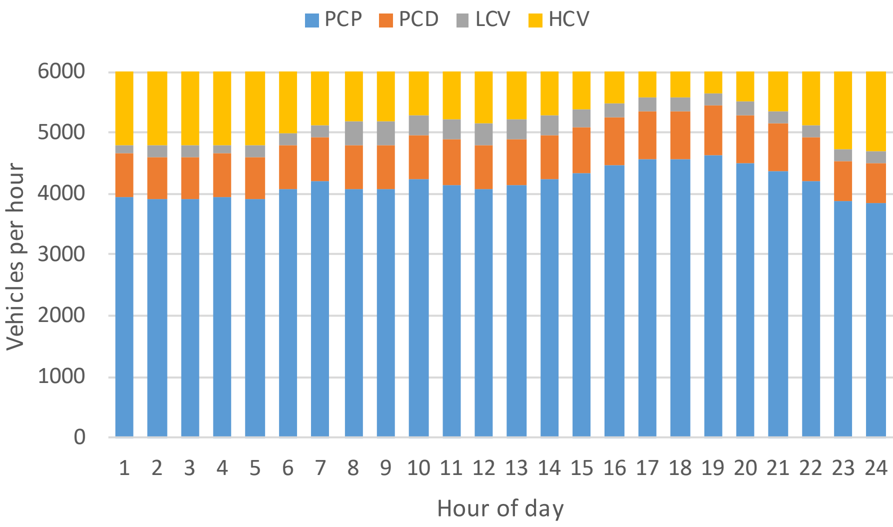


Figure 53: Maximum tunnel capacity northbound traffic – north section

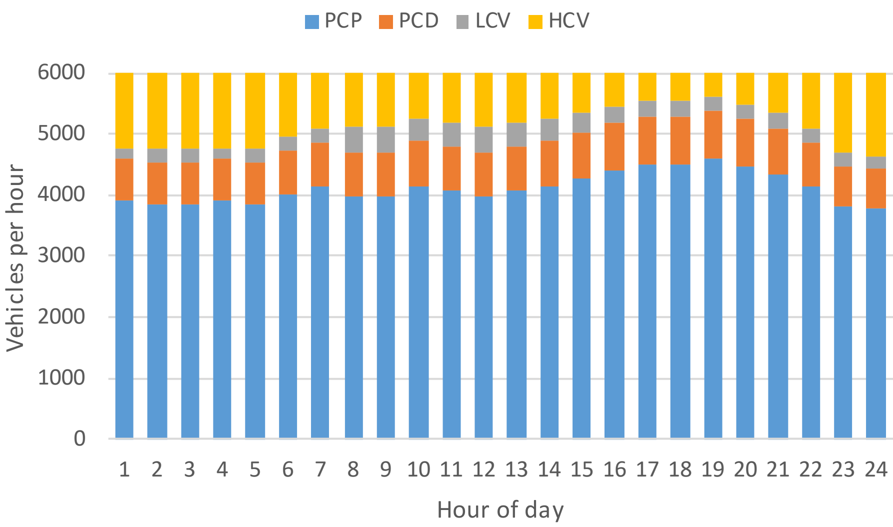


Figure 54: Maximum tunnel capacity northbound traffic – south section

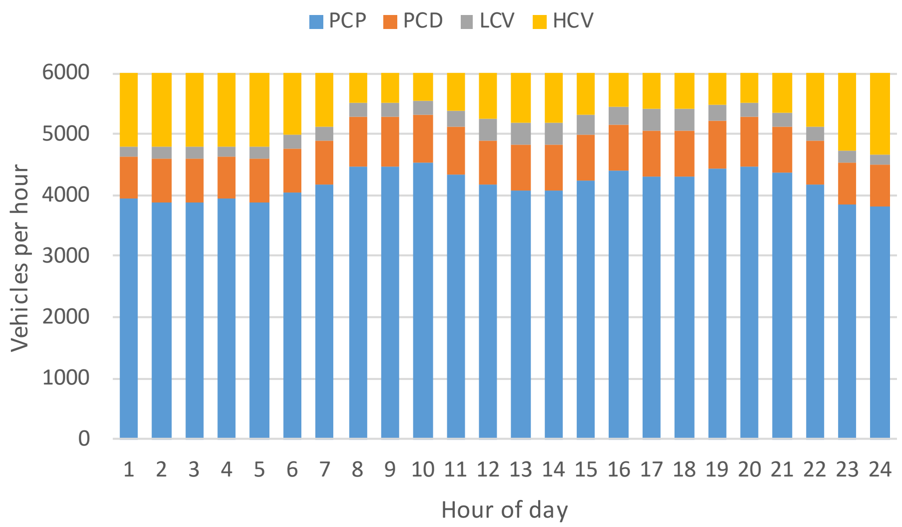


Figure 55: Maximum tunnel capacity southbound traffic – north section

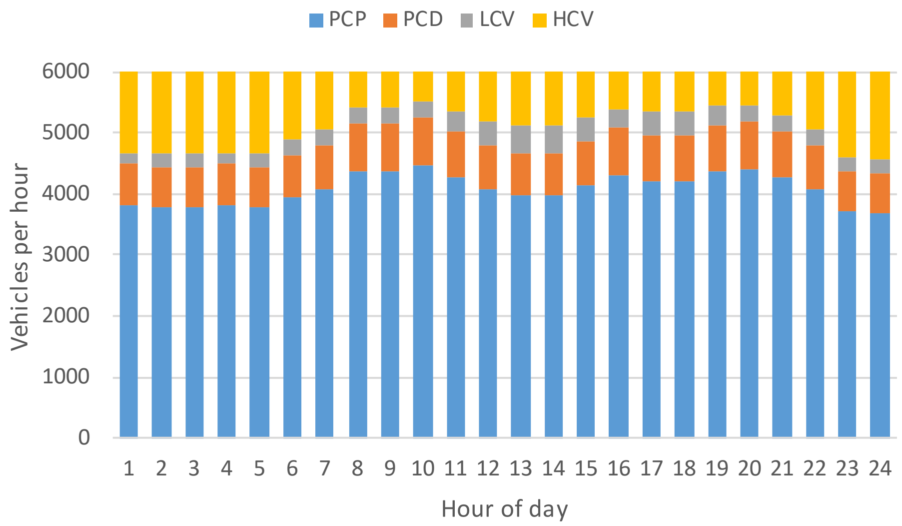


Figure 56: Maximum tunnel capacity southbound traffic – south section

A ventilation rate of 1,290 cubic metres per second has been assumed for the northern ventilation structure and 970 cubic metres per second for the southern ventilation structure for all hours. The pollutant emission inventories developed from the predicted traffic fleet mixes and emission factors for Scenario B1 are summarised in Figure 57 and Figure 58. The emission inventory data is provided in APPENDIX D.

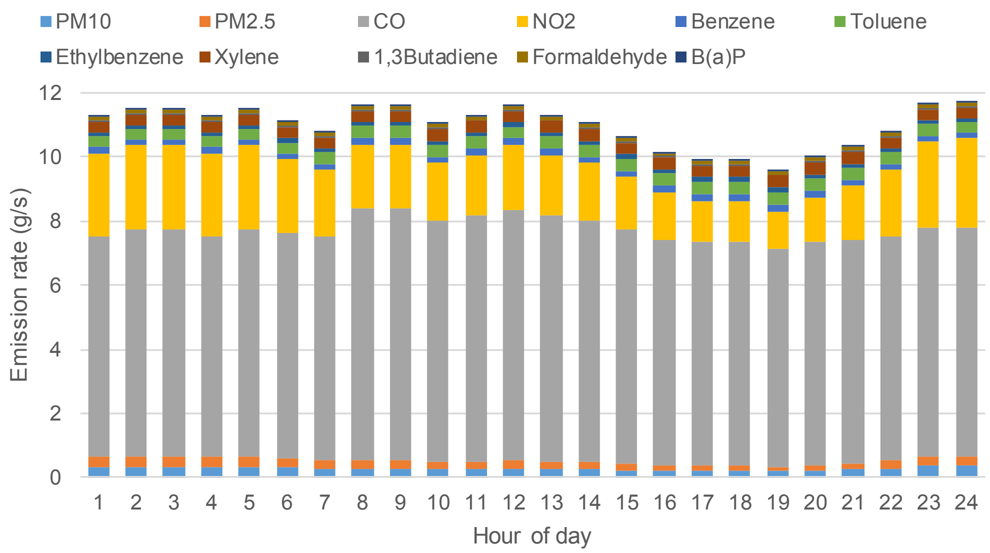


Figure 57: Maximum tunnel capacity northbound traffic emission rates

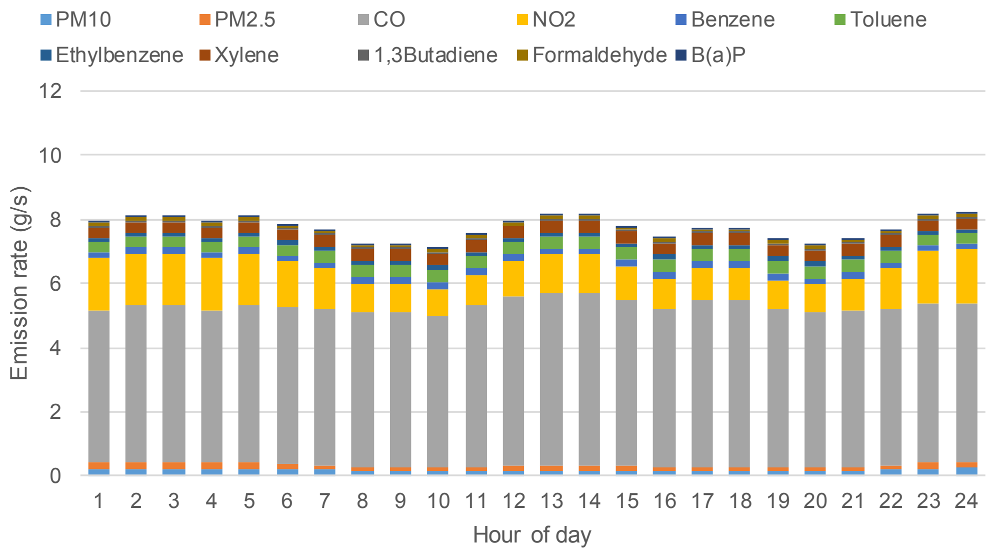


Figure 58: Maximum tunnel capacity southbound traffic emission rates

10.4.2 Emissions at in-tunnel air quality limits

To understand the potential impacts of North East Link on the receiving environment, and to demonstrate that appropriate measures have been incorporated into the design, a theoretical worst case scenario was modelled with ventilation structure exhaust concentrations equal to in-tunnel air quality limits at maximum tunnel ventilation flow rates.

Australian road tunnel projects are subject to environmental and/or planning approval conditions which specify the parameters to be monitored in-tunnel. These typically include air velocity, CO, NO_2 and visibility, with a requirement that the tunnel ventilation system be controlled to:

- prevent or reduce portal emissions and resultant environmental impacts
- ensure appropriate visibility for different tunnel operating conditions
- control public exposure to CO and NO_2 within the tunnel, through compliance with criteria for various averaging periods.

Historically, NO_2 in-tunnel concentrations have been estimated from NO measurements by assuming that NO_2 represented 10 per cent of NO_X, in accordance with PIARC recommendations. More recent road tunnel installations however utilise open path instruments for direct measurement of NO_2 concentrations.

Public exposure is typically assessed by averaging CO and NO (and/or NO_2) concentrations measured by a number of instruments located on possible travel paths throughout the tunnel system.

Environmental requirements relating to in-tunnel air quality and ventilation system emissions to air for the CityLink and EastLink road tunnels are contained in EPA Licence No.'s 1278 (Translink Operations Pty. Ltd.) and 2043 (ConnectEast Pty. Ltd.) respectively.

In both instances the following CO in-tunnel concentration limits apply:

- 150 parts per million (parts per million) (maximum)
- 50 parts per million (15-minute average)
- 25 parts per million (two-hour average).

For the purposes of a modelling sensitivity analysis, a maximum concentration of CO in the ventilation structure exhaust gases of 50 parts per million, conservatively assumed to occur over a one-hour period, has been utilised.

CO has historically been used as the basis for defining in-tunnel air quality and as such the CityLink and EastLink licences do not specify an NO_2 in-tunnel concentration limit. However, advances in engine technology have achieved greater reductions in CO in comparison with NO_2, meaning that in-tunnel criteria for CO alone may no longer be adequate to protect human health.

PIARC suggests a one part per million NO_2 criterion (15-minute average) at any point within a road tunnel. The New South Wales Government Advisory Committee on Tunnel Air Quality (NSW Government 2016) adopted a policy for new road tunnels over one kilometre in length that requires a NO_2 average concentration less than 0.5 parts per million (rolling 15-minute average) over the length of the tunnel.

The outcomes from an air quality impact assessment viewpoint are likely to be similar. Consequently, an NO_2 concentration equal to the NSW criterion in the ventilation system exhaust gases has been adopted for the purposes of the modelling sensitivity analysis.

The modelling sensitivity analysis was based on emission rates derived from in-tunnel pollutant concentrations, as summarised in Table 42.

Table 42: In-tunnel air quality limits

Pollutant	Limit (ppm)	Ventilation structure	Equivalent emission rate (g/s)	Ventilation flow rate (m^3/s)
CO	50	Northern	81	1,290
		Southern	61	970
NO_2	0.5	Northern	1.3	1,290
		Southern	1.0	970

Due to the inherent conservatism of the emission factors used to generate the emissions inventory, NO_2 emission rates for the maximum lane capacity sensitivity analysis are greater than the equivalent in-tunnel limit emission rate for the southern ventilation structure for several hours and for the northern ventilation structure for all hours.

10.4.3 Increased diesel to petrol fuelled car ratio

For the modelling of Scenarios A1, A2, B1 and B2, a 15 per cent diesel to 85 per cent petrol split for passenger car traffic data was assumed. In order to assess the sensitivity of the model to this assumption, in particular to PM_{10}, $PM_{2.5}$ and NO_2 predictions, additional modelling was conducted based on a diesel to petrol fuelled passenger car split of 30 per cent to 70 per cent.

The model run was based on Scenario B1 (2036), giving the traffic volume and fleet mix distributions presented in Figure 59, Figure 60, Figure 61 and Figure 62. Hourly traffic fleet composition data are provided in APPENDIX D.

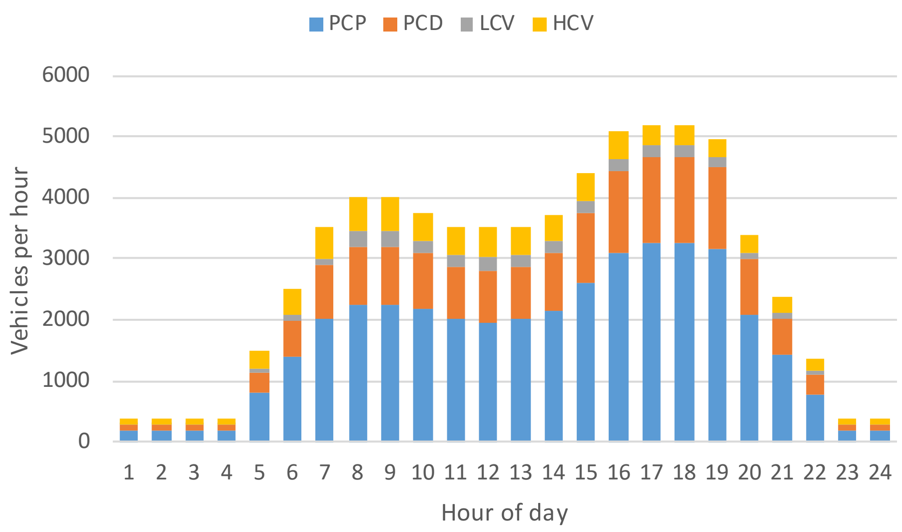


Figure 59: Increased diesel to petrol passenger car ratio northbound traffic – north section

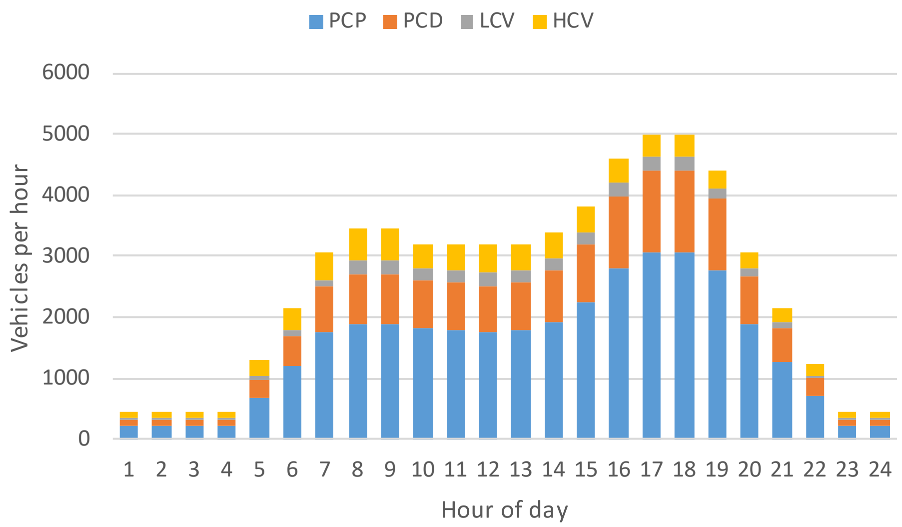


Figure 60: Increased diesel to petrol passenger car ratio northbound traffic – south section

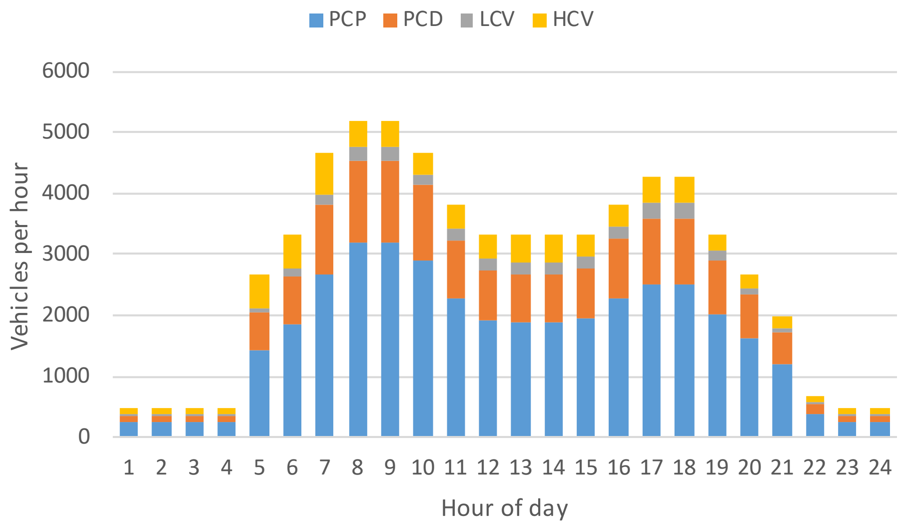


Figure 61: Increased diesel to petrol passenger car ratio southbound traffic – north section

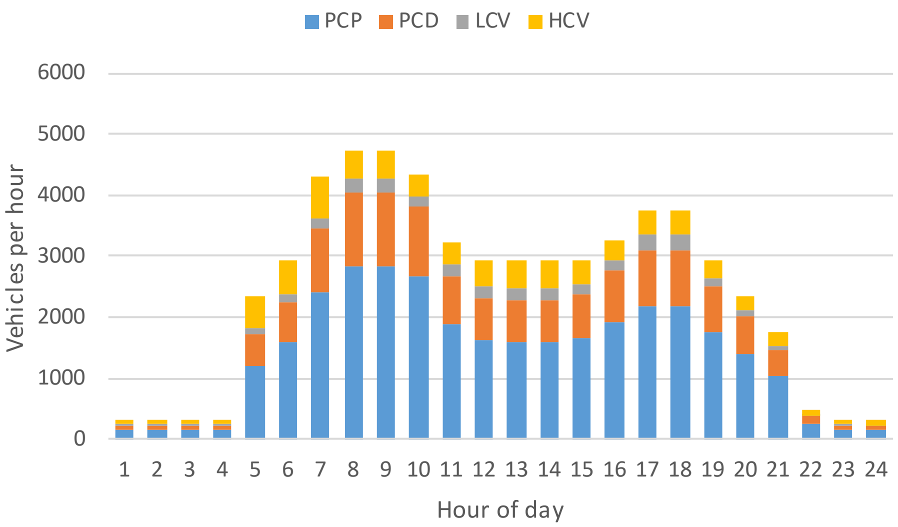


Figure 62: Increased diesel to petrol passenger car ratio southbound traffic – south section

The pollutant emissions inventories developed from these traffic fleet mixes and emission factors are summarised in Figure 63 and Figure 64. The emissions inventory data is provided in APPENDIX D.

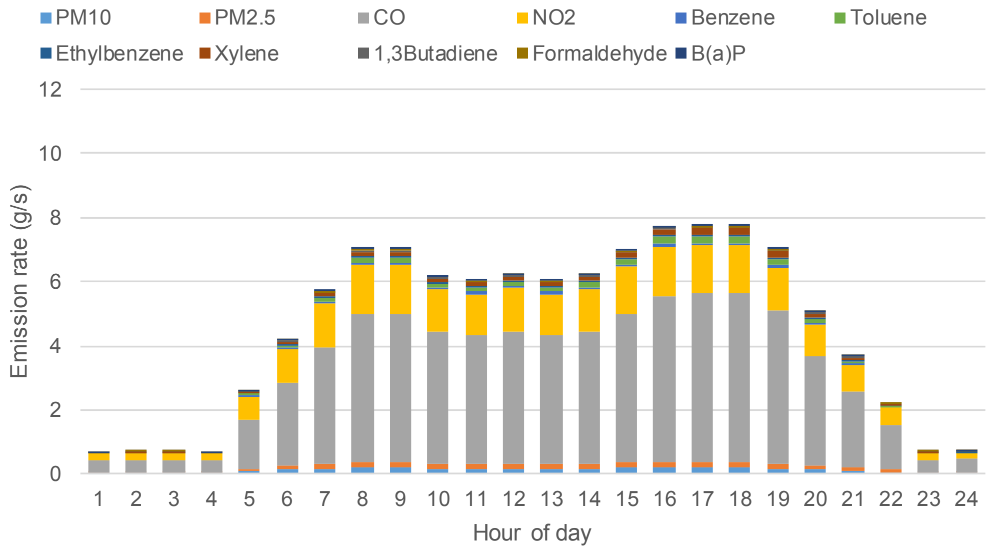


Figure 63: Increased diesel to petrol passenger car ratio northbound emission rates

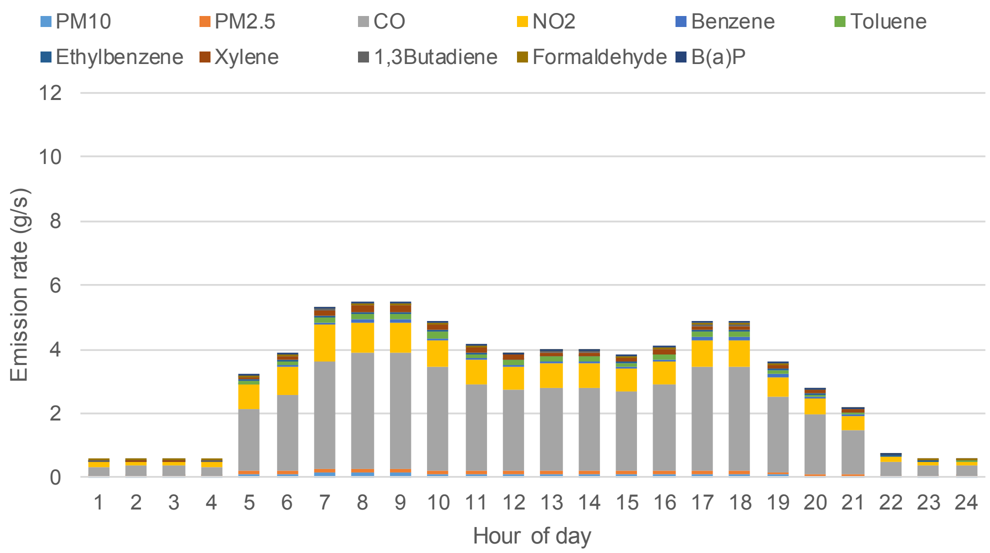


Figure 64: Increased diesel to petrol passenger car ratio southbound emission rates

10.4.4 Alternative ventilation structure locations

Alternative locations for the ventilation structures within potential construction footprints were assessed for the purpose of sensitivity analysis by locating the structures at a finite number of locations towards the extremities of the identified areas. Modelling was undertaken at the proposed design location and the alternative locations for $PM_{2.5}$ under Scenario B1 conditions. Northern and southern ventilation structures were assessed separately.

The ventilation structure locations assessed are provided in Table 43 and shown in Figure 65 and Figure 66.

Table 43: Ventilation structures – reference project and sensitivity testing locations

Ventilation structure	Location	Primary vent	Secondary vent
Northern	Reference project	330961 E, 5823137 S	330962 E, 5823147 S
	2	330886 E, 5823254 S	330876 E, 5823256 S
	3	330982 E, 5823232 S	330983 E, 5823242 S
	4	330862 E, 5823028 S	330582 E, 5823030 S
	5	330957 E, 5823024 S	330958 E, 5823034 S
Southern	Reference project	330740 E, 5817394 S	330749 E, 5817394 S
	2	330678 E, 5817546 S	330687 E, 5817546 S
	3	330802 E, 5817546 S	330811 E, 5817546 S
	4	330682 E, 5817302 S	330691 E, 5817302 S
	5	330762 E, 5817167 S	330771 E, 5817167 S

Figure 65: Northern ventilation structure – reference project and sensitivity testing locations

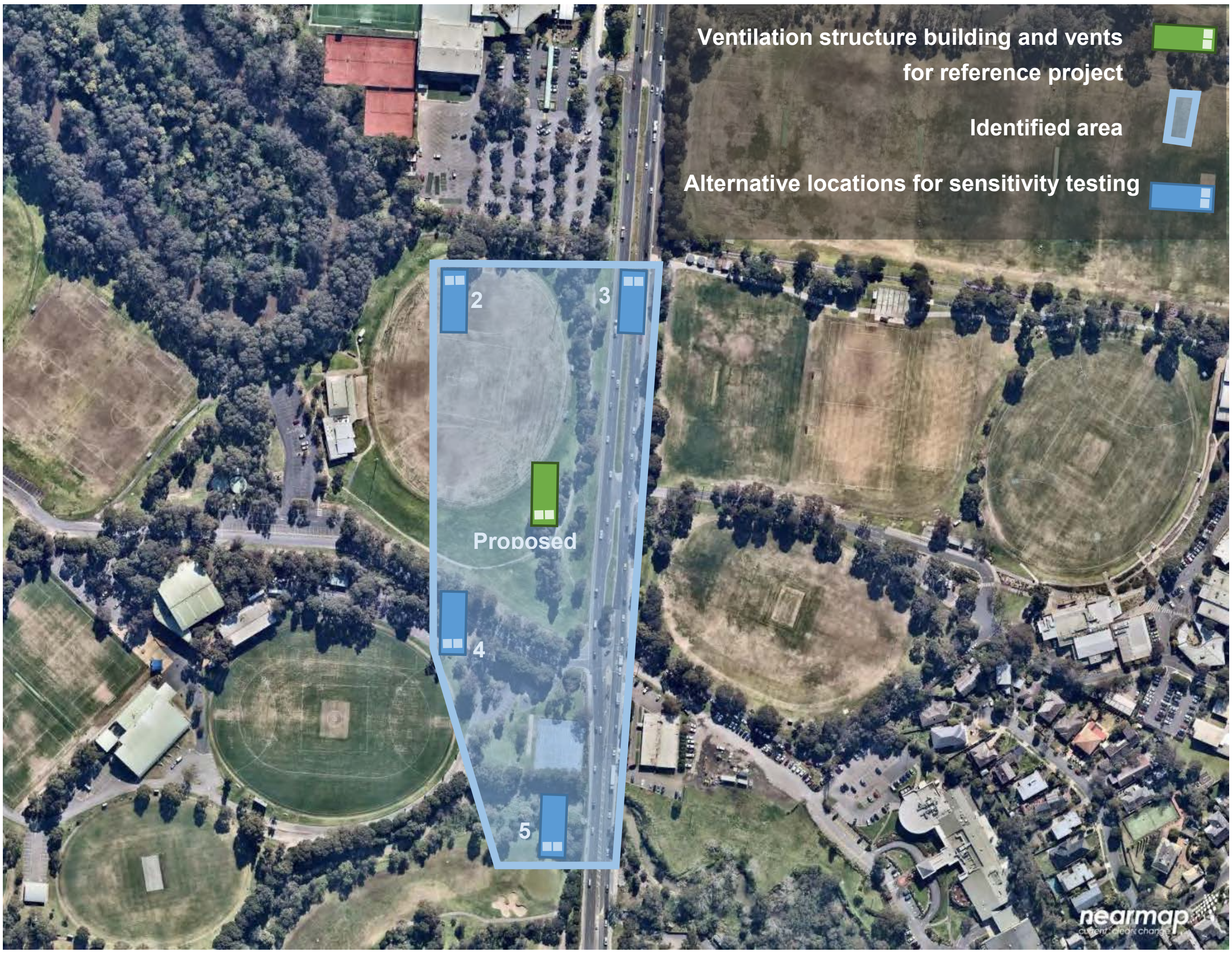


Figure 66: Southern ventilation structure – reference project and sensitivity testing locations

10.5 Model assumptions

10.5.1 Stack-tip downwash and building downwash

Stack-tip downwash occurs when airflow passing by a stack is rapidly mixed to the ground as frictional forces and pressure gradients cause stagnations and eddies to develop in the wake of the stack. This effect is greatest when the stack exit velocity is small compared with the wind speed. Stack-tip downwash was included in the modelling of the North East Link ventilation structure emissions.

Building downwash is the same phenomenon, but caused by structures near to pollutant emission sources, influencing atmospheric turbulence. Building downwash is a major consideration in the design of stacks and their positioning in relation to buildings. USEPA established a Good Engineering Practice (GEP) stack height defined as the '*height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutants in the immediate vicinity of the source as a result of atmospheric downwash, eddies or wakes which may be created by the source itself, nearby structures or nearby terrain obstacles*'. The definition of GEP stack height is the stack height plus 1.5 times the lesser of the building height or projected building width.

A stack is considered to be wake affected when the stack and building are located less than five times the lesser of the building height or project building width apart.

The dimensions of the buildings from which the ventilation structures extend were approximated from design drawings. Based on aerial photography, no existing buildings are likely to wake affect the proposed ventilation structures, consideration of building downwash was therefore restricted to the ventilation structure buildings.

10.5.2 Three-minute average GLCs

SEPP(AQM) design criteria (refer to Section 4.5 for air toxics are based on three minute average GLCs. AERMOD outputs for averaging periods less than one hour require post-processing of hourly average predictions. In accordance with EPA Victoria guidelines (2015) the following formula for converting one hour average concentrations to other averaging times was used:

$c(t) = c(t_0) \times (t_0/t)^{0.2}$

where t is the averaging time of interest (three minutes in this case), and t_0 is the modelling output averaging time (60 minutes).

10.6 Model outputs

10.6.1 Design assessment

For the 2013 to 2017 meteorological data files, the 99.9th percentile corresponds to the eighth highest one hour average concentration prediction for each year. Model predictions for the hours corresponding to the top seven predictions without background were consequently removed from the data set. A single pollutant ($PM_{2.5}$) was used to determine which of the five modelled years predicted the highest one hour average 99.9th percentile GLC, with the results presented in Table 44.

Table 44: Project only results by meteorological year

Meteorological year	Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]
2013	$PM_{2.5}$	µg/m^3	1 hour	3.4
2014	$PM_{2.5}$	µg/m^3	1 hour	3.2
2015	$PM_{2.5}$	µg/m^3	1 hour	3.4
2016	$PM_{2.5}$	µg/m^3	1 hour	3.5
2017	$PM_{2.5}$	µg/m^3	1 hour	3.6

Note:
1 99.9th percentile (8th highest value) as required for assessment against SEPP (AQM) design criterion.

Results from each year were within approximately 10 per cent of each other, with the meteorological year 2017 giving the highest result. All subsequent modelling of ventilation system emissions was conducted using the 2017 meteorological and background concentration datasets.

The results of the plume dispersion modelling assessments for Scenarios A1, A2, B1 and B2 are presented in Table 45 to Table 48.

Where time-varying background concentrations have been included in the assessments (PM_{10}, $PM_{2.5}$, CO and NO_2) the background concentration can have a strong influence on the assessment outcomes, in particular the hour at which the assessed maximum (99.9th percentile) occurs. Table 49 to Table 52 present the maximum (99.9th percentile) results for PM_{10}, $PM_{2.5}$, CO and NO_2 for Scenarios A1, A2, B1 and B2, without inclusion of the background concentration (project only).

Table 53 to Table 56 present the maximum (99.9th percentile) PM_{10}, $PM_{2.5}$, NO_2 and benzene results (project only) for discrete receptors for Scenarios A1, A2, B1 and B2. The maximum results for each of the discrete receptors are provided in APPENDIX C.

The SEPP (AQM) defines the maximum predicted concentration as the 99.9th percentile concentration (for averaging periods of one hour or less) at any receptor, including background. However, when the background concentration file contains exceedances of the design criterion, contour plots of the cumulative predictions have limited value. Therefore, in order to provide a more transparent representation of the predicted impacts associated with the project, the concentration isopleth plots presented in APPENDIX E are for the 100th percentile predicted concentrations excluding background.

Table 45: Results: Scenario A1

Pollutant	Units	Averaging period	Assessment background type [1]	Maximum predicted GLC [2]	Design criterion [3]	Location of predicted maximum	Contribution to maximum predicted GLC		Project contribution relative to design criterion (%)	Compliance
							Project	Background		
PM_{10}	µg/m³	1 hour	Time-varying	200	80	331550, 5823322 [4]	0.17	200	0.22	No [11]
$PM_{2.5}$	µg/m³	1 hour	Time-varying	74	50	331324, 5818194 [5]	0.063	74	0.13	No [11]
CO	mg/m³	1 hour	Time-varying	2.5	29	331000, 5822997 [6]	0.032	2.5	0.11	Yes
NO_2	µg/m³	1 hour	Time-varying	130	190	330475, 5822747 [7]	11	120	5.6	Yes
Benzene	µg/m³	3 minute	Constant	13	53	330825, 5823122 [8]	5.6	7.3	11	Yes
Toluene	µg/m³	3 minute	Constant	55	650	330825, 5823122 [8]	11	43	1.7	Yes
Ethylbenzene	µg/m³	3 minute	Constant	9.0	14,500	330825, 5823122 [8]	4.2	4.8	0.029	Yes
Xylene isomers	µg/m³	3 minute	Constant	31	350	330825, 5823122 [8]	11	20	3.1	Yes
1,3-Butadiene	µg/m³	3 minute	Constant	1.7	73	330624, 5817419 [9]	1.2	0.44	1.6	Yes
Formaldehyde	µg/m³	3 minute	Constant	7.2	40	330599, 5817444 [10]	2.3	4.9	5.8	Yes
PAHs [as B(a)P TEQ]	µg/m³	3 minute	Constant	0.0011	0.73	330599, 5817444 [10]	0.00056	0.00055	0.077	Yes

Notes:

Concentrations rounded to two significant figures.

1 Hourly time varying or constant background concentration (refer to Section 9.3). Hourly time varying concentrations change from hour to hour over a 24-hour period. A constant background concentration refers to one concentration used to represent background conditions (without the project).

2 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criteria. 100th percentile refers to the maximum value.

3 SEPP(AQM) design criterion.

4 600 m east-north-east of the northern ventilation structure within Simpson Barracks.

5 990 m northeast of the southern ventilation structure within residential area of Bulleen.

6 150 m south-south-east of the northern ventilation structure within Simpson Barracks.

7 620 m southwest of the northern ventilation structure within residential area of Macleod.

8 140 m west of the northern ventilation structure within residential area of Macleod.

9 120 m west of the southern ventilation structure within Carey Grammar Sports Complex.

10 150 m west of the southern ventilation structure within Carey Grammar Sports Complex.

11 See Section 10.7.1.

Table 46: Results: Scenario A2

Pollutant	Units	Averaging period	Assessment background type [1]	Maximum predicted GLC [2]	Design criterion [3]	Location of predicted maximum	Contribution to maximum predicted GLC		Project contribution relative to design criterion (%)	Compliance
							Project	Background		
PM_{10}	µg/m^3	1 hour	Time-varying	200	80	331550, 5823322 [4]	0.13	200	0.16	No [7]
$PM_{2.5}$	µg/m^3	1 hour	Time-varying	74	50	331324, 5818194 [5]	0.027	74	0.055	No [7]
NO_2	µg/m^3	1 hour	Time-varying	120	190	330475, 5822747 [6]	3.4	120	1.8	Yes

Notes:

Concentrations rounded to two significant figures.

1 Hourly time varying or constant background concentration (refer to Section 9.3). Hourly time varying concentrations change from hour to hour over a 24-hour period.

2 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion. 100th percentile refers to the maximum value.

3 SEPP(AQM) design criterion.

4 600 m east-north-east of the northern ventilation structure within Simpson Barracks.

5 990 m northeast of the southern ventilation structure within residential area of Bulleen.

6 620 m southwest of the northern ventilation structure within residential area of Macleod.

7 See Section 10.7.1.

Table 47: Results: Scenario B1

Pollutant	Units	Averaging period	Assessment background type [1]	Maximum predicted GLC [2]	Design criterion [3]	Location of predicted maximum	Contribution to maximum predicted GLC		Project contribution relative to design criterion (%)	Compliance
							Project	Background		
PM_{10}	µg/m³	1 hour	Time-varying	200	80	331550, 5823322 [4]	0.21	200	0.27	No [11]
$PM_{2.5}$	µg/m³	1 hour	Time-varying	74	50	331324, 5818194 [5]	0.083	74	0.17	No [11]
CO	mg/m³	1 hour	Time-varying	2.5	29	331000, 5822997 [6]	0.037	2.5	0.13	Yes
NO_2	µg/m³	1 hour	Time-varying	130	190	330475, 5822747 [7]	11	120	5.7	Yes
Benzene	µg/m³	3 minute	Constant	13	53	330825, 5823122 [8]	5.6	7.3	11	Yes
Toluene	µg/m³	3 minute	Constant	55	650	330599, 5817444 [9]	11	43	1.7	Yes
Ethylbenzene	µg/m³	3 minute	Constant	9.0	14,500	330599, 5817444 [9]	4.2	4.8	0.029	Yes
Xylene isomers	µg/m³	3 minute	Constant	31	350	330825, 5823122 [8]	11	20	3.1	Yes
1,3-Butadiene	µg/m³	3 minute	Constant	1.7	73	330599, 5817444 [9]	1.2	0.44	1.6	Yes
Formaldehyde	µg/m³	3 minute	Constant	7.2	40	330825, 5823122 [8]	2.3	4.9	5.8	Yes
PAHs [as B(a)P TEQ]	µg/m³	3 minute	Constant	0.0011	0.73	330624, 5817469 [10]	0.00058	0.00055	0.079	Yes

Notes:

Concentrations rounded to two significant figures.

1 Hourly time varying or constant background concentration (refer to Section 9.3). Hourly time varying concentrations change from hour to hour over a 24-hour period. A constant background concentration refers to one concentration used to represent background conditions (without the project).
2 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion. 100th percentile refers to the maximum value.
3 SEPP(AQM) design criterion.
4 600 m east-north-east of the northern ventilation structure within Simpson Barracks.
5 990 m northeast of the southern ventilation structure within residential area of Bulleen.
6 150 m south-south-east of the northern ventilation structure within Simpson Barracks.
7 620 m southwest of the northern ventilation structure within residential area of Macleod.
8 140 m west of the northern ventilation structure within residential area of Macleod.
9 150 m west of the southern ventilation structure within Carey Grammar Sports Complex.
10 140 m northwest of the southern ventilation structure within Carey Grammar Sports Complex.
11 See Section 10.7.1.

Table 48: Results: Scenario B2

Pollutant	Units	Averaging period	Assessment background type [1]	Maximum predicted GLC [2]	Design criterion [3]	Location of predicted maximum	Contribution to maximum predicted GLC		Project contribution relative to design criterion (%)	Compliance
							Project	Background		
PM_{10}	µg/m^3	1 hour	Time-varying	200	80	331550, 5823322 [4]	0.16	200	0.20	No [7]
$PM_{2.5}$	µg/m^3	1 hour	Time-varying	74	50	331324, 5818194 [5]	0.037	74	0.073	No [7]
NO_2	µg/m^3	1 hour	Time-varying	120	190	330475, 5822747 [6]	3.5	120	1.8	Yes

Notes:

Concentrations rounded to two significant figures.

1 Hourly time varying or constant background concentration (refer to Section 9.3). Hourly time varying concentrations change from hour to hour over a 24-hour period.

2 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion. 100th percentile refers to the maximum value.

3 SEPP(AQM) design criterion.

4 600 m east-north-east of the northern ventilation structure within Simpson Barracks.

5 990 m northeast of the southern ventilation structure within residential area of Bulleen.

6 620 m southwest of the northern ventilation structure within residential area of Macleod.

7 See Section 10.7.1.

Table 49: Results: Scenario A1 – project only

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Location of predicted maximum	Project contribution relative to design criterion (%)
PM_{10}	μg/m³	1 hour	4.2	80	331000, 5822997 [3]	5.3
$PM_{2.5}$	μg/m³	1 hour	3.6	50	331000, 5822997 [3]	7.2
CO	mg/m³	1 hour	0.15	29	331000, 5822997 [3]	0.52
NO_2	μg/m³	1 hour	29	190	330825, 5823122 [4]	15

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 145 m south-south-east of the northern ventilation structure within Simpson Barracks.
4 140 m west of the northern ventilation structure within residential area of Macleod.

Table 50: Results: Scenario A2 – project only

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Location of predicted maximum	Project contribution relative to design criterion (%)
PM_{10}	μg/m³	1 hour	3.2	80	331000, 5822997 [3]	4.0
$PM_{2.5}$	μg/m³	1 hour	2.0	50	331000, 5822997 [3]	4.0
NO_2	μg/m³	1 hour	9.4	190	330825, 5823122 [4]	4.9

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 145 m south-south-east of the northern ventilation structure within Simpson Barracks.
4 140 m west of the northern ventilation structure within residential area of Macleod.

Table 51: Results: Scenario B1 – project only

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Location of predicted maximum	Project contribution relative to design criterion (%)
PM_{10}	μg/m³	1 hour	4.8	80	330825, 5823122 [3]	6.0
$PM_{2.5}$	μg/m³	1 hour	4.1	50	330825, 5823122 [3]	8.2
CO	mg/m³	1 hour	0.15	29	331000, 5822997 [4]	0.52
NO_2	μg/m³	1 hour	35	190	330825, 5823122 [3]	18

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 140 m west of the northern ventilation structure within residential area of Macleod.
4 145 m south-south-east of the northern ventilation structure within Simpson Barracks.

Table 52: Results: Scenario B2 – project only

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Location of predicted maximum	Project contribution relative to design criterion (%)
PM_{10}	µg/m³	1 hour	3.4	80	331000, 5822997 [3]	4.2
$PM_{2.5}$	µg/m³	1 hour	2.2	50	330825, 5823122 [4]	4.4
NO_2	µg/m³	1 hour	11	190	330825, 5823122 [4]	5.8

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 145 m south-south-east of the northern ventilation structure within Simpson Barracks.
4 140 m west of the northern ventilation structure within residential area of Macleod.

Table 53: Results: Scenario A1 – project only, discrete receptors

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Receptor ID	Project contribution relative to design criterion (%)
PM_{10}	µg/m³	1 hour	2.9	80	105 [3]	3.6
$PM_{2.5}$	µg/m³	1 hour	2.5	50	105 [3]	5.0
NO_2	µg/m³	1 hour	20	190	105 [3]	10
Benzene	µg/m³	1 hour	2.7	53	105 [3]	5.0

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 Carey Grammar Sports Complex

Table 54: Results: Scenario A2 – project only, discrete receptors

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Receptor ID	Project contribution relative to design criterion (%)
PM_{10}	µg/m³	1 hour	2.1	80	68 [3]	2.6
$PM_{2.5}$	µg/m³	1 hour	1.3	50	68 [3]	2.6
NO_2	µg/m³	1 hour	6.4	190	105 [4]	3.4

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 Simpson Barracks
4 Carey Grammar Sports Complex

Table 55: Results: Scenario B1 – project only, discrete receptors

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Receptor ID	Project contribution relative to design criterion (%)
PM_{10}	µg/m^3	1 hour	3.3	80	105 [3]	4.1
$PM_{2.5}$	µg/m^3	1 hour	2.9	50	105 [3]	5.7
NO_2	µg/m^3	1 hour	22	190	105 [3]	12
Benzene	µg/m^3	1 hour	2.7	53	105 [3]	5.0

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 Carey Grammar Sports Complex

Table 56: Results: Scenario B2 – project only, discrete receptors

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Receptor ID	Project contribution relative to design criterion (%)
PM_{10}	µg/m^3	1 hour	2.2	80	105 [3]	2.7
$PM_{2.5}$	µg/m^3	1 hour	1.4	50	105 [3]	2.8
NO_2	µg/m^3	1 hour	7.4	190	105 [3]	3.9

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 Carey Grammar Sports Complex

10.6.2 Sensitivity analyses

Results of the additional sensitivity analyses [the maximum predicted (99.9th percentile) pollutant GLC] are presented in Table 57 to Table 61. Maximum predicted (99.9th percentile) results for the sensitivity analyses without time-varying background concentrations are presented in Table 62 to Table 64. The maximum lane capacity sensitivity analysis results for the each of the discrete receptors are provided in APPENDIX C.

Table 57: Sensitivity analysis results: maximum tunnel capacity

Pollutant	Units	Averaging period	Assessment background type [1]	Maximum predicted GLC [2]	Design criterion [3]	Location of predicted maximum	Contribution to maximum predicted GLC		Project contribution relative to design criterion (%)	Compliance
							Project	Background		
PM_{10}	µg/m^3	1 hour	Time-varying	200	80	331575, 5823322 [4]	0.25	200	0.31	No [8]
$PM_{2.5}$	µg/m^3	1 hour	Time-varying	75	50	331324, 5818194 [5]	1.2	74	2.3	No [8]
CO	mg/m^3	1 hour	Time-varying	2.7	29	331000, 5822997 [6]	0.17	2.5	0.58	Yes
NO_2	µg/m^3	1 hour	Time-varying	140	190	331000, 5822997 [6]	71	66	37	No
Benzene	µg/m^3	3 minute	Constant	17	53	330825, 5823122 [7]	10	7.3	19	Yes
Toluene	µg/m^3	3 minute	Constant	63	650	330825, 5823122 [7]	20	43	3.1	Yes
Ethylbenzene	µg/m^3	3 minute	Constant	12	14500	330825, 5823122 [7]	7.1	4.8	0.049	Yes
Xylene isomers	µg/m^3	3 minute	Constant	39	350	330825, 5823122 [7]	19	20	5.4	Yes
1,3-Butadiene	µg/m^3	3 minute	Constant	3.2	73	330825, 5823122 [7]	2.7	0.44	3.7	Yes
Formaldehyde	µg/m^3	3 minute	Constant	11	40	330825, 5823122 [7]	5.7	4.9	14	Yes
PAHs [as B(a)P TEQ]	µg/m^3	3 minute	Constant	0.0014	0.73	330825, 5823122 [7]	0.00089	0.00055	0.12	Yes

Notes:

Concentrations rounded to two significant figures.

1 Hourly time varying or constant background concentration (refer to Section 9.3). Hourly time varying concentrations change from hour to hour over a 24-hour period. A constant background concentration refers to one concentration used to represent background conditions (without the project).

2 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion. 100th percentile refers to the maximum value.

3 SEPP(AQM) design criterion.

4 630 m east-north-east of the northern ventilation structure within Simpson Barracks.

5 990 m northeast of the southern ventilation structure within residential area of Bulleen.

6 150 m south-south-east of the northern ventilation structure within Simpson Barracks.

7 150 m west of the northern ventilation structure within residential area of Macleod.

8 See Section 10.7.1.

Table 58: Sensitivity analysis results: in-tunnel air quality limits

Pollutant	Units	Averaging period	Assessment background type [1]	Maximum predicted GLC [2]	Design criterion [3]	Location of predicted maximum	Contribution to maximum predicted GLC		Project contribution relative to design criterion (%)	Compliance
							Project	Background		
CO	mg/m^3	1 hour	Time-varying	4.4	29	331000, 5822997 [4]	2.5	1.9	6.7	Yes
NO_2	µg/m^3	1 hour	Time-varying	130	190	330475, 5822747 [5]	13	120	6.9	Yes

Notes:

Concentrations rounded to two significant figures.

1 Hourly time varying or constant background concentration (refer to Section 9.3). Hourly time varying concentrations change from hour to hour over a 24-hour period.

2 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criteria. 100th percentile refers to the maximum value.

3 SEPP(AQM) design criterion.

4 150 m south-south-east of the northern ventilation structure within Simpson Barracks.

5 620 m southwest of the northern ventilation structure within residential area of Macleod.

Table 59: Sensitivity analysis results: increased ratio of diesel to petrol cars

Pollutant	Units	Averaging period	Assessment background type [1]	Maximum predicted GLC [2]	Design criterion [3]	Location of predicted maximum	Contribution to maximum predicted GLC		Project contribution relative to design criterion (%)	Compliance
							Project	Background		
PM_{10}	µg/m^3	1 hour	Time-varying	200	80	331550, 5823322 [4]	0.25	200	0.31	No [7]
$PM_{2.5}$	µg/m^3	1 hour	Time-varying	74	50	331324, 5818194 [5]	0.090	74	0.18	No [7]
NO_2	µg/m^3	1 hour	Time-varying	130	190	330475, 5822747 [6]	14	120	7.5	Yes

Notes:

Concentrations rounded to two significant figures.

1 Hourly time varying or constant background concentration (refer to Section 9.3). Hourly time varying concentrations change from hour to hour over a 24-hour period.

2 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion. 100th percentile refers to the maximum value.

3 SEPP(AQM) design criterion.

4 600 m east-north-east of the northern ventilation structure within Simpson Barracks.

5 990 m northeast of the southern ventilation structure within residential area of Bulleen.

6 620 m southwest of the northern ventilation structure within residential area of Macleod.

7 See Section 10.7.1.

Table 60: Sensitivity analysis results: alternative northern ventilation structure locations

Option	Pollutant	Units	Averaging period	Assessment background type [1]	Maximum predicted GLC [2]	Design criterion [3]	Location of predicted maximum	Contribution to maximum predicted GLC		Project contribution relative to design criterion (%)	Compliance
								Project	Background		
Proposed	$PM_{2.5}$	µg/m^3	1 hour	Time-varying	74	50	331587, 5824142 [4]	0.071	74	0.14	No [9]
2	$PM_{2.5}$	µg/m^3	1 hour	Time-varying	74	50	331481, 5824230 [5]	0.073	74	0.15	No [9]
3	$PM_{2.5}$	µg/m^3	1 hour	Time-varying	74	50	331733, 5824312 [6]	0.073	74	0.15	No [9]
4	$PM_{2.5}$	µg/m^3	1 hour	Time-varying	74	50	331082, 5823429 [7]	0.086	74	0.17	No [9]
5	$PM_{2.5}$	µg/m^3	1 hour	Time-varying	74	50	331433, 5823804 [8]	0.071	74	0.14	No [9]

Notes:

Concentrations rounded to two significant figures.

1 Hourly time varying or constant background concentration (refer to Section 9.3). Hourly time varying concentrations change from hour to hour over a 24-hour period.

2 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion. 100th percentile refers to the maximum value.

3 SEPP(AQM) design criterion.

4 1170 m northeast of the proposed northern ventilation structure within residential area of Macleod.

5 1130 m northeast of the Option 2 northern ventilation structure within residential area of Macleod.

6 1300 m northeast of the Option 3 northern ventilation structure within residential area of Macleod.

7 450 m northeast of the Option 4 northern ventilation structure within Simpson Barracks.

8 910 m northeast of the Option 5 northern ventilation structure within residential area of Macleod.

9 See Section 10.7.1.

Table 61: Sensitivity analysis results: alternative southern ventilation structure locations

Option	Pollutant	Units	Averaging period	Assessment background type [1]	Maximum predicted GLC [2]	Design criterion [3]	Location of predicted maximum	Contribution to maximum predicted GLC		Project contribution relative to design criterion (%)	Compliance
								Project	Background		
Proposed	$PM_{2.5}$	µg/m³	1 hour	Time-varying	74	50	331320, 5818194 [4]	0.083	74	0.17	No [9]
2	$PM_{2.5}$	µg/m³	1 hour	Time-varying	74	50	331208, 5818271 [5]	0.088	74	0.18	No [9]
3	$PM_{2.5}$	µg/m³	1 hour	Time-varying	74	50	331306, 5818221 [6]	0.10	74	0.19	No [9]
4	$PM_{2.5}$	µg/m³	1 hour	Time-varying	74	50	331312, 5818177 [7]	0.076	74	0.15	No [9]
5	$PM_{2.5}$	µg/m³	1 hour	Time-varying	74	50	331392, 5818117 [8]	0.071	74	0.15	No [9]

Notes:

Concentrations rounded to two significant figures.

1 Hourly time varying or constant background concentration (refer to Section 9.3). Hourly time varying concentrations change from hour to hour over a 24-hour period.

2 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion. 100th percentile refers to the maximum value.

3 SEPP(AQM) design criterion.

4 990 m northeast of the proposed southern ventilation structure within residential area of Bulleen.

5 900 m northeast of the Option 2 southern ventilation structure within residential area of Bulleen.

6 840 m northeast of the Option 3 southern ventilation structure within residential area of Bulleen.

7 1070 m northeast of the Option 4 southern ventilation structure within residential area of Bulleen.

8 1120 m northeast of the Option 5 southern ventilation structure within residential area of Bulleen.

9 See Section 10.7.1.

Table 62: Sensitivity analysis results: maximum tunnel capacity – project only

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Location of predicted maximum	Project contribution relative to design criterion (%)
PM_{10}	µg/m^3	1 hour	9.6	80	330825, 5823122 [3]	12
$PM_{2.5}$	µg/m^3	1 hour	8.4	50	330825, 5823122 [3]	17
CO	mg/m^3	1 hour	0.21	29	330825, 5823122 [3]	0.72
NO_2	µg/m^3	1 hour	75	190	330825, 5823122 [3]	39

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 140 m west of the northern ventilation structure within residential area of Macleod.

Table 63: Sensitivity analysis results: in-tunnel air quality limits – project only

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Location of predicted maximum	Project contribution relative to design criterion (%)
CO	mg/m^3	1 hour	2.2	29	330825, 5823122 [3]	7.6
NO_2	µg/m^3	1 hour	37	190	330825, 5823122 [3]	19

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 Carey Grammar Sports Complex.

Table 64: Sensitivity analysis results: increased ratio of diesel to petrol cars – project only

Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Location of predicted maximum	Project contribution relative to design criterion (%)
PM_{10}	µg/m^3	1 hour	5.4	80	330825, 5823122 [3]	6.8
$PM_{2.5}$	µg/m^3	1 hour	4.7	50	330825, 5823122 [3]	9.4
NO_2	µg/m^3	1 hour	41	190	330825, 5823122 [3]	22

Notes:
Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 140 m west of the northern ventilation structure within residential area of Macleod.

Table 65: Sensitivity analysis results: alternative northern ventilation structure locations – project only

Option	Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Location of predicted maximum	Project contribution relative to design criterion (%)
Proposed	$PM_{2.5}$	µg/m^3	1 hour	4.0	50	330837, 5823117 [3]	8.1
2	$PM_{2.5}$	µg/m^3	1 hour	4.0	50	330781, 5823155 [4]	8.1
3	$PM_{2.5}$	µg/m^3	1 hour	4.0	50	331033, 5823112 [5]	8.1
4	$PM_{2.5}$	µg/m^3	1 hour	4.0	50	330757, 5822929 [6]	8.1
5	$PM_{2.5}$	µg/m^3	1 hour	4.1	50	330833, 5823079 [7]	8.1

Notes:

Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 130 m west of the proposed northern ventilation structure within residential area of Macleod.
4 150 m southwest of the Option 2 northern ventilation structure within residential area of Macleod.
5 130 m south-south-east of the Option 3 northern ventilation structure within Simpson Barracks.
6 140 m southwest of the Option 4 northern ventilation structure within residential area of Macleod.
7 140 m west-north-west of the Option 5 northern ventilation structure within residential area of Macleod.

Table 66: Sensitivity analysis results: alternative southern ventilation structure locations – project only

Option	Pollutant	Units	Averaging period	Maximum predicted project contribution GLC [1]	Design criterion [2]	Location of predicted maximum	Project contribution relative to design criterion (%)
Proposed	$PM_{2.5}$	µg/m^3	1 hour	3.1	50	330620, 5817469 [3]	6.3
2	$PM_{2.5}$	µg/m^3	1 hour	3.2	50	330558, 5817471 [4]	6.4
3	$PM_{2.5}$	µg/m^3	1 hour	3.2	50	330706, 5817646 [5]	6.5
4	$PM_{2.5}$	µg/m^3	1 hour	3.2	50	330587, 5817202 [6]	6.4
5	$PM_{2.5}$	µg/m^3	1 hour	3.2	50	330867, 5817267 [7]	6.4

Notes:

Concentrations rounded to two significant figures.
1 99.9th percentile (8th highest value) as required for assessment against SEPP(AQM) design criterion.
2 SEPP(AQM) design criterion.
3 140 m northwest of the proposed southern ventilation structure within Carey Grammar Sports Complex.
4 140 m southwest of the Option 2 southern ventilation structure within Carey Grammar Sports Complex.
5 140 m northwest of the Option 3 southern ventilation structure within Veneto Club.
6 140 m southwest of the Option 4 southern ventilation structure within Carey Grammar Sports Complex.
7 140 m southwest of the Option 5 southern ventilation structure within Marcellin College.

10.7 Discussion

10.7.1 Design assessment

Emissions from the North East Link tunnel ventilation system were calculated for projected diurnal weekday traffic conditions in 2026 and 2036 using 2010 emission factors, adjusted to 2020 and 2025 to account for anticipated reductions in vehicle fleet emissions.

In accordance with the requirements of SEPP(AQM), modelling was conducted to predict the potential impacts of pollutant emissions from the proposed tunnel ventilation system on ground level concentrations, with the 99.9th percentile maximum predicted concentrations assessed against Schedule A design criteria. EPA Victoria guidance states that modelling be conducted using five years of meteorological data (2013 to 2017), reporting the worst case year results. The year 2017 was found to predict the highest one hour average 99.9th percentile GLC for a single pollutant ($PM_{2.5}$) and was therefore used for all subsequent modelling.

When available, SEPP(AQM) requires model predictions to incorporate time varying background concentration data. Time varying hourly average background concentration data were used for PM_{10}, $PM_{2.5}$, CO and NO_2. When appropriate time varying background concentration data are unavailable, SEPP(AQM) indicates the 70th percentile of observed concentrations, as a constant value, should be incorporated. Constant background concentrations provided by EPA Victoria were used for air toxics.

Hourly PM_{10} and $PM_{2.5}$ background concentrations at the Alphington AAQMS exceed the one hour average design criteria on multiple occasions in 2017. This effectively imposes exceedances for all Scenarios assessed before the additional impact of the tunnel ventilation system is considered.

Analysis of the hourly PM_{10} concentrations showed that exceedances of the 80 micrograms per cubic metre design criterion (one hour average) occurred on eight occasions during 2017, without any contribution from the project (Figure 67).

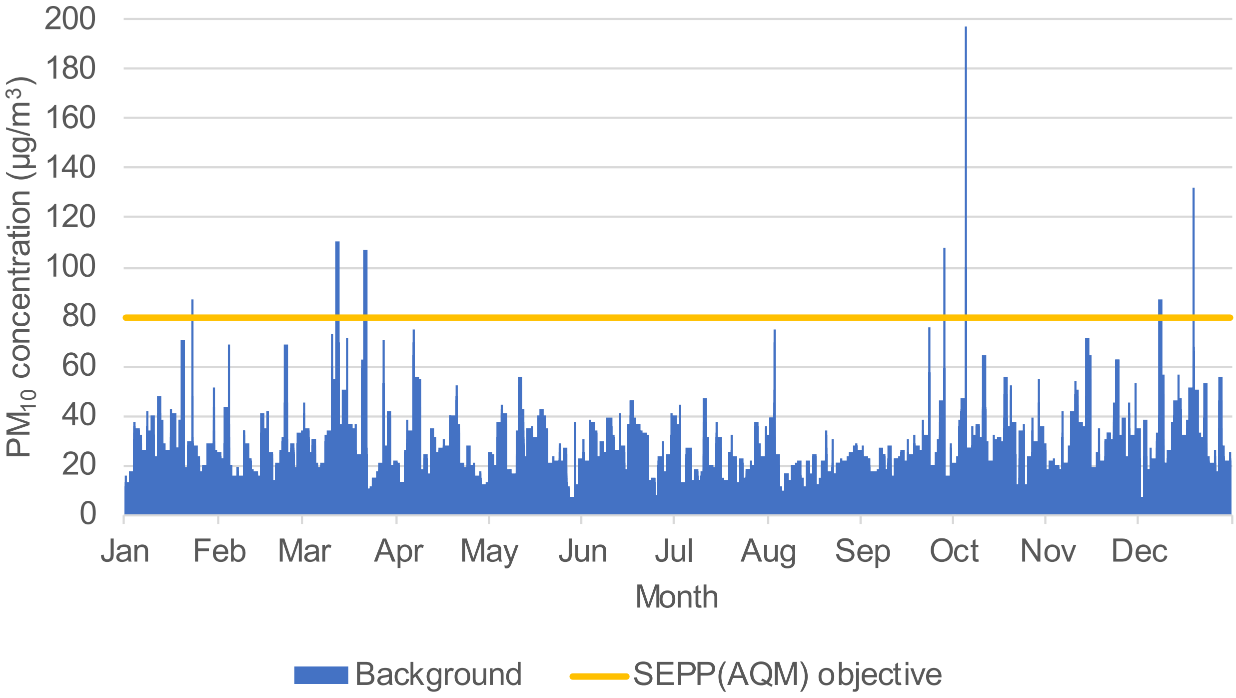


Figure 67: 2017 hourly background PM_{10} concentration

The hourly background concentrations for $PM_{2.5}$ at the Alphington AAQMS exceeded the 50 micrograms per cubic metre design criterion (one hour average) on 20 occasions during 2017 (Figure 68).

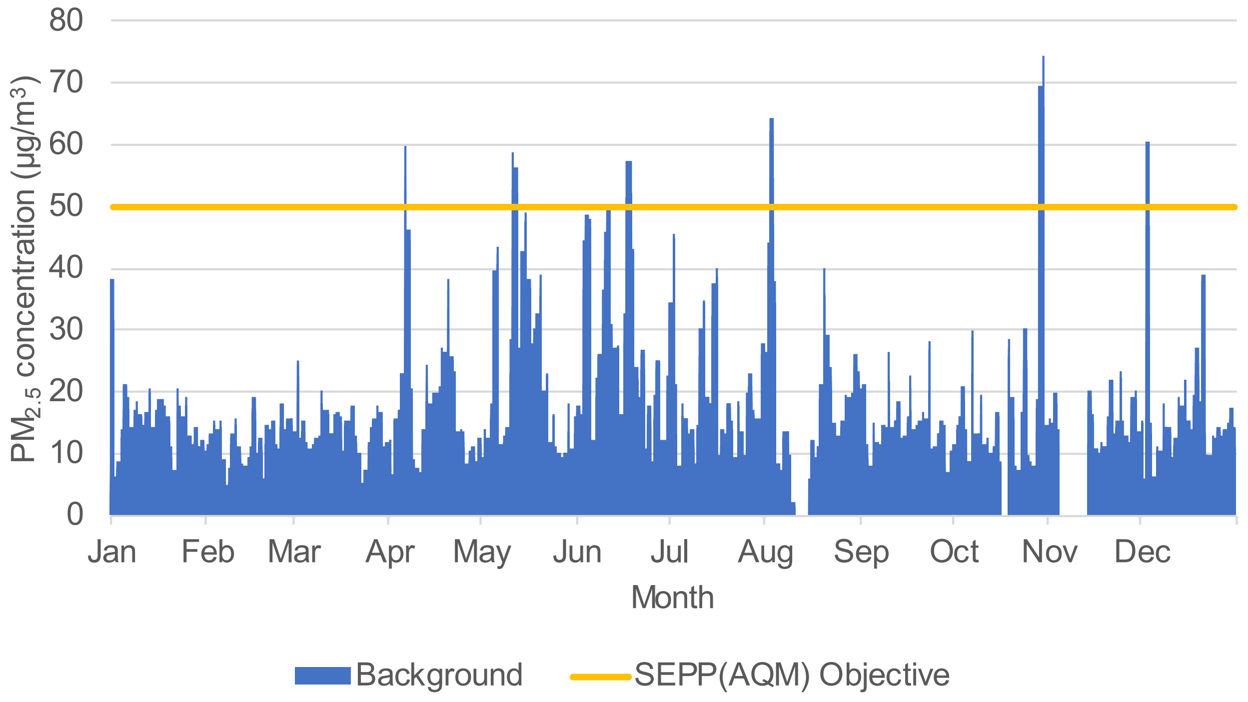


Figure 68: 2017 hourly background $PM_{2.5}$ concentration

Scenario A1 (2026 traffic; 2020 emission factors)

Ventilation system emissions result in no additional PM_{10} exceedances of the design criterion to those already imposed by the background contribution.

The air quality impact assessment indicated that, while the one hour average PM_{10} design criterion was exceeded in 2026, the tunnel ventilation system emissions only contributed 0.087 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.22 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration, with the maximum predicted GLC 600 metres east-north-east of the northern ventilation structure within the Simpson Barracks.

The maximum predicted project contribution to the PM_{10} GLC (no background) is 4.2 micrograms per cubic metre, or 5.3 per cent of the design criterion, approximately 145 metres south of the northern ventilation structure within the Simpson Barracks.

Ventilation system emissions result in one additional $PM_{2.5}$ exceedance, with a project contribution less than 0.7 micrograms per cubic metre and a corresponding background concentration of 49.8 micrograms per cubic metre.

The assessment indicated that, while the one hour average $PM_{2.5}$ design criterion was exceeded in 2026, the tunnel ventilation system emissions only contributed 0.084 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.13 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration, with the maximum predicted GLC 990 metres northeast of the southern ventilation structure within a Bulleen residential area.

The maximum predicted project contribution to the $PM_{2.5}$ GLC (no background) is 3.6 micrograms per cubic metre, or 7.2 per cent of the design criterion, approximately 145 metres south of the northern ventilation structure within the Simpson Barracks.

The maximum predicted project contributions for PM_{10} and $PM_{2.5}$ each represent the eighth worst hour of the year (rank 8 of 8,290 hours data for 2017) at the most impacted receptor. It is noted that during all other hours, all receptors are less impacted than this. Figure 69 presents the next 1,000 highest PM_{10} and $PM_{2.5}$ results, each representing the concentrations predicted at the most impacted receptor for that hour. Figure 69 illustrates that for most of the time the predicted PM_{10} and $PM_{2.5}$ impacts are significantly below the maximum results of 4.2 and 3.6 micrograms per cubic metre respectively.

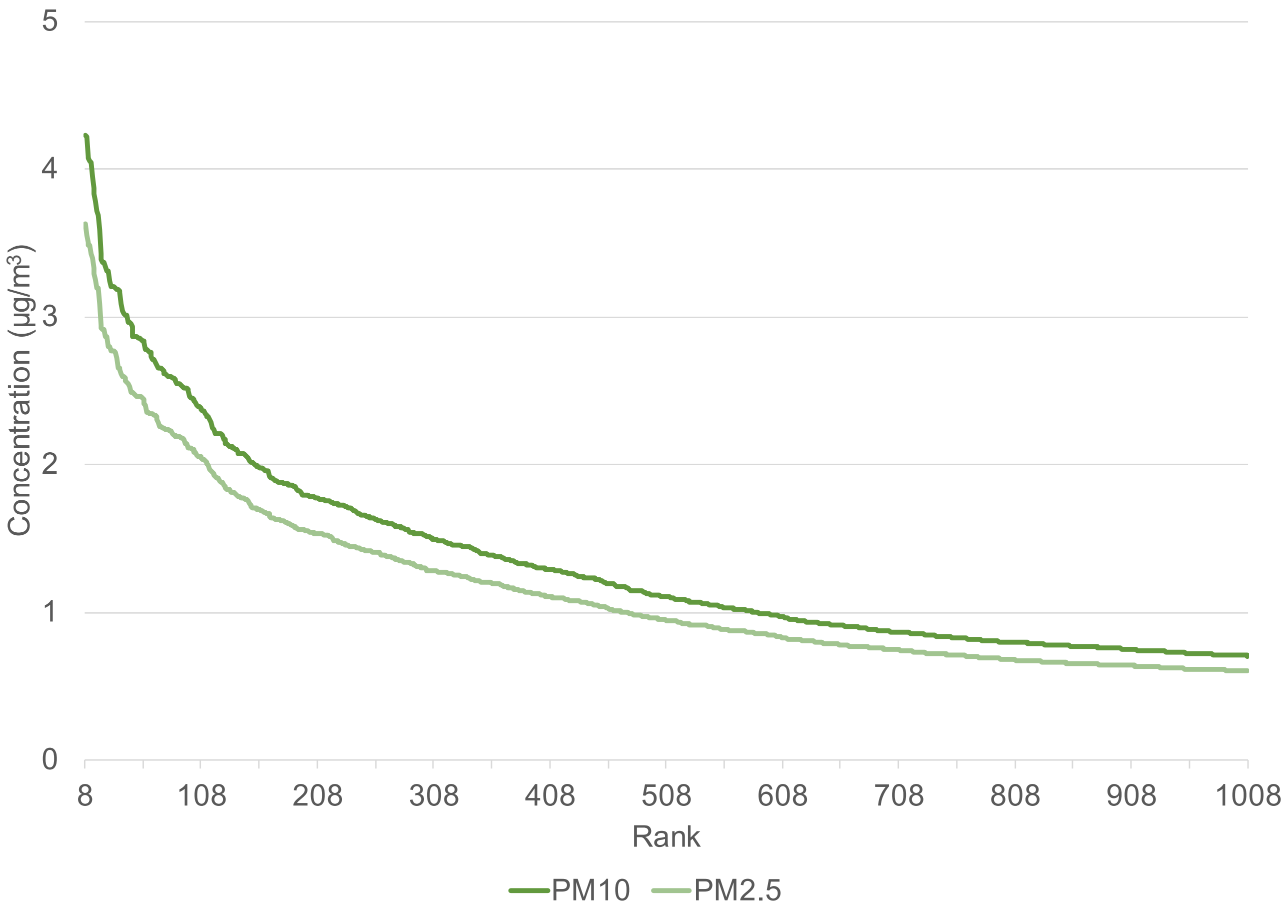


Figure 69: Scenario A1 PM_{10} and $PM_{2.5}$ 1,000 highest results

Predicted CO, NO_2, BTEX, 1,3-butadiene, formaldehyde and PAH [as B(a)P TEQ] concentrations comply with the applicable design criteria in 2026.

The most impacted discrete receptor was the same for each of the pollutants assessed with a maximum NO_2 project contribution equal to 10 per cent of the criterion (20 micrograms per cubic metre) at Carey Grammar Sports Complex (Receptor ID 105).

Scenario A2 (2026 traffic; 2025 emission factors)

Tunnel ventilation system emissions result in no additional exceedances of the PM_{10} design criterion to those already imposed by the background contribution.

The air quality impact assessment indicated that while the one hour average PM_{10} design criterion was exceeded in 2026, the tunnel ventilation system emissions only contributed 0.065 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.16 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration, with the maximum predicted GLC 600 metres east-north-east of the northern ventilation structure within the Simpson Barracks.

The maximum predicted project contribution to the PM_{10} GLC (no background) is 3.2 micrograms per cubic metre, or 4.0 per cent of the design criterion, approximately 145 metres south of the northern ventilation structure within the Simpson Barracks.

Tunnel ventilation system emissions result in one additional $PM_{2.5}$ exceedance, with a project contribution of less than 0.3 micrograms per cubic metre and a corresponding background concentration of 49.8 micrograms per cubic metre.

The assessment indicated that, while the one hour average $PM_{2.5}$ design criterion was exceeded in 2026, the tunnel ventilation system emissions only contributed 0.037 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.055 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration, with the maximum predicted GLC 990 metres northeast of the southern ventilation structure within a Bulleen residential area.

The maximum predicted project contribution to the $PM_{2.5}$ GLC (no background) is 2.0 micrograms per cubic metre, or 4.0 per cent of the design criterion, approximately 145 metres south of the northern ventilation structure, within the Simpson Barracks.

Figure 70 presents the rank 8 to rank 1008 PM_{10} and $PM_{2.5}$ concentrations predicted at the most impacted receptor for that hour and illustrates that for most of the time the predicted PM_{10} and $PM_{2.5}$ impacts are significantly below the maximum results of 3.2 and 2.0 micrograms per cubic metre respectively.

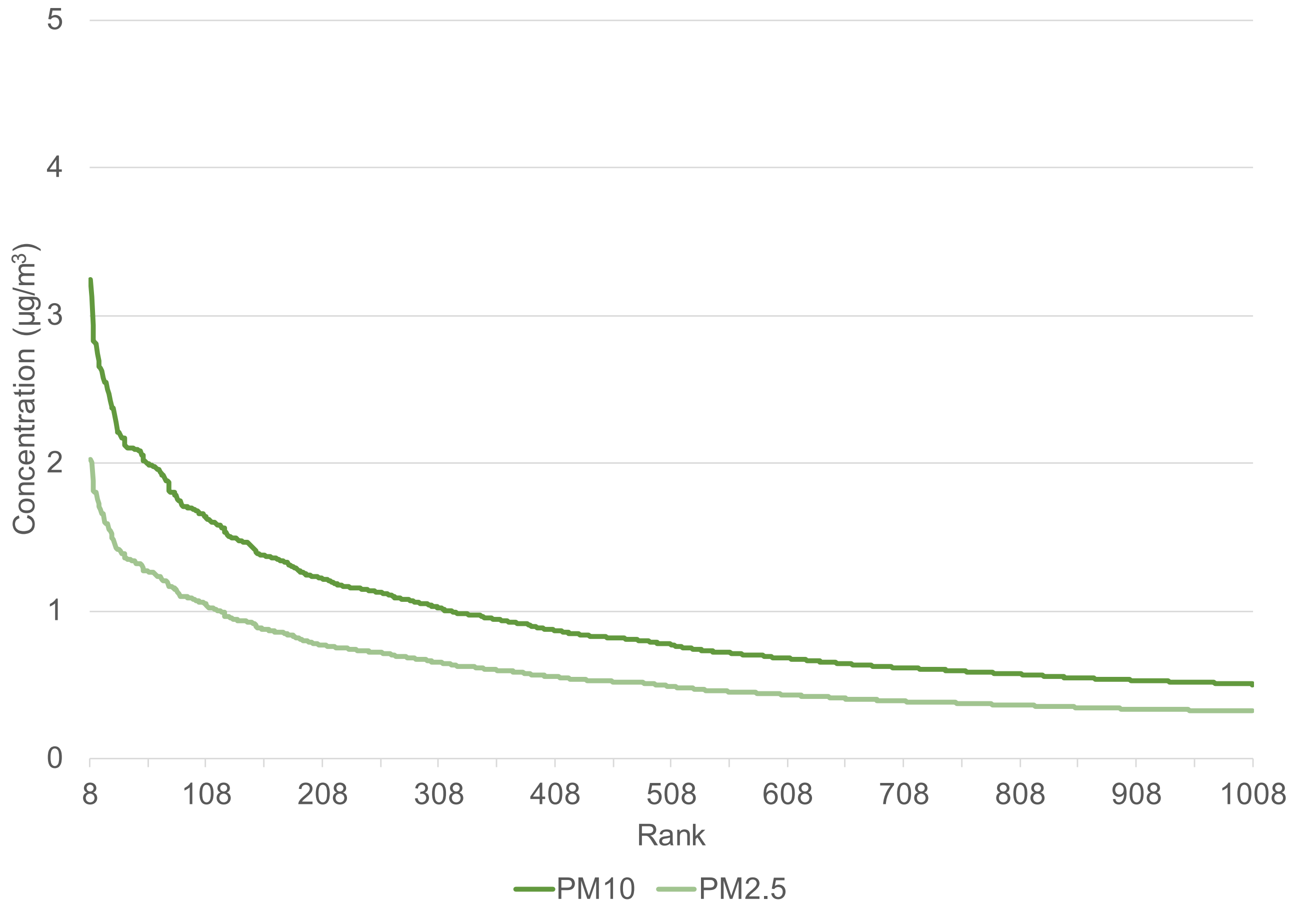


Figure 70: Scenario A2 PM_{10} and $PM_{2.5}$ 1,000 highest results

Predicted NO_2 concentrations comply with the applicable design criteria in 2026.

The most impacted discrete receptor for PM_{10} and $PM_{2.5}$ was the Simpson Barracks (Receptor 68) with maximum project contributions equal to 2.6 per cent of the criteria (2.1 and 1.3 micrograms per cubic metre) respectively. The most impacted discrete receptor for NO_2 was Carey Grammar Sports Complex (Receptor ID 105) with a maximum project contribution equal to 3.4 per cent of the criterion (6.4 micrograms per cubic metre).

Scenario B1 (2036 traffic; 2020 vehicle emission factors)

Tunnel ventilation system emissions result in no additional exceedances of the PM_{10} design criterion to those already imposed by the background contribution.

The assessment indicated that, while the one hour average PM_{10} design criterion was exceeded in 2036, the tunnel ventilation system emissions only contributed 0.11 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.27 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration, with the maximum predicted GLC 600 metres east-north-east of the northern ventilation structure within the Simpson Barracks.

The maximum predicted project contribution to the PM_{10} GLC (no background) is 4.8 micrograms per cubic metre, or 6.0 per cent of the design criterion, approximately 140 metres west of the northern ventilation structure within the Simpson Barracks.

Tunnel ventilation system emissions result in one additional exceedance of the $PM_{2.5}$ design criterion with a project contribution of less than 0.7 micrograms per cubic metre and a corresponding background concentration of 49.8 micrograms per cubic metre.

The assessment indicated that, while the one hour average $PM_{2.5}$ design criterion was exceeded in 2036, the tunnel ventilation system emissions only contributed 0.11 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.17 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration, with the maximum predicted GLC 990 metres northeast of the southern ventilation structure within a Bulleen residential area.

The maximum predicted project contribution to the $PM_{2.5}$ GLC (no background) is 4.1 micrograms per cubic metre, or 8.2 per cent of the design criterion, approximately 140 metres west of the northern ventilation structure within the residential area of Macleod.

Figure 71 presents the rank 8 to rank 1008 PM_{10} and $PM_{2.5}$ concentrations predicted at the most impacted receptor for that hour and illustrates that for most of the time the predicted PM_{10} and $PM_{2.5}$ impacts are significantly below the maximum results of 4.8 and 4.1 micrograms per cubic metre respectively.

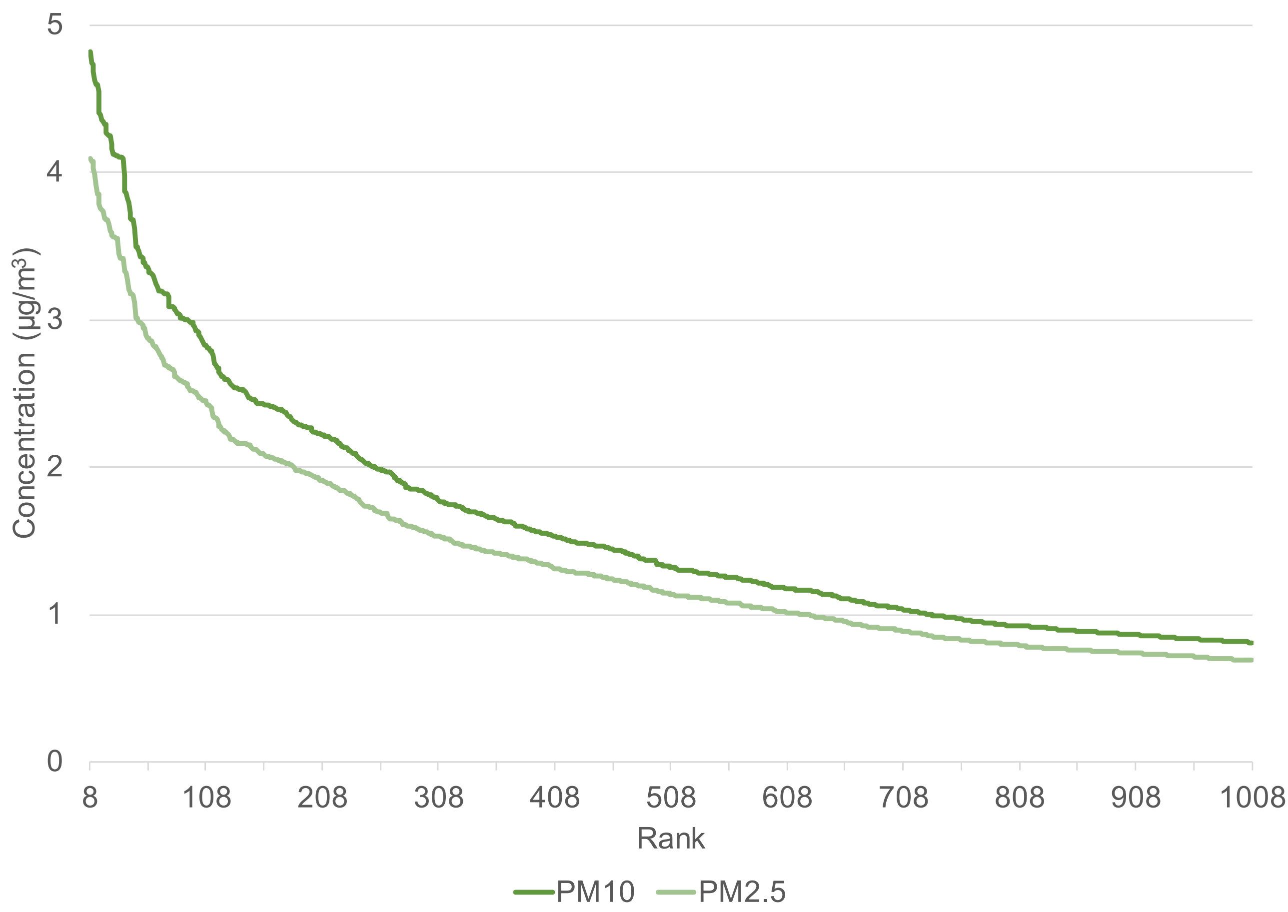


Figure 71: Scenario B1 PM_{10} and $PM_{2.5}$ 1,000 highest results

Predicted CO, NO_2, BTEX, 1,3-butadiene, formaldehyde and PAH [as B(a)P TEQ] concentrations comply with the applicable design criteria in 2036.

The most impacted discrete receptor was the same for each of the pollutants assessed, with a maximum NO_2 project contribution equal to 12 per cent of the criterion (22 micrograms per cubic metre) at Carey Grammar Sports Complex (Receptor ID 105).

Scenario B2 (2036 traffic; 2025 vehicle emission factors)

Tunnel ventilation system emissions result in no additional exceedances of the PM_{10} design criterion to those already imposed by the background contribution.

The assessment indicated that, while the one hour average PM_{10} design criterion was exceeded in 2036, the tunnel ventilation system emissions only contributed 0.081 per cent of the predicted 99.9th percentile GLC, which is equivalent to 0.20 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration, with the maximum predicted GLC 600 metres east-north-east of the northern ventilation structure within the Simpson Barracks.

The maximum predicted project contribution to the PM_{10} GLC (no background) is 3.4 micrograms per cubic metre, or 4.2 per cent of the design criterion, approximately 145 metres south of the northern ventilation structure within the Simpson Barracks.

Project tunnel ventilation system emissions result in one additional exceedance of the $PM_{2.5}$ design criterion, with a project contribution of less than 0.4 micrograms per cubic metre and a corresponding background concentration of 49.8 micrograms per cubic metre.

The assessment indicated that, while the one hour average $PM_{2.5}$ design criterion was exceeded in 2036, the tunnel ventilation system emissions only contributed 0.049 per cent of the predicted 99.9th percentile $PM_{2.5}$ GLC, which is equivalent to 0.073 per cent of the design criterion. This exceedance applies to all receptors assessed due to the elevated background concentration, with the maximum predicted GLC 990 metres northeast of the southern ventilation structure within a Bulleen residential area.

The maximum predicted project contribution to the $PM_{2.5}$ GLC (no background) is 2.2 micrograms per cubic metre, or 4.4 per cent of the design criterion, approximately 140 metres west of the northern ventilation structure within a Macleod residential area.

Figure 72 presents the rank 8 to rank 1008 PM_{10} and $PM_{2.5}$ concentrations predicted at the most impacted receptor for that hour and illustrates that for most of the time the predicted PM_{10} and $PM_{2.5}$ impacts are significantly below the maximum results of 3.4 and 2.2 micrograms per cubic metre respectively.

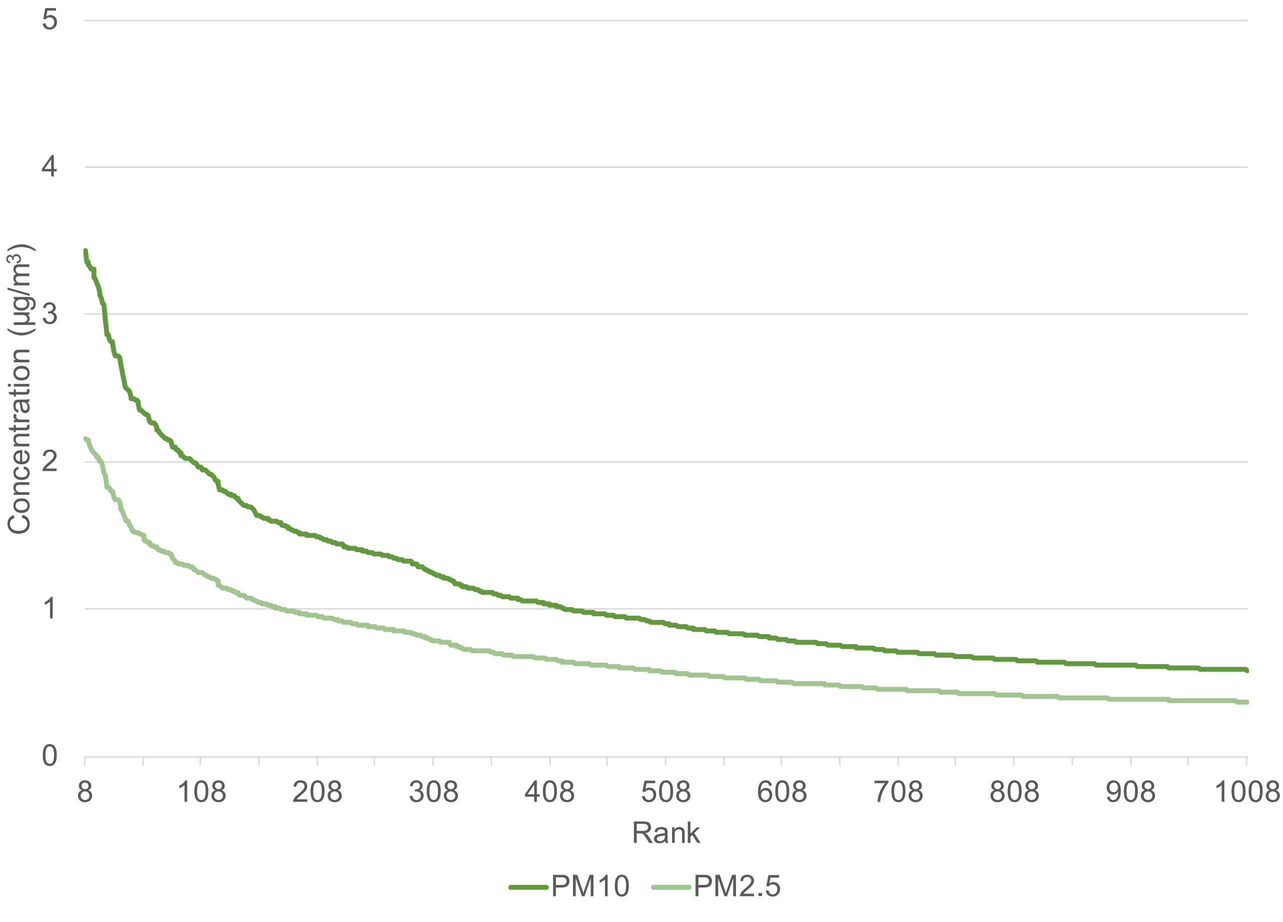


Figure 72: Scenario B2 PM_{10} and $PM_{2.5}$ 1,000 highest results

The most impacted discrete receptor was the same for each of the three pollutants assessed, with a maximum NO_2 project contribution equal to 3.9 per cent of the criterion (7.4 micrograms per cubic metre) at Carey Grammar Sports Complex (Receptor ID 105).

Summary

In summary, with the exception of PM_{10} and $PM_{2.5}$, compliance with all applicable SEPP(AQM) design criteria was demonstrated for the proposed North East Link tunnel ventilation system under normal operating conditions. The PM_{10} and $PM_{2.5}$ exceedances were due to the high background concentrations.

In its assessment report for the West Gate Tunnel project, EPA Victoria (EPA Victoria, 2017) noted that '*the proposed ventilation stacks meet the criteria for all air pollutants under the Policy, except for PM_{10} emissions, where the prevailing hourly PM_{10} background levels (the design criterion) are exceeded by the predicted cumulative PM_{10} levels'.* The '*exceedance is not considered to conflict with the intent of the Policy*', primarily due to the small contribution that emissions from the tunnel ventilation system made to the predicted concentrations. Consistent with the West Gate Tunnel ventilation system air quality impact assessment, the primary contributors to the exceedances associated with the North East Link tunnel ventilation system are the PM_{10} and $PM_{2.5}$ background concentrations. The exceedances of PM_{10} and $PM_{2.5}$ criteria are consequently not considered to conflict with the intent of the SEPP(AQM).

Further consideration of the health effects associated with these predicted impacts is presented in Technical Report J '*Human Health*'.

The sensitivity analysis provided in Scenarios A2 and B2 (2025 emission rates) provides some context as to the conservatism of the 2020 emission rates used in Scenarios A1 and B1.

The project contributions to the Scenario A2 99.9th percentile PM_{10}, $PM_{2.5}$ and NO_2 GLCs were found to decrease by approximately 26 per cent, 56 per cent and 68 per cent respectively, compared with the Scenario A1 predictions. Overall this resulted in a decrease to the resultant maximum predicted (99.9th percentile) PM_{10}, $PM_{2.5}$ and NO_2 GLCs of approximately 0.044, 0.035 and 7.3 micrograms per cubic metre, or 0.022 per cent, 0.048 per cent and 5.7 per cent. That is, due to the background contribution, the reduction in the maximum predicted (99.9th percentile) GLCs is minimal. The corresponding decreases in the maximum predicted project contribution GLCs (no background) are 1.0, 1.6 and 19 micrograms per cubic metre for PM_{10}, $PM_{2.5}$ and NO_2 respectively.

The project contributions to the Scenario B2 99.9th percentile PM_{10}, $PM_{2.5}$ and NO_2 GLCs were found to decrease by approximately 25 per cent, 56 per cent and 68 per cent respectively, compared with the Scenario B1 predictions. Overall this resulted in a decrease to the resultant maximum predicted (99.9th percentile) PM_{10}, $PM_{2.5}$ and NO_2 GLCs of approximately 0.054, 0.046 and 7.3 micrograms per cubic metre, or 0.027 per cent, 0.062 per cent and 5.7 per cent. As with the Scenario A1 and A2 comparison, due to the background contribution, the reduction in the maximum predicted (99.9th percentile) GLCs is minimal. The corresponding decreases in the maximum predicted project contribution GLCs (no background) are 1.4, 1.9 and 23 micrograms per cubic metre for PM_{10}, $PM_{2.5}$ and NO_2 respectively.

10.7.2 Sensitivity analyses

Maximum tunnel capacity (2036 traffic volumes and fleet mix; 2020 emission factors)

Again, the hourly PM_{10} and $PM_{2.5}$ background concentrations exceed the design criteria on several occasions effectively imposing exceedances before the additional impact of the tunnel ventilation system is considered.

Project tunnel ventilation system emissions result in no additional PM_{10} exceedances.

Project tunnel ventilation system emissions result in additional 16 $PM_{2.5}$ exceedances, with project contributions of 2.1 to 8.3 micrograms per cubic metre and corresponding background concentrations of 42.4 to 49.8 micrograms per cubic metre.

The tunnel ventilation system emissions contributed 0.12 per cent of the predicted 99.9th percentile PM_{10} GLC, equal to 0.31 per cent of the design criterion, and 1.5 per cent of the predicted 99.9th percentile $PM_{2.5}$ GLC, equal to 2.3 per cent of the design criterion.

The maximum predicted project contribution to the PM_{10} and $PM_{2.5}$ GLCs (no background) is 9.6 micrograms per cubic metre, or 12 per cent of the design criterion, and 8.4 micrograms per cubic metre, or 17 per cent of the design criterion respectively, both approximately 140 metres west of the northern ventilation structure within the Simpson Barracks.

Predicted CO, NO_2, BTEX, 1,3-butadiene, formaldehyde and PAH [as B(a)P TEQ] concentrations comply with the applicable design criteria for maximum lane capacity conditions (24 hours a day and 365 days per year) in 2036.

Emissions at in-tunnel air quality limits
(2036 traffic volumes and fleet mix; 2020 emission factors)

A theoretical worst-case traffic scenario was modelled for 2036, with tunnel ventilation system emission rates based on pollutant concentrations equal to in-tunnel air quality limits. Modelling indicated compliance with the CO and NO_2 SEPP(AQM) design criteria.

Although maximum ventilation rates were assumed, the contribution from the project relative to the design criteria (6.7 per cent and 6.9 per cent for CO and NO_2 respectively) indicates that a lower ventilation rate would also achieve compliance.

Increased diesel to petrol fuelled cars ratio
(2036 traffic volumes and fleet mix; 2020 emission factors)

Due to the uncertainty regarding the future proportion of diesel and petrol fuelled passenger cars, a scenario incorporating a conservative doubling of the proportion of diesel cars from 15 per cent of all cars to 30 per cent of all cars in 2036 was modelled. This focused on the primary pollutants associated with diesel fuel combustion, PM_{10}, $PM_{2.5}$ and NO_2.

The project contributions to the maximum predicted one hour average PM_{10} and $PM_{2.5}$ GLCs were found to increase by approximately 15 per cent and 8.5 per cent respectively compared with the Scenario B1 predictions. Overall, this resulted in an increase to the resultant maximum predicted (99.9th percentile) GLCs of approximately 0.032 and 0.0070 micrograms per cubic metre for PM_{10} and $PM_{2.5}$ respectively.

The project contribution to the maximum predicted one hour average NO_2 GLC increased by approximately 32 per cent (3.4 micrograms per cubic metre), again compared with Scenario B1 prediction.

Alternative ventilation structure locations
(2036 traffic volumes and fleet mix; 2020 emission factor)

Four alternative locations were modelled for the north and south ventilation structures to assess the sensitivity of the compliance assessment to the location within potential construction footprints. The northern and southern ventilation structures were assessed separately.

As discussed above, $PM_{2.5}$ background concentrations exceed the design criteria on several occasions effectively imposing exceedances before the additional impacts of the tunnel ventilation system were considered. The assessment of the proposed and alternative northern ventilation structure locations indicates that each results in one additional exceedance of the $PM_{2.5}$ design criterion. The assessment of the alternative southern ventilation structure locations also indicates that each results in one additional exceedance of the $PM_{2.5}$ design criterion.

With the exception of Option 4, the maximum predicted GLCs for each of the northern ventilation structure locations are approximately one kilometre to the northeast of the ventilation structure within a Macleod residential area. The maximum predicted GLC for Option 4 is less than 500 metres to the northeast within the Simpson Barracks. The ground elevation at this location is approximately 20 metres higher than at the Option 4 ventilation structure. The results indicate the plume is impacting in this area due to the increased elevation. The location of the other options is such that the plume clears this rise in terrain (Proposed, Option 2 and Option 3) or passes to the side of it (Option 5).

The maximum predicted project contributions to the $PM_{2.5}$ GLC (no background) for the northern and southern ventilation structure options differ by less than 1.0 per cent and 3.0 per cent respectively. The distances from each of the ventilation structure options at which the maxima occur are similar. However, due to the near calm, night time stable conditions for the hours at which the maxima occur, the direction from the ventilation structure varies.

Overlayed 100th percentile incremental GLC (without background) isopleth plots for the ventilation structure options are provided in APPENDIX E. These plots (one for the north and one for the south) consist of the maximum result for each of the five options at each modelled grid point.

Summary

The additional sensitivity analyses demonstrated that, while the project contribution to the maximum predicted GLC could increase significantly (up to 100 per cent in the case of NO_2 for a doubling in the proportion of diesel cars), due to the relatively low project contribution, there was relatively little change in the maximum predicted GLCs (project plus background).

It should be emphasised that a number of the sensitivity analyses represent unrealistic scenarios that have not occurred in any Australian road tunnel and are highly unlikely to occur in the future. In particular, while traffic at maximum tunnel capacity can occur during peak periods, the volume of vehicles used in the modelling assessment is extremely conservative and the maximum capacity conditions would not occur constantly, as assumed in the sensitivity analysis.

Alternative locations for the ventilation structures had a negligible effect on the maximum predicted $PM_{2.5}$ GLCs, only changing the locations at which the maxima would occur.

11.0 SURFACE ROAD IMPACTS

Modelling associated with major road projects is typically limited to assessing the impact of vehicle emissions associated with the road under construction. In this instance a more comprehensive assessment has been undertaken to include the prediction of dispersal and transport of air pollutants emitted from vehicles along key surface roads and intersections. The roads selected for assessment are likely to experience a significant change (either increase or decrease) in either total vehicle or HCV volumes, hence modified local air quality, arising either directly or indirectly from operation of North East Link.

This approach is consistent with risk AQ14 identified in Section 7.0, *impact on sensitive receptors from air quality changes associated with operation and* maintenance*, based on traffic volume projections*.

11.1 Road selection

Modelled roads were selected based on predicted changes in traffic volumes or fleet mix due to North East Link. The modelling selection criteria were as follows:

- Number of vehicles with or without project in 2036 is greater than 30,000 vehicles per day, with the change in total vehicles (no project to project case) greater than an increase or decrease of 25 per cent

or

- HCV volume with or without project in 2036 is greater than 1,000 vehicles per day, with the change in HCVs (no project to project case) greater than an increase or decrease of 25 per cent.

Road segments that satisfy the selection criteria are listed in Table 67 with predicted traffic changes for the project. Figure 73 presents the selected roads graphically with blue lines indicating a decrease in traffic and red lines indicating an increase in traffic. The dotted line shows the project roads including the North East Link alignment and upgraded Eastern Freeway with bus lanes. A complete list of all roads considered for modelling is presented in APPENDIX E.

Table 67: Selected surface roads

		No project 2036		Project 2036		% Change	
Road	Location	HCV	Total	HCV	Total	HCV	Total
Albert St	Bell St to Plenty Rd	1,600	48,000	600	45,000	-63%	-6%
Banksia St	Bulleen Rd to Bell St	1,000	62,000	600	64000	-40%	3%
Bell St	High St to Plenty Rd	1,400	62,000	1000	64000	-29%	3%
Bolton St	Bridge St to Main Rd	450	3,0000	200	22000	-56%	-27%
Broadway	High St to Bolderwood Pde	2,600	38,000	1300	38000	-50%	0%
Bulleen Rd	Eastern Fwy to Manningham Rd	1,900	56,000	900	55000	-53%	-2%
Chandler Hwy	Eastern Fwy to Heidelberg Rd	1,600	82,000	900	76000	-44%	-7%
Dalton Rd	Childs Rd to McKimmies Rd	800	73,000	1,200	74,000	50%	1%
Darebin Rd	Station St to Grange Rd	1,200	38,000	550	37,000	-54%	-3%
Eastern Fwy	Springvale Rd to Bulleen Rd	2,400	39,000	4,100	62,000	71%	59%

Road	Location	No project 2036		Project 2036		% Change	
		HCV	Total	HCV	Total	HCV	Total
Eastern Fwy	Bulleen Rd to Hoddle St	3,100	187,000	2,900	212,000	-6%	13%
Fitzsimons Ln	Reynolds Rd to Main Rd	1,400	82,000	650	64,000	-54%	-22%
Grange Rd	Darebin Rd to Heidelberg Rd	1,800	43,000	800	39,000	-56%	-9%
Greensborough Rd	Lower Plenty Rd to M80 Ring Rd	2,100	74,000	350	54,000	-83%	-27%
Grimshaw St	Watsonia Rd to Greensborough Hwy	600	30,000	1,100	35,000	83%	17%
High St	Settlement Rd to M80 Ring Rd	2,300	52,000	1,700	54,000	-26%	4%
Keon Pde	High St to Dalton Rd	800	28,000	1,100	34,000	38%	21%
Lower Plenty Rd	Rosanna Rd to Greensborough Rd	2,800	84,000	700	68,000	-75%	-19%
M80 Ring Rd	M80 Interchange to Hume Fwy	3,900	127,000	8,700	200,000	123%	57%
Main Rd	Para Rd to Bolton St	1,200	38,000	500	33,000	-58%	-13%
Manningham Rd	Thompsons Rd to Williamsons Rd	1,500	48,000	450	38,000	-70%	-21%
Middleborough Rd	Whitehorse Rd to Eastern Fwy	650	40,000	1,000	43,000	54%	8%
Plenty Rd	Albert St to M80 Ring Rd	1,000	83,000	600	72,000	-40%	-13%
Reynolds Rd	Blackburn Rd to Williamsons Rd	1,100	44,000	600	37,000	-45%	-16%
Rosanna Rd	Lower Heidelberg Rd to Lower Plenty Rd	2,400	54,000	350	40,000	-85%	-26%
Station St	Bell St to Darebin Rd	1,600	51,000	750	47,000	-53%	-8%
Williamsons Rd	Foote St to Warrandyte Rd	1,500	50,000	700	45,000	-53%	-10%

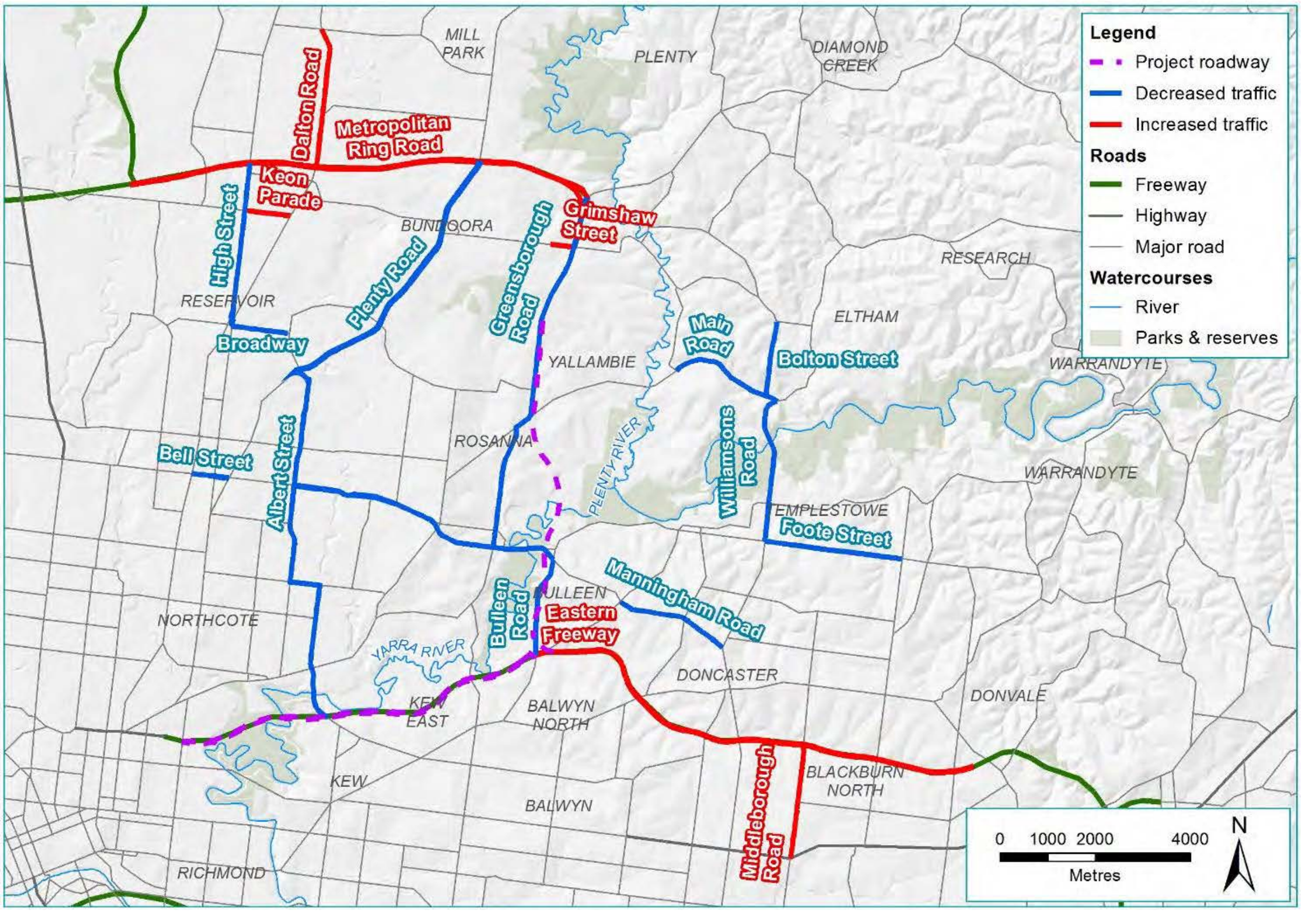


Figure 73: Selected surface roads for modelling

11.2 Modelling approach

11.2.1 Model selection

Ambient air quality impacts due to emissions from vehicular traffic have previously been modelled using the Victorian regulatory model AUSROADS developed by EPA Victoria, based on the CALINE series of models (CALINE4) originally developed by the California Department of Transportation. As of January 2017, the USEPA replaced CALINE3 with AERMOD as the preferred model for refined modelling of mobile sources. A model inter-comparison conducted by Heist et al (Heist 2013) concluded that *'…based on the data available, AERMOD is the best performing model for mobile source applications'.*

EPA Victoria has approved the use of AERMOD for the surface roads modelling assessment

One significant difference between AERMOD and AusRoads is the latter has the capability to model depressed road links, up to a depth of 10 metres as found in road cuttings. The reference project for North East Link has a cutting from the northern tunnel portals to Elder Street, to a maximum depth of approximately 17 metres.

In order to validate the selection of AERMOD for the assessment of air quality impacts associated with both North East Link and existing surface roads, a preliminary comparison was conducted between an AERMOD line volume source at grade and a CALRoads (commercial model package containing CALINE4) line source for an at grade road link and a depressed road link (road cutting). Traffic volumes, fleet mix and road widths were identical to those used in the North East Link surface road assessment. The North East Link cutting has five partially covered areas (land bridges), each with a width of approximately 60 metres. Uncovered areas between the land bridges vary in length from 30 metres to 170 metres. Line sources representing the northbound and southbound diurnal traffic $PM_{2.5}$ emission were positioned along the cutting in each of the open areas. To account for emissions from traffic within the land bridge sections a volume source was positioned at the exit portal of each covered section.

The comparison between AERMOD and CALRoads indicates that AERMOD run with the urban dispersion option results in similar predicted GLCs to CALRoads at grade, for one hour, 24 hour and annual averaging periods. For a 10 metre deep cutting, CALRoads predicts significantly higher GLCs within 10 metres of the road. However, predicted concentrations fall to below the AERMOD predicted GLCs at distances greater than 20 metres from the road. As the closest receptors in the surface roads modelling assessment are estimated to be at distances approximately 20 metres from the proposed alignment, AERMOD (urban dispersion option) has been used to assess the impact of vehicle emissions from surface roads for North East Link, with no allowance for depressed road links. Figure 74 to Figure 76 present plots of the model comparison for one hour, 24 hour and annual averages respectively.

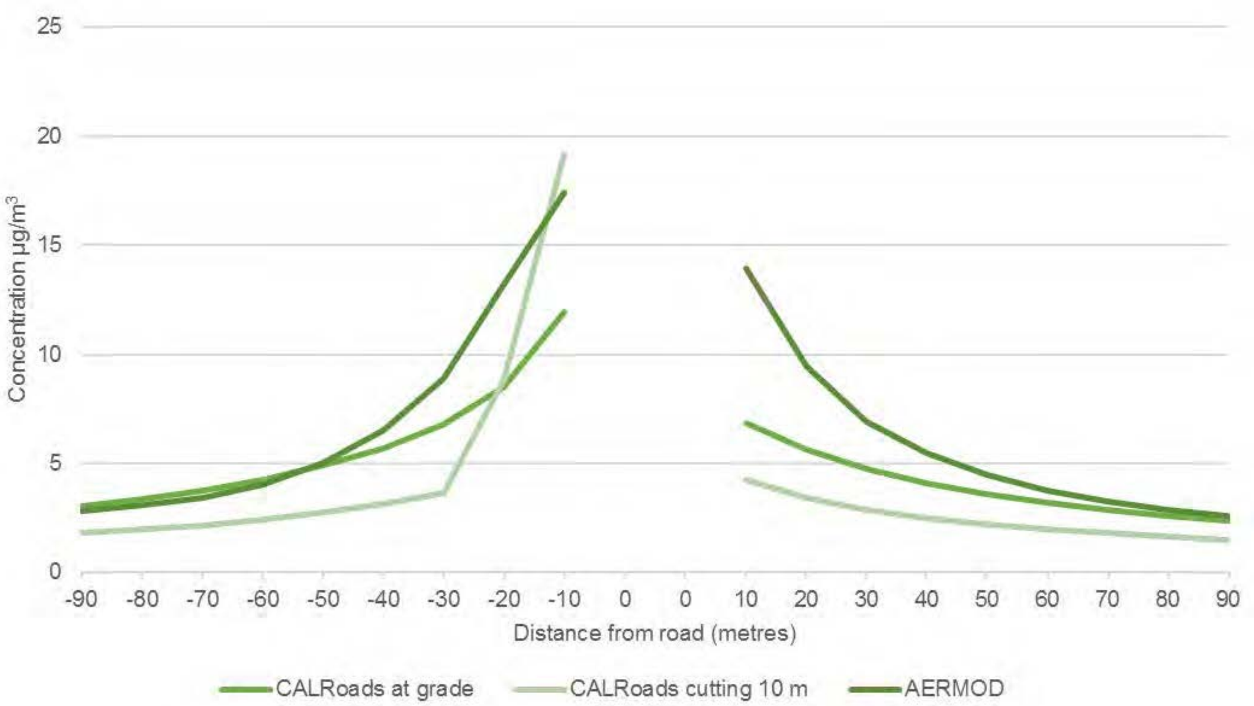


Figure 74: AERMOD and CALRoads comparison: maximum $PM_{2.5}$ 1 hour average GLC

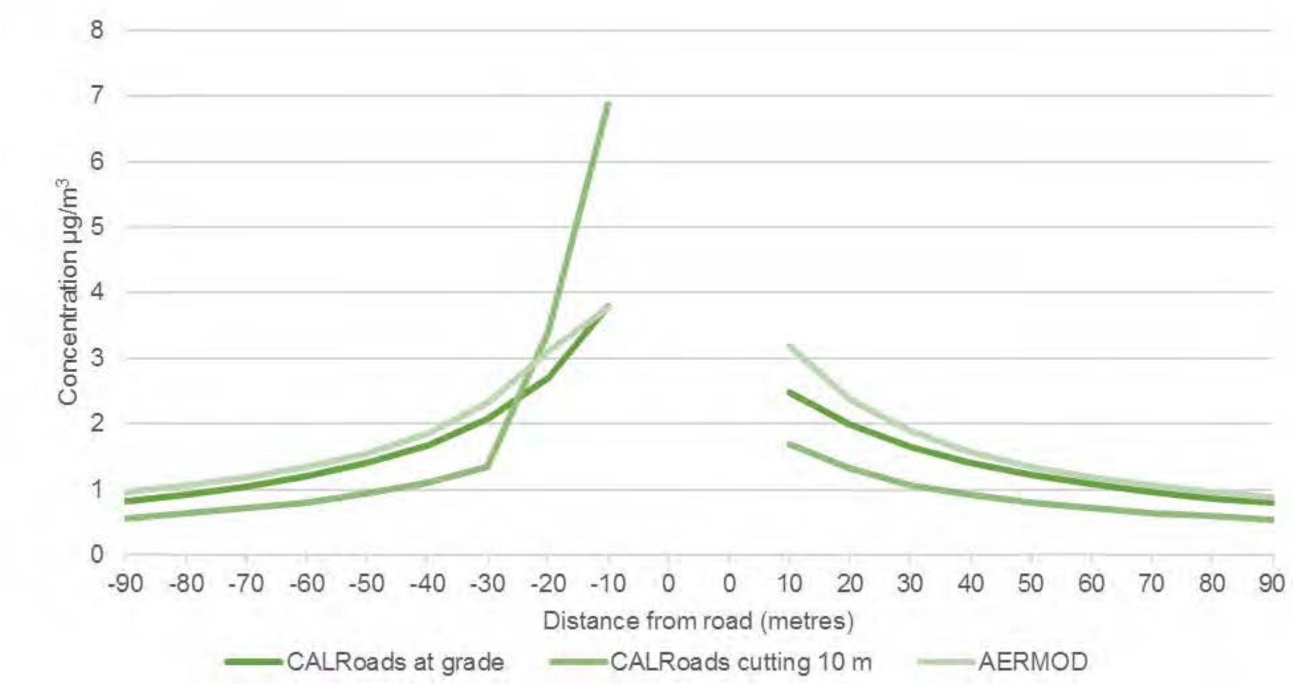


Figure 75: AERMOD and CALRoads comparison: maximum $PM_{2.5}$ 24 hour average GLC

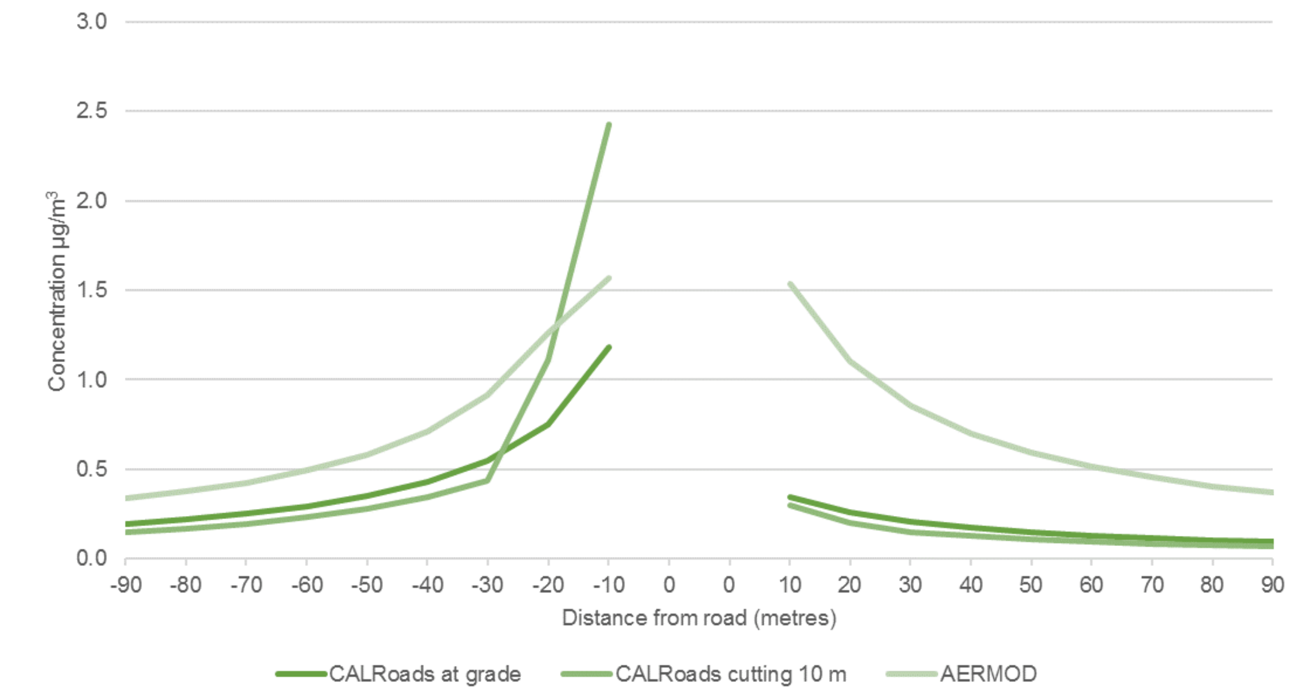


Figure 76: AERMOD and CALRoads comparison: $PM_{2.5}$ annual average GLC

11.2.2 Model Inputs

In AERMOD, mobile sources can be represented by a series of volume sources. Volume sources require the following input parameters:

- source coordinates
- base elevation
- release height

- initial lateral dimension
- initial vertical dimension
- pollutant emission rate.

The pollutant emission rate is calculated from the vehicle volumes along each road link and the emission factor expressed as mass of pollutant per unit length for each vehicle category. The determination of these parameters is described in Section 11.4.7.

Volume sources require an estimate of the initial vertical and lateral plume dimensions. For mobile sources the initial lateral dimension (plume width) is the modelled road width plus three metres on either side. AERMOD does not calculate concentrations within a defined area around the volume source called the volume source exclusion zone and receptors cannot be placed within the zone. The exclusion zone is defined as 2.15 times sigma Y plus one metre, where sigma Y is the initial lateral dimension, equivalent to the road width plus six metres.

Figure 77 shows an example of a line source showing individual volume sources and the exclusion zone represented by a dashed circle. Receptors indicated by orange dots are placed along the edge of the exclusion zone.

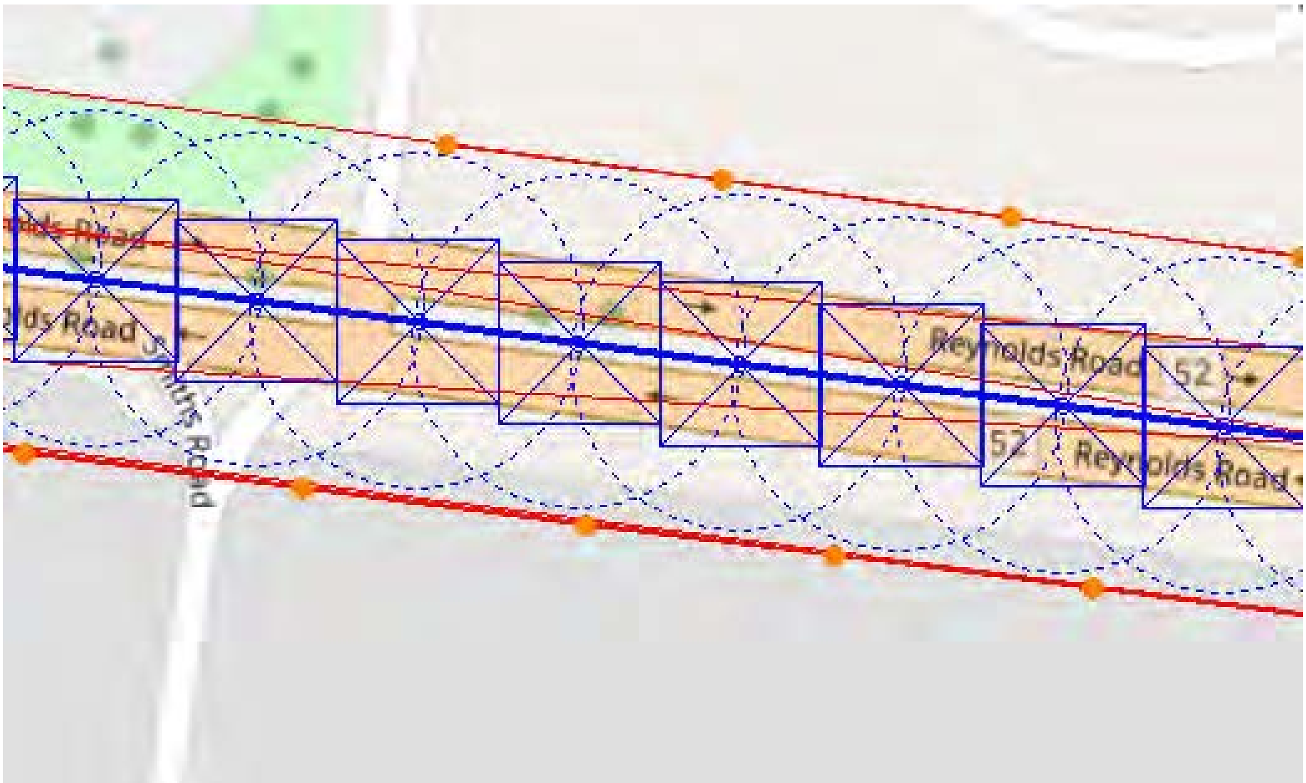


Figure 77: Volume source with exclusion zone

11.3 Meteorology

The meteorology of the area is described in Section 9.2, based on measured data collected at the Bureau of Meteorology AWS at Viewbank for the years 2013 to 2017.

Preliminary modelling was conducted with AERMOD based on meteorological data from the Viewbank site for the years 2013 to 2017, to determine the most appropriate year for assessing impacts from surface roads. An idealised set of road links were used, forming an intersection of roads oriented north-south and east-west in flat terrain.

The roads were one kilometre long and 14 metres wide (approximately the width of a four lane highway). Receptors were placed at 28 metres and 85 metres from the intersection in the northeast, northwest, southeast and southwest directions, to represent highly-impacted residential locations close to the road, and cycle paths and walking paths at further distances. The model was run for each year separately, with constant unit emissions from the roadways. For both receptor distances, the maximum hourly and 24 hour average concentrations were generally highest using the 2016 meteorological data. Consequently, to obtain conservatively high results, AERMOD was run for surface road impacts using 2016 meteorological data.

11.4 Model Configuration

11.4.1 Traffic Data and Emission Factors

The roads assessed were existing roads that met the road selection criteria (Figure 72) and proposed North East Link roads. These include connections between the tunnels and Eastern Freeway, Manningham Road, Lower Plenty Road, Grimshaw Street and M80 Ring Road.

The project would also change the geometry of some existing roadways; the relocation of ramps and extra lanes on the Eastern Freeway, including dedicated bus lanes from Hoddle Street to Doncaster, and upgrades to the M80 Ring Road interchange. Table 68 presents the project roads included in the model. Figure 78 to Figure 82 present schematics of the upgraded interchanges associated with North East Link.

Table 68: Road links

Road Link	Description
M80-NEL interchange	X1 – M80 to North East Link
M80-NEL interchange	X2 – M80 to Greensborough Bypass/Grimshaw
M80-NEL interchange	X3 – M80 to Greensborough Bypass
M80-NEL interchange	X4 – NEL/Grimshaw to Greensborough Bypass
M80-NEL interchange	X5 – Greensborough Bypass to NEL/Grimshaw
M80-NEL interchange	X6 – Greensborough Bypass to M80
M80-NEL interchange	X7 – Greensborough Bypass to Grimshaw
M80-NEL interchange	X8 – M80 to Grimshaw
M80-NEL interchange	X9 – Grimshaw to Greensborough Bypass
M80-NEL interchange	X10 – NEL to Greensborough Bypass
M80-NEL interchange	X11 – Grimshaw to M80/Plenty
M80-NEL interchange	X12 – North East Link to Plenty
M80-NEL interchange	X13 – Greensborough Bypass to Plenty
M80-NEL interchange	X14 – North East Link/Greensborough Bypass to Plenty
M80-NEL interchange	X15 – Grimshaw to Plenty
M80-NEL interchange	X16 – Grimshaw to M80
M80-NEL interchange	X17 – Plenty Road exit ramp
M80-NEL interchange	X18 – North East Link to M80
M80-NEL interchange	X19 – Greensborough Bypass to M80
NEL main road	Lower Plenty Rd to M80 interchange

Road Link	Description
NEL Ramp	U5 – NB Entry Ramp from City at Eastern Freeway
NEL Ramp	U7 – SB Exit Ramp to Eastern Suburbs at Eastern Freeway
NEL Ramp	U6 – NB Entry Ramp from Eastern Suburbs at Eastern Freeway
NEL Ramp	U8 – SB Exit Ramp to City at Eastern Freeway
NEL Ramp	M3 – SB Exit Ramp at Manningham Rd
NEL Ramp	M1 – NB Exit Ramp at Manningham Rd
NEL Ramp	M4 – SB Entry Ramp at Manningham Rd
NEL Ramp	L2 – NB Entry Ramp at Lower Plenty Rd
NEL Ramp	L3 – SB Exit Ramp at Lower Plenty Rd
NEL Ramp	L1 – NB Exit Ramp at Lower Plenty Rd
NEL Ramp	L4 – SB Entry Ramp at Lower Plenty Rd
NEL Ramp	G1 – NB Exit Ramp at Grimshaw St
NEL Ramp	G4 – SB Entry Ramp at Grimshaw St

NOTE:

NEL North East Link

NB Northbound

SB Southbound

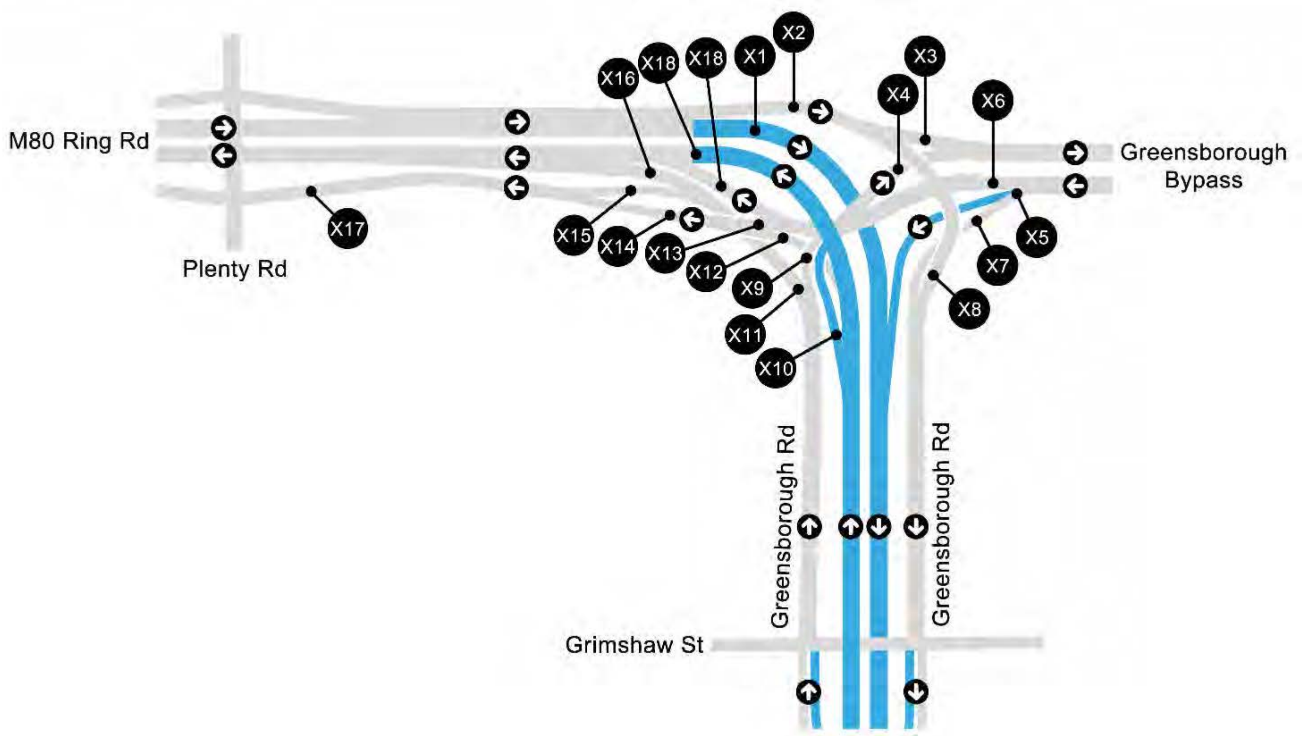


Figure 78: M80 Ring Road interchange

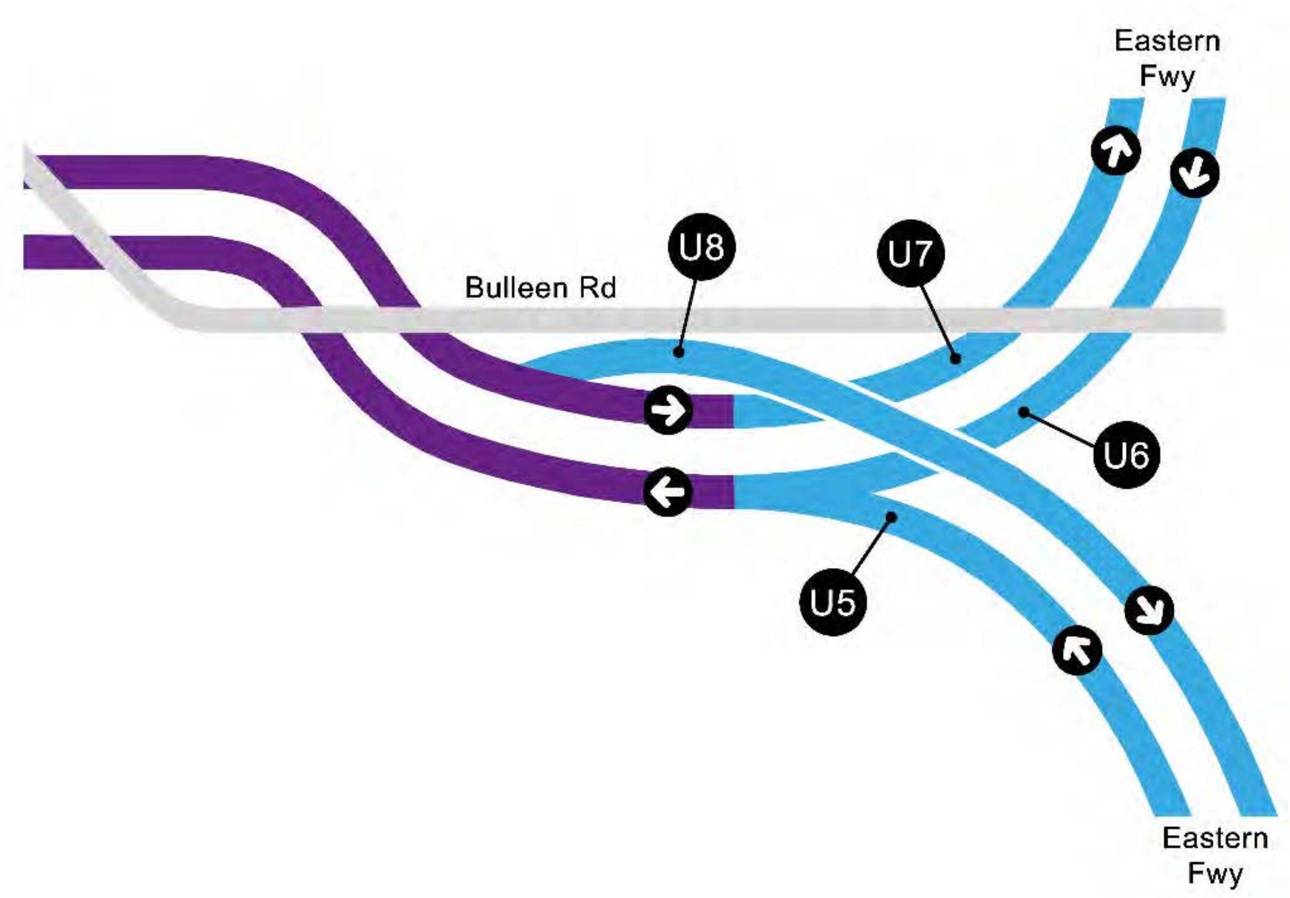


Figure 79: Eastern Freeway interchange

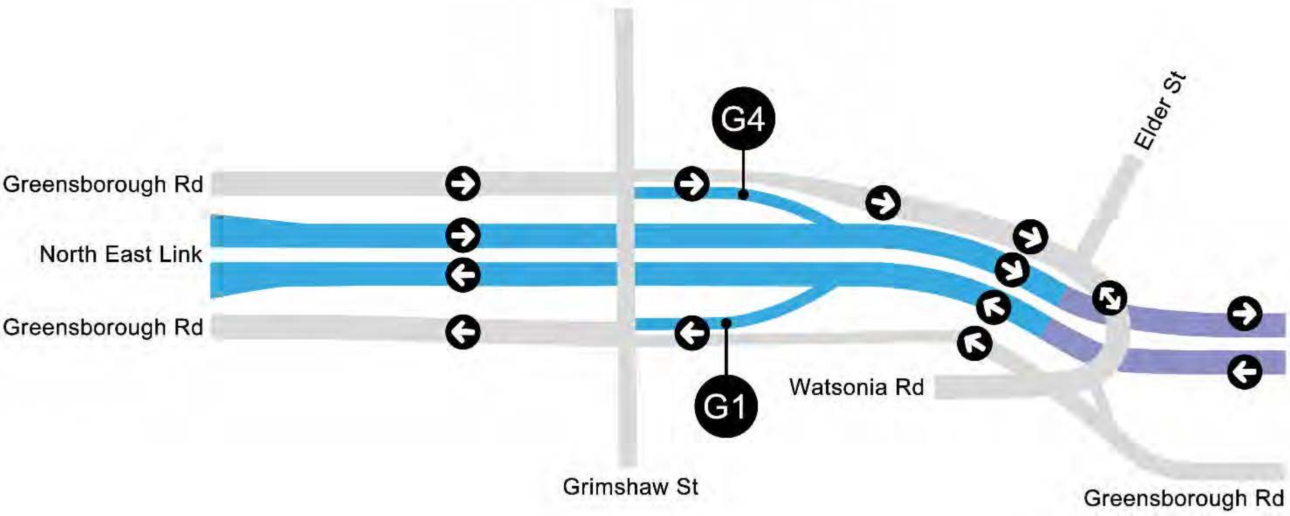


Figure 80: Grimshaw Street interchange

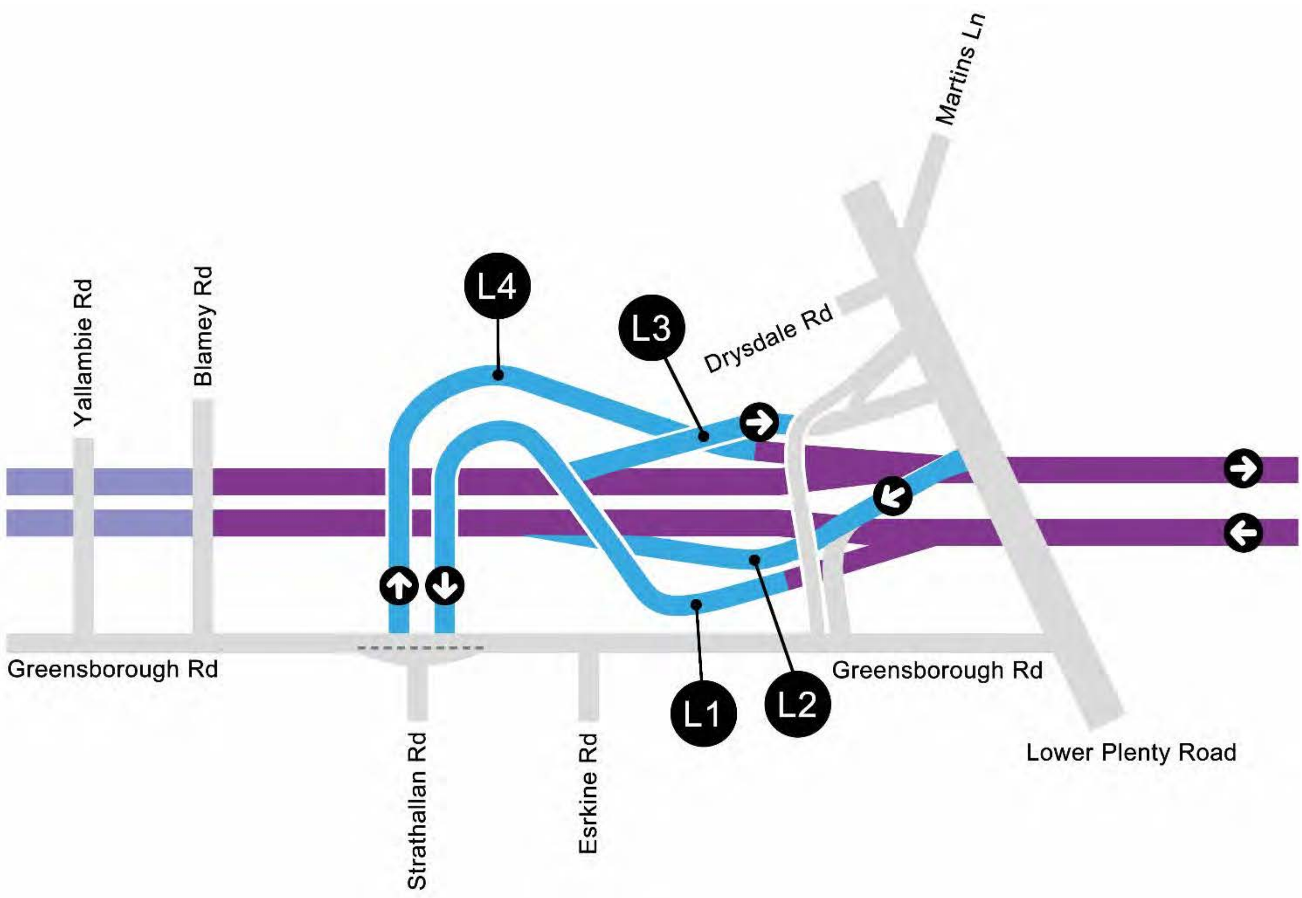


Figure 81: Lower Plenty Road interchange

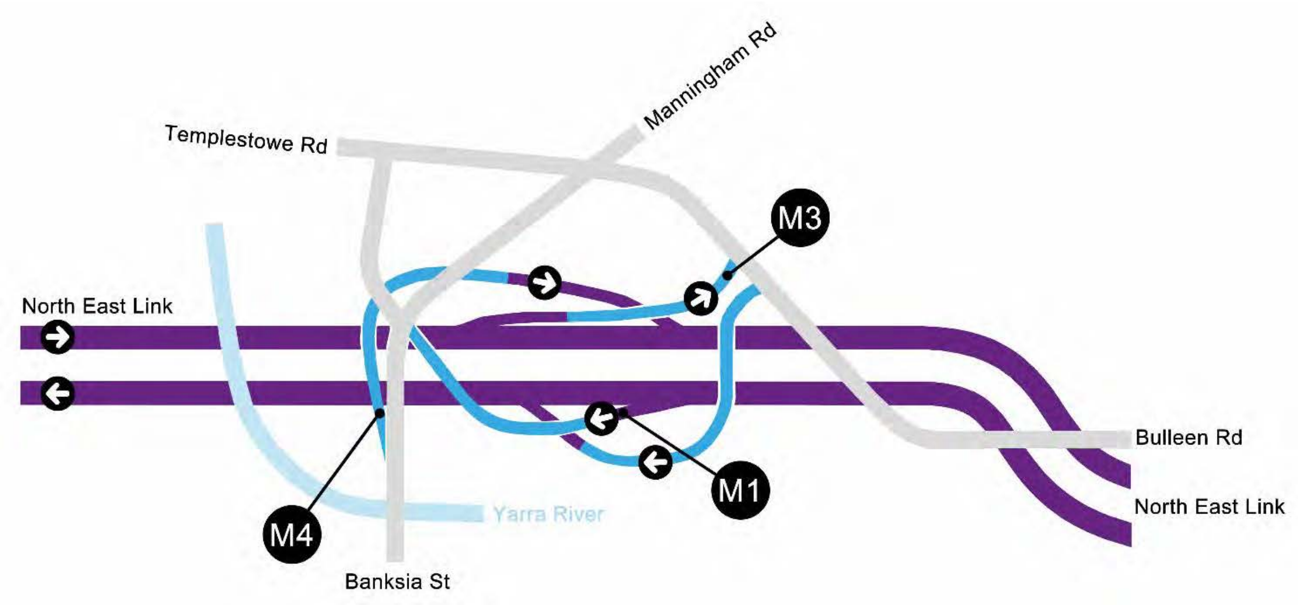


Figure 82: Manningham Road interchange

11.4.2 Model scenarios

Five scenarios were modelled:

- Scenario A1 base (without project using projected vehicle volumes for 2026 and 2020 emission factors)
- Scenario A1 project (with project using projected vehicle volumes for 2026 and 2020 emission factors)

- Scenario B1 base (without project using projected vehicle volumes for 2036 and 2020 emission factors)
- Scenario B1 project (with project using projected vehicle volumes for 2036 and 2020 emission factors)
- Scenario B2 project (with project using projected vehicle volumes for 2036 and 2025 emission factors).

Traffic and emissions data for the five scenarios are presented below. The base case uses projected traffic volumes and emissions without any project contribution.

11.4.3 Traffic data

Road traffic data was provided for three vehicle categories (passenger cars, LCVs and HCVs) over three time periods:

- morning peak 07:00 to 09:00 hours
- afternoon peak 16:00 to 18:00 hours
- total daily traffic 00:00 to 24:00 hours.

For each period, predicted traffic volumes were supplied with a range of approximately 10 to 20 per cent of the actual traffic volume. To address risk AQ19 identified in Section 7.0, *Underestimation of traffic volumes resulting in higher than anticipated ambient air quality impacts on sensitive receptors*, the maximum traffic volume for each period was selected for modelling.

As an example, predicted 2036 traffic volumes for the Eastern Freeway base and project scenarios are presented in Table 69 and Table 70. Traffic data for all scenarios and roads are contained in APPENDIX F.

Table 69: Eastern Freeway traffic volumes – base 2036

Road	Direction	Cars	LCVs	HCVs	Total
Middleborough Road to Tram Road	EB	89,000	3,800	2,900	95,700
	WB	93,000	3,600	2,900	99,500
Tram Road to Elgar Road	EB	74,000	3,300	2,900	80,200
	WB	74,000	3,300	2,900	80,200
Doncaster Road to Bulleen Road	EB	85,000	3,500	2,600	91,100
	WB	86,000	3,400	2,700	92,100

Table 70: Eastern Freeway traffic volumes – project 2036

Road	Direction	Cars	LCVs	HCVs	Total
Middleborough Road to Tram Road	EB	126,000	5,300	4,500	135,800
	WB	126,000	4,800	4,400	135,200
Tram Road to Elgar Road	EB	111,000	4,800	4,600	120,400
	WB	110,000	4,600	4,200	118,800
Doncaster Road to Bulleen Road	EB	128,000	5,600	4,600	138,200

Road	Direction	Cars	LCVs	HCVs	Total
Middleborough Road to Tram Road	EB	126,000	5,300	4,500	135,800
	WB	126,000	4,800	4,400	135,200
	WB	132,000	5,300	4,400	141,700

11.4.4 Fleet mix and speed

AERMOD requires hourly pollutant emission rates for each modelled road. As the supplied traffic modelling projections only provide fleet compositions for the morning peak (7 am to 9 am), afternoon peak (4 pm to 6 pm) and 24 hour daily total, hourly pollutant emission rates were calculated based on measured traffic fleet composition and speeds from the selected roads within the study area.

Hourly varying vehicle fleet composition for passenger cars, LCV and HCV were supplied by GHD for each of the selected roads, where available. Hourly vehicle speeds were extracted from data supplied by GHD from traffic surveys conducted between 2017 to 2018 by VicRoads and Austraffic. Where there were no available data for roads or sections of roads, data from other sections of the road or similar roads were used. Examples of vehicle fleet mix substitution are provided in Table 71.

Table 71: Surface road diurnal pattern substitution

Road with missing data		Road substituted	
Road	Location	Road	Location
Bell Street	High Street to Plenty Road	Bell Street	Station Street to Oriel Street
Greensborough Road	Lower Plenty Road to Erskine Road	Greensborough Road	Erskine Road to Strathallan Road
Greensborough Road	Strathallan Road to Yallambie Road	Greensborough Road	Erskine Road to Strathallan Road
Greensborough Road	Watsonia Road to Grimshaw Street	Greensborough Road	Grimshaw Street to M80 Ring Road
High Street	Keon Parade to Broadway	High Street	North of Settlement Road
High Street	Mahoneys Road to Settlement Road	High Street	North of Settlement Road
North East Link	X15 – Grimshaw Street to M80 Ring Road	North East Link	Manningham Road to Lower Plenty Road
North East Link	X16 – Grimshaw Street to M80 Ring Road	North East Link	Manningham Road to Lower Plenty Road

An example of the hourly varying fleet mix and speed for the Eastern Freeway (Tram Road to Middleborough Road) is provided in Table 72.

Base vehicle volumes were then adjusted to account for hourly varying diurnal patterns observed for each road. Figure 83 and Figure 84 present the diurnal patterns for the Eastern Freeway between Middleborough Road and Tram Road, eastbound and westbound. Diurnal patterns for all modelled roads are presented in APPENDIX G.

Table 72: Hourly traffic pattern – Eastern Freeway (Tram Road to Middleborough Road eastbound)

Hour	Cars (%)	LCVs (%)	HCVs (%)	Total (%)	Speed (km/h)
1	0.7	0.5	0.9	0.8	96
2	0.4	0.3	0.8	0.4	95
3	0.3	0.4	0.6	0.3	96
4	0.2	0.5	1.3	0.2	95
5	0.3	0.8	1.5	0.3	96
6	1.2	2.6	1.6	1.2	97
7	3.5	3.8	4.6	3.5	95
8	5.9	5.8	6.5	5.9	94
9	6.9	6.4	8.7	6.9	93
10	4.9	9.7	7.9	4.9	93
11	4.8	9.7	9.8	4.8	93
12	4.9	9.3	7.9	4.9	93
13	5.1	8.0	9.7	5.1	93
14	5.6	8.9	8.0	5.6	93
15	6.6	9.3	7.9	6.6	92
16	7.9	7.8	5.3	7.9	82
17	8.1	5.7	5.4	8.1	75
18	8.0	3.8	2.7	8.0	75
19	7.8	2.6	2.1	7.8	85
20	4.9	1.8	1.7	4.9	92
21	3.7	0.7	1.4	3.7	95
22	3.7	0.5	1.7	3.7	95
23	3.7	0.7	1.4	3.7	95
24	3.7	0.5	1.7	3.7	95
Total	100	100	100	100	

Note: Column totals may not add up to 100 due to rounding.

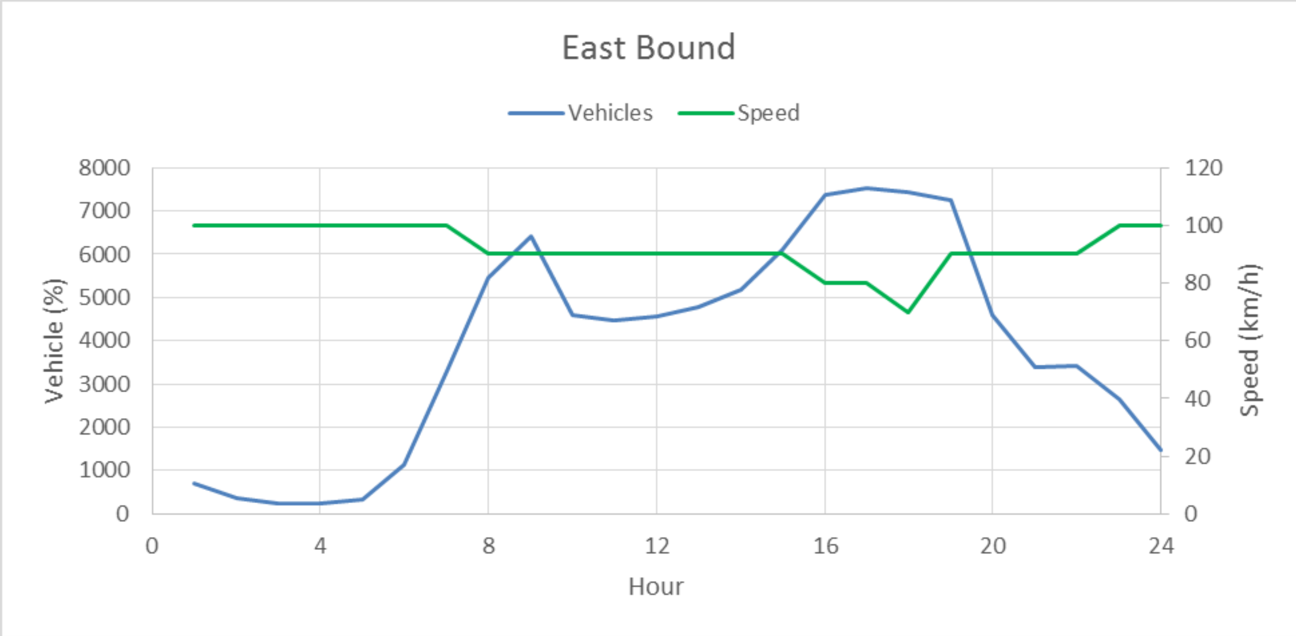


Figure 83: Eastern Freeway (Middleborough Road to Tram Road – eastbound)

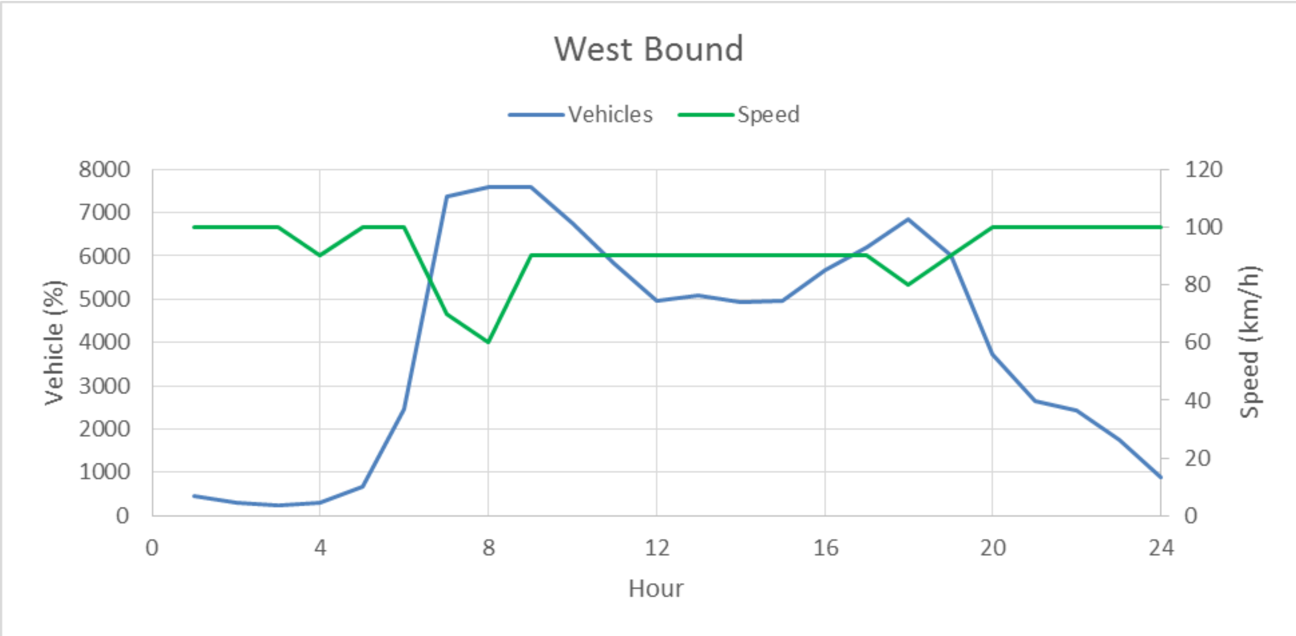


Figure 84: Eastern Freeway (Middleborough Road to Tram Road – westbound)

11.4.5 Pollutant emission rates

AERMOD requires pollutant emission rates, in grams of pollutant per second, for each volume source representing a section of road modelled. Emission factors are dependent on the vehicle fleet mix, vehicle speed and road gradient.

For each of the modelled roads the diurnal pattern of traffic mix and speed was applied to the daily traffic volumes to generate an hourly speed dependent emission factor. All roads were assumed to be at grade with zero gradient, except for the North East Link road cutting between the northern tunnel portal and Elder Street, which was assumed to have an average gradient of plus four per cent for northbound traffic and minus four per cent for southbound traffic.

Project road gradients are expected to meet VicRoads and AustRoads guidelines and should be no greater than five per cent.

Pollutant emission factors were derived from COPERT Australia (refer to Section 9.4.3), which include exhaust emissions and non-exhaust emissions (tyre and brake wear), adjusted using PIARC factors for gradient (where applicable) and the future years 2020 and 2025.

Examples of hourly traffic volumes and pollutant emission rates for the Eastern Freeway (Middleborough Road to Tram Road), are presented in Figure 85. The emissions inventories for all modelled road sections are contained in APPENDIX G.

Eastbound Westbound

Figure 85: Eastern Freeway (Middleborough Road to Tram Road)

11.4.6 Model domain and road geometry

The model comprised a 20 kilometre by 20 kilometre (400 square kilometre) model domain centred on the project alignment at the southern tunnel ventilation structure.

The selected roads are modelled as links between major intersections. Each road source is modelled as a straight road link, with curved roads divided into straight line segments. Where changes in road geometry occur (for example road widening due to multiple lanes or divided roads) the road is divided into multiple segments to represent the changed road geometry.

The remaining AERMOD road geometry inputs were provided as follows:

- separate links were defined for main carriageways where traffic data was provided for both directions

- for existing roads aerial images were used to count the number of lanes and estimate lane width and the distance between carriageways.

For proposed roads, the required road geometry inputs were determined from design drawings.

11.4.7 Background air quality

Background pollutant concentrations for 2016 are summarised in Table 73, Figure 86 to Figure 88 showing percentile plots for PM_{10}, $PM_{2.5}$ and NO_2 concentrations respectively.

Table 73: Background pollutant concentrations – 2016

Pollutant	Averaging period	Maximum µg/m³	Average µg/m³
PM_{10}	24 hour	38	15
$PM_{2.5}$	24 hour	33	7.5
NO_2	1 hour	88	18

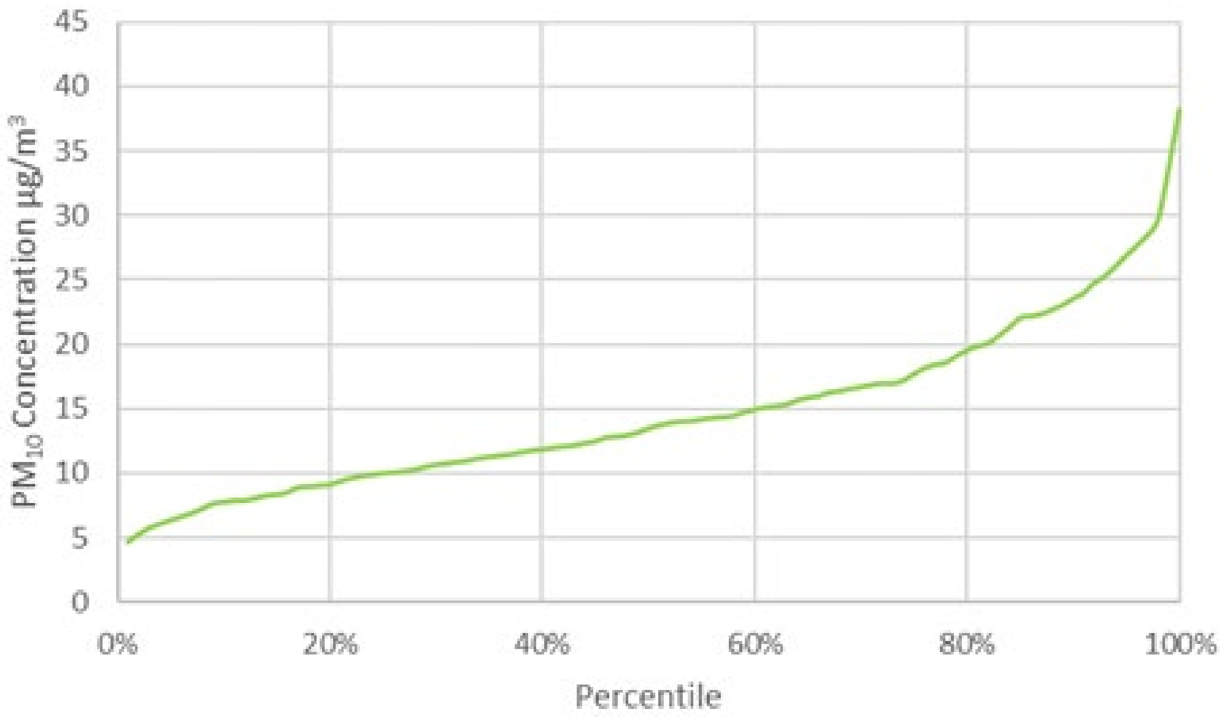


Figure 86: PM_{10} concentration percentiles – 2016

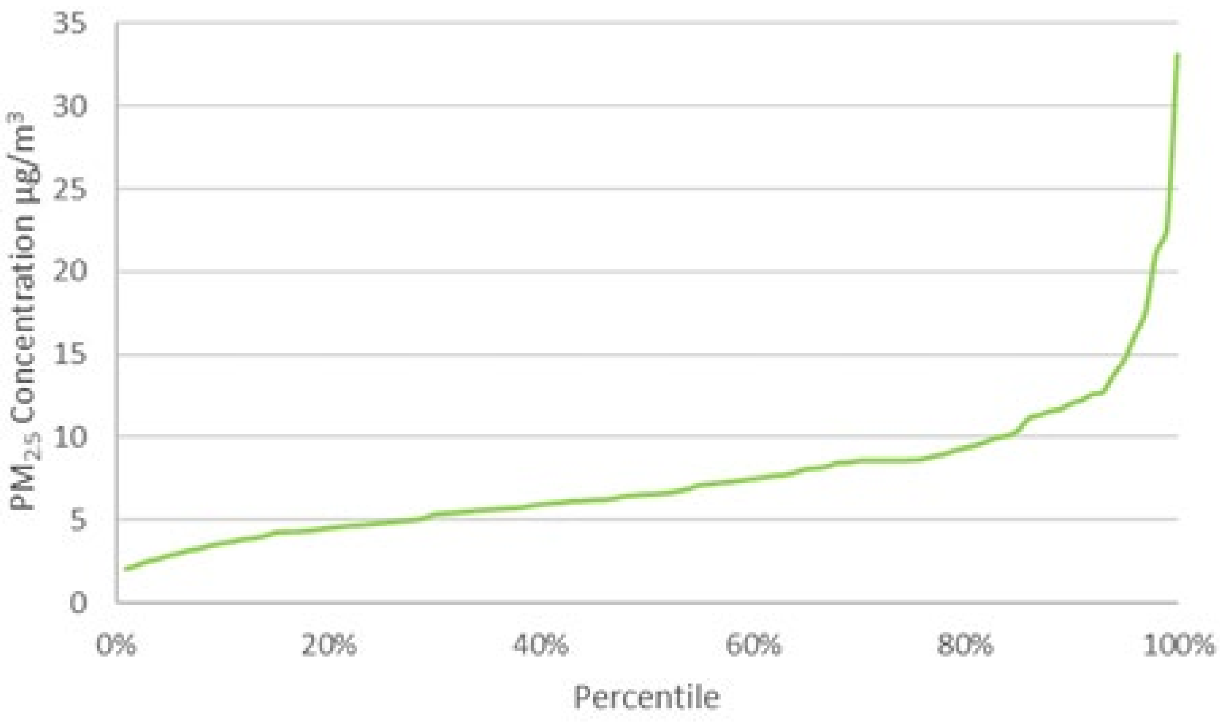


Figure 87: $PM_{2.5}$ concentration percentiles – 2016

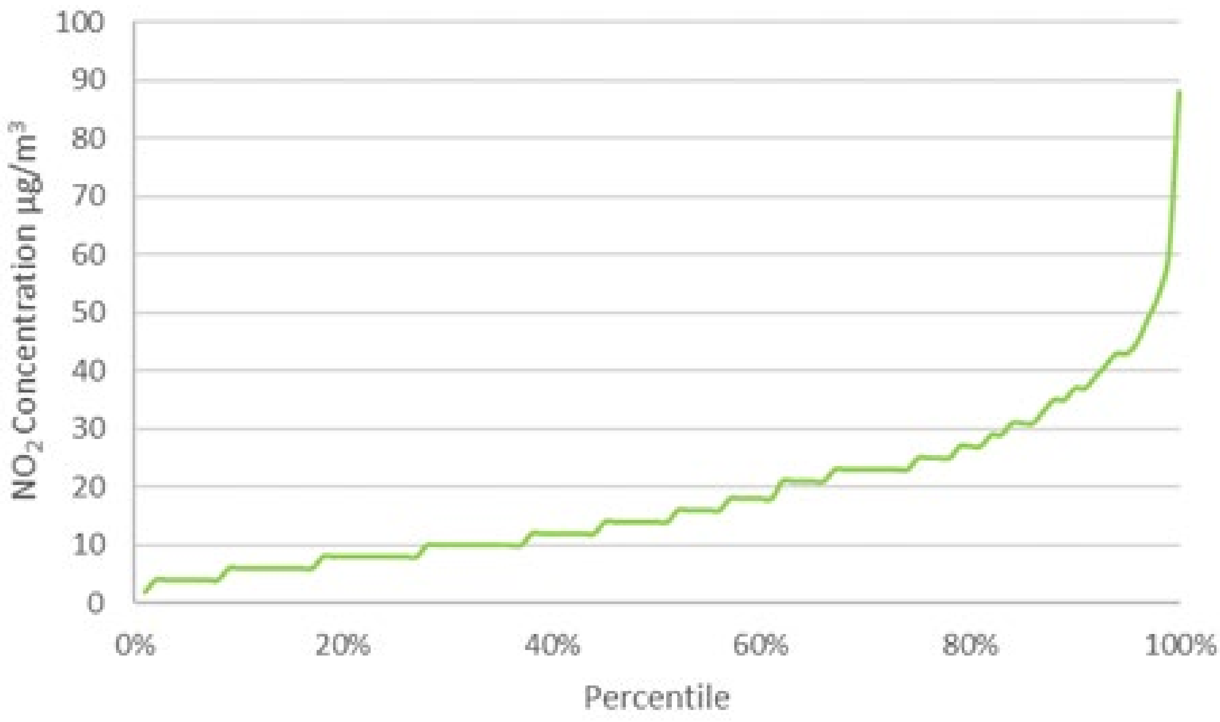


Figure 88: NO_2 concentration percentiles – 2016

The percentile plots demonstrate that the highest background concentrations are limited to a small number of days or hours in a year, with lower percentiles showing significantly decreased concentrations.

Karner A.A. et al (2010) evaluated roadside air quality data obtained from 42 roadside monitoring studies collected since 1978, corresponding to more than 700 pollutant concentration measurements. Using an edge of road normalisation technique, it was demonstrated the majority of pollutants reach background concentrations within a distance of 115 metres to 300 metres from the edge of the road, or 115 metres to 570 metres for almost all pollutants. It is noted, however, that night time or the period immediately prior to sunrise may result in increased distances, albeit at lower concentrations due to reduced traffic volumes.

11.4.8 Receptor locations

For the North East Link air quality impact assessment receptors were positioned at the property boundary nearest the roadside at 50 metre intervals along both sides of the road if the property included residences, schools or child care centres and at 200 metre intervals if the property was public open space. Additional receptors within residential areas were placed at intersections with other modelled roads to fully assess pollutant contributions from both roads. Receptors were not placed in industrial or commercial areas.

Receptors were placed as close to the property boundary as possible, outside the volume source exclusion zone. This was typically 20 to 30 metres from the road centreline for undivided dual lane carriageways or the nearest lane for multilane divided carriageways. As noted above pollutant concentrations reduce significantly with increasing distances from surface roads, consequently the placement of receptors at these locations is considered to represent the worst case.

Pollutant concentrations were predicted at approximately 2,600 receptor locations in the model domain. For consistency, receptors were positioned at the same locations for the base and project scenarios. Figure 89 shows all receptor locations over the modelled domain.

Receptors along the North East Link corridor from Lower Plenty Road to M80 Ring Road assess the combined impacts from Greensborough Road and North East Link due to the proximity of these roads. In this report that section of road where these combined impacts are considered is referred to as Greensborough Road (North East Link).

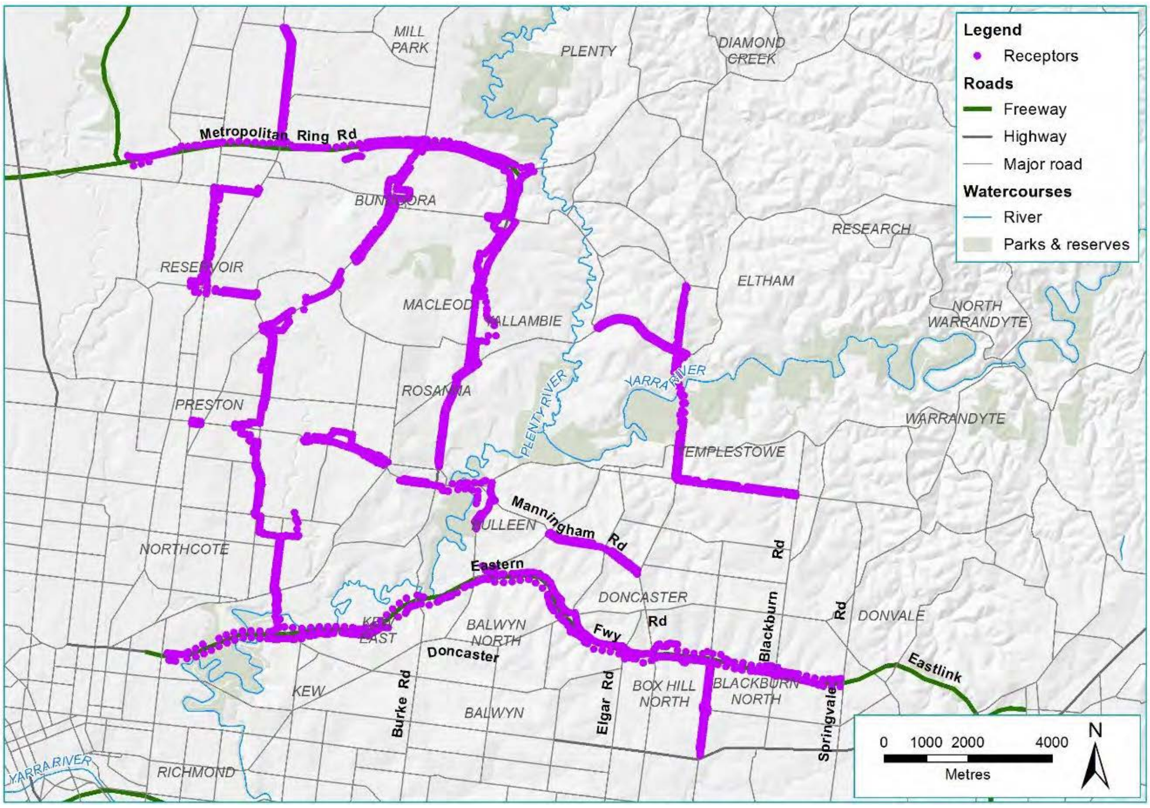


Figure 89: Receptor locations

11.5 Model assumptions

A number of assumptions were made when modelling motor vehicle emissions using AERMOD:

- surface roads were modelled at grade
- vehicle emissions included exhaust, brake and tyre wear emissions
- roads and ramps were correctly located relative to each other, so the combined impacts are appropriately assessed (road geometry was estimated from aerial photographs and design drawings)
- ramp speeds were assumed to be half the road speed limit
- to obtain reasonable concentration predictions at the selected receptors, it is sufficient to ensure they are the correct distance from the modelled road (the location of modelled roads may become imprecise at some locations, as they are represented as straight lines whereas in reality they may be slightly curved)
- all days in the modelled years (2026 and 2036) were conservatively assumed to be a weekday for the purpose of assessing annual averages.

11.6 Results – Scenarios A1 and B1

Surface road modelling outputs are presented below for each of the modelled scenarios A1 and B1 (base (without project) and project for 2026 and 2036 using 2020 emission factors). The results present maximum GLCs (100th percentile) in units of micrograms per cubic metre for each of the selected roads. GLCs are incremental levels and refer to the surface road contribution only (without background).

For all roads assessed, changes in maximum pollutant concentrations along a particular roadway are generally due to changes in one or more of the following factors:

- traffic volume
- vehicle fleet emissions, due to a change in fleet mix or speed
- the distribution of traffic along the roadway, relocating the point of maximum impact (the location may also differ between pollutants, as well as scenarios)
- changes in the proximity of the road alignment and receptors
- the temporal distribution of traffic, leading to emissions occurring under different meteorological conditions
- any of the above aspects along neighbouring roadways.

These factors may combine in different ways to produce changes in modelled concentrations between scenarios, pollutants and averaging periods (the concentration is dependent on the prevailing meteorological conditions during the specified averaging period). The maximum GLCs reported for each of the scenarios may also occur at different locations due to any of the changes listed above.

11.6.1 Albert Street

Albert Street was selected for modelling due to a predicted 63 per cent decrease in HCV traffic between Bell Street and Murray Road with the project in 2036 (a decrease of approximately 1,000 HCVs per day) and a 64 per cent decrease in HCV traffic between Murray Road and Plenty Road with the project in 2036 (a decrease of approximately 1,150 HCVs per day).

Modelling was conducted between the intersections with Bell Street and Plenty Road using two road links; Bell Street to Murray Road and Murray Road to Plenty Road, with differing traffic volumes. Each road section was represented by a single combined at-grade lane combining the northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Albert Street at 50 metre intervals along both sides of the road. On the west side of Albert Street residential areas extend approximately 120 metres from the Bell Street intersection to Plenty Road. On the east side of Albert Street residential areas extend from the intersection with Gower Street through to Plenty Road.

Comparison of base and project model outcomes

Table 74 shows the maximum predicted pollutant concentrations along Albert Street, from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ and one hour average NO_2 concentrations are predicted to occur on the western side of Albert Street, approximately 300 metres from the intersection with Plenty Road. Maximum annual average PM_{10}, $PM_{2.5}$ and NO_2 concentrations occur on the east side of Albert Street, approximately 90 metres from the Plenty Road intersection.

Table 74: Albert Street – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	1.5	1.2	-20%	1.7	1.3	-21%
	Annual	µg/m³	0.64	0.50	-21%	0.69	0.55	-21%
$PM_{2.5}$	24 hour	µg/m³	1.2	0.91	-23%	1.3	0.99	-23%
	Annual	µg/m³	0.49	0.38	-23%	0.53	0.41	-24%
NO_2	1 hour	µg/m³	18	14	-23%	20	15	-23%
	Annual	µg/m³	2.3	1.7	-26%	2.5	1.8	-27%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ are predicted to decrease 20 to 24 per cent in 2026 and 2036. NO_2 is predicted to decrease 23 to 26 per cent in 2026 and 23 to 27 per cent in 2036.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 63 to 64 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Albert Street.

Figure 90 to Figure 92 present linear concentration plots for 2036 along Albert Street from Bell Street to Lower Plenty Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.7 micrograms per cubic metre without the project and 1.3 micrograms per cubic metre with the project, while the average concentration along the length of Albert Street is predicted to be 1.1 micrograms per cubic metre without the project and 0.90 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.3 micrograms per cubic metre without the project and 0.99 micrograms per cubic metre with the project, while the average concentration along the length of Albert Street predicted to be 0.86 micrograms per cubic metre without the project and 0.67 micrograms per cubic metre with the project.

For NO_2 the maximum one hour average concentration is predicted to be 20 micrograms per cubic metre without the project and 15 micrograms per cubic metre with the project, with the average concentration along the length of Albert Street predicted to be 13 micrograms per cubic metre without the project and 10 micrograms per cubic metre with the project.

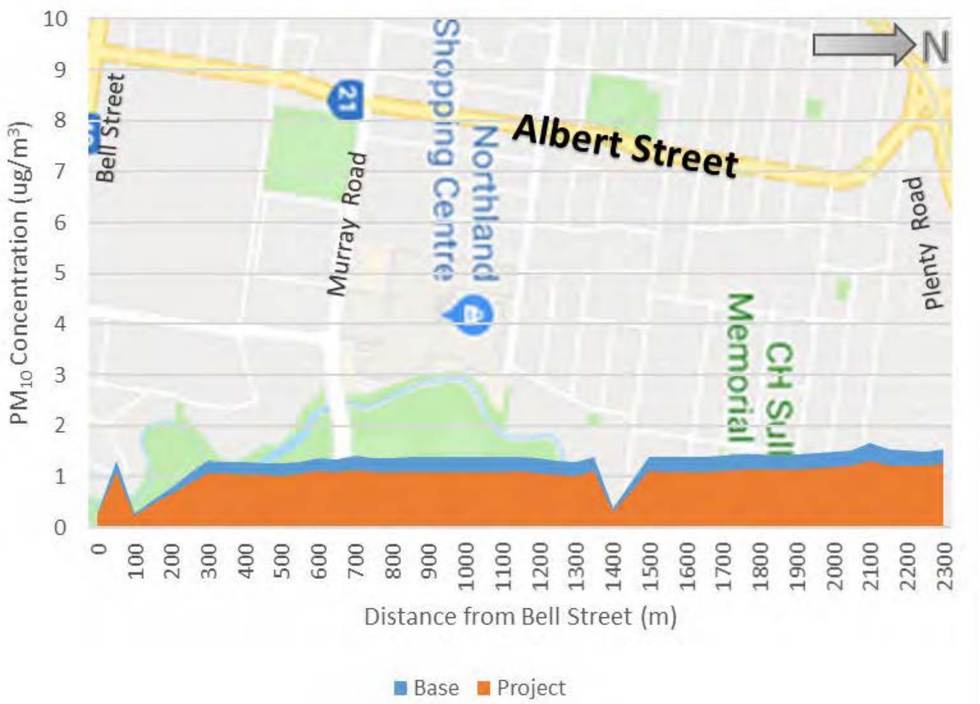


Figure 90: Albert Street maximum 24 hour average PM_{10} concentrations – 2036

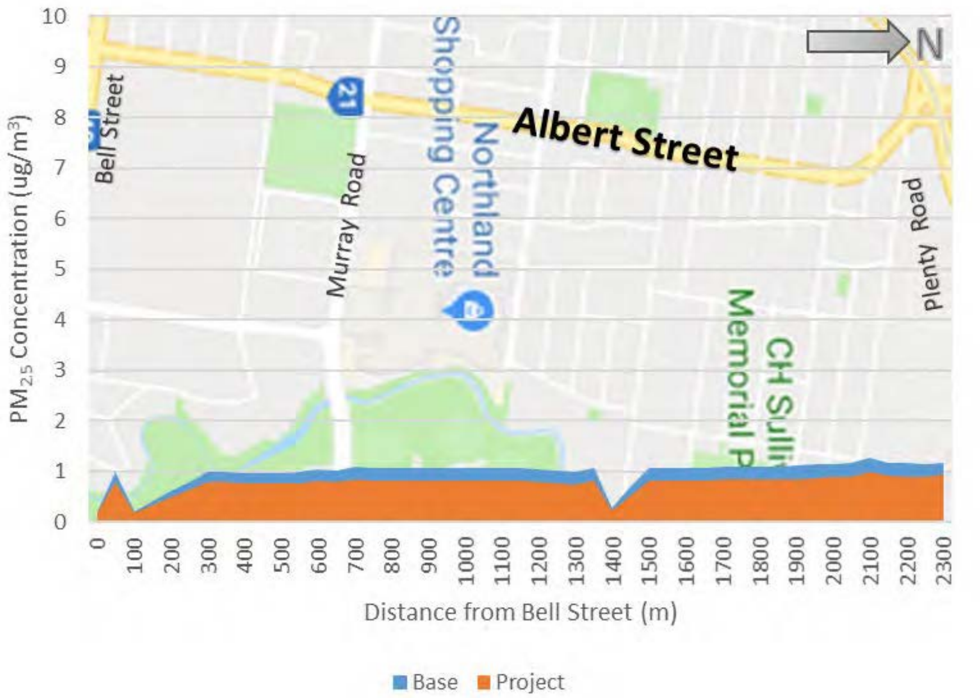


Figure 91: Albert Street maximum 24 hour average $PM_{2.5}$ concentrations – 2036

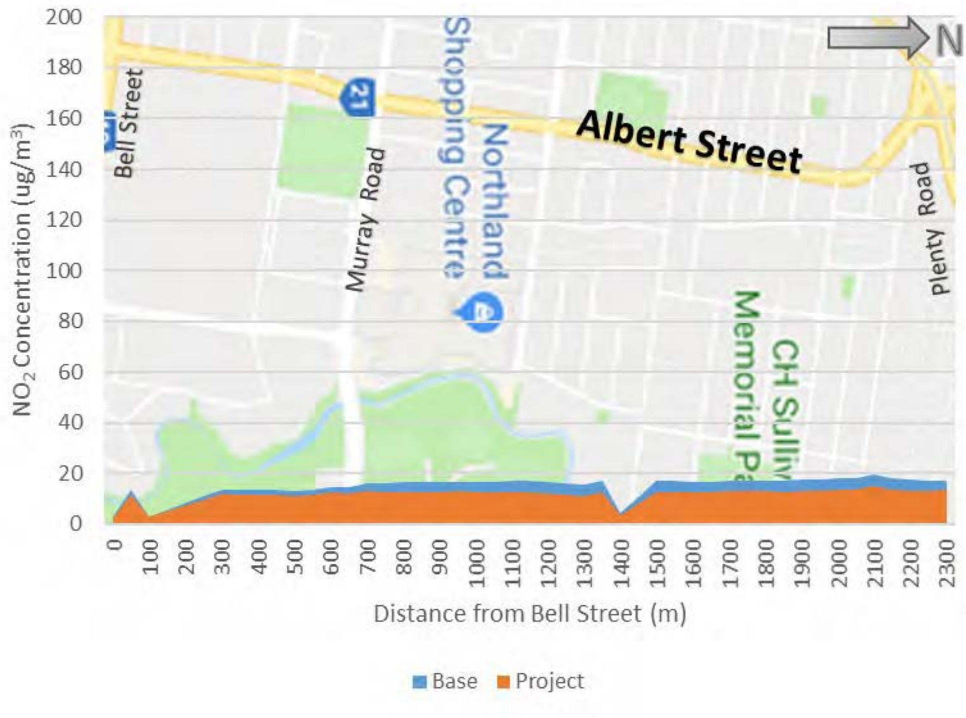


Figure 92: Albert Street maximum 1 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Albert Street through North East Link.

11.6.2 Banksia Street

Banksia Street was selected for modelling due to a predicted 65 per cent decrease in HCV traffic between Bulleen Road and Lower Heidelberg Road with the project in 2036 (a decrease of approximately 2,000 HCVs per day) and a 40 per cent decrease in HCV traffic between Mount Street and Hawdon Street with the project in 2036 (a decrease of approximately 400 HCVs per day).

Modelling was conducted between the intersections with Bulleen Road and Studley Road using two road links; Bulleen Road to Lower Heidelberg Road and Lower Heidelberg Road to Studley Road, with differing traffic volumes. Each road section was represented by a single combined at-grade lane combining the eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Banksia Street at 50 metre intervals on the south side of the road between the Boulevard and Studley Road and on the north side between Lower Heidelberg Road and Studley Road. Between Bulleen Road and the Boulevard there is public open space to the north and south of Banksia Street. Receptors in these areas were placed at approximately 200 metre intervals along the closest walking trail or public recreational areas.

Comparison of base and project model outcomes

Table 75 shows the maximum predicted pollutant concentrations along Banksia Street, from traffic sources only. Maximum concentrations of PM_{10} and $PM_{2.5}$ for the project case are predicted to occur close to Hawdon Street, while maximum concentrations for NO_2 for the project case are predicted to occur close to Glenard Drive.

Table 75: Banksia Street – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.9	1.6	-17%	2.0	1.7	-18%
	Annual	µg/m^3	0.69	0.58	-16%	0.76	0.62	-18%
$PM_{2.5}$	24 hour	µg/m^3	1.4	1.2	-19%	1.6	1.2	-22%
	Annual	µg/m^3	0.53	0.43	-19%	0.59	0.46	-21%
NO_2	1 hour	µg/m^3	26	20	-25%	29	21	-27%
	Annual	µg/m^3	2.6	2.0	-24%	2.9	2.1	-26%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ are predicted to decrease by 16 to 19 per cent in 2026 and 18 to 22 per cent in 2036. One hour and annual average NO_2 concentrations are predicted to decrease by 24 to 25 per cent in 2026 and 26 to 27 per cent in 2036.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 65 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Banksia Street.

Figure 93 to Figure 95 present linear concentration plots for 2036 along Banksia Street from Bullen Road to Lower Heidelberg Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively.

The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.’

The maximum 24 hour average PM_{10} concentration is predicted to be 2.0 micrograms per cubic metre without the project and 1.7 micrograms per cubic metre with the project, while the average concentration along the length of Banksia Street is predicted to be 1.4 micrograms per cubic metre without and with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.6 micrograms per cubic metre without the project and 1.2 micrograms per cubic metre with the project, while the average concentration along the length of Banksia Street is predicted to be 1.1 micrograms per cubic metre without the project and 1.0 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 29 micrograms per cubic metre without the project and 21 micrograms per cubic metre with the project, while the average concentration along the length of Banksia Street is predicted to be 18 micrograms per cubic metre without the project and 16 micrograms per cubic metre with the project.

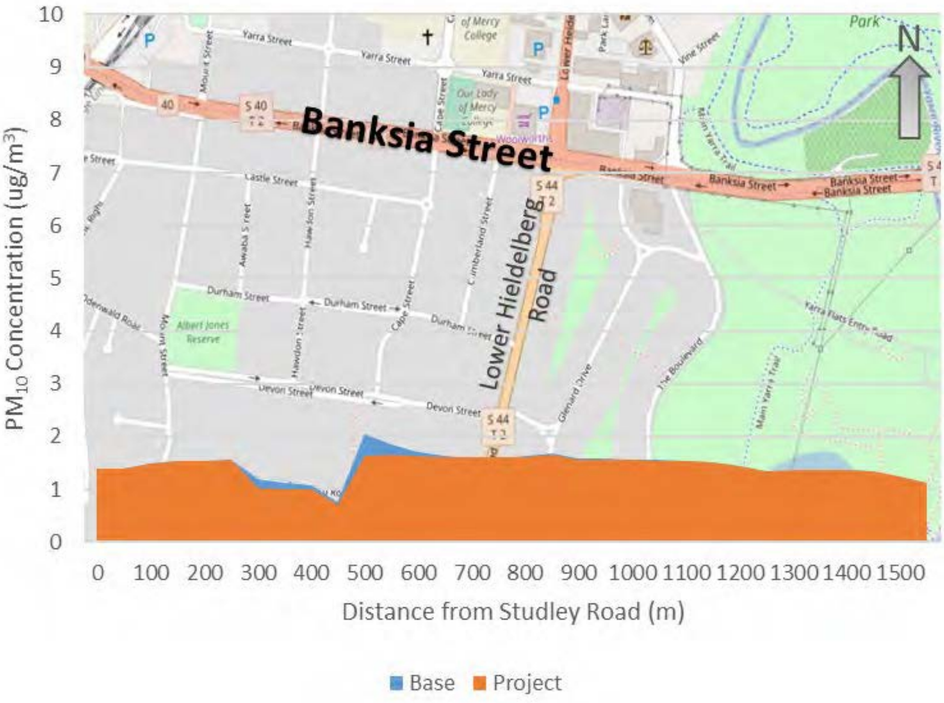


Figure 93: Banksia Street maximum 24 hour average PM_{10} concentrations – 2036

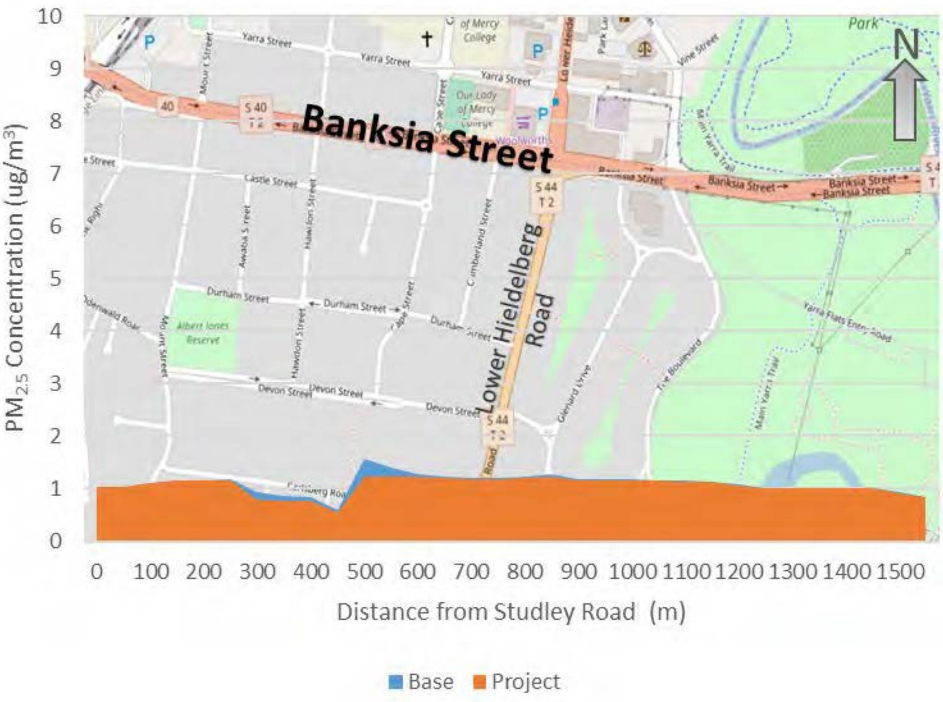


Figure 94: Banksia Street maximum 24 hour average $PM_{2.5}$ concentrations – 2036

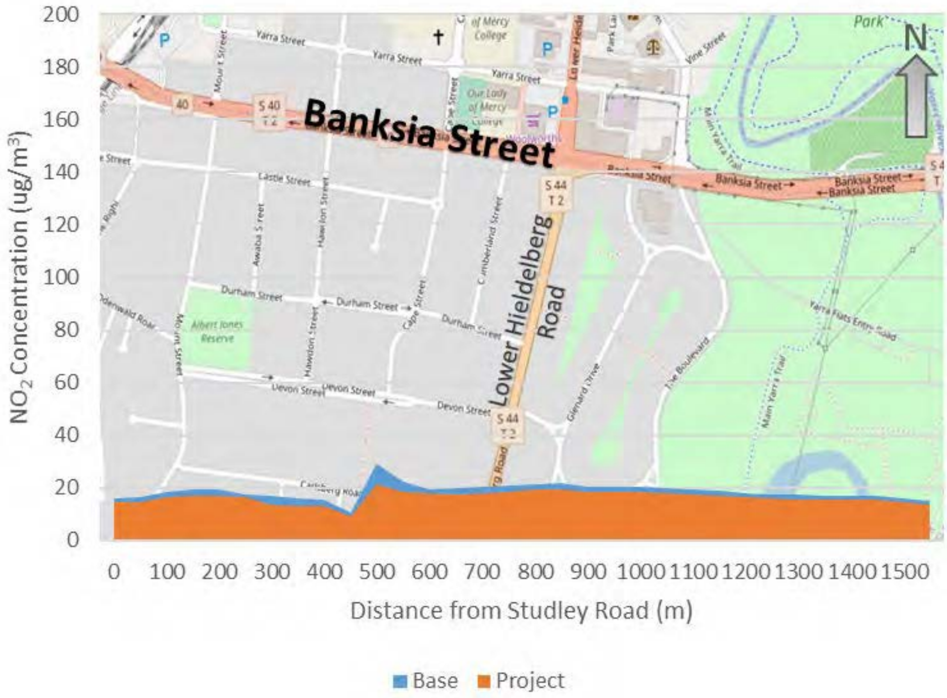


Figure 95: Banksia Street maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Banksia Street through North East Link.

11.6.3 Bell Street

Bell Street was selected for modelling due to a predicted 36 to 43 per cent decrease in HCV traffic between Bell Street and Oriel Road with the project in 2036 (a decrease of approximately 400 to 600 HCVs per day). There was also a 29 per cent decrease in HCV traffic between High Street and Plenty Road with the project in 2036 (a decrease of approximately 400 HCVs per day).

Modelling was conducted between the intersections with Lower Heidelberg Road and Albert Street and Plenty Road and High Street.

Bell Street was modelled using five road links; Studley Road to Upper Heidelberg Road, Upper Heidelberg Road to Waterdale Road, Waterdale Road to Oriel Road, Oriel Road to Albert Street and Plenty Road to High Street, with differing traffic volumes. Each road section was represented by a single combined at-grade lane combining the eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Bell Street at 50 metre intervals along both sides of the road from Upper Heidelberg Road to Darebin Creek. The area between Upper Heidelberg Road and Edwin Street is commercial with residential areas behind the commercial buildings. Receptors for this area were positioned at the residential buildings approximately 50 metres from Bell Street. There are no receptors from Darebin Creek to Albert Street as the surrounding land use is commercial.

Comparison of base and project model outcomes

Table 76 shows the maximum predicted pollutant concentrations along Bell Street (Upper Heidelberg Road to Oriel Road), from traffic sources only. Maximum concentrations of all pollutants are predicted to occur between Edwin Street and Waterdale Road.

Table 76: Bell Street – maximum receptor concentrations – Upper Heidelberg Road to Oriel Road

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.5	1.4	-8%	1.6	1.5	-9%
	Annual	µg/m^3	0.62	0.57	-9%	0.67	0.61	-9%
$PM_{2.5}$	24 hour	µg/m^3	1.1	1.0	-10%	1.2	1.1	-11%
	Annual	µg/m^3	0.47	0.42	-10%	0.51	0.45	-11%
NO_2	1 hour	µg/m^3	17	15	-8%	18	17	-10%
	Annual	µg/m^3	2.1	1.9	-12%	2.3	2.0	-13%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ are predicted to decrease 8 to 10 per cent in 2026 and 9 to 11 per cent in 2036. NO_2 is predicted to decrease 8 to 12 per cent in 2026 and 10 to 13 per cent in 2036.

For Bell Street (Upper Heidelberg Road to Albert Street), the decreases in maximum pollutant concentrations for PM_{10}, $PM_{2.5}$ and NO_2 are due to an approximate 36 to 43 per cent decrease in HCVs with the project scenario.

Table 77 shows the maximum predicted pollutant concentrations along Bell Street (Plenty Road to High Street), from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ and one hour average NO_2 concentrations are predicted to occur on the south side of Bell Street near Clifton Grove. The maximum one hour average NO_2 concentration occurs on the north side of Bell Street near Clifton Grove.

Table 77: Bell Street – maximum receptor concentrations – Plenty Road to High Street

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	0.76	0.73	-5%	0.83	0.78	-6%
	Annual	µg/m^3	0.32	0.31	-4%	0.35	0.33	-6%
$PM_{2.5}$	24 hour	µg/m^3	0.57	0.54	-6%	0.61	0.57	-7%
	Annual	µg/m^3	0.24	0.23	-5%	0.26	0.24	-7%
NO_2	1 hour	µg/m^3	8.9	8.6	-3%	9.5	9.2	-3%
	Annual	µg/m^3	1.2	1.1	-6%	1.3	1.2	-9%

When comparing the project over the base scenario for Bell Street (Plenty Road to High Street) in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ are predicted to decrease by four to six per cent in 2026 and six to seven per cent in 2036. NO_2 is predicted to decrease three to six per cent in 2026 and three to nine per cent in 2036.

For Bell Street (Plenty Road to High Street), the decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 29 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Bell Street.

Figure 96 to Figure 98 present linear concentration plots for 2036 along Bell Street from Darebin Creek to Upper Heidelberg Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.6 micrograms per cubic metre without the project and 1.5 micrograms per cubic metre with the project, while the average concentration along the length of Bell Street is predicted to be 0.89 micrograms per cubic metre without the project and 0.81 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.2 micrograms per cubic metre without the project and 1.1 micrograms per cubic metre with the project, while the average concentration along the length of Bell Street predicted to be 0.67 micrograms per cubic metre without the project and 0.60 micrograms per cubic metre with the project.

For NO_2 the maximum one hour average concentration is predicted to be 18 micrograms per cubic metre without the project and 17 micrograms per cubic metre with the project, while the average concentration along the length of Bell Street is predicted to be 10 micrograms per cubic metre without the project and 8.9 micrograms per cubic metre with the project.

Figure 96: Bell Street maximum 24 hour average PM_{10} concentrations – 2036

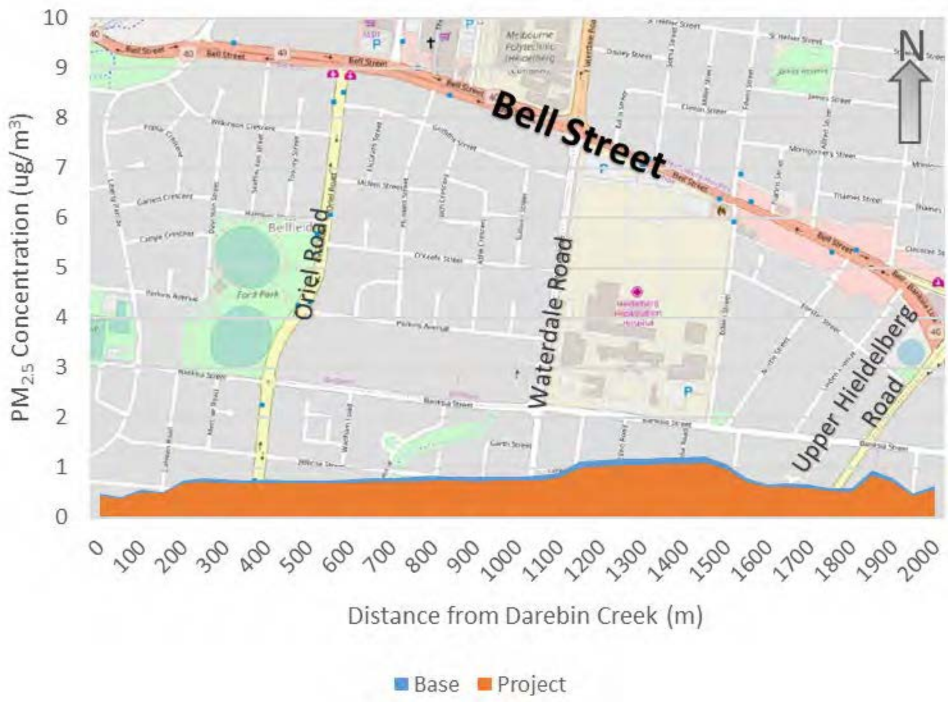


Figure 97: Bell Street maximum 24 hour average $PM_{2.5}$ concentrations – 2036

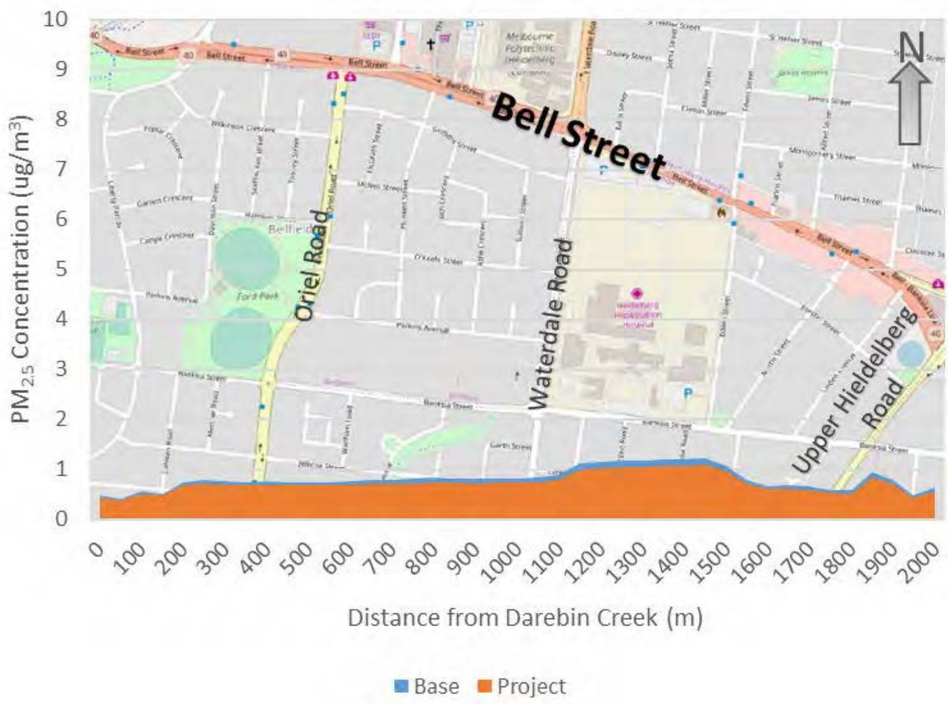


Figure 98: Bell Street maximum 1 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Bell Street through North East Link.

11.6.4 Bolton Street

Bolton Street was selected for modelling due to a predicted 27 per cent decrease in total traffic between Bridge Street and Main Road (a decrease of approximately 8,000 vehicles per day) with the project in 2036.

Modelling was conducted between the intersections with Bridge Road and Main Road. Bolton Street was modelled using one at-grade road link combining the northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Bolton Street at 50 metre intervals along both sides of the road from Main Road to Bridge Road.

Comparison of base and project model outcomes

Table 78 shows the maximum predicted pollutant concentrations along Bolton Street, from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ and one hour average NO_2 concentrations are predicted to occur close to Baxter Street, approximately 240 metres from the intersection with Main Road. Maximum concentrations for annual average PM_{10}, $PM_{2.5}$ and NO_2 concentrations are predicted to occur close to Withers Way, 950 metres from the intersection with Main Road.

Table 78: Bolton Street – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	0.87	0.69	-21%	0.97	0.73	-25%
	Annual	µg/m^3	0.38	0.30	-20%	0.42	0.32	-25%
$PM_{2.5}$	24 hour	µg/m^3	0.66	0.52	-22%	0.74	0.55	-26%
	Annual	µg/m^3	0.29	0.23	-21%	0.32	0.24	-26%
NO_2	1 hour	µg/m^3	12	9.8	-20%	14	10	-25%
	Annual	µg/m^3	1.3	1.0	-21%	1.5	1.1	-26%

When comparing the project over the base scenario for Bolton Street in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ are predicted to decrease by 20 to 22 per cent in 2026 and 25 to 26 per cent in 2036. One hour average NO_2 is predicted to decrease 20 per cent in 2026 and 25 per cent in 2036. Annual average NO_2 is predicted to decrease 21 per cent in 2026 and 26 per cent in 2036.

For Bolton Street, the decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 50 per cent decrease in HCVs with the project scenario.

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of total vehicles from Bolton Street through North East Link.

Analysis of significant changes

With North East Link decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Bolton Street.

Figure 99 to Figure 101 present linear concentration plots for 2036 along Bolton Street from Main Road to Bridge Street for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 0.97 micrograms per cubic metre without the project and 0.73 micrograms per cubic metre with the project, while the average concentration along the length of Bolton Street is predicted to be 0.85 micrograms per cubic metre without the project and 0.64 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 0.74 micrograms per cubic metre without the project and 0.55 micrograms per cubic metre with the project, while the average concentration along the length of Bolton Street is predicted to be 0.65 micrograms per cubic metre without the project and 0.48 micrograms per cubic metre with the project.

For NO_2 the maximum one hour average concentration is predicted to be 21 micrograms per cubic metre without the project and 14 micrograms per cubic metre with the project, while the average concentration along the length of Bolton Street is predicted to be 12 micrograms per cubic metre without the project and 8.9 micrograms per cubic metre with the project.

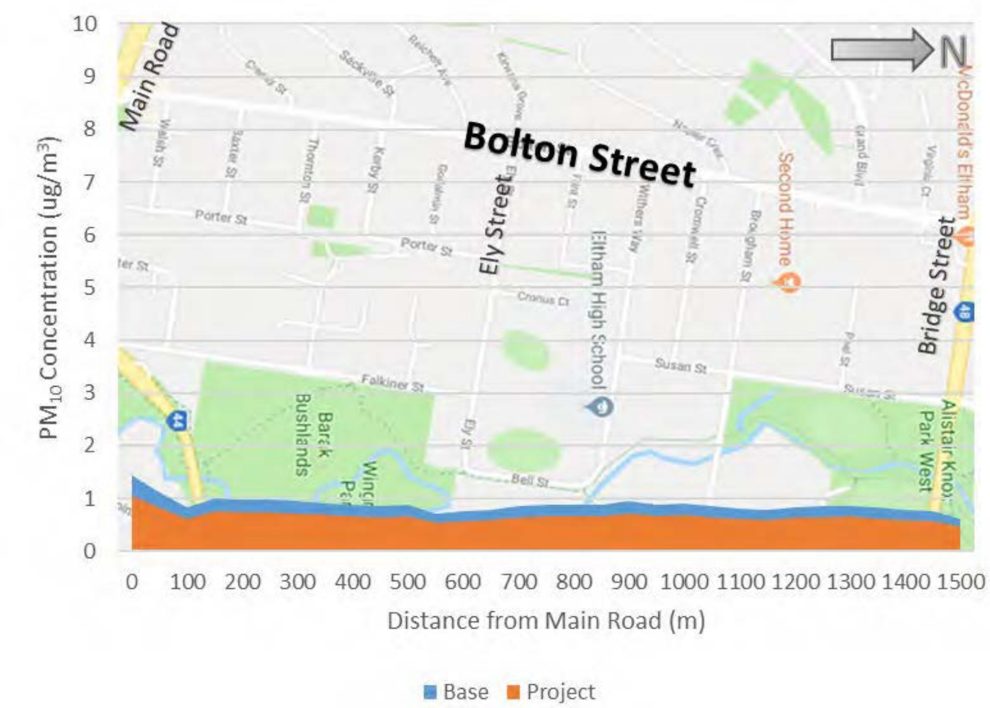


Figure 99: Bolton Street maximum 24 hour average PM_{10} concentrations – 2036

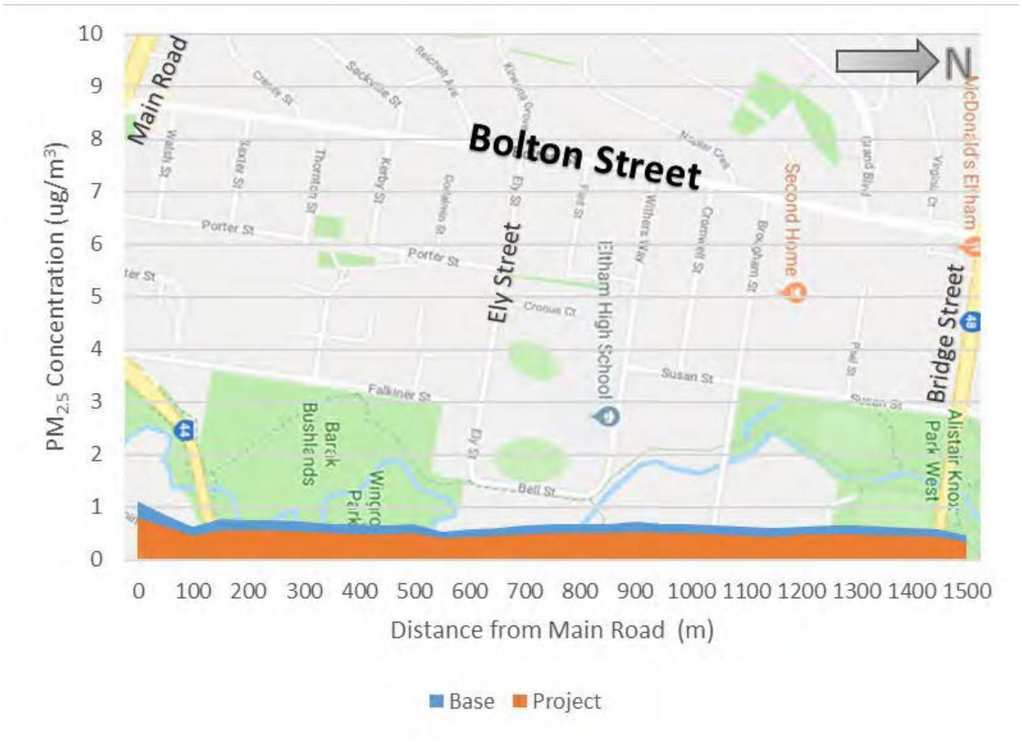


Figure 100: Bolton Street maximum 24 hour average $PM_{2.5}$ concentrations – 2036

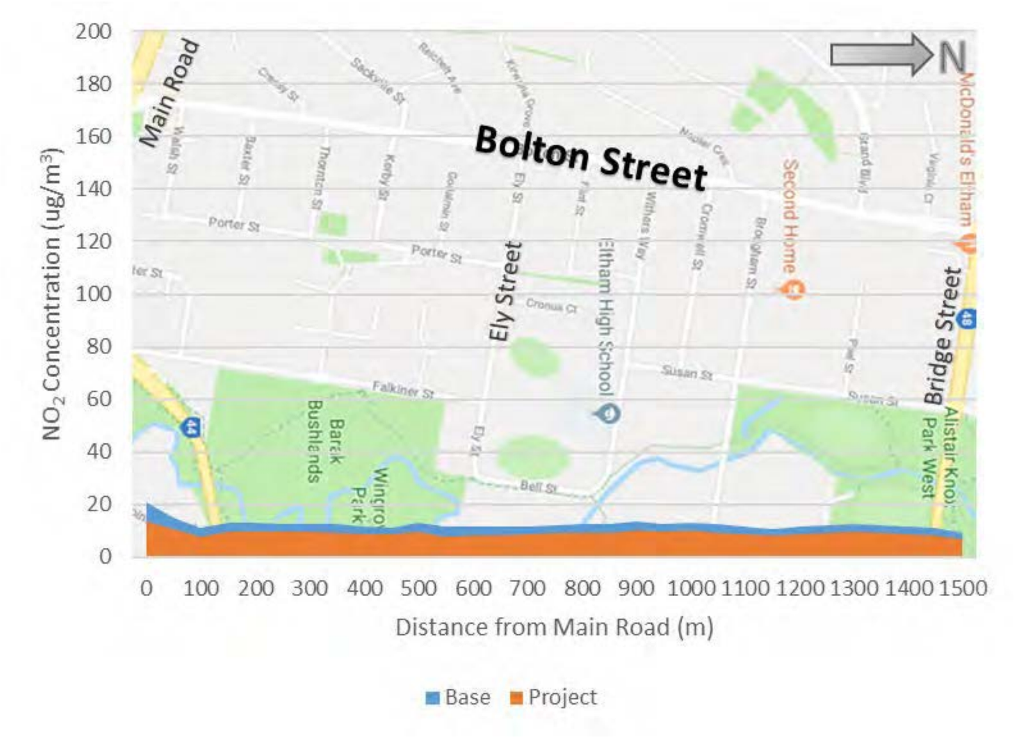


Figure 101: Bolton Street maximum 24 hour average NO_2 concentrations – 2036

11.6.5 Broadway

Broadway was selected for modelling due to a predicted 50 per cent decrease in HCVs between High Street and Bolderwood Parade (a decrease of approximately 1,300 vehicles per day) with the project in 2036.

Modelling was conducted between the intersections with High Street and Bolderwood Parade. Broadway was modelled using one at-grade road link combining the eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Broadway at 50 metre intervals along both sides of the road from Bernard Street to Bolderwood Parade.

Comparison of base and project model outcomes

Table 71 shows the maximum predicted pollutant concentrations along Broadway from traffic sources only. Maximum concentrations for all pollutants are predicted to occur close to Marchant Avenue, approximately 250 metres from the intersection with High Street.

Table 79: Broadway – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.2	0.97	-19%	1.2	0.97	-19%
	Annual	µg/m^3	0.53	0.43	-20%	0.53	0.43	-20%
$PM_{2.5}$	24 hour	µg/m^3	0.96	0.76	-21%	0.96	0.76	-21%
	Annual	µg/m^3	0.43	0.33	-22%	0.43	0.33	-22%
NO_2	1 hour	µg/m^3	16	11	-31%	16	11	-31%
	Annual	µg/m^3	2.1	1.6	-26%	2.1	1.6	-26%

When comparing the project over the base scenario for Broadway in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease by 19 to 22 per cent in 2026 and 2036. NO_2 concentrations are predicted to decrease 26 to 31 per cent in 2026 and 2036.

For Broadway the decreases in maximum pollutant concentrations for PM_{10}, $PM_{2.5}$ and NO_2 are due to an approximate 50 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Broadway.

Figure 102 to Figure 104 present linear concentration plots for 2036 along Broadway for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.2 micrograms per cubic metre without the project and 0.97 micrograms per cubic metre with the project, while the average concentration along the length of Broadway is predicted to be 1.1 micrograms per cubic metre without the project and 0.87 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 0.96 micrograms per cubic metre without the project and 0.76 micrograms per cubic metre with the project, while the average concentration along the length of Broadway is predicted to be 0.86 micrograms per cubic metre without the project and 0.68 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 16 micrograms per cubic metre without the project and 11 micrograms per cubic metre with the project, while the average concentration along the length of Broadway is predicted to be 15 micrograms per cubic metre without the project and 10 micrograms per cubic metre with the project.

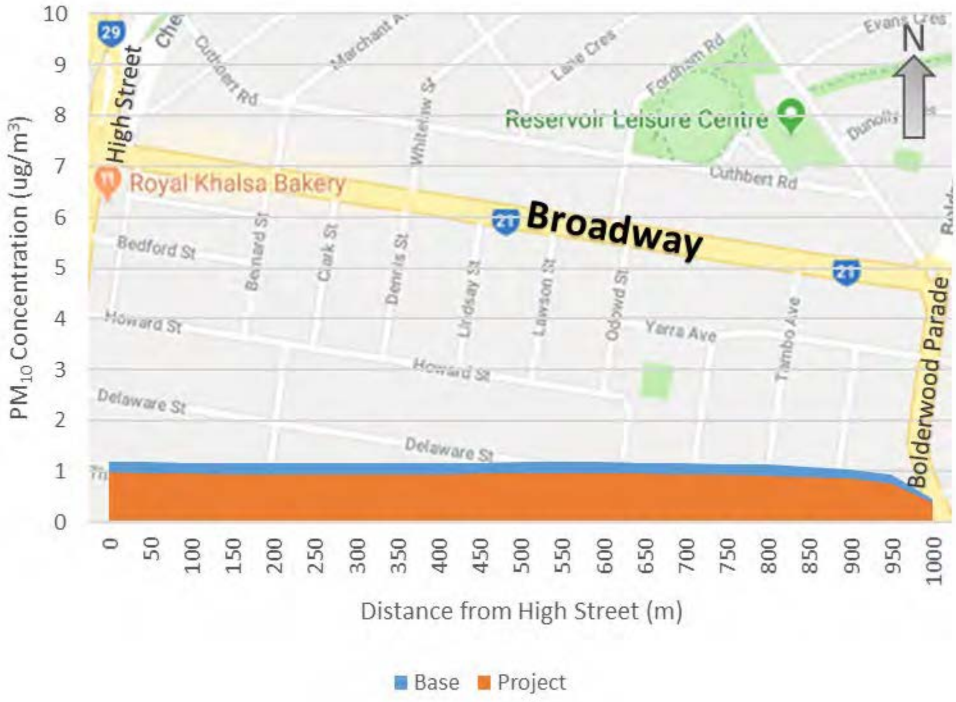


Figure 102: Broadway maximum 24 hour average PM_{10} concentrations – 2036

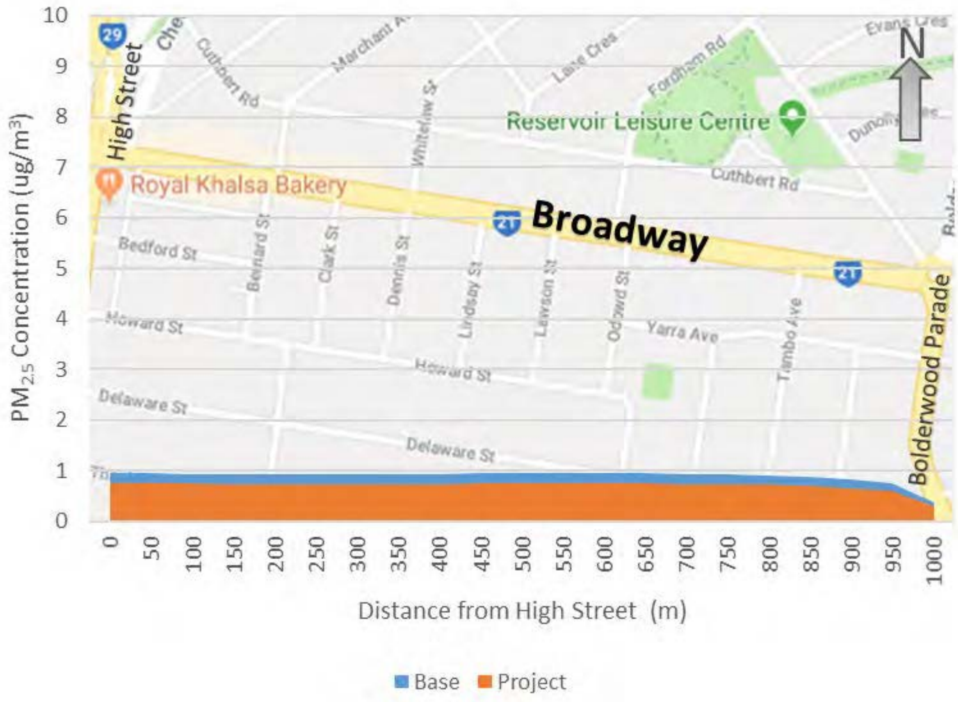


Figure 103: Broadway maximum 24 hour average $PM_{2.5}$ concentrations – 2036

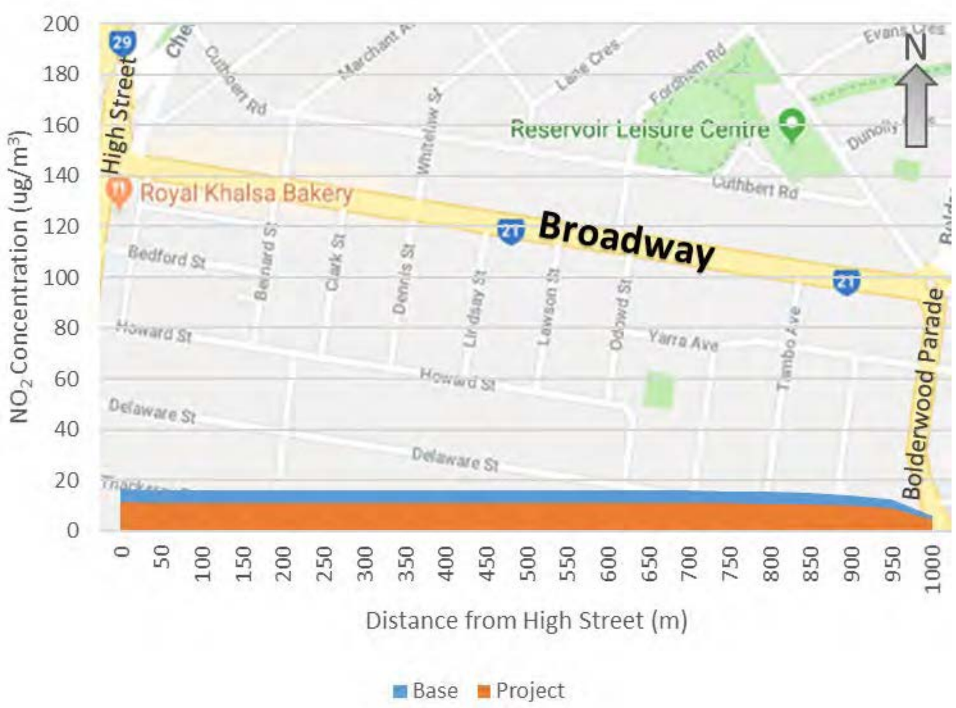


Figure 104: Broadway maximum 1 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of total vehicles from Broadway through North East Link.

11.6.6 Bulleen Road

Bulleen Road was selected for modelling due to a predicted 53 per cent decrease in HCVs between the Eastern Freeway and Manningham Road (a decrease of approximately 900 vehicles per day) with the project in 2036.

Modelling was conducted between the intersections with Eastern Freeway and Manningham Road. Bulleen Road was modelled using one at-grade road link combining the northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Bulleen Road at 50 metre intervals along the eastern side where the residential area begins at Claremont Lane and the western side at Robb Close to Manningham Road. Receptors were also placed on the sporting fields and Veneto Club at the southern section of Bulleen Road.

Comparison of base and project model outcomes

Table 80 shows the maximum predicted pollutant concentrations along Bulleen Road traffic sources only. Maximum concentrations for all pollutants are predicted to occur on the eastern side of Bulleen Road close to Avon Street, approximately 350 metres from the intersection with Manningham Road.

Table 80: Bulleen Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.2	1.6	33%	1.3	1.7	30%
	Annual	µg/m^3	0.50	0.61	23%	0.53	0.65	23%
$PM_{2.5}$	24 hour	µg/m^3	0.91	1.2	32%	1.0	1.3	29%
	Annual	µg/m^3	0.39	0.47	21%	0.41	0.50	22%
NO_2	1 hour	µg/m^3	17	18	7%	19	20	5%
	Annual	µg/m^3	1.9	2.3	19%	2.0	2.4	21%

When comparing the project over the base scenario for Bulleen Road in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour average PM_{10}, and $PM_{2.5}$ concentrations are predicted to increase by 29 to 33 per cent across both years, with annual average concentrations increasing by 21 to 23 per cent. One hour average NO_2 concentrations are predicted to increase five to seven per cent across both years, with annual averages predicted to increase by 19 to 21 per cent across both years.

For Bulleen Road the increases in maximum pollutant concentrations for PM_{10}, $PM_{2.5}$ and NO_2 are due to the proximity of the North East Link – Manningham Road interchange.

Analysis of significant changes

With North East Link, increased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Bulleen Road.

Figure 105 to Figure 107 present linear concentration plots for 2036 along Bulleen Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.3 micrograms per cubic metre without the project and 1.7 micrograms per cubic metre with the project, while the average concentration along the length of Broadway is predicted to be 1.0 micrograms per cubic metre without the project and 1.2 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.0 micrograms per cubic metre without the project and 1.3 micrograms per cubic metre with the project, while the average concentration along the length of Broadway is predicted to be 0.80 micrograms per cubic metre without the project and 0.95 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 19 micrograms per cubic metre without the project and 20 micrograms per cubic metre with the project, while the average concentration along the length of Broadway is predicted to be 13 micrograms per cubic metre without the project and 14 micrograms per cubic metre with the project.

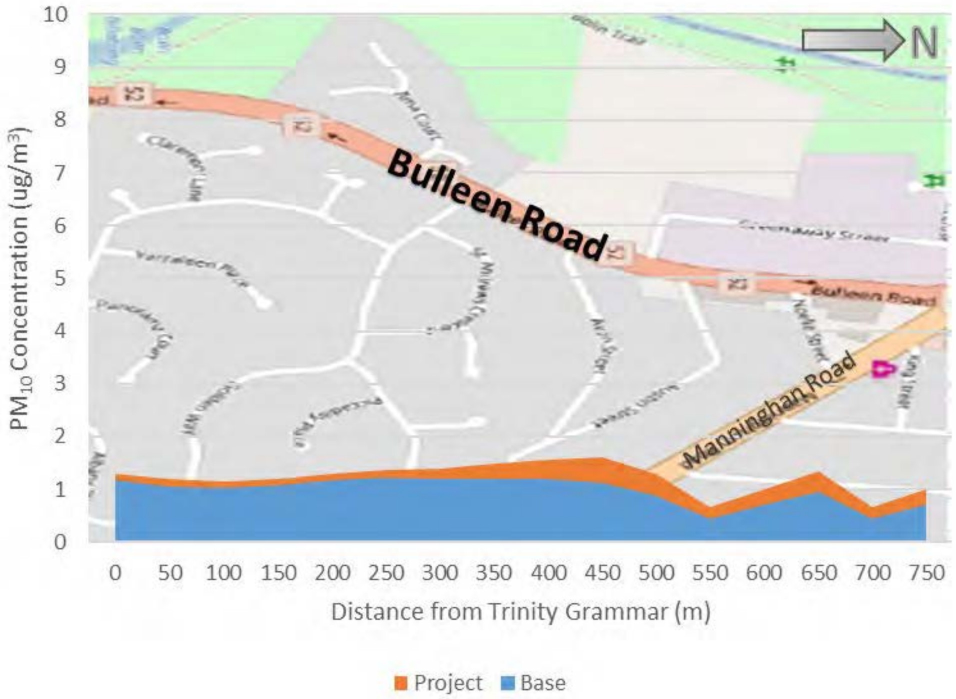


Figure 105: Bulleen Road maximum 24 hour average PM_{10} concentrations – 2036

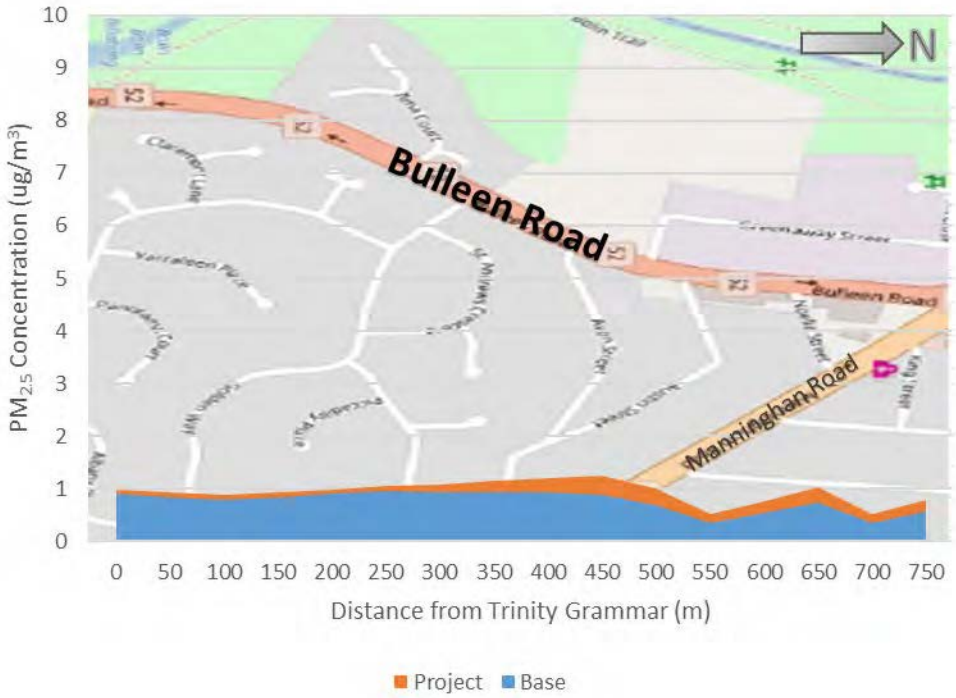


Figure 106: Bulleen Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

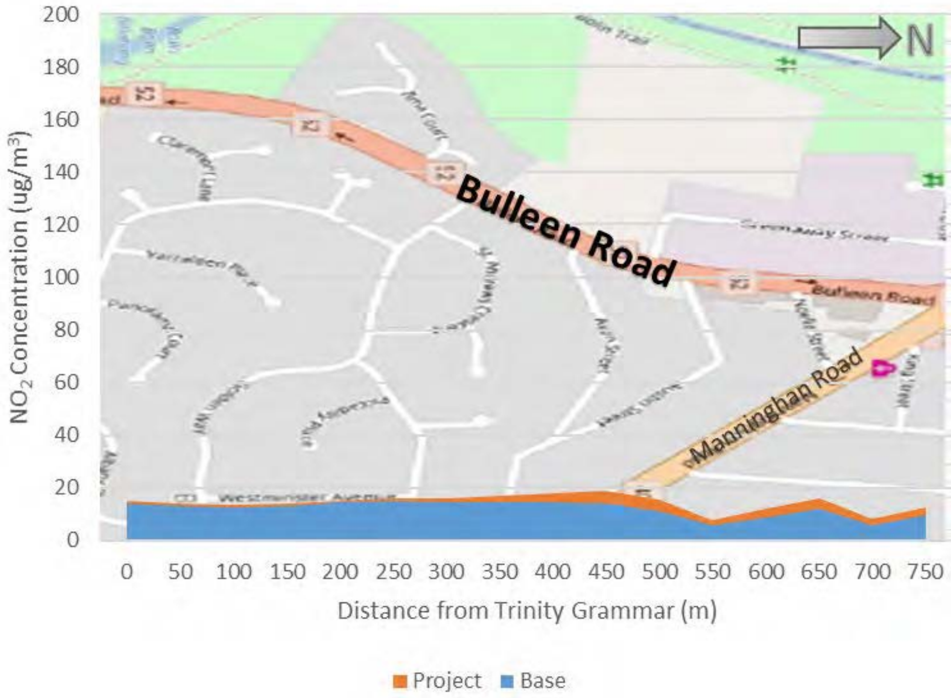


Figure 107: Bulleen Road maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to increase for the project over the base scenario in both 2026 and 2036 due to the proximity of the Manningham Road interchange.

11.6.7 Chandler Highway

Chandler Highway was selected for modelling due to a predicted 44 per cent decrease in HCV traffic between the Eastern Freeway to Heidelberg Road with the project in 2036 (a decrease of approximately 700 HCVs per day).

Modelling was conducted between the intersection with the Eastern Freeway to Heidelberg Road using a single combined at-grade road link combining the northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Chandler Highway at 50 metre intervals along both sides of the road from the Yarra River to Heidelberg Road. The area from the Eastern Freeway to the Yarra River is public open space and receptors were placed at 200 metre intervals.

Comparison of base and project model outcomes

Table 81 shows the maximum predicted pollutant concentrations along Chandler Highway, from traffic sources only. Maximum concentrations for all pollutants are predicted to occur on the eastern side of Chandler Highway approximately 300 metres south of the intersection with Heidelberg Road.

Table 81: Chandler Highway – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	μg/m^3	2.2	2.0	-11%	2.5	2.2	-10%
	Annual	μg/m^3	1.0	0.88	-12%	1.1	0.99	-12%
$PM_{2.5}$	24 hour	μg/m^3	1.7	1.5	-12%	1.9	1.7	-11%
	Annual	μg/m^3	0.77	0.67	-13%	0.86	0.75	-13%
NO_2	1 hour	μg/m^3	29	26	-12%	32	29	-11%
	Annual	μg/m^3	3.6	3.1	-13%	4.0	3.5	-12%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 10 to 13 per cent across both years. One hour average NO_2 is predicted to decrease 11 to 12 per cent in 2026 and 2036, while annual average NO_2 is predicted to decrease 12 to 13 per cent across both years.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 44 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, increased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Chandler Highway.

Figure 108 to Figure 110 present linear concentration plots for 2036 along Chandler Highway for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 2.5 micrograms per cubic metre without the project and 2.2 micrograms per cubic metre with the project, while the average concentration along the length of Chandler Highway is predicted to be 1.9 micrograms per cubic metre without the project and 1.7 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.9 micrograms per cubic metre without the project and 1.7 micrograms per cubic metre with the project, while the average concentration along the length of Chandler Highway is predicted to be 1.5 micrograms per cubic metre without the project and 1.3 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 32 micrograms per cubic metre without the project and 29 micrograms per cubic metre with the project, while the average concentration along the length of Chandler Highway is predicted to be 24 micrograms per cubic metre without the project and 21 micrograms per cubic metre with the project.

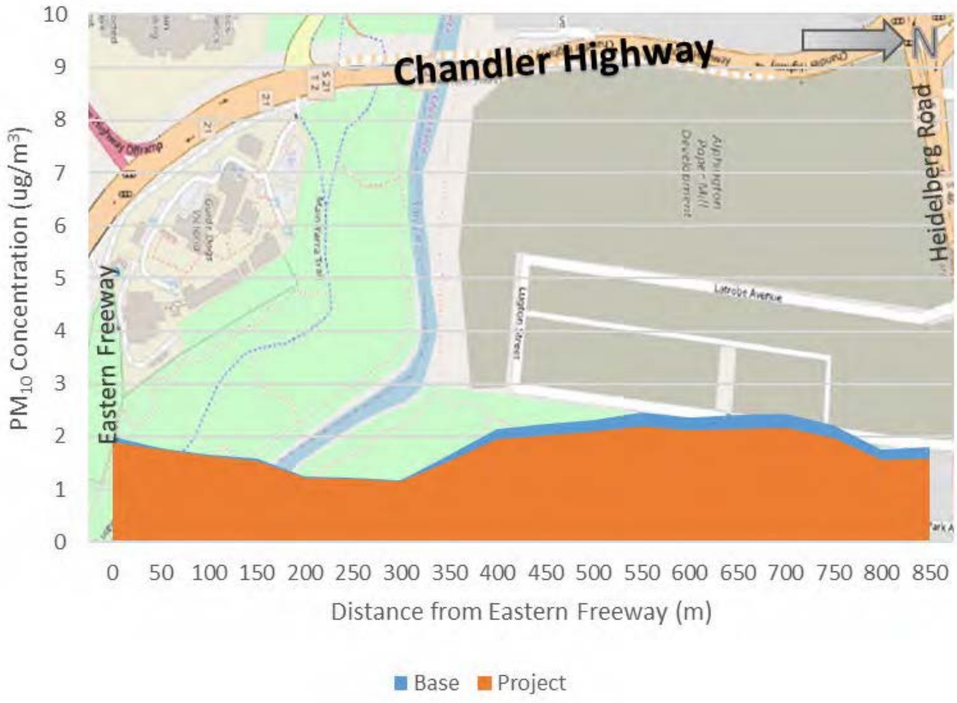


Figure 108: Chandler Highway maximum 24 hour average PM_{10} concentrations – 2036

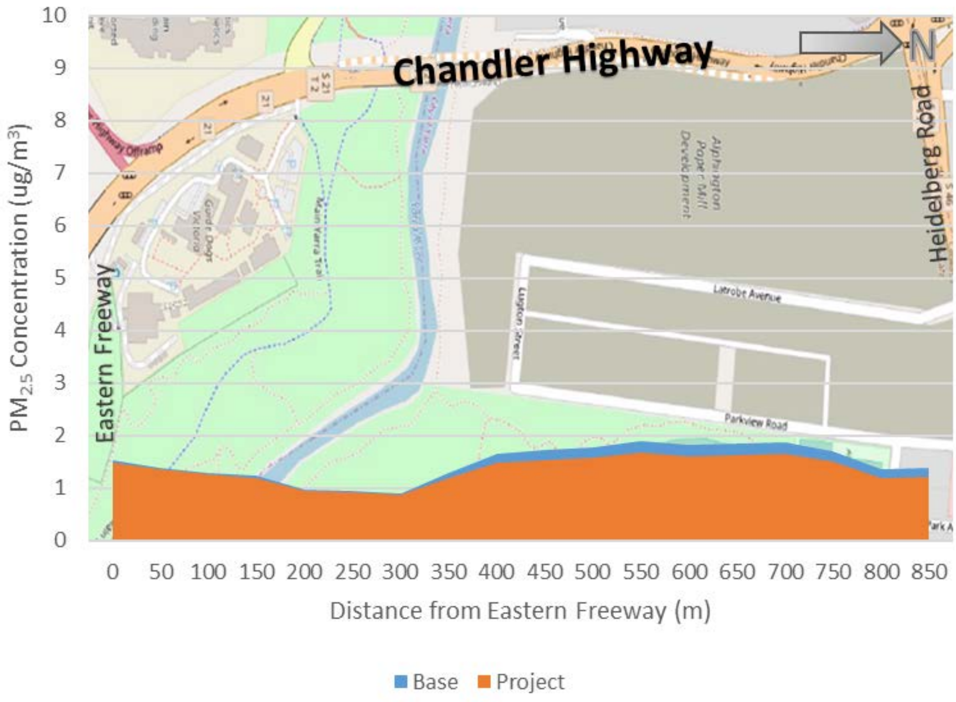


Figure 109: Chandler Highway maximum 24 hour average $PM_{2.5}$ concentrations – 2036

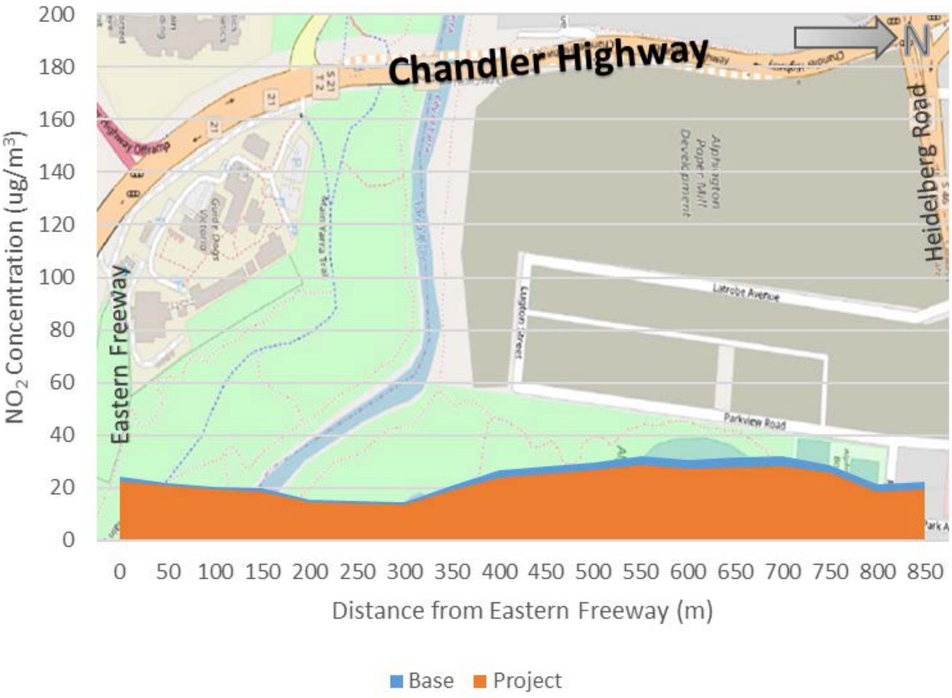


Figure 110: Chandler Highway maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Chandler Highway through North East Link.

11.6.8 Dalton Road

Dalton Road was selected for modelling due to a predicted 50 per cent increase in HCVs between Childs Road and McKimmies Road (an increase of approximately 300 vehicles per day) and a 25 per cent increase in HCVs between the M80 Ring Road and McKimmies Road (an increase of approximately 400 vehicles per day) with the project in 2036.

Modelling was conducted between the M80 Ring Road and Childs Road as two separate carriageways, northbound and southbound. Each carriageway was divided into two road links, M80 Ring Road to McKimmies Road and McKimmies Road to Childs Road, with differing traffic volumes.

Receptors representative of the adjoining residential properties were positioned along Dalton Road at 50 metre intervals along both sides of the road from M80 Ring Road to Childs Road. Residential areas start approximately 200 metres from the M80 Ring Road intersection.

Comparison of base and project model outcomes

Table 82 shows the maximum predicted pollutant concentrations along Dalton Road, from traffic sources only. Maximum concentrations for all pollutants are predicted to occur approximately 270 metres from the intersection with the M80 Ring Road at the start of the residential area.

Table 82: Dalton Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	2.0	2.1	7%	2.2	2.3	5%
	Annual	µg/m^3	0.90	0.95	6%	1.0	1.1	5%
$PM_{2.5}$	24 hour	µg/m^3	1.5	1.6	7%	1.7	1.8	6%
	Annual	µg/m^3	0.70	0.75	7%	0.80	0.84	6%
NO_2	1 hour	µg/m^3	27	29	9%	30	33	10%
	Annual	µg/m^3	3.2	3.4	8%	3.6	3.9	8%

Analysis of significant changes

With North East Link, increased impacts for PM_{10} are predicted to occur along Dalton Road from the M80 Ring Road to Childs Road. For $PM_{2.5}$ and NO_2 increased impacts are predicted to occur from the M80 Ring Road to Curtin Avenue, approximately 2.6 kilometres from the M80 Ring Road. From Curtin Road to Childs Road the project scenario is lower than the base scenario for these parameters.

Figure 111 to Figure 113 present linear concentration plots for 2036 along Dalton Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 2.2 micrograms per cubic metre without the project and 2.3 micrograms per cubic metre with the project, while the average concentration along the length of Dalton Road is predicted to be 1.5 micrograms per cubic metre without the project and 1.6 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.7 micrograms per cubic metre without the project and 1.8 micrograms per cubic metre with the project, while the average concentration along the length of Dalton Road is predicted to be 1.2 micrograms per cubic metre with and without the project.

The maximum one hour average NO_2 concentration is predicted to be 30 micrograms per cubic metre without the project and 33 micrograms per cubic metre with the project, while the average concentration along the length of Dalton Road is predicted to be 23 micrograms per cubic metre without the project and 25 micrograms per cubic metre with the project.

Figure 111: Dalton Road maximum 24 hour average PM_{10} concentrations – 2036

Figure 112: Dalton Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

Figure 113: Dalton Road maximum 1 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to increase by 6 to 9 per cent for the project over the base scenario in 2026 and 4 to 10 per cent in 2036.

11.6.9 Darebin Road

Darebin Road was selected for modelling due to a predicted 54 per cent decrease in HCVs between Grange Road and Station Street (a decrease of approximately 650 vehicles per day) with the project in 2036. However, there are no residential receptors along Darebin Road as the surrounding land use is light industrial. Consequently, maximum receptor concentrations specific to Darebin Road are not predicted but the impact of the road on adjoining roads and receptors has been considered.

Modelling was conducted between Grange Road and Station Street using a single combined at-grade road link, combining the eastbound and westbound traffic lanes.

11.6.10 Eastern Freeway

The Eastern Freeway was selected for modelling due to a predicted increase in total traffic and HCV traffic with the project in 2036. The following sections of the Eastern Freeway have significant increases in predicted traffic volumes:

■ Springvale Road to Blackburn Road	26 per cent increase in total vehicles	44,000 vehicles and 2,400 HCVs per day
■ Blackburn Road to Middleborough Road	26 per cent increase in total vehicles	50,000 vehicles and 2,600 HCVs per day
■ Middleborough Road to Tram Road	39 per cent increase in total vehicles	77,000 vehicles and 3,100 HCVs per day
■ Tram Road to Elgar Road	46 per cent increase in total vehicles	77,000 vehicles and 3,200 HCVs per day
■ Elgar Road to Doncaster Road	47 per cent increase in total vehicles	87,000 vehicles and 3,500 HCVs per day
■ Doncaster Road to Bulleen Road	57 per cent increase in total vehicles	100,000 vehicles and 3,700 HCVs per day

The Eastern Freeway was modelled over its entire length from Springvale Road to Hoddle Street, including entry and exit ramps. Nine road links, the six detailed above and an additional three road links; Bulleen Road to Bourke Road, Bourke Road to Chandler Highway and Chandler Highway to Hoddle Street, were modelled with differing traffic volumes. Each road link was modelled as two separate carriageways representing eastbound and westbound traffic lanes.

For the project scenario, the Eastern Freeway would be widened with additional lanes and collector distributor lanes added between Middleborough Road and Elgar Road. These lanes have been modelled as separate road links with differing traffic volumes. Additionally, some entry and exit ramps have been re-aligned closer to residential areas.

Receptors representative of the adjoining residential properties were positioned along both sides of the Eastern Freeway at 50 metre intervals from Springvale Road to Hoddle Street. In areas of public open space (eg Tram Road Reserve, Elgar Park, Bulleen Park, Freeway Public Golf Course, Green Acres Golf Club, Willesmere Park and Yarra Bend Park) receptors were placed at 200 metre intervals at the closest walking track or recreational area.

Comparison of base and project model outcomes

Eastern Freeway (Springvale Road to Middleborough Road)

Table 83 shows the maximum predicted pollutant concentrations along the Eastern Freeway (Springvale Road to Middleborough Road), from traffic sources only. Maximum 24 hour average and annual average PM_{10} and $PM_{2.5}$ concentrations for the project case are predicted to occur on the southern side of Eastern Freeway, west of Blackburn Road adjacent to the westbound entry ramp. One hour average and annual average NO_2 concentrations for the project case are predicted to occur on the southern side of the Eastern Freeway, at the intersection with Blackburn Road.

Table 83: Eastern Freeway (Springvale Road to Middleborough Road) – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	1.8	2.2	27%	1.9	2.4	28%
	Annual	µg/m³	0.69	0.87	26%	0.73	0.92	26%
$PM_{2.5}$	24 hour	µg/m³	1.4	1.8	32%	1.5	2.0	34%
	Annual	µg/m³	0.54	0.70	29%	0.58	0.76	32%
NO_2	1 hour	µg/m³	28	39	42%	30	43	44%
	Annual	µg/m³	3.3	4.5	40%	3.5	4.9	41%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour and annual average PM_{10} concentrations are predicted to increase 26 to 28 per cent across both 2026 and 2036. Similarly, 24 hour and annual average $PM_{2.5}$ concentrations are predicted to increase 29 to 34 per cent across both years. Annual average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 41 to 42 per cent in 2026 and 43 to 44 per cent in 2036. One hour average and annual average NO_2 concentrations are predicted to increase 40 to 44 per cent across both years.

The increases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 26 per cent increase in total vehicles with the project scenario.

Eastern Freeway (Middleborough Road to Elgar Road)

Table 84 shows the maximum predicted pollutant concentrations along the Eastern Freeway (Middleborough Road to Elgar Road), from traffic sources only. Maximum concentrations for all pollutants for the project case are predicted to occur on the northern side of Eastern Freeway, at the intersection with Tram Road.

Table 84: Eastern Freeway (Middleborough Road to Elgar Road) – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.9	2.9	54%	2.0	3.1	58%
	Annual	µg/m^3	0.75	1.2	64%	0.79	1.3	66%
$PM_{2.5}$	24 hour	µg/m^3	1.5	2.3	58%	1.6	2.5	62%
	Annual	µg/m^3	0.61	1.0	66%	0.65	1.1	68%
NO_2	1 hour	µg/m^3	28	47	70%	29	51	74%
	Annual	µg/m^3	3.8	6.5	71%	4.1	7.1	73%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 54 to 58 per cent in 2026 and 58 to 62 per cent in 2036. Annual average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 64 to 68 per cent across both years. One hour and annual average NO_2 concentrations are predicted to increase 70 to 74 per cent across both years.

The increases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 39 to 46 per cent increase in total vehicles with the project scenario.

Analysis of significant changes

With North East Link, increased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the Eastern Freeway between Middleborough Road and Bulleen Road.

Figure 114 to Figure 116 present linear concentration plots for 2036 along the Eastern Freeway from Middleborough Road to Elgar Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 2.0 micrograms per cubic metre without the project and 3.1 micrograms per cubic metre with the project, while the average concentration along the length of Eastern Freeway from Middleborough Road to Elgar Road is predicted to be 1.3 micrograms per cubic metre without the project and 1.9 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.6 micrograms per cubic metre without the project and 2.5 micrograms per cubic metre with the project, while the average concentration along the length of Eastern Freeway from Middleborough Road to Elgar Road is predicted to be 1.0 micrograms per cubic metre without the project and 1.5 micrograms per cubic metre with the project.

For NO_2 the maximum one hour average concentration is predicted to be 29 micrograms per cubic metre without the project and 51 micrograms per cubic metre with the project, while the average concentration along the length of Eastern Freeway from Middleborough Road to Elgar Road is predicted to be 20 micrograms per cubic metre without the project and 31 micrograms per cubic metre with the project.

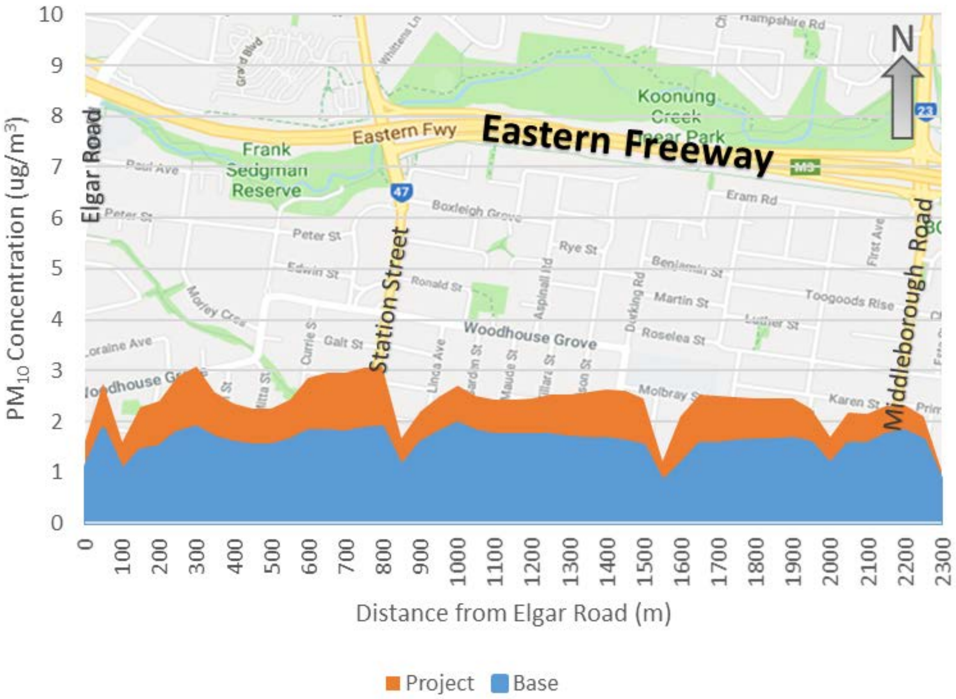


Figure 114: Eastern Freeway (Middleborough Road to Elgar Road) maximum 24 hour average PM_{10} concentrations – 2036

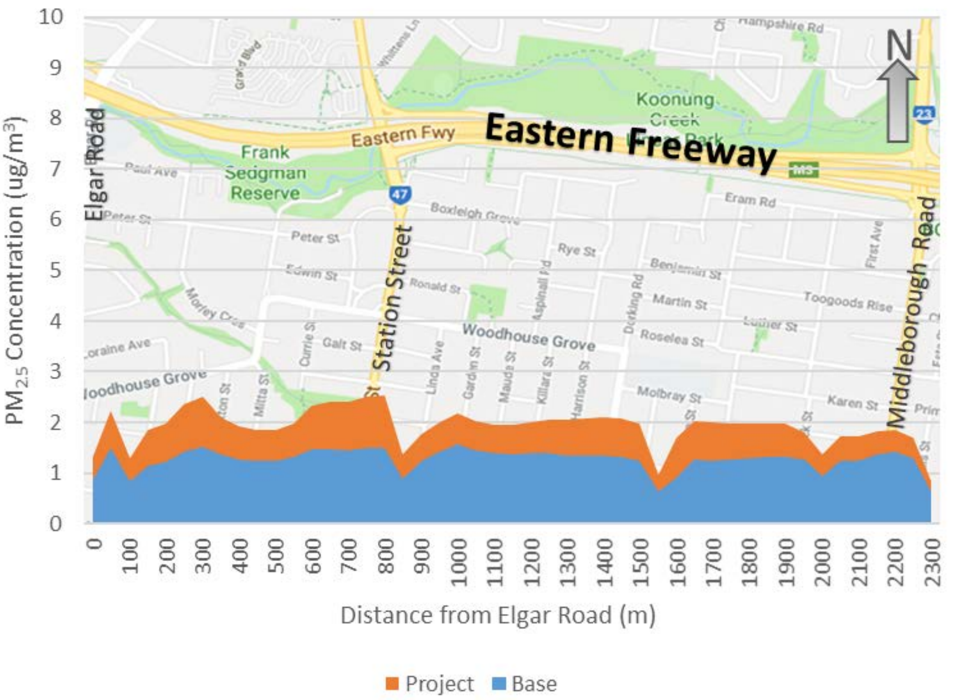


Figure 115: Eastern Freeway (Middleborough Road to Elgar Road) maximum 24 hour average $PM_{2.5}$ concentrations – 2036

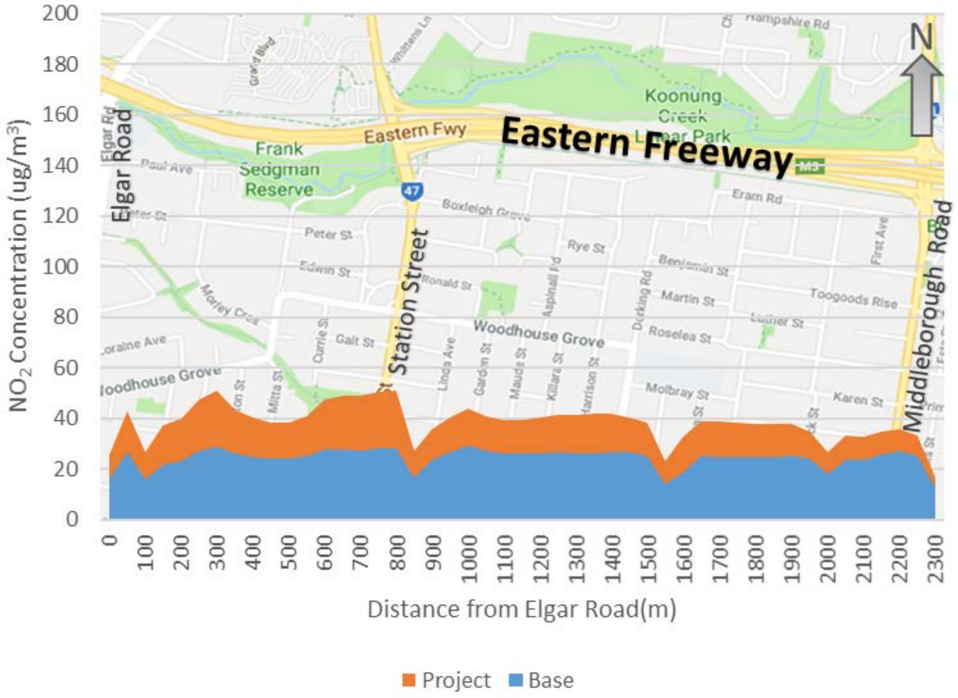


Figure 116: Eastern Freeway (Middleborough Road to Elgar Road) maximum 24 hour average NO_2 concentrations – 2036

Eastern Freeway (Elgar Road to Bulleen Road)

Table 85 shows the maximum predicted pollutant concentrations along the Eastern Freeway (Elgar Road to Bulleen Road), from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ concentrations for the project case are predicted to occur on the southern side of the Eastern Freeway, approximately half way between Elgar Road and Doncaster Road. One hour and annual average NO_2 and annual average PM_{10} and $PM_{2.5}$ concentrations for the project case are predicted to occur on the northern side of the Eastern Freeway, close to the Elgar Road westbound exit ramp.

Table 85: Eastern Freeway (Elgar Road to Bulleen Road) – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	2.1	4.9	130%	2.2	5.4	145%
	Annual	µg/m^3	0.87	1.9	113%	0.91	2.0	123%
$PM_{2.5}$	24 hour	µg/m^3	1.7	4.0	136%	1.8	4.5	152%
	Annual	µg/m^3	0.71	1.5	117%	0.74	1.7	127%
NO_2	1 hour	µg/m^3	32	60	87%	34	67	96%
	Annual	µg/m^3	4.6	8.5	85%	4.8	9.3	94%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 130 to 136 per cent in 2026 and 145 to 152 per cent in 2036. Annual average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 113 to 117 per cent in 2026 and 123 to 127 per cent in 2036. The one hour average NO_2 concentration is predicted to increase 87 per cent in 2026 and 96 per cent in 2036 and the annual average by 85 per cent in 2026 and 94 per cent in 2036.

The increases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 47 to 57 per cent increase in total vehicles with the project scenario.

Eastern Freeway (Bulleen Road to Hoddle Street)

Table 86 shows the maximum predicted pollutant concentrations along the Eastern Freeway (Bulleen Road to Hoddle Street), from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ concentrations for the project case are predicted to occur on the southern side of Eastern Freeway, close to Meldrum Street. One hour and annual average NO_2 and annual average PM_{10} and $PM_{2.5}$ concentrations for the project case are predicted to occur on the northern side of the Eastern Freeway, close to Belford Road.

Table 86: Eastern Freeway (Bulleen Road to Hoddle Street) – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	1.8	2.3	27%	2.0	2.6	29%
	Annual	µg/m³	0.67	0.85	25%	0.74	0.95	27%
$PM_{2.5}$	24 hour	µg/m³	1.4	1.9	33%	1.5	2.1	35%
	Annual	µg/m³	0.52	0.69	33%	0.58	0.78	35%
NO_2	1 hour	µg/m³	24	30	25%	26	34	30%
	Annual	µg/m³	3.3	4.3	30%	3.5	4.8	36%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour and annual average PM_{10} concentrations are predicted to increase 25 to 27 per cent in 2026 and 27 to 29 per cent in 2036. Twenty four hour and annual average $PM_{2.5}$ concentrations are predicted to increase 33 per cent in 2026 and 35 per cent in 2036. The one hour average NO_2 concentration is predicted to increase 25 per cent in 2026 and 30 per cent in 2036 and the annual average by 30 per cent in 2026 and 36 per cent in 2036.

The increases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 13 to 18 per cent increase in total vehicles with the project scenario.

Summary

Maximum concentrations of all pollutants are predicted to increase for the project over the base scenario in both 2026 and 2036.

11.6.11 Fitzsimons Lane

Fitzsimons Lane was selected for modelling due to a predicted 54 per cent decrease in HCV traffic between Foote Street and Main Road with the project in 2036 (a decrease of approximately 750 HCVs per day).

Modelling was conducted between the intersections with Foote Street and Main Road using a single combined at-grade road link combining the northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Fitzsimons Lane at 50 metre intervals along both sides of the road from Reynolds Road to Summerhill Road. Summerhill Road to Main Road has public open space on both sides of the road (Westerfolds Park and Yarra Valley Parklands), consequently receptors were positioned at approximately 200 metre intervals in these areas.

Comparison of base and project model outcomes

Table 87 shows the maximum predicted pollutant concentrations along Fitzsimons Lane, from traffic sources only. Maximum concentrations for all pollutants are predicted to occur on the eastern side of Fitzsimons Lane, approximately 200 metres south of the intersection with Main Road.

Table 87: Fitzsimons Lane – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	μg/m^3	1.5	1.2	-23%	1.7	1.3	-26%
	Annual	μg/m^3	0.63	0.49	-23%	0.71	0.53	-25%
$PM_{2.5}$	24 hour	μg/m^3	1.2	0.91	-24%	1.4	1.0	-27%
	Annual	μg/m^3	0.50	0.38	-24%	0.57	0.42	-26%
NO_2	1 hour	μg/m^3	24	17	-28%	28	19	-32%
	Annual	μg/m^3	2.6	2.0	-24%	3.0	2.2	-27%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 23 to 24 per cent in 2026 and 25 to 27 per cent in 2036. One hour average NO_2 is predicted to decrease 28 per cent in 2026 and 32 per cent in 2036 and the annual average by 24 per cent in 2026 and 27 per cent in 2036.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 54 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Fitzsimons Lane.

Figure 117 to Figure 119 present linear concentration plots for 2036 along Fitzsimons Lane for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.7 micrograms per cubic metre without the project and 1.3 micrograms per cubic metre with the project, while the average concentration along the length of North East Link is predicted to be 1.1 micrograms per cubic metre without the project and 0.88 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.4 micrograms per cubic metre without the project and 1.0 micrograms per cubic metre with the project, while the average concentration along the length of Fitzsimons Lane is predicted to be 0.91 micrograms per cubic metre without the project and 0.69 micrograms per cubic metre with the project.

For NO_2 the maximum one hour average concentration is predicted to be 28 micrograms per cubic metre without the project and 19 micrograms per cubic metre with the project, while the average concentration along the length of Fitzsimons Lane is predicted to be 19 micrograms per cubic metre without the project and 13 micrograms per cubic metre with the project.

Figure 117: Fitzsimons Lane maximum 24 hour average PM_{10} concentrations – 2036

Figure 118: Fitzsimons Lane maximum 24 hour average $PM_{2.5}$ concentrations – 2036

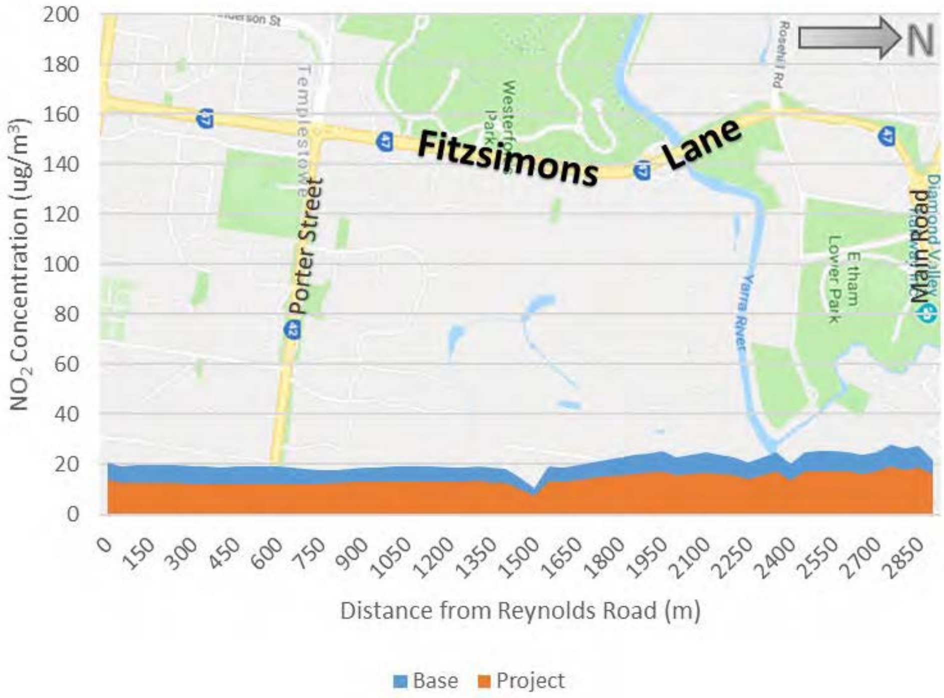


Figure 119: Fitzsimons Lane maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Fitzsimons Lane through North East Link.

11.6.12 Grange Road

Grange Road was selected for modelling due to a predicted 56 per cent decrease in HCV traffic between Darebin Road to Heidelberg Road with the project in 2036 (a decrease of approximately 1,750 HCVs per day). Modelling was conducted between the intersections with Darebin Road to Heidelberg Road using a single combined at-grade road link, combining the northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Grange Road, at 50 metre intervals along both sides of the road from Heidelberg Road to Chingford Street. There are no receptors between Chingford Street and Darebin Road as the surrounding land use on both sides of the road is light industrial.

Comparison of base and project model outcomes

Table 88 shows the maximum predicted pollutant concentrations along Grange Road, from traffic sources only. Maximum concentrations for all pollutants for the project case are predicted to occur on the eastern side of Grange Road, approximately 100 metres north of the intersection with Heidelberg Road.

Table 88: Grange Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	2.2	2.0	-11%	2.5	2.2	-10%
	Annual	µg/m³	1.0	0.88	-12%	1.1	0.99	-12%
$PM_{2.5}$	24 hour	µg/m³	1.7	1.5	-12%	1.9	1.7	-11%
	Annual	µg/m³	0.77	0.67	-13%	0.86	0.75	-13%
NO_2	1 hour	µg/m³	32	26	-20%	37	29	-22%
	Annual	µg/m³	3.6	3.1	-13%	4.0	3.5	-12%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 10 to 13 per cent across both years. One hour average NO_2 is predicted to decrease 20 to 22 per cent across both years and the annual average by 12 to 13 per cent across both years.

The decreases in maximum PM_{10}, $PM_{2.5}$, and NO_2 concentrations are due to an approximate 56 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Grange Road.

The maximum 24 hour average PM_{10} concentration is predicted to be 2.5 micrograms per cubic metre without the project and 2.2 micrograms per cubic metre with the project, while the average concentration along the length of Grange Road is predicted to be 1.0 micrograms per cubic metre without the project and 0.80 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.9 micrograms per cubic metre without the project and 1.7 micrograms per cubic metre with the project, while the average concentration along the length of Grange Road is predicted to be 0.81 micrograms per cubic metre without the project and 0.62 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 37 micrograms per cubic metre without the project and 29 micrograms per cubic metre with the project, while the average concentration along the length of Grange Road is predicted to be 17 micrograms per cubic metre without the project and 12 micrograms per cubic metre with the project.

Figure 120: Grange Road maximum 24 hour average PM_{10} concentrations – 2036

Figure 121: Grange Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

Figure 122: Grange Road maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Grange Road through North East Link.

11.6.13 Grimshaw Street

Grimshaw Street was selected for modelling due to a predicted 83 per cent increase in HCV traffic between Watsonia Road to Greensborough Road with the project in 2036 (an increase of approximately 1,100 HCVs per day).

Modelling was conducted between the intersections with Greensborough Road and Watsonia Road using a single combined at-grade road link, combining the northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Grimshaw Street at 50 metre intervals along both sides of the road from Watsonia Road to Frye Street and around the western edge of AK Lines Reserve.

Comparison of base and project model outcomes

Table 89 shows the maximum predicted pollutant concentrations along Grimshaw Street, from traffic sources only. Maximum concentrations for all pollutants for the project case are predicted to occur close to Fyre Street, approximately 200 metres west of the intersection with Greensborough Road.

Table 89: Grimshaw Street – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.3	1.4	8%	1.4	1.5	7%
	Annual	µg/m^3	0.53	0.59	11%	0.57	0.63	11%
$PM_{2.5}$	24 hour	µg/m^3	1.0	1.2	20%	1.1	1.3	18%
	Annual	µg/m^3	0.41	0.50	22%	0.44	0.54	23%
NO_2	1 hour	µg/m^3	20	26	30%	22	28	27%
	Annual	µg/m^3	2.5	3.4	36%	2.7	3.7	37%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} concentrations are predicted to increase 7 to 11 per cent across both years, while $PM_{2.5}$ concentrations are predicted to increase 18 to 23 per cent across both years. One hour average NO_2 concentrations are predicted to increase 30 per cent in 2026 and 27 per cent in 2036 and the annual average by 36 to 37 per cent across both years.

The increases in maximum PM_{10}, $PM_{2.5}$, and NO_2 concentrations are due to an approximate 83 per cent increase in HCVs with the project scenario.

Analysis of significant changes

With North East Link, increased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along Grimshaw Street from Greensborough Road to Watsonia Road.

Figure 123 to Figure 125 present linear concentration plots for 2036 along Grimshaw Street from Greensborough Road to Watsonia Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.4 micrograms per cubic metre without the project and 1.5 micrograms per cubic metre with the project, while the average concentration along Grimshaw Street from Greensborough Road to Watsonia Road is predicted to be 0.67 micrograms per cubic metre without the project and 1.2 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.1 micrograms per cubic metre without the project and 1.3 micrograms per cubic metre with the project, while the average concentration along Grimshaw Street from Greensborough Road to Watsonia Road is predicted to be 0.52 micrograms per cubic metre without the project and 1.0 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 22 micrograms per cubic metre without the project and 28 micrograms per cubic metre with the project, while the average concentration along Grimshaw Street from Greensborough Road to Watsonia Road is predicted to be 7.8 micrograms per cubic metre without the project and 17 micrograms per cubic metre with the project.

Figure 123: Grimshaw Street maximum 24 hour average PM_{10} concentrations – 2036

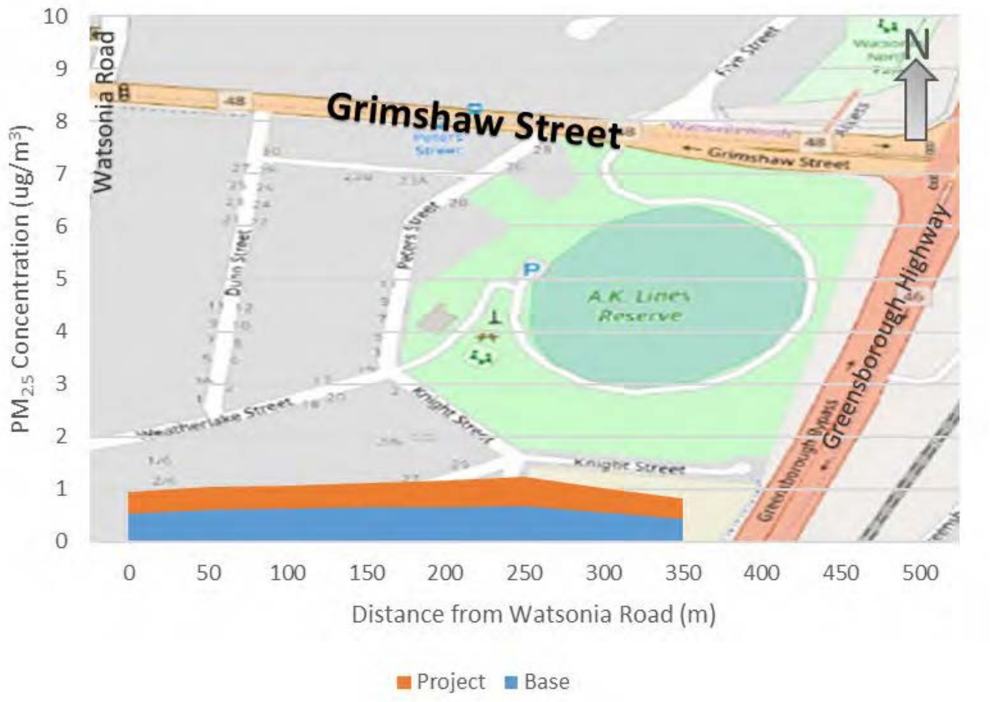


Figure 124: Grimshaw Street maximum 24 hour average $PM_{2.5}$ concentrations – 2036

Figure 125: Grimshaw Street maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to increase for the project over the base scenario in both 2026 and 2036, due to increased HCVs from Grimshaw Street through North East Link.

11.6.14 High Street

High Street was selected for modelling due to predicted decreases in HCV traffic with the project in 2036 for the following sections:

- Broadway to Keon Parade - 39 per cent decrease/700 vehicles per day
- Keon Parade to Settlement Road - 26 per cent decrease/600 vehicles per day
- Settlement Road to M80 Ring Road - 30 per cent decrease/900 vehicles per day.

Modelling was conducted between the intersections with Broadway and M80 Ring Road using three road links, as outlined above, with differing traffic volumes. Each link was modelled as a combined at-grade road link, combining the northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along High Street at 50 metre intervals along both sides of the road from Broadway to Keon Parade. There are no receptors between Keon Parade and the M80 Ring Road as the surrounding land use is industrial on both sides of the road.

Comparison of base and project model outcomes

Table 90 shows the maximum predicted pollutant concentrations along High Street from traffic sources only. Maximum concentrations for all pollutants for the project case are predicted to occur on the eastern side of High Street, approximately 100 metres south of the intersection with Keon Parade.

Table 90: High Street – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.7	1.5	-9%	1.9	1.7	-10%
	Annual	µg/m^3	0.68	0.62	-10%	0.76	0.68	-11%
$PM_{2.5}$	24 hour	µg/m^3	1.3	1.2	-10%	1.4	1.3	-11%
	Annual	µg/m^3	0.53	0.47	-11%	0.59	0.52	-12%
NO_2	1 hour	µg/m^3	20	17	-11%	22	19	-13%
	Annual	µg/m^3	2.5	2.2	-13%	2.8	2.4	-14%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 9 to 11 per cent in 2026 and 10 to 12 per cent in 2036. NO_2 concentrations are predicted to decrease 11 to 14 per cent across both years.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 26 to 39 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of High Street.

Figure 126 to Figure 128 present linear concentration plots for 2036 along High Street from Broadway to Keon Parade for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.9 micrograms per cubic metre without the project and 1.7 micrograms per cubic metre with the project, while the average concentration along the length of High Street is predicted to be 1.1 micrograms per cubic metre without the project and 1.0 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.4 micrograms per cubic metre without the project and 1.3 micrograms per cubic metre with the project, while the average concentration along the length of High Street is predicted to be 0.86 micrograms per cubic metre without the project and 0.76 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 22 micrograms per cubic metre without the project and 19 micrograms per cubic metre with the project, while the average concentration along the length of High Street is predicted to be 13 micrograms per cubic metre without the project and 12 micrograms per cubic metre with the project.

Figure 126: High Street maximum 24 hour average PM_{10} concentrations – 2036

Figure 127: High Street maximum 24 hour average $PM_{2.5}$ concentrations – 2036

Figure 128: High Street maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from High Street through North East Link.

11.6.15 Keon Parade

Keon Parade was selected for modelling due to a predicted 38 per cent increase in HCV traffic between High Street and Dalton Road with the project in 2036 (an increase of approximately 300 HCVs per day).

Modelling was conducted between the intersection with High Street to Dalton Road, as two separate carriageways representing eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Keon Parade at 50 metre intervals along the southern side of the road from High Street to Dalton Road. No receptors were located on the north side of the road as the surrounding land use is light industrial.

Comparison of base and project model outcomes

Table 91 shows the maximum predicted pollutant concentrations along Keon Parade from traffic sources only. Maximum concentrations for all pollutants are predicted to occur on the southern side of Keon Parade at the intersection with High Street.

Table 91: Keon Parade – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	0.86	0.93	8%	1.0	1.1	8%
	Annual	µg/m^3	0.33	0.36	8%	0.38	0.41	8%
$PM_{2.5}$	24 hour	µg/m^3	0.67	0.73	8%	0.78	0.84	8%
	Annual	µg/m^3	0.26	0.28	8%	0.30	0.32	8%
NO_2	1 hour	µg/m^3	12	13	11%	14	16	12%
	Annual	µg/m^3	1.3	1.4	8%	1.5	1.6	8%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 8 per cent in 2026 and 2036. NO_2 concentrations are predicted to increase 8 to 12 per cent across both years.

The increases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 38 per cent increase in HCVs with the project scenario.

Analysis of significant changes

With North East Link, increased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along Keon Parade between High Street and Dalton Road.

Figure 129 to Figure 131 present linear concentration plots for 2036 along Keon Parade from High Street to Dalton Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.0 micrograms per cubic metre without the project and 1.1 micrograms per cubic metre with the project, while the average concentration along the length of Keon Parade is predicted to be 0.74 micrograms per cubic metre without the project and 0.83 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 0.78 micrograms per cubic metre without the project and 0.84 micrograms per cubic metre with the project, while the average concentration along the length of Keon Parade is predicted to be 0.58 micrograms per cubic metre without the project and 0.65 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 14 micrograms per cubic metre without the project and 16 micrograms per cubic metre with the project, while the average concentration along the length of Keon Parade is predicted to be 11 micrograms per cubic metre without the project and 13 micrograms per cubic metre with the project.

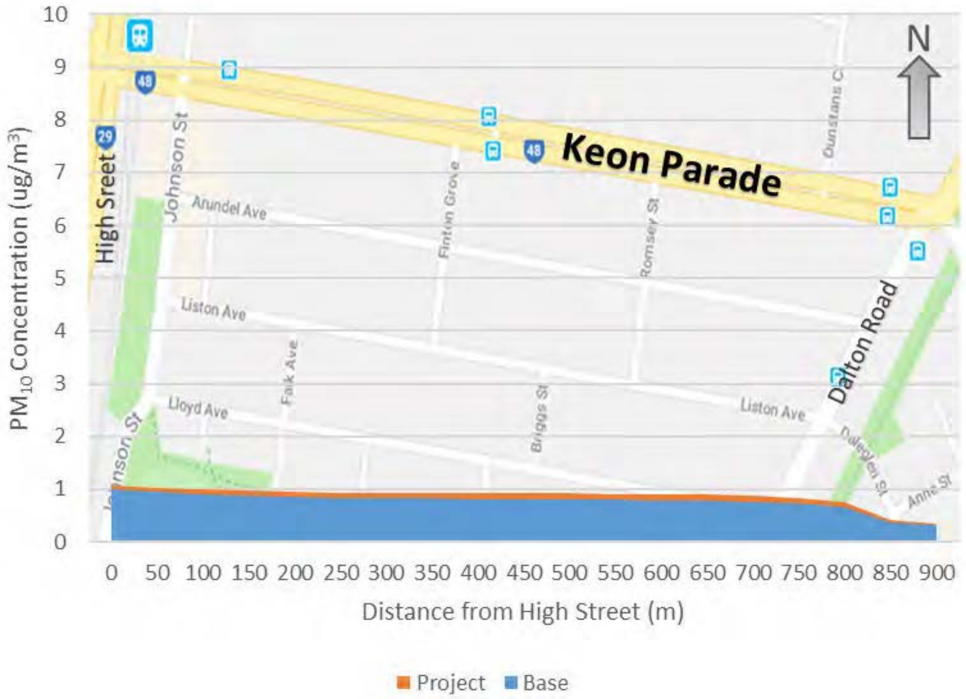


Figure 129: Keon Parade maximum 24 hour average PM_{10} concentrations – 2036

Figure 130: Keon Parade maximum 24 hour average $PM_{2.5}$ concentrations – 2036

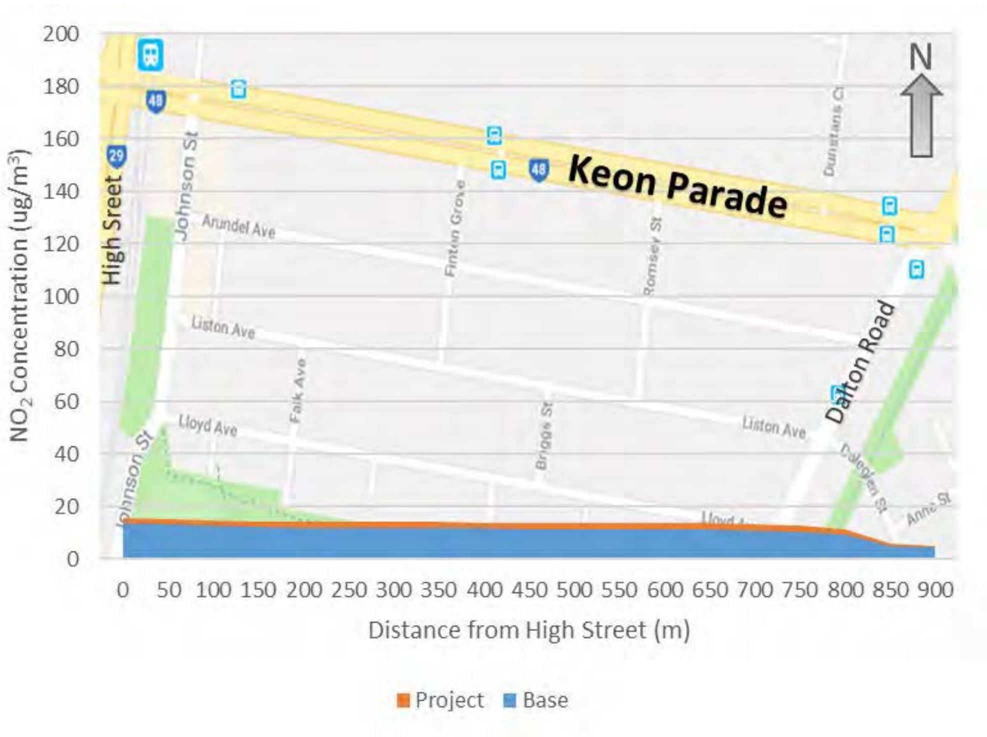


Figure 131: Keon Parade maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to increase for the project over the base scenario in both 2026 and 2036.

11.6.16 Lower Plenty Road

Lower Plenty Road was selected for modelling due to a predicted 75 per cent decrease in HCV traffic between Rosanna Road to Greensborough Road with the project in 2036 (a decrease of approximately 2,100 HCVs per day).

Modelling was conducted between the intersection with Rosanna Road to Greensborough Road, using a single at-grade road link combining the eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Lower Plenty Road, at 50 metre intervals along both sides of the road from Rosanna Road to Greensborough Road.

Comparison of base and project model outcomes

Table 91 shows the maximum predicted pollutant concentrations along Lower Plenty Road, from traffic sources only. Maximum concentrations for all pollutants are predicted to occur on the southern side of Lower Plenty Road, at the intersection with Rosanna Road.

Table 92: Lower Plenty Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	1.5	1.1	-28%	1.6	1.1	-29%
	Annual	µg/m³	0.66	0.46	-31%	0.72	0.48	-33%
$PM_{2.5}$	24 hour	µg/m³	1.1	0.78	-30%	1.2	0.83	-32%
	Annual	µg/m³	0.51	0.34	-34%	0.55	0.36	-35%
NO_2	1 hour	µg/m³	19	11	-40%	20	12	-40%
	Annual	µg/m³	2.6	1.6	-38%	2.8	1.7	-39%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 28 to 34 per cent in 2026 and 29 to 35 per cent in 2036. NO_2 concentrations are predicted to decrease 38 to 40 per cent across both years.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 75 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along Lower Plenty Road from Rosanna Road to Greensborough Road.

Figure 132 to Figure 134 present linear concentration plots for 2036 along Lower Plenty Road from Rosanna Road to Greensborough Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.6 micrograms per cubic metre without the project and 1.1 micrograms per cubic metre with the project, while the average concentration along Lower Plenty Road from Rosanna Road to Greensborough Road is predicted to be 1.2 micrograms per cubic metre without the project and 0.91 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.2 micrograms per cubic metre without the project and 0.83 micrograms per cubic metre with the project, while the average concentration along Lower Plenty Road from Rosanna Road to Greensborough Road is predicted to be 1.0 micrograms per cubic metre without the project and 0.68 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 20 micrograms per cubic metre without the project and 12 micrograms per cubic metre with the project, while the average concentration along Lower Plenty Road from Rosanna Road to Greensborough Road is predicted to be 16 micrograms per cubic metre without the project and 11 micrograms per cubic metre with the project.

Figure 132: Lower Plenty Road maximum 24 hour average PM_{10} concentrations – 2036

Figure 133: Lower Plenty Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

Figure 134: Lower Plenty Road maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Lower Plenty Road through North East Link.

11.6.17 M80 Ring Road

The M80 Ring Road was selected for modelling due to a predicted increase in total and HCV traffic with the project in 2036. The following sections of the M80 Ring Road show significant predicted increases:

■ M80 Ring Road interchange to Plenty Road	57 per cent increase in total vehicles	73,000 vehicles per day
■ M80 Ring Road interchange to Plenty Road	123 per cent increase in HCVs	4,800 HCVs per day
■ Plenty Road to Dalton Road	90 per cent increase in HCVs	3,700 HCVs per day
■ Dalton Road to Edgars Road	52 per cent increase in HCVs	3,100 HCVs per day
■ Edgars Road to Hume Freeway	34 per cent increase in HCVs	2,700 HCVs per day.

Modelling was conducted between the M80 Ring Road interchange and the Hume Freeway interchange using five road links as detailed above, with differing traffic volumes. Each road link was modelled as two separate carriageways representing eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along the M80 Ring Road, at 50 metre intervals along both sides of the road from the M80 interchange to Darebin Creek. From Darebin Creek to the Hume Freeway interchange on the northern side of the M80 Ring Road, receptors were placed at 50 metre intervals in residential areas and 200 metres in public open space (park land). The southern side of the M80 Ring Road between Darebin Creek and the Hume Freeway interchange did not have receptors as the land use is industrial.

Comparison of base and project model outcomes

M80 Ring Road Interchange

Table 93 shows the maximum predicted pollutant concentrations at the M80 Ring Road interchange from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ and 1 hour average NO_2 concentrations for the project case are predicted to occur on the northern side of the M80 Ring Road, approximately 500 metres from the interchange along Eastgate Drive.

Table 93: M80 Ring Road interchange – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	0.85	2.3	168%	0.93	2.6	177%
	Annual	µg/m³	0.34	0.99	189%	0.37	1.1	199%
$PM_{2.5}$	24 hour	µg/m³	0.71	1.9	162%	0.77	2.1	171%
	Annual	µg/m³	0.28	0.81	194%	0.30	0.91	205%
NO_2	1 hour	µg/m³	14	38	172%	16	43	177%
	Annual	µg/m³	1.7	5.3	214%	1.8	6.0	225%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 162 to 177 per cent across both years. Annual average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 189 to 205 per cent across both years. The one hour average NO_2 concentration is predicted to increase 172 to 177 per cent across both years and the annual average by 214 to 225 per cent across both years.

The increases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 123 per cent increase in HCVs and a 57 per cent increase in total vehicles with the project scenario.

Summary

Maximum concentrations of all pollutants are predicted to increase for the project over the base scenario in both 2026 and 2036.

M80 Ring Road (M80 interchange to Plenty Road)

Table 94 shows the maximum predicted pollutant concentrations along the M80 Ring Road, from the M80 Ring Road interchange to Plenty Road, from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ and 1 hour average NO_2 concentrations for the project case are predicted to occur on the southern side of the M80 Ring Road, at the intersection with Plenty Road. Maximum annual average PM_{10}, $PM_{2.5}$ and NO_2 concentrations for the project case are predicted to occur on the northern side of the M80 Ring Road, approximately one kilometre from the Plenty Road intersection at Killarney Ridge.

Table 94: M80 Ring Road to Plenty Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	1.5	2.3	56%	1.6	2.6	58%
	Annual	µg/m³	0.58	0.99	71%	0.64	1.1	73%
$PM_{2.5}$	24 hour	µg/m³	1.1	1.9	63%	1.3	2.1	66%
	Annual	µg/m³	0.45	0.81	79%	0.50	0.91	82%
NO_2	1 hour	µg/m³	19	41	110%	21	45	111%
	Annual	µg/m³	2.8	5.3	92%	3.0	6.0	100%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour average PM_{10} concentrations are predicted to increase 56 to 58 per cent across both years and the annual average by 71 to 73 per cent across both years. Twenty four hour and annual average $PM_{2.5}$ concentrations are predicted to increase 63 to 66 per cent across both years and the annual average by 79 to 82 per cent across both years. The one hour average NO_2 concentration is predicted to increase 110 to 11 per cent across both years and the annual average by 92 per cent in 2026 and 100 per cent in 2036.

The increases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 123 per cent increase in HCVs and a 57 per cent increase in total vehicles with the project scenario.

Analysis of significant changes

With North East Link, increased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along M80 Ring Road from Greensborough Road to Plenty Road.

Figure 135 to Figure 137 present linear concentration plots for 2036 along M80 Ring Road from Greensborough Road to Plenty Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.6 micrograms per cubic metre without the project and 2.6 micrograms per cubic metre with the project, while the average concentration along M80 Ring Road from Greensborough Road to Plenty Road is predicted to be 0.90 micrograms per cubic metre without the project and 1.8 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.3 micrograms per cubic metre without the project and 2.1 micrograms per cubic metre with the project, while the average concentration along M80 Ring Road from Greensborough Road to Plenty Road is predicted to be 0.75 micrograms per cubic metre without the project and 1.6 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 21 micrograms per cubic metre without the project and 45 micrograms per cubic metre with the project, while the average concentration along M80 Ring Road from Greensborough Road to Plenty Road is predicted to be 15 micrograms per cubic metre without the project and 35 micrograms per cubic metre with the project.

Figure 135: M80 Ring Road maximum 24 hour average PM_{10} concentrations – 2036

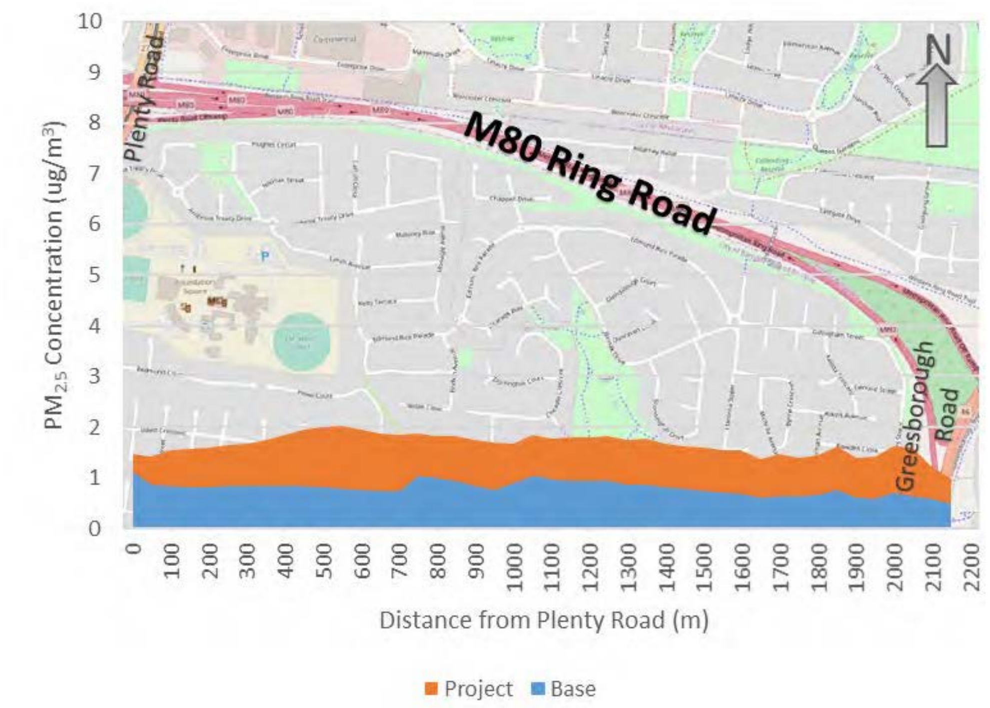


Figure 136: M80 Ring Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

Figure 137: M80 Ring Road maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to increase for the project over the base scenario in both 2026 and 2036.

M80 Ring Road (Plenty Road to Hume Freeway)

Table 95 shows the maximum predicted pollutant concentrations along the M80 Ring Road from Plenty Road to the Hume Freeway, from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ and annual average PM_{10}, $PM_{2.5}$ and NO_2 concentrations for the project case are predicted to occur on the northern side of the M80 Ring Road, at the intersection with the Hume Freeway interchange. The maximum one hour average NO_2 concentration for the project case is predicted to occur on the northern side of the M80 Ring Road, approximately 200 metres west of High Street.

Table 95: M80 Ring Road Plenty Road to Hume Freeway – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	1.7	1.9	12%	2.0	2.2	11%
	Annual	µg/m³	0.76	0.84	11%	0.85	0.95	12%
$PM_{2.5}$	24 hour	µg/m³	1.5	1.7	13%	1.6	1.8	12%
	Annual	µg/m³	0.64	0.72	12%	0.72	0.81	12%
NO_2	1 hour	µg/m³	31	36	14%	35	39	10%
	Annual	µg/m³	4.3	4.9	13%	4.9	5.6	14%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour and annual average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 11 to 13 per cent across both years. One hour and annual average NO_2 concentrations are predicted to increase 10 to 14 per cent in 2026 and 11 to 14 per cent in 2036.

The increases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 34 to 90 per cent increase in HCVs with the project scenario.

Summary

Maximum concentrations of all pollutants are predicted to increase for the project over the base scenario in both 2026 and 2036.

11.6.18 Main Road

Main Road was selected for modelling due to a predicted 58 per cent decrease in HCV traffic between Para Road to Bolton Street with the project in 2036 (a decrease of approximately 700 HCVs per day) and a 67 per cent decrease in HCV traffic between Bolton Street to Fitzsimons Lane with the project in 2036 (a decrease of approximately 600 HCVs per day).

Modelling was conducted between the intersection with Para Road to Fitzsimons Lane using a single at-grade road link combining the eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Main Road at 50 metre intervals along both sides of the road from Para Road to Fitzsimons Lane.

Comparison of base and project model outcomes

Table 96 shows the maximum predicted pollutant concentrations along Main Road, from traffic sources only. Maximum concentrations for all pollutants are predicted to occur close to the intersection with Fitzsimons Lane.

Table 96: Main Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	1.3	1.0	-23%	1.5	1.1	-26%
	Annual	µg/m³	0.53	0.41	-23%	0.60	0.45	-26%
$PM_{2.5}$	24 hour	µg/m³	1.0	0.78	-24%	1.2	0.85	-27%
	Annual	µg/m³	0.42	0.32	-24%	0.48	0.35	-27%
NO_2	1 hour	µg/m³	20	15	-24%	23	16	-31%
	Annual	µg/m³	2.2	1.6	-24%	2.5	1.8	-28%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 23 to 24 per cent in 2026 and 26 to 27 per cent in 2036. NO_2 concentrations are predicted to decrease 24 per cent in 2026 and 24 to 28 per cent in 2036.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 58 to 67 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along Main Road, from Para Road to Fitzsimons Lane.

Figure 138 to Figure 140 present linear concentration plots for 2036 along Main Road from Para Road to Fitzsimons Lane for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.5 micrograms per cubic metre without the project and 1.1 micrograms per cubic metre with the project, while the average concentration along the length of Main Road is predicted to be 0.91 micrograms per cubic metre without the project and 0.67 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.2 micrograms per cubic metre without the project and 0.85 micrograms per cubic metre with the project, while the average concentration along the length of Main Road is predicted to be 0.70 micrograms per cubic metre without the project and 0.51 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 23 micrograms per cubic metre without the project and 16 micrograms per cubic metre with the project, while the average concentration along the length of Main Road is predicted to be 15 micrograms per cubic metre without the project and 10 micrograms per cubic metre with the project.

Figure 138: Main Road maximum 24 hour average PM_{10} concentrations – 2036

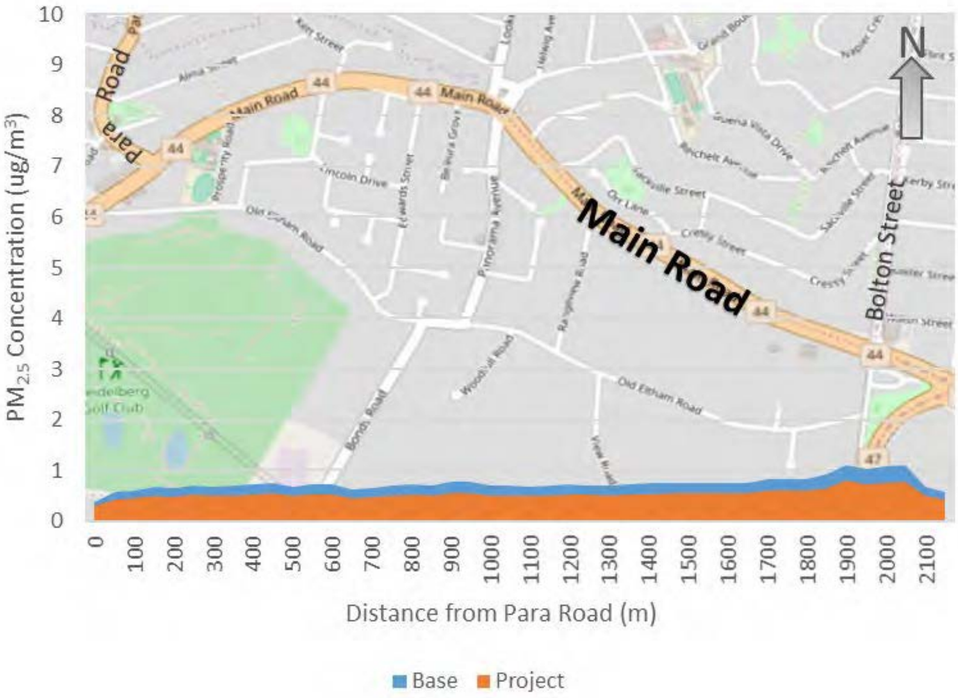


Figure 139: Main Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

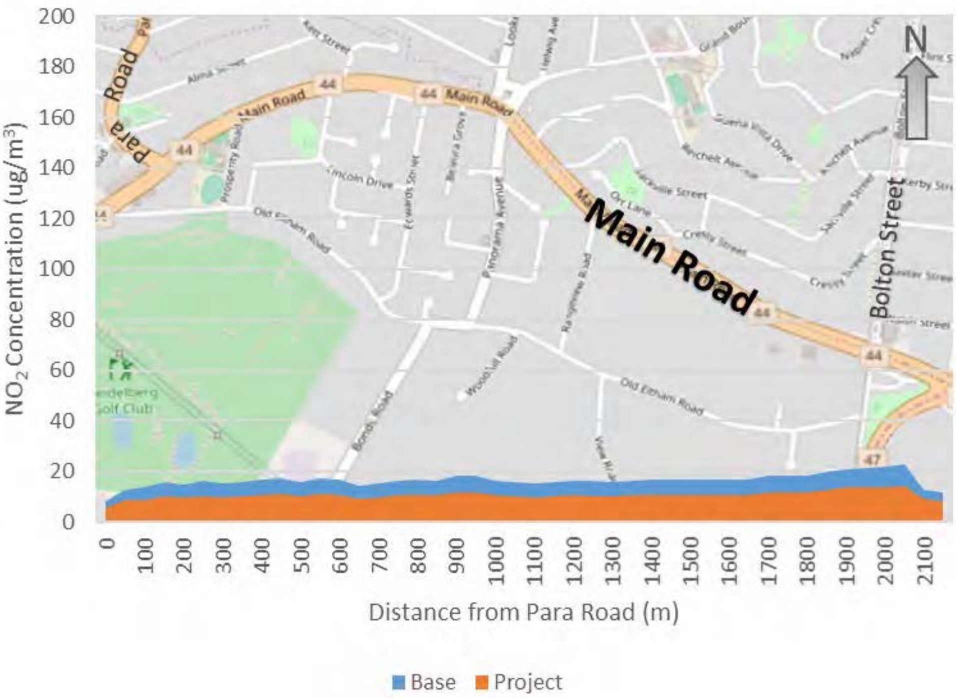


Figure 140: Main Road maximum 1 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Main Road through North East Link.

11.6.19 Manningham Road

Manningham Road was selected for modelling due to predicted decreases in HCV traffic with the project in 2036. The following sections of Manningham Road showed predicted decreases in HCV and total traffic:

- Thompsons Road to High Street - 70 per cent decrease/1,050 HCVs per day
- High Street to Williamsons Road - 70 per cent decrease/700 HCVs per day
- High Street to Williamsons Road - 25 per cent decrease/13,000 vehicles per day.

Modelling was conducted between the intersections with Thompsons Road and Williamsons Road using two combined road links; Thompsons Road to High Street and High Street to Williamsons Road with differing traffic volumes representing eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Manningham Road at 50 metre intervals along both sides of the road. An area approximately 200 metres on either side of the intersection with High Street (northern side) did not include receptors as the land use is commercial.

Comparison of base and project model outcomes

Table 97 shows the maximum predicted pollutant concentrations along Manningham Road, from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ and annual average PM_{10}, $PM_{2.5}$ and NO_2 concentrations for the project case are predicted to occur on the northern side of Manningham Road, approximately 250 metres from the intersection with Thompsons Road. The maximum one hour average NO_2 concentration for the project case is predicted to occur on the southern side of the road, approximately 80 metres from the intersection with High Street.

Table 97: Manningham Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	0.96	0.71	-26%	1.1	0.81	-27%
	Annual	µg/m^3	0.40	0.31	-24%	0.47	0.35	-25%
$PM_{2.5}$	24 hour	µg/m^3	0.73	0.53	-28%	0.86	0.61	-30%
	Annual	µg/m^3	0.31	0.23	-26%	0.36	0.26	-27%
NO_2	1 hour	µg/m^3	17	18	3%	20	19	-5%
	Annual	µg/m^3	1.5	1.1	-26%	1.8	1.3	-28%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum PM_{10}, $PM_{2.5}$ and annual average NO_2 concentrations are predicted to occur, while the one hour average NO_2 concentration is predicted to increase in 2026 and decrease in 2036. Twenty four hour average PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 26 to 30 per cent across both years. Annual average PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 24 to 27 per cent across both years. The one hour average NO_2 concentration is predicted to increase three per cent in 2026 and decrease five per cent in 2036 and the annual average is predicted to decrease 26 to 28 per cent across both years. The changes in one hour average NO_2 concentrations on Manningham Road are due to increased traffic volumes on parts of the Eastern Freeway and Eastern Freeway – North East Link interchange, with the locations at which the maxima occur varying between the base and project case, under different meteorological conditions and times of day.

The decreases in maximum PM_{10}, $PM_{2.5}$ and annual average NO_2 concentrations are due to an approximate 70 per cent decrease in HCVs and 25 per cent decrease in total vehicles with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along Manningham Road, from Thompsons Road to Williamsons Road.

Figure 141 to Figure 143 present linear concentration plots for 2036 along Manningham Road, from Thompsons Road to Williamsons Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.1 micrograms per cubic metre without the project and 0.81 micrograms per cubic metre with the project, while the average concentration along Manningham Road, from Thompsons Road to Williamsons Road is predicted to be 0.94 micrograms per cubic metre without the project and 0.69 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 0.86 micrograms per cubic metre without the project and 0.61 micrograms per cubic metre with the project, while the average concentration along the length of Manningham Road, from Thompsons Road to Williamsons Road is predicted to be 0.72 micrograms per cubic metre without the project and 0.52 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 20 micrograms per cubic metre without the project and 19 micrograms per cubic metre with the project, while the average concentration along Manningham Road, from Thompsons Road to Williamsons Road is predicted to be 17 micrograms per cubic metre without the project and 13 micrograms per cubic metre with the project.

Figure 141: Manningham Road maximum 24 hour average PM_{10} concentrations – 2036

Figure 142: Manningham Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

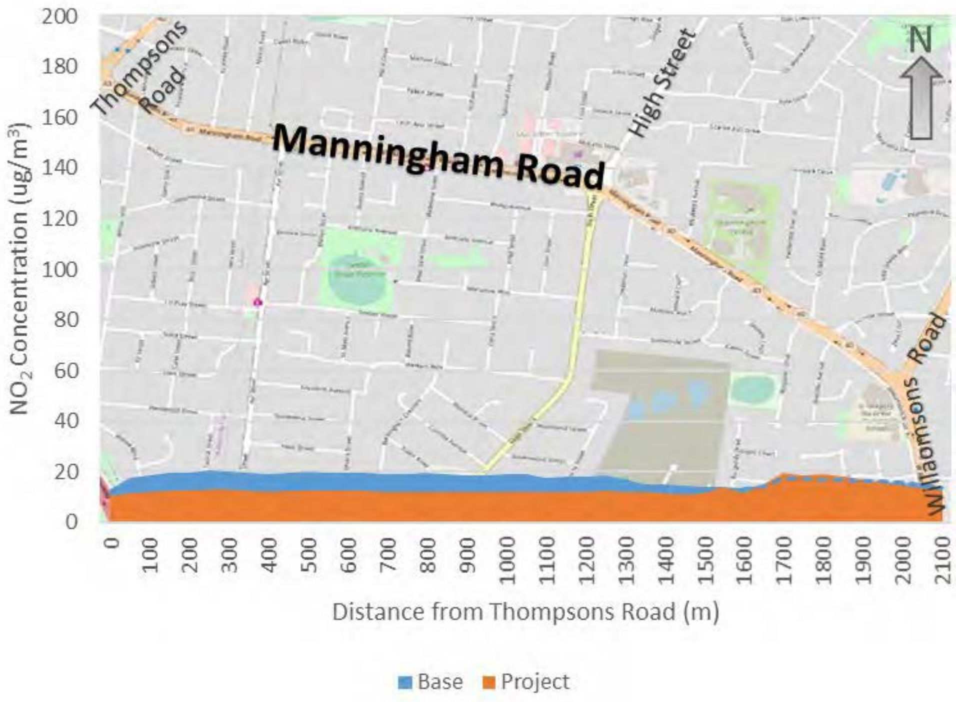


Figure 143: Manningham Road maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum PM_{10}, $PM_{2.5}$ and annual average NO_2 concentrations are predicted to decrease, while the one hour average NO_2 concentration is predicted to increase for the project over the base scenario in 2026 and decrease in 2036.

11.6.20 Middleborough Road

Middleborough Road was selected for modelling due to a predicted 54 per cent increase in HCV traffic between Eastern Freeway and Whitehorse Road with the project in 2036 (an increase of approximately 350 HCVs per day).

Modelling was conducted between the intersection with Whitehorse Road to the Eastern Freeway as a single combined road link representing eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Middleborough Road at 50 metre intervals along both sides of the road, from Whitehorse Road to the Eastern Freeway.

Comparison of base and project model outcomes

Table 98 shows the maximum predicted pollutant concentrations along Middleborough Road, from traffic sources only. Maximum concentrations for all pollutants are predicted to occur approximately 200 metres from the intersection with the Eastern Freeway.

Table 98: Middleborough Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.5	1.8	21%	1.5	1.9	22%
	Annual	µg/m^3	0.59	0.71	19%	0.62	0.75	20%
$PM_{2.5}$	24 hour	µg/m^3	1.1	1.4	22%	1.2	1.5	24%
	Annual	µg/m^3	0.45	0.55	20%	0.48	0.58	22%
NO_2	1 hour	µg/m^3	20	25	25%	21	27	28%
	Annual	µg/m^3	2.3	2.8	23%	2.4	3.0	26%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ are predicted to increase 19 to 24 per cent across both years. One hour average NO_2 is predicted to increase 26 to 28 per cent across both years and annual average NO_2 is predicted to increase 23 to 28 per cent across both years.

The increases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 54 per cent increase in HCVs with the project scenario.

Analysis of significant changes

With North East Link, increased impacts for PM_{10} are predicted to occur along Middleborough Road from Whitehorse Road to the Eastern Freeway.

Figure 144 to Figure 146 present linear concentration plots for 2036 along Middleborough Road from Whitehorse Road to the Eastern Freeway for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.5 micrograms per cubic metre without the project and 1.9 micrograms per cubic metre with the project, while the average concentration along Middleborough Road from Whitehorse Road to Eastern Freeway is predicted to be 1.1 micrograms per cubic metre without the project and 1.3 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.2 micrograms per cubic metre without the project and 1.5 micrograms per cubic metre with the project, while the average concentration along Middleborough Road from Whitehorse Road to Eastern Freeway is predicted to be 0.84 micrograms per cubic metre without the project and 1.0 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 21 micrograms per cubic metre without the project and 27 micrograms per cubic metre with the project, while the average concentration along Middleborough Road from Whitehorse Road to Eastern Freeway is predicted to be 15 micrograms per cubic metre without the project and 19 micrograms per cubic metre with the project.

Figure 144: Middleborough Road maximum 24 hour average PM_{10} concentrations – 2036

Figure 145: Middleborough Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

Figure 146: Middleborough Road maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to increase for the project over the base scenario in both 2026 and 2036.

11.6.21 North East Link/Greensborough Road

North East Link surface roads run from the M80 Ring Road interchange to the northern tunnel portal through a cutting. As described in Section 11.2.1 the cutting runs from the northern portal of the tunnels to Elder Street to a maximum depth of approximately 17 metres, with five land bridges providing pedestrian access across the cutting.

Comparison of base and project model outcomes

North East Link (Lower Plenty Road Interchange)

Table 99 shows the maximum predicted pollutant concentrations for North East Link at the Lower Plenty Road interchange, from traffic sources only. Maximum concentrations of all pollutants for the project case are predicted to occur on the western side of Greensborough Road, opposite Blamey Road.

Table 99: North East Link (Lower Plenty Road interchange) – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.4	1.6	18%	1.5	1.8	21%
	Annual	µg/m^3	0.60	0.64	6%	0.65	0.71	9%
$PM_{2.5}$	24 hour	µg/m^3	1.1	1.3	21%	1.2	1.5	24%
	Annual	µg/m^3	0.46	0.51	9%	0.50	0.56	12%
NO_2	1 hour	µg/m^3	18	25	41%	19	28	47%
	Annual	µg/m^3	2.4	3.4	42%	2.6	3.8	47%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 18 to 21 per cent in 2026 and 21 to 24 per cent in 2036. Annual average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 6 to 9 per cent in 2026 and 9 to 12 per cent in 2036. One hour and annual average NO_2 concentrations are predicted to increase 41 to 42 per cent in 2026 and 47 per cent in 2036.

North East Link (Lower Plenty Road to Grimshaw Street)

Table 100 shows the maximum predicted pollutant concentrations for North East Link (Lower Plenty Road to Grimshaw Street) from traffic sources only. Maximum concentrations of all pollutants for the project case are predicted to occur for the project case on the eastern side of Greensborough Road between Yallambie Road and Watsonia Road intersection, approximately 50 to 100 metres north of Yallambie Road.

Table 100: North East Link (Lower Plenty Road to Grimshaw Street) – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.5	2.7	85%	1.6	3.1	93%
	Annual	µg/m^3	0.60	1.2	104%	0.67	1.4	113%
$PM_{2.5}$	24 hour	µg/m^3	1.1	2.3	100%	1.2	2.6	110%
	Annual	µg/m^3	0.47	1.0	120%	0.52	1.2	129%
NO_2	1 hour	µg/m^3	20	69	253%	21	80	272%
	Annual	µg/m^3	2.4	8.4	244%	2.7	9.7	264%

When comparing the project over the base scenario in both 2026 and 2036, increases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 85 to 100 per cent in 2026 and 93 to 110 per cent in 2036. Annual average PM_{10} and $PM_{2.5}$ concentrations are predicted to increase 104 to 120 per cent in 2026 and 113 to 129 per cent in 2036. One hour and annual average NO_2 concentrations are predicted to increase 244 to 253 per cent in 2026 and 264 to 272 per cent in 2036.

Analysis of significant changes

With North East Link, increased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur between Yallambie Road and the M80 Ring Road interchange.

Figure 147 to Figure 149 present linear concentration plots for 2036 along North East Link from Lower Plenty Road to the M80 Ring Road interchange for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.6 micrograms per cubic metre without the project and 3.1 micrograms per cubic metre with the project, while the average concentration along the length of North East Link is predicted to be 0.83 micrograms per cubic metre without the project and 1.7 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.2 micrograms per cubic metre without the project and 2.6 micrograms per cubic metre with the project, while the average concentration along the length of North East Link is predicted to be 0.65 micrograms per cubic metre without the project and 1.4 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 21 micrograms per cubic metre without the project and 80 micrograms per cubic metre with the project, while the average concentration along the length of North East Link is predicted to be 11 micrograms per cubic metre without the project and 29 micrograms per cubic metre with the project.

Figure 147: North East Link maximum 24 hour average PM_{10} concentrations – 2036

Figure 148: North East Link maximum 24 hour average $PM_{2.5}$ concentrations – 2036

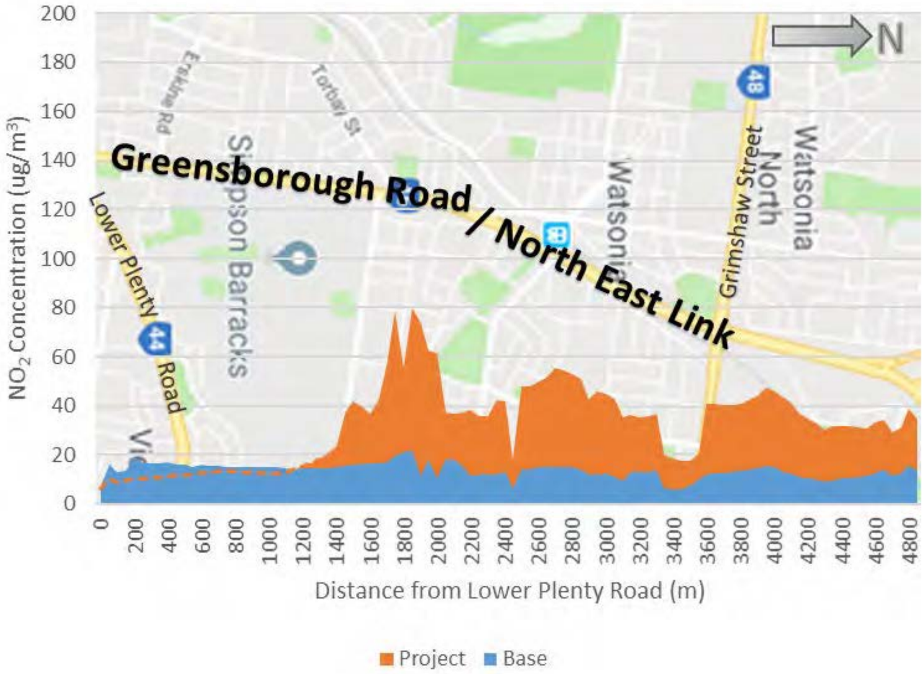


Figure 149: North East Link maximum 1 hour average NO_2 concentrations – 2036

11.6.22 Plenty Road

Plenty Road was selected for modelling due to a predicted 41 per cent decrease in HCV traffic between Settlement Road and the M80 Ring Road with the project in 2036 (a decrease of approximately 450 HCVs per day).

Modelling was conducted between the intersections with Albert Street and the M80 Ring Road using one combined road link representing eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Plenty Road, at 50 metre intervals along both sides of the road.

Comparison of base and project model outcomes

Table 101 shows the maximum predicted pollutant concentrations along Plenty Road, from traffic sources only. Maximum 24 hour and annual average PM_{10} and $PM_{2.5}$ concentrations for the project case are predicted to occur at the southern end of Plenty Road, close to the intersection with Albert Street. The maximum one hour and annual average NO_2 concentrations for the project case occur at the northern end of Plenty Road at the intersection with Taunton Drive, approximately 200 metres from the M80 Ring Road.

Table 101: Plenty Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	1.5	1.2	-19%	1.6	1.3	-19%
	Annual	µg/m³	0.64	0.50	-21%	0.69	0.55	-21%
$PM_{2.5}$	24 hour	µg/m³	1.1	0.89	-21%	1.2	0.98	-20%
	Annual	µg/m³	0.49	0.38	-23%	0.53	0.41	-24%
NO_2	1 hour	µg/m³	17	16	-5%	18	17	-4%
	Annual	µg/m³	2.3	1.8	-21%	2.5	2.0	-20%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 19 to 24 per cent across both years. The one hour average NO_2 concentration is predicted to decrease four to five per cent in both years and the annual average by 20 to 21 per cent across both years.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 41 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along Plenty Road from Albert Street to the M80 Ring Road.

Figure 150 to Figure 152 present linear concentration plots for 2036 along Plenty Road from Albert Street to the M80 Ring Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.6 micrograms per cubic metre without the project and 1.3 micrograms per cubic metre with the project, while the average concentration along Plenty Road from Albert Street to the M80 Ring Road is predicted to be 0.83 micrograms per cubic metre without project and 0.75 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 2 micrograms per cubic metre without the project and 0.98 micrograms per cubic metre with the project, while the average concentration along Plenty Road from Albert Street to the M80 Ring Road is predicted to be 0.63 micrograms per cubic metre without the project and 0.57 micrograms per cubic metre with the project.

For NO_2 the maximum one hour average concentration is predicted to be 18 micrograms per cubic metre without the project and 17 micrograms per cubic metre with the project, while the average concentration along the length of Plenty Road from Albert Street to the M80 Ring Road is predicted to be 10 micrograms per cubic metre without the project and 8.9 micrograms per cubic metre with the project.

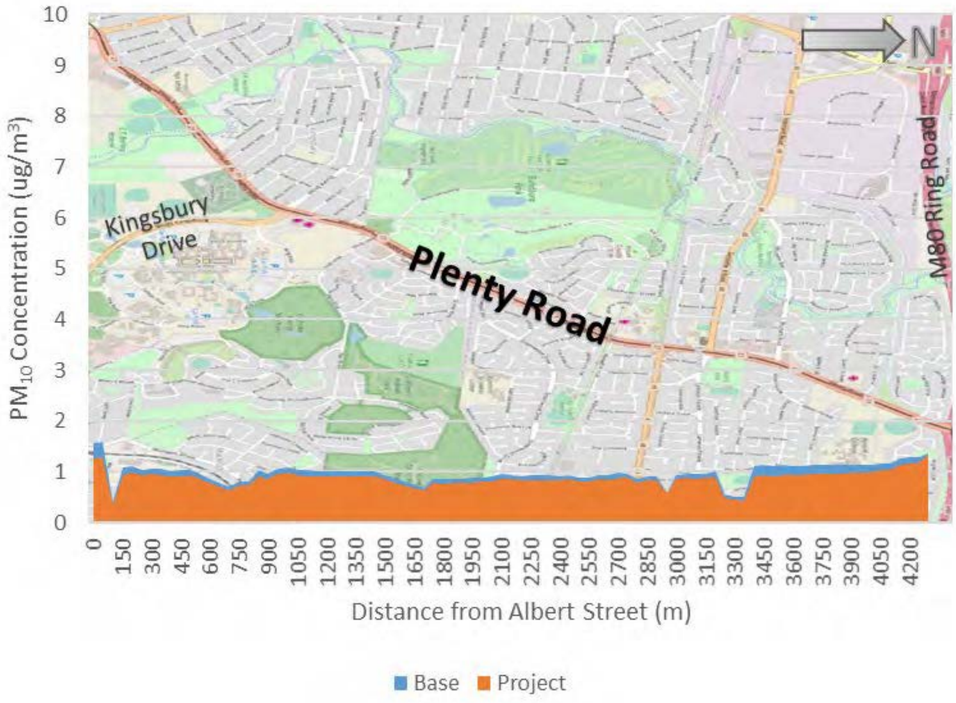


Figure 150: Plenty Road maximum 24 hour average PM_{10} concentrations – 2036

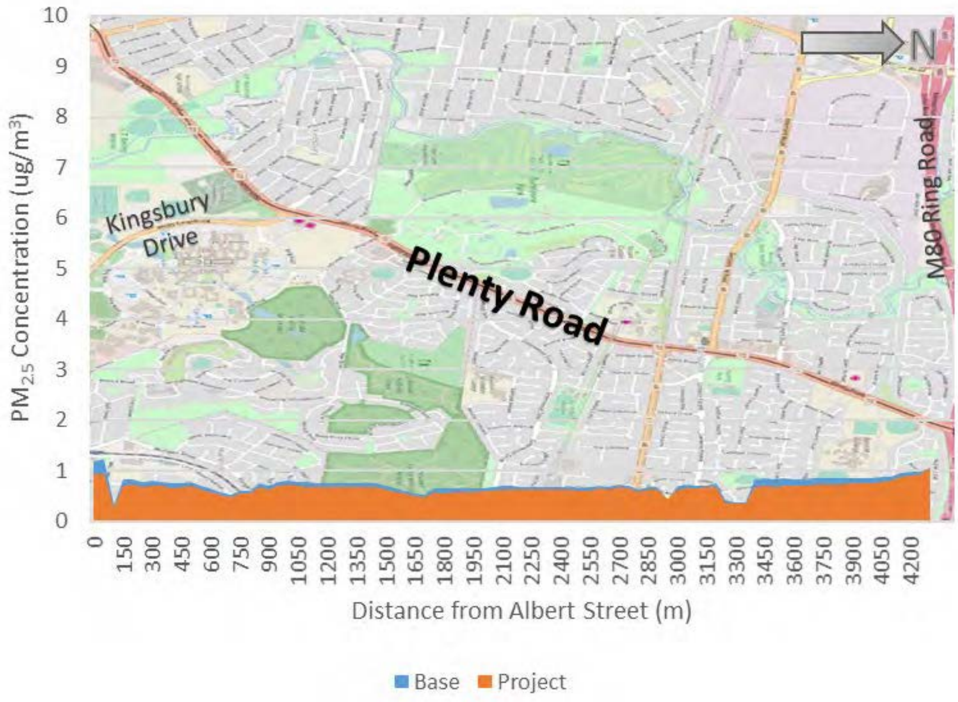


Figure 151: Plenty Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

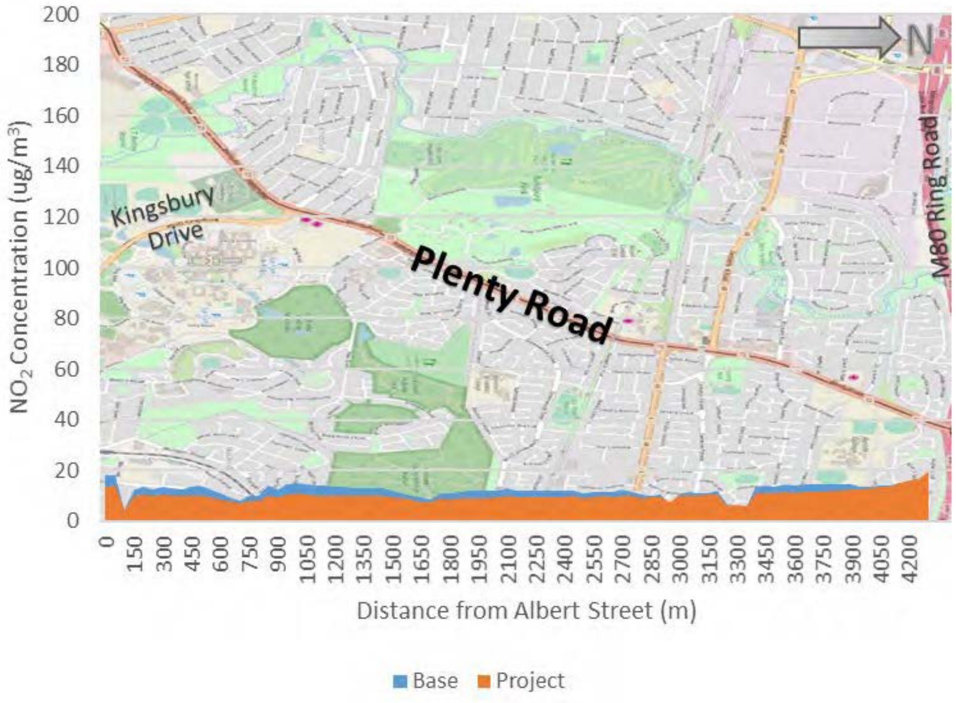


Figure 152: Plenty Road maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Plenty Road through North East Link.

11.6.23 Reynolds Road

Reynolds Road was selected for modelling due to a predicted 45 per cent decrease in HCV traffic between Blackburn Road and Fitzsimons Lane with the project in 2036 (a decrease of approximately 500 HCVs per day).

Modelling was conducted between the intersections with Blackburn Road and Fitzsimons Lane using one combined road link representing eastbound and westbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Reynolds Road at 50 metre intervals along both sides of the road.

Comparison of base and project model outcomes

Table 102 shows the maximum predicted pollutant concentrations along Reynolds Road, from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ concentrations for the project case are predicted to occur on the northern side of Reynolds Road, close to Smiths Road. The maximum one hour average NO_2 and annual average PM_{10} and $PM_{2.5}$ concentrations for the project case occur at the intersection with Fitzsimons Lane.

Table 102: Reynolds Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	0.69	0.60	-13%	0.78	0.68	-13%
	Annual	µg/m³	0.27	0.23	-14%	0.31	0.26	-14%
$PM_{2.5}$	24 hour	µg/m³	0.54	0.46	-14%	0.61	0.53	-14%
	Annual	µg/m³	0.21	0.18	-15%	0.24	0.21	-15%
NO_2	1 hour	µg/m³	11	8.3	-25%	12	9.5	-23%
	Annual	µg/m³	1.1	0.93	-15%	1.3	1.1	-15%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 13 to 15 per cent across both years. The one hour average NO_2 concentration is predicted to decrease 23 to 25 per cent across both years and the annual average by 15 per cent for both years.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 45 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Reynolds Road.

Figure 153 to Figure 155 present linear concentration plots for 2036 along Reynolds Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 0.78 micrograms per cubic metre without the project and 0.68 micrograms per cubic metre with the project, while the average concentration along the length of Reynolds Road is predicted to be 0.63 micrograms per cubic metre without project and 0.56 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 0.61 micrograms per cubic metre without the project and 0.53 micrograms per cubic metre with the project, while the average concentration along the length of Reynolds Road is predicted to be 0.49 micrograms per cubic metre without the project and 0.44 micrograms per cubic metre with the project.

For NO_2 the maximum one hour average concentration is predicted to be 12 micrograms per cubic metre without the project and 9.5 micrograms per cubic metre with the project, while the average concentration along the length of Reynolds Road is predicted to be 11 micrograms per cubic metre without the project and 8.6 micrograms per cubic metre with the project.

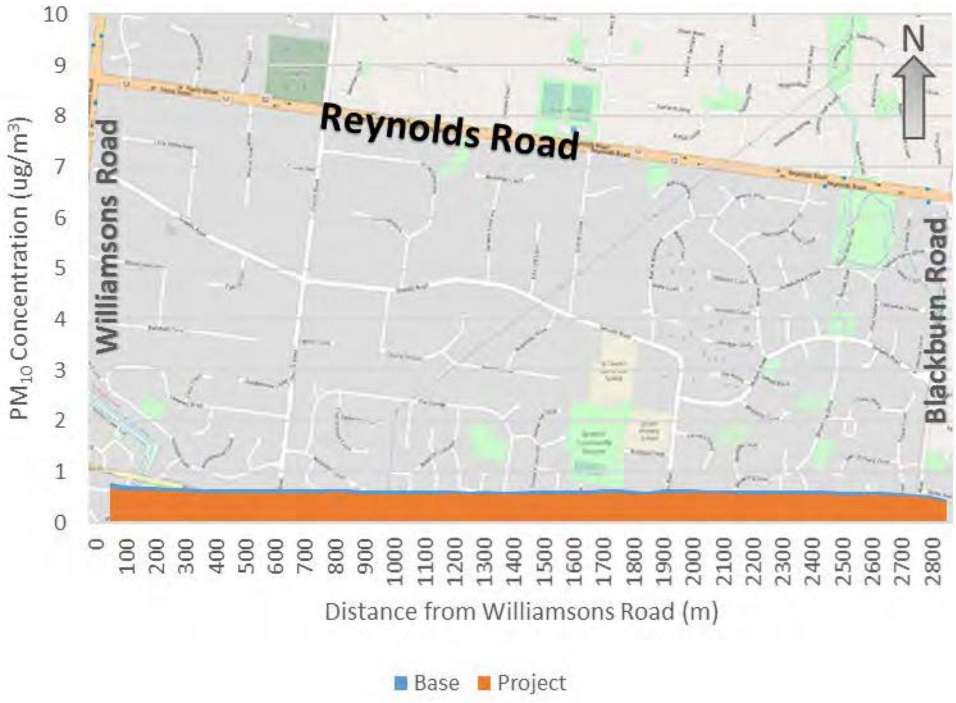


Figure 153: Reynolds Road maximum 24 hour average PM_{10} concentrations – 2036

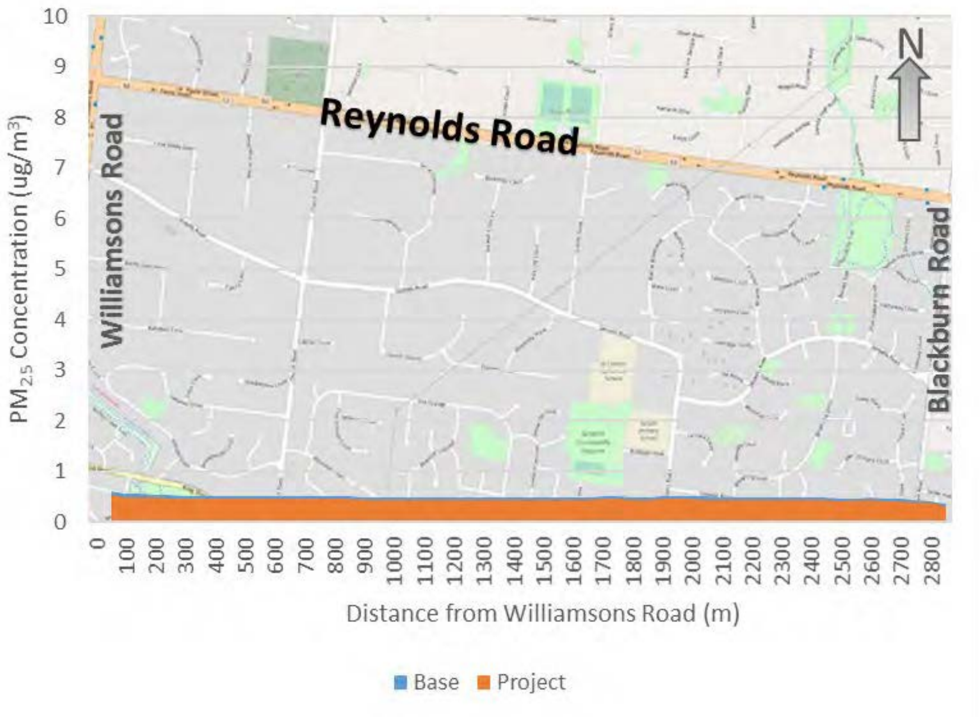


Figure 154: Reynolds Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

Figure 155: Reynolds Road maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Reynolds Road through North East Link.

11.6.24 Rosanna Road

Rosanna Road was selected for modelling due to a predicted 85 per cent decrease in HCV traffic between Blackburn Road and Fitzsimons Lane with the project in 2036 (a decrease of approximately 2,000 HCVs per day).

Modelling was conducted between the intersections with Bell Street and Lower Plenty Road using one combined road link representing northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Rosanna Road at 50 metre intervals along both sides of the road.

Comparison of base and project model outcomes

Table 103 shows the maximum predicted pollutant concentrations along Rosanna Road, from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ concentrations are predicted to occur on the western side of Rosanna Road, at the intersection with Lower Plenty Road. The maximum one hour average NO_2 concentration is predicted to occur close to Berrima Road. Maximum annual average PM_{10}, $PM_{2.5}$ and NO_2 concentrations occur close to Darebin Street.

Table 103: Rosanna Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m³	1.4	1.1	-26%	1.5	1.1	-28%
	Annual	µg/m³	0.67	0.46	-31%	0.72	0.48	-33%
$PM_{2.5}$	24 hour	µg/m³	1.1	0.78	-29%	1.2	0.83	-30%
	Annual	µg/m³	0.51	0.34	-34%	0.55	0.36	-36%
NO_2	1 hour	µg/m³	21	11	-46%	22	12	-47%
	Annual	µg/m³	2.6	1.6	-39%	2.8	1.7	-40%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. Twenty four hour average PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 26 to 29 per cent in 2026 and 28 to 30 per cent in 2036. Annual average PM_{10}, and $PM_{2.5}$ concentrations are predicted to decrease 31 to 36 per cent across both years. The one hour average NO_2 concentration is predicted to decrease 46 to 47 per cent across both years and the annual average by 39 to 40 per cent across both years.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 85 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Rosanna Road.

Figure 156 to Figure 158 present linear concentration plots for 2036 along Rosanna Road from Burgundy Street to Lower Heidelberg Road for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.5 micrograms per cubic metre without the project and 1.1 micrograms per cubic metre with the project, while the average concentration along the length of Rosanna Road is predicted to be 1.4 micrograms per cubic metre without the project and 0.97 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.2 micrograms per cubic metre without the project and 0.83 micrograms per cubic metre with the project, while the average concentration along the length of Rosanna road is predicted to be 1.1 micrograms per cubic metre without the project and 0.72 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 22 micrograms per cubic metre without the project and 12 micrograms per cubic metre with the project, while the average concentration along the length of Rosanna road is predicted to be 19 micrograms per cubic metre without the project and 10 micrograms per cubic metre with the project.

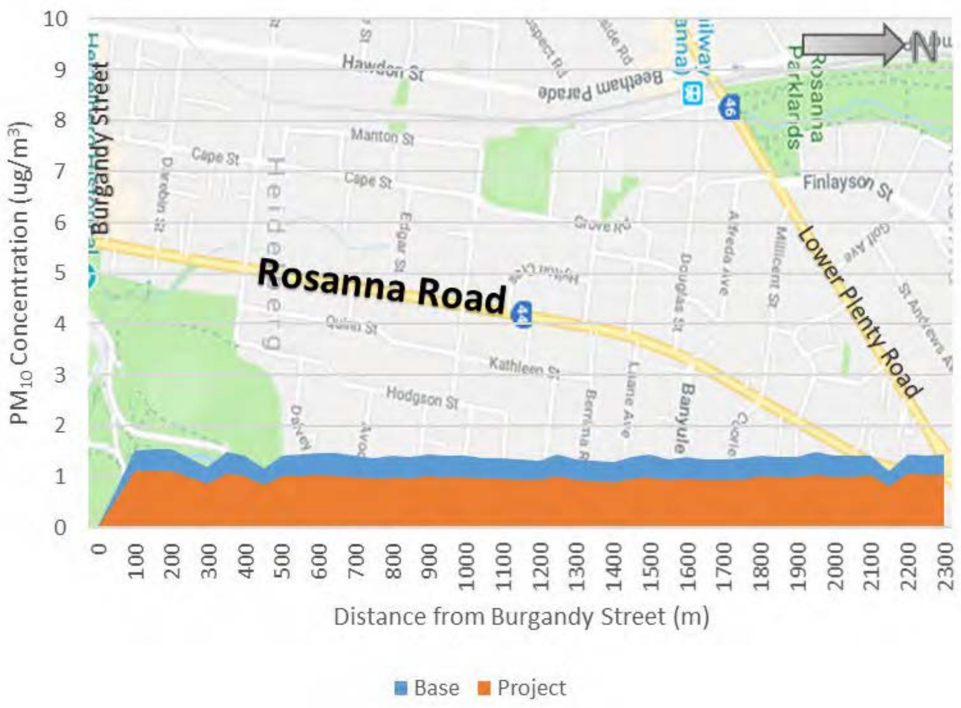


Figure 156: Rosanna Road maximum 24 hour average PM_{10} concentrations – 2036

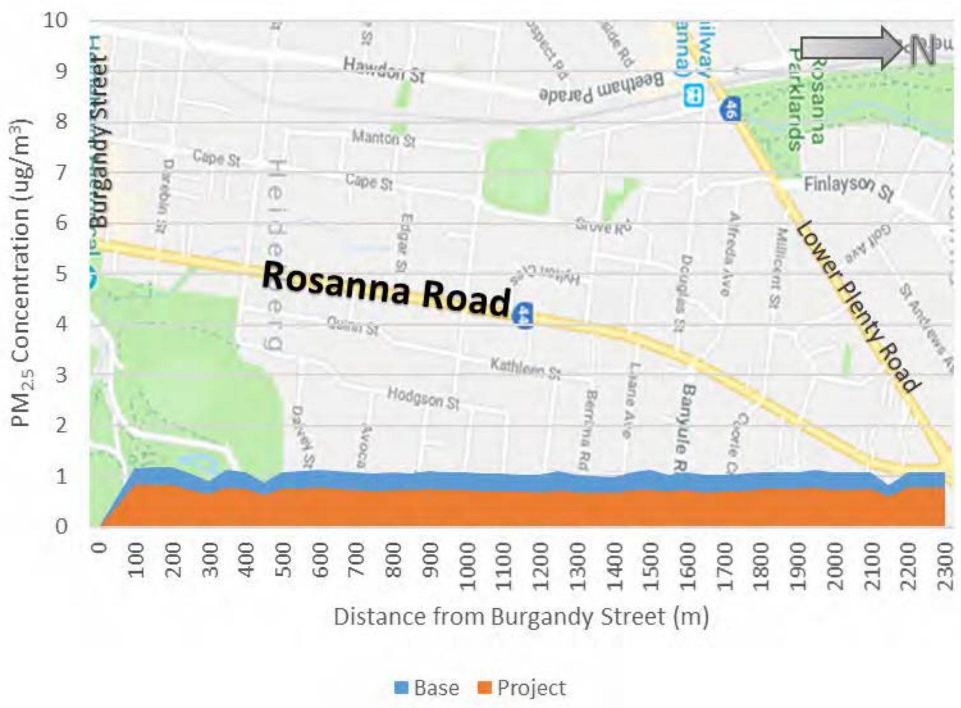


Figure 157: Rosanna Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

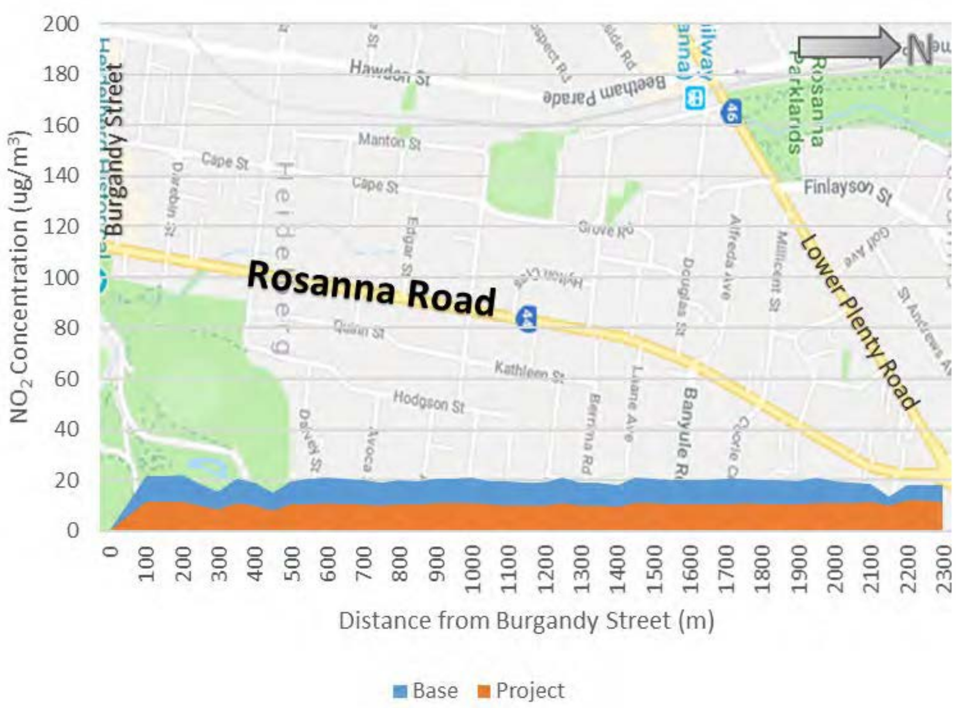


Figure 158: Rosanna Road maximum 1 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Rosanna Road through North East Link.

11.6.25 Station Street

Station Street was selected for modelling due to a predicted 53 per cent decrease in HCV traffic between Bell Street and Darebin Road with the project in 2036 (a decrease of approximately 850 HCVs per day).

Modelling was conducted between the intersections with Bell Street and Lower Darebin Road using one combined road link representing northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Station Street at 50 metre intervals along both sides of the road from Darebin Road to Dundas Street and from Dundas Street to Bell Street on the western side of the road. On the eastern side of the road from Dundas Street to Bell Street the surrounding land use is industrial and therefore did not have any receptors.

Comparison of base and project model outcomes

Table 104 shows the maximum predicted pollutant concentrations along Station Street, from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ concentrations are predicted to occur on the western side of Station Street between Flinders Street and Collins Street. The maximum one hour average NO_2 concentration is predicted to occur on the eastern side of the road, close to Raleigh Street. Annual average PM_{10}, $PM_{2.5}$ and NO_2 concentrations are predicted to occur on the eastern side of the road, close to Dundas Street.

Table 104: Station Street – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.3	1.1	-15%	1.5	1.2	-16%
	Annual	µg/m^3	0.64	0.52	-19%	0.71	0.57	-20%
$PM_{2.5}$	24 hour	µg/m^3	1.0	0.83	-18%	1.1	0.92	-18%
	Annual	µg/m^3	0.49	0.39	-21%	0.55	0.43	-22%
NO_2	1 hour	µg/m^3	18	13	-26%	20	14	-26%
	Annual	µg/m^3	2.2	1.7	-22%	2.5	1.9	-24%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 15 to 22 per cent across both years. NO_2 is predicted to decrease 22 to 26 per cent across both years.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 53 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along the entire length of Station Street.

Figure 159 to Figure 161 present linear concentration plots for 2036 along Station Street from Darebin Road to Bell Street for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.5 micrograms per cubic metre without the project and 1.2 micrograms per cubic metre with the project, while the average concentration along the length of Station Street is predicted to be 1.0 micrograms per cubic metre without the project and 0.85 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 1.1 micrograms per cubic metre without the project and 0.92 micrograms per cubic metre with the project, while the average concentration along the length of Station Street is predicted to be 0.78 micrograms per cubic metre without the project and 0.64 micrograms per cubic metre with the project.

The maximum one hour average NO_2 concentration is predicted to be 20 micrograms per cubic metre without the project and 14 micrograms per cubic metre with the project, while the average concentration along the length of Station Street is predicted to be 13 micrograms per cubic metre without the project and 9.6 micrograms per cubic metre with the project.

Figure 159: Station Street maximum 24 hour average PM_{10} concentrations – 2036

Figure 160: Station Street maximum 24 hour average $PM_{2.5}$ concentrations – 2036

Figure 161: Station Street maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Station Street through North East Link.

11.6.26 Williamsons Road

Williamsons Road was selected for modelling due to a predicted 53 per cent decrease in HCV traffic between Foote Street and Porter Street with the project in 2036 (a decrease of approximately 800 HCVs per day).

Modelling was conducted between the intersections with Foote Street and Porter Street using one combined road link representing northbound and southbound traffic lanes.

Receptors representative of the adjoining residential properties were positioned along Williamsons Road at 50 metre intervals along both sides of the road.

Comparison of base and project model outcomes

Table 105 shows the maximum predicted pollutant concentrations along Williamsons Road, from traffic sources only. Maximum 24 hour average PM_{10} and $PM_{2.5}$ concentrations for the project case in 2026 are predicted to occur on the western side of Williamsons Road, at the intersection with Porter Street. The maximum one hour average NO_2 and annual average PM_{10}, $PM_{2.5}$ and NO_2 concentrations for the project case in 2026 are predicted to occur on the eastern side of the road, at the intersection with Reynolds Road. For 2036, maximum pollutant concentrations for all pollutants are predicted to occur at the intersection with Reynolds Road.

Table 105: Williamsons Road – maximum receptor concentrations

Pollutant	Averaging period	Units	2026			2036		
			Base	Project	Change	Base	Project	Change
PM_{10}	24 hour	µg/m^3	1.00	0.84	-16%	1.1	0.92	-17%
	Annual	µg/m^3	0.40	0.34	-16%	0.45	0.37	-16%
$PM_{2.5}$	24 hour	µg/m^3	0.78	0.64	-17%	0.87	0.71	-18%
	Annual	µg/m^3	0.32	0.26	-17%	0.35	0.29	-18%
NO_2	1 hour	µg/m^3	19	13	-33%	21	14	-33%
	Annual	µg/m^3	1.6	1.3	-19%	1.8	1.5	-20%

When comparing the project over the base scenario in both 2026 and 2036, decreases in the maximum concentrations of all modelled pollutants are predicted to occur. PM_{10} and $PM_{2.5}$ concentrations are predicted to decrease 16 to 18 per cent across both years. One hour average NO_2 is predicted to decrease 33 per cent in both 2026 and 2036 and the annual average by 19 to 20 per cent across both years.

The decreases in maximum PM_{10}, $PM_{2.5}$ and NO_2 concentrations are due to an approximate 53 per cent decrease in HCVs with the project scenario.

Analysis of significant changes

With North East Link, decreased impacts for PM_{10}, $PM_{2.5}$ and NO_2 are predicted to occur along Williamsons Road from Foote Street to Porter Street.

Figure 162 to Figure 164 present linear concentration plots for 2036 along Williamsons Road from Foote Street to Porter Street for PM_{10}, $PM_{2.5}$ and NO_2 respectively. The blue area represents the maximum predicted concentration at each receptor over the entire year for the base scenario and the orange area represents the maximum predicted concentration at each receptor over the entire year for the project scenario.

The maximum 24 hour average PM_{10} concentration is predicted to be 1.1 micrograms per cubic metre without the project and 0.92 micrograms per cubic metre with the project, while the average concentration along Williamsons Road from Foote Street to Porter Street is predicted to be 1.0 micrograms per cubic metre without the project and 0.81 micrograms per cubic metre with the project.

Similarly, the maximum 24 hour average $PM_{2.5}$ concentration is predicted to be 0.87 micrograms per cubic metre without the project and 0.71 micrograms per cubic metre with the project, while the average concentration along Williamsons Road from Foote Street to Porter Street is predicted to be 0.79 micrograms per cubic metre without the project and 0.63 micrograms per cubic metre with the project.

For NO_2 the maximum one hour average concentration is predicted to be 21 micrograms per cubic metre without the project and 14 micrograms per cubic metre with the project, while the average concentration along Williamsons Road from Foote Street to Porter Street is predicted to be 18 micrograms per cubic metre without the project and 12 micrograms per cubic metre with the project.

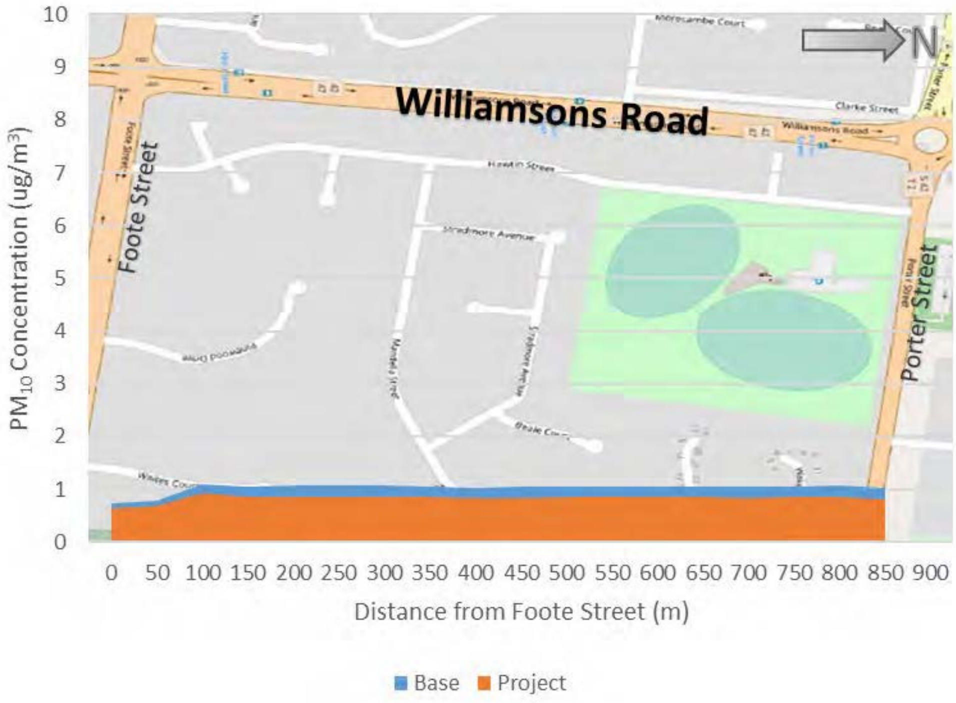


Figure 162: Williamsons Road maximum 24 hour average PM_{10} concentrations – 2036

Figure 163: Williamsons Road maximum 24 hour average $PM_{2.5}$ concentrations – 2036

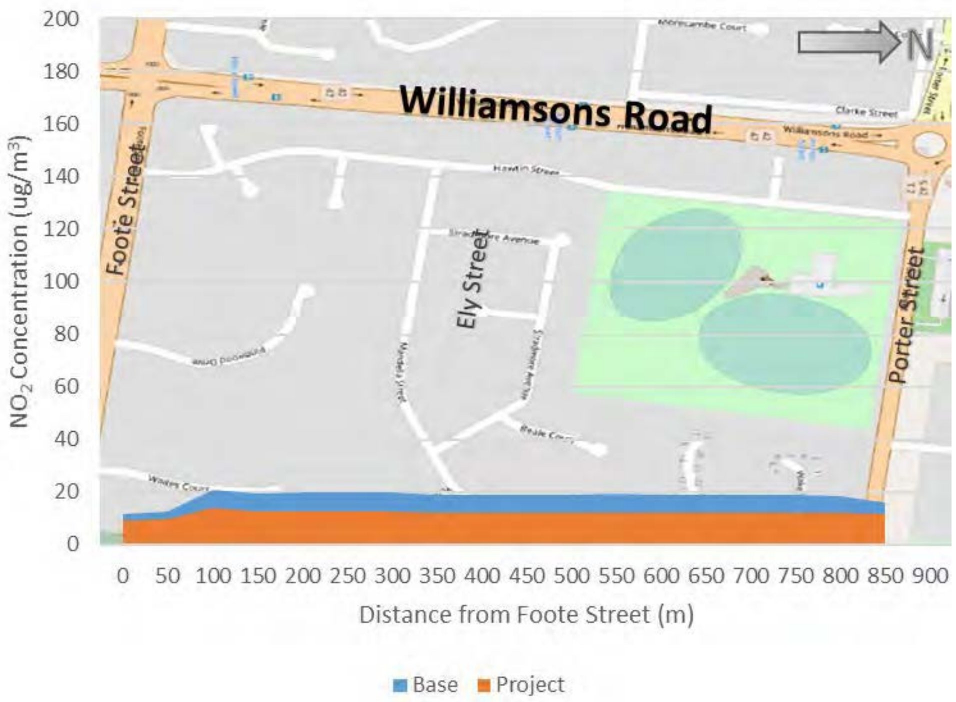


Figure 164: Williamsons Road maximum 24 hour average NO_2 concentrations – 2036

Summary

Maximum concentrations of all pollutants are predicted to decrease for the project over the base scenario in both 2026 and 2036, due to the re-routing of a significant proportion of HCVs from Williamsons Road through North East Link.

11.7 Results – Scenario B2

The surface roads assessment described in the preceding section was conducted using 2020 emission factors with 2036 predicted traffic volumes (Scenario B1). As discussed previously, this approach is considered conservative because there is a general trend towards lower emission vehicles, with improvements in vehicle technology beyond 2020 not accounted for.

To provide a comparison with more realistic vehicle fleet emission rates, a sensitivity analysis was conducted on the section of North East Link between the northern tunnel portals (Blamey Road) and M80 Ring Road using 2025 emission factors (Scenario B2) (refer Section 9.4.3). The maximum impacted North East Link receptor, approximately 130 metres north of Yallambie Road (UTM coordinates 330982E,5823704S), was used to assess the impacts for the purposes of the sensitivity analysis.

The sensitivity analysis was conducted in an identical manner to the main assessment and included surrounding roads (Greensborough Road, Grimshaw Street, Lower Plenty Road and M80 Ring Road)

Table 106 presents a comparison between the maximum GLCs (without background) resulting from the use of 2020 and 2025 emission factors for the project case (PM_{10}, $PM_{2.5}$ and NO_2 in 2036) at the North East Link maximum impacted receptor.

The comparison indicates that modelling predictions with 2025 emission factors result in a 28 per cent decrease in PM_{10}, 47 per cent decrease in $PM_{2.5}$ and 57 to 62 per cent decrease in NO_2 in GLCs for the project case in 2036.

Table 106: North East Link – maximum impacted North East Link receptor concentrations using 2020 and 2025 emission factors – 2036

Pollutant	Averaging period	Units	Project 2036		
			Scenario B1	Scenario B2	Change
PM_{10}	24 hour	μg/m³	3.1	2.2	-28%
	Annual	μg/m³	1.4	1.0	-28%
$PM_{2.5}$	24 hour	μg/m³	2.6	1.4	-47%
	Annual	μg/m³	1.2	0.65	-47%
NO_2	1 hour	μg/m³	80	34	-57%
	Annual	μg/m³	30	11	-62%

Figure 147 to Figure 149 present time series plots of the 24 hour average PM_{10} and $PM_{2.5}$ and one hour average NO_2 GLCs at the maximum impact receptor (project case in 2036), comparing the results obtained from using 2020 and 2025 emission factors.

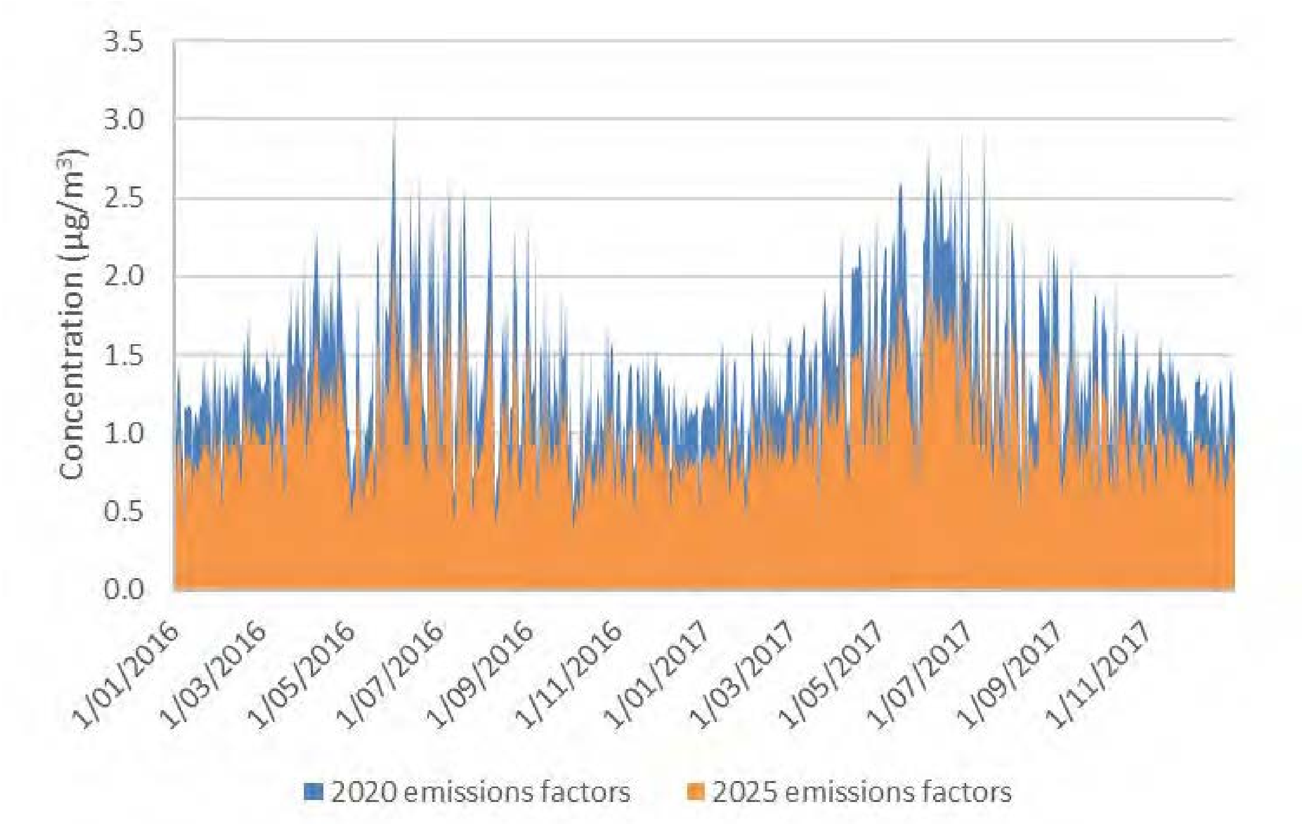


Figure 165: Predicted 24 hour average PM_{10} concentrations at maximum impacted North East Link receptor using 2020 and 2025 emission factors – Project 2036

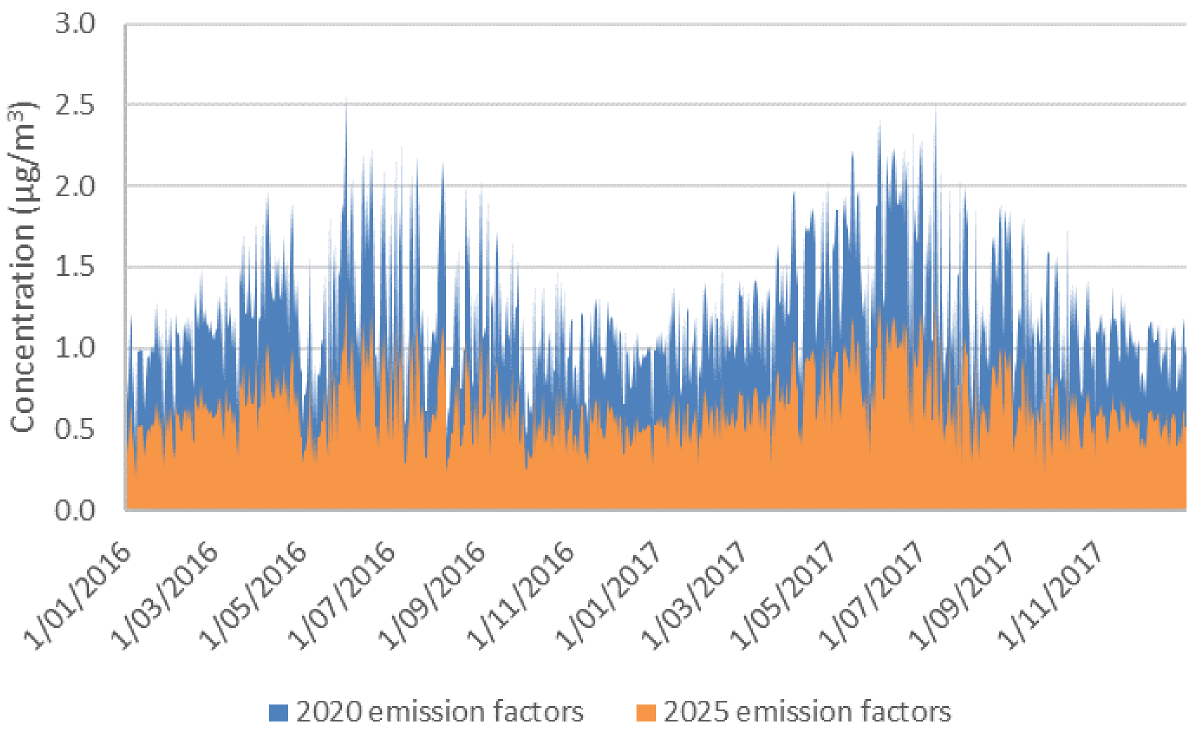


Figure 166: Predicted 24 hour average $PM_{2.5}$ concentrations at maximum impacted North East Link receptor using 2020 and 2025 emission factors – Project 2036

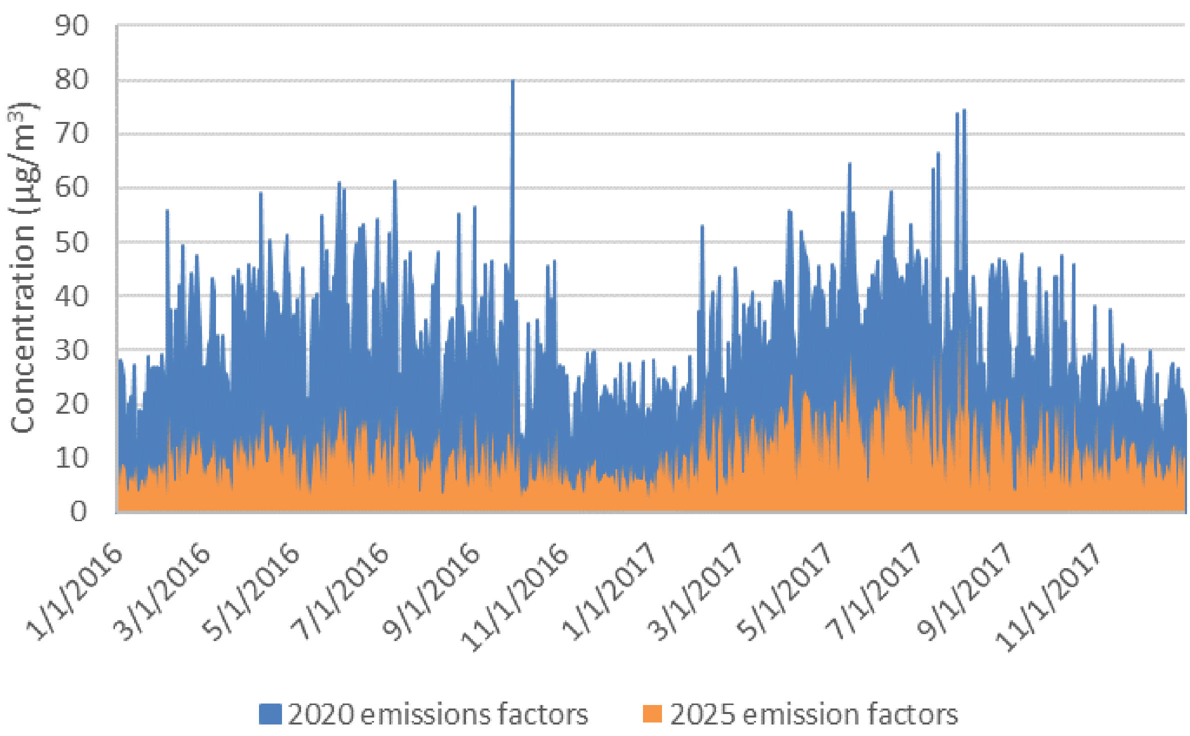


Figure 167: Predicted maximum daily 1 hour average NO_2 concentrations at maximum impacted North East Link receptor using 2020 and 2025 emission factors – Project 2036

Similar reductions are observed on all modelled surface roads. A summary of results for all modelled surface roads using 2025 emission factors for 2036 vehicle predictions (Scenario B2) are presented in Section 11.8.2.

11.8 Summary of surface road changes

Modelling was conducted to assess the air quality impacts of proposed or realigned roads associated with North East Link, together with existing roads likely to be significantly affected by the project. Twenty five roads were assessed with impacts considered at locations such as residential property boundaries or other sensitive receptors.

Maximum pollutant concentrations were predicted for each road at identified receptors for 2026 and 2036, using 2016 meteorological data.

In general, North East Link is predicted to decrease traffic on a number of arterial roads, resulting in either lower HCV or total traffic volumes and a community benefit due to improved air quality. However, for certain arterial roads that provide freeway access, reduced air quality has been identified for those areas.

The main findings of the surface roads modelling are as follows:

- Decreases in traffic volumes due to North East Link mean that air quality impacts are reduced for all pollutants assessed for the following 16 roads:
  - Albert Street
  - Banksia Street
  - Bell Street
  - Bolton Street
  - Broadway
  - Chandler Highway
  - Fitzsimons Lane
  - Grange Road
  - High Street
  - Lower Plenty Road
  - Main Road
  - Plenty Road
  - Reynolds Road
  - Rosanna Road
  - Station Street
  - Williamsons Road.

- Increases in traffic volumes due to North East Link mean air quality impacts are increased for all pollutants assessed for the following eight roads:
  - Bulleen Road
  - Dalton Road
  - Eastern Freeway
  - Grimshaw Street
  - Keon Parade
  - M80 Ring Road
  - Middleborough Road
  - North East Link/Greensborough Road.

For Manningham Road there is a mix of changes with PM_{10}, $PM_{2.5}$ and annual average NO_2 concentrations decreasing by 24 to 30 per cent in 2026 and 2036. However, one hour average NO_2 concentrations show an increase of three per cent with the project in 2026 and a decrease of five per cent in 2036. The changes in one hour average NO_2 concentrations on Manningham Road are due to increased traffic volumes on parts of the Eastern Freeway and Eastern Freeway – North East Link interchange, with the locations at which the maxima occur varying between the base and project case, under different meteorological conditions and times of day.

Maximum pollutant concentrations along each road generally occur near intersections, where contributions from several sources impact a single receptor, with the largest increases occurring along the North East Link alignment between Yallambie Road and the M80 Ring Road interchange.

11.8.1 Scenario A1 and Scenario B1 – 2020 emission factors

Table 107 to Table 110 present summaries of predicted 24 hour average PM_{10} and $PM_{2.5}$ and one hour average NO_2 concentrations for the base and project scenarios in 2026 and 2036 (scenarios A1 and B1), with and without background concentrations. The background concentrations used are Alphington AAQMS data for the time period corresponding to the maximum incremental contribution due to the surface road.

Decreases in concentration are indicated by green shading and increases by orange shading, while blue shading denotes no change. Figure 168 to Figure 170 present the changes in air quality with the project graphically, for PM_{10}, $PM_{2.5}$ and NO_2 respectively.

For all surface roads under the project scenario, the maximum concentrations listed occur on only two days of the year for PM_{10} and $PM_{2.5}$ and only nine hours of the year for NO_2, depending on the road under consideration.

Table 107: Summary of results – 2026 (with background)

Year	2026					
	PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)		NO_2 (µg/m^3)	
	24 hour average		24 hour average		1 hour average	
Road	Base	Project	Base	Project	Base	Project
Albert Street	26	26	26	26	41	59
Banksia Street	27	26	26	26	49	43
Bell Street	26	26	26	26	40	60
Bolton Street	26	26	26	25	57	55
Broadway	26	26	26	26	53	48
Bulleen Road	26	27	26	26	40	41
Chandler Highway	27	27	27	26	74	71
Dalton Road	27	27	26	27	50	52
Eastern Freeway	27	30	26	29	55	110
Fitzsimons Lane	26	26	26	26	61	54
Grange Road	27	27	27	26	77	71
Grimshaw Street	26	26	26	26	51	57
High Street	27	26	26	26	43	62
Keon Parade	26	26	26	26	49	50
Lower Plenty Road	26	26	26	26	64	56
M80 Ring Road	27	27	26	27	76	67
Main Road	26	26	26	26	57	60
Manningham Road	26	26	26	25	62	45
Middleborough Road	26	27	26	26	43	48
North East Link/Greensborough Road	18	28	16	27	51	110
Plenty Road	26	26	26	26	40	39
Reynolds Road	26	26	25	25	56	31
Rosanna Road	26	26	26	26	66	56
Station Street	26	26	26	26	63	58
Williamsons Road	26	26	26	26	64	58

Table 108: Summary of results – 2036 (with background)

Year	2036					
	PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)		NO_2 (µg/m^3)	
	24 hour average		24 hour average		1 hour average	
Road	Base	Project	Base	Project	Base	Project
Albert Street	27	26	26	26	43	60
Banksia Street	27	27	27	26	52	44
Bell Street	27	26	26	26	41	62
Bolton Street	26	26	26	25	59	55
Broadway	26	26	26	26	53	48
Bulleen Road	26	27	26	26	42	43
Chandler Highway	27	27	27	27	77	74
Dalton Road	27	27	27	27	53	56
Eastern Freeway	27	30	26	29	57	110
Fitzsimons Lane	27	26	26	26	65	56
Grange Road	27	27	27	27	82	74
Grimshaw Street	26	26	26	26	53	59
High Street	27	27	26	26	45	64
Keon Parade	26	26	26	26	51	53
Lower Plenty Road	27	26	26	26	65	53
M80 Ring Road	27	27	27	27	80	70
Main Road	26	26	26	26	60	61
Manningham Road	26	26	26	26	65	46
Middleborough Road	26	27	26	26	44	50
North East Link/Greensborough Road	18	28	16	27	52	120
Plenty Road	27	26	26	26	41	40
Reynolds Road	26	26	26	25	57	37
Rosanna Road	26	26	26	26	67	57
Station Street	26	26	26	26	65	59
Williamsons Road	26	26	26	26	66	59

Table 109: Summary of results – 2026 (without background)

Year	2026					
Road	PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)		NO_2 (µg/m^3)	
	24 hour average		24 hour average		1 hour average	
	Base	Project	Base	Project	Base	Project
Albert Street	1.5	1.2	1.2	0.9	18	14
Banksia Street	1.9	1.6	1.4	1.2	26	20
Bell Street	1.5	1.4	1.1	1.0	17	15
Bolton Street	0.9	0.7	0.7	0.5	12	10
Broadway	1.2	0.9	1.0	0.7	16	11
Bulleen Road	1.2	1.6	0.9	1.2	17	18
Chandler Highway	2.2	2.0	1.7	2.0	29	26
Dalton Road	2.0	2.1	1.5	1.6	27	29
Eastern Freeway	2.1	4.9	1.7	4.0	32	60
Fitzsimons Lane	1.5	1.2	1.2	0.9	24	17
Grange Road	2.2	2.0	1.7	1.5	32	26
Grimshaw Street	1.3	1.4	1.0	1.2	20	26
High Street	1.7	1.5	1.3	1.2	20	17
Keon Parade	0.86	0.93	0.67	0.73	12	13
Lower Plenty Road	1.5	1.1	1.1	0.8	19	11
M80 Ring Road	1.7	1.9	1.5	1.7	31	36
Main Road	1.3	1.0	1.0	0.8	20	15
Manningham Road	1.0	0.71	0.73	0.53	17	18
Middleborough Road	1.5	1.8	1.1	1.4	20	25
North East Link/Greensborough Road	1.5	2.7	1.1	2.3	20	69
Plenty Road	1.5	1.2	1.1	0.89	17	16
Reynolds Road	0.69	0.60	0.54	0.46	11	8.3
Rosanna Road	1.4	1.1	1.1	0.78	21	11
Station Street	1.3	1.1	1.0	0.83	18	13
Williamsons Road	1.0	0.84	0.78	0.64	19	13

Table 110: Summary of results – 2036 (without background)

Year	2036					
Road	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)		NO_2 (µg/m³)	
	24 hour average		24 hour average		1 hour average	
	Base	Project	Base	Project	Base	Project
Albert Street	1.7	1.3	1.3	1.0	20	15
Banksia Street	2.0	1.7	1.6	1.2	29	21
Bell Street	1.6	1.5	1.2	1.1	18	17
Bolton Street	1.0	0.7	0.74	0.55	14	10
Broadway	1.2	1.0	1.0	0.76	16	11
Bulleen Road	1.3	1.7	1.0	1.3	19	20
Chandler Highway	2.5	2.2	1.9	1.7	32	29
Dalton Road	2.2	2.3	1.7	1.8	30	33
Eastern Freeway	2.2	5.4	1.8	4.5	34	67
Fitzsimons Lane	1.7	1.3	1.4	1.0	28	19
Grange Road	2.5	2.2	1.9	1.7	37	29
Grimshaw Street	1.4	1.5	1.1	1.3	22	28
High Street	1.9	1.7	1.4	1.3	22	19
Keon Parade	1.0	1.1	0.78	0.84	14	16
Lower Plenty Road	1.6	1.1	1.2	0.83	20	12
M80 Ring Road	2.0	2.2	1.6	1.8	35	39
Main Road	1.5	1.1	1.2	0.9	23	16
Manningham Road	1.1	0.8	0.86	0.61	20	19
Middleborough Road	1.5	1.9	1.2	1.5	21	27
North East Link	1.6	3.1	1.2	2.6	21	80
Plenty Road	1.6	1.3	1.2	1.0	18	17
Reynolds Road	0.78	0.68	0.61	0.53	12	10
Rosanna Road	1.5	1.1	1.2	0.83	22	12
Station Street	1.5	1.2	1.1	0.92	20	14
Williamsons Road	1.1	0.92	0.87	0.71	21	14

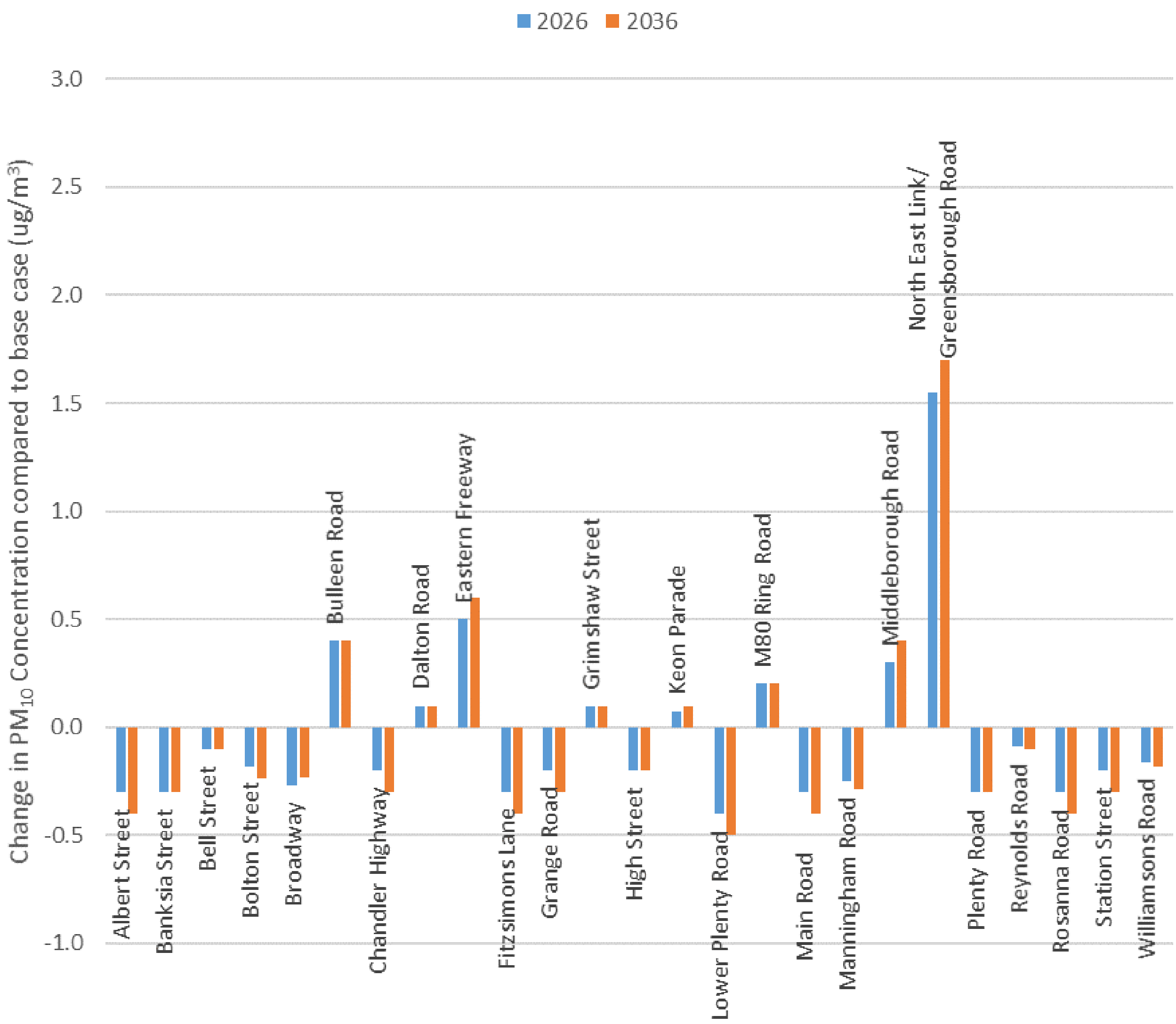


Figure 168: PM_{10} concentration changes by road for 2026 and 2036

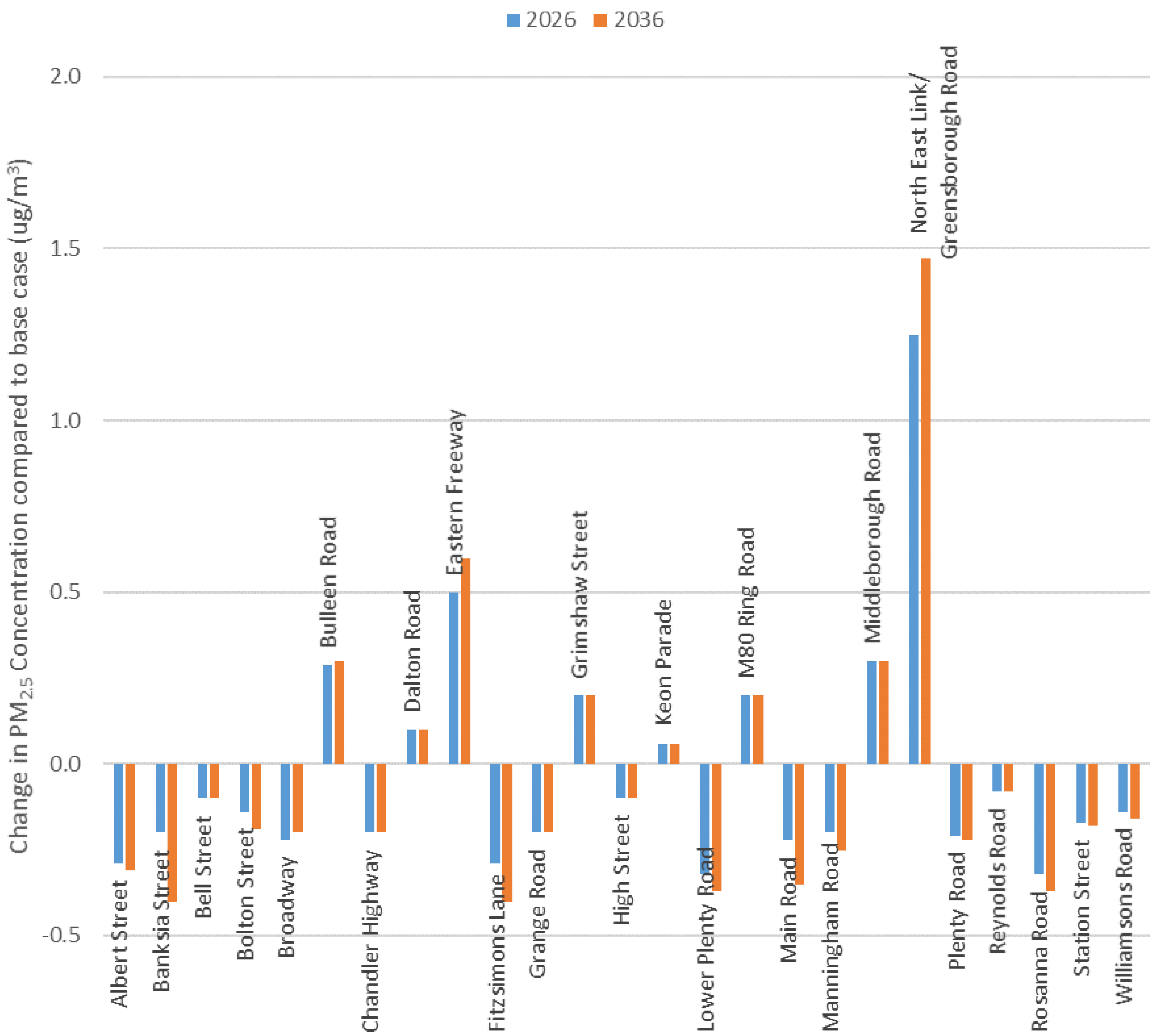


Figure 169: $PM_{2.5}$ concentration changes by road for 2026 and 2036

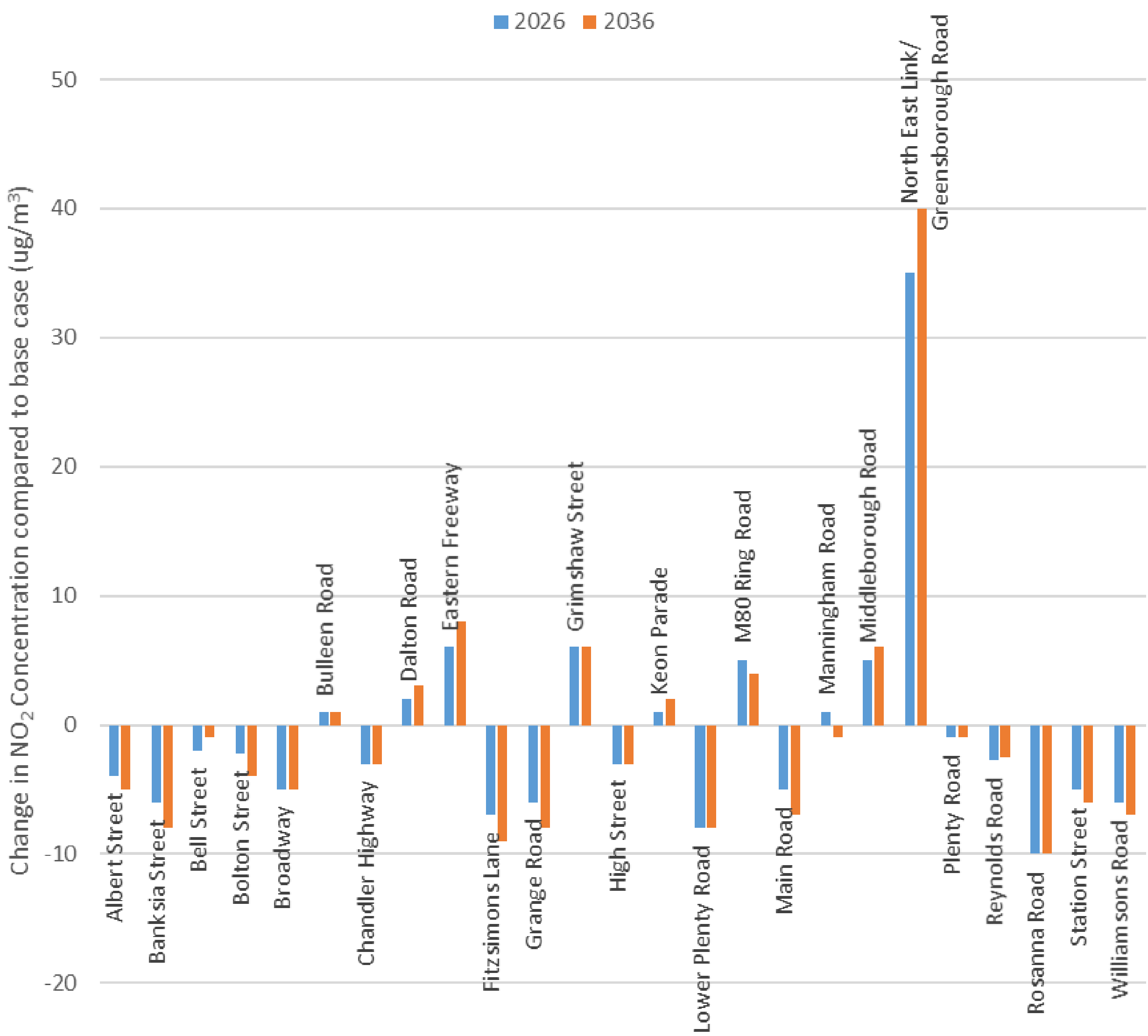


Figure 170: NO_2 concentration changes by road for 2026 and 2036

11.8.2 Scenario B2 – 2025 emission factors

A comparison of modelling predictions using the 2020 and 2025 emission factors at the most impacted sensitive receptor adjacent to North East Link/Greensborough Road (Scenario B2 project case), shows that maximum GLCs decrease by 28 per cent for PM_{10}, 47 per cent for $PM_{2.5}$ and 57 to 62 per cent for NO_2 with the 2025 factors.

Table 111 presents a summary of predicted 24 hour average PM_{10} and $PM_{2.5}$ and one hour average NO_2 concentrations for the base and project scenarios in 2036 (Scenario B2) for all modelled surface roads without background concentrations.

Decreases in concentration are indicated by green shading and increases by orange shading, while blue shading denotes no change.

Table 111: Summary of results – Scenario B2 (2036 without background)

Year	2036					
Road	PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)		NO_2 (µg/m^3)	
	24 hour average		24 hour average		1 hour average	
	Base	Project	Base	Project	Base	Project
Albert Street	1.5	1.3	0.88	0.74	6.1	4.3
Banksia Street	1.8	1.6	1.1	0.93	8.8	6.2
Bell Street	1.5	1.4	0.87	0.82	5.6	4.8
Bolton Street	0.91	0.71	0.53	0.41	4.0	3.0
Broadway	1.0	0.87	0.57	0.51	5.3	3.6
Bulleen Road	1.2	1.5	0.68	0.86	5.7	6.0
Chandler Highway	2.3	2.1	1.3	1.2	9.3	8.2
Dalton Road	2.1	2.2	1.3	1.3	9.1	10
Eastern Freeway	2.0	4.3	1.2	2.6	11	21
Fitzsimons Lane	1.6	1.3	1.0	0.75	8.6	5.7
Grange Road	2.3	2.1	1.3	1.2	11	8.2
Grimshaw Street	0.77	1.3	0.45	0.76	3.0	6.6
High Street	1.7	1.6	1.0	0.92	6.9	6.0
Keon Parade	0.92	1.0	0.55	0.59	4.4	5.0
Lower Plenty Road	1.4	1.1	0.82	0.63	6.1	3.6
M80 Ring Road	1.8	1.9	1.1	1.2	10	12
Main Road	1.4	1.1	0.85	0.64	7.2	4.8
Manningham Road	1.0	0.77	0.56	0.44	6.3	6.0
Middleborough Road	1.4	1.7	0.84	1.0	6.3	8.2
North East Link	1.4	2.2	0.83	1.4	6.6	26
Plenty Road	1.5	1.3	0.86	0.73	5.6	5.4
Reynolds Road	0.74	0.65	0.44	0.38	3.7	3.0
Rosanna Road	1.4	1.1	0.80	0.62	6.8	3.4
Station Street	1.3	1.2	0.76	0.68	5.8	4.2
Williamsons Road	1.0	0.88	0.60	0.52	6.1	4.1

Figure 168 to Figure 170 present 24 hour average PM_{10}, 24 hour average $PM_{2.5}$ and 1 hour average NO_2 concentrations (without background) for each modelled road for 2036 for the project case, comparing 2020 and 2025 emission factors (scenarios B1 and B2). These figures enable comparison of the relative contribution of the project case to predicted pollutant concentrations using the 2020 and 2025 emission factors.

For all modelled surface roads, application of 2025 emission factors (Scenario B2) reduces the average predicted PM_{10} concentration project contribution (without background) by seven per cent compared with that predicted using the 2020 emission factors (Scenario B1), with a maximum decrease of 29 per cent occurring on North East Link. For $PM_{2.5}$, the average reduction using 2025 emission factors compared with 2020 emission factors across all modelled roads is 30 per cent with a maximum decrease of 46 per cent occurring on North East Link. For NO_2, the average reduction across all modelled roads is 70 per cent with a maximum decrease of 76 per cent occurring on the Eastern Freeway.

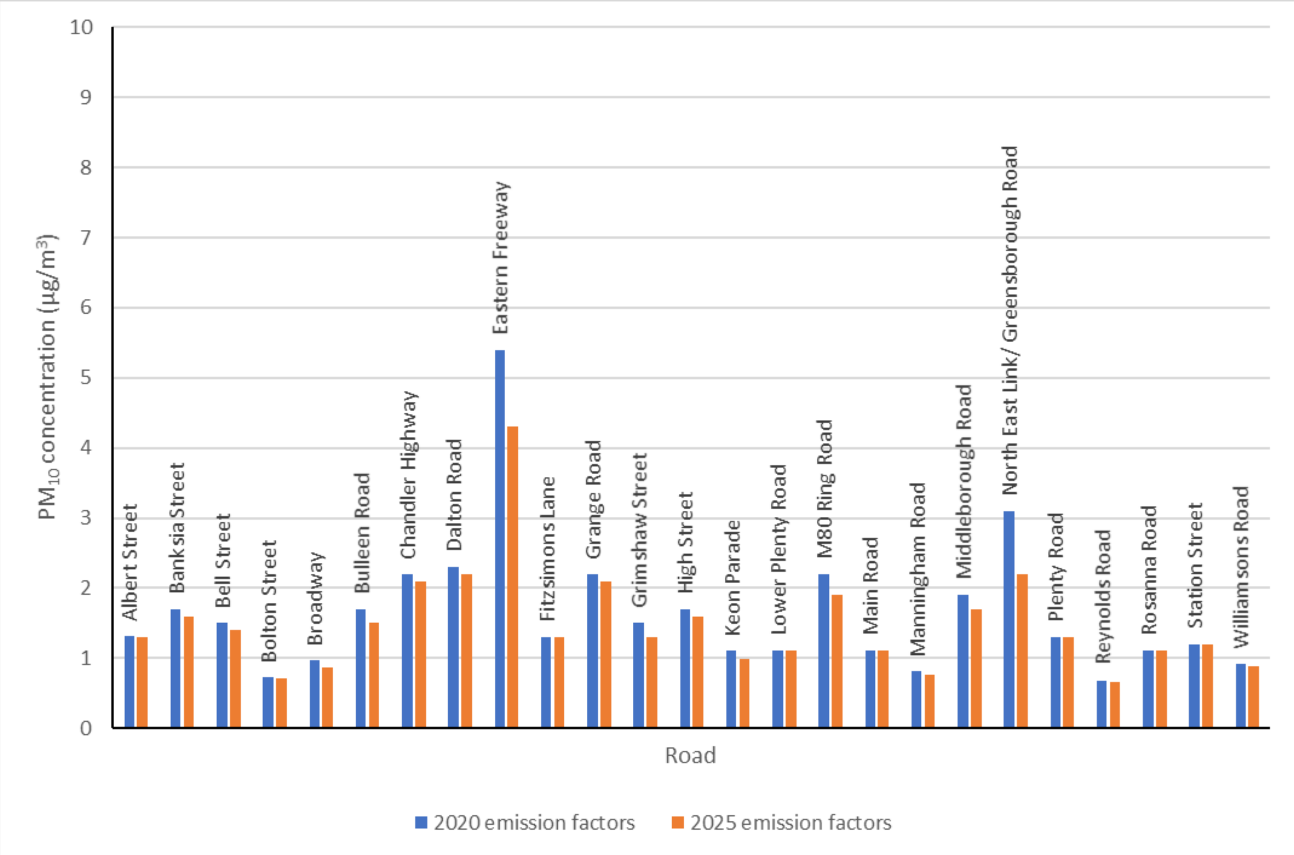


Figure 171: PM_{10} concentration by road for 2036 comparing 2020 and 2025 emission factors

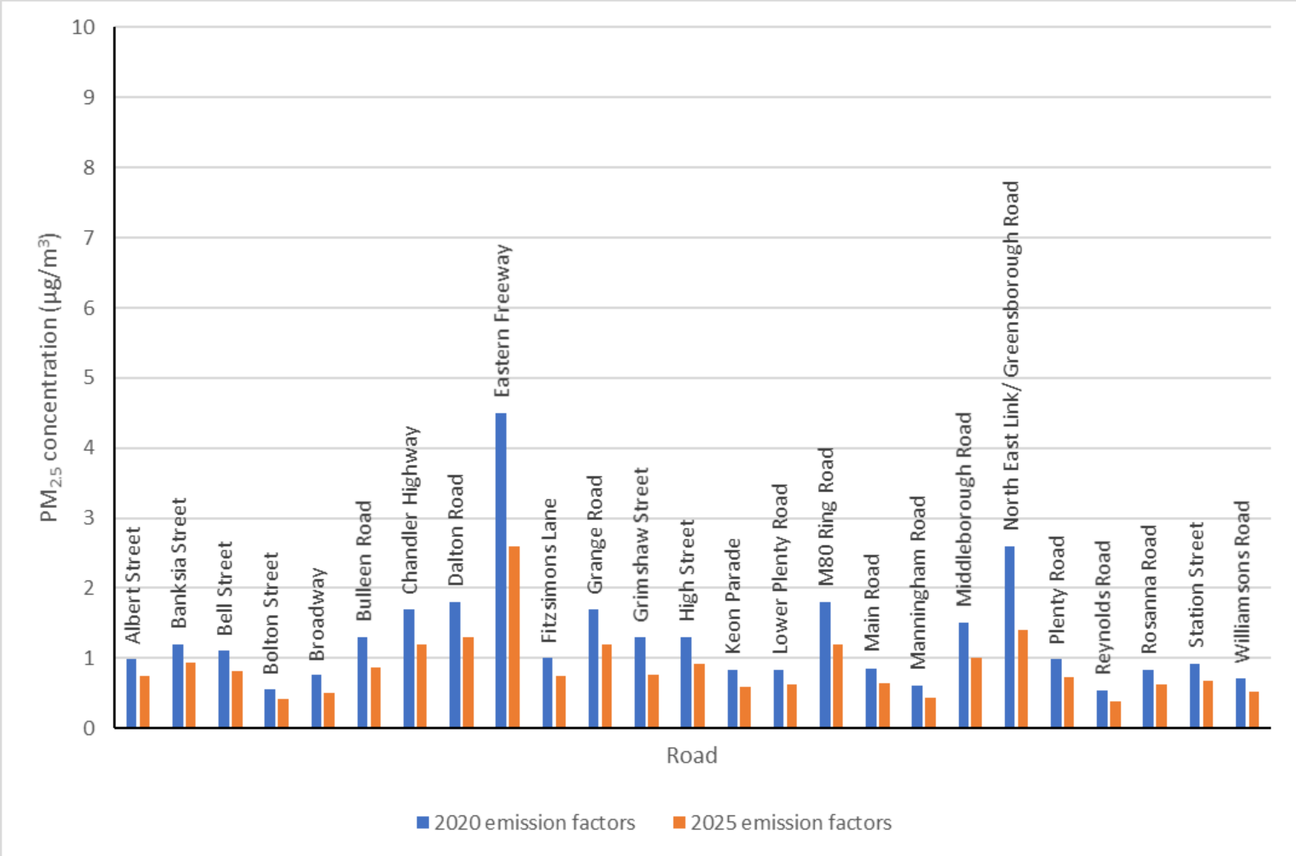


Figure 172: $PM_{2.5}$ concentration by road for 2036 comparing 2020 and 2025 emission factors

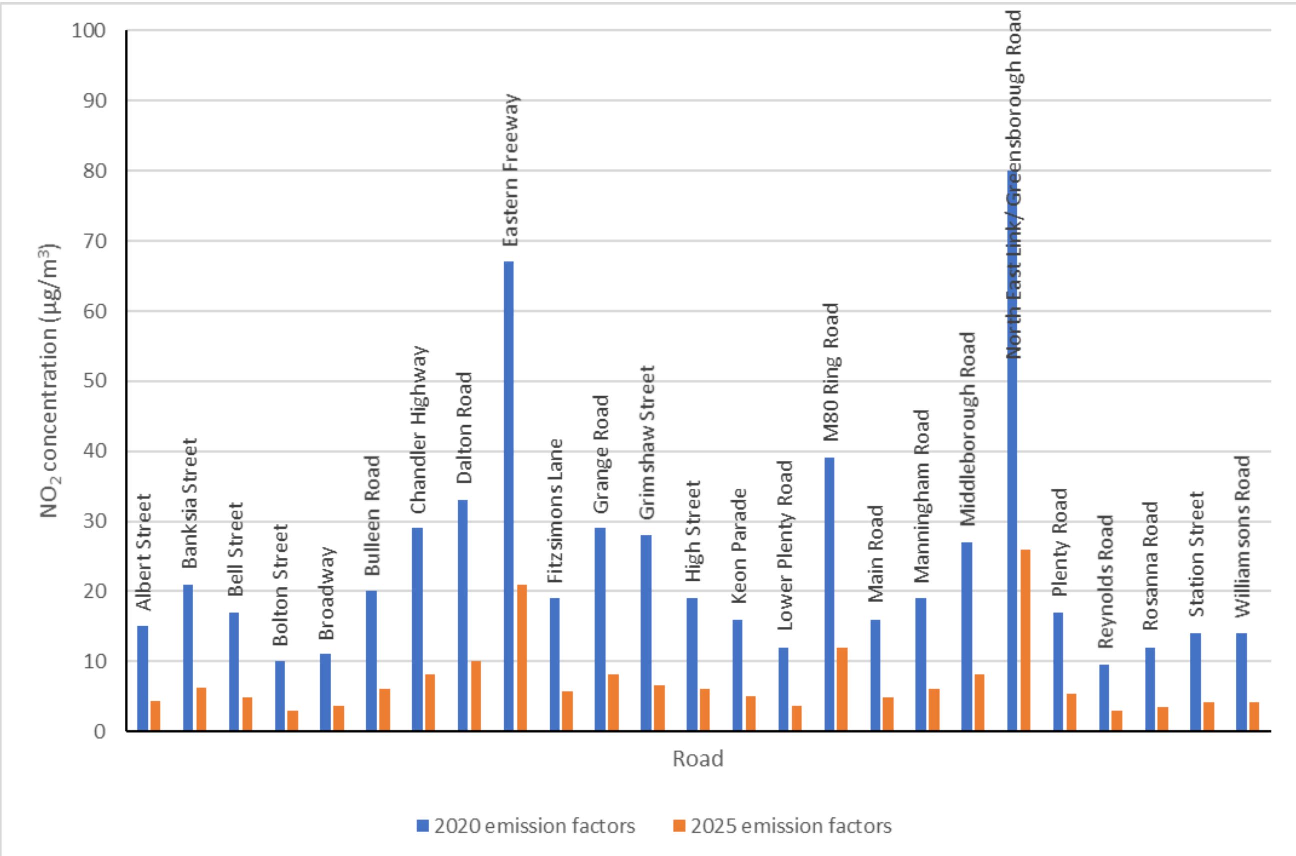


Figure 173: NO_2 concentration by road for 2036 comparing 2020 and 2025 emission factors

12.0 COMBINED IMPACTS

This section presents the findings of the combined impact assessment for North East Link. For the purposes of the air quality impact assessment, combined impacts refer to the combination of surface road (project scenario) and tunnel ventilation system pollutant emissions and background concentrations.

For each pollutant assessed, the maximum predicted concentrations due to emissions from the tunnel ventilation system and surface roads were added to the background concentration to determine the combined impact.

12.1 Modelled scenarios

Due to the proximity of the selected receptors to surface roads, they are primarily impacted by surface road emissions rather than road tunnel ventilation system emissions.

Consequently, the meteorological year chosen to assess the combined impacts, 2016, reflects the worst case year for surface road emissions, noting the percentage difference in the tunnel ventilation system maximum impacts between years was approximately 10 per cent.

Combined impacts were modelled for the following scenarios, consistent with those evaluated previously:

- Scenarios A1 (2020 emission factors) and A2 (2025 emission factors) –projected traffic volume and fleet mix for 2026 under normal operating conditions
- Scenarios B1 (2020 emission factors) and B2 (2025 emission factors) – projected traffic volume and fleet mix for 2036 under normal operating conditions.

The combined impacts were assessed at two receptors chosen from the surface road receptors and the discrete receptors used for tunnel ventilation system modelling. The receptors were selected based on their proximity to the North East Link surface road and a ventilation structure such that they are likely to be impacted significantly by both. Results for the receptor in the north of the study area (impacted by the northern ventilation structure) and in the south of the study area (impacted by the southern ventilation structure) are presented to show the relative contributions of the surface roads, the tunnel ventilation system and background concentrations over one year. In the absence of air quality modelling criteria relevant to roadside locations, the combined impacts are presented and compared against SEPP(AAQ) EQOs, for comparative rather than compliance purposes.

In both instances the selected receptors corresponded to a surface roads assessment receptor, 450 m north of the northern ventilation structure on Watson Street and the near boundary of a residence located approximately 280 metres south east of the southern ventilation structure.

12.2 Model outputs

Individual contributions from the surface roads, tunnel ventilation system and background concentrations to the maximum predicted PM_{10}, $PM_{2.5}$ and NO_2 GLCs are provided in Table 112 to Table 115 for Scenarios A1, A2, B1 and B2. Predictions greater than the SEPP(AAQ) EQO are shown in bold. Table 116 to Table 119 present the maximum predicted PM_{10}, $PM_{2.5}$ and NO_2 GLCs for Scenarios A1, A2, B1 and B2, without consideration of the background concentration (project only).

Table 112: Combined impact results: Scenario A1

Part of study area	Pollutant	Units	Averaging period	Maximum predicted GLC [1]	Objective [2]	Contribution to maximum predicted GLC		
						Tunnel ventilation	Surface roads	Background
North	PM_{10}	μg/m^3	24 hour	39	50	0.042	1.0	38
			Annual	16	20	0.052	1.2	15
	$PM_{2.5}$	μg/m^3	24 hour	**35**	20	0.039	1.5	**33**
			Annual	**8.5**	7	0.044	1.0	**7.5**
	NO_2	μg/m^3	1 hour	130	225	6.2	53	70
			Annual	26	56	0.34	7.7	18
South	PM_{10}	μg/m^3	24 hour	39	50	0.092	0.44	38
			Annual	15	20	0.043	0.54	15
	$PM_{2.5}$	μg/m^3	24 hour	**34**	20	0.075	0.77	**33**
			Annual	**8.0**	7	0.037	0.44	**7.5**
	NO_2	μg/m^3	1 hour	97	225	5.0	12	80
			Annual	21	56	0.26	2.2	18

Notes:
Concentrations rounded to two significant figures
1 100th percentile
2 For comparison only

Table 113: Combined impact results: Scenario A2

Part of study area	Pollutant	Units	Averaging period	Maximum predicted GLC [1]	Objective [2]	Contribution to maximum predicted GLC		
						Tunnel ventilation	Surface roads	Background
North	PM_{10}	μg/m^3	24 hour	39	50	0.028	0.73	38
			Annual	15	20	0.036	0.87	15
	$PM_{2.5}$	μg/m^3	24 hour	**34**	20	0.019	0.83	**33**
			Annual	**8.1**	7	0.023	0.54	**7.5**
	NO_2	μg/m^3	1 hour	94	225	0.86	13	80
			Annual	21	56	0.11	2.5	18
South	PM_{10}	μg/m^3	24 hour	39	50	0.058	0.33	38
			Annual	15	20	0.029	0.42	15
	$PM_{2.5}$	μg/m^3	24 hour	**34**	20	0.036	0.44	**33**
			Annual	**7.8**	7	0.018	0.25	**7.5**
	NO_2	μg/m^3	1 hour	89	225	0.045	1.0	88
			Annual	19	56	0.087	0.7	18

Notes:
Concentrations rounded to two significant figures
1 100th percentile
2 For comparison only

Table 114: Combined impact results: Scenario B1

Part of study area	Pollutant	Units	Averaging period	Maximum predicted GLC [1]	Objective [2]	Contribution to maximum predicted GLC		
						Tunnel ventilation	Surface roads	Background
North	PM_{10}	µg/m³	24 hour	39	50	0.051	1.2	38
			Annual	16	20	0.061	1.4	15
	$PM_{2.5}$	µg/m³	24 hour	**35**	20	0.046	1.8	**33**
			Annual	**8.7**	7	0.052	1.2	**7.5**
	NO_2	µg/m³	1 hour	140	225	6.3	61	70
			Annual	28	56	0.40	8.9	18
South	PM_{10}	µg/m³	24 hour	39	50	0.11	0.49	38
			Annual	15	20	0.051	0.60	15
	$PM_{2.5}$	µg/m³	24 hour	**34**	20	0.085	0.86	**33**
			Annual	**8.0**	7	0.044	0.49	**7.5**
	NO_2	µg/m³	1 hour	99	225	5.7	14	80
			Annual	21	56	0.31	2.5	18

Notes:
Concentrations rounded to two significant figures
1 100th percentile
2 For comparison only

Table 115: Combined impact results: Scenario B2

Part of study area	Pollutant	Units	Averaging period	Maximum predicted GLC [1]	Objective [2]	Contribution to maximum predicted GLC		
						Tunnel ventilation	Surface roads	Background
North	PM_{10}	µg/m³	24 hour	39	50	0.033	0.83	38
			Annual	16	20	0.042	1.0	15
	$PM_{2.5}$	µg/m³	24 hour	**34**	20	0.023	0.94	**33**
			Annual	**8.1**	7	0.027	0.62	**7.5**
	NO_2	µg/m³	1 hour	96	225	1.1	15	80
			Annual	21	56	0.13	2.9	18
South	PM_{10}	µg/m³	24 hour	39	50	0.068	0.37	38
			Annual	15	20	0.034	0.46	15
	$PM_{2.5}$	µg/m³	24 hour	**34**	20	0.041	0.49	**33**
			Annual	**7.8**	7	0.022	0.28	**7.5**
	NO_2	µg/m³	1 hour	89	225	0.054	1.1	88
			Annual	19	56	0.10	0.79	18

Notes:
Concentrations rounded to two significant figures
1 100th percentile
2 For comparison only

Table 116: Combined impact results: Scenario A1 – project only

Part of study area	Pollutant	Units	Averaging period	Maximum predicted GLC [1]	Objective [2]
North	PM_{10}	µg/m^3	24 hour	2.8	50
			Annual	1.2	20
	$PM_{2.5}$	µg/m^3	24 hour	2.4	20
			Annual	1.1	7
	NO_2	µg/m^3	1 hour	69	225
			Annual	8.1	56
South	PM_{10}	µg/m^3	24 hour	1.7	50
			Annual	0.58	20
	$PM_{2.5}$	µg/m^3	24 hour	1.4	20
			Annual	0.48	7
	NO_2	µg/m^3	1 hour	34	225
			Annual	2.5	56

Notes:

Concentrations rounded to two significant figures.

1 100th percentile

2 For comparison only

Table 117: Combined impact results: Scenario A2 – project only

Part of study area	Pollutant	Units	Averaging period	Maximum predicted GLC [1]	Objective [2]
North	PM_{10}	µg/m^3	24 hour	2.1	50
			Annual	0.9	20
	$PM_{2.5}$	µg/m^3	24 hour	1.3	20
			Annual	0.57	7
	NO_2	µg/m^3	1 hour	23	225
			Annual	2.6	56
South	PM_{10}	µg/m^3	24 hour	1.3	50
			Annual	0.45	20
	$PM_{2.5}$	µg/m^3	24 hour	0.82	20
			Annual	0.27	7
	NO_2	µg/m^3	1 hour	11	225
			Annual	0.79	56

Notes:

Concentrations rounded to two significant figures.

1 100th percentile

2 For comparison only

Table 118: Combined impact results: Scenario B1 – project only

Part of study area	Pollutant	Units	Averaging period	Maximum predicted GLC [1]	Objective [2]
North	PM_{10}	µg/m^3	24 hour	3.3	50
			Annual	1.4	20
	$PM_{2.5}$	µg/m^3	24 hour	2.8	20
			Annual	1.2	7
	NO_2	µg/m^3	1 hour	80	225
			Annual	9.3	56
South	PM_{10}	µg/m^3	24 hour	2.0	50
			Annual	0.65	20
	$PM_{2.5}$	µg/m^3	24 hour	1.6	20
			Annual	0.54	7
	NO_2	µg/m^3	1 hour	38	225
			Annual	2.8	56

Notes:
Concentrations rounded to two significant figures.
1 100th percentile
2 For comparison only

Table 119: Combined impact results: Scenario B2 – project only

Part of study area	Pollutant	Units	Averaging period	Maximum predicted GLC [1]	Objective [2]
North	PM_{10}	µg/m^3	24 hour	2.3	50
			Annual	1.0	20
	$PM_{2.5}$	µg/m^3	24 hour	1.5	20
			Annual	0.65	7
	NO_2	µg/m^3	1 hour	26	225
			Annual	3.0	56
South	PM_{10}	µg/m^3	24 hour	21.5	50
			Annual	0.49	20
	$PM_{2.5}$	µg/m^3	24 hour	0.91	20
			Annual	0.30	7
	NO_2	µg/m^3	1 hour	12	225
			Annual	0.89	56

Notes:
Concentrations rounded to two significant figures.
1 100th percentile
2 For comparison only

Time-series plots of the 24 hour average PM_{10} concentrations predicted for Scenario B1 are presented in Figure 174 and Figure 175 for the northern and southern parts of the study area respectively. For comparison, Figure 176 and Figure 177 present the PM_{10} time-series plots for the 2036 base scenario (surface roads only without project) at the same selected receptors (northern and southern parts of the study area). The corresponding $PM_{2.5}$ plots are presented in Figure 178 to Figure 181 and for NO_2 (daily maximum 1 hour average) in Figure 182 to Figure 185.

Time-series plots of the 24 hour average PM_{10} concentrations predicted for Scenario B2 are provided in Figure 186 and Figure 187 for the northern and southern parts of the study area respectively. The corresponding $PM_{2.5}$ and daily maximum 1 hour average NO_2 plots are presented in Figure 188 to Figure 191.

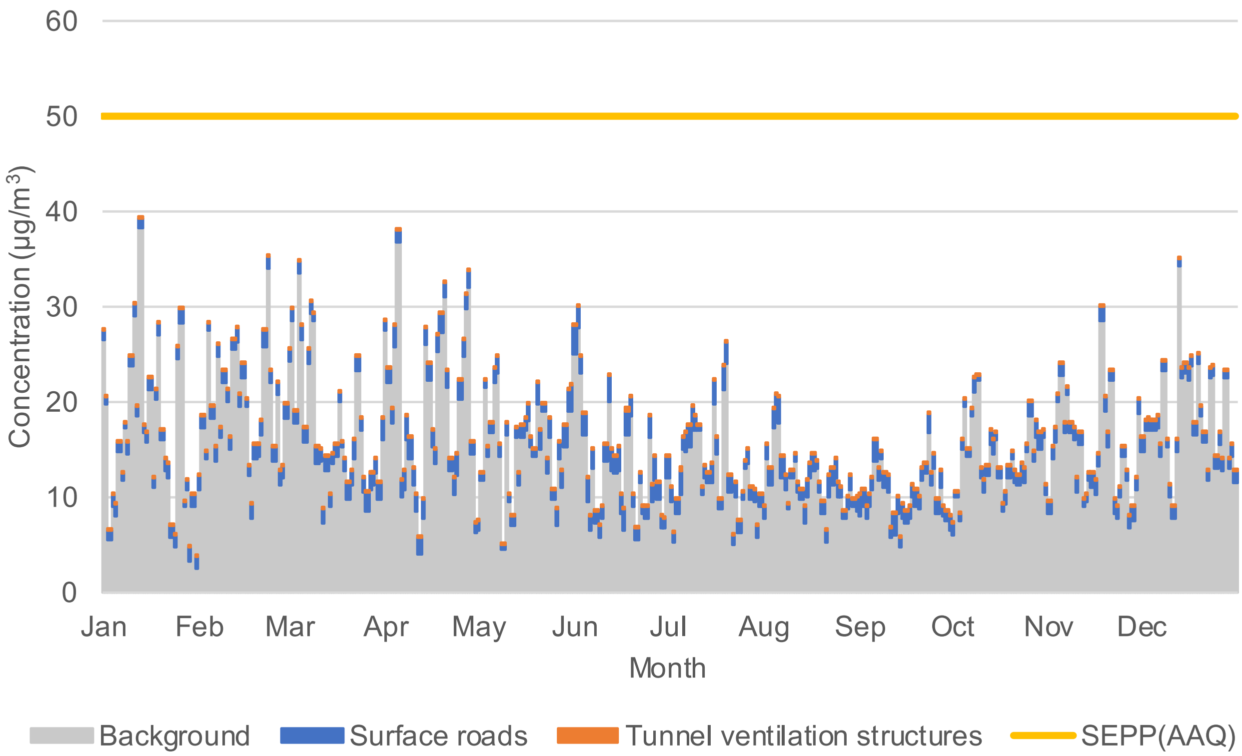


Figure 174: Scenario B1 project case (2036) predicted 24 hour average PM_{10} concentrations at selected receptor in northern part of the study area

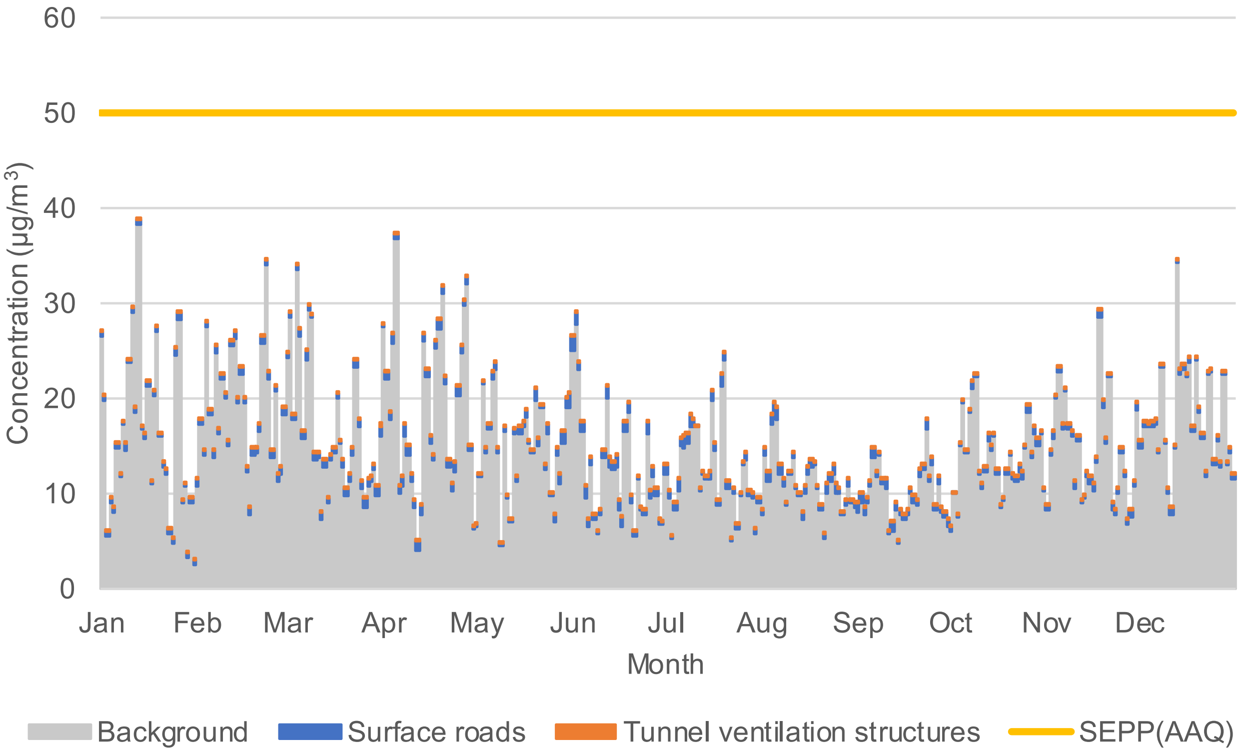


Figure 175: Scenario B1 project case (2036) predicted 24 hour average PM_{10} concentrations at selected receptor in southern part of the study area

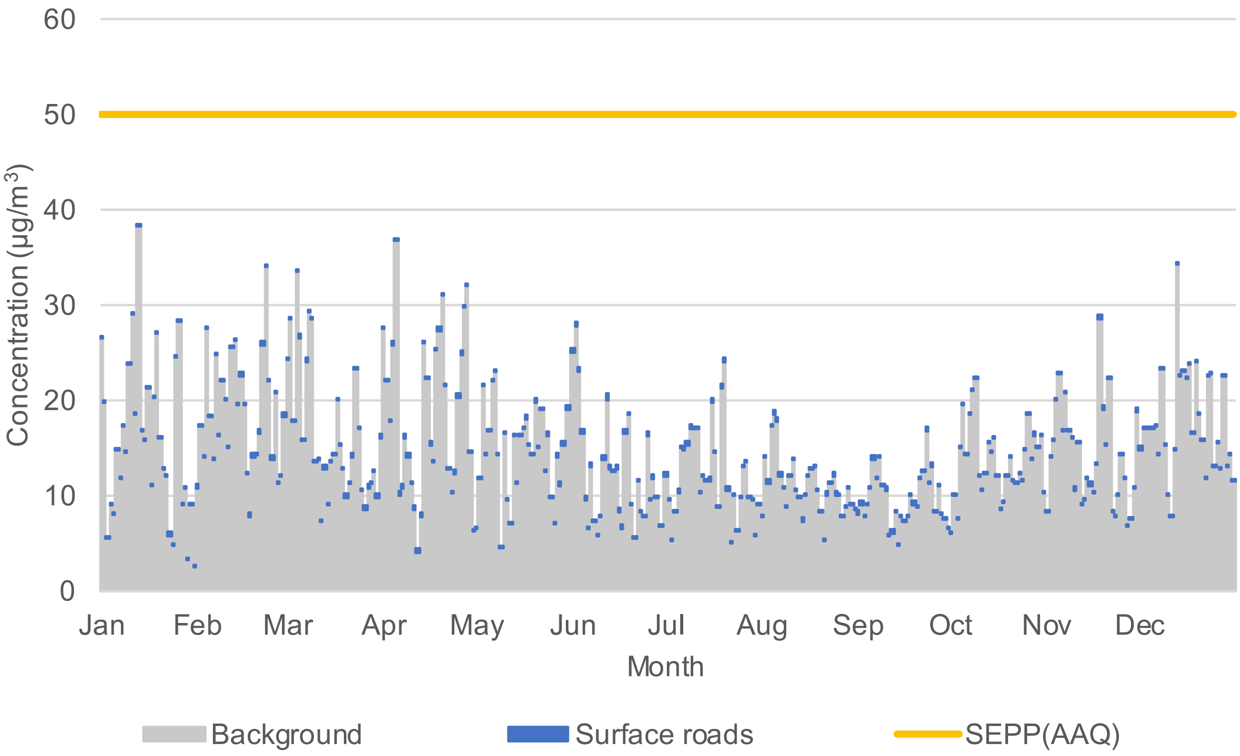


Figure 176: Scenario B1 base case (2036) predicted 24 hour average PM_{10} concentrations at selected receptor in northern part of the study area

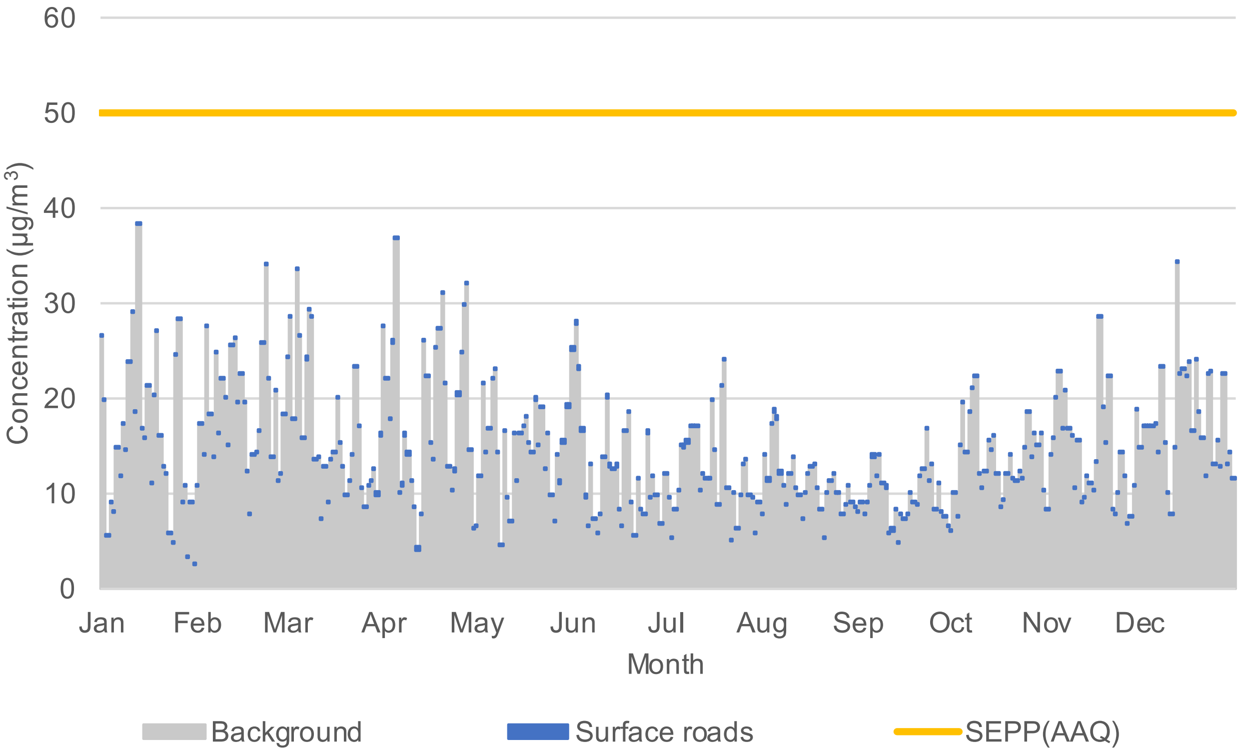


Figure 177: Scenario B1 base case (2036) predicted 24 hour average PM_{10} concentrations at selected receptor in southern part of the study area

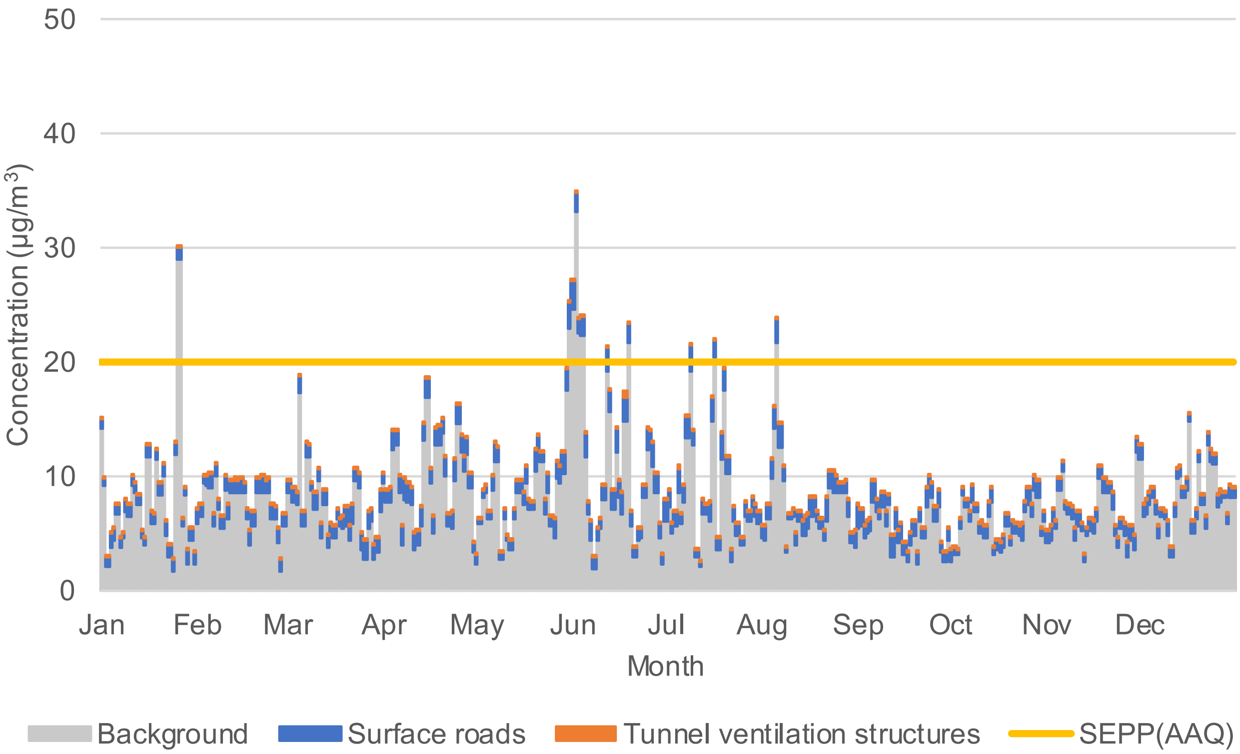


Figure 178: Scenario B1 project case (2036) predicted 24 hour average $PM_{2.5}$ concentrations at selected receptor in northern part of the study area

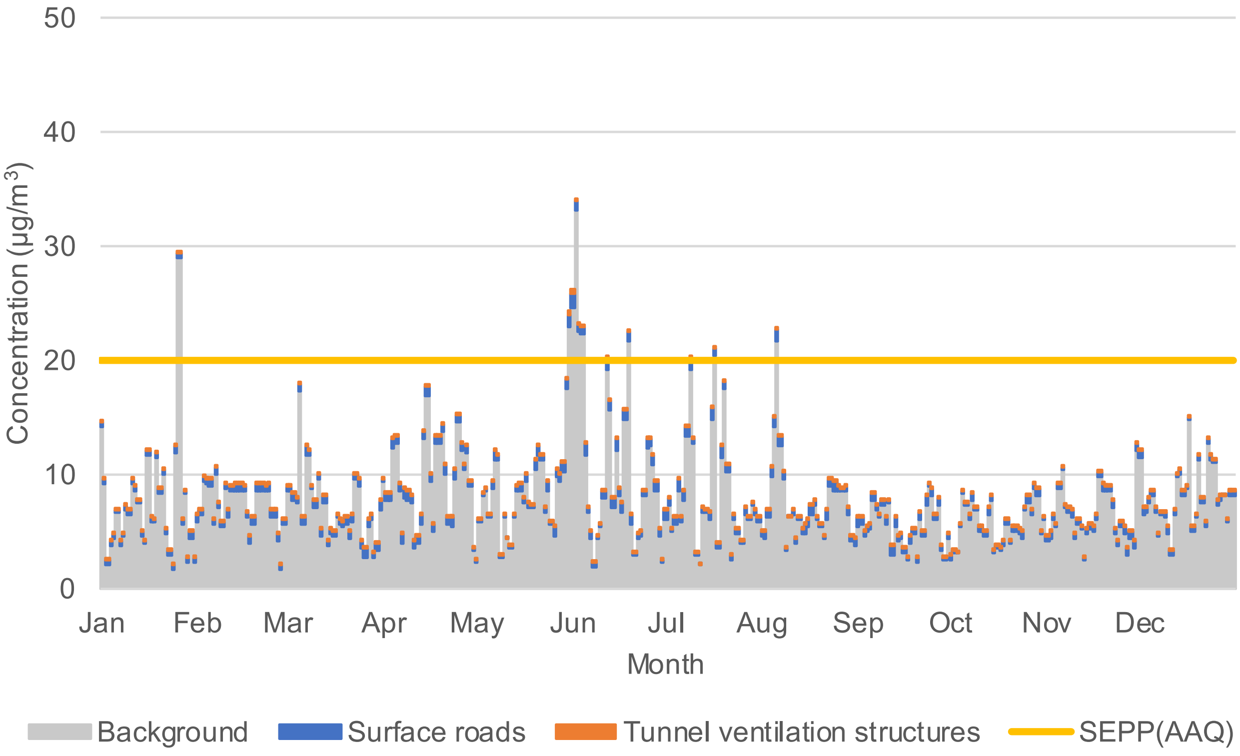


Figure 179: Scenario B1 project case (2036) predicted 24 hour average $PM_{2.5}$ concentrations at selected receptor in southern part of the study area

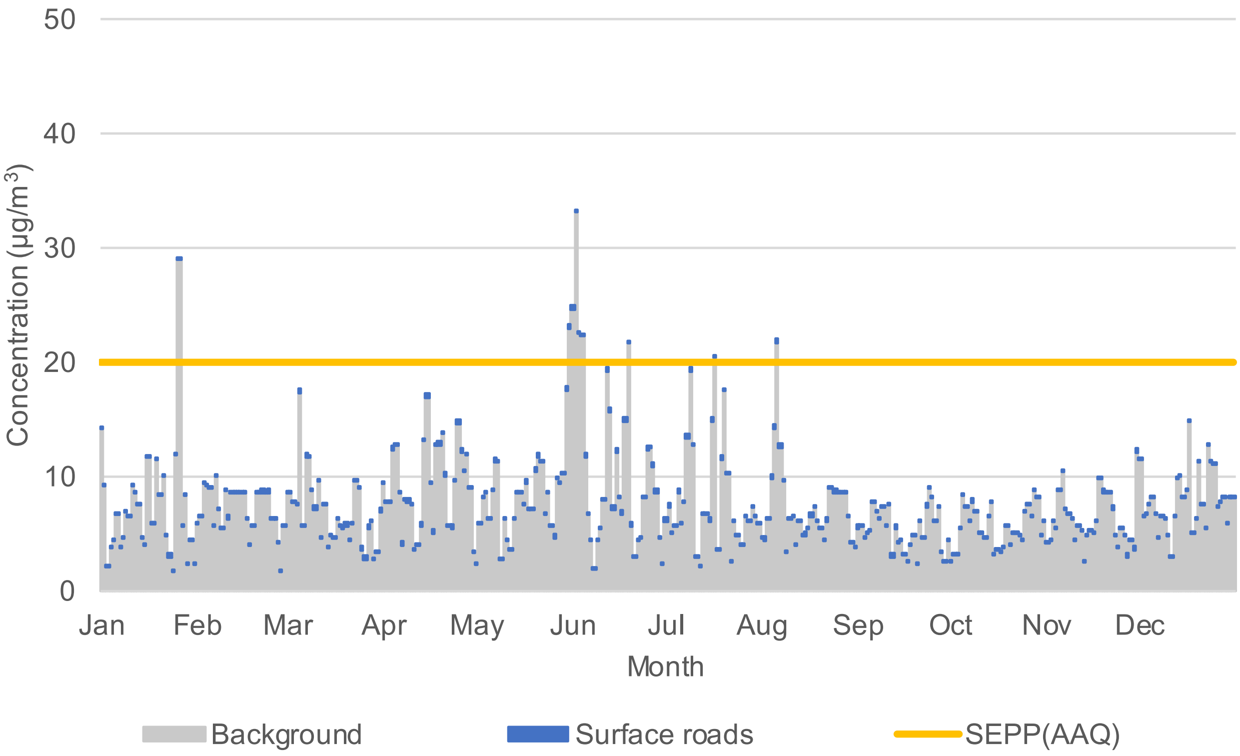


Figure 180: Scenario B1 base case (2036) predicted 24 hour average $PM_{2.5}$ concentrations at selected receptor in northern part of the study area

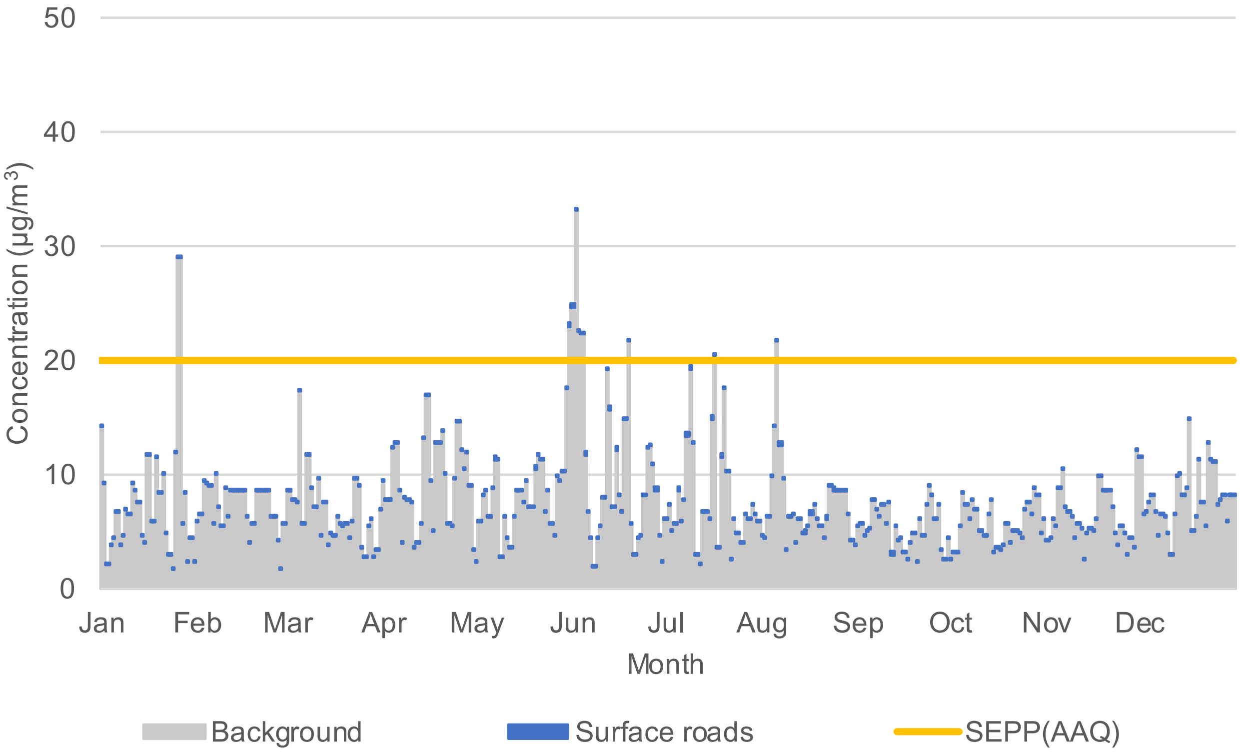


Figure 181: Scenario B1 base case (2036) predicted 24 hour average $PM_{2.5}$ concentrations at selected receptor in southern part of the study area

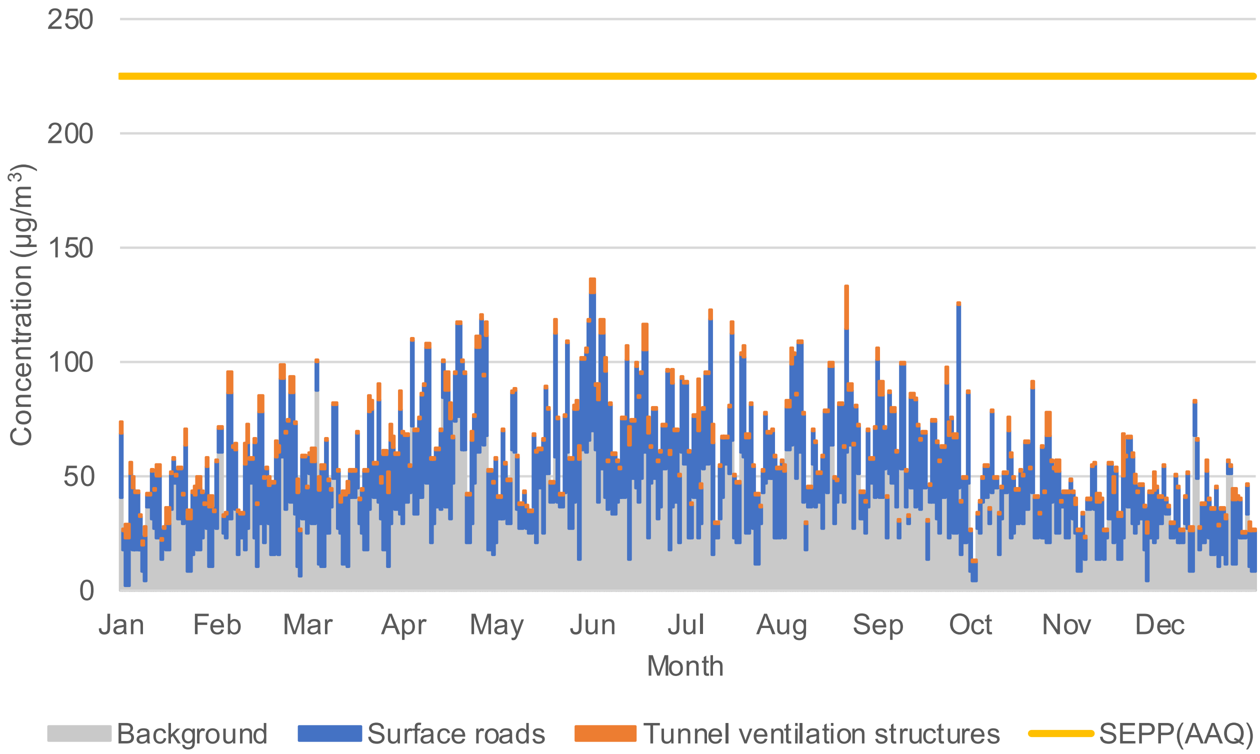


Figure 182: Scenario B1 project case (2036) predicted daily maximum 1 hour average NO_2 concentrations at selected receptor in northern part of the study area

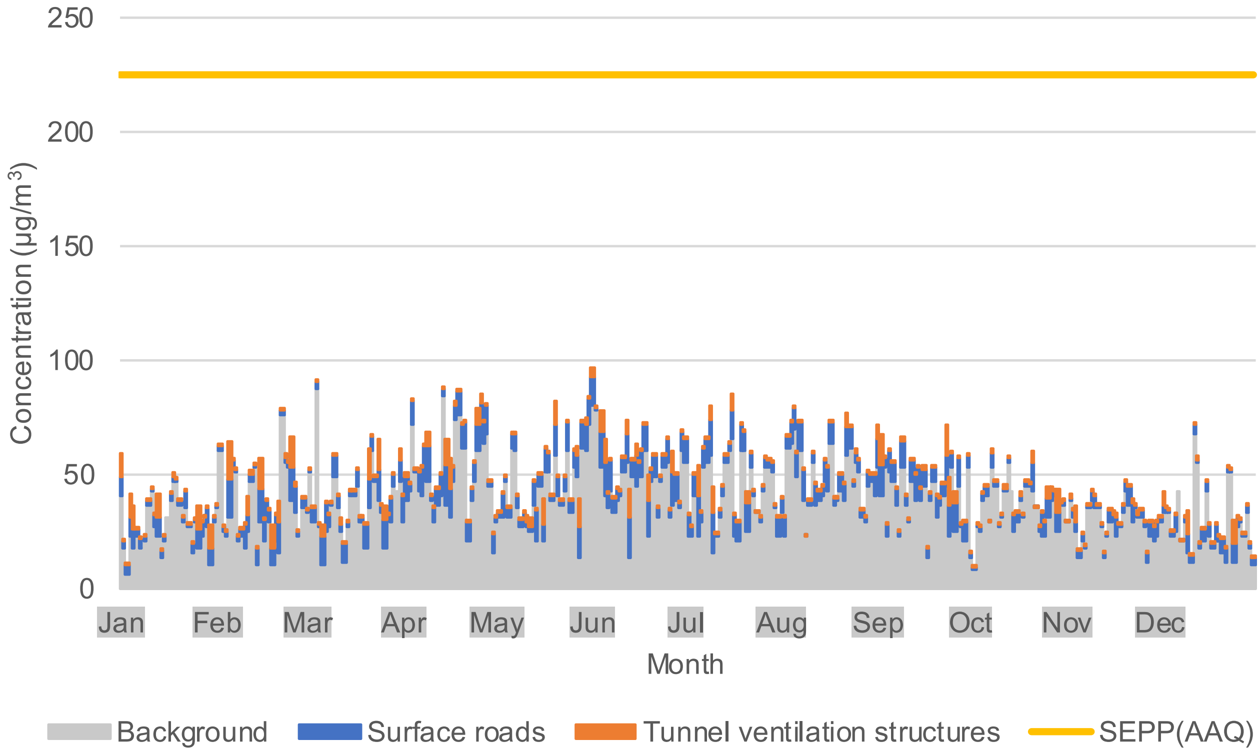


Figure 183: Scenario B1 project case (2036) predicted daily maximum 1 hour average NO_2 concentrations at selected receptor in southern part of the study area

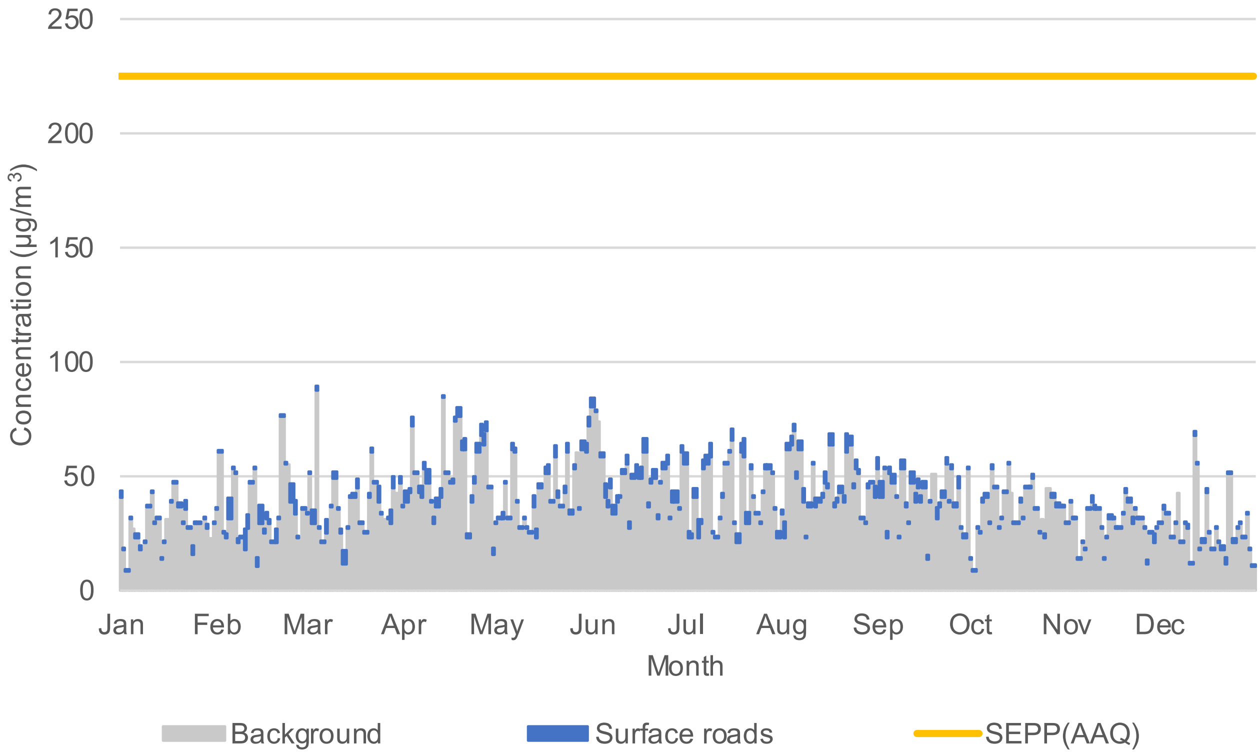


Figure 184: Scenario B1 base case (2036) predicted daily maximum 1 hour average NO_2 concentrations at selected receptor in northern part of the study area

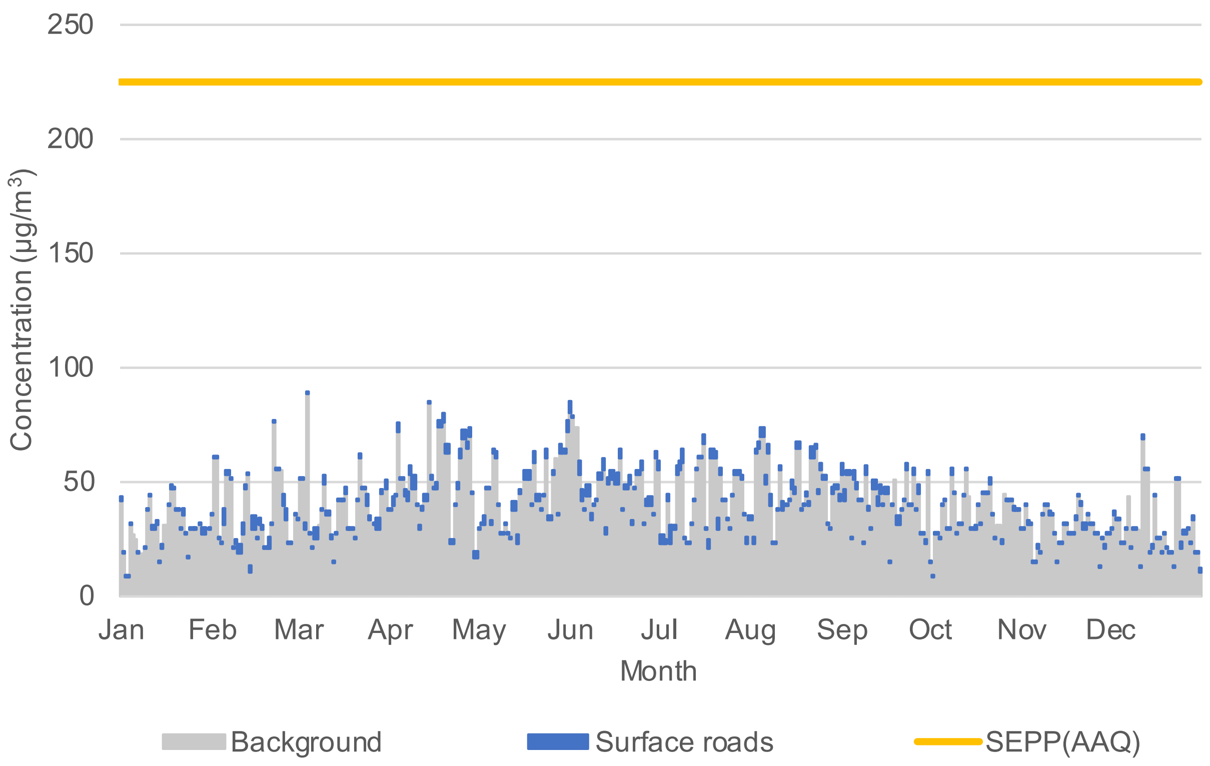


Figure 185: Scenario B1 base case (2036) predicted daily maximum 1 hour average NO_2 concentrations at selected receptor in southern part of the study area

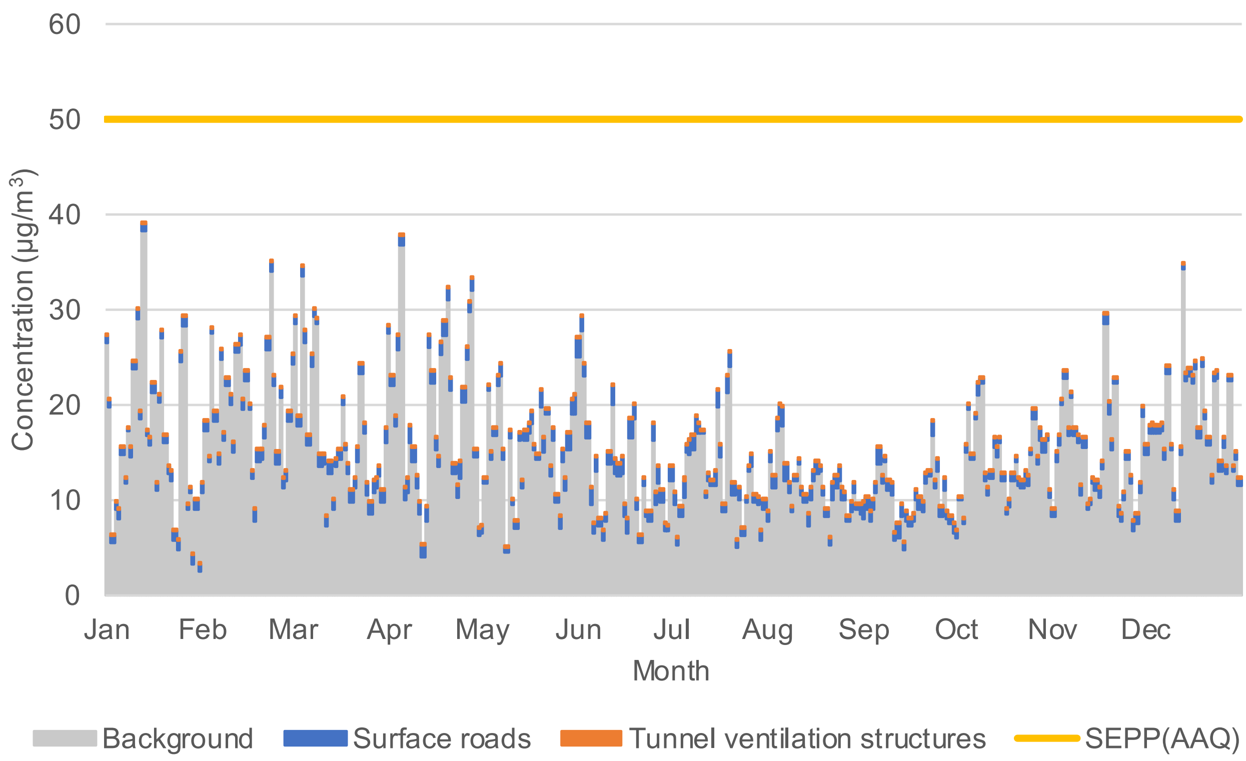


Figure 186: Scenario B2 project case (2036) predicted 24 hour average PM_{10} concentrations at selected receptor in northern part of the study area

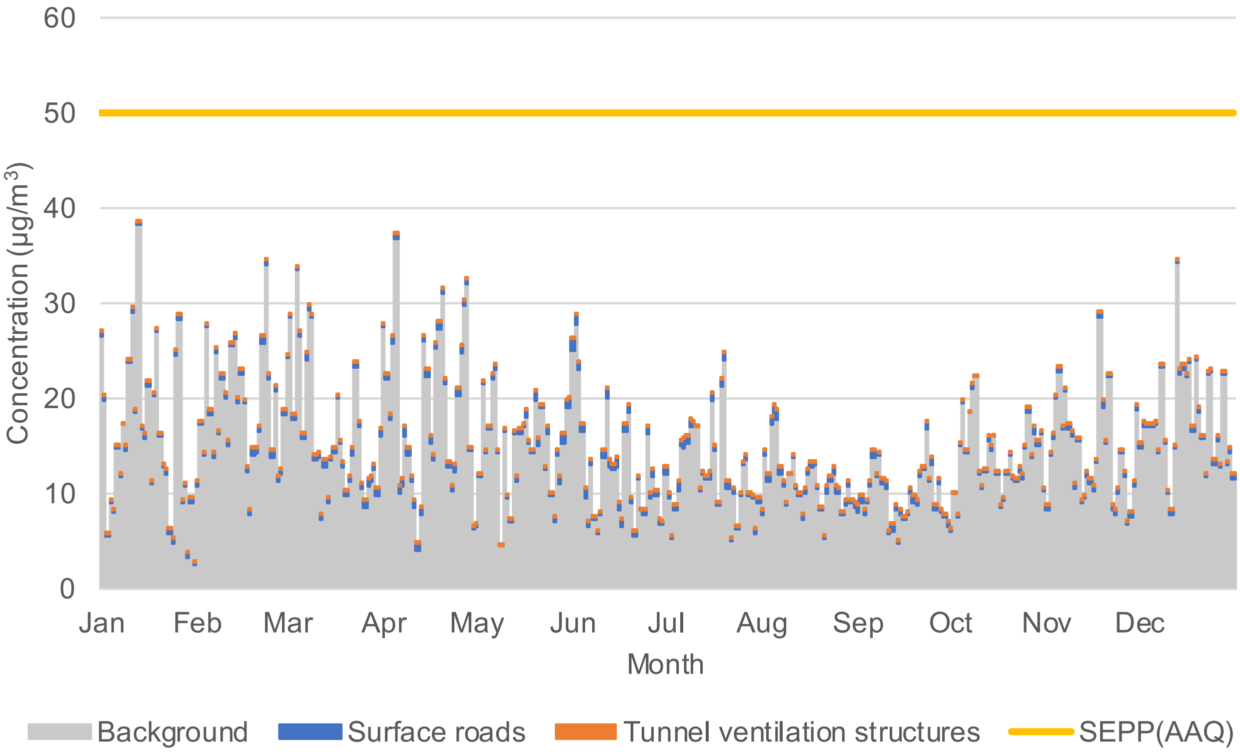


Figure 187: Scenario B2 project case (2036) predicted 24 hour average PM_{10} concentrations at selected receptor in southern part of the study area

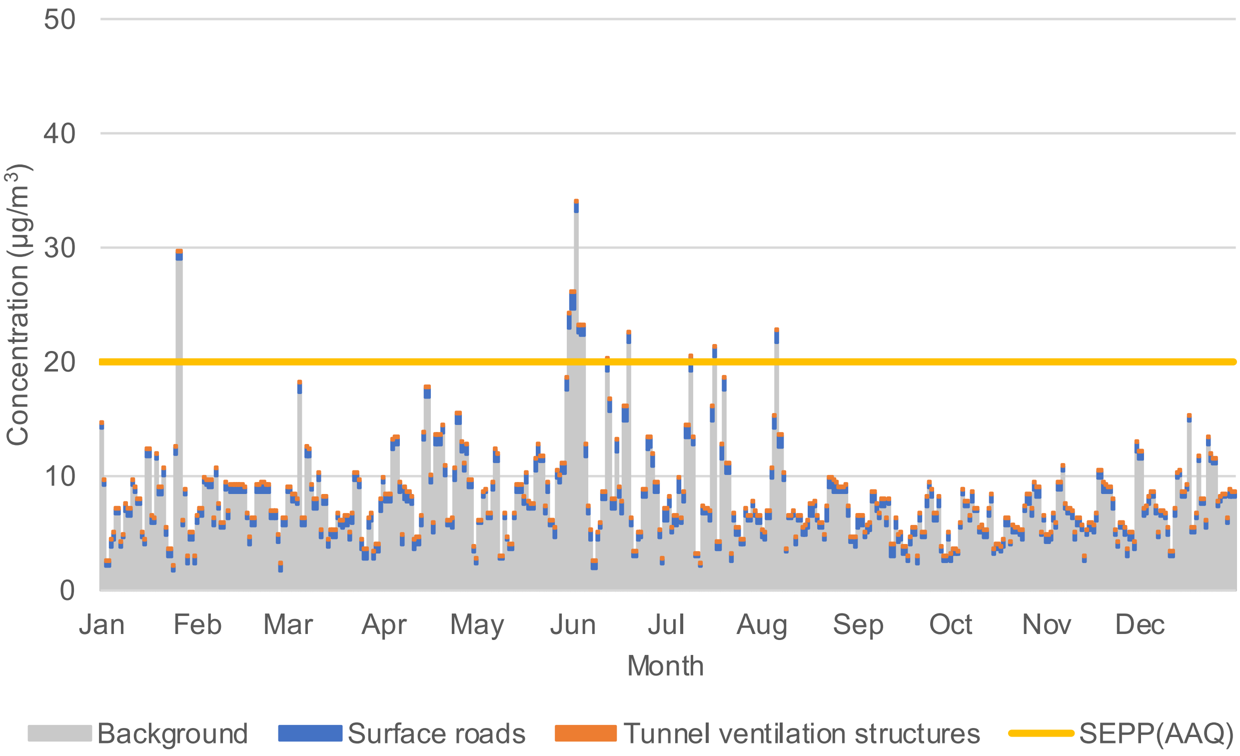


Figure 188: Scenario B2 project case (2036) predicted 24 hour average $PM_{2.5}$ concentrations at selected receptor in northern part of the study area

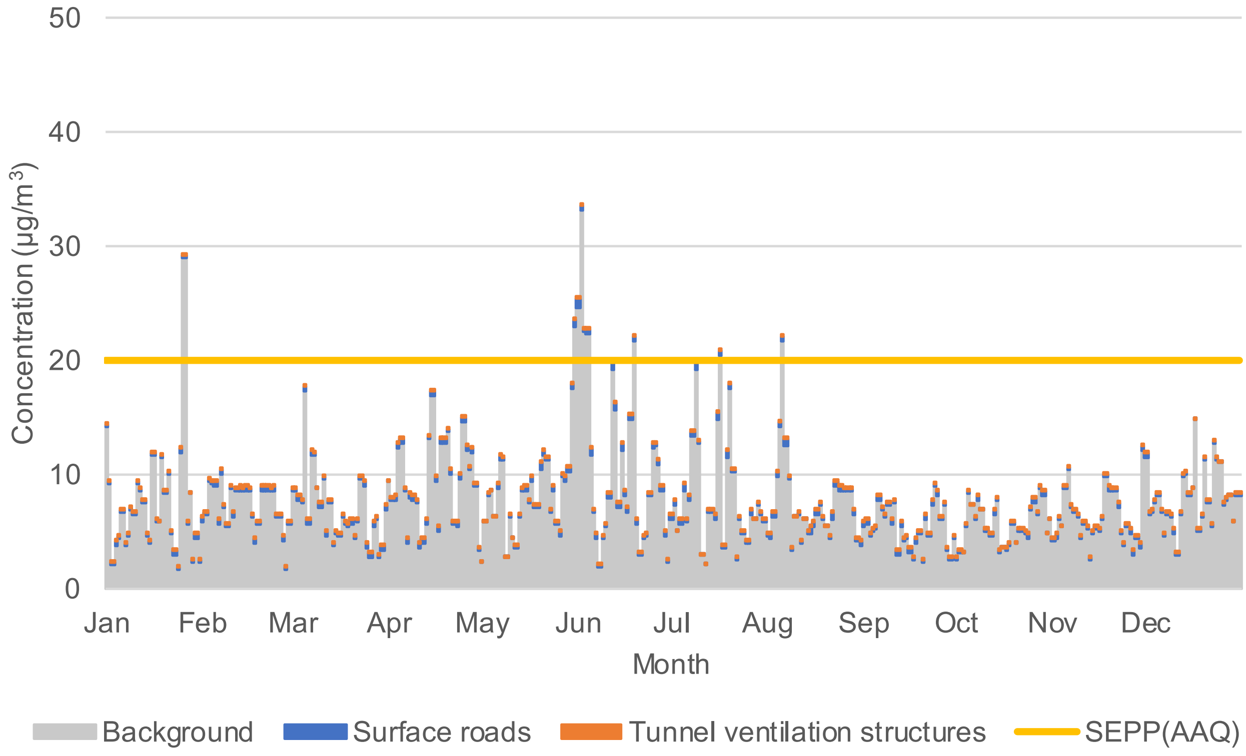


Figure 189: Scenario B2 project case (2036) predicted 24 hour average $PM_{2.5}$ concentrations at selected receptor in southern part of the study area

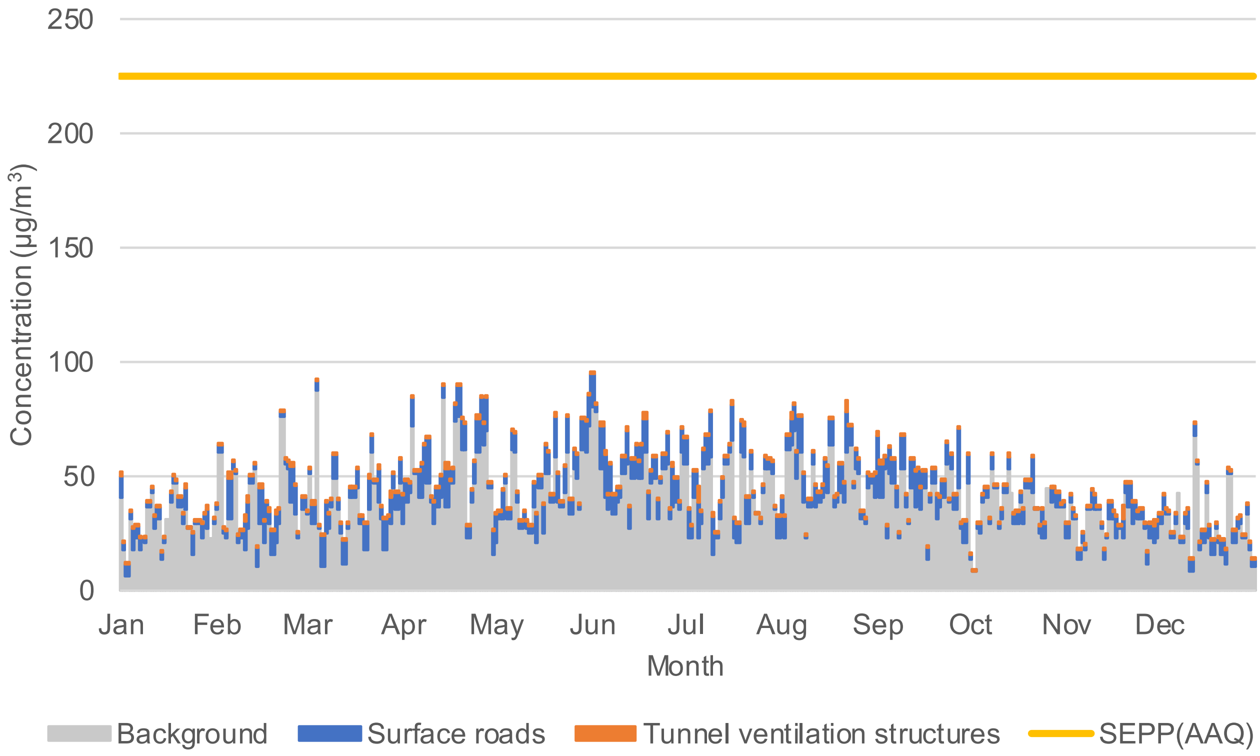


Figure 190: Scenario B2 project case (2036) predicted daily maximum 1 hour average NO_2 concentrations at selected receptor in northern part of the study area

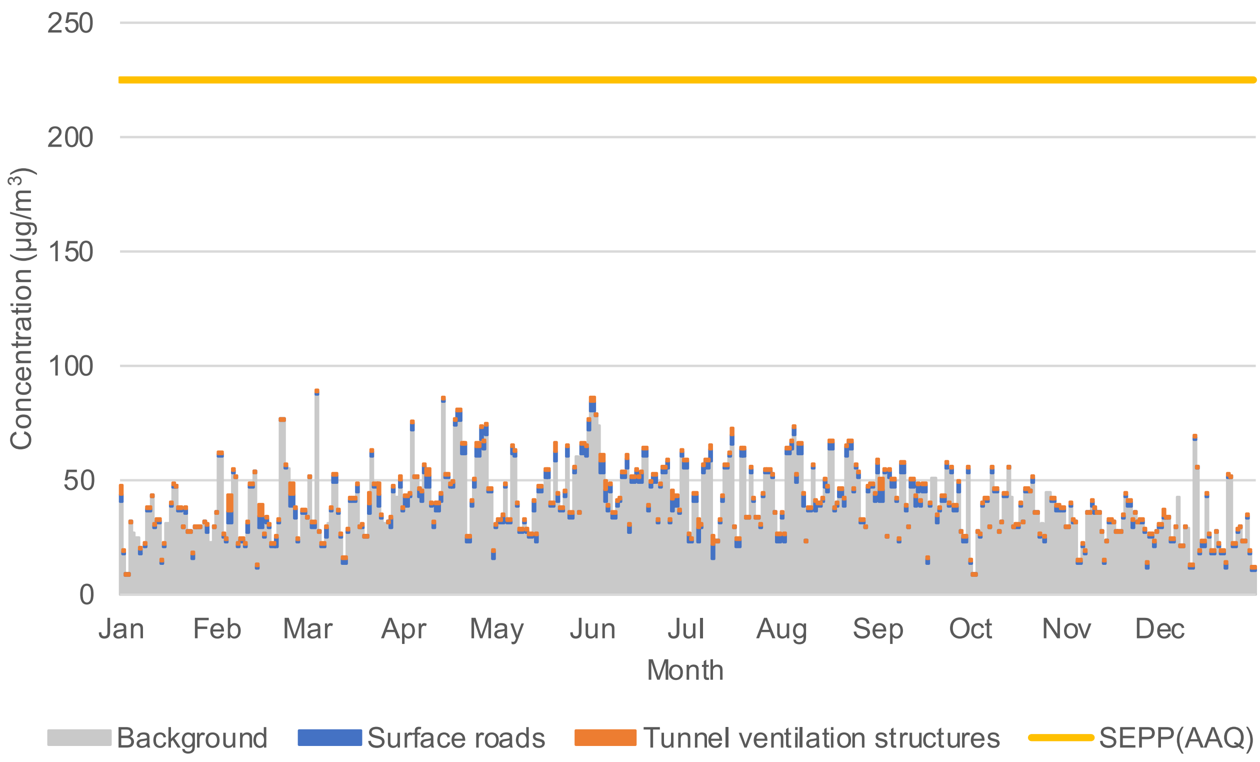


Figure 191: Scenario B2 project case (2036) predicted daily maximum 1 hour average NO_2 concentrations at selected receptor in southern part of the study area

12.3 Discussion

The maximum pollutant concentrations resulting from the proposed tunnel ventilation system and surface road emissions in 2026 and 2036 were predicted and added to 2016 background concentrations.

The 2016 meteorological data file was used in the modelling as it resulted in the highest surface road contributions to the combined impacts, which were significantly higher than the contributions from the tunnel ventilation system at the selected receptors.

The time-series plots of PM_{10}, $PM_{2.5}$ and NO_2 concentrations confirm that vehicle emissions on surface roads contribute more than the tunnel ventilation system at the selected receptors.

The maximum 24 hour average and annual average PM_{10} concentrations predicted for Scenarios A1, A2, B1 and B2 in the north and south parts of the study area are less than the SEPP(AAQ) EQOs.

When compared with Scenario A1 results (using more conservative emission factors), the Scenario A2 project contribution to the maximum 24 hour average PM_{10} concentration in the north of the study area reduces from approximately three per cent to two per cent of the combined project and background predicted concentration. In the south of the study area, there is a corresponding reduction in the maximum 24 hour average PM_{10} concentration of 1.4 per cent to 1 per cent. Annual average PM_{10} concentrations reduce from approximately eight per cent to six per cent, and four per cent to three per cent respectively. When compared with Scenario B1 results (using more conservative emission factors), the Scenario B2 project contribution to the maximum 24 hour average PM_{10} concentration in the north of the study area reduces from three per cent to two per cent of the combined project and background predicted concentration.

In the south of the study area, there is a corresponding reduction in the maximum 24 hour average PM_{10} concentration from two per cent to one per cent. Annual average PM_{10} concentrations reduce from nine per cent to seven per cent, and four per cent to three per cent respectively.

The maximum 24 hour average $PM_{2.5}$ concentrations predicted for Scenarios A1, A2, B1 and B2 in the north and south of the study area are greater than the revised SEPP(AAQ) EQO for 2025. As indicated in the $PM_{2.5}$ concentration time series plots (eg Figure 178), the background concentration exceeds the objective on several (9) occasions. For Scenarios A1, A2, B1 and B2 there are a further two occasions where the $PM_{2.5}$ concentration is greater than the objective in the north and south parts of the study area, resulting from the project contribution combined with the background concentration.

For Scenarios A1 and B1, the annual average $PM_{2.5}$ concentration in the north and the south parts of the study area is greater than the SEPP(AAQ) EQO, primarily because the background exceeds the objective, with the surface road impacts contributing between 6 per cent (Scenario A1: south part of the study area) and 13 per cent (Scenario B1; north part of the study area) of the objective. The tunnel ventilation system contributions are less than one per cent.

When compared with Scenario A1 results (using more conservative emission factors), the Scenario A2 project contribution to the maximum 24 hour average $PM_{2.5}$ concentration in the north part of the study area reduces from approximately five per cent to three per cent of the combined project and background predicted concentration. In the south part of the study area, there is a corresponding reduction in the maximum 24 hour average $PM_{2.5}$ concentration from two per cent to one per cent. Annual average $PM_{2.5}$ concentrations reduce from 12 per cent to 7 per cent, and 6 per cent to 4 per cent respectively. When compared with Scenario B1 results (using more conservative emission factors), the Scenario B2 project contribution to the maximum 24 hour average $PM_{2.5}$ concentration in the north part of the study area reduces from approximately five per cent to three per cent of the combined project and background predicted concentration. In the south part of the study area, there is a corresponding reduction in the maximum 24 hour average $PM_{2.5}$ concentration from three per cent to two per cent. Annual average $PM_{2.5}$ concentrations reduce from 14 per cent to 8 per cent, and 7 per cent to 4 per cent respectively.

The maximum one hour average and annual average NO_2 concentrations predicted for Scenarios A1 and B1 in the north and south of the study area are less than the SEPP(AAQ) EQOs. When compared with Scenario A1 results (using more conservative emission factors), the Scenario A2 project contribution to the maximum one hour average NO_2 concentration in the north part of the study area reduces from 46 per cent to 15 per cent of the combined project and background predicted concentration. In the south part of the study area, there is a corresponding reduction in the maximum one hour average NO_2 concentration from 18 per cent to 1 per cent. Annual average NO_2 concentrations reduce from 31 per cent to 13 per cent, and from 12 per cent to 4 per cent respectively. When compared with Scenario B1 results (using more conservative emission factors), the Scenario B2 project contribution to the maximum one hour average NO_2 concentration in the north part of the study area reduces from 49 per cent to 17 per cent of the combined project and background predicted concentration. In the south part of the study area, there is a corresponding reduction in the maximum one hour average NO_2 concentration from 20 per cent to 1 per cent. Annual average concentrations NO_2 reduce from 34 per cent to 14 per cent, and from 13 per cent to 5 per cent respectively.

12.3.1 Summary

The combined impacts of surface road and tunnel ventilation system emissions are less than the PM_{10} and NO_2 SEPP(AAQ) EQOs at receptors chosen to represent locations likely to be significantly impacted by both sources. The $PM_{2.5}$ SEPP(AAQ) EQO was not met at either receptor, primarily because the background exceeds the objective. The revised (2025) SEPP(AAQ) EQO for $PM_{2.5}$ is consistent with the position that changes and improvements in technology will drive a future reduction in anthropogenic emissions to improve air quality. A projected reduction in background concentrations (as would be expected when vehicle emissions are reduced across the metropolitan area in line with this scenario) has not been accounted for in any of the modelling undertaken for North East Link.

The 2020 emission factors used for the assessment of the tunnel ventilation system impacts against SEPP(AQM) criteria and surface road impacts include a number of conservative elements in order to thoroughly evaluate the North East Link design. The 2025 emission factors used in Scenarios A2 and B2 are considered to more realistically represent the predicted improvements in vehicle engine technology by 2026 and beyond. It should also be noted that 2025 emission factors do not allow for the predicted increase in EVs in the future vehicle fleet and therefore retain some conservatism.

With 2025 emission factors the combined impacts of the surface road and tunnel ventilation system emissions are predicted to be significantly reduced.

13.0 BEST PRACTICE

The following sections discuss best practice options for road tunnel ventilation systems and surface roads.

13.1 Ventilation systems

As noted in Section 4.2.3, SEPP(AQM) Clause 19 requires the application of best practice to the management of new air emission sources. Consequently, the North East Link ventilation system would require the application of best practice in managing emissions to air.

For Class 3 indicators (such as benzene, 1,3 butadiene and PAHs), emissions would need to be reduced to the Maximum Extent Achievable (MEA). MEA is defined in the SEPP(AQM) as:

'*a degree of reduction in the emission of wastes from a particular source that uses the most effective, practicable means to minimise the risk to human health from those emissions and is at least equivalent to or greater than that which can be achieved through the application of best practice*'.

Best practice management of pollutants emitted from vehicles in tunnels requires consideration of factors which include:

- the design of the tunnel ventilation structures
- the receiving environment into which emissions from the tunnel ventilation system are discharged
- the potential impact of emissions on the receiving environment
- air pollution control technology options and efficacy, together with capital and operating costs
- whether other sources of pollution in the local environment can achieve greater pollutant reduction at a lower cost.

EPA Victoria's '*Demonstrating Best Practice*' (2013) provides a methodology for demonstrating best practice, as well as guidelines on the requirements for a Works Approval Application (WAA).

Best practice for the North East Link tunnel ventilation systems principally relates to whether or not air pollution control technology should be installed.

Emissions from the tunnel ventilation system were assessed using the AERMOD plume dispersion model, based on forecast traffic conditions for the years 2026 and 2036 and five years of meteorological data (2013 to 2017).

The outcomes of the tunnel ventilation system air dispersion modelling assessment suggest that pollution control technology would not be required. The design of the tunnel ventilation structures, including their location, discharge height and efflux velocities are aimed at minimising the impact of pollutant emissions. Further discussion of pollution control technology is provided in the following sections.

13.1.1 Air pollution control equipment

Air pollution control equipment has been installed in road tunnels in several countries, including Norway, Japan, Austria, Italy, Spain and Australia (Sydney's M5 East Motorway tunnel trial).

The main types of control equipment utilised to remove pollutants from road tunnel vitiated air include:

- electrostatic precipitators (ESP) to remove particles
- absorption and adsorption ($DeNO_x$ filtration) technologies to remove NO and NO_2.

Pollution control equipment is installed for the purposes of either treating in-tunnel air to improve air quality (principally visibility) for tunnel users, or prior to discharge to atmosphere to improve ambient air quality in the vicinity of the tunnel ventilation structures.

There are approximately 60 ESPs installed in tunnels worldwide, three quarters of which are located in Japan and eight in Norway. The treatment of NO_x is much less common, with only five installations in tunnels worldwide.

While the operational performance and efficacy of these control technologies has been demonstrated in the control of industrial source emissions, where pollutant concentrations are orders of magnitude higher than in road tunnels, limited information is available on their performance in road tunnel applications. The available evidence suggests, however, that their efficacy is less than expected when applied to the removal of the low concentrations of pollutants that occur in road tunnels.

ESP particulate matter (PM) removal efficiencies depend on factors such as air speeds, particle size, particle concentration and the composition of the waste gas stream. PM removal efficiencies for ESPs installed in road tunnels are of the order of 70 per cent (NSW EPA 2006) which is low in comparison with up to 99.9 per cent for ESPs in industrial applications.

There are several reasons for this, including:

- ESPs operate more efficiently when PM concentrations are high. This is not the case for road tunnels where PM concentrations are low due to the high ventilation rates used to maintain in-tunnel air quality for human health and visibility purposes
- ESPs are more efficient at removing larger particles than smaller particles. A large proportion of PM emitted from vehicle exhausts is small (less than 2.5 microns).

ESP technology is considered most appropriate for situations where PM is high relative to gaseous emissions (NHMRC 2008), or where an increased supply of fresh air is unavailable or particularly expensive to provide.

In considering whether best practice comprises the use of ESPs to achieve ambient air quality objectives for the project, a removal efficiency of 70 per cent is not expected to achieve significant benefits (including health, environmental and cost) by reducing ground level PM concentrations, due to the predicted small contributions the ventilation structures make to existing background PM_{10} and $PM_{2.5}$ concentrations. Furthermore, consideration should be given to energy costs associated with ESP operation and the costs for waste treatment and disposal.

De-nitrification ($DeNO_x$) technology is primarily used for the removal of NO_2, with prior removal of PM needed to enhance removal efficiency. The filter system consists of a framework supporting a number of filter modules and a fan to draw air through the modules. Each module comprises a wire basket containing activated carbon as the filter medium.

Only limited data on the performance of this technology is available. The most recent information is for a $DeNO_x$ system installed on the M5 East tunnel in Sydney on a trial basis. The trial outcomes indicated a lower than expected NO_2 removal efficiency.

Sections 13.1.1.1 to 13.1.1.5 provide a review of air pollution control technology installed in road tunnels throughout the world.

13.1.1.1 Japan

Japan has the largest number of ESPs installed in road tunnels worldwide, the majority of which are used to maintain in-tunnel visibility.

In more recent times, ESPs have been used on at least seven road tunnels to comply with ambient air quality objectives, particularly for areas with poor air quality.

Operation of ESPs in Japan is on an as-needs-basis, as determined by air quality monitoring. Available information indicates that operating hours vary. As an example, the Tokyo Bay 'Aqualine' tunnel records only 12 to 13 hours of operation per year (CETU 2010). In the case of the Kan'etsu tunnel, the filtration system operates an average 143 hours per month at the northern portal and 40 hours per month at the southern portal.

Data demonstrating the effectiveness of ESPs in improving ambient air quality in Japan is not available.

In Tokyo, the Central Circular Shinjuku tunnel is 10 kilometres in length, with nine ventilation structures located in a highly urbanised area with poor ambient air quality. The tunnel has been fitted with at least two types of NO_x removal systems using the absorption method. The systems are combined with ESPs enabling greater NO_x removal efficiencies. Information concerning the performance of this filtration system is unavailable.

13.1.1.2 Norway

Of the eight road tunnels in Norway fitted with ESP technology, the majority were installed to maintain adequate in-tunnel visibility, caused by high PM concentrations resulting from the use of metal studded snow/ice tyres in winter.

The Laerdal tunnel, due to its length (over 22 kilometres) and depth (under a mountain), required ESP technology and a $DeNO_x$ removal system to maintain both in-tunnel air quality and visibility, primarily in winter, due to a lack of available fresh air. Neither system is currently being used.

Only one tunnel in Norway (Festning tunnel) was designed to improve ambient air quality, although the ESP system is no longer used.

Overall, the majority of tunnels fitted with ESPs in Norway are infrequently used and only on an as-needs-basis. They are switched on when visibility is expected to be poor or during high levels of traffic.

13.1.1.3 Other locations worldwide

ESPs have been installed in tunnels in Korea and Vietnam for the purposes of maintaining visibility. These tunnels are located in mountainous regions where construction of ventilation structures or fresh air inlets is impractical. ESPs maintain air quality and in-tunnel visibility in locations where fresh air dilution is not practical. No information on the efficacy of these ESPs is available.

In Italy, a refined ESP technology was installed in a tunnel in Cesena (south of Bologna) in 2006. Features of this technology include a novel electrostatic charged filter type technology and low power consumption, with the potential to be coupled to NO_x removal technologies. To date no information on its effectiveness is available.

13.1.1.4 Australia

A. M5 East Tunnel trial, Sydney

The most comprehensive study to date on the effectiveness of air pollution control equipment installed on road tunnel ventilation structures was conducted for the M5 East tunnel in Sydney.

From March 2010 to September 2011, the Sydney M5 East tunnel trialled an ESP and a DeNO$_x$ system. The principal purpose of the trial was to reduce in-tunnel haze caused by particles.

In 2011, The Commonwealth Scientific and Industrial Research Organisation (CSIRO) was commissioned by the then Roads and Transport Authority to evaluate the removal efficiencies of the ESP and DeNO$_x$ systems. The findings of the study concluded that removal efficiencies of $PM_{2.5}$, PM_{10} and NO_2 were 69 per cent, 70 per cent and 55 per cent respectively (CSIRO 2011a; CSIRO 2011b).

AMOG (2012) conducted a subsequent review of the M5 East tunnel air pollution control system operational performance, concluding that, for the ESP:

- approximately 65 per cent of PM_{10} was captured, much lower than the target 80 per cent efficiency
- modifications, including expansion of the collector plate area or decreased air flow, may increase the system effectiveness
- the system was unreliable, with an availability of only 84 per cent in comparison with the design value of 99.5 per cent.

For the DeNO$_x$ system:

- approximately 55 per cent of NO_2 was removed which was lower than expected
- NO_2 was converted to NO and released to the atmosphere rather than being captured by the filter
- the filter only processed 14 per cent of the air flow in the westbound tunnel and consequently could not have a large impact on in-tunnel NO_2 levels
- using activated carbon to reduce NO_2 in the tunnel only slightly reduced total NO_x emissions from the ventilation structure.

The report concluded that the air pollution control system should cease operation in its current form and that alternative methods for effectively removing PM and NO_2 should be investigated.

Trial costs

The cost of installing and operating the air pollution control technology was evaluated as part of the AMOG operational performance review of the M5 East tunnel trial. Cost estimates were presented per tonne of pollutant removed, with and without capital costs.

The cost to remove PM_{10} was calculated at:

- $17 million per tonne including operating and capital costs amortised over 20 years
- $3.8 million per tonne for operating costs only.

The cost of NO_2 removal was calculated at:

- $4 million per tonne including operating and capital costs amortised over 20 years
- $874,000 per tonne for operating costs only.

By comparison, the estimated cost of removing particulate matter using filters fitted to vehicle exhausts ranged from $150,000 per tonne to $300,000 per tonne. This indicates the cost of ESP and $DeNO_x$ control technology is very high.

Comparative costs

In 2012, the then New South Wales Department of Environment Climate Change and Water commissioned Sinclair Knight Merz (SKM 2010) to identify and analyse a range of pollutant abatement initiatives. The study identified 12 initiatives in the Sydney region, with PM_{10} reduction costs ranging from $1,000 to $274,000 per tonne. This information is presented below along with the estimated M5 East tunnel filtration costs for comparative purposes.

Table 120: Cost of PM_{10} reduction measures

PM_{10} reduction measure	Cost of PM_{10} reduction ($ per tonne)	PM_{10} reduction (tonnes per annum)
National emission standards for wood heater (1 g/kg limit)	1,000	1,701
National emission standards for wood heater (3 g/kg limit)	1,000	45
Emission limits for industry	5,000	359
Tier 4 emission standards for off-road vehicles and equipment	12,000	31
Wood heater – reduced moisture content of firewood	20,000	93
Small engines (2-stroke to 4-stroke) for recreational boating and lawn mowing	39,000	261
Truck and bus diesel retrofit program	151,000	1
Diesel locomotive replacement (USEPA Tier 0 to Tier 2)	156,000	53
Diesel locomotive replacement (USEPA Tier 0 to Tier 2 + Retrofit Tier 2 Locomotives with selective catalytic reduction)	191,000	72
Euro 5/6 emission standards for new passenger vehicles	209,000	131
Recommission and electrification of Enfield Port Botany freight line	244,000	3
Port Botany shore-side power	274,000	11
M5 East tunnel ESP (operating cost only)	**3,800,000**	**0.2**
M5 East tunnel ESP	**17,400,000**	**0.2**

Table 120 indicates that the operating cost alone for the M5 East tunnel ESP is significantly greater than the cost of implementing emission standards for wood heaters, replacing diesel locomotives and providing shore-side power at Port Botany.

Health benefits

The NSW Environment Protection Authority (NSW EPA) engaged PAE Holmes to develop a valuation methodology to account for the health impacts associated with a reduction in PM emissions. The study estimated the health benefit of removing one tonne of $PM_{2.5}$ to be valued at $280,000. As the majority of PM removed in the M5 East ESP trial comprised $PM_{2.5}$, its operating costs were more than 10 times higher than the estimated health benefit. Furthermore, all the pollution reduction initiatives presented in Table 120 cost less than one tenth of the M5 East ESP system, with the potential for removing significantly more PM.

B. East West Link project, Melbourne

The East West Link project (now cancelled) comprised an 18 kilometre tollway to connect the Eastern Freeway at Clifton Hill with the M80 Ring Road at Sunshine West. The first stage included twin 4.4 kilometre three lane tunnels from Hoddle Street, Clifton Hill to CityLink at Parkville. The tunnel component of the project was subject to an EPA Victoria Works Approval, granted with conditions in June 2014.

During the WAA process, EPA Victoria (2014a) reviewed the requirement for treating tunnel air emissions and considered that:

- *‘The combination of good tunnel air quality and high exhaust gas volume makes the use of air pollution control technology unnecessary, as demonstrated by the M5 East tunnel experience in Sydney. The relatively small gain in air quality impact is not justified by the cost, which needs to be considered as a part of best practice as prescribed in SEPP(AQM) under 7(1)(c) which states ‘the measures adopted should be cost-effective and in proportion to the significance of the environmental problems being addressed.*
- *The need to use air pollution control equipment to maintain in-tunnel visibility is more applicable in colder climates eg Norway, Japan. However, this is not considered a requirement where good in-tunnel visibility will be maintained as a function of tunnel length and design of the ventilation system including access to outside air.*
- *The need to use air pollution control technology to protect air quality in areas around the tunnel ventilation stacks, does not exist for this project.*
- *Tunnel ventilation system can achieve adequate dispersion of emissions during normal operation ensuring all emissions are discharged from the ventilation stacks and not from the tunnel portals.*
- *For Class 3 indicators, it is not feasible to use emission control technology to remove these from the discharge stacks. The most effective way is to remove them at source through improvements in fuel quality and motor vehicle technology. The improved emission quality associated with the introduction of tighter fuel quality requirements and Euro vehicle emission standards is considered to represent MEA for Class 3 indicators’.*

EPA Victoria concluded that the Reference Project for the East West Link, which did not include air pollution control technology, constituted best practice air emission management and that Class 3 indicators had been reduced to the MEA, in accordance with SEPP(AQM) requirements.

C. CityLink and East Link, Melbourne

In its submission on the East West Link Comprehensive Impact Statement, EPA Victoria (2014b), stated that:

‘as part of its assessment EPA has reviewed the need to filter emissions before leaving the vent stack. In previous tunnel ventilation system approvals (CityLink and East Link) filters were not required as the fans direct air flow through the tunnels to provide a safe in-tunnel air quality and dilute the emissions to a point where filters would not provide a significant benefit to air quality’.

To date no permanent air pollution control equipment has been installed in Australian road tunnels to control vehicle emissions to air.

13.1.1.5 Summary

Based on the information presented, air pollution control technology cannot be considered best practice for the North East Link tunnel ventilation system on the basis of health, environmental and cost considerations.

The tunnel ventilation structures have been optimised to ensure that air quality impacts on the receiving environment are minimised.

The French Government conducted an international assessment of the treatment of air in road tunnels (CETU 2010) and concluded that systems incorporating control equipment are '*still bulky and less cost effective than conventional systems, both in terms of investment and operation. Generally speaking these systems are also energy-intensive given the surplus ventilation requirements*'. The report also indicated that very few air filtration systems used in tunnels are routinely operated.

The NHMRC report (NHMRC 2008) on air quality in tunnels states the '*most effective way to manage air quality both in and around tunnels is through vehicle fleet emission reductions*'. Furthermore, the New Zealand Transport Agency (2013) states that the available evidence to date suggests the effectiveness of pollution control technology for removing emissions from vehicles in tunnels is questionable. Current technologies are pollutant specific, only address local and not regional road transport related air pollution, generate chemical waste and have significant capital and operating costs.

Evidence to date indicates there are more cost-effective mechanisms for reducing air pollution in metropolitan Melbourne with the potential for greater health benefits (such as reducing the use of wood heaters). In addition, introducing and enforcing more stringent fuel standards and adopting new vehicle technology through State and Commonwealth legislation are more practicable measures for controlling pollutant emissions from vehicles. These measures would have a flow on effect through the reduction of pollutant emissions from the North East Link tunnel ventilation system.

13.2 Surface roads

As noted in Section 12.1, the most effective measures for reducing the impact of pollutant emissions from vehicles on surface roads are through the introduction and enforcement of more stringent fuel standards, adoption of tighter new vehicle emission standards and financial incentives to encourage the uptake of low emission vehicle technology (for example EVs) through Federal and State legislative instruments. These measures are however outside the scope and influence of North East Link.

Other best practice options for managing air quality associated with vehicle emissions principally relate to the effectiveness of vegetative and acoustic barriers installed between the road and adjoining residential properties or other sensitive receptors. The effectiveness of these methods are discussed below.

13.2.1 Vegetative barriers

Roadside vegetation can reduce exposure to air pollution through the interception of airborne particles or through the uptake of gaseous air pollutants via stomata on the leaf's surface. The removal of gaseous pollutants can be permanent, while vegetation may only retain particles temporarily. Particles can be re-entrained due to the action of wind, removed by precipitation, or dropped to the ground with leaf and twig fall. These removal mechanisms can impact local air, water and soil pollution.

University of Leicester's Department of Physics and Astronomy conducted a computational fluid dynamics (CFD) modelling study (Jeanjean, A.P.R. et al, 2015) which suggests that trees have a beneficial impact on a regional basis by increasing turbulence, resulting in an estimated seven per cent average reduction in pollution from road traffic emissions in Leicester City, at pedestrian height.

In 2016 The Nature Conservancy published a report which evaluated the role of urban trees in addressing particulate matter pollution and extreme heat through the collection of geospatial information on forest and land cover, $PM_{2.5}$ concentrations and population density for 245 cities, together with a detailed review of published literature on the topics (The Nature Conservancy, 2016).

The report concluded that particulate matter is removed by plants through dry deposition onto the leaf surface, with much of the fine fraction ($PM_{2.5}$) permanently incorporated into the leaf wax or cuticle, while a portion of the coarse fraction is resuspended as a function of wind speed and the remainder washed to ground by precipitation. Farmer (Farmer, A., 2002) confirmed that small particles may enter the interior of the leaf as the opening of the stomata is generally between 8 to 10 microns. Factors which affect the degree of dry deposition include particulate matter concentration, leaf surface area and the amount of atmospheric mixing.

Quoted studies suggest the percentage reduction in PM_{10} concentrations near urban trees ranges from nine to 50 per cent, with The Nature Conservancy concluding that trees are at least as effective in removing $PM_{2.5}$ as they are at removing PM_{10}. Their analysis, however, suggests that tree planting and other vegetative screens have primarily local benefits, with most reductions in particulate matter concentrations occurring within 15 to 30 metres of the vegetation, with very little reduction in concentrations beyond 300 metres.

However, The Nature Conservancy regarded tree planting as a low return on investment particulate matter reduction option for a number of cities, including Melbourne, due to the relatively low concentrations of particulate matter in ambient air. It also concluded that, in general terms, the median cost of tree planting for particulate matter mitigation was higher than four of the other five particulate matter reduction strategies examined, suggesting that in many cases conventional strategies may be more cost effective.

New Zealand Landcare Research conducted a review of published information on the effectiveness of vegetative barriers in mitigating the impact of vehicle emissions (only published in draft form) (Landcare Research, 2006). The document quotes a number of studies which examined the deposition velocity for particles, suggesting that for particles greater than 5 microns sedimentation is the dominant mechanism, while for particles less than 0.1 microns Brownian diffusion predominates. It is also suggested that particles in the size range 0.1 to 2 microns have limited means to move through the leaf boundary layer, resulting in a lower deposition velocity.

A comprehensive review of literature dealing with urban vegetation and particle air pollution, funded by the Swedish Research Council Formas, the Swedish Energy Agency, the Swedish Environmental Protection Agency, the Swedish National Heritage Board and the Swedish Transport Administration (Janhall, S., 2015) concluded that vegetative barriers should be; close to the source to be effective; porous and high enough to allow the pollutant plume through, but solid enough to allow air to pass close to the surface. Other findings were that coarse particle deposition is more efficient at high wind speeds, with the opposite true for ultrafine particles; vegetation density often changes due to strong winds; to improve deposition, vegetation should be hairy and have a large leaf area index.

The USEPA has published recommendations for constructing roadside vegetative barriers to improve near road air quality (USEPA, 2016). Factors which influence the effectiveness of a vegetative barrier include species selection and maintenance requirements and barrier height, thickness and porosity.

Species selection is an important consideration with a preference for evergreen, native, drought resistant, non-invasive and non-poisonous species with waxy and/or hairy leaves and a high surface area (which exhibit higher particulate matter removal efficiencies), together with plants that emit low levels of VOCs (which can enhance the formation of ozone) and pollens (which can exacerbate human respiratory effects). It is also essential that the growth and viability of trees and shrubs are not affected by vehicle pollutants.

Studies have also shown that gaps in vegetation barriers can lead to increased pollutant concentrations downwind, sometimes higher than those present with no barrier.

Recommended vegetative barrier design requirements include a:

- minimum height of 5 metres (or extending a minimum of 1 metre above an acoustic barrier)
- minimum thickness of 10 metres, consisting of multiple rows of different types of vegetation
- porosity in the range 0.5 to 0.9
- length extending 50 metres beyond the area of concern, with an alternative consideration installation of the barrier perpendicular to the road, depending on land availability.

It is considered, however, that the minimum thickness of a vegetative barrier, and the time taken for it to establish, are major disadvantages against their use for air quality purposes in an urban environment.

13.2.2 Acoustic barriers

Plume dispersion models used to assess the impacts of vehicle emissions on air quality do not normally evaluate the effectiveness of noise walls (acoustic barriers) in reducing pollutant concentrations downwind.

Pollutant concentrations behind a barrier located downwind of a roadway are typically lower than concentrations in the absence of the barrier. The effectiveness of acoustic barriers at mitigating near road pollutant exposure depends on roadway configuration, local meteorology and barrier height, design and endpoint location.

A USEPA publication (2015) describes best practice measures for reducing rear-road pollutant exposure at schools. Measures other than improved building ventilation and filtration, upgraded bus fleets, idling policy, school siting and active transportation, include vegetative and acoustic barriers.

Quoted studies suggest that reductions in downwind pollutant concentrations within 150 metres of a highway in the presence of a well-designed acoustic barrier can be of the order of 15 to 50 per cent. It is further suggested that the combined use of vegetative and acoustic barriers could reduce vehicle pollution downwind of roadways by up to 60 per cent. However, in order to be effective the vegetation should exceed the height of the acoustic barrier such that it allows air flow through and over the plants to enhance pollutant removal and air mixing.

Research on acoustic barriers suggests the barrier should extend at least 50 metres laterally beyond the area of concern in order to maximize reductions in downwind concentrations (Baldauf, R.W. et al, 2016).

Bowker (Bowker G.E. et al, 2007) modelled the effectiveness of acoustic barriers in reducing pollutant concentrations using the Quick Urban & Industrial Complex (QUIC) model developed by the Los Alamos National Laboratory, with model validation studies conducted using a mobile ultrafine particle (UFP) analyser. The field site allowed UFP (20 and 75 nanometres) measurements in open terrain, with a noise barrier present near the highway and with a noise barrier and vegetation present near the highway. The modelling results suggested the highest pollutant concentrations in open terrain, followed by a noise barrier near the road and a noise barrier and vegetation near the road. It was noted, however, that open terrain concentrations decreased faster with distance than when roadside barriers were present. Mobile UFP (less than 0.1 microns) measurements indicated that QUIC reasonably represented pollutant transport and dispersion for each configuration. The study however was limited to the examination of winds perpendicular to the road and acoustic barrier.

In 2013 Golder conducted a study for VicRoads (Golder, 2013) which assessed the effect of roadway acoustic barriers on the dispersal of vehicle exhaust emissions using a 3D steady state CFD model and the QUIC model noted above. Barrier heights of zero, four and six metres were considered, together with wind speeds ranging from 0.5 to 10 metres per second, with angles of incidence perpendicular to the barrier ranging from zero to 60 degrees and model predictions at distances ranging from five to 100 metres from the barrier. In general, both models predict that acoustic barriers increase vertical dispersion of roadway emissions and reduce downwind pollutant concentrations downwind of the leeward barrier by over 30 per cent, depending on the configuration.

The CFD model predicted reduced downstream NO_x concentrations with increasing barrier height, increasing wind speed and decreasing wind angle of incidence on the road and barrier system. The response of the QUIC model to increasing barrier height and wind speed was as expected, predicting reduced downstream NOx concentrations overall. Its response to increasing wind angle of incidence however did not coincide with the CFD model predictions.

As the incidence angle deviates from zero degrees, the component of velocity normal to the barrier decreases. When a building was located in the near wake of the barrier, concentrations at the windward face of building were up to 50 per cent less than at the same distance without a building.

In a limited number of higher wind speed cases (five and 10 metres per second) CFD predicted higher NO_x concentrations at a distance of 20 metres from the four metre high barrier, however the six metre barrier had lower concentrations than when no barrier was present.

Baldauf (Baldauf, R.W. et al, 2008) measured CO and particulate matter number concentrations at various distances from a highway when winds were approximately perpendicular to the road (plus or minus 45 degrees). A section of the highway had open terrain perpendicular to the road and another section a 6 metre acoustic barrier with vegetation in the vicinity of the barrier. Pollutant concentrations generally decreased by 15 to 50 per cent behind the barrier, however conditions occurred where concentrations were greater behind the barrier than with no barrier. This was thought to be due to the barrier resulting in higher pollutant concentrations on the road side under certain wind conditions, consistent with the results of various modelling studies.

CO concentrations decreased by up to 50 per cent behind the barrier at a distance of 10 metres from the nearest traffic lane. Total particulate matter number concentrations decreased on average 20 per cent behind the barrier at a distance of 20 metre from the nearest traffic lane. Additional measurements specifically for 20 nm and 75 nm particles indicated an average 30 per cent reduction behind the barrier at a distance of 15 metres from the nearest traffic lane. Overall the acoustic barrier was shown to reduce pollutant concentrations by on average 15 to 25 per cent within the first 50 metres from the road, equalling concentrations measured in open terrain at a distance of approximately 150 to 200 metres from the road. The latter distance may however be increased for a continuous acoustic barrier, due to end effects. Measurements of the specific particle sizes (20 and 75 nanometres) tended to show the larger particle size concentration equalling the no terrain option closer to the road.

The results also demonstrated that pollutant concentrations did not decrease significantly until moving a distance of approximately 40 metres along the barrier from the end, with concentrations continuing to decrease further along the barrier. The presence of mature trees (greater than 10 metres in height) was demonstrated to also reduce particulate matter concentrations.

Wesseling (Wesseling, J., 2009) examined the results from 1.5 years of monitoring data downwind of a road, with and without a four metre acoustic barrier (at distances of 5, 10 and 28 metres from the barrier). Data was included for analysis when the wind speed was greater than or equal to one metre per second and the direction was perpendicular to the road (plus or minus 60 degrees) with an hourly standard deviation less than or equal to 15 degrees. The average results showed the acoustic barrier resulted in a 20 per cent reduction in NO_2 and NO_x at a distance of 10 metres from the roadway, with no significant impact on the barrier's effectiveness due to atmospheric stability and only a small influence due to wind speed. The PM_{10} data was not evaluated in detail, however a 30 per cent reduction at 10 metres was approximated from the reported data. There is also the suggestion that, based on limited data, increased mixing associated with the acoustic barrier results in higher levels of NO_2 at a distance of five metres when ozone is present in significant concentrations (greater than approximately 20 parts per billion).

Hooghwerff (Hooghwerff, J., 2009) evaluated PM_{10}, NO_x and ozone concentrations at a test site which contained instrumentation for measuring downwind of open terrain, a four metre reference acoustic barrier and various trial barriers (including a seven metre standard barrier, T-top barrier, vegetated barrier and a fibreboard barrier coated with titanium dioxide). At a distance of 10 metres the reference barrier showed a reduction of 20 per cent in NO_x, 14 per cent in NO_2 and 34 per cent in PM_{10} concentrations. The study concluded that barrier height is an important consideration, with the 7 metre standard barrier outperforming the four metre reference barrier. It was also concluded that none of the innovative barriers were significantly better than the reference barrier.

There is therefore clear evidence that acoustic barriers can effectively reduce pollutant concentrations downwind of the barrier in the near field, principally due to the upward deflection of air increasing vertical mixing and creating a recirculation cavity in the lee of the barrier, extending between three and 12 barrier heights downwind (Bowker, G.E. et al, 2007).

14.0 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

EPRs have been developed based on a review of those applied to previous road projects (principally West Gate Tunnel Project), discussions with EPA Victoria and feedback from the Technical Reference Group. Table 121 lists the recommended EPRs relevant to air quality.

Table 121: Environmental Performance Requirements

EPR ID[1]	Environmental Performance Requirement
EMF2	**Deliver project in accordance with an Environmental Strategy and Management Plans** Prepare and implement an Environmental Strategy, Construction Environmental Management Plan (CEMP), Worksite Environmental Management Plans (WEMPs), Operation Environmental Management Plan (OEMP) (operator only) and other plans as required by the Environmental Performance Requirements (EPRs) and in accordance with the Environmental Management Framework (EMF). The Environmental Strategy, CEMP, WEMPs and OEMP must be developed in consultation with relevant stakeholders as listed in the EMF and as required by NELP or under any statutory approvals. The CEMP must be prepared with reference to EPA Victoria Publication 480, Best Practice Environmental Management: Environmental Guidelines for Major Construction Sites.
AQ1	**Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction** Prepare and implement a Dust and Air Quality Management Plan(s), which sets out measures to minimise and monitor impacts on air quality during construction. The plan(s) must: ■ Set out how the project will control the emission of smoke, dust, fumes, odour and other pollution into the atmosphere during construction in accordance with the *State Environment Protection Policy (Air Quality Management)* and with reference to EPA Victoria publication 480 Environmental Guidelines for Major Construction Sites ■ Identify the main sources of dust and airborne pollutants, and the location of sensitive land uses ■ Describe the proposed air quality and dust management and monitoring requirements ■ Describe the mitigation measures that will be implemented to ensure compliance with air quality criteria ■ Describe monitoring requirements for key sensitive receptors.
AQ2	**Design tunnel ventilation system to meet EPA requirements for air quality** Design, construct and operate the tunnel ventilation system to meet the requirements of the *State Environment Protection Policy (Air Quality Management)*, in accordance with the requirements of the EPA Victoria Works Approval.
AQ3	**In-tunnel air quality performance standards** Design, construct and operate a tunnel ventilation system to introduce and remove air from the tunnels to meet the in tunnel air quality requirements for carbon monoxide (CO) and for NO_2 listed below. In tunnel air quality must meet the following CO standards: ■ Maximum peak CO value of 150 ppm ■ 15 minute average CO value of 50 ppm ■ 2-hour average CO value of 25 ppm. The tunnel ventilation system must also be designed and operated so that the tunnel average nitrogen dioxide (NO_2) concentration is less than 0.5 ppm as a rolling 15 minute average. Develop and implement contingency measures to manage in-tunnel air quality in the event of incidents or emergencies. Apply best practice Australian management techniques to minimise impacts on health from in-tunnel exposure to $PM_{2.5}$ and PM_{10}.

EPR ID[1]	Environmental Performance Requirement
AQ4	**Monitor ambient air quality** Develop and undertake an ambient air quality monitoring program in consultation with EPA Victoria to measure the air quality impacts of North East Link during operation. The ambient air quality monitoring program must include at least one year of monitoring before operation and, for the ventilation structures, be in accordance with the EPA Victoria licence.
AQ5	**Monitor compliance of in-tunnel air quality and ventilation structure emissions** Monitor in-tunnel air quality and ventilation structure emissions during operation of the ventilation system to demonstrate compliance with EPR AQ2, EPR AQ3 and the EPA Victoria licence to the satisfaction of EPA Victoria. Report the monitoring results publicly in accordance with the requirements of the EPA Victoria Licence. Take remedial action to the satisfaction of EPA Victoria if standards outlined in EPR AQ2, AQ3 and the EPA Victoria licence are not met.

CL1	**Implement a Spoil Management Plan**
	Prepare and implement a Spoil Management Plan (SMP) in accordance with relevant regulations, standards or best practice guidelines. The SMP must be developed in consultation with EPA Victoria and include processes and measures to manage spoil. The SMP must define roles and responsibilities and include requirements and methods for:
	■ Complying with applicable regulatory requirements.
	■ Completing a detailed site investigation (in accordance with AS 4482.1-2005 *Guide to the investigation and sampling of sites with potentially contaminated soil* and the EPA Victoria Industrial Waste Resource Guidelines) prior to any excavation of potentially contaminated areas to identify location, types and extent of impacts and to characterise spoil to inform spoil and waste management.
	■ Identifying the nature and extent of spoil (clean fill and contaminated spoil).
	■ Storage, handling, transport and disposal of spoil in a manner that protects human health and the environment and is consistent with the transport management plan(s) required by EPR T2. This includes methods and requirements for the appropriate treatment/remediation of any contaminated excavated spoil and contaminated residual material left on site.
	■ Design and management of temporary stockpile areas
	■ Minimising impacts and risks from disturbance of acid sulfate soils (as per EPR CL2), odour (as per EPR CL3) and vapour and ground gas intrusion (as per EPR CL4)
	■ Management of hazardous substances, including health, safety and environment procedures that address risks associated with exposure to hazardous substances for visitors and general public; contain measures to control exposure in accordance with relevant regulations, standards and best practice guidance and to the requirements of WorkSafe and EPA Victoria; and include method statements detailing monitoring and reporting requirements
	■ Identifying where any contaminated or hazardous material is exposed during construction (notably through former landfills, service stations and industrial land) and how it will be made safe for the public and the environment. Beneficial uses of land and *National Environment Protection (Assessment of Site Contamination) Measure 2013* guidance on criteria protective of those beneficial uses must be considered for the land uses in these areas. This must include methods for:
	  ▪ Construction of appropriate cover (soil, concrete, geofabric etc.) such that no contamination is left exposed at the surface or where it may be readily accessed by the public and such that it cannot generate runoff or leachate during rain events.
	  ▪ Maintenance of the cover
	  ▪ Identification of the nature and depth of the contaminants
	  ▪ Mitigating impacts during sub-surface works in those areas, eg drilling and excavation
	■ Monitoring and reporting
	■ Identifying locations and extent of any prescribed industrial waste (PIW), other waste, and the

EPR ID[1]	Environmental Performance Requirement
	method for characterising PIW and other waste spoil prior to excavation ■ Identifying and managing potential sites for re-use, management or disposal of any spoil in accordance with the *Environment Protection Act 1970* waste management hierarchy ■ Identifying suitable sites for disposal of any waste. This includes identifying contingency arrangements for management of waste, where required, to address any identified capacity issues associated with the licensed landfills' ability to receive PIW and other waste.
CL3	**Minimise odour impacts during spoil management** The SMP referenced in EPR CL1 must include requirements and methods for odour management (in accordance with EPA Victoria requirements) during the excavation, stockpiling and transportation of contaminated material including: ■ Identifying the areas of contamination that may pose an odour risk ■ Monitoring of the excavated material for possible odour risk ■ Management measures to minimise odour.

NOTE:

EPR EMF2, CL1 and CL3 do not form part of the air quality impact assessment; they have been reproduced here as they relate to air quality aspects discussed in this report.

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Signature Page

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https://golderassociates.sharepoint.com/sites/1897019/deliverables/1897019-007-r technical appendix b air quality/rev0/1897019-007-r-rev0.docx

APPENDIX A

Risk assessment

Risk ID	Potential threat and effect on the environment	INITIAL RISK							RESIDUAL RISK						
		Initial EPR	Magnitude of consequence			Overall consequence	Likelihood	Risk level	Final EPR	Magnitude of consequence			Overall consequence	Likelihood	Risk level
			Extent	Severity	Duration					Extent	Severity	Duration			
	CONSTRUCTION - SURFACE ROADS														
AQ01	Site clearance & construction site establishment. Deposition of larger dust particles causing physical discomfort (for example eye and throat irritation), deposition on man-made and vegetation surfaces causing soiling and annoyance and aesthetic impacts on buildings and vehicles at sensitive receptor locations.	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Medium	3 months to 2 years	Minor	Possible	Low	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans	Local	Medium	3 months to 2 years	Minor	Possible	Low
AQ02	Earthworks. Deposition of larger dust particles causing physical discomfort (for example eye and throat irritation), deposition on man-made and vegetation surfaces causing soiling and annoyance and aesthetic impacts on buildings and vehicles at sensitive receptor locations.	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Medium	3 months to 2 years	Minor	Almost certain	Medium	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Medium	3 months to 2 years	Minor	Almost certain	Medium
AQ03	Earthworks. Generation of PM_{10} and $PM_{2.5}$ from soil disturbance causing health impacts at sensitive receptor locations.	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Medium	3 months to 2 years	Minor	Possible	Low	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan.	Local	Medium	3 months to 2 years	Minor	Possible	Low
AQ04	Earthworks. Generation of odour due to exposure, stockpiling and transportation of contaminated or anaerobic soil, with resultant aesthetic impacts on sensitive receptor locations.	EPR AQ1 Implement a Dust and Air Quality Management and Monitoring Plan), EPR CL1 implement a Spoil Management Plan) and EPR CL3 (Odour Management).	Local	Medium	0-3 months	Minor	Possible	Low	EPR AQ1 Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction, EPR CL1 Implement a Spoil Management Plan and EPR CL3 Minimise odour impacts.	Local	Medium	0-3 months	Minor	Possible	Low
AQ05	Earthworks. Products of combustion (including PM_{10}, $PM_{2.5}$, CO, NOx, SO_2, VOC and SVOC) resulting from operation of diesel fuelled heavy equipment impacting on sensitive receptor locations.	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Low	3 months to 2 years	Minor	Possible	Low	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans	Local	Low	3 months to 2 years	Minor	Possible	Low
AQ06	Construction of surface roads and other civil infrastructure. Deposition of larger dust particles causing physical discomfort (for example eye and throat irritation), deposition on man-made and vegetation surfaces causing soiling and annoyance and aesthetic impacts on buildings and vehicles at sensitive receptor locations.	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Medium	0-3 months	Minor	Almost certain	Medium	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans	Local	Medium	0-3 months	Minor	Almost certain	Medium
AQ07	Construction of surface roads and other civil infrastructure. Generation of PM_{10} and $PM_{2.5}$ from soil disturbance causing health impacts at sensitive receptor locations.	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Medium	0-3 months	Minor	Likely	Medium	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Medium	0-3 months	Minor	Likely	Medium

Risk ID	Potential threat and effect on the environment	INITIAL RISK							RESIDUAL RISK						
		Initial EPR	Magnitude of consequence			Overall consequence	Likelihood	Risk level	Final EPR	Magnitude of consequence			Overall consequence	Likelihood	Risk level
			Extent	Severity	Duration					Extent	Severity	Duration			
AQ08	Construction of surface roads and other civil infrastructure. Generation of odour due to laying of asphalt with resultant aesthetic impacts on sensitive receptor locations.	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Medium	0-3 months	Minor	Almost certain	Medium	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans	Local	Medium	0-3 months	Minor	Almost certain	Medium
AQ09	Construction of surface roads and other civil infrastructure. Products of combustion (including PM10, PM2.5, CO, NOx, SO2, VOC and SVOC) resulting from operation of diesel fuelled heavy equipment impacting on sensitive receptor locations.	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Low	0-3 months	Negligible	Possible	Low	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans	Local	Low	0-3 months	Negligible	Possible	Low
	CONSTRUCTION - TUNNELS														
AQ10	Site clearance & construction site establishment. Deposition of larger dust particles causing physical discomfort (for example eye and throat irritation), deposition on man-made and vegetation surfaces causing soiling and annoyance and aesthetic impacts on buildings and vehicles at sensitive receptor locations.	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Medium	3 months to 2 years	Minor	Possible	Low	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans	Local	Medium	3 months to 2 years	Minor	Possible	Low
AQ11	Dive structure / portal and tunnel construction Deposition of larger dust particles causing physical discomfort (for example eye and throat irritation), deposition on man-made and vegetation surfaces causing soiling and annoyance and aesthetic impacts on buildings and vehicles at sensitive receptor locations.	EPR EMF2 Implement an Environmental Management Plan, EPR AQ1 implement a Dust and Air Quality Management and Monitoring Plan) and EPR CL3 (Odour Management).	Local	Medium	3 months to 2 years	Minor	Likely	Medium	EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans, EPR AQ1 Implement a Dust and Air Quality Management Plan to minimise air quality impacts during construction and EPR CL3 Minimise odour impacts.	Local	Medium	3 months to 2 years	Minor	Likely	Medium
AQ12	Precast plant construction and manufacturing of precast units. Potential impact on air quality due to dust, odour or other emissions for plant affecting sensitive receptor locations	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 implement an Environmental Management Plan	Local	Low	3 months to 2 years	Minor	Possible	Low	EPR AQ1 - Implement a Dust and Air Quality Management and Monitoring Plan to minimise air quality impacts during construction and EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans.	Local	Low	3 months to 2 years	Minor	Possible	Low
AQ13	Tunnelling activities. Generation of odour from tunnel ventilation during tunnel boring operations and exposure, stockpiling and transportation of contaminated or anaerobic soil, with resultant aesthetic impacts on sensitive receptor locations.	EPR EMF2 Implement an Environmental Management Plan, EPAR AQ1 implement a Dust and Air Quality Management and Monitoring Plan) and EPR CL3 (Odour Management).	Local	Low	3 months to 2 years	Minor	Possible	Low	EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans, EPR AQ1 Implement a Dust and Air Quality Management Plan to minimise air quality impacts during construction and EPR CL3 Minimise odour impacts.	Local	Medium	3 months to 2 years	Minor	Possible	Low

Risk ID	Potential threat and effect on the environment	INITIAL RISK							RESIDUAL RISK						
		Initial EPR	Magnitude of consequence			Overall consequence	Likelihood	Risk level	Final EPR	Magnitude of consequence			Overall consequence	Likelihood	Risk level
			Extent	Severity	Duration					Extent	Severity	Duration			
	OPERATION - SURFACE ROADS														
AQ14	Eastern Freeway and North East Link operations. Adverse impact on sensitive receptors from air quality changes associated with operation and maintenance of project (taking into account ventilation system and surface road emissions) and compared to no project situation, based on traffic volume projections	Implementation of EPR AQ4 (Ambient Air Quality Monitoring Program).	Corridor	Low	7+ years	Moderate	Unlikely	Low	Implementation of EPR AQ4 Monitor ambient air quality	Corridor	Low	7+ years	Moderate	Unlikely	Low
AQ15	Eastern Freeway and North East Link operations. Underestimation of traffic volumes resulting in higher than anticipated ambient air quality impacts on sensitive receptors.	Implementation of EPR AQ4 (Ambient Air Quality Monitoring Program).	Corridor	Low	7+ years	Moderate	Possible	Medium	Implementation of EPR AQ4 Monitor ambient air quality.	Corridor	Low	7+ years	Moderate	Possible	Medium
	OPERATION - TUNNELS														
AQ16	Tunnel operations. Impact on sensitive receptors due to NO_2, PM_{10} and $PM_{2.5}$ emissions to air from the tunnel portals and ventilation structures.	Implementation of EPRs AQ2 (Tunnel Ventilation System Design), AQ4 (Ambient Air Quality Monitoring Program), AQ5 (In-tunnel Air Quality and Ventilation Structure Emissions Compliance & Monitoring) and EMF2 (Environmental Management Plans).	Local	Very low	7+ years	Minor	Unlikely	Low	Implementation of EPR AQ2 Design tunnel ventilation system to meet EPA Victoria requirements for air quality, EPR AQ4 Monitor ambient air quality, EPR AQ5 Monitor compliance of in-tunnel air quality and ventilation structure emissions and EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans.	Local	Very low	7+ years	Minor	Unlikely	Low
AQ17	Tunnel operations. Impact on sensitive receptors due to emissions to air of pollutants other than NO_2, PM_{10} and $PM_{2.5}$ emissions to air from the tunnel portals and ventilation structures.	Implementation of EPRs AQ2 (Tunnel Ventilation System Design), AQ4 (Ambient Air Quality Monitoring Program), AQ5 (In-tunnel Air Quality and Ventilation Structure Emissions Compliance & Monitoring) and EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans.	Local	Very low	7+ years	Minor	Unlikely	Low	Implementation of EPR AQ2 Design tunnel ventilation system to meet EPA Victoria requirements for air quality, EPR AQ4 (Ambient Air Quality Monitoring Program), EPR AQ5 Monitor compliance of in-tunnel air quality and ventilation structure emissions and EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans.	Local	Very low	7+ years	Minor	Unlikely	Low
AQ18	Tunnel operations. Potential impact on road users due to in-tunnel air quality.	Implementation of EPRs EMF2 (Environmental Management Plans) ,AQ5 (In-tunnel Air Quality and Ventilation Structure Emissions Compliance & Monitoring).	Local	Medium	7+ years	Moderate	Unlikely	Low	Implementation of EPR EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans and EPR AQ5 Monitor compliance of in-tunnel air quality and ventilation structure emissions	Local	Medium	7+ years	Moderate	Unlikely	Low
AQ19	Tunnel operations. Underestimation of traffic volumes resulting in higher than anticipated ambient air quality impacts on road tunnel users and sensitive receptors.	Implementation of EPRs EMF2 (Environmental Management Plans) AQ2 (Tunnel Ventilation System Design), AQ3 (In-Tunnel Air Quality) and AQ5 (In-tunnel Air Quality and Ventilation Structure Emissions Compliance & Monitoring).	Local	Medium	7+ years	Moderate	Unlikely	Low	Implementation of EPRs EMF2 Deliver project in accordance with an Environmental Strategy and Environmental Management Plans, AQ2 Design tunnel ventilation system to meet EPA Victoria requirements for air quality, AQ3 (In-Tunnel Air Quality) and AQ5 Monitor compliance of in-tunnel air quality and ventilation structure emissions	Local	Medium	7+ years	Moderate	Unlikely	Low

APPENDIX B

Peer Review report

NORTH EAST LINK

Technical Peer Review
Air Quality Impact Assessment

Prepared for:

Clayton Utz
Level 18
333 Collins Street
Melbourne Vic 3000

SLR Ref: 640.11721-R01
Version No: -v1.0
February 2019

PREPARED BY

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Clayton Utz (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client and by North East Link Project (formerly the North East Link Authority) for the purposes of reviewing the preparation of the Air Quality Impact Assessment report for the North East Link Project EES. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
640.11721-R01-v1.0	11 February 2019	Alison Radford; Kirsten Lawrence	Kirsten Lawrence	Graeme Starke

CONTENTS

DOCUMENT REFERENCES

TABLES

APPENDICES

1 Introduction

SLR has been engaged by Clayton Utz on behalf of the North East Link Project to carry out an independent technical peer review of the Air Quality Impact Assessment (AQIA) report prepared by Golder Associates Pty Ltd (Golder) for the North East Link Environment Effects Statement (EES).

This report presents the outcome of the independent technical peer review of the AQIA. The independent technical peer review represents an impartial, independent review that has been based on knowledge and experience of current practices, procedures and information regarding air quality impact assessments for transport projects.

The purpose of this review is to assist in ensuring that the AQIA is prepared to a satisfactory standard, and that there is appropriate consideration of key issues relevant to air quality in the EES. The peer review considered whether the AQIA adequately addresses the relevant requirements of the EES Scoping Requirements, the "public works" declaration made by the Minister for Planning in relation to the North East Link Project, and is suitable to represent the air quality impacts of the project.

In carrying out this peer review, SLR has:

- assessed the process, methodology and assessment undertaken in preparation of the AQIA, including assessment criteria applied and assumptions relied upon;
- identified any additional matters which should be considered in order to address the EES Scoping Requirements, 'public works' Order or to otherwise adequately assess the likely impacts of the Project; and
- assessed the adequacy of proposed Environmental Performance Requirements to manage potential adverse impacts arising from the project relevant to air quality impacts.

The relevant EES scoping requirements (from Section 4.3 - Health, Amenity and Environmental Quality) relating to air quality are as follows:

- ***Evaluation objective:***
  - *To minimise adverse air quality on the health and amenity of nearby residents, local communities and road users during both construction and operation of the project.*
- ***Key issues:***
  - *Adverse effects on air quality near residential and other sensitive land uses due to dust, odour or other emissions from construction activities.*
  - *Effects on air quality near residential and other sensitive land uses of the project operations associated with changes in emissions from traffic on surface roads (including implications of changes in the distribution of vehicle types or brake and tyre wear dust) and from fixed plant, especially ventilation discharges from the tunnels.*

- ***Priorities for characterising the existing environment:***
  - *Identify residences (including sites that are the subject of current planning permit applications or planning scheme amendments), urban developments (where development proposals are identified in the planning scheme or form part of a seriously entertained planning proposal) and land uses (schools, hospitals, outdoor recreation sites, etc.) that require a particular focus on protecting the beneficial uses of the air environment relating to human health and wellbeing, local amenity and aesthetic enjoyment.*
  - *Collect local air quality data to characterise the expected affected area and compare with long-term urban data sets to ascertain if the long-term data sets are representative of the local air quality conditions.*
  - *Assess existing air quality and compare with relevant SEPP standards.*
- ***Design and mitigation measures:***
  - *Propose siting, design, mitigation and management measures to control emissions of dust or other air pollutants from construction activities.*
  - *Propose siting, design, mitigation and management measures to prevent air quality impacts during operations, including on existing and future residential areas (including sites that are the subject of current planning permit applications or planning scheme amendments or where development proposals are identified in the planning scheme of [sic] form part of a seriously entertained planning proposal) in the vicinity of existing and new elevated and surface roads, tunnel ventilation systems, Eastern Freeway and M80 widening works and any other roads where air quality is predicted to be affected due to the project's operation.*
- ***Assessment of likely effects:***
  - *Analyse the risk to sensitive uses associated with dust, odour or other emissions from construction works with respect to the EPA Publication 480 Guidelines for Major Construction Sites.*
  - *Analyse risk of project emissions exceeding the relevant SEPP standards for surface roads and Schedule A Design Criteria for the tunnel ventilation system describing sources both in isolation and in addition to background levels of air pollution and assessing their cumulative impact on air quality.*
  - *Predict any improvements to air quality due to project operation.*
  - *Evaluate any changes to air quality conditions for nearby residents and local communities that the project will deliver, particularly through redistribution or management of heavy vehicle traffic or altered road and traffic conditions and the implications of these for human health and amenity.*
- ***Approach to manage performance:***
  - *Describe the environmental performance requirements to set air quality outcomes that the project must achieve.*

1.1 The Peer Review Team

This peer review has been completed by SLR Consulting (SLR) personnel with extensive experience in completing air quality impact assessments of major infrastructure projects. The review team comprised the following personnel:

- Principal Air Quality Consultant: Kirsten Lawrence, BEng (Chem and Mats).

- Associate Air Quality Consultant: Dr Alison Radford, PhD, BSc (Chem).

1.2 Structure of this Review Report

This report provides SLR's structured response from our review of the methodology and draft reporting of the AQIA prepared by Golder Associates (Golder). The structure of this report is as follows:

- **Section 2**: Presents an outline of the review process that was undertaken.
- **Section 3**: Presents for each section of the final AQIA:
  - A brief summary of the approach or methodology that has been adopted by Golder;
  - SLR's opinion regarding the appropriateness of the methods chosen and any outstanding issues; and
  - Any limitations or outstanding risks to the project from the method or approach taken that have been identified by SLR.
- **Section 4**: Provides an overall summary whether, in SLR's opinion, the AQIA adequately represents the potential air quality impacts of the NEL project, if it adequately addresses the EES scoping requirements, and if SLR agrees with the overall conclusions of the AQIA.

2 Review Process

In undertaking this peer review, SLR has reviewed various drafts of the AQIA, as it was being developed, and provided comments and made recommendations on issues to be addressed in subsequent drafts. A number of meetings were also held to discuss the findings of the preliminary reviews, to seek clarification on the methodologies being used, and to agree on approaches to address and resolve issues raised.

SLR's technical peer review included a review of:

- the scope and methodology for the preparation of the AQIA including use of relevant models, model inputs and model validation material
- the existing conditions and impact assessment sections of the AQIA
- the proposed environmental performance requirements to air quality impacts.

As part of the review process, SLR provided comments on areas requiring amplification or clarification to improve transparency, readability and ease of understanding of the AQIA. The scope of this final review report however, is limited to technical aspects only.

3 Summary of the Technical Review of the AQIA

A summary of each of the chapters of the AQIA is outlined in **Table 1**, along with SLR's opinion regarding the appropriateness of the assessment methods used and any outstanding issues.

Table 1 Summary of Outstanding Issues

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
1.0 Introduction	The introduction of the report adequately addresses the purpose of the report, which is to assess the potential air quality impacts associated with North East Link to inform preparation of the EES required for the project. This section highlights the potential air quality impacts from both construction and operation.	SLR agrees with the scope of potential air quality impacts identified for both construction and operation.	None
2.0 EES Scoping Requirements	The EES scoping requirements provided by the Minister for Planning have been outlined in the report.	The EES scoping requirements for air quality have been correctly identified.	None
3.0 Project Description	The key elements of the North East Link alignment are described in this section of the report.	No aspects of the assessment method or approach are outlined in this section.	N/A

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
4.0 Legislation, Policy, Guidelines and Criteria	An overview of applicable commonwealth and state-based air quality legislation is provided in this section, along with provision of design criteria for use in assessing the predicted pollutant concentrations from the North East Link tunnel ventilation system. Regulatory criteria are not prescribed for assessing the impact of vehicle emissions from surface roads hence the assessment focusses on the change from impacts predicted for the existing road network. However, the combined impacts assessment has been compared to the *State Environment Protection Policy (Ambient Air Quality)* (SEPP (AAQ)) Environmental Quality Objectives (EQOs) but it is noted they have no regulatory status.	No justification (legislative or otherwise) is provided for why the SEPP(AAQ) objectives were used for comparison with air quality modelling predictions for the project's combined impacts.	Golder has stated in their response to SLR's review comments on previous drafts of the AQIA that "*in the absence of specific criteria for assessment of surface road impacts, use of SEPP (AAQ) objectives for comparative purposes is based on agreement with Environment Protection Authority (EPA).*" SLR believes a statement should be included in the report to reflect EPA agreement with this approach.
5.0 Methodology	This section describes the methods used to assess the potential impacts of North East Link, including a description of how the study area and the existing environment has been defined, the pollutants considered (including a discussion of ultrafine particles), and the methodology for the impact assessment for	**Pollutants Considered:** SLR agrees with the justification for the pollutants modelled in the AQIA.	None
		Pollutants Considered: SLR agrees with the conclusions made regarding ultrafine particles and why they have not been assessed in the AQIA.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
	construction and operation (including the use of AERMOD, the regulatory model in Victoria, for modelling of emissions from both ventilation systems and surface roads). This section also details the risk assessment, stakeholder engagement and community feedback processes.	**Impact Assessment Methodology:** SLR recommended that a section of the AQIA discuss the suitability of undertaking air dispersion modelling for the North East Link using AERMOD, including a discussion of the benefits and potential limitations associated with this approach. All atmospheric dispersion models, including AERMOD, represent a simplification of the many complex processes involved in the dispersion of pollutants in the atmosphere. To obtain good quality results it is important that the most appropriate model is used and the quality of the input data (meteorological, terrain, source characteristics) is adequate. The quality of the input data and the appropriateness of the dispersion model selection can impact the level of uncertainty associated with the subsequent predicted ground level concentrations. This should be outlined in the AQIA to provide readers with appropriate context when reviewing the modelling results. Part D 1 of Schedule C in the SEPP (AQM) states that *"proposed transport corridors such as roads must be assessed using one of the regulatory models for near-road modelling"*. There is no specific model stated as appropriate for near-road modelling in the SEPP (AQM). However, for previous projects (West Gate Tunnel Project), Ausroads has been used. While AERMOD is the current regulatory model in Victoria, the SEPP (AQM) allows provision for alternative model selection (Schedule C Part A 2), through submission of a modelling proposal to EPA, which must demonstrate that the alternative model is *"appropriate for the circumstances"*.	**Impact Assessment Methodology:** SLR believes that even if a model is the regulatory model, a discussion of the model selection is warranted, including any limitations and benefits of applying the selected model in the project-specific circumstances.
6.0 Characterisation of Existing Environment	This section details the physical features (local setting and topography), sensitive receptors, meteorology, and existing air quality of the project location.	**Sensitive receptors:** The list of sensitive receptors includes schools, kindergartens, aged care facilities, hospitals, childcare centres and recreational areas. SLR finds the list appropriate to address the sensitive populations according to the SEPP (AQM).	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		Meteorology: SLR agrees that the Viewbank AWS best reflects the meteorology nearest the North East Link tunnel ventilation structures.	None
		Air emission sources: The main industrial and non-industrial air emissions sources contributing to the local air shed have been adequately reviewed (including use of the National Pollution Inventory), key pollutants identified and a summary of emissions to air provided for Local Government Areas (LGAs) adjacent to the North East Link project.	None
		Ambient Air Quality: Comparison of 2013/14 to 2017 datasets for pollutants measured at Alphington AQMS compare well with long term trends and are considered an appropriate representation of ambient air quality.	None
		Background data: SLR agrees with the use of time-varying data sets for background air quality for CO, NO_2, PM_{10} and $PM_{2.5}$ from Alphington AQMS, and the background concentrations used for air toxics.	None
7.0 Risk Assessment	A risk assessment of project activities was performed to prioritise the focus of the impact assessment and development of Environmental Performance Requirements (EPRs).	The identified risks and associated residual risks of project activities related to the construction and operation phases of the project were adequately identified and rated by Golder.	None
8.0 Construction Impacts	This section describes the potential for impacts to air quality resulting from construction of tunnels and surface roads associated with North East Link.	Golder has adequately identified the potential for air quality impacts during construction works, primarily in the form of particulate matter, odour and products of combustion. The impacts are expected to be of short duration and intermittent in nature. Proposed mitigation measures have been presented to ensure impacts on the receiving environment are minimised, and EPRs developed to outline how risks to air quality will be mitigated during construction of North East Link.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
9.0 Dispersion Modelling Approach	This chapter outlines the dispersion modelling approach and details of inputs.	**Model Selection:** As an extension to the comment made in Section 5.0, discussion of model selection in the AQIA would ideally include a brief review of models used for near-road modelling around Australia and how they compare to AERMOD in the project-specific circumstances. SLR is satisfied with the use of the urban option in AERMOD following review of Golder's formal request to EPA Vic.	**Model Selection:** A discussion of the potential limitations and benefits of AERMOD compared to other potential models would increase the degree of confidence in the appropriateness of selecting AERMOD for the dispersion modelling and provide readers with appropriate context when reviewing the modelling results.
		Topography: The topographical dataset input into the model was appropriately developed from 1-5 metre Vicmap elevation data.	None
		Meteorology: Meteorological input files were developed by Golder in accordance with the EPA Vic Publication No 1550. Appropriate meteorological data sources were used in conjunction with AERMET to generate five 12-month meteorological files for 2013 to 2017.	None
		Vehicle Emissions: Traffic modelling undertaken by VLC and Smedtech to predict traffic volumes and fleet mixes for the years 2026 and 2036 formed the basis of traffic inputs into the AQIA. Conservatively, the upper limit of the predicted traffic volume range provided was selected for use in the AQIA.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		Diesel Passenger Cars: The Australian Bureau of Statistics (ABS) motor vehicle census for 2017 indicated that the Australian passenger car fleet consisted of approximately 13% diesel vehicles. Passenger car traffic for North East Link has been assumed to be 15% diesel and 85% petrol fuelled cars. SLR agrees with this approach as this is a conservative assumption given a higher percentage of diesel vehicles would mean lower CO emissions and higher PM_{10}, $PM_{2.5}$ and NO_2 emissions.	None
		Hybrid and electric vehicles: Conservatively, hybrid and electric vehicles were not considered in this assessment. SLR agrees that these vehicle types are likely to have a significant effect in reducing Victorian fleet emissions by 2036.	None
		2010 Emission Factors: Base 2010 vehicle emission factors were derived using the COPERT Australia road transport air pollutant emission inventory model. COPERT was configured on a state-based level, including vehicle fleet mix and mean fleet mileage statistics for Victoria in 2010 (taken from the NPI Motor Vehicle Emissions Inventory), to permit calculation of emission factors for each vehicle class in g/VKT. The two reported validation studies indicate that COPERT may, in some circumstances, underestimate certain pollutant emissions. Golder considers the conservative assumptions included in the estimation of the emission rates would compensate for any potential underestimation. SLR believes this approach is adequate to derive 2010 emission factors for Victoria given the level of data available at the time of reporting.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		2020 and 2025 Emission Factors: **Scenarios A1 and B1:** For Scenarios A1 and B1, the 2010 COPERT factors for each vehicle class were adjusted to provide 2020 factors using future year factors from PIARC. Base Emission Factors: COPERT (2010) Future Year Factor: PIARC (2020) Gradient scaling for PM_{10}, $PM_{2.5}$, CO, NO_2: PIARC Vehicle classes: PCP, PCD, LCD, HCV Pollutants: PM_{10}, $PM_{2.5}$, CO, NO_2 Traffic Data: Traffic model predictions (traffic volumes and fleet mix) for 2026 (Scenario A1) and 2036 (Scenario B1) **Scenarios A2 and B2:** For Scenarios A2 and B2, the 2010 COPERT factors for each vehicle class were adjusted to provide 2025 factors using the ratio of Brisbane City Council emission factors for 2010 and 2025. Base Emission Factors: COPERT (2010) Future Year Factor: Ratio of Brisbane City Council factors for 2010 and 2025 Gradient scaling for PM_{10}, $PM_{2.5}$, NO_2: PIARC Vehicle classes: PCP, PCD, LCD, HCV Pollutants: PM_{10}, $PM_{2.5}$, NO_2 Traffic Data: Traffic model predictions (traffic volumes and fleet mix) for 2026 (Scenario A2) and 2036 (Scenario B2).	None
		VOC and PAH Emission Factors: No scaling factors are presented for VOCs and PAHs, hence it is understood that the emission factors used in the assessment of these pollutant emissions from the ventilation structure are based on 2010 emission factors from COPERT. This would provide a conservative assessment.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		Summary of Modelling Conservative Assumptions: A range of conservative assumptions included in the modelling were outlined by Golder. In our opinion, the most significant of these are: - Background pollutant concentrations for the years 2026 and 2036 were assumed to remain at levels recorded for the period 2013 to 2017. - The upper limit of the predicted traffic volume range provided for all roads was selected for input into the model. - Vehicle emission factors used in Scenarios A1 and B1, representing 2026 and 2036 traffic respectively, were assumed to remain at levels predicted for 2020. Vehicle emission factors used in Scenarios A2 and B2, representing 2026 and 2036 traffic respectively, were assumed to remain at levels predicted for 2025.	None
10.0 Ventilation System Impacts	Emissions from vehicles travelling through the tunnels will be discharged through a ventilation system and dispersed into the atmosphere. This chapter outlines the dispersion modelling techniques used to	**Ventilation System Design:** Based on the design description, SLR believes it is appropriate to assume there are no emissions from the tunnel portals and that all vehicle emissions occurring within the tunnels are discharged via the ventilation structures.	None

<table>
<tr><th>Report Section</th><th>Summary of Chapter</th><th>Appropriateness of method/approach</th><th>Outstanding Issues</th></tr>
<tr><td rowspan="2"></td><td rowspan="2">predict pollutant GLCs, which were added to background levels and assessed against applicable air quality criteria.</td><td>Model domain and receptors:
SLR agrees that the model domain includes all relevant areas and the receptors (gridded and discrete) are appropriately input at ground level. The model domain included:
- an outer grid measuring 10 x 16 km (160 km²) with 100m resolution centred on the project
- an inner grid of 2.5 x 2.5 km (6.25 km²) centred on the northern ventilation structure with a 25 m resolution
- an inner grid of 2.5 x 2.5 km (6.25 km²) centred on the southern ventilation structure with a 25 m resolution
- 191 discrete receptors representing identified sensitive receptor locations</td><td>None</td></tr>
<tr><td>Emission Sources:
SLR agrees with the comment that due to the increase in elevation to the north (ie road gradient within the tunnel), traffic emissions from the northbound tunnel are predicted to be greater than those from the southbound. Hence, it’s appropriate that the northern ventilation system has been designed to account for this with a larger diameter, permitting higher ventilation rates.
Each ventilation structure consists of a primary and secondary vent and has been appropriately modelled as two discharge points given the primary vent would operate at all times, whereas use of the secondary vent is dependent on time of day, vehicle volumes, in-tunnel air quality and maintenance schedules.
SLR acknowledges that the ventilation structure exhaust temperatures have been conservatively assumed to be equal to ambient temperatures. The ventilation structure exhaust temperature is likely to be greater than ambient temperatures, which would result in a more buoyant plume, that would rise higher in to the atmosphere before diffusing and dispersing, resulting in lower GLCs.</td><td>None</td></tr>
</table>

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		Traffic Data: Four scenarios were modelled for the tunnel ventilation systems: - Scenario A1 (2020 emission factors) and A2 (2025 emission factors) – projected traffic volume and fleet mix for 2026 under normal operating conditions. - Scenarios B1 (2020 emission factors) and B2 (2025 emission factors) – projected traffic volume and fleet mix for 2036 under normal operating conditions. Traffic modelling provided the volumes of passenger cars, light commercial and heavy commercial vehicles for the northbound and southbound tunnels for 2026 and 2036. For the 6.1 km tunnel length, gradients were approximated for both the north and southbound sections. SLR considers these modelling inputs appropriate to enable prediction of GLCs from the tunnel ventilation systems.	None
		Sensitivity Analysis: A number of sensitivity analysis were undertaken to ensure worst-case emissions profiles and alternate ventilation structure locations were considered. SLR considers that the range of options covered in this sensitivity analysis is appropriate.	None
		Model Assumptions: Consideration of building downwash being restricted to the ventilation structure building is deemed appropriate by SLR. Conversion of one-hour average concentrations to 3-minute concentrations using the formula outlined in the EPA Vic guidelines (2015) is deemed appropriate by SLR.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		Model Outputs: Use of a single pollutant ($PM_{2.5}$) to determine which of the five modelled years predicted the highest one-hour average 99.9th percentile GLC is likely to be appropriate, given results from each year are within 10% of each other and $PM_{2.5}$ is generally the most critical pollutant in terms of compliance with ambient air quality criteria. Selection of 2017 as the subsequent model year is appropriate given 2017 gave the highest predicted concentrations.	None
		Discussion: For Scenario A1 (2026 traffic volume and fleet mix; 2020 emission factors) the ventilation system emissions result in: - No additional exceedances of the PM_{10} design criterion to those already imposed by the background concentrations - One additional exceedance of the $PM_{2.5}$ design criterion to those already imposed by the background concentrations - Predicted CO, NO_2, BTEX, 1,3-butadiene, formaldehyde and PAH concentrations comply with the applicable design criteria. For Scenario A2 (2026 traffic volume and fleet mix; 2025 emission factors) the ventilation system emissions result in: - No additional exceedances of the PM_{10} design criterion to those already imposed by the background concentrations - One additional exceedance of the $PM_{2.5}$ design criterion to those already imposed by the background concentrations - Predicted NO_2 concentrations comply with the applicable design criteria.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		For Scenario B1 (2036 traffic volume and fleet mix; 2020 emission factors) the ventilation system emissions result in: - No additional exceedances of the PM_{10} design criterion to those already imposed by the background concentrations - One additional exceedance of the $PM_{2.5}$ design criterion to those already imposed by the background concentrations - Predicted CO, NO_2, BTEX, 1,3-butadiene, formaldehyde and PAH concentrations comply with the applicable design criteria. For Scenario B2 (2036 traffic volume and fleet mix; 2025 emission factors) the ventilation system emissions result in: - No additional exceedances of the PM_{10} design criterion to those already imposed by the background concentrations - One additional exceedance of the $PM_{2.5}$ design criterion to those already imposed by the background concentrations - Predicted NO_2 concentrations comply with the applicable design criteria.	
		SLR agrees with the comment that the above exceedances are "'*not considered to conflict with the intent of the Policy*', primarily due to the small contribution that emissions from the tunnel ventilation structures made to the predicted concentrations". Likewise, the results of the sensitivity analyses demonstrated that, while the project contribution to the maximum predicted GLC could increase significantly, due to the relatively low project contribution, there was relatively little change in the maximum predicted GLCs (project plus background).	

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
11.0 Surface Road Impacts	This assessment includes the prediction of dispersal and transport of air pollutants emitted from vehicles along key surface roads and intersections.	**Road Selection:** SLR find the approach for roads selection for assessment (those that are likely to experience significant change (either increase or decrease) in either total vehicle or heavy commercial vehicle numbers arising either directly or indirectly from the operation of North East Link) to be appropriate.	None
		Modelling Approach: See Section 5.0 and 9.0 comments. Ideally, the discussion of the appropriateness of the model selection would also include reference to how a model simulates dispersion from the road cutting sections.	See Section 5.0 and 9.0.
		Model Inputs: SLR considers the use of volume sources to approximate the initial lateral and vertical plume dimensions to be appropriate for surface road emissions.	None
		Meteorology: Use of the 2016 meteorological year for surface roads modelling was deemed acceptable by SLR.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		Model Scenarios: Five scenarios were modelled: - Scenario A1 base (without project using projected vehicle volumes for 2026 and 2020 emission factors) - Scenario A1 project (with project using projected vehicle volumes for 2026 and 2020 emission factors) - Scenario B1 base (without project using projected vehicle volumes for 2036 and 2020 emission factors) - Scenario B1 project (with project using projected vehicle volumes for 2036 and 2020 emission factors) - Scenario B2 project (with project using projected vehicle volumes for 2036 and 2025 emission factors)	None
		Traffic Data: SLR accepts the approach of using the maximum traffic volume forecast for each of the three periods provided (morning peak, afternoon peak and total daily traffic) for passenger cars, LCV and HCVs.	None
		Fleet Mix and Speed: SLR accepts the approach used to calculate hourly pollutant emission rates based on measured traffic fleet composition and speeds from the selected roads within the study area. Base vehicle volumes were then adjusted to account for hourly varying diurnal patterns observed for each road.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		Pollutant Emission Rates: SLR agrees with the approach used to calculate emission rates, which applied the diurnal pattern of traffic mix and vehicle speed to the daily traffic volume projections to generate an hourly speed dependent emission rate. All roads were assumed to be at grade with zero gradient, except for the North East Link road cutting between the northern tunnel portal and Elder Street.	None
		Model Domain and Road Geometry: SLR accepts as appropriate the model domain being defined as a 20 x 20 km grid centred on the southern tunnel ventilation structure. SLR considers the approach used to model changing road geometries as appropriate.	None
		Receptor Locations: Receptors were located at the property boundary nearest the roadside at 50 m intervals along both sides of the road if the property was a residence, school, or child care centre, and at 200 m intervals if the property was public open space. Receptors were placed typically 20 to 30 metres from the road centreline for undivided dual lane carriageways or the nearest lane for multilane divided carriageways. This approach is considered adequately conservative by SLR.	None
		Model Assumptions: SLR believes that all model assumptions lean towards a conservative approach.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
		Summary of surface road changes: SLR understands that North East Link is predicted to decrease traffic on 16 roads as a result of either lower HCV or lower total traffic volumes. Increased traffic volumes due to North East Link mean air quality impacts are increased for all pollutants for eight roads. Comparisons are provided of the predicted pollutant concentrations between base and project scenarios for projected fleet mixes/volumes in 2026 and 2036 using 2020 emission factors (scenario A1 an B1) and 2025 emission factors (scenario B1 and B2).	None
12.0 Combined Impacts	This section presents the findings of the combined impact assessment for North East Link. Combined Impacts refers to the combination of surface road and tunnel ventilation system pollutant emissions and background concentrations.	**Modelled scenarios:** The receptors are primarily impacted by surface road vehicle emissions rather than road tunnel ventilation system emissions. Hence, SLR agrees with the approach that 2016 was the modelled year chosen to assess the combined impacts, which reflects the worst-case year for surface roads. SLR understands that combined impacts were assessed at two receptors, selected based on their proximity to the North East Link surface road and a ventilation structure such that they are likely to be impacted by both.	None
		Summary: The combined impacts of surface and tunnel ventilation system emissions are less than the PM_{10} and NO_2 SEPP (AAQ) EQOs at the two receptors. The $PM_{2.5}$ SEPP(AAQ) EQO was not met at either receptor, primarily because the background concentrations exceed the objective.	None

Report Section	Summary of Chapter	Appropriateness of method/approach	Outstanding Issues
13.0 Best Practice	This section discusses the best practice options for road tunnel ventilations systems and surface roads.	**Ventilation Systems:** Best practice management for the North East Link tunnel ventilation systems principally relates to whether or not air pollution control technology should be installed. SLR agrees that the modelling study suggests pollution control technology is not required. Based on the comprehensive review provided, air pollution control technology cannot be considered best practice for the North East Link tunnel ventilation system on the basis of health, environmental and cost considerations.	None
		Surface roads: Best practice management of vehicle emissions from the North East Link surface roads relate to the effectiveness of vegetation and acoustic barriers. SLR notes that the review of available research lists factors which influence the effectiveness of vegetation barriers, and states that the minimum thickness and time taken to establish are major disadvantages against the use of vegetation barriers for air quality purposes. The effectiveness of acoustic barriers at mitigating near road pollutant exposure is discussed and depends on roadway configuration, local meteorology and barrier height, design and endpoint location.	None
14.0 Environmental Performance Requirements	This chapter outlines the Environmental Performance Requirements (EPRs) for the North East Link project.	The EPRs relevant to air quality have been reviewed by SLR and are considered to establish an appropriate framework to govern the construction and operation of the NEL Project if it ultimately differs from the Concept Design.	None

4 Conclusion

Section 3 highlights SLR's general agreement with the approach and methodology used in the AQIA to assess the NEL project. However, a few areas which could be open to discussion have been raised. Overall, SLR believes the AQIA adequately represents the potential air quality impacts of the NEL project.

Table 2 outlines SLR's opinion on whether the AQIA adequately addresses the EES scoping requirements. SLR indicates that for each scoping requirement, the requirement has been met by this assessment. Overall, SLR agrees with the conclusions of the AQIA.

Table 2 EES Scoping Requirements Met

EES Scoping Requirement	Requirement Met
Evaluation objective	
To minimise adverse air quality on the health and amenity of nearby residents, local communities and road users during both construction and operation of the project.	Yes
Key issues	
Adverse effects on air quality near residential and other sensitive land uses due to dust, odour or other emissions from construction activities.	Yes
Effects on air quality near residential and other sensitive land uses of the project operations associated with changes in emissions from traffic on surface roads (including implications of changes in the distribution of vehicle types or brake and tyre wear dust) and from fixed plant, especially ventilation discharges from the tunnels.	Yes
Priorities for characterising the existing environment	
Identify residences (including sites that are the subject of current planning permit applications or planning scheme amendments), urban developments (where development proposals are identified in the planning scheme or form part of a seriously entertained planning proposal) and land uses (schools, hospitals, outdoor recreation sites, etc.) that require a particular focus on protecting the beneficial uses of the air environment relating to human health and wellbeing, local amenity and aesthetic enjoyment.	Yes
Collect local air quality data to characterise the expected affected area and compare with long-term urban data sets to ascertain if the long-term data sets are representative of the local air quality conditions.	Yes
Assess existing air quality and compare with relevant SEPP standards.	Yes
Design and mitigation measures	
Propose siting, design, mitigation and management measures to control emissions of dust or other air pollutants from construction activities.	Yes
Propose siting, design, mitigation and management measures to prevent air quality impacts during operations, including on existing and future residential areas (including sites that are the subject of current planning permit applications or planning scheme amendments or where development proposals are identified in the planning scheme of [sic] form part of a seriously entertained planning proposal) in the vicinity of existing and new elevated and surface roads, tunnel ventilation systems, Eastern Freeway and M80 widening works and any other roads where air quality is predicted to be affected due to the project's operation.	Yes

EES Scoping Requirement	Requirement Met
Assessment of likely effects	
Analyse the risk to sensitive uses associated with dust, odour or other emissions from construction works with respect to the *EPA Publication 480 Guidelines for Major Construction Sites*.	Yes
Analyse risk of project emissions exceeding the relevant SEPP standards for surface roads and Schedule A Design Criteria for the tunnel ventilation system describing sources both in isolation and in addition to background levels of air pollution and assessing their cumulative impact on air quality.	Yes
Predict any improvements to air quality due to project operation	
Evaluate any changes to air quality conditions for nearby residents and local communities that the project will deliver, particularly through redistribution or management of heavy vehicle traffic or altered road and traffic conditions and the implications of these for human health and amenity.	Yes
Approach to manage performance	
Describe the environmental performance requirements to set air quality outcomes that the project must achieve.	Yes

APPENDIX A

CVs of Technical Reviewers

CURRICULUM VITAE

KIRSTEN LAWRENCE

PRINCIPAL

Air Quality, Asia Pacific

QUALIFICATIONS

BE	1993	B.E. (Chemical and Materials) (Hons), Auckland University

EXPERTISE

- Project Management
- Air Quality Impact Assessments (AQIA)
- Air Quality Management Plans (AQMP)
- Stack Emissions Monitoring
- Ambient Air Quality Monitoring
- Emissions Estimation and Dispersion Modelling
- Greenhouse Gas Inventories
- Expert Witness

Kirsten is a process engineer with 25 years of experience as an environmental consultant specialising in air quality. During this time she has worked for a wide range of clients, including industry and government, in both Australia and New Zealand. Her particular expertise is in the assessment of the environmental effects of air discharges, emission inventories, atmospheric dispersion modelling and air monitoring.

Kirsten has been responsible for managing large-scale environmental projects for blue-chip clients. She has completed major projects for road and rail projects, waste management facilities, CSG developments, power stations, oil refineries, open cut and underground coal and metalliferous mines, chemical manufacturing plants and intensive agricultural developments.

She is experienced in the use of air dispersion models such as TAPM, CALPUFF, AERMOD and the dense gas model SLAB and has assessed air quality impacts from emissions of particulate matter, criteria pollutants, air toxics and odour. She is also experienced in the compilation of GHG emission inventories, and preparation of GHG assessments.

Kirsten has provided expert advice in the review of development applications in the Planning & Environment Court in Queensland, the Victorian Civil and Administrative Tribunal and the Environment Court of NSW. She is also experienced in presenting technical information to stakeholders, including both regulatory authorities and local community members.

PROJECTS

Cross-River Rail 2016

Project manager for an updated air quality and greenhouse gas impact assessment for the proposed CRR 2016 project in Brisbane. Potential impacts associated with fugitive dust emissions during the construction phase were assessed using published emission factors and the CALPUFF model. The potential impacts on local air quality in the vicinity of train stations due to changes in the local road network were assessed qualitatively, as were the impacts associated with emissions from the ventilation system outlets. The net GHG emissions from the project were estimated, taking into account electricity consumption by the new stations and train movements, and reductions in transport-related GHG emissions based on projected impacts of the project on vehicle use in Brisbane.

Melbourne Metro Early Works

Kirsten provided the lead contractor for the MMEW Project with advice regarding air quality management and monitoring. She peer reviewed or prepared several AQMPs for major construction sites associated with the project. This included an assessment of potential air quality impacts associated with emissions from the acoustic enclosures in the CBD North Precinct.

Telegraph Road and Wynnum Road Upgrades – Baseline Air Quality Monitoring	Project manager for two baseline air quality monitoring programmes for the proposed Stage 2 upgrade of Telegraph Road and for the proposed upgrade of Wynnum Road in Brisbane. The Telegraph Road upgrade works included rehabilitation of an old landfill area. The three month baseline monitoring programmes included continuous monitoring of TSP and PM_{10}, VOCs, metals, and dust deposition rates. Air Quality Monitoring and Mitigation Strategy reports were also prepared for the construction works.
Urban Redevelopment and Residential Development Projects - Air Quality Assessments	Peer reviewer for a number of air quality assessments for proposed mixed use developments close to major road and rail infrastructure, including the Bays Market District, Sydney Fish Markets, Waterloo Estate, and the Northern Gateway Masterplan. A number of these assessments included emissions estimation and dispersion modelling using GRAL to assess impacts from surrounding traffic.
Confidential Highway Project	Project manager for an air quality impact assessment for a proposed new highway in Queensland. Work included the estimation of vehicle emissions using the COPERT-Australia emissions modelling software, and dispersion modelling of the road and tunnel emissions using CAL3QHC and CALPUFF. Potential impacts associated with fugitive dust emissions during the construction phase were also assessed.
Proposed Childcare Centre Transport Impact Assessments	Kirsten has been peer reviewer for a number of air quality impact assessments performed for childcare centres proposed in the vicinity of major roads in Brisbane and Sydney. This work has included the estimation of emissions based on traffic data and published emission factors, modelling using CAL3QHCR model and assessment of cumulative air quality impacts (including background) at proposed air intakes and outdoor play areas. Kirsten is currently contracted by Brisbane City Council to perform independent peer reviews of air quality impact assessment reports submitted for proposed childcare centres and service stations.
National Air Emission Inventory for Non-Road Sources	Prepared a national emission inventory covering non-road sources in Australia, commissioned by the Department of Environment and Heritage. The sources included in this study included lawn and garden equipment, agricultural equipment, commercial and recreational marine equipment, industrial equipment and rail service equipment (among others). The results of the inventory were used to evaluate options for the management of these emissions.
Hutley Drive Extension	Kirsten prepared an air quality impact assessment for the construction phase of the Hutley Drive extension, in Ballina Queensland. This study included emission estimation for earthworks and machinery, modelling of these emissions using AUSPLUME and assessment of potential impacts at nearby residences. Mitigation measures were identified for the key emission sources.
North Ryde Transit-Orientated Development	Kirsten assisted with an assessment of potential air quality constraints for the proposed transit-orientated development in North Ryde associated with existing air emission sources in the local area. This project involved the assessment of existing and future air quality at the Project site due to local traffic emissions and emissions from a crematorium and waste transfer station in the surrounding area.

MEMBERSHIPS

CAQP	Certified Air Quality Professional (CASANZ)
CASANZ	Member of the Clean Air Society of Australia and New Zealand (CASANZ)

CURRICULUM VITAE

ALISON RADFORD

ASSOCIATE AIR QUALITY SCIENTIST

Melbourne

QUALIFICATIONS

PhD	2007	Doctor of Philosophy (Chemistry), University of Melbourne
BSc (Hons)	2002	First Class Hons Chemistry, University of Tasmania
BSc	2001	Bachelor of Science (Chemistry/Biochemistry), University of Tasmania

EXPERTISE

- Air Quality Management
- Atmospheric Dispersion Modelling
- Odour Assessment
- Greenhouse Gas Assessments
- Risk Management Strategies

Alison has a PhD in chemistry and over 10 years consulting experience. Alison 's experience covers key aspects of air quality and emissions management including dispersion modelling, monitoring, operational improvement, health risk, risk management and planning approvals.

Alison is proficient in several advanced dispersion modelling packages including CALMET/CALPUFF, AERMET/AERMOD, TAPM, GRAMM/GRAL, CHARM, ALOHA and TRAQ. She has utilised these software packages with the incorporation of specialised emission inventories to model emissions (including odour and particulate matter), and emergency releases, from a variety of sources.

Alison is also a certified Project Manager and Certified Air Quality Professional (CAQP) with the Clean Air Society of Australia and New Zealand (CASANZ).

PROJECTS

Hobsons Bay City Council (West Gate Tunnel Project), Vic	Provided technical support services (ie expert advice) in relation to air quality impacts associated with the West Gate Tunnel Project to assist HBCC as a stakeholder. General peer review and comment on the current EES technical assessment reports in relation to impacts on HBCC, standards adopted, environmental performance requirements and mitigation measures was provided
Melbourne Metro Early Works, Vic	Provided the lead contractor for the MMEW Project with advice regarding air quality management and monitoring. Several AQMPs for major construction sites associated with the project were prepared
Hyder Consulting Pty Ltd, Vic	Completed an Air Quality Impact Assessment of the operation of Webb Dock West Automotive Terminal, which formed part of the Webb Dock Port Capacity Project

Port of Melbourne Corporation (PoMC), Vic	An ambient air quality monitoring study of the dust emissions from dry bulk loading/unloading was conducted at specific PoMC sites to determine regulatory compliance. Emission rates of particulate matter were back calculated from the ambient monitoring data to feed into dispersion modelling of dry bulk loading/unloading operations to determine regulatory compliance
Sibelco Australia Ltd, Vic	Completed an Air Quality Impact Assessment for the reclamation of the Cavehill Limestone Quarry in Lilydale
CEA Consolidated Industries, Vic	Completed an Air Quality Impact Assessment development of a Concrete Batch Plant in Yarraville
Economix Pty Ltd, Vic	Completed a Dust Management Plan the recycling of concrete waste located at their facility in Deer Park
Brimbank City Council, Vic	Completed a comprehensive Air Quality Assessment of fugitive sources of particulate matter from a concrete crushing and batching plant and a proposed landfill on a site close to residences
Alcoa Australia Ltd, Vic	Developed a comprehensive emission inventory (of up to 120 point sources per facility) and undertook air dispersion modelling of a suite of pollutants from Alcoa's Portland and Point Henry Aluminium Smelters, and Anglesea Power Station in Victoria
Thiess Degrémont, Vic	Completed an odour survey and dispersion modelling of emissions from the Victorian Desalination Plant to determine compliance during the commissioning phase
SITA Australia Pty Ltd, Vic	Completed odour dispersion modelling of three odour reduction technologies associated with the composting process at two potential sites to determine the appropriate technology to enable compliance
Thiess Services, Vic	Completed an Air Quality Assessment to determine the potential impact of emissions from soil of class 2 and class 3 indicators from remediation activities on a contaminated site in Melbourne

MEMBERSHIPS

CAQP	Certified Air Quality Professional
CASANZ	Member of Clean Air Society of Australia and New Zealand

PUBLICATIONS

Odour Assessments – Should Animal Odour be Considered? A Case of Wild Goats. 22nd International Clean Air and Environment Conference, May 2015

Comparison of Near Field Impacts of Emergency Release Determined by AUSPLUME and CHARM; 20th International Clean Air and Environment Conference, July 2011

The Influence of Fluoride Guidelines on Human Health Risk Assessments; 19th International Clean Air and Environment Conference, August 2009

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APPENDIX C

Ventilation system impacts at discrete receptors

The results of the plume dispersion modelling assessments at the sensitive receptors for Scenarios A1, A2, B1 and B2, and for the maximum tunnel capacity sensitivity analysis are presented as follows:

TABLES

Table 1: Sensitive receptor results: Scenario A1

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
1	Greensborough bypass path	0.28	0.23	2.0	0.33
2	Plenty River Linear Reserve	0.27	0.22	1.8	0.35
3	Greensborough Collendina Reserve	0.19	0.16	1.4	0.23
4	Metropolitan Ring Road Linear Reserve	0.27	0.23	1.9	0.29
5	Unnamed reserve	0.18	0.15	1.2	0.22
6	Hughes Circuit Reserve	0.24	0.21	1.8	0.24
7	Maroonday Aqueduct	0.18	0.15	1.3	0.22
8	Garvey Oval	0.25	0.22	1.9	0.24
9	Northpark Private Hospital	0.28	0.24	2.0	0.26
10	Gillingham Reserve	0.25	0.22	1.7	0.28
11	Trist Street Reserve	0.36	0.30	2.5	0.41
12	Greensborough Preschool	0.49	0.42	3.3	0.59
13	Abacus Child Care Centre	0.46	0.40	3.1	0.54
14	Kalparrin Early Intervention Program child care	0.29	0.24	1.9	0.38
15	Greensborough Road Surgery	0.47	0.40	3.2	0.59
16	Diaverum Diamond Valley Dialysis Clinic	0.32	0.27	2.2	0.42
17	Greensborough Maternal and Child Health	0.49	0.41	3.3	0.62
18	St Mary's Church	0.43	0.37	3.0	0.54
19	St Mary's School	0.46	0.39	3.2	0.55
20	Greensborough College	0.69	0.57	4.7	0.77
21	Greensborough Primary School	0.44	0.37	3.0	0.54
22	Banyule City Council Greensborough Service Centre	0.35	0.30	2.4	0.44
23	Greensborough RSL	0.31	0.26	2.1	0.38
24	Kalparrin Gardens	0.28	0.24	1.9	0.37
25	Poulter Avenue Reserve	0.26	0.22	1.8	0.34
26	Whatmough Park	0.30	0.25	2.0	0.36
27	Fell Reserve	0.42	0.35	2.8	0.56
28	Plenty River Drive Reserve	0.26	0.21	1.7	0.34
29	St Mary's Reserve	0.46	0.40	3.1	0.57

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
30	Sarah's Reserve	0.28	0.24	2.1	0.34
31	Metropolitan Ring Road Path	0.24	0.21	1.6	0.26
32	Greensborough Police Station	0.47	0.40	3.1	0.61
33	Greensborough MFB Fire Station	0.46	0.39	3.1	0.59
34	Watsonia Occasional Child Care Centre	0.92	0.79	6.2	1.1
35	MS Respite Services	0.77	0.67	5.6	0.90
36	Watsonia scout hall	0.40	0.34	2.8	0.43
37	Watsonia RSL	0.46	0.39	3.4	0.56
38	North East Citizen Advocacy (NECA)	0.91	0.79	6.1	1.1
39	Watsonia Library	0.57	0.48	3.9	0.60
40	Holy Spirit Anglican Church	0.51	0.45	3.8	0.59
41	Grace Baptist Church	0.47	0.41	3.4	0.52
42	Watsonia Uniting Church	0.58	0.50	4.2	0.67
43	Concord School	0.44	0.38	3.2	0.49
44	Watsonia Primary School	0.50	0.42	3.5	0.53
45	AK Lines Reserve	0.40	0.35	2.9	0.45
46	Elder Street Reserve	0.90	0.79	6.1	0.99
47	West Mayling Reserve	0.86	0.74	6.2	0.91
48	Gabonia Avenue Reserve	0.91	0.79	6.4	1.1
49	Watsonia Station Carpark Reserve	0.68	0.58	4.5	0.71
50	Watsonia Road Reserve	0.54	0.47	4.0	0.62
51	Greensborough Road Early Learning and Kinder	0.65	0.55	4.6	0.70
52	Macleod Recreation and Fitness & CC	0.85	0.73	6.0	0.94
53	Macleod Preschool	0.85	0.72	5.8	0.95
54	Baptcare Strathalan Macleod	1.3	1.1	9.0	1.4
55	Regis Macleod	1.1	0.93	7.9	1.2
56	Macleod Maternal and Child Health	0.82	0.71	6.0	0.95
57	IDV	0.84	0.72	5.9	0.87
58	YMCA Recreation and Fitness Centre	0.84	0.72	6.0	0.92
59	Nets Stadium Banyule	0.90	0.78	6.4	1.0

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
60	Macleod Organic Community Garden	1.00	0.83	6.9	1.1
61	Winsor Reserve	1.4	1.2	9.5	1.3
62	Macleod College Oval	1.1	0.91	7.3	1.1
63	Macleod Netball Stadium	0.91	0.78	6.7	1.0
64	Harry Pottage Reserve	0.81	0.70	5.7	0.92
65	Macleod Park	0.83	0.71	5.8	0.83
66	Macleod Tennis Club	0.85	0.73	6.1	0.91
67	Junior Football Club and Macleod Cricket	0.79	0.68	5.6	0.80
68	Simpson Barracks	2.7	2.3	18	3.4
69	Coleen Reserve	1.1	0.96	8.2	1.3
70	Borlase Reserve	0.58	0.50	4.1	0.63
71	Melbourne Water easement	0.69	0.60	4.9	0.74
72	Goodstart Early Learning	0.28	0.24	2.0	0.28
73	Assisi Centre Aged Care	0.40	0.34	2.6	0.43
74	Japara Rosanna Views Nursing Home	0.50	0.42	3.5	0.57
75	St Martin of Tours Catholic Church	0.50	0.41	3.3	0.53
76	St Martin of Tours Catholic Primary School	0.51	0.43	3.5	0.56
77	Banyule Primary School	0.31	0.27	2.3	0.32
78	Maleela Grove, Rosanna	0.37	0.32	2.8	0.42
79	Mercedes Court Reserve	0.32	0.27	2.3	0.34
80	River Gum Walk	0.25	0.22	1.9	0.28
81	Creekbend Reserve	0.32	0.28	2.3	0.35
82	Viewbank College	0.30	0.25	2.1	0.35
83	Viewbank family medical group	0.70	0.60	5.0	0.71
84	Viewbank podiatry	0.71	0.61	5.0	0.75
85	Simla Close Reserve	0.30	0.26	2.2	0.31
86	Banyule Flats	0.24	0.20	1.7	0.28
87	River Gum Walk	0.22	0.19	1.6	0.25
88	Warringal Parklands	0.21	0.18	1.5	0.25
89	Banyule Tennis Club	0.21	0.18	1.5	0.25

Receptor ID	Pollutant		PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description	Averaging period	1 hour	1 hour	1 hour	3 minute
90	Heidelberg Park and Heidelberg cricket ground		0.22	0.19	1.5	0.34
91	Banyule Theatre Complex		0.22	0.19	1.5	0.25
92	Heidelberg Police Station		0.42	0.36	2.9	0.56
93	Austin Hospital Precinct		0.28	0.24	1.9	0.44
94	Yarra Flats Park		0.43	0.37	2.7	0.64
95	Yarra Flats Park		1.1	0.95	7.6	1.6
96	Creative Play Early Learning Centre		0.45	0.39	3.1	0.53
97	Kalker Montessori Centre		1.0	0.86	6.5	1.5
98	Veneto Club		2.0	1.7	13	3.3
99	Heide Museum of Modern Art		0.38	0.32	2.6	0.46
100	Bulleen Art and Garden		0.31	0.26	2.0	0.39
101	Marcellin College		1.7	1.5	11	2.9
102	Trinity Grammar School Sporting Complex		0.97	0.84	6.5	1.5
104	Bolin Bolin Billabong		0.85	0.74	5.8	1.3
105	Carey Grammar Sports Complex		2.9	2.5	20	4.8
106	Yarra Valley parklands		0.27	0.23	1.8	0.36
107	Sandra Street Reserve		1.7	1.4	11	2.4
108	Bulleen Park		1.3	1.1	8.9	1.9
109	Koonung Reserve		0.97	0.82	6.3	1.4
110	Koonung Creek Reserve		0.72	0.61	4.6	1.0
111	Willow Bend Reserve		0.58	0.49	3.8	0.81
112	Pipe Line Reserve		0.86	0.74	5.7	1.2
113	Yarra Valley Country Club		0.40	0.34	2.8	0.53
114	Bulleen Golf Driving Range		0.34	0.29	2.2	0.46
115	Wonderland Childcare and Kinder		0.33	0.28	2.1	0.47
116	Applewood Retirement Village		0.18	0.16	1.2	0.26
117	Tende Beck Scout Hall		0.30	0.26	2.1	0.47
118	North Eastern Jewish Centre-Yeshurun Congregation		0.33	0.28	2.1	0.45
119	Birralee Primary School		0.23	0.20	1.6	0.33
120	Wilsons Road Reserve		0.25	0.21	1.7	0.35

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
121	Katrina Street Reserve	0.21	0.18	1.3	0.29
122	Davis Street Reserve	0.19	0.17	1.4	0.28
123	Tram Road Reserve	0.17	0.14	1.2	0.25
124	Frank Sedgman Reserve	0.16	0.14	1.1	0.24
125	Koonung Creek Linear Park	0.17	0.14	1.1	0.22
126	Stanton Street Reserve	0.25	0.21	1.6	0.36
127	Doncaster Park and Ride	0.28	0.25	1.9	0.43
128	Tino Ceberano Martial Arts Academy	0.30	0.26	2.0	0.44
129	Greythorn Bowling Club	0.40	0.34	2.6	0.53
130	Manningham Park Reserve	0.42	0.36	2.8	0.57
131	Japara Sydney Williams Apartments	0.15	0.13	1.0	0.20
132	Japara Millward Nursing home	0.15	0.13	1.0	0.20
133	Koonung Creek Reserve	0.17	0.14	1.2	0.23
134	Boronia Grove Reserve	0.15	0.13	1.1	0.18
135	Heatherwood School	0.10	0.086	0.65	0.13
136	State Vision Resource Centre	0.099	0.086	0.65	0.13
137	Koonung Creek Linear Park	0.13	0.11	0.88	0.17
138	Aranga Reserve	0.10	0.091	0.71	0.14
139	Oxford Street Reserve	0.099	0.086	0.66	0.14
140	Belle Vue Primary School	0.93	0.79	6.0	1.4
141	Boroondara Tennis Centre	1.2	1.0	8.0	2.1
142	Musca Street Reserve	0.61	0.51	4.0	0.90
143	Columba Street Reserve	0.87	0.75	5.9	1.3
144	Leonis Avenue Reserve	1.1	0.95	7.2	1.8
145	Koonung Creek Reserve	0.72	0.61	4.6	1.0
146	Winfield Road Reserve	0.32	0.27	2.1	0.41
147	Yarra Flats Reserve	0.52	0.45	3.5	0.90
148	Freeway Public Golf Course	1.2	1.0	8.0	1.7
149	Kew Golf Club	0.31	0.26	2.0	0.47
150	Hays Paddock/Reserve	0.33	0.28	2.2	0.51

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
151	Hyde Park	0.20	0.18	1.4	0.32
152	Burke Rd. billabong reserve	0.53	0.46	3.5	0.84
153	Green Acres Golf Club	0.32	0.28	2.2	0.51
154	Willsmere-Chandler Park	0.26	0.23	1.8	0.41
155	Guide Dogs Victoria	0.17	0.15	1.2	0.27
156	Royal Talbot Rehabilitation Centre	0.20	0.17	1.3	0.27
157	Yarra Bend Park	0.12	0.11	0.84	0.19
158	Kate Campbell Reserve	0.18	0.15	1.2	0.27
159	Jack O'Toole Reserve	0.21	0.18	1.4	0.32
160	North Kew Tennis Club	0.20	0.17	1.4	0.31
161	1st Kew Scout Group	0.20	0.17	1.4	0.31
162	Elgar Park	0.22	0.19	1.4	0.30
163	Koonung Creek Wetlands	0.24	0.20	1.6	0.31
164	Presbyterian Theological College	0.18	0.15	1.2	0.22
165	Koonung Creek Linear Park	0.18	0.15	1.2	0.24
166	Frank Sedgemen Reserve	0.16	0.14	1.1	0.24
167	Bounce Inc.	0.14	0.12	0.98	0.19
168	Flow Through Yoga	0.13	0.12	0.94	0.19
169	Melbourne Badminton Centre	0.14	0.12	0.97	0.19
170	Eastern Freeway Linear Park	0.15	0.13	0.98	0.19
171	Koonung Creek Linear Park	0.14	0.12	0.95	0.16
172	Slater Reserve	0.12	0.11	0.84	0.17
173	Warekila Preschool	0.11	0.099	0.79	0.13
174	Eastern Freeway Linear Reserve	0.11	0.097	0.77	0.13
175	R E Gray Reserve	0.10	0.088	0.70	0.12
176	Koonung Creek Linear Park	0.12	0.10	0.81	0.16
177	Alphington Park	0.21	0.18	1.4	0.32
178	Latrobe Golf Club	0.20	0.17	1.3	0.30
179	Thomas Embling Hospital	0.14	0.12	0.91	0.21
180	Melbourne Polytechnic	0.15	0.13	0.96	0.22

Receptor ID	Pollutant		PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description	Averaging period	1 hour	1 hour	1 hour	3 minute
181	RMIT Surveying Field Station		0.13	0.11	0.87	0.19
182	Victorian Indigenous Nurseries Co-Operative		0.13	0.11	0.88	0.20
183	Yarra Bend Park		0.12	0.11	0.85	0.19
184	Fairlea Reserve		0.13	0.11	0.87	0.21
185	Yarra Bend Public Golf Course		0.13	0.12	0.92	0.20
186	Petit Early Learning Journey		0.093	0.080	0.62	0.14
187	Gray Street Reserve		0.086	0.074	0.58	0.13
188	Ramden Street Reserve		0.11	0.095	0.73	0.16
189	Dights Falls Reserve		0.084	0.073	0.58	0.13
190	Victoria Park		0.091	0.078	0.62	0.14
191	Maugie Street Reserve		0.092	0.078	0.61	0.14
Maximum						
105	Carey Grammar Sports Complex		2.9	2.5	20	4.8

Table 2: Sensitive receptor results: Scenario A2

Receptor ID	Pollutant	PM$_{10}$ (µg/m^3)	PM$_{2.5}$ (µg/m^3)	NO$_2$ (µg/m^3)
	Description / Averaging period	1 hour	1 hour	1 hour
1	Greensborough bypass path	0.20	0.12	0.63
2	Plenty River Linear Reserve	0.21	0.13	0.59
3	Greensborough Collendina Reserve	0.15	0.096	0.46
4	Metropolitan Ring Road Linear Reserve	0.18	0.12	0.61
5	Unnamed reserve	0.13	0.085	0.39
6	Hughes Circuit Reserve	0.16	0.10	0.60
7	Maroonday Aqueduct	0.13	0.081	0.42
8	Garvey Oval	0.17	0.11	0.63
9	Northpark Private Hospital	0.20	0.13	0.63
10	Gillingham Reserve	0.18	0.11	0.58
11	Trist Street Reserve	0.25	0.15	0.83
12	Greensborough Preschool	0.36	0.23	1.1
13	Abacus Child Care Centre	0.33	0.21	1.0
14	Kalparrin Early Intervention Program child care	0.23	0.14	0.63
15	Greensborough Road Surgery	0.36	0.23	1.0
16	Diaverum Diamond Valley Dialysis Clinic	0.26	0.16	0.70
17	Greensborough Maternal and Child Health	0.38	0.23	1.1
18	St Mary's Church	0.34	0.21	0.98
19	St Mary's School	0.34	0.21	1.0
20	Greensborough College	0.48	0.31	1.5
21	Greensborough Primary School	0.33	0.21	0.95
22	Banyule City Council Greensborough Service Centre	0.27	0.17	0.76
23	Greensborough RSL	0.24	0.15	0.67
24	Kalparrin Gardens	0.23	0.14	0.63
25	Poulter Avenue Reserve	0.21	0.13	0.57
26	Whatmough Park	0.22	0.14	0.64
27	Fell Reserve	0.34	0.21	0.91
28	Plenty River Drive Reserve	0.20	0.13	0.58
29	St Mary's Reserve	0.35	0.22	0.99

Receptor ID	Pollutant	PM10 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
	Description / Averaging period	1 hour	1 hour	1 hour
30	Sarah's Reserve	0.21	0.13	0.68
31	Metropolitan Ring Road Path	0.18	0.11	0.55
32	Greensborough Police Station	0.38	0.24	1.0
33	Greensborough MFB Fire Station	0.35	0.22	0.99
34	Watsonia Occasional Child Care Centre	0.69	0.43	2.0
35	MS Respite Services	0.56	0.36	1.8
36	Watsonia scout hall	0.28	0.18	0.93
37	Watsonia RSL	0.35	0.22	1.1
38	North East Citizen Advocacy (NECA)	0.66	0.42	2.0
39	Watsonia Library	0.39	0.25	1.2
40	Holy Spirit Anglican Church	0.37	0.23	1.2
41	Grace Baptist Church	0.33	0.21	1.1
42	Watsonia Uniting Church	0.43	0.27	1.4
43	Concord School	0.31	0.20	1.1
44	Watsonia Primary School	0.34	0.21	1.2
45	AK Lines Reserve	0.29	0.18	0.96
46	Elder Street Reserve	0.62	0.39	2.0
47	West Mayling Reserve	0.61	0.39	2.1
48	Gabonia Avenue Reserve	0.66	0.41	2.1
49	Watsonia Station Carpark Reserve	0.47	0.29	1.4
50	Watsonia Road Reserve	0.39	0.25	1.3
51	Greensborough Road Early Learning and Kinder	0.46	0.29	1.5
52	Macleod Recreation and Fitness & CC	0.60	0.38	2.0
53	Macleod Preschool	0.62	0.40	1.9
54	Baptcare Strathalan Macleod	0.89	0.57	3.0
55	Regis Macleod	0.82	0.52	2.6
56	Macleod Maternal and Child Health	0.61	0.39	2.0
57	IDV	0.58	0.37	1.9
58	YMCA Recreation and Fitness Centre	0.59	0.37	2.0
59	Nets Stadium Banyule	0.65	0.41	2.1

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO2 (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour
60	Macleod Organic Community Garden	0.70	0.44	2.3
61	Winsor Reserve	0.97	0.61	3.1
62	Macleod College Oval	0.75	0.48	2.4
63	Macleod Netball Stadium	0.67	0.42	2.2
64	Harry Pottage Reserve	0.57	0.36	1.9
65	Macleod Park	0.60	0.38	1.9
66	Macleod Tennis Club	0.64	0.40	2.0
67	Junior Football Club and Macleod Cricket	0.57	0.37	1.8
68	Simpson Barracks	2.1	1.3	5.8
69	Coleen Reserve	0.86	0.54	2.7
70	Borlase Reserve	0.41	0.26	1.4
71	Melbourne Water easement	0.50	0.32	1.6
72	Goodstart Early Learning	0.20	0.13	0.66
73	Assisi Centre Aged Care	0.29	0.18	0.87
74	Japara Rosanna Views Nursing Home	0.39	0.24	1.1
75	St Martin of Tours Catholic Church	0.37	0.23	1.1
76	St Martin of Tours Catholic Primary School	0.39	0.25	1.2
77	Banyule Primary School	0.23	0.14	0.75
78	Maleela Grove, Rosanna	0.27	0.17	0.91
79	Mercedes Court Reserve	0.22	0.14	0.77
80	River Gum Walk	0.19	0.12	0.61
81	Creekbend Reserve	0.22	0.14	0.75
82	Viewbank College	0.22	0.14	0.70
83	Viewbank family medical group	0.50	0.32	1.6
84	Viewbank podiatry	0.50	0.31	1.6
85	Simla Close Reserve	0.21	0.14	0.72
86	Banyule Flats	0.15	0.096	0.55
87	River Gum Walk	0.15	0.093	0.52
88	Warringal Parklands	0.14	0.089	0.49
89	Banyule Tennis Club	0.14	0.090	0.48

Receptor ID	Pollutant	PM10 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
	Description / Averaging period	1 hour	1 hour	1 hour
90	Heidelberg Park and Heidelberg cricket ground	0.16	0.10	0.51
91	Banyule Theatre Complex	0.14	0.090	0.51
92	Heidelberg Police Station	0.27	0.17	0.97
93	Austin Hospital Precinct	0.21	0.13	0.64
94	Yarra Flats Park	0.29	0.18	0.91
95	Yarra Flats Park	0.73	0.46	2.5
96	Creative Play Early Learning Centre	0.28	0.18	1.0
97	Kalker Montessori Centre	0.72	0.46	2.1
98	Veneto Club	1.4	0.90	4.4
99	Heide Museum of Modern Art	0.25	0.16	0.85
100	Bulleen Art and Garden	0.21	0.13	0.65
101	Marcellin College	1.2	0.79	3.8
102	Trinity Grammar School Sporting Complex	0.66	0.42	2.1
104	Bolin Bolin Billabong	0.62	0.39	1.9
105	Carey Grammar Sports Complex	2.0	1.3	6.4
106	Yarra Valley parklands	0.18	0.11	0.59
107	Sandra Street Reserve	1.1	0.70	3.8
108	Bulleen Park	0.81	0.52	2.9
109	Koonung Reserve	0.67	0.43	2.0
110	Koonung Creek Reserve	0.51	0.32	1.5
111	Willow Bend Reserve	0.41	0.26	1.2
112	Pipe Line Reserve	0.58	0.36	1.9
113	Yarra Valley Country Club	0.25	0.16	0.91
114	Bulleen Golf Driving Range	0.24	0.15	0.71
115	Wonderland Childcare and Kinder	0.23	0.15	0.69
116	Applewood Retirement Village	0.12	0.075	0.39
117	Tende Beck Scout Hall	0.22	0.14	0.69
118	North Eastern Jewish Centre-Yeshurun Congregation	0.23	0.15	0.69
119	Birralee Primary School	0.16	0.10	0.51
120	Wilsons Road Reserve	0.17	0.11	0.56

Receptor ID	Pollutant	PM10 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
	Description / Averaging period	1 hour	1 hour	1 hour
121	Katrina Street Reserve	0.14	0.087	0.45
122	Davis Street Reserve	0.13	0.080	0.45
123	Tram Road Reserve	0.11	0.071	0.37
124	Frank Sedgman Reserve	0.11	0.069	0.38
125	Koonung Creek Linear Park	0.11	0.069	0.38
126	Stanton Street Reserve	0.19	0.12	0.55
127	Doncaster Park and Ride	0.19	0.12	0.64
128	Tino Ceberano Martial Arts Academy	0.21	0.14	0.67
129	Greythorn Bowling Club	0.26	0.17	0.84
130	Manningham Park Reserve	0.27	0.17	0.91
131	Japara Sydney Williams Apartments	0.093	0.060	0.33
132	Japara Millward Nursing home	0.092	0.060	0.33
133	Koonung Creek Reserve	0.11	0.071	0.38
134	Boronia Grove Reserve	0.100	0.064	0.35
135	Heatherwood School	0.071	0.046	0.21
136	State Vision Resource Centre	0.071	0.046	0.21
137	Koonung Creek Linear Park	0.080	0.052	0.28
138	Aranga Reserve	0.071	0.046	0.23
139	Oxford Street Reserve	0.064	0.041	0.21
140	Belle Vue Primary School	0.68	0.43	2.0
141	Boroondara Tennis Centre	0.88	0.56	2.6
142	Musca Street Reserve	0.41	0.26	1.3
143	Columba Street Reserve	0.58	0.38	1.9
144	Leonis Avenue Reserve	0.80	0.51	2.4
145	Koonung Creek Reserve	0.52	0.32	1.5
146	Winfield Road Reserve	0.22	0.14	0.69
147	Yarra Flats Reserve	0.37	0.24	1.2
148	Freeway Public Golf Course	0.87	0.55	2.6
149	Kew Golf Club	0.21	0.14	0.66
150	Hays Paddock/Reserve	0.22	0.14	0.71

Receptor ID	Pollutant	PM10 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
	Description / Averaging period	1 hour	1 hour	1 hour
151	Hyde Park	0.14	0.091	0.45
152	Burke Rd. billabong reserve	0.36	0.23	1.2
153	Green Acres Golf Club	0.23	0.15	0.73
154	Willsmere-Chandler Park	0.19	0.12	0.59
155	Guide Dogs Victoria	0.12	0.077	0.39
156	Royal Talbot Rehabilitation Centre	0.13	0.084	0.42
157	Yarra Bend Park	0.086	0.054	0.28
158	Kate Campbell Reserve	0.12	0.080	0.39
159	Jack O'Toole Reserve	0.15	0.093	0.46
160	North Kew Tennis Club	0.14	0.091	0.45
161	1st Kew Scout Group	0.14	0.090	0.45
162	Elgar Park	0.16	0.10	0.47
163	Koonung Creek Wetlands	0.15	0.098	0.52
164	Presbyterian Theological College	0.13	0.085	0.39
165	Koonung Creek Linear Park	0.11	0.073	0.39
166	Frank Sedgemen Reserve	0.10	0.068	0.37
167	Bounce Inc.	0.091	0.058	0.32
168	Flow Through Yoga	0.090	0.058	0.31
169	Melbourne Badminton Centre	0.090	0.058	0.31
170	Eastern Freeway Linear Park	0.092	0.059	0.32
171	Koonung Creek Linear Park	0.089	0.057	0.31
172	Slater Reserve	0.080	0.051	0.28
173	Warekila Preschool	0.075	0.048	0.26
174	Eastern Freeway Linear Reserve	0.073	0.047	0.25
175	R E Gray Reserve	0.066	0.042	0.23
176	Koonung Creek Linear Park	0.074	0.048	0.26
177	Alphington Park	0.14	0.090	0.45
178	Latrobe Golf Club	0.14	0.087	0.44
179	Thomas Embling Hospital	0.095	0.061	0.30
180	Melbourne Polytechnic	0.10	0.065	0.32

Receptor ID	Pollutant		PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)
	Description	Averaging period	1 hour	1 hour	1 hour
181	RMIT Surveying Field Station		0.084	0.054	0.29
182	Victorian Indigenous Nurseries Co-Operative		0.088	0.056	0.29
183	Yarra Bend Park		0.086	0.054	0.28
184	Fairlea Reserve		0.088	0.055	0.29
185	Yarra Bend Public Golf Course		0.092	0.058	0.30
186	Petit Early Learning Journey		0.063	0.040	0.20
187	Gray Street Reserve		0.057	0.037	0.19
188	Ramden Street Reserve		0.074	0.047	0.23
189	Dights Falls Reserve		0.056	0.035	0.19
190	Victoria Park		0.062	0.039	0.20
191	Maugie Street Reserve		0.060	0.038	0.20
Maximum					
68	Simpson Barracks		2.1	1.3	-
105	Carey Grammar Sports Complex		-	-	6.4

Table 3: Sensitive receptor results: Scenario B1

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
1	Greensborough bypass path	0.32	0.27	2.3	0.38
2	Plenty River Linear Reserve	0.31	0.26	2.2	0.39
3	Greensborough Collendina Reserve	0.25	0.21	1.6	0.28
4	Metropolitan Ring Road Linear Reserve	0.31	0.26	2.2	0.34
5	Unnamed reserve	0.21	0.18	1.4	0.27
6	Hughes Circuit Reserve	0.29	0.25	2.1	0.29
7	Maroonday Aqueduct	0.21	0.18	1.5	0.26
8	Garvey Oval	0.31	0.26	2.2	0.29
9	Northpark Private Hospital	0.34	0.29	2.4	0.29
10	Gillingham Reserve	0.29	0.25	2.1	0.34
11	Trist Street Reserve	0.41	0.35	3.0	0.46
12	Greensborough Preschool	0.57	0.47	3.9	0.69
13	Abacus Child Care Centre	0.52	0.45	3.5	0.65
14	Kalparrin Early Intervention Program child care	0.34	0.29	2.4	0.44
15	Greensborough Road Surgery	0.57	0.48	3.9	0.64
16	Diaverum Diamond Valley Dialysis Clinic	0.36	0.31	2.5	0.45
17	Greensborough Maternal and Child Health	0.58	0.49	4.0	0.73
18	St Mary's Church	0.52	0.44	3.6	0.61
19	St Mary's School	0.53	0.45	3.6	0.62
20	Greensborough College	0.77	0.65	5.0	0.92
21	Greensborough Primary School	0.47	0.41	3.5	0.59
22	Banyule City Council Greensborough Service Centre	0.38	0.32	2.5	0.46
23	Greensborough RSL	0.33	0.28	2.2	0.41
24	Kalparrin Gardens	0.33	0.28	2.3	0.42
25	Poulter Avenue Reserve	0.29	0.25	2.1	0.37
26	Whatmough Park	0.32	0.28	2.4	0.41
27	Fell Reserve	0.47	0.40	3.2	0.60
28	Plenty River Drive Reserve	0.31	0.26	2.2	0.39
29	St Mary's Reserve	0.55	0.46	3.8	0.61

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
30	Sarah's Reserve	0.35	0.29	2.5	0.38
31	Metropolitan Ring Road Path	0.28	0.24	2.0	0.32
32	Greensborough Police Station	0.53	0.46	3.7	0.66
33	Greensborough MFB Fire Station	0.52	0.45	3.7	0.67
34	Watsonia Occasional Child Care Centre	1.1	0.95	7.6	1.3
35	MS Respite Services	0.93	0.79	6.5	0.97
36	Watsonia scout hall	0.46	0.39	3.3	0.53
37	Watsonia RSL	0.58	0.49	4.0	0.70
38	North East Citizen Advocacy (NECA)	1.1	0.95	7.4	1.3
39	Watsonia Library	0.68	0.58	4.7	0.71
40	Holy Spirit Anglican Church	0.62	0.53	4.4	0.70
41	Grace Baptist Church	0.56	0.47	4.0	0.62
42	Watsonia Uniting Church	0.69	0.58	5.0	0.81
43	Concord School	0.53	0.45	3.8	0.59
44	Watsonia Primary School	0.57	0.49	4.1	0.62
45	AK Lines Reserve	0.48	0.41	3.4	0.53
46	Elder Street Reserve	0.95	0.80	6.2	1.2
47	West Mayling Reserve	1.0	0.89	7.4	1.0
48	Gabonia Avenue Reserve	1.1	0.92	7.1	1.3
49	Watsonia Station Carpark Reserve	0.79	0.67	5.5	0.87
50	Watsonia Road Reserve	0.66	0.56	4.6	0.74
51	Greensborough Road Early Learning and Kinder	0.81	0.69	5.6	0.77
52	Macleod Recreation and Fitness & CC	1.0	0.89	7.4	1.1
53	Macleod Preschool	1.0	0.87	7.3	1.1
54	Baptcare Strathalan Macleod	1.6	1.3	11	1.4
55	Regis Macleod	1.3	1.1	9.4	1.2
56	Macleod Maternal and Child Health	1.0	0.90	7.5	1.1
57	IDV	1.0	0.88	7.3	1.1
58	YMCA Recreation and Fitness Centre	1.0	0.89	7.4	1.1
59	Nets Stadium Banyule	1.1	0.96	8.1	1.3

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
60	Macleod Organic Community Garden	1.2	1.0	8.3	1.2
61	Winsor Reserve	1.6	1.4	11	1.4
62	Macleod College Oval	1.3	1.1	9.4	1.3
63	Macleod Netball Stadium	1.1	0.99	8.2	1.2
64	Harry Pottage Reserve	0.99	0.85	7.1	1.1
65	Macleod Park	0.98	0.83	6.8	0.95
66	Macleod Tennis Club	1.0	0.87	7.4	1.1
67	Junior Football Club and Macleod Cricket	0.95	0.80	6.5	0.93
68	Simpson Barracks	3.0	2.6	22	3.4
69	Coleen Reserve	1.3	1.1	9.0	1.4
70	Borlase Reserve	0.71	0.61	5.2	0.68
71	Melbourne Water easement	0.85	0.73	6.1	0.83
72	Goodstart Early Learning	0.35	0.30	2.5	0.31
73	Assisi Centre Aged Care	0.46	0.39	3.1	0.52
74	Japara Rosanna Views Nursing Home	0.61	0.52	4.1	0.67
75	St Martin of Tours Catholic Church	0.59	0.49	4.1	0.66
76	St Martin of Tours Catholic Primary School	0.61	0.53	4.4	0.69
77	Banyule Primary School	0.39	0.34	2.7	0.37
78	Maleela Grove, Rosanna	0.48	0.41	3.4	0.45
79	Mercedes Court Reserve	0.37	0.32	2.8	0.38
80	River Gum Walk	0.32	0.28	2.4	0.31
81	Creekbend Reserve	0.39	0.34	2.9	0.36
82	Viewbank College	0.38	0.31	2.6	0.41
83	Viewbank family medical group	0.86	0.73	6.3	0.78
84	Viewbank podiatry	0.86	0.75	6.1	0.81
85	Simla Close Reserve	0.37	0.32	2.7	0.36
86	Banyule Flats	0.28	0.25	2.0	0.33
87	River Gum Walk	0.27	0.23	1.9	0.28
88	Warringal Parklands	0.25	0.22	1.7	0.29
89	Banyule Tennis Club	0.25	0.22	1.8	0.29

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
90	Heidelberg Park and Heidelberg cricket ground	0.27	0.23	1.8	0.37
91	Banyule Theatre Complex	0.26	0.22	1.9	0.28
92	Heidelberg Police Station	0.50	0.43	3.4	0.62
93	Austin Hospital Precinct	0.39	0.34	2.8	0.49
94	Yarra Flats Park	0.53	0.47	3.8	0.72
95	Yarra Flats Park	1.3	1.1	8.6	1.7
96	Creative Play Early Learning Centre	0.51	0.45	3.6	0.64
97	Kalker Montessori Centre	1.1	0.90	7.3	1.7
98	Veneto Club	2.3	2.0	15	3.4
99	Heide Museum of Modern Art	0.43	0.37	2.9	0.53
100	Bulleen Art and Garden	0.36	0.30	2.4	0.45
101	Marcellin College	1.9	1.7	13	2.9
102	Trinity Grammar School Sporting Complex	1.2	1.1	8.6	1.6
104	Bolin Bolin Billabong	1.1	0.97	7.9	1.3
105	Carey Grammar Sports Complex	3.3	2.9	22	4.8
106	Yarra Valley parklands	0.31	0.27	2.2	0.41
107	Sandra Street Reserve	1.9	1.6	13	2.5
108	Bulleen Park	1.5	1.3	10	1.9
109	Koonung Reserve	1.1	0.94	7.6	1.5
110	Koonung Creek Reserve	0.75	0.64	4.9	1.2
111	Willow Bend Reserve	0.61	0.52	4.0	0.94
112	Pipe Line Reserve	0.92	0.80	6.4	1.3
113	Yarra Valley Country Club	0.45	0.39	3.1	0.61
114	Bulleen Golf Driving Range	0.42	0.36	2.9	0.53
115	Wonderland Childcare and Kinder	0.40	0.35	2.8	0.51
116	Applewood Retirement Village	0.21	0.18	1.4	0.28
117	Tende Beck Scout Hall	0.38	0.33	2.6	0.51
118	North Eastern Jewish Centre-Yeshurun Congregation	0.39	0.35	2.8	0.52
119	Birralee Primary School	0.28	0.25	2.0	0.36
120	Wilsons Road Reserve	0.31	0.27	2.2	0.41

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
121	Katrina Street Reserve	0.25	0.22	1.7	0.31
122	Davis Street Reserve	0.23	0.20	1.6	0.29
123	Tram Road Reserve	0.20	0.17	1.3	0.27
124	Frank Sedgman Reserve	0.19	0.17	1.4	0.25
125	Koonung Creek Linear Park	0.19	0.17	1.3	0.24
126	Stanton Street Reserve	0.29	0.24	1.9	0.42
127	Doncaster Park and Ride	0.36	0.31	2.5	0.46
128	Tino Ceberano Martial Arts Academy	0.38	0.33	2.6	0.51
129	Greythorn Bowling Club	0.46	0.40	3.2	0.59
130	Manningham Park Reserve	0.48	0.41	3.3	0.59
131	Japara Sydney Williams Apartments	0.17	0.14	1.1	0.20
132	Japara Millward Nursing home	0.17	0.14	1.1	0.20
133	Koonung Creek Reserve	0.19	0.16	1.2	0.23
134	Boronia Grove Reserve	0.17	0.15	1.1	0.21
135	Heatherwood School	0.11	0.090	0.71	0.15
136	State Vision Resource Centre	0.11	0.091	0.71	0.15
137	Koonung Creek Linear Park	0.14	0.12	0.92	0.17
138	Aranga Reserve	0.12	0.099	0.76	0.15
139	Oxford Street Reserve	0.11	0.092	0.72	0.14
140	Belle Vue Primary School	1.2	1.0	7.7	1.5
141	Boroondara Tennis Centre	1.3	1.2	9.2	2.1
142	Musca Street Reserve	0.68	0.59	4.5	0.92
143	Columba Street Reserve	1.1	0.93	7.6	1.4
144	Leonis Avenue Reserve	1.2	1.0	7.9	1.8
145	Koonung Creek Reserve	0.75	0.64	4.9	1.2
146	Winfield Road Reserve	0.35	0.30	2.4	0.48
147	Yarra Flats Reserve	0.58	0.49	3.7	0.89
148	Freeway Public Golf Course	1.3	1.2	8.8	2.0
149	Kew Golf Club	0.33	0.28	2.2	0.50
150	Hays Paddock/Reserve	0.36	0.31	2.3	0.51

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / **Averaging period**	1 hour	1 hour	1 hour	3 minute
151	Hyde Park	0.23	0.20	1.6	0.33
152	Burke Rd. billabong reserve	0.58	0.50	4.0	0.89
153	Green Acres Golf Club	0.37	0.32	2.5	0.54
154	Willsmere-Chandler Park	0.30	0.26	2.0	0.43
155	Guide Dogs Victoria	0.20	0.17	1.4	0.28
156	Royal Talbot Rehabilitation Centre	0.21	0.19	1.4	0.29
157	Yarra Bend Park	0.14	0.12	0.97	0.20
158	Kate Campbell Reserve	0.19	0.17	1.3	0.29
159	Jack O'Toole Reserve	0.23	0.20	1.6	0.33
160	North Kew Tennis Club	0.23	0.20	1.5	0.32
161	1st Kew Scout Group	0.23	0.20	1.5	0.32
162	Elgar Park	0.24	0.21	1.7	0.34
163	Koonung Creek Wetlands	0.26	0.23	1.8	0.34
164	Presbyterian Theological College	0.21	0.18	1.4	0.27
165	Koonung Creek Linear Park	0.21	0.18	1.4	0.24
166	Frank Sedgemen Reserve	0.20	0.17	1.4	0.24
167	Bounce Inc.	0.17	0.14	1.1	0.19
168	Flow Through Yoga	0.15	0.13	1.0	0.19
169	Melbourne Badminton Centre	0.16	0.14	1.1	0.19
170	Eastern Freeway Linear Park	0.16	0.14	1.1	0.19
171	Koonung Creek Linear Park	0.15	0.13	1.0	0.18
172	Slater Reserve	0.14	0.12	0.94	0.17
173	Warekila Preschool	0.13	0.11	0.86	0.15
174	Eastern Freeway Linear Reserve	0.13	0.11	0.83	0.15
175	R E Gray Reserve	0.11	0.098	0.75	0.13
176	Koonung Creek Linear Park	0.13	0.11	0.85	0.16
177	Alphington Park	0.23	0.20	1.5	0.35
178	Latrobe Golf Club	0.22	0.19	1.5	0.31
179	Thomas Embling Hospital	0.15	0.13	1.0	0.23
180	Melbourne Polytechnic	0.16	0.14	1.1	0.25

Receptor ID	Pollutant		PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	NO_2 (µg/m^3)	Benzene (µg/m^3)
	Description	Averaging period	1 hour	1 hour	1 hour	3 minute
181	RMIT Surveying Field Station		0.14	0.12	0.98	0.20
182	Victorian Indigenous Nurseries Co-Operative		0.15	0.13	1.00	0.20
183	Yarra Bend Park		0.14	0.12	0.94	0.20
184	Fairlea Reserve		0.15	0.12	0.97	0.21
185	Yarra Bend Public Golf Course		0.15	0.13	1.0	0.22
186	Petit Early Learning Journey		0.10	0.087	0.66	0.15
187	Gray Street Reserve		0.096	0.084	0.66	0.13
188	Ramden Street Reserve		0.12	0.10	0.79	0.18
189	Dights Falls Reserve		0.097	0.083	0.66	0.13
190	Victoria Park		0.10	0.088	0.70	0.15
191	Maugie Street Reserve		0.100	0.086	0.69	0.14
Maximum						
105	Carey Grammar Sports Complex		3.3	2.9	22	4.8

Table 4: Sensitive receptor results: Scenario B2

Receptor ID	Pollutant	PM$_{10}$ (µg/m^3)	PM$_{2.5}$ (µg/m^3)	NO$_2$ (µg/m^3)
	Description / Averaging period	1 hour	1 hour	1 hour
1	Greensborough bypass path	0.24	0.15	0.78
2	Plenty River Linear Reserve	0.23	0.15	0.70
3	Greensborough Collendina Reserve	0.18	0.11	0.54
4	Metropolitan Ring Road Linear Reserve	0.21	0.14	0.70
5	Unnamed reserve	0.16	0.10	0.45
6	Hughes Circuit Reserve	0.21	0.14	0.70
7	Maroonday Aqueduct	0.15	0.098	0.49
8	Garvey Oval	0.20	0.13	0.71
9	Northpark Private Hospital	0.23	0.15	0.78
10	Gillingham Reserve	0.21	0.13	0.68
11	Trist Street Reserve	0.31	0.19	0.97
12	Greensborough Preschool	0.43	0.27	1.3
13	Abacus Child Care Centre	0.40	0.25	1.1
14	Kalparrin Early Intervention Program child care	0.26	0.16	0.75
15	Greensborough Road Surgery	0.42	0.26	1.2
16	Diaverum Diamond Valley Dialysis Clinic	0.28	0.18	0.82
17	Greensborough Maternal and Child Health	0.45	0.29	1.3
18	St Mary's Church	0.39	0.25	1.2
19	St Mary's School	0.39	0.24	1.2
20	Greensborough College	0.57	0.36	1.6
21	Greensborough Primary School	0.37	0.23	1.1
22	Banyule City Council Greensborough Service Centre	0.29	0.18	0.80
23	Greensborough RSL	0.25	0.16	0.69
24	Kalparrin Gardens	0.25	0.16	0.74
25	Poulter Avenue Reserve	0.23	0.14	0.68
26	Whatmough Park	0.25	0.16	0.77
27	Fell Reserve	0.37	0.23	1.1
28	Plenty River Drive Reserve	0.24	0.16	0.70
29	St Mary's Reserve	0.41	0.26	1.2

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO2 (µg/m³)
	Description — **Averaging period**	**1 hour**	**1 hour**	**1 hour**
30	Sarah's Reserve	0.24	0.15	0.81
31	Metropolitan Ring Road Path	0.21	0.13	0.65
32	Greensborough Police Station	0.40	0.25	1.2
33	Greensborough MFB Fire Station	0.40	0.25	1.2
34	Watsonia Occasional Child Care Centre	0.82	0.52	2.4
35	MS Respite Services	0.66	0.42	2.1
36	Watsonia scout hall	0.33	0.21	1.1
37	Watsonia RSL	0.41	0.26	1.3
38	North East Citizen Advocacy (NECA)	0.83	0.52	2.3
39	Watsonia Library	0.47	0.30	1.6
40	Holy Spirit Anglican Church	0.43	0.27	1.4
41	Grace Baptist Church	0.39	0.24	1.3
42	Watsonia Uniting Church	0.51	0.32	1.7
43	Concord School	0.37	0.23	1.2
44	Watsonia Primary School	0.42	0.26	1.4
45	AK Lines Reserve	0.34	0.21	1.1
46	Elder Street Reserve	0.71	0.45	2.1
47	West Mayling Reserve	0.74	0.47	2.4
48	Gabonia Avenue Reserve	0.83	0.53	2.3
49	Watsonia Station Carpark Reserve	0.54	0.34	1.8
50	Watsonia Road Reserve	0.46	0.29	1.5
51	Greensborough Road Early Learning and Kinder	0.55	0.35	1.8
52	Macleod Recreation and Fitness & CC	0.74	0.46	2.5
53	Macleod Preschool	0.74	0.46	2.4
54	Baptcare Strathalan Macleod	1.1	0.69	3.7
55	Regis Macleod	0.91	0.58	3.0
56	Macleod Maternal and Child Health	0.72	0.46	2.4
57	IDV	0.71	0.44	2.4
58	YMCA Recreation and Fitness Centre	0.73	0.45	2.5
59	Nets Stadium Banyule	0.81	0.50	2.7

Receptor ID	Pollutant Description / Averaging period	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	NO_2 (µg/m^3)
		1 hour	1 hour	1 hour
60	Macleod Organic Community Garden	0.86	0.55	2.7
61	Winsor Reserve	1.1	0.69	3.7
62	Macleod College Oval	0.89	0.57	3.1
63	Macleod Netball Stadium	0.81	0.51	2.7
64	Harry Pottage Reserve	0.73	0.46	2.3
65	Macleod Park	0.71	0.45	2.2
66	Macleod Tennis Club	0.74	0.46	2.4
67	Junior Football Club and Macleod Cricket	0.68	0.43	2.1
68	Simpson Barracks	2.1	1.4	7.1
69	Coleen Reserve	0.97	0.61	3.0
70	Borlase Reserve	0.50	0.32	1.7
71	Melbourne Water easement	0.57	0.37	2.0
72	Goodstart Early Learning	0.24	0.15	0.83
73	Assisi Centre Aged Care	0.34	0.22	1.0
74	Japara Rosanna Views Nursing Home	0.43	0.27	1.4
75	St Martin of Tours Catholic Church	0.42	0.27	1.3
76	St Martin of Tours Catholic Primary School	0.45	0.28	1.4
77	Banyule Primary School	0.26	0.17	0.87
78	Maleela Grove, Rosanna	0.32	0.21	1.1
79	Mercedes Court Reserve	0.27	0.17	0.91
80	River Gum Walk	0.21	0.14	0.78
81	Creekbend Reserve	0.27	0.17	0.94
82	Viewbank College	0.26	0.17	0.85
83	Viewbank family medical group	0.59	0.38	2.1
84	Viewbank podiatry	0.60	0.38	2.0
85	Simla Close Reserve	0.25	0.16	0.89
86	Banyule Flats	0.19	0.12	0.67
87	River Gum Walk	0.17	0.11	0.62
88	Warringal Parklands	0.16	0.10	0.57
89	Banyule Tennis Club	0.16	0.11	0.59

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO2 (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour
90	Heidelberg Park and Heidelberg cricket ground	0.18	0.12	0.61
91	Banyule Theatre Complex	0.17	0.11	0.61
92	Heidelberg Police Station	0.31	0.20	1.1
93	Austin Hospital Precinct	0.23	0.15	0.91
94	Yarra Flats Park	0.33	0.22	1.2
95	Yarra Flats Park	0.82	0.53	2.9
96	Creative Play Early Learning Centre	0.32	0.21	1.2
97	Kalker Montessori Centre	0.76	0.48	2.4
98	Veneto Club	1.5	0.94	5.1
99	Heide Museum of Modern Art	0.29	0.18	0.97
100	Bulleen Art and Garden	0.24	0.15	0.81
101	Marcellin College	1.3	0.81	4.3
102	Trinity Grammar School Sporting Complex	0.73	0.47	2.9
104	Bolin Bolin Billabong	0.69	0.44	2.6
105	Carey Grammar Sports Complex	2.2	1.4	7.4
106	Yarra Valley parklands	0.21	0.13	0.72
107	Sandra Street Reserve	1.2	0.80	4.3
108	Bulleen Park	0.91	0.59	3.4
109	Koonung Reserve	0.74	0.47	2.5
110	Koonung Creek Reserve	0.54	0.34	1.6
111	Willow Bend Reserve	0.42	0.27	1.3
112	Pipe Line Reserve	0.64	0.41	2.1
113	Yarra Valley Country Club	0.28	0.18	1.0
114	Bulleen Golf Driving Range	0.27	0.17	0.94
115	Wonderland Childcare and Kinder	0.26	0.17	0.93
116	Applewood Retirement Village	0.14	0.092	0.47
117	Tende Beck Scout Hall	0.24	0.16	0.87
118	North Eastern Jewish Centre-Yeshurun Congregation	0.26	0.17	0.94
119	Birralee Primary School	0.17	0.11	0.67
120	Wilsons Road Reserve	0.19	0.12	0.73

Receptor ID	Pollutant	PM10 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
	Description / Averaging period	1 hour	1 hour	1 hour
121	Katrina Street Reserve	0.16	0.10	0.57
122	Davis Street Reserve	0.14	0.093	0.52
123	Tram Road Reserve	0.14	0.089	0.44
124	Frank Sedgman Reserve	0.12	0.079	0.45
125	Koonung Creek Linear Park	0.13	0.081	0.43
126	Stanton Street Reserve	0.19	0.12	0.62
127	Doncaster Park and Ride	0.22	0.14	0.84
128	Tino Ceberano Martial Arts Academy	0.25	0.16	0.87
129	Greythorn Bowling Club	0.30	0.19	1.0
130	Manningham Park Reserve	0.31	0.20	1.1
131	Japara Sydney Williams Apartments	0.11	0.068	0.35
132	Japara Millward Nursing home	0.11	0.068	0.34
133	Koonung Creek Reserve	0.12	0.080	0.40
134	Boronia Grove Reserve	0.11	0.073	0.37
135	Heatherwood School	0.077	0.048	0.23
136	State Vision Resource Centre	0.076	0.048	0.23
137	Koonung Creek Linear Park	0.092	0.059	0.30
138	Aranga Reserve	0.081	0.051	0.25
139	Oxford Street Reserve	0.074	0.047	0.23
140	Belle Vue Primary School	0.72	0.45	2.5
141	Boroondara Tennis Centre	0.93	0.59	3.0
142	Musca Street Reserve	0.46	0.29	1.5
143	Columba Street Reserve	0.66	0.43	2.5
144	Leonis Avenue Reserve	0.89	0.56	2.6
145	Koonung Creek Reserve	0.54	0.34	1.6
146	Winfield Road Reserve	0.23	0.14	0.79
147	Yarra Flats Reserve	0.39	0.25	1.2
148	Freeway Public Golf Course	0.92	0.59	2.9
149	Kew Golf Club	0.23	0.15	0.74
150	Hays Paddock/Reserve	0.25	0.16	0.76

Receptor ID	Pollutant Description / Averaging period	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	NO_2 (µg/m^3)
		1 hour	1 hour	1 hour
151	Hyde Park	0.15	0.097	0.51
152	Burke Rd. billabong reserve	0.41	0.26	1.3
153	Green Acres Golf Club	0.24	0.15	0.82
154	Willsmere-Chandler Park	0.21	0.13	0.67
155	Guide Dogs Victoria	0.13	0.084	0.45
156	Royal Talbot Rehabilitation Centre	0.14	0.092	0.47
157	Yarra Bend Park	0.092	0.059	0.32
158	Kate Campbell Reserve	0.13	0.086	0.44
159	Jack O'Toole Reserve	0.16	0.100	0.51
160	North Kew Tennis Club	0.15	0.097	0.49
161	1st Kew Scout Group	0.15	0.095	0.49
162	Elgar Park	0.16	0.10	0.55
163	Koonung Creek Wetlands	0.17	0.11	0.59
164	Presbyterian Theological College	0.16	0.10	0.45
165	Koonung Creek Linear Park	0.13	0.083	0.44
166	Frank Sedgemen Reserve	0.12	0.078	0.45
167	Bounce Inc.	0.10	0.067	0.36
168	Flow Through Yoga	0.10	0.065	0.35
169	Melbourne Badminton Centre	0.11	0.069	0.36
170	Eastern Freeway Linear Park	0.10	0.066	0.36
171	Koonung Creek Linear Park	0.10	0.065	0.33
172	Slater Reserve	0.091	0.058	0.30
173	Warekila Preschool	0.085	0.055	0.28
174	Eastern Freeway Linear Reserve	0.083	0.054	0.27
175	R E Gray Reserve	0.075	0.048	0.24
176	Koonung Creek Linear Park	0.085	0.055	0.27
177	Alphington Park	0.16	0.100	0.50
178	Latrobe Golf Club	0.15	0.094	0.49
179	Thomas Embling Hospital	0.11	0.067	0.33
180	Melbourne Polytechnic	0.11	0.070	0.35

Receptor ID	Pollutant		PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)
	Description	Averaging period	1 hour	1 hour	1 hour
181	RMIT Surveying Field Station		0.095	0.061	0.32
182	Victorian Indigenous Nurseries Co-Operative		0.099	0.063	0.33
183	Yarra Bend Park		0.090	0.058	0.30
184	Fairlea Reserve		0.096	0.062	0.32
185	Yarra Bend Public Golf Course		0.10	0.064	0.33
186	Petit Early Learning Journey		0.068	0.043	0.22
187	Gray Street Reserve		0.063	0.041	0.22
188	Ramden Street Reserve		0.080	0.051	0.26
189	Dights Falls Reserve		0.063	0.040	0.22
190	Victoria Park		0.068	0.043	0.23
191	Maugie Street Reserve		0.067	0.043	0.22
Maximum					
105	Carey Grammar Sports Complex		2.2	1.4	7.4

Table 5: Sensitive receptor results: Sensitivity analysis – Maximum tunnel capacity

Receptor ID	Pollutant	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
1	Greensborough bypass path	0.98	0.85	7.6	1.1
2	Plenty River Linear Reserve	0.79	0.69	6.1	0.80
3	Greensborough Collendina Reserve	0.87	0.76	6.7	0.96
4	Metropolitan Ring Road Linear Reserve	1.1	0.94	8.3	1.1
5	Unnamed reserve	0.81	0.71	6.0	0.90
6	Hughes Circuit Reserve	0.81	0.71	6.3	0.85
7	Maroonday Aqueduct	0.74	0.65	5.7	0.92
8	Garvey Oval	0.85	0.74	6.4	0.90
9	Northpark Private Hospital	0.92	0.80	7.1	0.93
10	Gillingham Reserve	1.0	0.90	7.9	1.2
11	Trist Street Reserve	1.3	1.1	9.9	1.4
12	Greensborough Preschool	1.4	1.2	11	1.5
13	Abacus Child Care Centre	1.4	1.2	11	1.4
14	Kalparrin Early Intervention Program child care	0.81	0.71	6.3	0.85
15	Greensborough Road Surgery	1.7	1.5	13	1.6
16	Diaverum Diamond Valley Dialysis Clinic	0.98	0.86	7.7	0.95
17	Greensborough Maternal and Child Health	1.4	1.2	11	1.5
18	St Mary's Church	1.5	1.3	11	1.5
19	St Mary's School	1.5	1.3	12	1.5
20	Greensborough College	2.2	1.9	17	2.3
21	Greensborough Primary School	1.2	1.1	9.3	1.2
22	Banyule City Council Greensborough Service Centre	0.98	0.86	7.6	0.98
23	Greensborough RSL	0.88	0.76	6.6	0.85
24	Kalparrin Gardens	0.84	0.73	6.5	0.85
25	Poulter Avenue Reserve	0.81	0.70	6.3	0.79
26	Whatmough Park	0.83	0.72	6.4	0.83
27	Fell Reserve	1.2	1.0	9.1	1.2
28	Plenty River Drive Reserve	0.81	0.71	6.3	0.82
29	St Mary's Reserve	1.6	1.4	12	1.6

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
30	Sarah's Reserve	0.99	0.87	7.6	1.1
31	Metropolitan Ring Road Path	1.0	0.90	8.0	1.2
32	Greensborough Police Station	1.4	1.2	11	1.4
33	Greensborough MFB Fire Station	1.3	1.1	9.9	1.4
34	Watsonia Occasional Child Care Centre	3.2	2.8	25	3.1
35	MS Respite Services	3.1	2.7	23	3.4
36	Watsonia scout hall	1.6	1.4	12	1.7
37	Watsonia RSL	2.1	1.8	16	2.3
38	North East Citizen Advocacy (NECA)	3.1	2.7	24	3.1
39	Watsonia Library	2.2	2.0	17	2.5
40	Holy Spirit Anglican Church	2.2	1.9	17	2.3
41	Grace Baptist Church	1.9	1.6	14	2.0
42	Watsonia Uniting Church	2.5	2.2	19	2.6
43	Concord School	1.8	1.5	14	1.9
44	Watsonia Primary School	1.9	1.7	15	2.1
45	AK Lines Reserve	1.5	1.4	12	1.7
46	Elder Street Reserve	2.6	2.3	20	2.6
47	West Mayling Reserve	3.6	3.1	28	3.7
48	Gabonia Avenue Reserve	3.0	2.7	24	3.0
49	Watsonia Station Carpark Reserve	2.8	2.5	22	3.0
50	Watsonia Road Reserve	2.3	2.0	18	2.5
51	Greensborough Road Early Learning and Kinder	2.1	1.9	17	2.1
52	Macleod Recreation and Fitness & CC	2.3	2.0	18	2.3
53	Macleod Preschool	2.4	2.1	19	2.4
54	Baptcare Strathalan Macleod	3.6	3.1	28	3.5
55	Regis Macleod	4.2	3.6	32	4.2
56	Macleod Maternal and Child Health	2.5	2.2	19	2.4
57	IDV	2.4	2.1	18	2.3
58	YMCA Recreation and Fitness Centre	2.3	2.0	18	2.3
59	Nets Stadium Banyule	2.6	2.2	20	2.5

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO2 (µg/m³)	Benzene (µg/m³)
	Description — Averaging period	1 hour	1 hour	1 hour	3 minute
60	Macleod Organic Community Garden	2.8	2.5	22	2.8
61	Winsor Reserve	4.8	4.2	36	4.9
62	Macleod College Oval	3.1	2.7	24	3.0
63	Macleod Netball Stadium	2.6	2.3	20	2.6
64	Harry Pottage Reserve	2.4	2.1	19	2.3
65	Macleod Park	2.1	1.9	16	2.1
66	Macleod Tennis Club	2.3	2.0	18	2.2
67	Junior Football Club and Macleod Cricket	2.0	1.8	16	2.0
68	Simpson Barracks	5.7	5.0	44	6.1
69	Coleen Reserve	3.8	3.3	29	3.6
70	Borlase Reserve	1.9	1.7	15	1.9
71	Melbourne Water easement	2.2	2.0	17	2.3
72	Goodstart Early Learning	0.90	0.78	6.9	0.94
73	Assisi Centre Aged Care	1.3	1.1	10	1.3
74	Japara Rosanna Views Nursing Home	1.7	1.5	13	1.6
75	St Martin of Tours Catholic Church	1.6	1.4	13	1.6
76	St Martin of Tours Catholic Primary School	1.8	1.5	14	1.6
77	Banyule Primary School	1.00	0.87	7.7	1.0
78	Maleela Grove, Rosanna	1.3	1.1	9.9	1.2
79	Mercedes Court Reserve	1.0	0.90	8.0	1.0
80	River Gum Walk	0.81	0.70	6.2	0.96
81	Creekbend Reserve	1.0	0.89	7.8	1.0
82	Viewbank College	1.0	0.90	7.8	1.1
83	Viewbank family medical group	2.2	1.9	17	2.2
84	Viewbank podiatry	2.3	2.0	18	2.3
85	Simla Close Reserve	1.0	0.89	8.0	1.0
86	Banyule Flats	0.70	0.61	5.1	0.95
87	River Gum Walk	0.71	0.62	5.3	1.0
88	Warringal Parklands	0.66	0.58	4.7	0.97
89	Banyule Tennis Club	0.70	0.61	5.0	1.0

Receptor ID	Pollutant		PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description	Averaging period	1 hour	1 hour	1 hour	3 minute
90	Heidelberg Park and Heidelberg cricket ground		0.68	0.60	5.1	1.1
91	Banyule Theatre Complex		0.70	0.61	5.2	1.0
92	Heidelberg Police Station		1.1	0.97	7.9	1.7
93	Austin Hospital Precinct		0.99	0.86	7.1	1.5
94	Yarra Flats Park		1.3	1.2	9.4	2.0
95	Yarra Flats Park		2.4	2.1	17	3.6
96	Creative Play Early Learning Centre		1.4	1.2	9.9	2.1
97	Kalker Montessori Centre		2.3	2.0	16	3.4
98	Veneto Club		3.8	3.4	28	6.2
99	Heide Museum of Modern Art		1.2	1.1	8.6	1.8
100	Bulleen Art and Garden		1.2	1.0	8.2	1.7
101	Marcellin College		3.3	2.9	24	5.4
102	Trinity Grammar School Sporting Complex		2.9	2.5	20	4.5
104	Bolin Bolin Billabong		2.6	2.2	18	3.6
105	Carey Grammar Sports Complex		5.7	5.0	40	8.8
106	Yarra Valley parklands		1.0	0.90	7.3	1.5
107	Sandra Street Reserve		3.7	3.2	26	5.8
108	Bulleen Park		3.3	2.9	24	4.7
109	Koonung Reserve		2.4	2.1	17	3.6
110	Koonung Creek Reserve		1.6	1.4	11	2.3
111	Willow Bend Reserve		1.2	1.1	8.8	1.9
112	Pipe Line Reserve		1.9	1.6	13	2.8
113	Yarra Valley Country Club		1.2	1.1	8.7	1.7
114	Bulleen Golf Driving Range		1.0	0.87	7.1	1.5
115	Wonderland Childcare and Kinder		1.0	0.89	7.3	1.4
116	Applewood Retirement Village		0.56	0.49	4.0	0.83
117	Tende Beck Scout Hall		0.96	0.84	6.9	1.4
118	North Eastern Jewish Centre-Yeshurun Congregation		1.0	0.89	7.3	1.4
119	Birralee Primary School		0.66	0.58	4.7	0.98
120	Wilsons Road Reserve		0.74	0.65	5.3	1.1

Receptor ID	Pollutant	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
121	Katrina Street Reserve	0.63	0.55	4.5	0.91
122	Davis Street Reserve	0.66	0.58	4.7	0.94
123	Tram Road Reserve	0.54	0.47	3.8	0.78
124	Frank Sedgman Reserve	0.50	0.44	3.6	0.70
125	Koonung Creek Linear Park	0.43	0.38	3.1	0.65
126	Stanton Street Reserve	0.60	0.52	4.3	0.92
127	Doncaster Park and Ride	0.87	0.76	6.2	1.3
128	Tino Ceberano Martial Arts Academy	0.98	0.86	7.0	1.4
129	Greythorn Bowling Club	1.2	1.0	8.2	1.6
130	Manningham Park Reserve	1.2	1.1	8.6	1.7
131	Japara Sydney Williams Apartments	0.31	0.27	2.2	0.49
132	Japara Millward Nursing home	0.31	0.27	2.2	0.49
133	Koonung Creek Reserve	0.38	0.33	2.7	0.58
134	Boronia Grove Reserve	0.33	0.29	2.3	0.53
135	Heatherwood School	0.22	0.19	1.6	0.32
136	State Vision Resource Centre	0.22	0.19	1.6	0.32
137	Koonung Creek Linear Park	0.27	0.23	1.9	0.42
138	Aranga Reserve	0.23	0.20	1.7	0.34
139	Oxford Street Reserve	0.22	0.19	1.6	0.32
140	Belle Vue Primary School	2.8	2.4	20	4.0
141	Boroondara Tennis Centre	3.1	2.7	22	4.6
142	Musca Street Reserve	1.3	1.1	8.9	1.9
143	Columba Street Reserve	2.5	2.2	18	3.5
144	Leonis Avenue Reserve	2.7	2.3	19	4.1
145	Koonung Creek Reserve	1.6	1.4	11	2.3
146	Winfield Road Reserve	0.74	0.65	5.3	1.1
147	Yarra Flats Reserve	1.1	0.99	8.1	1.7
148	Freeway Public Golf Course	2.6	2.2	18	3.8
149	Kew Golf Club	0.67	0.59	4.8	1.00
150	Hays Paddock/Reserve	0.71	0.63	5.1	1.1

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour	3 minute
151	Hyde Park	0.46	0.40	3.3	0.68
152	Burke Rd. billabong reserve	1.2	1.1	8.6	1.8
153	Green Acres Golf Club	0.77	0.67	5.5	1.1
154	Willsmere-Chandler Park	0.61	0.53	4.4	0.90
155	Guide Dogs Victoria	0.39	0.34	2.8	0.60
156	Royal Talbot Rehabilitation Centre	0.44	0.38	3.1	0.66
157	Yarra Bend Park	0.28	0.24	2.0	0.43
158	Kate Campbell Reserve	0.41	0.36	2.9	0.59
159	Jack O'Toole Reserve	0.46	0.40	3.3	0.70
160	North Kew Tennis Club	0.45	0.39	3.2	0.68
161	1st Kew Scout Group	0.45	0.39	3.2	0.67
162	Elgar Park	0.51	0.44	3.6	0.77
163	Koonung Creek Wetlands	0.54	0.48	3.9	0.84
164	Presbyterian Theological College	0.81	0.71	6.0	0.90
165	Koonung Creek Linear Park	0.44	0.39	3.2	0.66
166	Frank Sedgemen Reserve	0.51	0.44	3.6	0.72
167	Bounce Inc.	0.36	0.31	2.6	0.54
168	Flow Through Yoga	0.32	0.28	2.3	0.49
169	Melbourne Badminton Centre	0.36	0.31	2.6	0.54
170	Eastern Freeway Linear Park	0.35	0.31	2.5	0.51
171	Koonung Creek Linear Park	0.29	0.25	2.1	0.47
172	Slater Reserve	0.28	0.25	2.0	0.43
173	Warekila Preschool	0.24	0.21	1.7	0.39
174	Eastern Freeway Linear Reserve	0.24	0.21	1.7	0.38
175	R E Gray Reserve	0.21	0.18	1.6	0.34
176	Koonung Creek Linear Park	0.25	0.22	1.8	0.39
177	Alphington Park	0.47	0.42	3.4	0.71
178	Latrobe Golf Club	0.44	0.38	3.1	0.67
179	Thomas Embling Hospital	0.31	0.27	2.2	0.48
180	Melbourne Polytechnic	0.34	0.30	2.4	0.51

Receptor ID	Pollutant		PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	Benzene (µg/m³)
	Description	Averaging period	1 hour	1 hour	1 hour	3 minute
181	RMIT Surveying Field Station		0.29	0.25	2.0	0.44
182	Victorian Indigenous Nurseries Co-Operative		0.30	0.26	2.1	0.46
183	Yarra Bend Park		0.29	0.25	2.0	0.42
184	Fairlea Reserve		0.30	0.26	2.1	0.45
185	Yarra Bend Public Golf Course		0.32	0.28	2.3	0.46
186	Petit Early Learning Journey		0.21	0.18	1.5	0.31
187	Gray Street Reserve		0.19	0.17	1.4	0.29
188	Ramden Street Reserve		0.25	0.22	1.8	0.37
189	Dights Falls Reserve		0.19	0.17	1.3	0.28
190	Victoria Park		0.21	0.18	1.5	0.31
191	Maugie Street Reserve		0.20	0.18	1.5	0.31
Maximum						
68	Simpson Barracks		5.7	5.0	44	-
105	Carey Grammar Sports Complex		-	-	-	8.8

Table 6: Sensitive receptor results: Sensitivity analysis – increased ratio of diesel to petrol cars

Receptor ID	Pollutant	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	NO_2 (µg/m^3)
	Description / Averaging period	1 hour	1 hour	1 hour
1	Greensborough bypass path	0.37	0.32	2.8
2	Plenty River Linear Reserve	0.36	0.32	2.7
3	Greensborough Collendina Reserve	0.29	0.25	2.1
4	Metropolitan Ring Road Linear Reserve	0.36	0.31	2.7
5	Unnamed reserve	0.24	0.21	1.8
6	Hughes Circuit Reserve	0.34	0.29	2.5
7	Maroonday Aqueduct	0.24	0.21	1.8
8	Garvey Oval	0.35	0.30	2.7
9	Northpark Private Hospital	0.37	0.32	2.8
10	Gillingham Reserve	0.33	0.29	2.5
11	Trist Street Reserve	0.47	0.40	3.5
12	Greensborough Preschool	0.64	0.56	4.9
13	Abacus Child Care Centre	0.60	0.53	4.5
14	Kalparrin Early Intervention Program child care	0.40	0.34	2.9
15	Greensborough Road Surgery	0.65	0.56	4.9
16	Diaverum Diamond Valley Dialysis Clinic	0.42	0.36	3.1
17	Greensborough Maternal and Child Health	0.69	0.59	5.0
18	St Mary's Church	0.60	0.52	4.5
19	St Mary's School	0.60	0.52	4.7
20	Greensborough College	0.87	0.76	6.6
21	Greensborough Primary School	0.55	0.47	4.1
22	Banyule City Council Greensborough Service Centre	0.44	0.38	3.3
23	Greensborough RSL	0.38	0.34	2.9
24	Kalparrin Gardens	0.39	0.33	2.9
25	Poulter Avenue Reserve	0.34	0.29	2.5
26	Whatmough Park	0.38	0.32	2.8
27	Fell Reserve	0.55	0.48	4.1
28	Plenty River Drive Reserve	0.37	0.31	2.7
29	St Mary's Reserve	0.61	0.53	4.8

Receptor ID	Pollutant		PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)
	Description	Averaging period	1 hour	1 hour	1 hour
30	Sarah's Reserve		0.40	0.35	3.0
31	Metropolitan Ring Road Path		0.32	0.28	2.4
32	Greensborough Police Station		0.62	0.53	4.6
33	Greensborough MFB Fire Station		0.61	0.52	4.6
34	Watsonia Occasional Child Care Centre		1.3	1.1	9.6
35	MS Respite Services		1.1	0.91	8.0
36	Watsonia scout hall		0.54	0.46	4.0
37	Watsonia RSL		0.63	0.56	5.0
38	North East Citizen Advocacy (NECA)		1.3	1.1	9.5
39	Watsonia Library		0.78	0.67	5.9
40	Holy Spirit Anglican Church		0.71	0.61	5.4
41	Grace Baptist Church		0.64	0.56	4.8
42	Watsonia Uniting Church		0.80	0.69	5.9
43	Concord School		0.61	0.53	4.6
44	Watsonia Primary School		0.66	0.57	5.0
45	AK Lines Reserve		0.55	0.48	4.2
46	Elder Street Reserve		1.1	0.95	8.2
47	West Mayling Reserve		1.2	1.0	9.1
48	Gabonia Avenue Reserve		1.2	1.1	9.4
49	Watsonia Station Carpark Reserve		0.89	0.77	6.8
50	Watsonia Road Reserve		0.75	0.65	5.7
51	Greensborough Road Early Learning and Kinder		0.91	0.79	6.9
52	Macleod Recreation and Fitness & CC		1.2	1.0	8.8
53	Macleod Preschool		1.2	1.0	8.8
54	Baptcare Strathalan Macleod		1.7	1.5	13
55	Regis Macleod		1.4	1.2	11
56	Macleod Maternal and Child Health		1.2	1.0	8.9
57	IDV		1.1	0.99	8.6
58	YMCA Recreation and Fitness Centre		1.1	1.0	8.7
59	Nets Stadium Banyule		1.2	1.1	9.7

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO2 (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour
60	Macleod Organic Community Garden	1.3	1.2	10
61	Winsor Reserve	1.8	1.6	14
62	Macleod College Oval	1.5	1.3	11
63	Macleod Netball Stadium	1.3	1.1	9.7
64	Harry Pottage Reserve	1.1	0.96	8.5
65	Macleod Park	1.1	0.98	8.5
66	Macleod Tennis Club	1.2	1.0	8.8
67	Junior Football Club and Macleod Cricket	1.1	0.93	8.2
68	Simpson Barracks	3.3	2.9	25
69	Coleen Reserve	1.5	1.3	11
70	Borlase Reserve	0.82	0.71	6.2
71	Melbourne Water easement	0.94	0.82	7.2
72	Goodstart Early Learning	0.39	0.34	3.0
73	Assisi Centre Aged Care	0.52	0.45	4.0
74	Japara Rosanna Views Nursing Home	0.69	0.60	5.2
75	St Martin of Tours Catholic Church	0.69	0.59	5.1
76	St Martin of Tours Catholic Primary School	0.68	0.59	5.3
77	Banyule Primary School	0.44	0.38	3.4
78	Maleela Grove, Rosanna	0.53	0.46	4.0
79	Mercedes Court Reserve	0.40	0.35	3.2
80	River Gum Walk	0.36	0.31	2.8
81	Creekbend Reserve	0.44	0.38	3.4
82	Viewbank College	0.43	0.38	3.3
83	Viewbank family medical group	0.96	0.84	7.4
84	Viewbank podiatry	0.98	0.84	7.5
85	Simla Close Reserve	0.42	0.36	3.2
86	Banyule Flats	0.31	0.28	2.4
87	River Gum Walk	0.29	0.26	2.3
88	Warringal Parklands	0.27	0.24	2.0
89	Banyule Tennis Club	0.28	0.24	2.1

Receptor ID	Pollutant	PM10 (µg/m3)	PM2.5 (µg/m3)	NO2 (µg/m3)
	Description / Averaging period	1 hour	1 hour	1 hour
90	Heidelberg Park and Heidelberg cricket ground	0.29	0.26	2.2
91	Banyule Theatre Complex	0.29	0.25	2.2
92	Heidelberg Police Station	0.55	0.48	4.1
93	Austin Hospital Precinct	0.42	0.37	3.2
94	Yarra Flats Park	0.58	0.51	4.3
95	Yarra Flats Park	1.4	1.2	10
96	Creative Play Early Learning Centre	0.56	0.49	4.2
97	Kalker Montessori Centre	1.2	1.1	8.7
98	Veneto Club	2.5	2.2	18
99	Heide Museum of Modern Art	0.49	0.43	3.5
100	Bulleen Art and Garden	0.41	0.35	2.9
101	Marcellin College	2.1	1.9	16
102	Trinity Grammar School Sporting Complex	1.3	1.2	9.8
104	Bolin Bolin Billabong	1.2	1.1	8.9
105	Carey Grammar Sports Complex	3.7	3.2	27
106	Yarra Valley parklands	0.35	0.31	2.5
107	Sandra Street Reserve	2.0	1.8	15
108	Bulleen Park	1.6	1.4	12
109	Koonung Reserve	1.2	1.0	8.6
110	Koonung Creek Reserve	0.86	0.74	6.1
111	Willow Bend Reserve	0.70	0.61	5.0
112	Pipe Line Reserve	1.0	0.90	7.5
113	Yarra Valley Country Club	0.49	0.43	3.7
114	Bulleen Golf Driving Range	0.46	0.40	3.4
115	Wonderland Childcare and Kinder	0.45	0.39	3.3
116	Applewood Retirement Village	0.24	0.21	1.7
117	Tende Beck Scout Hall	0.43	0.37	3.1
118	North Eastern Jewish Centre-Yeshurun Congregation	0.43	0.38	3.2
119	Birralee Primary School	0.31	0.27	2.3
120	Wilsons Road Reserve	0.33	0.29	2.5

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO2 (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour
121	Katrina Street Reserve	0.28	0.24	2.0
122	Davis Street Reserve	0.25	0.22	1.9
123	Tram Road Reserve	0.23	0.20	1.6
124	Frank Sedgman Reserve	0.21	0.19	1.6
125	Koonung Creek Linear Park	0.21	0.19	1.6
126	Stanton Street Reserve	0.31	0.27	2.3
127	Doncaster Park and Ride	0.39	0.34	2.9
128	Tino Ceberano Martial Arts Academy	0.42	0.37	3.1
129	Greythorn Bowling Club	0.51	0.45	3.8
130	Manningham Park Reserve	0.53	0.46	3.9
131	Japara Sydney Williams Apartments	0.18	0.16	1.4
132	Japara Millward Nursing home	0.18	0.16	1.4
133	Koonung Creek Reserve	0.20	0.18	1.5
134	Boronia Grove Reserve	0.19	0.17	1.4
135	Heatherwood School	0.12	0.11	0.90
136	State Vision Resource Centre	0.12	0.11	0.91
137	Koonung Creek Linear Park	0.16	0.14	1.2
138	Aranga Reserve	0.13	0.12	0.95
139	Oxford Street Reserve	0.12	0.11	0.88
140	Belle Vue Primary School	1.2	1.1	9.3
141	Boroondara Tennis Centre	1.5	1.3	11
142	Musca Street Reserve	0.75	0.66	5.5
143	Columba Street Reserve	1.2	1.0	8.6
144	Leonis Avenue Reserve	1.4	1.2	9.8
145	Koonung Creek Reserve	0.86	0.74	6.1
146	Winfield Road Reserve	0.39	0.34	2.9
147	Yarra Flats Reserve	0.65	0.57	4.8
148	Freeway Public Golf Course	1.5	1.3	11
149	Kew Golf Club	0.38	0.33	2.7
150	Hays Paddock/Reserve	0.40	0.35	2.9

Receptor ID	Pollutant		PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)
	Description	Averaging period	1 hour	1 hour	1 hour
151	Hyde Park		0.26	0.22	1.9
152	Burke Rd. billabong reserve		0.65	0.56	4.7
153	Green Acres Golf Club		0.41	0.36	3.0
154	Willsmere-Chandler Park		0.33	0.29	2.4
155	Guide Dogs Victoria		0.22	0.19	1.6
156	Royal Talbot Rehabilitation Centre		0.24	0.21	1.7
157	Yarra Bend Park		0.16	0.14	1.1
158	Kate Campbell Reserve		0.21	0.19	1.6
159	Jack O'Toole Reserve		0.25	0.22	1.9
160	North Kew Tennis Club		0.25	0.22	1.8
161	1st Kew Scout Group		0.25	0.22	1.8
162	Elgar Park		0.27	0.23	1.9
163	Koonung Creek Wetlands		0.28	0.25	2.1
164	Presbyterian Theological College		0.24	0.21	1.8
165	Koonung Creek Linear Park		0.22	0.20	1.7
166	Frank Sedgemen Reserve		0.22	0.19	1.6
167	Bounce Inc.		0.18	0.16	1.3
168	Flow Through Yoga		0.17	0.15	1.2
169	Melbourne Badminton Centre		0.18	0.16	1.3
170	Eastern Freeway Linear Park		0.18	0.16	1.3
171	Koonung Creek Linear Park		0.17	0.15	1.3
172	Slater Reserve		0.15	0.13	1.1
173	Warekila Preschool		0.14	0.12	1.0
174	Eastern Freeway Linear Reserve		0.14	0.12	1.0
175	R E Gray Reserve		0.13	0.11	0.93
176	Koonung Creek Linear Park		0.15	0.13	1.1
177	Alphington Park		0.25	0.22	1.9
178	Latrobe Golf Club		0.25	0.22	1.8
179	Thomas Embling Hospital		0.17	0.15	1.2
180	Melbourne Polytechnic		0.18	0.16	1.3

Receptor ID	Pollutant	PM10 (µg/m³)	PM2.5 (µg/m³)	NO2 (µg/m³)
	Description / Averaging period	1 hour	1 hour	1 hour
181	RMIT Surveying Field Station	0.16	0.14	1.2
182	Victorian Indigenous Nurseries Co-Operative	0.16	0.14	1.2
183	Yarra Bend Park	0.15	0.13	1.1
184	Fairlea Reserve	0.16	0.14	1.2
185	Yarra Bend Public Golf Course	0.17	0.15	1.2
186	Petit Early Learning Journey	0.11	0.098	0.82
187	Gray Street Reserve	0.11	0.094	0.78
188	Ramden Street Reserve	0.14	0.12	0.97
189	Dights Falls Reserve	0.11	0.093	0.78
190	Victoria Park	0.11	0.099	0.83
191	Maugie Street Reserve	0.11	0.097	0.81
Maximum				
105	Carey Grammar Sports Complex	3.7	3.2	27

APPENDIX D

Road tunnel traffic fleet mix and emissions inventory

Forecast fleet composition data and resulting emissions inventories for each of the modelled scenarios is presented as follows:

TABLES

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Table 1: Scenarios A1 and A2 northbound traffic fleet composition

Hour	North section					South section				
	PCP	PCD	LCV	HCV	Total	PCP	PCD	LCV	HCV	Total
1	208	37	7	66	318	211	37	9	68	325
2	206	36	10	66	318	208	37	12	68	325
3	206	36	10	66	318	208	37	12	68	325
4	208	37	7	66	318	211	37	9	68	325
5	792	140	37	253	1222	713	126	41	234	1113
6	1376	243	65	353	2037	1239	219	71	326	1855
7	1861	328	88	399	2677	1678	296	96	369	2438
8	2380	420	225	425	3450	2040	360	225	400	3025
9	2380	420	225	425	3450	2040	360	225	400	3025
10	2255	398	167	394	3214	1906	336	171	343	2756
11	2087	368	170	401	3026	1871	330	185	370	2756
12	2046	361	185	435	3026	1831	323	200	402	2756
13	2087	368	170	401	3026	1871	330	185	370	2756
14	2245	396	167	393	3201	2016	356	181	363	2915
15	2516	444	159	373	3492	2339	413	178	356	3286
16	3021	533	155	365	4074	2724	481	168	337	3710
17	3995	705	200	350	5250	3613	638	225	350	4825
18	3995	705	200	350	5250	3613	638	225	350	4825
19	2913	514	120	236	3783	2632	465	130	218	3445
20	2178	384	104	244	2910	1965	347	113	225	2650
21	1481	261	71	225	2037	1335	236	76	207	1855
22	809	143	38	173	1164	729	129	42	160	1060
23	203	36	10	69	318	205	36	12	72	325
24	202	36	10	72	318	203	36	12	74	325

Table 2: Scenarios A1 and A2 southbound traffic fleet composition

Hour	North section					South section				
	PCP	PCD	LCV	HCV	Total	PCP	PCD	LCV	HCV	Total
1	220	39	8	71	338	175	31	8	59	273
2	218	38	11	71	338	173	30	10	59	273
3	218	38	11	71	338	173	30	10	59	273
4	220	39	8	71	338	175	31	8	59	273
5	1127	199	56	367	1749	966	171	58	332	1527
6	1959	346	98	513	2915	1683	297	101	464	2545
7	2824	498	141	618	4081	2429	429	147	559	3563
8	3910	690	200	400	5200	3400	600	225	425	4650
9	3910	690	200	400	5200	3400	600	225	425	4650
10	3077	543	141	320	4081	2658	469	146	290	3563
11	2403	424	152	345	3323	1995	352	152	301	2800
12	2019	356	165	374	2915	1730	305	171	339	2545
13	1980	349	179	407	2915	1692	299	186	368	2545
14	1980	349	179	407	2915	1692	299	186	368	2545
15	2053	362	153	347	2915	1762	311	159	314	2545
16	2428	428	143	324	3323	2054	363	145	288	2850
17	2720	480	225	375	3800	2380	420	225	375	3400
18	2720	480	225	375	3800	2380	420	225	375	3400
19	2150	379	130	256	2915	1852	327	135	231	2545
20	1630	288	82	187	2186	1406	248	85	169	1909
21	1055	186	53	164	1458	909	160	55	148	1273
22	403	71	20	88	583	278	49	17	64	407
23	215	38	11	74	338	170	30	10	62	273
24	213	38	11	77	338	169	30	10	64	273

Table 3: Scenarios B1 and B2 northbound traffic fleet composition

Hour	North section					South section				
	PCP	PCD	LCV	HCV	Total	PCP	PCD	LCV	HCV	Total
1	244	43	8	75	370	284	50	12	91	437
2	242	43	11	75	370	281	50	16	91	437
3	242	43	11	75	370	281	50	16	91	437
4	244	43	8	75	370	284	50	12	91	437
5	972	172	46	300	1489	830	146	47	268	1292
6	1702	300	80	422	2505	1442	255	82	374	2153
7	2460	434	116	510	3520	2121	374	121	459	3075
8	2720	480	250	550	4000	2295	405	250	500	3450
9	2720	480	250	550	4000	2295	405	250	500	3450
10	2634	465	195	445	3739	2216	391	198	393	3198
11	2439	430	198	453	3520	2176	384	214	424	3198
12	2392	422	215	492	3520	2130	376	232	460	3198
13	2439	430	198	453	3520	2176	384	214	424	3198
14	2623	463	194	444	3724	2344	414	209	415	3383
15	3182	562	200	457	4401	2719	480	206	408	3813
16	3776	666	193	442	5078	3391	598	209	414	4613
17	3953	698	200	350	5200	3740	660	225	375	5000
18	3953	698	200	350	5200	3740	660	225	375	5000
19	3823	675	157	301	4955	3366	594	165	275	4401
20	2540	448	121	276	3385	2284	403	130	258	3075
21	1729	305	82	254	2370	1552	274	89	238	2153
22	946	167	45	196	1354	848	150	48	184	1230
23	238	42	11	78	370	277	49	16	95	437
24	236	42	11	81	370	275	48	16	98	437

Table 4: Scenarios B1 and B2 southbound traffic fleet composition

Hour	North section					South section				
	PCP	PCD	LCV	HCV	Total	PCP	PCD	LCV	HCV	Total
1	311	55	12	96	474	200	35	9	69	313
2	308	54	15	96	474	197	35	12	69	313
3	308	54	15	96	474	197	35	12	69	313
4	311	55	12	96	474	200	35	9	69	313
5	1733	306	87	542	2668	1470	259	90	516	2336
6	2255	398	114	568	3335	1922	339	118	541	2920
7	3247	573	165	684	4669	2935	518	180	689	4322
8	3868	683	200	425	5175	3443	608	225	450	4725
9	3868	683	200	425	5175	3443	608	225	450	4725
10	3527	622	165	355	4669	3242	572	181	360	4355
11	2757	486	177	382	3802	2282	403	176	351	3212
12	2319	409	192	415	3335	1978	349	198	395	2920
13	2274	401	209	450	3335	1934	341	216	429	2920
14	2274	401	209	450	3335	1934	341	216	429	2920
15	2357	416	178	384	3335	2015	356	184	366	2920
16	2785	491	166	359	3802	2351	415	169	336	3270
17	3060	540	250	425	4275	2635	465	250	400	3750
18	3060	540	250	425	4275	2635	465	250	400	3750
19	2465	435	151	283	3335	2120	374	156	270	2920
20	1993	352	102	221	2668	1717	303	106	210	2336
21	1453	256	74	218	2001	1248	220	77	207	1752
22	464	82	24	98	667	317	56	19	75	467
23	304	54	15	101	474	194	34	12	73	313
24	301	53	15	104	474	193	34	12	75	313

Table 5: Scenario A1 northbound traffic emission rates

Hour	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	CO (g/s)	NO_2 (g/s)	Benzene (g/s)	Toluene (g/s)	Ethylbenzene (g/s)	Xylene isomers (g/s)	1,3-Butadiene (g/s)	Formaldehyde (g/s)	B(a)P TEQ (g/s)
1	1.8E-02	1.6E-02	3.7E-01	1.4E-01	6.2E-03	1.2E-02	4.6E-03	1.2E-02	1.8E-03	3.6E-03	9.4E-07
2	1.8E-02	1.6E-02	3.8E-01	1.4E-01	6.2E-03	1.3E-02	4.6E-03	1.2E-02	1.8E-03	3.7E-03	9.4E-07
3	1.8E-02	1.6E-02	3.8E-01	1.4E-01	6.2E-03	1.3E-02	4.6E-03	1.2E-02	1.8E-03	3.7E-03	9.4E-07
4	1.8E-02	1.6E-02	3.7E-01	1.4E-01	6.2E-03	1.2E-02	4.6E-03	1.2E-02	1.8E-03	3.6E-03	9.4E-07
5	6.9E-02	6.1E-02	1.4E+00	5.4E-01	2.3E-02	4.7E-02	1.7E-02	4.6E-02	6.7E-03	1.4E-02	3.5E-06
6	1.0E-01	9.0E-02	2.4E+00	7.8E-01	4.0E-02	8.2E-02	3.0E-02	8.0E-02	1.1E-02	2.2E-02	5.5E-06
7	1.2E-01	1.1E-01	3.1E+00	9.2E-01	5.5E-02	1.1E-01	4.1E-02	1.1E-01	1.4E-02	2.7E-02	6.9E-06
8	1.5E-01	1.3E-01	4.4E+00	1.0E+00	7.3E-02	1.5E-01	5.4E-02	1.4E-01	1.7E-02	3.5E-02	8.6E-06
9	1.5E-01	1.3E-01	4.4E+00	1.0E+00	7.3E-02	1.5E-01	5.4E-02	1.4E-01	1.7E-02	3.5E-02	8.6E-06
10	1.3E-01	1.2E-01	3.9E+00	9.6E-01	6.7E-02	1.4E-01	5.0E-02	1.3E-01	1.6E-02	3.2E-02	7.9E-06
11	1.3E-01	1.2E-01	3.8E+00	9.6E-01	6.4E-02	1.3E-01	4.7E-02	1.3E-01	1.5E-02	3.1E-02	7.7E-06
12	1.4E-01	1.2E-01	3.9E+00	1.0E+00	6.3E-02	1.3E-01	4.7E-02	1.2E-01	1.6E-02	3.2E-02	7.9E-06
13	1.3E-01	1.2E-01	3.8E+00	9.6E-01	6.4E-02	1.3E-01	4.7E-02	1.3E-01	1.5E-02	3.1E-02	7.7E-06
14	1.4E-01	1.2E-01	4.0E+00	9.6E-01	6.8E-02	1.4E-01	5.1E-02	1.3E-01	1.6E-02	3.2E-02	7.9E-06
15	1.4E-01	1.2E-01	4.2E+00	9.6E-01	7.6E-02	1.5E-01	5.6E-02	1.5E-01	1.7E-02	3.4E-02	8.4E-06
16	1.5E-01	1.2E-01	4.7E+00	9.9E-01	8.9E-02	1.8E-01	6.7E-02	1.8E-01	2.0E-02	3.8E-02	9.3E-06
17	1.7E-01	1.4E-01	6.0E+00	1.1E+00	1.2E-01	2.4E-01	8.8E-02	2.3E-01	2.5E-02	4.7E-02	1.1E-05
18	1.7E-01	1.4E-01	6.0E+00	1.1E+00	1.2E-01	2.4E-01	8.8E-02	2.3E-01	2.5E-02	4.7E-02	1.1E-05
19	1.2E-01	9.6E-02	4.2E+00	7.5E-01	8.5E-02	1.7E-01	6.3E-02	1.7E-01	1.8E-02	3.3E-02	8.0E-06
20	1.0E-01	8.5E-02	3.3E+00	6.8E-01	6.4E-02	1.3E-01	4.8E-02	1.3E-01	1.4E-02	2.7E-02	6.5E-06
21	8.0E-02	6.8E-02	2.3E+00	5.7E-01	4.3E-02	8.8E-02	3.2E-02	8.6E-02	1.0E-02	2.0E-02	4.9E-06
22	5.4E-02	4.7E-02	1.3E+00	4.0E-01	2.4E-02	4.8E-02	1.8E-02	4.7E-02	6.0E-03	1.2E-02	3.0E-06
23	1.9E-02	1.7E-02	3.8E-01	1.5E-01	6.1E-03	1.2E-02	4.6E-03	1.2E-02	1.8E-03	3.7E-03	9.6E-07
24	1.9E-02	1.7E-02	3.8E-01	1.5E-01	6.1E-03	1.2E-02	4.5E-03	1.2E-02	1.8E-03	3.8E-03	9.7E-07

Table 6: Scenario A1 southbound traffic emission rates

Hour	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	CO (g/s)	NO_2 (g/s)	Benzene (g/s)	Toluene (g/s)	Ethylbenzene (g/s)	Xylene isomers (g/s)	1,3-Butadiene (g/s)	Formaldehyde (g/s)	B(a)P TEQ (g/s)
1	1.2E-02	1.1E-02	2.5E-01	8.6E-02	6.2E-03	1.3E-02	4.7E-03	1.2E-02	1.8E-03	3.7E-03	9.6E-07
2	1.2E-02	1.1E-02	2.6E-01	8.6E-02	6.3E-03	1.3E-02	4.7E-03	1.3E-02	1.8E-03	3.7E-03	9.6E-07
3	1.2E-02	1.1E-02	2.6E-01	8.6E-02	6.3E-03	1.3E-02	4.7E-03	1.3E-02	1.8E-03	3.7E-03	9.6E-07
4	1.2E-02	1.1E-02	2.5E-01	8.6E-02	6.2E-03	1.3E-02	4.7E-03	1.2E-02	1.8E-03	3.7E-03	9.6E-07
5	6.4E-02	5.6E-02	1.4E+00	4.6E-01	3.3E-02	6.7E-02	2.5E-02	6.6E-02	9.5E-03	2.0E-02	5.1E-06
6	9.5E-02	8.3E-02	2.3E+00	6.6E-01	5.7E-02	1.2E-01	4.3E-02	1.1E-01	1.5E-02	3.1E-02	7.9E-06
7	1.2E-01	1.1E-01	3.2E+00	8.3E-01	8.2E-02	1.7E-01	6.2E-02	1.6E-01	2.1E-02	4.2E-02	1.1E-05
8	1.1E-01	9.5E-02	4.1E+00	7.1E-01	1.1E-01	2.3E-01	8.6E-02	2.3E-01	2.5E-02	4.7E-02	1.2E-05
9	1.1E-01	9.5E-02	4.1E+00	7.1E-01	1.1E-01	2.3E-01	8.6E-02	2.3E-01	2.5E-02	4.7E-02	1.2E-05
10	8.7E-02	7.3E-02	3.1E+00	5.5E-01	8.9E-02	1.8E-01	6.7E-02	1.8E-01	1.9E-02	3.7E-02	9.0E-06
11	8.1E-02	6.9E-02	2.7E+00	5.2E-01	7.1E-02	1.4E-01	5.3E-02	1.4E-01	1.6E-02	3.1E-02	7.8E-06
12	8.1E-02	7.0E-02	2.5E+00	5.3E-01	6.1E-02	1.2E-01	4.5E-02	1.2E-01	1.5E-02	2.9E-02	7.3E-06
13	8.5E-02	7.4E-02	2.5E+00	5.7E-01	6.0E-02	1.2E-01	4.5E-02	1.2E-01	1.5E-02	3.0E-02	7.5E-06
14	8.5E-02	7.4E-02	2.5E+00	5.7E-01	6.0E-02	1.2E-01	4.5E-02	1.2E-01	1.5E-02	3.0E-02	7.5E-06
15	7.7E-02	6.6E-02	2.4E+00	5.1E-01	6.2E-02	1.2E-01	4.6E-02	1.2E-01	1.5E-02	2.9E-02	7.1E-06
16	7.8E-02	6.7E-02	2.6E+00	5.0E-01	7.1E-02	1.4E-01	5.3E-02	1.4E-01	1.6E-02	3.1E-02	7.7E-06
17	9.4E-02	8.0E-02	3.2E+00	6.0E-01	8.3E-02	1.7E-01	6.2E-02	1.6E-01	1.9E-02	3.7E-02	9.0E-06
18	9.4E-02	8.0E-02	3.2E+00	6.0E-01	8.3E-02	1.7E-01	6.2E-02	1.6E-01	1.9E-02	3.7E-02	9.0E-06
19	6.6E-02	5.6E-02	2.3E+00	4.2E-01	6.3E-02	1.3E-01	4.7E-02	1.2E-01	1.4E-02	2.7E-02	6.6E-06
20	4.8E-02	4.1E-02	1.7E+00	3.1E-01	4.8E-02	9.6E-02	3.6E-02	9.4E-02	1.0E-02	2.0E-02	4.9E-06
21	3.7E-02	3.2E-02	1.1E+00	2.4E-01	3.1E-02	6.2E-02	2.3E-02	6.1E-02	7.2E-03	1.4E-02	3.5E-06
22	1.7E-02	1.4E-02	4.3E-01	1.1E-01	1.1E-02	2.3E-02	8.5E-03	2.2E-02	2.9E-03	5.7E-03	1.5E-06
23	1.3E-02	1.1E-02	2.6E-01	9.0E-02	6.2E-03	1.2E-02	4.6E-03	1.2E-02	1.8E-03	3.8E-03	9.8E-07
24	1.3E-02	1.1E-02	2.6E-01	9.2E-02	6.1E-03	1.2E-02	4.6E-03	1.2E-02	1.8E-03	3.8E-03	1.0E-06

Table 7: Scenario A2 traffic emission rates

Hour	Northbound PM_{10} (g/s)	Northbound $PM_{2.5}$ (g/s)	Northbound NO_2 (g/s)	Southbound PM_{10} (g/s)	Southbound $PM_{2.5}$ (g/s)	Southbound NO_2 (g/s)
1	1.1E-02	7.1E-03	4.8E-02	7.1E-03	4.6E-03	2.9E-02
2	1.1E-02	7.2E-03	4.8E-02	7.2E-03	4.7E-03	2.9E-02
3	1.1E-02	7.2E-03	4.8E-02	7.2E-03	4.7E-03	2.9E-02
4	1.1E-02	7.1E-03	4.8E-02	7.1E-03	4.6E-03	2.9E-02
5	4.2E-02	2.7E-02	1.8E-01	3.8E-02	2.5E-02	1.5E-01
6	6.5E-02	4.2E-02	2.6E-01	5.9E-02	3.8E-02	2.2E-01
7	8.1E-02	5.2E-02	3.0E-01	7.9E-02	5.0E-02	2.7E-01
8	1.0E-01	6.6E-02	3.4E-01	8.5E-02	5.4E-02	2.3E-01
9	1.0E-01	6.6E-02	3.4E-01	8.5E-02	5.4E-02	2.3E-01
10	9.3E-02	6.0E-02	3.1E-01	6.5E-02	4.1E-02	1.8E-01
11	9.1E-02	5.9E-02	3.2E-01	5.7E-02	3.7E-02	1.7E-01
12	9.4E-02	6.1E-02	3.4E-01	5.5E-02	3.5E-02	1.8E-01
13	9.1E-02	5.9E-02	3.2E-01	5.7E-02	3.7E-02	1.9E-01
14	9.4E-02	6.0E-02	3.2E-01	5.7E-02	3.7E-02	1.9E-01
15	9.9E-02	6.3E-02	3.1E-01	5.3E-02	3.4E-02	1.7E-01
16	1.1E-01	6.8E-02	3.2E-01	5.7E-02	3.6E-02	1.6E-01
17	1.3E-01	8.3E-02	3.5E-01	6.8E-02	4.3E-02	2.0E-01
18	1.3E-01	8.3E-02	3.5E-01	6.8E-02	4.3E-02	2.0E-01
19	9.3E-02	5.8E-02	2.4E-01	4.9E-02	3.1E-02	1.4E-01
20	7.6E-02	4.8E-02	2.2E-01	3.6E-02	2.3E-02	9.9E-02
21	5.7E-02	3.6E-02	1.9E-01	2.6E-02	1.6E-02	7.9E-02
22	3.5E-02	2.3E-02	1.3E-01	1.1E-02	6.8E-03	3.7E-02
23	1.1E-02	7.3E-03	5.0E-02	7.4E-03	4.8E-03	3.0E-02
24	1.1E-02	7.4E-03	5.1E-02	7.5E-03	4.9E-03	3.1E-02

Table 8: Scenario B1 northbound traffic emission rates

Hour	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	CO (g/s)	NO_2 (g/s)	Benzene (g/s)	Toluene (g/s)	Ethylbenzene (g/s)	Xylene isomers (g/s)	1,3-Butadiene (g/s)	Formaldehyde (g/s)	B(a)P TEQ (g/s)
1	2.2E-02	1.9E-02	4.4E-01	1.7E-01	7.5E-03	1.5E-02	5.6E-03	1.5E-02	2.1E-03	4.3E-03	1.1E-06
2	2.2E-02	1.9E-02	4.5E-01	1.7E-01	7.5E-03	1.5E-02	5.6E-03	1.5E-02	2.1E-03	4.4E-03	1.1E-06
3	2.2E-02	1.9E-02	4.5E-01	1.7E-01	7.5E-03	1.5E-02	5.6E-03	1.5E-02	2.1E-03	4.4E-03	1.1E-06
4	2.2E-02	1.9E-02	4.4E-01	1.7E-01	7.5E-03	1.5E-02	5.6E-03	1.5E-02	2.1E-03	4.3E-03	1.1E-06
5	8.2E-02	7.2E-02	1.7E+00	6.4E-01	2.8E-02	5.7E-02	2.1E-02	5.6E-02	8.0E-03	1.6E-02	4.2E-06
6	1.2E-01	1.1E-01	2.9E+00	9.3E-01	4.9E-02	1.0E-01	3.7E-02	9.8E-02	1.3E-02	2.6E-02	6.7E-06
7	1.6E-01	1.4E-01	4.0E+00	1.2E+00	7.2E-02	1.4E-01	5.4E-02	1.4E-01	1.8E-02	3.6E-02	9.0E-06
8	1.8E-01	1.6E-01	5.1E+00	1.3E+00	8.3E-02	1.7E-01	6.2E-02	1.6E-01	2.0E-02	4.1E-02	1.0E-05
9	1.8E-01	1.6E-01	5.1E+00	1.3E+00	8.3E-02	1.7E-01	6.2E-02	1.6E-01	2.0E-02	4.1E-02	1.0E-05
10	1.5E-01	1.3E-01	4.6E+00	1.1E+00	7.9E-02	1.6E-01	5.9E-02	1.6E-01	1.9E-02	3.7E-02	9.1E-06
11	1.5E-01	1.3E-01	4.4E+00	1.1E+00	7.4E-02	1.5E-01	5.5E-02	1.5E-01	1.8E-02	3.6E-02	8.9E-06
12	1.6E-01	1.4E-01	4.5E+00	1.2E+00	7.4E-02	1.5E-01	5.5E-02	1.5E-01	1.8E-02	3.6E-02	9.1E-06
13	1.5E-01	1.3E-01	4.4E+00	1.1E+00	7.4E-02	1.5E-01	5.5E-02	1.5E-01	1.8E-02	3.6E-02	8.9E-06
14	1.6E-01	1.3E-01	4.6E+00	1.1E+00	7.9E-02	1.6E-01	5.9E-02	1.6E-01	1.9E-02	3.7E-02	9.2E-06
15	1.7E-01	1.4E-01	5.2E+00	1.2E+00	9.4E-02	1.9E-01	7.0E-02	1.9E-01	2.1E-02	4.2E-02	1.0E-05
16	1.8E-01	1.5E-01	5.9E+00	1.2E+00	1.1E-01	2.3E-01	8.3E-02	2.2E-01	2.4E-02	4.7E-02	1.2E-05
17	1.7E-01	1.4E-01	6.0E+00	1.1E+00	1.2E-01	2.4E-01	8.8E-02	2.3E-01	2.5E-02	4.7E-02	1.1E-05
18	1.7E-01	1.4E-01	6.0E+00	1.1E+00	1.2E-01	2.4E-01	8.8E-02	2.3E-01	2.5E-02	4.7E-02	1.1E-05
19	1.5E-01	1.2E-01	5.5E+00	9.6E-01	1.1E-01	2.2E-01	8.3E-02	2.2E-01	2.3E-02	4.3E-02	1.0E-05
20	1.2E-01	9.8E-02	3.9E+00	7.8E-01	7.4E-02	1.5E-01	5.6E-02	1.5E-01	1.6E-02	3.1E-02	7.6E-06
21	9.2E-02	7.8E-02	2.7E+00	6.5E-01	5.1E-02	1.0E-01	3.8E-02	1.0E-01	1.2E-02	2.3E-02	5.6E-06
22	6.2E-02	5.3E-02	1.6E+00	4.6E-01	2.8E-02	5.6E-02	2.1E-02	5.5E-02	6.9E-03	1.4E-02	3.5E-06
23	2.2E-02	2.0E-02	4.5E-01	1.7E-01	7.4E-03	1.5E-02	5.5E-03	1.5E-02	2.1E-03	4.4E-03	1.1E-06
24	2.3E-02	2.0E-02	4.5E-01	1.8E-01	7.3E-03	1.5E-02	5.5E-03	1.5E-02	2.2E-03	4.5E-03	1.2E-06

Table 9: Scenario B1 southbound traffic emission rates

Hour	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	CO (g/s)	NO_2 (g/s)	Benzene (g/s)	Toluene (g/s)	Ethylbenzene (g/s)	Xylene isomers (g/s)	1,3-Butadiene (g/s)	Formaldehyde (g/s)	B(a)P TEQ (g/s)
1	1.6E-02	1.4E-02	3.4E-01	1.1E-01	8.5E-03	1.7E-02	6.4E-03	1.7E-02	2.4E-03	5.0E-03	1.3E-06
2	1.6E-02	1.4E-02	3.5E-01	1.1E-01	8.6E-03	1.7E-02	6.4E-03	1.7E-02	2.4E-03	5.0E-03	1.3E-06
3	1.6E-02	1.4E-02	3.5E-01	1.1E-01	8.6E-03	1.7E-02	6.4E-03	1.7E-02	2.4E-03	5.0E-03	1.3E-06
4	1.6E-02	1.4E-02	3.4E-01	1.1E-01	8.5E-03	1.7E-02	6.4E-03	1.7E-02	2.4E-03	5.0E-03	1.3E-06
5	9.7E-02	8.5E-02	2.1E+00	6.9E-01	5.0E-02	1.0E-01	3.8E-02	1.0E-01	1.4E-02	3.0E-02	7.7E-06
6	1.1E-01	9.4E-02	2.6E+00	7.5E-01	6.6E-02	1.3E-01	4.9E-02	1.3E-01	1.7E-02	3.5E-02	9.0E-06
7	1.4E-01	1.2E-01	3.7E+00	9.6E-01	9.6E-02	1.9E-01	7.2E-02	1.9E-01	2.4E-02	4.8E-02	1.2E-05
8	1.2E-01	9.8E-02	4.1E+00	7.3E-01	1.1E-01	2.3E-01	8.5E-02	2.2E-01	2.5E-02	4.8E-02	1.2E-05
9	1.2E-01	9.8E-02	4.1E+00	7.3E-01	1.1E-01	2.3E-01	8.5E-02	2.2E-01	2.5E-02	4.8E-02	1.2E-05
10	1.0E-01	8.4E-02	3.6E+00	6.3E-01	1.0E-01	2.1E-01	7.8E-02	2.0E-01	2.2E-02	4.2E-02	1.0E-05
11	9.2E-02	7.8E-02	3.0E+00	5.9E-01	8.1E-02	1.6E-01	6.1E-02	1.6E-01	1.8E-02	3.6E-02	8.8E-06
12	9.2E-02	7.9E-02	2.8E+00	6.0E-01	7.0E-02	1.4E-01	5.2E-02	1.4E-01	1.7E-02	3.3E-02	8.3E-06
13	9.6E-02	8.4E-02	2.9E+00	6.4E-01	6.9E-02	1.4E-01	5.2E-02	1.4E-01	1.7E-02	3.4E-02	8.5E-06
14	9.6E-02	8.4E-02	2.9E+00	6.4E-01	6.9E-02	1.4E-01	5.2E-02	1.4E-01	1.7E-02	3.4E-02	8.5E-06
15	8.8E-02	7.5E-02	2.8E+00	5.7E-01	7.1E-02	1.4E-01	5.3E-02	1.4E-01	1.7E-02	3.3E-02	8.1E-06
16	8.9E-02	7.6E-02	3.0E+00	5.7E-01	8.2E-02	1.7E-01	6.1E-02	1.6E-01	1.8E-02	3.5E-02	8.7E-06
17	1.0E-01	9.0E-02	3.6E+00	6.7E-01	9.2E-02	1.9E-01	6.9E-02	1.8E-01	2.1E-02	4.1E-02	1.0E-05
18	1.0E-01	9.0E-02	3.6E+00	6.7E-01	9.2E-02	1.9E-01	6.9E-02	1.8E-01	2.1E-02	4.1E-02	1.0E-05
19	7.5E-02	6.3E-02	2.7E+00	4.7E-01	7.3E-02	1.5E-01	5.4E-02	1.4E-01	1.6E-02	3.1E-02	7.5E-06
20	5.9E-02	5.0E-02	2.1E+00	3.7E-01	5.8E-02	1.2E-01	4.4E-02	1.1E-01	1.3E-02	2.4E-02	6.0E-06
21	5.0E-02	4.3E-02	1.6E+00	3.3E-01	4.2E-02	8.6E-02	3.2E-02	8.4E-02	9.8E-03	1.9E-02	4.7E-06
22	1.9E-02	1.6E-02	5.0E-01	1.3E-01	1.3E-02	2.6E-02	9.7E-03	2.6E-02	3.3E-03	6.5E-03	1.6E-06
23	1.7E-02	1.5E-02	3.5E-01	1.2E-01	8.4E-03	1.7E-02	6.3E-03	1.7E-02	2.5E-03	5.1E-03	1.3E-06
24	1.7E-02	1.5E-02	3.5E-01	1.2E-01	8.4E-03	1.7E-02	6.3E-03	1.7E-02	2.5E-03	5.2E-03	1.3E-06

Table 10: Scenario B2 traffic emission rates

	Northbound			Southbound		
	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$	NO_2
Hour	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
1	1.3E-02	8.4E-03	5.6E-02	9.5E-03	6.2E-03	3.8E-02
2	1.3E-02	8.5E-03	5.6E-02	9.6E-03	6.2E-03	3.8E-02
3	1.3E-02	8.5E-03	5.6E-02	9.6E-03	6.2E-03	3.8E-02
4	1.3E-02	8.4E-03	5.6E-02	9.5E-03	6.2E-03	3.8E-02
5	5.0E-02	3.2E-02	2.1E-01	5.8E-02	3.7E-02	2.3E-01
6	7.8E-02	5.0E-02	3.1E-01	6.7E-02	4.3E-02	2.5E-01
7	1.1E-01	6.7E-02	3.9E-01	9.1E-02	5.8E-02	3.2E-01
8	1.2E-01	7.9E-02	4.3E-01	8.6E-02	5.4E-02	2.4E-01
9	1.2E-01	7.9E-02	4.3E-01	8.6E-02	5.4E-02	2.4E-01
10	1.1E-01	6.9E-02	3.6E-01	7.6E-02	4.8E-02	2.0E-01
11	1.1E-01	6.8E-02	3.6E-01	6.6E-02	4.2E-02	1.9E-01
12	1.1E-01	7.0E-02	3.8E-01	6.3E-02	4.0E-02	2.0E-01
13	1.1E-01	6.8E-02	3.6E-01	6.5E-02	4.2E-02	2.1E-01
14	1.1E-01	6.9E-02	3.6E-01	6.5E-02	4.2E-02	2.1E-01
15	1.2E-01	7.7E-02	3.8E-01	6.1E-02	3.9E-02	1.9E-01
16	1.3E-01	8.5E-02	3.9E-01	6.5E-02	4.1E-02	1.9E-01
17	1.3E-01	8.3E-02	3.5E-01	7.5E-02	4.8E-02	2.2E-01
18	1.3E-01	8.3E-02	3.5E-01	7.5E-02	4.8E-02	2.2E-01
19	1.2E-01	7.5E-02	3.1E-01	5.6E-02	3.5E-02	1.5E-01
20	8.8E-02	5.5E-02	2.5E-01	4.4E-02	2.8E-02	1.2E-01
21	6.5E-02	4.2E-02	2.1E-01	3.5E-02	2.2E-02	1.1E-01
22	4.1E-02	2.6E-02	1.5E-01	1.2E-02	7.8E-03	4.2E-02
23	1.3E-02	8.7E-03	5.8E-02	9.8E-03	6.4E-03	3.9E-02
24	1.4E-02	8.8E-03	6.0E-02	9.9E-03	6.5E-03	4.0E-02

Table 11: Sensitivity analysis: maximum lane capacity northbound traffic fleet composition

Hour	North section					South section				
	PCP	PCD	LCV	HCV	Total	PCP	PCD	LCV	HCV	Total
1	3956	698	138	1208	6000	3902	689	164	1245	6000
2	3917	691	184	1208	6000	3856	680	218	1245	6000
3	3917	691	184	1208	6000	3856	680	218	1245	6000
4	3956	698	138	1208	6000	3902	689	164	1245	6000
5	3917	691	184	1208	6000	3856	680	218	1245	6000
6	4078	720	192	1011	6000	4020	709	228	1042	6000
7	4193	740	198	869	6000	4139	730	235	895	6000
8	4080	720	375	825	6000	3991	704	435	870	6000
9	4080	720	375	825	6000	3991	704	435	870	6000
10	4227	746	312	715	6000	4158	734	371	737	6000
11	4158	734	337	771	6000	4083	721	401	795	6000
12	4076	719	366	838	6000	3996	705	435	864	6000
13	4158	734	337	771	6000	4083	721	401	795	6000
14	4227	746	312	715	6000	4158	734	371	737	6000
15	4339	766	272	623	6000	4279	755	324	642	6000
16	4462	787	228	523	6000	4411	778	272	539	6000
17	4561	805	231	404	6000	4488	792	270	450	6000
18	4561	805	231	404	6000	4488	792	270	450	6000
19	4629	817	190	364	6000	4589	810	226	375	6000
20	4503	795	214	488	6000	4456	786	255	503	6000
21	4377	772	208	643	6000	4327	764	247	662	6000
22	4193	740	198	869	6000	4139	730	235	895	6000
23	3866	682	181	1270	6000	3804	671	215	1309	6000
24	3833	676	179	1311	6000	3770	665	213	1351	6000

Table 12: Sensitivity analysis: maximum lane capacity southbound traffic fleet composition

Hour	North section					South section				
	PCP	PCD	LCV	HCV	Total	PCP	PCD	LCV	HCV	Total
1	3939	695	147	1219	6000	3825	675	173	1327	6000
2	3897	688	196	1219	6000	3776	666	231	1327	6000
3	3897	688	196	1219	6000	3776	666	231	1327	6000
4	3939	695	147	1219	6000	3825	675	173	1327	6000
5	3897	688	196	1219	6000	3776	666	231	1327	6000
6	4057	716	205	1022	6000	3949	697	242	1112	6000
7	4172	736	212	879	6000	4074	719	250	957	6000
8	4484	791	232	493	6000	4371	771	286	571	6000
9	4484	791	232	493	6000	4371	771	286	571	6000
10	4532	800	212	456	6000	4466	788	249	496	6000
11	4350	768	280	602	6000	4263	752	329	656	6000
12	4172	736	346	746	6000	4063	717	408	812	6000
13	4091	722	376	810	6000	3974	701	443	882	6000
14	4091	722	376	810	6000	3974	701	443	882	6000
15	4240	748	321	691	6000	4140	731	378	752	6000
16	4395	776	263	566	6000	4313	761	309	616	6000
17	4295	758	351	596	6000	4216	744	400	640	6000
18	4295	758	351	596	6000	4216	744	400	640	6000
19	4435	783	272	510	6000	4356	769	321	555	6000
20	4482	791	230	496	6000	4410	778	271	540	6000
21	4356	769	223	652	6000	4274	754	262	710	6000
22	4172	736	212	879	6000	4074	719	250	957	6000
23	3847	679	193	1281	6000	3722	657	227	1394	6000
24	3815	673	191	1321	6000	3687	651	225	1438	6000

Table 13: Sensitivity analysis: maximum lane capacity northbound traffic emission rates

Hour	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	CO (g/s)	NO_2 (g/s)	Benzene (g/s)	Toluene (g/s)	Ethylbenzene (g/s)	Xylene isomers (g/s)	1,3-Butadiene (g/s)	Formaldehyde (g/s)	B(a)P TEQ (g/s)
1	3.4E-01	3.0E-01	6.9E+00	2.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.3E-02	1.1E-01	1.7E-05
2	3.4E-01	3.0E-01	7.1E+00	2.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.4E-02	1.1E-01	1.8E-05
3	3.4E-01	3.0E-01	7.1E+00	2.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.4E-02	1.1E-01	1.8E-05
4	3.4E-01	3.0E-01	6.9E+00	2.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.3E-02	1.1E-01	1.7E-05
5	3.4E-01	3.0E-01	7.1E+00	2.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.4E-02	1.1E-01	1.8E-05
6	3.0E-01	2.6E-01	7.1E+00	2.3E+00	1.8E-01	3.5E-01	1.3E-01	3.4E-01	5.1E-02	1.0E-01	1.6E-05
7	2.8E-01	2.4E-01	7.0E+00	2.1E+00	1.8E-01	3.6E-01	1.3E-01	3.4E-01	5.0E-02	1.0E-01	1.6E-05
8	2.8E-01	2.4E-01	7.9E+00	2.0E+00	1.9E-01	3.7E-01	1.3E-01	3.5E-01	5.0E-02	1.0E-01	1.6E-05
9	2.8E-01	2.4E-01	7.9E+00	2.0E+00	1.9E-01	3.7E-01	1.3E-01	3.5E-01	5.0E-02	1.0E-01	1.6E-05
10	2.6E-01	2.2E-01	7.5E+00	1.8E+00	1.9E-01	3.8E-01	1.4E-01	3.6E-01	4.9E-02	9.6E-02	1.5E-05
11	2.7E-01	2.3E-01	7.7E+00	1.9E+00	1.9E-01	3.8E-01	1.3E-01	3.5E-01	4.9E-02	9.9E-02	1.5E-05
12	2.8E-01	2.4E-01	7.9E+00	2.0E+00	1.9E-01	3.7E-01	1.3E-01	3.5E-01	5.0E-02	1.0E-01	1.6E-05
13	2.7E-01	2.3E-01	7.7E+00	1.9E+00	1.9E-01	3.8E-01	1.3E-01	3.5E-01	4.9E-02	9.9E-02	1.5E-05
14	2.6E-01	2.2E-01	7.5E+00	1.8E+00	1.9E-01	3.8E-01	1.4E-01	3.6E-01	4.9E-02	9.6E-02	1.5E-05
15	2.4E-01	2.0E-01	7.3E+00	1.6E+00	1.9E-01	3.8E-01	1.4E-01	3.6E-01	4.8E-02	9.3E-02	1.4E-05
16	2.2E-01	1.8E-01	7.0E+00	1.5E+00	2.0E-01	3.9E-01	1.4E-01	3.7E-01	4.6E-02	8.9E-02	1.4E-05
17	2.0E-01	1.6E-01	7.0E+00	1.3E+00	2.0E-01	4.0E-01	1.4E-01	3.7E-01	4.5E-02	8.5E-02	1.3E-05
18	2.0E-01	1.6E-01	7.0E+00	1.3E+00	2.0E-01	4.0E-01	1.4E-01	3.7E-01	4.5E-02	8.5E-02	1.3E-05
19	1.8E-01	1.5E-01	6.8E+00	1.2E+00	2.0E-01	4.0E-01	1.4E-01	3.7E-01	4.4E-02	8.3E-02	1.3E-05
20	2.1E-01	1.8E-01	7.0E+00	1.4E+00	2.0E-01	3.9E-01	1.4E-01	3.7E-01	4.6E-02	8.8E-02	1.4E-05
21	2.4E-01	2.0E-01	7.0E+00	1.7E+00	1.9E-01	3.8E-01	1.4E-01	3.6E-01	4.7E-02	9.3E-02	1.4E-05
22	2.8E-01	2.4E-01	7.0E+00	2.1E+00	1.8E-01	3.6E-01	1.3E-01	3.4E-01	5.0E-02	1.0E-01	1.6E-05
23	3.5E-01	3.1E-01	7.1E+00	2.7E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.4E-02	1.1E-01	1.8E-05
24	3.6E-01	3.1E-01	7.1E+00	2.8E+00	1.7E-01	3.3E-01	1.2E-01	3.2E-01	5.5E-02	1.1E-01	1.8E-05

Table 14: Sensitivity analysis: maximum lane capacity southbound traffic emission rates

Hour	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	CO (g/s)	NO_2 (g/s)	Benzene (g/s)	Toluene (g/s)	Ethylbenzene (g/s)	Xylene isomers (g/s)	1,3-Butadiene (g/s)	Formaldehyde (g/s)	B(a)P TEQ (g/s)
1	2.2E-01	2.0E-01	4.8E+00	1.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.4E-02	1.1E-01	1.8E-05
2	2.3E-01	2.0E-01	4.9E+00	1.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.4E-02	1.1E-01	1.8E-05
3	2.3E-01	2.0E-01	4.9E+00	1.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.4E-02	1.1E-01	1.8E-05
4	2.2E-01	2.0E-01	4.8E+00	1.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.4E-02	1.1E-01	1.8E-05
5	2.3E-01	2.0E-01	4.9E+00	1.6E+00	1.7E-01	3.4E-01	1.2E-01	3.2E-01	5.4E-02	1.1E-01	1.8E-05
6	2.0E-01	1.8E-01	4.9E+00	1.4E+00	1.8E-01	3.5E-01	1.3E-01	3.3E-01	5.2E-02	1.1E-01	1.7E-05
7	1.8E-01	1.6E-01	4.9E+00	1.3E+00	1.8E-01	3.6E-01	1.3E-01	3.4E-01	5.0E-02	1.0E-01	1.6E-05
8	1.4E-01	1.2E-01	4.9E+00	8.7E-01	2.0E-01	3.9E-01	1.4E-01	3.7E-01	4.6E-02	8.8E-02	1.4E-05
9	1.4E-01	1.2E-01	4.9E+00	8.7E-01	2.0E-01	3.9E-01	1.4E-01	3.7E-01	4.6E-02	8.8E-02	1.4E-05
10	1.3E-01	1.1E-01	4.8E+00	8.3E-01	2.0E-01	3.9E-01	1.4E-01	3.7E-01	4.6E-02	8.7E-02	1.4E-05
11	1.5E-01	1.3E-01	5.0E+00	9.8E-01	1.9E-01	3.9E-01	1.4E-01	3.6E-01	4.7E-02	9.2E-02	1.4E-05
12	1.7E-01	1.5E-01	5.3E+00	1.1E+00	1.9E-01	3.8E-01	1.4E-01	3.5E-01	4.9E-02	9.8E-02	1.5E-05
13	1.8E-01	1.6E-01	5.4E+00	1.2E+00	1.9E-01	3.7E-01	1.3E-01	3.5E-01	5.0E-02	1.0E-01	1.6E-05
14	1.8E-01	1.6E-01	5.4E+00	1.2E+00	1.9E-01	3.7E-01	1.3E-01	3.5E-01	5.0E-02	1.0E-01	1.6E-05
15	1.6E-01	1.4E-01	5.2E+00	1.1E+00	1.9E-01	3.8E-01	1.4E-01	3.6E-01	4.9E-02	9.6E-02	1.5E-05
16	1.5E-01	1.2E-01	5.0E+00	9.4E-01	2.0E-01	3.9E-01	1.4E-01	3.6E-01	4.7E-02	9.1E-02	1.4E-05
17	1.5E-01	1.3E-01	5.2E+00	9.8E-01	2.0E-01	3.9E-01	1.4E-01	3.6E-01	4.8E-02	9.3E-02	1.5E-05
18	1.5E-01	1.3E-01	5.2E+00	9.8E-01	2.0E-01	3.9E-01	1.4E-01	3.6E-01	4.8E-02	9.3E-02	1.5E-05
19	1.4E-01	1.2E-01	5.0E+00	8.8E-01	2.0E-01	3.9E-01	1.4E-01	3.7E-01	4.6E-02	8.9E-02	1.4E-05
20	1.4E-01	1.2E-01	4.8E+00	8.7E-01	2.0E-01	3.9E-01	1.4E-01	3.7E-01	4.6E-02	8.8E-02	1.4E-05
21	1.6E-01	1.3E-01	4.9E+00	1.0E+00	1.9E-01	3.8E-01	1.4E-01	3.6E-01	4.8E-02	9.3E-02	1.5E-05
22	1.8E-01	1.6E-01	4.9E+00	1.3E+00	1.8E-01	3.6E-01	1.3E-01	3.4E-01	5.0E-02	1.0E-01	1.6E-05
23	2.3E-01	2.0E-01	4.9E+00	1.7E+00	1.7E-01	3.3E-01	1.2E-01	3.2E-01	5.5E-02	1.1E-01	1.8E-05
24	2.4E-01	2.1E-01	4.9E+00	1.7E+00	1.7E-01	3.3E-01	1.2E-01	3.2E-01	5.5E-02	1.2E-01	1.8E-05

Table 15: Sensitivity analysis: increased diesel to petrol passenger car ratio northbound traffic fleet composition

Hour	North section					South section				
	PCP	PCD	LCV	HCV	Total	PCP	PCD	LCV	HCV	Total
1	201	86	8	75	370	234	100	12	91	437
2	199	85	11	75	370	231	99	16	91	437
3	199	85	11	75	370	231	99	16	91	437
4	201	86	8	75	370	234	100	12	91	437
5	801	343	46	300	1489	683	293	47	268	1292
6	1402	601	80	422	2505	1188	509	82	374	2153
7	2026	868	116	510	3520	1747	749	121	459	3075
8	2240	960	250	550	4000	1890	810	250	500	3450
9	2240	960	250	550	4000	1890	810	250	500	3450
10	2169	930	195	445	3739	1825	782	198	393	3198
11	2009	861	198	453	3520	1792	768	214	424	3198
12	1970	844	215	492	3520	1754	752	232	460	3198
13	2009	861	198	453	3520	1792	768	214	424	3198
14	2160	926	194	444	3724	1931	827	209	415	3383
15	2621	1123	200	457	4401	2239	960	206	408	3813
16	3109	1333	193	442	5078	2793	1197	209	414	4613
17	3255	1395	200	350	5200	3080	1320	225	375	5000
18	3255	1395	200	350	5200	3080	1320	225	375	5000
19	3148	1349	157	301	4955	2772	1188	165	275	4401
20	2092	897	121	276	3385	1881	806	130	258	3075
21	1424	610	82	254	2370	1278	548	89	238	2153
22	779	334	45	196	1354	699	299	48	184	1230
23	196	84	11	78	370	228	98	16	95	437
24	195	83	11	81	370	226	97	16	98	437

Table 16: Sensitivity analysis: increased diesel to petrol passenger car ratio southbound traffic fleet composition

Hour	North section					South section				
	PCP	PCD	LCV	HCV	Total	PCP	PCD	LCV	HCV	Total
1	256	110	12	96	474	165	71	9	69	313
2	254	109	15	96	474	162	70	12	69	313
3	254	109	15	96	474	162	70	12	69	313
4	256	110	12	96	474	165	71	9	69	313
5	1427	612	87	542	2668	1211	519	90	516	2336
6	1857	796	114	568	3335	1583	678	118	541	2920
7	2674	1146	165	684	4669	2417	1036	180	689	4322
8	3185	1365	200	425	5175	2835	1215	225	450	4725
9	3185	1365	200	425	5175	2835	1215	225	450	4725
10	2905	1245	165	355	4669	2670	1144	181	360	4355
11	2270	973	177	382	3802	1879	805	176	351	3212
12	1910	818	192	415	3335	1629	698	198	395	2920
13	1873	803	209	450	3335	1593	683	216	429	2920
14	1873	803	209	450	3335	1593	683	216	429	2920
15	1941	832	178	384	3335	1659	711	184	366	2920
16	2294	983	166	359	3802	1936	830	169	336	3270
17	2520	1080	250	425	4275	2170	930	250	400	3750
18	2520	1080	250	425	4275	2170	930	250	400	3750
19	2030	870	151	283	3335	1746	748	156	270	2920
20	1641	703	102	221	2668	1414	606	106	210	2336
21	1196	513	74	218	2001	1028	440	77	207	1752
22	382	164	24	98	667	261	112	19	75	467
23	250	107	15	101	474	160	69	12	73	313
24	248	106	15	104	474	159	68	12	75	313

Table 17: Sensitivity analysis: increased diesel to petrol passenger car ratio traffic emission rates

	Northbound			Southbound		
	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$	NO_2
Hour	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
1	2.3E-02	2.1E-02	1.9E-01	1.7E-02	1.5E-02	1.3E-01
2	2.4E-02	2.1E-02	1.9E-01	1.7E-02	1.5E-02	1.3E-01
3	2.4E-02	2.1E-02	1.9E-01	1.7E-02	1.5E-02	1.3E-01
4	2.3E-02	2.1E-02	1.9E-01	1.7E-02	1.5E-02	1.3E-01
5	8.9E-02	7.9E-02	7.2E-01	1.0E-01	9.2E-02	7.8E-01
6	1.4E-01	1.2E-01	1.1E+00	1.2E-01	1.0E-01	8.7E-01
7	1.8E-01	1.5E-01	1.4E+00	1.5E-01	1.4E-01	1.1E+00
8	2.0E-01	1.8E-01	1.5E+00	1.3E-01	1.1E-01	9.4E-01
9	2.0E-01	1.8E-01	1.5E+00	1.3E-01	1.1E-01	9.4E-01
10	1.7E-01	1.5E-01	1.3E+00	1.2E-01	1.0E-01	8.2E-01
11	1.7E-01	1.5E-01	1.3E+00	1.0E-01	9.0E-02	7.4E-01
12	1.8E-01	1.6E-01	1.4E+00	1.0E-01	8.9E-02	7.3E-01
13	1.7E-01	1.5E-01	1.3E+00	1.1E-01	9.3E-02	7.6E-01
14	1.7E-01	1.5E-01	1.3E+00	1.1E-01	9.3E-02	7.6E-01
15	1.9E-01	1.7E-01	1.4E+00	9.8E-02	8.5E-02	7.0E-01
16	2.1E-01	1.8E-01	1.5E+00	1.0E-01	8.8E-02	7.2E-01
17	2.0E-01	1.7E-01	1.4E+00	1.2E-01	1.0E-01	8.3E-01
18	2.0E-01	1.7E-01	1.4E+00	1.2E-01	1.0E-01	8.3E-01
19	1.8E-01	1.5E-01	1.3E+00	8.6E-02	7.4E-02	6.1E-01
20	1.3E-01	1.2E-01	1.0E+00	6.7E-02	5.8E-02	4.8E-01
21	1.0E-01	9.1E-02	8.0E-01	5.7E-02	4.9E-02	4.1E-01
22	6.9E-02	6.0E-02	5.4E-01	2.1E-02	1.8E-02	1.5E-01
23	2.4E-02	2.1E-02	2.0E-01	1.8E-02	1.6E-02	1.3E-01
24	2.5E-02	2.2E-02	2.0E-01	1.8E-02	1.6E-02	1.4E-01

APPENDIX E

Ventilation structure impact isopleths

Isopleths of the 100th percentile predicted incremental GLC (without background) for the ventilation structures are presented as follows:

FIGURES

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Building 7, Botanicca Corporate Park, 570 – 588 Swan Street, Richmond, Victoria 3121, Australia
A.B.N. 64 006 107 857

T: +61 3 8862 3500 F: +61 3 8862 3501

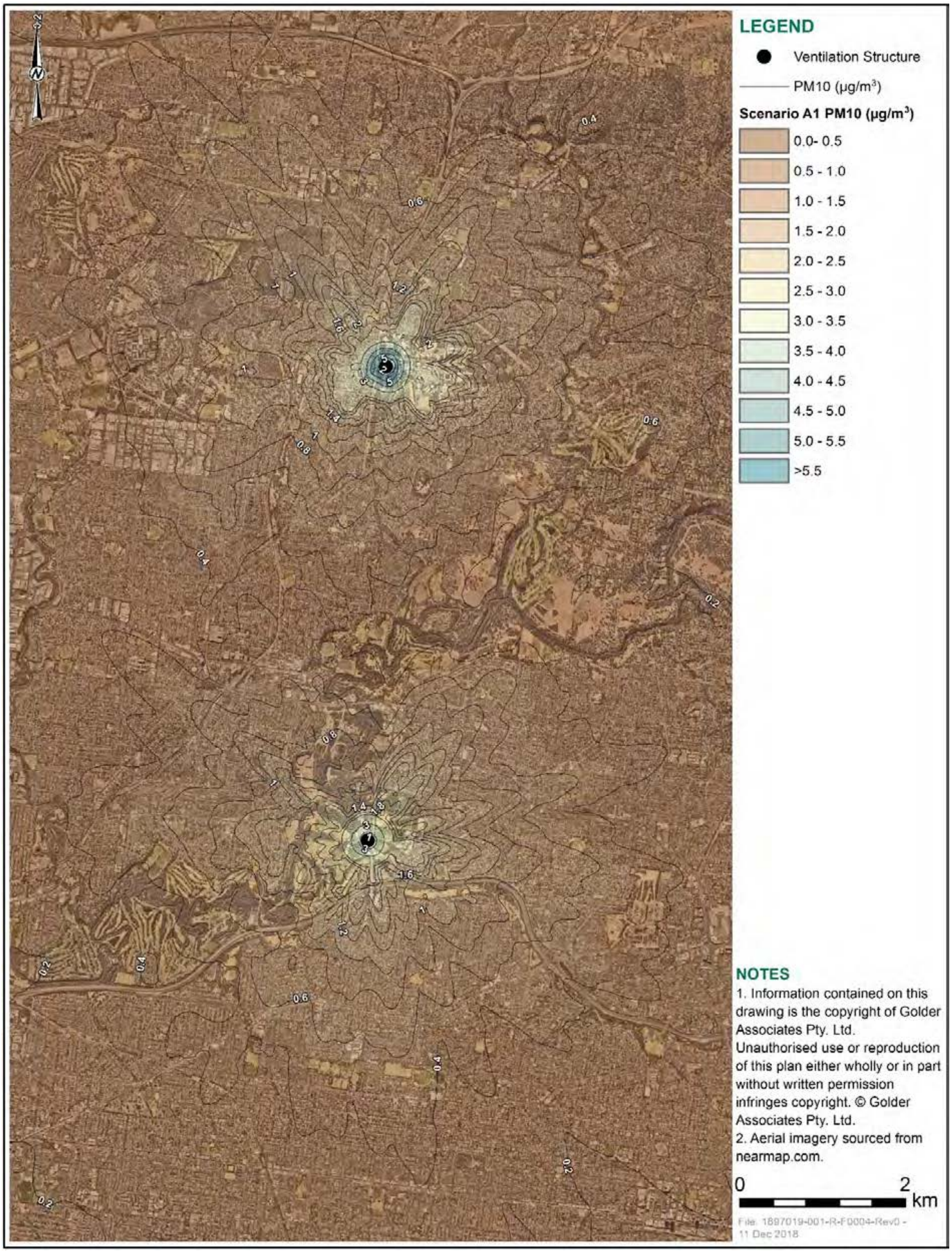


Figure 1: Scenario A1: Maximum predicted one hour average PM_{10} GLC

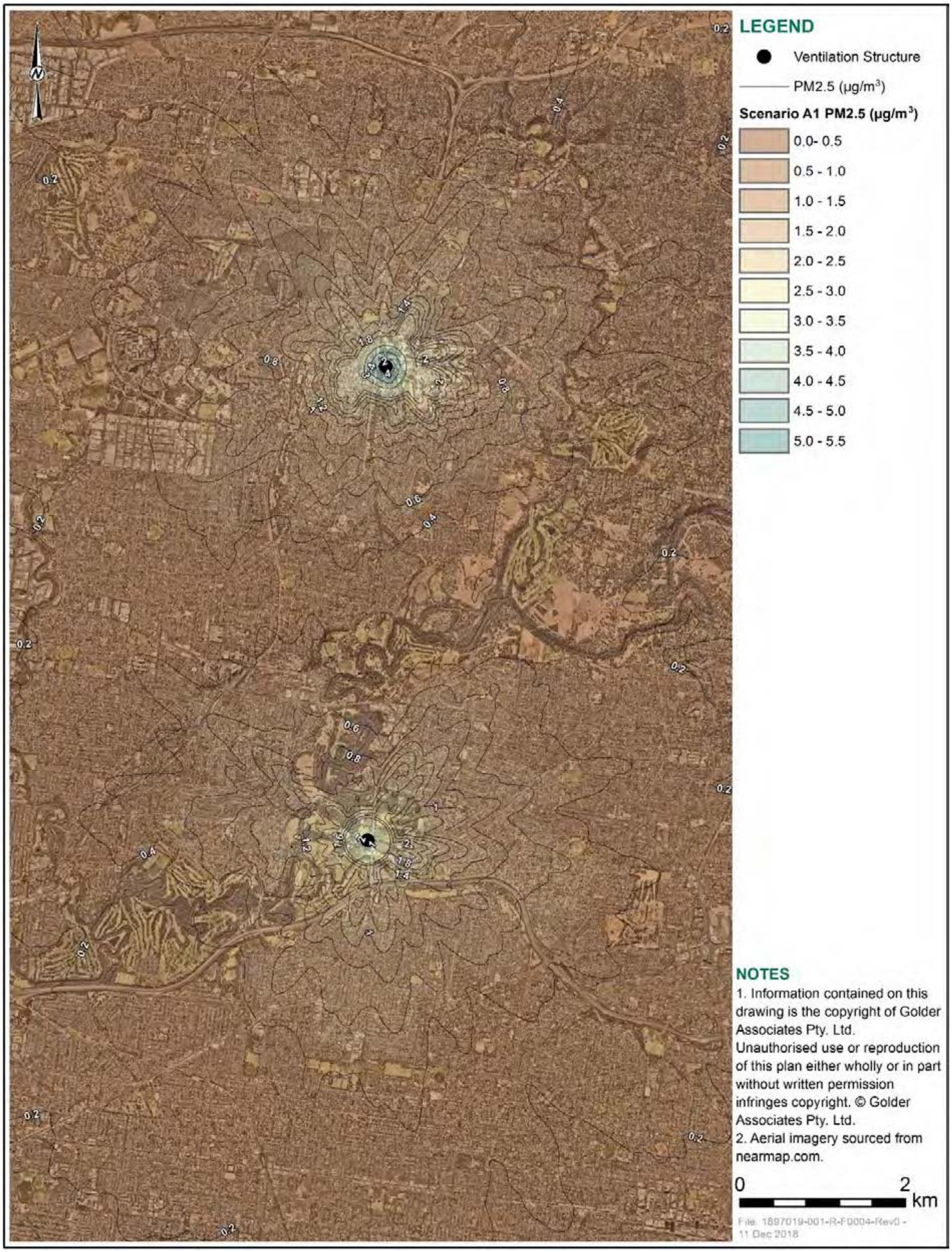


Figure 2: Scenario A1: Maximum predicted one hour average $PM_{2.5}$ GLC

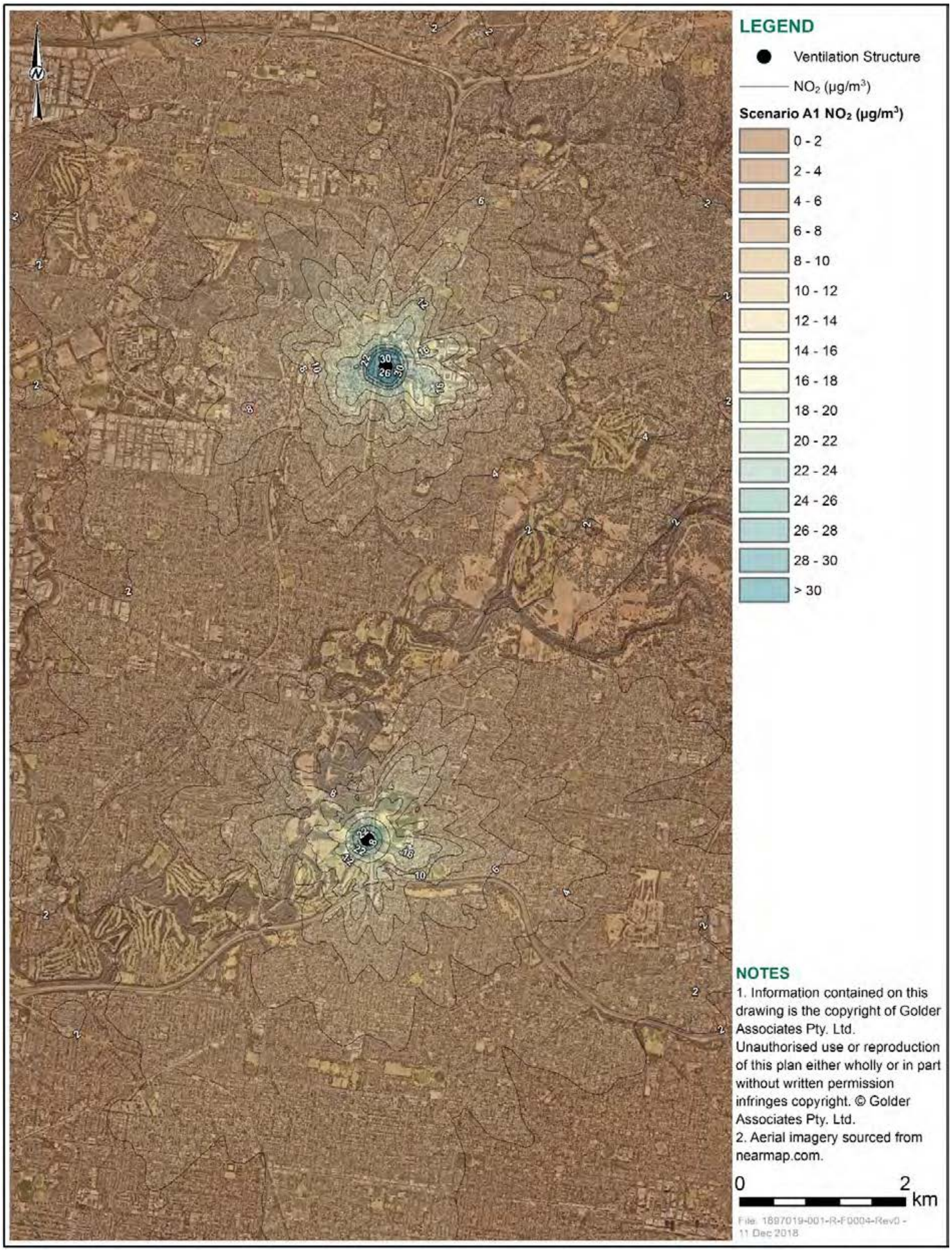


Figure 3: Scenario A1: Maximum predicted one hour average NO_2 GLC

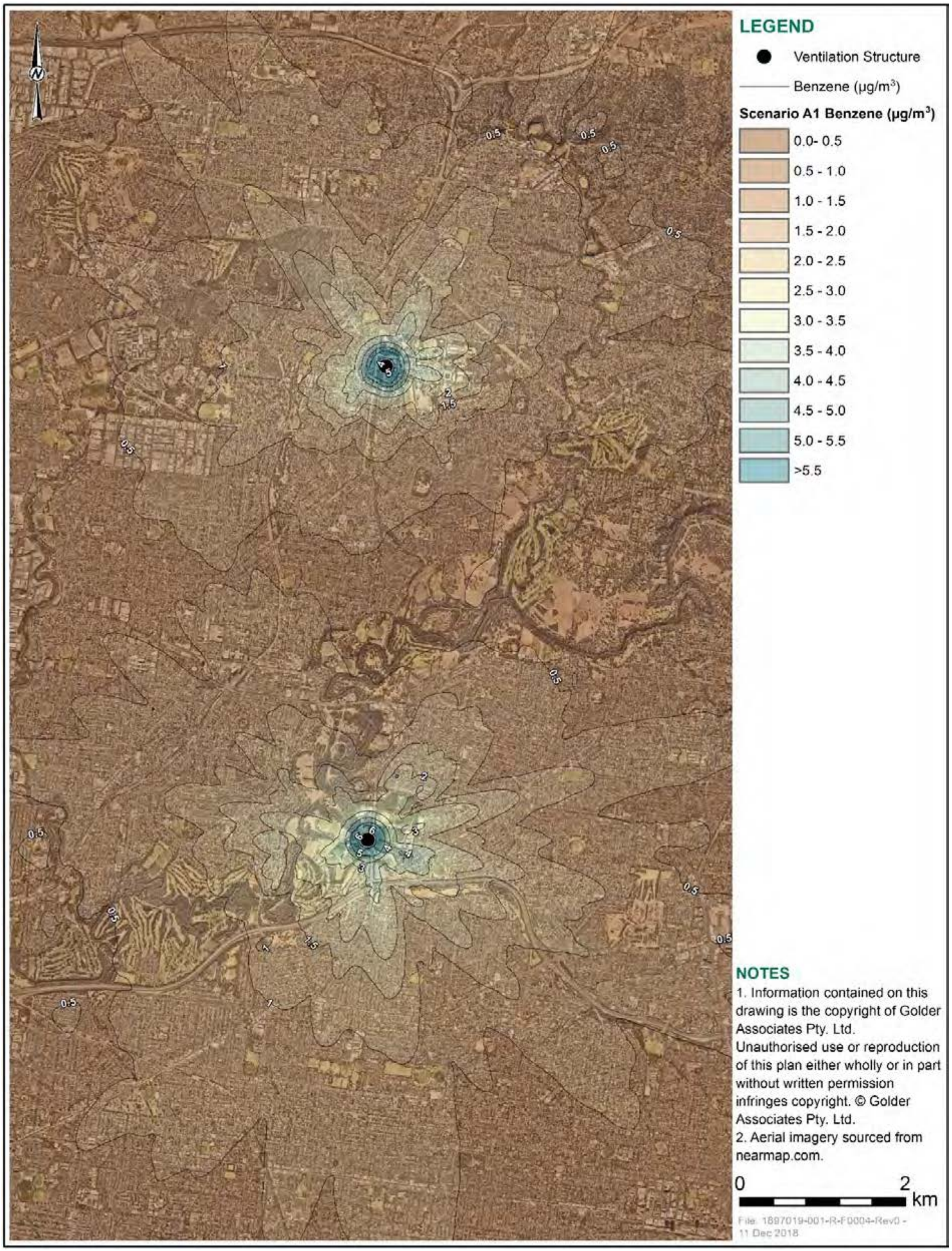


Figure 4: Scenario A1: Maximum predicted three minute average benzene GLC

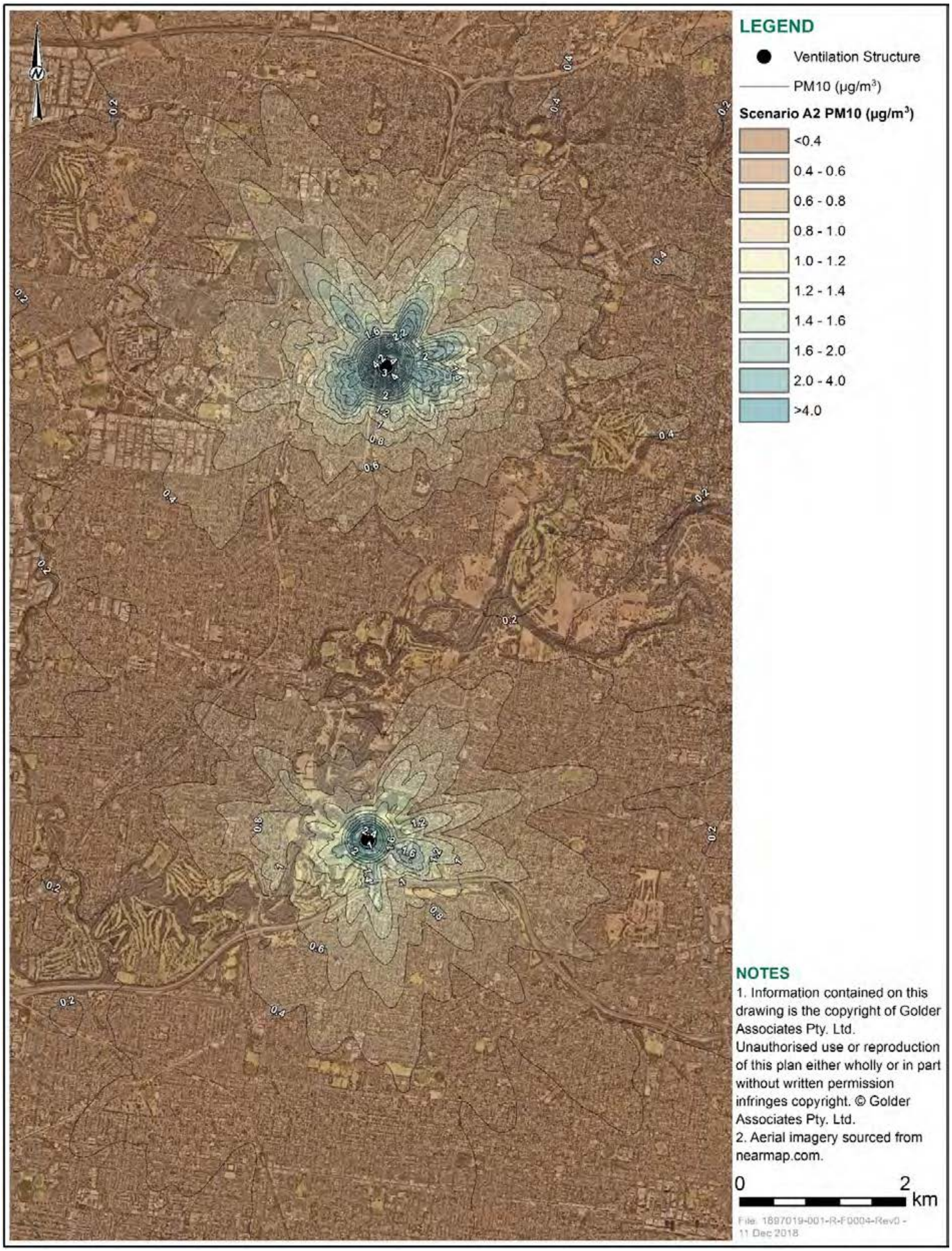


Figure 5: Scenario A2: Maximum predicted one hour average PM_{10} GLC

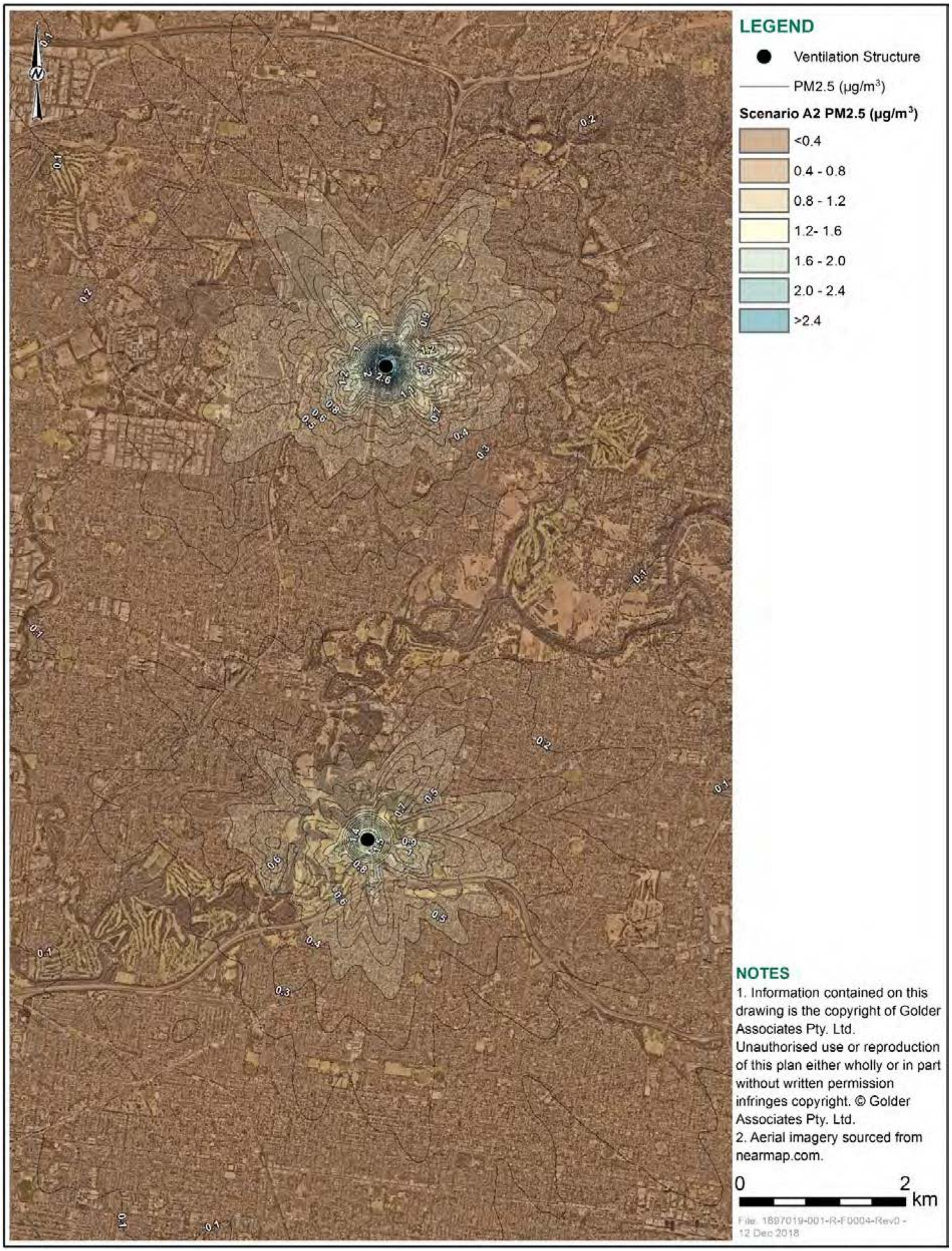


Figure 6: Scenario A2: Maximum predicted one hour average $PM_{2.5}$ GLC

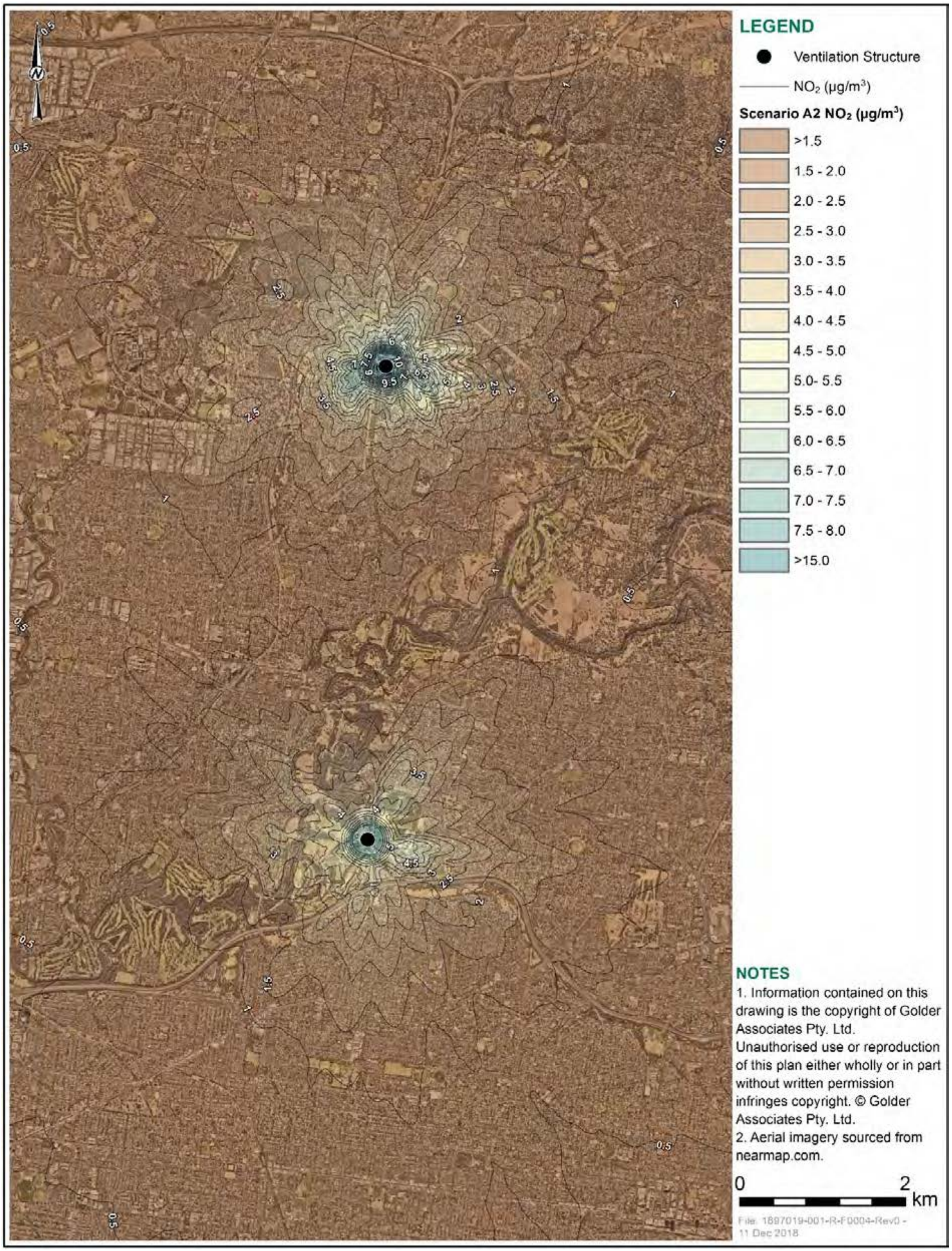


Figure 7: Scenario A2: Maximum predicted one hour average NO_2 GLC

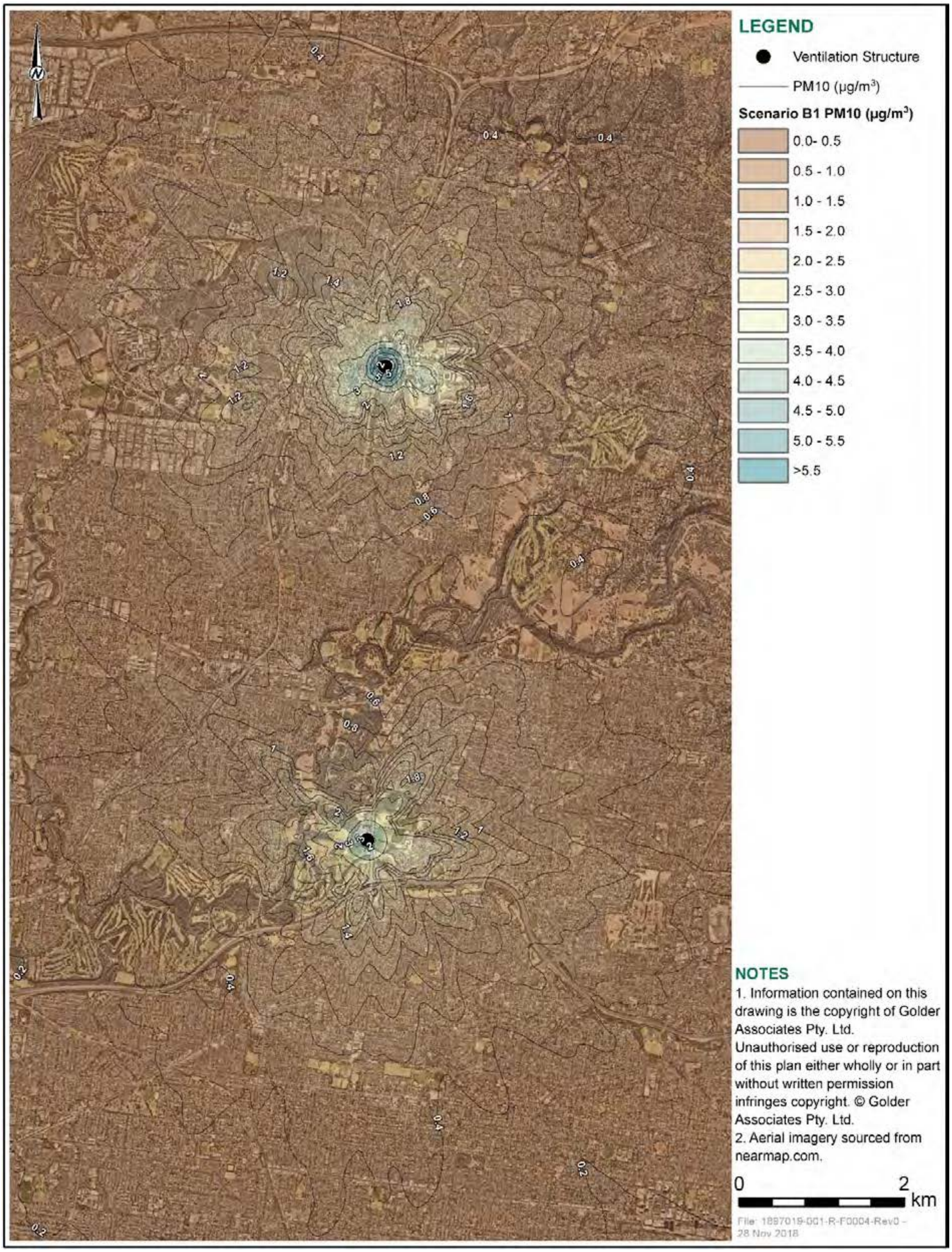


Figure 8: Scenario B1: Maximum predicted one hour average PM_{10} GLC

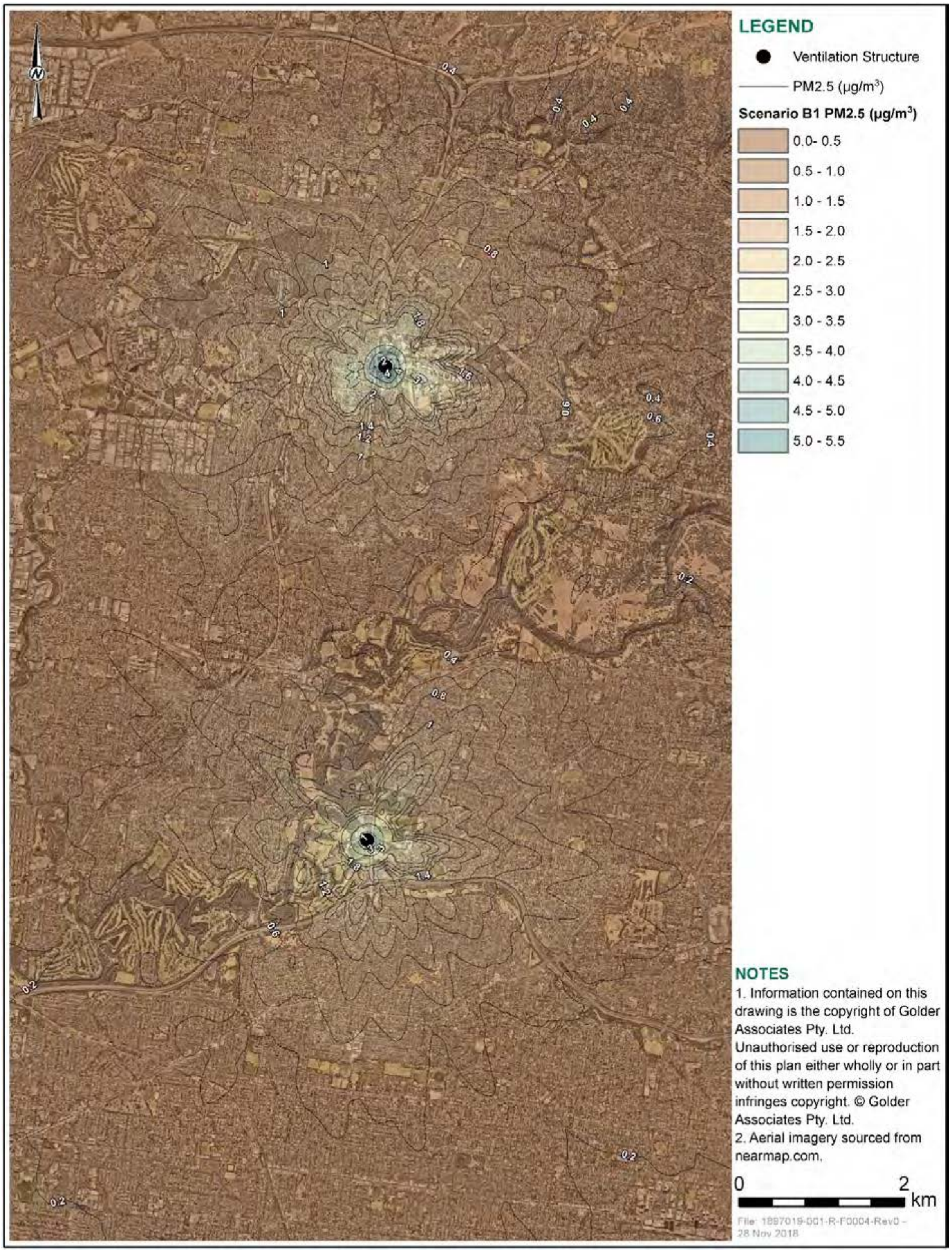


Figure 9: Scenario B1: Maximum predicted one hour average $PM_{2.5}$ GLC

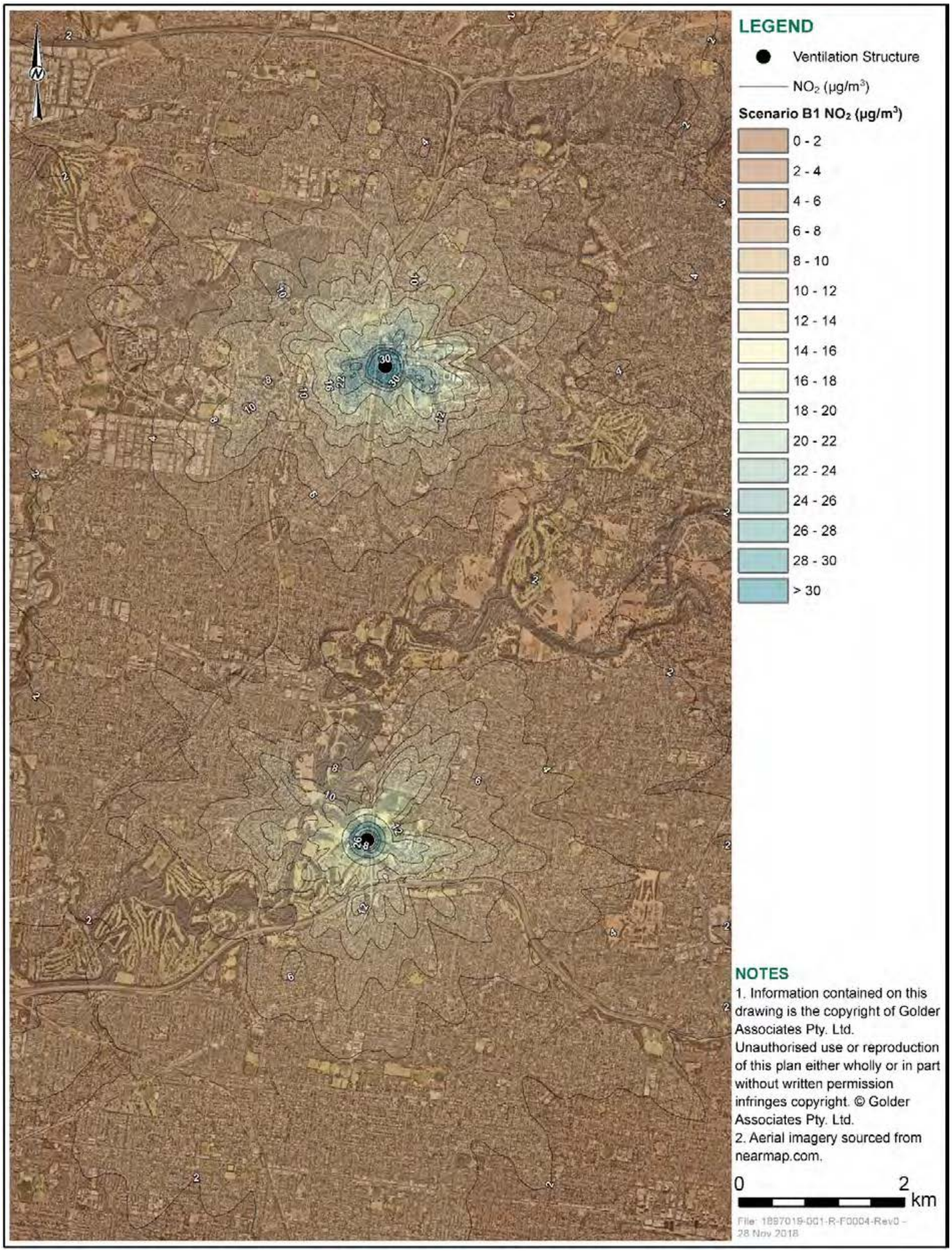


Figure 10: Scenario B1: Maximum predicted one hour average NO_2 GLC

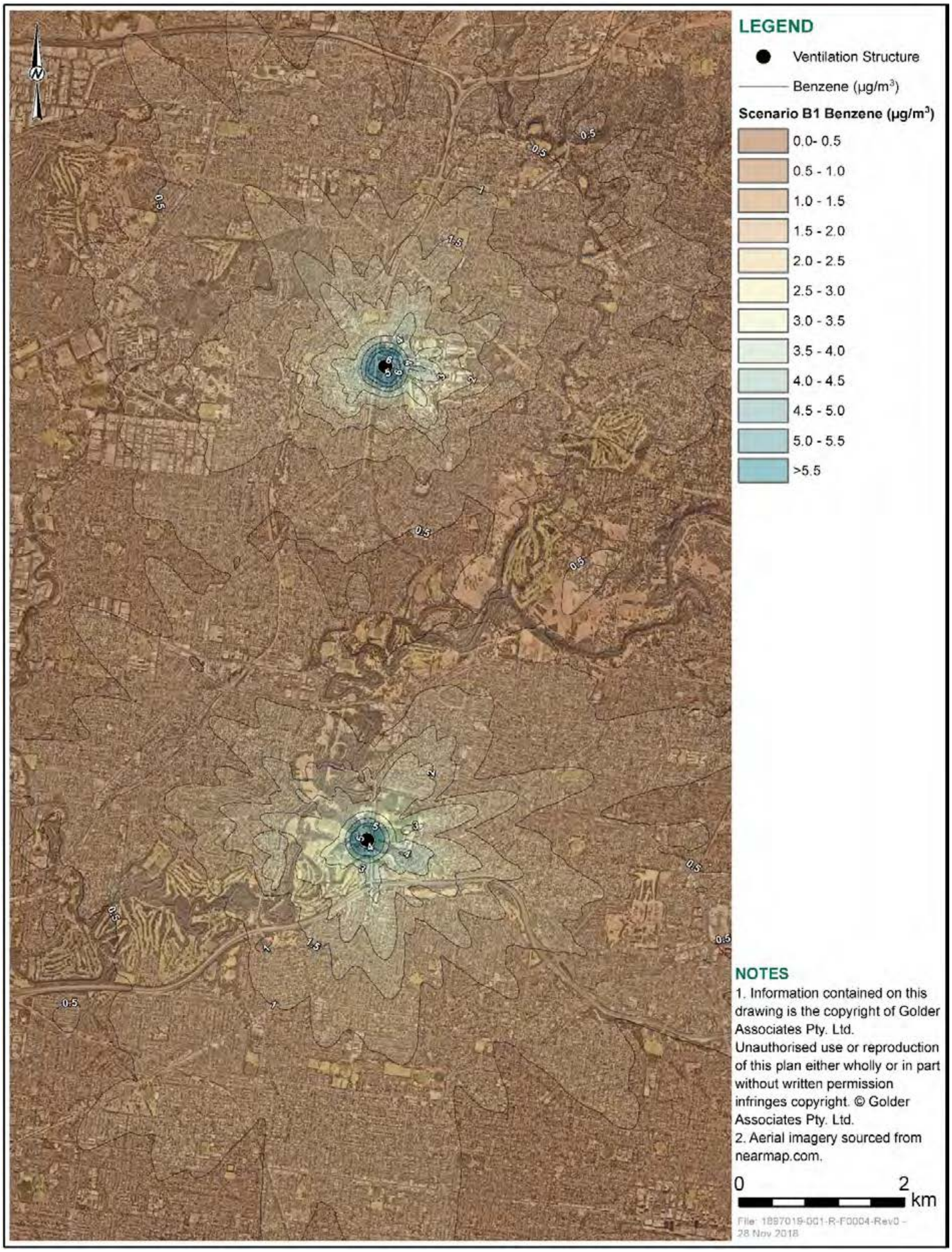


Figure 11: Scenario B1: Maximum predicted three minute average benzene GLC

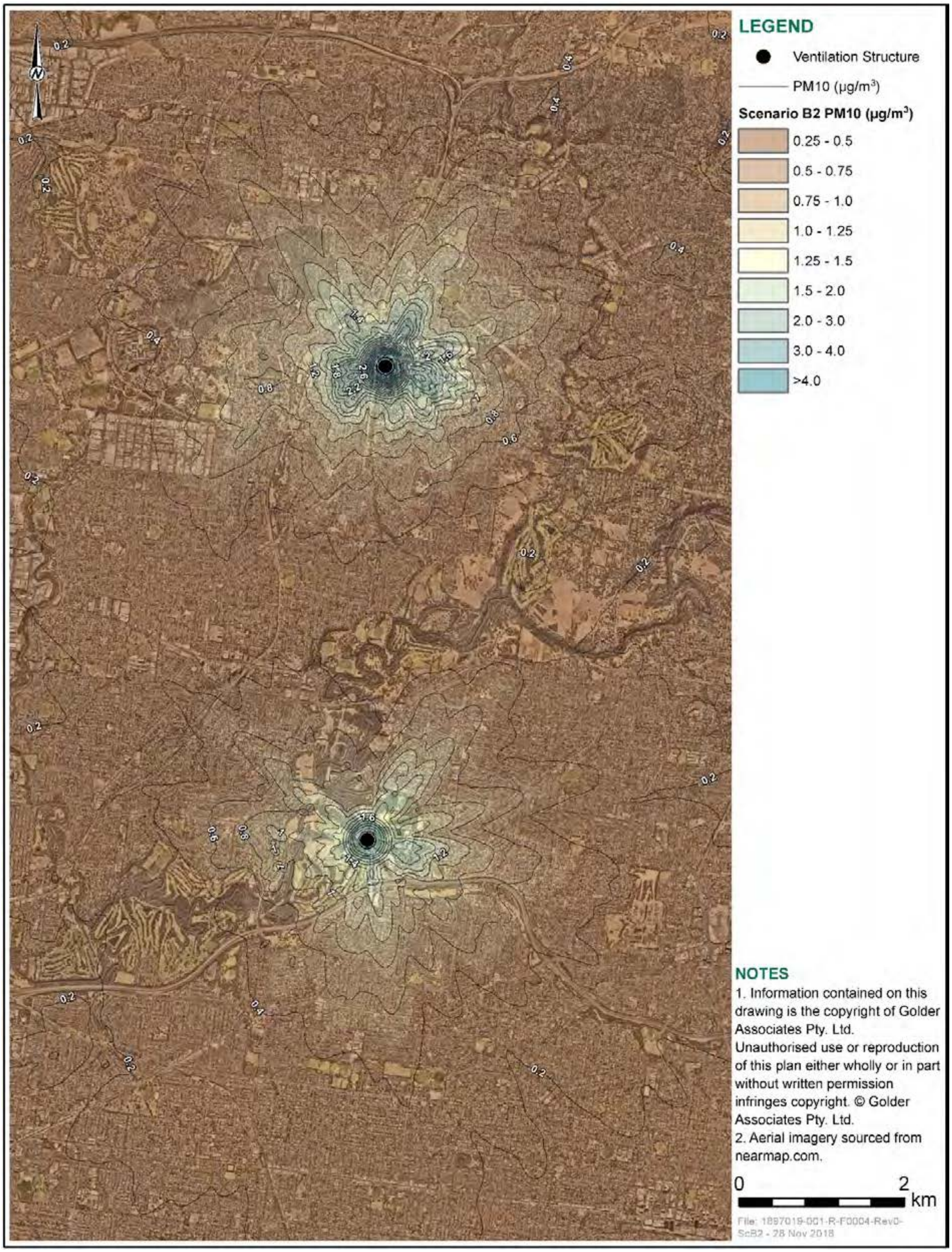


Figure 12: Scenario B2: Maximum predicted one hour average PM_{10} GLC

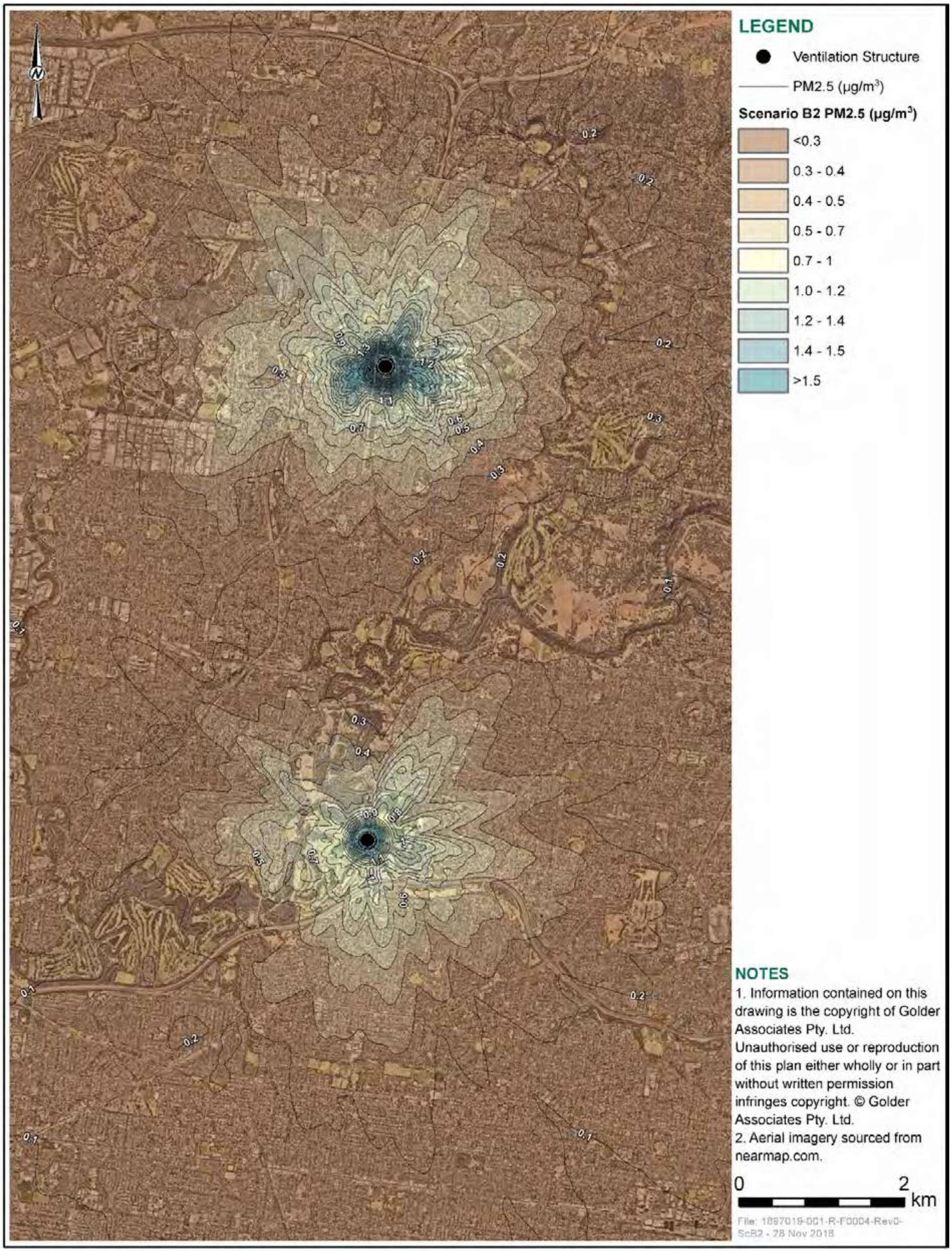


Figure 13: Scenario B2: Maximum predicted one hour average $PM_{2.5}$ GLC

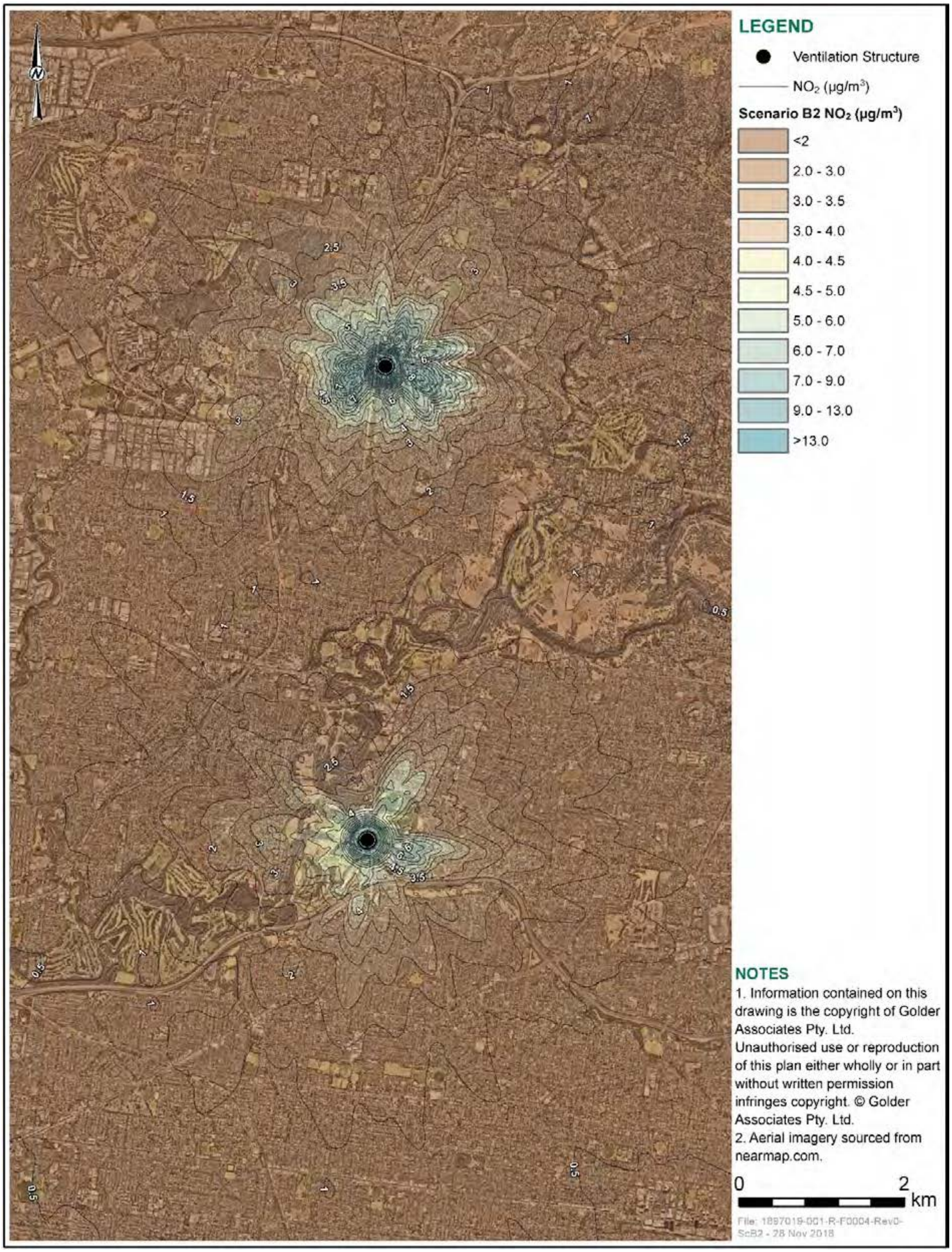


Figure 14: Scenario B2: Maximum predicted one hour average NO_2 GLC

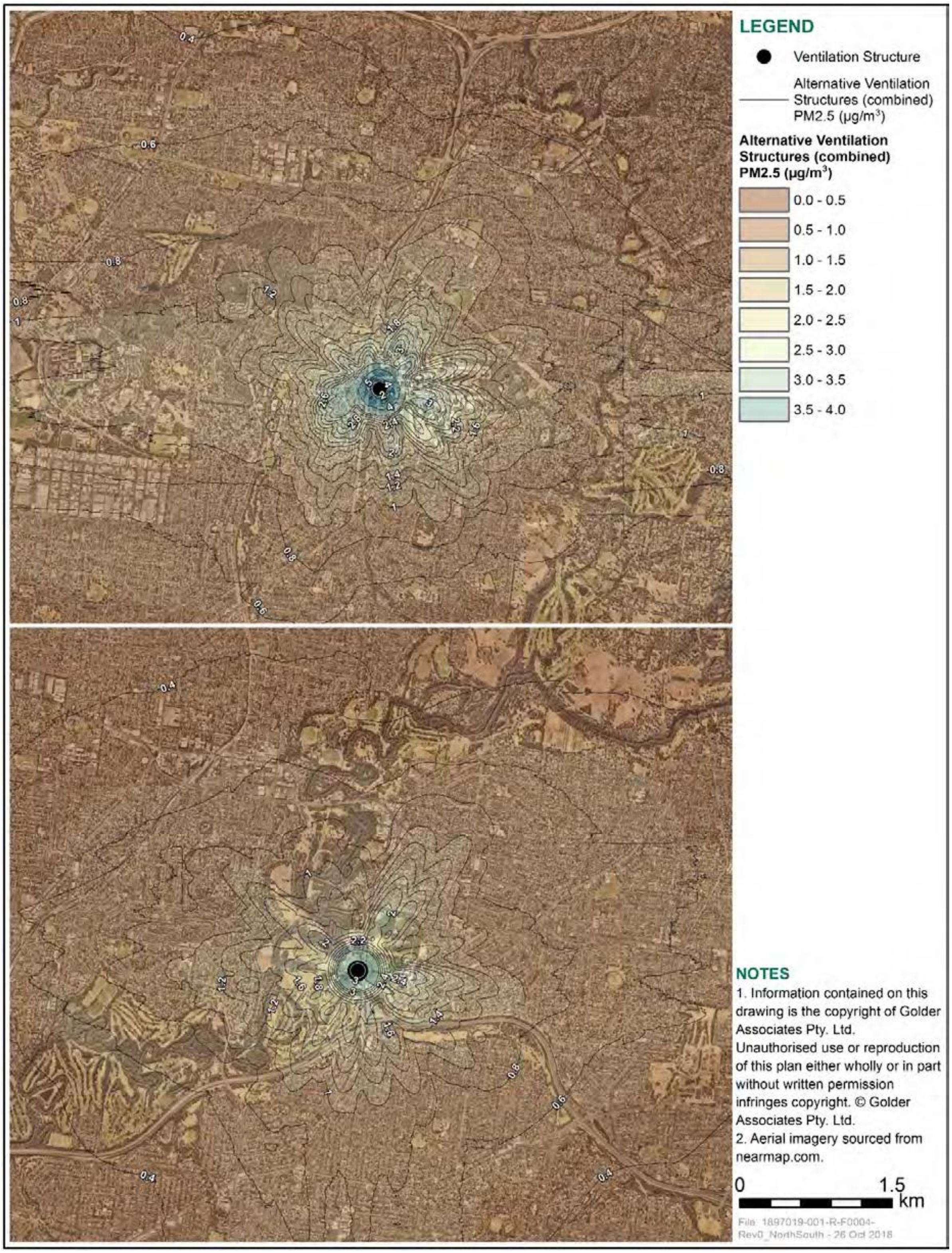


Figure 15: Sensitivity analysis: Alternative northern and southern ventilation structure locations maximum predicted one hour average $PM_{2.5}$ GLC (combined)

APPENDIX F

Surface roads considered for modelling

1.0 ALBERT STREET

1.1 Base 2026

Table 1: Albert Street 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Murray St to Bell St	NB	20000	1400	700	22100
	SB	20000	1200	700	21900
Plenty Rd to Murray Rd	NB	22000	2200	800	25000
	SB	22000	2200	800	25000

North Bound South Bound

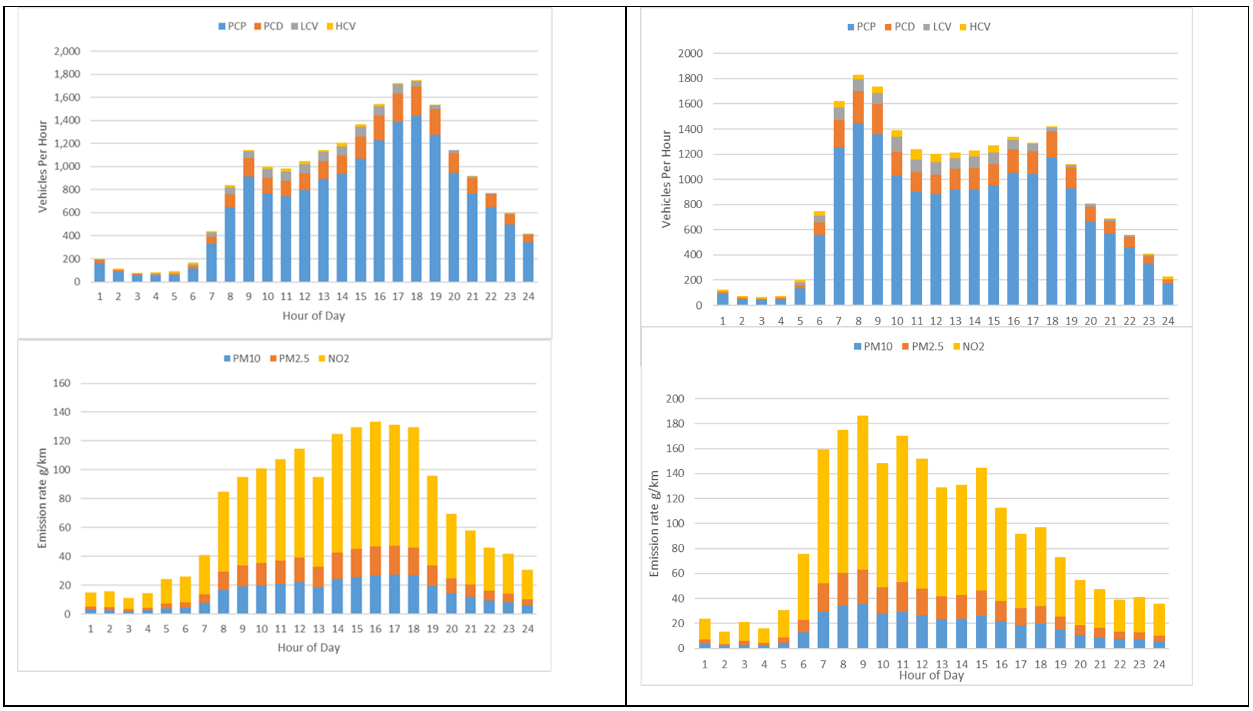


Figure 1: Albert Street: Murray St to Bell St – Base 2026

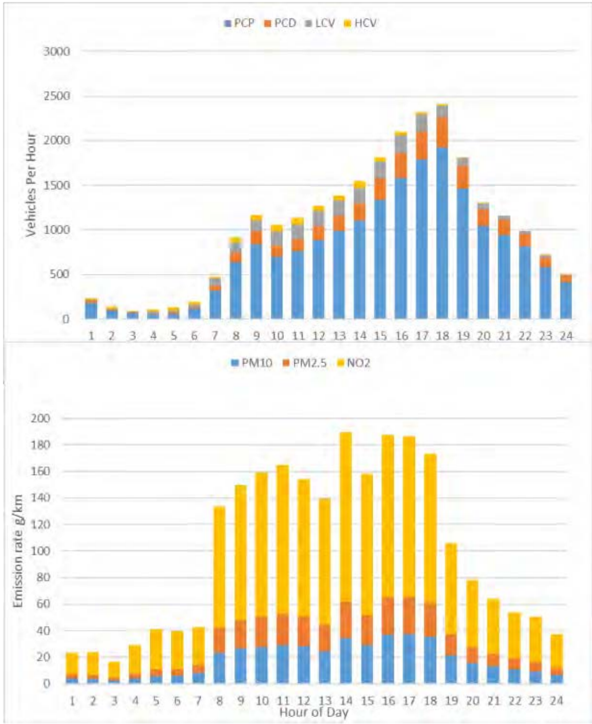
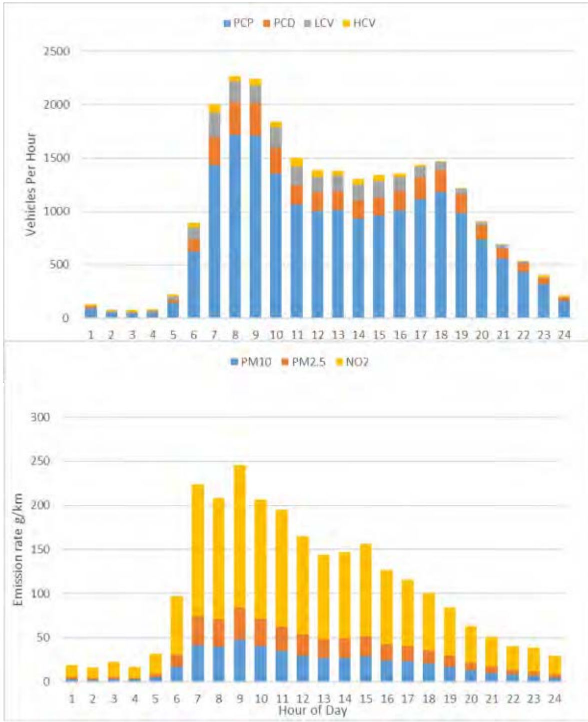
North Bound	South Bound
	

Figure 2: Albert Street: Plenty Rd to Murray St – Base 2026

1.2 Project 2026

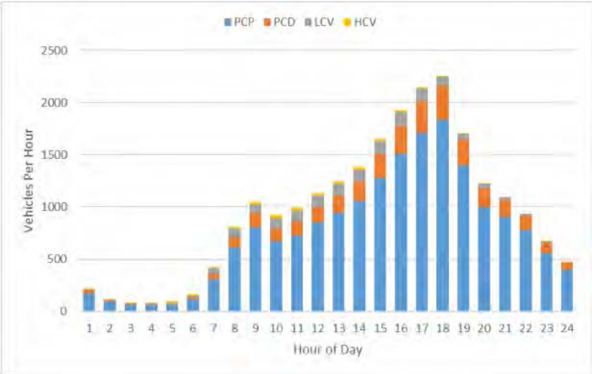
Table 2: Albert Street 24 hour traffic Volumes - Project 2026

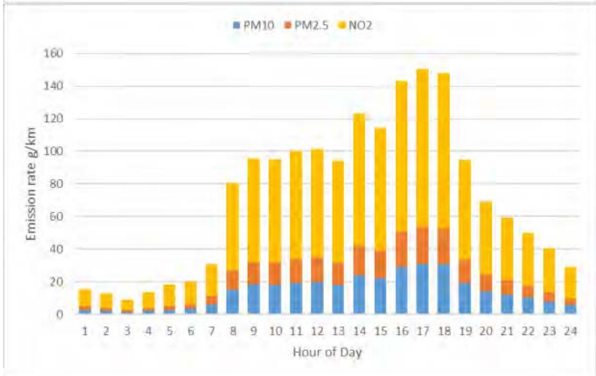
Road	Direction	Cars	LCV	HCV	Total
Murray St to Bell St	NB	19000	1000	300	20300
	SB	20000	900	300	21200
Plenty Rd to Murray Rd	NB	21000	1500	300	22800
	SB	21000	1600	300	22900

North Bound	South Bound

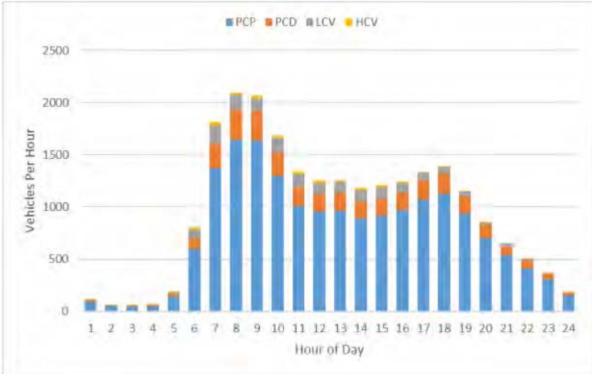
Figure 3: Albert Street: Murray St to Bell St – Project 2026

North Bound





South Bound



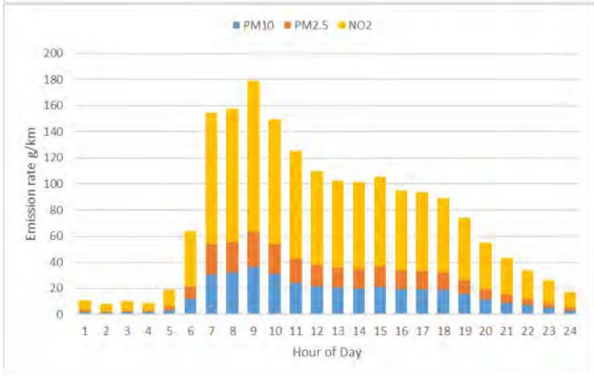


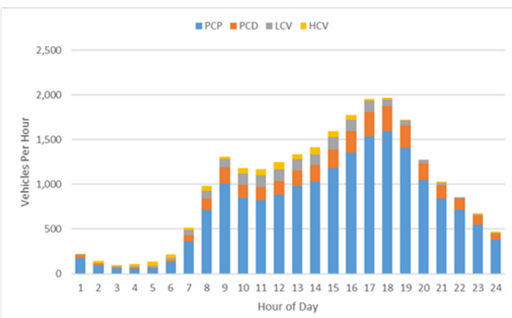
Figure 4: Albert Street: Plenty Rd to Murray Rd – Project 2026

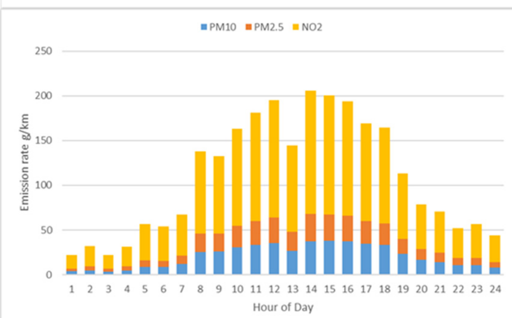
1.3 Base 2036

Table 3: Albert Street 24 hour traffic Volumes - Base 2036

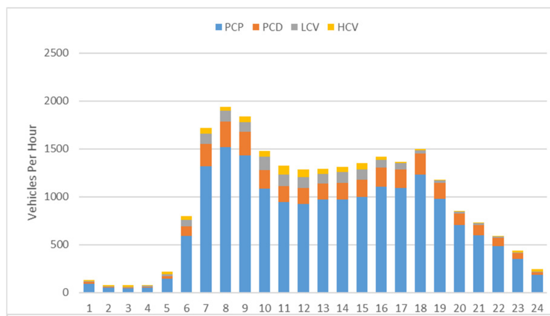
Road	Direction	Cars	LCV	HCV	Total
Murray St to Bell St	NB	21000	1600	800	23400
	SB	21000	1400	800	23200
Plenty Rd to Murray Rd	NB	24000	2400	900	27300
	SB	24000	2400	900	27300

North Bound





South Bound



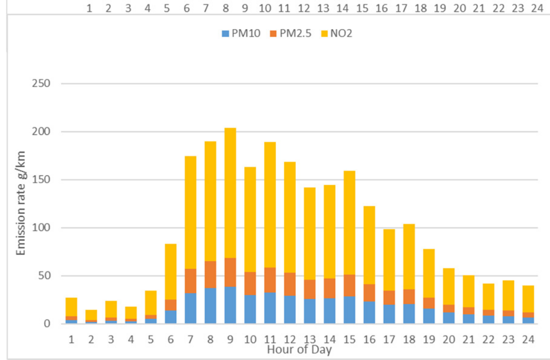


Figure 5: Albert Street: Murray St to Bell St – Base 2036

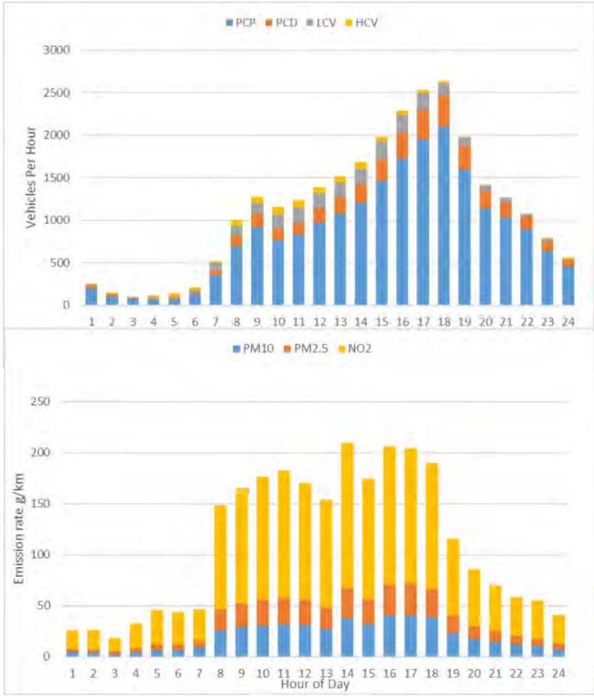
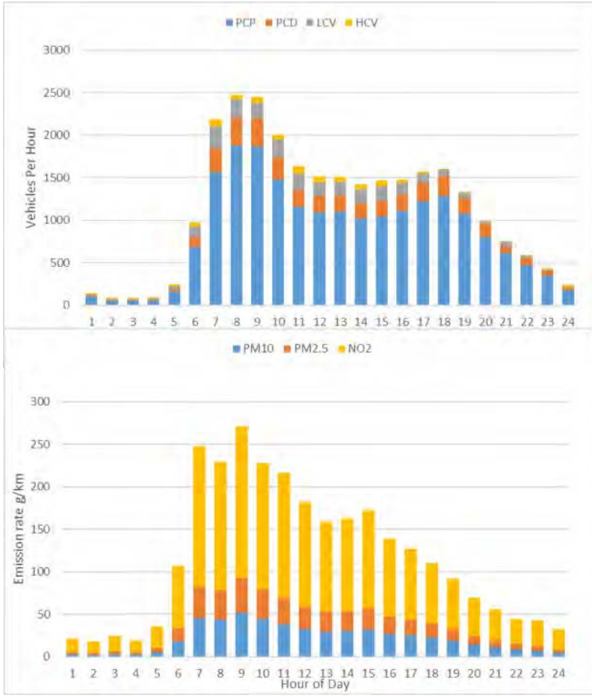
North Bound	South Bound
	

Figure 6: Albert Street: Plenty Rd to Murray Rd – Base 2036

1.4 Project 2036

Table 4: Albert Street 24 hour traffic Volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Murray St to Bell St	NB	21000	1100	300	22400
	SB	21000	1400	800	23200
Plenty Rd to Murray Rd	NB	23000	1600	350	24950
	SB	23000	1700	300	25000

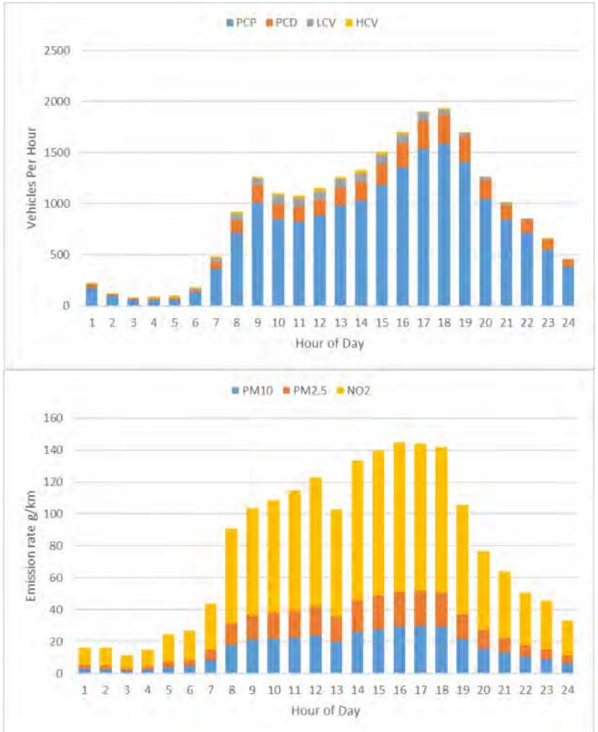
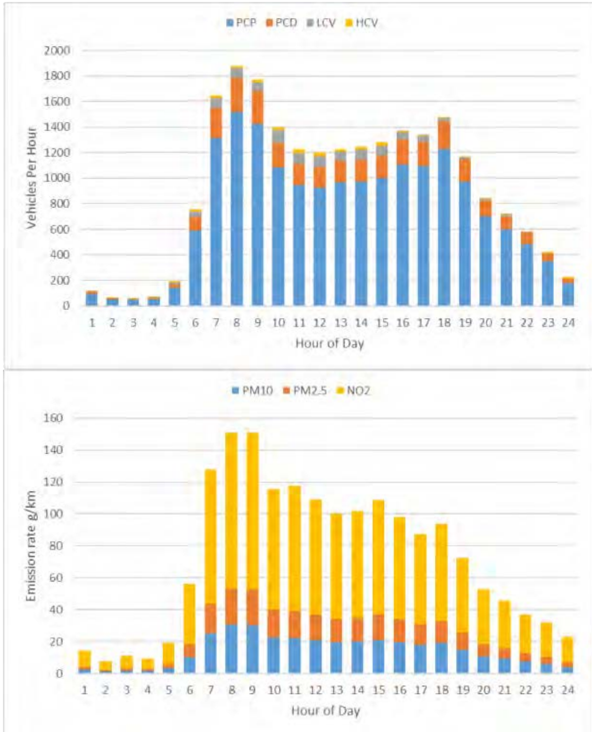
North Bound	South Bound
	

Figure 7: Albert Street: Murray St to Bell St – Project 2036

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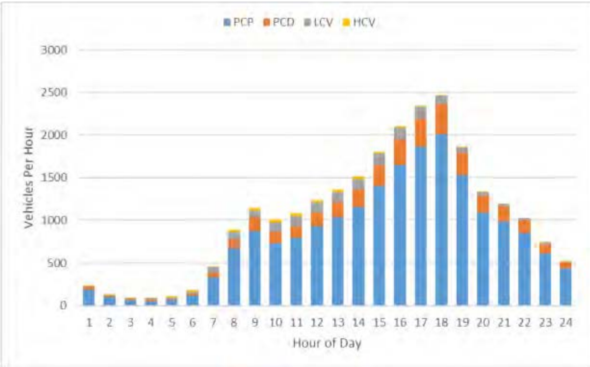

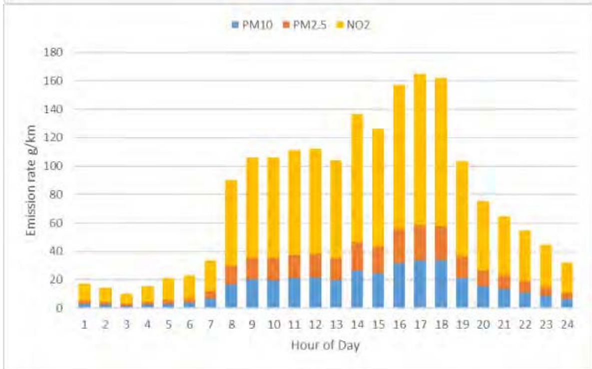

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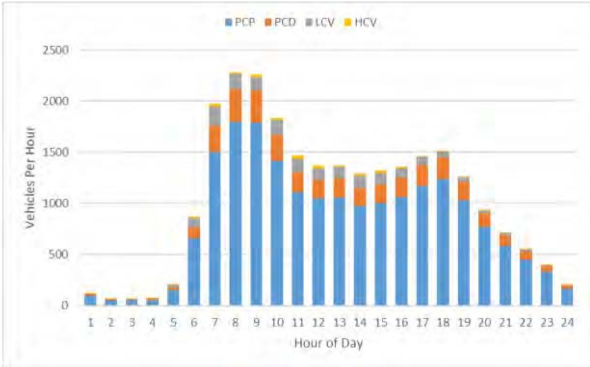

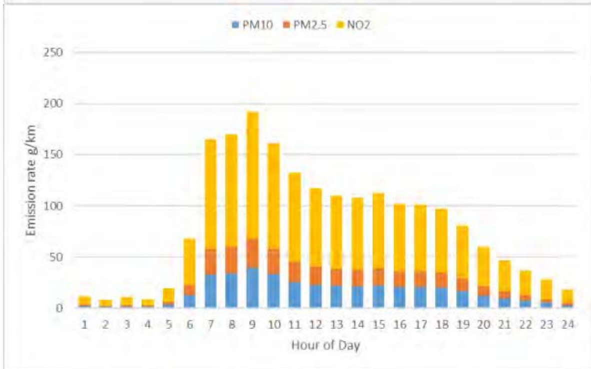

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Figure 8: Albert Street: Plenty Rd to Murray Rd – Project 2036

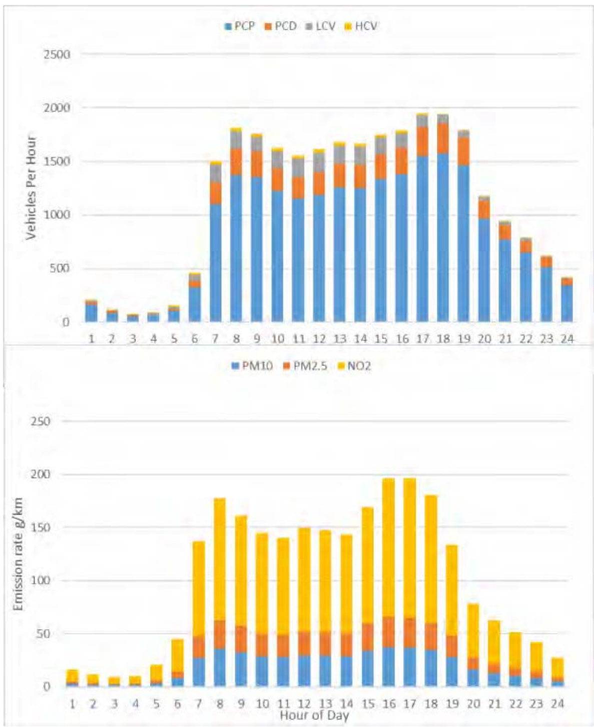
2.0 BANKSIA STREET

2.1 Base 2026

Table 5: Banksia Street 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Mount St to Hawdon St	East Bound	25000	2100	400	27500
	West Bound	29000	1800	400	31200
At Yarra River	East Bound	41000	3000	1400	45400
	West Bound	39000	1900	1400	42300

East Bound



West Bound

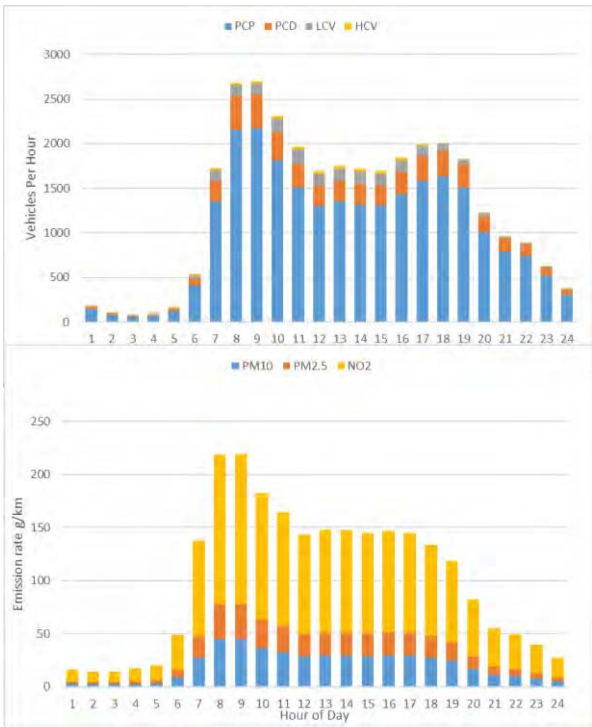


Figure 9: Banksia Street: Mount St to Hawdon St – Base 2026

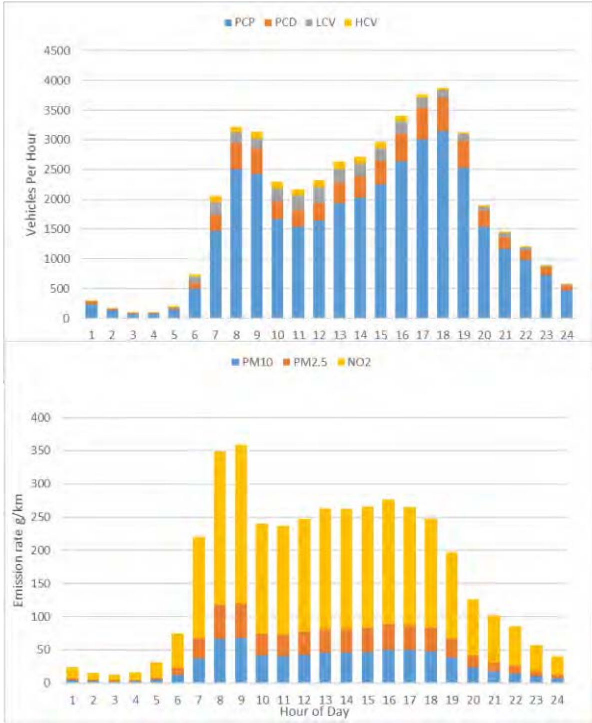
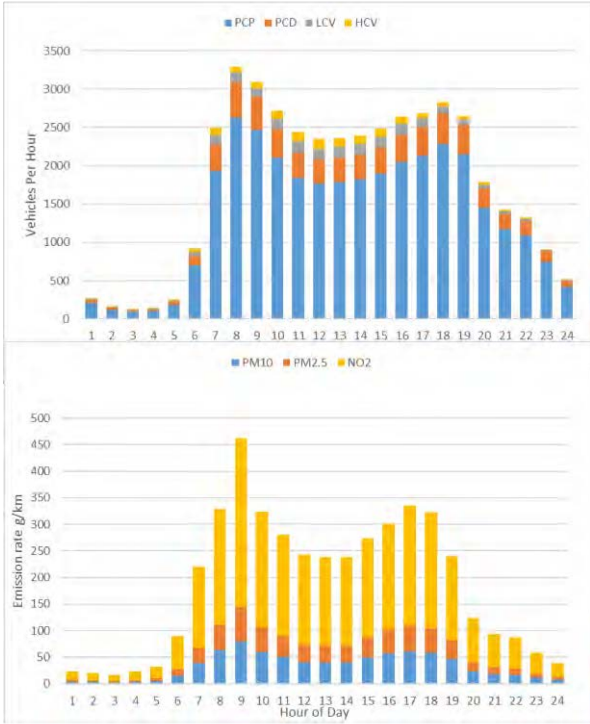
East Bound	West Bound
	

Figure 10: Banksia St: At Yarra River - Base 2026

2.2 Project 2026

Table 6: Banksia Street 24 hour traffic Volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Mount St to Hawdon St	EB	26000	2100	300	28400
	WB	31000	1700	250	32950
At Yarra River	East Bound	36000	2300	500	38800
	West Bound	37000	1500	500	39000

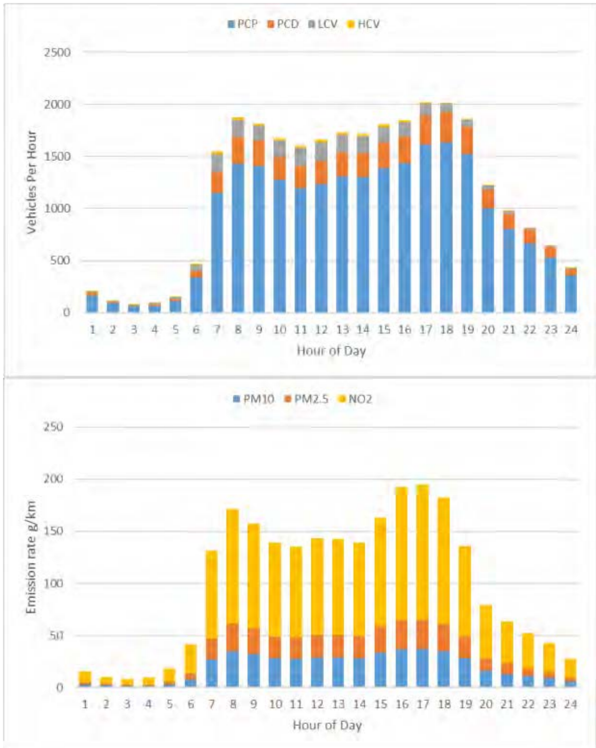
East Bound	West Bound
	

Figure 11: Banksia Street: Mount St to Hawdon St – Project 2026

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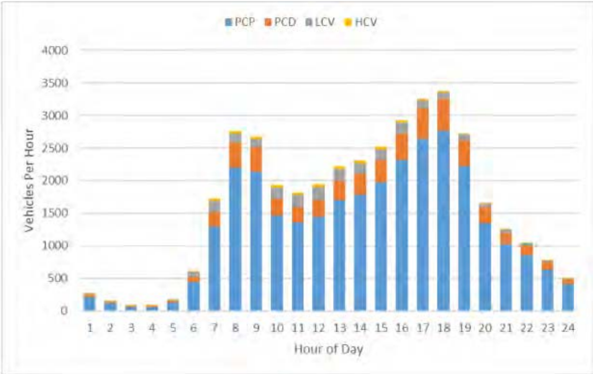

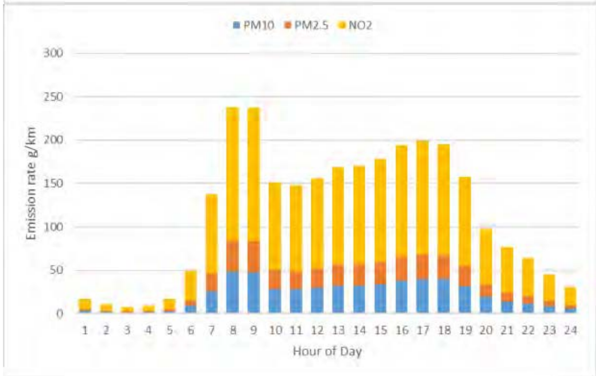

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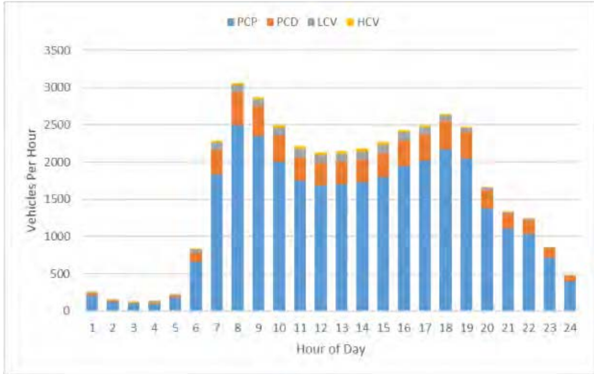

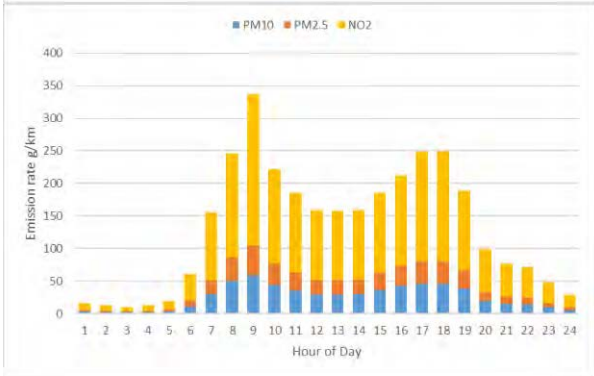

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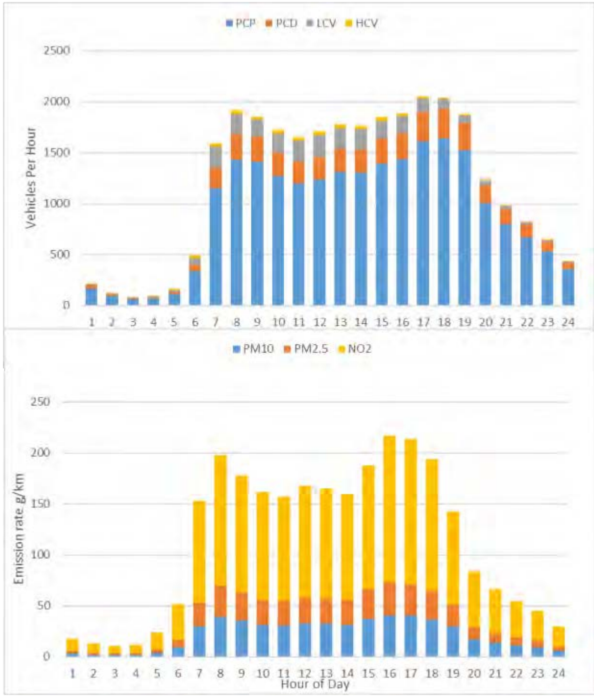
Figure 12: Banksia St: At Yarra River - Project 2026

2.3 Base 2036

Table 7: Banksia Street 24 hour traffic Volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Mount St to Hawdon St	EB	26000	2500	500	29000
	WB	31000	2100	500	33600
At Yarra River	East Bound	45000	3400	1500	49900
At Yarra River	West Bound	42000	2200	1600	45800

East Bound	West Bound



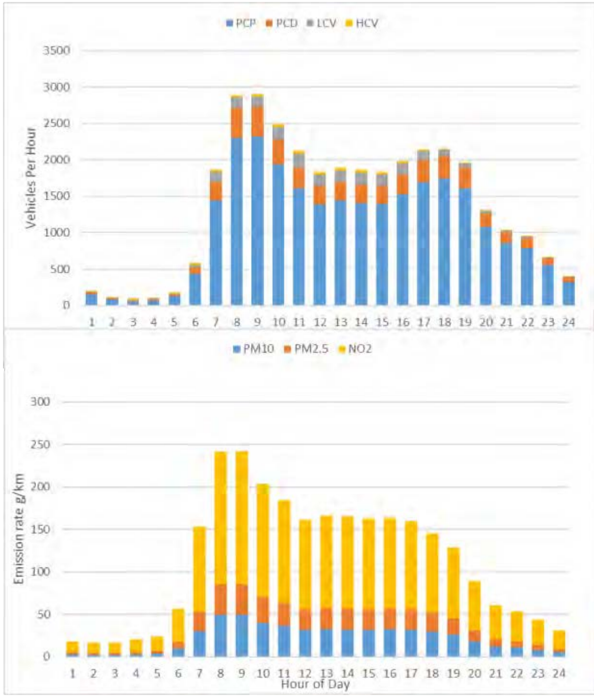


Figure 13: Banksia Street: Mount St to Hawdon St – Base 2036

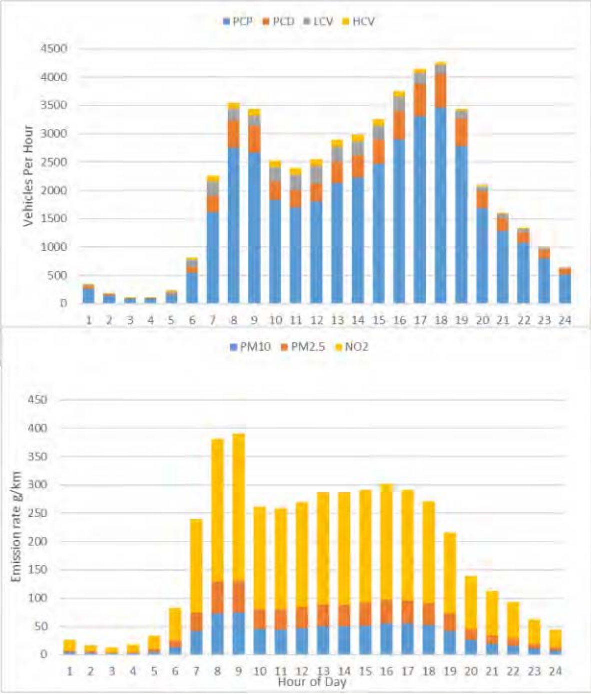
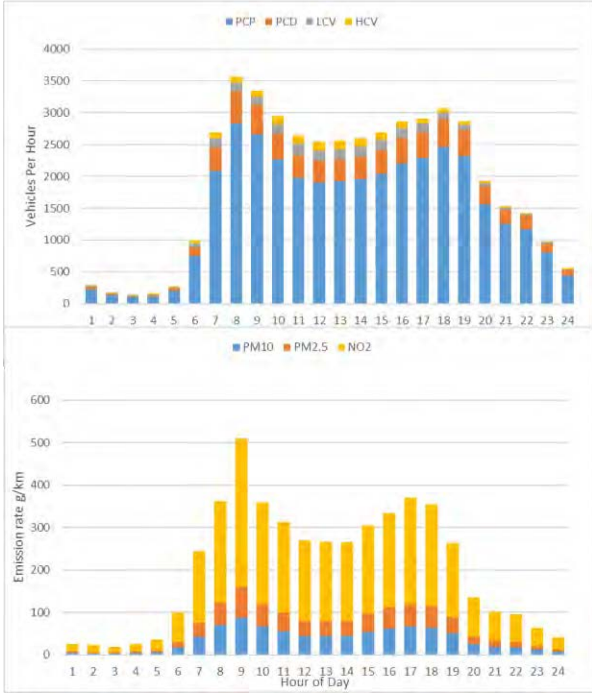
East Bound	West Bound
	

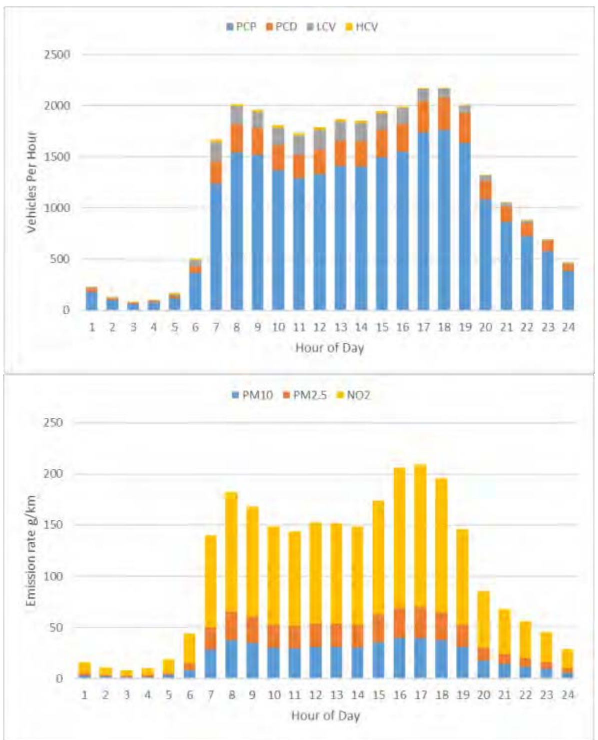
Figure 14: Banksia St: At Yarra River - Base 2036

2.4 Project 2036

Table 8: Banksia Street 24 hour traffic Volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Mount St to Hawdon St	EB	28000	2300	300	30600
	WB	33000	1800	300	35100
At Yarra River	East Bound	39000	2600	600	42200
At Yarra River	West Bound	38000	1600	500	40100

East Bound



West Bound

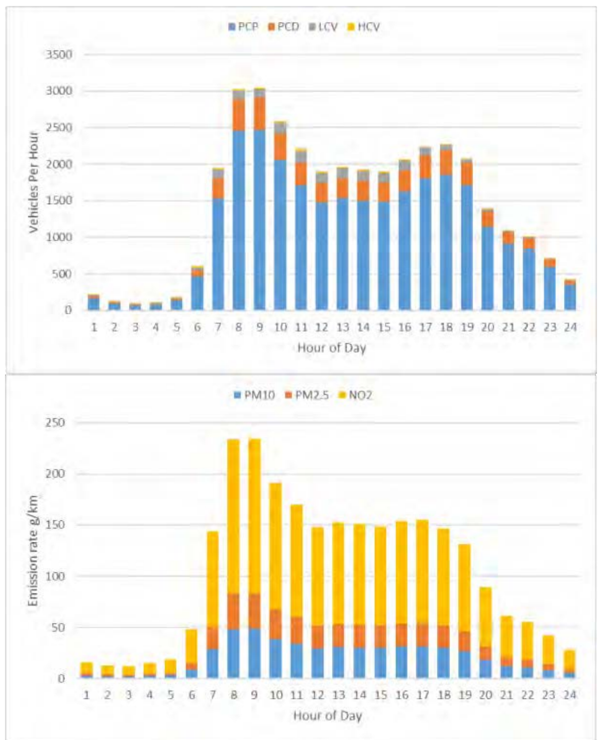


Figure 15: Banksia Street: Mount St to Hawdon St – Project 2036

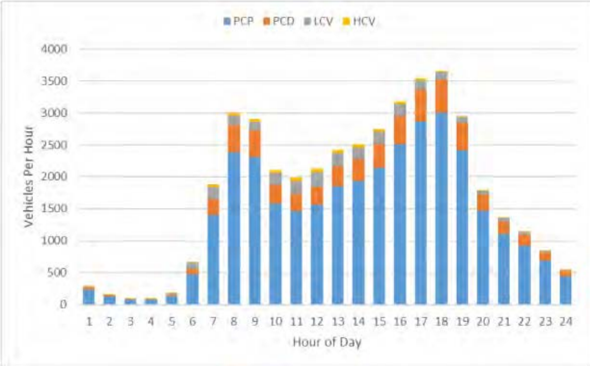
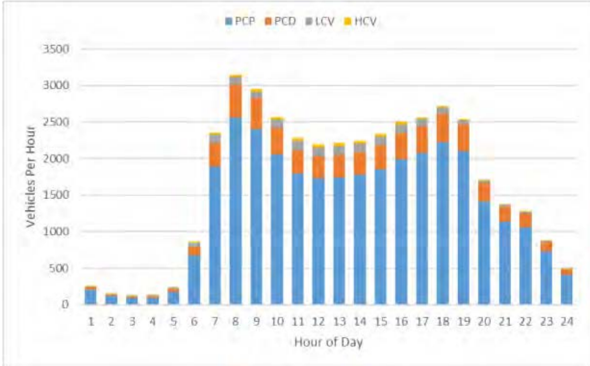
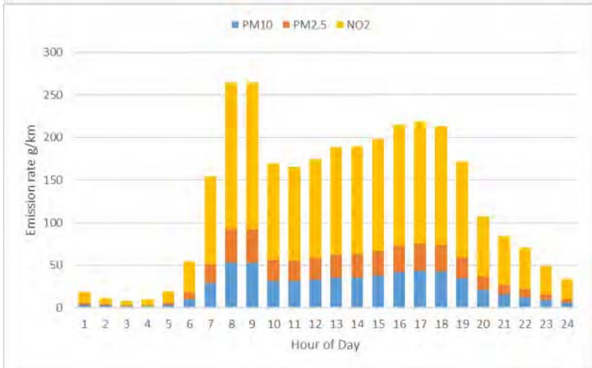
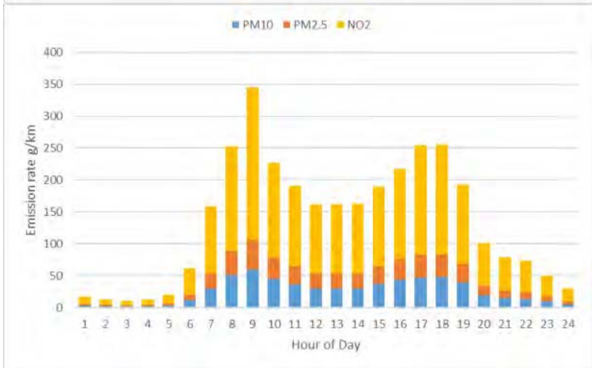
East Bound	West Bound
	
	

Figure 16: Banksia St: At Yarra River - Project 2036

3.0 BELL STREET

3.1 Base 2026

Table 9: Bell Street 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Station St to Oriel Rd	EB	27000	2400	900	29900
	WB	29000	2000	500	31500
Studley Rd to Rail line	EB	25000	1500	500	27000
	WB	28000	1900	500	30400
Oriel Rd to Waterdale Rd	EB	25000	1600	800	27400
	WB	25000	1900	600	27500
Waterdale Rd to Upper Heidelberg Rd	EB	31000	1900	600	33500
	WB	31000	2700	600	34300
High St to Plenty Rd	EB	35000	900	600	36500
	WB	33000	900	600	34500

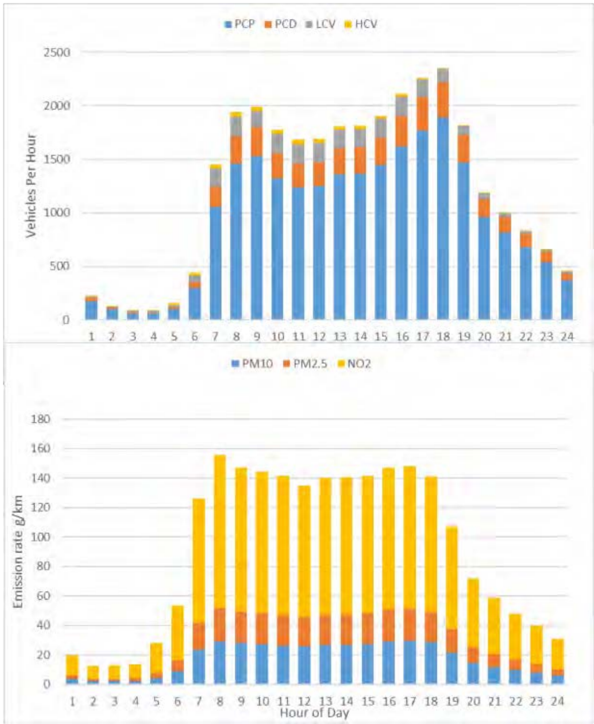
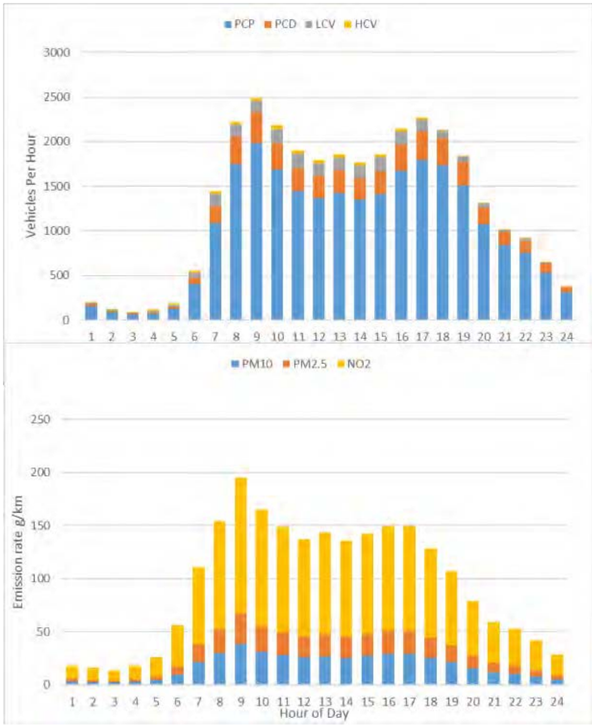
East Bound	West Bound
	

Figure 17: Bell Street: Station St to Oriel Rd – Base 2026

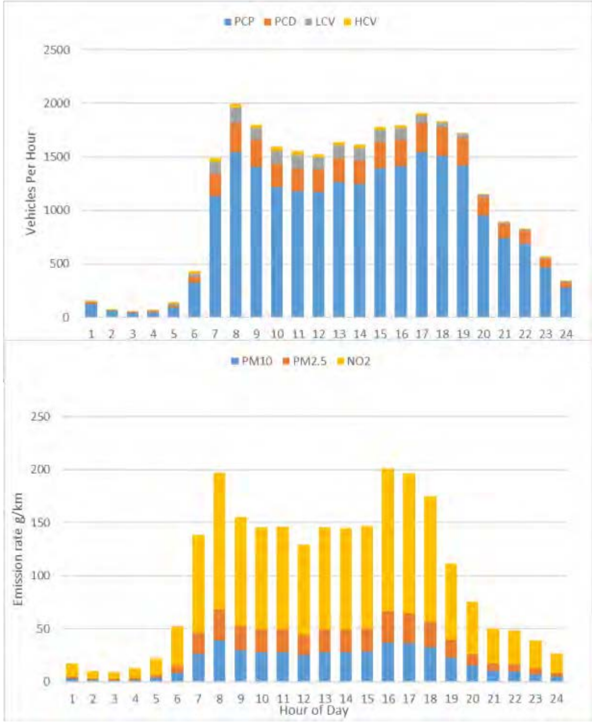
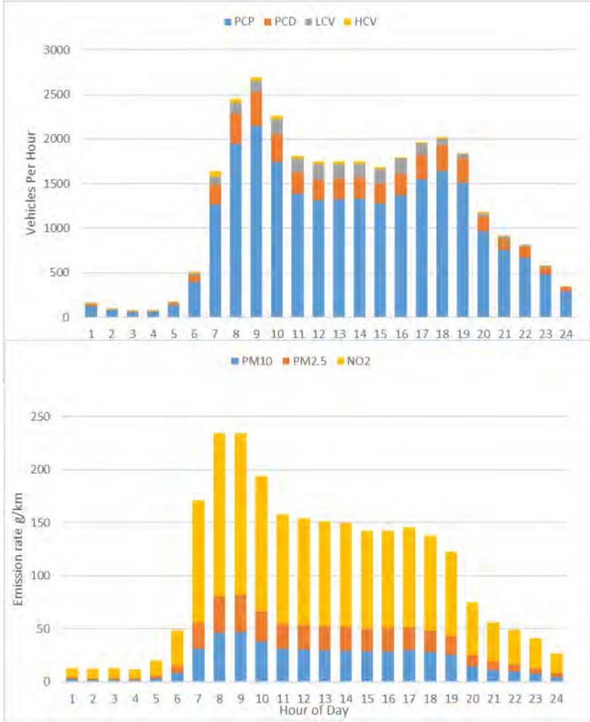
East Bound	West Bound
	

Figure 18: Bell Street: Studley Rd to Rail Line – Base 2026

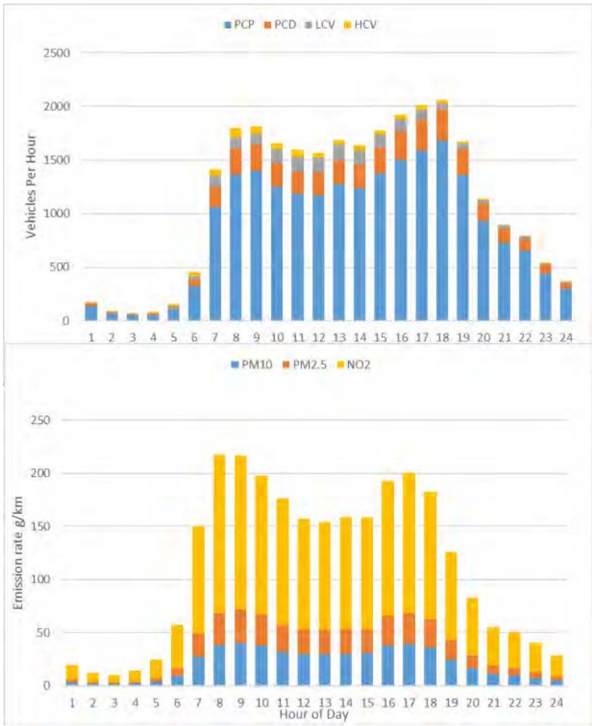
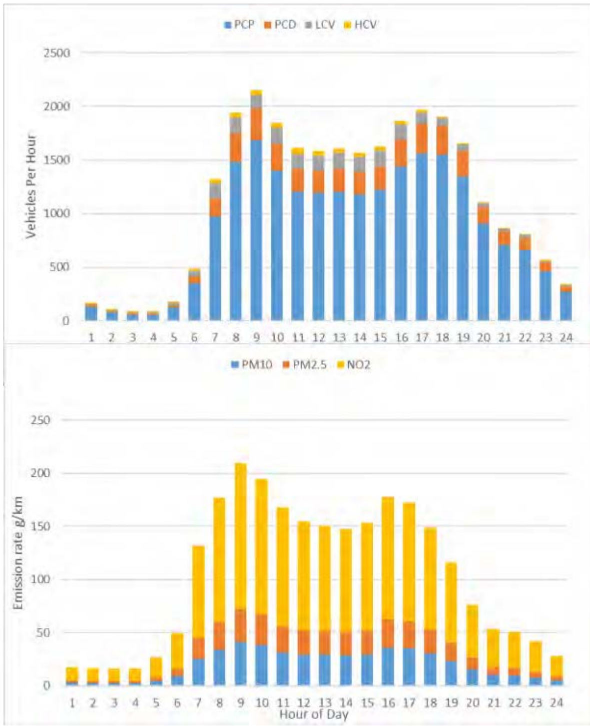
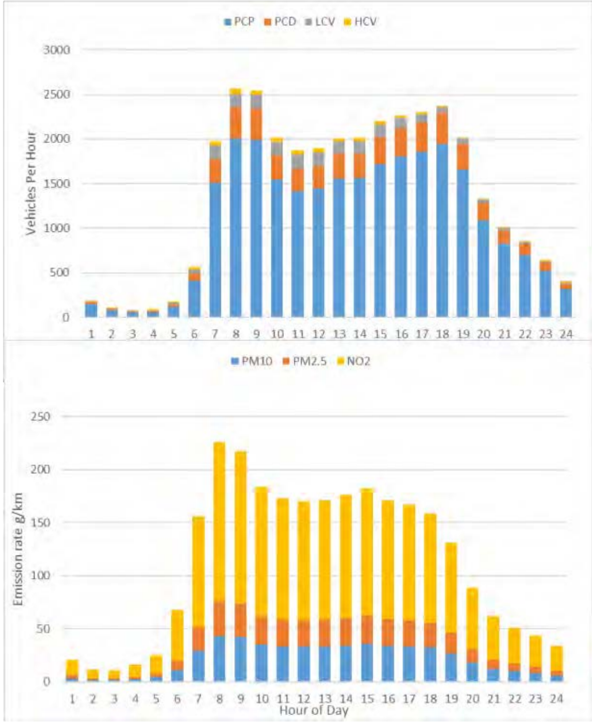
East Bound	West Bound
	

Figure 19: Bell Street: Oriel Rd to Waterdale Rd – Base 2026

East Bound	West Bound



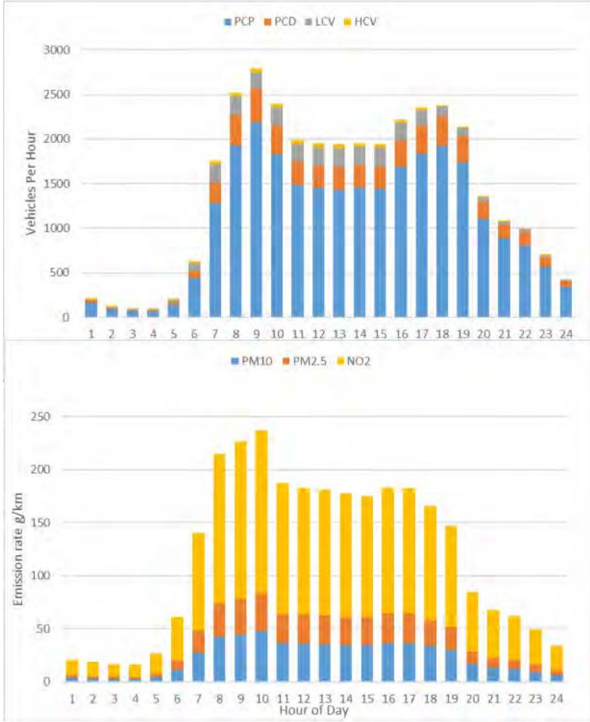
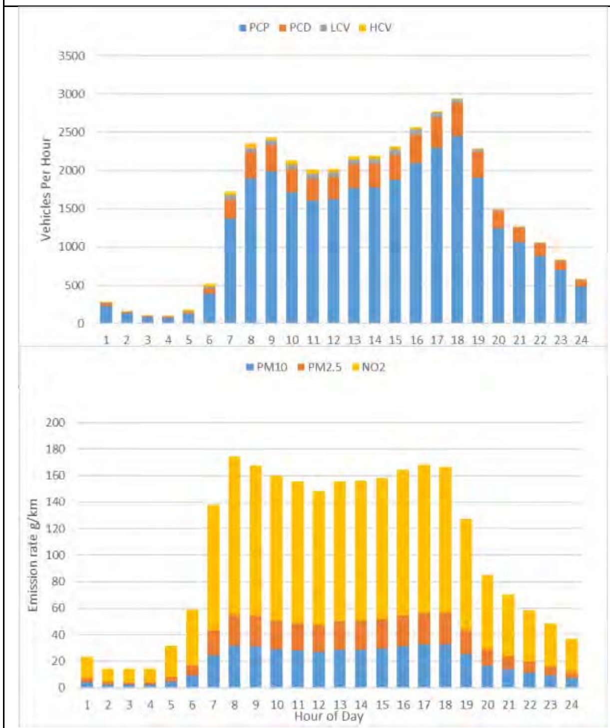


Figure 20: Bell Street: Waterdale Rd to Upper Heidelberg Rd – Base 2026

East Bound	West Bound



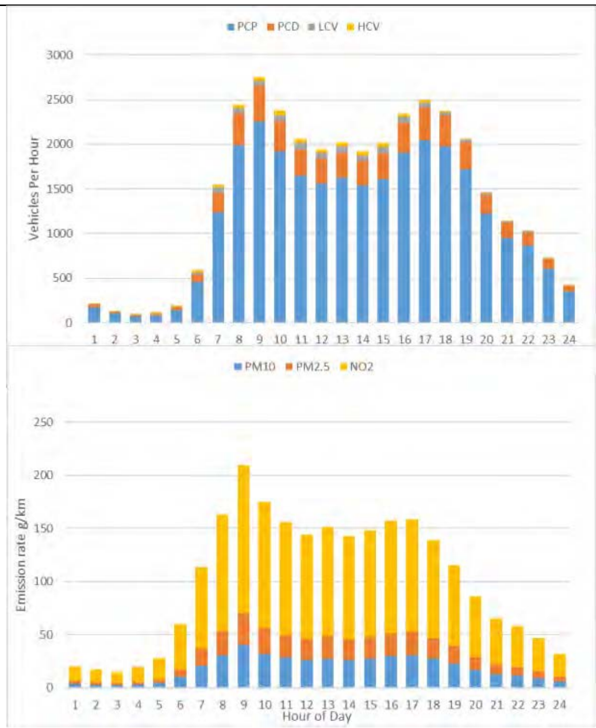


Figure 21: Bell Street: High St Rd to Plenty Rd – Base 2026

3.2 Project 2026

Table 10: Bell Street 24 hour traffic Volumes – Project 2026

Road	Direction	Cars	LCV	HCV	Total
Station St to Oriel Rd	EB	27000	2100	300	29400
	WB	30000	1600	300	31900
Studley Rd to Rail line	EB	27000	1400	300	28700
	WB	30000	1800	400	32200
Oriel Rd to Waterdale Rd	EB	26000	1300	400	27700
	WB	26000	1700	400	28100
Waterdale Rd to Upper Heidelberg Rd	EB	31000	1700	400	33100
	WB	31000	2300	300	33600
High St to Plenty Rd	EB	34000	800	500	35300
	WB	33000	900	500	34400

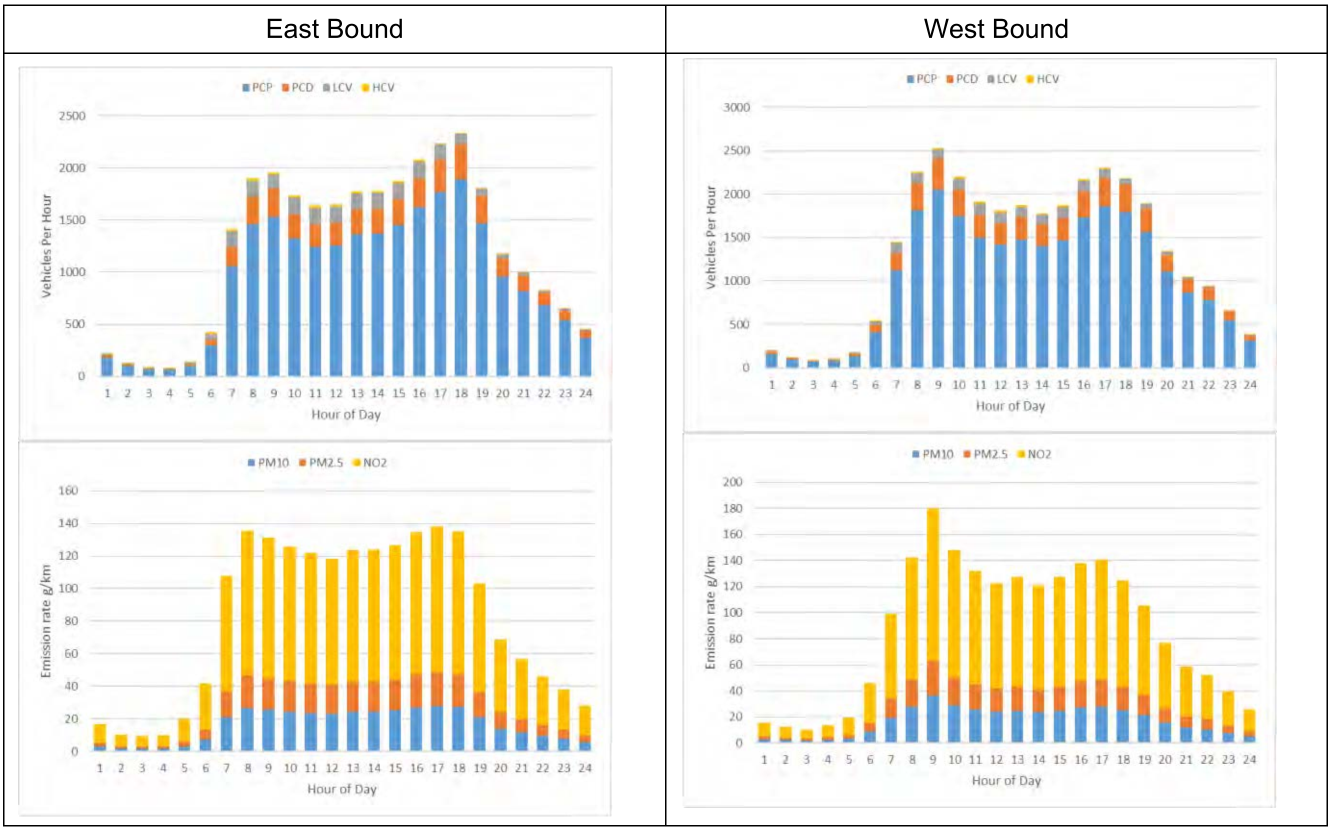
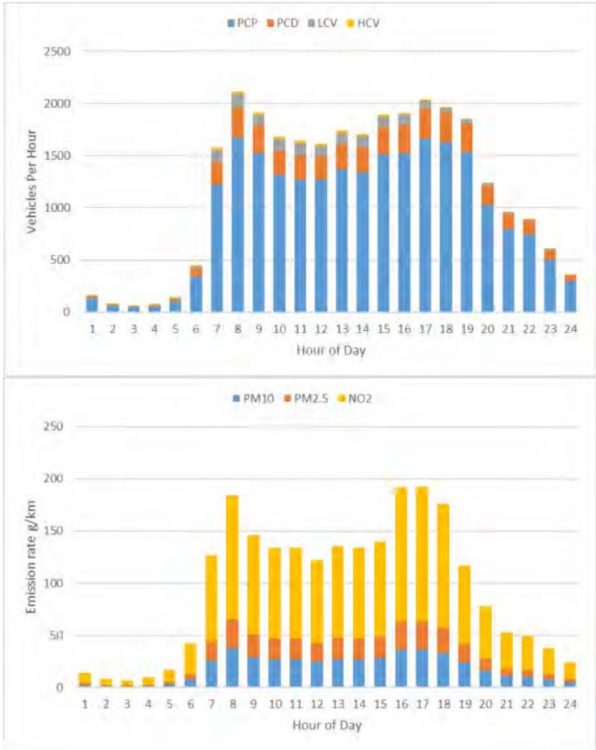


Figure 22: Bell Street: Station St to Oriel Rd – Project 2026

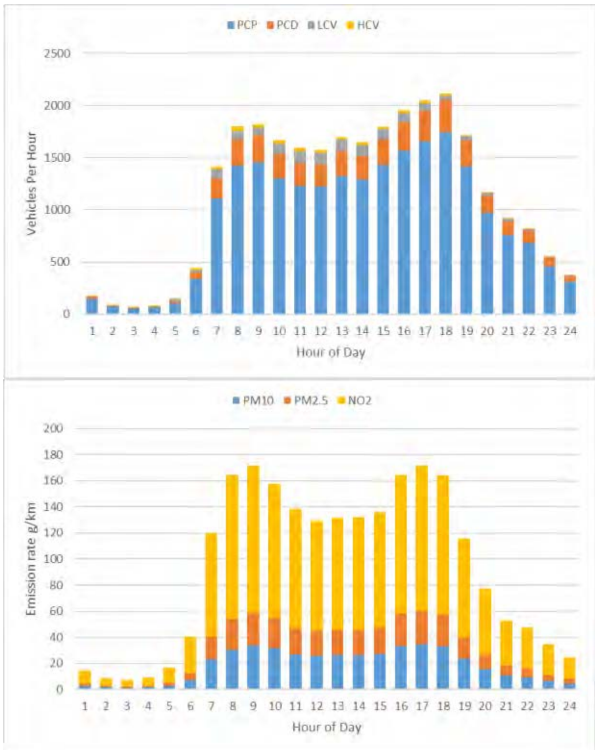
East Bound



West Bound

Figure 23: Bell Street: Studley Rd to Rail Line – Project 2026

East Bound



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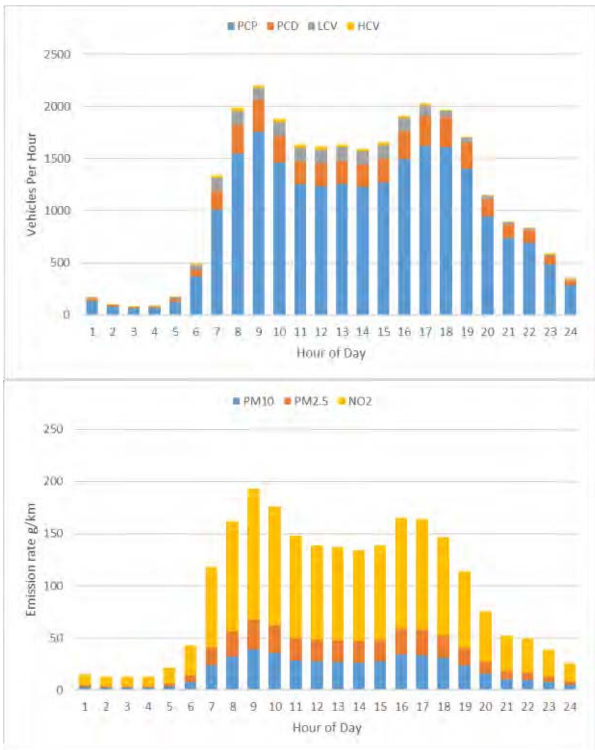


Figure 24: Bell Street: Oriel Rd to Waterdale Rd – Project 2026

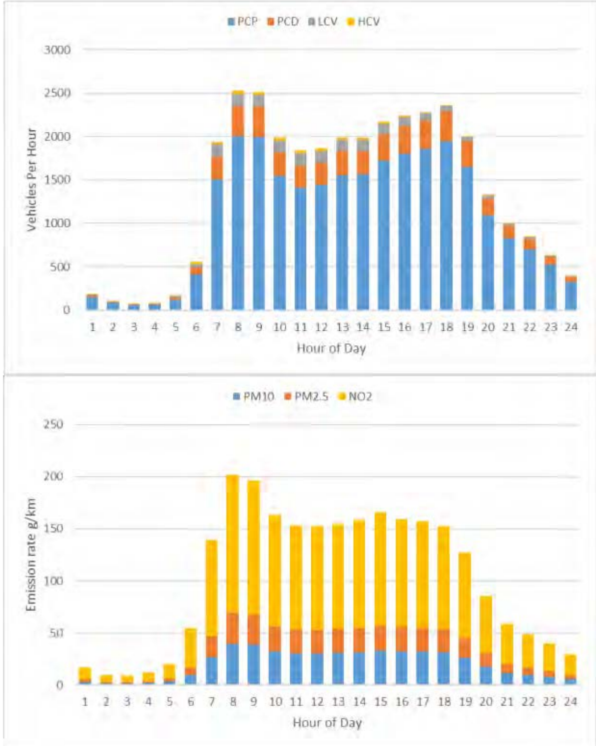
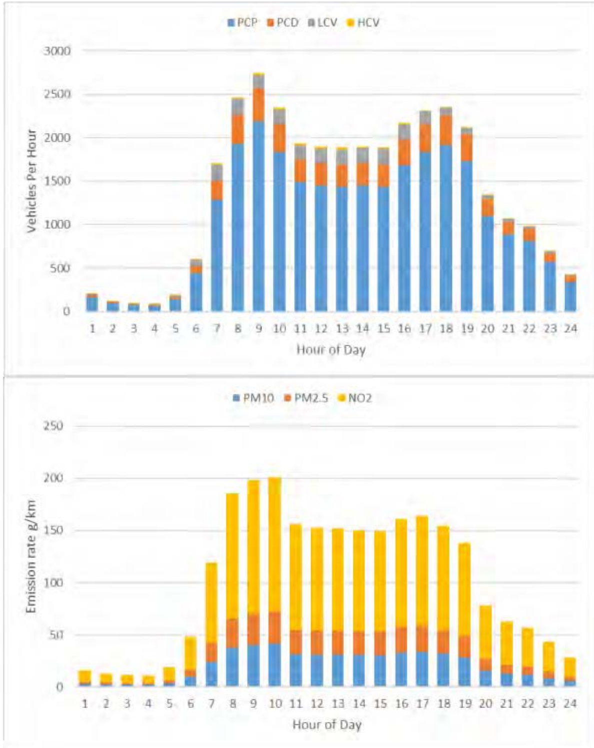
East Bound	West Bound
	

Figure 25: Bell Street: Waterdale Rd to Upper Heidelberg Rd – Project 2026

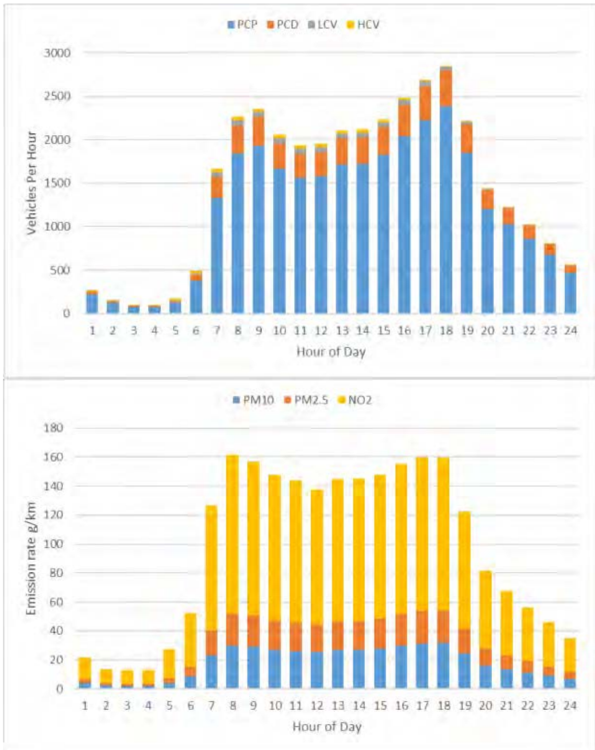
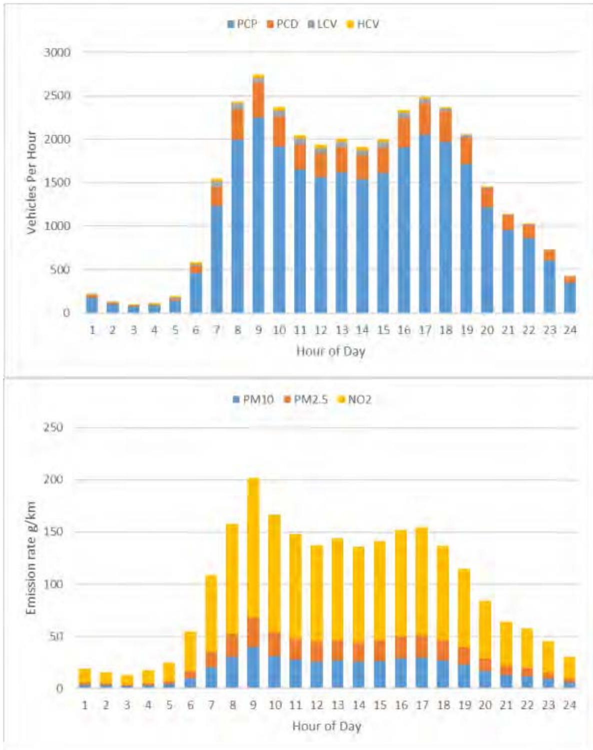
East Bound	West Bound
	

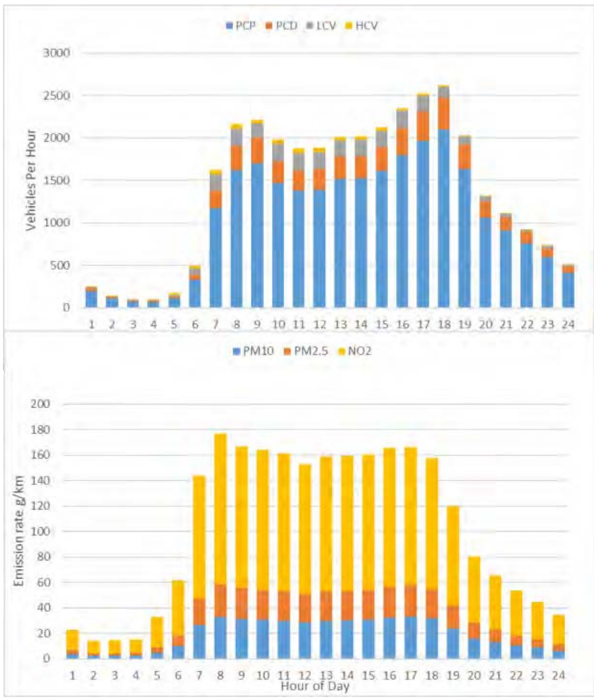
Figure 26: Bell Street: High St Rd to Plenty Rd – Project 2026

3.3 Base 2036

Table 11: Bell Street 24 hour traffic Volumes – Base 2036

Road	Direction	Cars	LCV	HCV	Total
Station St to Oriel Rd	EB	30000	2700	600	33300
	WB	31000	2200	500	33700
Studley Rd to Rail line	EB	26000	1700	500	28200
	WB	30000	2200	600	32800
Oriel Rd to Waterdale Rd	EB	27000	1800	900	29700
	WB	27000	2200	600	29800
Waterdale Rd to Upper Heidelberg Rd	EB	33000	2100	700	35800
	WB	32000	3000	700	35700
High St to Plenty Rd	EB	37000	1000	700	38700
	WB	35000	1000	700	36700

East Bound



West Bound

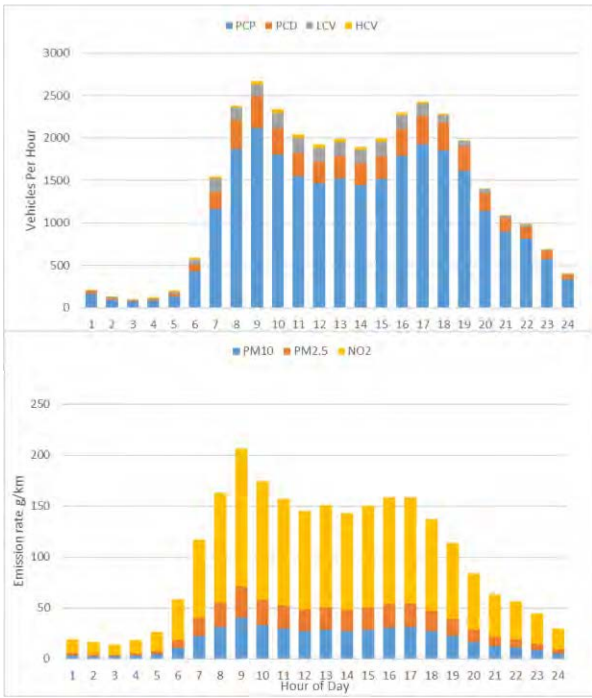


Figure 27: Bell Street: Station St to Oriel Rd – Base 2036

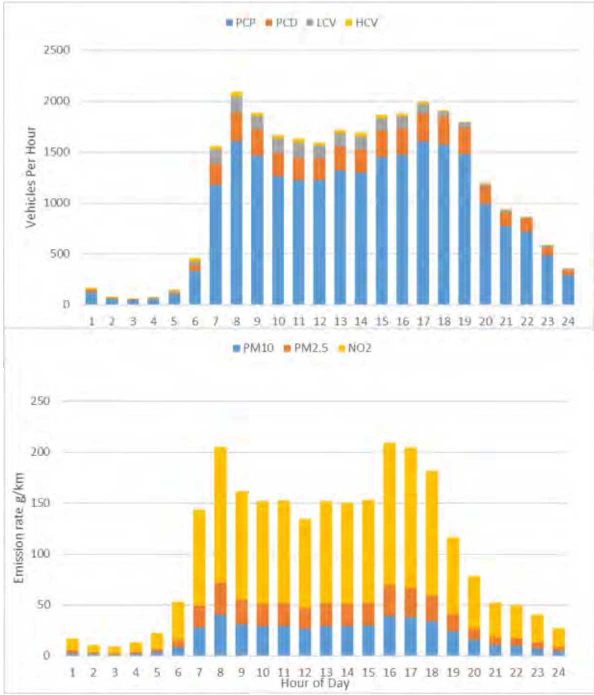
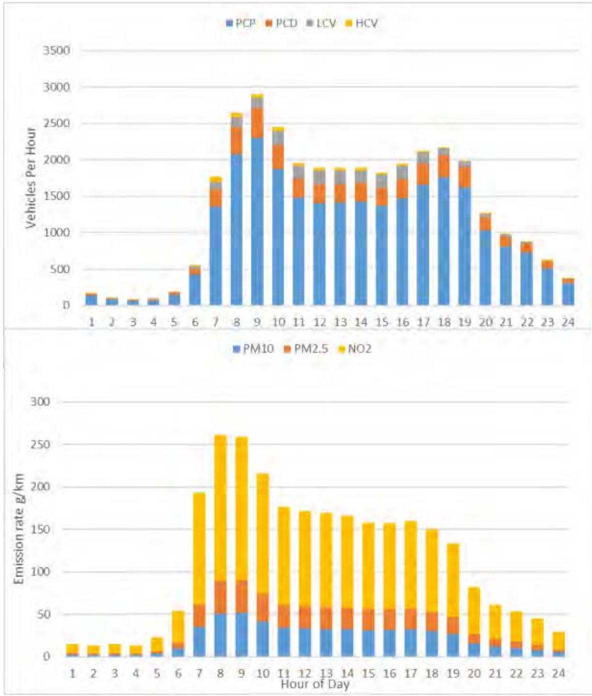
East Bound	West Bound
	

Figure 28: Bell Street: Studley Rd to Rail Line – Base 2036

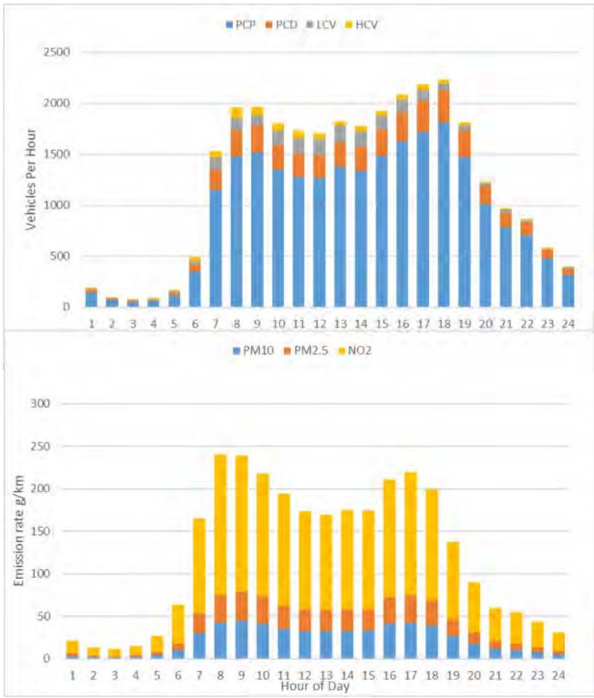
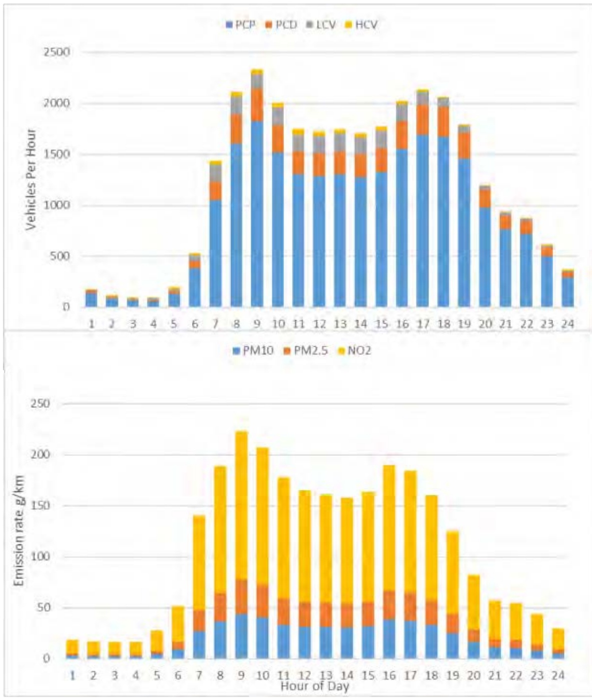
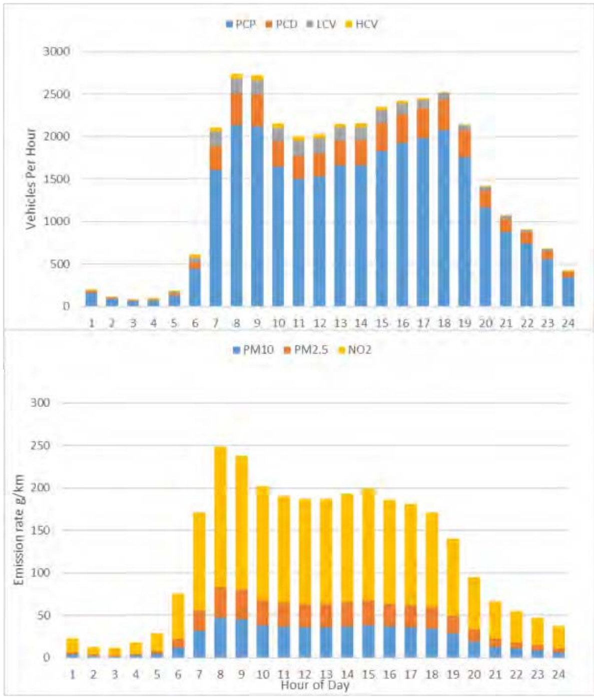
East Bound	West Bound
	

Figure 29: Bell Street: Oriel Rd to Waterdale Rd – Base 2036

East Bound	West Bound



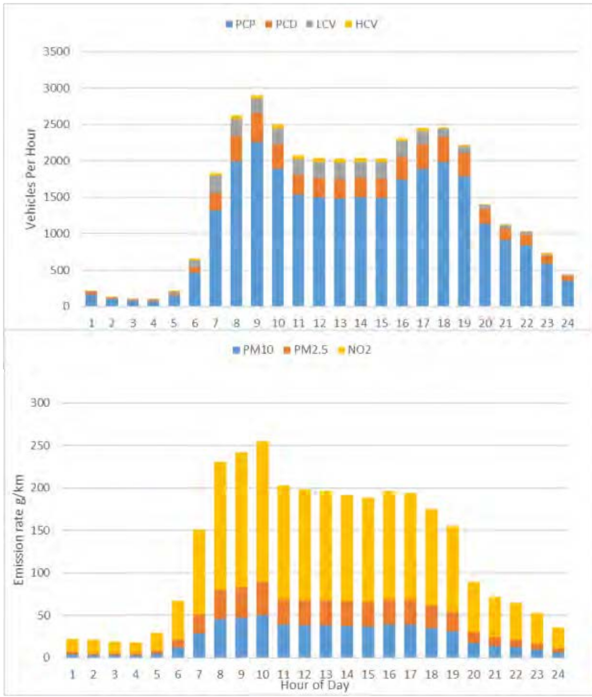
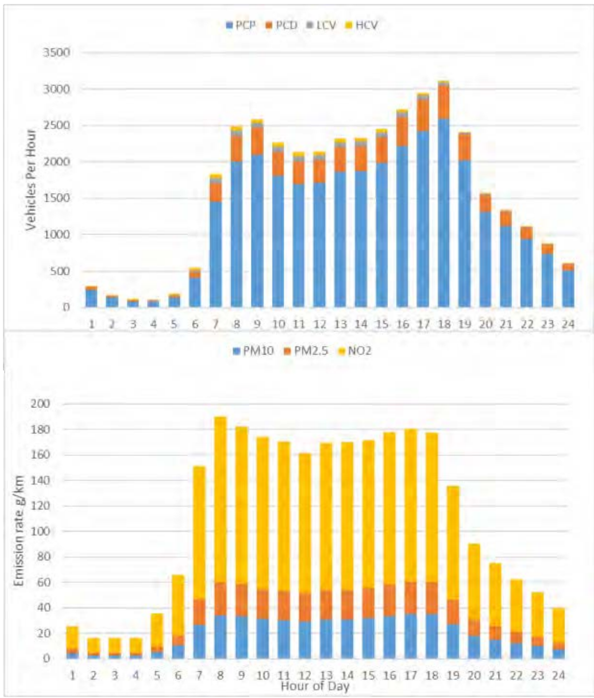


Figure 30: Bell Street: Waterdale Rd to Upper Heidelberg Rd – Base 2036

East Bound	West Bound



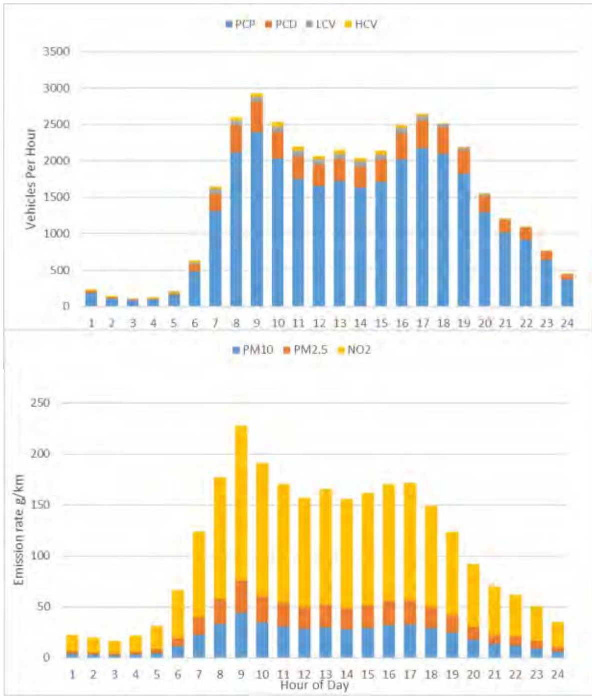


Figure 31: Bell Street: High St Rd to Plenty Rd – Base 2036

3.4 Project 2036

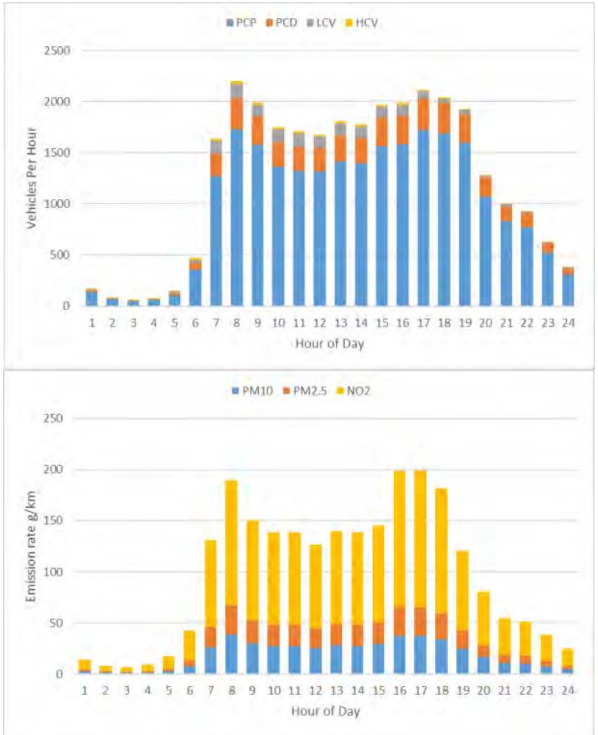
Table 12: Bell Street 24 hour traffic Volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Station St to Oriel Rd	EB	30000	2300	400	32700
	WB	32000	1800	300	34100
Studley Rd to Rail line	EB	28000	1500	300	29800
	WB	32000	2100	400	34500
Oriel Rd to Waterdale Rd	EB	28000	1500	500	30000
	WB	28000	1900	400	30300
Waterdale Rd to Upper Heidelberg Rd	EB	33000	1800	400	35200
	WB	33000	2500	400	35900
High St to Plenty Rd	EB	37000	900	500	38400
	WB	35000	900	500	36400

East Bound | West Bound

Figure 32: Bell Street: Station St to Oriel Rd – Project 2036

East Bound



West Bound

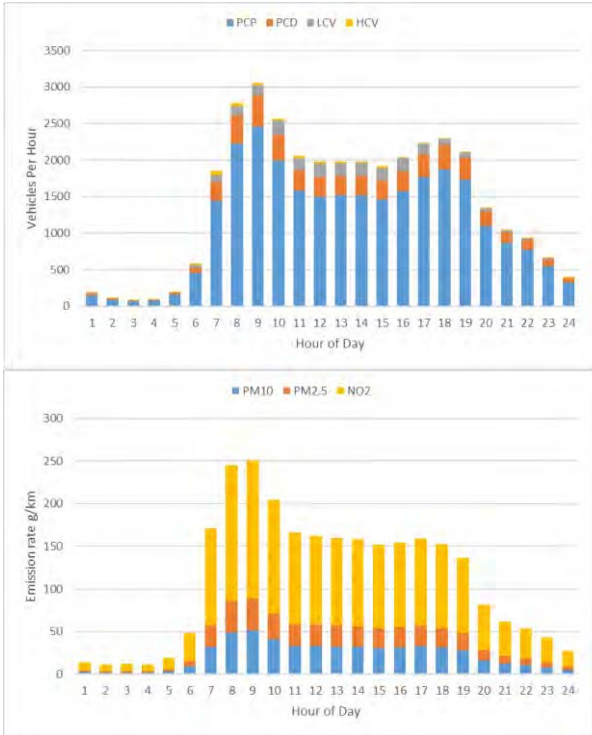
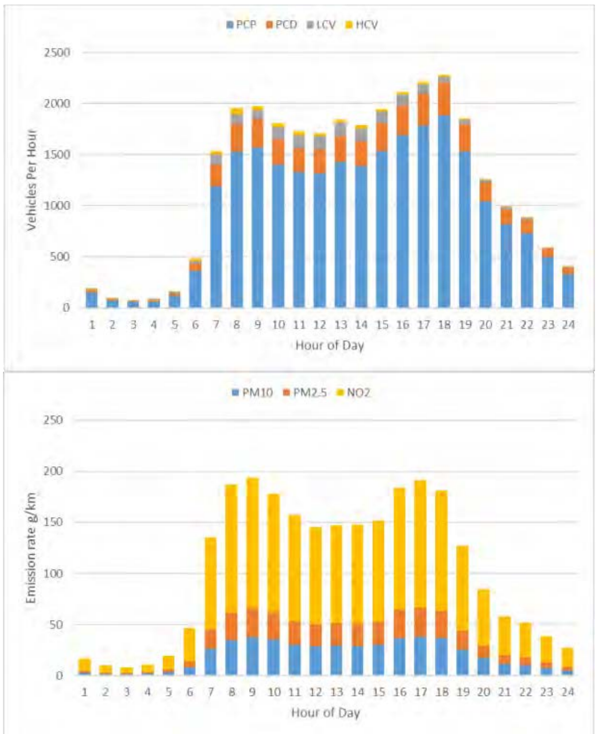


Figure 33: Bell Street: Studley Rd to Rail Line – Project 2036

East Bound



West Bound

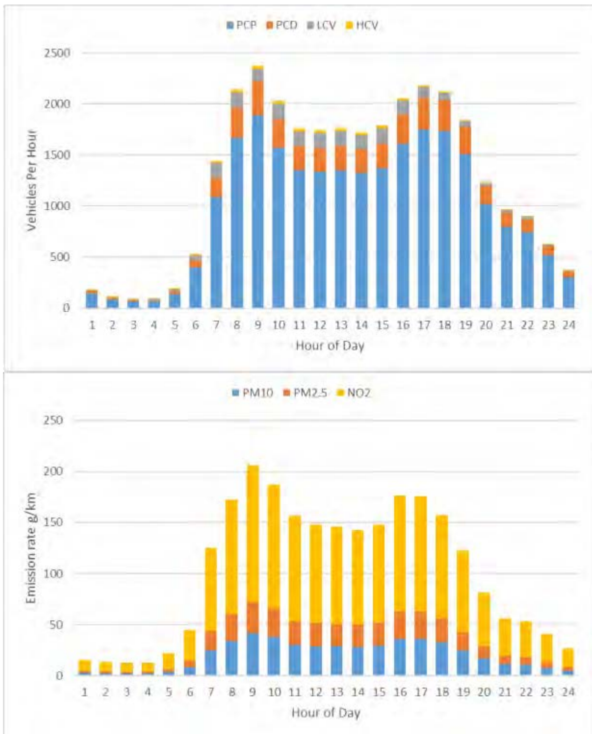


Figure 34: Bell Street: Oriel Rd to Waterdale Rd – Project 203

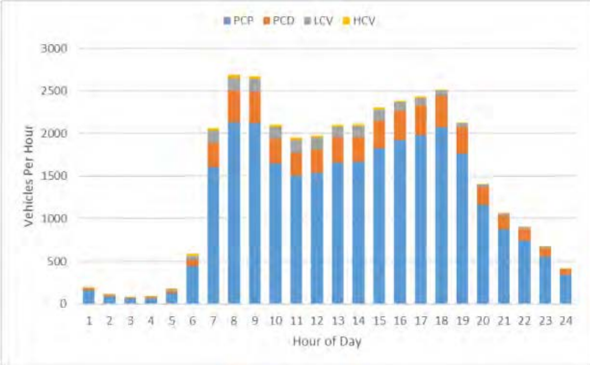
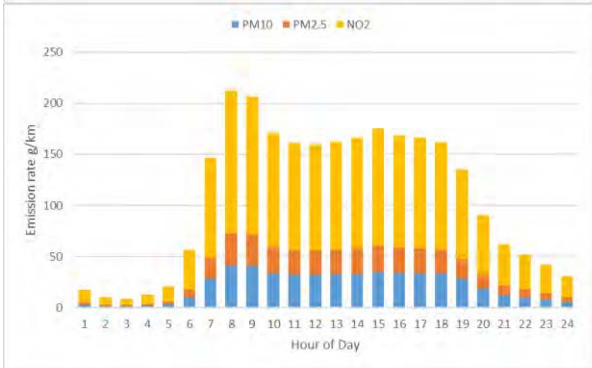
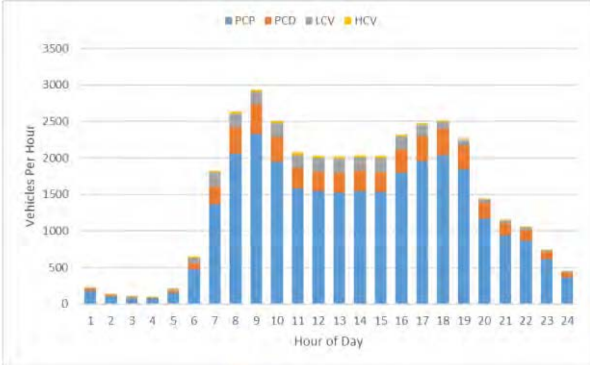
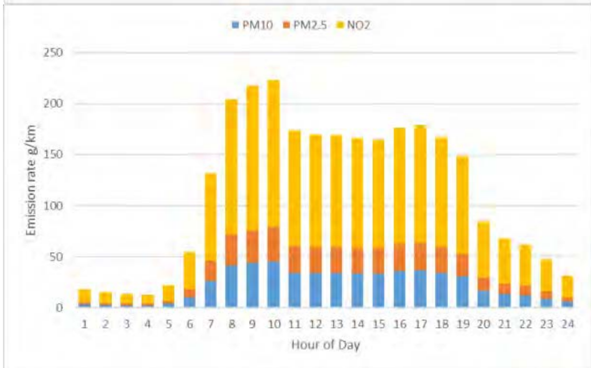
East Bound	West Bound
 	 

Figure 35: Bell Street: Waterdale Rd to Upper Heidelberg Rd – Project 2036

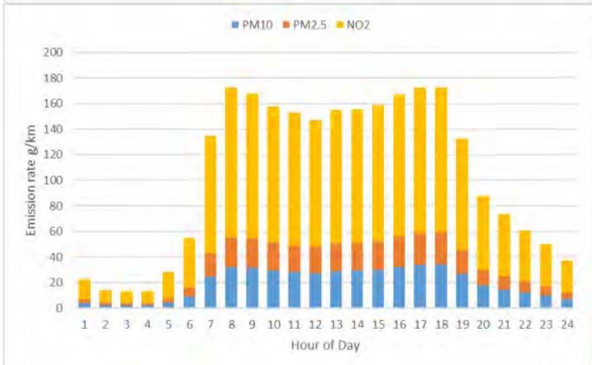
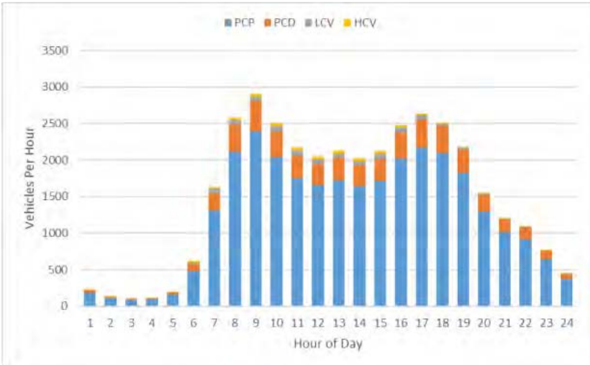
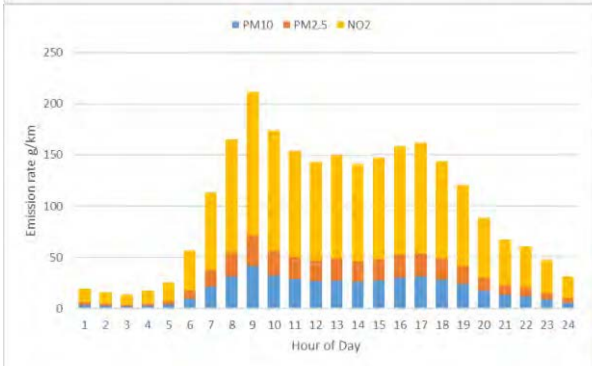
East Bound	West Bound
 	 

Figure 36: Bell Street: High St Rd to Plenty Rd – Project 2036

4.0 BOLTON STREET

4.1 Base 2026

Table 13: Bolton Street 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Bridge St to Main Rd	NB	12000	900	150	13050
	SB	12000	700	200	12900

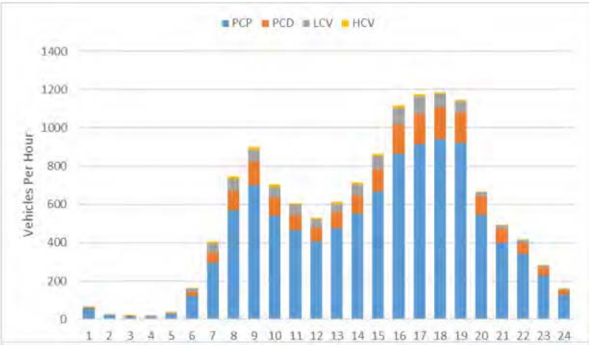
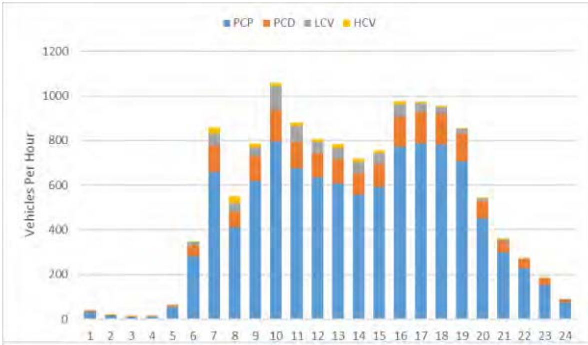
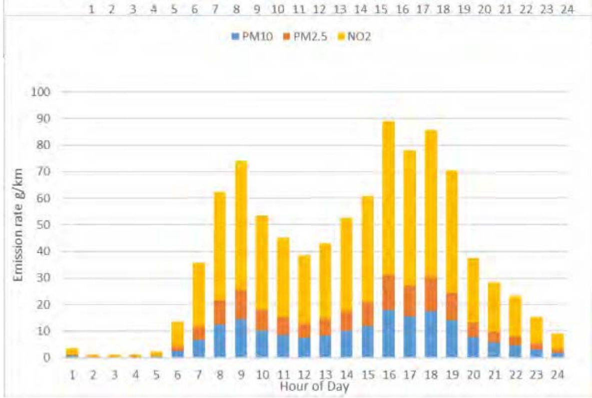
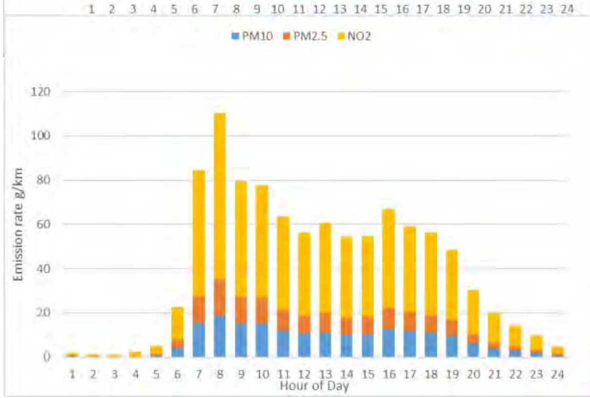
North Bound	South Bound
	
	

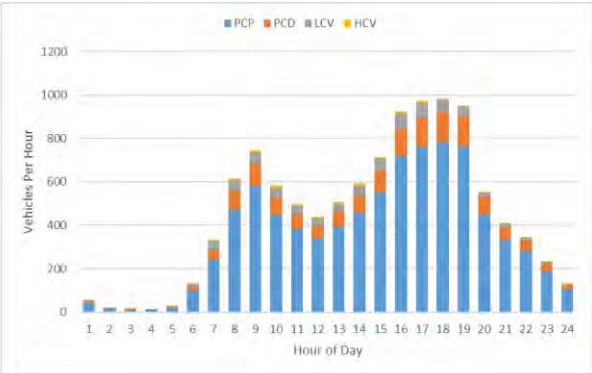
Figure 37: Bolton Street: Bridge St to Main Rd – Base 2026

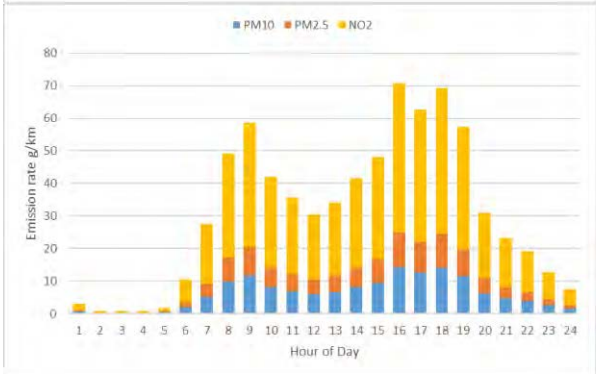
4.2 Project 2026

Table 14: Bolton Street 24 hour traffic Volumes – Project 2026

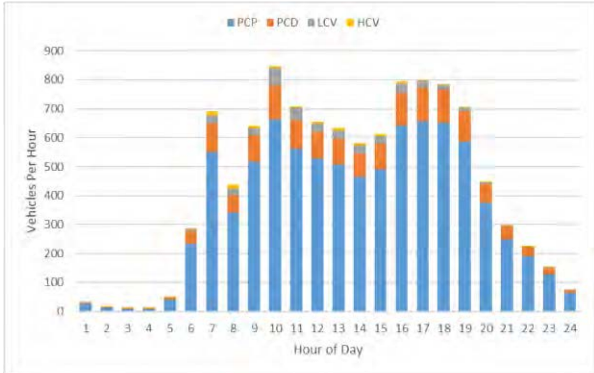
Road	Direction	Cars	LCV	HCV	Total
Bridge St to Main Rd	NB	10000	700	100	10800
	SB	10000	400	100	10500

North Bound





South Bound



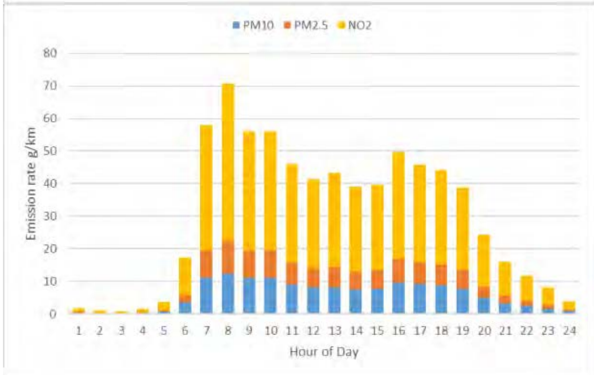


Figure 38: Bolton Street: Bridge St to Main Rd – Project 2026

4.3 Base 2036

Table 15: Bolton Street 24 hour traffic Volumes – Base 2036

Road	Direction	Cars	LCV	HCV	Total
Bridge St to Main Rd	NB	13000	1000	250	14200
	SB	13000	800	250	14050

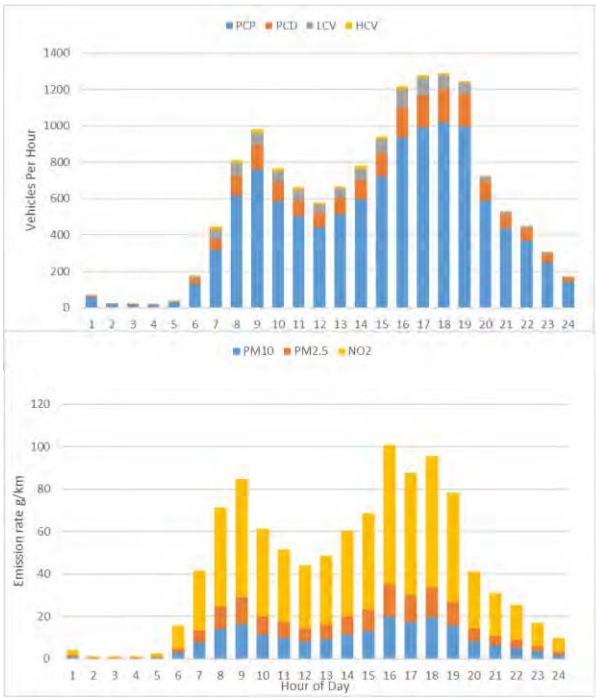
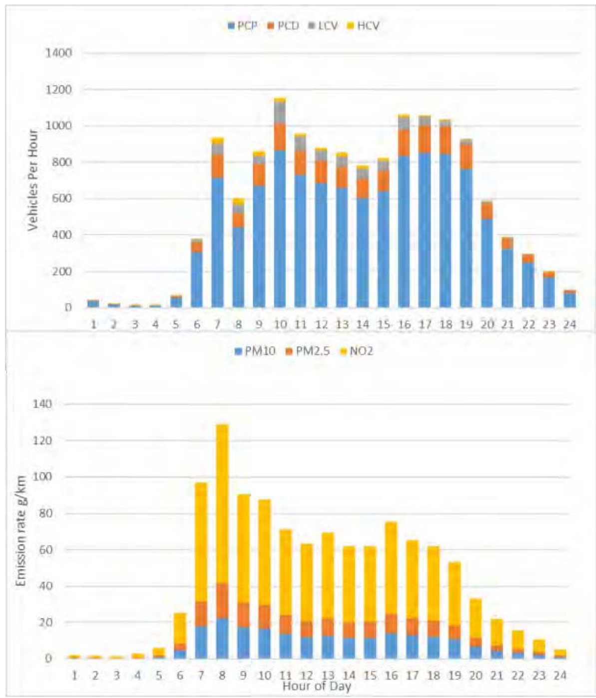
North Bound	South Bound
	

Figure 39: Bolton Street: Bridge St to Main Rd – Base 2036

4.4 Project 2036

Table 16: Bolton Street 24 hour traffic Volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Bridge St to Main Rd	NB	10000	700	100	10800
	SB	13000	800	250	14050

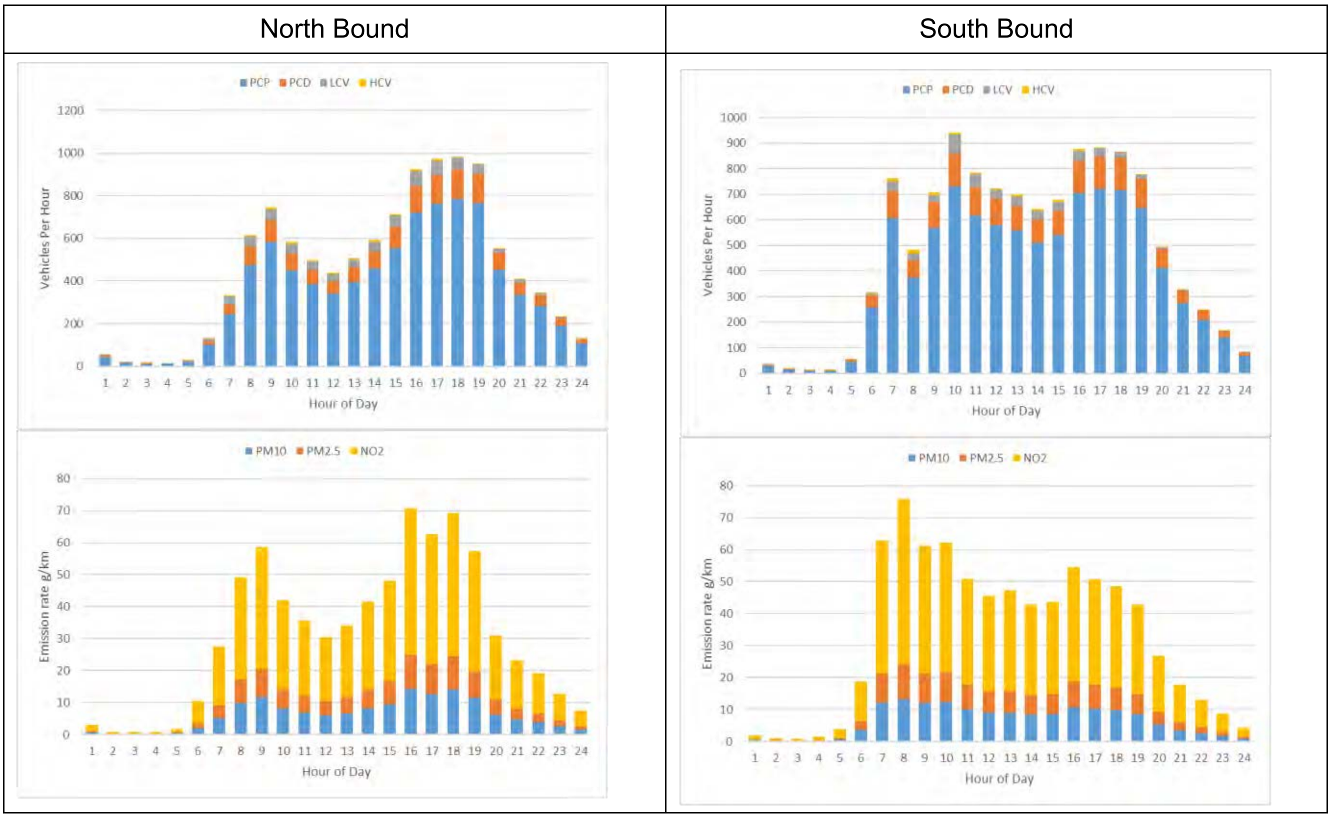


Figure 40: Bolton Street: Bridge St to Main Rd – Project 2036

5.0 BROADWAY

5.1 Base 2026

Table 17: Broadway 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
High Street to Bolderwood Pde	EB	11000	1700	1200	13900
	WB	16000	2600	1500	20100

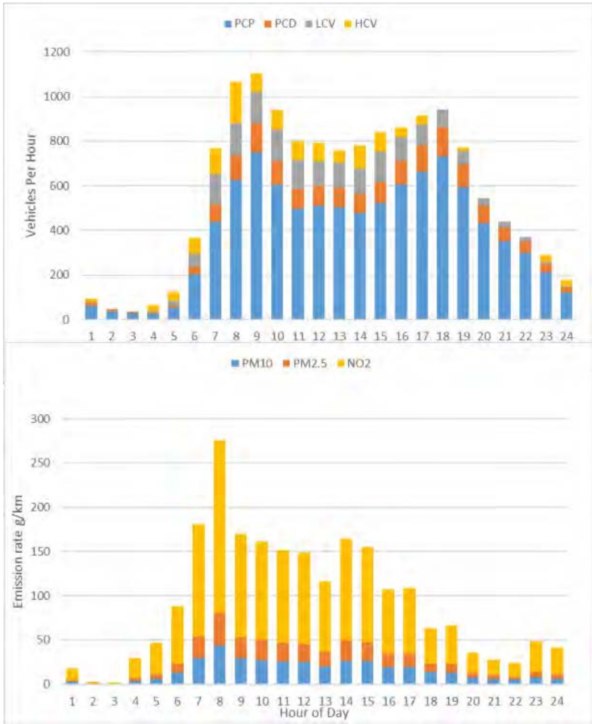
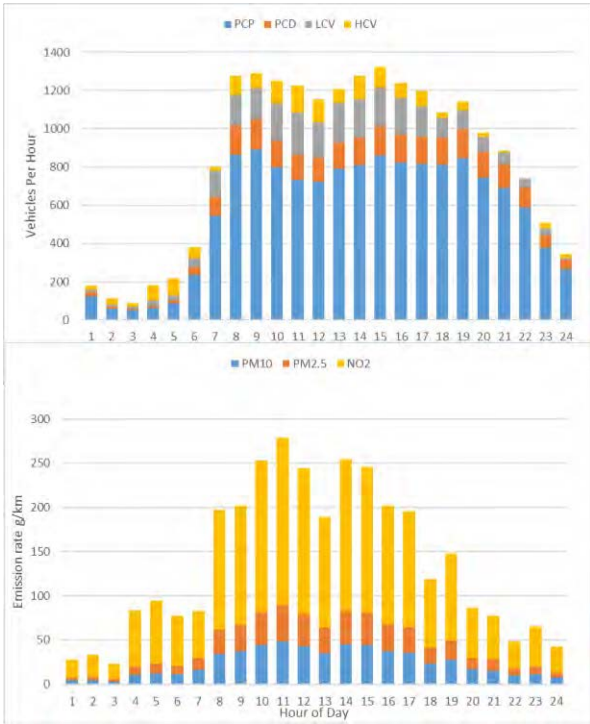
East Bound	West Bound
	

Figure 41: Broadway: High Street to Bolderwood Pde – Base 2026

5.2 Project 2026

Table 18: Broadway 24 hour traffic Volumes – Project 2026

Road	Direction	Cars	LCV	HCV	Total
Bridge St to Main Rd	EB	11000	1500	600	13100
	WB	17000	2400	700	20100

East Bound	West Bound

Figure 42: Broadway: High Street to Bolderwood Pde – Project 2026

5.3 Base 2036

Table 19: Broadway 24 hour traffic Volumes – Base 2036

Road	Direction	Cars	LCV	HCV	Total
Bridge St to Main Rd	EB	11000	1600	1200	13800
	WB	18000	2500	1400	21900

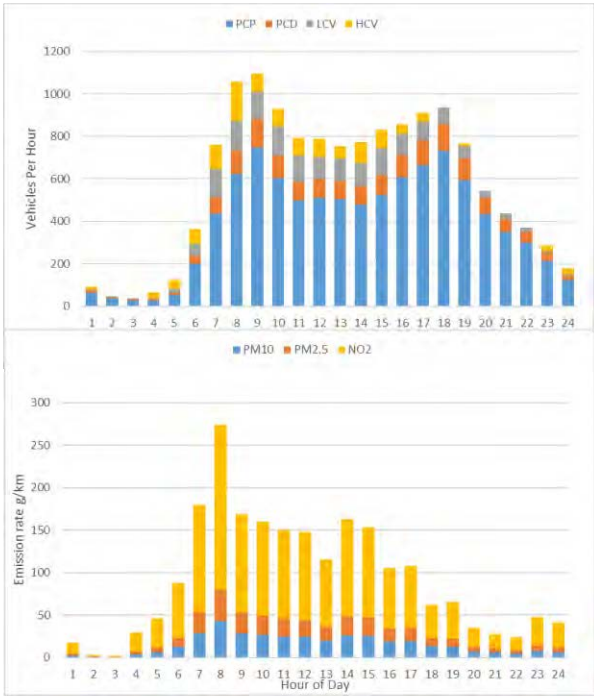
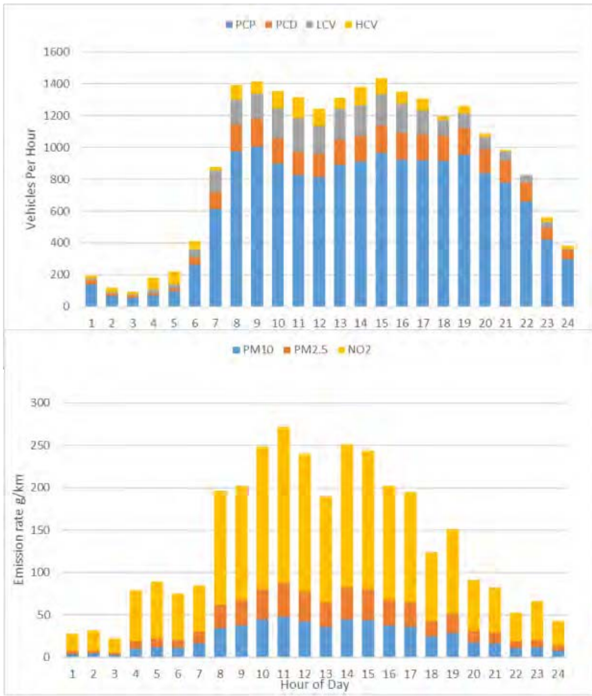
East Bound	West Bound
	

Figure 43: Broadway: High Street to Bolderwood Pde – Base 2036

5.4 Project 2036

Table 20: Broadway 24 hour traffic Volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Bridge St to Main Rd	EB	12000	1500	600	14100
	WB	12000	1500	600	14100

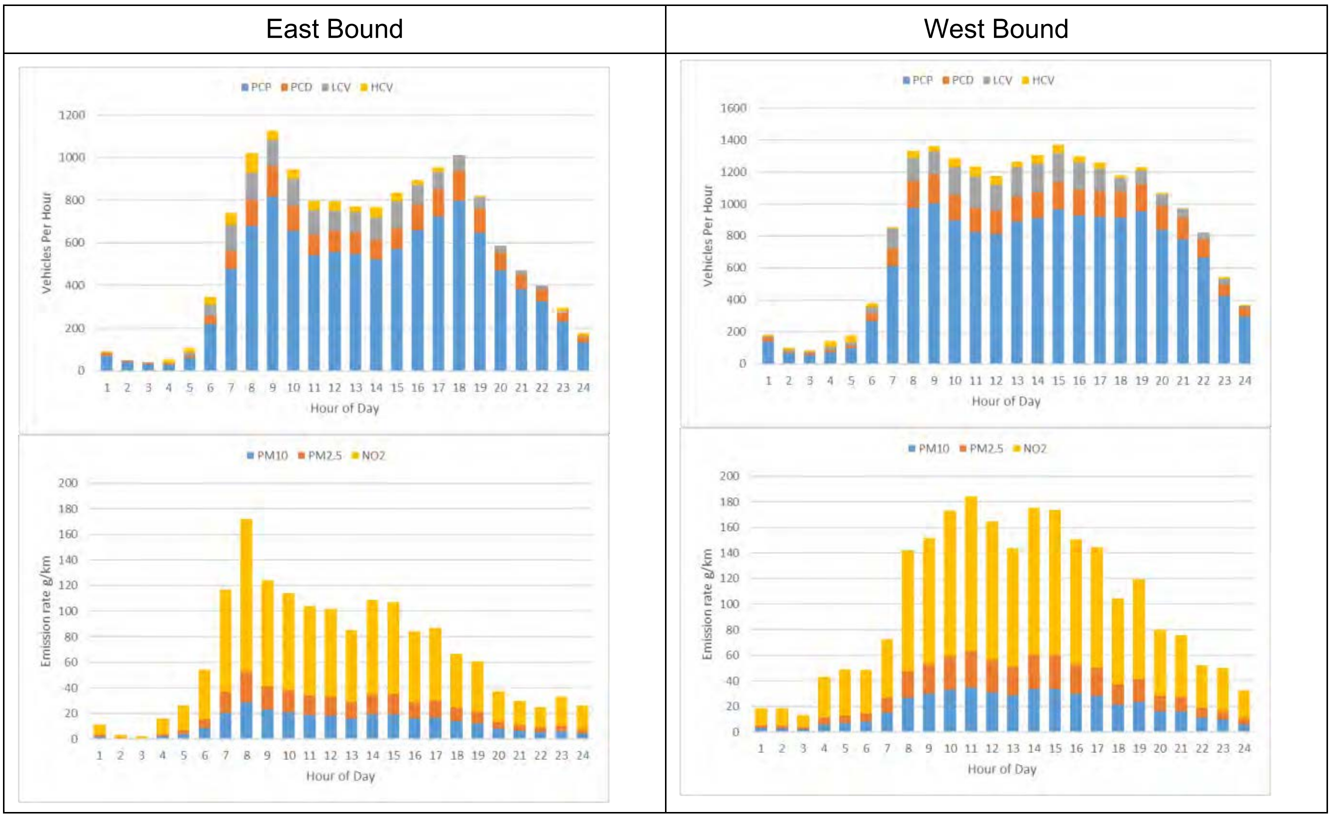


Figure 44: Broadway: High Street to Bolderwood Pde – Project 2036

6.0 BULLEEN ROAD

6.1 Base 2026

Table 21: Bullen Road 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Manningham Rd	NB	25000	1800	1100	27900
	SB	22000	1900	800	24700

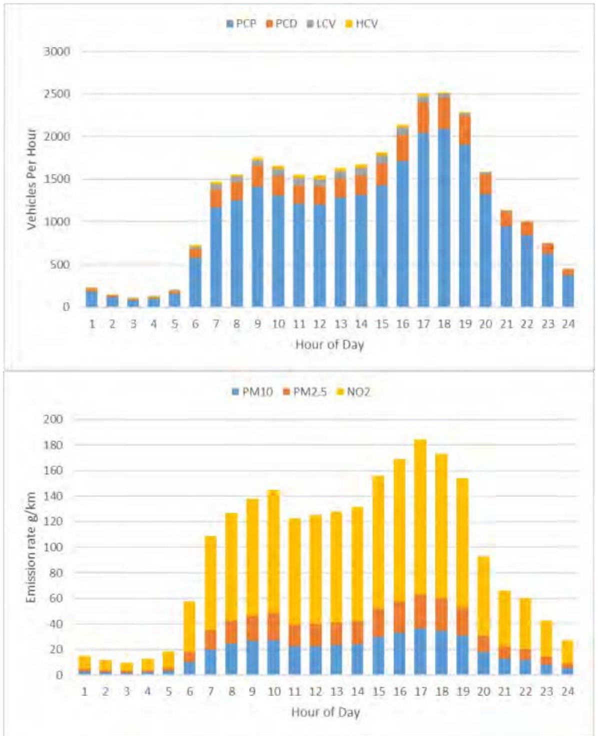
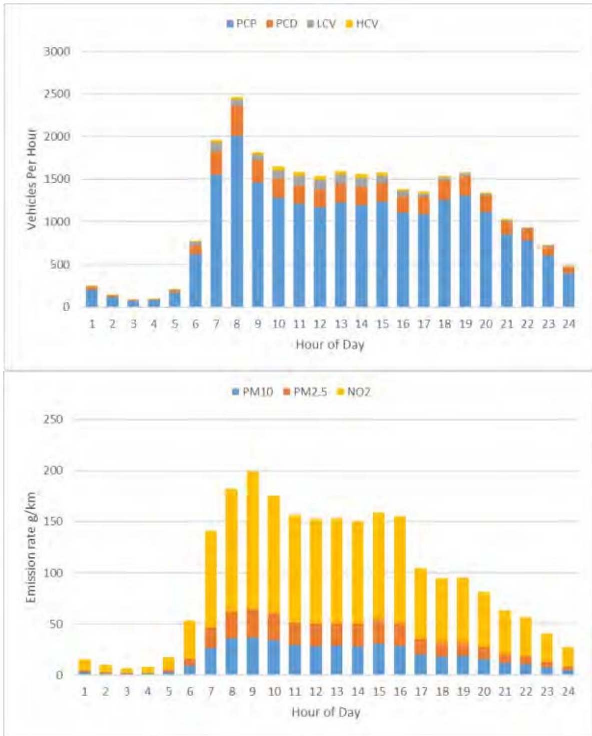
North Bound	South Bound
	

Figure 45: Bulleen Road: Eastern Fwy to Manningham Rd – Base 2026

6.2 Project 2026

Table 22: Bullen Road 24 hour traffic Volumes – Project 2026

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Manningham Rd	NB	29000	1000	500	30500
	SB	25000	1100	400	26500

North Bound	South Bound

Figure 46: Bullen Road: Eastern Fwy to Manningham Rd – Project 2026

6.3 Base 2036

Table 23: Bullen Road 24 hour traffic Volumes – Base 2036

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Manningham Rd	NB	27000	1900	1100	30000
	SB	24000	2100	800	26900

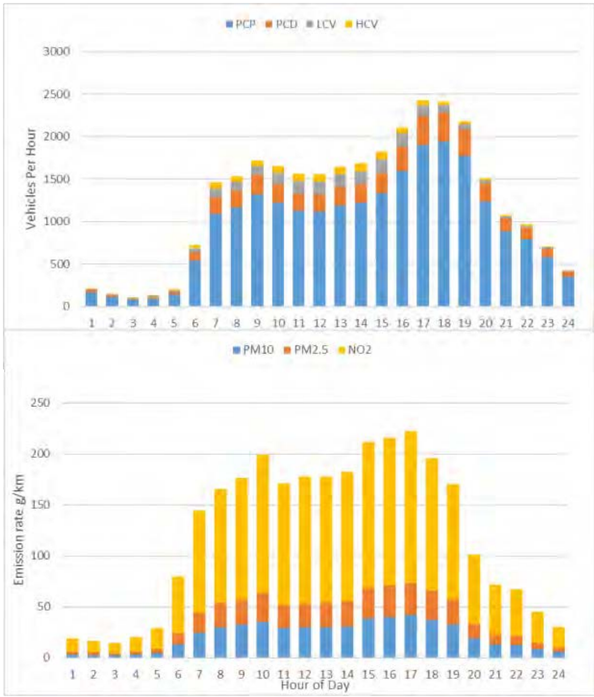
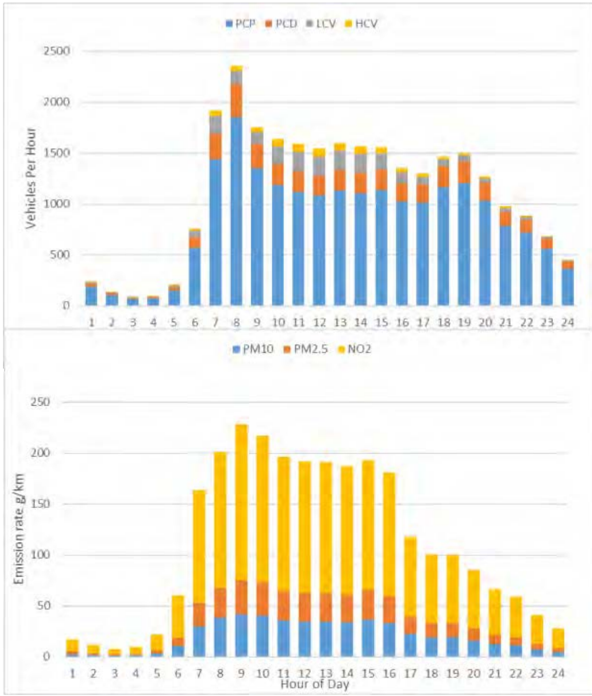
North Bound	South Bound
	

Figure 47: Bullen Road: Eastern Fwy to Manningham Rd – Base 2036

6.4 Project 2036

Table 24: Bullen Road 24 hour traffic Volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Manningham Rd	NB	29000	1100	500	30600
	SB	26000	1200	500	27700

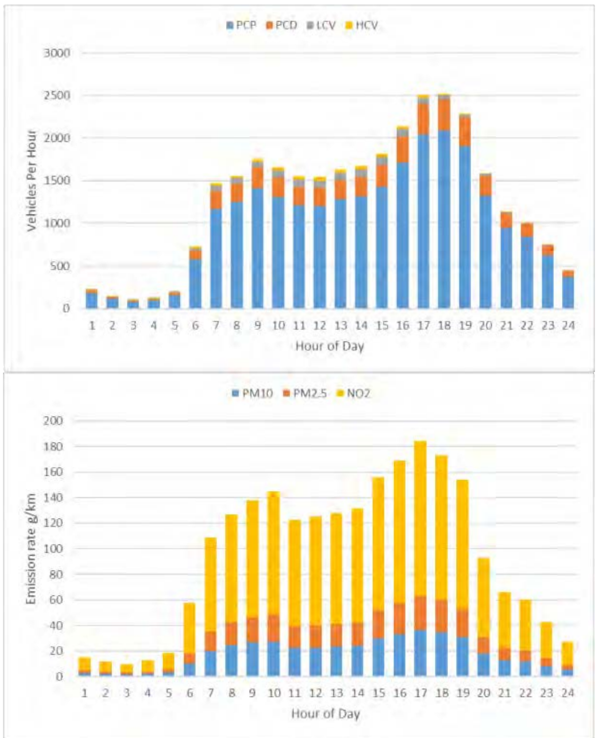
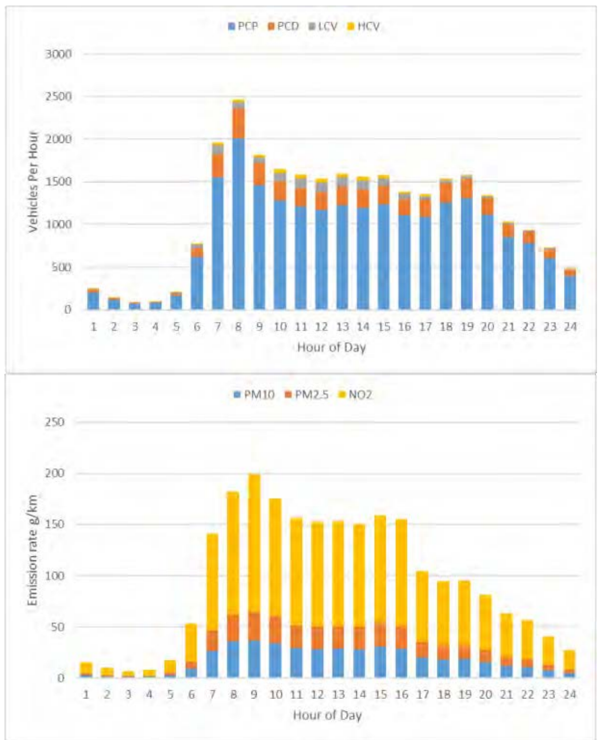
North Bound	South Bound
	

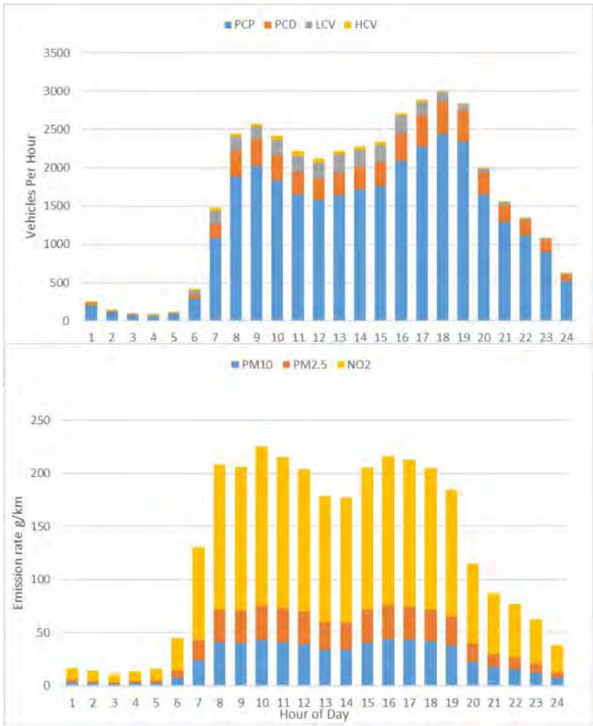
Figure 48: Bulleen Rd: Eastern Fwy to Manningham Rd – Project 2036

7.0 CHANDLER HWY

7.1 Base 2026

Table 25: Chandler Hwy 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Heidelberg Rd	NB	36000	2700	600	39300
	SB	33000	1800	700	35500

North Bound	South Bound


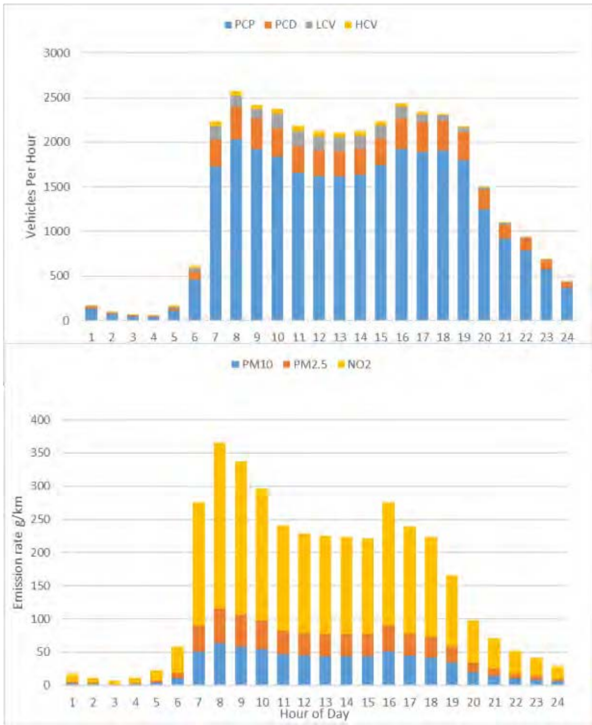


Figure 49: Chandler Hwy: Eastern Fwy to Heidelberg Rd – Base 2026

7.2 Project 2026

Table 26: Chandler Hwy 24 hour traffic Volumes – Project 2026

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Heidelberg Rd	NB	35000	2400	300	37700
	SB	29000	1400	400	30800

North Bound	South Bound

Figure 50: Chandler Hwy: Eastern Fwy to Heidelberg Rd – Project 2026

7.3 Base 2036

Table 27: Chandler Hwy 24 hour traffic Volumes – Base 2036

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Heidelberg Rd	NB	39000	3100	800	42900
	SB	36000	2100	800	38900

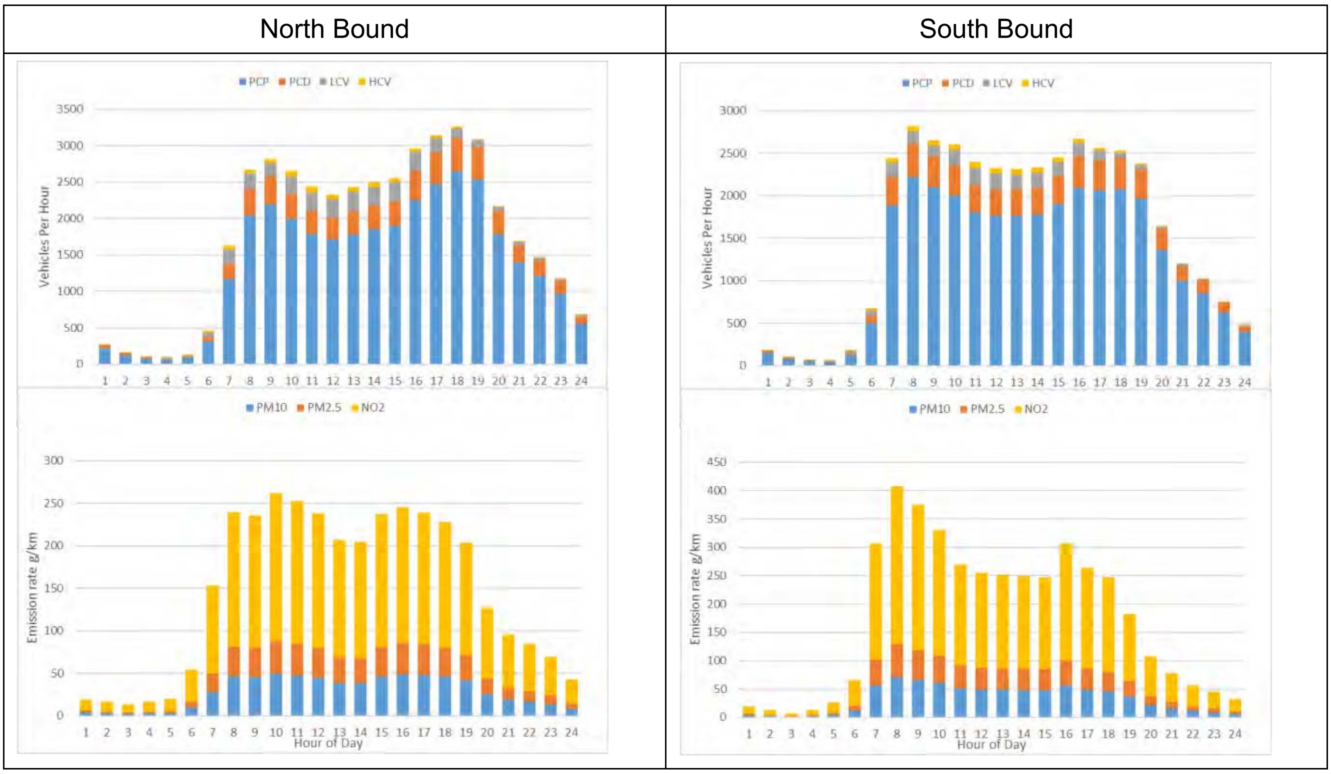


Figure 51: Chandler Hwy: Eastern Fwy to Heidelberg Rd – Base 2036

7.4 Project 2036

Table 28: Chandler Hwy 24 hour traffic Volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Heidelberg Rd	NB	27000	2700	400	42100
	SB	32000	1600	500	34100

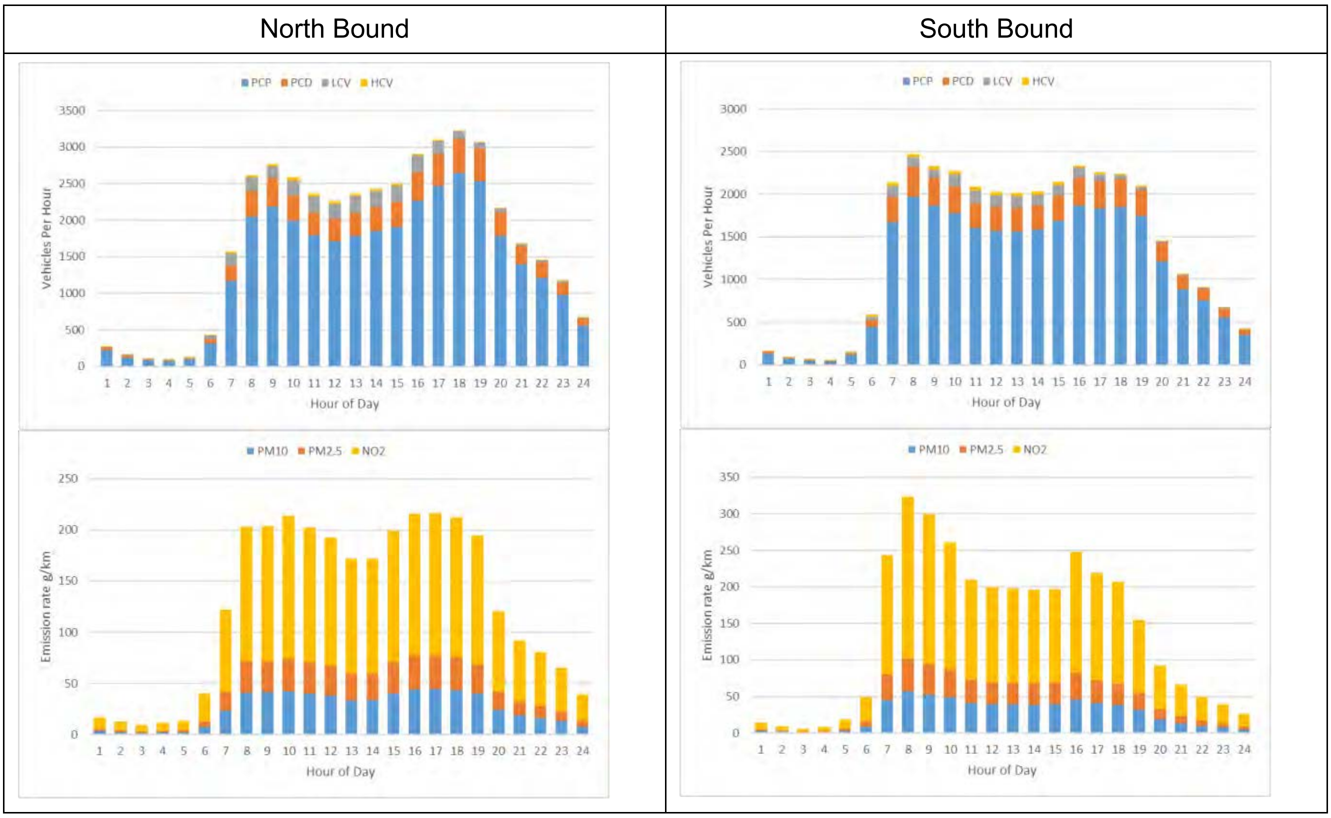


Figure 52: Chandler Hwy: Eastern Fwy to Heidelberg Rd – Project 2036

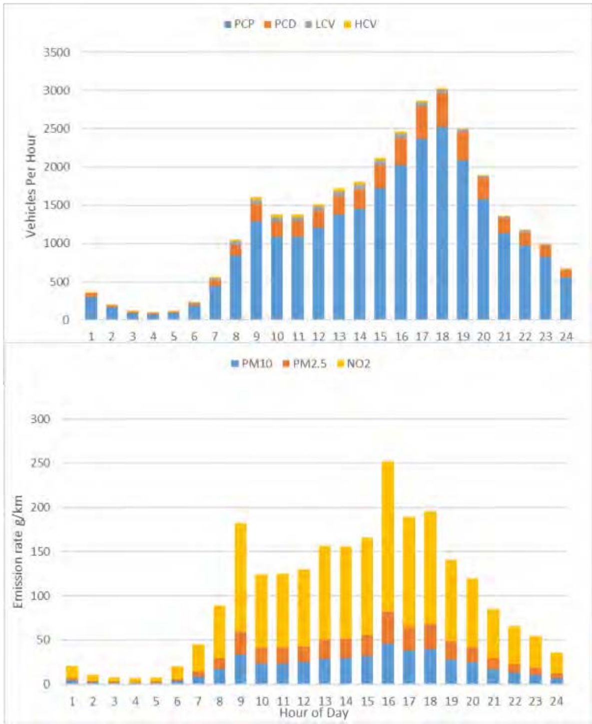
8.0 DALTON ROAD

8.1 Base 2026

Table 29: Dalton Road 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
North of Metropolitan Ring Road	NB	30000	800	400	31200
	SB	27000	6400	600	34000
Childs Rd to McKimmies Rd	NB	23000	1600	400	25000
	SB	23000	1300	300	24600

North Bound



South Bound

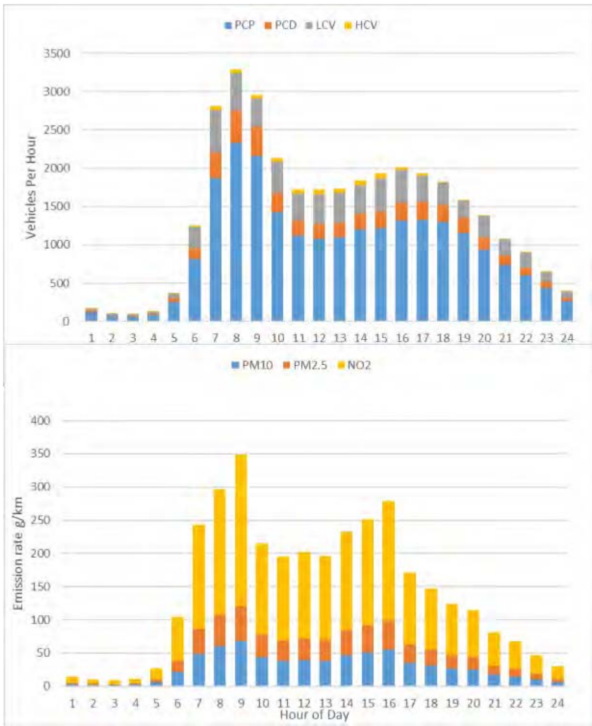
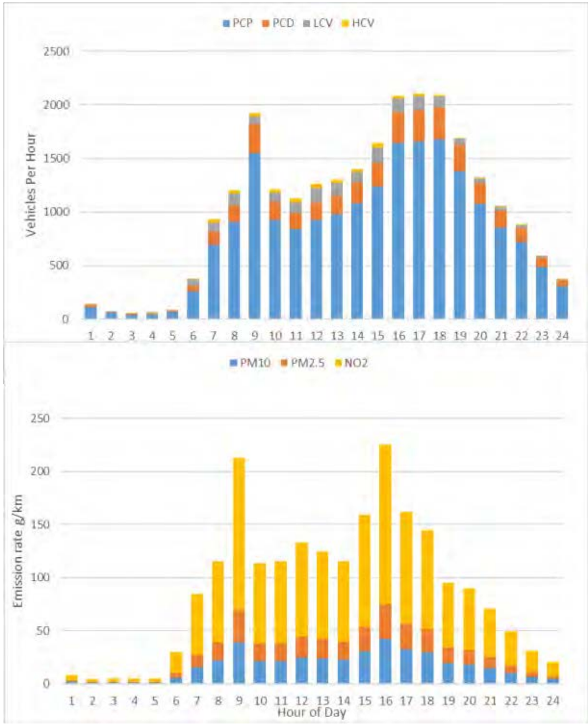


Figure 53: Dalton Road: North of Metropolitan Ring Road – Base 2026

North Bound



South Bound

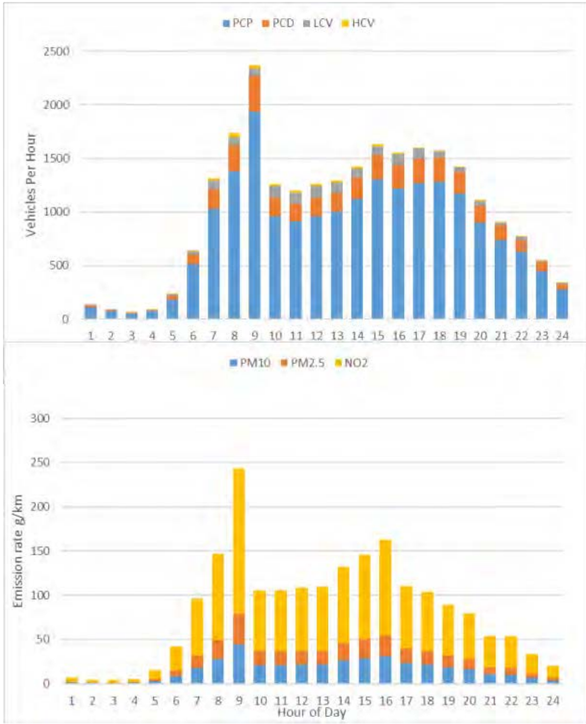


Figure 54: Dalton Road: Childs Rd to McKimmies Rd – Base 2026

8.2 Project 2026

Table 30: Dalton Road 24 hour traffic Volumes – Project 2026

Road	Direction	Cars	LCV	HCV	Total
North of Metropolitan Ring Road	NB	31000	900	400	32300
	SB	28000	6900	600	35500
Childs Rd to McKimmies Rd	NB	23000	1600	400	25000
	SB	23000	1300	350	24650

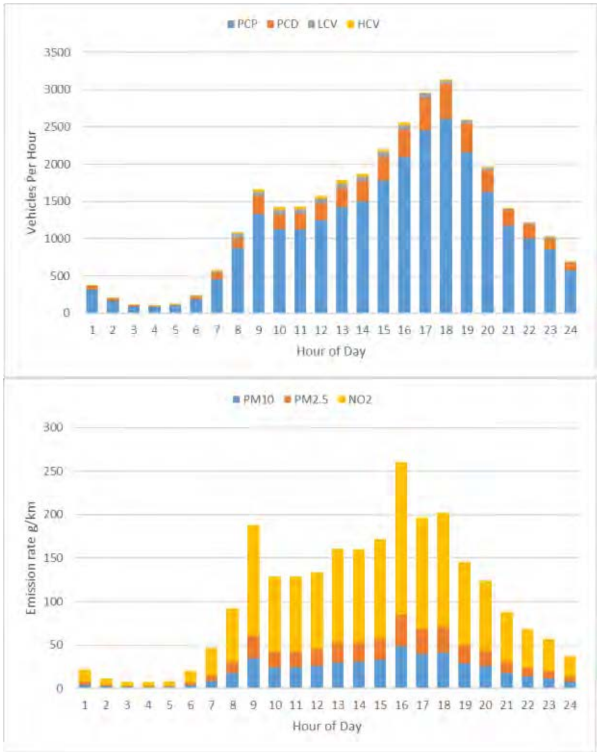
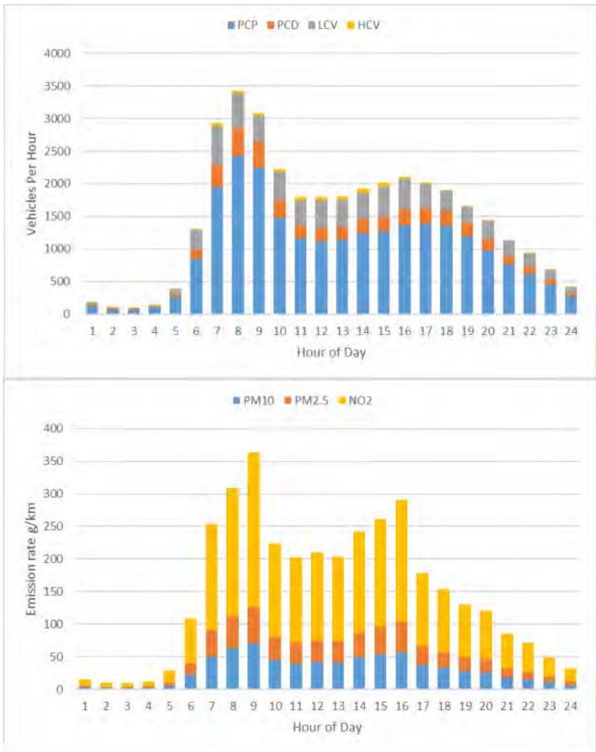
North Bound	South Bound
	

Figure 55: Dalton Road: North of Metropolitan Ring Road – Project 2026

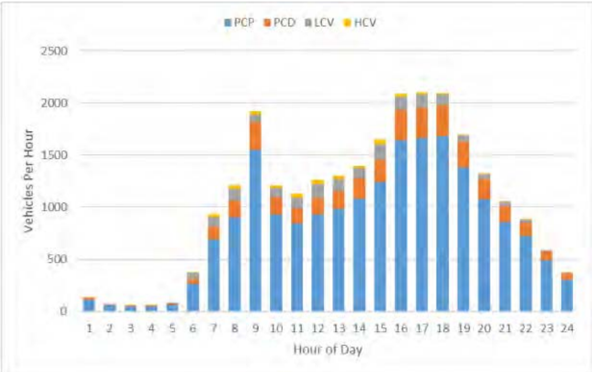
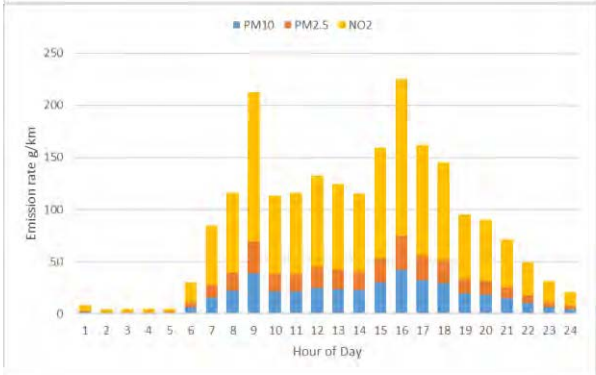
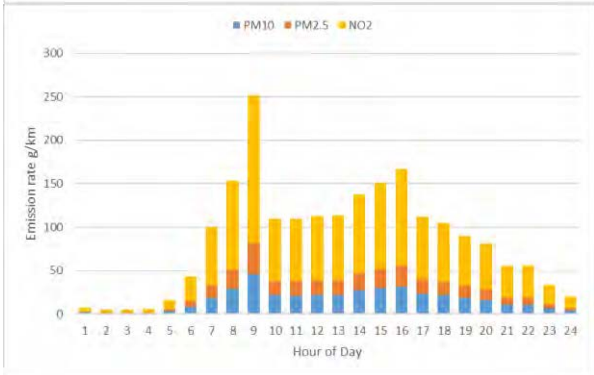
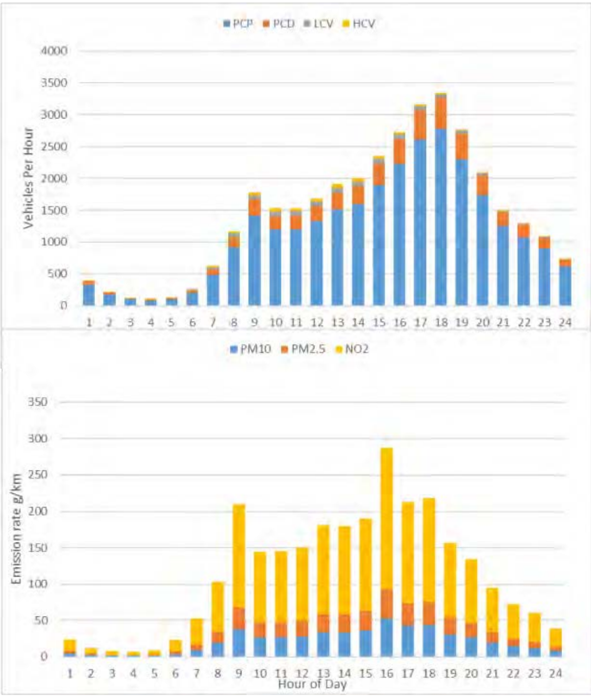
North Bound	South Bound
	
	

Figure 56: Dalton Road: Childs Rd to McKimmies Rd – Project 2026

8.3 Base 2036

Table 31: Chandler Hwy 24 hour traffic Volumes – Base 2036

Road	Direction	Cars	LCV	HCV	Total
North of Metropolitan Ring Road	NB	33000	1000	500	34500
	SB	30000	7500	700	38200
Childs Rd to McKimmies Rd	NB	26000	1800	400	28200
	SB	26000	1300	400	28000

North Bound	South Bound


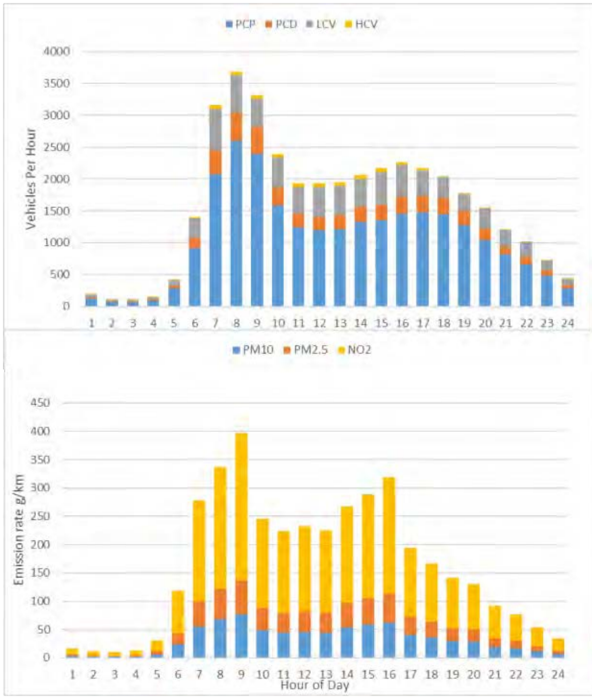
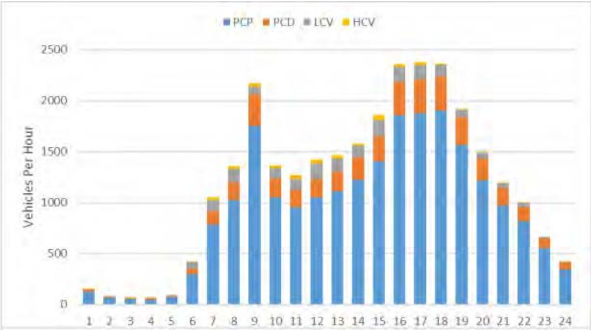
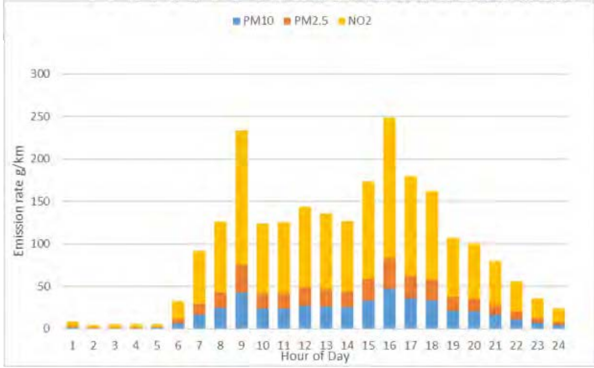


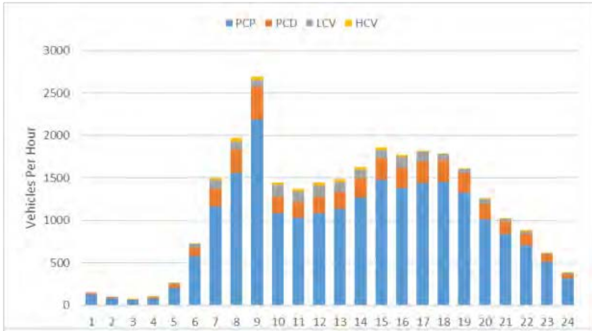
Figure 57: Dalton Road: North of Metropolitan Ring Road – Base 2036

North Bound





South Bound



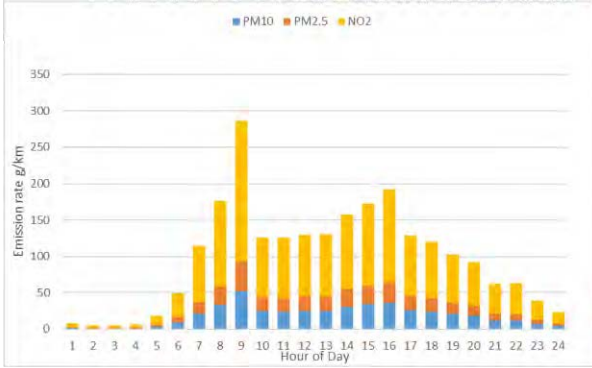


Figure 58: Dalton Road: Childs Rd to McKimmies Rd – Base 2036

8.4 Project 2036

Table 32: Dalton Road 24 hour traffic Volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
North of Metropolitan Ring Road	NB	33000	1000	700	34700
	SB	32000	1600	500	34100
Childs Rd to McKimmies Rd	NB	25000	1800	800	27600
	SB	25000	1600	400	27000

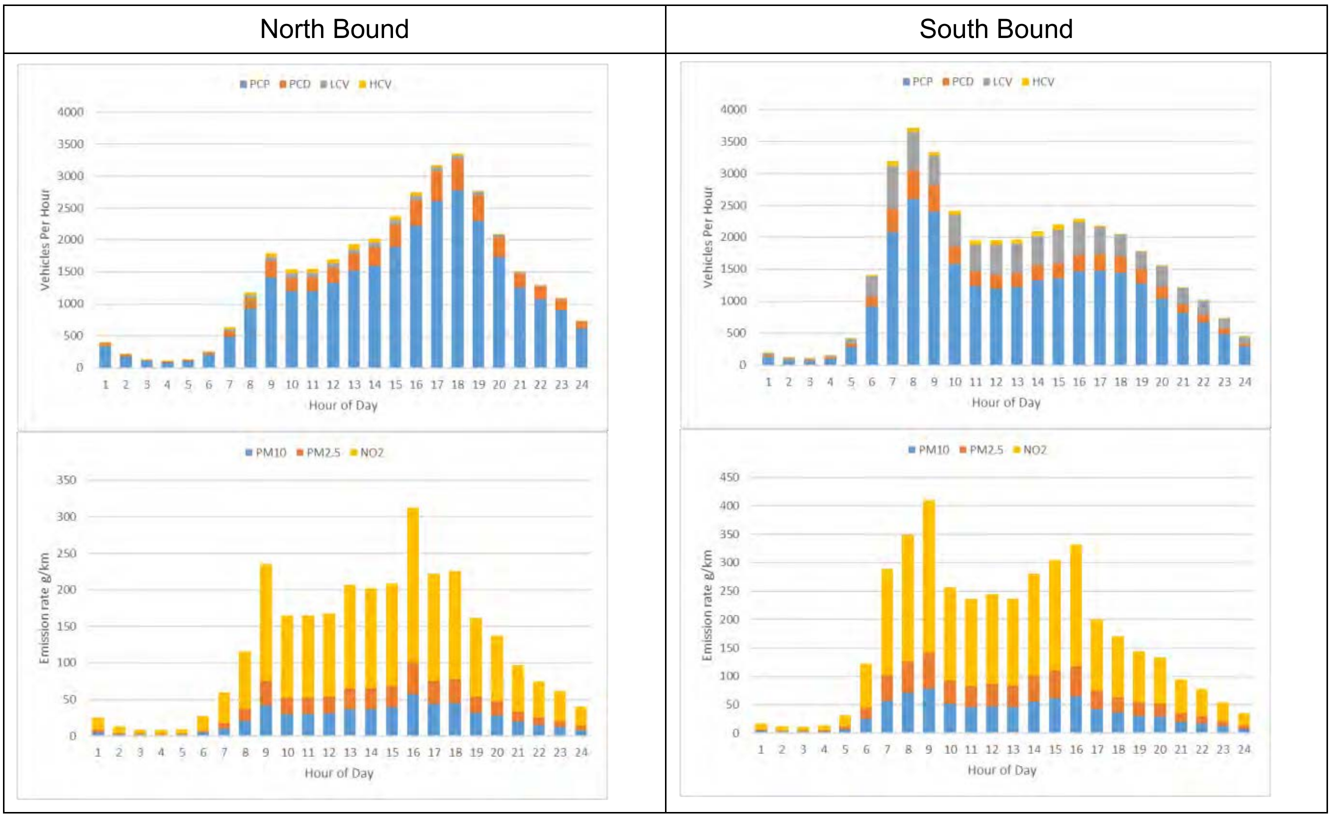
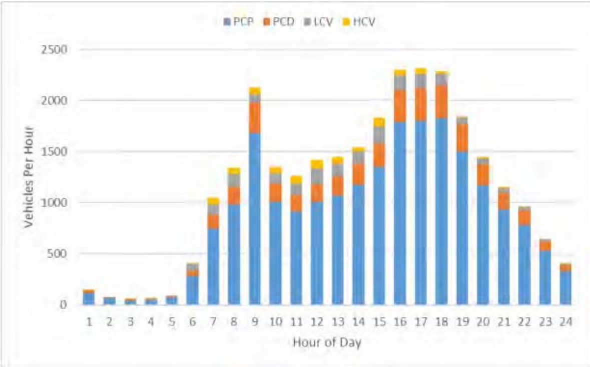
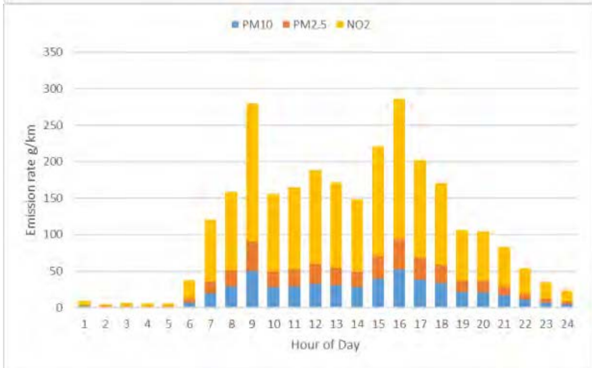


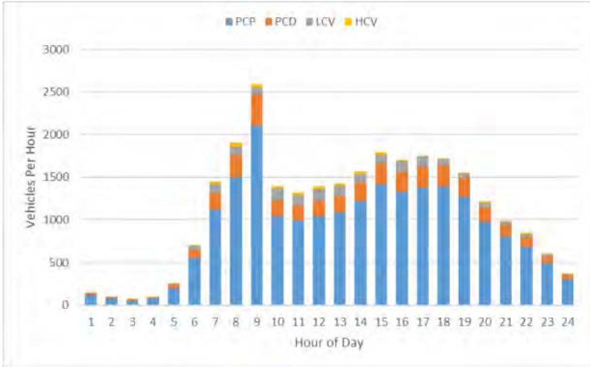
Figure 59: Dalton Road: North of Metropolitan Ring Road – Project 2036

North Bound





South Bound



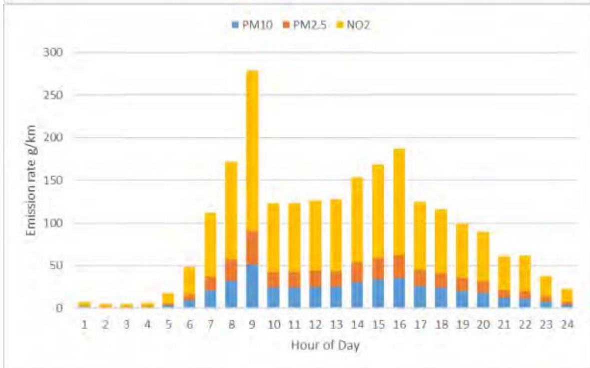


Figure 60: Dalton Road: Childs Rd to McKimmies Rd – Project 2036

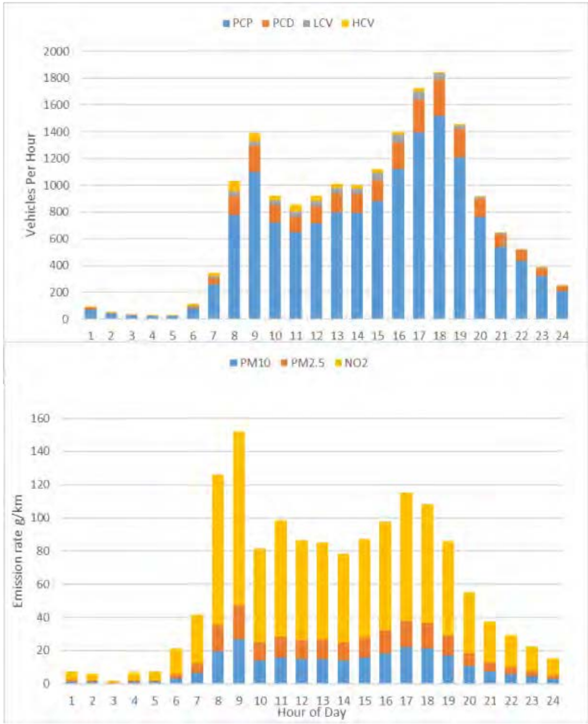
9.0 DAREBIN ROAD

9.1 Base 2026

Table 33: Darebin Road 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Station St to Grange Rd	EB	17000	600	500	18100
	WB	16000	600	500	17100

East Bound



West Bound

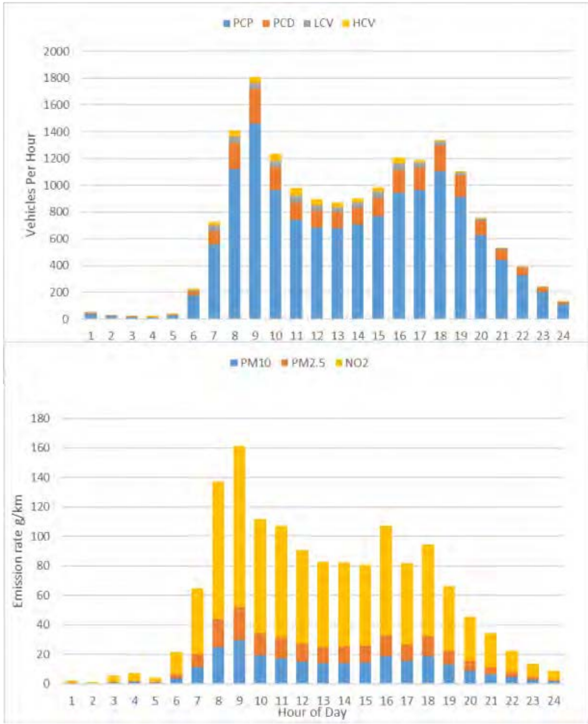


Figure 61: Darebin Road: Station St to Grange Rd – Base 2026

9.2 Project 2026

Table 34: Darebin Road 24 hour traffic Volumes – Project 2026

Road	Direction	Cars	LCV	HCV	Total
Station St to Grange Rd	EB	17000	500	250	17750
	WB	16000	500	250	16750

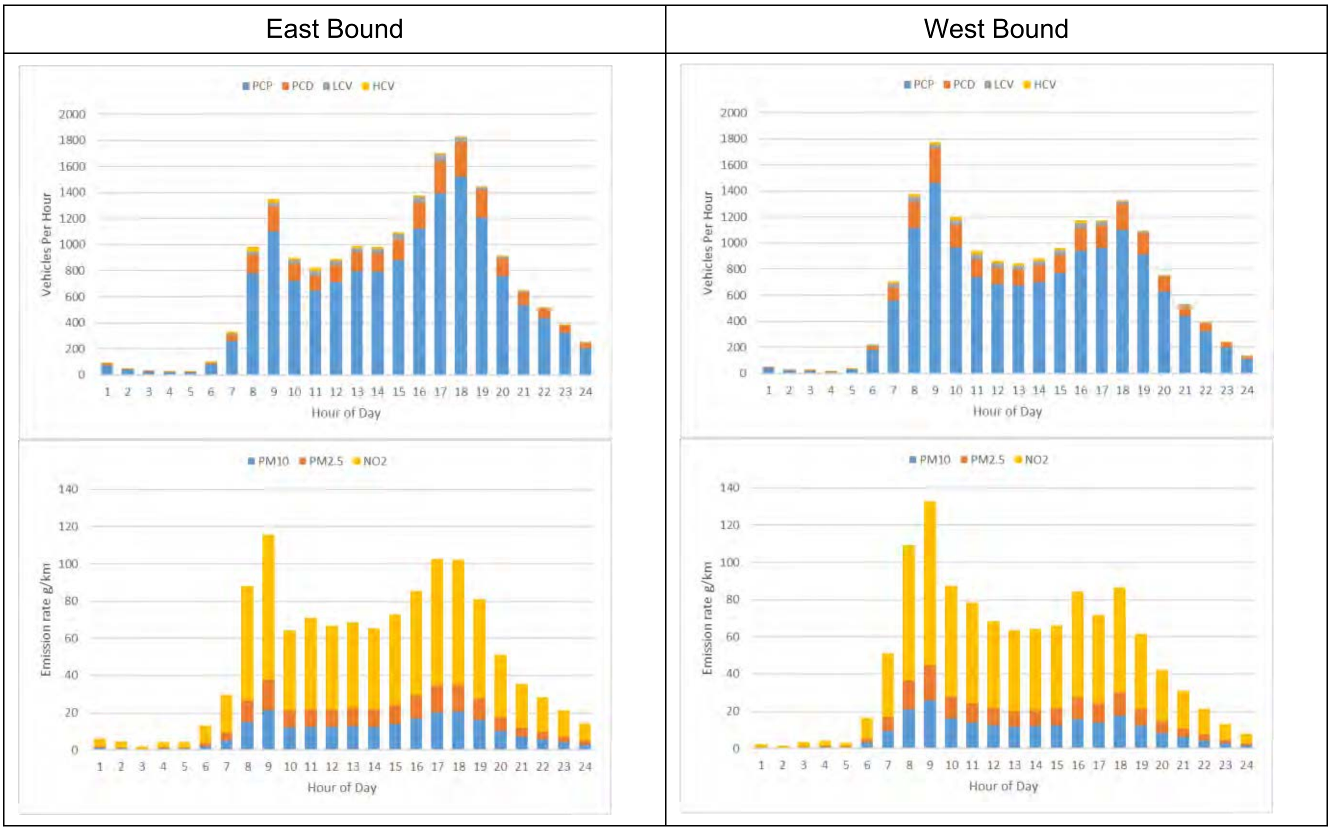


Figure 62: Darebin: Station St to Grange Rd – Project 2026

9.3 Base 2036

Table 35: Darebin 24 hour traffic Volumes – Base 2036

Road	Direction	Cars	LCV	HCV	Total
Station St to Grange Rd	EB	17000	500	250	17750
	WB	16000	500	250	16750

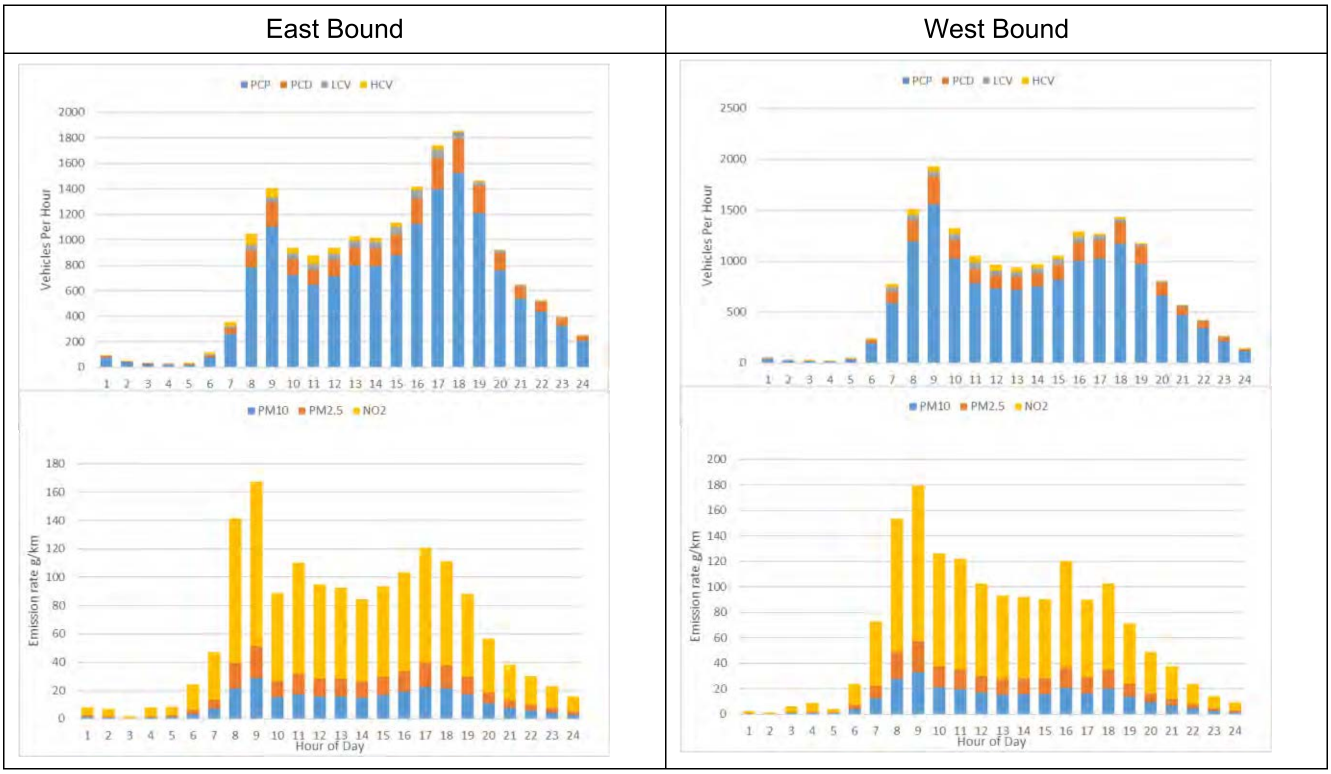


Figure 63: Darebin: Station St to Grange Rd – Base 2036

9.4 Project 2036

Table 36: Darebin Road 24 hour traffic Volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Station St to Grange Rd	EB	16000	500	250	16750
	WB	17000	500	300	17800

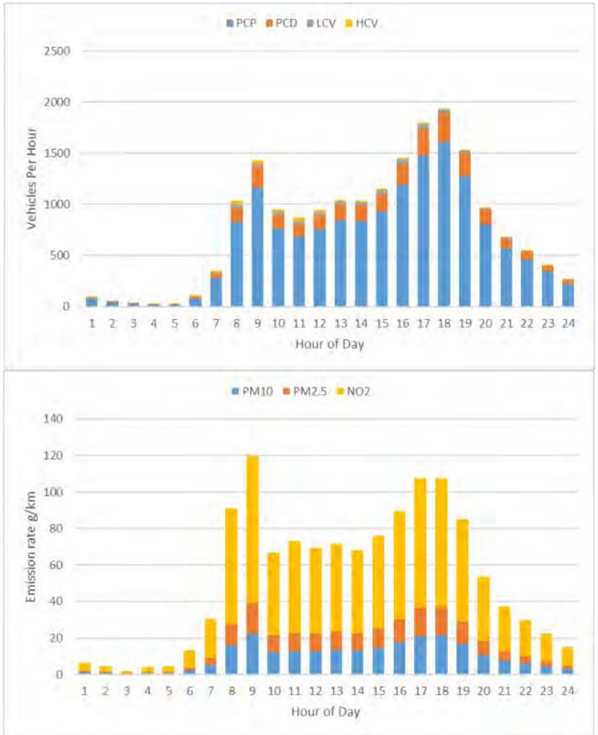
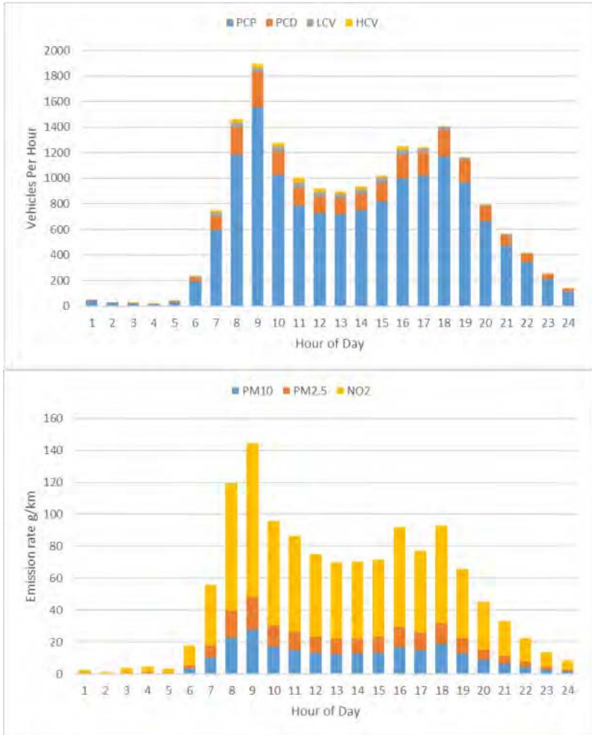
East Bound	West Bound
	

Figure 64: Darebin Rd: Station St to Grange Rd – Project 2036

10.0 EASTERN FREEWAY MIDBLOCK: COLLECTOR DISTRIBUTOR

10.1 Project 2026

Table 37: Eastern Freeway Midblock 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Middleborough Rd to Tram Rd	East Bound	66000	3000	2500	71500
Middleborough Rd to Tram Rd	West Bound	16000	600	200	16800
Tram Rd to Elgar Rd	East Bound	48000	2600	2800	53400
Elgar Rd to Doncaster Rd	East Bound	63000	3000	2700	68700
Elgar Rd to Doncaster Rd	West Bound	65000	2700	2600	70300
Doncaster Rd to Bulleen Rd	East Bound	64000	3200	2800	70000
Doncaster Rd to Bulleen Rd	West Bound	71000	3100	2700	76800
Under Doncaster Rd	East Bound	56000	2400	2600	61000
Under Doncaster Rd	West Bound	59000	2300	2400	63700

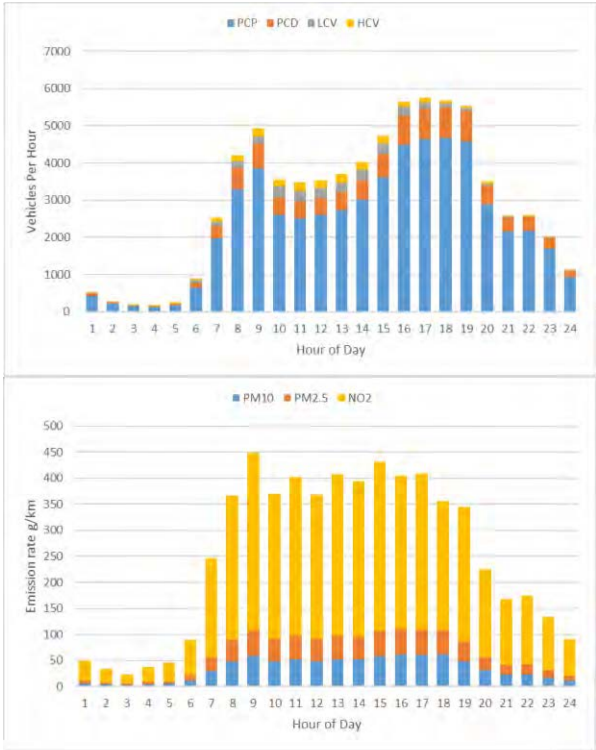
East Bound	West Bound
	

Figure 65: Eastern Fwy Midblock: Collector Distributor: Middleborough Rd to Tram Rd - Project 2026

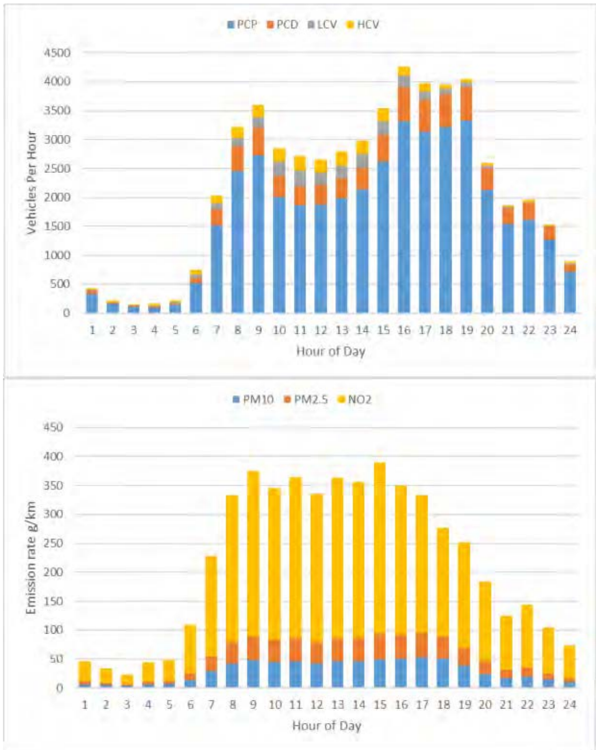
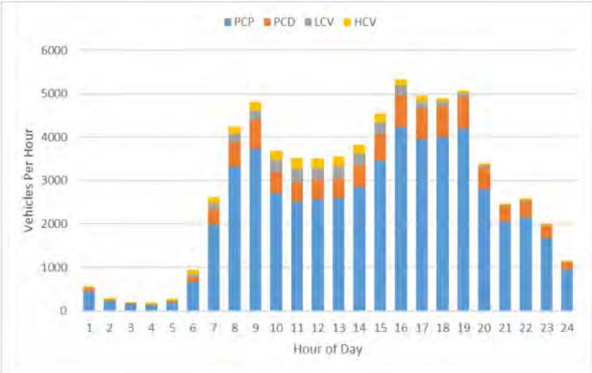
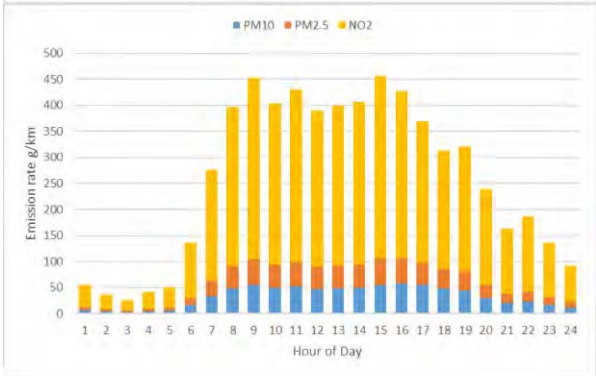
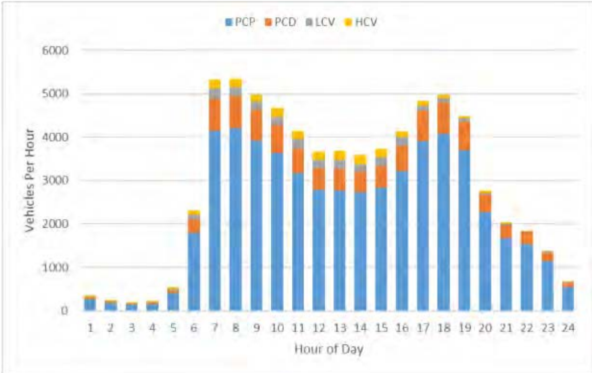
East Bound


Figure 66: Eastern Fwy Midblock: Collector Distributor: Tram Rd to Elgar Rd - Project 2026

East Bound	West Bound







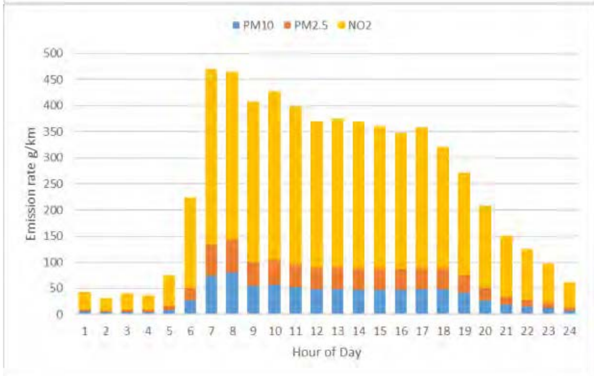
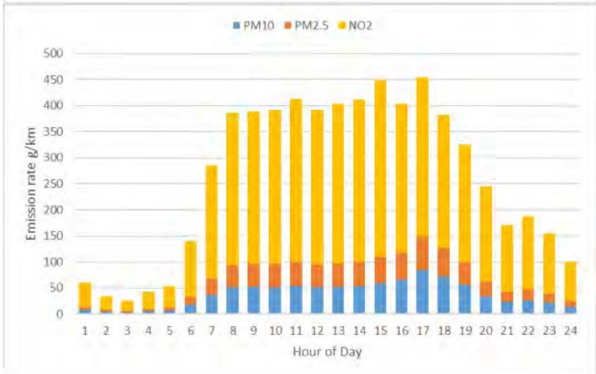


Figure 67: Eastern Fwy Midblock: Collector Distributor: Elgar Rd to Doncaster Rd - Project 2026

East Bound	West Bound



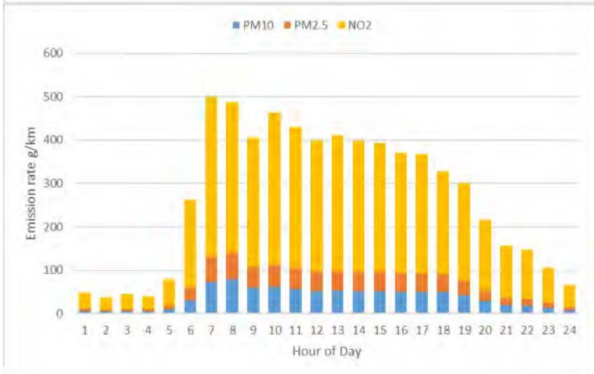


Figure 68: Eastern Fwy Midblock: Collector Distributor: Doncaster Rd to Bulleen Rd - Project 2026

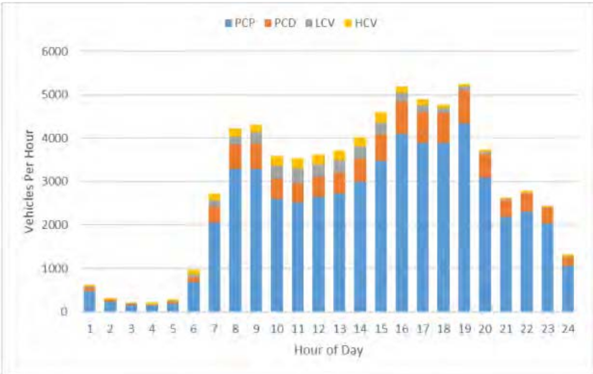
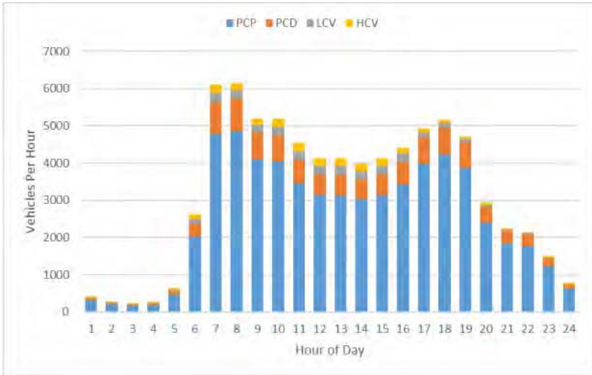
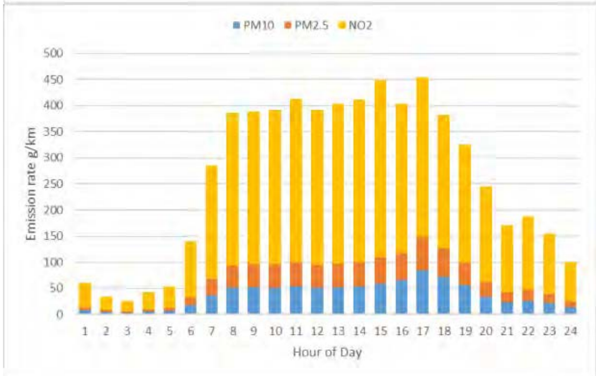
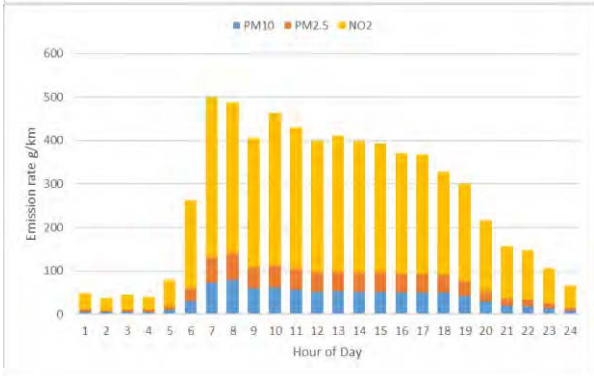
East Bound	West Bound
	
	

Figure 69: Eastern Fwy Midblock: Collector Distributor: Under Doncaster Rd - Project 2026

10.2 Project 2036

Table 38: Eastern Freeway Midblock 24 hour traffic Volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Middleborough Rd to Tram Rd	East Bound	70000	3200	2800	76000
Middleborough Rd to Tram Rd	West Bound	18000	700	250	18950
Tram Rd to Elgar Rd	East Bound	51000	2800	3100	56900
Elgar Rd to Doncaster Rd	East Bound	67000	3300	3100	73400
Elgar Rd to Doncaster Rd	West Bound	68000	2900	3000	73900
Doncaster Rd to Bulleen Rd	East Bound	68000	3500	3200	74700
Doncaster Rd to Bulleen Rd	West Bound	74000	3400	3100	80500
Under Doncaster Rd	East Bound	60000	2600	2900	65500
Under Doncaster Rd	West Bound	61000	2500	2700	66200

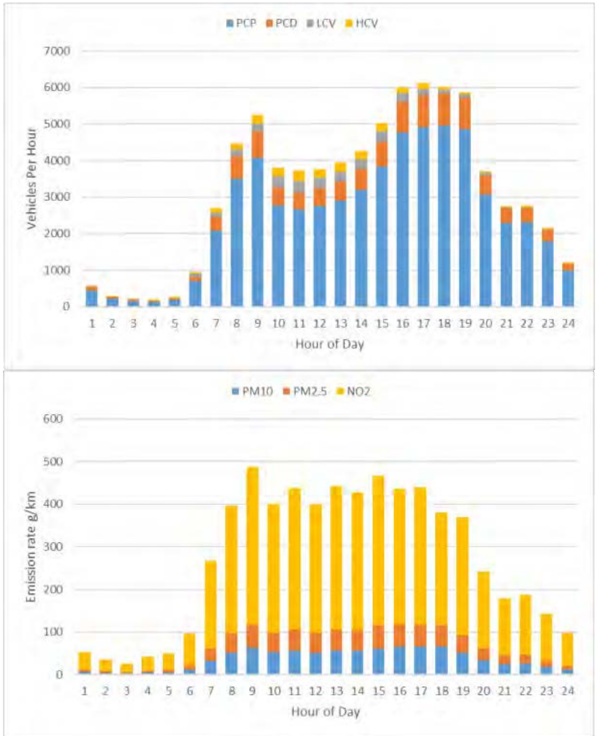
East Bound	West Bound
	

Figure 70: Eastern Fwy Midblock: Collector Distributor: Middleborough Rd to Tram Rd - Project 2036

East Bound


Figure 71: Eastern Fwy Midblock: Collector Distributor: Tram Rd to Elgar Rd - Project 2036

East Bound	West Bound

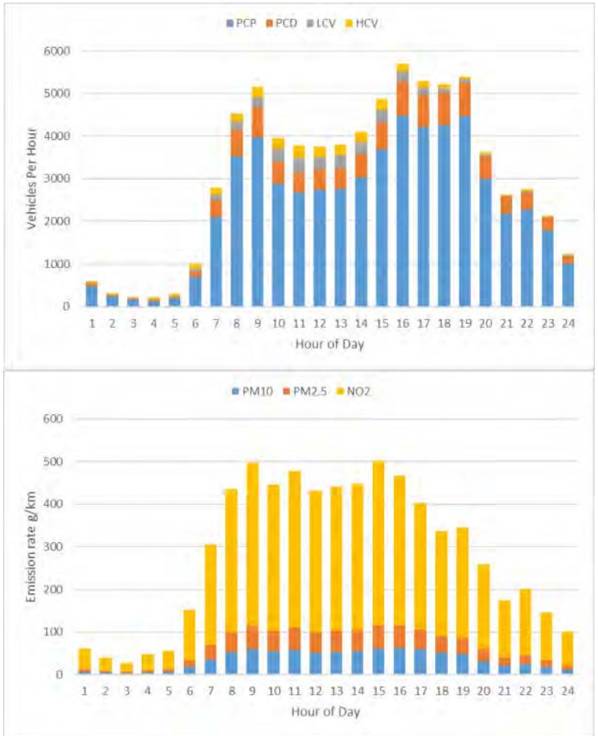
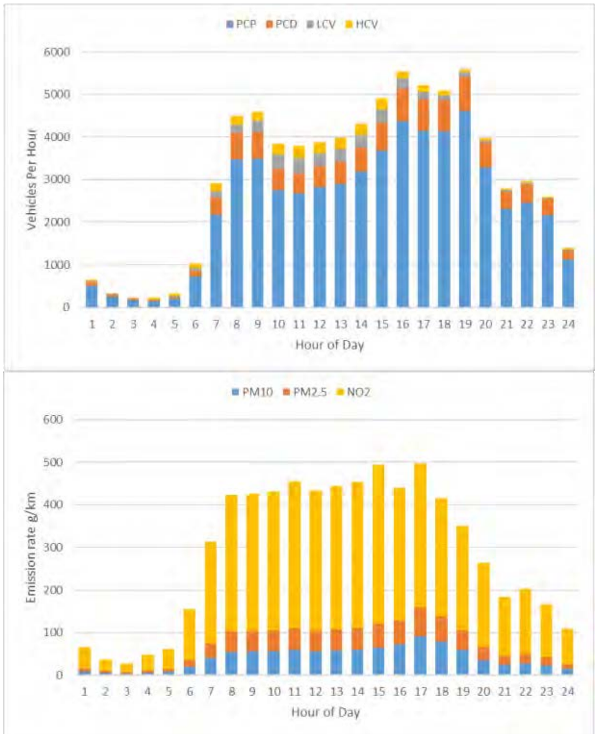


Figure 72: Eastern Fwy Midblock: Collector Distributor: Elgar Rd to Doncaster Rd - Project 2036

East Bound	West Bound



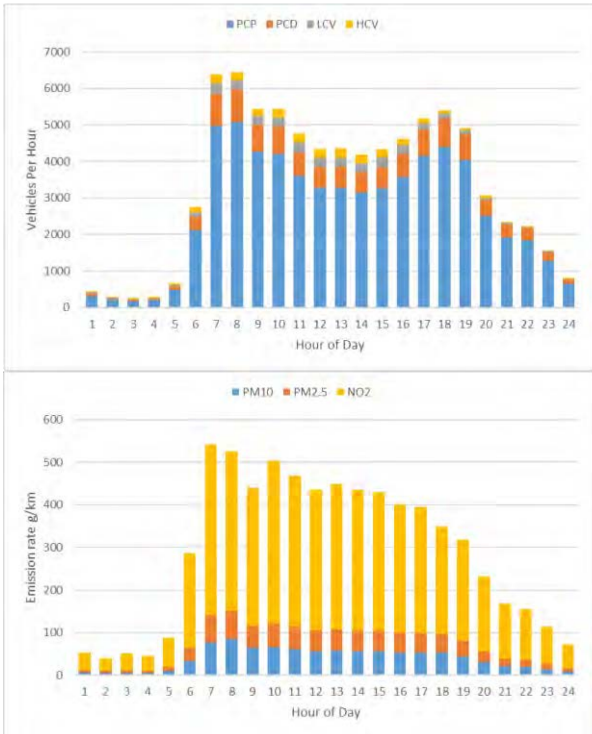


Figure 73: Eastern Fwy Midblock: Collector Distributor: Doncaster Rd to Bulleen Rd - Project 2036

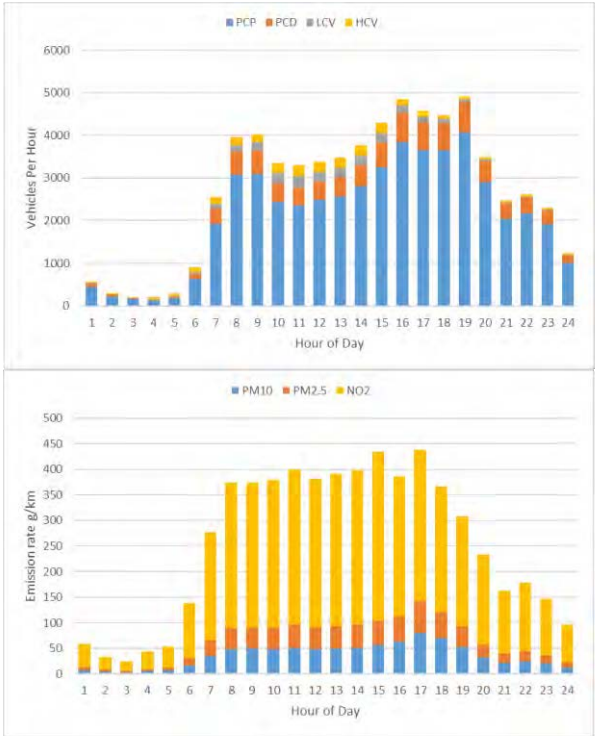
East Bound	West Bound
	

Figure 74: Eastern Fwy Midblock: Collector Distributor: Under Doncaster Rd - Project 2036

11.0 EASTERN FREEWAY MIDBLOCK: MAINLINE

11.1 Project 2026

Table 39: Eastern Freeway Midblock 24 hour traffic Volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Middleborough Rd to Tram Rd	East Bound	54000	1800	1400	57200
	West Bound	104000	3700	3700	111400
Elgar Rd to Doncaster Rd	East Bound	58000	1800	1200	61000
Elgar Rd to Doncaster Rd	West Bound	55000	1700	1000	57700
Doncaster Rd to Bulleen Rd	East Bound	58000	1800	1200	61000
Doncaster Rd to Bulleen Rd	West Bound	55000	1700	1000	57700
Under Doncaster Rd	East Bound	58000	1800	1200	61000
Under Doncaster Rd	West Bound	55000	1700	1000	57700

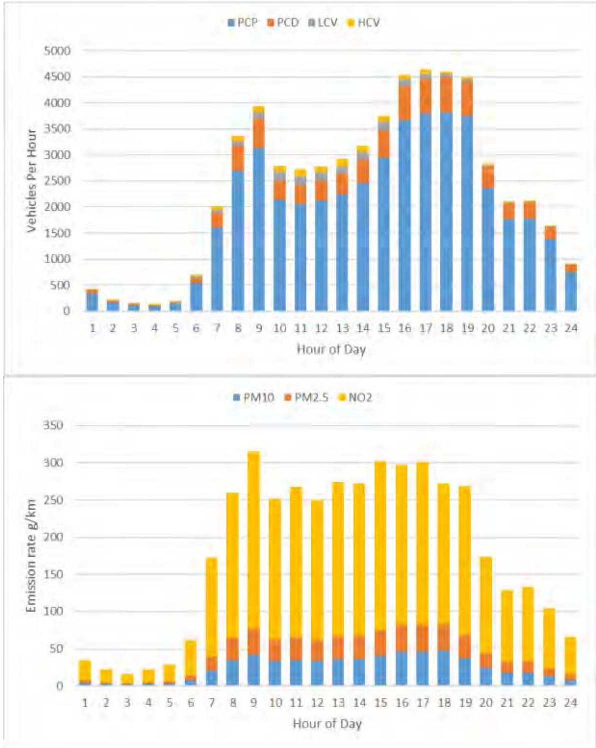
East Bound	West Bound
	

Figure 75: Eastern Fwy Midblock: Collector Distributor: Middleborough Rd to Tram Rd - Project 2026

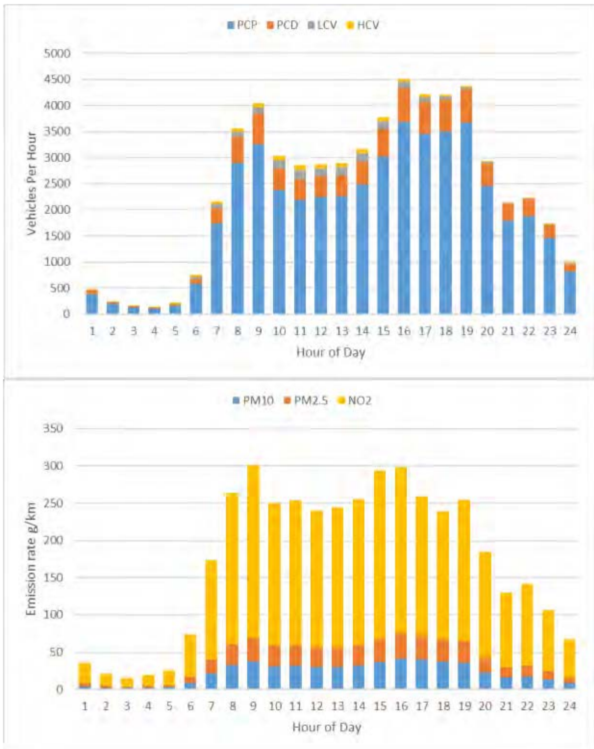
East Bound	West Bound
	

Figure 76: Eastern Fwy Midblock: Collector Distributor: Elgar Rd to Doncaster Rd - Project 2026

East Bound	West Bound

Figure 77: Eastern Fwy Midblock: Collector Distributor: Doncaster Rd to Bulleen Rd - Project 2026

East Bound	West Bound

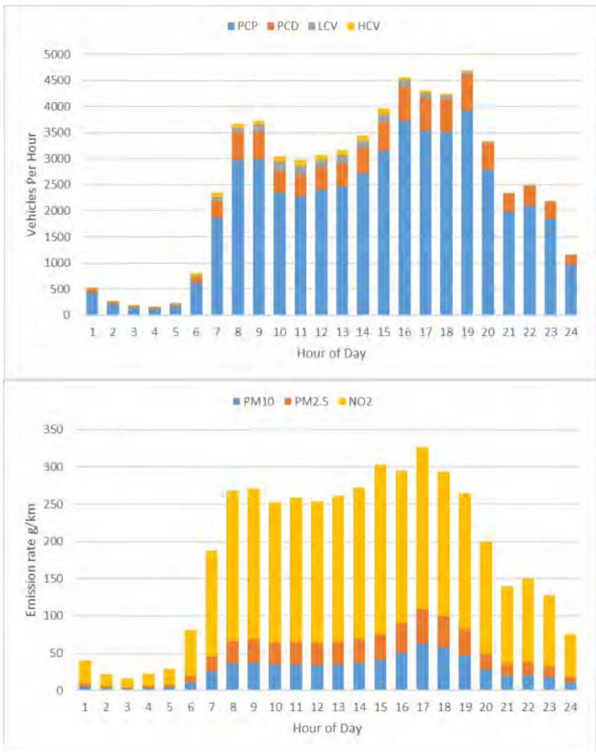


Figure 78: Eastern Fwy Midblock: Collector Distributor: Under Doncaster Rd - Project 2026

11.2 Project 2036

Table 40: Eastern Freeway Midblock 24 hour traffic Volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Middleborough Rd to Tram Rd	East Bound	55000	2100	1700	58800
Middleborough Rd to Tram Rd	West Bound	109000	4100	4300	117400
Tram Rd to Elgar Rd	East Bound	60000	2000	1400	63400
Elgar Rd to Doncaster Rd	East Bound	60000	2000	1400	63400
Elgar Rd to Doncaster Rd	West Bound	58000	1900	1300	61200
Doncaster Rd to Bulleen Rd	East Bound	60000	2000	1400	63400
Doncaster Rd to Bulleen Rd	West Bound	60000	2000	1400	63400
Under Doncaster Rd	East Bound	60000	2600	2900	65500
Under Doncaster Rd	West Bound	61000	2500	2700	66200

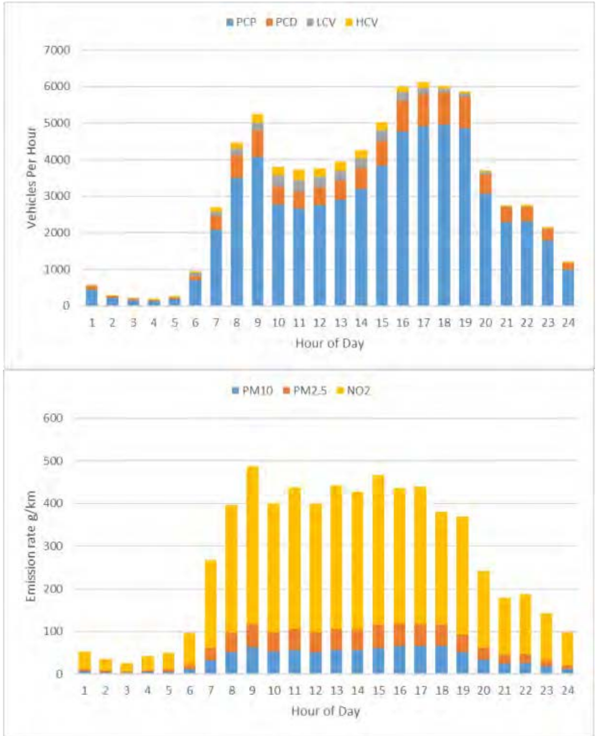
East Bound	West Bound
	

Figure 79: Eastern Fwy Midblock: Collector Distributor: Middleborough Rd to Tram Rd - Project 2036

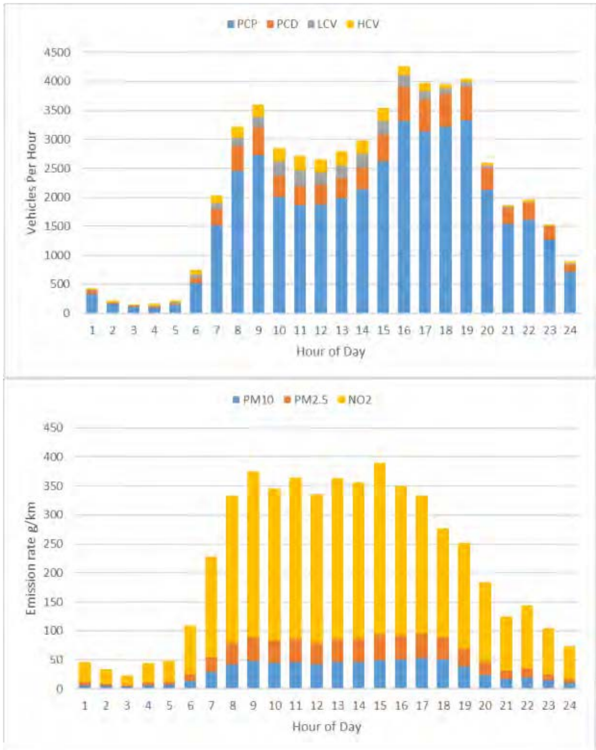
East Bound


Figure 80: Eastern Fwy Midblock: Collector Distributor: Tram Rd to Elgar Rd - Project 2036

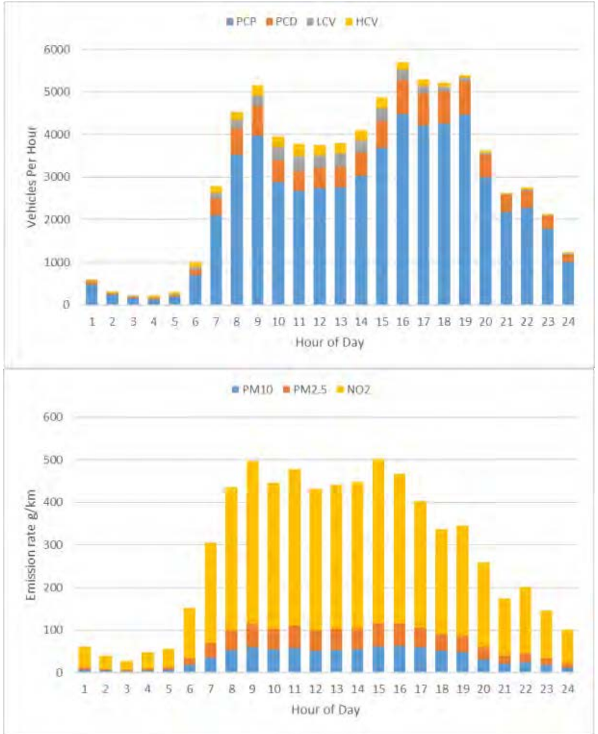
East Bound	West Bound
	

Figure 81: Eastern Fwy Midblock: Collector Distributor: Elgar Rd to Doncaster Rd - Project 2036

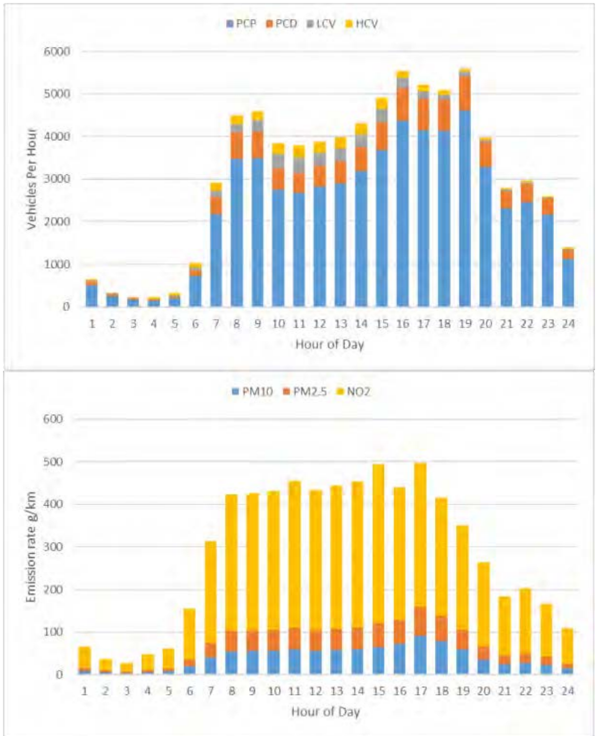
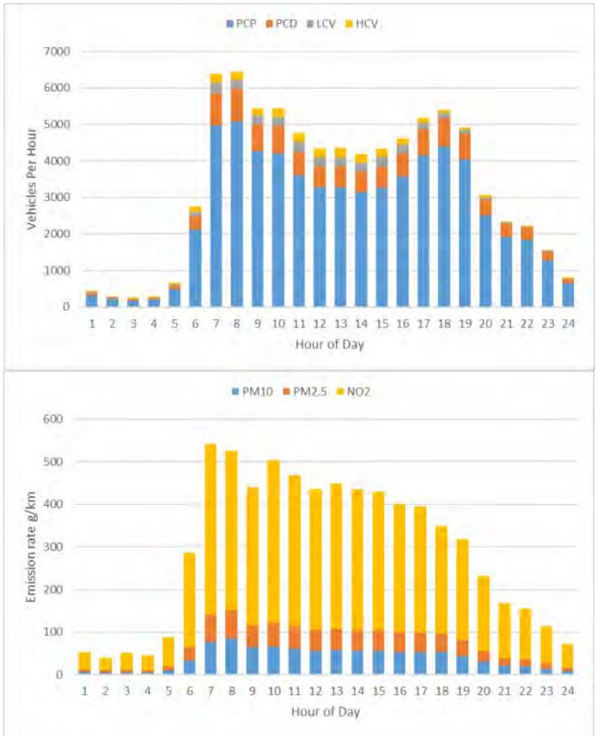
East Bound	West Bound
	

Figure 82: Eastern Fwy Midblock: Collector Distributor: Doncaster Rd to Bulleen Rd - Project 2036

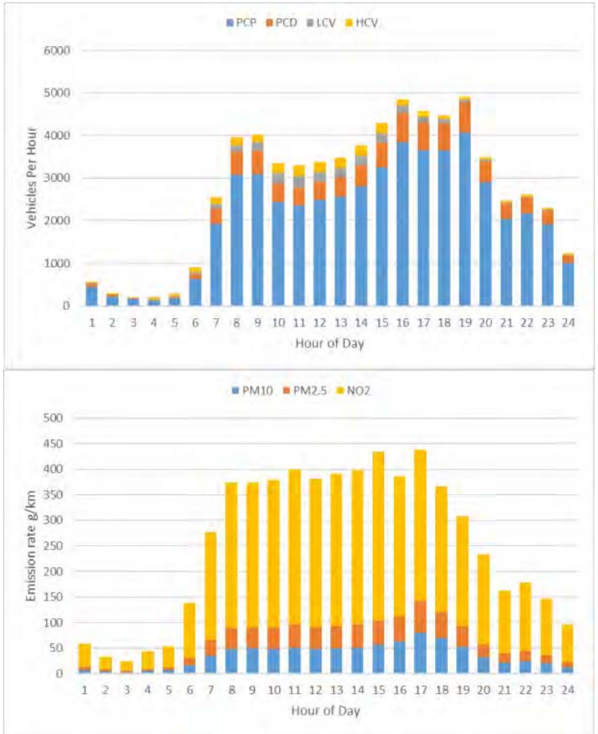
East Bound	West Bound
	

Figure 83: Eastern Fwy Midblock: Collector Distributor: Under Doncaster Rd - Project 2036

12.0 EASTERN FWY MIDBLOCK

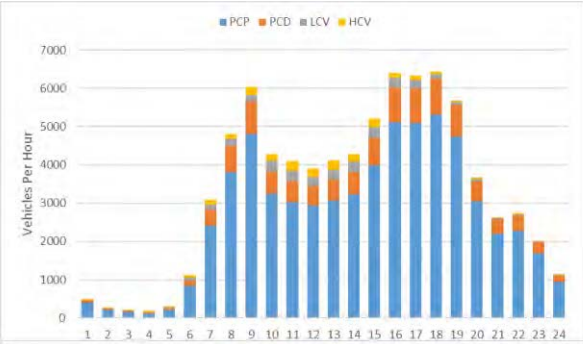
12.1 Base 2026

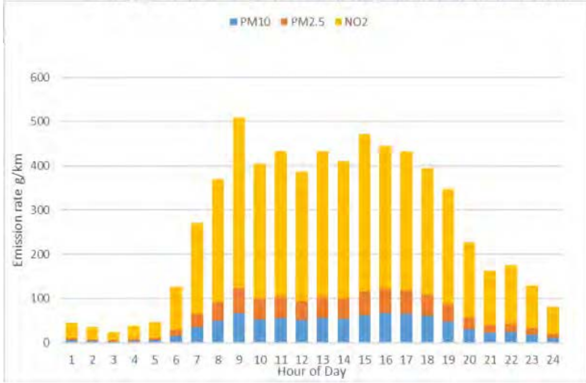
Table 41: Eastern Fwy Midblock 24 hour traffic volumes - Base 2026

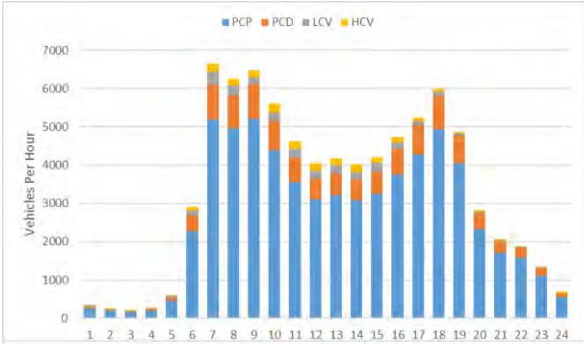
Road	Direction	Cars	LCV	HCV	Total
Springvale Rd to Blackburn Rd	East Bound	74000	3000	2500	79500
Springvale Rd to Blackburn Rd	West Bound	75000	2900	2400	80300
Blackburn Rd to Middleborough Rd	East Bound	83000	3200	2800	89000
Blackburn Rd to Middleborough Rd	West Bound	85000	3100	2500	90600
Middleborough Rd to Tram Rd	East Bound	87000	3500	2500	93000
Middleborough Rd to Tram Rd	West Bound	90000	3300	2500	95800
Tram Rd to Elgar Rd	East Bound	73000	3000	2500	78500
Tram Rd to Elgar Rd	West Bound	75000	3000	2300	80300
Elgar Rd to Doncaster Rd	East Bound	83000	3200	2400	88600
Elgar Rd to Doncaster Rd	West Bound	86000	3200	2400	91600
Doncaster Rd to Bulleen Rd	East Bound	83000	3300	2400	88700
Doncaster Rd to Bulleen Rd	West Bound	84000	3200	2400	89600
Bulleen Rd to Burke Rd	East Bound	74000	2400	1200	77600

Road	Direction	Cars	LCV	HCV	Total
Bulleen Rd to Burke Rd	West Bound	76000	2400	1200	79600
Burke Rd to Chandler Hwy	East Bound	85000	2600	1300	88900
Burke Rd to Chandler Hwy	West Bound	85000	2500	1200	88700
Chandler Hwy to Hoddle St	East Bound	78000	2500	900	81400
Chandler Hwy to Hoddle St	West Bound	70000	2300	900	73200
Under Springale Rd	East Bound	50000	600	1800	52400
Under Springale Rd	West Bound	51000	2100	1700	54800
Under Middlelborough Rd	East Bound	76000	3000	2300	81300
Under Middlelborough Rd	West Bound	78000	2700	2400	83100
Under Doncaster Rd	East Bound	75000	2800	2300	80100
Under Doncaster Rd	West Bound	77000	2700	2200	81900
Under Bulleen Rd	East Bound	63000	1800	1000	65800
Under Bulleen Rd	West Bound	65000	1300	1000	67300
Under Chandler Hwy	East Bound	68000	1800	800	70600
Under Chandler Hwy	West Bound	66000	700	600	67300

East Bound	West Bound







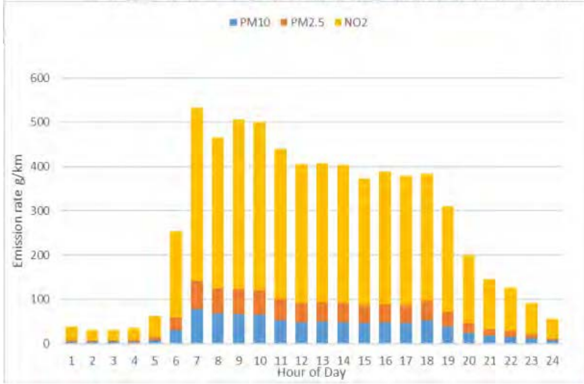


Figure 84: Eastern Fwy Midblock: Springvale Rd to Blackburn Rd - Base 2026

East Bound	West Bound

Figure 85: Eastern Fwy Midblock: Blackburn Rd to Middleborough Rd - Base 2026

East Bound	West Bound

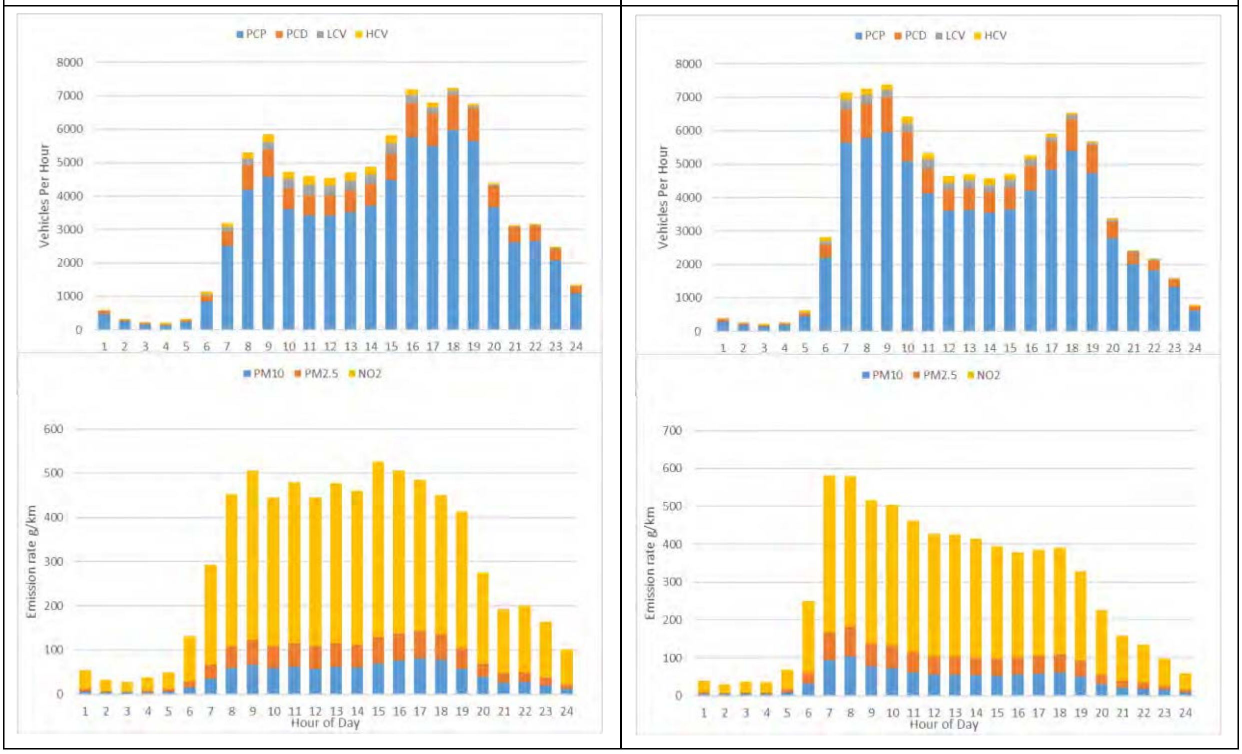


Figure 86: Eastern Fwy Midblock: Blackburn Rd to Middleborough Rd - Base 2026

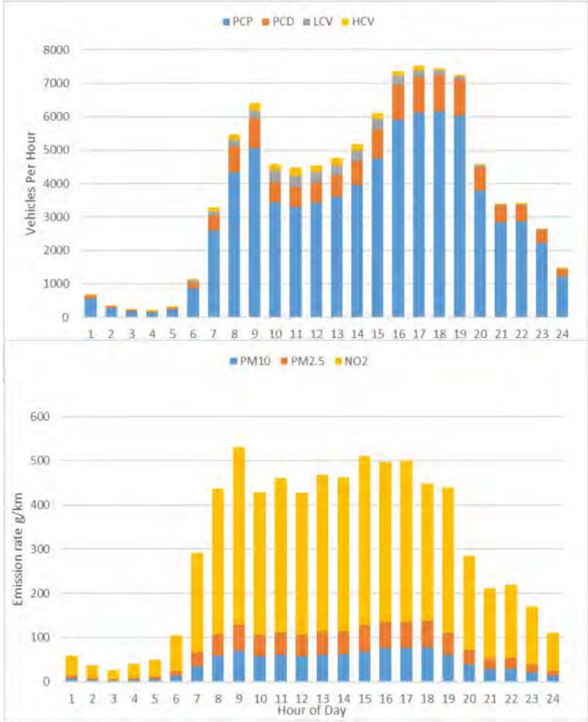
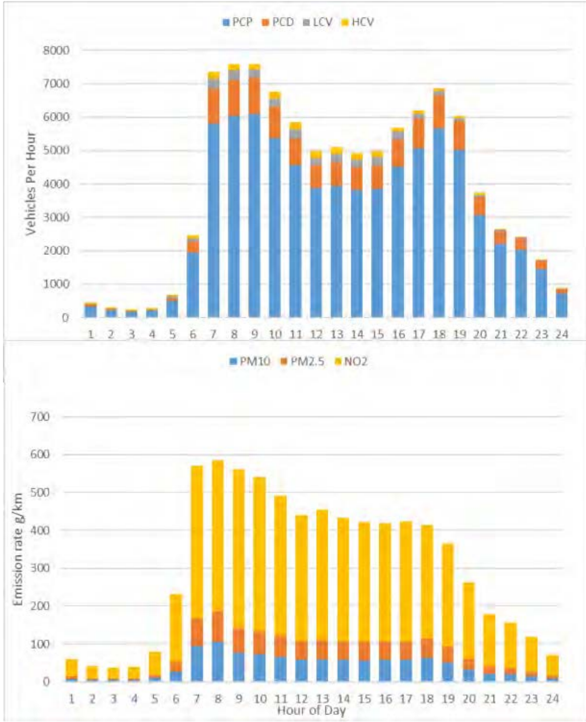
East Bound	West Bound
	

Figure 87: Eastern Fwy Midblock: Middleborough Rd to Tram Rd - Base 2026

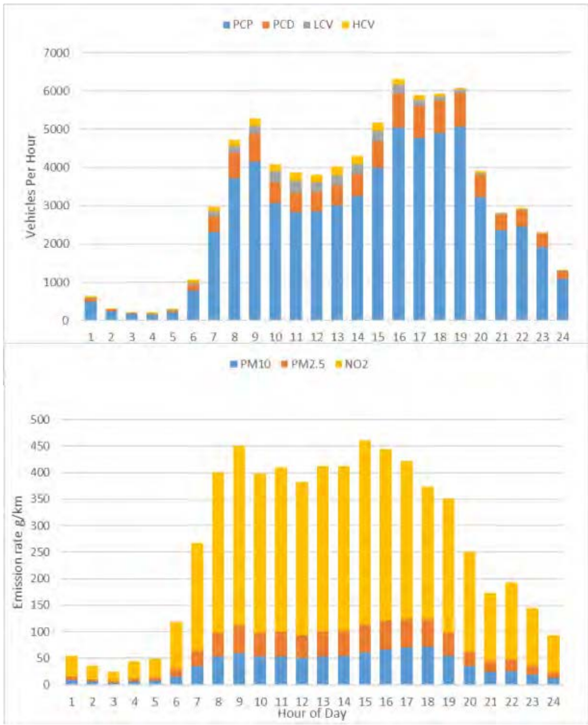
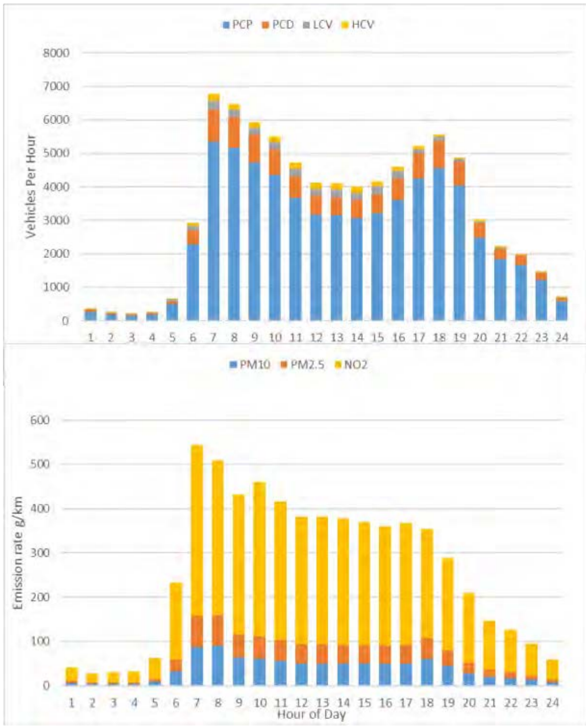
East Bound	West Bound
	

Figure 88: Eastern Fwy Midblock: Tram Rd to Elgar Rd - Base 2026

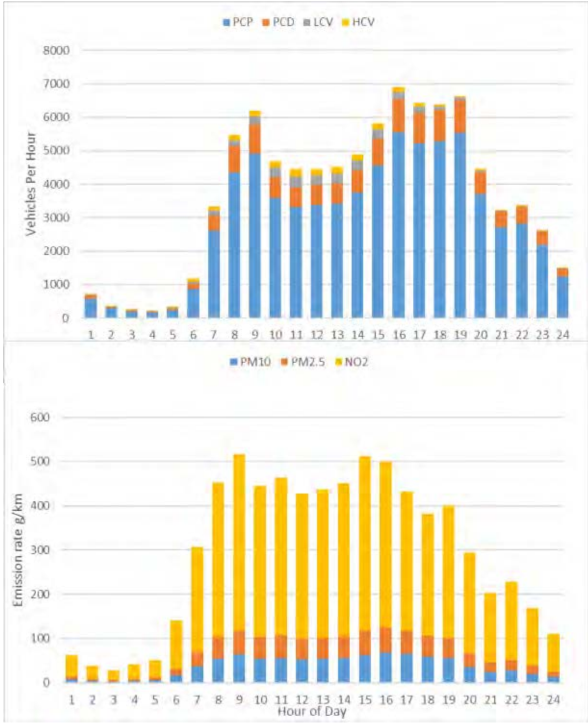
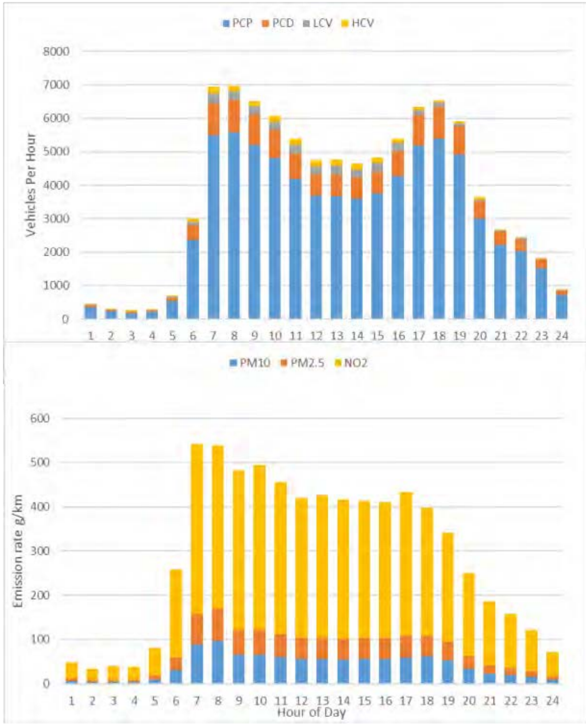
East Bound	West Bound
	

Figure 89: Eastern Fwy Midblock: Elgar Rd to Doncaster Rd - Base 2026

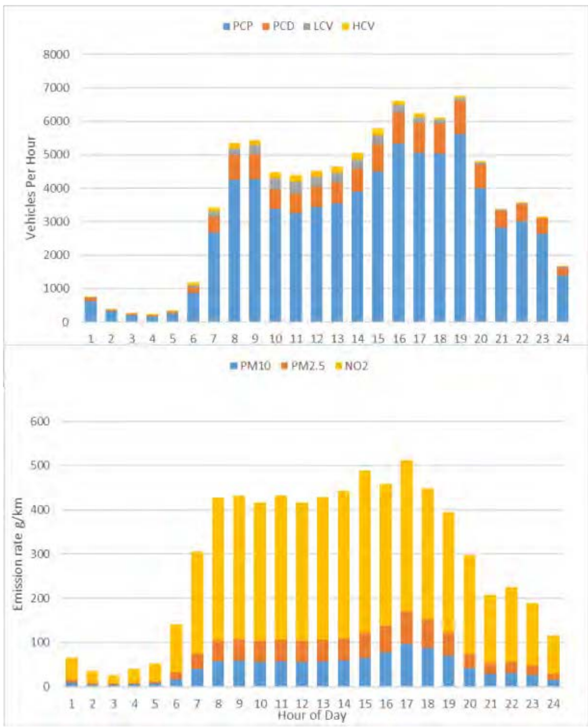
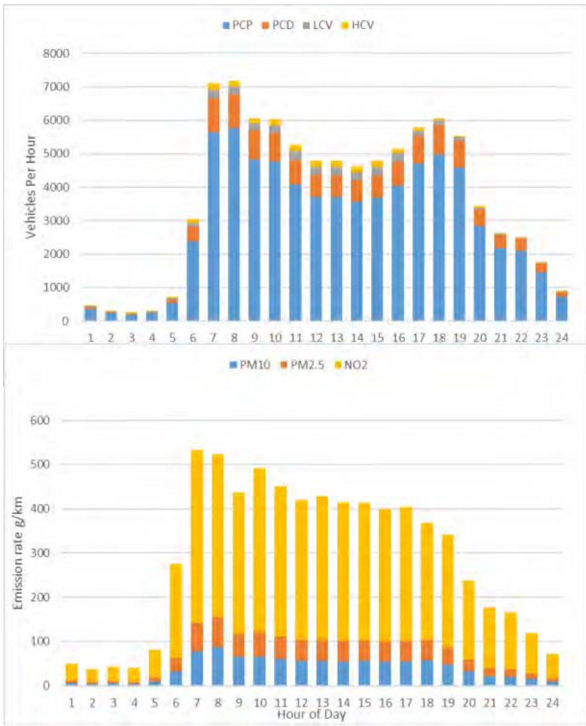
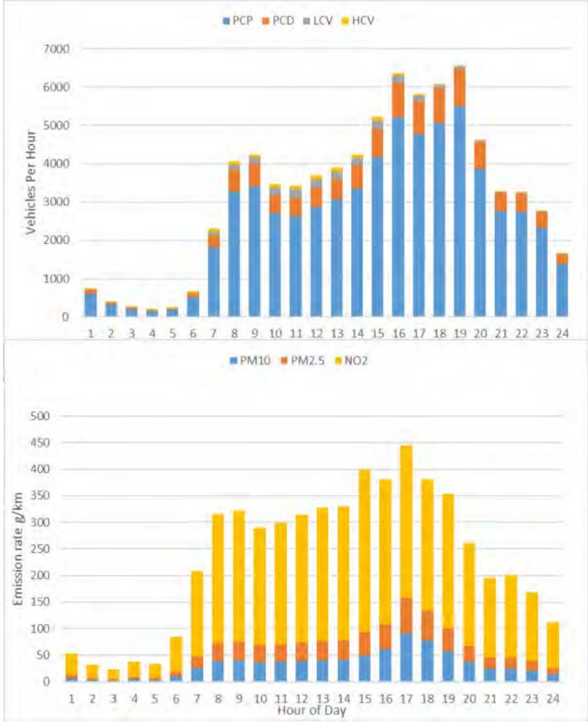
East Bound	West Bound
	

Figure 90: Eastern Fwy Midblock: Doncaster Rd to Bulleen Rd - Base 2026

East Bound



West Bound

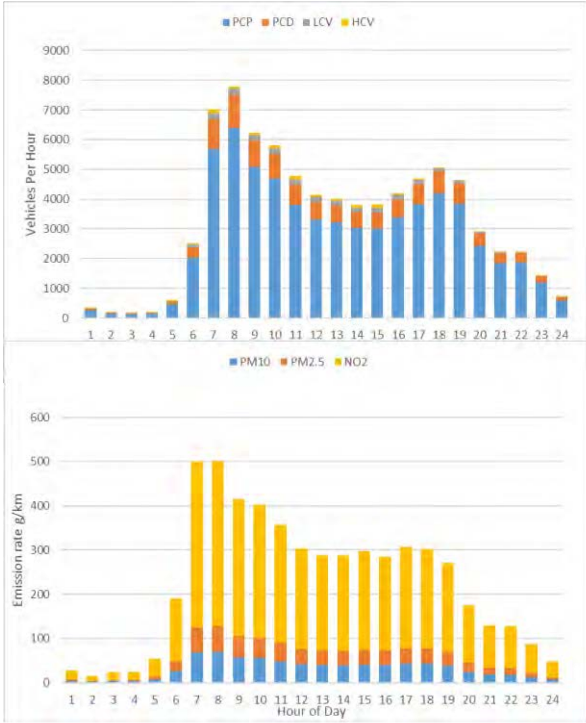
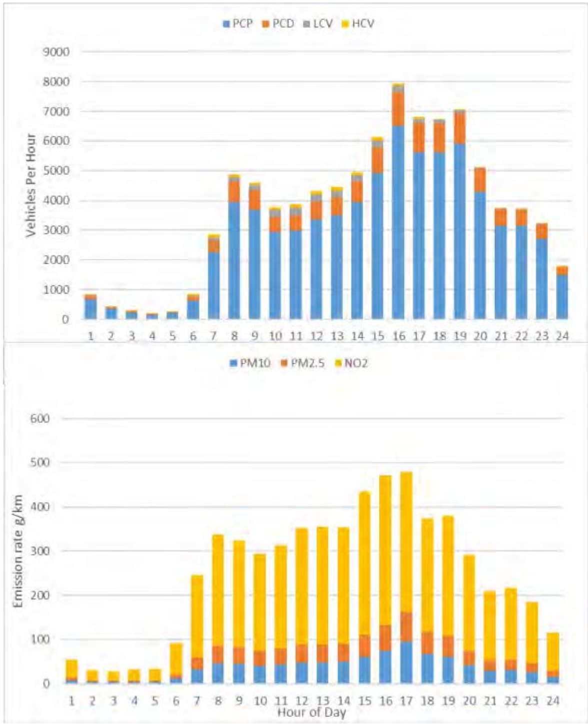


Figure 91: Eastern Fwy Midblock: Bulleen Rd to Burke Rd - Base 2026

East Bound



West Bound

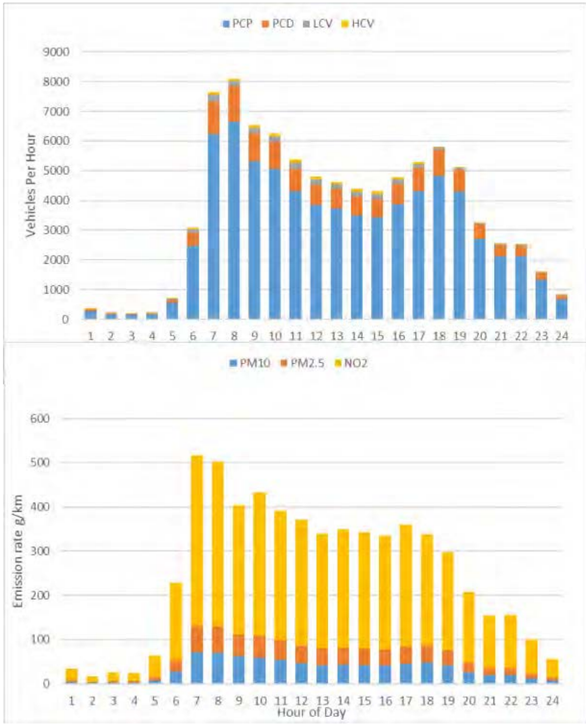


Figure 92: Eastern Fwy Midblock: Burke Rd to Chandler Hwy - Base 2026

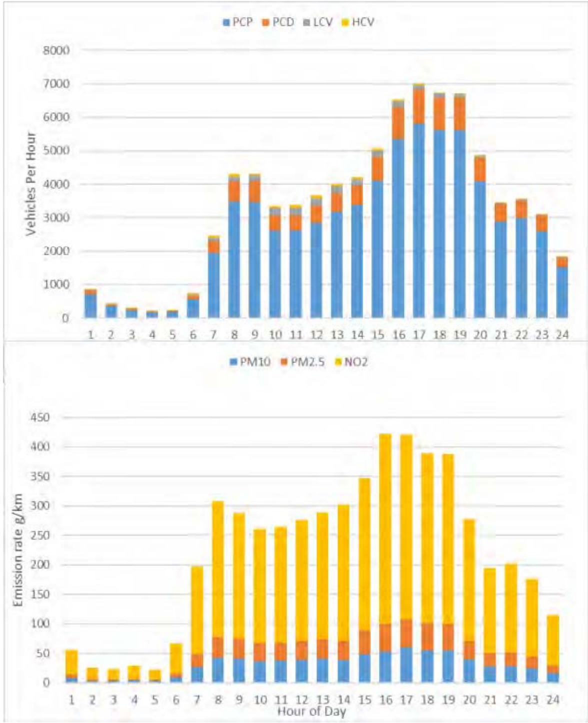
East Bound	West Bound
	

Figure 93: Eastern Fwy Midblock: Chandler Hwy to Hoddle St - Base 2026

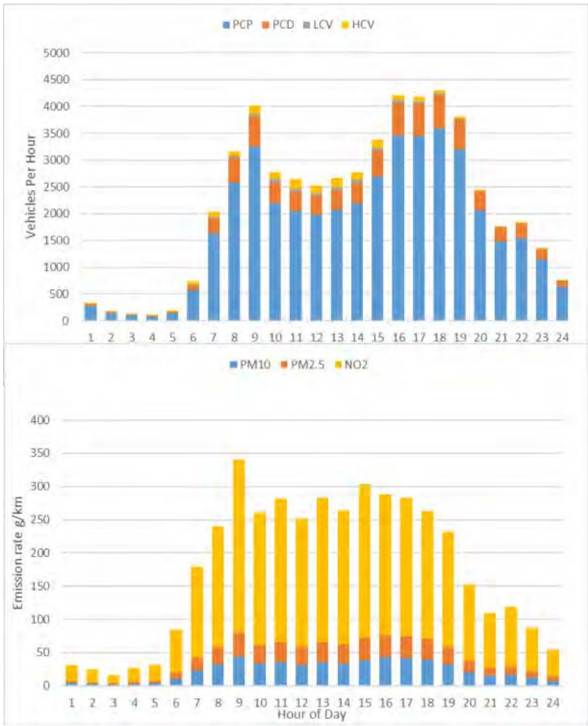
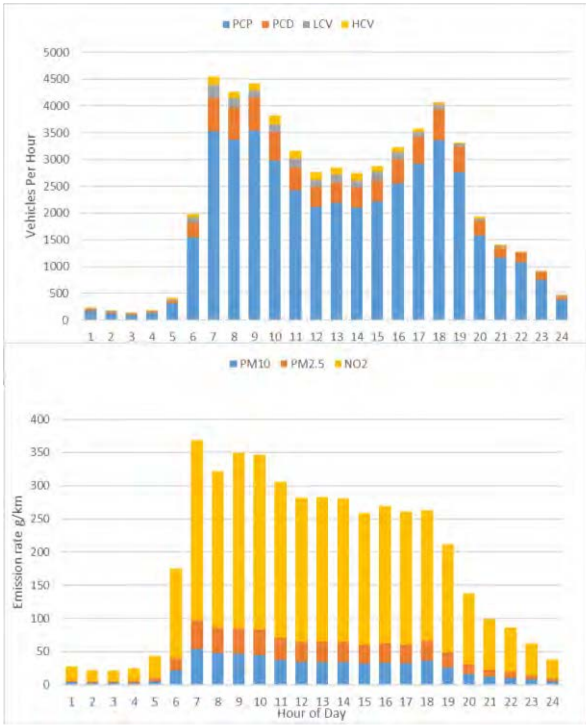
East Bound	West Bound
	

Figure 94: Eastern Fwy Midblock: Under Springvale Rd - Base 2026

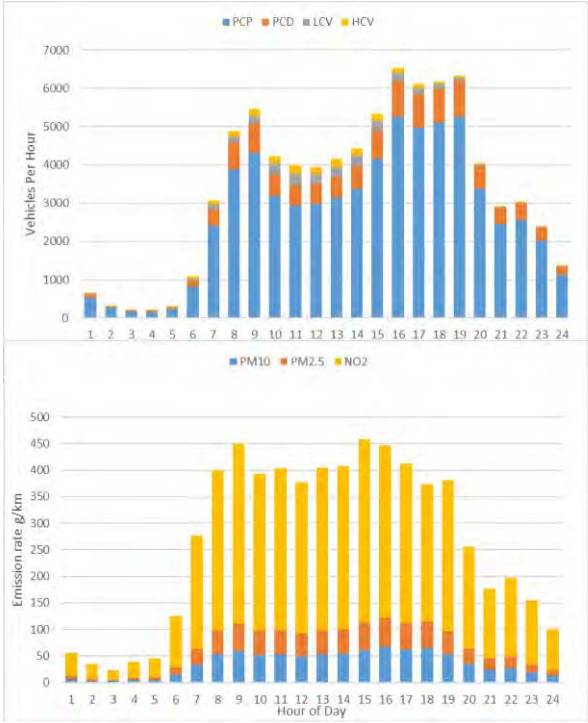
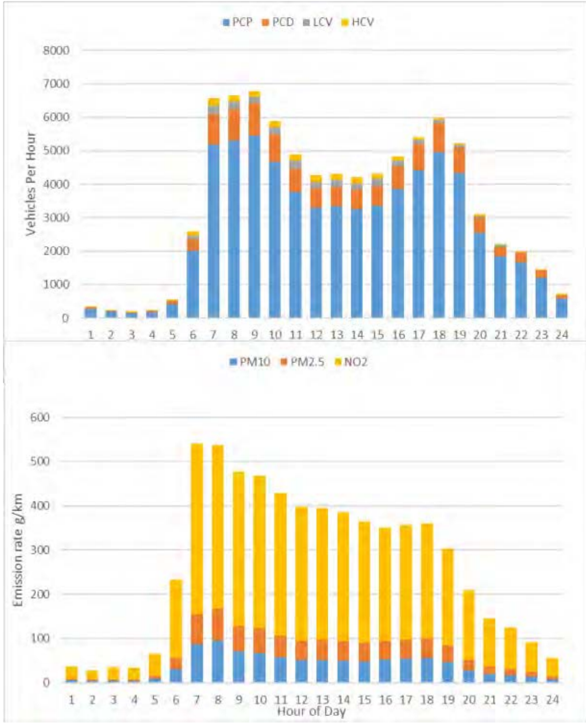
East Bound	West Bound
	

Figure 95: Eastern Fwy Midblock: Under Middlelborough Rd - Base 2026

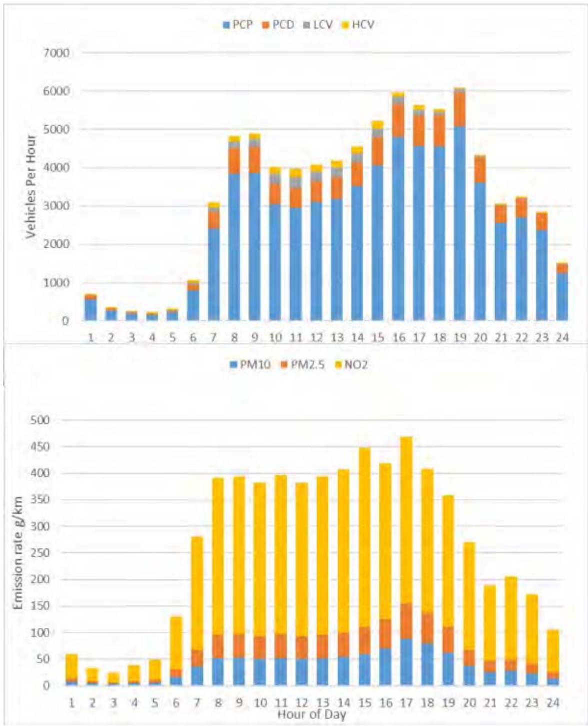
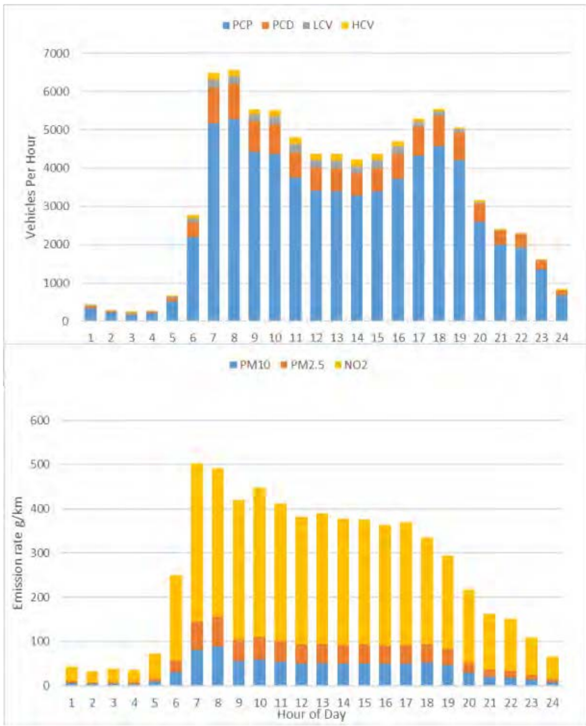
East Bound	West Bound
	

Figure 96: Eastern Fwy Midblock: Under Doncaster Rd - Base 2026

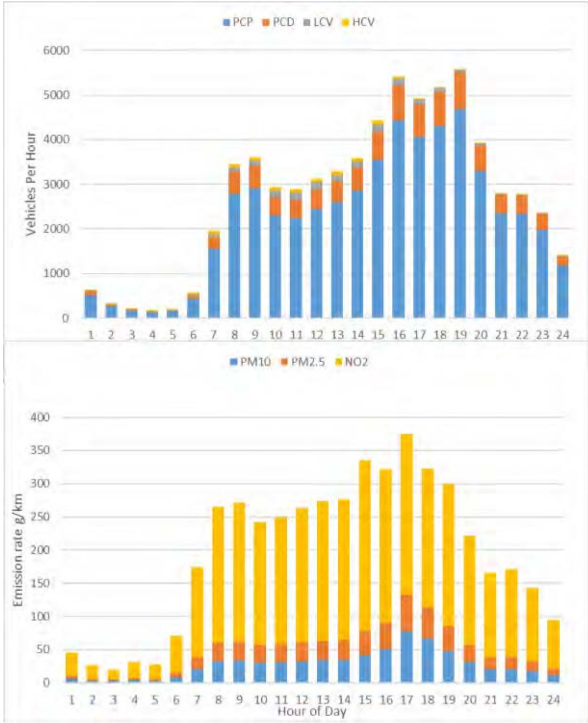
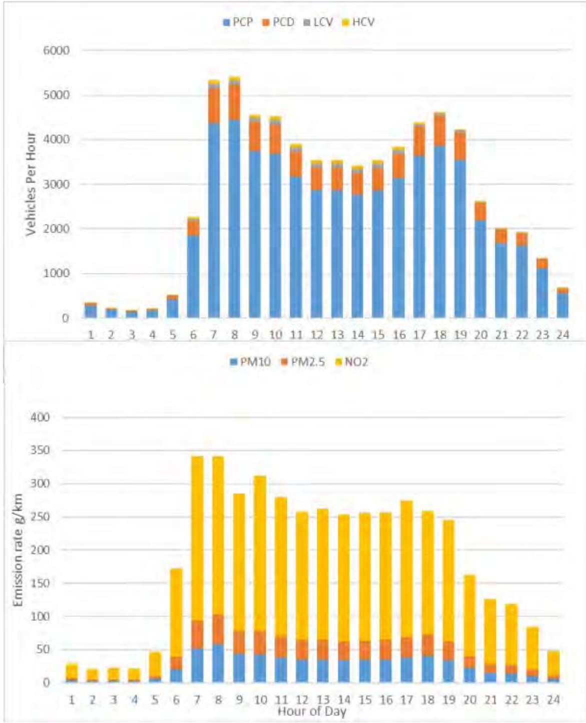
East Bound	West Bound
	

Figure 97: Eastern Fwy Midblock: Under Bulleen Rd - Base 2026

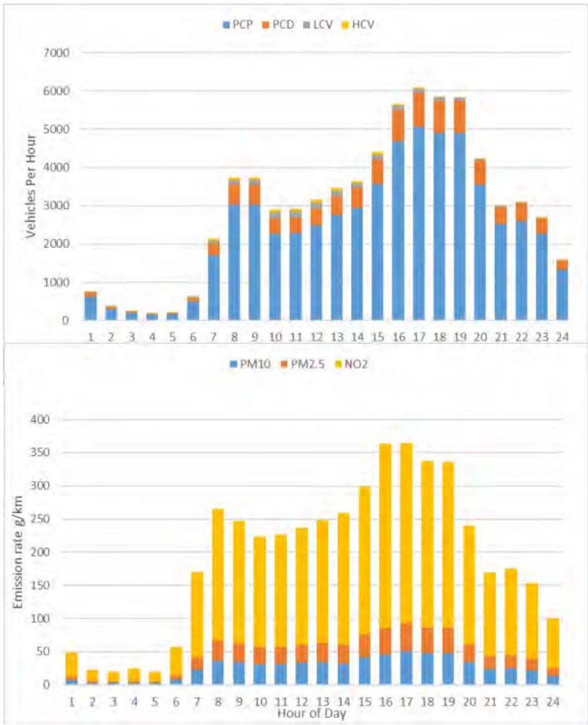
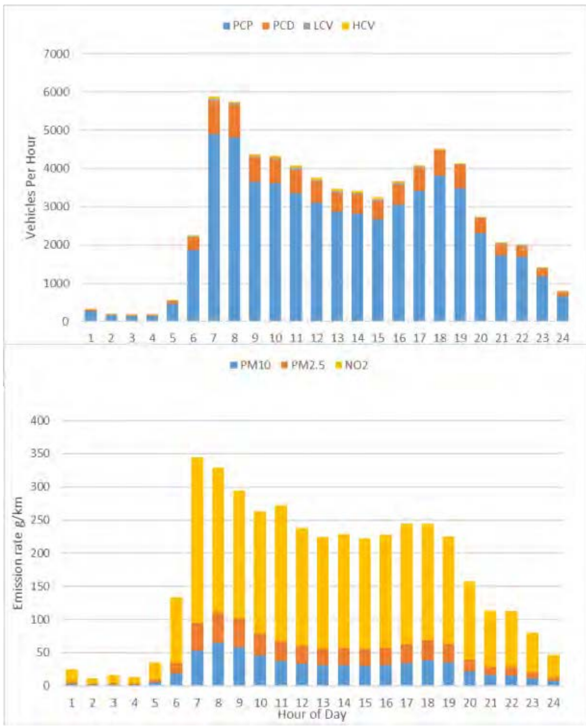
East Bound	West Bound
	

Figure 98: Eastern Fwy Midblock: Under Chandler Hwy - Base 2026

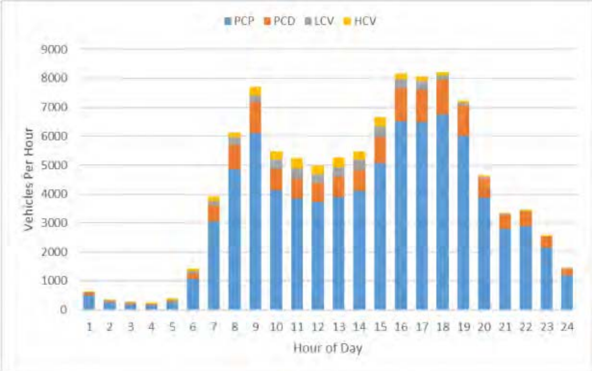
12.2 Project 2026

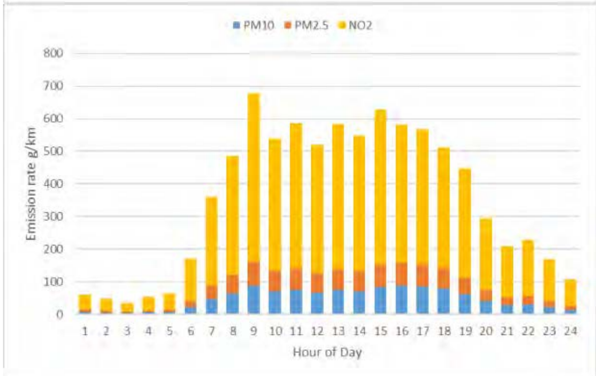
Table 42: Eastern Fwy Midblock 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Springvale Rd to Blackburn Rd	East Bound	94000	3800	3600	101400
Springvale Rd to Blackburn Rd	West Bound	90000	3400	3400	96800
Blackburn Rd to Middleborough Rd	East Bound	105000	4000	4000	113000
Blackburn Rd to Middleborough Rd	West Bound	103000	3800	3700	110500
Middleborough Rd to Tram Rd	East Bound	120000	4800	3900	128700
Middleborough Rd to Tram Rd	West Bound	120000	4300	3800	128100
Tram Rd to Elgar Rd	East Bound	105000	4400	3900	113300
Tram Rd to Elgar Rd	West Bound	105000	4200	3600	112800
Elgar Rd to Doncaster Rd	East Bound	120000	4800	3900	128700
Elgar Rd to Doncaster Rd	West Bound	120000	4400	3700	128100
Doncaster Rd to Bulleen Rd	East Bound	122000	5000	4000	131000
Doncaster Rd to Bulleen Rd	West Bound	125000	4800	3700	133500
Bulleen Rd to Burke Rd	East Bound	88000	2800	1100	91900
Bulleen Rd to Burke Rd	West Bound	88000	2800	1100	91900

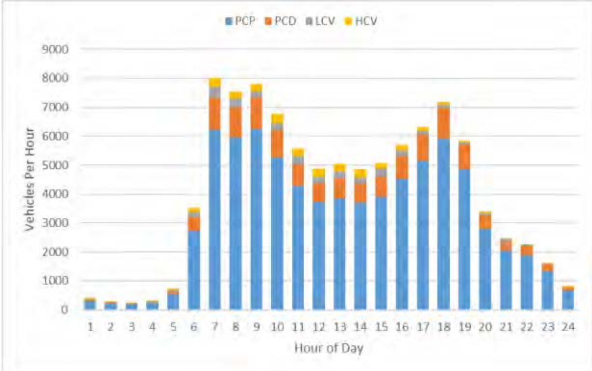
Road	Direction	Cars	LCV	HCV	Total
Burke Rd to Chandler Hwy	East Bound	97000	2800	1200	101000
Burke Rd to Chandler Hwy	West Bound	95000	2800	1200	99000
Chandler Hwy to Hoddle St	East Bound	83000	2700	900	86600
Chandler Hwy to Hoddle St	West Bound	74000	2400	900	77300
Under Springale Rd	East Bound	59000	700	2700	62400
Under Springale Rd	West Bound	60000	2400	2500	64900
Under Middlelborough Rd	East Bound	102000	3900	3400	109300
Under Middlelborough Rd	West Bound	101000	3500	3600	108100
Under Doncaster Rd	East Bound	113000	4200	3700	120900
Under Doncaster Rd	West Bound	114000	4000	3400	121400
Under Bulleen Rd	East Bound	79000	2200	1000	82200
Under Bulleen Rd	West Bound	103000	2600	2300	107900

East Bound





West Bound



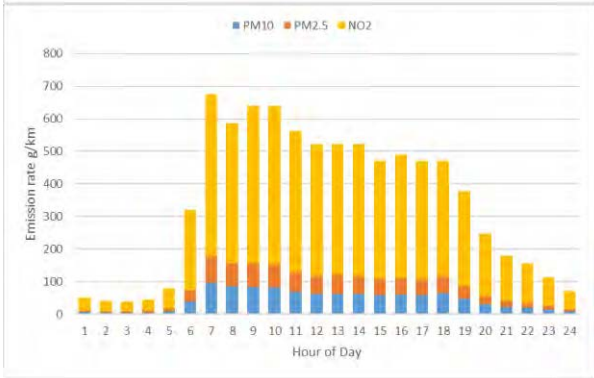
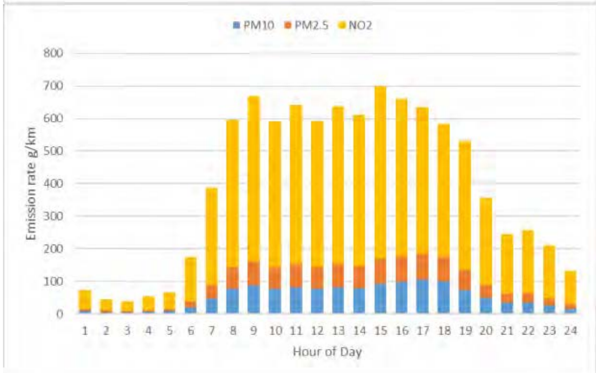


Figure 99: Eastern Fwy Midblock: Springvale Rd to Blackburn Rd - Project 2026

East Bound



West Bound

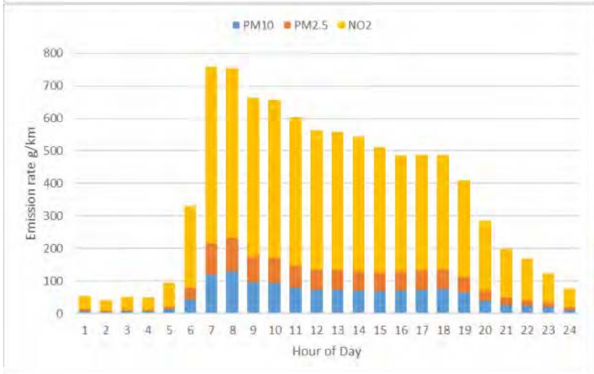


Figure 100: Eastern Fwy Midblock: Blackburn Rd to Middleborough Rd - Project 2026

East Bound	West Bound

Figure 101: Eastern Fwy Midblock: Middleborough Rd to Tram Rd - Project 2026

East Bound	West Bound

Figure 102: Eastern Fwy Midblock: Tram Rd to Elgar Rd - Project 2026

East Bound	West Bound

Figure 103: Eastern Fwy Midblock: Elgar Rd to Doncaster Rd - Project 2026

East Bound	West Bound

Figure 104: Eastern Fwy Midblock: Doncaster Rd to Bulleen Rd - Project 2026

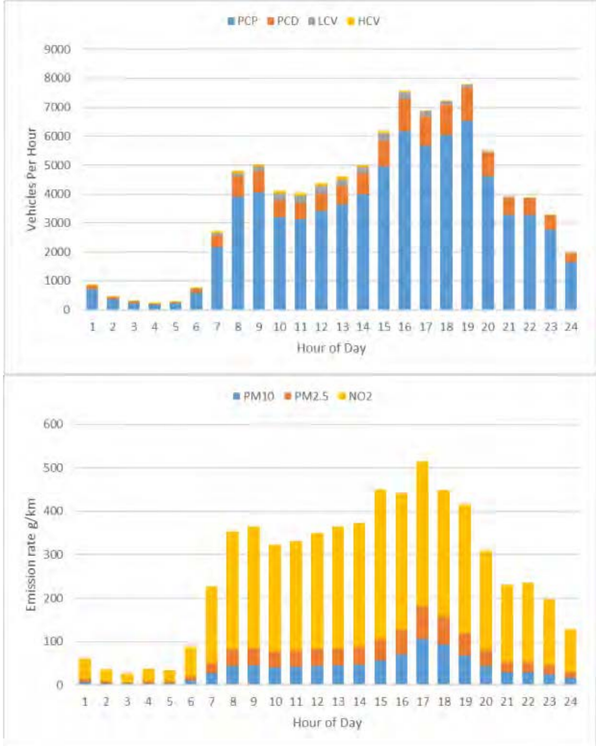
East Bound	West Bound
	

Figure 105: Eastern Fwy Midblock: Bulleen Rd to Burke Rd - Project 2026

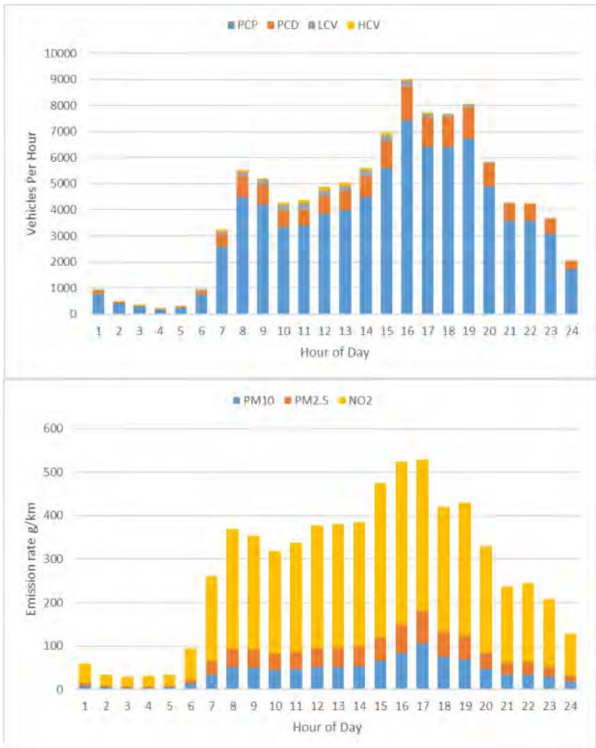
East Bound	West Bound
	

Figure 106: Eastern Fwy Midblock: Burke Rd to Chandler Hwy - Project 2026.

<table>
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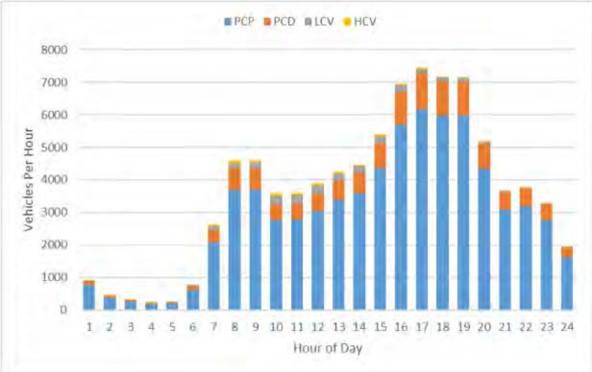

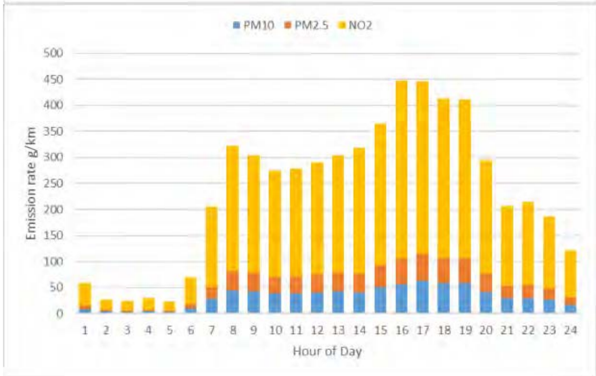

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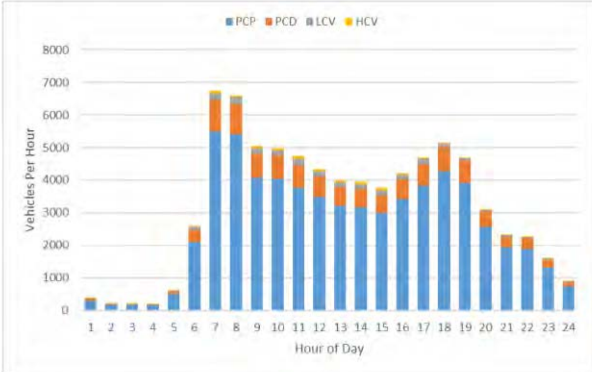

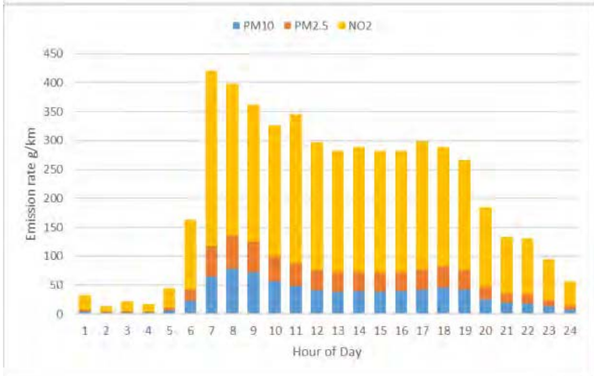

</td></tr>
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Figure 107: Eastern Fwy Midblock: Chandler Hwy to Hoddle St - Project 2026

<table>
<tr><th>East Bound</th><th>West Bound</th></tr>
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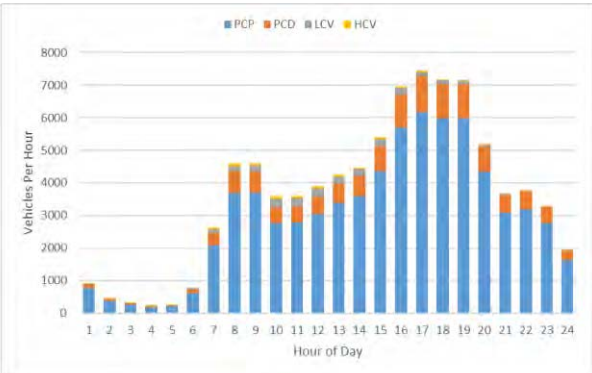

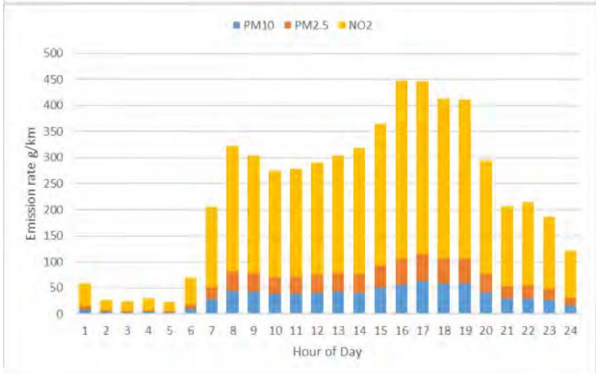

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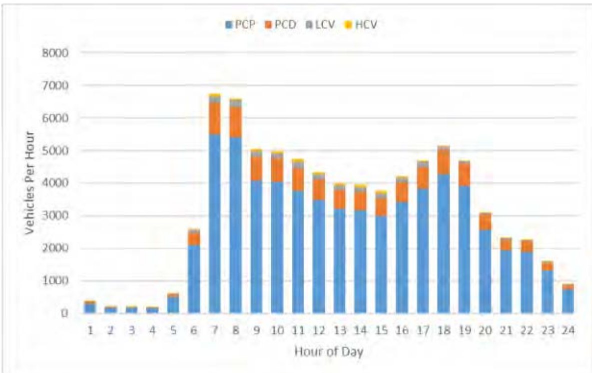
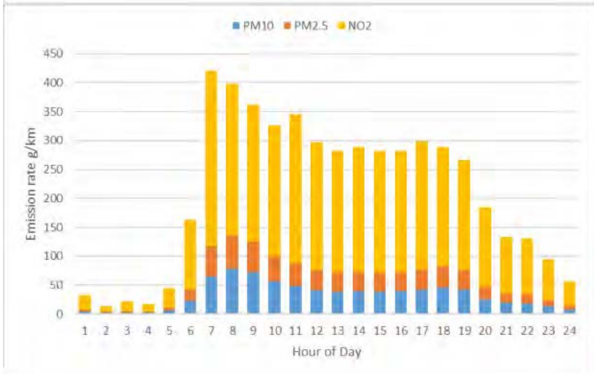




</td></tr>
</table>

Figure 108: Eastern Fwy Midblock: Chandler Hwy to Hoddle St - Project 2026

East Bound	West Bound

Figure 109: Eastern Fwy Midblock: Under Springale Rd - Project 2026

East Bound	West Bound

Figure 110: Eastern Fwy Midblock: Under Middlelborough Rd - Project 2026

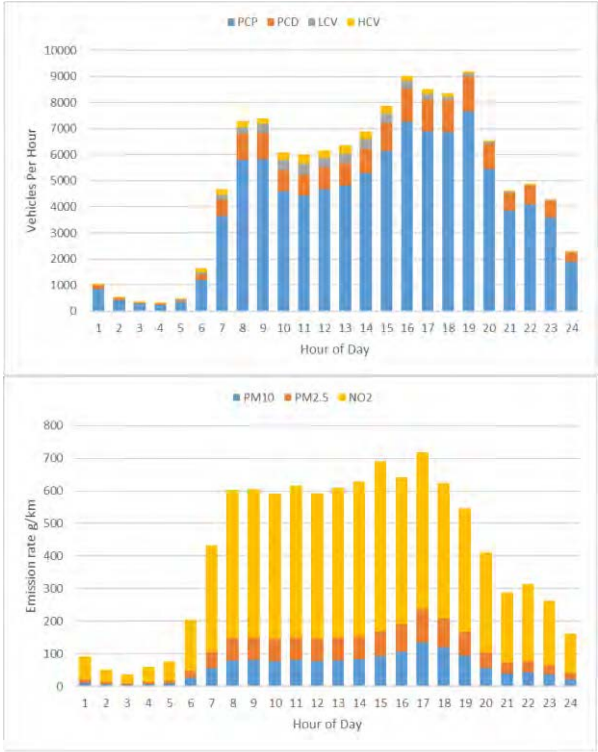
East Bound	West Bound
	

Figure 111: Eastern Fwy Midblock: Under Doncaster Rd - Project 2026

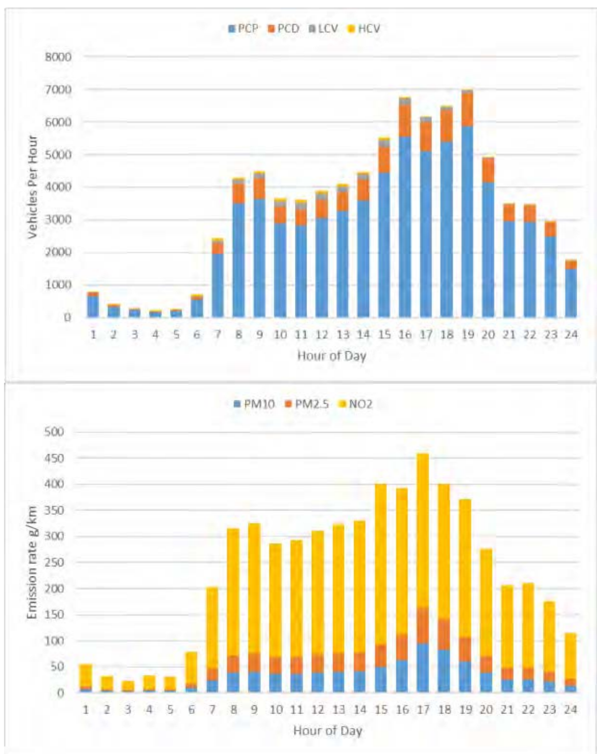
East Bound	West Bound
	

Figure 112: Eastern Fwy Midblock: Under Bulleen Rd - Project 2026

12.3 Base 2036

Table 43: Eastern Fwy Midblock 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Springvale Rd to Blackburn Rd	East Bound	77000	3400	2900	83300
Springvale Rd to Blackburn Rd	West Bound	78000	3200	2700	83900
Blackburn Rd to Middleborough Rd	East Bound	85000	3600	3200	91800
Blackburn Rd to Middleborough Rd	West Bound	89000	3500	3000	95500
Middleborough Rd to Tram Rd	East Bound	89000	3800	2900	95700
Middleborough Rd to Tram Rd	West Bound	93000	3600	2900	99500
Tram Rd to Elgar Rd	East Bound	74000	3300	2900	80200
Tram Rd to Elgar Rd	West Bound	78000	3300	2700	84000
Elgar Rd to Doncaster Rd	East Bound	84000	3500	2700	90200
Elgar Rd to Doncaster Rd	West Bound	88000	3500	2700	94200
Doncaster Rd to Bulleen Rd	East Bound	85000	3500	2600	91100
Doncaster Rd to Bulleen Rd	West Bound	86000	3400	2700	92100
Bulleen Rd to Burke Rd	East Bound	76000	2700	1400	80100
Bulleen Rd to Burke Rd	West Bound	80000	2700	1400	84100
Burke Rd to Chandler Hwy	East Bound	87000	2900	1600	91500
Burke Rd to Chandler Hwy	West Bound	88000	2800	1500	92300
Chandler Hwy to Hoddle St	East Bound	80000	2800	1100	83900
Chandler Hwy to Hoddle St	West Bound	72000	2600	1100	75700
Under Springvale Rd	East Bound	54000	700	2100	56800

Road	Direction	Cars	LCV	HCV	Total
Under Springvale Rd	West Bound	56000	2400	2000	60400
Under Middlelborough Rd	East Bound	78000	3200	2600	83800
Under Middlelborough Rd	West Bound	81000	3000	2800	86800
Under Doncaster Rd	East Bound	77000	3000	2500	82500
Under Doncaster Rd	West Bound	78000	3000	2500	83500
Under Bulleen Rd	East Bound	64000	2000	1200	67200
Under Bulleen Rd	West Bound	67000	1500	1200	69700
Under Chandler Hwy	East Bound	69000	2000	900	71900
Under Chandler Hwy	West Bound	68000	700	800	69500

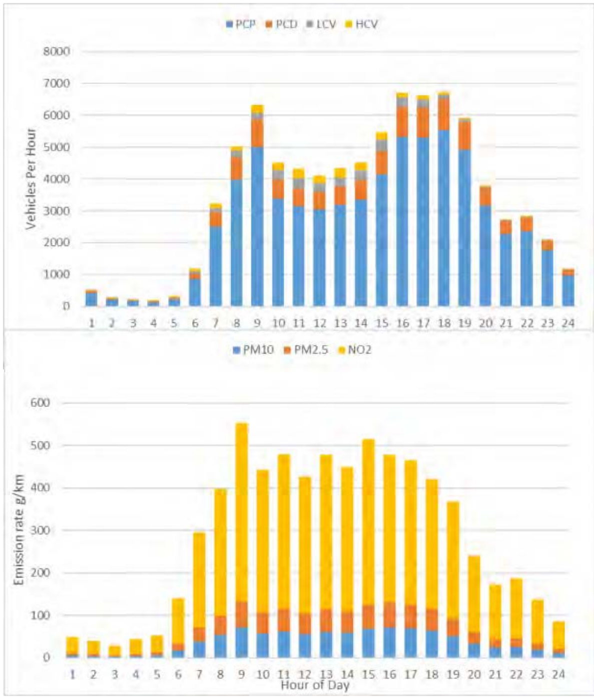
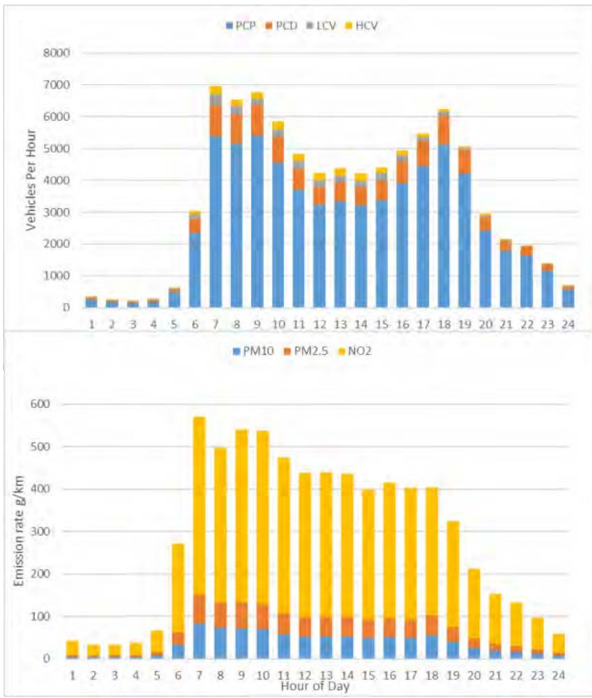
East Bound	West Bound
	

Figure 113: Eastern Fwy Midblock: Springvale Rd to Blackburn Rd - Base 2036

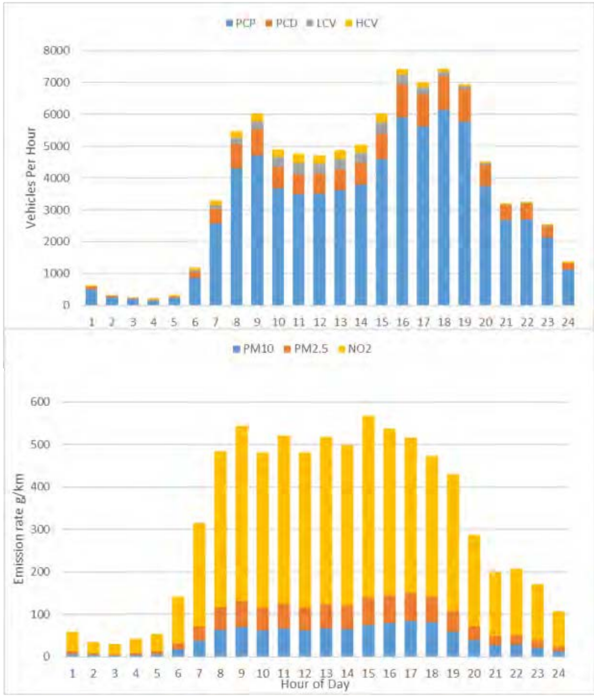
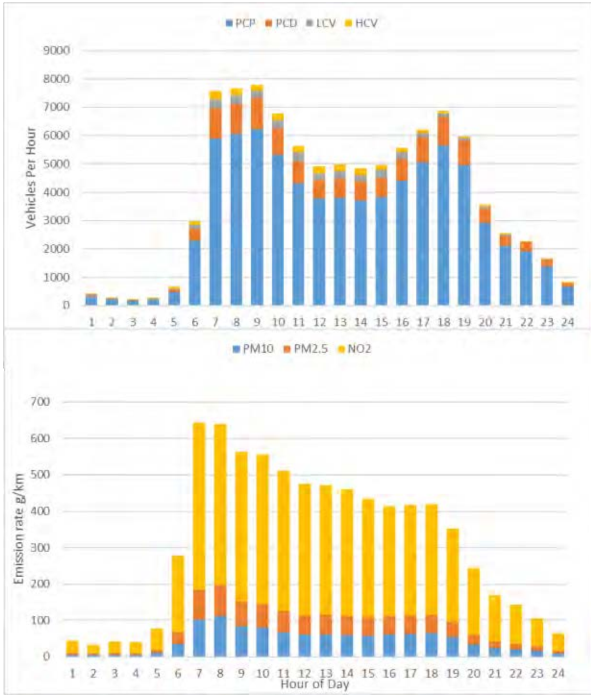
East Bound	West Bound
	

Figure 114: Eastern Fwy Midblock: Blackburn Rd to Middleborough Rd - Base 2036

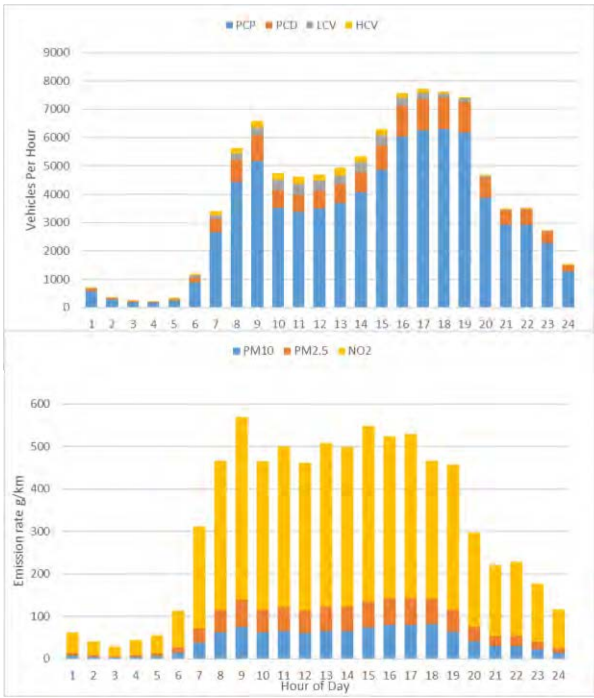
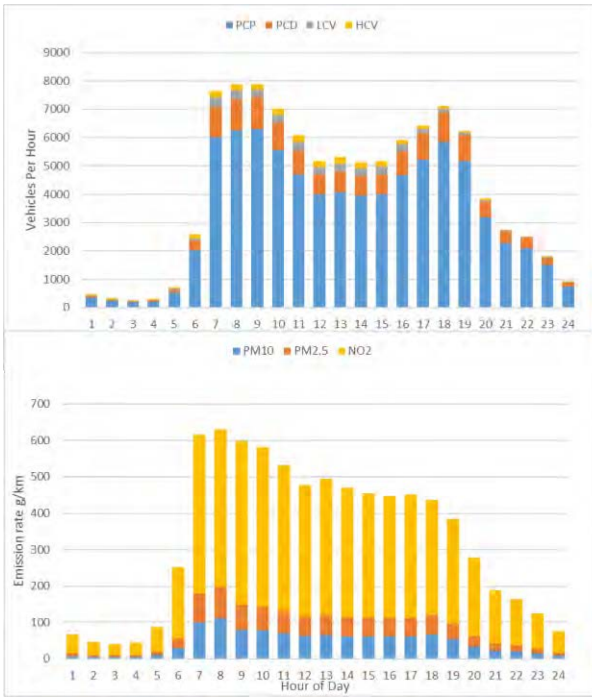
East Bound	West Bound
	

Figure 115: Eastern Fwy Midblock: Middleborough Rd to Tram Rd - Base 2036

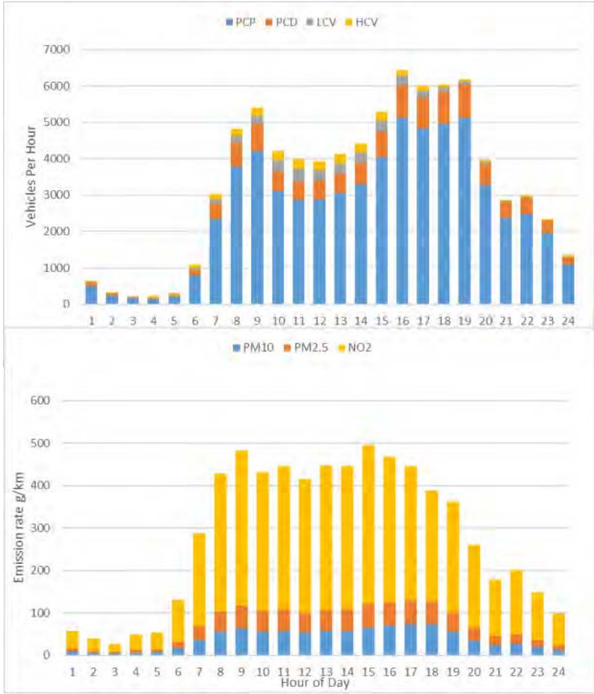
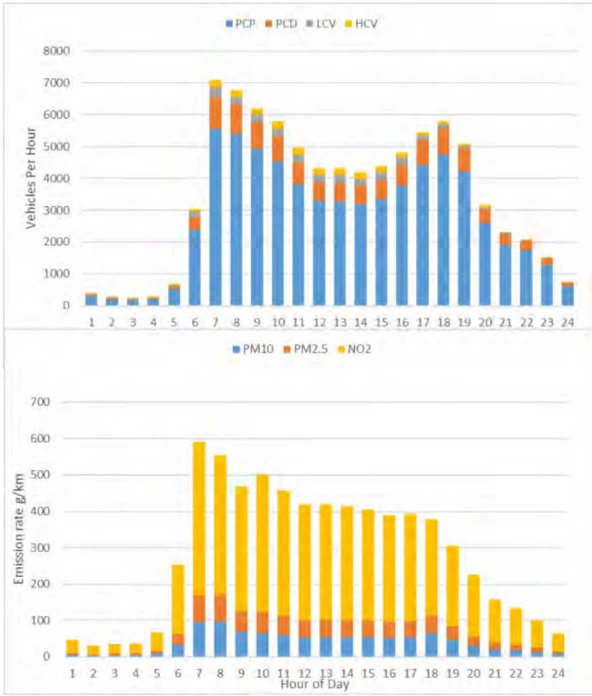
East Bound	West Bound
	

Figure 116: Eastern Fwy Midblock: Tram Rd to Elgar Rd - Base 2036

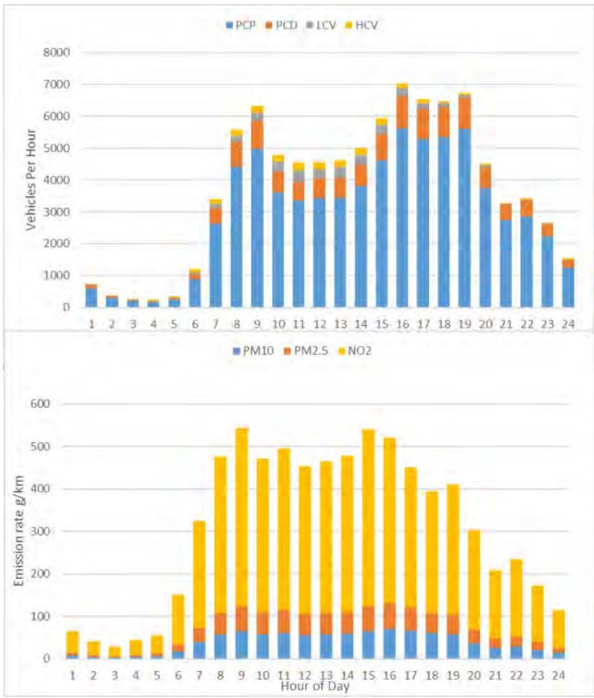
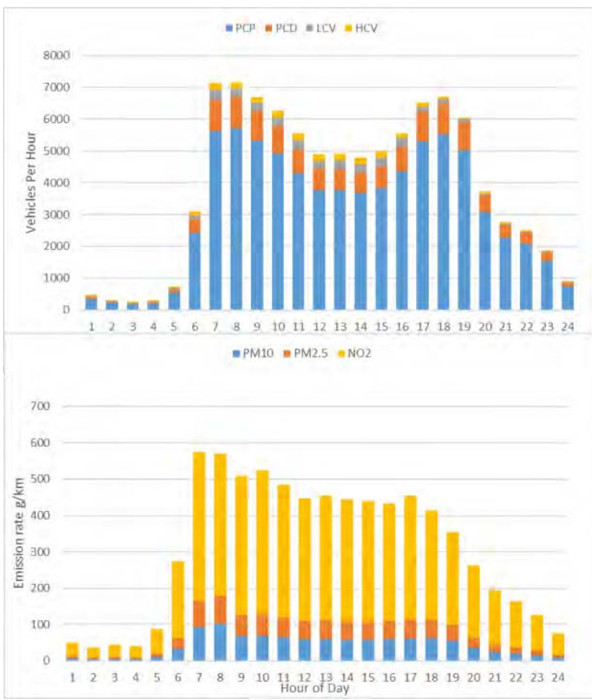
East Bound	West Bound
	

Figure 117: Eastern Fwy Midblock: Elgar Rd to Doncaster Rd - Base 2036

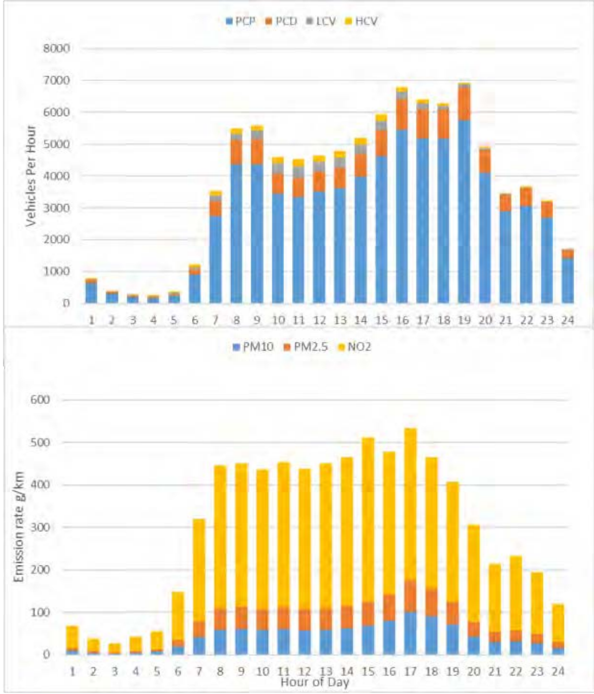
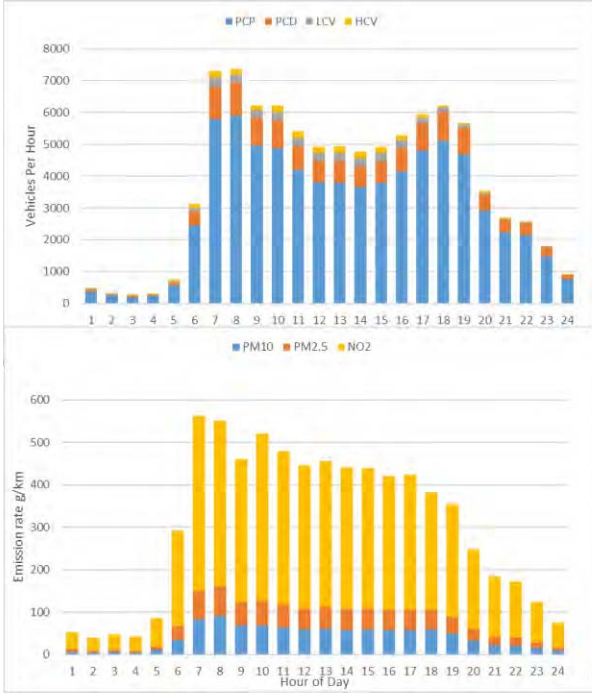
East Bound	West Bound
	

Figure 118: Eastern Fwy Midblock: Doncaster Rd to Bulleen Rd - Base 2036

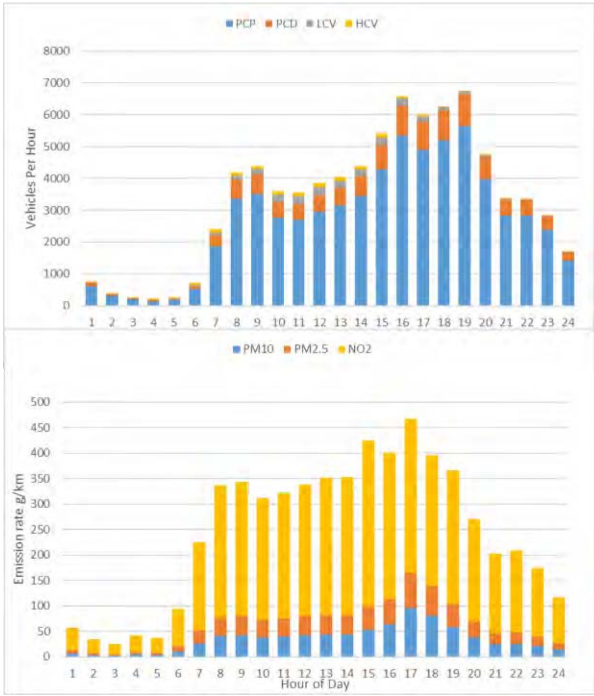
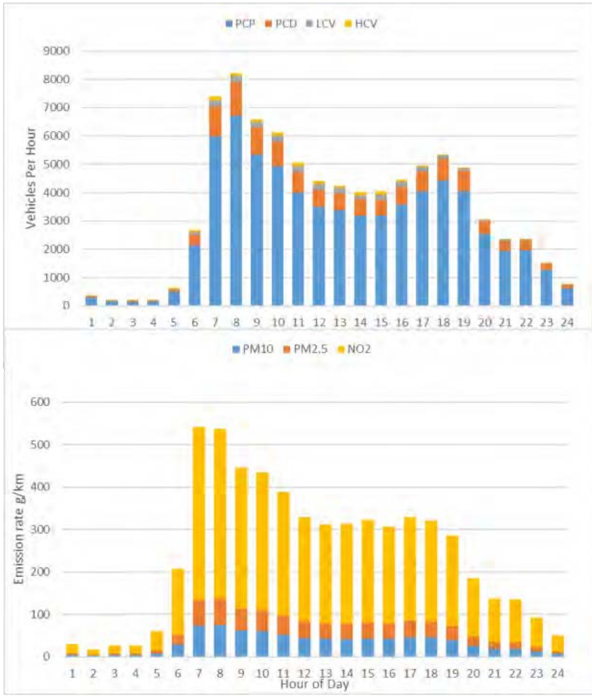
East Bound	West Bound
	

Figure 119: Eastern Fwy Midblock: Bulleen Rd to Burke Rd - Base 2036

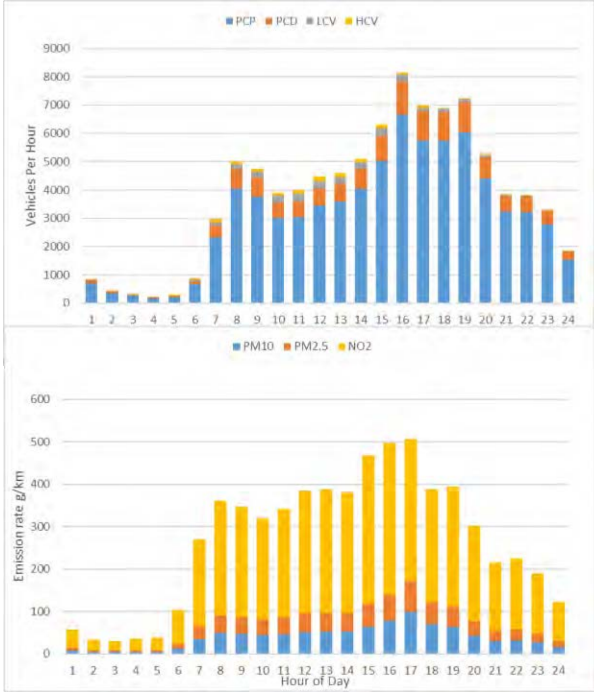
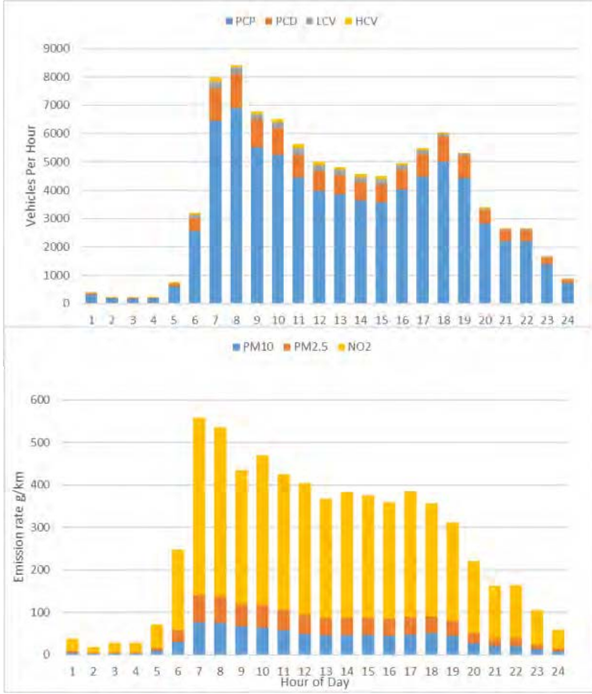
East Bound	West Bound
	

Figure 120: Eastern Fwy Midblock: Burke Rd to Chandler Hwy - Base 2036

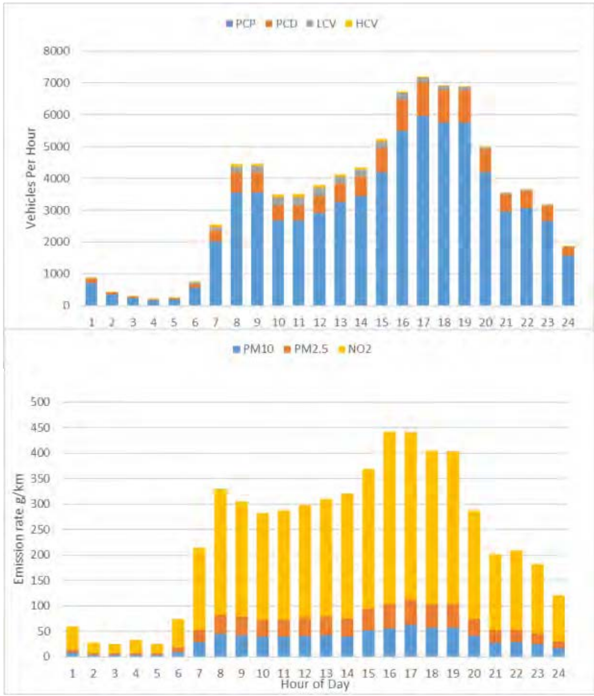
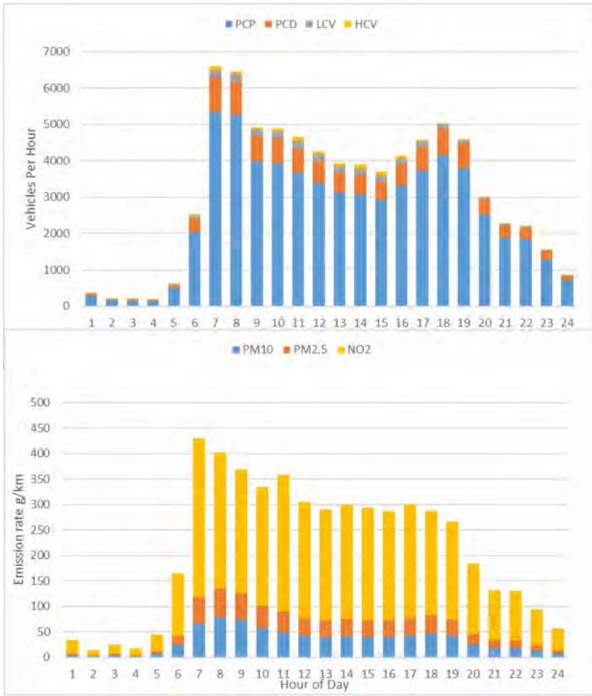
East Bound	West Bound
	

Figure 121: Eastern Fwy Midblock: Chandler Hwy to Hoddle St - Base 2036

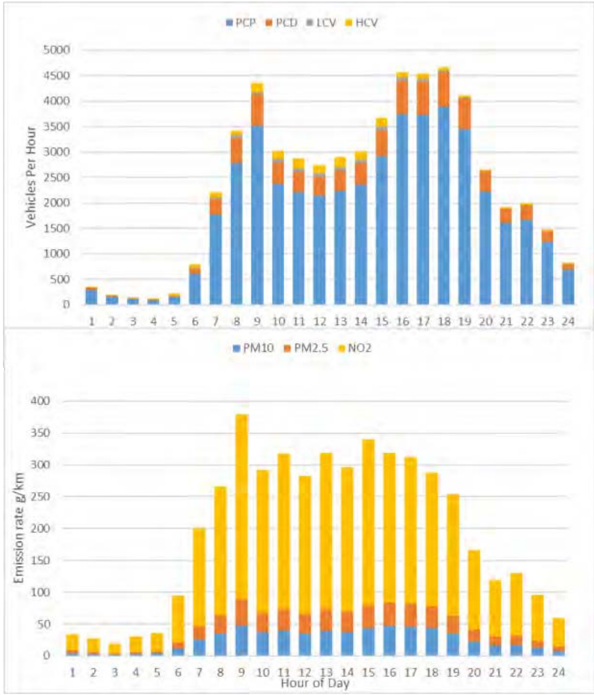
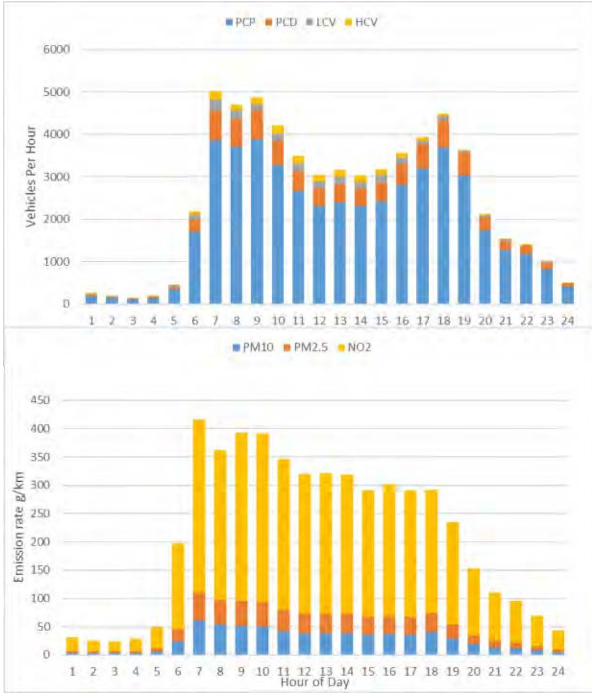
East Bound	West Bound
	

Figure 122: Eastern Fwy Midblock: Under Springale Rd - Base 2036

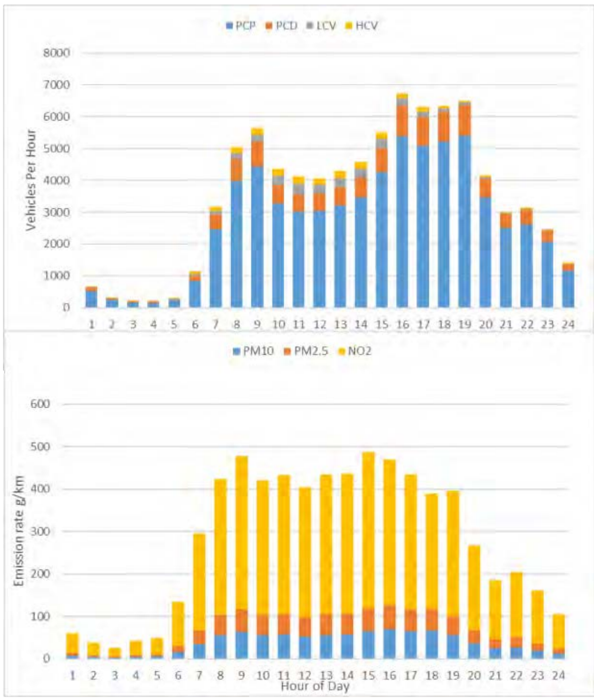
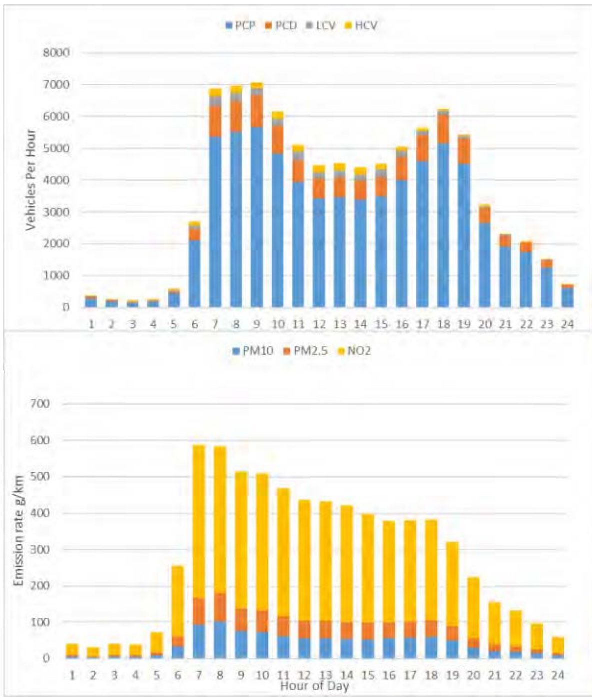
East Bound	West Bound
	

Figure 123: Eastern Fwy Midblock: Under Middlelborough Rd - Base 2036

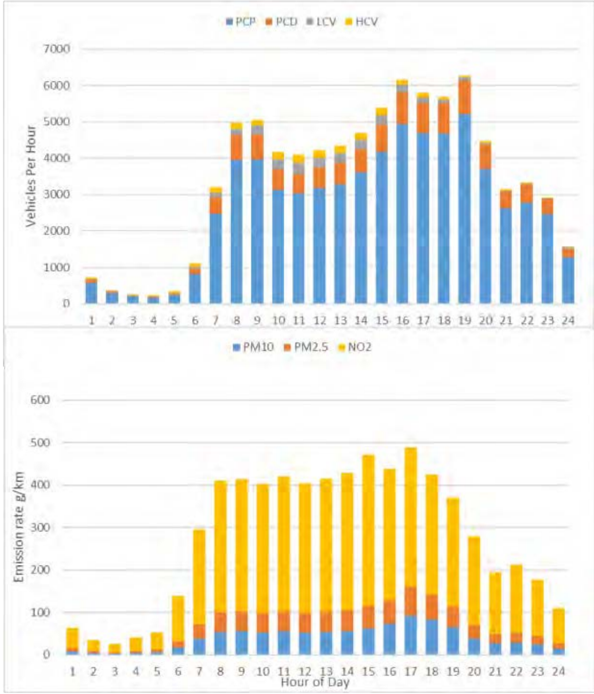
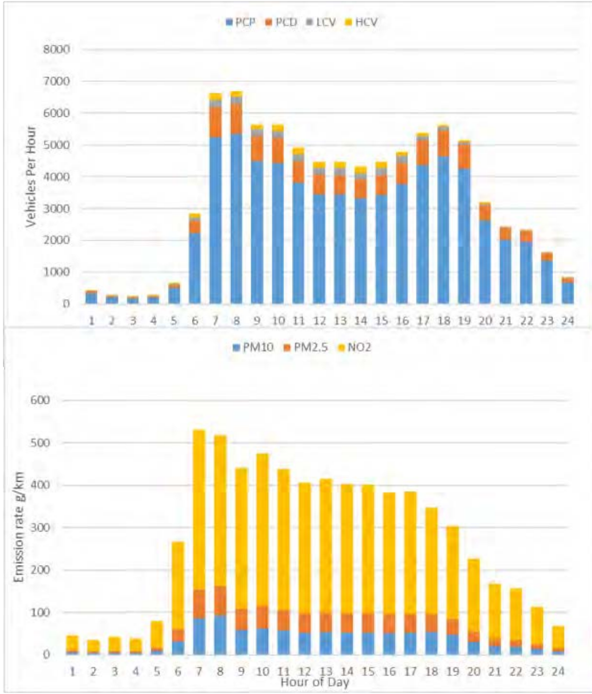
East Bound	West Bound
	

Figure 124: Eastern Fwy Midblock: Under Doncaster Rd - Base 2036

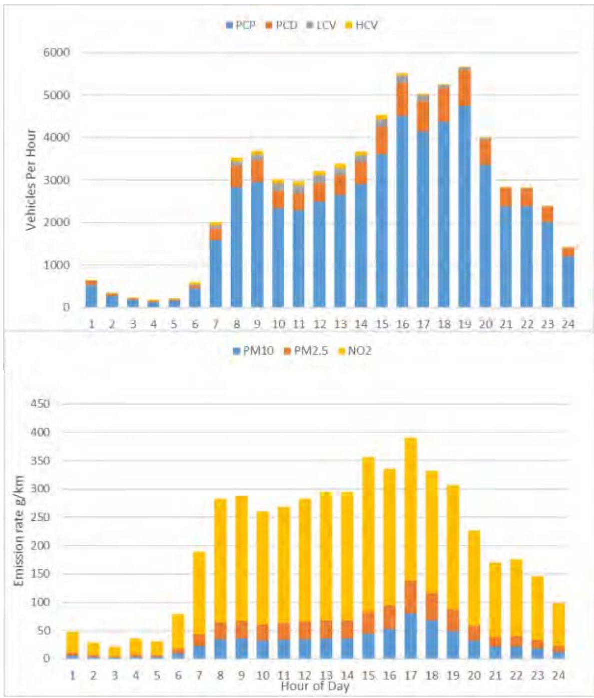
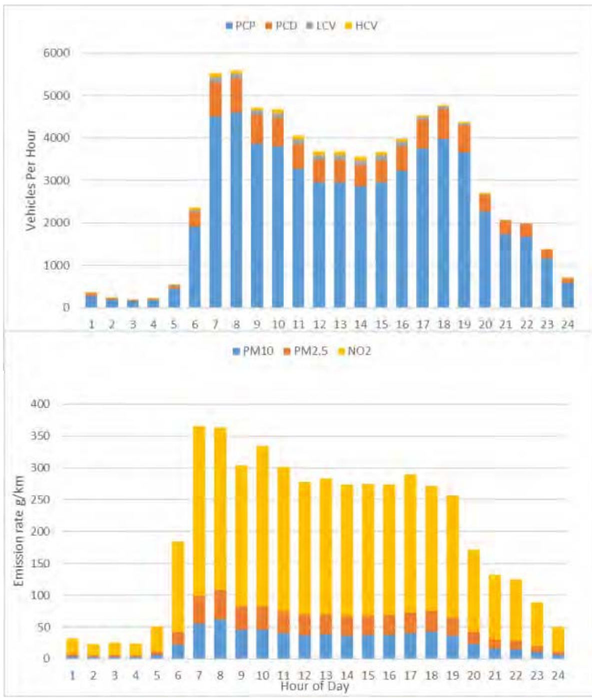
East Bound	West Bound
	

Figure 125: Eastern Fwy Midblock: Under Bulleen Rd - Base 2036

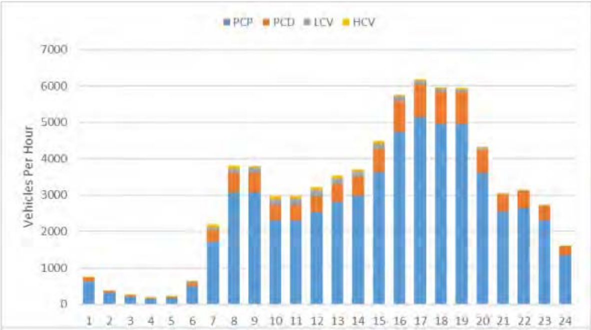
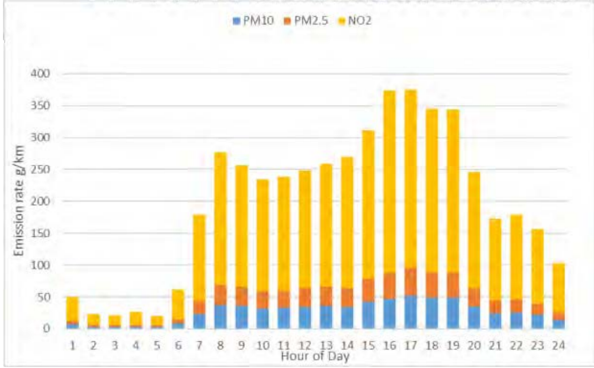
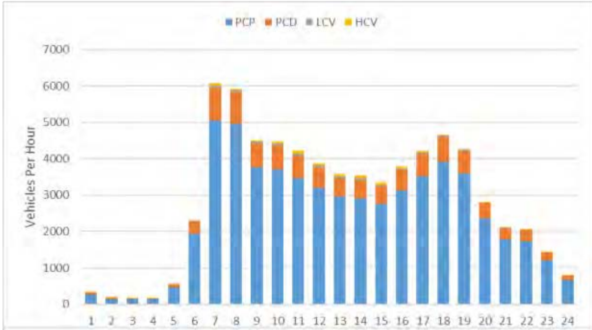
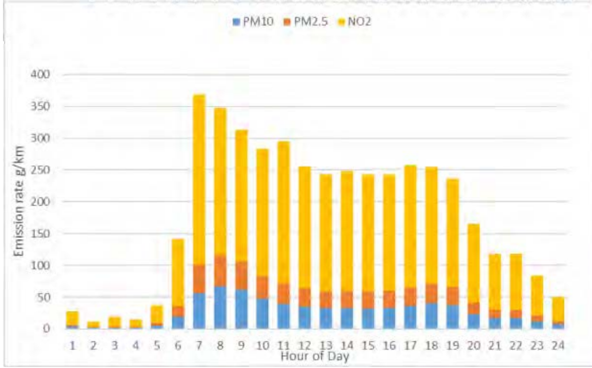
East Bound	West Bound
 	 

Figure 126: Eastern Fwy Midblock: Under Chandler Hwy - Base 2036

12.4 Project 2036

Table 44: Eastern Fwy Midblock 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Blackburn Rd to Middleborough Rd	East Bound	110000	4400	4600	119000
Blackburn Rd to Middleborough Rd	West Bound	109000	4100	4200	117300
Middleborough Rd to Tram Rd	East Bound	126000	5300	4500	135800
Middleborough Rd to Tram Rd	West Bound	126000	4800	4400	135200
Tram Rd to Elgar Rd	East Bound	111000	4800	4600	120400
Tram Rd to Elgar Rd	West Bound	110000	4600	4200	118800
Elgar Rd to Doncaster Rd	East Bound	126000	5300	4600	135900
Elgar Rd to Doncaster Rd	West Bound	125000	4800	4300	134100
Doncaster Rd to Bulleen Rd	East Bound	128000	5600	4600	138200
Doncaster Rd to Bulleen Rd	West Bound	132000	5300	4400	141700
Bulleen Rd to Burke Rd	East Bound	92000	3200	1400	96600
Bulleen Rd to Burke Rd	West Bound	94000	3200	1400	98600
Burke Rd to Chandler Hwy	East Bound	102000	3300	1500	106800
Burke Rd to Chandler Hwy	West Bound	100000	3200	1400	104600
Chandler Hwy to Hoddle St	East Bound	86000	3100	1100	90200
Chandler Hwy to Hoddle St	West Bound	76000	2800	1100	79900
Under Springale Rd	East Bound	63000	800	3100	66900
Under Springale Rd	West Bound	65000	2700	2900	70600

Road	Direction	Cars	LCV	HCV	Total
Under Middlelborough Rd	East Bound	106000	4300	3900	114200
Under Middlelborough Rd	West Bound	107000	3800	4100	114900
Under Doncaster Rd	East Bound	119000	4700	4300	128000
Under Doncaster Rd	West Bound	119000	4400	4000	127400
Under Bulleen Rd	East Bound	83000	2600	1200	86800
Under Bulleen Rd	West Bound	111000	2900	2800	116700
Under Chandler Hwy	East Bound	77000	2300	1000	80300
Under Chandler Hwy	West Bound	74000	800	800	75600

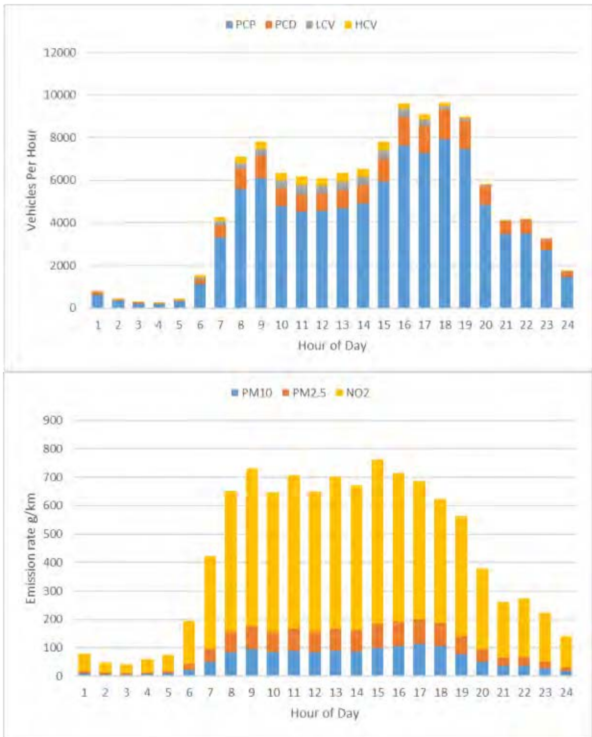
East Bound	West Bound
	

Figure 127: Eastern Fwy Midblock: Blackburn Rd to Middleborough Rd - Project 2036

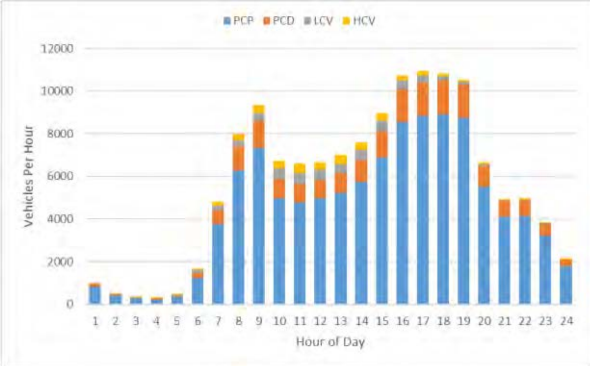
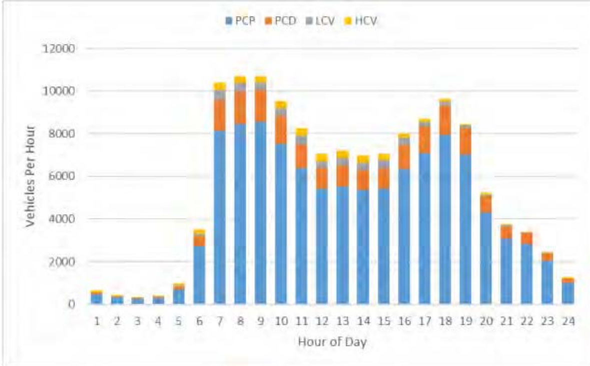
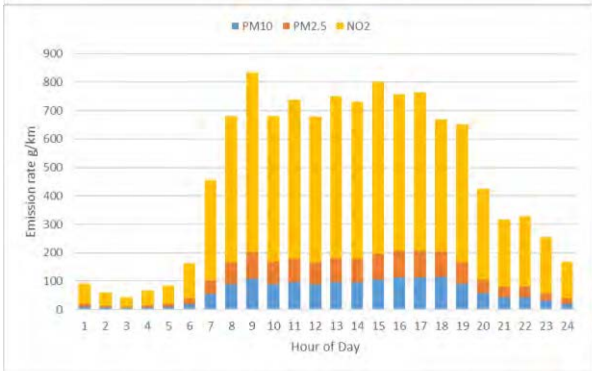
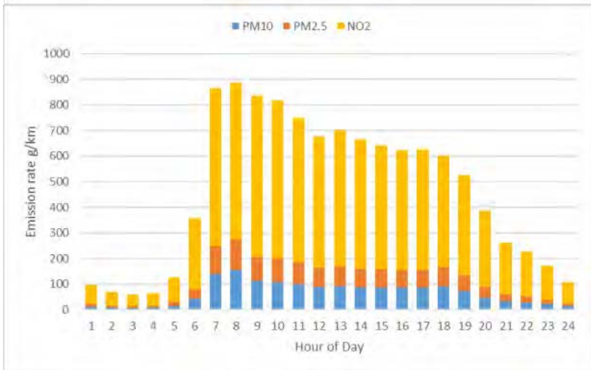
East Bound	West Bound
	
	

Figure 128: Eastern Fwy Midblock: Middleborough Rd to Tram Rd - Project 2036

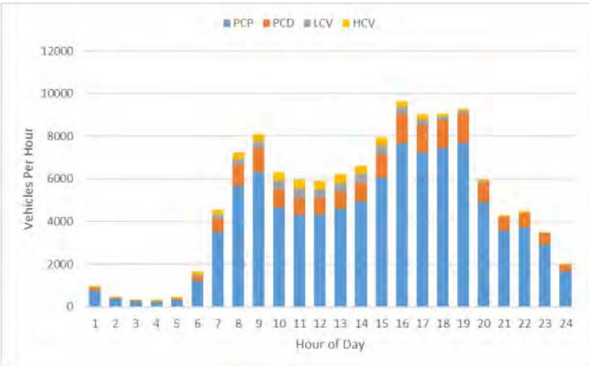
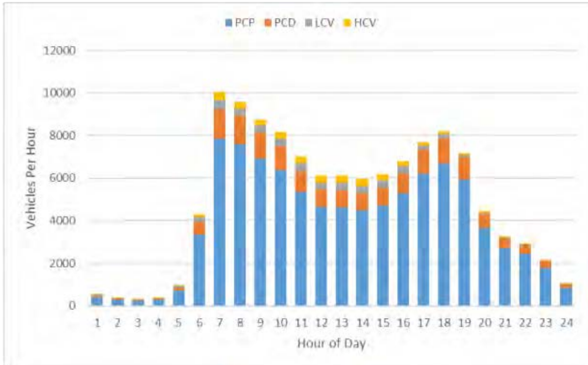
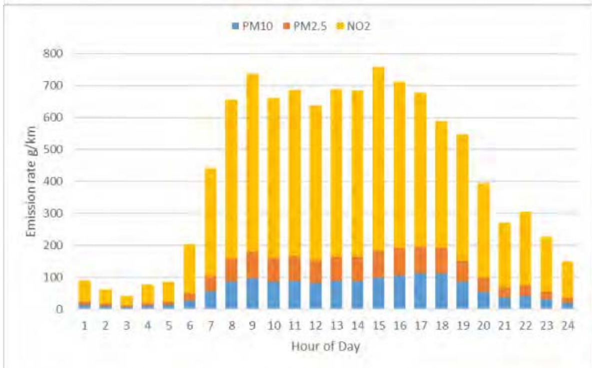
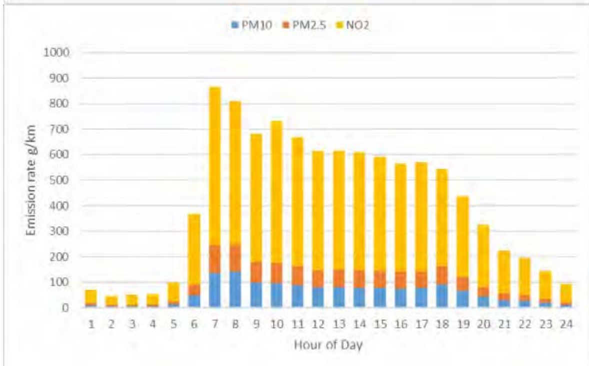
East Bound	West Bound
	
	

Figure 129: Eastern Fwy Midblock: Tram Rd to Elgar Rd - Project 2036

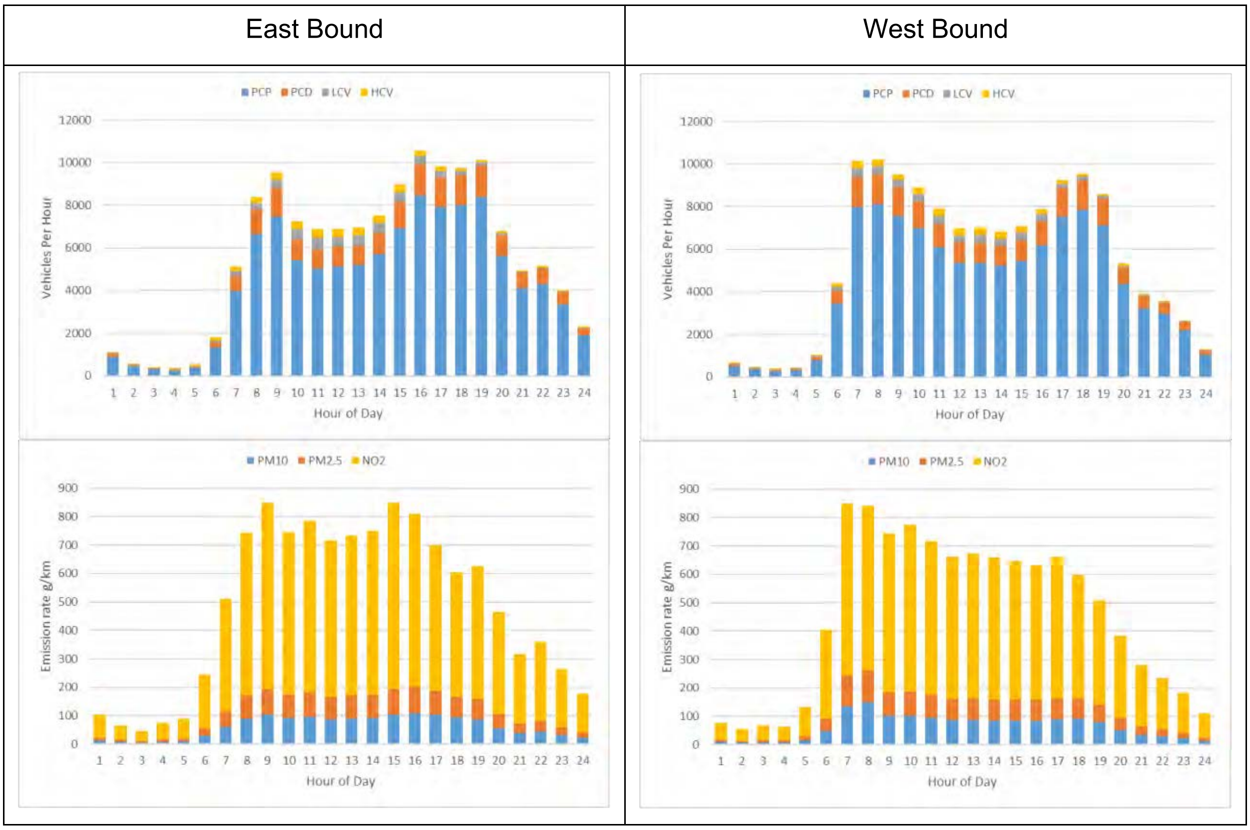


Figure 130: Eastern Fwy Midblock: Elgar Rd to Doncaster Rd - Project 2036

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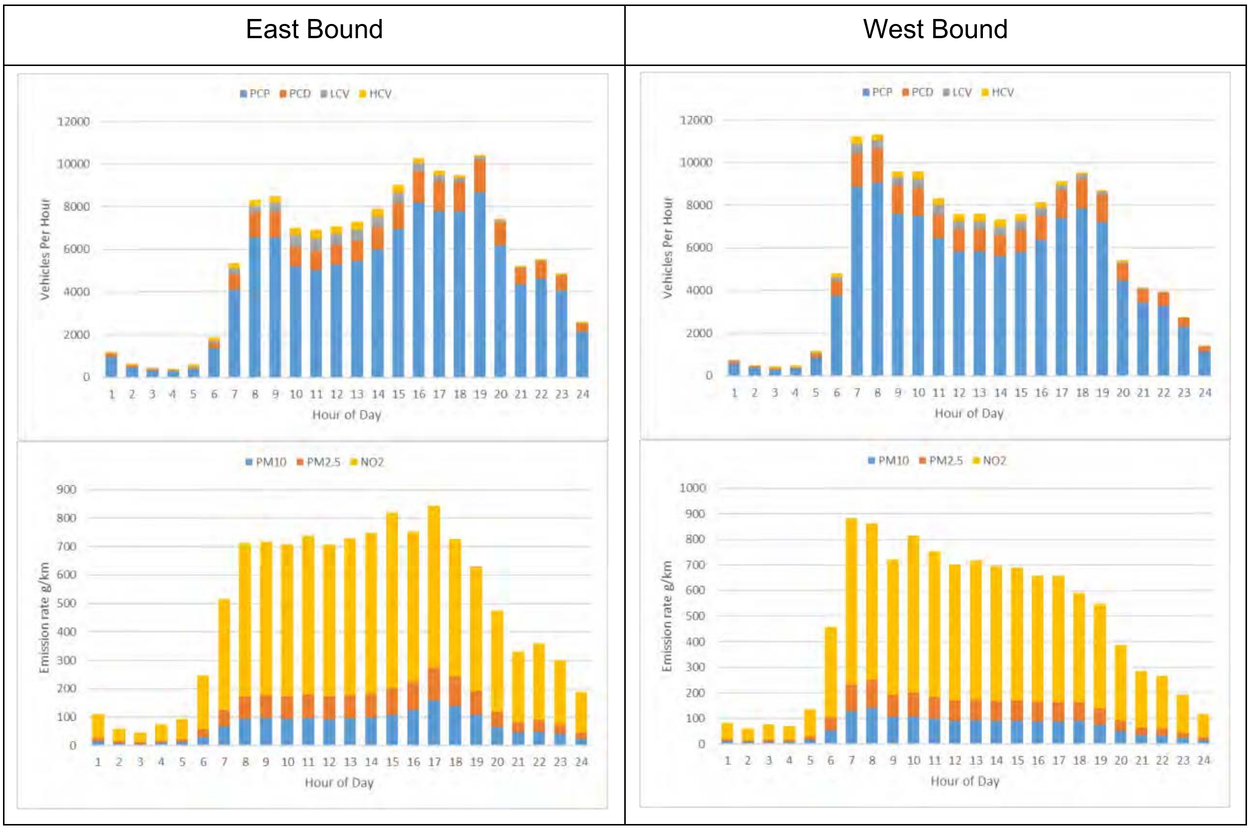


Figure 131: Eastern Fwy Midblock: Doncaster Rd to Bulleen Rd - Project 2036

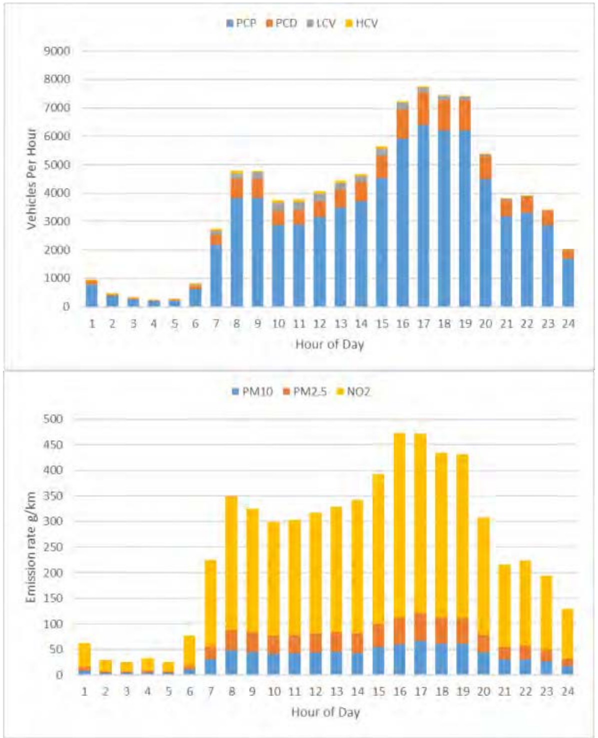
East Bound	West Bound

Figure 132: Eastern Fwy Midblock: Bulleen Rd to Burke Rd - Project 2036

East Bound	West Bound

Figure 133: Eastern Fwy Midblock: Burke Rd to Chandler Hwy - Project 2036

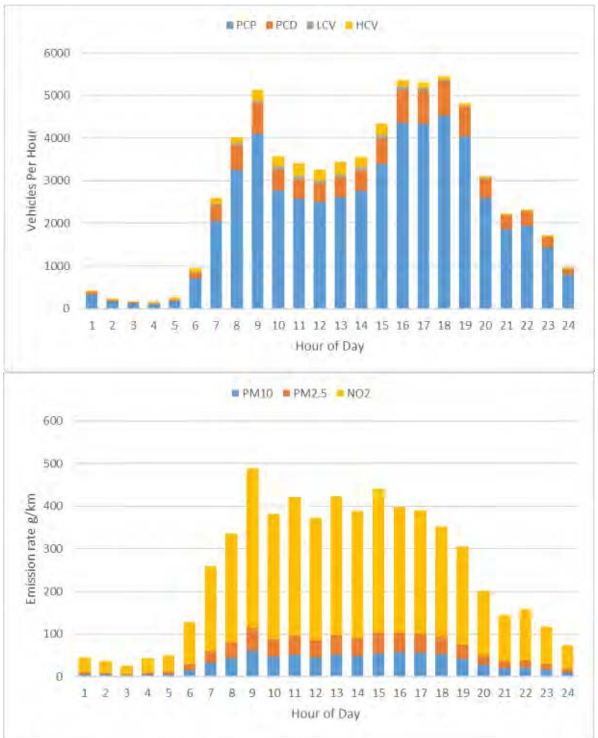
East Bound



West Bound

Figure 134: Eastern Fwy Midblock: Chandler Hwy to Hoddle St - Project 2036

East Bound



West Bound

Figure 135: Eastern Fwy Midblock: Under Springvale Rd - Project 2036

East Bound	West Bound

Figure 136: Eastern Fwy Midblock: Under Middlelborough Rd - Project 2036

East Bound	West Bound

Figure 137: Eastern Fwy Midblock: Under Doncaster Rd - Project 2036

East Bound	West Bound

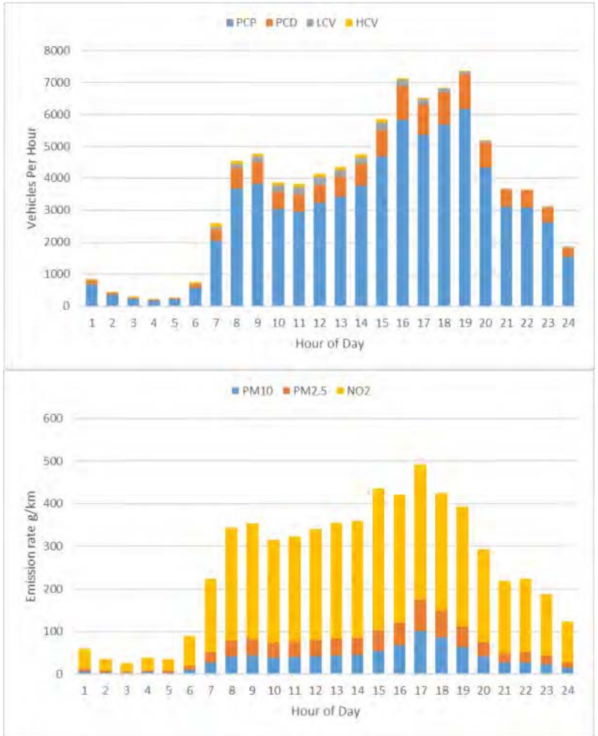
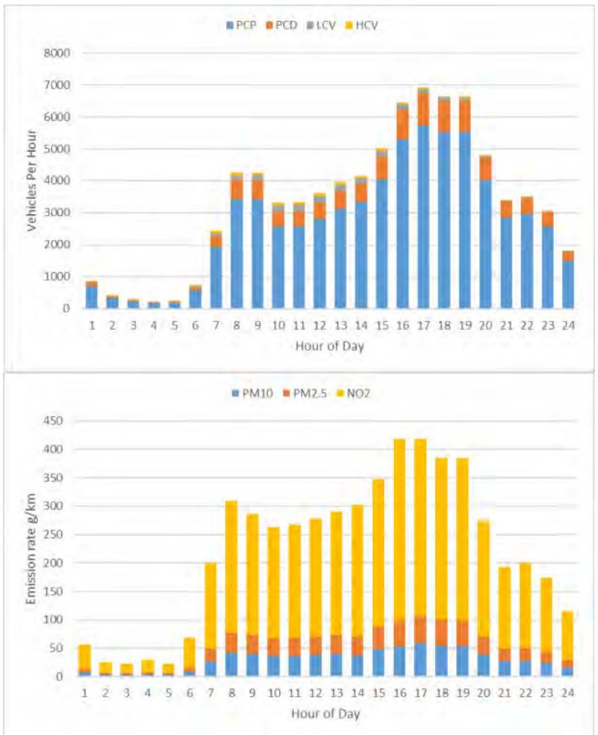


Figure 138: Eastern Fwy Midblock: Under Bulleen Rd - Project 2036

East Bound	West Bound



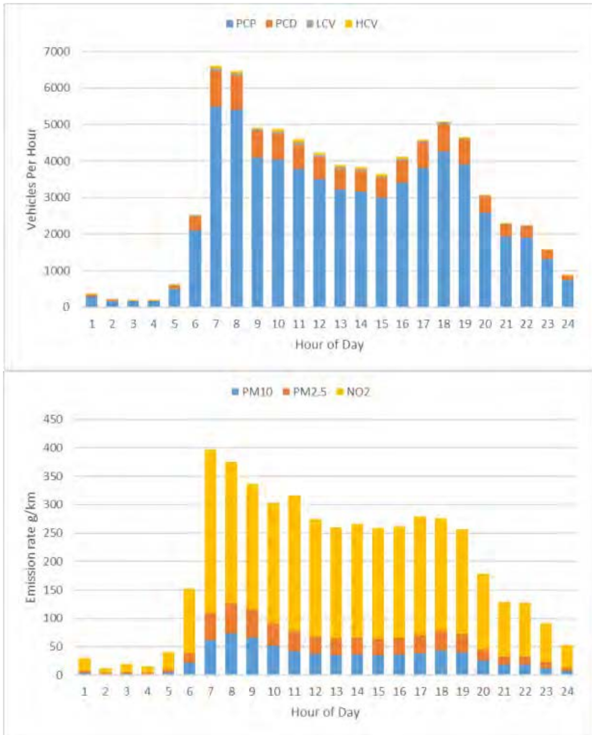


Figure 139: Eastern Fwy Midblock: Under Chandler Hwy - Project 2036

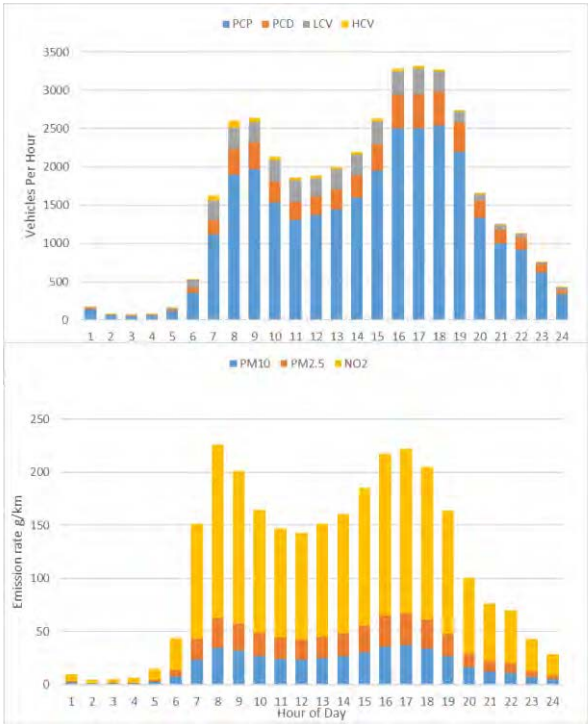
13.0 FITZSIMONS LN

13.1 Base 2026

Table 45: Fitzsimons Ln 24 hour traffic volumes - Base 2026.

Road	Direction	Cars	LCV	HCV	Total
At Yarra River	North Bound	34000	3900	600	38500
At Yarra River	South Bound	35000	1600	400	37000

North Bound



South Bound

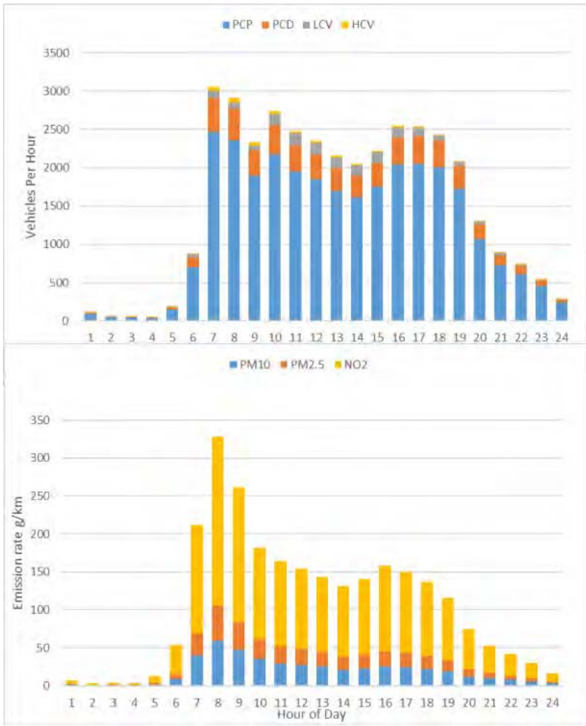


Figure 140: Fitzsimons Ln: At Yarra River - Base 2026

13.2 Project 2026

Table 46: Fitzsimons Ln 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
At Yarra River	North Bound	28000	2700	350	31050
At Yarra River	South Bound	28000	1100	200	29300

North Bound	South Bound

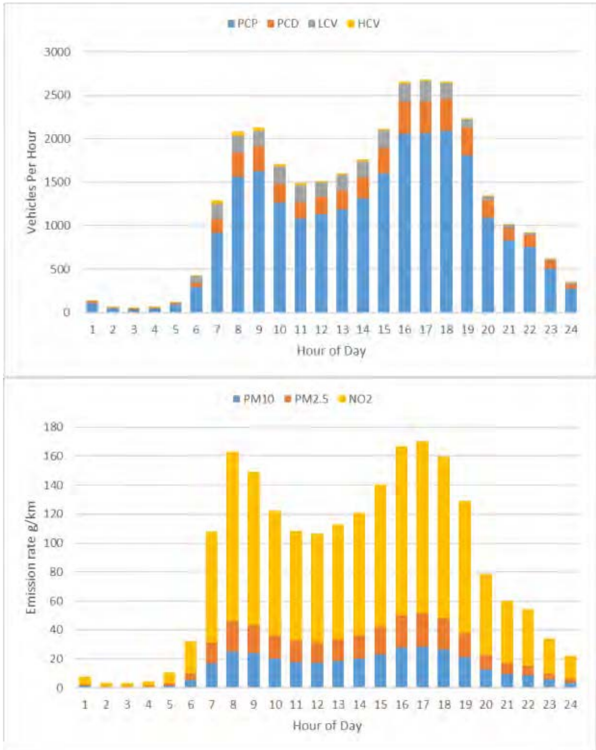


Figure 141: Fitzsimons Ln: At Yarra River - Project 2026

13.3 Base 2036

Table 47: Fitzsimons Ln 24 hour traffic volumes - Base 2036.

Road	Direction	Cars	LCV	HCV	Total
At Yarra River	North Bound	37000	4600	900	42500
At Yarra River	South Bound	38000	1800	500	40300

North Bound	South Bound

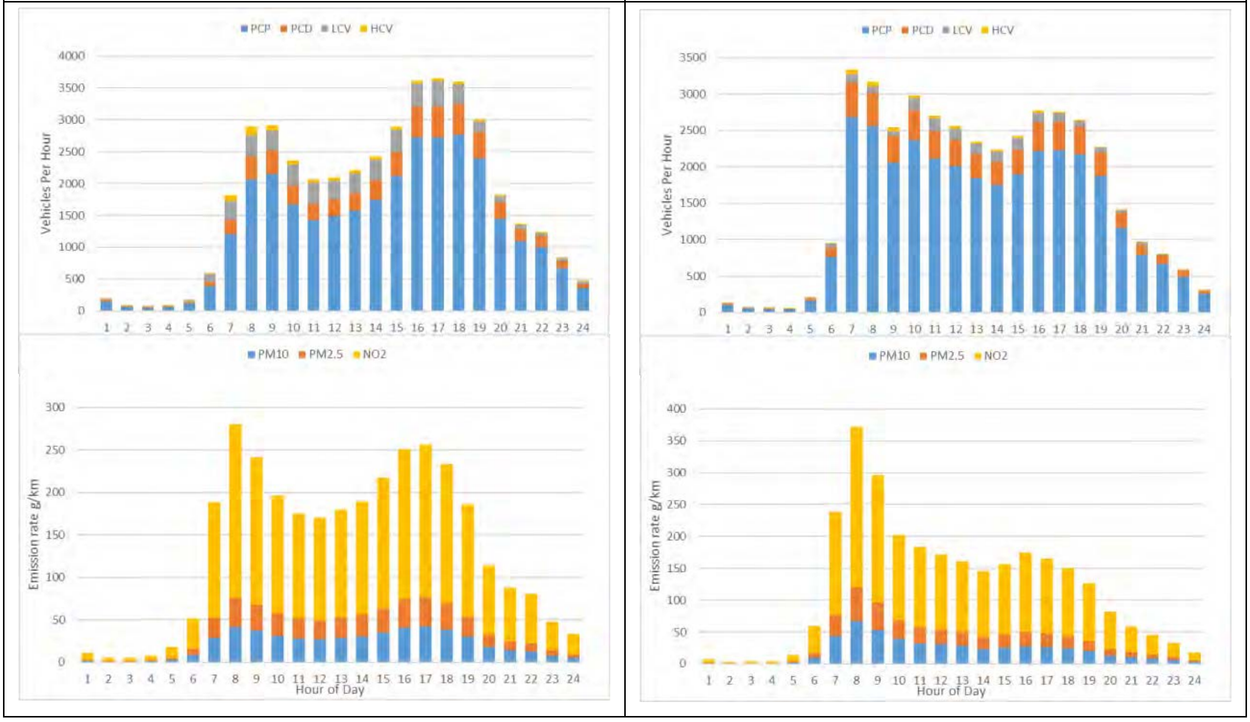


Figure 142: Fitzsimons Ln: At Yarra River - Base 2036

13.4 Project 2036

Table 48: Fitzsimons Ln 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
At Yarra River	North Bound	30000	3200	400	33600
At Yarra River	South Bound	30000	1300	250	31550

North Bound	South Bound

Figure 143: Fitzsimons Ln: At Yarra River - Project 2036

14.0 GRANGE RD

14.1 Base 2026

Table 49: Grange Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Darebin Rd to Heidelberg Rd	North Bound	21000	1100	900	23000
Darebin Rd to Heidelberg Rd	South Bound	15000	1000	600	16600

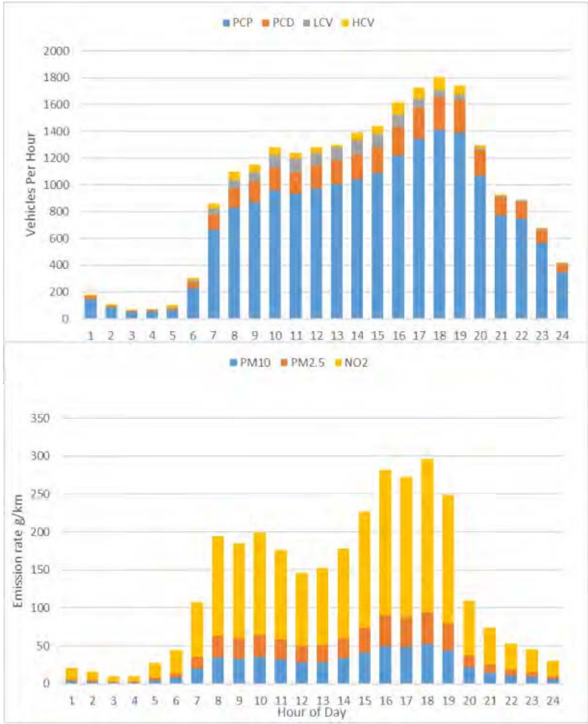
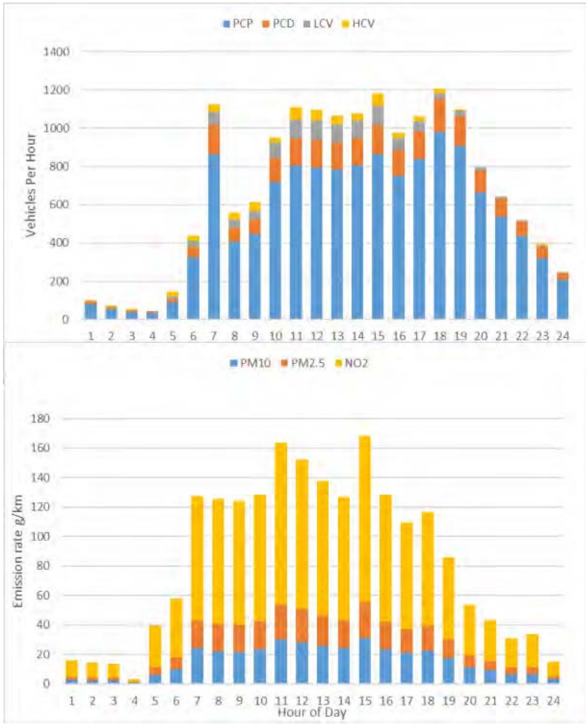
North Bound	South Bound
	

Figure 144: Grange Rd: Darebin Rd to Heidelberg Rd - Base 2026

14.2 Project 2026

Table 50: Grange Rd 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Darebin Rd to Heidelberg Rd	North Bound	19000	900	400	20300
Darebin Rd to Heidelberg Rd	South Bound	14000	700	250	14950

North Bound	South Bound

Figure 145: Grange Rd: Darebin Rd to Heidelberg Rd - Project 2026

14.3 Base 2036

Table 51: Grange Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Darebin Rd to Heidelberg Rd	North Bound	23000	1400	1100	25500
Darebin Rd to Heidelberg Rd	South Bound	16000	1100	700	17800

North Bound	South Bound

Figure 146: Grange Rd: Darebin Rd to Heidelberg Rd - Base 2036

14.4 Project 2036

Table 52: Grange Rd 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Darebin Rd to Heidelberg Rd	North Bound	21000	1100	500	22600
Darebin Rd to Heidelberg Rd	South Bound	16000	900	300	17200

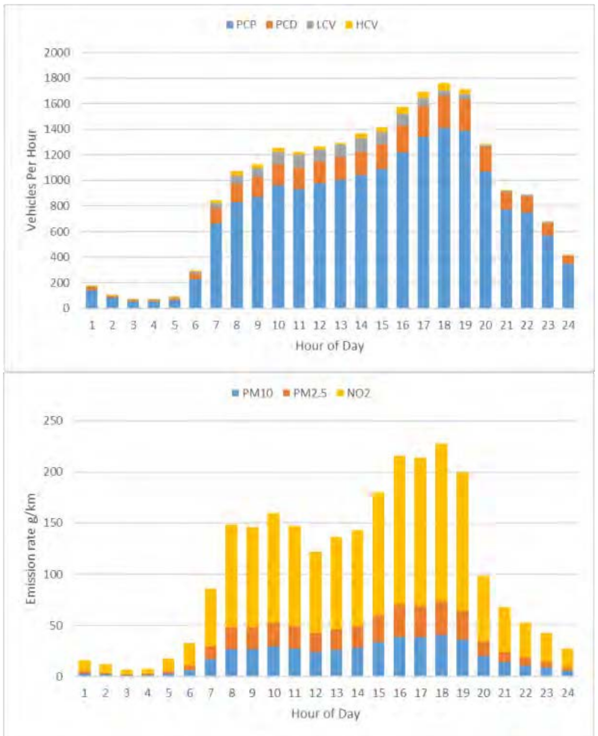
North Bound	South Bound
	

Figure 147: Grange Rd: Darebin Rd to Heidelberg Rd - Project 2036

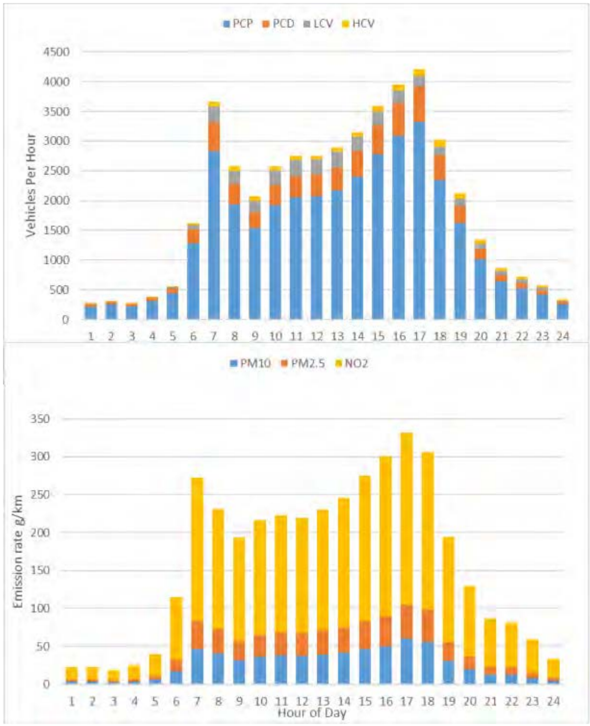
15.0 GREENSBOROUGH HIGHWAY

15.1 Base 2026

Table 53: Greensborough Highway 24 hour traffic volumes - Base 2026.

Road	Direction	Cars	LCV	HCV	Total
Grimshaw St to M80	North Bound	42000	3200	1400	46600
Grimshaw St to M80	South Bound	44000	3200	1600	48800

North Bound



South Bound

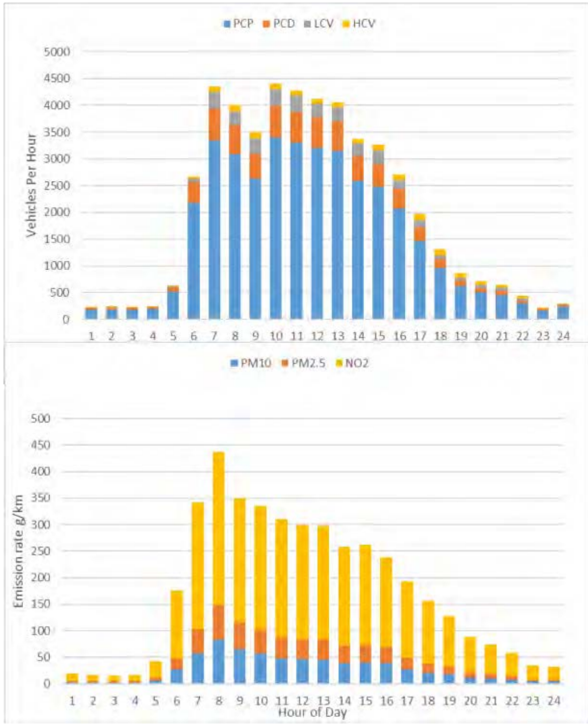


Figure 148: Greensborough Highway: Grimshaw St to M80 - Base 2026

15.2 Project 2026

Table 54: Greensborough Highway 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Grimshaw St to M80	North Bound	36000	550	500	37050
Grimshaw St to M80	South Bound	34000	550	400	34950

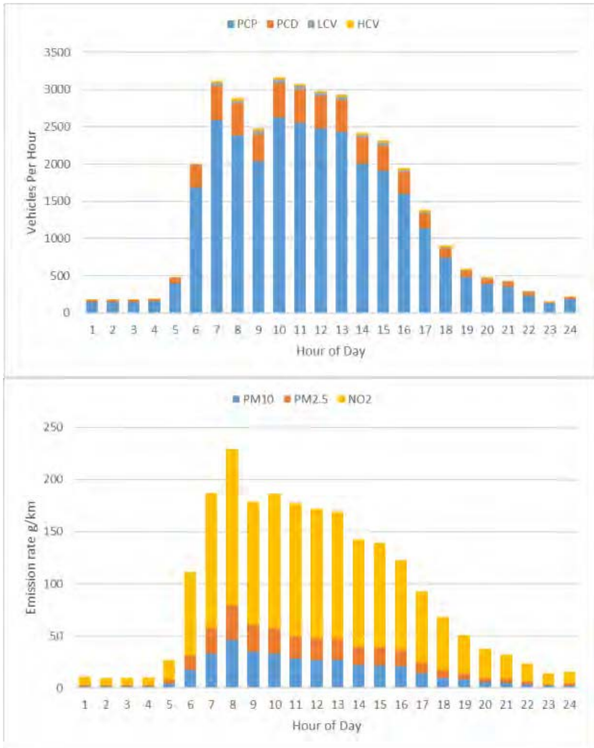
North Bound	South Bound
	

Figure 149: Greensborough Highway: Grimshaw St to M80 - Project 2026

15.3 Base 2036

Table 55: Greensborough Highway 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Grimshaw St to M80	North Bound	45000	3700	1500	50200
Grimshaw St to M80	South Bound	47000	3600	1700	52300

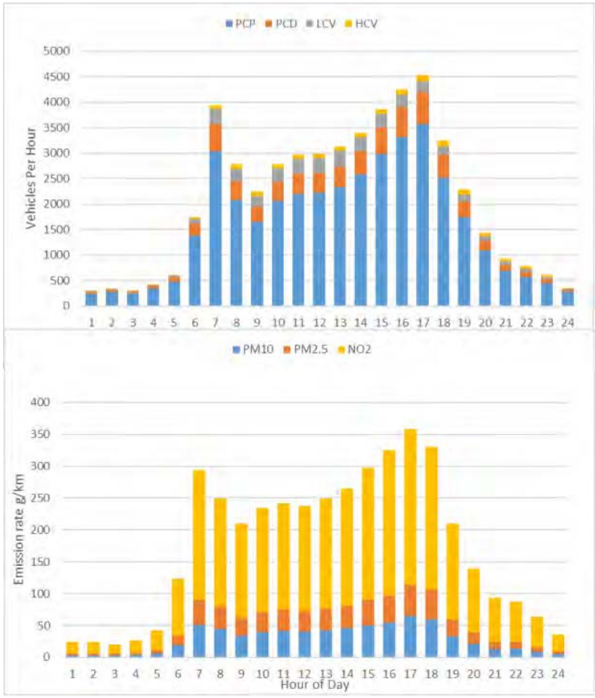
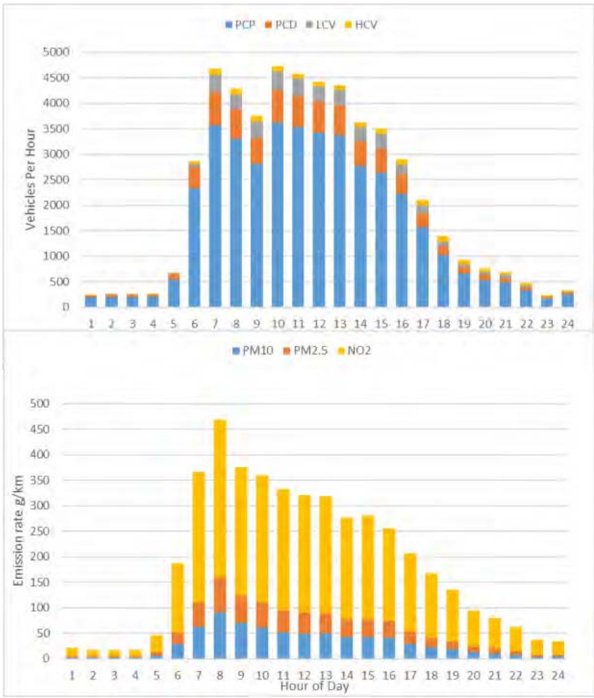
North Bound	South Bound
	

Figure 150: Greensborough Highway: Grimshaw St to M80 - Base 2036

15.4 Project 2036

Table 56: Greensborough Highway 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Grimshaw St to M80	North Bound	40000	550	500	41050
Grimshaw St to M80	South Bound	37000	550	400	37950

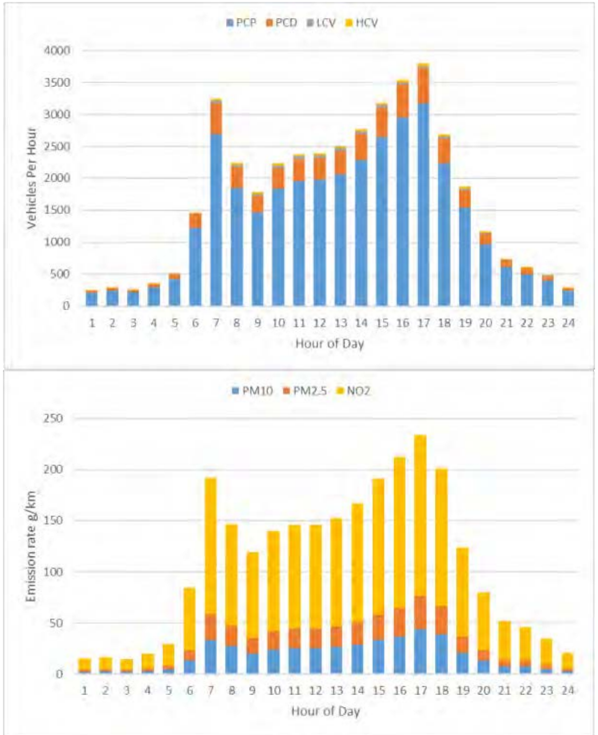
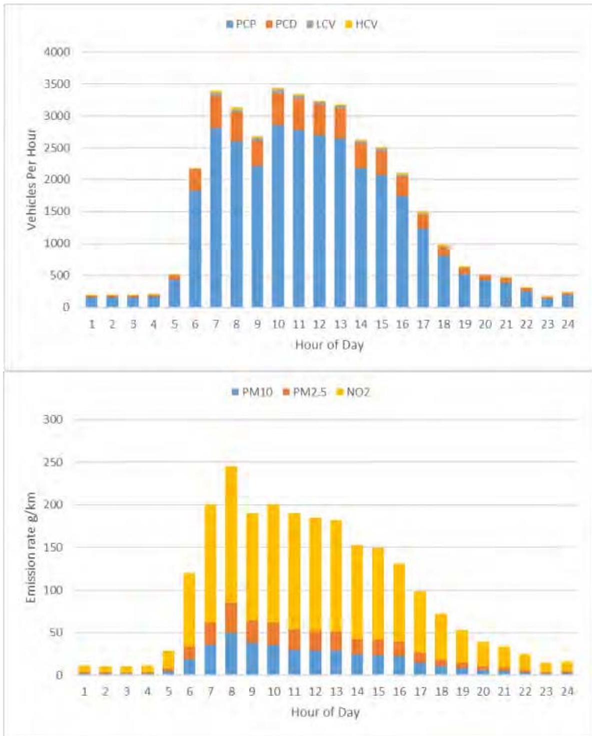
North Bound	North Bound
	

Figure 151: Greensborough Highway: Grimshaw St to M80 - Project 2036

16.0 GREENSBOROUGH RD

16.1 Base 2026

Table 57: Greensborough Highway 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Erskine Rd to Strathallan Rd	North Bound	31000	1100	1000	33100
Erskine Rd to Strathallan Rd	South Bound	31000	1200	1000	33200
Strathallan Rd to Yallambie Rd	North Bound	32000	1200	1000	34200
Strathallan Rd to Yallambie Rd	South Bound	32000	1200	1100	34300
Watsonia Rd to Grimshaw St	North Bound	31000	3200	1300	35500
Watsonia Rd to Grimshaw St	South Bound	33000	2100	1400	36500
at Simpsons Barracks	Northbound	31000	1300	1200	33500
at Simpsons Barracks	Southbound	32000	1400	1300	34700

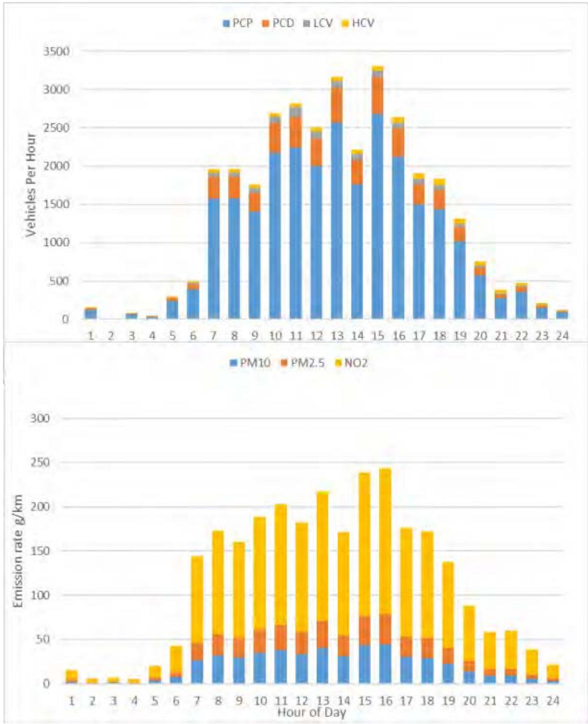
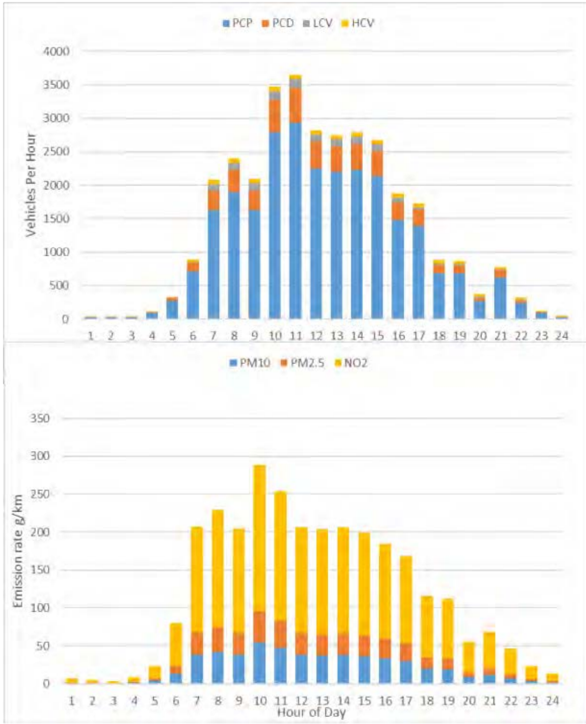
North Bound	South Bound
	

Figure 152: Greensborough Rd: Erskine Rd to Strathallan Rd - Base 2026

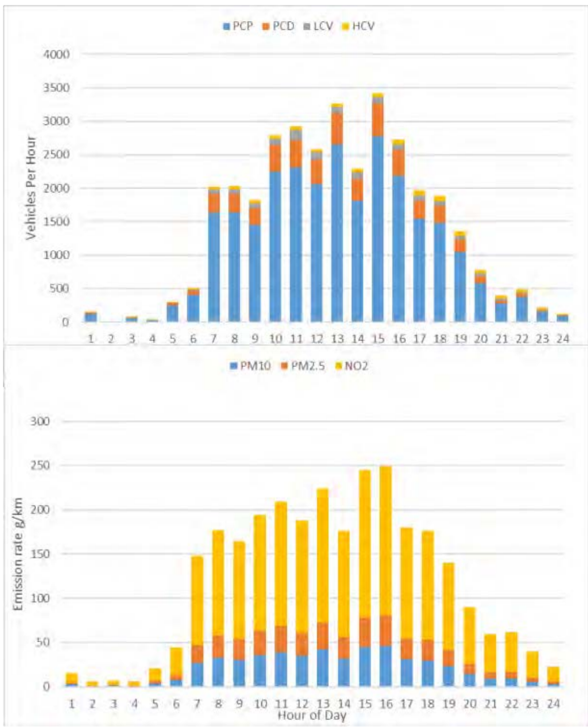
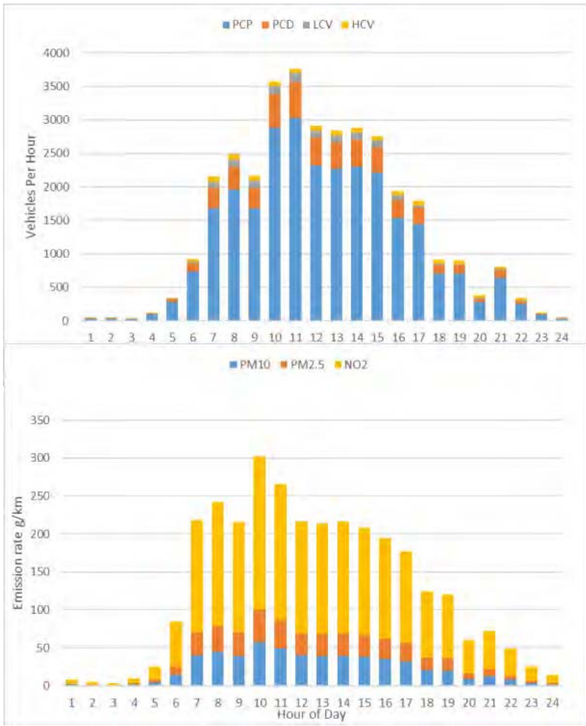
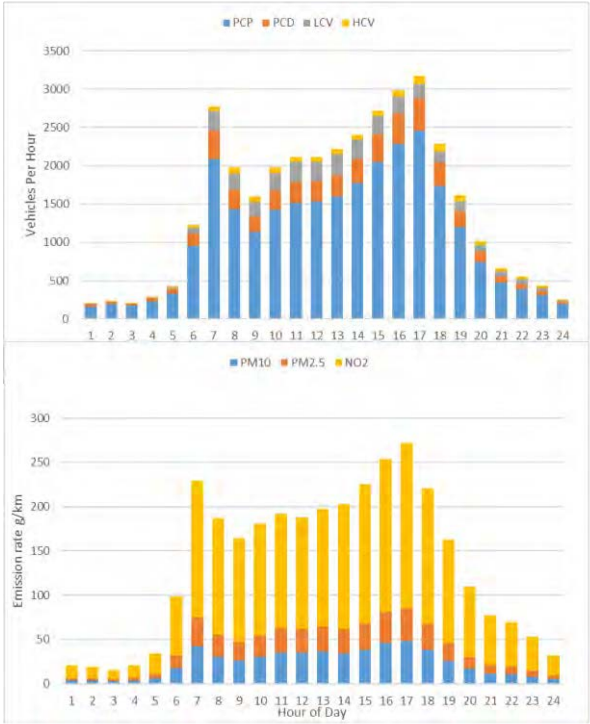
North Bound	South Bound
	

Figure 153: Greensborough Rd: Strathallan Rd to Yallambie Rd - Base 2026

North Bound	South Bound



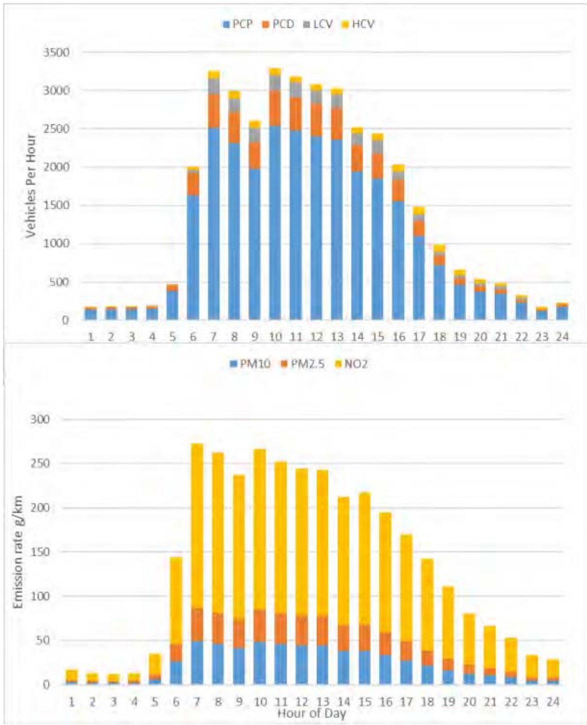
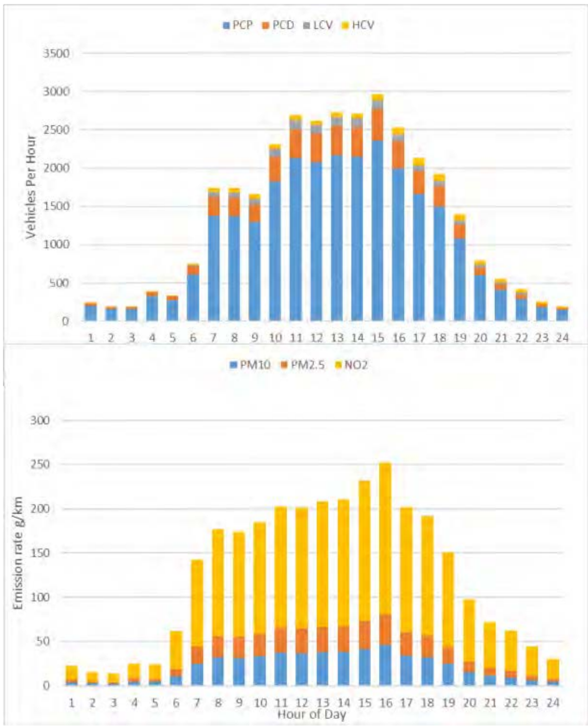


Figure 154: Greensborough Rd: Watsonia Rd to Grimshaw St - Base 2026

North Bound	South Bound



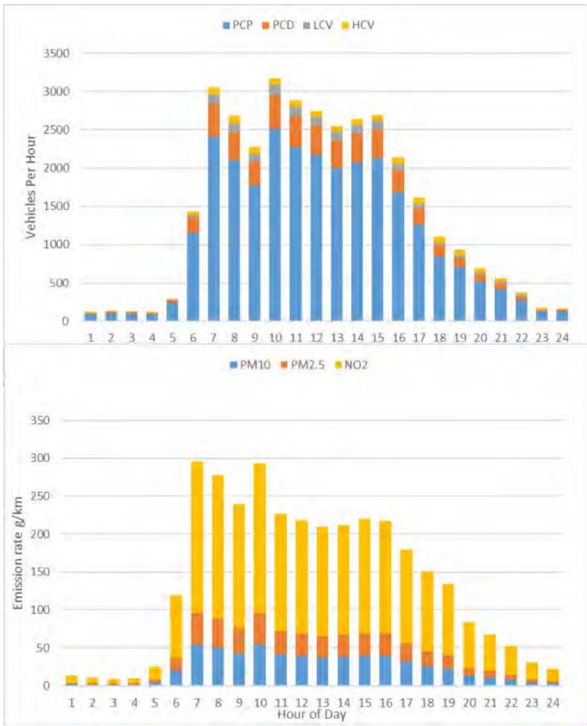


Figure 155: Greensborough Rd : at Simpsons Barracks - Base 2026

16.2 Project 2026

Table 58: Greensborough Rd 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Erskine Rd to Strathallan Rd	North Bound	18000	500	150	18650
Erskine Rd to Strathallan Rd	South Bound	18000	500	150	18650
Strathallan Rd to Yallambie Rd	North Bound	25000	400	150	25550
Strathallan Rd to Yallambie Rd	South Bound	25000	400	200	25600
Watsonia Rd to Grimshaw St	North Bound	17000	500	200	17700
Watsonia Rd to Grimshaw St	South Bound	15000	400	150	15550
at Simpsons Barracks	Northbound	18000	600	150	18750
at Simpsons Barracks	Southbound	17000	600	150	17750

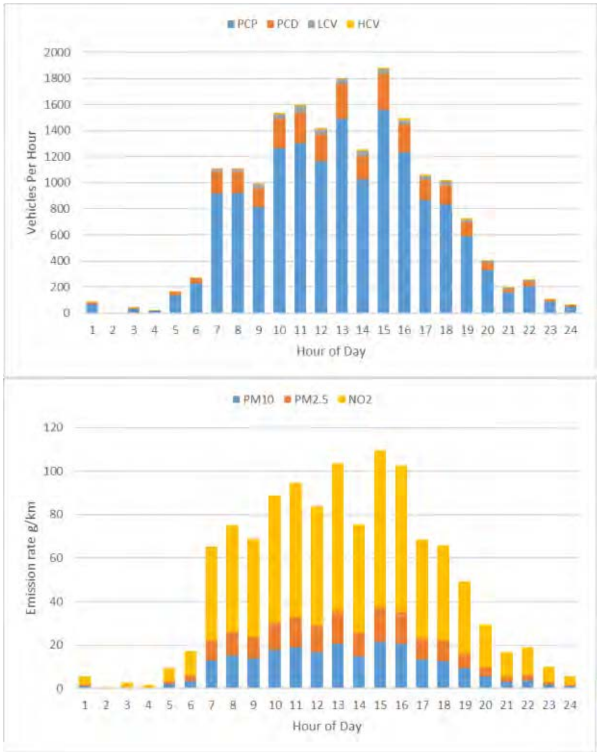
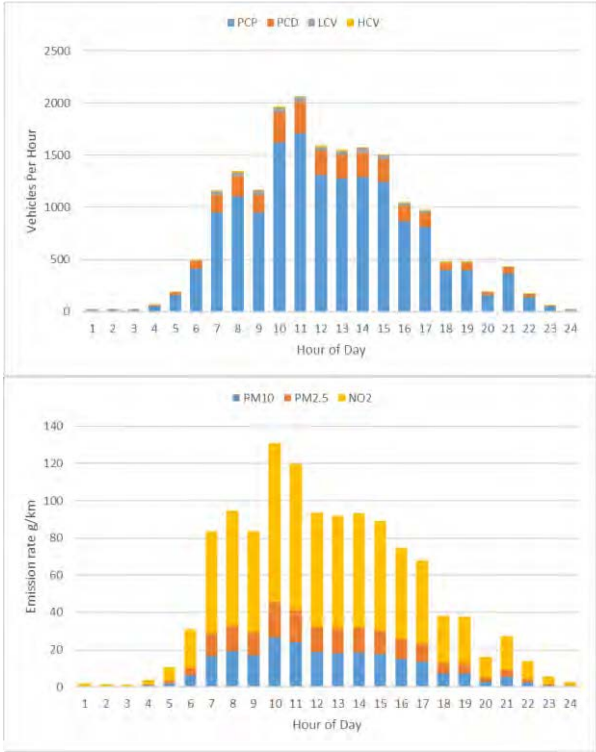
North Bound	South Bound
	

Figure 156: Greensborough Rd: Erskine Rd to Strathallan Rd - Project 2026

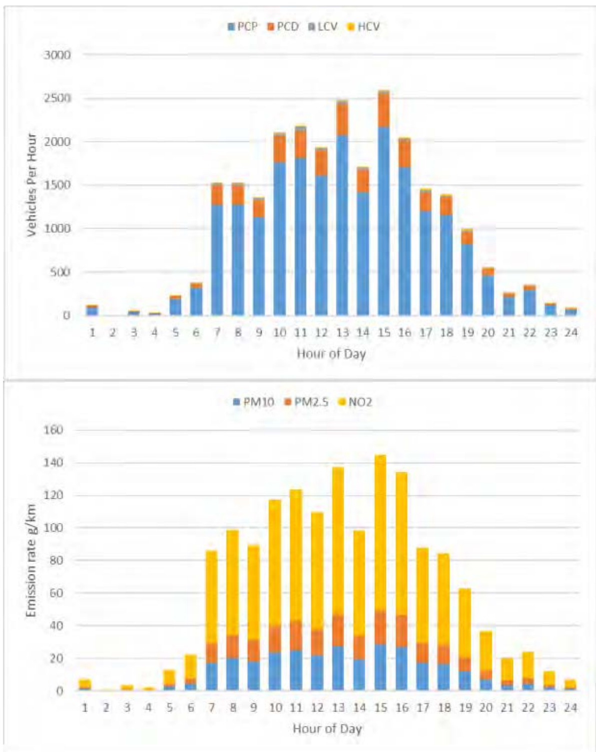
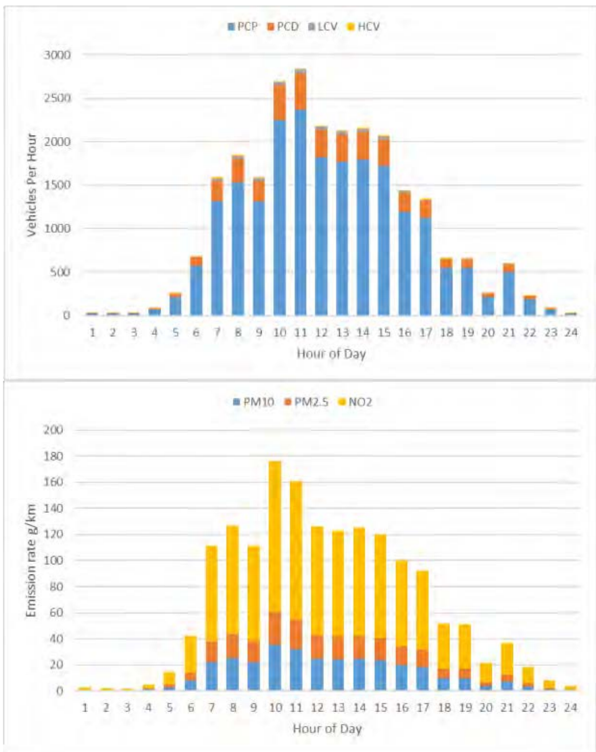
North Bound	South Bound
	

Figure 157: Greensborough Rd: Strathallan Rd to Yallambie Rd - Project 2026

North Bound

South Bound

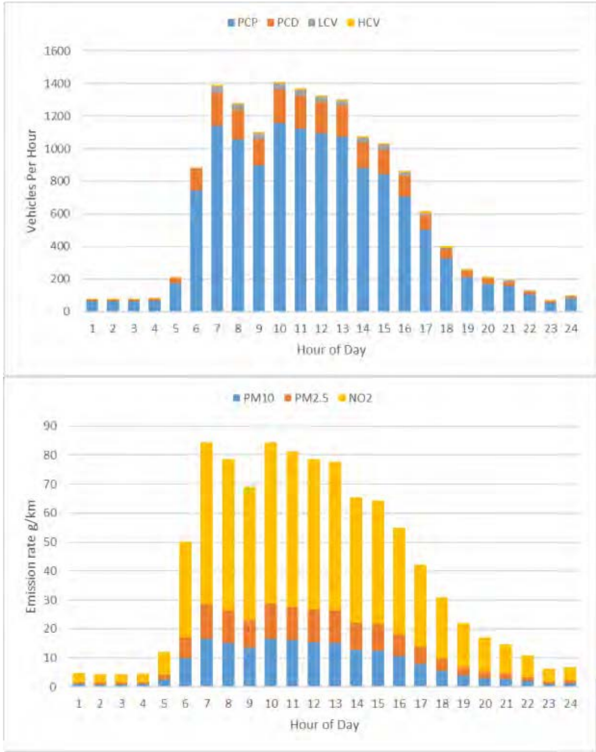
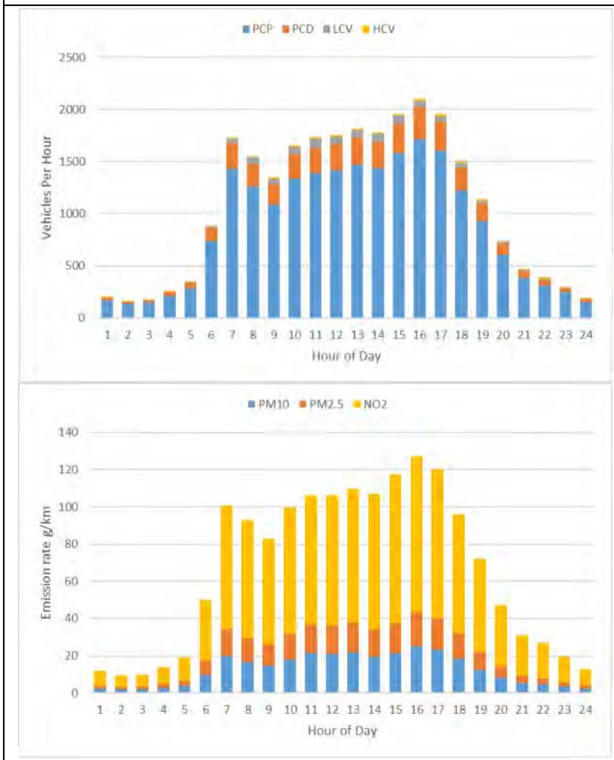


Figure 158: Greensborough Rd: Watsonia Rd to Grimshaw St - Project 2026

North Bound



South Bound

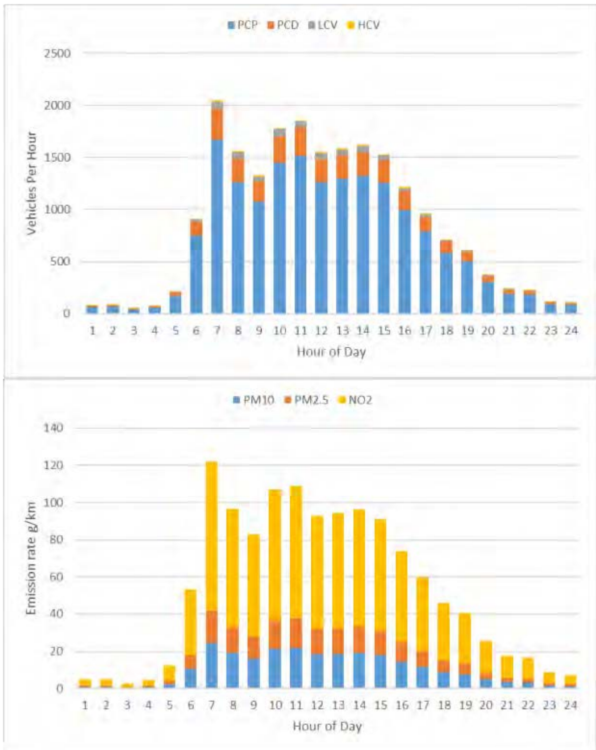
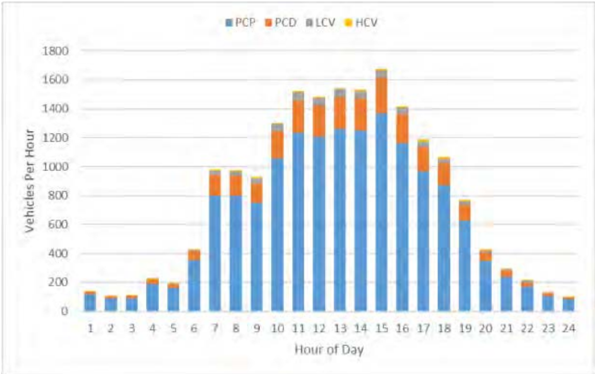
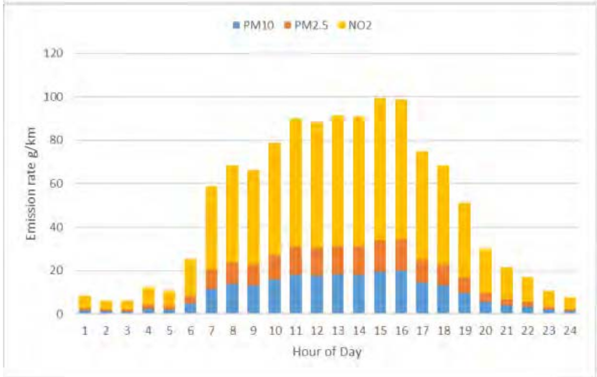


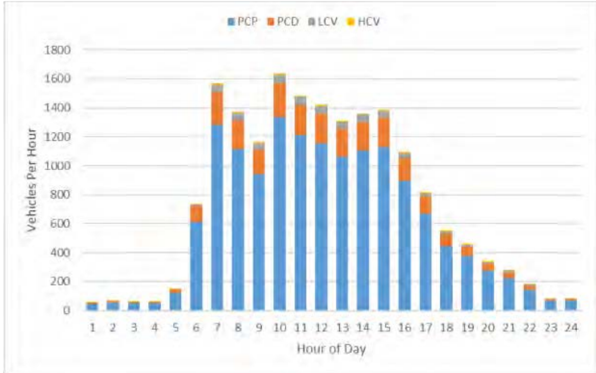
Figure 159: Greensborough Rd: South Of Watsonia Rd - Project 2026

North Bound





South Bound



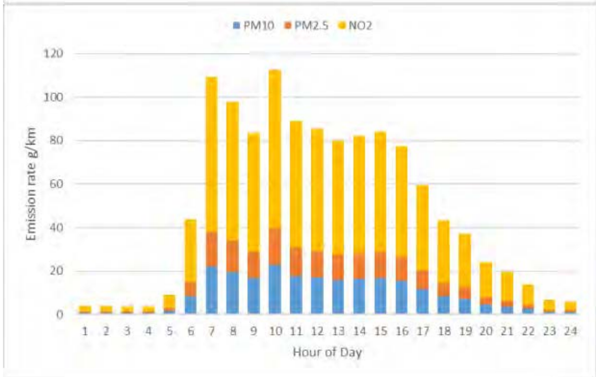


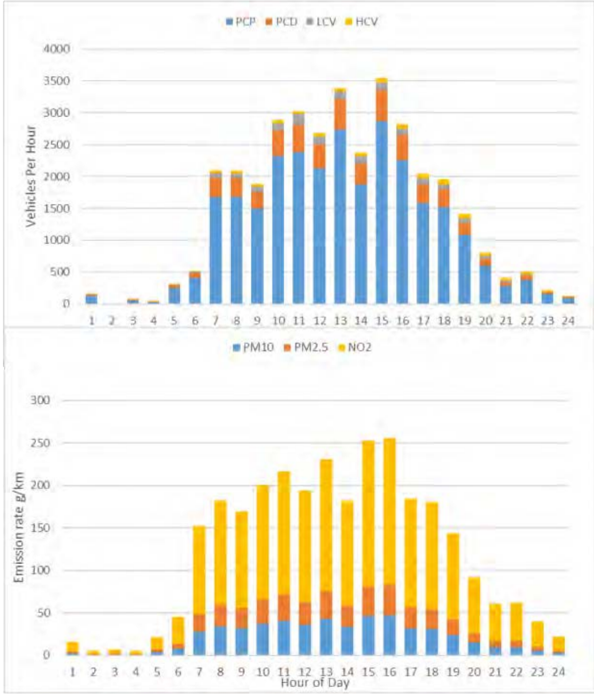
Figure 160: Greensborough Rd : at Simpsons Barracks - Project 2026

16.3 Base 2036

Table 59: Greensborough Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Erskine Rd to Strathallan Rd	North Bound	33000	1400	1000	35400
Erskine Rd to Strathallan Rd	South Bound	33000	1400	1100	35500
Strathallan Rd to Yallambie Rd	North Bound	34000	1400	1000	36400
Strathallan Rd to Yallambie Rd	South Bound	34000	1400	1100	36500
Watsonia Rd to Grimshaw St	North Bound	34000	3800	1400	39200
Watsonia Rd to Grimshaw St	South Bound	36000	2500	1600	40100
at Simpsons Barracks	Northbound	33000	1500	1300	35800
at Simpsons Barracks	Southbound	34000	1700	1500	37200

North Bound	South Bound



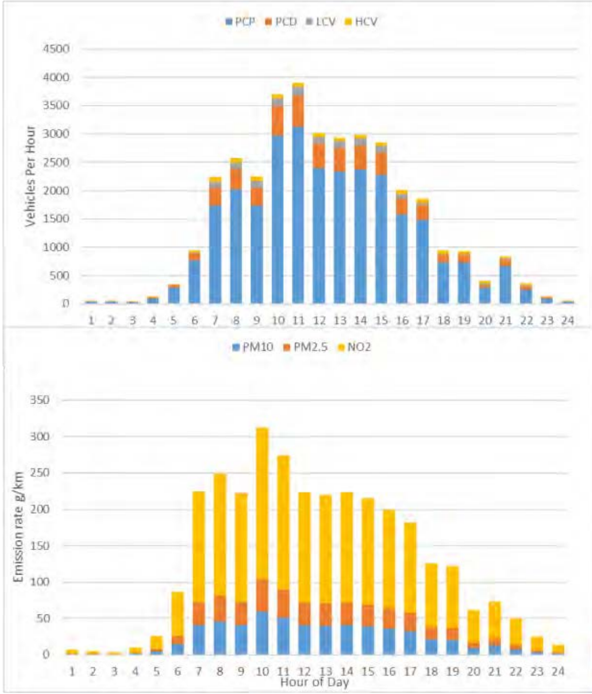
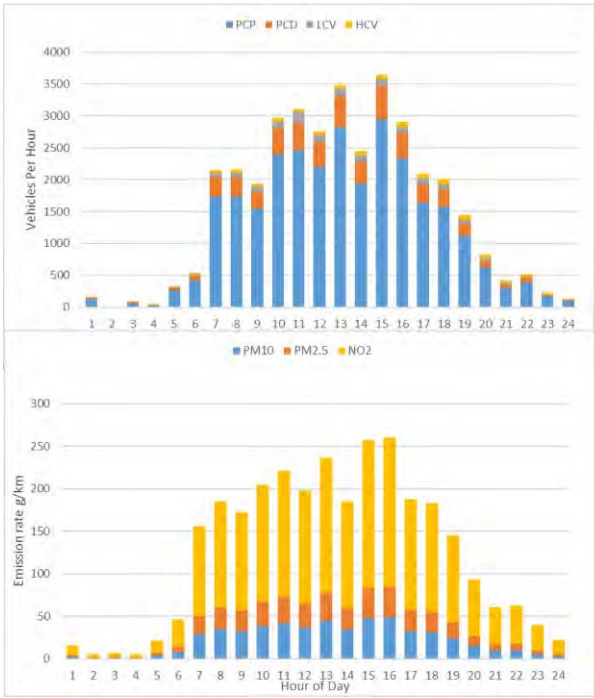


Figure 161: Greensborough Rd: Erskine Rd to Strathallan Rd - Base 2036

North Bound	South Bound



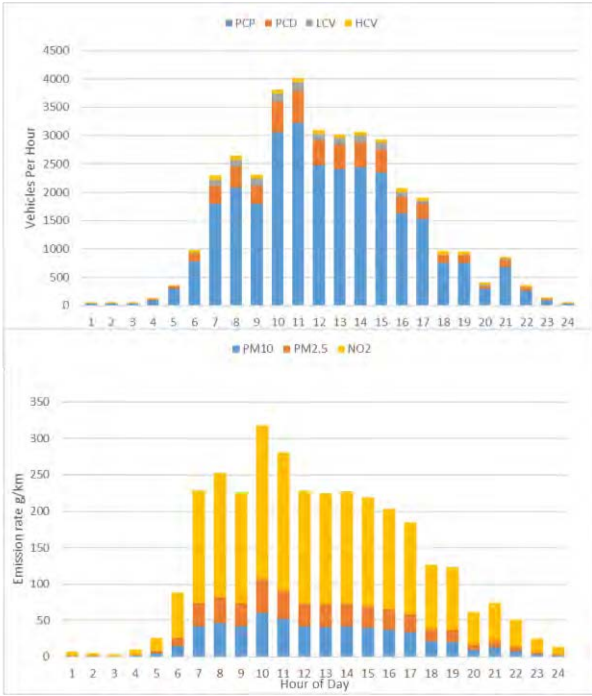


Figure 162: Greensborough Rd: Strathallan Rd to Yallambie Rd - Base 2036

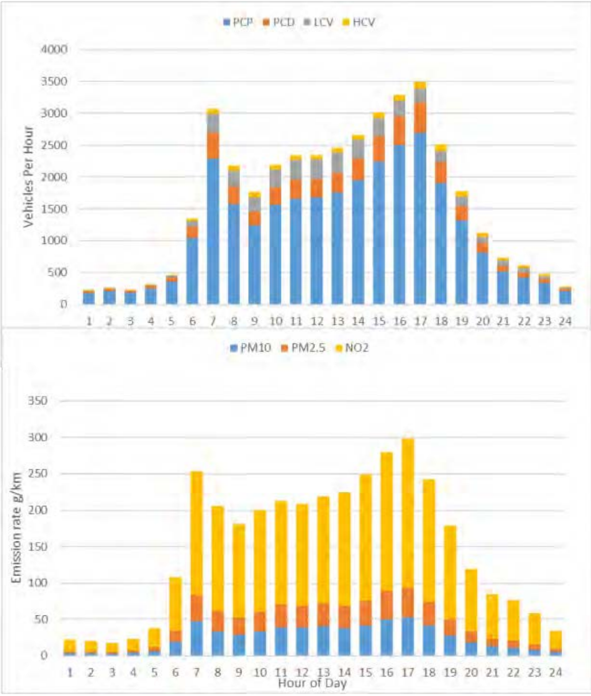
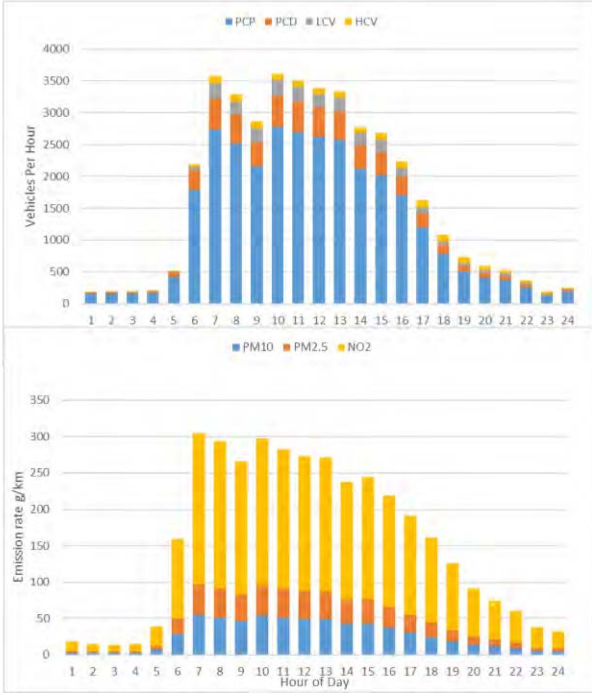
North Bound	South Bound
	

Figure 163: Greensborough Rd: Watsonia Rd to Grimshaw St - Base 2036

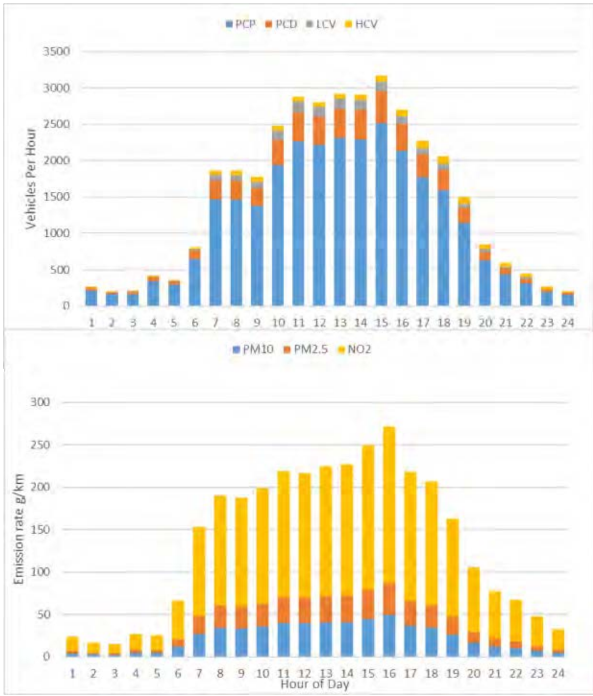
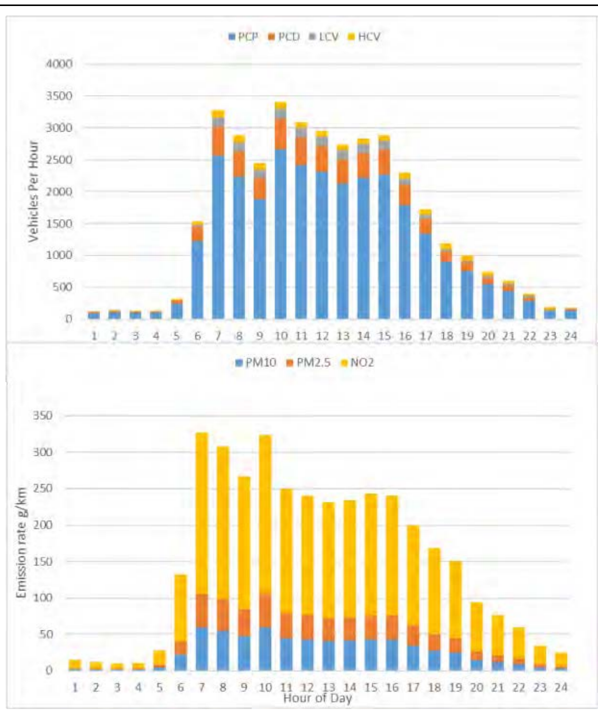
North Bound	South Bound
	

Figure 164: Greensborough Rd : at Simpsons Barracks - Base 2036

16.4 Project 2036

Table 60: Greensborough Rd 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Erskine Rd to Strathallan Rd	North Bound	20000	600	150	20750
Erskine Rd to Strathallan Rd	South Bound	20000	600	150	20750
Strathallan Rd to Yallambie Rd	North Bound	27000	400	150	27550
Strathallan Rd to Yallambie Rd	South Bound	27000	400	200	27600
Watsonia Rd to Grimshaw St	North Bound	18000	500	150	18650
Watsonia Rd to Grimshaw St	South Bound	16000	400	150	16550
at Simpsons Barracks	Northbound	20000	700	200	20900
at Simpsons Barracks	Southbound	18000	700	200	18900

North Bound	South Bound

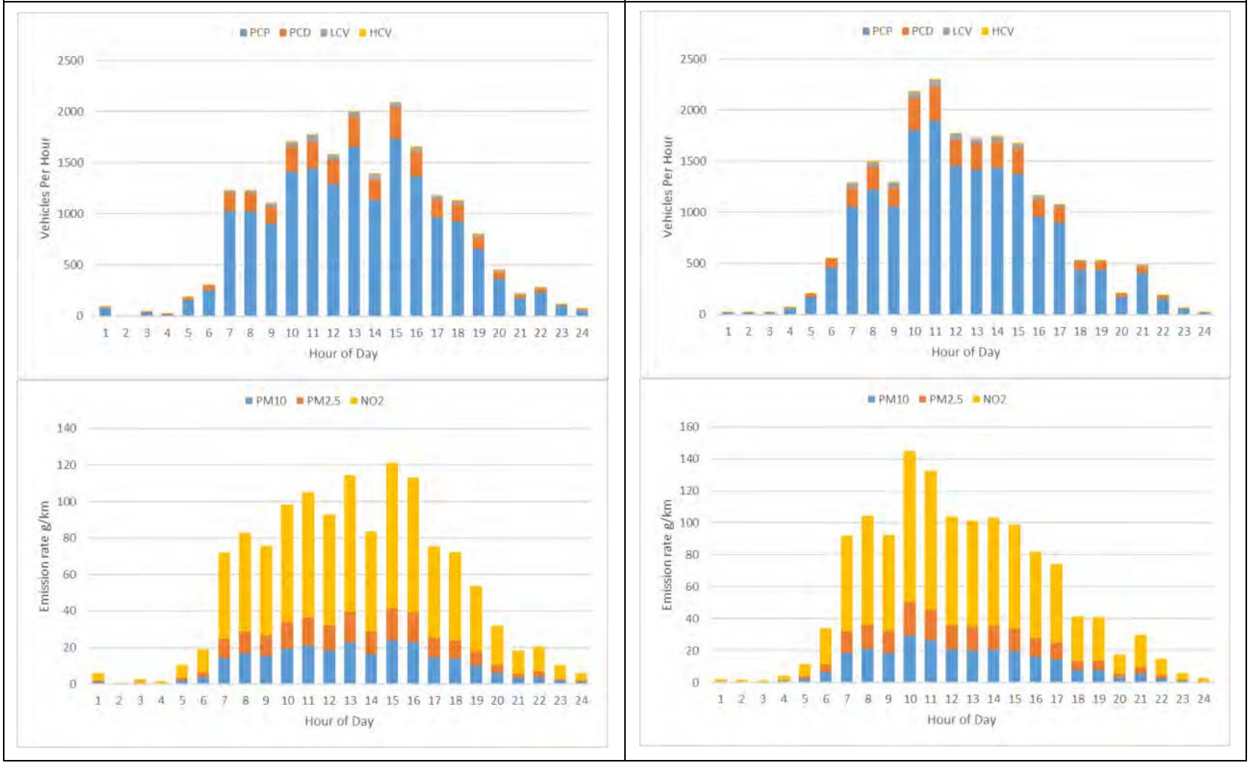


Figure 165: Greensborough Rd: Erskine Rd to Strathallan Rd - Project 2036

North Bound	South Bound

Figure 166: Greensborough Rd: Strathallan Rd to Yallambie Rd - Project 2036

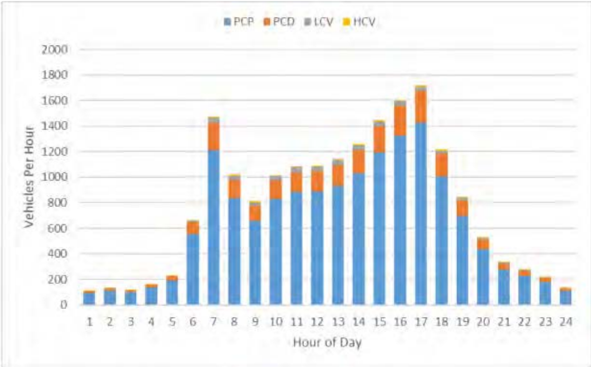
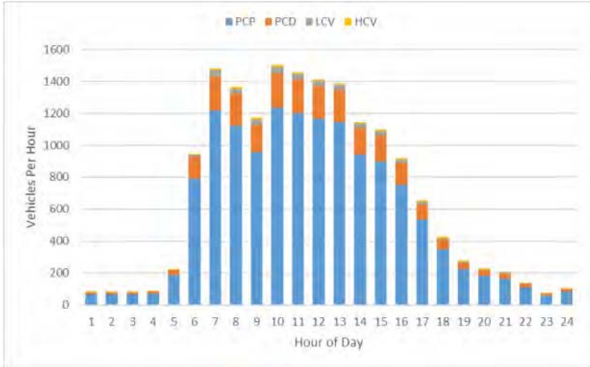
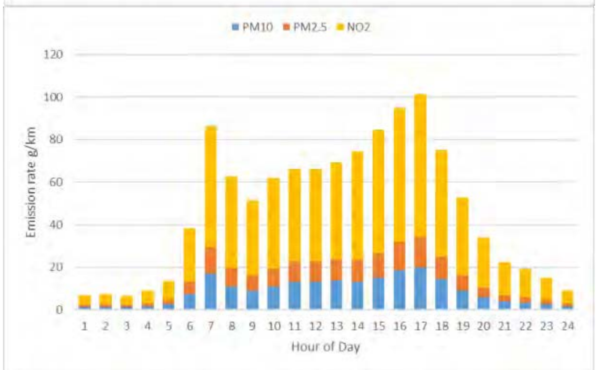
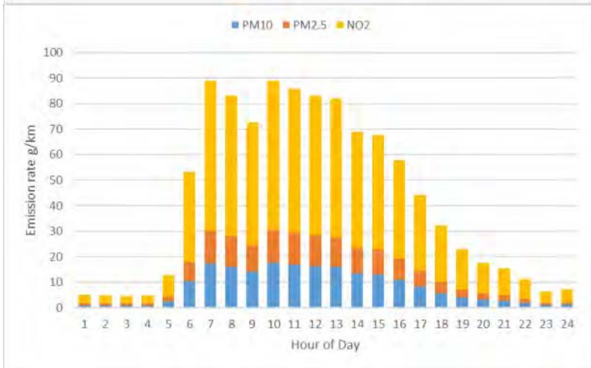
North Bound	South Bound
	
	

Figure 167: Greensborough Rd: Watsonia Rd to Grimshaw St - Project 2036

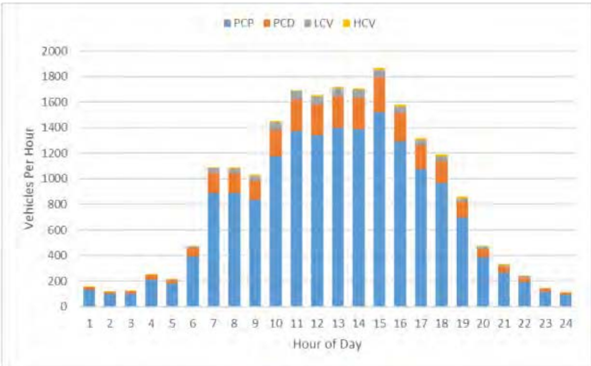
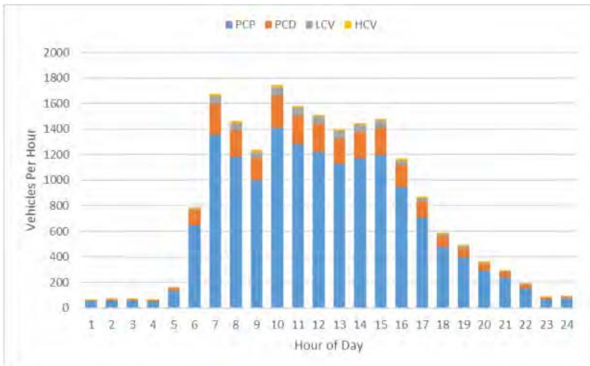
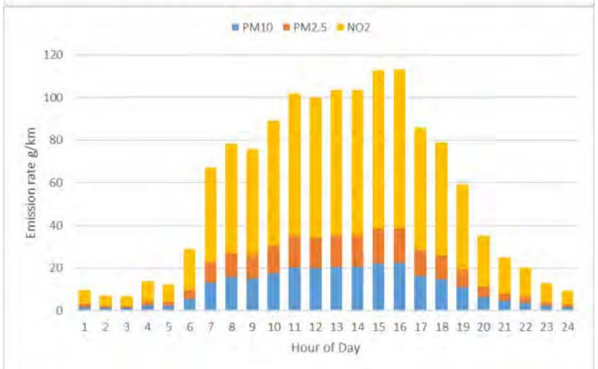
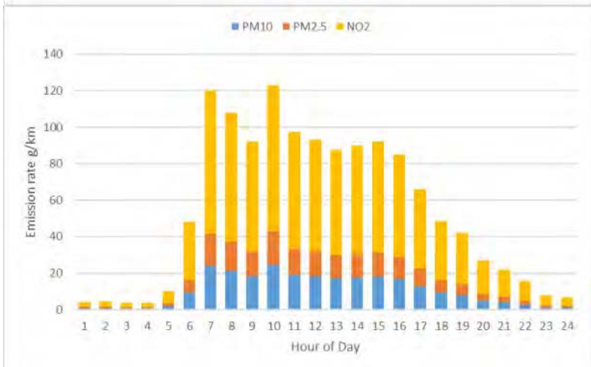
North Bound	South Bound
	
	

Figure 168: Greensborough Rd : at Simpsons Barracks - Project 2036

17.0 GRIMSHAW ST

17.1 Base 2026

Table 61: Grimshaw St 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Watsonia Rd to Greensborough Hwy	East Bound	13000	700	250	13950
Watsonia Rd to Greensborough Hwy	West Bound	12000	600	250	12850

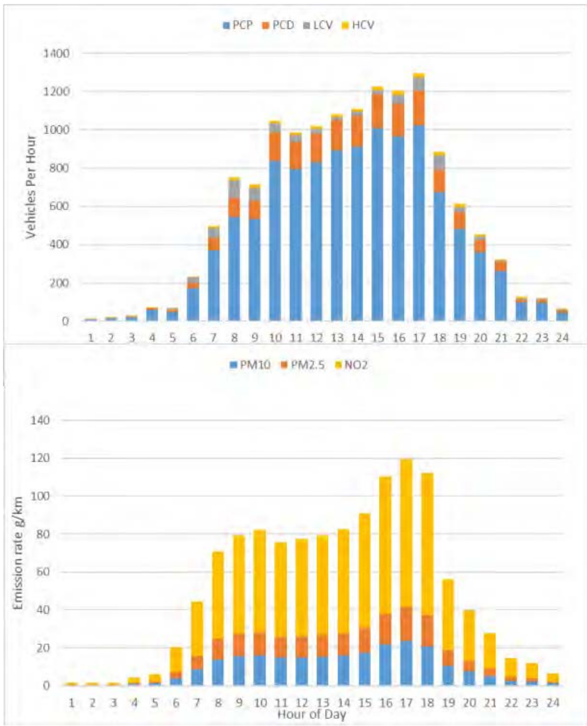
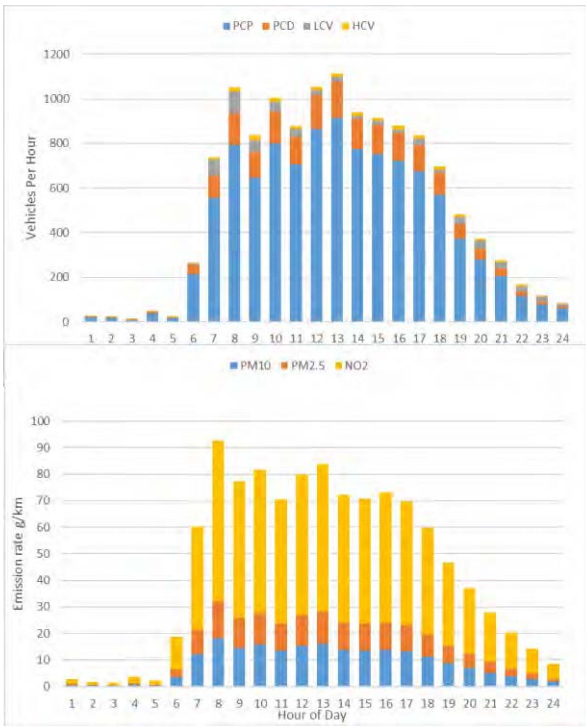
East Bound	West Bound
	

Figure 169: Grimshaw St: Watsonia Rd to Greensborough Hwy - Base 2026

17.2 Project 2026

Table 62: Grimshaw St 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Watsonia Rd to Greensborough Hwy	East Bound	15000	1100	500	16600
Watsonia Rd to Greensborough Hwy	West Bound	14000	800	350	15150

East Bound	West Bound

Figure 170: Grimshaw St: Watsonia Rd to Greensborough Hwy - Project 2026

17.3 Base 2036

Table 63: Grimshaw St 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Watsonia Rd to Greensborough Hwy	East Bound	15000	900	300	16200
Watsonia Rd to Greensborough Hwy	West Bound	14000	700	300	15000

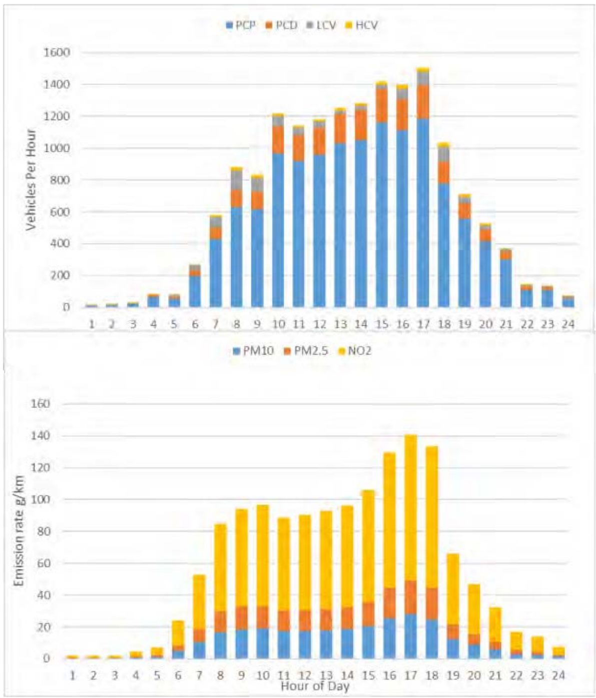
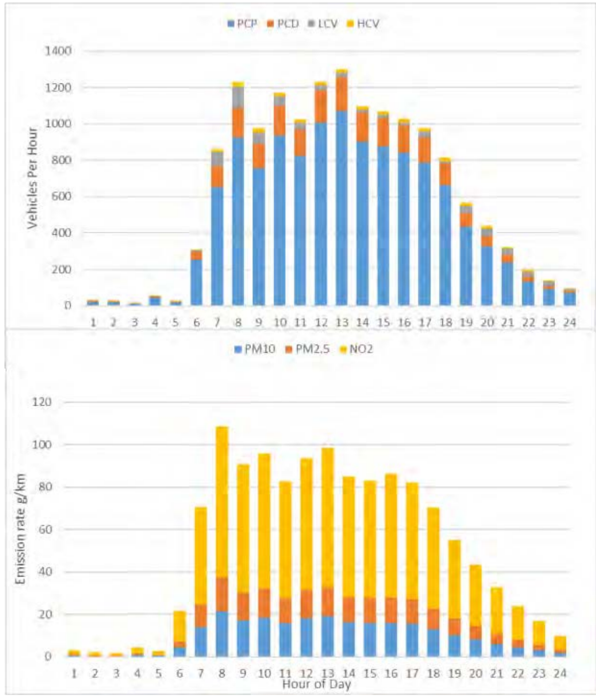
East Bound	West Bound
	

Figure 171: Grimshaw St: Watsonia Rd to Greensborough Hwy - Base 2036

17.4 Project 2036

Table 64: Grimshaw St 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Watsonia Rd to Greensborough Hwy	East Bound	17000	1200	600	18800
Watsonia Rd to Greensborough Hwy	West Bound	15000	900	400	16300

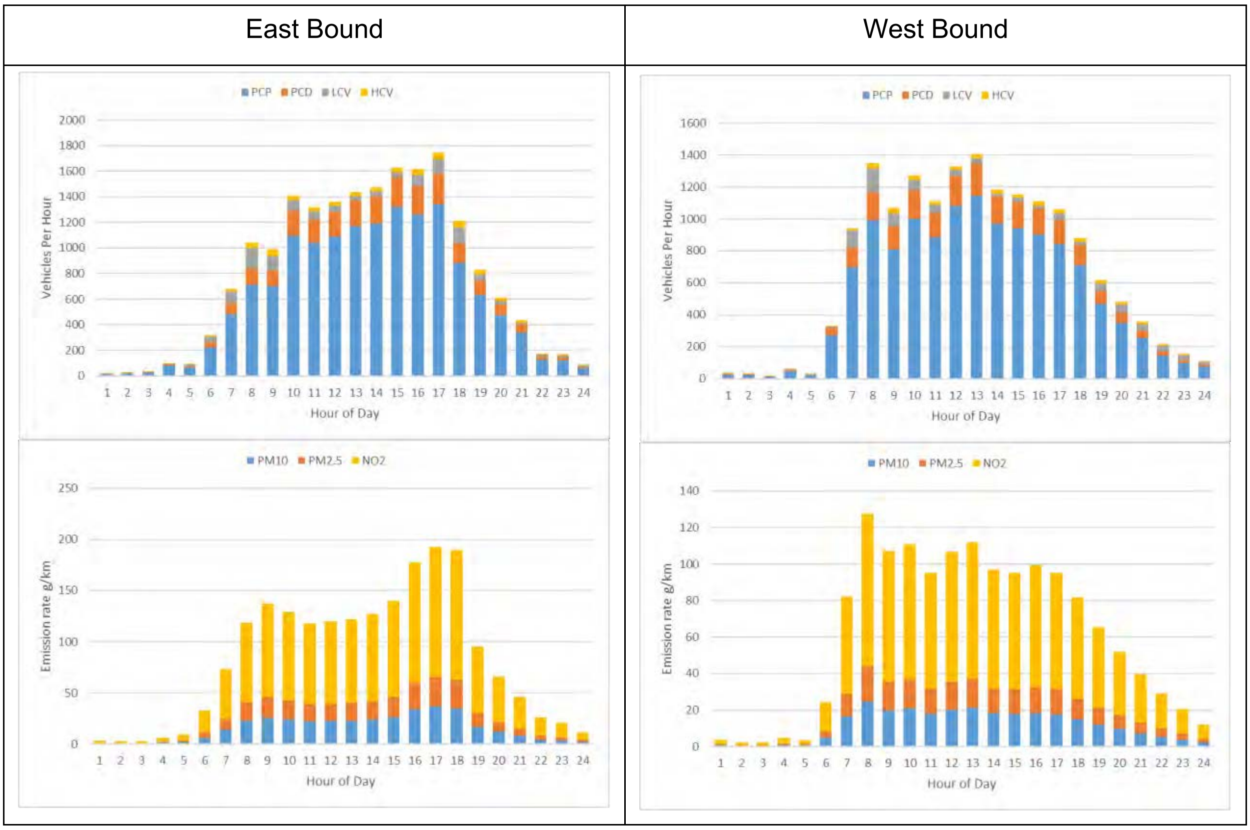


Figure 172: Grimshaw St: Watsonia Rd to Greensborough Hwy - Project 2036

18.0 HIGH ST

18.1 Base 2026

Table 65: High St 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
North of Settlement Rd	North Bound	21000	700	400	22100
North of Settlement Rd	South Bound	21000	500	600	22100
Keon Pde to Broadway	North Bound	25000	1500	900	27400
Keon Pde to Broadway	South Bound	21000	2100	700	23800
Mahoneys Rd to Settlement Rd	North Bound	20000	800	1100	21900
Mahoneys Rd to Settlement Rd	South Bound	19000	1200	300	20500

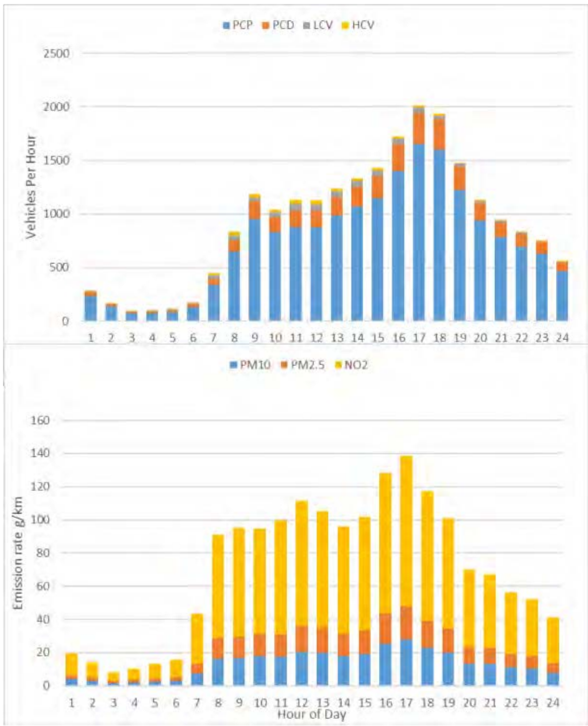
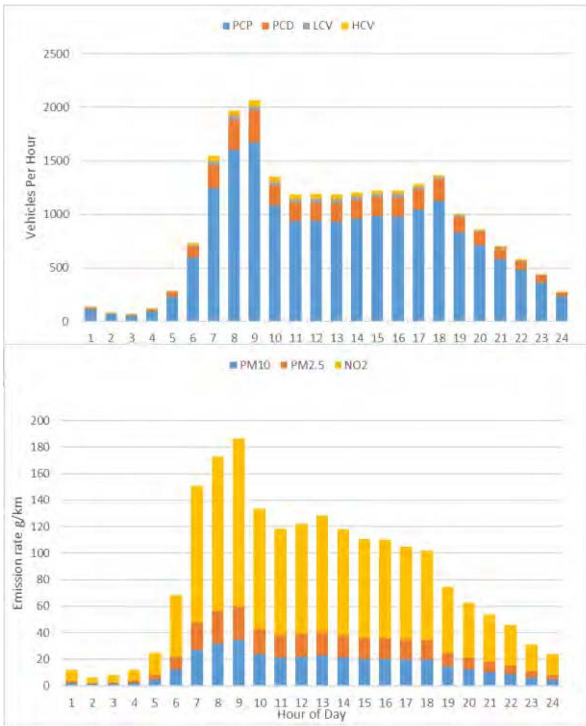
North Bound	South Bound
	

Figure 173: High St: North of Settlement Rd - Base 2026

North Bound	South Bound

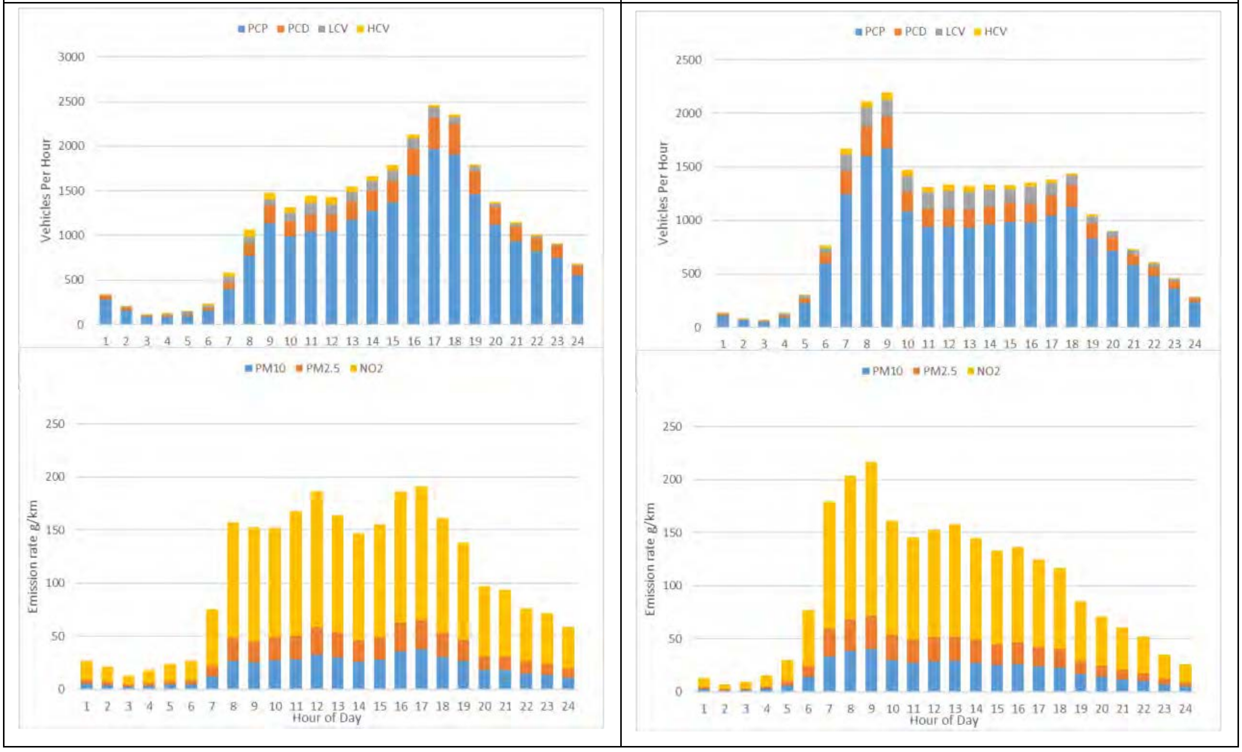


Figure 174: High St: Keon Pde to Broadway - Base 2026

North Bound	South Bound

Figure 175: High St: Mahoneys Rd to Settlement Rd - Base 2026

18.2 Project 2026

Table 66: High St 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
North of Settlement Rd	North Bound	21000	700	400	22100
North of Settlement Rd	South Bound	21000	500	600	22100
Keon Pde to Broadway	North Bound	25000	1300	500	26800
Keon Pde to Broadway	South Bound	22000	1900	400	24300
Mahoneys Rd to Settlement Rd	North Bound	19000	700	1000	20700
Mahoneys Rd to Settlement Rd	South Bound	19000	1200	300	20500

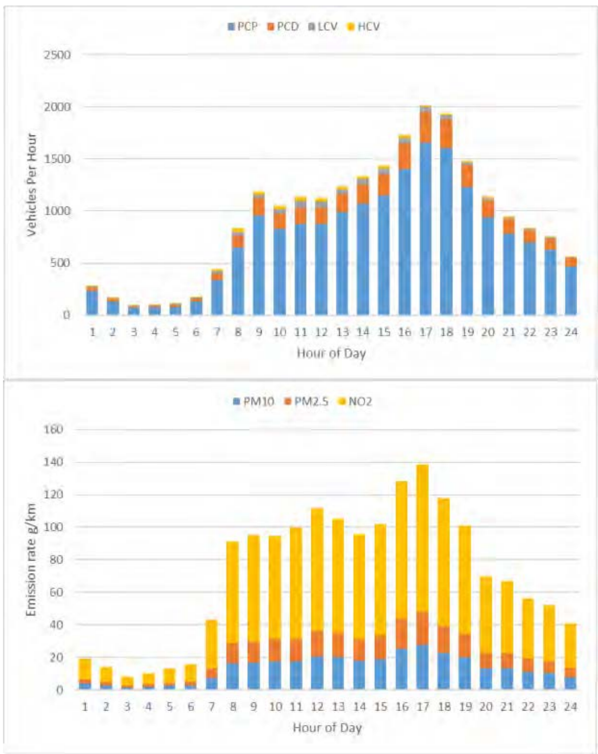
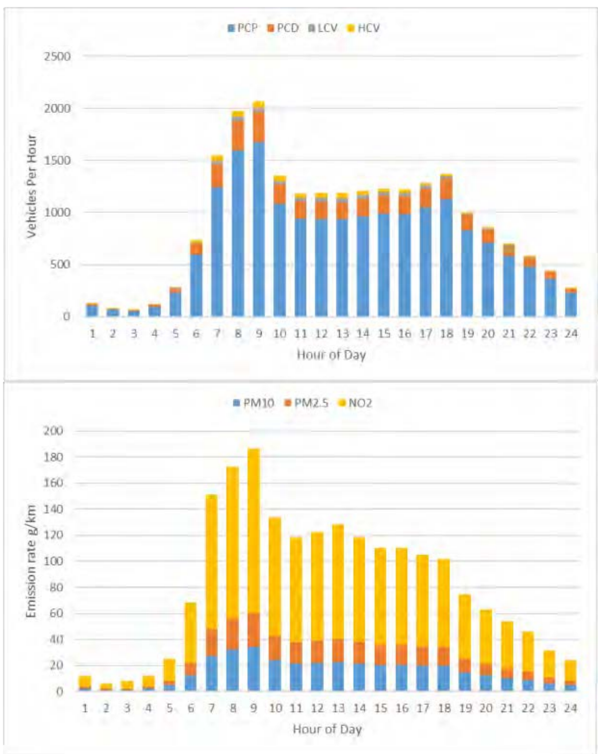
North Bound	South Bound
	

Figure 176: High St: North of Settlement Rd - Project 2026

North Bound	South Bound

Figure 177: High St: Keon Pde to Broadway - Project 2026

North Bound	South Bound

Figure 178: High St: Mahoneys Rd to Settlement Rd - Project 2026

18.3 Base 2036

Table 67: High St 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
North of Settlement Rd	North Bound	24000	900	900	25800
North of Settlement Rd	South Bound	24000	600	1400	26000
Keon Pde to Broadway	North Bound	28000	1500	1000	30500
Keon Pde to Broadway	South Bound	24000	2200	800	27000
Mahoneys Rd to Settlement Rd	North Bound	23000	900	2300	26200
Mahoneys Rd to Settlement Rd	South Bound	23000	1400	700	25100

North Bound	South Bound

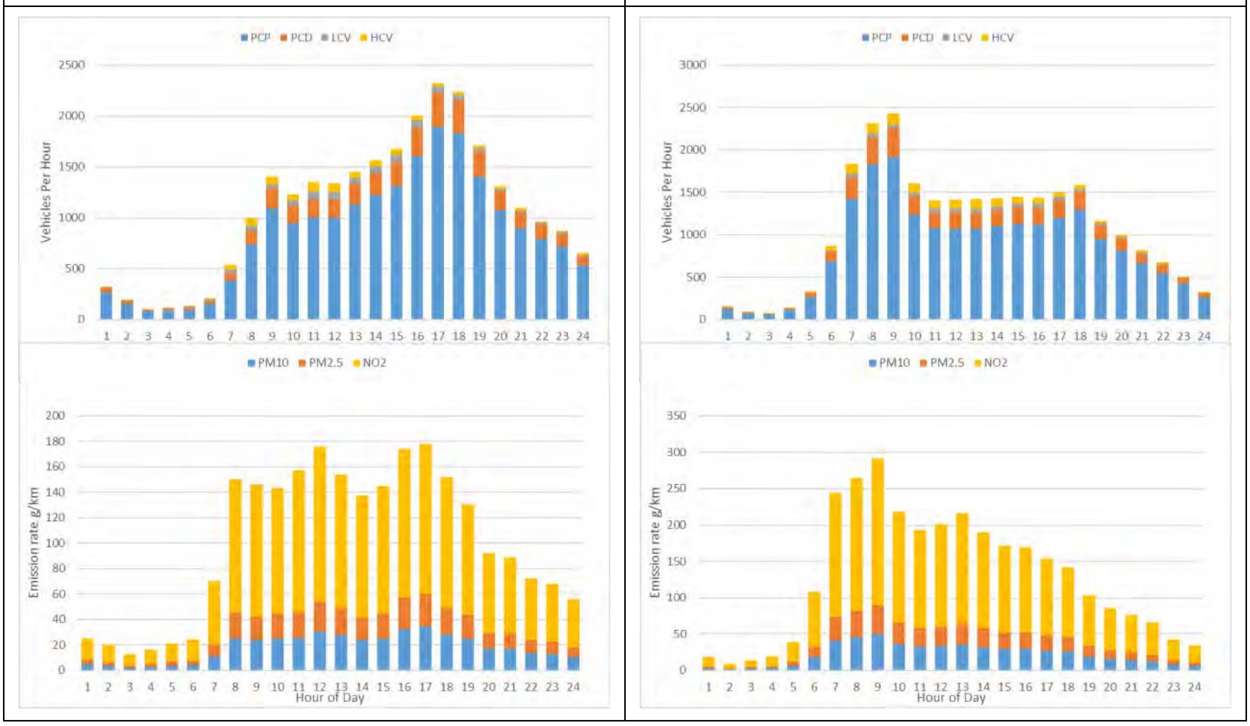


Figure 179: High St: North of Settlement Rd - Base 2036

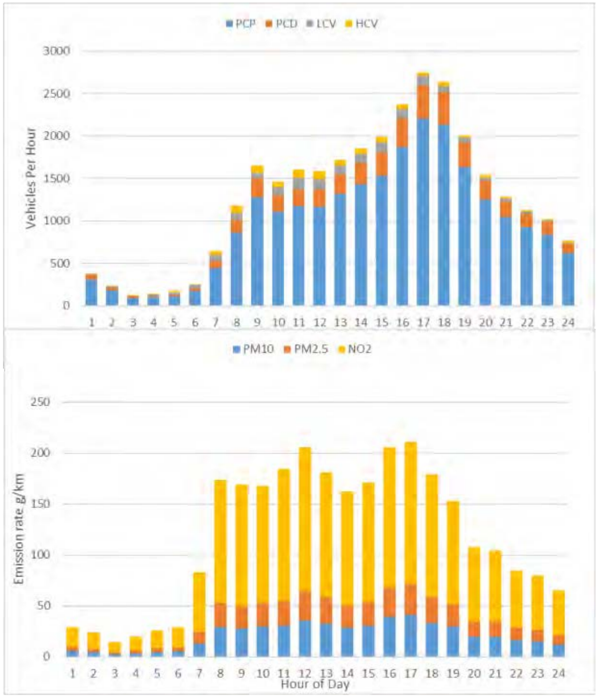
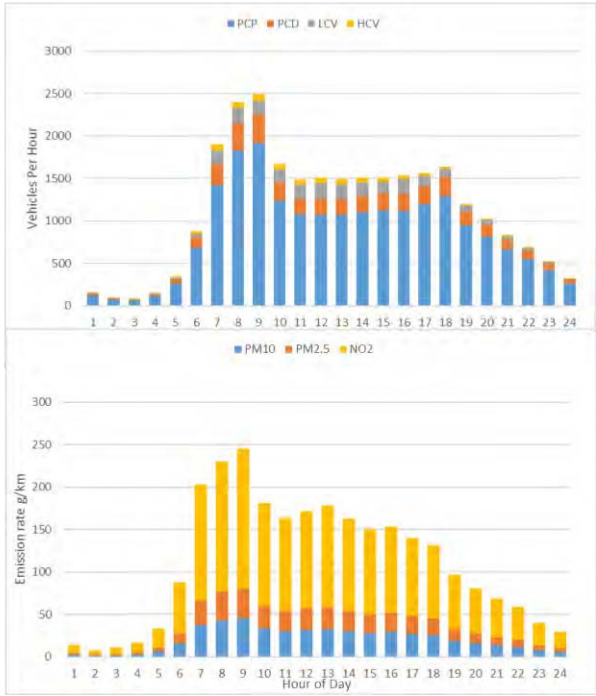
North Bound	South Bound
	

Figure 180: High St: Keon Pde to Broadway - Base 2036

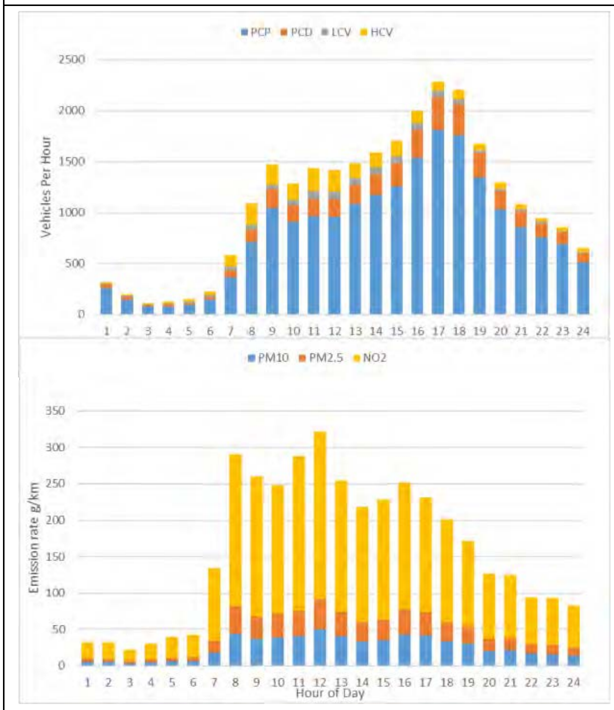
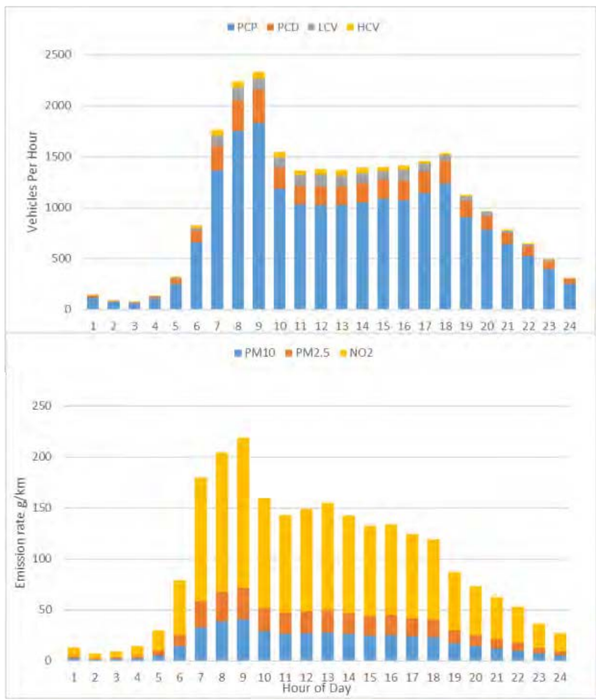
North Bound	South Bound
	

Figure 181: High St: Mahoneys Rd to Settlement Rd - Base 2036

18.4 Project 2036

Table 68: High St 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
North of Settlement Rd	North Bound	25000	900	700	26600
North of Settlement Rd	South Bound	25000	600	1000	26600
Keon Pde to Broadway	North Bound	27000	1400	600	29000
Keon Pde to Broadway	South Bound	24000	1900	500	26400
Mahoneys Rd to Settlement Rd	North Bound	23000	800	1600	25400
Mahoneys Rd to Settlement Rd	South Bound	23000	1300	500	24800

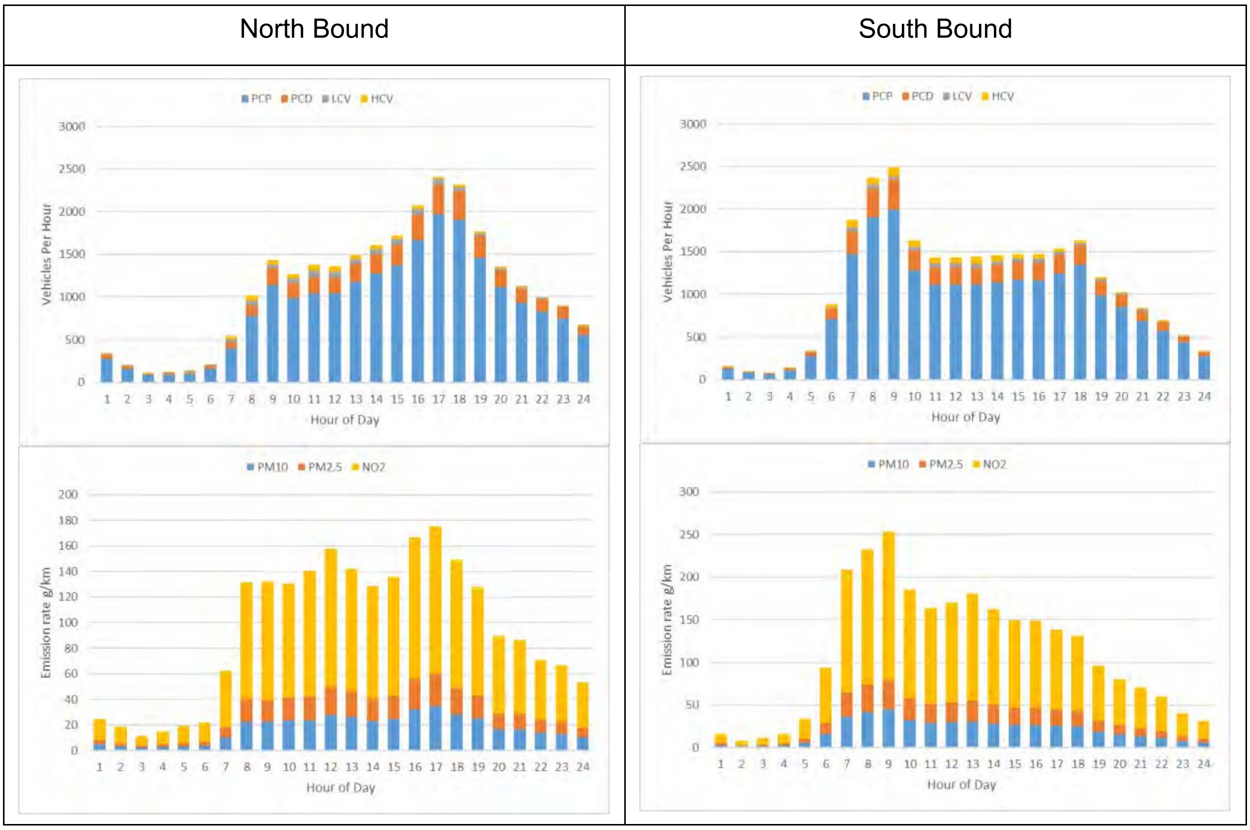


Figure 182: High St: North of Settlement Rd - Project 2036

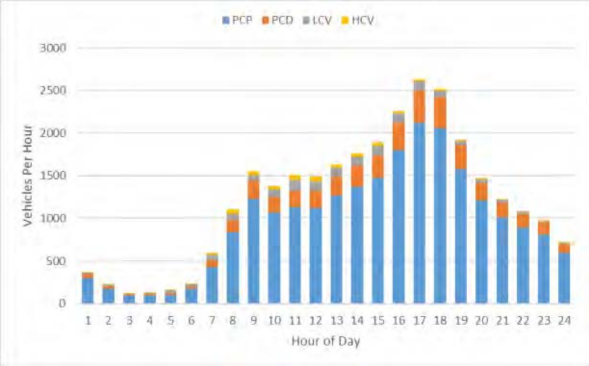
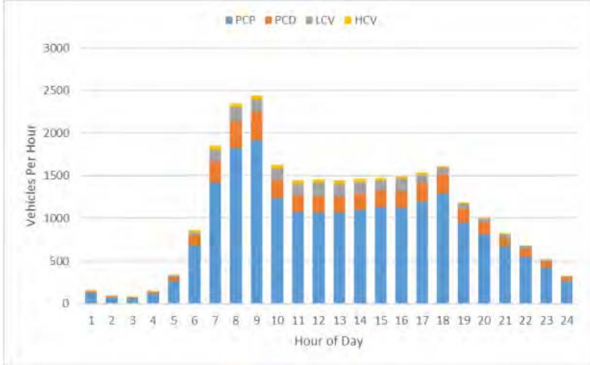
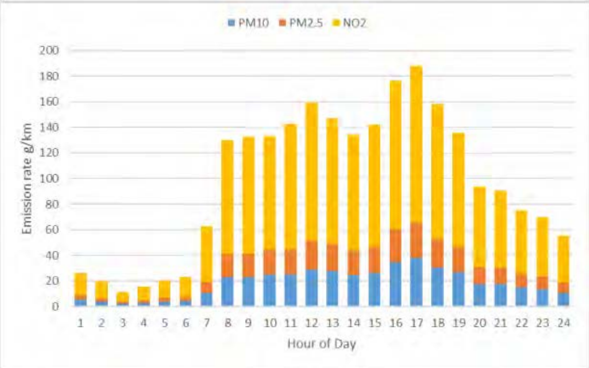
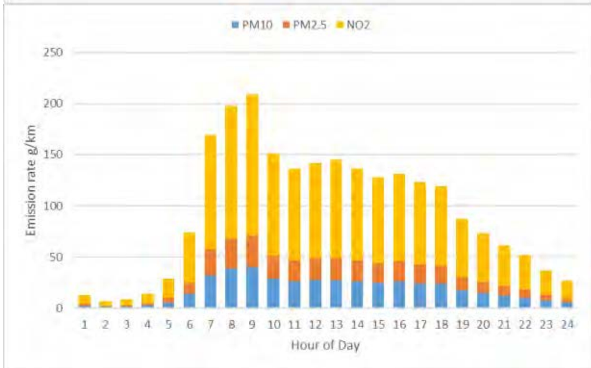
North Bound	South Bound
	
	

Figure 183: High St: Keon Pde to Broadway - Project 2036

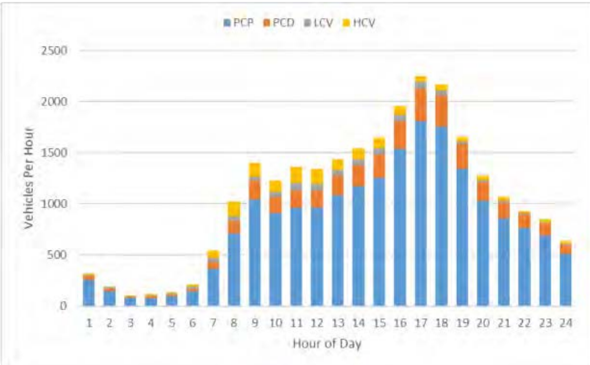
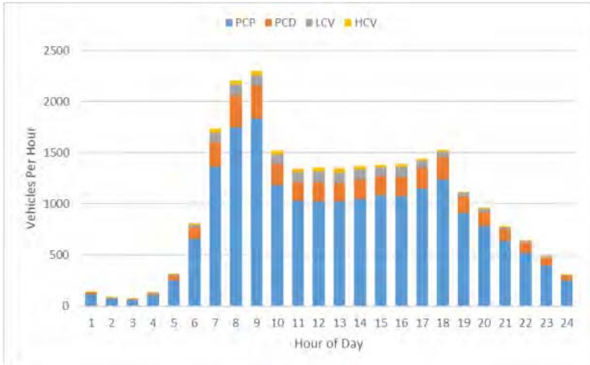
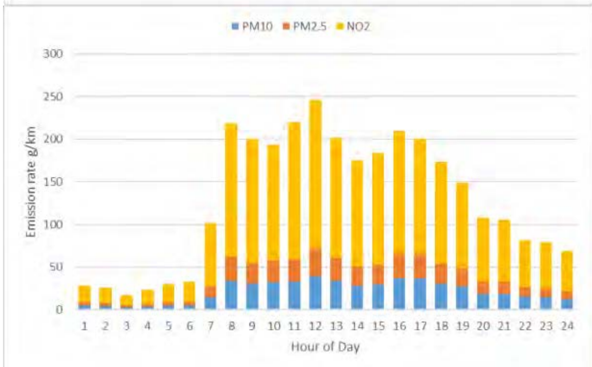
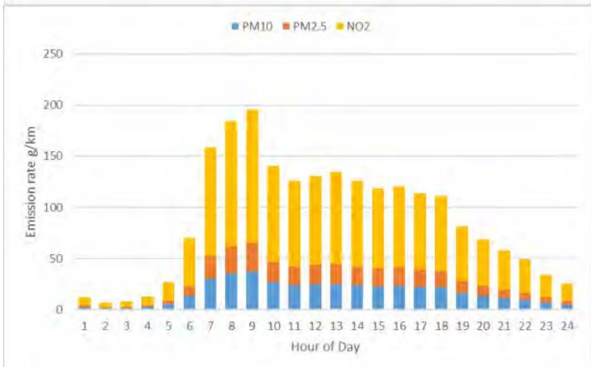
North Bound	South Bound
	
	

Figure 184: High St: Mahoneys Rd to Settlement Rd - Project 2036

19.0 KEON PDE

19.1 Base 2026

Table 69: Keon Pde 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
High St to Dalton Rd	East Bound	12000	1700	400	14100
High St to Dalton Rd	West Bound	10000	1300	250	11550

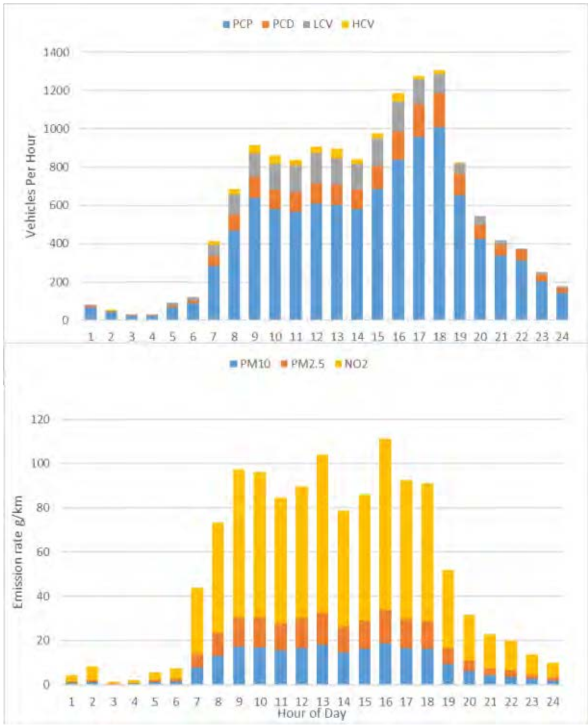
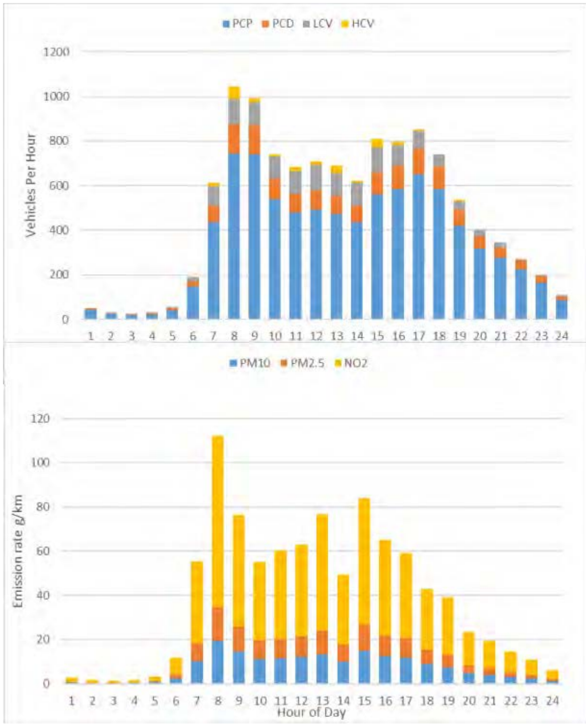
East Bound	West Bound
	

Figure 185: Keon Pde: High St to Dalton Rd - Base 2026

19.2 Project 2026

Table 70: Keon Pde 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
High St to Dalton Rd	East Bound	13000	1900	500	15400
High St to Dalton Rd	West Bound	12000	1600	300	13900

East Bound	West Bound

Figure 186: Keon Pde: High St to Dalton Rd - Project 2026

19.3 Base 2036

Table 71: Keon Pde 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
High St to Dalton Rd	East Bound	13000	1900	500	15400
High St to Dalton Rd	West Bound	12000	1500	300	13800

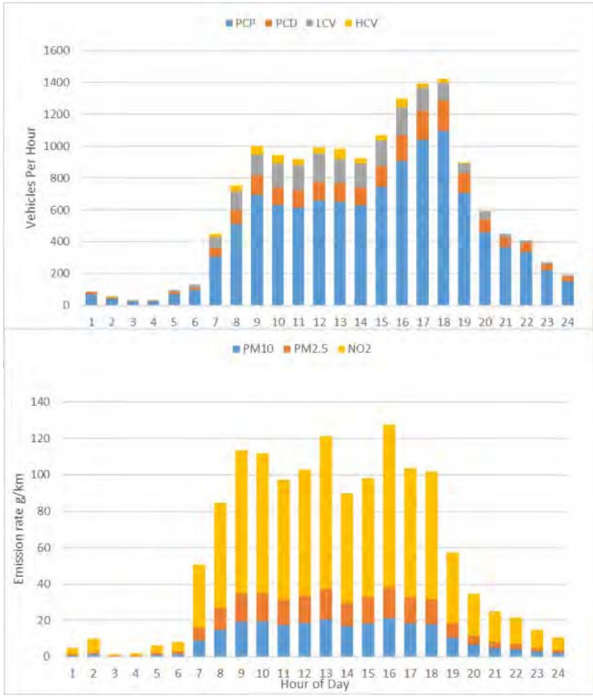
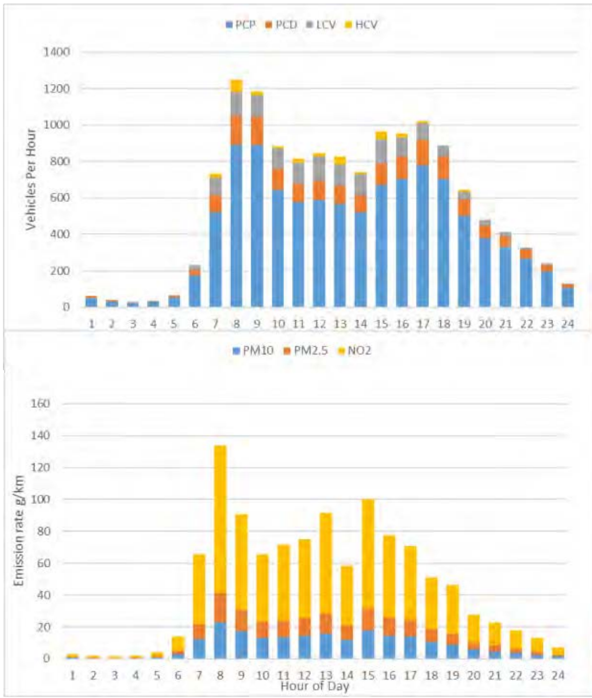
East Bound	West Bound
	

Figure 187: Keon Pde: High St to Dalton Rd - Base 2036

19.4 Project 2036

Table 72: Keon Pde 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
High St to Dalton Rd	East Bound	15000	2100	700	17800
High St to Dalton Rd	West Bound	14000	1800	400	16200

East Bound	West Bound

Figure 188: Lower Plenty Rd: Rosanna Rd to Greensborough Rd - Project 2036

20.0 LOWER PLENTY RD

20.1 Base 2026

Table 73: Lower Plenty Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Rosanna Rd to Greensborough Rd	East Bound	37000	1200	1200	39400
Rosanna Rd to Greensborough Rd	West Bound	37000	1300	1300	39600

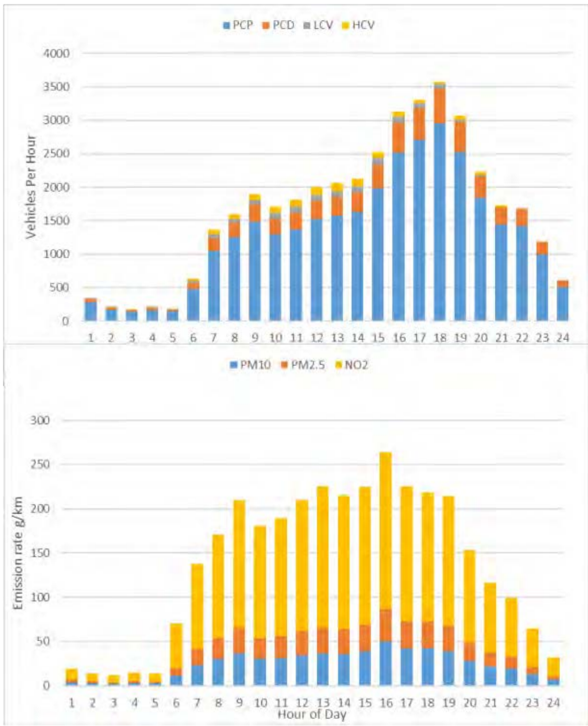
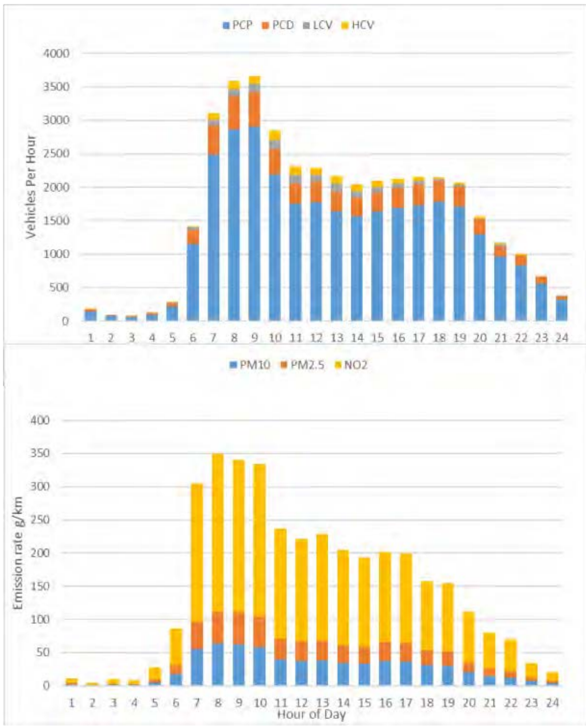
East Bound	West Bound
	

Figure 189: Lower Plenty Rd: Rosanna Rd to Greensborough Rd - Base 2026

20.2 Project 2026

Table 74: Lower Plenty Rd 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Rosanna Rd to Greensborough Rd	East Bound	32000	800	300	33100
Rosanna Rd to Greensborough Rd	West Bound	30000	900	300	31200

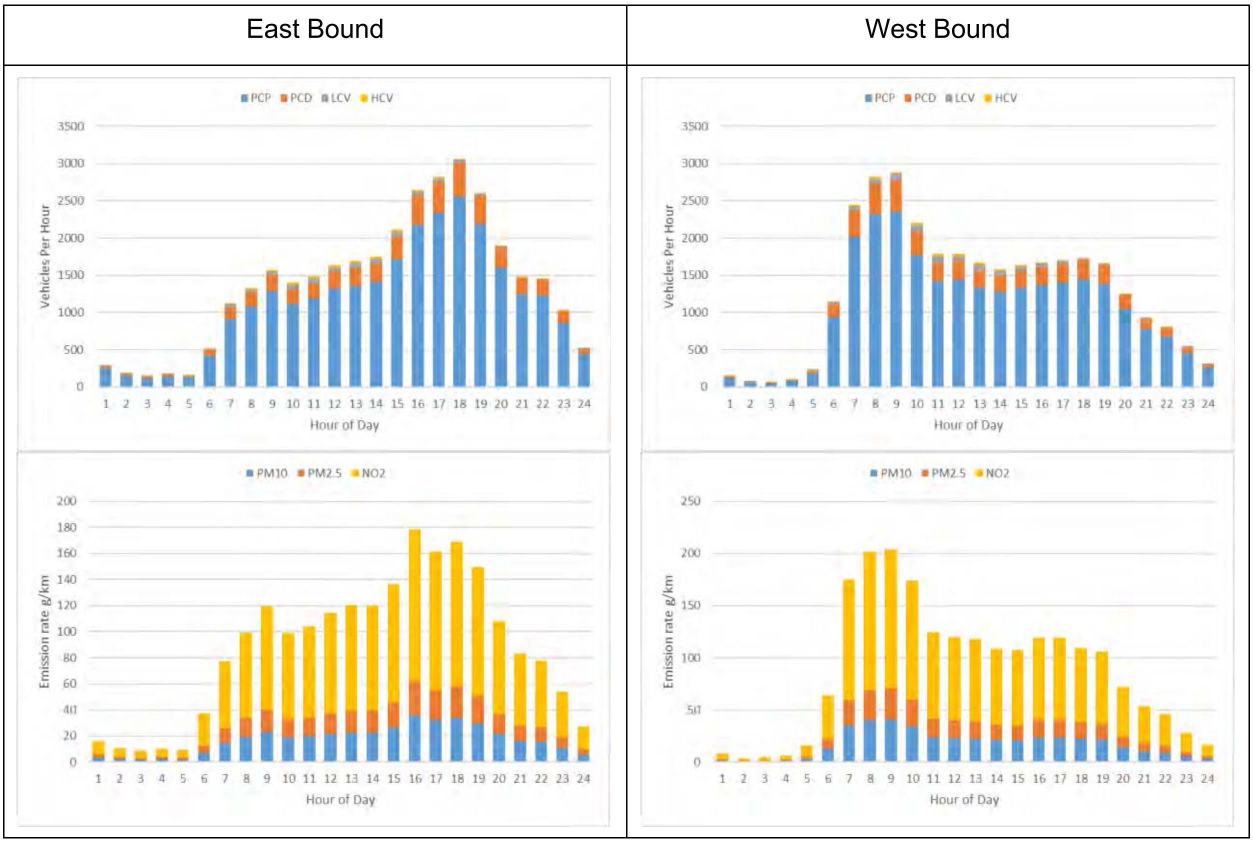


Figure 190: Lower Plenty Rd: Rosanna Rd to Greensborough Rd - Project 2026

20.3 Base 2036

Table 75: Lower Plenty Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Rosanna Rd to Greensborough Rd	East Bound	39000	1400	1300	41700
Rosanna Rd to Greensborough Rd	West Bound	39000	1500	1500	42000

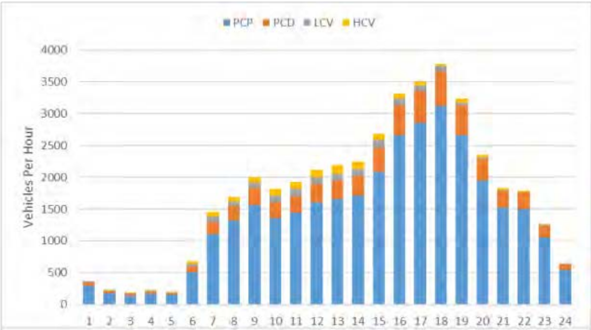
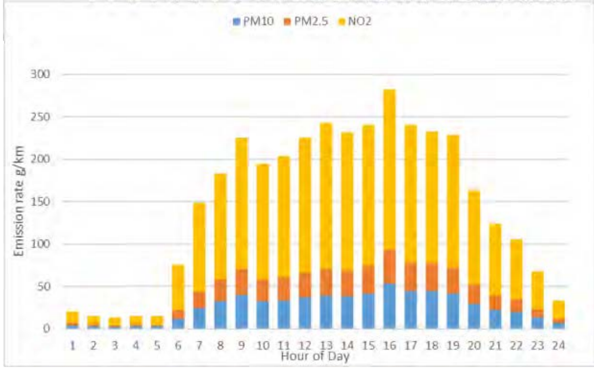
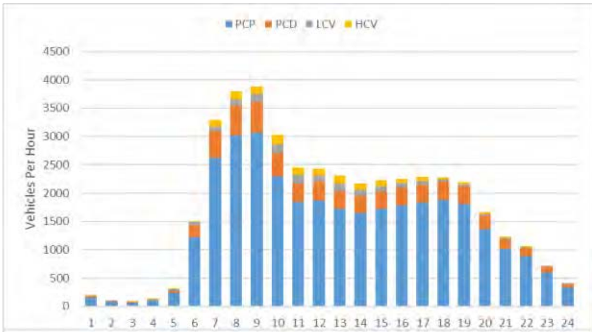
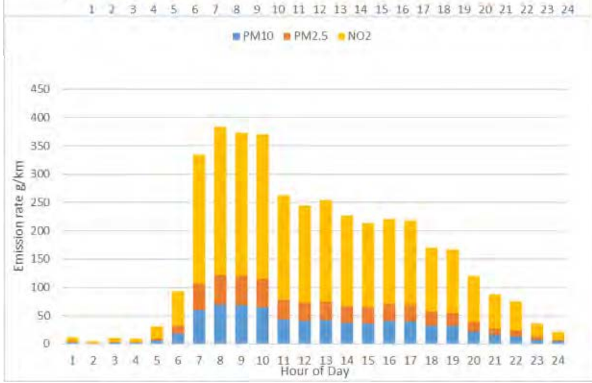
East Bound	West Bound
 	 

Figure 191: Lower Plenty Rd: Rosanna Rd to Greensborough Rd - Base 2036

20.4 Project 2036

Table 76: Lower Plenty Rd 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Rosanna Rd to Greensborough Rd	East Bound	33000	1000	300	34300
Rosanna Rd to Greensborough Rd	West Bound	32000	1000	350	33350

East Bound	West Bound

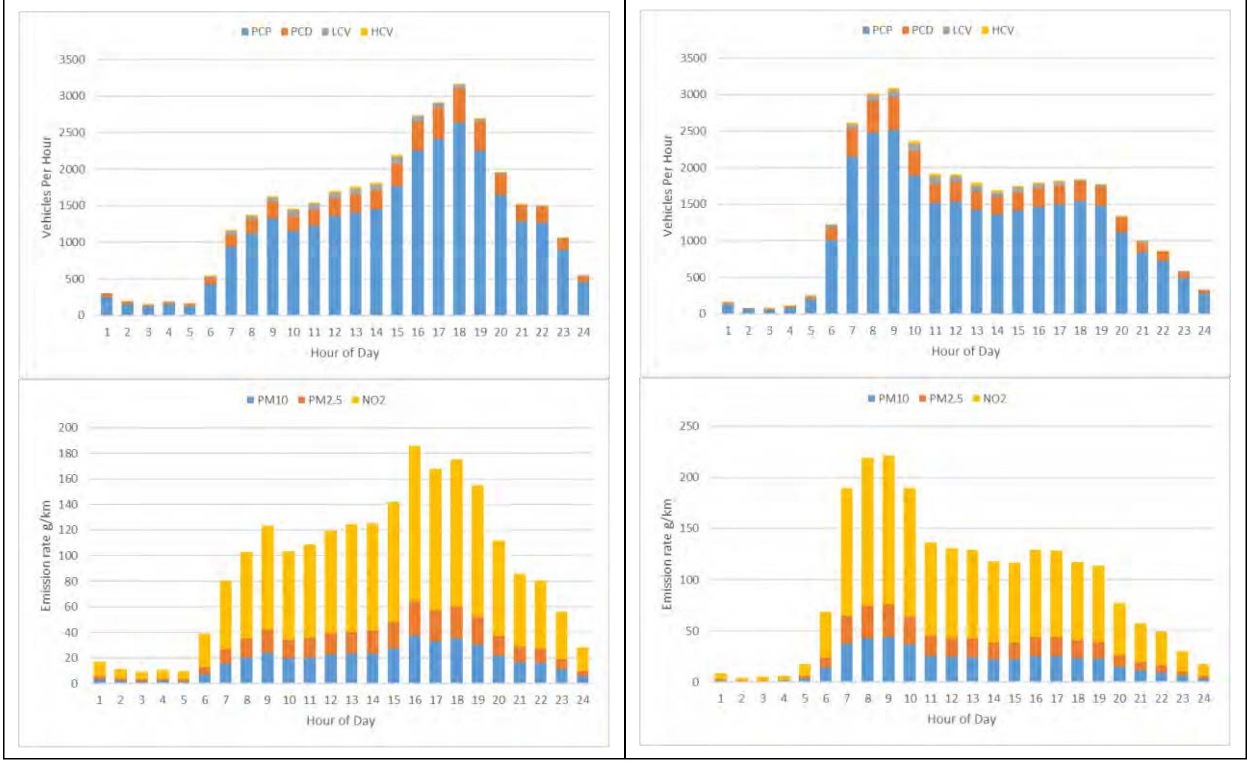


Figure 192: Lower Plenty Rd: Rosanna Rd to Greensborough Rd - Project 2036

21.0 M80 RING RD

21.1 Base 2026

Table 77: M80 Ring Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Dalton Rd to Plenty Rd	East bound	65000	2300	1800	69100
Dalton Rd to Plenty Rd	West bound	66000	2300	1800	70100
Dalton Rd to Edgars Rd	East Bound	77000	3100	2700	82800
Dalton Rd to Edgars Rd	West Bound	74000	2900	2600	79500
Edgars Rd to Hume Fwy	East Bound	93000	3600	3700	100300
Edgars Rd to Hume Fwy	West Bound	86000	3300	3400	92700
M80 Interchange to Plenty Rd	East Bound	57000	2200	1800	61000
M80 Interchange to Plenty Rd	West Bound	54000	2100	1600	57700

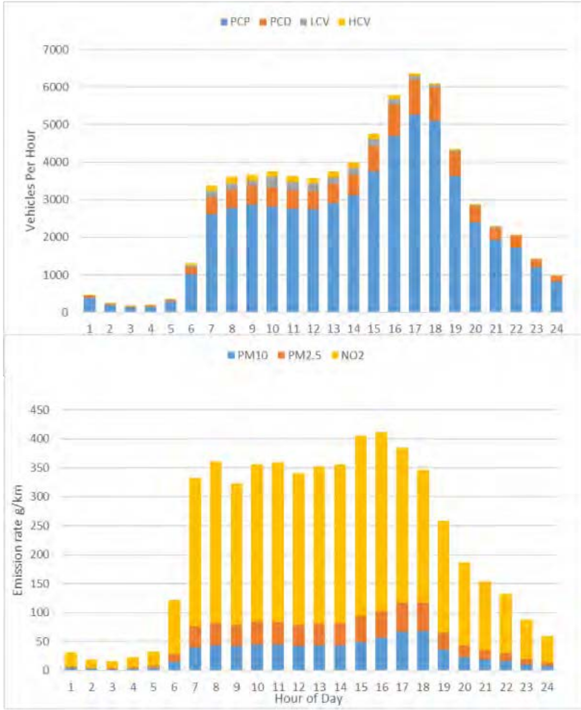
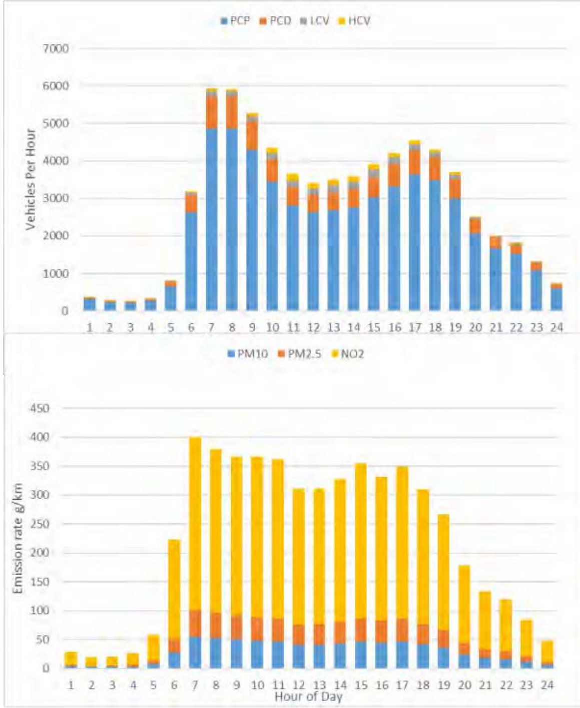
East Bound	West Bound
	

Figure 193: M80 Ring Rd: Dalton Rd to Plenty Rd - Base 2026

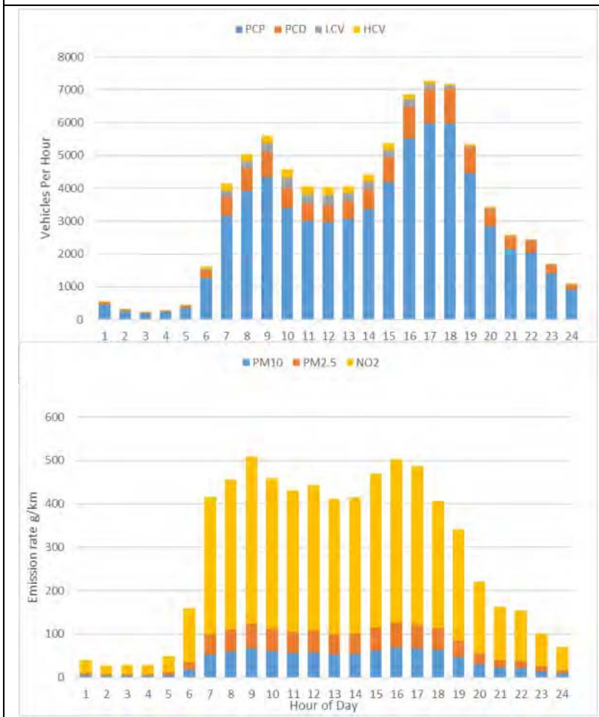
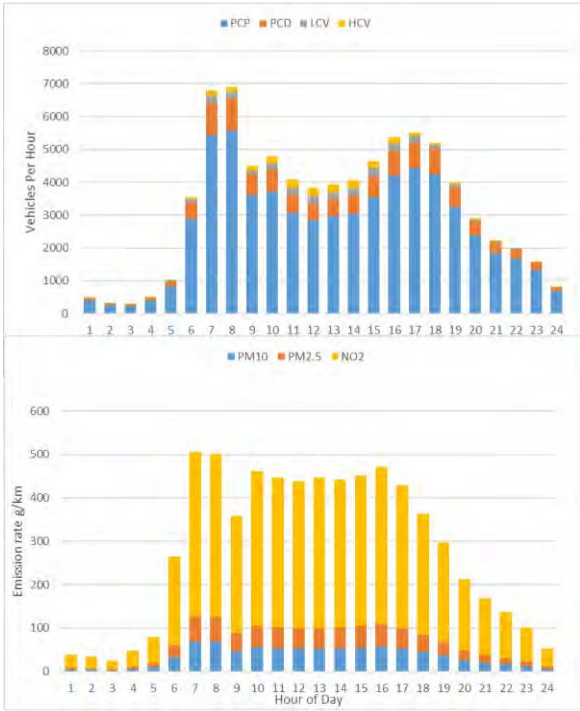
East Bound	West Bound
	

Figure 194: M80 Ring Rd: Dalton Rd to Edgars Rd - Base 2026

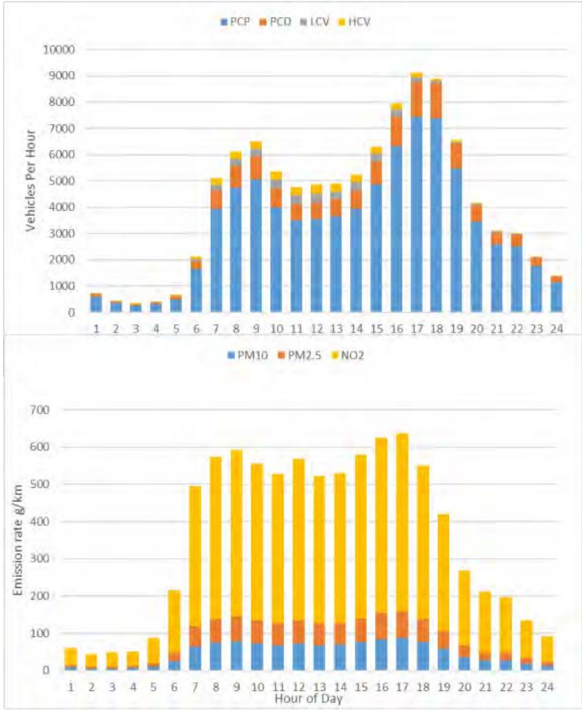
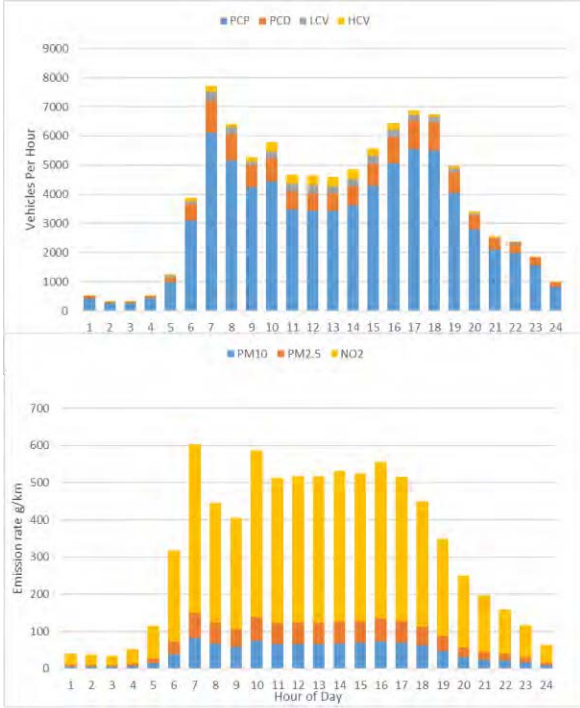
East Bound	West Bound
	

Figure 195: M80 Ring Rd: Edgars Rd to Hume Fwy - Base 2026

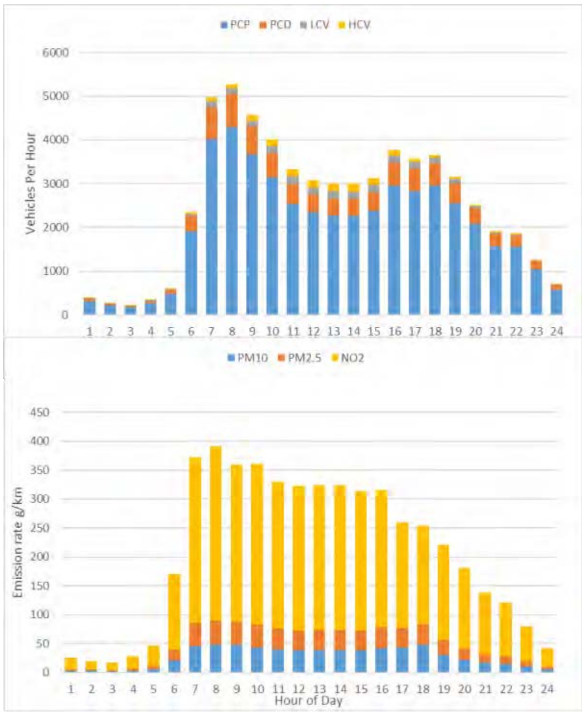
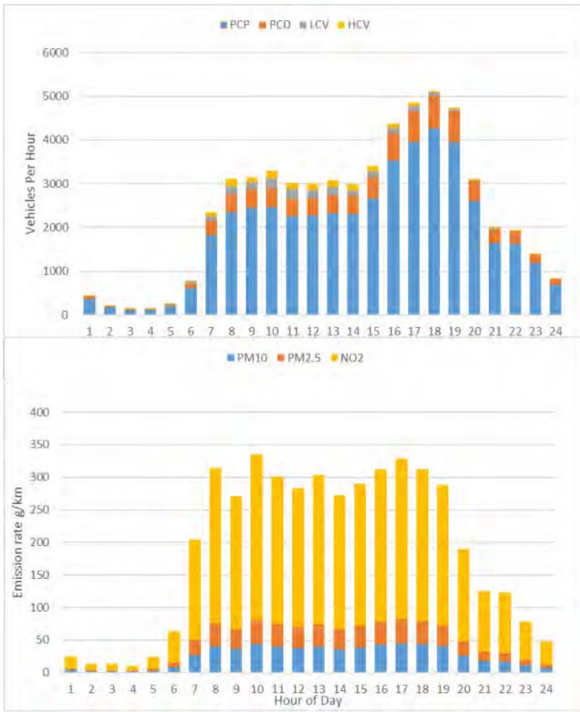
East Bound	West Bound
	

Figure 196: M80 Ring Rd: M80 Interchange to Plenty Rd - Base 2026

21.2 Project 2026

Table 78: M80 Ring Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Dalton Rd to Plenty Rd	East bound	69000	2600	3500	75100
Dalton Rd to Plenty Rd	West bound	71000	2700	3500	77200
Dalton Rd to Edgars Rd	East Bound	82000	3400	4400	89800
Dalton Rd to Edgars Rd	West Bound	79000	3200	4100	86300
Edgars Rd to Hume Fwy	East Bound	97000	3800	4700	105500
Edgars Rd to Hume Fwy	West Bound	90000	3500	4600	98100
M80 Interchange to Plenty Rd	East Bound	84000	3800	3900	91700
M80 Interchange to Plenty Rd	West Bound	84000	3800	3800	91600

East Bound	West Bound

Figure 197: M80 Ring Rd: Dalton Rd to Plenty Rd - Project 2026

East Bound	West Bound

Figure 198: M80 Ring Rd: Dalton Rd to Edgars Rd - Project 2026

East Bound	West Bound

Figure 199: M80 Ring Rd: Edgars Rd to Hume Fwy - Project 2026

East Bound	West Bound

Figure 200: M80 Ring Rd: M80 Interchange to Plenty Rd - Project 2026

21.3 Base 2036

Table 79: M80 Ring Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Dalton Rd to Plenty Rd	East bound	69000	2500	2100	73600
Dalton Rd to Plenty Rd	West bound	70000	2500	2000	74500
Dalton Rd to Edgars Rd	East Bound	82000	3400	3100	88500
Dalton Rd to Edgars Rd	West Bound	79000	3200	2900	85100
Edgars Rd to Hume Fwy	East Bound	104000	4200	4100	112300
Edgars Rd to Hume Fwy	West Bound	96000	3800	3900	103700

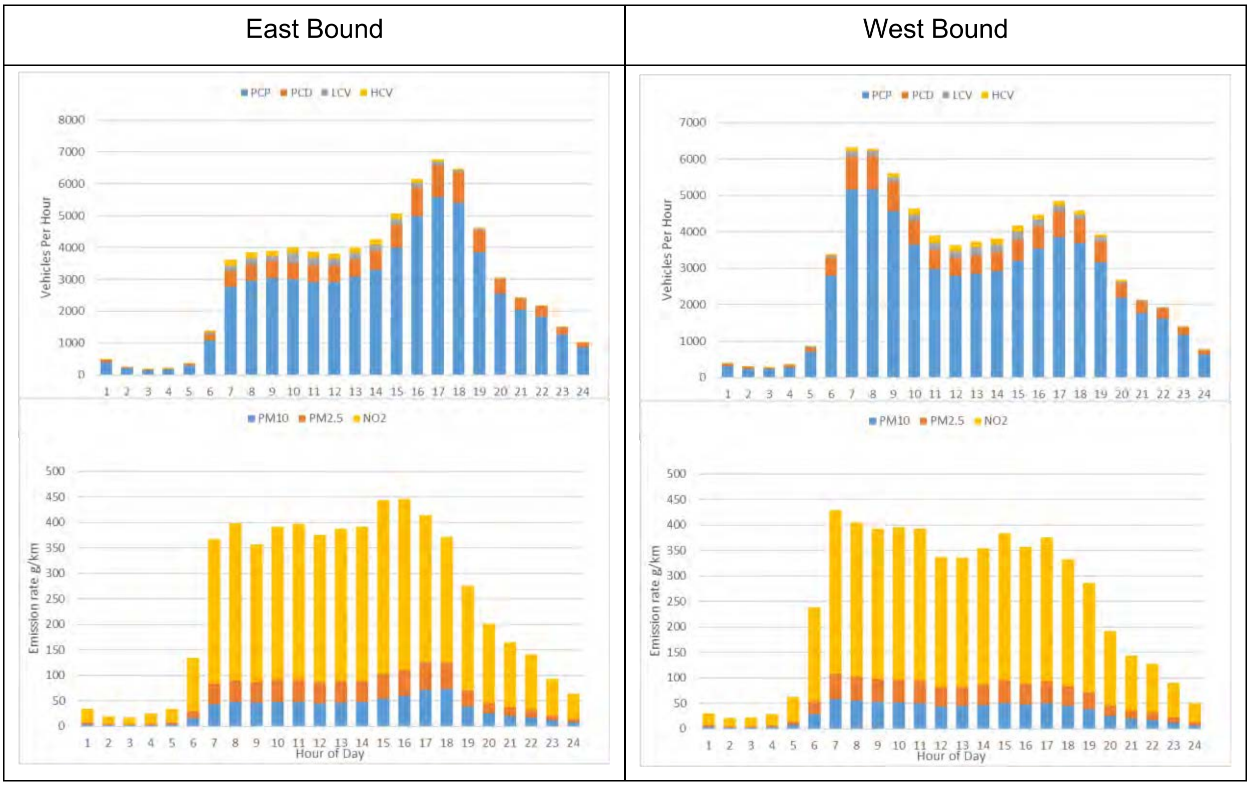


Figure 201: M80 Ring Rd: Dalton Rd to Plenty Rd - Base 2036

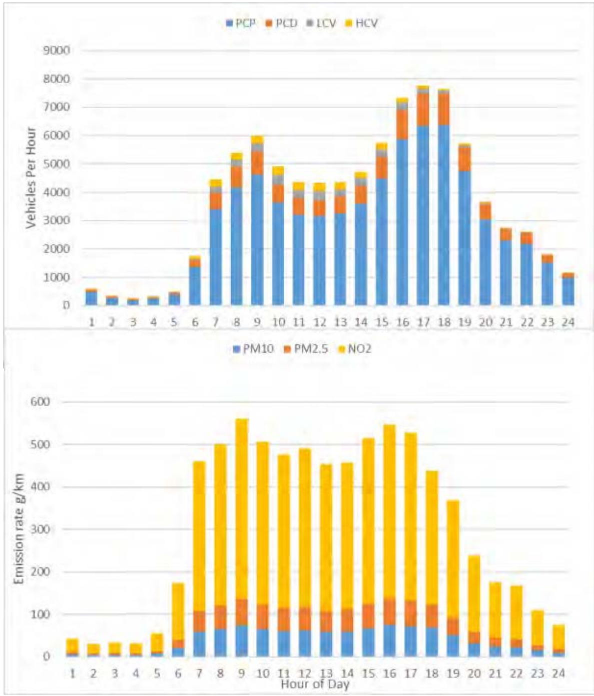
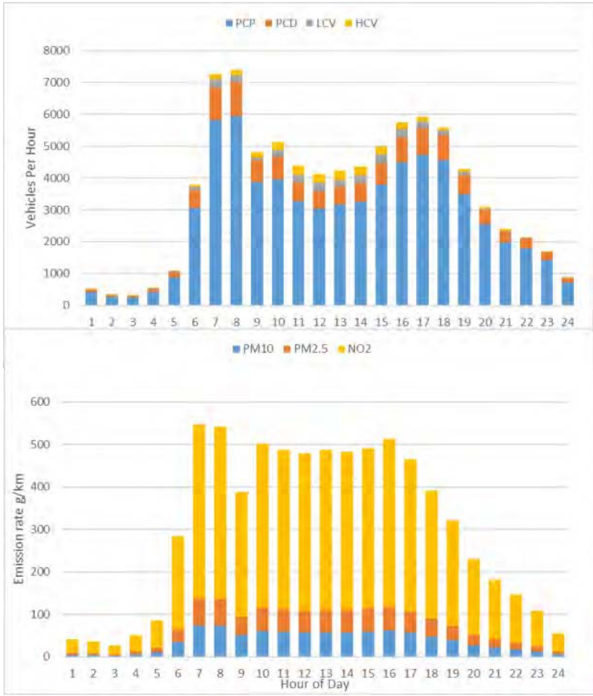
East Bound	West Bound
	

Figure 202: M80 Ring Rd: Dalton Rd to Edgars Rd - Base 2036

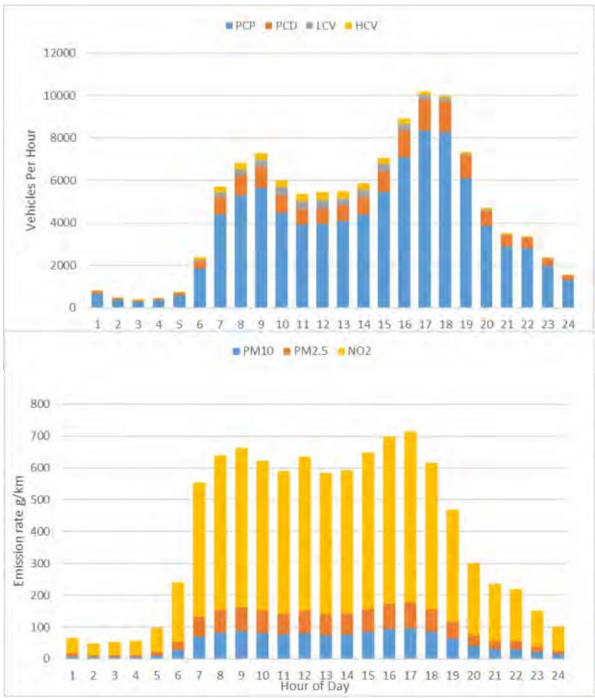
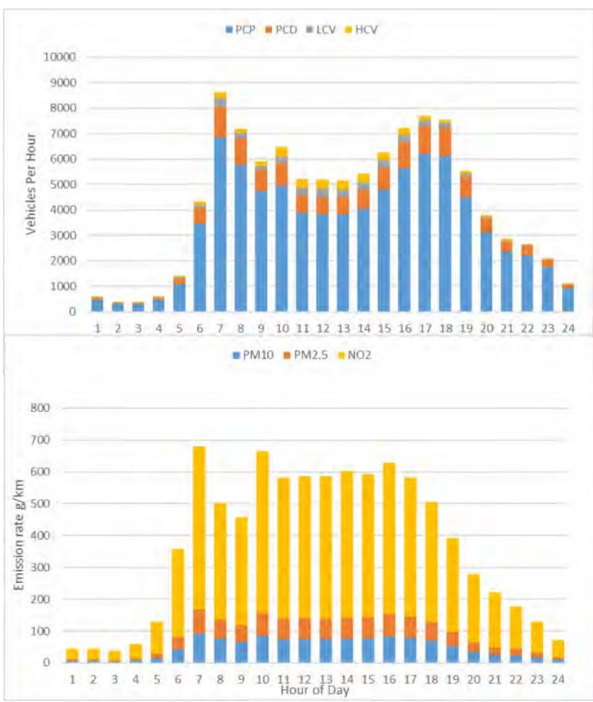
East Bound	West Bound
	

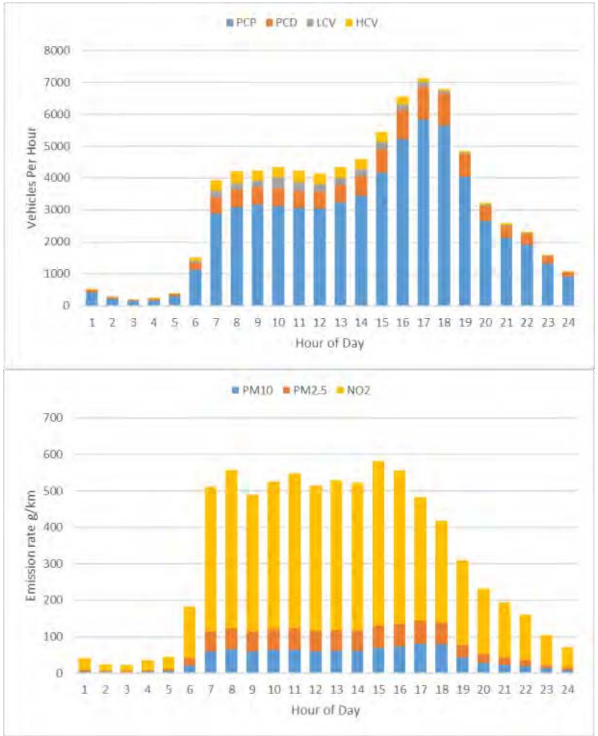
Figure 203: M80 Ring Rd: Edgars Rd to Hume Fwy - Base 2036

21.4 Project 2036

Table 80: M80 Ring Rd 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Dalton Rd to Plenty Rd	East bound	72000	2800	3900	78700
Dalton Rd to Plenty Rd	West bound	75000	2800	3900	81700
Dalton Rd to Edgars Rd	East Bound	86000	3600	4800	94400
Dalton Rd to Edgars Rd	West Bound	84000	3400	4300	91700
Edgars Rd to Hume Fwy	East Bound	108000	4400	5500	117900
Edgars Rd to Hume Fwy	West Bound	101000	4000	5200	110200
M80 Interchange to Plenty Rd	East Bound	91000	4200	4500	99700
M80 Interchange to Plenty Rd	West Bound	91000	4200	4300	99500

East Bound	West Bound



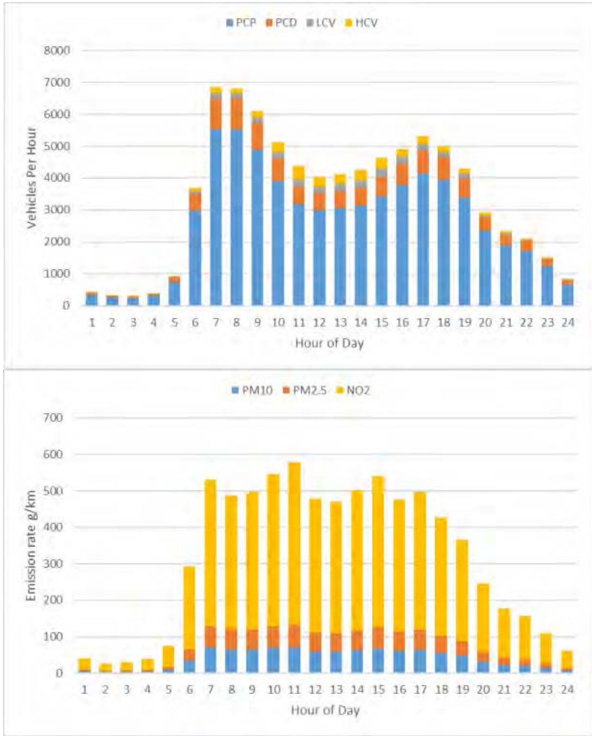
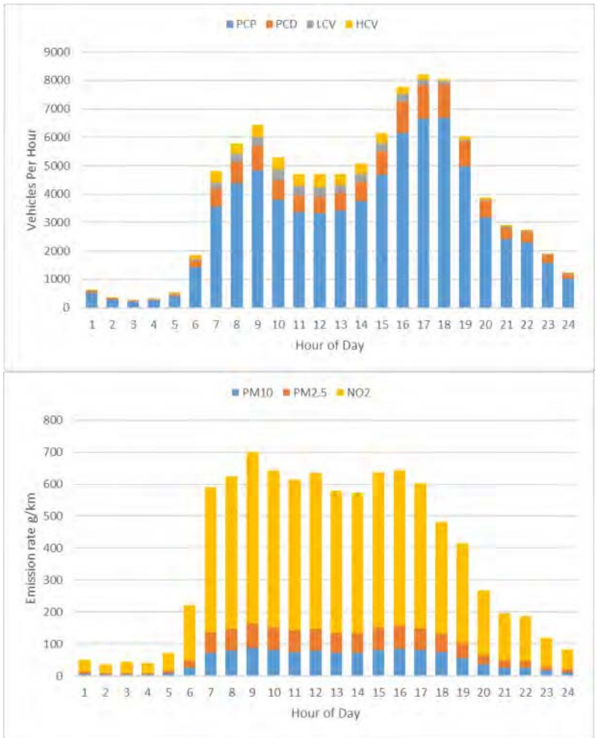


Figure 204: M80 Ring Rd: Dalton Rd to Plenty Rd - Project 2036

East Bound	West Bound



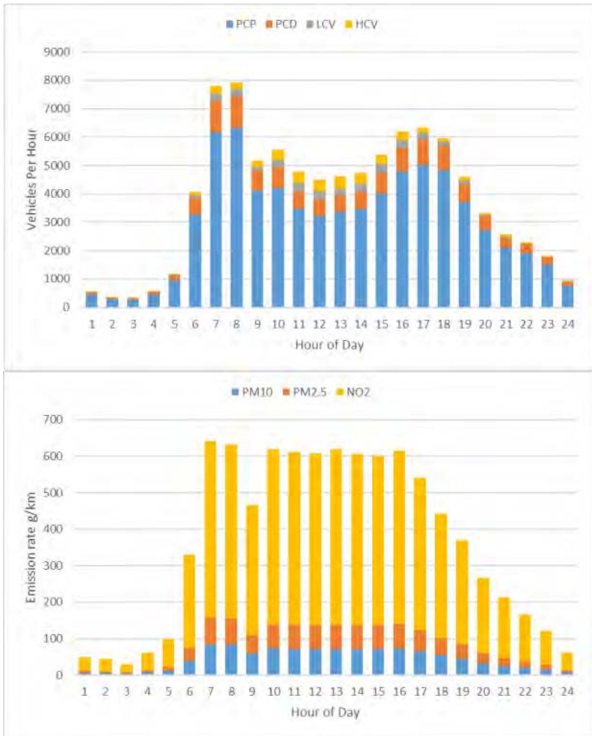


Figure 205: M80 Ring Rd: Dalton Rd to Edgars Rd - Project 2036

East Bound	West Bound

Figure 206: M80 Ring Rd: Edgars Rd to Hume Fwy - Project 2036

East Bound	West Bound

Figure 207: M80 Ring Rd: M80 Interchange to Plenty Rd - Project 2036

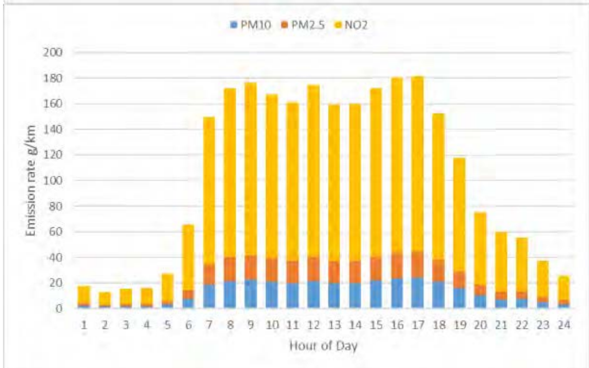
22.0 M80 RING RD: COLLECTOR DISTRIBUTOR

22.1 Project 2026

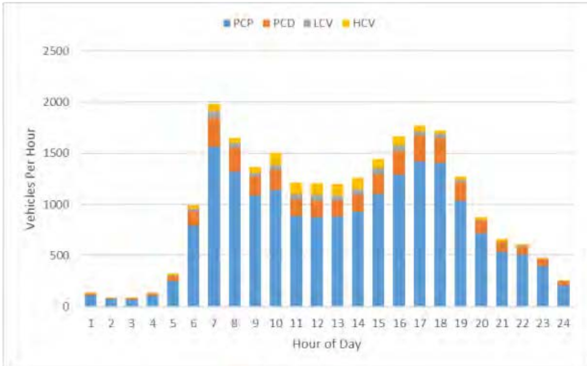
Table 81: M80 Ring Rd: Collector Distributor 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Edgars Rd to Hume Fwy	East Bound	25000	800	1300	27100
Edgars Rd to Hume Fwy	West Bound	22000	700	1200	23900

East Bound



West Bound



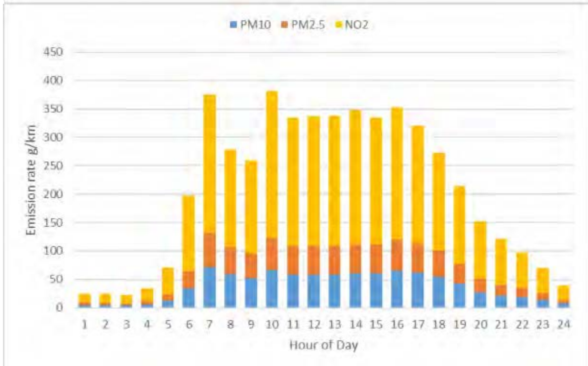


Figure 208: M80 Ring Rd: Collector Distributor: Edgars Rd to Hume Fwy - Project 2026

22.2 Project 2036

Table 82: M80 Ring Rd: Collector Distributor 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Edgars Rd to Hume Fwy	East Bound	30000	1000	1500	32500
Edgars Rd to Hume Fwy	West Bound	27000	1000	1500	29500

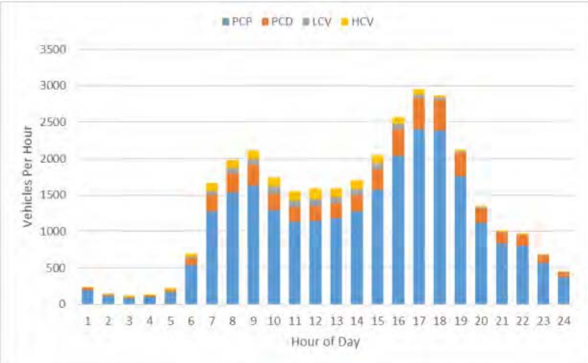
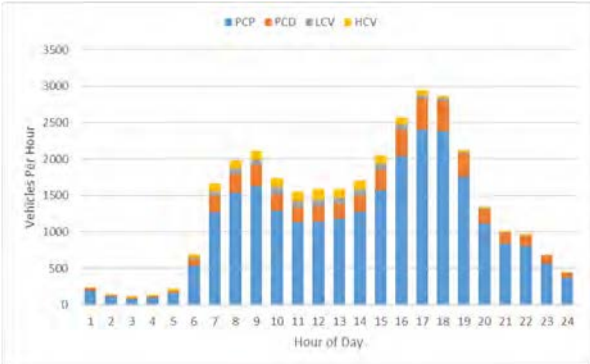
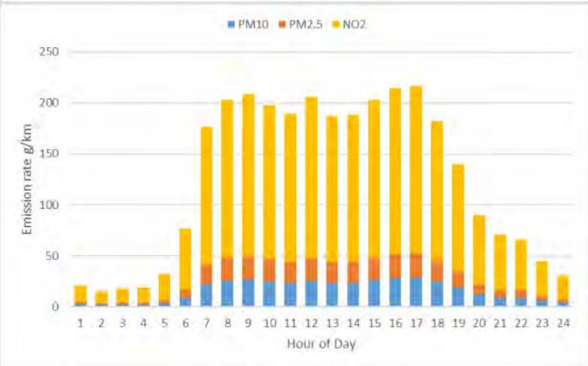
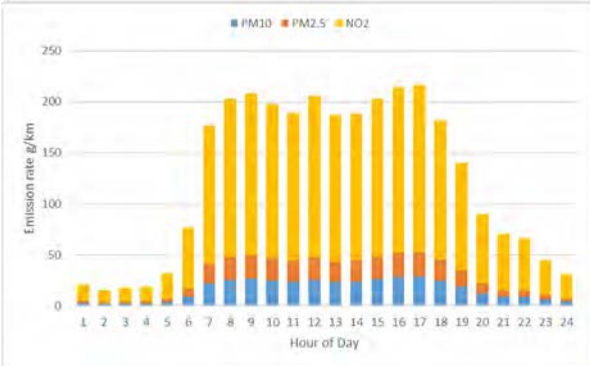
East Bound	West Bound
	
	

Figure 209: M80 Ring Rd: Collector Distributor: Edgars Rd to Hume Fwy - Project 2036

23.0 M80 RING RD: MAINLINE

23.1 Project 2026

Table 83: M80 Ring Rd: Mainline 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Edgars Rd to Hume Fwy	West Bound	22000	700	1200	23900
Edgars Rd to Hume Fwy	East Bound	77000	3400	6400	86800

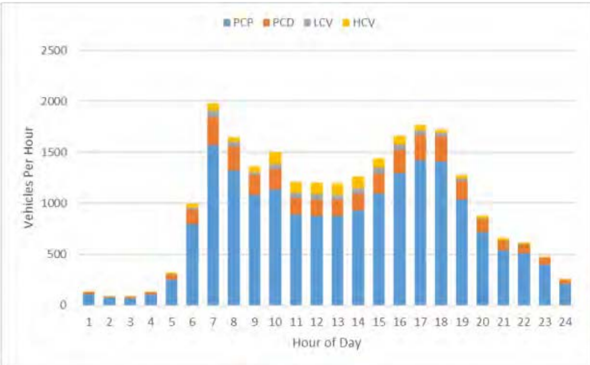
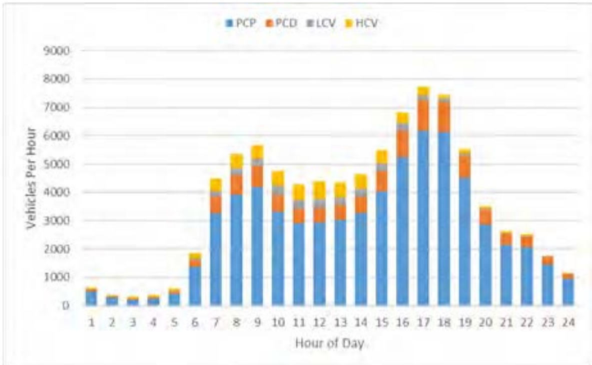
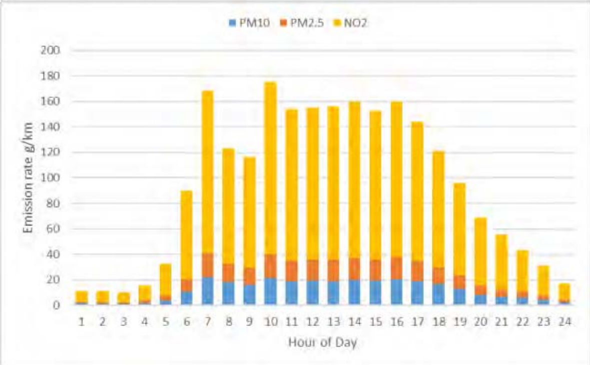
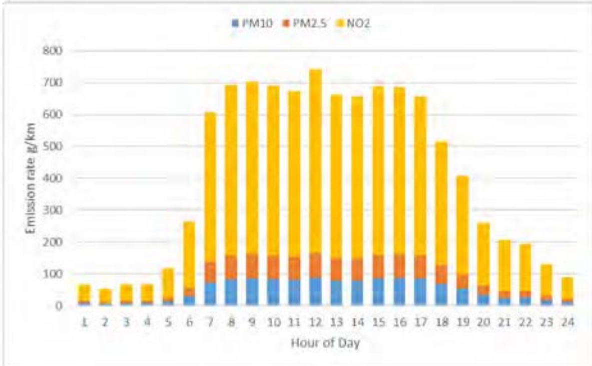
East Bound	West Bound
	
	

Figure 210: M80 Ring Road Mainline: Edgars Rd to Hume Fwy - Project 2026

23.2 Project 2036

Road	Direction	Cars	LCV	HCV	Total
Edgars Rd to Hume Fwy	East Bound	82000	3600	7200	92800
Edgars Rd to Hume Fwy	West Bound	83000	3700	7100	93800

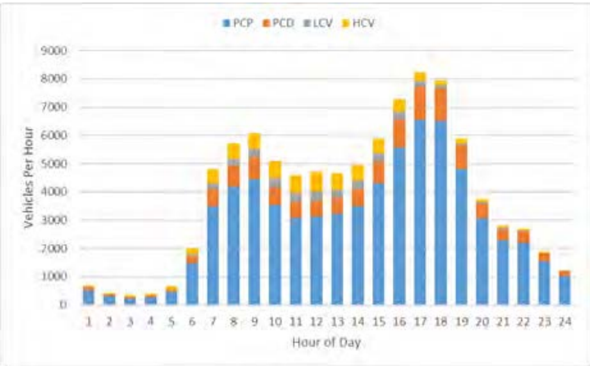
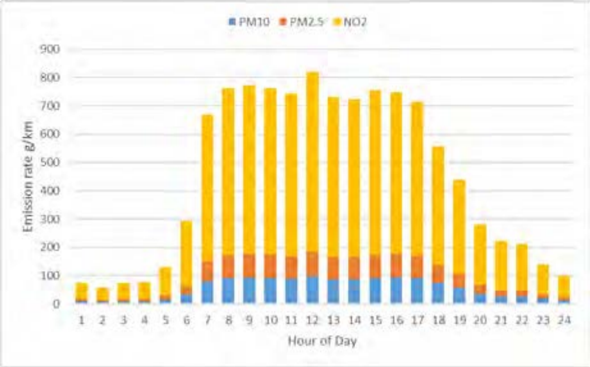
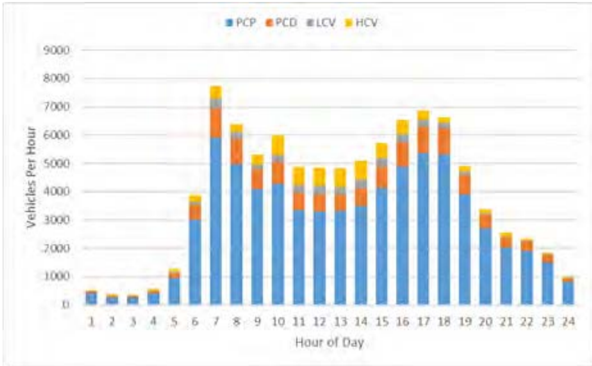
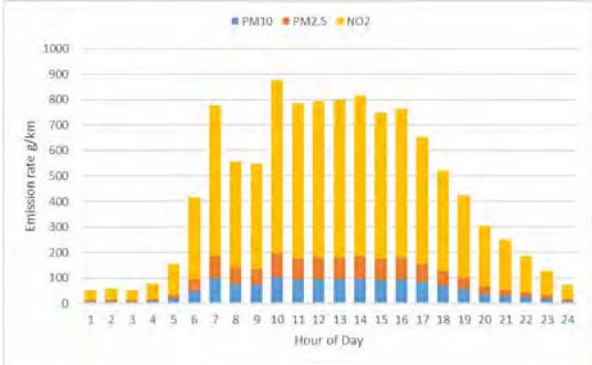
East Bound	West Bound
 	 

Figure 211: M80 Ring Road Mainline: Edgars Rd to Hume Fwy - Project 2026

24.0 M80-NEL INTERCHANGE

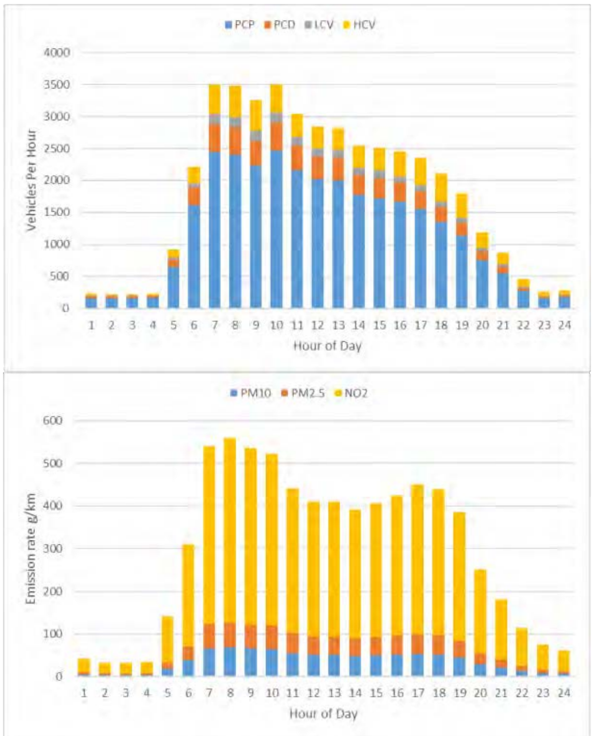
24.1 Project 2026

Table 84: M80-NEL interchange 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
X1 - M80 to NEL	South Bound	35000	1900	6400	43300
X2 - M80 to Greensborough Bypass/Grimshaw	East Bound	57000	1500	1200	59700
X3 - M80 to Greensborough Bypass	East Bound	29000	1100	1000	31100
X4 - NEL/Grimshaw to Greensborough Bypass	East Bound	15000	600	400	16000
X5 - Greensborough Bypass to NEL/Grimshaw	South Bound	13000	600	400	14000
X6 - Greensborough Bypass to M80	West Bound	30000	1200	1000	32200
X7 - Greensborough Bypass to Grimshaw	South Bound	6000	150	100	6250
X8 - M80 to Grimshaw	South Bound	28000	400	300	28700
X9 - Grimshaw to Greensborough Bypass	East Bound	7000	150	100	7250
X10 - NEL to Greensborough Bypass	East Bound	8000	500	400	8900
X11 - Grimshaw to M80/Plenty	West Bound	29000	400	400	29800
X12 - NEL to Plenty	West Bound	12000	700	1900	14600
X13 - Greensborough Bypass to Plenty	West Bound	7000	250	150	7400
X14 - NEL/Greensborough Bypass to Plenty	West Bound	19000	900	1900	21800

Road	Direction	Cars	LCV	HCV	Total
X15 - Grimshaw to Plenty	West Bound	10000	150	150	10300
X16 - Grimshaw to M80	West Bound	19000	300	300	19600
X17 - Plenty Road exit ramp	West Bound	28000	1000	2000	31000
X18 - NEL to M80	West Bound	22000	1300	4400	27700
X19 - Greensborough Bypass to M80	West Bound	24000	1000	900	25900

X1 - M80 to NEL	X2 - M80 to Greensborough Bypass/Grimshaw



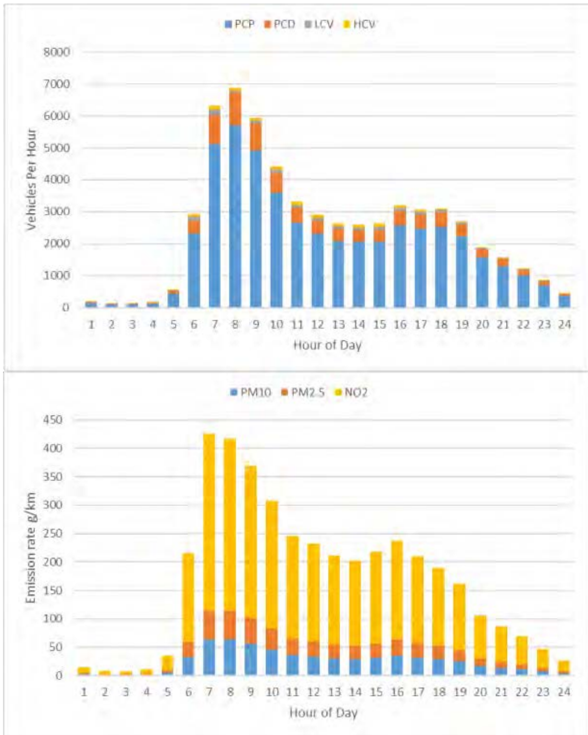


Figure 212: M80-NEL interchange: X1 – X2 - NEL to M80 - Project 2026

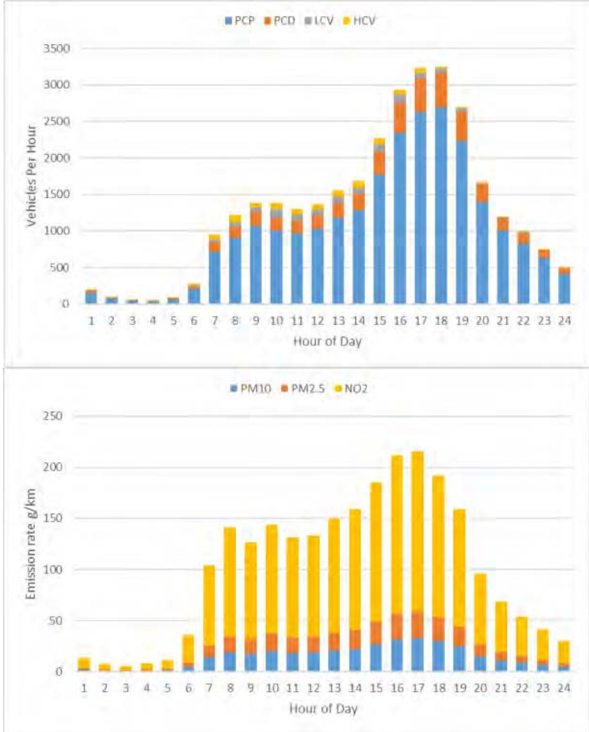
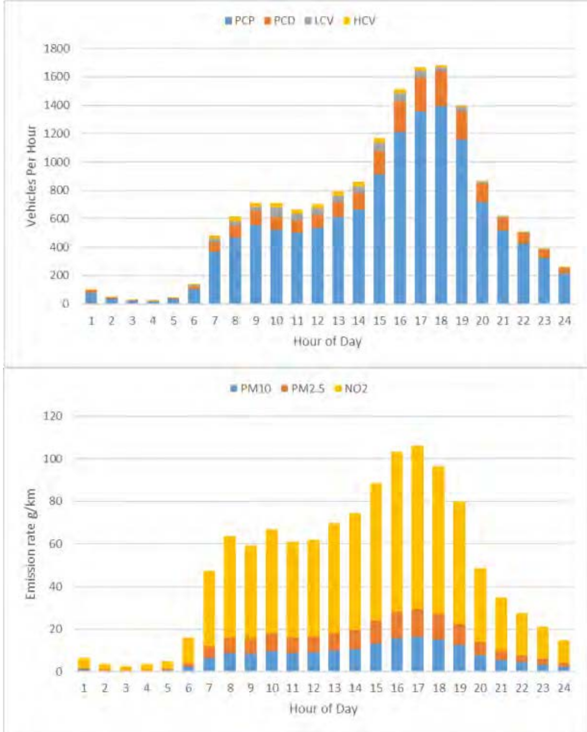
X3 - M80 to Greensborough Bypass	X4 - NEL/Grimshaw to Greensborough Bypass
	

Figure 213: M80-NEL interchange: X3 – X4 - NEL to M80 - Project 2026

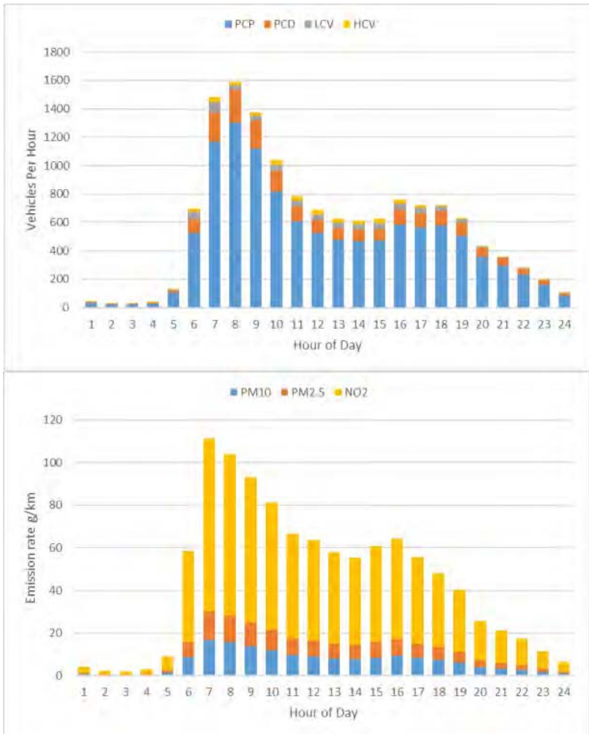
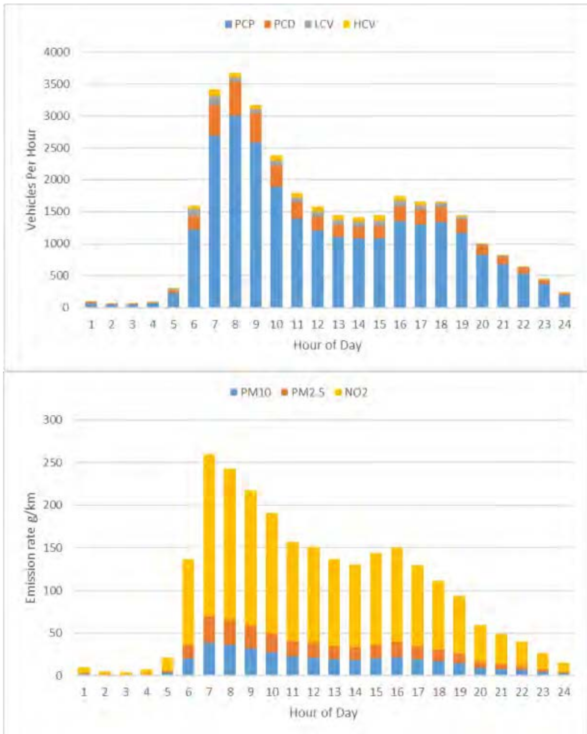
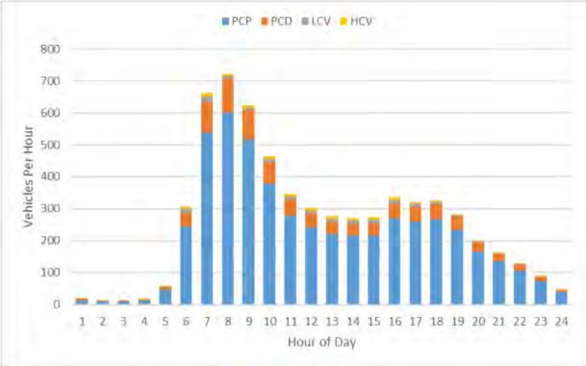
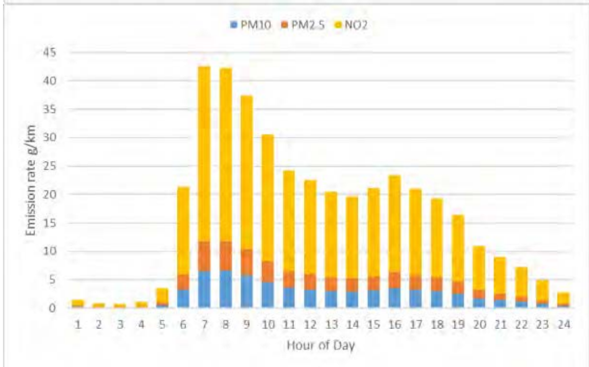
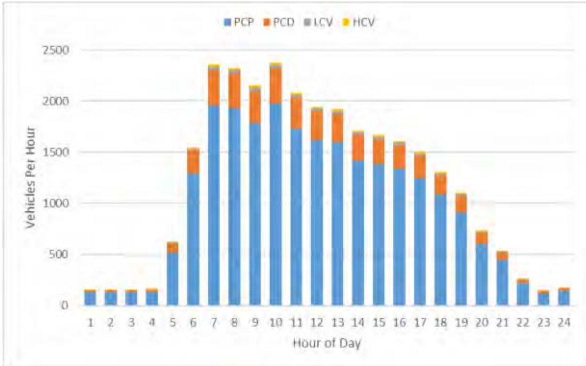
X5 - Greensborough Bypass to NEL/Grimshaw	X6 - Greensborough Bypass to M80
	

Figure 214: M80-NEL interchange: X5 – X6 - NEL to M80 - Project 2026

X7 - Greensborough Bypass to Grimshaw	X8 - M80 to Grimshaw







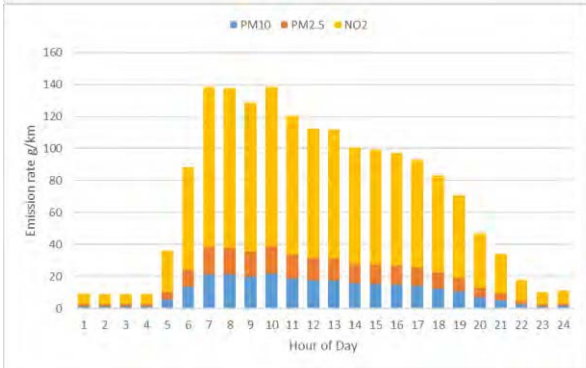
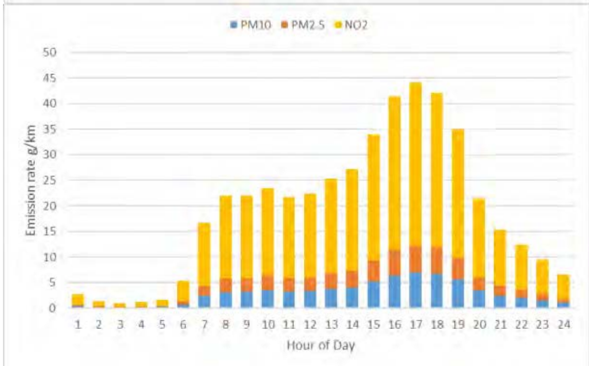
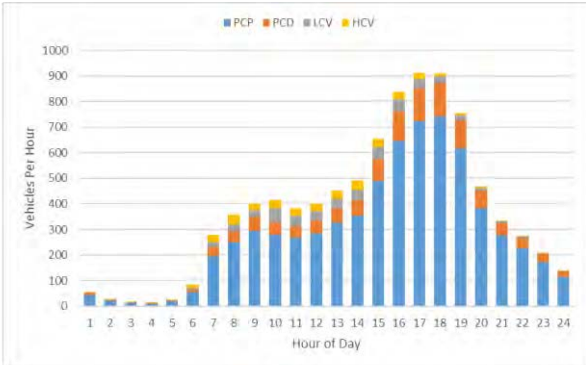


Figure 215: M80-NEL interchange: X7– X8 NEL to M80 - Project 2026

X9 - Grimshaw to Greensborough Bypass	X10 - NEL to Greensborough Bypass





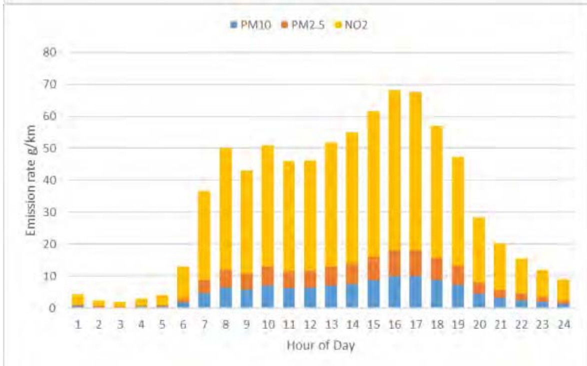


Figure 216: M80-NEL interchange: X9 – X10 NEL to M80 - Project 2026

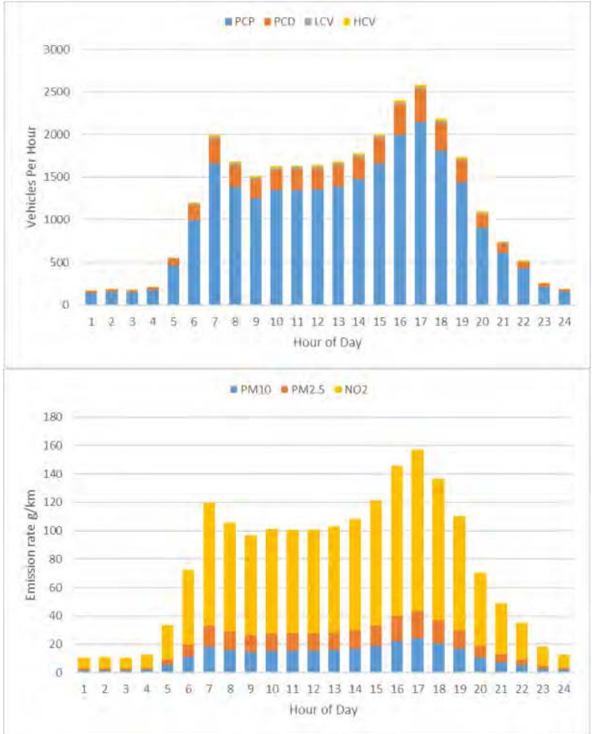
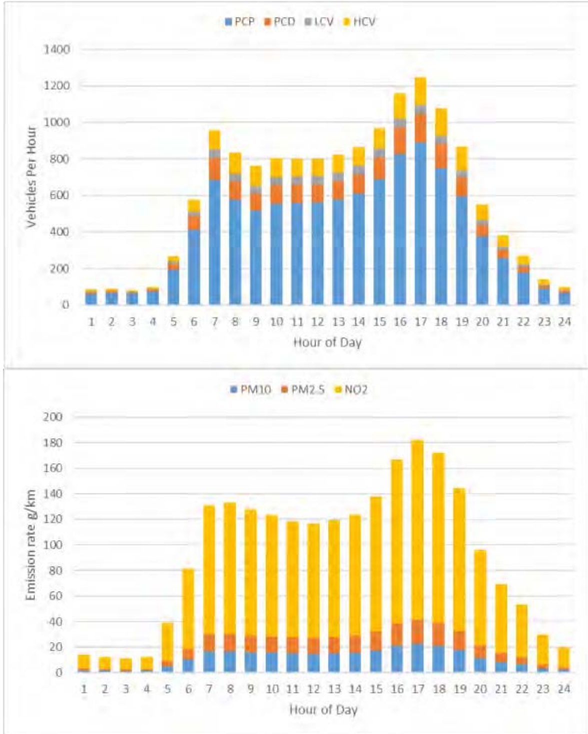
X11 - Grimshaw to M80/Plenty	X12 - NEL to Plenty
	

Figure 217: M80-NEL interchange: X11 - X12 NEL to M80 - Project 2026

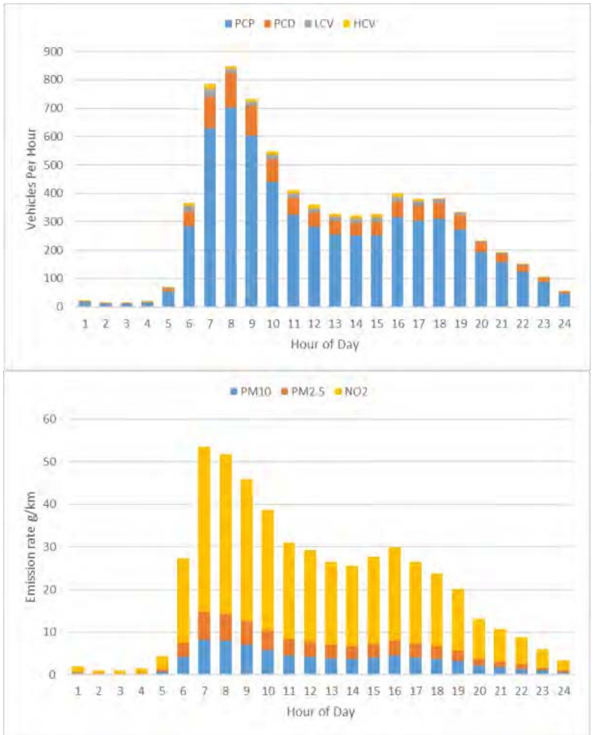
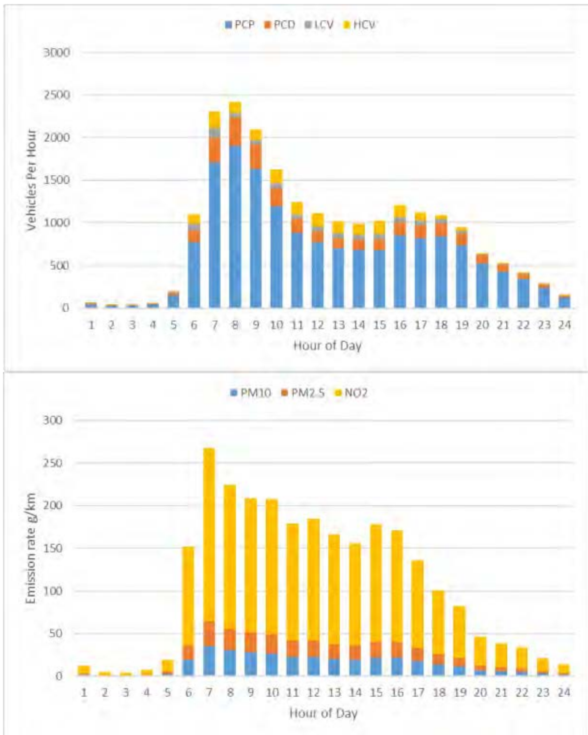
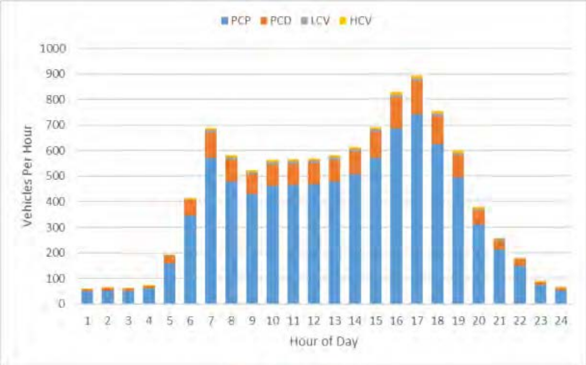
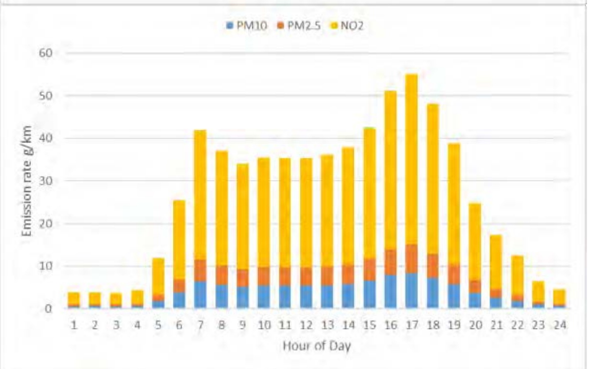
X13 - Greensborough Bypass to Plenty	X14 - NEL/Greensborough Bypass to Plenty
	

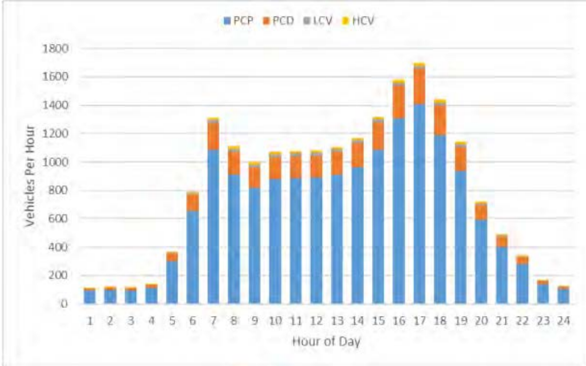
Figure 218: M80-NEL interchange: X13 - 14 NEL to M80 - Project 2026

X15 - Grimshaw to Plenty





X16 - Grimshaw to M80



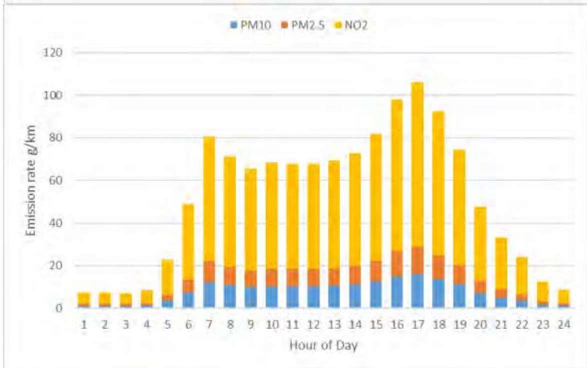
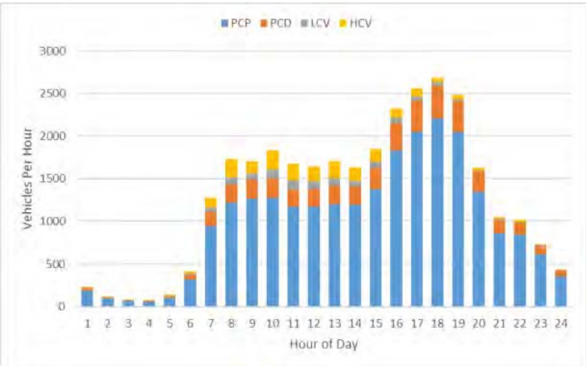
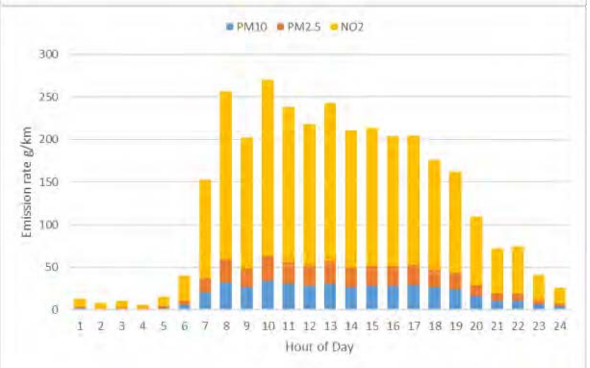


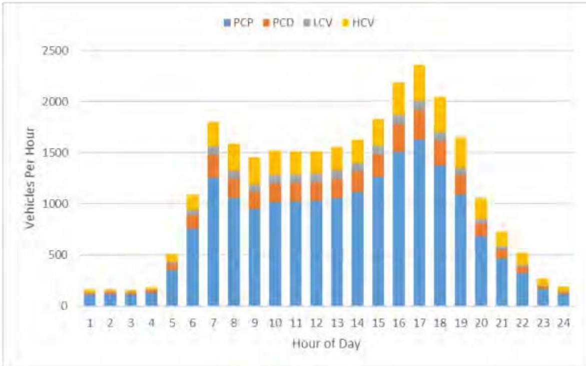
Figure 219: M80-NEL interchange: X15 - X16 NEL to M80 - Project 2026

X17 - Plenty Road exit ramp





X18 - NEL to M80



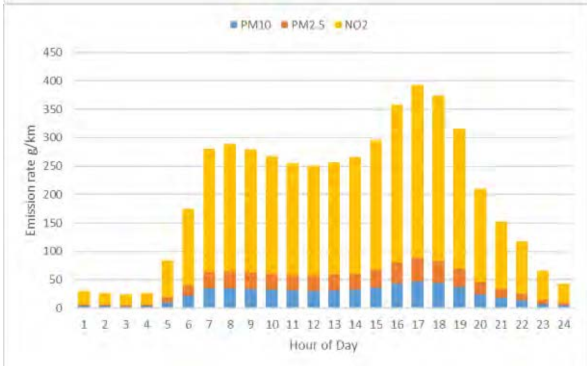


Figure 220: M80-NEL interchange: X17 - X18 - NEL to M80 - Project 2026

X19 - Greensborough Bypass to M80

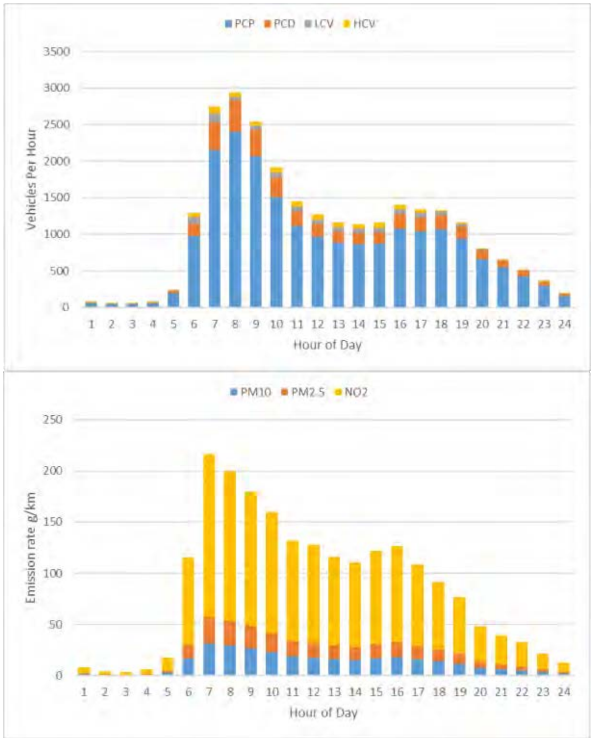


Figure 221: M80-NEL interchange: X19 - NEL to M80 - Project 2026

24.2 Project 2036

Table 85: M80-NEL interchange 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
X1 - M80 to NEL	South Bound	40000	2100	7300	49400
X2 - M80 to Greensborough Bypass/Grimshaw	East Bound	58000	1600	1400	61000
X3 - M80 to Greensborough Bypass	East Bound	29000	1200	1100	31300
X4 - NEL/Grimshaw to Greensborough Bypass	East Bound	18000	800	600	19400
X5 - Greensborough Bypass to NEL/Grimshaw	South Bound	16000	700	600	17300
X6 - Greensborough Bypass to M80	West Bound	31000	1300	1100	33400
X7 - Greensborough Bypass to Grimshaw	South Bound	7000	150	100	7250
X8 - M80 to Grimshaw	South Bound	30000	400	300	30700
X9 - Grimshaw to Greensborough Bypass	East Bound	9000	150	150	9300
X10 - NEL to Greensborough Bypass	East Bound	10000	600	500	11100
X11 - Grimshaw to M80/Plenty	West Bound	31000	400	350	31750
X12 - NEL to Plenty	West Bound	13000	800	2100	15900
X13 - Greensborough Bypass to Plenty	West Bound	6000	250	150	6400
X14 - NEL/Greensborough Bypass to Plenty	West Bound	20000	1000	2200	23200

Road	Direction	Cars	LCV	HCV	Total
X15 - Grimshaw to Plenty	West Bound	11000	150	150	11300
X16 - Grimshaw to M80	West Bound	20000	300	250	20550
X17 - Plenty Road exit ramp	West Bound	30000	1100	2300	33400
X18 - NEL to M80	West Bound	25000	1400	5000	31400
X19 - Greensborough Bypass to M80	West Bound	24000	1000	1000	26000

X1 - M80 to NEL

X2 - M80 to Greensborough Bypass/Grimshaw

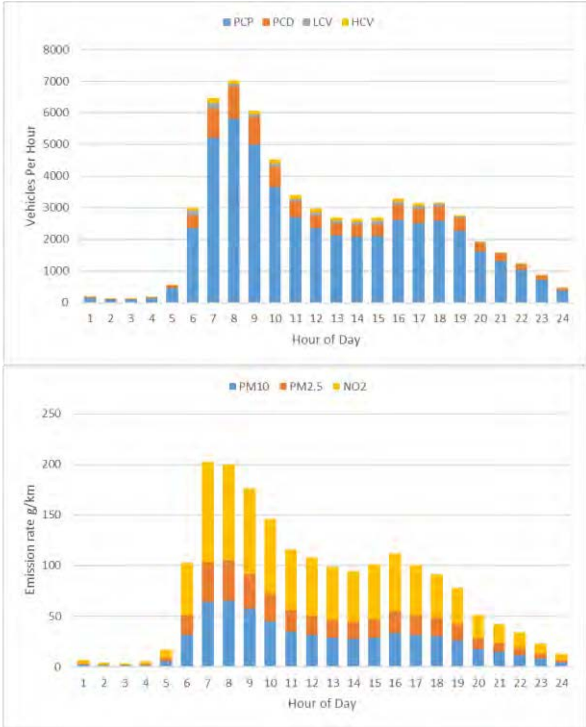


Figure 222: M80-NEL interchange: X1 – X2 - M80 to NEL - Project 2036

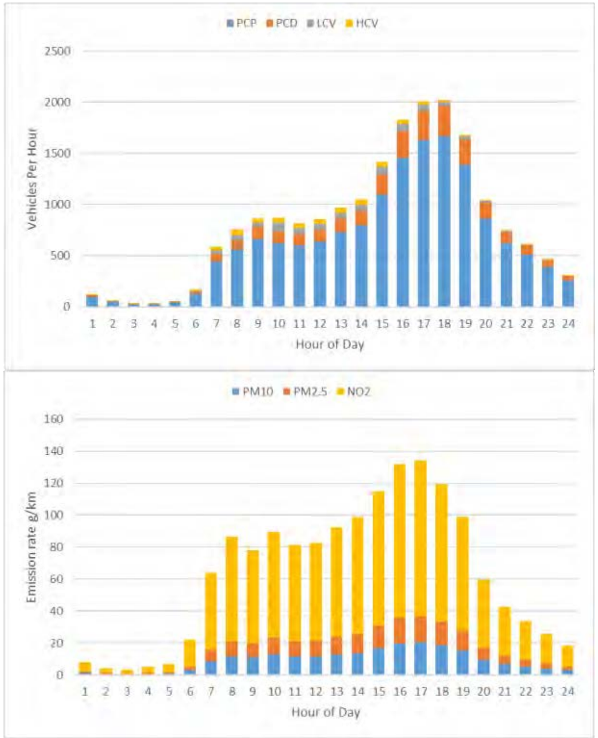
X3 - M80 to Greensborough Bypass	X4 - NEL/Grimshaw to Greensborough Bypass
	

Figure 223: M80-NEL interchange: X3 – X4 - M80 to NEL - Project 2036

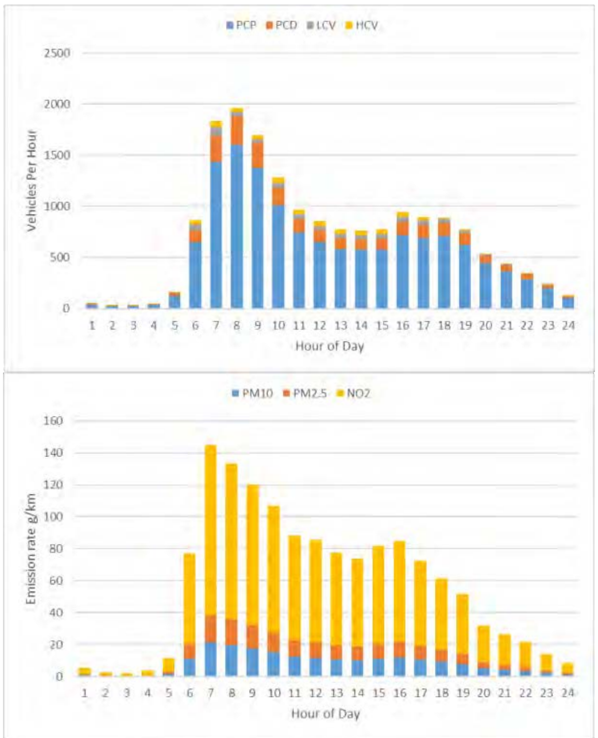
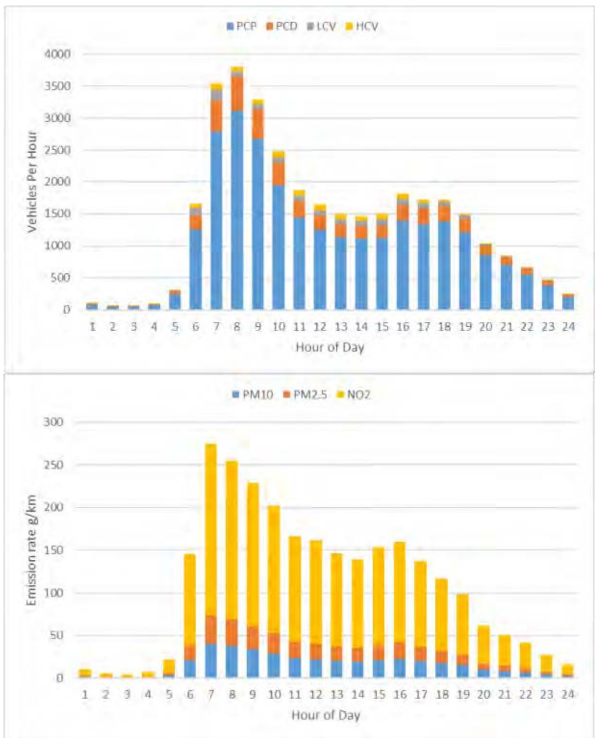
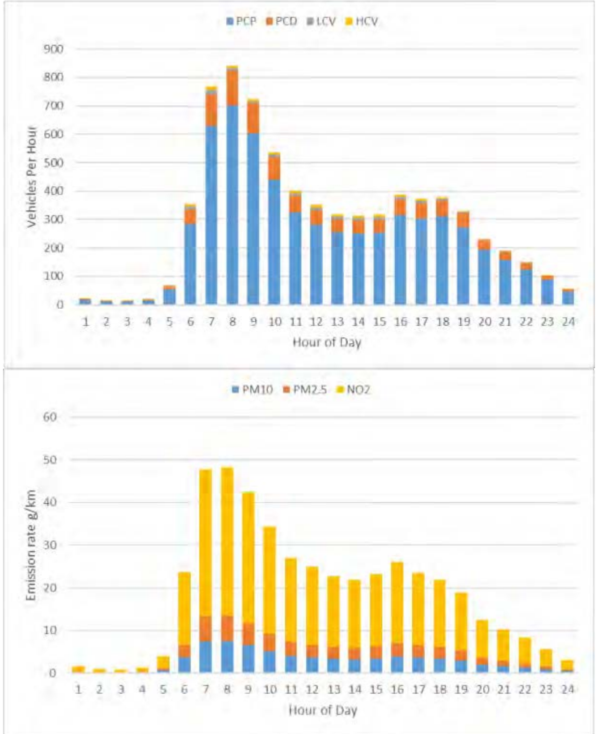
X5 - Greensborough Bypass to NEL/Grimshaw	X6 - Greensborough Bypass to M80
	

Figure 224: M80-NEL interchange: X5 – X6 - M80 to NEL - Project 2036

X7 - Greensborough Bypass to Grimshaw	X8 - M80 to Grimshaw



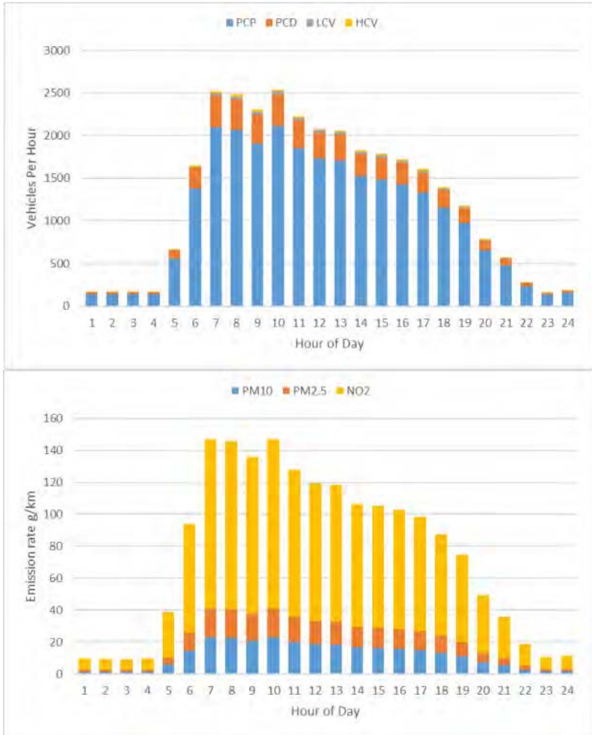
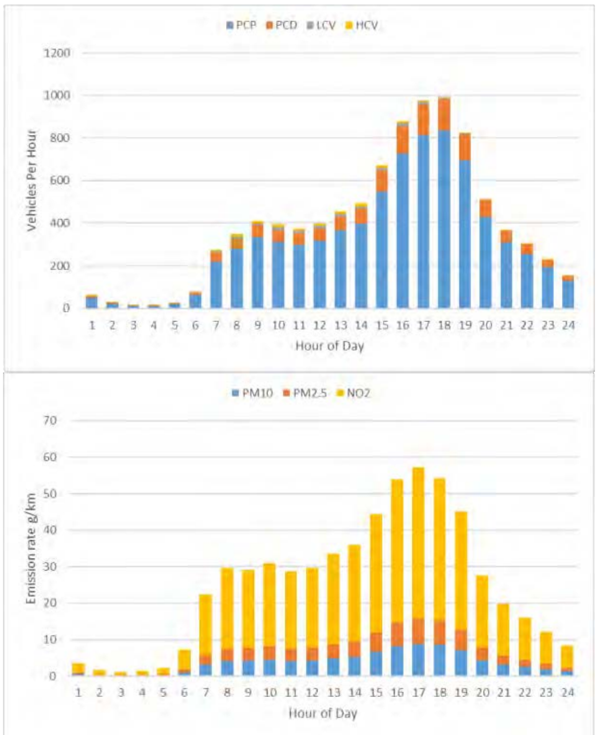


Figure 225: M80-NEL interchange: X7 – X8 - M80 to NEL - Project 2036

X9 - Grimshaw to Greensborough Bypass	X10 - NEL to Greensborough Bypass



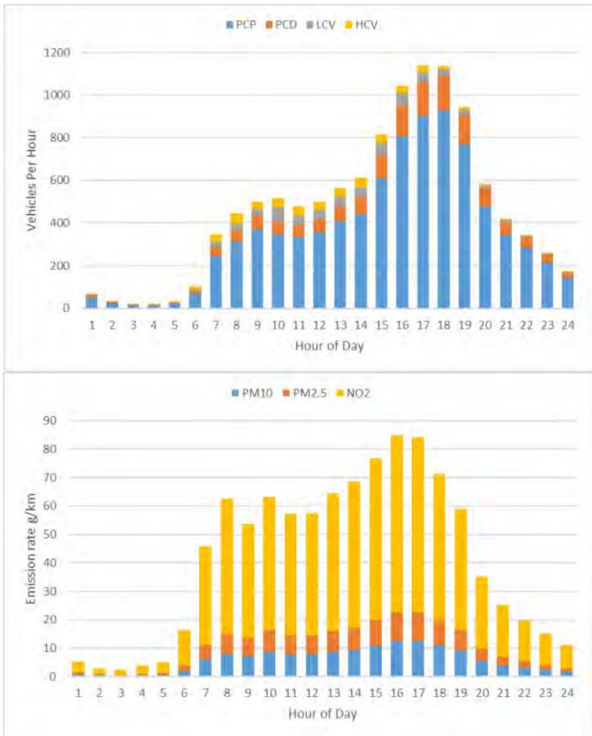
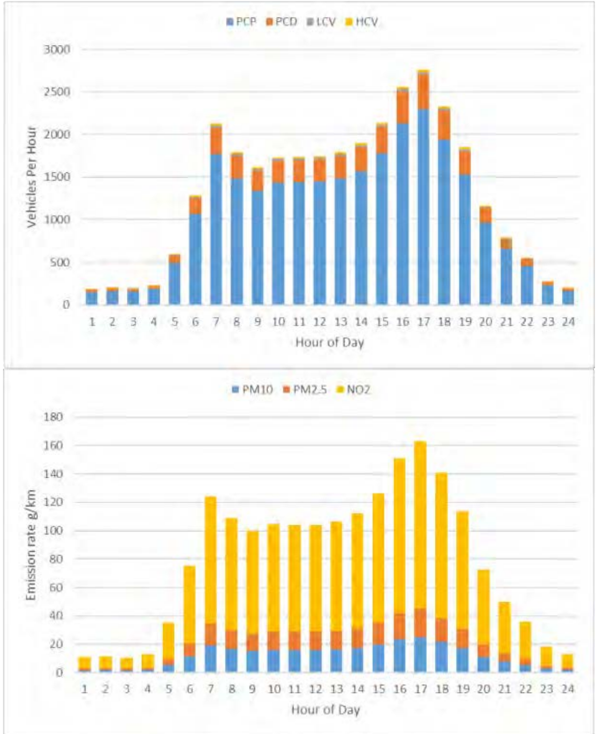


Figure 226: M80-NEL interchange: X9 – X10 - M80 to NEL - Project 2036

X11 - Grimshaw to M80/Plenty



X12 - NEL to Plenty

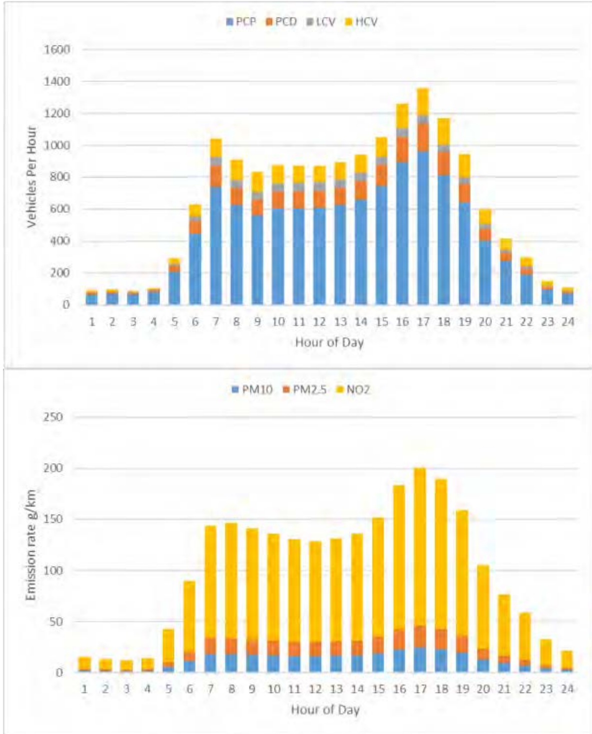
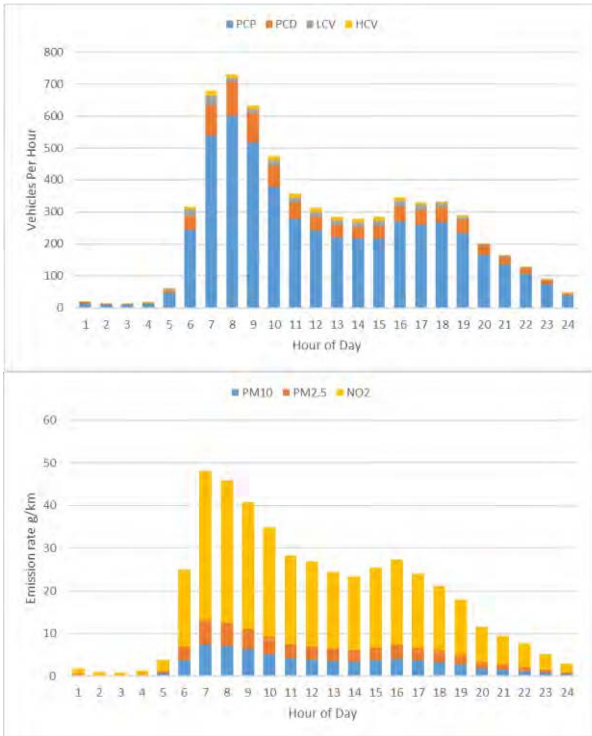


Figure 227: M80-NEL interchange: X11 – X12 - M80 to NEL - Project 2036

X13 - Greensborough Bypass to Plenty



X14 - NEL/Greensborough Bypass to Plenty

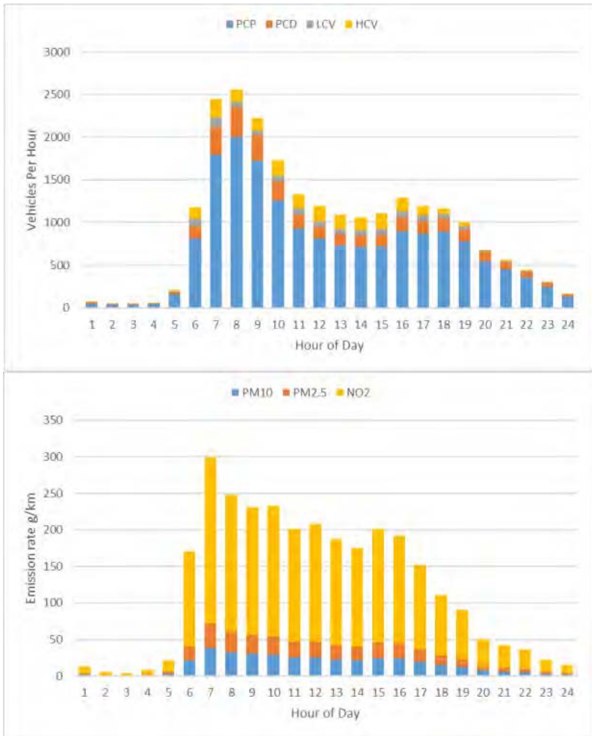
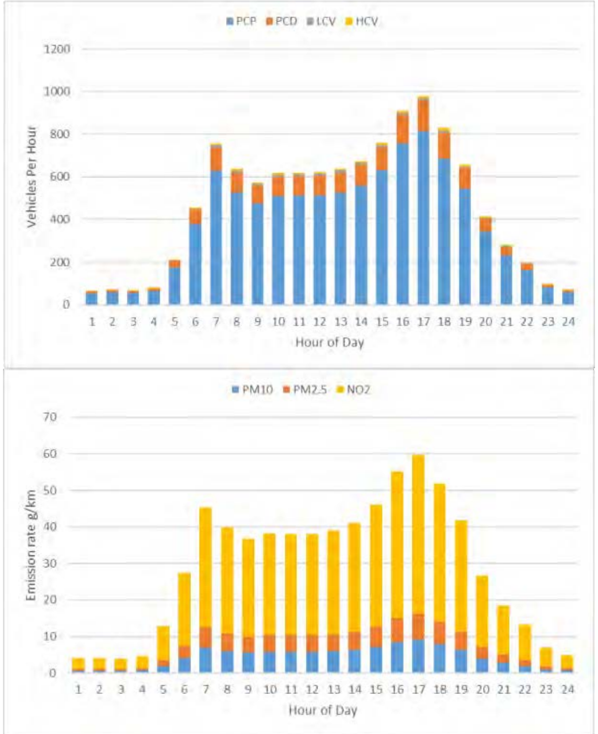


Figure 228: M80-NEL interchange: X13 – X14 - M80 to NEL - Project 2036

X15 - Grimshaw to Plenty



X16 - Grimshaw to M80

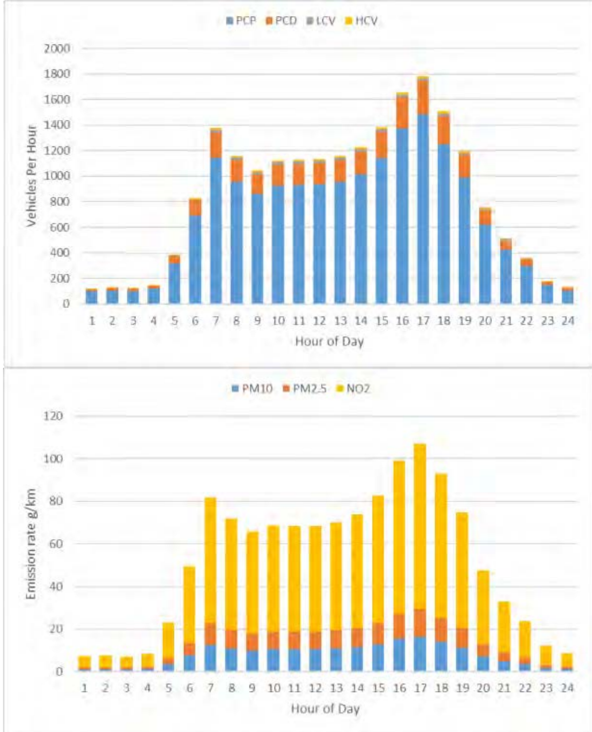


Figure 229: M80-NEL interchange: X15 – X16 - M80 to NEL - Project 2036

X17 - Plenty Road exit ramp

X18 - NEL to M80

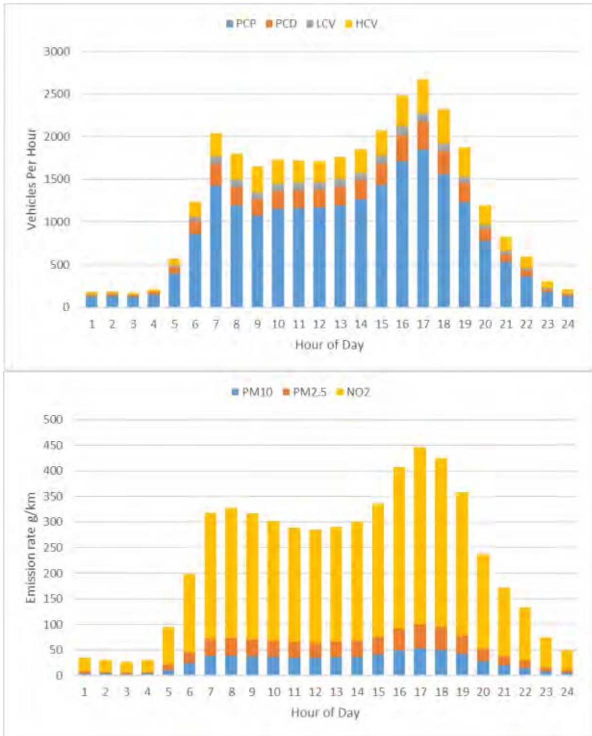


Figure 230: M80-NEL interchange: X17 – X18 - M80 to NEL - Project 2036

X19 - Greensborough Bypass to M80

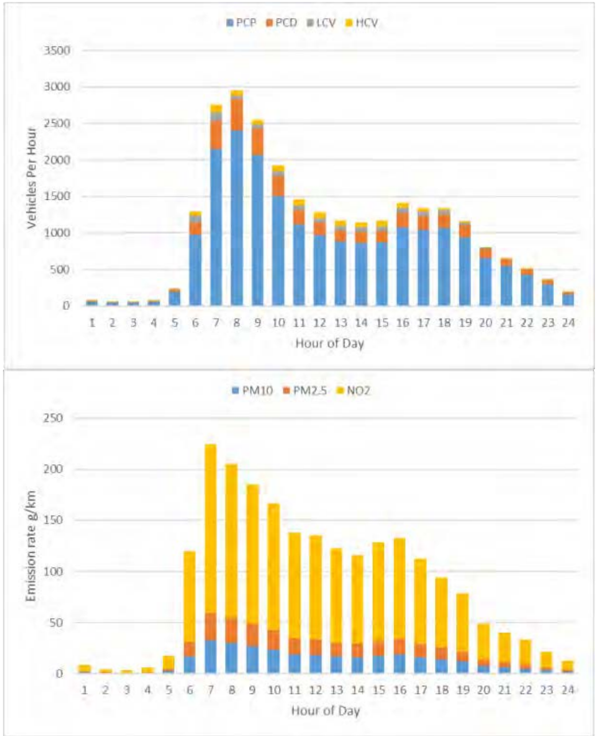


Figure 231: M80-NEL interchange: X19 - Greensborough Bypass to M80 - Project 2036

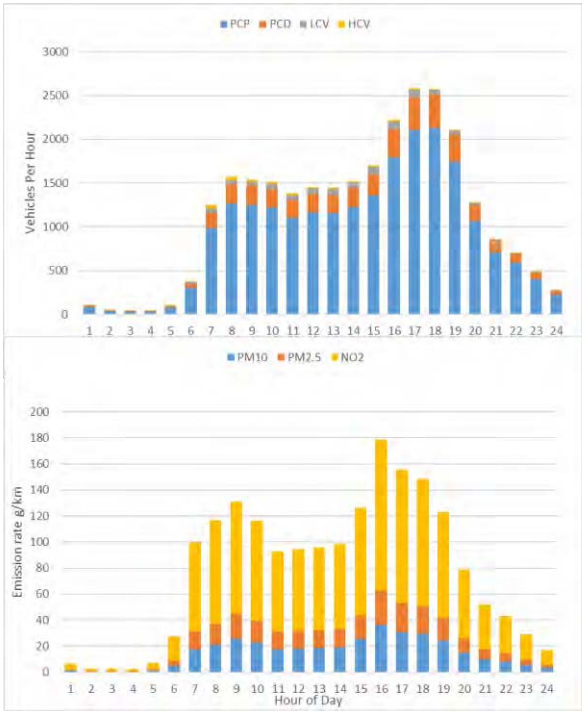
25.0 MAIN RD

25.1 Base 2026

Table 86: Main Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Para Rd to Bolton St	East Bound	15000	1500	400	16900
Para Rd to Bolton St	West Bound	17000	800	500	18300
Fitzsimons La to Bolton St	Eastbound	26000	900	300	27200
Fitzsimons La to Bolton St	Westbound	22000	800	300	23100

East Bound



West Bound

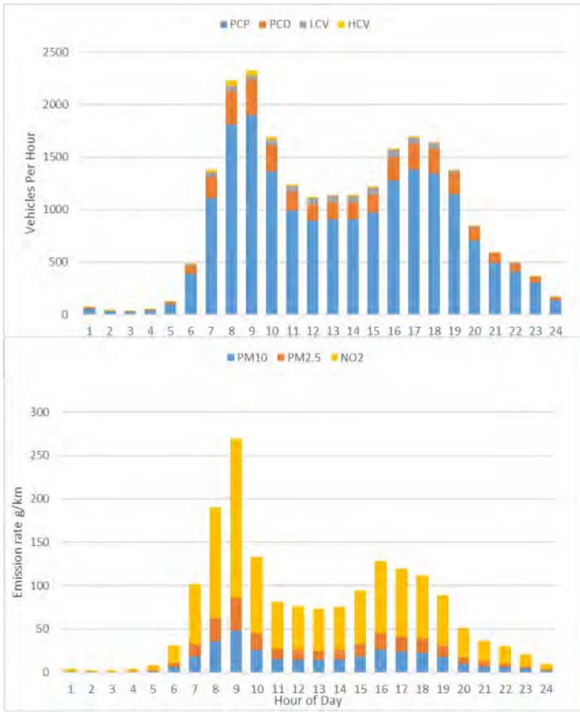


Figure 232: Main Rd : Fitzsimons La to Bolton St - Base 2026

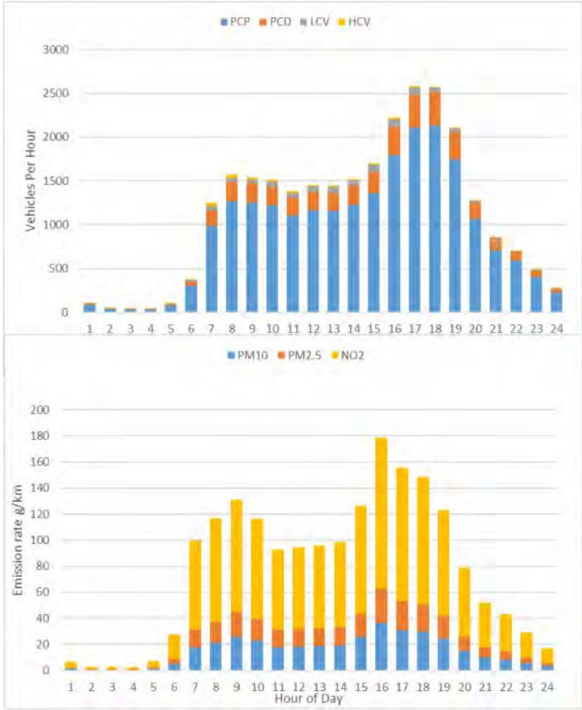
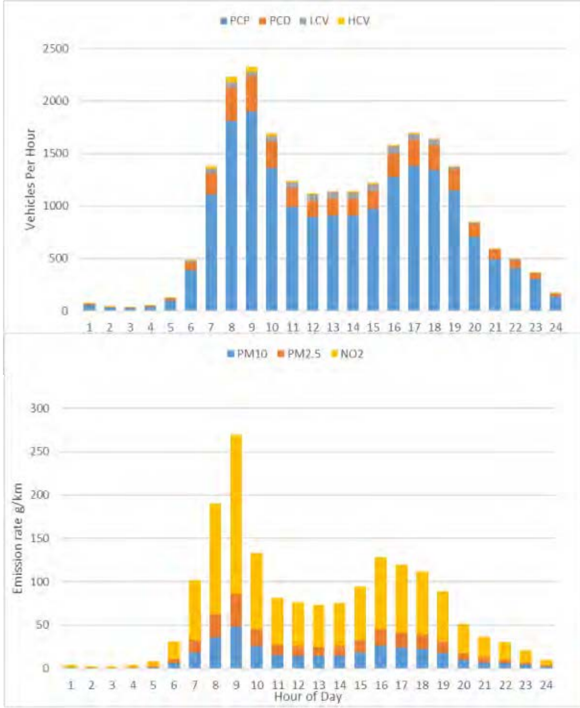
East Bound	West Bound
	

Figure 233: Main Rd : Fitzsimons La to Bolton St - Base 2026

25.2 Project 2026

Table 87: Main Rd 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Para Rd to Bolton St	East Bound	13000	1000	250	14250
Para Rd to Bolton St	West Bound	15000	500	250	15750
Fitzsimons La to Bolton St	Eastbound	21000	500	150	21650
Fitzsimons La to Bolton St	Westbound	17000	500	150	17650

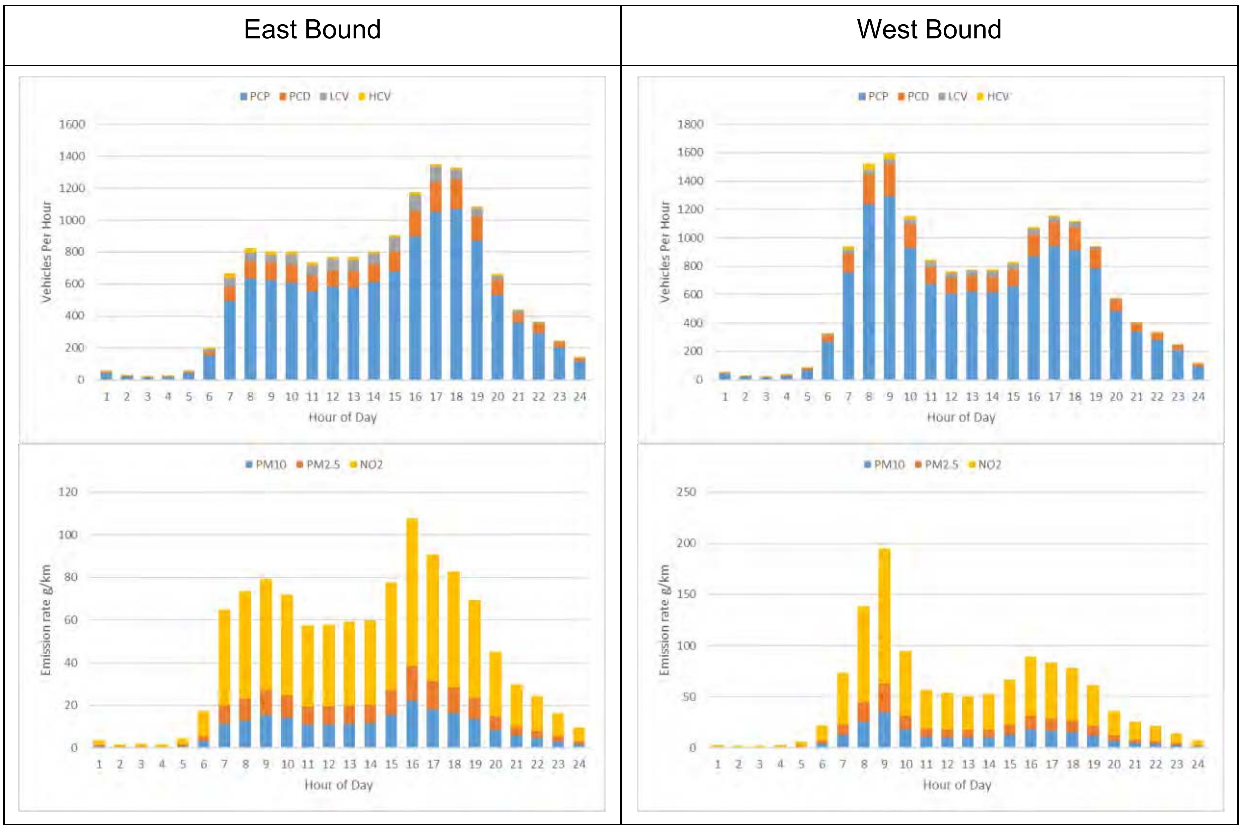
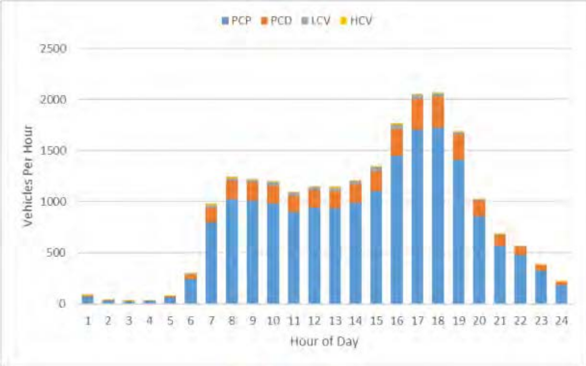
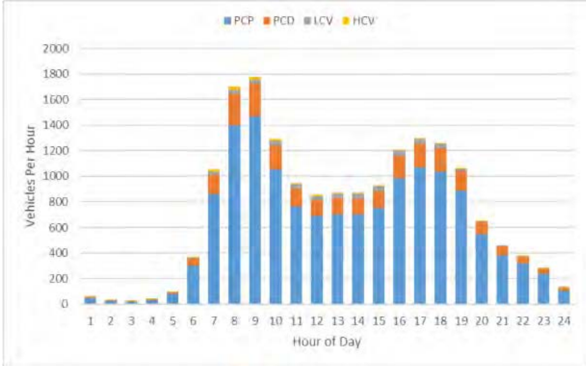
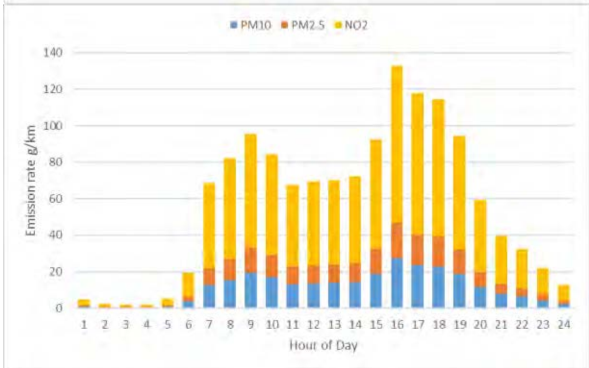


Figure 234: Main Rd: Para Rd to Bolton St - Project 2026

East Bound	West Bound







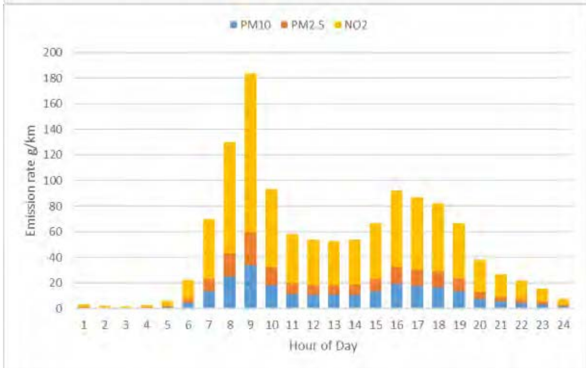


Figure 235: Main Rd : Fitzsimons La to Bolton St - Project 2026

25.3 Base 2036

Table 88: Main Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Para Rd to Bolton St	East Bound	16000	1800	500	18300
Para Rd to Bolton St	West Bound	18000	900	700	19600
Fitzsimons La to Bolton St	Eastbound	29000	1000	400	30400
Fitzsimons La to Bolton St	Westbound	24000	1000	500	25500

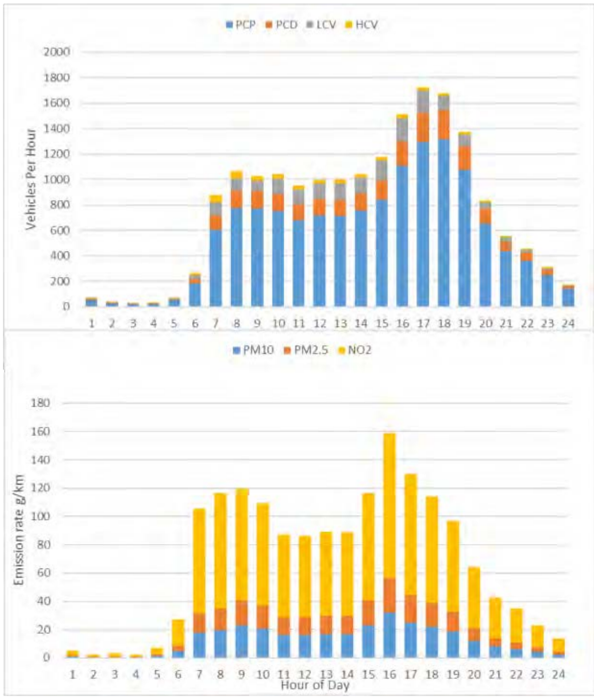
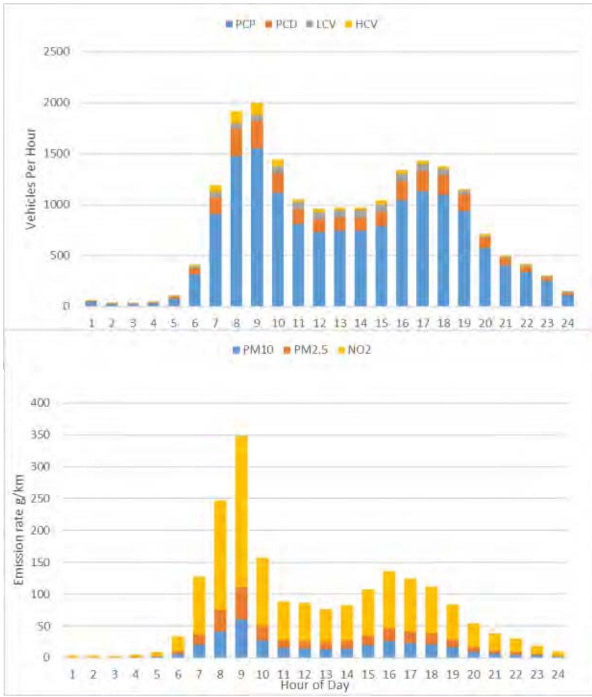
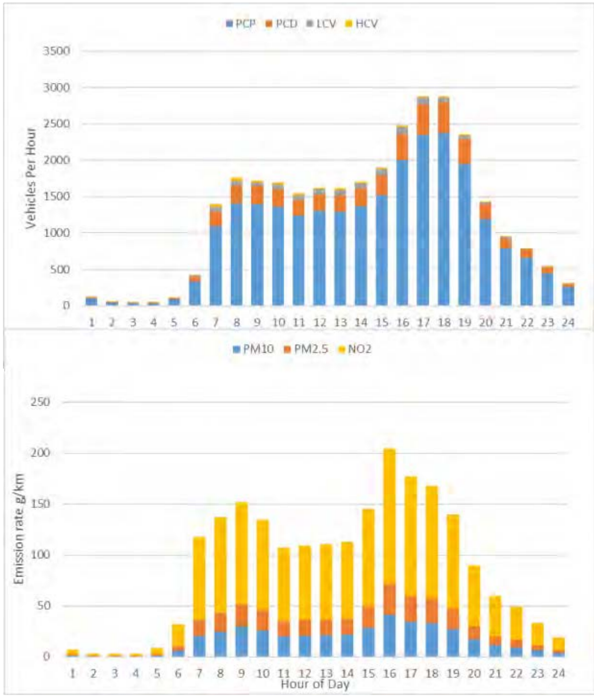
East Bound	West Bound
	

Figure 236: Main Rd: Para Rd to Bolton St - Base 2036

East Bound



West Bound

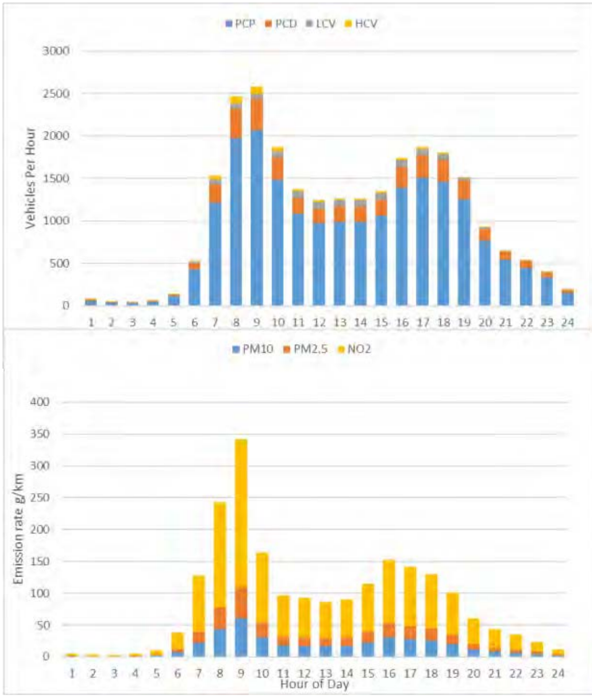


Figure 237: Main Rd : Fitzsimons La to Bolton St - Base 2036

25.4 Project 2036

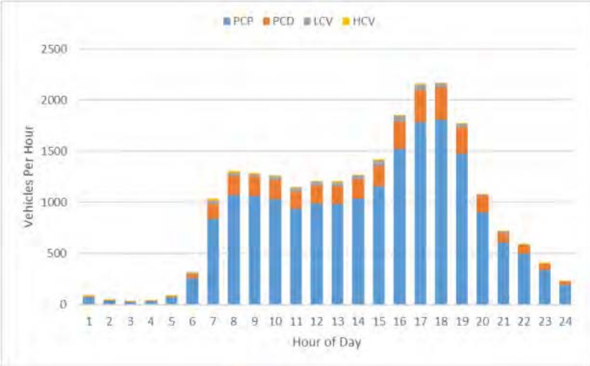
Table 89: Main Rd 24 hour traffic volumes - Project 2036

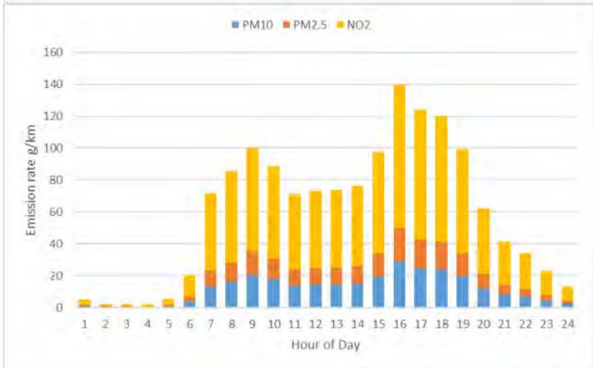
Road	Direction	Cars	LCV	HCV	Total
Para Rd to Bolton St	East Bound	14000	1100	250	15350
Para Rd to Bolton St	West Bound	16000	600	250	16850
Fitzsimons La to Bolton St	Eastbound	22000	600	150	22750
Fitzsimons La to Bolton St	Westbound	18000	500	150	18650

East Bound	West Bound

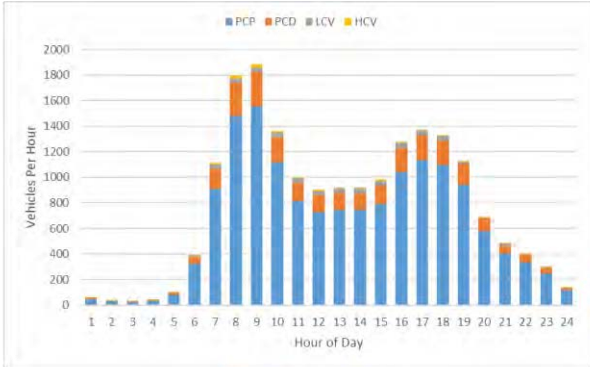
Figure 238: Main Rd: Para Rd to Bolton St - Project 2036

East Bound





West Bound



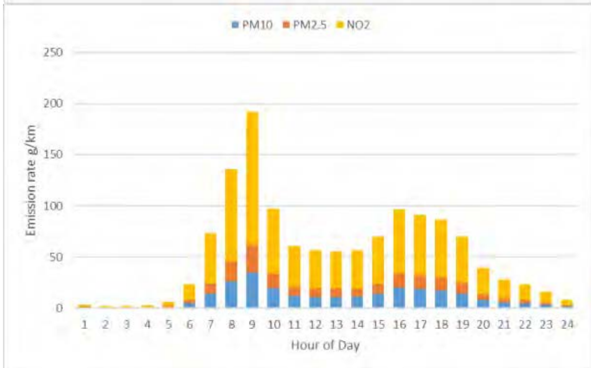


Figure 239: Main Rd : Fitzsimons La to Bolton St - Project 2036

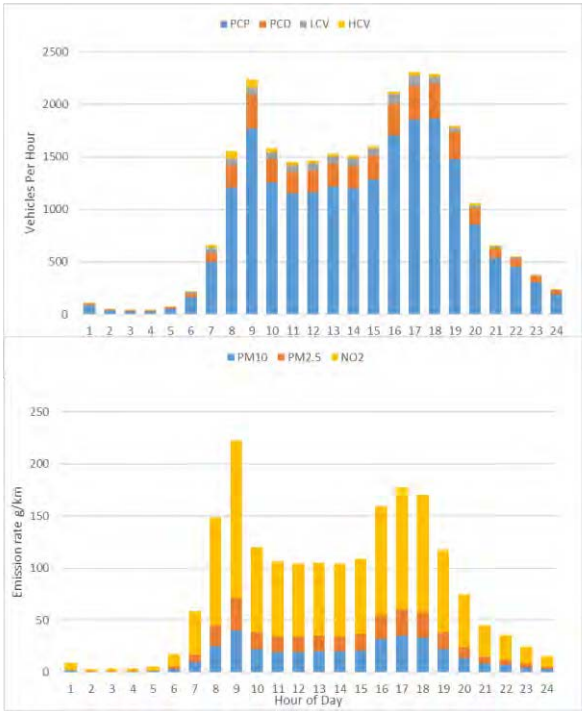
26.0 MANNINGHAM RD

26.1 Base 2026

Table 90: Manningham Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
High St to Williamsons Rd	East Bound	24000	1000	500	25500
High St to Williamsons Rd	West Bound	21000	700	250	21950
Thompsons Rd to High St	East Bound	21000	900	900	22800
Thompsons Rd to High St	West Bound	20000	900	150	21050

East Bound	West Bound



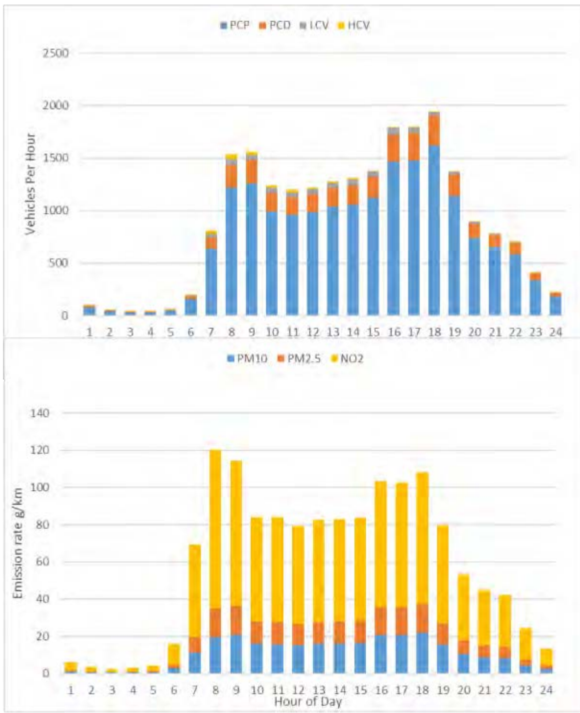


Figure 240: Manningham Rd: High St to Williamsons Rd - Base 2026

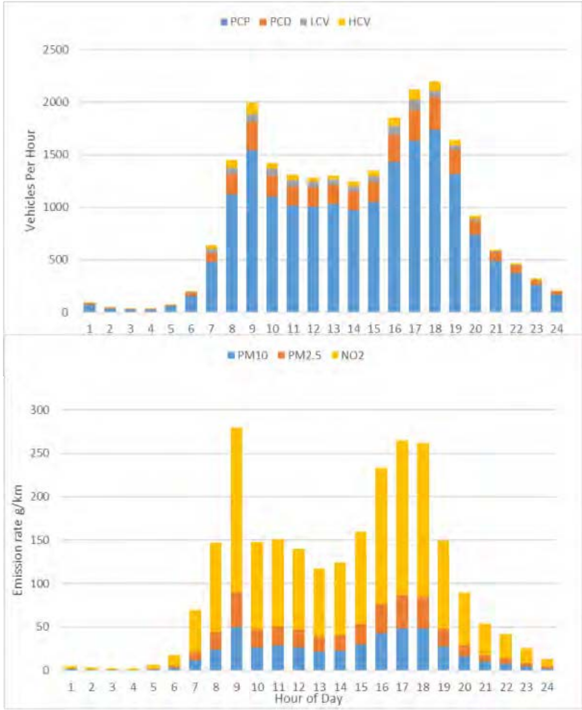
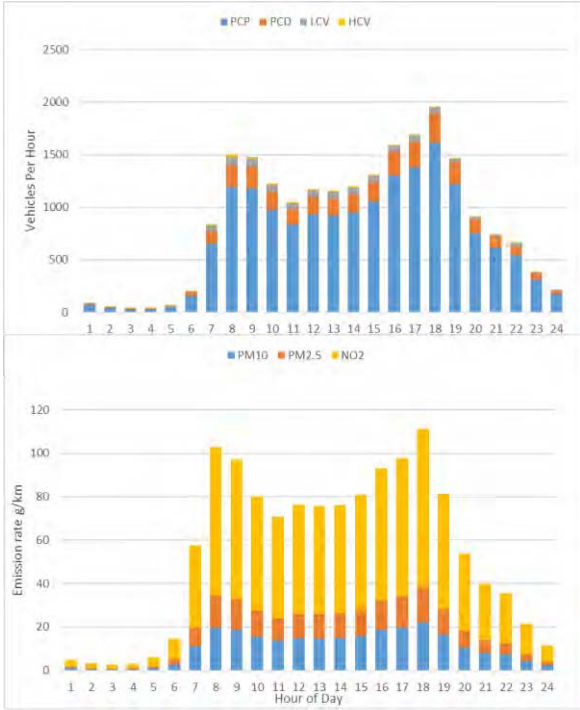
East Bound	West Bound
	

Figure 241: Manningham Rd: Thompsons Rd to High St - Base 2026

26.2 Project 2026

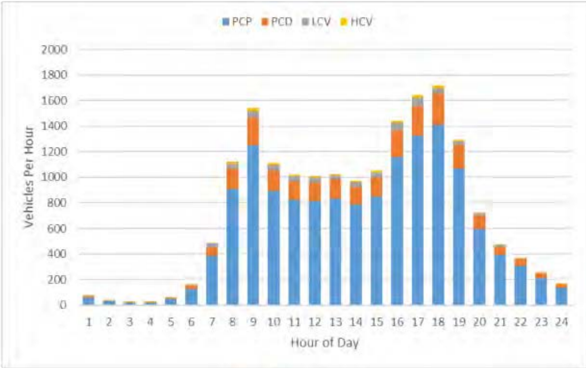
Table 91: Manningham Rd 24 hour traffic volumes - Project 2026

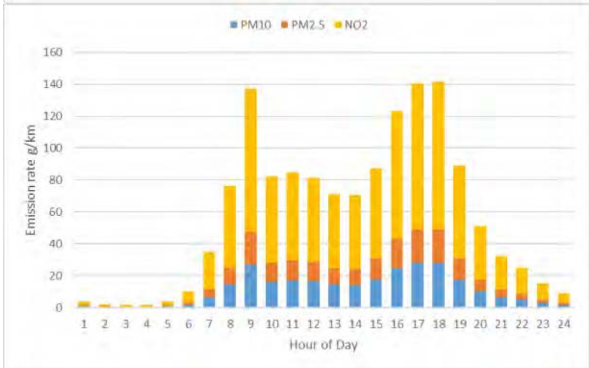
Road	Direction	Cars	LCV	HCV	Total
High St to Williamsons Rd	East Bound	17000	500	150	17650
High St to Williamsons Rd	West Bound	17000	400	150	17550
Thompsons Rd to High St	East Bound	17000	600	200	17800
Thompsons Rd to High St	West Bound	16000	600	100	16700

East Bound	West Bound

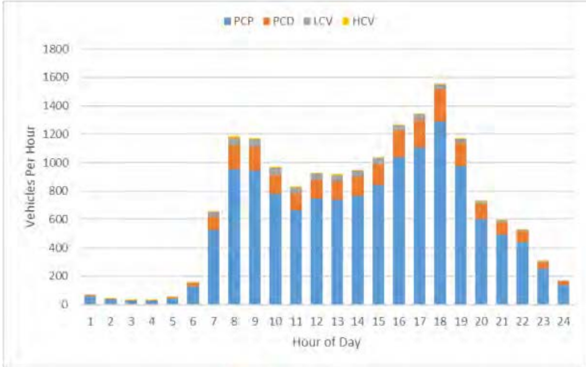
Figure 242: Manningham Rd: High St to Williamsons Rd - Project 2026

East Bound





West Bound



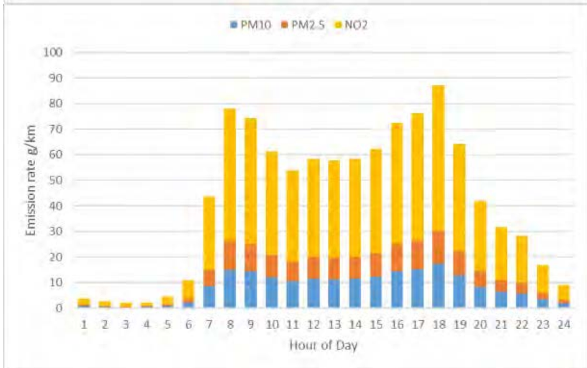


Figure 243: Manningham Rd: Thompsons Rd to High St - Project 2026

26.3 Base 2036

Table 92: Manningham Rd: High St to Williamsons Rd - Base 2036

Road	Direction	Cars	LCV	HCV	Total
High St to Williamsons Rd	East Bound	26000	1200	700	27900
High St to Williamsons Rd	West Bound	23000	800	300	24100
Thompsons Rd to High St	East Bound	22000	1000	1300	24300
Thompsons Rd to High St	West Bound	22000	1000	200	23200

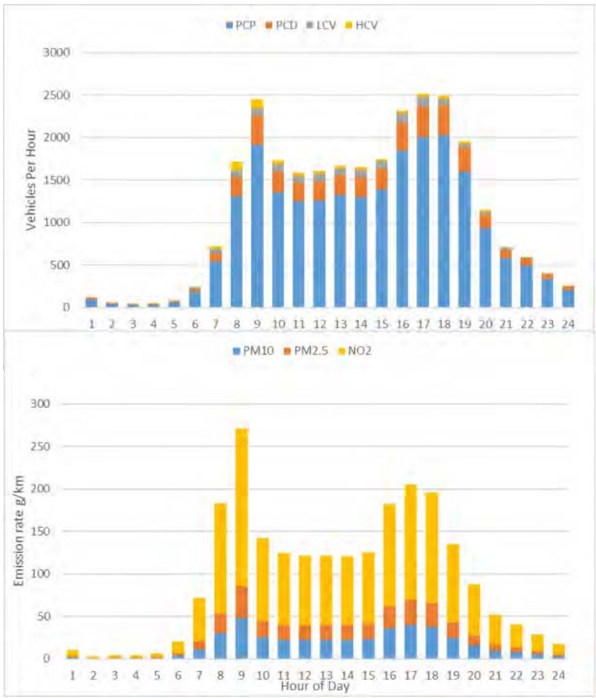
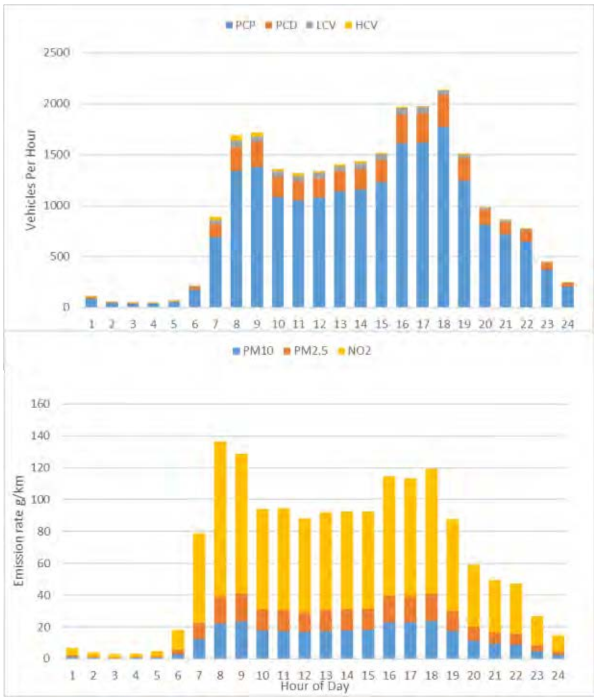
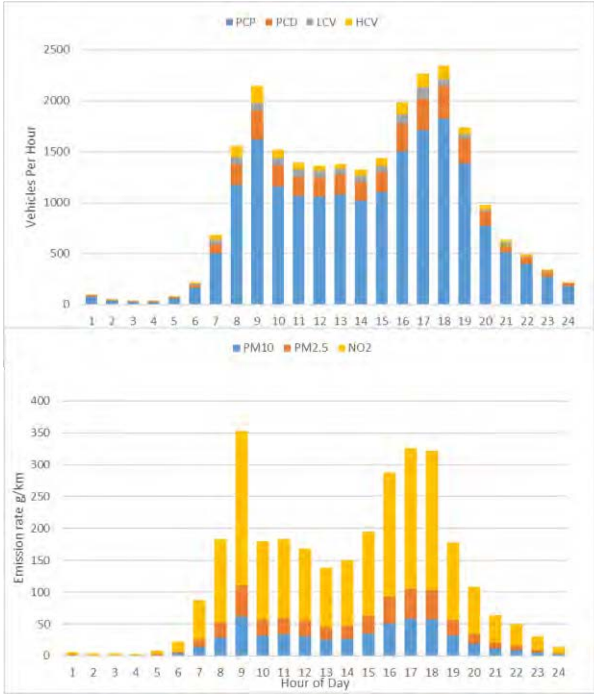
East Bound	West Bound
	

Figure 244: Manningham Rd: High St to Williamsons Rd - Base 2036

East Bound	West Bound



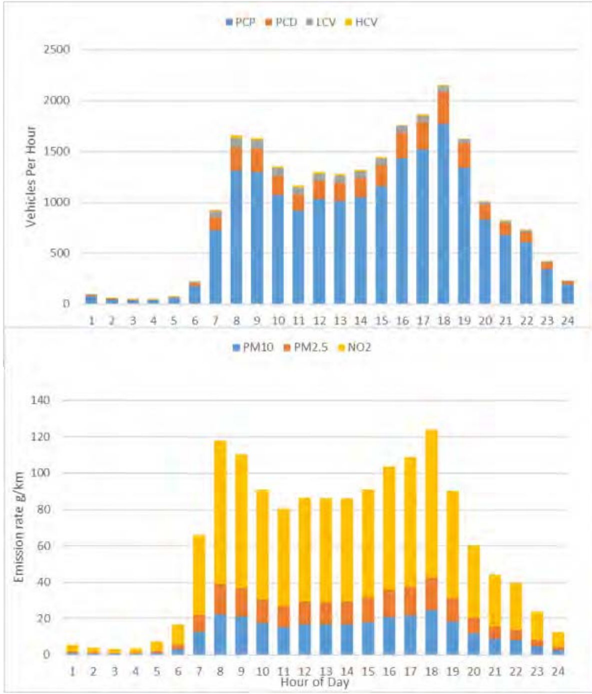


Figure 245: Manningham Rd: Thompsons Rd to High St - Base 2036

26.4 Project 2036

Table 93: Manningham Rd 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
High St to Williamsons Rd	East Bound	19000	600	150	19750
High St to Williamsons Rd	West Bound	20000	500	150	20650
Thompsons Rd to High St	East Bound	19000	600	300	19900
Thompsons Rd to High St	West Bound	18000	700	150	18850

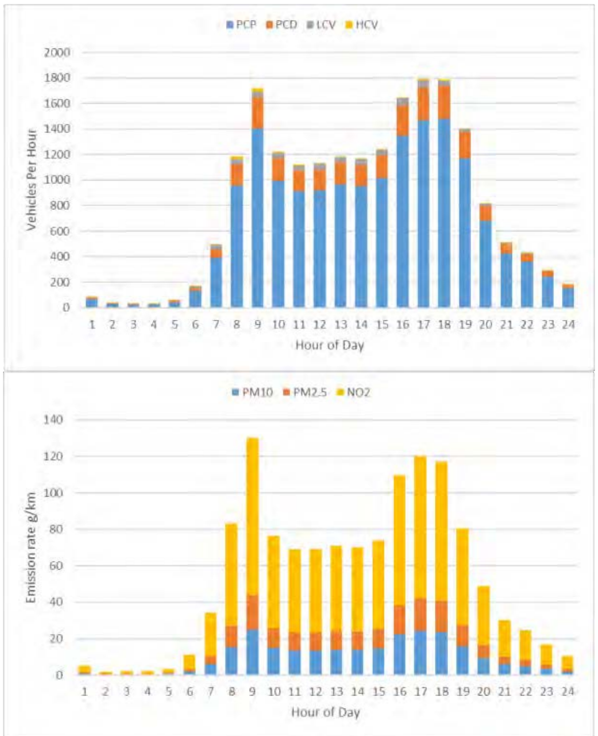
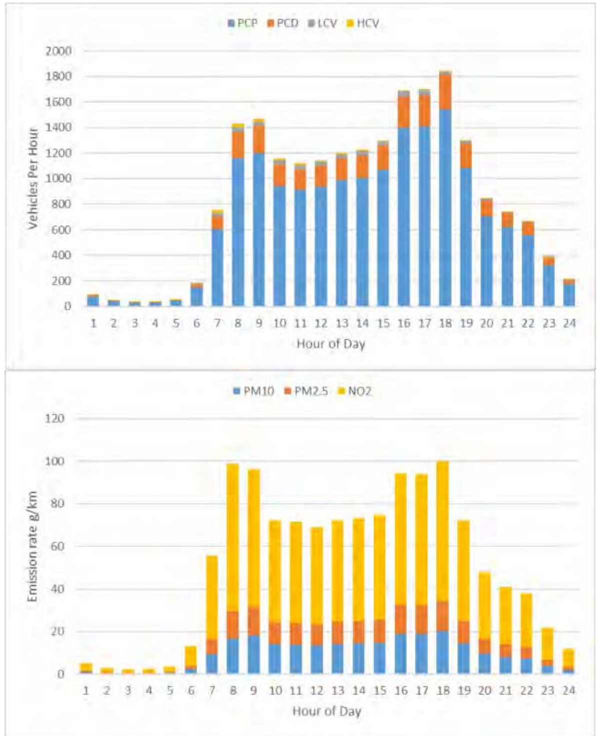
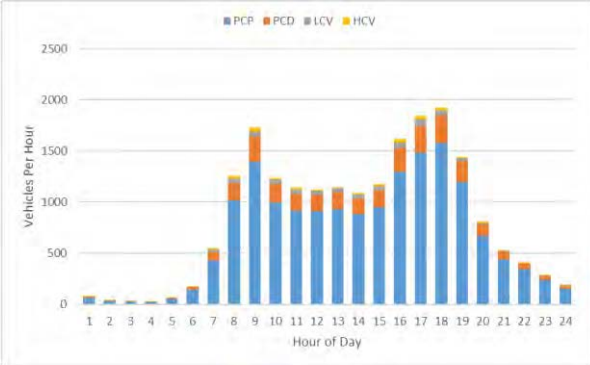
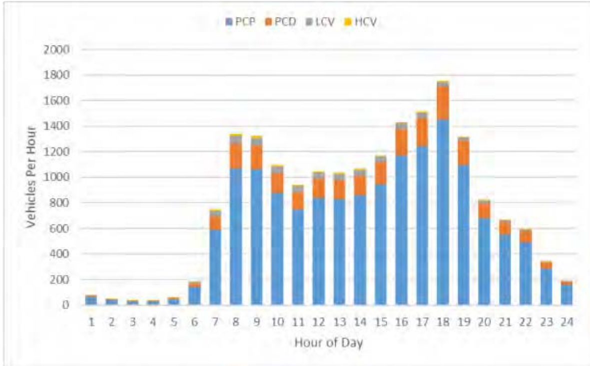
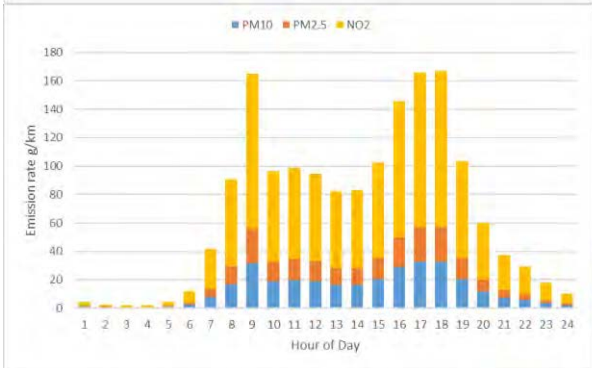
East Bound	West Bound
	

Figure 246: Manningham Rd: Thompsons Rd to High St - Project 2036

East Bound	West Bound







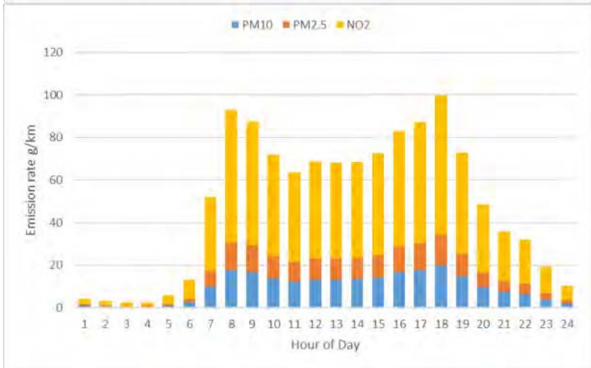


Figure 247: Manningham Rd: Thompsons Rd to High St - Project 2036

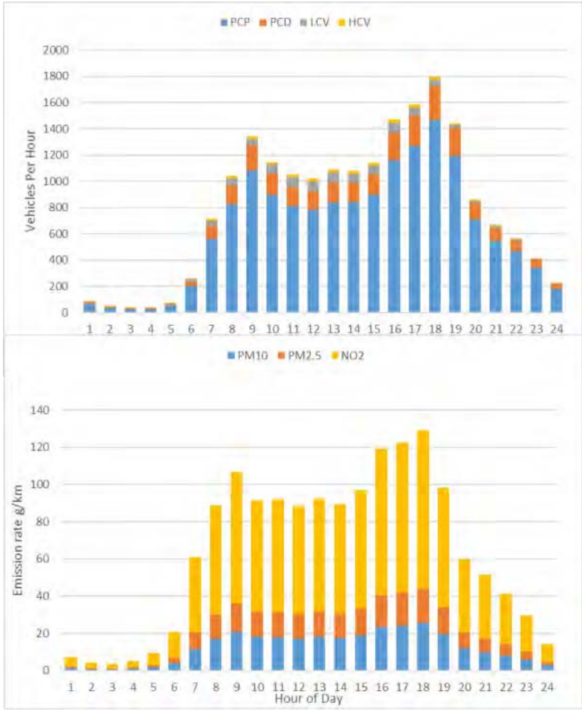
27.0 MIDDLEBOROUGH RD

27.1 Base 2026

Table 94: Middleborough Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Whitehorse Rd to Eastern Fwy	North Bound	18000	900	300	19200
Whitehorse Rd to Eastern Fwy	South Bound	18000	900	300	19200

North Bound



South Bound

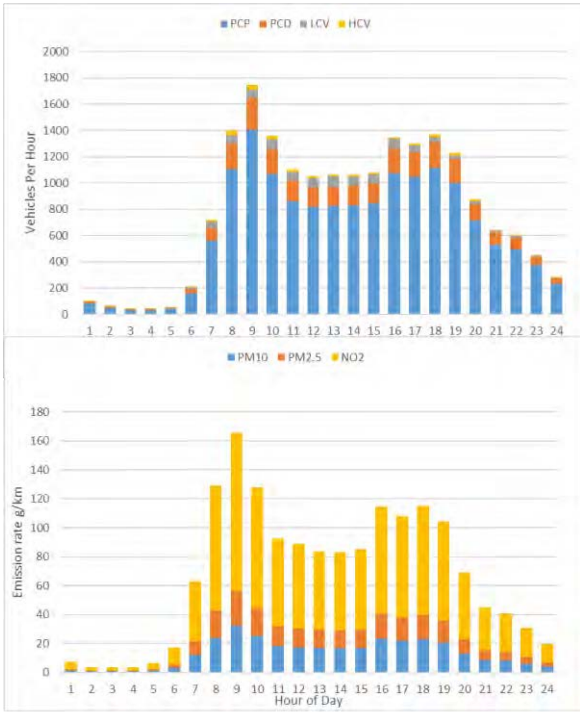


Figure 248: Middleborough Rd: Whitehorse Rd to Eastern Fwy - Base 2026

27.2 Project 2026

Table 95: Middleborough Rd 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Whitehorse Rd to Eastern Fwy	North Bound	20000	1000	400	21400
Whitehorse Rd to Eastern Fwy	South Bound	19000	1000	400	20400

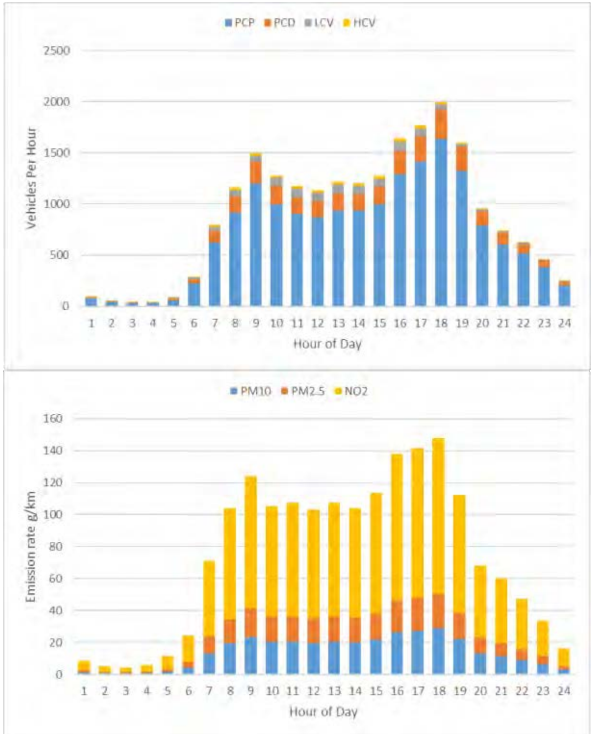
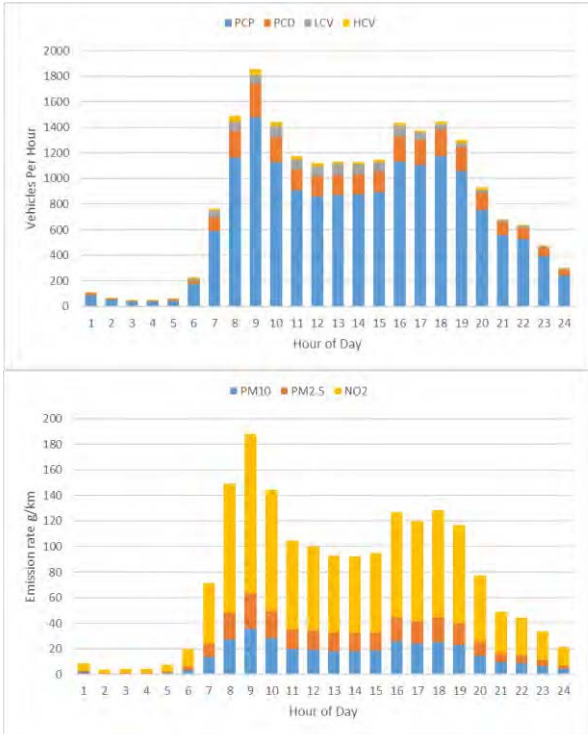
North Bound	South Bound
	

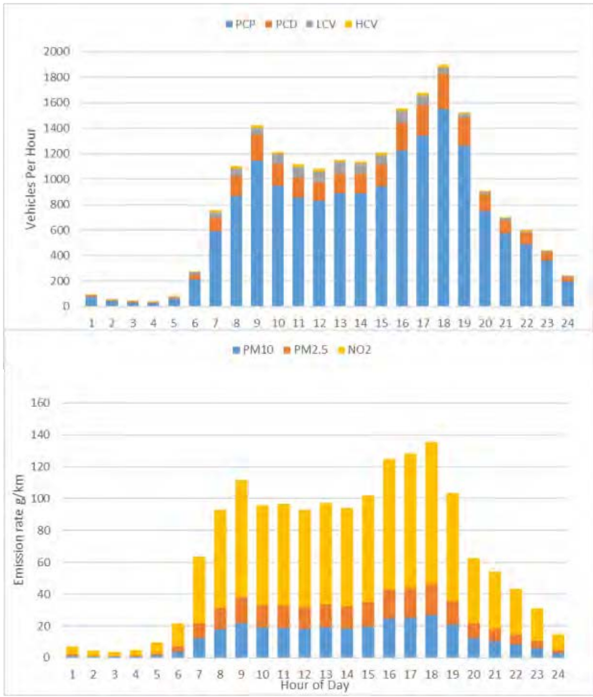
Figure 249: Middleborough Rd: Whitehorse Rd to Eastern Fwy - Project 2026

27.3 Base 2036

Table 96: Middleborough Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Whitehorse Rd to Eastern Fwy	North Bound	19000	1000	300	20300
Whitehorse Rd to Eastern Fwy	South Bound	18000	1000	350	19350

East Bound	West Bound



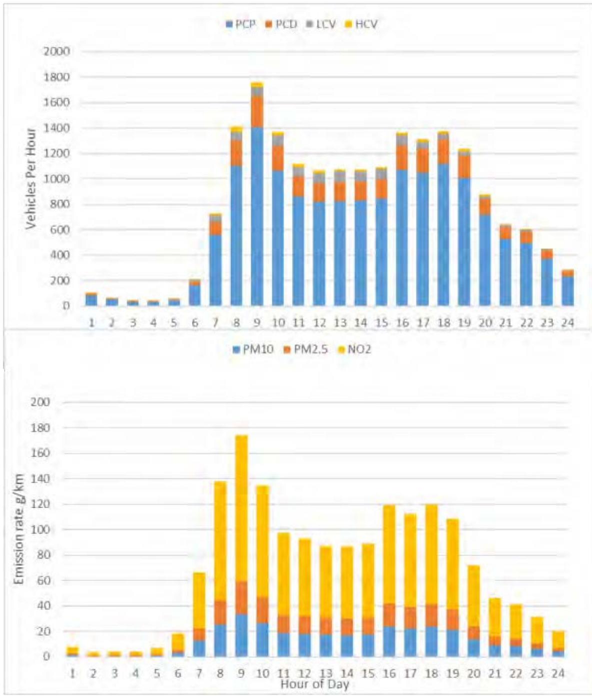


Figure 250: Middleborough Rd: Whitehorse Rd to Eastern Fwy - Base 2036

27.4 Project 2036

Table 97: Middleborough Rd 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Whitehorse Rd to Eastern Fwy	North Bound	20000	1100	500	21600
Whitehorse Rd to Eastern Fwy	South Bound	19000	1000	500	20500

North Bound	South Bound

Figure 251: Middleborough Rd: Whitehorse Rd to Eastern Fwy - Project 2036

28.0 NEL MIDBLOCK

28.1 Project 2026

Table 98: NEL Midblock 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Manningham Rd	North Bound	44000	2800	6200	53000
Eastern Fwy to Manningham Rd	South Bound	42000	2700	6200	50900
Manningham Rd to Lower Plenty Rd	North Bound	49000	2600	6600	58200
Manningham Rd to Lower Plenty Rd	South Bound	49000	2600	6700	58300
Lower Plenty Rd to Grimshaw St	North Bound	48000	2800	6700	57500
Lower Plenty Rd to Grimshaw St	South Bound	48000	2800	6800	57600
Grimshaw St to M80	North Bound	40000	2300	6300	48600
Grimshaw St to M80	South Bound	40000	2300	6400	48700
Under Manningham Rd	North Bound	32000	2000	5400	39400
Under Manningham Rd	South Bound	31000	2000	5500	38500
Under Lower Plenty Rd	North Bound	34000	2200	6300	42500
Under Lower Plenty Rd	South Bound	35000	2200	6400	43600

Road	Direction	Cars	LCV	HCV	Total
Under Grimshaw St	North Bound	40000	2300	6300	48600
Under Grimshaw St	South Bound	40000	2300	6400	48700

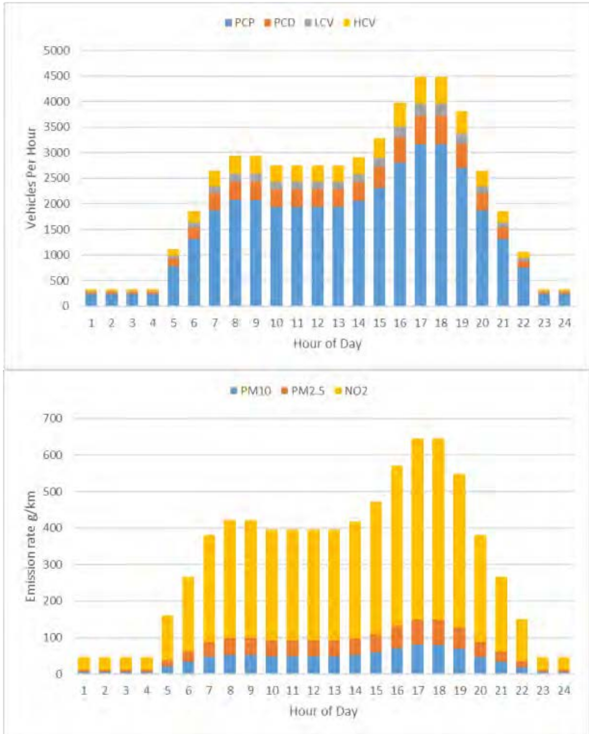
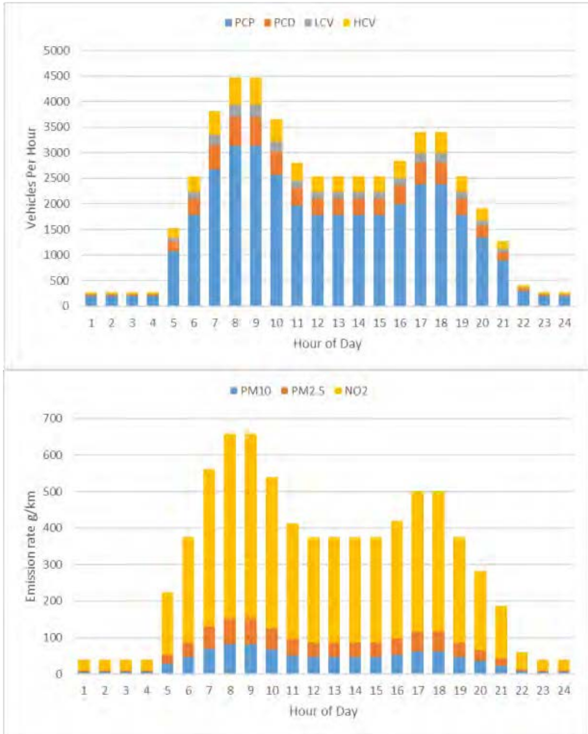
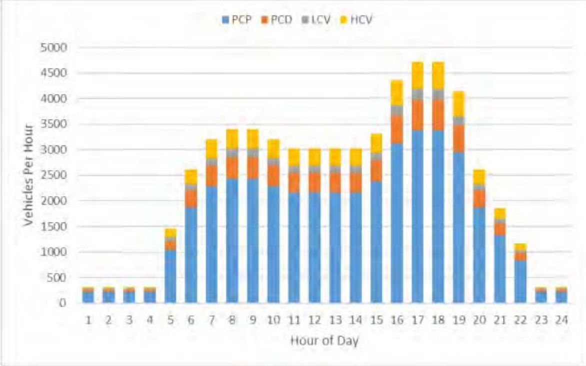
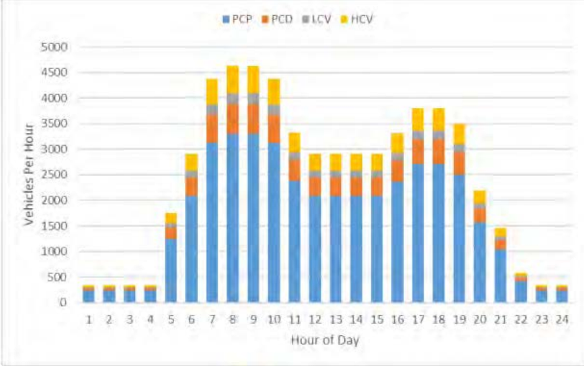
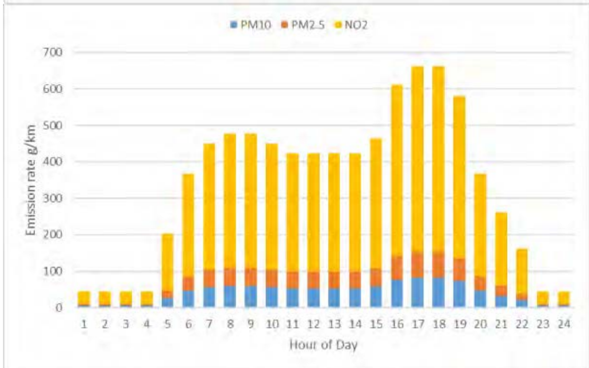
North Bound	South Bound
	

Figure 252: NEL Midblock: Eastern Fwy to Manningham Rd - Project 2026

North Bound	South Bound







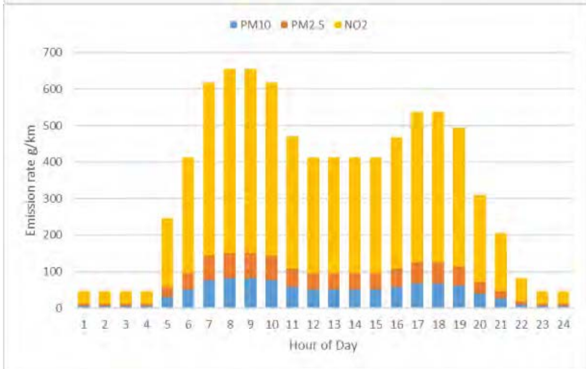
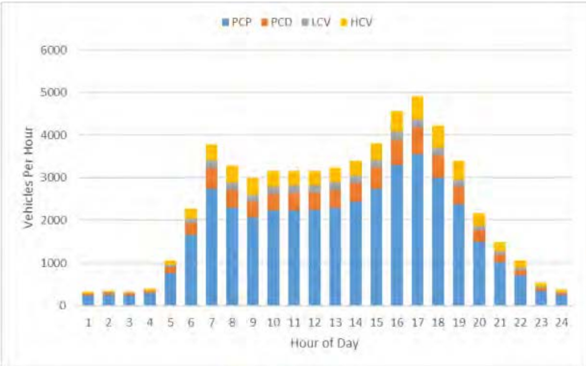
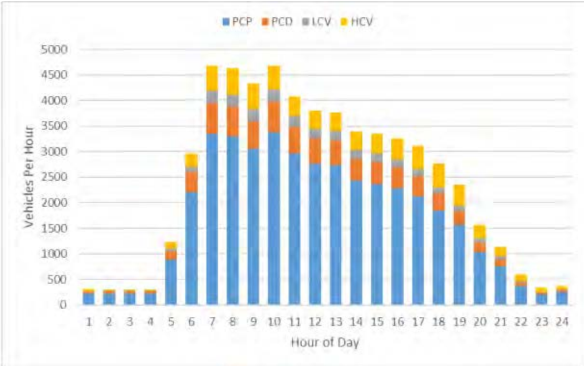
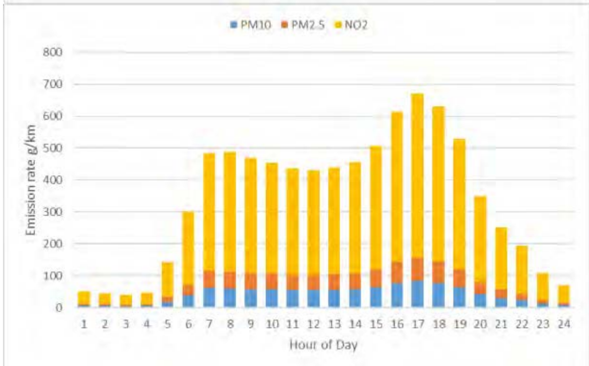


Figure 253: NEL Midblock: Manningham Rd to Lower Plenty Rd - Project 2026

North Bound	South Bound







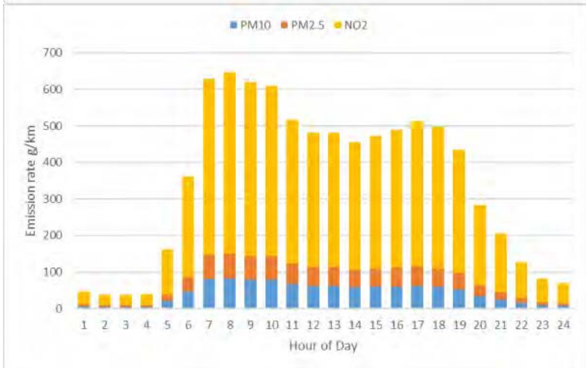
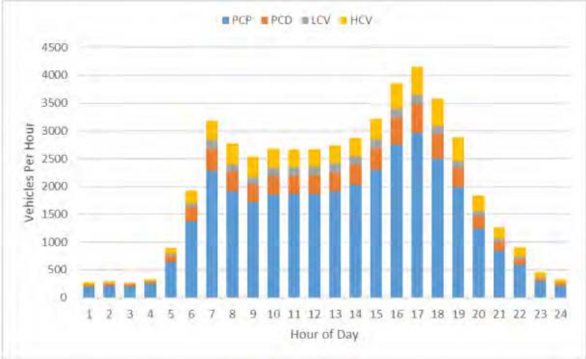
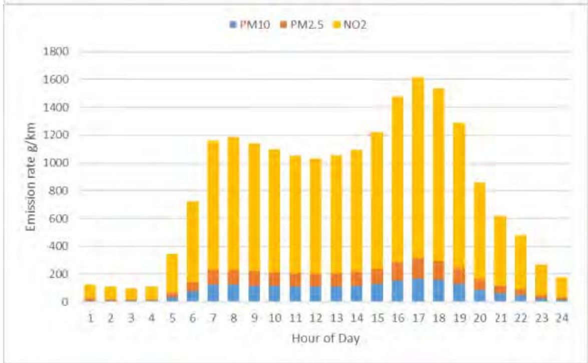
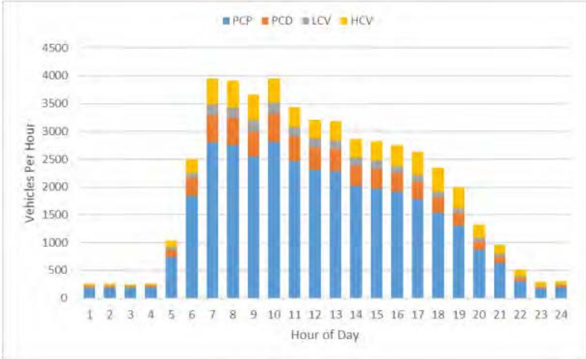


Figure 254: NEL Midblock: Lower Plenty Rd to Grimshaw St - Project 2026

North Bound	South Bound







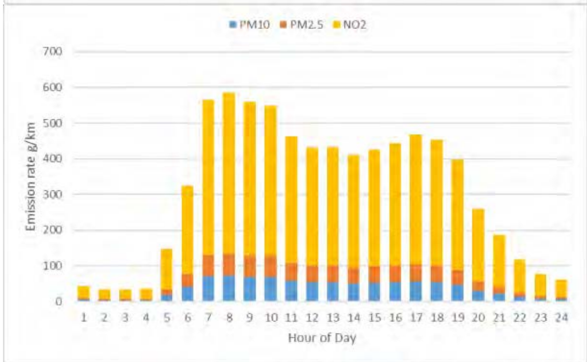
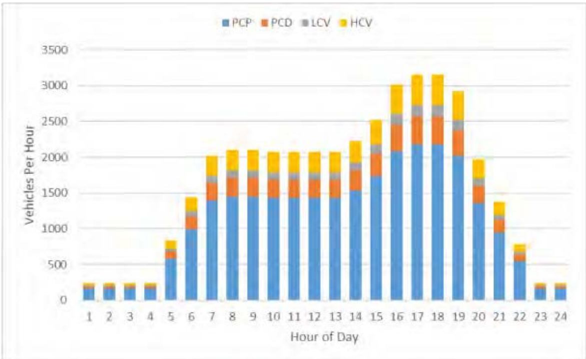
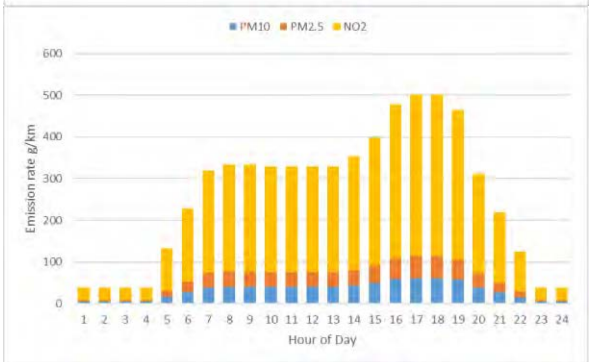
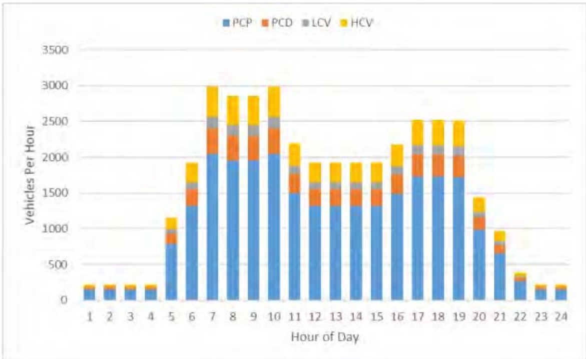


Figure 255: NEL Midblock: Grimshaw St to M80 - Project 2026

North Bound	South Bound







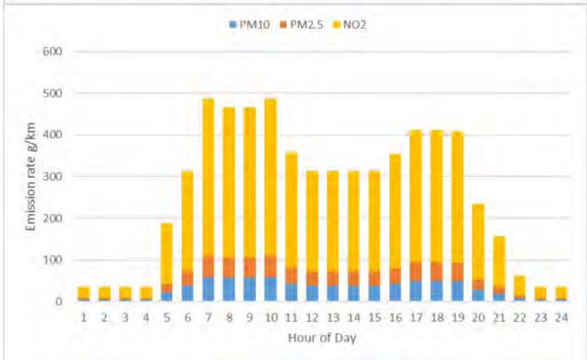


Figure 256: NEL Midblock: Under Manningham Rd - Project 2026

North Bound	South Bound

Figure 257: NEL Midblock: Under Lower Plenty Rd - Project 2026

North Bound	South Bound

Figure 258: NEL Midblock: Under Grimshaw St - Project 2026

28.2 Project 2036

Table 99: NEL Midblock 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Eastern Fwy to Manningham Rd	North Bound	51000	3200	7300	61500
Eastern Fwy to Manningham Rd	South Bound	48000	3100	7300	58400
Manningham Rd to Lower Plenty Rd	North Bound	57000	3000	7700	67700
Manningham Rd to Lower Plenty Rd	South Bound	56000	3000	7700	66700
Lower Plenty Rd to Grimshaw St	North Bound	54000	3200	7900	65100
Lower Plenty Rd to Grimshaw St	South Bound	55000	3200	7900	66100
Grimshaw St to M80	North Bound	45000	2600	7400	55000
Grimshaw St to M80	South Bound	46000	2600	7400	56000
Under Manningham Rd	North Bound	37000	2300	6400	45700
Under Manningham Rd	South Bound	36000	2300	6400	44700
Under Lower Plenty Rd	North Bound	40000	2500	7300	49800
Under Lower Plenty Rd	South Bound	40000	2500	7300	49800
Under Grimshaw St	North Bound	45000	2600	7400	55000

Road	Direction	Cars	LCV	HCV	Total
Under Grimshaw St	South Bound	46000	2600	7400	56000

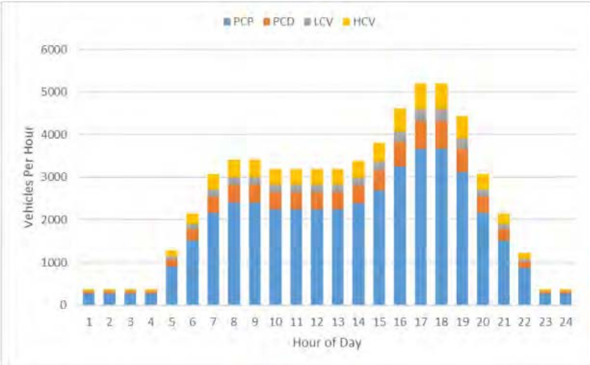
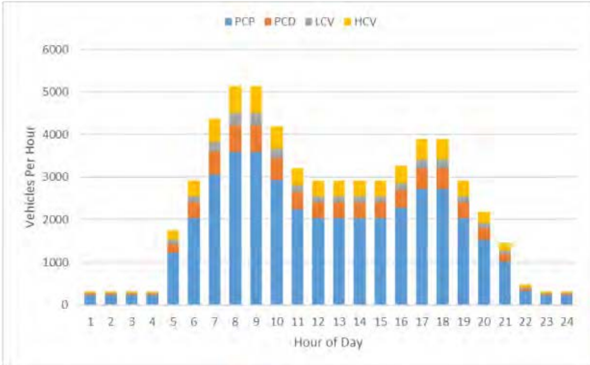
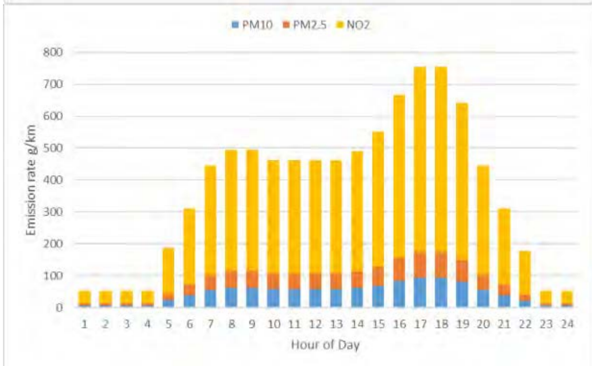
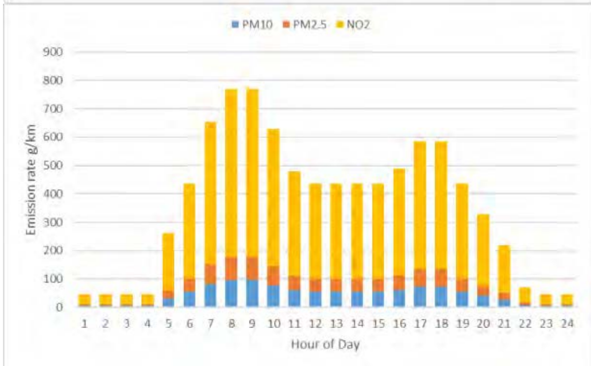
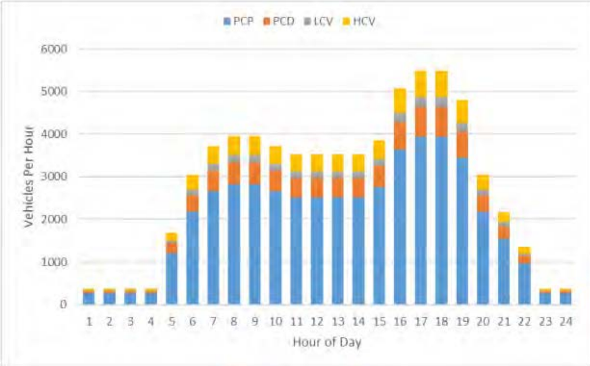
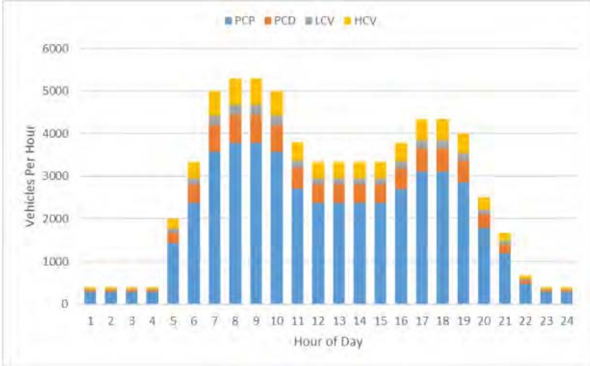
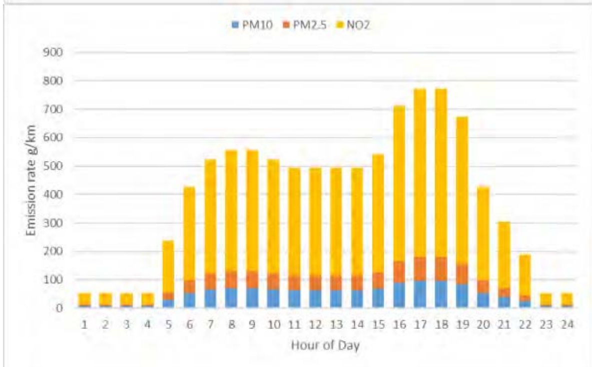
North Bound	South Bound
	
	

Figure 259: NEL Midblock: Eastern Fwy to Manningham Rd - Project 2036

North Bound	South Bound







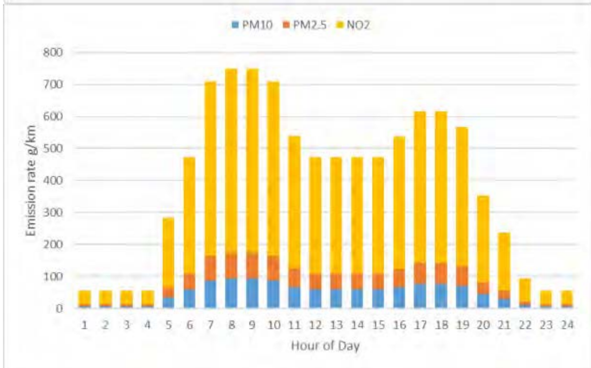
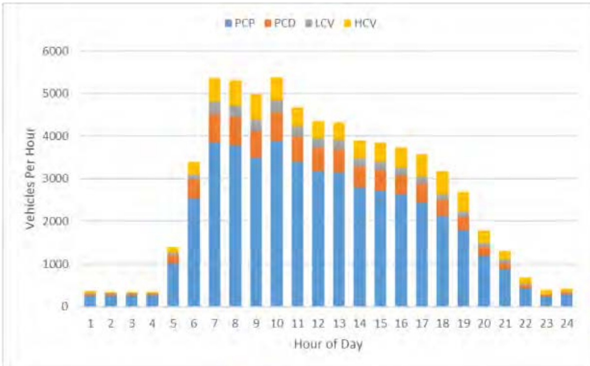
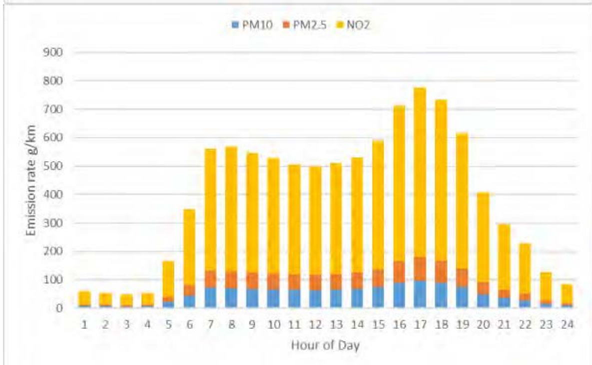


Figure 260: NEL Midblock: Manningham Rd to Lower Plenty Rd - Project 2036

North Bound	South Bound





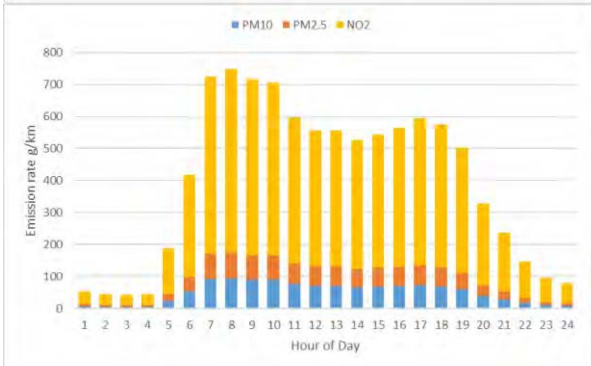


Figure 261: NEL Midblock: Lower Plenty Rd to Grimshaw St - Project 2036

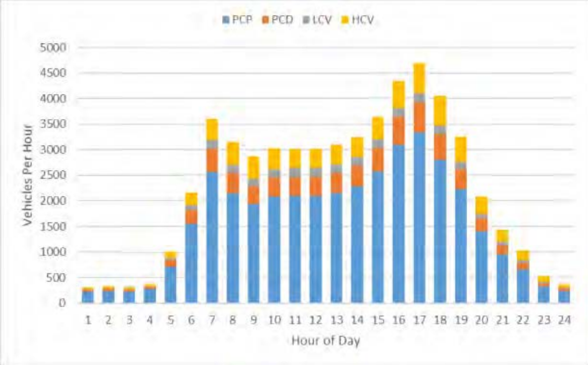
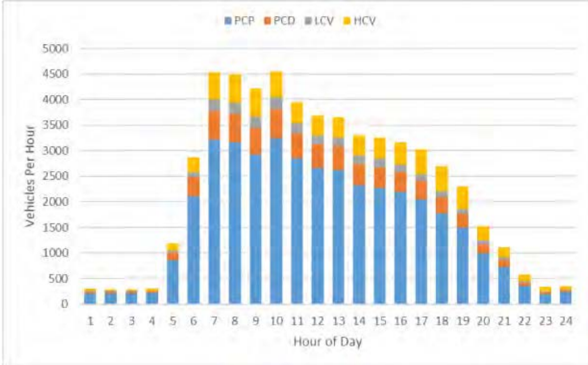
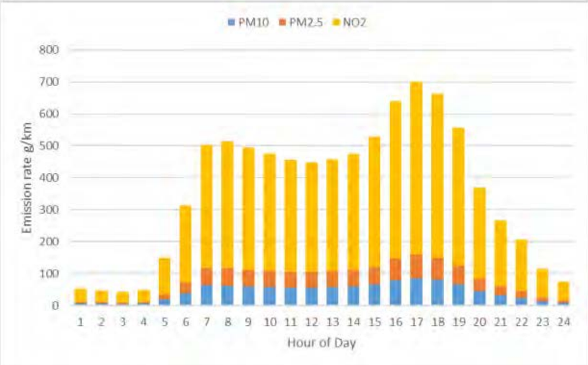
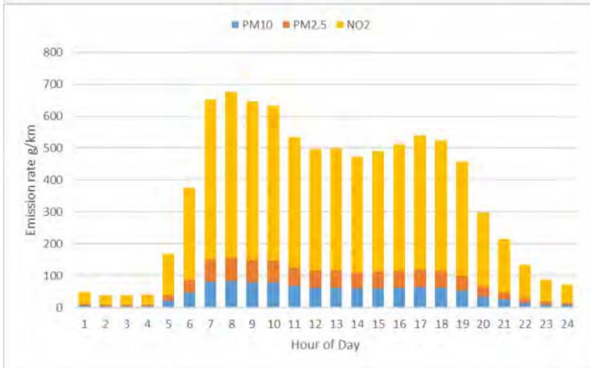
North Bound	South Bound
	
	

Figure 262: NEL Midblock: Grimshaw St to M80 - Project 2036

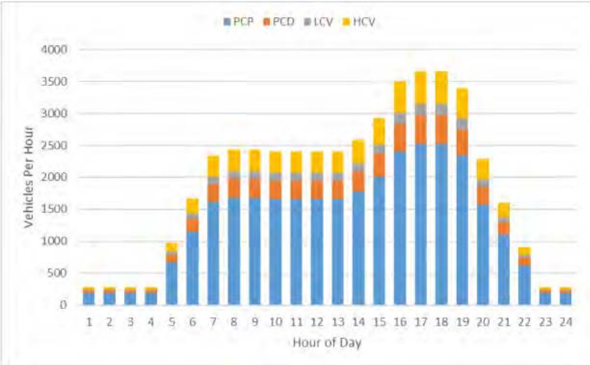
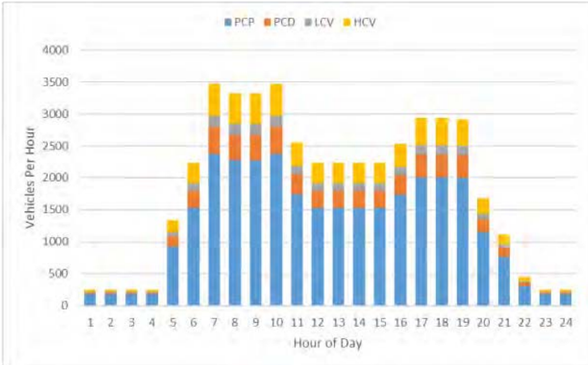
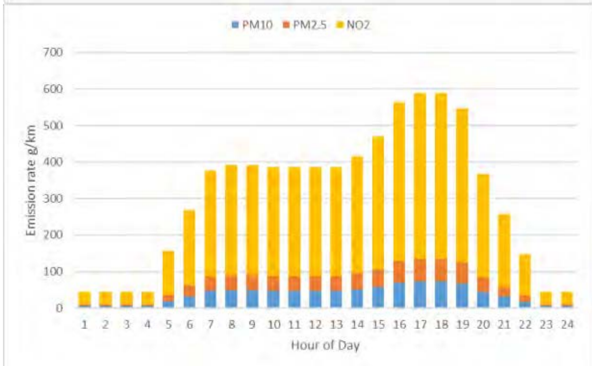
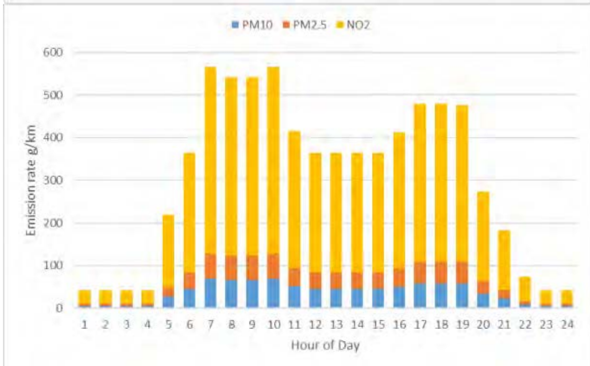
North Bound	South Bound
	
	

Figure 263: NEL Midblock: Under Manningham Rd - Project 2036

North Bound	South Bound

Figure 264: NEL Midblock: Under Lower Plenty Rd - Project 2036

North Bound	South Bound

Figure 265: NEL Midblock: Under Grimshaw St - Project 2036

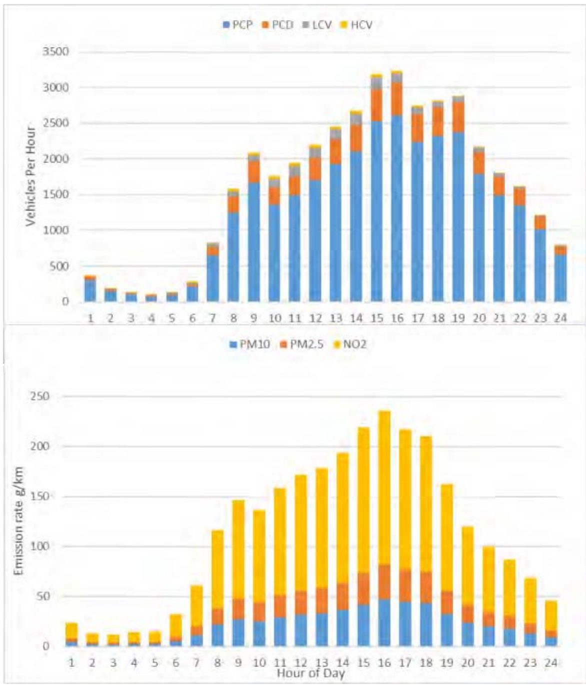
29.0 PLENTY RD

29.1 Base 2026

Table 100: Plenty Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Main Dr to Greenwood Dr	North Bound	37000	1700	500	39200
Main Dr to Greenwood Dr	South Bound	36000	1400	500	37900
Settlement Rd to M80 Ring Rd	North Bound	40000	1500	500	42000
Settlement Rd to M80 Ring Rd	South Bound	27000	1000	500	28500

North Bound



South Bound

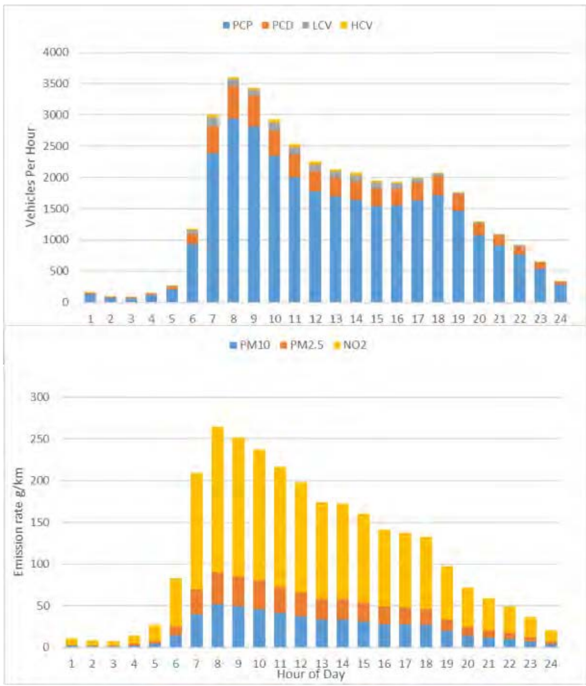


Figure 266: Plenty Rd: Main Dr to Greenwood Dr - Base 2026

North Bound	South Bound

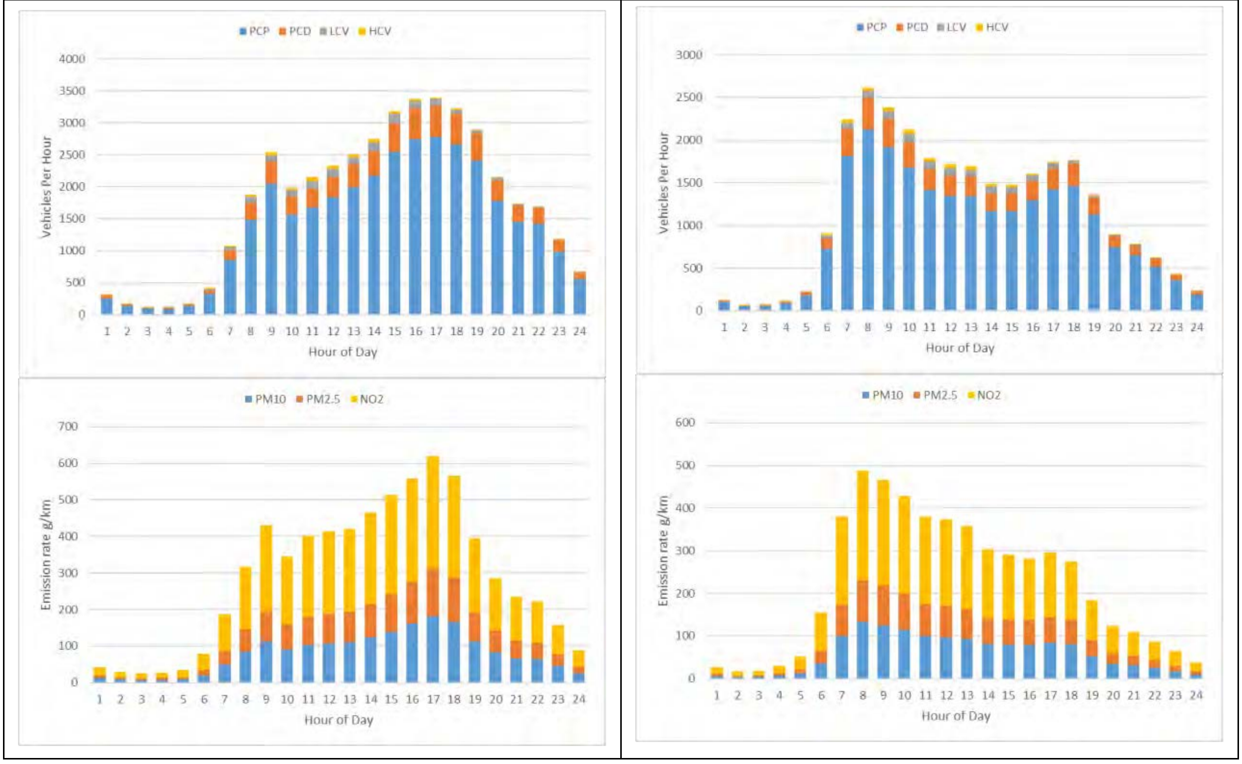


Figure 267: Plenty Rd : Settlement Rd to M80 Ring Rd - Base 2026

29.2 Project 2026

Table 101: Plenty Rd 24 hour traffic volumes - Project 2026

Road	Direction	Cars	LCV	HCV	Total
Main Dr to Greenwood Dr	North Bound	33000	1300	300	34600
Main Dr to Greenwood Dr	South Bound	33000	1000	250	34250
Settlement Rd to M80 Ring Rd	North Bound	32000	1100	250	33350
Settlement Rd to M80 Ring Rd	South Bound	25000	800	250	26050

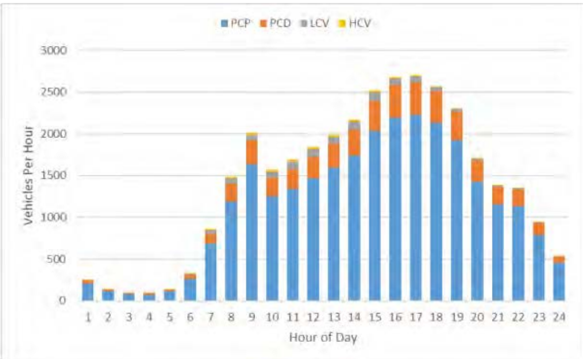
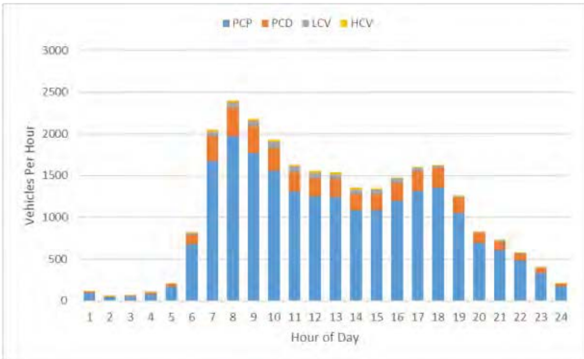
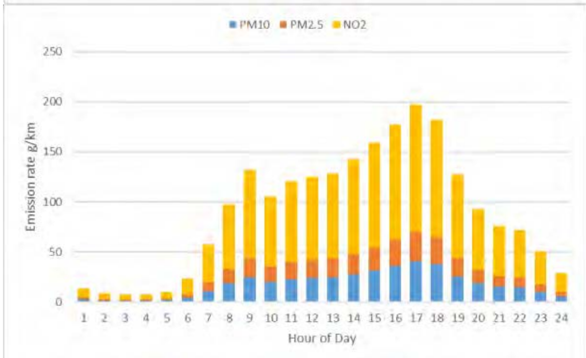
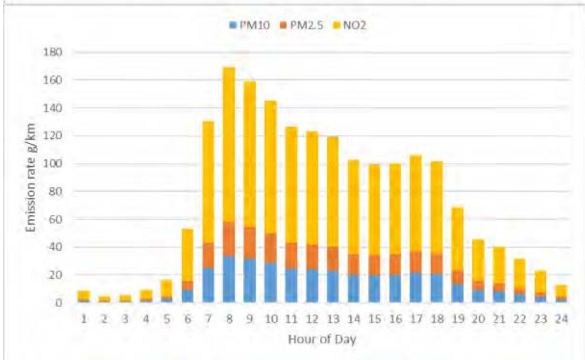
North Bound	South Bound
	
	

Figure 268: Plenty Rd: Main Dr to Greenwood Dr - Project 2026

North Bound	South Bound

Figure 269: Plenty Rd : Settlement Rd to M80 Ring Rd - Project 2026

29.3 Base 2036

Table 102: Plenty Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Main Dr to Greenwood Dr	North Bound	39000	1900	500	41400
Main Dr to Greenwood Dr	South Bound	39000	1600	500	41100
Settlement Rd to M80 Ring Rd	North Bound	45000	1700	600	47300
Settlement Rd to M80 Ring Rd	South Bound	31000	1100	500	32600

North Bound	South Bound

Figure 270: Plenty Rd: Main Dr to Greenwood Dr - Base 2036

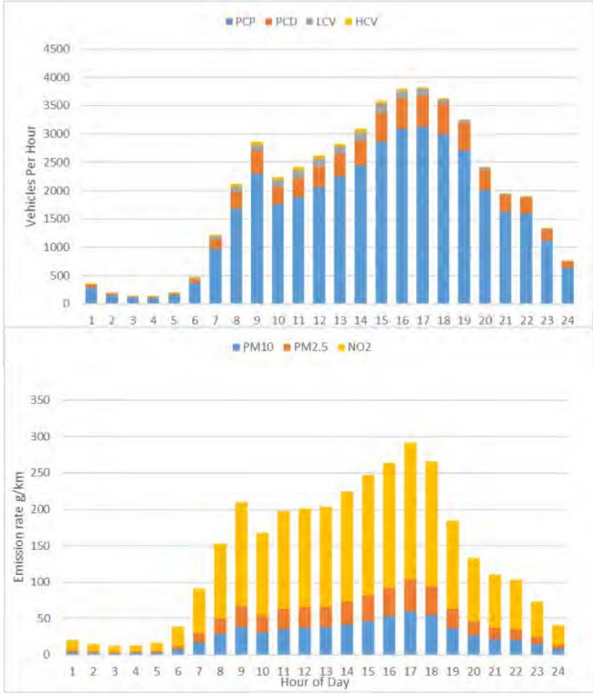
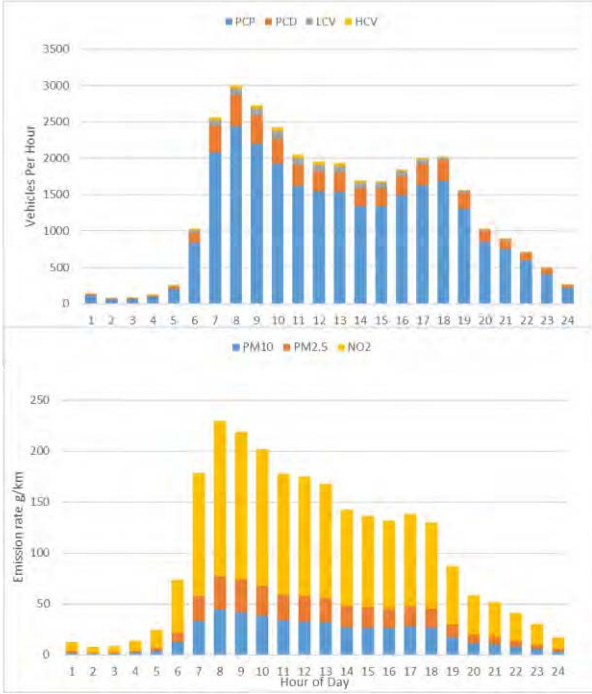
North Bound	South Bound
	

Figure 271: Plenty Rd : Settlement Rd to M80 Ring Rd - Base 2036

29.4 Project 2036

Table 103: Plenty Rd 24 hour traffic volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Main Dr to Greenwood Dr	North Bound	35000	1400	300	36700
Main Dr to Greenwood Dr	South Bound	35000	1200	300	36500
Settlement Rd to M80 Ring Rd	North Bound	36000	1200	300	37500
Settlement Rd to M80 Ring Rd	South Bound	27000	900	300	28200

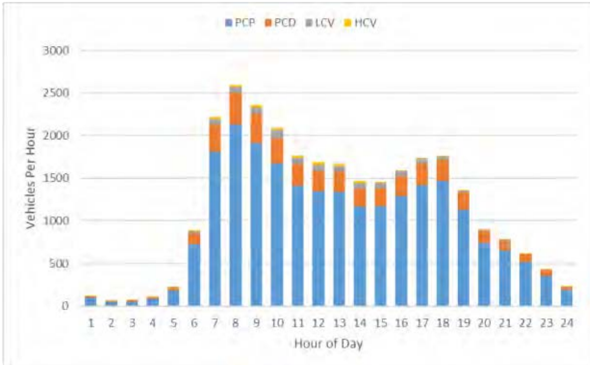
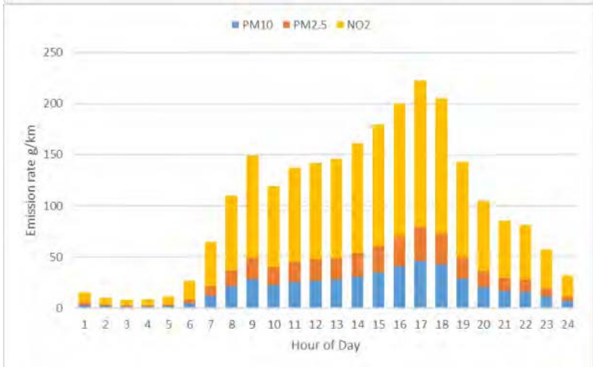
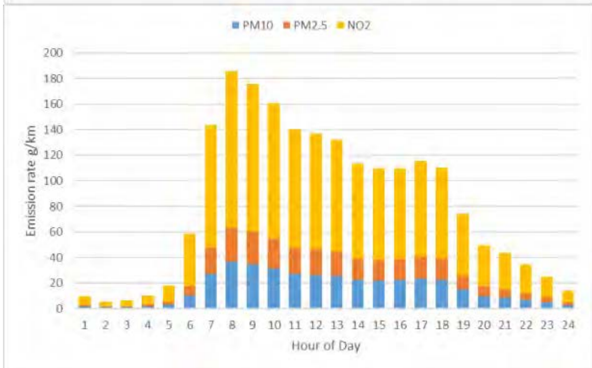
North Bound	South Bound
	
	

Figure 272: Plenty Rd: Main Dr to Greenwood Dr – Project 2036

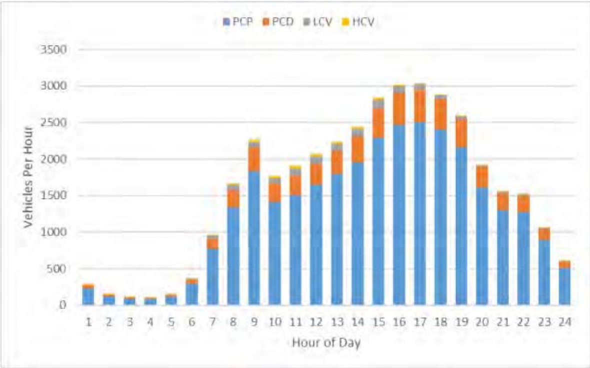
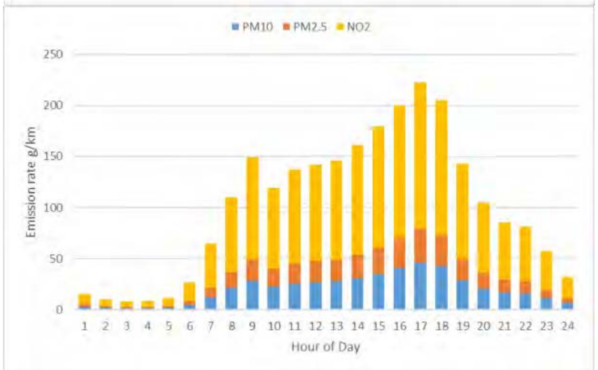
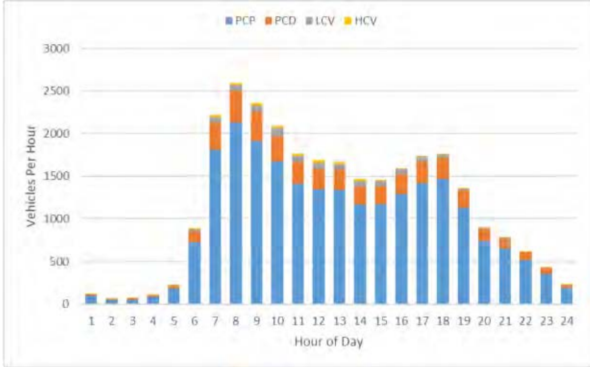
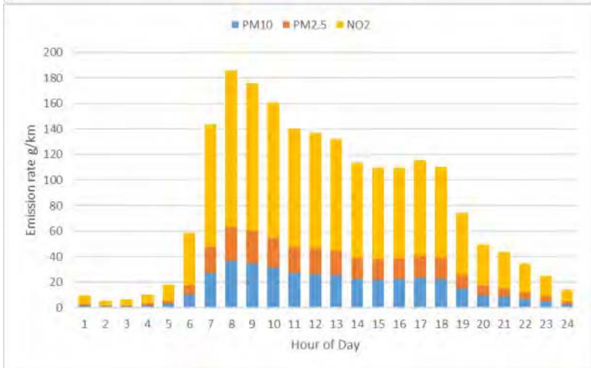
North Bound	South Bound
 	 

Figure 273: Plenty Rd : Settlement Rd to M80 Ring Rd – Project 2036

30.0 REYNOLDS RD

30.1 Base 2026

Table 104: Reynolds Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Blackburn Rd to Williamsons Rd	East Bound	18000	1100	300	19400
Blackburn Rd to Williamsons Rd	West Bound	18000	1100	600	19700

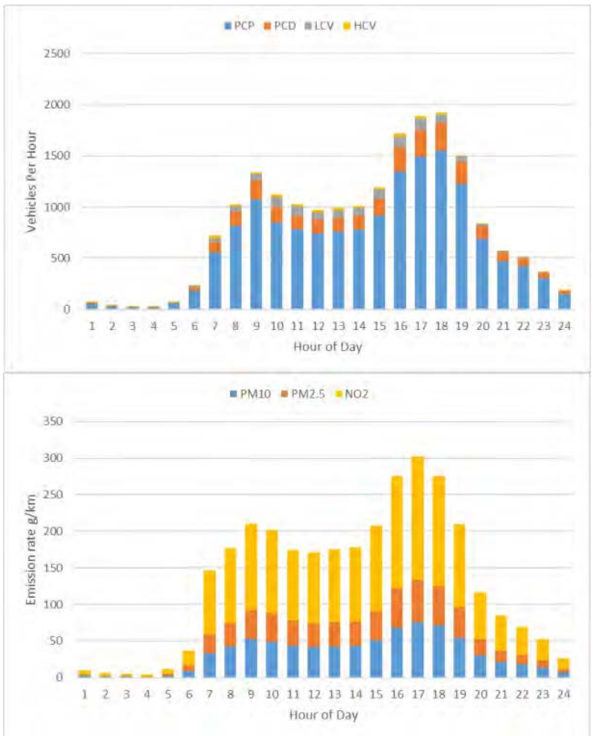
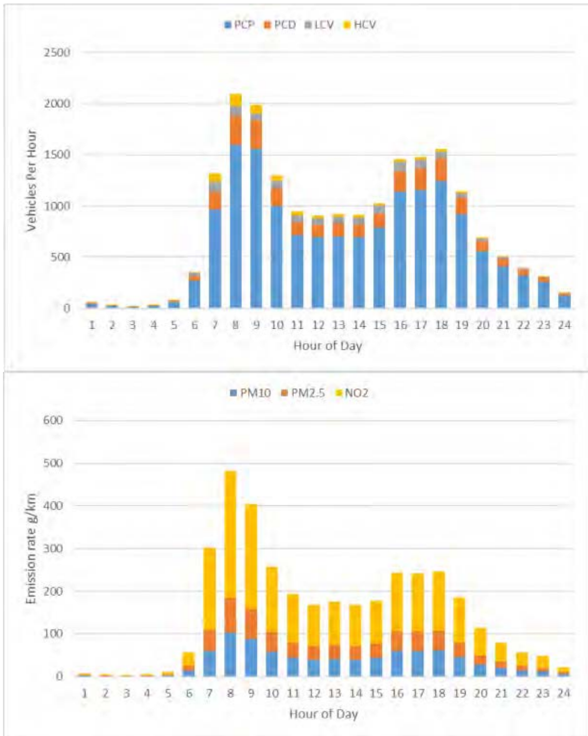
East Bound	West Bound
	

Figure 274: Reynolds Rd: Blackburn Rd to Williamsons Rd - Base 2026

30.2 Base 2026

Table 105: Reynolds Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Blackburn Rd to Williamsons Rd	East Bound	15000	800	150	15950
Blackburn Rd to Williamsons Rd	West Bound	16000	800	300	17100

East Bound	West Bound

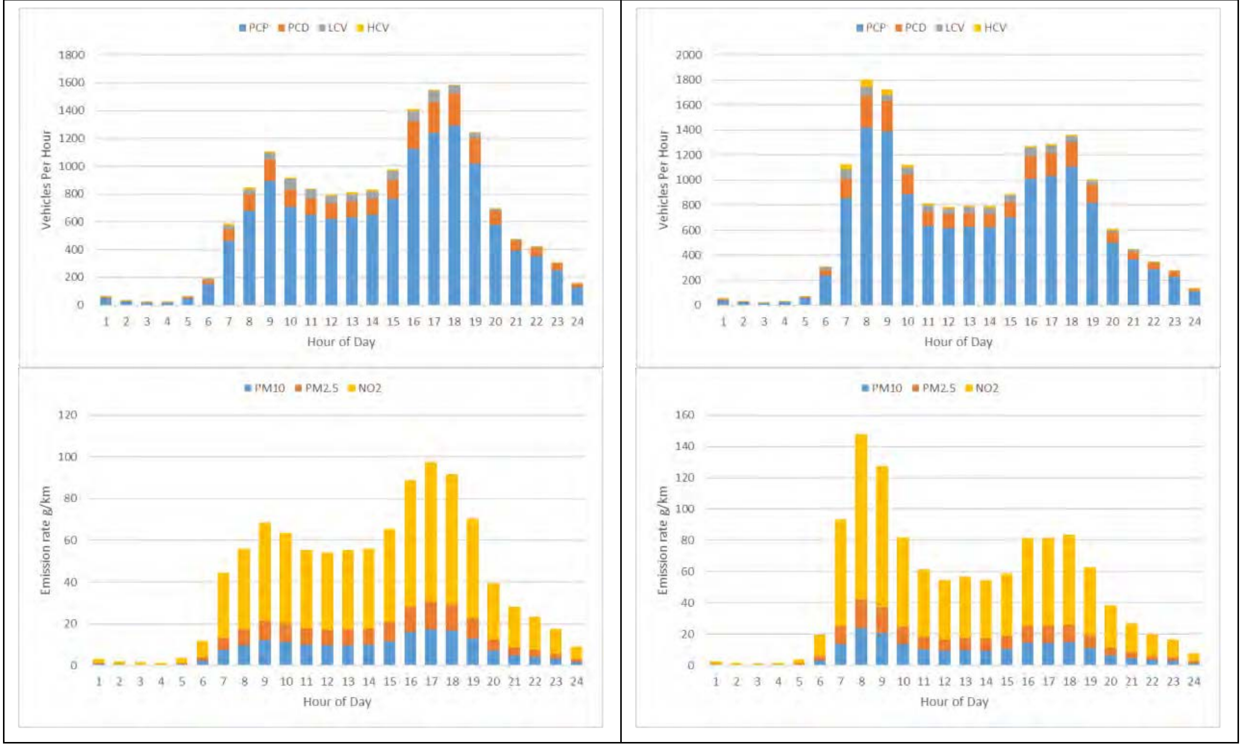


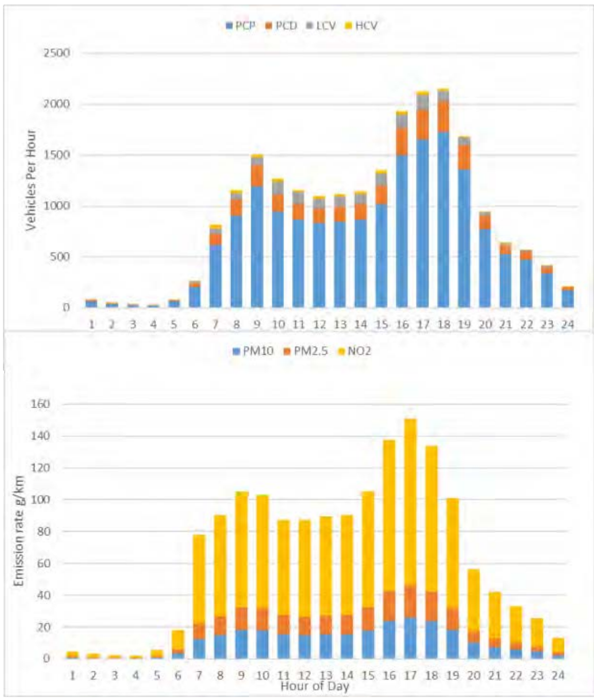
Figure 275: Reynolds Rd: Blackburn Rd to Williamsons Rd - Project 2026

30.3 Base 2036

Table 106: Reynolds Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Blackburn Rd to Williamsons Rd	East Bound	20000	1400	400	21800
Blackburn Rd to Williamsons Rd	West Bound	20000	1300	700	22000

North Bound



South Bound

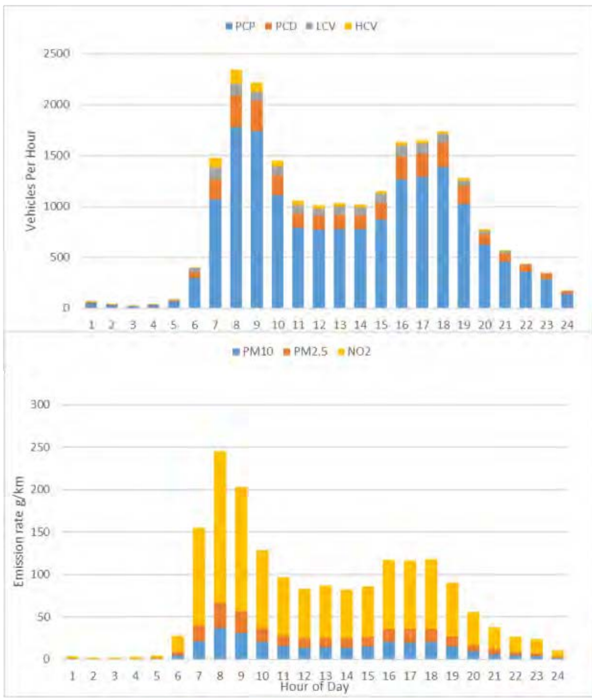


Figure 276: Reynolds Rd: Blackburn Rd to Williamsons Rd - Base 2036

30.4 Project 2036

Table 107: Reynolds Rd 24 hour traffic volumes – Project 2036

Road	Direction	Cars	LCV	HCV	Total
Blackburn Rd to Williamsons Rd	East Bound	17000	1000	200	18200
Blackburn Rd to Williamsons Rd	West Bound	18000	1100	400	19500

East Bound	West Bound

Figure 277: Reynolds Rd: Blackburn Rd to Williamsons Rd – Project 2036

31.0 ROSANNA RD

31.1 Base 2026

Table 108: Rosanna Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Lower heidelberg Rd intersection	North Bound	24000	1000	1000	26000
Lower heidelberg Rd intersection	South Bound	23000	1100	1200	25300

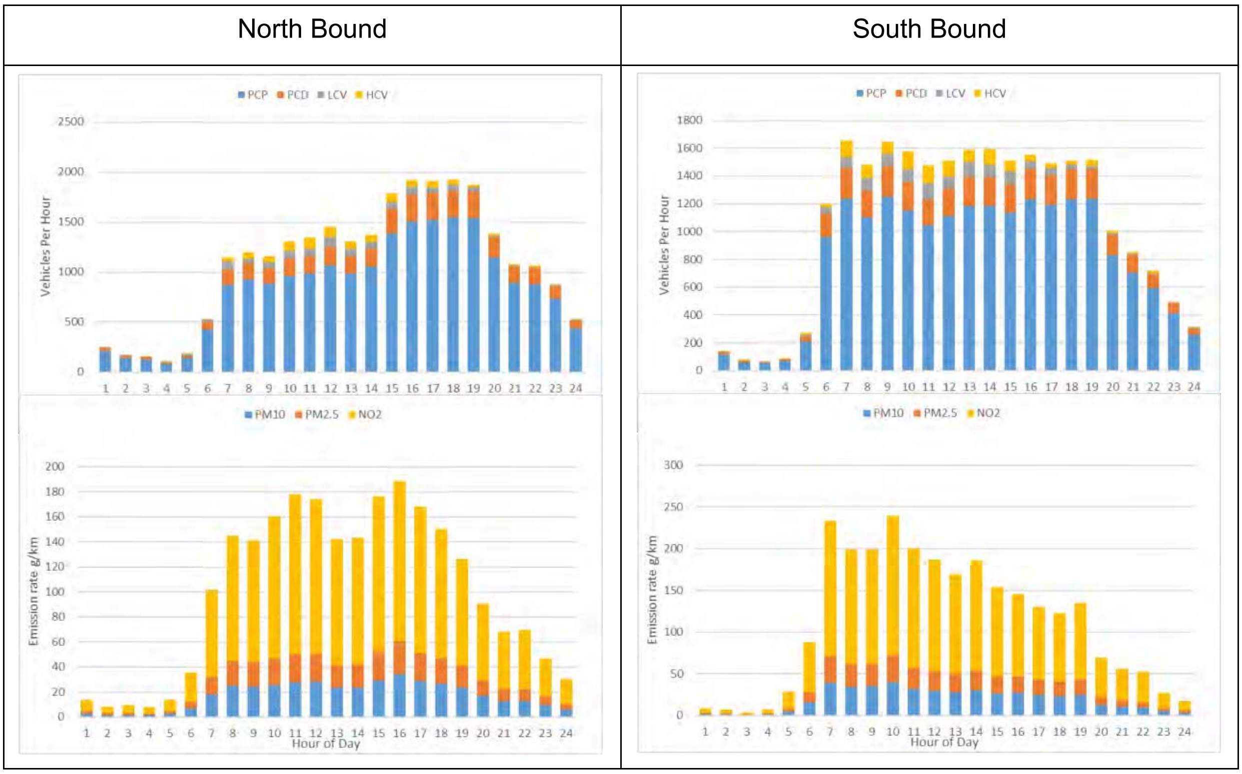


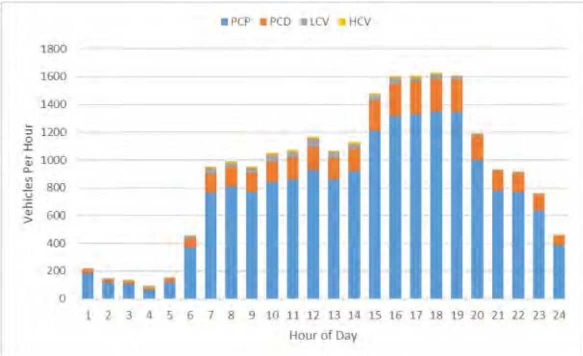
Figure 278: Rosanna Rd: Lwr heidelberg Rdto Lwr Plenty Rd - Base 2026

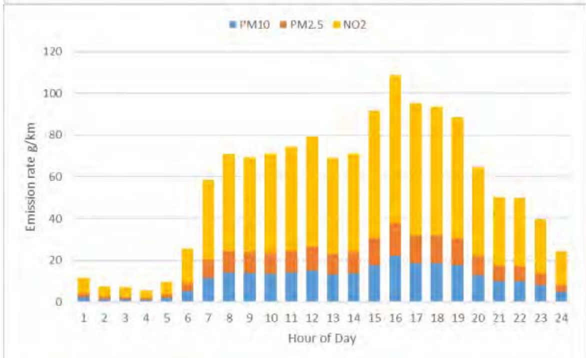
31.2 Project 2026

Table 109: Rosanna Rd 24 hour traffic volumes - Project 2026

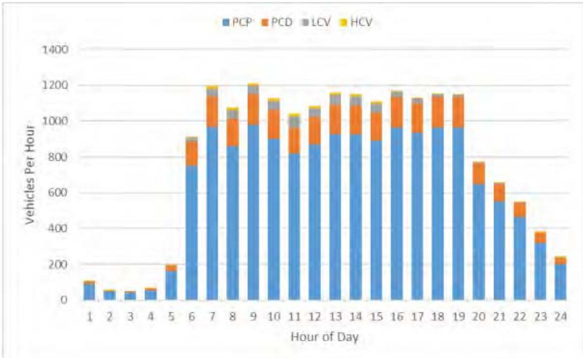
Road	Direction	Cars	LCV	HCV	Total
Lwr heidelberg Rdto Lwr Plenty Rd	North Bound	21000	600	150	21750
Lwr heidelberg Rdto Lwr Plenty Rd	South Bound	18000	600	150	18750

North Bound





South Bound



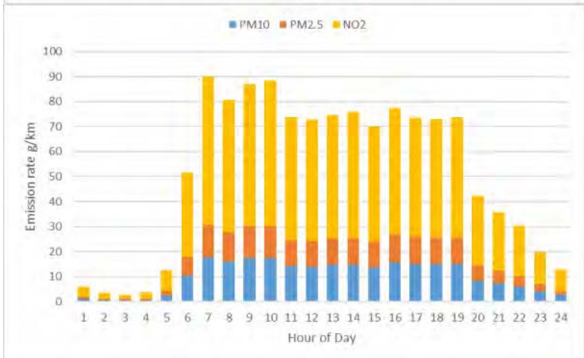


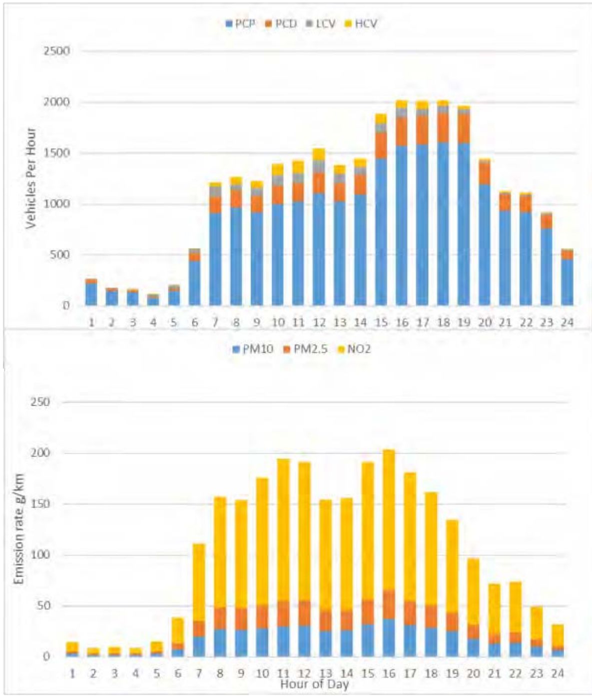
Figure 279: Rosanna Rd: Lwr heidelberg Rdto Lwr Plenty Rd - Project 2026

31.3 Base 2036

Table 110: Rosanna Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Lower heidelberg Rd intersection	North Bound	24000	1000	1000	26000
Lower heidelberg Rd intersection	South Bound	23000	1100	1200	25300

North Bound



South Bound

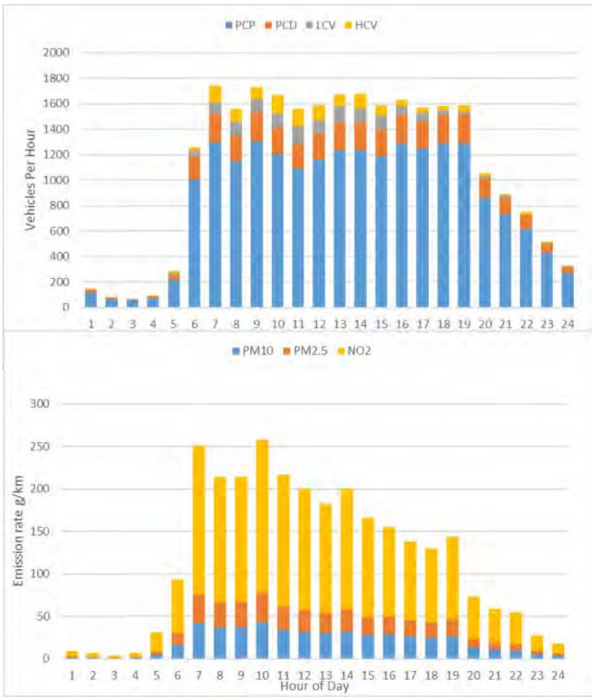


Figure 280: Rosanna Rd: Lwr heidelberg Rdto Lwr Plenty Rd - Base 2036

31.4 Project 2036

Table 111: Rosanna Rd 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Lower heidelberg Rd intersection	North Bound	24000	1000	1000	26000
Lower heidelberg Rd intersection	South Bound	23000	1100	1200	25300

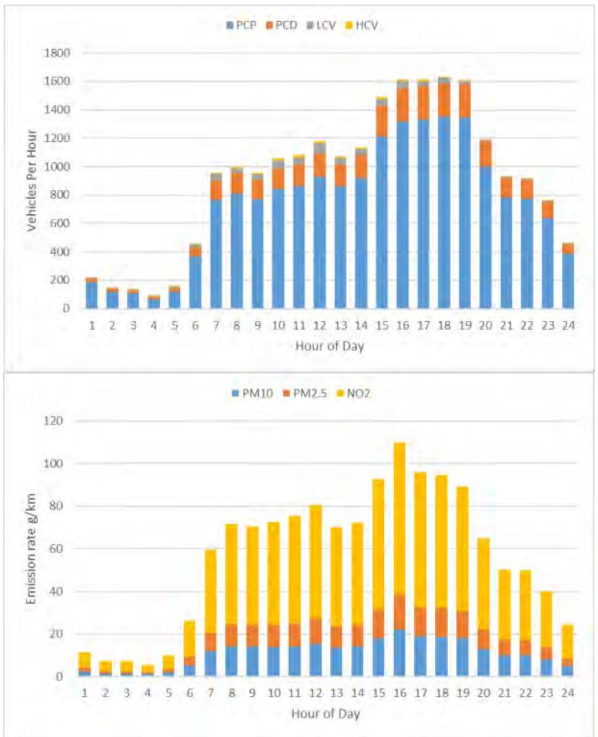
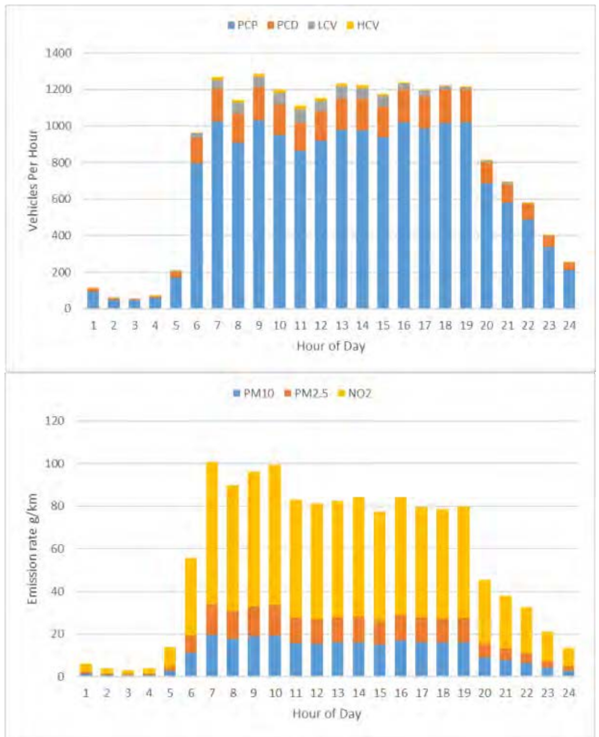
North Bound	South Bound
	

Figure 281: Rosanna Rd 24 hour traffic volumes - Project 2036

32.0 STATION ST

32.1 Base 2026

Table 112: Station St 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Bell St to Darebin Rd	North Bound	21000	1600	600	23200
Bell St to Darebin Rd	South Bound	22000	1400	700	24100

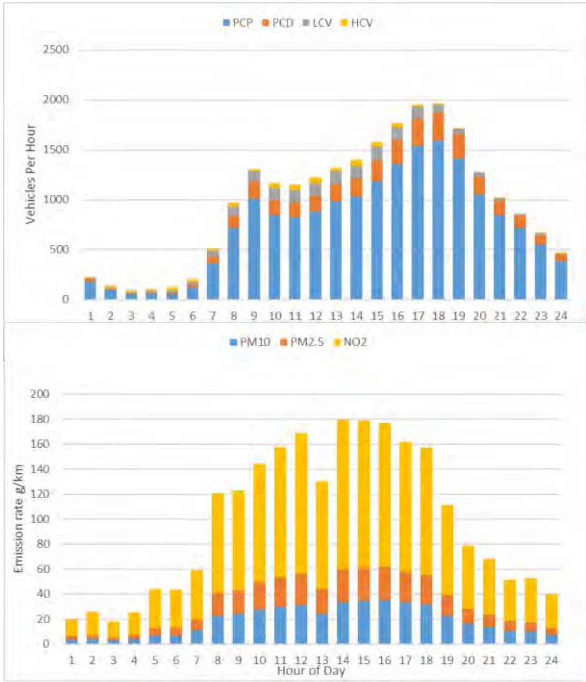
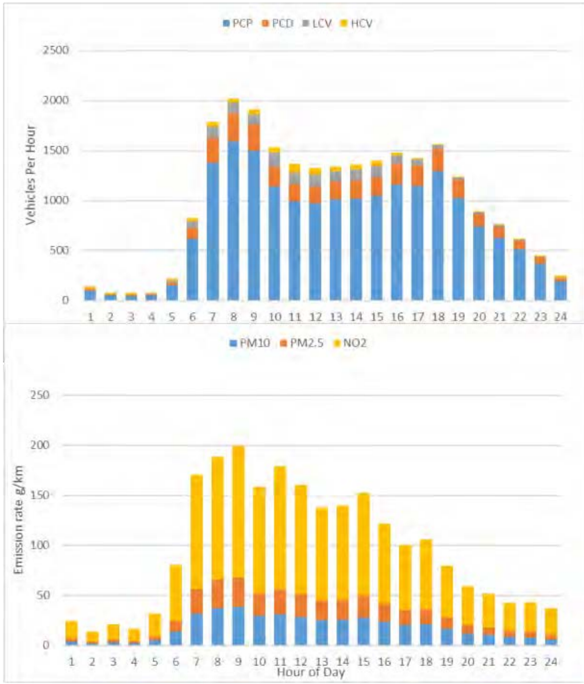
North Bound	South Bound
	

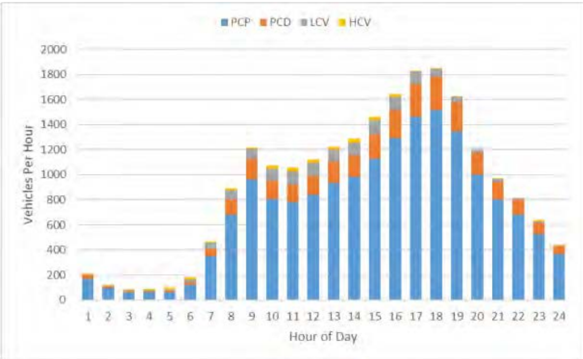
Figure 282: Station St: Bell St to Darebin Rd - Base 2026

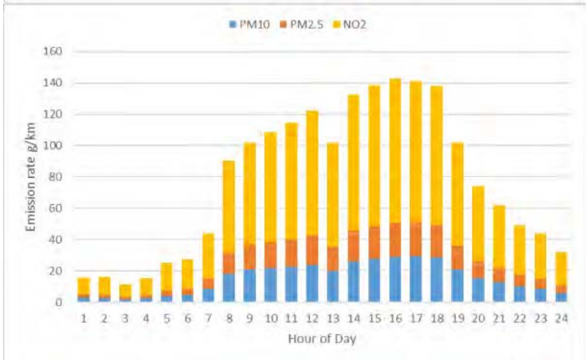
32.2 Project 2026

Table 113: Station St 24 hour traffic volumes - Project 2026

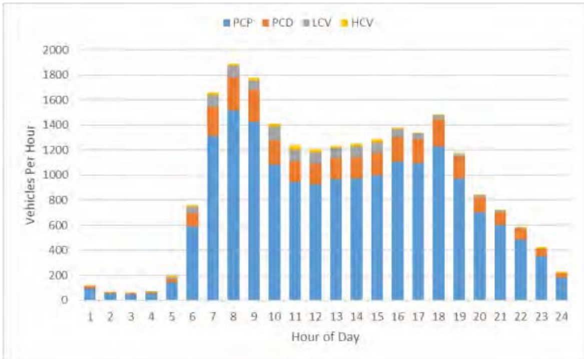
Road	Direction	Cars	LCV	HCV	Total
Bell St to Darebin Rd	North Bound	20000	1300	300	21600
Bell St to Darebin Rd	South Bound	21000	1100	300	22400

North Bound





South Bound



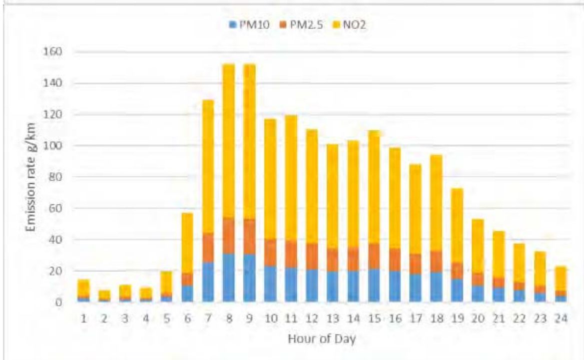


Figure 283: Station St: Bell St to Darebin Rd - Project 2026

32.3 Base 2036

Table 114: Station St 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Bell St to Darebin Rd	North Bound	22000	1700	800	24500
Bell St to Darebin Rd	South Bound	23000	1600	800	25400

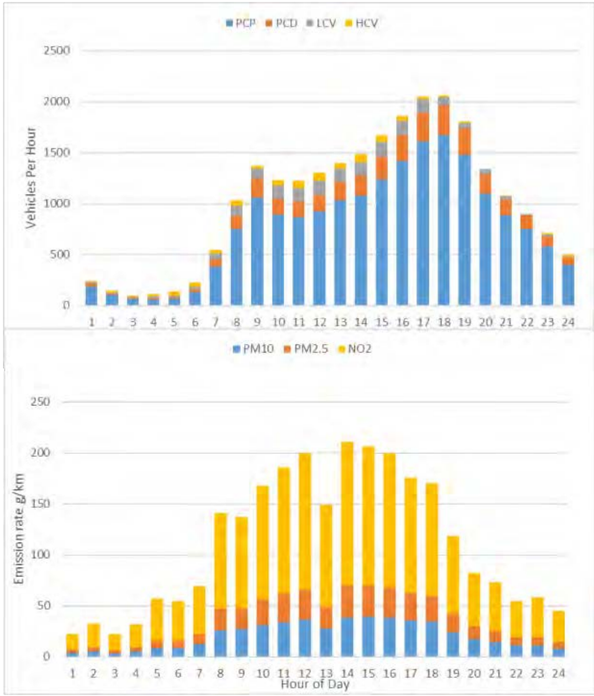
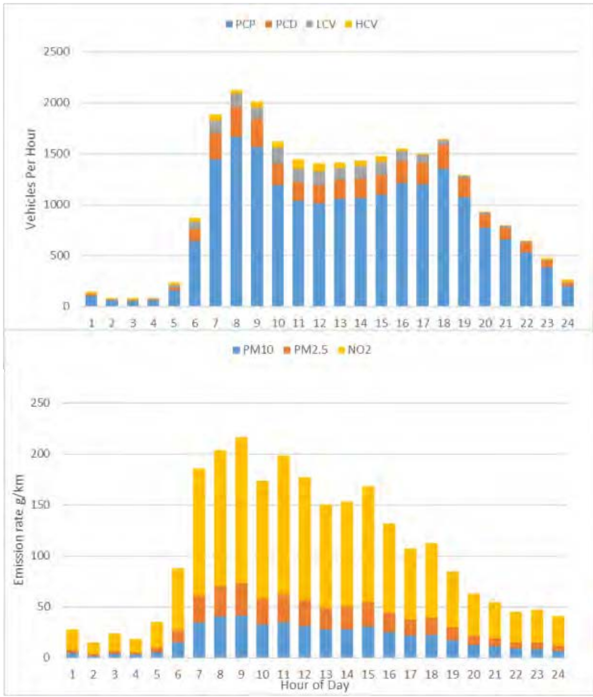
North Bound	South Bound
	

Figure 284: Station St: Bell St to Darebin Rd - Base 2036

32.4 Project 2036

Table 115: Station St 24 hour traffic volumes - Project 2036

Road	Direction	Cars	LCV	HCV	Total
Bell St to Darebin Rd	North Bound	21000	1400	400	22800
Bell St to Darebin Rd	South Bound	23000	1300	350	24650

North Bound	South Bound

Figure 285: Station St: Bell St to Darebin Rd – Project 2036

33.0 WILLIAMSONS RD

33.1 Base 2026

Table 116: Williamsons Rd 24 hour traffic volumes - Base 2026

Road	Direction	Cars	LCV	HCV	Total
Foote St to Warrandyte Rd	North Bound	22000	1700	600	24300
Foote St to Warrandyte Rd	South Bound	22000	1100	600	23700

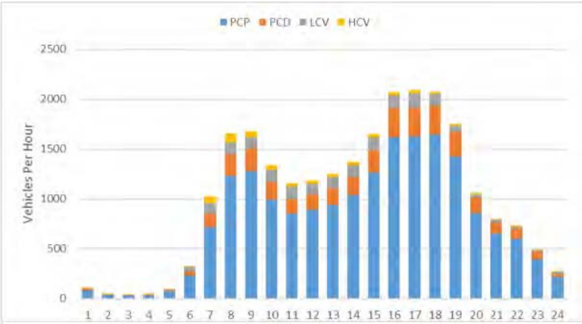
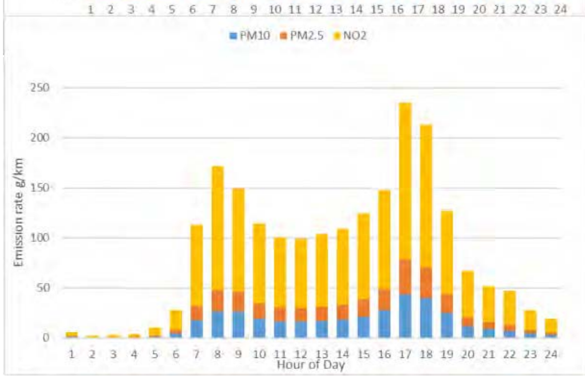
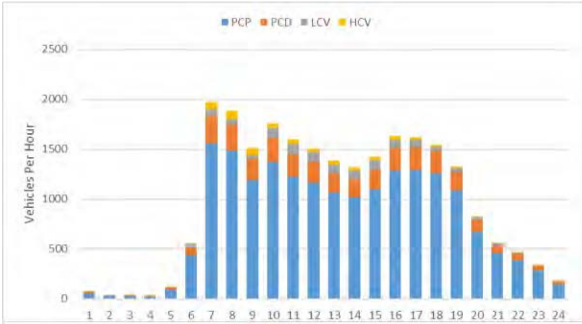
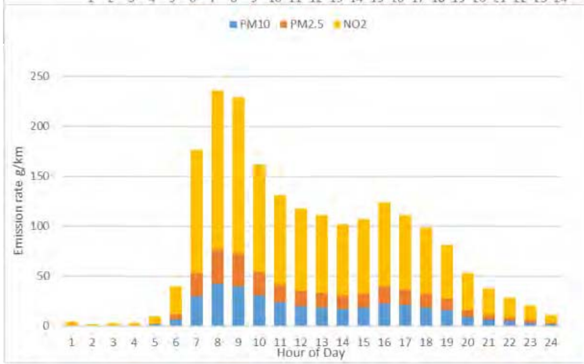
North Bound	South Bound
	

Figure 286: Williamsons Rd: Foote St to Warrandyte Rd - Base 2026

33.2 Project 2026

Table 117: Williamsons Rd 24 hour traffic volumes – Project 2026

Road	Direction	Cars	LCV	HCV	Total
Foote St to Warrandyte Rd	North Bound	21000	1400	300	22700
Foote St to Warrandyte Rd	South Bound	20000	900	300	21200

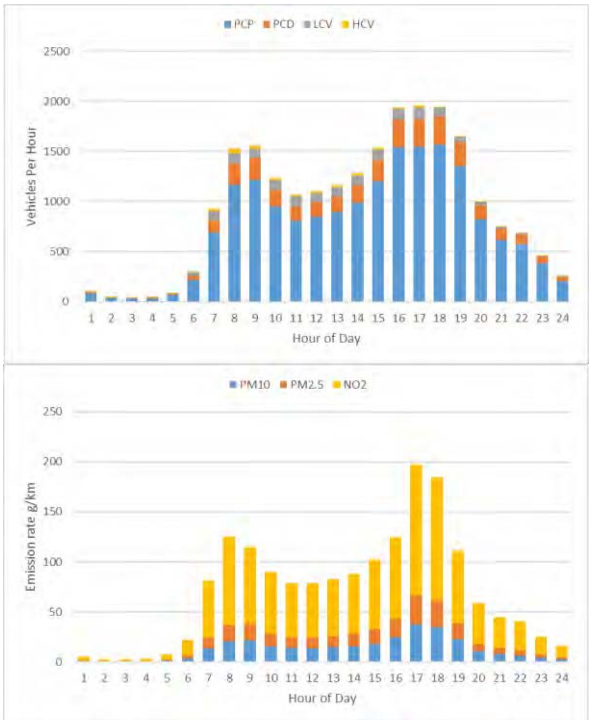
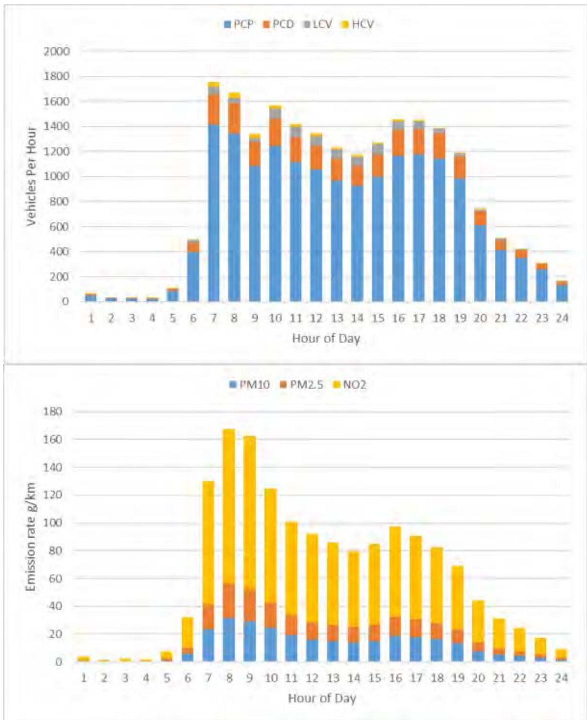
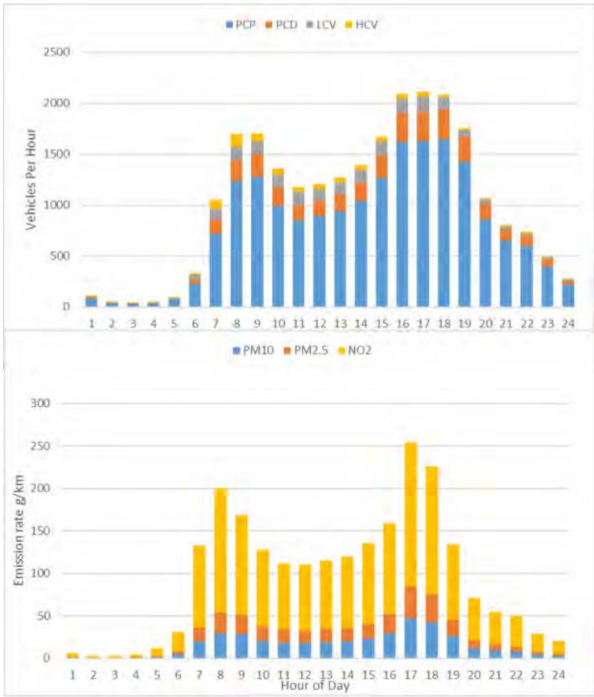
North Bound	South Bound
	

Figure 287: Williamsons Rd: Foote St to Warrandyte Rd – Project 2026

33.3 Base 2036

Table 118: Williamsons Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Foote St to Warrandyte Rd	North Bound	22000	1800	800	24600
Foote St to Warrandyte Rd	South Bound	23000	1200	700	24900

North Bound	South Bound


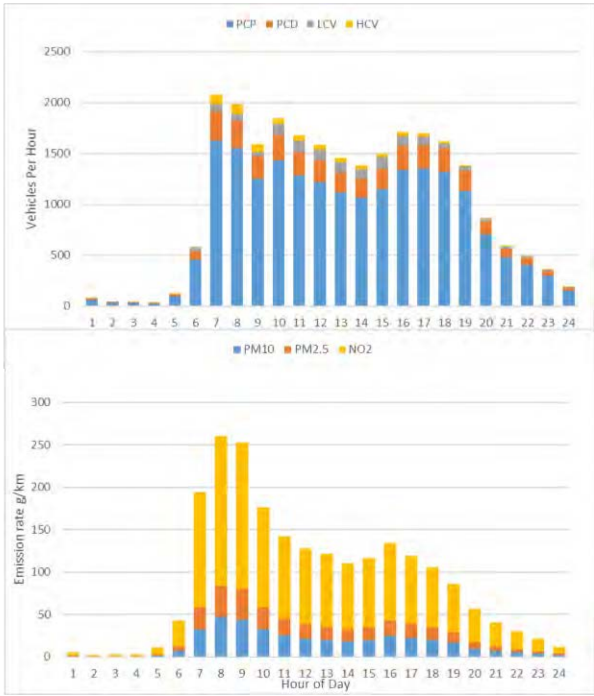


Figure 288: Williamsons Rd: Foote St to Warrandyte Rd - Base 2036

33.4 Project 2036

Table 119: Williamsons Rd 24 hour traffic volumes - Base 2036

Road	Direction	Cars	LCV	HCV	Total
Foote St to Warrandyte Rd	North Bound	21000	1600	350	22950
Foote St to Warrandyte Rd	South Bound	21000	1000	350	22350

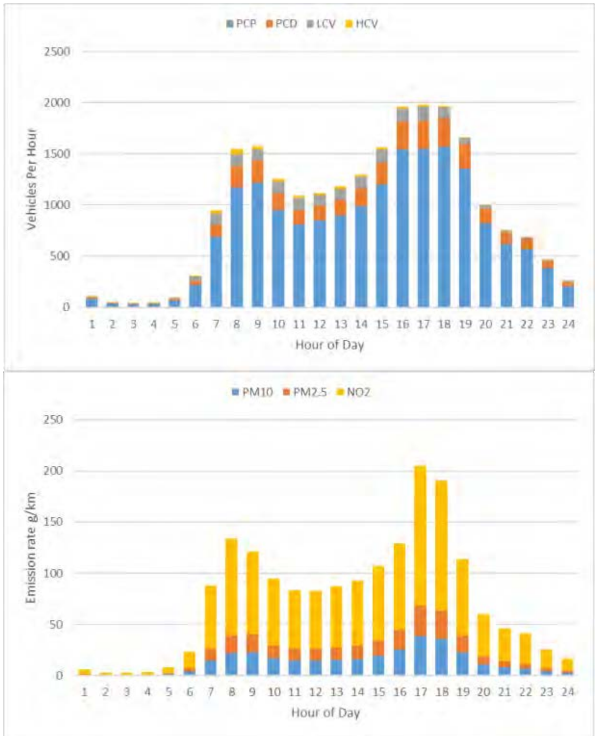
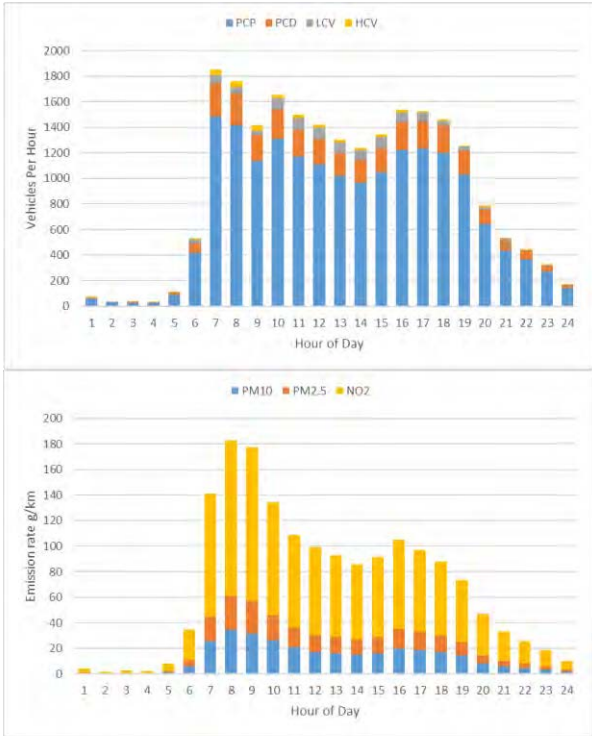
North Bound	South Bound
	

Figure 289: Williamsons Rd: Foote St to Warrandyte Rd - Project 2036

APPENDIX G

Surface road diurnal traffic emissions and fleet mix

Base 2026

2026 Daily

No	Road	Location	Direction	24 hours			
				Cars	LCV	HCV	Total
1	Albert St	Btwn Murray St to Bell St	North Bound	20,000	1,400	700	22,000
2	Albert St	Btwn Murray St to Bell St	South Bound	20,000	1,200	700	22,000
3	Albert St	Btwn Plenty Rd to Murray Rd	North Bound	22,000	2,200	800	25,000
4	Albert St	Btwn Plenty Rd to Murray Rd	South Bound	22,000	2,200	800	25,000
5	Alexandra Pde	Btwn Rathdown St to Nicholson St	Eastbound	38,000	1,300	900	41,000
6	Alexandra Pde	Btwn Rathdown St to Nicholson St	Westbound	39,000	1,200	900	41,000
7	Alexandra Pde	Btwn Nicholson St to Brunswick St	Eastbound	48,000	1,500	1,000	51,000
8	Alexandra Pde	Btwn Nicholson St to Brunswick St	Westbound	47,000	1,400	1,000	49,000
9	Alexandra Pde	Btwn Queens Pde to Hoddle St	Eastbound	41,000	1,400	900	44,000
10	Alexandra Pde	Btwn Queens Pde to Hoddle St	Westbound	37,000	1,200	800	40,000
11	Anderson St	Btwn James St to Porter St	North Bound	9,000	800	150	9,000
12	Anderson St	Btwn James St to Porter St	South Bound	10,000	900	150	11,000
13	Andersons Creek Rd	Reynolds Rd to Warrandyte Rd	North Bound	5,000	400	150	6,000
14	Andersons Creek Rd	Reynolds Rd to Warrandyte Rd	South Bound	5,000	400	200	6,000
15	Andersons Creek Rd	Blackburn Rd to Reynolds Rd	North Bound	6,000	300	150	6,000
16	Andersons Creek Rd	Blackburn Rd to Reynolds Rd	South Bound	6,000	300	150	6,000
17	Balwyn Rd	Btwn Belmore Rd to Whitehorse Rd	North Bound	12,000	600	150	12,000
18	Balwyn Rd	Btwn Belmore Rd to Whitehorse Rd	South Bound	11,000	600	150	12,000
19	Balwyn Rd	Btwn Doncaster Rd to Belmore Rd	North Bound	8,000	800	150	9,000
20	Balwyn Rd	Btwn Doncaster Rd to Belmore Rd	South Bound	8,000	900	150	9,000
21	Banksia St	Btwn Mount St to Hawdon St	East Bound	25,000	2,100	400	27,000
22	Banksia St	Btwn Mount St to Hawdon St	West Bound	29,000	1,800	400	31,000
23	Banksia St	At Yarra River	East Bound	41,000	3,000	1,400	46,000
24	Banksia St	At Yarra River	West Bound	39,000	1,900	1,400	42,000
25	Bell St	Station St to Oriel Rd	East Bound	27,000	2,400	500	30,000
26	Bell St	Station St to Oriel Rd	West Bound	29,000	2,000	500	32,000
27	Bell St	Studley Rd to Rail Line	East Bound	25,000	1,500	500	27,000
28	Bell St	Studley Rd to Rail Line	West Bound	28,000	1,900	500	31,000
29	Bell St	Btwn Plenty Rd to Albert St	East Bound	29,000	1,700	600	31,000
30	Bell St	Btwn Plenty Rd to Albert St	West Bound	27,000	2,000	500	29,000
31	Bell St	Oriel Rd to Waterdale Rd	East Bound	25,000	1,600	800	27,000
32	Bell St	Oriel Rd to Waterdale Rd	West Bound	25,000	1,900	600	28,000
33	Bell St	Waterdale Rd to Upper Heidelberg Rd	East Bound	31,000	1,900	600	33,000
34	Bell St	Waterdale Rd to Upper Heidelberg Rd	West Bound	31,000	2,700	600	34,000
35	Bell St	Btwn High St to Plenty Rd	Eastbound	35,000	900	600	36,000
36	Bell St	Btwn High St to Plenty Rd	Westbound	33,000	900	600	34,000
37	Belmore Rd	Btwn Union Rd to Winfield Rd	North Bound	8,000	250	100	8,000
38	Belmore Rd	Btwn Union Rd to Winfield Rd	South Bound	7,000	150	100	7,000
39	Belmore Rd	Btwn Burke Rd to Balwyn Rd	Eastbound	12,000	300	100	12,000
40	Belmore Rd	Btwn Burke Rd to Balwyn Rd	Westbound	10,000	250	150	11,000
41	Blackburn Rd	Eastern Fwy to Doncaster Rd	North Bound	14,000	600	200	15,000
42	Blackburn Rd	Eastern Fwy to Doncaster Rd	South Bound	14,000	800	250	15,000
43	Blackburn Rd	Doncaster Rd to Andersons Creek Rd	North Bound	16,000	800	250	18,000
44	Blackburn Rd	Doncaster Rd to Andersons Creek Rd	South Bound	17,000	800	250	19,000
45	Blackburn Rd	Reynolds Rd to Andersons Creek Rd	North Bound	11,000	1,000	300	12,000
46	Blackburn Rd	Reynolds Rd to Andersons Creek Rd	South Bound	10,000	900	200	11,000
47	Bolton St	Bridge St to Main Rd	North Bound	12,000	900	150	13,000
48	Bolton St	Bridge St to Main Rd	South Bound	12,000	700	200	13,000
49	Bridge St	Bolton St to Main Rd	East Bound	10,000	700	150	11,000
50	Bridge St	Bolton St to Main Rd	West Bound	10,000	800	150	11,000
51	Bridge St	Btwn Manningham St to Templestowe Rd	East Bound	8,000	400	150	9,000
52	Bridge St	Btwn Manningham St to Templestowe Rd	West Bound	7,000	250	200	8,000
53	Broadway	Btwn High St to Bolderwood Pde	East Bound	11,000	1,700	1,200	14,000
54	Broadway	Btwn High St to Bolderwood Pde	West Bound	16,000	2,600	1,500	21,000
55	Bulleen Rd	Eastern Fwy to Manningham Rd	North Bound	25,000	1,800	1,100	28,000
56	Bulleen Rd	Eastern Fwy to Manningham Rd	South Bound	22,000	1,900	800	24,000
57	Bulleen Rd	Doncaster Rd to Eastern Fwy	North Bound	8,000	300	150	8,000
58	Bulleen Rd	Doncaster Rd to Eastern Fwy	South Bound	7,000	400	150	8,000
59	Burgundy St	Rosanna Rd to Upper Heidelberg Rd	East Bound	9,000	600	600	10,000
60	Burgundy St	Rosanna Rd to Upper Heidelberg Rd	West Bound	6,000	500	150	6,000
61	Burke Rd	Btwn Harp Rd to Cotham Rd	North Bound	19,000	800	200	20,000
62	Burke Rd	Btwn Harp Rd to Cotham Rd	South Bound	19,000	800	200	20,000
63	Burke Rd	Eastern Fwy to Lower Heidelberg Rd	North Bound	21,000	1,200	250	22,000
64	Burke Rd	Eastern Fwy to Lower Heidelberg Rd	South Bound	23,000	1,100	200	24,000
65	Burke Rd	Doncaster Rd to Eastern Fwy	North Bound	16,000	1,000	300	18,000
66	Burke Rd	Doncaster Rd to Eastern Fwy	South Bound	18,000	800	150	19,000
67	Burke Rd	Btwn High St to Harp Rd	Northbound	17,000	500	200	18,000
68	Burke Rd	Btwn High St to Harp Rd	Southbound	17,000	500	200	18,000
69	Bush Blvd	McDonalds Rd to Plenty Rd	North Bound	12,000	700	150	13,000
70	Bush Blvd	McDonalds Rd to Plenty Rd	South Bound	10,000	600	150	11,000
71	Chandler Hwy	Eastern Fwy to Heidelberg Rd	North Bound	36,000	2,700	600	39,000
72	Chandler Hwy	Eastern Fwy to Heidelberg Rd	South Bound	33,000	1,800	700	35,000
73	Chapman St	Btwn Ellesmere Pde to Thomson Dr	East Bound	8,000	700	100	9,000
74	Chapman St	Btwn Ellesmere Pde to Thomson Dr	West Bound	9,000	600	100	9,000
75	Cherry St	Btwn Waiora Rd to Wungan St	East Bound	5,000	250	100	5,000

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No	Road	Location	Direction	2026 Daily 24 hours			
76	Cherry St	Btwn Waiora Rd to Wungan St	West Bound	4,000	200	100	5,000
77	Childs Rd	Dalton Rd to Plenty Rd	East Bound	23,000	600	150	24,000
78	Childs Rd	Dalton Rd to Plenty Rd	West Bound	22,000	1,000	150	23,000
79	Cooper St	Edgars Rd to High St	East Bound	24,000	1,200	1,000	27,000
80	Cooper St	Edgars Rd to High St	West Bound	25,000	2,200	700	27,000
81	Cooper St	Hume Fwy to Edgars Rd	East Bound	20,000	2,900	900	24,000
82	Cooper St	Hume Fwy to Edgars Rd	West Bound	22,000	2,400	1,000	26,000
83	Cotham Rd	Btwn Glenferrie Rd to Burke Rd	Eastbound	10,000	150	100	11,000
84	Cotham Rd	Btwn Glenferrie Rd to Burke Rd	Westbound	10,000	150	100	10,000
85	Cotham Rd	Btwn HighSt to Glenferrie Rd	Eastbound	9,000	150	100	9,000
86	Cotham Rd	Btwn HighSt to Glenferrie Rd	Westbound	10,000	150	100	10,000
87	Dalton Rd	North of Metropolitan Ring Rd	North Bound	30,000	800	400	32,000
88	Dalton Rd	North of Metropolitan Ring Rd	South Bound	27,000	6,400	600	34,000
89	Dalton Rd	Btwn Childs Rd to McKimmies Rd	North Bound	23,000	1,600	400	25,000
90	Dalton Rd	Btwn Childs Rd to McKimmies Rd	South Bound	23,000	1,300	300	25,000
91	Dalton Rd	Btwn Keon Pde to Settlement Rd	North Bound	22,000	1,500	400	23,000
92	Dalton Rd	Btwn Keon Pde to Settlement Rd	South Bound	24,000	3,100	500	27,000
93	Dalton Rd	Btwn Settlement Rd to M80	North Bound	35,000	3,000	900	39,000
94	Dalton Rd	Btwn Settlement Rd to M80	South Bound	29,000	2,200	700	32,000
95	Dalton Rd	South of Cooper St	North Bound	18,000	800	200	19,000
96	Dalton Rd	South of Cooper St	South Bound	9,000	400	200	9,000
97	Darebin Rd	At Darebin Creek	East Bound	12,000	1,000	150	13,000
98	Darebin Rd	At Darebin Creek	West Bound	10,000	700	150	11,000
99	Darebin Rd	Btwn High St to Station St	East Bound	9,000	500	150	10,000
100	Darebin Rd	Btwn High St to Station St	West Bound	10,000	500	150	11,000
101	Darebin Rd	Btwn Station St to Grange Rd	Eastbound	17,000	600	500	18,000
102	Darebin Rd	Btwn Station St to Grange Rd	Westbound	16,000	600	500	17,000
103	Diamond Creek Rd	Btwn Civic Drive to Yan Yean Rd	East Bound	26,000	2,100	400	29,000
104	Diamond Creek Rd	Btwn Civic Drive to Yan Yean Rd	West Bound	26,000	1,800	800	29,000
105	Diamond Creek Rd	Btwn St Helena Rd to Greensborough Bypass	North Bound	17,000	1,100	400	19,000
106	Diamond Creek Rd	Btwn St Helena Rd to Greensborough Bypass	South Bound	14,000	1,000	300	15,000
107	Diamond Creek Rd	Btwn Yan Yean Rd to Ryans Rd	East Bound	20,000	800	600	21,000
108	Diamond Creek Rd	Btwn Yan Yean Rd to Ryans Rd	West Bound	21,000	1,300	1,000	23,000
109	Doncaster Rd	East of Eastern Fwy	East Bound	14,000	400	200	14,000
110	Doncaster Rd	East of Eastern Fwy	West Bound	14,000	600	150	15,000
111	Doncaster Rd	Btwn Middleborough Rd to Station St	East Bound	20,000	600	250	20,000
112	Doncaster Rd	Btwn Middleborough Rd to Station St	West Bound	19,000	900	250	20,000
113	Doncaster Rd	Btwn Balwyn Rd to Eastern Fwy	East Bound	13,000	500	200	14,000
114	Doncaster Rd	Btwn Balwyn Rd to Eastern Fwy	West Bound	19,000	800	300	20,000
115	Doncaster Rd	Btwn Blackburn Rd to Springvale Rd	East Bound	17,000	1,100	300	19,000
116	Doncaster Rd	Btwn Blackburn Rd to Springvale Rd	West Bound	18,000	800	300	19,000
117	Doncaster Rd	Btwn Blackburn Rd to Wetherby Rd	East Bound	17,000	1,000	200	18,000
118	Doncaster Rd	Btwn Blackburn Rd to Wetherby Rd	West Bound	16,000	900	200	17,000
119	Doncaster Rd	btw Balwyn Rd to Bulleen Rd	Eastbound	12,000	300	150	12,000
120	Doncaster Rd	btw Balwyn Rd to Bulleen Rd	Westbound	11,000	250	100	11,000
121	Drysdale St	Btwn Greensborough Rd to Borlase St	East Bound	1,000	100	100	1,500
122	Drysdale St	Btwn Greensborough Rd to Borlase St	West Bound	1,000	100	100	1,000
123	Dunne St	At Darebin Creek	East Bound	5,000	400	150	6,000
124	Dunne St	At Darebin Creek	West Bound	6,000	300	150	6,000
125	Earl St	Btwn Princess St to Willsmere Rd	North Bound	9,000	400	150	9,000
126	Earl St	Btwn Princess St to Willsmere Rd	South Bound	11,000	700	150	12,000
127	astern Fwy Midblock: Collector Distribu	Middleborough Rd to Tram Rd	East Bound				
128	astern Fwy Midblock: Collector Distribu	Middleborough Rd to Tram Rd	West Bound				
129	astern Fwy Midblock: Collector Distribu	Tram Rd to Elgar Rd	East Bound				
130	astern Fwy Midblock: Collector Distribu	Elgar Rd to Doncaster Rd	East Bound				
131	astern Fwy Midblock: Collector Distribu	Elgar Rd to Doncaster Rd	West Bound				
132	astern Fwy Midblock: Collector Distribu	Doncaster Rd to Bulleen Rd	East Bound				
133	astern Fwy Midblock: Collector Distribu	Doncaster Rd to Bulleen Rd	West Bound				
134	astern Fwy Midblock: Collector Distribu	Under Doncaster Rd	East Bound				
135	astern Fwy Midblock: Collector Distribu	Under Doncaster Rd	West Bound				
136	Eastern Fwy Midblock: Mainline	Middleborough Rd to Tram Rd	East Bound				
137	Eastern Fwy Midblock: Mainline	Middleborough Rd to Tram Rd	West Bound				
138	Eastern Fwy Midblock: Mainline	Tram Rd to Elgar Rd	East Bound				
139	Eastern Fwy Midblock: Mainline	Elgar Rd to Doncaster Rd	East Bound				
140	Eastern Fwy Midblock: Mainline	Elgar Rd to Doncaster Rd	West Bound				
141	Eastern Fwy Midblock: Mainline	Doncaster Rd to Bulleen Rd	East Bound				
142	Eastern Fwy Midblock: Mainline	Doncaster Rd to Bulleen Rd	West Bound				
143	Eastern Fwy Midblock: Mainline	Under Doncaster Rd	East Bound				
144	Eastern Fwy Midblock: Mainline	Under Doncaster Rd	West Bound				
145	Eastern Fwy Midblock	Springvale Rd to Blackburn Rd	East Bound	74,000	3,000	2,500	80,000
146	Eastern Fwy Midblock	Springvale Rd to Blackburn Rd	West Bound	75,000	2,900	2,400	80,000
147	Eastern Fwy Midblock	Blackburn Rd to Middleborough Rd	East Bound	83,000	3,200	2,800	89,000
148	Eastern Fwy Midblock	Blackburn Rd to Middleborough Rd	West Bound	85,000	3,100	2,500	92,000
149	Eastern Fwy Midblock	Middleborough Rd to Tram Rd	East Bound	87,000	3,500	2,500	94,000
150	Eastern Fwy Midblock	Middleborough Rd to Tram Rd	West Bound	90,000	3,300	2,500	96,000
151	Eastern Fwy Midblock	Tram Rd to Elgar Rd	East Bound	73,000	3,000	2,500	79,000

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No	Road	Location	Direction	24 hours			
152	Eastern Fwy Midblock	Tram Rd to Elgar Rd	West Bound	75,000	3,000	2,300	81,000
153	Eastern Fwy Midblock	Elgar Rd to Doncaster Rd	East Bound	83,000	3,200	2,400	89,000
154	Eastern Fwy Midblock	Elgar Rd to Doncaster Rd	West Bound	86,000	3,200	2,400	92,000
155	Eastern Fwy Midblock	Doncaster Rd to Bulleen Rd	East Bound	83,000	3,300	2,400	89,000
156	Eastern Fwy Midblock	Doncaster Rd to Bulleen Rd	West Bound	84,000	3,200	2,400	90,000
157	Eastern Fwy Midblock	Bulleen Rd to Burke Rd	East Bound	74,000	2,400	1,200	78,000
158	Eastern Fwy Midblock	Bulleen Rd to Burke Rd	West Bound	76,000	2,400	1,200	80,000
159	Eastern Fwy Midblock	Burke Rd to Chandler Hwy	East Bound	85,000	2,600	1,300	89,000
160	Eastern Fwy Midblock	Burke Rd to Chandler Hwy	West Bound	85,000	2,500	1,200	89,000
161	Eastern Fwy Midblock	Chandler Hwy to Hoddle St	East Bound	78,000	2,500	900	82,000
162	Eastern Fwy Midblock	Chandler Hwy to Hoddle St	West Bound	70,000	2,300	900	74,000
163	Eastern Fwy Midblock	Under Springale Rd	East Bound	50,000	600	1,800	53,000
164	Eastern Fwy Midblock	Under Springale Rd	West Bound	51,000	2,100	1,700	55,000
165	Eastern Fwy Midblock	Under Middlelborough Rd	East Bound	76,000	3,000	2,300	82,000
166	Eastern Fwy Midblock	Under Middlelborough Rd	West Bound	78,000	2,700	2,400	84,000
167	Eastern Fwy Midblock	Under Doncaster Rd	East Bound	75,000	2,800	2,300	81,000
168	Eastern Fwy Midblock	Under Doncaster Rd	West Bound	77,000	2,700	2,200	82,000
169	Eastern Fwy Midblock	Under Bulleen Rd	East Bound	63,000	1,800	1,000	66,000
170	Eastern Fwy Midblock	Under Bulleen Rd	West Bound	65,000	1,300	1,000	68,000
171	Eastern Fwy Midblock	Under Chandler Hwy	East Bound	68,000	1,800	800	71,000
172	Eastern Fwy Midblock	Under Chandler Hwy	West Bound	66,000	700	600	68,000
173	Eastern Fwy Ramp	C2 - EB Entry Ramp At Chandler Hwy	East Bound	19,000	1,400	900	21,000
174	Eastern Fwy Ramp	D2 - EB Entry Ramp At Doncaster Rd	East Bound	9,000	500	300	10,000
175	Eastern Fwy Ramp	U2 - EB Entry Ramp At Thompsons Rd	East Bound	15,000	2,100	1,100	18,000
176	Eastern Fwy Ramp	T1 - EB Entry Ramp At Tram Rd	East Bound	17,000	800	250	18,000
177	Eastern Fwy Ramp	W2 - EB Entry Ramp At Wetherby Rd	East Bound	7,000	500	150	8,000
178	Eastern Fwy Ramp	A1 - EB Exit Ramp At Blackburn Rd	East Bound	11,000	800	200	12,000
179	Eastern Fwy Ramp	U1 - EB Exit Ramp At Bulleen Rd	East Bound	11,000	700	200	12,000
180	Eastern Fwy Ramp	B1 - EB Exit Ramp At Burke Rd	East Bound	9,000	500	150	9,000
181	Eastern Fwy Ramp	C1 - EB Exit Ramp At Chandler Hwy	East Bound	11,000	900	150	12,000
182	Eastern Fwy Ramp	D1 - EB Exit Ramp At Doncaster Rd	East Bound	8,000	500	150	8,000
183	Eastern Fwy Ramp	E1 - EB Exit Ramp At Elgar Rd	East Bound	11,000	700	150	11,000
184	Eastern Fwy Ramp	S1 - EB Exit Ramp At Springvale Rd	East Bound	25,000	2,200	600	28,000
185	Eastern Fwy Ramp	W1 - EB Exit Ramp At Wetherby Rd	East Bound	12,000	600	300	12,000
186	Eastern Fwy Ramp	U4 - WB Entry Ramp At Bulleen Rd	West Bound	12,000	600	300	13,000
187	Eastern Fwy Ramp	C4 - WB Entry Ramp At Chandler Hwy	West Bound	6,000	500	150	7,000
188	Eastern Fwy Ramp	D4 - WB Entry Ramp At Doncaster Rd	West Bound	7,000	600	150	8,000
189	Eastern Fwy Ramp	E2 - WB Entry Ramp At Elgar Rd	West Bound	11,000	600	150	12,000
190	Eastern Fwy Ramp	W4 - WB Entry Ramp At Middleborough Rd	West Bound	12,000	500	200	13,000
191	Eastern Fwy Ramp	S4 - WB Entry Ramp At Springvale Rd	West Bound	25,000	800	700	26,000
192	Eastern Fwy Ramp	A2 - WB Entry Ramp At Surrey rd	West Bound	11,000	500	150	12,000
193	Eastern Fwy Ramp	B2 - WB Entry Ramp At Burke Rd	West Bound	8,000	700	150	9,000
194	Eastern Fwy Ramp	U3 - WB Exit Ramp At Bulleen Rd	West Bound	20,000	1,800	1,400	23,000
195	Eastern Fwy Ramp	C3 - WB Exit Ramp At Chandler Hwy	West Bound	19,000	1,800	700	22,000
196	Eastern Fwy Ramp	D3 - WB Exit Ramp At Doncaster Rd	West Bound	10,000	400	250	10,000
197	Eastern Fwy Ramp	W3 - WB Exit Ramp At Middleborough Rd	West Bound	7,000	600	150	8,000
198	Eastern Fwy Ramp	T2 - WB Exit Ramp At Station St	West Bound	15,000	600	250	16,000
199	Edgars Rd	South of Cooper St	North Bound	16,000	800	150	17,000
200	Edgars Rd	South of Cooper St	South Bound	15,000	800	150	16,000
201	Edgars Rd	North of Metropolitan Ring Rd	North Bound	26,000	1,400	500	29,000
202	Edgars Rd	North of Metropolitan Ring Rd	South Bound	24,000	1,900	250	26,000
203	Elder St	Btwn Papua St to Longmuir Rd	East Bound	4,000	300	100	5,000
204	Elder St	Btwn Papua St to Longmuir Rd	West Bound	4,000	250	100	4,000
205	Elgar Rd	North of Eastern Fwy	North Bound	13,000	400	150	13,000
206	Elgar Rd	North of Eastern Fwy	South Bound	11,000	400	250	12,000
207	Elgar Rd	Btwn Belmore Rd to Eastern Fwy	North Bound	20,000	1,000	250	21,000
208	Elgar Rd	Btwn Belmore Rd to Eastern Fwy	South Bound	20,000	900	150	21,000
209	Elgar Rd	Btwn Belmore Rd to Whitehorse Rd	North Bound	17,000	800	150	18,000
210	Elgar Rd	Btwn Belmore Rd to Whitehorse Rd	South Bound	17,000	1,000	150	18,000
211	Eltham-Yarra Glen Rd	North of Donaldson Rd	Northbound	7,000	500	150	7,000
212	Eltham-Yarra Glen Rd	North of Donaldson Rd	South Bound	6,000	600	150	7,000
213	Eltham-Yarra Glen Rd	North of Henley Rd	North Bound	2,500	250	150	3,000
214	Eltham-Yarra Glen Rd	North of Henley Rd	South Bound	2,500	300	150	3,000
215	Eltham-Yarra Glen Rd	wn Kangaroo Ground-St Andrews Rd to Henley	East Bound	3,000	300	150	3,500
216	Eltham-Yarra Glen Rd	wn Kangaroo Ground-St Andrews Rd to Henley	West Bound	3,000	700	150	3,500
217	Erskine Rd	Btwn Ferguseon St to Argyle St	East Bound	5,000	150	100	5,000
218	Erskine Rd	Btwn Ferguseon St to Argyle St	West Bound	4,000	200	100	4,000
219	Fitzsimons Ln	At Yarra River	North Bound	34,000	3,900	600	39,000
220	Fitzsimons Ln	At Yarra River	South Bound	35,000	1,600	400	37,000
221	Foote St	West Of Fitzsimons Ln	East Bound	10,000	1,000	150	11,000
222	Foote St	West Of Fitzsimons Ln	West Bound	9,000	700	150	10,000
223	Gorge Rd	At Plenty River	East Bound	9,000	600	150	9,000
224	Gorge Rd	At Plenty River	West Bound	8,000	900	150	9,000
225	Grange Rd	Btwn Darebin Rd to Heidelberg Rd	North Bound	21,000	1,100	900	23,000
226	Grange Rd	Btwn Darebin Rd to Heidelberg Rd	South Bound	15,000	1,000	600	16,000
227	Greensborough Bypass	Btwn M80 Interchange to Diamond Creek Rd	East Bound	30,000	1,300	500	32,000

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				2026 Daily			
No	Road	Location	Direction	24 hours			
228	Greensborough Bypass	Btwn M80 Interchange to Diamond Creek Rd	West Bound	34,000	1,900	500	36,000
229	Greensborough Highway	Btwn Grimshaw St to M80	North Bound	42,000	3,200	1,400	46,000
230	Greensborough Highway	Btwn Grimshaw St to M80	South Bound	44,000	3,200	1,600	49,000
231	Greensborough Rd	Btwn Erskine Rd to Strathallan Rd	North Bound	31,000	1,100	1,000	33,000
232	Greensborough Rd	Btwn Erskine Rd to Strathallan Rd	South Bound	31,000	1,200	1,000	33,000
233	Greensborough Rd	Btwn Strathallan Rd to Yallambie Rd	North Bound	32,000	1,200	1,000	34,000
234	Greensborough Rd	Btwn Strathallan Rd to Yallambie Rd	South Bound	32,000	1,200	1,100	34,000
235	Greensborough Rd	Btwn Lower Plenty Rd to Erskine Rd	North bound	31,000	1,200	1,000	33,000
236	Greensborough Rd	Btwn Lower Plenty Rd to Erskine Rd	South bound	31,000	1,200	1,100	33,000
237	Greensborough Rd	Btwn Watsonia Rd to Grimshaw St	North Bound	31,000	3,200	1,300	36,000
238	Greensborough Rd	Btwn Watsonia Rd to Grimshaw St	South Bound	33,000	2,100	1,400	37,000
239	Greensborough Rd	Btwn Santon St to Teresa St	North Bound	1,500	100	100	1,500
240	Greensborough Rd	Btwn Santon St to Teresa St	South Bound	1,500	100	100	1,500
241	Greensborough Rd	South Of Watsonia Rd	North Bound	33,000	3,000	1,300	37,000
242	Greensborough Rd	South Of Watsonia Rd	South Bound	33,000	3,400	1,500	38,000
243	Greensborough Rd	Under Grimshaw St	North Bound				
244	Greensborough Rd	Under Grimshaw St	South Bound				
245	Greensborough Rd	North of Grimshaw St	North Bound				
246	Greensborough Rd	North of Grimshaw St	South Bound				
247	Greensborough Rd	at Simpsons Barracks	Northbound	31,000	1,300	1,200	34,000
248	Greensborough Rd	at Simpsons Barracks	Southbound	32,000	1,400	1,300	35,000
249	Greenwood Dr	Btwn Gresswell Park Dr to Ladd St	East Bound	3,000	200	100	3,000
250	Greenwood Dr	Btwn Gresswell Park Dr to Ladd St	West Bound	3,000	150	100	3,000
251	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	East Bound	14,000	900	200	15,000
252	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	West Bound	14,000	500	150	14,000
253	Grimshaw St	Btwn Greensborough Hwy to The Circuit	East Bound	23,000	1,100	250	25,000
254	Grimshaw St	Btwn Greensborough Hwy to The Circuit	West Bound	18,000	1,000	500	19,000
255	Grimshaw St	Btwn Watsonia Rd to Greensborough Hwy	East Bound	13,000	700	250	14,000
256	Grimshaw St	Btwn Watsonia Rd to Greensborough Hwy	West Bound	12,000	600	250	13,000
257	Grimshaw St	Btwn Main St to Para Rd	East Bound	1,500	150	100	2,500
258	Grimshaw St	Btwn Main St to Para Rd	West Bound	11,000	800	200	12,000
259	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	East Bound	15,000	1,300	150	16,000
260	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	West Bound	13,000	800	150	14,000
261	Heidelberg Rd	At Darebin Creek	North Bound	15,000	500	100	16,000
262	Heidelberg Rd	At Darebin Creek	South Bound	16,000	1,000	150	17,000
263	Heidelberg Rd	Btwn Hoddle St to Station St	East Bound	20,000	1,300	250	22,000
264	Heidelberg Rd	Btwn Hoddle St to Station St	West Bound	23,000	1,500	250	25,000
265	Heidelberg-Kinglake Rd	North of Main Hurstbridge Rd	North Bound	2,500	200	100	2,500
266	Heidelberg-Kinglake Rd	North of Main Hurstbridge Rd	South Bound	2,500	200	100	2,500
267	Heidelberg-Kinglake Rd	n Kangaroo Ground-Wattle Glen Rd to Wilson	North Bound	7,000	900	200	8,000
268	Heidelberg-Kinglake Rd	n Kangaroo Ground-Wattle Glen Rd to Wilson	South Bound	7,000	800	200	8,000
269	Heidelberg-Warrandyte Rd	At Mullum Mullum Creek	North Bound	5,000	600	150	6,000
270	Heidelberg-Warrandyte Rd	At Mullum Mullum Creek	South Bound	5,000	1,100	150	6,000
271	High St	South of Cooper St	North Bound	26,000	1,100	400	28,000
272	High St	South of Cooper St	South Bound	27,000	1,200	600	29,000
273	High St	North of Settlement Rd	North Bound	21,000	700	400	22,000
274	High St	North of Settlement Rd	South Bound	21,000	500	600	22,000
275	High St	Btwn Doncaster Rd to Manningham Rd	North Bound	12,000	600	100	13,000
276	High St	Btwn Doncaster Rd to Manningham Rd	South Bound	11,000	300	150	12,000
277	High St	Btwn Keon Pde to Broadway	North Bound	25,000	1,500	900	27,000
278	High St	Btwn Keon Pde to Broadway	South Bound	21,000	2,100	700	24,000
279	High St	Btwn Mahoneys Rd to Settlement Rd	North Bound	20,000	800	1,100	21,000
280	High St	Btwn Mahoneys Rd to Settlement Rd	South Bound	19,000	1,200	300	21,000
281	High St	Btwn Westgarth St to Queens Pde	North Bound	20,000	900	150	21,000
282	High St	Btwn Westgarth St to Queens Pde	South Bound	19,000	1,000	200	20,000
283	High St	Btwn Cotham Rd to Parkhill Rd	Eastbound	13,000	150	100	13,000
284	High St	Btwn Cotham Rd to Parkhill Rd	Westbound	13,000	200	100	13,000
285	High St	Btwn Harp Rd to Burke Rd	Eastbound	8,000	150	100	8,000
286	High St	Btwn Harp Rd to Burke Rd	Westbound	9,000	150	100	9,000
287	Hoddle St	Btwn Heidelberg Rd to Eastern Fwy	North Bound	24,000	1,000	200	25,000
288	Hoddle St	Btwn Heidelberg Rd to Eastern Fwy	South Bound	21,000	1,500	200	22,000
289	Hoddle St	Btwn Eastern Fwy to Johnston St	Northbound	50,000	1,800	400	52,000
290	Hoddle St	Btwn Eastern Fwy to Johnston St	Southbound	49,000	1,800	400	51,000
291	Hoddle St	Btwn Johnston St to Victoria St	Northbound	48,000	1,700	400	50,000
292	Hoddle St	Btwn Johnston St to Victoria St	Southbound	50,000	1,700	400	52,000
293	Hoddle St	Btwn Victoria St to Bridge Rd	Northbound	38,000	1,000	300	39,000
294	Hoddle St	Btwn Victoria St to Bridge Rd	Southbound	39,000	1,000	300	41,000
295	Hume Fwy	Btwn M80 Ring Rd to Cooper St	North Bound	57,000	3,000	5,900	65,000
296	Hume Fwy	Btwn M80 Ring Rd to Cooper St	South Bound	57,000	2,600	6,000	65,000
297	Hume Fwy	North of Cooper St	North Bound	52,000	2,000	4,200	58,000
298	Hume Fwy	North of Cooper St	South Bound	51,000	1,600	4,200	57,000
299	Jika St	Btwn Rosanna Rd to Banksia St	Northbound	9,000	400	150	10,000
300	Jika St	Btwn Rosanna Rd to Banksia St	South Bound	16,000	1,000	200	17,000
301	Johnston St	Btwn Wellington St to Hoddle St	Eastbound	9,000	400	150	10,000
302	Johnston St	Btwn Wellington St to Hoddle St	Westbound	10,000	300	100	10,000
303	Kangaroo Ground-St Andrews Rd	n Kangaroo Ground-Wattle Glen Rd to Dawson	North Bound	2,500	600	150	3,000

Base 2026

No	Road	Location	Direction	2026 Daily 24 hours			
304	Kangaroo Ground-St Andrews Rd	n Kangaroo Ground-Wattle Glen Rd to Dawsor	South Bound	2,500	350	150	3,000
305	Kangaroo Ground-Warrandyte Rd	Near Pigeon Bank Rd	North Bound	5,000	300	150	5,000
306	Kangaroo Ground-Warrandyte Rd	Near Pigeon Bank Rd	South Bound	5,000	250	150	5,000
307	Kangaroo Ground-Warrandyte Rd	At Yarra River	North Bound	11,000	400	200	12,000
308	Kangaroo Ground-Warrandyte Rd	At Yarra River	South Bound	10,000	700	200	11,000
309	Kangaroo Ground-Wattle Glen Rd	elberg-Kinglake Rd to Kangaroo Ground-St Ar	East Bound	6,000	250	150	6,000
310	Kangaroo Ground-Wattle Glen Rd	elberg-Kinglake Rd to Kangaroo Ground-St Ar	West Bound	5,000	1,000	200	6,000
311	Karingal Drive	East Of St Helena Rd	North Bound	14,000	900	200	15,000
312	Karingal Drive	East Of St Helena Rd	South Bound	13,000	900	300	14,000
313	Keon Pde	Btwn High St to Dalton Rd	East Bound	12,000	1,700	400	14,000
314	Keon Pde	Btwn High St to Dalton Rd	West Bound	10,000	1,300	250	11,000
315	King St	East of Williamsons Rd	East Bound	9,000	700	200	9,000
316	King St	East of Williamsons Rd	West Bound	7,000	500	150	8,000
317	Kingsbury Drive	East Of Waterdale Rd	East Bound	9,000	700	150	10,000
318	Kingsbury Drive	East Of Waterdale Rd	West Bound	8,000	400	250	8,000
319	Kingsbury Drive	West of Waterdale Rd	East Bound	18,000	800	400	19,000
320	Kingsbury Drive	West of Waterdale Rd	West Bound	17,000	900	350	18,000
321	Livingstone St	Btwn Oriel Rd to Waterdale Rd	East Bound	8,000	400	100	8,000
322	Livingstone St	Btwn Oriel Rd to Waterdale Rd	West Bound	7,000	250	100	7,000
323	Lower Heidelberg Rd	Btwn Maltravers Rd to The Eyrie	North Bound	20,000	800	200	21,000
324	Lower Heidelberg Rd	Btwn Maltravers Rd to The Eyrie	South Bound	19,000	800	300	20,000
325	Lower Heidelberg Rd	Near Ivanhoe Park	East Bound	7,000	250	100	7,000
326	Lower Heidelberg Rd	Near Ivanhoe Park	West Bound	6,000	250	100	6,000
327	Lower Plenty Rd	Btwn Greensborough Rd to Para Rd	East Bound	17,000	900	250	18,000
328	Lower Plenty Rd	Btwn Greensborough Rd to Para Rd	West Bound	17,000	600	250	18,000
329	Lower Plenty Rd	Btwn Rosanna Rd to Greensborough Rd	East Bound	37,000	1,200	1,200	39,000
330	Lower Plenty Rd	Btwn Rosanna Rd to Greensborough Rd	West Bound	37,000	1,300	1,300	40,000
331	Lower Plenty Rd	Btwn Turnham Ave to Rosanna Rd	East Bound	10,000	500	150	10,000
332	Lower Plenty Rd	Btwn Turnham Ave to Rosanna Rd	West Bound	11,000	400	150	12,000
333	M80 Ring Rd	Dalton Rd to Plenty Rd	East bound	65,000	2,300	1,800	69,000
334	M80 Ring Rd	Dalton Rd to Plenty Rd	West bound	66,000	2,300	1,800	70,000
335	M80 Ring Rd	Dalton Rd to Edgars Rd	East Bound	77,000	3,100	2,700	83,000
336	M80 Ring Rd	Dalton Rd to Edgars Rd	West Bound	74,000	2,900	2,600	80,000
337	M80 Ring Rd	Edgars Rd to Hume Fwy	East Bound	93,000	3,600	3,700	100,000
338	M80 Ring Rd	Edgars Rd to Hume Fwy	West Bound	86,000	3,300	3,400	92,000
339	M80 Ring Rd	Hume Fwy to Sydney Rd	East Bound	102,000	4,200	7,100	113,000
340	M80 Ring Rd	Hume Fwy to Sydney Rd	West Bound	97,000	3,700	6,600	107,000
341	M80 Ring Rd	M80 Interchange to Plenty Rd	East Bound	57,000	2,200	1,800	61,000
342	M80 Ring Rd	M80 Interchange to Plenty Rd	West Bound	54,000	2,100	1,600	57,000
343	M80 Ring Rd: Mainline	M80 Interchange to Plenty Rd	West Bound				
344	M80 Ring Rd: Collector Distributor	M80 Interchange to Plenty Rd	West Bound				
345	M80 Ring Rd: Collector Distributor	Edgars Rd to Hume Fwy	East Bound				
346	M80 Ring Rd: Collector Distributor	Edgars Rd to Hume Fwy	West Bound				
347	M80 Ring Rd: Mainline	Edgars Rd to Hume Fwy	East Bound				
348	M80 Ring Rd: Mainline	Edgars Rd to Hume Fwy	West Bound				
349	M80-NEL interchange	X1 - M80 to NEL	0				
350	M80-NEL interchange	X2 - M80 to Greensborough Bypass/Grimshaw	0				
351	M80-NEL interchange	X3 - M80 to Greensborough Bypass	0				
352	M80-NEL interchange	X4 - NEL/Grimshaw to Greensborough Bypass	0				
353	M80-NEL interchange	X5 - Greensborough Bypass to NEL/Grimshaw	0				
354	M80-NEL interchange	X6 - Greensborough Bypass to M80	0				
355	M80-NEL interchange	X7 - Greensborough Bypass to Grimshaw	0				
356	M80-NEL interchange	X8 - M80 to Grimshaw	0				
357	M80-NEL interchange	X9 - Grimshaw to Greensborough Bypass	0				
358	M80-NEL interchange	X10 - NEL to Greensborough Bypass	0				
359	M80-NEL interchange	X11 - Grimshaw to M80/Plenty	0				
360	M80-NEL interchange	X12 - NEL to Plenty	0				
361	M80-NEL interchange	X13 - Greensborough Bypass to Plenty	0				
362	M80-NEL interchange	X14 - NEL/Greensborough Bypass to Plenty	0				
363	M80-NEL interchange	X15 - Grimshaw to Plenty	0				
364	M80-NEL interchange	X16 - Grimshaw to M80	0				
365	M80-NEL interchange	X17 - Plenty Road exit ramp	0				
366	M80-NEL interchange	X18 - NEL to M80	0				
367	M80-NEL interchange	X19 - Greensborough Bypass to M80	0				
368	Main Hurstbridge Rd	At Diamond Creek	East Bound	13,000	1,300	250	14,000
369	Main Hurstbridge Rd	At Diamond Creek	West Bound	13,000	600	200	14,000
370	Main Hurstbridge Rd	vn Ryans Rd to Kangaroo Ground-Wattle Glen	East Bound	8,000	1,000	300	9,000
371	Main Hurstbridge Rd	vn Ryans Rd to Kangaroo Ground-Wattle Glen	West Bound	8,000	1,000	250	9,000
372	Main Rd	At Plenty River	East Bound	15,000	900	200	16,000
373	Main Rd	At Plenty River	West Bound	16,000	400	150	16,000
374	Main Rd	East Of Ingrams Rd	East Bound	4,000	400	100	5,000
375	Main Rd	East Of Ingrams Rd	West Bound	4,000	500	100	5,000
376	Main Rd	Btwn Para Rd to Bolton St	East Bound	15,000	1,500	400	17,000
377	Main Rd	Btwn Para Rd to Bolton St	West Bound	17,000	800	500	18,000
378	Main Rd	Btwn Wattletree Rd to Bridge St	North Bound	13,000	500	300	14,000
379	Main Rd	Btwn Wattletree Rd to Bridge St	South Bound	13,000	900	200	14,000

Base 2026

No	Road	Location	Direction	2026 Daily 24 hours			
380	Main Rd	East of Wattletree Rd	East Bound	11,000	700	150	12,000
381	Main Rd	East of Wattletree Rd	West Bound	12,000	900	250	13,000
382	Main Rd	At Diamond Creek	North Bound	15,000	800	200	16,000
383	Main Rd	At Diamond Creek	South Bound	14,000	700	150	15,000
384	Main Rd	Btwn Fitzsimons La to Bolton St	Eastbound	26,000	900	300	28,000
385	Main Rd	Btwn Fitzsimons La to Bolton St	Westbound	22,000	800	300	23,000
386	Main St	Btwn Para Rd to St Helena Rd	North Bound	16,000	1,900	250	18,000
387	Main St	Btwn Para Rd to St Helena Rd	South Bound	14,000	1,000	150	15,000
388	Manningham Rd	Btwn High St to Williamsons Rd	East Bound	24,000	1,000	500	25,000
389	Manningham Rd	Btwn High St to Williamsons Rd	West Bound	21,000	700	250	21,000
390	Manningham Rd	Btwn Thompsons Rd to High St	East Bound	21,000	900	900	23,000
391	Manningham Rd	Btwn Thompsons Rd to High St	West Bound	20,000	900	150	21,000
392	Manningham Rd	Btwn Bulleen Rd to Thompsons Rd	East Bound	21,000	1,400	300	23,000
393	Manningham Rd	Btwn Bulleen Rd to Thompsons Rd	West Bound	16,000	900	150	17,000
394	Maroondah Hwy	East Of Eastlink	East bound	23,000	500	250	23,000
395	Maroondah Hwy	East Of Eastlink	West bound	26,000	700	300	27,000
396	Maroondah Hwy	Btwn Ringwood St to Warrandyte Rd	East Bound	17,000	800	250	18,000
397	Maroondah Hwy	Btwn Ringwood St to Warrandyte Rd	West Bound	18,000	1,600	250	20,000
398	Maroondah Hwy	Btwn Mitcham Rd to Eastlink	Eastbound	35,000	1,000	400	36,000
399	Maroondah Hwy	Btwn Mitcham Rd to Eastlink	Westbound	35,000	900	400	36,000
400	Maroondah Hwy	Btwn Mt Dandenong Rd to Dublin Rd	Northbound	34,000	1,100	600	35,000
401	Maroondah Hwy	Btwn Mt Dandenong Rd to Dublin Rd	Southbound	35,000	1,100	600	37,000
402	McDonalds Rd	West of Pindari Ave	East Bound	12,000	500	200	13,000
403	McDonalds Rd	West of Pindari Ave	West Bound	12,000	500	200	13,000
404	Merri Pde	Btwn St Georges Rd to Westgarth St	East Bound	9,000	600	100	10,000
405	Merri Pde	Btwn St Georges Rd to Westgarth St	West Bound	12,000	600	100	13,000
406	Middleborough Rd	North of Eastern Fwy	North Bound	16,000	800	150	17,000
407	Middleborough Rd	North of Eastern Fwy	South Bound	16,000	700	150	17,000
408	Middleborough Rd	Btwn Whitehorse Rd to Eastern Fwy	North Bound	18,000	900	300	19,000
409	Middleborough Rd	Btwn Whitehorse Rd to Eastern Fwy	South Bound	18,000	900	300	19,000
410	Mitcham Rd At Eastern Fwy	At Eastern Fwy	North Bound	15,000	700	150	16,000
411	Mitcham Rd At Eastern Fwy	At Eastern Fwy	South Bound	16,000	800	150	17,000
412	Mt Dandenong Rd	Maroondah Hwy to Dublin Rd	East Bound	22,000	1,400	300	24,000
413	Mt Dandenong Rd	Maroondah Hwy to Dublin Rd	West Bound	22,000	1,000	300	23,000
414	Murray Rd	Btwn High St to Plenty Rd	East Bound	7,000	500	150	8,000
415	Murray Rd	Btwn High St to Plenty Rd	West Bound	9,000	500	150	9,000
416	Murray Rd	Btwn Plenty Rd to Albert St	East Bound	7,000	500	150	8,000
417	Murray Rd	Btwn Plenty Rd to Albert St	West Bound	8,000	400	150	8,000
418	Murray Rd At Darebin Creek	At Darebin Creek	East Bound	16,000	1,000	200	18,000
419	Murray Rd At Darebin Creek	At Darebin Creek	West Bound	15,000	1,100	150	16,000
420	NEL Midblock	Btwn Eastern Fwy to Manningham Rd	North Bound				
421	NEL Midblock	Btwn Eastern Fwy to Manningham Rd	South Bound				
422	NEL Midblock	Btwn Manningham Rd to Lower Plenty Rd	North Bound				
423	NEL Midblock	Btwn Manningham Rd to Lower Plenty Rd	South Bound				
424	NEL Midblock	Btwn Lower Plenty Rd to Grimshaw St	North Bound				
425	NEL Midblock	Btwn Lower Plenty Rd to Grimshaw St	South Bound				
426	NEL Midblock	Btwn Grimshaw St to M80	North Bound				
427	NEL Midblock	Btwn Grimshaw St to M80	South Bound				
428	NEL Midblock	Under Manningham Rd	North Bound				
429	NEL Midblock	Under Manningham Rd	South Bound				
430	NEL Midblock	Under Lower Plenty Rd	North Bound				
431	NEL Midblock	Under Lower Plenty Rd	South Bound				
432	NEL Midblock	Under Grimshaw St	North Bound				
433	NEL Midblock	Under Grimshaw St	South Bound				
434	NEL Ramp	J5 - NB Entry Ramp From City At Eastern Fwy	North Bound				
435	NEL Ramp	SB Exit Ramp To Eastern Suburbs at Eastern	South Bound				
436	NEL Ramp	B Entry Ramp From Eastern Suburbs at Easte	North Bound				
437	NEL Ramp	U8 - SB Exit Ramp To City at Eastern Fwy	South Bound				
438	NEL Ramp	M2 - NB Entry Ramp At Manningham Rd	North Bound				
439	NEL Ramp	M3 - SB Exit Ramp At Manningham Rd	South Bound				
440	NEL Ramp	M1 - NB Exit Ramp At Manningham Rd	North Bound				
441	NEL Ramp	M4 - SB Entry Ramp At Manningham Rd	South Bound				
442	NEL Ramp	L2 - NB Entry Ramp At Lower Plenty Rd	North Bound				
443	NEL Ramp	L3 - SB Exit Ramp At Lower Plenty Rd	South Bound				
444	NEL Ramp	L1 - NB Exit Ramp At Lower Plenty Rd	North Bound				
445	NEL Ramp	L4 - SB Entry Ramp At Lower Plenty Rd	South Bound				
446	NEL Ramp	G1 - NB Exit Ramp At Grimshaw St	North Bound				
447	NEL Ramp	G4 - SB Entry Ramp At Grimshaw St	South Bound				
448	Nell Street	Btwn Longmuir Rd to Greta Street	East Bound	1,500	100	100	1,500
449	Nell Street	Btwn Longmuir Rd to Greta Street	West Bound	1,500	150	100	1,500
450	Oriel Rd	Btwn Bell St to Livingston St	North Bound	11,000	600	150	12,000
451	Oriel Rd	Btwn Bell St to Livingston St	South Bound	10,000	700	150	10,000
452	Para Rd	Btwn Rattray Rd to Main Rd	North Bound	11,000	1,000	200	12,000
453	Para Rd	Btwn Rattray Rd to Main Rd	South Bound	10,000	500	150	11,000
454	Parker St	Btwn Reynolds Rd to Swilk St	East Bound	1,000	100	100	1,500
455	Parker St	Btwn Reynolds Rd to Swilk St	West Bound	1,500	100	100	1,500

Base 2026

				2026 Daily			
No	Road	Location	Direction	24 hours			
456	Plenty Rd	At Darebin Creek	East Bound	23,000	700	250	24,000
457	Plenty Rd	At Darebin Creek	West Bound	23,000	700	200	23,000
458	Plenty Rd	Btwn Main Dr to Greenwood Dr	North Bound	37,000	1,700	500	39,000
459	Plenty Rd	Btwn Main Dr to Greenwood Dr	South Bound	36,000	1,400	500	38,000
460	Plenty Rd	Btwn McDonalds Rd to Bush Blvd	North Bound	32,000	1,800	400	35,000
461	Plenty Rd	Btwn McDonalds Rd to Bush Blvd	South Bound	39,000	900	350	40,000
462	Plenty Rd	North of Mckimmies	North Bound	41,000	4,500	700	46,000
463	Plenty Rd	North of Mckimmies	South Bound	43,000	2,700	600	46,000
464	Plenty Rd	Btwn Settlement Rd to M80 Ring Rd	North Bound	40,000	1,500	500	41,000
465	Plenty Rd	Btwn Settlement Rd to M80 Ring Rd	South Bound	27,000	1,000	500	29,000
466	Plenty Rd	Btwn Albert St to Murray Rd	Northbound	12,000	250	100	13,000
467	Plenty Rd	Btwn Albert St to Murray Rd	Southbound	14,000	250	100	14,000
468	Plenty Rd	Btwn Murray St to Bell St	Northbound	13,000	250	150	14,000
469	Plenty Rd	Btwn Murray St to Bell St	Southbound	13,000	250	150	14,000
470	Princess St	Btwn Duke St to Wills St	North Bound	18,000	900	200	19,000
471	Princess St	Btwn Duke St to Wills St	South Bound	21,000	600	200	22,000
472	Queens Pde	Btwn Hoddle St to Alexandra Pde	North Bound	8,000	600	100	9,000
473	Queens Pde	Btwn Hoddle St to Alexandra Pde	South Bound	9,000	800	150	10,000
474	Research-Warrandyte Rd	wn Main Rd to Kangaroo Ground-Warrandyte	North Bound	5,000	200	100	6,000
475	Research-Warrandyte Rd	wn Main Rd to Kangaroo Ground-Warrandyte	South Bound	5,000	250	100	5,000
476	Reynolds Rd	Btwn Blackburn Rd to Williamsons Rd	East Bound	18,000	1,100	300	20,000
477	Reynolds Rd	Btwn Blackburn Rd to Williamsons Rd	West Bound	18,000	1,100	600	20,000
478	Reynolds Rd	Btwn Blackburn Rd to Andersons Creek Rd	Eastbound	17,000	800	200	18,000
479	Reynolds Rd	Btwn Blackburn Rd to Andersons Creek Rd	Westbound	17,000	700	200	18,000
480	Ringwood Bypass	East of Eastlink	East bound	41,000	1,300	900	43,000
481	Ringwood Bypass	East of Eastlink	West bound	38,000	1,100	900	41,000
482	Ringwood Bypass	btw Ringwood St to Warrandyte Rd	Eastbound	38,000	1,500	800	40,000
483	Ringwood Bypass	btw Ringwood St to Warrandyte Rd	Westbound	38,000	1,300	800	40,000
484	Ringwood-Warrandyte Rd	South of Jumping Creek Rd	North Bound	8,000	700	150	9,000
485	Ringwood-Warrandyte Rd	South of Jumping Creek Rd	South Bound	8,000	700	150	9,000
486	Ringwood-Warrandyte Rd	Btwn Milne Rd to Tortice Dr	North Bound	11,000	1,000	200	12,000
487	Ringwood-Warrandyte Rd	Btwn Milne Rd to Tortice Dr	South Bound	11,000	1,000	200	13,000
488	Rosanna Rd	Btwn Brown St to Reid St	North Bound	24,000	1,000	1,000	27,000
489	Rosanna Rd	Btwn Brown St to Reid St	South Bound	23,000	1,100	1,200	25,000
490	Ryans Rd	Btwn Diamond Creek Rd to Allendale Rd	North Bound	8,000	250	150	8,000
491	Ryans Rd	Btwn Diamond Creek Rd to Allendale Rd	South Bound	8,000	400	100	8,000
492	Settlement Rd	At Darebin Creek	East Bound	11,000	1,100	200	12,000
493	Settlement Rd	At Darebin Creek	West Bound	10,000	1,100	150	11,000
494	Settlement Rd	Btwn Dalton Rd to High St	East Bound	6,000	700	250	7,000
495	Settlement Rd	Btwn Dalton Rd to High St	West Bound	7,000	600	200	8,000
496	Southern Rd	Btwn Waterdale Rd to Waiora Rd	East Bound	7,000	350	100	7,000
497	Southern Rd	Btwn Waterdale Rd to Waiora Rd	West Bound	7,000	500	100	7,000
498	Spring St	Btwn Broadway to Murray Rd	North Bound	16,000	900	200	18,000
499	Spring St	Btwn Broadway to Murray Rd	South Bound	16,000	1,000	250	17,000
500	Springvale Rd	North of Eastlink	North Bound	23,000	900	400	24,000
501	Springvale Rd	North of Eastlink	South Bound	21,000	1,300	500	23,000
502	Springvale Rd	Btwn Reynolds Rd to Old Warrandyte Rd	North Bound	13,000	800	300	14,000
503	Springvale Rd	Btwn Reynolds Rd to Old Warrandyte Rd	South Bound	12,000	900	300	13,000
504	Springvale Rd	Btwn Whitehorse Rd to Eastern Fwy	North Bound	30,000	3,500	800	34,000
505	Springvale Rd	Btwn Whitehorse Rd to Eastern Fwy	South Bound	31,000	3,000	800	34,000
506	St Georges Rd	Btwn Bell St to Normanby Ave	North Bound	25,000	1,400	250	26,000
507	St Georges Rd	Btwn Bell St to Normanby Ave	South Bound	25,000	1,700	300	27,000
508	St Georges Rd	Btwn Holden St to Alexandra Pde	North Bound	10,000	600	150	11,000
509	St Georges Rd	Btwn Holden St to Alexandra Pde	South Bound	12,000	900	200	13,000
510	St Georges Rd	Btwn Murray St to Bell St	North Bound	22,000	900	250	23,000
511	St Georges Rd	Btwn Murray St to Bell St	South Bound	19,000	1,300	250	21,000
512	St Georges Rd	Btwn Normanby Ave to Merri Pde	North Bound	25,000	1,000	200	26,000
513	St Georges Rd	Btwn Normanby Ave to Merri Pde	South Bound	25,000	1,000	200	26,000
514	Station St	Btwn Whitehorse Rd to Eastern Fwy	North Bound	16,000	600	200	17,000
515	Station St	Btwn Whitehorse Rd to Eastern Fwy	South Bound	16,000	700	300	17,000
516	Station St	Btwn Bell St to Darebin Rd	North Bound	21,000	1,600	600	23,000
517	Station St	Btwn Bell St to Darebin Rd	South Bound	22,000	1,400	700	24,000
518	Station St	Btwn Darebin Rd to Heidelberg Rd	North Bound	10,000	500	150	11,000
519	Station St	Btwn Darebin Rd to Heidelberg Rd	South Bound	10,000	400	200	11,000
520	Studley Park	Rd at Yarra River	Eastbound	11,000	300	100	11,000
521	Studley Park	Rd at Yarra River	Westbound	13,000	300	100	13,000
522	Surrey Rd	Btwn Whitehorse Rd to Eastern Fwy	North Bound	13,000	600	150	13,000
523	Surrey Rd	Btwn Whitehorse Rd to Eastern Fwy	South Bound	13,000	700	150	14,000
524	Templestowe Rd	Near Birrarrung Park	Eastbound	12,000	600	150	12,000
525	Templestowe Rd	Near Birrarrung Park	Westbound	11,000	400	150	11,000
526	Thompsons Rd	Btwn Manningham Rd to Foote St	North Bound	8,000	250	100	8,000
527	Thompsons Rd	Btwn Manningham Rd to Foote St	South Bound	8,000	500	100	8,000
528	Thompsons Rd	North East Of Eastern Fwy	East Bound	13,000	500	100	14,000
529	Thompsons Rd	North East Of Eastern Fwy	West Bound	14,000	1,000	150	16,000
530	Tram Rd	North of Eastern Fwy	North Bound	19,000	800	300	20,000
531	Tram Rd	North of Eastern Fwy	South Bound	21,000	1,400	300	23,000

Base 2026

No	Road	Location	Direction	2026 Daily 24 hours			
532	Upper Heidelberg Rd	Btwn Banksia St to Studley Rd	North Bound	9,000	700	150	10,000
533	Upper Heidelberg Rd	Btwn Banksia St to Studley Rd	South Bound	10,000	800	400	11,000
534	Upper Heidelberg Rd	Btwn Burgundy St to Waiora Rd	North Bound	16,000	1,000	150	17,000
535	Upper Heidelberg Rd	Btwn Burgundy St to Waiora Rd	South Bound	18,000	900	500	20,000
536	Victoria Pde	Btwn Hoddle ST to Lansdown St	Eastbound	31,000	1,300	300	33,000
537	Victoria Pde	Btwn Hoddle ST to Lansdown St	Westbound	27,000	1,200	350	29,000
538	Waiora Rd	Btwn Southern Rd to Dougharty Rd	North Bound	12,000	600	100	13,000
539	Waiora Rd	Btwn Southern Rd to Dougharty Rd	South Bound	14,000	600	100	14,000
540	Warrandyte Rd	Btwn Fitzsimons Ln to Blackburn Rd	East Bound	6,000	350	150	6,000
541	Warrandyte Rd	Btwn Fitzsimons Ln to Blackburn Rd	West Bound	7,000	500	150	7,000
542	Waterdale Rd	Btwn Southern Rd to Dougharty Rd	North Bound	12,000	600	200	13,000
543	Waterdale Rd	Btwn Southern Rd to Dougharty Rd	South Bound	11,000	900	250	13,000
544	Waterdale Rd	Btwn Southern Rd to Bell St	North Bound	11,000	900	300	12,000
545	Waterdale Rd	Btwn Southern Rd to Bell St	South Bound	12,000	1,100	300	14,000
546	Watsonia Rd	Btwn Princes St to Bungay St	North Bound	9,000	500	100	10,000
547	Watsonia Rd	Btwn Princes St to Bungay St	South Bound	6,000	300	100	7,000
548	Watsonia Rd	Greensborough Rd to Rail Line	North Bound	10,000	400	200	10,000
549	Watsonia Rd	Greensborough Rd to Rail Line	South Bound	8,000	200	100	8,000
550	Wattletree Rd	At Diamond Creek	North Bound	10,000	800	150	10,000
551	Wattletree Rd	At Diamond Creek	South Bound	11,000	700	250	12,000
552	Westgarth St	Btwn High St to Heidelberg Rd	East Bound	5,000	400	100	6,000
553	Westgarth St	Btwn High St to Heidelberg Rd	West Bound	6,000	300	100	6,000
554	Whitehorse Rd	Btwn Station Street to Middleborough Rd	East Bound	20,000	700	150	21,000
555	Whitehorse Rd	Btwn Station Street to Middleborough Rd	West Bound	19,000	1,000	150	20,000
556	Whitehorse Rd	Elgar Rd to Station St	East Bound	17,000	700	150	17,000
557	Whitehorse Rd	Elgar Rd to Station St	West Bound	14,000	900	250	15,000
558	Whitehorse Rd	Middleborough Rd to Surrey Rd	Eastbound	17,000	400	150	18,000
559	Whitehorse Rd	Middleborough Rd to Surrey Rd	Westbound	18,000	400	150	19,000
560	Whitehorse Rd	Btwn Surrey Rd to Springvale Rd	Eastbound	23,000	600	200	24,000
561	Whitehorse Rd	Btwn Surrey Rd to Springvale Rd	Westbound	23,000	600	200	24,000
562	Whitehorse Rd	btw Springvale Rd to Mitcham Rd	Eastbound	29,000	800	400	30,000
563	Whitehorse Rd	btw Springvale Rd to Mitcham Rd	Westbound	30,000	900	400	31,000
564	Whitehorse Rd	Btwn Burke Rd to Balwyn Rd	Eastbound	9,000	200	100	9,000
565	Whitehorse Rd	Btwn Burke Rd to Balwyn Rd	Westbound	10,000	200	100	10,000
566	Whitehorse Rd	btw Union Rd to Elgar Rd	Eastbound	12,000	250	100	12,000
567	Whitehorse Rd	btw Union Rd to Elgar Rd	Westbound	11,000	200	100	12,000
568	Williamsons Rd	Btwn Doncaster Rd to Manningham Rd	North Bound	27,000	1,600	300	29,000
569	Williamsons Rd	Btwn Doncaster Rd to Manningham Rd	South Bound	28,000	1,400	300	30,000
570	Williamsons Rd	Btwn Foote St to Warrandyte Rd	North Bound	22,000	1,700	600	25,000
571	Williamsons Rd	Btwn Foote St to Warrandyte Rd	South Bound	22,000	1,100	600	24,000
572	Williamsons Rd	Btwn King St to Foote St	North Bound	14,000	1,700	300	16,000
573	Williamsons Rd	Btwn King St to Foote St	South Bound	15,000	2,400	300	18,000
574	Williamsons Rd	Btwn Manningham Rd to King St	North Bound	14,000	1,400	250	16,000
575	Williamsons Rd	Btwn Manningham Rd to King St	South Bound	14,000	800	150	15,000
576	Wungan St	Btwn Skye St to Nicholls St	North Bound	4,000	400	100	5,000
577	Wungan St	Btwn Skye St to Nicholls St	South Bound	4,000	150	100	5,000
578	Yallambie Rd	Btwn Joules Ct to Fresham Rd	East Bound	2,500	150	100	3,000
579	Yallambie Rd	Btwn Joules Ct to Fresham Rd	West Bound	3,000	200	100	3,500
580	Yan Yean Rd	North of Diamond Creek Rd	North Bound	18,000	1,600	300	20,000
581	Yan Yean Rd	North of Diamond Creek Rd	South Bound	15,000	2,000	300	18,000
582	Yarra St	Btwn Cape St to Hawden St	East Bound	2,500	150	100	3,000
583	Yarra St	Btwn Cape St to Hawden St	West Bound	2,000	150	100	2,500

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No	Road	Location	Direction	2026 Daily 24 hours Cars	LCV	HCV	Total
1	Albert St	Btwn Murray St to Bell St	North Bound	19,000	1,000	300	21,000
2	Albert St	Btwn Murray St to Bell St	South Bound	20,000	900	300	21,000
3	Albert St	Btwn Plenty Rd to Murray Rd	North Bound	21,000	1,500	300	23,000
4	Albert St	Btwn Plenty Rd to Murray Rd	South Bound	21,000	1,600	300	23,000
5	Alexandra Pde	Btwn Rathdown St to Nicholson St	Eastbound	39,000	1,300	900	41,000
6	Alexandra Pde	Btwn Rathdown St to Nicholson St	Westbound	40,000	1,200	900	42,000
7	Alexandra Pde	Btwn Nicholson St to Brunswick St	Eastbound	48,000	1,500	1,000	51,000
8	Alexandra Pde	Btwn Nicholson St to Brunswick St	Westbound	47,000	1,400	900	49,000
9	Alexandra Pde	Btwn Queens Pde to Hoddle St	Eastbound	42,000	1,400	800	45,000
10	Alexandra Pde	Btwn Queens Pde to Hoddle St	Westbound	38,000	1,200	800	41,000
11	Anderson St	Btwn James St to Porter St	North Bound	6,000	500	150	7,000
12	Anderson St	Btwn James St to Porter St	South Bound	6,000	500	100	7,000
13	Andersons Creek Rd	Reynolds Rd to Warrandyte Rd	North Bound	5,000	300	100	5,000
14	Andersons Creek Rd	Reynolds Rd to Warrandyte Rd	South Bound	5,000	400	150	6,000
15	Andersons Creek Rd	Blackburn Rd to Reynolds Rd	North Bound	6,000	300	150	6,000
16	Andersons Creek Rd	Blackburn Rd to Reynolds Rd	South Bound	6,000	250	150	6,000
17	Balwyn Rd	Btwn Belmore Rd to Whitehorse Rd	North Bound	12,000	600	100	13,000
18	Balwyn Rd	Btwn Belmore Rd to Whitehorse Rd	South Bound	12,000	600	150	12,000
19	Balwyn Rd	Btwn Doncaster Rd to Belmore Rd	North Bound	9,000	900	150	10,000
20	Balwyn Rd	Btwn Doncaster Rd to Belmore Rd	South Bound	9,000	900	150	10,000
21	Banksia St	Btwn Mount St to Hawdon St	East Bound	26,000	2,100	300	28,000
22	Banksia St	Btwn Mount St to Hawdon St	West Bound	31,000	1,700	250	32,000
23	Banksia St	At Yarra River	East Bound	36,000	2,300	500	38,000
24	Banksia St	At Yarra River	West Bound	37,000	1,500	500	37,000
25	Bell St	Station St to Oriel Rd	East Bound	27,000	2,100	300	29,000
26	Bell St	Station St to Oriel Rd	West Bound	30,000	1,600	300	31,000
27	Bell St	Studley Rd to Rail Line	East Bound	27,000	1,400	300	28,000
28	Bell St	Studley Rd to Rail Line	West Bound	30,000	1,800	400	32,000
29	Bell St	Btwn Plenty Rd to Albert St	East Bound	28,000	1,500	500	30,000
30	Bell St	Btwn Plenty Rd to Albert St	West Bound	26,000	1,800	400	28,000
31	Bell St	Oriel Rd to Waterdale Rd	East Bound	26,000	1,300	400	27,000
32	Bell St	Oriel Rd to Waterdale Rd	West Bound	26,000	1,700	400	27,000
33	Bell St	Waterdale Rd to Upper Heidelberg Rd	East Bound	31,000	1,700	400	32,000
34	Bell St	Waterdale Rd to Upper Heidelberg Rd	West Bound	31,000	2,300	300	33,000
35	Bell St	Btwn High St to Plenty Rd	Eastbound	34,000	800	500	35,000
36	Bell St	Btwn High St to Plenty Rd	Westbound	33,000	900	500	33,000
37	Belmore Rd	Btwn Union Rd to Winfield Rd	North Bound	8,000	250	100	8,000
38	Belmore Rd	Btwn Union Rd to Winfield Rd	South Bound	7,000	200	100	7,000
39	Belmore Rd	Btwn Burke Rd to Balwyn Rd	Eastbound	10,000	250	100	11,000
40	Belmore Rd	Btwn Burke Rd to Balwyn Rd	Westbound	9,000	200	100	9,000
41	Blackburn Rd	Eastern Fwy to Doncaster Rd	North Bound	15,000	600	200	15,000
42	Blackburn Rd	Eastern Fwy to Doncaster Rd	South Bound	14,000	800	250	15,000
43	Blackburn Rd	Doncaster Rd to Andersons Creek Rd	North Bound	15,000	800	150	17,000
44	Blackburn Rd	Doncaster Rd to Andersons Creek Rd	South Bound	16,000	700	200	18,000
45	Blackburn Rd	Reynolds Rd to Andersons Creek Rd	North Bound	9,000	700	100	10,000
46	Blackburn Rd	Reynolds Rd to Andersons Creek Rd	South Bound	8,000	600	100	9,000
47	Bolton St	Bridge St to Main Rd	North Bound	10,000	700	100	10,000
48	Bolton St	Bridge St to Main Rd	South Bound	10,000	400	100	10,000
49	Bridge St	Bolton St to Main Rd	East Bound	10,000	700	150	11,000
50	Bridge St	Bolton St to Main Rd	West Bound	10,000	800	150	11,000
51	Bridge St	Btwn Manningham St to Templestowe Rd	East Bound	9,000	400	100	10,000
52	Bridge St	Btwn Manningham St to Templestowe Rd	West Bound	6,000	200	150	7,000
53	Broadway	Btwn High St to Bolderwood Pde	East Bound	11,000	1,500	600	14,000
54	Broadway	Btwn High St to Bolderwood Pde	West Bound	17,000	2,400	700	22,000
55	Bulleen Rd	Eastern Fwy to Manningham Rd	North Bound	29,000	1,000	500	29,000
56	Bulleen Rd	Eastern Fwy to Manningham Rd	South Bound	25,000	1,100	400	26,000
57	Bulleen Rd	Doncaster Rd to Eastern Fwy	North Bound	10,000	400	250	11,000
58	Bulleen Rd	Doncaster Rd to Eastern Fwy	South Bound	10,000	600	300	10,000
59	Burgundy St	Rosanna Rd to Upper Heidelberg Rd	East Bound	9,000	600	500	10,000
60	Burgundy St	Rosanna Rd to Upper Heidelberg Rd	West Bound	7,000	500	150	7,000
61	Burke Rd	Btwn Harp Rd to Cotham Rd	North Bound	19,000	800	250	20,000
62	Burke Rd	Btwn Harp Rd to Cotham Rd	South Bound	19,000	800	250	20,000
63	Burke Rd	Eastern Fwy to Lower Heidelberg Rd	North Bound	18,000	900	150	19,000
64	Burke Rd	Eastern Fwy to Lower Heidelberg Rd	South Bound	19,000	700	150	19,000
65	Burke Rd	Doncaster Rd to Eastern Fwy	North Bound	14,000	700	250	15,000
66	Burke Rd	Doncaster Rd to Eastern Fwy	South Bound	16,000	600	150	17,000
67	Burke Rd	Btwn High St to Harp Rd	Northbound	18,000	500	200	18,000
68	Burke Rd	Btwn High St to Harp Rd	Southbound	17,000	500	200	18,000
69	Bush Blvd	McDonalds Rd to Plenty Rd	North Bound	12,000	700	150	13,000
70	Bush Blvd	McDonalds Rd to Plenty Rd	South Bound	10,000	600	150	11,000
71	Chandler Hwy	Eastern Fwy to Heidelberg Rd	North Bound	35,000	2,400	300	38,000
72	Chandler Hwy	Eastern Fwy to Heidelberg Rd	South Bound	29,000	1,400	400	31,000
73	Chapman St	Btwn Ellesmere Pde to Thomson Dr	East Bound	8,000	1,000	100	9,000
74	Chapman St	Btwn Ellesmere Pde to Thomson Dr	West Bound	9,000	800	150	10,000
75	Cherry St	Btwn Waiora Rd to Wungan St	East Bound	4,000	250	100	5,000
76	Cherry St	Btwn Waiora Rd to Wungan St	West Bound	4,000	200	100	4,000
77	Childs Rd	Dalton Rd to Plenty Rd	East Bound	24,000	600	150	25,000
78	Childs Rd	Dalton Rd to Plenty Rd	West Bound	23,000	1,000	150	24,000
79	Cooper St	Edgars Rd to High St	East Bound	24,000	1,200	1,100	27,000
80	Cooper St	Edgars Rd to High St	West Bound	25,000	2,200	700	28,000
81	Cooper St	Hume Fwy to Edgars Rd	East Bound	21,000	3,000	1,100	25,000
82	Cooper St	Hume Fwy to Edgars Rd	West Bound	23,000	2,500	1,100	26,000
83	Cotham Rd	Btwn Glenferrie Rd to Burke Rd	Eastbound	10,000	150	100	10,000

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No	Road	Location	Direction	2026 Daily 24 hours Cars	LCV	HCV	Total
84	Cotham Rd	Btwn Glenferrie Rd to Burke Rd	Westbound	10,000	150	100	10,000
85	Cotham Rd	Btwn HighSt to Glenferrie Rd	Eastbound	9,000	150	100	9,000
86	Cotham Rd	Btwn HighSt to Glenferrie Rd	Westbound	9,000	150	100	10,000
87	Dalton Rd	North of Metropolitan Ring Rd	North Bound	31,000	900	400	33,000
88	Dalton Rd	North of Metropolitan Ring Rd	South Bound	28,000	6,900	600	35,000
89	Dalton Rd	Btwn Childs Rd to McKimmies Rd	North Bound	23,000	1,600	400	25,000
90	Dalton Rd	Btwn Childs Rd to McKimmies Rd	South Bound	23,000	1,300	350	25,000
91	Dalton Rd	Btwn Keon Pde to Settlement Rd	North Bound	19,000	1,400	300	21,000
92	Dalton Rd	Btwn Keon Pde to Settlement Rd	South Bound	23,000	3,000	400	26,000
93	Dalton Rd	Btwn Settlement Rd to M80	North Bound	35,000	2,900	800	39,000
94	Dalton Rd	Btwn Settlement Rd to M80	South Bound	31,000	2,200	700	34,000
95	Dalton Rd	South of Cooper St	North Bound	19,000	800	200	20,000
96	Dalton Rd	South of Cooper St	South Bound	9,000	400	200	9,000
97	Darebin Rd	At Darebin Creek	East Bound	11,000	900	150	12,000
98	Darebin Rd	At Darebin Creek	West Bound	10,000	700	150	11,000
99	Darebin Rd	Btwn High St to Station St	East Bound	9,000	400	150	10,000
100	Darebin Rd	Btwn High St to Station St	West Bound	10,000	500	150	11,000
101	Darebin Rd	Btwn Station St to Grange Rd	Eastbound	17,000	500	250	18,000
102	Darebin Rd	Btwn Station St to Grange Rd	Westbound	16,000	500	250	17,000
103	Diamond Creek Rd	Btwn Civic Drive to Yan Yean Rd	East Bound	31,000	2,500	400	33,000
104	Diamond Creek Rd	Btwn Civic Drive to Yan Yean Rd	West Bound	30,000	2,200	700	32,000
105	Diamond Creek Rd	3twn St Helena Rd to Greensborough Bypass	North Bound	17,000	900	200	18,000
106	Diamond Creek Rd	3twn St Helena Rd to Greensborough Bypass	South Bound	14,000	900	200	15,000
107	Diamond Creek Rd	Btwn Yan Yean Rd to Ryans Rd	East Bound	21,000	900	500	23,000
108	Diamond Creek Rd	Btwn Yan Yean Rd to Ryans Rd	West Bound	22,000	1,500	800	24,000
109	Doncaster Rd	East of Eastern Fwy	East Bound	12,000	400	150	12,000
110	Doncaster Rd	East of Eastern Fwy	West Bound	14,000	700	200	15,000
111	Doncaster Rd	Btwn Middleborough Rd to Station St	East Bound	17,000	400	150	17,000
112	Doncaster Rd	Btwn Middleborough Rd to Station St	West Bound	16,000	700	150	17,000
113	Doncaster Rd	Btwn Balwyn Rd to Eastern Fwy	East Bound	14,000	600	200	14,000
114	Doncaster Rd	Btwn Balwyn Rd to Eastern Fwy	West Bound	18,000	700	300	19,000
115	Doncaster Rd	Btwn Blackburn Rd to Springvale Rd	East Bound	15,000	900	200	16,000
116	Doncaster Rd	Btwn Blackburn Rd to Springvale Rd	West Bound	17,000	700	200	18,000
117	Doncaster Rd	Btwn Blackburn Rd to Wetherby Rd	East Bound	15,000	800	150	15,000
118	Doncaster Rd	Btwn Blackburn Rd to Wetherby Rd	West Bound	16,000	700	150	16,000
119	Doncaster Rd	btw Balwyn Rd to Bulleen Rd	Eastbound	10,000	250	100	10,000
120	Doncaster Rd	btw Balwyn Rd to Bulleen Rd	Westbound	8,000	200	100	9,000
121	Drysdale St	Btwn Greensborough Rd to Borlase St	East Bound	1,000	100	100	1,000
122	Drysdale St	Btwn Greensborough Rd to Borlase St	West Bound	1,000	100		1,000
123	Dunne St	At Darebin Creek	East Bound	6,000	400	150	6,000
124	Dunne St	At Darebin Creek	West Bound	6,000	300	150	7,000
125	Earl St	Btwn Princess St to Willsmere Rd	North Bound	9,000	350	100	9,000
126	Earl St	Btwn Princess St to Willsmere Rd	South Bound	10,000	600	100	11,000
127	stern Fwy Midblock: Collector Distribu	Middleborough Rd to Tram Rd	East Bound	66,000	3,000	2,500	72,000
128	stern Fwy Midblock: Collector Distribu	Middleborough Rd to Tram Rd	West Bound	16,000	600	200	17,000
129	stern Fwy Midblock: Collector Distribu	Tram Rd to Elgar Rd	East Bound	48,000	2,600	2,800	55,000
130	stern Fwy Midblock: Collector Distribu	Elgar Rd to Doncaster Rd	East Bound	63,000	3,000	2,700	70,000
131	stern Fwy Midblock: Collector Distribu	Elgar Rd to Doncaster Rd	West Bound	65,000	2,700	2,600	73,000
132	stern Fwy Midblock: Collector Distribu	Doncaster Rd to Bulleen Rd	East Bound	64,000	3,200	2,800	72,000
133	stern Fwy Midblock: Collector Distribu	Doncaster Rd to Bulleen Rd	West Bound	71,000	3,100	2,700	78,000
134	stern Fwy Midblock: Collector Distribu	Under Doncaster Rd	East Bound	56,000	2,400	2,600	63,000
135	stern Fwy Midblock: Collector Distribu	Under Doncaster Rd	West Bound	59,000	2,300	2,400	65,000
136	Eastern Fwy Midblock: Mainline	Middleborough Rd to Tram Rd	East Bound	54,000	1,800	1,400	57,000
137	Eastern Fwy Midblock: Mainline	Middleborough Rd to Tram Rd	West Bound	104,000	3,700	3,700	113,000
138	Eastern Fwy Midblock: Mainline	Tram Rd to Elgar Rd	East Bound	58,000	1,800	1,200	60,000
139	Eastern Fwy Midblock: Mainline	Elgar Rd to Doncaster Rd	East Bound	58,000	1,800	1,200	60,000
140	Eastern Fwy Midblock: Mainline	Elgar Rd to Doncaster Rd	West Bound	55,000	1,700	1,000	57,000
141	Eastern Fwy Midblock: Mainline	Doncaster Rd to Bulleen Rd	East Bound	58,000	1,800	1,200	60,000
142	Eastern Fwy Midblock: Mainline	Doncaster Rd to Bulleen Rd	West Bound	55,000	1,700	1,000	57,000
143	Eastern Fwy Midblock: Mainline	Under Doncaster Rd	East Bound	58,000	1,800	1,200	60,000
144	Eastern Fwy Midblock: Mainline	Under Doncaster Rd	West Bound	55,000	1,700	1,000	57,000
145	Eastern Fwy Midblock	Springvale Rd to Blackburn Rd	East Bound	94,000	3,800	3,600	103,000
146	Eastern Fwy Midblock	Springvale Rd to Blackburn Rd	West Bound	90,000	3,400	3,400	98,000
147	Eastern Fwy Midblock	Blackburn Rd to Middleborough Rd	East Bound	105,000	4,000	4,000	114,000
148	Eastern Fwy Midblock	Blackburn Rd to Middleborough Rd	West Bound	103,000	3,800	3,700	112,000
149	Eastern Fwy Midblock	Middleborough Rd to Tram Rd	East Bound	120,000	4,800	3,900	129,000
150	Eastern Fwy Midblock	Middleborough Rd to Tram Rd	West Bound	120,000	4,300	3,800	129,000
151	Eastern Fwy Midblock	Tram Rd to Elgar Rd	East Bound	105,000	4,400	3,900	115,000
152	Eastern Fwy Midblock	Tram Rd to Elgar Rd	West Bound	105,000	4,200	3,600	114,000
153	Eastern Fwy Midblock	Elgar Rd to Doncaster Rd	East Bound	120,000	4,800	3,900	130,000
154	Eastern Fwy Midblock	Elgar Rd to Doncaster Rd	West Bound	120,000	4,400	3,700	130,000
155	Eastern Fwy Midblock	Doncaster Rd to Bulleen Rd	East Bound	122,000	5,000	4,000	132,000
156	Eastern Fwy Midblock	Doncaster Rd to Bulleen Rd	West Bound	125,000	4,800	3,700	135,000
157	Eastern Fwy Midblock	Bulleen Rd to Burke Rd	East Bound	88,000	2,800	1,100	92,000
158	Eastern Fwy Midblock	Bulleen Rd to Burke Rd	West Bound	88,000	2,800	1,100	92,000
159	Eastern Fwy Midblock	Burke Rd to Chandler Hwy	East Bound	97,000	2,800	1,200	101,000
160	Eastern Fwy Midblock	Burke Rd to Chandler Hwy	West Bound	95,000	2,800	1,200	99,000
161	Eastern Fwy Midblock	Chandler Hwy to Hoddle St	East Bound	83,000	2,700	900	87,000
162	Eastern Fwy Midblock	Chandler Hwy to Hoddle St	West Bound	74,000	2,400	900	77,000
163	Eastern Fwy Midblock	Under Springale Rd	East Bound	59,000	700	2,700	63,000
164	Eastern Fwy Midblock	Under Springale Rd	West Bound	60,000	2,400	2,500	66,000
165	Eastern Fwy Midblock	Under Middlelborough Rd	East Bound	102,000	3,900	3,400	110,000
166	Eastern Fwy Midblock	Under Middlelborough Rd	West Bound	101,000	3,500	3,600	109,000

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No	Road	Location	Direction	2026 Daily 24 hours Cars	LCV	HCV	Total
167	Eastern Fwy Midblock	Under Doncaster Rd	East Bound	113,000	4,200	3,700	123,000
168	Eastern Fwy Midblock	Under Doncaster Rd	West Bound	114,000	4,000	3,400	122,000
169	Eastern Fwy Midblock	Under Bulleen Rd	East Bound	79,000	2,200	1,000	82,000
170	Eastern Fwy Midblock	Under Bulleen Rd	West Bound	103,000	2,600	2,300	112,000
171	Eastern Fwy Midblock	Under Chandler Hwy	East Bound	74,000	2,000	800	77,000
172	Eastern Fwy Midblock	Under Chandler Hwy	West Bound	71,000	700	600	73,000
173	Eastern Fwy Ramp	C2 - EB Entry Ramp At Chandler Hwy	East Bound	26,000	1,500	600	28,000
174	Eastern Fwy Ramp	D2 - EB Entry Ramp At Doncaster Rd	East Bound	11,000	600	300	12,000
175	Eastern Fwy Ramp	U2 - EB Entry Ramp At Thompsons Rd	East Bound	15,000	900	500	17,000
176	Eastern Fwy Ramp	T1 - EB Entry Ramp At Tram Rd	East Bound	15,000	800	250	16,000
177	Eastern Fwy Ramp	W2 - EB Entry Ramp At Wetherby Rd	East Bound	6,000	400	150	6,000
178	Eastern Fwy Ramp	A1 - EB Exit Ramp At Blackburn Rd	East Bound	14,000	900	250	15,000
179	Eastern Fwy Ramp	U1 - EB Exit Ramp At Bulleen Rd	East Bound	10,000	500	150	11,000
180	Eastern Fwy Ramp	B1 - EB Exit Ramp At Burke Rd	East Bound	7,000	350	100	7,000
181	Eastern Fwy Ramp	C1 - EB Exit Ramp At Chandler Hwy	East Bound	9,000	700	150	10,000
182	Eastern Fwy Ramp	D1 - EB Exit Ramp At Doncaster Rd	East Bound	10,000	800	300	11,000
183	Eastern Fwy Ramp	E1 - EB Exit Ramp At Elgar Rd	East Bound	16,000	1,200	250	18,000
184	Eastern Fwy Ramp	S1 - EB Exit Ramp At Springvale Rd	East Bound	37,000	3,500	900	42,000
185	Eastern Fwy Ramp	W1 - EB Exit Ramp At Wetherby Rd	East Bound	19,000	1,100	500	21,000
186	Eastern Fwy Ramp	U4 - WB Entry Ramp At Bulleen Rd	West Bound	12,000	600	300	13,000
187	Eastern Fwy Ramp	C4 - WB Entry Ramp At Chandler Hwy	West Bound	5,000	400	150	5,000
188	Eastern Fwy Ramp	D4 - WB Entry Ramp At Doncaster Rd	West Bound	12,000	1,200	350	13,000
189	Eastern Fwy Ramp	E2 - WB Entry Ramp At Elgar Rd	West Bound	15,000	800	200	16,000
190	Eastern Fwy Ramp	W4 - WB Entry Ramp At Middleborough Rd	West Bound	20,000	1,000	300	21,000
191	Eastern Fwy Ramp	S4 - WB Entry Ramp At Springvale Rd	West Bound	31,000	1,000	900	33,000
192	Eastern Fwy Ramp	A2 - WB Entry Ramp At Surrey rd	West Bound	14,000	700	200	15,000
193	Eastern Fwy Ramp	B2 - WB Entry Ramp At Burke Rd	West Bound	5,000	350	100	6,000
194	Eastern Fwy Ramp	U3 - WB Exit Ramp At Bulleen Rd	West Bound	23,000	800	500	24,000
195	Eastern Fwy Ramp	C3 - WB Exit Ramp At Chandler Hwy	West Bound	24,000	2,200	600	27,000
196	Eastern Fwy Ramp	D3 - WB Exit Ramp At Doncaster Rd	West Bound	9,000	350	150	9,000
197	Eastern Fwy Ramp	W3 - WB Exit Ramp At Middleborough Rd	West Bound	6,000	500	150	6,000
198	Eastern Fwy Ramp	T2 - WB Exit Ramp At Station St	West Bound	16,000	600	250	16,000
199	Edgars Rd	South of Cooper St	North Bound	17,000	800	150	17,000
200	Edgars Rd	South of Cooper St	South Bound	16,000	800	200	17,000
201	Edgars Rd	North of Metropolitan Ring Rd	North Bound	27,000	1,400	500	29,000
202	Edgars Rd	North of Metropolitan Ring Rd	South Bound	25,000	2,000	300	27,000
203	Elder St	Btwn Papua St to Longmuir Rd	East Bound	5,000	300	100	5,000
204	Elder St	Btwn Papua St to Longmuir Rd	West Bound	1,000	100		1,000
205	Elgar Rd	North of Eastern Fwy	North Bound	12,000	400	100	12,000
206	Elgar Rd	North of Eastern Fwy	South Bound	9,000	300	150	9,000
207	Elgar Rd	Btwn Belmore Rd to Eastern Fwy	North Bound	23,000	1,200	250	24,000
208	Elgar Rd	Btwn Belmore Rd to Eastern Fwy	South Bound	21,000	1,000	200	23,000
209	Elgar Rd	Btwn Belmore Rd to Whitehorse Rd	North Bound	19,000	900	150	20,000
210	Elgar Rd	Btwn Belmore Rd to Whitehorse Rd	South Bound	18,000	1,100	200	19,000
211	Eltham-Yarra Glen Rd	North of Donaldson Rd	Northbound	6,000	400	100	6,000
212	Eltham-Yarra Glen Rd	North of Donaldson Rd	South Bound	5,000	400	100	6,000
213	Eltham-Yarra Glen Rd	North of Henley Rd	North Bound	2,500	200	150	3,000
214	Eltham-Yarra Glen Rd	North of Henley Rd	South Bound	2,500	300	100	2,500
215	Eltham-Yarra Glen Rd	n Kangaroo Ground-St Andrews Rd to Henley	East Bound	3,000	300	150	3,500
216	Eltham-Yarra Glen Rd	n Kangaroo Ground-St Andrews Rd to Henley	West Bound	3,000	600	150	3,500
217	Erskine Rd	Btwn Ferguseon St to Argyle St	East Bound	5,000	200	150	6,000
218	Erskine Rd	Btwn Ferguseon St to Argyle St	West Bound	4,000	300	150	5,000
219	Fitzsimons Ln	At Yarra River	North Bound	28,000	2,700	350	31,000
220	Fitzsimons Ln	At Yarra River	South Bound	28,000	1,100	200	29,000
221	Foote St	West Of Fitzsimons Ln	East Bound	11,000	1,100	150	12,000
222	Foote St	West Of Fitzsimons Ln	West Bound	10,000	800	150	11,000
223	Gorge Rd	At Plenty River	East Bound	7,000	400	100	8,000
224	Gorge Rd	At Plenty River	West Bound	7,000	700	150	8,000
225	Grange Rd	Btwn Darebin Rd to Heidelberg Rd	North Bound	19,000	900	400	20,000
226	Grange Rd	Btwn Darebin Rd to Heidelberg Rd	South Bound	14,000	700	250	15,000
227	Greensborough Bypass	Btwn M80 Interchange to Diamond Creek Rd	East Bound	36,000	1,500	400	38,000
228	Greensborough Bypass	Btwn M80 Interchange to Diamond Creek Rd	West Bound	38,000	2,200	400	41,000
229	Greensborough Highway	Btwn Grimshaw St to M80	North Bound				
230	Greensborough Highway	Btwn Grimshaw St to M80	South Bound				
231	Greensborough Rd	Btwn Erskine Rd to Strathallan Rd	North Bound	18,000	500	150	19,000
232	Greensborough Rd	Btwn Erskine Rd to Strathallan Rd	South Bound	18,000	500	150	19,000
233	Greensborough Rd	Btwn Strathallan Rd to Yallambie Rd	North Bound	25,000	400	150	25,000
234	Greensborough Rd	Btwn Strathallan Rd to Yallambie Rd	South Bound	25,000	400	200	26,000
235	Greensborough Rd	Btwn Lower Plenty Rd to Erskine Rd	North bound	12,000	150	100	12,000
236	Greensborough Rd	Btwn Lower Plenty Rd to Erskine Rd	South bound	11,000	200	100	11,000
237	Greensborough Rd	Btwn Watsonia Rd to Grimshaw St	North Bound	17,000	500	200	18,000
238	Greensborough Rd	Btwn Watsonia Rd to Grimshaw St	South Bound	15,000	400	150	16,000
239	Greensborough Rd	Btwn Santon St to Teresa St	North Bound	2,500	150	100	3,000
240	Greensborough Rd	Btwn Santon St to Teresa St	South Bound	1,500	100	100	1,500
241	Greensborough Rd	South Of Watsonia Rd	North Bound	25,000	900	200	27,000
242	Greensborough Rd	South Of Watsonia Rd	South Bound	20,000	700	150	22,000
243	Greensborough Rd	Under Grimshaw St	North Bound	16,000	150	250	16,000
244	Greensborough Rd	Under Grimshaw St	South Bound	13,000	150	150	14,000
245	Greensborough Rd	North of Grimshaw St	North Bound	36,000	500	400	37,000
246	Greensborough Rd	North of Grimshaw St	South Bound	34,000	500	300	35,000
247	Greensborough Rd	at Simpsons Barracks	Northbound	18,000	600	150	19,000
248	Greensborough Rd	at Simpsons Barracks	Southbound	17,000	600	150	18,000
249	Greenwood Dr	Btwn Gresswell Park Dr to Ladd St	East Bound	3,000	200	100	3,000

Project 2026

No	Road	Location	Direction	2026 Daily 24 hours			
				Cars	LCV	HCV	Total
250	Greenwood Dr	Btwn Gresswell Park Dr to Ladd St	West Bound	3,000	150	100	3,000
251	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	East Bound	13,000	900	250	14,000
252	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	West Bound	12,000	500	150	13,000
253	Grimshaw St	Btwn Greensborough Hwy to The Circuit	East Bound	21,000	1,200	250	22,000
254	Grimshaw St	Btwn Greensborough Hwy to The Circuit	West Bound	17,000	1,100	600	19,000
255	Grimshaw St	Btwn Watsonia Rd to Greensborough Hwy	East Bound	15,000	1,100	500	16,000
256	Grimshaw St	Btwn Watsonia Rd to Greensborough Hwy	West Bound	14,000	800	350	15,000
257	Grimshaw St	Btwn Main St to Para Rd	East Bound		150	100	1,500
258	Grimshaw St	Btwn Main St to Para Rd	West Bound	9,000	800	200	11,000
259	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	East Bound	14,000	1,300	250	15,000
260	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	West Bound	11,000	700	150	12,000
261	Heidelberg Rd	At Darebin Creek	North Bound	14,000	400	100	14,000
262	Heidelberg Rd	At Darebin Creek	South Bound	15,000	900	150	16,000
263	Heidelberg Rd	Btwn Hoddle St to Station St	East Bound	19,000	1,200	250	21,000
264	Heidelberg Rd	Btwn Hoddle St to Station St	West Bound	22,000	1,400	250	24,000
265	Heidelberg-Kinglake Rd	North of Main Hurstbridge Rd	North Bound	2,500	200	100	2,500
266	Heidelberg-Kinglake Rd	North of Main Hurstbridge Rd	South Bound	2,500	250	100	2,500
267	Heidelberg-Kinglake Rd	ı Kangaroo Ground-Wattle Glen Rd to Wilsoı	North Bound	7,000	1,000	250	8,000
268	Heidelberg-Kinglake Rd	ı Kangaroo Ground-Wattle Glen Rd to Wilsoı	South Bound	7,000	1,000	200	8,000
269	Heidelberg-Warrandyte Rd	At Mullum Mullum Creek	North Bound	5,000	500	150	6,000
270	Heidelberg-Warrandyte Rd	At Mullum Mullum Creek	South Bound	5,000	900	150	6,000
271	High St	South of Cooper St	North Bound	26,000	1,100	500	27,000
272	High St	South of Cooper St	South Bound	27,000	1,300	700	29,000
273	High St	North of Settlement Rd	North Bound	21,000	700	400	23,000
274	High St	North of Settlement Rd	South Bound	21,000	500	600	22,000
275	High St	Btwn Doncaster Rd to Manningham Rd	North Bound	10,000	500	100	11,000
276	High St	Btwn Doncaster Rd to Manningham Rd	South Bound	12,000	300	150	12,000
277	High St	Btwn Keon Pde to Broadway	North Bound	25,000	1,300	500	27,000
278	High St	Btwn Keon Pde to Broadway	South Bound	22,000	1,900	400	24,000
279	High St	Btwn Mahoneys Rd to Settlement Rd	North Bound	19,000	700	1,000	21,000
280	High St	Btwn Mahoneys Rd to Settlement Rd	South Bound	19,000	1,200	300	21,000
281	High St	Btwn Westgarth St to Queens Pde	North Bound	19,000	800	150	19,000
282	High St	Btwn Westgarth St to Queens Pde	South Bound	18,000	800	150	19,000
283	High St	Btwn Cotham Rd to Parkhill Rd	Eastbound	13,000	150	100	13,000
284	High St	Btwn Cotham Rd to Parkhill Rd	Westbound	13,000	200	100	13,000
285	High St	Btwn Harp Rd to Burke Rd	Eastbound	8,000	150	100	8,000
286	High St	Btwn Harp Rd to Burke Rd	Westbound	9,000	150	100	9,000
287	Hoddle St	Btwn Heidelberg Rd to Eastern Fwy	North Bound	22,000	900	150	23,000
288	Hoddle St	Btwn Heidelberg Rd to Eastern Fwy	South Bound	20,000	1,300	150	22,000
289	Hoddle St	Btwn Eastern Fwy to Johnston St	Northbound	52,000	1,900	400	54,000
290	Hoddle St	Btwn Eastern Fwy to Johnston St	Southbound	50,000	1,800	400	52,000
291	Hoddle St	Btwn Johnston St to Victoria St	Northbound	49,000	1,800	350	52,000
292	Hoddle St	Btwn Johnston St to Victoria St	Southbound	50,000	1,700	400	53,000
293	Hoddle St	Btwn Victoria St to Bridge Rd	Northbound	39,000	1,000	300	40,000
294	Hoddle St	Btwn Victoria St to Bridge Rd	Southbound	40,000	900	300	41,000
295	Hume Fwy	Btwn M80 Ring Rd to Cooper St	North Bound	57,000	2,900	6,200	66,000
296	Hume Fwy	Btwn M80 Ring Rd to Cooper St	South Bound	58,000	2,500	6,100	66,000
297	Hume Fwy	North of Cooper St	North Bound	52,000	1,900	4,500	58,000
298	Hume Fwy	North of Cooper St	South Bound	52,000	1,600	4,500	58,000
299	Jika St	Btwn Rosanna Rd to Banksia St	Northbound	10,000	300	100	10,000
300	Jika St	Btwn Rosanna Rd to Banksia St	South Bound	13,000	600	100	13,000
301	Johnston St	Btwn Wellington St to Hoddle St	Eastbound	9,000	400	150	10,000
302	Johnston St	Btwn Wellington St to Hoddle St	Westbound	10,000	300	100	10,000
303	Kangaroo Ground-St Andrews Rd	ı Kangaroo Ground-Wattle Glen Rd to Dawso	North Bound	2,000	400	100	2,500
304	Kangaroo Ground-St Andrews Rd	ı Kangaroo Ground-Wattle Glen Rd to Dawso	South Bound	2,500	250	100	2,500
305	Kangaroo Ground-Warrandyte Rd	Near Pigeon Bank Rd	North Bound	4,000	250	100	4,000
306	Kangaroo Ground-Warrandyte Rd	Near Pigeon Bank Rd	South Bound	4,000	200	100	4,000
307	Kangaroo Ground-Warrandyte Rd	At Yarra River	North Bound	10,000	300	100	10,000
308	Kangaroo Ground-Warrandyte Rd	At Yarra River	South Bound	9,000	500	100	9,000
309	Kangaroo Ground-Wattle Glen Rd	elberg-Kinglake Rd to Kangaroo Ground-St A	East Bound	5,000	200	100	5,000
310	Kangaroo Ground-Wattle Glen Rd	elberg-Kinglake Rd to Kangaroo Ground-St A	West Bound	4,000	800	150	5,000
311	Karingal Drive	East Of St Helena Rd	North Bound	12,000	600	150	13,000
312	Karingal Drive	East Of St Helena Rd	South Bound	12,000	600	150	12,000
313	Keon Pde	Btwn High St to Dalton Rd	East Bound	13,000	1,900	500	15,000
314	Keon Pde	Btwn High St to Dalton Rd	West Bound	12,000	1,600	300	14,000
315	King St	East of Williamsons Rd	East Bound	7,000	500	150	8,000
316	King St	East of Williamsons Rd	West Bound	7,000	500	100	7,000
317	Kingsbury Drive	East Of Waterdale Rd	East Bound	10,000	600	250	11,000
318	Kingsbury Drive	East Of Waterdale Rd	West Bound	8,000	400	350	9,000
319	Kingsbury Drive	West of Waterdale Rd	East Bound	17,000	700	400	18,000
320	Kingsbury Drive	West of Waterdale Rd	West Bound	15,000	800	300	17,000
321	Livingstone St	Btwn Oriel Rd to Waterdale Rd	East Bound	8,000	350	100	8,000
322	Livingstone St	Btwn Oriel Rd to Waterdale Rd	West Bound	7,000	250	100	7,000
323	Lower Heidelberg Rd	Btwn Maltravers Rd to The Eyrie	North Bound	18,000	600	150	19,000
324	Lower Heidelberg Rd	Btwn Maltravers Rd to The Eyrie	South Bound	17,000	600	250	18,000
325	Lower Heidelberg Rd	Near Ivanhoe Park	East Bound	7,000	250	100	7,000
326	Lower Heidelberg Rd	Near Ivanhoe Park	West Bound	6,000	250	100	6,000
327	Lower Plenty Rd	Btwn Greensborough Rd to Para Rd	East Bound	18,000	900	250	19,000
328	Lower Plenty Rd	Btwn Greensborough Rd to Para Rd	West Bound	20,000	600	250	21,000
329	Lower Plenty Rd	Btwn Rosanna Rd to Greensborough Rd	East Bound	32,000	800	300	33,000
330	Lower Plenty Rd	Btwn Rosanna Rd to Greensborough Rd	West Bound	30,000	900	300	31,000
331	Lower Plenty Rd	Btwn Turnham Ave to Rosanna Rd	East Bound	10,000	400	150	10,000
332	Lower Plenty Rd	Btwn Turnham Ave to Rosanna Rd	West Bound	11,000	300	150	11,000

Project 2026

No	Road	Location	Direction	2026 Daily 24 hours Cars	LCV	HCV	Total
333	M80 Ring Rd	Dalton Rd to Plenty Rd	East bound	69,000	2,600	3,500	76,000
334	M80 Ring Rd	Dalton Rd to Plenty Rd	West bound	71,000	2,700	3,500	78,000
335	M80 Ring Rd	Dalton Rd to Edgars Rd	East Bound	82,000	3,400	4,400	90,000
336	M80 Ring Rd	Dalton Rd to Edgars Rd	West Bound	79,000	3,200	4,100	87,000
337	M80 Ring Rd	Edgars Rd to Hume Fwy	East Bound	97,000	3,800	4,700	106,000
338	M80 Ring Rd	Edgars Rd to Hume Fwy	West Bound	90,000	3,500	4,600	99,000
339	M80 Ring Rd	Hume Fwy to Sydney Rd	East Bound	103,000	4,400	6,800	113,000
340	M80 Ring Rd	Hume Fwy to Sydney Rd	West Bound	99,000	3,900	6,300	109,000
341	M80 Ring Rd	M80 Interchange to Plenty Rd	East Bound	84,000	3,800	3,900	93,000
342	M80 Ring Rd	M80 Interchange to Plenty Rd	West Bound	84,000	3,800	3,800	93,000
343	M80 Ring Rd: Mainline	M80 Interchange to Plenty Rd	West Bound	62,000	2,400	5,300	70,000
344	M80 Ring Rd: Collector Distributor	M80 Interchange to Plenty Rd	West Bound	27,000	900	2,000	30,000
345	M80 Ring Rd: Collector Distributor	Edgars Rd to Hume Fwy	East Bound	25,000	800	1,300	27,000
346	M80 Ring Rd: Collector Distributor	Edgars Rd to Hume Fwy	West Bound	22,000	700	1,200	24,000
347	M80 Ring Rd: Mainline	Edgars Rd to Hume Fwy	East Bound	77,000	3,400	6,400	87,000
348	M80 Ring Rd: Mainline	Edgars Rd to Hume Fwy	West Bound	78,000	3,400	6,400	88,000
349	M80-NEL interchange	X1 - M80 to NEL	0	35,000	1,900	6,400	43,000
350	M80-NEL interchange	X2 - M80 to Greensborough Bypass/Grimshaw	0	57,000	1,500	1,200	60,000
351	M80-NEL interchange	X3 - M80 to Greensborough Bypass	0	29,000	1,100	1,000	31,000
352	M80-NEL interchange	X4 - NEL/Grimshaw to Greensborough Bypass	0	15,000	600	400	16,000
353	M80-NEL interchange	X5 - Greensborough Bypass to NEL/Grimshaw	0	13,000	600	400	14,000
354	M80-NEL interchange	X6 - Greensborough Bypass to M80	0	30,000	1,200	1,000	32,000
355	M80-NEL interchange	X7 - Greensborough Bypass to Grimshaw	0	6,000	150	100	6,000
356	M80-NEL interchange	X8 - M80 to Grimshaw	0	28,000	400	300	29,000
357	M80-NEL interchange	X9 - Grimshaw to Greensborough Bypass	0	7,000	150	100	8,000
358	M80-NEL interchange	X10 - NEL to Greensborough Bypass	0	8,000	500	400	9,000
359	M80-NEL interchange	X11 - Grimshaw to M80/Plenty	0	29,000	400	400	30,000
360	M80-NEL interchange	X12 - NEL to Plenty	0	12,000	700	1,900	15,000
361	M80-NEL interchange	X13 - Greensborough Bypass to Plenty	0	7,000	250	150	7,000
362	M80-NEL interchange	X14 - NEL/Greensborough Bypass to Plenty	0	19,000	900	1,900	21,000
363	M80-NEL interchange	X15 - Grimshaw to Plenty	0	10,000	150	150	10,000
364	M80-NEL interchange	X16 - Grimshaw to M80	0	19,000	300	300	20,000
365	M80-NEL interchange	X17 - Plenty Road exit ramp	0	28,000	1,000	2,000	31,000
366	M80-NEL interchange	X18 - NEL to M80	0	22,000	1,300	4,400	28,000
367	M80-NEL interchange	X19 - Greensborough Bypass to M80	0	24,000	1,000	900	26,000
368	Main Hurstbridge Rd	At Diamond Creek	East Bound	13,000	1,300	200	15,000
369	Main Hurstbridge Rd	At Diamond Creek	West Bound	14,000	700	150	15,000
370	Main Hurstbridge Rd	n Ryans Rd to Kangaroo Ground-Wattle Glen	East Bound	8,000	1,000	200	9,000
371	Main Hurstbridge Rd	n Ryans Rd to Kangaroo Ground-Wattle Glen	West Bound	8,000	1,000	200	9,000
372	Main Rd	At Plenty River	East Bound	16,000	600	150	17,000
373	Main Rd	At Plenty River	West Bound	17,000	400	150	18,000
374	Main Rd	East Of Ingrams Rd	East Bound	4,000	350	100	5,000
375	Main Rd	East Of Ingrams Rd	West Bound	4,000	400	100	5,000
376	Main Rd	Btwn Para Rd to Bolton St	East Bound	13,000	1,000	250	15,000
377	Main Rd	Btwn Para Rd to Bolton St	West Bound	15,000	500	250	16,000
378	Main Rd	Btwn Wattletree Rd to Bridge St	North Bound	12,000	350	200	13,000
379	Main Rd	Btwn Wattletree Rd to Bridge St	South Bound	12,000	700	150	13,000
380	Main Rd	East of Wattletree Rd	East Bound	12,000	600	100	12,000
381	Main Rd	East of Wattletree Rd	West Bound	12,000	900	150	13,000
382	Main Rd	At Diamond Creek	North Bound	14,000	700	150	15,000
383	Main Rd	At Diamond Creek	South Bound	13,000	600	150	14,000
384	Main Rd	Btwn Fitzsimons La to Bolton St	Eastbound	21,000	500	150	21,000
385	Main Rd	Btwn Fitzsimons La to Bolton St	Westbound	17,000	500	150	18,000
386	Main St	Btwn Para Rd to St Helena Rd	North Bound	17,000	1,600	150	19,000
387	Main St	Btwn Para Rd to St Helena Rd	South Bound	15,000	1,000	150	16,000
388	Manningham Rd	Btwn High St to Williamsons Rd	East Bound	17,000	500	150	17,000
389	Manningham Rd	Btwn High St to Williamsons Rd	West Bound	17,000	400	150	18,000
390	Manningham Rd	Btwn Thompsons Rd to High St	East Bound	17,000	600	200	17,000
391	Manningham Rd	Btwn Thompsons Rd to High St	West Bound	16,000	600	100	17,000
392	Manningham Rd	Btwn Bulleen Rd to Thompsons Rd	East Bound	17,000	800	150	17,000
393	Manningham Rd	Btwn Bulleen Rd to Thompsons Rd	West Bound	14,000	600	150	15,000
394	Maroondah Hwy	East Of Eastlink	East bound	23,000	600	250	24,000
395	Maroondah Hwy	East Of Eastlink	West bound	26,000	700	350	27,000
396	Maroondah Hwy	Btwn Ringwood St to Warrandyte Rd	East Bound	17,000	800	200	18,000
397	Maroondah Hwy	Btwn Ringwood St to Warrandyte Rd	West Bound	18,000	1,700	250	20,000
398	Maroondah Hwy	Btwn Mitcham Rd to Eastlink	Eastbound	35,000	1,000	400	36,000
399	Maroondah Hwy	Btwn Mitcham Rd to Eastlink	Westbound	34,000	900	400	36,000
400	Maroondah Hwy	Btwn Mt Dandenong Rd to Dublin Rd	Northbound	34,000	1,100	700	36,000
401	Maroondah Hwy	Btwn Mt Dandenong Rd to Dublin Rd	Southbound	35,000	1,100	700	37,000
402	McDonalds Rd	West of Pindari Ave	East Bound	12,000	500	200	13,000
403	McDonalds Rd	West of Pindari Ave	West Bound	12,000	500	250	13,000
404	Merri Pde	Btwn St Georges Rd to Westgarth St	East Bound	9,000	600	100	10,000
405	Merri Pde	Btwn St Georges Rd to Westgarth St	West Bound	12,000	500	100	12,000
406	Middleborough Rd	North of Eastern Fwy	North Bound	15,000	800	150	16,000
407	Middleborough Rd	North of Eastern Fwy	South Bound	16,000	600	150	17,000
408	Middleborough Rd	Btwn Whitehorse Rd to Eastern Fwy	North Bound	20,000	1,000	400	21,000
409	Middleborough Rd	Btwn Whitehorse Rd to Eastern Fwy	South Bound	19,000	1,000	400	20,000
410	Mitcham Rd At Eastern Fwy	At Eastern Fwy	North Bound	15,000	600	150	15,000
411	Mitcham Rd At Eastern Fwy	At Eastern Fwy	South Bound	17,000	800	150	18,000
412	Mt Dandenong Rd	Maroondah Hwy to Dublin Rd	East Bound	23,000	1,400	400	24,000
413	Mt Dandenong Rd	Maroondah Hwy to Dublin Rd	West Bound	22,000	1,000	350	24,000
414	Murray Rd	Btwn High St to Plenty Rd	East Bound	7,000	500	150	8,000
415	Murray Rd	Btwn High St to Plenty Rd	West Bound	8,000	500	150	9,000

Project 2026

2026 Daily

No	Road	Location	Direction	24 hours			
				Cars	LCV	HCV	Total
416	Murray Rd	Btwn Plenty Rd to Albert St	East Bound	7,000	500	150	7,000
417	Murray Rd	Btwn Plenty Rd to Albert St	West Bound	7,000	400	150	8,000
418	Murray Rd At Darebin Creek	At Darebin Creek	East Bound	16,000	900	200	17,000
419	Murray Rd At Darebin Creek	At Darebin Creek	West Bound	14,000	1,100	150	15,000
420	NEL Midblock	Btwn Eastern Fwy to Manningham Rd	North Bound	44,000	2,800	6,200	53,000
421	NEL Midblock	Btwn Eastern Fwy to Manningham Rd	South Bound	42,000	2,700	6,200	51,000
422	NEL Midblock	Btwn Manningham Rd to Lower Plenty Rd	North Bound	49,000	2,600	6,600	59,000
423	NEL Midblock	Btwn Manningham Rd to Lower Plenty Rd	South Bound	49,000	2,600	6,700	58,000
424	NEL Midblock	Btwn Lower Plenty Rd to Grimshaw St	North Bound	48,000	2,800	6,700	58,000
425	NEL Midblock	Btwn Lower Plenty Rd to Grimshaw St	South Bound	48,000	2,800	6,800	57,000
426	NEL Midblock	Btwn Grimshaw St to M80	North Bound	40,000	2,300	6,300	49,000
427	NEL Midblock	Btwn Grimshaw St to M80	South Bound	40,000	2,300	6,400	49,000
428	NEL Midblock	Under Manningham Rd	North Bound	32,000	2,000	5,400	39,000
429	NEL Midblock	Under Manningham Rd	South Bound	31,000	2,000	5,500	39,000
430	NEL Midblock	Under Lower Plenty Rd	North Bound	34,000	2,200	6,300	42,000
431	NEL Midblock	Under Lower Plenty Rd	South Bound	35,000	2,200	6,400	44,000
432	NEL Midblock	Under Grimshaw St	North Bound	40,000	2,300	6,300	49,000
433	NEL Midblock	Under Grimshaw St	South Bound	40,000	2,300	6,400	49,000
434	NEL Ramp	J5 - NB Entry Ramp From City At Eastern Fwy	North Bound	13,000	700	600	14,000
435	NEL Ramp	SB Exit Ramp To Eastern Suburbs at Eastern	South Bound	33,000	2,200	5,800	41,000
436	NEL Ramp	3 Entry Ramp From Eastern Suburbs at Easte	North Bound	32,000	2,200	5,600	39,000
437	NEL Ramp	U8 - SB Exit Ramp To City at Eastern Fwy	South Bound	9,000	550	450	10,000
438	NEL Ramp	M2 - NB Entry Ramp At Manningham Rd	North Bound	17,000	700	1,200	19,000
439	NEL Ramp	M3 - SB Exit Ramp At Manningham Rd	South Bound	18,000	650	1,200	20,000
440	NEL Ramp	M1 - NB Exit Ramp At Manningham Rd	North Bound	13,000	900	750	14,000
441	NEL Ramp	M4 - SB Entry Ramp At Manningham Rd	South Bound	11,000	800	700	13,000
442	NEL Ramp	L2 - NB Entry Ramp At Lower Plenty Rd	North Bound	15,000	600	450	16,000
443	NEL Ramp	L3 - SB Exit Ramp At Lower Plenty Rd	South Bound	13,000	650	450	14,000
444	NEL Ramp	L1 - NB Exit Ramp At Lower Plenty Rd	North Bound	16,000	500	400	16,000
445	NEL Ramp	L4 - SB Entry Ramp At Lower Plenty Rd	South Bound	14,000	450	350	15,000
446	NEL Ramp	G1 - NB Exit Ramp At Grimshaw St	North Bound	8,000	500	450	9,000
447	NEL Ramp	G4 - SB Entry Ramp At Grimshaw St	South Bound	8,000	500	450	9,000
448	Nell Street	Btwn Longmuir Rd to Greta Street	East Bound	1,500	100	100	1,500
449	Nell Street	Btwn Longmuir Rd to Greta Street	West Bound	1,500	150	100	1,500
450	Oriel Rd	Btwn Bell St to Livingston St	North Bound	10,000	500	150	10,000
451	Oriel Rd	Btwn Bell St to Livingston St	South Bound	8,000	500	100	9,000
452	Para Rd	Btwn Rattray Rd to Main Rd	North Bound	9,000	500	100	10,000
453	Para Rd	Btwn Rattray Rd to Main Rd	South Bound	9,000	300	100	9,000
454	Parker St	Btwn Reynolds Rd to Swilk St	East Bound	1,000	100	100	1,000
455	Parker St	Btwn Reynolds Rd to Swilk St	West Bound	1,000	100	100	1,000
456	Plenty Rd	At Darebin Creek	East Bound	22,000	500	150	22,000
457	Plenty Rd	At Darebin Creek	West Bound	22,000	500	150	22,000
458	Plenty Rd	Btwn Main Dr to Greenwood Dr	North Bound	33,000	1,300	300	34,000
459	Plenty Rd	Btwn Main Dr to Greenwood Dr	South Bound	33,000	1,000	250	33,000
460	Plenty Rd	Btwn McDonalds Rd to Bush Blvd	North Bound	32,000	1,700	400	34,000
461	Plenty Rd	Btwn McDonalds Rd to Bush Blvd	South Bound	39,000	900	400	40,000
462	Plenty Rd	North of Mckimmies	North Bound	43,000	4,600	700	48,000
463	Plenty Rd	North of Mckimmies	South Bound	46,000	2,800	600	50,000
464	Plenty Rd	Btwn Settlement Rd to M80 Ring Rd	North Bound	32,000	1,100	250	33,000
465	Plenty Rd	Btwn Settlement Rd to M80 Ring Rd	South Bound	25,000	800	250	25,000
466	Plenty Rd	Btwn Albert St to Murray Rd	Northbound	12,000	250	100	12,000
467	Plenty Rd	Btwn Albert St to Murray Rd	Southbound	13,000	250	100	14,000
468	Plenty Rd	Btwn Murray St to Bell St	Northbound	12,000	250	100	13,000
469	Plenty Rd	Btwn Murray St to Bell St	Southbound	12,000	200	150	13,000
470	Princess St	Btwn Duke St to Wills St	North Bound	19,000	900	200	20,000
471	Princess St	Btwn Duke St to Wills St	South Bound	22,000	600	200	23,000
472	Queens Pde	Btwn Hoddle St to Alexandra Pde	North Bound	8,000	500	100	9,000
473	Queens Pde	Btwn Hoddle St to Alexandra Pde	South Bound	8,000	800	150	9,000
474	Research-Warrandyte Rd	vn Main Rd to Kangaroo Ground-Warrandyte	North Bound	4,000	150	100	4,000
475	Research-Warrandyte Rd	vn Main Rd to Kangaroo Ground-Warrandyte	South Bound	4,000	150	100	4,000
476	Reynolds Rd	Btwn Blackburn Rd to Williamsons Rd	East Bound	15,000	800	150	16,000
477	Reynolds Rd	Btwn Blackburn Rd to Williamsons Rd	West Bound	16,000	800	300	18,000
478	Reynolds Rd	Btwn Blackburn Rd to Andersons Creek Rd	Eastbound	15,000	500	150	16,000
479	Reynolds Rd	Btwn Blackburn Rd to Andersons Creek Rd	Westbound	16,000	600	150	17,000
480	Ringwood Bypass	East of Eastlink	East bound	41,000	1,400	1,000	43,000
481	Ringwood Bypass	East of Eastlink	West bound	38,000	1,100	900	41,000
482	Ringwood Bypass	btw Ringwood St to Warrandyte Rd	Eastbound	38,000	1,600	900	41,000
483	Ringwood Bypass	btw Ringwood St to Warrandyte Rd	Westbound	37,000	1,300	900	40,000
484	Ringwood-Warrandyte Rd	South of Jumping Creek Rd	North Bound	7,000	500	100	8,000
485	Ringwood-Warrandyte Rd	South of Jumping Creek Rd	South Bound	7,000	600	100	8,000
486	Ringwood-Warrandyte Rd	Btwn Milne Rd to Tortice Dr	North Bound	11,000	800	150	12,000
487	Ringwood-Warrandyte Rd	Btwn Milne Rd to Tortice Dr	South Bound	11,000	900	150	12,000
488	Rosanna Rd	Btwn Brown St to Reid St	North Bound	21,000	600	150	21,000
489	Rosanna Rd	Btwn Brown St to Reid St	South Bound	18,000	600	150	18,000
490	Ryans Rd	Btwn Diamond Creek Rd to Allendale Rd	North Bound	7,000	150	100	7,000
491	Ryans Rd	Btwn Diamond Creek Rd to Allendale Rd	South Bound	7,000	300	100	7,000
492	Settlement Rd	At Darebin Creek	East Bound	13,000	1,200	250	14,000
493	Settlement Rd	At Darebin Creek	West Bound	11,000	1,200	200	13,000
494	Settlement Rd	Btwn Dalton Rd to High St	East Bound	7,000	700	200	7,000
495	Settlement Rd	Btwn Dalton Rd to High St	West Bound	7,000	600	200	8,000
496	Southern Rd	Btwn Waterdale Rd to Waiora Rd	East Bound	6,000	300	100	7,000
497	Southern Rd	Btwn Waterdale Rd to Waiora Rd	West Bound	6,000	400	100	7,000
498	Spring St	Btwn Broadway to Murray Rd	North Bound	15,000	800	150	16,000

Project 2026

No	Road	Location	Direction	2026 Daily 24 hours Cars	LCV	HCV	Total
499	Spring St	Btwn Broadway to Murray Rd	South Bound	15,000	800	200	16,000
500	Springvale Rd	North of Eastlink	North Bound	26,000	900	400	28,000
501	Springvale Rd	North of Eastlink	South Bound	20,000	1,100	300	22,000
502	Springvale Rd	Btwn Reynolds Rd to Old Warrandyte Rd	North Bound	11,000	600	150	12,000
503	Springvale Rd	Btwn Reynolds Rd to Old Warrandyte Rd	South Bound	10,000	700	150	11,000
504	Springvale Rd	Btwn Whitehorse Rd to Eastern Fwy	North Bound	32,000	3,800	900	37,000
505	Springvale Rd	Btwn Whitehorse Rd to Eastern Fwy	South Bound	33,000	3,500	800	37,000
506	St Georges Rd	Btwn Bell St to Normanby Ave	North Bound	24,000	1,300	250	25,000
507	St Georges Rd	Btwn Bell St to Normanby Ave	South Bound	25,000	1,700	300	27,000
508	St Georges Rd	Btwn Holden St to Alexandra Pde	North Bound	10,000	500	150	11,000
509	St Georges Rd	Btwn Holden St to Alexandra Pde	South Bound	11,000	800	200	12,000
510	St Georges Rd	Btwn Murray St to Bell St	North Bound	21,000	900	200	22,000
511	St Georges Rd	Btwn Murray St to Bell St	South Bound	18,000	1,200	250	19,000
512	St Georges Rd	Btwn Normanby Ave to Merri Pde	North Bound	24,000	900	200	25,000
513	St Georges Rd	Btwn Normanby Ave to Merri Pde	South Bound	24,000	900	200	25,000
514	Station St	Btwn Whitehorse Rd to Eastern Fwy	North Bound	16,000	600	150	16,000
515	Station St	Btwn Whitehorse Rd to Eastern Fwy	South Bound	17,000	600	150	17,000
516	Station St	Btwn Bell St to Darebin Rd	North Bound	20,000	1,300	300	21,000
517	Station St	Btwn Bell St to Darebin Rd	South Bound	21,000	1,100	300	22,000
518	Station St	Btwn Darebin Rd to Heidelberg Rd	North Bound	10,000	400	150	10,000
519	Station St	Btwn Darebin Rd to Heidelberg Rd	South Bound	10,000	400	150	10,000
520	Studley Park	Rd at Yarra River	Eastbound	11,000	300	100	11,000
521	Studley Park	Rd at Yarra River	Westbound	13,000	250	100	13,000
522	Surrey Rd	Btwn Whitehorse Rd to Eastern Fwy	North Bound	14,000	700	200	15,000
523	Surrey Rd	Btwn Whitehorse Rd to Eastern Fwy	South Bound	14,000	800	150	15,000
524	Templestowe Rd	Near Birrarrung Park	Eastbound	13,000	700	150	14,000
525	Templestowe Rd	Near Birrarrung Park	Westbound	10,000	400	150	11,000
526	Thompsons Rd	Btwn Manningham Rd to Foote St	North Bound	6,000	150	100	6,000
527	Thompsons Rd	Btwn Manningham Rd to Foote St	South Bound	7,000	400	100	8,000
528	Thompsons Rd	North East Of Eastern Fwy	East Bound	13,000	400	100	13,000
529	Thompsons Rd	North East Of Eastern Fwy	West Bound	14,000	900	150	15,000
530	Tram Rd	North of Eastern Fwy	North Bound	18,000	700	250	19,000
531	Tram Rd	North of Eastern Fwy	South Bound	20,000	1,200	150	21,000
532	Upper Heidelberg Rd	Btwn Banksia St to Studley Rd	North Bound	8,000	600	150	8,000
533	Upper Heidelberg Rd	Btwn Banksia St to Studley Rd	South Bound	8,000	700	350	9,000
534	Upper Heidelberg Rd	Btwn Burgundy St to Waiora Rd	North Bound	14,000	800	150	15,000
535	Upper Heidelberg Rd	Btwn Burgundy St to Waiora Rd	South Bound	16,000	700	300	17,000
536	Victoria Pde	Btwn Hoddle ST to Lansdown St	Eastbound	31,000	1,300	300	33,000
537	Victoria Pde	Btwn Hoddle ST to Lansdown St	Westbound	27,000	1,200	300	29,000
538	Waiora Rd	Btwn Southern Rd to Dougharty Rd	North Bound	9,000	400	100	9,000
539	Waiora Rd	Btwn Southern Rd to Dougharty Rd	South Bound	10,000	400	100	11,000
540	Warrandyte Rd	Btwn Fitzsimons Ln to Blackburn Rd	East Bound	5,000	250	100	5,000
541	Warrandyte Rd	Btwn Fitzsimons Ln to Blackburn Rd	West Bound	5,000	300	150	5,000
542	Waterdale Rd	Btwn Southern Rd to Dougharty Rd	North Bound	10,000	500	200	11,000
543	Waterdale Rd	Btwn Southern Rd to Dougharty Rd	South Bound	10,000	800	200	11,000
544	Waterdale Rd	Btwn Southern Rd to Bell St	North Bound	10,000	900	250	11,000
545	Waterdale Rd	Btwn Southern Rd to Bell St	South Bound	11,000	1,000	250	12,000
546	Watsonia Rd	Btwn Princes St to Bungay St	North Bound	11,000	500	100	12,000
547	Watsonia Rd	Btwn Princes St to Bungay St	South Bound	10,000	250	100	11,000
548	Watsonia Rd	Greensborough Rd to Rail Line	North Bound	10,000	350	200	11,000
549	Watsonia Rd	Greensborough Rd to Rail Line	South Bound	11,000	150	100	11,000
550	Wattletree Rd	At Diamond Creek	North Bound	10,000	800	150	10,000
551	Wattletree Rd	At Diamond Creek	South Bound	11,000	600	150	12,000
552	Westgarth St	Btwn High St to Heidelberg Rd	East Bound	5,000	400	100	6,000
553	Westgarth St	Btwn High St to Heidelberg Rd	West Bound	6,000	300	100	6,000
554	Whitehorse Rd	Btwn Station Street to Middleborough Rd	East Bound	19,000	700	150	20,000
555	Whitehorse Rd	Btwn Station Street to Middleborough Rd	West Bound	18,000	1,000	150	19,000
556	Whitehorse Rd	Elgar Rd to Station St	East Bound	16,000	700	150	17,000
557	Whitehorse Rd	Elgar Rd to Station St	West Bound	14,000	900	250	16,000
558	Whitehorse Rd	Middleborough Rd to Surrey Rd	Eastbound	16,000	400	150	17,000
559	Whitehorse Rd	Middleborough Rd to Surrey Rd	Westbound	18,000	400	150	19,000
560	Whitehorse Rd	Btwn Surrey Rd to Springvale Rd	Eastbound	22,000	600	200	23,000
561	Whitehorse Rd	Btwn Surrey Rd to Springvale Rd	Westbound	23,000	600	200	24,000
562	Whitehorse Rd	btw Springvale Rd to Mitcham Rd	Eastbound	28,000	800	400	29,000
563	Whitehorse Rd	btw Springvale Rd to Mitcham Rd	Westbound	31,000	1,000	400	32,000
564	Whitehorse Rd	Btwn Burke Rd to Balwyn Rd	Eastbound	8,000	200	100	9,000
565	Whitehorse Rd	Btwn Burke Rd to Balwyn Rd	Westbound	9,000	150	100	9,000
566	Whitehorse Rd	btw Union Rd to Elgar Rd	Eastbound	11,000	200	100	11,000
567	Whitehorse Rd	btw Union Rd to Elgar Rd	Westbound	11,000	200	100	11,000
568	Williamsons Rd	Btwn Doncaster Rd to Manningham Rd	North Bound	24,000	1,200	150	25,000
569	Williamsons Rd	Btwn Doncaster Rd to Manningham Rd	South Bound	24,000	900	150	25,000
570	Williamsons Rd	Btwn Foote St to Warrandyte Rd	North Bound	21,000	1,400	300	22,000
571	Williamsons Rd	Btwn Foote St to Warrandyte Rd	South Bound	20,000	900	300	21,000
572	Williamsons Rd	Btwn King St to Foote St	North Bound	13,000	1,500	150	15,000
573	Williamsons Rd	Btwn King St to Foote St	South Bound	14,000	2,000	150	16,000
574	Williamsons Rd	Btwn Manningham Rd to King St	North Bound	13,000	1,200	150	14,000
575	Williamsons Rd	Btwn Manningham Rd to King St	South Bound	14,000	700	150	15,000
576	Wungan St	Btwn Skye St to Nicholls St	North Bound	4,000	400	100	4,000
577	Wungan St	Btwn Skye St to Nicholls St	South Bound	4,000	150	100	4,000
578	Yallambie Rd	Btwn Joules Ct to Fresham Rd	East Bound	2,000	150		2,500
579	Yallambie Rd	Btwn Joules Ct to Fresham Rd	West Bound	3,500	200	100	4,000
580	Yan Yean Rd	North of Diamond Creek Rd	North Bound	20,000	1,800	300	22,000
581	Yan Yean Rd	North of Diamond Creek Rd	South Bound	16,000	2,400	300	19,000

Project 2026

No	Road	Location	Direction	2026 Daily 24 hours			
				Cars	LCV	HCV	Total
582	Yarra St	Btwn Cape St to Hawden St	East Bound	2,500	150	100	3,000
583	Yarra St	Btwn Cape St to Hawden St	West Bound	2,000	150	100	2,500

Base 2036

No	Road	Location	Direction	2036 Daily 24 hours Cars	LCV	HCV	Total
1	Albert St	Btwn Murray St to Bell St	North Bound	21,000	1,600	800	24,000
2	Albert St	Btwn Murray St to Bell St	South Bound	21,000	1,400	800	24,000
3	Albert St	Btwn Plenty Rd to Murray Rd	North Bound	24,000	2,400	900	27,000
4	Albert St	Btwn Plenty Rd to Murray Rd	South Bound	24,000	2,400	900	27,000
5	Alexandra Pde	Btwn Rathdown St to Nicholson St	Eastbound	39,000	1,500	1,000	42,000
6	Alexandra Pde	Btwn Rathdown St to Nicholson St	Westbound	40,000	1,300	900	42,000
7	Alexandra Pde	Btwn Nicholson St to Brunswick St	Eastbound	48,000	1,700	1,200	52,000
8	Alexandra Pde	Btwn Nicholson St to Brunswick St	Westbound	48,000	1,600	1,100	51,000
9	Alexandra Pde	Btwn Queens Pde to Hoddle St	Eastbound	42,000	1,500	1,000	45,000
10	Alexandra Pde	Btwn Queens Pde to Hoddle St	Westbound	38,000	1,300	900	41,000
11	Anderson St	Btwn James St to Porter St	North Bound	10,000	1,000	200	11,000
12	Anderson St	Btwn James St to Porter St	South Bound	11,000	1,100	150	13,000
13	Andersons Creek Rd	Reynolds Rd to Warrandyte Rd	North Bound	6,000	500	150	7,000
14	Andersons Creek Rd	Reynolds Rd to Warrandyte Rd	South Bound	6,000	500	250	7,000
15	Andersons Creek Rd	Blackburn Rd to Reynolds Rd	North Bound	6,000	300	150	6,000
16	Andersons Creek Rd	Blackburn Rd to Reynolds Rd	South Bound	6,000	300	150	6,000
17	Balwyn Rd	Btwn Belmore Rd to Whitehorse Rd	North Bound	12,000	600	150	13,000
18	Balwyn Rd	Btwn Belmore Rd to Whitehorse Rd	South Bound	12,000	600	150	13,000
19	Balwyn Rd	Btwn Doncaster Rd to Belmore Rd	North Bound	9,000	900	150	10,000
20	Balwyn Rd	Btwn Doncaster Rd to Belmore Rd	South Bound	9,000	1,000	150	10,000
21	Banksia St	Btwn Mount St to Hawdon St	East Bound	26,000	2,500	500	29,000
22	Banksia St	Btwn Mount St to Hawdon St	West Bound	31,000	2,100	500	33,000
23	Banksia St	At Yarra River	East Bound	45,000	3,400	1,500	50,000
24	Banksia St	At Yarra River	West Bound	42,000	2,200	1,600	46,000
25	Bell St	Station St to Oriel Rd	East Bound	30,000	2,700	600	33,000
26	Bell St	Station St to Oriel Rd	West Bound	31,000	2,200	500	34,000
27	Bell St	Studley Rd to Rail Line	East Bound	26,000	1,700	500	29,000
28	Bell St	Studley Rd to Rail Line	West Bound	30,000	2,200	600	33,000
29	Bell St	Btwn Plenty Rd to Albert St	East Bound	31,000	1,900	700	34,000
30	Bell St	Btwn Plenty Rd to Albert St	West Bound	29,000	2,200	600	32,000
31	Bell St	Oriel Rd to Waterdale Rd	East Bound	27,000	1,800	900	29,000
32	Bell St	Oriel Rd to Waterdale Rd	West Bound	27,000	2,200	600	30,000
33	Bell St	Waterdale Rd to Upper Heidelberg Rd	East Bound	33,000	2,100	700	35,000
34	Bell St	Waterdale Rd to Upper Heidelberg Rd	West Bound	32,000	3,000	700	36,000
35	Bell St	Btwn High St to Plenty Rd	Eastbound	37,000	1,000	700	38,000
36	Bell St	Btwn High St to Plenty Rd	Westbound	35,000	1,000	700	37,000
37	Belmore Rd	Btwn Union Rd to Winfield Rd	North Bound	8,000	250	100	9,000
38	Belmore Rd	Btwn Union Rd to Winfield Rd	South Bound	8,000	200	100	8,000
39	Belmore Rd	Btwn Burke Rd to Balwyn Rd	Eastbound	13,000	350	100	14,000
40	Belmore Rd	Btwn Burke Rd to Balwyn Rd	Westbound	12,000	250	150	12,000
41	Blackburn Rd	Eastern Fwy to Doncaster Rd	North Bound	15,000	700	300	16,000
42	Blackburn Rd	Eastern Fwy to Doncaster Rd	South Bound	15,000	900	300	16,000
43	Blackburn Rd	Doncaster Rd to Andersons Creek Rd	North Bound	16,000	800	250	19,000
44	Blackburn Rd	Doncaster Rd to Andersons Creek Rd	South Bound	17,000	800	250	19,000
45	Blackburn Rd	Reynolds Rd to Andersons Creek Rd	North Bound	12,000	1,200	300	13,000
46	Blackburn Rd	Reynolds Rd to Andersons Creek Rd	South Bound	11,000	1,100	250	12,000
47	Bolton St	Bridge St to Main Rd	North Bound	13,000	1,000	200	15,000
48	Bolton St	Bridge St to Main Rd	South Bound	13,000	800	250	15,000
49	Bridge St	Bolton St to Main Rd	East Bound	11,000	700	150	12,000
50	Bridge St	Bolton St to Main Rd	West Bound	10,000	900	150	11,000
51	Bridge St	Btwn Manningham St to Templestowe Rd	East Bound	13,000	600	150	13,000
52	Bridge St	Btwn Manningham St to Templestowe Rd	West Bound	12,000	400	300	12,000
53	Broadway	Btwn High St to Bolderwood Pde	East Bound	11,000	1,600	1,200	15,000
54	Broadway	Btwn High St to Bolderwood Pde	West Bound	18,000	2,500	1,400	23,000
55	Bulleen Rd	Eastern Fwy to Manningham Rd	North Bound	27,000	1,900	1,100	30,000
56	Bulleen Rd	Eastern Fwy to Manningham Rd	South Bound	24,000	2,100	800	26,000
57	Bulleen Rd	Doncaster Rd to Eastern Fwy	North Bound	9,000	350	150	9,000
58	Bulleen Rd	Doncaster Rd to Eastern Fwy	South Bound	8,000	400	150	8,000
59	Burgundy St	Rosanna Rd to Upper Heidelberg Rd	East Bound	10,000	700	700	11,000
60	Burgundy St	Rosanna Rd to Upper Heidelberg Rd	West Bound	7,000	500	150	7,000
61	Burke Rd	Btwn Harp Rd to Cotham Rd	North Bound	20,000	1,000	250	21,000
62	Burke Rd	Btwn Harp Rd to Cotham Rd	South Bound	20,000	1,000	250	21,000
63	Burke Rd	Eastern Fwy to Lower Heidelberg Rd	North Bound	22,000	1,600	250	24,000
64	Burke Rd	Eastern Fwy to Lower Heidelberg Rd	South Bound	24,000	1,300	250	25,000
65	Burke Rd	Doncaster Rd to Eastern Fwy	North Bound	18,000	1,200	350	19,000
66	Burke Rd	Doncaster Rd to Eastern Fwy	South Bound	20,000	900	200	21,000
67	Burke Rd	Btwn High St to Harp Rd	Northbound	19,000	600	200	19,000
68	Burke Rd	Btwn High St to Harp Rd	Southbound	18,000	600	200	19,000
69	Bush Blvd	McDonalds Rd to Plenty Rd	North Bound	13,000	800	150	14,000
70	Bush Blvd	McDonalds Rd to Plenty Rd	South Bound	11,000	700	150	11,000
71	Chandler Hwy	Eastern Fwy to Heidelberg Rd	North Bound	39,000	3,100	800	43,000
72	Chandler Hwy	Eastern Fwy to Heidelberg Rd	South Bound	36,000	2,100	800	39,000
73	Chapman St	Btwn Ellesmere Pde to Thomson Dr	East Bound	10,000	800	100	10,000
74	Chapman St	Btwn Ellesmere Pde to Thomson Dr	West Bound	10,000	700	100	11,000
75	Cherry St	Btwn Waiora Rd to Wungan St	East Bound	5,000	250	100	6,000
76	Cherry St	Btwn Waiora Rd to Wungan St	West Bound	4,000	200	100	6,000
77	Childs Rd	Dalton Rd to Plenty Rd	East Bound	26,000	700	150	27,000
78	Childs Rd	Dalton Rd to Plenty Rd	West Bound	25,000	1,200	200	26,000
79	Cooper St	Edgars Rd to High St	East Bound	23,000	900	800	25,000
80	Cooper St	Edgars Rd to High St	West Bound	24,000	1,600	600	26,000
81	Cooper St	Hume Fwy to Edgars Rd	East Bound	22,000	2,800	1,300	26,000
82	Cooper St	Hume Fwy to Edgars Rd	West Bound	25,000	2,400	1,200	29,000
83	Cotham Rd	Btwn Glenferrie Rd to Burke Rd	Eastbound	12,000	200	100	12,000

Base 2036

No	Road	Location	Direction	2036 Daily 24 hours Cars	LCV	HCV	Total
84	Cotham Rd	Btwn Glenferrie Rd to Burke Rd	Westbound	12,000	200	100	12,000
85	Cotham Rd	Btwn HighSt to Glenferrie Rd	Eastbound	10,000	150	100	10,000
86	Cotham Rd	Btwn HighSt to Glenferrie Rd	Westbound	11,000	150	100	11,000
87	Dalton Rd	North of Metropolitan Ring Rd	North Bound	33,000	1,000	500	35,000
88	Dalton Rd	North of Metropolitan Ring Rd	South Bound	30,000	7,500	700	38,000
89	Dalton Rd	Btwn Childs Rd to McKimmies Rd	North Bound	26,000	1,800	400	28,000
90	Dalton Rd	Btwn Childs Rd to McKimmies Rd	South Bound	26,000	1,600	400	28,000
91	Dalton Rd	Btwn Keon Pde to Settlement Rd	North Bound	24,000	1,800	500	26,000
92	Dalton Rd	Btwn Keon Pde to Settlement Rd	South Bound	26,000	3,600	600	30,000
93	Dalton Rd	Btwn Settlement Rd to M80	North Bound	38,000	3,300	1,000	43,000
94	Dalton Rd	Btwn Settlement Rd to M80	South Bound	32,000	2,400	800	36,000
95	Dalton Rd	South of Cooper St	North Bound	18,000	700	150	19,000
96	Dalton Rd	South of Cooper St	South Bound	9,000	350	150	9,000
97	Darebin Rd	At Darebin Creek	East Bound	13,000	1,200	200	15,000
98	Darebin Rd	At Darebin Creek	West Bound	12,000	900	150	13,000
99	Darebin Rd	Btwn High St to Station St	East Bound	10,000	500	150	11,000
100	Darebin Rd	Btwn High St to Station St	West Bound	11,000	600	150	12,000
101	Darebin Rd	Btwn Station St to Grange Rd	Eastbound	17,000	700	600	19,000
102	Darebin Rd	Btwn Station St to Grange Rd	Westbound	17,000	700	600	19,000
103	Diamond Creek Rd	Btwn Civic Drive to Yan Yean Rd	East Bound	28,000	2,400	400	31,000
104	Diamond Creek Rd	Btwn Civic Drive to Yan Yean Rd	West Bound	29,000	2,100	800	32,000
105	Diamond Creek Rd	Btwn St Helena Rd to Greensborough Bypass	North Bound	19,000	1,300	500	21,000
106	Diamond Creek Rd	Btwn St Helena Rd to Greensborough Bypass	South Bound	15,000	1,100	400	17,000
107	Diamond Creek Rd	Btwn Yan Yean Rd to Ryans Rd	East Bound	21,000	900	700	22,000
108	Diamond Creek Rd	Btwn Yan Yean Rd to Ryans Rd	West Bound	22,000	1,500	1,200	25,000
109	Doncaster Rd	East of Eastern Fwy	East Bound	15,000	500	250	15,000
110	Doncaster Rd	East of Eastern Fwy	West Bound	15,000	700	200	16,000
111	Doncaster Rd	Btwn Middleborough Rd to Station St	East Bound	21,000	700	300	22,000
112	Doncaster Rd	Btwn Middleborough Rd to Station St	West Bound	20,000	1,000	250	21,000
113	Doncaster Rd	Btwn Balwyn Rd to Eastern Fwy	East Bound	14,000	600	250	15,000
114	Doncaster Rd	Btwn Balwyn Rd to Eastern Fwy	West Bound	21,000	900	400	22,000
115	Doncaster Rd	Btwn Blackburn Rd to Springvale Rd	East Bound	19,000	1,300	300	21,000
116	Doncaster Rd	Btwn Blackburn Rd to Springvale Rd	West Bound	20,000	900	300	21,000
117	Doncaster Rd	Btwn Blackburn Rd to Wetherby Rd	East Bound	19,000	1,100	200	20,000
118	Doncaster Rd	Btwn Blackburn Rd to Wetherby Rd	West Bound	18,000	1,000	200	19,000
119	Doncaster Rd	btw Balwyn Rd to Bulleen Rd	Eastbound	13,000	300	150	13,000
120	Doncaster Rd	btw Balwyn Rd to Bulleen Rd	Westbound	12,000	300	150	13,000
121	Drysdale St	Btwn Greensborough Rd to Borlase St	East Bound	1,000	100	100	1,500
122	Drysdale St	Btwn Greensborough Rd to Borlase St	West Bound	1,000	100	100	1,000
123	Dunne St	At Darebin Creek	East Bound	5,000	400	150	7,000
124	Dunne St	At Darebin Creek	West Bound	6,000	300	150	7,000
125	Earl St	Btwn Princess St to Willsmere Rd	North Bound	10,000	400	150	10,000
126	Earl St	Btwn Princess St to Willsmere Rd	South Bound	12,000	800	150	12,000
127	astern Fwy Midblock: Collector Distribut	Middleborough Rd to Tram Rd	East Bound				
128	astern Fwy Midblock: Collector Distribut	Middleborough Rd to Tram Rd	West Bound				
129	astern Fwy Midblock: Collector Distribut	Tram Rd to Elgar Rd	East Bound				
130	astern Fwy Midblock: Collector Distribut	Elgar Rd to Doncaster Rd	East Bound				
131	astern Fwy Midblock: Collector Distribut	Elgar Rd to Doncaster Rd	West Bound				
132	astern Fwy Midblock: Collector Distribut	Doncaster Rd to Bulleen Rd	East Bound				
133	astern Fwy Midblock: Collector Distribut	Doncaster Rd to Bulleen Rd	West Bound				
134	astern Fwy Midblock: Collector Distribut	Under Doncaster Rd	East Bound				
135	astern Fwy Midblock: Collector Distribut	Under Doncaster Rd	West Bound				
136	Eastern Fwy Midblock: Mainline	Middleborough Rd to Tram Rd	East Bound				
137	Eastern Fwy Midblock: Mainline	Middleborough Rd to Tram Rd	West Bound				
138	Eastern Fwy Midblock: Mainline	Tram Rd to Elgar Rd	East Bound				
139	Eastern Fwy Midblock: Mainline	Elgar Rd to Doncaster Rd	East Bound				
140	Eastern Fwy Midblock: Mainline	Elgar Rd to Doncaster Rd	West Bound				
141	Eastern Fwy Midblock: Mainline	Doncaster Rd to Bulleen Rd	East Bound				
142	Eastern Fwy Midblock: Mainline	Doncaster Rd to Bulleen Rd	West Bound				
143	Eastern Fwy Midblock: Mainline	Under Doncaster Rd	East Bound				
144	Eastern Fwy Midblock: Mainline	Under Doncaster Rd	West Bound				
145	Eastern Fwy Midblock	Springvale Rd to Blackburn Rd	East Bound	77,000	3,400	2,900	84,000
146	Eastern Fwy Midblock	Springvale Rd to Blackburn Rd	West Bound	78,000	3,200	2,700	85,000
147	Eastern Fwy Midblock	Blackburn Rd to Middleborough Rd	East Bound	85,000	3,600	3,200	93,000
148	Eastern Fwy Midblock	Blackburn Rd to Middleborough Rd	West Bound	89,000	3,500	3,000	96,000
149	Eastern Fwy Midblock	Middleborough Rd to Tram Rd	East Bound	89,000	3,800	2,900	97,000
150	Eastern Fwy Midblock	Middleborough Rd to Tram Rd	West Bound	93,000	3,600	2,900	100,000
151	Eastern Fwy Midblock	Tram Rd to Elgar Rd	East Bound	74,000	3,300	2,900	81,000
152	Eastern Fwy Midblock	Tram Rd to Elgar Rd	West Bound	78,000	3,300	2,700	85,000
153	Eastern Fwy Midblock	Elgar Rd to Doncaster Rd	East Bound	84,000	3,500	2,700	91,000
154	Eastern Fwy Midblock	Elgar Rd to Doncaster Rd	West Bound	88,000	3,500	2,700	96,000
155	Eastern Fwy Midblock	Doncaster Rd to Bulleen Rd	East Bound	85,000	3,500	2,600	91,000
156	Eastern Fwy Midblock	Doncaster Rd to Bulleen Rd	West Bound	86,000	3,400	2,700	93,000
157	Eastern Fwy Midblock	Bulleen Rd to Burke Rd	East Bound	76,000	2,700	1,400	82,000
158	Eastern Fwy Midblock	Bulleen Rd to Burke Rd	West Bound	80,000	2,700	1,400	85,000
159	Eastern Fwy Midblock	Burke Rd to Chandler Hwy	East Bound	87,000	2,900	1,600	93,000
160	Eastern Fwy Midblock	Burke Rd to Chandler Hwy	West Bound	88,000	2,800	1,500	94,000
161	Eastern Fwy Midblock	Chandler Hwy to Hoddle St	East Bound	80,000	2,800	1,100	85,000
162	Eastern Fwy Midblock	Chandler Hwy to Hoddle St	West Bound	72,000	2,600	1,100	76,000
163	Eastern Fwy Midblock	Under Springale Rd	East Bound	54,000	700	2,100	57,000
164	Eastern Fwy Midblock	Under Springale Rd	West Bound	56,000	2,400	2,000	61,000
165	Eastern Fwy Midblock	Under Middlelborough Rd	East Bound	78,000	3,200	2,600	85,000
166	Eastern Fwy Midblock	Under Middlelborough Rd	West Bound	81,000	3,000	2,800	87,000

Base 2036

No	Road	Location	Direction	2036 Daily			
				24 hours			
				Cars	LCV	HCV	Total
167	Eastern Fwy Midblock	Under Doncaster Rd	East Bound	77,000	3,000	2,500	83,000
168	Eastern Fwy Midblock	Under Doncaster Rd	West Bound	78,000	3,000	2,500	85,000
169	Eastern Fwy Midblock	Under Bulleen Rd	East Bound	64,000	2,000	1,200	69,000
170	Eastern Fwy Midblock	Under Bulleen Rd	West Bound	67,000	1,500	1,200	71,000
171	Eastern Fwy Midblock	Under Chandler Hwy	East Bound	69,000	2,000	900	73,000
172	Eastern Fwy Midblock	Under Chandler Hwy	West Bound	68,000	700	800	71,000
173	Eastern Fwy Ramp	C2 - EB Entry Ramp At Chandler Hwy	East Bound	20,000	1,500	1,100	23,000
174	Eastern Fwy Ramp	D2 - EB Entry Ramp At Doncaster Rd	East Bound	10,000	600	350	11,000
175	Eastern Fwy Ramp	U2 - EB Entry Ramp At Thompsons Rd	East Bound	15,000	2,200	1,000	18,000
176	Eastern Fwy Ramp	T1 - EB Entry Ramp At Tram Rd	East Bound	18,000	900	250	19,000
177	Eastern Fwy Ramp	W2 - EB Entry Ramp At Wetherby Rd	East Bound	8,000	600	200	9,000
178	Eastern Fwy Ramp	A1 - EB Exit Ramp At Blackburn Rd	East Bound	12,000	800	250	12,000
179	Eastern Fwy Ramp	U1 - EB Exit Ramp At Bulleen Rd	East Bound	12,000	900	250	13,000
180	Eastern Fwy Ramp	B1 - EB Exit Ramp At Burke Rd	East Bound	8,000	500	150	9,000
181	Eastern Fwy Ramp	C1 - EB Exit Ramp At Chandler Hwy	East Bound	12,000	1,000	200	13,000
182	Eastern Fwy Ramp	D1 - EB Exit Ramp At Doncaster Rd	East Bound	8,000	600	150	9,000
183	Eastern Fwy Ramp	E1 - EB Exit Ramp At Elgar Rd	East Bound	11,000	700	150	12,000
184	Eastern Fwy Ramp	S1 - EB Exit Ramp At Springvale Rd	East Bound	24,000	2,300	700	27,000
185	Eastern Fwy Ramp	W1 - EB Exit Ramp At Wetherby Rd	East Bound	12,000	600	300	12,000
186	Eastern Fwy Ramp	U4 - WB Entry Ramp At Bulleen Rd	West Bound	13,000	700	400	14,000
187	Eastern Fwy Ramp	C4 - WB Entry Ramp At Chandler Hwy	West Bound	7,000	600	150	7,000
188	Eastern Fwy Ramp	D4 - WB Entry Ramp At Doncaster Rd	West Bound	8,000	700	150	9,000
189	Eastern Fwy Ramp	E2 - WB Entry Ramp At Elgar Rd	West Bound	11,000	600	150	12,000
190	Eastern Fwy Ramp	W4 - WB Entry Ramp At Middleborough Rd	West Bound	12,000	600	200	13,000
191	Eastern Fwy Ramp	S4 - WB Entry Ramp At Springvale Rd	West Bound	24,000	800	800	26,000
192	Eastern Fwy Ramp	A2 - WB Entry Ramp At Surrey rd	West Bound	11,000	500	200	12,000
193	Eastern Fwy Ramp	B2 - WB Entry Ramp At Burke Rd	West Bound	8,000	800	150	9,000
194	Eastern Fwy Ramp	U3 - WB Exit Ramp At Bulleen Rd	West Bound	20,000	1,800	1,400	23,000
195	Eastern Fwy Ramp	C3 - WB Exit Ramp At Chandler Hwy	West Bound	21,000	2,000	800	24,000
196	Eastern Fwy Ramp	D3 - WB Exit Ramp At Doncaster Rd	West Bound	11,000	500	250	11,000
197	Eastern Fwy Ramp	W3 - WB Exit Ramp At Middleborough Rd	West Bound	8,000	700	200	9,000
198	Eastern Fwy Ramp	T2 - WB Exit Ramp At Station St	West Bound	15,000	600	250	16,000
199	Edgars Rd	South of Cooper St	North Bound	27,000	1,400	250	29,000
200	Edgars Rd	South of Cooper St	South Bound	26,000	1,300	250	27,000
201	Edgars Rd	North of Metropolitan Ring Rd	North Bound	29,000	1,700	400	31,000
202	Edgars Rd	North of Metropolitan Ring Rd	South Bound	26,000	2,100	250	28,000
203	Elder St	Btwn Papua St to Longmuir Rd	East Bound	5,000	300	100	5,000
204	Elder St	Btwn Papua St to Longmuir Rd	West Bound	4,000	300	100	4,000
205	Elgar Rd	North of Eastern Fwy	North Bound	14,000	500	250	15,000
206	Elgar Rd	North of Eastern Fwy	South Bound	12,000	400	500	13,000
207	Elgar Rd	Btwn Belmore Rd to Eastern Fwy	North Bound	21,000	1,100	250	23,000
208	Elgar Rd	Btwn Belmore Rd to Eastern Fwy	South Bound	21,000	1,000	150	22,000
209	Elgar Rd	Btwn Belmore Rd to Whitehorse Rd	North Bound	17,000	800	200	19,000
210	Elgar Rd	Btwn Belmore Rd to Whitehorse Rd	South Bound	18,000	1,000	150	19,000
211	Eltham-Yarra Glen Rd	North of Donaldson Rd	Northbound	8,000	600	200	8,000
212	Eltham-Yarra Glen Rd	North of Donaldson Rd	South Bound	7,000	800	150	8,000
213	Eltham-Yarra Glen Rd	North of Henley Rd	North Bound	2,500	250	150	3,000
214	Eltham-Yarra Glen Rd	North of Henley Rd	South Bound	2,500	400	150	3,000
215	Eltham-Yarra Glen Rd	vn Kangaroo Ground-St Andrews Rd to Henley	East Bound	3,000	350	150	4,000
216	Eltham-Yarra Glen Rd	vn Kangaroo Ground-St Andrews Rd to Henley	West Bound	3,000	800	150	4,000
217	Erskine Rd	Btwn Ferguseon St to Argyle St	East Bound	5,000	150	100	6,000
218	Erskine Rd	Btwn Ferguseon St to Argyle St	West Bound	4,000	200	100	5,000
219	Fitzsimons Ln	At Yarra River	North Bound	37,000	4,600	900	42,000
220	Fitzsimons Ln	At Yarra River	South Bound	38,000	1,800	500	40,000
221	Foote St	West Of Fitzsimons Ln	East Bound	11,000	1,100	150	12,000
222	Foote St	West Of Fitzsimons Ln	West Bound	10,000	800	150	11,000
223	Gorge Rd	At Plenty River	East Bound	10,000	700	150	10,000
224	Gorge Rd	At Plenty River	West Bound	9,000	1,000	200	10,000
225	Grange Rd	Btwn Darebin Rd to Heidelberg Rd	North Bound	23,000	1,400	1,100	25,000
226	Grange Rd	Btwn Darebin Rd to Heidelberg Rd	South Bound	16,000	1,100	700	18,000
227	Greensborough Bypass	Btwn M80 Interchange to Diamond Creek Rd	East Bound	32,000	1,500	500	34,000
228	Greensborough Bypass	Btwn M80 Interchange to Diamond Creek Rd	West Bound	36,000	2,200	600	39,000
229	Greensborough Highway	Btwn Grimshaw St to M80	North Bound	45,000	3,700	1,500	50,000
230	Greensborough Highway	Btwn Grimshaw St to M80	South Bound	47,000	3,600	1,700	53,000
231	Greensborough Rd	Btwn Erskine Rd to Strathallan Rd	North Bound	33,000	1,400	1,000	35,000
232	Greensborough Rd	Btwn Erskine Rd to Strathallan Rd	South Bound	33,000	1,400	1,100	35,000
233	Greensborough Rd	Btwn Strathallan Rd to Yallambie Rd	North Bound	34,000	1,400	1,000	37,000
234	Greensborough Rd	Btwn Strathallan Rd to Yallambie Rd	South Bound	34,000	1,400	1,100	37,000
235	Greensborough Rd	Btwn Lower Plenty Rd to Erskine Rd	North bound	33,000	1,400	1,000	35,000
236	Greensborough Rd	Btwn Lower Plenty Rd to Erskine Rd	South bound	33,000	1,500	1,300	35,000
237	Greensborough Rd	Btwn Watsonia Rd to Grimshaw St	North Bound	34,000	3,800	1,400	39,000
238	Greensborough Rd	Btwn Watsonia Rd to Grimshaw St	South Bound	36,000	2,500	1,600	40,000
239	Greensborough Rd	Btwn Santon St to Teresa St	North Bound	1,500	100	100	1,500
240	Greensborough Rd	Btwn Santon St to Teresa St	South Bound	1,500	100	100	1,500
241	Greensborough Rd	South Of Watsonia Rd	North Bound	35,000	3,600	1,400	40,000
242	Greensborough Rd	South Of Watsonia Rd	South Bound	36,000	4,100	1,700	41,000
243	Greensborough Rd	Under Grimshaw St	North Bound				
244	Greensborough Rd	Under Grimshaw St	South Bound				
245	Greensborough Rd	North of Grimshaw St	North Bound				
246	Greensborough Rd	North of Grimshaw St	South Bound				
247	Greensborough Rd	at Simpsons Barracks	Northbound	33,000	1,500	1,300	36,000
248	Greensborough Rd	at Simpsons Barracks	Southbound	34,000	1,700	1,500	37,000
249	Greenwood Dr	Btwn Gresswell Park Dr to Ladd St	East Bound	3,000	200	100	3,500

Base 2036

No	Road	Location	Direction	2036 Daily			
				24 hours			
				Cars	LCV	HCV	Total
250	Greenwood Dr	Btwn Gresswell Park Dr to Ladd St	West Bound	3,000	150	100	3,500
251	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	East Bound	15,000	1,200	250	17,000
252	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	West Bound	15,000	700	150	16,000
253	Grimshaw St	Btwn Greensborough Hwy to The Circuit	East Bound	26,000	1,200	250	27,000
254	Grimshaw St	Btwn Greensborough Hwy to The Circuit	West Bound	20,000	1,100	600	21,000
255	Grimshaw St	Btwn Watsonia Rd to Greensborough Hwy	East Bound	15,000	900	300	16,000
256	Grimshaw St	Btwn Watsonia Rd to Greensborough Hwy	West Bound	14,000	700	300	14,000
257	Grimshaw St	Btwn Main St to Para Rd	East Bound	1,500	150	100	3,000
258	Grimshaw St	Btwn Main St to Para Rd	West Bound	11,000	800	200	13,000
259	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	East Bound	16,000	1,600	250	18,000
260	Grimshaw St	Btwn Plenty Rd to Watsonia Rd	West Bound	15,000	1,000	150	16,000
261	Heidelberg Rd	At Darebin Creek	North Bound	17,000	600	150	18,000
262	Heidelberg Rd	At Darebin Creek	South Bound	18,000	1,100	150	19,000
263	Heidelberg Rd	Btwn Hoddle St to Station St	East Bound	22,000	1,700	300	24,000
264	Heidelberg Rd	Btwn Hoddle St to Station St	West Bound	25,000	1,900	300	27,000
265	Heidelberg-Kinglake Rd	North of Main Hurstbridge Rd	North Bound	2,500	200	100	2,500
266	Heidelberg-Kinglake Rd	North of Main Hurstbridge Rd	South Bound	2,500	250	150	2,500
267	Heidelberg-Kinglake Rd	vn Kangaroo Ground-Wattle Glen Rd to Wilson	North Bound	8,000	900	300	9,000
268	Heidelberg-Kinglake Rd	vn Kangaroo Ground-Wattle Glen Rd to Wilson	South Bound	7,000	900	300	8,000
269	Heidelberg-Warrandyte Rd	At Mullum Mullum Creek	North Bound	6,000	700	150	6,000
270	Heidelberg-Warrandyte Rd	At Mullum Mullum Creek	South Bound	6,000	1,300	150	7,000
271	High St	South of Cooper St	North Bound	31,000	1,100	400	32,000
272	High St	South of Cooper St	South Bound	32,000	1,100	500	34,000
273	High St	North of Settlement Rd	North Bound	24,000	900	900	26,000
274	High St	North of Settlement Rd	South Bound	24,000	600	1,400	26,000
275	High St	Btwn Doncaster Rd to Manningham Rd	North Bound	14,000	700	150	14,000
276	High St	Btwn Doncaster Rd to Manningham Rd	South Bound	12,000	350	200	13,000
277	High St	Btwn Keon Pde to Broadway	North Bound	28,000	1,500	1,000	30,000
278	High St	Btwn Keon Pde to Broadway	South Bound	24,000	2,200	800	27,000
279	High St	Btwn Mahoneys Rd to Settlement Rd	North Bound	23,000	900	2,300	25,000
280	High St	Btwn Mahoneys Rd to Settlement Rd	South Bound	23,000	1,400	700	25,000
281	High St	Btwn Westgarth St to Queens Pde	North Bound	21,000	1,100	200	22,000
282	High St	Btwn Westgarth St to Queens Pde	South Bound	21,000	1,200	200	23,000
283	High St	Btwn Cotham Rd to Parkhill Rd	Eastbound	15,000	200	100	15,000
284	High St	Btwn Cotham Rd to Parkhill Rd	Westbound	14,000	200	100	15,000
285	High St	Btwn Harp Rd to Burke Rd	Eastbound	9,000	150	100	10,000
286	High St	Btwn Harp Rd to Burke Rd	Westbound	11,000	150	100	11,000
287	Hoddle St	Btwn Heidelberg Rd to Eastern Fwy	North Bound	25,000	1,200	250	26,000
288	Hoddle St	Btwn Heidelberg Rd to Eastern Fwy	South Bound	21,000	1,700	200	23,000
289	Hoddle St	Btwn Eastern Fwy to Johnston St	Northbound	52,000	2,200	500	55,000
290	Hoddle St	Btwn Eastern Fwy to Johnston St	Southbound	52,000	2,200	500	55,000
291	Hoddle St	Btwn Johnston St to Victoria St	Northbound	50,000	2,100	400	53,000
292	Hoddle St	Btwn Johnston St to Victoria St	Southbound	52,000	2,100	500	55,000
293	Hoddle St	Btwn Victoria St to Bridge Rd	Northbound	39,000	1,200	400	41,000
294	Hoddle St	Btwn Victoria St to Bridge Rd	Southbound	40,000	1,100	350	42,000
295	Hume Fwy	Btwn M80 Ring Rd to Cooper St	North Bound	60,000	2,800	5,700	69,000
296	Hume Fwy	Btwn M80 Ring Rd to Cooper St	South Bound	62,000	2,500	5,600	70,000
297	Hume Fwy	North of Cooper St	North Bound	58,000	2,300	4,200	64,000
298	Hume Fwy	North of Cooper St	South Bound	58,000	1,900	4,100	64,000
299	Jika St	Btwn Rosanna Rd to Banksia St	Northbound	10,000	500	150	10,000
300	Jika St	Btwn Rosanna Rd to Banksia St	South Bound	16,000	1,100	200	18,000
301	Johnston St	Btwn Wellington St to Hoddle St	Eastbound	10,000	400	150	11,000
302	Johnston St	Btwn Wellington St to Hoddle St	Westbound	11,000	350	150	11,000
303	Kangaroo Ground-St Andrews Rd	n Kangaroo Ground-Wattle Glen Rd to Dawsor	North Bound	2,500	700	150	3,500
304	Kangaroo Ground-St Andrews Rd	n Kangaroo Ground-Wattle Glen Rd to Dawsor	South Bound	3,000	400	150	3,500
305	Kangaroo Ground-Warrandyte Rd	Near Pigeon Bank Rd	North Bound	6,000	350	150	6,000
306	Kangaroo Ground-Warrandyte Rd	Near Pigeon Bank Rd	South Bound	6,000	300	150	6,000
307	Kangaroo Ground-Warrandyte Rd	At Yarra River	North Bound	13,000	500	250	14,000
308	Kangaroo Ground-Warrandyte Rd	At Yarra River	South Bound	12,000	800	250	13,000
309	Kangaroo Ground-Wattle Glen Rd	lelberg-Kinglake Rd to Kangaroo Ground-St Ar	East Bound	6,000	300	150	6,000
310	Kangaroo Ground-Wattle Glen Rd	lelberg-Kinglake Rd to Kangaroo Ground-St Ar	West Bound	5,000	1,100	250	7,000
311	Karingal Drive	East Of St Helena Rd	North Bound	15,000	1,100	300	16,000
312	Karingal Drive	East Of St Helena Rd	South Bound	14,000	1,200	400	15,000
313	Keon Pde	Btwn High St to Dalton Rd	East Bound	13,000	1,900	500	15,000
314	Keon Pde	Btwn High St to Dalton Rd	West Bound	12,000	1,500	300	13,000
315	King St	East of Williamsons Rd	East Bound	9,000	800	250	10,000
316	King St	East of Williamsons Rd	West Bound	7,000	500	100	8,000
317	Kingsbury Drive	East Of Waterdale Rd	East Bound	11,000	700	150	12,000
318	Kingsbury Drive	East Of Waterdale Rd	West Bound	9,000	500	300	10,000
319	Kingsbury Drive	West of Waterdale Rd	East Bound	19,000	900	400	21,000
320	Kingsbury Drive	West of Waterdale Rd	West Bound	18,000	1,000	350	20,000
321	Livingstone St	Btwn Oriel Rd to Waterdale Rd	East Bound	9,000	400	150	9,000
322	Livingstone St	Btwn Oriel Rd to Waterdale Rd	West Bound	8,000	250	150	8,000
323	Lower Heidelberg Rd	Btwn Maltravers Rd to The Eyrie	North Bound	21,000	1,000	250	22,000
324	Lower Heidelberg Rd	Btwn Maltravers Rd to The Eyrie	South Bound	20,000	1,000	400	21,000
325	Lower Heidelberg Rd	Near Ivanhoe Park	East Bound	8,000	300	100	8,000
326	Lower Heidelberg Rd	Near Ivanhoe Park	West Bound	6,000	300	100	7,000
327	Lower Plenty Rd	Btwn Greensborough Rd to Para Rd	East Bound	18,000	1,200	300	20,000
328	Lower Plenty Rd	Btwn Greensborough Rd to Para Rd	West Bound	19,000	700	300	20,000
329	Lower Plenty Rd	Btwn Rosanna Rd to Greensborough Rd	East Bound	39,000	1,400	1,300	42,000
330	Lower Plenty Rd	Btwn Rosanna Rd to Greensborough Rd	West Bound	39,000	1,500	1,500	42,000
331	Lower Plenty Rd	Btwn Turnham Ave to Rosanna Rd	East Bound	11,000	600	150	11,000
332	Lower Plenty Rd	Btwn Turnham Ave to Rosanna Rd	West Bound	12,000	400	150	13,000

Base 2036

No	Road	Location	Direction	2036 Daily 24 hours Cars	LCV	HCV	Total
333	M80 Ring Rd	Dalton Rd to Plenty Rd	East bound	69,000	2,500	2,100	74,000
334	M80 Ring Rd	Dalton Rd to Plenty Rd	West bound	70,000	2,500	2,000	74,000
335	M80 Ring Rd	Dalton Rd to Edgars Rd	East Bound	82,000	3,400	3,100	88,000
336	M80 Ring Rd	Dalton Rd to Edgars Rd	West Bound	79,000	3,200	2,900	85,000
337	M80 Ring Rd	Edgars Rd to Hume Fwy	East Bound	104,000	4,200	4,100	112,000
338	M80 Ring Rd	Edgars Rd to Hume Fwy	West Bound	96,000	3,800	3,900	103,000
339	M80 Ring Rd	Hume Fwy to Sydney Rd	East Bound	108,000	4,600	7,300	120,000
340	M80 Ring Rd	Hume Fwy to Sydney Rd	West Bound	104,000	4,000	6,800	115,000
341	M80 Ring Rd	M80 Interchange to Plenty Rd	East Bound	61,000	2,400	2,000	65,000
342	M80 Ring Rd	M80 Interchange to Plenty Rd	West Bound	57,000	2,300	1,900	62,000
343	M80 Ring Rd: Mainline	M80 Interchange to Plenty Rd	West Bound				
344	M80 Ring Rd: Collector Distributor	M80 Interchange to Plenty Rd	West Bound				
345	M80 Ring Rd: Collector Distributor	Edgars Rd to Hume Fwy	East Bound				
346	M80 Ring Rd: Collector Distributor	Edgars Rd to Hume Fwy	West Bound				
347	M80 Ring Rd: Mainline	Edgars Rd to Hume Fwy	East Bound				
348	M80 Ring Rd: Mainline	Edgars Rd to Hume Fwy	West Bound				
349	M80-NEL interchange	X1 - M80 to NEL	0				
350	M80-NEL interchange	X2 - M80 to Greensborough Bypass/Grimshaw	0				
351	M80-NEL interchange	X3 - M80 to Greensborough Bypass	0				
352	M80-NEL interchange	X4 - NEL/Grimshaw to Greensborough Bypass	0				
353	M80-NEL interchange	X5 - Greensborough Bypass to NEL/Grimshaw	0				
354	M80-NEL interchange	X6 - Greensborough Bypass to M80	0				
355	M80-NEL interchange	X7 - Greensborough Bypass to Grimshaw	0				
356	M80-NEL interchange	X8 - M80 to Grimshaw	0				
357	M80-NEL interchange	X9 - Grimshaw to Greensborough Bypass	0				
358	M80-NEL interchange	X10 - NEL to Greensborough Bypass	0				
359	M80-NEL interchange	X11 - Grimshaw to M80/Plenty	0				
360	M80-NEL interchange	X12 - NEL to Plenty	0				
361	M80-NEL interchange	X13 - Greensborough Bypass to Plenty	0				
362	M80-NEL interchange	X14 - NEL/Greensborough Bypass to Plenty	0				
363	M80-NEL interchange	X15 - Grimshaw to Plenty	0				
364	M80-NEL interchange	X16 - Grimshaw to M80	0				
365	M80-NEL interchange	X17 - Plenty Road exit ramp	0				
366	M80-NEL interchange	X18 - NEL to M80	0				
367	M80-NEL interchange	X19 - Greensborough Bypass to M80	0				
368	Main Hurstbridge Rd	At Diamond Creek	East Bound	14,000	1,500	300	15,000
369	Main Hurstbridge Rd	At Diamond Creek	West Bound	14,000	700	250	15,000
370	Main Hurstbridge Rd	vn Ryans Rd to Kangaroo Ground-Wattle Glen	East Bound	8,000	1,100	300	10,000
371	Main Hurstbridge Rd	vn Ryans Rd to Kangaroo Ground-Wattle Glen	West Bound	8,000	1,200	300	10,000
372	Main Rd	At Plenty River	East Bound	17,000	1,100	250	18,000
373	Main Rd	At Plenty River	West Bound	17,000	600	250	18,000
374	Main Rd	East Of Ingrams Rd	East Bound	4,000	500	150	5,000
375	Main Rd	East Of Ingrams Rd	West Bound	4,000	600	150	5,000
376	Main Rd	Btwn Para Rd to Bolton St	East Bound	16,000	1,800	500	18,000
377	Main Rd	Btwn Para Rd to Bolton St	West Bound	18,000	900	700	20,000
378	Main Rd	Btwn Wattletree Rd to Bridge St	North Bound	14,000	500	350	15,000
379	Main Rd	Btwn Wattletree Rd to Bridge St	South Bound	15,000	1,000	200	16,000
380	Main Rd	East of Wattletree Rd	East Bound	12,000	700	150	13,000
381	Main Rd	East of Wattletree Rd	West Bound	12,000	1,000	250	13,000
382	Main Rd	At Diamond Creek	North Bound	16,000	900	200	17,000
383	Main Rd	At Diamond Creek	South Bound	15,000	800	150	16,000
384	Main Rd	Btwn Fitzsimons La to Bolton St	Eastbound	29,000	1,000	400	30,000
385	Main Rd	Btwn Fitzsimons La to Bolton St	Westbound	24,000	1,000	500	25,000
386	Main St	Btwn Para Rd to St Helena Rd	North Bound	18,000	2,100	300	21,000
387	Main St	Btwn Para Rd to St Helena Rd	South Bound	16,000	1,100	150	17,000
388	Manningham Rd	Btwn High St to Williamsons Rd	East Bound	26,000	1,200	700	29,000
389	Manningham Rd	Btwn High St to Williamsons Rd	West Bound	23,000	800	300	24,000
390	Manningham Rd	Btwn Thompsons Rd to High St	East Bound	22,000	1,000	1,300	25,000
391	Manningham Rd	Btwn Thompsons Rd to High St	West Bound	22,000	1,000	200	23,000
392	Manningham Rd	Btwn Bulleen Rd to Thompsons Rd	East Bound	22,000	1,600	400	25,000
393	Manningham Rd	Btwn Bulleen Rd to Thompsons Rd	West Bound	17,000	1,000	250	19,000
394	Maroondah Hwy	East Of Eastlink	East bound	26,000	600	300	27,000
395	Maroondah Hwy	East Of Eastlink	West bound	30,000	800	400	31,000
396	Maroondah Hwy	Btwn Ringwood St to Warrandyte Rd	East Bound	19,000	800	250	20,000
397	Maroondah Hwy	Btwn Ringwood St to Warrandyte Rd	West Bound	20,000	1,700	300	22,000
398	Maroondah Hwy	Btwn Mitcham Rd to Eastlink	Eastbound	37,000	1,100	400	39,000
399	Maroondah Hwy	Btwn Mitcham Rd to Eastlink	Westbound	38,000	1,000	500	39,000
400	Maroondah Hwy	Btwn Mt Dandenong Rd to Dublin Rd	Northbound	36,000	1,200	700	38,000
401	Maroondah Hwy	Btwn Mt Dandenong Rd to Dublin Rd	Southbound	38,000	1,200	700	40,000
402	McDonalds Rd	West of Pindari Ave	East Bound	12,000	600	250	13,000
403	McDonalds Rd	West of Pindari Ave	West Bound	12,000	600	250	13,000
404	Merri Pde	Btwn St Georges Rd to Westgarth St	East Bound	10,000	700	100	11,000
405	Merri Pde	Btwn St Georges Rd to Westgarth St	West Bound	12,000	700	100	13,000
406	Middleborough Rd	North of Eastern Fwy	North Bound	18,000	1,000	200	19,000
407	Middleborough Rd	North of Eastern Fwy	South Bound	18,000	800	150	19,000
408	Middleborough Rd	Btwn Whitehorse Rd to Eastern Fwy	North Bound	19,000	1,000	300	20,000
409	Middleborough Rd	Btwn Whitehorse Rd to Eastern Fwy	South Bound	18,000	1,000	350	20,000
410	Mitcham Rd At Eastern Fwy	At Eastern Fwy	North Bound	16,000	800	200	17,000
411	Mitcham Rd At Eastern Fwy	At Eastern Fwy	South Bound	17,000	900	150	18,000
412	Mt Dandenong Rd	Maroondah Hwy to Dublin Rd	East Bound	24,000	1,500	400	26,000
413	Mt Dandenong Rd	Maroondah Hwy to Dublin Rd	West Bound	23,000	1,000	350	25,000
414	Murray Rd	Btwn High St to Plenty Rd	East Bound	8,000	500	150	9,000
415	Murray Rd	Btwn High St to Plenty Rd	West Bound	10,000	500	150	10,000

Base 2036

No	Road	Location	Direction	2036 Daily 24 hours Cars	LCV	HCV	Total
416	Murray Rd	Btwn Plenty Rd to Albert St	East Bound	8,000	600	150	8,000
417	Murray Rd	Btwn Plenty Rd to Albert St	West Bound	9,000	400	150	9,000
418	Murray Rd At Darebin Creek	At Darebin Creek	East Bound	19,000	1,100	200	21,000
419	Murray Rd At Darebin Creek	At Darebin Creek	West Bound	17,000	1,300	150	19,000
420	NEL Midblock	Btwn Eastern Fwy to Manningham Rd	North Bound				
421	NEL Midblock	Btwn Eastern Fwy to Manningham Rd	South Bound				
422	NEL Midblock	Btwn Manningham Rd to Lower Plenty Rd	North Bound				
423	NEL Midblock	Btwn Manningham Rd to Lower Plenty Rd	South Bound				
424	NEL Midblock	Btwn Lower Plenty Rd to Grimshaw St	North Bound				
425	NEL Midblock	Btwn Lower Plenty Rd to Grimshaw St	South Bound				
426	NEL Midblock	Btwn Grimshaw St to M80	North Bound				
427	NEL Midblock	Btwn Grimshaw St to M80	South Bound				
428	NEL Midblock	Under Manningham Rd	North Bound				
429	NEL Midblock	Under Manningham Rd	South Bound				
430	NEL Midblock	Under Lower Plenty Rd	North Bound				
431	NEL Midblock	Under Lower Plenty Rd	South Bound				
432	NEL Midblock	Under Grimshaw St	North Bound				
433	NEL Midblock	Under Grimshaw St	South Bound				
434	NEL Ramp	U5 - NB Entry Ramp From City At Eastern Fwy	North Bound				
435	NEL Ramp	SB Exit Ramp To Eastern Suburbs at Eastern	South Bound				
436	NEL Ramp	B Entry Ramp From Eastern Suburbs at Easte	North Bound				
437	NEL Ramp	U8 - SB Exit Ramp To City at Eastern Fwy	South Bound				
438	NEL Ramp	M2 - NB Entry Ramp At Manningham Rd	North Bound				
439	NEL Ramp	M3 - SB Exit Ramp At Manningham Rd	South Bound				
440	NEL Ramp	M1 - NB Exit Ramp At Manningham Rd	North Bound				
441	NEL Ramp	M4 - SB Entry Ramp At Manningham Rd	South Bound				
442	NEL Ramp	L2 - NB Entry Ramp At Lower Plenty Rd	North Bound				
443	NEL Ramp	L3 - SB Exit Ramp At Lower Plenty Rd	South Bound				
444	NEL Ramp	L1 - NB Exit Ramp At Lower Plenty Rd	North Bound				
445	NEL Ramp	L4 - SB Entry Ramp At Lower Plenty Rd	South Bound				
446	NEL Ramp	G1 - NB Exit Ramp At Grimshaw St	North Bound				
447	NEL Ramp	G4 - SB Entry Ramp At Grimshaw St	South Bound				
448	Nell Street	Btwn Longmuir Rd to Greta Street	East Bound	1,500	100	100	1,500
449	Nell Street	Btwn Longmuir Rd to Greta Street	West Bound	1,500	150	100	1,500
450	Oriel Rd	Btwn Bell St to Livingston St	North Bound	13,000	900	150	14,000
451	Oriel Rd	Btwn Bell St to Livingston St	South Bound	12,000	1,000	150	13,000
452	Para Rd	Btwn Rattray Rd to Main Rd	North Bound	11,000	1,200	250	13,000
453	Para Rd	Btwn Rattray Rd to Main Rd	South Bound	11,000	500	150	11,000
454	Parker St	Btwn Reynolds Rd to Swilk St	East Bound	1,500	100	100	1,500
455	Parker St	Btwn Reynolds Rd to Swilk St	West Bound	1,500	100	100	1,500
456	Plenty Rd	At Darebin Creek	East Bound	25,000	800	250	26,000
457	Plenty Rd	At Darebin Creek	West Bound	25,000	800	250	26,000
458	Plenty Rd	Btwn Main Dr to Greenwood Dr	North Bound	39,000	1,900	500	42,000
459	Plenty Rd	Btwn Main Dr to Greenwood Dr	South Bound	39,000	1,600	500	41,000
460	Plenty Rd	Btwn McDonalds Rd to Bush Blvd	North Bound	35,000	2,200	400	38,000
461	Plenty Rd	Btwn McDonalds Rd to Bush Blvd	South Bound	42,000	1,100	400	43,000
462	Plenty Rd	North of Mckimmies	North Bound	44,000	5,300	800	49,000
463	Plenty Rd	North of Mckimmies	South Bound	46,000	3,200	600	50,000
464	Plenty Rd	Btwn Settlement Rd to M80 Ring Rd	North Bound	45,000	1,700	600	47,000
465	Plenty Rd	Btwn Settlement Rd to M80 Ring Rd	South Bound	31,000	1,100	500	33,000
466	Plenty Rd	Btwn Albert St to Murray Rd	Northbound	13,000	300	150	13,000
467	Plenty Rd	Btwn Albert St to Murray Rd	Southbound	15,000	300	150	15,000
468	Plenty Rd	Btwn Murray St to Bell St	Northbound	14,000	300	150	15,000
469	Plenty Rd	Btwn Murray St to Bell St	Southbound	15,000	250	150	15,000
470	Princess St	Btwn Duke St to Wills St	North Bound	19,000	900	200	20,000
471	Princess St	Btwn Duke St to Wills St	South Bound	22,000	700	250	23,000
472	Queens Pde	Btwn Hoddle St to Alexandra Pde	North Bound	9,000	700	150	10,000
473	Queens Pde	Btwn Hoddle St to Alexandra Pde	South Bound	10,000	1,100	150	11,000
474	Research-Warrandyte Rd	wn Main Rd to Kangaroo Ground-Warrandyte F	North Bound	6,000	250	100	7,000
475	Research-Warrandyte Rd	wn Main Rd to Kangaroo Ground-Warrandyte F	South Bound	5,000	300	100	6,000
476	Reynolds Rd	Btwn Blackburn Rd to Williamsons Rd	East Bound	20,000	1,400	400	22,000
477	Reynolds Rd	Btwn Blackburn Rd to Williamsons Rd	West Bound	20,000	1,300	700	22,000
478	Reynolds Rd	Btwn Blackburn Rd to Andersons Creek Rd	Eastbound	19,000	900	250	20,000
479	Reynolds Rd	Btwn Blackburn Rd to Andersons Creek Rd	Westbound	18,000	800	200	19,000
480	Ringwood Bypass	East of Eastlink	East bound	43,000	1,500	1,100	46,000
481	Ringwood Bypass	East of Eastlink	West bound	41,000	1,200	1,000	43,000
482	Ringwood Bypass	btw Ringwood St to Warrandyte Rd	Eastbound	39,000	1,600	900	41,000
483	Ringwood Bypass	btw Ringwood St to Warrandyte Rd	Westbound	38,000	1,400	900	41,000
484	Ringwood-Warrandyte Rd	South of Jumping Creek Rd	North Bound	9,000	800	150	10,000
485	Ringwood-Warrandyte Rd	South of Jumping Creek Rd	South Bound	9,000	900	150	10,000
486	Ringwood-Warrandyte Rd	Btwn Milne Rd to Tortice Dr	North Bound	12,000	1,300	250	14,000
487	Ringwood-Warrandyte Rd	Btwn Milne Rd to Tortice Dr	South Bound	12,000	1,300	250	14,000
488	Rosanna Rd	Btwn Brown St to Reid St	North Bound	25,000	1,300	1,100	28,000
489	Rosanna Rd	Btwn Brown St to Reid St	South Bound	24,000	1,300	1,300	26,000
490	Ryans Rd	Btwn Diamond Creek Rd to Allendale Rd	North Bound	9,000	300	150	10,000
491	Ryans Rd	Btwn Diamond Creek Rd to Allendale Rd	South Bound	9,000	400	100	10,000
492	Settlement Rd	At Darebin Creek	East Bound	12,000	1,300	200	13,000
493	Settlement Rd	At Darebin Creek	West Bound	11,000	1,300	150	12,000
494	Settlement Rd	Btwn Dalton Rd to High St	East Bound	7,000	800	250	8,000
495	Settlement Rd	Btwn Dalton Rd to High St	West Bound	7,000	700	250	8,000
496	Southern Rd	Btwn Waterdale Rd to Waiora Rd	East Bound	8,000	400	100	9,000
497	Southern Rd	Btwn Waterdale Rd to Waiora Rd	West Bound	8,000	600	100	9,000
498	Spring St	Btwn Broadway to Murray Rd	North Bound	18,000	1,100	250	20,000

Base 2036

No	Road	Location	Direction	2036 Daily 24 hours			
				Cars	LCV	HCV	Total
499	Spring St	Btwn Broadway to Murray Rd	South Bound	18,000	1,100	300	20,000
500	Springvale Rd	North of Eastlink	North Bound	24,000	1,000	500	26,000
501	Springvale Rd	North of Eastlink	South Bound	23,000	1,500	500	25,000
502	Springvale Rd	Btwn Reynolds Rd to Old Warrandyte Rd	North Bound	14,000	900	400	15,000
503	Springvale Rd	Btwn Reynolds Rd to Old Warrandyte Rd	South Bound	13,000	1,100	350	14,000
504	Springvale Rd	Btwn Whitehorse Rd to Eastern Fwy	North Bound	31,000	3,800	900	36,000
505	Springvale Rd	Btwn Whitehorse Rd to Eastern Fwy	South Bound	32,000	3,400	900	36,000
506	St Georges Rd	Btwn Bell St to Normanby Ave	North Bound	25,000	1,500	300	27,000
507	St Georges Rd	Btwn Bell St to Normanby Ave	South Bound	27,000	1,900	350	29,000
508	St Georges Rd	Btwn Holden St to Alexandra Pde	North Bound	10,000	700	250	11,000
509	St Georges Rd	Btwn Holden St to Alexandra Pde	South Bound	12,000	1,000	300	13,000
510	St Georges Rd	Btwn Murray St to Bell St	North Bound	24,000	1,100	300	25,000
511	St Georges Rd	Btwn Murray St to Bell St	South Bound	21,000	1,400	300	22,000
512	St Georges Rd	Btwn Normanby Ave to Merri Pde	North Bound	26,000	1,200	250	27,000
513	St Georges Rd	Btwn Normanby Ave to Merri Pde	South Bound	26,000	1,100	250	27,000
514	Station St	Btwn Whitehorse Rd to Eastern Fwy	North Bound	17,000	800	200	18,000
515	Station St	Btwn Whitehorse Rd to Eastern Fwy	South Bound	17,000	800	350	18,000
516	Station St	Btwn Bell St to Darebin Rd	North Bound	22,000	1,700	800	25,000
517	Station St	Btwn Bell St to Darebin Rd	South Bound	23,000	1,600	800	26,000
518	Station St	Btwn Darebin Rd to Heidelberg Rd	North Bound	11,000	500	200	12,000
519	Station St	Btwn Darebin Rd to Heidelberg Rd	South Bound	11,000	500	250	12,000
520	Studley Park	Rd at Yarra River	Eastbound	12,000	350	100	13,000
521	Studley Park	Rd at Yarra River	Westbound	14,000	300	100	15,000
522	Surrey Rd	Btwn Whitehorse Rd to Eastern Fwy	North Bound	13,000	700	200	14,000
523	Surrey Rd	Btwn Whitehorse Rd to Eastern Fwy	South Bound	14,000	800	150	15,000
524	Templestowe Rd	Near Birrarrung Park	Eastbound	17,000	900	150	18,000
525	Templestowe Rd	Near Birrarrung Park	Westbound	16,000	700	150	17,000
526	Thompsons Rd	Btwn Manningham Rd to Foote St	North Bound	8,000	250	100	8,000
527	Thompsons Rd	Btwn Manningham Rd to Foote St	South Bound	8,000	400	100	8,000
528	Thompsons Rd	North East Of Eastern Fwy	East Bound	14,000	500	150	14,000
529	Thompsons Rd	North East Of Eastern Fwy	West Bound	15,000	1,100	200	16,000
530	Tram Rd	North of Eastern Fwy	North Bound	21,000	900	350	22,000
531	Tram Rd	North of Eastern Fwy	South Bound	23,000	1,600	300	25,000
532	Upper Heidelberg Rd	Btwn Banksia St to Studley Rd	North Bound	10,000	900	150	11,000
533	Upper Heidelberg Rd	Btwn Banksia St to Studley Rd	South Bound	11,000	1,000	400	13,000
534	Upper Heidelberg Rd	Btwn Burgundy St to Waiora Rd	North Bound	18,000	1,200	200	19,000
535	Upper Heidelberg Rd	Btwn Burgundy St to Waiora Rd	South Bound	21,000	1,000	600	22,000
536	Victoria Pde	Btwn Hoddle ST to Lansdown St	Eastbound	32,000	1,500	400	34,000
537	Victoria Pde	Btwn Hoddle ST to Lansdown St	Westbound	29,000	1,400	400	31,000
538	Waiora Rd	Btwn Southern Rd to Dougharty Rd	North Bound	15,000	800	150	16,000
539	Waiora Rd	Btwn Southern Rd to Dougharty Rd	South Bound	17,000	800	150	18,000
540	Warrandyte Rd	Btwn Fitzsimons Ln to Blackburn Rd	East Bound	7,000	500	150	8,000
541	Warrandyte Rd	Btwn Fitzsimons Ln to Blackburn Rd	West Bound	8,000	700	250	9,000
542	Waterdale Rd	Btwn Southern Rd to Dougharty Rd	North Bound	13,000	600	200	14,000
543	Waterdale Rd	Btwn Southern Rd to Dougharty Rd	South Bound	12,000	900	250	14,000
544	Waterdale Rd	Btwn Southern Rd to Bell St	North Bound	12,000	1,000	300	14,000
545	Waterdale Rd	Btwn Southern Rd to Bell St	South Bound	13,000	1,200	300	15,000
546	Watsonia Rd	Btwn Princes St to Bungay St	North Bound	9,000	500	100	11,000
547	Watsonia Rd	Btwn Princes St to Bungay St	South Bound	6,000	300	100	8,000
548	Watsonia Rd	Greensborough Rd to Rail Line	North Bound	11,000	600	300	12,000
549	Watsonia Rd	Greensborough Rd to Rail Line	South Bound	8,000	250	150	9,000
550	Wattletree Rd	At Diamond Creek	North Bound	10,000	900	200	11,000
551	Wattletree Rd	At Diamond Creek	South Bound	11,000	800	250	12,000
552	Westgarth St	Btwn High St to Heidelberg Rd	East Bound	6,000	600	100	6,000
553	Westgarth St	Btwn High St to Heidelberg Rd	West Bound	7,000	400	100	7,000
554	Whitehorse Rd	Btwn Station Street to Middleborough Rd	East Bound	23,000	800	200	24,000
555	Whitehorse Rd	Btwn Station Street to Middleborough Rd	West Bound	21,000	1,200	200	23,000
556	Whitehorse Rd	Elgar Rd to Station St	East Bound	18,000	900	150	19,000
557	Whitehorse Rd	Elgar Rd to Station St	West Bound	15,000	1,000	250	16,000
558	Whitehorse Rd	Middleborough Rd to Surrey Rd	Eastbound	19,000	500	150	20,000
559	Whitehorse Rd	Middleborough Rd to Surrey Rd	Westbound	21,000	400	200	21,000
560	Whitehorse Rd	Btwn Surrey Rd to Springvale Rd	Eastbound	26,000	700	250	27,000
561	Whitehorse Rd	Btwn Surrey Rd to Springvale Rd	Westbound	27,000	700	250	28,000
562	Whitehorse Rd	btw Springvale Rd to Mitcham Rd	Eastbound	31,000	900	400	33,000
563	Whitehorse Rd	btw Springvale Rd to Mitcham Rd	Westbound	33,000	1,100	500	34,000
564	Whitehorse Rd	Btwn Burke Rd to Balwyn Rd	Eastbound	10,000	250	100	11,000
565	Whitehorse Rd	Btwn Burke Rd to Balwyn Rd	Westbound	11,000	250	100	12,000
566	Whitehorse Rd	btw Union Rd to Elgar Rd	Eastbound	14,000	300	150	14,000
567	Whitehorse Rd	btw Union Rd to Elgar Rd	Westbound	14,000	250	100	14,000
568	Williamsons Rd	Btwn Doncaster Rd to Manningham Rd	North Bound	30,000	1,900	500	32,000
569	Williamsons Rd	Btwn Doncaster Rd to Manningham Rd	South Bound	31,000	1,600	400	33,000
570	Williamsons Rd	Btwn Foote St to Warrandyte Rd	North Bound	22,000	1,800	800	25,000
571	Williamsons Rd	Btwn Foote St to Warrandyte Rd	South Bound	23,000	1,200	700	25,000
572	Williamsons Rd	Btwn King St to Foote St	North Bound	15,000	1,700	400	17,000
573	Williamsons Rd	Btwn King St to Foote St	South Bound	16,000	2,500	350	19,000
574	Williamsons Rd	Btwn Manningham Rd to King St	North Bound	15,000	1,500	400	17,000
575	Williamsons Rd	Btwn Manningham Rd to King St	South Bound	15,000	800	200	16,000
576	Wungan St	Btwn Skye St to Nicholls St	North Bound	4,000	400	100	6,000
577	Wungan St	Btwn Skye St to Nicholls St	South Bound	4,000	150	100	5,000
578	Yallambie Rd	Btwn Joules Ct to Fresham Rd	East Bound	2,500	150	100	3,000
579	Yallambie Rd	Btwn Joules Ct to Fresham Rd	West Bound	3,000	200	100	4,000
580	Yan Yean Rd	North of Diamond Creek Rd	North Bound	21,000	1,700	400	23,000
581	Yan Yean Rd	North of Diamond Creek Rd	South Bound	18,000	2,100	400	21,000

Base 2036

No	Road	Location	Direction	2036 Daily 24 hours			
				Cars	LCV	HCV	Total
582	Yarra St	Btwn Cape St to Hawden St	East Bound	2,500	150	100	3,000
583	Yarra St	Btwn Cape St to Hawden St	West Bound	2,000	150	100	2,500

Project 2036

2036 Daily

No	Road	Location	Direction	24 hours			
				Cars	LCV	HCV	Total
1	Albert St	Btwn Murray St to Bell St	NB	21,000	1,100	300	22,000
2	Albert St	Btwn Murray St to Bell St	South Bound	21,000	1,000	300	23,000
3	Albert St	Btwn Plenty Rd to Murray Rd	North Bound	23,000	1,600	350	25,000
4	Albert St	Btwn Plenty Rd to Murray Rd	South Bound	23,000	1,700	300	25,000
5	Alexandra Pde	wn Rathdown St to Nicholson	Eastbound	39,000	1,400	1,000	42,000
6	Alexandra Pde	wn Rathdown St to Nicholson	Westbound	40,000	1,300	1,000	43,000
7	Alexandra Pde	wn Nicholson St to Brunswick	Eastbound	48,000	1,700	1,200	52,000
8	Alexandra Pde	wn Nicholson St to Brunswick	Westbound	48,000	1,600	1,100	51,000
9	Alexandra Pde	Btwn Queens Pde to Hoddle S	Eastbound	42,000	1,600	1,000	45,000
10	Alexandra Pde	Btwn Queens Pde to Hoddle S	Westbound	39,000	1,300	900	42,000
11	Anderson St	Btwn James St to Porter St	North Bound	7,000	600	150	8,000
12	Anderson St	Btwn James St to Porter St	South Bound	8,000	600	150	8,000
13	Andersons Creek Rd	Reynolds Rd to Warrandyte Rd	North Bound	5,000	350	100	5,000
14	Andersons Creek Rd	Reynolds Rd to Warrandyte Rd	South Bound	5,000	400	150	6,000
15	Andersons Creek Rd	Blackburn Rd to Reynolds Rd	North Bound	6,000	300	150	6,000
16	Andersons Creek Rd	Blackburn Rd to Reynolds Rd	South Bound	7,000	300	150	7,000
17	Balwyn Rd	wn Belmore Rd to Whitehorse	North Bound	13,000	700	150	14,000
18	Balwyn Rd	wn Belmore Rd to Whitehorse	South Bound	13,000	600	150	13,000
19	Balwyn Rd	wn Doncaster Rd to Belmore I	North Bound	10,000	1,100	150	11,000
20	Balwyn Rd	wn Doncaster Rd to Belmore I	South Bound	9,000	1,100	150	11,000
21	Banksia St	Btwn Mount St to Hawdon St	East Bound	28,000	2,300	300	30,000
22	Banksia St	Btwn Mount St to Hawdon St	West Bound	33,000	1,800	300	34,000
23	Banksia St	At Yarra River	East Bound	39,000	2,600	600	42,000
24	Banksia St	At Yarra River	West Bound	38,000	1,600	500	39,000
25	Bell St	Station St to Oriel Rd	East Bound	30,000	2,300	400	32,000
26	Bell St	Station St to Oriel Rd	West Bound	32,000	1,800	300	34,000
27	Bell St	Studley Rd to Rail Line	East Bound	28,000	1,500	300	29,000
28	Bell St	Studley Rd to Rail Line	West Bound	32,000	2,100	400	34,000
29	Bell St	Btwn Plenty Rd to Albert St	East Bound	31,000	1,700	500	33,000
30	Bell St	Btwn Plenty Rd to Albert St	West Bound	29,000	2,000	500	31,000
31	Bell St	Oriel Rd to Waterdale Rd	East Bound	28,000	1,500	500	29,000
32	Bell St	Oriel Rd to Waterdale Rd	West Bound	28,000	1,900	400	30,000
33	Bell St	erdale Rd to Upper Heidelberg	East Bound	33,000	1,800	400	35,000
34	Bell St	erdale Rd to Upper Heidelberg	West Bound	33,000	2,500	400	35,000
35	Bell St	Btwn High St to Plenty Rd	Eastbound	37,000	900	500	38,000
36	Bell St	Btwn High St to Plenty Rd	Westbound	35,000	900	500	36,000
37	Belmore Rd	Btwn Union Rd to Winfield Rd	North Bound	8,000	250	100	9,000
38	Belmore Rd	Btwn Union Rd to Winfield Rd	South Bound	8,000	200	100	8,000
39	Belmore Rd	Btwn Burke Rd to Balwyn Rd	Eastbound	12,000	250	100	12,000
40	Belmore Rd	Btwn Burke Rd to Balwyn Rd	Westbound	10,000	200	100	10,000
41	Blackburn Rd	Eastern Fwy to Doncaster Rd	North Bound	16,000	700	200	16,000
42	Blackburn Rd	Eastern Fwy to Doncaster Rd	South Bound	15,000	800	250	16,000
43	Blackburn Rd	caster Rd to Andersons Creek	North Bound	15,000	700	150	17,000
44	Blackburn Rd	caster Rd to Andersons Creek	South Bound	16,000	700	150	18,000
45	Blackburn Rd	ynolds Rd to Andersons Creek	North Bound	10,000	900	150	11,000
46	Blackburn Rd	ynolds Rd to Andersons Creek	South Bound	9,000	800	100	9,000
47	Bolton St	Bridge St to Main Rd	North Bound	10,000	700	100	11,000
48	Bolton St	Bridge St to Main Rd	South Bound	11,000	500	100	11,000
49	Bridge St	Bolton St to Main Rd	East Bound	11,000	700	150	12,000
50	Bridge St	Bolton St to Main Rd	West Bound	11,000	800	150	12,000
51	Bridge St	Manningham St to Templestow	East Bound	11,000	500	150	12,000
52	Bridge St	Manningham St to Templestow	West Bound	8,000	250	150	9,000
53	Broadway	twn High St to Bolderwood Pd	East Bound	12,000	1,500	600	15,000
54	Broadway	twn High St to Bolderwood Pd	West Bound	18,000	2,300	700	23,000
55	Bulleen Rd	Eastern Fwy to Manningham R	North Bound	29,000	1,100	500	30,000
56	Bulleen Rd	Eastern Fwy to Manningham R	South Bound	26,000	1,200	500	28,000
57	Bulleen Rd	Doncaster Rd to Eastern Fwy	North Bound	11,000	500	300	12,000
58	Bulleen Rd	Doncaster Rd to Eastern Fwy	South Bound	10,000	600	350	11,000
59	Burgundy St	sanna Rd to Upper Heidelberg	East Bound	10,000	700	600	11,000
60	Burgundy St	sanna Rd to Upper Heidelberg	West Bound	7,000	600	150	8,000
61	Burke Rd	Btwn Harp Rd to Cotham Rd	North Bound	20,000	1,000	250	22,000
62	Burke Rd	Btwn Harp Rd to Cotham Rd	South Bound	20,000	1,000	250	21,000
63	Burke Rd	stern Fwy to Lower Heidelberg	North Bound	18,000	1,100	200	20,000
64	Burke Rd	stern Fwy to Lower Heidelberg	South Bound	19,000	900	150	21,000
65	Burke Rd	Doncaster Rd to Eastern Fwy	North Bound	16,000	900	250	17,000
66	Burke Rd	Doncaster Rd to Eastern Fwy	South Bound	18,000	800	150	19,000
67	Burke Rd	Btwn High St to Harp Rd	Northbound	19,000	600	250	20,000

Project 2036				2036 Daily			
No	Road	Location	Direction	24 hours			
				Cars	LCV	HCV	Total
68	Burke Rd	Btwn High St to Harp Rd	Southbound	18,000	500	250	19,000
69	Bush Blvd	McDonalds Rd to Plenty Rd	North Bound	13,000	800	150	14,000
70	Bush Blvd	McDonalds Rd to Plenty Rd	South Bound	11,000	700	200	12,000
71	Chandler Hwy	Eastern Fwy to Heidelberg Rd	North Bound	39,000	2,700	400	42,000
72	Chandler Hwy	Eastern Fwy to Heidelberg Rd	South Bound	32,000	1,600	500	34,000
73	Chapman St	wn Ellesmere Pde to Thomson	East Bound	10,000	1,100	100	11,000
74	Chapman St	wn Ellesmere Pde to Thomson	West Bound	11,000	1,000	150	12,000
75	Cherry St	Btwn Waiora Rd to Wungan S	East Bound	5,000	250	100	7,000
76	Cherry St	Btwn Waiora Rd to Wungan S	West Bound	5,000	250	100	6,000
77	Childs Rd	Dalton Rd to Plenty Rd	East Bound	28,000	800	200	29,000
78	Childs Rd	Dalton Rd to Plenty Rd	West Bound	27,000	1,300	200	28,000
79	Cooper St	Edgars Rd to High St	East Bound	23,000	900	900	25,000
80	Cooper St	Edgars Rd to High St	West Bound	24,000	1,600	700	27,000
81	Cooper St	Hume Fwy to Edgars Rd	East Bound	23,000	2,900	1,300	27,000
82	Cooper St	Hume Fwy to Edgars Rd	West Bound	25,000	2,400	1,300	29,000
83	Cotham Rd	Btwn Glenferrie Rd to Burke R	Eastbound	11,000	200	100	12,000
84	Cotham Rd	Btwn Glenferrie Rd to Burke R	Westbound	11,000	200	100	11,000
85	Cotham Rd	Btwn HighSt to Glenferrie Rd	Eastbound	10,000	150	100	10,000
86	Cotham Rd	Btwn HighSt to Glenferrie Rd	Westbound	11,000	150	100	11,000
87	Dalton Rd	North of Metropolitan Ring Rd	North Bound	33,000	1,000	700	36,000
88	Dalton Rd	North of Metropolitan Ring Rd	South Bound	30,000	7,700	800	38,000
89	Dalton Rd	wn Childs Rd to McKimmies R	North Bound	25,000	1,800	800	28,000
90	Dalton Rd	wn Childs Rd to McKimmies R	South Bound	25,000	1,600	400	28,000
91	Dalton Rd	twn Keon Pde to Settlement R	North Bound	21,000	1,600	400	23,000
92	Dalton Rd	twn Keon Pde to Settlement R	South Bound	25,000	3,300	500	28,000
93	Dalton Rd	Btwn Settlement Rd to M80	North Bound	37,000	3,200	1,000	42,000
94	Dalton Rd	Btwn Settlement Rd to M80	South Bound	33,000	2,400	800	36,000
95	Dalton Rd	South of Cooper St	North Bound	18,000	700	250	19,000
96	Dalton Rd	South of Cooper St	South Bound	9,000	400	250	10,000
97	Darebin Rd	At Darebin Creek	East Bound	13,000	1,100	150	14,000
98	Darebin Rd	At Darebin Creek	West Bound	11,000	800	150	12,000
99	Darebin Rd	Btwn High St to Station St	East Bound	11,000	500	150	11,000
100	Darebin Rd	Btwn High St to Station St	West Bound	11,000	600	150	12,000
101	Darebin Rd	Btwn Station St to Grange Rd	Eastbound	18,000	500	250	19,000
102	Darebin Rd	Btwn Station St to Grange Rd	Westbound	17,000	500	300	18,000
103	Diamond Creek Rd	twn Civic Drive to Yan Yean R	East Bound	34,000	2,900	500	37,000
104	Diamond Creek Rd	twn Civic Drive to Yan Yean R	West Bound	33,000	2,500	800	36,000
105	Diamond Creek Rd	Helena Rd to Greensborough	North Bound	18,000	1,100	250	19,000
106	Diamond Creek Rd	Helena Rd to Greensborough	South Bound	15,000	1,000	200	16,000
107	Diamond Creek Rd	Btwn Yan Yean Rd to Ryans R	East Bound	22,000	1,000	600	24,000
108	Diamond Creek Rd	Btwn Yan Yean Rd to Ryans R	West Bound	24,000	1,600	1,000	26,000
109	Doncaster Rd	East of Eastern Fwy	East Bound	13,000	500	200	14,000
110	Doncaster Rd	East of Eastern Fwy	West Bound	16,000	800	250	17,000
111	Doncaster Rd	n Middleborough Rd to Statio	East Bound	19,000	500	150	19,000
112	Doncaster Rd	n Middleborough Rd to Statio	West Bound	18,000	800	200	19,000
113	Doncaster Rd	Btwn Balwyn Rd to Eastern Fw	East Bound	15,000	600	250	15,000
114	Doncaster Rd	Btwn Balwyn Rd to Eastern Fw	West Bound	19,000	800	300	20,000
115	Doncaster Rd	n Blackburn Rd to Springvale	East Bound	17,000	1,100	250	18,000
116	Doncaster Rd	n Blackburn Rd to Springvale	West Bound	19,000	900	250	20,000
117	Doncaster Rd	wn Blackburn Rd to Wetherby	East Bound	16,000	900	150	17,000
118	Doncaster Rd	wn Blackburn Rd to Wetherby	West Bound	18,000	900	200	19,000
119	Doncaster Rd	btw Balwyn Rd to Bulleen Rd	Eastbound	11,000	250	150	12,000
120	Doncaster Rd	btw Balwyn Rd to Bulleen Rd	Westbound	9,000	200	100	10,000
121	Drysdale St	n Greensborough Rd to Borlas	East Bound	1,000	100		1,000
122	Drysdale St	n Greensborough Rd to Borlas	West Bound	1,000	100		1,000
123	Dunne St	At Darebin Creek	East Bound	6,000	400	150	7,000
124	Dunne St	At Darebin Creek	West Bound	6,000	300	150	7,000
125	Earl St	wn Princess St to Willsmere F	North Bound	10,000	400	150	10,000
126	Earl St	wn Princess St to Willsmere F	South Bound	11,000	700	150	12,000
127	Fwy Midblock: Collector D	Middleborough Rd to Tram Rd	East Bound	70,000	3,200	2,800	77,000
128	Fwy Midblock: Collector D	Middleborough Rd to Tram Rd	West Bound	18,000	700	250	18,000
129	Fwy Midblock: Collector D	Tram Rd to Elgar Rd	East Bound	51,000	2,800	3,100	59,000
130	Fwy Midblock: Collector D	Elgar Rd to Doncaster Rd	East Bound	67,000	3,300	3,100	75,000
131	Fwy Midblock: Collector D	Elgar Rd to Doncaster Rd	West Bound	68,000	2,900	3,000	76,000
132	Fwy Midblock: Collector D	Doncaster Rd to Bulleen Rd	East Bound	68,000	3,500	3,200	77,000
133	Fwy Midblock: Collector D	Doncaster Rd to Bulleen Rd	West Bound	74,000	3,400	3,100	83,000
134	Fwy Midblock: Collector D	Under Doncaster Rd	East Bound	60,000	2,600	2,900	67,000

Project 2036

No	Road	Location	Direction	2036 Daily 24 hours			
				Cars	LCV	HCV	Total
135	Fwy Midblock: Collector D	Under Doncaster Rd	West Bound	61,000	2,500	2,700	69,000
136	stern Fwy Midblock: Main	Middleborough Rd to Tram Rd	East Bound	55,000	2,100	1,700	60,000
137	stern Fwy Midblock: Main	Middleborough Rd to Tram Rd	West Bound	109,000	4,100	4,300	119,000
138	stern Fwy Midblock: Main	Tram Rd to Elgar Rd	East Bound	60,000	2,000	1,400	63,000
139	stern Fwy Midblock: Main	Elgar Rd to Doncaster Rd	East Bound	60,000	2,000	1,400	63,000
140	stern Fwy Midblock: Main	Elgar Rd to Doncaster Rd	West Bound	58,000	1,900	1,300	60,000
141	stern Fwy Midblock: Main	Doncaster Rd to Bulleen Rd	East Bound	60,000	2,000	1,400	63,000
142	stern Fwy Midblock: Main	Doncaster Rd to Bulleen Rd	West Bound	58,000	1,900	1,300	60,000
143	stern Fwy Midblock: Main	Under Doncaster Rd	East Bound	60,000	2,000	1,400	63,000
144	stern Fwy Midblock: Main	Under Doncaster Rd	West Bound	58,000	1,900	1,300	60,000
145	Eastern Fwy Midblock	Springvale Rd to Blackburn Rd	East Bound	99,000	4,200	4,100	109,000
146	Eastern Fwy Midblock	Springvale Rd to Blackburn Rd	West Bound	95,000	3,800	3,900	104,000
147	Eastern Fwy Midblock	ackburn Rd to Middleborough	East Bound	110,000	4,400	4,600	120,000
148	Eastern Fwy Midblock	ackburn Rd to Middleborough	West Bound	109,000	4,100	4,200	119,000
149	Eastern Fwy Midblock	Middleborough Rd to Tram Rd	East Bound	126,000	5,300	4,500	137,000
150	Eastern Fwy Midblock	Middleborough Rd to Tram Rd	West Bound	126,000	4,800	4,400	137,000
151	Eastern Fwy Midblock	Tram Rd to Elgar Rd	East Bound	111,000	4,800	4,600	122,000
152	Eastern Fwy Midblock	Tram Rd to Elgar Rd	West Bound	110,000	4,600	4,200	121,000
153	Eastern Fwy Midblock	Elgar Rd to Doncaster Rd	East Bound	126,000	5,300	4,600	138,000
154	Eastern Fwy Midblock	Elgar Rd to Doncaster Rd	West Bound	125,000	4,800	4,300	136,000
155	Eastern Fwy Midblock	Doncaster Rd to Bulleen Rd	East Bound	128,000	5,600	4,600	140,000
156	Eastern Fwy Midblock	Doncaster Rd to Bulleen Rd	West Bound	132,000	5,300	4,400	143,000
157	Eastern Fwy Midblock	Bulleen Rd to Burke Rd	East Bound	92,000	3,200	1,400	97,000
158	Eastern Fwy Midblock	Bulleen Rd to Burke Rd	West Bound	94,000	3,200	1,400	99,000
159	Eastern Fwy Midblock	Burke Rd to Chandler Hwy	East Bound	102,000	3,300	1,500	107,000
160	Eastern Fwy Midblock	Burke Rd to Chandler Hwy	West Bound	100,000	3,200	1,400	105,000
161	Eastern Fwy Midblock	Chandler Hwy to Hoddle St	East Bound	86,000	3,100	1,100	91,000
162	Eastern Fwy Midblock	Chandler Hwy to Hoddle St	West Bound	76,000	2,800	1,100	81,000
163	Eastern Fwy Midblock	Under Springale Rd	East Bound	63,000	800	3,100	68,000
164	Eastern Fwy Midblock	Under Springale Rd	West Bound	65,000	2,700	2,900	72,000
165	Eastern Fwy Midblock	Under Middlelborough Rd	East Bound	106,000	4,300	3,900	116,000
166	Eastern Fwy Midblock	Under Middlelborough Rd	West Bound	107,000	3,800	4,100	117,000
167	Eastern Fwy Midblock	Under Doncaster Rd	East Bound	119,000	4,700	4,300	130,000
168	Eastern Fwy Midblock	Under Doncaster Rd	West Bound	119,000	4,400	4,000	129,000
169	Eastern Fwy Midblock	Under Bulleen Rd	East Bound	83,000	2,600	1,200	88,000
170	Eastern Fwy Midblock	Under Bulleen Rd	West Bound	111,000	2,900	2,800	122,000
171	Eastern Fwy Midblock	Under Chandler Hwy	East Bound	77,000	2,300	1,000	81,000
172	Eastern Fwy Midblock	Under Chandler Hwy	West Bound	74,000	800	800	77,000
173	Eastern Fwy Ramp	- EB Entry Ramp At Chandler	East Bound	28,000	1,700	700	31,000
174	Eastern Fwy Ramp	- EB Entry Ramp At Doncaster	East Bound	11,000	600	300	12,000
175	Eastern Fwy Ramp	EB Entry Ramp At Thompson	East Bound	15,000	1,000	500	17,000
176	Eastern Fwy Ramp	1 - EB Entry Ramp At Tram R	East Bound	16,000	800	200	16,000
177	Eastern Fwy Ramp	- EB Entry Ramp At Wetherby	East Bound	6,000	400	150	7,000
178	Eastern Fwy Ramp	- EB Exit Ramp At Blackburn	East Bound	14,000	1,000	300	16,000
179	Eastern Fwy Ramp	1 - EB Exit Ramp At Bulleen R	East Bound	10,000	500	200	11,000
180	Eastern Fwy Ramp	31 - EB Exit Ramp At Burke Rd	East Bound	7,000	400	150	7,000
181	Eastern Fwy Ramp	- EB Exit Ramp At Chandler H	East Bound	10,000	800	150	11,000
182	Eastern Fwy Ramp	- EB Exit Ramp At Doncaster	East Bound	10,000	900	300	11,000
183	Eastern Fwy Ramp	E1 - EB Exit Ramp At Elgar Rd	East Bound	17,000	1,300	250	19,000
184	Eastern Fwy Ramp	- EB Exit Ramp At Springvale	East Bound	38,000	3,800	1,100	43,000
185	Eastern Fwy Ramp	. - EB Exit Ramp At Wetherby	East Bound	21,000	1,300	600	23,000
186	Eastern Fwy Ramp	- WB Entry Ramp At Bulleen	West Bound	13,000	700	400	14,000
187	Eastern Fwy Ramp	WB Entry Ramp At Chandler	West Bound	5,000	400	150	5,000
188	Eastern Fwy Ramp	WB Entry Ramp At Doncaste	West Bound	13,000	1,300	400	14,000
189	Eastern Fwy Ramp	2 - WB Entry Ramp At Elgar R	West Bound	15,000	900	200	17,000
190	Eastern Fwy Ramp	VB Entry Ramp At Middleboro	West Bound	20,000	1,100	350	22,000
191	Eastern Fwy Ramp	WB Entry Ramp At Springvale	West Bound	32,000	1,100	1,000	34,000
192	Eastern Fwy Ramp	2 - WB Entry Ramp At Surrey	West Bound	15,000	700	250	15,000
193	Eastern Fwy Ramp	2 - WB Entry Ramp At Burke R	West Bound	5,000	400	150	6,000
194	Eastern Fwy Ramp	3 - WB Exit Ramp At Bulleen R	West Bound	22,000	900	500	23,000
195	Eastern Fwy Ramp	- WB Exit Ramp At Chandler H	West Bound	27,000	2,500	700	30,000
196	Eastern Fwy Ramp	- WB Exit Ramp At Doncaster	West Bound	8,000	350	150	9,000
197	Eastern Fwy Ramp	VB Exit Ramp At Middleborou	West Bound	6,000	600	150	6,000
198	Eastern Fwy Ramp	2 - WB Exit Ramp At Station S	West Bound	17,000	600	250	18,000
199	Edgars Rd	South of Cooper St	North Bound	28,000	1,400	250	29,000
200	Edgars Rd	South of Cooper St	South Bound	27,000	1,300	250	28,000
201	Edgars Rd	North of Metropolitan Ring Rd	North Bound	29,000	1,700	400	31,000

Project 2036

No	Road	Location	Direction	2036 Daily 24 hours			
				Cars	LCV	HCV	Total
202	Edgars Rd	North of Metropolitan Ring Rd	South Bound	26,000	2,200	300	28,000
203	Elder St	Btwn Papua St to Longmuir Rd	East Bound	5,000	350	100	6,000
204	Elder St	Btwn Papua St to Longmuir Rd	West Bound	1,000	100		1,000
205	Elgar Rd	North of Eastern Fwy	North Bound	13,000	500	100	13,000
206	Elgar Rd	North of Eastern Fwy	South Bound	10,000	300	150	10,000
207	Elgar Rd	twn Belmore Rd to Eastern Fw	North Bound	24,000	1,300	300	25,000
208	Elgar Rd	twn Belmore Rd to Eastern Fw	South Bound	23,000	1,100	250	25,000
209	Elgar Rd	wn Belmore Rd to Whitehorse	North Bound	20,000	1,000	200	21,000
210	Elgar Rd	wn Belmore Rd to Whitehorse	South Bound	19,000	1,200	250	21,000
211	Eltham-Yarra Glen Rd	North of Donaldson Rd	Northbound	6,000	400	100	7,000
212	Eltham-Yarra Glen Rd	North of Donaldson Rd	South Bound	6,000	500	100	6,000
213	Eltham-Yarra Glen Rd	North of Henley Rd	North Bound	2,500	250	150	3,000
214	Eltham-Yarra Glen Rd	North of Henley Rd	South Bound	2,500	350	150	3,000
215	Eltham-Yarra Glen Rd	aroo Ground-St Andrews Rd to	East Bound	3,500	350	150	4,000
216	Eltham-Yarra Glen Rd	aroo Ground-St Andrews Rd to	West Bound	3,000	800	150	3,500
217	Erskine Rd	Btwn Ferguseon St to Argyle S	East Bound	6,000	250	150	7,000
218	Erskine Rd	Btwn Ferguseon St to Argyle S	West Bound	5,000	350	150	6,000
219	Fitzsimons Ln	At Yarra River	North Bound	30,000	3,200	400	33,000
220	Fitzsimons Ln	At Yarra River	South Bound	30,000	1,300	250	31,000
221	Foote St	West Of Fitzsimons Ln	East Bound	12,000	1,400	150	13,000
222	Foote St	West Of Fitzsimons Ln	West Bound	11,000	900	150	12,000
223	Gorge Rd	At Plenty River	East Bound	8,000	500	100	9,000
224	Gorge Rd	At Plenty River	West Bound	8,000	800	150	9,000
225	Grange Rd	wn Darebin Rd to Heidelberg I	North Bound	21,000	1,100	500	22,000
226	Grange Rd	wn Darebin Rd to Heidelberg I	South Bound	16,000	900	300	17,000
227	Greensborough Bypass	80 Interchange to Diamond Cr	East Bound	39,000	1,800	500	41,000
228	Greensborough Bypass	80 Interchange to Diamond Cr	West Bound	42,000	2,500	500	44,000
229	Greensborough Highway	Btwn Grimshaw St to M80	North Bound				
230	Greensborough Highway	Btwn Grimshaw St to M80	South Bound				
231	Greensborough Rd	wn Erskine Rd to Strathallan I	North Bound	20,000	600	150	20,000
232	Greensborough Rd	wn Erskine Rd to Strathallan I	South Bound	20,000	600	150	20,000
233	Greensborough Rd	wn Strathallan Rd to Yallambie	North Bound	27,000	400	150	27,000
234	Greensborough Rd	wn Strathallan Rd to Yallambie	South Bound	27,000	400	200	27,000
235	Greensborough Rd	wn Lower Plenty Rd to Erskine	North bound	12,000	200	100	12,000
236	Greensborough Rd	wn Lower Plenty Rd to Erskine	South bound	11,000	250	100	11,000
237	Greensborough Rd	wn Watsonia Rd to Grimshaw	North Bound	18,000	500	150	19,000
238	Greensborough Rd	wn Watsonia Rd to Grimshaw	South Bound	16,000	400	150	16,000
239	Greensborough Rd	Btwn Santon St to Teresa St	North Bound	3,000	150	100	3,000
240	Greensborough Rd	Btwn Santon St to Teresa St	South Bound	1,500	100	100	1,500
241	Greensborough Rd	South Of Watsonia Rd	North Bound	27,000	1,000	200	28,000
242	Greensborough Rd	South Of Watsonia Rd	South Bound	21,000	800	150	22,000
243	Greensborough Rd	Under Grimshaw St	North Bound	16,000	150	200	17,000
244	Greensborough Rd	Under Grimshaw St	South Bound	14,000	150	150	14,000
245	Greensborough Rd	North of Grimshaw St	North Bound	40,000	600	400	41,000
246	Greensborough Rd	North of Grimshaw St	South Bound	37,000	500	400	38,000
247	Greensborough Rd	at Simpsons Barracks	Northbound	20,000	700	200	20,000
248	Greensborough Rd	at Simpsons Barracks	Southbound	18,000	700	200	19,000
249	Greenwood Dr	wn Gresswell Park Dr to Ladd	East Bound	3,000	200	100	3,500
250	Greenwood Dr	wn Gresswell Park Dr to Ladd	West Bound	3,000	150	100	3,500
251	Grimshaw St	Btwn Plenty Rd to Watsonia Ro	East Bound	15,000	1,000	300	16,000
252	Grimshaw St	Btwn Plenty Rd to Watsonia Ro	West Bound	13,000	600	150	14,000
253	Grimshaw St	Greensborough Hwy to The C	East Bound	23,000	1,400	300	25,000
254	Grimshaw St	Greensborough Hwy to The C	West Bound	19,000	1,300	700	21,000
255	Grimshaw St	Watsonia Rd to Greensboroug	East Bound	17,000	1,200	600	19,000
256	Grimshaw St	Watsonia Rd to Greensboroug	West Bound	15,000	900	400	17,000
257	Grimshaw St	Btwn Main St to Para Rd	East Bound		150	100	2,000
258	Grimshaw St	Btwn Main St to Para Rd	West Bound	9,000	800	200	12,000
259	Grimshaw St	Btwn Plenty Rd to Watsonia Ro	East Bound	15,000	1,500	300	17,000
260	Grimshaw St	Btwn Plenty Rd to Watsonia Ro	West Bound	13,000	900	150	14,000
261	Heidelberg Rd	At Darebin Creek	North Bound	15,000	500	150	16,000
262	Heidelberg Rd	At Darebin Creek	South Bound	16,000	1,000	150	17,000
263	Heidelberg Rd	Btwn Hoddle St to Station St	East Bound	21,000	1,500	300	23,000
264	Heidelberg Rd	Btwn Hoddle St to Station St	West Bound	24,000	1,700	300	26,000
265	Heidelberg-Kinglake Rd	North of Main Hurstbridge Rd	North Bound	2,500	250	100	3,000
266	Heidelberg-Kinglake Rd	North of Main Hurstbridge Rd	South Bound	2,500	250	150	3,000
267	Heidelberg-Kinglake Rd	aroo Ground-Wattle Glen Rd to	North Bound	8,000	1,100	400	10,000
268	Heidelberg-Kinglake Rd	aroo Ground-Wattle Glen Rd to	South Bound	8,000	900	300	9,000

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				2036 Daily			
No	Road	Location	Direction	24 hours			
				Cars	LCV	HCV	Total
269	Heidelberg-Warrandyte R	At Mullum Mullum Creek	North Bound	6,000	600	150	7,000
270	Heidelberg-Warrandyte R	At Mullum Mullum Creek	South Bound	6,000	1,000	150	7,000
271	High St	South of Cooper St	North Bound	31,000	1,100	400	32,000
272	High St	South of Cooper St	South Bound	33,000	1,100	500	35,000
273	High St	North of Settlement Rd	North Bound	25,000	900	700	27,000
274	High St	North of Settlement Rd	South Bound	25,000	600	1,000	27,000
275	High St	n Doncaster Rd to Manninghar	North Bound	11,000	500	100	12,000
276	High St	n Doncaster Rd to Manninghar	South Bound	13,000	400	150	13,000
277	High St	Btwn Keon Pde to Broadway	North Bound	27,000	1,400	600	29,000
278	High St	Btwn Keon Pde to Broadway	South Bound	24,000	1,900	500	26,000
279	High St	vn Mahoneys Rd to Settlement	North Bound	23,000	800	1,600	25,000
280	High St	vn Mahoneys Rd to Settlement	South Bound	23,000	1,300	500	25,000
281	High St	wn Westgarth St to Queens P	North Bound	20,000	1,000	150	21,000
282	High St	wn Westgarth St to Queens P	South Bound	20,000	900	150	21,000
283	High St	Btwn Cotham Rd to Parkhill Rd	Eastbound	14,000	150	100	14,000
284	High St	Btwn Cotham Rd to Parkhill Rd	Westbound	15,000	250	100	15,000
285	High St	Btwn Harp Rd to Burke Rd	Eastbound	9,000	150	100	10,000
286	High St	Btwn Harp Rd to Burke Rd	Westbound	10,000	150	100	11,000
287	Hoddle St	vn Heidelberg Rd to Eastern F	North Bound	23,000	1,000	150	24,000
288	Hoddle St	vn Heidelberg Rd to Eastern F	South Bound	21,000	1,500	150	23,000
289	Hoddle St	twn Eastern Fwy to Johnston S	Northbound	54,000	2,300	500	57,000
290	Hoddle St	twn Eastern Fwy to Johnston S	Southbound	52,000	2,200	500	55,000
291	Hoddle St	Btwn Johnston St to Victoria S	Northbound	51,000	2,100	400	54,000
292	Hoddle St	Btwn Johnston St to Victoria S	Southbound	53,000	2,100	500	56,000
293	Hoddle St	Btwn Victoria St to Bridge Rd	Northbound	40,000	1,200	400	42,000
294	Hoddle St	Btwn Victoria St to Bridge Rd	Southbound	41,000	1,200	350	43,000
295	Hume Fwy	Btwn M80 Ring Rd to Cooper S	North Bound	61,000	2,900	6,000	70,000
296	Hume Fwy	Btwn M80 Ring Rd to Cooper S	South Bound	62,000	2,500	6,100	70,000
297	Hume Fwy	North of Cooper St	North Bound	58,000	2,200	4,600	64,000
298	Hume Fwy	North of Cooper St	South Bound	58,000	1,800	4,500	64,000
299	Jika St	Btwn Rosanna Rd to Banksia S	Northbound	10,000	400	100	10,000
300	Jika St	Btwn Rosanna Rd to Banksia S	South Bound	14,000	700	100	13,000
301	Johnston St	Btwn Wellington St to Hoddle S	Eastbound	10,000	400	150	11,000
302	Johnston St	Btwn Wellington St to Hoddle S	Westbound	11,000	350	150	11,000
303	garoo Ground-St Andrew	roo Ground-Wattle Glen Rd to	North Bound	2,500	500	100	3,000
304	garoo Ground-St Andrew	roo Ground-Wattle Glen Rd to	South Bound	2,500	300	100	3,000
305	garoo Ground-Warrandyt	Near Pigeon Bank Rd	North Bound	4,000	250	100	4,000
306	garoo Ground-Warrandyt	Near Pigeon Bank Rd	South Bound	4,000	200	100	4,000
307	garoo Ground-Warrandyte	At Yarra River	North Bound	11,000	350	150	11,000
308	garoo Ground-Warrandyte	At Yarra River	South Bound	9,000	500	150	10,000
309	garoo Ground-Wattle Gle	Kinglake Rd to Kangaroo Grou	East Bound	5,000	200	150	5,000
310	garoo Ground-Wattle Gle	Kinglake Rd to Kangaroo Grou	West Bound	4,000	700	150	5,000
311	Karingal Drive	East Of St Helena Rd	North Bound	13,000	800	150	14,000
312	Karingal Drive	East Of St Helena Rd	South Bound	12,000	900	150	13,000
313	Keon Pde	Btwn High St to Dalton Rd	East Bound	15,000	2,100	700	18,000
314	Keon Pde	Btwn High St to Dalton Rd	West Bound	14,000	1,800	400	16,000
315	King St	East of Williamsons Rd	East Bound	8,000	600	150	9,000
316	King St	East of Williamsons Rd	West Bound	7,000	600	100	8,000
317	Kingsbury Drive	East Of Waterdale Rd	East Bound	12,000	600	250	13,000
318	Kingsbury Drive	East Of Waterdale Rd	West Bound	10,000	400	400	10,000
319	Kingsbury Drive	West of Waterdale Rd	East Bound	18,000	800	400	20,000
320	Kingsbury Drive	West of Waterdale Rd	West Bound	17,000	900	350	18,000
321	Livingstone St	Btwn Oriel Rd to Waterdale Rd	East Bound	9,000	400	150	9,000
322	Livingstone St	Btwn Oriel Rd to Waterdale Rd	West Bound	8,000	250	100	8,000
323	Lower Heidelberg Rd	Btwn Maltravers Rd to The Eyri	North Bound	19,000	700	200	20,000
324	Lower Heidelberg Rd	Btwn Maltravers Rd to The Eyri	South Bound	18,000	700	300	19,000
325	Lower Heidelberg Rd	Near Ivanhoe Park	East Bound	8,000	300	100	8,000
326	Lower Heidelberg Rd	Near Ivanhoe Park	West Bound	6,000	250	100	7,000
327	Lower Plenty Rd	vn Greensborough Rd to Para	East Bound	20,000	1,000	300	21,000
328	Lower Plenty Rd	vn Greensborough Rd to Para	West Bound	21,000	700	300	22,000
329	Lower Plenty Rd	Rosanna Rd to Greensboroug	East Bound	33,000	1,000	300	34,000
330	Lower Plenty Rd	Rosanna Rd to Greensboroug	West Bound	32,000	1,000	350	33,000
331	Lower Plenty Rd	wn Turnham Ave to Rosanna I	East Bound	10,000	500	150	11,000
332	Lower Plenty Rd	wn Turnham Ave to Rosanna I	West Bound	12,000	350	150	12,000
333	M80 Ring Rd	Dalton Rd to Plenty Rd	East bound	72,000	2,800	3,900	80,000
334	M80 Ring Rd	Dalton Rd to Plenty Rd	West bound	75,000	2,800	3,900	82,000
335	M80 Ring Rd	Dalton Rd to Edgars Rd	East Bound	86,000	3,600	4,800	96,000

Project 2036

No	Road	Location	Direction	2036 Daily 24 hours			
				Cars	LCV	HCV	Total
336	M80 Ring Rd	Dalton Rd to Edgars Rd	West Bound	84,000	3,400	4,300	92,000
337	M80 Ring Rd	Edgars Rd to Hume Fwy	East Bound	108,000	4,400	5,500	118,000
338	M80 Ring Rd	Edgars Rd to Hume Fwy	West Bound	101,000	4,000	5,200	110,000
339	M80 Ring Rd	Hume Fwy to Sydney Rd	East Bound	109,000	4,700	7,000	120,000
340	M80 Ring Rd	Hume Fwy to Sydney Rd	West Bound	105,000	4,200	6,600	115,000
341	M80 Ring Rd	M80 Interchange to Plenty Rd	East Bound	91,000	4,200	4,500	101,000
342	M80 Ring Rd	M80 Interchange to Plenty Rd	West Bound	91,000	4,200	4,300	100,000
343	M80 Ring Rd: Mainline	M80 Interchange to Plenty Rd	West Bound	66,000	2,600	6,000	75,000
344	Ring Rd: Collector Distri	M80 Interchange to Plenty Rd	West Bound	29,000	1,000	2,200	32,000
345	Ring Rd: Collector Distri	Edgars Rd to Hume Fwy	East Bound	30,000	1,000	1,500	33,000
346	Ring Rd: Collector Distri	Edgars Rd to Hume Fwy	West Bound	27,000	1,000	1,500	30,000
347	M80 Ring Rd: Mainline	Edgars Rd to Hume Fwy	East Bound	82,000	3,600	7,200	92,000
348	M80 Ring Rd: Mainline	Edgars Rd to Hume Fwy	West Bound	83,000	3,700	7,100	94,000
349	M80-NEL interchange	X1 - M80 to NEL	0	40,000	2,100	7,300	49,000
350	M80-NEL interchange	) to Greensborough Bypass/G	0	58,000	1,600	1,400	61,000
351	M80-NEL interchange	- M80 to Greensborough Byp	0	29,000	1,200	1,100	31,000
352	M80-NEL interchange	./Grimshaw to Greensborough	0	18,000	800	600	20,000
353	M80-NEL interchange	ensborough Bypass to NEL/G	0	16,000	700	600	17,000
354	M80-NEL interchange	- Greensborough Bypass to M	0	31,000	1,300	1,100	33,000
355	M80-NEL interchange	Greensborough Bypass to Grim	0	7,000	150	100	7,000
356	M80-NEL interchange	X8 - M80 to Grimshaw	0	30,000	400	300	30,000
357	M80-NEL interchange	Grimshaw to Greensborough B	0	9,000	150	150	9,000
358	M80-NEL interchange	) - NEL to Greensborough Byp	0	10,000	600	500	11,000
359	M80-NEL interchange	X11 - Grimshaw to M80/Plenty	0	31,000	400	350	32,000
360	M80-NEL interchange	X12 - NEL to Plenty	0	13,000	800	2,100	16,000
361	M80-NEL interchange	- Greensborough Bypass to P	0	6,000	250	150	7,000
362	M80-NEL interchange	NEL/Greensborough Bypass to	0	20,000	1,000	2,200	23,000
363	M80-NEL interchange	X15 - Grimshaw to Plenty	0	11,000	150	150	11,000
364	M80-NEL interchange	X16 - Grimshaw to M80	0	20,000	300	250	21,000
365	M80-NEL interchange	X17 - Plenty Road exit ramp	0	30,000	1,100	2,300	34,000
366	M80-NEL interchange	X18 - NEL to M80	0	25,000	1,400	5,000	31,000
367	M80-NEL interchange	) - Greensborough Bypass to M	0	24,000	1,000	1,000	26,000
368	Main Hurstbridge Rd	At Diamond Creek	East Bound	14,000	1,600	250	16,000
369	Main Hurstbridge Rd	At Diamond Creek	West Bound	15,000	800	200	16,000
370	Main Hurstbridge Rd	s Rd to Kangaroo Ground-Wat	East Bound	9,000	1,100	250	10,000
371	Main Hurstbridge Rd	s Rd to Kangaroo Ground-Wat	West Bound	8,000	1,100	250	10,000
372	Main Rd	At Plenty River	East Bound	17,000	700	200	18,000
373	Main Rd	At Plenty River	West Bound	18,000	400	200	19,000
374	Main Rd	East Of Ingrams Rd	East Bound	4,000	400	150	5,000
375	Main Rd	East Of Ingrams Rd	West Bound	5,000	500	150	5,000
376	Main Rd	Btwn Para Rd to Bolton St	East Bound	14,000	1,100	250	16,000
377	Main Rd	Btwn Para Rd to Bolton St	West Bound	16,000	600	250	17,000
378	Main Rd	Btwn Wattletree Rd to Bridge S	North Bound	13,000	400	200	14,000
379	Main Rd	Btwn Wattletree Rd to Bridge S	South Bound	13,000	800	150	14,000
380	Main Rd	East of Wattletree Rd	East Bound	12,000	700	150	12,000
381	Main Rd	East of Wattletree Rd	West Bound	12,000	1,000	200	13,000
382	Main Rd	At Diamond Creek	North Bound	15,000	800	200	16,000
383	Main Rd	At Diamond Creek	South Bound	14,000	800	150	15,000
384	Main Rd	Btwn Fitzsimons La to Bolton S	Eastbound	22,000	600	150	22,000
385	Main Rd	Btwn Fitzsimons La to Bolton S	Westbound	18,000	500	150	18,000
386	Main St	Btwn Para Rd to St Helena Rd	North Bound	18,000	1,800	150	20,000
387	Main St	Btwn Para Rd to St Helena Rd	South Bound	16,000	1,100	150	17,000
388	Manningham Rd	Btwn High St to Williamsons R	East Bound	19,000	600	150	20,000
389	Manningham Rd	Btwn High St to Williamsons R	West Bound	20,000	500	150	21,000
390	Manningham Rd	Btwn Thompsons Rd to High S	East Bound	19,000	600	300	19,000
391	Manningham Rd	Btwn Thompsons Rd to High S	West Bound	18,000	700	150	19,000
392	Manningham Rd	wn Bulleen Rd to Thompsons	East Bound	18,000	1,000	150	19,000
393	Manningham Rd	wn Bulleen Rd to Thompsons	West Bound	16,000	700	150	16,000
394	Maroondah Hwy	East Of Eastlink	East bound	27,000	600	300	28,000
395	Maroondah Hwy	East Of Eastlink	West bound	31,000	800	400	32,000
396	Maroondah Hwy	n Ringwood St to Warrandyte	East Bound	19,000	900	250	20,000
397	Maroondah Hwy	n Ringwood St to Warrandyte	West Bound	20,000	1,800	300	22,000
398	Maroondah Hwy	Btwn Mitcham Rd to Eastlink	Eastbound	38,000	1,100	500	40,000
399	Maroondah Hwy	Btwn Mitcham Rd to Eastlink	Westbound	38,000	1,000	500	39,000
400	Maroondah Hwy	n Mt Dandenong Rd to Dublin	Northbound	37,000	1,200	800	39,000
401	Maroondah Hwy	n Mt Dandenong Rd to Dublin	Southbound	38,000	1,200	800	40,000
402	McDonalds Rd	West of Pindari Ave	East Bound	12,000	600	250	13,000

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No	Road	Location	Direction	2036 Daily 24 hours Cars	LCV	HCV	Total
403	McDonalds Rd	West of Pindari Ave	West Bound	13,000	600	250	14,000
404	Merri Pde	⁄n St Georges Rd to Westgartl	East Bound	10,000	600	100	10,000
405	Merri Pde	⁄n St Georges Rd to Westgartl	West Bound	12,000	600	100	13,000
406	Middleborough Rd	North of Eastern Fwy	North Bound	16,000	900	200	17,000
407	Middleborough Rd	North of Eastern Fwy	South Bound	17,000	800	150	18,000
408	Middleborough Rd	⁄n Whitehorse Rd to Eastern F	North Bound	20,000	1,100	500	22,000
409	Middleborough Rd	⁄n Whitehorse Rd to Eastern F	South Bound	19,000	1,000	500	21,000
410	litcham Rd At Eastern Fw	At Eastern Fwy	North Bound	16,000	800	150	17,000
411	litcham Rd At Eastern Fw	At Eastern Fwy	South Bound	18,000	1,000	200	19,000
412	Mt Dandenong Rd	Maroondah Hwy to Dublin Rd	East Bound	24,000	1,500	400	26,000
413	Mt Dandenong Rd	Maroondah Hwy to Dublin Rd	West Bound	24,000	1,100	400	25,000
414	Murray Rd	Btwn High St to Plenty Rd	East Bound	8,000	500	150	9,000
415	Murray Rd	Btwn High St to Plenty Rd	West Bound	9,000	500	150	10,000
416	Murray Rd	Btwn Plenty Rd to Albert St	East Bound	7,000	500	150	8,000
417	Murray Rd	Btwn Plenty Rd to Albert St	West Bound	8,000	400	150	9,000
418	urray Rd At Darebin Cree	At Darebin Creek	East Bound	18,000	1,100	200	20,000
419	urray Rd At Darebin Cree	At Darebin Creek	West Bound	16,000	1,300	150	18,000
420	NEL Midblock	n Eastern Fwy to Manningham	North Bound	51,000	3,200	7,300	62,000
421	NEL Midblock	n Eastern Fwy to Manningham	South Bound	48,000	3,100	7,300	58,000
422	NEL Midblock	Manningham Rd to Lower Plei	North Bound	57,000	3,000	7,700	68,000
423	NEL Midblock	Manningham Rd to Lower Plei	South Bound	56,000	3,000	7,700	66,000
424	NEL Midblock	n Lower Plenty Rd to Grimsha	North Bound	54,000	3,200	7,900	65,000
425	NEL Midblock	n Lower Plenty Rd to Grimsha	South Bound	55,000	3,200	7,900	66,000
426	NEL Midblock	Btwn Grimshaw St to M80	North Bound	45,000	2,600	7,400	55,000
427	NEL Midblock	Btwn Grimshaw St to M80	South Bound	46,000	2,600	7,400	56,000
428	NEL Midblock	Under Manningham Rd	North Bound	37,000	2,300	6,400	46,000
429	NEL Midblock	Under Manningham Rd	South Bound	36,000	2,300	6,400	45,000
430	NEL Midblock	Under Lower Plenty Rd	North Bound	40,000	2,500	7,300	50,000
431	NEL Midblock	Under Lower Plenty Rd	South Bound	40,000	2,500	7,300	50,000
432	NEL Midblock	Under Grimshaw St	North Bound	45,000	2,600	7,400	55,000
433	NEL Midblock	Under Grimshaw St	South Bound	46,000	2,600	7,400	56,000
434	NEL Ramp	Entry Ramp From City At East	North Bound	15,000	850	750	17,000
435	NEL Ramp	Ramp To Eastern Suburbs at	South Bound	37,000	2,500	6,700	47,000
436	NEL Ramp	Ramp From Eastern Suburbs	North Bound	36,000	2,400	6,500	45,000
437	NEL Ramp	B Exit Ramp To City at Easter	South Bound	11,000	650	600	12,000
438	NEL Ramp	NB Entry Ramp At Manningha	North Bound	20,000	700	1,300	22,000
439	NEL Ramp	SB Exit Ramp At Manninghar	South Bound	20,000	700	1,300	22,000
440	NEL Ramp	NB Exit Ramp At Manninghar	North Bound	14,000	900	900	16,000
441	NEL Ramp	SB Entry Ramp At Manningha	South Bound	12,000	850	900	14,000
442	NEL Ramp	NB Entry Ramp At Lower Plen	North Bound	14,000	700	550	16,000
443	NEL Ramp	SB Exit Ramp At Lower Plent	South Bound	15,000	700	550	16,000
444	NEL Ramp	NB Exit Ramp At Lower Plent	North Bound	17,000	550	450	18,000
445	NEL Ramp	SB Entry Ramp At Lower Plen	South Bound	15,000	500	350	16,000
446	NEL Ramp	. - NB Exit Ramp At Grimshaw	North Bound	9,000	600	500	10,000
447	NEL Ramp	- SB Entry Ramp At Grimshaw	South Bound	9,000	600	500	10,000
448	Nell Street	wn Longmuir Rd to Greta Stre	East Bound	1,500	100	100	1,500
449	Nell Street	wn Longmuir Rd to Greta Stre	West Bound	1,500	150	100	1,500
450	Oriel Rd	Btwn Bell St to Livingston St	North Bound	11,000	700	150	12,000
451	Oriel Rd	Btwn Bell St to Livingston St	South Bound	10,000	700	150	10,000
452	Para Rd	Btwn Rattray Rd to Main Rd	North Bound	10,000	600	100	10,000
453	Para Rd	Btwn Rattray Rd to Main Rd	South Bound	9,000	350	100	9,000
454	Parker St	Btwn Reynolds Rd to Swilk St	East Bound	1,000	100	100	1,500
455	Parker St	Btwn Reynolds Rd to Swilk St	West Bound	1,500	100	100	1,500
456	Plenty Rd	At Darebin Creek	East Bound	24,000	600	150	25,000
457	Plenty Rd	At Darebin Creek	West Bound	24,000	600	150	25,000
458	Plenty Rd	3twn Main Dr to Greenwood D	North Bound	35,000	1,400	300	36,000
459	Plenty Rd	3twn Main Dr to Greenwood D	South Bound	35,000	1,200	300	36,000
460	Plenty Rd	:wn McDonalds Rd to Bush Bl	North Bound	35,000	2,000	400	37,000
461	Plenty Rd	:wn McDonalds Rd to Bush Bl	South Bound	42,000	1,000	400	43,000
462	Plenty Rd	North of Mckimmies	North Bound	46,000	5,200	800	52,000
463	Plenty Rd	North of Mckimmies	South Bound	49,000	3,100	700	53,000
464	Plenty Rd	⁄n Settlement Rd to M80 Ring	North Bound	36,000	1,200	300	37,000
465	Plenty Rd	⁄n Settlement Rd to M80 Ring	South Bound	27,000	900	300	28,000
466	Plenty Rd	Btwn Albert St to Murray Rd	Northbound	12,000	250	100	13,000
467	Plenty Rd	Btwn Albert St to Murray Rd	Southbound	14,000	300	150	15,000
468	Plenty Rd	Btwn Murray St to Bell St	Northbound	13,000	300	150	14,000
469	Plenty Rd	Btwn Murray St to Bell St	Southbound	13,000	250	150	14,000

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No	Road	Location	Direction	2036 Daily 24 hours			
				Cars	LCV	HCV	Total
470	Princess St	Btwn Duke St to Wills St	North Bound	20,000	1,000	200	21,000
471	Princess St	Btwn Duke St to Wills St	South Bound	23,000	700	250	24,000
472	Queens Pde	twn Hoddle St to Alexandra Pc	North Bound	9,000	700	150	10,000
473	Queens Pde	twn Hoddle St to Alexandra Pc	South Bound	9,000	1,000	150	10,000
474	Research-Warrandyte Rd	Rd to Kangaroo Ground-Warı	North Bound	5,000	150	100	5,000
475	Research-Warrandyte Rd	Rd to Kangaroo Ground-Warı	South Bound	4,000	150	100	4,000
476	Reynolds Rd	n Blackburn Rd to Williamsons	East Bound	17,000	1,000	200	18,000
477	Reynolds Rd	n Blackburn Rd to Williamsons	West Bound	18,000	1,100	400	19,000
478	Reynolds Rd	3lackburn Rd to Andersons Cr	Eastbound	16,000	700	150	17,000
479	Reynolds Rd	3lackburn Rd to Andersons Cr	Westbound	17,000	700	150	18,000
480	Ringwood Bypass	East of Eastlink	East bound	43,000	1,500	1,100	46,000
481	Ringwood Bypass	East of Eastlink	West bound	40,000	1,200	1,000	43,000
482	Ringwood Bypass	v Ringwood St to Warrandyte	Eastbound	39,000	1,600	900	42,000
483	Ringwood Bypass	v Ringwood St to Warrandyte	Westbound	38,000	1,400	1,000	41,000
484	Ringwood-Warrandyte Rc	South of Jumping Creek Rd	North Bound	8,000	600	100	9,000
485	Ringwood-Warrandyte Rc	South of Jumping Creek Rd	South Bound	8,000	600	100	8,000
486	Ringwood-Warrandyte Rc	Btwn Milne Rd to Tortice Dr	North Bound	12,000	1,000	150	13,000
487	Ringwood-Warrandyte Rc	Btwn Milne Rd to Tortice Dr	South Bound	12,000	1,000	150	13,000
488	Rosanna Rd	Btwn Brown St to Reid St	North Bound	21,000	700	150	21,000
489	Rosanna Rd	Btwn Brown St to Reid St	South Bound	19,000	700	200	19,000
490	Ryans Rd	Diamond Creek Rd to Allenda	North Bound	8,000	200	100	8,000
491	Ryans Rd	Diamond Creek Rd to Allenda	South Bound	8,000	300	100	8,000
492	Settlement Rd	At Darebin Creek	East Bound	13,000	1,400	300	15,000
493	Settlement Rd	At Darebin Creek	West Bound	12,000	1,500	250	14,000
494	Settlement Rd	Btwn Dalton Rd to High St	East Bound	7,000	700	250	8,000
495	Settlement Rd	Btwn Dalton Rd to High St	West Bound	8,000	700	250	8,000
496	Southern Rd	twn Waterdale Rd to Waiora F	East Bound	7,000	400	100	8,000
497	Southern Rd	twn Waterdale Rd to Waiora F	West Bound	7,000	500	100	8,000
498	Spring St	Btwn Broadway to Murray Rd	North Bound	17,000	1,000	200	18,000
499	Spring St	Btwn Broadway to Murray Rd	South Bound	17,000	1,000	200	18,000
500	Springvale Rd	North of Eastlink	North Bound	28,000	1,100	500	29,000
501	Springvale Rd	North of Eastlink	South Bound	22,000	1,300	400	23,000
502	Springvale Rd	Reynolds Rd to Old Warrandy	North Bound	12,000	700	200	13,000
503	Springvale Rd	Reynolds Rd to Old Warrandy	South Bound	11,000	800	150	12,000
504	Springvale Rd	vn Whitehorse Rd to Eastern F	North Bound	34,000	4,100	1,000	38,000
505	Springvale Rd	vn Whitehorse Rd to Eastern F	South Bound	35,000	3,700	1,000	39,000
506	St Georges Rd	Btwn Bell St to Normanby Ave	North Bound	25,000	1,400	300	26,000
507	St Georges Rd	Btwn Bell St to Normanby Ave	South Bound	26,000	1,800	300	28,000
508	St Georges Rd	twn Holden St to Alexandra Pc	North Bound	10,000	700	200	11,000
509	St Georges Rd	twn Holden St to Alexandra Pc	South Bound	12,000	900	250	13,000
510	St Georges Rd	Btwn Murray St to Bell St	North Bound	22,000	1,000	250	24,000
511	St Georges Rd	Btwn Murray St to Bell St	South Bound	20,000	1,300	250	21,000
512	St Georges Rd	twn Normanby Ave to Merri Pc	North Bound	25,000	1,100	200	26,000
513	St Georges Rd	twn Normanby Ave to Merri Pc	South Bound	25,000	1,000	200	26,000
514	Station St	vn Whitehorse Rd to Eastern F	North Bound	17,000	700	150	18,000
515	Station St	vn Whitehorse Rd to Eastern F	South Bound	18,000	700	150	19,000
516	Station St	Btwn Bell St to Darebin Rd	North Bound	21,000	1,400	400	23,000
517	Station St	Btwn Bell St to Darebin Rd	South Bound	23,000	1,300	350	24,000
518	Station St	wn Darebin Rd to Heidelberg I	North Bound	10,000	500	150	11,000
519	Station St	wn Darebin Rd to Heidelberg I	South Bound	11,000	500	200	11,000
520	Studley Park	Rd at Yarra River	Eastbound	12,000	350	100	12,000
521	Studley Park	Rd at Yarra River	Westbound	14,000	300	100	15,000
522	Surrey Rd	vn Whitehorse Rd to Eastern F	North Bound	14,000	800	250	16,000
523	Surrey Rd	vn Whitehorse Rd to Eastern F	South Bound	15,000	900	200	16,000
524	Templestowe Rd	Near Birrarrung Park	Eastbound	16,000	800	200	18,000
525	Templestowe Rd	Near Birrarrung Park	Westbound	14,000	600	150	15,000
526	Thompsons Rd	twn Manningham Rd to Foote	North Bound	6,000	150	100	6,000
527	Thompsons Rd	twn Manningham Rd to Foote	South Bound	7,000	400	100	8,000
528	Thompsons Rd	North East Of Eastern Fwy	East Bound	13,000	500	150	14,000
529	Thompsons Rd	North East Of Eastern Fwy	West Bound	15,000	1,100	200	16,000
530	Tram Rd	North of Eastern Fwy	North Bound	20,000	800	250	21,000
531	Tram Rd	North of Eastern Fwy	South Bound	22,000	1,400	150	23,000
532	Upper Heidelberg Rd	Btwn Banksia St to Studley Rc	North Bound	9,000	700	150	9,000
533	Upper Heidelberg Rd	Btwn Banksia St to Studley Rc	South Bound	10,000	800	400	11,000
534	Upper Heidelberg Rd	3twn Burgundy St to Waiora R	North Bound	16,000	900	150	17,000
535	Upper Heidelberg Rd	3twn Burgundy St to Waiora R	South Bound	18,000	800	400	19,000
536	Victoria Pde	3twn Hoddle ST to Lansdown S	Eastbound	32,000	1,500	350	34,000

Project 2036

2036 Daily

No	Road	Location	Direction	24 hours			
				Cars	LCV	HCV	Total
537	Victoria Pde	;twn Hoddle ST to Lansdown S	Westbound	29,000	1,400	400	31,000
538	Waiora Rd	wn Southern Rd to Dougharty	North Bound	11,000	500	100	12,000
539	Waiora Rd	wn Southern Rd to Dougharty	South Bound	13,000	500	100	14,000
540	Warrandyte Rd	vn Fitzsimons Ln to Blackburn	East Bound	6,000	300	150	6,000
541	Warrandyte Rd	vn Fitzsimons Ln to Blackburn	West Bound	6,000	350	150	6,000
542	Waterdale Rd	wn Southern Rd to Dougharty	North Bound	12,000	600	200	12,000
543	Waterdale Rd	wn Southern Rd to Dougharty	South Bound	11,000	900	250	12,000
544	Waterdale Rd	Btwn Southern Rd to Bell St	North Bound	11,000	900	250	12,000
545	Waterdale Rd	Btwn Southern Rd to Bell St	South Bound	12,000	1,100	250	14,000
546	Watsonia Rd	Btwn Princes St to Bungay St	North Bound	11,000	500		13,000
547	Watsonia Rd	Btwn Princes St to Bungay St	South Bound	10,000	250		12,000
548	Watsonia Rd	Greensborough Rd to Rail Line	North Bound	12,000	400	200	13,000
549	Watsonia Rd	Greensborough Rd to Rail Line	South Bound	12,000	200	100	12,000
550	Wattletree Rd	At Diamond Creek	North Bound	10,000	900	150	11,000
551	Wattletree Rd	At Diamond Creek	South Bound	11,000	700	200	12,000
552	Westgarth St	Btwn High St to Heidelberg Rc	East Bound	6,000	600	100	7,000
553	Westgarth St	Btwn High St to Heidelberg Rc	West Bound	7,000	350	100	7,000
554	Whitehorse Rd	Station Street to Middleborou	East Bound	21,000	800	200	22,000
555	Whitehorse Rd	Station Street to Middleborou	West Bound	20,000	1,200	200	22,000
556	Whitehorse Rd	Elgar Rd to Station St	East Bound	18,000	900	200	19,000
557	Whitehorse Rd	Elgar Rd to Station St	West Bound	16,000	1,100	250	17,000
558	Whitehorse Rd	Middleborough Rd to Surrey R	Eastbound	19,000	500	150	19,000
559	Whitehorse Rd	Middleborough Rd to Surrey R	Westbound	20,000	400	150	21,000
560	Whitehorse Rd	twn Surrey Rd to Springvale R	Eastbound	25,000	700	250	26,000
561	Whitehorse Rd	twn Surrey Rd to Springvale R	Westbound	26,000	700	250	27,000
562	Whitehorse Rd	w Springvale Rd to Mitcham R	Eastbound	31,000	1,000	400	32,000
563	Whitehorse Rd	w Springvale Rd to Mitcham R	Westbound	34,000	1,100	500	35,000
564	Whitehorse Rd	Btwn Burke Rd to Balwyn Rd	Eastbound	10,000	200	100	10,000
565	Whitehorse Rd	Btwn Burke Rd to Balwyn Rd	Westbound	11,000	200	100	11,000
566	Whitehorse Rd	btw Union Rd to Elgar Rd	Eastbound	13,000	300	100	13,000
567	Whitehorse Rd	btw Union Rd to Elgar Rd	Westbound	13,000	250	100	13,000
568	Williamsons Rd	Doncaster Rd to Manninghar	North Bound	27,000	1,400	200	28,000
569	Williamsons Rd	Doncaster Rd to Manninghar	South Bound	26,000	1,000	150	27,000
570	Williamsons Rd	twn Foote St to Warrandyte R	North Bound	21,000	1,600	350	23,000
571	Williamsons Rd	twn Foote St to Warrandyte R	South Bound	21,000	1,000	350	22,000
572	Williamsons Rd	Btwn King St to Foote St	North Bound	13,000	1,600	200	15,000
573	Williamsons Rd	Btwn King St to Foote St	South Bound	15,000	2,200	150	17,000
574	Williamsons Rd	twn Manningham Rd to King S	North Bound	14,000	1,300	150	15,000
575	Williamsons Rd	twn Manningham Rd to King S	South Bound	14,000	800	150	15,000
576	Wungan St	Btwn Skye St to Nicholls St	North Bound	4,000	400	100	5,000
577	Wungan St	Btwn Skye St to Nicholls St	South Bound	4,000	150	100	4,000
578	Yallambie Rd	Btwn Joules Ct to Fresham Rc	East Bound	2,000	150		2,500
579	Yallambie Rd	Btwn Joules Ct to Fresham Rc	West Bound	3,500	200	100	4,000
580	Yan Yean Rd	North of Diamond Creek Rd	North Bound	24,000	2,100	400	26,000
581	Yan Yean Rd	North of Diamond Creek Rd	South Bound	20,000	2,500	400	24,000
582	Yarra St	Btwn Cape St to Hawden St	East Bound	2,500	150	100	3,000
583	Yarra St	Btwn Cape St to Hawden St	West Bound	2,000	150	100	2,500

APPENDIX H

Important information relating to this report

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