7.0 Environmental assessment

7.3 Air quality

An Air Quality Impact Assessment (AQIA) was prepared to assess potential construction and operation air quality impacts associated with the proposal modification. The AQIA is attached as **Appendix J** (Air quality impact assessment).

7.3.1 Introduction

Table 7-27 sets out the SEARs relevant to the air quality assessment and identifies where the requirements have been addressed in this section.

Table 7-27 SEARs – Air quality

Desired Performance Outcome	SEAR	Where addressed within the Modification Report
Other issues *[No performance outcome stated]*	An assessment of the following issues must be undertaken in accordance with the commitments in Attachment 2 of the M7 Motorway (SSI 663) – Project Modification letter submitted 9 May 2022 (via Major Projects Portal): • Air Quality *Extract from Attachment 2 of the M7 Motorway (SSI 663) – Project Modification letter submitted 9 May 2022:* Air quality impact assessment (AQIA) for construction and operation of the proposed modification in accordance with the current guidelines. This will include:	**Section 7.3**
	a. an analysis of relevant regional characteristics including existing air pollutant concentrations in the area, meteorological modelling, identification of sensitive receptors, and identification of obstacles to air dispersion	**Section 7.3.4**
	b. a qualitative risk assessment of construction impacts	**Section 7.3.5**
	c. dispersion modelling for operational impacts. This will compare existing motorway pollutant concentrations (2017 or 2018); do-nothing (two lane carriageway plus M12/M7 intersection) (year of opening and design year) and the cumulative do-something (motorway widening plus M12/M7 intersection) (year of opening and design year) scenarios.	**Section 7.3.5**
	d. qualitative cumulative impact assessment with the Elizabeth Drive project.	**Section 7.18.**

7.3.2 Method of assessment

Legislative and policy context

The air quality assessment was prepared in accordance with the following legislation and guidelines where relevant:

- *National Environment Protection Council Act 1994* (Commonwealth) and relevant National Environmental Protection Measures (NEPM), which include:

  - *National Environment Protection (Ambient Air Quality) Measure 2021* (Ambient Air Quality NEPM, 2021)
  - *National Environment Protection (Air Toxics) Measure 2004* (Air Toxics NEPM, 2004)
- *Protection of the Environment Operations Act 1997* (NSW)
- *Protection of the Environment Operations (Clean Air) Regulation 2010 (NSW)*
- *Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales* (NSW Environmental Protection Agency (EPA), 2017)
- *Guidance on the assessment of dust from demolition and construction* (Institute of Air Quality Management (IAQM), 2014)
- *Air pollution from road transport good practice guide* (Transport Special Interest Group)
- *Guideline for Assessing and Minimising Air Pollution in Victoria* (VIC EPA, 2022)
- *An Australian incremental guideline for particulate matter (PM2.5) to assist in development and planning decisions* (Capon, A. & Wright J. 2019)
- *Air Quality Impact Assessment Criteria* (NSW EPA, 2017).

Method of assessment - Construction assessment

Dust emissions

Potential impacts from dust generation during construction have

been assessed using the UK IAQM, *Guidance on the assessment of dust from demolition and construction* (2014). This guidance document provides a qualitative risk assessment process for the potential unmitigated impact of dust generated from construction related activities.

The IAQM guidance process is a four-step risk-based assessment of dust emissions associated with demolition, land clearing and earth moving and construction activities. The IAQM assessment process is summarised in the following sections.

Step 1 – Screening assessment

Step 1 requires determination of whether there are any receptors close enough to warrant further assessment.

A screening assessment was undertaken for each of the study area zones (refer to **Section 7.3.3**) to identify both ‘human’ and ‘ecological’ receptors within close proximity to the construction footprint.

Step 2 – Dust risk assessment

Step 2 is a risk assessment designed to appraise the potential for dust impacts due to unmitigated dust emissions. The key components of the risk assessment involve defining:

- dust emission magnitudes (Step 2A)
- the surrounding area’s sensitivity to dust emissions (Step 2B)
- combining these in a risk matrix (Step 2C) to determine a potential risk rating for dust impacts on surrounding receptors.

The dust emission magnitude determined in Step 2A is combined with the sensitivity determined in Step 2B to determine the risk of dust impacts with no mitigation applied (Step 2C). Table 7-28 provides the risk ranking for dust impacts from construction activities for each scale of activity.

Table 7-28 Risk of dust impacts (for dust soiling and human health impacts)

Activity	Surrounding area sensitivity	Dust emission magnitude		
		Large	Medium	Small
Demolition	High	High	Medium	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Negligible
Earthworks	High	High	Medium	Low
	Medium	Medium	Medium	Low
	Low	Low	Low	Negligible
Construction	High	High	Medium	Low
	Medium	Medium	Medium	Low
	Low	Low	Low	Negligible
Trackout	High	High	Medium	Low
	Medium	Medium	Low	Negligible
	Low	Low	Low	Negligible

Step 3 – Management strategies

The outcome of Step 2C is used to determine the level of management that is required to manage dust impacts on surrounding sensitive receptors at acceptable levels. A high or medium-level risk rating suggests that mitigation measures must be implemented during construction.

Step 4 – Re-assessment

The final step is to determine whether there are significant residual impacts, post-mitigation, arising from the construction activities.

Combustion emissions

Potential impacts from combustion emissions during construction of the proposed modification has been qualitatively assessed**.** The qualitative assessment of combustion emissions from site plant and on-site traffic takes into consideration the estimated daily vehicle movements and type of plant equipment required during construction as discussed in **Chapter 4** (Proposed modification).

Odour emissions

A qualitative assessment of odour impacts from construction works associated with the proposed modification has also been undertaken.

Method of assessment - Operational assessment

To assess operational air quality impacts, a Level 2 Assessment was undertaken in accordance with the *Approved Methods for the modelling and assessment of air pollutants in NSW* (NSW EPA, 2017b).

The assessment of the effect of a large-scale infrastructure project on air quality involves the collection of a range of data which are combined with a dispersion model to predict the concentration of a pollutant at a location (whether that location is a sensitive receptor location or at an arbitrary point within the modelling domain to enable the generation of a contour plot).

The assessment involved:

- Study area identification
- Modelling scenario identification
- Model selection

- Data inputs into the dispersion model
- Emissions inventory development
- Analysis of traffic network.

Study area

The study area sets the boundaries of the overall proposed modification and provides context to the overall analysis. The study area for the air quality assessment is described in **Section 7.3.3**.

Modelling scenario

Five modelling scenarios were investigated for the proposed modification to determine the potential air quality impacts. The modelling scenarios are described in Table 7-29.

Table 7-29 Modelled scenarios for operation of proposed modification

Scenario	Name	Description
1	**Existing**	Westlink M7 traffic operations based on 2021[1] traffic volumes with existing motorway traffic lane arrangement.
2	**Do nothing** Design opening year	Westlink M7 traffic operations based on 2026 traffic volumes without the proposed modification, utilising existing motorway traffic lane arrangement. The 2026 traffic data accounts for the operation of the M12 and included modelling of on and off ramps at the M7/M12 intersection.
3	**Proposed modification** Design opening year	Westlink M7 traffic operations based on 2026 with the proposed widened traffic lane arrangement. The 2026 traffic data accounts for the operation of the M12 and included modelling of on and off ramps at the M7/M12 intersection.
4	**Do nothing** 10 years after opening	Westlink M7 traffic operations based on 2036 traffic volumes without the proposed modification, utilising existing motorway traffic lane arrangement. The 2036 traffic data accounts for the operation of the M12 and included modelling of on and off ramps at the M7/M12 intersection.
5	**Proposed modification** 10 years after opening	Westlink M7 traffic operations based on 2036 with the proposed widened traffic lane arrangement. The 2036 traffic data accounts for the operation of the M12 and included modelling of on and off ramps at the M7/M12 intersection.

Two main comparisons of the scenarios were assessed, including:

- Comparing operations in 2026 and 2036 with the proposed modification (scenario 3 and 5) to operations in 2026 and 2036 without the proposed modification (scenario 2 and 4)
- Comparing the future scenarios (scenario 2, 3, 4 and 5) with the existing operations (scenario 1).

[1] 2021 traffic data was used for the Traffic and Transport Impact Assessment (TTIA) (refer to **Appendix D** (Traffic and transport technical assessment)). The traffic data from 2021 was compared to traffic data from 2019 to understand the potential impacts of the COVID-19 pandemic on local traffic. The comparison showed that the 2021 data was higher than the 2019 data, therefore the 2021 data was adopted for the TTIA. Subsequently, this more recent data was also used for the AQIA, rather than 2017 or 2018 as per the SEAR requirement.

The second comparison is used to show that even when there may be air quality pollutant increases as a result of a proposal, overall, future air quality pollutants may be lower than existing conditions. This can be due to a range of factors including a general improvement in vehicle emission standards over time (which is accounted for in the model).

Model selection

Given the nature of the proposed modification and its immediate surrounds, which result in complex air flows, the use of a dispersion model able to predict air flows on a fine scale and predict concentrations in the near-field was required. Given its ability to provide dispersion concentrations on micro-scale grids within complex building environments, the GRAL model has been used for this assessment.

Modelling inputs

The model required a range of data inputs that can be broadly separated into the following categories:

- Meteorological data
- Terrain data
- Land use data
- Building data
- Receptor locations
- Source emissions data.

Emissions inventory

The air quality assessment considers emissions to air due to the operation of motor vehicles on the Westlink M7 for both existing and proposed lane configurations. Motor vehicles create emissions to air from the combustion and evaporations of fuels to power the vehicles, and from non-combustion processes such as tyre, brake and road wear.

To enable a spatially accurate emissions profile along the length of the Westlink M7, the surface road and the on/off access ramps were divided into a series of unique links to allow for changes in the road profile and traffic behaviours.

Emissions rates for each unique link were calculated using a high level generic formula.

Traffic network analysis

The air quality assessment assumed emissions from the mainline of the Westlink M7 along with the emissions associated with the on-ramp and off-ramps. Larger traffic generating developments including approved road projects and upgrades such as the M12 which would influence future traffic numbers on the Westlink M7 have been accounted for using growth factors in the modelled scenarios described in Table 7-29.

Broader network air quality modelling was not undertaken to account for the potential changes in road traffic volumes in the surrounding road network which may be influenced by the proposed widening of the Westlink M7. As such, a qualitative assessment of and how those potential changes could impact the air quality predictions made by the AQIA.

Assessment criteria

The air quality assessment criteria provided in Table 7-30 was adopted for the proposed modification based on the ambient air quality criteria in the *Approved Methods for the modelling and assessment of air pollutants in NSW* (NSW EPA, 2017b).

Table 7-30 Characteristics of assumed background concentrations

Pollutant	Averaging period	Criteria (µg/m³)
NO_2 (Nitrogen dioxide)	1-hour (maximum)	246
	Annual Average	62
CO_2 (Carbon dioxide)	1-hour (maximum)	30,000
	8-hour (maximum)	10,000
PM_{10} (Particulate matter equal to or less than 10 microns in diameter)	24-hour (maximum)	25
	Annual Average	8
$PM_{2.5}$ (Particulate matter equal to or less than 2.5 microns in diameter)	24-hour (maximum)	25
	Annual Average	8
Benzene	99.9th Percentile 1-hour average	29
Formaldehyde	99.9th Percentile 1-hour average	20
1,3-butadiene	99.9th Percentile 1-hour average	40
Toluene	99.9th Percentile 1-hour average	360
Ethylbenzene	99.9th Percentile 1-hour average	8000
Xylene	99.9th Percentile 1-hour average	190
Polycyclic Aromatic Hydrocarbons (PAHs) (as Benzo(a)pyrene)	99th Percentile 1 Hour	0.04

Given the high annual $PM_{2.5}$ concentrations within the Sydney basin, incremental health assessment criteria for annual $PM_{2.5}$ exposure was also adopted. Based on the paper *An Australian incremental guideline for particulate matter ($PM_{2.5}$) to assist in development and planning decisions* (Capon, A. & Wright J. 2019), the following incremental annual average $PM_{2.5}$ categories were used to define the level of risk from the proposed modification:

- Negligible Risk for $PM_{2.5}$ < 0.02 micrograms (µg)
- Acceptable Risk for $PM_{2.5}$ between 0.02 - 0.17 µg
- Tolerable Risk for $PM_{2.5}$ between 0.17 – 1.7 µg
- Unacceptable Risk for $PM_{2.5}$ between >1.7 µg.

7.3.3 Study area

Construction

For the construction assessment, buffer distances of 20 metres, 50 metres, 100 metres, 200 metres and 350 metres around the construction footprint were used to define the study area for the air quality assessment, as shown on Figure 7-27 and Figure 7-28.

Given the length of the proposed modification, the study area was divided into the following zones:

- Zone 1 Prestons to Hoxton Park
- Zone 2 Hoxton Park to Elizabeth Hills
- Zone 3 Elizabeth Hills
- Zone 4 Cecil Hills
- Zone 5 Cecil Park
- Zone 6 Horsley Park
- Zone 7 Horsley Park to Eastern Creek
- Zone 8 Eastern Creek
- Zone 9 Eastern Creek to Rooty Hill
- Zone 10 Rooty Hill to Glendenning
- Zone 11 Glendening to Oakhurst.

Operation

For the operational assessment, the study area was broken up into two modelling domains:

- Southern domain: which covers the area from Prestons to Horsley Park as presented in Figure 7-29
- Northern domain: which covers the area from Horsley Park to Oakhurst as presented in Figure 7-30.

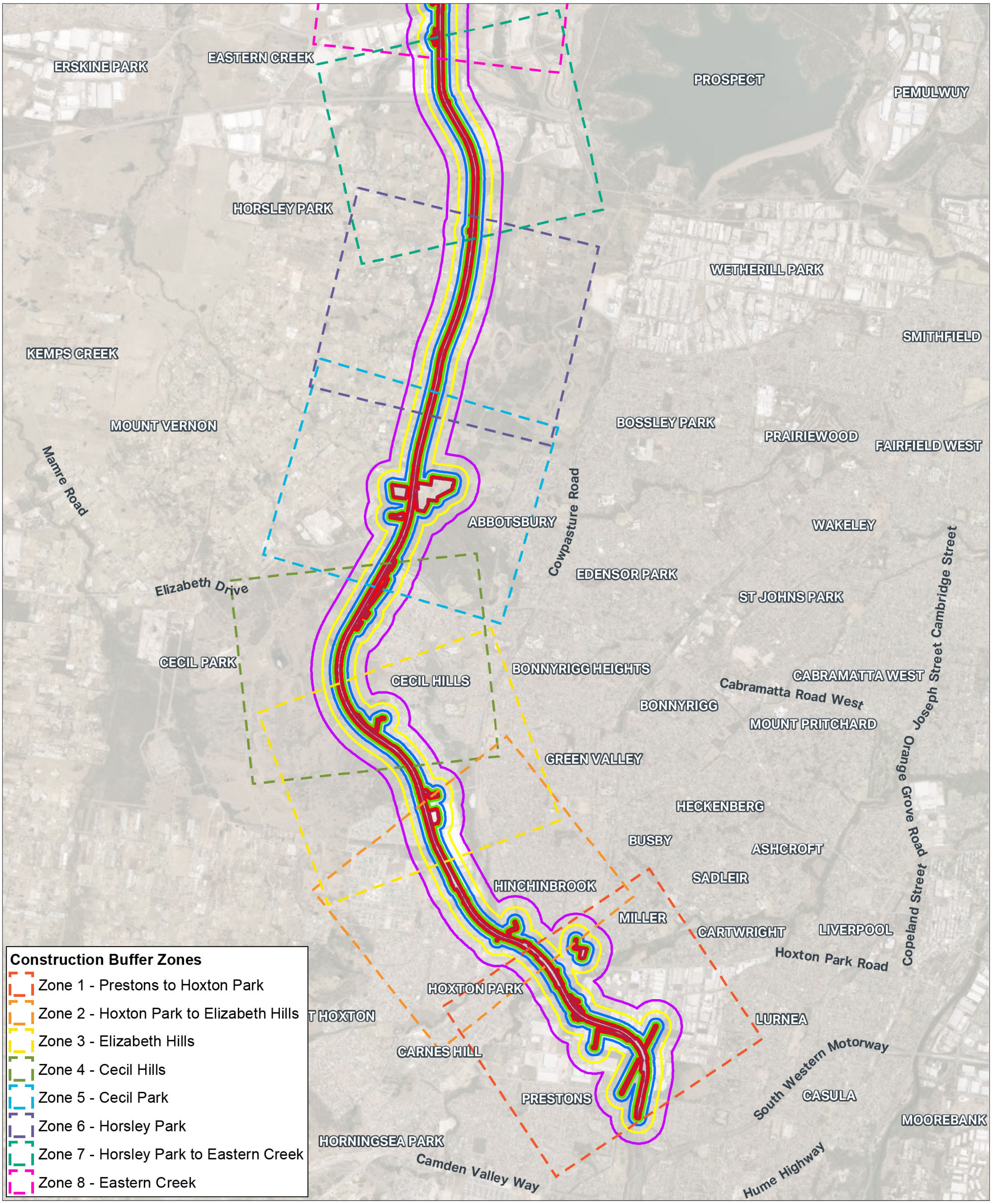

FIGURE 7-27: AIR QUALITY ASSESSMENT CONSTRUCTION STUDY AREA - SOUTH

Legend

- Construction footprint
- 20m buffer from construction footprint
- 50m buffer from construction footprint
- 100m buffer from construction footprint
- 200m buffer from construction footprint
- 350m buffer from construction footprint

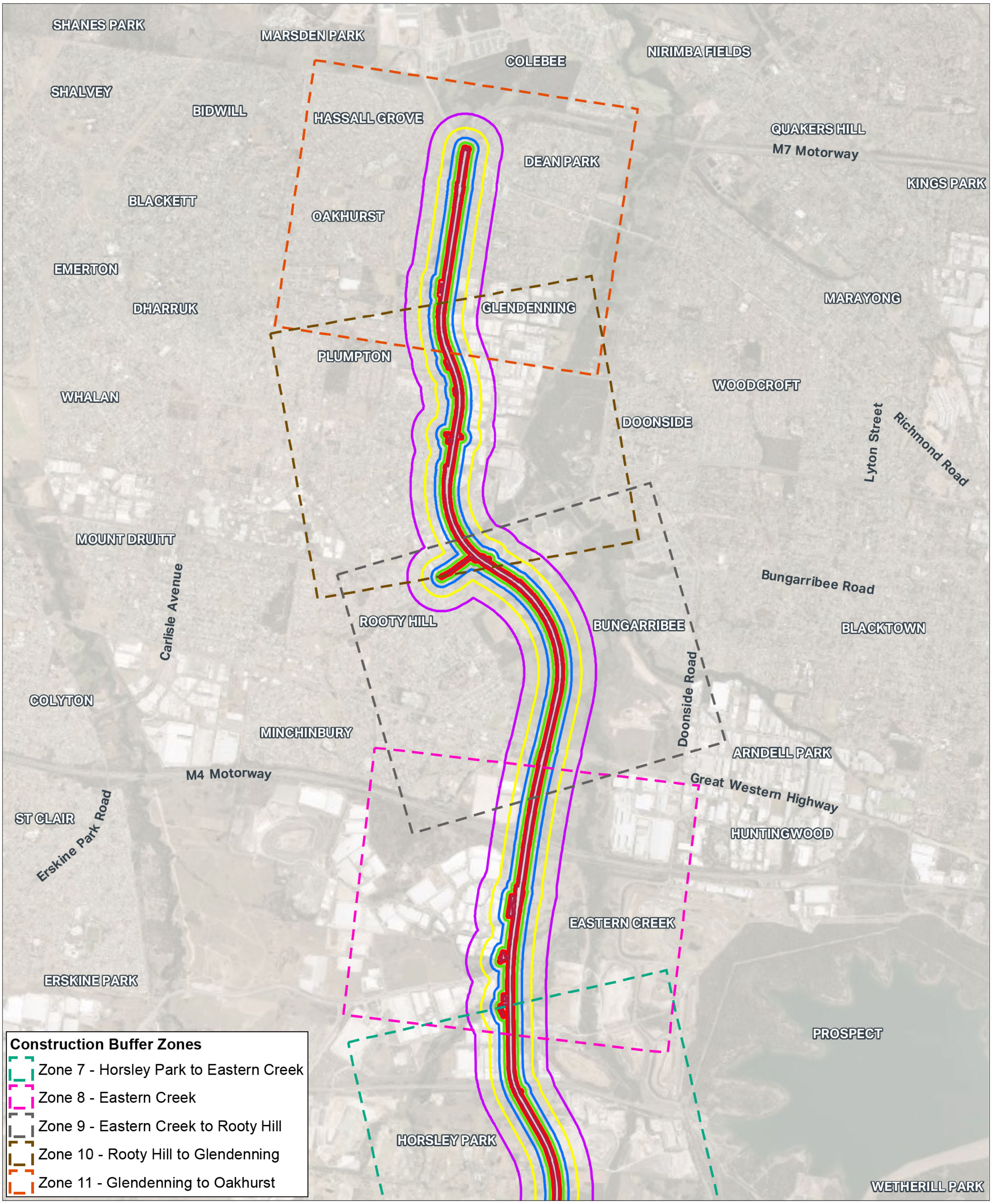

FIGURE 7-28: AIR QUALITY ASSESSMENT CONSTRUCTION STUDY AREA - NORTH

0 1 2 km

AECOM

Legend

- Construction footprint
- 20m buffer from construction footprint
- 50m buffer from construction footprint
- 100m buffer from construction footprint
- 200m buffer from construction footprint
- 350m buffer from construction footprint

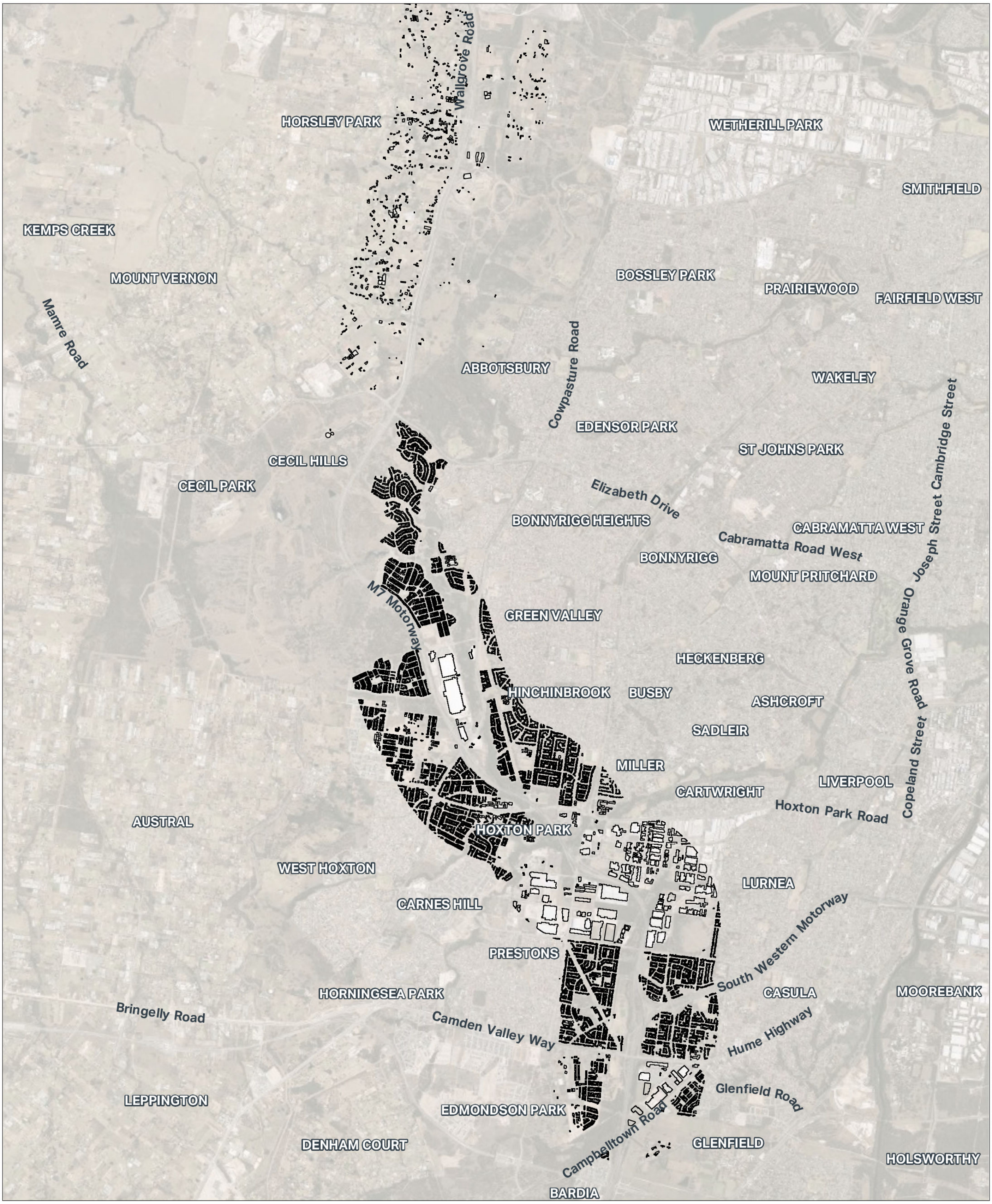

FIGURE 7-29: AIR QUALITY ASSESSMENT OPERATIONAL STUDY AREA - SOUTHERN DOMAIN

Legend

Building

Source: Imagery © Department of Customer Service 2020

FIGURE 7-30: AIR QUALITY ASSESSMENT OPERATIONAL STUDY AREA - NORTHERN DOMAIN

N 0 1 2 km

AECOM

Legend

Building

7.3.4 Existing environment

Air pollution from road traffic is one of the major sources of air emissions in urban areas and can be associated with a wide range of health effects. Vehicle emissions degrade ambient air quality for individuals living near major roadways and within an airshed in general. It is therefore important to identify the key pollutants of interest associated with vehicle emissions and understand the potential air quality impacts associated with the proposed modification. Pollutants of interest from the proposed modification would include those generated from both the combustion of fossil fuels and from non-exhaust emission sources such as the disturbance of soil generating dust and the generation of dust from the movement of vehicles themselves.

The existing air quality environment has been examined in terms of the regional meteorology, existing pollutant levels, terrain features and land use characteristics in the modelling domain, and nearby sensitive receptors (e.g. residents, schools). Further information on these aspects of the existing environment is provided in Section 5.0 of **Appendix J** (Air quality impact assessment).

Meteorology

The proposed modification would occur over a 26-kilometre-long stretch of road and as such local meteorological conditions across the study area are likely to be influenced by varying topography and land use characteristics.

Both the Environment, Energy and Science (EES) group and Bureau of Meteorology (BoM) operate a network of ambient pollutant and meteorological data monitoring stations at several locations across the Sydney basin. The BoM Horsley Park Station was selected to provide a discussion on existing local meteorological conditions as it is roughly central to the southern half of the Sydney basin, is situated within both the northern and southern domains for the operational study area and is close to the existing Westlink M7.

The Station identified a low annual average wind speed combined with high occurrence of calms which indicates poorer localised dispersion of air pollutants due to more stable atmospheric conditions.

General observed seasonal trends show that the hottest month is January with an average maximum temperature of 29 °C and the coldest month is July with an average minimum temperature of approximately 7 °C. Average rainfall tends to follow a similar trend to temperature with a general decline around the winter period with an increase during summer. February was found to have the highest rainfall while the month of May was found to have the lowest rainfall.

Air quality

The key pollutants of interest in NSW are Ozone, NO_2 and particulate matter, with regional levels of certain pollutants approaching or exceeding the national standards prescribed in the *National Environment Protection Measure for Ambient Air Quality* (NEPM). The Westlink M7 is expected to generate emissions of NO_2, CO, particulates and volatile organic compounds (VOC). Of these pollutants identified, only NO_2, CO and particulates need to be considered cumulatively with existing background concentration, necessitating an analysis of the background air pollutant concentrations.

Background air pollution is characterised through ambient monitoring undertaken by the NSW Government at locations throughout the Sydney basin. Eight EES ambient pollutant monitoring stations were investigated in total, with four being in the northern domain and four in the southern domain.

Table 7-31 provides a summary of measured pollutant concentrations within the southern and northern domains for the period 2015 to 2020, along with the adopted air quality assessment criteria for the proposed modification.

Air pollution in the Sydney basin already exceeds the $PM_{2.5}$ standards.

Table 7-31 Characteristics of assumed background concentrations

Pollutant	Averaging period	Concentration (µg/m³)		Criteria (µg/m³)
		Northern domain	Southern domain	
NO_2	1-hour (maximum)	143.5	131.2	246
	Annual Average	21.9	25.2	62
CO	1-hour (maximum)	2375	3000	30,000
	8-hour (maximum)	1578	2016	10,000
PM_{10}	24-hour (maximum)	113.3	101.5	25
	Annual Average	21.8	24.2	8
$PM_{2.5}$	24-hour (maximum)	93.2	56.4	25
	Annual Average	9.2	10.4	8

Monitoring data across all stations show that NO_2 and CO levels in the ambient environment are well below current criteria. General seasonal trends in pollutant concentration were observed with higher concentrations occurring during winter and lower concentrations noted in summer.

Particulate concentrations show that levels of dust in the ambient environment surrounding the proposed modification are elevated with exceedances of short-term PM_{10} and $PM_{2.5}$ criteria. These short-term exceedances are typically attributed to unusual events like bushfires and dust storms which occurred in both 2018 and 2019. Particulate concentrations during unusual events should not be used as indicators of long-term peak particulate concentrations and compliance with EPA criteria.

For PM_{10}, the average 90th percentile 24-hour concentration across all stations in the southern domain was 28.7 µg/ m^3 and 28.8 µg/m^3 for the northern domain. For $PM_{2.5}$, the average 90th percentile 24-hour concentration across all stations in the southern domain was 13.1 µg/ m^3 and 12.5 µg/ m^3 for the northern domain.

Terrain

Terrain elevation along the Westlink M7 varies from around 100 metres to around 25 metres above sea level. Most of study area and surrounding area is around 30 to 50 metres above sea level, with higher elevations observed of up to approximately 125 metres between Cecil Hills, near the intersection with Elizabeth Drive, and Eastern Creek west of Prospect Reservoir.

Surrounding land use

In the south of the study area, around Prestons, the surrounding land use primarily consists of general and heavy industrial interspersed with areas of environmental conservation and residual native vegetation. The areas of Hoxton Park and Hinchinbrook are primarily general residential and low density residential.

Between Elizabeth Hills and Horsley Park is a mix of parklands (Western Sydney Parklands), low density residential, rural residential, agriculture and horticulture, recreational land and environmental conservation areas and remnant native vegetation. Between Horsley Park and Eastern Creek there is a wide range of land uses including general industrial, waste management, rural residential, agriculture/horticulture, mining, open space, environmental conservation areas and remnant native vegetation. Eastern Creek is primarily comprised of industrial manufacturing, commercial services, and recreational land.

At the northern end of the alignment between Rooty Hill and Glendening is primarily urban residential, commercial, service facilities and recreational areas.

Land use surrounding the proposed modification is discussed further in **Section 7.9** (Land use and property).

Sensitive receptors

The NSW EPA defines a sensitive receptor to be *“a location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area”* (NSW EPA, 2017b). Sensitive receptor locations included in the assessment included nearby representative commercial / industrial buildings along with the representative residential dwellings.

Highly sensitive receptors

While sensitive receptors generally refer to land uses where there is the potential for humans to be exposed to air pollutants over a period of eight hours or more per day, some sensitive receptors contain a higher proportion of occupants that are more susceptible to adverse effects of air pollution. Highly sensitive receptors generally contain a higher proportion of children and elderly people as well as people generally with underlying health conditions. A total of 18 highly sensitive receptors were identified within the study area, including:

- Nine schools and childcare facilities
- Six health clinics/medical centres
- Three retirement and aged care facilities.

The location of each highly sensitive receptor is provided in Figure 7-31.

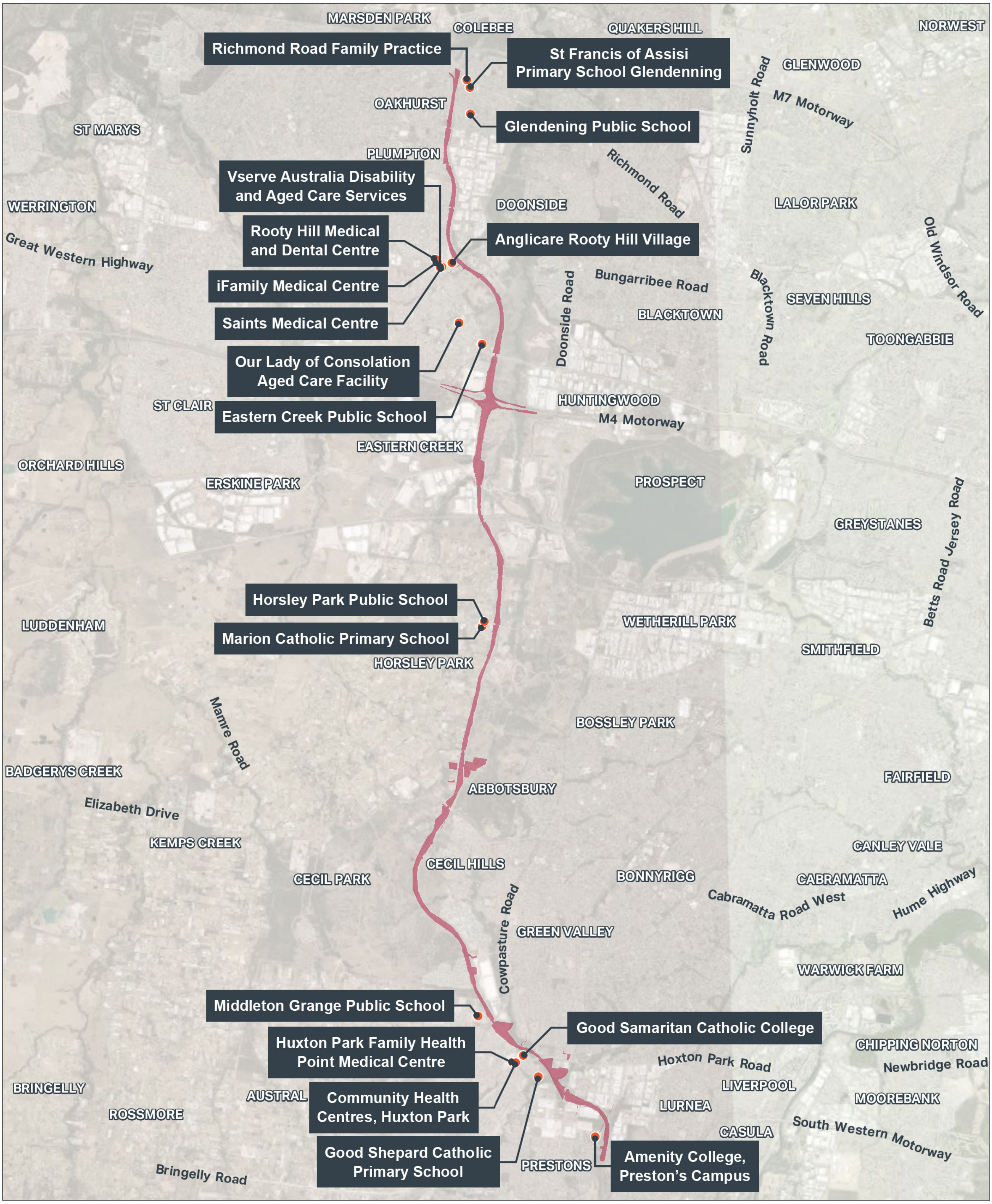

FIGURE 7-31: LOCATION OF IDENTIFIED HIGHLY SENSITIVE RECEPTORS

AECOM

Legend
- Project modification
- Highly sensitive receptor

Population density and vulnerability

Higher population density rates generally result in increased pressure on ambient air quality; this is due to the increased number of anthropogenic air emissions within an air shed. Population density within the study area varies from less than 500 people per square kilometre to up to 2,000 to 5,000 people per square kilometre. The areas of highest density are generally within Dean Park, Oakhurst, Plumpton, Rooty Hill and Hoxton Park.

In addition to population density, it is important to understand the vulnerability to pollutants of the potentially affected population. An approximate indicator of the vulnerability of a community is the Index of Relative Socio-economic Disadvantage (IRSD). The IRSD is a general socio-economic index that summarises a range of information about the socioeconomic condition of people and households within an area and provides an indicator of the relative disadvantage or lack of disadvantage within a population.

An IRSD with a quintile of 1 represents the most disadvantaged populations and a quintile of 5 represents the least disadvantaged populations.

Most populations within the study area are within quintile 2 and quintile 4. Horsley Park and Hinchinbrook were identified to be within quintile 1 and are considered more vulnerable to air pollution and potential air quality impacts.

Ecological receptors

Ecological receptors are areas of ecological significance. This can include areas such as national parks, State conservation areas, nature reserves and endangered ecological communities or species. Ecological receptors can also include agricultural activities that might be vulnerable to air emissions such as fruit and vegetable farms, flower farms or vineyards.

Assessment of ecological impacts associated with the proposed modification is provided in **Section 7.6** (Biodiversity). Understanding the condition and significance of ecological receptors within the study area is important for the assessment of construction dust impacts in accordance with the IAQM methodology.

The study area contains remnant vegetation including some threatened endangered communities and the area has a long history of disturbance. Given the area contains particularly important plant species, where its dust sensitivity is uncertain or unknown and local designation areas where the features may be affected by dust deposition, the study area receptor sensitivity would be considered low to medium.

7.3.5 Impact assessment

Construction

Dust emissions

Step 1 – Screening assessment

There are both human and ecological receptors within the study area, 350 metres and 50 metres respectively from the construction footprint, which triggered the requirement for further assessment.

Step 2 – Dust risk assessment

<u>*Construction activity magnitudes*</u>

Construction activity magnitudes for each construction zone are presented in Table 7-32.

Table 7-32 Stage 2 IAQM assessment construction activity magnitudes

Construction activity magnitudes			
Demolition	Earthworks	Construction	Trackout
Large	Large	Large	Large

Dust risk ratings

The magnitude of each activity was combined with the sensitivity for each zone to give the risk ratings. The potential risks for the proposed modification were found to range from Low to High, as summarised in Table 7-33.

Table 7-33 Summary of unmitigated risk assessment for proposed modification

Zone	Activity	Step 2A: Potential for dust emissions	Step 2B: Sensitivity of area			Step 2C: Risk of unmitigated dust impacts		
			Dust soiling	Human health	Eco logical	Dust soiling	Human health	Eco logical
1 & 11	Demolition	Large	High	High	Medium	High	High	High
	Earthworks	Large	High	High	Medium	High	High	Medium
	Construction	Large	High	High	Medium	High	High	Medium
	Trackout	Large	High	High	Medium	High	High	Medium
2-8	Demolition	Large	Medium	Medium	Medium	High	High	High
	Earthworks	Large	Medium	Medium	Medium	Medium	Medium	Medium
	Construction	Large	Medium	Medium	Medium	Medium	Medium	Medium
	Trackout	Large	Medium	Medium	Medium	Medium	Medium	Medium
10	Demolition	Large	Medium	Medium	Low	High	High	Medium
	Earthworks	Large	Medium	Medium	Negligible	Medium	Medium	Negligible
	Construction	Large	Medium	Medium	Negligible	Medium	Medium	Negligible
	Trackout	Large	Medium	Medium	Negligible	Medium	Medium	Negligible

Sensitivity to dust soiling

Due to the length of the construction footprint, sensitivity to dust soiling was examined for each of the construction zones. The following was concluded:

- Zones 1 and Zone 11 were found to have a high risk of dust soiling (prior to mitigation) due to the proximity of highly sensitive receptors close to the construction footprint
- All other zones were found to have a moderate risk of dust soiling (prior to mitigation), corresponding to the proximity of highly sensitive receptors close to the construction footprint.

Sensitivity to exposure to dust - human receptors

Due to the size of the construction footprint, sensitivity to dust (as PM_{10}) in relation to human health risks have been examined for each of the construction zones. The following was concluded:

- Zones 1 and Zone 11 were found to have a high risk to human health (prior to mitigation) due to the proximity of highly sensitive receptors close to the construction footprint
- All other zones were found to have a moderate risk to human health (prior to mitigation) due to the proximity of highly sensitive receptors close to the construction footprint.

Sensitivity to exposure to dust - ecological receptors

Due to the size of the construction footprint, dust sensitivity risks to ecological receptors have been examined for each of the construction zones. The following was concluded:

- Most construction zones were found to have a medium risk of dust exposure to ecological receptors (prior to mitigation) due to the proximity of native vegetation and areas zoned for environmental conservation purposes within 20 metres of the construction footprint
- Construction zone 10 contains no ecological receptors of significance due to a high level of urban development, therefore the risk is considered negligible.

Combustion emissions

The source of combustion emissions during construction would be due to the combustion of petrol and diesel fuel by light and heavy vehicles traveling to and from site as well as onsite, mobile construction equipment and stationary equipment such as diesel generators. Pollutants emitted by construction vehicles are likely to include CO, particulate matter (PM_{10} and $PM_{2.5}$), NO_2, SO_2, VOCs, and PAHs.

Given the existing volume of traffic utilising the Westlink M7 and surrounding road network, combustion emissions from construction traffic on the Westlink M7 and adjacent road network are unlikely to result in a notable increase in ambient air quality at nearby sensitive receptors based on the construction traffic volume contribution. Off-motorway detours due to construction works are expected to result in some localised changes to ground level pollutant concentration distribution patterns. Higher ground level concentrations would be expected within approximately 50 metres of any detour but would be temporary in nature.

Given the typically transitory nature of construction traffic, as well as use of mobile and stationary plant equipment, exhaust emissions are unlikely to make a significant impact on local air quality.

Odour emissions

Potential odour impacts from the proposed modification during construction would be temporary in nature. Potential sources of odour would primarily occur from the potential disturbance of acid sulphate soils, however the likelihood of this is extremely low as discussed below.

Based on the findings of the contamination assessment carried out for the proposed modification (refer to **Appendix L** (Contamination assessment report)), the probability of intercepting acid sulphate soils across the study area is extremely low. There is however potential for inland acid sulphate soils to be encountered in water bodies within the study area where construction activities lower the water table by more than one metre. If potential acid sulphate soils is present, it is not expected to be excavated in large quantities as they are limited in depth (only exist in a thin layer) and the excavation works in the areas of risk would be localised pilings and footings for the bridge structures with minimal groundwater dewatering. Therefore, potential odour risks associated with the proposed modification are not considered likely. Potential management measures for acid sulphate soils are discussed in **Section 7.11** (Soils and contamination).

Operation

The following sections provide a summarised discussion on the change in concentrations for predicted pollutant concentrations between modelled operational scenarios outlined in Table 7-29.

A detailed discussion on the predicted changes for both the southern domain and northern domain is provided in **Appendix J** (Air quality impact assessment).

Contributions from road traffic was modelled for each scenario in isolation (for all pollutants), as well as the cumulative contribution from all of the scenarios combined (for pollutants NO_2, CO, PM_{10} and $PM_{2.5}$). These were then assessed against relevant EPA criteria. This is presented in further detail in Annexure J of **Appendix J** (Air quality impact assessment).

Pollutant concentrations

The operational air quality analysis along the Westlink M7 mainline assessed changes in contribution of:

- 1 hour maximum and annual average NO_2 concentrations
- 1 hour and 8 hour maximum CO concentrations
- 24 hour maximum and annual average PM_{10} and $PM_{2.5}$ concentrations.

In the modelled area of the Westlink M7 mainline, when comparing future scenarios (2026 and 2036) with and without the proposed modification, the scenario with the proposed modification generally predicted slightly higher ground level concentrations for all pollutant concentrations (NO_2, CO and particulates (PM_{10} and $PM_{2.5}$)). The highest differences were observed in the northern domain, particularly near urban residential premises in Oakhurst and Glendenning. These differences between with and without the proposed modification would be relatively minor when viewed as a percentage change against the relevant EPA criteria.

Regardless of the potential slight differences in pollutant concentrations in 2026 and 2036 due to the proposed modification, all future scenarios (i.e. 2026 and 2036 scenarios with and without the proposed modification) have lower predicted ground level concentrations at sensitive receptors for all pollutants when compared to existing operations. This is due to anticipated general societal changes in vehicle fleets, with expected future increases in the uptake in vehicles with more stringent emission standards, and reduced number of aging vehicles with lower emission standards on the Sydney road network.

Incremental health assessment ($PM_{2.5}$)

Changes in predicted annual $PM_{2.5}$ concentrations were assessed as a result of the proposed modification in both 2026 and 2036. Overall, for most of the study area along the Westlink M7 mainline, the potential health risk associated with the proposed modification (2026 and 2036) in relation to annual average $PM_{2.5}$ is negligible to acceptable. Within the study area, most ground level annual average $PM_{2.5}$ values would be within the negligible risk category; with higher annual $PM_{2.5}$ values closer to the kerb of the Westlink M7 classified as acceptable risk. Consideration of broader traffic redistribution which may result due to the proposed widening and which would have influence over the cumulative $PM_{2.5}$ levels at receptors is discussed below.

Some smaller areas close to the road corridor fall within the tolerable risk category.

The worst affected sensitive receptors would occur in 2036 with an annual $PM_{2.5}$ value just under 0.4 µg, which is at the lower end of the tolerable risk category. Most sensitive receptors for both 2026 and 2036 have a predicted annual $PM_{2.5}$ value of less than 0.2 µg which is within the acceptable risk category. There are no sensitive receptors across either of the scenarios with an annual $PM_{2.5}$ value within the unacceptable risk category.

Volatile organic compounds and polycyclic aromatic hydrocarbons

Of the VOC's assessed in the AQIA, benzene and formaldehyde have the lowest 1-hour 99th percentile, therefore the analysis in this section focused on these pollutants with results for toluene, acetaldehyde, xylene and 1,3 butadiene reported in Appendix I of **Appendix J** (Air quality impact assessment).

When comparing 2026 and 2036 with and without the proposed modification, changes in contribution of predicted 1-hour 99.9th percentile benzene and formaldehyde concentrations indicate there is no significant difference in predicted ground level VOC or total PAH concentrations at sensitive receptors. Predicted changes across all scenarios in contribution for both benzene and formaldehyde were found to be less than 1 percent.

When comparing existing operations with future scenarios (with and without the proposed modification), potential decreases of VOC and PAH concentrations at sensitive receptors were observed. These changes are attributed to anticipated changes in vehicle fleets, more stringent emission standards and reduced number of aging vehicles on the road network, as discussed previously.

Influence of traffic changes on parallel routes

Traffic modelling has predicted that there would be an increase in road traffic on the Westlink M7 as a direct result of the proposed modification. This increase in traffic has resulted in the air pollutant predictions at several locations showing a negligible to small increase in pollutant concentrations at sensitive receptors (despite an increase in vehicle speed and efficiency). This is purely due to increased traffic numbers on the Westlink M7 close to these particular receptor locations (speed changes were examined to understand the sensitivity of the predictions to speed, which showed only a minor effect on the overall findings).

The modelled results which show a negligible to small increase in pollutant concentrations does not include the potentially beneficial changes in road traffic volumes in the surrounding road network which may be influenced by the proposed widening of the Westlink M7. It would be expected that in the airshed immediately surrounding the Westlink M7, that the distribution of air pollutant emissions would change as a result of the proposed modification. These changes would be expected to result in some areas experiencing higher traffic volumes and hence higher impacts while other locations would experience lower traffic numbers and hence lower pollutant concentrations as vehicles which may have used parallel routes instead use the more free-flowing Westlink M7. The effect of the proposed modification across the airshed would be expected to be broadly balanced with some areas experiencing increases while other experiencing decreases. As such, the modelling results presented above are considered conservative and actual air pollutants in some areas along the Westlink M7 would be lower than existing and modelled levels.

Due to the length of the proposed widening, complex regional road network the variability in local context, detailed assessment of the redistribution of air pollutants within the regional airshed within the context of the wider road network were not considered further.

7.3.6 Management and mitigation

The mitigation and management measures described in Table 7-34 have been recommended to address potential air quality impacts identified as result of the proposed modification.

Air quality mitigation measures consistent with current industry practice will be adopted in the construction environmental management plan (CEMP) and implemented during construction to meet air quality performance outcomes.

The generation of air emissions from the proposed modification includes those generated from the implementation of mitigation measures to address other environmental impacts (e.g. noise wall adjustments, use of construction vehicles to install temporary erosion and sediment controls). These activities would also be subject to the mitigation measures below.

Table 7-34 Mitigation measures

Impact	ID	Mitigation measure	Responsibility	Timing
Complaints	AQ1	A communications plan will be displayed at each construction zone, including a duty phone number so stakeholders and community members can get in contact regarding the construction activities. All complaints will be recorded and investigated, and measures taken in response.	Construction contractor	Construction

Impact	ID	Mitigation measure	Responsibility	Timing
Cumulative impacts with other projects	AQ2	On a regular basis the stages of other major constructions within 500 metres of the proposed modification will be assessed, to determine any cumulative air quality impacts. The possibility of co-ordinating activities between sites will be assessed to avoid potentially high dust impact activities occurring at the same time.	Construction contractor	Construction
Combustion emissions	AQ3	Use of diesel- or petrol- powered generators will be avoided where practicable and mains electricity or battery powered equipment will be used where practicable.	Construction contractor	Construction
	AQ4	All vehicles and plant will be switched off engines when stationary - no idling vehicles.	Construction contractor	Construction
Dust emissions	AQ5	During periods of high potential for increased air quality impacts and/or prolonged dry or windy conditions the frequency of site inspections will be increased by the person accountable for air quality and dust issues.	Construction contractor	Construction
	AQ6	At each construction zone, the site arrangement will be planned so that dust generating activities are undertaken to minimise dust at nearby receptors. Measures may include stockpiles located as far away from receptors as possible; dust barriers being erected around dusty activities/site boundary, or similar.	Construction contractor	Construction
	AQ7	A maximum speed limit of 15 km/h on unsurfaced roads and construction work areas will be imposed and signposted.	Construction contractor	Construction
	AQ8	Adequate water supply will be provided on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	Construction contractor	Construction
	AQ9	Earthworks and exposed areas/soil stockpiles will be re-vegetated or stabilised as soon as practicable.	Construction contractor	Construction
	AQ10	Water-assisted dust sweeper(s) will be used on access and local roads, to remove, as necessary, any material tracked out of the site.	Construction contractor	Construction

Impact	ID	Mitigation measure	Responsibility	Timing
	AQ11	Vehicles entering and leaving sites will be covered to prevent escape of materials during transport.	Construction contractor	Construction
	AQ12	A wheel washing system will be implemented at relevant construction ancillary facilities (with rumble grids to dislodge accumulated dust and mud prior to leaving the site), where reasonably practicable.	Construction contractor	Construction
Odour	AQ13	Any acid sulphate soils encountered during earthworks will be managed in accordance with the with the *Acid Sulfate Soil Manual* (Acid Sulfate Soil Management Advisory Committee, 1998) and *Guidelines for the Management of Acid Sulfate Materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze* (NSW Roads and Traffic Authority, 2005b).	Construction contractor	Construction