AJM Joint Venture

MELBOURNE AIRPORT RAIL

MAR STATE LAND AIR QUALITY IMPACT ASSESSMENT

MAR-AJM-PWD-PWD-REP-XEV-NAP-0001721

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Prepared for Rail Projects Victoria

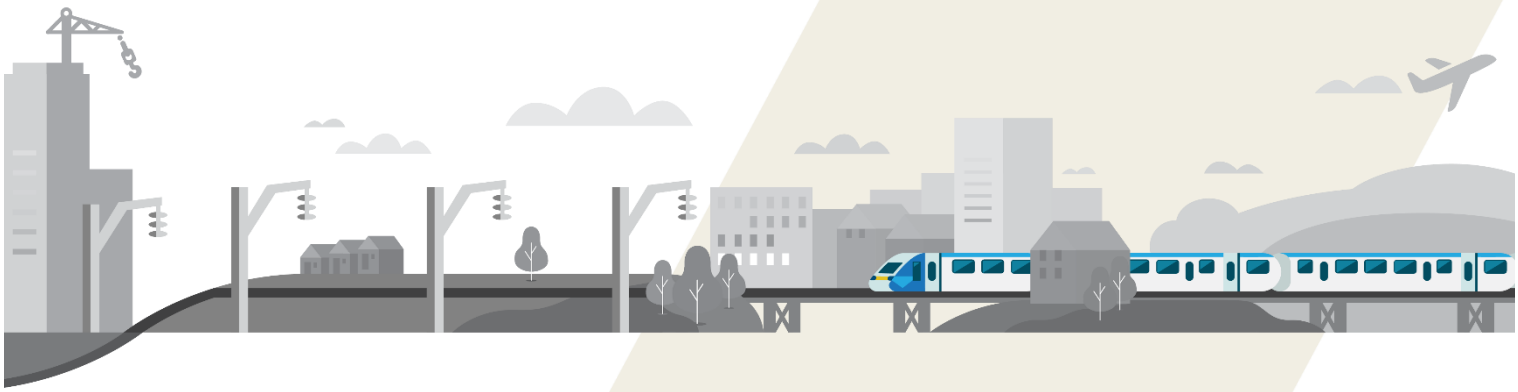

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Table of Abbreviations

Table 1-1 Table of Abbreviations

Abbreviation	Definition
1h	Averaging period of 1 hour for measurement of air quality
24h	Averaging period of 24 hours for measurement of air quality
AJM-JV	Aurecon Jacobs Mott MacDonald Joint Venture
AQIA	Air Quality Impact Assessment
AQMS	Air Quality Monitoring Station
ARTC	Australian Rail Track Corporation
AWS	Automatic Weather Station
BOM	Bureau of Meteorology
CCBD Guide	Civil Construction, Building and Demolition Guide (EPA, 2020b).
CEMP	Construction Environmental Management Plan
CSR	Combined Services Route
DELWP	The State of Victoria Department of Environment, Land, Water and Planning
EE Act	Environment Effects Act 1978
EES	Environment Effects Statement
EPA	Environment Protection Authority
EP Act	Environment Protection Act 2017
ERS	Environment Reference Standard (Victoria Government, 2021)
GED	General Environmental Duty
GIS	Geospatial Information System
IAQM	Institute of Air Quality Management (United Kingdom)
km/h	Kilometres per hour
kPa	kiloPascals (unit of pressure)
MAR	Melbourne Airport Rail
m/s	Metres per second
µg/m^3	Micrograms per cubic metre
µm	Micrometer (one millionth of one metre)
NEPC	National Environment Protection Council
NEPM(AAQ)	National Environment Protection Measure for Ambient Air Quality
OHLE	Overhead line equipment
$PM_{2.5}$	Particulate matter less than 2.5 micrometres equivalent aerodynamic diameter
$PM_{2.5-10}$	Fraction of PM_{10} that is greater than 2.5 micrometers equivalent aerodynamic diameter (less than 10 micrometres equivalent aerodynamic diameter)
PM_{10}	Particulate matter less than 10 micrometres equivalent aerodynamic diameter
Project Land	The proposed project land describes the approval area. The project land includes the areas in which the project components would be contained, including both permanent structures and temporary construction areas (both above and below ground).
SEPP	State Environment Protection Policy
SUP	Shared User Path
TSP	Total suspended particulate

1. Executive Summary

Aurecon Jacobs Mott Macdonald Joint Venture (AJM-JV) has been engaged by Rail Projects Victoria (RPV) to prepare the Melbourne Airport Rail (MAR) State Land Air Quality Impact Assessment (the Impact Assessment). The Impact Assessment identifies and evaluates air quality values relevant to the project, potential impacts to those air quality values, subsequent project constraints, and the Commonwealth and State legislation and policy requirements relevant to the MAR Project (the Project). This has been completed through a desktop assessment.

The Project is a transformational public transport project connecting Melbourne Airport with a rail service for the first time. In 2018, the Victorian Government released the *Melbourne Airport Rail Link Sunshine Route Strategic Appraisal* (Transport for Victoria, 2018), which confirmed that the Sunshine route is the best solution for an airport rail link. This alignment is between a new railway station at Melbourne Airport and Melbourne CBD, via the Albion-Jacana rail corridor, Sunshine Station and connecting to the new tunnels provided via the Metro Tunnel Project. It is noted that only State Project Land along this alignment is addressed in this Impact Assessment as Commonwealth land is subject to a separate approvals process.

The Project, as relevant to State Land, is based on three project sections, including two location-specific sections, the Corridor section and the Sunshine section, and one line-wide Rail Systems section.

Scope

- For the MAR Project, air discharges are only associated with activities occurring during construction. After construction is completed, Project works are unlikely to result in ongoing emissions to air. The MAR trains will be electrified and therefore will not create emissions associated with combustion of fuel such as in diesel-fired train engines.
- Air quality impacts can include impacts on human health (such as concentrations of respirable airborne pollutants) and impacts on amenity (such as dust deposition or odour). Both types of impact are assessed.
- The key air pollutant relevant to construction of the project is particulate matter, also interchangeably referred to as dust.
- The health effects of particles are strongly influenced by the size of the particles. Particulates are therefore classified according to their size. Total suspended particulates (TSP) are defined as all airborne particles and typically range in size up to approximately 50 micrometres (particles larger than this fall out of the atmosphere relatively quickly). The size categories commonly known as PM_{10} (particles with a diameter of 10 micrometres (µm) or less) and $PM_{2.5}$ (particles with a diameter of 2.5 µm or less) are recognised internationally as having the greatest potential to cause health problems due to their inhalation potential, and are regulated at the Commonwealth level in the National Environment Protection Measure (Ambient Air Quality) (NEPM(AAQ)) and at the state level in the new Environment Reference Standard (ERS) which replaced the State Environment Protection Policy (Ambient Air Quality) (SEPP(AAQ)) on 1 July 2021.
- Potential air quality impacts from disturbance of contaminated land include human health and amenity (due to odour) impacts. The MAR State Land Contaminated Land Impact Assessment (MAR-AJM-PWD-PWD-REP-XEV-NAP-0001715) concludes that the Project is not likely to have a potential significant effect on the environment based solely on contaminated land impacts. Mitigation measures will be developed and incorporated into the Project Environmental Management Framework (EMF) in relation to contaminated land. These will outline well-established construction techniques and management processes, that can be implemented to mitigate and avoid these potential impacts. RPV will develop specific environmental management requirements for contaminated land to be implemented in the construction phase including a Construction Environmental Management Plan (CEMP) and other management sub-plans as required.

Existing Conditions

- Background air quality
  - > Representative background air quality is drawn from the Footscray air quality monitoring site (AQMS) operated by the Victoria Environment Protection Authority (EPA). Measured PM_{10} and $PM_{2.5}$ concentrations are usually well below the applicable air quality criteria, but have approached or exceeded the 24-hour averaged criteria on several days per year.
- Meteorology
  - > Wind conditions are important for determining the direction and rate at which emissions from a source would disperse. For dust emissions from construction activities, high wind speed conditions are important as higher wind speeds cause greater emissions from dusty surfaces through wind erosion, and also increase dust release during handling/movement of dusty materials (such as loading spoil onto a truck using a front-end loader). Across the MAR alignment, high wind speeds are strongly oriented to the northerly and southerly compass directions. Therefore, sensitive receptors at highest risk of exposure to windblown dust would be those situated to the south and north of the various MAR construction sites.
  - > Some dust emissions from earthmoving vehicles, such as bulldozers and dump trucks, can occur regardless of the wind speed. Dust emissions arising from these activities disperse most slowly under low wind speeds. These wind speeds are very infrequent at the exposed Melbourne Airport and Essendon Airport locations but more frequent in built-up urban areas. Wind directions under these low wind speeds can be highly variable depending on local terrain and buildings, but generally tend to come from a northerly direction.
- Land uses close to the MAR alignment
  - > Land uses close to the proposed location of the MAR track vary widely across the length of the alignment, from low sensitivity to high sensitivity towards air emissions. In many locations where the MAR track will be constructed within the existing Australian Rail Track Corporation (ARTC) rail corridor, residential areas and industrial buildings have been developed very close to the corridor boundary.
  - > Existing industrial buildings close to the railway have been built facing away from the railway with solid, windowless walls facing the tracks. These walls will provide sheltering to the construction sites under some wind directions, reducing the potential for wind-driven dust erosion.

Impact Assessment

This Impact Assessment considers all locations within the MAR Project Land that would be subject to extended periods of occupation and / or construction activities with potential to generate dust emissions within the overall construction plan. The assessment involved a qualitative review for each site of the likelihood of post-mitigation residual emissions impacting on sensitive receptors, after taking into account the following factors:

- The nature of activities that will be carried out.
- The distance of sensitive receptors from the construction activities.
- Common wind directions when wind speeds are high.
- The location of the sensitive receptors relative to the construction site under those wind directions.

Key findings are identified as follows:

- For the Project, air discharges are only associated with activities occurring during construction.
- The key air pollutant relevant to construction of the project is particulate matter, including the fine fractions PM_{10} and $PM_{2.5}$ which have the potential to impact human health, and total settleable dust which has the potential to cause nuisance impacts through dust deposition.

- Background PM_{10} and $PM_{2.5}$ concentrations in ambient air are usually well below the applicable air quality criteria, but have historically approached or exceeded the criteria on several days per year.
- Given the role of MAR in providing an alternative transport mode and reducing the reliance on road transport, is not expected that the operation of MAR would facilitate any extensive or major changes to existing air emissions; to the contrary, it would contribute to a reduction of PM_{10} and $PM_{2.5}$ emissions into the Melbourne airshed due to reduced numbers of passengers relying on road transport to travel to the Airport. Any emissions of PM_{10} and $PM_{2.5}$ from power generation needed to supply the trains with electricity are not be expected to contribute to concentrations of fine particulate matter within the Melbourne urban airshed.

Following the above assessment, the below mitigation measures are recommended for the Project:

- Good practice dust containment measures will be adopted at each construction site consistent with EPA recommendations in the Civil Construction, Building and Demolition Guide[1] (CCBD Guide), including use of hardstand surfacing for frequently travelled access routes, availability of water carts for dry periods, construction vehicle speed restrictions, minimising stockpiling of excavated material or fill material brought to site, and semi-porous or solid boundary fencing.
- If stockpiling of potentially dusty materials is necessary, the stockpiles would be managed to minimise dust emissions according to the recommendations in the CCBD Guide and located as far from sensitive receptors as reasonably practicable.
- Use of continuous air quality monitoring equipment for PM_{10} and $PM_{2.5}$ concentrations in ambient air to monitor the effectiveness of mitigation measures and alert site managers of poor background air quality and/or impacts caused by construction activities. The use of dust deposition gauges is also recommended for performance monitoring; however, these only provide long term deposition information and are not useful for day to day proactive management.
- The continuous air quality monitors should be placed in strategic locations along the MAR alignment, where the most significant earthmoving activities are required over a long period. The recommended locations are the two sites identified in the impact assessment as having the highest potential for air quality impacts:
    - MAR Viaduct Zone 1, near the construction of the viaduct ramps at a suitable location between Anderson Road and Sunshine Station.
    - Maribyrnong River valley crossing new bridge, on the northern side of the Maribyrnong River to the east of the rail tracks.

In consideration of the relevant *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978* (2006), this impact assessment concludes that for all construction activities proposed for the MAR project:

- There is a low risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants; and
- The potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as low.

[1] EPA (2020), Civil Construction, Building and Demolition Guide. Publication 1834, November 2020.

2. Introduction

Aurecon Jacobs Mott Macdonald Joint Venture (AJM-JV) has been engaged by Rail Projects Victoria (RPV) to prepare the Melbourne Airport Rail (MAR) State Land Air Quality Impact Assessment (the Impact Assessment).

2.1 Purpose

The purpose of the Impact Assessment is to determine air quality values that are likely to be impacted by the proposed works. This information will be used to inform the relevant approvals for the MAR Project (the Project). The specific objectives of the impact assessment are to:

- Identify the air quality values present within the State Project Land, and the nature and proximity of potentially sensitive receptors.
- Provide an assessment of the likely impact of the project on air quality values present to inform approvals under relevant policy and legislation.
- Provide recommendations to further avoid or minimise impacts on identified air quality values where appropriate.
- Provide comment on the criterion relevant to air quality under the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978* (2006) (the Ministerial Guidelines) to determine the potential effects to air quality.

2.2 Methodology

The preparation of the Impact Assessment involved the following:

- Review of the scope of works and mapping presented in the 'MAR Corridor and Sunshine Sections Project Description for Environmental Specialists' (MAR-AJM-PWD-PWD-MEM-XLP-NAP-0001505, Revision C) (the Project Description).
- Analysis of representative meteorological data and background air quality data to contextualise the risk of downwind receptors being exposed to air pollutants from the Project.
- Review of planning zone maps and aerial photographs to identify receptors that are potentially sensitive to air quality discharges from the Project.
- Identification of potential air quality discharges from construction of each element along the Project alignment and recommend appropriate mitigation measures to minimise the risk of air quality impacts to sensitive receptors. These measures will be formalised through an Environmental Management Framework (EMF), prepared and approved in accordance with the relevant planning approval. The EMF will provide a transparent and integrated governance framework to manage the environmental aspects of the Project and will detail Environmental Management Requirements (EMR) that must be implemented by the Delivery Partner.

2.3 Assumptions and Limitations

The following assumptions and limitations apply to the Impact Assessment:

- The Impact Assessment relates only to public and privately owned State land and does not consider Commonwealth-owned land or the 'Airport' design section, as Commonwealth land is not subject to Victoria's legislative framework. Impact Assessments associated with Commonwealth land, specifically land at Melbourne Airport, will form part of a separate suite of impact assessments.
- The Impact Assessment is based on the following:
  - The scope of works detailed in the Project Description and State Project Land derived from MAR 'Project Land' Revision A.7 (MAR-AJM-PWD-PWD-MAP-XLP-MMN-0111172) approved by RPV.

> Details of construction activities provided by RPV on 2 March 2021 and subsequent comments provided on Revision A of this report on 14 May 2021.

> State of knowledge and regulatory guidance available at the time of writing (effectively 1 June 2021).

- The MAR State Land Contaminated Land Impact Assessment (MAR-AJM-PWD-PWD-REP-XEV-NAP-0001715) has identified isolated areas of potential contaminated land that may be encountered during Project construction, but concludes that the Project is not likely to have a potential significant effect on the environment based solely on contaminated land impacts due to mitigation measures that will be developed and incorporated into the Project Environmental Management Framework (EMF) in relation to contaminated land. The EMF will outline well-established construction techniques and management processes, that with strict implementation will mitigate if not avoid these potential impacts. Therefore, the potential impacts of dispersion of contaminated dust material is not included in the scope of this Impact Assessment.

  > RPV will develop specific environmental management requirements for contaminated land to be implemented in the construction phase including a Construction Environmental Management Plan (CEMP) and other management sub-plans as required.

  > RPV will also implement a requirement for delivery contractors to develop an Asbestos Management Procedure/Plan to ensure that asbestos containing material is identified and controls are established to eliminate the potential for exposure of workers and the public.

  > It is assumed for this assessment that these plans will contain sufficient detail to manage the containment of contaminated particulate and avoid off-site migration of such particulates in the air.

3. Background

3.1 Strategic Context

The Project is a once-in-a-generation transformation of Victoria's transport network, connecting Melbourne Airport's Integrated Terminal Precinct with a rail service for the first time.

Melbourne Airport handled more than 37 million passenger movements in 2018-19[2] and by 2038, this figure is projected to almost double to more than 67 million[3], which is an average growth of 3.2% per annum. Transport connectivity from Melbourne Airport to Melbourne's Central Business District (CBD) is currently limited to the Tullamarine Freeway, and therefore, the Victorian Government is committed to delivering an efficient, competitive alternative to cater for the ongoing increase in passenger numbers at Melbourne Airport.

In 2002, the Victorian Government considered possible corridor and alignment options for a Melbourne Airport Rail Link, ultimately selecting the Sunshine route as the preferred option. At this time, land was reserved between the Albion-Jacana rail corridor and extending through to Sharps Road, Tullamarine for the construction of a rail link.

In 2018, the Victorian Government released the Melbourne Airport Rail Link Sunshine Route Strategic Appraisal, which confirmed that the Sunshine route remains the best solution for an airport rail link. The Sunshine route would provide superior connections to regional Victoria, Melbourne's growth areas in the north and west and Melbourne's south eastern suburbs and could be delivered sooner and at a significantly lower cost than other route options.

3.2 State Project Land

As discussed in section 3.3.1 below, the Project Land is comprised of both Commonwealth Project Land (the Airport Section) and State Project Land.The State Project Land defines the State land within which the Project components and construction activities are planned to be contained. It sets out the full extent of State land identified as potentially required for the delivery of the Project.

The State Project Land encompasses all State land areas that would be used for permanent structures and temporary construction areas. It provides the basis for and informs the Impact Assessment

State Project Land relevant to State-based approvals generally includes:

- Land between Sharps Road and the Albion-Jacana rail corridor, including land crossing the Western Ring Road Freeway.
- The existing Albion-Jacana rail corridor generally between Jacana and Albion Stations.
- Land around Sunshine and Albion Stations, including the existing rail corridor.
- Land required for the Project from Jacana Station in the north-east to Newport Station in the south-west and Middle Footscray Station in the east. This largely includes the Albion-Jacana rail corridor via Sunshine and Albion Stations and land required for a new rail corridor between Sharps Road and the Albion-Jacana rail corridor.

The State Project Land is described in two geographically interfacing sections, Sunshine (SUN) and Corridor (COR), which include all works for the Project on State land. The extent of the State Land is shown in Figure 3.1.

[2] https://www.bitre.gov.au/publications/ongoing/airport_traffic_data
[3] https://www.melbourneairport.com.au/Corporate/Planning-projects/Master-plan

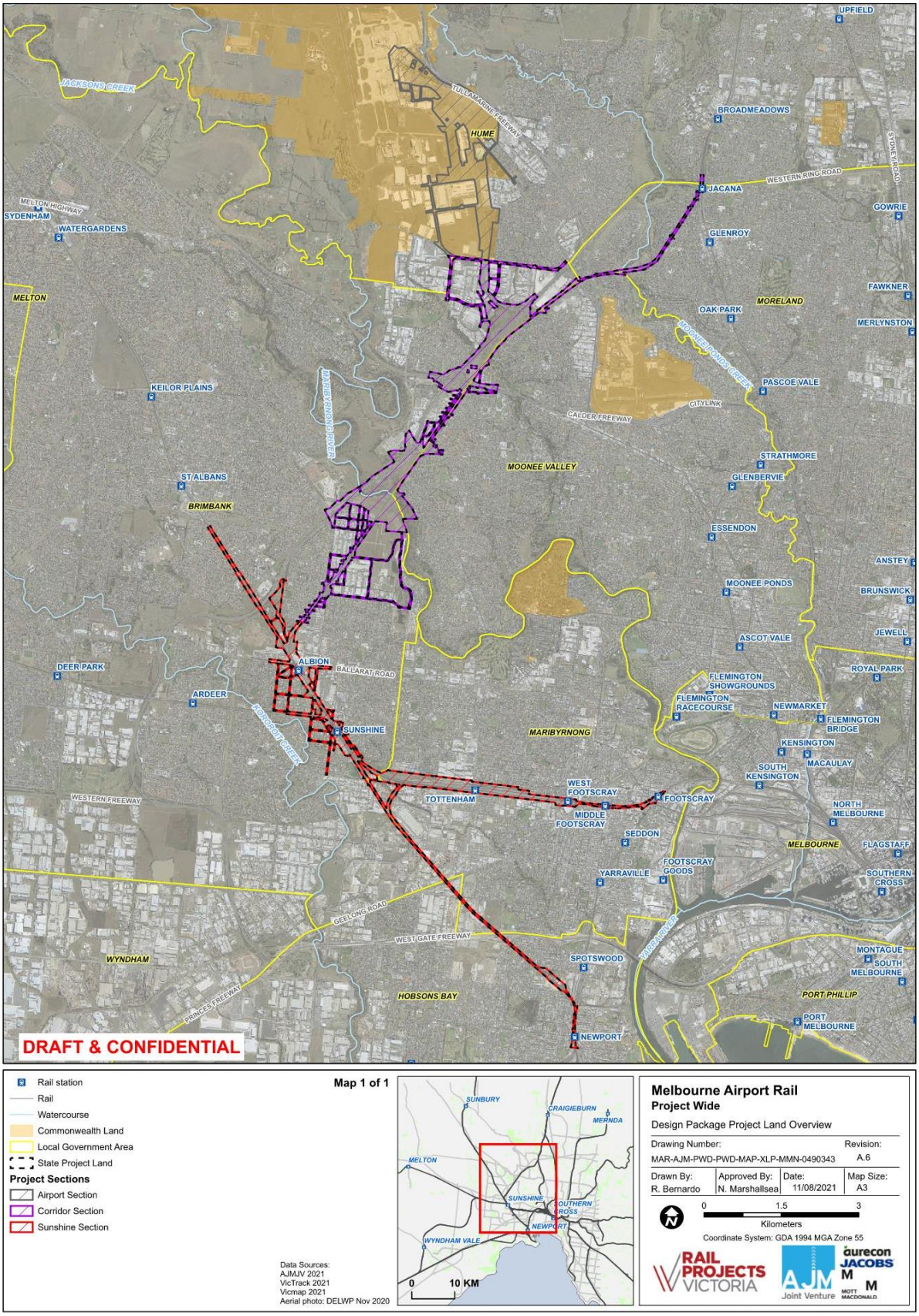

Figure 3.1 Sections of the Project Overview

3.3 Main Works Scope

3.3.1 Project Sections

The main works for the Project comprise of three geographically distinct sections. The sections are summarised in Table 3-1 and the location of the sections are shown in Figure 3.1.

Table 3-1 Summary of Project sections

Section	Summary
Airport section Not considered in State land approvals.	The Airport section generally includes all land relevant to the Project between Sharps Road, Tullamarine and Melbourne Airport and is located on Commonwealth owned land and is subject to a separate approvals process under the *Commonwealth Airports Act 1996*
Corridor section	The COR section generally includes the Albion-Jacana rail corridor between Jacana Station and south of Barwon Avenue, Sunshine North, as well as land between Sharps Road, Tullamarine and the Albion-Jacana rail corridor.
Sunshine section	The SUN section generally includes the existing rail corridor between Barwon Avenue, Sunshine North and Middle Footscray Station. The SUN Section also includes the Sunbury rail corridor to Ginifer Station and the Brooklyn freight corridor to Newport Station.

3.4 Corridor Section Summary

The COR section of the Project includes the following main works:

- Construction of the new MAR tracks, comprising an approximately 8 km dual track railway and associated overhead line equipment (OHLE), combined services route (CSR) and track drainage works, including:
  - A 2.3 km long elevated twin track viaduct structure between Sharps Road, Tullamarine and the Albion-Jacana rail corridor, crossing Steele Creek and the Western Ring Road including emergency and maintenance access points.
  - New at-grade MAR tracks within the existing Albion-Jacana rail corridor, located on the Western side of the existing Australian Rail Track Corporation (ARTC) tracks.
  - An elevated twin track viaduct structure across the Maribyrnong River valley, adjacent to the Western side of the existing state significant heritage bridge.
  - Slewing of ARTC tracks between Keilor Park Drive and the Calder Freeway.
- Signalling works along the Albion-Jacana rail corridor between Jacana Station and Barwon Avenue, Sunshine North and within the new MAR corridor North of the Western Ring Road.
- Construction of an intake supply substation at Terror Street or the Northeast area of Brimbank Park and two traction substations at Fullarton Road and within the McIntyre Sidings, Sunshine North.
- Construction of two new Digital Train Radio System (DTRS) facilities one North or South of Keilor Park Drive, Keilor East and a second at Airport Drive, Tullamarine.
- Diversion, relocation and replacement works associated with utilities and underground services, including the existing ARTC CSR, high voltage (HV) transmission lines and numerous miscellaneous assets
- Protection works associated with the Exxon Mobil jet fuel pipeline along the Albion-Jacana rail corridor.
- Modifications to existing structures, including structural modifications and strengthening works at Calder Freeway inbound and outbound bridges, Fullarton Road bridge, Western Ring Road on-ramp and off-ramp bridges, Keilor Park Drive and McIntyre Road bridges.
- Replacement of shared use path (SUP) connections at Calder Freeway / Fullarton Road, provision of a new SUP overpass at Cranbourne Avenue, and provision of a Strategic Cycling Corridor link between Western Ring Road and Airport Drive via Steele Creek.

- The provision of retention basins at several locations along the Albion-Jacana rail corridor
- Establishment of temporary construction laydown areas, site offices, worksites, storage, parking areas and access roads

3.5 Sunshine Section Summary

The SUN section of the Project includes the following main works:

- Construction of a new 1.8 km long MAR twin track viaduct structure, including associated OHLE and CSR between Sunshine Station and the Albion-Jacana corridor, crossing Anderson Road, Ballarat Road, the Sunbury rail corridor, St Albans Road and Stony Creek.
- Signalling works, including the installation of trackside equipment along the Sunbury line towards Ginifer Station, along the Brooklyn freight corridor towards Newport Station, and along the Western rail corridor to West Footscray Station.
- Modifications to the tracks, formation, drainage, CSR, OHLE and signalling equipment for the MAR, Sunbury and Bendigo tracks from Albion to the beginning of the Jacana freight corridor
- Modifications to the Western and Eastern Albion Station forecourts and car parks.
- Modifications to Sunshine Station, including modifications to platforms, the Sunshine Station western car park and the construction of a new concourse.
- Modifications to the existing Sunshine and Sunshine West substations
- Diversion, relocation and protection of existing utilities and underground services.
- Establishment of temporary construction laydown areas, site offices, worksites, storage, parking areas and access roads

3.6 Construction Methods and Approaches

RPV provided advice on general construction methods that may be utilised across the SUN and COR Sections that will likely have an impact on the assessment of potential for dust emissions. Based on the RPV advice, the approaches assumed for this Impact Assessment are as follows:

- Hardstands (general)
  - > Hardstands on site will be constructed using graded aggregates, and the upper layer generally a cap of 50mm minus stone to allow the material to be heavily compacted. This locks the material together to form a smooth surface which is easy to walk on and provides an effective seal which prevents water ingress as well as preventing loss of fine materials due to wind / usage.
  - > In the event of excessive heat and wind, the area will be wetted down using water carts to minimise dust from an environmental as well as occupational health and safety perspective.
- Temporary worksites, site offices, construction laydown areas
  - > The surface under the covered walkways and covered common areas in the site compounds, between the crib sheds, offices and ablutions will be sealed where appropriate, or constructed as per hardstand comments above.
  - > Laydown areas will be constructed as per hardstand comments above - compacted graded aggregate topped with a thin layer of fine material to provide a smooth “sealed” (by virtue of compaction) surface. Laydown areas and work yards may also potentially be sealed with a cement treated product so that the surface is somewhat weatherproof.
- Heavy vehicle access tracks

> Heavy vehicle access tracks will be constructed as per hardstand comments above: compacted graded aggregate. Sufficient depth and layers of aggregate will be provided to withstand anticipated loads.

- Spoil haul routes within sites
  > All heavy haulage routes within site will be based on a construction access hardstand material. Generally, the construction access paths are compacted in layers with different classes of crush rock.
- Concrete Batching
  > Concrete batching plants are not considered as part of this assessment and if required, would be considered separately to the main MAR Project approvals.
- Spoil Handling
  > If excavated material is excess then the material will either be loaded away by an excavator at the point of excavation straight into a truck and off site, or stockpiled on site prior to removal or reuse.

  > If stockpiling is necessary, the stockpiles would be managed to minimise dust emissions according to the recommendations in the EPA Civil Construction, Building and Demolition Guide (Publication 1834, November 2020) (see Section 5.1.2 for more detail).

4. Existing Conditions

4.1 Legislation, Policy and Guidelines

4.1.1 Commonwealth and State Legislation

Table 4-1 provides an overview of key commonwealth and state legislation relevant to this Impact Assessment.

Table 4-1 Key commonwealth legislation relevant to the air quality assessment

Legislation	Relevance to this assessment
National Environment Protection (Ambient Air Quality) Measure (NEPM(AAQ))	
Section 14 of the *National Environment Protection Council Act 1994* and the equivalent provision of the corresponding Act of each participating State and Territory provides for the making of measures by the National Environment Protection Council and the matters to which they may relate. This Measure relates to ambient air quality.	The NEPM(AAQ) provides standards for ambient air quality that must be regulated by individual states.
Environment Protection Act 2017	
The *Environment Protection Act 2017* (EP Act) is a risk-based approach to preventing environmental harm and includes a general environmental duty (GED). The GED requires people to take reasonably practicable steps to eliminate, or otherwise reduce risks of harm to human health to the environment from pollution and waste. Doing what is reasonably practicable means putting in proportionate controls to mitigate or minimise the risk of harm. In addition to the GED, duties under the EP Act relevant to air quality include the duty to respond to harm (s.31) and the duty to notify of an incident (ss. 32- 33).	This legislation provides the framework for the policies, guidelines and objectives which are relevant to all air quality impact assessments in Victoria. The GED requires identification of all risks and implementation of effective control measures so far as reasonably practicable. This guides the approach to managing impacts on air quality and associated environments during the Project. Key subordinate instruments which dictate policies to establish environmental quality objectives associated with air quality are able to be created under this legislation.

4.1.2 Policy / Guidelines / Standards

Table 4-2 provides an overview of key policies, guidelines and standards relevant to this Impact Assessment. Further information from these policies, guidelines and standards that is relevant to this Impact Assessment are provided in Appendix A.

Table 4-2 Policy, Guidelines and Standards relevant to the air quality assessment.

Legislation	Relevance to this assessment
Environment Reference Standard (ERS)	
The ERS (Victoria Government 2021) is a new subordinate instrument made under the EP Act 2017. The ERS was gazetted on 26 May 2021. The ERS identifies environmental values for Victoria in the areas of air quality, noise, water and contaminated land; and defines indicators and objectives to measure those values. Prior to the ERS coming into effect on 1 July 2021, policies for environmental quality objectives were set out in the State Environment Protection Policies (SEPPs). The beneficial uses, environmental quality indicators and objectives from the SEPPs are used in the ERS, with some language changes and some additional indicators. The ERS supports the protection of the environment from pollution and waste by providing a benchmark to assess and report on environmental conditions in the whole or any part of Victoria (Victoria Government 2019).	The air quality objectives defined in the ERS represent the objectives for air quality for the Project.

Legislation	Relevance to this assessment
Civil Construction, Building and Demolition Guide	
EPA published the Civil Construction, Building and Demolition Guide (Publication 1834, herein referred to as the CCBD Guide) in November 2020. This guide replaces EPA Publication 480 (February 1996) "Best Practice Environmental Guidelines for Major Construction Sites". The CCBD Guide is described more fully in Section 5.1.2.	This Guide is key to identifying relevant mitigation measures, likely effects and performance criteria.

4.2 Factors Affecting Air Quality Impact Assessment

Several different factors that affect the generation and dispersion of air discharges are considered in an air quality impact assessment. These factors can be grouped into categories and include:

- Source (what is discharged)
  - > Identify source activities and potential pollutants.
  - > Identify management and mitigation activities that are employed to avoid or minimise air emissions.
- Pathway (how the pollutant is dispersed)
  - > Meteorological features that could suppress or elevate generation and dispersion of air emissions.
  - > Topographical or structural features that could affect the pattern of generation and/or dispersion.
- Receptor (how is the receptor exposed)
  - > Location of sensitive receptors and downwind directions.
  - > Other significant local sources of the same pollutants.
  - > Background concentrations of the potential pollutants already present.
  - > Considerations that increase or decrease the likely sensitivity of particular receptors.

The "source" factors can only be considered in a generic high level context in this report, as detailed construction plans are not yet available. However, a study of the existing conditions, as per the purpose of this report, can inform the pathway and receptor factors. These are presented in the following sections.

4.3 Key Pollutants

Air quality assessments can encompass a myriad of potential pollutants, each of which has its own impact potential and background air quality characteristics. It is necessary to identify the key potential pollutants from a project prior to assessing the existing conditions.

For the Project, air discharges are only associated with activities occurring during construction. After construction is completed, Project works are unlikely to result in ongoing emissions to air. The MAR trains will be electrified and therefore will not create emissions associated with combustion of fuel such as in diesel-fired train engines.

Air quality impacts can include impacts on human health (such as concentrations of respirable airborne pollutants) and impacts on amenity (such as dust deposition or odour).

4.3.1 Particulate Matter / Dust

The key air pollutant relevant to construction of the project is particulate matter. Particulate matter in the atmosphere refers to a range of particle types and sizes. The particles may be emitted from natural sources such as windblown dust, sea spray, bush fires, and pollens; or from anthropogenic sources such as

combustion of fuels, power generation, industrial activities, excavation works, unpaved roads, and the crushing and handling of materials.

Particles will be the key pollutant generated and emitted into air during construction of MAR. These emissions will occur from a variety of sources and activities including:

- Excavation and handling of spoil.
- Demolition of existing structures.
- Formation of access tracks.
- Construction of foundations.
- Construction of Rail Track Infrastructure including ballasting, tamping and regulating.
- Movement of plant and equipment across exposed, unsealed ground.
- Driving trucks and vehicles on unsealed roads.
- Uncovered stockpiles (if used) of soils and/or construction and demolition materials.
- High wind speeds moving across unsealed surfaces.
- Vehicle and generator exhaust fumes.

Dust emitted into the air presents a risk of causing a range of impacts to human health and the environment. Dust can impact human respiratory and cardiovascular health and ecosystem health. In addition, dust can cause nuisance and amenity issues through soiling of surfaces.

The health effects of particles are strongly influenced by the size of the particles. Particulates are therefore classified according to their size. Total suspended particulates (TSP) are defined as all airborne particles and typically range in size up to approximately 50 micrometres (particles larger than this fall out of the atmosphere relatively quickly). The size categories commonly known as PM_{10} and $PM_{2.5}$ are recognised internationally as having the greatest potential to cause health problems due to their inhalation potential, and are regulated in the NEPM(AAQ) and ERS:

- PM_{10} (particles with an equivalent aerodynamic diameter of 10 micrometres (µm) or less): these particles are small enough to pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects.
- $PM_{2.5}$ (particles with an equivalent aerodynamic diameter of 2.5 µm or less): these particles are so small they can get deep into the lungs and into the bloodstream. The PM_{10} category includes the $PM_{2.5}$ size range.

By way of comparison, a human hair is about 100 µm in width, so roughly 40 particles of diameter 2.5 µm could be placed on its width.

Most of the PM_{10} dust from construction sites is typically in the coarse ($PM_{2.5-10}$) fraction, rather than the $PM_{2.5}$ fraction (IAQM, 2014). Research undertaken in the USA (Midwest Research Institute, 2006; as reported in IAQM, 2014) suggests that 85% to 90% by weight of the fugitive dust emissions of PM_{10} from construction sites are $PM_{2.5-10}$ and 10% to 15% are in the $PM_{2.5}$ fraction.

4.3.2 Products of Combustion

The operation of trucks and heavy machinery during construction activities, and the use of mobile generators for power supply where needed, discharges products of diesel or fuel oil combustion into the air including nitrogen oxides, carbon monoxide, sulfur dioxide, and fine particulates.

There are no confined spaces where this machinery will operate over the MAR project sections, and for vehicles and mobile plant operating at the surface any emissions of products of combustion will disperse rapidly once discharged into the air. The project-related emissions of these contaminants in a regional context is minor compared with the day-to-day Victoria vehicle fleet using roads around the Project, and no specific assessment of potential impacts from emissions of combustion-derived pollutants is necessary.

4.3.3 Odour

Odour is a known chemical or a mixture of chemicals that interact to produce a smell (that can be either pleasant or unpleasant). The ERS objective for odour is “an air environment that is free from offensive odours from commercial, industrial, trade and domestic activities” (Victoria Government, 2021).

Current and historical land uses including commercial, industrial, quarrying and waste disposal, combined with poor environmental management, can potentially leave a legacy of contamination. During excavation and earthworks activities, contaminated soil, rock and groundwater can be encountered, giving rise to odour and fumes which may affect amenity. Odour can also be emitted from soils containing naturally occurring chemicals such as sulfides that when exposed to the air produce an unpleasant gas (hydrogen sulfide). The potential for disturbance of such soils has been considered in the MAR State Land Contaminated Land Impact Assessment (MAR-AJM-PWD-PWD-REP-XEV-NAP-0001715). That report concluded that while there are some isolated areas of potential contaminated land that may be encountered during Project construction, the Project is not likely to have a potential significant effect on the environment based solely on contaminated land impacts due to the small scope of the potential emissions and the mitigation measures that would be developed and incorporated into the EMF.

The earthworks and excavation activities in potentially contaminated sites will be carefully managed to minimise, so far as reasonably practicable, impacts on amenity and human health as a result of odour if any such emissions arise.

Products of combustion from construction vehicles can give rise to odour. As noted in Section 4.3.2 above, the potential for these emissions to have an adverse impact outside the boundary of the construction works sites is low, and this includes potential impacts from odour although it is likely that very close residences may notice some diesel fume odour from time to time.

As no potentially significant odour sources have been identified for the Project, no further assessment of potential impacts from odour is provided in this report.

4.4 Sensitive Receptors

Sensitive land uses relevant to the Impact Assessment for the Project include:

- Residential dwellings.
- Assisted-living centres.
- Childcare centres.
- Hospitals and medical centres.
- Schools, Colleges and University Campuses.
- Community facilities – halls, gyms, churches.
- Outdoor exercise and recreational facilities.
- Retail – particularly in high density retail strips and open malls.
- Food preparation outlets, cafes and restaurants.

This list is not exhaustive but indicates the types of land uses that are potentially sensitive to particulate matter in ambient air quality.

The presence of these types of land uses close to the construction sites for each Project element was identified through review of a range of data sources including:

- Planning zone maps.
- Aerial photographs from both Google Earth and the MAR Project Graphical Information System (GIS).
- Google Street View images, accessed through Google Earth.

- A video recorded in August 2018 of the current ARTC train route taken from the driver's front window of an ARTC train travelling from Southern Cross Station to Craigieburn that was provided by RPV for use by environmental specialists in lieu of a site visit to the rail corridor.

4.5 Background Air Quality

4.5.1 Data Sources

EPA conducts long-term ambient air quality monitoring at a number of Air Quality Monitoring Stations (AQMS) to meet its obligations under the NEPM(AAQ). The AQMS at both Alphington and Footscray are potentially relevant to the Project, and both sites measure both PM_{10} and $PM_{2.5}$ concentrations in ambient air. The location of these stations is shown in Figure 4.1. The Footscray AQMS is described as an "industrial/residential" location, and the Alphington AQMS is classified as a "residential/light industrial" location (EPA, 2019).

The Footscray AQMS is closest to the MAR alignment, and therefore is potentially the most representative monitoring location for characterising the existing ambient air quality near the Project, particularly in the southern parts of the alignment. However, the Footscray AQMS may overestimate PM_{10} and $PM_{2.5}$ concentrations in the northern parts of the alignment due to the density of industrial activity around the Footscray area. Therefore, historical data from both AQMS was extracted for the existing conditions assessment.

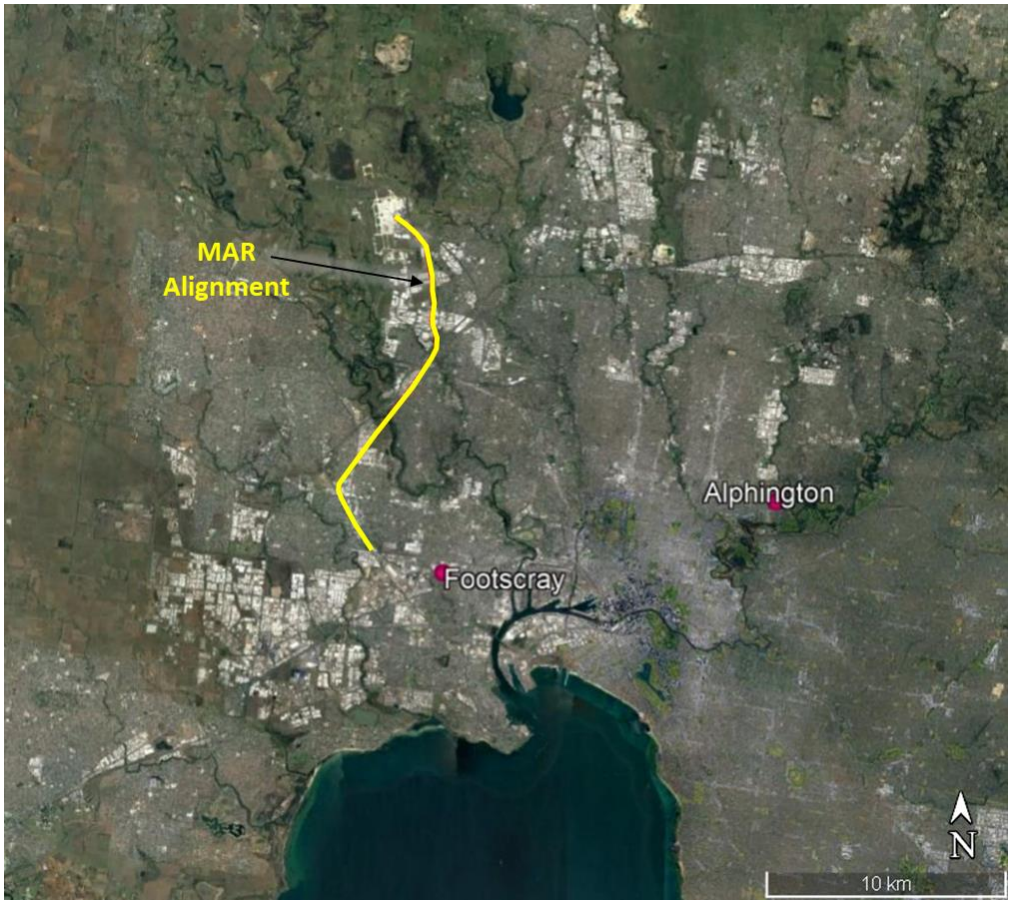

Figure 4.1 Location of Alphington and Footscray air quality monitoring stations operated by EPA. Aerial basemap from Google Earth, accessed 26 March 2021.

4.5.2 Data Analysis

Hourly concentration records for the Alphington and Footscray AQMS to December 2018 were downloaded from Data Vic[4]. Tabulated data statistics for these two monitoring sites for 24h average PM_{10} and $PM_{2.5}$ is provided in Appendix B. The 24h average is the only averaging period for PM_{10} and $PM_{2.5}$ that is relevant to the Project. Whilst annual averages are also regulated, these are not relevant because air emissions caused by Project construction activities will be intermittent and of limited duration.

The following observations are concluded from the data analysis:

- PM_{10}
  - > Concentration values for each percentile (e.g. 99th, 70th, 50th percentile) are reasonably consistent from year to year, but the maximum values for each year either exceed or approach the NEPM(AAQ) standard and ERS objective of 50 µg/m^3. EPA attributes this to a combination of factors such as windborne dust (crustal material, often from distant sources), smoke from bushfires and land burning (fuel hazard reduction, regeneration, agricultural burning, private burning), urban sources typically from motor vehicles or domestic wood heaters, and commercial/industrial emissions (e.g. EPA, 2019). Some of these events qualify as exceptional events[5] under the NEPM(AAQ), but not all.
  - > Comparing the PM_{10} results for the Alphington and Footscray AQMS locations, PM_{10} concentrations measured at Footscray appear to be slightly higher than those measured at Alphington, however the difference is not significant in terms of informing background air quality for the Project.
- $PM_{2.5}$
  - > The maximum 24h average concentrations for each year and also the 99th and 98th percentiles either exceed or approach the NEPM(AAQ) standard and ERS objective of 25 µg/m^3.
  - > The number of exceedances per year will increase if the measured concentrations are compared to the maximum concentration goal stated in the NEPM(AAQ) of 20 µg/m^3 which is to be achieved by 2025, unless further efforts are made regionally to reduce $PM_{2.5}$ emissions. Reduction of $PM_{2.5}$ emissions within Victoria is outside the scope of this report, however it is noted that encouraging more commuter use of trains to travel to Melbourne Airport will reduce reliance on motor vehicles and therefore have a positive effect on the overall inventory of $PM_{2.5}$ emissions within the airshed (this positive effect will also apply to PM_{10}).
  - > As with PM_{10}, EPA attributes the current exceedances to a combination of factors such as windborne dust, smoke from bushfires and land burning, urban sources and commercial/industrial emissions (EPA, 2019).
  - > Comparing the $PM_{2.5}$ results for the Alphington and Footscray AQMS locations, $PM_{2.5}$ concentrations measured at Footscray appear to be slightly lower than those measured at Alphington, however the difference is not significant in terms of informing background air quality for the Project.

4.5.3 Conclusion

From the analysis of background air quality data, the following conclusions are drawn:

- Representative background air quality can be drawn from either the Footscray or Alphington AQMS sites. Geographically, the Footscray site is closer to the MAR alignment and is therefore recommended as the reference site for background air quality.

[4] https://discover.data.vic.gov.au/dataset/epa-air-watch-all-sites-air-quality-hourly-averages-yearly
[5] "Exceptional event" is defined in the NEPM(AAQ) as a fire or dust occurrence that adversely affects air quality at a particular location, and causes an exceedance of the 1 day average standards in excess of normal historical fluctuations and background levels and is direction related to bushfire, jurisdiction authorised hazard reduction burning or continental scale windblown dust (NEPC, 2016).

- PM_{10} and $PM_{2.5}$ 24h average concentrations are usually well below the applicable air quality criteria, but have, historically, approached or exceeded the criteria on several days per year.
- Construction works should be modified, as appropriate, to minimise impacts during adverse air quality or meteorological conditions. This approach is recognised in the CCBD Guide (see Section 5.1.2) and will be documented in the construction air quality management plan that will be prepared for the Project.

4.6 Meteorological Data

4.6.1.1 Role in Impact Assessment

Meteorological conditions are important for determining the direction and rate at which emissions from a source would disperse. For dust emissions from construction activities such as those likely during construction of the Project, high wind speed conditions are important. The critical wind speed for pickup of dust from surfaces is 5 m/s (18 km/h), and above 10 m/s (36 km/h) pickup increases rapidly (AWMA, 2000). Higher wind speeds also increase dust release during handling/movement of dusty materials (such as loading spoil onto a truck using a front-end loader).

Low wind speeds are also significant as under such conditions the rate of dispersion of any released dust is slowest. This would be of most relevance for emissions of fine particulates with lower settling velocity, such as PM_{10} and $PM_{2.5}$.

4.6.1.2 Data Sources

The location of meteorological monitoring sites in the southeast region of Melbourne is shown in Figure 4.2. There are three meteorological monitoring sites near the Project alignment; the Bureau of Meteorology (BOM) conducts measurements at Melbourne Airport and Essendon Airport automatic weather stations (AWS), and EPA Victoria conducts meteorological monitoring at the Footscray AQMS.

Data from Olympic Park AWS was also included even though it is further away from the alignment, because the Footscray raw data is unsuitable for gust wind speed analysis.

4.6.2 Wind Frequency Distributions

Windroses showing the distribution of hourly-averaged wind speeds and directions over all hours of the day and all hours of the year are shown in Appendix D for the Melbourne Airport, Essendon Airport, Olympic Park, and Footscray AWS. The hourly-averaged wind speed distribution statistics for each AWS are summarised in Table 4-3.

The Footscray and Olympic Park AWS sites show a greater percentage of lower wind speeds than the two Airport BOM sites. This may be due to the Footscray and Olympic Park sites being less exposed to wind than the Airport sites.

Table 4-3 Hourly-Average Wind speed distributions for Melbourne Airport, Essendon Airport and Footscray AWS, January 2011 – December 2020.

Wind speed category	Olympic Park*	Essendon Airport	Melbourne Airport	Footscray
	Percentage of Hourly-Average Records Less Than Category			
<3.6 km/h (<1 m/s)	14.7%	2.9%	1.8%	12.5%
3.6-10.8 km/h (1-3 m/s)	40.9%	21.9%	17.7%	42.7%
10.8-18 km/h (3-5 m/s)	34.4%	31.6%	32.1%	31.9%
18-28.8 km/h (5-8 m/s)	9.6%	32.2%	31.1%	12.4%
28.8-36 km/h (8-10 m/s)	0.5%	8.5%	10.3%	0.5%
	Percentage of Hourly-Average Records Greater Than Category			

Wind speed category	Olympic Park*	Essendon Airport	Melbourne Airport	Footscray
≥18 km/h (≥5 m/s)	10.1%	43.6%	48.4%	12.9%
≥28.8 km/h (≥8 m/s)	0.5%	11.4%	17.3%	0.5%
≥36 km/h (≥10 m/s)	0.0%	2.9%	7.0%	0.0%

* Monitoring commenced May 2013.

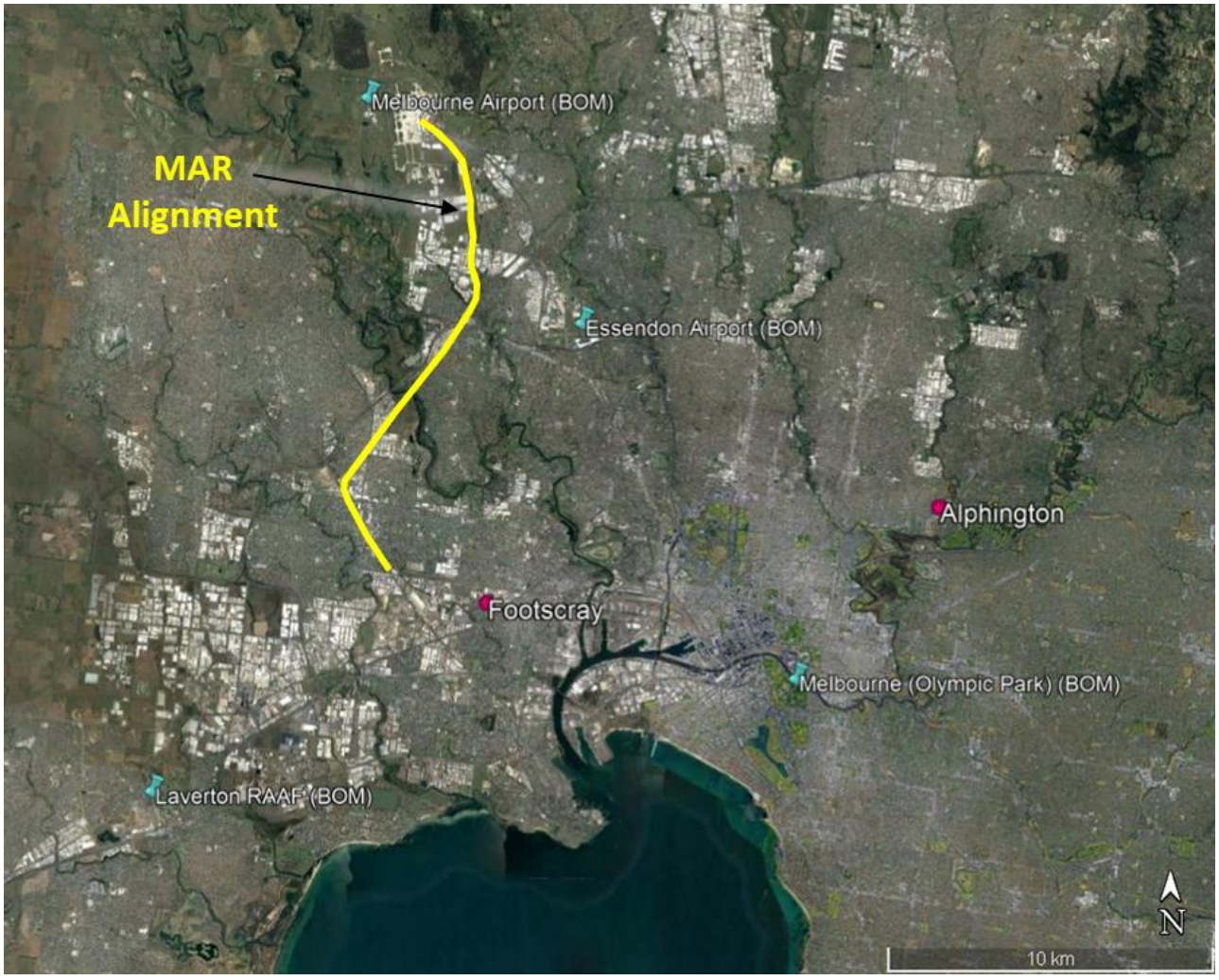

Figure 4.2 Location of meteorological monitoring stations operated by Bureau of Meteorology (BOM – blue pins) or EPA (pink circles). Aerial basemap from Google Earth, accessed 27 March 2021.

4.6.3 High Speed Wind Gust Analysis

Analysis of the frequency and direction distribution of high wind speed gusts was conducted using the data obtained from the BOM. Wind gust data was reported as wind gusts at 60-minute intervals, with a wind gust defined as the highest 3-second mean wind speed (sampled every second) over the last 60 minutes.

Appendix D shows bar charts of frequency of occurrence of gust wind speeds for the Melbourne Airport, Olympic Park and Essendon AWS as a function of wind direction. The wind speed categories show critical wind speeds for dust pickup, as described in Section 4.6.1.1, and highlight the wind directions under which these high wind speeds are most frequent.

The data shows a pronounced trend of the highest percentage of high wind gust speeds coming from a northerly direction, with a secondary peak in high wind gust speeds from the south direction.

For the EPA AWS at Footscray, data was only reported as average wind speeds at 5-minute intervals and therefore is not directly comparable with the BOM gust data.

4.6.4 Interpretation

Considering the frequency and speed of winds at the Melbourne Airport, Essendon Airport, Olympic Park and Footscray AWS, sensitive receptors at highest risk of exposure to windblown dust would be those situated to the south and north of the various MAR construction sites.

However, some dust emissions from earthmoving vehicles, such as bulldozers and dump trucks, can occur regardless of the wind speed. Dust emissions arising from these activities disperse most slowly under low wind speeds (especially <6 km/h, the yellow segments in the windroses in Appendix D). These low wind speeds are very infrequent at the exposed Melbourne Airport and Essendon Airport locations but more frequent in built-up urban areas as shown in the Footscray and Olympic Park windroses and in the wind speed breakdown in Table 4-3. Wind directions under these low wind speeds can be highly variable depending on local terrain and buildings, but generally tend to come from a northerly direction following the gradual decline in terrain height as the land falls towards Port Phillip Bay.

5. Impact Assessment

5.1 Inter-Relationship of Mitigation and Impact Assessment for Dust Emissions

5.1.1 Approach

In this report, good practice dust mitigation measures are assumed to be adopted as the baseline prior to Impact Assessment, adopting the recommendations of the CCBD Guide (see Section 5.1.2).

This report therefore undertakes an impact assessment of the likelihood of post-mitigation residual emissions impacting on sensitive receptors, after taking into account the following factors:

- The nature of activities that will be carried out.
- The distance of sensitive receptors from the construction activities.
- Common wind directions when wind speeds are high.
- The location of the sensitive receptors relative to the construction site under those wind directions.

5.1.2 Mitigation Measures Assumed – CCBD Guide Recommendations

In November 2020, EPA published the Civil Construction, Building and Demolition Guide (Publication 1834, herein referred to as the "CCBD Guide") (EPA, 2020b). This guide replaces EPA Publication 480 (released February 1996) "Best Practice Environmental Guidelines for Major Construction Sites" (EPA, 1996).

The CCBD Guide provides an overview of:

- Duties under the EP Act.
- Activities that may lead to erosion and the generation of sediment and dust.
- Potential impacts of sediment and dust.
- Factors to consider in understanding erosion, sediment and dust generation.
- Controls and/or mitigation measures that can be implemented to minimise the generation and transport of dust, and manage risk associated with dust emissions from activities associated with civil construction, building, and demolition.

Controls and mitigation measures that are recommended in the CCBD Guide to minimise the generation and transport of dust include:

- Install sealed ground surfaces or use stabilised materials in high traffic areas.
- Schedule dust generating activities by avoiding adverse weather conditions, such as during hot and dry periods, high winds, and days with poor air quality.
- Manage soil disturbance to minimise the adverse impacts, with more specific advice provided in a Guidance Sheet (EPA, 2020e) including:
    - > Minimise vegetation disturbance.
    - > Stage soil work to minimise areas of exposure.
    - > Plan and schedule soil disturbance activities and consider adverse weather conditions (for example hot, dry periods, high winds, and days with poor air quality).
    - > Stop works if dust from the site is visible beyond the site boundaries and moving towards sensitive receivers. Resume works only when effective controls can be implemented, or weather conditions and air quality improve.

- > Install shade cloths as a windbreak to slow down winds and minimise wind erosion (wind-blown dust).
- > Install dust screens around the site as appropriate.
- > Wind barriers (for example solid board fences, crate walls, bales of hay, burlap fences and trees) help with preventing erosion by obstructing the wind near the ground and in turn, prevent soil from being blown off site. Wind barriers are most effective when placed perpendicular to the prevailing wind.
- > Supress dust by using water carts to wet down areas where works are happening, including outside business hours if windy weather is forecast.
- > Stabilise exposed soils for example, revegetating soils (e.g. hydroseeding, hydromulching) by applying spray suppressants or soil binders, or installing stabilisation matting.
- > Suppress dust using misting or fogging systems.
- > Stabilise vehicle movement areas to prevent tracking of sediment or generation of dust.
- > Avoid driving over stabilised or exposed soil.
- > Monitor controls to ensure they operate effectively and as planned.

- Manage stockpiles in a way that minimises dust generation, with more specific advice provided in a Guidance Sheet (EPA, 2020c) including:
  - > Locate stockpiles away from the site boundary, waterways and catchments, residential areas, and other sensitive receivers.
  - > Use the location to protect stockpiles from the prevailing wind.
  - > Limit stockpile heights based on their stability, manageability, dust and amenity impacts.
  - > Use gentle slopes for unstable soils.
  - > Store fine or powdery material (less than 3mm in size) inside buildings or enclosures if practicable.
  - > Keep stockpiles for shortest time possible, and minimise the time the stockpile will be inactive.
  - > Stabilise inactive soil stockpiles left for long periods of time by establishing vegetation or grass (for example hydroseeding).
  - > Erect fences, screens with shade cloth or use other windbreaks such as trees, hedges and earth-banks of similar height and size to the stockpile.
  - > Enclose stockpiles within bunkers.
  - > Use machinery to contour or scarify across the slope of the surface of the stockpiles; this will help reduce run-off velocity and erosion.
  - > Suppress dust from small stockpiles using water or chemical dust suppressants, apply using a water truck or hand-held hose.
- Manage truck and vehicle movements to limit dust generation, with more specific advice provided in a Guidance Sheet (EPA, 2020d) including:
  - > Manage site access
    - – Develop a traffic management plan.
    - – Minimise site access to limit the impact from vehicles on roads.
    - – Identify entry and exit points, and high traffic areas.
    - – Stabilise site entry and exit points with a sealed road, aggregate or road base.
    - – Divert surface water run-off away from site access points so it does not wash or track sediment offsite.

> Manage road use
  - Minimise the number of access roads vehicles use.
  - Seal roads with asphalt or a spray seal, or stabilise with aggregate, gravel or road base. Replace aggregate or gravel periodically.
  - Maintain, clean and grade haul routes on a regular basis.
  - If roads are not stabilised or sealed, minimise dust using water or chemical dust suppressants.
  - Minimise haul route distances and locate haul routes away from sensitive receivers.
  - Set appropriate and site-specific speed limits to minimise generating dust.
> Machinery hygiene
  - Manage dirt and mud on access roads/routes
  - Cover trucks transporting loose materials with fitted canopies. Ensure all loads are covered before trucks leave site.
  - Limit load size to avoid spillages.
  - Install rumble grids at site exit points to shake soil off trucks. Ensure the road between rumble grids and the site exit is stabilised and with adequate distance and wheel rotations (recommended minimum three-wheel rotation).
  - Submerge rumble grids in water so tyres are washed as the truck crosses the rumble grid.
  - Use a water-assisted dust sweeper on access and local roads to remove material tracked off site.
> Monitor controls in place to prevent or mitigate risks and ensure they operate effectively and as planned. For managing truck and vehicle movement, this could include monitoring:
  - Site entry, exit points and haul routes and performing maintenance as required.
  - Driver compliance of speed limits and canopy use on trailers.
  - The condition and effectiveness of rumble grids and periodically removing built-up sediment and soil from under the rumble grids.
  - Inspect local roads for tracked soil and dust regularly.

- Minimise dust generation at sources by considering appropriate physical and engineering controls for the situation and work activities.
- Suppress dust during concrete cutting and construction and demolition activities.
- Install shade cloth as a wind break to slow down winds and minimise wind carried dust.
- Suppress dust from construction activities such as rock breaking and drilling where appropriate with on-tool dust extraction and enclosure of activities.
- Temporarily stop works if dust is visibly discharging or emitting nuisance airborne particles beyond site boundaries. Resume works only when effective controls can be implemented, or weather conditions and air quality improve.
- Monitor air quality for dust (PM10) with use of ambient dust monitoring equipment located onsite and offsite in the surrounding community to assist with identifying the effectiveness of implemented dust controls.
- Conduct post-installation maintenance of established controls (including dust monitoring equipment) and assess control effectiveness at regular intervals.

5.2 Corridor Section

5.2.1 Airport Drive and Truck Parking Bay Realignment

5.2.1.1 Description of Works

Project Alignment: Ch22+300 to Ch23+000.

A section of the Airport Drive and truck parking bay will need to be realigned to accommodate the viaduct flyover into the centre median at Ch22+300.

Activities required during construction with the potential to generate dust emissions include:

- Imported fill to build out the road formation, new east carriageway and truck parking bay.
- Fill placement and construction of pavement layers.
- Demolish and remove existing pavement as required.

Plant and vehicles required at the site, relevant to the potential for dust emissions, will include excavators, tip trucks/tandems, front end loaders, and skid steer loaders.

A laydown area for quarry materials will be in the centre median to avoid double handling of materials.

5.2.1.2 Area Impacted

The local planning zones overlaying an aerial image of the location where these works will occur is shown at Appendix C. The location is an existing road corridor with truck parking bays surrounded by industrial-zoned buildings to the east and west of the construction site, with frontages facing away from Airport Drive.

Appendix C also shows the planned Works Site / Laydown Areas, temporary and permanent construction works areas, and the State Project Land. The construction area is elongated and oriented in a north-south direction.

5.2.1.3 Impact Assessment

Sensitivity of Neighbouring Properties

The location is an existing traffic corridor with truck parking bays surrounded by industrial-zoned buildings to the east and west of the construction site, with frontages facing away from Airport Drive.

Meteorology

- High wind speeds are strongly oriented north-south, in line with the work site orientation.
- More State Project Land areas are located to the south and north of the work site, insensitive to potential dust emissions during high wind speeds.

Impact Assessment Rationale and Assumptions

- It is assumed that standard good practice dust containment measures will be adopted at this construction site, including use of hardstand surfacing for frequently travelled access routes, availability of water carts for dry periods, construction vehicle speed restrictions, and semi-porous or solid boundary fencing.
- Any dust pick-up during high wind speeds will be usually be carried away from neighbouring buildings due to the north-south orientation of the location being in line with the orientation of prevailing winds.
- The adjacent land uses are industrial, with building frontages facing away from the construction location.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.

- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.2.2 Western Ring Road Elevated Section

5.2.2.1 Description of Works

Project Alignment: Ch20+700 to Ch23+000.

The works involves construction of an elevated viaduct structure to span across Steele Creek lower crossing, the Western Ring Road and Steele Creek upper crossing, Snyder Court, Tullamarine Park Road, Airport Drive and Sharps Road.

Activities required during construction with the potential to generate dust emissions include:

- Demolishment of existing building at Ch22+100.
- Construction and use of material lay down / site office areas.
- Ground clearing and earthworks associated with foundations and pier construction, including access roads.
- Excavation of existing embankment on north side of Steele Creek upper crossing, at Ch21+750.
- Miscellaneous activities and vehicle movements associated with pier construction, girder installation and superstructure construction.
- Enabling works – preparation of heavy vehicle access tracks and crane pads capable of supporting precast girders.
- Enabling works – Western Ring Road traffic management temporary barriers. Requires removal of existing earth embankment.

Plant and vehicles required at the site, relevant to the potential for dust emissions, will include graders, excavators, vibrating rollers, and tip trucks.

Site access tracks, crane pads and hardstand will be required along the full length of the viaduct. Site facilities (site offices, project carparking) are being considered at the following locations:

- Terror Street, Keilor Park
- Snyder Court, Tullamarine.
- Prima Court, Tullamarine.
- North and south side of Western Ring Road.

5.2.2.2 Area Impacted

The Western Ring Road elevated section covers 2.3 km of track length. The local planning zones overlaying an aerial image of the location where these works will occur are shown in Appendix D. Travelling towards the Airport destination, the elevated section passes over the Western Ring Road and undeveloped industrial-zoned land from 20+700 to 21+800, and then over existing industrial properties until aligning with Airport Drive at 22+300. These existing industrial properties will be either temporarily or permanently acquired for the project construction. The area impacted from 22+300 to 23+000 is the same as discussed in Section 5.2.1.

Appendix D also shows the planned Works Site / Laydown Areas, temporary and permanent construction works areas and the State Project Land. The figure also identifies four locations close to the State Project Land boundary that could potentially be impacted by dust emissions – labelled A to D as follows:

- A – 23 Tullamarine Park Road: Arrow Wood Products Pty Ltd, Head Office and Main Manufacturing Facility (bench tops).

- B – Beverage Drive - existing large commercial buildings for manufacturing, warehousing and/or showrooms; double-storey height. Building openings face away from the proposed viaduct and construction site.
- C – Dib Court – Commercial/trade showrooms and/or manufacturing, warehousing. Double-storey height with entrances facing away from the Western Ring Road and the State Project Land. Building walls facing Western Ring Road and State Project Land are solid panels with no windows or doors (see Figure 5.1).
- D – Parer Road residential properties with rear of sections adjacent to existing ARTC tracks (see Figure 5.2).

Figure 5.1 Dib Court buildings, rear view from Western Ring Road – Google Street View image dated March 2020.

Figure 5.2 Steele Creek lower crossing, on ARTC tracks adjacent to Ch20+900 (looking north); view from driver's front window, ARTC train (August 2018).

5.2.2.3 Impact Assessment

Sensitivity of Neighbouring Properties

- The industrial-zoned neighbouring properties (specifically those identified as A, B and C in Appendix D (refer to Map MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490512)) could be sensitive or insensitive to elevated ambient dust concentrations, depending on the nature of occupation and activities carried out there.

- The residential dwellings on Parer Road in the vicinity of annotation “D” as shown in Appendix D (refer to map MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490512) (see also Figure 5.3) may be sensitive to elevated ambient dust concentrations, due to the residential land uses.

Meteorology

- High wind speeds are strongly oriented north-south, in line with the work site orientation and carrying any dust emissions away from potentially sensitive receptors for most of the time.
- Wind directions (low or high speeds) from the north have the potential to carry dust emissions towards the residential dwellings on Parer Road.

Impact Assessment Rationale and Assumptions

- Activities required with potential for dust emissions can be controlled through normal good practice mitigation measures.
- It is assumed that standard good practice dust containment measures will be adopted at this construction site, including use of hardstand surfacing for frequently travelled access routes, availability of water carts for dry periods, construction vehicle speed restrictions, and semi-porous or solid boundary fencing.
- Any residual dust pick-up during high wind speeds will be usually be carried away from neighbouring buildings due to the north-south orientation of the location.
- This is potentially not the case for the residential dwellings on Parer Road, however the nearby upwind dust sources are relatively small (laydown area and site offices, and individual pier foundations), and emissions can be mitigated through normal good practices.
- For the commercial buildings on Tullamarine Park Road, Beverage Drive and Dib Court, the large rear walls of these buildings will provide some sheltering and reduce residual dust migration off-site if the properties are downwind of dust sources.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as low.

Figure 5.3 Screenshot from ARTC Train video – showing residential dwellings in annotation “D” (see Map 0490512, Appendix C) to the right of the ARTC tracks.

5.2.3 Calder Freeway Structures and Fullarton Road Shared User Path (SUP) Bridge

5.2.3.1 Description of Works

Project Alignment: Ch20+200 to Ch20+500.

The works will involve the modification of the existing west abutment of the four Calder Freeway bridges and Fullarton Road bridge to make way for two additional rail lines.

Activities required during construction with the potential to generate dust emissions include:

- Spoil removal and haulage offsite from under the west abutments – approximately 11,500 m^3 loose or 1200 truckloads.
- General construction activities, including foundations and abutment strengthening, pier strengthening and deck strengthening.
- Site laydown area adjacent to existing concrete batching plant on Terror Street.

Plant and vehicles required at the site, relevant to the potential for dust emissions, will include excavators and tip trucks/tandems.

Following completion of abutment works for Calder Freeway, construct new overpass structure to replace the under-bridge section of the Shared User Path (SUP) once it is removed to make way for the new rail lines. The new overpass will be located on the existing Fullerton Road bridge abutment.

5.2.3.2 Area Impacted

The local planning zones overlaying an aerial image of the location where these works will occur are shown at Appendix E. The location is an existing major traffic corridor.

Appendix E also shows the planned Works Site / Laydown Areas, the bridge strengthening works area, and the State Project Land.

The main neighbouring land uses that are potentially sensitive to dust are:

- The commercial activities marked “A” in Appendix E (refer to map MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490514), in the industrial zone on Roberts Road to the northeast of the bridges, which are double-storey height and face away from the Calder Freeway and rail corridor (Figure 5.4).
- The residential dwellings on Borva Drive marked “B” in Appendix E (refer to map MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490514), to the southeast of the bridges closest to the Calder Freeway and rail corridor.

Figure 5.4 Fullarton Road looking towards commercial properties on Roberts Road. Photo taken May 2019.

5.2.3.3 Impact Assessment

Sensitivity of Neighbouring Properties

- The industrial-zoned nearby buildings on Roberts Road could be sensitive to elevated ambient dust concentrations, however potential exposure is reduced because the buildings face away from the Calder Freeway and the rail corridor.
- The residential dwellings on Borva Drive close to the Calder Freeway overpass and the rail corridor may be sensitive to elevated ambient dust concentrations, due to the residential land uses.

Meteorology

- High wind speeds are strongly oriented north-south, in line with the work site orientation. Winds blowing from a westerly direction that could carry residual dust towards the sensitive receptors are infrequent, and the construction site will be afforded some sheltering in such conditions due to the layout of the Calder Freeway and the bridges.

Impact Assessment Rationale and Assumptions

- Potential dust emissions can be controlled through normal good practice mitigation measures.
- It is assumed that standard good practice dust containment measures will be adopted at this construction site, including use of hardstand surfacing for frequently travelled access routes, availability of water carts for dry periods, construction vehicle speed restrictions, minimising stockpiling of excavated material, and semi-porous or solid boundary fencing.
- If stockpiling is necessary, the stockpiles would be managed to minimise dust emissions according to the recommendations in the CCBD Guide.
- Dust emissions from the excavation will be partly mitigated by sheltering due to the excavation occurring under the existing bridges.

- Any dust pick-up during high wind speeds will be usually be carried away from potentially sensitive neighbouring properties due to the north-south orientation of the location.
- The nearest residential dwellings are relatively close to the southern end of the required embankment excavation, although the location will be sheltered to some extent under conditions when the residential dwellings are downwind by the Freeway and bridge structures. Nevertheless, solid temporary site fencing between the ARTC track and the residential dwellings is recommended to further reduce the risk of dust impacts off-site.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.2.4 Keilor Park Drive Bridge

5.2.4.1 Description of Works

Project Alignment: Ch18+500 to Ch19+900.

This section includes slewing of the existing ARTC Track – rebuilding the ARTC tracks 4.5m to the southeast to allow two MAR tracks to be installed without modifying the span length of the Keilor Park Drive bridge.

The works will be conducted in a narrow corridor with limited locations for material stockpiles.

Activities required during construction with the potential to generate dust emissions include:

- General earthworks to complete formation and track drainage.
- General construction activities to install new track and install bridge abutment protection works.
- Handling of spoil generated from formation works.
- General construction activities, including foundations and abutment strengthening and deck strengthening.
- Multiple site laydown areas including Border Drive Reserve near Keilor Park Drive on-ramp to the Western Ring Road.

5.2.4.2 Area Impacted

The local planning zones overlaying an aerial image of the location where these works will occur are shown at Appendix F. The location is an existing traffic corridor with truck parking bays surrounded by industrial-zoned buildings to the east and west of the construction site, with frontages facing away from Airport Drive.

Appendix F also shows the planned Works Site / Laydown Areas, temporary and permanent construction works areas, the bridge strengthening works area, and the State Project Land.

North of Keilor Park Drive, the rail corridor is flanked by industrial-zoned buildings to the west, and residential properties to the east (see Figure 5.5). South of Keilor Park Drive, the rail corridor is also flanked by residential properties to the east, but has a large area of vacant land to the west known as Brimbank Park which will be temporarily occupied for use as laydown area and/or for site offices and a new substations is also proposed as being located on the land (see Figure 5.6).

The industrial buildings to the west of the rail corridor face away from the railway and have high solid rear walls standing close to neighbours all along the corridor. These buildings form a near-continuous solid wind break that will provide shelter to the construction works within the corridor, in the event of high wind speeds.

The main neighbouring land uses that are potentially sensitive to dust are the residential areas bordering the railway to the east, and the residential dwellings adjacent to Border Drive Reserve. The commercial/industrial

buildings on Slater Parade and Webber Parade next to the rail corridor could also be sensitive to dust, depending on the type of activities carried out at the premises.

Figure 5.5 Rail Corridor north of Keilor Park Drive bridge (from Google Street View, image taken Feb 2020).

Figure 5.6 Rail Corridor south of Keilor Park Drive bridge (from Google Street View, image taken Feb 2020).

5.2.4.3 Impact Assessment

Sensitivity of Neighbouring Properties

- The main neighbouring land uses that are potentially sensitive to dust are the residential areas bordering the railway to the east, and the residential dwellings adjacent to Border Drive Reserve.

- The commercial/industrial buildings on Slater Parade and Webber Parade next to the rail corridor could also be sensitive to dust, depending on the type of activities carried out at the premises.

Meteorology

- North of Keilor Park Drive, the potential for wind-driven dust pick-up from exposed surfaces will be significantly reduced due to the sheltering provided by the built-up industrial properties to the west of the rail corridor. Some sheltering will also be afforded by the densely built residential environment to the east in the event of southerly or easterly strong winds.
- Residential dwellings located around Border Drive Reserve may be more exposed to higher wind speeds from the north and west, potentially picking up dust from the laydown area proposed within Border Drive Reserve.
- South of Keilor Park Drive, the residential dwellings to the east of the rail corridor may be exposed to higher wind speeds from the north and west, potentially picking up dust from the corridor construction works and the laydown area to the west of the tracks.

Impact Assessment Rationale and Assumptions

- Residential dwellings in the residential areas east of the railway corridor are potentially sensitive to dust, although the risk of exposure to unacceptable levels of dust is lower for the residential dwellings immediately alongside the rail corridor to the north of Keilor Park Drive because of the sheltering effect from the industrial buildings on Slater Parade and Webber Parade.
- However, construction activities planned in this location have a relatively low potential for dust emissions. It is assumed that standard good practice dust containment measures will be adopted along the rail corridor and at the laydown areas, including use of hardstand surfacing for frequently travelled access routes, availability of water carts for dry periods, construction vehicle speed restrictions, minimising stockpiling of excavated material or fill material brought to site, and semi-porous or solid boundary fencing. If stockpiling is necessary, the stockpiles would be managed to minimise dust emissions according to the recommendations in the CCBD Guide.
- The risk of exposure to dust for industrial properties to the west of the rail corridor is reduced because of the wind sheltering effect of the rear building walls and the residential buildings across the corridor, and also because the building openings facing away from the tracks.
- Construction contractors will need to pay diligent attention to dust mitigation measures including providing wind sheltering, surface consolidation, water trucks, and limiting speeds for the laydown areas in Border Drive Reserve and in the vacant land to the south and west of Keilor Park Drive.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.2.5 Maribyrnong River Valley Crossing

5.2.5.1 Description of Works

Project Alignment: Ch17+300 to Ch17+800.

This section involves the construction of 500m rail bridge to cross the Maribyrnong River alongside but separate to the existing ARTC rail bridge (see Figure 5.7). The bridge will comprise two abutments and eight piers with pad footings or bored pile foundations. Significant ground disturbance is required to gain access to the pier locations. Access track locations are yet to be confirmed.

Activities required during construction with the potential to generate dust emissions include:

- Clearing illegal rubbish dump on upper slope of the southern embankment. Asbestos or other contaminated material may be present and the clearing works will proceed in accordance with a contaminated land environmental management plan.
- Cutting of access tracks into the embankment, and use of the embankments by construction vehicles.
- General earthworks to complete pier foundations.
- General construction activities and heavy vehicle movements associated with constructing concrete piers and installing bridge spans.
- Worksite / laydown area on the North and South side of Maribyrnong River Valley.

Generally, all structural fill materials required for the works will be imported from other construction sites / quarry. A percentage of the spoil generated will be re-compacted, if the properties of the spoil are deemed suitable.

A small percentage of spoil deemed suitable may be stockpiled for reinstatement of access paths or revegetation. Spoil stockpile locations will be limited to the top of the valley, outside of the Maribyrnong River flood zones and ecological sensitive areas.

5.2.5.2 Area Impacted

The local planning zones overlaying an aerial image of the location where these works will occur are shown at Appendix G. Appendix G shows the planned Works Site / Laydown Areas, temporary and permanent construction works areas, the bridge works area, and the State Project Land.

The main neighbouring land uses that are potentially sensitive to dust are the residential areas to the northeast of the proposed bridge, on Hedgerow Court and Sterling Drive. The industrial area to the southwest of the bridge has a relatively low sensitivity to elevated dust emissions due to the nature of activities carried out there.

Figure 5.7 Existing ARTC rail bridge across Maribyrnong River valley, image from Google Street View (dated March 2020), taken from Western Ring Road to the west of the rail bridge.

5.2.5.3 Impact Assessment

Sensitivity of Neighbouring Properties

- The main neighbouring land uses that are potentially sensitive to dust are the residential areas to the northeast of the bridge, on Hedgerow Court and Sterling Drive.
- The industrial area to the southwest of the bridge has a relatively low sensitivity to elevated dust emissions due to the nature of activities carried out there.

Meteorology

- The only wind conditions likely to carry residual dust to the residential areas to the northeast of the bridge are strong south or southwesterly winds.
- The potential for wind-driven dust pick-up from exposed surfaces within the valley will be reduced due to the sheltering provided by the valley orientation. However, laydown areas and access tracks at railway elevation will be fairly exposed to strong winds.

Impact Assessment Rationale and Assumptions

- Potential dust emissions can be controlled through normal good practice mitigation measures and careful planning of the location of potentially dusty sources.
- It is assumed that standard good practice dust containment measures will be adopted for the access tracks and at the laydown areas, including use of hardstand surfacing, availability of water carts for dry periods, construction vehicle speed restrictions, semi-porous or solid boundary fencing for wind sheltering where needed.
- If stockpiling of potentially dusty materials is necessary, the stockpiles would be located away from sensitive receptors and managed to minimise dust emissions according to the recommendations in the CCBD Guide.
- Construction contractors will need to pay diligent attention to dust mitigation measures including providing wind sheltering, surface consolidation, water trucks, and limiting speeds for any access tracks and laydown areas on the northern side of the Maribyrnong River, particularly to the east of the rail tracks. Instrumental dust monitoring is recommended at this location, with regular review of the monitoring data and effectiveness of dust controls. If found to be necessary, works with higher risk of dust emissions should be suspended during high wind speed conditions.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.2.6 McIntyre Road Bridge

5.2.6.1 Description of Works

Project Alignment: Ch15+400.

Works will involve the installation of a retaining wall and removing the existing embankment to make room for the MAR tracks. In addition, there will be strengthening and protection works to existing abutment and pier, bridge girders and traffic barriers.

Activities required during construction with the potential to generate dust emissions include:

- Installation of retaining wall.
- Demolishment of existing structures where required.
- General construction activities including foundations and abutment strengthening, pier strengthening, and deck strengthening.
- General associated construction activities.
- Site offices area to the north and/or south of the bridge adjacent to McIntyre Road.

5.2.6.2 Area Impacted

Appendix H shows the local planning zones overlaying an aerial image of the location where these works will occur. Appendix H also shows the planned Works Site / Laydown Areas, temporary and permanent construction works areas and the State Project Land.

The main neighbouring land uses that are potentially sensitive to dust are the residential dwellings to the west of McIntyre Road, and south of Berkshire Road close to McIntyre Road.

The industrial-zoned buildings to the north and east of the bridge on McIntyre Road and Steers Street are also potentially sensitive to dust, but to a lesser extent than the residential locations.

5.2.6.3 Impact Assessment

Sensitivity of Neighbouring Properties

- The main neighbouring land uses that are potentially sensitive to dust are the residential dwellings to the west of McIntyre Road, and south of Berkshire Road close to McIntyre Road.
- The industrial-zoned buildings to the north and east of the bridge on McIntyre Road and Steers Street are also potentially sensitive to dust, but to a lesser extent than the residential locations.

Meteorology

- High wind speeds are strongly oriented north-south, in line with McIntyre Road. These wind directions will carry any residual dust generated during strong winds away from most sensitive land uses. The presence of McIntrye Road and the existing bridge over the road are likely to create a localised wind tunnelling effect, exacerbating this factor.
- Residences potentially downwind under such wind conditions are located at least 100 m southeast of the bridge.

Impact Assessment Rationale and Assumptions

- Dust emissions from this works site are relatively small due to the nature of works entailed and the small footprint of the site laydown areas. Potential dust emissions can be controlled through normal good practice mitigation measures.
- It is assumed that standard good practice dust containment and wind sheltering measures will be adopted at this construction site, and stockpiling of potentially dusty materials will be minimised.
- Residences potentially downwind of the works under strong northerly winds conditions are located at least 100 m southeast of the bridge, which is a reasonable distance for dust dispersion given the small footprint of the works entailed at this site.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.2.7 General Corridor Works

5.2.7.1 Description of Works

Project Alignment: Ch15+000 to 20+700.

In addition to the specific project components described in Sections 5.2.1 to 5.2.6, other construction works will be required along the COR Section for the following:

- High voltage (HV) transmission line modifications including 7 new transmission towers, to facilitate the proposed rail viaduct installation at Keilor Park Drive and the Western Ring Road crossing.
- Construction of CSR for signalling, traction power, electrolysis and VicTrack telecommunications services. This requires a trench and construction of pits of various dimensions at regular intervals along the route.
- General earthworks and track drainage to build new track formation.
- Installation of new tracks.
- New substations, conduits, and power supply network.
- New noise walls and retaining walls.
- Installation of trackside equipment.

Activities required during construction of these components with the potential to generate dust emissions include trucks travelling on access roads, earthworks for trenching and excavations, placing bedding material and forming subgrades, and placing of backfill material (i.e. sand, crushed rock, and possibly excavated spoil if suitable) and compaction in layers.

5.2.7.2 Area Impacted

These general works apply across the entire corridor section and the neighbouring properties potentially impacted will depend on the part of the section that is being worked on. There is the potential for sensitive receptors (usually in the form of residential dwellings) to be located close to the State Project Land boundary.

5.2.7.3 Impact Assessment

Sensitivity of Neighbouring Properties

- There is the potential for sensitive receptors (usually in the form of residential dwellings) to be located close to the State Project Land boundary

Impact Assessment Rationale and Assumptions

- Dust emissions from each works site will be relatively small compared to the larger construction sites in the Project due to the nature of works and the constrained working environment within the active rail corridor.
- Stockpiling of potentially dusty materials at the construction locations will be minimal due to site dimension constraints.
- When sensitive receptors are downwind of the works, the cross-section footprint of works site area that is upwind of the receptor is small as the wind is blowing across the rail corridor.
- Potential dust emissions can be controlled through normal good practice mitigation measures. It is assumed that standard good practice dust containment and wind sheltering measures will be adopted to the degree appropriate for the proximity of sensitive receptors.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.3 Sunshine Section

5.3.1 MAR Viaduct Zone 1

5.3.1.1 Description of Works

The MAR Viaduct includes approximately 1.8 km of elevated structure, including approximately 200 m and 150 meters of Up End and Down End earth ramp structures respectively.

Construction of the viaduct will be separated into 3 areas for construction:

1) Zone 1 – Anderson Road Area: CH12+800 – CH13+200
2) Zone 2 – Albion Station Area: CH13+200 – CH13+700
3) Zone 3 – Viaduct over Rail and Down End Area: CH13+700 – CH14+630

This section addresses the impacts associated with for Zone 1.

Zone 1 of the MAR Viaduct works includes the following components:

- Amendment and extension of rail bridge over Anderson Road and temporary slew of the Up and Down Sunbury tracks over the bridge.
- Slew of the Sunbury tracks at CH12+700 to add extra room to allow the ramps to be constructed on the Up End of Anderson Road.
- Significant piling to construct the viaduct approach ramp retaining walls.
- Significant engineered fill to form ramps.
- Significant retaining walls to the west side of the alignment to retain the Bendigo tracks ramp.
- Departure ramps from Anderson Road bridges back to grade.
- Installation of abutment piles and abutments.
- Relocation of CSR routes.

Activities required during construction with the potential to generate dust emissions include:

- Demolition of some existing protection walls and portions of bridge deck
- Earthworks on existing bridge abutments
- Preparation of foundations for viaduct piers
- Construction of ramps – compacted engineered fill and retaining walls.
- General associated construction activities and truck movements on access/haul roads.
- Material laydown area and site offices area.
- Demolition of existing rail track structure and removal of redundant ballast.
- Construction of slewed rail track including formation earthworks, placement of ballast, tamping, and regulating.
- Excavation and trenching works for re-aligned CSR.

5.3.1.2 Area Impacted

Appendix I shows the local planning zones overlaying an aerial image of the location where these works will occur.

Appendix I also shows the planned Works Site / Laydown Areas, temporary and permanent construction works areas and the State Project Land.

The main neighbouring land uses that are potentially sensitive to dust are the residential dwellings on King Edward Avenue to the south of the portion of Barclay Reserve to be used for Works Site / Laydown Area, and west of Andersons Road south of and close to the bridge.

The commercial properties to the northeast of the railway either side of Andersons Road may also be sensitive to dust.

5.3.1.3 Impact Assessment

Sensitivity of Neighbouring Properties

- Residential and commercial land uses that are potentially sensitive to dust are located in close proximity (less than 100 m separation) to the proposed works areas.

Meteorology

- High wind speeds are strongly oriented north-south, roughly in line with Andersons Road. Residences to the south of Barclay Reserve are potentially exposed to residual dust emissions during northerly winds.

Impact Assessment Rationale and Assumptions

- Dust emissions from this works site are potentially significant due to the nature of works entailed, however potential dust emissions can be minimised through attention to good practice mitigation measures.
- It is assumed that standard good practice dust containment measures will be adopted at this construction site, including use of hardstand surfacing for frequently travelled access routes, availability of water carts for dry periods, construction vehicle speed restrictions, minimising stockpiling of excavated material, and semi-porous or solid boundary fencing.
- If stockpiling is necessary, such as prior to occupations, the stockpiles would be managed to minimise dust emissions according to the recommendations in the CCBD Guide and located as far from sensitive neighbours as reasonably practicable. Instrumental dust monitoring is recommended at this site at a suitable location between Anderson Road and Sunshine Station, with regular review of the monitoring data and effectiveness of dust controls. If found to be necessary, works with higher risk of dust emissions should be suspended during high wind speed conditions.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.3.2 MAR Viaduct Zone 2

5.3.2.1 Description of Works

Project Alignment: CH13+200 – CH13+700.

Zone 2 of the MAR Viaduct works includes the following components:

- Installation of piers, beams and deck for continuation of elevated MAR viaduct and track from Zone 1.
- New track construction for Bendigo Up and Sunbury Down tracks to cross under the MAR viaduct before Albion Station.
- Modifications to the western and eastern Albion Station forecourts and car parks at Ch13+700.

Activities required during construction with the potential to generate dust emissions are assumed to include:

- Preparation of foundations for viaduct piers.
- Viaduct structures requiring retaining walls and engineered fill.
- General associated construction activities and truck movements on access/haul roads.
- Demolition of existing rail track structure and removal of redundant ballast.
- Construction of slewed rail track including formation earthworks, placement of ballast, tamping, and regulating.
- Excavation and trenching works for re-aligned CSR.
- Material laydown area and site offices area.

5.3.2.2 Area Impacted

Appendix J shows the local planning zones overlaying an aerial image of the location where these works will occur. Appendix J also shows the planned Works Site / Laydown Areas and temporary and permanent construction works areas for the Zone 2 works, and the State Project Land.

The main neighbouring land uses that are potentially sensitive to dust are the residential dwellings and the Sunshine City Club / lawn bowls facility in the area marked “A” in Appendix J (refer to Map MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490524), and also the residential dwellings in the area marked “B”.

The vacant industrial property at the location marked “C” in Appendix J (refer to Map MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490524)and also shown in Figure 5.8 is considered to be relatively insensitive to residual dust emissions from the MAR Viaduct works. Similarly, the commercial property at the location marked “D” in Appendix J (refer to Map MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490524), which is a self-storage facility as shown in Figure 5.9, is also considered to be relatively insensitive to residual dust emissions.

Figure 5.8 Aerial view of vacant industrial property at the location marked “C” on Map 0490524, bounded by Sydney Street, Ferguson Street, and the rail corridor; Albion Station shown in top left of image. Image from Google Earth (dated December 2018).

Figure 5.9 Self Storage facility on east side of rail corridor at corner of Ballarat Road and McIntyre Road marked “D” on Map 0490524. Image from Google Street View (dated March 2020), taken from Ballarat Road looking south (rail corridor is to the right of the image).

5.3.2.3 Impact Assessment

Sensitivity of Neighbouring Properties

- Residential and public land uses that are potentially sensitive to dust are located in close proximity to the proposed works but only in a limited area.

Meteorology

- High wind speeds are strongly oriented north-south. Sensitive receptors are partially downwind of the rail corridor, Albion Station and/or works laydown areas under these wind directions.

Impact Assessment Rationale and Assumptions

- It is assumed that standard good practice dust containment measures will be adopted at this construction site, including use of hardstand surfacing for frequently travelled access routes, availability of water carts for dry periods, construction vehicle speed restrictions, minimising stockpiling of excavated material, and semi-porous or solid boundary fencing.
- If stockpiling is necessary, such as prior to occupations, the stockpiles would be managed to minimise dust emissions according to the recommendations in the CCBD Guide and located as far from sensitive neighbours as reasonably practicable.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.3.3 MAR Viaduct Zone 3

5.3.3.1 Description of Works

Project Alignment: CH13+700 – CH14+630.

Zone 3 of the MAR Viaduct works extends from the south side of Ballarat Road bridge to the Airport end of the SUN Section where the COR Section begins. Zone 3 comprises several long spans of the MAR Viaduct over several existing road and rail structures, including Ballarat Road eastbound and westbound bridge, Sunbury tracks, St Albans Road and Stony Creek culvert. Zone 3 also includes up and down ramps for the Viaduct at the Airport end of the zone, returning the MAR track to ground level.

In addition, drainage works including construction of a new drainage pond associated with Stony Creek are included in Zone 3.

Activities required during construction with the potential to generate dust emissions include:

- Preparation of foundations for viaduct piers
- Construction of ramps – compacted engineered fill and retaining walls.
- General associated construction activities and truck movements on access/haul roads.
- Slew of existing ARTC rail track including formation earthworks, placement of ballast, tamping, and regulating.
- Excavation and trenching works for re-aligned CSR.
- Material laydown areas and site offices areas.

5.3.3.2 Area Impacted

Appendix K shows the local planning zones overlaying an aerial image of the location where these works will occur. Appendix K also shows the planned Works Site / Laydown Areas and temporary and permanent construction works areas for the Zone 3 works, and the State Project Land.

Most neighbouring land uses in Zone 3 are not sensitive to dust. These land uses include various industrial activities annotated in Appendix K (refer to map MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490526) and summarised as follows:

- “A” – Public Use Zone 1 - Service and Utility (PUZ1) that comprises exposed surface soils and stockpiles (Figure 5.10).
- “B” - Textile manufacture and dyehouse adjacent to “A” and already exposed to dust from “A” under dry conditions and strong wind speeds (Figure 5.11).
- “C” - Steel Reinforcing and Precast Panels manufacture and storage facility (Figure 5.12).
- “D” – BlueScope Steel, Steel Supplies Depot (Figure 5.13).
- “E” – Motor Vehicle Auction Yard.
- “F” – AkzoNobel Surface Coatings factory.

Locations that are potentially sensitive to residual dust emissions from the works include residential dwellings near the Ballarat Road bridge at the intersection of Ballarat Road, Derrimut Street and Sydney Street. Residential dwellings to the south of Cary Street bordering with the PUZ1-zoned land may also be sensitive to dust from the works, however those residential dwellings are more than 130 m from the Airport end of Zone 3. Those residential dwellings may already experience impacts from dust erosion from the PUZ1-zoned site during dry conditions and strong wind speeds from the south.

Residential dwellings on the west side of Camperdown Avenue are also potentially sensitive to dust emissions from the drainage works associated with the Stony Creek culvert, and the adjacent laydown area.

Figure 5.10 PUZ1-zoned property, marked “A” on Map 0490526 (Appendix C), Google Street View image taken August 2019.

Figure 5.11 Texture manufacture and dyehouse, marked “B” on Map 0490526 (Appendix C), Google Street View image captured August 2019.

Figure 5.12 Steel Reinforcing and Precast Panels manufacture and storage, marked “C” on Map 0490526 (Appendix C), Google Street View image captured March 2020.

Figure 5.13 BlueScope Steel, Steel Supplies Depot, marked “D” on Map 0490526 (Appendix C), Google Street View image captured March 2020.

5.3.3.3 Impact Assessment

Sensitivity of Neighbouring Properties

- Residential land uses that are potentially sensitive to dust emissions from the works associated with the Viaduct construction are located close to the south end of the zone, but in a limited area, and to the north of the zone.
- Residential land uses that are potentially sensitive to dust emissions from the works associated with the Stony Creek culvert are located to the east of the works area.

Meteorology

- High wind speeds are strongly oriented north-south. Sensitive receptors may be downwind under these wind conditions.

Impact Assessment Rationale and Assumptions

- It is assumed that standard good practice dust containment measures will be adopted at this construction site, including use of hardstand surfacing for frequently travelled access routes, availability

of water carts for dry periods, construction vehicle speed restrictions, minimising stockpiling of excavated material, and semi-porous or solid boundary fencing.

- If stockpiling is necessary, such as prior to occupations, the stockpiles would be managed to minimise dust emissions according to the recommendations in the CCBD Guide and located as far from sensitive neighbours as reasonably practicable.
- Potentially dust-generating construction activities have a small footprint near the residential dwellings to the southwest of Ballarat Road bridge.
- The residential dwellings to the south of Cary Street are sufficiently separated from the Zone 3 works that any dust impacts from emissions from the Project activities will be indistinguishable above any existing dust impacts from the adjacent PUZ1-zoned land.
- The residential dwellings on Camperdown Avenue close to the works area associated with the Stony Creek culvert are not downwind of the works site under the prevailing north-south wind directions.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.3.4 Sunshine Station

5.3.4.1 Description of Works

Project Alignment: CH11+975 – CH12+300.

Activities required during construction with the potential to generate dust emissions include:

- Earthworks – surface excavations, engineered fill, and preparation of foundations.
- General associated construction activities and truck movements.
- Material laydown area and site offices area.

5.3.4.2 Area Impacted

Appendix L shows the local planning zones overlaying an aerial image of the location where these works will occur.

Appendix L shows the planned Works Site / Laydown Areas, temporary and permanent construction works areas and the State Project Land.

Residential land uses that are potentially sensitive to dust are located in close proximity to the Sunshine Station, particularly along Station Place. Other residential properties on Sun Crescent (northwest of Sunshine Station) and the eastern end of Morris Street (south of the Works Site / Laydown Area from CH11+700 to CH11+950) may also be potentially exposed to residual dust emissions.

5.3.4.3 Impact Assessment

Sensitivity of Neighbouring Properties

- Residential and commercial/retail land uses that are potentially sensitive to dust are located in close proximity to the proposed works areas.

Meteorology

- High wind speeds are strongly oriented north-south. Some sensitive receptors are downwind of Sunshine Station or planned Works Site / Laydown Areas under these wind directions.

Impact Assessment Rationale and Assumptions

- It is assumed that standard good practice dust containment measures will be adopted at this construction site, including use of hardstand surfacing for frequently travelled access routes, availability of water carts for dry periods, construction vehicle speed restrictions, minimising stockpiling of excavated material, and semi-porous or solid boundary fencing.
- If stockpiling is necessary, the stockpiles would be managed to minimise dust emissions according to the recommendations in the CCBD Guide and located as far from sensitive neighbours as reasonably practicable.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

5.3.5 General Sunshine Section Works

5.3.5.1 Description of Works

Project Alignment:

In addition to the specific project components described in Sections 5.3.1 to 5.3.4, other construction works will be required along the SUN section for the following:

- Between Sunshine Station and MAR Viaduct Zone 1 - Ch12+300 to 12+800.
  - > Renewal or slewing of tracks, construction of turnouts, formation earthworks, construction of CSR, OHW, and signalling.
- West Footscray to Sunshine Station
  - > Construction of CSR and signalling.
- Albion Station to Ginifer Station.
  - > Construction of CSR and signalling.
- Brooklyn freight corridor from Newport Station to Ch11+700
  - > Construction of CSR and signalling.

Activities required during construction of these components with the potential to generate dust emissions include:

- Trucks travelling on access roads.
- Earthworks for trenching and excavations if required, placing bedding material and forming subgrades, placing of backfill material (i.e. sand, crushed rock, and possibly excavated spoil if suitable) and compaction in layers.
- Construction of slewed track where required including formation earthworks, placement of ballast, tamping and regulating.

5.3.5.2 Area Impacted

The neighbouring properties potentially impacted will depend on the part of the section that is being worked on. There is the potential for sensitive receptors (usually in the form of residential dwellings) to be located close to the State Project Land boundary adjacent to the works.

5.3.5.3 Impact Assessment

Sensitivity of Neighbouring Properties

- There is the potential for sensitive receptors (usually in the form of residential dwellings) to be located close to the State Project Land boundary.

Impact Assessment Rationale and Assumptions

- Dust emissions from each works site will be relatively small compared to the larger construction sites in the Project due to the nature of works and the constrained working environment within the active rail corridor.
- Stockpiling of potentially dusty materials at the construction locations will be minimal due to site dimension constraints.
- When sensitive receptors are downwind of the works, the cross-section footprint of works site area that is upwind of the receptor is small as the wind is blowing across the rail corridor.
- Potential dust emissions can be controlled through normal good practice mitigation measures. It is assumed that standard good practice dust containment and wind sheltering measures will be adopted to the degree appropriate for the proximity of sensitive receptors.

Impact Assessment Conclusion

- Considering the factors above and in consideration of the relevant criterion under the Ministerial Guidelines, there is a **low** risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants.
- Further, the potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as **low**.

6. *Environment Effects Act 1978* Self-Assessment Criteria

The *Environment Effects Act 1978* is relevant to the Project as it provides for the assessment of proposed projects that may have a significant effect on the environment. The Ministerial Guidelines under the Environment Effects Act provide the criteria used to determine whether a project warrants referral to the Minister for Planning. A project proponent is responsible for assessing whether its project will have potential adverse environmental effects that could be significant in a regional or State context.

As part of this Impact Assessment, consideration has been given to the criteria relevant to air quality to determine the potential extent effects. The referral criteria relevant to this Impact Assessment and the associated response is provided in Table 6-1 below.

Criteria relevant to other environmental matters is addressed in the relevant impact assessment.

Table 6-1: Air Quality Assessment of EE Act Referral Criteria

EE Act Referral Criteria	Air Quality Response	Criterion for referral met?
Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences.	It is not anticipated that there will be extensive or major effects on the health, safety or well-being of the community due to emissions to air. After construction is completed, Project works are unlikely to result in ongoing emissions to air. The MAR trains will be electrified and therefore will not create emissions associated with combustion of fuel in diesel-fired train engines. It is also noted that the provision of a rail connection to the Airport will encourage a mode shift from road transport to rail, and deliver a rail connection to cater for the expected increase in passenger numbers at the Airport in the coming years. Given the role of MAR in providing an alternative transport mode and reducing the reliance on road transport, is not expected that the operation of MAR would facilitate any extensive or major increases to existing air emissions. To the contrary, the operation of MAR would contribute to a reduction of PM_{10} and $PM_{2.5}$ emissions into the Melbourne airshed due to the reduction in passengers relying on road transport to travel to the Airport.* Potential impacts from construction phase emissions will be managed through the implementation of standard good practice construction mitigation measures, thereby limiting potential impacts.	Criterion not met.
Potential exposure of a human community to severe or chronic health or safety hazards over the short or long term, due to emissions to air or water or noise or chemical hazards or associated transport.	There is limited potential for the exposure of a human community to severe or chronic health hazards due to air emissions during the short-term. The potential air emissions expected during construction will be typical of a construction project, and subject to control measures formalised within a contractor's Construction Environmental Management Plan (CEMP). During the operational phase, the provision of a rail connection to the Airport will encourage a mode shift to rail and reduce the current reliance on road transport. As the MAR trains will be electrified, the operation of MAR will not result in any negative extensive or major changes to existing air emissions.	Criterion not met.

* Whilst power generation will be required to provide electricity for the trains which may discharge PM_{10} and $PM_{2.5}$ to air if the energy is derived from combustion of fuel, any large-scale power generation will be remote from the Melbourne urban airshed, more efficient than combustion of fuel in cars or trains due to combustion technology efficiency and emission controls, and with greatly improved dispersion through the use of tall stacks and spatial separation from the Melbourne metropolitan area. Therefore, any emissions of PM_{10} and $PM_{2.5}$ from power generation needed to supply the trains with electricity are not be expected to contribute to concentrations of fine particulate matter within the Melbourne urban airshed.

7. Conclusion

This report details the Impact Assessment for the Project. The purpose of the impact assessment is to determine air quality values that are likely to be impacted by the proposed works. The key findings of this Impact Assessment are summarised as follows:

- For the Project, air discharges are only associated with activities occurring during construction.
- Air quality impacts can include impacts on human health (such as concentrations of respirable airborne pollutants) and impacts on amenity (such as dust deposition or odour).
- The key air pollutant relevant to construction of the project is particulate matter, including the fine fractions PM_{10} and $PM_{2.5}$ which have the potential to impact human health, and total settleable dust which has the potential to cause nuisance impacts through dust deposition.
- Background PM_{10} and $PM_{2.5}$ concentrations in ambient air are usually well below the applicable air quality criteria, but have historically approached or exceeded the criteria on several days per year.
- Given the role of MAR in providing an alternative transport mode and reducing the reliance on road transport, is not expected that the operation of MAR will facilitate any extensive or major changes to existing air emissions; to the contrary, it will contribute to a reduction of PM_{10} and $PM_{2.5}$ emissions into the Melbourne airshed due to reduced numbers of passengers relying on road transport to travel to the Airport. There is a low risk of air quality impact due to other types of air discharges during Project construction, including:
  - > Amenity impacts from odour emissions due to disturbance of contaminated soils
  - > Human health impacts from disturbance of contaminated soils
  - > Human health impacts from exhaust emissions from trucks and heavy machinery working on the construction sites.

Arising from this assessment, the following mitigation measures are recommended for the Project:

- Good practice dust containment measures will be adopted at each construction site, including use of hardstand surfacing for frequently travelled access routes, availability of water carts for dry periods, construction vehicle speed restrictions, minimise stockpiling of excavated material or fill material brought to site, and semi-porous or solid boundary fencing. These mitigation measures are further detailed at Section 5.1.2.
- If stockpiling of potentially dusty materials is necessary, the stockpiles would be managed to minimise dust emissions according to the recommendations in the CCBD Guide and located as far from sensitive neighbours as reasonably practicable.
- Construction works should be modified, as appropriate, to minimise impacts during adverse air quality or meteorological conditions. This approach is recognised in the CCBD Guide (see Section 5.1.2) and should be documented in the construction air quality management plan that would be prepared for the Project.
- Use of continuous air quality monitoring equipment for PM_{10} and $PM_{2.5}$ concentrations in ambient air is recommended to monitor the effectiveness of mitigation measures and alert site managers of poor background air quality and/or impacts caused by construction activities. The use of dust deposition monitors is also recommended, however these only provide long term deposition information and are not useful for day to day proactive management.
  - > The continuous air quality monitors should be placed in strategic locations along the MAR alignment, where the most significant earthmoving activities are required over a long period. The recommended locations are the two sites identified in the impact assessment as having the highest potential for air quality impacts:
    - – MAR Viaduct Zone 1, near the construction of the viaduct ramps at a suitable location between Anderson Road and Sunshine Station.

  - Maribyrnong River valley crossing new bridge, on the northern side of the Maribyrnong River to the east of the rail tracks.

- Develop specific environmental management requirements for contaminated land to be implemented in the construction phase including a Construction Environmental Management Plan (CEMP) and other management sub-plans as required.

In consideration of the relevant EE Act Ministerial Guidelines criterion, the Impact Assessment concludes that for all construction activities proposed for the MAR project:

- There is a low risk of dust emissions causing potential extensive or major effects on the health, safety or well-being of neighbouring building occupants; and
- The potential exposure of neighbouring building occupants to severe or chronic health or safety hazards over the short or long term due to emissions of dust to air is also rated as low.

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APPENDIX A
RELEVANT LEGISLATION, POLICIES, GUIDELINES AND STANDARDS

Appendix A – Relevant Legislation, Policies, Guidelines and Standards

A.1 Relevant Legislation

A.1.1 Summary of Legislation

Table A.1 summarises the relevant legislation applicable to the air quality impact assessment as well as implications for the Project.

Table A.1 Legislation summary – amenity and air quality

Legislation or policy	Key policies and strategies
Commonwealth	
National Environment Protection (Ambient Air Quality) Measure (NEPM(AAQ))	Section 14 of the *National Environment Protection Council Act 1994* and the equivalent provision of the corresponding Act of each participating state and territory provides for the making of measures by the National Environment Protection Council (NEPC) and the matters to which they may relate. This Measure relates to ambient air quality. The desired environmental outcome of the NEPM(AAQ) is ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution. The NEPM(AAQ) requires participating jurisdictions to undertake monitoring, evaluation and reporting activities that allow communities to understand their local air quality and assist the formulation of air quality policies. It provides a focus for air quality issues and drives all jurisdictions to work towards nationally consistent monitoring techniques and reporting. The NEPM(AAQ) does not compel or direct pollution control measures. EPA Victoria is responsible for the regulation, monitoring, assessment and reporting of air pollution in Victoria. Pollutant concentrations measured at EPA's ambient air monitoring stations are compared against the NEPM(AAQ) standards. EPA monitors and assesses a range of indicators including carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particles less than 10 micrometres in diameter (PM_{10}) and particles less than 2.5 micrometres in diameter ($PM_{2.5}$). In April 2021, the National Environment Protection Council approved a variation to the NEPM(AAQ) standards for O_3, NO_2 and SO_2. A variation to the NEPM(AAQ) was registered on 26 May 2021. The changes reflect the most recent evidence emerging about the health effects of air pollutants. In the 2021 review, Ministers agreed to commence a further review of the O_3, NO_2 and SO_2 standards in 2025; noting reviews of the $PM_{2.5}$ and annual PM_{10} standards are also planned.
State	
Environment Protection Act 2017 (EP Act 2017)	The EP Act 2017 is a risk-based approach to preventing environmental harm and includes a general environmental duty (GED). The GED requires people to take reasonably practicable steps to eliminate, or otherwise reduce risks of harm to human health to the environment from pollution and waste. Doing what is reasonably practicable means putting in proportionate controls to mitigate or minimise the risk of harm. In addition to the GED, duties under the EP Act 2017 relevant to air quality include the duty to respond to harm (s.31) and the duty to notify of an incident (ss. 32- 33). This legislation provides the framework for the policies, guidelines and objectives which are relevant to all air quality impact assessments in Victoria. The GED requires identification of all risks and implementation of effective control measures so far as reasonably practicable. This guides the approach to managing impacts on air quality and associated environments during the Project.

Legislation or policy	Key policies and strategies
	Key subordinate instruments which dictate policies to establish environmental quality objectives associated with air quality are able to be created under this legislation.
Environmental Reference Standard (ERS)	The ERS (Victoria Government 2021) is a new subordinate instrument made under the EP Act 2017. The ERS was gazetted on 26 May 2021. The ERS identifies environmental values for Victoria in the areas of air quality, noise, water and contaminated land; and defines indicators and objectives to measure those values. Prior to the ERS coming into effect on 1 July 2021, policies for environmental quality objectives were set out in the State Environment Protection Policies (SEPPs). The beneficial uses, environmental quality indicators and objectives from the SEPPs are used in the ERS, with some language changes and some additional indicators. The ERS supports the protection of the environment from pollution and waste by providing a benchmark to assess and report on environmental conditions in the whole or any part of Victoria (Victoria Government 2019). The ERS does not set out enforceable compliance limits; rather, risks of harm to human health and the environment from pollution and waste must be minimised as far as reasonably practicable, in accordance with the GED. The ERS works alongside the GED. Although it is not a compliance standard and does not set compliance limits, the ERS must be taken into account by responsible authorities when making planning decisions. The ERS includes a qualitative objective for odour, which applies to offensive odours from commercial, industrial, trade and domestic activities.
Environment Protection Regulations	The Environment Protection Regulations (EPA 2021a) are a subordinate instrument of the EP Act 2017 and cover a broad suite of topics including contaminated land, the new framework for permissions, waste management and environmental management (including air and noise) as well as administrative matters relating to offences, fees and transitional arrangements. Part 5 (Environmental Management) of the Regulations addresses matters including air. Part 5.2 – Air (Regulations 103 to 112) specifies obligations on manufacturers and suppliers in relation to air pollution, including in relation to the National Pollutant Inventory and specifies obligations in relation to Class 3 substances (listed in Schedule 4). Part 5.6 prescribes standards, limits, testing requirements and offences relating to vehicle noise and air emissions. Due to the activities and the nature of the predicted emissions, the Environment Protection Regulations are less directly relevant to the air quality impact assessment for the Project.

A.1.2 General Environmental Duty and Reasonably Practicable

The cornerstone of the new environmental protection legislation is the general environmental duty (GED). The GED requires anyone conducting an activity that poses risks of harm to human health and the environment from pollution or waste must minimise those risks, so far as reasonably practicable.

'Reasonably practicable' measures means putting in controls to eliminate the risk of harm to human health and the environment so far as reasonably practicable. If eliminating the risk of harm is not reasonably practicable, then the risk of harm must be reduced so far as reasonably practicable. A number of matters must be considered in deciding what is reasonably practicable in the circumstances:

- the likelihood of those risks eventuating;
- the degree of harm that would result if those risks eventuated;
- what the person concerned knows, or ought reasonably know, about the harm or risks of harm and any ways of eliminating or reducing those risks;
- the availability and suitability of ways to eliminate or reduce those risks; and

- the cost of eliminating or reducing those risks

EPA Victoria (2020a) explains that when dealing with a common risk or harm, demonstrating that the person or business undertaking the activity has done what is reasonably practicable can be achieved if:

- Well-established effective practices or controls have been adopted to eliminate or manage risk; and/or
- Where well-established practices or controls do not exist, it can be shown that effective controls have been assessed and adopted.

A.1.3 Other Relevant Duties

In addition to the GED, positive duties imposed by the EP Act 2017 relevant to the air quality impact assessment are the:

- duty to notify of certain (notifiable) pollution incidents to the EPA as soon as practicable after the person becomes or should have become aware of the incident (s.32); and
- duty to respond to harm (restore the environment) after a pollution incident, which imposes a duty to reasonably practicable steps to restore the land affected by a pollution incident that causes or is likely to cause harm to human health or the environment (s.31)

A.2 Ambient Air Quality Criteria

A.2.1 NEPM(AAQ)

National ambient air quality standards are specified in the current National Environment Protection Measure for Ambient Air Quality, with the latest update gazetted in 2021 (the "NEPM(AAQ)").

The currently gazetted NEPM(AAQ) concentration standards are listed in Table A-1. Indicators that are relevant to the Project are PM_{10} and $PM_{2.5}$. Definitions of these indicator pollutants are provided in Section 4.3.1.

The NEPM(AAQ) also includes reduced concentration goals for $PM_{2.5}$ that regulators should seek to achieve by 1 January 2025. These reduced concentration goals are provided in Table A-2. The goals provide a framework for continuous improvement (through policy changes such as emissions from home heating and motor vehicles which take time to implement) and facilitate a review of the $PM_{2.5}$ standard in future. The summary of public submissions report on the 2015 variation of the NEPM(AAQ) (NEPC, 2015) states that the reduced concentration goals are not standards, but "ambitious 10-year goals" to achieve continued and further reductions in maximum concentrations of $PM_{2.5}$ in ambient air over the 2015-2025 period.

Table A-1 NEPM(AAQ) concentration standards – current May 2020

Environmental Indicator (Air Pollutant)	Averaging Period	NEPM(AAQ) Maximum Concentration Standard[1]	NEPM(AAQ) Permissible Exceedances[2]
Particles as PM_{10}	1 day	50 µg/m^3	None[3]
	1 year	25 µg/m^3	None
Particles as $PM_{2.5}$	1 day	25 µg/m^3	None[3]
	1 year	8 µg/m^3	None

1 Mass concentrations for particles in NEPM(AAQ) are referenced to gas conditions of 0°C, 101.3 kPa
2 Maximum allowable exceedances of concentration standard in one calendar year.
3 Excludes exceptional events directly related to bushfire, authorised hazard reduction burning or continental scale windblown dust.

Table A-2 NEPM(AAQ) goal for particles as $PM_{2.5}$ by 2025

Environmental Indicator (Air Pollutant)	Averaging Period	NEPM(AAQ) Maximum Concentration Goal[1]
Particles as $PM_{2.5}$ by 2025	1 day	20 µg/m^3
	1 year	7 µg/m^3

1 Mass concentrations for particles in NEPM(AAQ) are referenced to gas conditions of 0°C, 101.3 kPa

A.2.2 ERS

The ERS adopts the same objectives for PM_{10} and $PM_{2.5}$ air quality, with the exception that the annual average PM_{10} concentration objective is lower than the NEPM(AAQ), at a goal of 20 µg/m^3.

A.3 EPA AirWatch Air Quality Categories

EPA Victoria's AirWatch programme on the EPA's website uses air quality categories to show the level of air pollutants at monitoring sites across Victoria in real time[6]. To calculate an air quality category as defined in the AirWatch programme, the average concentration of a pollutant is measured in the air over an hour. This measurement is then compared to the pollutant's air quality guideline or standard, and the measurement is assigned to one of five categories specific to the particular pollutant which for PM_{10} and $PM_{2.5}$ are shown in Table A-3.

Table A-3 Pollutant concentrations used to define air quality categories on EPA AirWatch website (as updated by EPA, January 2021).

Pollutant	Averaging period	Unit of measurement	Air quality category				
			Good	Fair	Poor	Very Poor	Extremely Poor
PM_{10}	1 hour	µg/m^3 [1]	<40	40-80	80-120	120-300	≥300
$PM_{2.5}$	1 hour	µg/m^3 [1]	<25	25-50	50-100	100-300	≥300

1 Gas reference conditions 0°C, 101.3 kPa.

The air quality categories are all based on measurements taken over a period of one hour, even if the NEPM(AAQ) and ERS objectives for a pollutant is expressed over a longer averaging period – such as for PM_{10} and $PM_{2.5}$. For other air quality pollutants such as nitrogen dioxide, a poor, very poor or extremely poor category indicates that the level of a pollutant is higher than its 1h air quality guideline or standard. However, for PM_{10} and $PM_{2.5}$ there are no regional, national or international guidelines or standards for 1h average concentrations. Using the shorter averaging period for the air quality categories for fine particulate allows more rapid indication of air quality in real time, including potential impacts from short term exposure (such as from dust or smoke over a period of several hours) that would not necessarily be reflected in real time using the longer averaging period. The rationale used by EPA to select the concentrations that define the category thresholds for PM_{10} and $PM_{2.5}$ has not been published but is understood to be based on EPA experience.

These air quality categories were of widespread interest across Victoria over the summer of 2019/2020, due to major bushfire events causing smoke hazards. In Melbourne, air quality concentrations of $PM_{2.5}$ were the most applicable indicator of air quality from the bushfire smoke. Concentrations of $PM_{2.5}$ were highly variable across a 24-hour period, depending on wind conditions.

[6] https://www.epa.vic.gov.au/for-community/monitoring-your-environment/about-epa-airwatch/calculate-air-quality-categories, accessed 21 January 2021.

APPENDIX B
BACKGROUND AIR QUALITY DATA FOR ALPHINGTON AND FOOTSCRAY

Appendix B – Background Air Quality Data for Alphington and Footscray.

B.1 PM_{10} 24h Average

Table B-4: Percentiles of 24h average PM_{10} at Footscray AQMS (2015–2019).

Year	NEPM(AAQ) and ERS (µg/m^3)	No. of Exceedances of Standard	Max (µg/m^3)	Percentiles (µg/m^3)					
				99th	98th	95th	90th	70th	50th
2015	50	3	72	45	35	32	28	20	15
2016	50	0	44	38	35	29	26	18	14
2017	50	0	50	37	34	30	28	20	16
2018	50	1	61	46	44	36	30	21	17
2019*	50	8	65	53	51	39	32	21	16
2015-2019*	50	12	72	47	40	33	29	20	15

* Monitoring for PM_{10} ceased in October 2019.

Table B-5: Percentiles of 24h average PM_{10} at Alphington AQMS (2015–2019).

Year	NEPM(AAQ) and ERS (µg/m^3)	No. of Exceedances of Standard	Max (µg/m^3)	Percentiles (µg/m^3)					
				99th	98th	95th	90th	70th	50th
2015	50	0	47	32	30	26	24	17	14
2016	50	0	38	34	30	27	24	17	13
2017	50	0	35	31	30	26	23	18	15
2018	50	3	74	46	44	36	30	20	16
2019	50	5	70	55	45	37	31	20	16
2015-2019	50	8	74	44	38	31	26	19	15

B.2 $PM_{2.5}$ 24h Average

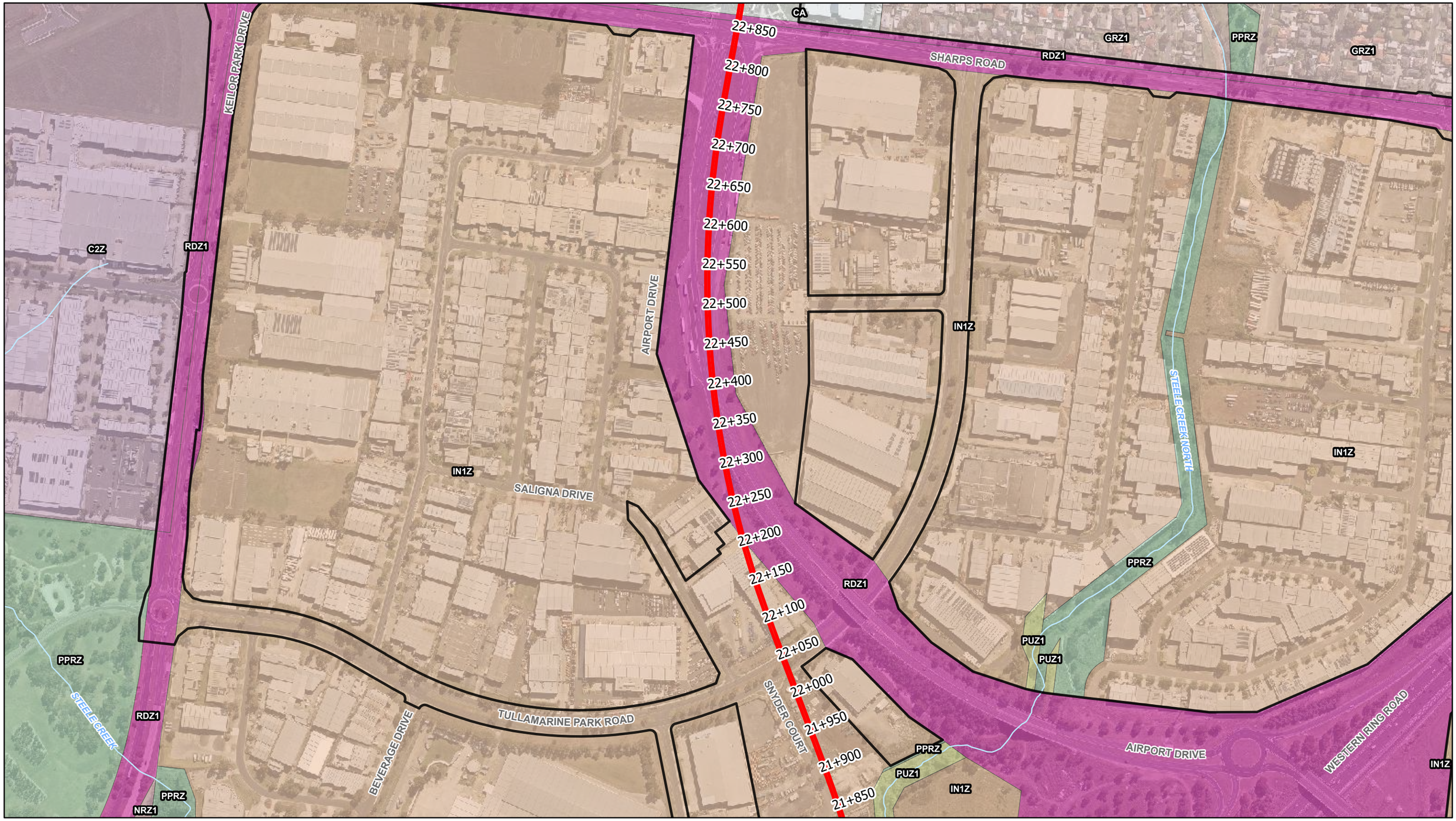
Table B-6: Percentiles of 24h average $PM_{2.5}$ at Footscray AQMS (2015–2019).

Year	NEPM(AAQ) and ERS (µg/m^3)	No. of Exceedances of Standard	Max (µg/m^3)	Percentiles (µg/m^3)					
				99th	98th	95th	90th	70th	50th
2015	25	0	23	20	16	13	12	9	7
2016	25	2	26	20	15	13	11	8	6
2017	25	4	33	24	21	16	13	8	7
2018	25	5	32	29	21	15	12	8	7
2019	25	3	31	22	20	15	12	8	7
2015-2019	25	14	33	23	20	14	12	8	7

Table B-7: Percentiles of 24h average $PM_{2.5}$ at Alphington AQMS (2015–2019).

Year	NEPM(AAQ) and ERS (µg/m3)	No. of Exceedances of Standard	Max (µg/m3)	Percentiles (µg/m3)					
				99th	98th	95th	90th	70th	50th
2015	50	2	32	23	22	19	13	9	7
2016	50	2	33	23	22	15	12	8	6
2017	50	8	35	27	26	20	16	10	8
2018	50	8	42	29	28	18	13	8	7
2019	50	2	30	24	19	16	13	9	7
2015-2019	50	22	42	28	23	18	13	9	7

APPENDIX C
AIRPORT DRIVE AND TRUCK PARKING BAY REALIGNMENT



- Watercourse
- Assessment Area
- MAR Alignment

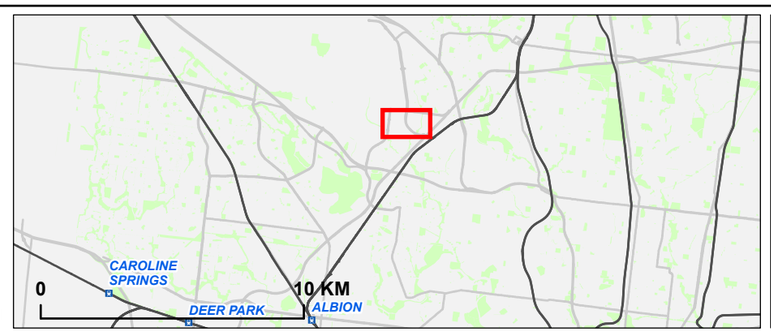
Planning Zone

- C2Z - Commercial 2 Zone
- CA - Commonwealth Land Not Controlled By Planning Scheme
- GRZ - General Residential Zone
- IN1Z - Industrial 1 Zone
- NRZ - Neighbourhood Residential Zone
- PPRZ - Public Park and Recreation Zone
- PUZ1 - Public Use Zone Service and Utility
- RDZ1 - Road Zone Category 1

1 of 1

***Chainage: 22+ 400*

Data Sources:
AJMJV 2021
VicTrack 2021
Vicmap 2021
Aerial photo: DELWP Apr. 2021



RAIL PROJECTS VICTORIA

AJM Joint Venture

aurecon JACOBS MOTT MACDONALD

Melbourne Airport Rail

Airport Drive and Truck Parking Bay Realignment

Existing Environment

Drawing Number:			Revision:
MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490509			A.1
Drawn By: J. Rivera	Approved By: N. Marshallsea	Date: 6/09/2021	Map Size: A3

0 130 260
Metres

Coordinate System: GDA 1994 MGA Zone 55

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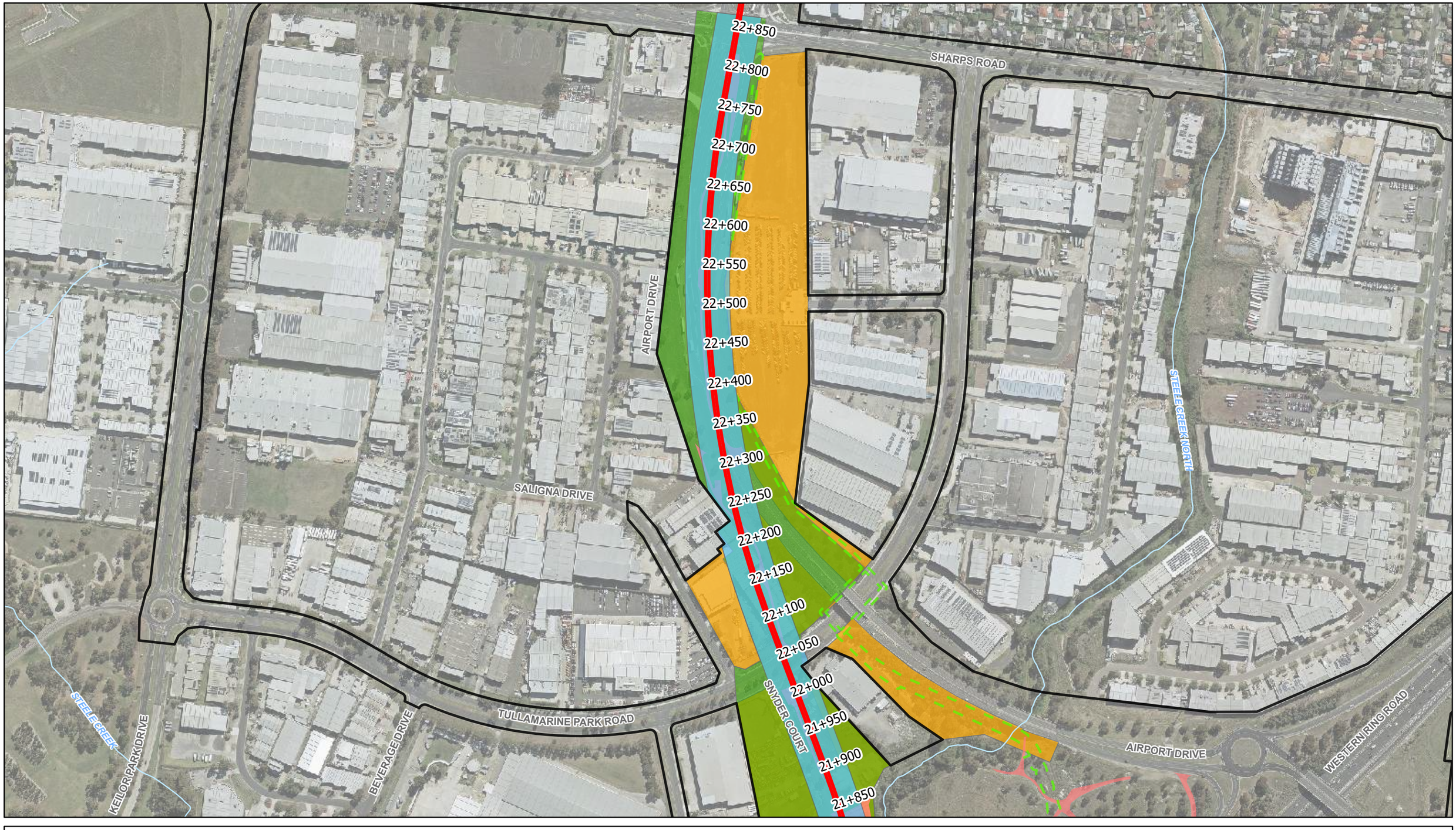


- Watercourse
- MAR Alignment
- Assessment Area

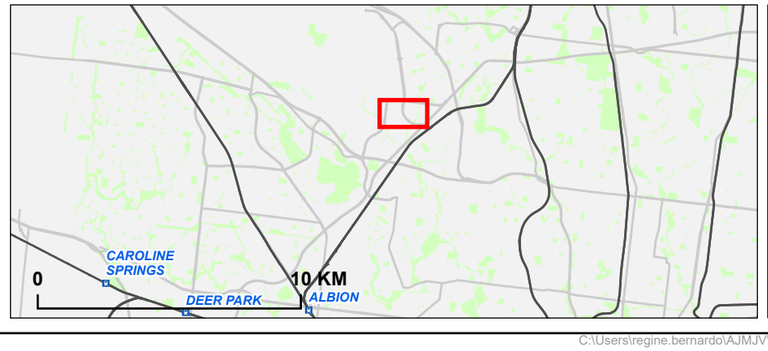
Assumed Impacts

- Maintenance Paths
- Track and Civil
- Viaduct Alignment
- Elevated Viaduct Works
- Shared User Path
- Works Site / Laydown Area

1 of 1

***Chainage: 22+ 400*

Data Sources:
AJMJV 2021
VicTrack 2021
Vicmap 2021
Aerial photo: DELWP Apr. 2021



Melbourne Airport Rail

Airport Drive and Truck Parking Bay Realignment

Land Required for Project Construction

Drawing Number:			Revision:
MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490510			A.1
Drawn By:	Approved By:	Date:	Map Size:
J. Rivera	N. Marshallsea	6/09/2021	A3

0 130 260
Metres
Coordinate System: GDA 1994 MGA Zone 55

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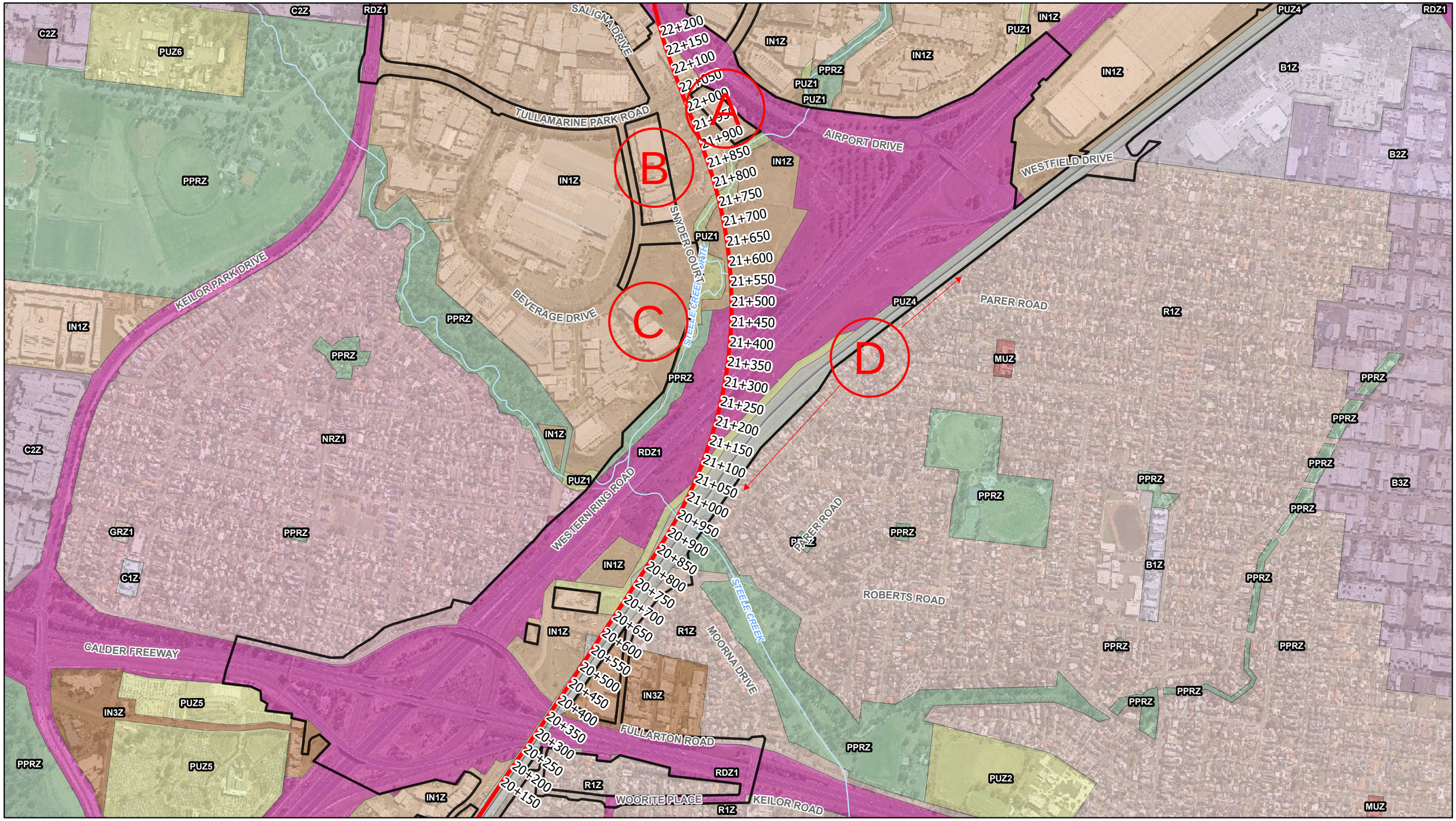
APPENDIX D
WESTERN RING ROAD ELEVATED SECTION



- Rail
- Watercourse
- Assessment Area
- MAR Alignment

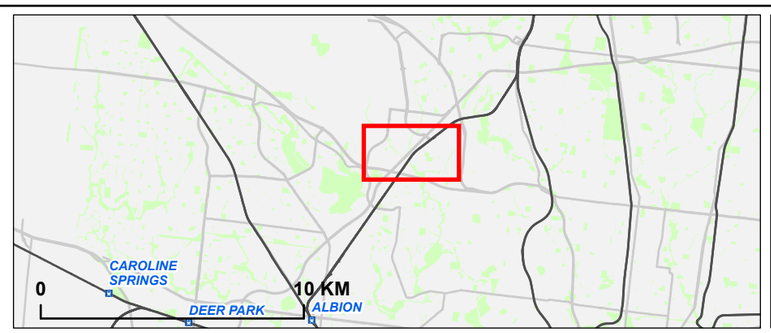
Planning Zone

- B1Z - Commerical 1 Zone
- B2Z - Commerical 1 Zone
- B3Z - Commerical 2 Zone
- C1Z - Commercial 1 Zone
- C2Z - Commercial 2 Zone
- GRZ - General Residential Zone
- IN1Z - Industrial 1 Zone
- IN3Z - Industrial 3 Zone
- MUZ - Mixed Use Zone
- NRZ - Neighbourhood Residential Zone
- PPRZ - Public Park and Recreation Zone
- PUZ1 - Public Use Zone Service and Utility
- PUZ2 - Public Use Zone Education
- PUZ4 - Public Use Zone Transport
- PUZ5 - Public Use Zone Cemetery/crematorium
- PUZ6 - Public Use Zone Local Government
- R1Z - Residential 1 Zone
- RDZ1 - Road Zone Category 1

***Chainage: 22+ 400*

Data Sources:
AJMJV 2021
VicTrack 2021
Vicmap 2021
Aerial photo: DELWP Apr. 2021

1 of 1



Melbourne Airport Rail

Western Ring Road Section – Existing Environment

Existing Environment

Drawing Number:			Revision:
MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490511			A.1
Drawn By: J. Rivera	Approved By: N. Marshallsea	Date: 6/09/2021	Map Size: A3

0 260 520
Metres
Coordinate System: GDA 1994 MGA Zone 55

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- Watercourse
- MAR Alignment
- Assessment Area

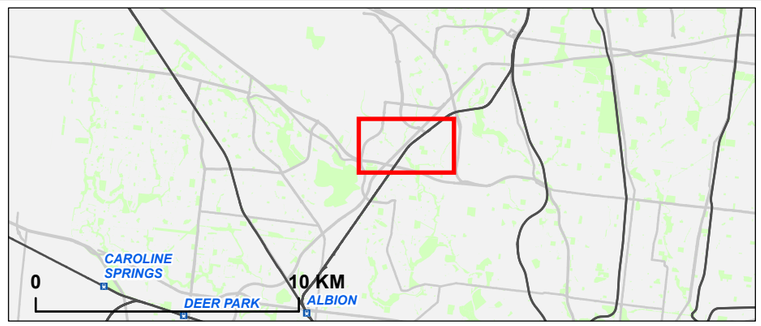
Assumed Impacts

- Bridge Strengthening
- Maintenance Paths
- Substation
- Track and Civil
- Viaduct Alignment
- Elevated Viaduct Works
- Shared User Path
- Works Site / Laydown Area

1 of 1

***Chainage: 22+ 400*

Data Sources:
AJMJV 2021
VicTrack 2021
Vicmap 2021
Aerial photo: DELWP Apr. 2021



RAIL PROJECTS VICTORIA

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Melbourne Airport Rail

Western Ring Road Section – Existing Environment

Land Required for Project Construction

Drawing Number:			Revision:
MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490512			A.1
Drawn By: J. Rivera	Approved By: N. Marshallsea	Date: 6/09/2021	Map Size: A3

0 260 520
Metres
Coordinate System: GDA 1994 MGA Zone 55

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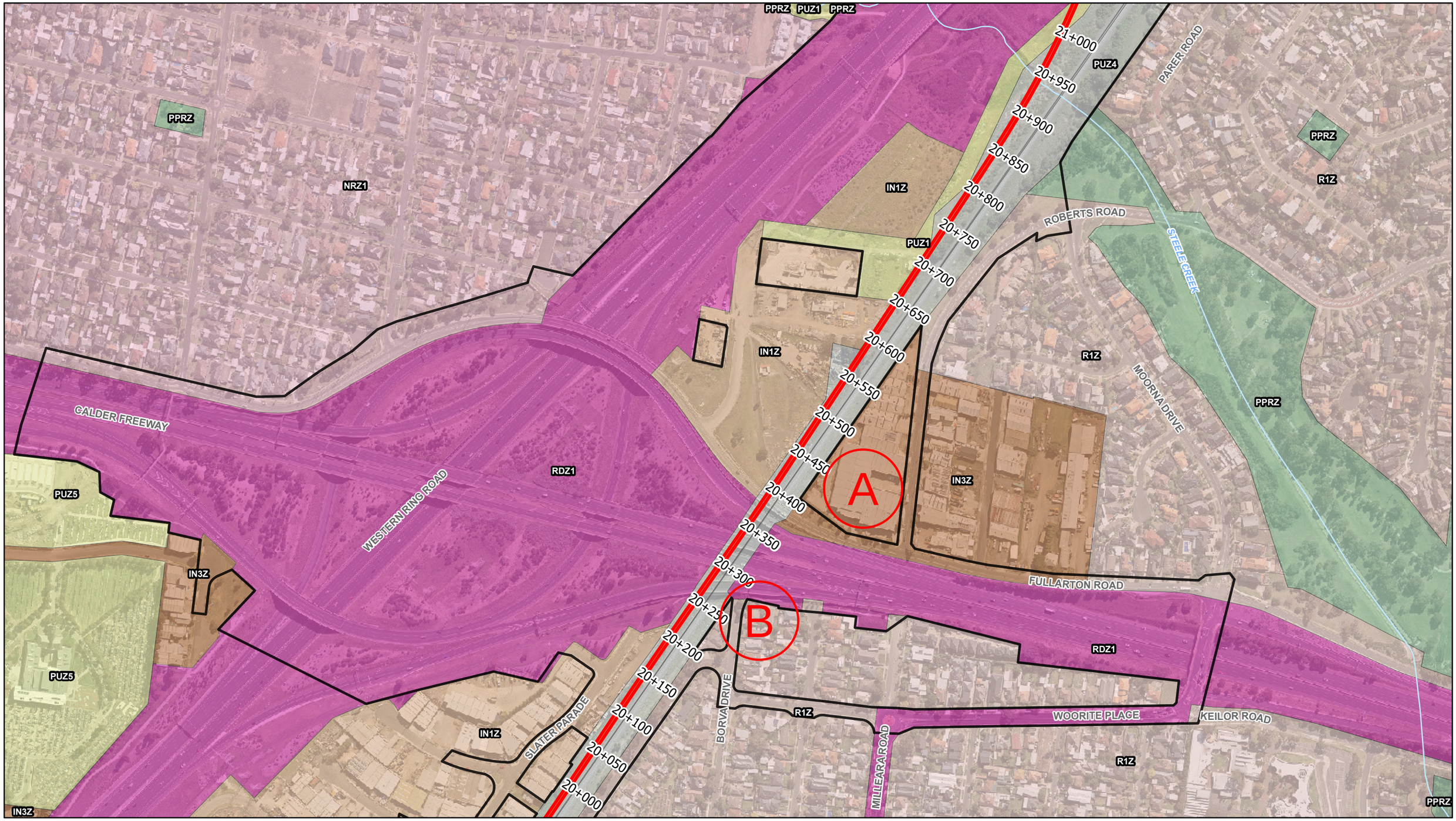
APPENDIX E
CALDER FREEWAY STRUCTURES AND FULLARTON ROAD SHARED USER PATH BRIDGE



- Rail
- Watercourse
- Assessment Area
- MAR Alignment

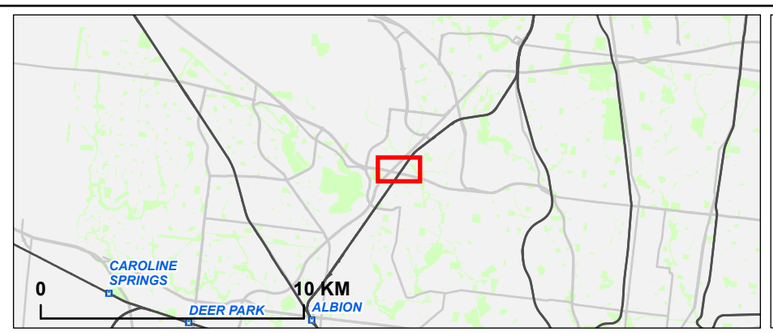
Planning Zone

- IN1Z - Industrial 1 Zone
- IN3Z - Industrial 3 Zone
- NRZ - Neighbourhood Residential Zone
- PPRZ - Public Park and Recreation Zone
- PUZ1 - Public Use Zone Service and Utility
- PUZ4 - Public Use Zone Transport
- PUZ5 - Public Use Zone Cemetery/crematorium
- R1Z - Residential 1 Zone
- RDZ1 - Road Zone Category 1

1 of 1

***Chainage: 22+ 400*

Data Sources:
AJMJV 2021
VicTrack 2021
Vicmap 2021
Aerial photo: DELWP Apr. 2021



RAIL PROJECTS VICTORIA

AJM Joint Venture

aurecon JACOBS M MOTT MACDONALD

Melbourne Airport Rail

Calder Freeway Structures and Fullarton Road Shared User Path Bridge

Existing Environment

Drawing Number:			Revision:
MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490513			A.1
Drawn By: J. Rivera	Approved By: N. Marshallsea	Date: 7/09/2021	Map Size: A3

0 110 220
Metres

Coordinate System: GDA 1994 MGA Zone 55

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- Watercourse
- MAR Alignment
- Assessment Area

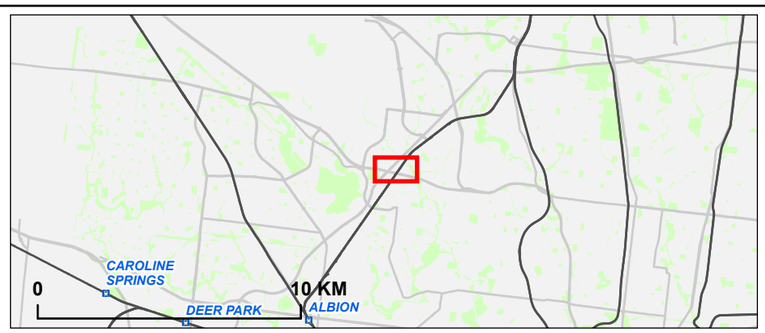
Assumed Impacts

- Bridge Strengthening
- Maintenance Paths
- Substation
- Track and Civil
- Viaduct Alignment
- Elevated Viaduct Works
- Shared User Path
- Works Site / Laydown Area

1 of 1

***Chainage: 22+ 400*

Data Sources:
AJMJV 2021
VicTrack 2021
Vicmap 2021
Aerial photo: DELWP Apr. 2021



RAIL PROJECTS VICTORIA

AJM Joint Venture

aurecon JACOBS MOTT MACDONALD

Melbourne Airport Rail

Calder Freeway Structures and Fullarton Road Shared User Path Bridge

Land Required for Project Construction

Drawing Number:			Revision:
MAR-AJM-PWD-PWD-MAP-XLP-MMN-0490514			A.1
Drawn By:	Approved By:	Date:	Map Size:
J. Rivera	N. Marshallsea	6/09/2021	A3

0 110 220
Metres

Coordinate System: GDA 1994 MGA Zone 55

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