AIR QUALITY IMPACT ASSESSMENT

Oakdale East Industrial Estate
Concept Plan and Stage 2 Works

Prepared for:

Goodman Property Services (Aust) Pty Ltd
The Hayesbery
1-11 Hayes Road
Rosebery NSW 2018

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Goodman Property Services (Aust) Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.30733-R02-v1.0	7 June 2022	Varun Marwaha	Kirsten Lawrence	Graeme Starke
610.30733-R02-v1.0	11 April 2022	Varun Marwaha	Kirsten Lawrence	Varun Marwaha

CONTENTS

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Goodman Property Services (Australia) Pty Ltd (Goodman) to prepare an Air Quality Impact Assessment (AQIA) to accompany a development application (DA) for the Oakdale East Industrial Estate (OEIE) Project (Estate).

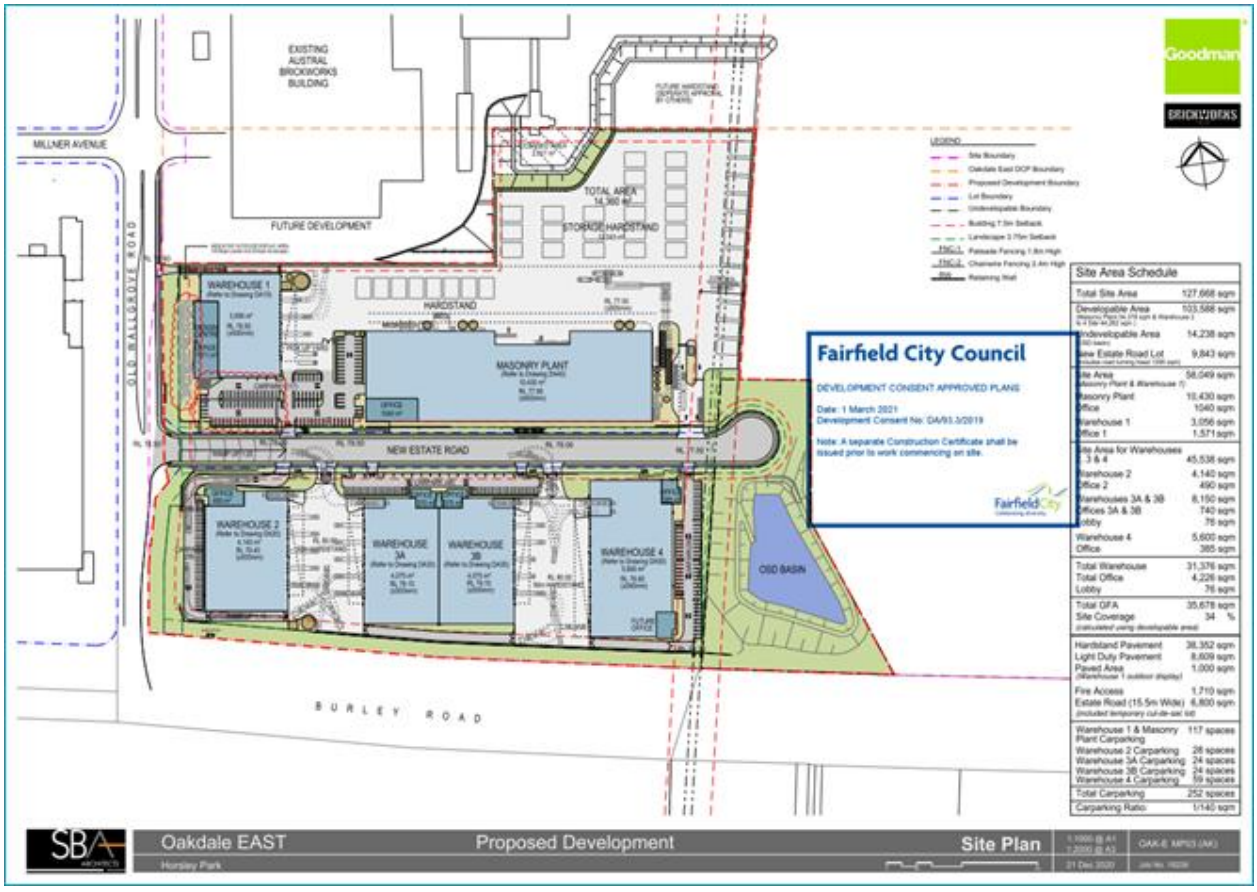
The DA seeks approval for:

a. an updated Concept Plan across OEIE; and

b. Stage 2 works at the OEIE.

The Stage 1 of the OEIE was approved in March 2021 (see **Figure 1**) and includes a masonry plant with a capacity of 220,000 tonnes per annum (tpa), four (4) industrial warehouses, hardstand and car parking, a new local estate road, associated infrastructure and services. Stage 1 works were completed in September 2021 and included Precinct 1 building and infrastructure works.

Figure 1 Approved Concept Plan - Oakdale East Industrial Estate



The aim of this AQIA is to assess the air quality risks associated with the potential air quality impacts during construction and operation of a proposed extension to Precinct 1, and construction and operation of Precinct 3 only.

2 Statutory Requirements

The Secretary's Environmental Assessment Requirements (SEARs) for the Oakdale East Industrial Estate (SSD 37486043) were issued on 1 March 2022. The air quality related SEARs are reproduced below:

> *"a quantitative assessment of the potential air quality, dust and odour impacts of the development (construction and operation) on surrounding landowners, businesses and sensitive receptors, in accordance with relevant Environment Protection Authority guidelines, including details of proposed mitigation, management and monitoring measures."*

A quantitative Air Quality Impact Assessment (AQIA) for the Oakdale East Industrial Estate was completed by Air Labs Environmental in March 2019 (Airlabs 2019), which assessed potential off-site air quality impacts associated with the masonry plant operations, CSR brick manufacturing plant and the existing Austral Plant 3 operations (to be demolished prior to construction of Stage 2).

As this application does not propose any changes to the operations of the masonry plant operations, the revision to the AQIA is not to be warranted. The results and conclusions of the AQIA (Airlabs 2019) are summarised in **Section 8.2**.

In regard to the construction impacts, the quantitative assessments require a variety of data such as the location of sources, types of fuel combusted, types of sources etc. Due to the transitory nature of construction works, it is not possible to quantify the parameters required for a quantitative assessment. Therefore, a qualitative risk-based assessment is provided in **Section 7**, including the proposed mitigation, management and measurement measures.

3 Proposed Development

This application seeks approval for a Concept Plan across Goodman's Oakdale East Industrial Estate ("Estate") and approval for Stage 2 of works at the Estate. The site is located within the Fairfield Local Government Area and is legally described as Lot 102 and Lot 103 in DP1268366. Stage 1 of the works were completed in September 2021 and included Precinct 1 building and infrastructure works as indicated on the proposed Estate Masterplan.

The Concept Plan is proposed to set the development controls for the Estate which will override the Development Control Plan ("DCP") that is currently with Department of Planning and Environment (DPE) for consideration. This DCP has been lodged with DPE to support the Rehabilitation Development Application that is currently with Fairfield City Council for consideration.

The Rehabilitation Development Application seeks approval for works only to Precinct 1 expansion, Precincts 2, 3 and 4 and includes the following (this application excludes works to Precinct 5):

- Cut and Fill works to provide bulk pad levels;
- Provision of Estate stormwater infrastructure including completion of detention basins and swales;
- Removal of 2.58 ha of vegetation;
- Demolition of the Brick Factory and rehabilitation of the surrounding land;
- Installation of 1 x retaining wall on the eastern portion of Precinct 3;
- Consideration for Aboriginal Heritage and Geotech assessments

The proposed Concept Plan approval seeks approval for:

- The proposed Estate masterplan allowing development of 303,009 sqm of GLA;
- 24/7 hours of operation;
- Building Height of 43m for Precinct 3 (excluding roof-top plant and solar) and 15m (excluding roof-top plant and solar) to the remainder of the Estate;
- Estate subdivision;
- Estate wide planning controls as shown in the EIS
- Construction hours 7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday
- Geotech and Aboriginal heritage considerations for Precinct 5

The Stage 2 works considered under this application include the following:

- Cut and fill works to Precinct 5 only to provide bulk pad level;
- Completion of lead-in infrastructure works including intersection upgrades at Millner Ave / Old Wallgrove Road and Lenore Drive / Old Wallgrove Road
- Clearing of 2.28 ha of native vegetation
- Completion of the internal road network (excl. the proposed private driveway providing access to Precinct 5 but including all other roads shown on the proposed masterplan);
- Reticulation of services infrastructure to provide serviced development pads to all precincts;

- Completion of retaining walls across the entire Estate;
- Completion of Building works to Precinct 1 expansion and Precinct 3 including any ancillary on lot infrastructure and detailed civil works required;.

3.1 Precinct 1 Extension

- Construction, operation, fit-out and use approval of a warehouse with ancillary office spanning 3,122 sqm of GLA;
- 24/7 hours of operation;
- 15m building height (excluding solar and rooftop plant).

3.2 Precinct 3 Construction and Operation

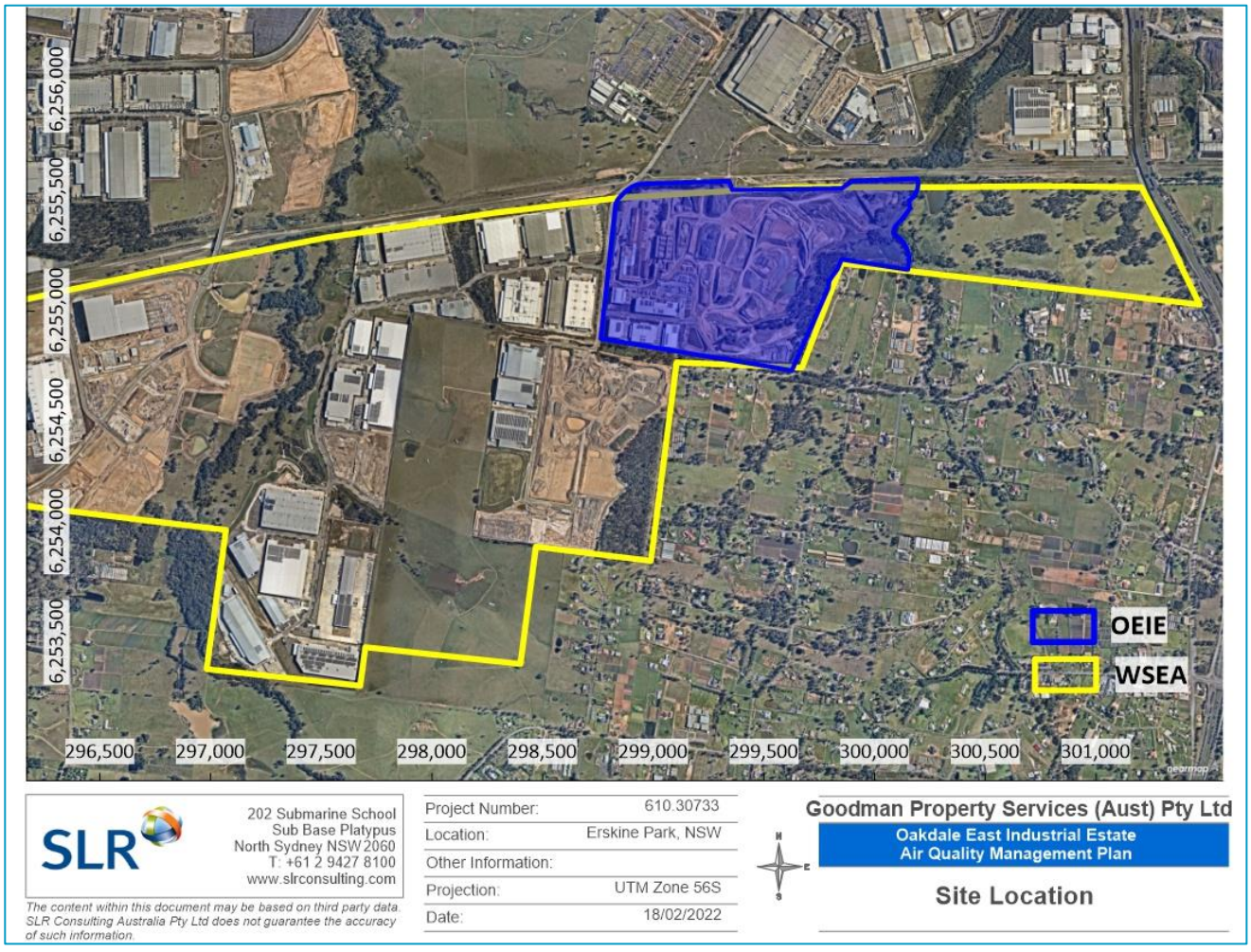
- Construction, operation, fit-out and use approval of a temperature controlled automated distribution centre;
- Total GLA of 96,810 sqm including 10,009 sqm of which is for future expansion;
- In addition to this, 38,050 sqm of mezzanines will be installed within the premises;
- 43m building height (excluding solar and rooftop plant)
- Storage of dangerous goods and flammable goods that exceed the SEPP33 threshold; and
- 24/7 hours of operation.

4 Project Overview

4.1 Site Location

The OEIE is a warehousing and distribution complex on an 87.95 ha site located at 2-10 Wallgrove Road, Horsley Park within the Fairfield Local Government Area (LGA). The OEIE forms part of the broader 'Oakdale Industrial Estate' developed and operated by Goodman within the Western Sydney Employment Area (WSEA) (see **Figure 2**).

Figure 2 Site Location



4.2 Site Layout

As mentioned in **Section 3**, the proposed Concept Plan includes four new precincts (ie Precincts 2, 3, 4, and 5), and the extended Precinct 1. The OEIE updated Concept Plan is shown in **Figure 3.**

The subject area of this assessment is presented in **Figure 4**.

Figure 3 Proposed Concept Plan - Oakdale East Industrial Estate

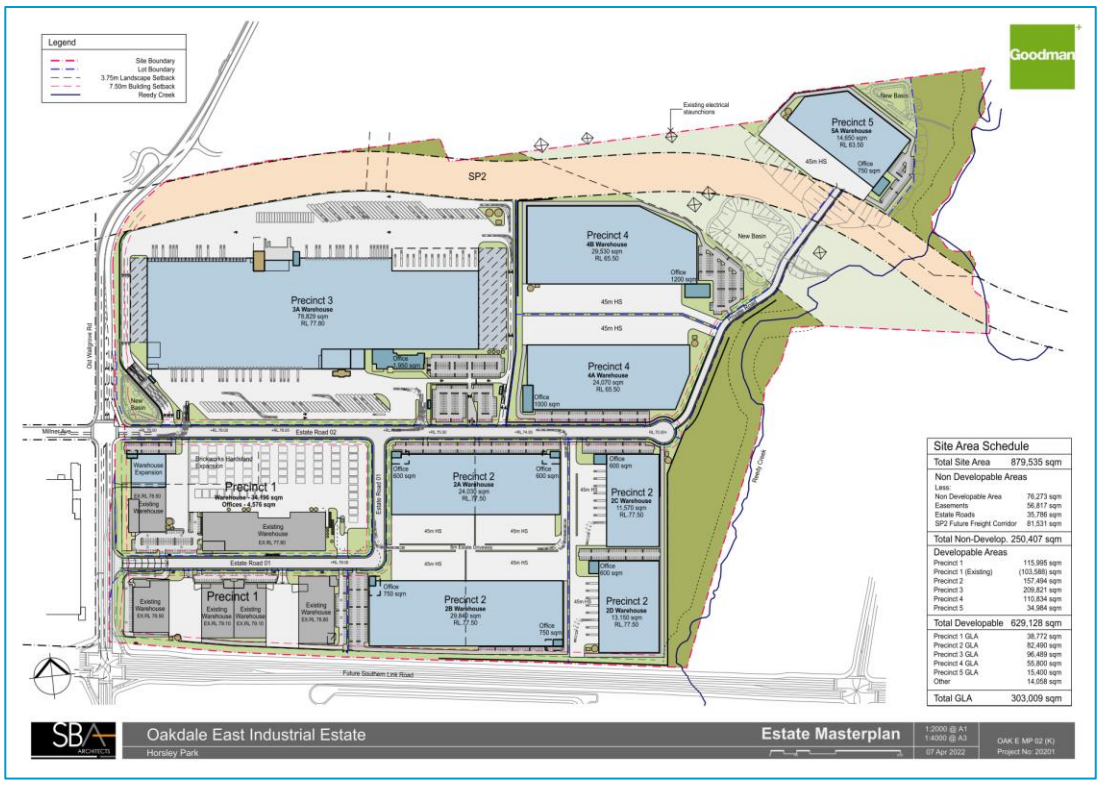
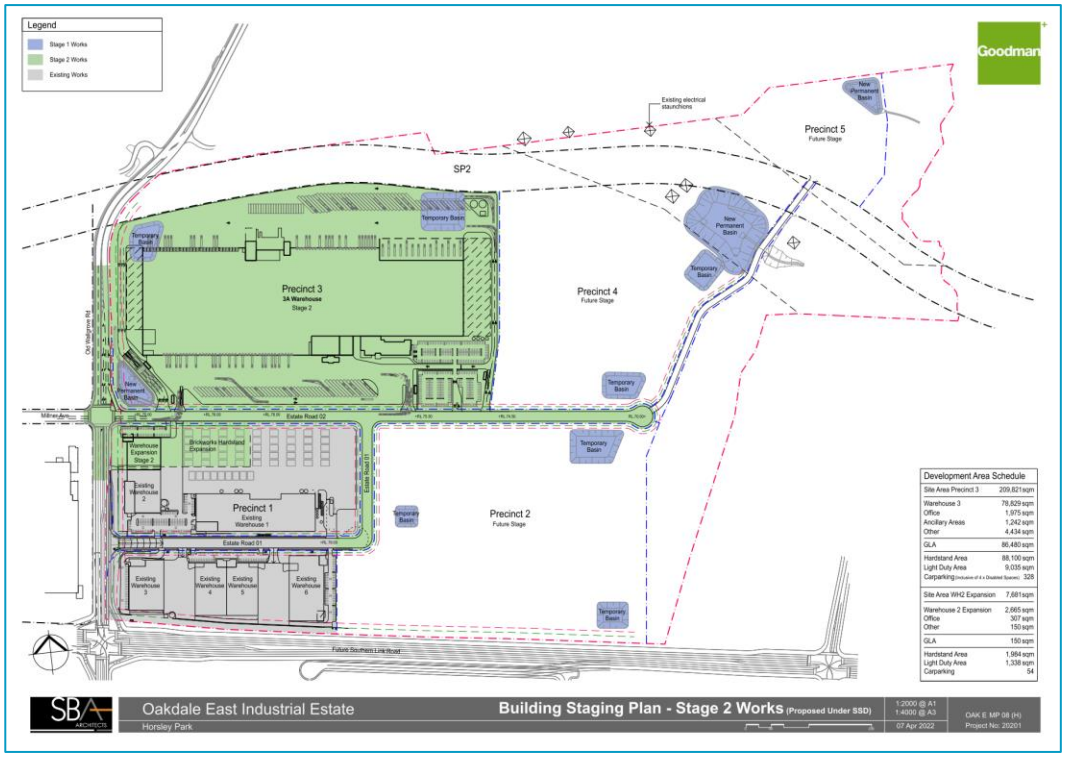


Figure 4 Subject Area of this Assessment – Stage 2 of Oakdale East Industrial Estate



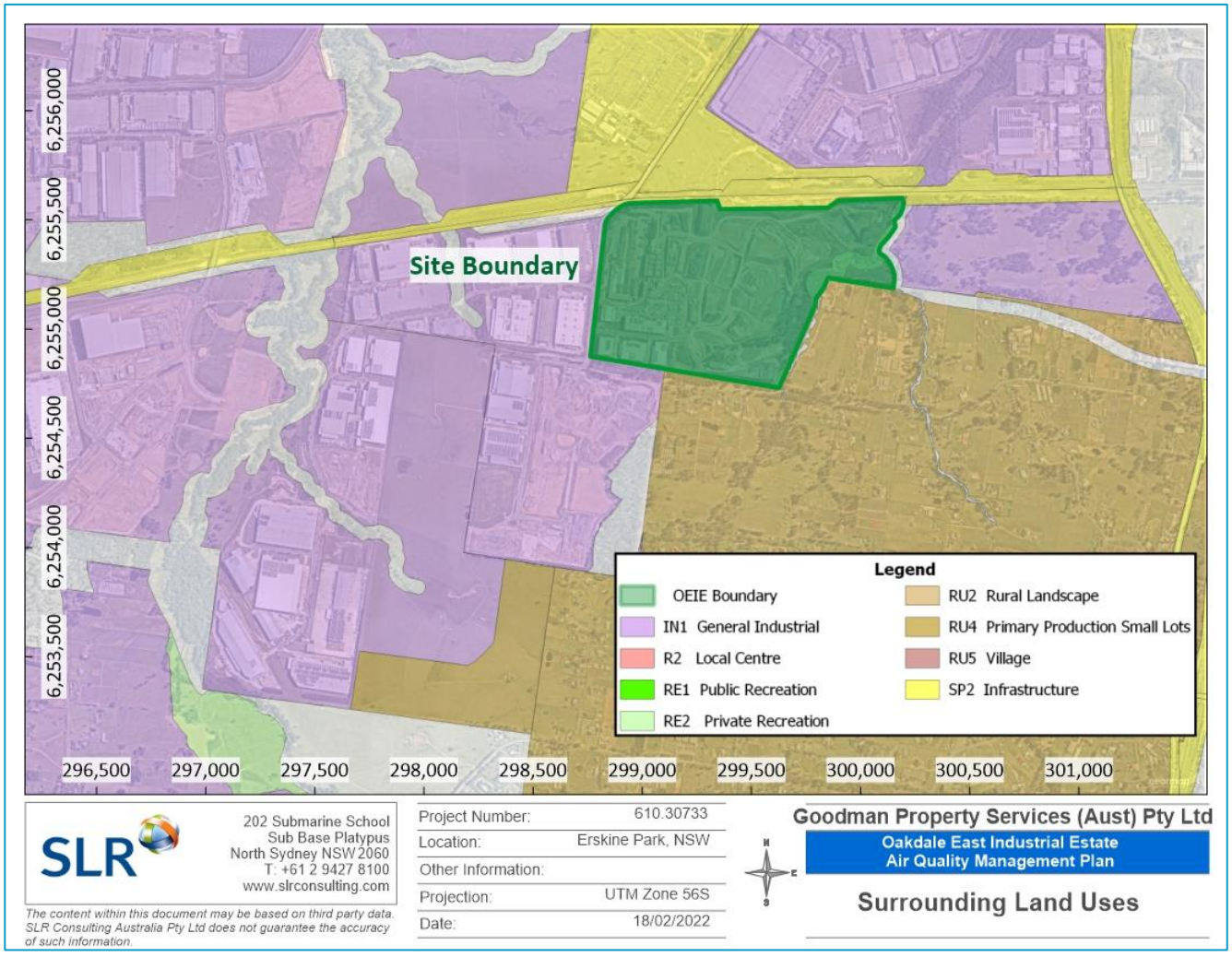
4.3 Surrounding Land uses

The OEIE site is currently subject to the land use and development control provisions of the *Fairfield Local Environmental Plan 2013*. **Figure 5** illustrates the surrounding land zoning as specified in the *Fairfield Local Environmental Plan 2013*. The areas immediately to the east and west of the OEIE are zoned general industrial (IN1). An infrastructure (SP2) zone is located immediately to the north, while rural landscape (RU1) and primary production small lots (RU4) are located immediately south of the OEIE.

The nearest residential receptors are located on Burley Road, approximately 150 m south of the OEIE boundary, and the nearest commercial receptors are located on Old Wallgrove Road, approximately 50 m west of the OEIE boundary, in addition to the existing OEIE warehouses to the south of Precinct 3.

For the purpose of this assessment, the number of residential receptors are conservatively estimated to be between 10 and 100 within 200 m of the closest OEIE boundary, and the number of commercial receptors are estimated to be more than 100 within 100 m of the closest OEIE boundary.

Figure 5 Surrounding Land Uses



4.4 Potential Sources of Air Emissions

As outlined in **Section 3**, the scope of this AQIA covers potential air quality impacts on surrounding receptors due to the proposed construction and operation of the Precinct 1 extension and Precinct 3.

4.4.1 During Construction

The potential for dust to be emitted during the construction phase will be directly influenced by the nature of the activities being performed at any given time. Generally, the activities that are most likely to lead to short-term emissions of dust, include:

- Grading;
- Loading and unloading of materials;
- Wheel-generated dust and combustion emissions from construction equipment;
- Wheel-generated dust from trucks travelling on unpaved surfaces; and
- Wind erosion of exposed surfaces.

Temporary elevations in local dust levels are most likely to occur when construction activities are undertaken during periods of low rainfall and/or windy conditions. The impact of elevated dust emissions is dependent upon the potential for particulates to become and remain airborne prior to being deposited as dust or experienced as an ambient particulate concentration.

A number of environmental factors may affect the generation and dispersion of dust emissions, including:

- Wind direction - determines whether dust and suspended particles are transported in the direction of the sensitive receptors;
- Wind speed - determines the potential suspension and drift resistance of particles;
- Surface type - more erodible surface material types have an increased soil or dust erosion potential;
- Surface material moisture - increased surface material moisture reduces soil or dust erosion potential; and
- Rainfall or dew - rainfall or heavy dew that wets the surface of the soil reduces the risk of dust generation.

Where diesel-powered mobile machinery and vehicles are being used, localised elevations in ambient concentrations of combustion-related pollutants may also occur, however any potential for the relevant impact assessment criteria for these pollutants to be exceeded at surrounding sensitive areas will be minimal. Fugitive dust emissions are generally considered to have the greatest potential to give rise to downwind air quality impacts at construction sites, and combustion emissions during construction have not been considered further.

Potential air quality impacts associated with fugitive dust emissions from the construction phase of the project have been addressed in **Section 7**.

4.4.2 During OEIE Operations

During the operational phase, the main source of air emissions would be emissions of products of fuel combustion and particulate matter (associated with brake and tyre wear as well as re-entrainment of road dust) associated with the trucks and other vehicles entering and leaving the OEIE, or idling at the site during loading/unloading operations. At the time of writing this report, information on the site specific operations (eg, vehicle numbers and types) is not available. Therefore, a general risk assessment associated with warehousing operations is presented in **Section 8**.

In addition, the masonry plant operations located in Precinct 1 has the potential to emit products of fuel combustion (including particulate matter). Even though the masonry plant operations are not part of this application, it is important to understand the potential extent and impact of air emissions from the masonry plant on the rest of the OEIE. An AQIA completed for the OEIE by Airlabs (Airlabs 2019) addressed emissions from the masonry plant and this assessment refers to the conclusions from the Airlabs report to address that issue.

5 Legislation, Regulation and Guidance

5.1 Pollutants of Concern

The key air pollutants of concern during construction are products of fuel combustion (including particulate matter) and fugitive dust emissions from:

- Earthworks associated with the proposed OEIE extension and Precinct 3 works; and
- Material handling activities associated with the proposed OEIE extension and Precinct 3 works.

The key air pollutants of concern during operations are products of fuel combustion (including particulate matter) from:

- Gas-fired boilers from the masonry plant; and
- Trucks and vehicles travelling within the OEIE local road network.

The potential health and amenity issues associated with these pollutants are outlined below.

Particulate Matter

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms “dust” and “particulates” are often used interchangeably. The health effects of particulate matter are strongly influenced by the size of the airborne particles. Smaller particles can penetrate further into the respiratory tract, with the smallest particles having a greater impact on human health as they penetrate to the gas exchange areas of the lungs. Larger particles primarily cause nuisance associated with coarse particles settling on surfaces.

The term “particulate matter” refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm and is termed total suspended particulate (TSP). Particulate matter with an aerodynamic diameter of 10 microns or less is referred to as PM_{10}. The PM_{10} size fraction is sufficiently small to penetrate the large airways of the lungs, while $PM_{2.5}$ (2.5 microns or less) particulates are generally small enough to be drawn in and deposited into the deepest portions of the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $PM_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

Products of Combustion

Emissions associated with the combustion of fossil fuels in boilers (natural gas) and road traffic will include carbon monoxide (CO), oxides of nitrogen (NO_x), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2) and volatile organic compounds (VOCs).

CO is an odourless, colourless gas formed from the incomplete burning of fuels in motor vehicles. It can be a common pollutant at the roadside and highest concentrations are found at the kerbside with concentrations decreasing rapidly with increasing distance from the road. CO in urban areas results almost entirely from vehicle emissions and its spatial distribution follows that of traffic flow. The incomplete combustion of fuel in diesel powered vehicles can generate particulate in the form of black soot.

Oxides of nitrogen (NO_X) is a general term used to describe any mixture of nitrogen oxides formed during combustion. In atmospheric chemistry, NO_X generally refers to the total concentration of nitric oxide (NO) and nitrogen dioxide (NO_2). NO is a colourless and odourless gas that does not significantly affect human health. However, in the presence of oxygen, NO can be oxidised to NO_2 which can have significant health effects including damage to the respiratory tract and increased susceptibility to respiratory infections and asthma. NO will be converted to NO_2 soon after leaving the engine exhaust.

Engine exhausts can also contain emissions of sulfur dioxide (SO_2) due to impurities in the fuel. The sulfur content in diesel fuel has significantly reduced over the years and currently ambient SO_2 concentrations in Australian cities are typically well below regulatory criteria.

5.2 Air Quality Criteria

Particulate Matter and Products of Combustion

State air quality guidelines specified by the NSW Environmental Protection Agency (EPA) for the pollutants identified in **Section 5** are published in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2017) [hereafter 'Approved Methods']. The ground level air quality impact assessment criteria listed in Section 7 of the Approved Methods have been established by NSW EPA to achieve appropriate environmental outcomes and to minimise risks to human health. They have been derived from a range of sources and are the defining ambient air quality criteria for NSW, and are considered to be appropriate for use in this assessment.

A summary of the relevant impact assessment criteria for particulate matter and products of combustion is provided in **Table 1**.

Table 1 NSW EPA Goals for Particulate Matter and Combustion Gases

Pollutant	Averaging Period	Concentration	
CO	15 minutes	87 ppm	100 mg/m^3
	1 hour	25 ppm	30 mg/m^3
	8 hours	9 ppm	10 mg/m^3
NO_2	1 hour	12 pphm	246 µg/m^3
	Annual	3 pphm	62 µg/m^3
PM_{10}	24 Hours Annual	- -	50 µg/m^3 30 µg/m^3
$PM_{2.5}$	24 Hours Annual	- -	25 µg/m^3 8 µg/m^3
SO_2	10 minutes	25 pphm	712 µg/m^3
	1 hour	20 pphm	570 µg/m^3
	24 hours	8 pphm	228 µg/m^3
	Annual	2 pphm	60 µg/m^3

Source: EPA 2017

In relation to the air quality criteria shown in **Table 1**, it is noted that on 18 May 2021, the National Environment Protection Council (NEPC) varied the National Environment Protection (Ambient Air Quality) Measure (hereafter the Ambient Air NEPM) standards for ozone, NO_2 and SO_2 based on the latest scientific understanding of the health risks arising from these pollutants. In addition, the Ambient Air NEPM includes reduced standards for $PM_{2.5}$ to be adopted from 2025. As the ambient air quality criteria set out in the Approved Methods are based on the standards in the Ambient Air NEPM, these reduced standards should also be considered in assessing impacts for developments that will be operating if/when these reduced standards are adopted in the Approved Methods in the future. A summary of the updated standards for NO_2 and $PM_{2.5}$ is provided below in **Table 2**.

Table 2 Recent Changes to National Ambient Air Quality Criteria Relevant to this Assessment

Pollutant	Averaging Period	Previous NEPM Standard (µg/m³)	New NEPM Standard (µg/m³)
NO_2	1-Hour	246	165
	Annual	62	31
$PM_{2.5}$ *(from 2025)*	24-Hour	25	20
	Annual	8	7

Note: At the time of writing this report, these standards have not been adopted in the Approved Methods (EPA 2017).

5.3 State Environmental Planning Policy (Western Sydney Employment Area) 2009

The aim of the State Environmental Planning Policy (SEPP) is to protect and enhance the land to which this Policy applies (the *Western Sydney Employment Area*) for employment purposes. Specifically, the particular aims of the WSEA SEPP are as follows:

a. *to promote economic development and the creation of employment in the Western Sydney Employment Area by providing for development including major warehousing, distribution, freight transport, industrial, high technology and research facilities,*

b. *to provide for the co-ordinated planning and development of land in the Western Sydney Employment Area,*

c. *to rezone land for employment or environmental conservation purposes,*

d. *to improve certainty and regulatory efficiency by providing a consistent planning regime for future development and infrastructure provision in the Western Sydney Employment Area,*

e. *to ensure that development occurs in a logical, environmentally sensitive and cost-effective manner and only after a development control plan (including specific development controls) has been prepared for the land concerned,*

f. *to conserve and rehabilitate areas that have a high biodiversity or heritage or cultural value, in particular areas of remnant vegetation.*

Clause 33H - Earthworks

The objectives of this clause are as follows:

- *to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land,*
- *to allow earthworks of a minor nature without separate development consent.*

The OEIE is located within the WSEA and therefore the aims of the WSEA SEPP (including Clause 33H) apply to this site. There are no air quality specific development standards or provisions identified in the WSEA SEPP, however the broader environmental protection context defined in (e) above is considered relevant to this AQIA.

5.4 Local Government Air Quality Toolkit

The NSW EPA has developed the Local Government Air Quality Toolkit (EPA 2018), in response to requests from local Council officers for information and guidance on the common air quality issues they manage. Guidance is available under Part 3 of the Local Government Air Quality Toolkit for construction sites. These documents list the common sources of emissions and mitigation and management measures to control airborne dust levels from construction sites and have been consulted in the development of this AQIA.

6 Existing Environment

6.1 Local Wind Conditions

Local wind speed and direction influence the dispersion of air pollutants. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of 'plume' stretching. Wind direction, and the variability in wind direction, determines the general path pollutants will follow and the extent of crosswind spreading. Surface roughness (characterised by features such as the topography of the land and the presence of buildings, structures and trees) will also influence dispersion.

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The closest such station recording wind speed and wind direction data is the Horsley Park Automatic Weather Station (AWS), located approximately 4 km southeast of the OEIE (Station ID 67119). For the purpose of this assessment, it is assumed that the wind conditions recorded by the Horsley Park AWS are representative of the wind conditions experienced at the OEIE.

Annual wind roses for the years 2017 to 2021 along with seasonal wind roses compiled from data recorded by the AWS at Horsley Park are presented in **Figure 6**, Wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points (degrees from North). The bar at the top of each wind rose diagram represents winds blowing from the north (i.e. northerly winds), and so on. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds. Thus, it is possible to visualise how often winds of a certain direction and strength occur over a long period, either for all hours of the day, or for particular periods during the day.

The 'Beaufort Wind Scale' (consistent with terminology used by the BoM) presented in **Table 3** was used to describe the wind speeds experienced at the OEIE.

Table 3 Beaufort Wind Scale

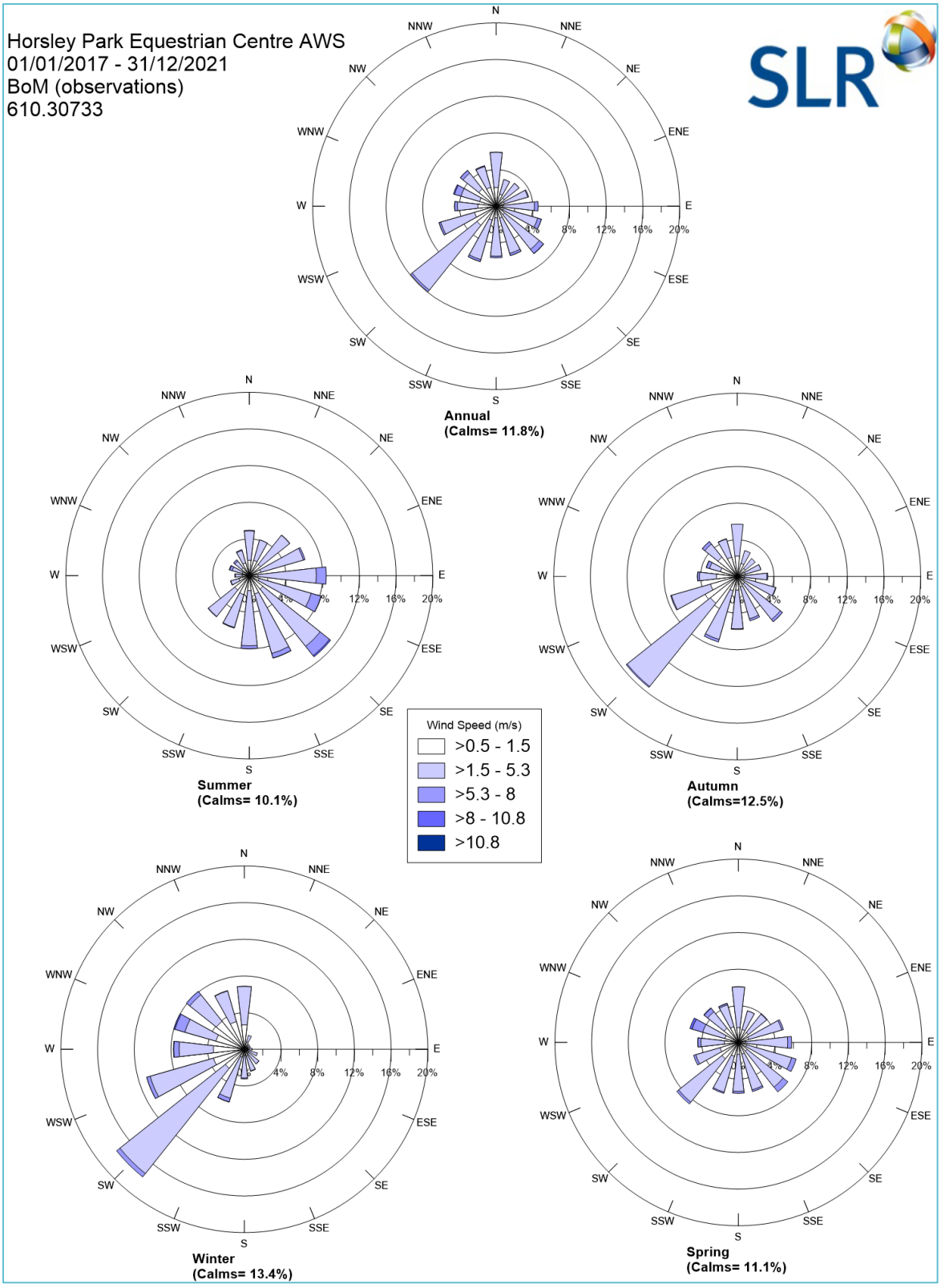
Beaufort Scale #	Description	m/s	Description on Land
0	Calm	0-0.5	Smoke rises vertically
1	Light air	0.5-1.5	Smoke drift indicates wind direction
2-3	Light/gentle breeze	1.5-5.3	Wind felt on face, leaves rustle, light flags extended, ordinary vanes moved by wind
4	Moderate winds	5.3-8.0	Raises dust and loose paper, small branches are moved
5	Fresh winds	8.0-10.8	Small trees in leaf begin to sway, crested wavelets form on inland waters
6	Strong winds	>10.8	Large branches in motion, whistling heard in telephone wires; umbrellas used with difficulty

Source: http://www.bom.gov.au/lam/glossary/beaufort.shtml

The annual wind rose (**Figure 6**) indicates that the predominant wind directions in the area are from the southwest. Calm wind conditions (wind speed less than 0.5 m/s) were recorded approximately 12% of the time throughout the five year period reviewed. The average seasonal wind roses for the years 2017-2021 indicate that:

- In summer, wind speeds ranged from calm to fresh winds (between 0.5 m/s and 9.8 m/s). The majority of winds originated from eastern and south eastern quadrants, with very few winds from westerly directions. Calm wind conditions were recorded approximately 10% of the time during summer.
- In autumn, wind speeds ranged from calm to fresh winds (between 0.5 m/s and 9.1 m/s). The majority of winds originated from the southwest quadrant, with very few winds from the northeast. Calm wind conditions were observed to occur approximately 12.5% of the time during autumn.
- In winter, wind speeds ranged from calm to fresh winds (between 0.5 m/s and 10.1 m/s). The majority of winds originated from the southwest quadrant, with very few winds from the east. Calm wind conditions were observed to occur approximately 13.5% of the time during winter.
- In spring, wind speeds ranged from calm to fresh winds (between 0.5 m/s and 9.9 m/s). The frequencies of winds were generally even from all directions. Calm wind conditions were observed to occur approximately 11% of the time during spring.

Figure 6 Annual Wind Roses for Horsley Park AWS (2016 to 2020)



6.2 Background Air Quality

Air quality is generally classified as good in Sydney, based on information from the 43 station Air Quality Monitoring Network operated by the NSW Department of Planning, Industry and Environment's (DPIE's) Environment, Energy and Science (EES) group. Between 2000 and 2019, the air quality was 'very good', 'good' or 'fair' for 94% of days in the Sydney northwest region, within which the proposal is located. During this time, exceedances of the national air quality standards for particle pollution have usually been associated with regional dust storms and vegetation fires (DPIE 2021).

Air quality monitoring is performed by the NSW OEH at a number of monitoring stations across NSW. The nearest such station is located at St Marys, approximately 4.5 km northwest of the OEIE. The St Marys AQMS was commissioned in 1992 and is located on a residential property off Mamre Road, St Marys. It is situated in the centre of the Hawkesbury Basin and is at an elevation of 29 m. The St Marys AQMS monitors the concentration levels of following air pollutants:

- Oxides of nitrogen (NO, NO_2 and NO_X); and
- Fine particles ($PM_{2.5}$ and PM_{10}); and

A summary of the monitored pollutant concentrations for the last five years (2017-2021) is presented in **Table 4** and the data are presented graphically in **Figure 7** to **Figure 9**.

Table 4 Summary of Air Quality Monitoring Data at St Marys AQMS (2017 - 2021)

Pollutant	NO_2		PM_{10}		$PM_{2.5}$	
	Maximum 1-hour	Annual	Maximum 24-hour	Annual	Maximum 24-hour	Annual
	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
2017	75.9	8.1	49.8	16.2	38.2	7.0
2018	75.9	9.6	100.5	19.4	80.5	7.8
2019	67.7	7.6	159.8	24.7	88.3	9.8
2020	69.7	7.4	260.3	18.9	82.5	7.6
2021	67.7	7.5	54.9	16.2	40.3	5.8
Criterion	**246**	**62**	**50**	**25**	**25**	**8**

Figure 7 Measured Daily Maximum 1-Hour Average NO_2 Concentrations at St Marys AQMS (2017 - 2021)

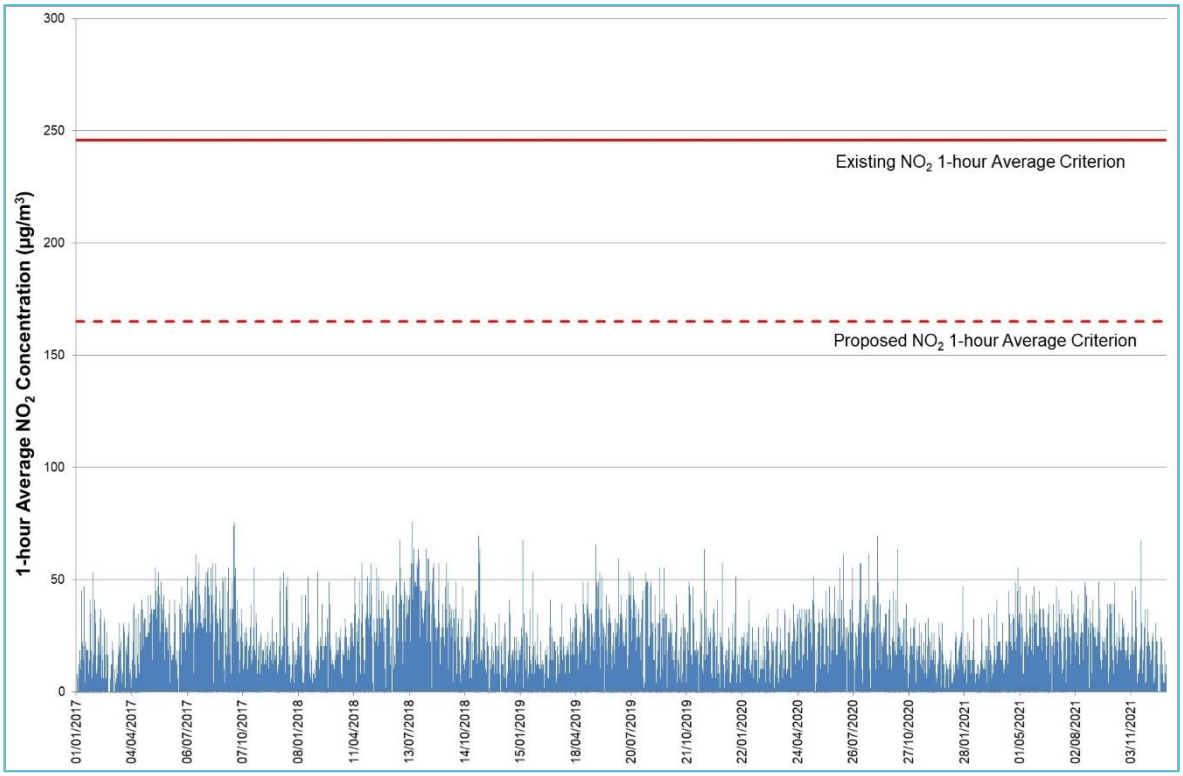


Figure 8 Measured 24-Hour Average PM_{10} Concentrations at St Marys AQMS (2017 - 2021)

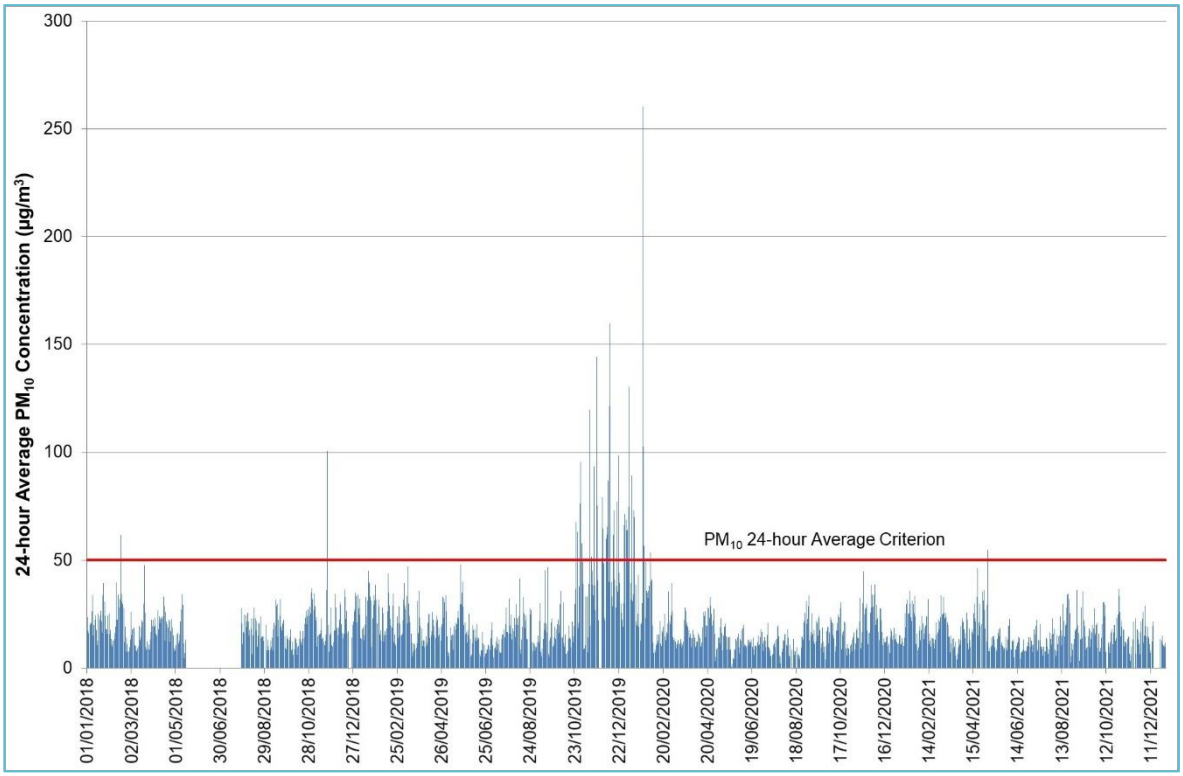
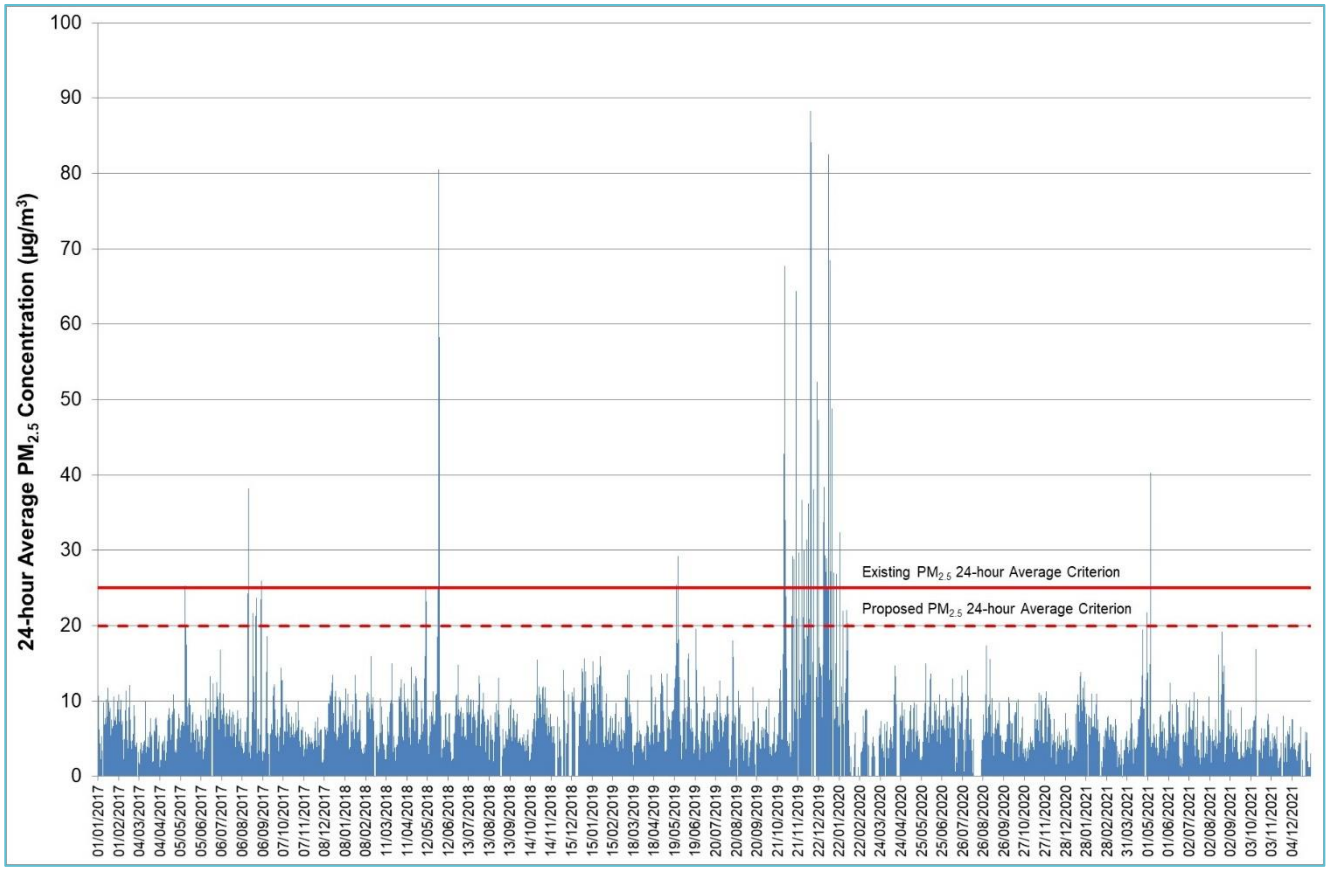


Figure 9 Measured 24-Hour Average $PM_{2.5}$ Concentrations at St Marys AQMS (2017 - 2021)



A review of the ambient air quality data presented in the following tables and graphs shows:

- Generally, the 24-hour average PM_{10} and $PM_{2.5}$ concentrations recorded by the St Marys AQMS are below the relevant 24-hour average guidelines, however isolated exceedances (normally on less than ten days per year) have been recorded in most years. The exception to this was the November 2019 to January 2020 period, when unprecedented and extensive bushfires within NSW resulted in an extended period of very elevated particulate concentrations across Sydney that were significantly above the 24-hour average PM_{10} and $PM_{2.5}$ guidelines. A review of the available compliance monitoring reports indicates that the intermittent exceedance days recorded during the other years were also primarily due to exceptional events such as bushfire emergencies, dust storms and hazard reduction burns.
- No exceedances of the annual average PM_{10} criterion were recorded at St Marys during the five years investigated, however the annual average $PM_{2.5}$ criterion was exceeded in 2019 due to the bushfire event that started in November 2019.
- Ambient concentrations of the gaseous pollutant NO_2 were well below the relevant criteria for all years investigated.

7 Assessment of Dust Emissions During Construction

7.1 Construction Dust Risk Assessment Methodology

For this assessment, the *IAQM Guidance on the Assessment of Dust from Demolition and Construction* developed in the United Kingdom by the Institute of Air Quality Management ([IAQM], Holman *et al* 2014) has been used to provide a qualitative assessment method (refer to **Appendix A** for full methodology). The IAQM method uses a four-step process for assessing dust impacts from construction activities:

- **Step 1**: Screening based on distance to the nearest sensitive receptor; whereby the sensitivity to dust deposition and human health impacts of the identified sensitive receptors is determined.
- **Step 2**: Assess risk of dust effects from activities based on:
  - the scale and nature of the works, which determines the potential dust emission magnitude; and
  - the sensitivity of the area surrounding dust-generating activities.
- **Step 3**: Determine site-specific mitigation for remaining activities with greater than negligible effects.
- **Step 4**: Assess significance of remaining activities after management measures have been considered.

7.2 Construction Phase Dust Risk Assessment

Step 1 – Screening Based on Separation Distance

As noted in **Section 4.3**, the nearest residential receptors are located approximately 140 m from the southern boundary of the OEIE. The nearest commercial receptors are located approximately 30 m to the south, 100 m to the east and 120 m to the north of the OEIE boundary.

The IAQM screening criteria for further assessment is the presence of a sensitive receptor within:

- 350 m of the boundary of the site; or
- 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

As residential receptors are located approximately 150 m of the boundary of the OEIE, and commercial receptors are located within 50 m (to the west and the existing OEIE warehouse buildings), further assessment is required.

Step 2a – Assessment of Scale and Nature of the Works

Based on the IAQM definitions presented in **Appendix A**, the dust emission magnitudes for each phase of the construction works have been categorised as presented in **Table 5**. Even though the demolition activities for Austral Plant #3 are proposed to be a part of a separate application, impacts due to demolition are also assessed here for completeness.

Table 5 Categorisation of Dust Emission Magnitude

Activity	Dust Emission Magnitude	Basis
Demolition	Large	**IAQM Definition:** Total building volume >50,000 m^3, potentially dusty construction material (eg concrete), on-site crushing and screening, demolition activities >20 m above ground level. **Relevance to this Project:** *An estimated 400,000 m^3 of buildings is expected to be demolished for the Austral Plant #3.*
Earthworks	Large	**IAQM Definition:** Total site area greater than 10,000 m^2 (ie 10 ha), potentially dusty soil type (eg clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved more than 100,000 t. **Relevance to this Project:** *An estimated 32.5 ha (~11.5 ha for Precinct 1 extension + ~21 ha for Precinct 3) site area is expected to undergo bulk earthworks.*
Construction	Large	**IAQM Definition:** Total building volume greater than 100,000 m^3, piling, on site concrete batching, sandblasting. **Relevance to this Project:** *The total proposed warehouse area is proposed to be 8 ha (~0.25 ha for Precinct 1 extension + ~7.75 ha for Precinct 3). Assuming a building height of 13 m, the total building volume is estimated to be 1,000,000 m^3.*
Trackout	Large	**IAQM Definition:** More than 50 heavy vehicle movements per day, surface materials with a high potential for dust generation, greater than 100 m of unpaved road length. **Relevance to this Project:** *It is estimated that approximately 100 heavy vehicles movements per day will occur during the peak construction period.*

Step 2b – Risk Assessment

Receptor Sensitivity

Based on the criteria listed in **Table A1** in **Appendix A**, the sensitivity of the identified residential receptors is concluded to be *high* while the sensitivity of the commercial receptors is concluded to be *medium*, for both dust soiling and health impacts.

Sensitivity of the Area

Based on the classifications shown in **Table A2** and **Table A3** in **Appendix A**, the sensitivity of the area to both dust soiling and health effects may be classified as follows:

- *Low* for residential (high sensitivity) receptors as no residential dwellings have been identified within 100 m of the OEIE boundary.

- *Low* for commercial (medium sensitivity) receptors as the nearest commercial receptors are more than 50 m from the OEIE boundary.

Additionally, these categorisations have been made taking into account the 5-year mean background PM_{10} concentration of 19.1 µg/m^3 recorded at St Marys AQMS (see **Section 6.2**).

Risk Assessment

Given the sensitivity of the general area for dust soiling and for health effects is classified as *low* at both residential receptors and commercial receptors, and the dust emission magnitudes for the various construction phase activities as shown in **Table 5**, the resulting risk of air quality impacts if no controls are implemented is as presented in **Table 6**.

Table 6 Preliminary Risk of Air Quality Impacts from Construction Activities (Uncontrolled)

Type of Receptor	Impact	Sensitivity of Area	Dust Emission Magnitude				Preliminary Risk			
			Demolition	Earthworks	Construction	Trackout	Demolition	Earthworks	Construction	Trackout
Residential	Dust Soiling	Low	Large	Large	Large	Large	Medium	Low	Low	Low
	Human Health	Low					Medium	Low	Low	Low
Commercial	Dust Soiling	Low	Large	Large	Large	Large	Medium	Low	Low	Low
	Human Health	Low					Medium	Low	Low	Low

The results indicate that if no dust controls are applied, the risks of adverse dust soiling and human health impacts are as follows:

- *Medium risk* at residential and commercial receptors during the demolition works.
- *Low risk* at residential and commercial receptors during the earthworks and construction phases and due to trackout.

It is noted that no complaints were received during the Stage 1 construction. As the residential receptors are located further from Stage 2 works, it is anticipated that the risks can be managed by implementing appropriate mitigation measures.

Step 3 - Mitigation Measures

As detailed in the above section, construction works at the OEIE pose a *medium risk* to neighbouring commercial receptors during the demolition phase and a *low risk* during earthworks and construction phases and due to trackout. Given this, the mitigation measures shown in **Table 7** are based on *medium risk*.

Table 7 lists the relevant mitigation measures designated as *highly recommended* (H) or *desirable* (D) by the IAQM methodology for a development shown to have a medium risk of adverse impacts. Not all these measures would be practical or relevant to the proposed OEIE, therefore a detailed review of the recommendations should be performed, and the most appropriate measures be adopted as part of the Construction Environmental Management Plan (CEMP). For almost all construction activity, the IAQM Method notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation and experience shows that this is normally possible.

Table 7 Site-Specific Management Measures Recommended by the IAQM

	Activity	
1	**Communications**	
1.1	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site	H
1.2	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H
1.3	Display the head or regional office contact information.	H
1.4	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority.	H
2	**Site Management**	
2.1	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H
2.2	Make the complaints log available to the local authority when asked.	H
2.3	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	H
3	**Monitoring**	
3.1	Perform daily on-site and off-site inspections where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary.	D
3.2	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority, when asked.	H
3.3	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H
3.4	Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	H
4	**Preparing and Maintaining the Site**	
4.1	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H
4.2	Erect solid screens or barriers around dusty activities or the site boundary that is at least as high as any stockpiles on site.	H
4.3	Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period	H
4.4	Avoid site runoff of water or mud	H
4.5	Keep site fencing, barriers and scaffolding clean using wet methods.	H
4.6	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below	H

	Activity	
4.7	Cover, seed or fence stockpiles to prevent wind erosion	H
5	**Operating Vehicle/Machinery and Sustainable Travel**	
5.1	Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable	H
5.2	Ensure all vehicles switch off engines when stationary - no idling vehicles	H
5.3	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable	H
5.4	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)	D
5.5	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	H
5.6	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing	D
6	**Operations**	
6.1	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	H
6.2	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate	H
6.3	Use enclosed chutes and conveyors and covered skips	H
6.4	Minimise drop heights from loading shovels and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate	H
6.5	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods	H
7	**Waste Management**	
7.1	Avoid bonfires and burning of waste materials.	H
8	**Earthworks**	
8.1	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable	D
8.2	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable	D
8.3	Only remove the cover in small areas during work and not all at once	D
9	**Construction**	
9.1	Avoid scabbling (roughening of concrete surfaces) if possible	D
9.2	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place	H
9.3	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery	D
9.4	For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust	D
10	**Trackout**	
10.1	Use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary, any material tracked out of the site.	H
10.2	Avoid dry sweeping of large areas.	H
10.3	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	H
10.4	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	H

	Activity	
10.5	Record all inspections of haul routes and any subsequent action in a site log book.	H
10.6	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned	H
10.7	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	H
10.8	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits	H
10.9	Access gates to be located at least 10 m from receptors where possible	H
11	**Demolition**	
11.1	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D
11.2	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H
11.3	Avoid explosive blasting, instead using appropriate manual or mechanical alternatives.	H
11.4	Bag and remove any biological debris or damp down such material before demolition.	H

H = Highly recommended; D = Desirable

Step 4 - Residual Impacts

A reappraisal of the predicted unmitigated air quality impacts on sensitive receptors has been performed to demonstrate the opportunity for minimising risks associated with the use of mitigation strategies. These are termed 'residual impacts'. The results of the reappraisal are presented below in **Table 8**.

Table 8 Residual Risk of Air Quality Impacts from Construction

Type of Receptor	Impact	Sensitivity of Area	Preliminary Risk			
			Demolition	Earthworks	Construction	Trackout
Residential	Dust Soiling	Low	Low	Negligible	Negligible	Negligible
	Human Health	Low	Low	Negligible	Negligible	Negligible
Commercial	Dust Soiling	Low	Low	Negligible	Negligible	Negligible
	Human Health	Low	Low	Negligible	Negligible	Negligible

The mitigated dust soiling and human health impacts are anticipated to be *negligible* at the residential receptor for earthworks, construction and trackout phases of the works. During the demolition phase impacts are anticipated to be *low risk*.

8 Assessment of Emissions During Operations

8.1 Warehouse Operations

As discussed in **Section 4.4.2**, air quality issues associated with the proposed warehouse operations predominantly relate to emissions of products of combustion and particulate matter and from trucks and other vehicles accessing and idling at the site.

These emissions will be of a similar nature to existing emissions from traffic on Old Wallgrove Road and other local roads connecting the industrial operations in the area. The scale and magnitude of emissions from the OEIE is anticipated to be significantly lower compared to the estimated annual average daily traffic on Old Wallgrove Road. To assess the risk of air emissions from the OEIE impacting on surrounding sensitive receptors during the operational phase, the following 'risk based' approach has been adopted.

The risk-based assessment takes account of a range of impact descriptors, including the following:

- **Nature of Impact**: does the impact result in an adverse, neutral or beneficial environment?

  The nature of impact is anticipated to be *neutral* to the environment.

- **Receptor Sensitivity**: how sensitive is the receiving environment to the anticipated impacts?

  The nearest sensitive receptors to the OEIE include residences approximately 150 m to the south (see **Section 4.3**). In terms of the methodology in **Appendix B**, the sensitivity of the surrounding residential areas to emissions from the OEIE should be considered *high*.

- **Magnitude**: what is the anticipated scale of the impact?

  Based on the relatively small amount of traffic movements on site, the magnitude of these emissions considered to be *negligible*.

Given the above considerations, and the scale of operations, the potential impact of the OEIE on the local sensitive receptors is concluded to be ***neutral*** for all receptors (see **Table 9**).

Table 9 Impact Significance

Magnitude / Sensitivity	Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
Very High Sensitivity	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

A vegetative buffer exists between the OEIE and the existing sensitive receptors located to the south. It is recommended that this vegetative buffer is retained and expanded, as this will assist in screening the existing residents to the south from any air impacts.

Furthermore, the warehouses should implement a number of air emissions mitigation measures, as follows:

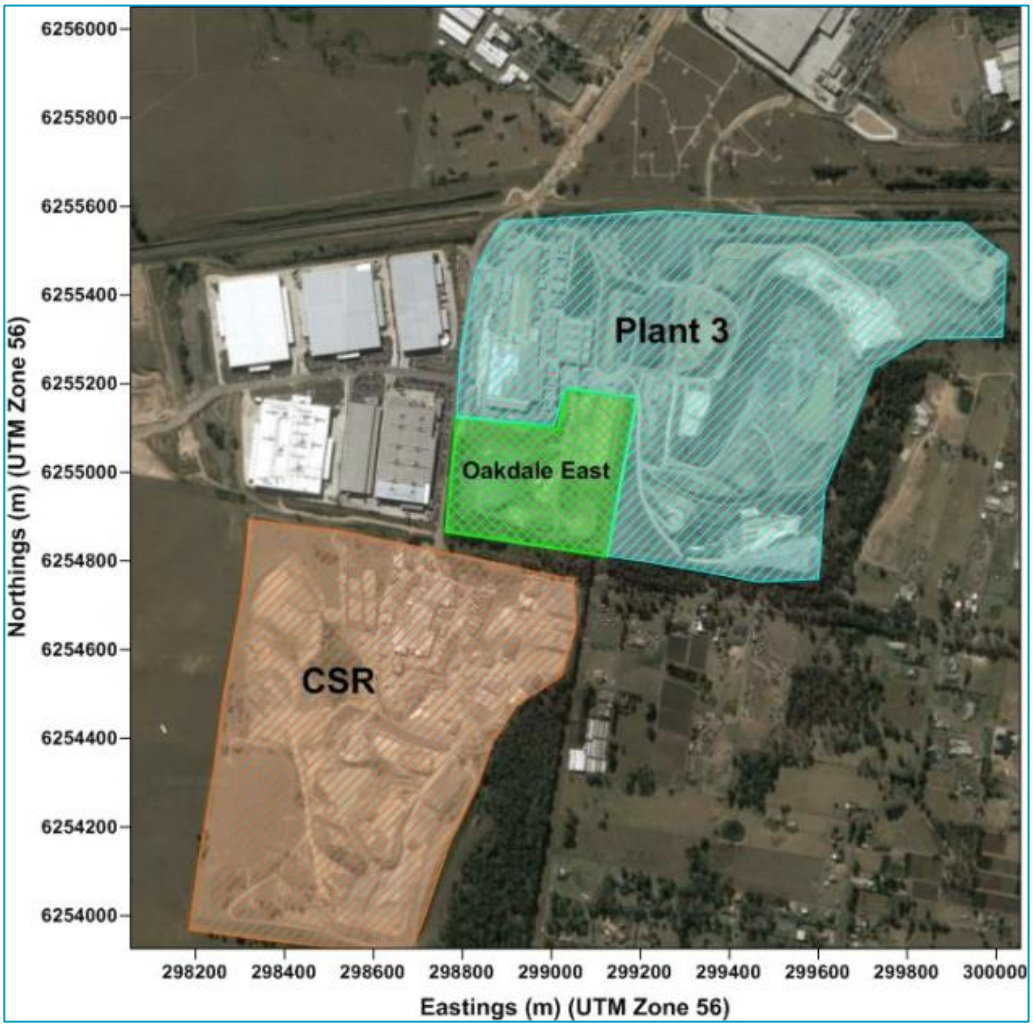
- Stationary trucks are to switch off engines if idling time on-site is likely to exceed 5 minutes.
- Minimise truck queuing and unnecessary trips through effective logistical planning.
- Haulage routes for the warehouses will be paved, limiting the potential for wheel generated dust from heavy trucks.

8.2 Masonry Plant

Even though the emissions from masonry plant are not part of this application, it is important to understand the extent and impact of masonry plant emissions on the rest of the OEIE.

An AQIA was completed by Air Labs Environmental in March 2019 (Airlabs 2019), which assessed potential off-site air quality impacts associated with the masonry plant operations, CSR brick manufacturing plant and the existing Austral Plant 3 operations (to be demolished prior to construction of Stage 2). The locations of projects assessed as part of the AQIA are shown in **Figure 10**.

Figure 10 Location of the Surrounding Projects



Source: Airlabs 2019

The masonry plant proposes to produce 220,000 tpa of masonry products, including grey and coloured blocks, retaining walls and pavers. and operation of five warehouses intended for generic warehousing and distribution purposes. The main emissions sources were identified to be natural gas boiler emissions and fugitive dust emissions from the masonry plant, and wheel-generated dust from truck movements associated with the warehousing operations.

The pollutants investigated in this assessment included particulate matter (as TSP, PM_{10} and $PM_{2.5}$), NO_2, CO, SO_2, VOCs (benzene, toluene, ethyl benzene and xylenes), metals, polycylic aromatic hydrocarbons (PAHs) and polychlorinated dioxins and furans (PCDF).

The contribution of OEIE operations to local air pollution was estimated using the CALPUFF dispersion modelling program for one worst case scenario. The results and conclusions of the AQIA are discussed in the below sections.

Particulate Matter

A summary of the calculated particulate emissions from Austral Plant 3, OEIE and the CSR are shown in **Table 10**.

Table 10 Contribution of Individual Emission Sources in the AQIA

Pollutant	Austral Plant 3		CSR		OEIE			OEIE %age of Total
	Stack	Fugitive	Stack	Fugitive	Boiler	Masonry Plant	Warehousing	
TSP	11,563	21,606	11,494	10,137	23.5	845.5	981.4	**3.3%**
PM_{10}	9,460.8	7,540	5,747	3,532	24.8	247.3	188.4	**1.7%**
$PM_{2.5}$	8,514.7	921	5,172	93	23.5	47.1	45.6	**0.8%**

Source: Airlabs 2019

Based on the above, the contribution of OEIE and Austral Plant 3 operations is less than 4% and 60% respectively of the modelled emissions. As the Austral Plant 3 will be demolished as part of this Project, emissions of particulate matter in the local airshed will therefore reduce significantly.

It was concluded that in relation to the OEIE masonry plant:

> *"Modelling shows that the incremental impacts (emissions generated from the proposed facility alone) are quite minimal, with predicted particulate matter impacts ranging from 0.6% (TSP annual average) to 3.2% ($PM_{2.5}$ 24-hour average) of the relevant assessment criteria."*

As the Austral Plant 3 is proposed to be demolished before the construction of Precinct 3, the risk of cumulative particulate impacts exceeding the respective criteria will be reduced significantly.

Products of Combustion and Air Toxics

The main existing sources of products of combustion identified in the local air shed are stack emissions from the existing CSR brick manufacturing plant the Austral Plant 3 operations and traffic emissions from the local road network. The proposed OEIE masonry plant and warehousing operations would be a relatively minor contributor compared to these existing sources.

The pollutants investigated in the AQIA completed by in March 2019 (Airlabs 2019) included NO_2, CO, SO_2, VOCs (benzene, toluene, ethyl benzene and xylenes), metals, polycylic aromatic hydrocarbons (PAHs) and polychlorinated dioxins and furans (PCDF). It was concluded that:

> *"For the other pollutants, including SO_2, NO_2, CO, the maximum predicted incremental concentrations across all sensitive receptors are 0.2% or below their respective assessment criteria.*
>
> *For individual air toxics, predicted impacts for all pollutants were found to be below 0.6% of their respective assessment criteria."*

On this basis, the ambient concentrations of products of combustion and air toxics are expected to be well below the respective criteria in the airshed.

As the Austral Plant 3 is proposed to be demolished before the construction of Precinct 3, the risk of cumulative air toxics impacts exceeding the respective criteria will be significantly reduced.

9 Conclusions

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Goodman Property Services (Australia) Pty Ltd (Goodman) to prepare an Air Quality Impact Assessment (AQIA) to accompany a development application (DA) for the Oakdale East Industrial Estate (OEIE) Project.

The aim of this AQIA is to assess the air quality risks associated with the potential air quality impacts during construction and operation of a proposed extension to Precinct 1, and construction and operation of Precinct 3 only.

A desktop review has been undertaken to identify existing and proposed air emission sources in the locality of the OEIE. The following existing and proposed sources of air pollutants were identified in the area:

- Emissions of particulate matter, oxides of nitrogen, sulfur oxides and hydrogen fluoride from the Austral Bricks Plant 3 and fugitive dust emissions from the associated quarrying operations (to be demolished as part of Stage 2);
- Emissions of particulate matter and products of combustion from the CSR brick manufacturing plant located south of the OEIE; and
- Products of fuel combustion (including particulate matter) and fugitive dust from the proposed masonry plant (OEIE) and five warehouses.

It was concluded that:

- The results of this assessment indicate that dust impacts due to the Stage 2 construction works can be adequately managed with the implementation of site-specific mitigation measures, and that the residual impacts are likely to be of *negligible risk* for the proposed demolition and construction activities (ie earthworks, construction and trackout) at neighbouring residential receptors. The residual dust impacts are anticipated to have *low risk* of dust impactsat the nearest commercial receptors.
- An air quality impact assessment performed in 2019 for the proposed Oakdale East Project operations (Airlabs 2019) showed that the Austral Bricks Plant 3 and associated quarrying activities are a significant contributor to cumulative concentrations of particulate matter and other pollutants in the local airshed, including across the OEIE Stage 2 site. The closure of this facility (Austral Plant 3) prior to construction and operation of OEIE Stage 2 will result in a significant improvement in air quality at the OEIE and nearby sensitive receptors. Operational phase emissions from the proposed OEIE masonry plant and warehousing operations would be a relatively minor contributor of air pollutant emissions compared to existing sources and would not be expected to adversely impact on air quality at the Stage 2 site.

Based on the above, air quality issues are not considered to represent a constraint for the proposed development.

10 References

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11 Feedback

At SLR, we are committed to delivering professional quality service to our clients. We are constantly looking for ways to improve the quality of our deliverables and our service to our clients. Client feedback is a valuable tool in helping us prioritise services and resources according to our client needs.

To achieve this, your feedback on the team's performance, deliverables and service are valuable and SLR welcome all feedback via https://www.slrconsulting.com/en/feedback. We recognise the value of your time and we will make a $10 donation to our 2022 Charity Partner – Lifeline, for every completed form.

APPENDIX A

CONSTRUCTION RISK ASSESSMENT METHODOLOGY

Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM guidance suggests screening out any assessment of impacts from construction activities where sensitive receptors are located more than 350 m from the boundary of the site, more than 50 m from the route used by construction vehicles on public roads and more than 500 m from the site entrance. This step is noted as having deliberately been chosen to be conservative, and will require assessments for most projects.

Step 2a – Assessment of Scale and Nature of the Works

Step 2a of the assessment provides "dust emissions magnitudes" for each of four dust generating activities; demolition, earthworks, construction, and track-out (the movement of site material onto public roads by vehicles). The magnitudes are: *Large*; *Medium*; or *Small*, with suggested definitions for each category. The definitions given in the IAQM guidance for earthworks, construction activities and track-out, which are most relevant to this Development, are as follows:

Demolition *(Any activity involved with the removal of an existing structure [or structures]. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time)*:

- ***Large***: Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;
- ***Medium***: Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- ***Small***: Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

Earthworks *(Covers the processes of soil-stripping, ground-levelling, excavation and landscaping)*:

- ***Large***: Total site area greater than 10,000 m^2, potentially dusty soil type (eg clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved more than 100,000 t.
- ***Medium***: Total site area 2,500 m^2 to 10,000 m^2, moderately dusty soil type (eg silt), 5 to 10 heavy earth moving vehicles active at any one time, formation of bunds 4 m to 8 m in height, total material moved 20,000 t to 100,000 t.
- ***Small***: Total site area less than 2,500 m^2, soil type with large grain size (eg sand), less than five heavy earth moving vehicles active at any one time, formation of bunds less than 4 m in height, total material moved less than 20,000 t, earthworks during wetter months.

Construction *(Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc)*:

- ***Large***: Total building volume greater than 100,000 m^3, piling, on site concrete batching; sandblasting.

- ***Medium***: Total building volume 25,000 m^3 to 100,000 m^3, potentially dusty construction material (eg concrete), piling, on site concrete batching.
- ***Small***: Total building volume less than 25,000 m^3, construction material with low potential for dust release (eg metal cladding or timber).

Track-out *(The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network)*:

- ***Large***: More than 50 heavy vehicle movements per day, surface materials with a high potential for dust generation, greater than 100 m of unpaved road length.
- ***Medium***: Between 10 and 50 heavy vehicle movements per day, surface materials with a moderate potential for dust generation, between 50 m and 100 m of unpaved road length.
- ***Small***: Less than 10 heavy vehicle movements per day, surface materials with a low potential for dust generation, less than 50 m of unpaved road length.

Note: No demolition of existing structures will be performed as part of this Development.

In order to provide a conservative assessment of potential impacts, it has been assumed that if at least one of the parameters specified in the 'large' definition is satisfied, the works are classified as large, and so on.

Step 2b – Risk Assessment

Assessment of the Sensitivity of the Area

Step 2b of the assessment process requires the sensitivity of the area to be defined. The sensitivity of the area takes into account:

- The specific sensitivities that identified sensitive receptors have to dust deposition and human health impacts;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Other site-specific factors, such as whether there are natural shelters such as trees to reduce the risk of wind-blown dust.

Individual receptors are classified as having *high*, *medium* or *low* sensitivity to dust deposition and human health impacts (ecological receptors are not addressed using this approach). The IAQM method provides guidance on the sensitivity of different receptor types to dust soiling and health effects as summarised in **Table A1**. It is noted that user expectations of amenity levels (dust soiling) is dependent on existing deposition levels.

Table A1 IAQM Guidance for Categorising Receptor Sensitivity

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Dust soiling	Users can reasonably expect a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	The enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
	Examples: Dwellings, museums, medium and long term car parks and car showrooms.	*Examples: Parks and places of work.*	*Examples: Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.*
Health effects	Locations where the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where human exposure is transient.
	Examples: Residential properties, hospitals, schools and residential care homes.	*Examples: Office and shop workers, but will generally not include workers occupationally exposed to PM10.*	*Examples: Public footpaths, playing fields, parks and shopping street.*

According to the IAQM methods, the sensitivity of the identified individual receptors (as described above) is then used to assess the *sensitivity of the area* surrounding the active construction area, taking into account the proximity and number of those receptors, and the local background PM_{10} concentration (in the case of potential health impacts) and other site-specific factors. Additional factors to consider when determining the sensitivity of the area include:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area and if relevant, the season during which the works will take place;
- any conclusions drawn from local topography;
- the duration of the potential impact (as a receptor may be willing to accept elevated dust levels for a known short duration, or may become more sensitive or less sensitive (acclimatised) over time for long-term impacts); and

- any known specific receptor sensitivities which go beyond the classifications given in the IAQM document.

The IAQM guidance for assessing the sensitivity of an area to dust soiling is shown in **Table A2**. The sensitivity of the area should be derived for each of activity relevant to the project (ie construction and earthworks).

Table A2 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Soiling Effects

Receptor Sensitivity	Number of receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Note: Estimate the total number of receptors within the stated distance. Only the *highest level* of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors < 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors < 50 m is 102. The sensitivity of the area in this case would be high.

A modified version of the IAQM guidance for assessing the *sensitivity of an area* to health impacts is shown in **Table A3**. For high sensitivity receptors, the IAQM methods takes the existing background concentrations of PM_{10} (as an annual average) experienced in the area of interest into account and is based on the air quality objectives for PM_{10} in the UK. As these objectives differ from the ambient air quality criteria adopted for use in this assessment (ie an annual average of 19.8 $\mu g/m^3$ for PM_{10}) the IAQM method has been modified slightly.

This approach is consistent with the IAQM guidance, which notes that in using the tables to define the *sensitivity of an area*, professional judgement may be used to determine alternative sensitivity categories, taking into account the following factors:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area, and if relevant the season during which the works will take place;
- any conclusions drawn from local topography;
- duration of the potential impact; and
- any known specific receptor sensitivities which go beyond the classifications given in this document.

Table A3 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Health Effects

Receptor sensitivity	Annual mean PM_{10} conc.	Number of receptors [a,b]	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	21-25 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	17-21 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<17 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>25 µg/m³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	21-25 µg/m³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	17-21 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<17 µg/m³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Notes:

(a) Estimate the total within the stated distance (e.g. the total within 350 m and not the number between 200 and 350 m); noting that only the highest level of area sensitivity from the table needs to be considered.

(b) In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

Risk Assessment

The dust emission magnitude from Step 2a and the receptor sensitivity from Step 2b are then used in the matrices shown in **Table A4** (earthworks and construction) and **Table A5** (track-out) to determine the risk category with no mitigation applied.

Table A4 Risk Category from Demolition Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table A4 Risk Category from Earthworks and Construction Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A5 Risk Category from Track-out Activities

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

APPENDIX B

OPERATIONAL PHASE RISK ASSESSMENT METHODOLOGY

Nature of Impact

Predicted impacts may be described in terms of the overall effect upon the environment:

- **Beneficial**: the predicted impact will cause a beneficial effect on the receiving environment.
- **Neutral**: the predicted impact will cause neither a beneficial nor adverse effect.
- **Adverse**: the predicted impact will cause an adverse effect on the receiving environment.

Receptor Sensitivity

Sensitivity may vary with the anticipated impact or effect. A receptor may be determined to have varying sensitivity to different environmental changes, for example, a high sensitivity to changes in air quality, but low sensitivity to noise impacts. Sensitivity may also be derived from statutory designation which is designed to protect the receptor from such impacts.

Sensitivity terminology may vary depending upon the environmental effect, but generally this may be described in accordance with the following broad categories - Very high, High, Medium and Low.

Table B1 outlines the methodology used in this study to define the sensitivity of receptors to air quality impacts.

Table B1 Methodology for Assessing Sensitivity of a Receptor

Sensitivity	Criteria
Very High	Receptors of very high sensitivity to air pollution (e.g. dust or odour) such as: hospitals and clinics, and retirement homes.
High	Receptors of high sensitivity to air pollution, such as: schools, residential areas, food retailers, glasshouses and nurseries.
Medium	Receptors of medium sensitivity to air pollution, such as: farms / horticultural land, offices/recreational areas, painting and furnishing, hi-tech industries and food processing, and outdoor storage (ie new cars).
Low	All other air quality sensitive receptors not identified above, such as light and heavy industry.

Magnitude

Magnitude describes the anticipated scale of the anticipated environmental change in terms of how that impact may cause a change to baseline conditions. Magnitude may be described quantitatively or qualitatively. Where an impact is defined by qualitative assessment, suitable justification is provided in the text.

Table B2 Magnitude of Impacts

Magnitude	Description
Substantial	Impact is predicted to cause significant consequences on the receiving environment (may be adverse or beneficial)
Moderate	Impact is predicted to possibly cause statutory objectives/standards to be exceeded (may be adverse)
Slight	Predicted impact may be tolerated.
Negligible	Impact is predicted to cause no significant consequences.

Significance

The risk-based matrix provided below illustrates how the definition of the sensitivity and magnitude interact to produce impact significance.

Table B3 Impact Significance Matrix

Sensitivity \ Magnitude		[Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by TableB1]	**Very High Sensitivity**	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
	Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

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