



Oakdale East Industrial Estate – Precinct 2 – Building 2A, Building 2B and Lot 2C (SSDA -120888992)

Air Quality Impact Assessment

Goodman Property Services (Aust) Pty Ltd

The Hayesbery
1-11 Hayes Road
Rosebery NSW 2018

Prepared by:

SLR Consulting Australia Pty Ltd

SLR Project No.: 630.033047.00001

2 July 2026

Revision: v2.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
V2.0	2 July 2026	A Naghizadeh	G Starke	A Naghizadeh
V1.0	26 May 2026	F Jafariogol A Naghizadeh	A Naghizadeh G Starke	A Naghizadeh

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.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.



Table of Contents

Basis of Report	i
Acronyms and Abbreviations	vii
1.0 Introduction	1
1.1 Concept Plan approval Amendments State Significant Development Application [37486043] (Mod 6)	1
1.2 Detailed Application State Significant Development Application [120888992]	1
1.3 Related Applications/Activities	3
1.4 Secretary’s Environmental Assessment Requirements	6
1.5 Site Location	7
1.6 Approach to Assessment	8
1.6.1 Construction Impact Assessment Methodology	8
1.6.2 Operational Impact Assessment Methodology	9
1.7 Potential Emissions to Air	9
1.7.1 Construction Phase Emission Sources	9
1.7.2 Operational Phase Emission Sources	10
1.7.3 Pollutants of Interest	11
2.0 Relevant Legislation, Policy and Guidance	14
2.1 State Environmental Planning Policy (Precincts—Western Parkland City) 2021	14
2.2 Protection of the Environment Operations (POEO) Act 1997 & Amendment Act 2011	14
2.3 Protection of the Environment Operations (Clean Air) Regulation 2022	15
2.4 NSW Environment Protection Authority Air Quality Policy and Guidance	15
2.5 Ambient Air Quality Criteria	15
2.6 Guidelines and Recommended Separation distances	17
3.0 Existing Environment	19
3.1 Topography	19
3.2 Surrounding Land Zoning and Sensitive Receptors	20
3.3 Sensitive Receptors	21
3.4 Local Meteorological Conditions	23
3.4.1 Temperature	23
3.4.2 Rainfall	24
3.4.3 Humidity	25
3.4.4 Wind	25
3.5 Background Air Quality	28
3.5.1 NSW DCCEW Air Quality Data	28



3.5.2 Oakdale East Estate Air Quality Monitoring Data.....	34
4.0 Construction Assessment Methodology	36
4.1 Meteorological Modelling.....	36
4.1.1 TAPM	37
4.1.2 CALMET	37
4.2 Dispersion Modelling	38
4.2.1 Model Configuration	38
4.3 Accuracy of Modelling	39
4.4 Emission Estimation	40
4.4.1 Construction Activities	40
4.4.2 Surrounding Sources.....	43
4.5 Adopted Background for this Assessment	47
5.0 Assessment of Construction Air Quality Impacts.....	49
5.1 Particles as PM _{2.5}	49
5.1.1 Maximum 24-Hour Average PM _{2.5} Concentrations	49
5.1.2 Annual Average PM _{2.5} Concentrations.....	52
5.2 Particles as PM ₁₀	53
5.2.1 Maximum 24-Hour Average PM ₁₀ Concentrations	53
5.2.2 Meteorological Conditions Contributing to Exceedances	56
5.2.3 Annual Average PM ₁₀ Concentrations	59
5.3 Particles as TSP.....	60
5.4 Dust Deposition.....	61
5.5 Mitigation Measures	62
5.5.1 Recommended Ambient Air Quality Monitoring	65
5.5.2 Recommended Trigger Action Response Plan	66
6.0 Operational Air Quality Assessment.....	68
6.1 Emissions From Site Generated Vehicles.....	68
6.1.1 Modelling Assumptions.....	68
6.1.2 Dispersion Model Configuration.....	70
6.1.3 Modelling Results	71
6.1.4 Mitigation Measures & Recommendations.....	72
6.2 VOC Emissions from Fuel Storage and Refuelling	73
6.2.1 Nature of Impact.....	73
6.2.2 Receptors Sensitivity	73
6.2.3 Magnitude	73



6.2.4 Significance of Impact	74
6.2.5 Mitigation Measure Existing Controls.....	75
6.3 Emissions from Emergency Backup Generators.....	76
6.3.1 Nature of Impact.....	76
6.3.2 Receptors Sensitivity	76
6.3.3 Magnitude	76
6.3.4 Significance of Impact	77
6.3.5 Mitigation Measure Existing Controls.....	77
7.0 Conclusion.....	78
9.0 References.....	80

Tables

Table 1	Secretary's Environmental Assessment Requirements	6
Table 2	NSW EPA Impact Assessment Criteria for Air Quality Assessment.....	16
Table 3	Recommended Separation Distances	18
Table 4	Sensitive Receptor Locations	22
Table 5	Wind Scale Descriptions	26
Table 6	Summary of Air Quality Monitoring Data at Prospect AQMS (2021-2025)	30
Table 7	Summary of CEMP Dust Deposition Monitoring (March 2025 – March 2026)	35
Table 8	TAPM and CALMET Modelling Domain Details	38
Table 9	CALPUFF Domain Details and Model Settings.....	38
Table 10	Activity Emission Rates	42
Table 11	Summary of Emission Data Used to Derive Emission Factor	43
Table 12	Surrounding Developments	45
Table 13	Summary of Emission Rates used to Assess Cumulative Impacts – Surrounding Sources.....	46
Table 14	Adopted Background Data	48
Table 15	Top 15 Highest PM _{2.5} Incremental Impact Receptors - 24-Hour PM _{2.5} Impact	50
Table 16	Top 15 Highest PM _{2.5} Incremental Impact Receptors - Annual PM _{2.5} Impact.. ..	52
Table 17	Top 15 Highest PM ₁₀ Incremental Impact Receptors - 24-Hour PM ₁₀ Impact . ..	54
Table 18	Top 15 Highest PM ₁₀ Incremental Impact Receptors - Annual PM ₁₀ Impact... ..	59
Table 19	Predicted Incremental and Cumulative Annual Average TSP Concentrations	60
Table 20	Predicted Annual Average Dust Deposition Rates.....	61
Table 21	Recommended Dust Mitigation Measures for the Site	63
Table 22	Mitigation Measures Specific to Earthworks	64
Table 23	Mitigation Measures Specific to Trackout	65



Table 24	Air Quality and Meteorological Monitoring Program.....	65
Table 25	TARP PM ₁₀ Trigger Levels and Responses.....	67
Table 26	Peak Hour Traffic Generation (year-2036).....	69
Table 27	RAQST Input Data	71
Table 28	RAQST Model Results	72
Table 29	Risk Assessment of VOC Impacts – Fuel Storage and Refuelling	75
Table 30	Risk Assessment of VOC Impacts – Diesel Generator Operations	77

Figures

Figure 1	SSD – 120888992 Proposed Estate Masterplan	4
Figure 2	Proposed Cut and Fill Plans	5
Figure 3	Site Location	8
Figure 4	Regional Topography	19
Figure 5	Surrounding Land Zoning.....	20
Figure 6	Surrounding Receptors	21
Figure 7	Temperature trends for Horsley Park Equestrian Centre AWS (1997 - 2026)	24
Figure 8	Monthly Rainfall Data for Horsley Park Equestrian Centre AWS (1997 – 2026)	24
Figure 9	Humidity Data for Horsley Park Equestrian Centre AWS (1995 – 2010).....	25
Figure 10	Horsley Park Equestrian Centre Annual and Seasonal Wind Roses 2021-2025	27
Figure 11	Measured 24-Hour Average PM ₁₀ Concentrations at Prospect AQMS (2021- 2025).....	31
Figure 12	Measured 24-Hour Average PM _{2.5} Concentrations at Prospect AQMS (2021- 2025).....	31
Figure 13	Measured 1-Hour Average NO ₂ Concentrations at Prospect AQMS (2021- 2025).....	32
Figure 14	Measured 1-Hour Average CO Concentrations at Prospect AQMS (2021-2025)	32
Figure 15	Measured 8-Hour Average CO Concentrations at Prospect AQMS (2021-2025)	33
Figure 16	Measured 1-Hour Average SO ₂ Concentrations at Prospect AQMS (2021- 2025).....	33
Figure 17	Measured 24-Hour Average SO ₂ Concentrations at Prospect AQMS (2021- 2025).....	34
Figure 18	Comparison of PM ₁₀ Concentrations: Oakdale East Real-Time Monitors vs Prospect AQMS	35
Figure 19	Location of Modelled Surrounding Sources	47



Figure 20	Daily Contemporaneous Analysis for Receptor R37	51
Figure 21	Ranked Daily Contemporaneous Analysis for Receptor R37	51
Figure 22	Daily Contemporaneous Analysis for Receptor R38	55
Figure 23	Ranked Daily Contemporaneous Analysis for Receptor R38	55
Figure 24	Polar Plots of Predicted 1-hour Average PM ₁₀ Contribution at Selected Worst Impacted Receptors	57
Figure 25	Annual and Seasonal Wind Roses at the Site	58
Figure 26	Existing Monitoring Locations	66
Figure 27	Refuelling Station – Separation Distance	74

Appendices

Appendix A	Selection of Representative Meteorological Data
Appendix B	Evaluation of Meteorological Data
Appendix C	Emission Factors and Assumptions for Emission Estimation
Appendix D	Variable Emission File
Appendix E	Risk Assessment Methodology
Appendix F	Isopleths



Acronyms and Abbreviations

%	percent
>	greater than
<	less than
°C	degrees Celsius
µg	microgram
µg/m ³	microgram per cubic metre
µm	microns
AHD	Australian Height Datum
Approved Methods	<i>Approved Methods for Modelling and Assessment of Air Pollutants in NSW (2022)</i>
Approved Methods for Sampling	<i>Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (2022)</i>
AQIA	Air Quality Impact Assessment
AQMS	Air Quality Monitoring Station
AWS	Automatic Weather Station
BoM	Bureau of Meteorology
CASANZ	Clean Air Society of Australia and New Zealand
CAQP	Certified Air Quality Professional
CAQMP	Construction Air Quality Management Plan
CO	carbon monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEEW	Department of Climate Change, Energy, the Environment, and Water
DoP	Department of Planning
DPE	NSW Department of Planning and Environment (now Department of Planning, Housing and Infrastructure)
DPHI	Department of Planning, Housing and Infrastructure
EIS	Environmental Impact Statement
EV	electric vehicles
g	gram
GFA	gross floor area
GLA	gross lettable area
GMR	Greater Metropolitan Area
g/VKT	grams per vehicle kilometre travelled
ha	hectares
HDV	heavy duty vehicles
km	kilometre



km/hr	kilometres per hour
kw	kilowatts
LDV	light duty vehicles
m	metres
mm	millimetres
m/s	metre per second
m ²	square metres
m ³	cubic metre
mg/m ³	milligram per cubic metre
NEPC	National Environment Protection Council
NEPM AAQ	National Environment Protection (Ambient Air Quality) Measure
NO	nitric oxide
NO ₂	nitrogen dioxide
NO _x	oxides of nitrogen
NPI	National Pollutant Inventory (Australia)
NSW	New South Wales
NSW EPA	Environmental Protection Authority
PM ₁₀	particulate matter with an equivalent aerodynamic diameter of 10 microns or less
PM _{2.5}	particulate matter with an equivalent aerodynamic diameter of 2.5 microns or less
RAQST	Roadside Air Quality Screening Tool
POEO Act	Protection of the Environment Operations Act
pphm	parts per hundred million (10 ⁸)
ppm	parts per million (10 ⁶)
SEPP	State Environmental Planning Policy
SEARs	Secretary's Environmental Assessment Requirements
SLR	SLR Consulting Australia Pty Ltd
SO ₂	sulphur dioxide
SSD	State Significant Development
SSDA	State Significant Development Application
TARP	Trigger Response Action Plan
TfNSW	Transport for New South Wales
TSP	total suspended particulate matter
VOCs	volatile organic compounds
US EPA	United States Environmental Protection Agency
VKT	vehicle kilometres travelled



1.0 Introduction

This Air Quality Impact Assessment (AQIA) report has been prepared by SLR Consulting Australia Pty Ltd (SLR) to address the following Development Applications:

- Concept Plan Amendments (Mod 6): Amendments to State Significant Development Application 37486043 (as modified) in accordance with Section 4.24 of the *Environmental Planning & Assessment Act 1979*
- Detailed Application (Proposed Works): State Significant Development Application (SSDA) No. 120888992 based on Industry-Specific Secretary's Environmental Assessment Requirements (SEARs) dated 8 May 2026.

The proposed development is being undertaken by Goodman Property Services (Aust) Pty Ltd (Applicant) on behalf of BGMG 14 Pty Ltd (ACN 661 888 884) as trustee of BGMG 1 Oakdale East Trust No.2 (Owner). The development is located within Lot 109 in DP 1293112, formally referred to as 2-10 Old Wallgrove Road, Horsley Park (the Site).

The below further outlines the respective works the Development Applications seek approval for.

1.1 Concept Plan approval Amendments | State Significant Development Application [37486043] (Mod 6)

As part of the proposed works under SSD No. 120888992, the following amendments are proposed to the Concept approval and Stage 1 Infrastructure works approved under SSDA 37486043:

- Amendment to approved Masterplan and Subdivision plan to accommodate revised Precinct 2-5 layout which will consolidate Precincts 2, 4 and 5, resulting in a total of three (3) precincts. (Precinct 1, 2 & 3).
- Amendment of Stage 2 infrastructure scope to accommodate revised and consolidated Precinct 2-5 layout
- Amendment of Development Controls, including those prescribed under Condition A9 & A10 of the consent, specifically:
 - Building Height
 - Maximum GLA
- Increase maximum permissible vehicle from a 30 m super B-double to a 36.5m B-triple (Condition D14)

This application, inclusive of the amendments to the Concept approval under SSD 37486043, seeks to facilitate the development of Building 2A, 2B & Lot 2C and associated Internal infrastructure changes.

1.2 Detailed Application | State Significant Development Application [120888992]

The SSDA seeks approval for the construction, fit-out, operation and use of 2 warehouse buildings and associated internal site infrastructure works to accommodate the proposed building layouts (refer **Figure 1** for Estate Masterplan). Specifically, this includes:

- Warehouses and Distribution Building – Building 2A



- 24/7 warehouse and distribution use
- Construction, operation, fit-out (warehouse racking and office fit-out) and use of approximately 18,110 square metres (m²) warehouse with ancillary office GLA. Proposed ridge height of 14.6m (excluding rooftop plant and solar).
- Includes hard stand, dock offices, loading bays, landscaping, electric vehicle charging, solar panels and signage.
- Warehouses and Distribution Building – Building 2B & Lot 2C
 - 24/7 warehouse and distribution use for an automated mail and parcel processing and sorting facility.
 - Construction, operation, fit-out (office and warehouse) and use of approximately 142,157 m² of warehouse and office GLA across two levels spanning a proposed ridge height of 25.0 m (excluding rooftop plant, roof access stairs and solar).
 - Warehouse fit-out includes automation and sortation equipment along with associated mezzanine structures.
 - Building 2B will include hardstand, heavy rigid parking, guardhouses, dock offices, loading bays, landscaping, electric vehicle charging, goods collection lockers, solar panels six lithium-ion battery energy storage systems (BESS) external to the main warehouse building and fleet workshop, weighbridges, fleet workshop, dock temperature control with external units, emergency generators, refuelling bay, truck wash and signage.
 - Dangerous goods (DGs) are proposed to be stored at the site, which are below the threshold quantities under Chapter 3 of the State Environmental Planning Policy (Resilience and Hazard) 2021
 - Ground Improvements to Warehouse 2B building footprint (i.e. pilling), including a 200 mm thick layer of Cement Treated Fine Crushed Rock (CTFCR) placed under the entire warehouse footprint.

Internal Estate Infrastructure

- Bulk Earthworks to Precinct 2 (formerly Precinct 2, 4 & 5), (refer **Figure 2**)
 - Approximately 550,000 cubic metres (m³) fill importation required as either virgin excavated natural material (VENM), excavated natural material (ENM) or Resource Recovery Order under Section 286A of the Protection of the Environment Operations Act 1997 (PoEO Act 1997) Importation proposed to be 24 hours, 7 days a week during the Fill Importation program
 - Export any unsuitable material (ie topsoil and clay)
- Retaining Walls (including importation of Engineered backfill)
- Stormwater Basin D (including fit-out)
- Construction and associated Easement to Drain of Stage 1 stormwater discharge line through Building 2B to Basin C
- Stage 1 road and servicing amendments to reflect revised Precinct 2, 4 & 5 building layout
- Noise barriers



- Lead-in services including additional 11 kv feeder via the extension of HV feeders from existing Endeavour Energy switching stations within Roberts Road and Capicure Drive
- Noise barriers

Other

- Expansion and on-going management of DA 347.1/2021 Containment Cell
- Subdivision of Precinct 2, 4 & 5 to suit revised precinct plan and ultimate lot layout

1.3 Related Applications/Activities

A Fairfield City Council Development Application DA 347.1/2021 (as modified) has previously been approved over the site facilitating Bulk Earthworks and Rehabilitation (including an initial Containment Cell) Works at the Site to provide relative levels suitable for future industrial development.

These levels are:

- Precinct 2 (western portion): BE 77.5
- Precinct 2 (eastern portion): BE 71.5
- Precinct 3: BE 77.0
- Precinct 4: BE 70.0

Proposed SSD-120888992 assumes these levels and works in respect of assessment of environmental impacts previously assessed in accordance with Clause 4.63 (a) *Environmental Planning & Assessment Act 1979*. Further re-assessment is therefore not required.

DA 347.1/2021 assessed the Environmental Impacts associated with the required rehabilitation to achieve the above Bulk Earthworks levels.

Notwithstanding, DA 347.1/2021 (as modified) is currently unable to be fulfilled as the consent approves a shortfall of:

- Fill importation required to achieve the above FCC approved rehab levels
- Contamination cell size required to fulfill rehabilitation obligations under the Fairfield City Council consent and associated Rehabilitation Action Plan.

SSD-120888992 assess and seeks approval to address these shortfalls as part of the Environmental Impact Assessment.



Figure 1 SSD – 120888992 Proposed Estate Masterplan

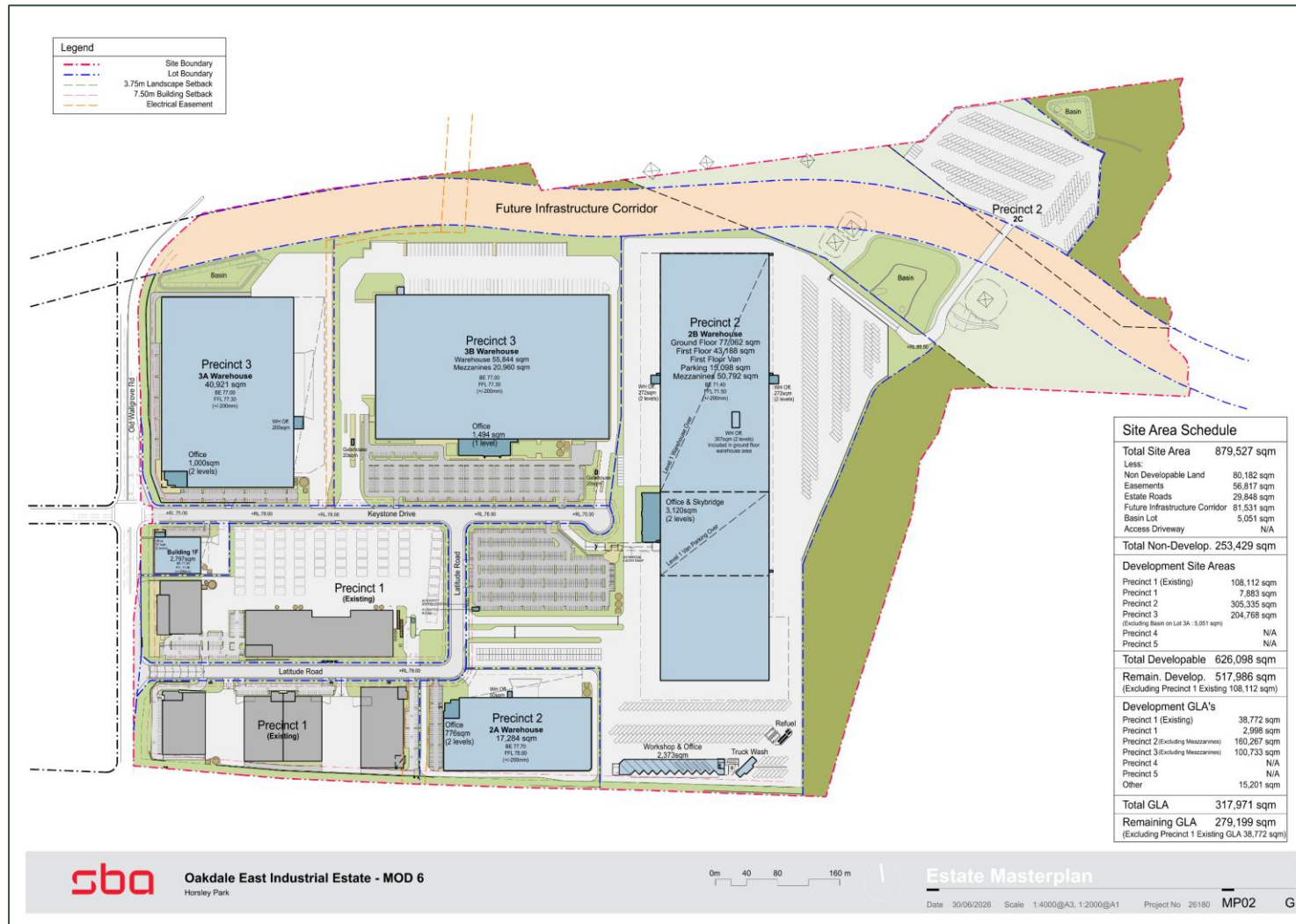
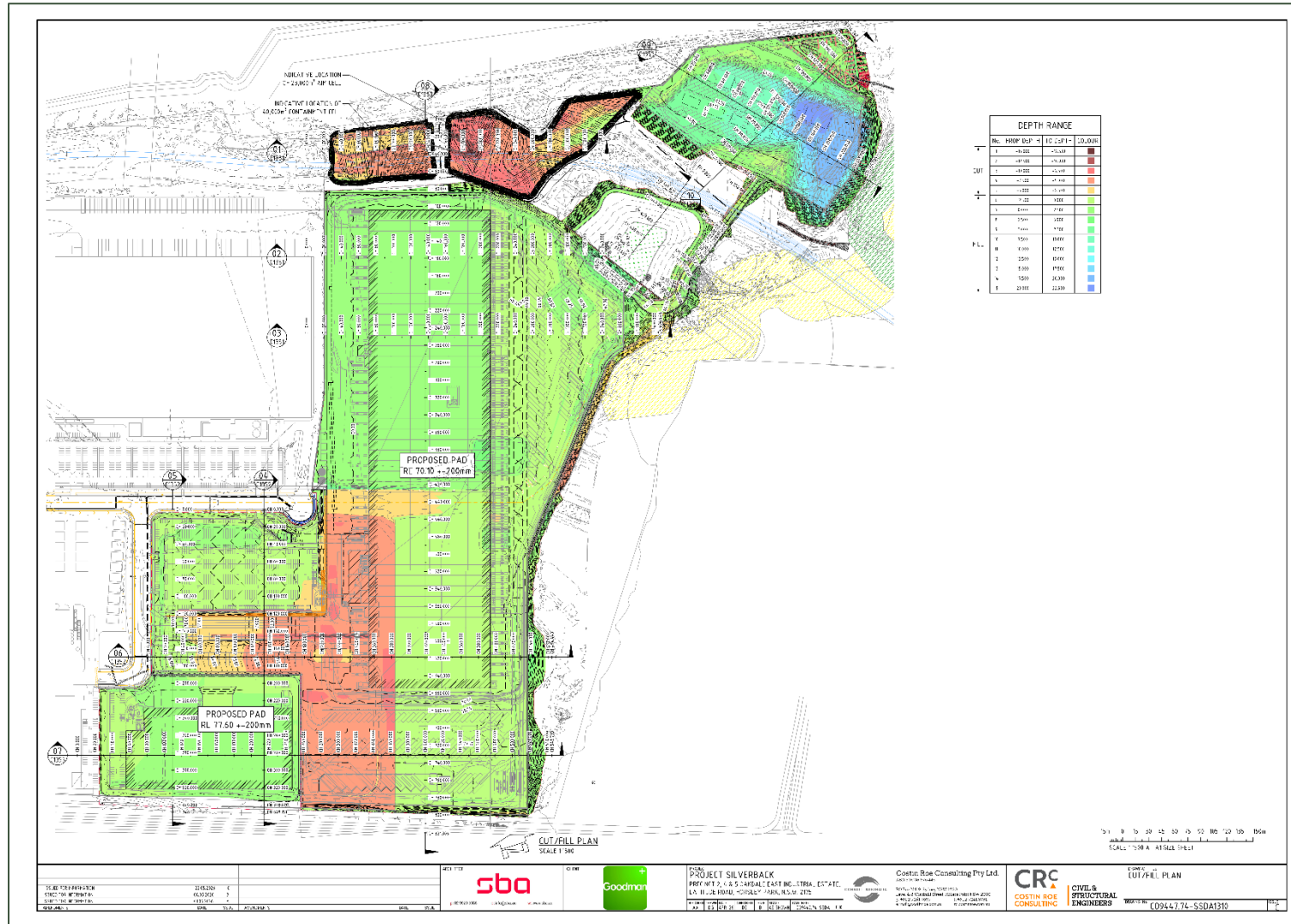


Figure 2 Proposed Cut and Fill Plans



1.4 Secretary's Environmental Assessment Requirements

On 8 May 2026, the NSW Department of Planning, Housing and Infrastructure (DPHI) issued Secretary's Environmental Assessment Requirements (SEARs). The air quality related SEARs are outlined in **Table 1**.

Table 1 Secretary's Environmental Assessment Requirements

Item	Description of Requirement	Section Reference (this report)
Key Issue	Identify significant air emission sources at the proposed development (during construction and operation), assess their potential to cause adverse off-site impacts, and detail proposed management and mitigation measures that would be implemented. Where air emissions during operation have the potential to cause adverse off-site impacts, provide a quantitative air quality impact assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines.	Section 5.0 (Construction AQA) Section 6.0 (Operational AQA)
Key Issue	Explain how the requirements of Schedule 2, Part B (Conditions for Future Development Applications) of SSD -37486043 have been addressed, for example the requirements for air quality assessments in Condition B13. Condition B13 of SSD -37486043 states: AIR QUALITY <i>B13. Future DAs must be accompanied by an Air Quality and Odour Impact Assessment. The assessment must:</i> <i>(a) be prepared in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016) and Assessment and Management of Odour from Stationary Sources in NSW (DEC 2006);</i> <i>(b) identify the air quality and odour impacts during construction and operation, including potential impacts on sensitive receivers;</i> <i>(c) assess any potential cumulative impacts from concurrent construction and operational activities on the site; and</i> <i>(d) recommend mitigation, management and monitoring measures to be implemented to minimise air quality and odour impacts during construction and operation.</i>	This Report

The assessment was prepared with consideration of the following policies and guidelines:

- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA 2022)(the Approved Methods)
- Approved Methods for the Sampling and Analysis of Air Pollutants in (NSW EPA 2022a)
- *Protection of the Environment Operations Act 1997* (NSW Parliament, 1997)
- Protection of the Environment Operations (Clean Air) Regulation 2022 (NSW Parliament 2022)
- National Environment Protection (Ambient Air Quality) Measure (NEPC 2021)

The Approved Methods outlines the requirements for conducting an air quality impact assessment as follows (also indicated are the relevant sections of this report where the requirements are met):

- Description of local topographic features and sensitive receptor locations (**Section 3.1** and **Section 3.2** respectively)
- Establishment of air quality assessment criteria (**Section 2.5**)
- Analysis of climate and dispersion meteorology for the region (**Appendix B**)
- Description of existing air quality environment (**Section 3.5**)
- Compilation of a comprehensive emissions inventory for the proposed activities (**Section 4.4**)
- Completion of atmospheric dispersion modelling and analysis of results (**Section 4.1**)
- Preparation of an air quality impact assessment report comprising the above.

1.5 Site Location

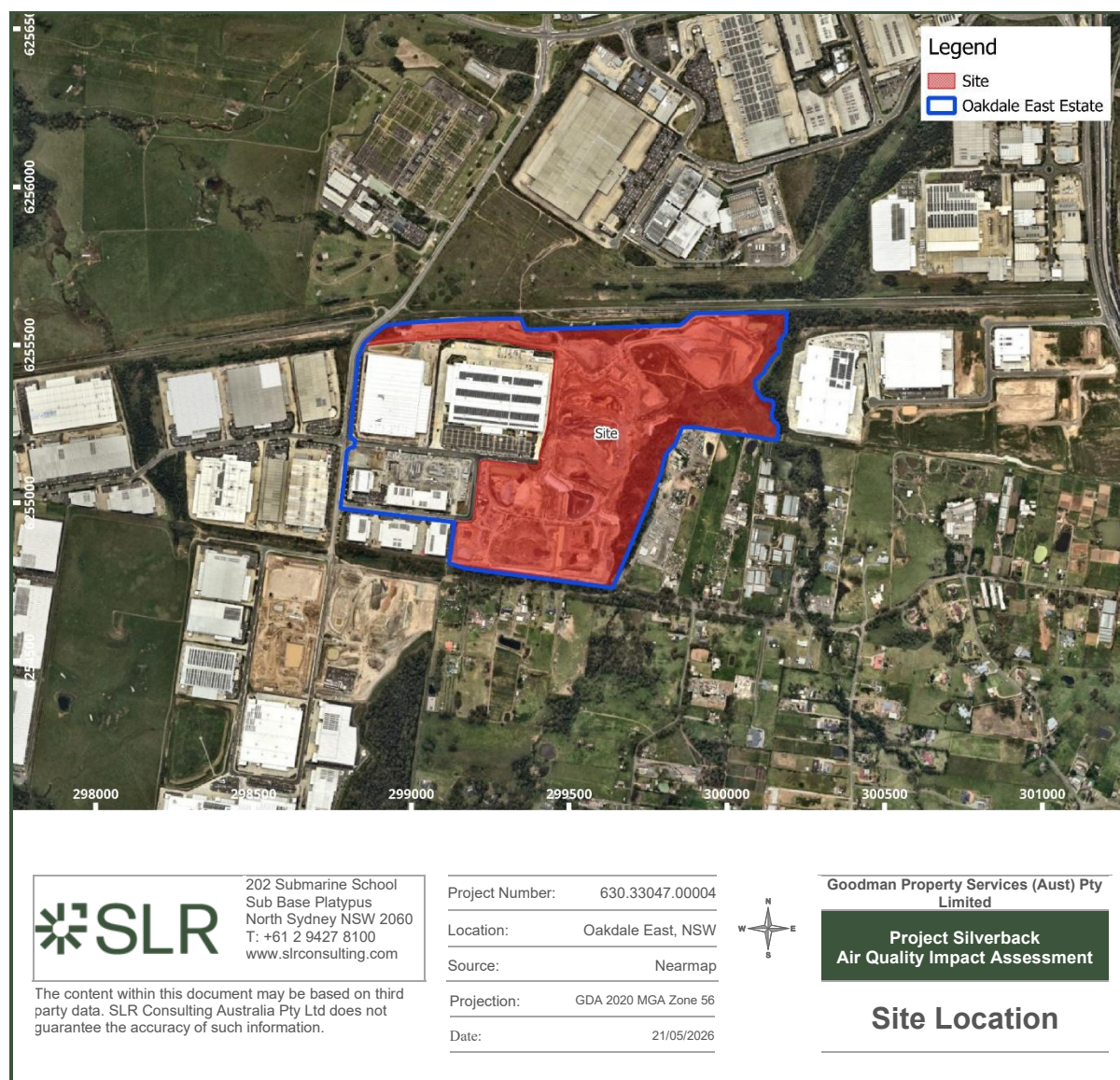
As shown in **Figure 3**, Project Silverback (the Site) is located on the east side of the Oakdale East Estate, which is located at 2 - 10 Old Wallgrove Road, Horsley Park, NSW. The Site is situated immediately west of the M7 Motorway and south of the M4 Motorway, providing strong access to the regional freight and motorway network.

The Site lies within the M7 Business Hub, an established industrial and logistics precinct, and is surrounded primarily by industrial and employment land uses to the north and west, including the Erskine Park and Mamre Road precincts. Prospect Reservoir and associated conservation land are located to the east, while lower-intensity rural-residential and open space areas occur to the south around Horsley Park.

Overall, the Site occupies a strategically located position within a major employment area, with strong transport connectivity and separation from more sensitive land uses provided by major road infrastructure and open space buffers.

As shown in **Figure 2**, the construction phase of the Site includes site preparatory works, including bulk earthworks to create flat development platforms for the proposed buildings. It is noted that the proposed bulk earth works the shortfall for what was previously approved under DA 347.1/2021. All other Bulk Earthworks considered under previous approvals.

Figure 3 Site Location



1.6 Approach to Assessment

1.6.1 Construction Impact Assessment Methodology

The key potential air quality issue identified for the construction phase of the Site is particulate matter emissions associated with bulk earthworks.

To assess potential peak impacts associated with construction stage emissions from the Site, a quantitative assessment in general accordance with the NSW EPA's *Approved Methods for Modelling and Assessment of Air Pollutants in NSW* publication (NSW EPA 2022) (hereafter referred to as the Approved Methods), has been prepared.

Section 2.1 of the Approved Methods outlines a two-tiered approach to Air Quality Impact Assessments (AQIA):

- Level 1, which is a basic screening using worst-case assumptions, and

- Level 2, a more detailed assessment with refined techniques and site-specific data.

If a Level 1 assessment shows that adverse impacts are unlikely, there is no need to proceed to Level 2.

For this assessment, considering the type of emissions associated with construction works, a Level 2 assessment using the TAPM/CALMET/CALPUFF modelling systems has been completed.

This assessment also considers cumulative impacts from surrounding construction activities. However, as construction activities are temporary and often consist of multiple stages, each with varying durations and emission levels, dust emissions from a single construction site tend to fluctuate significantly over time and are influenced by the type of work being done and weather conditions. This variability limits the accuracy that can be achieved using quantitative assessments and several conservative assumptions are required.

1.6.2 Operational Impact Assessment Methodology

The key potential air quality issue identified for the operational phase of the Site is emissions of combustion products associated with vehicle movements.

For this assessment, the Roadside Air Quality Screening Tool (RAQST) is employed. While RAQST was developed by Transport for NSW (TfNSW) primarily for road infrastructure projects, from a strictly technical and scientific perspective, the tool is entirely fit for purpose for this assessment. Its application fundamentally aligns with the requirements of a Level 1 screening assessment as defined in the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (the Approved Methods). The Approved Methods define a Level 1 assessment as a screening-level dispersion modelling technique using worst-case input data. The RAQST methodology inherently satisfies this definition.

Specifically, RAQST utilises a single dispersion function derived from the CALINE 4 model. This function was developed using theoretical worst-case meteorological conditions (such as Pasquill-Gifford F class stability, 1 m/s wind speed, and wind angles producing maximum concentrations) to ensure predictions are highly conservative. The tool's emission calculations are driven by the Link Emissions Calculator, which utilises a simplified version of the road vehicle emission model derived from the NSW Greater Metropolitan Region (GMR) emissions inventory. This represents the most accurate, peer-reviewed, and locally relevant traffic emissions data available in NSW.

The physics of vehicular emissions and atmospheric dispersion remain identical regardless of whether a project is a new road delivered by TfNSW or associated with vehicle emissions from traffic generated by a private development. Furthermore, the TfNSW RAQST Guideline explicitly recognises that screening models are routinely used as part of the air quality impact assessment process for new developments alongside road corridors.

Given the above, RAQST is considered appropriate for the intended purpose of this assessment, namely a conservative screening assessment of operational traffic impacts to determine whether a more detailed Level 2 assessment is warranted.

1.7 Potential Emissions to Air

1.7.1 Construction Phase Emission Sources

The main air quality issues associated with construction works relate to emissions of fugitive dust. The potential for dust to be emitted during the construction works 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:

- Loading and unloading of materials.
- Dozers
- Grading
- Wheel-generated dust and combustion emissions from construction equipment.
- Wheel-generated dust from trucks travelling on unpaved surfaces.
- 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 before 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 used, localised elevations in ambient concentrations of combustion-related pollutants may also occur, however, the potential risk of the relevant impact assessment criteria for these pollutants being exceeded in surrounding sensitive areas is considered to be low. Fugitive dust emissions are generally considered to have the greatest potential to give rise to downwind air quality impacts at construction sites.

1.7.2 Operational Phase Emission Sources

During the operational phase, the primary sources of air emissions will comprise products of fuel combustion and particulate matter (including brake and tyre wear, as well as re-entrained paved road dust) associated with vehicle movements, idling, and loading/unloading operations across the site. Additional sources include fugitive volatile organic compound (VOC) emissions from two diesel refuelling points located in the south-eastern corner of the Site and point source emissions (combustion gases) arising from the routine maintenance testing and operation of emergency backup generators.

Emissions associated with the combustion of fuel (diesel, petrol, etc.) in road vehicles and generators will include carbon monoxide (CO), oxides of nitrogen (NO_x), particulate matter (PM₁₀ and PM_{2.5}), sulfur dioxide (SO₂) and volatile organic compounds (VOC_s). The exact rate and composition of air pollutant emissions from road vehicles is a function of several

factors, including the type, size and age of the vehicles, the type of fuel combusted, the number and speed of vehicles and the road gradient. In addition to combustion sources, the operation of the diesel refuelling stations will result in fugitive VOC emissions, primarily associated with fuel vapour displacement during tank filling operations and minor liquid spillages.

1.7.3 Pollutants of Interest

As identified above, the key air pollutants of interest are considered to be particulate matter from construction works, wheel-generated dust and products of fuel combustion from operations.

The following sections outline the potential health and amenity issues associated with particulate matter and products of fuel combustion, while **Section 2.5** identifies the relevant air quality assessment criteria.

Particulate Matter

Airborne contaminants that can be inhaled directly into the lungs can be classified based on 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 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 called 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 $\text{PM}_{2.5}$ (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 $\text{PM}_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

Nuisance Dust

In addition, nuisance impacts need also to be considered, mainly in relation to deposited dust. Dust can cause nuisance by settling on surfaces and possessions, affecting visibility and contaminating tank water supplies. High rates of dust deposition can also adversely affect vegetation by blanketing leaf surfaces.

Dust falling onto plants can physically smother the leaves affecting photosynthesis, respiration and transpiration (Highways England 2019). Literature suggests that the most sensitive species appear to be affected by dust deposition at levels above 30 $\text{g}/\text{m}^2/\text{month}$, with most species unaffected until dust deposition rates are at levels considerably higher than this (Farmer 1993). This represents a level of impact approximately 7.5 times of the criteria adopted by this report and presented in **Section 2.5**.

Products of Combustion

Emissions associated with road traffic and the combustion of fossil fuels (diesel, petrol, AVGAS etc.) will include CO , NO_x , PM_{10} , $\text{PM}_{2.5}$, SO_2 and 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 the 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.

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 (NO₂). 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 NO₂ 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 NO₂ soon after leaving the engine exhaust.

Engine exhausts can contain emissions of SO₂ due to impurities in the fuel. However, the sulfur content in diesel fuel has significantly reduced over the years with the result that ambient SO₂ concentrations in Australian cities are typically well below regulatory criteria.

Volatile organic compounds (VOCs) may be emitted as a result of the incomplete combustion of fuel. VOCs emissions are reducing significantly due to the improved combustion processes offered by modern engines.

VOC Emissions from Fuel Storage and Vehicle Refuelling

The Project incorporates a dedicated diesel refuelling system to service fleet vehicles accessing the Site. The proposed infrastructure comprises two 110,000 L self-bunded above-ground diesel storage tanks and two 10,000 L AdBlue storage tanks. The facility will also include dual-hose diesel dispensers with extended reach for bilateral vehicle access, fuel conditioning systems (incorporating pumps and filters), transfer pumps for tanker unloading, and associated fuel management infrastructure.

Potential air quality impacts associated with bulk fuel storage and refuelling predominantly relate to fugitive emissions of volatile organic compounds (VOCs), including benzene, toluene, ethylbenzene, and xylenes (BTEX). As outlined in the National Pollutant Inventory (NPI) Emission Estimation Technique Manual for Fuel and Organic Liquid Storage (2012), these fugitive emissions typically manifest as working losses (vapour displacement during tank filling and emptying) and standing losses (vapour expansion and contraction driven by ambient temperature and barometric pressure variations).

It is a critical distinction that evaporative VOC emissions from diesel storage and dispensing systems are inherently negligible when compared to light distillates like petrol. This is driven by the fundamentally lower volatility and corresponding Reid Vapour Pressure (RVP) of diesel fuel. Because diesel possesses an RVP of only a few kilopascals, it generates minimal ambient vapour concentrations under standard thermodynamic conditions. Consequently, the displaced volume expelled from the tank during a delivery event is predominantly atmospheric air rather than dense hydrocarbon vapours.

Given this lack of vapour generation, the installation of Stage 1 (VR1) or Stage 2 (VR2) vapour recovery infrastructure provides no material environmental benefit and is not proposed for this facility. This approach aligns with the New South Wales regulatory framework. Under the Protection of the Environment Operations (Clean Air) Regulation 2022 (and supported by the *Standards and Best Practice Guidelines for Vapour Recovery at Petrol Service Stations* (NSW EPA 2017)), the legislative mandates and compliance thresholds for installing vapour recovery systems apply exclusively to the storage and

dispensing of petrol, and do not include diesel fuel. Accordingly, the proposed diesel refuelling station is exempt from VR1 and VR2 requirements and will instead rely on standard passive engineering controls (such as submerged fill pipes) to safely manage fluid transfer and minimise baseline emissions.

2.0 Relevant Legislation, Policy and Guidance

The following relevant Air Quality Policy and Guidance documents have been referenced within this assessment and have been used to identify the relevant air quality criteria.

2.1 State Environmental Planning Policy (Precincts—Western Parkland City) 2021

Chapter 4 of the WPC SEPP relates to the Western Sydney Aerotropolis. The aims of this section of the WPC SEPP are as follows:

- (a) *to facilitate development in the Western Sydney Aerotropolis in accordance with the objectives and principles of the Western Sydney Aerotropolis Plan,*
- (b) *to promote sustainable, orderly and transformational development in the Western Sydney Aerotropolis,*
- (c) *to ensure development is compatible with the long-term growth and development of the Western Sydney Airport (including in relation to the operation of the Airport 24 hours a day) and other critical transport infrastructure,*
- (d) *to promote employment and world-class innovation and provide for residential development in suitable locations,*
- (e) *to recognise the physical and cultural connection of the local Aboriginal community to the land and to incorporate local Aboriginal knowledge, culture and tradition into development,*
- (f) *to preserve land for future infrastructure development,*
- (g) *to protect, maintain and enhance, and to minimise the impact of development on, trees and vegetation, soil quality and the health of waterways and to contribute to the conservation of biodiversity,*
- (h) *to recognise and protect the ecological and cultural value of Wianamatta—South Creek.*

There are no air quality specific development standards or provisions identified in Chapter 4 of the WPC SEPP, however the broader environmental protection context defined in (g) above is considered relevant to this AQA.

2.2 Protection of the Environment Operations (POEO) Act 1997 & Amendment Act 2011

The POEO Act (and Amendment Act 2011) is a key piece of environment protection legislation administered by the EPA group which enables and establishes instruments for setting environmental standards, goals, protocols and guidelines.

The following sections of the POEO Act are of general relevance to the Site:

- Section 126 of the POEO Act requires that materials (e.g. raw ingredients and waste storage/disposal at the Site) are managed in a proper and efficient manner to prevent air pollution (e.g. odour).
- Section 128 of the POEO Act states:
 - 1 The occupier of premises must not carry out any activity or operate any plant in or on the premises in such a manner to cause or permit the emission at any point specified in or determined in accordance with the regulation of air impurities in

excess of [the standard of concentration and/or the rate] prescribed by the regulations in respect of any such activity or any such plant.

- 2 Where neither such a standard nor rate has been so prescribed, the occupier of any premises must carry on activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution.

2.3 Protection of the Environment Operations (Clean Air) Regulation 2022

The POEO (Clean Air) Regulation 2022 (the Regulation) is the core regulatory instrument for air quality issues in NSW. In relation to industry, the Regulation:

- sets maximum limits on emissions from activities and plants for a number of substances; and
- restricts the use of high sulphur liquid fuel.

2.4 NSW Environment Protection Authority Air Quality Policy and Guidance

The NSW Environmental Protection Agency (EPA) is the NSW regulatory authority responsible for air quality regulation and associated activities.

The NSW EPA document, Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (hereafter 'the Approved Methods') (NSW EPA 2022) , lists the statutory methods for modelling and assessing air pollutants from stationary sources and specifies criteria that reflect the environmental outcomes adopted by the EPA. The Approved Methods are referred to in the POEO (Clean Air) Regulation 2022 for the assessment of impacts of air pollutants. The air quality criteria set out in the Approved Methods have been reproduced and discussed in **Section 2.5**.

2.5 Ambient Air Quality Criteria

State air quality guidelines specified by the NSW EPA for the pollutants identified in **Section 2.4** are published in the Approved Methods. The 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.

The impact assessment criteria listed in the Approved Methods for relevant pollutants are shown in **Table 2**.

Table 2 NSW EPA Impact Assessment Criteria for Air Quality Assessment

Pollutant	Averaging Period	Ambient Air Quality Criterion	
		µg/m ³	pphm
Total suspended particulate (TSP)	Annual	90	-
Particulate matter less than 10 microns (PM ₁₀)	24-Hour	50	-
	Annual	25	-
Particulate matter less than 2.5 microns (PM _{2.5})	24-Hour	25	-
	Annual	8	-
Nitrogen dioxide (NO ₂)	1-hour	164	8
	Annual	31	1.5
Carbon monoxide (CO)	15-minutes	100,000	8,700
	1-hour	30,000	2,500
	8-hour	10,000	900
Photochemical oxidants (as ozone)	8-hour	139	6.5
Sulfur dioxide (SO ₂)	1-hour	215	10
	24-hour	57	2
Benzene	1-hour	29	0.9
Toluene	1-hour	360	9
Ethylbenzene	1-hour	8,000	180
Xylenes	1-hour	190	4

2.6 Guidelines and Recommended Separation distances

Currently, there are no specific minimum separation distances prescribed by the NSW Environment Protection Authority (EPA) for petroleum storage or refuelling operations. Consequently, guidance is typically drawn from other state or local environmental authorities to assess potential amenity and health impacts at sensitive land uses (such as residential zones, hospitals, and schools). A review of potentially relevant separation distances is provided in **Table 3**.

When applying these interstate policies, it is critical to contextualise their intended regulatory scope. These standard separation distances are multidisciplinary and are formulated to manage a cumulative range of amenity impacts, encompassing not only air quality and VOC emissions, but also noise, light spill, etc. Furthermore, these guidelines are primarily designed for commercial service stations or broad-spectrum bulk hydrocarbon depots. Commercial service stations routinely handle highly volatile fuel (such as petrol) and frequently incorporate ancillary odour sources, including hot food preparation premises. Applying these generic separation distances to a dedicated, diesel-only fleet refuelling facility is an inherently conservative approach, given the significantly lower volatility, negligible odour profile, and reduced fugitive VOC emissions associated strictly with diesel fuel.

A review of the available frameworks indicates that the Brisbane City Council guidelines offer a highly relevant, albeit still conservative, benchmark for this scale of operation, recommending a minimum separation distance of 10 m to 50 m depending on annual throughput of fuel. Regarding site-specific parameters, the proposed total diesel storage capacity for the Project is 220 m³. While the final operational metrics are subject to detailed design, the anticipated annual diesel throughput is estimated to be between 9 ML and 12 ML. Given the low-volatility nature of the fuel, the restricted storage volume, a separation distance of 50 m has been adopted for the purpose of this assessment.

Table 3 Recommended Separation Distances

Guideline Jurisdiction	Activity	Activity Description	Recommended Separation
Australian Capital Territory ¹	Petroleum storage	Petroleum products are stored in tanks with a total storage capacity exceeding 2,000 cubic metres.	250 m
Western Australia ²	Service Stations (Involving vehicle cleaning/detailing facilities & the retailing of spare parts & foodstuffs)	For premises operating during normal hours, i.e. Monday – Saturday from 7:00 am – 7:00 pm hours.	50 m
		Freeway service centre (24-hour operations).	100 m
		For all other 24-hour operations.	200 m
South Australia ³	Hydrocarbon storage or production works	Petrol stations – all.	50 m
		Petrol stations operating 10:00 pm – 7:00 pm.	100 m
Brisbane City Council ⁴	Service Stations	Where annual throughput is less than 0.52 ML.	10 m
		Where annual throughput is greater than 0.52 ML and equal to or less than 3 ML.	Where Stage 1 vapour recovery is installed – 10 m.
		Where annual throughput is greater than 3 ML and equal to or less than 6 ML.	Where Stage 1 vapour recovery is installed – 30 m.
		Where annual throughput is greater than 6 ML and equal to or less than 9 ML.	Where Stage 1 vapour recovery is installed – 40 m.
		Where annual throughput is greater than 9 ML and equal to or less than 12 ML.	Where Stage 1 vapour recovery is installed – 50 m.
		Where annual throughput is greater than 12 ML	No acceptable outcome.

¹ (ACT Government 2018)

² (EPA WA 2015)

³ (EPA SA 2023)

⁴ (BCC 2014)

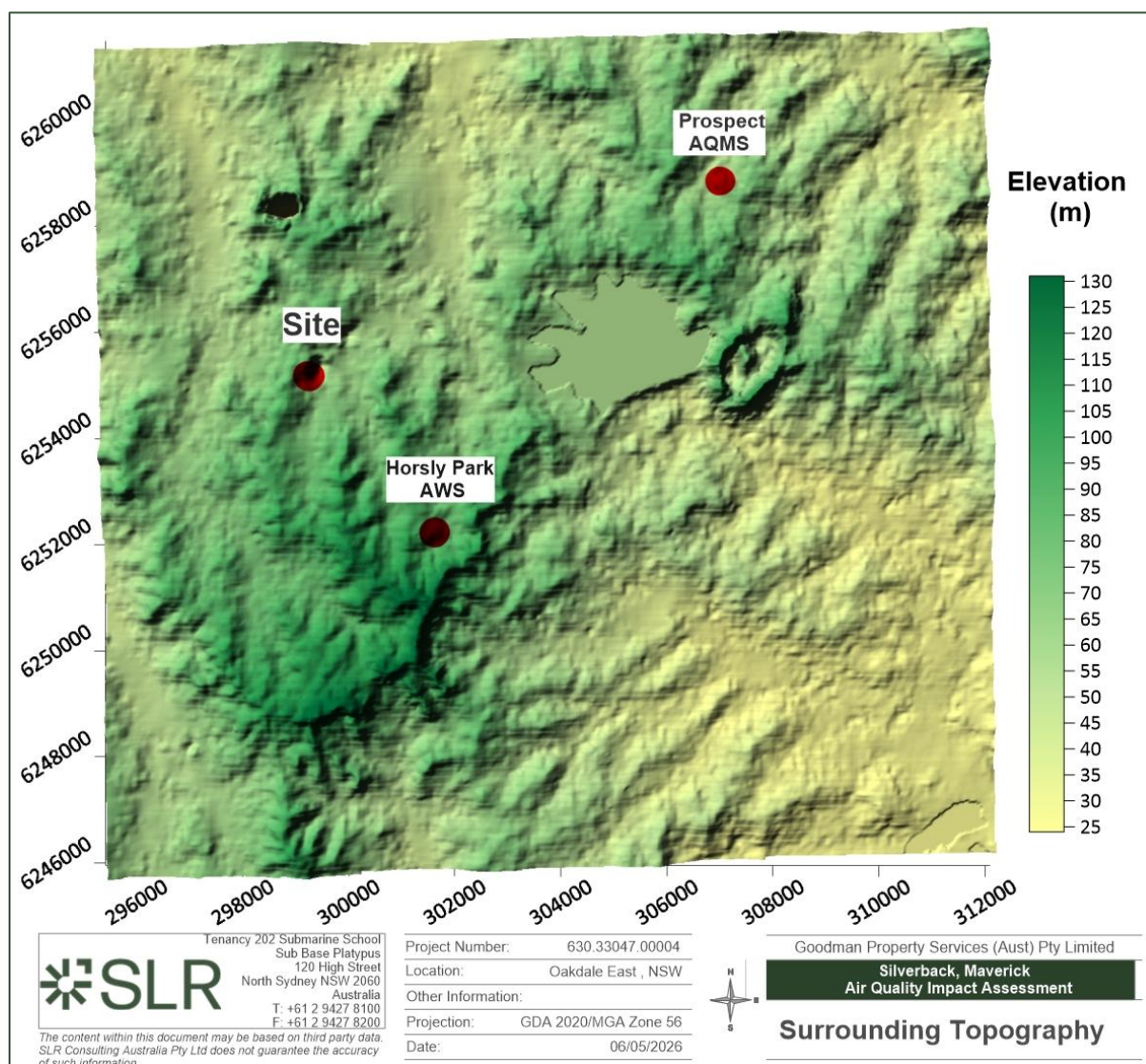
3.0 Existing Environment

3.1 Topography

Local topography is important in air quality studies as local atmospheric dispersion can be influenced by night-time katabatic (downhill) drainage flows from elevated terrain or channelling effects in valleys or gullies.

The Site is relatively flat and is located at an elevation of approximately 60- 65 m above sea level. A pseudo three-dimensional representation of the surrounding region is presented in **Figure 4**, indicating undulating terrain with elevations ranging from approximately 25 m in lower-lying areas to greater than 120 m in elevated areas to the north-east of the Site. The locations of the Horsley Park automatic weather station (AWS; refer **Section 4.1**) and the Prospect air quality monitoring station (AQMS; refer **Section 3.5**) are also shown relative to the Site.

Figure 4 Regional Topography

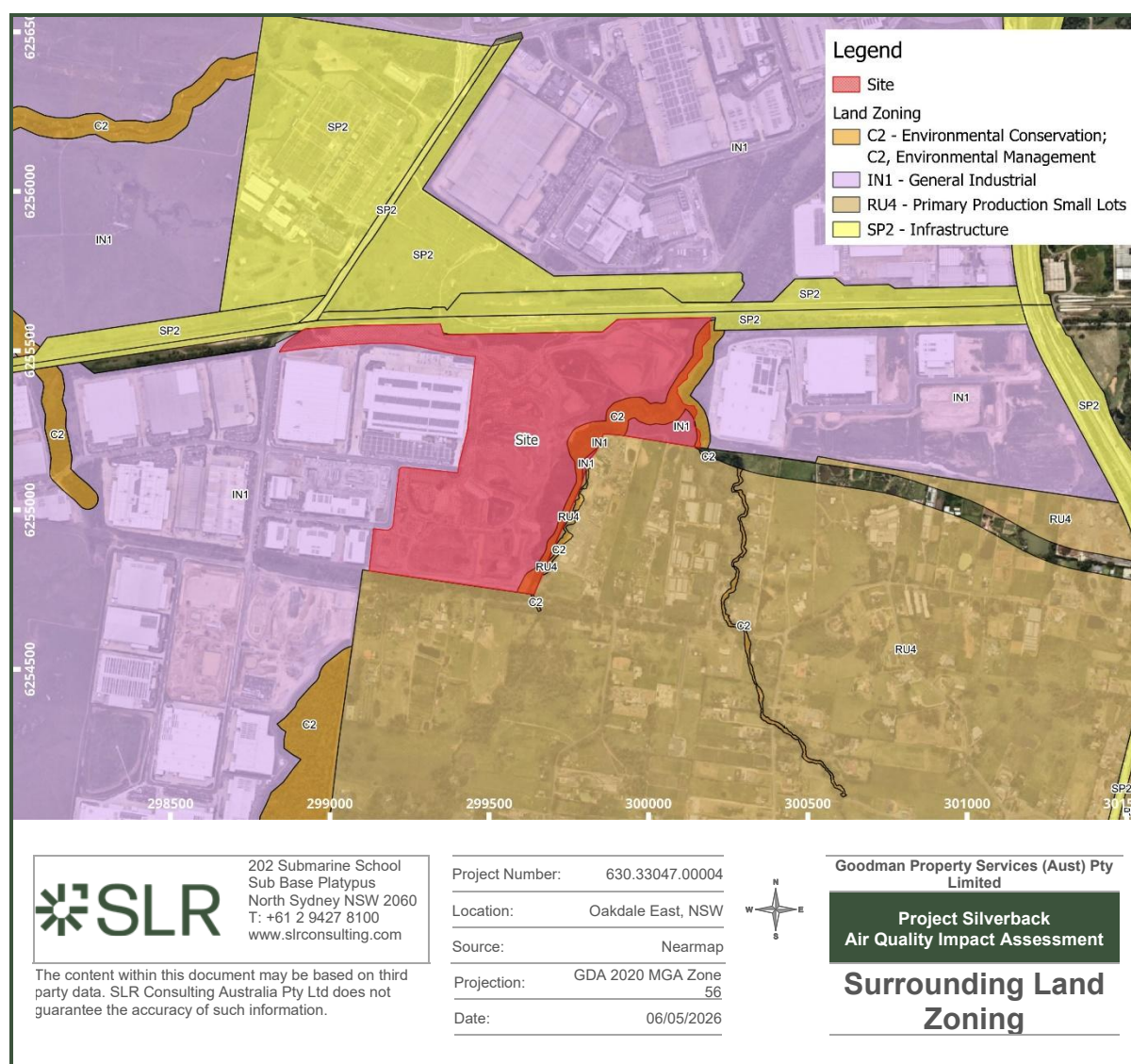


3.2 Surrounding Land Zoning and Sensitive Receptors

Figure 5 illustrates the surrounding land zoning. The Site is zoned IN1 - General Industrial, consistent with the extensive, established industrial areas immediately to its west. To the north, the industrial zoning is bounded by a major east-west transport corridor zoned SP2 - Infrastructure.

Along its eastern and southern boundaries, the Site directly abuts areas zoned C2 - Environmental Conservation / Environmental Management (which follow mapped waterways and drainage corridors) and RU4 - Primary Production Small Lots. This large RU4 zone extends significantly to the south and southeast, characterizing a transition into dispersed rural-residential development. Further east, this rural-residential area is bordered by another major north-south SP2 - Infrastructure corridor.

Figure 5 Surrounding Land Zoning



3.3 Sensitive Receptors

Residential and commercial receptors are located in all directions surrounding the Site, as shown in **Figure 6**. The nearest sensitive receptors are commercial premises located within the Oakdale East Estate, at an approximate separation distance of 50 m from the western Site boundary. **Table 4** identifies the representative sensitive receptors included in the assessment and provides their approximate distances to the nearest Site boundary.

Figure 6 Surrounding Receptors



Table 4 Sensitive Receptor Locations

Map ID	Easting (m)	Northing (m)	Receptor Type	Distance from Closest Site Boundary (m)
R 1	300,347	6,254,958	Residential	670
R 2	300,338	6,254,872	Residential	700
R 3	300,322	6,254,792	Residential	700
R 4	300,042	6,254,416	Residential	550
R 5	299,927	6,254,565	Residential	350
R 6	299,835	6,254,570	Residential	280
R 7	299,439	6,254,660	Residential	100
R 8	299,303	6,254,659	Residential	115
R 9	299,957	6,254,313	Residential	540
R 10	299,125	6,254,548	Residential	250
R 11	299,209	6,254,625	Residential	150
R 12	299,400	6,254,648	Residential	110
R 13	300,357	6,255,000	Residential	660
R 14	300,702	6,255,910	Commercial	750
R 15	300,814	6,255,753	Commercial	350
R 16	300,148	6,254,988	Commercial	480
R 17	300,106	6,254,854	Commercial	490
R 18	300,118	6,254,763	Commercial	500
R 19	300,079	6,255,874	Commercial	300
R 20	299,901	6,255,833	Commercial	230
R 21	300,110	6,256,144	Commercial	570
R 22	300,284	6,256,222	Commercial	700
R 23	300,390	6,256,252	Commercial	770
R 24	300,775	6,256,146	Commercial	930
R 25	299,016	6,255,008	Commercial	180
R 26	299,086	6,254,889	Commercial	50
R 27	298,957	6,254,894	Commercial	170
R 28	298,840	6,254,916	Commercial	300
R 29	298,652	6,255,022	Commercial	550
R 30	298,667	6,255,333	Commercial	750
R 31	298,389	6,254,765	Commercial	740
R 32	298,372	6,254,624	Commercial	770
R 33	298,372	6,254,473	Commercial	800

Map ID	Easting (m)	Northing (m)	Receptor Type	Distance from Closest Site Boundary (m)
R 34	299,626	6,256,031	Commercial	570
R 35	298,851	6,255,958	Commercial	760
R 36	299,046	6,255,306	Commercial	370
R 37	299,269	6,255,207	Commercial	140
R 38	300,234	6,255,366	Commercial	190
R 39	300,594	6,255,458	Commercial	520
R 40	298,559	6,254,273	Commercial	780
R 41	298,764	6,254,251	Commercial	670

3.4 Local Meteorological Conditions

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 Equestrian Centre Automatic Weather Station (HPEC AWS) (Station ID 67119), located approximately 4 kilometres (km) southeast of the Site.

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, determine 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.

Horsley Park Equestrian Centre AWS, has data available from 1995 to the present for the following parameters:

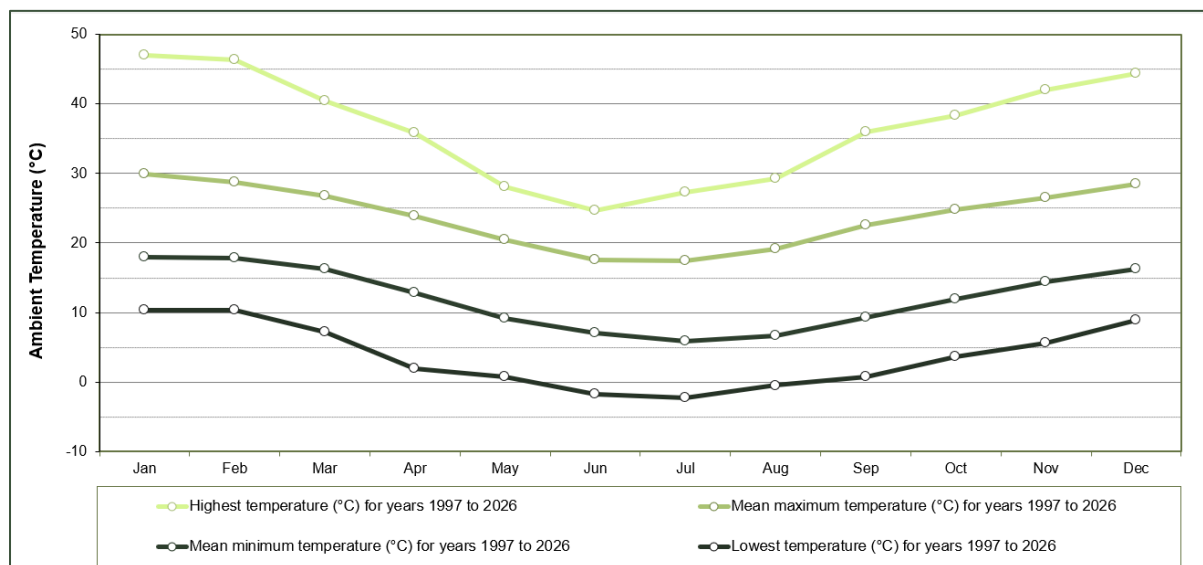
- Temperature (°C)
- Rainfall (mm)
- Relative humidity (%)
- Wind speed (m/s) and wind direction (degrees).

A review of the long-term data collected at this AWS is provided in the following sections.

3.4.1 Temperature

Temperature statistics for Horsley Park Equestrian Centre AWS between 1997 and 2026 are summarised in **Figure 7**. Mean maximum temperatures range from 17.6°C in winter to 30°C in summer, while mean minimum temperatures range from 4.3°C in winter to 17.2°C in summer.

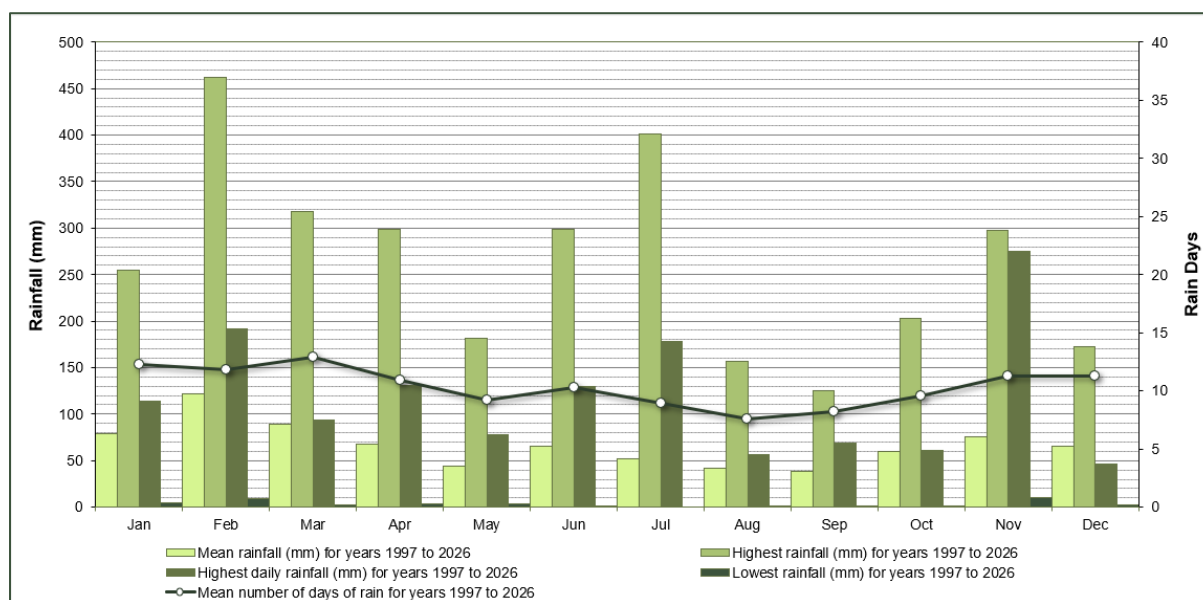
Figure 7 Temperature trends for Horsley Park Equestrian Centre AWS (1997 - 2026)



3.4.2 Rainfall

Rainfall statistics for Horsley Park Equestrian Centre AWS for the years 1997 to 2026 are summarised in **Figure 8**. Mean monthly rainfall is highest in late summer, peaking in February at approximately 120 mm, and remains relatively elevated through March. Rainfall is lowest in late winter to early spring, with August and September recording mean values of around 40–50 mm. The highest monthly rainfall recorded over the period exceeds 450 mm in February, while July also shows a notable peak of around 400 mm. The mean number of rain days per month ranges from approximately 9 days in winter to around 14–15 days in late summer.

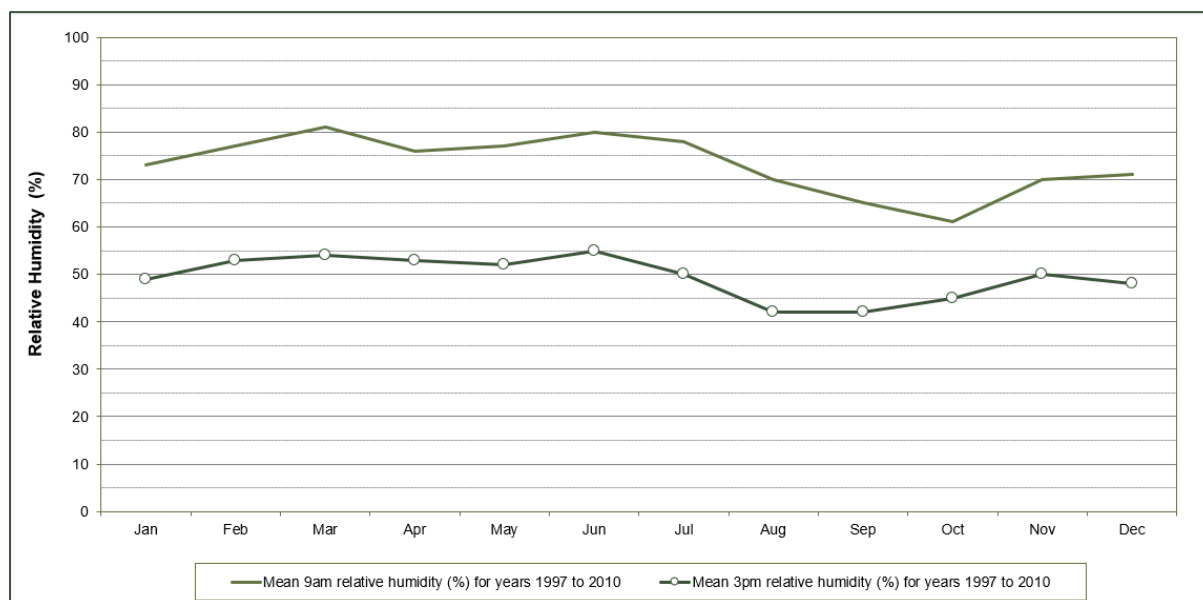
Figure 8 Monthly Rainfall Data for Horsley Park Equestrian Centre AWS (1997 – 2026)



3.4.3 Humidity

Available humidity statistics (9 am and 3 pm monthly averages) for Horsley Park Equestrian Centre AWS for the years 1995 to 2010 are summarised in **Figure 9**. Morning (9 am) relative humidity ranges from approximately 80% in March to around 61% in October, with generally higher values in late summer and lower values in spring. Afternoon (3 pm) relative humidity is consistently lower, ranging from about 55% in June to approximately 42% in August and September.

Figure 9 Humidity Data for Horsley Park Equestrian Centre AWS (1995 – 2010)



3.4.4 Wind

Annual and seasonal wind roses for the past five years, 2021 to 2025, compiled from data recorded by the Horsley Park Equestrian Centre AWS are presented in **Figure 10**. 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.

There are times when the wind is calm (defined as being from zero to 0.5 metres/second), and the percentage of the time that winds are calm is shown as a note on the wind rose.

Table 5 outlines the wind scale used to describe the wind speed.

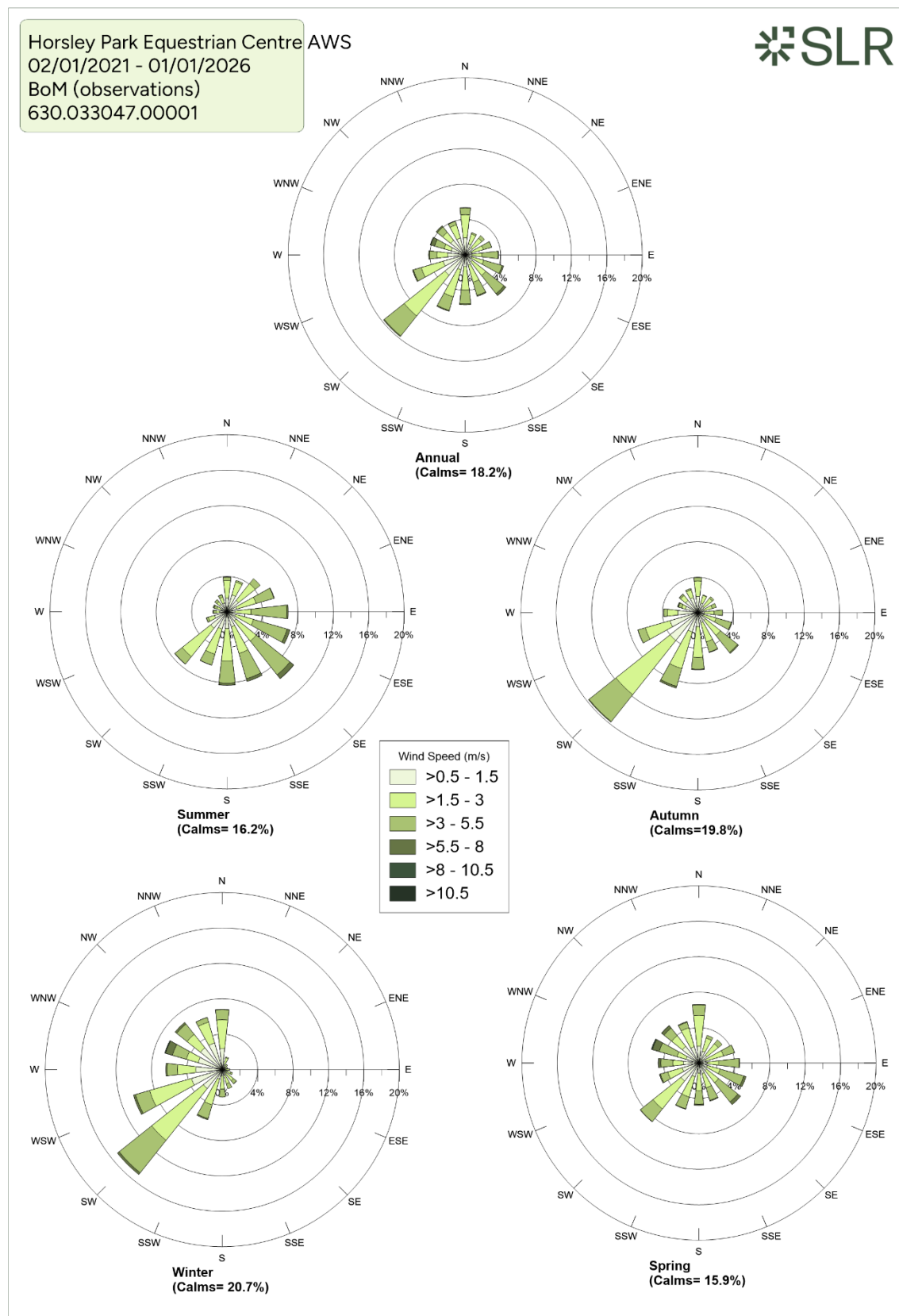
Table 5 Wind Scale Descriptions

Description	km/h	m/s	Description on land
Calm	0-1.8	0-0.5	Smoke rises vertically
Light air	1.8-5.5	0.5-1.5	Smoke drift indicates wind direction
Light breeze	5.4-10.8	1.5-3	Wind felt on face, leaves rustle, light flags extended, ordinary vanes moved by wind
Gentle breeze	10.8-19.8	3-5.5	Leaves and small twigs in constant motion; light flags extended.
Moderate winds	19.8-28.8	5.5-8.0	Raises dust and loose paper, small branches are moved
Fresh winds	28.8-37.8	8.0-10.5	Small trees in leaf begin to sway, crested wavelets form on inland waters
Strong winds	>37.8	>10.5	Large branches in motion, whistling heard in telephone wires; umbrellas used with difficulty

The average seasonal wind roses for the period 2021–2025 indicate that:

- In summer, winds are predominantly light to gentle (generally between 0.5 m/s and 5.5 m/s) and occur mainly from the east through to southeast sectors, with secondary contributions from the south and southwest. Periods of calm conditions are relatively common, with calms occurring 16.2% of the time during summer.
- In autumn, winds are generally light to gentle (between 0.5 m/s and 5.5 m/s) and are strongly dominated by southwesterly winds, with some contribution from the west and south. Calms occur 19.8% of the time during the autumn months.
- In winter, winds are most frequently light to moderate (approximately 1.5 m/s to 8 m/s) and are strongly dominated by the southwest sector, with notable contributions from the west and northwest. Winds from the eastern quadrants are relatively infrequent. Calm conditions occur 20.7% of the time during winter.
- In spring, winds are generally light to gentle (between 0.5 m/s and 5.5 m/s) and are distributed across most wind directions, with a slight predominance from the southwest and south. Calms occur 15.9% of the time during the spring months.

Figure 10 Horsley Park Equestrian Centre Annual and Seasonal Wind Roses 2021-2025



3.5 Background Air Quality

3.5.1 NSW DCCEW Air Quality Data

Air quality monitoring is performed by the NSW Department of Climate Change, Energy, the Environment and Water (DCCEW) at a number of monitoring stations across NSW. The closest station to the Site is the Prospect Air Quality Monitoring Station (AQMS), located approximately 8 km to the northeast of the Site (see **Figure 4**).

The following air pollutants are monitored at this station:

- NO, NO₂ & NO_x
- PM₁₀
- PM_{2.5}
- SO₂

A summary of the monitored pollutant concentrations for the last five years (2021-2025) is presented in **Table 6** and the data are presented graphically in **Figure 11** to **Figure 17**. These illustrate:

- Maximum 24-hour average PM₁₀ concentrations exceeded the 50 µg/m³ criterion once during the monitoring period, in 2025. No exceedances were recorded in 2021–2024. Annual average PM₁₀ concentrations ranged from 13.4 µg/m³ to 17.6 µg/m³, with a five-year average of 16.2 µg/m³, all below the annual average criterion of 25 µg/m³.
- Maximum 24-hour average PM_{2.5} concentrations exceeded the 25 µg/m³ criterion in 2021 and 2023. No exceedances were recorded in 2022, 2024 or 2025. Annual average PM_{2.5} concentrations ranged from 5.3 µg/m³ to 7.4 µg/m³, remaining below the annual average criterion of 8 µg/m³ for all years.
- Maximum 1-hour average NO₂ concentrations measured at Prospect ranged from 86.1 µg/m³ to 100.5 µg/m³, remaining well below the 164 µg/m³ criterion. Annual average concentrations ranged from 13.1 µg/m³ to 18.1 µg/m³, all below the annual criterion of 31 µg/m³.
- Maximum 24-hour average SO₂ concentrations at Prospect ranged from 42.9 µg/m³ to 74.4 µg/m³ across the assessment period, remaining well below the 215 µg/m³ 24-hour criterion. Annual average SO₂ concentrations ranged from 8.6 µg/m³ to 14.3 µg/m³, also well below the relevant criteria.
- Maximum 1-hour average CO concentrations ranged from 1.5 mg/m³ to 1.8 mg/m³, and maximum 8-hour average concentrations ranged from 1.1 mg/m³ to 1.3 mg/m³. All CO concentrations were well below the applicable criteria of 30 mg/m³ (1-hour) and 10 mg/m³ (8-hours).

No TSP monitoring is conducted by the Prospect AQMS. In the absence of any monitoring data for TSP, daily varying ambient TSP concentrations have been estimated from the PM₁₀ concentrations recorded by the Prospect AQMS using a PM₁₀/TSP ratio of 0.4⁵, which is

⁵ This is conservative as when this ratio is determined from the total PM₁₀ and TSP emissions to area in Sydney as detailed in the 2013 Calendar Year Air Emissions Inventory for the Greater Metropolitan Region in NSW, the ratio is 0.6, which would result in a concentration was estimated to be 25.5 µg/m³. This includes the following sources of emissions: natural, commercial, domestic-commercial, industrial, off-road mobile, on-road mobile.

typical for industrial areas in Australia. Therefore, for cumulative analysis purposes, the annual average background TSP concentration was estimated to be 44 µg/m³.

No background dust deposition monitoring is conducted by the Prospect AQMS.

Potential cumulative impacts from construction on surrounding sensitive receptors from the Site and surrounding likely construction developments is considered in **Section 4.4.2**.

Table 6 Summary of Air Quality Monitoring Data at Prospect AQMS (2021-2025)

Pollutant	NO ₂		PM ₁₀		PM _{2.5}		CO		SO ₂	
Averaging Period	Maximum 1-hour	Annual	Maximum 24-hour	Annual	Maximum 24-hour	Annual	Maximum 1-hour	Maximum 8-hour	Maximum 24-hour	Annual
Units	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³	mg/m ³	mg/m ³	µg/m ³	µg/m ³
2021	88.2	14.9	44.6	17.2	37.3	6.9	1.6	1.3	42.9	8.6
2022	86.1	13.1	29.2	13.4	18.2	5.3	1.6	1.1	48.6	8.6
2023	100.5	16.2	44.4	16.8	29.6	7.4	1.8	1.3	68.6	11.4
2024	86.1	18.1	43.5	17.4	20.3	7.3	1.5	1.3	60.1	11.4
2025	98.4	18.0	84.1	17.6	21.7	6.7	1.6	1.3	74.4	14.3
Criterion	164	31	50	25	25	8	30	10	215	57



Figure 11 Measured 24-Hour Average PM₁₀ Concentrations at Prospect AQMS (2021-2025)

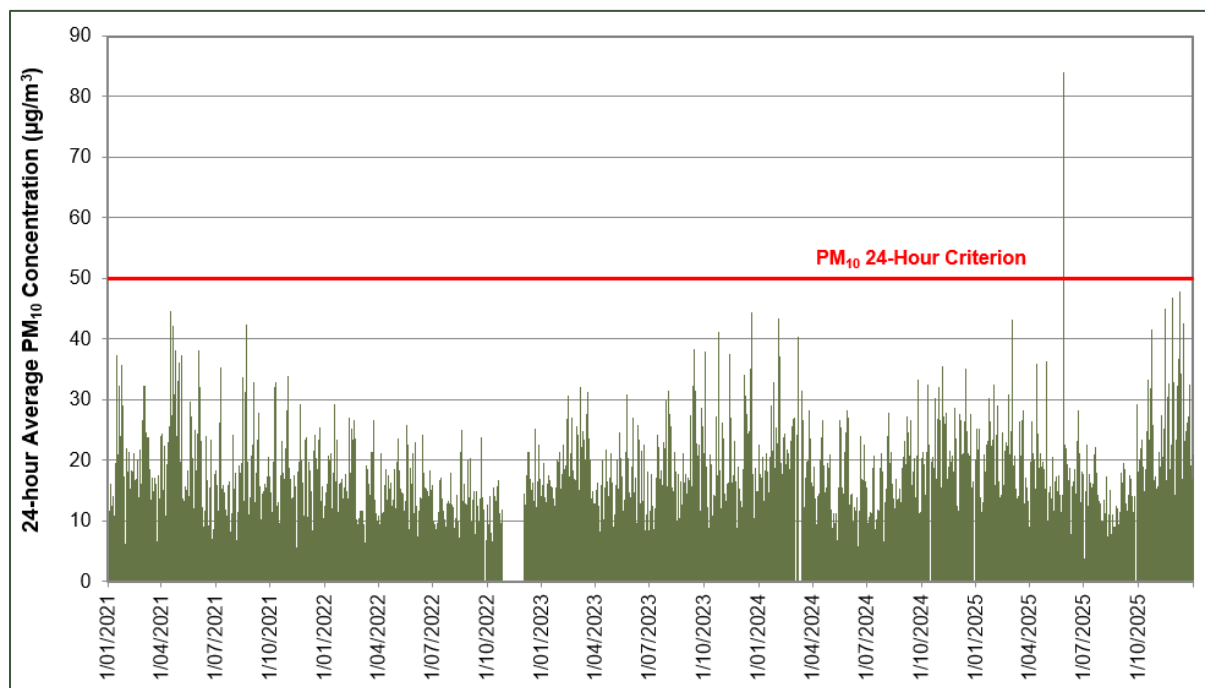


Figure 12 Measured 24-Hour Average PM_{2.5} Concentrations at Prospect AQMS (2021-2025)

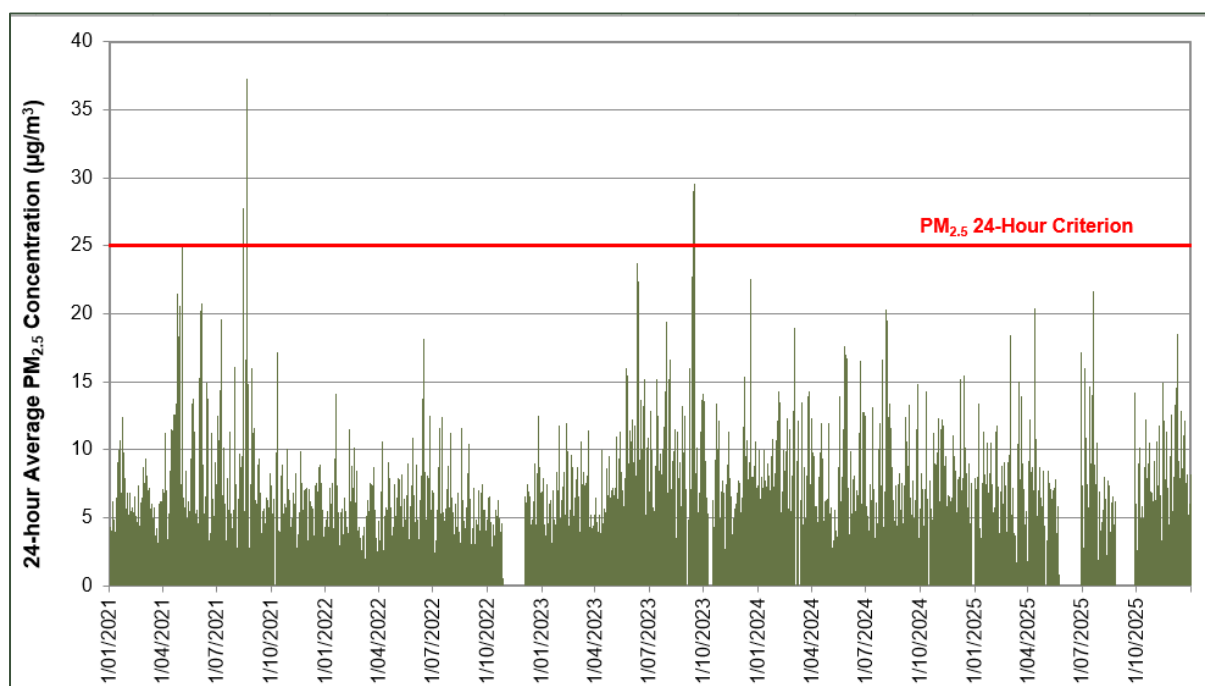


Figure 13 Measured 1-Hour Average NO₂ Concentrations at Prospect AQMS (2021-2025)

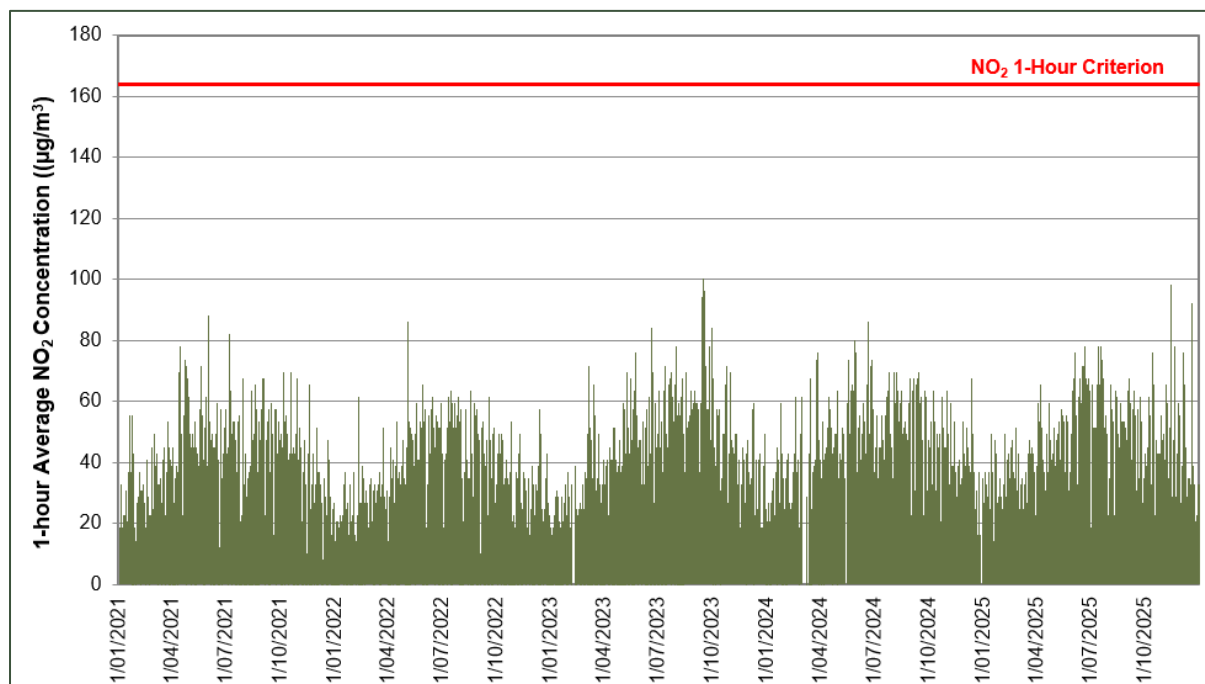


Figure 14 Measured 1-Hour Average CO Concentrations at Prospect AQMS (2021-2025)

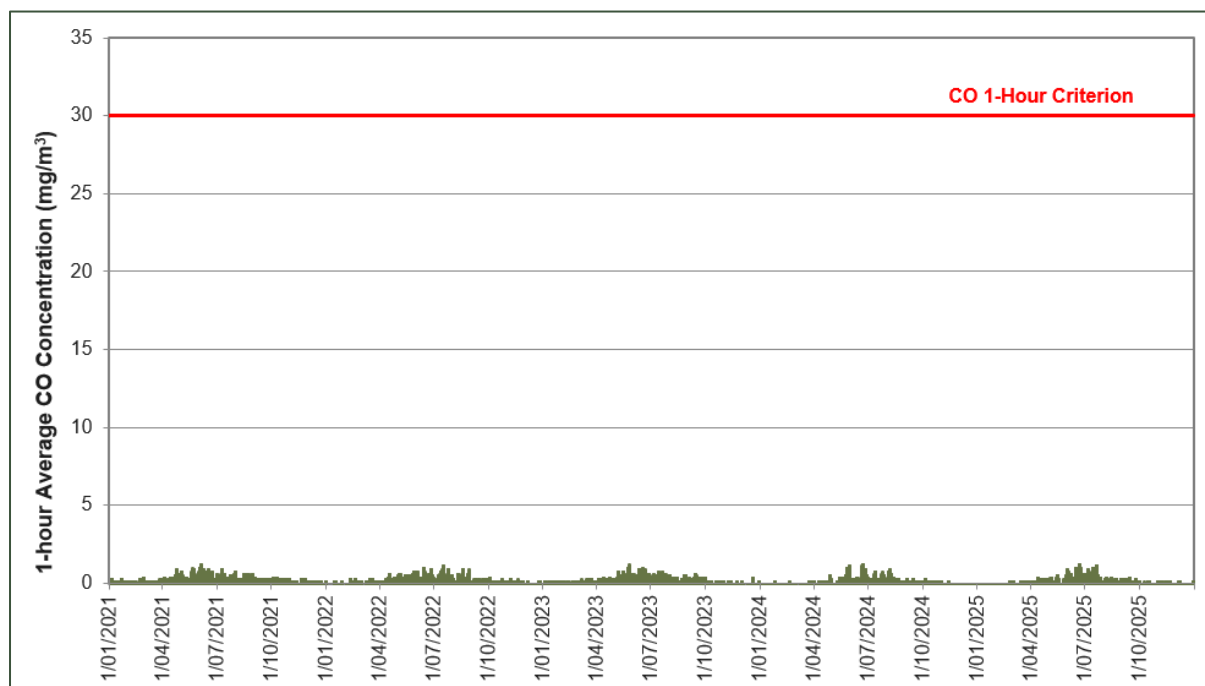


Figure 15 Measured 8-Hour Average CO Concentrations at Prospect AQMS (2021-2025)

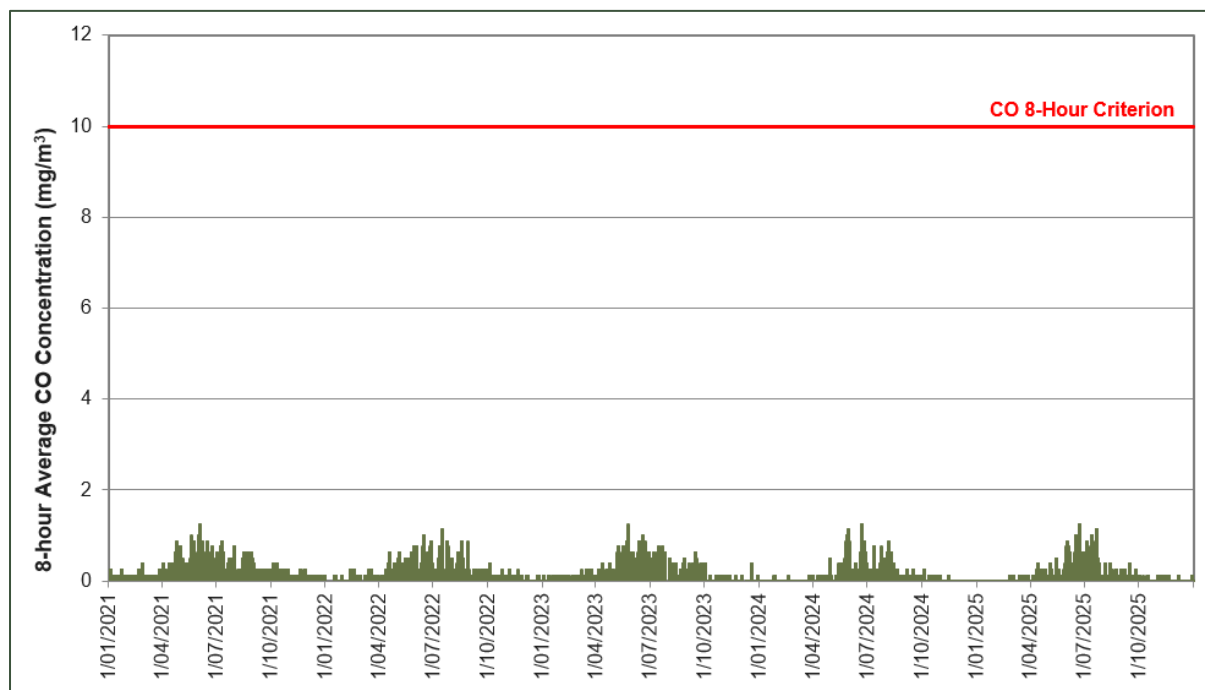


Figure 16 Measured 1-Hour Average SO₂ Concentrations at Prospect AQMS (2021-2025)

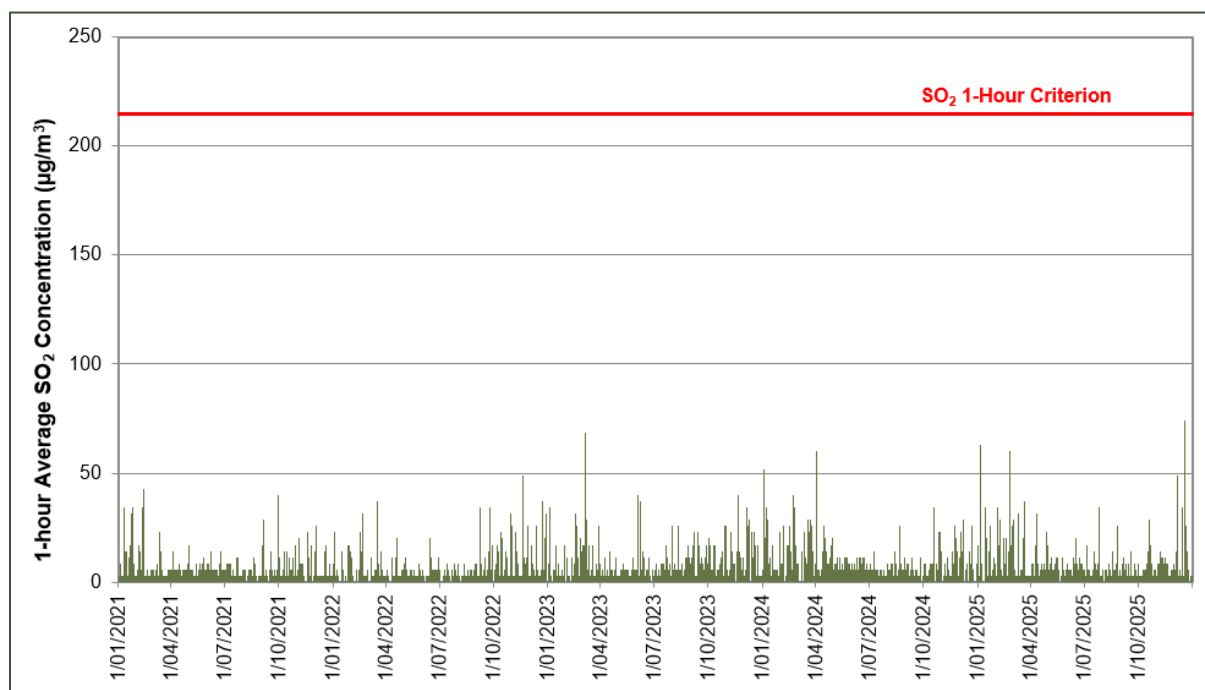
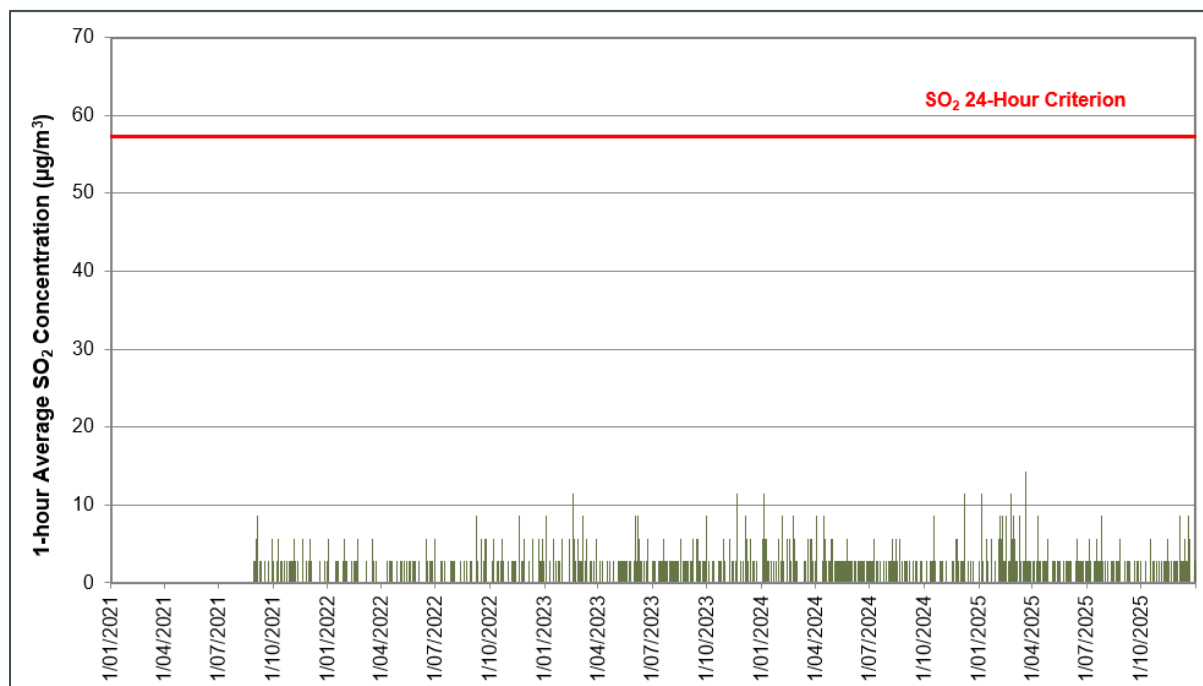


Figure 17 Measured 24-Hour Average SO₂ Concentrations at Prospect AQMS (2021-2025)



3.5.2 Oakdale East Estate Air Quality Monitoring Data

Construction and rehabilitation works are currently being undertaken at the Oakdale East Estate. As part of the project's Conditions of Consent, an approved Construction Environmental Management Plan (CEMP) is in place, which requires the ongoing monitoring and management of dust emissions to minimise impacts on the surrounding environment and demonstrate compliance.

To fulfil these requirements, continuous real-time monitoring of PM₁₀ is performed at key locations across the site. **Figure 18** presents a visual time-series comparison of the on-site PM₁₀ concentrations against the regional background data recorded at the Prospect AQMS.

When interpreting this data, it should be noted that the Prospect AQMS utilises fully compliant, regulatory-grade equipment. In contrast, the on-site monitors are indicative real-time instruments (e.g., light-scattering devices), which is standard industry practice for construction boundary monitoring. While this means the datasets are not strictly an "apples-to-apples" comparison from a regulatory compliance perspective, indicative monitors are robust, industry-accepted tools that perform well in tracking localised particulate trends and enabling proactive site management.

A review of the data in **Figure 18** demonstrates that the on-site PM₁₀ concentrations are generally in line with the regional levels measured at Prospect, following similar temporal trends and regional peaks. This alignment indicates that the site's reactive dust mitigation measures are operating effectively, preventing significant or sustained localised impacts above the broader regional background.

In addition to real-time PM₁₀ monitoring, dust deposition gauges (DDGs) are maintained around the site in accordance with the CEMP. A review of the dust deposition data collected over the March 2025 to March 2026 period has been undertaken and is summarised in **Table 7** which demonstrates that the last 12-month average dust deposition rates across the



compliance network are below the NSW EPA impact assessment criterion of 4 g/m²/month (expressed as an annual average).

Figure 18 Comparison of PM₁₀ Concentrations: Oakdale East Real-Time Monitors vs Prospect AQMS

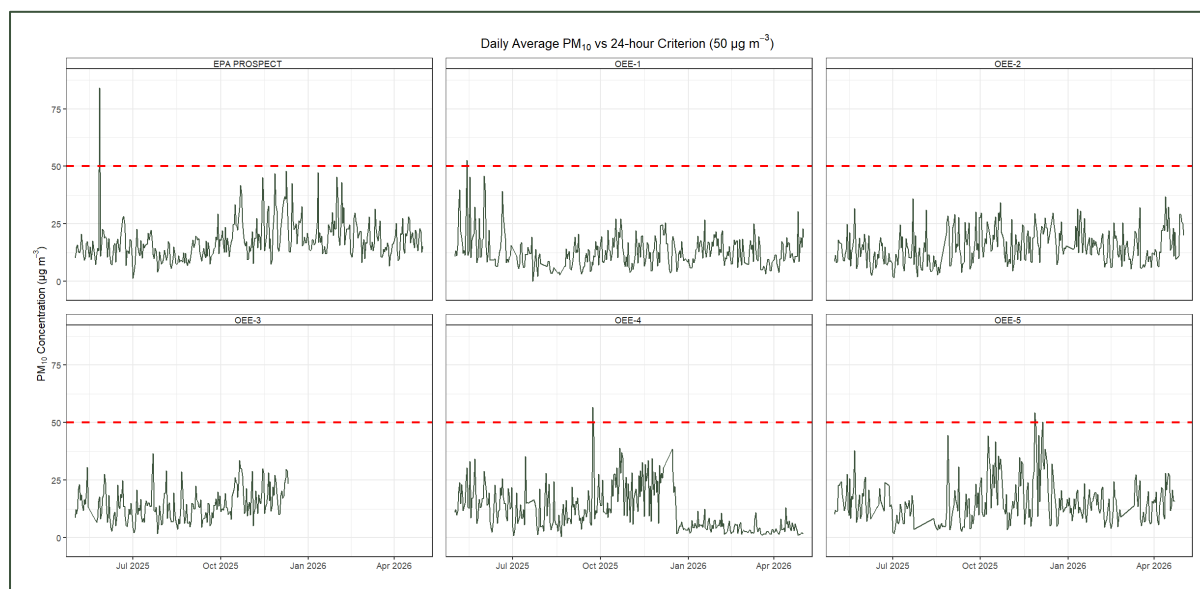


Table 7 Summary of CEMP Dust Deposition Monitoring (March 2025 – March 2026)

DDG Location	Feb 2025-March 2026 (g/m ² /month)	NSW EPA Impact Assessment Criterion
South Dust Deposition Gauge	0.6	4.0
East Dust Deposition Gauge	1.2	4.0



4.0 Construction Assessment Methodology

The assessment of air emissions from the proposed construction has been performed quantitatively using dispersion modelling techniques.

The dispersion modelling was performed using the CALPUFF dispersion model (Version 6). The CALPUFF dispersion model is approved by NSW EPA for the modelling of air quality impacts in NSW and it has been used in numerous air quality impact assessments in NSW and across Australia.

CALPUFF is a transport and dispersion model that ejects “puffs” of material emitted from modelled sources, simulating dispersion and transformation processes along the way. In doing so it typically uses the fields generated by a meteorological pre-processor CALMET. Topographical, temporal and spatial variations in the meteorological fields selected are explicitly incorporated in the resulting distribution of puffs throughout a simulation period.

The primary output files from CALPUFF contain hourly concentrations or deposition values evaluated at selected receptor locations. The CALPOST post-processor is then used to process these files, producing tabulations that summarise results of the simulation for user-selected averaging periods.

4.1 Meteorological Modelling

Meteorological mechanisms govern the dispersion, transformation and eventual removal of pollutants from the atmosphere. The extent to which pollution will accumulate or disperse in the atmosphere is dependent on the degree of thermal and mechanical turbulence within the earth’s boundary layer. Dispersion comprises vertical and horizontal components of motion. The stability of the atmosphere and the depth of the surface-mixing layer define the vertical component. The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field. The wind speed determines both the distance of downwind transport and the rate of dilution as a result of plume ‘stretching’. The generation of mechanical turbulence is similarly a function of the wind speed, in combination with the surface roughness. The wind direction, and the variability in wind direction, determines the general path pollutants will follow, and the extent of crosswind spreading.

Pollution concentration levels therefore fluctuate in response to changes in atmospheric stability, to concurrent variations in the mixing depth, and to shifts in the wind field (Oke 1988).

To adequately characterise the dispersion meteorology of the Site, information is needed on the prevailing wind regime, mixing height and atmospheric stability and other parameters such as ambient temperature, rainfall and relative humidity.

In order to determine a representative meteorological year for use in dispersion modelling, five years of meteorological data (2021-2025) from the closest meteorological monitoring station (i.e. Horsley Park Equestrian Centre AWS) were analysed against the five-year average meteorological conditions. Specifically, the following parameters were analysed:

- Frequency and distribution of the predominant wind directions
- Monthly average wind speeds observed
- Monthly average temperatures.

Based on this analysis, it was concluded that the year 2021 was representative of the last five years of meteorological conditions experienced at the Site and hence the 2021 calendar



year was adopted for use in this assessment. A summary of the analysis is presented in **Appendix A**.

Details of the meteorological modelling completed are provided below. A summary of the meteorological model domain details is provided in **Table 8**. Evaluation of the processed meteorological data is provided **Appendix B**.

4.1.1 TAPM

In order to calculate all required meteorological parameters required by the dispersion modelling process, meteorological modelling using The Air Pollution Model (TAPM, v 4.0.4) has been performed. TAPM, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) is a prognostic model which may be used to predict three-dimensional meteorological data and air pollution concentrations.

TAPM model predicts wind speed and direction, temperature, pressure, water vapour, cloud, rainwater and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations at user-defined levels within the atmosphere. A full description of TAPM is available in the model user manual (CSIRO, 2008).

TAPM model may assimilate actual local wind observations so that they can optionally be included in a model solution. However, given that TAPM is known to under-predict calm wind conditions, the wind speed and direction observations obtained from the nearest BoM and stations have also been used in the subsequent CALMET component of the modelling as described in **Section 4.2**.

The dispersion modelling requires twelve months of hourly timestep meteorological data. The Air Pollution Model (TAPM) was used to generate site-representative data for input into CALMET for further processing of the fine scale three-dimensional wind field data required for the CALPUFF dispersion model.

4.1.2 CALMET

In the simplest terms, CALMET is a meteorological model that develops hourly wind and other meteorological fields on a three-dimensional gridded modelling domain that are required as inputs to the CALPUFF dispersion model. Associated two-dimensional fields such as mixing height, surface characteristics and dispersion properties, are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, sea breeze, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field. The final hourly varying wind field thus reflects the influences of local topography and land uses.

A full description of the CALMET/CALPUFF model is available in the CALPUFF manual (SRC 2011).

The CALMET domain was modelled with a resolution of 0.05 km. The TAPM-generated 3-dimensional meteorological data (1 km resolution) was used as the 'initial guess' wind field and the local topography and available surface weather observations in the area were used to refine the wind field predetermined by TAPM.



Table 8 TAPM and CALMET Modelling Domain Details

Model and Domain Settings	Details	Model and Domain Settings	Details
TAPM		CALMET	
5 nested grids	25 x 25 x 35 grid points	Domain size	10 km x 10 km
Grid point resolutions	30 km, 10 km, 3 km, 1 km	Receptor grid	50 m resolution
Domain origin centre point	E: 295,164 N: 6,253,975 Zone: 56H	Domain origin southwest corner	E: 295,000 N: 6,250,000 Zone: 56H
Period	31/12/2020 to 01/01/2022	Period	31/12/2020 to 01/01/2022
Modelled with wind assimilation data for Horsley Park Equestrian Centre AWS. Further details on model settings can be provided as required.		Initial guess field	3D output from TAPM

4.2 Dispersion Modelling

CALPUFF was used for the dispersion modelling and is widely used in Australia as a suitable model for a range of applications and conditions including odour modelling assessments.

As with any air dispersion model, CALPUFF requires inputs in three major areas:

- emission rates and source details
- meteorology
- terrain and surface details, as well as specification of specific receptor locations.

A summary of the model details is provided in **Table 9**.

Table 9 CALPUFF Domain Details and Model Settings

Item	Details
Domain details	50 m resolution for a 10 km by 10 km domain
Receptor details	50 m resolution gridded receptors and 41 discrete receptors
Emissions data	Varys by emission source. Refer to Appendix D for details.
Further details on model settings can be provided as required.	

4.2.1 Model Configuration

Emissions from the activities at the Site were represented by a series of volume sources, while wind erosion from exposed areas was represented by area sources.

The estimated particulate emissions were modelled as:

- Fine Particulates (FP < 2.5 µm).
- Coarse Matter (2.5 µm < CM < 10 µm).



- The Rest (RE>10 µm).

These parameters were then grouped using CALPOST to predict PM_{2.5}, PM₁₀ and TSP concentrations at surrounding receptor locations. This approach provides the most realistic treatment of the differing size fractions, with the lighter, finer particulate matter being dispersed further than the heavier size fraction which settles out of the air more rapidly.

Based on the sensitivity of each activity to wind speed, an hourly varying emission file representing hourly FP, CM and RE emissions for each source was generated using the annual average emission rate estimated for each activity. Details of the algorithm used to generate the variable emission files are presented in **Appendix D**.

4.3 Accuracy of Modelling

All atmospheric dispersion models, including CALPUFF, represent a simplification of the many complex processes involved in the dispersion of pollutants in the atmosphere. To obtain good quality results it is important that the most appropriate model is used and the quality of the input data (meteorological, terrain, source characteristics) is adequate.

The main sources of uncertainty in dispersion models, and their effects, are discussed below:

- Oversimplification of physics: This can lead to both under-prediction and over-prediction of ground level pollutant concentrations. Uncertainties are greater in Gaussian plume models as they do not include the effects of non-steady-state meteorology (i.e., spatially- and temporally varying meteorology).
- Uncertainties in emission rates: Ground level concentrations are proportional to the pollutant emission rate. In addition, most modelling studies assume constant worst-case emission levels or are based on the results of a small number of stack tests, however operations (and thus emissions) are often quite variable. Accurate measurement of emission rates and source parameters requires continuous monitoring.
- Uncertainties in wind direction and wind speed: Wind direction affects the direction of plume travel, while wind speed affects plume rise and dilution of plume. Uncertainties in these parameters can result in errors in the predicted distance from the source of the plume impact, and magnitude of that impact. In addition, aloft wind directions commonly differ from surface wind directions. The preference to use rugged meteorological instruments to reduce maintenance requirements also means that light winds are often not well characterised.
- Uncertainties in mixing height: If the plume elevation reaches 80% or more of the mixing height, more interaction will occur, and it becomes increasingly important to properly characterise the depth of the mixed layer as well as the strength of the upper air inversion.
- Uncertainties in temperature: Ambient temperature affects plume buoyancy, so inaccuracies in the temperature data can result in potential errors in the predicted distance from the source of the plume impact, and magnitude of that impact.
- Uncertainties in stability estimates: Gaussian plume models use estimates of stability class, and 3D models use explicit vertical profiles of temperature and wind (which are used directly or indirectly to estimate stability class for Gaussian models). In either case, uncertainties in these parameters can cause either under-prediction or over-



prediction of ground level concentrations. For example, if an error is made of one stability class, then the computed concentrations can be off by 50% or more.

- The US EPA makes the following statement in its Modelling Guideline (US EPA 2005) on the relative accuracy of models:

“Models are more reliable for estimating longer time-averaged concentrations than for estimating short-term concentrations at specific locations; and the models are reasonably reliable in estimating the magnitude of highest concentrations occurring sometime, somewhere within an area. For example, errors in highest estimated concentrations of ± 10 to 40% are found to be typical, i.e., certainly well within the often-quoted factor-of-two accuracy that has long been recognised for these models. However, estimates of concentrations that occur at a specific time and site are poorly correlated with actually observed concentrations and are much less reliable.”

4.4 Emission Estimation

4.4.1 Construction Activities

To effectively estimate the worst-case impacts associated with the proposed construction activities at the Site, a maximum annual operating scenario was assessed and assumed to occur every day. This approach ensures that the 24-hour impacts for the peak construction phase are appropriately captured.

The total duration of bulk earthworks (primarily fill import and placement) is anticipated to be approximately 15.5 months (1 January 2027 to 15 April 2028). It is anticipated that from July 2027 onwards, works associated with the construction of the proposed buildings would also commence and overlap with the bulk earthworks. It is understood that the Bulk Earthworks and Rehabilitation (including an initial Containment Cell) Works approved under DA 347.1/2021 would be completed prior to the commencement of the fill import and placement works and building construction works.

Import and placement activities are proposed to occur 24 hours per day, 7 days per week. Other construction activities, including dozer operations and general construction works, are proposed to occur during standard construction hours only (7:00 am to 6:00 pm Weekdays and 8:00 am to 1:00 pm Saturdays). For the purpose of the assessment, the model assumes continuous operation over 365 days per year to conservatively assess all meteorological conditions.

The emission-generating activity intensities were derived by averaging the indicative bulk material volumes over the anticipated total construction duration. The assessment assumes that import, placement, cut, and export activities may occur concurrently to represent a conservative worst-case scenario. Wind erosion emissions were modelled continuously over 24 hours per day and 365 days per year. The equipment is anticipated to include the following:

- Dozers
- Graders
- Dump trucks
- Material delivery trucks
- Water trucks



It is important to note that as the emission inventory is based on quantity (and type) of material moved, and/or distance travelled, the precise numbers and types of equipment would not change the extent or shape of the predicted dust dispersion.

In addition, as the precise location of the equipment will vary on a day-to-day basis, the emissions estimation conservatively assumes that multiple equipment will be operating concurrently across the Site. Thus, the predicted contributions are also considered to be conservative, particularly with respect to travel on unsealed roads.

A detailed breakdown of the emissions factors and assumptions used to estimate the Site emissions is provided in **Appendix C**. The estimated emissions for each activity are presented in **Table 10**.



Table 10 Activity Emission Rates

Description	Annual Average Emission Rate (kg/y)		
	TSP emission (kg/y)	PM ₁₀ emission (kg/y)	PM _{2.5} emission (kg/y)
Loading material to trucks in cut area for transfer to stockpile	38	18	3
Haulage of excavated material to stockpiles	2,351	673	67
Unloading excavated material at stockpile	38	18	3
Haulage of imported material to stockpile/fill area	25,210	7,220	722
Unloading imported material at stockpile/fill area	468	221	34
Loading stockpiled material to trucks for transfer to fill	81	38	6
Haulage of stockpiled material from stockpile to fill area	4,975	1,425	142
Unloading of stockpiled material at fill area	81	38	6
Loading unusable cut material for export	26	12	2
Haulage of unusable cut material offsite	1,390	398	40
Heavy vehicles travelling on unpaved surfaces – General Construction	48,393	13,859	1,386
Dozer	62,230	13,410	6,534
Grader	7,199	2,904	223
Wind erosion Area 1	22,776	11,388	1,708
Wind erosion Area 2	18,971	9,486	1,423
Wind erosion Area 3	5,681	2,841	426
Diesel combustion	1,878	1,878	1,798
Total TSP emissions (kg/yr)	201,786	65,829	14,522



4.4.2 Surrounding Sources

Surrounding the proposed development, there are other existing or likely future developments that may give rise to potential cumulative impacts during construction. These developments are reviewed in **Table 12**. Sources included in the assessment are shown in **Figure 19**.

To estimate emissions from construction activities at these surrounding developments, in the absence of detailed air quality impact assessments from these approved/proposed developments, emissions were estimated using emission factors derived from comparable large-scale construction projects in the vicinity of the Site.

To derive an appropriate emission factor, a review of detailed emission inventories prepared for four comparable local projects was undertaken (125-175 Lawson Road, 225-245 Martin Road, and two confidential local projects). To establish a normalised emission rate, the total estimated annual emissions (kg/year) for each benchmark project were first divided by their respective disturbed site area (hectares) to determine a site-specific emission rate (kg/hectare/year). These individual rates were then averaged across the four benchmark projects. This average area-based rate was subsequently converted into a standardised surface flux (g/m²/s) for input into the dispersion model. This final conversion accounted for unit standardisation and an assumed construction operational window of 11 hours per day. A summary of the derived emission factors is presented in **Table 11**.

Table 11 Summary of Emission Data Used to Derive Emission Factor

Activity	Pollutant	125-175 Lawson Road (kg/y)	Confidential Project A (kg/y)	Confidential Project B (kg/y)	225-245 Martin Road (kg/y)	Derived Emission Factor (g/m ² /s)
Construction Activities	TSP	4,236	1,108	10,447	4,790	3.56E-05
	PM ₁₀	1,138	371	3,248	1,432	1.07E-05
	PM _{2.5}	320	37	325	275	1.66E-06
Wind Erosion	TSP	1,752	3,504	3,504	1,752	8.33E-06
	PM ₁₀	876	1,752	1,752	876	4.17E-06
	PM _{2.5}	88	263	263	131	5.90E-07
Disturbed Site Area (ha)	-	7	27	26	88	-

These derived emission factors were then applied to the area of the Surrounding Sources to calculate the total annual emissions, which were subsequently converted to grams per second (g/s) for input into the dispersion model.

The resulting estimated emissions for all surrounding sources are detailed in **Table 13**.

To ensure a conservative cumulative assessment, the modelling assumed that for all Surrounding Sources:

- All proposed developments would be under construction simultaneously;
- 50% of the developable land for each surrounding site is actively under construction at any given time;



- Construction occurs 365 days a year, for 11 hours per day (7:00 am to 6:00 pm), with wind erosion modelled continuously; and
- Mitigation controls achieve a similar reduction efficiency to those applied at the Site (see **Section 5.5**).



Table 12 Surrounding Developments

Source Number (Figure 19)	Development	Status	Consideration	Construction Details
Source 1	Gazcorp Industrial Estate	Approved	This development is located within 1km from the Site, cumulative impacts are considered possible.	The site area is approximately 265,000 m ² , however the total project area is approximately 132,500 m ² ^a . An air quality impact assessment is publicly available for the development. However, it does not include a detailed quantitative assessment of construction stage impacts.
Source 2	NEXTDC S4 Data Centre Horsley Park	Approved	This development is located within 1km from the Site, cumulative impacts are considered possible.	The site area is approximately 82,000 m ² , however the total project area is approximately 41,000 m ² ^b . An air quality impact assessment is publicly available for the development. However, it does not include a detailed quantitative assessment of construction stage impacts.
Source 3	NEXTDC S4 Data Centre Phase 2, Horsley Park	Prepare EIS	This development is located within 1km from the Site, cumulative impacts are considered possible.	The site area is approximately 42,050 m ² , however the total project area is approximately 21,025 m ² ^c . An air quality impact assessment is not publicly available for the development.
Source 4	Horsley Logistics Park Stage 2	Approved	This development is located within 1km from the Site, cumulative impacts are considered possible.	The site area is approximately 86,721 m ² , however the total project area is approximately 43,361 m ² ^d . An air quality impact assessment is publicly available for the development. However, it does not include a detailed quantitative assessment of construction stage impacts.
Source 5	Eastern Creek Drive Development	n/a	This development is located within 1km from the Site, cumulative impacts are considered possible.	The site area is estimated to be approximately 30,000 m ² , based on aerial imagery. An assessment of air quality impacts is not publicly available at this stage.
Notes: a– Source: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-74191717%2120250520T055155.401%20GMT, Accessed 8 May 2026. b– Source: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-65529236%2120231206T221219.036%20GMT, Accessed 8 May 2026. c – Source: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=PDA-81613458%2120250327T235757.337%20GMT, Accessed 8 May 2026. d – Source: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=EXH-83152958%2120251013T041327.831%20GMT, Accessed 8 May 2026.				

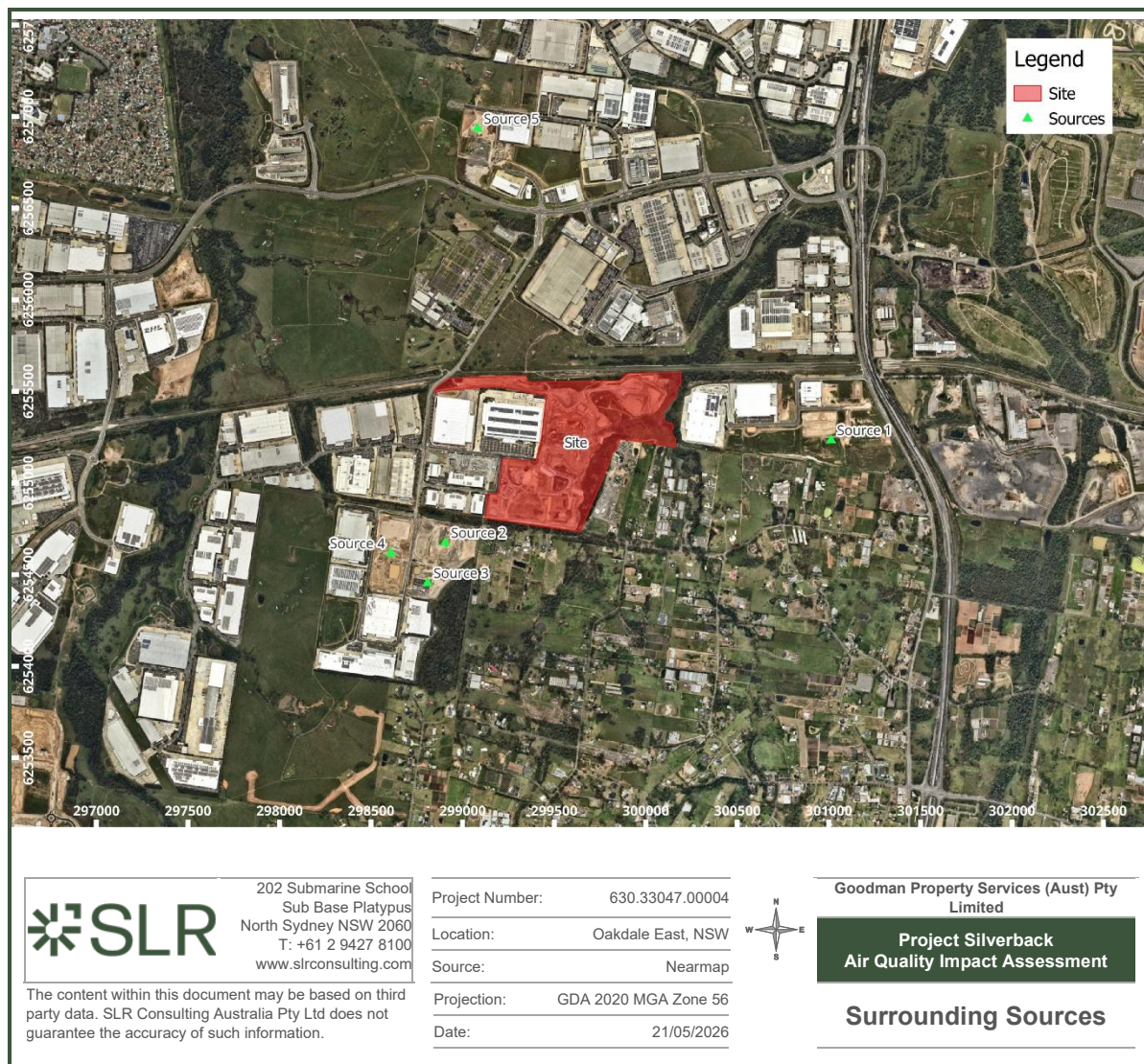


Table 13 Summary of Emission Rates used to Assess Cumulative Impacts – Surrounding Sources

Activity	Address of Construction	Area Modelled (m ²)	TSP emissions (g/s)	PM ₁₀ emissions (g/s)	PM _{2.5} emissions (g/s)
Construction	Gazcorp Industrial Estate	132,500	2.16	0.65	0.1
	NEXTDC S4 Data Centre Horsley Park	41,000	0.67	0.2	0.03
	NEXTDC S4 Data Centre Phase 2, Horsley Park	21,025	0.34	0.1	0.02
	Horsley Logistics Park Stage 2	43,361	0.71	0.21	0.03
	Eastern Creek Drive Development	15,000	0.24	0.07	0.01
Wind Erosion	Gazcorp Industrial Estate	132,500	1.10	0.55	0.08
	NEXTDC S4 Data Centre Horsley Park	41,000	0.34	0.17	0.02
	NEXTDC S4 Data Centre Phase 2, Horsley Park	21,025	0.18	0.09	0.01
	Horsley Logistics Park Stage 2	43,361	0.36	0.18	0.03
	Eastern Creek Drive Development	15,000	0.13	0.06	0.01



Figure 19 Location of Modelled Surrounding Sources



4.5 Adopted Background for this Assessment

The purpose of assessing background air quality is to determine the concentrations of air pollutants currently experienced at surrounding receptors, with the predicted concentrations from the Site and any other cumulative sources modelled added to these background concentrations to identify the likely future cumulative air quality impacts.

For the purposes of assessing potential cumulative off-site air quality impacts, an estimation of ambient air quality concentrations is required. In accordance with the Approved Methods, the background data used in this AQIA is based on the same year as the meteorological year used in the modelling (ie 2021).

The representative background ambient air quality concentrations adopted for use in this assessment are summarised in **Table 14**.



Table 14 Adopted Background Data

Pollutant	Averaging Period	Concentration	Notes
TSP	Annual	44 µg/m ³	Calculated from PM ₁₀ concentrations at Prospect AQMS during 2021 during a PM ₁₀ /TSP ratio of 0.4
PM ₁₀	24-hour	Daily varying	As monitored at Prospect AQMS during 2021
	Annual	17.2 µg/m ³	As monitored at Prospect AQMS during 2021
PM _{2.5}	24-hour	Daily varying	As monitored at Prospect AQMS during 2021
	Annual	6.9 µg/m ³	As monitored at Prospect AQMS during 2021
Deposited dust	Annual	2 g/m ² /month	An adopted background value of 2.0 g/m ² /month has been applied to the cumulative assessment. A review of site-specific monitoring data from Oakdale East Estate for the last 12 months indicates that current actual annual average deposition rates in the immediate vicinity are generally lower than this adopted value. Therefore, the use of 2.0 g/m ² /month provides a conservative baseline for assessing the cumulative impacts of the Project. (refer Section 3.5.2)



5.0 Assessment of Construction Air Quality Impacts

The sections below present a summary of the air quality impacts predicted by the modelling at the worst impacted sensitive receptors modelled.

Isopleth plots showing the incremental impact predicted due to the Site emissions (ie excluding background levels) for each pollutant are presented in **Appendix F**. These plots do not represent the dispersion pattern for any individual time period but rather illustrate the maximum concentration that was predicted to occur at each model calculation point given the range of meteorological conditions occurring over the 2021 modelling period.

5.1 Particles as PM_{2.5}

5.1.1 Maximum 24-Hour Average PM_{2.5} Concentrations

Table 15 summarises the incremental and cumulative 24-hour average PM_{2.5} impacts for the 15 most affected discrete receptor locations modelled. These locations were selected based on the maximum 24-hour PM_{2.5} increments predicted by the modelling due to the proposed construction works.

A contemporaneous analysis was conducted to assess cumulative impacts against the relevant air quality criteria. This involved combining the incremental 24-hour PM_{2.5} impacts from Site construction activities with the developments identified in **Section 4.4.2** (Surrounding Sources) and the daily varying background concentrations recorded at the Prospect AQMS on an hour-by-hour basis.

Cumulative 24-hour average PM_{2.5} concentrations are predicted to exceed the 25 µg/m³ criterion at all modelled receptors, these results are heavily influenced by elevated background levels. It is noted that the background data for the 2021 meteorological year already included two exceedances of the criterion, independent of the Site's activities.

Receptor R37, identified as having the highest incremental impact, is predicted to experience eight additional exceedances above the background levels. However, the number of additional exceedances at R37 would decrease if emissions from surrounding construction sites are adequately controlled or if all Surrounding Sources are not simultaneously under construction. Further, the recommended trigger action response plan (TARP) and monitoring outlined in **Section 5.5.2** could significantly reduce the likelihood of additional exceedances (but only if the Site is driving these exceedances).

A detailed daily contemporaneous analysis of Receptor R37 is presented in **Figure 20** and **Figure 21**, illustrating that incremental impacts from the Site are highest during the winter months. **Figure 21** illustrates that for the vast majority of days, throughout the year cumulative concentrations are well below the NSW EPA impact assessment criterion of 25 µg/m³ at the most impacted receptor.

Isopleths showing dispersion patterns across the modelling domain are provided in **Appendix F**.



Table 15 Top 15 Highest PM_{2.5} Incremental Impact Receptors - 24-Hour PM_{2.5} Impact

Receptor ID	Maximum 24-Hour Average PM _{2.5} Concentrations (µg/m ³)		Additional Exceedances ² due to Site Activities & Surrounding Sources	Additional Exceedances ² due to Site Activities only
	Incremental Impact	Cumulative Impact ¹		
R37	12.9	38.7	8	8
R38	12.4	44.9	4	5
R7	12.1	39.7	2	2
R12	11.5	39.7	2	2
R8	10.1	39.9	2	2
R26	8.5	39.2	3	2
R20	8.0	38.6	3	3
R11	7.9	40.2	3	1
R16	7.7	41.3	1	2
R25	7.2	38.1	0	1
R17	6.6	40.2	1	2
R36	6.5	37.7	0	1
R13	6.4	40.7	1	2
R10	6.4	40.2	3	1
R27	6.3	38.5	2	0
Criterion		25		
1 – Cumulative impact includes: Site activities, Surrounding Sources, background concentrations.				
2 – Additional exceedances above and over Prospect AQMS				



Figure 20 Daily Contemporaneous Analysis for Receptor R37

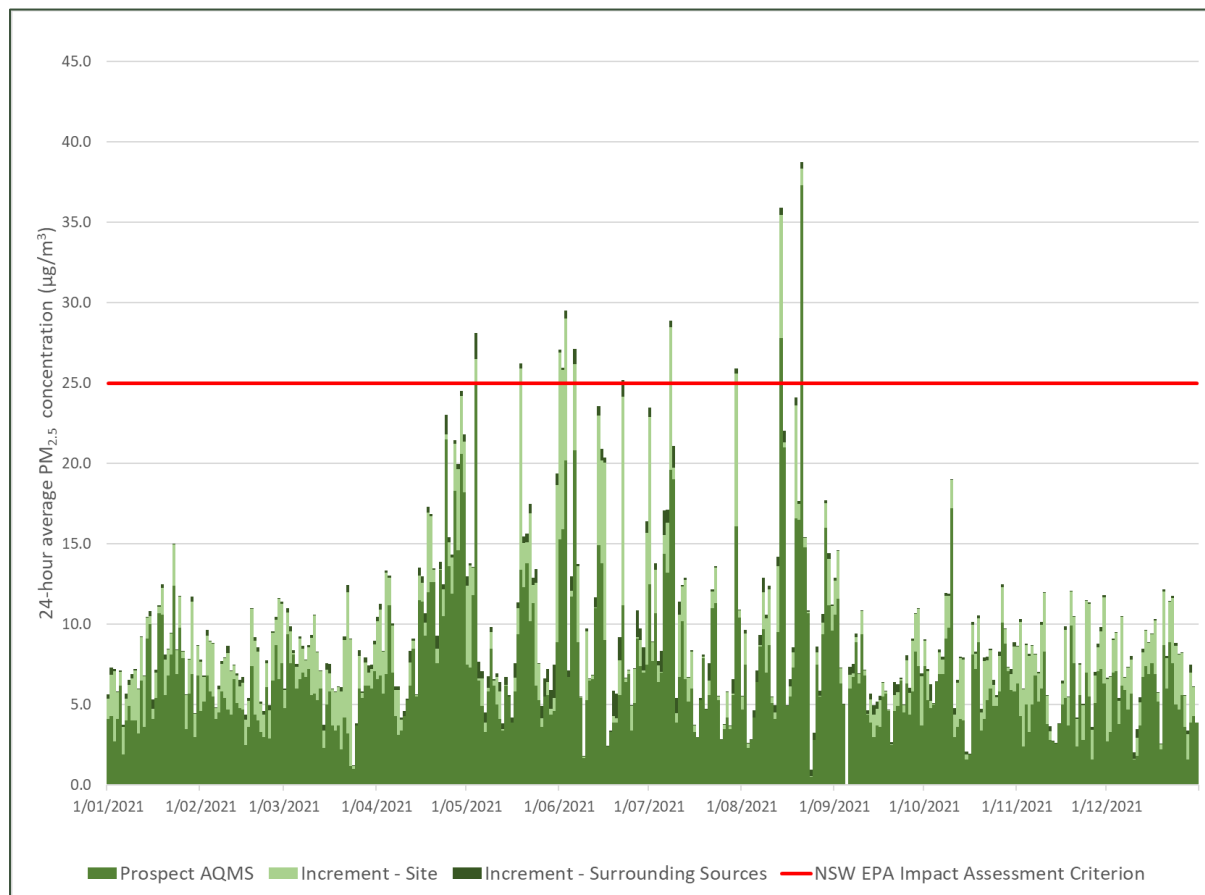
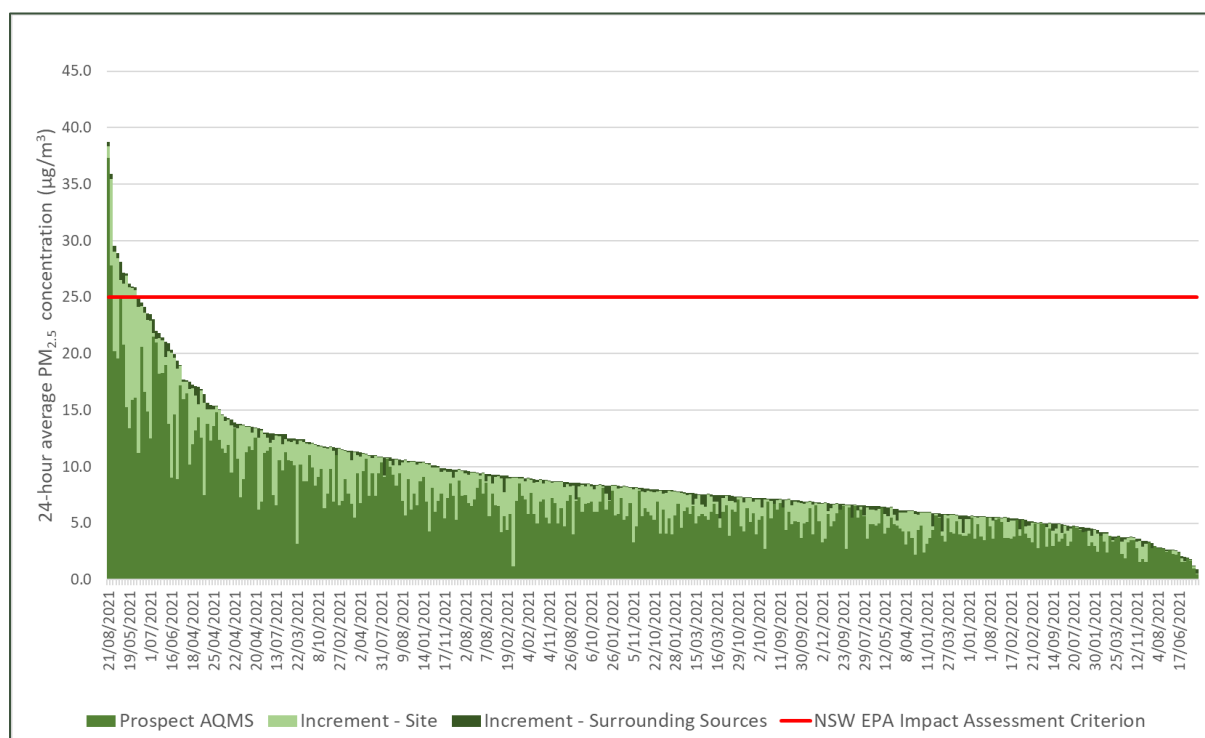


Figure 21 Ranked Daily Contemporaneous Analysis for Receptor R37



5.1.2 Annual Average PM_{2.5} Concentrations

Table 16 summarises the incremental and cumulative annual average PM_{2.5} impacts for the 15 most affected discrete receptor locations modelled. These locations were selected based on the annual average PM_{2.5} increments predicted by the modelling due to the proposed construction works at the Site. Cumulative impacts have been assessed against the PM_{2.5} annual average criterion by combining predicted contributions from Site activities, Surrounding Sources, and background concentrations adopted from the Prospect AQMS.

The cumulative annual average PM_{2.5} concentrations are predicted to exceed the annual average PM_{2.5} criterion of 8 µg/m³ at 14 of the 41 receptors modelled. However, these predictions overestimate the impacts as the conservative assumptions used in the emission estimation, to ensure short-term impacts were not underestimated, lead to an overestimation of annual averages.

Receptor R37, identified as the most impacted location, is predicted to receive annual average PM_{2.5} concentrations that exceed the annual criterion by 1.3 µg/m³. As outlined in **Section 5.5.2**, cumulative impacts at R37 would decrease if emissions from surrounding construction sites are adequately controlled, if all Surrounding Sources are not simultaneously under construction or if the recommended TARP, mitigation activities and monitoring outlined in **Section 5.5** is implemented.

Annual average PM_{2.5} isopleths illustrating dispersion patterns across the modelling domain are provided in **Appendix F**.

Table 16 Top 15 Highest PM_{2.5} Incremental Impact Receptors - Annual PM_{2.5} Impact

Receptor ID	Annual Average PM _{2.5} Concentrations (µg/m ³)		Additional Exceedances ² due to Site Activities & Surrounding Sources
	Incremental Impact	Cumulative Impact ¹	
R37	2.1	9.3	Yes
R38	1.7	8.8	Yes
R20	1.3	8.4	Yes
R7	1.2	8.4	Yes
R12	1.1	8.4	Yes
R8	1.1	8.5	Yes
R26	1.0	8.7	Yes
R16	0.9	8.0	Yes
R19	0.9	7.9	No
R11	0.8	8.4	Yes
R25	0.8	8.2	Yes
R36	0.8	7.9	No
R17	0.7	7.8	No
R39	0.7	8.1	Yes
R27	0.6	8.5	Yes
Criterion		8	

¹ – Cumulative impact includes: Site activities, Surrounding Sources, background concentrations.



Receptor ID	Annual Average PM _{2.5} Concentrations (µg/m ³)		Additional Exceedances ² due to Site Activities & Surrounding Sources
	Incremental Impact	Cumulative Impact ¹	
2 – Additional exceedances above and over Prospect AQMS			

5.2 Particles as PM₁₀

5.2.1 Maximum 24-Hour Average PM₁₀ Concentrations

Table 17 summarises the incremental and cumulative 24-hour average PM₁₀ impacts for the 15 most affected discrete receptor locations modelled. These locations were selected based on the maximum 24-hour PM₁₀ increments predicted by the modelling due to the proposed bulk earthworks.

A contemporaneous analysis was conducted to assess cumulative impacts against the relevant air quality criteria. This involved combining the incremental 24-hour PM₁₀ impacts from Site activities with those from Surrounding Sources and the daily varying background concentrations recorded at the Prospect AQMS.

While cumulative 24-hour average PM₁₀ concentrations are predicted to exceed the 50 µg/m³ criterion at 39 of the 41 modelled receptors.

Receptors R38, identified as having the highest incremental impact, is predicted to experience 15 additional exceedances above the background levels. However, further analysis indicates that the number of additional exceedances at R38 would decrease if emissions from surrounding construction sites are adequately controlled or if all Surrounding Sources are not simultaneously under construction. Further, the recommended trigger action response plan (TARP), mitigation activities and monitoring outlined in **Section 5.5.2** could significantly reduce the likelihood of additional exceedances.

A detailed daily contemporaneous analysis of Receptor R37 is presented in **Figure 22** and **Figure 23**, illustrating that incremental impacts associated with the Site are higher in the winter months. **Figure 23** illustrates that for the vast majority of days, throughout the year cumulative concentrations are well below the relevant criterion at the most impacted receptor.

Isopleths showing dispersion patterns across the modelling domain are provided in **Appendix F**.



Table 17 Top 15 Highest PM₁₀ Incremental Impact Receptors - 24-Hour PM₁₀ Impact

Receptor ID	Maximum 24-Hour Average PM ₁₀ Concentrations (µg/m³)		Additional Exceedances ² due to Site Activities & Surrounding Sources	Additional Exceedances ² due to Site Activities only
	Incremental Impact	Cumulative Impact ¹		
R38	50.4	73.4	15	12
R7	50.4	65.9	12	7
R12	47.9	66.6	11	6
R37	45.5	81.9	22	16
R8	42.0	70.4	14	5
R20	31.4	71.5	7	7
R11	31.0	68.4	10	2
R26	30.7	72.2	18	7
R16	30.1	59.7	5	4
R25	25.9	61.9	11	4
R17	25.6	58.0	3	2
R13	24.5	57.3	5	2
R39	23.4	59.5	5	4
R10	23.4	65.2	11	2
R27	23.1	65.2	14	4
Criterion		50		
1 – Cumulative impact includes: Site activities, Surrounding Sources, background concentrations.				
2 – Additional exceedances above and over Prospect AQMS				



Figure 22 Daily Contemporaneous Analysis for Receptor R38

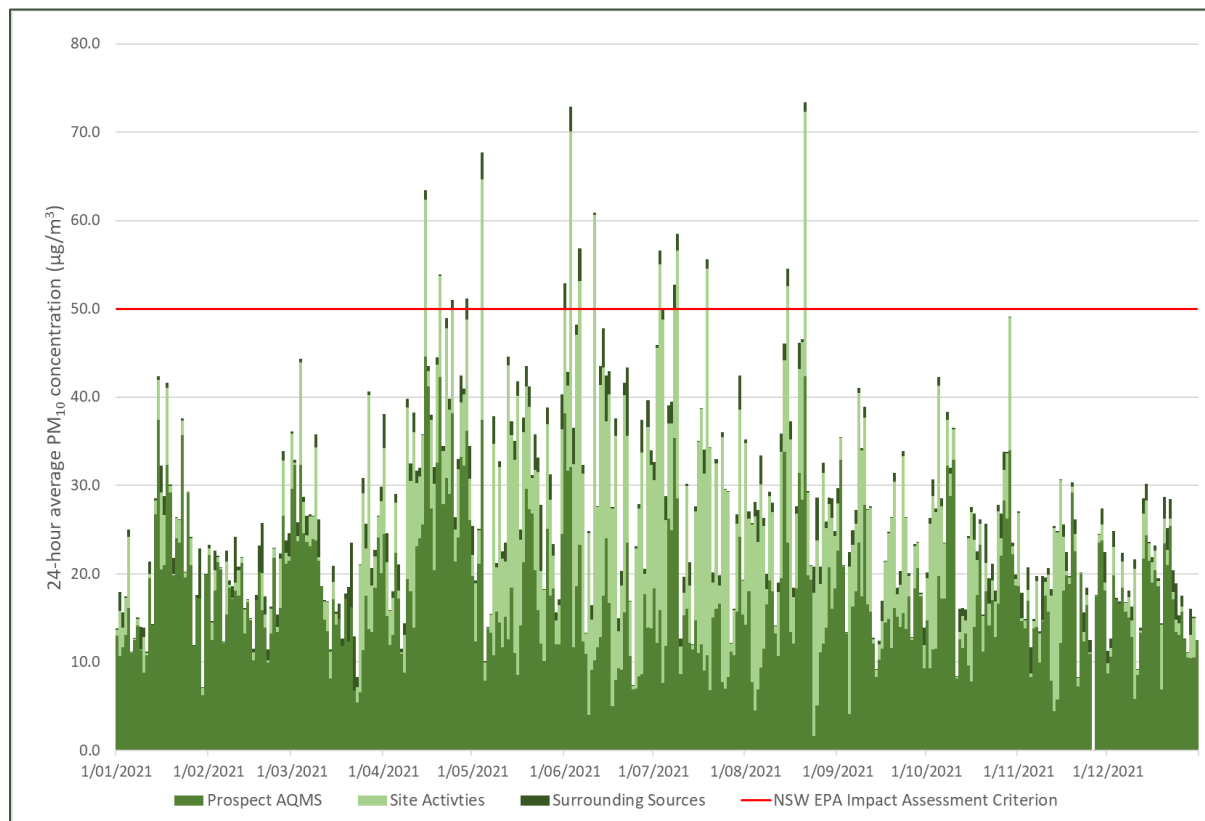
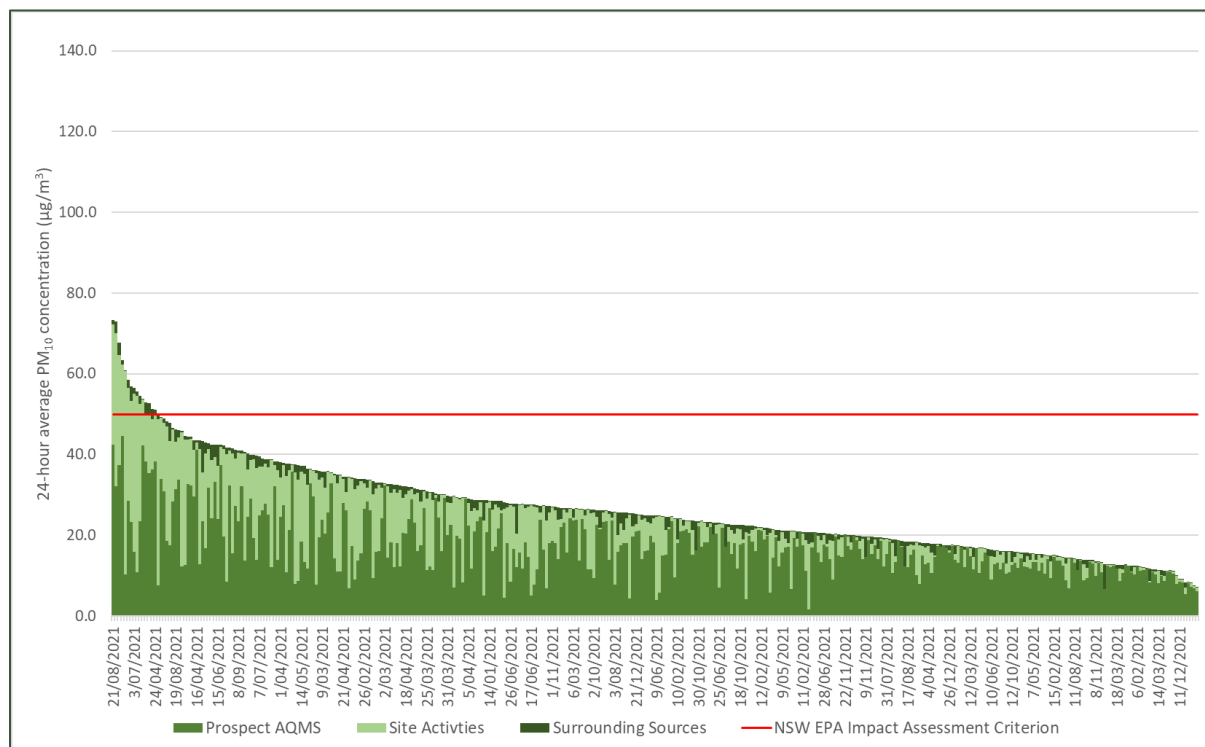


Figure 23 Ranked Daily Contemporaneous Analysis for Receptor R38



5.2.2 Meteorological Conditions Contributing to Exceedances

In order to determine the meteorological conditions that result in the highest contribution at the worst impacted receptors, timeseries of predicted 1-hour average PM₁₀ contributions were extracted at the six most affected discrete receptor locations modelled (R7, R8, R12, R20, R37 and R38) and combined with the contemporaneous wind speed and wind direction data to create the polar plots presented in **Figure 24**.

Polar plots show how the predicted contribution at each receptor varies with both wind speed and wind direction. All figures are plotted on the same scale to allow direct comparison between receptors.

Figure 24 presents the 95th percentile data to remove the influence of outliers. A review of the polar plots indicates that the highest PM₁₀ contributions generally occur during low wind speed conditions, typically below approximately 2–3 m/s, indicating that reduced dispersion under calmer conditions contributes to elevated concentrations at the receptors. The plots also show that impacts vary depending on receptor location, with no single predominant wind direction resulting in elevated concentrations across all receptors. Receptors R7, R8 and R12 generally experience higher contributions during northerly to north-easterly winds, whereas receptors R20, R37 and R38 are more influenced by southerly, easterly and westerly wind directions respectively. This reflects the varying locations of the receptors relative to the Site.

Figure 25 presents the annual and seasonal wind roses at the Site based on the meteorological data used in the dispersion modelling. While the highest emission-generating activities (such as dozer and grader operations) are restricted to standard construction hours (7:00 am to 6:00 pm), other activities including the importation and placement of fill, as well as wind erosion, occur 24 hours a day, 7 days a week. A review of these 24-hour wind roses indicates that southwesterly winds are the predominant wind pattern throughout the year, with the strongest and most frequent higher wind speed conditions occurring during the winter and autumn months.



Figure 24 Polar Plots of Predicted 1-hour Average PM₁₀ Contribution at Selected Worst Impacted Receptors

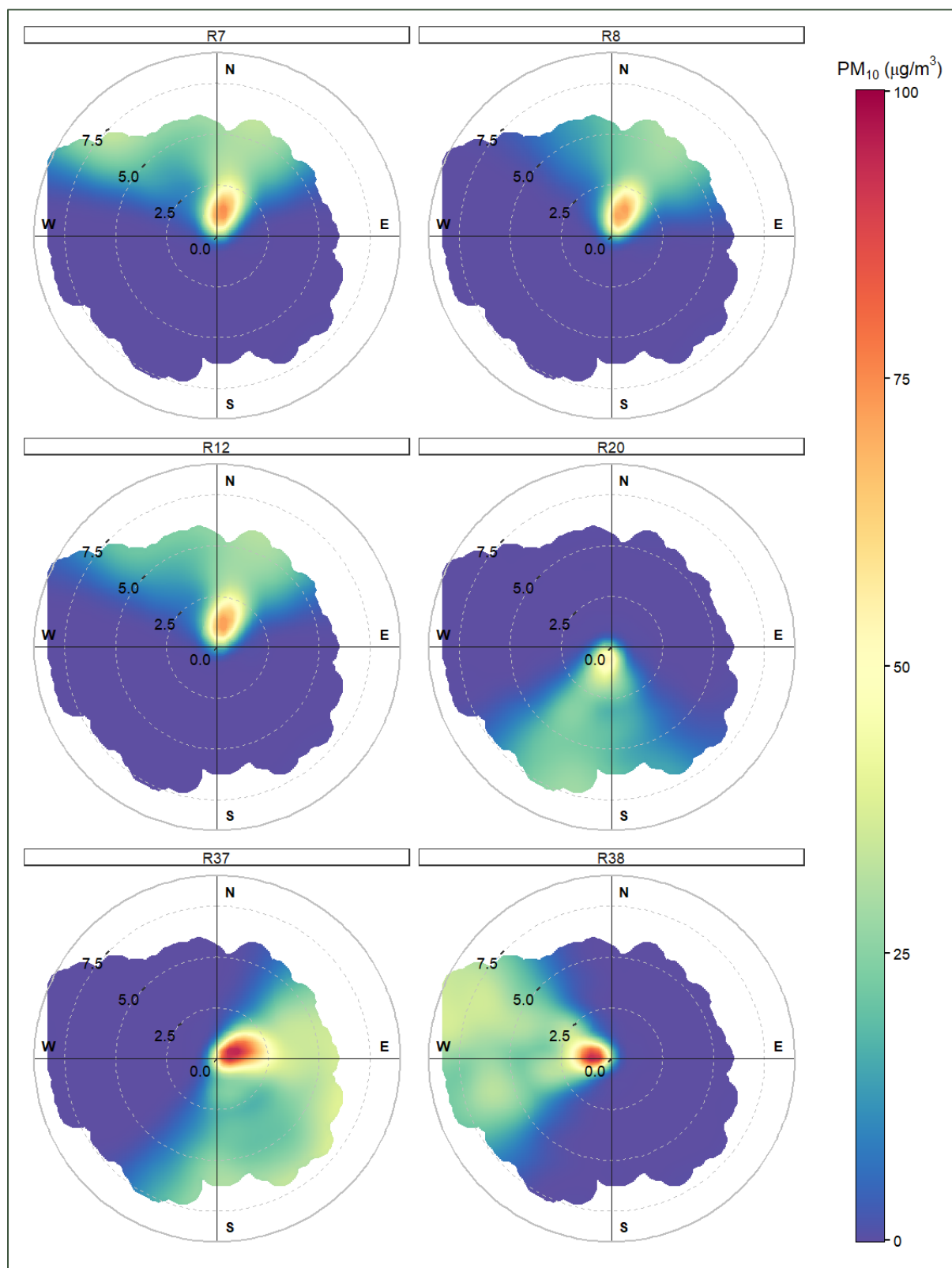
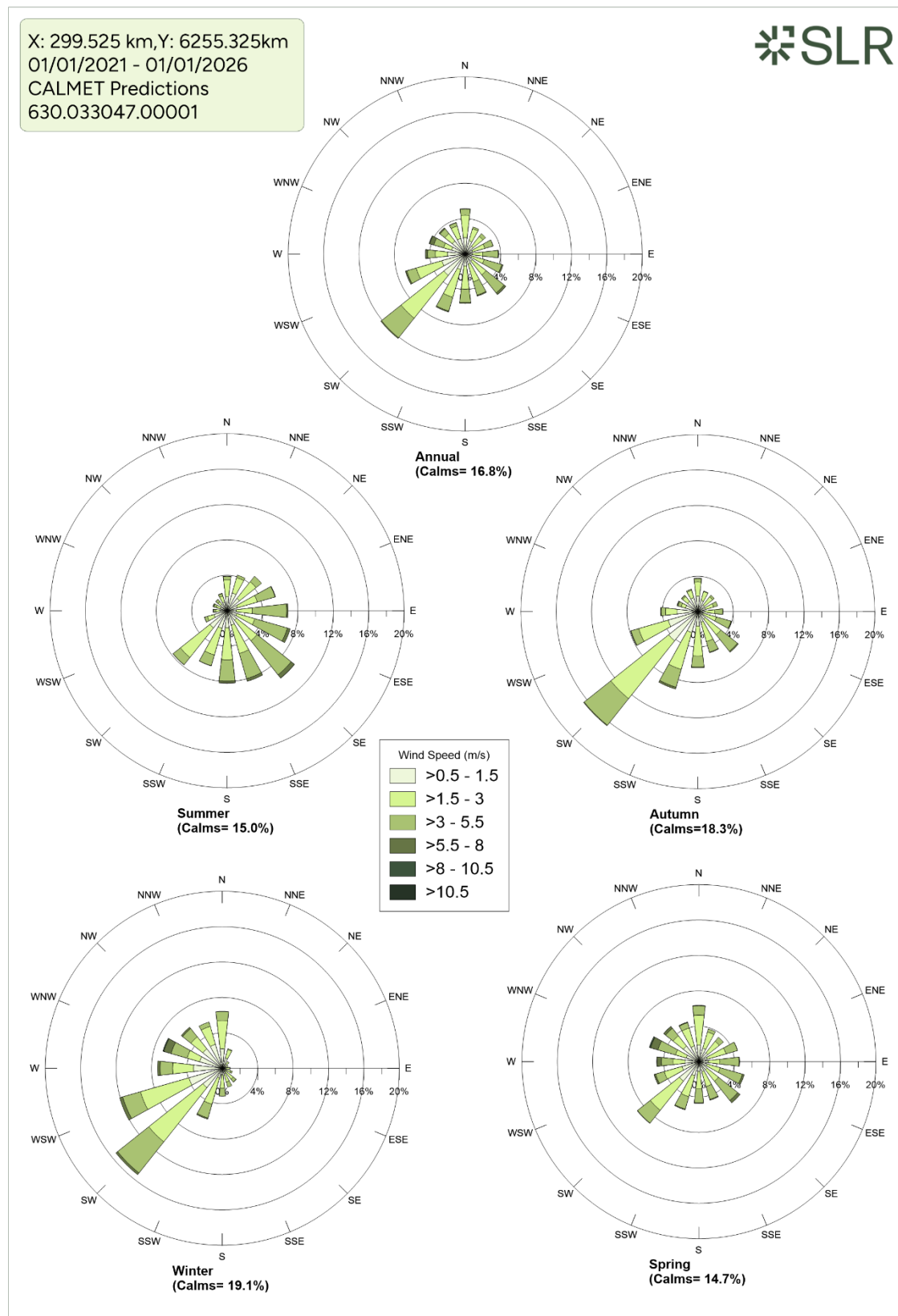


Figure 25 Annual and Seasonal Wind Roses at the Site



5.2.3 Annual Average PM₁₀ Concentrations

Table 18 summarises the incremental and cumulative annual average PM₁₀ impacts for the 15 most affected discrete receptor locations modelled. These locations were selected based on the annual average PM₁₀ increments predicted by the modelling due to the proposed construction activities at the Site.

Cumulative impacts against the criterion have been considered by including the annual average concentrations from Site activities, Surrounding Sources, and background concentrations adopted from the Prospect AQMS.

The cumulative annual average PM₁₀ concentrations are predicted to exceed the annual average PM₁₀ criterion of 25 µg/m³ at 7 of the 41 receptors modelled. However, these predictions are expected to overestimate the impacts as the conservative assumptions used in the emission estimation, to ensure short-term impacts were not underestimated, lead to an overestimation of annual averages.

As outlined previously, cumulative impacts would decrease if emissions from surrounding construction sites are adequately controlled, if all Surrounding Sources are not simultaneously under construction or if the recommended TARP and monitoring outlined in **Section 5.5.2** is implemented. Isopleths showing dispersion patterns across the modelling domain are provided in **Appendix F**.

Table 18 Top 15 Highest PM₁₀ Incremental Impact Receptors - Annual PM₁₀ Impact

Receptor ID	Annual Average PM ₁₀ Concentrations (µg/m ³)		Additional Exceedances ² due to Site Activities
	Incremental Impact	Cumulative Impact ¹	
R37	10.1	29.1	Yes
R38	8.1	26.5	Yes
R20	6.9	25.0	Yes
R7	5.7	24.9	No
R12	5.3	24.8	No
R8	5.0	25.3	Yes
R26	4.8	27.4	Yes
R19	4.3	22.2	No
R16	4.2	22.5	No
R11	3.9	25.6	Yes
R25	3.9	24.4	No
R36	3.8	22.3	No
R39	3.4	23.5	No
R17	3.4	21.7	No
R34	3.0	20.9	No
Criterion		25	
1 – Cumulative impact includes: Site activities, Surrounding Sources, background concentrations.			
2 – Additional exceedances above and over Prospect AQMS			



5.3 Particles as TSP

Table 19 summarises the incremental and cumulative annual average TSP impacts for the 15 most affected discrete receptor locations modelled. These locations were selected based on the annual average TSP increments predicted by the modelling due to the proposed bulk earthworks at the Site.

Cumulative impacts against the criterion have been considered by including the annual average concentrations from Site activities, surrounding sources, and estimated background concentrations. Background TSP concentrations have been calculated from PM₁₀ concentrations at Prospect AQMS during 2021 assuming a PM₁₀/TSP ratio of 0.4.

The cumulative annual average TSP concentrations are predicted to comply with the annual average TSP criterion of 90 µg/m³ at all 41 receptors modelled. As outlined in previously, annual average predictions overestimate the impacts as the conservative assumptions used in the emission estimation to ensure short-term impacts were not underestimated lead to an overestimation of annual averages.

In addition, cumulative impacts would decrease if emissions from surrounding construction sites are adequately controlled, if all surrounding sources are not simultaneously under construction or if the recommended TARP and monitoring outlined in **Section 5.5.2** is implemented. Isopleths showing dispersion patterns across the modelling domain are provided in **Appendix F**.

Table 19 Predicted Incremental and Cumulative Annual Average TSP Concentrations

Receptor ID	Annual Average TSP Concentrations (µg/m ³)	
	Incremental Impact	Cumulative Impact ¹
R37	24.8	69.5
R20	16.2	61.0
R7	13.6	60.8
R12	12.6	60.3
R8	11.8	61.5
R26	11.1	66.1
R40	11.1	66.1
R19	10.0	54.6
R16	9.6	54.9
R11	9.0	61.8
R25	8.7	58.9
R39	8.7	58.9
R36	8.5	53.1
R17	7.6	53.0
R27	6.7	64.1
Criterion	-	90

¹ – Cumulative impact includes: Site activities, Surrounding Sources, background concentrations.



5.4 Dust Deposition

Table 20 summarises the incremental and cumulative dust deposition rates for the 15 most affected discrete receptor locations modelled. These locations were selected based on the annual average dust deposition increments predicted by the modelling due to the proposed bulk earthworks at the Site. Cumulative dust deposition impacts have been assessed by combining contributions from Site activities, surrounding construction sources, and an assumed background dust deposition rate of 2 g/m²/month, consistent with typical residential and mixed-use environments and the assumptions adopted for this assessment.

The worst incremental impacted receptor is identified as R37. **Table 20** indicates that the predicted incremental annual average dust deposition rates are below the criterion of 2 g/m²/month. Cumulative annual average dust deposition rates are below the 4 g/m²/month criterion at all receptors. As outlined previously, annual average dust deposition predictions are expected to be conservative. This is because the emission estimates and modelling assumptions were adopted to ensure that potential short-term impacts were not underestimated, which may result in an overestimation of longer-term average deposition rates.

In practice, cumulative dust deposition impacts would be further reduced where emissions from surrounding construction sites are effectively managed, where multiple sites are not under construction concurrently, and where the recommended mitigation measures, real-time monitoring, and Trigger Action Response Plan (TARP) outlined in **Section 5.5.2** are implemented.

Table 20 Predicted Annual Average Dust Deposition Rates

Receptor ID	Annual Average Dust Deposition Rate (g/m ² /month)	
	Incremental Impact	Cumulative Impact ¹
R37	0.9	3.0
R38	0.6	2.7
R20	0.5	2.6
R7	0.4	2.6
R19	0.4	2.5
R12	0.4	2.6
R26	0.4	2.9
R8	0.3	2.7
R16	0.3	2.4
R36	0.3	2.4
R25	0.3	2.6
R17	0.3	2.3
R11	0.3	2.7
R39	0.2	2.5
R34	0.2	2.3
Criterion	2 g/m²/month	4 g/m²/month
1 – Cumulative impact includes: Site activities, Surrounding Sources, background concentrations.		



5.5 Mitigation Measures

The results of the dispersion modelling indicate that, under conservative worst-case assumptions, potential exceedances of short-term (24-hour) and long-term (annual average) PM_{2.5} and PM₁₀ criteria may occur during the construction phase if appropriate mitigation measures are not implemented. It is noted that conservative assumptions made to ensure short term impacts are not underpredicted are expected to have resulted in potentially significant over estimation of long-term impacts. Therefore, if appropriate measures are put in place to ensure compliance with the relevant short-term criteria, exceedances of long-term criteria are unlikely.

While the dispersion modelling indicates this potential for elevated localised concentrations, real-world monitoring data from the Oakdale East Estate demonstrates that these theoretical impacts do not typically materialize when proactive management is applied. As discussed in **Section 3.5.2**, historical performance of real-time PM₁₀ monitors at Oakdale East Estate which is currently undergoing bulk earth works and rehabilitation works confirms that the rigorous implementation of a site-specific management plan successfully maintains cumulative particulate concentrations and dust deposition rates below the applicable NSW EPA criteria. Therefore, if similar appropriate measures are put in place at the Site to ensure compliance with the relevant short-term criteria, exceedances of long-term criteria are unlikely.

Control measures already quantified for the purpose of this AQIA and proposed to be adopted for the Site are listed in **Appendix C**.

Additional recommended mitigation and management measures are provided in **Table 21** to **Table 24**. It is noted that the full benefits of all mitigation measures could not be quantified within the modelling and therefore the predicted impacts remain conservative.

These mitigation measures may be adopted in a site-specific Construction Air Quality Management Plan (CAQMP). CAQMPs cover all sources of emissions, such as those identified in **Section 4.4.1** of this AQIA, including wind erosion, wheel generated dust, extraction and material handling. The CAQMP should also recognise the increased risk of impacts during winter.

In addition, it is recommended that the Site implement a Trigger Action Response Plan (TARP) supported by real-time PM₁₀ monitoring to enable proactive management of construction-related air quality impacts. The TARP should be based on 1-hour average PM₁₀ concentrations, supplemented by meteorological conditions and visual observations, and include staged response measures as outlined in **Section 5.5.2**.

Due to the inherently variable nature of construction activities, on-site operations and the extent of active disturbance may differ from the assumptions adopted in this assessment at any given time. While this AQIA does not predict every possible operational variation, adherence to the recommended mitigation measures, real-time monitoring, and the TARP framework will provide adequate flexibility to manage changing site conditions and ensure that any short-term changes in active disturbed areas do not result in unacceptable air quality impacts at sensitive receptors.



Table 21 Recommended Dust Mitigation Measures for the Site

	Activity
1	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.
2	Display the head or regional office contact information.
3	Develop and implement a CAQMP which includes a TARP, details of the proposed monitoring program as well as measures to control dust and if required other emissions (such as odour and combustion gases).
Site Management	
4	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.
5	Make the complaints log available to the local authority when asked.
6	Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the logbook.
Monitoring	
7	Undertake real-time monitoring and daily on-site and off-site inspections, where receptors are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked.
8	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.
9	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.
Preparing and Maintaining the Site	
10	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
11	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
12	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period
13	Avoid site runoff of water or mud.
14	Keep site fencing, barriers and scaffolding clean using wet methods.
15	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.
16	Cover, seed, or fence stockpiles to prevent wind whipping where possible and when stored for extended periods.
Operating Vehicle/Machinery and Sustainable Travel	
17	Ensure all vehicles switch off engines when stationary - no idling vehicles.
18	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
19	Impose and signpost a maximum-speed-limit of 20 km/h on surfaced and 10 km/h on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be



	Activity
	increased with suitable additional control measures provided, subject to the approval of the nominated undertaker).
Operations	
20	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.
21	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
22	Use enclosed chutes and conveyors, and covered skips.
23	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and using fine water sprays on such equipment wherever appropriate.
24	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.
Waste Management	
25	Avoid bonfires and burning of waste materials.

Table 22 Mitigation Measures Specific to Earthworks

Activity
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
Only remove the cover in small areas during work and not all at once.
During windy weather, large, unprotected areas will be kept moist (not wet) by sprinkling with water to keep dust under control. In the event water is not available in sufficient quantities, soil binders and/or dust retardants will be used or the surface will be left in a cloddy state that resists removal by wind.
Limiting the area of lands exposed to erosive forces through phasing works, provision of a protective ground cover including (mulches, vegetation, organic binders or dust retardants) keeping the ground surface damp (not wet), leaving the surface in a rough cloddy condition to increase roughness and slow surface wind speed.
If unexpected odorous materials are uncovered, works in the affected area will cease immediately. The exposed material will be covered to minimise emissions, and removed offsite immediately. If there is another occurrence, the same procedure should be followed in addition to engaging and a qualified environmental specialist to assess the source and extent of the odorous material. Appropriate controls—such as temporary capping, rapid removal, or modification of the excavation sequence—will be implemented before excavation resumes.



Table 23 Mitigation Measures Specific to Trackout

Activity
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
Record all inspections of haul routes and any subsequent action in a site log book.
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permit.
Access gates to be located at least 10 m from receptors where possible.

5.5.1 Recommended Ambient Air Quality Monitoring

Ambient air quality monitoring is proposed to assist in mitigating potential impacts at sensitive receptors. An example monitoring program is provided in **Table 24**.

Goodman maintains real-time monitoring using SiteHive monitors as well as dust deposition monitoring as per the approved CEMP for OEE.

As discussed in **Section 3.2**, as there are receptors in all directions from Site, there is not a predominate wind direction causing impacts at receptors, therefore it is recommended that monitors are located in each direction near the most impacted receptors.

The locations monitored currently at the Site are shown in **Figure 26**. It is considered suitable to continue monitoring at these locations to assist with effective project management and assist in minimising the potential for adverse air quality impacts at the sensitive receptors.

However, it is recommended that these locations are reviewed periodically to ensure representative of current construction activities and the seasonal variation in wind directions presented in **Figure 10**.

Table 24 Air Quality and Meteorological Monitoring Program

Actions	Frequency
Conduct real-time continuous PM ₁₀ monitoring and monthly DDG sampling at locations representative of nearest sensitive receptors & prevailing wind directions.	Continuously during construction.
Continuous meteorological data will be recorded from an on-site station including wind speed and wind direction as a minimum.	Continuously during construction.
Undertake regular on-site inspections to check compliance with dust controls and maintain a log of results.	Daily during construction.



Figure 26 Existing Monitoring Locations



5.5.2 Recommended Trigger Action Response Plan

TARPs define the minimum set of actions required by workers in response to a deviation from normal working conditions.

A 1-hour average time period has been selected as a practical time-step for identifying sustained elevated dust concentrations that could potentially result in an exceedance of the NSW EPA 24-hour average PM₁₀ criterion, while providing sufficient time for additional mitigation measures to be implemented at the Site to reduce dust emissions before such an exceedance occurs. Monitoring of PM₁₀ will be outlined in the AQGHGMP.

Table 25 presents recommended 1-hour average PM₁₀ concentrations and actions. In the absence of local guidance, these values are adapted from the recommendation in the UK Institute of Air Quality Management (IAQM) Guidance on Monitoring in the Vicinity of



Demolition and Construction Sites (IAQM 2018) that was developed based on extensive monitoring in the vicinity of construction sites and recommended a 1-hour average PM₁₀ concentration of 190 mg/m³ as the trigger upon which action must immediately be taken to minimise dust emissions. The upper trigger has been conservatively lowered to 150 mg/ m³.

Table 25 TARP PM₁₀ Trigger Levels and Responses

Level	1-hour Average PM ₁₀ Trigger Level	Action
Alert	$\geq 100 \mu\text{g/ m}^3$ but $< 125 \mu\text{g/ m}^3$ Or Wind speed $< 2\text{m/s}$ Or Visible dust leaving the Site	- Review operations via a visual inspection of dust emissions from current activities to ensure all standard dust mitigation measures are being appropriately implemented. Where appropriate, implement additional remedial measures, such as: - Deployment of additional water sprays, water trucks etc - Determine if background concentrations may be the key contributor to high concentrations being recorded (e.g., based on wind direction, information on regional events such as bush fires or dust storms, etc). - Continue to closely monitor PM₁₀ concentrations being recorded.
Action I	$\geq 125 \mu\text{g/ m}^3$ but $< 150 \mu\text{g/ m}^3$ AND Wind speed $< 2\text{m/s}$ Or Visible dust leaving the Site	- Increase watering rates on haul roads where appropriate. - Reduce speed of equipment / vehicles. - Continue to closely monitor PM₁₀ concentrations being recorded. - Undertake an investigation of the dust generating activities, and if necessary, temporarily halt the dust generating activities
Action II	$\geq 150 \mu\text{g/ m}^3$ AND Wind speed $< 2\text{m/s}$ AND Or Visible dust leaving the Site	- Review planned operations considering exposed areas. - Cease any non-critical dust-producing activities or relocate relevant activities where possible away from sensitive receptors, or to less exposed locations. - Continue to closely monitor PM₁₀ concentrations being recorded.



6.0 Operational Air Quality Assessment

6.1 Emissions From Site Generated Vehicles

RAQST provides predictions of NO₂, PM₁₀ and PM_{2.5} concentrations at various distances from the road kerb. It does not provide predictions of the other traffic-related pollutants identified in **Section 1.7.2**, namely CO, SO₂ and VOCs. Given the low level of CO and SO₂ emissions from vehicles and the low ambient concentrations recorded in the region (see **Section 3.5**), it is reasonable to assume that CO and SO₂ emissions from road traffic are unlikely to result in any exceedances of the relevant criteria at locations beyond the road kerb. SLR's experience in modelling VOC emissions from roads has also shown that the kerbside concentration of VOCs is typically well below the relevant air quality guidelines.

Given the above, CO, SO₂ and VOC traffic emissions have not been considered further in this assessment.

6.1.1 Modelling Assumptions

Table 26 presents the anticipated hourly traffic generation associated with the operation of the Site, based on traffic advice provided by ASON. The total forecast Average Annual Daily Traffic (AADT) generated by the development is 3,966 vehicles per day (vpd).

Based on the data presented in **Table 26**, the traffic composition is expected to comprise 37% heavy vehicles and 63% light vehicles.

For this assessment, it has been conservatively assumed that all Site-generated vehicles enter and exit the Site via the same access point on Old Wallgrove Road and travel in a single direction past the nearest affected sensitive receptor. In practice, traffic movements will be distributed across multiple directions and time periods.

The closest existing receptor is located approximately 30 m from the Old Wallgrove Road Kerbside.



Table 26 Peak Hour Traffic Generation (year-2036)

Movement Type	Cars In	Cars Out	Van/PUD In	Van/PUD Out	Rigid Truck In	Rigid Truck Out	Semi In	Semi Out	B-Double In	B-Double Out	B-Trip In	B-Trip Out
0:00	0	64	0	0	1	2	1	5	1	5	0	1
1:00	0	107	0	0	1	2	1	5	1	4	0	1
2:00	0	86	0	0	0	2	1	4	0	3	0	0
3:00	0	64	0	0	1	2	1	7	0	5	0	0
4:00	21	43	0	0	1	0	2	6	1	4	0	0
5:00	64	21	0	0	2	20	3	12	2	7	1	0
6:00	107	21	37	56	9	40	11	20	5	13	1	0
7:00	86	0	19	149	5	66	7	20	3	13	1	0
8:00	64	0	16	74	3	40	5	14	3	9	1	0
9:00	43	0	16	0	2	14	5	9	3	6	2	1
10:00	0	0	0	0	1	1	5	9	4	6	2	1
11:00	0	0	37	0	2	0	5	7	4	5	2	0
12:00	21	0	19	54	5	1	8	8	4	5	2	0
13:00	43	21	27	35	11	0	12	6	5	4	1	0
14:00	64	64	39	0	10	13	10	6	4	4	1	0
15:00	107	107	67	0	18	15	18	8	7	6	1	1
16:00	86	86	100	0	27	15	26	5	10	5	2	1
17:00	64	64	22	16	56	15	50	6	19	6	2	1
18:00	43	43	0	16	66	15	65	6	25	6	2	1
19:00	0	21	0	0	46	15	48	6	18	6	2	1
20:00	0	21	0	0	18	15	21	6	8	6	1	1
21:00	21	0	0	0	8	2	10	7	4	6	1	1
22:00	21	0	0	0	5	3	7	7	3	6	0	1
23:00	0	21	0	0	4	2	7	6	3	6	1	1
Total	856	856	400	400	304	301	330	195	138	144	26	16



6.1.2 Dispersion Model Configuration

RAQST requires a number of inputs to describe the Site environment and emissions to air, including:

- Background pollutant concentrations
- Daily or peak hour traffic volumes and vehicle speeds
- Traffic mix (heavy vehicle percentage)
- Road type, number of lanes and gradient
- Year of assessment (vehicle fleet).

The sources of the required data and assumptions made for this assessment are summarised in **Table 27**.



Table 27 RAQST Input Data

Parameter	Value	Description
Assessment Year	2036	Traffic data projection year
Electric vehicle projections	Included	-
Number of Lanes	1 in each direction	-
Road type	Arterial	Based on road type and land use of the area
Road gradient	+/- 2%	Average road gradients calculated based on terrain elevations.
Lane width (m)	3.5 m	Assumed
Level for traffic composition	Level 2 37% Heavy Vehicle 63% Light Vehicle split	No detailed information on traffic composition is available.
Traffic speed	10 km/hr	Conservative assumption representative of emissions during high congestion periods
Traffic volume	3,966 vpd (1,983 vpd per lane)	Peak incremental change
Peak hour traffic as a percentage of AADT	10%	Minimum Peak hour % in RAQST. This is a conservative setting as the calculated peak hour traffic as a percentage of AADT is 8%
Heavy vehicle percentage	37%	Averaged from AADT data provided by ASON.
Background Concentrations		
Background site	Prospect AQMS	Nearest air quality monitoring station
Background year	2021	-
1-hour metric for NO _x	Maximum	Per the Approved Methods, if the existing ambient air pollutant concentrations exceed the impact assessment criteria, the assessment demonstrates that no additional exceedances of the impact assessment criteria will occur.
24-hour metric for PM ₁₀ and PM _{2.5}	Maximum below the criterion	

6.1.3 Modelling Results

The nearest receptors to the Old Wallgrove Road kerbside, which is the main access point for the Project, are located approximately 30 m from the kerb. Therefore, predicted air pollutant concentrations at 30 m from the kerbside have been quantified.

As shown in **Table 28**, the incremental concentrations associated with vehicle movements along Old Wallgrove Road are small. The maximum annual incremental NO₂ concentration is 1.6 µg/m³, representing approximately 5% of the annual NO₂ criterion. Incremental PM₁₀ and PM_{2.5} concentrations are also low, contributing generally less than 3% of the relevant assessment criteria.



For most pollutants and averaging periods, the predicted cumulative concentrations are predicted to be below the applicable air quality criteria. However, the maximum 24-hour PM_{2.5} cumulative concentration (25.4 µg/m³) marginally exceeds the 24-hour PM_{2.5} criterion of 25 µg/m³. This exceedance is driven primarily by background concentrations, with the project contributing only 0.5 µg/m³ to the total concentration.

Given the very small incremental contribution from the development, the project would not materially influence the frequency or magnitude of PM_{2.5} exceedances in the area. Accordingly, while a marginal exceedance of the 24-hour PM_{2.5} criterion is predicted, the overall air quality impact of the development is considered low. It is crucial to note that the conservative vehicle speed of 10 km/hr assumed for the model is unlikely to occur for a full 24-hour period, therefore, the predicted 24-hour and annual average concentrations are deemed to be highly conservative.

It is also noted that impacts at residential or commercial receptors located further from the kerbside would be lower than those presented in **Table 28**, which represent the nearest assessed receptors.

Table 28 RAQST Model Results

Pollutant and Averaging Period	Background Concentration (µg/m ³)	Incremental Impact (µg/m ³)	Cumulative Impact (µg/m ³)	Criteria
Maximum 1-hour NO ₂ concentrations	Not Applicable	Not applicable	143.4	164
Annual NO ₂ concentrations	16.3	1.6	17.9	31
Maximum 24-hour PM ₁₀ concentrations	44.6	0.7	45.3	50
Annual PM ₁₀ concentrations	17.2	0.3	17.5	25
Maximum 24-hour PM _{2.5} concentrations	24.9	0.5	25.4	25
Annual PM _{2.5} concentrations	6.9	0.2	7.1	8

6.1.4 Mitigation Measures & Recommendations

In addition to dust and air emission mitigation measures for the construction phase provided in **Section 5.5**, recommended air quality management measures for the operational phase of the proposed activities include:

- Minimising vehicle idling times around the Site using best management practices, including:
 - Requiring vehicle engines to be turned off when loading/unloading; when drivers are on a break, or waiting to get administrative clearances, etc.; and
 - Installation of appropriate signage at relevant locations encouraging drivers to switch off engines when not in use.
- Mobile heavy lift equipment and other vehicles operated on site are maintained and operated as per manufacturer specifications or best practice requirements.
- Any spillages are cleaned up in a timely manner.



- Sealed access roads and hardstand areas are maintained and the surface kept free of significant dust-generating materials.

6.2 VOC Emissions from Fuel Storage and Refuelling

As discussed in **Section 2.6**, the NSW EPA does not provide specific separation distances for fuel storage and refuelling facilities. As such, the separation distances recommended by the Brisbane City Council guidelines for service stations have been adopted for this assessment. Based on the anticipated annual fuel throughput being less than 12 ML, a separation distance of 50 m is recommended between the refuelling area and sensitive land uses. It is noted that the referenced guideline assumes the presence of highly volatile fuels (petrol) and Stage 1 vapour recovery; however, as previously established, this is inherently inapplicable to a diesel-only refuelling facility, making the 50 m buffer highly conservative.

The nearest existing sensitive receptor is located approximately 190 m southwest of the refuelling area (see **Figure 27**) and the refuelling area is set back approximately 65 m from the southern and eastern boundaries of the Site. Therefore, the adopted 50 m separation distance falls wholly within the Site.

6.2.1 Nature of Impact

The nature of impacts associated with emissions of VOCs into the atmosphere is *adverse* to the environment.

6.2.2 Receptors Sensitivity

The surrounding sensitive receptors to the Site comprise a mix of industrial/commercial receivers to the west and north, and residential receivers to the south and south-east of the Site, as shown in **Figure 27**.

In accordance with the risk assessment criteria outlined in **Appendix E**, the commercial/industrial receivers are considered to have **medium** sensitivity, while the identified residential receivers are considered to be **high sensitivity** receptors. Given the presence of several residential dwellings in proximity to the southern and south-eastern boundaries of the Site, the overall receptor sensitivity for the area is conservatively classified as high.

6.2.3 Magnitude

A review of the annual wind rose and local meteorological conditions indicates that prevailing winds are strongly dominated by the south-west (SW) and south-southwest (SSW) sectors, with secondary contributions from the west (W).

Consequently, these prevailing winds will predominantly transport any potential fugitive emissions toward the northeast and east, directing them over adjacent industrial and commercial land uses rather than the sensitive residential areas. The nearest highly sensitive residential receptor (R7) is located 190 m to the southwest. For emissions to be transported toward R7, winds from the northeast would be required; however, the wind rose demonstrates that winds from this sector occur very infrequently.

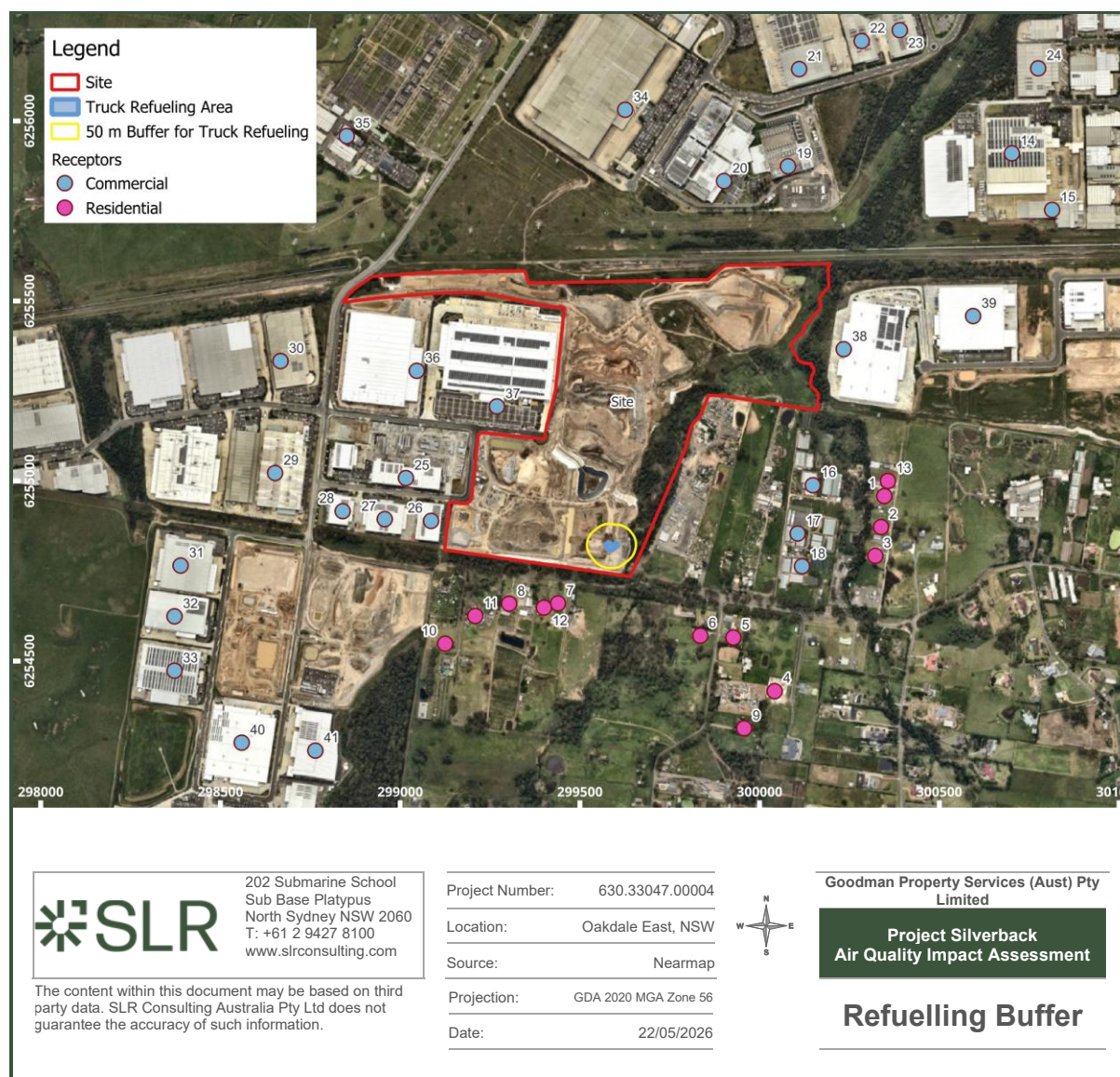
While calm conditions can occasionally limit atmospheric dispersion, the inherent physicochemical properties of diesel fuel dictate that negligible volatile vapour is generated under standard environmental operating conditions.

Based on the strictly diesel-only nature of the facility, the substantial 190 m distance to the nearest receptor, and the highly favourable local meteorology (where prevailing winds direct



emissions away from the nearest residential areas), the overall magnitude of any offsite impact associated with truck refuelling is predicted to be **negligible** (i.e. the impact is predicted to cause no significant consequences, as defined by **Table E2**).

Figure 27 Refuelling Station – Separation Distance



6.2.4 Significance of Impact

Given the **high sensitivity** of the nearest residential receptors and the negligible magnitude of potential impacts from diesel storage and refuelling activities, the resulting impact significance is assessed as **neutral significance** in accordance with **Table 29**. Accordingly, no significant off-site air quality or amenity impacts are anticipated for the nearest sensitive receptors.



Table 29 Risk Assessment of VOC Impacts – Fuel Storage and Refuelling

Sensitivity		Impact Magnitude [Defined by Table E2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table E1]	Very High Sensitivity	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/M inor Significance	Neutral Significance
	Medium Sensitivity	Intermediate Significance	Intermediate/M inor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/M inor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

6.2.5 Mitigation Measure Existing Controls

It is recommended that the design and operational specifications of the refuelling system are reviewed prior to construction to confirm that appropriate passive engineering controls are incorporated to minimise fluid turbulence and subsequent fugitive emissions during tank filling .

In addition, the following management measures are recommended:

- Operational control measures outlined in relevant standards and guidelines relating to fuel handling and storage should be implemented at the Site.
- All fuel storage and dispensing infrastructure should be designed, installed, and tested in accordance with relevant Australian Standards, applicable codes of practice, and industry guidelines.
- A Spill Management Plan should be implemented, including staff training in spill response procedures and the use of spill kits.
- Any fuel spills should be cleaned up as soon as practicable to minimise potential odour and VOC emissions.



6.3 Emissions from Emergency Backup Generators

The Project will incorporate emergency backup diesel generators to provide critical power redundancy in the event of a grid failure. As the final mechanical specifications, electrical capacities, and specific unit quantities are yet to be finalised, a quantitative dispersion modelling assessment has not been conducted. Instead, a qualitative risk assessment has been performed in accordance with the methodology outlined in **Appendix E**.

6.3.1 Nature of Impact

The combustion of diesel fuel in the backup generators will result in point source emissions of NO_x, PM₁₀, PM_{2.5}, CO, and volatile organic compounds (VOCs). For intermittent diesel generator operations, the primary air quality constraint is typically the short-term (1-hour average) concentration of nitrogen dioxide (NO₂).

The nature of impacts associated with combustion gas emissions is *adverse* to the environment.

6.3.2 Receptors Sensitivity

As established in **Section 6.2.2**, the surrounding sensitive receptors comprise a mix of industrial and commercial receivers (medium sensitivity) alongside specific residential receptors. Based on the proposed site layout, the minimum separation distance between the proposed generators and the nearest residential receptor (R7) is estimated to be 330 m, while the minimum separation distance to the nearest commercial receptor (OEE Building 3B) is approximately 55 m. Given the presence of these residential dwellings within the broader study area, the overall receptor sensitivity is conservatively classified as **high**.

6.3.3 Magnitude

To accurately assess the magnitude of impact, the operation of the backup generators must be categorised into two distinct operational profiles: routine maintenance testing and prolonged emergency operations.

Routine Maintenance Testing

Under standard operational conditions, generator usage will be strictly limited to scheduled routine testing (typically conducted on a monthly or quarterly basis for short durations, often at reduced electrical loads). Based on SLR's extensive quantitative dispersion modelling experience assessing large-scale data centres (which routinely feature significantly higher quantities of larger capacity diesel generators positioned much closer to sensitive receptors), off-site exceedances of the NSW EPA impact assessment criteria during standard testing regimes are highly unlikely. Furthermore, as noted in **Appendix B**, prevailing winds from the west and southwest predominantly direct atmospheric plumes toward the north-east, away from the nearest sensitive residential receptors (located 330 m to the south). Consequently, the magnitude of impact during routine testing is considered negligible.

Emergency Operations

During a prolonged loss of grid power, all standby generators may be required to operate simultaneously under load. While such grid failure events are statistically rare, the simultaneous operation of all units over an extended period increases the potential for localised, short-term exceedances of ambient air quality criteria (particularly under poor dispersion conditions, such as overnight temperature inversions). Therefore, the magnitude of impact during an unmitigated, prolonged emergency operation is conservatively assessed as moderate.



6.3.4 Significance of Impact

Given the high receptor sensitivity, and in accordance with **Table 30**, the impact significance is assessed as **neutral** significance for routine testing operations. For prolonged emergency operations, the unmitigated impact is assessed as **intermediate** significance.

Table 30 Risk Assessment of VOC Impacts – Diesel Generator Operations

Sensitivity		Impact Magnitude [Defined by Table E2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table E1]	Very High Sensitivity	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance (Emergency Operations)	Intermediate/Minor Significance	Neutral Significance (Routine Operations)
	Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

6.3.5 Mitigation Measure Existing Controls

To mitigate potential impacts from generator emissions and ensure optimal atmospheric dispersion, the following design and management measures are recommended for integration into the final detailed design:

- All generator exhaust flues must be designed to discharge vertically upwards, completely unimpeded. The installation of weather cowls or caps that deflect the exhaust laterally or downwards must be strictly avoided where possible, as these significantly impact the vertical exit velocity and thermal buoyancy of the plume.
- The mechanical procurement process should prioritise the selection of generator units with the lowest feasible and practical NOx and particulate emission profiles.
- Routine maintenance testing should be scheduled during daytime hours (between 9:00 am and 4:00 pm) when atmospheric mixing depths are typically greatest, promoting optimal plume dispersion. Where multiple generators are installed, routine testing should be staggered sequentially to avoid the simultaneous operation of all units.



7.0 Conclusion

This Air Quality Impact Assessment (AQIA) has evaluated the potential air quality impacts associated with the construction and operation of Project Silverback, located within the Oakdale East Industrial Estate, in accordance with the NSW EPA Approved Methods and relevant regulatory criteria.

The assessment identified that the primary air quality risk during construction relates to fugitive dust emissions (PM_{10} , $PM_{2.5}$ and TSP). A detailed Level 2 dispersion modelling assessment was undertaken using conservative assumptions, including extended construction hours, continuous activity, and simultaneous development of surrounding sites. The modelling results indicate that:

- Cumulative impacts, which include contributions from surrounding construction activities and background concentrations, are predicted to exceed the 24-hour and annual $PM_{2.5}$ and PM_{10} criteria at several receptors.
- While elevated background concentrations and concurrent regional construction activities contribute heavily to these cumulative totals, the modelling indicates the Site's incremental impacts can also be significant under certain infrequent, worst-case meteorological conditions.

Construction-related air quality impacts would be temporary and variable, influenced by meteorological conditions (particularly wind speed and direction), as well as the intensity, scale and staging of construction activities.

The modelling adopts conservative assumptions, including peak construction scenarios and the simultaneous operation of surrounding sources. It also does not fully account for the effectiveness of proposed mitigation measures such as reduced vehicle speeds, adaptive management during adverse weather conditions, and rainfall effects. Accordingly, predicted impacts represent an upper-bound scenario.

Crucially, a review of real-time air quality monitoring data from the Oakdale East Estate confirms that these theoretically modelled exceedances do not typically materialize in practice. Empirical evidence demonstrates that the proactive implementation of a site-specific Construction Air Quality Management Plan (CAQMP) and Trigger Action Response Plan (TARP) supported by real-time monitoring successfully maintains cumulative particulate concentrations and dust deposition rates below the applicable NSW EPA criteria within this locality.

Therefore, with the implementation of the recommended dust mitigation measures and the TARP outlined in **Section 5.5.2**, emissions from the Site can be effectively managed and minimised, ensuring potential impacts at surrounding sensitive receptors are controlled to acceptable levels.

For the operational phase, emissions associated with vehicle movements were assessed using the RAQST screening tool. The results indicate that operational air quality impacts are negligible and well below relevant assessment criteria and therefore are not expected to constrain the development.

A qualitative assessment of volatile organic compound (VOC) emissions associated with diesel fuel storage and refuelling indicates a neutral impact significance. This is driven by the inherently low Reid Vapour Pressure (RVP) of diesel fuel, the substantial 190 m separation distance to the nearest residential receptors (well beyond conservative 50 m separation distance adopted), and favourable prevailing winds that predominantly direct trace emissions toward adjacent industrial areas. With the implementation of standard design controls (such



as submerged fill pipes) and operational spill management, no significant off-site impacts are anticipated.

A qualitative risk assessment of the emergency backup generators determined that routine maintenance testing will result in a negligible magnitude of impact, equating to a neutral significance. While prolonged, unmitigated emergency operations during a grid failure pose a moderate risk of short-term localised impacts, this risk could be effectively mitigated through proactive design and management controls. These include engineering all exhaust flues to discharge vertically upwards, procuring low-emission generator units, and scheduling routine testing during daytime hours to maximise atmospheric dispersion.

As part of the proposed amendment to the existing concept plan, a comparison with the original air quality assessment prepared for Oakdale East Industrial Estate SSDA (SSD-37486043) was considered. Because the original assessment relied entirely on qualitative evaluation rather than quantitative dispersion or screening models, a direct numerical comparison of predicted impacts cannot be made. Nevertheless, the overall level of air quality risk identified through the detailed modelling in this AQIA is considered to be consistent with the findings of the original assessment. Both assessments conclude that, provided appropriate mitigation and management controls are implemented, the development will not result in unacceptable air quality impacts.

Overall, the assessment concludes that:

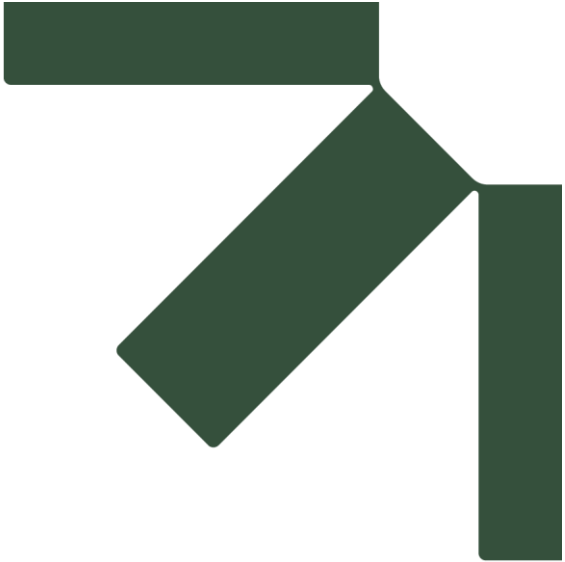
- The Project is unlikely to result in significant adverse air quality impacts during the construction stage with appropriate mitigation, monitoring and management measures in place.
- Operational air quality impacts are minimal and not expected to constrain the ongoing use of the Site.



9.0 References

- Air & Waste Management Association. 2000. *Air Pollution Engineering Manual 1st Edition*.
- Cowherd, Chatten, John Donaldson, and Robert Hegarty. 2010. "Proposed Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors."
- DEWHA. 2008. "Emission Estimation Technique Manual for Combustion Engines Version 3.0." Department of the Environment, Water, Heritage, and the Arts.
- DSEWPC. 2012. "NPI Emission Estimation Technique Manual for Mining." *Version 3.1*. Department of Sustainability, Environment, Water, Population and Communities.
- Farmer, A M. 1993. "The Effects of Dust on Vegetation." *Environmental Pollution*, 79: 63-75.
- Highways England. 2019. *Design Manual for Roads and Bridges : Vol. 11 : Environmental Assessment, Section 3 : Environmental Assessment Techniques, Part 11*.
- IAQM. 2018. "Guidance on the Monitoring in the Vicinity of Demolition and Construction Sites." London.
- NEPC. 2021. *National Environment Protection (Ambient Air Quality) Measure*. National Environment Protection Council.
- NOAA. 2018. *Air Resources Laboratory*. 14 February. Accessed February 20, 2018. <https://www.ready.noaa.gov/READYpgclass.php>.
- NSW EPA. 2022. *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. New South Wales Environment Protection Authority.
- NSW EPA. 2022a. *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. NSW Environment Protection Authority.
- NSW EPA. 2017. *Standards and Best Practice Guidelines for Vapour Recovery at Petrol Service Stations*. Sydney: State of NSW and Environment Protection Authority.
- NSW Parliament. 2022. *Protection of the Environment Operations (Clean Air) Regulation 2022*. December.
- Oke, T R. 1988. *Boundary Layer Climates (2nd Edition)*.
- SRC. 2011. "CALPUFF Modelling System Version 6 User Instructions."
- US EPA. 2006. *AP 42 Compilation of Air Pollutant Emission Factors, Chapter 13.2.5 Industrial Wind Erosion*. United States Environmental Protection Agency.
- US EPA. 1998. *AP-42 Chapter 11.9 Western Surface Coal Mining*. United States Environmental Protection Agency.
- US EPA. 2006b. *AP42 Chapter 13.2.4 Aggregate Handling And Storage Piles*. United States Environment Protection Agency.
- US EPA. 2006a. "AP42 Section 13.2.2 Unpaved Roads."
- US EPA. 2005. *Appendix W to Part 51 - Guideline on Air Quality Models*. Federal Register Vol. 70, No. 216; November 9, 2005.





Appendix A Selection of Representative Meteorological Data

**Oakdale East Industrial Estate – Precinct 2 – Building 2A,
Building 2B and Lot 2C (SSDA -120888992)**

Air Quality Impact Assessment

Goodman Property Services (Aust) Pty Ltd

SLR Project No.: 630.033047.00001

2 July 2026

Meteorological Year Selection

Once emitted to atmosphere, the emissions will:

- Rise according to the momentum and buoyancy of the emission at the discharge point relative to the prevailing atmospheric conditions.
- Be advected from the source according to the strength and direction of the wind at the height which the plume has risen in the atmosphere.
- Be diluted due to mixing with the ambient air, according to the intensity of turbulence.
- (Potentially) be chemically transformed and/or depleted by deposition processes.

Dispersion is the combined effect of these processes. Dispersion modelling is used as a tool to simulate the air quality effects of specific emission sources, given the meteorology typical for a local area together with the expected emissions. Selection of a year when the meteorological data is atypical means that the resultant predictions may not appropriately represent the most likely air quality impacts. Therefore, in dispersion modelling, one of the key considerations is the representative nature of the meteorological data used.

The year of meteorological data used for the dispersion modelling was selected by reviewing the most recent five years of historical surface observations at (2021 to 2025 inclusive) to determine the year that is most representative of average conditions. Wind direction and wind speed were compared to averages for the region to determine the most representative year.

Data collected from 2021 to 2025 is summarised in **Figures A-1 to A-2**. Examination of the data indicates the following:

Figure A-1 indicates relatively similar wind roses for all years analysed, with a higher frequency of winds from the west-southwest in 2025.

Figure A-2 indicates that 2021 and 2022 exhibit wind speeds that are lower than the 5-year average which will result in a conservative assessment due to reduced dispersion.

Figure A-3 indicates relatively similar monthly temperatures for all years analysed, with some above average temperatures in 2022, 2024 and 2025.

Given the above, the year 2021 was selected as the representative year of meteorology.



Figure A-1 Frequency of Winds at Horsley Park Equestrian Centre AWS for 2021 – 2025

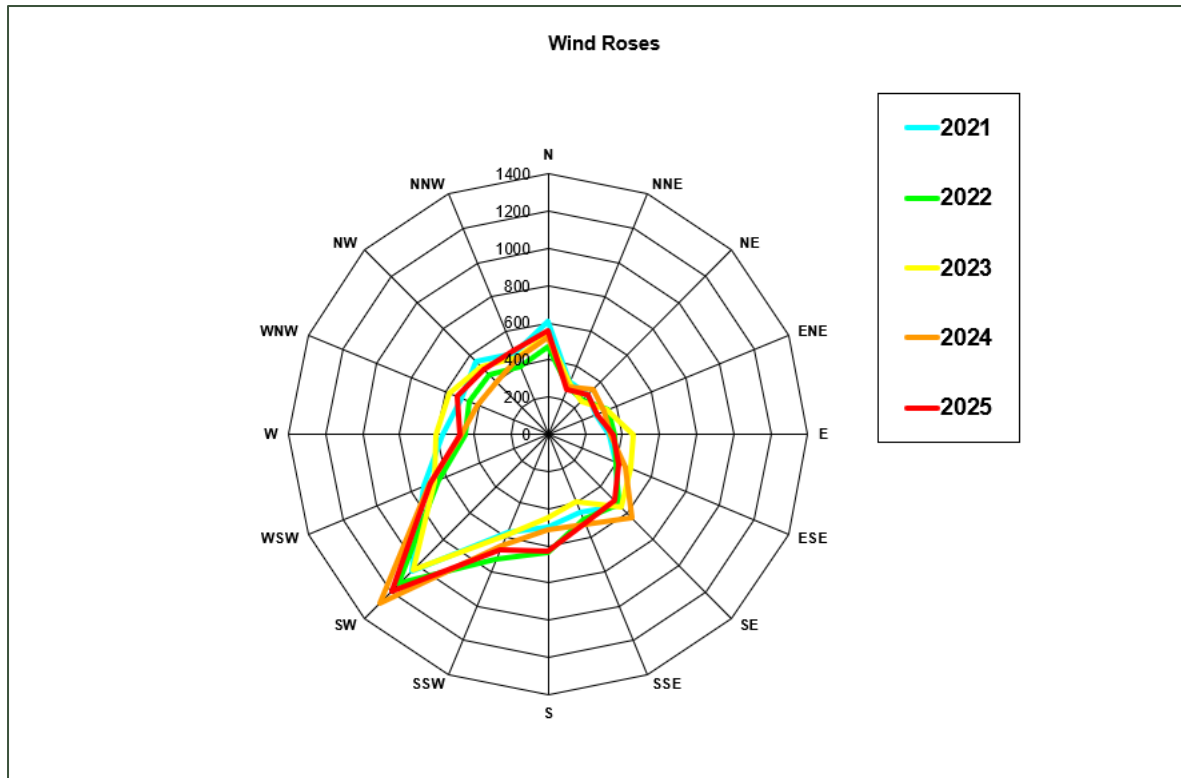


Figure A-2 Monthly Average Wind Speed at Horsley Park Equestrian Centre AWS for 2021 – 2025

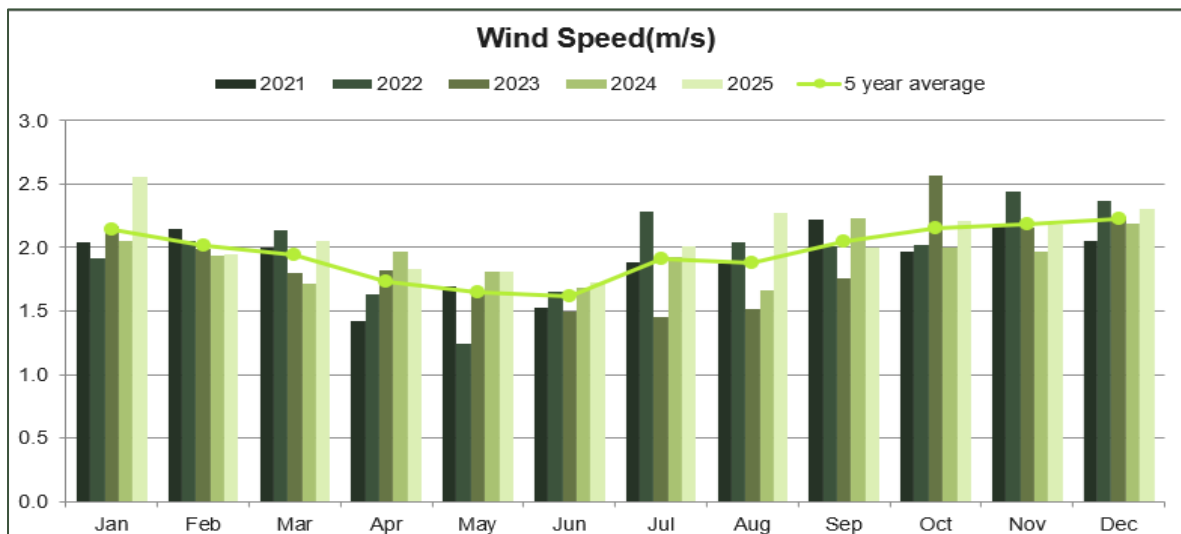
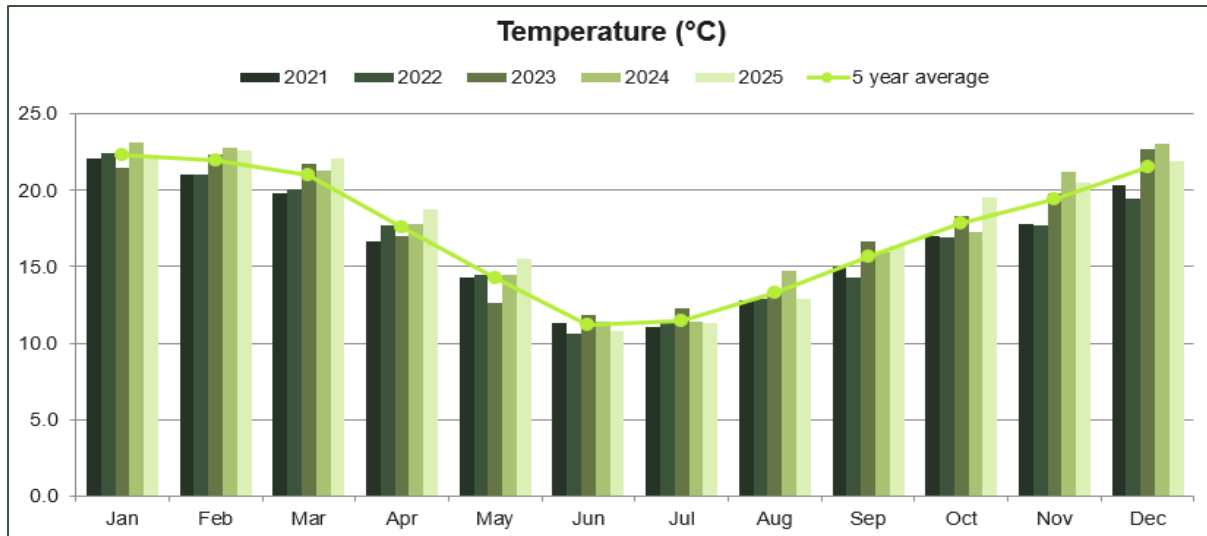
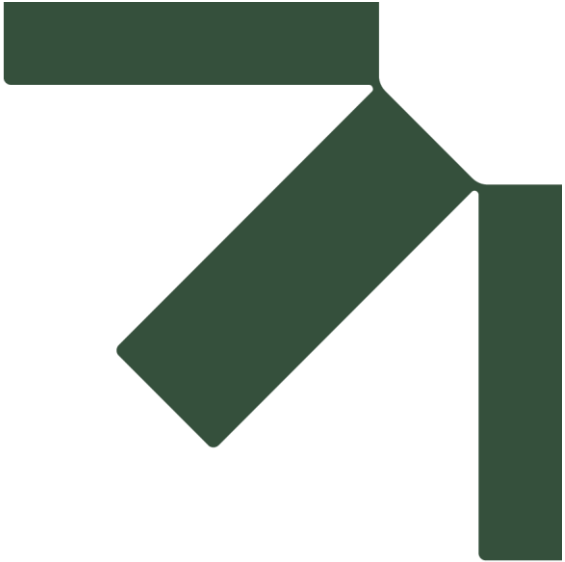


Figure A-3 Monthly Average Temperature at Horsley Park Equestrian Centre AWS for 2021 – 2025





Appendix B Evaluation of Meteorological Data

**Oakdale East Industrial Estate – Precinct 2 – Building 2A,
Building 2B and Lot 2C (SSDA -120888992)**

Air Quality Impact Assessment

Goodman Property Services (Aust) Pty Ltd

SLR Project No.: 630.033047.00001

2 July 2026

The primary meteorological data parameters relevant for dispersion modelling are typically:

- Wind (wind speed and direction)
- Turbulence (atmospheric stability)
- Mixing height (depth of turbulent layer)

A review of the meteorological data used in the dispersion modelling for the above parameters is provided below.

Wind Speed and Wind Direction

A summary of the annual wind behaviour predicted by CALMET for 2021 (extracted at the Site) is presented as wind roses in **Figure B-1** and as a wind speed distribution plot in **Figure B-2**. These plots show that winds in the study area were predicted to be predominantly light to moderate during 2021. Calm wind conditions were predicted to occur 16.8% of the time throughout the modelling period.

The seasonal wind roses indicate that typically:

- In summer, winds predominantly blow from the eastern to southern quadrants, particularly from the east-southeast and south directions, while winds from the western and northwestern quadrants occur less frequently. Calms were predicted 15.0% of the time during the summer months.
- In autumn, winds predominantly blow from the southwestern quadrant, with the highest frequency occurring from the southwest direction. Winds from the northeastern quadrant occur less frequently. Calms were predicted 18.3% of the time during the autumn months.
- In winter, winds predominantly blow from the southwestern quadrant, with secondary contributions from the western and northwestern quadrants. Winds from the eastern and southeastern quadrants occur least frequently. Calms were predicted 19.1% of the time during the winter months.
- In spring, winds blow relatively evenly from most directions, with slightly higher frequencies from the western and northwestern quadrants. Calms were predicted 14.7% of the time during the spring months.

A comparison of the wind roses presented in **Figure B-1** with the Horsley Park Equestrian Centre AWS wind roses presented in **Figure 10** shows that the frequency distribution of wind speed and direction for both is very similar throughout the year, with the CALMET predictions having slightly lower calm frequency.



Figure B-1 CALMET-Predicted Seasonal Wind Roses for the Site – 2021

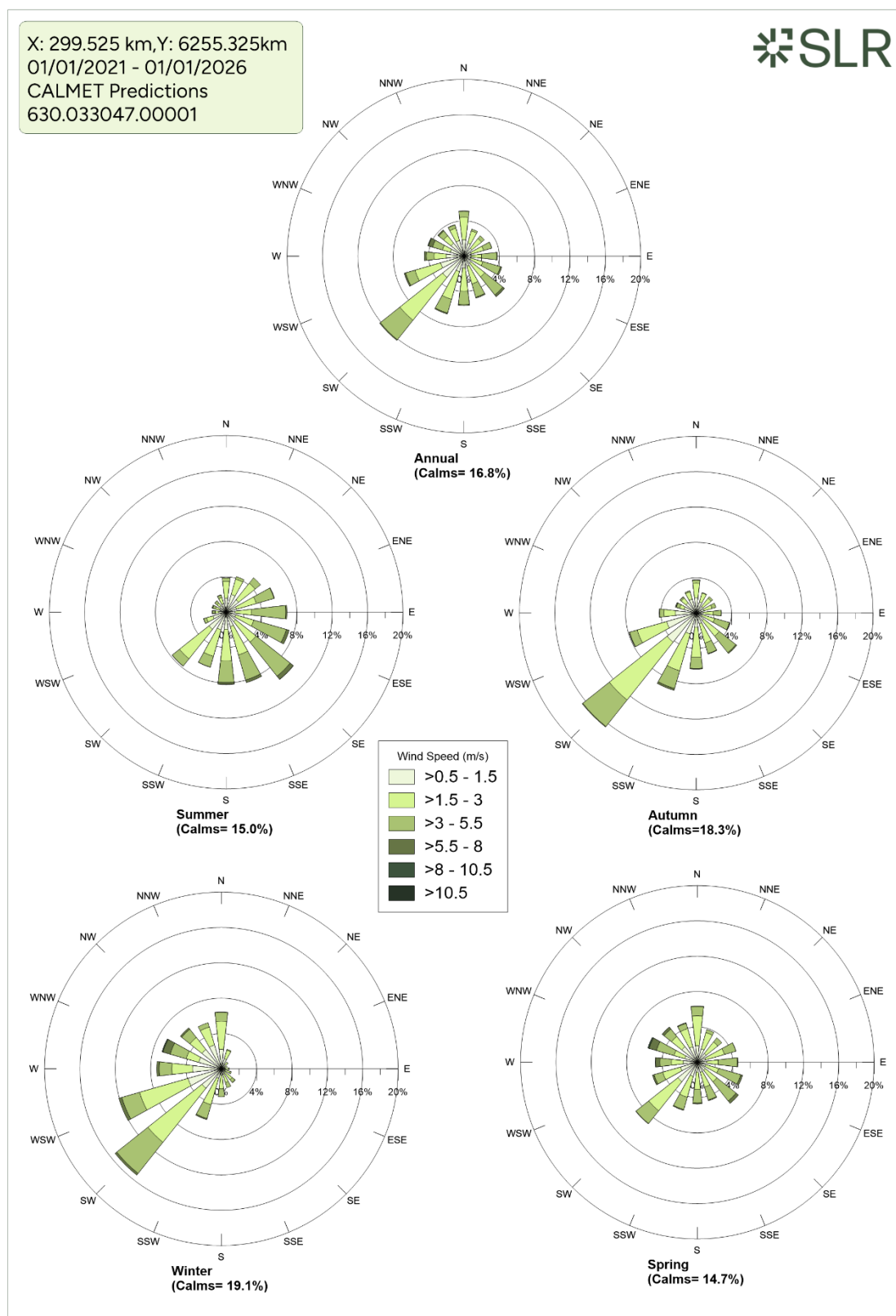
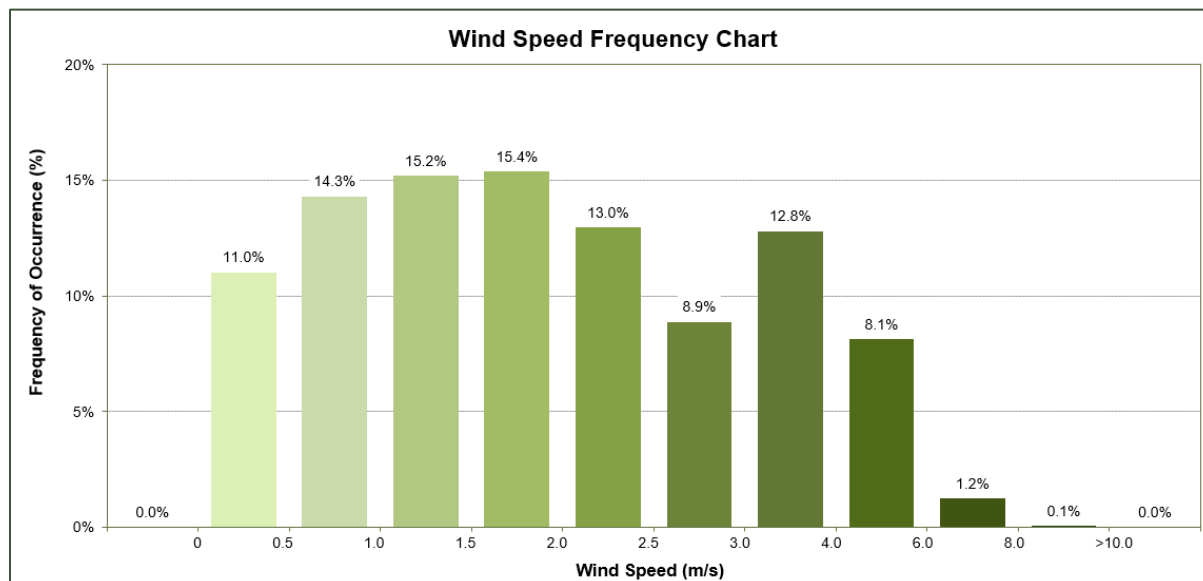


Figure B-2 Annual Wind Speed Frequencies at the Site (CALMET Predictions, 2021)



Atmospheric Stability

Atmospheric stability refers to atmospheric turbulence and the tendency of the atmosphere to resist or enhance vertical motion. Depending on conditions the atmospheric stability can either inhibit or promote pollutant dispersion. The Pasquill-Gifford scheme provides six stability classes, A to F, to categorise the degree of atmospheric stability as follows:

- A = Extremely unstable conditions
- B = Moderately unstable conditions
- C = Slightly unstable conditions
- D = Neutral conditions
- E = Slightly stable conditions
- F = Moderately stable conditions

The meteorological conditions defining each PGT stability class are shown in **Table B-1**.

Unstable conditions are favourable for dispersion, while stable conditions are unfavourable for dispersion.

The dispersion modelling in CALPUFF used a more advanced atmospheric stability scheme (based on micro meteorology). Stability class data was extracted from the meteorological dispersion modelling data set for the meteorological data evaluation.



Table B-1 Meteorological Conditions Defining PGT Stability Classes

Surface Wind Speed (m/s)	Daytime Insolation			Night-Time Conditions	
	Strong	Moderate	Slight	Thin overcast or > 4/8 low cloud	<= 4/8 cloudiness
< 2	A	A - B	B	E	F
2 - 3	A - B	B	C	E	F
3 - 5	B	B - C	C	D	E
5 - 6	C	C - D	D	D	D
> 6	C	D	D	D	D

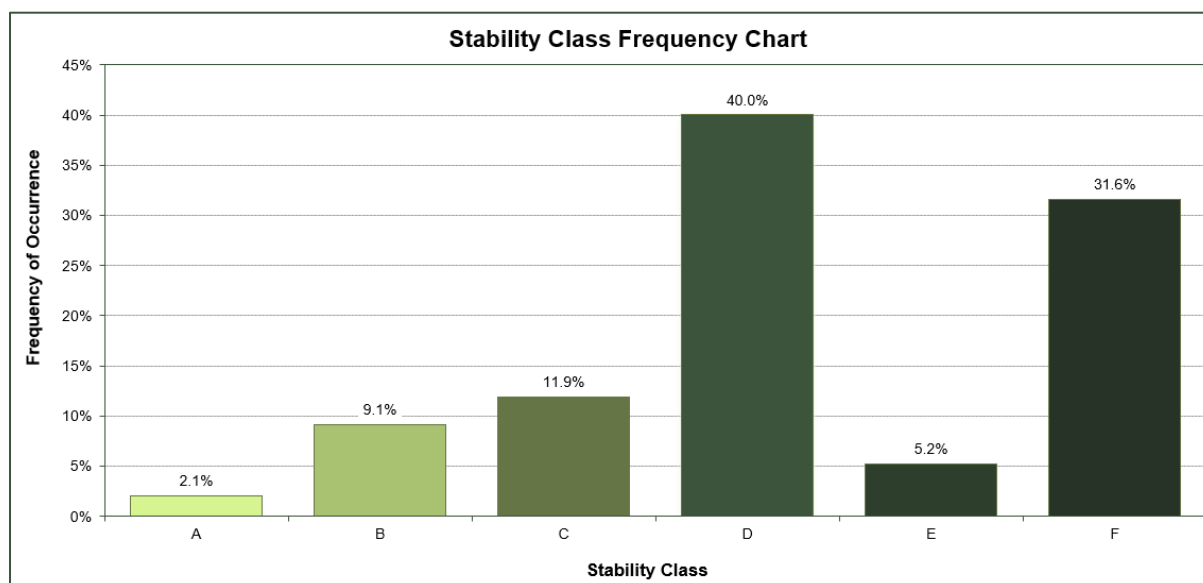
Source: (NOAA 2018)

Notes:

- Strong insolation corresponds to sunny midday in midsummer in England, slight insolation to similar conditions in midwinter.
- Night refers to the period from 1 hour before sunset to 1 hour after sunrise.
- The neutral category D should also be used, regardless of wind speed, for overcast conditions during day or night and for any sky conditions during the hour preceding or following night as defined above.

The frequency of each stability class predicted by CALMET at the Site during the modelling period is presented in **Figure B-3**. The results indicate a high frequency of conditions typical to Stability Class D and F. Stability Class D is indicative of neutral conditions, conducive to a moderate level of pollutant dispersion due to mechanical mixing. Stability Class F is indicative of calm conditions, which typically indicates poorer dispersion of pollutants.

Figure B-3 Predicted Stability Class Frequencies at the Site (CALMET predictions, 2021)



Mixing Heights

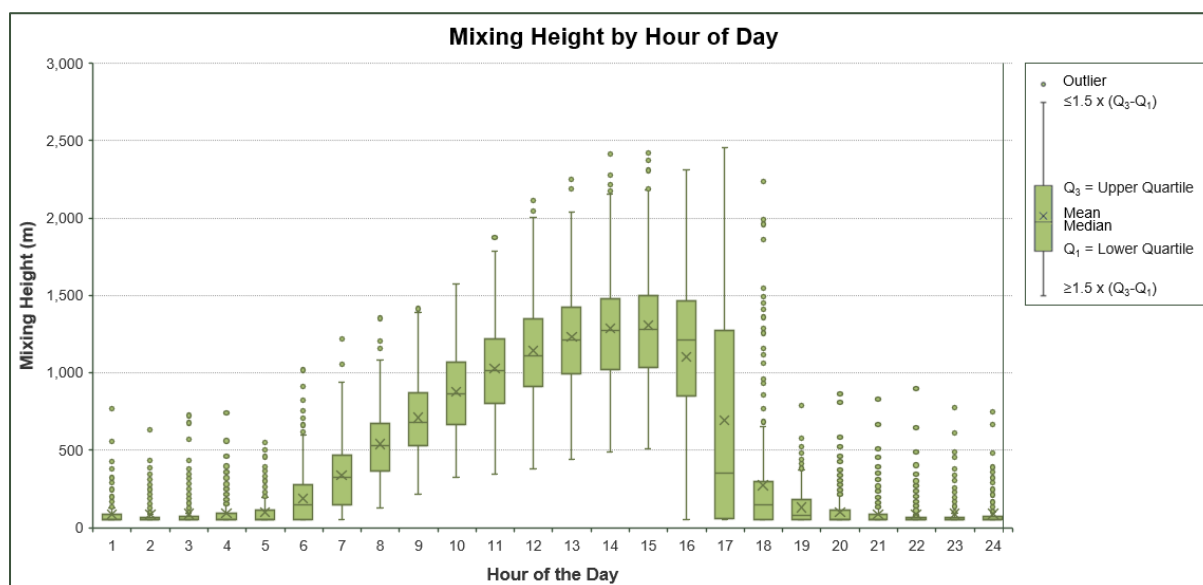
The mixing height is the depth of the atmospheric mixing layer between ground level and an elevated temperature inversion. Depending on conditions, vertical dispersion is typically limited by the mixing height. This is an important parameter in dispersion modelling since the mixing height largely sets the vertical profile the dispersion can take place in.

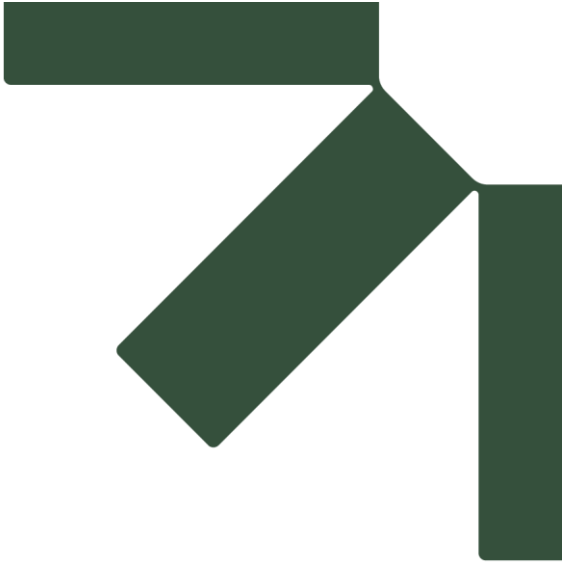
Mixing heights exhibit a diurnal variation in response to convective mixing driven by solar insolation. They typically increase from sunrise to around midday, gradually decline throughout the afternoon, and then drop rapidly at sunset. If a plume penetrates through or is released above the mixing height, the pollutants will be trapped aloft with no mixing to ground level (except under specific conditions such as fumigation). Conversely, if a plume is trapped below a low mixing height (such as an inversion layer), vertical dispersion will be limited, and higher ground-level concentrations are likely to occur.

Diurnal variations in maximum and average mixing heights predicted by CALMET at the Site during the 2021 modelling period are illustrated in **Figure B-4**.

As would be expected, an increase in mixing depth during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and growth of the convective mixing layer.

Figure B-4 Predicted Mixing Heights at the Site (CALMET predictions, 2021)





Appendix C Emission Factors and Assumptions for Emission Estimation

**Oakdale East Industrial Estate – Precinct 2 – Building 2A,
Building 2B and Lot 2C (SSDA -120888992)**

Air Quality Impact Assessment

Goodman Property Services (Aust) Pty Ltd

SLR Project No.: 630.033047.00001

2 July 2026

Particulate matter emissions from the Site have been estimated using published emission factors for the relevant emission sources. Emission factors were sourced from the following documents:

- National Pollutant Inventory Emissions Estimation Technique Manual (NPI EETM) for Mining Version 3.1 (DSEWPC 2012).
- US EPA AP42 Section 11.9 Western Surface Coal Mining (US EPA 1998).
- US EPA AP42 Section 13.2.2 Unpaved Roads (US EPA 2006a).
- US EPA AP42 Section 13.2.4 Aggregate Handling and Storage Piles (US EPA 2006b).
- US EPA AP42 Section 13.2.5 Industrial Wind Erosion (US EPA 2006).
- Proposed Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors (Cowherd, Donaldson and Hegarty 2010).
- National Pollutant Inventory Emissions Estimation Technique Manual (NPI EETM) for Combustion engines Version 3.0 June 2008 (DEWHA 2008).

A summary of the emission factor equations used to estimate emissions from each activity at the Site are presented in **Table C-1**.

The assumptions applied to the relevant equations are provided as follows:

- Material properties refer to Table C-2.
- Vehicle properties and exposed areas refer to Table C-3.

Dust control measures are presented in **Table C-5**.

Estimated emission factors are presented in **Table C-6**.



Table C-1 Summary of Emission Factor/ Equations Used to Estimate Emissions

Activity	Emission Factor			Units	Sources & Notes
	TSP	PM ₁₀	PM _{2.5}		
Unloading and unloading (material transfer)	$EF_{TSP} = \frac{0.74 \times 0.0016 \times \frac{U^{1.3}}{2.2}}{\frac{M^{1.4}}{2}}$	$EF_{PM10} = \frac{0.35 \times 0.0016 \times \frac{U^{1.3}}{2.2}}{\frac{M^{1.4}}{2}}$	$EF_{PM2.5} = \frac{0.053 \times 0.0016 \times \frac{U^{1.3}}{2.2}}{\frac{M^{1.4}}{2}}$	kg/t	EFTSP, EFPM ₁₀ , & EFPM _{2.5} : (US EPA 2006b) Average of U ^{1.3} /2.2 = wind speed factor = 1.11m/s Refer to Table C-2 for moisture (M) assumptions
Dozer	$EF_{TSP} = 2.6 \times \frac{S^{1.2}}{M^{1.3}}$	$EF_{PM10} = 0.34 \times \frac{S^{1.5}}{M^{1.4}}$	EFPM _{2.5} = 0.105 × EFTSP	kg/h	EFTSP & EFPM ₁₀ : (DSEWPC 2012) EFPM _{2.5} : (US EPA 1998) Refer to Table C-2 for silt (s) and moisture (M) assumptions
Grader	$EF_{TSP} = 0.0034 \times (S^{2.5})$	$EF_{PM10} = (0.0056 \times (S^2)) \times 0.6$	EFPM _{2.5} = 0.031 × EFTSP	kg/VKT	EFTSP & EFPM ₁₀ : (US EPA 1998) EFPM _{2.5} : Derived from the application of PM _{2.5} /TSP scaling factor Refer to Table C-2 for mean vehicle speed (S) assumptions
Vehicle Movements on Unpaved Roads	$EF_{TSP} = \left(\frac{0.4536}{1.6093}\right) \times 4.9 \times \left(\frac{S}{12}\right)^{0.7} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45}$	$EF_{PM10} = \left(\frac{0.4536}{1.6093}\right) \times 1.5 \times \left(\frac{S}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45}$	$EF_{PM2.5} = \left(\frac{0.4536}{1.6093}\right) \times 0.15 \times \left(\frac{S}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45}$	kg/VKT	EFTSP, EFPM ₁₀ , & EFPM _{2.5} : (US EPA 2006a) Refer to Table C-2 for surface silt (s) and vehicle weight (W) assumptions
Diesel Combustion	EFTSP = 1.17	EFPM ₁₀ = 1.17	EFPM _{2.5} = 1.12	kg/ m ³	EFTSP, EFPM ₁₀ , & EFPM _{2.5} : (DEWHA 2008). All TSP is assumed to be PM ₁₀



Activity	Emission Factor			Units	Sources & Notes
	TSP	PM ₁₀	PM _{2.5}		
Wind Erosion of Exposed Areas	EFTSP = 0.4	EFPM ₁₀ = 0.5 × EFTSP	EFPM _{2.5} = 0.075 × EFTSP	kg/ha/hr	EFTSP & EFPM ₁₀ : (DSEWPC 2012) EFPM _{2.5} : Derived from the application of PM _{2.5} /TSP particle size multiplier (US EPA 2006) Refer to Table C-4 for assumptions.
Where: M = material moisture content (%) s = material silt content (or surface silt content in unpaved roads) (%) U = wind speed (m/s) W = mean vehicle weight (tonnes) S = mean vehicle speed (km/h)					

Table C-2 Emission Factor Assumptions - Material Properties

Parameter	Value	Units	Sources & Notes
Silt content	8.6	%	Double the average silt content value in AP42 Section 11.9 Table 11.9-3 (haul truck mean) (US EPA 1998)
Moisture content	4	%	Conservatively half of the average moisture content value in AP42 Section 11.9 Table 11.9-3 (Overburden mean) (US EPA 1998)
Topsoil density	1.8	t/m ³	Confirmed by client; Source: https://theconstructor.org/building/density-construction-materials/13531/ ,
Clay density	1.6	t/m ³	Confirmed by client; Source: https://civilplanets.com/unit-weight-of-construction-materials/ Accessed
Shale density	2.5	t/m ³	Confirmed by client; Source: https://theconstructor.org/building/density-construction-materials/13531/ ,
Hard rock density	3.0	t/m ³	Confirmed by client; Source: https://civilplanets.com/unit-weight-of-construction-materials/ Accessed



Table C-3 Emission Factor Assumptions – Vehicles

Variable	Value	Units	Source
Dozers			
Number of units	6	-	Client information
Utilisation	95	%	
Operating hours	21,945	Hours per year	Client information
Grader			
Number of units	3	-	Client information. Conservative Assumption
Operating hours	2,668 hr/year		
Speed of grader	6	km/hr	Client information
Haul Trucks – Import/Export			
Empty weight	28	tonnes	Client information
Capacity	42.5	tonnes per load	
Gross weight	70.5	tonnes	
Average empty/gross weight	49.3	tonnes	
Haul Trucks – Onsite transfer			
Empty weight	28	tonnes	Client information
Capacity	36	tonnes per load	
Gross weight	64	tonnes	
Average empty/gross weight	46	tonnes	



Table C-4 Material Movements and Travel Distances

Parameter	Annual Average	Unit
Works Duration / hours of operation		
Total Duration	15.5	months
Hours per day	24 (fill import and emplacement) 11 (other construction activities)	hours/day
CUT		
Cut total quantities		
Cut Material Total	50,000	m ³ TOTAL
Cut Material Total	38,710	m ³ /annum
Clay	40%	%
Brown shales	40%	%
Hard rock	20%	%
Fill from Cut Breakdown		
Fill Material from cut	50,000	m ³ TOTAL
Clay	40%	%
Brownshales	40%	%
Hard rock	20%	%
Export Breakdown		
Export Total	25,000	m ³ TOTAL
Export Total	56,875	tonnes TOTAL
Export annual	58,710	tonnes/annum
Export annual	19,355	m ³ /annum
Clay	25%	%



Parameter	Annual Average	Unit
Brown shales	75%	%
Hard rock	0%	%
Cut total breakdown		
Cut - Clay	20,000	m³ TOTAL
	32,000	tonnes TOTAL
	24,774	tonnes/annum
	15,484	m³/annum
Cut - Brown Shales	20,000	m³ TOTAL
	50,000	tonnes TOTAL
	38,710	tonnes/annum
	15,484	m³/annum
Cut - Hard Rock	10,000	m³ TOTAL
	30,000	tonnes TOTAL
	23,226	tonnes/annum
	7,742	m³/annum
Cut (excluding topsoil)	112,000	tonnes TOTAL
	86,710	tonnes/annual
	38,710	m³/annum
Cut Useable breakdown (for fill)		
Cut - Clay	20,000	m³ TOTAL
	32,000	tonnes TOTAL
	24,774	tonnes/annum



Parameter	Annual Average	Unit
	15,484	m ³ /annum
Cut - Brown Shales	20,000	m ³ TOTAL
	50,000	tonnes TOTAL
	38,710	tonnes/annum
	15,484	m ³ /annum
Cut - Hard Rock	10,000	m ³ TOTAL
	30,000	tonnes TOTAL
	23,226	tonnes/annum
	7,742	m ³ /annum
Unusable material breakdown / To be exported		
Cut - Clay	6,250	m ³ TOTAL
	10,000	tonnes TOTAL
	7,742	tonnes/annum
	4,839	m ³ /annum
Cut - Brown Shales	18,750	m ³ TOTAL
	46,875	tonnes TOTAL
	36,290	tonnes/annum
	14,516	m ³ /annum
Cut - Hard Rock	-	m ³ TOTAL
	-	tonnes TOTAL
	-	tonnes/annum
	-	m ³ /annum



Parameter	Annual Average	Unit
FILL		
Material Import		
Import	550,000	m³ TOTAL
	1,375,000	tonnes TOTAL
	1,064,516	tonnes/annum
Clay	0%	%
Brown shales	100%	%
Hard rock	0%	%
Clay	-	tonnes TOTAL
Brown Shales	1,375,000	tonnes TOTAL
Hard Rock	-	tonnes TOTAL
Total Fill (from cut and import)		
Fill	600,000	m³ TOTAL
	1,487,000	tonnes TOTAL
	1,151,226	tonnes/annum
Clay	32,000	tonnes TOTAL
	24,774	tonnes/annum
Brown Shales	1,425,000	tonnes TOTAL
	1,103,226	tonnes/annum
Hard Rock	30,000	tonnes TOTAL
	23,226	tonnes/annum



Parameter	Annual Average	Unit
Material properties		
Topsoil - moisture content	4.0	%
Topsoil - density	1.80	t/m ³
Clay - moisture content	4.0	%
Clay - density	1.60	t/m ³
Brown shales - moisture content	4.0	%
Brown shales- density	2.5	t/m ³
Hard rock - Moisture content	4.0	%
Hard Rock - density	3.00	t/m ³
Average silt content	8.6	%
Dozer		
Total no.	6.0	
Utilisation	95%	%
Hours per year (total)	21,945.0	hours per year
Grader		
Total no.	3.0	
Hours grader each operated	2,668.0	hr/year EACH
Speed of Grader	6.0	km/hr
Grader Vehicle km travelled	48,024.0	km/annum
Cut hauling		
Haul truck empty weight	28.0	tonnes
Haul truck capacity - for inventory	36.0	tonnes per load



Parameter	Annual Average	Unit
Haul truck gross weight	64.0	tonnes
Haul truck - average empty/gross - for inventory	46.0	tonnes
Number of return trips	2,409	trips/annum
Haul road silt content	8.6	% silt content
Haul road length (from cut to stockpile)	1.0	km/return trip
Haul road length (from stockpile to fill)	1.0	km/return trip
Truck unloading at fill area	86,709.7	tonnes / annum
Import Hauling (from offsite to stockpile)		
Haul truck empty weight	28.0	tonnes
Haul truck capacity - for inventory	42.5	tonnes per load
Haul truck gross weight	70.5	tonnes
Haul truck - average empty/gross - for inventory	49.3	tonnes
Number of return trips across pit	25,047	trips/annum
Haul road silt content	8.6	%
Haul road length	1.0	km/return trip
Truck import	1,064,516.1	tonnes / year
Export Hauling (from stockpile to offsite)		
Haul truck empty weight	28.0	tonnes
Haul truck capacity - for inventory	42.5	tonnes per load
Haul truck gross weight	70.5	tonnes
Haul truck - average empty/gross - for inventory	49.3	tonnes



Parameter	Annual Average	Unit
Number of return trips across pit	1,381.4	trips/annum
Haul road silt content	8.6	%
Haul road length	1.0	km/return trip
Truck export	58,709.7	tonnes / year
Wind erosion potential		
Active area (wind erosion likely)	27	ha
Fuel usage		
Diesel combustion -Stage 2	1,605,290	L/year
Building Construction - Vehicle movements		
Heavy vehicle average weight	40	tonnes
Construction hours per week	62	hours per week
Construction hours per year	3,224	hours
Number of heavy vehicle trips per hours	-	trips per hour
Distance travelled on unsealed roads per trip	0.8	km/return trip
Haul road silt content	8.6	%
Total kilometres travelled per year of construction activities	66,000	km/annum
Total trips per year of construction activities	82,500	



Table C-5 Control Measures

Control Measure	Control Efficiency
Water carts used while scrapers stripping	50%
Water carts used while scraper travels	75%
Water carts used on haulage routes (Level 2 watering (>2 L/m ² /h)	75%
Water carts used with dozer activities*	50%
Water carts used with grader activities	50%
Water carts used on exposed area	50%
Source: (DSEWPC 2012)	
*Assumed to be similar to scrapers stripping.	

Haul Road Watering to Suppress Wheel Generated Dust

The NPI EETM for Mining indicates emission control of wheel generated dust as follows:

- Level 1 watering (2 L/m²/h): 50% control
- Level 2 watering (>2 L/m²/h): 75% control

Site specific watering emission control C expressed as a percentage can be estimated from typical evaporation rates for the area and haul road traffic rate using the following equation (Air & Waste Management Association 2000):

$$C = 100 - \frac{0.8pdt}{i}$$

where p is the average hourly daytime evaporation rate, d is the average hourly daytime traffic rate, t is the time (hours) between water application and i is the application intensity (L/m²).

BoM⁶ publish total evaporation maps for Australia showing the amount of water which evaporates from an open pan. Annual average and seasonal average evaporation rates for the area in which the Site is situated are calculated from these maps which indicate the following:

- Approximate total annual average evaporation rate: 1600 mm, or 0.18 mm/h
- Approximate total summer average evaporation rate: 600 mm, or 0.28 mm/h

Using water carts and water sprays to suppress dust emissions will achieve less control in areas with greater evaporation than areas with less evaporation. Greater rates of watering are likely to be required in summer when evaporation rates are increased to achieve adequate dust control. From the evaporation rates above, if a conservative traffic rate of 40 movements per hour and 1 hour between water applications, a control of greater than 90% is calculated for the Site haul roads (including for the summer months) with a watering rate of less than 1 L/m²/h. This control rate would increase with more frequent water application, likely lower traffic rates, and the anticipated watering rate of less than 2 L/m²/h. However, for modelling purposes, a 75% control factor was conservatively applied to the unpaved haul road wheel generated dust estimates.

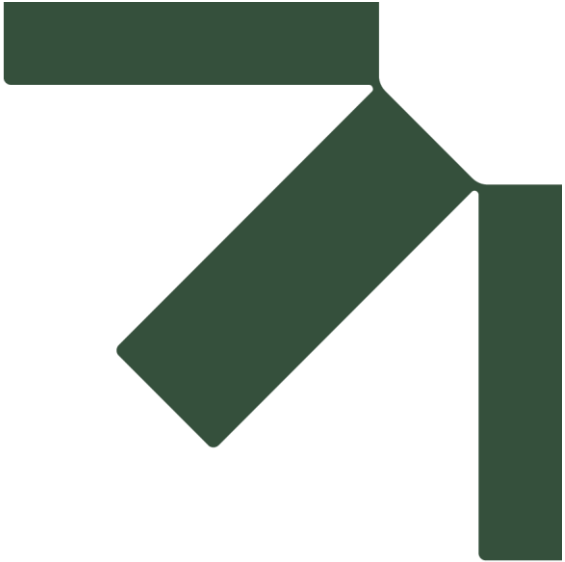
⁶ Australian Climate Averages - Evaporation (Climatology 1975-2005), ,
http://www.bom.gov.au/jsp/ncc/climate_averages/evaporation/index.jsp?period=sum#maps, accessed February 2025



Table C-6 Emission Factors

Activity	TSP Emission Factor	PM ₁₀ Emission Factor	PM _{2.5} Emission Factor	Units
Loading material to trucks in cut area for transfer to stockpile	0.00044	0.00021	0.000031	kg/t
Haulage of excavated material to stockpiles	0.11	0.031	0.0031	kg/t
Unloading excavated material at stockpile	0.00044	0.00021	0.000031	kg/t
Haulage of imported material to stockpile/fill area	0.09	0.03	0.003	kg/t
Unloading imported material at stockpile/fill area	0.00044	0.00021	0.000031	kg/t
Loading stockpiled material to trucks for transfer to fill	0.00044	0.00021	0.000031	kg/t
Haulage of stockpiled material from stockpile to fill area	0.11	0.031	0.0031	kg/t
Unloading of stockpiled material at fill area	0.00044	0.00021	0.000031	kg/t
Loading unusable cut material for export	0.00044	0.00021	0.000031	kg/t
Haulage of unusable cut material offsite	0.09	0.03	0.003	kg/t
Heavy vehicles travelling on unpaved surfaces – General Construction	2.93	0.84	0.084	kg/vkt
Dozer	5.7	1.2	0.60	kg/h
Grader	0.30	0.12	0.0093	kg/vkt
Wind erosion Area 1	0.40	0.20	0.030	kg/ha/hour
Wind erosion Area 2	0.40	0.20	0.030	kg/ha/hour
Wind erosion Area 3	0.40	0.20	0.030	kg/ha/hour
Diesel combustion	1.2	1.2	1.1	kg/m ³





Appendix D Variable Emission File

**Oakdale East Industrial Estate – Precinct 2 – Building 2A,
Building 2B and Lot 2C (SSDA -120888992)**

Air Quality Impact Assessment

Goodman Property Services (Aust) Pty Ltd

SLR Project No.: 630.033047.00001

2 July 2026

Variable Emission File – Calculation Steps

A brief summary of the steps used in calculating the hourly varying emission rates for each source are presented below.

Step 1: Calculate annual average emission rate (kg/year) for FP, CM and RE

FPannual = PM _{2.5} , annual	(FP) Fine Particulate – particulate of size less than 2.5 µm
CMannual = PM ₁₀ , annual – PM _{2.5} , annual	(CM) Coarse Particulate – particulate of size between 10 µm and 2.5 µm
REannual = TSPannual - PM ₁₀ , annual	(RE) Rest Particulate – particulate of size greater than 10 µm

Step 2: Identify the operating hours for each activity

Step 3: Classify the sensitivity of each type of activity to wind speed

Wind insensitive: activities with an emission factor that is independent of wind speed (e.g. blasting)

Wind sensitive: activities with an emission factor that is a function of (wind speed/2.2)^{1.3} (e.g. loading)

Wind erosion: emission from exposed areas/stockpiles

Step 4: Identify the number of sources associated with each activity

Note that each wind erosion source is modelled as an independent source.

Step 5: Calculate the hourly average emission rate for each activity per source



$FP_{AC,i,h} = \frac{FP_{annual,i} \times 1000}{N_{days} \times OH_i \times 3600 \times N_{s,i} \times WSFactor_{i,h}}$ $CM_{AC,i,h} = \frac{CM_{annual,i} \times 1000}{N_{days} \times OH_i \times 3600 \times N_{s,i} \times WSFactor_{i,h}}$ $RE_{AC,i,h} = \frac{RE_{annual,i} \times 1000}{N_{days} \times OH_i \times 3600 \times N_{s,i} \times WSFactor_{i,h}} \times$ FOR WIND INSENSITIVE ACTIVITIES $WSFactor_{i,h} = 1$ FOR WIND SENSITIVE ACTIVITIES $WSFactor_{i,h} = \frac{\left(\frac{WS_h}{2.2}\right)^{1.3}}{\frac{\sum_{j=1}^n \left(\frac{WS_j}{2.2}\right)^{1.3}}{n}}$ FOR WIND EROSION ACTIVITIES $WSFactor_{i,h} = \frac{(WS_h)^3}{\frac{\sum_{j=1}^n (WS_j)^3}{n}}$	WHERE: FP_{ac,i,h}- FINE PARTICULATES EMISSION RATE FOR ACTIVITY I (G/S) AT HOUR H CM_{ac,i,h}- COARSE PARTICULATES EMISSION RATE FOR ACTIVITY I (G/S) AT HOUR H RE_{ac,i,h}- REST OF PARTICULATES EMISSION RATE FOR ACTIVITY I (G/S) AT HOUR H OH_i-DAILY OPERATING HOURS (1- 24) FOR ACTIVITY I N_{days} -NUMBER OF DAYS IN THE METEOROLOGICAL DATA FILE N_{s,i} -NUMBER OF SOURCES ASSOCIATED WITH ACTIVITY I WS_h-WIND SPEED AT THE HOUR N -NUMBER OF HOURS IN THE METEOROLOGICAL DATA FILE
---	--

Note: If the activity was modelled as area source, the equation on the left column of the table needs to be divided by the area of that activity.

Step 6: Calculate hourly average emission rate for each source

To calculate the emission rate for a particular source for a particular hour, add up the calculated emission rate for each activity associated with source.

For example, if Source 1 is associated with Activity 1, Activity 2 and Activity 3, then:

$$ERS1,h,FP = FPAC,1,h+ FPAC,2,h+ FPAC,3,h$$

$$ERS1,h,CM = CMAC,1,h+ CMAC,2,h+ CMAC,3,h$$

$$ERS1,h,RE = REAC,1,h+ REAC,2,h+ REAC,3,h$$



Appendix E Risk Assessment Methodology

**Oakdale East Industrial Estate – Precinct 2 – Building 2A,
Building 2B and Lot 2C (SSDA -120888992)**

Air Quality Impact Assessment

Goodman Property Services (Aust) Pty Ltd

SLR Project No.: 630.033047.00001

2 July 2026

Operational Assessment Methodology

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 or beneficial environment?

Sensitivity: how sensitive is the receiving environment to the anticipated impacts? This may be applied to the sensitivity of the environment in a regional context or specific receptor locations.

Magnitude: what is the anticipated scale of the impact?

The integration of receptor sensitivity with impact magnitude is used to derive the predicted **significance** of that change.

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 broad categories outlined in **Table E1**, which has been used in this assessment to define the sensitivity of receptors to air quality impacts.

Table E1 Methodology for Assessing Sensitivity of a Receptor to Air Quality Impacts

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

Magnitude of Impact

Magnitude describes the anticipated scale of the anticipated environmental change in terms of how that impact may cause a change to baseline conditions. **Table E2** outlines the methodology used in this assessment to define the magnitude of the identified potential air quality impacts.

Table E2 Methodology for Assessing Magnitude of Impacts

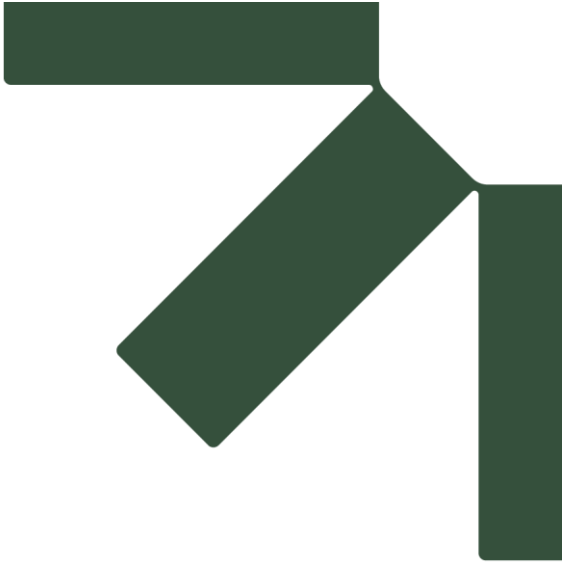
Magnitude	Description
Substantial	Impact is predicted to cause significant consequences on the receiving environment (may be adverse or beneficial)
Moderate	Impact is predicted to possibly cause statutory objectives/standards to be exceeded (may be adverse)
Slight	Predicted impact may be tolerated.
Negligible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

Significance of Impact

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

Table E3 Impact Significance Matrix

Magnitude		[Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	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



Appendix F Isopleths

**Oakdale East Industrial Estate – Precinct 2 – Building 2A,
Building 2B and Lot 2C (SSDA -120888992)**

Air Quality Impact Assessment

Goodman Property Services (Aust) Pty Ltd

SLR Project No.: 630.033047.00001

2 July 2026

Figure F-1 Predicted 24-hour Average Incremental PM_{2.5} - Construction

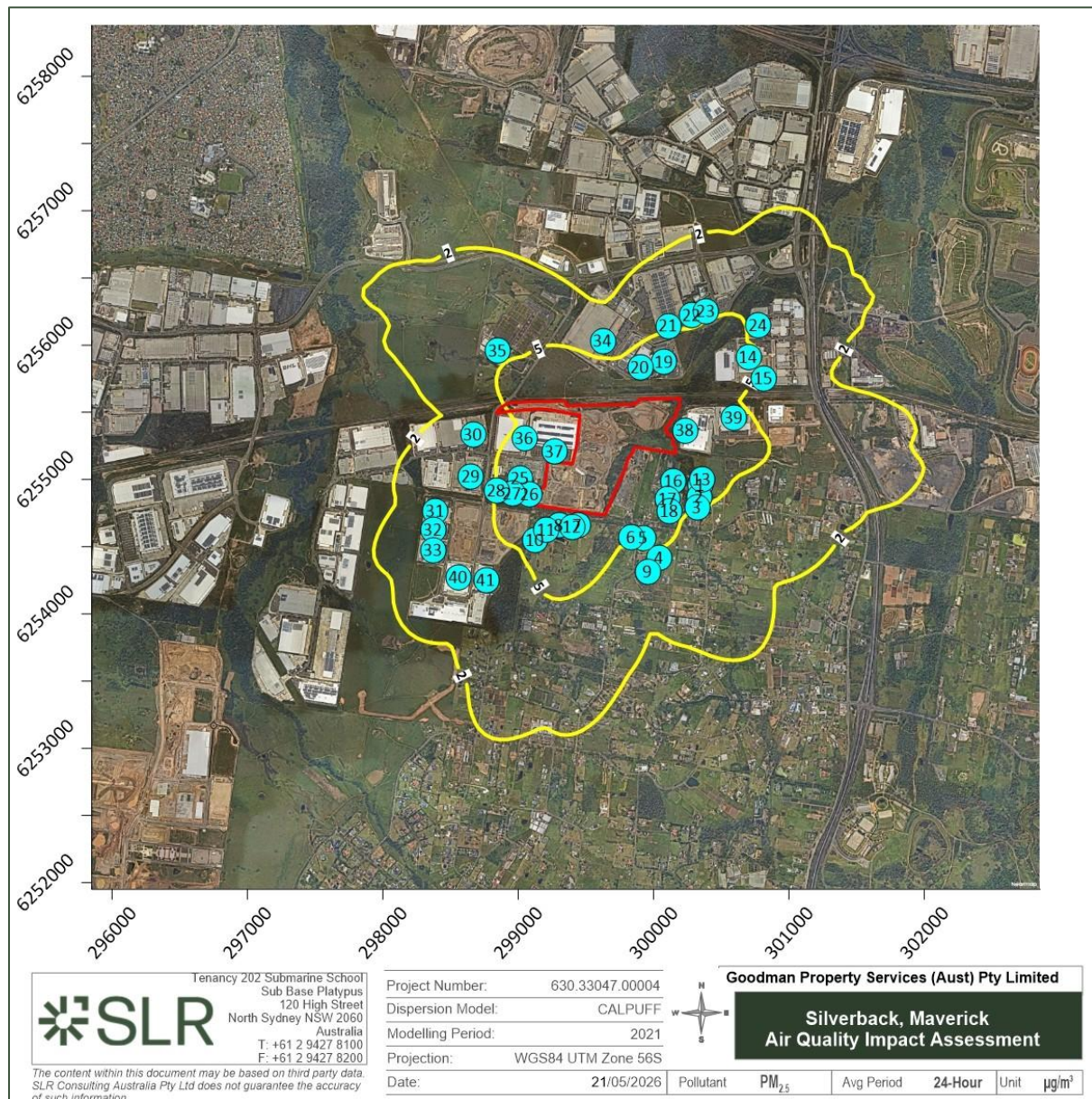


Figure F-2 Predicted Annual Average Incremental PM_{2.5} - Construction

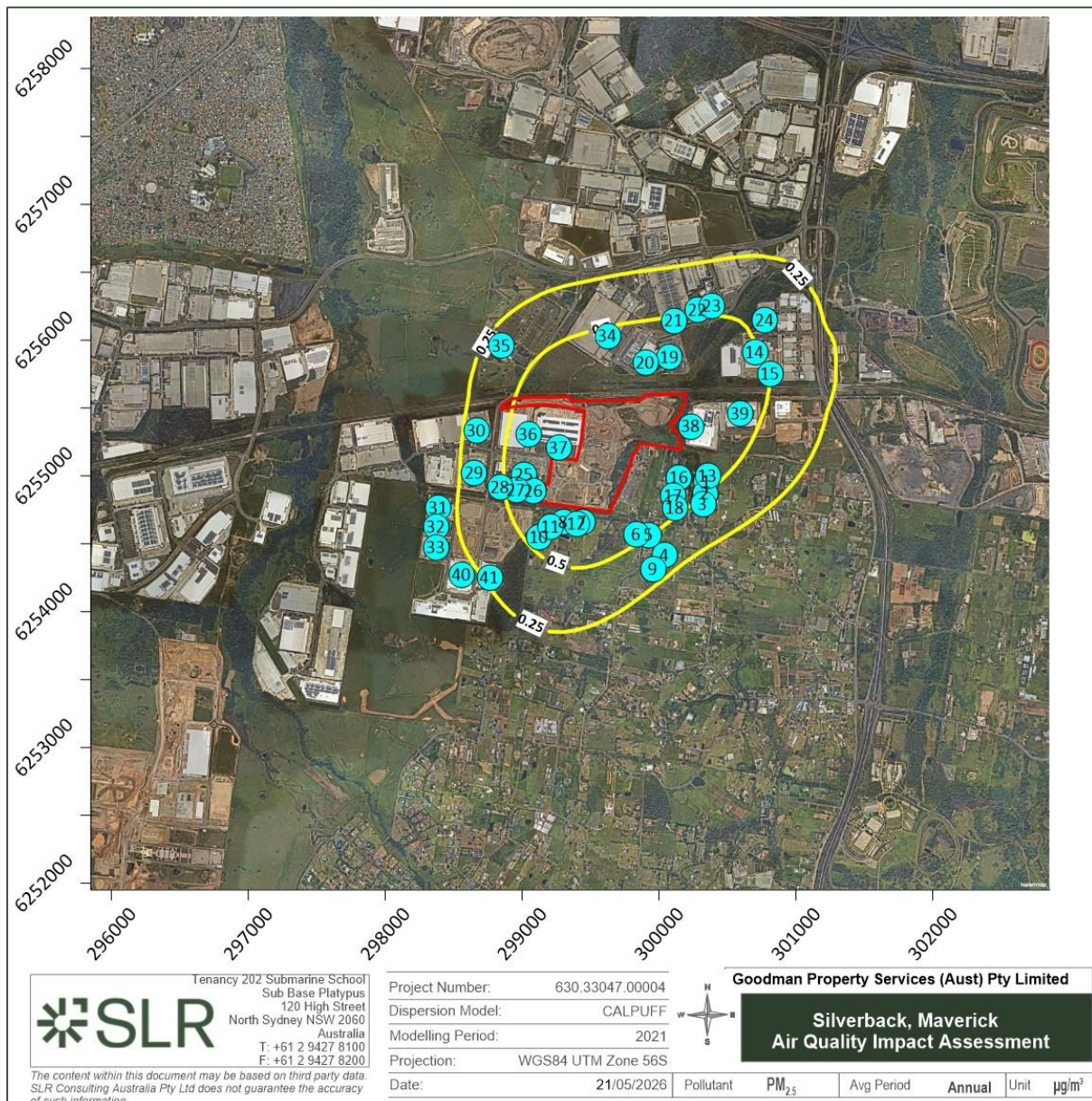


Figure F-3 Predicted 24-hour Average Incremental PM_{10} - Construction

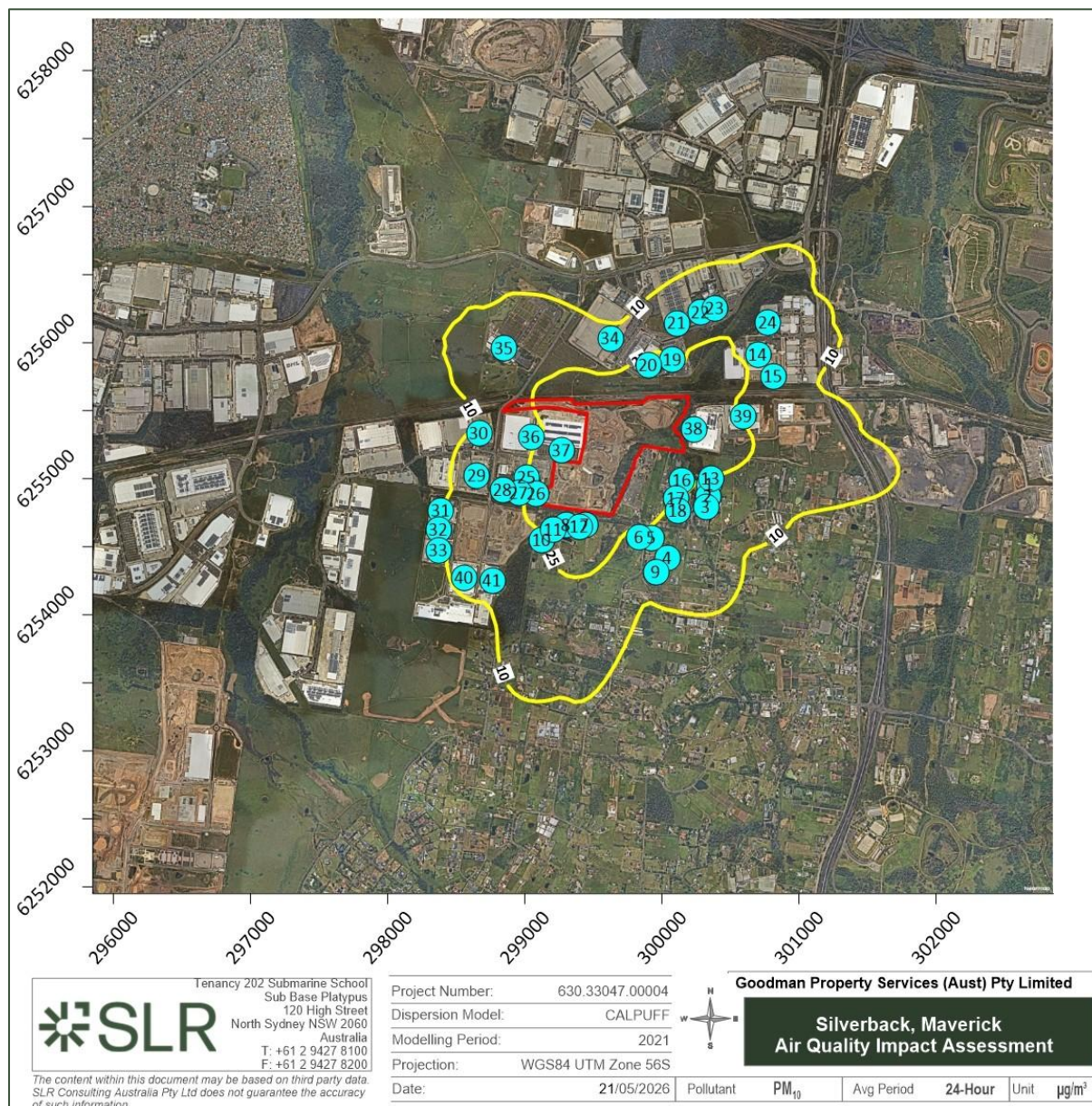


Figure F-4 Predicted Annual Average Incremental PM_{10} - Construction

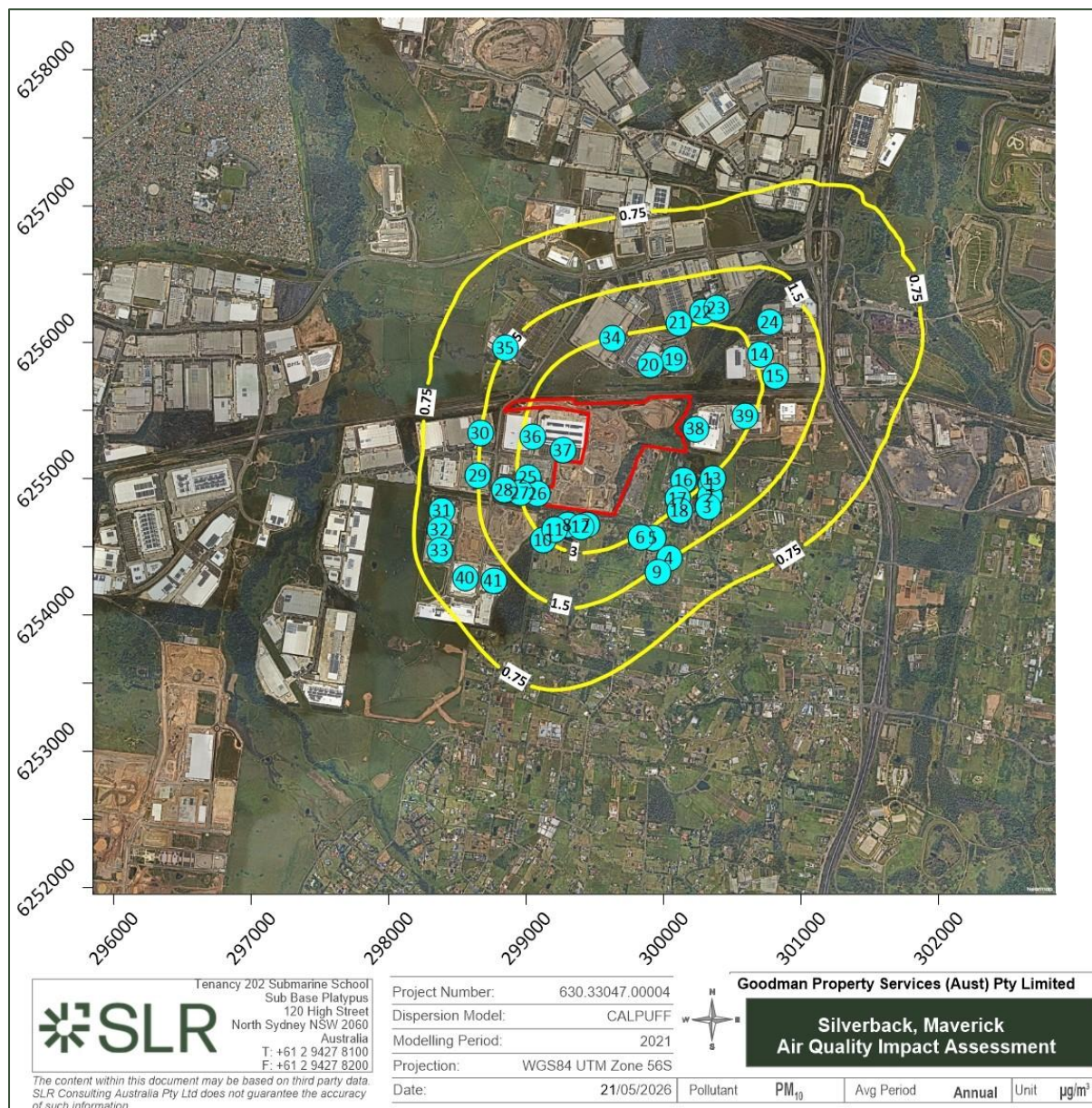


Figure F-5 Predicted Annual Average Incremental TSP - Construction

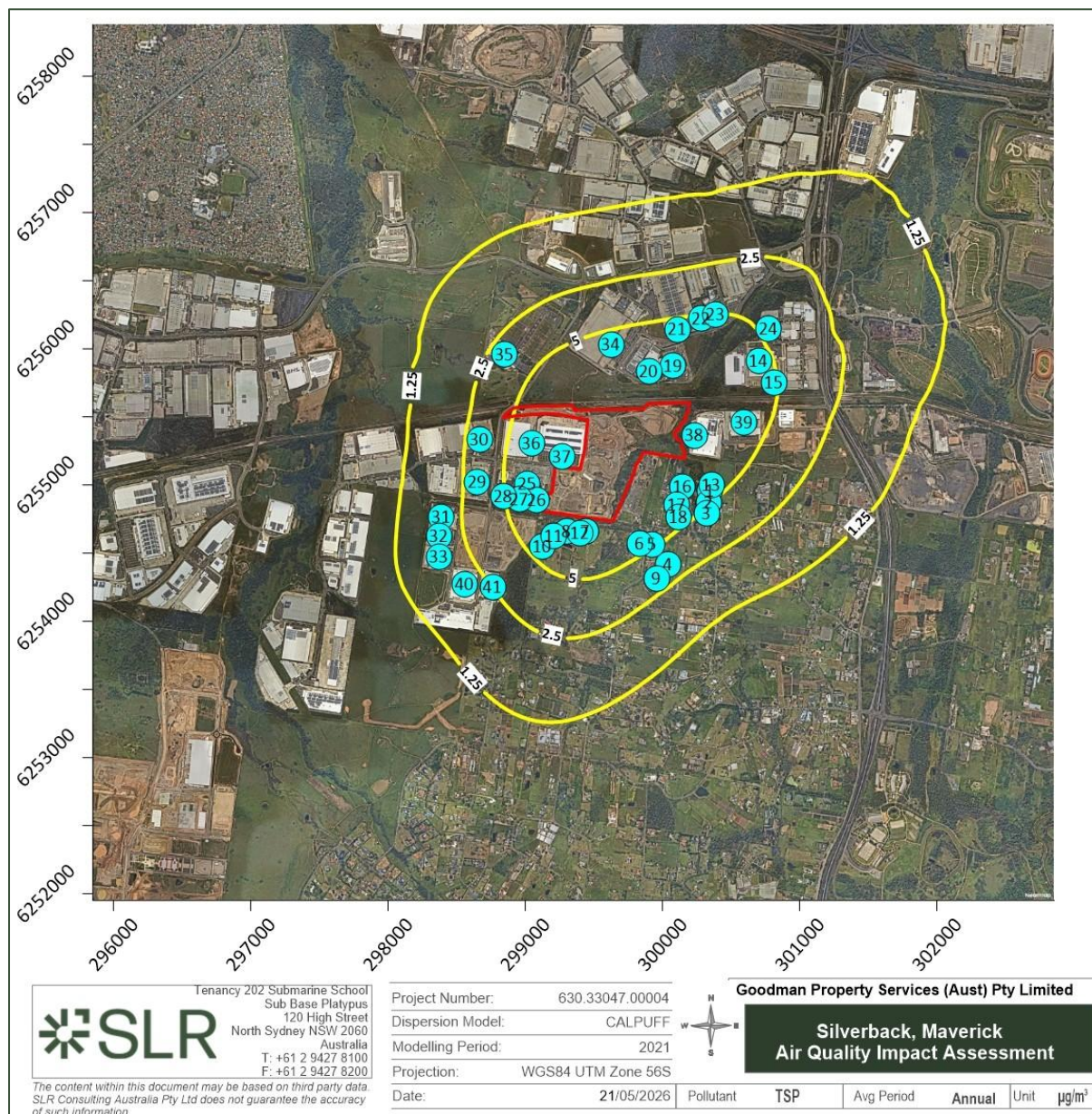
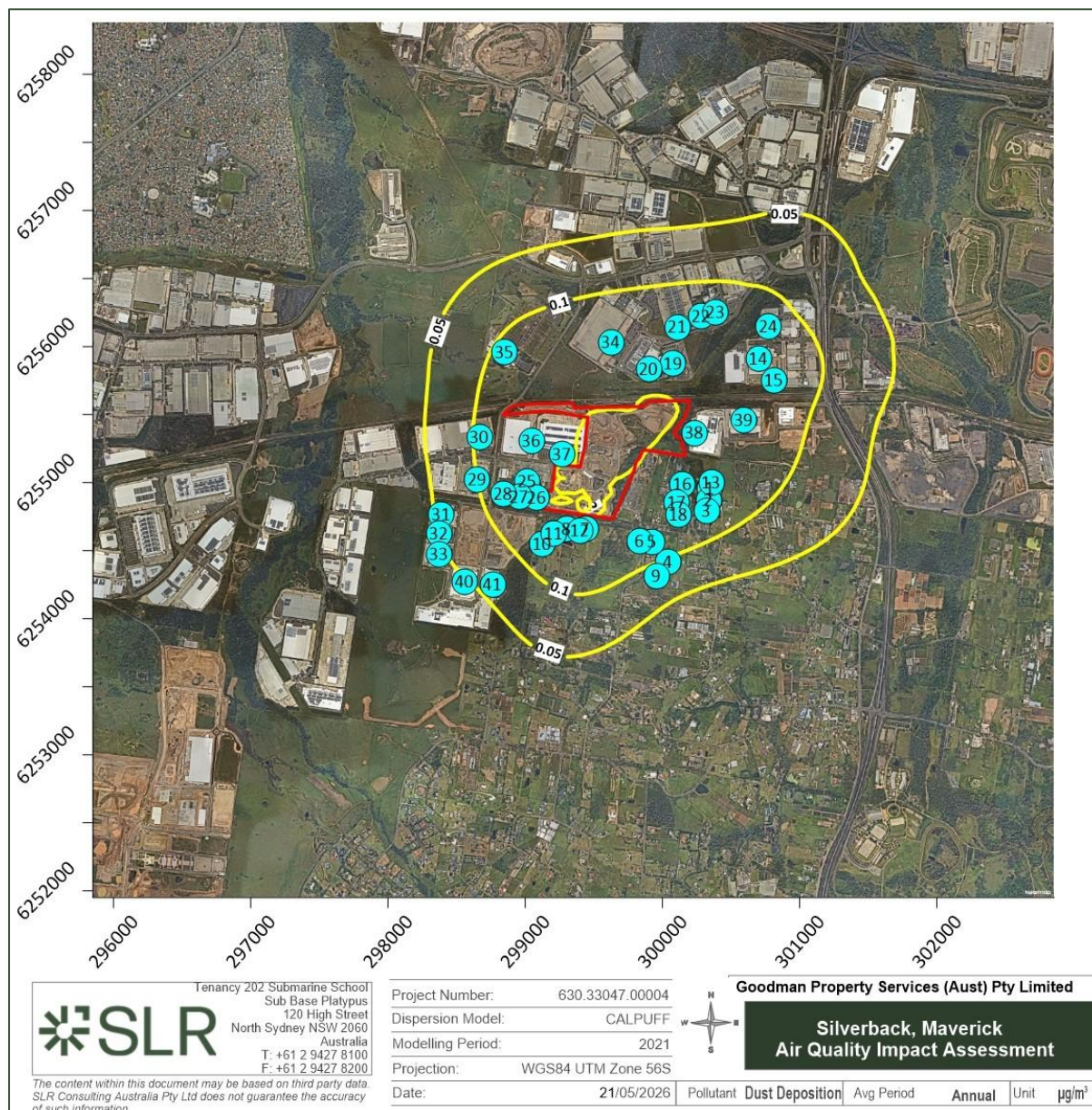
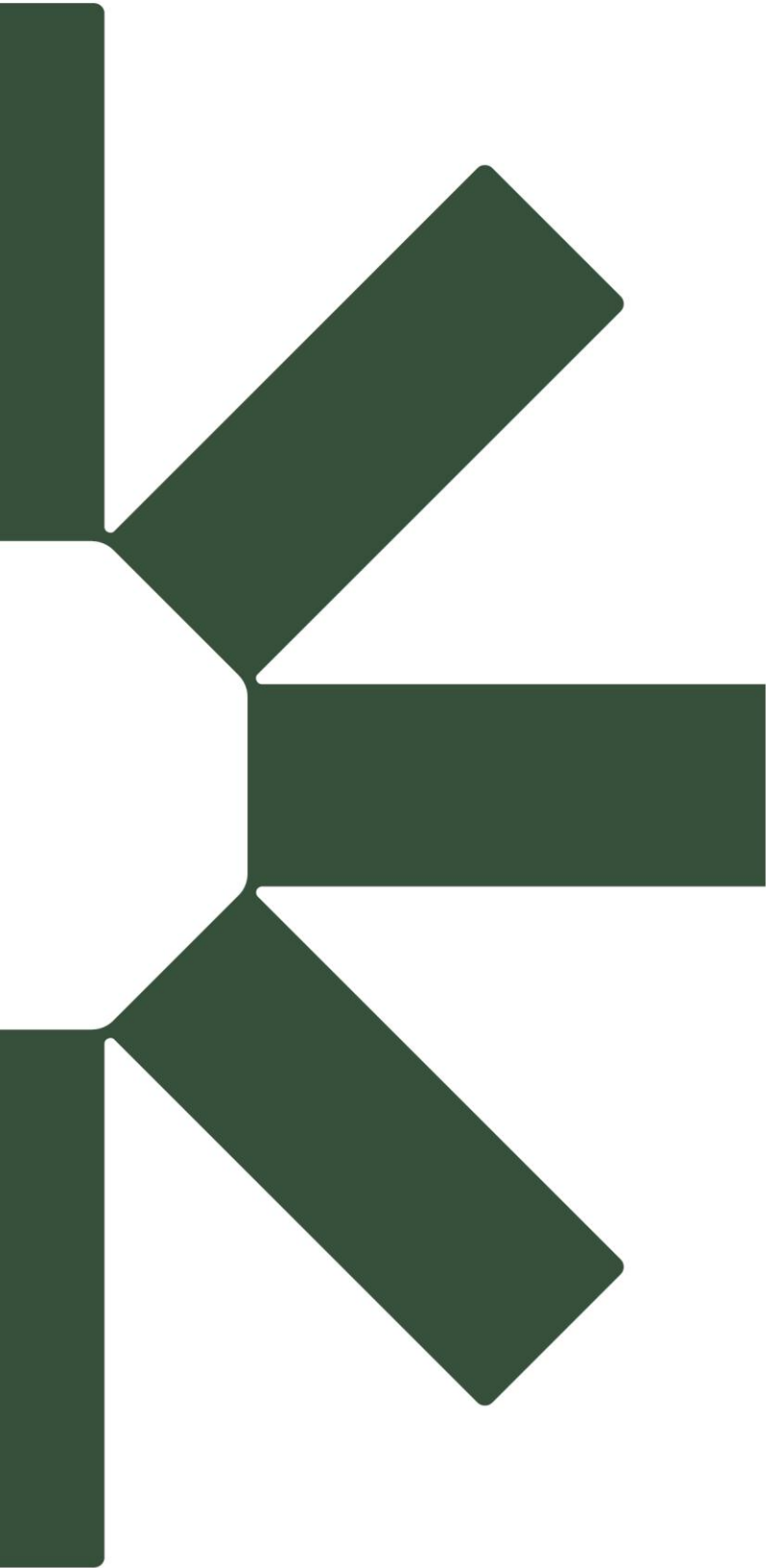


Figure F-6 Predicted Annual Average Incremental Dust Deposition - Construction





Making Sustainability Happen