Montrose Quarry Extension

Air Quality Impact Assessment

Boral Resources (VIC) Pty Ltd

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Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	16 February 2024	J Shepherd	J A Cox	Jason Shepherd

Basis of Report

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

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Executive Summary

Boral Resources (Vic) Pty Ltd engaged SLR Consulting Australia Pty Ltd to prepare an air quality impact assessment (AQIA) for Montrose Quarry (the Quarry), 56-72 Canterbury Road, Montrose, Victoria (the Site).

To secure long-term access to extractive resources, Boral proposes to extend the extraction limit of the Quarry (the Project) to access known reserves within the existing buffer areas.

To inform this AQIA, and specifically to establish appropriate existing background concentrations with which to predict cumulative (Project plus background) concentrations, Boral engaged SLR to undertake a baseline ambient air quality monitoring program (AAQMP) for the Project between July 2022 and July 2023.

Methodology

Emissions of dust as particles with equivalent aerodynamic diameters of less than 10 µm and 2.5 µm (PM_{10} and $PM_{2.5}$) and respirable crystalline silica (RCS) associated with the Project were estimated for:

- excavator and loader material handling
- truck and light vehicle movements on unsealed roads
- crushing and screening
- drilling and blasting
- wind erosion of stockpiles and exposed areas
- asphalt and concrete batching plant material transfer lines and baghouse.

Fugitive emission rates of PM_{10} and $PM_{2.5}$ were estimated using published emission factors and quarrying activity intensity (e.g. throughput, vehicle kilometres travelled etc).

The dispersal of emissions to air from the Project and the resulting ground level concentrations (GLCs) at nearby sensitive receptors were modelled using the Victorian regulatory model, AERMOD. Three scenarios were modelled representing:

- Scenario 0: Base Case - Existing Operations
- Scenario 1: Project Year 5 – Quarry extension stage 3 (worst case construction)
- Scenario 2: Project Year 15 onwards – Quarry operation stage 7 and 8 (maximum operating conditions).

Results

Elevated background concentrations of PM_{10} monitored during the baseline monitoring period were used to represent existing conditions result in up to one exceedance of the 24-hour average air pollution assessment criterion (APAC) per year at some of the nearest sensitive receptors once the Project contribution is added. Under normal background conditions, the PM_{10} APAC is predicted to be met at all receptors.

The background concentrations used in conjunction with the predicted Project ground level concentrations (GLCs) to give the maximum cumulative GLCs (Project plus background) may already include contributions from the existing operations (Scenario 0), and therefore the cumulative GLCs can be considered conservative (i.e., over-predictions).

Overall, the sensitive receptors with the greatest predicted GLCs under existing operations are likely to experience a relatively small increase during Scenario 1 and a small decrease during Scenario 2.

These results indicate that increase in maximum Project 24-hour average PM_{10} GLCs at any receptor is 4.3 µg/m^3 under Scenario 1 and 1.8 µg/m^3 under Scenario 2. The corresponding increases in the maximum Project 24-hour average $PM_{2.5}$ GLCs are 0.5 µg/m^3 and 0.0 µg/m^3, respectively.

The 24-hour average $PM_{2.5}$ APAC and annual average APACs for PM_{10}, $PM_{2.5}$ and RCS (as $PM_{2.5}$) are predicted to be met at all receptors.

The assessment includes a number of conservative assumptions and therefore actual maximum GLCs are likely to be less than those predicted.

Summary

The risk of adverse impacts to air quality at the nearest sensitive receptors is predicted to be low with the PM_{10} and $PM_{2.5}$ 24-hour average and annual average APAC's met in all cases except in those unusual cases where background 24-hour average PM_{10} conditions approach the APAC. The maximum increase in Project 24-hour average PM_{10} GLCs over existing operations, at any receptor under both either Scenario 1 or 2, is predicted to be a small fraction of the PM_{10} APAC.

With the application of the proposed management and mitigation strategies, potential impacts on air quality due to the Project would be avoided, minimised or managed to required standards such that the health, wellbeing and amenity of residents and the local community would be protected from fugitive dust.

Table of Contents

Tables in Text

Figures in Text

Appendices

Acronyms and Abbreviations

Abbreviation	Description
%	percent
°C	degrees Celsius
APAC	air pollution assessment criterion
AAQMS	ambient air quality monitoring station
Air NEPM	National Environment Protection (Ambient Air Quality) Measure
AQIA	air quality impact assessment
AWS	automatic weather station
BoM	Bureau of Meteorology
CO	carbon monoxide
CO_2	carbon dioxide
DEECA	Department of Energy, Environment and Climate Action (previously DELWP)
DELWP	Department of Environment, Land, Water and Planning (now DEECA)
DP	Discharge point
EPA	Environment Protection Authority Victoria
g	gram
GED	general environmental duty
GHG	greenhouse gas
GLC	ground level concentration
GJ	gigajoule
H_2S	hydrogen sulphide
ha	hectare
kg	kilogram
kg/h	kilograms per hour
kL	kilolitre
km	kilometre
KPag	kilopascal gauge
kW	kilowatt
kWh	kilowatt hour
L	litre
m	metre
mg/m^3	milligrams per cubic metre
m/s	metres per second
Mt	million tonnes
MWh	megawatt hour

Abbreviation	Description
N_2O	nitrous oxide
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measures
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
PAH	polycyclic aromatic hydrocarbons
PM_{10}	particles with equivalent aerodynamic diameters of less than 10 μm
$PM_{2.5}$	particles with equivalent aerodynamic diameters of less than 2.5 μm
ppm	parts per million
RCS	respirable crystalline silica
SO_2	sulphur dioxide
SRTM DEM	Shuttle Radar Topography Mission Derived Digital Elevation Model
t	tonne
tpa	tonnes per annum
TSP	total suspended particulate
$\mu g/m^3$	micrograms per cubic metre
μm	micrometre
WRF	Weather Research and Forecasting model
VOC	volatile organic compound

Glossary

Term	Definition
AERMET	Meteorological data pre-processor for AERMOD
AERMOD	The American Meteorological Society (AMS)/USEPA Regulatory Model
Air Guideline	EPA Victoria Guideline for Assessing and Minimising Air Pollution
ambient	Pertaining to the surrounding environment or prevailing conditions.
atmosphere	A gaseous mass surrounding the planet that is retained by Earth's gravity. It is divided into five layers, with most of the weather and clouds found in the first layer.
biennial	(An event) lasting for two years or occurring every two years.
combustion	The process of burning. A chemical change, especially oxidation, accompanied by the production of heat and light.
fossil fuel	A natural fuel such as coal, diesel or gas, formed in the geological past from the remains of living organisms.
guideline	A general rule, principle, or piece of advice. A statement or other indication of policy or procedure by which to determine a course of action.

1.0 Introduction

Boral Resources (Vic) Pty Ltd (Boral) engaged SLR Consulting Australia Pty Ltd (SLR) to prepare an air quality impact assessment (AQIA) for Montrose Quarry (the Quarry), 56-72 Canterbury Road, Montrose, Victoria (the Site).

To secure long-term access to extractive resources, Boral proposes to extend the extraction limit of the Quarry (the Project) to access known reserves within the existing buffer areas.

This AQIA is prepared in support of the statutory approvals under the Mineral Resources (Sustainable Development) Act (Victorian State Government 1990) and the Planning and Environment Act (Victorian State Government 1987).

2.0 Project Description

2.1 Local Setting

The Site location, including existing and proposed boundaries and limits, is presented in **Figure 1**. A zoning map indicating the land zoning surrounding the Site is presented **Figure 2**.

Figure 1 Site Location, Boundary and Extraction Limits

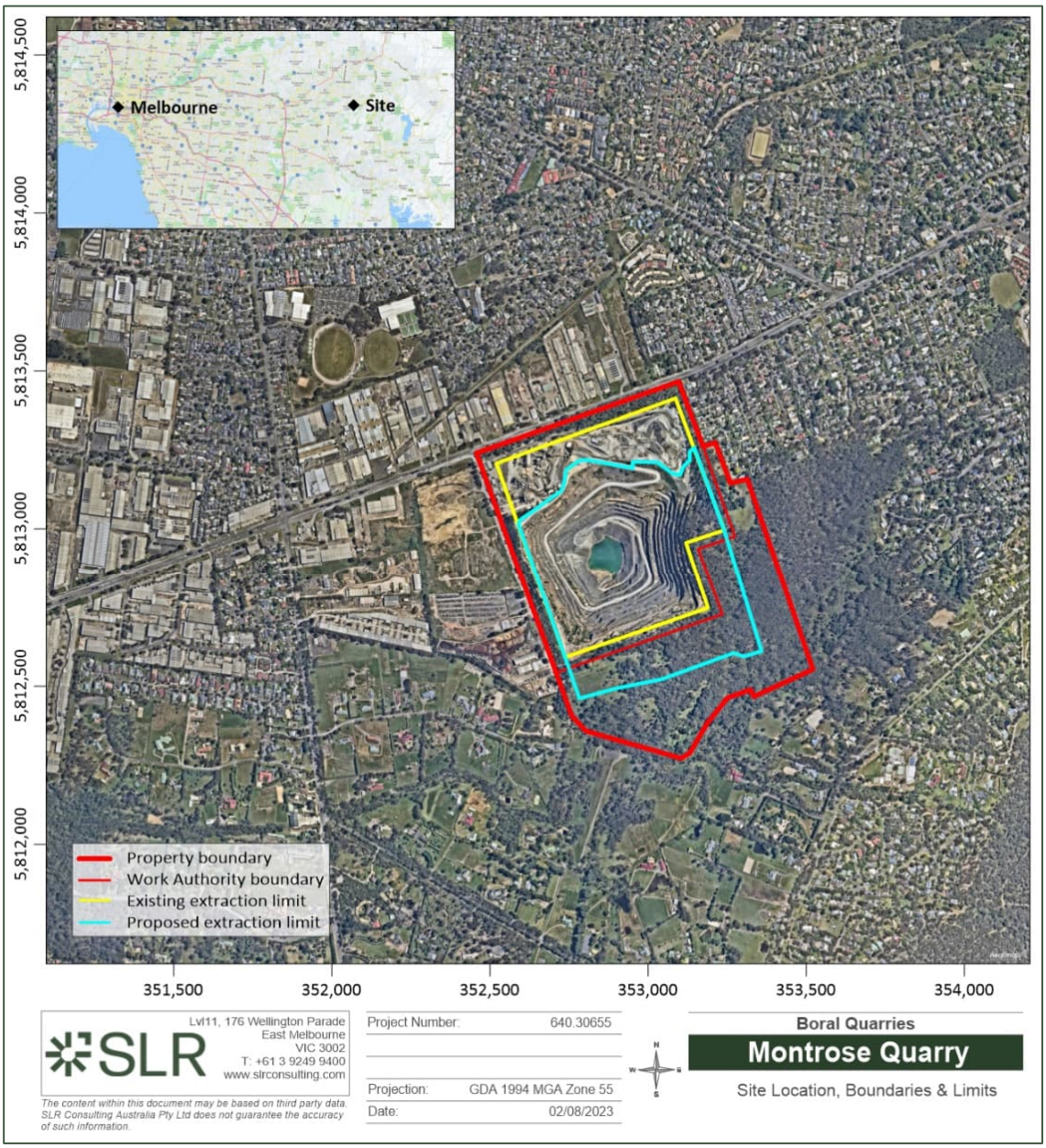
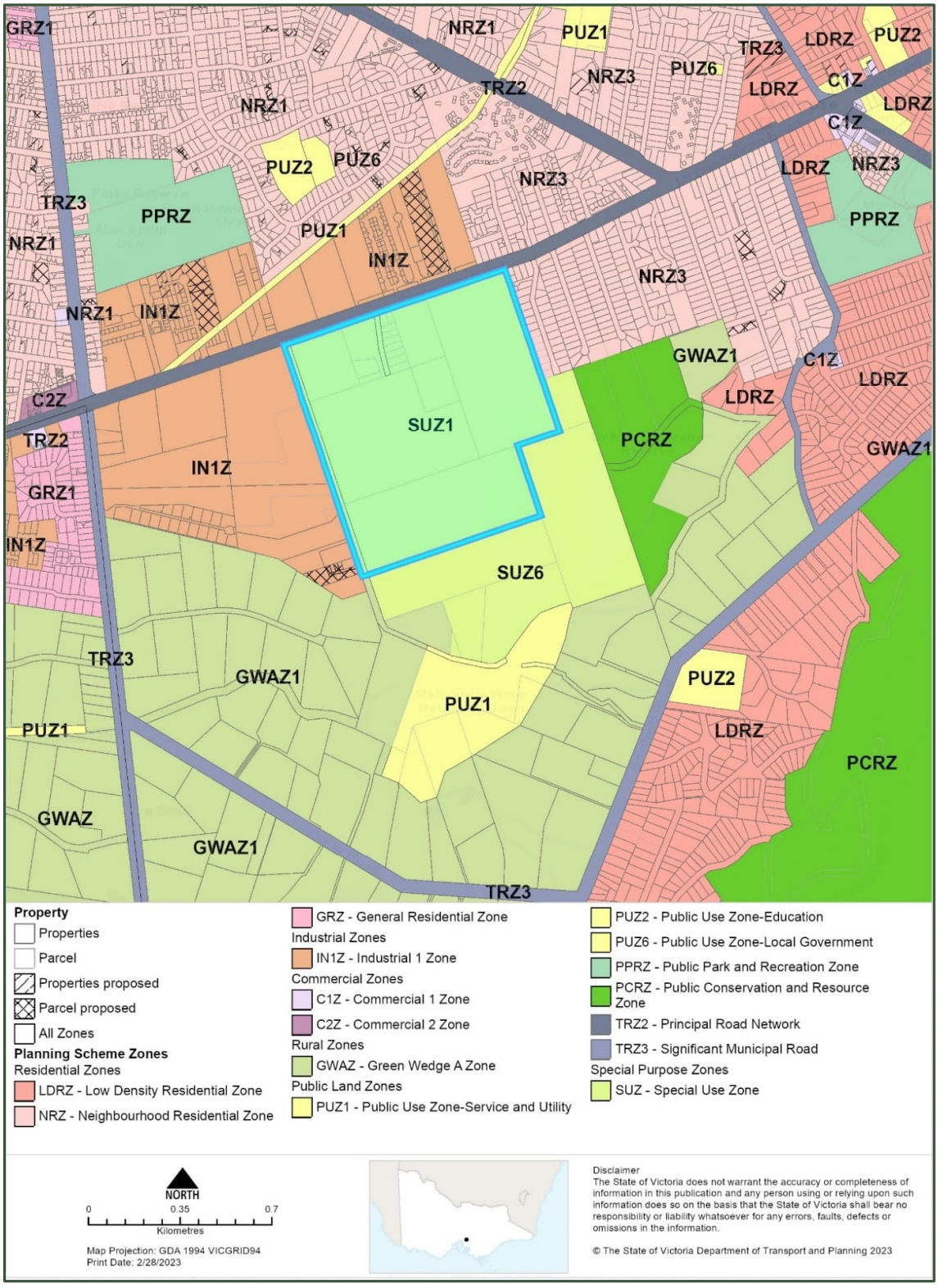


Figure 2 Zoning Map



2.2 Project Components

The Project includes the extension of the open-pit quarry extraction limit towards the south as indicated in **Figure 1**. The development of the proposed pit expansion is envisaged to be occur in eight stages as summarised in **Table 1**.

Table 1 Project Extraction Volumes by Stage

Stage	Years from Start	Volume (m^3)	Overburden (m^3)	Resource (m^3)	Resource (t) [a]
1	0.5	55,400	55,400	-	-
2	2.3	682,400	408,000	274,400	740,880
3	5.5	1,609,000	638,800	970,200	2,619,540
4	7.2	938,100	349,500	588,600	1,589,220
5	10.2	1,354,300	124,500	1,235,500	3,335,850
6	14.7	1,336,700	-	1,337,000	3,609,900
7	21.8	2,132,900	-	2,132,900	5,758,830
8	29.3	2,246,900	-	2,246,900	6,066,630
Final	32.2	878,500	-	878,500	2,371,950
Total	32.2	11,234,200	1,576,000	9,658,000	26,076,600
a 2.7 t/m^3					

The Project will not include any changes to the existing hot mix asphalt plant and concrete batching plant on Site. These plants will remain unchanged in terms of throughput, production, location etc. Emissions of particulate from these plants are deemed to be included under existing background conditions (refer **Section 5.4**). Other emissions to air from these plants (e.g. odour and volatile organic compounds from the asphalt plant), also remain unchanged and are therefore not considered by this AQIA.

For the purposes of this assessment, three scenarios are assessed based on existing operations and likely worst case (maximum intensity and location of activities) development stages, nominally stage 3 (construction) and stage 7 / stage 8 (extended operations; refer **Section 7.2.1**).

2.3 Physical and Chemical Characteristics of Extracted Material

The rock at the Quarry consists of a rhyolitic tuff (Geochempet Services 2019) containing:

- Durable minerals: 7% feldspar as phenocrysts (plagioclase), 16% quartz as phenocrysts, 23% coarse feldspar in groundmass (K-feldspar and plagioclase), 9% coarse quartz in groundmass, 25% finely microcrystalline feldspar and quartz (about 8% quartz), 3% epidote, 1% leucoxene, 1% opaque oxide grains
- Moderately durable minerals: 3% calcite
- Soft, weak, and non-durable minerals: 2% chlorite, 6% sericite, 3% limonite/goethite 1% biotite.

The free silica content is estimated to between 16 and 33%, and locked within crystalline rock.

Overburden to be removed in extending the of the open-pit extraction limit will generally consists of Type B Fill, with a moisture content of approximately 11%.

2.4 Dust Mitigation Measures

The Quarry employs several dust management and mitigation measures including:

- fixed speed limit for all vehicles
- enclosed processing plant with negative pressure dust collection system with fixed water sprays with dust suppressants
- fixed water sprays on conveyor drop points and hopper loading
- fixed sprinklers along main internal roads
- water cart for dust suppression using both spray bars on all internal roads and other potential dust generating areas and water cannon for wetting stockpiles.

3.0 Project Air Quality Indicators

This AQIA considers air quality indicators associated with fugitive dust emissions from the Quarry operations. Emissions of dust are associated with:

- excavator and loader material handling
- truck and light vehicle movements on unsealed roads
- crushing and screening
- drilling and blasting
- wind erosion of stockpiles and exposed areas
- asphalt and concrete batching plant material transfer lines and baghouse.

While emissions of pollutants associated with the combustion of diesel fuel (e.g. fine particulate, carbon monoxide, oxides of nitrogen, sulphur dioxide and volatile organic compounds) will be generated by various operations at the quarry, these emissions are unlikely to compromise air quality goals at the closest receptors, given the nature and scale of the operations and the distances to receptors, and are therefore not specifically considered by this AQIA.

Emitted dust may contain respirable crystalline silica, which is naturally occurring in the rock.

3.1 Particulate Matter

Particulate matter has the capacity to affect human health and to cause nuisance effects, and is categorised by size and/or by chemical composition. The potential for harmful effects depends on both. In air quality assessments, particulate size ranges are commonly described as:

- TSP – refers to all (total) suspended particles in the air. In practice, the upper size range is typically 30 micrometres (µm) to 50 µm.
- PM_{10} – refers to all particles with equivalent aerodynamic diameters of less than 10 µm.

- $PM_{2.5}$ – refers to all particles with equivalent aerodynamic diameters of less than 2.5 µm diameter. These are often referred to as 'fine' particles and are a sub-component of PM_{10}.
- Deposited dust – refers to particulate matter that has settled out of the air and is measured as a dust deposition rate, which is dust settled out over a given area and time under the influence of gravity. Deposited dust can include particles of any size, but it generally comprises particles larger than 20 µm in diameter that rapidly settle out of the air near the point of emission. It is measured to assess if an emission source is causing a nuisance, such as soiling of property and materials, including rainwater tanks.

Both natural and anthropogenic processes contribute to the atmospheric load of particulate matter. Coarse particles ($PM_{2.5-10}$) are derived primarily from mechanical processes, resulting from the suspension of dust, soil, or other crustal materials from roads, farming, quarrying, dust storms, and so forth. Coarse particles also include sea salts, pollen, mould, spores, and other plant parts.

Fine particles, or $PM_{2.5}$, are derived primarily from combustion processes, such as vehicle emissions, wood burning, gas, diesel or coal burning for power generation, hazard reduction burns and bush fires. Fine particles also consist of transformation products, including sulphate and nitrate particles, and secondary organic aerosols formed from volatile organic compound emissions.

The size of particles determines their behaviour in the respiratory system, including how far the particles are able to penetrate, where they deposit, and how effective the body's clearance mechanisms are in removing them. Additionally, particle size is an important parameter in determining the residence time and spatial distribution of particles in ambient air, which are key considerations in assessing exposure.

$PM_{2.5}$, and in particular the ultrafine sub-micron particles, may penetrate beyond the larynx and into the thoracic respiratory tract, and evidence suggests that particles in this size range are more harmful than the coarser component of PM_{10}.

3.2 Respirable Crystalline Silica

Silica is one of the most abundant minerals found in the earth's crust. Crystalline silica is most dangerous to health when dust is generated, becomes airborne and is then inhaled. Respirable crystalline silica (RCS) dust particles are small enough to penetrate deep into the lungs and can cause irreversible lung damage due to the sharp edges created where the particles facture and the resilient nature of the mineral.

In the context of ambient air concentrations, RCS is generally represented by the $PM_{2.5}$ fraction. RCS is a hazardous substance, the inhalation of which can lead to silicosis, an incurable lung disease that can lead to disability and death. RCS can also contribute to lung cancer, renal cancer, and chronic obstructive pulmonary disease. RCS is generally associated with hard rock or pure sand quarries.

4.0 Legislative Context and Assessment Criteria

The key legislation, regulations and guidelines that apply to the air quality impact assessment (AQIA) for the Project are summarised in **Table 2**.

Table 2 Legislation, Policy, Guidelines and Standards Relevant to the Assessment

Document Title	Summary	Relevance to Project
Commonwealth Government		
National Environment Protection (Ambient Air Quality) Measure (NEPC 2021)	The National Environment Protection (Ambient Air Quality) Measure (Air NEPM) developed by the National Environment Protection Council (NEPC) contains standards and goals for key pollutants that are required to be achieved nationwide, with due regard to population exposure. Air NEPM standards apply at performance monitoring locations, with each station located in such a manner that it obtains a representative measure of air quality likely to be experienced by the general population in a region or sub-region of 25,000 people or more. The desired environmental outcome of the Air NEPM is ambient air quality that allows for the adequate protection of human health and well-being.	The standards are not intended to be applied as modelling criteria for assessing air emissions from individual sources, specific industries or roadside locations and are therefore not strictly appropriate for this AQIA. However, the Victorian Environmental Reference Standard which provides assessment criteria relevant to this AQIA adopts (in part) the Air NEPM standards.
Victorian Government		
Environment Protection Act 2017 (Victoria State Government 2017)	The *Environment Protection Act 2017* took effect on 1 July 2021 and introduced: • a general environmental duty (GED), which requires everyone, including businesses and individuals, conducting activities that pose a risk to human health or the environment from pollution or waste to understand those risks and take reasonably practicable steps to eliminate or minimise them. • a duty to notify, which requires a person in management or control of land to notify EPA as soon as practicable if the contamination or pollution incident may pose a significant risk to human health or the environment.	The GED is relevant to the Project requiring risks of harm from emissions to air to be eliminated or minimised so far as reasonably practicable. In determining whether it is reasonably practicable to minimise risks of harm to human health and the environment, the following matters are relevant: • the likelihood of the risk eventuating • the degree of harm that would result if the risk eventuated • what the person knows, or ought reasonably to know about the harm or risks of harm and ways of eliminating or reducing those risks • the availability and suitability of ways to eliminate or reduce the risk • the cost of eliminating or reducing the risk.

Document Title	Summary	Relevance to Project
Environmental Reference Standard (Victoria Government 2022)	Under the *Environmental Protection Act 2017*, the Environment Reference Standard (ERS) is to be used to assess and report on environmental conditions in the whole or any part of Victoria. It sets out indicators and objectives for the ambient air environment. The ERS provides a reference to help make decisions. It does not: • create specific obligations that must be followed • set out enforceable compliance limits • describe levels that it is permitted to pollute up to	The ERS sets out ambient air quality objectives for *criteria pollutants*, some of which are relevant to the Project, including: • PM_{10} • $PM_{2.5}$ For the most part, the ERS adopts the Air NEPM standards for these pollutants which aim to provide for the adequate protection of human health and well-being.
Guideline for Assessing and Minimising Air Pollution in Victoria (EPAV 2022b)	The Guideline for Assessing and Minimising Air Pollution in Victoria (the Air Guideline) provides a framework to assess and control risks associated with air pollution. It is a technical guideline for air quality practitioners and specialists with a role managing pollution discharges to air. The air pollution assessment criteria (APACs) in the Air Guideline are concentrations of air pollutants that provide a benchmark to understand potential risks. They are risk-based concentrations that help identify when or if an activity is likely to pose an unacceptable risk to human health and the environment. This represents a change in attitude to air quality criteria which were previously concentrations that facilities could effectively 'pollute up to'. There are now no concentrations below which no action, management and/or mitigation of emissions to air is required	The Air Guideline sets out levels of quantitative assessment and APACs that the Project must comply with, though compliance with an APAC does not absolve a person from the obligation to minimise risks of harm from emissions under the GED. The Air Guideline APACs for criteria pollutants are adopted from the ERS and should be updated to reflect any future update to the ERS. The Air Guideline defines a quantitative assessment appropriate for the Project to include: • air pollution modelling carried out using EPA's preferred model in line with standard modelling methodologies directed by United States Environmental Protection Agency (US EPA) AERMOD modelling guidance • air pollution monitoring including: o real time continuous 24-hour PM_{10} and $PM_{2.5}$ data for a 12-month period o analysis of crystalline silica ($PM_{2.5}$ fraction) and heavy metal content (PM_{10}) and/or other air toxics (where applicable). The Air Guideline discourages the modelling assessment of nuisance dust deposition rates.

Document Title	Summary	Relevance to Project
Recommended Separation Distances for Industrial Residual Air Emissions (EPAV 2013) and Separation Distance Guideline (DRAFT) (EPAV 2022a)	The Recommended Separation Distances for Industrial Residual Air Emissions guideline provides advice on recommended separation distances between industrial land uses that emit odour or dust, and sensitive land uses (e.g. residences). EPAV (2022) is currently out for consultation and is likely to supersede EPAV (2013) in 2023. EPAV (2013) recognises that equipment failure, accidents and abnormal weather conditions can lead to emission beyond the boundary of a premises and that the recommended separation distances are intended to protect sensitive land uses in these instances. EPAV (2022) does not intend for the separation distances, which are largely unchanged from EPAV (2013), to account for these upset conditions	EPAV (2013) states a separation distance of 500 m for *Quarry* facilities that include blasting, described by activities including quarrying, crushing, screening, stockpiling and conveying of rock. EPAV (2022) states that this separation distance can be reduced to 250 m if activity is substantially below ground level (> 10 m). For new and expanded facilities, where a recommended separation distance isn't met, a risk assessment is required to assess whether an alternative (reduced) separation distance is appropriate.
Yarra Ranges		
Yarra Ranges Planning Scheme (DTP 2022)	The Yarra Ranges Planning Scheme controls land use and development within Yarra Ranges. It contains State and local planning policies, zones and overlays and other provisions that affect how land can be used and developed.	Clause 13.06-1S Air quality management strategies include *"Ensure, wherever possible, that there is suitable separation distance between land uses that reduce air amenity and sensitive land uses*" and in doing so, to consider the Recommended Separation distances for Industrial Residual Air Emissions (EPAV, 2013) and the ERS (Victoria Government, 2022). Clause 13.07-1S Land use compatibility strategies include *"Ensure that use or development of land is compatible with adjoining and nearby land uses"* and *"Avoid or otherwise minimise adverse off-site impacts from commercial, industrial and other uses through land use separation, siting, building design and operational measures."* Clause 14.03-1S Resource exploration and extraction strategies include *"Provide for the long-term protection of natural resources in Victoria.* *Protect the opportunity for exploration and extraction of natural resources where this is consistent with overall planning considerations and acceptable environmental practice.*

Document Title	Summary	Relevance to Project
		Recognise the possible need to provide infrastructure, including transport networks, for the exploration and extraction of natural resources. *Determine buffer areas between extractive activities and sensitive land uses on the following considerations:* • *Appropriate limits on effects can be met at the sensitive locations using practical and available technology.* • *Whether a change of land use in the vicinity of the extractive industry is proposed.* • *Use of land within the buffer areas is not limited by adverse effects created by the extractive activities.* • *Performance standards identified under the relevant legislation.* • *Types of activities within land zoned for public use."* Clause 52.08 Earth and Energy Resource Industry, the purpose of which includes *"To encourage land to be used and developed for exploration and extraction of earth and energy resources in accordance with acceptable environmental standards.*

4.1 Air Pollution Assessment Criteria

Relevant APACs sourced from the Air Guideline are provided in **Table 3.** The APACs are risk-based concentrations that help identify when, or if, an activity is likely to pose an unacceptable risk to human health and the environment, and are not to be considered concentrations below which no management and/or mitigation of emissions to air is required. In accordance with the GED, the Project must take steps to eliminate or minimise those emissions so far as reasonably practicable.

In relation to the application of APACs to modelling outputs, the Air Guideline advises that APACs with averaging periods of one hour or less apply to the 99.9th percentile predicted concentration at any location at or beyond the boundary of the facility. For all averaging periods greater than one hour, the APACs apply to the 100th percentile predicted concentration at sensitive receptor locations. This is because acute exposures can plausibly occur in most locations (e.g. a park, a shopping strip or at a place of work), while longer exposures are more likely at sensitive receptors, such as a nearby residence. All relevant APACs are applicable at sensitive receptors only.

Table 3 Relevant Air Pollution Assessment Criteria

Substance	Details [a]	Averaging Time	APAC ($\mu g/m^3$)
PM_{10}	Cumulative	24 hours	50 [b]
	Cumulative	Annual	20 [b]
$PM_{2.5}$	Cumulative	24 hours	25 [b]
	Cumulative	Annual	8 [b]
RCS	Cumulative	Annual	3 [b]

a Cumulative APACs apply to the total concentration (Project plus background).
b At discrete sensitive receptor locations.

5.0 Existing Conditions

5.1 Sensitive Receptors

In general, sensitive receptors includes houses, schools, kindergartens, recreation areas and sporting ovals. Sensitive receptors identified in the vicinity of the Project comprise a number of nearby residences to the east and north east, and the south and southwest. In accordance with the Air Guideline, the potential impacts at these residences have been assessed as part of this AQIA.

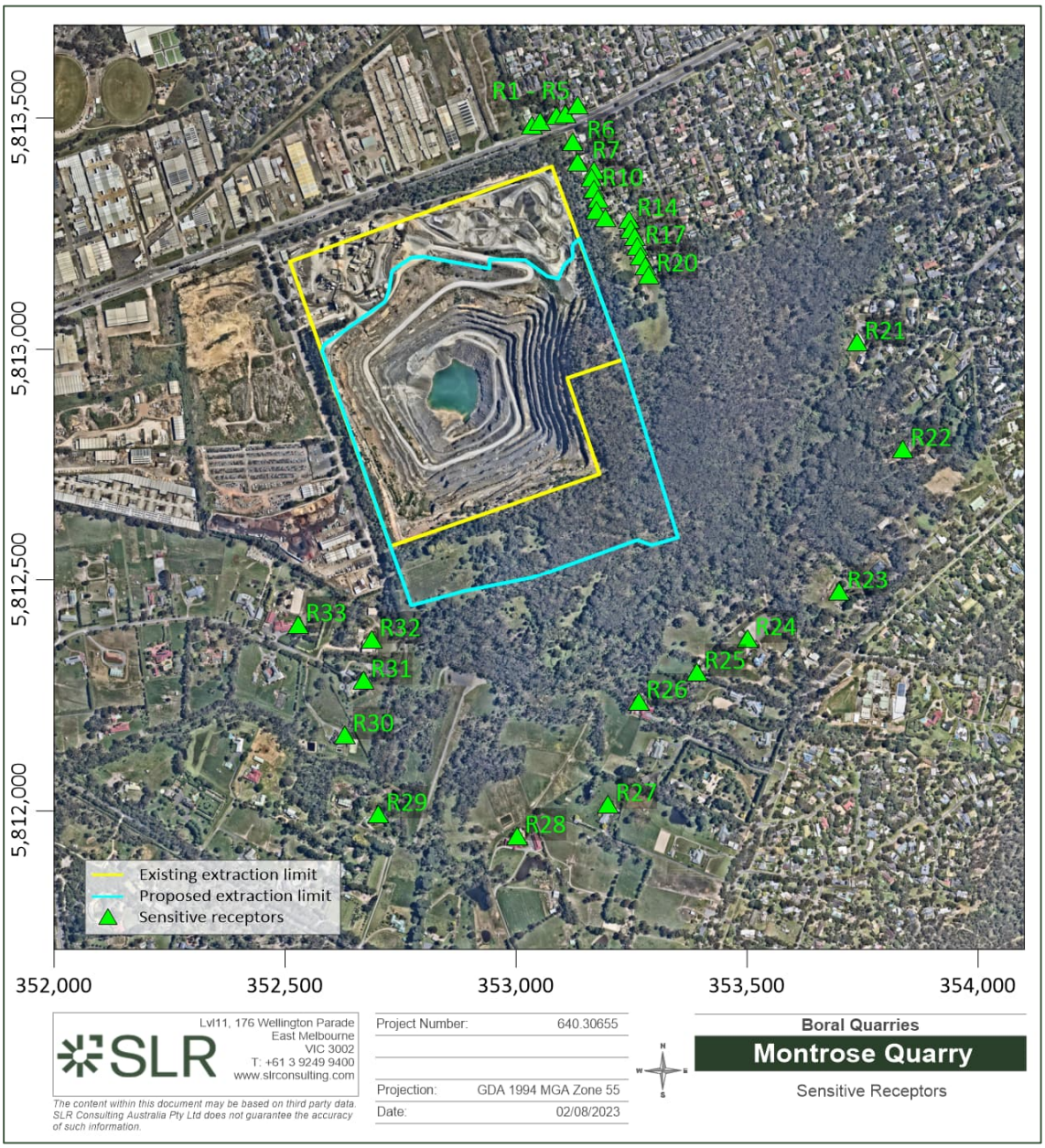
The closest sensitive receptor to the Project is approximately 55 m to from the existing quarry extraction limit. This separation distance would not be reduced under the proposed extraction limit. To the south, the nearest sensitive receptor is approximately 220 m from the existing quarry extraction limit which would reduce to approximately 120 m under the proposed extraction limit. The nearest identified sensitive receptors to the Project are listed in **Table 4** and presented in **Figure 3**.

Table 4 Identified Nearest Sensitive Receptors

ID	Description	UTM Coordinates (Zone 55)		Distance and Direction from Nearest Existing Extraction Limit
		(m E)	(m S)	
R1	Residence	353,035	5,813,484	0.09 km N
R2	Residence	353,052	5,813,492	0.09 km N
R3	Residence	353,087	5,813,504	0.10 km N
R4	Residence	353,107	5,813,509	0.11 km N
R5	Residence	353,134	5,813,528	0.13 km N
R6	Residence	353,122	5,813,449	0.07 km E
R7	Residence	353,133	5,813,405	0.06 km E
R8	Residence	353,168	5,813,387	0.07 km E
R9	Residence	353,164	5,813,370	0.07 km E

ID	Description	UTM Coordinates (Zone 55)		Distance and Direction from Nearest Existing Extraction Limit
		(m E)	(m S)	
R10	Residence	353,169	5,813,346	0.06 km E
R11	Residence	353,178	5,813,325	0.06 km E
R12	Residence	353,174	5,813,300	0.05 km E
R13	Residence	353,193	5,813,284	0.06 km E
R14	Residence	353,245	5,813,281	0.11 km E
R15	Residence	353,249	5,813,260	0.11 km E
R16	Residence	353,257	5,813,244	0.11 km E
R17	Residence	353,262	5,813,222	0.11 km E
R18	Residence	353,269	5,813,201	0.11 km E
R19	Residence	353,280	5,813,180	0.11 km E
R20	Residence	353,287	5,813,161	0.11 km E
R21	Residence	353,738	5,813,015	0.50 km E
R22	Residence	353,837	5,812,784	0.64 km E
R23	Residence	353,700	5,812,475	0.58 km SE
R24	Residence	353,501	5,812,373	0.49 km SE
R25	Residence	353,391	5,812,300	0.48 km SSE
R26	Residence	353,265	5,812,237	0.50 km S
R27	Residence	353,199	5,812,014	0.69 km S
R28	Residence	353,002	5,811,945	0.69 km S
R29	Residence	352,702	5,811,993	0.60 km S
R30	Residence	352,629	5,812,164	0.44 km SSW
R31	Residence	352,669	5,812,282	0.31 km SSW
R32	Residence	352,688	5,812,371	0.22 km SSW
R33	Residence	352,528	5,812,403	0.27 km SW

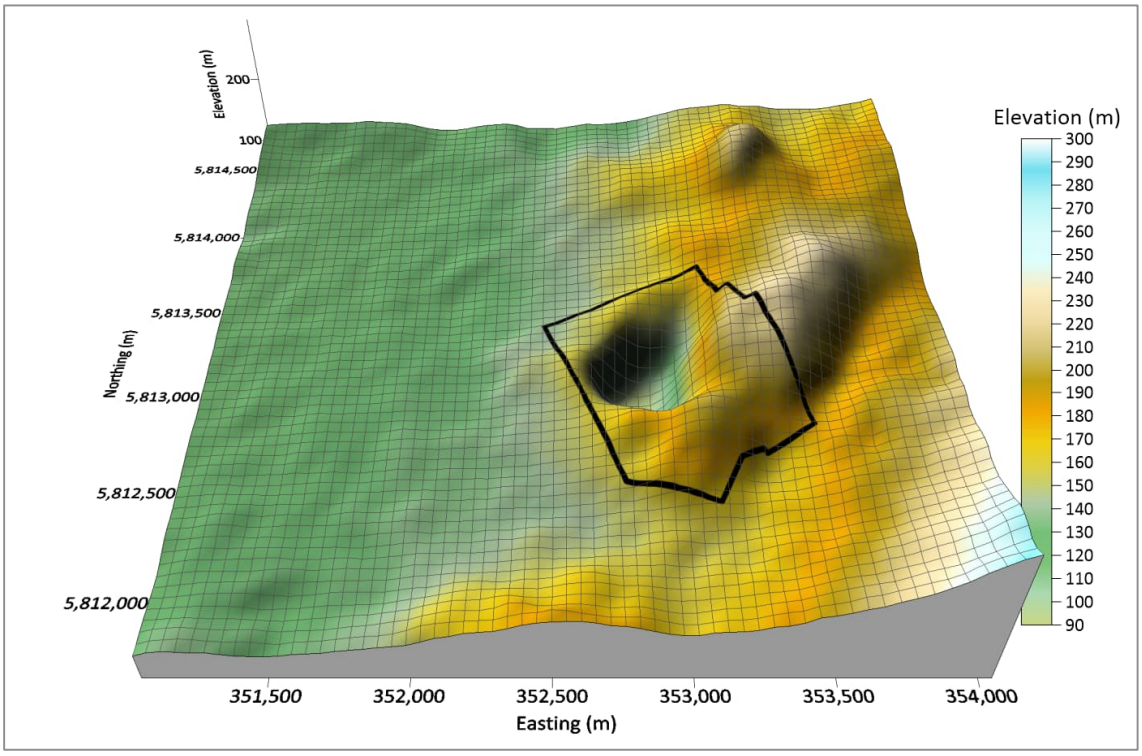
Figure 3 Identified Nearest Sensitive Receptors



5.2 Topography

The Site is located at approximately 180 m on the edge of the Dandenong Ranges which rise to the east-southeast of the Site, peaking at Mount Dandenong, 633 m above sea level, approximately 2 km from away. The topography surrounding the Site is generally flat or gently undulating to the west. The east of the Site is approximately 20 m greater in elevation than the west. A three-dimensional representation of the topographical features in the Project area is presented in **Figure 4**

Figure 4 Project Site Boundary and Topography



5.3 Meteorology

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

In relation to dust emissions due to wind erosion, temperature, rainfall and relative humidity all influence the soil moisture content and hence the threshold friction velocity, which is the minimum friction velocity required to initiate movement of soil particles by wind.

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The nearest available automatic weather stations (AWS) collecting data suitable for use in a quantitative air dispersion modelling study operated by the BoM is

located at Scoresby, approximately 9 km southeast of the Project and is likely subject to similar conditions as the Site.

The Scoresby AWS (Station 86104, elevation 90 m), has data available from 1948 to present for the following parameters:

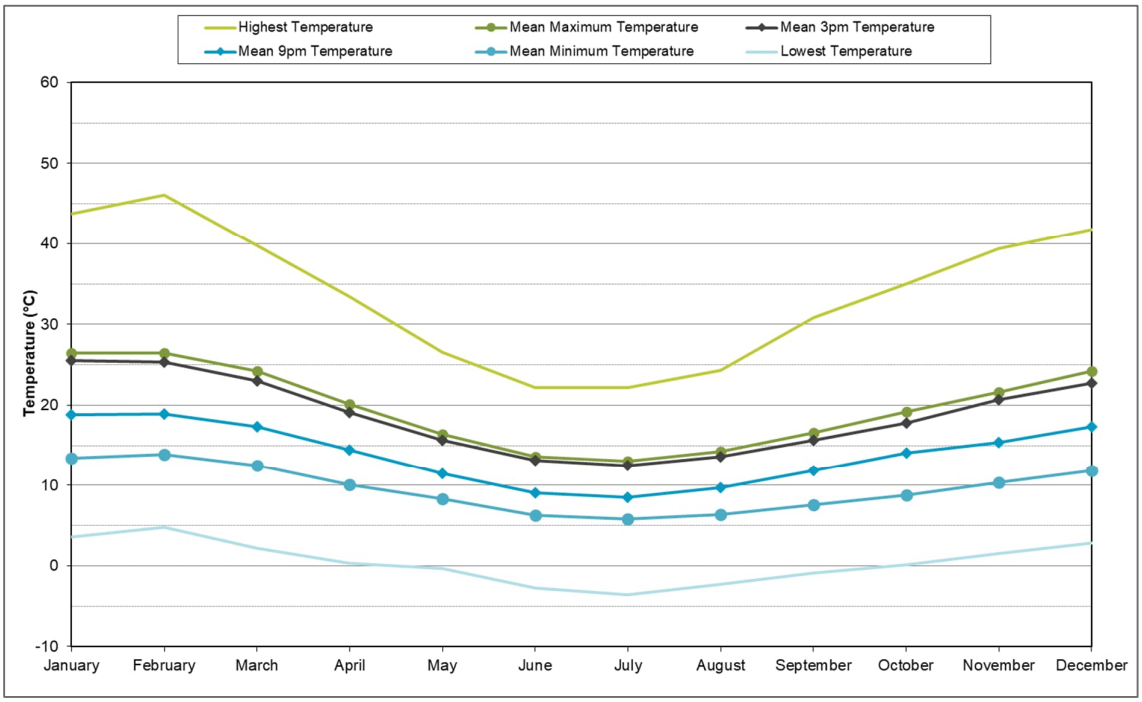
- temperature (°C)
- rainfall (mm)
- relative humidity (%)
- wind speed (m/s) and wind direction (degrees).

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

5.3.1 Temperature

Temperature statistics for Scoresby between 1948 and 2023 are summarised in **Figure 5.** Mean maximum temperatures range from 13.1°C in winter to 26.5°C in summer, while mean minimum temperatures range from 5.8°C in winter to 13.9°C in summer.

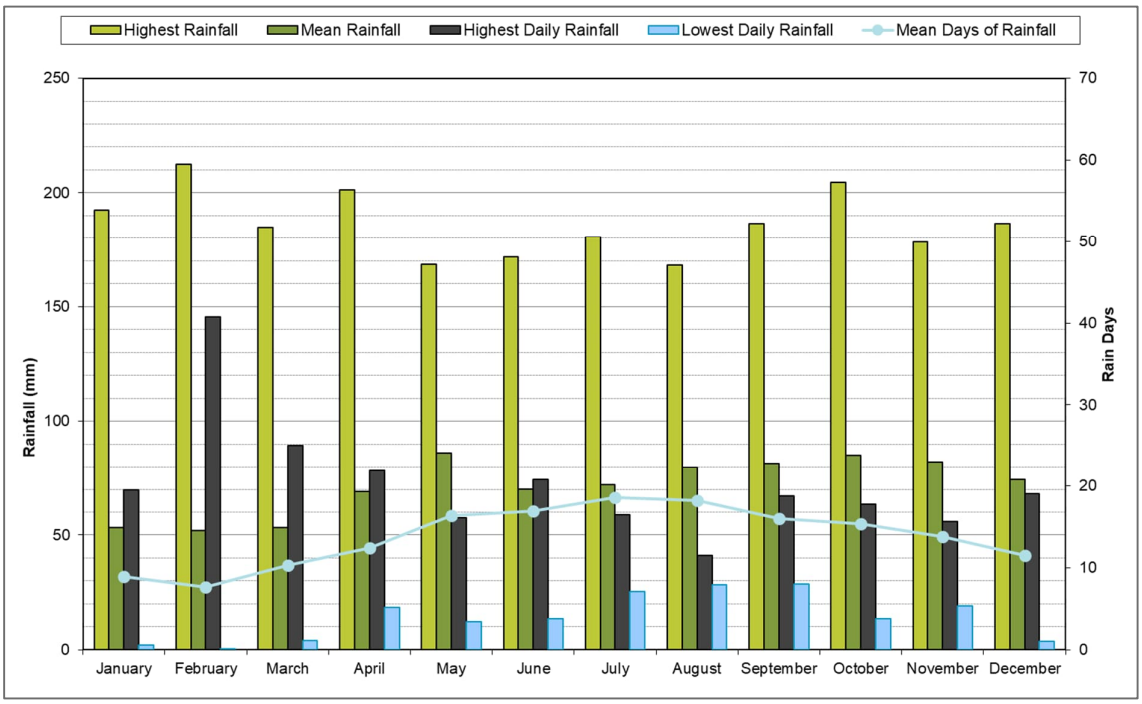
Figure 5 Temperature Trends for Scoresby AWS (1948 – 2023)



5.3.2 Rainfall

Rainfall statistics for Scoresby for the years 1948 to 2023 are summarised in **Figure 6**. The mean annual rainfall is 857 millimetres (mm). The average monthly rainfall is highest in autumn with the highest average monthly rainfall of 86 mm/month in May and an average of 12 rain days recorded in this month. The lowest average of 52 mm/month, and 6 days of rain occurs in February. The highest monthly rainfall recorded over the time period examined was 212.4 mm recorded in February 2011. The maximum daily rainfall of 145.4 mm was recorded on 03 February 2005.

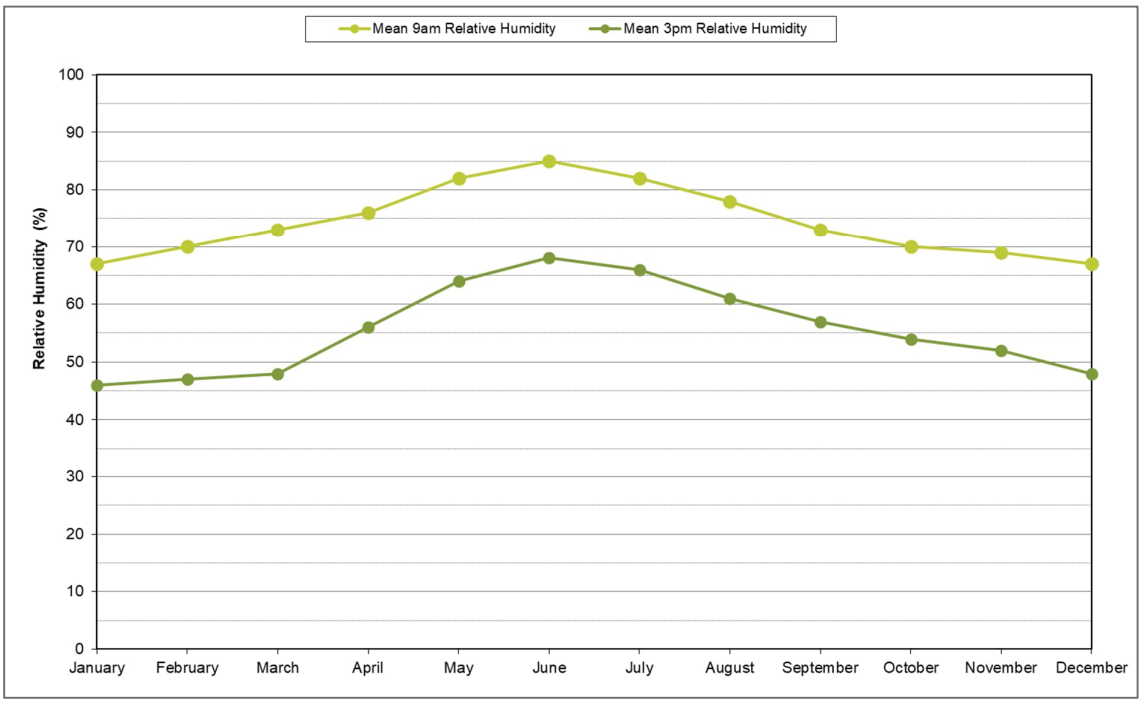
Figure 6 Long Term Monthly Rainfall Data for Scoresby AWS (1948 – 2023)



5.3.3 Relative Humidity

Humidity statistics (9 am and 3 pm monthly averages) for Scoresby for the years 1948 to 2010 are summarised in **Figure 7**. Morning humidity levels range from an average of around 67% in summer to around 85% in winter. Afternoon humidity levels are lower, at around 68% in summer dropping to around 46% in winter.

Figure 7 Humidity Data for Scoresby AWS (1948 – 2010)

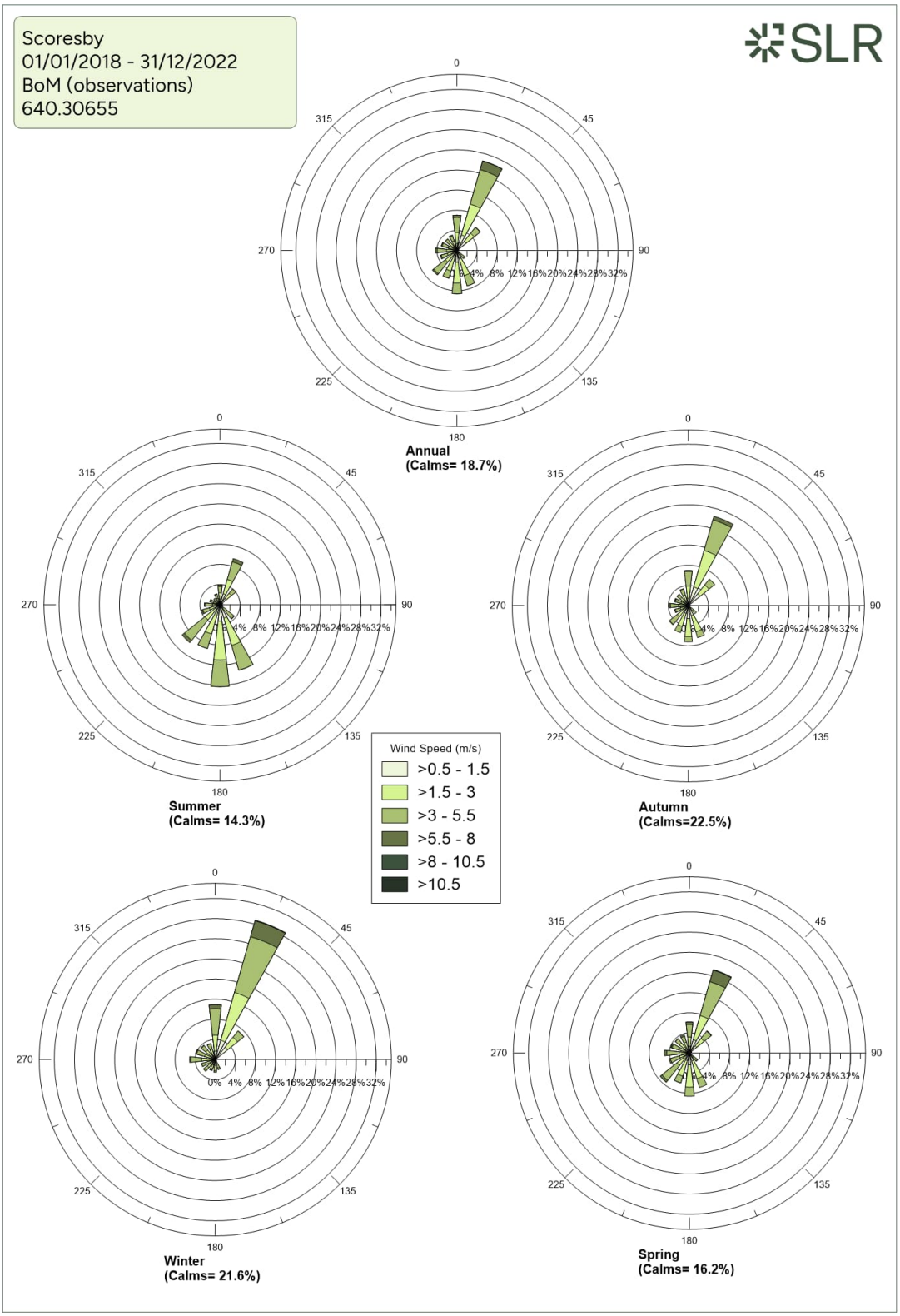


5.3.4 Wind

Annual and seasonal wind roses for Scoresby for the years 2018 to 2022 are presented in **Figure 8**. The wind roses show that overall, winds from the north-northeast are predominant, with few winds from the east. Spring and autumn have similar distributions to the annual distribution. Summer months see more winds from the southern quadrant, while winter sees more winds from the northern quadrant.

Scoresby AWS reports calm (less than 0.5 m/s) conditions on average 20% of the time.

Figure 8 Annual and Seasonal Wind Roses for Scoresby AWS (2018 – 2022)



5.3.5 Evaporation

The BoM publishes total evaporation maps for Australia showing the amount of water that evaporates from an open pan (BoM n.d.). Annual average and seasonal average evaporation rates for the area in which the Project is situated have been conservatively estimated from these maps, which indicate the following:

- approximate total annual average evaporation rate: 1,200 mm, or 0.27 mm/h assuming evaporation occurs during daytime (12 hours) only
- approximate total summer average evaporation rate: 500 mm, or 0.46 mm/h assuming evaporation occurs during daytime (12 hours) only.

Using water carts and water sprays to supress 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.

5.4 Air Quality

To inform this AQIA, and specifically to establish appropriate existing background concentrations with which to predict cumulative (Project plus background) concentrations, Boral engaged SLR to undertake a baseline ambient air quality monitoring program (AAQMP) for the Project. The monitoring was conducted between July 2022 and July 2023 and, in consultation with EPA, included the following at one location (**Figure 12**):

- continuous monitoring of PM_{10} and $PM_{2.5}$
- batch monitoring of respirable crystalline silica (as $PM_{2.5}$).

Windspeed and wind direction, temperature and pressure were also monitored.

The baseline monitoring report (SLR 2023), provided in **Appendix A,** details the monitoring campaign and provides full results. A summary is provided below.

The concentrations monitored at this location are considered to be generally representative of regional background plus influences from the existing operations at the Site (including quarrying, asphalt production and concrete batching) and from nearby industries to the north and west of the Site. With very few easterly winds in Melbourne, the monitoring location is seldomly upwind of these existing sources.

Details of the AAQMP are provided in **Table 5**.

The 24-hourly averaged PM_{10} and $PM_{2.5}$ data collected at the monitoring location between 1 August 2022 and 31 July 2023 are summarised in **Figure 9** and **Figure 10**, respectively. Monthly 7-day (approximate) average RCS concentrations monitored between July 2022 and June 2023 and are summarised in **Figure 11**. Annual averages are provided along with summary statistics in **Table 6.** The monitored concentrations were below the corresponding ERS / APAC concentrations during this period.

Table 5 Project Background Air Quality Monitoring Details

Parameter	Method and Australian Standard	Frequency / Sample Period
PM_{10}	EBAM Plus (AS/NZS 3580.9.11 2016)	Continuous
$PM_{2.5}$	BAM1022 (AS/NZS 3580.9.12 2013)	Continuous
Silica (as $PM_{2.5}$)	Partisol (AS/NZS 3580.9.10 2017)	One nominal 7-day sample per month

Figure 9 24-Hour Average PM_{10} Concentration (1 August 2022 – 31 July 2023)

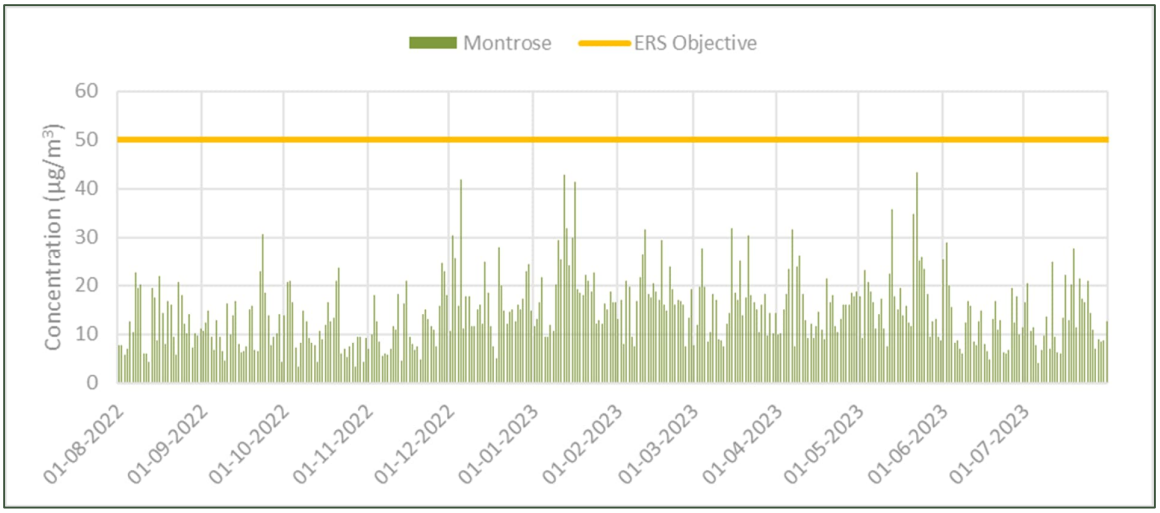


Figure 10 24-Hour Average $PM_{2.5}$ Concentration (1 August 2022 – 31 July 2023)

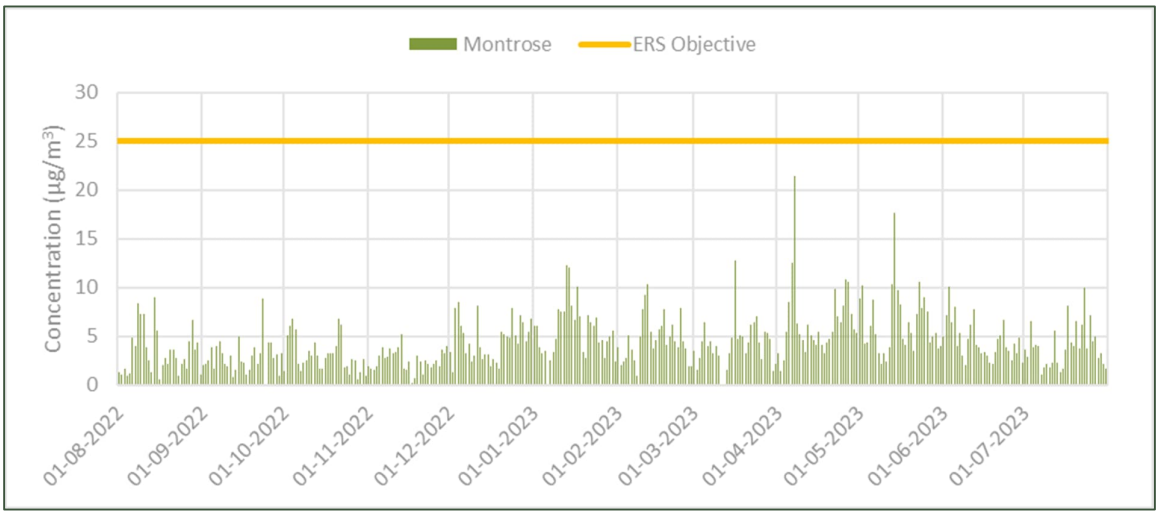


Figure 11 Monthly 7-Day Average RCS Concentrations (July 2022 – June 2023)

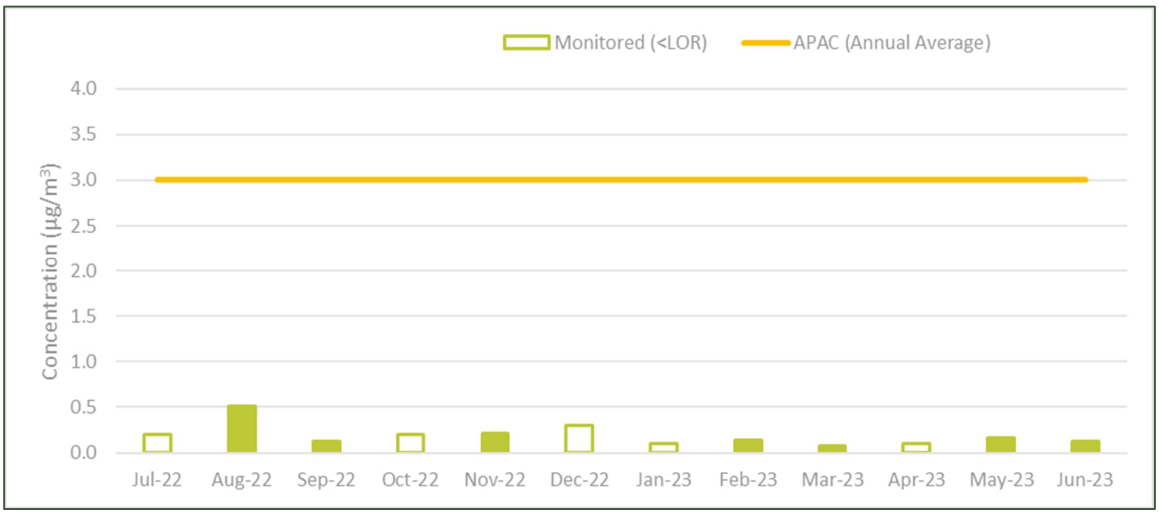
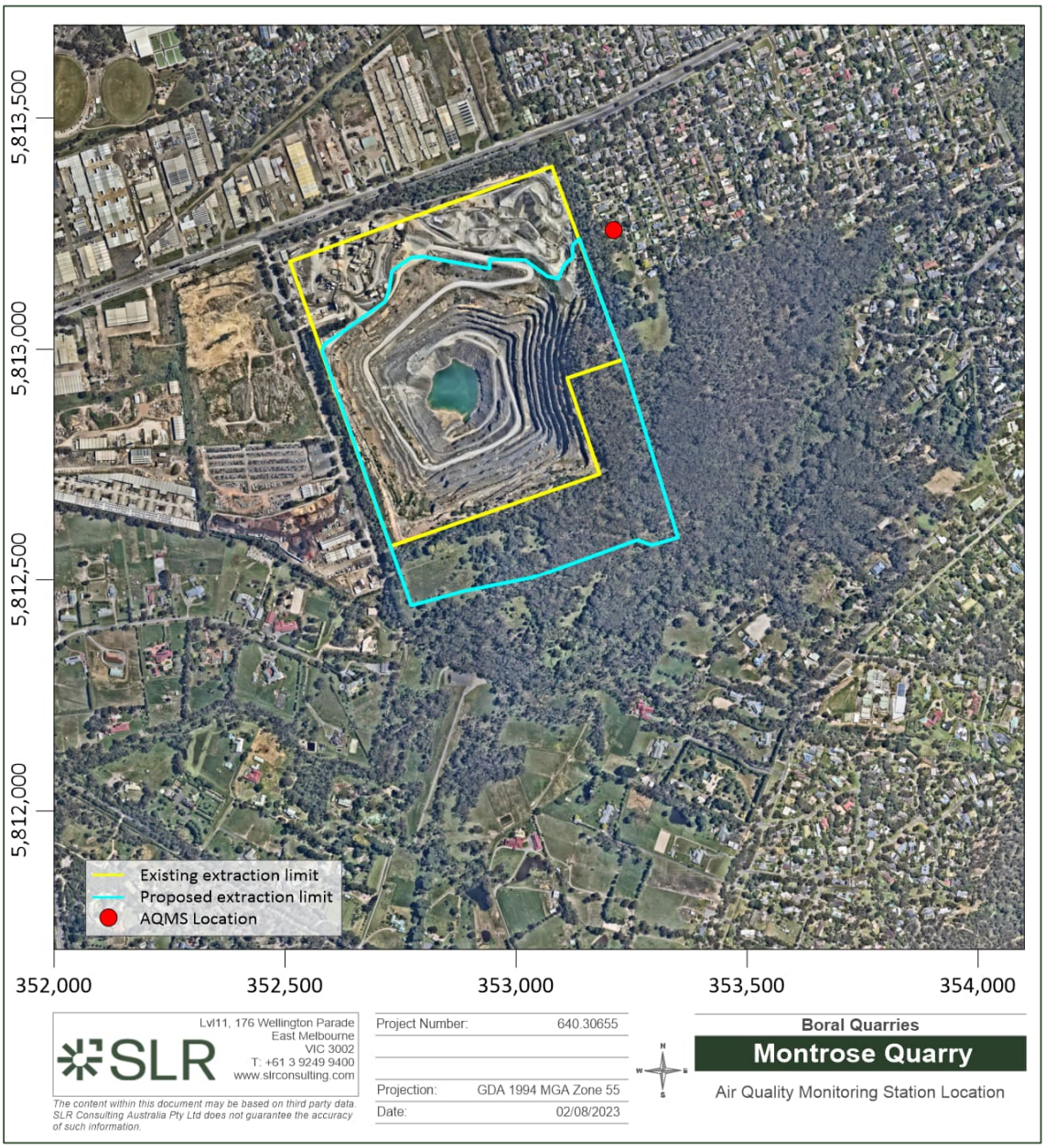


Table 6 Project Background PM_{10}, $PM_{2.5}$ and RCS Monitoring Summary (1 August 2022 – 31 July 2023)

Parameter	Averaging Period	Statistic					
		Maximum	Percentile				Annual Average
			99th	95th	90th	70th	
PM_{10}	24 hours	43 (50) [a]	37	28	23	18	15 (20) [a]
$PM_{2.5}$	24 hours	21 (25) [a]	12	9.0	7.8	5.1	4.4 (8) [a]
RCS	Nominal 7 days	0.5	NA	NA	NA	NA	0.2 (3) [a]

a ERS / APAC concentration in parenthesis.
NA Not applicable.

Figure 12 Ambient Air Quality Monitoring Location



6.0 Risk Assessment

An environmental risk assessment has been completed to evaluate the potential impacts of the Project. The risk-based approach adopted to identify potential impacts and prioritise potential environmental issues during the construction and operation of the Project aligns with the Earth Resources Regulation (ERR) risk assessment process for the *"Preparation of Work Plans and Work Plan Variations; Guideline for Extractive Industry Projects"* (Victoria State Government, 2020).

The following tasks were undertaken to identify, analyse and evaluate environmental risks:

- establishment of the context of the risk assessment – identifies the boundaries of the project including the project definition, the duration of construction and operation, the design and environmental controls that would be in place, the location of the project, and the environmental values, assets and uses with the potential to be impacted
- risk identification – identification of risk pathways that link project activities (causes) to their potential effects on the environmental assets, values or uses
- risk analysis – assessment of risk for each risk pathway, whereby risk is a combination of the likelihood of an impact on an environmental value, asset or use, and the magnitude of the potential impact (in terms of its extent, severity and duration)
- risk evaluation – review key risks posed by the project to focus effort in terms of impact assessment and mitigation
- risk treatment – identification of additional controls where required to reduce risk levels where possible.

Risk levels were categorised as very low, low, medium, high or very high. The results of the initial risk assessment were used as a screening tool to prioritise the key issues for assessment and inform measures to avoid, minimise and offset potential effects. Wheel generated dust was identified as representing a very high risk of impacts to sensitive receptors. In order to reduce this to a low risk, the need for controls such as well finished haul roads with dust suppression including application of water and chemical dust suppressants was identified.

The risk assessment completed for this study is provided in **Appendix B**.

7.0 Impact Assessment Methodology

In accordance with the Air Guideline, the dispersal of emissions to air from the Project were modelled using the Victorian regulatory model, AERMOD. The American Meteorological Society (AMS)/USEPA Regulatory Model (AERMOD Version 19191) was specifically designed to support the USEPA's regulatory programs, however it is also the Victorian regulatory model. AERMOD is a steady-state plume modelling system with three components: AERMOD (dispersion model), AERMAP (terrain data pre-processor) and AERMET (meteorological data pre-processor).

AERMOD was used to predict maximum cumulative pollutant ground level concentrations (GLCs) resulting from the Project emissions to air and existing background concentrations.

7.1 Environmental Inputs

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

- topographical data
- meteorological data
- background pollutant concentrations.

The sources of the required data are summarised in **Table 7** and these inputs are discussed in the following sections.

Table 7 Air Dispersion Model Input Data

Item	Source	Description
Topographical data	Shuttle Radar Topography Mission (SRTM) Derived Digital Elevation Model (DEM)	1 second (~30m) resolution
Meteorological data	Weather Research and Forecasting (WRF) model and AERMET pre-processor.	A site specific synthetic meteorological dataset representative of the Project location provides input to AERMOD's meteorological pre-processor, AERMET.
Background pollutant concentrations	Project site specific monitoring campaign	12 months monitoring of PM_{10}, $PM_{2.5}$ and RCS.

7.1.1 Topography

Shuttle Radar Topography Mission (SRTM) one arc-second (approximately 30 metres) global digital surface model data is commonly used for plume dispersion modelling purposes. This data was processed with AERMAP for use in AERMOD.

7.1.2 Meteorology

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 2002).

For this study, a site-representative three-dimensional meteorological dataset was compiled using WRF before extracting the necessary on-site and upper air input files for the AERMOD meteorological pre-cursor model, AERMET. Details of the WRF modelling are provided in **Appendix C**.

In accordance with EPA guidance, five years of meteorological data (2018 to 2022), modelled for this assessment.

Surface characteristics (albedo, Bowen ratio and surface roughness) of the assessment location were determined in accordance with EPAV guidance (EPAV 2013) informed from publicly available on-line aerial imagery. A summary of the AERMET modelling options and parameters used for the assessment is provided in **Table 8**. A summary of the resulting AERMOD meteorological files is provided in **Table 9.**

Table 8 AERMET Model Parameters

Parameter	Option / Source			
Adjusted U* (surface friction velocity)	Yes			
Threshold wind speed (m/s)	0.28			
Wind speed and direction	WRF			
Temperature	WRF			
Upper air data	WRF			
Scalar Parameters [a]	**Winter**	**Spring**	**Summer**	**Autumn**
Albedo	0.17	0.16	0.16	0.16
Bowen ratio	1.1	0.83	0.73	1.1
Surface roughness 1° – 72° (m)	0.30	0.36	0.36	0.36
Surface roughness 73° – 216° (m)	0.30	0.30	0.30	0.30
Surface roughness 217° – 252° (m)	0.30	0.34	0.34	0.34
Surface roughness 253° – 324° (m)	0.42	0.42	0.42	0.42
Surface roughness 325° – 360° (m)	0.36	0.40	0.40	0.40

a Albedo and Bowen ratio assessed as a simple arithmetic average of land cover based on 10 km x 10 km domain centred on Project. Surface roughness assessed as the geometric mean of land cover of a 1 km radius circle centred on Project by sector arc (10 sectors of 36°).

Table 9 AERMOD Meteorological Input Data

Meteorological Year	Available Hours	Calms [a] and Missing Data	Valid Hours [b]
2018	8,760	51	8,709
2019	8,760	24	8736
2020	8,784	50	8,734
2021	8,760	35	8,725
2022	8,760	32	8,728

a <0.28 m/s
b AERMOD does not predict GLCs during calms

7.1.3 Background Pollutant Concentrations

Existing air quality in the area surrounding the Project will be affected by a combination of emissions from sources in the local area, as well as emissions that flow into the area from the wider region.

The air environment surrounding the Project site will be affected by:

- Vehicular traffic on Canterbury Road to the north of the Site
- Fine particulates from aggregate supplies and light industries across Canterbury Road
- Fine particulate from Bark King wood recycling, and Pick-a-Part and Kingswood vehicle recycling facilities and other light industries to the west of the Site
- Long-range transport of fine particulate matter from other regions.

The Air Guideline states that level 2 and level 3 assessments require real time continuous 24-hour average PM_{10} and $PM_{2.5}$ data for a 12-month period from the area where the operation is proposed, with analysis of RCS (as $PM_{2.5}$), where applicable.

Time varying background concentrations (24-hour averages) of PM_{10} and $PM_{2.5}$ recorded at the Project site between 1 August 2022 and 31 July 2023 (refer Section 5.4) were included in the models such that the cumulative 24-hour and annual average concentrations (Project impact plus background) could be assessed against the criteria.

For RCS, the annual average background concentration recorded at the Project site was added to the predicted annual average Project impact to give the cumulative annual average concentrations.

Note that for all background concentrations, these may include contributions from the existing operations at the Quarry (Scenario 0) and therefore there is likely to be some degree of *double-counting* when adding predicted contributions from the Quarry, under all scenarios, to the background concentrations to assess the cumulative concentrations. This constitutes an element of conservatism, or over-prediction, in this assessment.

7.2 Dispersion Model Configuration

7.2.1 Modelled Project Quarrying Scenarios

In order to demonstrate the incremental increase or decrease in impacts arising from the Project three operation scenarios are modelled based on likely worst case (maximum intensity and location of activities) development stages (refer **Table 1**):

- Scenario 0: Base Case - Existing Operations
- Scenario 1: Project Year 5 – Quarry extension stage 3 (worst case construction)
- Scenario 2: Project Year 15 onwards – Quarry operation stage 7 and 8 (maximum operating conditions).

The basis of the emission rate estimation for the Project is summarised in **Table 10**.

Table 10 Project Component Quarrying Activity

Parameter	Quantity	Units	Comment / Source	Source	Modelled Scenarios
Conditions					
Moisture Content (excavated material)	7.9	%	Western Surface Coal Mining Table 11.9.3 – Overburden	AP42	All
Silt Content (excavated material)	6.9	%		AP42	All
Silt Content (unpaved roads)	8.3	%	Western Surface Coal Mining Table 13.2.2-1 – Stone quarrying and processing – haul road to/from pit	AP42	All
Silt Loading (paved roads)	8.2	g/m^2	Paved Roads Table 13.2.1-4 – Quarry	AP42	All
Hours of operation	6:00 am - 6:00 pm 10:00 am - 4:00 pm		All Drilling and blasting	Boral	All
Material Handled					
Throughput	4500 380	t/day t/h	-	Boral	Scenario 0, 1, 2
Overburden stripping	1300 110	t/day t/h	-	Boral	Scenario 1
Excavator in pit	380	t/h	-	Boral	Scenario 0
Excavator with hammer in pit	380	t/h	-	Boral	Scenario 0
Excavator stripping south	245	t/h	-	Boral	Scenario 1, 2
Excavator with hammer stripping south	380	t/h	-	Boral	Scenario 1, 2
Excavator stripping east	245	t/h	-	Boral	Scenario 1, 2
Pad FEL	380	t/h	-	Boral	All
Sales FEL	380	t/h	-	Boral	All
Crushing loadout FEL	380	t/h	-	Boral	All
Pit to Crushing	380	t/h	-	Boral	All
Crushing loadout to stockpiles (upper)	76	t/h	Assume 20% goes to coarse stockpiles	Boral	All
Crushing loadout to stockpiles (lower)	304	t/h	Assume 80% goes to medium and fine stockpiles	Boral	All

Parameter	Quantity	Units	Comment / Source	Source	Modelled Scenarios
Sales	380	t/h	-	Boral	All
Trucks					
Pit to Crushing	16.2	VKT/h	Cat775	Aerial imagery, material handled per hour and load capacity.	Scenario 0
South to waste dump	6.7	VKT/h	Cat740		Scenario 1
East to waste dump	5.6	VKT/h	Cat740		Scenario 1
South to Crushing	5.1	VKT/h	Cat775		Scenario 1, 2
East to Crushing	3.0	VKT/h	Cat775		Scenario 1, 2
Crushing loadout to stockpiles (high)	2.6	VKT/h	Truck and dog		All
Crushing loadout to stockpiles (low)	10.5	VKT/h	Truck and dog		All
Sales (unsealed)	7.9	VKT/h	Truck and dog		All
Sales (sealed)	8.1	VKT/h	Truck and dog		All
Empty rigid haul truck	50	t	Cat 775 Pit to crusher	Cat 775 specs	All
Laden rigid haul truck	120	t			
Load rigid haul truck	70	t			
Empty road truck	20	t	Truck and dog	Estimate	All
Laden road truck	50	t			
Load per road truck	30	t			
Empty artic haul truck	32	t	Cat 740 Stripping	Cat 740 specs	Scenario 1
Laden artic haul truck	70	t			
Load per artic haul truck	38	t			
Crushing					
Primary crusher	380	t/h	Assume all throughput goes through all processes	Boral / estimate	All
Conveyor	380	t/h			
Secondary crusher	380	t/h			
Conveyor	380	t/h			
Tertiary crusher	380	t/h			
Conveyor	380	t/h			
Screening	380	t/h			
Loadout	380	t/h			
Drilling and Blasting-					
Drill rate-	0.5	holes/h	Estimate	Boral	All
Blast are-a	2000	m^2		Boral	All

Parameter	Quantity	Units	Comment / Source	Source	Modelled Scenarios
Blast rate	0.5	per week	0.01 per hour	Boral	All
Wind Erosion					
Stockpile (upper)	8	ha	Coarse	Aerial imagery / estimate	All
Stockpile (lower 1)	5	ha	Medium and fine		All
Stockpile (lower 2)	5	ha	Medium and fine		All
South	18	ha	-		Scenario 1
East	18	ha	-		Scenario 1
South	31	ha	-		Scenario 2
East	31	ha	-		Scenario 2

7.2.2 PM_{10} and $PM_{2.5}$ Modelling Methodology

Emissions from the site were represented in the model by a series of volume sources, except for wind erosion from the exposed areas, which were represented by area sources.

Based on the sensitivity of each activity to wind speed, hourly varying emission files representing hourly TSP, PM_{10} and $PM_{2.5}$ emissions from each source were compiled based on the daily average emission rates estimated for each activity. Details of the algorithm used to generate the variable emission files are presented in **Appendix D**.

The following operating conditions were also incorporated into the variable emission files:

- Wind erosion occurs every hour of the year adjusted for windspeed.
- For 12-hour operations, dust generating extractive activities occur 12 hours per day, 7 days per week.
- Blasting is considered primarily for annual impacts and assumes the equivalent of 1 blast every two weeks, spread across the hours 10:00 am to 4:00 pm, 7 days per week.

7.2.3 Emission Estimation Methodology

7.2.3.1 Fugitive Particulate Emissions

Fugitive emissions of PM_{10} and $PM_{2.5}$ were estimated using published emission factors from the National Pollutant Inventory (NPI) Emission Estimation Technique Manual for Mining (DSEWPC 2012) [incorporating (SPCC 1986)] and USEPA AP-42 Compilation of Air Emissions Factors (US EPA ,2012 and Updates), as appropriate (refer **Appendix E**).

Notable assumptions made in calculating the emission rates for each activity are as follows:

- Water sprays and water cart are used on internal haul roads and on stockpiles
- Water sprays will be used around drilling, stockpiles, and crushing plant.
- Haulage distances (expressed in total vehicle kilometres travelled (VKT)) on unsealed roads were estimated based on the length of the haulage route and number of trips per hour calculated from the total daily tonnage and truck payload).

7.2.3.2 Wheel Generated Dust

The "*NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*" (Donnelly, et al. 2011) commissioned under the NSW EPA Dust Stop Program found that wheel generated dust emissions, primarily generated by trucks travelling on unsealed haul roads was the largest contributor to the total emissions of TSP and PM_{10}, and the second largest contributor of $PM_{2.5}$.

The amount of wheel generated particulate matter from an unpaved haul road is a function of:

- the erodibility of the wearing course
- the erosivity of the actions to which the wearing course is subjected.

The first is a property of the design of the haul road whilst the second is affected by how the road is used and managed. The second is road down to maintenance and management, which for the Project, may include:

- Surface treatments or suppressants (water and/or chemical), which by their nature will require periodic reapplication. Donnelly et al. (2011) reports that the use of suppressant solution could achieve a 57% reduction in water applied per square metre and a 167% increase in time between watering, compared with use of water alone.
- Constructing haul roads using materials with low silt content. Typically haul road construction material is sourced onsite, if this material has poor bonding properties or a high proportion of fine material (e.g., silt) the dustiness of the haul road may increase along with the costs of maintaining the road surface. Increasing the amount of large aggregates in the construction material by adding gravel or slag can reduce the dustiness of haul roads and reduce maintenance costs as the road is less susceptible to deterioration.

Monitoring programs undertaken as part of the NSW EPA Dust Stop Program found that the haul road particulate matter control efficiencies of between 80 and 99% could be achieved with 16 of the 42 results (38%) of the studies reporting control efficiencies of 95% or greater.

The Quarry has an extensive network of water sprays and in combination with a water truck, is able to supress wheel-generated dust emissions effectively.

Project Site Specific Haul Road Watering Control Efficiency Calculation

A site-specific watering emission control factor (*C*, expressed as a percentage) can be estimated from typical evaporation rates for the area and the 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 (mm/h),
- *d* is the average hourly daytime traffic rate (trips/h),
- *t* is the time (h) between water application, and
- *i* is the application intensity (L/m2).

Based on the typical evaporation rates for the area (**Section 5.3.5**) and a worst-case traffic frequency of up to 13 trips per hour, a control of greater than 95% is calculated for the Project onsite haul roads for an hourly water application rate of 0.8 L/m^2. The estimated hourly water application rate rises to 1.3 L/m^2/h during the summer months to achieve this level of control. In general, traffic frequency is estimated to be less than this, requiring a lower application intensity rate.

For modelling purposes therefore, a 95% control factor was applied to the uncontrolled unpaved haul road wheel generated dust estimates for the worst-case wheel generated dust conditions associated.

These control factors reflect the Project's consideration of the GED. In practice, this level of control will be achieved by a combination of water application, chemical suppressant application, good road design and management including:

- considering water cart/water sprays needs for various seasons and planning for this
- adjusting water cart usage on the day in response to forecast and observed weather conditions (for example, hot seating water carts through crib breaks and use of water extender products as required)
- optimising the spray volume to increase efficiency of water carts whilst maintaining a safe travelling surface for haul trucks
- increasing the frequency of watering on active haul roads (i.e., watering to reflect use) including attentive monitoring and application of suppressants as surface dries out to avoid excessive emissions
- constructing the road surface using materials with low silt content
- scheduling grading and gravelling of heavy traffic areas such as intersections with regular resurfacing of high traffic areas such as intersections to reduce silt build up.

7.2.3.3 Wind Speed Dependent Wind Erosion

The base wind erosion emission rates were varied hourly based on a cubic relationship with the wind speed for each hour to accurately simulate the increased dust generation at higher wind speeds. That is, for each hour, h, the hourly emission rate, *E* is:

$$E(h) = E_{base} * u(h)^3 / \overline{u^3}$$

where E_{base} is the base emission rate in kg/h, and *u* is the hourly wind speed in m/s contained within the meteorological file. Note that although increased wind speeds generate increased wind erosion emission rates, they also promote increased plume dispersion. This offsetting effect generally leads to reduced downwind ground level particulate concentrations at higher wind speeds.

7.2.3.4 RCS Emissions

Petrographic analysis of aggregate from the quarry indicates that the free silica content is estimated to be between 16 and 33%, and locked within crystalline rock. However, for the purpose of this study, it has been conservatively assumed that the RCS emission rates for all activities are equal to 100% of the $PM_{2.5}$ emission rates.

7.3 Emission Inventory and Model Layout

The emission inventory is summarised in **Table 11** and in **Figure 13** to **Figure 15** for each scenario.

Layouts of the models for each scenario are presented in **Figure 16** to **Figure 18**.

Table 11 Estimated Particulate Emissions

Scenario	Activity	Emission Factor				Emission Rate (kg/hr)		Mitigation Measures Assumed in Emission Rate Estimate
		PM_{10}	$PM_{2.5}$	Unit	Source	PM_{10}	$PM_{2.5}$	
Excavators and Front-End Loaders (FELs)								
0	Excavator in pit	0.00013	0.00003	kg/t	AP42	0.046	0.010	Pit retention (5%)
0	Excavator with hammer in pit	0.00013	0.00003	kg/t	AP42	0.046	0.010	Pit retention (5%)
1	Excavator overburden and ore south	0.00013	0.00003	kg/t	AP42	0.030	0.007	None
2	Excavator ore south	0.00013	0.00003	kg/t	AP42	0.023	0.005	None
1, 2	Excavator with hammer south	0.00013	0.00003	kg/t	AP42	0.046	0.010	None
1	Excavator overburden and ore east	0.00013	0.00003	kg/t	AP42	0.030	0.007	None
2	Excavator ore east	0.00013	0.00003	kg/t	AP42	0.023	0.005	None
0, 1, 2	Pad FEL	0.00013	0.00003	kg/t	AP42	0.046	0.010	None
0, 1, 2	Sales FEL	0.00013	0.00003	kg/t	AP42	0.046	0.010	None
0, 1, 2	Crushing loadout FEL	0.00013	0.00003	kg/t	AP42	0.046	0.010	None
Trucks Dumping								
0, 1, 2	Rigid haul trucks at Crusher	0.00013	0.00003	kg/t	AP42	0.046	0.010	None
0, 1, 2	Road truck to upper stockpiles	0.00013	0.00003	kg/t	AP42	0.009	0.002	None
0, 1, 2	Road truck to lower stockpiles	0.00013	0.00003	kg/t	AP42	0.037	0.008	None
1	Articulated haul trucks to waste dump	0.00013	0.00003	kg/t	AP42	0.013	0.003	None
Drilling and Blasting								
0, 1, 2	Drilling	0.31	0.018	kg/hole	NPI	0.044	0.003	Pit retention (5%; Scenario 0 only)
0, 1, 2	Blasting	10.2	0.59	kg/blast	NPI	0.10	0.01	Pit retention (5%; Scenario 0 only)
Crushing								

Scenario	Activity	Emission Factor				Emission Rate (kg/hr)		Mitigation Measures Assumed in Emission Rate Estimate
		PM_{10}	$PM_{2.5}$	Unit	Source	PM_{10}	$PM_{2.5}$	
0, 1, 2	Primary crusher	0.004	0.0007	kg/t	NPI	0.008	0.001	Enclosure and water sprays (85%)
0, 1, 2	Conveyor	0.002	0.0004	kg/t	NPI	0.23	0.042	Enclosure (70%)
0, 1, 2	Secondary crusher	0.012	0.0022	kg/t	NPI	0.023	0.004	Enclosure and water sprays (85%)
0, 1, 2	Conveyor	0.002	0.0004	kg/t	NPI	0.23	0.042	Enclosure (70%)
0, 1, 2	Tertiary crusher	0.010	0.0019	kg/t	NPI	0.019	0.004	Enclosure and water sprays (85%)
0, 1, 2	Conveyor	0.002	0.0004	kg/t	NPI	0.23	0.042	Enclosure (70%)
0, 1, 2	Screening	0.0060	0.0010	kg/t	NPI	0.34	0.063	Enclosure and water sprays (85%)
0, 1, 2	Loadout	0.0020	0.0004	kg/t	NPI	0.11	0.021	Enclosure and water sprays (85%)
Wheel Generated Dust								
0	Cat775 Pit to Crusher	1.4	0.14	kg/VKT	AP42	0.31	0.031	Water truck (95%; refer **Section 7.2.3.2**)
1, 2	Cat775 South to Crusher	1.4	0.14	kg/VKT	AP42	0.10	0.010	
1, 2	Cat775 East to Crusher	1.4	0.14	kg/VKT	AP42	0.059	0.006	
1	Cat740 South to waste dump	1.1	0.11	kg/VKT	AP42	0.11	0.011	
1	Cat740 South to waste dump	1.1	0.11	kg/VKT	AP42	0.088	0.009	
0, 1, 2	Truck and dog Crusher to Stockpiles (upper)	0.96	0.096	kg/VKT	AP42	0.035	0.003	
0, 1, 2	Truck and dog Crusher to Stockpiles (lower)	0.96	0.096	kg/VKT	AP42	0.14	0.014	
0, 1, 2	Truck and dog sales (unsealed)	0.96	0.096	kg/VKT	AP42	0.10	0.010	
0, 1, 2	Truck and dog sales (sealed)	0.14	0.035	kg/VKT	AP42	0.016	0.004	
Wind Erosion								
0, 1, 2	Stockpile 1 (upper)	0.2	0.03	kg/ha/hr	NPI	0.08	0.012	Water sprays (50%)
0, 1, 2	Stockpile 2 (lower)	0.2	0.03	kg/ha/hr	NPI	0.05	0.008	Water sprays (50%)

Scenario	Activity	Emission Factor				Emission Rate (kg/hr)		Mitigation Measures Assumed in Emission Rate Estimate
		PM_{10}	$PM_{2.5}$	Unit	Source	PM_{10}	$PM_{2.5}$	
0, 1, 2	Stockpile 3 (lower)	0.2	0.03	kg/ha/hr	NPI	0.05	0.008	Water sprays (50%)
1	South	0.2	0.03	kg/ha/hr	NPI	0.18	0.027	Water sprays (50%)
1	East	0.2	0.03	kg/ha/hr	NPI	0.18	0.027	Water sprays (50%)
2	South	0.2	0.03	kg/ha/hr	NPI	0.31	0.047	Water sprays (50%)
2	East	0.2	0.03	kg/ha/hr	NPI	0.31	0.047	Water sprays (50%)
Total per hour Scenario 0						**5.4**	**0.8**	
Scenario 1						**6.0**	**0.9**	
Scenario 2						**5.6**	**0.9**	
Total per day Scenario 0						**66**	**10**	
Scenario 1						**78**	**12**	
Scenario 2						**76**	**12**	

Figure 13 Scenario 0 Estimated Particulate Emission Source Distribution

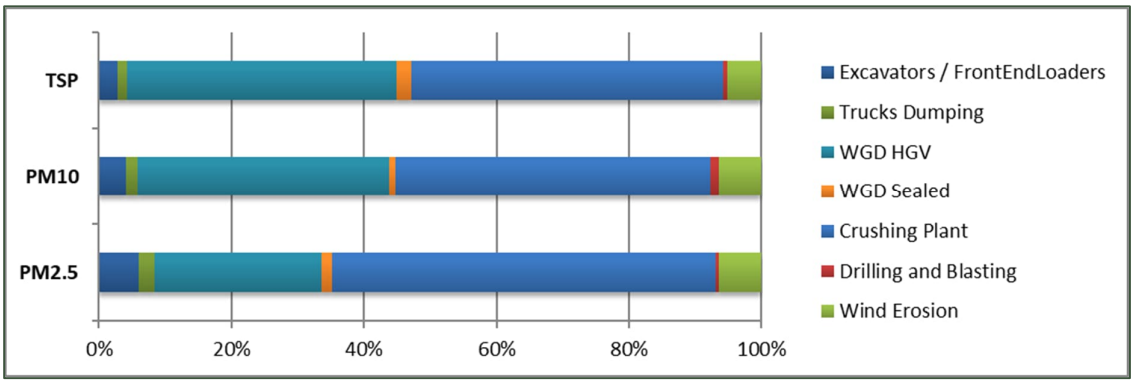


Figure 14 Scenario 1 Estimated Particulate Emission Source Distribution

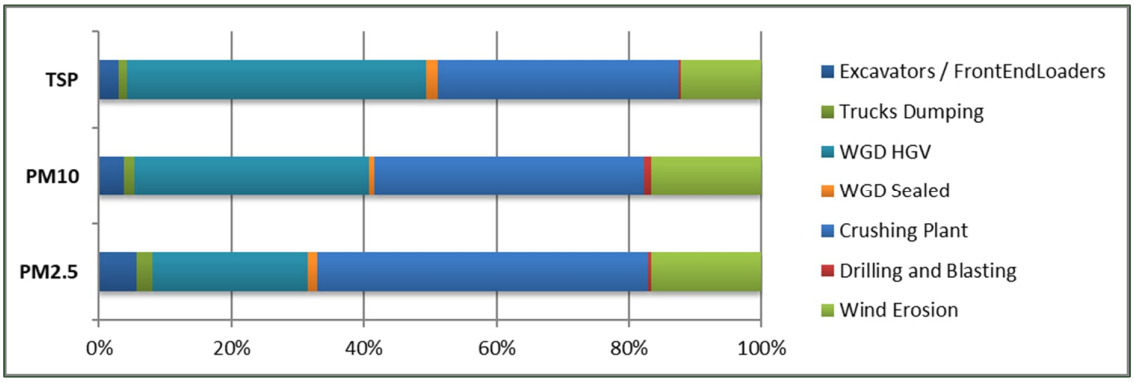


Figure 15 Scenario 2 Estimated Particulate Emission Source Distribution

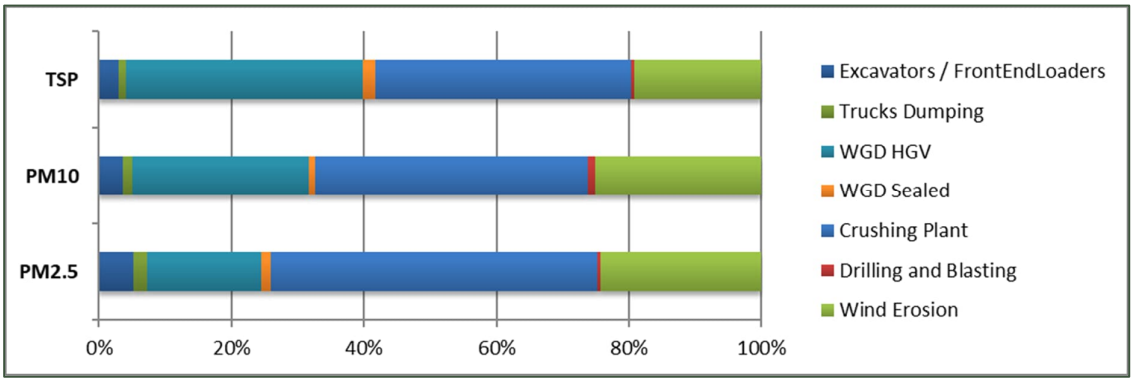


Figure 16 Scenario 0 Model Layout

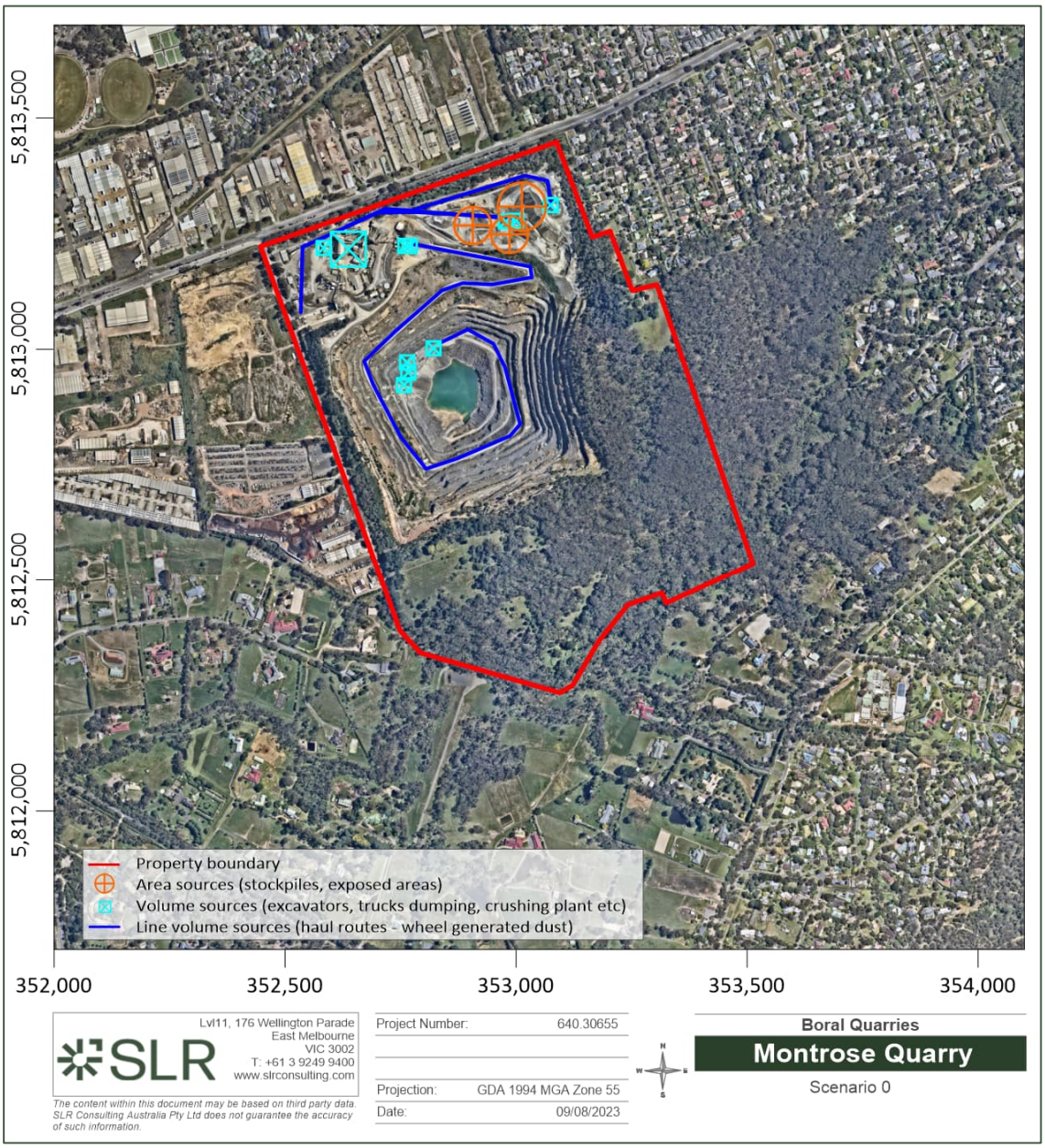


Figure 17 Scenario 1 Model Layout

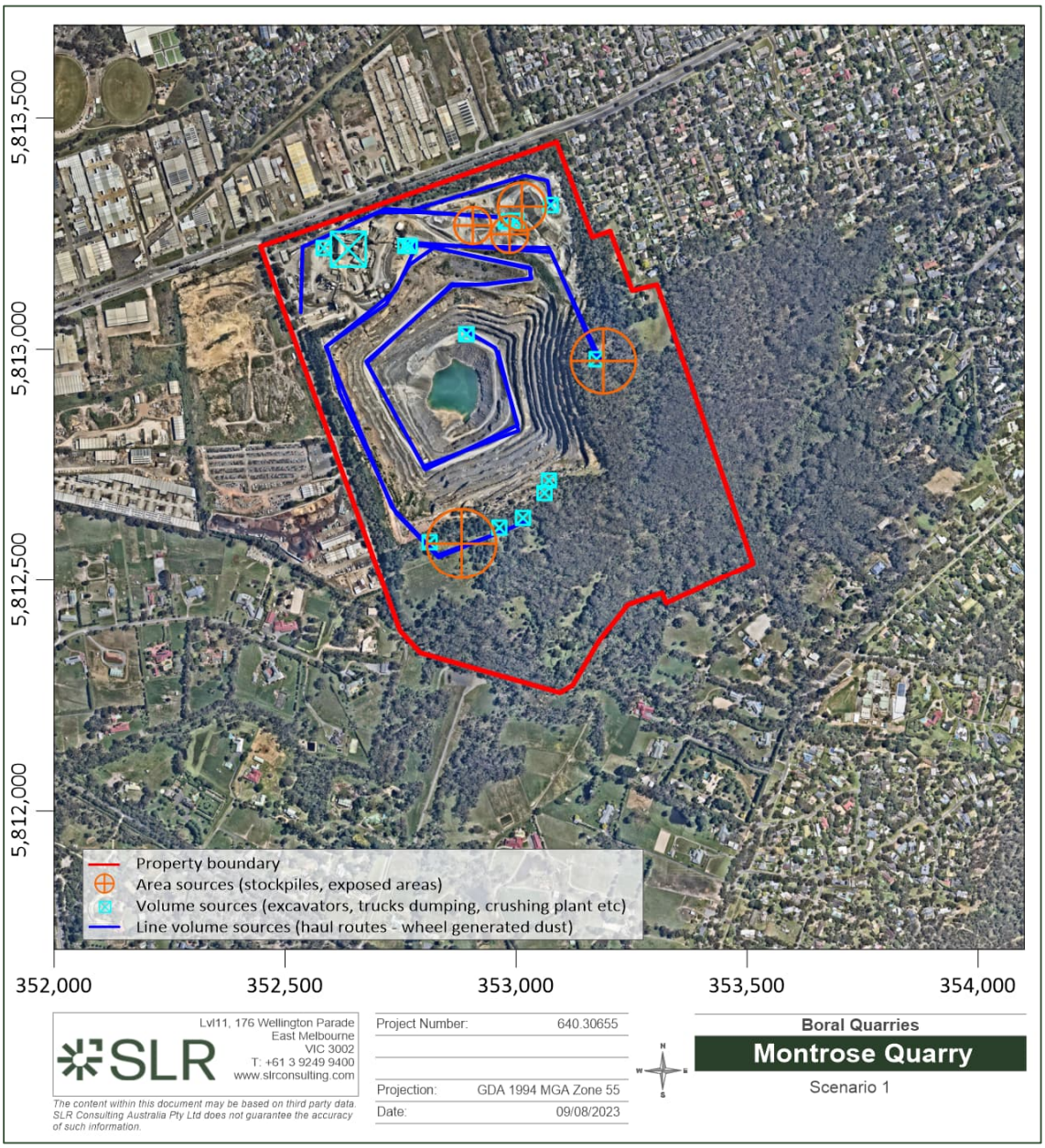
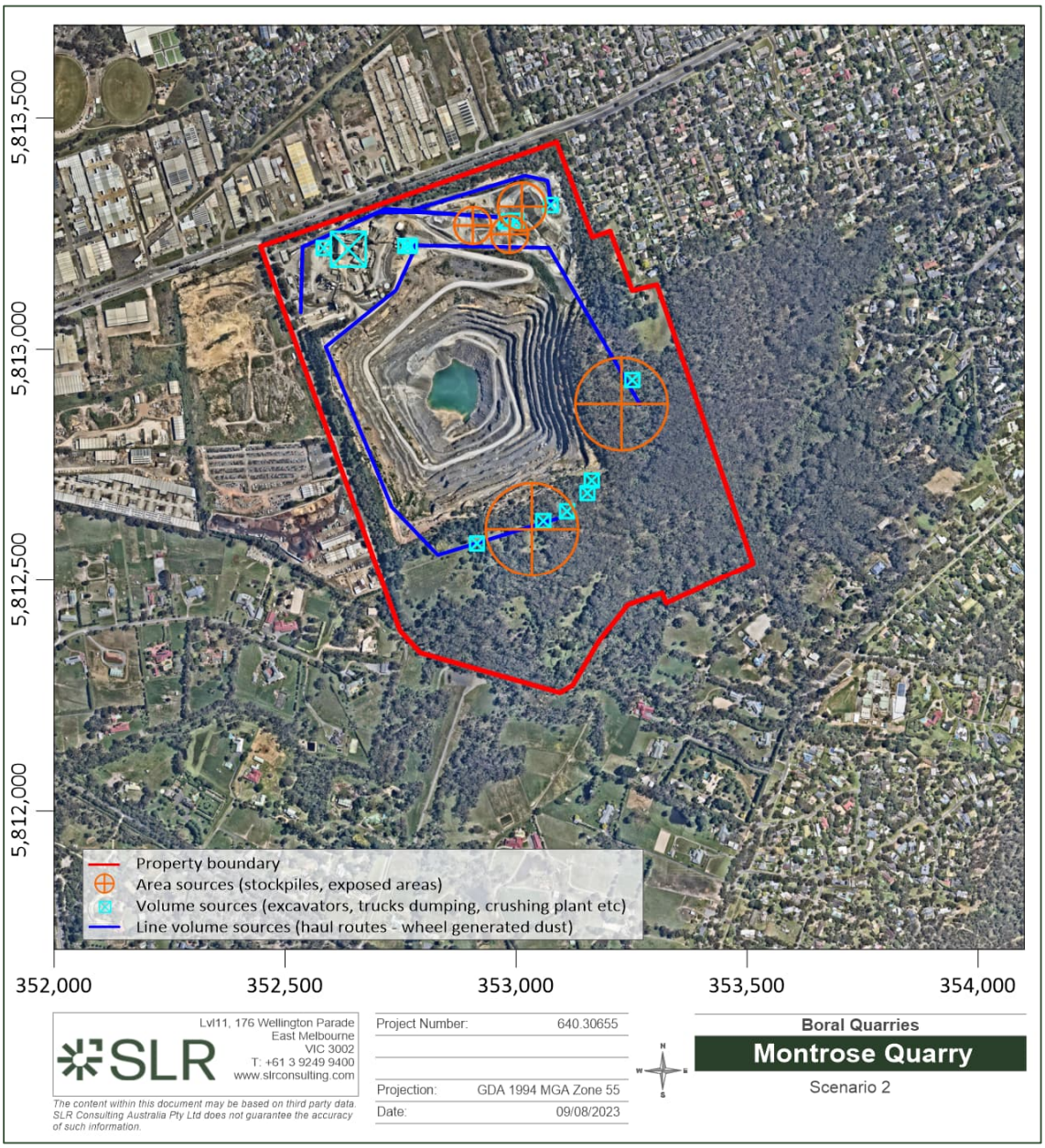


Figure 18 Scenario 2 Model Layout



7.4 Model Parameters and Options

A summary of additional AERMOD modelling options and parameters used for the assessment is provided **Table 12.**

Table 12 Model Parameters

Parameter	Option
Adjusted U* (friction velocity)	Yes
Output type	Concentration (µg/m^3)
Depletion options	None
Dispersion coefficient	Rural
Building downwash	None
Gridded receptors	Uniform cartesian 2 km x 2 km, 50 m spacing at 0 m AGL for generating isopleth plots only.
Discrete receptors	Sensitive receptor locations (Refer **Section 5.1**) 0 m (AGL)
AGL Above ground level	

7.5 Limitation, Uncertainties and Assumptions

The following limitations, uncertainties and assumptions apply to this assessment.

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

The 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:** GLCs 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 USEPA 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."

7.6 Linkages to Other Technical Reports

This report has interdependencies with the Ambient Air Quality Monitoring report (SLR 2023), provided in **Appendix A,** in relation to the characterisation of the existing air quality at the Site and provides input to the RCS Preliminary Public Health Risk Assessment report (SLR 2022).

7.7 Impact Assessment Significance

A change to existing conditions caused by Project activities in any of the Project stages may give rise to impacts, or *residual* impacts once appropriate avoidance and mitigation measures are applied.

The significance of the residual impacts is assessed in general accordance with the ERR likelihood and consequence guidance from which Impact Assessment Significance Criteria have been developed, as provided in **Table 13**. These guidelines are based on applicable legislation, policy and standards and the evaluation objectives and environmental significance guidelines arising from the government terms of reference established to guide the assessments.

This study has quantitatively assessed the potential residual impacts of construction and operation and used these outcomes to qualitatively assess the potential impacts of the Project on air quality assets and values to be protected. Note that rehabilitation impacts will be significantly less than construction and operation due to reduced intensity and are therefore not specifically addressed.

Table 13 Impact Assessment Significance Criteria

Severity	Consequence for "any member of the public" – Public Health, Safety, Amenity	Consequences for "the environment" – Air
Critical • Critical impact - severity and/ or duration • Effects may be irreversible • Widespread community outrage	**Public health and safety** One or more fatalities or life-threatening injuries or illness • Public exposed to a severely debilitating chronic health impact or life-threatening hazard • One or more injuries resulting in permanent disablement **Public amenity** Community or multiple individuals continuously experience major losses of amenity from dust, odour, fumes over periods of weeks or longer	**Environmental contamination event** • State-level incident response is required • Incident response, clean-up and rehabilitation expected to run for years and/or cost ≥$10 million
Major • Major impact – severity and/or duration and/ or frequency of occurrence • Some effects irreversible • Widespread community concern	**Public health and safety** • One or more injuries or illness requiring surgery or resulting in long-term disablement • Public exposed to a hazard that results in hospitalisation for treatment from injury or illness **Public amenity** • Community or multiple individuals regularly experience (weekly-monthly basis) major losses of amenity due to dust, odour, fumes	**Environmental contamination event** • Regional emergency management incident response • Clean-up and rehabilitation expected to run for months and/or cost $1–10 million
Moderate • Moderate, noticeable impact, in terms of severity, duration and/ or frequency of occurrence • Moderate remediation effort may be required • Limited community concern	**Public health and safety** • One or more injuries or illness requiring treatment by a physician or hospitalisation • Public exposed to a hazard that results in injuries or health effects requiring treatment by a physician **Public amenity** • Community or multiple individuals regularly (weekly- monthly basis) experience significant loss of amenity from dust, odour, fumes	**Environmental contamination event** • Clean-up and rehabilitation expected to run for weeks and cost $10k–$1 million
Minor • Hazard is perceived but has minor and typically temporary effects • Some remediation may be required	**Public health and safety** • One or more injuries or illness requiring first aid treatment • Public exposed to a hazard that could cause injuries or adverse health effects requiring first aid treatment **Public amenity** • Dust, odour, fumes infrequently (<monthly) have a minor effect on the amenity of the community or individuals	**Environmental contamination event** • Clean-up and rehabilitation may be required but can be completed within days
Insignificant • Impacts are barely recognised and/or quickly recovered from • No specific remediation required	**Public health and safety** • An injury or ailment that does not require medical or first aid treatment **Public amenity** • Dust, odour, fumes infrequently (no more than monthly) contribute to a small reduction in the amenity of the community or individuals	**Environmental contamination event** No noticeable effect beyond the immediate occurrence or expression of the hazard

8.0 Impact Assessment Results

As noted in **Section 7.1.3**, the background concentrations used in conjunction with the predicted Project GLCs to give the maximum cumulative GLCs (Project plus background) may already include contributions from the existing operations (Scenario 0), and therefore the cumulative GLCs can be considered conservative (i.e., over-predictions). The most significant outcomes are primarily the relative differences between the proposed construction and operation scenarios (Scenarios 1 and 2) and the existing operations (Scenario 0), as summarised in **Section 8.4**.

8.1 PM_{10}

8.1.1 Maximum Predicted 24-Hour Average GLCs

The maximum predicted 24-hour average cumulative (Project plus background) PM_{10} GLCs at any receptor are provided in **Table 14** for Scenario 0, 1 and 2. Exceedances of the APAC are predicted due to the maximum background concentration approaching the APAC before the Project contribution is added. The number of exceedances predicted to be generated by the Project, are also provided. The corresponding results for all receptors are provided in **Appendix F**.

Table 14 Maximum Predicted Cumulative 24-Hour Average PM_{10} GLCs

Scenario	Receptor ID	24-Hour Average Concentration (µg/m³)			Additional Maximum Exceedances Each Year due to Project
		Maximum Cumulative	Corresponding Project	Corresponding Background	
0	R6	55	11	43	1
1	R1	55	12	43	1
2	R7	52	8.3	43	1
APAC		**50**			

The maximum predicted 24-hour average Project-only PM_{10} GLCs at each receptor, along with the corresponding background and resulting cumulative concentrations, are provided **Table 15.** The predicted Project contributions relative to the APAC, expressed as percentages, are also provided. The corresponding results for all receptors are provided in **Appendix F**.

Table 15 Maximum Predicted Project 24-Hour Average PM_{10} GLCs

Scenario	Receptor ID	24-Hour Average Concentration (µg/m³)			Project Contribution Relative to APAC
		Maximum Project	Corresponding Background	Corresponding Cumulative	
0	R1	22	6.8	28	43%
1	R1	22	6.8	29	45%
2	R7	16	6.2	22	31%
			APAC	**50**	

8.1.2 Maximum Predicted Annual Average GLCs

The maximum predicted annual average cumulative PM_{10} GLCs at any receptor (over the 5 years modelled) are provided in **Table 16** for Scenario 0, 1 and 2. The predicted Project contributions relative to the APAC, expressed as percentages, are also provided. The corresponding results for all receptors are provided in **Appendix F**.

Table 16 Maximum Predicted Cumulative Annual Average PM_{10} GLCs

Scenario	Receptor ID	Annual Average Concentration (µg/m³)			Project Contribution Relative to APAC
		Maximum Cumulative	Corresponding Project	Corresponding Background	
0	R1	17	2.8	15	14%
1	R1	17	3.0	15	15%
2	R1	17	2.2	15	11%
APAC		**20**			

8.2 $PM_{2.5}$

8.2.1 Maximum Predicted 24-Hour Average GLCs

The maximum predicted 24-hour average cumulative (Project plus background) $PM_{2.5}$ GLCs at any receptor are provided in **Table 17** for Scenario 0, 1 and 2. The corresponding results for all receptors are provided in **Appendix F**.

Table 17 Maximum Predicted Cumulative 24-Hour Average $PM_{2.5}$ GLCs

Scenario	Receptor ID	24-Hour Average Concentration (µg/m³)			Additional Maximum Exceedances Each Year due to Project
		Maximum Cumulative	Corresponding Project	Corresponding Background	
0	R1	22	0.8	21	0
1	R1	22	0.8	21	0
2	R1	22	0.6	21	0
APAC		**25**			

The maximum predicted 24-hour average Project-only $PM_{2.5}$ GLCs at each receptor, along with the corresponding background and resulting cumulative concentrations, are provided **Table 18.** The predicted Project contributions relative to the APAC, expressed as percentages, are also provided. The corresponding results for all receptors are provided in **Appendix F**.

Table 18 Maximum Predicted Project 24-Hour Average $PM_{2.5}$ GLCs

Scenario	Receptor ID	24-Hour Average Concentration (µg/m³)			Project Contribution Relative to APAC
		Maximum Project	Corresponding Background	Corresponding Cumulative	
0	R1	3.1	1.8	4.9	13%
1	R1	3.1	0.8	4.9	12%
2	R7	1.8	1.3	3.1	7%
APAC				**25**	

8.2.2 Maximum Predicted Annual Average GLCs

The maximum predicted annual average cumulative $PM_{2.5}$ GLCs at any receptor (over the 5 years modelled) are provided in **Table 19** for Scenario 0, 1 and 2. The predicted Project contributions relative to the APAC, expressed as percentages, are also provided. The corresponding results for all receptors are provided in **Appendix F**.

Table 19 Maximum Predicted Cumulative Annual Average $PM_{2.5}$ GLCs

Scenario	Receptor ID	Annual Average Concentration (µg/m³)			Project Contribution Relative to APAC
		Maximum Cumulative	Corresponding Project	Corresponding Background	
0	R1	4.7	0.3	4.3	4%
1	R1	4.6	0.3	4.3	4%
2	R1	4.6	0.2	4.3	3%
APAC		**8**			

8.3 RCS

The maximum predicted annual average cumulative RCS GLCs at any receptor (over the 5 years modelled) are provided in **Table 20** for Scenario 0, 1 and 2. The predicted Project contributions relative to the APAC, expressed as percentages, are also provided. The corresponding results for all receptors are provided in **Appendix F**.

Table 20 Maximum Predicted Cumulative Annual Average RCS GLCs

Scenario	Receptor ID	Annual Average Concentration (µg/m³)			Project Contribution Relative to APAC
		Maximum Project	Corresponding Background	Corresponding Cumulative	
0	R1	0.3	0.2	0.5	10%
1	R1	0.3	0.2	0.5	10%
2	R1	0.2	0.2	0.4	7%
APAC				**3**	

8.4 Summary – Increase/Decrease over Existing Operations

The relative differences between the proposed construction and operation scenarios (Scenarios 1 and 2) and existing operations (Scenario 0) are summarised in **Table 21.**

The results at the receptor with the highest GLCs indicate that, compared with Scenario 0, there is a relatively small increase in maximum predicted GLCs during Scenario 1 and a small decrease during Scenario 2.

Table 24 presents the greatest relative differences between the maximum predicted 24-hour Project GLCs of all receptors.

These results indicate that increase in maximum Project 24-hour average PM_{10} GLCs at any receptor is 4.3 µg/m^3 under Scenario 1 and 1.8 µg/m^3 under Scenario 2. The corresponding increases in the maximum Project 24-hour average $PM_{2.5}$ GLCs are 0.5 µg/m^3 and 0.0 µg/m^3, respectively.

Table 21 Difference in Maximum Predicted GLCs for Scenario 1 and 2

	24-Hour Average		Annual Average		
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	RCS
Difference between Scenario 1 and Scenario 0: Cumulative					
Receptor	R1	R1	R1	R1	R1
Maximum predicted cumulative GLC	0.6%	-0.1%	1.0%	-0.2%	-1.4%
Exceedances of APAC generated by Project	0	0			
Difference between Scenario 1 and Scenario 0: Project					
Receptor	R1	R1			
Maximum predicted Project GLC	3%	-1%			
Difference between Scenario 2 and Scenario 0					
Receptor	R7	R1	R1	R1	R1
Maximum predicted cumulative GLC	-5.4%	-1.0%	-3.2%	-2.1%	-20%
Exceedances of APAC generated by Project	0	0			
Difference between Scenario 2 and Scenario 0: Project					
Receptor	R7	R7			
Maximum predicted Project GLC	-28%	-42%			

Table 22 Greatest Difference in Predicted 24-Hour Project GLCs for Scenario 1 and 2

	PM_{10}	$PM_{2.5}$
Scenario 1		
Receptor	R26	R31
Scenario 0 Maximum predicted Project GLC	6.1 µg/m^3	1.1 µg/m^3
Scenario 1 Maximum predicted Project GLC	10 µg/m^3	1.6 µg/m^3
Difference	+4.3 µg/m^3 (+70%)	+0.5 µg/m^3 (+45%)
Scenario 2		
Receptor	R32	R31
Scenario 0 Maximum predicted Project GLC	10 µg/m^3	1.1 µg/m^3
Scenario 2 Maximum predicted Project GLC	11 µg/m^3	1.1 µg/m^3
Difference	+1.8 µg/m^3 (+19%)	0.0 µg/m^3 (-4%)

Isopleth plots comparing the maximum predicted 24-hour average PM_{10} Project GLCs under Scenario 0 and Scenario 1, and under Scenario 0 and Scenario 2, are presented in **Figure 19** and **Figure 20**, respectively. Isopleths comparing the corresponding annual average GLCs are presented in **Figure 21** and **Figure 22**.

The plots indicate the extent with which maximum impacts are predicted to vary from those associated with the existing operations. In particular the slight increase in maximum 24-hour average GLCs at the sensitive receptors under Scenario 2 is apparent in **Figure 19** and the slight decrease in maximum 24-hour average GLCs at the sensitive receptors under Scenario 2 is apparent in **Figure 20**.

Figure 19 Maximum Predicted Project 24-Hour Average PM_{10} GLCs: Scenario 0 and 1

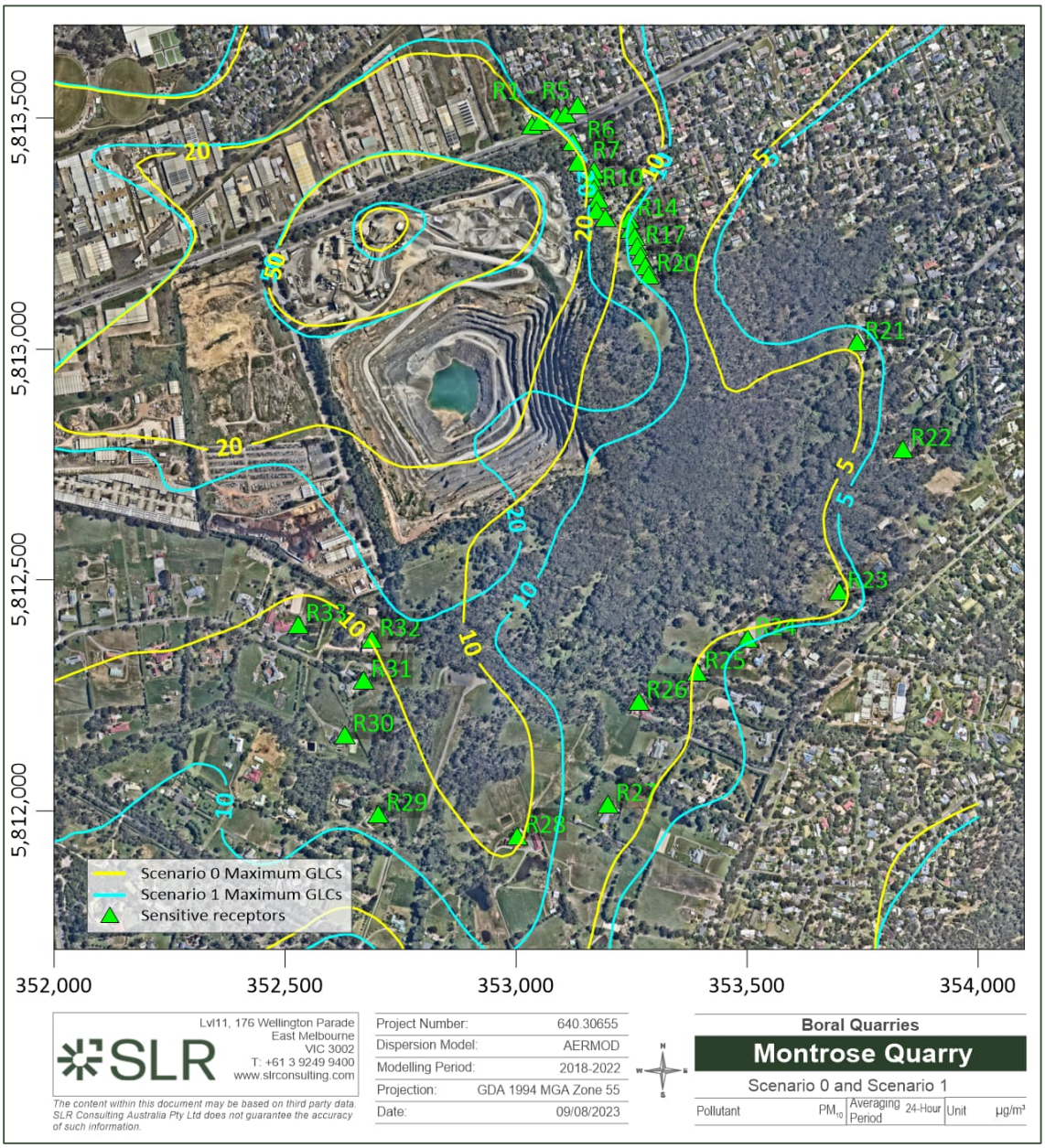


Figure 20 Maximum Predicted Project 24-Hour Average PM_{10} GLCs: Scenario 0 and 2

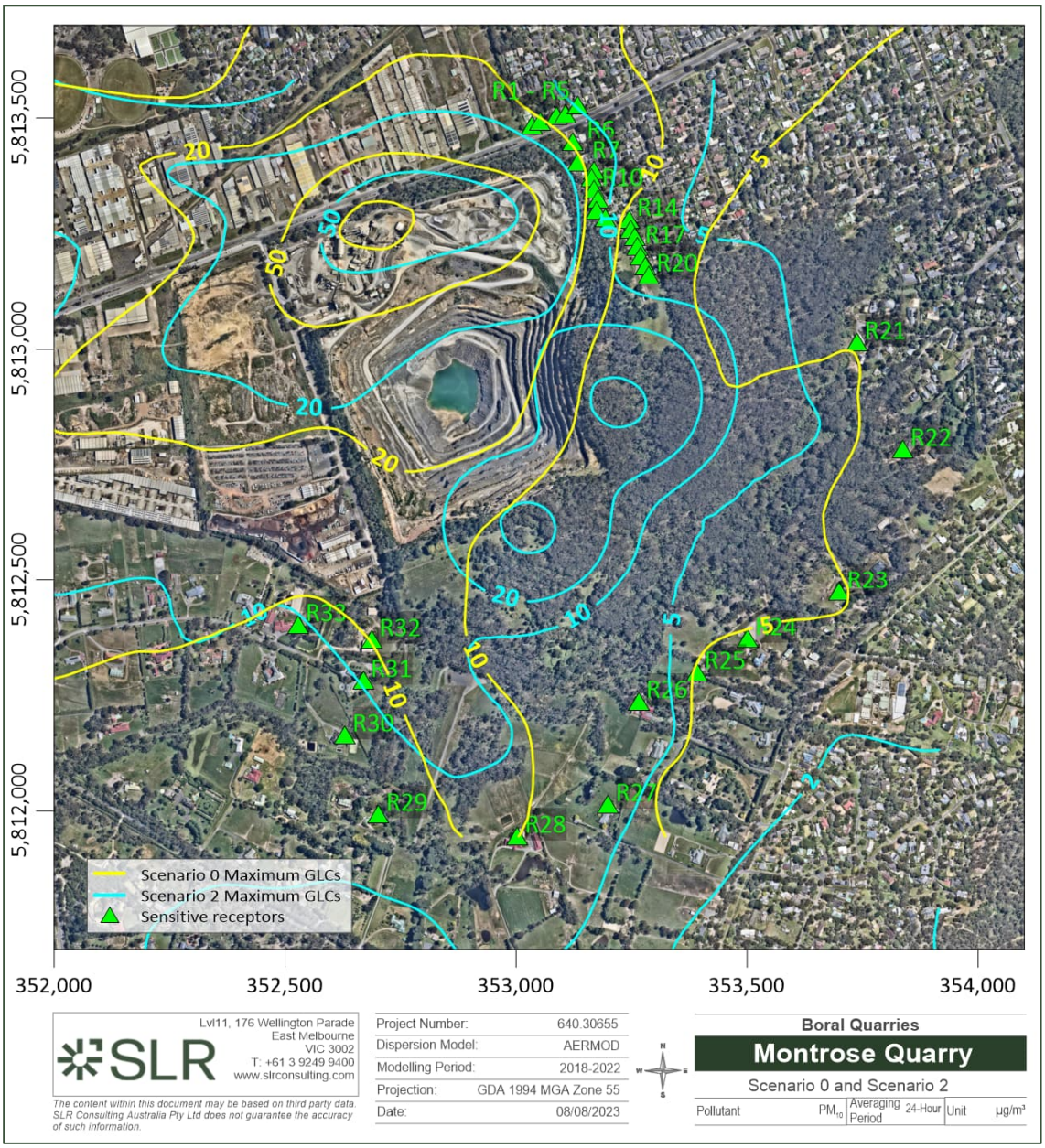


Figure 21 Maximum Predicted Project Annual Average PM_{10} GLCs: Scenario 0 and 1

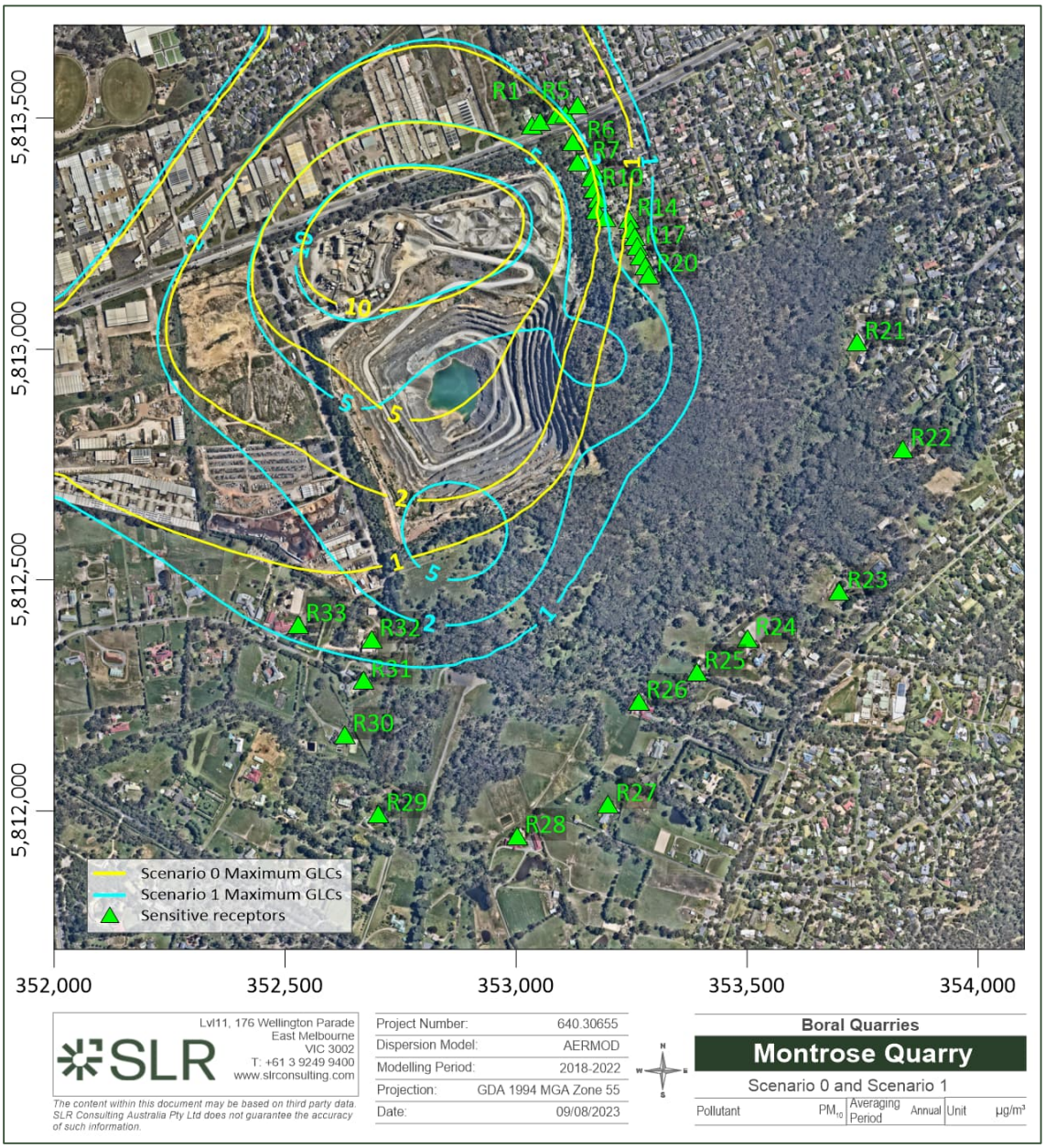
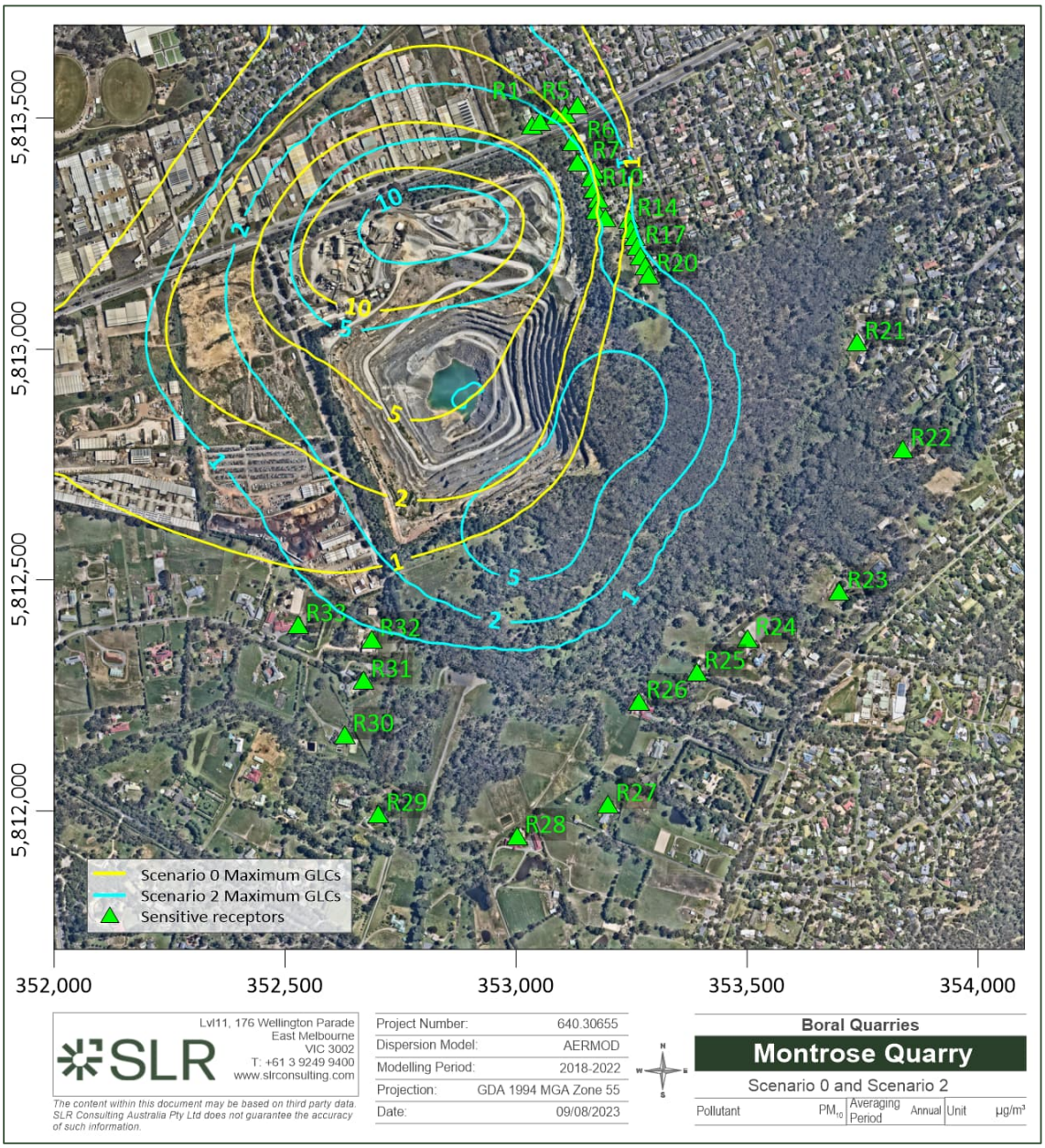


Figure 22 Maximum Predicted Project Annual Average PM_{10} GLCs: Scenario 0 and 2



9.0 Impact Assessment Significance

9.1 PM_{10} and $PM_{2.5}$

The significance of the residual impacts (after the application of appropriate avoidance and mitigation measures) predicted by the impact assessment have been assessed in accordance with the ERR derived Impact Assessment Significance Criteria provided in **Section 7.7** as follows:

Scenario 0 – Existing Operations: There is predicted to be a residual air quality impact with an additional one exceedance of the 24-hour average PM_{10} APAC at nine of the closest receptors. These exceedances are primarily driven by the elevated background concentrations with the maximum Project contribution equivalent to approximately 43% of the APAC. There are no additional exceedances of the 24-hour average $PM_{2.5}$ APAC predicted at any receptor.

The severity of residual impacts from existing quarrying activities is considered to be ***insignificant*** or ***minor*** as defined by the Impact Assessment Significance Criteria:

- *Impacts are barely recognised and/or quickly recovered from / hazard is perceived but has minor and typically temporary effects.*
- *No specific remediation required / some remediation may be required.*
- *Dust infrequently (no more than monthly) contributes to a small reduction in the amenity of the community or individuals / has a minor effect on the amenity of the community or individuals.*
- *No noticeable effect beyond the immediate occurrence or expression of the hazard / clean-up and rehabilitation may be required but can be completed within days.*

Scenario 1 – Project Construction: There is predicted to be a residual air quality impact with an additional one exceedance of the 24-hour average PM_{10} APAC at nine of the closest receptors. These exceedances are primarily driven by the elevated background concentrations with the maximum Project contribution equivalent to approximately 45% of the APAC. There are no additional exceedances of the 24-hour average $PM_{2.5}$ APAC predicted at any receptor.

The severity of residual impacts from existing quarrying activities is considered to be ***insignificant*** or ***minor*** as defined by the Impact Assessment Significance Criteria.

Scenario 2 – Project Operation: There is predicted to be a residual air quality impact with an additional one exceedance of the 24-hour average PM_{10} APAC at five of the closest receptors. These exceedances are primarily driven by the elevated background concentrations with the maximum Project contribution equivalent to approximately 45% of the APAC. There are no additional exceedances of the 24-hour average $PM_{2.5}$ APAC predicted at any receptor.

The severity of residual impacts from existing quarrying activities is considered to be ***insignificant*** or ***minor*** as defined by the Impact Assessment Significance Criteria.

9.2 RCS

There is no residual RCS impact from both any Scenario. The severity of residual RCS impacts from all Scenario is considered to be ***insignificant***.

10.0 Summary of Mitigation, Monitoring and Contingency Measures

10.1 Mitigation Measures

The mitigation measures that are proposed to avoid, mitigate or manage air quality impacts associated with the Project are summarised in **Table 23** noting that the GED is a concurrent separate obligation in relation to the proposed mitigation measures/controls.

Additional mitigation measures may be employed to minimise the risk of harm to human health or the environment so far as reasonably practicable under the GED. These additional measures may evolve overtime as the 'state of knowledge' evolves. The identified environmental risks and which of these measures will be adopted to avoid or mitigated them are presented in **Appendix B**.

Boral's existing environmental management plan will be updated to reflect Project specific considerations where appropriate.

Table 23 Mitigation Measures Relevant to Air Quality

Measure ID	Mitigation Measure
01	Training and inductions incorporate material on potential Environment and Community measures on potential impacts and avoidance and minimisation strategies where practicable.
02	Prepare and maintain active roads onsite to minimise dust emissions from vehicle traffic so far as reasonably practicable
03	Utilise dust suppression controls, including water treatment of unsealed roads and stabilising materials (e.g., crushed rock, hydro mulch or chemical dust suppressants) on exposed areas, where practicable.
04	Application of water as surface dries out to avoid excessive emissions due to wind erosion or mechanical disturbance so far as reasonably practicable.
05	Procedures to manage dust generating activities for example minimise height from which material is dropped into trucks and/or stop work during high-risk periods, where dust suppression controls are unable to be operated or ineffective.
06	Enclose dust generating equipment and operate dust suppression devices such as sprays and sprinklers to minimise dust emissions so far as reasonably practicable.
07	Where practicable, the positioning and layout of site infrastructure, plant and equipment is planned to minimise vegetation clearance, utilise existing exposed areas, and establish or maintain vegetation screens, topographic features and/or landforms to act as wind breaks to minimise dust generation.
08	Stabilise landforms by establishing vegetation through progressive rehabilitation and maintenance programs so far as reasonably practicable.
09	Where stabilisation of landform surface through rehabilitation is not undertaken, utilise compaction of stockpiles to reduce the potential erosion of material, so far as reasonably practicable and place finer material stockpiles further from site boundaries.
10	Implement maintenance regimes and procedures in accordance with manufacturers specifications to maximise equipment operational efficiency.

10.2 Monitoring and Contingency Measures

The monitoring and contingency measures that are proposed to assess air quality impacts associated with the Project are summarised in **Table 24**.

Mitigation measures will also be checked regularly to make sure they are working, well maintained, effective and remain the most appropriate option. This process includes monitoring control measures and identifying any changes that may need to be made to improve their effectiveness.

Table 24 Monitoring and Contingency Measures Relevant to Air Quality

Measure ID	Monitoring or Contingency Measure	Extraction Stage [a]
11	*Compliance* continuous PM_{10} and $PM_{2.5}$ monitoring will be conducted in accordance with relevant Australian Standards at a location representative a sensitive receptor(s) predicted to potentially experience high particulate concentrations to demonstrate that dust emissions are being controlled adequately to meet relevant APACs. Monitors will be used that are compliant with the relevant Australian Standards. Monitoring will be conducted by a suitably qualified person holding NATA accreditation for the monitoring methods. Where monitoring indicates that ERS objectives are exceeded and the source of PM_{10} and/or $PM_{2.5}$ is reasonably attributable to Quarry operations, work intensity will be reduced or ceased until such time that compliance with the ERS objectives can be achieved. In accordance with EPAV (2022), a 1-hour average PM_{10} trigger criterion of 80 µg/m^3 will be used to indicate that the 24-hour average ERS objective may not be met, triggering timely corrective actions.	1 to 3
12	Compliance monitoring of RCS (as $PM_{2.5}$) will be conducted monthly in accordance with relevant Australian Standards at a location representative a sensitive receptor(s) likely to experience the highest particulate concentrations during the operational stage of the Project to demonstrate that dust emissions are being controlled adequately to meet relevant APACs. Monitors will be used that are compliant with the relevant Australian Standards. Monitoring will be conducted by a suitably qualified person holding NATA accreditation for the monitoring methods. Where monitoring indicates that the annual average APACs may be exceeded and the source of RCS is reasonably attributable to Quarry operations, work intensity will be reduced or ceased until such time that compliance with the APACs will be achieved.	1 to 3
13	Visual assessment of both fugitive dust generation. All Quarry personnel will have the responsibility to report observations of any excessive dust generation resulting from their own, or others work. The Quarry manager will implement appropriate mitigation measures (e.g. increased haul road watering and/or further reduced speed limits for road trucks on unsealed site and public roads).	1 to Final
a Refer **Table 1**		

11.0 Conclusion

A summary of the key assets, values or uses potentially affected by the Project, and an associated assessment of air quality impacts and recommended mitigation measures, are summarised below.

With the implementation of the mitigation measures recommended and included in this assessment, potential adverse impacts to air quality resulting from the Project are demonstrated to be minimised, protecting the health and wellbeing of nearby residents and workers.

Existing Environment

The land surrounding the Quarry includes commercial properties, light industries, residential areas and large residential blocks.

Winds in the area are predominantly from the north-northeast, with very few winds from the east.

Site specific ambient air quality monitoring has been undertaken on the eastern boundary of the Quarry for 12 months, with particular focus on PM_{10}, $PM_{2.5}$ and RCS and do not indicate any unusually elevated concentrations. In particular, the annual average concentrations of RCS are approximately an order of magnitude less than the APAC. Elevated concentrations of the monitored 24-hour average PM_{10} concentrations are not necessarily exclusively due to emissions from the Quarry, rather they are likely to result from a combination of Quarry emissions, sources in the local area, and emissions that flow into the area from the wider region.

Impact Assessment Findings

Elevated background concentrations of PM_{10} monitored during the baseline monitoring period and used to represent existing conditions result in up to one exceedance of the 24-hour average APAC per year at some of the nearest sensitive receptors once the Project contribution is added. Under normal background conditions, the PM_{10} APAC is predicted to be met at all receptors.

The background concentrations used in conjunction with the predicted Project GLCs to give the maximum cumulative GLCs (Project plus background) may already include contributions from the existing operations (Scenario 0), and therefore the cumulative GLCs can be considered conservative (i.e., over-predictions).

Overall, the sensitive receptors with the greatest predicted GLCs under existing operations are likely to experience a relatively small increase during Scenario 1 and a small decrease during Scenario 2.

These results indicate that increase in maximum Project 24-hour average PM_{10} GLCs at any receptor is 4.3 $\mu g/m^3$ under Scenario 1 and 1.8 $\mu g/m^3$ under Scenario 2. The corresponding increases in the maximum Project 24-hour average $PM_{2.5}$ GLCs are 0.5 $\mu g/m^3$ and 0.0 $\mu g/m^3$, respectively.

The 24-hour average $PM_{2.5}$ APAC and annual average APACs for PM_{10}, $PM_{2.5}$ and RCS (as $PM_{2.5}$) are predicted to be met at all receptors.

The assessment includes a number of conservative assumptions and therefore actual maximum GLCs are likely to be less than those predicted. These assumptions include:

- Operations under all scenarios are assumed to be occurring at the peak hourly rate, 365 days per year.

- Background concentrations of PM_{10}, $PM_{2.5}$ and RCS to which predicted Project GLCs are added are likely to already include some contribution from the Quarry existing operations.
- RCS emission rates for all activities are equal to 100% of the $PM_{2.5}$ emission rates.

The significance of the Project residual impacts (after the application of appropriate avoidance and mitigation measures) predicted by the impact assessment are assessed in accordance with the ERR derived Impact Assessment Significance Criteria to be *minor* or *insignificant* both construction and operational scenarios.

Mitigation and Contingency Measures

Dust emission mitigation measures will be employed for all aspects of the Project operations including use of water sprays and water trucks. Wheel generated dust from haul roads has been identified as the primary potential source of dust emissions, therefore preparing and maintaining level and well finished haul road surfaces will be considered a priority. Contingency measures may include reducing the site speed limit for haul trucks during periods of hot and dry weather coupled with increased water truck application.

Real time continuous monitoring for management purposes will be implemented to minimise the potential risks of impacts at downwind sensitive receptors.

Closing

The risk of adverse impacts to air quality at the nearest sensitive receptors is predicted to be low with the PM_{10} and $PM_{2.5}$ 24-hour average and annual average APAC's met in all cases except in those unusual cases where background 24-hour average PM_{10} conditions approach the APAC. The maximum increase in Project 24-hour average PM_{10} GLCs over existing operations, at any receptor under both either Scenario 1 or 2, is predicted to be a small fraction of the PM_{10} APAC.

With the application of the proposed management and mitigation strategies, potential impacts on air quality due to the Project would be avoided, minimised or managed to required standards such that the health and wellbeing of residents and the local community would be protected.

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13.0 Feedback

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

To achieve this, your feedback on the team's performance, deliverables and service are valuable and SLR welcome all feedback via https://www.slrconsulting.com/en/feedback. We recognise the value of your time and we will make a $10 donation to our 2023 Charity Partner - Lifeline, for every completed form.

Appendix A Ambient Air Quality Monitoring Report

Montrose Quarry Extension

Air Quality Impact Assessment

Boral Resources (VIC) Pty Ltd

SLR Project No.: 640.V30655.00000

16 February 2024

Montrose Quarry

Air Quality Monitoring Program
July 2022 – July 2023

Boral Resources (Vic) Pty Ltd

Level 1, 251 Salmon Street
Port Melbourne VIC 3207

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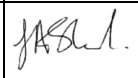
SLR Project No.: 640.V30374.00000

16 August 2023

Revision: 1.0

Accredited for Compliance with
ISO/IEC 17025 - Testing

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	16 August 2023	James Boreham	Jason Shepherd	

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Boral Resources (Vic) 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. Results relate only to the items tested, calibrated or sampled.

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

Table of Contents

Tables in Text

Figures in Text

Appendices

1.0 Introduction

Boral Limited (Boral) engaged SLR Consulting Australia Pty Ltd (SLR) to conduct an air quality monitoring program for Montrose Quarry (the Quarry). To secure long-term access to extractive resources, Boral proposes to extend the extraction limit of the Quarry to access known reserves within the exiting buffer areas. The proposed changes will require statutory approvals under the Mineral Resources (Sustainable Development) Act (Victrorian State Government 1990) and the Planning and Environment Act (Victorian State Government 1987). In consultation with the Environment Protection Authority Victoria (EPA), Boral are required to conduct air quality monitoring at the Quarry to inform future air quality impact assessment (AQIA) for the proposed extraction limit extension.

The air quality monitoring program was conducted by SLR Consulting Australia Pty Ltd, NATA Accreditation No. 3130.

This report presents the results of the monitoring program from commencement on 13 July 2022 to 31 July 2023 (the monitoring period).

1.1 Purpose

In the absence of existing nearby background ambient air quality monitoring data representative of the project area with which to inform future AQIA, 12-months of real-time continuous 24-hour monitoring of particulate with an aerodynamic diameter of less than 10 microns (PM_{10}) and of less than 2.5 microns ($PM_{2.5}$) must be conducted. This should also include monitoring for respirable crystalline silica (as $PM_{2.5}$).

1.2 Scope

1.2.1 Background

SLR previously prepared an air quality monitoring plan (AQMP) for Montrose Quarry (SLR 2021) prescribing monitoring methods and frequencies such that air quality conditions could be appropriately quantified to inform future assessments associated with the potential expansion of operations.

In accordance with the AQMP, SLR commissioned a Met One E-BAM Plus beta-attenuation monitor (BAM) to monitor PM_{10} and a Met One BAM1022 BAM to monitor $PM_{2.5}$ at the quarry on 13 July 2022. An Airmetrics MiniVol low volume air sampler (LVAS) was also deployed to collect gravimetric samples of $PM_{2.5}$ for subsequent RCS analysis.

The monitoring location at Montrose quarry was finalised in consultation with EPA.

The scope of monitoring included monthly site visits by SLR staff to maintain and calibrate the equipment as required by the relevant Australian Standards and/or manufacture's specifications.

1.2.2 Addendum

At Boral's request, two additional LVAS were deployed at Montrose during the fourth quarter of the monitoring period to collect gravimetric samples of PM_{10} and PM_4 for subsequent RCS analysis. Samples were collected concurrently with the RCS (as $PM_{2.5}$) samples for the May-June 2023 and June-July 2023 monitoring periods.

2.0 Monitoring Location

The monitoring location was commissioned on 13 July 2022, as presented in **Figure 1**.

Figure 1 Monitoring Location

Monitors were sited in accordance with Australian Standard AS/NZS 3580.1.1: 2016 *"Methods for sampling and analysis of ambient air: Guide to siting air monitoring equipment"* and in compliance with AS/NZS 3580.1.1: 2016 siting criteria.

The siting criteria were not met for the monitoring location as it did not meet the minimum distance to the dripline of a nearby tree (≥10 metres) for a background monitoring location.

Non-compliance with these criteria does not invalidate the results, but may impose certain considerations when deriving conclusions from those results.

Table 1 provides a summary of compliance for each monitoring location against the AS/NZS 3580.1.1.2016 siting criteria.

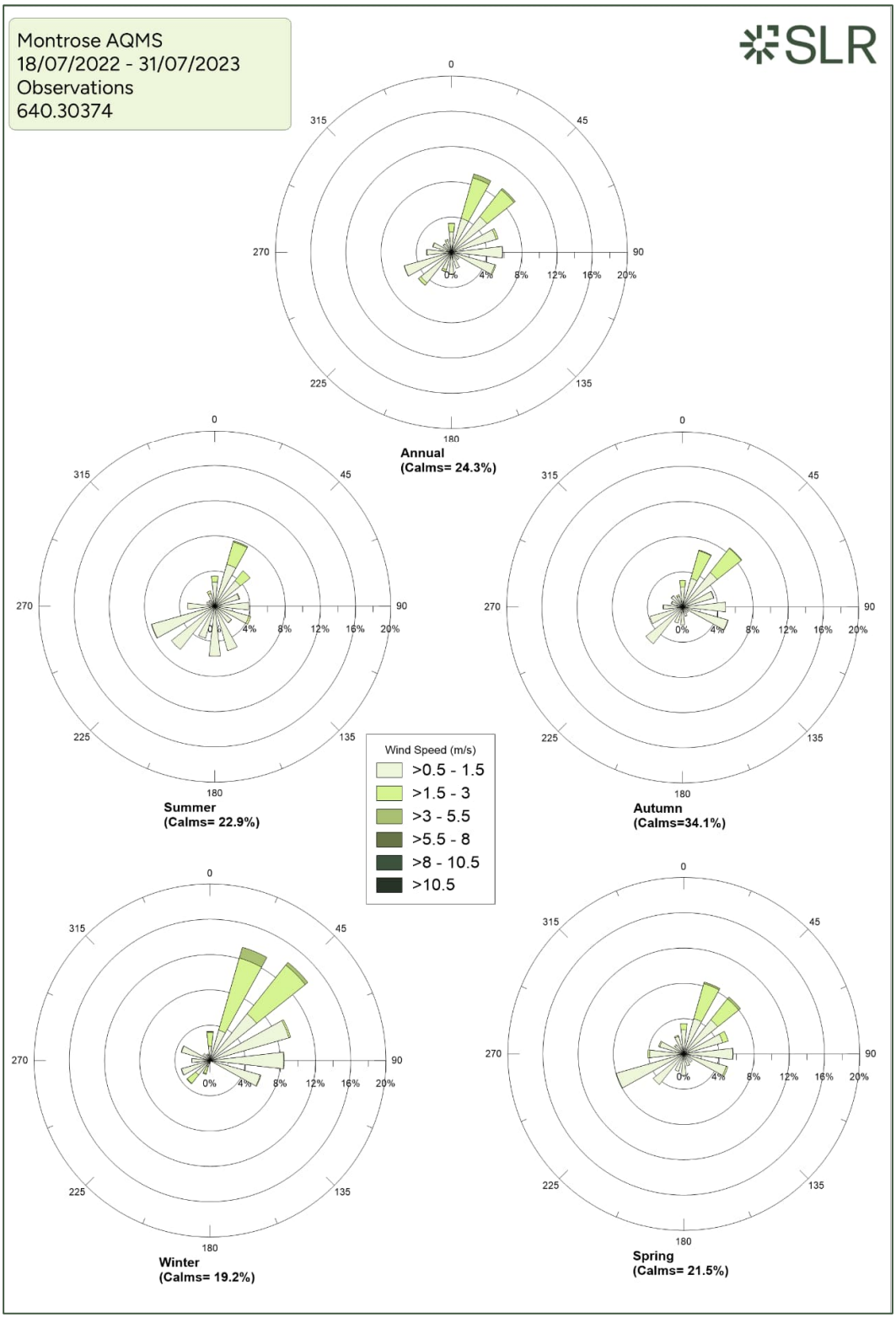
Table 1 Siting Criteria Compliance

Parameter	AS3580.1.1 Compliance [a]
Location type	Neighbourhood / Background
Inlet height above ground (m): PM_{10}/$PM_{2.5}$ 1.5 – 15	Yes
>10 m from nearest object/tree dripline	No
>5 m from source	Yes
Clear Sky Angle >120°	Yes
Unrestricted airflow of 360° around sample inlet	Yes
No extraneous sources	Yes
a Non-compliance with these criteria does not invalidate the results but may impose certain considerations when deriving conclusions from the results.	

3.0 Wind Conditions

Annual and seasonal wind roses over the 12-month monitoring period as monitored at the monitoring location are presented in .

Figure 2 Wind Roses



4.0 Assessment Criteria

PM_{10} and $PM_{2.5}$ air quality criteria with which to inform the averaging periods of the monitoring to be reported and to provide context with which to compare the monitored concentrations have been sourced from the Environmental Reference Standard (ERS) (Victoria Government 2022). The ERS is to be used to assess and report on environmental conditions in the whole or any part of Victoria. It sets out indicators and objectives for the ambient air environment and provides a reference to help make decisions. It does not:

- create specific obligations that must be followed
- set out enforceable compliance limits
- describe levels that it is permitted to pollute up to.

An RCS air quality criterion with which to compare the monitoring data has been sourced from *"Guideline for Assessing and Minimising Air Pollution in Victoria"* (the Air Guideline) (EPAV 2022). The Air Guideline provides a framework to assess and control risks associated with air pollution. It is a technical guideline for air quality practitioners and specialists with a role managing pollution discharges to air.

The air pollution assessment criteria (APACs) in the Air Guideline are concentrations of air pollutants that provide a benchmark to understand potential risks. They are risk-based concentrations that help identify when or if an activity is likely to pose an unacceptable risk to human health and the environment. This represents a change in attitude to air quality criteria which were previously concentrations that facilities could effectively 'pollute up to'. There are now no concentrations below which no action, management and/or mitigation of emissions to air is required.

Relevant air quality criteria are provided in **Table 2**.

Table 2 Air Quality Criteria

Substance	Source	Averaging Time	Criteria ($\mu g/m^3$ at 0°C)
PM_{10}	ERS (Victoria Government 2022)	24 hours	50
		Annual	20
$PM_{2.5}$	ERS (Victoria Government 2022)	24 hours	25
		1 year	8
RCS (as $PM_{2.5}$)	Air Guideline (EPAV 2022)	1 year	3

5.0 Methodology

Sampling for PM_{10}, $PM_{2.5}$ and RCS was conducted by SLR Consulting Australia Pty Ltd, NATA Accreditation No. 3130.

5.1 PM_{10}

Continuous PM_{10} monitoring was performed using USEPA equivalent method (FEM) compliant E-BAM Plus[1] in accordance with AS/NZS 3580.9.11:2022 *"Methods for sampling and analysis of ambient air: Determination of suspended particulate matter - PM_{10} beta attenuation monitors".*

AS 3580.9.11:2022 states that BAMs may record short-term (<24h) negative PM_{10} concentrations due to loss of moisture or semi-volatile compounds in the collected particulate matter from the filter media. Short term negative values resulting from such loss should be considered real data and should not be invalidated from the dataset.

5.2 $PM_{2.5}$

Continuous $PM_{2.5}$ monitoring was performed using USEPA FEM compliant BAM-1022[2] in accordance with AS/NZS 3580.9.12:2022 *"Methods for sampling and analysis of ambient air: Determination of suspended particulate matter - $PM_{2.5}$ beta attenuation monitors".*

AS 3580.9.12:2022 states that BAMs may record short-term (<24h) negative $PM_{2.5}$ concentrations due to loss of moisture or semi-volatile compounds in the collected particulate matter from the filter media. Short term negative values resulting from such loss should be considered real data and should not be invalidated from the dataset.

5.3 RCS

Batch $PM_{2.5}$ monitoring for RCS was performed using a LVAS and 47mm PVC filters in accordance with AS/NZS 3580.9.10:2017 *"Methods for sampling and analysis of ambient air: Determination of suspended particulate matter – $PM_{2.5}$ low volume sampler – Gravimetric method"* and NISOH 7500 *"Silica, Crystalline, by XRD (filter redeposition)"* . The AQMP indicates that monitoring will be conducted for seven days each month.

Additional batch monitoring for crystalline silica as PM_{10} and as PM_4 was performed using two additional LVAS at Montrose during this quarter for the periods May-June 2023 and June-July 2023.

Batch PM_{10} monitoring for crystalline silica was performed using a LVAS and 47mm PVC filters in accordance with AS/NZS 3580.9.9:2017 *"Methods for sampling and analysis of ambient air: Determination of suspended particulate matter – PM_{10} low volume sampler – Gravimetric method"* and NISOH 7500.

Batch PM_4 monitoring for RCS with a SKC cyclone designed to sample respirable dust on to 25mm PVC filters in general accordance with AS 2985:2009 *"Workplace atmospheres – Method for sampling and gravimetric determination of dust"* and NISOH 7500. The SKC cyclone has a 50% cut-point of 4.0 µm at 3.0 L/min and is similar to the Higgins-Dewell design cyclone, except it runs at 3.0 L/min making it suitable for use with the LVAS.

[1] EQPM-1215-226 (USEPA, 2022)

[2] EQPM-1013-209 (USEPA, 2022)

Gravimetric and crystalline silica (a-quartz) analysis (by x-ray diffraction (XRD)) was conducted by Envirolab Services (WA) Pty Ltd (Envirolab), NATA accreditation No. 2901.

5.4 Instrument Flow Rates

Instrument flow rates were calibrated using a BGI TetraCal air flow calibrator and inlet flow adaptor. The TetraCal was calibrated by Vipac Engineers and Scientists Ltd, NATA accreditation No 676.

5.5 Temperature

Ambient temperature was monitored using a BGI TetraCal. The TetraCal was calibrated by Vipac Engineers and Scientists Ltd, NATA accreditation No 676.

5.6 Pressure

Barometric pressure was monitored using a BGI TetraCal. The TetraCal was calibrated by Vipac Engineers and Scientists Ltd, NATA accreditation No 676.

5.7 Data Averaging and Data Capture

AS 3580.19:2020 *"Methods for sampling and analysis of ambient air: Ambient air quality data validation and reporting"* states that 24-hour average concentration data can be reported if a minimum of 75% valid data are available and that 24-hour average concentrations are calculated from midnight to midnight.

Annual average concentrations are calculated from one-hour average concentrations, provided there is a minimum of 75% valid data in each calendar quarter. For non-continuous particulate matter methods (e.g., LVAS), annual averages are to be calculated from 24-hour average concentrations.

AS 3580.19:2020 states that *"for each data averaging period, a minimum data capture percentage of 75% is a critical criterion"*.

The AQMP data capture criteria objectives for 24-hour average PM_{10} and $PM_{2.5}$ are as follows:

- Calendar quarter: >75%
- Annual: >75%.

5.8 Reporting Precision

AS 3580.19:2020 states that the concentration of a pollutant should not be reported with an excessive number of significant figures. The number of significant figures used should be based on the calculated or estimate measurement uncertainty for the test method.

Where the result is less than the method limit of reporting (LOR), only one significant figure should be used.

AS 3580.19:2020 suggests that for PM_{10} and $PM_{2.5}$ concentrations should be rounded to three significant figures or one decimal place.

5.9 Standard Temperature and Pressure

Mass concentrations are reported at standard temperature and pressure (STP; 0°C and 101.325 kPa).

6.0 Measurement Uncertainty

6.1 PM_{10}

The MetOne E-BAM Plus meets USEPA requirements for accuracy and precision for PM_{10} measurement. SLR estimates that the measurement uncertainty associated with PM_{10} (24-hour average) by E-BAM Plus is ±2 µg/m^3 [3] .

6.2 $PM_{2.5}$

The MetOne BAM-1022 meets USEPA requirements for Class III $PM_{2.5}$ FEM. SLR estimates that the measurement uncertainty associated with $PM_{2.5}$ (24-hour average) by BAM-1022 is ±2 µg/m^3 [3].

6.3 RCS

The measurement uncertainty associated with low volume sampling is stated in AS/NZS 3580.9.10 and AS/NZS 3580.9.9 as being typically ±5 µg/m^3 at 95% confidence limit over the entire measurement range (24-hours at 3 L/min). Envirolab state that the estimated measurement uncertainty for the laboratory analysis of quartz is 30% at 25 µg at 95% confidence limit (i.e., statistically the true value lies between 17-31 µg / filter (35 – 65 µg/m^3) at 95% confidence).

The measurement uncertainty associated with sampling and analysis of RCS in accordance with AS 2985 is discussed in *"Measuring respirable crystalline silica"* (Safe Work Australia 2020). The report found that the uncertainty in measurement of RCS is significantly increased at and below a workplace exposure standard (WES) of 0.02 mg/m^3 (20 µg/m^3). However, a WES is generally based on an 8-hour sample at a sample rate of 2 L/min, to give an 8-hour time weighted average (TWA) and therefore this finding may not be representative of the Boral monitoring program where sampling periods are generally for 7-day (168-hour) period or greater.

The measurement uncertainty associated with NOISH 7500 is not stated.

[3] Equivalent Thermo-fisher 5014i USEPA FEM instrument specifications state ±2.0 µg/m^3 <80 µg/m^3; 4-5 µg/m^3 > 80 µg/m^3 (24-hour average).

7.0 Results

Summary results for each of the parameters monitored at the monitoring location are provided in the following sections. Full results for PM_{10} and $PM_{2.5}$ are provided in **Appendix A**.

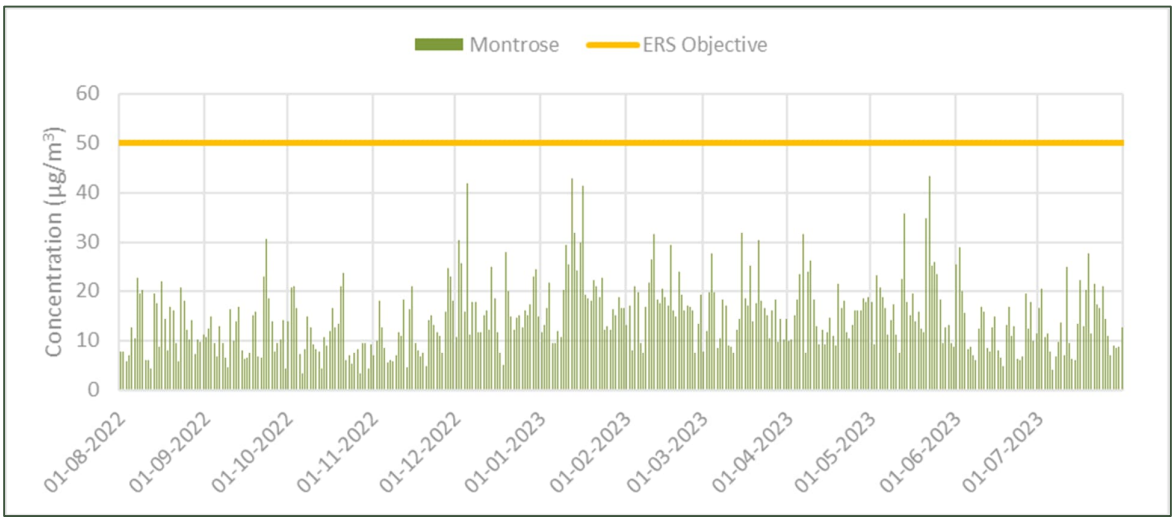
7.1 PM_{10}

The monitoring data is summarised in **Table 3.** The 24-hour averaged datasets are presented in **Figure 3**.

Table 3 Summary of 24-Hour Average PM_{10} Monitoring: E-BAM Plus

Monitoring Period	Concentration (µg/m^3)		No. of Exceedances of Criterion (50 µg/m^3)
	Maximum	Average	
01-08-2022 – 31-08-2022	22.6	12.3	0
01-09-2022 – 30-09-2022	30.6	11.6	0
01-10-2022 – 31-10-2022	23.6	10.8	0
01-11-2022 – 30-11-2022	24.5	11.7	0
01-12-2022 – 31-12-2022	41.8	17.1	0
01-01-2023 – 31-01-2023	42.9	19.7	0
01-02-2023 – 28-02-2023	31.6	17.6	0
01-03-2023 – 31-03-2023	31.8	15.8	0
01-04-2023 – 30-04-2023	31.7	15.6	0
01-05-2023 – 31-05-2023	43.3	17.9	0
01-06-2023 – 30-06-2023	28.9	12.3	0
01-07-2023 – 31-07-2023	27.6	13.0	0
ERS	**50**		
Annual Average Concentration (µg/m^3)			
01-08-2022 – 31-07-2022	15		
ERS	**20**		

Figure 3 24-hour Average PM_{10} Datasets: E-BAM Plus



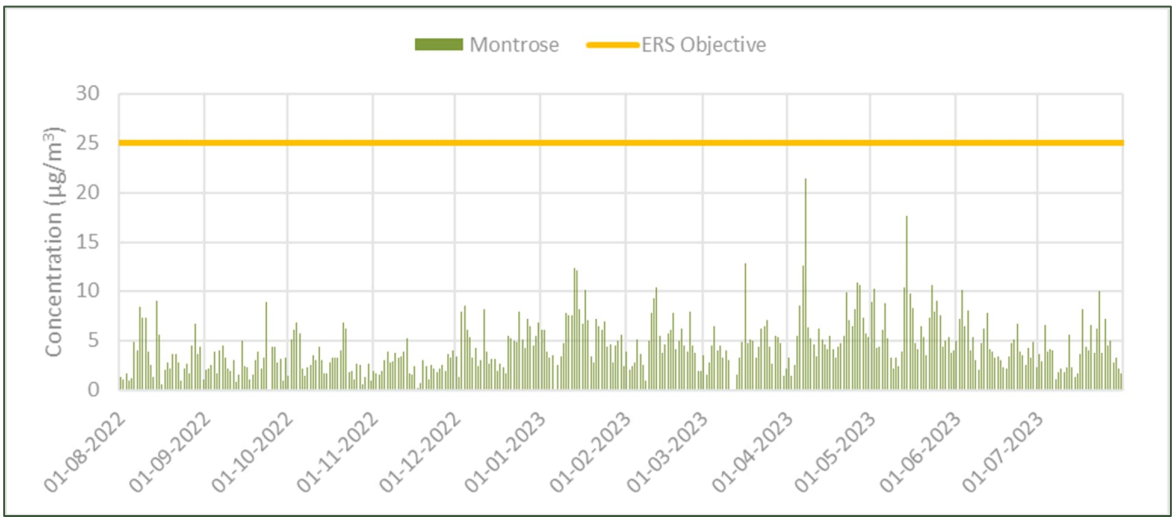
7.2 $PM_{2.5}$

The monitoring data is summarised in **Table 4**. The 24-hour averaged datasets of each location are presented in a **Figure 4**.

Table 4 Summary of 24-Hour Average $PM_{2.5}$ Monitoring: BAM-1022

Monitoring Period	Concentration (µg/m³)		No. of Exceedances of Criterion (25 µg/m³)
	Maximum	Average	
01-08-2022 – 31-08-2022	9.0	3.4	0
01-09-2022 – 30-09-2022	8.8	2.9	0
01-10-2022 – 31-10-2022	6.8	3.1	0
01-11-2022 – 30-11-2022	5.2	2.6	0
01-12-2022 – 31-12-2022	8.5	4.7	0
01-01-2023 – 31-01-2023	12.3	5.7	0
01-02-2023 – 28-02-2023	10.3	4.7	0
01-03-2023 – 31-03-2023	12.8	4.4	0
01-04-2023 – 30-04-2023	21.4	6.6	0
01 -05-2023 – 31-05-2023	17.6	6.2	0
01-06-2023 – 30-06-2023	10.1	4.5	0
01-07-2023 – 31-07-2023	9.9	3.6	0
ERS	**25**		
Annual Average Concentration (µg/m³)			
01-08-2022 – 31-07-2022	4.4		
ERS	**8**		

Figure 4 24-Hour Average $PM_{2.5}$ Datasets: BAM-1022



7.3 RCS

The RCS (as $PM_{2.5}$) monitoring results are provided in **Table 5** and **Figure 5**. Crystalline silica as PM_{10} and RCS (as PM_4) monitoring results for Montrose are provided in **Table 6**. Laboratory test certificates are provided in **Appendix B.**

Table 5 RCS (as $PM_{2.5}$) Monitoring: LVAS

SLR Sample Number	Monitoring Period		Concentration $PM_{2.5}$ (µg/m³)	Concentration RCS (µg/m³)	Laboratory Analysis Report
	Start - Finish	Hours (Days)			
12390	Jul 2022 – Aug 2022	122.2 (5.1)	3.7	<0.2	PDH0999
12561	Aug 200 – Sep 2022	177.7 (7.4)	2.4	0.51	PDI0809
12646	Sep 2022 – Oct 2022	216.1 (9.0)	3.3	<0.09	PDJ06898
12721	Oct 2022 – Nov 2022	133.7 (5.6) [a]	4.0	<0.2	PDK1011
12700	Nov 2022 – Dec 2022	120.1 (5.0) [a]	2.1	0.21	PDL0750
12984	Dec 2022 – Jan 2022	78.1 (3.3) [a]	4.5	<0.3	PEA1051
12903	Jan 2023 – Feb 2023	216.1 (9.0)	5.8	<0.1	PEB0671
13179	Feb 2023 – Mar 2023	168.1 (7.0)	7.1	0.14	PEC1157
13144	Mar 2023 – Apr 2023	240.1 (10.0)	4.9	0.08	PED0587
13378	Apr 2023 – May 2023	179.8 (7.5)	4.7	<0.1	PEE0704
13366	May 2023 – Jun 2023	120.2 (5.0) [a]	11	0.16	PED0650
13559	Jun 2023 – Jul 2023	168.1 (7.0)	6.1	0.12	PEG0485
Rolling Annual Average Concentration [b]				<0.2	
APAC (Annual Average)				**3**	

a Sample period less than the recommended seven days, however SLR do not consider this to significantly impact the reported concentrations.

b Inclusive of July 2022 to July 2023 monitoring results.

Figure 5 7-Day Average RCS

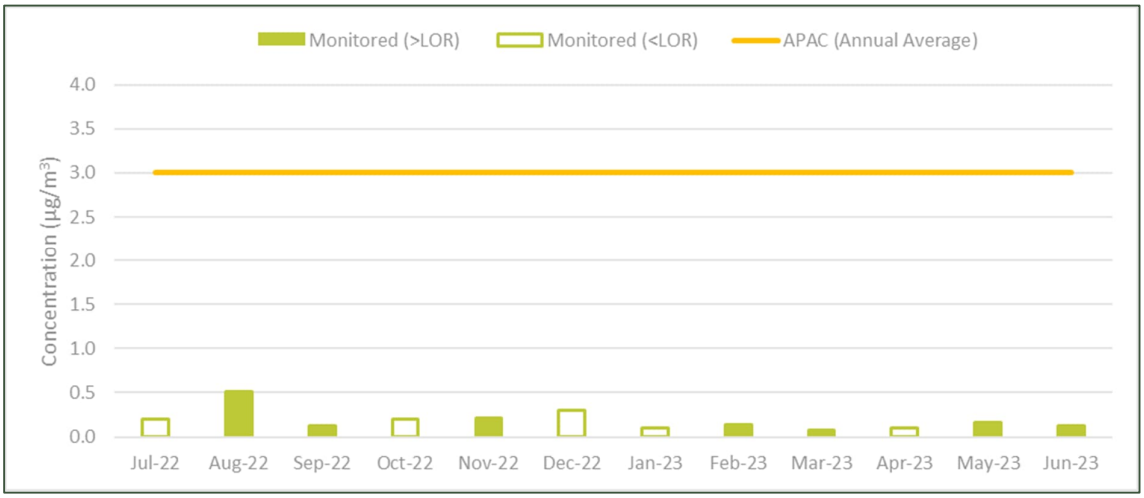


Table 6 Crystaline Silica (as PM_{10}) and RCS (as PM_4) Monitoring: LVAS

Indicator	SLR Sample Number	Monitoring Period		Concentration (µg/m³)		Laboratory Analysis Report
		Start - Finish	Hours (Days)	$PM_{2.5}$	RCS	
Crystalline Silica as PM_{10}	13461	May 2023 – Jun 2023	240.0 (10.0)	13.2	0.24	PED0650
	13558	Jun 2023 – Jul 2023	168.1 (7.0)	10.5	0.36	PEG0485
	Average Concentration [b]				**<0.3**	
RCS as PM_4	13462	May 2023 – Jun 2023	197.8 (8.2)	9.7	<0.2	PED0650
	13563	Jun 2023 – Jul 2023	158.9 (6.6) [a]	7.0	<0.3	PEG0485
	Average Concentration [b]				**<0.3**	

a Sample period less than the recommended seven days, however SLR do not consider this to significantly impact the reported concentrations.

b Inclusive of July 2022 to July 2023 monitoring results.

8.0 QA/QC

8.1 Data Validation

Data contained in this report has been validated against performance and calibration requirements for each monitoring method. Data has been removed from the validated dataset for periods where the instrument has not performed within specified performance limits (e.g., sample flow rate tolerance) and during periods where maintenance and calibration has been conducted. Data exceptions for the monitoring period are provided in **Appendix C**.

8.2 Data Capture

8.2.1 Continuous PM_{10} and $PM_{2.5}$

The PM_{10} and $PM_{2.5}$ data capture for the monitoring period is summarised in **Table 7.** Notable monitoring events resulting in interruptions to data collection are summarised in **Table C 1**.

Table 7 PM_{10} and $PM_{2.5}$ Data Capture

Monitoring Period	Data Capture			
	PM_{10}		$PM_{2.5}$	
	Monthly	Quarterly	Monthly	Quarterly
01-08-2022 – 31-08-2022	100%	100%	100%	99%
01-09-2022 – 30-09-2022	100%		97%	
01-10-2022 – 31-10-2022	100%		100%	
01-11-2022 – 30-11-2022	100%	100%	100%	99%
01-12-2022 – 31-12-2022	100%		100%	
01-01-2023 – 31-12-2023	100%		97%	
01-02-2023 – 28-02-2023	100%	100%	100%	98%
01-03-2023 – 31-03-2023	100%		94%	
01-04-2023 – 30-04-2023	100%		100%	
01-05-2023 – 31-05-2023	100%	100%	100%	100%
01-06-2023 – 30-06-2023	100%		100%	
01-07-2023 – 31-07-2023	100%		100%	
Objective		**75%**		**75%**

8.2.2 RCS

During the monitoring period, one RCS (as $PM_{2.5}$) sample was collected per month as scheduled (100% data capture). Two samples did not meet the recommended 7-day sample period, however, SLR does not consider this to significantly impact the result.

One crystalline silica as PM_{10} sample and one RCS (as PM_4) sample was collected per month during the second and third months of the quarter as scheduled (100% data capture at all locations).

9.0 Closing

The quarterly data capture objective has been met for each indicator. Monitoring of RCS indicates that concentrations when sampled as $PM_{2.5}$ do not significantly differ from concentrations sampled as PM_{10} or PM_4. It is recommended that monitoring of RCS as PM_4 continues into the warmer drier months when both $PM_{2.5}$ and PM_4 concentrations may be greater.

10.0 References

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End of Report

Appendix A PM$_{10}$ and PM$_{2.5}$ Monitoring Results

Montrose Quarry

Air Quality Monitoring Program
July 2022 – July 2023

Boral Resources (Vic) Pty Ltd

SLR Project No.: 640.V30374.00000

16 August 2023

Table A 1 24-Hour Average Datasets

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
01-08-2022	7.8	1.1
02-08-2022	7.8	1.7
03-08-2022	5.7	0.9
04-08-2022	6.9	1.2
05-08-2022	12.6	4.8
06-08-2022	10.3	4.0
07-08-2022	22.6	8.4
08-08-2022	19.5	7.3
09-08-2022	20.2	7.3
10-08-2022	6.0	3.9
11-08-2022	6.1	2.5
12-08-2022	4.2	1.3
13-08-2022	19.5	9.0
14-08-2022	17.5	5.6
15-08-2022	8.6	0.6
16-08-2022	21.8	2.0
17-08-2022	14.2	2.7
18-08-2022	7.9	2.2
19-08-2022	16.7	3.6
20-08-2022	16.1	3.6
21-08-2022	9.3	2.8
22-08-2022	5.8	0.9
23-08-2022	20.6	2.1
24-08-2022	17.9	2.6
25-08-2022	12.0	1.6
26-08-2022	10.1	4.5
27-08-2022	14.1	6.7
28-08-2022	7.1	3.6
29-08-2022	10.2	4.3
30-08-2022	9.7	1.0
31-08-2022	11.1	2.0
01-09-2022	10.6	2.2
02-09-2022	12.3	2.5
03-09-2022	14.9	3.8
04-09-2022	9.4	1.7
05-09-2022	6.8	4.0
06-09-2022	12.9	4.5

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
07-09-2022	9.4	3.2
08-09-2022	6.4	2.2
09-09-2022	4.5	1.9
10-09-2022	16.3	3.0
11-09-2022	9.9	0.8
12-09-2022	13.8	1.5
13-09-2022	16.8	4.9
14-09-2022	7.9	2.4
15-09-2022	6.2	2.3
16-09-2022	6.4	1.1
17-09-2022	7.5	1.5
18-09-2022	15.1	3.0
19-09-2022	15.8	3.8
20-09-2022	6.7	2.1
21-09-2022	6.4	3.2
22-09-2022	22.8	8.8
23-09-2022	30.6	ND
24-09-2022	18.4	4.4
25-09-2022	13.9	4.4
26-09-2022	7.7	2.7
27-09-2022	9.3	3.1
28-09-2022	10.2	0.9
29-09-2022	14.0	3.2
30-09-2022	4.4	1.4
01-10-2022	13.9	5.1
02-10-2022	20.6	6.0
03-10-2022	20.9	6.8
04-10-2022	16.4	5.7
05-10-2022	7.3	2.1
06-10-2022	3.3	1.4
07-10-2022	8.3	2.3
08-10-2022	14.9	2.5
09-10-2022	12.7	3.5
10-10-2022	9.1	3.0
11-10-2022	8.1	4.4
12-10-2022	7.7	3.0
13-10-2022	4.2	1.6
14-10-2022	10.7	1.6

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
15-10-2022	9.0	2.8
16-10-2022	11.8	3.2
17-10-2022	16.6	3.3
18-10-2022	12.5	3.3
19-10-2022	13.4	4.0
20-10-2022	20.8	6.8
21-10-2022	23.6	6.2
22-10-2022	6.1	1.8
23-10-2022	6.9	1.9
24-10-2022	5.2	1.1
25-10-2022	7.4	2.6
26-10-2022	8.2	2.5
27-10-2022	3.4	0.5
28-10-2022	9.5	1.3
29-10-2022	9.4	2.6
30-10-2022	4.3	0.9
31-10-2022	9.1	1.9
01-11-2022	7.0	1.6
02-11-2022	9.8	1.5
03-11-2022	17.9	1.9
04-11-2022	12.7	3.0
05-11-2022	8.5	3.8
06-11-2022	5.5	2.7
07-11-2022	5.9	2.9
08-11-2022	5.8	3.7
09-11-2022	6.9	3.2
10-11-2022	11.5	3.4
11-11-2022	10.9	3.8
12-11-2022	18.1	5.2
13-11-2022	4.5	1.7
14-11-2022	16.3	1.5
15-11-2022	20.9	2.4
16-11-2022	9.3	0.2
17-11-2022	8.0	0.7
18-11-2022	6.7	3.0
19-11-2022	7.4	2.4
20-11-2022	4.7	1.0
21-11-2022	14.0	2.5

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
22-11-2022	15.1	2.2
23-11-2022	13.2	1.8
24-11-2022	11.7	2.2
25-11-2022	10.9	2.5
26-11-2022	7.5	1.9
27-11-2022	15.7	3.6
28-11-2022	24.5	3.3
29-11-2022	22.8	4.0
30-11-2022	18.0	3.4
01-12-2022	10.6	1.3
02-12-2022	30.4	7.9
03-12-2022	25.6	8.5
04-12-2022	15.7	6.1
05-12-2022	41.8	5.3
06-12-2022	11.1	3.3
07-12-2022	17.8	4.2
08-12-2022	17.7	2.4
09-12-2022	11.7	3.0
10-12-2022	11.7	8.1
11-12-2022	15.1	3.8
12-12-2022	15.9	2.6
13-12-2022	12.1	3.1
14-12-2022	24.8	3.1
15-12-2022	18.5	1.9
16-12-2022	11.5	2.6
17-12-2022	7.4	2.3
18-12-2022	5.1	1.7
19-12-2022	27.9	5.5
20-12-2022	19.8	5.2
21-12-2022	14.8	4.9
22-12-2022	12.0	4.8
23-12-2022	14.6	7.9
24-12-2022	15.0	5.1
25-12-2022	12.5	4.2
26-12-2022	15.9	7.1
27-12-2022	15.1	6.4
28-12-2022	17.3	4.5
29-12-2022	22.8	5.5

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
30-12-2022	24.2	6.8
31-12-2022	14.8	6.0
01-01-2023	11.5	6.1
02-01-2023	13.0	3.9
03-01-2023	16.5	3.3
04-01-2023	21.5	3.5
05-01-2023	9.3	ND
06-01-2023	9.5	2.5
07-01-2023	11.9	3.4
08-01-2023	10.6	4.7
09-01-2023	20.1	7.8
10-01-2023	29.4	7.5
11-01-2023	25.4	7.5
12-01-2023	42.9	12.3
13-01-2023	31.9	12.0
14-01-2023	24.0	8.1
15-01-2023	29.9	6.7
16-01-2023	41.1	10.1
17-01-2023	19.1	7.0
18-01-2023	18.4	3.4
19-01-2023	18.0	2.8
20-01-2023	22.2	7.1
21-01-2023	21.0	6.4
22-01-2023	18.8	6.0
23-01-2023	22.6	6.9
24-01-2023	12.2	4.4
25-01-2023	12.8	4.6
26-01-2023	12.2	2.8
27-01-2023	16.2	4.5
28-01-2023	15.1	4.9
29-01-2023	18.8	5.6
30-01-2023	16.6	2.4
31-01-2023	16.4	3.8
01-02-2023	13.2	2.0
02-02-2023	16.9	2.4
03-02-2023	7.9	2.8
04-02-2023	21.0	5.1
05-02-2023	19.7	3.6

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
06-02-2023	9.4	2.5
07-02-2023	7.5	0.9
08-02-2023	16.8	5.0
09-02-2023	21.7	7.7
10-02-2023	26.5	9.2
11-02-2023	31.6	10.3
12-02-2023	18.1	5.5
13-02-2023	17.5	3.7
14-02-2023	20.3	4.6
15-02-2023	18.8	5.7
16-02-2023	16.9	6.0
17-02-2023	29.5	7.8
18-02-2023	15.9	4.1
19-02-2023	14.8	4.9
20-02-2023	23.7	6.2
21-02-2023	19.1	4.5
22-02-2023	16.1	3.8
23-02-2023	17.0	7.9
24-02-2023	16.8	4.5
25-02-2023	16.1	3.7
26-02-2023	7.4	1.9
27-02-2023	13.3	1.9
28-02-2023	19.1	3.5
01-03-2023	7.6	1.5
02-03-2023	11.9	2.8
03-03-2023	19.7	4.5
04-03-2023	27.8	6.4
05-03-2023	19.7	4.0
06-03-2023	8.5	4.5
07-03-2023	10.5	3.2
08-03-2023	18.1	4.0
09-03-2023	17.0	3.0
10-03-2023	9.0	ND
11-03-2023	8.7	ND
12-03-2023	7.5	1.5
13-03-2023	12.2	3.3
14-03-2023	14.4	4.8
15-03-2023	31.8	12.8

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
16-03-2023	18.4	4.7
17-03-2023	17.1	5.1
18-03-2023	25.0	5.0
19-03-2023	13.8	3.3
20-03-2023	17.5	4.3
21-03-2023	30.4	6.2
22-03-2023	17.9	6.4
23-03-2023	16.4	7.0
24-03-2023	15.0	4.4
25-03-2023	10.4	2.6
26-03-2023	16.1	5.5
27-03-2023	18.3	5.3
28-03-2023	9.6	4.7
29-03-2023	14.2	1.4
30-03-2023	10.1	2.2
31-03-2023	14.3	3.3
01-04-2023	9.8	1.4
02-04-2023	10.2	2.5
03-04-2023	15.1	5.4
04-04-2023	18.3	8.5
05-04-2023	23.4	12.5
06-04-2023	31.7	21.4
07-04-2023	7.4	6.3
08-04-2023	23.9	5.2
09-04-2023	26.2	4.6
10-04-2023	18.3	3.4
11-04-2023	12.9	6.2
12-04-2023	9.2	5.1
13-04-2023	12.2	4.6
14-04-2023	9.2	4.1
15-04-2023	11.5	5.4
16-04-2023	14.5	4.1
17-04-2023	10.8	3.3
18-04-2023	8.9	4.3
19-04-2023	21.4	4.7
20-04-2023	16.4	5.4
21-04-2023	17.9	9.8
22-04-2023	11.5	7.0

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
23-04-2023	10.5	6.4
24-04-2023	13.2	8.1
25-04-2023	16.0	10.8
26-04-2023	16.0	10.6
27-04-2023	16.0	7.3
28-04-2023	18.4	5.7
29-04-2023	17.7	5.3
30-04-2023	18.6	8.9
01-05-2023	17.7	10.2
02-05-2023	9.1	4.2
03-05-2023	23.1	4.4
04-05-2023	20.6	6.0
05-05-2023	18.7	8.7
06-05-2023	16.4	5.2
07-05-2023	11.2	3.3
08-05-2023	14.1	2.2
09-05-2023	17.2	3.3
10-05-2023	11.2	2.4
11-05-2023	7.4	3.8
12-05-2023	22.4	10.3
13-05-2023	35.7	17.6
14-05-2023	17.6	9.7
15-05-2023	15.0	8.3
16-05-2023	19.4	4.7
17-05-2023	13.7	4.1
18-05-2023	15.8	6.4
19-05-2023	12.4	5.3
20-05-2023	11.7	3.5
21-05-2023	34.9	7.3
22-05-2023	43.3	10.6
23-05-2023	25.1	7.9
24-05-2023	25.8	9.0
25-05-2023	23.3	7.5
26-05-2023	18.3	4.3
27-05-2023	9.3	4.9
28-05-2023	12.5	5.3
29-05-2023	13.2	3.7
30-05-2023	9.3	4.0

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
31-05-2023	8.6	4.9
01-06-2023	25.2	7.1
02-06-2023	28.9	10.1
03-06-2023	20.0	6.4
04-06-2023	15.5	8.0
05-06-2023	8.3	4.0
06-06-2023	8.6	5.3
07-06-2023	6.9	3.0
08-06-2023	6.1	2.0
09-06-2023	12.4	4.7
10-06-2023	16.7	6.2
11-06-2023	15.8	7.7
12-06-2023	8.5	4.1
13-06-2023	7.6	3.9
14-06-2023	12.5	3.2
15-06-2023	14.7	3.4
16-06-2023	8.0	3.0
17-06-2023	6.4	2.3
18-06-2023	4.9	2.1
19-06-2023	13.1	3.4
20-06-2023	16.7	4.7
21-06-2023	11.0	5.1
22-06-2023	12.8	6.7
23-06-2023	6.2	3.9
24-06-2023	5.9	3.5
25-06-2023	6.7	2.5
26-06-2023	19.5	4.2
27-06-2023	12.4	3.2
28-06-2023	17.8	4.8
29-06-2023	9.8	2.3
30-06-2023	11.4	3.6
01-07-2023	16.6	2.9
02-07-2023	20.4	6.6
03-07-2023	10.6	3.8
04-07-2023	11.4	4.1
05-07-2023	7.6	4.0
06-07-2023	4.0	1.1
07-07-2023	6.8	1.8

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
08-07-2023	9.6	2.2
09-07-2023	13.6	1.8
10-07-2023	6.9	2.3
11-07-2023	24.9	5.6
12-07-2023	9.3	2.3
13-07-2023	6.2	1.3
14-07-2023	5.9	1.7
15-07-2023	13.3	3.6
16-07-2023	22.1	8.1
17-07-2023	12.8	4.3
18-07-2023	20.2	4.0
19-07-2023	27.6	6.5
20-07-2023	11.3	3.7
21-07-2023	21.3	6.2
22-07-2023	17.2	9.9
23-07-2023	16.4	3.7
24-07-2023	20.8	7.1
25-07-2023	14.3	4.5
26-07-2023	10.8	5.0
27-07-2023	7.0	2.8
28-07-2023	9.0	3.3
29-07-2023	8.5	2.1
30-07-2023	8.7	1.6
31-07-2023	12.5	3.6
ND No data (<75% data capture)		

Appendix B Laboratory Test Certificates

Montrose Quarry

Air Quality Monitoring Program
July 2022 – July 2023

Boral Resources (Vic) Pty Ltd

SLR Project No.: 640.V30374.00000

16 August 2023

Envirolab Services (WA) Pty Ltd trading as MPL Laboratories
ABN 53 140 099 207
16-18 Hayden Court Myaree WA 6154
ph +61 8 9317 2505 fax +61 8 9317 4163
lab@mpl.com.au
www.mpl.com.au

Certificate of Analysis PDH0999

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Jason Shepherd
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	18/08/2022
Date Samples Registered	18/08/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	25/08/2022
Date of Issue	25/08/2022

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Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Joshua Lim, LIMS Administrator Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PDH0999

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PDH0999-01	12391	Filter	11/08/2022	18/08/2022
PDH0999-02	12390	Filter	12/08/2022	18/08/2022
PDH0999-03	12392	Filter	12/08/2022	18/08/2022
PDH0999-04	12389	Filter	12/08/2022	18/08/2022

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
12391	SLRV83	[NA]	[NA]	[NA]
12390	SLRV82	[NA]	[NA]	[NA]
12392	SLRV84	[NA]	[NA]	[NA]
12389	SLRV81	[NA]	[NA]	[NA]

Certificate of Analysis PDH0999

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PDH0999-01	PDH0999-02	PDH0999-03	PDH0999-04
Your Reference			12391	12390	12392	12389
Date Sampled			11/08/2022	12/08/2022	12/08/2022	12/08/2022
Dust	mg	0.040	0.12	0.13	0.12	<0.040

Certificate of Analysis PDH0999

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PDH0999-01	PDH0999-02	PDH0999-03	PDH0999-04
Your Reference			12391	12390	12392	12389
Date Sampled			11/08/2022	12/08/2022	12/08/2022	12/08/2022
a-Quartz	µg/sample	5.0	<5.0	<5.0	<5.0	<5.0

Certificate of Analysis PDH0999

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 17-31µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100	Gravimetric determination of Inhalable dust as per AS3640.

Certificate of Analysis PDH0999

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from the latest "Australian Drinking Water Guidelines", published by NHMRC & ARMC.

The recommended maximums for analytes are taken from the latest "TLVs and BEIs" as published by the ACGIH.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PDH0999

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	25/08/2022

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Data Quality Assessment Summary PDH0999

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	1	11/08/2022	18/08/2022	18/08/2022	Yes
	2-4	12/08/2022	18/08/2022	18/08/2022	Yes
Quartz by XRD | Filter	1	11/08/2022	18/08/2022	24/08/2022	Yes
	2-4	12/08/2022	18/08/2022	24/08/2022	Yes

Quality Control PDH0999

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BDH1690

Analyte	Units	PQL	Blank	DUP1 PDH0999-01 Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	<5.0 | <5.0 | [NA]	95.0

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16-18 Hayden Court Myaree WA 6154
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www.mpl.com.au

Certificate of Analysis PDI0809

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Mark Skoroszewski
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	14/09/2022
Date Samples Registered	14/09/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	21/09/2022
Date of Issue	21/09/2022

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Authorisation Details

Results Approved By	Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PDI0809

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PDI0809-01	12560	Filter	15/08/2022	14/09/2022
PDI0809-02	12561	Filter	15/08/2022	14/09/2022
PDI0809-03	12562	Filter	15/08/2022	14/09/2022
PDI0809-04	12563	Filter	12/08/2022	14/09/2022

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
12560	SLRV101	[NA]	[NA]	[NA]
12561	SLRV102	[NA]	[NA]	[NA]
12562	SLRV103	[NA]	[NA]	[NA]
12563	SLRV104	[NA]	[NA]	[NA]

Certificate of Analysis PDI0809

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PDI0809-01	PDI0809-02	PDI0809-03	PDI0809-04
Your Reference			12560	12561	12562	12563
Date Sampled			15/08/2022	15/08/2022	15/08/2022	12/08/2022
Dust	mg	0.040	0.090	0.12	0.090	<0.040

Certificate of Analysis PDI0809

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PDI0809-01	PDI0809-02	PDI0809-03	PDI0809-04
Your Reference			12560	12561	12562	12563
Date Sampled			15/08/2022	15/08/2022	15/08/2022	12/08/2022
a-Quartz	µg/sample	5.0	<5.0	25	<5.0	<5.0

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 17-31µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100	Gravimetric determination of Inhalable dust as per AS3640.

Certificate of Analysis PDI0809

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from the latest "Australian Drinking Water Guidelines", published by NHMRC & ARMC.

Urine Analysis - recommended maximums are taken from the BEI's as published by ACGIH (where available).

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PDI0809

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	21/09/2022

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PDI0809

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	4	12/08/2022	16/09/2022	16/09/2022	Yes
	1-3	15/08/2022	16/09/2022	16/09/2022	Yes
Quartz by XRD | Filter	4	12/08/2022	16/09/2022	21/09/2022	Yes
	1-3	15/08/2022	16/09/2022	21/09/2022	Yes

Quality Control PDI0809

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BDI1929

Analyte	Units	PQL	Blank	DUP1 PDI0809-01 Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	<5.0 | <5.0 | [NA]	80.0

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lab@mpl.com.au
www.mpl.com.au

Certificate of Analysis PDJ0698

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Jason Shepherd
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	13/10/2022
Date Samples Registered	13/10/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	20/10/2022
Date of Issue	20/10/2022

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Authorisation Details

Results Approved By	Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PDJ0698

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PDJ0698-01	12645	Filter	07/09/2022	13/10/2022
PDJ0698-02	12646	Filter	09/09/2022	13/10/2022
PDJ0698-03	12647	Filter	09/09/2022	13/10/2022
PDJ0698-04	12648	Filter	06/09/2022	13/10/2022

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
12645	SLRV85	[NA]	[NA]	[NA]
12646	SLRV86	[NA]	[NA]	[NA]
12647	SLRV87	[NA]	[NA]	[NA]
12648	SLRV88	[NA]	[NA]	[NA]

Certificate of Analysis PDJ0698

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PDJ0698-01	PDJ0698-02	PDJ0698-03	PDJ0698-04
Your Reference			12645	12646	12647	12648
Date Sampled			07/09/2022	09/09/2022	09/09/2022	06/09/2022
Dust	mg	0.040	0.13	0.20	0.17	<0.040

Certificate of Analysis PDJ0698

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PDJ0698-01	PDJ0698-02	PDJ0698-03	PDJ0698-04
Your Reference			12645	12646	12647	12648
Date Sampled			07/09/2022	09/09/2022	09/09/2022	06/09/2022
a-Quartz	µg/sample	5.0	<5.0	7.7	<5.0	<5.0

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 17-31µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100	Gravimetric determination of Inhalable dust as per AS3640.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - recommended maximums are taken from the BEI’s as published by ACGIH (where available).

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PDJ0698

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	20/10/2022

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PDJ0698

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	4	06/09/2022	17/10/2022	17/10/2022	Yes
	1	07/09/2022	17/10/2022	17/10/2022	Yes
	2-3	09/09/2022	17/10/2022	17/10/2022	Yes
Quartz by XRD | Filter	4	06/09/2022	18/10/2022	20/10/2022	Yes
	1	07/09/2022	18/10/2022	20/10/2022	Yes
	2-3	09/09/2022	18/10/2022	20/10/2022	Yes

Quality Control PDJ0698

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BDJ1736

Analyte	Units	PQL	Blank	DUP1 BDJ1736-DUP1# Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	<5.0 | <5.0 | [NA]	90.2

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

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Certificate of Analysis PDK1011

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	R Abrantes
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	17/11/2022
Date Samples Registered	17/11/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	24/11/2022
Date of Issue	24/11/2022

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Thomas Edwards, OHL Supervisor Todd Lee, Group Operations Manager
Laboratory Manager	Michael Kubiak

Certificate of Analysis PDK1011

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PDK1011-01	12720	Filter	11/10/2022	17/11/2022
PDK1011-02	12721	Filter	11/10/2022	17/11/2022
PDK1011-03	12722	Filter	11/10/2022	17/11/2022
PDK1011-04	12719	Filter	11/10/2022	17/11/2022

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
12720	SLRV107	[NA]	[NA]	[NA]
12721	SLRV105	[NA]	[NA]	[NA]
12722	SLRV106	[NA]	[NA]	[NA]
12719	SLRV108	[NA]	[NA]	[NA]

Certificate of Analysis PDK1011

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PDK1011-01	PDK1011-02	PDK1011-03	PDK1011-04
Your Reference			12720	12721	12722	12719
Date Sampled			11/10/2022	11/10/2022	11/10/2022	11/10/2022
Dust	mg	0.040	0.15	0.15	0.13	<0.040

Certificate of Analysis PDK1011

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PDK1011-01	PDK1011-02	PDK1011-03	PDK1011-04
Your Reference			12720	12721	12722	12719
Date Sampled			11/10/2022	11/10/2022	11/10/2022	11/10/2022
a-Quartz	µg/sample	5.0	6.1	<5.0	<5.0	<5.0

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 18-32µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100_RESP	Gravimetric determination of Respirable dust as pre AS2985.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PDK1011

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	24/11/2022

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PDK1011

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	1-4	11/10/2022	21/11/2022	21/11/2022	Yes
Quartz by XRD | Filter	1-4	11/10/2022	21/11/2022	24/11/2022	Yes

Quality Control PDK1011

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BDK2335

Analyte	Units	PQL	Blank	DUP1 PDK1011-01 Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	6.10 | 6.00 | 1.65	112

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Certificate of Analysis PDL0750

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Jason Shepherd
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	13/12/2022
Date Samples Registered	13/12/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	20/12/2022
Date of Issue	19/12/2022

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Joshua Lim, LIMS Administrator Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PDL0750

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PDL0750-01	12699	Filter	07/12/2022	13/12/2022
PDL0750-02	12700	Filter	07/12/2022	13/12/2022
PDL0750-03	12701	Filter	07/12/2022	13/12/2022
PDL0750-04	12698	Filter	07/12/2022	13/12/2022

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
12699	SLRV91	[NA]	[NA]	[NA]
12700	SLRV92	[NA]	[NA]	[NA]
12701	SLRV93	[NA]	[NA]	[NA]
12698	SLRV90	[NA]	[NA]	[NA]

Certificate of Analysis PDL0750

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PDL0750-01	PDL0750-02	PDL0750-03	PDL0750-04
Your Reference			12699	12700	12701	12698
Date Sampled			07/12/2022	07/12/2022	07/12/2022	07/12/2022
Dust	mg	0.040	0.13	0.070	0.12	<0.040

Certificate of Analysis PDL0750

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PDL0750-01	PDL0750-02	PDL0750-03	PDL0750-04
Your Reference			12699	12700	12701	12698
Date Sampled			07/12/2022	07/12/2022	07/12/2022	07/12/2022
a-Quartz	µg/sample	5.0	11	7.0	7.5	<5.0

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 18-32µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100_RESP	Gravimetric determination of Respirable dust as pre AS2985.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PDL0750

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	19/12/2022

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PDL0750

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	1-4	07/12/2022	15/12/2022	15/12/2022	Yes
Quartz by XRD | Filter	1-4	07/12/2022	15/12/2022	16/12/2022	Yes

Quality Control PDL0750

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BDL1651

Analyte	Units	PQL	Blank	DUP1 PDL0750-01 Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	10.8 | 9.70 | 10.7	93.4

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lab@mpl.com.au
www.mpl.com.au

Certificate of Analysis PEA1051

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Jason Shepherd
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	25/01/2023
Date Samples Registered	25/01/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	02/02/2023
Date of Issue	01/02/2023

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEA1051

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PEA1051-01	SLRV127	Filter	05/01/2023	25/01/2023
PEA1051-02	SLRV109	Filter	05/01/2023	25/01/2023
PEA1051-03	SLRV110	Filter	09/01/2023	25/01/2023
PEA1051-04	SLRV128	Filter	09/01/2023	25/01/2023

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
SLRV127	SLRV127	[NA]	[NA]	[NA]
SLRV109	SLRV109	[NA]	[NA]	[NA]
SLRV110	SLRV110	[NA]	[NA]	[NA]
SLRV128	SLRV128	[NA]	[NA]	[NA]

Certificate of Analysis PEA1051

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PEA1051-01	PEA1051-02	PEA1051-03	PEA1051-04
Your Reference			SLRV127	SLRV109	SLRV110	SLRV128
Date Sampled			05/01/2023	05/01/2023	09/01/2023	09/01/2023
Dust	mg	0.040	0.19	0.10	0.29	<0.040

Certificate of Analysis PEA1051

Respirable Crystalline Silica (Filter)

Envirolab ID	Units	PQL	PEA1051-01	PEA1051-02	PEA1051-03	PEA1051-04
Your Reference			SLRV127	SLRV109	SLRV110	SLRV128
Date Sampled			05/01/2023	05/01/2023	09/01/2023	09/01/2023
a-Quartz	µg/sample	5.0	<5.0	<5.0	<5.0	<5.0

Method Summary

Method ID	Methodology Summary
DUST-004_QTZ	Respirable Quartz (and/or Cristobalite) is determined after ashing, redeposition and FTIR determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 40% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 15-35µg / filter (30 – 70 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100_RESP	Gravimetric determination of Respirable dust as pre AS2985.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
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Quality Control Definitions

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Surrogate Spike

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A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

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This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PEA1051

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	01/02/2023

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEA1051

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	1-2	05/01/2023	31/01/2023	31/01/2023	Yes
	3-4	09/01/2023	31/01/2023	31/01/2023	Yes
Quartz | Filter	1-2	05/01/2023	31/01/2023	01/02/2023	Yes
	3-4	09/01/2023	31/01/2023	01/02/2023	Yes

Quality Control PEA1051

DUST-004_QTZ|Respirable Crystalline Silica (Filter) | Batch BEA2347

Analyte	Units	PQL	Blank	DUP1 PEA1051-01 Samp | QC | RPD %	DUP2 BEA2347-DUP2# Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	86.3

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

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Certificate of Analysis PEB0671

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Jason Shepherd
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	10/02/2023
Date Samples Registered	10/02/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	17/02/2023
Date of Issue	16/02/2023

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEB0671

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PEB0671-01	12902	Filter	08/02/2023	10/02/2023
PEB0671-02	12903	Filter	08/02/2023	10/02/2023
PEB0671-03	12904	Filter	08/02/2023	10/02/2023
PEB0671-04	12901	Filter	08/02/2023	10/02/2023

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
12902	SL90	[NA]	[NA]	[NA]
12903	SL91	[NA]	[NA]	[NA]
12904	SL92	[NA]	[NA]	[NA]
12901	SLRV125	[NA]	[NA]	[NA]

Certificate of Analysis PEB0671

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PEB0671-01	PEB0671-02	PEB0671-03	PEB0671-04
Your Reference			12902	12903	12904	12901
Date Sampled			08/02/2023	08/02/2023	08/02/2023	08/02/2023
Dust	mg	0.040	0.23	0.34	0.32	<0.040

Certificate of Analysis PEB0671

Respirable Crystalline Silica (Filter)

Envirolab ID	Units	PQL	PEB0671-01	PEB0671-02	PEB0671-03	PEB0671-04
Your Reference			12902	12903	12904	12901
Date Sampled			08/02/2023	08/02/2023	08/02/2023	08/02/2023
a-Quartz	µg/sample	5.0	<5.0	<5.0	<5.0	<5.0

Method Summary

Method ID	Methodology Summary
DUST-004_QTZ	Respirable Quartz (and/or Cristobalite) is determined after ashing, redeposition and FTIR determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 40% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 15-35µg / filter (30 – 70 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100_RESP	Gravimetric determination of Respirable dust as pre AS2985.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PEB0671

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	16/02/2023

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEB0671

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	1-4	08/02/2023	15/02/2023	15/02/2023	Yes
Quartz | Filter	1-4	08/02/2023	15/02/2023	16/02/2023	Yes

Quality Control PEB0671

DUST-004_QTZ|Respirable Crystalline Silica (Filter) | Batch BEB1642

Analyte	Units	PQL	Blank	DUP1 BEB1642-DUP1# Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	<5.0 | <5.0 | [NA]	99.2

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

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Certificate of Analysis PEC1157

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Jason Shepherd
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	16/03/2023
Date Samples Registered	16/03/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	23/03/2023
Date of Issue	23/03/2023

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEC1157

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PEC1157-01	13178	Filter	07/03/2023	16/03/2023
PEC1157-02	13179	Filter	08/03/2023	16/03/2023
PEC1157-03	13180	Filter	09/03/2023	16/03/2023
PEC1157-04	13181	Filter	07/03/2023	16/03/2023

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
13178	SLRV129	[NA]	[NA]	[NA]
13179	SL89	[NA]	[NA]	[NA]
13180	SLRV130	[NA]	[NA]	[NA]
13181	SLRV131	[NA]	[NA]	[NA]

Certificate of Analysis PEC1157

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PEC1157-01	PEC1157-02	PEC1157-03	PEC1157-04
Your Reference			13178	13179	13180	13181
Date Sampled			07/03/2023	08/03/2023	09/03/2023	07/03/2023
Dust	mg	0.040	0.16	0.32	0.19	<0.040

Certificate of Analysis PEC1157

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PEC1157-01	PEC1157-02	PEC1157-03	PEC1157-04
Your Reference			13178	13179	13180	13181
Date Sampled			07/03/2023	08/03/2023	09/03/2023	07/03/2023
a-Quartz	µg/sample	5.0	7.0	6.4	9.4	<5.0

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 18-32µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100_RESP	Gravimetric determination of Respirable dust as pre AS2985.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

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Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PEC1157

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	23/03/2023

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEC1157

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	1, 4	07/03/2023	18/03/2023	18/03/2023	Yes
	2	08/03/2023	18/03/2023	18/03/2023	Yes
	3	09/03/2023	18/03/2023	18/03/2023	Yes
Quartz by XRD | Filter	1, 4	07/03/2023	20/03/2023	23/03/2023	Yes
	2	08/03/2023	20/03/2023	23/03/2023	Yes
	3	09/03/2023	20/03/2023	23/03/2023	Yes

Quality Control PEC1157

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BEC2086

Analyte	Units	PQL	Blank	DUP1 PEC1157-01 Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	7.00 | 8.00 | 13.3	106

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Certificate of Analysis PED0587

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Jason Shepherd
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	12/04/2023
Date Samples Registered	12/04/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	19/04/2023
Date of Issue	19/04/2023

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Michael Kubiak, Lab Manager
Laboratory Manager	Michael Kubiak

Certificate of Analysis PED0587

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PED0587-01	13143	Filter	10/04/2023	12/04/2023
PED0587-02	13144	Filter	10/04/2023	12/04/2023
PED0587-03	13145	Filter	10/04/2023	12/04/2023
PED0587-04	13142	Filter	10/04/2023	12/04/2023

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
13143	SLRV94	[NA]	[NA]	[NA]
13144	SLRV95	[NA]	[NA]	[NA]
13145	SLRV96	[NA]	[NA]	[NA]
13142	SLRV97	[NA]	[NA]	[NA]

Certificate of Analysis PED0587

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PED0587-02	PED0587-03	PED0587-04
Your Reference			13144	13145	13142
Date Sampled			10/04/2023	10/04/2023	10/04/2023
Dust	mg	0.040	0.31	0.32	<0.040

Certificate of Analysis PED0587

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PED0587-01	PED0587-02	PED0587-03	PED0587-04
Your Reference			13143	13144	13145	13142
Date Sampled			10/04/2023	10/04/2023	10/04/2023	10/04/2023
a-Quartz	µg/sample	5.0	8.9	5.4	8.1	<5.0

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 18-32µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100_RESP	Gravimetric determination of Respirable dust as pre AS2985.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
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PQL	Practical Quantitation Limit
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DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
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##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

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Surrogate Spike

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Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PED0587

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	19/04/2023

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PED0587

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	2-4	10/04/2023	14/04/2023	14/04/2023	Yes
Quartz by XRD | Filter	1-4	10/04/2023	15/04/2023	19/04/2023	Yes

Quality Control PED0587

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BED1259

Analyte	Units	PQL	Blank	DUP1 BED1259-DUP1# Samp | QC | RPD %	DUP2 BED1259-DUP2# Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	<5.0 | <5.0 | [NA]	7.00 | 7.10 | 1.42	98.7

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

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www.mpl.com.au

Certificate of Analysis PEE0704

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Jason Shepherd
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	4 Filter
Date Samples Received	10/05/2023
Date Samples Registered	10/05/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	17/05/2023
Date of Issue	17/05/2023

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEE0704

Samples in this Report

Envirolab ID	Sample ID	Description	Matrix	Date Sampled	Date Received
PEE0704-01	13377	1	Filter	12/04/2023	10/05/2023
PEE0704-02	13378	2	Filter	12/04/2023	10/05/2023
PEE0704-03	13379	3	Filter	12/04/2023	10/05/2023
PEE0704-04	13380	4	Filter	12/04/2023	10/05/2023

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
13377	SLRQ4	[NA]	[NA]	[NA]
13378	SLRQ8	[NA]	[NA]	[NA]
13379	SLRQ10	[NA]	[NA]	[NA]
13380	SLRQ15	[NA]	[NA]	[NA]

Certificate of Analysis PEE0704

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PEE0704-01	PEE0704-02	PEE0704-03	PEE0704-04
Your Reference			13377 1	13378 2	13379 3	13380 4
Date Sampled			12/04/2023	12/04/2023	12/04/2023	12/04/2023
Dust	mg	0.040	0.24	0.23	0.25	<0.040

Certificate of Analysis PEE0704

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PEE0704-01	PEE0704-02	PEE0704-03	PEE0704-04
Your Reference			13377 1	13378 2	13379 3	13380 4
Date Sampled			12/04/2023	12/04/2023	12/04/2023	12/04/2023
a-Quartz	µg/sample	5.0	5.4	<5.0	5.3	<5.0

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 18-32µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100_RESP	Gravimetric determination of Respirable dust as pre AS2985.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PEE0704

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	17/05/2023

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEE0704

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	1-4	12/04/2023	13/05/2023	13/05/2023	Yes
Quartz by XRD | Filter	1-4	12/04/2023	15/05/2023	17/05/2023	Yes

Quality Control PEE0704

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BEE1693

Analyte	Units	PQL	Blank	DUP1 BEE1693-DUP1# Samp | QC | RPD %	DUP2 BEE1693-DUP2# Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	107

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

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www.mpl.com.au

Certificate of Analysis PEF0650

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	Jason Shepherd
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	7 Filter
Date Samples Received	12/06/2023
Date Samples Registered	12/06/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	19/06/2023
Date of Issue	19/06/2023

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Airborne Dust Approved By	Thomas Edwards
Results Approved By	Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEF0650

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PEF0650-01	13365	Filter	10/05/2023	12/06/2023
PEF0650-02	13366	Filter	10/05/2023	12/06/2023
PEF0650-03	13367	Filter	10/05/2023	12/06/2023
PEF0650-04	13368	Filter	04/05/2023	12/06/2023
PEF0650-05	13461	Filter	09/05/2023	12/06/2023
PEF0650-06	13462	Filter	09/05/2023	12/06/2023
PEF0650-07	13463	Filter	12/06/2023	12/06/2023

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
13365	SL76	[NA]	[NA]	[NA]
13366	SL77	[NA]	[NA]	[NA]
13367	SL78	[NA]	[NA]	[NA]
13368	SL79	[NA]	[NA]	[NA]
13461	SL80	[NA]	[NA]	[NA]
13462	RSLQ166	[NA]	[NA]	[NA]
13463	RSLQ176	[NA]	[NA]	[NA]

Certificate of Analysis PEF0650

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PEF0650-01	PEF0650-02	PEF0650-03	PEF0650-04	PEF0650-05
Your Reference			13365	13366	13367	13368	13461
Date Sampled			10/05/2023	10/05/2023	10/05/2023	04/05/2023	09/05/2023
Dust	mg	0.040	0.31	0.38	0.48	0.040	0.90

Envirolab ID	Units	PQL	PEF0650-06	PEF0650-07
Your Reference			13462	13463
Date Sampled			09/05/2023	12/06/2023
Dust	mg	0.040	0.25	<0.040

Certificate of Analysis PEF0650

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PEF0650-01	PEF0650-02	PEF0650-03	PEF0650-04	PEF0650-05
Your Reference			13365	13366	13367	13368	13461
Date Sampled			10/05/2023	10/05/2023	10/05/2023	04/05/2023	09/05/2023
a-Quartz	µg/sample	5.0	<5.0	5.5	7.6	<5.0	16

Envirolab ID	Units	PQL	PEF0650-06	PEF0650-07
Your Reference			13462	13463
Date Sampled			09/05/2023	12/06/2023
a-Quartz	µg/sample	5.0	<5.0	<5.0

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 18-32µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100_RESP	Gravimetric determination of Respirable dust as pre AS2985. NSW Resources Regulator have licenced (MLA0017505) Envirolab/MPL for the Analysis of Inhalable & Respirable Dust and Respirable Crystaline Silica.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
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Quality Control Definitions

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Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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Miscellaneous Information

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Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PEF0650

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	19/06/2023

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEF0650

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	4	04/05/2023	14/06/2023	14/06/2023	Yes
	5-6	09/05/2023	14/06/2023	14/06/2023	Yes
	1-3	10/05/2023	14/06/2023	14/06/2023	Yes
	7	12/06/2023	14/06/2023	14/06/2023	Yes
Quartz by XRD | Filter	4	04/05/2023	14/06/2023	19/06/2023	Yes
	5-6	09/05/2023	14/06/2023	19/06/2023	Yes
	1-3	10/05/2023	14/06/2023	19/06/2023	Yes
	7	12/06/2023	14/06/2023	19/06/2023	Yes

Quality Control PEF0650

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BEF1593

Analyte	Units	PQL	Blank	DUP1 BEF1593-DUP1# Samp | QC | RPD %	DUP2 BEF1593-DUP2# Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	101

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

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lab@mpl.com.au
www.mpl.com.au

Certificate of Analysis PEG0485

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Contact	aqlabresults
Address	Level 11, 176 Wellington Parade, EAST MELBOURNE, VIC, 3002

Sample Details

Your Reference	640.30374
Number of Samples	7 Filter
Date Samples Received	10/07/2023
Date Samples Registered	10/07/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	24/07/2023
Date of Issue	21/07/2023

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Airborne Dust Approved By	Thomas Edwards
Results Approved By	Thomas Edwards, OHL Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEG0485

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PEG0485-01	13561	Filter	10/05/2023	10/07/2023
PEG0485-02	13559	Filter	09/06/2023	10/07/2023
PEG0485-03	13560	Filter	10/05/2023	10/07/2023
PEG0485-04	13562	Filter	08/06/2023	10/07/2023
PEG0485-05	13558	Filter	09/06/2023	10/07/2023
PEG0485-06	13563	Filter	09/06/2023	10/07/2023
PEG0485-07	13564	Filter	09/06/2023	10/07/2023

Sample Information

Sample ID	Filter ID	Flow Rate (L/min)	Time Sampled (min)	Air Volume (m3)
13561	SLRQ19	[NA]	[NA]	[NA]
13559	SLRQ16	[NA]	[NA]	[NA]
13560	SLRQ18	[NA]	[NA]	[NA]
13562	SLRV75	[NA]	[NA]	[NA]
13558	SLRQ17	[NA]	[NA]	[NA]
13563	RSLQ213	[NA]	[NA]	[NA]
13564	RSLQ186	[NA]	[NA]	[NA]

Certificate of Analysis PEG0485

Respirable Dust (Filter)

Envirolab ID	Units	PQL	PEG0485-01	PEG0485-02	PEG0485-03	PEG0485-04	PEG0485-05
Your Reference			13561	13559	13560	13562	13558
Date Sampled			10/05/2023	09/06/2023	10/05/2023	08/06/2023	09/06/2023
Dust	mg	0.040	0.17	0.29	0.23	<0.040	0.49

Envirolab ID	Units	PQL	PEG0485-06	PEG0485-07
Your Reference			13563	13564
Date Sampled			09/06/2023	09/06/2023
Dust	mg	0.040	0.14	<0.040

Certificate of Analysis PEG0485

Quartz/Cristobalite by XRD (Filter)

Envirolab ID	Units	PQL	PEG0485-01	PEG0485-02	PEG0485-03	PEG0485-04	PEG0485-05
Your Reference			13561	13559	13560	13562	13558
Date Sampled			10/05/2023	09/06/2023	10/05/2023	08/06/2023	09/06/2023
a-Quartz	µg/sample	5.0	5.5	5.8	<5.0	<5.0	17

Envirolab ID	Units	PQL	PEG0485-06	PEG0485-07
Your Reference			13563	13564
Date Sampled			09/06/2023	09/06/2023
a-Quartz	µg/sample	5.0	<5.0	<5.0

Method Summary

Method ID	Methodology Summary
DUST-005	Respirable Quartz (and/or Cristabolite) determined direct on filter (unless otherwise indicated) by XRD determination. The Quartz exposure standard is 50µg/m3, therefore where sampling follows MDHS 101 guidelines and at least 500L of air is sampled, this is equivalent to a dust weight of 25µg/filter. The estimated measurement uncertainty for the laboratory analysis of Quartz is 30% at 25µg at 95% confidence limit (i.e. statistically the true value lies between 18-32µg / filter (35 – 65 µg/m3) at 95% confidence). The estimated measurement uncertainty was determined during method validation.
INORG-100_RESP	Gravimetric determination of Respirable dust as pre AS2985. NSW Resources Regulator have licenced (MLA0017505) Envirolab/MPL for the Analysis of Inhalable & Respirable Dust and Respirable Crystaline Silica.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PEG0485

Client Details

Client	SLR Consulting Australia Pty Ltd (VIC)
Your Reference	640.30374
Date Issued	21/07/2023

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEG0485

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
Gravimetric Dust | Filter	4	08/06/2023	20/07/2023	20/07/2023	Yes
	2, 5-7	09/06/2023	20/07/2023	20/07/2023	Yes
	1, 3	10/05/2023	20/07/2023	20/07/2023	Yes
Quartz by XRD | Filter	4	08/06/2023	20/07/2023	21/07/2023	Yes
	2, 5-7	09/06/2023	20/07/2023	21/07/2023	Yes
	1, 3	10/05/2023	20/07/2023	21/07/2023	Yes

Quality Control PEG0485

DUST-005|Quartz/Cristobalite by XRD (Filter) | Batch BEG2139

Analyte	Units	PQL	Blank	DUP1 PEG0485-06 Samp | QC | RPD %	LCS %
a-Quartz	µg/sample	5.0	<5.0	<5.0 | <5.0 | [NA]	91.8

Appendix C PM_{10} and $PM_{2.5}$ Data Exceptions

Montrose Quarry

Air Quality Monitoring Program
July 2022 – July 2023

Boral Resources (Vic) Pty Ltd

SLR Project No.: 640.V30374.00000

16 August 2023

Table C 1 Monitoring Period Data Exceptions Summary

Data Exception Period		Description
Beginning	End	
07-09-2022 16:00	09-09-2022 11:00	Installation of replacement EBAM Plus to investigate sensor issue data flag
10-03-2023 16:00	11-03-2023 13:00	BAM 1022 $PM_{2.5}$ operation interruption – cause unknown – EBAM Plus PM_{10} instrument continued to operate during this period.
05-01-2023 00:00	05-01-2023 16:00	BAM 1022 $PM_{2.5}$ tape break

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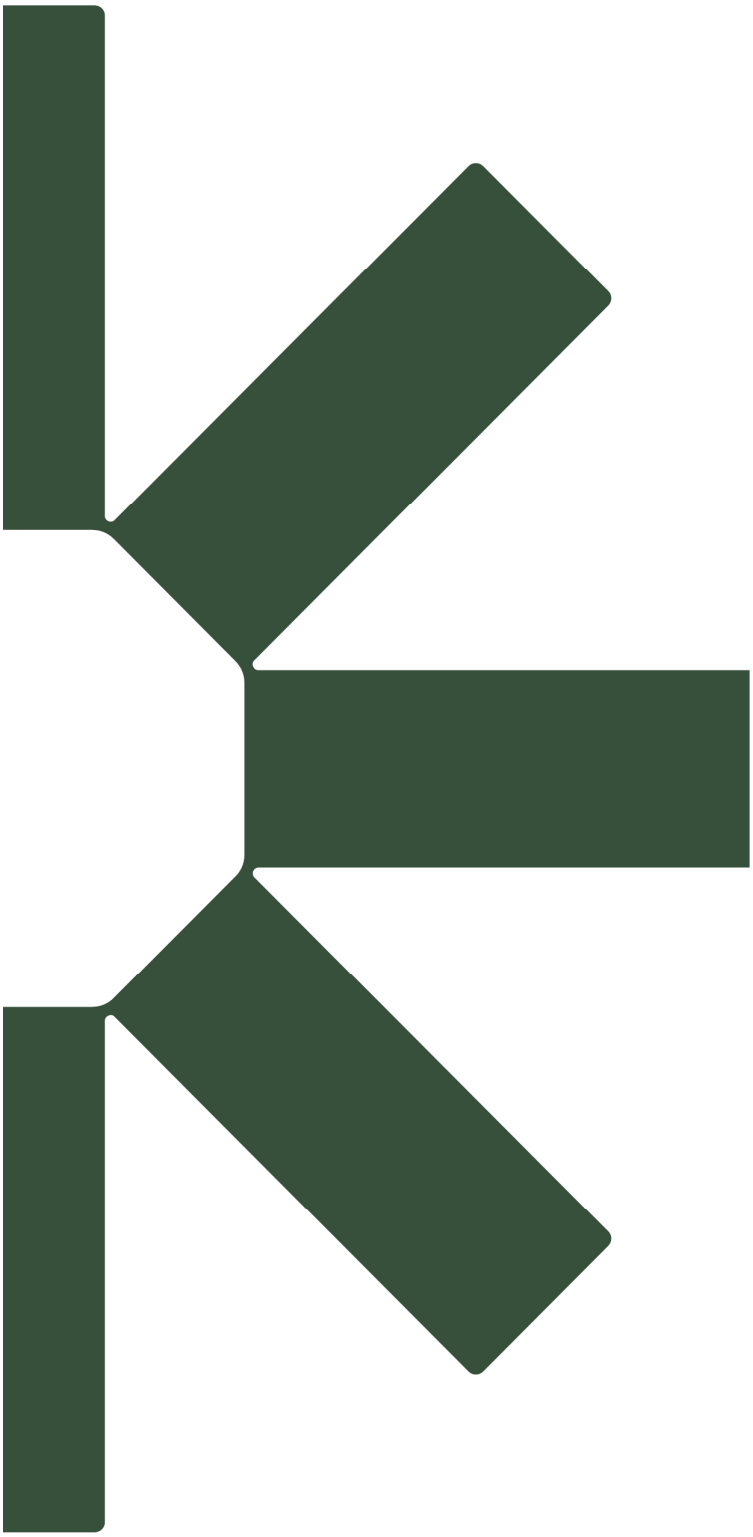


Making Sustainability Happen

Appendix B Risk Register

Montrose Quarry Extension

Air Quality Impact Assessment

Boral Resources (VIC) Pty Ltd

SLR Project No.: 640.V30655.00000

16 February 2024

Table B 1 Risk Register

Risk	Risk Event (Description)	Receptors	Project Phase			Inherent Risk			Measure ID	Mitigation Measure	Residual Risk		
			Construction	Operation	Rehabilitation	Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
R-01	Particulate emissions to air associated with excavation and agitation of ground surface material by e.g., excavators and loading trucks impacting sensitive receptors.	Public health and safety Public amenity	Yes	No	Yes	Likely	Moderate	High	01	All staff to receive a site induction including details of the various ways dust can be generated, methods to minimise dust generation, requirement for speed restrictions across the site and on public unsealed roads particularly for road truck (below the posted speed limit) and their responsibility to minimise and report observed dust generation.	Unlikely	Minor	Low
									03	Utilise dust suppression controls, including water treatment of unsealed roads and stabilising materials (e.g., crushed rock, hydro mulch or chemical dust suppressants) on exposed areas, where practicable.			
									04	Attentive monitoring and application of water as surface dries out to avoid excessive emissions due to wind erosion or mechanical disturbance.			
									05	Minimise height from which material is dropped into trucks to reduce dust emission.			
									06	Enclose dust generating equipment or install dust suppression devices such as sprays and sprinklers to minimise dust emissions so far as reasonably practicable.			

Risk	Risk Event (Description)	Receptors	Project Phase			Inherent Risk			Measure ID	Mitigation Measure	Residual Risk		
			Construction	Operation	Rehabilitation	Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
R-02	Particulate emissions to air from vehicular traffic on unsealed roads generates dust emissions (*wheel generated dust*) as function of traffic intensity (VKT), vehicle weight, number of wheels, vehicle speed, and silt and moisture content of the road surface impacting sensitive receptors.	Public health and safety Public amenity	Yes	Yes	Yes	Almost certain	Moderate	Very high	01	All staff to receive a site induction including details of the various ways dust can be generated, methods to minimise dust generation, requirement for speed restrictions across the site and on public unsealed roads particularly for road truck (below the posted speed limit) and their responsibility to minimise and report observed dust generation.	Unlikely	Minor	Low
									02	Prepare and maintain level and well finished haul road surfaces with low-silt content material to minimising dust emission so far as reasonably practicable from rolling wheeled vehicles.			
									03	Utilise dust suppression controls, including water treatment of unsealed roads and stabilising materials (e.g., crushed rock, hydro mulch or chemical dust suppressants) on exposed areas, where practicable.			
R-03	Particulate emissions to air associated with agitation of material from trucks dumping impacting sensitive receptors.	Public health and safety Public amenity	Yes	Yes	Yes	Likely	Moderate	High	05	Minimise height from which material is dropped into trucks to reduce dust emission.	Unlikely	Minor	Low
									06	Enclose dust generating equipment or install dust suppression devices such as sprays and sprinklers to minimise dust emissions so far as reasonably practicable.			
R-04	Particulate emissions to air from loose mined material including topsoil, overburden, clay and ore from exposed surface and stockpiles subject to wind erosion impacting sensitive receptors.	Public health and safety Public amenity	Yes	Yes	Yes	Likely	Moderate	High	08	Stabilise landforms by establishing vegetation through progressive rehabilitation and maintenance programs. to mitigate wind erosion so far as reasonably practicable.	Unlikely	Minor	Low
									09	Compaction of stockpile batters will reduce the amount of loose material that can be eroded by wind.			

Risk	Risk Event (Description)	Receptors	Project Phase			Inherent Risk			Measure ID	Mitigation Measure	Residual Risk		
			Construction	Operation	Rehabilitation	Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
R-05	Particulate emissions to air from the agitation of mined material during transfer, sorting, crushing etc impacting sensitive receptors.	Public health and safety Public amenity	No	Yes	No	Likely	Moderate	High	06	Enclose and utilise water sprays to supress particulate emissions	Unlikely	Minor	Low
R-06	Vehicle and plant emissions to air associated with the combustion of diesel fuel including $PM_{2.5}$, NO_x, SO_2, CO and VOCs will be emitted from all diesel site vehicles and plant including trucks and excavators impacting sensitive receptors.	Public health and safety Public amenity	Yes	Yes	Yes	Unlikely	Minor	Low	10	All equipment/vehicles to be operated and maintained to manufacturer's specifications in order to minimise exhaust emissions.	Rare	Minor	Low

Appendix C Meterorological Modelling

Montrose Quarry Extension

Air Quality Impact Assessment

Boral Resources (VIC) Pty Ltd

SLR Project No.: 640.V30655.00000

16 February 2024

C.1 WRF

The Weather Research and Forecast (WRF) model is a mesoscale numerical weather prediction system designed for both atmospheric research and operational forecasting needs. The model serves a wide range of meteorological applications across scales from tens of meters to thousands of kilometres.

For this assessment, the WRF modelling system was used to produce the meteorological field from which the AERMET input files could be extracted at the Project location. Parameters used in the WRF model for this assessment are presented **Table C1.** Data was also extracted at the location of the nearest BoM AWS at Scoresby to enable model validation to be undertaken (below).

Table C1 Meteorological Parameters – WRF

Parameter	Domain 1	Domain 2	Domain 3	Domain 4 (Project)
Modelling domain (km)	873 x 873	279 x 279	93 x 93	31 x 31
Grid resolution (km)	27	9	3	1
Number of metgrid levels	31	31	31	31
Parent Domain	-	1	2	3
Microphysics	WSM6	WSM6	WSM6	WSM6
Cumulus parametrization	Kain-Fritsch	Kain-Fritsch	Kain-Fritsch	Kain-Fritsch
Shortwave radiation physics	Dudhia	Dudhia	Dudhia	Dudhia
Longwave radiation physics	RRTM	RRTM	RRTM	RRTM
Planetary boundary layer	YSU	YSU	YSU	YSU

C.1.1 Model Data Validation

To provide confidence in the site representative meteorological dataset generated using WRF, meteorological data representative of Scoresby was generated then compared with the observational data recorded at Scoresby AWS for validation purposes.

Modelled and observed wind data at Scoresby AWS site are presented as annual and seasonal wind roses in **Figure C1** and **Figure C2**, respectively. The predicted wind data are in reasonably good agreement with the observational data. Both model predictions and observational data indicate a southeasterly bias on an annual basis, with the following observed for both datasets by season:

- Summer winds are similar to the annual distribution with increased bias to the from the southeastern quadrants.
- The distribution of winds in autumn and spring is similar to the annual distribution.
- Winter winds are similar to the annual distribution, but with lower windspeeds.

The comparison of the WRF meteorological modelling and observational data at the BoM station location suggests that the modelling output at the Project site may also likely be generally representative of local conditions.

Figure C1 Modelled Wind Data – Scoresby 2018-2022

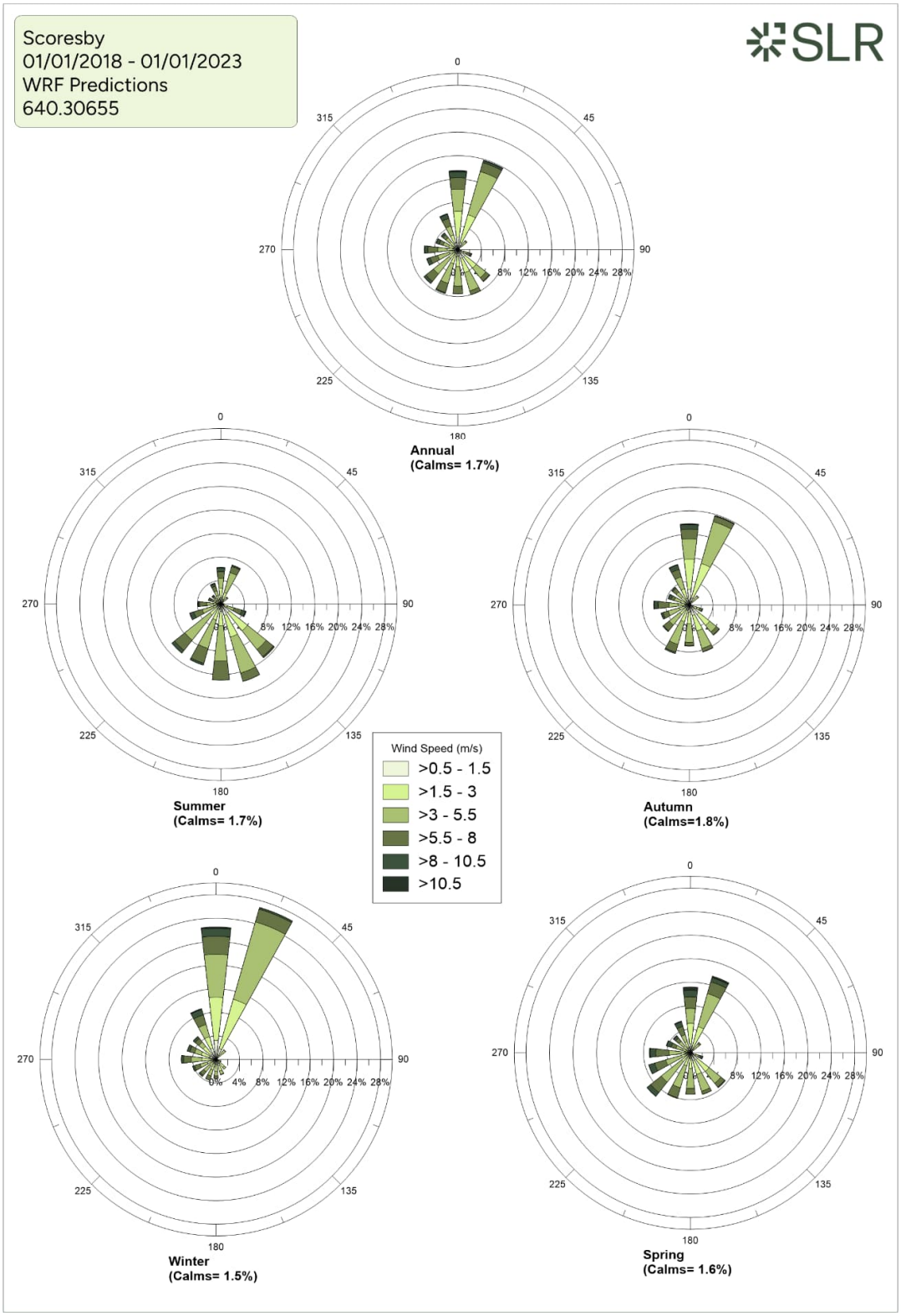


Figure C2 Observed Wind Data – Scoresby 2018 to 2022

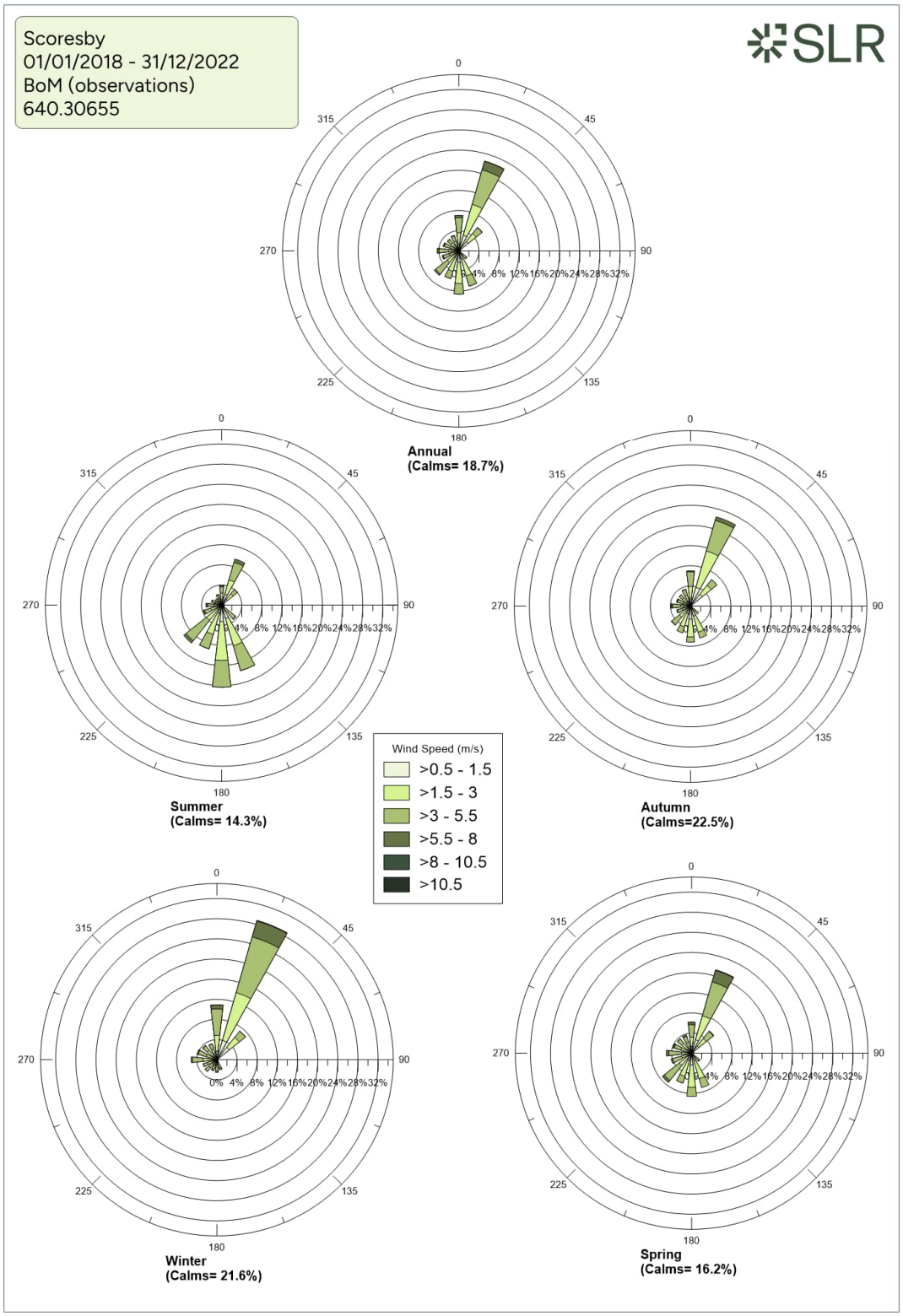


Table C2 provides a summary of the model performance statistics, while **Figure C3** and **Figure C4** present the observed and predicted wind speed and wind direction frequencies, respectively. The WRF predictions generally under-predict the wind speeds and could therefore be considered conservative for modelling purposes.

Table C2 Model Performance Statistics

Parameter	Statistic	Observed	Predicted
Wind Speed	Mean	2.3	1.7
	Standard Deviation	3.8	2.4
	Index of Agreement[1]	0.74	
Wind direction	Mean[2]	145	112
	Standard deviation	175	110
	Index of agreement[1]	0.66	

1. The index of agreement (IOA) is a measure of the overall agreement between modelled and observed time series. It ranges between zero for no agreement and 1 if the two time series are identical. The IOA shows no agreement if the time series are different by orders of magnitude, even if they happen to be correlated, and hence is a more stringent measure of performance than the correlation coefficient. IOAs of 0.7 - 0.8 are considered to indicate good dispersion model performance.

2 Scalar mean.

Figure C3 Wind Speed Frequency Comparison

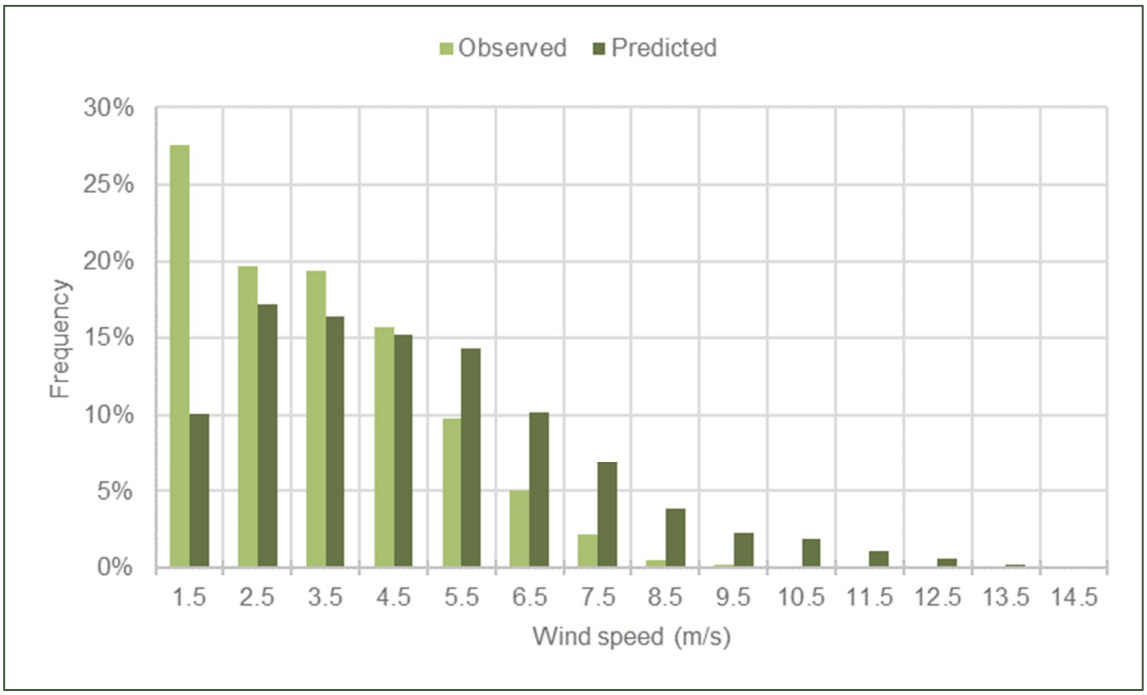
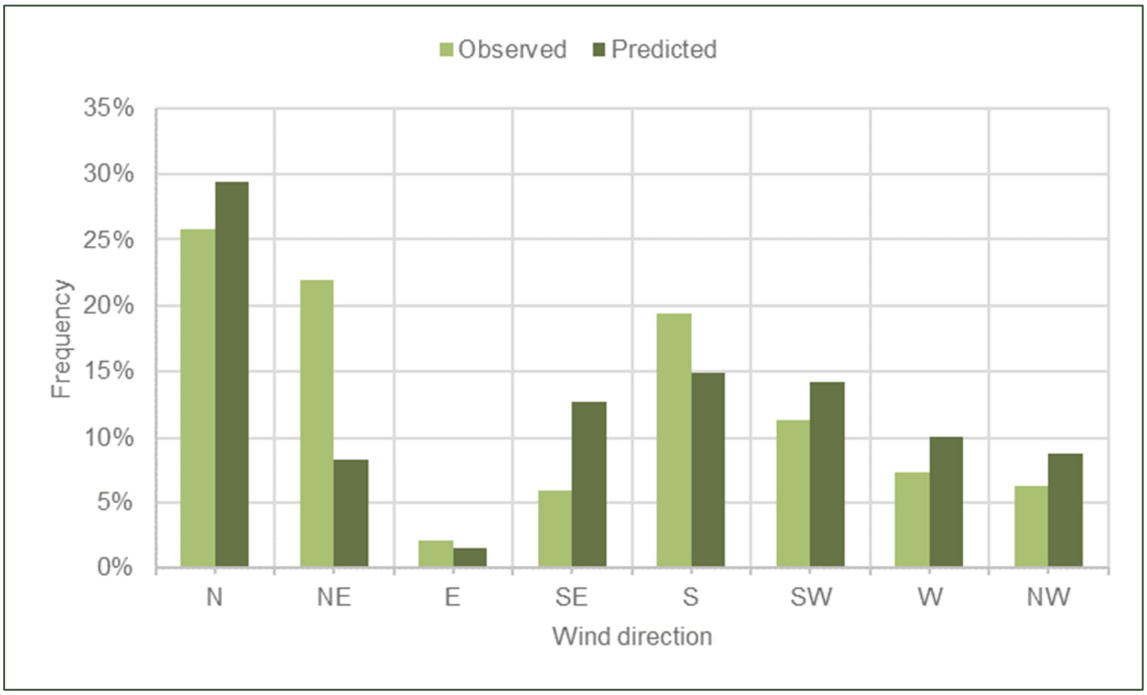


Figure C4 Wind Direction Frequency Comparison



C.1.2 Summary

Overall, WRF predictions are concluded to adequately represent the observed wind speeds and wind directions recorded by the Scoresby AWS BoM station. It is expected that WRF solutions extracted at the Project is likely to be a good representation of the conditions experienced at that location.

C.2 Project Site Representative Meteorological Data

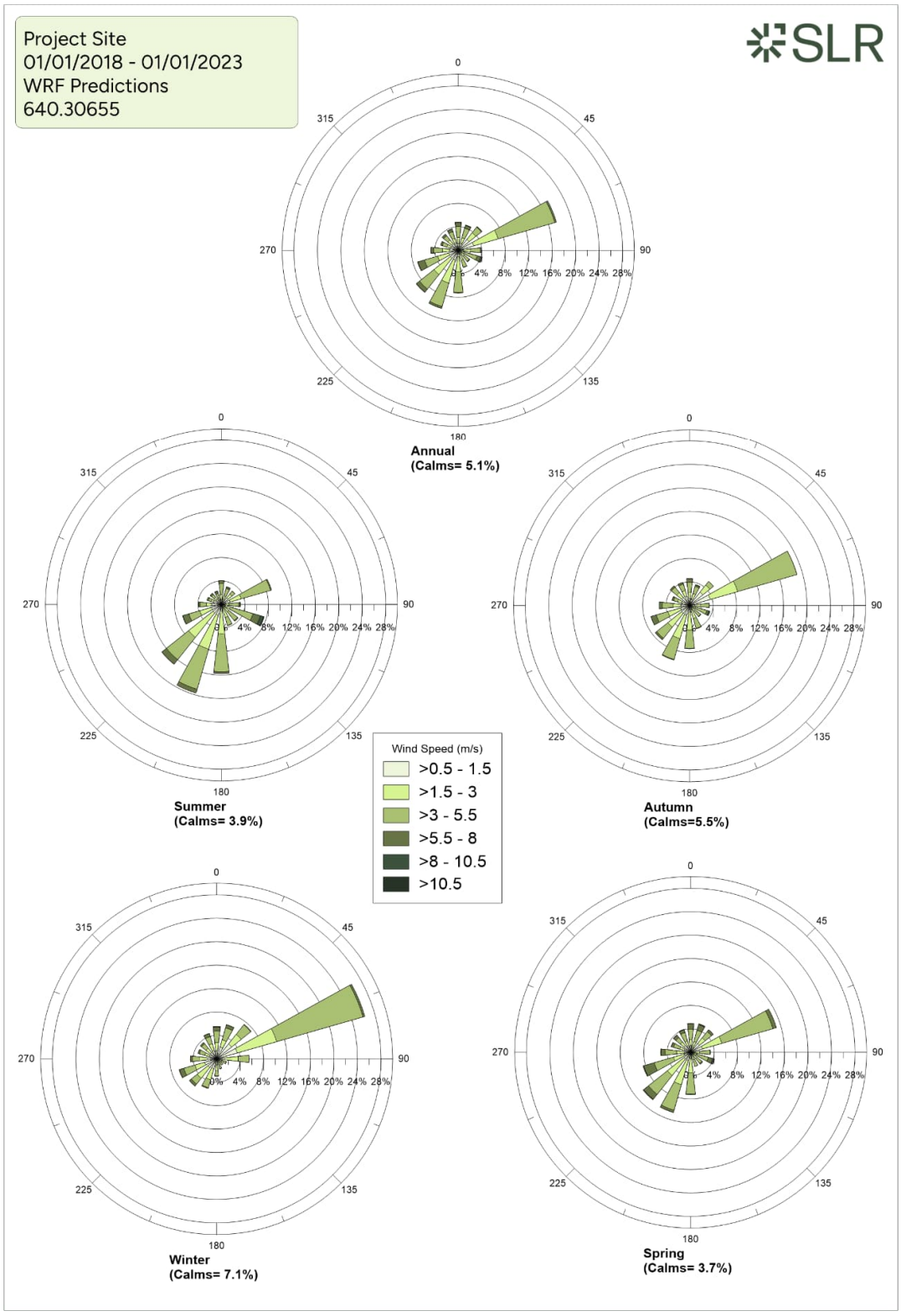
This section presents a summary of the key meteorological conditions predicted by WRF and AERMET at the Project site.

C.2.1 Wind Speed and Direction

A summary of the annual wind behaviour predicted by WRF for the Project site is presented in **Figure C5.** Based on the model predictions, the site experiences winds, from all directions but with some bias from the southeastern quadrant and the east-northeast and few winds from the north and southeast. Calm wind conditions (wind speeds less than 0.5 m/s) are predicted to occur approximately 5% of the time.

The seasonal wind roses indicate that in summer, when dust emissions are potentially greatest due to warm and dry conditions, winds from the south-eastern quadrant predominate.

Figure C5 Wind Roses for the Project Site, as Predicted by WRF



The diurnal variations in maximum and average wind speed predicted by WRF at the Project are illustrated in **Figure C6.** Wind speeds during the day are greater due to convective forcing. The frequency of wind speeds predicted by WRF at the Project are illustrated in **Figure C7**. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of 'plume' stretching. In general, higher wind speeds promote dispersion and result in lower pollutant ground level concentrations.

Figure C6 WRF Predicted Diurnal Variation in Wind Speed for the Project (2018-2022)

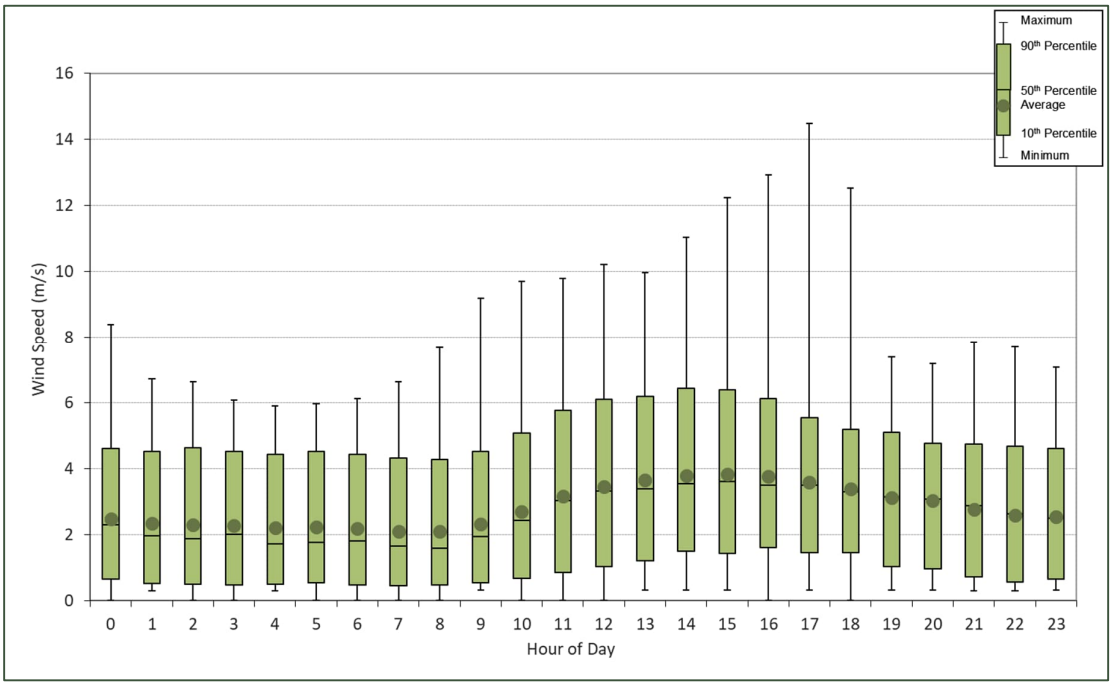
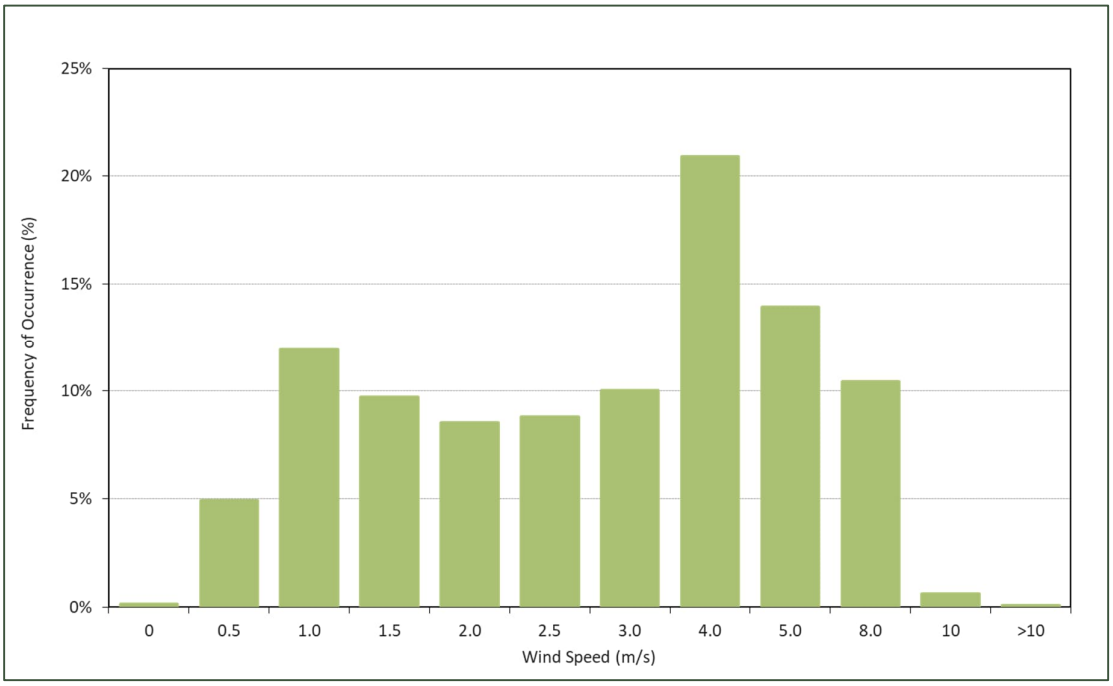


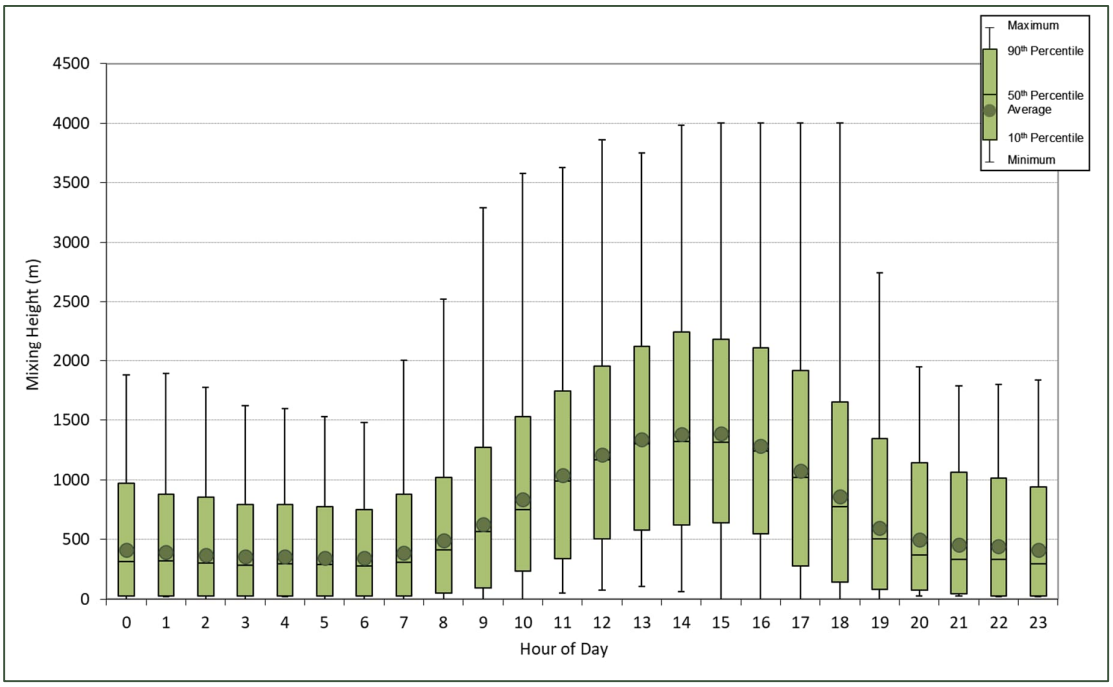
Figure C7 WRF Predicted Wind Speed Frequency for the Project (2018-2022)



C.2.2 Mixing Height

The diurnal variations in maximum and average mixing depths predicted by AERMET at the Project are illustrated in **Figure C8.** An increase in the mixing depth during the morning is apparent, arising due to the onset of vertical mixing following sunrise. The maximum average mixing heights occur in the early to mid-afternoon, then begin to decrease due to the dissipation of ground-based temperature inversions and the growth of the convective mixing layer.

Figure C8 AERMET Predicted Diurnal Variation in Mixing Height for the Project (2018-2022)



Appendix D Variable Emission File Configuration

Montrose Quarry Extension

Air Quality Impact Assessment

Boral Resources (VIC) Pty Ltd

SLR Project No.: 640.V30655.00000

16 February 2024

D.1 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 daily/weekly/annual average emission rate (kg/year) for PM_{10} and $PM_{2.5}$

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

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

$$PM_{AC,i,h} = \frac{PM_i \times 1000}{N_{days} \times OH_i \times 3600 \times N_{s,i}} \times WSFactor_{i,h}$$

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:

$PM_{AC,i,h}$- 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.

Appendix E Emission Formulae

Montrose Quarry Extension

Air Quality Impact Assessment

Boral Resources (VIC) Pty Ltd

SLR Project No.: 640.V30655.00000

16 February 2024

Table E1 Extractive Industry Emission Formulae

Inventory Activity	Units	TSP Emission Factor	PM_{10} Emission Factor	$PM_{2.5}$ Emission Factor	Source
Overburden Activities					
Loading/unloading overburden to/from trucks/front end loader, excavator, or shovel	kg/t	$0.74 \times 0.0016 \times \left(\left(\frac{U}{2.2}\right)^{1.3} / \left(\frac{M}{2}\right)^{1.4}\right)$	$0.35 \times 0.0016 \times \left(\left(\frac{U}{2.2}\right)^{1.3} / \left(\frac{M}{2}\right)^{1.4}\right)$	$0.053 \times 0.0016 \times \left(\left(\frac{U}{2.2}\right)^{1.3} / \left(\frac{M}{2}\right)^{1.4}\right)$	NPI EETM/ AP42 13.2.4
Bulldozers/front end loaders on overburden i.e. dozers FEL pushing material around	kg/hr	$2.6 \times \frac{s^{1.2}}{M^{1.3}}$	$0.3375 \times \frac{s^{1.5}}{M^{1.4}}$	0.105 * TSP	NPI EETM/ AP42 11.9 Table 11.9-2
Graders	kg/t	$0.0034 \times S^{2.5}$	$0.0034 \times S^{2.0}$		NPI EETM/ AP42 11.9 Table 11.9-4
Hauling					
Hauling on unsealed roads	kg/VKT	$\left(\frac{0.4536}{1.6093}\right) \times 4.9 * \left(\frac{s}{12}\right)^{0.7} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45}$	$\left(\frac{0.4536}{1.6093}\right) \times 1.5 * \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45}$	$\left(\frac{0.4536}{1.6093}\right) \times 0.15 * \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45}$	AP42 13.2.2
Hauling on sealed roads	kg/VKT	$(k(sL)^{0.91} \times (W * 1.1023)^{1.02}) / 1000$			AP42 13.2.1
		k = 3.23	k = 0.62	k = 0.15	
Wind Erosion					
Wind erosion	kg/ha/h	0.4	0.2	0.03 * TSP (AP42-13-2-5 Industrial wind erosion states an emission factor multiplier for $PM_{2.5}$ of 0.075*TSP)	NPI EETM
Drilling and Blasting					
Drilling	kg/hole	0.59	0.52 * TSP (PM_{10} ratio assumed same as blasting AP42 11.9.7 Table 11.9-2)	0.03 * TSP ($PM_{2.5}$ ratio assumed same as blasting AP42 11.9.7 Table 11.9-2)	NPI EETM/ AP42 11.9 Table 11.9-4
Blasting	kg/blast	$0.00022 \times A^{1.5}$	0.52 * TSP	0.03 * TSP	NPI EETM/ AP42 11.9 Table 11.9-2
Crushing (Ore Moisture Content >4%)					
Primary	kg/t	0.010	0.004	0.00074	NPI EETM/ AP42 11.9-2 Table 11.9-2-1
Secondary	kg/t	0.03	0.012	0.00222	
Tertiary	kg/t	0.03	0.01	0.00185	
Handling, transferring	kg/t	0.005	0.002	0.00037	

A	=	horizontal area (m2)
M	=	material moisture content (%)
s	=	material silt content (or surface silt content in unpaved roads) (%)
u	=	wind speed (m/s)
d	=	drop height (m)
W	=	mean vehicle weight (tonnes)
S	=	mean vehicle speed (km/h)
sL	=	silt loading (%)

Appendix F Predicted GLCs at Sensitive Receptors

Montrose Quarry Extension

Air Quality Impact Assessment

Boral Resources (VIC) Pty Ltd

SLR Project No.: 640.V30655.00000

16 February 2024

Table F1 Scenario 0 Maximum Predicted Cumulative 24-Hour Average PM_{10} GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Maximum Additional Exceedances Each Year
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	55	11	43	1
R2	54	11	43	1
R3	53	10	43	1
R4	53	9.5	43	1
R5	52	8.4	43	1
R6	55	11	43	1
R7	54	11	43	1
R8	52	8.3	43	1
R9	51	7.8	43	1
R10	49	5.9	43	0
R11	48	4.3	43	0
R12	47	3.4	43	0
R13	46	2.8	43	0
R14	45	2.2	43	0
R15	45	1.9	43	0
R16	45	1.7	43	0
R17	45	1.4	43	0
R18	45	1.2	43	0
R19	44	1.1	43	0
R20	44	1.1	43	0
R21	44	0.5	43	0
R22	44	0.3	43	0
R23	44	0.3	43	0
R24	44	1.0	43	0
R25	45	1.6	43	0
R26	45	1.7	43	0
R27	45	1.5	43	0
R28	45	1.4	43	0
R29	44	0.9	43	0
R30	45	1.5	43	0
R31	45	1.9	43	0
R32	46	2.3	43	0
R33	46	2.3	43	0
APAC	**50**			

Red font indicates an exceedance

Table F2 Scenario 1 Maximum Predicted Cumulative 24-Hour Average PM_{10} GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Maximum Additional Exceedances Each Year
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	55	12	43	1
R2	54	11	43	1
R3	54	10	43	1
R4	53	10	43	1
R5	52	8.6	43	1
R6	55	11	43	1
R7	55	11	43	1
R8	52	8.8	43	1
R9	52	8.2	43	1
R10	50	6.4	43	0
R11	48	4.8	43	0
R12	47	4.0	43	0
R13	47	3.3	43	0
R14	46	2.5	43	0
R15	46	2.2	43	0
R16	45	2.0	43	0
R17	45	1.9	43	0
R18	45	1.8	43	0
R19	45	1.8	43	0
R20	45	1.7	43	0
R21	44	0.5	43	0
R22	44	0.3	43	0
R23	44	0.3	43	0
R24	44	1.1	43	0
R25	45	1.7	43	0
R26	45	1.9	43	0
R27	45	1.7	43	0
R28	45	1.8	43	0
R29	45	1.2	43	0
R30	45	1.8	43	0
R31	46	2.5	43	0
R32	46	3.1	43	0
R33	46	3.2	43	0
APAC	**50**			

Red font indicates an exceedance

Table F3 Scenario 2 Maximum Predicted Cumulative 24-Hour Average PM_{10} GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Maximum Additional Exceedances Each Year
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	51	7.4	43	1
R2	51	7.2	43	1
R3	50	6.8	43	1
R4	50	6.5	43	0
R5	49	5.7	43	0
R6	51	8.1	43	1
R7	52	8.3	43	1
R8	49	6.2	43	0
R9	49	5.7	43	0
R10	47	4.1	43	0
R11	46	2.8	43	0
R12	46	2.3	43	0
R13	46	2.3	43	0
R14	45	1.9	43	0
R15	45	2.0	43	0
R16	45	2.0	43	0
R17	45	2.1	43	0
R18	45	2.2	43	0
R19	45	2.2	43	0
R20	45	2.1	43	0
R21	44	0.4	43	0
R22	44	0.2	43	0
R23	44	0.2	43	0
R24	44	0.9	43	0
R25	44	1.1	43	0
R26	44	1.1	43	0
R27	44	1.1	43	0
R28	44	1.1	43	0
R29	44	0.8	43	0
R30	45	1.8	43	0
R31	46	2.2	43	0
R32	46	2.5	43	0
R33	45	1.9	43	0
APAC	**50**			

Red font indicates an exceedance

Table F4 Scenario 0 Maximum Predicted Project 24-Hour Average PM_{10} GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Project Contribution Relative to APAC
	Maximum Project	Corresponding Background	Corresponding Cumulative	
R1	22	6.8	28	43%
R2	21	6.8	28	42%
R3	19	6.8	25	37%
R4	17	6.8	24	34%
R5	14	6.8	21	28%
R6	18	6.8	25	36%
R7	21	6.2	27	42%
R8	19	6.2	25	38%
R9	19	6.2	25	38%
R10	16	6.2	23	33%
R11	14	5.9	19	27%
R12	12	5.7	18	24%
R13	10	5.9	16	21%
R14	8.3	5.9	14	17%
R15	7.9	12	20	16%
R16	7.7	12	19	15%
R17	7.8	18	26	16%
R18	7.5	18	25	15%
R19	6.9	18	25	14%
R20	6.3	18	24	13%
R21	5.6	14	19	11%
R22	3.9	12	16	8%
R23	5.3	6.9	12	11%
R24	4.8	6.9	12	10%
R25	4.4	11	16	9%
R26	6.1	11	17	12%
R27	6.3	25	32	13%
R28	11	19	30	22%
R29	8.6	12	21	17%
R30	8.0	9.4	17	16%
R31	8.6	9.4	18	17%
R32	9.6	12	22	19%
R33	9	9.4	19	19%
		APAC	**50**	

Table F5 Scenario 1 Maximum Predicted Project 24-Hour Average PM_{10} GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Project Contribution Relative to APAC
	Maximum Project	Corresponding Background	Corresponding Cumulative	
R1	22	6.8	29	45%
R2	21	6.8	28	43%
R3	19	6.8	26	38%
R4	17	6.8	24	35%
R5	14	6.8	21	28%
R6	19	6.2	25	37%
R7	22	6.2	28	44%
R8	20	6.2	26	40%
R9	20	6.2	26	40%
R10	17	6.2	24	35%
R11	15	5.9	20	29%
R12	13	5.9	19	27%
R13	12	4.0	16	24%
R14	10	4.0	14	19%
R15	9.1	4.0	13	18%
R16	8.6	4.0	13	17%
R17	8.3	4.0	12	17%
R18	8.1	18	26	16%
R19	7.5	18	25	15%
R20	6.9	18	25	14%
R21	6.0	14	20	12%
R22	4.0	12	16	8%
R23	5.4	6.9	12	11%
R24	5.1	11	17	10%
R25	5.5	11	17	11%
R26	10	11	22	21%
R27	7.7	25	33	15%
R28	13	19	32	26%
R29	13	12	25	26%
R30	11	15	26	23%
R31	13	12	25	26%
R32	15	12	27	30%
R33	13	9.4	22	26%
		APAC	**50**	

Table F6 Scenario 2 Maximum Predicted Project 24-Hour Average PM_{10} GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Project Contribution Relative to APAC
	Maximum Project	Corresponding Background	Corresponding Cumulative	
R1	14	6.8	20	27%
R2	13	6.8	20	26%
R3	12	6.8	19	24%
R4	11	6.8	18	22%
R5	8.8	6.8	16	18%
R6	13	6.8	19	25%
R7	16	6.2	22	31%
R8	14	6.2	20	28%
R9	14	6.2	20	28%
R10	12	6.2	18	24%
R11	9.2	6.2	15	18%
R12	8.7	5.7	14	17%
R13	7.9	4.0	12	16%
R14	6.4	4.0	10	13%
R15	6.1	4.0	10	12%
R16	5.9	4.0	10	12%
R17	5.9	18	24	12%
R18	5.8	4.0	10	12%
R19	5.8	4.0	10	12%
R20	5.5	4.0	10	11%
R21	4.5	11	16	9%
R22	2.4	22	25	5%
R23	3.2	6.9	10	6%
R24	3.0	11	14	6%
R25	3.9	11	15	8%
R26	6.2	11	18	12%
R27	6.6	19	25	13%
R28	9.2	19	28	18%
R29	9.5	12	22	19%
R30	8.9	15	24	18%
R31	10	9.0	19	20%
R32	11	12	24	23%
R33	10	9.4	19	19%
		APAC	**50**	

Table F7 Scenario 0 Maximum Predicted Cumulative Annual Average PM_{10} GLCs

Receptor ID	Annual Average Concentration (µg/m³)			Project Contribution Relative to APAC
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	17	2.8	15	14%
R2	17	2.5	15	12%
R3	16	2.0	15	10%
R4	16	1.7	15	9%
R5	16	1.4	15	7%
R6	17	2.0	15	10%
R7	17	2.1	15	11%
R8	16	1.7	15	9%
R9	16	1.8	15	9%
R10	16	1.7	15	8%
R11	16	1.4	15	7%
R12	16	1.3	15	7%
R13	16	1.1	15	6%
R14	15	0.8	15	4%
R15	15	0.8	15	4%
R16	15	0.8	15	4%
R17	15	0.7	15	4%
R18	15	0.7	15	3%
R19	15	0.6	15	3%
R20	15	0.6	15	3%
R21	15	0.3	15	2%
R22	15	0.2	15	1%
R23	15	0.2	15	1%
R24	15	0.3	15	1%
R25	15	0.3	15	2%
R26	15	0.4	15	2%
R27	15	0.3	15	2%
R28	15	0.3	15	2%
R29	15	0.4	15	2%
R30	15	0.5	15	3%
R31	15	0.6	15	3%
R32	15	0.7	15	4%
R33	15	0.8	15	4%
APAC	**20**			

Table F8 Scenario 1 Maximum Predicted Cumulative Annual Average PM_{10} GLCs

Receptor ID	Annual Average Concentration (µg/m^3)			Project Contribution Relative to APAC
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	17	3.0	15	15%
R2	17	2.6	15	13%
R3	17	2.1	15	10%
R4	16	1.9	15	9%
R5	16	1.5	15	8%
R6	17	2.2	15	11%
R7	17	2.3	15	12%
R8	16	1.9	15	10%
R9	17	2.0	15	10%
R10	16	1.9	15	9%
R11	16	1.7	15	9%
R12	16	1.7	15	8%
R13	16	1.5	15	7%
R14	16	1.2	15	6%
R15	16	1.2	15	6%
R16	16	1.1	15	6%
R17	16	1.2	15	6%
R18	16	1.1	15	6%
R19	16	1.1	15	6%
R20	16	1.1	15	5%
R21	15	0.4	15	2%
R22	15	0.3	15	1%
R23	15	0.3	15	1%
R24	15	0.4	15	2%
R25	15	0.4	15	2%
R26	15	0.5	15	3%
R27	15	0.4	15	2%
R28	15	0.4	15	2%
R29	15	0.5	15	3%
R30	15	0.6	15	3%
R31	15	0.8	15	4%
R32	16	1.1	15	6%
R33	16	1.1	15	6%
APAC	**20**			

Table F9 Scenario 2 Maximum Predicted Cumulative Annual Average PM_{10} GLCs

Receptor ID	Annual Average Concentration (µg/m^3)			Project Contribution Relative to APAC
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	17	2.2	15	11%
R2	17	2.0	15	10%
R3	16	1.6	15	8%
R4	16	1.4	15	7%
R5	16	1.1	15	6%
R6	16	1.7	15	8%
R7	16	1.8	15	9%
R8	16	1.5	15	7%
R9	16	1.5	15	8%
R10	16	1.5	15	7%
R11	16	1.3	15	7%
R12	16	1.3	15	6%
R13	16	1.1	15	6%
R14	15	0.9	15	5%
R15	15	0.9	15	5%
R16	15	0.9	15	5%
R17	15	1.0	15	5%
R18	16	1.0	15	5%
R19	16	1.0	15	5%
R20	16	1.0	15	5%
R21	15	0.4	15	2%
R22	15	0.2	15	1%
R23	15	0.2	15	1%
R24	15	0.3	15	2%
R25	15	0.4	15	2%
R26	15	0.4	15	2%
R27	15	0.3	15	1%
R28	15	0.3	15	2%
R29	15	0.3	15	2%
R30	15	0.4	15	2%
R31	15	0.6	15	3%
R32	15	0.9	15	4%
R33	15	0.8	15	4%
APAC	**20**			

Table F10 Scenario 0 Maximum Predicted Cumulative 24-Hour Average $PM_{2.5}$ GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Maximum Additional Exceedances Each Year
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	22	0.8	21	0
R2	22	0.7	21	0
R3	22	0.6	21	0
R4	22	0.6	21	0
R5	22	0.5	21	0
R6	22	0.6	21	0
R7	22	0.6	21	0
R8	22	0.6	21	0
R9	22	0.6	21	0
R10	22	0.4	21	0
R11	22	0.2	21	0
R12	22	0.2	21	0
R13	22	0.1	21	0
R14	21	0.1	21	0
R15	21	0.1	21	0
R16	21	0.1	21	0
R17	21	0.1	21	0
R18	21	0.1	21	0
R19	21	0.1	21	0
R20	21	0.1	21	0
R21	21	0.0	21	0
R22	21	0.0	21	0
R23	21	0.0	21	0
R24	22	0.1	21	0
R25	22	0.2	21	0
R26	22	0.1	21	0
R27	22	0.1	21	0
R28	22	0.1	21	0
R29	22	0.1	21	0
R30	22	0.2	21	0
R31	22	0.2	21	0
R32	22	0.3	21	0
R33	22	0.3	21	0
APAC	**25**			

Table F11 Scenario 1 Maximum Predicted Cumulative 24-Hour Average $PM_{2.5}$ GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Maximum Additional Exceedances Each Year
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	22	0.8	21	0
R2	22	0.7	21	0
R3	22	0.6	21	0
R4	22	0.6	21	0
R5	22	0.5	21	0
R6	22	0.6	21	0
R7	22	0.6	21	0
R8	22	0.6	21	0
R9	22	0.6	21	0
R10	22	0.4	21	0
R11	22	0.2	21	0
R12	22	0.2	21	0
R13	22	0.2	21	0
R14	22	0.1	21	0
R15	22	0.1	21	0
R16	22	0.1	21	0
R17	22	0.1	21	0
R18	22	0.1	21	0
R19	22	0.1	21	0
R20	22	0.1	21	0
R21	21	0.1	21	0
R22	21	0.0	21	0
R23	21	0.0	21	0
R24	22	0.1	21	0
R25	22	0.2	21	0
R26	22	0.1	21	0
R27	22	0.2	21	0
R28	22	0.2	21	0
R29	22	0.2	21	0
R30	22	0.2	21	0
R31	22	0.3	21	0
R32	22	0.4	21	0
R33	22	0.3	21	0
APAC	**25**			

Table F12 Scenario 2 Maximum Predicted Cumulative 24-Hour Average $PM_{2.5}$ GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Maximum Additional Exceedances Each Year
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	22	0.6	21	0
R2	22	0.5	21	0
R3	22	0.4	21	0
R4	22	0.4	21	0
R5	22	0.3	21	0
R6	22	0.4	21	0
R7	22	0.4	21	0
R8	22	0.3	21	0
R9	22	0.3	21	0
R10	22	0.2	21	0
R11	22	0.2	21	0
R12	22	0.1	21	0
R13	22	0.1	21	0
R14	22	0.1	21	0
R15	21	0.1	21	0
R16	21	0.1	21	0
R17	21	0.1	21	0
R18	21	0.1	21	0
R19	21	0.1	21	0
R20	21	0.1	21	0
R21	21	0.1	21	0
R22	21	0.0	21	0
R23	21	0.0	21	0
R24	21	0.1	21	0
R25	21	0.1	21	0
R26	22	0.1	21	0
R27	21	0.1	21	0
R28	21	0.1	21	0
R29	22	0.1	21	0
R30	22	0.1	21	0
R31	22	0.2	21	0
R32	22	0.2	21	0
R33	22	0.2	21	0
APAC	**25**			

Table F13 Scenario 0 Maximum Predicted Project 24-Hour Average $PM_{2.5}$ GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Project Contribution Relative to APAC
	Maximum Project	Corresponding Background	Corresponding Cumulative	
R1	3.1	1.8	4.9	13%
R2	3.0	1.8	4.8	12%
R3	2.6	1.8	4.4	11%
R4	2.4	1.8	4.2	10%
R5	1.9	1.8	3.7	8%
R6	2.5	1.3	3.8	10%
R7	2.8	1.3	4.1	11%
R8	2.5	1.3	3.8	10%
R9	2.5	1.3	3.8	10%
R10	2.2	1.3	3.5	9%
R11	1.8	3.5	5.3	7%
R12	1.7	3.5	5.2	7%
R13	1.4	3.5	4.9	6%
R14	1.1	3.5	4.6	4%
R15	1.0	3.5	4.5	4%
R16	1.0	3.5	4.5	4%
R17	1.0	2.6	3.6	4%
R18	1.0	2.6	3.6	4%
R19	1.0	2.6	3.6	4%
R20	0.9	2.6	3.5	4%
R21	0.8	1.8	2.6	3%
R22	0.6	5.3	5.9	2%
R23	0.7	2.3	3.0	3%
R24	0.7	4.0	4.7	3%
R25	0.7	4.6	5.3	3%
R26	1.0	4.1	5.1	4%
R27	0.9	7.1	8.0	4%
R28	1.4	5.2	6.6	5%
R29	1.1	4.6	5.7	5%
R30	1.1	3.4	4.5	4%
R31	1.1	4.6	5.7	4%
R32	1.4	5.2	6.6	6%
R33	1.2	2.9	4.1	5%
		APAC	**25**	

Table F14 Scenario 1 Maximum Predicted Project 24-Hour Average $PM_{2.5}$ GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Project Contribution Relative to APAC
	Maximum Project	Corresponding Background	Corresponding Cumulative	
R1	3.1	1.8	4.9	12%
R2	3.0	1.8	4.8	12%
R3	2.6	1.8	4.4	10%
R4	2.3	1.8	4.1	9%
R5	1.9	1.8	3.7	8%
R6	2.5	1.3	3.8	10%
R7	2.7	1.3	4.0	11%
R8	2.5	1.3	3.8	10%
R9	2.5	1.3	3.8	10%
R10	2.2	1.3	3.5	9%
R11	1.9	3.5	5.4	7%
R12	1.7	3.5	5.2	7%
R13	1.5	3.5	5.0	6%
R14	1.2	1.1	2.3	5%
R15	1.2	1.1	2.3	5%
R16	1.1	1.1	2.2	5%
R17	1.1	1.1	2.2	4%
R18	1.0	1.1	2.1	4%
R19	1.0	2.6	3.6	4%
R20	1.0	2.6	3.6	4%
R21	0.8	1.8	2.6	3%
R22	0.6	5.3	5.9	2%
R23	0.7	2.3	3.0	3%
R24	0.8	4.0	4.8	3%
R25	0.8	4.6	5.4	3%
R26	1.4	4.1	5.5	6%
R27	1.1	7.1	8.2	4%
R28	1.5	5.2	6.7	6%
R29	1.5	4.6	6.1	6%
R30	1.3	4.6	5.9	5%
R31	1.6	4.6	6.2	6%
R32	1.9	5.2	7.1	8%
R33	1.6	2.9	4.5	6%
		APAC	**25**	

Table F15 Scenario 2 Maximum Predicted Project 24-Hour Average $PM_{2.5}$ GLCs

Receptor ID	24-Hour Average Concentration (µg/m³)			Project Contribution Relative to APAC
	Maximum Project	Corresponding Background	Corresponding Cumulative	
R1	1.7	1.8	3.5	7%
R2	1.6	1.8	3.4	6%
R3	1.4	1.8	3.2	6%
R4	1.3	1.8	3.1	5%
R5	1.1	1.8	2.9	4%
R6	1.5	1.3	2.8	6%
R7	1.8	1.3	3.1	7%
R8	1.6	1.3	2.9	7%
R9	1.7	1.3	3.0	7%
R10	1.4	1.3	2.7	6%
R11	1.2	3.2	4.4	5%
R12	1.0	0.9	1.9	4%
R13	0.9	1.1	2.0	4%
R14	0.7	1.1	1.8	3%
R15	0.7	1.1	1.8	3%
R16	0.7	2.6	3.3	3%
R17	0.7	2.6	3.3	3%
R18	0.7	1.1	1.8	3%
R19	0.7	1.1	1.8	3%
R20	0.6	1.1	1.7	3%
R21	0.5	5.1	5.6	2%
R22	0.3	2.6	2.9	1%
R23	0.4	2.3	2.7	2%
R24	0.4	4.0	4.4	2%
R25	0.5	4.1	4.6	2%
R26	0.7	4.1	4.8	3%
R27	0.7	5.2	5.9	3%
R28	1.0	5.2	6.2	4%
R29	1.1	4.6	5.7	4%
R30	1.0	8.3	9.3	4%
R31	1.1	4.6	5.7	4%
R32	1.3	4.6	5.9	5%
R33	1.1	2.9	4.0	4%
		APAC	**25**	

Table F16 Scenario 0 Maximum Predicted Cumulative Annual Average $PM_{2.5}$ GLCs

Receptor ID	Annual Average Concentration (µg/m^3)			Project Contribution Relative to APAC
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	4.7	0.3	4.3	4%
R2	4.6	0.3	4.3	4%
R3	4.6	0.2	4.3	3%
R4	4.5	0.2	4.3	3%
R5	4.5	0.2	4.3	2%
R6	4.6	0.2	4.3	3%
R7	4.6	0.3	4.3	3%
R8	4.5	0.2	4.3	3%
R9	4.6	0.2	4.3	3%
R10	4.5	0.2	4.3	3%
R11	4.5	0.2	4.3	2%
R12	4.5	0.2	4.3	2%
R13	4.5	0.1	4.3	2%
R14	4.4	0.1	4.3	1%
R15	4.4	0.1	4.3	1%
R16	4.4	0.1	4.3	1%
R17	4.4	0.1	4.3	1%
R18	4.4	0.1	4.3	1%
R19	4.4	0.1	4.3	1%
R20	4.4	0.1	4.3	1%
R21	4.4	0.0	4.3	1%
R22	4.4	0.0	4.3	0%
R23	4.4	0.0	4.3	0%
R24	4.4	0.0	4.3	0%
R25	4.4	0.0	4.3	1%
R26	4.4	0.1	4.3	1%
R27	4.4	0.0	4.3	1%
R28	4.4	0.0	4.3	1%
R29	4.4	0.1	4.3	1%
R30	4.4	0.1	4.3	1%
R31	4.4	0.1	4.3	1%
R32	4.4	0.1	4.3	1%
R33	4.4	0.1	4.3	1%
APAC	**8**			

Table F17 Scenario 1 Maximum Predicted Cumulative Annual Average $PM_{2.5}$ GLCs

Receptor ID	Annual Average Concentration (µg/m^3)			Project Contribution Relative to APAC
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	4.6	0.3	4.3	4%
R2	4.6	0.3	4.3	4%
R3	4.6	0.2	4.3	3%
R4	4.5	0.2	4.3	3%
R5	4.5	0.2	4.3	2%
R6	4.6	0.2	4.3	3%
R7	4.6	0.3	4.3	3%
R8	4.6	0.2	4.3	3%
R9	4.6	0.2	4.3	3%
R10	4.5	0.2	4.3	3%
R11	4.5	0.2	4.3	3%
R12	4.5	0.2	4.3	2%
R13	4.5	0.2	4.3	2%
R14	4.5	0.1	4.3	2%
R15	4.5	0.1	4.3	2%
R16	4.5	0.1	4.3	2%
R17	4.5	0.1	4.3	2%
R18	4.4	0.1	4.3	2%
R19	4.4	0.1	4.3	1%
R20	4.4	0.1	4.3	1%
R21	4.4	0.1	4.3	1%
R22	4.4	0.0	4.3	0%
R23	4.4	0.0	4.3	0%
R24	4.4	0.0	4.3	1%
R25	4.4	0.1	4.3	1%
R26	4.4	0.1	4.3	1%
R27	4.4	0.1	4.3	1%
R28	4.4	0.1	4.3	1%
R29	4.4	0.1	4.3	1%
R30	4.4	0.1	4.3	1%
R31	4.4	0.1	4.3	1%
R32	4.5	0.1	4.3	2%
R33	4.5	0.1	4.3	2%
APAC	**8**			

Table F18 Scenario 2 Maximum Predicted Cumulative Annual Average $PM_{2.5}$ GLCs

Receptor ID	Annual Average Concentration (µg/m^3)			Project Contribution Relative to APAC
	Maximum Cumulative	Corresponding Project	Corresponding Background	
R1	4.6	0.2	4.3	3%
R2	4.5	0.2	4.3	3%
R3	4.5	0.2	4.3	2%
R4	4.5	0.1	4.3	2%
R5	4.4	0.1	4.3	1%
R6	4.5	0.2	4.3	2%
R7	4.5	0.2	4.3	2%
R8	4.5	0.2	4.3	2%
R9	4.5	0.2	4.3	2%
R10	4.5	0.2	4.3	2%
R11	4.5	0.1	4.3	2%
R12	4.5	0.1	4.3	2%
R13	4.4	0.1	4.3	1%
R14	4.4	0.1	4.3	1%
R15	4.4	0.1	4.3	1%
R16	4.4	0.1	4.3	1%
R17	4.4	0.1	4.3	1%
R18	4.4	0.1	4.3	1%
R19	4.4	0.1	4.3	1%
R20	4.4	0.1	4.3	1%
R21	4.4	0.0	4.3	0%
R22	4.4	0.0	4.3	0%
R23	4.4	0.0	4.3	0%
R24	4.4	0.0	4.3	0%
R25	4.4	0.0	4.3	1%
R26	4.4	0.0	4.3	1%
R27	4.4	0.0	4.3	0%
R28	4.4	0.0	4.3	0%
R29	4.4	0.0	4.3	0%
R30	4.4	0.0	4.3	1%
R31	4.4	0.1	4.3	1%
R32	4.4	0.1	4.3	1%
R33	4.4	0.1	4.3	1%
APAC	**8**			

Table F19 Scenario 0 Maximum Predicted Cumulative Annual Average RCS GLCs

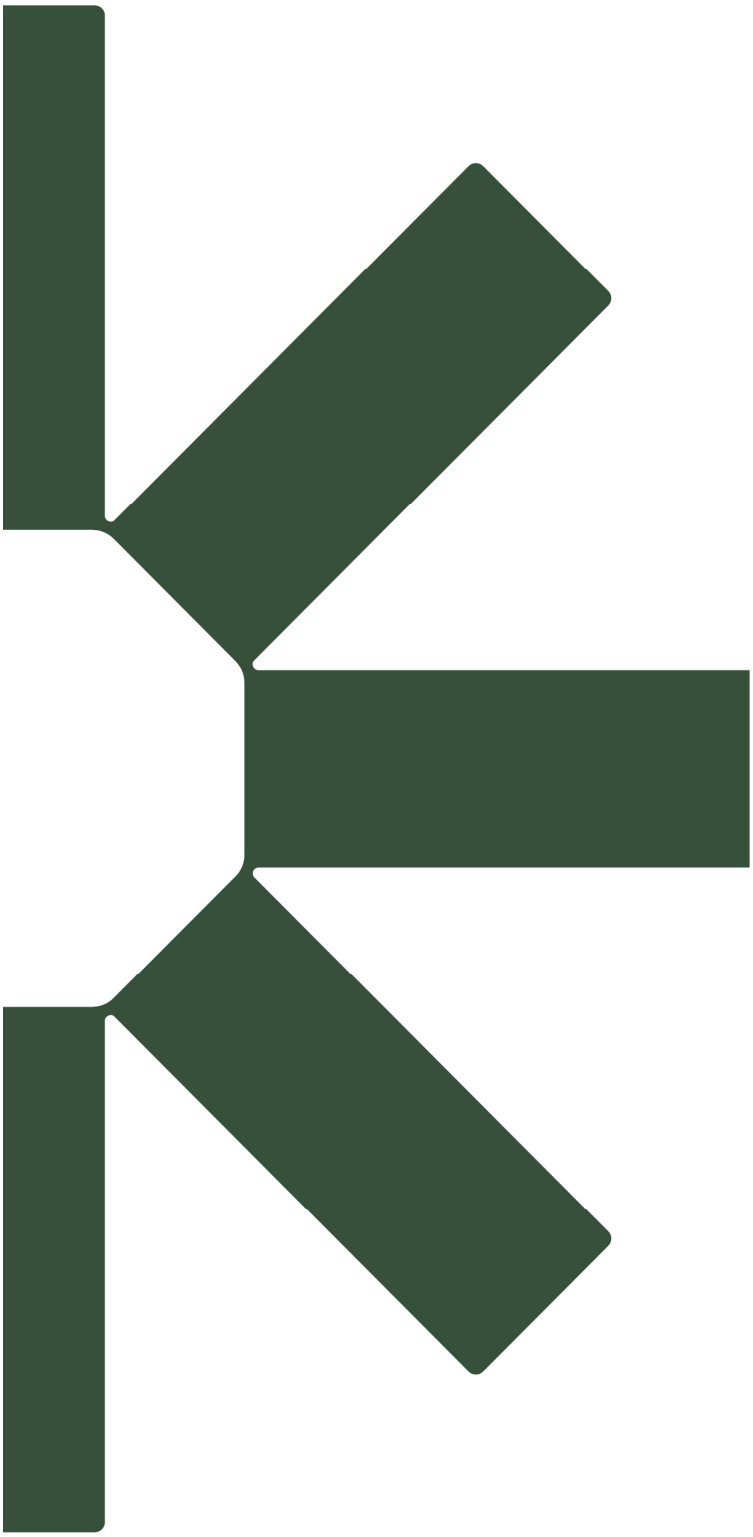
Receptor ID	Annual Average Concentration (µg/m^3)			Cumulative Concentration Relative to APAC
	Maximum Project	Background	Cumulative	
R1	0.3	0.2	0.5	10%
R2	0.3	0.2	0.5	10%
R3	0.2	0.2	0.4	7%
R4	0.2	0.2	0.4	7%
R5	0.2	0.2	0.4	7%
R6	0.2	0.2	0.4	7%
R7	0.3	0.2	0.5	10%
R8	0.2	0.2	0.4	7%
R9	0.2	0.2	0.4	7%
R10	0.2	0.2	0.4	7%
R11	0.2	0.2	0.4	7%
R12	0.2	0.2	0.4	7%
R13	0.1	0.2	0.3	3%
R14	0.1	0.2	0.3	3%
R15	0.1	0.2	0.3	3%
R16	0.1	0.2	0.3	3%
R17	0.1	0.2	0.3	3%
R18	0.1	0.2	0.3	3%
R19	0.1	0.2	0.3	3%
R20	0.1	0.2	0.3	3%
R21	>0.1	0.2	0.2	0%
R22	>0.1	0.2	0.2	0%
R23	>0.1	0.2	0.2	0%
R24	>0.1	0.2	0.2	0%
R25	>0.1	0.2	0.2	0%
R26	0.1	0.2	0.3	3%
R27	>0.1	0.2	0.2	0%
R28	>0.1	0.2	0.2	0%
R29	0.1	0.2	0.3	3%
R30	0.1	0.2	0.3	3%
R31	0.1	0.2	0.3	3%
R32	0.1	0.2	0.3	3%
R33	0.1	0.2	0.3	3%
		APAC	**3**	

Table F20 Scenario 1 Maximum Predicted Cumulative Annual Average RCS GLCs

Receptor ID	Annual Average Concentration (µg/m^3)			Cumulative Concentration Relative to APAC
	Maximum Project	Background	Cumulative	
R1	0.3	0.2	0.5	10%
R2	0.3	0.2	0.5	10%
R3	0.2	0.2	0.4	7%
R4	0.2	0.2	0.4	7%
R5	0.2	0.2	0.4	7%
R6	0.2	0.2	0.4	7%
R7	0.3	0.2	0.5	10%
R8	0.2	0.2	0.4	7%
R9	0.2	0.2	0.4	7%
R10	0.2	0.2	0.4	7%
R11	0.2	0.2	0.4	7%
R12	0.2	0.2	0.4	7%
R13	0.2	0.2	0.4	7%
R14	0.1	0.2	0.3	3%
R15	0.1	0.2	0.3	3%
R16	0.1	0.2	0.3	3%
R17	0.1	0.2	0.3	3%
R18	0.1	0.2	0.3	3%
R19	0.1	0.2	0.3	3%
R20	0.1	0.2	0.3	3%
R21	0.1	0.2	0.3	3%
R22	>0.1	0.2	0.2	0%
R23	>0.1	0.2	0.2	0%
R24	>0.1	0.2	0.2	0%
R25	0.1	0.2	0.3	3%
R26	0.1	0.2	0.3	3%
R27	0.1	0.2	0.3	3%
R28	0.1	0.2	0.3	3%
R29	0.1	0.2	0.3	3%
R30	0.1	0.2	0.3	3%
R31	0.1	0.2	0.3	3%
R32	0.1	0.2	0.3	3%
R33	0.1	0.2	0.3	3%
		APAC	**3**	

Table F21 Scenario 2 Maximum Predicted Cumulative Annual Average RCS GLCs

Receptor ID	Annual Average Concentration (µg/m³)			Cumulative Concentration Relative to APAC
	Maximum Project	Background	Cumulative	
R1	0.2	0.2	0.4	7%
R2	0.2	0.2	0.4	7%
R3	0.2	0.2	0.4	7%
R4	0.1	0.2	0.3	3%
R5	0.1	0.2	0.3	3%
R6	0.2	0.2	0.4	7%
R7	0.2	0.2	0.4	7%
R8	0.2	0.2	0.4	7%
R9	0.2	0.2	0.4	7%
R10	0.2	0.2	0.4	7%
R11	0.1	0.2	0.3	3%
R12	0.1	0.2	0.3	3%
R13	0.1	0.2	0.3	3%
R14	0.1	0.2	0.3	3%
R15	0.1	0.2	0.3	3%
R16	0.1	0.2	0.3	3%
R17	0.1	0.2	0.3	3%
R18	0.1	0.2	0.3	3%
R19	0.1	0.2	0.3	3%
R20	0.1	0.2	0.3	3%
R21	>0.1	0.2	0.2	0%
R22	>0.1	0.2	0.2	0%
R23	>0.1	0.2	0.2	0%
R24	>0.1	0.2	0.2	0%
R25	>0.1	0.2	0.2	0%
R26	>0.1	0.2	0.2	0%
R27	>0.1	0.2	0.2	0%
R28	>0.1	0.2	0.2	0%
R29	>0.1	0.2	0.2	0%
R30	>0.1	0.2	0.2	0%
R31	0.1	0.2	0.3	3%
R32	0.1	0.2	0.3	3%
R33	0.1	0.2	0.3	3%
		APAC	**3**	



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