

Mulgrave Central Mill



REQUIREMENT 4: ENVIRONMENTAL REPORT

27 March 2023

Document History and Status

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Glossary

Term / Acronym	Meaning
AQMP	Air Quality Monitoring Program
AQO	Air quality objective
AS/NZS	Australian / New Zealand Standard
CO_2 / CO	Carbon dioxide / carbon monoxide
CQG	CQ Environmental Pty Ltd (trading as CQG Consulting)
DES	Department of Environment and Science
EA	Environmental authority
EE Notice	Notice to conduct or commission an environmental evaluation (DES Ref: STAT-E-100072540, dated 9 June 2021) – refer to Appendix A of the AQMP in **Appendix A**.
Ektimo	Ektimo Pty Ltd (ABN 86 600 381 413)
EnvironData	EnvironData Weather Stations Pty Ltd (ABN 77 131 757 125)
ERA	Environmentally relevant activity
Katestone	Katestone Environmental Pty Ltd (ABN 92 097 270 276)
LVAS	Low volume air sampler
MCM	Mulgrave Central Mill Company Pty Ltd
NATA	National Association of Testing Authorities
NPI	National Pollutant Inventory
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
O_2	Oxygen
OPC	Optical particle counter
PM	Particulate matter
$PM_{2.5}$	Particulate matter with an equivalent aerodynamic diameter of 2.5 micrometres or less

Term / Acronym	Meaning
PM_{10}	Particulate matter with an equivalent aerodynamic diameter of 10 micrometres or less
PSA	Particle size analysis
SO_2	Sulfur dioxide
SQP	Suitably qualified person, is defined as a person or persons who has demonstrated professional qualifications, training, skills or experience relevant to performing the function.
SRI	Sugar Research Institute (Sugar Research Limited – ABN 17 009 666 899)
t	Tonnes
TAPM	The Air Pollution Model
TPM	Total particulate matter

1. Introduction

The Mulgrave Central Mill Company Pty Ltd (MCM), owns and operates the Mulgrave Sugar Mill (the Mill), located at 47 Gordon Street in Gordonvale, approximately 20 km south of Cairns. The Mill receives and crushes sugar cane, processes the extracted juice to produce sugar, and burns the residual fibrous product (bagasse) to generate steam for factory use and electricity. The operation is permitted in accordance with environmental authority EPPR00390613 (EA) for environmentally relevant activity (ERA) 28: Sugar milling or refining – crushing or grinding 200 tonnes (t) or more of sugar cane in a year or manufacturing 200 t or more of sugar or other sugarcane products in a year.

Following the receipt of reports from community members of smoke nuisance and offensive odour in June 2020, the Department of Environment and Science (DES) issued MCM with a Notice to conduct or commission an environmental evaluation (EE Notice) on 9 June 2021.

The Mill operates from June to November each year, known as "the crush season". During normal operations, the four available boilers (No. 2, 5, 6 and 7) are fuelled by bagasse. However, on start-up and during breakdown events, MCM supplements this with oil in boiler No. 6 and 7 (suspension-type boilers) as permitted by EA condition B6. These boilers are fitted with a Hosokawa Micron Mikro-Vale wet scrubber to minimise particulate emissions. The other boilers are smaller Beta boilers that are not used at all times and do not burn oil. These are connected into the No. 6 boiler wet scrubber.

A Sugar Research Institute (SRI) assessment conducted in July 2020 indicated nuisance emissions from No. 6 and 7 boilers were primarily caused by the air to fuel ratio to one or more of the boilers being too low (visible smoke emissions from the boiler house stack) and oil firing (odour). MCM made significant progress toward addressing SRI recommendations to improve boiler performance prior to the 2021 crush seasons. In particular, oil use has reduced significantly over this time (from 1143 t and 952 t in 2019 and 2020 to 474 t and 411 t in 2021 and 2022), with its use now largely restricted to non-normal operating conditions where the safe operation of the boiler would otherwise be compromised.

2. EE Notice Requirements

The EE Notice listed a series of requirements for MCM to fulfill. These requirements and a summary response against each, with a reference to where detailed information is presented in this Environmental Report, are provided in **Table 2.1**.

Table 2.1: EE Notice Requirements Summary Response

Requirement	Response
Requirement 1	
By 12 April 2021, you must develop an Air Quality Monitoring Program (AQMP) to investigate potential environmental nuisance associated with air emissions from MCM and submit a copy to the department for review. You must have due regard and consideration for any comments made by the department in relation to the documents submitted.	A Draft AQMP was submitted to DES for review on 12 April 2021. MCM received formal feedback from DES on 18 May 2021, 15 June 2021 and 6 July 2021, which were considered in the Final AQMP submitted to DES dated 9 July 2021 (refer to **Appendix A**).
Requirement 2 – the AQMP must:	
a) Be prepared by a suitably qualified person (SQP);	The AQMP was prepared by MCM, SRI and CQG Consulting (CQG) with peer review by air quality specialists, Katestone Environmental Pty Ltd (Katestone). These organisations were

Requirement	Response
	also involved in the implementation of the AQMP (refer to Requirement 3), in addition to EnvironData Weather Stations Pty Ltd (EnvironData) for site-specific weather information and Ektimo Pty Ltd (Ektimo) for stack monitoring. Refer to **Section 3** and **Appendix B**.
b) Include monitoring of both point source air emissions from MCM and ambient air quality, having consideration of sensitive receptors and meteorological variables;	Monitoring of stack emissions (point source) and ambient air quality (particulate matter (PM)) was conducted. Sensitive receptors and meteorological variables were considered in the siting of the ambient monitoring equipment and associated results, and through air dispersion modelling of stack emissions. Refer to **Section 4** and **Section 5**.
c) Account for variation in fuel types used during start-up and operation of MCM, as well as planned changes to fuel inputs over the 2021 and 2022 crushing seasons;	Bagasse is the predominant fuel used in the boilers during normal operations (refer to **Section 1**) and was used during all stack monitoring rounds. However, oil was added to the fuel mix for the purpose of monitoring heavy metal emissions from the stack. The ambient air quality program was conducted during both bagasse only and bagasse and oil use in boilers. Refer to **Section 4** and **Section 5**.
d) Identify contaminants to be monitored with consideration of reported sugar mill combustion by-products, planned fuel inputs, and applicable environmental and health based guidelines and standards;	Contaminants to be monitored through the stack and ambient air programs were recommended by the preliminary dispersion modelling assessment (refer to response to 2b and c).
e) Include a timeline for implementation of the monitoring program over 2021 and 2022 crushing seasons identifying key milestones and duration of monitoring periods;	The proposed monitoring schedule was included in Appendix J of the AQMP (refer to **Appendix A**). Actual implementation details (including monitoring timeframes) are discussed in **Section 4**, **Section 5** and **Section 6**.
f) Be conducted in accordance with relevant Australian or International standards, or other method/s identified and demonstrated as being appropriate for assessment against applicable environmental and health based guidelines and standards;	Monitoring was conducted in accordance with relevant standards with results compared against applicable air quality objectives (AQOs) Refer to **Section 4** and **Section 5**.
g) Ensure all analysis required is carried out by a laboratory that has National	Three rounds of stack monitoring were conducted by Ektimo, a NATA accredited air monitoring provider. Two rounds of stack

Requirement	Response
Association of Testing Authorities (NATA) accreditation, or an equivalent certification, for such analysis;	monitoring were conducted by SRI identified by DES as an acceptable body to carry out air emission testing on Queensland sugar mills. Analysis of stack and ambient air samples were conducted by NATA accredited laboratories, unless otherwise specified. Refer to **Section 3** and **Section 4**.
h) Include an analysis and review of monitoring results against applicable environmental and health based guidelines and standards;	An assessment has been conducted against applicable standards as per the response to f).
i) Include record keeping of the following information, where applicable, on a daily basis during, and for a 14 day period prior to and following any monitoring: i. boiler throughputs; ii. the type, volume, composition, and supplier of fuel/s burned; iii. any operational or equipment factors, including incidents, maintenance and modifications, that may influence air emissions from the MCM; iv. any community reports of environmental nuisance received and the subsequent response, as per Condition H15 of Environmental Authority EPPR00390613; and v. visual estimates of smoke darkness (density), as per Condition B1 (d) of Environmental Authority EPPR00390613.	These records are provided in **Appendix C**.
Requirement 3	
The Air Quality Monitoring Program must be implemented by a suitably qualified person during the 2021 and 2022 crushing seasons and must commence after receipt of the department's comments, if any, with regards to documents submitted under Requirement 1.	Refer to response to Requirement 2(a) and **Section 3**. Note the respective crushing seasons occurred over the following dates: • 2021 – 15 June to 12 November; and • 2022 – 14 June to 18 November.
Requirement 4	
By **30 January 2023**, you must submit the Environmental Report, including results and interpretation of the Air Quality Monitoring Program, to the department.	This document fulfills this requirement.

Following the submission of the Environmental Report as per Requirement 4 in **Table 2.1**, DES issued MCM with a Notice for further information on 13 February 2023.

This Notice and the summary of responses to it detailed within this updated version of the Environmental Report are included in **Appendix D**. The revised report based on this Notice must be submitted to DES on 27 March 2023.

3. Suitably qualified persons

A team of SQPs were involved with implementation of the AQMP, detailed in this section by organisation. Further details of individual SQPs involved are available as noted in **Appendix B**.

3.1 MCM

The MCM Safety and Environmental Technician was responsible for the following:

- Accessing sites for equipment installation;
- Ongoing operational monitoring and retaining associated records (refer to **Appendix C**);
- Collection of ambient samples from low volume air sampler (LVAS) for analysis of the PM weight by a NATA accredited laboratory (SGS Australia Pty Ltd, accreditation number 2562) and provision of LVAS air volume information for the 24-hour exposure period to enable comparison against AQOs; and
- In-field maintenance, calibration and trouble-shooting related to ambient monitoring equipment.

3.2 CQG

CQG was engaged to conduct the following:

- Provision of general environmental advice related to the EE Notice;
- Ambient air monitoring set-up (LVAS and optical particle counter (OPC)) and provision of training and on-going support to MCM Safety and Environmental Technician in relation to sample collection, and review / reporting of results; and
- Preparation of the Environmental Report for review, approval and issue by MCM.

3.3 Ektimo

Ektimo conducted the following stack monitoring rounds:

- 14 September 2021;
- 26 July 2022; and
- 27 September 2022.

Analysis was conducted as follows:

- Total (gaseous and particulate) metals – Envirolab NATA accreditation number 2901;
- Particle size analysis (PSA) – Method 201A was not performed in the field due to the high level of free moisture in the stack, rather a laser diffraction method was conducted by HRL Technology or Ektimo (not covered by NATA accreditation); and
- Otherwise – Ektimo NATA accreditation number 14601.

3.4 SRI

SRI conducted the following stack monitoring rounds:

- 21 September 2021; and
- 5 November 2021.

SRI is not NATA accredited, however, has been identified by DES as an acceptable body to carry out air emission testing on Queensland sugar mills (refer to **Appendix A**).

PSA was not performed in the field as per Ektimo stack monitoring rounds (refer to **Section 3.3**), rather samples were collected and analysed by Particle and Surface Sciences Pty Ltd via a laser in conjunction with a charge-coupled device.

3.5 EnvironData

EnvironData was engaged to install and service a weather station that provided real-time weather data.

3.6 Katestone

Katestone was engaged to provide general technical advice, conduct air dispersion modelling, and detailed analysis of the monitoring data collected and peer review of this Environmental Report.

4. Methodology

4.1 Weather station

A Weather Maestro weather station was selected to meet the requirements of the *Australian / New Zealand Standard (AS/NZS) 3580.14:2014 - Methods for sampling and analysis of ambient air: Meteorological monitoring for ambient air quality monitoring applications*. The weather station recorded air temperature, wind speed, wind direction, rainfall, relative humidity and barometric pressure with a secure flash memory for more than one year of data including ten minute, hourly and daily summaries.

The weather station installation location was reviewed against AS/NZS 3580.14:2014 and Bureau of Meteorology Observation Specification No: 2013.1: Guidelines for the Siting and Exposure of Meteorological Instruments and Observing Facilities. Consideration was also given to the Mill boundaries, safe access and minimising environmental impact.

The weather station was installed and commissioned by EnvironData on 23 June 2021, who certified that installation was completed to AS/NZS 3580.14:2018 as far as practicably allowed for by site conditions as detailed in their report provided at **Appendix E**.

Sensor calibration certificates for the weather station sensors are also provided at **Appendix E**. It is noted that the:

- The barometric pressure sensor failed soon after installation, with a replacement barometer and calibration certificate provided on 15 July 2021; and
- The 6-monthly weather station calibration was delayed (due December 2021 / conducted March 2022) as a result of COVID restrictions and resourcing issues, as well as site operational constraints due to wet weather. However, the 12-monthly calibration was conducted in June 2022.

The 1 October 2021 to 30 September 2022 dataset was used to inform the final air dispersion modelling output which requires 12-months of site-specific meteorological data (refer to **Section 4.2**). Elevated ambient air monitoring results were also reviewed against available site-specific weather data available (refer to **Section 4.4**).

4.2 Air dispersion modelling

The Air Pollution Model (TAPM) developed by CSIRO Atmospheric Research was used to conduct air dispersion modelling. This is a prognostic meteorological model that uses synoptic meteorological data to characterise conditions at a site. TAPM provides a reliable representation of meteorological conditions at a site without site-specific meteorological observations, while also allowing for assimilation of site-specific meteorological observations.

Preliminary air dispersion modelling inputs included potential air contaminants of concern based on MCM National Pollutant Inventory (NPI) data, historic biannual stack monitoring results for particulates, fuel oil specification, NPI emission estimation technique manuals, operational records of bagasse and fuel oil feed rates, local terrain features and existing levels of air pollutants. Several years of meteorological data available from Cairns Racecourse (Station Ref: 031222), located approximately 17 km north of the mill, provided an initial evaluation of the meteorological dataset generated by TAPM.

The modelling was used to determine the potential risk of each contaminant during two routine operating scenarios (i.e., 1. bagasse only use in boilers and 2. combined bagasse and oil use) by comparison of ground-level concentrations against the relevant AQO's (refer to **Section 4.6**). Contaminants identified to be low risk based on dispersion modelling results and / or combustion processes and planned fuel inputs were not included in the stack or ambient air monitoring plan.

The model also ran a sensitivity analysis to identify where peak plume impacts are likely to occur under an upset condition scenario, as changes in emission rates are not readily quantifiable for such events. This information was also used to inform the siting of ambient air monitoring equipment.

Results were reviewed following the 2021 stack monitoring rounds. Although some of the monitored stack concentrations were higher than assumed in the modelling (in particular NOx and CO), predicted ambient concentrations scaled using the emission concentrations were still well below the respective AQOs so no additional modelling was undertaken at this time.

The preliminary air dispersion modelling was refined for the two routine operating scenarios following the completion of the five rounds of stack monitoring, using the maximum emission concentrations across the rounds (refer to **Section 4.3**), 12-months of site-specific weather data (refer to **Section 4.1**) and maximum sulphur content from the current fuel supplier applied to the bagasse and oil use scenario. To determine cumulative concentrations three (for PM particles less than 10 µm and 2.5 µm, i.e., PM_{10} and $PM_{2.5}$, excluding 2019) or four (for nitrogen dioxide (NO_2) and sulfur dioxide (SO_2)) years of data from the Townsville North Ward monitoring station were analysed and the 70th percentile concentrations applied as representative background concentrations. This is compared to two years of data (including 2019 data for PM_{10} and $PM_{2.5}$) at the 75th percentile applied for the preliminary air dispersion model, noting Katestone indicated:

- The North Ward location is expected to be influenced to a greater degree by major roads and industrial activities and provide a conservative overestimate of ambient background concentrations in Gordonvale;
- 2019 PM data was not used in the final air dispersion model as DES reported unusually high concentrations for the year, with all exceedances due to dust storms and bushfires in the region; and
- The standard approach to background assessment is to use the 70th percentile, thus this was used for a more robust final assessment in place of the 75th percentile concentrations that are more readily extractable from the Queensland Government's annual air monitoring reports.

Otherwise, assumptions have remained the same from the preliminary air dispersion model.

The upset condition results presented in the preliminary air dispersion model were identified as still valid and it was not considered necessary to revisit these in the final air dispersion modelling report, although the modelling of upset conditions is discussed further in **Section 6.3.4**.

Refer to the preliminary and final air dispersion modelling reports at **Appendix F** for full details. Comparison of modelled particulate concentrations to those measured is provided in **Section 6.3**.

4.3 Stack monitoring

It is not possible to conduct stack monitoring during start-up or upset conditions because steady-state conditions, which are a pre-requisite to stack emissions monitoring, are not present. Stack emissions monitoring conducted reflected normal operations of the Mill only.

Based on the preliminary air dispersion modelling results, the following indicators were identified as necessary to include in the stack monitoring campaign:

- NO_2 – modelled up to 18% of the AQO;
- SO_2 – modelled up to 42% of the AQO;
- PM_{10} – modelled up to 43% of the AQO;
- $PM_{2.5}$ – modelled up to 49% of the AQO; and
- Cadmium and nickel – modelled up to 58% and 14% of the AQO, respectively.

Five stack monitoring rounds were conducted across the AQMP; three by Ektimo (refer to **Section 3.3**) and two by SRI (refer to **Section 3.4**). The methods employed by each are discussed in the following sections.

Results were used in air dispersion modelling (refer to **Section 4.2**) to enable comparison with AQOs, with raw results compared to available EA limits (refer to **Section 4.6**).

4.3.1 Ektimo method

Over three rounds, Ektimo reported flow rate, temperature, velocity, moisture, carbon dioxide (CO_2), oxygen (O_2), carbon monoxide (CO), nitrogen oxides (NOx), SO_2, total PM (TPM), PSA and total (gaseous and particulate) metals (cadmium, chromium, lead and nickel) emissions from the Mill stack.

TPM was sampled and analysed in accordance with *AS 4323.2:1995 Stationary source emissions Determination of total particulate matter - Isokinetic manual sampling - Gravimetric method.* Otherwise sampling and / or analysis was conducted in accordance with the relevant USEPA Method and NATA accreditation requirements, with the following exceptions:

- Sampling points – conducted in accordance with USEPA Method 1 given *AS 4323.1:2021 Stationary source emissions: Selection of sampling positions and measurement of velocity in stacks* was first published in 1995 and the Mill pre-dates this (i.e. constructed in 1973). Ektimo further note that the sample plane does not meet requirements of USEPA Method 1 in relation to the minimum distance from disturbance, with additional points sampled in the July 2022 and September 2022 stack monitoring rounds to compensate for this as allowed for by USEPA Method 1; and
- PSA – analysed using a laser diffraction method as discussed in **Section 3.3**.

Stack monitoring was undertaken whilst boilers were in standard operation (i.e. using bagasse fuel). Oil was only added to the fuel mix for the purpose of monitoring heavy metal emissions from the stack.

Refer to the Ektimo reports at **Appendix G** for full details.

4.3.2 SRI method

Over two rounds, SRI reported flow rate, temperature, velocity, moisture, CO_2, O_2 and TPM from the Mill stack. These tests were conducted in accordance with AS 4323.2:1995.

During the 21 September 2021 round SRI also reported CO, NOx, SO_2 and PSA. SRI confirmed in an email dated 21 October 2021 that gas sampling was conducted using a calibrated gas analyser in accordance with the relevant USEPA Method. PSA was analysed using a laser in conjunction with a charge-coupled device method as discussed in **Section 3.4**.

Stack monitoring was undertaken whilst boilers were in standard operation (i.e. using bagasse fuel).

Refer to the SRI reports at **Appendix H** for full details.

4.4 Ambient air monitoring

The preliminary air dispersion modelling recommended that the ambient monitoring program should include one centrally located monitoring station (with Gordonvale Turf Club being one example location specifically mentioned), focusing on $PM_{2.5}$.

Feedback received by DES on the AQMP (refer to Requirement 1 of **Table 2.1**) identified that both PM_{10} and $PM_{2.5}$ were of interest to them, as well as sensitive receptors to the north of the stack.

Results were compared to PM AQOs (refer to **Section 4.6**).

Refer to the CQG report at **Appendix I** for full details.

4.4.1 Low volume air sampler (LVAS)

The LVAS installation was reviewed against *AS/NZS 3580.1.1:2016 - Methods for sampling and analysis of ambient air Guide to siting air monitoring equipment*. Consideration was also given to the preliminary air dispersion modelling, site-specific weather data, safe access and minimising environmental impact / vandalism. The LVAS was installed in accordance with AS/NZS 3580.1.1:2016 as far as practicably allowed for by site conditions as detailed in the report provided at **Appendix I** at the following downwind receptors:

- Location 1: Gordonvale Turf Club – 27 April to 6 September 2022; and
- Location 2: North of the Mill – 7 September to 28 November 2022.

These periods covered baseline conditions (prior to and following the 2022 crush season), steam trials, start-up, full crush season (including two routine operating scenarios and upset periods) and boil out.

PM_{10} and $PM_{2.5}$ was sampled at a frequency of 1 day in 3 in an alternating sequence using the same sampler (i.e. alternating the PM_{10} and $PM_{2.5}$ size selective inlets). This frequency was increased to 1 day in 2 for operations of particular interest (i.e. steam trial and the start-up week). Pre-weighed filters provided by the NATA accredited laboratory (refer to **Section 3.1**) were used and returned for analysis of the PM fraction relevant to the size selective inlet used during the 24-hour exposure period, with the corrected volume of air as displayed on the LVAS display screen provided to enable calculation of the average concentration in air from the weighed result, for comparison against the AQO (refer to **Section 4.6**).

Monitoring was undertaken in accordance with:

- AS/NZS 3580.9.10:2017 – Methods for sampling and analysis of ambient air: Determination of suspended particulate matter – PM2.5 low volume sampler – gravimetric method; and
- AS/NZS 3580.9.9:2017 – Methods for sampling and analysis of ambient air: Determination of suspended particulate matter – PM10 low volume sampler – gravimetric method.

Following submission of Revision 2 of this report on 30 January 2023, DES requested further information to justify the siting of equipment at Location 1 (Requirement 2 of DES RFI, dated 13 February 2023, refer to **Appendix D**).

The monitoring locations were chosen balancing the requirements of the Australian Standard with issues of site access, security and the concerns and constraints of the landowners. As noted in the Australian Standard, ideal sites that satisfy all criteria are “rarely achieved”. Katestone’s opinion is that the non-conformities with the Australian Standard do not cause the data or conclusions of the monitoring program regarding the Mill to be invalid (refer to **Appendix I** for further detailed assessment of the siting of this equipment).

4.4.2 Optical particle counter (OPC)

Two OPCs, capable of recording two PM fractions (i.e. PM_{10} and $PM_{2.5}$) concurrently at one-minute intervals with 24-hour rolling averages, were set up at Location 1 and 2 as described in **Section 4.4.1** from 26 May to 28 November 2022.

This equipment was used to inform LVAS results (refer to **Section 4.4.1**) in association with operating information and meteorological station monitoring data (refer to **Section 4.1**).

This equipment remained in place for the duration of the 2022 crush season to cover potential upset events (refer to **Section 4.5**).

Technical issues were encountered during the program with batteries and / or solar panels on the OPCs resulting in some loss of data, in addition to more significant data losses i.e. three months of data (28 June to 28 September 2022) reported at ER0120007 (Location 1, including for dates of interest based on LVAS results i.e., 24 and 30 July 2022) subject to a tubing obstruction and nine

days of data (20 to 29 November 2022) reported at 0519SDS-018-DX (Location 1) resulting from equipment malfunction.

In the experience of Katestone and CQG such data losses are very difficult to avoid despite careful planning and execution of a monitoring program. Whilst these data losses are unfortunate, useful data was collected through the monitoring program that allows reliable conclusions to be drawn despite data loss having occurred as discussed in **Section 6.2** and **Appendix I.**

4.5 Upset condition monitoring

As noted in **Section 4.3**, it is not possible to conduct stack monitoring during start-up or upset conditions as non-steady state conditions will exist in the stack. Alternative methods used to identify and evaluate potential impacts from such events were as follows:

- Continuous in-house boiler oxygen monitoring to report non-optimal performance conditions i.e. a low air to fuel ratio in one or more of the boilers is a precursor to the generation of visible smoke emissions from the boiler house stack. Oxygen analysers are part of the automated control strategy and oxygen concentrations are continuously monitored, with an audible console alarm activated when oxygen levels fall below 1% requiring operator attention; and
- Where an oxygen alarm was activated, this was recorded (refer to **Appendix C**) with the following other measurements available to evaluate the potential impact at a sensitive receptor:
    - stack camera footage of smoke emissions;
    - ambient monitoring results (refer to **Section 4.4**); and
    - site-specific meteorological data (refer to **Section 4.1**).

Refer to **Section 6** for further discussions related to monitoring results of significance, and details of upset conditions where relevant.

4.6 Air quality objectives (AQOs)

Results of the air dispersion modelling (refer to **Section 4.2**) and ambient air monitoring (refer to **Section 4.4**) are compared against relevant ambient AQOs as summarised in **Table 4.1**.

Table 4.1: AQOs for contaminants relevant to AQMP

Contaminant	Environmental value	Averaging period	AQO (µg/m^3)
NO_2	Health and wellbeing	1-hour	250
		1-year	62
SO_2	Health and wellbeing	1-hour	570
		24-hour	229
		1-year	57
CO	Health and wellbeing	8-hour	11,000
PM_{10}	Health and wellbeing	24-hour	50
		1-year	25

Contaminant	Environmental value	Averaging period	AQO (µg/m^3)
$PM_{2.5}$	Health and wellbeing	24-hour	25
		1-year	8
Cadmium	Health and wellbeing	1-year	0.005
Chromium	Health and wellbeing	24-hour	0.5
Lead	Health and wellbeing	1-year	0.5
Nickel	Health and wellbeing	1-year	0.022
NOTE: AQOs are derived from the *Environmental Protection (Air) Policy 2019* with the exception of chromium which was sourced from the Ontario Ministry of the Environment, Conservation and Parks (May 2020) *Ambient Air Quality Criteria.*			

Results of the stack monitoring (refer to **Section 4.3**) were used in the air dispersion modelling (refer to **Section 4.2**) to enable comparisons with AQOs as described above, and were also compared against EA condition B1 air emission release criteria as presented in **Table 4.2**.

Table 4.2: EA condition B1 air emission release criteria

Parameter	Release criteria	Type
Exit velocity	12 m/s	Minimum
TPM	250 mg/m^3 (1)	Maximum
NOTE: 1. The release criteria does not apply to the one hour period immediately after start-up of a boiler (including a restart after power failure) or a 30 minute period immediately after change of fuel or an abnormal feed condition, in which case the smoke density must not exceed Ringelmann 3 (these results are reported in **Appendix C**).		

5. Results

5.1 Stack monitoring

The cumulative stack monitoring results reported across the AQMP are summarised in **Table 5.1**.

Table 5.1: Stack monitoring results summary

Parameter	Units	Ektimo results			SRI results	
		14/09/2021	26/07/2022	27/09/2022	21/09/2021	5/11/2021
Exit velocity	m/s	14.0	13.0	13.0	12.2	13.2
Diameter	M	4.4	4.4	4.4	4.4	4.4
Exhaust temperature	°C	94	90	85	95	96
Volume flow (actual)	m^3/s	216.7	200.0	183.3	185.5	200.8
CO	g/s	113.3	118.3	73.3	116.4	291.7
NOx	g/s	36.7	30.0	45.0	19.3	11.4
SO2	g/s	0.7	6.0	1.3	0.0	0.0
TPM	g/s	9.3	8.3	4.0	6.1	13.7
	mg/m^3	81	83	39	71	123
PM_{10}#	g/s	8.2	7.5	3.8	N/A	6.7
$PM_{2.5}$#	g/s	4.0	3.8	2.0	N/A	2.4
Cadmium	g/s	0.0002	0.00008	<0.0001	N/A	N/A
Chromium	g/s	0.00042	0.00052	0.00047	N/A	N/A
Lead	g/s	0.0023	0.0105	0.0045	N/A	N/A
Nickel	g/s	0.0045	0.0013	0.0012	N/A	N/A

NOTE:

Bagasse was the fuel used across all stack monitoring rounds, with the exception of metals sample collection conducted by Ektimo where oil was added to the fuel mix (refer to **Section 4.3**).

Any number in red = maximum concentrations assumed in the final air dispersion model. Noting that for the bagasse and oil emissions scenario, CO, NOx, SO_2, PM_{10} and $PM_{2.5}$ mass emissions were scaled down to 68% to account for reduced for bagasse use in this scenario, with additional emissions added to account for the combustion of oil (NPI emission factor for CO, NOx, PM_{10} and $PM_{2.5}$, and mass balance assuming all sulfur from the highest concentration fuel specification converts to SO_2 which is highly conservative). The exit velocity of 12 m/s and temperature of 75°C was retained from the preliminary air dispersion model assumptions to represent worst case conditions.

PSA method (refer to **Section 3.3** and **Section 3.4**)

Refer to further discussion at **Section 6** and the Ektimo and SRI stack monitoring reports at **Appendix G** and **Appendix H** respectively for full details.

5.2 Ambient air

5.2.1 LVAS

In total 72 LVAS samples were collected, analysed and compared with the AQO in the 2022 crush season across two PM fractions. **Table 5.2** summarises the number of samples by the Mill operating status.

Table 5.2: Breakdown of LVAS PM sample numbers collected across the 2022 crush season

Location	Baseline[1]	Start-up / shut-down[2]	Crush	
			Bagasse only[3]	Bagasse and oil[4]
Location 1	PM_{10} – 8[5] $PM_{2.5}$ – 8	PM_{10} – 1 $PM_{2.5}$ – 2	PM_{10} – 10 $PM_{2.5}$ – 5	PM_{10} – 7 $PM_{2.5}$ – 9[5]
Location 2	PM_{10} – 2 $PM_{2.5}$ – 1	PM_{10} – 0 $PM_{2.5}$ – 1	PM_{10} – 2 $PM_{2.5}$ – 1	PM_{10} – 7 $PM_{2.5}$ – 8

NOTE:

1. Baseline samples were collected before the season commenced at Location 1, with those at Location 2 collected after the season (the Mill boil out) was completed. Shut-down days due to wet-weather where no fuel was identified as burnt (i.e. 3 and 6 July 2022, refer to **Appendix C**) are also included in these baseline numbers.
2. The Mill start-up occurred on 14 June 2022 with one $PM_{2.5}$ sample collected on this day, one of each PM fraction was collected during the earlier steam trial on 31 May 2022 (burning timber) and 2 June 2022 (bagasse) – these three samples were collected at Location 1. Shut-down (boil out) occurred on 18 November 2022 with one $PM_{2.5}$ sample collected at Location 2 on this day. Note the 9 July 2022 boiler restart following an extended wet-weather shutdown is included in "crush" rather than these numbers, noting Location 1 (PM_{10} sampling occurring at this time) was not downwind of the Mill during the identified upset period (refer to **Section 5.2.2**).
3. Bagasse was generally identified as used under normal operations – only two occasions indicated potential upset conditions (i.e. maintenance stop on 11 August 2022 and cane supply issues on 15 November 2022, refer to **Appendix C**).
4. The use of bagasse and oil was more commonly associated with upset conditions, with over 50% of instances identifying wet weather, maintenance stop and / or cane supply issues (refer to **Appendix C**).
5. One additional sample for these types was collected but not able to be compared against the AQO on these occasions given the LVAS pump did not start due to battery wiring error (i.e. 16 May and 5 August 2022, refer to **Appendix I**).

None of the low volume samples reported PM_{10} above the AQO, however, two $PM_{2.5}$ samples at Location 1 did as follows:

- 24 July 2022 – 40 µg/m^3 (bagasse and oil); and
- 30 July 2022 – 60 µg/m^3 (bagasse only).

Refer to further discussion at **Section 6** and the CQG PM monitoring report at **Appendix I** for full details.

5.2.2 OPC

The 24-hour average concentrations of PM_{10} and $PM_{2.5}$ were below the AQOs (50 µg/m^3 and 25 µg/m^3, respectively) on every day at both OPC monitoring locations, except for at Location 2 on 9 July 2022 ($PM_{2.5}$ at 42 µg/m^3 and PM_{10} at 64 µg/m^3).

It is noted that some gaps were reported in the OPC dataset as identified in **Section 4.4.2**.

Refer to further discussion at **Section 6** and the CQG PM monitoring report at **Appendix I** for full details.

5.3 Upset condition monitoring

Non-normal conditions were recorded and investigated as required throughout the 2021 and 2022 crush seasons. It is noted that MCM reported no complaints related to stack emissions during the 2021 or 2022 crush seasons (refer to **Appendix C**).

Ambient monitoring undertaken during upset conditions is further discussed in **Section 6**.

5.4 Final air dispersion modelling

Based on the assumptions summarised in **Section 4.2** (which are conservative) the modelled contribution of the Mill to ambient air emissions in isolation and cumulatively with other potential sources is presented in **Table 5.3** and **Table 5.4,** respectively.

Table 5.3: Predicted maximum concentrations in Gordonvale from the Mill in isolation

Pollutant	Averaging period	AQO (µg/m^3)	Bagasse only		Bagasse and oil[1]	
			µg/m^3	% of AQO	µg/m^3	% of AQO
NO_2	1-hour	250	77.3	31	63.4	25
	1-year[2]	62	1.3	2	1.0	2
SO_2	1-hour	570	34.4	6	162.3	28
	24-hour	230	5.6	2	26.5	12
	1-year[2]	57	0.6	1	2.7	5
CO	8-hour	11,000	663.5	6	454.9	4
PM_{10}	24-hour	50	7.6	15	21.0	42
	1-year[2]	25	0.8	3	2.1	8
$PM_{2.5}$	24-hour	25	3.7	15	11.5	46
	1-year[2]	8	0.4	5	1.2	14
Cadmium	1-year[2]	0.005	N/A[3]	N/A[3]	0.00002	0.3
Chromium	24-hour	0.5	N/A[3]	N/A[3]	0.0005	0.1

Pollutant	Averaging period	AQO (µg/m^3)	Bagasse only		Bagasse and oil[1]	
			µg/m^3	% of AQO	µg/m^3	% of AQO
Lead	1-year[2]	0.5	N/A[3]	N/A[3]	0.0010	0.2
Nickel	1-year[2]	0.02	N/A[3]	N/A[3]	0.0004	2

NOTE:

1. Bagasse and fuel oil co-firing occurs infrequently and for short periods and, consequently, these results represent a conservative overestimate.
2. Annual average concentrations have assumed the Mill operates for six months of the year, i.e. annual mean model outputs assuming continuous operation throughout the year have been halved.
3. These pollutants are emitted due to combustion of waste oil only.

Table 5.4: Predicted maximum cumulative concentrations in Gordonvale

Pollutant	Averaging period	AQO (µg/m^3)	Bagasse only		Bagasse and oil[1]	
			µg/m^3	% of AQO	µg/m^3	% of AQO
NO_2	1-hour	250	83.5	33	69.6	28
	1-year[2]	62	6.6	11	6.4	10
SO_2	1-hour	570	37.2	7	165.1	29
	24-hour	230	7.8	3	28.7	12
	1-year[2]	57	2.0	4	4.2	7
PM_{10}	24-hour	50	25.9	52	39.3	79
	1-year[2]	25	16.9	68	18.3	73
$PM_{2.5}$	24-hour	25	10.3	41	18.0	72
	1-year[2]	8	6.2	78	7.0	88

NOTE:

1. Bagasse and fuel oil co-firing occurs infrequently and for short periods and, consequently, these results represent a conservative overestimate.
2. Annual average concentrations have assumed the Mill operates for six months of the year, i.e. annual mean model outputs assuming continuous operation throughout the year have been halved.

6. Discussion

6.1 Stack monitoring

All five stack monitoring rounds conducted in 2021 and 2022 reported results within the EA air emission release criteria (refer to **Section 4.6** and **Section 5.1**). The stack monitoring results also indicated that approximately 50% of PM_{10} emissions from the Mill are within the $PM_{2.5}$ fraction.

Air dispersion modelling conducted based on stack monitoring results did not indicate that emissions from the Mill (either in isolation or considering cumulative sources) would result in exceedances of relevant ambient AQOs. The following pollutants and averaging periods provide the worst-case impacts from the MCM stack in terms of the proportion of the relevant AQO for the two routine operating scenarios modelled for the Mill in isolation:

- Scenario 1 (bagasse only): 1-hour average concentrations of NO_2 – 31% of the AQO. Other pollutants ranged between 1% and 15% of the AQO; and
- Scenario 2 (bagasse and oil): 24-hour average concentrations of $PM_{2.5}$ – 46% of the AQO. Other pollutants ranged between 0.1% and 42% of the AQO.

The $PM_{2.5}$ annual average concentration presents the worst-case modelled impact in consideration of cumulative concentrations based on the Mill results discussed above added to measured ambient concentrations from the DES ambient air quality monitoring station at Townsville's North Ward for both scenarios i.e., 78% and 88% for Scenario 1 and 2, respectively. It is noted that for emissions from the Mill alone these numbers are significantly less at 5% and 14% respectively. Maximum modelled annual average $PM_{2.5}$ concentrations occurred in the vicinity of the ambient air monitoring Location 1.

Further to this, the model applied the following assumptions:

- Lower temperature and exit velocity (12 m/s and 75^{o}C respectively) compared to those measured (lowest stack monitoring results 12.2 m/s and 85^{o}C respectively), resulting in modelling that is worst-case in terms of potential ground-level concentrations (i.e., a higher exit velocity and temperature results in greater initial vertical momentum and buoyancy, which will increase initial dispersion and reduce ground-level concentrations);
- The highest emission rates for all contaminants measured across the five stack monitoring rounds (refer to **Table 5.1**);
- For the bagasse and oil scenario, co-firing occurs infrequently and for short periods and, consequently, these results represent a conservative overestimate (i.e., assume continuous operation year-round for 1-hour and 24-hour averaging periods, and for six months of the year for annual averages); and
- For the estimation of cumulative concentrations, the North Ward monitoring station was identified as the most representative available monitoring station, however, it is likely to be influenced to a greater degree by major roads and industrial activities (including port operations and metals processing) than any location in Gordonvale.

6.2 Ambient air monitoring

One LVAS was installed for the extent of the 2022 crush season at the positions as described in **Section 4.4.1** i.e., during baseline conditions, steam trials, start-up, full crush season (including two routine operating scenarios and upset periods) and boil out.

None of the samples reported PM_{10} above the AQO, however, two $PM_{2.5}$ samples at Location 1 in July 2022 did as follows:

- 24 July 2022 – 40 µg/m^3 (fuel usage: approximately 0.14 tonnes and 3,234 tonnes of oil and bagasse respectively); and
- 30 July 2022 – 60 µg/m^3 (fuel usage: approximately 3,331 tonnes of bagasse).

The Mill was operating normally at these times, although several low oxygen indicator alarms were noted on 30 July 2022 (refer to **Appendix C**). Further discussion is provided below with detailed analysis in **Appendix I**.

Two OPCs were installed, one each at Location 1 and 2 across the 2022 crush season.

The 24-hour average concentrations of PM_{10} and $PM_{2.5}$ were below the AQOs (50 µg/m^3 and 25 µg/m^3, respectively) on every day at both OPC monitoring locations, except for Location 2 on 9 July 2022 ($PM_{2.5}$ at 42 µg/m^3 and PM_{10} at 64 µg/m^3).

No oxygen alarms were reported on this day (refer to **Appendix C**), but high concentrations under southerly winds in the hours between midnight and 9 am were the cause of the elevated 24-hour average concentrations measured, with the Mill considered the most likely source. Further discussion is provided below with detailed analysis provided in **Appendix I**.

6.2.1 OPC and LVAS data comparison

There does not appear to be an obvious correlation between the measurements made by the two different types of instruments, except perhaps that when low concentrations (<10 µg/m^3) are measured by the OPCs, concentrations measured by the LVAS also tend to be low.

6.2.2 Directional Analysis

6.2.2.1 Location 1

The highest average PM_{10} concentrations recorded by the OPC occurred under strong winds from the southeast, which is roughly the direction of the Mill stack, although contributions from the Mill might be expected to have more of an easterly component (Location 1 is at a bearing of 285 degrees from the Mill stack).

PM2.5 shows a similar trend from the southeast, but also demonstrates elevated concentrations under winds from the northwest. It is noted that concentrations measured by the OPC at Location 1 were not especially high, so while the Mill might be making a contribution under normal operating conditions, this contribution is small and would not cause an exceedance of the AQOs for particulates.

Upset conditions may lead to elevated concentrations of particulates, but it would appear unlikely that these would cause exceedances of the AQO at Location 1, even during start-up of the boilers.

Refer to **Section 6.2.3.1** for further information relating to the identified LVAS AQO exceedances on 24 and 30 July 2022.

6.2.2.2 Location 2

The highest average concentrations recorded by the OPC occurred under strong winds from the south, which is the direction of the Mill stack.

Based on the wind directions, it is likely that the elevated concentrations measured at Location 2 on the following dates relate to start-up of the Mill (refer to **Appendix C** operational records):

- 14 June 2022 from 3:00 to 8:00 and also likely at 10:00 (although the wind sensor was identified as offline for the 12-month service at this time);
- 9 July 2022 from 1:00 to 12:00;
- 1 September 2022 from 5:00 to 6:00 (noting that at 05:00 the vector averaged wind direction was just outside the 161-201° range, but that the 10-minute data for this hour suggest that Location 1 was within the downwind range for at least a third of this hour); and
- September 2022 from 1:00 to 2:00.

Some dates with start-ups did not coincide with elevated measured OPC concentrations – emissions may not have been especially high on these occasions and / or monitors may not have been downwind of the Mill stack, in which case an elevated measured concentration would not be expected. However, other factors may be the cause of other identified elevated emissions as follows:

- 13 June 2022 at 20:00 – the wind direction was not between 161-201° in any of the 10-minute periods making up this hour and concentrations at the Location 1 OPC were also relatively elevated, suggesting another source contributing to concentrations at both monitors. While a contribution from the Mill stack cannot be completely discounted due to the warming fires burning at this time and the relatively light winds measured, it is considered relatively unlikely that it contributed significantly. It is also possible that activities in the mill laydown yards adjacent to monitoring Location 2 (directly south) could have been the source of some of the PM_{10} that was measured;
- 13 July 2022 from 17:00 to 19:00 – operational records (**Appendix C**) identify a maintenance stop on this day between 12:00 and 17:30, and a harvester operating to the east of the Mill. While it cannot be said with absolute certainty, given the wind direction, it would seem likely that the cause of the elevated concentrations on this day would have been the harvester;
- 19 June 2022 at 17:00 – concentrations at the Location 2 OPC were not especially high and concentrations at the Location 1 OPC were relatively elevated, suggesting another source contributing to concentrations at both monitors, but given the wind direction and low wind speed, it is possible that the Mill made some contribution, but again this would have been small and not sufficient to trigger a potential 24-hour average AQO exceedance;
- 28 June 2022 at 0:00 – concentrations were higher than on 19 June 2022 at 17:00, but again concentrations at the Location 1 OPC were relatively elevated, suggesting another source contributing to concentrations at both monitors, and any contribution from the Mill stack would not have been sufficient to trigger a potential 24-hour average AQO exceedance;
- 4 October at 22:00 and 11 November 2022 at 20:00 – no upset conditions were reported on these days and wind direction was not recorded between 161-201° in any of the 10-minute periods in the hour of interest for each site; and
- 14 October 2022 at 0:00 – no upset conditions were recorded on 13 October 2022 between 11pm and midnight (i.e., 14/10/2022 0:00), and while the wind direction was only just outside the arc of influence (161-201°), concentrations in this hour were not especially high.

Based on the information presented above (and detailed in **Appendix I**), it would seem clear that it is only the start-ups from a cold, or relatively cool, boiler that have the potential to cause elevated PM_{10} and $PM_{2.5}$ emissions to the extent that ambient impacts are distinct in the OPC monitoring data. On the morning of 9 July 2022 1-hour average concentrations were high enough and prolonged enough to lead to 24-hour average concentrations above the AQOs. MCM advises that this exceedance of the AQOs may have resulted from atypical start-up conditions that were not experienced at any other time during the crushing season.

Refer to **Section 6.2.3.2** for further information relating to the OPC identified AQO exceedance on 9 July 2022.

6.2.3 AQO exceedances

6.2.3.1 24 and 30 July 2022 by LVAS

Location 1 LVAS 24-hour average $PM_{2.5}$ concentrations exceeded the AQO on 24 and 30 July 2022 (24-hour average concentrations of 40 $\mu g/m^3$ and 60 $\mu g/m^3$, respectively). No valid OPC data was available from Location 1 on these dates due to a tubing obstruction as discussed in **Section 4.4.2**.

The Location 2 OPC was operational on these dates; 1-hour average $PM_{2.5}$ concentrations were never especially high (concentrations did not exceed 7.6 µg/m^3 on 24 July 2022 or 8.6 µg/m^3 on 30 July 2022). The data from this unit have been reviewed for elevated concentrations when downwind of the Mill stack (wind directions between about 161-201°).

The Location 2 OPC was not sited directly downwind of the Mill stack on 24 July 2022, however, higher concentrations tended to align with winds closest to the "downwind" directions. Concentrations were still low though, at no more than 12.2 µg/m^3 for PM_{10} and 7.6 µg/m^3 for $PM_{2.5}$, suggesting that even if there was some contribution from the Mill on this day, it was small. It is not feasible to draw conclusions as to the cause of the elevated concentrations measured at the Location 1 LVAS on this day based on the Location 2 OPC data.

The Location 2 OPC would likely have been downwind of the Mill stack over some of the hours on 30 July 2023, but that concentrations were not especially elevated when it was. The two hours with the highest concentrations at the end of the day (6.3 µg/m^3 at 10-11pm and 8.6 µg/m^3 at 11pm-midnight) had wind directions of 148.8° and 113.0°, respectively. The way concentrations rose sharply as the wind changed from southerly to east-south-easterly would seem to suggest a source to the east or southeast of the monitor as the cause of elevated concentrations, rather than the Mill stack.

MCM advised that the oxygen alarm on Boiler #7 lasted for 10.5 minutes between 1:30 am and 1:40 am on 30 July 2022, with ten other alarms recorded (seven for less than one minute and three for less than 1.5 minutes) between the hours of 1:20 am to 4:45 am and 10:30 pm to 11:05 pm on the same date. The Location 2 OPC was only downwind of the Mill stack at the following coinciding times on 30 July 2022:

- Between 3 am to 4 am – concentrations at this time (3.9 µg/m3) and throughout the early hours of 30 July 2022, were very low (no higher than 4.8 µg/m3), suggesting very little contribution from the Mill stack at the times of the earlier oxygen alarms; and
- Between 8 pm and 10 pm, but not in the two hours at the end of the day with the highest concentrations. Analysis of 10-minute wind direction data shows that the monitor may have been downwind of the Mill stack for around ten minutes between 10:30 pm and 11:05 pm on 30 July 2022, but was not downwind between 11pm and midnight, when concentrations were highest. This suggests that it is very unlikely that emissions from the Mill stack contributed significantly to measured concentrations on the evening of 30 July 2022.

Location 1 was also not downwind of the Mill in the hours in which oxygen alarms occurred, so it is considered likely that this conclusion would also apply to measured concentrations at Location 1 on 30 July 2022.

It is most likely that elevated $PM_{2.5}$ concentration measured by the Location 1 LVAS on this day were a result of a source relatively close to the monitor. This cannot be confirmed, but it would seem highly unlikely that the cause was emissions from the Mill stack under normal operations in the middle of the day (wind direction was between 85-125° in most of the hours between 10am and 6pm); if normal operations led to high concentrations at Location 1 when downwind of the Mill stack then high concentrations would have been measured at Location 1 on most afternoons, as afternoon winds were frequently between 85-125° (refer to the diurnal wind rose in Figure 5 of Katestone's final dispersion modelling report, **Appendix F**).

6.2.3.2 9 July 2022 by OPC (Location 2)

A discussed in **Section 6.2.2.2** elevated concentrations at Location 2 did, for the most part, align with periods of start-up of the Mill.

MCM has advised that the event on the 8 / 9 July 2022 where the boilers were lit, then stopped and re-lit a couple of hours later was an unusual event resulting from supply issues. The available data also identifies this as the only event that led to a potential measured exceedance of an AQO by an OPC monitor (refer to **Section 6.2.2.2**).

The 24-hour average concentrations measured at the OPC at Location 2 on 9 July 2022 were 64 $\mu g/m^3$ for PM_{10} and 42 $\mu g/m^3$ for $PM_{2.5}$. On 9 July, elevated concentrations were only measured during the hours midnight-midday; between midday-midnight the average concentrations was just 4.3 $\mu g/m^3$ for PM_{10} and 1.9 $\mu g/m^3$ for $PM_{2.5}$.

Figure 6.1shows how Location 2 OPC concentrations varied through 8, 9 and 10 July 2022, and how these related to wind direction.

MCM operational records (refer to **Appendix C**) indicate that oil was used between 6:10am to 6:38am and 10:40am to 4:47pm on 9 July 2022. The concentration measured by the OPC at Location 2 between 6am and 7am was actually lower than those from midnight to 5am and 7am to 9am, with concentrations not especially high in the hours after 10am, suggesting that the use of oil did not cause a significant increase in particulate emissions, and wasn't a factor in the elevated concentrations measured between 1am and 4am. Oil was quite regularly used through the crush season under what would be considered normal operations, yet there is no indication that emissions from the Mill stack led to elevated 24-hour average concentrations under normal operations. Therefore, it is considered likely that the use of oil (at the volumes used during the 2022 crush season) is of little significance in terms of particulate emissions from the Mill.

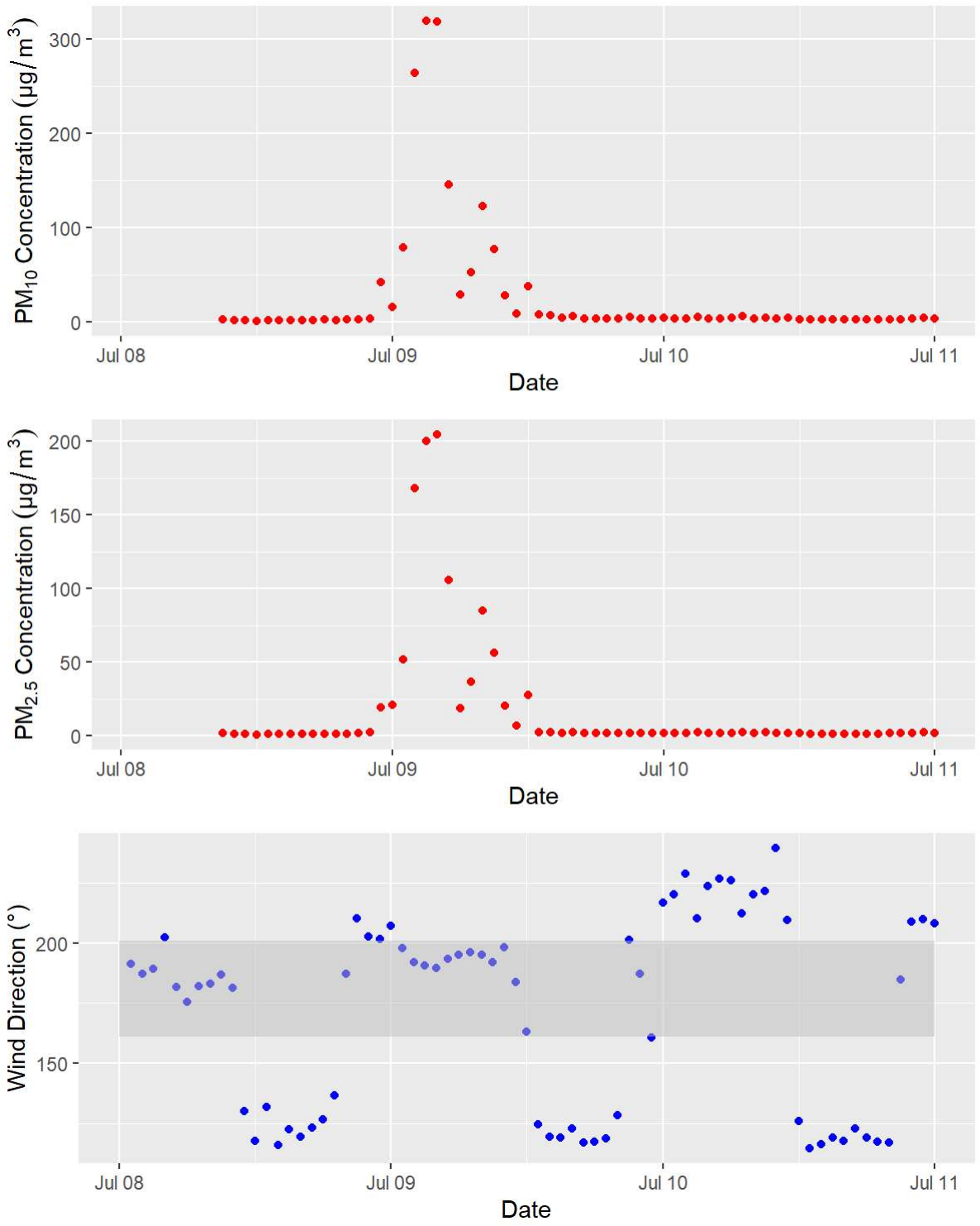


Figure 6.1: Time series of 1-hour average PM10 and PM2.5 concentrations measured by OPC at Location 2 and MCM weather station wind direction data (downwind direction highlighted) on 8 to 10 July 2022

6.3 Dispersion Modelling Results in the Context of Ambient Monitoring Results

6.3.1 Limitations

There are no background monitors local to Gordonvale; instead concentrations from the North Ward monitoring station in Townsville were used. Annual average concentrations from North Ward were added to modelled annual average concentrations, while the highest 70th percentile 24-hour average concentration from North Ward across any of the years 2017, 2018 and 2020 was added to modelled 24-hour concentrations. Townsville is some 265 km from Gordonvale and it would be unrealistic to use contemporaneous concentrations from the North Ward monitor alongside model outputs to predict hour-by-hour, or even day-by-day concentrations, as they will be affected by different sources and the modelled concentrations would not be realistic. Katestone (2023) noted:

> *"Whilst the North Ward station is situated in a residential area, it is likely to be influenced to a greater degree by major roads and industrial activities (including port operations and metals processing) than any location in Gordonvale. Consequently, the North Ward data can be expected to provide a conservative overestimate of ambient background concentrations in Gordonvale".*

The dispersion modelling assessment (refer to **Appendix F**) made the best possible estimate of total concentrations, but this lack of local background concentrations was a limitation, and presents a significant obstacle to carrying out any kind of model validation or comparison to measured concentrations, as it cannot be expected to account for the hour-by-hour changes in background concentrations that occur in the real world. It must also be noted that this approach will have missed extreme events, such as regional episodes of elevated concentrations associated with dust storms or bushfires, or hyper-local events that may be caused by construction works, agricultural activities or bonfires, amongst other activities. The modelling will not, therefore, predict concentrations as high as might be experienced under these conditions.

The modelling also only accounts for normal operations. No attempt was made to predict ambient concentrations under upset conditions, as the emissions data required to carry out any such modelling simply was not available (upset conditions modelling is discussed further in **Section 6.3.4**). Nevertheless, it is still possible to compare modelled and measured concentrations and draw relevant conclusions.

6.3.2 24-hour average concentrations

Scatter plots have been prepared to present modelled 24-hour average PM_{10} and $PM_{2.5}$ concentrations against those measured by the OPC (refer to **Figure 6.2** and **Figure 6.3**) and LVAS (refer to **Figure 6.4** and **Figure 6.5**) monitors. It should be noted that LVAS concentrations were only reported by SGS to the nearest 10 µg/m^3; where SGS reported a concentration of <10 µg/m^3, these are presented in the plots as being 5 µg/m^3.

The modelled concentrations are total concentrations, incorporating the same 70th percentile background concentrations from North Ward on every day of the year. It is, therefore, not surprising that these modelled concentrations are clustered around and just above the background concentrations used, and that measured concentrations show much more variability.

Modelling was carried out for the period October 2021 to September 2022, therefore any measured concentrations collected in October or November of 2022 are not incorporated in the scatter plots.

Taking into account the above discussion, it is unsurprising that on most days, the modelled concentrations exceed the measured concentrations. This is the case for every OPC measurement made at Location 1. It is also the case for all but two PM_{10} measurements made by the OPC at Location 2, and all but six $PM_{2.5}$ measurements, only two of which are significantly above the modelled concentration. Bearing in mind the rounded nature of the LVAS results, there is only one PM_{10} result from Location 1 that is significantly above the modelled concentration, and four $PM_{2.5}$ results. There are only a limited number of comparable LVAS results at Location 2, but two of the PM_{10} results were significantly higher than modelled. Again, bearing in mind the discussion above regarding regional

and local dust events, as well as upset conditions at the Mill, it is unsurprising that there were measured concentrations that exceeded those modelled on very limited number of occasions.

In general, it is considered that the model has done a good job of conservatively representing normal operations at the Mill.

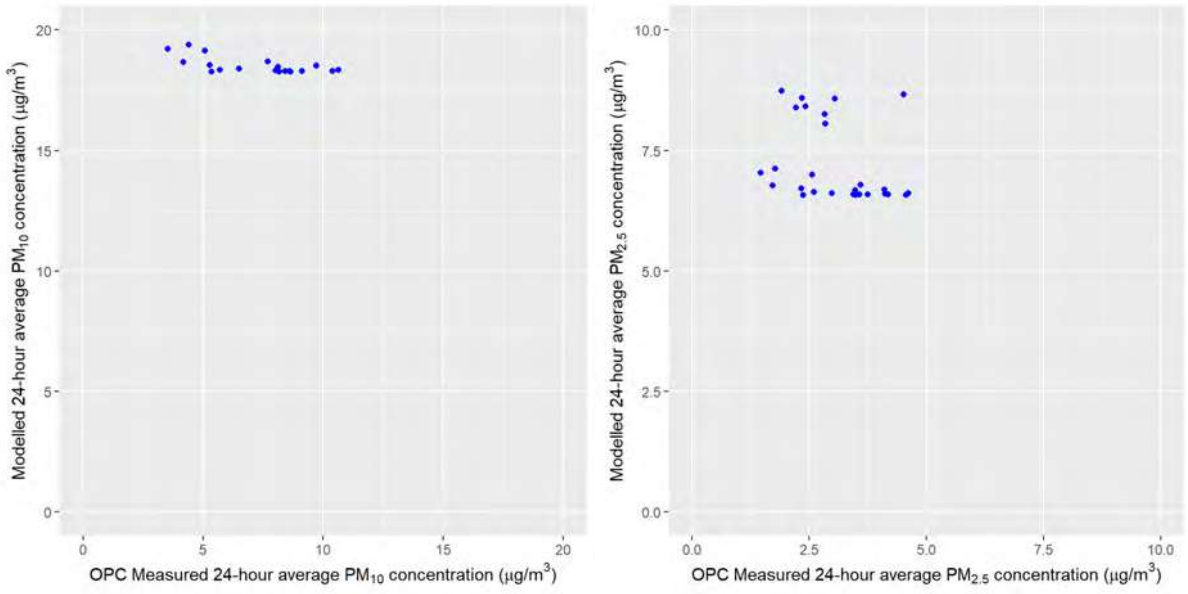


Figure 6.2: Scatter plot of OPC measured (x-axis) and modelled (y-axis) 24-hour average PM10 concentrations (left) and PM2.5 concentrations (right) at Location 1

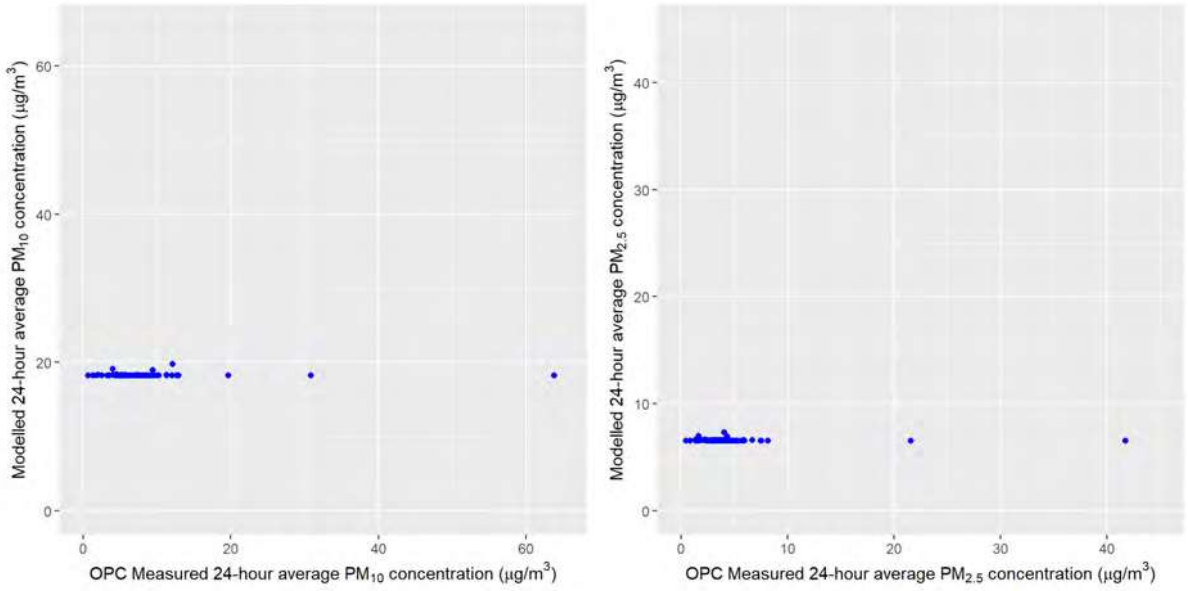


Figure 6.3: Scatter plot of OPC measured (x-axis) and modelled (y-axis) 24-hour average PM_{10} concentrations (left) and $PM_{2.5}$ concentrations (right) at Location 2

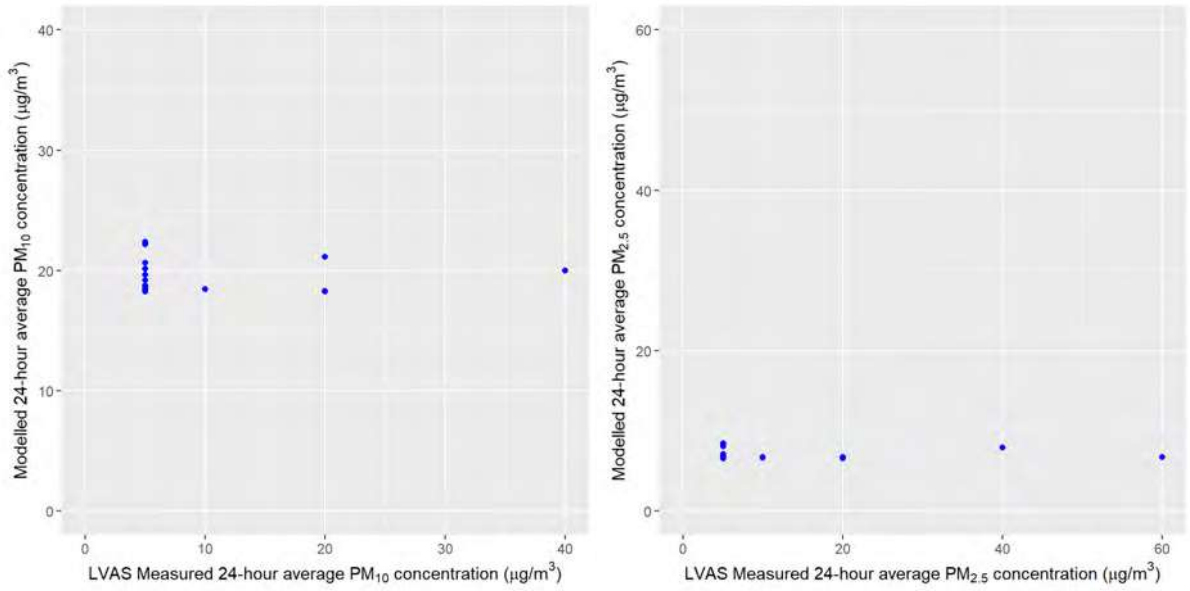


Figure 6.4: Scatter plot of LVAS measured (x-axis) and modelled (y-axis) 24-hour average PM10 concentrations (left) and PM2.5 concentrations (right) at Location 1

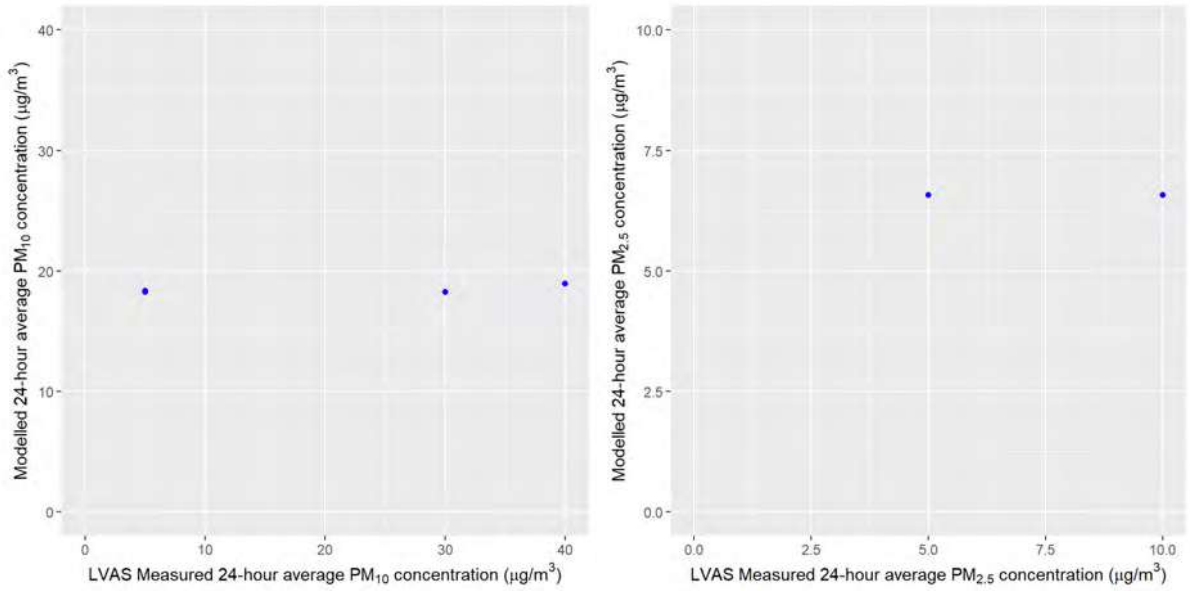


Figure 6.5: Scatter plot of LVAS measured (x-axis) and modelled (y-axis) 24-hour average PM10 concentrations (left) and PM2.5 concentrations (right) at Location 2

6.3.3 1-hour average concentrations

Scatter plots of 1-hour average concentrations measured by the OPC monitors are presented in **Figure 6.6** and **Figure 6.7**. The modelled concentrations presented in these incorporate no background contribution (as discussed in **Section 6.2.2**) and given this it is unsurprising that they appear to represent under-predictions.

Bearing in mind this lack of background data, the following observations are made:

- There is just one event that could be said to potentially represent a significant model under-prediction at Location 1 i.e., 26 June 2022 at 18:00 with a modelled wind direction of 192° (not downwind of the Mill stack) compared to measured wind direction in this hour of 121°, suggesting that the monitor may have been downwind of the plume from the Mill stack for

some of this period. However, elevated PM_{10} concentrations were also measured at Location 2 and no upset conditions were recorded on this day, suggesting the likelihood of another source to the east of the Mill; and

- There were a larger number of OPC measured concentrations significantly higher than those modelled at Location 2. These events, and their causes, have been discussed in **Section 6.2**.

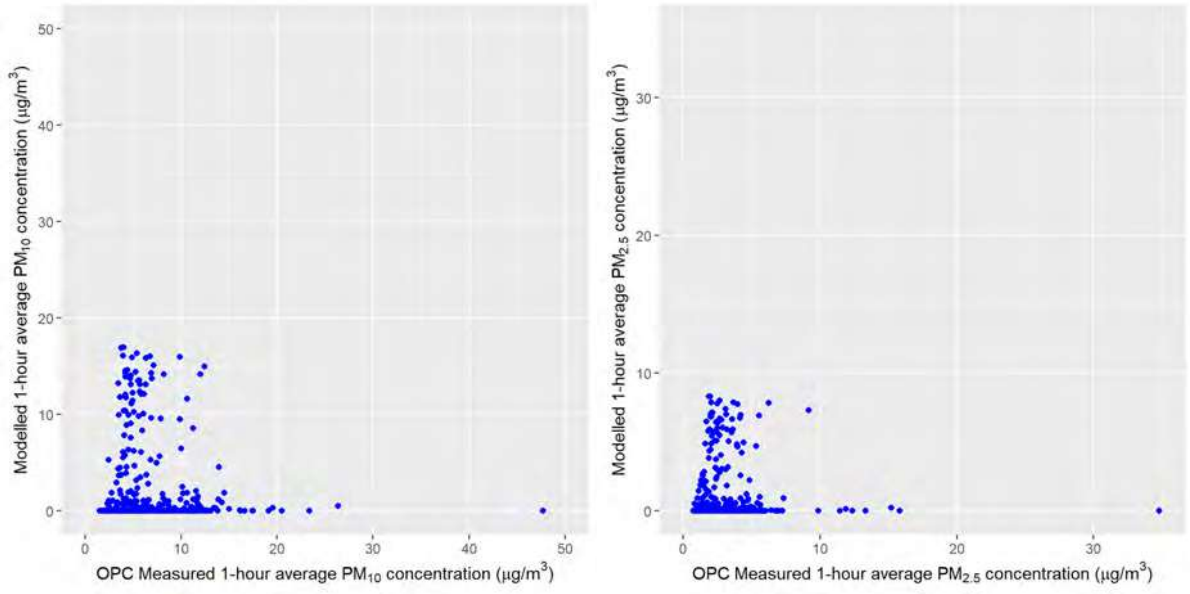


Figure 6.6: Scatter plot of OPC measured (x-axis) and modelled (y-axis) 1-hour average PM10 concentrations (left) and PM2.5 concentrations (right) at Location 1

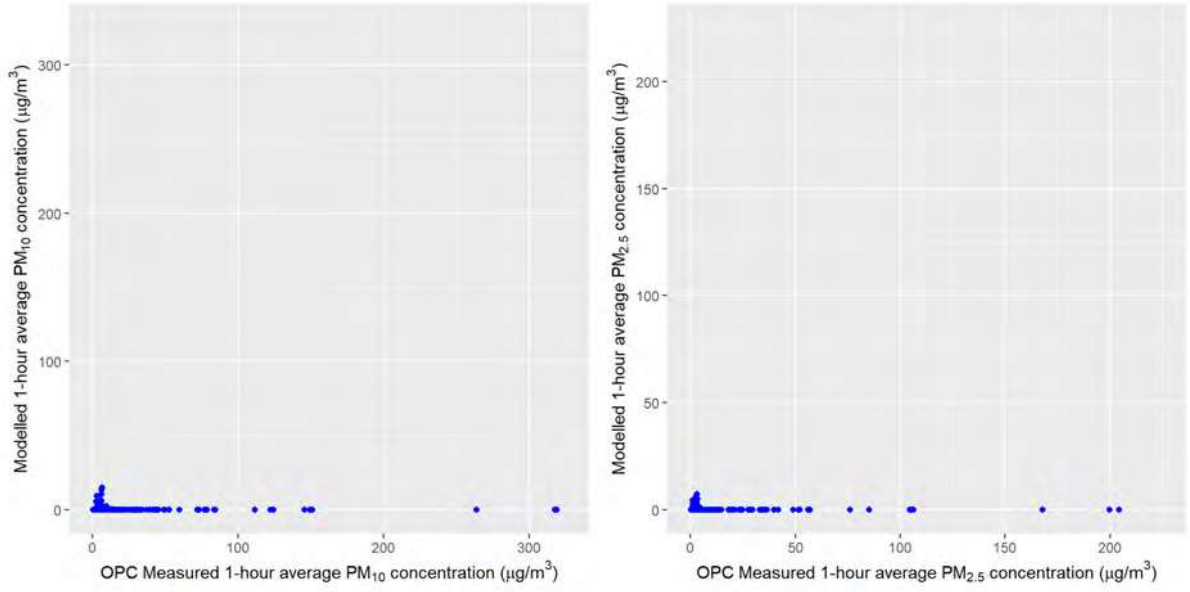


Figure 6.7: Scatter plot of OPC measured (x-axis) and modelled (y-axis) 1-hour average PM10 concentrations (left) and PM2.5 concentrations (right) at Location 2

6.3.4 Upset Conditions

Upset conditions were considered through sensitivity testing in Katestone's preliminary dispersion modelling report (2022, refer to **Appendix F**), in a simplistic way whereby exit velocity was adjusted down to 40%, 60% and 80% of full load. These conditions were modelled for every hour of the year to ensure that worst-case conditions were captured, in terms of both 1-hour and 24-hour average concentrations. The focus of this assessment was to determine where geographically the main impacts of the plume occur when the Mill operates below full load. This was then used to inform the selection of the ambient monitoring location, seeking to ensure that the monitoring location would capture worst-case impacts under upset conditions.

The approach was decided upon based on the following information provided by MCM:

- The most common upset condition (a short stop) typically involves the boilers continuing to run for a few hours at reduced load. With the milling train stopped and the rest of the factory going the boilers typically operate at around 40% load.
- Upset conditions are unlikely to change exhaust temperature as the wet scrubber already reduces the plume temperature.

It is not possible to sample the stack emissions during upset conditions due to the very high moisture contents that occur and because upset conditions are, by definition, not steady state and therefore isokinetic sampling cannot be conducted. As such, no information is available regarding pollutant emission rates during upset conditions, including boiler start-up processes, and it is not possible for us to specifically model impacts under such conditions. It should be noted that the approach was not intended to reflect a specific upset condition, such as a short stop or start-up; this is not possible due to the lack of emissions data.

Sensitivity testing assumed mass emissions of pollutants to be the same under all load conditions (40%, 60%, 80% or 100%), which is likely a conservative assumption for most scenarios, except perhaps if combustion efficiency is significantly affected (and it is not possible to robustly estimate emissions under such a scenario).

The Katestone (2022) assessment of upset conditions concluded the following:

- During routine operations, the highest 1-hour average concentrations of air pollutants occur at the south-western edge of the township, approximately 2.5km from the stack. This is likely to be due to the plume interacting with higher elevation terrain.
- At lower exit velocities, the plume comes to ground in closer proximity to the stack. The maximum 1-hour average ground-level concentrations of air pollutants occur within the central part of the township, between 1-3 km from the stack. While it does not experience the highest concentrations in any scenario, concentrations are elevated relative to the full load scenario at Location 1 in all three lower-load scenarios.
- For 24-hour average concentrations, the reduced plume velocity results in an area of elevated concentration to the west of the Turf Club (approximately 500m to 1km west of the stack) and immediately west (less than 500m) of the stack and further north towards the boundary of the township. While it does not experience the highest concentrations in any scenario (although it is close for the 80% load scenario), concentrations are again elevated relative to the full load scenario at Location 1 in all three lower-load scenarios, even more so than for predicted 1-hour average concentrations. This supports the use of Location 1 for ambient monitoring.
- There are no scenarios where the highest ground-level concentrations occur to the north of the stack, although in the 40% load scenarios concentrations are elevated to the north and north-northwest, including at Location 2, although predicted concentrations are higher to its west.

Katestone's final dispersion modelling (2023, refer to **Appendix F**) used the highest pollutant mass emission rates measured in any stack test (which showed significant variability) alongside a conservatively low exit velocity and temperature (lower than any measured in the five rounds of stack testing carried out to inform the Environmental Report). As such, it represents a very conservative assessment of normal operating conditions.

In the absence of stack sampling data, it is not possible to robustly predict impacts under upset conditions, beyond estimating where geographically they might be likely to occur.

7. Conclusion

Stack emission monitoring results collected during the 2021 and 2022 crush seasons for relevant contaminants, and associated air dispersion modelling conducted based on conservative assumptions, do not indicate that the Mill operations (either in isolation or considering cumulative ambient sources) would result in exceedances of the relevant AQOs in the surrounding community. It is not possible to sample during upset conditions, thus robust dispersion modelling of emissions during upset conditions could not be carried out.

There was loss of data during the monitoring program, resulting from a range of causes, but the analysis presented above has been able to draw clear conclusions regardless of this data loss.

No complaints related to stack emissions during the 2021 or 2022 crush seasons were reported to MCM.

Ambient monitoring results for PM_{10} and $PM_{2.5}$ support this conclusion during normal operations, with measured concentrations generally being well below the AQOs. This includes periods when waste oil was used as a fuel, and during oxygen alarms. Even when concentrations were elevated, on most days the elevated concentrations are thought to have been the result of external contributing factors, rather than emissions from the Mill. This includes 24 and 30 July 2022, when 24-hour average $PM_{2.5}$ concentrations measured by the *AS/NZS 3580.9.10:2017* compliant LVAS at Location 1 were above the AQO. The Mill was operating normally on these days; if normal operations led to high concentrations at Location 1 when downwind of the Mill stack then high concentrations would have been measured at Location 1 on most afternoons (due to the monitor being downwind on most afternoons), and, based on the OPC monitoring results, this is not the case. It is, therefore, considered that the Mill did not contribute significantly to concentrations on these two days, and that there must have been an alternative local source of $PM_{2.5}$ affecting this monitor.

However, the analysis has also identified that startup conditions have the potential to lead to elevated concentrations at locations of relevant exposure in Gordonvale. This includes the startup on 9 July 2022, when high measured concentrations in some hours of the morning at the Location 1 OPC led to 24-hour average concentrations above the AQOs for both $PM_{2.5}$ and PM_{10}. Other startup events also resulted in some of the highest measured concentrations during the monitoring program, but not to the extent that the 24-hour average concentrations exceeded the AQOs.

APPENDIX A. Final AQMP (Rev 2A, 9 July 2021)



Mulgrave Central Mill

Air Quality Monitoring Program



9 JULY 2021

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Definitions

AQMP	Air Quality Monitoring Program
AQO	Air quality objective
Contaminant	As per section 11 of the EP Act i.e., can be: (a) a gas, liquid or solid; or (b) an odour; or (c) an organism (whether alive or dead), including a virus; or (d) energy, including noise, heat, radioactivity and electromagnetic radiation; or (e) a combination of contaminants.
CoPC	Contaminants of potential concern
DES	Department of Environment and Science (Qld environmental regulator)
EE Notice	Notice to conduct or commission an environmental evaluation (DES Ref: STAT-E-100072540, dated 9 June 2021) – refer to **Appendix A**
Environmental harm	As per section 14 of the EP Act i.e., any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance.
Environmental nuisance	As per section 15 of the EP Act i.e., is unreasonable interference or likely interference with an environmental value caused by: (a) aerosols, fumes, light, noise, odour, particles or smoke; or (b) an unhealthy, offensive or unsightly condition because of contamination; or (c) another way prescribed by regulation.
Environmental value	As per section 9 of the EP Act i.e., is: (a) a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or (b) another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.
EP Act	*Environmental Protection Act 1994* (Qld)
EP Reg	*Environmental Protection Regulation 2019* (Qld)
MCM	Mulgrave Central Mill Company Pty Ltd
NATA	National Association of Testing Authorities

NPI	National Pollutant Inventory
$PM_{2.5}$	Particulate matter with an equivalent aerodynamic diameter of 2.5 micrometres or less
PM_{10}	Particulate matter with an equivalent aerodynamic diameter of 10 micrometres or less
Qld	Queensland
Sensitive place	As per section 3 of the Guideline Application requirements for activities with impacts to air (ESR/2015/1840, V4.03, 6 March 2017) could include but not limited to: • a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; • a motel, hotel or hostel; • a kindergarten, school, university or other educational institution • a medical centre or hospital; • a protected area under the Nature Conservation Act 1992, the Marine Parks Act 2004 or a World Heritage Area; • a public park or garden; and • a place used as a workplace including an office for business or commercial purposes.
SQP	Suitably qualified person, is defined as a person or persons who has demonstrated professional qualifications, training, skills or experience relevant to performing the function.

1 Introduction

The Mulgrave Central Mill Company Pty Ltd (MCM), owns and operates the Mulgrave Sugar Mill, located at 47 Gordon Street, Gordonvale. The mill receives and crushes sugar cane, processes the extracted juice to create sugar, and burns the residual fibrous product (bagasse) to create steam for factory use and to generate electricity. MCM is the holder of the site environmental authority EPPR00390613 (EA) and recipient of the Notice to conduct or commission an environmental evaluation (EE Notice) (refer to **Appendix A**).

MCM is based in the township of Gordonvale, approximately 20 km south of Cairns, in Far North Queensland. Pursuant the site EA, MCM carries out the following environmentally relevant activity (ERA):

- ERA 28: Sugar milling or refining – crushing or grinding 200 tonnes or more of sugar cane in a year or manufacturing 200 tonnes or more of sugar or other sugarcane products in a year (Schedule 2 of the *Environmental Protection Regulation 2019* (Qld) (EP Reg)).

MCM typically operates the mill boilers from June to November each year, known as "the crush season". During normal operations throughout the crush season, the boilers are fuelled by bagasse. However, on start-up and during breakdown events, MCM supplements this with oil in two of its boilers where insufficient bagasse is available, as permitted by EA condition B6.

In June 2020, following the receipt of reports from community members of smoke nuisance and offensive odour, the Department of Environment and Science (DES) undertook monitoring within the Gordonvale area. Following this event:

- MCM engaged QUT / SRI to review the performance of the No. 6 and 7 boilers, the two boilers with the capacity to burn oil. Based on their assessment conducted on 7 July 2020, QUT / SRI (2020) indicated nuisance emissions from No. 6 and 7 boilers were primarily caused by the air to fuel ratio to one or more of the boilers being too low (visible smoke emissions from the boiler house stack) and oil firing (odour); and
- DES issued MCM with an EE Notice – noting the original issued on 16 December 2020 was superseded on 2 February 2021 following an internal review with additional minor amendments made on 9 June 2021. The final version of the EE Notice is provided at **Appendix A**.

MCM has progressed actions to address recommendations made by QUT / SRI to improve boiler performance prior to the 2021 crush season. The status of actions taken in accordance with these recommendations has been updated from those presented in the DES Internal review of decision to issue an EE Notice dated 2 February 2021 (refer to **Appendix B**). In addition, MCM intends to rely on a predominately bagasse start-up, including steam trials, commencing from the 2021 crush season. This will be a marked departure from the practice employed previously, with approximately 165 tonnes of oil being used during start-up (including steam trials) in 2020.

Based on investigations conducted in 2020, MCM significantly reduced oil use in the end of season boil out process with 17.9 tonnes used in 2020, down from 117 tonnes used in 2019. MCM is also committing to a predominately bagasse boil out at the end of the 2021 crush season. MCM will only use oil in strict compliance with the requirements of the EA. However, having regard to the successful investigations conducted in 2020, as described above, if the use of oil is to occur, it is likely to be confined to the following circumstances (if they arise), namely, a) bagasse feeder chokes, b) bagasse reclaimer chokes / malfunction, c) bagasse belt trips, d) instances where the safe operation of the boiler is compromised during non-normal operating conditions, with such events recorded.

2 Objectives

The objective of the AQMP is to meet Requirements 1 and 2 of the EE Notice. **Table 2.1** details how the AQMP achieves the stipulated requirements.

Table 2.1: Response to Requirement 1 and 2 of the EE Notice

Requirement	Comment / section of the AQMP
Requirement 1	
By 12 April 2021, you must develop an AQMP to investigate potential environmental nuisance associated with air emissions from MCM and submit a copy to the department for review.	A Draft AQMP was submitted to DES for review on 12 April 2021. MCM received formal feedback from DES on 18 May 2021, 15 June 2021 and 6 July 2021, which has been considered in this Final AQMP dated 9 July 2021.
You must have due regard and consideration for any comments made by the department in relation to the documents submitted.	Noted - refer to above response.
Requirement 2 – the AQMP must:	
a) Be prepared by a suitably qualified person.	The AQMP has been prepared by: • Operations monitoring – Chris Hoare (Mill Manager and qualified sugar chemist with over 40 years sugar milling experience) and Kate Barnes (Safety and Environment Technician and qualified Bachelor of Science (Industrial Chemistry), with seven years sugar milling experience); • Stack monitoring – QUT / SRI: Anthony Mann (refer to **Appendix C**); and • Ambient monitoring – CQG Consulting: Cathee Miller and Patrice Brown (refer to **Appendix D**). A peer review was conducted by air quality specialists, Katestone Environmental Pty Ltd. This Final AQMP has been updated in accordance with Katestone's recommendations. Refer to **Appendix E** for Katestone's Capability Statement, CVs of suitably qualified persons (SQPs); Director – Simon Welchman and Senior Air Quality Consultant – Tania Haigh and peer review of the AQMP for MSF Sugar Mill.
b) Include monitoring of both point source air emissions from MCM and ambient air quality, having consideration of sensitive receptors and meteorological variables.	Monitoring of stack emissions (point source) and ambient air quality is proposed to be based on the outcomes of preliminary air dispersion modelling of contaminants of potential concern (CoPC) using Mulgrave Mill National Pollutant

Requirement	Comment / section of the AQMP
	Inventory (NPI) data and historic biannual stack monitoring results for particulates. This will enable a risk assessment to be conducted for individual CoPC against the respective ambient air quality objective (AQO), ensuring the air quality monitoring campaign is effectively targeted. Final air dispersion modelling will be conducted for the Environmental Report (Requirement 4 of the EE Notice) assimilating monitored air emission results and having regard to one year of site-specific weather station data. Refer to **Section 6.1**, **Section 6.7**, **Appendix F** and **Appendix G** for further details.
c) Account for variation in fuel types used during start-up and operation of MCM, as well as planned changes to fuel inputs over the 2021 and 2022 crushing seasons.	Bagasse is the predominant fuel proposed for use in the boilers from the 2021 crush season, except in certain circumstances (refer to **Section 1**, **Section 4.2** and **Appendix H**). Upset situations (under which supplementary oil is likely to be required) cannot be captured by stack emissions monitoring. The preliminary air dispersion modelling will simulate exhaust temperature and flow rates during upset conditions, with additional supporting information to be collected through subsequent operational and ambient monitoring. Refer to **Section 6** and **Appendix I** or further details.
d) Identify contaminants to be monitored with consideration of reported sugar mill combustion by-products, planned fuel inputs, and applicable environmental and health based guidelines and standards.	Refer to response to Requirement 2 b) and c).
e) Include a timeline for implementation of the monitoring program over 2021 and 2022 crushing seasons identifying key milestones and duration of monitoring periods.	Refer to **Appendix J** – given the staged nature of this monitoring program, this proposed timeline may be subject to change as further information comes to hand. DES will be advised of any material changes to this proposed program.
f) Be conducted in accordance with relevant Australian or International standards, or other method/s identified and demonstrated as being appropriate for assessment against	All monitoring and modelling will be conducted in accordance with relevant standards and results will be compared against applicable air quality objectives (refer to **Section 6** and **Appendix F**).

Requirement	Comment / section of the AQMP
applicable environmental and health based guidelines and standards.	
g) Ensure all analysis required is carried out by a laboratory that has National Association of Testing Authorities (NATA) accreditation, or an equivalent certification, for such analysis.	Analysis to be conducted by NATA accredited laboratories or equivalent (refer to **Section 6)**.
h) Include an analysis and review of monitoring results against applicable environmental and health based guidelines and standards.	Refer to **Section 6** and **Appendix F**.
i) Include record keeping of the following information, where applicable, on a daily basis during, and for a 14 day period prior to and following any monitoring: i. boiler throughputs; ii. the type, volume, composition, and supplier of fuel/s burned; iii. any operational or equipment factors, including incidents, maintenance and modifications, that may influence air emissions from the MCM; iv. Any community reports of environmental nuisance received and the subsequent response, as per Condition H15 of Environmental Authority EPPR00390613; and v. Visual estimates of smoke darkness (density), as per Condition B1 (d) of Environmental Authority EPPR00390613.	Refer to **Appendix K**.

3 Site Operations

Sugar cane is harvested and transported to MCM. It is then weighed, tipped onto the cane carrier and transferred to the shredder, where the cane billets are smashed open to expose the sucrose containing cells. The shredded cane is crushed through a series of rollers (mills) where the sugar juice is extracted from the cane fibres. After the extraction of the sugar juice the fibrous material is referred to as bagasse and is burnt as a renewable energy source in the boilers to create steam (refer to **Section 4.2**).

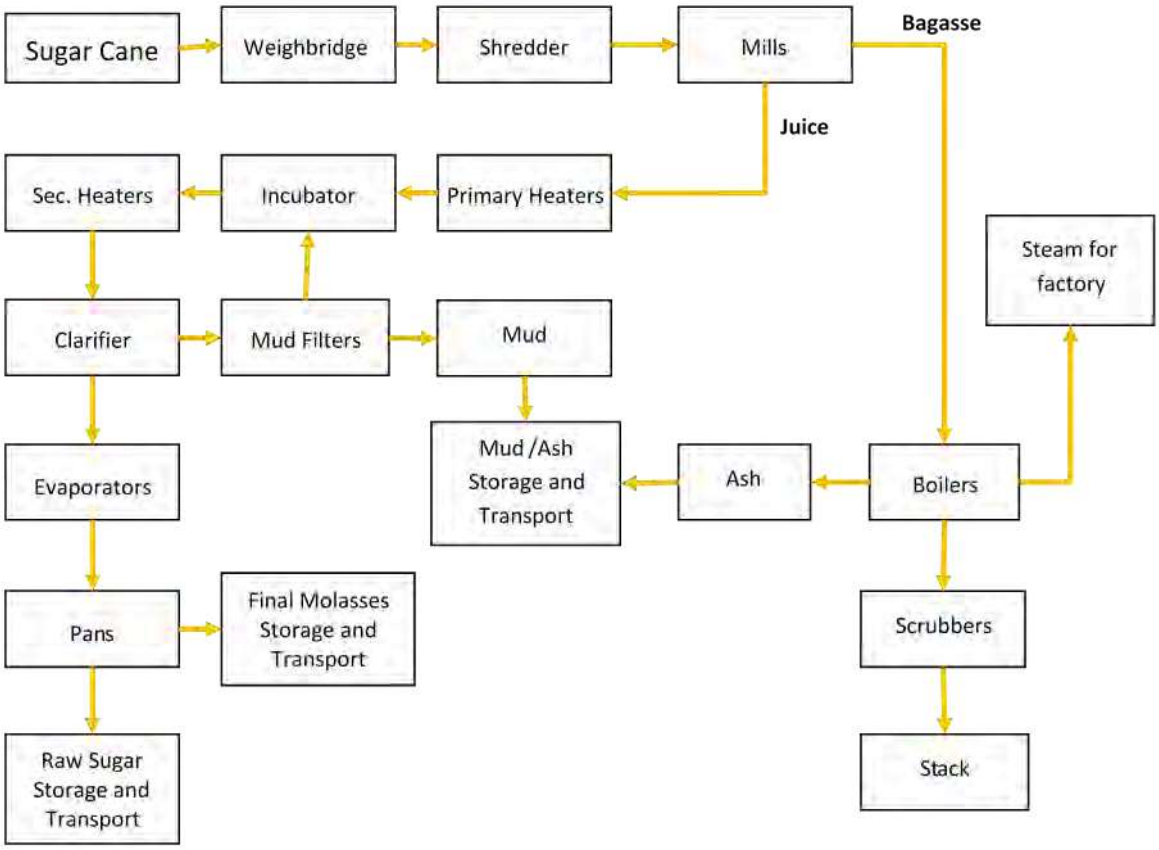
The sugar juice is heated to ~75°C in the primary heater, from there lime is added to create a neutral pH and the juice is held in the incubator to provide time for the starch molecules in the juice to naturally degrade.

The sugar juice is then heated in the secondary heaters to ~103°C, before being passed into the flash tank for the removal of entrained air. The de-aerated juice then passes into the clarifier, where the

insoluble solids including soil particles, bagacillo, protein and other matter is settled out with the aid of flocculants, as liquid mud, which is filtered and dried. The clarified juice continues onto the evaporators, where it is concentrated into a syrup.

The syrup is pumped into the process house, where the process of crystallisation occurs. The final stage involves the centrifuging of the molasses off the sugar crystals and washing the sugar prior to storage. A site process flow diagram is presented at **Figure 3.1.**

Figure 3.1: Sugar milling process flow diagram



4 Site Emission Sources

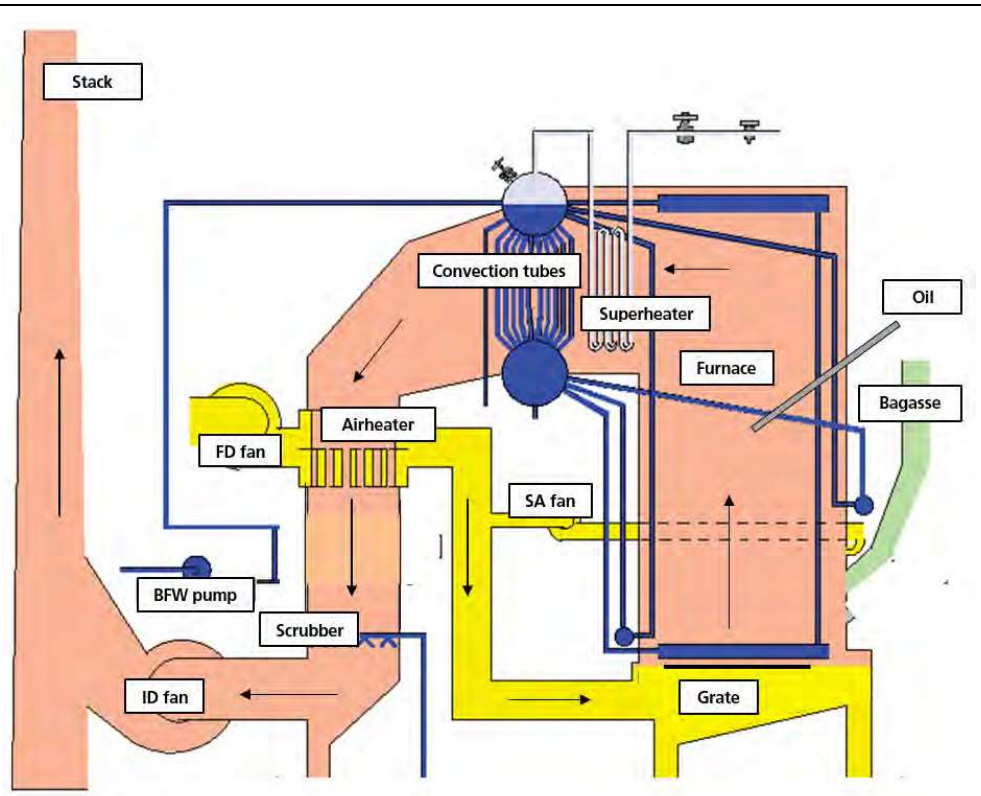
4.1 Overview

There are various sources of localised emissions from the milling process e.g. storage and process tanks with fugitive venting, diesel generators, minor hazardous goods storages, material transfer location and storages and so on. These facilities are not considered by this AQMP given they pose a low to negligible risk of potential environmental nuisance and were not relevant to the issues raised by the EE Notice which relate to the boiler house stack only (refer to **Section 4.2** and **Appendix A** for further details).

4.2 Boiler house stack

The function of the boilers is to produce sufficient steam at the required pressure, temperature and rate to operate the factory turbines and to meet factory heating requirements. Boilers consist essentially of a heat generation section and a heat absorption section. The residual hot gases (flue gases) are passed to atmosphere through air pollution reduction equipment to meet environmental requirements. The basic boiler layout is described in **Figure 4.1.**

Figure 4.1: Sugar mill boiler – typical overview



Furnace	Fuel is burnt in air (suspended fireball) to produce gaseous combustion products and heats the tubes on the walls.
Superheater	Heat from the furnace gas increases the temperature of the steam.
Bagasse	Feeders for bagasse (or oil guns in non-normal operating condition case only)
Grate	Entrance for combustion air. Combustion of large fuel particles.
Convection tubes	Water is evaporated to steam
Air heater	Heating of air entering furnace
FD fan	Forced draft fan to blow ambient air through the air heater
ID fan	Induced draft fan creating negative pressure to maintain the gas flow path
SA fan	Secondary air fan improves mixing and combustion
Scrubber	Removes particles from the combustion gas
BFW pump	Boiler feed water pump provides water to the boilers

MCM operates four boilers at the Mulgrave Mill, namely No. 2, 5, 6 and 7. Boiler No's 6 and 7 are suspension-type boilers that have the capacity to burn oil as well as bagasse. Boiler No. 6 produces steam at approximately 60 tonnes per hour and No. 7 at approximately 160 tonnes per hour. Both are fitted with a Hosokawa Micron Mikro-Vane wet scrubber to minimise particulate emissions. Boiler No's 2 and 5 are smaller Beta boilers that produce steam loads of approximately 12 and 20 tonnes

per hour, respectively. These boilers are not in use at all times and are not used during start-up. Flue gas ductwork of these boilers is connected into the No. 6 boiler wet scrubber and induced draft fan.

MCM burns about 120 tonnes of bagasse per hour at MCR and approximately 40 tonnes of bagasse per hour at start up, with the bagasse bin controlling supply to the boilers.

The installation of the new bagasse out-loading facility in August 2020 and provision of a temporary mobile bagasse in-loading facility, will enable the use of more bagasse during steam trials, start-up and boil out during the 2021 crush season.

Initial bagasse will be sourced from another mill (which is located at South Johnstone and is owned by a related company to MCM, namely MSF Sugar Pty Ltd), with additional transfers made as required until MCM has produced enough bagasse to become self-sustaining for the season.

Bagasse is an organic biofuel whose quality is directly related to the cane feedstock. Refer to **Appendix H** for the Safety Data Sheet for bagasse. Where oil is required, this is supplied by Cleanaway in accordance with their Product Data Sheet specification (refer to **Appendix I**).

5 Environmental context

5.1 Surrounding land use

MCM has been in operation since 1896. Gordonvale originally developed into a small town with three hotels, a butcher shop and a general store, which provided the community and farmers with provisions as well as equipment. In the early days, the township also had a mechanical repair store for the small farming community. MCM was located between sugarcane farmlands, banana plantations and timber productions, with sugarcane becoming the dominant product. The township of Gordonvale has grown in the last couple of decades as the city of Cairns has expanded. Official census population for Gordonvale (formerly Nelson) in 1911 was 506 [(1),] with that number continuing to increase with the most recent census statistics (2016) indicating a population of 6,671 for Gordonvale.

Surrounding land use zones to the MCM site as per the CairnsPlan 2016 are presented in **Figure 5.1**. These zones include potentially sensitive receptors including low to medium density residential, community facilities, open space, sport and recreation and district centre. Outside of the township uses, the predominant land use in the area is growing sugarcane.

Key potentially sensitive places in the vicinity of MCM are listed in **Table 5.1** by type consistent with the “noise sensitive place” definition in the EA. These locations are also presented in **Figure 5.2**.

Table 5.1: Key sensitive receptors in Gordonvale township

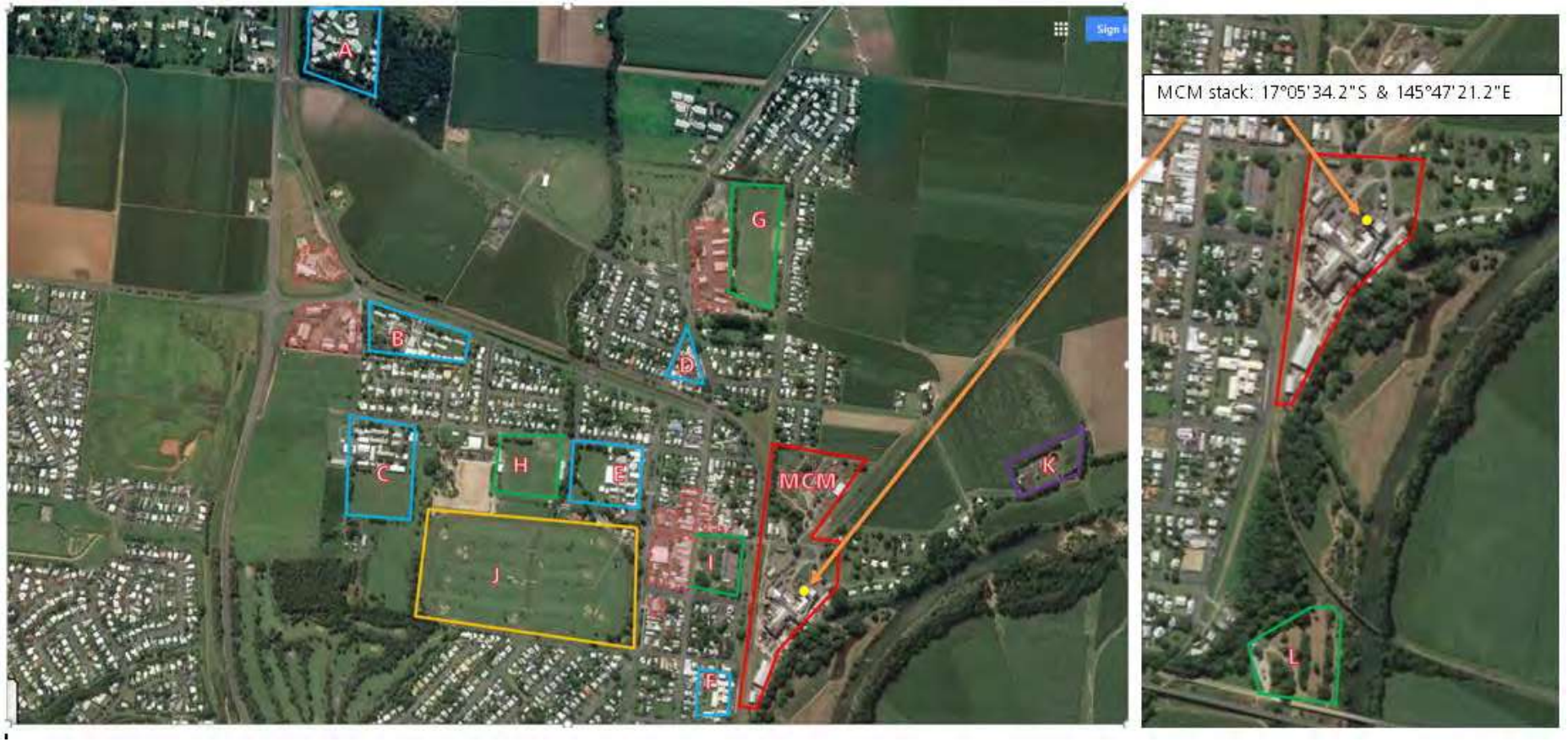
Sensitive place type	Sensitive place	Distance and direction from mill stack
Residential – permanent	Residential zoning	~ 400 m N
	Pyramid Residential Care Centre	~ 1.3 km NW
Residential – temporary	Greenpatch camping grounds	~ 800 m S
	Great Northern Hotel	~ 320 m WNW
	The Gordonvale Hotel	~ 330 m W
School	Gordonvale State School	~ 500 m NW
	Gordonvale State High School	~ 1.2 km WNW
	Djarragun College (incl boarding)	~ 1.8 km NW
	St Michael's School	~ 300 m SW
Hospital	Gordonvale Memorial Hospital	~ 700 m NNW
Protected area	Great Barrier Reef Region	~ 15 km E
	Wet Tropics of Queensland	~ 5km W
	Malbon Thompson Forest Reserve	~ 10km E
	Grey Peaks National Park	~ 9km NE
Public park or garden	Norman Park	~ 200 m W
	Johnson Park	~ 800m N
	Alley Park	~ 800m NW
	Gordonvale Turf Club and Golf Course	~ 500 m W

Figure 5.1: Surrounding land zones as per Cairns Plan 2016



Source: https://ssapub.cairns.qld.gov.au/connect/analyst/mobile/#/main?mapcfg=CairnsPlan%202016
NB: The Mulgrave Mill is identified as High impact industry (in purple).

Figure 5.2: Gordonvale community locations in relation to MCM



KEY NOTES:

- MCM site denoted by red outline and boiler stack by yellow circle
- Key community locations identified by letter reference as per below.

A	Djarragun College (& boarding school)	E	Gordonvale State School	I	Norman Park
B	Pyramid Residential Care Centre	F	St Michael's School	J	Gordonvale Turf Club & Golf Course
C	Gordonvale State High School	G	Johnson Park	K	Gordonvale Wastewater Treatment Plant
D	Gordonvale Memorial Hospital	H	Alley Park	L	Greenpatch camping grounds

5.2 Climate

The Bureau of Meteorology (BOM) Cairns Aero (Station Ref: 031011) weather station is located approximately 25 km north of the mill. BOM classifies Cairns as a tropical climate experiencing hot humid summers, with marked wet summers and dry winters [(2)]. Weather data has been collected from this station from 1941 to 2020, with a summary of the cumulative data provided in **Table 5.2**.

Table 5.2: Historic Weather Information, Cairns Aero, 1941-2020

Month	Temperature °C		Relative Humidity %		Wind Speed Km/h		Predominant Wind Direction		Cloud Cover oktas		Rainfall mm
	Max	Min	9am	3pm	9am	3pm	9am	3pm	9am	3pm	Avg
January	31.5	23.7	75	66	8.8	15.6	S	SE, NE & N	5.4	5.3	402.7
February	31.3	23.8	78	69	8.9	14.6	S	SE, N & NE	5.7	5.8	443.8
March	30.6	23.1	78	67	12.2	17.3	S	SE	5.2	5.4	417.6
April	29.3	21.7	78	65	14.5	19.0	S	SE	4.9	5.0	191.2
May	27.7	19.9	76	64	14.7	17.9	S	SE	4.5	4.8	91.5
June	26.1	18.0	74	61	15.9	18.1	S	SE	4.2	4.2	47.0
July	25.8	17.1	72	58	15.7	18.7	S	SE	4.1	4.1	30.7
August	26.7	17.4	70	56	14.8	19.6	S	SE	3.6	3.5	25.9
September	28.2	18.7	66	55	13.9	20.5	S	SE	3.6	3.2	33.5
October	29.6	20.6	65	57	11.3	19.1	S & SE	SE, E & NE	3.7	3.0	47.5
November	30.7	22.3	68	60	10.0	18.0	S & SE	NE, SE, E & N	4.2	3.8	90.3
December	31.5	23.4	70	62	9.2	17.0	S	SE	4.8	4.5	182.9
red = highest value blue = lowest value											

The predominant morning wind direction in the region tends to prevail from the south, with a minor variation to the south-east in spring. The afternoon winds consistently come from the south-east throughout the year, however, during spring and summer other northerly to easterly wind directions are also common. Wind rose figures 9am and 3pm from the Cairns airport weather station are presented in **Appendix L**.

It is noted that another BOM weather station at Cairns Racecourse (Station Ref: 031222) is located closer to the mill (approximately 17 km north). This station was opened in 2013.

Under certain meteorological conditions, the air is stable and a layer of cooler, dense air lies near the ground with a layer of warmer air above. This condition, called a temperature or thermal inversion,

prevents air pollutants that are released below the inversion from dispersing and air pollutants can build up. Inversions generally occur in winter on cool, clear nights when the earth's surface loses heat quickly.[3] The effects of such inversions to trap air pollutants tend to be quite clear in areas with low level emission sources in winter. Wood heaters is the classic example of this where cold weather coincides with wood heater use and elevated levels of particulate matter.

Due to the boiler stack being 50 metres tall, emissions are likely to be emitted above the night time inversion layer. In these circumstances, the boiler plume will tend to stay aloft and not come to ground level. After sunrise, heating of the earth's surface will cause greater mixing of air at ground level and, consequently, the inversion will rise and will eventually break up. As the inversion reaches the height of the plume, air pollutants can then be mixed down to ground level in a process that is called fumigation.

This suggests that MSL's practice of starting up the boilers before sunrise is an effective way to minimise ground-level concentrations of air pollutants.

5.3 Topography

MCM is located on flat and low-lying land (approximately 10 m above sea level), draining to the Mulgrave River.

The township of Gordonvale is surrounded by ranges; just east of the Gillies Range that leads to the Atherton Tableland, Islet Hills to the north-west, Lamb Range to the south-west, Bellenden Ker Range to the south and Thompson Range to the east.

Topography can play a role in creating a temperature inversion as discussed in **Section 5.2**, since it can sometimes cause cold air to flow from peaks into the valleys, pushing cold air under the warmer air rising from the valley. [4]

6 Methodology

6.1 Preliminary air dispersion modelling

The Air Pollution Model (TAPM) developed by CSIRO Atmospheric Research will be used to conduct air dispersion modelling under this AQMP. This is a prognostic meteorological model that uses synoptic meteorological data to characterise conditions at a site. TAPM provides a reliable representation of meteorological conditions at a site without site-specific meteorological observations.[5]

Preliminary air dispersion modelling inputs will include potential CoPC based on MCM NPI data (refer to **Appendix M**) and historic biannual stack monitoring results for particulates. Several years of meteorological data available from Cairns Racecourse (Station Ref: 031222), located approximately 17 km north of the mill, will also be reviewed to provide an initial evaluation of the meteorological dataset generated by TAPM.

This modelling will be used to determine the potential risk of each CoPC during routine operations by comparison of ground-level concentrations against the relevant AQO. Contaminants identified to be low risk based on dispersion modelling results and / or combustion processes and planned fuel inputs do not need to be included in the stack emissions or ambient monitoring plan.

Separate model scenarios will be developed for bagasse and oil firing.

The model will also confirm the representativeness of the sensitive receptor for siting ambient air monitoring equipment (refer to **Section 6.4**).

Modelling will be conducted by a suitably qualified person, which, subject to availability throughout the course of the program is likely to be either QUT / SRI (refer to **Appendix C**) or Katestone (refer to **Appendix E**).

The efficacy of the field monitoring program as outlined in the AQMP will be further considered once preliminary air dispersion modelling outcomes are available. Results of this assessment will be provided to DES.

6.2 Site weather station

A site-specific meteorological monitoring station has been installed on site to provide a minimum of 12 months of data collection over the EE Notice period (including during crush and non-crush seasons as indicated in **Appendix J**).

The meteorological monitoring station is compliant with the Australian / New Zealand Standard (AS/NZS) 3580.14:2014 (Methods for sampling and analysis of ambient air: Meteorological monitoring for ambient air quality monitoring applications) and has been sited in accordance with AS/NZS 3580.1.1 (Methods for sampling and analysis of ambient air: Guide to siting air monitoring equipment). The weather station will record air temperature, wind speed, wind direction, rainfall, relative humidity and barometric pressure with a secure flash memory for more than one year of data including ten minute, hourly and daily summaries. Refer to **Appendix G** for details.

This dataset will be used to inform:

- The potential impact of the mill operations during identified upset situations or when complaints are received (refer to **Section 6.5**); and
- The TAPM final air dispersion modelling output to be included in the Environmental Report as per Requirement 4 of the EE Notice. This model will use 12-months of site-specific meteorological data to evaluate the meteorological dataset of previous air dispersion modelling (refer to **Section 6.1** and **Section 6.3**), and if relevant, be assimilated into the model to further understand the potential impact of the mill operations.

6.3 Point source monitoring

As outlined in **Section 4.1**, the most significant point source air emission at the mill is the boiler house stack.

It is not possible to conduct stack monitoring during start-up or upset conditions because steady-state conditions, which are a pre-requisite to stack emissions monitoring, are not present. Stack emissions monitoring conducted at the site will reflect normal operations of the mill only. Alternative methods to identify and evaluate non-routine operations are discussed in **Section 6.5**.

Under normal operations, bagasse will most likely be the fuel used (as noted in **Section 1**). Stack emissions during routine operations are not anticipated to be highly variable due to the consistency of the bagasse and oil fuels that are used. Where oil is used during normal operations, this will be as supplied by Cleanaway in accordance with their Product Data Sheet identifying the maximum concentrations of a range of indicators (refer to **Appendix I**). The fuel type used during the point source monitoring events and other relevant information will be confirmed in the record keeping checklists (refer to **Appendix K**).

Four rounds of stack monitoring are proposed; two during each season as indicated in **Appendix J**. The initial round of stack monitoring will measure total suspended particles (TSP), PM_{10} and $PM_{2.5}$ to confirm the site-specific stack emission particle size distribution (currently assumed 99% is $PM_{2.5}$ fraction based on similar studies conducted by QUT / SRI at other mills with wet scrubbers). These results will be used to rationalise the particle sizes sampled in all future stack monitoring rounds and the selection of indicators for inclusion in the ambient monitoring program.

The preliminary air dispersion modelling (refer to **Section 6.1**) will confirm the CoPCs that will be analysed during stack monitoring events. Once confirmed, MCM will engage QUT / SRI and / or another SQP (where parameters are outside QUT / SRI capability) to conduct the monitoring and confirm that the sampling method is compliant with a relevant Australian or International Standard and that analysis is to be undertaken by a NATA accredited laboratory, or equivalent. This information will be made available to DES following the preliminary air dispersion modelling, but prior to Round 1 stack monitoring commencing. In relation to QUT / SRI, DES has previously advised that SRI is

considered acceptable to carry out air emission testing on Queensland sugar mills (refer to **Appendix C**).

Where site-specific monitoring shows that a contaminant has a low risk of impact when compared against the AQOs, that contaminant will be removed from subsequent monitoring rounds, unless there is a change in the fuel composition (i.e. if supplementary oil is used during normal operations in subsequent rounds, where bagasse only has been previously monitored).

Additional modelling will be conducted after each stack test event if the measured emissions are significantly higher than those assumed in the preliminary air dispersion modelling exercise (refer to **Section 6.1**).

6.4 Ambient monitoring

Particulate matter monitoring will be conducted at a downwind sensitive receptor. An upwind location is not considered necessary as the dispersion pattern of emissions from the 50-metre stack will be complex and is not suited to the upwind / downwind analysis that is commonly conducted when investigating the potential contribution of fugitive (i.e. ground-level emission) sources on sensitive receptors.

The Gordonvale State School is currently considered the most likely sensitive receptor based on the complaints presented in the EE Notice and the predominant wind direction (refer to **Appendix L**). However, if it is not possible to set up the monitoring equipment at this location (e.g. due to a lack of security, power or other concerns), an alternate location representative of the school as identified by the preliminary air dispersion model (e.g. turf club / golf course, refer to **Section 6.1**) may be used.

The following equipment is proposed to be co-located at the sensitive receptor:

- One low volume air sampler– identified as approved against:
    - AS/NZS 3580.9.10:2006 – Methods for sampling and analysis of ambient air: Determination of suspended particulate matter – $PM_{2.5}$ low volume sampler – gravimetric method; and
    - AS/NZS 3580.9.9:2006 – Methods for sampling and analysis of ambient air: Determination of suspended particulate matter – PM_{10} low volume sampler – gravimetric method.

  Noting the key concern in the EE Notice is smoke that has occurred during upset conditions. Smoke is generally made up of particles in the $PM_{2.5}$ size range and is considered the most direct and reliable indicator of smoke from the mill. However, in consideration of DES' comments, PM_{10} and $PM_{2.5}$ will be sampled at a frequency of 1 day in 3 in an alternating sequence using the same sampler (i.e. alternating the PM_{10} and $PM_{2.5}$ size selective inlets). Pre-weighed filters will be analysed at a NATA accredited laboratory for the particle size relevant to the size selective inlet installed at the time of collection.

  This monitoring will be undertaken for a period of 14 days prior to the commencement of and two months during the 2022 crush season (including the start-up period). This duration and frequency can be reviewed in the event of verified complaints, data loss, inconclusive outcomes and / or stack sampling and air dispersion modelling demonstrating that PM_{10} and / or $PM_{2.5}$ monitoring is unnecessary.

- One two-fraction optical particle counter capable of recording PM_{10} and $PM_{2.5}$ concurrently at five-minute intervals with 1-hour and 24-hour rolling averages. This equipment can be used to understand short-term concentrations of PM_{10} and $PM_{2.5}$ during identified upset periods or when complaints are received in association with operating information and AS/NZS meteorological station monitoring data (refer to **Section 6.2**). The data from this equipment can also be evaluated against the AS/NZS low volume air sampler data.

This equipment will be installed for a period of 14 days prior to the commencement of the 2022 crush season, and remain in place for the duration of the 2022 crush season to cover any potential upset event (refer to **Section 6.5**).

Refer to **Appendix D** for further details on the proposed sensitive receptor ambient monitoring equipment.

The preliminary air dispersion modelling will be used to identify whether there are likely to be additional key receptor locations or high-risk indicators. These will be further considered after the preliminary air dispersion modelling is complete (refer to **Section 6.1**).

6.5 Upset condition monitoring

As noted in **Section 6.3**, it is not possible to conduct stack monitoring during start-up or upset conditions as non-steady state conditions will exist in the stack. However, it is important to have some data to assess these situations as they may contribute to complaints. Alternative methods to identify and evaluate potential impacts from such events, or in instances when complaints are received, are as follows:

- Continuous in-house boiler oxygen monitoring to report non-optimal performance conditions – as noted by QUT / SRI (refer to **Section 1** and **Appendix B**) a low air to fuel ratio in one or more of the boilers is a precursor to the generation of visible smoke emissions from the boiler house stack. Oxygen analysers are part of the automated control strategy and oxygen concentrations are continuously monitored, with an audible console alarm activated when oxygen levels fall below 1% requiring operator attention; and
- Where an oxygen alarm is activated, this will be recorded with the following other measurements which can be used to evaluate the potential impact at a sensitive receptor:
    - stack camera footage of smoke emissions (snapshots before, during and after the event are to be saved for later reference);
    - ambient monitoring results (refer to **Section 6.4**); and
    - site-specific meteorological data (refer to **Section 6.2**).

The oxygen data and assessment of smoke will provide a useful assessment of the combustion conditions during these periods.

6.6 Suitably qualified persons

The monitoring program will be implemented by a team of SQPs, with roles as outlined in **Table 6.1**.

Table 6.1: SQP Roles

Role	Including	SQP
Project management / site coordination	• Arranging monitoring / modelling / weather station contracts; • Accessing sites for equipment installation (on-site and at sensitive receptor locations); • Operational monitoring including continuous boiler oxygen, stack camera and reporting upset situations (refer to **Section 6.5**);	MCM Mill Manager and Safety and Environment Technician

Role	Including	SQP
	• Field reporting (including checklists as per **Appendix K**); • Collection of ambient samples from low volume air sampler (refer to **Section 6.4**) in accordance with a Sampling and Analysis Plan (SAP) prepared by CQG; and • Provision of Statutory Declaration for above scope for Final EE Report.	
Weather station	• Installation and data management (refer to **Section 6.2**).	EnvironData (refer to **Appendix G**)
Air dispersion modelling	• Stack modelling and reporting including assessment against AQOs (refer to **Section 6.1**, **Section 6.3, Section 6.7** and **Appendix F**); and • Provision of Statutory Declaration for above scope for Final EE Report.	An SQP comprising either: Anthony Mann – QUT / SRI (refer to **Appendix C**) OR Tania Haigh and Simon Welchmann – Katestone (refer to **Appendix E**)
Stack monitoring	• Stack monitoring and reporting (refer to **Section 6.3**); and • Provision of Statutory Declaration for above scope for Final EE Report.	Anthony Mann – QUT / SRI (refer to **Appendix C**) Note depending on results of preliminary air dispersion modelling outcomes additional resourcing may be required.
Ambient monitoring	• Equipment setup, SAP preparation and training of MSF personnel; • Particulate matter result review and reporting in comparison with relevant AQOs (refer to **Appendix F**); and • Provision of Statutory Declaration for above scope for Final EE Report.	Cathee Miller and Patrice Brown – CQG (refer to **Appendix D**)
Sample analysis	• Analysis of stack and ambient emission samples.	NATA accredited or equivalent certification:

Role	Including	SQP
		• QUT / SRI for stack particulate analysis (refer to **Appendix C**); • SGS for low volume air sampler particulate analysis; and • Others identified as required (refer to **Section 6.1**)
EE Notice prescribed report development	• Reviewing all AQMP deliverables. • Collation of all relevant data into Final EE Report including information as outlined in **Section 6.7.**	Prepared by: Cathee Miller and Patrice Brown – CQG (refer to **Appendix D**) Peer review: Tania Haigh and Simon Welchmann – Katestone (refer to **Appendix E**) Approved by: MCM Mill Manager and Safety and Environment Technician

6.7 Reporting

MCM will review and report the monitoring results against applicable environmental and health-based guidelines and standards for the EE Notice prescribed Environmental Report due by 30 January 2023. It is noted that for stack emissions, modelling of the emission data collected will be required in order to assess against the AQOs (as outlined in **Appendix F**). Preliminary modelling is proposed to inform the field monitoring program, with subsequent modelling to occur after each stack test event if the measured emissions are significantly higher than those assumed in the preliminary air dispersion modelling exercise.

The proposed schedule also allows for a meeting with DES to report on the 2021 results (refer to **Appendix J**). MCM can also meet with DES at any other time about the implementation of the AQMP on request.

The EE Notice prescribed Environmental Report will include the following:

- Introduction;
- Methodology – including details of relevant sampling and analysis standards used and any variations from the AQMP following air dispersion modelling and across the monitoring events;
- Results – collation of monitoring event results;
- Discussion – having consideration of AQOs, sensitive receptors and meteorological variables as well as any improvements made by MCM during the program;
- Conclusions; and
- Appendices – including:
    - final TAPM air dispersion modelling output. This model will use 12-months of site-specific meteorological data (refer to **Section 6.2**) to evaluate the meteorological dataset of previous air dispersion modelling (refer to **Section 6.1** and **Section 6.3**) and stack and ambient monitoring results (refer to **Section 6.3** and **Section 6.4**), with additional data assimilated into the model, where relevant, to further understand the potential impact of the mill operations;

- consultants full reports;
- site pre and post monitoring checklist;
- weather station data;
- supporting information to any significant upset condition reports; and
- associated statutory declarations.

7 References

1. **Australian Bureau of Statistics.** 168 - Population and occupied dwellings in all localities. *1911 Census - Volume III - Part XIV Summary.* 1911.
2. **Bureau of Meteorology.** [Online] 11 February 2021. http://www.bom.gov.au/.
3. **State of Queensland.** Inversions. [Online] 27 September 2016. https://www.qld.gov.au/environment/pollution/monitoring/air/air-monitoring/meteorology-influence/meteorology-inversions.
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5. **Department of Environment and Heritage Protection** (2013) Odour Impact Assessment from Developments. [Online] 31 March 2013 https://environment.des.qld.gov.au/__data/assets/pdf_file/0021/90246/guide-odour-impact-assess-developments.pdf.
6. **USEPA.** AP 42, Fifth Edition, Volume 1 Chapter 1: External Combustion Sources. [Online] 21 October 2020. https://www.epa.gov/sites/production/files/2020-09/documents/1.8_bagasse_combustion_in_sugar_mills.pdf.

APPENDIX A. EE NOTICE – STAT – E – 1000072540

Notice

Environmental Protection Act 1994

Environmental Evaluation

Notice to conduct or commission an environmental evaluation

This notice to conduct or commission an environmental evaluation is issued by the administering authority pursuant to section 326B of the Environmental Protection Act 1994*.*

The Mulgrave Central Mill Company Pty Ltd
47 Gordon Street
Gordonvale QLD 4865

Your reference: EPPR00390613
Our reference: 101/0009102, C-CPLRC-100008829; E-100072540

Wednesday, 9 June 2021

Take notice: that under the *Environmental Protection Act 1994* (the Act) a notice to conduct or commission an environmental investigation (EE) is issued to The Mulgrave Central Mill Company Pty Ltd (ACN 009 657 032) (you) by the administering authority. The administering authority is the Chief Executive of the Department of Environment and Science (the department).

The notice to conduct or commission an environmental investigation is issued with respect to the activities of The Mulgrave Central Mill Company Pty Ltd on land described as 47 Gordon Street, Gordonvale, Lot 102 on Plan SP279534, Lot 184 on Plan NR5231, Lot 11 on Plan RP835454, and Lot 12 on Plan RP835454 (the licensed place).

Take further notice that:

- The original notice was issued on 16 December 2020 and varied on 2 February 2021 following an internal review.
- On 9 June 2021 amendments were made the varied notice pursuant to section 24AA of the Acts Interpretation Act 1954. The amendments were as follows:
    - Delete "*Tuesday, 2 February 2021*" and insert "*Wednesday, 9 June 2021*" on page 1 to reflect the date the Notice was amended.
    - Delete "*14 November 2022*" and insert "*30 January 2023*" to extend the timeframe for Requirement 4. This extension will capture all monitoring results prior to submission of the final report and following advice that the 2022 crushing season is likely to extend into late November or early December.
    - Delete "*must commence no sooner than 20 business days following receipt of the departments comments*" and replace with "*must commence after the receipt of the department's comments*". Removal of the 20 business day is considered reasonable due to the potential conflict with the planned commencement of the 2021 crushing season and previous provision of written comments to Mulgrave Mill on 18 May 2021.
    - Delete "*The environmental investigation must be carried out, and the environmental report prepared by a suitably qualified person. A suitably quality person is defined as a person or*

Queensland Government

persons who has demonstrated professional qualifications, training, skills or experience relevant to performing the function" and replace with "*The environmental investigation must be carried out, and the environmental report prepared by a suitably qualified person. A suitably qualified person is defined as a person or persons who has demonstrated professional qualifications and experience relevant to performing the function*" on page 7 to correct typographical error and provide consistency with section 564 of the *Environmental Protection Act 1994*.

A. Grounds

The notice to conduct or commission an environmental investigation is issued on the following grounds:

1. In accordance with section 326B(1)(a) and 326B(1)(b) of the Act, the department is satisfied that an event has happened causing environmental harm while an activity was being carried out and an activity or proposed activity is causing, or is likely to cause environmental harm.

The facts and circumstances forming the basis for these grounds are:

1. The Mulgrave Central Mill Company Pty Ltd operates the Mulgrave Sugar Mill and is the holder of environmental authority EPPR00390613 (EA), which authorises the following environmentally relevant activity (ERA) at the licensed place:
    a) ERA 28 – *Sugar milling or refining* – crushing or grinding 200 tonnes or more of sugar cane in a year; or manufacturing 200 tonnes or more of sugar or other sugarcane products in a year.
2. The licenced place, as defined in the EA, includes Lot 102 on Plan SP279534, Lot 184 on Plan NR5231, Lot 11 on Plan RP835454, and Lot 12 on Plan RP835454, located at Gordon Street, Gordonvale.
3. Mulgrave Sugar Mill operates continuously during the crushing season which lasts approximately 22 weeks/year. Additionally, steam trials are completed prior to the start of crush as part of the safety and commissioning component of boiler start-up.
4. Release of contaminants to the atmosphere are authorised via the boiler house stack (Release Point A1) located on Lot 102 on Plan SP279534, in accordance with conditions of the EA.
5. When operating, emissions are treated in a wet scrubber system and released via the boiler house stack at a height of 50.3 metres.
6. Bureau of Meteorology (BOM) wind rose graphs for the Cairns Aero Station (ID 031011) show that the predominant wind directions during crushing season are from a Southerly and South-Easterly direction.
7. Mulgrave Sugar Mill is situated on the Eastern edge of the township of Gordonvale; consequently, stack emissions tend to be directed towards the township.
8. Mulgrave Sugar Mill's boilers are permitted to be fuelled by bagasse, coal, fuel oil, wood, or waste oil, in accordance with conditions of the EA.
9. Mulgrave Sugar Mill utilise waste oil as a fuel to supplement bagasse during boiler start-up and during times of abnormal or suboptimal cane feed conditions and/or bagasse quality.
10. Bagasse and waste oil have highly variable composition, combustion properties and combustion by-products.
11. Amounts and concentrations of sugar mill combustion by-products released to the atmosphere are influenced by combustion efficiency and the effectiveness of emissions control measures including wet scrubbing.

12. Sugar mill combustion by-products include carbon monoxide, sulphur oxides, oxides of nitrogen, acid gases and organic compounds. Metals and their compounds may also be entrained and carried by gas or vapour.
13. Emissions of substances listed on the National Pollutant Inventory (NPI) are estimated using the NPI Emission Estimation Technique Manuals. Where the emission estimate for a substance exceeds the reporting threshold, it is reported annually to the NPI by The Mulgrave Central Mill Company Pty Ltd.
14. The 2018/2019 NPI report for Mulgrave Sugar Mill recorded the following annual emission estimates:
    a) Carbon monoxide – 957,137 kilograms
    b) Oxides of Nitrogen – 282,866 kilograms
    c) Sulfur dioxide – 91,822 kilograms
    d) Particulate Matter <10.0 microns (PM10) – 38,617 kilograms (3,078 kilograms of which are recorded as fugitive rather than point source emissions)
    e) Particulate Matter <2.5 microns (PM2.5) – 20,257 kilograms
    f) Total Volatile Organic Compounds (TVOCs) – 11,025 kilograms
    g) Ethanol – 10,851 kilograms
    h) Lead and compounds – 91.39 kilograms
    i) Chromium (III) compounds – 3.37 kilograms
    j) Nickel and compounds – 1.85 kilograms
    k) Cadmium and compounds – 1.57 kilograms
    l) Polycyclic aromatic hydrocarbons (PAHs) – 0.05 kilograms
15. Exposure to oxides of nitrogen, PAHs, sulphur dioxide, TVOCs, and ethanol may cause irritation to the eyes, nose and throat, and can lead to coughing. Oxides of nitrogen and sulfur dioxide, among other substances, can also cause strong odours.
16. Particulates with an equivalent aerodynamic diameter (EAD) of 10 microns and less (PM10) are classified as respirable and hence may affect human health. Particulates with an EAD of 2.5 microns and less (PM2.5) have been statistically associated with human health effects including the exacerbation of asthma.
17. Exposure to the above mentioned substances may therefore cause adverse impacts on qualities of the air environment that are conducive to human health and wellbeing, aesthetics of the environment, and may also cause offensive odours.
18. The department considers that based on the predominant wind direction, the variability of fuel qualities, and the reported emission estimates of combustion by-products, your activities at the licensed place have the potential to impact environmental values and cause environmental harm, as nuisance, at sensitive receptors.
19. On 4 June 2020, the department received a report of smoke nuisance and offensive odour which identified Mulgrave Sugar Mill as the alleged source. The community notifier reported that this was not an isolated occurrence and nuisance has been experienced at different times over the past 4 years. This report was not considered frivolous or vexatious.
20. The department responded to this community report and conducted monitoring within Gordonvale area over the succeeding weeks.
21. On 16 June 2020, departmental officers conducted monitoring in Gordonvale and made the following observations:
    a) Smoke nuisance and offensive odour were recorded between 10:20am and 11:40am at the front of the Turf Club and Gordonvale State School, located on George Street, approximately 500 metres from Mulgrave Sugar Mill. It is noted that departmental officers departed this location soon after 11:40am in order to avoid prolonged exposure, and that the smoke nuisance was ongoing at the time of departure.

b) Smoke nuisance was recorded between 12:20pm and 12:30pm at the front of Pyramid Residential Care Centre, located on Cairns Road approximately 1.3 kilometres from Mulgrave Sugar Mill.
c) Smoke nuisance was again observed between 2:50pm and 3:05pm in the Gordonvale CBD. It is noted that departmental officers departed this location soon after 3:05pm and that the smoke nuisance was ongoing at the time of departure.
d) The smoke nuisance and offensive odour was not detected at upwind monitoring sites on 16 June 2020, nor was it detected during background monitoring conducted on 5 and 11 June 2020.

22. On 16 June 2020, departmental officers observed smoke being emitted from the Mulgrave Sugar Mill stack and observed it falling to ground level and travelling towards nuisance sensitive places within the Gordonvale township, including those locations described above.
    a) The smoke elicited the reflex to cough and caused irritation to the eyes of departmental officers. Members of the public in proximity to the State School entrance were also observed to cough and wave at the smoke in an effort of avoid exposure.
    b) When exposed to the smoke, departmental officers experienced a strong synthetic burning odour that caused displeasure to the officer's sense of smell and was deemed offensive by an authorised person at George Street, Gordonvale.
    c) No other potential sources of smoke or emissions were observed on 16 June 2020.
23. Environmental nuisance of this nature impacts the environmental values of human health and wellbeing and aesthetics of the environment, including the amenity and odour qualities of a place, which are considered to be values present at the nuisance sensitive places described above.
24. On two occasions on 16 June 2020, members of the public approached departmental officers and advised that smoke nuisance of a similar nature frequently occurs during the crushing season. These community members expressed concern for the potential respiratory and health implications of the smoke.
25. On 24 June 2020, you received two community reports of nuisance. These community notifiers reported a burning oil smell and difficulty breathing at a distance of over 2 kilometres from Mulgrave Sugar Mill.
26. Dark coloured smoke, which is considered an indicator of inefficient combustion and/or ineffective wet scrubbing, has been observed on a number of occasions by departmental officers at various locations within the Gordonvale township, including on 4 June 2020 at 3:20pm, on 16 June 2020 from 1:25pm to 1:50pm and from 2:35pm to 2:40pm, and on 24 June 2020 at 3:20pm.
27. On 23 June 2020, the department issued you correspondence identifying potential non-compliances with your EA and provisions of the Act, and requested further information relating to your activities on 16 June 2020 including actions taken to prevent or minimise harm.
28. On 2 July 2020, you provided a response which advised that you would take action to address the matters identified commencing with site investigations by a subject matter expert in boiler function. In the response, you also advised the following:
    a) Bagasse and waste oil were burnt concurrently throughout the day on 16 June 2020, with crushing commencing at 4:35pm.
    b) Atmospheric conditions were noted as including low cloud cover, South-Easterly wind direction towards the township, and wind velocity such that stack emissions were sheared immediately and pushed down towards the township.
    c) Review of camera footage identified 6 periods of darker smoke emissions ranging from one to three minutes in duration between 11:48am and 3:03pm, which is characteristic of lower oxygen levels in the boiler furnace.

d) There are no environmental incident logs of any operational matters that may have affected environmental performance.
e) The response also provided supporting documentation including waste oil product information, logs of visual monitoring using the Ringelmann scale of smoke darkness, records of complaints received, the most recent stack test and a stack diagram, and a schedule of wet scrubber maintenance.

29. The Mulgrave Central Mill Company Pty Ltd monitors stack emissions through visual assessments and camera footage, however as at June 2020, had not undertaken stack testing of particulate matter concentration since October 2018, nor has there been monitoring of ambient air quality within the Gordonvale township.
30. The department considers that an event has happened on 16 June 2020 that caused environmental harm in the form of offensive odour resulting from smoke emissions while an activity was being carried out at the licensed place.
31. On 23 July 2020, the department issued you a penalty infringement notice (PIN) for contravention of condition B4 of your EA which states *"The environmentally relevant activities which are the subject of this environmental authority must be carried out in such a manner to ensure that no odour deemed offensive by an authorised person and caused by the environmentally relevant activities can be detected beyond the boundaries of the licenced place."*
32. Furthermore, based on observations of departmental officers, reports of environmental nuisance from members of the community, and reported sugar mill combustion by-products, the department considers that activities at the licensed place are causing or are likely to cause environmental harm in relation to offensive odour and smoke nuisance to nuisance sensitive places in the township of Gordonvale.
33. Environmental harm is defined under section 14 of the Act as *"any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance."*
34. Environmental nuisance is defined under section 15 of the Act as *"unreasonable interference or likely interference with an environmental value caused by –*
    a) aerosols, fumes, light, noise, odour, particles or smoke; or
    b) an unhealthy, offensive or unsightly condition because of contamination; or
    c) another way prescribed by regulation."
35. Environmental value, as defined under section 9 of the Act, *"is –*
    a) a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or
    b) another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation."
36. The *Environmental Protection (Air) Policy 2019* identifies the qualities of the air environment that are conducive to human health and wellbeing and to protecting the aesthetics of the environment as environmental values to be enhanced or protected.
37. Smoke nuisance and offensive odour impact the environmental values of human health and wellbeing and aesthetics of the environment, including the amenity and odour qualities of a place, which are considered to be values present throughout residential and commercial premises within the township of Gordonvale.
38. Impact to environmental values was evidenced by:
    a) Community reports of environmental nuisance on 4 June 2020 and 24 June 2020;
    b) The strong intensity of the offensive odour detected during monitoring on 16 June 2020;
    c) The severity of the ground level haze caused by smoke emissions observed on 16 June 2020;

d) The physical responses of coughing and irritation to one's eyes that the smoke elicited on 16 June 2020; and
e) The effect on members of the community who were observed to cough and wave at the smoke and who spoke directly with departmental officers on 16 June 2020.

39. Further likely impact to members of the community was evidenced by:
    a) The spatial extent of the smoke which was observed up to and beyond 1.3 kilometres from the source on 16 June 2020;
    b) The duration of the smoke nuisance which was experienced for over an hour at the State School on 16 June 2020; and
    c) The potential health effects posed by exposure to particulate matter and other contaminants produced by sugar mill combustion.
40. The department has determined that the facts and circumstances warrant the issuing of a notice to conduct or commission an environmental investigation under section 326B(1)(a) and 326B(1)(b) of the Act.
41. Subsequent to the issuing of statutory notice STAT-E-100022326 on 16 December 2020, The Mulgrave Central Mill Company Pty Ltd submitted an application for internal review on 4 January 2021.
42. The application was accompanied by new information not previously made available to the department, that warranted consideration by the department with regards to the statutory notice issued. New information included the following:
    a) The outcome of proactive site investigations undertaken by a suitably qualified person in July 2020 and submission of a report produced in December 2020 evaluating boiler performance at Mulgrave Sugar Mill;
    b) Commitment from The Mulgrave Central Mill Company Pty Ltd to implement certain recommendations provided by the suitably qualified person including, but not limited to, reviewing maintenance of wet scrubbers, installing and trialling the use of an opacity meter, and reviewing various operational and procedural aspects of boiler start-up and operation; and
    c) Details of works undertaken to complete a new bagasse inloading facility, upgrade boiler electrical systems, and install a deaerator, to assist in the efficient operation of the boilers;
    d) Maintenance and repairs undertaken and further works planned including upgrades to increase the capacity of induced draught fans to assist in the efficient operation of the boilers; and
    e) Further works planned to expand bagasse storage capacity with the aim of progressing to exclusive use of bagasse as a fuel source.
43. Having considered this new information and the implications of ongoing and planned changes to the operation of Mulgrave Sugar Mill with regards to fuel types, boiler operation, and start-up processes, the department has determined that, in accordance with the department's internal review processes, revised environmental investigation requirements are warranted, as stated in this statutory notice.

B. Requirements

The report on the environmental investigation must address the following relevant matters:

1. By **12 April 2021**, you must develop an **Air Quality Monitoring Program** to investigate potential environmental nuisance associated with air emissions from the Mulgrave Sugar Mill, and submit a copy to the department for review. You must have due regard and consideration for any comments made by the department in relation to the documents submitted.

2. The **Air Quality Monitoring Program** must:
    a) Be prepared by a *suitably qualified person*;
    b) Include monitoring of both point source air emissions from Mulgrave Sugar Mill and ambient air quality, having consideration of sensitive receptors and meteorological variables;
    c) Account for variation in fuel types used during start-up and operation of Mulgrave Sugar Mill, as well as planned changes to fuel inputs over the 2021 and 2022 crushing seasons;
    d) Identify contaminants to be monitored with consideration of reported sugar mill combustion by-products, planned fuel inputs, and appliable environmental and health based guidelines and standards;
    e) Include a timeline for implementation of the monitoring program over 2021 and 2022 crushing seasons identifying key milestones and duration of monitoring periods;
    f) Be conducted in accordance with relevant Australian or International standards, or other method/s identified and demonstrated as being appropriate for assessment against applicable environmental and health based guidelines and standards;
    g) Ensure all analysis required is carried out by a laboratory that has National Association of Testing Authorities (NATA) accreditation, or an equivalent certification, for such analysis;
    h) Include an analysis and review of monitoring results against applicable environmental and health based guidelines and standards;
    i) Include record keeping of the following information, where applicable, on a daily basis during, and for a 14 day period prior to and following any monitoring:
        i) Boiler throughputs;
        ii) The type, volume, composition, and supplier of fuel/s burned;
        iii) Any operational or equipment factors, including incidents, maintenance and modifications, that may influence air emissions from the Mulgrave Sugar Mill;
        iv) Any community reports of environmental nuisance received and the subsequent response, as per Condition H15 of Environmental Authority EPPR00390613; and
        v) Visual estimates of smoke darkness (density), as per Condition B1 (d) of Environmental Authority EPPR00390613.
3. The Air Quality Monitoring Program must be implemented by a *suitably qualified person* during the 2021 and 2022 crushing seasons and must commence after receipt of the department's comments, if any, with regards to documents submitted under Requirement 1.
4. By **30 January 2023**, you must submit the Environmental Report, including results and interpretation of the Air Quality Monitoring Program, to the department.

The environmental investigation must be carried out, and the environmental report prepared by a *suitably qualified person*. A *suitably qualified person* is defined as a person or persons who has demonstrated professional qualifications and experience relevant to performing the function.

The environmental report (including all requirements) must be submitted to the department on or before:
Monday, 30 January 2023

As the recipient of this notice, you are also required to provide a statutory declaration in the form attached, to accompany the environmental report submitted to the department.

The *suitably qualified person* who prepares the environmental report must also provide a statutory declaration in the form attached to the environmental report submitted to the department.

Copies of the template statutory declarations can also be accessed from the Queensland Government website at www.qld.gov.au, using the publication number as a search term:

1. Statutory declaration environmental evaluation for recipient (ESR/2016/1997)
2. Statutory declaration for *suitably qualified person* (ESR/2016/2266)
3. Statutory declaration environmental evaluation for auditor (ESR/2016/2265)

Take notice:

1. The requirements of the notice to conduct or commission an environmental investigation take effect immediately upon service of this notice;
2. This notice remains in force until further notice from the department; and
3. You are responsible for meeting the costs of conducting or commissioning the environmental evaluation, preparing the environmental report and providing any further information as requested by the department.

C. Reviews and appeals

The provisions regarding reviews of decisions and appeals are found in sections 519 to 539 of the Act.

A person who is dissatisfied with certain decisions of the department, may be able to apply to have the department review that original decision.

Generally, a request to have a decision reviewed must:

- be made within 10 business days of the decision being notified to the person;
- be supported by enough information to enable the department to decide the application for review; and
- be made using the application form, Application for review of original decision (ESR/2015/1573) available on the Queensland Government website at www.qld.gov.au, using the publication number (ESR/2015/1573) as a search term.

Where an application has been made for a decision to be reviewed, the applicant may also apply to the relevant court for a stay of the decision to secure the effectiveness of the review.

Once the original decision has been reviewed, a person who is dissatisfied with the review decision may be able to appeal against that decision to the relevant court within 22 business days after receiving notice of the review decision.

A person whose interests are or would be adversely affected by a decision of the department may also be able to request a statement of reasons for a decision or a statutory order review under the *Judicial Review Act 1991*.

For further information about reviews and appeals see the information sheet, Internal review and appeals (ESR/2015/1742) available on the Queensland Government website at www.qld.gov.au, using the publication number (ESR/2015/1742) as a search term.

Information sheets are available on the Queensland Government website at www.qld.gov.au, using the publication number as a search term.

You may have other legal rights or obligations and should seek your own legal advice.

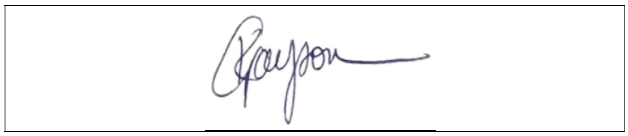
D. Penalty

Failure to comply with a notice to conduct or commission an environmental evaluation is an offence.

1. The maximum penalty for an individual is 300 penalty units, totalling $ 40,035.00.

2. The maximum penalty for a corporation is 1500 penalty units, totalling $ 200,175.00.

Should you have any queries in relation to this notice, please contact Kristen Corkill of the department on telephone number (07) 4222 5161.



Signature

9 June 2021

Date

Kate Grayson,
Manager (Compliance)
Delegate of the Chief Executive
Department of Environment and Science
Environmental Protection Act 1994

Enquiries:

Kristen Corkill, Environmental Officer
Department of Environment and Science
5B Sheridan Street, Cairns QLD 4870
PO Box 7230, Cairns QLD 4870
Ph: (07) 4222 5161
Email: ESTownsville@des.qld.gov.au

APPENDIX B. MCM Actions against QUT / SRI (2020) Recommendations

Table B.1: MCM status against QUT / SRI (2020) recommendations

Recommendations	Status
1. Air to fuel ratio too low, noting induced draft fans on No. 6 and 7 boilers are often at maximum capacity. Only way to increase air to fuel ratio is to reduce feeder speeds.	During the 2020 season, MCM commissioned an upgrade to No's 6 & 7 boilers electrical master control centre (MCC). The project included the migration of No.7 boiler to a Yokogawa distribution control system (DCS). The total project has resulted in increased electrical circuit load capacity and cost ~ **$450,000**. Also a ~ **$4.7 mill** bagasse out-loading facility project was completed in August 2020, including the installation of a deaerator (representing about half of the total cost). The incorporation of the deaerator improves boiler performance as a consequence of reducing the load on induced draft (ID) fans. In addition, the scheduled maintenance program has been undertaken to repair air leakage in the boilers; including patching and replacement of degraded ducting, expansion joints and baffle components. Works have commenced and are scheduled to be completed prior to 2021 crush season at an estimated cost of **$50,000.**
2. Recent changes to settings of left three grate air inlet duct dampers to assist with drum level control could be making the inadequate oxygen problem worse and should be reconsidered (high carbon monoxide levels were identified here).	The previous practice of the operator was to restrict under-grate air to different sides of the furnace to control boiler water drum levels. There was at times a differential split in boiler drum level from one side of the boiler to the other. This practice caused high carbon monoxide levels on one side of the boiler furnace and an imbalance in the fire in the furnace. As per QUT / SRI recommendations, the settings of the left three under-grate air inlet duct dampers have been set to the fully open position (so flow no longer reduced by the dampers).
3. Scrubbers to be checked and blockages cleared – noted most gas side pressure drop that contributes to loading on induced draft fan in bagasse boilers occurs across scrubbers.	Scrubber inspections are conducted between February and May each year as part of the annual maintenance program. During the crush season wet scrubbers and water flows are monitored to ensure that temperature and flow rates are within operating parameters. If water flow cannot be maintained (i.e. a blockage) then a shutdown is required to protect the equipment.
4. Consider opacity meter for advance warning of dark smoke so crushing rate can be reduced resulting in less load on boilers – noting opacity meters do not always perform well on boilers with wet scrubbers.	Given opacity meters are known to perform poorly on wet scrubber systems, MCM will be liaising with suppliers during the 2021 crush season to trial other meters which may be more suited to the wet scrubber arrangement. In the meantime, smoke density visual estimates as per Australian Standard (AS 3543: Use of standard Ringelmann and Australian Standard miniature smoke charts) will continue, with results included in the 14 day pre and post-monitoring reports as required by EE Notice Requirement 2(i)(iv) (refer to **Appendix A**).
5. Recommended boilers be started up as quickly as procedures / physical condition of boilers allow, so completed prior to prevailing wind is directed toward town (late morning) and to reduce supplementary fuel requirement.	Boilers to be started as per original equipment manufacturer (OEM) recommendations i.e. Riley Dodds Australia Limited Boiler Operating Instructions, dated 10/06/1966. The start-up time of the boilers follows the curve of the manufacturers recommended warm-up rate for increasing the temperature and pressure.

Recommendations	Status
Noted as currently taking well over four hours.	However, operational procedures have been changed to improve the issues noted by this recommendation: • No. 6 and No. 7 boilers will be able to start up together given efficiency improvement works (refer to status against Recommendation 1) which will reduce the overall start-up time; • Start-up will be completed on shift when the land breeze is blowing away from the town, with the boilers fully operational by early morning to avoid predominant winds blowing towards the Gordonvale township; and • Steam trials would previously start and stop with the day shift roster, until sufficient hours had elapsed to conduct all required checks. Commencing from the 2021 crush season, steam trials will run continuously (commencing on shift, as noted for the start-up above), unless an issue is identified that requires rectification for the steam trial to resume.
6. Using air instead of steam for oil atomisation by No. 7 boiler oil burners (allow No. 7 boiler to start first, with smoke and odour associated occurring earlier in the start-up process – may also reduce total start up time)	As noted in the DES Internal Review the following improvements were made in relation to odour: • $4.7 mill bagasse out-loading facility project was completed in August 2020 (refer to status against Recommendation 1); and • A mobile bagasse in-loading facility was installed and commissioned during the 2020 crush season. This facility is provided as a temporary measure to enable bagasse from South Johnstone or Tableland Mill to be stored until a more permanent in-loading storage facility can be developed (subject to land negotiation and planning approvals). Given the availability of this infrastructure, MCM intends to rely on a predominately bagasse start-up, including steam trials, commencing from the 2021 crush season. If the use of oil is to occur, it is likely to be confined to the following circumstances (if they arise), namely, a) bagasse feeder chokes, b) bagasse reclaimer chokes / malfunction, c) bagasse belt trips, d) instances where the safe operation of the boiler is compromised during non-normal operating conditions, with such events recorded. This will be a marked departure from the practice employed in 2020, during which time significant quantities of oil were used. The approach noted here and at Recommendation 5 means this QUT / SRI recommendation is no longer applicable.
7. Use of diesel rather than bunker oil in the burners, given it does not require heating and produces less odour than bunker oil.	MCM have reviewed the use of diesel since the issue of the email dated 13 January 2021 to DES. Diesel is not at this point in time being considered as an option as an interim measure, given there would need to be equipment modification to operate a different fuel type. In addition, as noted in the same email, MCM's clear objective is to cease using fossil fuels, rather than moving to a different one. This transitional process has been brought forward in the case of the boiler start-up (refer to status against Recommendation 6).
8. Option of installing a cone on top of stack to increase efflux velocity and disperse smoke and odour – drawback being that loadings on boiler induced fan drafts will increase.	The cone option is not being considered, given drawback identified and because increased ID fan speed and reduced air leaks has the same effect of increasing efflux velocity (refer to status against Recommendation 1 and 3).

APPENDIX C. QUT / SRI Information



Anthony Mann is a mechanical engineer (RPEQ) who specialises in computational fluid dynamics (CFD), combustion modelling and boilers. He has more than 30 years' CFD experience, mostly in boiler combustion modelling. He is the principal author of more than 200 consulting and research reports for Australian and overseas clients. The consultation work includes CFD modelling of boiler design modifications for reduced tube erosion and dew point corrosion, improved combustion performance and reduced emissions. He has carried out several boiler design evaluations, boiler upgrade studies, boiler circulation analyses and pneumatic conveying system designs. He is also extensively involved in boiler performance testing and troubleshooting, emission testing, training courses for sugar factory personnel and modelling of pollutant emissions. He has carried out emission testing for the Australian sugar industry for over 20 years and, as part of the SRI group at QUT, has been the main provider of emission testing services to the Australian sugar industry for the last 10 years. He has carried out gas analyser measurements on several boilers in the Australian and overseas sugar industries and has assisted with the determination of emission factors used by the national pollutant inventory (NPI) for bagasse combustion.

Queensland Government

File/Ref TSV76

Department of
Environment and Resource Management

7 December 2009

Mr Doug Sockhill
Production Manager - Pioneer Sugar Mill
CSR Sugar
Townsville Qld 4816

CC: Mr Jay Venning
CSR Limited
PMB 6
TOWNSVILLE MC QLD 4810
Fax: (07) 4724 5715

Dear Mr Stockhill

Stack Emission Monitoring for CSR Ltd Qld Sugar Mills

I refer to your email received by the Department of Environment and Resource Management (DERM) on 23 April 2009 regarding the continued use of Sugar Research Institute (SRI) as the preferred air emission consultants for the CSR Ltd Queensland Sugar Mills.

Condition H6 (a) of your development approval (NR0026) states; "all determinations in relation to the air monitoring program of contaminate releases to the atmosphere at the steam boilers chimney stack release points must be made by a person or body registered by the National Association of Testing Authorities (NATA) for the required determinations or a body acceptable to the Administering Authority".

As SRI is not NATA accredited, the DERM Air Sciences group has reviewed their operation and procedures to determine if they are an acceptable body under this condition. Based on the information provided and SRI affiliations that provide access to NATA accredited services and quality assurance systems, SRI is considered to be acceptable to DERM for carrying out air emission testing on Queensland sugar mills.

Should you have any further enquiries, please do not hesitate to contact Mr Graham Poacher, Senior Environmental Officer of the department on telephone 4722 5352.

Yours sincerely

J. Smith

Tim Smith
Principal Environmental Officer
Environment, North Region

\\PALFP02\shares\Environmental Operations\Operations\Licencing\EPA_IPA\TSV76 CSR Sugar Mills\2009\Correspondence\Outwards\Letter confirming SRI as aceptable testing body071209.doc

Cape Pallarenda Conservation Park
Cape Pallarenda Road Townsville
Queensland 4810 Australia

Telephone + 61 7 4722 5353
Facsimile + 61 7 4722 5351

Website www.derm.qld.gov.au

ABN 46 640 294 485

APPENDIX D. CQG Information

Staff Profile

Cathee Miller

Principal Environmental Scientist



Cathee has over 20 years' experience as a senior environmental manager and scientist working in the private and public sectors.

She has a good working knowledge of key environmental legislative instruments including the Commonwealth *National Environment Protection (Ambient Air Quality) Measure* (NEPM) and Queensland *Environmental Protection Act 1994* and *Environmental Protection (Air) Policy 2019* (EPP Air) as well as other guidelines and standards relating to air quality.

Cathee has managed several major Environmental Impact Statement (EIS) projects, requiring the oversight of robust baseline environmental monitoring programs, risk and impact assessments and development of management plans. In all cases, consideration of potential development air quality impacts were required.

She has managed ambient air monitoring programs conducted in accordance with various AS/NZS 3580 series (Methods for sampling and analysis of ambient air series) standards, and overseen the preparation of air dispersion modelling outputs.

Cathee is certified as an Exemplar Global Environmental Principal Auditor (No. 114619) and has conducted numerous independent third-party audits against approval conditions often requiring the review and understanding of available data; including air quality monitoring and modelling outputs.

She also co-facilitated the Australia Sugar Milling Council (ASMC) environmental committee established to share learnings across the industry on environmental improvements and raise awareness of emerging concerns.

Specialisations

- Management of major environmental impact assessment projects
- Environmental approvals
- Environmental compliance and auditing
- Environmental management systems, including implementation of compliance and due diligence environmental monitoring programs

Qualifications

- Bachelor of Environmental Science (Honours), University of Wollongong (1994)
- Master of Environmental Science, University of Wollongong (1994)
- Certified Environmental Principal Auditor, Exemplar Global (Certificate No. 114619)
- Graduate Certificate in Project and Program Management, CQUniversity

Career Summary

- **Nov 2010 to Jul 2019 / Jan 2020 to current** – Principal Environmental Scientist, CQG Consulting
- **Jul 2019 to Dec 2020** – Environmental Business Partner, Cleanaway Operations Pty Ltd
- **Feb 2009 to Aug 2010** – Environmental Approvals Manager, Oakajee Port and Rail Pty Ltd
- **Jun 2008 to Jan 2009** – Environmental Operations Manager, John Holland Group
- **Dec 2005 to Jun 2008** – Senior Environmental Scientist - GHD Pty Ltd
- **Jun 2005 to Dec 2005** – Environmental Manager, ecologica Environment
- **Nov 2004 to May 2005** – Airport Environmental Officer, SMEC Australia Pty Ltd
- **Mar 2001 to Nov 2004** – Environmental Officer, City of Swan

Staff Profile

Cathee Miller

Principal Environmental Scientist



Relevant Project Experience

Rockhampton Regional Council

- Project Director – routine and event-based monitoring at operating and closed waste facilities, involving groundwater, surface water, depositional dust, landfill gas and leachate monitoring undertaken in accordance with relevant Australian Standards as outlined in CQG Standard Operating Procedures (SOPs) and project-specific Sampling and Analysis Plans (SAPs). Samples collected required analysis by a National Association of Testing Authorities (NATA) laboratory, with results reported against environmental authority (EA) release limits where available, or other relevant guidance triggers.

Cleanaway Operations Pty Ltd

- Environmental Business Partner to 20+ facilities in Queensland.
- Oversight of various site environmental monitoring programs; including preparing / reviewing scopes, selecting suitably qualified consultants, managing site logistics and reviewing reports related to groundwater, surface water and point source and fugitive air emission monitoring programs.
- Development of site-specific air emission registers.
- Liaison with regulators, including in relation to environmental monitoring programs and results with respect to EA release limits or other relevant guidance triggers and EA amendments related to point source air release limits.

Cheetham Salt Ltd

- Project Manager – ambient depositional dust monitoring program undertaken in accordance with relevant Australian Standards as outlined in CQG Dust Deposition SOP. Samples collected required analysis by a NATA laboratory, with results reported against *DES Guideline: Application requirements for activities with impacts to air*.

Kara Industrial Minerals Pty Ltd

- Project Manager – reporting to Department of Environment and Science (DES) on depositional dust monitoring program and liaison with DES and Gladstone Ports Corporation through approval amendment related to air conditions and dust monitoring program logistics.

Mackay Sugar Pty Ltd

- Team member – reviewing Mossman Mill depositional dust and PM_{10} monitoring deliverables, required under a transitional environmental program (TEP) for Mossman Mill stack emissions. All work was required to be conducted in accordance with relevant Australian Standards, samples analysed by NATA laboratories and reported against relevant guidance triggers.

Environmental Impact Statements

EIS projects require robust assessment of environmental values, risk and management measures for review by regulators and the community. Confirming baseline environmental values, through site-specific environmental monitoring programs, is a key component of EIS impact assessment. Cathee has been instrumental in the following EIS projects:

- Project Manager – Boulder Steel Ltd: $4.4 billion Gladstone Steel Plant Project – developed documentation in accordance with the *State Development and Public Works Act 1971* (Qld) terms of reference. – including an assessment to predict combustion gas emissions potentially generated through the steel making process and evaluate against EPP (Air).
- Environmental Approvals Manager – Oakajee Port and Rail Pty Ltd: 45 Mtpa iron ore terrestrial port development – developed documentation in accordance with the *Environmental Protection Act 1986* (WA) – including baseline PM_{10} monitoring and modeling to predict impact from proposed dust emission sources and power station emissions against NEPM criteria.

Various other

- Project management – variety of air monitoring programs, including related to point source and fugitive air emissions.
- Project Manager – development of programs, procedures and training material for environmental monitoring programs, including those stipulated through an enforcement process requiring submission of reports to regulators.
- Auditor – conducted third-party audits against site EA/s and / or management plans including review of environmental monitoring data and compliance.

Staff Profile

Patrice Brown

CEO/Founder



Patrice is one of Queensland's leading environmental practitioners with over 30 years' experience. She is a Fellow of the Environmental Institute of Australia and New Zealand, a Certified Environmental Practitioner, a qualified sugar technologist and an experienced project manager.

Patrice has prepared numerous reports that have withstood public and peer scrutiny. Under her leadership, CQG Consulting is the largest environmental consultancy in regional Queensland with staff in Rockhampton head office, Gladstone, Mackay, Townsville and South East Queensland and a reputation as a "go to" firm to deliver practical solutions.

Patrice is regarded highly in the environmental sector with long established relationships with all levels of government. She has a very strong network with other environmental professionals throughout Australia and a thorough understanding of environmental legislation.

She has experience designing and implementing ambient air monitoring programs for clients in a range of sectors and authored several environmental impact assessment reports that included air quality reports.

Patrice's experience with air quality monitoring commenced in 1996 with formal training through the Environmental Protection Authority as an employee. Since then she has set up various monitoring units and prepared scopes and managed air quality monitoring programs and investigations for greenfield and brownfield projects in NSW and Qld. She has worked closely with air quality specialists such as Katestone and others for over 30 years in her various roles as an environmental practitioner.

Specialisations

- Environmental approvals and compliance
- Government liaison and strategic advisor
- Indigenous training and partnering
- Contaminated land, waste, monitoring programs

Qualifications

- Bachelor of App Sc (Chem), CQU (external)
- Master of Engineering (Civil), UNSW (external)
- Diploma of Chemistry (Sugar), Mackay TAFE
- Certified Environmental Practitioner, EIANZ
- Diploma Australian Institute of Company Directors
- Certificate of Maritime Environmental Management, Lloyds, London
- Certificate Sustainability in Business, University of Cambridge



Staff Profile

Patrice Brown

CEO/ Founder

Career Summary

- **April 2003 to current** – Company Director CQG
- **2002 to 2003** – Environmental Manager Aldoga Aluminium
- **2000 to 2002** – Rockhampton Manager Connell Wagner
- **1996 to 2000** – Rockhampton Manager & Townsville Enviro Team Leader SKM
- **1996** – EPA Senior Environmental Officer
- **1990 – 1995** – NSW Environment Manager CSR Timber
- **Prior to 1990** - Sugar mill supervisor/chemist

Appointed Roles

- Gladstone Industry Advisory Group (current)
- Member Qld Premier's Business Advisory Council (wrapped up in Nov 2019)
- CQUniversity Council (current)
- Fitzroy Partnership for River Health Management Committee (current)
- Rockhampton Regional Development Ltd (previous)
- Capricorn Enterprise (previous)
- Gladstone Area Water Board (previous)
- Sugar Research and Development Corporation (previous)
- Emerald Agricultural College (previous)

Relevant Project Experience

Patrice has project managed numerous major environmental impact assessment projects in Queensland and New South Wales for developments including large industrial facilities, coal mines, transmission lines, substations, tourism developments, railroad, and port developments. She has also peer reviewed several EIS reports for other consultancies including for a proposed port facility on Kangaroo Island in South Australia. These studies required the coordination of environmental monitoring programs, including ambient air quality, identification of potential impacts on sensitive receptors and nomination of mitigation measures to minimise those impacts.

Patrice has been the project director / project manager for over 100 environmental monitoring projects across Queensland. She has on-ground sampling, overseen service delivery, designed programs, managed resources to complete works, provided support to project managers, liaised with clients and provided strategic advice, reported on and reviewed output and secured permits and approvals for a range of developments.

A snap-shot of these projects are provided on the following pages.

Staff Profile

Patrice Brown

CEO/ Founder



Relevant Project Experience

Civil Construction Projects

Laing O'Rourke – ASMTI SWBTA Environmental Package Lead WP.91101- Project Director

Australian-Singapore Military Training Initiative (ASMTI) Facilities Project (Defence)

- Project Director of Environmental Services Package (including air quality monitoring for asbestos).
- Construction environmental advice and support for the 4.5-year project which includes roads, camps, urban training areas, fencing and firebreaks, creek crossings (>10,000-hectare footprint)
- Environmental report, Management Plans, significant impact assessment that include the consideration of potential air quality impacts from construction works.

LendLease (Acciona)

Project Manager – Environmental Approvals Advice Rookwood Weir Project

- Project Director for air quality monitoring program during construction works.

Environmental Impact Statements (EIS)

Mitchell Ports

- Project Manager for an EIS for proposed port projects in Queensland. Infrastructure plans included rail loops, conveyors, tug harbour, offshore anchoring points and coal terminal facilities.
- CQG was responsible for designing an air quality monitoring program to determine ambient air quality at Port Alma to inform the EIS. Setting up dust gauges.

Gladstone Steel Plant Project EIS

Including marine import and export options

- Project Director - EIS for Boulder Steel $4.4 billion Gladstone Steel Plant Project.
- Study included identification of environmental values in the Aldoga State Development Area and consideration of potential impacts to the terrestrial and marine environments including determining potential impacts on air quality.

Wongai Environmental Impact Statement (EIS) - Coking Coal Project

Project Manager - EIS for the Traditional Owners of the Wongai Project

- Underground coking coal mine and barging transshipping operation in the Great Barrier Reef World Heritage Area linked with a model to return to country for tourism and cattle production, Bathurst Heads, Cape York.
- Preparation of referral and technical reports for proposed road, mine and associated infrastructure, coordination of dust deposition monitoring and identification of potential sensitive receptors and air quality impacts.

Great Keppel Island Revitalisation Plan EIS

- Project manager - delivered approved EIS for $1 billion GKI Resorts Revitalisation Plan
- Led team of >90 specialists which included determining potential impacts on air quality from the project during construction and operation phases.

Kangaroo Island EIS

Timber Plantation and Port Development Project

- Peer review of EIS for a proposed multi-user port on Kangaroo Island in South Australia. Includes a review of ambient air quality monitoring and identification of potential impacts on sensitive receptors from the storage and handling of wood chips and logs.

Hummock Hill Island Gladstone

EIS under the EPBC Act

- Preparation of the revised referral, government liaison, peer review of EIS for proposed residential and tourism development, Hummock Hill Island in the Southern Great Barrier Reef (GBR World Heritage Area), which included potential impacts to air quality during construction and operation of the facility.

Other EIS Projects

- Reviewer for impacts from major proposed highway realignment South Australia adjacent to salt fields, including potential impacts from construction on marine environment.

Staff Profile

Patrice Brown

CEO/ Founder



- **Project manager EIS for major highway** interchange on Hume Highway – Mariner Financial. Assessment included consideration of ambient air quality and potential impacts from construction and traffic during operation.

Rockhampton Regional Council

(2003 to current)

- Project Director environmental monitoring program for closed and operating landfills. Project includes dust deposition monitoring.
- Provision of advice to address air quality complaints associated with landfilling and civil operations works.
- Project Director for an ambient air quality monitoring to inform an EA amendment to include ERA 54 on an operating landfill site.

CSR Sugar, Mackay Sugar

(1997) (SKM)

- Project Manager for an environmental assessment at eight mill sites in Queensland to determine ambient air quality, stack emissions and potential impacts.

Mackay Sugar

- Provision of environmental advisory support and coordination of ambient air quality monitoring at Marian Mill and Racecourse Mills for bagasse stockpile areas.
- Project Manager for TEP Mossman Mill (initial stages) which included setting up on units on site to measure PM2.5 and PM10 as well as deposition dust.
- Project Director for an odour investigation at Racecourse Mill ponds.

Bundaberg Sugar

- Project Director for an odour investigation report and subsequent monitoring program.
- Provision of advice to monitor air quality associated with stack emissions.

Air Quality Investigations (Various)

- Preparation of scope and coordination of stack monitoring for Stanwell Power Station.
- Project Director/ Manager for various air quality investigations for quarry operations in Central Qld – including dust deposition and respirable dust monitoring.

Tully Sugar

- Project Manager – air quality investigations at to determine potential impacts from a bagasse storage facility. Included setting up PM2.5 and PM10 units and interpretation of results.

Isaac Regional Council Moranbah Cumulative Air Study

- Facilitation of workshop, review of Qld government air quality data and explanation to the focus group.

Ecotech
ACOEM Group

MicroVol 1100

LOW VOLUME AIR SAMPLER



The MicroVol 1100 low volume air sampler provides a flexible sampling platform for PM_{10}, $PM_{2.5}$ or TSP particulates and basic meteorological parameters.

The MicroVol 1100 is suitable for both indoor and outdoor applications. The unit is microprocessor controlled and uses a mass flow sensor in conjunction with ambient temperature and pressure sensors to automatically maintain a constant volumetric flow rate.

APPROVALS

- PM_{10} AS/NZS 3580.9.9 2006
- $PM_{2.5}$ AS/NZS 3580.9.10 2006
- Manufactured under ISO 9001.

INDOOR SAMPLING

- Low power consumption
- Quiet operation - ideal for indoor air quality studies
- Volumetric flow control automatically corrected to standard reference temperature
- Ultra-efficient, long life DC pump delivers flow rates of 1.0 to 4.5 L/min.

OUTDOOR SAMPLING

- Wind direction and speed used to activate/de-activate sampler
- Fence line monitoring available with a network of samplers
- Built for all conditions - lightweight, rugged weatherproof construction
- Can operate via battery or solar powered sources (optional).

ENHANCED COMMUNICATION

- RS232 output for data collection and remote communication
- Filter block and instrument error alarms available
- Total control of instrument remotely from PC
- Simple programming of sampling periods, including daily and weekly programs, with in built “1-in-X day” sampling capability.

DIRECTIONAL SAMPLING

- Wind direction and speed used to activate/de-activate sampler
- External trigger (0 - 5 VDC) can be used for activating sampling program.

SPECIFICATIONS

Operation:	Microprocessor controlled (internal data logging)
Volumetric flow range/accuracy:	1.0 - 4.5 L/m
Flow accuracy:	± 2 % of reading
Flow repeatability:	± 0.5 % of reading
Temperature range accuracy:	0 to 45 °C ± 1 °C
Barometric pressure range:	600 - 900 Torr ± 4 Torr
Filter types:	47 mm ringed circular filter
Inlets available:	PM_{10}, TSP (standard), $PM_{2.5}$ (optional)
Sampler dimensions:	300 x 170 x 170
Sampler weight:	3.75kg
Battery pack dimensions:	185 x 170 x 170
Battery pack weight:	4.4 kg
Battery pack life:	Up to 40 hours sampling from fully charged battery pack
Operating voltage:	12 VDC
Power consumption:	2.5 - 3 watts depending on filter loading
Standard accessories:	• TSP/PM_{10} size selective inlet • Single 47 mm filter holder • 100 - 240 AC to 12 VDC power converter • MicroVol Downloader software • RS232 cable

COMMUNICATION & DATA LOGGING

Number of readings

- 150 (averaging period is user selectable, e.g. 75 hrs of 30 min averages)

External inputs

- 1 x wind direction sensor input (10 k potentiometer)
- 1 x wind speed sensor input (contact closure)
- 1 x spare contact closure input (e.g. tipping bucket rain gauge)

Output

- RS232C

OPTIONS

- Purpose built battery pack, or solar panel and battery pack
- Moisture elimination system
- Optional $PM_{2.5}$ size selective inlet adaptor
- Optional wind speed and direction sensor or tipping bucket rain gauge.

bsi. ISO 9001 Quality Management FS 603790 AS/NZS 4801 Occupational Health and Safety Management OHS 603791

ECOTECH Pty Ltd (Global Head Office)
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Ecotech
ACOEM Group

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DATASHEET

AirMetER-DX
2-FRACTION OPTICAL PARTICLE COUNTER

LOW-MAINTENANCE DUAL-FRACTION DUST MONITOR FOR OUTDOOR AIR QUALITY MONITORING APPLICATIONS



The AirMetER-DX is an economical, laser-based Optical Particle Counter for the monitoring and recording of PM2.5 and PM10 dust fractions.

Designed specifically for remote outdoor monitoring applications, the AirMetER-DX integrates seamlessly with Air-Met Scientific's web-based data portal to provide customisable SMS and/or email alerts, rolling averages and automated reports.

A range of accessories are also available, making the AirMetER-DX an ideal dust monitoring solution for your next project.



FEATURES

- Heated inlet
- Humidity correction
- Over the air (OTA) K-factor correction (requires gravimetric sample data)
- Low maintenance requirement
- Simultaneous PM2.5 and PM10 measurement
- OPTIONAL:
  - 3 years onboard datalogging with unique file name creation every 24 hours for easy download
  - Dedicated alarm relay (24Vdc) for PM2.5 and PM10 level plus common alarm relay
  - ModBus RTU via RJ12 port for integration

DATA

Cellular telemetry through Air-Met's secure data portal.

- 5 minute datalogging interval with FTP transfer to Air-Met's secure data portal
- 1-hour and 24-hour rolling averages as standard
- Data downloads, user management, threshold alert management (SMS and or email) and auto-report generation all managed via Air-Met's data portal.

Requires minumum 6-month subscription to Air-Met's data portal.

APPLICATIONS

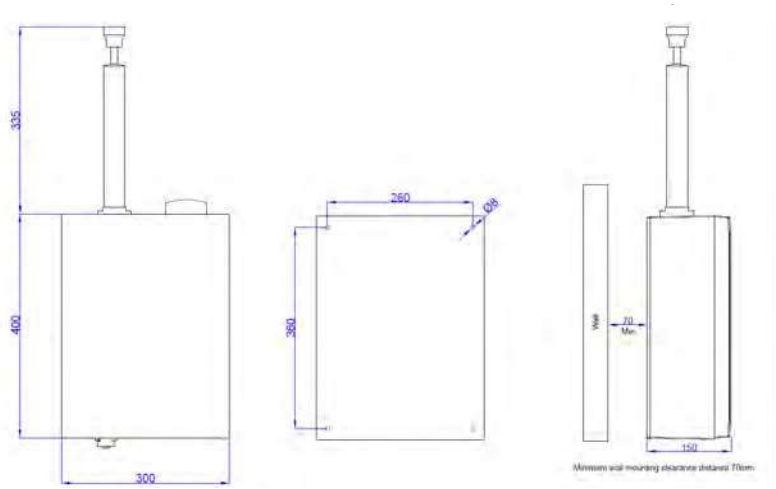
- Construction sites
- Road-side monitoring
- Large area monitoring projects

TECHNICAL SPECIFICATIONS

GENERAL	
Power requirement	10.8−30V DC (12VDC nominal)
Rated Power	20W max with heated inlet 8W max without heated inlet
Datalogging (optional)	3 years of logs onboard
Alarm Indicator (optional)	Onboard dedicated alarm relay for PM2.5 and PM10 levels
Communication (optional)	ModBus RTU (RJ12) for PLC or SCADA integration
Operating Temperature	-20°C to 60°C
Operating Humidity	0 to 98% non-condensing
Operating Pressure	860 to 1100 mbar
Laser Module Operating Life	3 years (when operated below 40°C)

MEASUREMENTS	PM2.5	PM10
Range	0.0−1999.9µg/m^3	0.0 – 2999.9µg/m^3
Counting Efficiency	70% at 0.3µm, 98% at 0.5µm	70% at 0.3µm 98% at 0.5µm
Relative Error	Max of ±10% and ±8µg/m^3	Max of ±15% and ±10µg/m^3

ENCLOSURE	
Material	Polycarbonate
Dimensions (mm)	400 (H) x 300 (W) x 150 (D)
Instrument Weight	6.7kg
Mounting Options	Pole-mount kit supplied (recommended installation method) Wall-mount − ~70 mm offset required for dust inlet clearance



ACCESSORIES

PART NO.	ACCESSORY
TF-TRI-AM	Tripod
AMS/200S/170B/15M/9C	Remote Power System
AMS-LPF-60-12	IP67 230VAC to 12VDC Mains Power Adaptor
Contact Us	Meteorological Sensors

APPENDIX E. Katestone Information

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11 June 2021

Attn: Cathee Miller

CQG Consulting
180 Quay Street
Rockhampton Qld 4700

Email: cathee.miller@cqgroup.com.au

Re: Peer review of proposed Air Quality Monitoring Program for Mulgrave Sugar Mill

Dear Cathee,

Katestone Environmental Pty Ltd was commissioned by CQ Group to conduct a peer review of the proposed Air Quality Monitoring Program (AQMP) that was prepared in relation to the Mulgrave Sugar Mill in response to a Notice to Conduct or Commission an Environmental Evaluation (Notice) that was issued to Mulgrave Central Mill Company Pty Ltd (MCM) on 2 February 2021. The Notice was issued due to complaints of smoke and odour nuisance alleged to have been caused by emissions from the stack located at the Mulgrave Sugar Mill located in Gordonvale, Queensland.

The following documents have been considered in this peer review:

- Notice to conduct or commission an environmental evaluation, EPPR00390613, issued on 9 June 2021 and previous versions (EE Notice)
- Mulgrave Central Mill, draft Air Quality Monitoring Program, dated 11 June 2021 and Appendices A to M (Draft AQMP)
- Comments from DES on the draft AQMP, issued 18 May 2021.

Under Section B of the EE Notice an environmental investigation is required that addresses the following matters:

1. *By 12 April 2021, you must develop an Air Quality Monitoring Program to investigate potential environmental nuisance associated with air emissions from the Mulgrave Sugar Mill, and submit a copy to the department for review. You must have due regard and consideration for any comments made by the department in relation to the documents submitted.*
2. *The Air Quality Monitoring Program must:*
   a) *Be prepared by a suitably qualified person;*
   b) *Include monitoring of both point source air emissions from Mulgrave Sugar Mill and ambient air quality, having consideration of sensitive receptors and meteorological variables;*
   c) *Account for variation in fuel types used during start-up and operation of Mulgrave Sugar Mill, as well as planned changes to fuel inputs over the 2021 and 2022 crushing seasons;*

d) *Identify contaminants to be monitored with consideration of reported sugar mill combustion by-products, planned fuel inputs, and applicable environmental and health based guidelines and standards;*
e) *Include a timeline for implementation of the monitoring program over 2021 and 2022 crushing seasons identifying key milestones and duration of monitoring periods;*
f) *Be conducted in accordance with relevant Australian or International standards, or other method/s identified and demonstrated as being appropriate for assessment against applicable environmental and health based guidelines and standards;*
g) *Ensure all analysis required is carried out by a laboratory that has National Association of Testing Authorities (NATA) accreditation, or an equivalent certification, for such analysis;*
h) *Include an analysis and review of monitoring results against applicable environmental and health based guidelines and standards;*
i) *Include record keeping of the following information, where applicable, on a daily basis during, and for a 14 day period prior to and following any monitoring:*
    i) *Boiler throughputs;*
    ii) *The type, volume, composition, and supplier of fuel/s burned;*
    iii) *Any operational or equipment factors, including incidents, maintenance and modifications, that may influence air emissions from the Mulgrave Sugar Mill;*
    iv) *Any community reports of environmental nuisance received and the subsequent response, as per Condition H15 of Environmental Authority EPPR00390613; and*
    v) *Visual estimates of smoke darkness (density), as per Condition B1 (d) of Environmental Authority EPPR00390613.*

3. *The Air Quality Monitoring Program must be implemented by a suitably qualified person during the 2021 and 2022 crushing seasons and must commence after receipt of the department's comments, if any, with regards to documents submitted under Requirement 1.*
4. *By 30 January 2023, you must submit the Environmental Report, including results and interpretation of the Air Quality Monitoring Program, to the department.*

Simon Welchman (Director) and Tania Haigh (Senior Consultant) of Katestone have completed a detailed review of the Draft AQMP and related documents. It is Simon Welchman and Tania Haigh's opinion that the Draft AQMP meets the requirements of the EE Notice.

Please contact the undersigned on (07) 3369 3699 if you would like to discuss the review.

Yours sincerely,



Simon Welchman – Director



Tania Haigh – Senior Consultant

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SERVICE HIGHLIGHT | MONITORING PROGRAM

Katestone has been a leading provider of expert air quality services in Australia since 1989. Our experienced team of scientists and engineers is dedicated to delivering expert advice and solutions to industry, government and the community on all aspects of air quality, odour, greenhouse gas and climate change.

Our team provides a full suite of services for assessment of emission problems and impacts. These include site evaluation studies, analysis of stack and ambient monitoring and meteorological data, source apportionment, dispersion modelling, evaluation of control efficiencies and real-time monitoring and forecasting.

Our team is experienced in providing advice to both industry and government on the impacts to air quality and odour from industrial and infrastructure projects via due diligence and pre-feasibility studies through to detail design. Based on Katestone's technical reviews, our clients have a sound basis to make decisions since the conceptual design phase of a project.

Our clients have benefit from robust environmental impact studies, environmental management overview strategies and environmental management plans. We stand by our work and we have the capability, expertise and standing to support you through every step of the approval process. Our team has provided expert witness advice in legal cases and hearings and are aware of the most recent developments in air quality legislation, assessment methodologies and control strategies.

Katestone's Experience

- 30 years' experience in conducting diligent reviews
- Provided advice to manufacturing companies, mining operators and bulk handling terminals on potential controls and mitigation measures to achieve compliance with Environmental Approvals.
- Designed, implemented and reviewed air quality monitoring programs including proactive and reactive monitoring strategies.
- Conducted ambient monitoring data validation and analysis to satisfy regulatory reporting requirements.
- Developed effective air quality and dust management plans for existing and proposed manufacturing companies, refineries, mines and LNG plants.
- Extensive experience in the use of regulatory dispersion models including, AERMOD, TAPM, TAPM-CTM and CALMET/CALPUFF.
- Developed Air Monitoring Protocols to satisfy Environmental Approvals.
- Conducted best practice dust management benchmarking studies.
- Reviewed Environmental Approval Conditions relating to air quality and provided recommendations for amendments to ensure the client could achieve its environmental outcomes.
- Quantified emissions for National Pollutant Inventory Reporting (NPI) and the greenhouse gas emissions for the National Greenhouse and Energy Reporting (NGER).
- Developed weather forecasting and decision support systems and tools for clients to significantly enhance their ability to manage their business.
- Successfully represented clients as expert witness in various court matters in Queensland and New South Wales.

Projects

Manufacturing Companies

- Tomago Stack height Assessment (2021) Tomago Aluminium Company Pty Ltd
- Chunkers Modelling pre build (2021), Real Pet Food Co
- Audit and monitoring (2021), Resitech
- Munster stack test modelling (2021), Cockburn Cement Ltd
- Angaston Dust Management Dashboard (2021), Adelaide Brighton Cement Ltd
- Odour Management Plan (2021), Resitech Resins Pty Ltd
- Ambient air report 2020 (2021), Santos
- Townsville Boat Building Reverse Amenity Assessment (2020), Wild Environmental Consultants
- Concrete batching plant (2020), Wagners
- NuGrow TEP (2020), NuGrow Ipswich Pty Ltd
- LNG EA Amendment (2020), Santos
- Rudd Street Oxley (2020), MCD Australia
- Balter Brewing Height Increase (2020), Balter Brewing Company

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16 Marie St, Milton, QLD

- Gotzingers Small Goods Air Quality Assessment (2020), Watpac
- Odour assessment for a microbrewery (2019), Ward's Brewing Company
- Molindar Beef Jerky Manufacturing - Development Application , (2019) Storey and Castle Planning
- Wind fence alternatives, 2019, Adelaide Brighton Cement Ltd
- Paste Plant PAH (2019), Tomago Aluminium Company Pty Ltd
- Coil Steels Air Quality Assessment (2019), Metecno Pty Ltd
- Racecourse Mill Odour (2019), Confidential Client
- Newstead Brewery Expansion (2019), Newstead Brewery
- Bundaberg Sugar Environmental Investigation (2019), CQG Consulting
- Real Pet Food Yatala (2019), VIP Pet Foods
- Bundaberg Sugar (2019), CQ Group
- Manufacturing Plant Audit (2018), Arcadis
- Banagher Abattoir (2018), Panther Environmental Solutions Ltd
- Swanbank Glass Manufacturing Plant (2018), Orora
- Sunstate Cement Manufacturing Plant (2018), EMM Consulting Pty Ltd
- WWTP Timoleague (2018), Staunton Foods Limited
- Munster Cement Plant (2018), Cockburn Cement Ltd
- TARP review (2020), Adelaide Brighton Cement Ltd
- Darwin LNG plant Hot Vent Analysis (2018), ConocoPhillips Australasia West business Unit
- Munster Cement Plant (2018), Cockburn Cement Limited
- Brisbane Valley Protein Precinct (2018), Brisbane Valley Protein
- Tuan Plant (2018), Altus Renewables Ltd
- Darwin LNG Hot Vent Trialing (2017), ConocoPhillips Australasia West Business Unit
- Tomago Aluminium Smelter (2017), Tomago Aluminium Company Pty Ltd
- Emission Abatement Review (2019), Alcoa of Australia Ltd
- Associated Finance Pty Ltd & Ors v Industrial Galvanizers Corporation Pty Ltd (2017)
- Birkenhead plant (2017), Adelaide Brighton Cement Ltd
- Ardex Chemical Processing Plant (2017), CDM Smith
- Talinga Pipeline Compressor Facility (2017) Origin Energy Resources Ltd
- Amaca Pty Ltd & Ors ats Swiatek
- Tuan Plant (2016), Altus Renewables Ltd
- Wunderlich Factory (2016), Maurice Blackburn Lawyers

Monitoring

- SO2, H2S and CS2 Monitoring at Lihir (2021), Newcrest Mining Ltd
- Monitoring data review (2021), Ravenswood Gold
- Air Quality Monitoring Plan (2021), Middlemount Coal Pty Ltd
- Audit and monitoring (2021), Resitech
- Legacy Way Ambient Monitoring (2020), Transurban Queensland
- Monitoring network update (2020), Port Kembla Coal Terminal Ltd
- Image Flat Dust Deposition Monitoring (2019), Sunshine Coast Regional Council
- Emissions Monitoring Study (2019), Select Harvests
- Bell Bay Monitoring (2018), Tasmanian Ports Corporation Pty Ltd
- Yarrabee Coal Project Monitoring review (2018), Yancoal Australia
- Ambient Monitoring 16/17 (2018), ConocoPhillips Australasia West Business Unit
- 17/18 Monitoring Network Annual Report (2018), Port Hedland Industries Council
- Dust Deposition Monitoring (2019), Quarry Products Pty Ltd
- Monitoring Report (2017), Port Hedland Industries Council
- Environmental Monitoring Report (2016), Port Kembla Coal Terminal Ltd
- Fugitive Wood Fibre Monitoring Plan (2017), Tasmanian Ports Corporation Pty Ltd

Due diligence assessments

- Confidential Facility in Gladstone Due Diligence (2021), Confidential Client
- 91 Montague Street, South Brisbane Due Diligence (2020), Planvista
- South Ripley Residential Development Due Diligence (2019), Podium Property Group Pty Ltd
- Ventilation Feasibility Study (2019), Confidential Client

- Open Cut Coal Mine Prefeasibility Study (2019), Confidential Client
- Smithfield Energy Facility Due Diligence (2018), Infigen
- Wiggins Island Coal Export Terminal Dust Emissions Review for Due Diligence (2011), Aurecon Hatch
- Air Quality due diligence study for the acquisition of land for the proposed Arrow LNG Mainland Launch Site (2011), Coffey Arrow
- Boral Cedars Quarry Due Diligence (2010), Boral
- Air quality feasibility study of proposed open cycle gas-fired power station at Bulli Creek, South East Queensland (2010), Stanwell Corporation
- Titchum Creek Quarry Atherton Table Lands Due Diligence (2008), Boral Resources
- Proposed concrete batching plant in Gladstone Due Diligence (2008), Parsons Brinckerhoff
- Boral Redlynch Quarry Due diligence (2007), Boral Resources

Reviews and Peer Reviews

- Lae Energy Park GHG Emissions Review (2021), Mayur Resources
- Peer review of Dust Hazard Assessment (2021), CQ Group
- Peer Review and Odour Assessment of Proposed Poultry Farm Expansion (2021), Somerset Regional Council
- Response to HRA Peer Review (2020). Confidential Client
- Peer Review of AQ and GHG Assessments - Mount Pleasant Optimisation Project EIS (2020), Resource Strategies
- Bluff Coal Mine EPO Review (2020), Nitro Solutions
- Peer review Saleyards (2019), CQ Group
- Peer Review of Asbestos Fibres - 3 Hasset Street (2019), Maurice Blackburn Lawyers - Melbourne
- Baralaba South EIS Peer Review (2019), Wonbindi Coal Pty Ltd
- Air Quality Review for proposed Northern Extension Modification Snapper Mine (2019), Resource Strategies
- NEPM Review (2019), Confidential Client
- Emission Abatement Review (2019), Alcoa of Australia Ltd
- Dashboard Meteorology Data Review (2019), Adelaide Brighton Cement Ltd
- DA Peer Reviews (2019), Brisbane City Council
- Independent Development Reviews (2018), Brisbane City Council
- HAPs Review (2017), NSW EPA

Expert Witness

- Expert witness (2021), HWL Ebsworth Lawyers
- Dust emissions expert Akara Resources (2020), Akara Resources
- Pembroke Olive Downs v Sunland Cattle Co Pty Ltd & Ors (2019) - Expert Witness, Allens
- Cleanaway - New Chum Appeal (2019), Allens
- Eastern Creek Energy from Waste Facility (2019), Allens
- New Acland AEMP (2019), New Hope Group
- Confidential Project Air Quality and Odour Assessment (2019), Allens
- Euthulla Waste Facility (2018), We Kando Pty Ltd
- North Surat Baseline (2018), New Hope Group
- Agrifutures Workshop (2018), Industry Ag & Environment
- Ecco Ripley Shopping Precinct (2017), Seed Engineering
- Bungowannah Piggery (2017), Allens
- North Surat Project (2017), New Hope Group



Simon Welchman — Director - Air Quality

Simon is an Environmental Engineer with a background of proven success over twenty-four years working as an air quality expert in the private sector and for the environmental regulator. Simon has been a Director of Katestone Environmental Pty Ltd since 2004 during which time he has conducted, managed, supervised or quality assured numerous air quality projects for clients across many sectors including: Local, State and Federal Government, heavy industry, refining, mining, construction, materials handling, intensive agriculture, land development, infrastructure, transport, road tunnels, manufacturing, electricity generation and distribution, waste treatment and disposal, aviation, LNG upstream collection infrastructure and LNG export facilities. Projects have considered the potential effects of many air pollutants on the environment and communities including: odour, dust, particulate matter, criteria pollutants, volatile organic compounds, air toxics, photochemical smog, secondary particulate generation, heavy metals, polycyclic aromatic hydrocarbons, dioxins and furans.

Simon has an extensive knowledge of air pollutants, their emission or formation in the atmosphere and the circumstances that contribute to their impact on the environment and people. Having worked in government and as an expert peer reviewer for Local and State Governments, Simon has a detailed and practical understanding of strategic planning, approval conditions and regulatory approaches to air quality management and control. Simon is expert in the use of regulatory dispersion models, interpretation of air quality data and a proficient and effective communicator of the sometimes complex science and concepts that underpin his work.

Simon is a member of the Institute of Engineers Australia and a Registered Professional Engineer of Queensland. Simon is an expert witness and has given evidence in the Queensland Planning and Environment Court, Queensland Land Court, Queensland Supreme Court, NSW Land and Environment Court and the Supreme Court of Victoria.

ACADEMIC QUALIFICATIONS

Bachelor of Engineering (Environmental) (Hons), University of Queensland 1994.

PROFESSIONAL AFFILIATIONS

Member of the Clean Air Society of Australia and New Zealand
Member of the Institution of Engineers Australia (NER)

SPECIALIST SKILLS

Expert advice on emissions regulation, emissions benchmarking and assessment of best available control technologies
Air quality impact assessment studies of major industrial and infrastructure projects
Developing government policy for air quality and odour impact assessment; and, developing environmental regulation
Air quality modelling including TAPM, CALMET/CALPUFF, Ausplume, ISC3, Caline (traffic) and in-house dispersion models for tall stacks in coastal and inland situations
Air pollution emissions monitoring and ambient air quality monitoring

PROFESSIONAL EXPERIENCE

Director of Katestone Environmental (2004-present)
New South Wales Environment Protection Authority (1999 – 2004)

- Acting Manager, Air Technical Advisory Services Unit
- Acting Principal Technical Policy Advisor
- Senior Technical Policy Advisor

Katestone Scientific Pty. Ltd. (1997 – 1999)
HLA Envirosciences Pty. Ltd. Mackay/Brisbane (1995 – 1997)

Monitoring, mitigation and emission control strategies

- SO2, H2S and CS2 Monitoring at Lihir (2021), Newcrest Mining Ltd
- Monitoring data review (2021), Ravenswood Gold
- Air Quality Monitoring Plan (2021), Middlemount Coal Pty Ltd
- Audit and monitoring (2021), Resitech
- Legacy Way Ambient Monitoring (2020), Transurban Queensland
- Emissions Monitoring Study (2019), Select Harvests
- Jellinbah and Mackenzie North Mine (2018), Jellinbah Mining
- New Chum Landfill (2018), Cleanaway
- DSM Web Form (2017), Tasmanian Ports Corporation Pty ltd
- APLNG Facility EA Amendment (2017) ConocoPhillips East Business Unit.
- Clem7 Tunnel (2017), Transurban Queensland
- Darwin LNG Facility (2017) ConocoPhillips West Business Unit.
- Ormeau Quarry Expansion (2017), Boral Construction Materials Group Ltd
- North Surat Project (2017), New Hope Group
- Coal Dust Management Project (2016), Central Queensland Coal Network
- Legacy Way Tunnel (2016), Egis Group
- Stanwell Power Station Ambient Air Monitoring Advice (2016), Stanwell Corporation.
- Stanwell Power Station Ash Storage Facility (2016), Stanwell.
- Tarong and Tarong North ASA (2016), Stanwell.
- Australia Pacific LNG Downstream (2014), ConocoPhillips
- Wiggins Island Coal Export Terminal (2014), WICET Pty Ltd
- Darling Downs Power Stations (2011 and 2012), Origin.
- Diamantina Power Station (2010) APA Group
- Jilalan Rail (2007), Connell Hatch

Peer Review – Air Quality

- East Rockingham Waste to Energy (2018), City of Rockingham
- Evaporator Spray Drift Assessment Report (2018), Minetek
- Clem7 Tunnel (2017), Transurban Queensland
- Lihir Power Station (2017), Lihir Gold Ltd
- Maules Creek Coal Mine (2017), NSW Environment Protection Authority
- North Quay Childcare Centre (2017), Perri Projects
- West Gate Tunnel Project (2017), EPA Victoria
- Maroochy Sands (2016) Sunshine Coast Regional Council

Peer Review - Odour

- Poultry Farm Applications (2018), EPA Ireland

- Bungowannah Piggery (2017), Allens
- Colliery Road Feedlot (2017) Hede Brynn & Hall Lawyers
- Ebborn Farm Expansion (2017), Somerset Regional Council
- Mount Mort Proposed Poultry Farm (2017), Ipswich City Council
- Bischoffs Road Poultry Farm Expansion (2016), Somerset Regional Council
- Golden Egg Producers MCU Application (2016) Lockyer Valley Regional Council
- IHAP Panel Blantyer Farms Piggery (2016), Hilltops Council

Expert Witness

Acted as an Expert Witness in the Queensland Planning and Environment Court and Land Court and the NSW Land and Environment Court

- Land Court Qld – Pembroke Olive Downs Pty Ltd V Sunland Cattle Co Pty Ltd & Ors
- Xstrata Coal Queensland Pty Ltd & ORS v Friends of the Earth Brisbane Co-Op Ltd & ORS, and Department of Environment and Resource Management
- P&E Court No. 4630/18 Qld James Family Funeral Trust V Logan City Council
- P&E Court Qld 5003/12 Phoenix Power Recyclers V Gold Coast City Council
- Minister for Planning and Penrith City Council v Dellara Pty Ltd (10928 of 2010)
- Gary Peters and Patricia Peters v Caboolture Shire Council (Appeal no. BD2474 of 2005)
- Merlin Holdings v Beaudesert Shire Council (Appeal No. BD2474 of 2005)

Expert Advice

Provided Expert Advice to government, industry and the community on:

- The impact of new industrial and infrastructure projects on air quality – road tunnels, busways, coal mining
- Regulatory and licensing requirements for new sources of air pollution
- Technical veracity of air quality impact assessment

Air Quality Assessments - Industrial Coal and Mineral Mining and Transport

- Cameby Downs Continued Operations Project (2018), Syntech Resources Pty Ltd
- Western Extension Project (2018), Middlemount Coal Pty Ltd
- Isaac Plains East Project (2017), Stanmore Coal Ltd
- Coal Dust Management Project (2016), Central Queensland Coal Network
- Hillalong Coal Project (2016), Queensland Coal Exploration Pty Ltd
- Abbot Point Growth Gateway Project (2015), Advisian
- Eastern Leases Project (2015), South 32 Pty Ltd.
- Yeelirrie Uranium Project (2015), Cameco Australia Pty Ltd.
- TAZA EWT Sour Gas Field (2014), Oil Search (Iraq) Limited
- Wateranga Project (2013), Queensland Industrial Minerals Pty Ltd.
- Woodlark Island Gold (2013), Coffey Environments Australia
- Atlas Campaspe Project (2012), Cristal Mining Australia Limited.
- Duralie Extension Project (2012), Duralie Coal Pty Ltd
- Foxleigh Plains (2012), Anglo Coal Pty Ltd
- Ginkgo Mineral Sand Mine – Crayfish Modification (2012), Cristal Mining Australia Limited.
- Simberi Gold Mine Expansion (2012), Coffey Environments
- Wandoan Coal Mine (2012), Xstrata Coal Queensland.
- Jacinth Ambrosia Project (2008), Illuka Resources Limited.
- Watershed Project (2007), Vital Metals Limited

Air Quality Assessments - Power Generation & Manufacturing

- APLNG Facility EA Amendment (2017), ConocoPhillips Australasia East Business Unit
- Peat Gas Plant (2017) Origin Energy Resources Ltd
- Birkenhead Cement Plant (2017), Adelaide Brighton Cement
- Darwin LNG License Amendment (2017), ConocoPhillips Pipeline Australia Pty Ltd
- APLNG Facility (2016 – 2017), ConocoPhillips Australasia East Business Unit
- QCLNG Plant (2015), QGC Pty Ltd
- Australia Pacific LNG Downstream (2014), ConocoPhillips
- Moranbah Dust Monitoring Review (2014), Moranbah Cumulative Impact Group
- Wiggins Island Coal Export Terminal (2014), WICET Pty Ltd
- Arrow LNG Plant (2012), Arrow CSG (Australia) Pty Ltd
- Uranquinty Power Station (2011), Origin Energy Uranquinty Power
- Australia Pacific LNG Plant (2010), Worley Parsons
- Bayswater B Power Station Project (2009), Macquarie Generation
- GLNG Plant (2009), Worley Parsons
- Sun LNG Plant (2008), RLMS Pty Ltd
- Wagerup Refinery Expansion (2006), Alcoa World Alumina Australia
- Kwinana Gas-fired Power Station (2005), ELP Pty Ltd

Air Quality Assessments and Peer Review - Waste to Energy, Waste Processing and Landfills

- Confidential Waste-to-Energy Facility (Ongoing) Confidential
- Next Generation Energy from Eastern Creek Waste Facility (Ongoing), Allens
- East Rockingham Waste to Energy Project (2018), City of Rockingham
- Lismore Organic Waste Processing Facility (2018), Lismore City Council
- Lytton ULAB Recycling Plant (2017), ASA Green
- Pyrolysis Plant (2016), We Kando Pty Ltd
- Non-recyclable Plastic to Liquid Fuel Facility (2015), Integrated Green Energy Limited
- Reedy Creek Landfill Extension (2011), Gold Coast City Council
- Pierce Avenue Landfill (2011), Sunshine Coast Regional Council
- Winfield's Road Landfill Upgrade (2011), Western Downs Regional Council
- Rochedale Landfill (2009), LMS Generation
- Birkdale Landfill (2009), LMS Generation
- Impact Blue, Ferntree Landfill (2008), Impact Blue Pty Ltd

Benchmarking, Policy Analysis and Best Practice

- Intensive Agriculture Cumulative Impacts (2019), EPA Ireland
- LBL (2017), NSW EPA
- Maules Creek Coal Mine (2017), NSW Environment Protection Authority
- NSW Office of Environment and Heritage, NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining
- Central Queensland Ports Authority, RG Tanna Dust Benchmarking Study, Gladstone Port Coal Dust Study
- Benchmark review of emissions from a Queensland coal-fired power station

Emergency Release

- Pipe leak and blowout from a pressurised oil pipeline (2014), Oil Search Limited
- Fugitive gas leak from an oil well pad (2014), Oil Search Limited
- Emergency Release Modelling System (2013), Rio-Tinto Yarwun
- Assessment of Methane Ignition (2010), Xstrata Coal
- Risk Assessment of Potential Chlorine Gas Release (2010), Boyne Smelters ltd
- High pressure release from a pipeline (2010), Queensland Gas Company Ltd
- Risk of Flare Temperature on Vegetation (2009), Energen Solutions

Quarries

- Gosnells Quarry Southeast Pit Extension (2018), Holcim Australia
- Ormeau Quarry Dust (2017), Boral Construction Materials Group Ltd
- Ormeau Quarry Expansion (2017), Boral Construction Materials Group Ltd
- Tweed Sand Quarry (2017), Hanson Construction Materials
- Gold Coast Quarry (2016), Boral Property Group Northern Region
- Harlaxton Quarry (2016), Quarry Products Pty Ltd
- Cedars Quarry (2014), Boral Resources Pty Ltd
- Innes Park South Quarry (2014), Holcim Australia Pty Ltd
- Bargara Quarry (2014), Holcim Australia Pty Ltd
- Yandina Creek Quarry Planning & Environment Court of Queensland. Parklands Blue Metal Pty Ltd v Sunshine Coast Regional Council & ORS

Linear infrastructure

- NorthConnex Ventilation Outlet (2018), NSW Roads and Maritime Services
- Clem7 Tunnel (2017), Transurban Queensland
- West Gate Tunnel Project (2017), EPA Victoria
- Legacy Way Tunnel (2016), Egis Group
- Sunshine Coast Airport Expansion Project (2015), Sunshine Coast Regional Council
- Camden Airport (2015), Camden Airport Limited.
- Bankstown Airport (2014), Bankstown Airport Limited.
- Eastern Busway (2009), Eastern Busway Alliance.
- Boggo Road Busway (2008) Translink
- Hale Street Link (2008) Brisbane City Council
- Ipswich Motorway Upgrade Project (2008), Maunsell
- Moura-Aldoga Rail Link (2008), Connell Wagner
- Jilalan Rail (2007), Connell Hatch
- North-South Bypass Tunnel (2006), RiverCity Motorway Consortium.
- Inter Government Working Group – Nitrogen Dioxide in Road Tunnels. NSW EPA's air quality expert on an Inter Government working group investigating nitrogen dioxide in road tunnels.
- Cross-City Tunnel, Lane Cove Tunnel and M5 East. Review of air quality assessments for and provision of recommendations to the NSW EPA and Planning NSW on the technical veracity of the assessments, the potential for adverse air quality impacts and appropriate conditions of development approval.
- Consolidated Learning Project – Development of technical guidelines for assessment of potential air quality impacts for busway projects

Odour Assessment

- Odour impact assessment and odour control strategies for:
  - Agricultural industries: feedlots, mushroom composters, piggeries, broiler farms and abattoir and rendering plants
  - Waste and wastewater industries: sewage treatment plants, grease-trap waste treatment plants, transfer stations and landfills
  - Industry: coal-fired power station, breweries and paper mill, asphalt plants
- Berriedale WWTP (2018) MONA
- Rangers Valley Station Feedlot (2017) EnviroAg Australia
- Wagga Hotmix Asphalt Plant (2011), Wagga Hotmix Pty Ltd

Greenhouse Gas Assessment

- Cameby Downs Continued Operations Project (2018), Syntech Resources Pty Ltd
- Western Extension Project (2018), Middlemount Coal Pty Ltd
- HAPs Review (2017), NSW EPA
- West Gate Tunnel Project (2017), EPA Victoria
- Gold Coast Quarry (2016), Boral Resources Pty Ltd
- Hillalong Coal Project (2016), Queensland Coal Exploration Pty Ltd
- Sunshine Coast Airport Expansion Project (2015), Sunshine Coast Regional Council
- Eastern Leases Project (2014), BHP Billiton Manganese Australia Pty Ltd
- Atlas Campaspe Project (2012), Cristal Mining Australia Limited.
- Ginkgo Mineral Sands Mine (2012), BEMAX Resources Limited

AWARDS

- CASANZ Clean Air Achievement Award - 2011
- Australian Bulk Handling Excellence Award – Dust Management - 2008

PUBLICATIONS

- Burchill M, Welchman S, 2017, Air Quality and the law: A Historical Review of cases in the Queensland Planning and Environmental Court.
- Burchill M, Welchman S, 2017, The National Pollutant Inventory: Facts and Fiction.
- Balch A, Wiebe A, Schloss A, Vernon A, Killip C, Welchman S, 2011, Air Quality and Odour Impact Assessment of an Estate Containing Noxious and Offensive Industry. Presented at the 20th International Clean Air and Environment Conference, Auckland, New Zealand, July/August 2011.
- Wiebe A, Balch A, Quintarelli F, Burchill M, Killip C, Welchman S, 2011, Investigation of Regionally Specific PM10 and PM2.5 Signatures for Developing a Technique for use in Cumulative Impact Assessment.



Tania Haigh — Senior Consultant - Air Quality

Tania is a highly qualified air quality consultant. Tania graduated from Massey University (NZ) with a Bachelor of Science and holds two post graduate qualifications in Physics. During her eight years at Katestone, Tania has led and contributed to the air quality and greenhouse assessment for a wide range of complex projects, most recently the Fingerboards Mineral Sand Project (Victoria) where Tania has been the lead air quality consultant. With strong analytical skills, Tania has become an expert user of a wide range of dispersion modelling applications and is well-versed in utilising a variety of analytical tools, including Geographic Information Systems (GIS) applications. From her strong experience base in air quality assessments for mining and gas processing facilities, aviation, extractive industries, agriculture and residential property development, Tania can provide high-level advice and identification of constraints from local planning schemes as well as detailed emissions estimation and dispersion modelling studies for Environmental Impact Assessments. Tania's achievements demonstrate her capability as both an efficient team member and effective project manager.

ACADEMIC QUALIFICATIONS

MPhil (Physics) – University of Queensland (2010)

Master of Science (Physics) - Massey University, New Zealand (2008)

Bachelor of Science (Physics) - Massey University, New Zealand (2006)

TRAINING COURSES

Odour – Design and Control Equipment, Emission Rates, Sewer Networks and Septicity (CASANZ, 2018)

Road transport emissions and modelling (CASANZ, 2017)

Meteorological modelling with TAPM (CASANZ)

SPECIALIST SKILLS

Meteorological modelling with TAPM and CALMET

Dispersion modelling using CALPUFF and Ausplume

Analysis and interpretation of meteorological and air pollution monitoring data

Emissions estimation using approved methods from the NPI and AP-42 documents

PROJECT EXPERIENCE

Air Quality Assessment – Coal, Mineral Mining & Manufacturing

- Abbot Point Coal Terminal (2018) Adani Australia Company Pty Ltd
- Confidential Coal Mine Expansion Project (2018), Confidential client.
- Cameby Downs Continued Operations Project (2018) Syntech Resources Pty Ltd
- Western Extension Project (2018), Middlemount Coal Pty Ltd
- Coal Terminal Optimisation Project (2017), of Wiggins Island Coal Terminal Pty Ltd.
- Isaac Plains East Coal Mine (2017), Stanmore Coal Ltd
- Maules Creek Coal Mine (2017), NSW Environment Protection Authority
- Port of Brisbane Coal Terminal (2017), Queensland Bulk Handling Pty Ltd
- Hay Point Coal Terminal Productivity Initiatives (2016), BHP Billiton Mitsubishi Alliance
- Ipswich Concrete Batching Plant (2016) Boral Property Group
- Waisoi Copper and Gold Project (2016), Coffey
- Eastern Leases Project (2015), South 32 Pty Ltd.
- Yeelirrie Uranium Project (2015), Cameco Australia Pty Ltd.
- Harlaxton Quarry (2014), Quarry Products Pty Ltd
- Innes Park South Quarry (2014), Holcim Australia Pty Ltd
- Dudgeon Point Coal Terminal (2013), North Queensland Bulk Ports Corporation Limited
- Wateranga Project (2013), Queensland Industrial Minerals Pty Ltd
- Atlas-Campaspe Mineral Sands Project (2012), Cristal Mining Australia Limited
- Ginkgo Mineral Sands Mine (2012), BEMAX Resources Limited

Air Quality Assessments – Construction

- Biggera Waters Land Re-Zoning (2018), Lewis Land Group
- Bowen Hills Subdivision (2018), Peter Armstrong
- Fuller Street Redevelopment (2018), Dan Salomone
- High Street Development Toowoong (2018), TLPC Pty Ltd
- Redland Bay Mixed-use Development (2018), Cinque Projects Pty Ltd
- Rochedale Road Development (2018), Think Tank Developments
- Hope Island Mixed Use Development (2017), CPW Trailer Sales & Repairs Pty Ltd
- North Lakes Residential Development (2017) Stockland Development Pty Ltd
- Wynnum Road Residential Development (2017), Platform Properties
- Toowong Development (2016), Stockland

Air Quality Assessments – Power Stations

- Moray Power Station (2015), Moray Power Pty Ltd
- North Goonyella Power Station (2014), EDL Projects Pty Ltd

Air Quality Monitoring

- Darwin LNG (2017), ConocoPhillips Australasia West Business Unit

- Coal Dust Management Project (2016), Central Queensland Coal Network
- Foxleigh Coal Mine (2017), Middlemount South
- Harlaxton Quarry (2016), Quarry Products Pty Ltd
- Legacy Way Tunnel (2016), Egis Group
- Port of Hay Point and Mackay (2012), North Queensland Bulk Ports Corporation

Benchmarking

- Maules Creek Coal Mine Dust Management (2017), NSW EPA

Dust Impact Assessments

- Confidential Motorsport Training Centre (Ongoing), confidential Client
- Birkenhead Cement Plant (2018), Adelaide Brighton Cement Ltd
- Gosnells Quarry Southeast Pit Extension (2018), Holcim Australia
- Jellinbah and Mackenzie North Mine (2018), Jellinbah Mining Pty Ltd
- Lytton JV (2017), Boral Property Group
- Maules Creek Coal Mine (2017), NSW Environment Protection Authority
- ACARP Rail Dust Minimisation Study (2016), Introspec Consulting
- Coal Dust Management Project (2016), Central Queensland Coal Network
- Harlaxton Quarry (2016), Quarry Products Pty Ltd

Greenhouse Consulting

- GPC Duplicate Channel (Ongoing), Aurecon Group Pty Ltd
- Cameby Downs Continued Operations Project (2018), Syntech Resources Pty Ltd
- Dalrymple Bay Coal Terminal (2015-18), DBCT Pty Ltd
- Wiggins Island Coal Terminal (2016-2018), WICET Pty Ltd
- Fingerboards Mineral Sands Project (2018), Kalbar Resources Pty Ltd
- Olive Downs Coking Coal Project (2018) Pembroke Olive Downs Pty Ltd
- Western Extension Project (2018), Middlemount Coal Pty Ltd
- Eastern Leases Project (2015), Groote Eylandt Mining Company Pty Ltd
- North Goonyella Power Station (2014), EDL Projects Pty Ltd
- Minyango Project (2013), Blackwater Coal Pty Ltd
- Ginkgo Mineral Sands Mine (2012), BEMAX Resources Limited

National Pollutant Inventory (NPI) and National Greenhouse Energy Reporting (NGER) Projects

- Gladstone Facility Annual Reporting (Ongoing), Wiggins Island Coal Export Terminal
- Annual Reporting (Ongoing), Dalrymple Bay Coal Terminal Pty Ltd
- Foxleigh Coal Mine (2017), Middlemount South
- Port of Brisbane Coal Terminal NPI (2017), Queensland Bulk Handling Pty Ltd
- Surat Basin QGC Inventory (2017), CSIRO
- Harlaxton Quarry (2015), Quarry Products Pty Ltd

Odour Assessment – Agriculture, Energy and Resources

- Berriedale WWTP (2018) MONA
- East Rockingham Waste to Energy (2018), City of Rockingham
- Brisbane Valley Protein Precinct (2017), TJ Kelly Surveys
- Helensvale Sewage Infrastructure (2017), Mortons Urban Solutions
- Iranda Feedlot Expansion (2017), Thomas Foods International
- Paringa Feedlot (2017) FSA Consulting Pty Ltd
- Rangers Valley Station Feedlot (2017) EnviroAg Australia
- Stapylton Resource Recovery Facility (2017), Gold Coast Landfill Unit Trust
- IHAP Panel Blantyer Farms Piggery (2016), Hilltops Council
- Pelican Waters Sewage Pump Station (2015), Cardno Pty Ltd

Project management

- Fingerboards Mineral Sands Project (2018), Kalbar Resources Pty Ltd
- Expansion of renewable energy facility in Victoria (2018), Confidential
- Expansion of renewable energy facility in South Australia (2018), Confidential
- Cameby Downs Continued Operations Project (2018), Syntech Resources Pty Ltd
- Pump Stations (2018), Various clients
- Coal Dust Management Project (2016), Central Queensland Coal Network
- Harlaxton Quarry (2016), Quarry Products Pty Ltd
- Ipswich Concrete Batching Plant (2016) Boral Property Group

Approvals Support and Peer Review

- Maules Creek Coal Mine (2017), NSW Environment Protection Authority
- Benowa Batching Plant (2016), Boral Property Group
- Innes Park South Quarry (2014), Holcim Australia Pty Ltd

Climate and Climate Change Adaptation

- Gladstone Ports Corporation Channel Duplication Project (2018), Aurecon

Plume rise assessments

- Estimation of vertical plume velocities for aviation safety assessments: gas compression facilities and power stations
- Moomba Compressor Station (2013), APA Group
- Wallumbilla Compressor Station Upgrade (2013), APA Group

Petroleum and Gas Extraction

- Moranbah Gas Field Compressor Station (2011), Arrow Energy Pty Ltd

APPENDIX F. Ambient Air Quality Objectives

Table F1: Ambient air quality objectives

Indicator	Environmental value	Air quality objectives (AQO)		Period	Days (max. allowable exceedances)
		µg/m^3 (except where noted otherwise)	ppm (volume/volume)		
Heavy metals					
Cadmium and compounds (measured as the total metal content in PM_{10})[1]	Health and wellbeing	5ng/m^3		1 year	None
Chromium compounds (hexavalent forms, CrVI)[2]	Health and wellbeing	0.00035 (as PM_{10}) 0.0007 (as SPM)		24 hours	None
		0.00007 (as PM_{10}) 0.00014 (as SPM)		1 year	None
Chromium compounds (metallic, divalent and trivalent forms)[2]	Health and wellbeing	0.5		24 hours	None
Lead and compounds (measured as the total metal content in total suspended particles)[1]	Health and wellbeing	0.5		1 year	None
Nickel and compounds (measured as the total metal content in PM_{10})[1]	Health and wellbeing	22 ng/m^3		1 year	None
Solid particles					
$PM_{2.5}$[1,3]	Health and wellbeing	25		24 hours	None
		8		1 year	None
PM_{10}[1,3]	Health and wellbeing	50		24 hours	None
		25		1 year	None
Total suspended particles (TSP)[1,4]	Health and wellbeing	90		1 year	None

Total Volatile Organic Compound (TVOC)					
Benzene[1,5]	Health and wellbeing	5.4	0.002	1 year	None
1.3-butadiene[1]	Health and wellbeing	2.4	0.001	1 year	None
1.2-dichloroethane[1]	Health and wellbeing	764	0.173	24 hours	None
Dichloromethane[1]	Health and wellbeing	3.3 mg/m^3	0.9	24 hours	None
		0.49 mg/m^3	0.13	1 week	None
Ethanol[2]	Odour	19,000		1 hour	None
Ethylbenzene[2]	Health and wellbeing	1,000		24 hours	None
	Odour	1,900		10 minutes	None
Formaldehyde[1] (& 6 as noted)	Health and wellbeing	54	0.04[6]	24 hours	None
	Protecting aesthetic environment	109	0.082	30 minutes	None
Styrene[1]	Health and wellbeing	284	0.061	1 week	None
	Protecting aesthetic environment	76	0.016	30 minutes	None
Tetrachloroethylene[1]	Health and wellbeing	0.27mg/m^3	0.037	1 year	None
	Protecting aesthetic environment	8.7mg/m^3	1.2	30 minutes	None
Toluene[1] (& 6 as noted)	Health and wellbeing	4.1mg/m^3	1[6]	24 hours	None
		400	0.1[6]	1 year	None
	Protecting aesthetic environment	1.1mg/m^3	0.3	30 minutes	None
Vinyl chloride monomer[1]	Health and wellbeing	28	0.010	24 hours	None
Xylenes (as a total of ortho, meta and para isomers)[1] (& 6 as noted)	Health and wellbeing	1.2 mg/m^3	0.25[6]	24 hours	None
		950	0.2[6]	1 year	None
Polycyclic aromatic hydrocarbon (PAH)					
Benzo(a)pyrene (as a marker for PAH) [1,7]	Health and wellbeing	0.3 ng/m^3		1 year	None
Other					
Carbon monoxide[1,3]	Health and wellbeing	11 mg/m^3	9	8 hours	1 day each year

Nitrogen dioxide[1] (& 3 as noted)	Health and wellbeing	250	0.12[3]	1 hr	1 day each year
		62	0.03[3]	1 year	None
	Health and biodiversity of ecosystems	33	0.016	1 year	None
Sulfur dioxide[1] (& 3 as noted)	Health and wellbeing	570	0.2[3]	1 hr	1 day each year
		229	0.08[3]	1 day	1 day each year
		57	0.02[3]	1 year	None
	Protecting agriculture	31	0.011	1 year	None
	Health and biodiversity of ecosystems (for forests and natural vegetation)	21	0.0075	1 year	None

Notes:

1. *Environmental Protection (Air) Policy 2019* (Qld).
2. Ontario Ministry of the Environment, Conservation and Parks (May 2020) *Ambient Air Quality Criteria* (only used where no Qld or Comm guideline available).
3. Human health applied in the *National Environment Protection (Ambient Air Quality) Measure* (Comm)
4. MCM EA EPPR00390613 dated 7 December 2000 – noting particulates release limit from the boiler house stack is to be less than 250 mg/m^3 at all times except for a one-hour period immediately after start-up of a boiler (including a restart after power failure) or a thirty-minute period immediately after a change of fuel or an abnormal feed condition, during which period the maximum smoke density must not exceed Ringelmann 3.
5. Benzene also included in *National Environment Protection (Air Toxics) Measure* (Comm) (see Note 7), however, value higher than the EPP being 0.003 ppm (annual average).
6. Monitoring investigations levels for human health applied in the *National Environment Protection (Air Toxics) Measure* (Comm).
7. 16 priority PAH pollutants listed by the United States EPA, namely, naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benz(α)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(α)pyrene, indeno[123cd] pyrene, dibenz[ah]anthracene and benzo[ghi]perylene, expressed as benzo(α)pyrene equivalents using the potency equivalence factors specified by the World Health Organisation.

Not applicable

SPM = suspended particulate matter

APPENDIX G. Weather Station Details

Environdata to install a Weather Maestro Weather Station (see attachments) to Australian Standards, including:

- Tipping Bucket Rain Gauge;
- Wind Speed Sensor;
- Wind Direction Sensor;
- Air Temperature Sensor;
- Relative Humidity Sensor;
- Solar Radiation Sensor;
- Barometric Pressure Sensor;
- Vector Analysis Firmware;
- Sigma Theta Firmware; and
- Dew Point Firmware.

Install and commissioning to include:

- Preparing site;
- Erecting 10 metre mast and mounting posts;
- Trenching cables;
- Fitting sensors;
- Testing system; and
- Completing reports and documentation.

Environdata regularly supply, install and maintain weather monitoring systems that meet the following standards:

- AS/NZS 3580.1.1:2007 Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment
- AS 3580.14:2011 Methods for sampling and analysis of ambient air – Meteorological monitoring for ambient air
- NSW EPA: Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales, specifically AM-2 and AM-4.
- NSW Roads and Maritime Services (RMS): QA Specification R272 Automatic Weather Stations
- QLD EPA: Air Quality Sampling Manual
- QLD TMR: MRTS231 Provision of Road Weather Monitors
- Many other State and Territory based standards, which refer to the two Australian Standards (AS) above.

Refer to https://environdata.com.au/faqs/what-are-the-weather-station-standards-and-license-requirements/

Environdata
WEATHER STATION SPECIALISTS



Weather Maestro

Weather Station Data Logger

Environdata's Weather Maestro weather stations are robust, reliable, Australian Made & designed specifically for monitoring your weather conditions.

Features:

- Robust design & construction
- Easy to assemble, easy to use
- Powerful on-board processor
- Low power, ideal for remote siting
- Full instructions & Manufacturer's support
- 10, 16 or 20 channel versions
- Smart Sensor Interfaces
- Current readings, 10 minute, hourly and daily weather data logged in independent memories
- Memories fully configurable
- 8 Mb flash memory for 1,000,000 sets of readings with individual date and time stamp.
- Ideal system for meeting Australian Standards and EPA requirements
- Australian Made

Designed to survive in harsh conditions, your Weather Maestro weather station will provide reliable, accurate weather recording, no matter the environment.

This robust and reliable system is ideal for EIS, Mining, Industrial, Landfill, Road Construction, Water Treatment plants, Feedlots and all industries where a reliable long term solution is sought.

On-board data processing, advanced calculations and remote telemetry options give you the weather data you need; when, how and where you want it.

Weather Sensors

Typically, the Weather Maestro will have a range of sensors added, including Environdata's:

- Air Temperature





Environdata Weather Stations Pty Ltd
P.O. Box 395, WARWICK, Queensland, 4370, Australia
Phone: (07) 4661 4699 **Int. Phone:** + 61 7 4661 4699
Fax: (07) 4661 2485 **Int. Fax:** +61 7 4661 2485
ABN: 77 131 757 125
Proudly Australian Owned
http://www.environdata.com.au
e-mail: sales@environdata.com.au
Version 190725

AUSTRALIAN MADE

- Relative Humidity
- Wind Speed
- Wind Direction
- Rainfall
- Barometric Pressure
- Solar Radiation
- Soil Temperature

Other sensors are easily interfaced to provide a complete solution for your weather monitoring.

Communications and Remote Monitoring

All models feature an RS232 serial connection for on-site downloading of logged data to a laptop. Various telemetry options are also available:

- GSM, Cellular VPN, & Satellite Data modems
- UHF & VHF Radio Links
- Direct cable, MODBUS, Ethernet & Internet

Software

The Weather Maestro with telemetry (cellular modem or Satellite modem typically) is the perfect solution for connecting your weather stations to our WeatherMation LIVE service.

WeatherMation LIVE automates your data collection and provides secure access to your live & historic weather data via our web interface.

Receive SMS or Email alerts, Regular notifications, run, edit and save reports securely via your browser.

For direct download to Laptop, our EasiAccess software provides comprehensive download, database and reporting capabilities.

Advanced Calculations

Environdata's Weather Maestro can provide advanced calculations such as: FAO56 evaporation rates / Thermal Work Limit (TWL) / HLI / AHLU / Dew Point / Chill Hours & more, provided the appropriate sensors are connected. This data is saved as if a standard sensor, and can be used to trigger alerts.

Flexible Memory

The memory is divided into 4 independent areas, which can be customised to suit your specific data interval requirements.

The flash memory is retained indefinitely, and data is stored in final text form with date and time stamps.

Factory Programmed

The Weather Maestro is factory programmed, so is fully operational out of the box. New program files are readily available and simple to load.

Installation:

Designed to be self installed. Environdata also offer a full installation and commissioning service Australia wide. On-site preventative maintenance, calibration checks, repairs & servicing a specialty.

Specifications:

Inputs

10, 16 or 20 channels. For Environdata sensors or other sensors with an Environdata interface

Smart Sensor Interface allows custom connection to a wide range of serial sensors.

Built-in Memory

8 Mb on-board flash (non-volatile) memory stores up to a typical total of 1,000,000 value sets (data plus time & date stamp records). Equivalent to 12 months of 10 minute, hourly and daily data, concurrently.

System Indicators

LED indicators provided for simple identification of operating status and mode

Battery & Solar Panel

Capacity for up to 2 weeks' operation without sunlight on a typical system

Battery:

- 12 volt 18.0AH rechargeable gel cell SLA ***or***
- 12 volt 20.0AH rechargeable Lithium Polymer

Solar panel:

- 30 Watt solar panel typical

Power Consumption

- 10mA in logging mode
- 35mA while communicating
- 2.5mA per typical Environdata sensor

Environdata Weather Stations Pty Ltd
P.O. Box 395, WARWICK, Queensland, 4370, Australia
Phone: (07) 4661 4699 Int. Phone: + 61 7 4661 4699
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e-mail: sales@environdata.com.au
Version 190725

Environdata
WEATHER STATION SPECIALISTS



WeatherMation LIVE

Weather Station Web Portal

Environdata's WeatherMation Live service takes all the headache out of managing your data collection, storage and distribution.

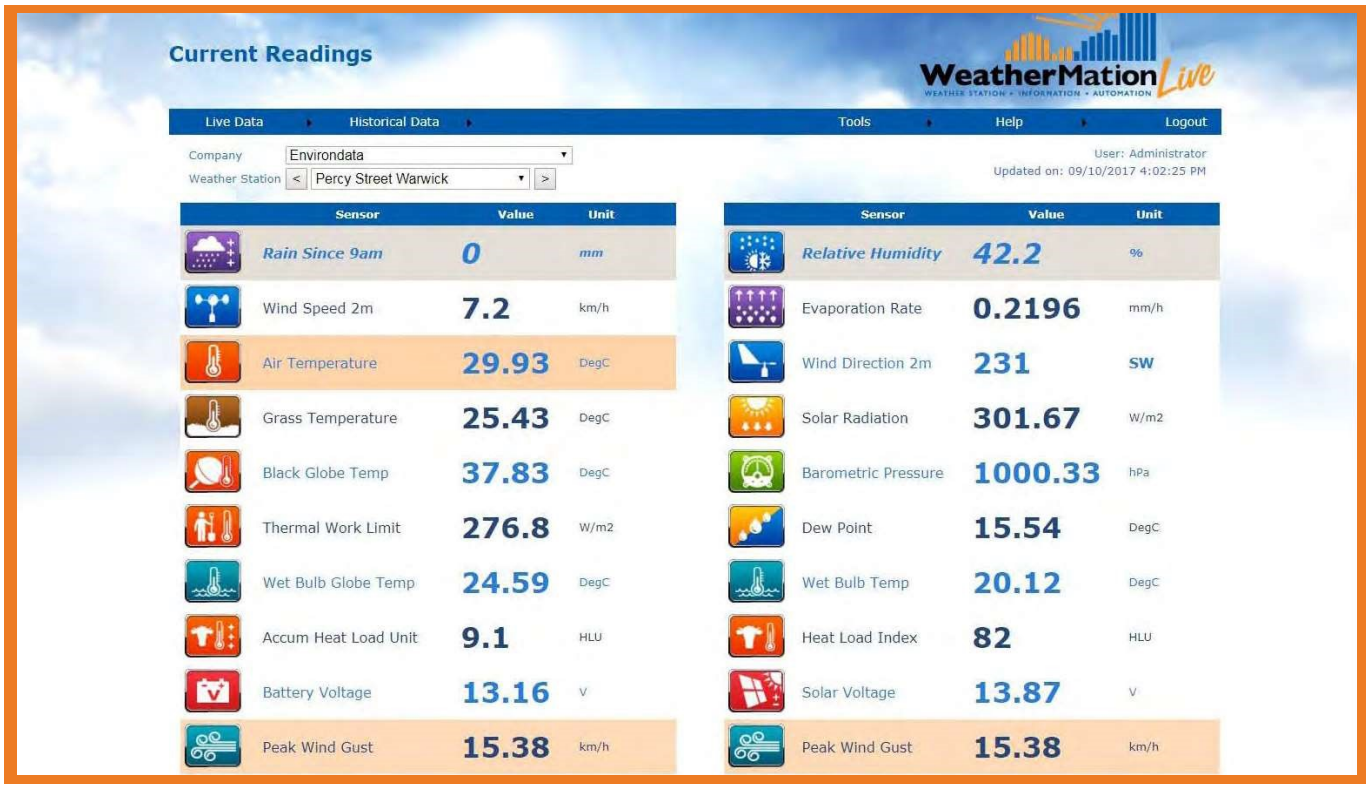
- **Environdata manages data collection, storage and distribution for you**
- **Hosted on Environdata's secure servers**
- **One or many Weather Stations**
- **One or many users with secure login access from any web browser**
- **Live & historical weather data**
- **Optional SMS and E-mail alerts**
- **Regular Notifications by SMS email or FTP**
- **Mobile device customised display**
- **Advanced user access control**
- **Online Reports, including Wind Rose & Dashboards**

Automated Data Collection

WeatherMation LIVE will

- Collect your weather data from all of your Environdata weather stations. Typically every minute for Cellular connections
- Provide all of your Users secure access to live and historic weather data via our secure web portal
- Send SMS and E-mail alerts when your pre-set weather conditions are met. (Optional)
- Send SMS or E-mail notifications on your specified schedule. (Optional)

Weather data from all of your Environdata weather stations is automatically collected and saved into WeatherMation's secure SQL database, held on our servers. You own the weather data and only your authorised users can access the site.



Environdata Weather Stations Pty Ltd
P.O. Box 395, WARWICK, Queensland, 4370, Australia
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Fax: (07) 4661 2485 **Int. Fax:** +61 7 4661 2485
Proudly Australian Owned
http://www.environdata.com.au
e-mail: sales@environdata.com.au

AUSTRALIAN MADE

Environdata
WEATHER STATION SPECIALISTS

User Based Access

Secure logins ensure only those people you allow to see each station will be able to do so.

Public access can be assigned to weather stations you wish to be viewed with no login required.

Live Weather Data

WeatherMation Live can provide your users access to current weather conditions immediately, any time from any browser.

For live data we will need a cellular data connection or an IP based connection via your network to each weather station. Satellite connected stations have much higher data costs and typically download 6 times per day, although more frequent updates are available on request.

Data Trends

The current readings option shows trend graphs for convenient display of immediate weather history.

The Dashboard reports can include these trend graphs as well as other key information.

The historic data dispaly also includes live updating trend graphs, to enable quick viewing of longer trends on screen.

Historic Data

All memory data from your weather stations is held securely in the WeatherMation SQL database. You own your weather data.

Alerts & Notifications

When the weather impacts your operation, having an automated method for alerting your staff by e-mail and / or SMS will save you time and money.

WeatherMation's Alerts Module provides alerts by E-mail or SMS based on your weather data.

You can set 'Do Not Contact' times for your users and alert types, to make sure the people who have to know the weather data get notified when and how they need to.



Mobile phone or tablet accessible data

WeatherMation LIVE Demo Login:

This allows you to see first-hand our real-time and historic weather data service.

Go to:
www.weathermation.net.au/Default.aspx
Username: Environdata.Guest
Password: FR56yhB!

Please note this system also doubles as our test system – sensors change or go offline as we test new designs.

This login has reports and 'on screen' alerts enabled. For further information please contact Environdata

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APPENDIX H. SDS Bagasse

Bagasse

MSF Sugar Pty Ltd

Chemwatch Hazard Alert Code: **1**

Chemwatch: **5337-92**
Version No: **3.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **01/11/2019**
Print Date: **02/03/2021**
L.GHS.AUS.EN

SECTION 1 Identification of the substance / mixture and of the company / undertaking

Product Identifier

Product name	Bagasse
Chemical Name	Not Applicable
Synonyms	Not Available
Chemical formula	Not Applicable
Other means of identification	Not Available

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Compost, feed material, fuel.

Details of the supplier of the safety data sheet

Registered company name	**MSF Sugar Pty Ltd**
Address	P.O. Box 130 47 Gordon Street Gordonvale QLD 4865 Australia
Telephone	+61 7 4043 3333
Fax	+61 7 4043 3300
Website	www.msfsugar.com.au
Email	msf@msfsugar.com.au

Emergency telephone number

Association / Organisation	**Poisons Information Centre**
Emergency telephone numbers	131126
Other emergency telephone numbers	Not Available

SECTION 2 Hazards identification

Classification of the substance or mixture

NON-HAZARDOUS CHEMICAL. NON-DANGEROUS GOODS. According to the WHS Regulations and the ADG Code.

ChemWatch Hazard Ratings

	Min	Max
Flammability	1	
Toxicity	0	
Body Contact	0	
Reactivity	1	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Poisons Schedule	Not Applicable
Classification [1]	Not Applicable

Label elements

Hazard pictogram(s)	Not Applicable
Signal word	**Not Applicable**

Hazard statement(s)

Not Applicable

Precautionary statement(s) Prevention

Not Applicable

Precautionary statement(s) Response

Not Applicable

Precautionary statement(s) Storage

Not Applicable

Precautionary statement(s) Disposal

Not Applicable

SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
9004-34-6	40-50	cellulose
Not Available	1-10	sugars
7732-18-5	NotSpec.	water

SECTION 4 First aid measures

Description of first aid measures

Eye Contact	If this product comes in contact with eyes: • Wash out immediately with water. • If irritation continues, seek medical attention. • Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin or hair contact occurs: • Flush skin and hair with running water (and soap if available). • Seek medical attention in event of irritation.
Inhalation	• If dust is inhaled, remove from contaminated area. • Encourage patient to blow nose to ensure clear passage of breathing. • If irritation or discomfort persists seek medical attention.
Ingestion	• Immediately give a glass of water. • First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

Continued...

SECTION 5 Firefighting measures

Extinguishing media

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

Special hazards arising from the substrate or mixture

Fire Incompatibility	‣ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

Advice for firefighters

Fire Fighting	‣ Alert Fire Brigade and tell them location and nature of hazard. ‣ Wear breathing apparatus plus protective gloves. ‣ Prevent, by any means available, spillage from entering drains or water courses. ‣ Use water delivered as a fine spray to control fire and cool adjacent area. ‣ **DO NOT** approach containers suspected to be hot. ‣ Cool fire exposed containers with water spray from a protected location. ‣ If safe to do so, remove containers from path of fire. ‣ Equipment should be thoroughly decontaminated after use.
Fire/Explosion Hazard	When dry, will burn easily. ‣ Combustible solid which burns but propagates flame with difficulty; it is estimated that most organic dusts are combustible (circa 70%) - according to the circumstances under which the combustion process occurs, such materials may cause fires and / or dust explosions. ‣ Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions). ‣ Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust (420 micron or less) may burn rapidly and fiercely if ignited - particles exceeding this limit will generally not form flammable dust clouds; once initiated, however, larger particles up to 1400 microns diameter will contribute to the propagation of an explosion. ‣ In the same way as gases and vapours, dusts in the form of a cloud are only ignitable over a range of concentrations; in principle, the concepts of lower explosive limit (LEL) and upper explosive limit (UEL) are applicable to dust clouds but only the LEL is of practical use; - this is because of the inherent difficulty of achieving homogeneous dust clouds at high temperatures (for dusts the LEL is often called the "Minimum Explosible Concentration", MEC). ‣ When processed with flammable liquids/vapors/mists,ignitable (hybrid) mixtures may be formed with combustible dusts. Ignitable mixtures will increase the rate of explosion pressure rise and the Minimum Ignition Energy (the minimum amount of energy required to ignite dust clouds - MIE) will be lower than the pure dust in air mixture. The Lower Explosive Limit (LEL) of the vapour/dust mixture will be lower than the individual LELs for the vapors/mists or dusts. ‣ A dust explosion may release of large quantities of gaseous products; this in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people. ‣ Usually the initial or primary explosion takes place in a confined space such as plant or machinery, and can be of sufficient force to damage or rupture the plant. If the shock wave from the primary explosion enters the surrounding area, it will disturb any settled dust layers, forming a second dust cloud, and often initiate a much larger secondary explosion. All large scale explosions have resulted from chain reactions of this type. ‣ Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport. ‣ Build-up of electrostatic charge may be prevented by bonding and grounding. ‣ Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting. ‣ All movable parts coming in contact with this material should have a speed of less than 1-meter/sec. ‣ A sudden release of statically charged materials from storage or process equipment, particularly at elevated temperatures and/ or pressure, may result in ignition especially in the absence of an apparent ignition source. ‣ One important effect of the particulate nature of powders is that the surface area and surface structure (and often moisture content) can vary widely from sample to sample, depending of how the powder was manufactured and handled; this means that it is virtually impossible to use flammability data published in the literature for dusts (in contrast to that published for gases and vapours). ‣ Autoignition temperatures are often quoted for dust clouds (minimum ignition temperature (MIT)) and dust layers (layer ignition temperature (LIT)); LIT generally falls as the thickness of the layer increases. Combustion products include: carbon monoxide (CO) carbon dioxide (CO2) other pyrolysis products typical of burning organic material.
HAZCHEM	Not Applicable

SECTION 6 Accidental release measures

Continued...

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid contact with skin and eyes. ▸ Wear impervious gloves and safety glasses. ▸ Use dry clean up procedures and avoid generating dust. ▸ Vacuum up (consider explosion-proof machines designed to be grounded during storage and use). ▸ Do NOT use air hoses for cleaning ▸ Place spilled material in clean, dry, sealable, labelled container.
Major Spills	▸ Clear area of personnel and move upwind. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Control personal contact with the substance, by using protective equipment and dust respirator. ▸ Prevent spillage from entering drains, sewers or water courses. ▸ Avoid generating dust. ▸ Sweep, shovel up. Recover product wherever possible. ▸ Put residues in labelled plastic bags or other containers for disposal. ▸ If contamination of drains or waterways occurs, advise emergency services.

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling	▸ Limit all unnecessary personal contact. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ Avoid contact with incompatible materials. ▸ When handling, **DO NOT** eat, drink or smoke. ▸ Keep containers securely sealed when not in use. ▸ Avoid physical damage to containers. ▸ Always wash hands with soap and water after handling. ▸ Work clothes should be laundered separately. ▸ Use good occupational work practice. ▸ Observe manufacturer's storage and handling recommendations contained within this SDS. ▸ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained. ▸ Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions) ▸ Minimise airborne dust and eliminate all ignition sources. Keep away from heat, hot surfaces, sparks, and flame. ▸ Establish good housekeeping practices. ▸ Remove dust accumulations on a regular basis by vacuuming or gentle sweeping to avoid creating dust clouds. ▸ Use continuous suction at points of dust generation to capture and minimise the accumulation of dusts. Particular attention should be given to overhead and hidden horizontal surfaces to minimise the probability of a "secondary" explosion. According to NFPA Standard 654, dust layers 1/32 in.(0.8 mm) thick can be sufficient to warrant immediate cleaning of the area. ▸ Do not use air hoses for cleaning. ▸ Minimise dry sweeping to avoid generation of dust clouds. Vacuum dust-accumulating surfaces and remove to a chemical disposal area. Vacuums with explosion-proof motors should be used. ▸ Control sources of static electricity. Dusts or their packages may accumulate static charges, and static discharge can be a source of ignition. ▸ Solids handling systems must be designed in accordance with applicable standards (e.g. NFPA including 654 and 77) and other national guidance. ▸ Do not empty directly into flammable solvents or in the presence of flammable vapors. ▸ The operator, the packaging container and all equipment must be grounded with electrical bonding and grounding systems. Plastic bags and plastics cannot be grounded, and antistatic bags do not completely protect against development of static charges. Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source. ▸ Do NOT cut, drill, grind or weld such containers. ▸ In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace

Continued...

	safety authorisation or permit.
Other information	‣ Store in original containers. ‣ Keep containers securely sealed. ‣ Store in a cool, dry area protected from environmental extremes. ‣ Store away from incompatible materials and foodstuff containers. ‣ Protect containers against physical damage and check regularly for leaks. ‣ Observe manufacturer's storage and handling recommendations contained within this SDS. For major quantities: ‣ Consider storage in bunded areas - ensure storage areas are isolated from sources of community water (including stormwater, ground water, lakes and streams}. ‣ Ensure that accidental discharge to air or water is the subject of a contingency disaster management plan; this may require consultation with local authorities.

Conditions for safe storage, including any incompatibilities

Suitable container	‣ Lined metal can, lined metal pail/ can. ‣ Plastic pail. ‣ Polyliner drum. ‣ Packing as recommended by manufacturer. ‣ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	Avoid contamination of water, foodstuffs, feed or seed. Cellulose and its derivatives may react vigorously with calcium oxide, bleaching powder, perchlorates, perchloric acid, sodium chlorate, fluorine, nitric acid, sodium nitrate and sodium nitrite. May be incompatible with aminacrine hydrochloride, chlorocresol, mercuric chloride, phenol, resorcinol, tannic acid and silver nitrate. ‣ Avoid reaction with oxidising agents

SECTION 8 Exposure controls / personal protection

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Australia Exposure Standards	cellulose	Cellulose (paper fibre)	10 mg/m3	Not Available	Not Available	(a) This value is for inhalable dust containing no asbestos and < 1% crystalline silica.

Emergency Limits

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
Bagasse	Not Available	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
cellulose	Not Available	Not Available
water	Not Available	Not Available

MATERIAL DATA

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use. Employers may need to use multiple types of controls to prevent employee overexposure. ‣ Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction. ‣ Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace. ‣ If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of: (a): particle dust respirators, if necessary, combined with an absorption cartridge; (b): filter respirators with absorption cartridge or canister of the right type; (c): fresh-air hoods or masks

Continued...

- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to efficiently remove the contaminant.

Type of Contaminant:	Air Speed:
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min) for extraction of crusher dusts generated 2 metres distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Personal protection



Eye and face protection

- Safety glasses with side shields
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

Skin protection

See Hand protection below

Hands/feet protection

The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.
Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:
· frequency and duration of contact,
· chemical resistance of glove material,
· glove thickness and
· dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).
· When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
· When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
· Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use.
· Contaminated gloves should be replaced.

As defined in ASTM F-739-96 in any application, gloves are rated as:
· Excellent when breakthrough time > 480 min
· Good when breakthrough time > 20 min
· Fair when breakthrough time < 20 min
· Poor when glove material degrades

For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.
It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.

Continued...

	Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers' technical data should always be taken into account to ensure selection of the most appropriate glove for the task. Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example: · Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of. · Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended. Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present. ▸ polychloroprene. ▸ nitrile rubber. ▸ butyl rubber. ▸ fluorocaoutchouc. ▸ polyvinyl chloride. Gloves should be examined for wear and/ or degradation constantly.
Body protection	See Other protection below
Other protection	No special equipment needed when handling small quantities. **OTHERWISE:** ▸ Overalls. ▸ Barrier cream. ▸ Eyewash unit.

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Bagasse

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A
NATURAL RUBBER	C
PVA	C

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

Particulate. (AS/NZS 1716 & 1715, EN 143:2000 & 149:001, ANSI Z88 or national equivalent)

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	P1 Air-line*	- -	PAPR-P1 -
up to 50 x ES	Air-line**	P2	PAPR-P2
up to 100 x ES	-	P3	-
		Air-line*	-
100+ x ES	-	Air-line**	PAPR-P3

* - Negative pressure demand ** - Continuous flow
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory protection. These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

SECTION 9 Physical and chemical properties

Continued...

Information on basic physical and chemical properties

Appearance	Light coloured straw like solid; insoluble in water.

Physical state	Solid	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Available
pH (as supplied)	Not Applicable	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Applicable
Initial boiling point and boiling range (°C)	Not Applicable	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Available	**Taste**	Not Available
Evaporation rate	Not Applicable	**Explosive properties**	Not Available
Flammability	Not Available	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Available	**Surface Tension (dyn/cm or mN/m)**	Not Applicable
Lower Explosive Limit (%)	Not Available	**Volatile Component (%vol)**	Not Applicable
Vapour pressure (kPa)	Not Applicable	**Gas group**	Not Available
Solubility in water	Immiscible	**pH as a solution (1%)**	Not Applicable
Vapour density (Air = 1)	Not Applicable	**VOC g/L**	Not Applicable

SECTION 10 Stability and reactivity

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 Toxicological information

Information on toxicological effects

Inhaled	The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
Ingestion	The material has **NOT** been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.
Skin Contact	The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.
Eye	Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may cause transient discomfort characterised by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result. The material may produce foreign body irritation in certain individuals.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

Bagasse	**TOXICITY**	**IRRITATION**
	Not Available	Not Available

Continued...

cellulose	**TOXICITY**	**IRRITATION**
	Dermal (rabbit) LD50: >0.002 mg/kg[2]	Not Available
	Inhalation(Rat) LC50; >5.8 mg/L4hrs[2]	
	Oral(Rat) LD50; >0.005 mg/kg[2]	
water	**TOXICITY**	**IRRITATION**
	Oral(Rat) LD50; >90 mg/kg[2]	Not Available
Legend:	*1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances*	

CELLULOSE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.
Bagasse & WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	✗	**Carcinogenicity**	✗
Skin Irritation/Corrosion	✗	**Reproductivity**	✗
Serious Eye Damage/Irritation	✗	**STOT - Single Exposure**	✗
Respiratory or Skin sensitisation	✗	**STOT - Repeated Exposure**	✗
Mutagenicity	✗	**Aspiration Hazard**	✗

Legend: ✗ *– Data either not available or does not fill the criteria for classification*
✔ *– Data available to make classification*

SECTION 12 Ecological information

Toxicity

Bagasse	**Endpoint**	**Test Duration (hr)**	**Species**	**Value**	**Source**
	Not Available	Not Available	Not Available	Not Available	Not Available
cellulose	**Endpoint**	**Test Duration (hr)**	**Species**	**Value**	**Source**
	Not Available	Not Available	Not Available	Not Available	Not Available
water	**Endpoint**	**Test Duration (hr)**	**Species**	**Value**	**Source**
	Not Available	Not Available	Not Available	Not Available	Not Available
Legend:	*Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data*				

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
cellulose	LOW	LOW

Continued...

Ingredient	Persistence: Water/Soil	Persistence: Air
water	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
cellulose	LOW (LogKOW = -5.1249)
water	LOW (LogKOW = -1.38)

Mobility in soil

Ingredient	Mobility
cellulose	LOW (KOC = 10)
water	LOW (KOC = 14.3)

SECTION 13 Disposal considerations

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible. ▸ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ▸ Dispose of by: burial in a land-fill specifically licensed to accept chemical and / or pharmaceutical wastes or Incineration in a licensed apparatus (after admixture with suitable combustible material) ▸ Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

SECTION 14 Transport information

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (ADG): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

Product name	Group
cellulose	Not Available
water	Not Available

Transport in bulk in accordance with the ICG Code

Product name	Ship Type
cellulose	Not Available
water	Not Available

SECTION 15 Regulatory information

Safety, health and environmental regulations / legislation specific for the substance or mixture

cellulose is found on the following regulatory lists

Australian Inventory of Industrial Chemicals (AIIC)
International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

water is found on the following regulatory lists

Continued...

Australian Inventory of Industrial Chemicals (AIIC)

National Inventory Status

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	Yes
Canada - DSL	Yes
Canada - NDSL	No (water)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	No (cellulose)
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	Yes
Vietnam - NCI	Yes
Russia - ARIPS	Yes
Legend:	*Yes = All CAS declared ingredients are on the inventory* *No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)*

SECTION 16 Other information

Revision Date	01/11/2019
Initial Date	05/03/2019

SDS Version Summary

Version	Issue Date	Sections Updated
2.1.1.1	05/03/2019	Appearance, Environmental, Exposure Standard, Fire Fighter (fire/explosion hazard), First Aid (inhaled), Supplier Information, Use
3.1.1.1	01/11/2019	One-off system update. NOTE: This may or may not change the GHS classification

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Definitions and abbreviations

Continued...

PC—TWA: Permissible Concentration-Time Weighted Average
PC—STEL: Permissible Concentration-Short Term Exposure Limit
IARC: International Agency for Research on Cancer
ACGIH: American Conference of Governmental Industrial Hygienists
STEL: Short Term Exposure Limit
TEEL: Temporary Emergency Exposure Limit。
IDLH: Immediately Dangerous to Life or Health Concentrations
OSF: Odour Safety Factor
NOAEL :No Observed Adverse Effect Level
LOAEL: Lowest Observed Adverse Effect Level
TLV: Threshold Limit Value
LOD: Limit Of Detection
OTV: Odour Threshold Value
BCF: BioConcentration Factors
BEI: Biological Exposure Index

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end of SDS

APPENDIX I. SDS and Product Data Sheet Fuel Oil

Product Data Sheet

Fuel Oil 100

Application:
Fuel oil processed from used lubricating oil for combustion in industrial and marine applications (eg power stations, steel mills, large scale industrial processes and bunker fuel applications).

Property	Units	Method	Limit	Typical
Appearance		Visual	Report	Dark brown / black liquid
Density @ 15°C	kg/L	ASTM D4052	0.9 max	0.885
Flash Point	°C	ASTM D93	61 min	110
Kinematic Viscosity @ 40°C	mm²/s	ASTM D445	100 max	70
Kinematic Viscosity @ 50°C	mm²/s	ASTM D445	80 max	45
Pour Point	°C	ASTM D97	-6 max	-20
Sulphur	% mass	ASTM D4294 / D5453	1.5 max	0.7
Ash Content	% mass	ASTM D482	1.0 max	0.8
Water by Distillation	vol %	ASTM D95	1.0 max	0.7
Sediment by Extraction	% mass	ASTM D473	1.0 max	0.3
Gross Calorific Value	MJ/kg	ASTM D240	40 min	43
Carbon Residue	% mass	ASTM D4530 / D189	Report	1.4
Polychlorinated biphenyls (PCB)	mg/kg	ASTM D4059	2 max	<2
Calcium	mg/kg	ASTM D5185 / ICP	Report	1900
Phosphorus, Zinc	mg/kg	ASTM D5185 / ICP	Report	Each <800
Sodium	mg/kg	ASTM D5185 / ICP	Report	250
Potassium	mg/kg	ASTM D5185 / ICP	Report	90
Iron	mg/kg	ASTM D5185 / ICP	Report	85
Boron, Silicon	mg/kg	ASTM D5185 / ICP	Report	Each <70
Aluminium, Copper, Magnesium, Molybdenum	mg/kg	ASTM D5185 / ICP	Report	Each <30
Chromium, Lead, Nickel	mg/kg	ASTM D5185 / ICP	Report	Each <10
Antimony, Arsenic, Barium, Beryllium, Cadmium, Cobalt, Lithium, Manganese, Mercury, Selenium, Silver, Tin, Titanium, Vanadium	mg/kg	ASTM D5185 / ICP	Report	Each <10

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Revision Date: August 15, 2016

Summary of Fuel Oil Certificates of Analysis

Test/method	Units	Cleanaway				Lavis		Veolia		
		Date Sampled								
		03 Jul 2020	07 Jul 2019	15 May 2019	15 Nov 2016	19 Feb 2019	09 Mar 2018	30 Apr 2018	18 Sep 2017	17 Mar 2017
Sulfur										
by EDXRF (ASTM D4294)	% m/m	0.401	--	--	--	--	--	--	--	--
by WDXRF (D2622)	Mass %	--	0.386	0.301	0.405	--	--	--	--	--
(ASTM D129)	% w/w	--	--	--	--	0.2667	1.32	0.36	0.27	0.38
Ash										
Ash (ASTM D482)	Mass %	0.723	0.844	0.744	0.907	--	--	0.54	--	0.61
Kinematic Viscosity										
Viscosity at 40°C (ASTM D445)	cST	59.15	73.000	66.190	66.300	78	103.0	69.14	--	77.95
Physical / Chemical										
Carbon (ASTM D5291)	%	84.32	84.34	83.04						
Hydrogen (ASTM D5291)	%	13.62	13.49	13.21						
Nitrogen (ASTM D5291)	%	< 0.7	< 0.7	< 0.7						
Density @ 15°C	g/mL	0.8737	0.8779	0.8772	0.8808		0.843	0.878		0.882
Water (ASTM D95)	Volume %	0.54	0.33	2.74	0.80	2.6	4.96 (D6304)	0.23	2.15	4.1
Gross Heat of Combustion (ASTM D240)	MJ/kg	44.737	44.880	45.390	47.670			44.69		42.16
PCB Total (ASTM D4059)	mg/L	< 2.0	< 2	< 2	--		< 2	< 2		< 2
Flash Point (ASTM D93 Procedure A)										
Flash Point PMCC (ASTM D93)	°C	> 116	116.0	187.0	117.0		130	> 110		> 80

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

1.1 Product identifier

Product name **FUEL OIL 100**

Synonyms DEHYDRATED OIL (FORMERLY) • NATIONWIDE OIL DEHYDRATED OIL • TRANSPACIFIC FUEL OIL 100 (FORMERLY)

1.2 Uses and uses advised against

Uses INDUSTRIAL APPLICATIONS • MARINE APPLICATIONS

Fuel oil for combustion in industrial and marine applications (eg power stations, steel mills, large scale processes and bunker fuel applications).

1.3 Details of the supplier of the product

Supplier name **CLEANAWAY WASTE MANAGEMENT LTD**

Address Level 4, 441 St Kilda Road, Melbourne, VIC, 3004, AUSTRALIA

Telephone +61 3 8397 5100

Website https://www.cleanaway.com.au/

1.4 Emergency telephone numbers

Emergency 1800 774 557 or +61 3 8769 0268

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

CLASSIFIED AS HAZARDOUS (GHS ONLY) ACCORDING TO SAFE WORK AUSTRALIA CRITERIA

Physical Hazards

Flammable Liquids: Category 4

Health Hazards

Not classified as a Health Hazard

Environmental Hazards

Not classified as an Environmental Hazard

2.2 GHS Label elements

Signal word **WARNING**

Pictograms

Hazard statements

H227 Combustible liquid.

Prevention statements

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

Response statements

P370 + P378 In case of fire: Use appropriate media for extinction.

Storage statements

P403 + P235 Store in a well-ventilated place. Keep cool.

Disposal statements

P501 Dispose of contents/container in accordance with relevant regulations.

2.3 Other hazards
No information provided.

3. COMPOSITION/ INFORMATION ON INGREDIENTS

3.1 Substances / Mixtures

Ingredient	CAS Number	EC Number	Content
LUBRICATING OILS, USED	70514-12-4	274-635-9	>90%
WATER	7732-18-5	231-791-2	<1%

4. FIRST AID MEASURES

4.1 Description of first aid measures

Eye If in eyes, hold eyelids apart and flush continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre, a doctor, or for at least 15 minutes.

Inhalation If inhaled, remove from contaminated area. Apply artificial respiration if not breathing.

Skin If skin or hair contact occurs, remove contaminated clothing and flush skin and hair with running water. Continue flushing with water until advised to stop by a Poisons Information Centre or a doctor.

Ingestion For advice, contact a Poisons Information Centre on 13 11 26 (Australia Wide) or a doctor (at once). If swallowed, do not induce vomiting. Rinse mouth out with water and give plenty of water to drink.

First aid facilities Eye wash facilities and safety shower should be available.

4.2 Most important symptoms and effects, both acute and delayed
Adverse effects not expected from this product under normal conditions of use.

4.3 Immediate medical attention and special treatment needed
Treat symptomatically.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media
Dry agent, carbon dioxide or foam. Prevent contamination of drains and waterways.

5.2 Special hazards arising from the substance or mixture
Combustible. May evolve carbon oxides and hydrocarbons when heated to decomposition.

5.3 Advice for firefighters
Evacuate area and contact emergency services. Toxic gases may be evolved in a fire situation. Remain upwind and notify those downwind of hazard. Wear full protective equipment including Self Contained Breathing Apparatus (SCBA) when combating fire. Use waterfog to cool intact containers and nearby storage areas.

5.4 Hazchem code
None allocated.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear Personal Protective Equipment (PPE) as detailed in section 8 of the SDS. Clear area of all unprotected personnel. Ventilate area where possible.

6.2 Environmental precautions
Prevent product from entering drains and waterways.

6.3 Methods of cleaning up
Contain spillage, then cover / absorb spill with non-combustible absorbent material (vermiculite, sand, or similar), collect and place in suitable containers for disposal.

6.4 Reference to other sections
See Sections 8 and 13 for exposure controls and disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas.

7.2 Conditions for safe storage, including any incompatibilities

Store in a cool, dry, well ventilated area, removed from incompatible substances, heat or ignition sources and foodstuffs. Ensure containers are adequately labelled, protected from physical damage and sealed when not in use. Check regularly for leaks or spills. Large storage areas should have appropriate fire protection systems. Store as a Class C1 Combustible Liquid (AS1940).

7.3 Specific end uses

No information provided.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Exposure standards

No exposure standards have been entered for this product.

Biological limits

No biological limit values have been entered for this product.

8.2 Exposure controls

Engineering controls Avoid inhalation. Use in well ventilated areas. Where an inhalation risk exists, mechanical extraction ventilation is recommended.

PPE

Eye / Face	Wear splash-proof goggles.
Hands	Wear PVC or rubber gloves. With prolonged use, wear viton (R) or nitrile gloves.
Body	When using large quantities or where heavy contamination is likely, wear coveralls. With prolonged use, wear coveralls.
Respiratory	Where an inhalation risk exists, wear a Type A (Organic vapour) respirator.



9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	DARK BROWN TO BLACK LIQUID
Odour	SLIGHT ODOUR
Flammability	CLASS C1 COMBUSTIBLE
Flash point	> 61°C; 110°C (typically)
Boiling point	NOT AVAILABLE
Melting point	NOT AVAILABLE
Evaporation rate	NOT AVAILABLE
pH	NOT AVAILABLE
Vapour density	NOT AVAILABLE
Specific gravity	0.90
Solubility (water)	INSOLUBLE
Vapour pressure	NOT AVAILABLE
Upper explosion limit	NOT AVAILABLE
Lower explosion limit	NOT AVAILABLE
Partition coefficient	NOT AVAILABLE
Autoignition temperature	NOT AVAILABLE
Decomposition temperature	NOT AVAILABLE
Viscosity	100 cSt @ 40°C (kinematic) (maximum)
Explosive properties	NOT AVAILABLE

9.1 Information on basic physical and chemical properties

Oxidising properties	NOT AVAILABLE
Odour threshold	NOT AVAILABLE

9.2 Other information

Pour point	-6°C

10. STABILITY AND REACTIVITY

10.1 Reactivity

Carefully review all information provided in sections 10.2 to 10.6.

10.2 Chemical stability

Stable under recommended conditions of storage.

10.3 Possibility of hazardous reactions

Polymerization is not expected to occur.

10.4 Conditions to avoid

Avoid heat, sparks, open flames and other ignition sources.

10.5 Incompatible materials

Incompatible with oxidising agents (e.g. hypochlorites), acids (e.g. nitric acid), alkalis (e.g. sodium hydroxide), heat and ignition sources.

10.6 Hazardous decomposition products

May evolve carbon oxides and hydrocarbons when heated to decomposition.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity	Based on available data, the classification criteria are not met. Ingestion of large quantities may result in nausea, vomiting, abdominal pain and diarrhoea.
Skin	Not classified as a skin irritant. Prolonged or repeated contact may result in mild irritation, rash and dermatitis.
Eye	Not classified as an eye irritant. Contact may result in mild irritation, lacrimation and redness.
Sensitisation	Not classified as causing skin or respiratory sensitisation.
Mutagenicity	Not classified as a mutagen.
Carcinogenicity	Test data confirms the product is not classified as a carcinogen. Highly refined mineral oils are not classifiable as to its carcinogenicity in humans (IARC Group 3).
Reproductive	Not classified as a reproductive toxin.
STOT - single exposure	Not classified as causing organ damage from single exposure. Due to product form / nature of use, an inhalation hazard is not anticipated with normal use. However, if product is heated or mists generated, exposure may result in respiratory irritation, headache and nausea.
STOT - repeated exposure	Not classified as causing organ damage from repeated exposure.
Aspiration	Not classified as causing aspiration.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

This product can float on water, restricting oxygen exchange with possible asphyxiation of aquatic life.

12.2 Persistence and degradability

Expected to be inherently biodegradable.

12.3 Bioaccumulative potential

No information provided.

12.4 Mobility in soil

Low solubility and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

12.5 Other adverse effects

No information provided.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Waste disposal Reuse where possible or return to manufacturer/supplier. May be recycled. Do not release to drains or waterways. Contact the manufacturer/supplier for additional information (if required).

Legislation Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE, IMDG OR IATA

	LAND TRANSPORT (ADG)	SEA TRANSPORT (IMDG / IMO)	AIR TRANSPORT (IATA / ICAO)
14.1 UN Number	None allocated.	None allocated.	None allocated.
14.2 Proper Shipping Name	None allocated.	None allocated.	None allocated.
14.3 Transport hazard class	None allocated.	None allocated.	None allocated.
14.4 Packing Group	None allocated.	None allocated.	None allocated.

14.5 Environmental hazards

Not a Marine Pollutant

14.6 Special precautions for user

Hazchem code None allocated.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Poison schedule A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Classifications Safework Australia criteria is based on the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

Inventory listings **AUSTRALIA: AICS (Australian Inventory of Chemical Substances)**
All components are listed on AICS, or are exempt.

16. OTHER INFORMATION

Additional information

MINERAL OILS - SOLVENT REFINED: Animal experiments and human experience have not shown cancer risks when handling solvent refined mineral oils, unlike non refined mineral oils.
CLEANING MINERAL OIL CONTAMINATED CLOTHING: Cleaners are advised that when cleaning oil contaminated clothing it is essential that freshly distilled solvent is used for each batch, including final rinse, as even filtered solvent will leave oil residues.

MINERAL OILS - USED: Used mineral oils in engine crankcases and other high temperature/high stress environments may contain potentially harmful residues, some of which have been shown to cause irreversible skin effects, including cancer. Prolonged and repeated inhalation of mists associated with used mineral oils may result in pulmonary fibrosis.

MINERAL OILS - INJECTION: Where high pressure applications are used the risk of accidental injection under the skin exists and may result in an extremely painful and serious injury requiring immediate medical attention. Depending on the pressure used, mineral oils may be injected a considerable distance below the skin and may cause permanent tissue damage. SEEK IMMEDIATE MEDICAL ATTENTION. EXERCISE EXTREME CARE WHEN USING HIGH PRESSURE EQUIPMENT.

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:
The recommendation for protective equipment contained within this report is provided as a guide only. Factors such as form of product, method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

HEALTH EFFECTS FROM EXPOSURE:
It should be noted that the effects from exposure to this product will depend on several factors including: form of product; frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
CAS #	Chemical Abstract Service number - used to uniquely identify chemical compounds
CNS	Central Nervous System
EC No.	EC No - European Community Number
EMS	Emergency Schedules (Emergency Procedures for Ships Carrying Dangerous Goods)
GHS	Globally Harmonized System
GTEPG	Group Text Emergency Procedure Guide
IARC	International Agency for Research on Cancer
LC50	Lethal Concentration, 50% / Median Lethal Concentration
LD50	Lethal Dose, 50% / Median Lethal Dose
mg/m³	Milligrams per Cubic Metre
OEL	Occupational Exposure Limit
pH	relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).
ppm	Parts Per Million
STEL	Short-Term Exposure Limit
STOT-RE	Specific target organ toxicity (repeated exposure)
STOT-SE	Specific target organ toxicity (single exposure)
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
SWA	Safe Work Australia
TLV	Threshold Limit Value
TWA	Time Weighted Average

Report status

This document has been compiled by RMT on behalf of the manufacturer, importer or supplier of the product and serves as their Safety Data Sheet ('SDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer, importer or supplier or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer, importer or supplier.

While RMT has taken all due care to include accurate and up-to-date information in this SDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, RMT accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this SDS.

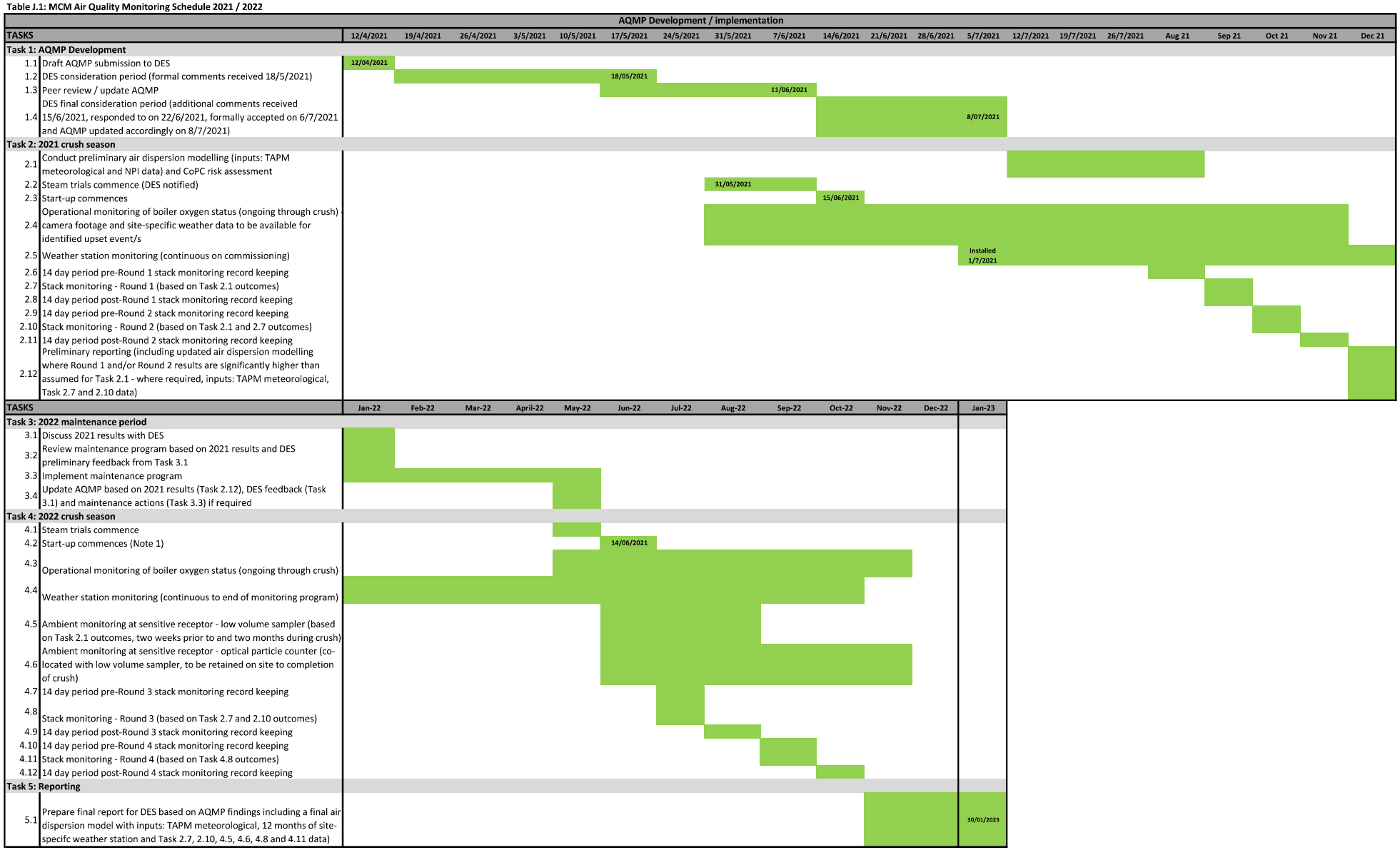
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[End of SDS]

APPENDIX J. Proposed Monitoring Schedule

Table J.1: MCM Air Quality Monitoring Schedule 2021 / 2022



NOTES:

(1) Start up date subject to successful steam trials, sugar cane availability etc

APPENDIX K. Record Keeping Checklists

Table K.1: Pre-stack monitoring 14-day records checklist

Data	Days before monitoring													
	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Date														
Boiler throughputs (tonnes per hour)														
Fuel/s burnt (B = bagasse, note if FO = fuel oil used – refer also to recording requirements)														
Fuel volume														
Composition														
Operational / equipment factors that could influence air emissions (N = no, Y = yes, if Y need to reference record no)[1]														
Community complaints (N = no, Y = yes, if Y need to reference record no)														
AM – Smoke density (0-5) (as per Ringelmann Smoke Chart)[2]														
AM – smoke density assessment time														
PM – Smoke density (0-5) (as per Ringelmann Smoke Chart)[2]														
PM – smoke density assessment time														

Note:

1. May include change in operational conditions (any non-optimal performance conditions e.g. boiler low oxygen alarms should also be noted), maintenance and modifications – where Y need to reference record no. where further details can be obtained. The need to use fuel oil under exceptional circumstances must be logged, where this results in dark smoke emissions for a period greater than the allowance under EA condition B1(d) (i.e. one hour immediately after start up of a boiler or a 30 minute period after change of a fuel or an abnormal feed condition) this must additionally be reported to DES as required below.
2. Condition B1(d) also states that smoke density must not exceed Ringelmann 3 – if this density is exceeded immediate measures must be taken to rectify and as soon as possible thereafter the incident lodged in the MCM system and reported to DES as required below.

Any such incidents must be reported to DES within 24 hours as required by condition H16 and H17 of the EA and section 320 of the *Environmental Protection Act 1994* (Qld). Reporting against H16 and H17 also triggers additional reporting within 14 days of the original notification as per condition H18 of the EA.

Table K.2: Stack monitoring day/s records checklist

Data	Day/s of monitoring (N/A where days not used)		
	1	2	3
Date			
Monitoring being undertaken			
Contractor conducting monitoring			
Any other information relevant to the monitoring program			
Boiler throughputs (tonnes per hour)			
Fuel/s burnt (B = bagasse, note if FO = fuel oil used – refer also to recording requirements)			
Fuel volume			
Composition			
Operational / equipment factors that could influence air emissions (N = no, Y = yes, if Y need to reference record no)[1]			
Community complaints (N = no, Y = yes, if Y need to reference record no)			
AM – Smoke density (as per Ringelmann Smoke Chart) (0-5)[2]			
AM – smoke density assessment time			
PM – Smoke density (as per Ringelmann Smoke Chart) (0-5)[2]			
PM – smoke density assessment time			

Note:

1. May include change in operational conditions (any non-optimal performance conditions e.g. boiler low oxygen alarms should also be noted), maintenance and modifications – where Y need to reference record no. where further details can be obtained. The need to use fuel oil under exceptional circumstances must be logged, where this results in dark smoke emissions for a period greater than the allowance under EA condition B1(d) (i.e. one hour immediately after start up of a boiler or a 30 minute period after change of a fuel or an abnormal feed condition) this must additionally be reported to DES as required below.
2. Condition B1(d) also states that smoke density must not exceed Ringelmann 3 – if this density is exceeded immediate measures must be taken to rectify and as soon as possible thereafter the incident lodged in the MCM system and reported to DES as required below.

Any such incidents must be reported to DES within 24 hours as required by condition H16 and H17 of the EA and section 320 of the *Environmental Protection Act 1994* (Qld). Reporting against H16 and H17 also triggers additional reporting within 14 days of the original notification as per condition H18 of the EA.

Table K.3: Post-stack monitoring 14-day records checklist

Data	Days after monitoring													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Date														
Boiler throughputs (tonnes per hour)														
Fuel/s burnt (B = bagasse, note if FO = fuel oil used – refer also to recording requirements)														
Fuel volume														
Composition														
Operational / equipment factors that could influence air emissions (N = no, Y = yes, if Y need to reference record no)[1]														
Community complaints (N = no, Y = yes, if Y need to reference record no)														
AM – Smoke density (0-5) (as per Ringelmann Smoke Chart)[2]														
AM – smoke density assessment time														
PM – Smoke density (0-5) (as per Ringelmann Smoke Chart)[2]														
PM – smoke density assessment time														

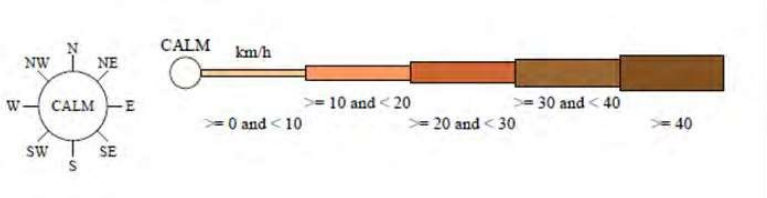
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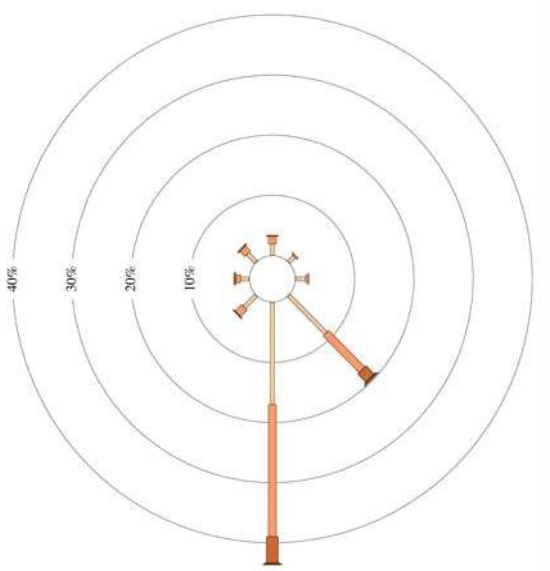
1. May include change in operational conditions (any non-optimal performance conditions e.g. boiler low oxygen alarms should also be noted), maintenance and modifications – where Y need to reference record no. where further details can be obtained. The need to use fuel oil under exceptional circumstances must be logged, where this results in dark smoke emissions for a period greater than the allowance under EA condition B1(d) (i.e. one hour immediately after start up of a boiler or a 30 minute period after change of a fuel or an abnormal feed condition) this must additionally be reported to DES as required below.
2. Condition B1(d) also states that smoke density must not exceed Ringelmann 3 – if this density is exceeded immediate measures must be taken to rectify and as soon as possible thereafter the incident lodged in the MCM system and reported to DES as required below.

Any such incidents must be reported to DES within 24 hours as required by condition H16 and H17 of the EA and section 320 of the *Environmental Protection Act 1994* (Qld). Reporting against H16 and H17 also triggers additional reporting within 14 days of the original notification as per condition H18 of the EA.

APPENDIX L. Wind Roses

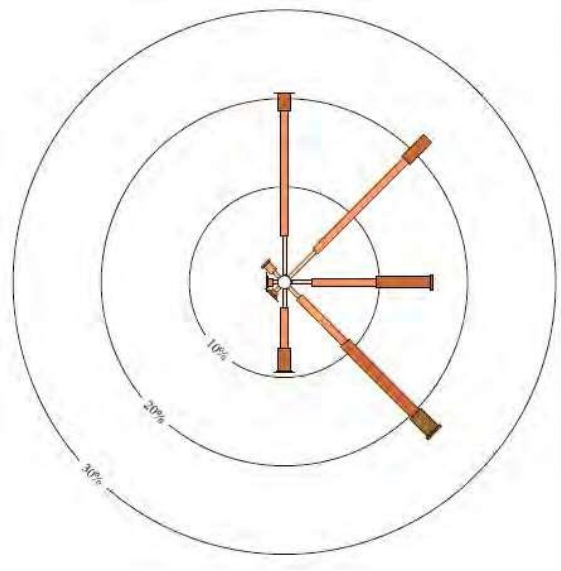
Wind roses are recorded from BOM data from the Cairns airport weather station, at 2 metres above sea level.





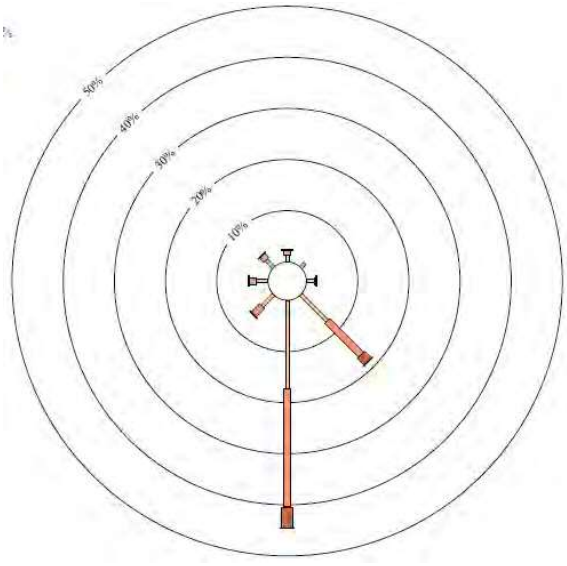
January 9am (1941 – 2019)

2382 Observations (Calm 19%)



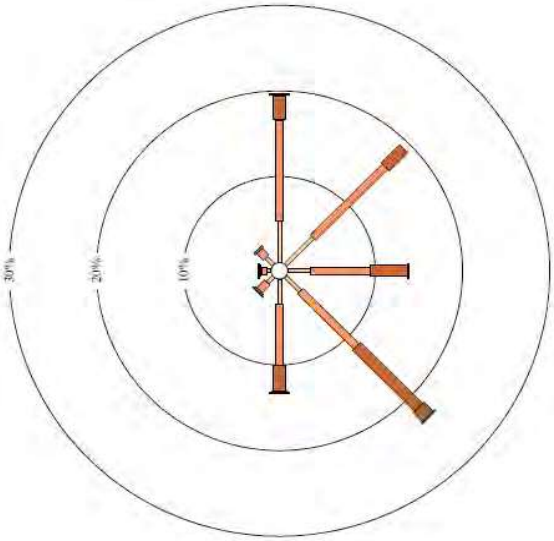
January 3pm (1941 – 2019)

2384 Observations (Calm 4%)



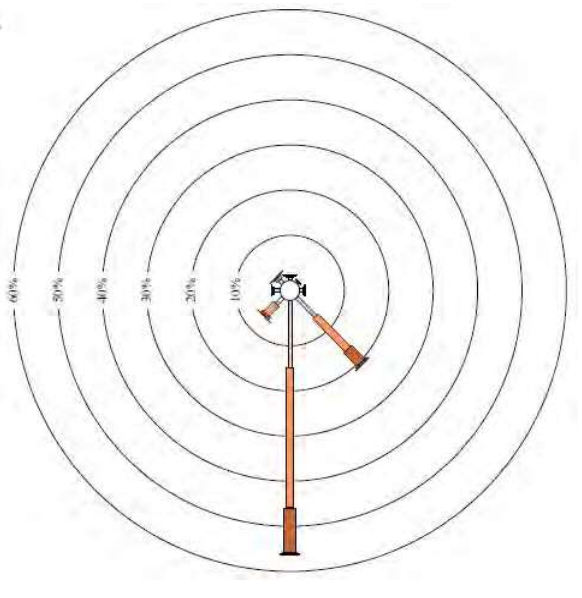
February 9am (1941 – 2019)

2171 Observations (Calm 19%)

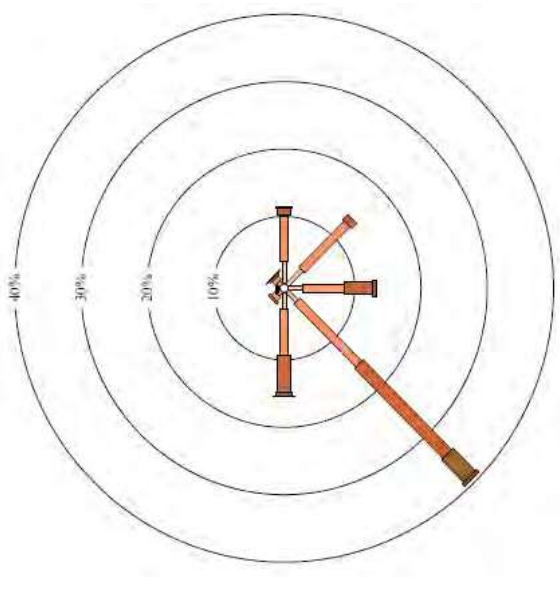


February 3pm (1941 – 2019)

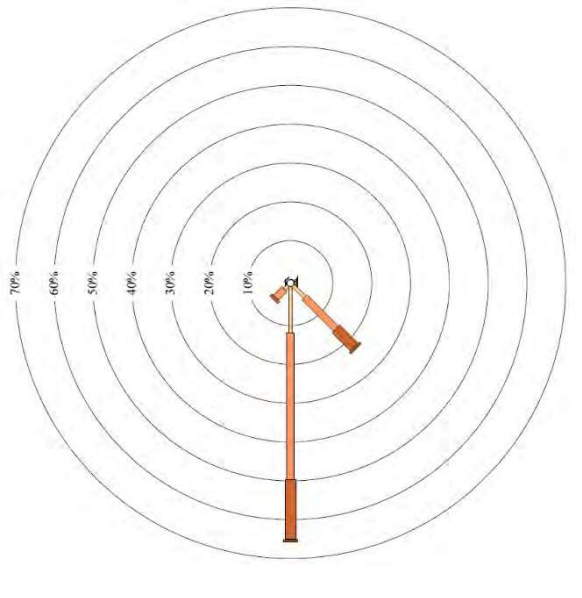
2172 Observations (Calm 5%)



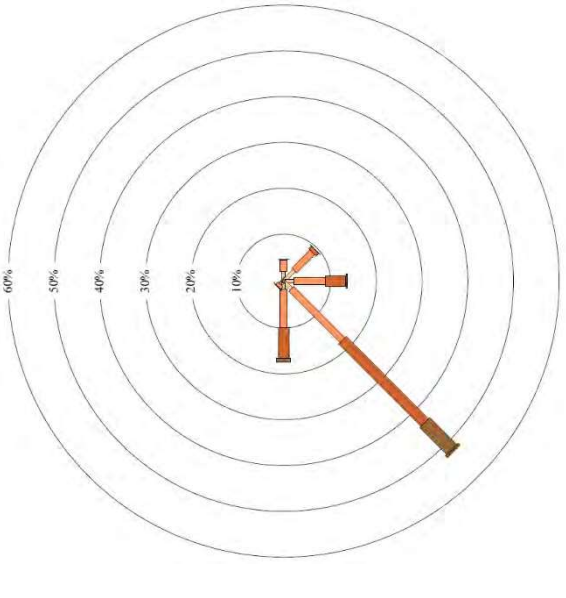
March 9am (1941 – 2019)
2390 Observations (Calm 11%)



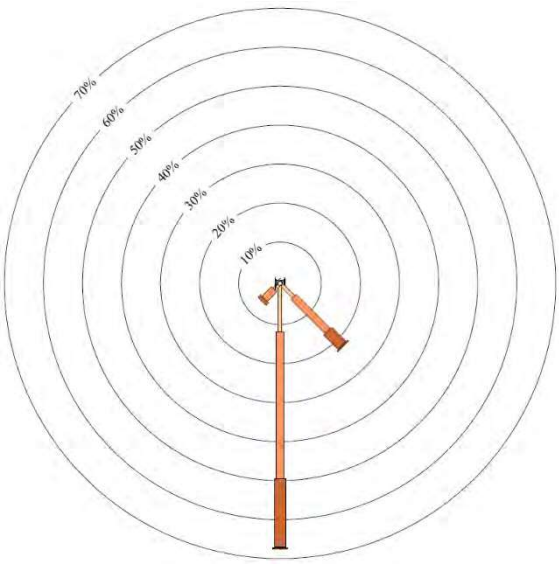
March 3pm (1941 – 2019)
2383 Observations (Calm 3%)



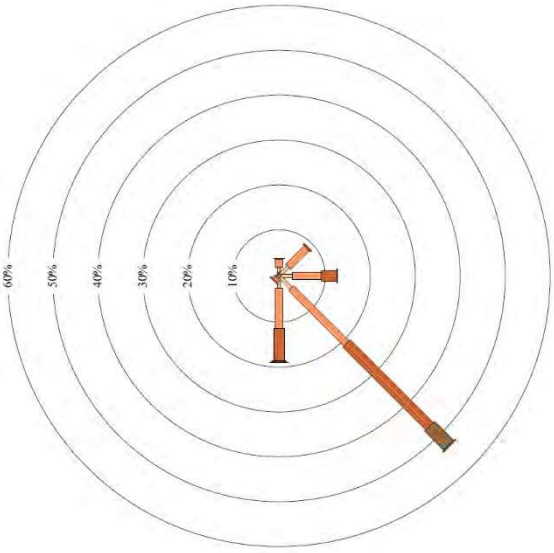
April 9am (1942 – 2019)
2332 Observations (Calm 4%)



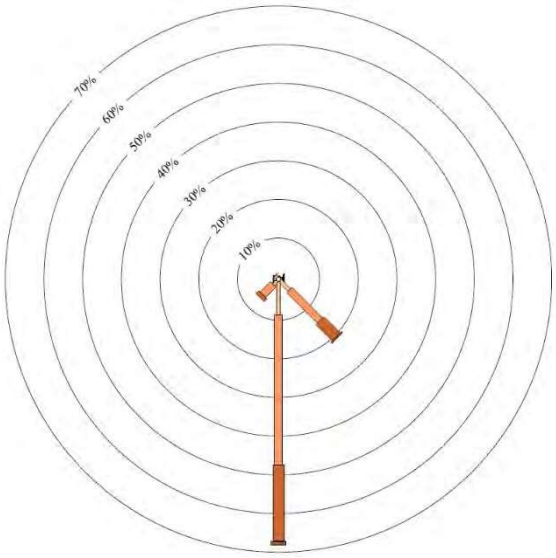
April 3pm (1942 – 2019)
2325 Observations (Calm 1%)



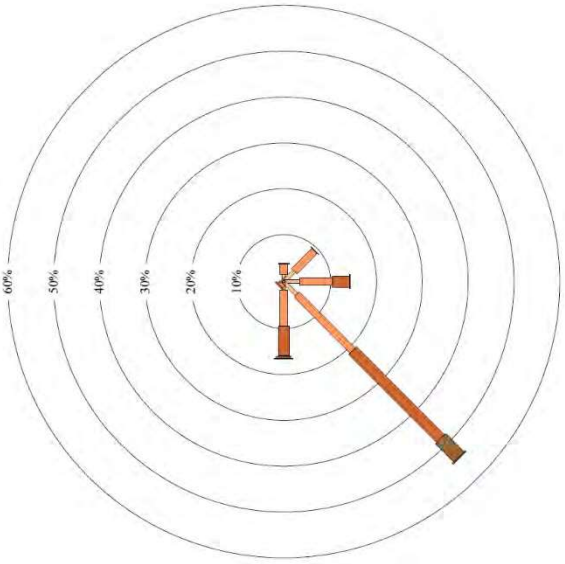
May 9am (1941 – 2019)
2432 Observations (Calm 3%)



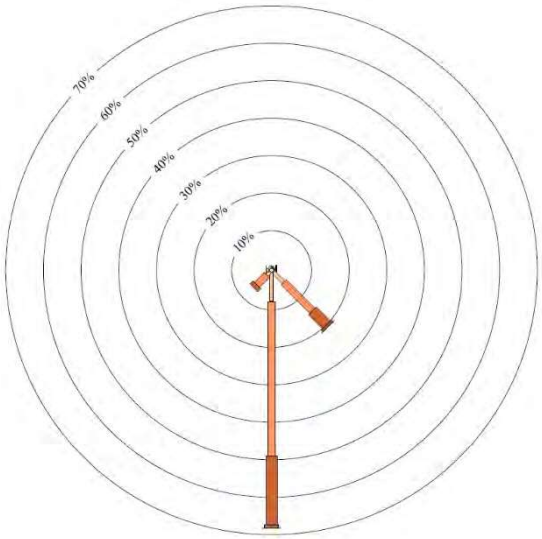
May 3pm (1941 – 2019)
2425 Observations (Calm 1%)



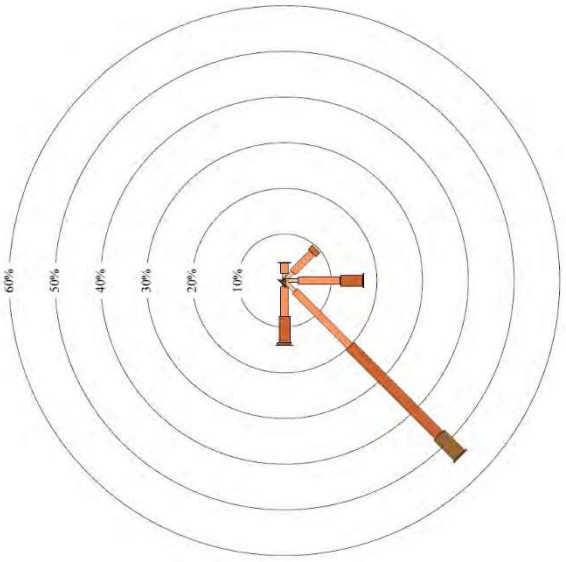
June 9am (1941 – 2019)
2350 Observations (Calm 3%)



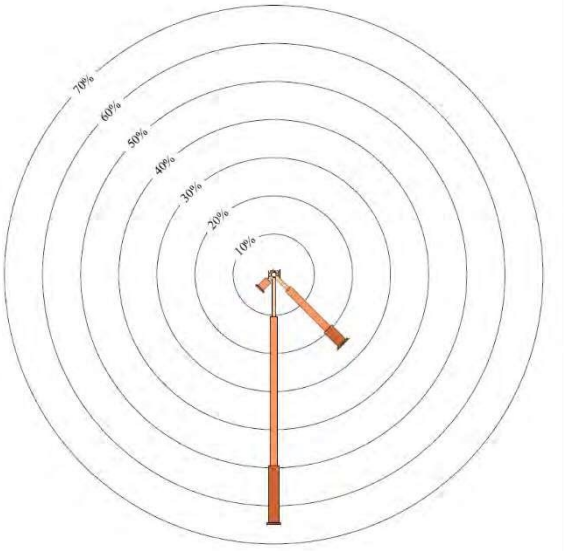
June 3pm (1941 – 2019)
2346 Observations (Calm 1%)



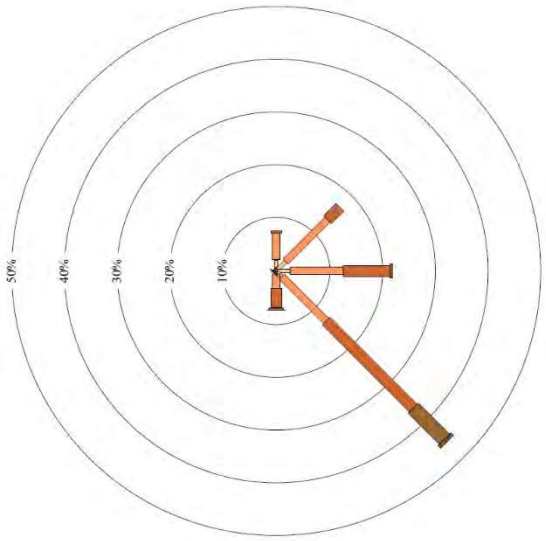
July 9am (1941 – 2019)
2406 Observations (Calm 3%)



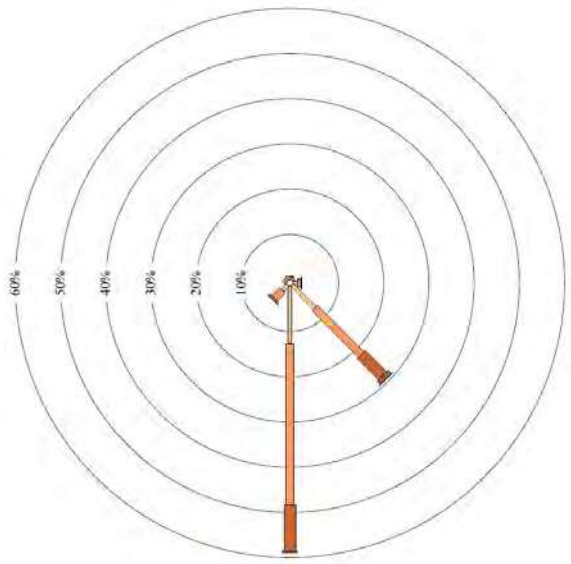
July 3pm (1941 – 2019)
2398 Observations (Calm 1%)



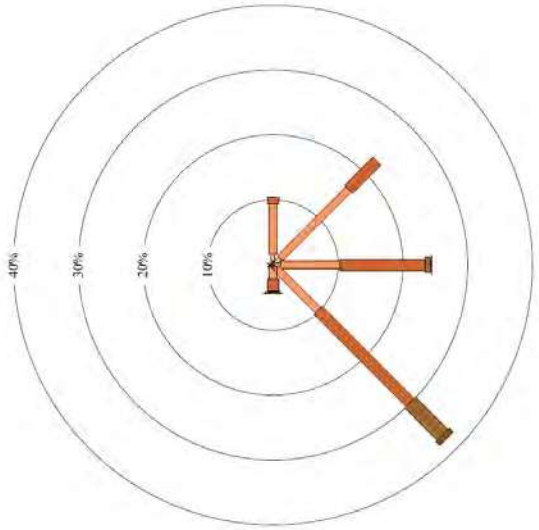
August 9am (1941 – 2018)
2383 Observations (Calm 3%)



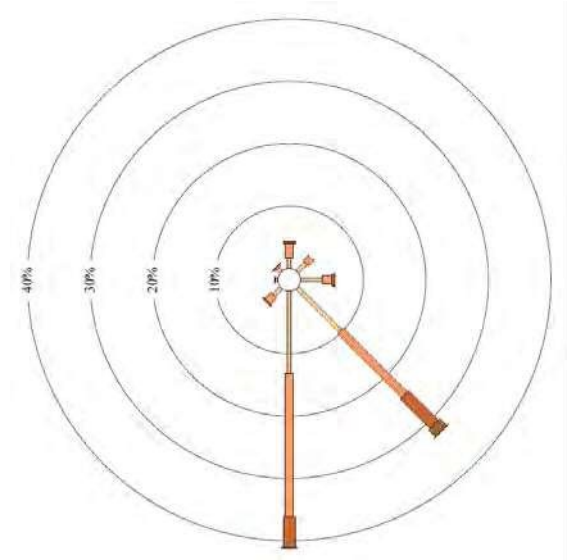
August 3pm (1941 – 2018)
2381 Observations (Calm 1%)



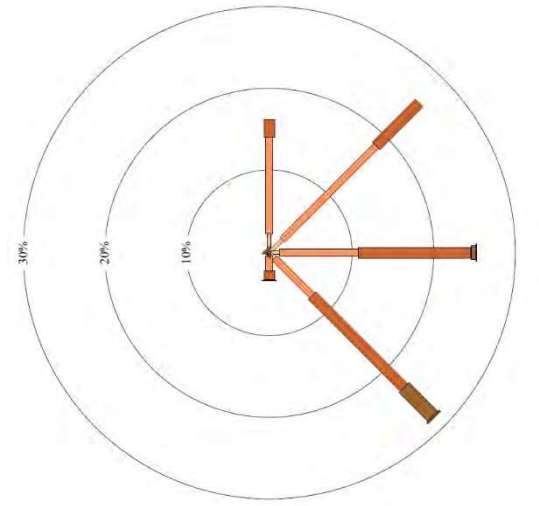
September 9am (1941 – 2018)
2329 Observations (Calm 3%)



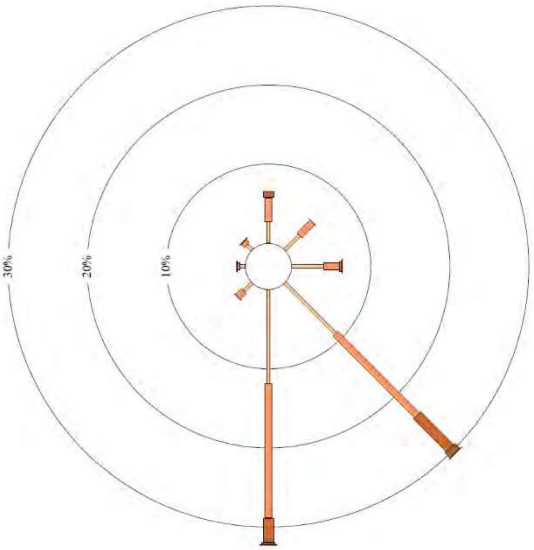
September 3pm (1941 – 2018)
2323 Observations (Calm < 0.5%)



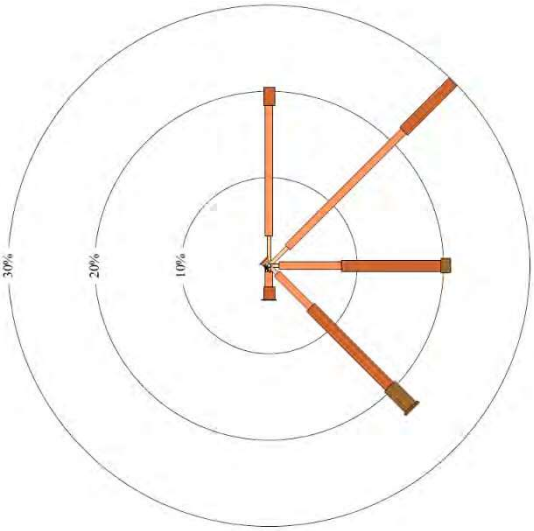
October 9am (1941 – 2018)
2414 Observations (Calm 9%)



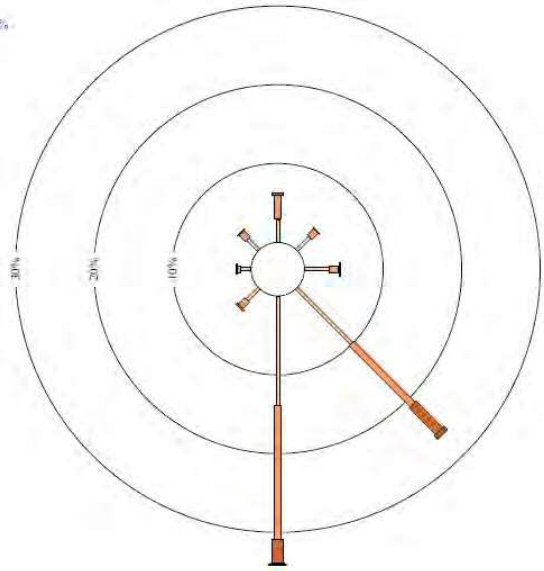
October 3pm (1941 – 2018)
2407 Observations (Calm 1%)



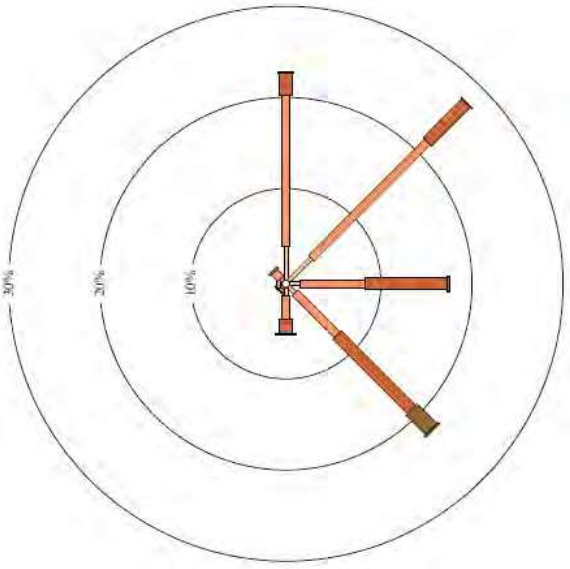
November 9am (1941 – 2018)
2330 Observations (Calm 15%)



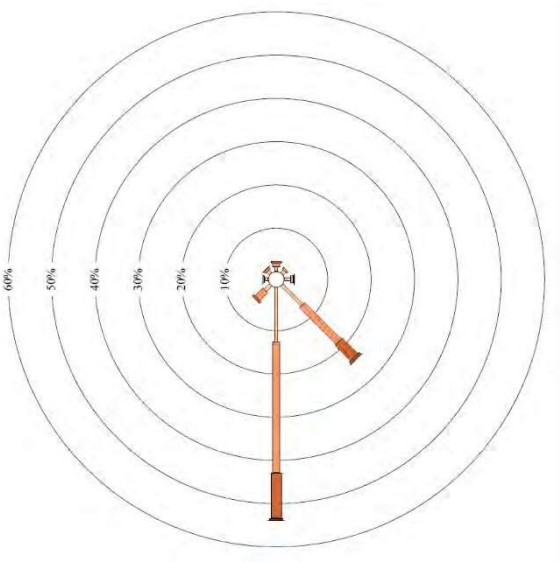
November 3pm (1941 – 2018)
2324 Observations (Calm 1%)



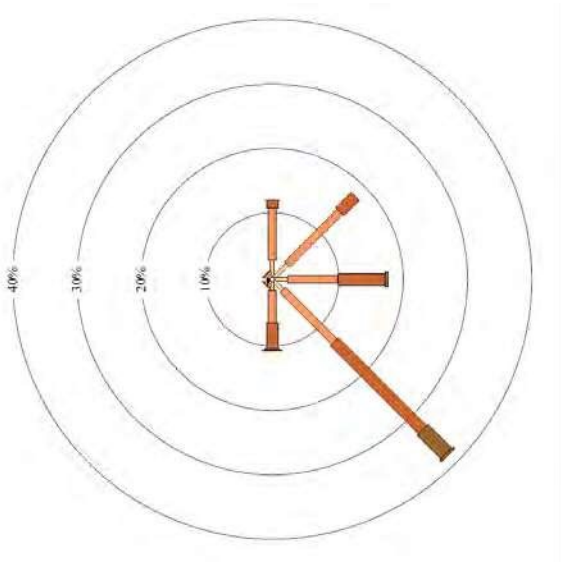
December 9am (1941 – 2019)
2408 Observations (Calm 17%)



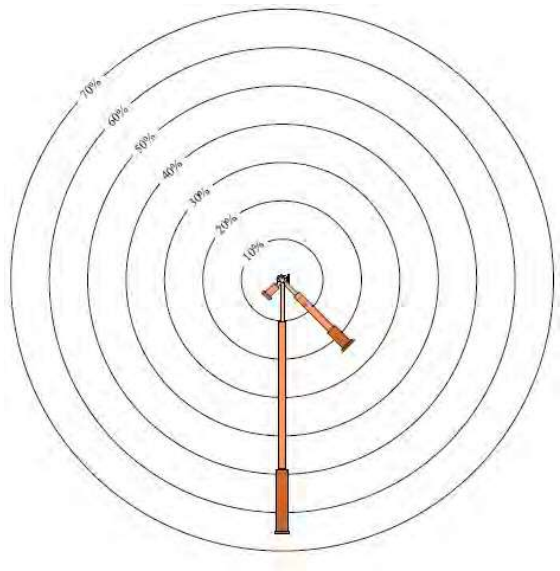
December 3pm (1941 – 2019)
2409 Observations (Calm 2%)



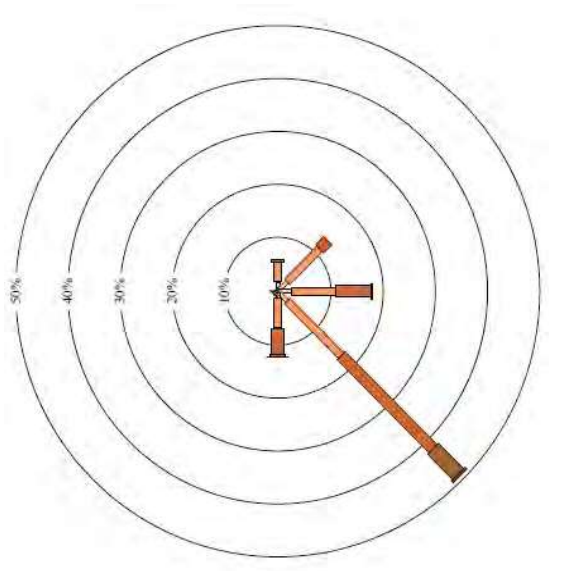
Annual 9am (05 May 1941 – 31 July 2019)
28432 Observations (Calm 9%)



Annual 3pm (05 May 1941 – 31 July 2019)
28380 Observations (Calm 2%)



May – September 9am (1941 – 2019)
12000 Observations (Calm 3%)



May – September 3pm (1941 – 2019)
11972 Observations (Calm 1%)

APPENDIX M. Mulgrave Sugar Mill NPI Data

Table M.1: MCM National Pollutant Inventory (NPI) Data

CoPC	Quantity (kg / year) 2020/2021 2019 / 2020 2018 / 2019 2017 / 2018		
	Point	**Fugitive**	**Air Total**
Heavy metals			
Cadmium & compounds	1.11384 1.33731 1.56663 0.98865	0 0 0 0	1.11384 1.33731 1.56663 0.98865
Chromium (III) compounds	2.39904 2.88036 3.37428 2.1294	0 0 0 0	2.39904 2.88036 3.37428 2.1294
Lead & compounds	64.9264 77.9526 91.3918 57.629	0 0 0 0	64.9264 77.9526 91.3918 57.629
Nickel & compounds	1.31376 1.57734 1.84782 1.1661	0 0 0 0	1.3176 1.57734 1.84782 10,719
Solid particles			
$PM_{2.5}$	13,330 19,494 20,257 17,335	0 0 0 0	13,330 19,494 20,257 17,335
PM_{10}	23,385 34,200 35,539 30,412	3510 3154 3078 3536	26,895 37,354 38,617 33,948
Total Volatile Organic Compound (TVOC)			
Ethanol	10,667 9,978 10,851 10,719	0 0 0 0	10,667 9,978 10,851 10,719
TVOC	10,791 10,126 11,025 10,829	0 0 0 0	10,791 10,126 11,025 10,829
Polycyclic aromatic hydrocarbon (PAH)			
Benzo(a)pyrene (as a marker for PAH)	0.035224 0.042291 0.049543 0.031265	0 0 0 0	0.035224 0.042291 0.049543 0.031265

CoPC	Quantity (kg / year) 2020/2021 2019 / 2020 2018 / 2019 2017 / 2018		
	Point	**Fugitive**	**Air Total**
Other			
Carbon monoxide	943,828 992,522 957,137 1,077,434	0 0 0 0	943,828 992,522 957,137 1,077,434
Oxides of nitrogen	277,788 292,561 282,866 316,361	0 0 0 0	277,788 292,561 282,866 316,361
Sulfur dioxide	90,506 95,191 91,822 103,292	0 0 0 0	90,506 95,191 91,822 103,292

Note:

- CoPC quantities have been derived through an emission factor estimate, with the exception of $PM_{2.5}$ and PM_{10} from the point source which was derived by a direct measurement estimate.

APPENDIX B. SQP Register

Table B.1: Suitably qualified person register

Person	Title	Organisation	AQMP Role	CV Reference
Kate Barnes	Safety and Environment Technician	MCM	Project Manager – AQMP Field logistics and reporting	**Appendix B**
Cathee Miller	Principal Environmental Scientist	CQG	Project Manager – Environmental Report Project Director – Ambient air monitoring	AQMP (**Appendix A**, refer to Appendix D of the AQMP)
Patrice Brown	Company Director	CQG	Project Director – Environmental Report	AQMP (**Appendix A**, refer to Appendix D of the AQMP)
Edward Rice	Senior Environmental Scientist	CQG	Project Manager – Ambient air monitoring	**Appendix B**
Simon Welchman	Director – Air Quality	Katestone	Peer review pre-AQMP implementation Preliminary air dispersion modelling	AQMP (**Appendix A**, refer to Appendix E of the AQMP)
Tania Haigh	Senior Consultant – Air Quality	Katestone	Preliminary air dispersion modelling	AQMP (**Appendix A**, refer to Appendix E of the AQMP)
Ricky Gellatly	Team Leader Operations	Katestone	Peer review – Environmental Report and throughout AQMP implementation Final air dispersion modelling	**Appendix B**
Henry Diona	Senior Air Monitoring Consultant	Ektimo	Project Manager – Stack monitoring	**Appendix B**
Manipal Singh	Air Monitoring Technician	Ektimo	Field technician – Stack monitoring	**Appendix B**
Dr Anthony Mann	Mechanical Engineer (Registered Professional Engineer of Queensland # 22873)	SRI	Project Manager / field technician – Stack monitoring	AQMP (**Appendix A**, refer to Appendix C of the AQMP)
Matthew Probets	Sales and Marketing Manager	EnvironData	Weather station set-up	**Appendix F** (refer to Appendix 1 of the EnvironData report)
Rob Somerville	Service Technician	EnvironData	In-field 6 and 12-monthly calibrations	**Appendix B**

Katherine (Kate) Barnes CV
Safety and Environment Technician

Bachelor of Science (Industrial Chemistry) – CQU
(2010-2015)

8 years' experience
(2014 – current):
Inspection, maintenance, troubleshooting and/or calibration of various laboratory/monitoring equipment, including, but not limited to:

- TPS Field Lab Analysers
- Thermoreactor
- Spectrophotometers
- Polarimeters
- Refractometers
- Balances,
- pH and conductivity meters
- Weather Maestro
- Low Volume Air Sampler
- 2-Fraction Optical Particle Counter

Conduct Ringelmann visual stack monitoring (AS 3543:2014)
Collection, preparation, and analysis of water samples
Conduct noise monitoring
Chemical handling

Certificate III in Electronic (Trade) – NTU
(1988 – 1991)

8 years' experience
(1988 – 1996):
Installing, calibrating, repair and maintenance, and regular scheduled testing of security and fire detection systems in defence base buildings and government department buildings.

Staff Profile

Edward Rice

Environmental Scientist /Rockhampton Environmental Operations Manager



Edward is an experienced and dynamic environmental scientist with a range of technical skills and experience in environmental monitoring, environmental management and contaminated land investigations.

Edward's experience includes set-up and use of Australian Standard gravimetric equipment for particulate matter for compliance monitoring purposes, and the use of telemetered dust and noise monitoring equipment for remote monitoring programs. He is trained to conduct personal (respirable) dust and respirable crystalline silica sampling.

Edward specialises in data analysis and scientific report writing. In addition, he has extensive experience with drafting and implementing environmental management plans in a variety of industries.

Edward's role as the environmental operations manager for the Rockhampton CQG office has provided him several years of experience in coordinating a variety of environmental projects across various sectors. Edward develops good working relationships with colleagues, clients and subcontractors, and has a proven track record of collaborating effectively to meet deadlines and deliver within budget.

Edward regularly conducts soil and groundwater sampling as part of contamination investigations and environmental monitoring programs. He has experience with installing and downloading conductivity and water level data loggers and collecting groundwater, surface water, soil and expression samples, and his field skills include soil logging, setting up and downloading data loggers, and calibration of various field instruments.

His experience includes routine environmental monitoring such as surface water, gas, depositional dust and soil sampling (including PFAS). He is adept in using a range of groundwater devices including peristaltic and low-flow pumps, Hydrasleeves and Waterra methods.

Edward has hands-on experience working with hydrogeologists and drillers in the selection of sites for environmental monitoring and groundwater supply bores.

Specialisations

- Environmental monitoring (particulate matter and depositional dust, gas, groundwater, surface water, soils and leachate)
- Respirable dust sampling
- Contamination investigations (groundwater and soil)
- Environmental management planning (drafting and implementation)
- Noise monitoring and attended noise assessments

Qualifications

- MSc Conservation Biology (2012), University of Cape Town
- BSc (Honours) Ecology (2010), University of KwaZulu-Natal
- BSc Environmental Science (2008), University of KwaZulu-Natal
- QLD White Card (Construction Induction)
- Monitoring respirable dust in coal mines (BSBWHS409 Assist with workplace monitoring processes), Simtars
- Standard 11

Staff Profile

Edward Rice

Environmental Scientist



Career Summary

- **Aug 2019 to current** - Environmental Scientist / Rockhampton Environmental Operations Manager - CQG Consulting
- **Jan 2015 to Aug 2019** - Principal Environmental Consultant - ETC-Africa
- **May 2012 to July 2013** - Programme Coordinator and Marketing Manager - Samara Wildlife Volunteer Programme
- **July 2010 to Dec 2010** - Junior Environmental Consultant - Indwe Environmental Consulting

Relevant Project Experience

Acciona (Rookwood Weir Alliance)

Rookwood Weir Dust Monitoring Program

- Design and implementation of a dust monitoring program using depositional dust gauges and telemetered optical particle counters for blasting works for the Rookwood Weir Construction Project

Mulgrave Central Mill

PM Monitoring Program

- Particulate matter monitoring using low volume samplers and telemetered optical particle counters

Rockhampton Regional Council

Closed and Operating Landfill Environmental Monitoring

- Coordinating dust (telemetered particulate matter) and noise monitoring to supplement an EA amendment application for crushing operations
- Environmental sampling and monitoring (groundwater, surface water, gas, dust and leachate) of operating and closed landfills
- Soil investigations at closed landfills (test pitting to determine capping depth)
- Data entry and reporting
- Down-hole camera inspections to determine bore condition
- Preparation of health, safety and quality control documents; Sampling and Analysis Plans (SAPs); and Job Safety Environmental Analyses (JSEAs)
- Calibration of in-situ sampling equipment (water quality meters)
- Environmental management plans
- Downloading data from in-situ units
- Working with specialist engineers to establish acoustic quality objectives and environmental objectives for air quality as per Schedule 8, Environmental Protection Regulation 2019

Various Clients (Confidential)

Contaminated Land Investigations

- Test pitting, drilling and push tube sampling at industrial sites and historical service stations
- Collection of soil samples for contamination screening
- Reporting on contamination status of sites
- Installation and use of vapour pins and photo ionisation detectors (PID) detection of volatiles
- Soil classification assessments and determining soil disposal suitability

Laing O'Rourke

Australia-Singapore Military Training Initiative (ASMTI)

- Groundwater monitoring (collecting samples with low-flow equipment and taking in-situ measurements)
- Setting up and downloading data loggers
- Coordinating drilling of a network of production bores and monitoring wells
- Purging and sampling groundwater
- Asbestos sampling (asbestos containing material and airborne fibre sampling)
- Soil sampling and soil logging (during contaminated soil investigations and bore installations)

Rockhampton Regional Council

Rugby Park Contaminated Land Investigation

- Site history review and invasive sampling to assess suitability for use

Staff Profile

Edward Rice

Environmental Scientist



Greening Australia

Woorabinda Park Contaminated Land investigation

- Site history review and invasive sampling to investigate extent and nature of buried waste
- Advising on remediation actions for recreational use

Flexihire

Pre-purchase environmental due diligence assessments for properties in Rockhampton and Gladstone

- Desktop site history investigations and intrusive site investigations
- Vacuum excavation, push tube sampling and surface soil sampling to determine contamination status of properties and assess integrity of underground fuel storage tanks
- Advising on environmental liability regarding acquisition of contaminated land

Fitzroy Basin Association

Water quality baseline assessment

- Project Manager for a water quality monitoring program to establish baseline trends to allow for assessment of water quality changes during and post construction of the Rookwood Weir

Resources Safety and Health Queensland

Bajool Explosives Reserve

- Project Manager for revising of Site Based Management Plan and water quality monitoring for Bajool Explosives Reserve

Queensland Alumina Limited (QAL)

- Groundwater, surface water and soil monitoring around QAL's residue disposal area and alumina plant
- Installation and downloading data loggers

Banana Shire Council

Operating Landfill Environmental Monitoring

- Groundwater and gas monitoring of an operating landfill
- Calibration of equipment
- Populating data field sheets and COC
- Down-hole camera inspections of monitoring wells to determine bore condition and design



Ricky Gellatly – Team Leader Operations - Air Quality

Ricky Gellatly is the Operations Team Leader at Katestone Environmental with over 10 years of experience in the fields of air quality and odour. He oversees and contributes to dozens of projects each year, many using dispersion modelling, and takes a lead role in developing technical approaches and tools for in-house and external use, as well as undertaking regular analytical studies to inform and advance the understanding of trends and other developments in the field of air quality.

Ricky has contributed his technical skills to a range of small, medium and large-scale projects. He led a team delivering air quality modelling for Heathrow Airport's proposed third runway; he oversaw the development of a bespoke assessment approach, involving the creation of a suite of project-specific tools using proprietary software alongside bespoke Python and Visual Basic (VBA) scripts, the subsequent preparation of model inputs, running of thousands of models, processing of model outputs and combination of multiple outputs (background, airside and road) for hundreds of thousands of receptors into concise and informative impact assessment results.

Ricky has also carried out a number of in-depth analytical data studies, mostly using the R software package. These analyses have largely focussed on the analysis of ambient air quality data, establishing the key sources influencing measured concentrations and the conditions under which these contributions occur, as well as the magnitude of contribution of different sources. These have included analyses of trends in roadside nitrogen oxides and nitrogen dioxide concentrations across the UK, which demonstrated significant reductions since 2016. In Australia, he has used his skills to review monitoring networks for coal ports and power stations in both Queensland and New South Wales, as well as a refinery in Western Australia, amongst other projects. He has also carried out assessments of a wide range of facilities and sources in Australia, from power stations and industrial facilities to transport projects and developments for sensitive uses such as childcare facilities. He has also carried out a number of in-depth odour assessments of industrial sources in Australia.

Ricky has assisted clients with assessments covering a very broad range of emission sources and operations and likes to maintain a positive relationship with his clients through a helpful, personable approach.

ACADEMIC QUALIFICATIONS

Bachelor of Science - Meteorology and Oceanography (First Class Honours), University of East Anglia, 2008.

SPECIALIST SKILLS

Project Management
Dispersion Modelling
Emissions Inventories
Data Analysis (R)
GIS
Qualitative Assessments (e.g. risk assessment techniques)
Airport Emissions
Industrial Emissions
Emissions Control Systems
Odour
Meteorology
Public Consultation
Air Quality Monitoring
Energy from Waste

PROFESSIONAL EXPERIENCE

Katestone (2021-present)
Principal Consultant, Air Quality Consultants Ltd (2012-2021)
Assistant Consultant, Odournet UK Ltd (2011 – 2012)

PROJECT EXPERIENCE

Air Quality Assessment – Airports

- Heathrow Airport Third Runway
- London City Airport
- Leeds Bradford Airport
- Luton Airport
- UK Airports Commission
- Dublin Airport

Air Quality Assessment – Transport

- Nathan, Salisbury, Moorooka Neighbourhood Plan Air Quality Study, Brisbane
- 23 Maud Street, Newstead, Brisbane
- Heathrow Airport Third Runway
- Waltham Forest Detailed Modelling
- Review of Maidstone Air Quality Management Area
- Peel Centre, Barnsley
- Hawkhurst Detailed Assessment
- Saint Cloud Way, Maidenhead
- South West Milton Keynes
- Supermarket, Watford
- Road Development, Doha, Qatar
- Road scheme, Birmingham

- Retrofitting of Buses, Tunbridge Wells
- Cold Drinks Storage and Distribution Warehouse, Rugby
- Victoria Square, Woking
- Electricity House, Bristol

Air Quality Assessment – Residential/Sensitive Uses

- 240 Gardner Road, Rochedale
- 23-27 Maud Street, Newstead, Brisbane
- Childcare Centre, Elimbah
- Urban Extension, Kirkby-in-Ashfield
- Great Stall East
- Leicester Forest East, Blaby
- Twigworth & Innsworth, Tewkesbury
- Gascoigne East
- Whittingham Lane, Goosnargh
- West Street, Biddulph
- Naish's Cross
- 6-10 Market Road, Islington
- The Music Box, Southwark

Air Quality Assessment - Power Stations and Generation

- Vales Point Power Station
- Stanwell Power Station
- Lockyer Energy Project
- CHP, Runcorn
- Nottingham Road Energy Centre
- Shawhouse Farm Gas Power Generation Facility
- Newburn Haugh Gas Power Generation Facility
- Skelmersdale Gas Power Generation Facility
- St Helens Gas Power Generation Facility
- Stoke-on-Trent Gas Power Generation Facility
- Crugmore Farm Anaerobic Digestion Facility
- Vale of Glamorgan Anaerobic Digestion Facility

Air Quality Assessment – Industrial

- Biochar Kiln, Hervey Bay
- Olive Pit Tumble Drier, Victoria
- Nathan, Salisbury, Moorooka Neighbourhood Plan Air Quality Study, Brisbane
- Mulgrave Sugar Mill, Gordonvale, Cairns
- New Kiln, Birkenhead, Adelaide
- Santos DLNG Annual Ambient Air Quality Monitoring Report
- Concrete Batching Plant, Newham
- Concrete Batching Plant, Reading
- Concrete Batching Plant, Barking
- East Midlands Gateway Strategic Rail Freight Interchange

Waste to Energy, Landfills and Resource Recovery

- Bridgwater Resource Recovery Facility
- Rotherham Renewable Energy Centre
- Sunderland Renewable Energy Centre
- Fort Parkway Energy
- Hams Hall Energy Centre
- Hownsgill Energy Centre
- Swadlincote Resource Recovery Park
- Kingmoor Park Energy from Waste
- Kelvin Energy Recovery Facility
- Waste Management Centre, West Dorset
- Waste Transfer Station, Wychavon

Dust Assessment and Monitoring

- Quarry Emissions Assessment Peer Review, NSW
- Abbot Point Bulk Coal Terminal Dust Network Review
- Refinery Dust Monitoring Network Review, WA
- Dust Risk Assessment, Port Hedland
- Port Kembla Coal Terminal Annual Reporting
- Topsoil Screening Facility, Nambour
- Lacy Place, Bundamba
- New Acland Coal Mine
- Bow East Goods Yard
- Lemon Grove
- Great Ormond Street Hospital

National Pollutant Inventory (NPI) and National Greenhouse Energy Reporting (NGER) Projects

- NPI Audit for Four Mines in Queensland
- Perilya Port Pirie
- Perilya Broken Hill
- Wiggins Island Coal Export Terminal
- New Acland Coal Mine

Odour Assessment

- NuGrow Ipswich Odour Management Plan
- NuGrow Ipswich Minor Change Application
- Landfill Odour, Queensland
- Rising Main Odour Emissions, Brisbane
- Cala Gran Holiday Park
- Lichfield Road Industrial Estate
- Penllyn Estate Farm Composting Facility
- Frog Island MBT facility
- Jenkins Lane MBT facility
- Vinten Bury St Edmunds
- Great Billing Sewage Treatment Works
- Sandy Sewage Treatment Works
- Newton Stewart Sewage Treatment Works
- Poultry Farm, Forest of Dean
- Buntingford Waste Water Treatment Works
- McDonald's Fast Food Restaurant and Drive-Thru, Chesterfield
- McDonald's Fast Food Restaurant and Drive-Thru, Belfast
- Fried Chicken Restaurant, Bath
- Wicks Farm Anaerobic Digestion Facility
- Stericycle Clinical Waste Treatment
- Merton Kitchen Odour Risk Assessment
- Odour risk assessments and dispersion modelling for numerous Energy from Waste facilities
- Three Sewage Treatment Works, Northern Ireland
- 15 Sewage Treatment Works, Republic of Ireland
- Equestrian Centre, Harrow
- Poultry farm, Taunton
- Gourmet Burger Restaurant, Bristol
- Commercial Bakery, Ealing

Health

- Health Impacts of Air Pollution in Bristol

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BIOSKETCH

Henry Diona



POSITION

Senior Air Monitoring Consultant

DATE APPOINTED TO POSITION

01/01/2015

RELEVANT EXPERIENCE & SKILLSETS

- Over 15 years of emission testing experience
- Sound knowledge and experience in emission inventory and air quality management
- Involved in the establishment of Geothermal Airshed - Philippines
- Training of Junior staff member

EMPLOYMENT HISTORY

Air Monitoring Consultant, EKTIMO

2015 – Present

Environmental Scientist, ECS STACK PTY LTD

2010 – 2014

Environmental Management Specialist, ENVIRONMENTAL MANAGEMENT BUREAU (PHILIPPINES)

2002 – 2008

QUALIFICATIONS & COURSES

Bachelor of Science in Chemical Engineering, Philippines

Diploma in Industrial Technology, Philippines

Certificate III in Local Government (Environment and Health), Australia

PREVIOUS EXPERIENCE

CS Energy Pty Ltd – Callide A, B, C & Kogan Creek

Milmerran Power Station – Millmerran Operating Company

Stanwell Power Station

Miles Power Station

Mount Isa Mines Power Station

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MANIPAL SINGH



POSITION

Air Monitoring Technician

DATE APPOINTED TO POSITON

18/05/2021

RELEVANT EXPERIENCE & SKILLSETS	Worked as an environmental science lecturer for 2 years Sound knowledge and experience in air quality dispersion models, air quality regulations and policies, and effluent treatment plants and sewage treatment plants
EMPLOYMENT HISTORY	Medical receptionist at Marshal Lane Medical Centre, Qld 2/12/2018 to 10/6/2019 Environmental sciences lecturer at Guru Nanak college, Muktsar, Punjab 10/02/2016 to 25/04/2018
QUALIFICATIONS / COURSES	BSC. Biotechnology, Punjabi university Patiala – 2011 to 2014 MSC. Environmental sciences, Guru Nanak Dev University (Amritsar)- 2014-2016 Master's in public health, Torrens University (QLD) – 2018-2021
PREVIOUS EXPERIENCE	Weipa Power Station, Rio Tinto Amrun Power Station, Rio Tinto Andoom Power Station, Rio Tinto CS Energy Callide B & C, CS Energy CS Energy Kogan, CS Energy Mulgrave Sugar Mill, MSF Sugar QLD Gas Pipeline, Jemena South West QLD pipeline, APA Group
SAFETY	0 recorded personal lost time injury in 12 months of field work.

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ACN: 131 757 125
ABN: 77 131 757 125

Robert Somerville CV for the purposes of siting, Installing and Servicing Weather Stations to the Australian Standard 3580.14:2014.

24th January 2023

To Whom it May concern,

Robert Somerville has been employed by Environdata Weather Stations Pty Ltd since July 2020.

Originally employed as Service technician, Robert has received in depth Environdata Training in all facets of Environdata's Weather Stations and sensors.

Robert started as a field service technician and is now currently employed as the service department manager.

Robert has performed over 200 field calibration services to Environdata specifications and installed more than 30 Environdata weather stations.

In his current role as the service manager he leads a team of 4 service technicians and guide them on how to service and install Environdata weather stations.

Robert has been trained in the siting, installation, maintenance & calibration requirement of the Australian Standards 3580.14:2014, BoM Observation Guidelines and World Meteorological Organisation Standards for Meteorological Monitoring, as they pertain to Environdata's Equipment.

For the purposes of the DES Requirement in the AQMP, it is our assertation that Robert Somerville is a suitably qualified person (SQP) to advise on equipment selection and siting in order to best meet the need of the AS3580.14:2014 weather station siting and equipment.

Environdata Weather Stations Pty Ltd hereby Certifies that Robert Somerville has received suitable training and has proved to be competent in the maintenance and calibrations of Environdata's equipment to AS 3580.14:2014

Best Regards,

Matthew Probets
Sales Manager
mprobets@environdata.com.au

APPENDIX C. Record keeping checklists

Table C1: Record keeping checklist: Stack Monitoring Days

Data	Day of monitoring				
	SM1.2021	**SM2.2021**	**SM3.2021**	**SM4.2022**	**SM5.2022**
Date	14/9/21	21/9/21	5/11/21	26/7/22	27/9/22
Monitoring being undertaken	• Metals (including Cd, Cr, Ni, Pb) • Total particulate matter • $PM_{2.5}$ and PM_{10} • Combustion gases (NOx, SO_2, CO, CO_2, O_2)	• Total particulate matter • Combustion gases (NOx, SO_2, CO, CO_2, O_2)	• Total particulate matter • $PM_{2.5}$ and PM_{10} • Combustion gases (NOx, SO_2, CO, CO_2, O_2)	• Metals (including Cd, Cr, Ni, Pb) • Total particulate matter • $PM_{2.5}$ and PM_{10} • Combustion gases (NOx, SO_2, CO, CO_2, O_2)	• Metals (including Cd, Cr, Ni, Pb) • Total particulate matter • $PM_{2.5}$ and PM_{10} • Combustion gases (NOx, SO_2, CO, CO_2, O_2)
Contractor conducting monitoring	Ektimo	SRI	SRI	Ektimo	Ektimo
Fuel volume (tonnes) used during contractor stack monitoring	1037.9 B 0.39 FO	944.2 B 0.00 FO	960.1 B 0.09 FO	1,133.7 B 0.3157 FO	1,015.9 B 0.9626 FO
Boiler throughputs (tonnes per hour)	5915.8	5,958.2	5,270.0	5,891.8	6,113.3
Fuel/s burnt (B = bagasse, FO = fuel oil)	B & FO	B	B & FO	B & FO	B & FO
Fuel volume (tonnes)	3144.6 B 0.43 FO	2,992.6 B 0.00 FO	2,600.2 B 7.25 FO	3,000.8 B 9.35 FO	2,979.1 B 0.98 FO
Composition	As per Cleanaway PDS	N/A	As per Cleanaway PDS	As per Veolia CoA	As per Veolia CoA
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	N	N	Y low O_2 alarm 1 < 5-minutes 1 < 1-minute	N	N
Community complaints (N = no, Y = yes)	N	N	N	N	N
AM – Smoke density (Ringelmann Smoke Chart) (0-5)	0.2	0.5	0.4	0.6	0.1
AM – smoke density assessment time	08:56	08:30	11:10	07:41	10:06
PM – Smoke density (Ringelmann Smoke Chart) (0-5)	0.5	0.7	0.7	0.1	0.0
PM – smoke density assessment time	13:52	13:53	14:14	14:52	14:11
Figures from shift 08:00 – 16:00 for contractor visit					
Cane crushed (tonne)	3193.48	2940.3	2845.98	3357.36	3137.72
Fibre	16.38	16.22	16.49	15.33	15.93
Moisture	50.4	50.51	48.88	45.40	49.20
Bagasse (tonne)	1037.9	944.2	960.1	1133.7	1015.9

Table C2: Record keeping checklist – pre SM1.2021 14-day records

Data (08:00-07:59)	Days before monitoring													
	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Date	31/8/21	1/9/21	2/9/21	3/9/21	4/9/21	5/9/21	6/9/21	7/9/21	8/9/21	9/9/21	10/9/21	11/9/21	12/9/21	13/9/21
Boiler throughputs - steam (approx. tonnes per hour)	4,904.2	31.0	Wet weather stop continued	541.8	5,539.7	5,230.3	5,280.3	5,384.8	5,936.3	4,936.1	4,412.3	5,931.6	5,486.8	5,915.8
Fuel burnt (B = bagasse, FO = fuel oil)	B & FO	B & FO		B & FO	B & FO	B & FO	B	B	B & FO	B & FO	B & FO	B	B & FO	B
Fuel volume (tonnes)	2168.8 B 15.92 FO	0 B 0.94 FO		210.3 B 9.02 FO	2985.0 B 4.15 FO	2593.4 B 4.08 FO	2682.5 B 0.00 FO	2881.5 B 0.00 FO	3148.1 B 0.36 FO	2634.5 B 0.92 FO	2369.4 B 1.44 FO	3134.3 B 0.00 FO	2876.3 B 0.24 FO	3237.9 B 0.00 FO
Fuel oil Composition	As per Cleanaway PDS	As per Cleanaway PDS		As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	N/A	N/A	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	N/A	As per Cleanaway PDS	N/A
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	Y low O_2 alarm 1 < 1-minute	N		Y low O_2 alarm 2 > 5-minutes	Y low O_2 alarm 1 < 1-minute	Y low O_2 alarm 2 < 5-minutes	N	N	Y low O_2 alarm 1 < 5-minutes 1 < 1-minute	Y low O_2 alarm 1 < 1-minute	Y low O_2 alarm 1 < 1-minute	Y low O_2 alarm 1 < 5-minutes	N	N
Community complaints (N = no, Y = yes)	N	N		N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	0.4	No emissions from stack		No emissions from stack	1.5	1	0.4	0.8	0.6	0.6	0.3	0.1	0.7	0.8
AM – smoke density assessment time	09:40	07:00		07:00	09:30	08:26	07:47	08:25	07:55	08:24	07:00	08:45	08:14	08:34
PM – Smoke density (0-5) (Ringelmann)	1.6	No emissions from stack		No emissions from stack	0.5	0	0.6	0.5	0.5	1.4	0.7	0	0.7	0.2
PM – smoke density assessment time	14:55	15:30		15:30	14:10	14:30	15:53	13:13	13:57	15:22	16:53	15:15	15:34	15:20
Comments	Wet weather stop 06:30-continued	Wet weather stop continued		Wet weather stop continued-05:30		Wet weather stop 10:15-12:30	Wet weather stop 09:30-11:30			Wet weather stop 09:20-15:15	Wet weather stop 08:45-16:35			

Table C3: Record keeping checklist – post SM1.2021 14-day records

Data (08:00-07:59)	Days after monitoring													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Date	15/9/21	16/9/21	17/9/21	18/9/21	19/9/21	20/9/21	21/9/21	22/9/21	23/9/21	24/9/21	25/9/21	26/9/21	27/9/21	28/9/21
Boiler throughputs - steam (approx. tonnes per hour)	5,648.4	5,191.6	6,062.5	5,984.5	5,810.9	6,076.4	5,958.2	5,340.7	5,925.7	6,003.4	5,646.8	5,859.2	6,086.7	5,787.6
Fuel burnt (B = bagasse, FO = fuel oil)	B & FO	B & FO	B	B	B	B	B	B & FO	B	B & FO	B & FO	B & FO	B & FO	B & FO
Fuel volume (tonnes)	3,101.1 B 0.77 FO	2,515.6 B 0.52 FO	3,063.2 B 0.00 FO	3,128.8 B 0.00 FO	3,093.1 B 0.00 FO	3,195.9 B 0.00 FO	2,992.6 B 0.00 FO	2,347.0 B 2.11 FO	3,019.4 B 0.00 FO	3,147.9 B 0.73 FO	2,994.2 B 0.38 FO	3,005.2 B 0.13 FO	3,105.4 B 1.41 FO	2,945.1 B 0.09 FO
Fuel oil Composition	As per Cleanaway PDS	As per Cleanaway PDS	N/A	N/A	N/A	N/A	N/A	As per Cleanaway PDS	N/A	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	Y low O_2 alarm 2 < 1-minute	Y low O_2 alarm 1 < 1-minute	N	N	N	N	N	N	N	N	N	N	N	Y low O_2 alarm 4 < 1-minute
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	0.6	0.9	1.5	1.3	0.7	0.5	0.5	0.4	0.8	0.4	0.7	0.8	0.6	0.7
AM – smoke density assessment time	09:00	07:17	08:15	08:23	08:20	08:10	08:30	07:14	07:33	08:30	08:13	08:09	07:52	08:47
PM – Smoke density (0-5) (Ringelmann)	0.1	0.9	0.7	0.6	0.4	1.2	0.7	0.1	0.7	0.5	0.7	0.4	1	0.3
PM – smoke density assessment time	13:26	14:39	12:55	12:05	12:29	14:00	13:53	14:23	13:41	13:00	14:49	13:04	14:26	14:10
Comments		Maintenance stop 09:45-14:38						Maintenance stop 08:26-14:20			Mill Stop 08:40-10:50			Maintenance stop 06:00-continued

Table C4: Record keeping checklist – pre SM2.2021 14-day records

Data (08:00-07:59)	**Days before monitoring**													
	14	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Date	7/9/21	8/9/21	9/9/21	10/9/21	11/9/21	12/9/21	13/9/21	14/9/21	15/9/21	16/9/21	17/9/21	18/9/21	19/9/21	20/9/21
Boiler throughputs - steam (approx. tonnes per hour)	See **Table C2**							See **Table C1**	See **Table C3**					
Fuel burnt (B = bagasse, FO = fuel oil)														
Fuel volume (tonnes)														
Fuel oil Composition														
Operational / equipment factors that could influence air emissions (N = no, Y = yes)														
Community complaints (N = no, Y = yes)														
AM – Smoke density (0-5) (Ringelmann)														
AM – smoke density assessment time														
PM – Smoke density (0-5) (Ringelmann)														
PM – smoke density assessment time														
Comments														

Table C5: Record keeping checklist – post SM2.2021 14-day records checklist

Data (08:00-07:59)	Days after monitoring													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Date	22/9/21	23/9/21	24/9/21	25/9/21	26/9/21	27/9/21	28/9/21	29/9/21	30/9/21	1/10/21	2/10/21	3/10/21	4/10/21	5/10/21
Boiler throughputs - steam (approx. tonnes per hour)	See **Table C3**							3,505.7	6,006.9	5,922.8	5,771.0	5,911.1	5,765.0	5,643.7
Fuel burnt (B = bagasse, FO = fuel oil)								B & FO	B & FO	B	B	B	B	B
Fuel volume (tonnes)								1,772.7 B 2.90 FO	3,259.5 B 0.33 FO	3,016.1 B 0.00 FO	2,822.4 B 0.00 FO	3,026.7 B 0.00 FO	2,940.7 B 0.00 FO	2,947.6 B 0.00 FO
Fuel oil Composition								As per Cleanaway PDS	As per Cleanaway PDS	N/A	N/A	N/A	N/A	N/A
Operational / equipment factors that could influence air emissions (N = no, Y = yes)								Y low O_2 alarm 1 > 5-minute	Y low O_2 alarm 1 < 1-minute	N	N	N	N	N
Community complaints (N = no, Y = yes)								N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)								0	0.3	0.4	0.2	0.8	0.1	0.2
AM – smoke density assessment time								07:27	07:32	08:03	10:06	11:17	07:51	08:32
PM – Smoke density (0-5) (Ringelmann)								No emissions from stack	0.1	0.3	0.6	1	0.4	0.5
PM – smoke density assessment time								14:51	15:11	14:23	15:45	14:06	15:01	13:01
Comments								Maintenance stop continued-18:10						

Table C6: Record keeping checklist – pre SM3.2021 14-day records

Data (08:00-07:59)	Days before monitoring													
	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Date	22/10/21	23/10/21	24/10/21	25/10/21	26/10/21	27/10/21	28/10/21	29/10/21	30/10/21	31/10/21	1/11/21	2/11/21	3/11/21	4/11/21
Boiler throughputs - steam (approx. tonnes per hour)	5,779.3	5,497.0	5,564.1	5,807.8	4,402.9	5,846.0	5,797.6	5,782.0	5,935.6	5,902.2	5,630.5	5,666.8	4,895.5	5,165.0
Fuel burnt (B = bagasse, FO = fuel oil)	B	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B	B	B & FO	B & FO	B & FO	B & FO
Fuel volume (tonnes)	2,878.2 B 0.00 FO	2,966.0 B 1.26 FO	2,870.0 B 0.63 FO	2,721.4 B 0.09 FO	1,938.0 B 7.89 FO	3,055.4 B 0.24 FO	2,932.4 B 0.66 FO	3,105.6 B 0.15 FO	3,092.6 B 0.00 FO	2,770.6 B 0.00 FO	2,832.8 B 0.74 FO	2,897.1 B 0.71 FO	2,301.2 B 9.55 FO	2,507.0 B 2.42 FO
Fuel oil Composition	N/A	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	N/A	N/A	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	Y low O_2 alarm 1 < 1-minute	N	Y low O_2 alarm 2 < 1-minute	N	Y low O_2 alarm 1 > 5-minutes 3 < 5-minutes	Y low O_2 alarm 3 < 5-minutes 4 < 1-minute	N	Y low O_2 alarm 1 < 1-minute	N	N	Y low O_2 alarm 2 < 5-minutes 2 < 1-minute	Y low O_2 alarm 2 < 5-minutes 3 < 1-minute	N	Y low O_2 alarm 1 > 5-minutes 1 < 5-minutes 3 < 1-minute
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	0.6	0.2	0.1	0.3	0.2	1.5	1.2	0.4	0.1	0.3	0	0.6	0.1	1.2
AM – smoke density assessment time	09:00	06:40	07:58	08:45	06:49	06:47	09:20	07:10	07:06	08:37	07:04	08:03	07:50	08:05
PM – Smoke density (0-5) (Ringelmann)	1	0.3	0.3	1.3	0.5	0.4	0.5	0.6	1.2	0.9	0	0.4	1.2	0.6
PM – smoke density assessment time	12:50	14:02	15:02	13:07	14:48	15:00	15:29	14:27	12:51	14:37	14:25	13:37	14:13	13:35
Comments				Maintenance stop 06:45-continued	Maintenance stop continued-10:00. 23:15-04:45								Maintenance stop 08:15-14:10	Wet weather stop 09:50-13:00

Table C7: Record keeping checklist – post SM3.2021 14-day records checklist

Data (08:00-07:59)	**Days after monitoring**													
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Date	6/11/21	7/11/21	8/11/21	9/11/21	10/11/21	11/11/21	12/11/21	13/11/21	14/11/21	15/11/21	16/11/21	17/11/21	18/11/21	19/11/21
Boiler throughputs - steam (approx. tonnes per hour)	4,573.2	5,813.4	5,609.4	5,525.0	5,212.6	1,866.4	484.8	Crush season completed						
Fuel burnt (B = bagasse, FO = fuel oil)	B & FO	B & FO	B	B	B & FO	B & FO	B & FO							
Fuel volume (tonnes)	2,381.5 B 16.99 FO	3,163.7 B 2.49 FO	3,104.9 B 0.00 FO	2,815.3 B 0.00 FO	2,424.0 B 0.61 FO	573.6 B 25.99 FO	187.3 B 4.15 FO							
Fuel oil Composition	As per Cleanaway PDS	As per Cleanaway PDS	N/A	N/A	As per Cleanaway PDS	As per Cleanaway PDS	As per Cleanaway PDS							
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	Y ENV2102 low O_2 alarm 1 > 5-minutes 4 < 5-minutes 9 < 1-minute	Y low O_2 alarm 1 < 5-minutes	Y low O_2 alarm 1 < 5-minutes	N	N	N	N							
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N							
AM – Smoke density (0-5) (Ringelmann)	0.3	0.1	0.1	0.7	1.4	0.5	0							
AM – smoke density assessment time	07:27	08:12	11:10	09:15	09:17	07:04	07:41							
PM – Smoke density (0-5) (Ringelmann)	0.2	1	0.4	0.6	0.5	0.5	0.5							
PM – smoke density assessment time	14:12	15:07	14:53	13:18	15:24	12:40	13:45							
Comments	See log ENV2102 08:00-13:45				Mill stopped crushing 04:20	Mill stopped crushing	Boilers off 18:00							

Table C8: Record keeping checklist – 2022 crush season records

Data (08:00-07:59)	**Dates**													
	30/05/22	31/5/22	1/6/22	2/6/22	13/6/22	14/6/22	15/6/22	16/6/22	17/6/22	18/6/22	19/6/22	20/6/22	21/6/22	22/6/22
Boiler throughputs - steam (approx. tonnes per hour)			321.3	324.1	201.3	4,687.7	6,016.2	5,758.6	6,033.6	5,669.2	5,466.4	5,389.7	5,879.6	5,487.3
Fuel burnt (B = bagasse, FO = fuel oil)	Timber	Timber B	B & FO	B	B	B & FO	B	B & FO	B	B & FO	B & FO	B & FO	B	B
Fuel volume (tonnes)		440.0 B	680.0 B 5.11 FO	400.0 B 0.00 FO		2,559.3 B 1.89 FO	3,212.8 B 0.00 FO	3,043.7 B 0.08 FO	3,223.8 B 0.00 FO	3,126.8 B 0.01 FO	2,806.9 B 7.71 FO	2,792.0 B 10.77 FO	3,168.1 B 0.00 FO	2,668.3 B 0.00 FO
Fuel oil Composition	N/A	N/A	As per SOR PDS	N/A	N/A	As per SOR PDS	N/A	As per SOR PDS	N/A	As per SOR PDS	As per SOR PDS	As per SOR PDS	N/A	N/A
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	Warming of boiler	Warming of boiler	Steam Trials	Steam Trials	Warming of boiler	Y low O_2 alarm 1 < 5-minutes 2 < 1-minute	N	Y low O_2 alarm 1 < 1-minute	N	Y low O_2 alarm 1 < 1-minute	N	Y low O_2 alarm 3 < 1-minute	N	N
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	No emission from stack	No emission from stack	0.1	0.7	No emission from stack	0.2	1.5	0.6	1.3	0.5	0.6	0.4	0.7	0.4
AM – smoke density assessment time	07:00	07:00	08:24	08:09	07:00	09:26	07:33	07:10	07:57	09:28	08:08	09:08	10:49	08:58
PM – Smoke density (0-5) (Ringelmann)	No emission from stack		0.3	0.5		0.7	0.5	0.5	0.0	0.1	0.0	0.3	0.2	0.1
PM – smoke density assessment time	15:30		14:49	14:30		14:27	13:39	14:18	13:48	14:53	13:50	14:04	14:59	14:37
Comments	Timber lit to start warming approx 15:00	Timber still burning. Bagasse on approx 21:00	Bagasse on until ≈19:00 On again ≈ 02:00	Bagasse on until ≈18:00	AS service Weather station 14:50-17:40	Crush started 09:30 AS service Weather station 08:30-12:40								Wet weather stop 05:40-continued

Data (08:00-07:59)	Dates													
	23/6/22	24/6/22	25/6/22	26/6/22	27/6/22	28/6/22	29/6/22	30/6/22	1/7/22	2/7/22	3/7/22	4/7/22	5/7/22	6/7/22
Boiler throughputs - steam (approx. tonnes per hour)	3,734.9	5,684.8	5,465.1	5,310.7	1,715.8	5,949.1	6,207.9	2,852.2	Wet weather stop continued					
Fuel burnt (B = bagasse, FO = fuel oil)	B & FO	B & FO	B & FO	B & FO	B & FO	B	B	B & FO						
Fuel volume (tonnes)	1,881.4 B 6.11 FO	3,328.5 B 0.08 FO	2,793.7 B 0.09 FO	2,960.2 B 17.24 FO	957.3 B 0.93 FO	3,413.3 B 0.00 FO	3,259.7 B 0.00 FO	1,237.6 B 22.70 FO						
Fuel oil Composition	As per SOR PDS	As per SOR PDS	As per SOR PDS	As per SOR PDS	As per SOR PDS	N/A	N/A	As per Veolia CoA						
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	N	N	N	N	Y low O_2 alarm 1 < 1-minute	Y low O_2 alarm 1 < 1-minute	N	N						
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N						
AM – Smoke density (0-5) (Ringelmann)	No emission from stack	0.1	0.0	0.0	0.3	0.3	0.2	0.4						
AM – smoke density assessment time	08:13	09:12	08:15	08:33	08:03	10:06	08:30	08:24						
PM – Smoke density (0-5) (Ringelmann)	0.8	0.5	0.7	0.2	No emission from stack	0.9	0.4	0.4						
PM – smoke density assessment time	15:12	13:50	14:42	15:02	15:06	14:25	14:33	12:21						
Comments	Wet weather stop continued-17:15				Wet weather stop 07:55-01:30			Out of cane stop 07:00-12:20 Wet weather stop 22:00-continued						

Data (08:00-07:59)	Dates													
	7/7/22	8/7/22	9/7/22	10/7/22	11/7/22	12/7/22	13/7/22	14/7/22	15/7/22	16/7/22	17/7/22	18/7/22	19/7/22	20/7/22
Boiler throughputs - steam (approx. tonnes per hour)	Wet weather stop continued	0.0	4,591.2	6,220.4	5,870.0	5,891.5	5,111.8	5,168.7	6,028.7	5,136.9	4,643.7	2,588.5	5,971.9	6,121.4
Fuel burnt (B = bagasse, FO = fuel oil)		B & FO	B & FO	B	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B	B & FO	B	B
Fuel volume (tonnes)		109.4 B 0.38 FO	2,443.8 B 22.01 FO	3,625.0 B 0.00 FO	3,250.7 B 3.21 FO	3,000.7 B 12.44 FO	2,689.1 B 13.36 FO	2,665.9 B 17.96 FO	3,550.7 B 0.34 FO	2,430.5 B 0.58 FO	2,820.7 B 0.00 FO	1,442.4 B 1.73 FO	3,482.5 B 0.00 FO	3,487.5 B 0.00 FO
Fuel oil Composition		As per Veolia CoA	As per Veolia CoA	N/A	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	N/A	As per Veolia CoA	N/A	N/A
Operational / equipment factors that could influence air emissions (N = no, Y = yes)		Warming of boiler	N	N	Y low O_2 alarm 1 < 5-minutes	N	Y low O_2 alarm 1 < 5-minutes 1 < 1-minute	Y low O_2 alarm 1 < 5-minutes 1 < 1-minute	N	N	N	Y low O_2 alarm 1 < 1-minute	N	N
Community complaints (N = no, Y = yes)		N	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)		No emission from stack	0.0	0.5	1.5	0.6	1.4	0.7	0.5	0.4	0.0	No emissions from stack	0.6	0.3
AM – smoke density assessment time		08:02	07:53	10:21	07:18	10:58	07:15	07:38	09:07	08:17	08:10	09:20	08:14	08:28
PM – Smoke density (0-5) (Ringelmann)		0.5	1.0	0.5	0.6	0.5	0.0	0.0	0.1	0.4	0.0	No emissions from stack	0.7	0.3
PM – smoke density assessment time		14:15	14:43	13:12	15:00	14:26	14:52	13:10	14:39	13:55	14:41	14:02	13:06	13:38
Comments		Bagasse on approx 08:30 Out of cane stop 15:30-22:00 Bagasse on 22:00	Started crushing 15:00 Harvester operating East of Mill			Out of Cane stop 09:00-11:00. Mill stop 14:00-15:00	Maintenance stop 12:00-17:30. Harvester operating East of Mill	WHS stop 14:00-18:15		Wet weather / Maintenance stop 09:50-16:50	Wet weather stop 03:00-continued	Wet weather stop continued-21:00		Harvester operating East of Mill

Data (08:00-07:59)	**Dates**													
	21/7/22	22/7/22	23/7/22	24/7/22	25/7/22	26/7/22	27/7/22	28/7/22	29/7/22	30/7/22	31/7/22	1/8/22	2/8/22	3/8/22
Boiler throughputs - steam (approx. tonnes per hour)	5,536.3	5,922.1	5,491.6	5,936.0	6,064.4	5,891.8	4,974.2	5,810.3	5,977.8	6,057.5	5,877.7	5,841.2	5,985.7	4,574.2
Fuel burnt (B = bagasse, FO = fuel oil)	B	B & FO	B & FO	B & FO	B	B & FO	B & FO	B	B	B	B	B	B	B & FO
Fuel volume (tonnes)	2,999.1 B 0.00 FO	3,624.8 B 1.74 FO	2,820.6 B 0.43 FO	3,233.8 B 0.14 FO	3,249.2 B 0.00 FO	3,000.8 B 9.35 FO	2,422.6 B 2.70 FO	2,904.5 B 0.00 FO	3,313.0 B 0.00 FO	3,331.3 B 0.00 FO	3,378.3 B 0.00 FO	3,075.6 B 0.00 FO	3,326.2 B 0.00 FO	2,262.3 B 2.81 FO
Fuel oil Composition	N/A	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	N/A	As per Veolia CoA	As per Veolia CoA	N/A	N/A	N/A	N/A	N/A	N/A	As per Veolia CoA
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	N	N	N	N	N	N	N	N	Y low O_2 alarm 1 < 5-minutes	Y low O_2 alarm 1 > 5-minutes 3 < 5-minutes 7 < 1-minute	Y low O_2 alarm 1 < 5-minutes 2 < 1-minute	N	Y low O_2 alarm 1 < 5-minutes	Y low O_2 alarm 1 < 5-minutes 3 < 1-minute
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	0.3	0.1	0.5	1.8	1.2	0.6	0.3	0.4	0.5	0.6	0.2	0.7	0.0	0.0
AM – smoke density assessment time	07:58	08:20	08:39	09:55	08:28	07:41	11:05	11:10	11:27	09:32	10:24	08:21	09:32	08:59
PM – Smoke density (0-5) (Ringelmann)	0.3	0.4	0.0	0.0	0.0	0.1	0.9	0.2	0.3	0.0	0.0	0.6	1.2	No emissions from stack
PM – smoke density assessment time	14:17	13:22	14:21	14:51	13:53	14:52	14:48	14:29	13:16	13:56	15:58	14:05	14:52	15:30
Comments							Maintenance stop 08:45-13:45 Pyramid fire						Burning off East of Mill	Maintenance stop 08:00-16:30

Data (08:00-07:59)	**Dates**													
	4/8/22	5/8/22	6/8/22	7/8/22	8/8/22	9/8/22	10/8/22	11/8/22	12/8/22	13/8/22	14/8/22	15/8/22	16/8/22	17/8/22
Boiler throughputs - steam (approx. tonnes per hour)	5,777.7	5,945.7	6,128.3	5,996.8	6,149.2	5,705.6	5,656.1	2,958.4	5,974.7	5,967.6	6,170.7	6,078.5	5,974.2	5,089.2
Fuel burnt (B = bagasse, FO = fuel oil)	B	B & FO	B	B	B & FO	B & FO	B	B	B	B	B	B & FO	B	B & FO
Fuel volume (tonnes)	3,103.3 B 0.00 FO	3,251.2 B 0.27 FO	3,286.9 B 0.00 FO	3,251.3 B 0.00 FO	3,241.1 B 0.02 FO	3,002.8 B 0.27 FO	3,001.1 B 0.00 FO	1,649.4 B 0.00 FO	3,308.7 B 0.00 FO	3,261.9 B 0.00 FO	3,503.6 B 0.00 FO	3,232.7 B 0.44 FO	3,041.3 B 0.00 FO	2,517.2 B 0.12 FO
Fuel oil Composition	N/A	As per Veolia CoA	N/A	N/A	As per Veolia CoA	As per Veolia CoA	N/A	N/A	N/A	N/A	N/A	As per Veolia CoA	N/A	As per Veolia CoA
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	Y low O_2 alarm 1 < 5-minutes 2 < 1-minute	Y low O_2 alarm 2 < 1-minute	N	N	N	Y low O_2 alarm 1 < 1-minute	N	Y low O_2 alarm 1 < 1-minute	N	N	N	N	N	N
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	1.2	1.0	0.9	0.3	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
AM – smoke density assessment time	11:03	07:50	09:18	10:17	08:03	08:16	09:13	07:55	09:00	08:54	11:13	08:10	09:47	08:56
PM – Smoke density (0-5) (Ringelmann)	1.2	0.1	0.0	0.0	0.1	0.2	0.1	No emissions from stack	0.2	0.0	0.0	0.2	0.2	No emissions from stack
PM – smoke density assessment time	13:51	14:18	14:48	16:21	14:58	14:10	14:33	15:05	13:57	15:21	16:32	15:04	12:27	15:09
Comments								Maintenance stop 05:50-19:30						Maintenance stop 09:30-15:30

Data (08:00-07:59)	Dates													
	18/8/22	19/8/22	20/8/22	21/8/22	22/8/22	23/8/22	24/8/22	25/8/22	26/8/22	27/8/22	28/8/22	29/8/22	30/8/22	31/8/22
Boiler throughputs - steam (approx. tonnes per hour)	5,972.2	5,753.3	5,729.0	5,736.2	6,053.2	6,328.6	5,644.4	6,155.4	6,187.8	5,641.4	1,050.8	Wet weather stop continued		
Fuel burnt (B = bagasse, FO = fuel oil)	B	B	B	B & FO	B	B	B & FO	B & FO	B	B & FO	B & FO			
Fuel volume (tonnes)	3,045.0 B 0.00 FO	2,888.2 B 0.00 FO	8,557.0 B 0.00 FO	2,853.8 B 5.92 FO	3,011.0 B 0.00 FO	3,180.6 B 0.00 FO	2,575.9 B 6.02 FO	2,846.2 B 0.07 FO	2,993.5 B 0.00 FO	2,581.7 B 1.56 FO	374.6 B 15.71 FO			
Fuel oil Composition	N/A	N/A	N/A	As per Veolia CoA	N/A	N/A	As per Veolia CoA	As per Veolia CoA	N/A	As per Veolia CoA	As per Veolia CoA			
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	N	N	N	N	N	N	Y low O_2 alarm 1 < 5-minutes 2 < 1-minute	Y low O_2 alarm 1 < 5-minutes 2 < 1-minute	N	N	N			
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N	N	N			
AM – Smoke density (0-5) (Ringelmann)	1.2	0.5	0.0	0.0	0.1	1.0	1.3	0.7	0.5	0.1	0.3			
AM – smoke density assessment time	08:51	09:30	08:25	11:14	08:05	08:46	09:10	10:16	07:58	08:52	11:27			
PM – Smoke density (0-5) (Ringelmann)	0.1	0.4	0.1	0.0	0.1	0.1	0.4	0.1	0.1	0.5	No emission from stack			
PM – smoke density assessment time	14:58	14:14	14:32	12:45	13:28	13:34	14:09	14:03	13:03	13:02	14:22			
Comments			Out of cane stop 12:30-14:00			Fires burning in hills West of Mill	Maintenance stop 10:00-14:05		Fires still burning in hills West of Mill	Maintenance stop 12:30-14:00	Wet weather stop 10:50-continued			

Data (08:00-07:59)	Dates													
	1/9/22	2/9/22	3/9/22	4/9/22	5/9/22	6/9/22	7/9/22	8/9/22	9/9/22	10/9/22	11/9/22	12/9/22	13/9/22	14/9/22
Boiler throughputs - steam (approx. tonnes per hour)	2,340.4	3,149.0	Wet weather stop continued	1,108.2	5,876.0	5,969.7	5,923.6	5,955.6	6,050.8	5,956.2	5,841.7	5,187.2	6,023.6	5,911.1
Fuel burnt (B = bagasse, FO = fuel oil)	B & FO	B & FO		B & FO	B	B & FO	B	B	B	B	B	B & FO	B	B & FO
Fuel volume (tonnes)	1,143.9 B 18.76 FO	1,514.3 B 7.08 FO		575.5 B 0.96 FO	3,252.8	3,176.4 B 0.16 FO	3,165.4 B 0.00 FO	3,294.3 B 0.00 FO	3,363.7 B 0.00 FO	3,175.6 B 0.00 FO	3,083.0 B 0.00 FO	2,445.7 B 19.11 FO	3,357.1 B 0.00 FO	2,928.3 B 0.17 FO
Fuel oil Composition	As per Veolia CoA	As per Veolia CoA		As per Veolia CoA	N/A	As per Veolia CoA	N/A	N/A	N/A	N/A	N/A	As per Veolia CoA	N/A	As per Veolia CoA
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	Y low O_2 alarm 1 < 1-minute	N		Y low O_2 alarm 1 < 1-minute	Y low O_2 alarm 1 < 5-minutes	N	N	N	N	N	N	N	N	N
Community complaints (N = no, Y = yes)	N	N		N	N	N	N	N	N	N	N	N	Y	N
AM – Smoke density (0-5) (Ringelmann)	No emissions from stack	0.0		No emissions from stack	0.0	0.8	0.0	0.6	0.1	0.6	0.1	0.4	0.1	0.2
AM – smoke density assessment time	-	10:28		-	08:33	07:32	08:00	07:21	09:16	08:20	09:51	09:35	08:14	07:54
PM – Smoke density (0-5) (Ringelmann)	No emissions from stack	0.0		No emissions from stack	0.0	0.3	0.2	1.2	0.3	0.2	0.2	No emission from stack	0.1	0.2
PM – smoke density assessment time	-	12:48		-	13:56	15:27	13:41	12:42	12:18	15:07	13:15	-	14:09	14:15
Comments 00:00 to 24:00	Wet weather stop continued-23:53	Wet weather stop 19:45-continued		Wet weather stop continued-04:00			Wet weather stop 10:30-12:00					Maintenance stop 10:30 - 17:30	Complaint unrelated to stack emissions	

Data (08:00-07:59)	**Dates**													
	15/9/22	16/9/22	17/9/22	18/9/22	19/9/22	20/9/22	21/9/22	22/9/22	23/9/22	24/9/22	25/9/22	26/9/22	27/9/22	28/9/22
Boiler throughputs - steam (approx. tonnes per hour)	6,110.1	5,998.4	5,995.5	6,282.0	6,155.1	5,364.7	6,102.4	6,018.5	6,024.0	6,191.9	6,139.2	6,154.6	6,113.3	5,197.3
Fuel burnt (B = bagasse, FO = fuel oil)	B	B & FO	B	B	B	B & FO	B	B	B & FO	B & FO	B	B	B & FO	B & FO
Fuel volume (tonnes)	3,044.5 B 0.00 FO	2,970.8 B 0.15 FO	3,100.9 B 0.00 FO	3,137.5 B 0.00 FO	3,180.0 B 0.00 FO	2,679.0 B 2.82 FO	3,293.4 B 0.00 FO	3,166.8 B 0.00 FO	3,102.0 B 0.37 FO	3,378.4 B 0.12 FO	3,310.4 B 0.00 FO	3,032.6 B 0.00 FO	2,979.1 B 0.98 FO	2,370.3 B 0.16 FO
Fuel oil Composition	N/A	As per Veolia CoA	N/A	N/A	N/A	As per Veolia CoA	N/A	N/A	As per Veolia CoA	As per Veolia CoA	N/A	N/A	As per Veolia CoA	As per Veolia CoA
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	N	N	N	N	Y low O_2 alarm 1 > 5-minutes 2 < 5-minutes	N	N	N	Y low O_2 alarm 1 < 1-minute	N	N	N	N	N
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	0.5	0.4	0.0	0.1	0.0	No emissions from stack	0.4	0.0	0.1	0.0	0.0	0.1	0.1	0.0
AM – smoke density assessment time	07:54	08:09	07:16	08:31	08:34	10:09	10:06	08:25	07:51	09:12	10:29	08:00	10:06	06:55
PM – Smoke density (0-5) (Ringelmann)	0.2	0.2	0.3	0.0	0.0	0.3	0.3	0.5	0.1	0.5	0.2	0.6	0.0	0.1
PM – smoke density assessment time	13:43	13:00	14:14	16:15	14:28	14:18	13:56	14:37	13:49	14:45	15:43	13:18	14:11	15:17
Comments					Maintenance stop 07:00-continued	Maintenance stop continued-12:00								Maintenance stop 08:40-15:15

Data **(08:00-07:59)**	**Dates**													
	29/9/22	30/9/22	1/10/22	2/10/22	3/10/22	4/10/22	5/10/22	6/10/22	7/10/22	8/10/22	9/10/22	10/10/22	11/10/22	12/10/22
Boiler throughputs - steam (approx. tonnes per hour)	6,225.4	6,181.4	5,997.0	6,228.8	3,929.3	1,588.9	6,027.1	6,127.3	5,622.8	5,360.1	6,021.5	5,598.0	5,863.2	4,858.3
Fuel burnt (B = bagasse, FO = fuel oil)	B	B	B & FO	B	B	B & FO	B	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO
Fuel volume (tonnes)	2,990.6 B 0.00 FO	3,094.9 B 0.00 FO	3,011.9 B 0.19 FO	3,129.6 B 0.00 FO	1,799.0 B 0.00 FO	769.1 B 0.14 FO	3,280.8 B 0.00 FO	3,407.6 B 0.54 FO	2,882.4 B 0.78 FO	2,926.4 B 0.01 FO	3,097.2 B 0.13 FO	2,760.2 B 0.76 FO	3,133.2 B 1.50 FO	2,448.5 B 15.83 FO
Fuel oil Composition	N/A	N/A	As per Veolia CoA	N/A	N/A	As per Veolia CoA	N/A	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	N	N	N	N	N	N	Y low O_2 alarm 1 < 5-minutes	N	N	N	N	Y low O_2 alarm 1 < 1-minute	N	N
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	0.1	0.1	0.0	0.0	0.0	No emissions from stack	0.0	0.0	0.0	No emissions from stack	0.0	0.0	0.0	0.5
AM – smoke density assessment time	07:53	06:44	07:03	08:20	07:27	07:15	07:13	10:21	06:56	10:03	10:51	07:26	06:44	08:57
PM – Smoke density (0-5) (Ringelmann)	0.0	0.1	0.0	0.1	0.1	No emissions from stack	0.0	0.0	0.0	0.0	0.0	0.0	0.0	No emission from stack
PM – smoke density assessment time	13:53	14:45	16:49	12:53	13:05	14:50	14:35	14:30	14:10	15:21	13:07	13:56	13:19	15:01
Comments					Maintenance stop 21:50-continued	Maintenance stop Continued-02:30			Wet weather stop 05:10-continued	Wet weather stop continued-11:00		Wet weather stop 08:00-11:00		Maintenance stop 10:30 - 17:50

Data (08:00-07:59)	**Dates**													
	13/10/22	14/10/22	15/10/22	16/10/22	17/10/22	18/10/22	19/10/22	20/10/22	21/10/22	22/10/22	23/10/22	24/10/22	25/10/22	26/10/22
Boiler throughputs - steam (approx. tonnes per hour)	5,709.0	5,796.6	5,769.8	5,827.5	6,006.6	6,040.8	3,113.1	559.4	5,742.5	4,981.3	5,744.8	5,815.7	5,526.3	5,072.7
Fuel burnt (B = bagasse, FO = fuel oil)	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO
Fuel volume (tonnes)	3,151.6 B 2.25 FO	2,936.3 B 0.48 FO	3,052.6 B 0.49 FO	3,265.3 B 0.40 FO	3,287.6 B 0.02 FO	3,110.7 B 0.78 FO	1,428.9 B 8.80 FO	246.5 B 13.61 FO	3,337.2 B 8.02 FO	2,413.3 B 4.06 FO	3,096.0 B 6.59 FO	3,082.6 B 0.95 FO	3,036.2 B 6.56 FO	2,366.1 B 3.71 FO
Fuel oil Composition	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	N	N	Y low O_2 alarm 1 < 5-minutes	N	N	N	N	N	Y low O_2 alarm 2 > 5-minutes 2 < 5-minutes 2 < 1-minute	Y low O_2 alarm 1 < 5-minutes	N	Y low O_2 alarm 1 < 5-minutes 9 < 1-minute	Y low O_2 alarm 6 < 5-minutes 6 < 1-minute	Y low O_2 alarm 4 < 5-minutes 3 < 1-minute
Community complaints (N = no, Y = yes)	N	Y	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	0.0	0.0	0.4	0.0	0.3	0.0	0.0	No emission from stack	0.9	0.0	0.5	0.1	0.8	0.7
AM – smoke density assessment time	09:54	09:02	07:46	11:17	10:50	09:28	08:20	07:14	10:24	07:24	11:05	08:12	07:45	09:46
PM – Smoke density (0-5) (Ringelmann)	0.0	0.2	0.0	0.0	0.0	0.0	0.1	No emission from stack	0.5	0.0	0.5	0.3	0.5	No emission from stack
PM – smoke density assessment time	13:29	14:17	17.26	12:55	15:00	13:12	14:36	15:30	13:50	16:02	13:15	14:03	13:44	15:30
Comments		Complaint unrelated to stack emissions					Maintenance stop 22:30-continued	Maintenance stop continued-23:40 00:25-07:00		Wet weather stop 09:30-13:15	Wet weather 08:00-10:30	Wet weather 09:15-11:00		Maintenance stop 12:00-17:50

Data (08:00-07:59)	**Dates**													
	27/10/22	28/10/22	29/10/22	30/10/22	31/10/22	1/11/22	2/11/22	3/11/22	4/11/22	5/11/22	6/11/22	7/11/22	8/11/22	9/11/22
Boiler throughputs - steam (approx. tonnes per hour)	5,993.0	6,007.2	6,040.6	5,758.8	3,868.8	5,140.8	5,416.8	5,474.4	5,486.4	4,137.6	5,448.0	5,556.0	5,467.2	5,404.8
Fuel burnt (B = bagasse, FO = fuel oil)	B & FO	B	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B & FO	B
Fuel volume (tonnes)	3,203.1 B 0.51 FO	3,102.0 B 0.00 FO	3,324.0 B 0.09 FO	3,105.2 B 0.09 FO	1,722.3 B 4.46 FO	2,939.0 B 4.69 FO	2,948.5 B 2.30 FO	3,072.7 B 0.59 FO	3,030.1 B 0.91 FO	1,932.9 B 9.83 FO	3,071.1 B 0.19 FO	3,223.5 B 0.51 FO	3,017.4 B 1.13 FO	3,000.5 B 0.00 FO
Fuel oil Composition	As per Veolia CoA	N/A	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	N/A
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	N	N	N	N	N	N	Y low O_2 alarm 1 < 1-minute	Y low O_2 alarm 2 < 5-minutes 1 < 1-minute	N	Y low O_2 alarm 1 < 1-minute	N	N	Y low O_2 alarm 1 < 1-minute	N
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N	N	N	N	N	N
AM – Smoke density (0-5) (Ringelmann)	0.1	0.0	0.2	0.0	0.1	0.3	0.3	0.2	0.5	0.0	0.0	0.0	0.6	0.5
AM – smoke density assessment time	07:58	07:35	08:09	08:32	07:38	11:40	10:58	06:01	09:06	8:08	09:22	09:50	09:18	07:11
PM – Smoke density (0-5) (Ringelmann)	0.2	0.2	0.1	0.4	0.3	0.5	0.6	0.3	0.0	0.0	0.0	0.1	0.0	0.4
PM – smoke density assessment time	13:36	14:07	14:12	14:50	14:04	13:48	13:37	12:55	12:23	14:17	17:34	13:40	14:23	14:02
Comments					Out of cane stop 07:30-12:00 Ergon caused outage 01:48-continued	Ergon caused outage continued-08:30 Maintenance stop 08:30-11:00				Maintenance stop 22:55-06:00				

Data (08:00-07:59)	**Dates**													
	10/11/22	11/11/22	12/11/22	13/11/22	14/11/22	15/11/22	16/11/22	17/11/22	18/11/22	19/11/22	20/11/22	21/11/22	22/11/22	23/11/22
Boiler throughputs - steam (approx. tonnes per hour)	4,402.0	5,721.4	5,660.8	5,658.4	5,668.1	5,304.9	4,405.9	3,303.2	1,790.9	Crush season completed				
Fuel burnt (B = bagasse, FO = fuel oil)	B & FO	B & FO	B & FO	B & FO	B & FO	B	B	B & FO	B & FO					
Fuel volume (tonnes)	2,083.2 B 9.48 FO	3,129.6 B 0.31 FO	2,968.1 B 0.41 FO	3,158.1 B 0.52 FO	3,047.7 B 0.16 FO	2,599.3 B 0.00 FO	2,207.9 B 0.00 FO	1,049.4 B 26.62 FO	569.6 B 27.60 FO					
Fuel oil Composition	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	As per Veolia CoA	N/A	N/A	As per Veolia CoA	As per Veolia CoA					
Operational / equipment factors that could influence air emissions (N = no, Y = yes)	N	N	N	N	N	Y low O_2 alarm 1 < 1-minute	N	Y low O_2 alarm 1 < 5-minutes	N					
Community complaints (N = no, Y = yes)	N	N	N	N	N	N	N	N	N					
AM – Smoke density (0-5) (Ringelmann)	0.1	0.0	0.5	0.0	0.6	0.8	0.4	No emission from stack	0.0					
AM – smoke density assessment time	07:25	07:57	07:32	08:10	09:28	07:38	11:23	-	08:25					
PM – Smoke density (0-5) (Ringelmann)	No emission from stack	0.5	0.0	0.1	0.8	0.2	0.4	0.0	0.0					
PM – smoke density assessment time	15:19	13:22	15:05	13:58	14:48	13:45	14:48	13:03	13:42					
Comments	Maintenance stop 08:15-16:30					Out of cane stop 08:40-10:30 06:30-continued	Out of cane stop continued-11:05 04:30-continued	Out of cane stop continued-12:10 Crush ceased 20:15 Boil-out 20:15-continued	Boil-out continued-04:15 Off steam 04:15					

APPENDIX D. DES RFI and Summary Response

RECEIVED
18 FEB 2023
BY: .....

Notice

Environmental Protection Act 1994
Environmental Evaluation

Notice requesting further information

This notice requesting further information in response to receiving an environmental report about an environmental investigation is issued by the administering authority pursuant to section 326F(2) of the Environmental Protection Act 1994.

The Mulgrave Central Mill Company Pty Ltd
47 Gordon Street
Gordonvale QLD 4865

Your reference: EPPR00390613

Our Reference: 101/0009102, C-CPLRC-100008829, E-100072540

Monday, 13 February 2023

Take notice: that under the *Environmental Protection Act 1994* (the Act), a notice requesting further information on an environmental report is issued to The Mulgrave Central Mill Company Pty Ltd (ACN 009 657 032) (you) by the administering authority. The administering authority is the Chief Executive of the Department of Environment and Science (the department).

This notice requesting further information is issued in respect of the activities by The Mulgrave Central Mill Company Pty Ltd on land described as Lot 102 on Plan SP279534, Lot 184 on Plan NR5231, Lot 11 on Plan RP835454, and Lot 12 on Plan RP835454 (the licensed place) situated at 47 Gordon Street, Gordonvale.

The further information is required in regard to a report on an environmental investigation submitted by you to the department on Monday, 30 January 2023.

A. Grounds

The notice requesting further information is issued on the following grounds:

1. In response to a notice issued to you by the department to conduct or commission an environmental investigation, you submitted an environmental report to the department 30 January 2023.
2. The department may, within 10 business days after the report is received, ask the recipient of a notice to conduct or commission an environmental report to give further information needed to decide whether to approve the environmental report.
3. The department is satisfied that further information is required to decide whether to approve the environmental report and the department requests that you provide the further information requested.

B. Facts and Circumstances

The facts and circumstances forming the basis for these grounds are:

1. A notice to conduct or commission an environmental investigation was issued to you by the department on 16 December 2020 (ref. E-100022326) on the grounds that an event has happened causing

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environmental harm while an activity was being carried out and an activity or proposed activity is causing, or is likely to cause environmental harm.

2. Following an internal review, a varied notice to conduct or commission an environmental investigation was issued to you by the department on 2 February 2021 (ref. E-100072540).
3. The notice to conduct or commission an environmental investigation (the Notice) was then amended by the department on 9 June 2021 (ref. E-100072540).
4. A draft Air Quality Monitoring Program (AQMP) was submitted to the department on 12 April 2021, in accordance with requirement 1 of the Notice. The department provided comments regarding the draft AQMP on 18 May 2021.
5. A final AQMP was submitted to the department on 11 June 2021. The department provided further comments regarding the final AQMP on 15 June 2021.
6. You responded to these further comments on 22 June 2021 and an updated final AQMP was submitted to the department on 9 July 2021.
7. In accordance with the AQMP, preliminary air dispersion modelling of emissions was undertaken and submitted to the department on 10 September 2021.
8. In accordance with the AQMP, stack testing and meteorological monitoring was undertaken during 2021 and 2022 crushing seasons, and ambient particulate matter monitoring was undertaken in 2022.
9. An Environmental Report was submitted to the department by you on 30 January 2023, in accordance with requirement 4 of the Notice, with the accompanying recipient declaration provided on 2 February 2023.
10. A review of the Environmental Report has identified matters requiring further information to enable the department to assess environmental obligations under the Notice.
11. The Notice requires that the Environmental Report, submitted in accordance with requirement 4 of the Notice, be prepared by a suitably qualified person (SQP). An SQP is further defined in the Notice as a person or persons who has demonstrated professional qualifications and experience relevant to performing the function. The function in this instance being the interpretation of results from the Air Quality Monitoring Program and preparation of an Environmental Report.
12. Preparation of the final report, including interpretation of the various monitoring and investigation activities undertaken, is an important function in holistically reviewing results and presenting recommendations regarding the level of risk for environmental harm. The authorship of the Environmental Report, submitted on 30 January 2023, is not identified and it is not clearly demonstrated as being carried out by an SQP.
13. Requirement 2 of the Notice requires monitoring of ambient air quality, having consideration of sensitive receptors and meteorological variables, and requires monitoring undertaken to be in accordance with relevant Australian or International standards.
14. Review of the Environmental Report identified limitations with the ambient particulate matter monitoring undertaken in relation to the 2022 crushing season.
    a) Siting of air sampling equipment was found to be not in accordance with the relevant Australian standard (AS/NZS 3580.1.1:2016). In particular, at monitoring Location 1, equipment was mounted in very close proximity to a large metal sign measuring approximately 12 metres in length and 0.5 metres in height. This structure is reasonably considered as an impediment to air flow and can influence air turbulence in proximity to the sampling inlet. The department therefore

holds concerns about the validity of ambient monitoring at Location 1 and, noting the apparent unobstructed areas surrounding this location, considers the justification provided within the Environmental Report, including appendix H, to be insufficient.

b) Ambient monitoring data was impacted by considerable data losses resulting from equipment failures, including over 3 months of Optical Particle Counter (OPC) data. Due to the frequency of the Low Volume Air Sampler (LVAS) being run typically once every third day, the continuous OPC data was intended to enable an indicative understanding of short-term particulate matter concentrations and assist in determining the likely cause of elevated concentrations, in conjunction with meteorological data. OPC equipment failures therefore present limitations in the ability to interpret elevated LVAS concentrations that occurred on 24 and 30 July 2022.

c) Departmental review of the elevated LVAS particulate matter concentrations that occurred on 24 and 30 July 2022 identified the following;

   i. Weather station data wind roses for 24 and 30 July 2022 show that the wind direction was within the south-east quadrant (i.e., in the direction of monitoring Location 1) for approximately 35% and 50% of hours, respectively. Review of wind direction within the quadrants more accurately reflects the dispersive nature of air emissions towards sensitive receptors.

   ii. The number of low oxygen boiler alarms recorded on 30 July 2022, more than any other day during the 2022 crushing season, suggests that the 30 July 2022 can be characterised as a period of upset conditions. Upset conditions are typically associated with low air to fuel ratios in the boiler/s (at times triggering low oxygen alarms) and have been known to increase particulate matter emissions (as indicated by colour and density of stack emissions signalling poorer combustion efficiency).

   iii. Mulgrave Mill record keeping checklists note fires observed on the Pyramid landform and to the east of the Mill on 27 July 2022 and 2 August 2022, respectively. LVAS data from these dates did not identify elevated particulate matter. This brings into question the potential contributions of smoke from these reported fires to elevated particulate matter concentrations during that period.

   iv. Lack of OPC data at monitoring Location 1, as discussed above, presents limitations to the conclusions that can be drawn from the elevated LVAS data on 24 and 30 July 2022. It is noted, however that OPC data was obtained for monitoring Location 2 on these dates. It is unclear from the Environmental Report whether the OPC data from monitoring Location 2 was considered when interpreting these elevated results.

   v. It is noted that visual assessments of smoke density (Ringelmann) have not been demonstrated as being in accordance with the relevant Australian Standard and are therefore considered limited in their application. It is further noted that the frequency of these visual assessments limits the ability to capture upset conditions, due to the intermittent nature of visual smoke emissions previously observed.

d) Departmental review of the elevated OPC particulate matter concentrations that occurred on 9 July 2022, during which boiler start-up occurred, identified the following;

   i. Monitoring results suggest that boiler start-up processes, also referred to as upset conditions, continue to be high risk periods for particulate matter emissions with there being three (3) consecutive hours on 9 July 2022 during which particulate matter at monitoring Location 2 was elevated above 250 µg/m³ in the PM10 fraction, and above 150

µg/m³ in the PM2.5 fraction. There is only limited discussion of these results in the Environmental Report, for example, it is unclear whether such results are considered representative of boiler start-up processes, whether this event was reviewed against other dates of boiler start-up/upset conditions, and limited discussion of associated risk to environmental values.

15. Requirement 2 of the Notice requires monitoring of point source air emissions from Mulgrave Sugar Mill, having consideration of sensitive receptors and meteorological variables, and requires analysis and review of monitoring results against applicable environmental and health based guidelines and standards. These requirements were achieved by undertaking stack testing and air dispersion modelling to assess ground level concentrations. Additionally, requirement 4 of the Notice requires the Environmental Report to include results and interpretation of the Air Quality Monitoring Program.
16. Review of the Environmental Report, including appendix E, identified limited discussion or interpretation of air dispersion modelling results in the context of ambient particulate matter monitoring results. This is of particular interest considering that predicted worst-case scenario concentrations indicated no exceedances of the air quality objectives, however ambient particulate matter levels were found to be elevated on several occasions.
    a) The Environmental Report does not include observations about the level of model calibration, or comparison of predicted versus measured particulate matter concentrations (including background concentrations).
    b) There is limited discussion of ambient locations, Mill operating conditions, and/or meteorological conditions of highest risk for impacts to environmental values.
17. Review of the Environmental Report, including appendix E, identified limited discussion or interpretation of modelling results relating to upset conditions. This is of particular interest due to upset conditions historically resulting in the highest risk for environmental nuisance reports.
    a) Analysis of particulate matter concentrations during upset conditions was provided in the preliminary modelling via a sensitivity analysis, examining the effect of reduced exit velocities. This analysis was not revisited following completion of stack testing to incorporate measured emission variables, and has not been discussed in the Environmental Report, or reviewed in relation to ambient monitoring results, including elevated concentrations recorded to the north of the Mill.
    b) The upset conditions considered in the preliminary modelling were described as a short stop, with the boilers continuing to run but at a reduced load. It is not clear from this preliminary analysis how long of a boiler stoppage was assumed (when determining 24-hour average) and whether boiler start-up processes were considered, which may differ from a short stop with regards to duration and emission variables (such as temperature, volume and velocity).
18. The department acknowledges the considerable reductions made in the amounts of fuel oil used and recognises that no community reports of environmental nuisance were received during the 2021 and 2022 crushing seasons.
19. Noting the duration of start-up processes, the inability to capture upset conditions via stack testing, and the associated elevated particulate matter measured in the ambient environment, the preliminary review of the Environmental Report indicates that stack emissions and risk for environmental nuisance during these periods of boiler start-up/upset conditions may not be adequately captured by Environmental Authority conditions.

20. The department considers that it is reasonable to request that you provide additional information to respond to the issues raised in this notice.

C. Requirements

The further information you are requested to provide is as follows:

1. With reference to paragraphs 11 and 12 of the facts and circumstances listed above, you are requested to clarify the authorship of the Environmental Report (as distinct from appendices) and demonstrate that it was prepared by a SQP with respect to professional qualifications and experience interpreting results of an Air Quality Monitoring Program. If the Environmental Report was not prepared by a SQP, then you are advised to submit an updated Environmental Report following preparation and signed authorship by an SQP.
2. With reference to paragraphs 13, 14 a) and 14 b) of the facts and circumstances listed above, you are requested to provide comments and/or justifications regarding the identified limitations of the ambient particulate matter monitoring and advice regarding the validity of conclusions that can be drawn from ambient monitoring results having consideration of the siting of equipment, the data losses, and ability to interpret elevated results.
3. With reference to paragraphs 13 and 14 c) of the facts and circumstances listed above, and with consideration of the department's comments regarding elevated ambient particulate matter concentrations that occurred on 24 and 30 July 2022 (LVAS), you are requested to provide further discussion and interpretation of these monitoring results. This includes, but is not limited to, consideration of wind roses, potential upset conditions, ambient measurements on or around the time of reported fires, and available OPC data at either monitoring location.
4. With reference to paragraphs 13 and 14 d) of the facts and circumstances listed above, and with consideration of the department's comments regarding elevated ambient particulate matter concentrations that occurred on 9 July 2022 (OPC), you are requested to provide further discussion and interpretation of these monitoring results. This includes, but is not limited to, consideration of the representativeness of this boiler start-up event, review against other dates of boiler start-up/upset conditions, and associated risk to environmental values.
5. With reference to paragraphs 15 and 16 of the facts and circumstances listed above, you are requested to provide further discussion and interpretation of air dispersion modelling results in the context of ambient particulate matter monitoring results. This includes, but is not limited to:
    a) Observations about the level of model calibration and comparison of predicted versus measured particulate matter concentrations (including background concentrations); and
    b) Further discussion of ambient locations, Mill operating conditions, and/or meteorological conditions of highest risk for impacts to environmental values.
6. With reference to paragraphs 15 and 17 of the facts and circumstances listed above, you are requested to provide further discussion and interpretation of modelling results relating to upset conditions. This includes, but is not limited to:
    a) Consideration of measured emission variables obtained from stack testing;
    b) Discussion in relation to ambient monitoring results, including elevated concentrations recorded to the north of the Mill during upset conditions;
    c) Clarification about how long of a boiler stoppage was assumed (when determining 24-hour average); and

d) Consideration of boiler start-up processes, which may differ from a short stop with regards to duration and emission variables (such as temperature, volume and velocity).

7. With reference to paragraph 19 of the facts and circumstances listed above, you are requested to respond to the observation made.
8. The further information must be submitted to the department on or before **Monday, 27 March 2023.**

Take notice:

1. The requirements of this Notice to provide further information take effect immediately upon service of this Notice.
2. This Notice remains in force until further notice from the department.
3. You are responsible for meeting the costs of providing the further information to the department.

C. Reviews and appeals

There are no review or appeal rights under the *Environmental Protection Act* for a request for further information made under section 326F(2).

A person whose interests are or would be adversely affected by a decision of the department may be able to request a statement of reasons for a decision or a statutory order review under the *Judicial Review Act 1991*.

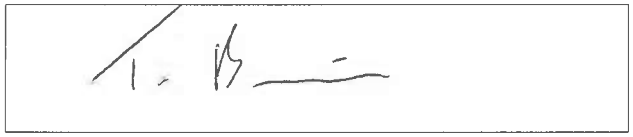
Under the *Judicial Review Act 1991,* a person whose interests are, or would be adversely affected by a decision of the department is able to:

- Request a statement of reasons from the department explaining the decision
- Apply to the Supreme Court for a statutory order of review of the decision if the person is not satisfied with the statement of reasons.

You may have other legal rights or obligations and should seek your own legal advice.

If you fail to provide the further information, the department will make a decision about the environmental report on the information already submitted.

Should you have any queries in relation to this notice, please contact the department on telephone number 07 4222 5161.



Signature

13 February 2023

Date

Tim Brain

Manager (Compliance)

Delegate of the Chief Executive

Department of Environment and Science

Environmental Protection Act 1994

Enquiries:

Ph: (07) 4222 5161

Email: ESTownsville@des.qld.gov.au

APPENDIX D: RFI Summary Response

RFI	Paragraph information	Response
1. With reference to paragraphs 11 and 12 of the facts and circumstances listed above, you are requested to clarify the authorship of the Environmental Report (as distinct from appendices) and demonstrate that it was prepared by a SQP with respect to professional qualifications and experience interpreting results of an Air Quality Monitoring Program. If the Environmental Report was not prepared by a SQP, then you are advised to submit an updated Environmental Report following preparation and signed authorship by an SQP	Paragraphs 11 and 12 state: *"11. The Notice requires that the Environmental Report, submitted in accordance with requirement 4 of the Notice, be prepared by a suitably qualified person (SQP). An SQP is further defined in the Notice as a person or persons who has demonstrated professional qualifications and experience relevant to performing the function. The function in this instance being the interpretation of results from the Air Quality Monitoring Program and preparation of an Environmental Report.* *12. Preparation of the final report, including interpretation of the various monitoring and investigation activities undertaken, is an important function in holistically reviewing results and presenting recommendations regarding the level of risk for environmental harm. The authorship of the Environmental Report, submitted on 30 January 2023, is not identified and it is not clearly demonstrated as being carried out by an SQP".*	The Environmental Report was prepared, and has been updated in response to this RFI, by suitably qualified persons from CQ Environmental Pty Ltd (trading as CQG Consulting) and Katestone Environmental Pty Ltd as described in Section 6.6 of the Air Quality Monitoring Program (Rev 2A dated 9 July 2021). A Document History and Status table has been added to reflect this.
2. With reference to paragraphs 13, 14 a) and 14 b) of the facts and circumstances listed above, you are requested to provide comments and/or justifications regarding the identified limitations of the ambient particulate matter monitoring and advice regarding the validity of conclusions that can be drawn from ambient monitoring results having consideration of the siting of equipment, the data losses, and ability to interpret elevated results	Paragraphs 13, 14 a) and 14 b) state: *"13. Requirement 2 of the Notice requires monitoring of ambient air quality, having consideration of sensitive receptors and meteorological variables, and requires monitoring undertaken to be in accordance with relevant Australian or International standards.* *14. Review of the Environmental Report identified limitations with the ambient particulate matter monitoring undertaken in relation to the 2022 crushing season.* *a) Siting of air sampling equipment was found to be not in accordance with the relevant Australian standard (AS/NZS 3580.1.1:2016). In particular, at monitoring Location 1, equipment was mounted in very close proximity to a large metal sign measuring approximately 12 metres in length and 0.5 metres in height. This structure is reasonably considered as an impediment to air flow and can influence air turbulence in proximity to the sampling inlet. The department therefore holds concerns about the validity of ambient monitoring at Location 1 and, noting the apparent unobstructed areas surrounding this location, considers the justification provided within the Environmental Report, including appendix H, to be insufficient.* *b) Ambient monitoring data was impacted by considerable data losses resulting from equipment failures, including over 3 months of Optical Particle Counter (OPC) data. Due to the frequency of the Low Volume Air Sampler (LVAS) being run typically once every third day, the continuous OPC data was intended to enable an indicative understanding of short-term particulate matter concentrations and assist in determining the likely cause of elevated concentrations in conjunction with meteorological data. OPC equipment failures therefore present limitations in the ability to interpret elevated LVAS concentrations that occurred on 24 and 30 July 2022".*	**Siting of equipment** A summary of this information has been added at Section 4.4.1 of the Environmental Report. Additional detailed comments against *AS/NZS 3580.1.1:2016* have been provided in the added Section 3.3.1 and Appendix B of the CQG Particulate Monitoring Report (at Appendix I of the Environmental Report) for details. **OPC Data Loss** A summary of this information has been added at Section 4.4.2 and the conclusions updated at Section 7 of the Environmental Report. Additional detailed analysis is provided in the added Section 4.3 and updated Section 6 of the CQG Particulate Monitoring Report (at Appendix I of the Environmental Report).
3. With reference to paragraphs 13 and 14 c) of the facts and circumstances listed above, and with consideration of the department's comments regarding elevated ambient particulate matter concentrations that occurred on 24 and	Paragraph 13 is reproduced at RFI 2 of this letter. Paragraph 14 c) states: *"c) Departmental review of the elevated LVAS particulate matter concentrations that occurred on 24 and 30 July 2022 identified the following:* *i. Weather station data wind roses for 24 and 30 July 2022 show that the wind direction was within the south-east quadrant (i.e., in the direction of monitoring Location 1) for*	Refer to the added Section 5.1 to Section 5.4 and updated conclusion (Section 6) of the CQG Particulate Monitoring Report (at Appendix I of the Environmental Report) – a summary of the detailed assessment has been included in Section 6.2.1 to 6.2.3 (and updated conclusions at Section 7) of the Environmental Report.

RFI	Paragraph information	Response
30 July 2022 (LVAS), you are requested to provide further discussion and interpretation of these monitoring results. This includes, but is not limited to, consideration of wind roses. potential upset conditions, ambient measurements on or around the time of reported fires, and available OPC data at either monitoring location.	*approximately 35% and 50% of hours, respectively. Review of wind direction within the quadrants more accurately reflects the dispersive nature of air emissions towards sensitive receptors.* *ii. The number of low oxygen boiler alarms recorded on 30 July 2022, more than any other day during the 2022 crushing season, suggests that the 30 July 2022 can be characterised as a period of upset conditions. Upset conditions are typically associated with low air to fuel ratios in the boiler/s (at times triggering low oxygen alarms) and have been known to increase particulate matter emissions (as indicated by colour and density of stack emissions signalling poorer combustion efficiency).* *iii. Mulgrave Mill record keeping checklists note fires observed on the Pyramid landform and to the east of the Mill on 27 July 2022 and 2 August 2022, respectively. LVAS data from these dates did not identify elevated particulate matter. This brings into question the potential contributions of smoke from these reported fires to elevated particulate matter concentrations during that period.* *iv. Lack of OPC data at monitoring Location 1. as discussed above, presents limitations to the conclusions that can be drawn from the elevated LVAS data on 24 and 30 July 2022. It is noted, however that OPC data was obtained for monitoring Location 2 on these dates. It is unclear from the Environmental Report whether the OPC data from monitoring Location 2 was considered when interpreting these elevated results.* *v. It is noted that visual assessments of smoke density (Ringelmann) have not been demonstrated as being in accordance with the relevant Australian Standard and are therefore considered limited in their application. It is further noted that the frequency of these visual assessments limits the ability to capture upset conditions, due to the intermittent nature of visual smoke emissions previously observed.13. Requirement 2 of the Notice requires monitoring of ambient air quality, having consideration of sensitive receptors and meteorological variables, and requires monitoring undertaken to be in accordance with relevant Australian or International standards".*	
4. With reference to paragraphs 13 and 14 d) of the facts and circumstances listed above, and with consideration of the department's comments regarding elevated ambient particulate matter concentrations that occurred on 9 July 2022 (OPC), you are requested to provide further discussion and interpretation of these monitoring results. This includes, but is not limited to, consideration of the representativeness of this boiler start-up event, review against other dates of boiler start-up/upset conditions, and associated risk to environmental values	Paragraph 13 is reproduced at RFI 2 of this letter. Paragraph 14 d) states: *"d) Departmental review of the elevated OPC particulate matter concentrations that occurred on 9 July 2022, during which boiler start-up occurred, identified the following;* *i. Monitoring results suggest that boiler start-up processes, also referred to as upset conditions, continue to be high risk periods for particulate matter emissions with there being three (3) consecutive hours on 9 July 2022 during which particulate matter at monitoring Location 2 was elevated above 250 µg/m3 in the PM10 fraction, and above 150 µg/m3 in the PM2.5 fraction. There is only limited discussion of these results in the Environmental Report, for example, it is unclear whether such results are considered representative of boiler start-up processes, whether this event was reviewed against other dates of boiler start-up/upset conditions, and limited discussion of associated risk to environmental values".*	Refer to the added Section 5.5 and updated conclusion (Section 6) of the CQG Particulate Monitoring Report (at Appendix I of the Environmental Report) – a summary of the detailed assessment has been included in Section 6.2.1 to 6.2.3 (and updated conclusions at Section 7) of the Environmental Report.
5. With reference to paragraphs 15 and 16 of the facts and circumstances listed above, you are requested to provide further discussion and interpretation of air dispersion modelling results in the context of ambient particulate matter	Paragraphs 15 and 16 state: *"15. Requirement 2 of the Notice requires monitoring of point source air emissions from Mulgrave Sugar Mill, having consideration of sensitive receptors and meteorological variables, and requires analysis and review of monitoring results against applicable environmental and health based guidelines and standards. These requirements were achieved by undertaking stack testing and air dispersion modelling to assess ground level*	Refer to added Section 6.3 of the Environmental Report.

RFI	Paragraph information	Response
monitoring results. This includes, but is not limited to: a) Observations about the level of model calibration and comparison of predicted versus measured particulate matter concentrations (including background concentrations); and b) Further discussion of ambient locations, Mill operating conditions, and/or meteorological conditions of highest risk for impacts to environmental values.	*concentrations. Additionally, requirement 4 of the Notice requires the Environmental Report to include results and interpretation of the Air Quality Monitoring Program.* *16. Review of the Environmental Report, including appendix E, identified limited discussion or interpretation of air dispersion modelling results in the context of ambient particulate matter monitoring results. This is of particular interest considering that predicted worst-case scenario concentrations indicated no exceedances of the air quality objectives, however ambient particulate matter levels were found to be elevated on several occasions.* *a) The Environmental Report does not include observations about the level of model calibration, or comparison of predicted versus measured particulate matter concentrations (including background concentrations).* *b) There is limited discussion of ambient locations, Mill operating conditions, and/or meteorological conditions of highest risk for impacts to environmental values".*	
6. With reference to paragraphs 15 and 17 of the facts and circumstances listed above, you are requested to provide further discussion and interpretation of modelling results relating to upset conditions. This includes, but is not limited to: *a) Consideration of measured emission variables obtained from stack testing;* *b) Discussion in relation to ambient monitoring results, including elevated concentrations recorded to the north of the Mill during upset conditions;* *c) Clarification about how long of a boiler stoppage was assumed (when determining 24-hour average); and* *d) Consideration of boiler start-up processes, which may differ from a short stop with regards to duration and emission variables (such as temperature, volume and velocity)".*	Paragraph 15 is reproduced in RFI 5 of this letter. Paragraph 17 states: *"17. Review of the Environmental Report, including appendix E, identified limited discussion or interpretation of modelling results relating to upset conditions. This is of particular interest due to upset conditions historically resulting in the highest risk for environmental nuisance reports.* *a) Analysis of particulate matter concentrations during upset conditions was provided in the preliminary modelling via a sensitivity analysis, examining the effect of reduced exit velocities. This analysis was not revisited following completion of stack testing to incorporate measured emission variables, and has not been discussed in the Environmental Report, or reviewed in relation to ambient monitoring results, including elevated concentrations recorded to the north of the Mill.* *b) The upset conditions considered in the preliminary modelling were described as a short stop, with the boilers continuing to run but at a reduced load. It is not clear from this preliminary analysis how long of a boiler stoppage was assumed (when determining 24-hour average) and whether boiler start-up processes were considered, which may differ from a short stop with regards to duration and emission variables (such as temperature, volume and velocity)".*	Refer to added Section 6.3.4 of the Environmental Report.
7. With reference to paragraph 19 of the facts and circumstances listed above, you are requested to respond to the observation made.	Paragraph 19 states: *"19. Noting the duration of start-up processes, the inability to capture upset conditions via stack testing, and the associated elevated particulate matter measured in the ambient environment, the preliminary review of the Environmental Report indicates that stack emissions and risk for environmental nuisance during these periods of boiler start-up/upset conditions may not be adequately captured by Environmental Authority conditions".*	Refer to the updated conclusions at Section 7 of the Environmental Report. The adequacy of environmental authority conditions is addressed by the EA holder's response. It is noted as advised by DES that there have been no complaints received regarding the boiler stack emissions for the last two years.

APPENDIX E. Weather station siting report and calibration certificates

Environdata Weather Stations Pty Ltd
42-44 Percy Street, Warwick, QLD 4370
PH: 07 4661 4699 FAX: 07 4661 2485
Email: sales@environdata.com.au

Environdata
WEATHER STATION SPECIALISTS

Temperature Sensor Calibration Certificate

Calibration Date: 28/05/2021
Part Number: TA70
Description: Digital Air Temperature Sensor
Serial Number: **2105-6547-004**
Work Order No: 6547
Hardware Version: A
Firmware Version: V2.1
Heat Soak Passed: ☑

Traceability of STANDARD
Transfer Standard: *TA70 - 2004-5515-007*
Calibration Date: 22/11/2019
Reference Standard: PICO Tech PT-104 *FO527/099*

	STANDARD MEASURED FREQUENCY		STANDARD CALCULATED TEMPERATURE	SENSOR MEASURED FREQUENCY		SENSOR CALCULATED TEMPERATURE	SENSOR TEMPERATURE ERROR
COLD	15.145	=	10.29 Deg C	15.17	=	10.34 Deg C	**-0.05 Deg C**

Max. Allowable Error +/- 0.2 degrees C

Average Current: 1.39 mA
Measure 3.3-Volt Rail: 0 VDC

Factory Setup: RDC:
Calibration Data

TA70 V2.1
SN=6547004
FHI=50.000
FLO=10.000
AHI=8000
ALO=0
CAL=1

Calibrated/Tested by: A. Moore
Signature:

Signature certifies the sensor is within Environdata Calibration Standards on the calibration date

Customer Details:

ENVIRONDATA Australia Pty Ltd
42-44 PERCY STREET
WARWICK QLD 4370
PH: 61 7 4661 4699 FAX: 61 7 4661 2485
www.environdata.com.au

Environdata
WEATHER STATION SPECIALISTS

Wind Direction Sensor Calibration Certificate

Hall Type Wind Direction Sensor

CertificateNumber	978
Part Number	WD50
Description	WIND DIRECTION
Version	C
Serial Number	2104-6479-004
Work Order/RG No.	6479
Calibration Date	04/06/21

Traceability of STANDARD

Working Standard	Agilent 34401A
was Last Calibrated against	18/04/2019
Reference Standard	Keysight1-7884580691-1

Scale: 90 HZ Represents 360 Degrees

POSITION	READING		ANGLE		ERROR	
North (0 deg.):	0	HZ	0	Deg.	0.000	Deg.
East (90 deg.):	22.55	HZ	90.20000000	Deg.	0.200	Deg.
South (180 deg.):	45.056	HZ	180.2239999	Deg.	0.224	Deg.
West (270 deg.):	67.514	HZ	270.0560000	Deg.	0.056	Deg.

(Max. allowable error ± 2 deg.)

Current Drain:	15.26	mA Max	1.35	mA Min	4.065	mA Avg

Correct Cable Lengh : 0.2 Flylead

Cal. / Tested by : A. Moore Sign :

Comments:

HEATSOAK ✓

Environdata Australia Pty Ltd
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WARWICK QLD 4370
PH: 61 7 4661 4699 FAX: 61 7 4661 2485
www.environdata.com.au

Environdata
WEATHER STATION SPECIALISTS

Wind Speed Sensor Calibration Certificate

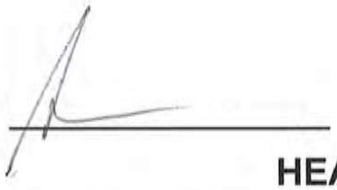
Hall Type Wind Speed Sensors (WS30 to WS52)

Certificate Number	1639
Part Number	WS52
Description	Hall Effect Wind
Version	B
Serial Number	2106-6481-004
Work Order/ RG No.	6481
Calibration Date	02/06/21

Traceability of STANDARD

Working Standard	Agilent 34401A MY41045441
was Last Calibrated	18/04/2019

Pulses / Rev.	2	
Bearing Check	PASS	
5.7 and 6.8 Volts	PASS	
Current Drain	1.90	mA
CheckPulseCount	PASS	
Correct Cable Lengh	0.2m flylead	
Cal. / Tested by	A. Moore	

Sign 

HEATSOAK ☑

Comments

Environdata Weather Stations Pty Ltd
42-44 Percy Street, Warwick, QLD 4370
PH: 07 4661 4699 FAX: 07 4661 2485
Email: sales@environdata.com.au

Environdata
WEATHER STATION SPECIALISTS

Relative Humidity Electronic Function Test Certificate

Calibration Date:	02/06/2021
Part Number:	RH70
Description:	Relative Humidity Sensor
Serial Number:	**2106-6355-005**
Work Order No:	6355
Hardware Version:	A
Firmware Version:	V2.5
Heat Soak Passed:	☐

FREQUENCY OUTPUT		CALCULATED RELATIVE HUMIDITY	FREQUENCY OUTPUT		CALCULATED RELATIVE HUMIDITY	FREQUENCY OUTPUT at TIME OF TEST		CALCULATED RELATIVE HUMIDITY
10.0 Hz	=	0 %	20.0 Hz	=	100 %	15.8764 Hz	=	58.72 %

Average Current:	1.798 mA
Measure 5-Volt Rail	Passed
Calibrated/Tested by:	P. Rodeck
Signature:	Peter R. Rodeck

Signature certifies the sensor is within Environdata Calibration Statandards on the c

Customer Details:
Only applicable to Repair Calibrations

Ver. 3.4.1

Environdata Weather Stations Pty Ltd
42-44 Percy Street, Warwick, QLD 4370
PH: 07 4661 4699 FAX: 07 4661 2485
Email: sales@environdata.com.au

Environdata
WEATHER STATION SPECIALISTS

Temperature Sensor Calibration Certificate

Calibration Date: 02/06/2021
Part Number: TA70
Description: Digital Air Temperature Sensor
Serial Number: **2105-6547-002**
Work Order No: 6547
Hardware Version: A
Firmware Version: V2.1
Heat Soak Passed: ☐

Traceability of STANDARD
Transfer Standard: *TA70 - 2004-5515-007*
Calibration Date: 22/11/2019
Reference Standard: PICO Tech PT-104 *FO527/099*

	STANDARD MEASURED FREQUENCY		STANDARD CALCULATED TEMPERATURE	SENSOR MEASURED FREQUENCY		SENSOR CALCULATED TEMPERATURE	SENSOR TEMPERATURE ERROR
WARM	20.25 Hz	=	20.5 Deg C	20.275 Hz	=	20.55 Deg C	**-0.05 Deg C**

Max. Allowable Error
+/- 0.1 degrees C

Average Current: 1.89 mA
Measure 3.3-Volt Rail: Passed

Factory Setup:
Calibration Data

RDC:

TA70 V2.1
SN=6547002
FHI=50.000
FLO=10.000
AHI=8000
ALO=0
CAL=1

Calibrated/Tested by: P. Rodeck
Signature:

Peter R. Rodeck

Signature certifies the sensor is within Environdata Calibration Statandards on the calibration date.

Customer Details:
Only applicable to Repair Calibrations

Ver. 3.4.1

Environdata Weather Stations Pty Ltd
42-44 Percy Street, Warwick, QLD 4370
PH: 07 4661 4699 FAX: 07 4661 2485
Email: sales@environdata.com.au

Environdata
WEATHER STATION SPECIALISTS

Solar Radiation Sensor Calibration Certificate

Calibration Date: 13/05/2021
Part Number: SR50
Description: Solar Radiation Sensor
Serial Number: **2104-6330-005**
Work Order No: 6330
Hardware Version: C
Firmware Version: V2.00
Heat Soak Passed: ☐

Traceability of STANDARD
Transfer Standard: *SR42 - 3862-009*
Calibration Date: 19/03/2018
Reference Standard: Middleton Solar Pyranometer EQ08-E S#8526
Light Box Calibration Factor: 1.058

	STANDARD MEASURED FREQUENCY		STANDARD CALCULATED RADIATION	SENSOR MEASURED FREQUENCY		SENSOR CALCULATED RADIATION	SENSOR RADIATION ERROR
DARK VALUE	10.000 Hz	=	0 W/m2	10.000 Hz	=	0 W/m2	**0%** (0 W/m2)
HIGH VALUE	25.268 Hz	=	763.418 W/m2	25.369 Hz	=	768.45 W/m2	**0.66 %** (-5.03 W/m2)

Max. Allowable Error +/- 1.0 %

Average Current: 4.128 mA

Maximum Light Range: **1815.98 W/m2**

Measure 3-Volt Rail: Passed
Measure 5-Volt Rail: Passed
Factory Setup: RDC:
Calibration Data

SR40 V2.00
YM=2104
SN=6330005
FHI=26.135
FLO=10.000
AHI=1777
ALO=3
CAL=1

Linearity: 1.886 A***llowable +/- 0.1***
Expected Value 1.95

Linearity Check: *1.926*

Calibrated/Tested by: P. Rodeck
Signature:

Signature certifies the sensor is within Environdata Calibration Statandards on the calibration date.

Customer Details:
Only applicable to Repair Calibrations

Ver. 3.3.8

Environdata
WEATHER STATION SPECIALISTS
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AUSTRALIAN MADE AND OWNED
Proudly Designed & Manufactured in Australia

Observator Instruments Pty Ltd
ABN 56 007 283 963

8 - 10 Keith Campbell Court, Scoresby
PO Box 9039, Scoresby
VIC 3179 AUSTRALIA

Calibration Certificate

RIMCO RIM-7499-020-ENV Tipping Bucket Rain Gauge

Environdata

Model:	RIM-7499-020-ENV
Serial Number:	111626
Bucket capacity (mm):	0.2mm
Siphon:	☒
Preliminary setting:	☒ 10 tips per side, 65 cm³ each side
Calibrated at 0.9 mm:	☒ 100 tips per 650 ml at approx 109 mm/hr
Date of Calibration:	22/04/2021

Calibration Results:

		Aggregated Measurements		
Nozzle dia. (mm)	Approx. flow (mm/hr)	Run 1	Run 2	Run 3
0.9	109	99	199	299
0.6	36	99		
1.55	347	96		
0.9	109	99		

Error allowed:

±1	tips at reference point
±3	tips at 36 mm/hr and 109 mm/hr
±4	tips at 251 to 350 mm/hr

Notes:

Job Number: 9837

Calibrated by: Mario Borg

Environdata Weather Stations Pty Ltd
42-44 Percy St
Warwick Qld 4370 Australia
Tel: +61 7 4661 4699
E-Mail: matthew@environdata.com.au
ACN: 131 757 125
ABN: 77 131 757 125

Weather Station Siting & Installation Report for MSF Sugar Gordonvale

27th September 2021

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1. Introduction – Equipment & Siting requirement

MSF Sugar's Mulgrave Mill site was requested by QLD DES to install an Australian Standard (AS3580.14 - Meteorological monitoring for ambient air quality monitoring applications) Weather Station on site at 47 Gordon Street, Gordonvale QLD 4865, as an integral part of their Air Quality Management Plan. (AQMP)

Environdata Weather Stations Pty Ltd (Environdata) were engaged to supply equipment to meet the required standard and to advise on suitable sites for the weather station at 47 Gordon St.

Environdata was also engaged to carry out the installation and commissioning of the weather station to the required standard.

2.1 Siting Methodology

2.2 An investigation into correct AWS siting and locations has been undertaken, with the aim to determine an optimum site location (AWS) to best meet the requirements and guidelines in the AS3580.14 - Meteorological monitoring for ambient air quality monitoring applications

2.2.1 Consideration is also given to the project boundaries, operation needs of the project during construction, safe access, and minimising environmental impact.

2.3 Kate Barnes (Safety & Environment Technician, MSF Sugar, Mulgrave Mill) together with Matthew Probets (Sales & Marketing Manager, Environdata Weather Stations (B.Comm / B. Sci)) identified potential locations within the project boundary for the AS3580.14 AWS required for this project, referring to on ground investigations, aerial and satellite imagery, topographic maps, surrounding terrain & sensitive receivers, while specifically being mindful that:

a) The monitoring location is suitable for its intended purpose;
b) The location selected is within the site boundary;
c) The location selected is available for the duration of the monitoring period;
d) There are minimal security risks for the proposed location;

2.4 The potential sites were then reviewed following Kate Barnes' On-Ground Inspections and management confirmation the areas chosen were not going to be used operationally in the future. Specifically, Matthew reviewed the site against the following standards:

- AS 3580.14-2014 Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air (replaces AS 2923-1987)
- Bureau of Meteorology Observation Specification No: 2013.1 Guidelines for: The Siting and Exposure of Meteorological Instruments and Observing Facilities.

2.5 Recommendations are therefore made as to the preferred AWS location.

3. Siting

Potential locations within the site were sought using on site investigation, aerial and satellite imagery, topographic maps and site plans. One site was chosen from the initial review for ground based site inspection and to be considered with future operational plans in mind.

3.1 47 Gordon Street, Gordonvale QLD 4865:



3.2 Site selection

The facility at 47 Gordon Street provides very few locations that can meet the open representative ground required to site a weather station to AS3580.14.

The available sites chosen for a preliminary investigation near the primary staff carpark and between the company owned residences to the north east are obstructed by trees and buildings.

The remaining site selected for investigation is to the North West corner of the site:

Proposed Location 1; North West corner adjacent to secondary driveway: (-17.092° 145.788°)



3.3 Site Review:

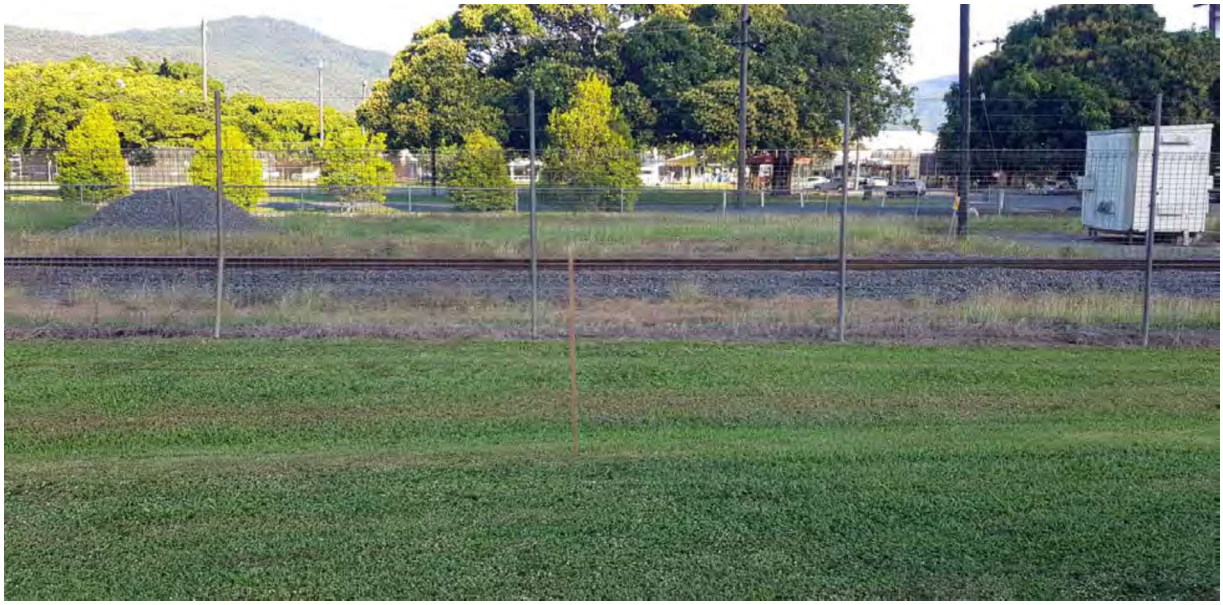
Facing East:



Facing South:



Facing West:



Facing North:



4. Site Review & Recommendations

Please note; Dead Wattles are being cleared on 16/6/21.

With the planned clearing of dead wattle trees at site one being undertaken prior to the installation works, the site at stockpile 4 is the best available & recommended.

The selected site represents best available siting:

- Best available open terrain within the site
- Not interfering with future operational needs of the site
- Being reasonably flat and open terrain with desired exposure for temperature, relative humidity and rain gauge instruments & the best available exposure ratios for the wind instruments.
- Being situated directly between the plant and the main township & Sensitive receivers.

Selection Criteria

1) Providing the best available clearances from the centre of the weather station 10m Mast of all available locations within the Site. Specifically, obstructions are varied in nature, typically small objects or single trees, or small groups of trees and at varying distances and heights as follows:
    a. 150m+ clear to the North
    b. 55m Clear to a building of 4m height to the North-North-East
    c. 90m clear to trees of 10m height to the North-East
    d. 42m clear to the 5m high shed to the East-North-East
    e. 100m+ Clear to the East
    f. 80m clear to the East-South-East to site sheds of 4m height
    g. 70m clear to the open crane infrastructure of 8m height to the South-East
    h. 50m clear to the 5m high building to the South-South-East
    i. 30m clear to the South to the narrow shrub line of 3.5m height
    j. 115m clear to the South-South-West to a 7m tree
    k. 100m clear to the South-West to a 10m tree
    l. 65m clear to the West-South-West to a 10m Tree
    m. 50m clear to the West to a 15m high tree
    n. 35m clear to a small 4m tree to the West-North-West
    o. 55m clear to the 5m high commercial buildings to the North-West
    p. 100m clear to the private residences to the North-North-West

2) Additionally, the site has been reviewed for practical considerations and the following points noted:
    a. The location affords easy access for maintenance
    b. The location and access routes to the location, do not present operators with unreasonable safety risks
    c. There are no nearby utilities to make installation and operation complex, e.g. high pressure gas lines, overhead power cables, etc.
    d. The location has mobile telephone coverage – both for telemetry and safety reasons.

3) Therefore the proposed site:

a. Is representative of both the monitoring area and monitoring intent for the QLD DES' Requirement of a Weather Station to AS3580.14:2014

b. Considered the best available site within the mill boundary.

c. Is recommended for approval for the AWS Installation

5. Installation Report & Certification

The Weather Maestro weather station selected to meet the AS3580.14:2014 from Environdata Weather Stations Pty Ltd, was installed and commissioned at the Site selected on the 23rd June 2021.





Following the Installation, the sensors were all calibration checked on site against known Transfer Standards. The Post – Installation Calibration data is shown below:

Table 1: Installation Calibration Data

Weather Station ID:	MSF Sugar Gordonvale 10m AWS	**Sales Order**	5664
Installation date	22/06/2021	**Software Version**	WeatherMation
Serial No	2106-6575-129	**System Type**	DL3110

System					**Calibration Transfer Standards**					**Results**		
Sensor	**Code**	**Ser.no**	**Output Hz**	**Sensor reading**	**Sensor**	**Code**	**Ser.no**	**Output Hz**	**Sensor reading**	**Difference**	**Tolerance +/-**	**Status**
Air Temperature	TA70	2105-6547-002	23.03	26.06	Air Temperature	TA60	1908-5072-001	23.04	26.08	-0.02 Deg C	0.1 Deg C	Pass
Air Temperature 10m	TA70 10m	2105-6547-004	23.03	26.06	Air Temperature	TA60	1908-5072-001	23.04	26.08	-0.02 Deg C	0.1 Deg C	Pass
Relative Humidity	RH70	2106-6355-005	15.66	56.6	Relative Humidity	RH40	1510-9051	15.63	56.3	0.3%	2.0%	Pass
Wind Speed	WS52	2106-6481-004	299 pls	4.83	Wind Speed	WS52	1909-5111-004	298 pls	4.82	0.01%	1.0%	Pass
Wind Direction	WD50	2104-6479-004	0 /22.48 / 44.97 / 67.47 / 89.96		Field Test Box	TB40	1907-766	0.00 /22.50 / 45.00 / 67.50 / 89.99		Avg of less than -0.03 Degrees	3.0 Degrees	Pass
Barometric Pressure	BP40	2105-6438-014	53.46	1017.3	Barometric Pressure	BP40	1905-4853-015	53.48	1017.4	-0.1 hPa C21	1.0 HPa	Pass
Solar Radiation	SR50	2104-6330-005	23.85	692.5	Solar Radiation	SR41R	1902-4667-009	23.78	689	0.27% FS	1.5% FS	Pass
Rain Gauge	RG50	2106-6580-626	**101 Tips @ 100mm/hr**	20.2	FCD	RGFC	#545	**101 Tips @ 100mm/hr**	20.2	0	2%	Pass

Table 2: Transfer Standard Calibration Data

Transfer Calibration Standards			
Sensor	**Code**	**Last Calibration Date**	**Calibrated Against Primary Standard:**
Air Temperature 1908-5072-001	TA60	23/11/2020	AMA Glass Thermometer 0685412
Relative Humidity 1510-9051	RH40	23/03/2021	Rotronic HP22 Ser#60222696
Solar Radiation 1902-4667-009	SR41R	23/03/2021	Middleton Solar Secondary Standard Pyranometer EQ08-E S#8526
Barometric Pressure 1905-4853-015	BP40	21/05/2021	Vaisala PTB220 Ser#43276-19
Wind Speed 1909-5111-004	WS52	13/11/2020	EcoTech High Speed Calibration (Wind Tunnel) Run Number 021362 0.39 to 29.89 m/s

We hereby certify the installation was completed to Australian Standard AS 3580.14:2018 as far as practicably allowed in the siting conditions provided and detailed in this report.

Best Regards,

Matthew Probets
Sales & Marketing Manager
B.Sci B.Com
Environdata Weather Stations Pty Ltd

Appendix 1: Skills & Qualifications

The project leader for the siting and equipment specification and installation delivery was Matthew Probets from Environdata Weather Stations Pty Ltd.

Matthew gained tertiary qualifications in Business and Science from Griffith University in 2000; a Bachelor of Commerce & Bachelor of Science.

Following some years of working with the Department of Natural Resources and Mines in Indooroopilly and Wooloongabba, he has been employed at Environdata since 2004. Matthew has lead the sales and service teams since 2006, including the development of the service team, including installations of weather stations to various standards including the pre-cursers to AS3580.14:2014, NSW EPA Approved Methods, BoM Observation Guidelines and World Meteorological Organisation Standards for Meteorological Monitoring.

Matthew has been personally responsible for managing the siting and installation of weather stations to the AS3580.14:2014 since 2014, comprising over 147 Weather stations personally sited and installed as per his recommendation. Matthew leads the team of Service technicians and oversees the installations themselves to ensure the equipment is correctly installed and operational.

For the purposes of the DES Requirement in the AQMP, it is our assertation that Matthew Probets is a suitably qualified person (SQP) to advise on equipment selection and siting in order to best meet the need of the AS3580.14:2014 weather station siting and equipment. The data is automatically collected and stored in a secure web portal. From MSF Sugar, Kate Barnes has received training in its retrieval and reporting, including the ability to contact Matthew or other Environdata team Members whenever the need arises.

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Environdata
WEATHER STATION SPECIALISTS

Barometric Pressure Sensors Calibration Certificate

(BP40)

Certificate Number	232
Part Number	BP40
Description	Barometric Pressure
Hardware Version	D3C
Firmware Version	2
Serial Number	2105-6438-008
Calibration Date	12/07/21
Work Order/ RG no.	6438

Traceability of STANDARD

Working Standard	Vaisala PBT220
was Last Calibrated	21/03/2019

Max. Allowable Error +/-0.5 hPa

	STANDARD FREQUENCY		CALCULATED BaroPressure		SENSOR FREQUENCY		CALCULATED BaroPressure		SENSOR ERROR	
Low:	42.418	=	962.09	hPa	42.394	=	961.97	hPa	-0.120	hPa
High:	59.393	=	1046.97	hPa	59.372	=	1046.86	hPa	-0.105	hPa

Average Current :		3 Volt Rail		5 Volt Rail	
1.63	mA	3.005	V	5.001	V

Cable Length : Separate 1.5m

Calibrated / Tested by : A. Moore

Signature :

Signature certifies the sensor is within Environdata Calibration Standards on the calibration date.

Comments :

Factory Setup:

```
>RDC:
BP40 V1.22
SN=680
FHI=64.641
FLO=42.880
AHI=107254
ALO=96356
CAL=1
>
```

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Field Calibration Report

Customer	MSF Sugar	**Accentis Reference**	MSFSUGAR7685
Company Contact	Kate Barnes	**Company Contact Number**	0434 789 590
Site Contact at time of Service	Kate Barnes	**Site Contact Number**	0434 789 590
Sales Order Number	6165		

Weather Station	MSF Sugar Gordonvale		
Service Date	17/03/2022	**Firmware Version - Main**	2.42 2022/01/19
Serial Number	2106-1129	**Firmware Version - IO**	1.28a MK4IO
System Type	Weather Maestro	**Schedule File**	MSFSugar:129MSFSugar_1C.dl3
Location	Gordonvale QLD	**GPS**	17.091943, 145.788205

Sensor Calibration – Wind Speed

Sensor	Code	Serial Number	UOM		2 Pulses/Rev Status	Mark/Space Ratio Test Values	Mark/Space Ratio Test Status	Highest Detectable Speed Value	Highest Detectable Speed Status
Wind Speed	WS52	2015-0528	km/h	Pre-Calibration	Pass	15.33 / 50.10 & 16.33 / 18.24	Pass	261.2232	**Pass**
				Post-Calibration	Pass	15.33 / 50.10 & 16.33 / 18.24	Pass	261.2232	**Pass**

WIND SPEED SENSOR
Actions Taken: Bearings Passed, Replace at 12 Months.

Calibration check method: AS3580.14 states there is only a functional test required at 6 Months' interval. We proved the function of the sensor with a co-located transfer standard comparison with 1 minute data. This co-located data from 168 minutes of data showed an average difference of 0.035m/s. The AS requires a difference of 0.2m/s or less & This sensor performs well.
See **Excel Worksheet** For Wind Speed Data set comparison.

GENERAL WIND SPEED SENSOR NOTES:
The calibration is a function of the bearing friction & wind speed cup shape and 'geometry', therefore cup sets must be clean and in good repair. Damaged cup sets need to be replaced to ensure correct calibration.
The Mark/ Space Ratio range ensures that the sensor can achieve the full range of high-speed operation. A lower result would mean that the highest wind speeds would not be detected.

Sensor Calibration – Wind Direction

Sensor	Code	Serial Number	UOM		North Point Calibration	Standard Used	Linearity Test	Status
Wind Direction	WD50	0000-0000	Degs	Pre-Calibration	Pass	Smart Phone		
				Post-Calibration	Pass	Smart Phone	0.11Hz, 22.6Hz, 67.52Hz, 45.22Hz	**Pass**

WIND DIRECTION SENSOR
Initial Inspection: 0% out from North
Bearings: Passed - Not Replaced

Calibration check method: AS3580.14 states there is only a functional test required at 6 Months' interval. We proved the function of the sensor via confirming the frequency output matched the alignment of the wind vane and both being correct to within +/- 1.0 degree at each cardinal point. This is within the AS required accuracy of +/- 5 Degrees.

GENERAL WIND DIRECTION SENSOR NOTES:
The sensor operation is tested at four points of the compass to confirm operation and linearity.
Setting the North point is most easily adjusted at ground level for 10 metre systems, allowing for the change in orientation when the mast is raised.

Sensor Calibration – Temperature

Sensor	Code	Serial Number	UOM	System Samples:	Sensor Reading	Standard Sensor Reading	Results Difference Degrees Celcius	Tolerance	Status
Air Temperature	TA70	2105-6547-002	DegC	Continuous recording	28.50	28.44	+0.06	+/- 0.3	**PASS**
Air Temperature 10m	TA70	2105-6547-004	DegC	for 1 hour	28.44		0.00	+/- 0.3	**PASS**

GENERAL TEMPERATURE SENSOR NOTES:
Accurate calibration can only be done in a brass block or in a water bath. Our field technicians will use a Brass Block for calibrations unless circumstances require a water bath.

AS3580.14:2016 calls for an operational check every 6 months. Method followed:
10m Sensor and 2m Sensor were placed in a brass block in a water bath at 'air temperature'. After 30 minutes of stable readings, 60 x 1 minute records were recorded comparing all 3 sensors. The results show an average difference of +0.06 Degrees Celsius for the 2m Air temperature sensor and 0.00 Degrees Celsius for the 10m Air temperature sensor. This is well inside the limits of +/- 0.3 Degrees Celsius. See Test Data Spreadsheet for more detail.

Sensor Calibration – Relative Humidity

Sensor	Code	Serial Number	UOM	System Output Hz	System Sensor Reading	Standard Output Hz	Standard Sensor Reading	Results Difference	Results Tolerance	Results Status
Relative Humidity	RH50	2106-6355-005	%	11.11	11.10	11.03	10.30	0.8%	2 %	**Pass**

RELATIVE HUMIDITY SENSOR
Actions Taken: Firmware Upgrade: Not Required, latest version running.

Calibration check method: AS3580.14 states there is only an operational Precision Test required at 6 Months' interval. This was performed by comparing the RH reading from the station's sensor with the RH reading from a Transfer Standard RH sensor in a sealed test environment. 2 runs were performed, with readings recorded at 5-minute intervals. The first test atmosphere had an RH of below 35% RH and the second test atmosphere had an RH of above 35%

Relative Humidity Standard Tests

Over 35% RH

Test Time	Sensor on Test Hz	Sensor on Test % RH	Sensor Standard Hz	Sensor Standard % RH	% RH Variance	Acceptable Variance	Status
11:50am	15.36	53.6	15.48	54.8	1.20%	+/- 7.0%	PASS
11:55am	15.69	56.9	15.82	58.2	1.30%	+/- 7.0%	PASS
12:00pm	16.02	60.2	16.16	61.6	1.40%	+/- 7.0%	PASS

Under 35%

Test Time	Sensor on Test Hz	Sensor on Test % RH	Sensor Standard Hz	Sensor Standard % RH	% RH Variance		Status
12:10pm	11.16	11.6	11.19	11.9	0.30%	+/- 5.0%	PASS
12:15pm	11.01	10.1	11.06	10.6	0.60%	+/- 5.0%	PASS
12:20pm	11.03	10.3	11.11	11.1	0.80%	+/- 5.0%	PASS

GENERAL RELATIVE HUMIDITY SENSOR NOTES:
Relative Humidity tips are considered as consumables. It is not possible to adjust the tip, so replacement is recommended every 12 months to ensure continuous and accurate function until the next service interval.

Sensor Calibration – Rain Gauge

Sensor	Code	Serial Number	UOM	Calibration Test	Sensor Tips	Standard Tips	Results Difference Tips & %	Tolerance	Status
Rain Gauge	RG50	2106-6580-626	mm	Pre-Clean & Calibration	100	101	-1 (-0.99%)	10 Tips	**Pass**
				Post-Calibration	101	101	0 (0%)	10 Tips	**Pass**

RAIN GAUGE SENSOR
Initial Physical Inspection: In Good Working Order Actions Taken: Cleaned Filter, Checked Rain Gauge is Level, Outlets Operating Correctly

AS3580.14:2016 calls for an operational check every 6 months. Method followed:
The rain Gauge was calibration tested using a Field Calibration Device, simulating 20.2 mm of Rainfall at 100mm/hr flow rate. While the sensor was still well in calibration following the onsite test, clean and calibration adjustment the desired accuracy of Exactly 101 tips was achieved.

GENERAL RAIN GAUGE SENSOR NOTES: Keeping the bucket clean is important Client to ensure it is visually inspected and cleaned if required every 3 months at a minimum..

Sensor Calibration – Solar Radiation

Sensor	Code	Serial Number	UOM	System Output Hz	System Sensor Reading	Standard Output Hz	Standard Sensor Reading	Results Difference	Tolerance	Status
Solar Radiation	SR41	2104-6330-005	Watts/m2	24.03	701.50	24.4	720.00	-18.5w/m2 -1.0%	+/- 50w/m2 +/- 2.5 %	**Pass**

SOLAR RADIATION SENSOR
Actions Taken: Level checked and sensor cleaned. Condition was good.

GENERAL SOLAR RADIATION SENSOR NOTES:
AS3580.14:2016 calls for an operational check every 6 months. Method followed:
A co-located transfer standard test was undertaken by locating the transfer standard adjacent to the in situ sensor and taking a set of readings. The difference was -18.5 w/m2 and this is inside the tolerance of +/- 50w/m2

Sensor Calibration – Barometric Pressure

Sensor	Code	Serial Number	UOM	System Output Hz	System Sensor Reading	Standard Output Hz	Standard Sensor Reading	Results Difference	Results Tolerance	Results Status
Barometric Pressure	BP40	2105-6438-008	hPa	51.22	1006.10	51.31	1006.55	-0.45hPa	+/-3.0 hPa	**Pass**

GENERAL BAROMETRIC PRESSURE SENSOR NOTES:

AS3580.14:2016 calls for an operational check every 6 months. Method followed:
A co-located transfer standard test was undertaken by locating the transfer standard adjacent to the in situ sensor, allowing 30 minutes for the sensors to stabilise then taking a single point reading as required. The difference between the transfer standard and the in situ sensor was – 0.45 hPa, well inside the +/- 3hPa tolerance allowed.

Full System Test	
Communications Method	DL3110 WeatherMaestro to ETM P3 4G to WeatherMation LIVE
Mobile Signal Strength	3G Signal 63Dbs High 4G Signal 79Dbs High
Communications Integrity Test	Pass
Data Integrity Check	Pass
Hardware Integrity Test	**Data Logger I/O & Schedule testing**

HZ sent to logger		result	Expected result	Variance	Status
Channel 1	20	71.0km/hr	71.0km/hr	0.00%	**PASS**
Channel 2	20	80.0 Degrees*	80.0 Degrees*	0.00%	**PASS**
Channel 3	15	50.0%	50.0%	0.00%	**PASS**
Channel 4	20	20.0 deg C	20.0 deg C	0.00%	**PASS**
Channel 5	10 Pulses	2.0mm	2.0mm	0.00%	**PASS**
Channel 6	20	499.99	500.00	0.00%	**PASS**
Channel 7	20	850.0 hpa	850.0 hpa	0.00%	**PASS**
Channel 8	20	20.0 deg C	20.0 deg C	0.00%	**PASS**

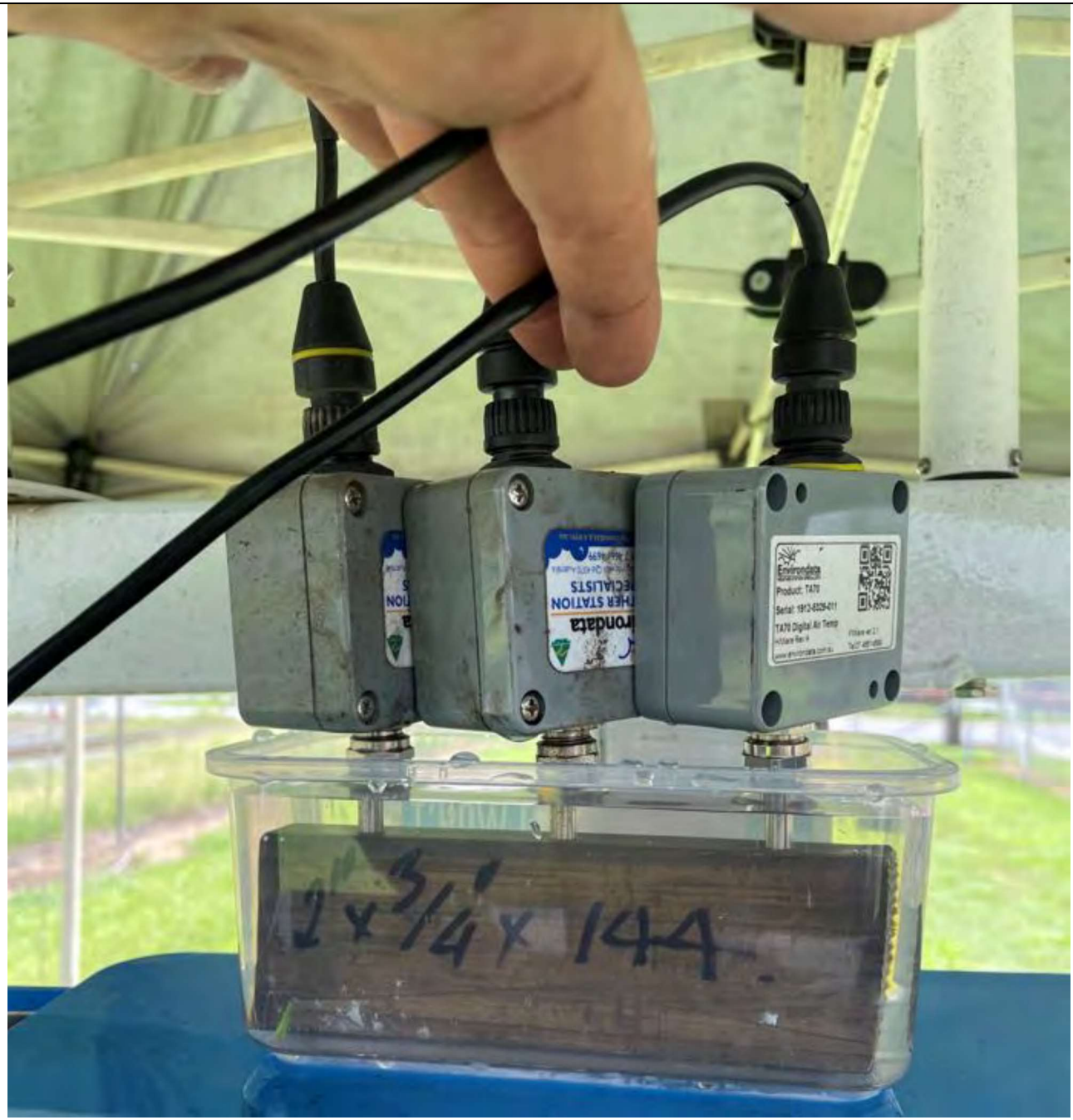
*clockwise from North

PASS – all Channels report correctly from generated signal

General Actions Taken	Solar Panel Cleaned - Done Sensor Shelters Cleaned - Done Full System Cleaned - Done Cable Connectors and Joins and Sockets Cleaned - Done Damage or Corrosion Checked - Done Refill Backshells - Not Required - All moulded cables
Battery Date	17/11/2021
Battery Voltage	System Reading: 12.9 V Manual Reading: 13.0 V General Battery Voltage Notes The battery voltage indicates the state of charge of the battery. This MUST be measured with all charging sources disconnected. As a guide, 12.0 volts indicates about 10 % of charge remaining. 12.8 volts indicates about 90 % of charge remaining.

Charge Voltage	System Reading: 12.8 V Manual Reading: 13.8 V Short Circuit Current: 805 mA Good
Load Current (Comms)	77.2 mA Excellent. General Load Current Notes Load current for a standard system should be in the range 60 – 90 mA, based on a daily average – see your recent data. This applies to a system with 6 sensors and a mobile data connection. Allowance must be made for additional sensors and alternative communications devices. A comparison with previous service reports is a good guide.
Charge Current	86.0 mA General Charge Current Notes Charge currents are reduced where the battery is already fully charged. Measurement of the solar panel operation separately as part of your service is required.
Equipment Used	None required this service
Comments & Recommendations – General	The sensor shelters on site were installed upside down. Sensor performance was not impeded. Sensor shelters have now been installed correctly. Customer to continue to maintain grounds as they have been. Consider a routine Rain Gauge and solar panel clean every 3 months.
Comments & Recommendations - For next Service	The customer has requested that on the next visit the guy wire visibility kit be added to their station for safety reasons. Consumables required: • Wind Speed Bearings • Relative Humidity Tip • System Main Battery

Station Photos	


Environdata
Product: TA70
TA70 Digital Air Temp
2 x 3/4 x 144


Environdata
WEATHER MAESTRO

Station Photos	

Calibration Standards				
Sensor	**Code**	**Serial Number**	**Last Calibration Date**	**Calibrated Against**
Barometric Sensor	BP40	3869-018	09/03/2018	Vaisala PBT220
Relative Humidity Sensor	RH50	1906-4905-005	23/10/2015	Rotronic HP22 S/N 60222696
Solar Radiation Sensor	SR50	2106-6628-010	12/09/2018	Kipp & Zonen S/N 152580
Temperature Sensor	TA60	1912-5329-011	22/06/2017	AMA Glass Thermometer 0685412

	Name	**Position**	**Signature**	**Date**
Certificate Completed by	Rob Somerville	Service Technician		17/03/2022

2.7.4

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Field Calibration Report

Customer	MSF Sugar	**Accentis Reference**	MSFSUGAR7685
Company Contact	Kate Barnes	**Company Contact Number**	
Site Contact at time of Service	Kate Barnes	**Site Contact Number**	0434 789 590
Sales Order Number	6165		

Weather Station	MSF Sugar Gordonvale		
Service Date	14/06/2022	**Firmware Version - Main**	2.44 2022/06/14
Serial Number	2106-1129	**Firmware Version - IO**	1.28a MK4IO
System Type	Weather Maestro	**Schedule File**	MSFSugar:129MSFSugar_1C.dl3
Location	Gordonvale QLD	**GPS**	17.091943, 145.788205

Sensor Calibration – Wind Speed

Sensor	Code	Serial Number	UOM		2 Pulses/Rev Status	Mark/Space Ratio Test Values	Status	Highest Detectable Speed Value	Status
Wind Speed	WS52	2015-0528	km/h	Pre-Calibration	Pass	15.89 / 50.14 & 16.01 / 17.94	Pass	255.8961	**Pass**
				Post-Calibration	Pass	16.13 / 49.99 & 16.33 / 18.24	Pass	259.4524	**Pass**

WIND SPEED SENSOR
Actions Taken: Bearings replaced.

Calibration check method: AS3580.14 states there is only a functional test required at 12 Months' interval. We proved the function of the sensor with a co-located transfer standard comparison with 1 minute data. This co-located data from 168 minutes of data showed an average difference of 0.012m/s. The AS requires a difference of 0.2m/s or less & This sensor performs well.
See **Excel Worksheet** for Wind Speed Data set comparison.

GENERAL WIND SPEED SENSOR NOTES:
The calibration is a function of the bearing friction & wind speed cup shape and 'geometry', therefore cup sets must be clean and in good repair. Damaged cup sets need to be replaced to ensure correct calibration.
The Mark/ Space Ratio range ensures that the sensor can achieve the full range of high-speed operation. A lower result would mean that the highest wind speeds would not be detected.

Sensor Calibration – Wind Direction

Sensor	Code	Serial Number	UOM		North Point Calibration	Standard Used	Linearity Test	Status
Wind Direction	WD50	0000-0000	Degs	Pre-Calibration	Pass	Smart Phone		
				Post-Calibration	Pass	Smart Phone	0.0Hz, 22.4Hz, 67.51Hz, 45.15Hz	**Pass**

WIND DIRECTION SENSOR
Initial Inspection: 0% out from North
Bearings: Passed - Not Replaced

Calibration check method: AS3580.14 states there is only a functional test required at 12 Months' interval. We proved the function of the sensor via confirming the frequency output matched the alignment of the wind vane and both being correct to within +/- 1.0 degree at each cardinal point. This is within the AS required accuracy of +/- 5 Degrees.

GENERAL WIND DIRECTION SENSOR NOTES:
The sensor operation is tested at four points of the compass to confirm operation and linearity.
Setting the North point is most easily adjusted at ground level for 10 metre systems, allowing for the change in orientation when the mast is raised.

Sensor Calibration – Temperature

Sensor	Code	Serial Number	UOM	System Samples:	Sensor Reading	Standard Sensor Reading	Results Difference Degrees Celcius	Tolerance	Status
Air Temperature	TA70	2105-6547-002	DegC	Continuous recording	22.84	22.80	+0.04	+/- 0.3	**PASS**
Air Temperature 10m	TA70	2105-6547-004	DegC	for 1 hour	21.23	21.19	+0.04	+/- 0.3	**PASS**

GENERAL TEMPERATURE SENSOR NOTES:
Accurate calibration can only be done in a brass block or in a water bath. Our field technicians will use a Brass Block for calibrations unless circumstances require a water bath.

AS3580.14:2016 calls for an operational check every 6 months. Method followed:
10m Sensor and 2m Sensor were placed in a brass block in a water bath at 0c for 20 mins after settling, @20c for 20 mins after settling and at 40c for 20 mins after settling.
See **Excel Worksheet** for air temerature Data set comparison
The results are all well inside the limits of +/- 0.3 Degrees Celsius.
The allowable variance is for the 2m and 10m temp sensors to have +/- 0.3 variance from the standard and +/-0.1 variance from each other as an average difference

Sensor Calibration – Relative Humidity

Sensor	Code	Serial Number	UOM	System		Standard		Results		
				Output Hz	Sensor Reading	Output Hz	Sensor Reading	Difference	Tolerance	Status
Relative Humidity	RH50	2106-6355-005	%	11.11	11.10	11.03	10.30	0.8%	2 %	**Pass**

RELATIVE HUMIDITY SENSOR
Actions Taken: Firmware Upgrade: Not Required, latest version running.

Calibration check method: AS3580.14 states there is only an operational Precision Test required at 12 Months' interval. This was performed by comparing the RH reading from the station's sensor with the RH reading from a Transfer Standard RH sensor in a sealed test environment. 2 runs were performed, with readings recorded at 5-minute intervals. The first test atmosphere had an RH of below 35% RH and the second test atmosphere had an RH of above 35%
The results of this test showed an average difference of 1% difference for the over 35% test and 1.3% for the under 35% test. These results are well below the allowable variance of +/- 5% variance at less than 35% RH & +/- 7% variance at above 35% RH
See **Excel Worksheet** for Relative Humidity 5 min Data set comparison.

GENERAL RELATIVE HUMIDITY SENSOR NOTES:
Relative Humidity tips are considered as consumables. It is not possible to adjust the tip, so replacement is recommended every 12 months to ensure continuous and accurate function until the next service interval.

Sensor Calibration – Rain Gauge

Sensor	Code	Serial Number	UOM		Calibration Test mm	Tips	Standard Tips	Results Difference Tips & %	Tolerance	Status
Rain Gauge	RG50	2106-6580-626	mm	Pre-Clean & Calibration	20.6	103	101	2 (1.98%)	10 Tips	**Pass**
				Post-Calibration test #1	21.4	107	101	6 (5.96%)	10 Tips	**Fail**
				Post-Calibration test #2	21.4	109	101	8 (7.95%)	10 Tips	**Fail**
				Post-Calibration test #3	19.8	99	101	2 (1.98%)	10 Tips	**Pass**
				Post-Calibration test #4	20.2	101	101	0 (0%)	10 Tips	**Pass**

RAIN GAUGE SENSOR
Initial Physical Inspection: In Good Working Order Actions Taken: Cleaned Filter, Checked Rain Gauge is Level, Outlets Operating Correctly

AS3580.14:2016 calls for an operational check every 6 months. Method followed:
The rain Gauge was calibration tested using a Field Calibration Device, simulating 20.2 mm of Rainfall at 100mm/hr flow rate. While the sensor was still well in calibration following the onsite test, clean and calibration adjustment the desired accuracy of Exactly 101 tips was achieved.

GENERAL RAIN GAUGE SENSOR NOTES: Keeping the bucket clean is important Client to ensure it is visually inspected and cleaned if required every 3 months at a minimum..

Sensor Calibration – Solar Radiation

Sensor	Code	Serial Number	UOM	System Output Hz	System Sensor Reading	Standard Output Hz	Standard Sensor Reading	Results Difference	Tolerance	Status
Solar Radiation	SR41	2104-6330-005	Watts/m2	21.39	569.54	21.7	587.41	-17.8w/m2 -1.0%	+/- 50w/m2 +/- 2.5 %	**Pass**

SOLAR RADIATION SENSOR
Actions Taken: Level checked and sensor cleaned. Condition was good.

GENERAL SOLAR RADIATION SENSOR NOTES:
AS3580.14:2016 calls for an operational check every 6 months. Method followed:
A co-located transfer standard test was undertaken by locating the transfer standard adjacent to the in-situ sensor and recording 5 minute data sets for 4 hours, this results in 48 data points. This data is then averaged over all 48 data points. The average difference was -26.96W/m2 or -1.35% and this result is well inside the tolerance of +/- 50w/m2
See **Excel Worksheet** for solar radiation Data set comparison.

Sensor Calibration – Barometric Pressure										
				System		Standard		Results		
Sensor	**Code**	**Serial Number**	**UOM**	**Output Hz**	**Sensor Reading**	**Output Hz**	**Sensor Reading**	**Difference**	**Tolerance**	**Status**
Barometric Pressure	BP40	2105-6438-008	hPa	53.19	1015.9	53.6	1018	-2.1hPa	+/-3.0 hPa	**Pass**

GENERAL BAROMETRIC PRESSURE SENSOR NOTES:

AS3580.14:2016 calls for an operational check every 6 months. Method followed:
A co-located transfer standard test was undertaken by locating the transfer standard adjacent to the in-situ sensor, allowing 30 minutes for the sensors to stabilise then the data was logged for 120mins at 1 minute data points.
This data is then averaged over the 120 data points. The average difference between the transfer standard and the in-situ sensor was – 2.20 hPa, well inside the +/- 3hPa tolerance allowed.
The average value change over a 1 hour period is 0.20 which is well below the 1hpa tolerance allowed.

Full System Test	
Communications Method	DL3110 WeatherMaestro to ETM P3 4G to WeatherMation LIVE
Mobile Signal Strength	3G Signal 64Dbs High 4G Signal 80Dbs High
Communications Integrity Test	Pass
Data Integrity Check	Pass
Hardware Integrity Test	**Data Logger I/O & Schedule testing**

HZ sent to logger		result	Expected result	Variance	Status
Channel 1	10	35.5km/hr	35.5km/hr	0.00%	**PASS**
Channel 2	45	180.0 Degrees*	180.0 Degrees*	0.00%	**PASS**
Channel 3	15	50.0%	50.0%	0.00%	**PASS**
Channel 4	20	20.0 deg C	20.0 deg C	0.00%	**PASS**
Channel 5	10 Pulses	2.0mm	2.0mm	0.00%	**PASS**
Channel 6	45	1750	1750	0.00%	**PASS**
Channel 7	20	850.0 hpa	850.0 hpa	0.00%	**PASS**
Channel 8	20	20.0 deg C	20.0 deg C	0.00%	**PASS**

*Clockwise from North

PASS – all Channels report correctly from generated signal

General Actions Taken	Solar Panel Cleaned - Done Sensor Shelters Cleaned - Done Full System Cleaned - Done Cable Connectors and Joins and Sockets Cleaned - Done Damage or Corrosion Checked - Done Refill Backshells - Not Required - All moulded cables
Battery Date	17/11/2021
Battery Voltage	System Reading: 13.2 V Manual Reading: 13.1 V General Battery Voltage Notes

	The battery voltage indicates the state of charge of the battery. This MUST be measured with all charging sources disconnected. As a guide, 12.0 volts indicates about 10 % of charge remaining. 12.8 volts indicates about 90 % of charge remaining.
Charge Voltage	System Reading: 12.8 V Manual Reading: 13.8 V Short Circuit Current: 654 mA Good
Load Current (Comms)	86.3 mA Excellent. General Load Current Notes Load current for a standard system should be in the range 60 – 90 mA, based on a daily average – see your recent data. This applies to a system with 6 sensors and a mobile data connection. Allowance must be made for additional sensors and alternative communications devices. A comparison with previous service reports is a good guide.
Charge Current	564.0 mA General Charge Current Notes Charge currents are reduced where the battery is already fully charged. Measurement of the solar panel operation separately as part of your service is required.
Equipment Used	Sensor 1 - WS48 - WSBKit - Wind Speed Bearing Upgrade Kit Sensor 3 - RH41 - CAS009S - Relative Humidity Tip Battery - CBA12 - DL3010 Maestro 12V 12AHr Lead Acid
Comments & Recommendations – General	Customer to continue to maintain grounds as they have been. Consider a routine Rain Gauge and solar panel clean every 3 months.
Comments & Recommendations - For next Service	The station does not have a dedicated compound and can be accessed easily by pedestrians, for this reason it is recommended that the high visibility guy wire kit is added to the station to reduce the risk of injury. There seems to be small amount of bird waste in the rain gage at the time of service, to prevent this a rain gauge bird spike kit can be added to the rain gauge.

Station Photos





Station Photos

RAIN AUGE
Pre-clean



Rain Gauge
cleaning process



Rain gauge
calibration adjustment



Rain gauge
Level check



Rain Gauge
calibration process





Temperature sensor
0c Ice bath test



Relative humidity
<35% test



Solar radiation
Sensor comparison



Post service pictures	 

Calibration Standards				
Sensor	**Code**	**Serial Number**	**Last Calibration Date**	**Calibrated Against**
Barometric Sensor	BP40	3869-018	09/03/2018	Vaisala PBT220
Relative Humidity Sensor	RH50	1906-4905-005	23/10/2015	Rotronic HP22 S/N 60222696
Solar Radiation Sensor	SR50	2106-6628-010	12/09/2018	Kipp & Zonen S/N 152580
Temperature Sensor	TA60	1912-5329-011	22/06/2017	AMA Glass Thermometer 0685412

	Name	**Position**	**Signature**	**Date**
Certificate Completed by	Rob Somerville	Service Technician	RS	17/03/2022

2.7.4

APPENDIX F. Air Dispersion Modelling (Katestone)

Preliminary: 9 September 2021 (V1.0)

Final: 25 January 2023 (V1.1)

Dispersion Modelling Assessment of Mulgrave Sugar Mill

Prepared for:

CQ Group Pty Ltd

September 2021

Final

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Glossary

Term	Definition
µg/m^3	micrograms per cubic metre
µm	microns
°C	degrees Celsius
km	kilometre
m	metre
m/s	metres per second
m^2	square metres
m^3	cubic metres
Nomenclature	**Definition**
CO	carbon monoxide
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
PM_{10}	particulate matter with a diameter less than 10 micrometres
$PM_{2.5}$	particulate matter with a diameter less than 2.5 micrometres
SO_2	sulfur dioxide
Abbreviations	**Definition**
Air EPP	*Environmental Protection (Air) Policy 2019*
AMSC	Australian Sugar Mill Council
EF	Emission factor
EP Act	*Environmental Protection Act 1994*
DES	Department of Environment and Science (Qld)
MCM	Mulgrave Central Mill
NPI	National Pollutant Inventory database

EXECUTIVE SUMMARY

Katestone Environmental Pty Ltd (Katestone) was commissioned by the Mulgrave Central Mill Company Pty Ltd to undertake TAPM air dispersion modelling of emissions from the Mulgrave Central Mill located at 47 Gordon Street, Gordonvale. The study aims to inform stack and ambient monitoring to be conducted at the site as part of an Environmental Evaluation of smoke nuisance due to the Mulgrave Central Mill (MCM).

The dispersion modelling has considered:

- Likely emissions during routine conditions, with reference to National Pollutant Inventory reports for the site, historical stack tests, operational records, and feed stock specifications from suppliers
- Both routine and upset conditions
- Local meteorological and terrain features, and existing levels of air pollutants.

The dispersion modelling results have been evaluated by comparison with air quality criteria relevant to the protection of human health.

Based on this comparison, the following indicators and therefore be included in a stack testing campaign:

- Nitrogen dioxide
- Sulfur dioxide
- Particulates, specifically:
    - The particulate matter size distribution including particles less than 10 µm and 2.5µm
    - Heavy metal content, including cadmium and nickel.

The ambient monitoring program should include one centrally located monitoring station monitoring $PM_{2.5}$. A location at or near the Golf Course/Turf Club, Alley Park or the Gordonvale State School or Gordonvale State High School would be suitable.

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by the Mulgrave Central Mill Company Pty Ltd to undertake TAPM air dispersion modelling of emissions from the Mulgrave Central Mill (MCM) located at 47 Gordon Street, Gordonvale. This dispersion modelling study is required by Section 6.1 of the Mulgrave Central Mill Air Quality Monitoring Program (Rev 2A, 9 July 2021) (Air Quality Monitoring Plan) and has been conducted to further inform stack and ambient monitoring programs.

The Air Quality Monitoring Plan was prepared in response to a Notice to Conduct or Commission an Environmental Evaluation (EE Notice) issued by the Department of Environment and Science (DES) on 9 June 2021. The EE Notice states that DES considers MCM the likely cause of smoke emissions that caused complaints about odour and health effects on some occasions during June 2020.

The following scope of works has been conducted:

- Compilation of emissions inventories and exhaust characteristics, considering:
    - MCM's National Pollutant Inventory reports for recent years
    - Historical stack test data from the site
    - Fuel oils specification
    - Operational records of bagasse and fuel oil feed rates.
- Dispersion modelling for the following scenarios:
    - Routine operations – bagasse
    - Routine operations – fuel oil
    - Upset conditions.
- Evaluation of predicted pollutant concentrations by comparison with relevant air quality criteria, and identification of pollutants that are not low risk
- Development of recommendations for:
    - Pollutants to monitor (in-stack and at ambient sites)
    - Number and location of ambient monitoring stations.

2. LEGISLATIVE FRAMEWORK FOR AIR QUALITY

The *Environmental Protection Act 1994* (EP Act) provides for the management of the air environment in Queensland. The EP Act gives the Department of Environment and Science (DES) the power to create Environmental Protection Policies that identify, and aim to protect, environmental values of the atmosphere that are conducive to the health and well-being of humans and biological integrity. *The Environmental Protection (Air) Policy* (Air EPP) was made under the EP Act and gazetted in 1997; the Air EPP was revised and reissued in 2019.

The objective of the Air EPP is to identify the environmental values of the air environment to be enhanced or protected and to achieve the objective of the Environmental Protection Act 1994, i.e. ecologically sustainable development.

The environmental values to be enhanced or protected under the Air EPP are the qualities of the environment that are conducive to:

- protecting health and biodiversity of ecosystems
- human health and wellbeing
- protecting the aesthetics of the environment, including the appearance of building structures and other property
- protecting agricultural use of the environment.

The administering authority must consider the requirements of the Air EPP when it decides an application for an environmental authority, amendment of a licence or approval of a draft environmental management plan. Schedule 1 of the Air EPP specifies air quality indicators and objectives for a number of contaminants that may be present in the air environment.

The Air EPP air quality objectives relevant to the key air pollutants that may be generated from the Project and are relevant for the protection of health and wellbeing are presented in Table 1. Chromium is not identified in the Air EPP. Consequently, the Ontario Ministry of the Environment, Conservation and Parks (May 2020) *Ambient Air Quality Criteria* has been used for chromium.

Air quality objectives for the health and biodiversity of ecosystems or for protecting agriculture have not been considered here, as they are not relevant to the nature of complaints regarding smoke nuisance detailed in the EE Notice.

Table 1 Ambient air quality objectives

Pollutant	Environmental value	Averaging period	Air quality objective (µg/m³)	Number of days of exceedance allowed per year
NO_2	Health and wellbeing	1-hour	250	1
		1-year	62	N/A
SO_2	Health and wellbeing	1-hour	570	1
		24-hour	230	1
		1-year	57	N/A
CO	Health and wellbeing	8-hour	11,000	N/A
PM_{10}	Health and wellbeing	24-hour	50	5
		1-year	25	N/A
$PM_{2.5}$	Health and wellbeing	24-hour	25	N/A
		1-year	8	N/A
Cadmium	Health and wellbeing	1-year	0.005	N/A
Chromium*	Health and wellbeing	24-hour	0.5	N/A
Lead	Health and wellbeing	1-year	0.5	N/A
Nickel	Health and wellbeing	1-year	0.02	N/A
Benzo(a)pyrene (as a marker for PAH)	Health and wellbeing	1-year	0.0003	N/A

Table note:

* Ontario Ministry of the Environment, Conservation and Parks (May 2020) *Ambient Air Quality Criteria*. All other criteria are sourced from the Air EPP.

3. EXISTING ENVIRONMENT

3.1 Local terrain and land-use

MCM is located on the eastern edge of the Gordonvale township, approximately 400m from residential areas and 14km inland from the coast. The township and surrounding horticultural activities, which are predominantly sugar cane growing, are located in a low-lying valley bordered by significant ranges to the southwest and northeast. Directly to the southwest of the township, terrain rises significantly by over 300m within 1km. To the east, an increase in elevation of approximately 1km separates the valley from the coast.

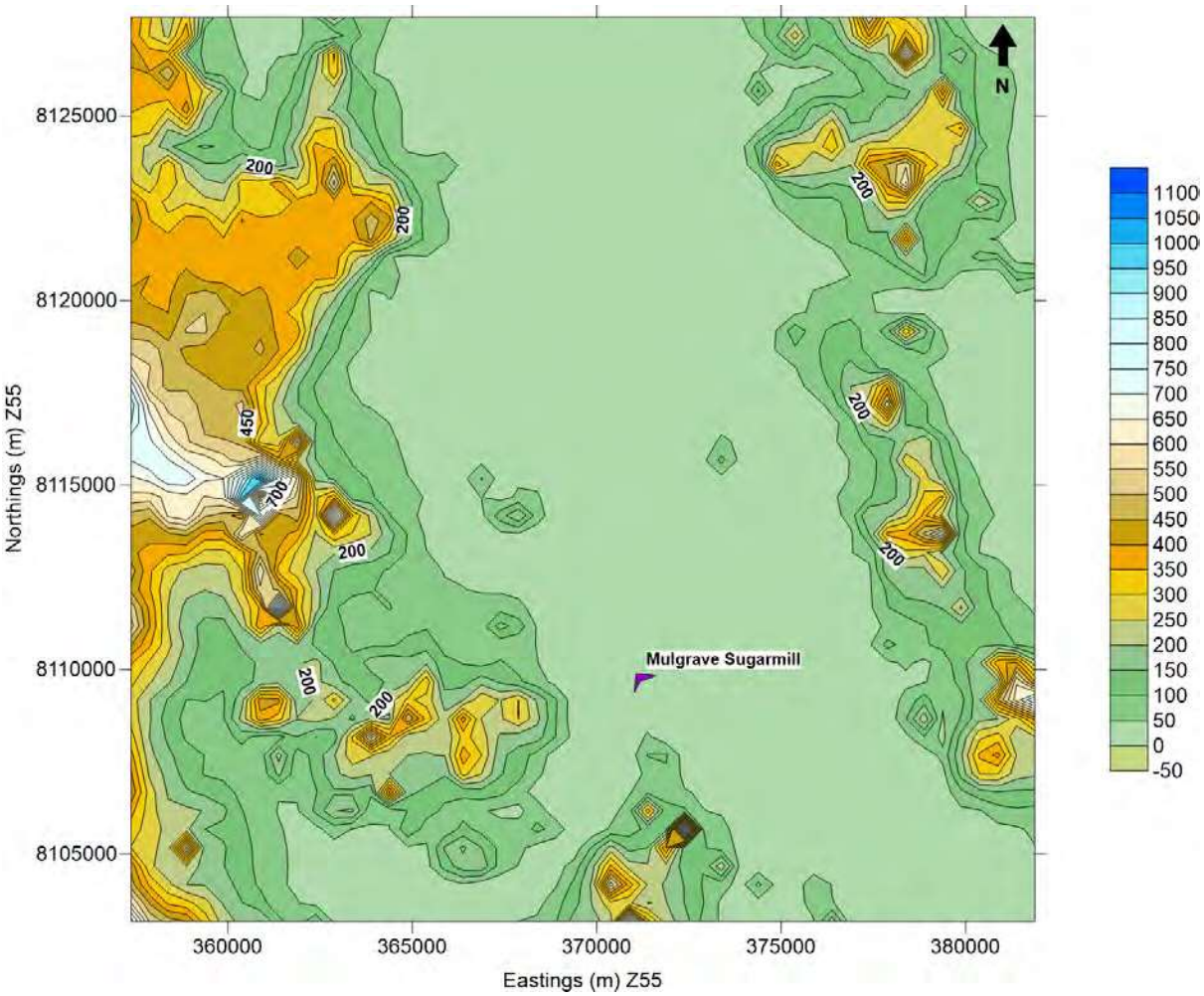


Figure 1 Terrain in the vicinity of the MCM

3.2 Sensitive receptors

Sensitive places in the vicinity of MCM have been identified in the AQMP. They are reproduced in Table 1 and Figure 2.

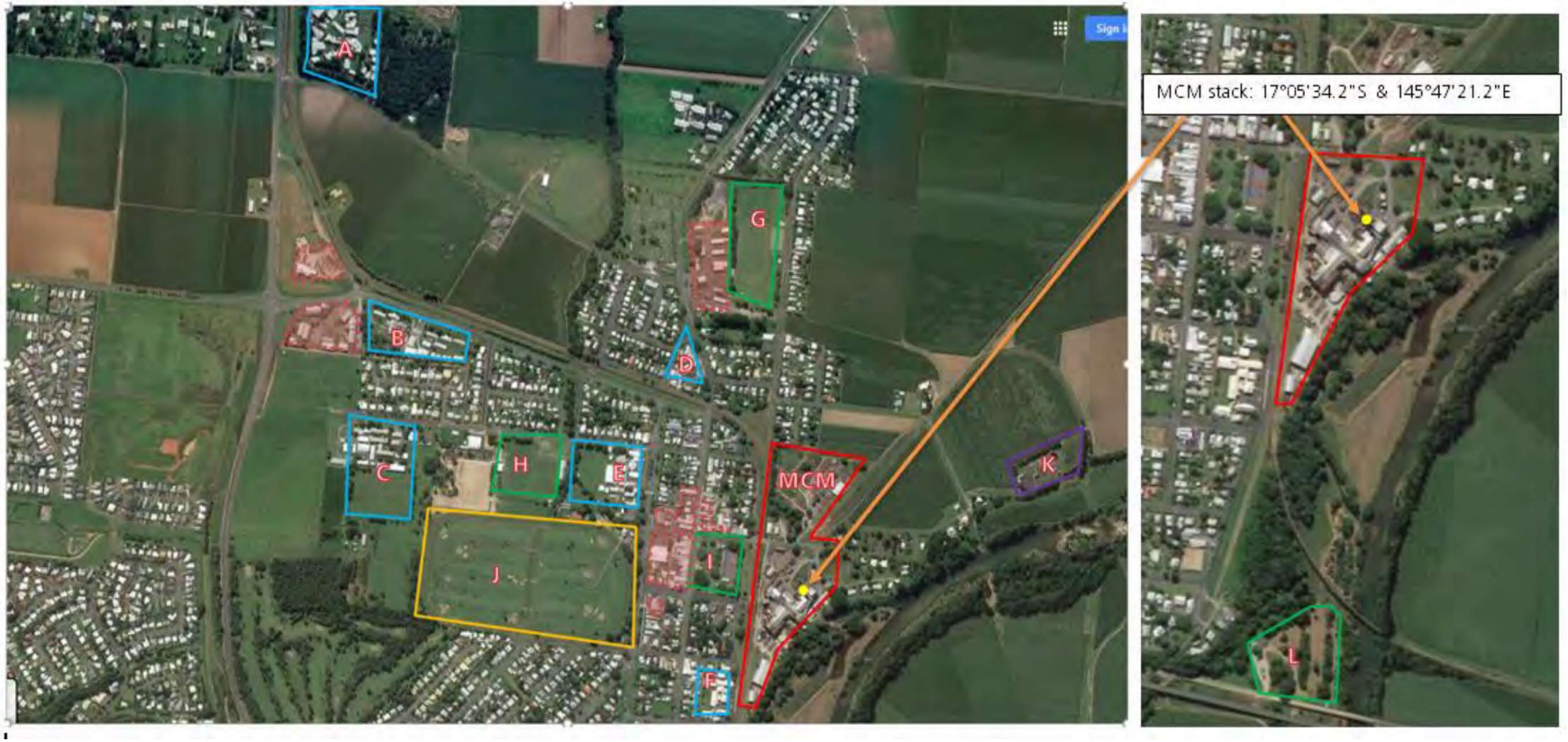
For reference, the EE Notice notes that complaints were received from the following locations:

- Front of the Turf Club and Gordonvale State School, located on George Street
- Front of Pyramid Residential Care Centre, located on Cairns Road

- Gordonvale CBD.

Table 2 Key sensitive receptors in the vicinity of MCM

Sensitive place type	Sensitive place	Distance and direction from mill stack
Residential – permanent	Residential zoning	~ 400 m N
	Pyramid Residential Care Centre	~ 1.3 km NW
Residential – temporary	Greenpatch camping grounds	~ 800 m S
	Great Northern Hotel	~ 320 m WNW
	The Gordonvale Hotel	~ 330 m W
School	Gordonvale State School	~ 500 m NW
	Gordonvale State High School	~ 1.2 km WNW
	Djarragun College (incl boarding)	~ 1.8 km NW
	St Michael's School	~ 300 m SW
Hospital	Gordonvale Memorial Hospital	~ 700 m NNW
Protected area	Great Barrier Reef Region	~ 15 km E
	Wet Tropics of Queensland	~ 5km W
	Malbon Thompson Forest Reserve	~ 10km E
	Grey Peaks National Park	~ 9km NE
Public park or garden	Norman Park	~ 200 m W
	Johnson Park	~ 800m N
	Alley Park	~ 800m NW
	Gordonvale Turf Club and Golf Course	~ 500 m W



KEY NOTES:					
• MCM site denoted by red outline and boiler stack by yellow circle • Key community locations identified by letter reference as per below.					
A	Djarragun College (& boarding school)	E	Gordonvale State School	I	Norman Park
B	Pyramid Residential Care Centre	F	St Michael's School	J	Gordonvale Turf Club & Golf Course
C	Gordonvale State High School	G	Johnson Park	K	Gordonvale Wastewater Treatment Plant
D	Gordonvale Memorial Hospital	H	Alley Park	L	Greenpatch camping grounds

Figure 2 Key sensitive receptors in the vicinity of MCM

3.3 Existing ambient air quality

The nearest DES ambient air quality monitoring stations are located in Townsville. The North Ward monitoring station is located furthest from the industrial activities in Townsville and is, therefore, the most suitable to provide background data representative of locations with minimal industrial influence, noting that the intention is to use background concentrations representative of Gordonvale without any contribution from MCM. Whilst the North Ward station is situated in a residential area, it is likely to be influenced to a greater degree by major roads and industrial activities including port operations and metals processing than any location in Gordonvale. Consequently, the North Ward data provides a conservative overestimate of ambient background concentrations in Gordonvale.

The North Ward monitoring station measures ambient concentrations of the following air pollutants NO_2, SO_2, PM_{10} and $PM_{2.5}$. The North Ward monitoring station does not monitor CO. Data published by DES in the 2018 and 2019 have been analysed to determine ambient background concentrations for use in the assessment (Table 3).

Table 3 Summary of background concentrations used in the assessment

Pollutant	Averaging period	Value	Source
PM_{10}	24-hour	22.1	Highest 75th percentile from 2018 and 2019
	Annual	20.2	Highest annual average from 2018 and 2019
$PM_{2.5}$	24-hour	8.0	Highest 75th percentile from 2018 and 2019
	Annual	7.0	Highest annual average from 2018 and 2019
NO_2	1-hour	18.5	Highest 75th percentile from 2018 and 2019
	Annual	6.2	Highest annual average from 2018 and 2019
SO_2	1-hour	5.7	Highest 75th percentile from 2018 and 2019
	24-hour	2.9	Highest 75th percentile from 2018 and 2019
	Annual	2.9	Highest annual average from 2018 and 2019

4. DISPERSION MODELLING METHODOLOGY

4.1 Emissions estimation

Emission rates and exhaust characteristics were compiled by considering:

- MCM's National Pollutant Inventory reports for recent years
- Historical stack test data from the site
- Fuel oils specification
- Operational records of bagasse and fuel oil feed rates.

The fuel feed rates for the routine scenarios have been selected to represent likely worst-case emissions due to full load operation.

Upset conditions have been characterised using information provided by MCM regarding the likely changes in operations due to the most common upset situations. This resulted in a stack velocity sensitivity analysis being selected as the most appropriate way to investigate the potential changes in plume dispersion during upset conditions.

4.2 TAPM meteorological and dispersion modelling

Meteorological modelling of the region was conducted using the TAPM model. Data recorded by the nearest BoM monitoring station at the Cairns Racecourse was used to evaluate the performance of the model.

A meteorological monitoring station was recently installed at MCM. The meteorological modelling will be reviewed after collection of 12 months of weather data from an on-site monitoring station.

The TAPM model was also used for dispersion modelling. Twelve months of meteorological data generated in TAPM was used as input for the pollution model to include all weather conditions likely to be experienced in the region during a typical year. The modelling has been used to predict ground-level concentrations of dust and odour across a Cartesian grid and at the locations of the nearest sensitive receptors.

Details of model configuration are provided in Appendix A.

4.3 Cumulative impacts

In order to evaluate the potential impacts of the mill on the surrounding environment, representative ambient levels of air pollutants been added to dispersion modelling predictions where representative background concentrations were available. These levels are discussed in Section 3.3.

5. EMISSIONS TO THE ATMOSPHERE

5.1 Overview

Emissions from the MCM have been derived considering the following:

- MCM's National Pollutant Inventory reports for recent years
- Historical stack test data from the site
- Fuel oils specification
- Operational records of bagasse and fuel oil feed rates.

All pollutants reported to the NPI for the 2018/19 reporting year have been included in this dispersion modelling exercise, with the exception of total volatile organic compounds and ethanol. Total volatile organic compounds (VOCs) and ethanol are not generated as a result of fuel combustion in the boiler and, therefore, have not been considered in the dispersion modelling.

In addition, total suspected particulates (TSP) have not been modelled explicitly, as the smaller particle sizes (PM_{10} and $PM_{2.5}$) are more relevant for the investigation of smoke effects. If compliance with the objectives for PM_{10} and $PM_{2.5}$ can be demonstrated, compliance will also be achieved with the TSP objective.

5.2 Routine operations

Table 4 presents the stack characteristics and emission rates used to investigate worst-case operational emissions. The scenarios are based on the following fuel feed rates:

- Scenario 1 – Full load scenario operating on bagasse only. Based on a maximum daily bagasse feed rate of 3,400 tonnes/day. The maximum tonnage of bagasse in daily records from 31 May 2021 to 18 July 2021 was 3,301 tonnes.
- Scenario 2 – Full load scenario operating on bagasse supplemented by waste oil. Based on the maximum 32% load for fuel oil (228 tonnes/day) and 2,312 tonnes/day of bagasse (total energy output is equivalent to 3,400 tonnes/day of bagasse).

Scenario 2 generates highest emission rates of most air pollutants and the largest range of air pollutants due to the combination of bagasse and fuel oil. In reality, supplementary firing with fuel oil occurs infrequently and for short periods.

Exit velocity and temperature of emissions from the boiler stack have been selected as the minimum values from stack testing conducted at the site. This is a conservative assumption that will result in relatively higher ground-level concentrations of air pollutants.

Table 4 Stack characteristics and emission rates for routine operations

Parameter	Units	Scenario 1 – Bagasse only	Scenario 2 – Waste Oil and Bagasse
Bagasse feed rate	tonnes/hour	141.7	96.3
Waste oil feed rate	tonnes/hour	-	9.5
Exit velocity	m/s	12	12
Height	m	50	50
Diameter	m	4.4	4.4
Exhaust temperature	°C	348	348
Emission rates			
NOx	g/s	29.91[1]	26.6[1,4]
CO	g/s	102.71[1]	71.5[1,4]
SO_2	g/s	9.84[1]	46.2[1,5]
Cd	g/s	-	0.03[5]
Cr	g/s	-	0.03[5]
Pb	g/s	-	0.18[5]
Ni	g/s	-	0.03[5]
PM_{10}	g/s	11.3[2]	22.8[1,4]
$PM_{2.5}$	g/s	11.3[2]	12.9[1,4]
PAHs	g/s	- [3]	0.000098 [4]

Table notes:

[1] Emissions from bagasse combustion calculated using the NPI emission factors for combustion of bagasse in boilers with a wet scrubber (NPI, 2011)

[2] Maximum value of particulate stack tests, or the emission rate calculated using the NPI emission factors for combustion of bagasse in boilers with a wet scrubber (NPI, 2011)

[3] NPI emission factor for PAHs from bagasse combustion has not been used, based on commentary provided by the Australian Sugar Mill Council (ASMC)

[4] Emissions from waste oil combustion calculated using the NPI emission factors for combustion of oil in boilers (NPI, 2011)

[5] Emissions from waste oil are the maximum value of either the emission rate calculated using NPI emission factors for combustion of oil in boilers (NPI, 2011), or the value calculated using a mass balance approach based on fuel oil specifications.

5.3 Upset conditions

Potential air quality impacts due to upset conditions were investigated based on the following information:

- The most common upset condition (a short stop) would likely involve the boilers continuing to run, but at reduced load for a few hours. An estimate of minimum load during these conditions by MCM is 40%, which reflects the boiler operation if the milling train has ceased, and the rest of the factory continues to operate.
- Upset conditions are unlikely to change exhaust temperature until very low loads, as the wet scrubber already reduces the plume temperature during routine operation.

The key effect of upset conditions is likely to be elevated emissions of particulate matter, at times, due to poorer combustion efficiency. These conditions will be associated with lower exhaust velocity. Changes in emission rates during upset conditions are not readily quantifiable. Therefore, upset conditions have been investigated using a sensitivity analysis considering exhaust velocity from the mill stack. This sensitivity analysis has been used to identify where peak plume impacts are likely to occur under upset conditions.

The following exit velocities have been considered (for comparison, it has been assumed the full load exit velocity is 12 m/s, which is the minimum exit velocity specified in the sugar mill's licence):

- 4.8 m/s – 40% load
- 7.2 m/s – 60% load
- 9.6 m/s – 80% load.

6. METEOROLOGY

The following sections describe the meteorology in the vicinity of the MCM, focusing on parameters that are important for dispersion of air pollutants. A validation of the meteorological data that was generated by TAPM is presented in Appendix A.

6.1 Wind speed and wind direction

Figure 3, Figure 4 and Figure 5 show the annual, seasonal and diurnal distribution of winds predicted by TAPM at the MCM site. The winds in the area appear to be highly influence by the local terrain features, with a high frequency of winds occurring from both the southeast and southwest. South-easterly winds align with the low-lying valley in which the MCM and Gordonvale township are located. These winds occur during the day and are the dominant wind direction during the afternoon (midday – 6pm), and during these conditions the Gordonvale township would be downwind of the MCM. South-westerlies occur at all times except during the afternoon; however, they are most frequent between midnight and 6am, and during winter. The south-westerlies are also characterised by very light wind speeds (predominantly < 2 m/s). These are likely to be drainage flows from the ranges to the southwest.

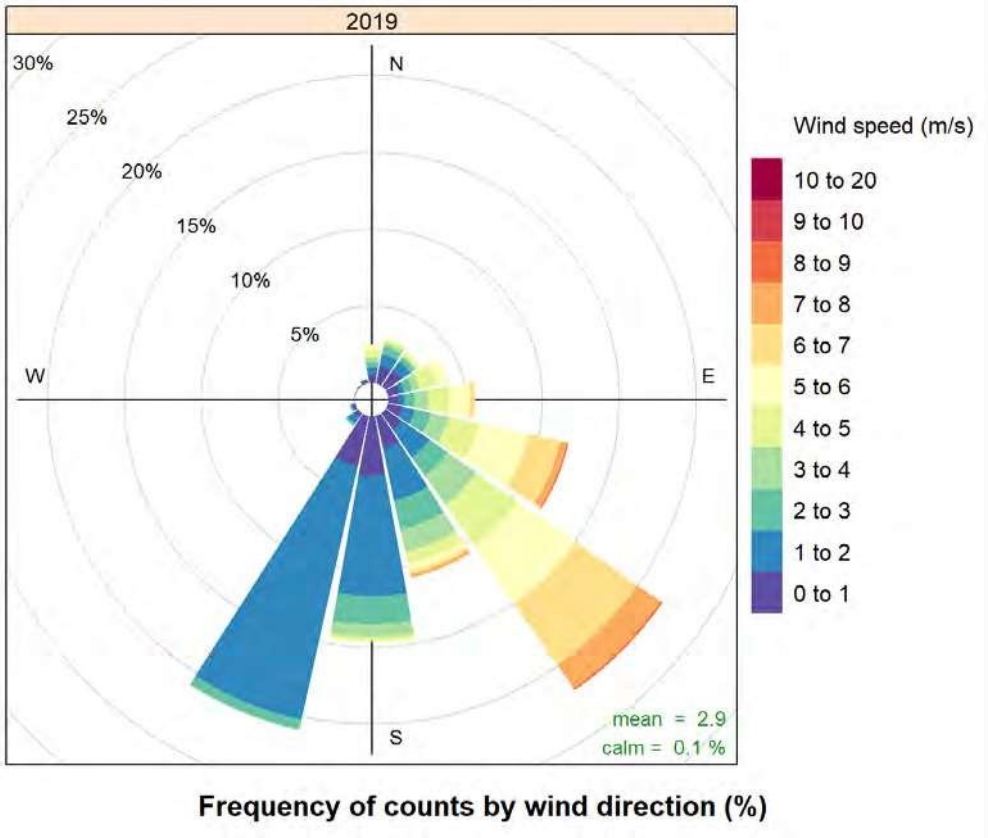


Figure 3 Wind distribution in the vicinity of MCM (as generated by TAPM)

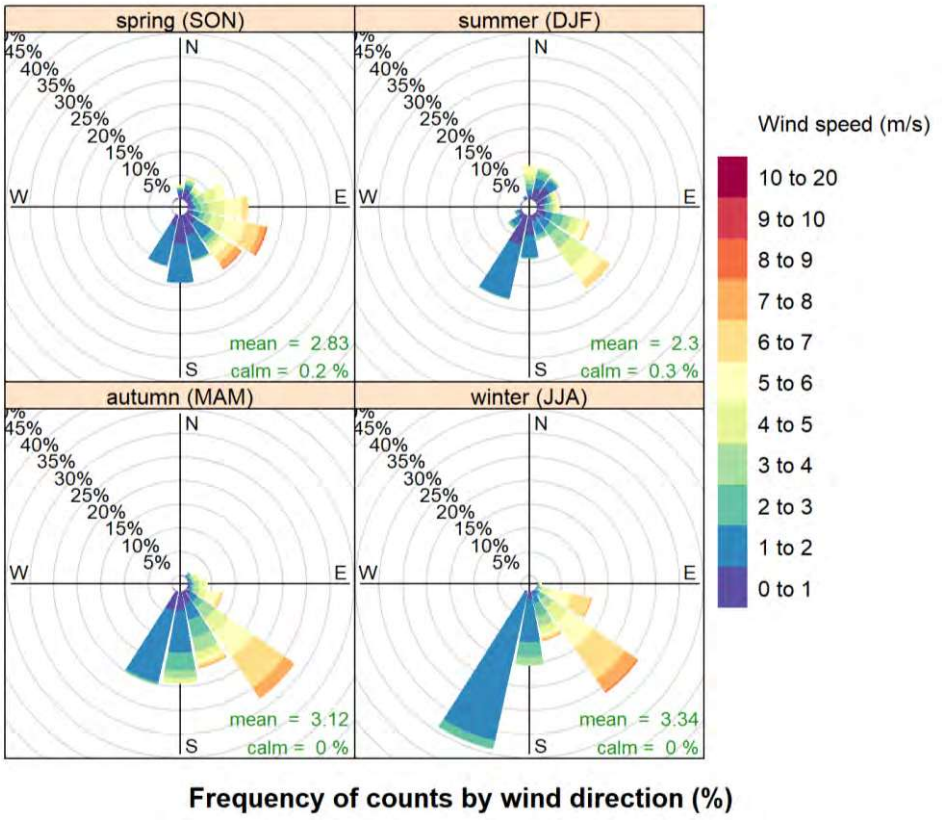


Figure 4 **Seasonal wind distribution in the vicinity of MCM (as generated by TAPM)**

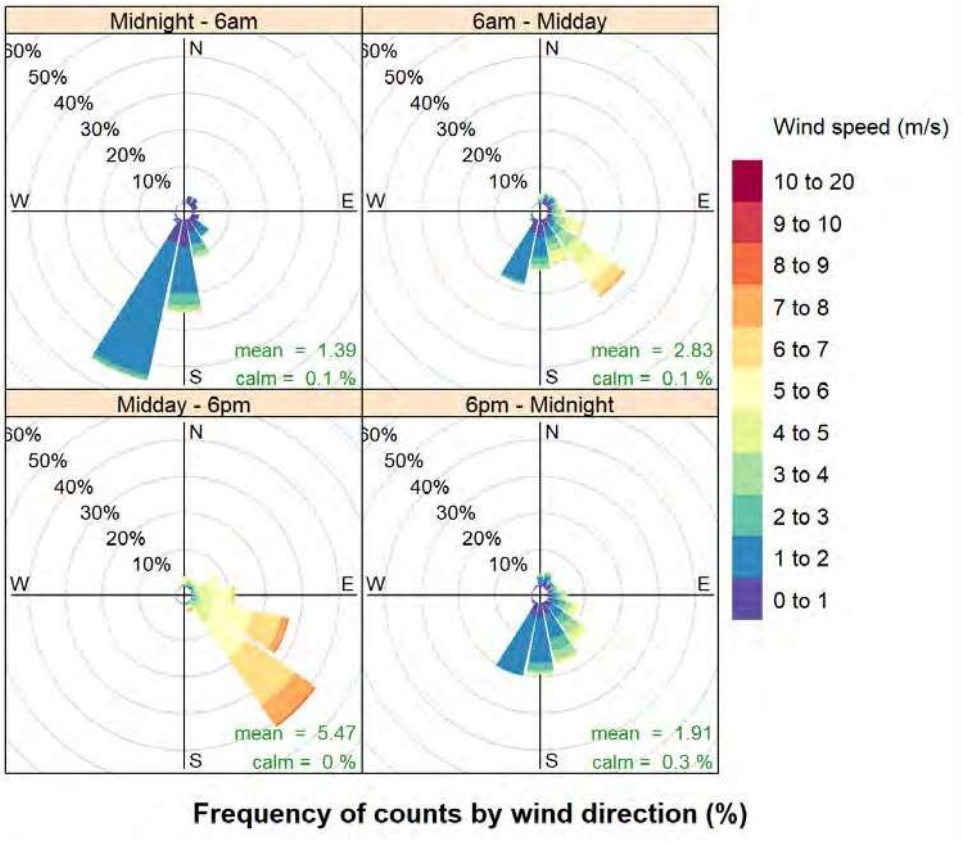


Figure 5 **Diurnal wind distribution in the vicinity of MCM (as generated by TAPM)**

6.2 Mixing height

The mixing height refers to the height above ground within which particulates or other pollutants released at or near ground can mix with ambient air. During stable atmospheric conditions, the mixing height is often quite low and particulate dispersion is limited to within this layer. During the day, solar radiation heats the air at the ground level and causes the mixing height to rise. The growth of the mixing height is dependent on how well the air can mix with the cooler upper level air and therefore depends on meteorological factors such as the intensity of solar radiation and wind speed. During strong wind speed conditions, the air will be well mixed, resulting in a high mixing height.

Mixing height information for the project has been extracted from the TAPM simulation and is presented in Figure 6. The data shows that the mixing height develops around 7 am, increases to a peak in the early afternoon before descending between 3 pm and 6 pm to an overnight low.

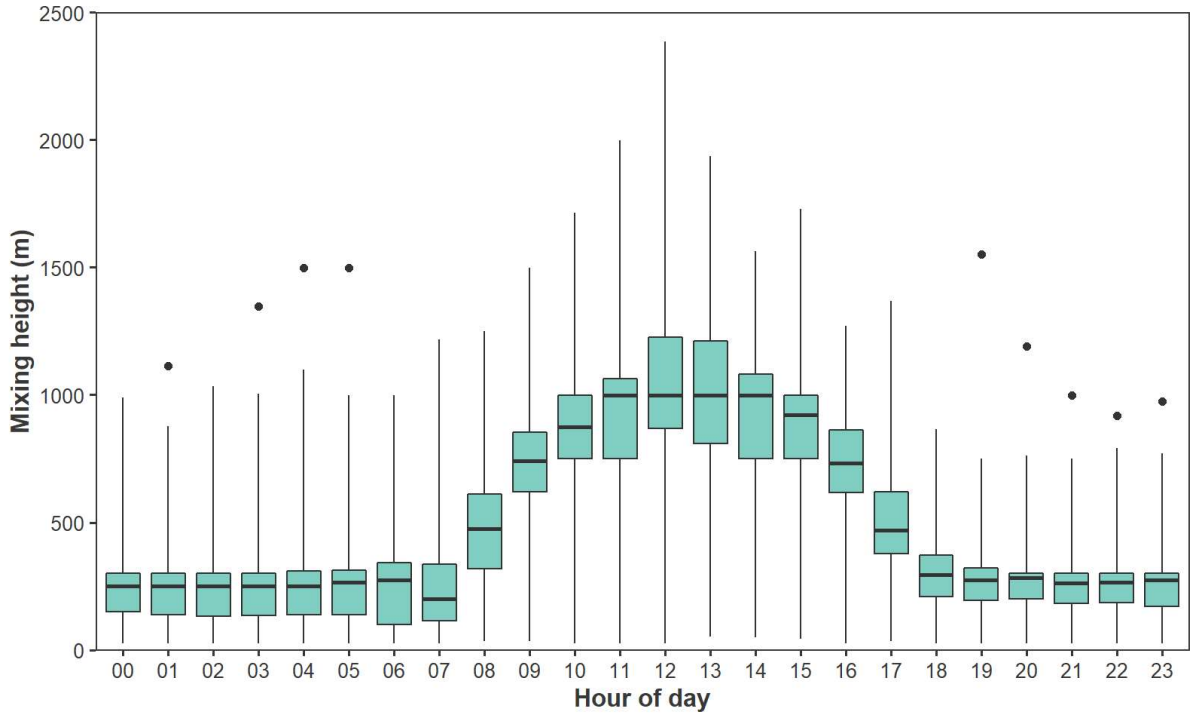


Figure 6 Diurnal distribution of the mixing height at the MCM site (predicted by TAPM)

7. RESULTS

7.1 Routine operations

Table 5 presents the maximum predicted concentration of each air pollutant within the Gordonvale township due to routine operations of the mill at full load in isolation.

Table 6 presents the cumulative maximum predicted concentration of key air pollutants within the Gordonvale township due to routine operations of the mill at full load and background levels of air pollutants.

Figure 7 is a plot of the maximum concentration of key air pollutants emitted from MCM predicted in the Gordonvale township compared to the Air EPP air quality objectives.

Contour plots are presented in Plate 1 and Plate 2 for maximum 1-hour average concentrations of NO_2, and maximum 24-hour average concentrations of SO_2 for Scenario 2 due to the sugar mill in isolation. The overall trends shown in these plots are similar for Scenario 1.

The results show:

- For routine operation of MCM in isolation, ground-level concentrations of pollutants are predicted to be below the air quality objectives across the Gordonvale township.
- For routine operations using bagasse as fuel, predicted concentrations of $PM_{2.5}$ are highest relative to its air quality objective.
- For routine operations using bagasse and fuel oil, predicted concentrations of cadmium are highest relative to its air quality objective.
- Bagasse and fuel oil co-firing occurs infrequently and for short periods and, consequently, these results represent a conservative over-estimate.

Table 5 Predicted concentrations in Gordonvale township due to routine operation of the Mulgrave Sugar Mill in isolation

Pollutant	Averaging period	Air quality objective (µg/m^3)	Scenario 1 - Bagasse		Scenario 2 – Bagasse and Oil[1]	
			Max concentration in township (µg/m^3)	% of objective	Max concentration in township (µg/m^3)	% of objective
NO_2	1-hour	250	46.1	18%	41.0	16%
	1-year[2]	62	1.0	2%	0.9	1%
SO_2	1-hour	570	50.6	9%	237.6	42%
	24-hour	230	9.3	4%	43.9	19%
	1-year[2]	57	1.1	2%	5.1	9%
CO	8-hour	11,000	199.5	2%	138.5	1%
PM_{10}	24-hour	50	10.7	21%	21.7	43%
	1-year[2]	25	1.2	5%	2.5	10%
$PM_{2.5}$	24-hour	25	10.7	43%	12.3	49%
	1-year[2]	8	1.2	10%	1.4	18%
PAHs	1-year[2]	0.0003	n/a[3]	n/a[3]	0.00002	7%
Cadmium	1-year[2]	0.005	n/a[3]	n/a[3]	0.003	58%
Chromium	24-hour	0.5	n/a[3]	n/a[3]	0.025	5%
Lead	1-year[2]	0.5	n/a[3]	n/a[3]	0.02	4%
Nickel	1-year[2]	0.02	n/a[3]	n/a[3]	0.003	14%

Tables notes:

[1] Bagasse and fuel oil co-firing occurs infrequently and for short periods and, consequently, these results represent a conservative overestimate

[2] Annual average concentrations have assumed sugar mill operations for six months of the year, i.e. annual mean model outputs assuming continuous operation throughout the year have been halved

[3] n/a – these pollutants are emitted due to combustion of waste oil only

Table 6 **Predicted concentrations in Gordonvale township due to routine operation of the Mulgrave Sugar Mill including ambient background concentrations**

Pollutant	Averaging period	Air quality objective (µg/m³)	Scenario 1 - Bagasse		Scenario 2 – Bagasse and Oil[1]	
			Max concentration in township (µg/m³)	% of objective	Max concentration in township (µg/m³)	% of objective
NO_2	1-hour	250	64.6	26%	59.5	24%
	1-year[2]	62	7.1	12%	7.0	11%
SO_2	1-hour	570	56.3	10%	243.4	43%
	24-hour	230	12.2	5%	46.7	20%
	1-year[2]	57	3.9	7%	7.9	14%
PM_{10}	24-hour	50	32.8	66%	43.8	88%
	1-year[2]	25	21.4	86%	22.7	91%
$PM_{2.5}$	24-hour	25	18.7	75%	20.3	81%
	1-year[2]	8	8.2	103%	8.4	105%

Tables notes:

[1] Bagasse and fuel oil co-firing occurs infrequently and for short periods and, consequently, these results represent a conservative overestimate

[2] Annual average concentrations have assumed sugar mill operations for six months of the year

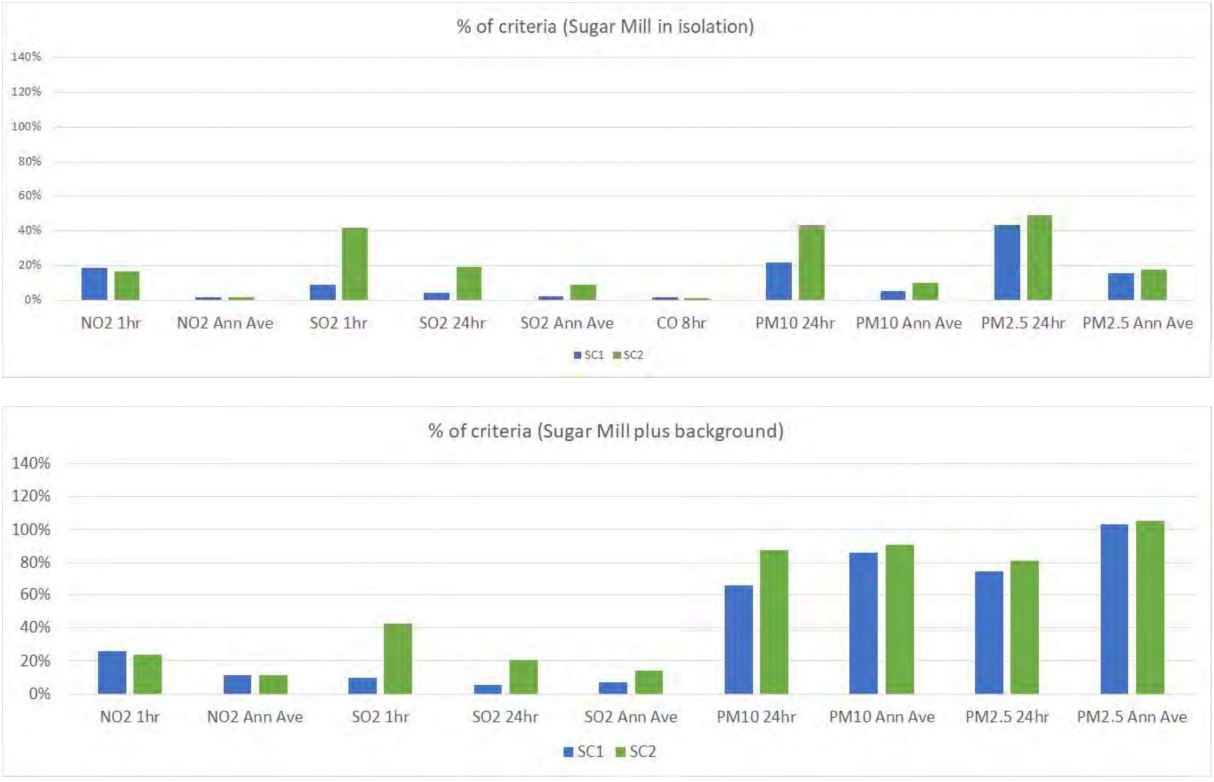


Figure 7 **Maximum concentrations of key pollutants emitted by the Mulgrave Sugar Mill in the Gordonvale township as a percentage of the air quality objective**

7.2 Upset conditions

Figure 8 and Figure 9 present a comparison of maximum short-term concentrations of air pollutants during routine operations and the upset conditions. These plots show the following:

- During routine operations, the highest 1-hour average concentrations of air pollutants occur at the south-western edge of the township, approximately 2.5km from the stack. This is likely to be due to the plume interacting with higher elevation terrain.
- At lower exit velocities, the plume does not disperse as well and comes to ground in closer proximity to the stack. The maximum 1-hour average ground-level concentrations of air pollutants occur within the central part of the township, approximately 1-2km from the stack.
- For 24-hour average concentrations, the reduced plume velocity results in an area of elevated concentration to the west of the golf club (approximately 500m - 1km west of the stack) and immediately west (<500m) of the stack and further north towards the boundary of the township.
- There are no scenarios where highest ground-level concentrations occur to the north of the stack.

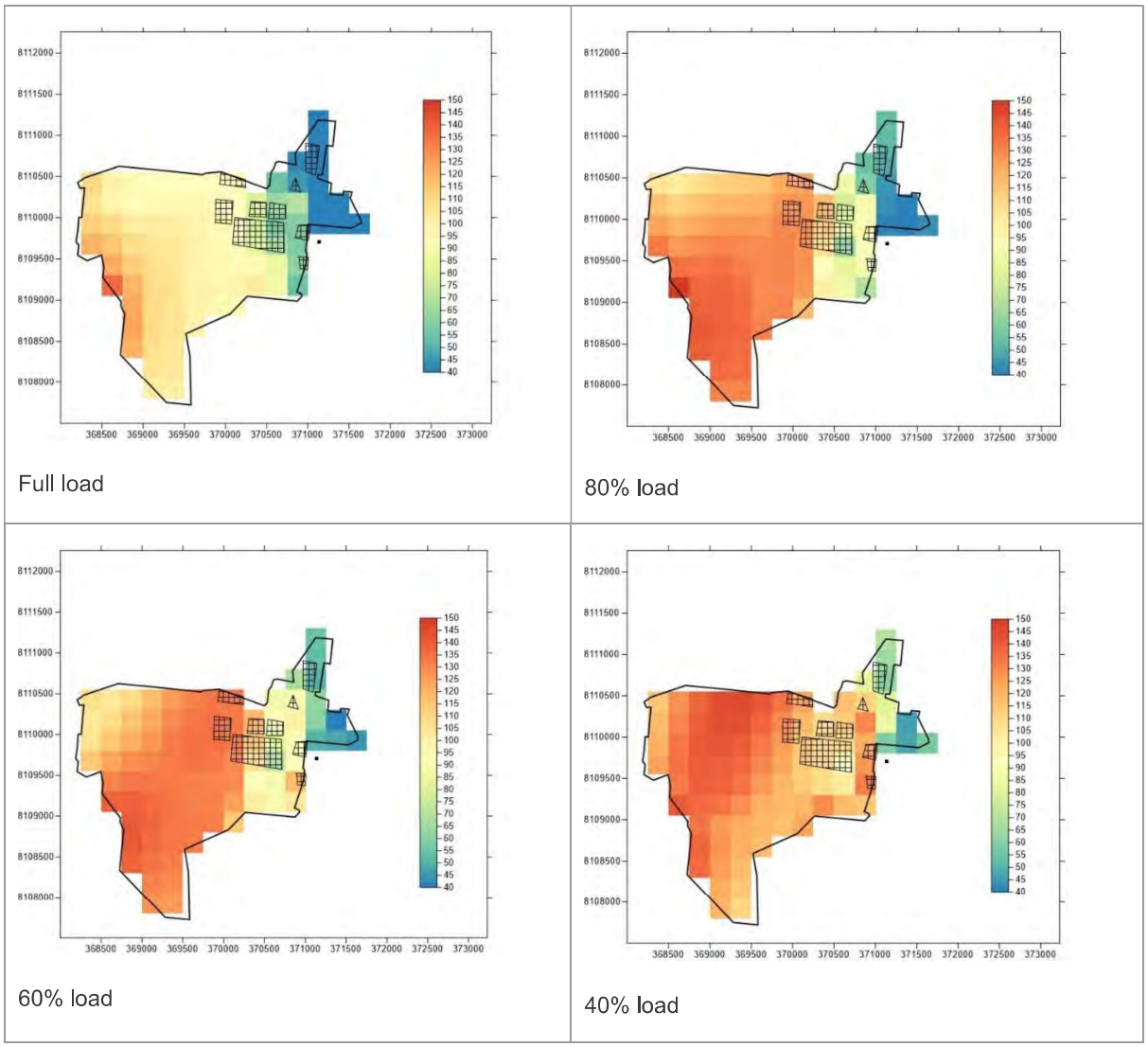


Figure 8 **Comparison of maximum 1-hour average ground-level concentrations during routine and upset conditions**

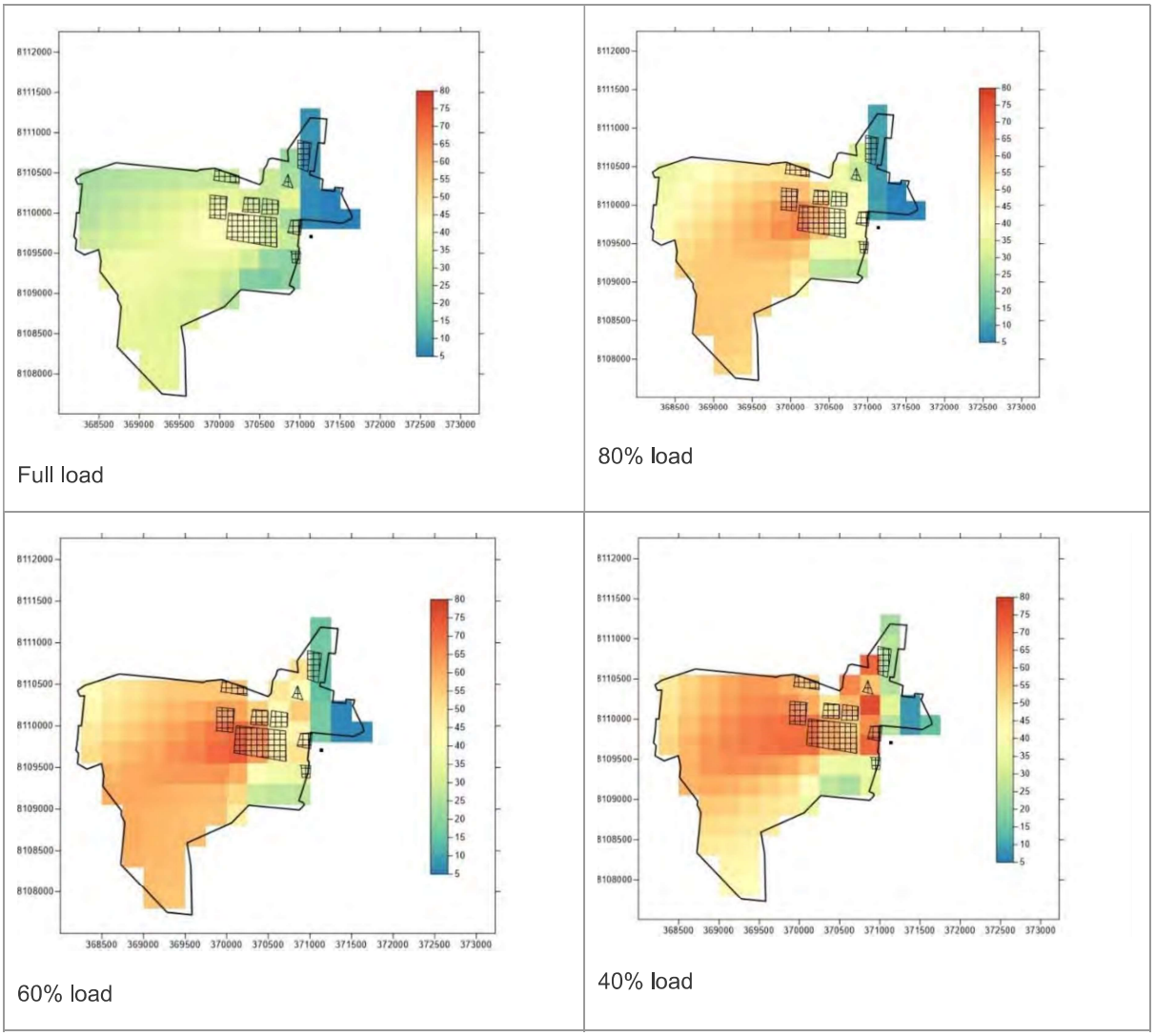


Figure 9 **Comparison of maximum 24-hour average ground-level concentrations during routine and upset conditions**

8. MONITORING RECOMMENDATIONS

Based on the results of dispersion modelling, the following recommendations should be considered in preparing the ambient monitoring program:

- Stack testing should include determination of particulate matter size distribution (including particles less than 10 µm and 2.5 µm). In addition, stack testing should include SO_2 during boiler firing with waste oil. Particulate samples should also be analysed to determine the portion of heavy metals, particularly cadmium and nickel.
- The most critical air pollutant emitted from the MCM boiler is $PM_{2.5}$ and, hence, should be the focus of ambient air quality monitoring. There is no additional value obtained by monitoring for PM_{10}.
- Ambient monitoring should be conducted at a central location where complaints have been received, or near where complaints have been received. A location at or near the Golf Course/Turf Club, Alley Park or the Gordonvale State School or Gordonvale State High School would be suitable based on the dispersion modelling results.
- The modelling does not identify any monitoring locations that are likely to be better than the central one discussed above.

9. REFERENCES

DES, 2019, *Queensland air monitoring 2018, National Environment Protection (Ambient Air Quality) Measure*, prepared by Air Quality Monitoring, Department of Environment and Science, June 2019.

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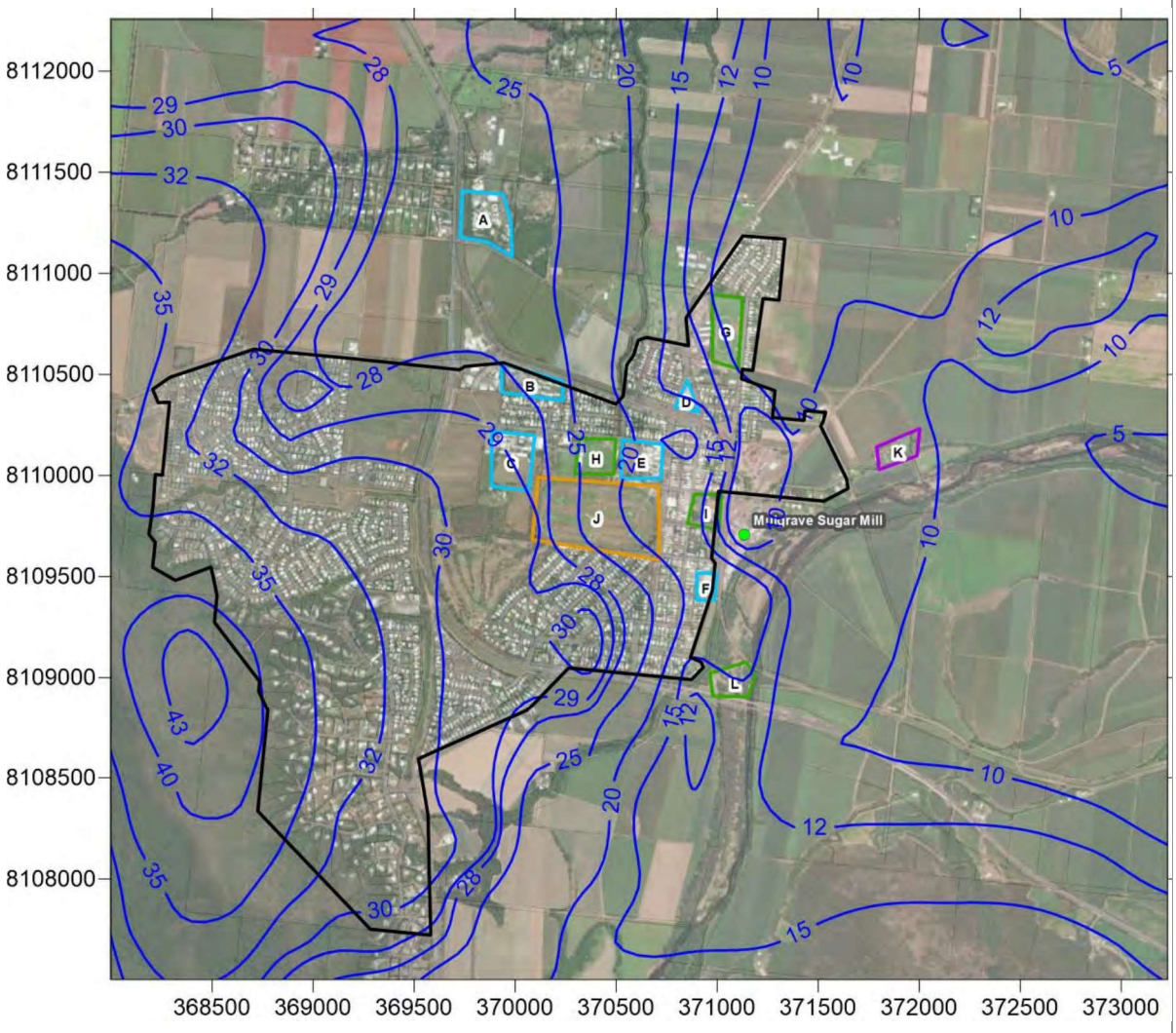


Plate 1 **Scenario 2 – Maximum 1-hour NO_2 concentration due to the Mulgrave Sugar Mill in isolation**

Location:	**Averaging period:**	**Data source:**	**Units:**
Gordonvale, Queensland	1-hour	TAPM	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	250 µg/m^3	Padraig McDowell	August 2021

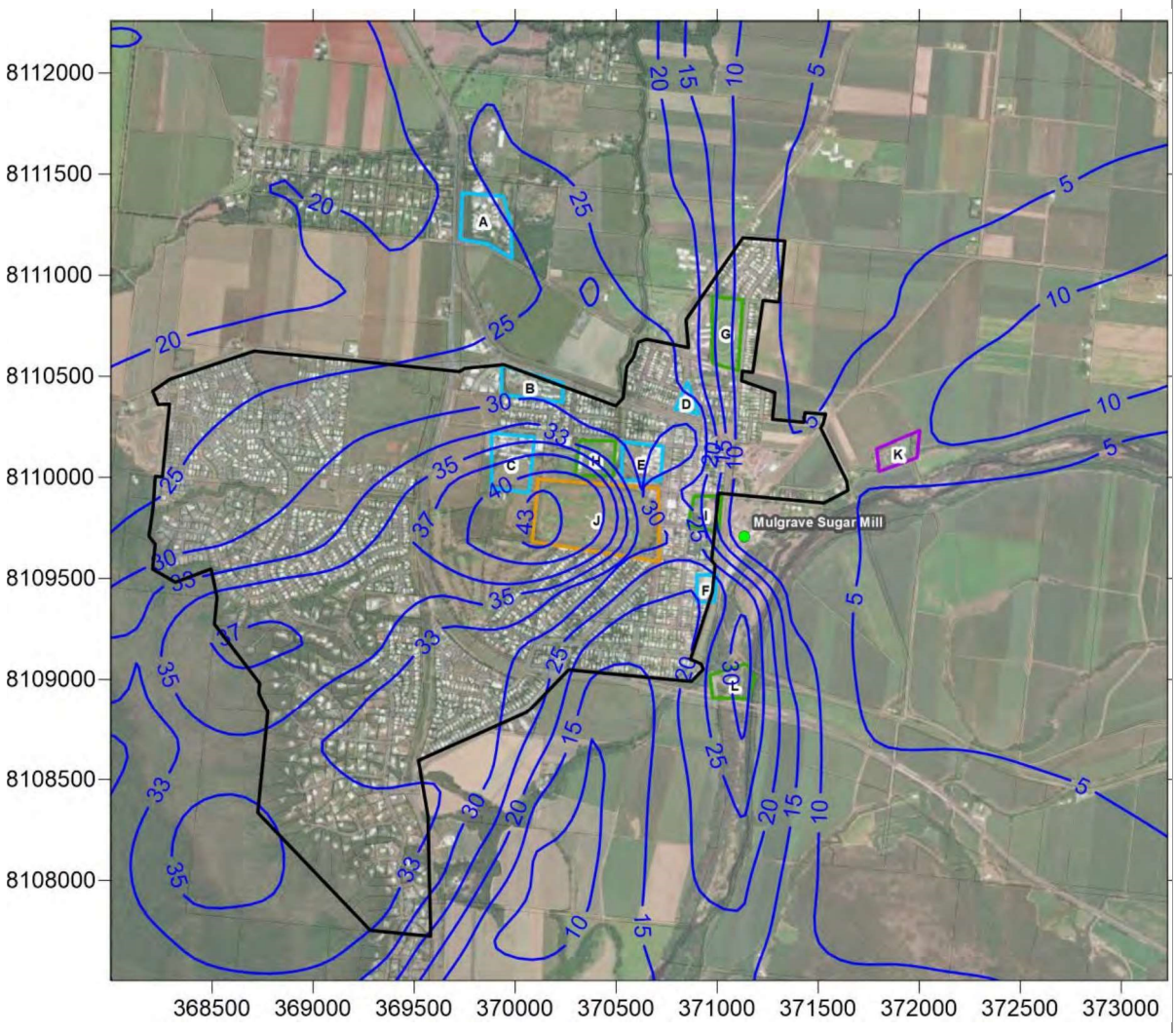


Plate 2 **Scenario 2 – Maximum 24-hour SO_2 concentration due to the Mulgrave Sugar Mill in isolation**

Location:	**Averaging period:**	**Data source:**	**Units:**
Gordonvale, Queensland	24-hour	TAPM	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	250 µg/m^3	Padraig McDowell	August 2021

APPENDIX A METEOROLOGICAL AND DISPERSION MODELLING METHODOLOGY

A1 TAPM METEOROLOGY

TAPM was configured as follows:

- 1 January 2019 to 31 December 2019 modelled
- 50 x 50 grid point domain with an outer grid of 20 km and nesting grids of 10 kilometres, 3 kilometres, and 1 kilometre.
- Grid centred approximately 6km north of the MCM site, to include the BoM monitoring site at Cairns Racecourse in the 1km domain.
- Geoscience Australia 9-second digital elevation model terrain data.
- Default land use data edited for consistency with aerial imagery.
- 25 vertical grid levels.
- Advanced options set to default, except for the model advection and gravity-wave time-step, which was set to 0.67 to avoid numerical instability.
- No data assimilation.

A2 COMPARISON OF TAPM OUTPUT WITH OBSERVATIONAL DATA

The model validation in the following sections compares observational meteorological data with data derived from running TAPM.

Table A1 presents statistical comparisons of TAPM output (wind speed and temperature) at the MCM site to meteorological data recorded by the BoM monitoring station at the Cairns Racecourse. Figure A1 shows probability density functions that graphically compare statistical distributions of meteorological parameters between the TAPM output and observational data. The TAPM output was extracted from the closest inner grid point to the location of the automatic weather station.

The following statistical measures of model accuracy are presented in the tables.

The mean bias, which is the mean model prediction minus the mean observed value. Values of the mean bias close to zero show good prediction accuracy.

The root mean square error (RMSE), which is the standard deviation of the differences between predicted values and observed values. The RMSE is non-negative and values of the RMSE close to zero show good prediction accuracy. The RMSE is given by

$$\mathrm{RMSE} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)^2}$$

Where:

N is the number of observations

P_i are the hourly model predictions

O_i are the hourly observations.

The index of agreement (IOA), which takes a value between 0 and 1, with 1 indicating perfect agreement between predictions and observations. The IOA is calculated following a method described in Willmott (1982), using the equation

$$\mathrm{IOA} = 1 - \frac{\sum_{i=1}^{N}(P_i - O_i)^2}{\sum_{i=1}^{N}(|P_i - O_{mean}| + |O_i - O_{mean}|)^2}$$

Where:

N is the number of observations

P_i are the hourly model predictions

O_i are the hourly observations

O_{mean} is the observed observation mean.

With the exception of the bias for temperature, the predicted wind speeds and temperatures are within the benchmark values (Table A1). The probability density functions (Figure 10) illustrate reasonable agreement between predicted and observed meteorological data. It should also be noted that meteorological data will be gathered at the MCM site over the coming 12 months, and this data can be incorporated into TAPM to improve the dataset, if appropriate, at a later date.

Table A1 A comparison of the observed meteorological data with the first-level TAPM output

Statistic	"Good" value	Wind speed			Temperature		
		Benchmark	Observational data	TAPM	Benchmark	Observational data	TAPM
Mean	-	-	2.9	2.6	-	24.0	25.1
Standard deviation	-	-	1.7	1.3	-	4.2	3.1
Minimum	-	-	0.0	0.0	-	8.5	17.3
Maximum	-	-	8.4	7.0	-	39.0	36.8
Bias	0	<+-0.5	0.3		<+-0.5	1.1	
Root mean square error (RMSE)	Close to 0	<2	1.29		-	2.41	

Statistic	"Good" value	Wind speed			Temperature		
		Benchmark	Observational data	TAPM	Benchmark	Observational data	TAPM
Index of agreement	Close to 1	>0.6	0.80		>=0.8	0.89	

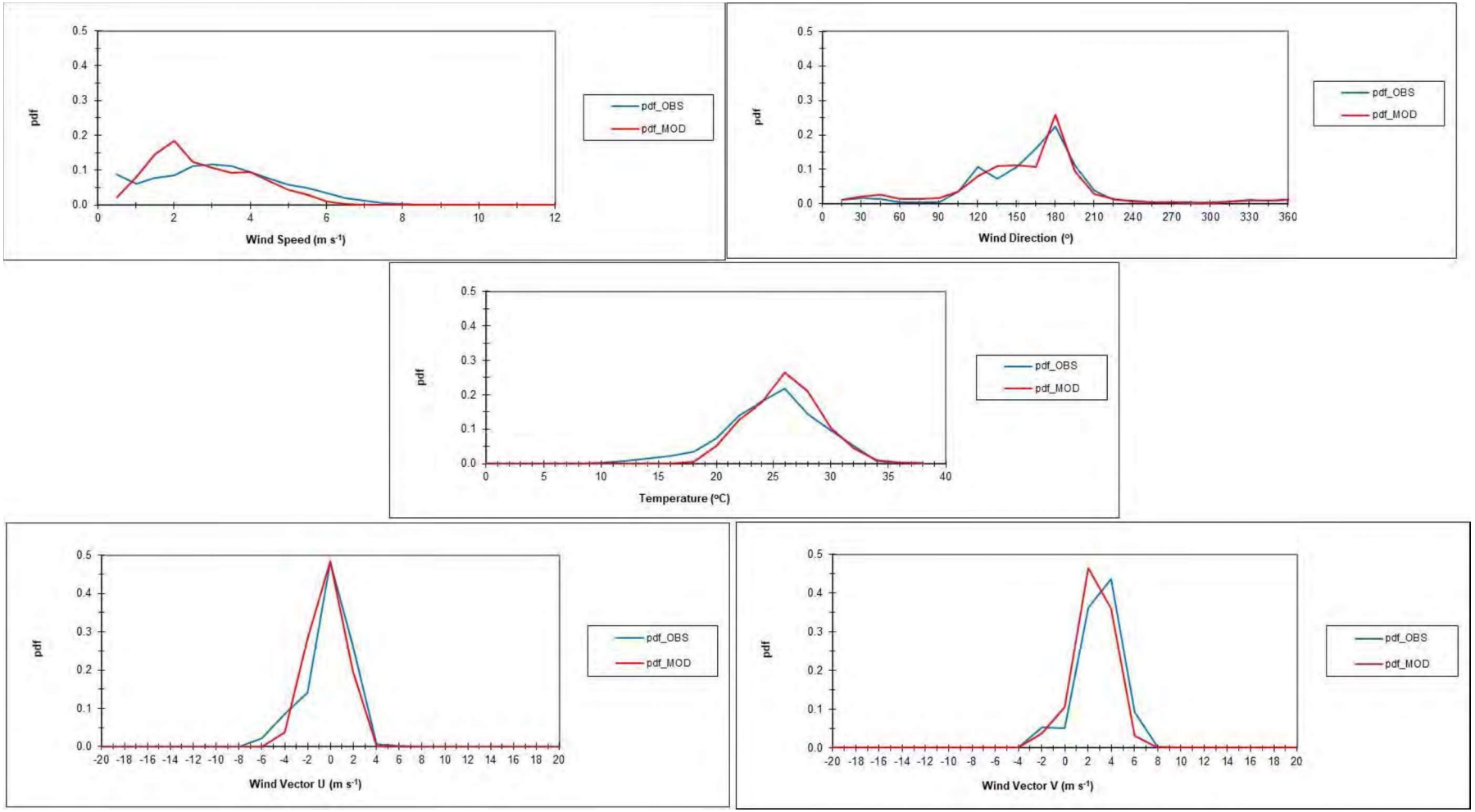


Figure 10 **Probability distribution functions comparing TAPM with BoM observations at the Cairns Racecourse**

A3 TAPM POLLUTION

TAPM Pollution was configured as follows:

- 1 Tracer (TR1) ($\mu g/m^3$) with no chemistry
- Unit emission rate modelled constantly for the entire year
- 65 x 75 pollution grid point domain with 250m grid spacing
- Source representation using Eulerian grid and Lagrangian near-source
- Model advection and gravity-wave time-step adjusted for one month to assist resolving numerical instability
- All other options set as default.

Final Dispersion Modelling Assessment of Mulgrave Sugar Mill

Prepared for:

CQ Group Pty Ltd

January 2023

Final

Prepared by:

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Glossary

Term	Definition
µg/m^3	micrograms per cubic metre
µm	microns
°	degrees
°C	degrees Celsius
g/s	grams per second
km	kilometres
m	metres
m/s	metres per second
m^2	square metres
m^3	cubic metres
m^3/s	cubic metres per second
Nomenclature	**Definition**
CO	carbon monoxide
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
PM_{10}	particulate matter with a diameter less than 10 micrometres
$PM_{2.5}$	particulate matter with a diameter less than 2.5 micrometres
SO_2	sulfur dioxide
Abbreviations	**Definition**
AHD	Australian Height Datum
Air EPP	Environmental Protection (Air) Policy 2019
Air NEPM	National Environmental Protection (Ambient Air Quality) Measure
ASMC	Australian Sugar Mill Council
BoM	Bureau of Meteorology
DES	Department of Environment and Science
EA	Environmental Authority
EP Act	*Environmental Protection Act 1994*
EPA	Environment Protection Authority
NPI	National Pollutant Inventory
QLD	Queensland
TAPM	The Air Pollution Model

EXECUTIVE SUMMARY

Katestone was commissioned by the Mulgrave Central Mill Company Pty Ltd to undertake updated dispersion modelling of emissions from the Mulgrave Central Mill located at 47 Gordon Street, Gordonvale. The revised modelling is an update to the preliminary modelling conducted in 2021 and incorporates into the modelling the results of stack test monitoring and meteorological monitoring carried out at the site.

This assessment has been conducted as part of the Mulgrave Central Mill Air Quality Monitoring Program and is to be included in the Environment Report that is required as per Requirement 4 of the Notice to Conduct or Commission an Environmental Evaluation issued by the Department of Environment and Science on 9 June 2021. The assessment has included:

- Emissions and stack characteristics configured using the results of point source (stack test) monitoring conducted on the boiler stack during routine operations
- TAPM meteorological and dispersion modelling for the October 2021 to September 2022 period incorporating meteorological monitoring data from the onsite meteorological monitoring station for this period
- An evaluation of predicted maximum ground-level pollutant concentrations to occur within the Gordonvale township against the relevant air quality criteria

The dispersion modelling carried out has predicted no exceedances of the air quality objectives from the Environmental Protection (Air) Policy 2019 in any scenario, despite adopting worst-case emissions assumptions (using the maximum emission rates measured from multiple samples for each pollutant).

Maximum contributions to 24-hour average concentrations of PM_{10} and $PM_{2.5}$ as a result of emissions from the mill constitute no more than 15% of the objective when firing bagasse only and no more than 46% of the objective when firing bagasse and waste oil.

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by the Mulgrave Central Mill Company Pty Ltd to undertake updated TAPM air dispersion modelling of emissions from the Mulgrave Central Mill (MCM) located at 47 Gordon Street, Gordonvale, Queensland. Katestone prepared a preliminary dispersion modelling assessment of emissions from the Mill in September 2021 (Katestone Deliverable No. D21005-2) (Katestone, 2021).

1.1 Background

The MCM operates under environmental authority EPPR00390613 (EA). The facility receives and crushes sugar cane, processes the extracted juice to create sugar, and burns the residual fibrous product (bagasse) to create steam for factory use and to generate electricity.

The Department of Environment and Science (DES) issued MCM with a Notice to Conduct or Commission an Environmental Evaluation (EE Notice) on 9 June 2021. The EE Notice states that DES considers MCM the likely cause of smoke emissions that caused complaints about odour and health effects on some occasions during June 2020. In response, an Air Quality Monitoring Plan (AQMP) was prepared.

Katestone completed a preliminary air quality dispersion modelling study in September 2021 that was required by Section 6.1 of the Mulgrave Central Mill Air Quality Monitoring Program (Rev 2A, 9 July 2021) (Air Quality Monitoring Plan). The preliminary study was conducted to further inform stack and ambient monitoring programs by identifying contaminants of potential concern against the respective ambient air quality objectives.

In accordance with the AQMP and using the results of the preliminary dispersion modelling, MCM conducted the following at the site:

- Installation of a site-specific meteorological monitoring station and collection of (a minimum of) 12 months of data over the EE Notice period (including during crush and non-crush seasons), sited and operated in accordance with AS/NZS 3580.1.1 (Methods for sampling and analysis of ambient air: Guide to siting air monitoring equipment)
- Point source (stack test) monitoring during normal operating conditions
- Ambient air monitoring of PM_{10} and $PM_{2.5}$ at locations in the Gordonvale township

Katestone has been commissioned by MCM to utilise the stack testing results and on-site meteorological data to conduct a final TAPM air dispersion modelling assessment to be included in the Environment Report that is required as part of Requirement 4 of the EE Notice. Katestone has also given consideration to the results of the ambient air monitoring of PM_{10} and $PM_{2.5}$ in discussing the results of the dispersion modelling.

1.2 Scope of work

The final TAPM dispersion modelling includes the following:

- Review of relevant legislative requirements relating to air quality
- Review of existing environment including local terrain and land use, proximity of nearby sensitive receptors, and existing ambient air quality
- Compilation of emissions inventories and exhaust characteristics, considering MCM's National Pollutant Inventory reports for recent years, historical and recent stack test data from the site, fuel oils specification, and operational records of bagasse and fuel oil feed rates
- TAPM meteorological modelling and characterisation of site meteorology

- TAPM dispersion modelling for routine operations using bagasse only and a combination of bagasse and fuel oil
- Evaluation of predicted maximum ground-level pollutant concentrations to occur within the Gordonvale township with the relevant air quality criteria

2. LEGISLATIVE FRAMEWORK FOR AIR QUALITY

The Environmental Protection Act 1994 (EP Act) provides for the management of the air environment in Queensland. The EP Act gives the Department of Environment and Science (DES) the power to create Environmental Protection Policies that identify, and aim to protect, environmental values of the atmosphere that are conducive to the health and well-being of humans and biological integrity. The Environmental Protection (Air) Policy (Air EPP) was made under the EP Act and gazetted in 1997; the Air EPP was revised and reissued in 2019.

The objective of the Air EPP is to identify the environmental values of the air environment to be enhanced or protected and to achieve the objective of the Environmental Protection Act 1994, i.e., ecologically sustainable development.

The environmental values to be enhanced or protected under the Air EPP are the qualities of the environment that are conducive to:

- protecting health and biodiversity of ecosystems
- human health and wellbeing
- protecting the aesthetics of the environment, including the appearance of building structures and other property
- protecting agricultural use of the environment.

The administering authority must consider the requirements of the Air EPP when it decides an application for an environmental authority, amendment of a licence or approval of a draft environmental management plan. Schedule 1 of the Air EPP specifies air quality indicators and objectives for a number of contaminants that may be present in the air environment.

The Air EPP air quality objectives relevant to the key air pollutants that may be generated from the Project and are relevant for the protection of health and wellbeing are presented in Table 1. Chromium is not identified in the Air EPP. Consequently, the Ontario Ministry of the Environment, Conservation and Parks (May 2020) Ambient Air Quality Criteria has been used for chromium.

Air quality objectives for the health and biodiversity of ecosystems or for protecting agriculture have not been considered here, as they are not relevant to the nature of complaints regarding smoke nuisance detailed in the EE Notice.

Table 1 Ambient air quality objectives

Pollutant	Environmental value	Averaging period	Air quality objective (µg/m³)	Number of days of exceedance allowed per year
NO_2	Health and wellbeing	1-hour	250	1
		1-year	62	N/A
SO_2	Health and wellbeing	1-hour	570	1
		24-hour	229	1
		1-year	57	N/A
CO	Health and wellbeing	8-hour	11,000	N/A
PM_{10}	Health and wellbeing	24-hour	50	N/A
		1-year	25	N/A
$PM_{2.5}$	Health and wellbeing	24-hour	25	N/A
		1-year	8	N/A
Cadmium	Health and wellbeing	1-year	0.005	N/A
Chromium*	Health and wellbeing	24-hour	0.5	N/A
Lead	Health and wellbeing	1-year	0.5	N/A
Nickel	Health and wellbeing	1-year	0.02	N/A

Table note:

* Ontario Ministry of the Environment, Conservation and Parks (May 2020) *Ambient Air Quality Criteria*. All other criteria are sourced from the Air EPP.

3. EXISTING ENVIRONMENT

3.1 Local terrain and land use

MCM is located on the eastern edge of the Gordonvale township, approximately 400m from residential areas and 14km inland from the coast. The township and surrounding horticultural activities, predominantly sugar cane growing, are located in a low-lying valley bordered by significant ranges to the southwest and northeast (Figure 1). Directly to the southwest of the township, terrain rises significantly by over 300m within 1km. To the east, an increase in elevation of approximately 1km separates the valley from the coast.

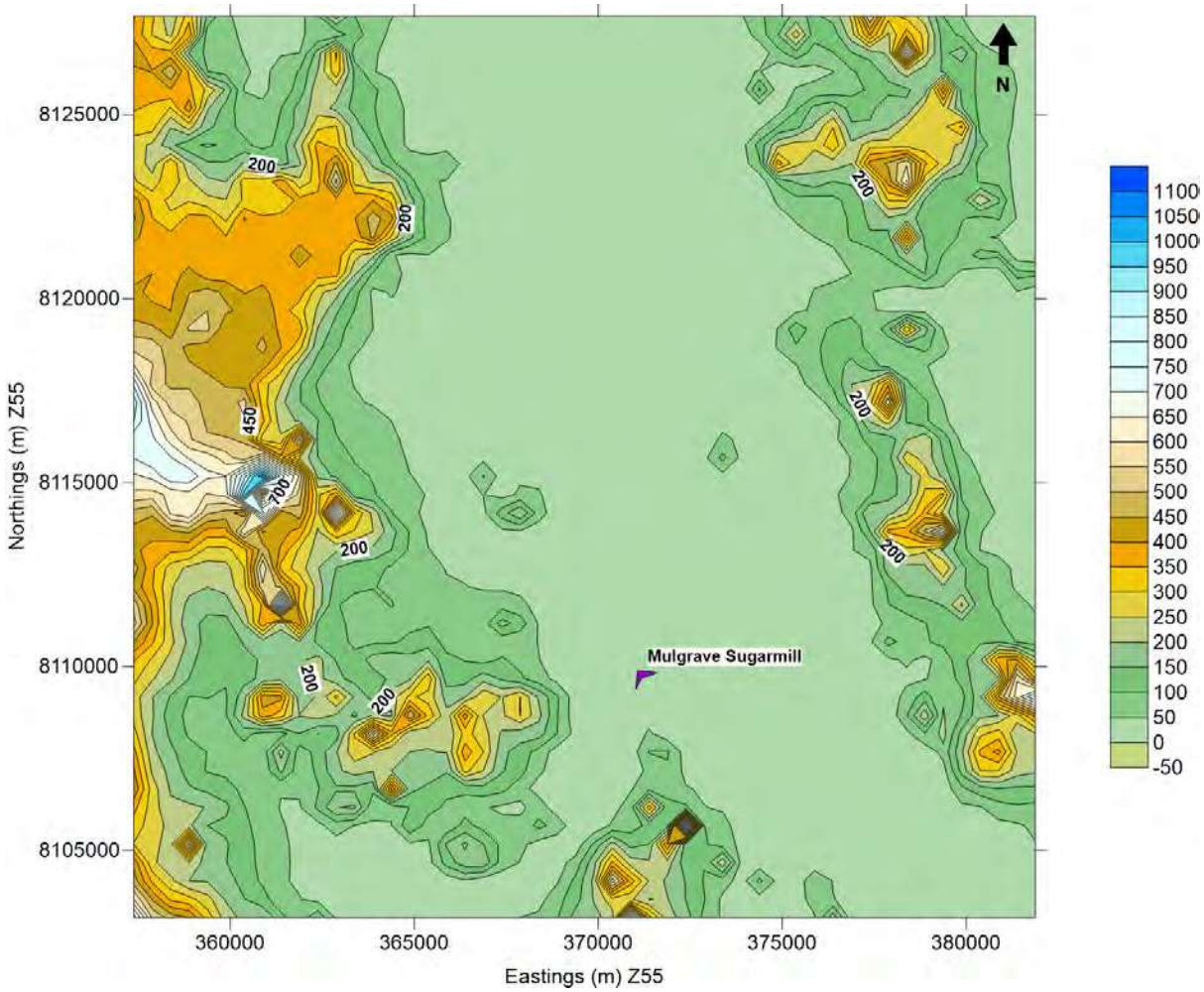


Figure 1 Terrain in the vicinity of the MCM

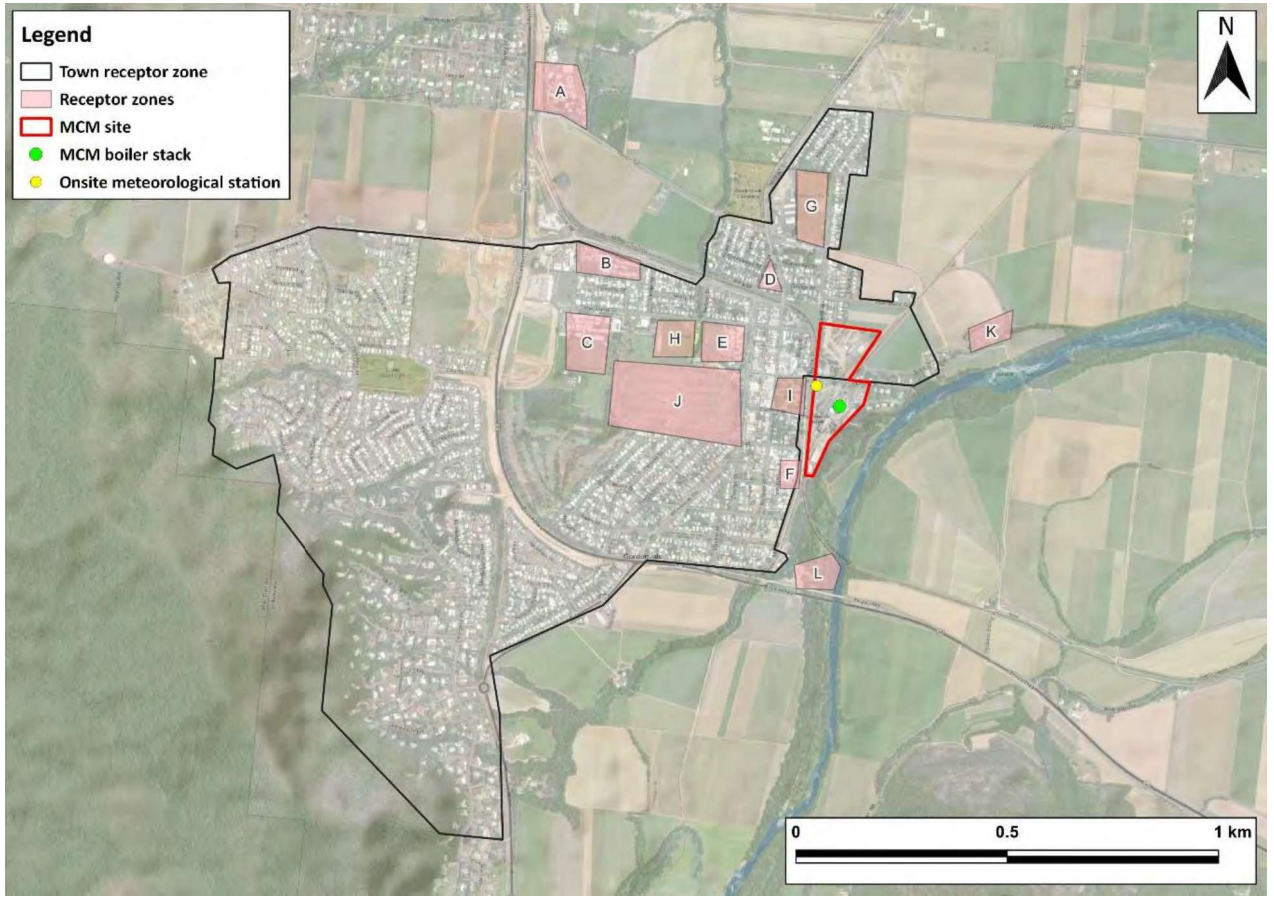
3.2 Sensitive receptors

Sensitive places in the vicinity of MCM identified in the AQMP have been reproduced in Table 2 and Figure 2. For reference, the EE Notice notes that complaints were received from the following locations:

- Front of the Turf Club and Gordonvale State School, located on George Street
- Front of Pyramid Residential Care Centre, located on Cairns Road
- Gordonvale CBD.

Table 2 Key sensitive receptors in the vicinity of MCM

Sensitive place type	Sensitive place	Distance and direction from mill stack
Residential – permanent	Residential zoning	~ 400 m N
	Pyramid Residential Care Centre	~ 1.3 km NW
Residential – temporary	Greenpatch camping grounds	~ 800 m S
	Great Northern Hotel	~ 320 m WNW
	The Gordonvale Hotel	~ 330 m W
School	Gordonvale State School	~ 500 m NW
	Gordonvale State High School	~ 1.2 km WNW
	Djarragun College (incl boarding)	~ 1.8 km NW
	St Michael's School	~ 300 m SW
Hospital	Gordonvale Memorial Hospital	~ 700 m NNW
Protected area	Great Barrier Reef Region	~ 15 km E
	Wet Tropics of Queensland	~ 5km W
	Malbon Thompson Forest Reserve	~ 10km E
	Grey Peaks National Park	~ 9km NE
Public park or garden	Norman Park	~ 200 m W
	Johnson Park	~ 800m N
	Alley Park	~ 800m NW
	Gordonvale Turf Club and Golf Course	~ 500 m W



KEY NOTES:

- MCM site denoted by red outline and boiler stack by green circle

Key community locations identified by letter reference as per below.

A	Djarragun College (& boarding school)	C	Gordonvale State High School	E	Gordonvale State School	G	Johnson Park	I	Norman Park	K	Gordonvale Wastewater Treatment Plant
B	Pyramid Residential Care Centre	D	Gordonvale Memorial Hospital	F	St Michael's School	H	Alley Park	J	Gordonvale Turf Club & Golf Course	L	Greenpatch camping grounds

Figure 2 Key sensitive receptors in the vicinity of MCM

3.3 Existing ambient air quality

The nearest DES ambient air quality monitoring stations are located in Townsville. The North Ward monitoring station is located furthest from the industrial activities in Townsville and is, therefore, the most suitable to provide background data representative of locations with minimal industrial influence, noting that the intention is to use background concentrations representative of Gordonvale without any contribution from MCM. Whilst the North Ward station is situated in a residential area, it is likely to be influenced to a greater degree by major roads and industrial activities (including port operations and metals processing) than any location in Gordonvale. Consequently, the North Ward data can be expected to provide a conservative overestimate of ambient background concentrations in Gordonvale.

The North Ward monitoring station measures ambient concentrations of nitrogen dioxide (NO_2), sulfur dioxide (SO_2), PM_{10} and $PM_{2.5}$, but does not monitor carbon monoxide (CO). Data from the North Ward site for the 2017 to 2020 period has been used to characterise ambient background levels of these pollutants and to determine concentrations for use in the assessment. A summary of this data is provided in Table 3.

Particulate levels reported during the 2019 year were unusually high and not representative of normal conditions, with DES reporting that, during this year, all exceedances of PM_{10} were due to dust storms/region-wide dust events during extremely dry conditions, and all exceedances of $PM_{2.5}$ were due to dust storms and bushfires (DES, 2020). Consequently, 2019 measurements of PM_{10} and $PM_{2.5}$ were excluded from the summary and representative ambient background concentrations for the assessment were based on the second highest year.

Representative ambient background levels of NO_2 and SO_2 were determined using monitoring data cross the full 2017 to 2020 period.

Table 3 Summary of background concentrations used in the assessment

Pollutant	Averaging period	Value	Source
PM_{10}	24-hour	18.3	Highest 70th percentile from 2017, 2018 and 2020
	Annual	16.2	Highest annual average from 2017, 2018 and 2020
$PM_{2.5}$	24-hour	6.6	Highest 70th percentile from 2017, 2018 and 2020
	Annual	5.8	Highest annual average from 2017, 2018 and 2020
NO_2	1-hour	6.2	Highest 70th percentile from 2017, 2018, 2019 and 2020
	Annual	5.3	Highest annual average from 2017, 2018, 2019 and 2020
SO_2	1-hour	2.9	Highest 70th percentile from 2017, 2018, 2019 and 2020
	24-hour	2.2	Highest 70th percentile from 2017, 2018, 2019 and 2020
	Annual	1.5	Highest annual average from 2017, 2018, 2019 and 2020

4. DISPERSION MODELLING METHODOLOGY

4.1 Emissions estimation

Emission rates and exhaust characteristics were compiled by considering:

- MCM's National Pollutant Inventory reports for recent years
- Historical and recent stack test data from the site
- Fuel oils specification
- Operational records of bagasse and fuel oil feed rates
- Parameters used in Katestone's preliminary dispersion modelling assessment (Katestone, 2021).

The fuel feed rates for the routine scenarios have been selected to represent likely worst-case emissions due to full load operation.

Air quality impacts associated with upset conditions determined in the preliminary air dispersion modelling assessment (Katestone 2021) provide anticipated worst-case impacts associated with upset operations. The results presented in the previous report are still valid and should approximate the impacts under reduced load operations, thus it is not considered necessary to revisit upset conditions in this report.

4.2 TAPM meteorological and dispersion modelling

Meteorological modelling of the region was conducted using the TAPM model, with data recorded at the onsite MCM meteorological monitoring station assimilated into the model to improve the model's predictions at the site.

The TAPM model was also used for dispersion modelling. Twelve months of meteorological data generated in TAPM was used as input for the pollution model to include all weather conditions likely to be experienced in the region during a typical year. The modelling has been used to predict ground-level concentrations of key pollutants across a Cartesian grid and at sensitive locations in the Gordonvale township.

Details of model configuration are provided in Appendix A.

4.3 Cumulative impacts

To evaluate the potential impacts of the mill on the surrounding environment, representative ambient levels of air pollutants been added to dispersion modelling predictions where representative background concentrations were available. These levels are discussed in Section 3.3.

5. METEOROLOGY

The following sections describe the meteorology in the vicinity of the MCM, focusing on parameters that are important for dispersion of air pollutants. The summary is based on the updated TAPM meteorological data for the site, generated using the assimilation of the onsite MCM meteorological data for the October 2021 to September 2022 period.

5.1 Wind speed and wind direction

Figure 3, Figure 4 and Figure 5 show the annual, seasonal, and diurnal distribution of winds predicted by TAPM at the MCM site. The winds in the area appear to be influenced by the local terrain features, with a high frequency of winds occurring from both the southeast and southwest. South-easterly winds align with the low-lying valley in which the MCM and Gordonvale township are located. These winds occur during the day and are the dominant wind direction during the afternoon (midday – 6pm), and during these conditions the Gordonvale township would be downwind of the MCM. South-westerlies are common at all times except during the afternoon; however, they are most frequent between midnight and 6am, and during winter. The south-westerlies are also characterised by very light wind speeds (predominantly < 2 m/s). These are likely to be drainage flows from the ranges to the southwest.

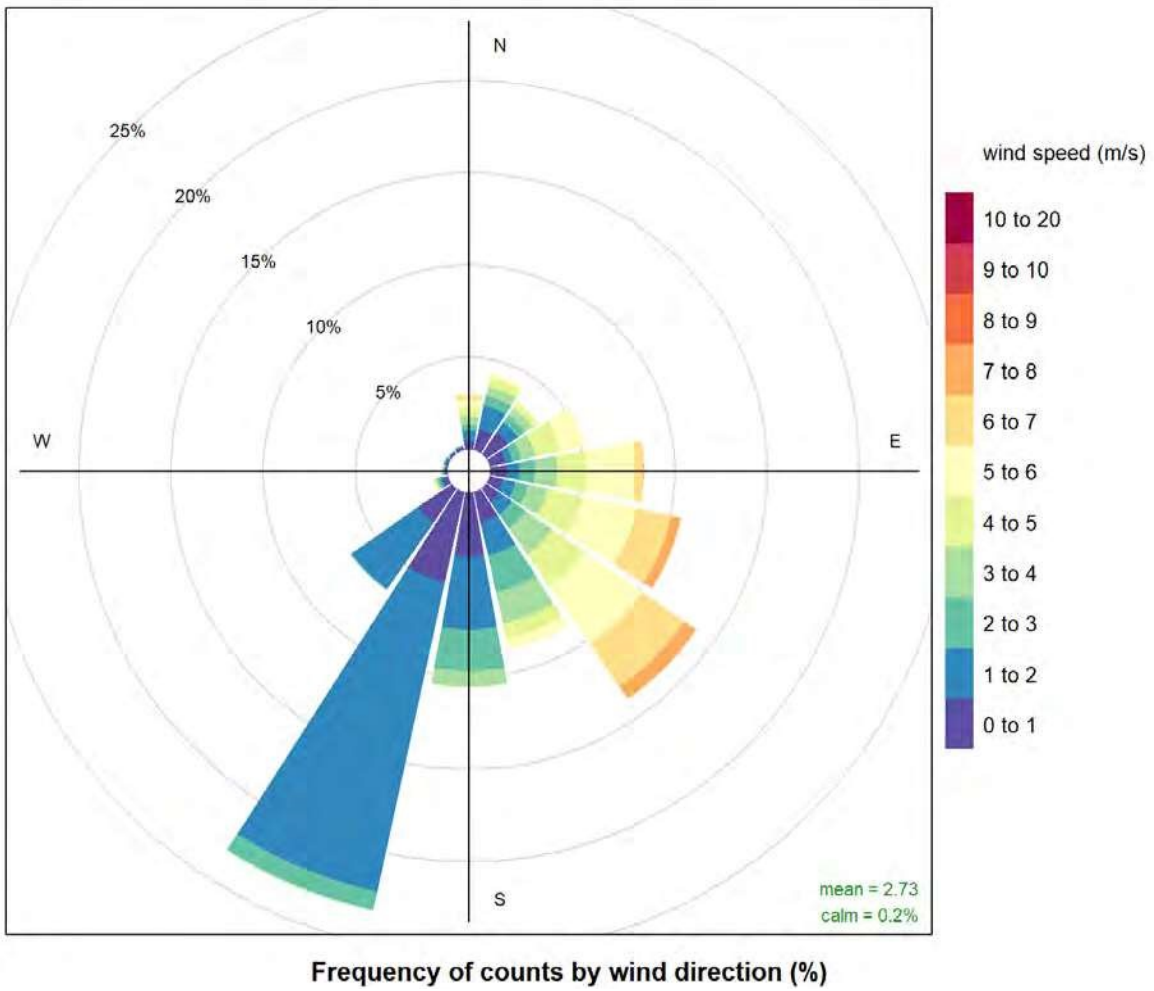


Figure 3 Wind distribution in the vicinity of MCM (as generated by TAPM)

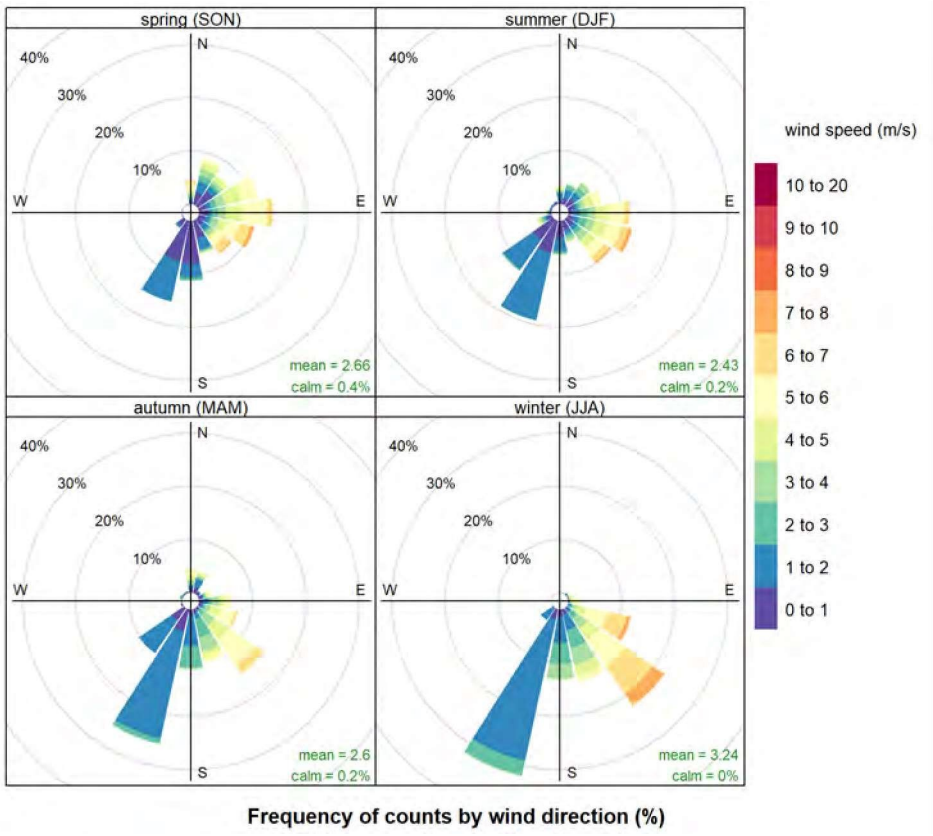


Figure 4 Seasonal wind distribution in the vicinity of MCM (as generated by TAPM)

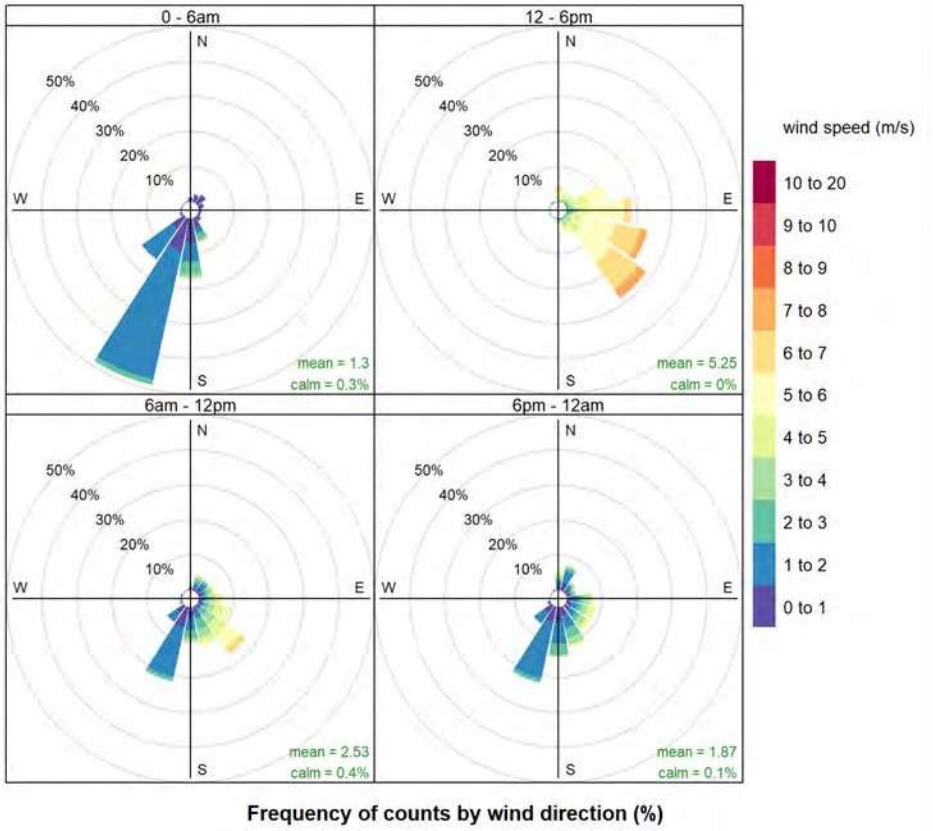


Figure 5 Diurnal wind distribution in the vicinity of MCM (as generated by TAPM)

5.2 Atmospheric stability

Stability classification is a measure of the stability of the atmosphere and can be determined from wind measurements and other atmospheric observations. The stability classes range from A Class, which represents very unstable atmospheric conditions that may typically occur on a sunny day, to F Class stability which represents very stable atmospheric conditions that typically occur during light wind conditions at night. Unstable conditions (Classes A to C) are characterised by strong solar heating of the ground that induces turbulent mixing in the atmosphere close to the ground. This turbulent mixing is the main driver of dispersion during unstable conditions. Dispersion processes for Class D conditions are dominated by mechanical turbulence generated as the wind passes over irregularities in the local surface. During the night, the atmospheric conditions are generally stable (often Classes E and F).

Figure 6 shows the distribution of stability classes at the MCM site extracted from the TAPM dataset, where Class A represents the most unstable conditions and Class F represents the most stable. Neutral (D class) conditions are present throughout the day, comprising 46% of total time. Slightly unstable (Class C) conditions comprise 26% of total time, while stable (Class E) and very stable (Class F) conditions comprise 11% and 9% of total time, respectively, and only occur between 7pm and 7am.

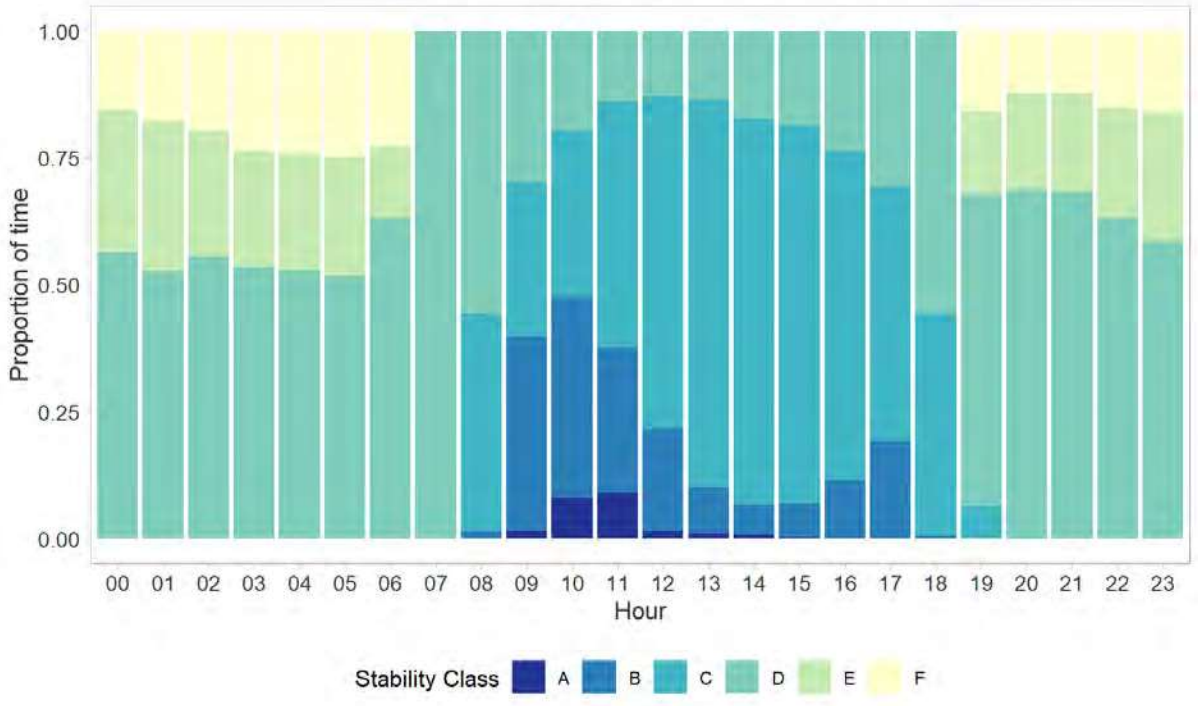


Figure 6 Frequency distribution of atmospheric stability conditions at the MCM site (predicted by TAPM)

5.3 Mixing height

The mixing height refers to the height above ground within which particulates or other pollutants released at or near ground can mix with ambient air. During stable atmospheric conditions, the mixing height is often quite low and particulate dispersion is limited to within this layer. During the day, solar radiation heats the air at the ground level and causes the mixing height to rise. The growth of the mixing height is dependent on how well the air can mix with the cooler upper-level air and therefore depends on meteorological factors such as the intensity of solar radiation and wind speed. During strong wind speed conditions, the air will be well mixed, resulting in a high mixing height.

Mixing height information for the project has been extracted from the TAPM simulation and is presented in Figure 7. The mixing height develops around 8 am, increases to a peak in the early afternoon before descending between 3 pm and 6 pm to an overnight low.

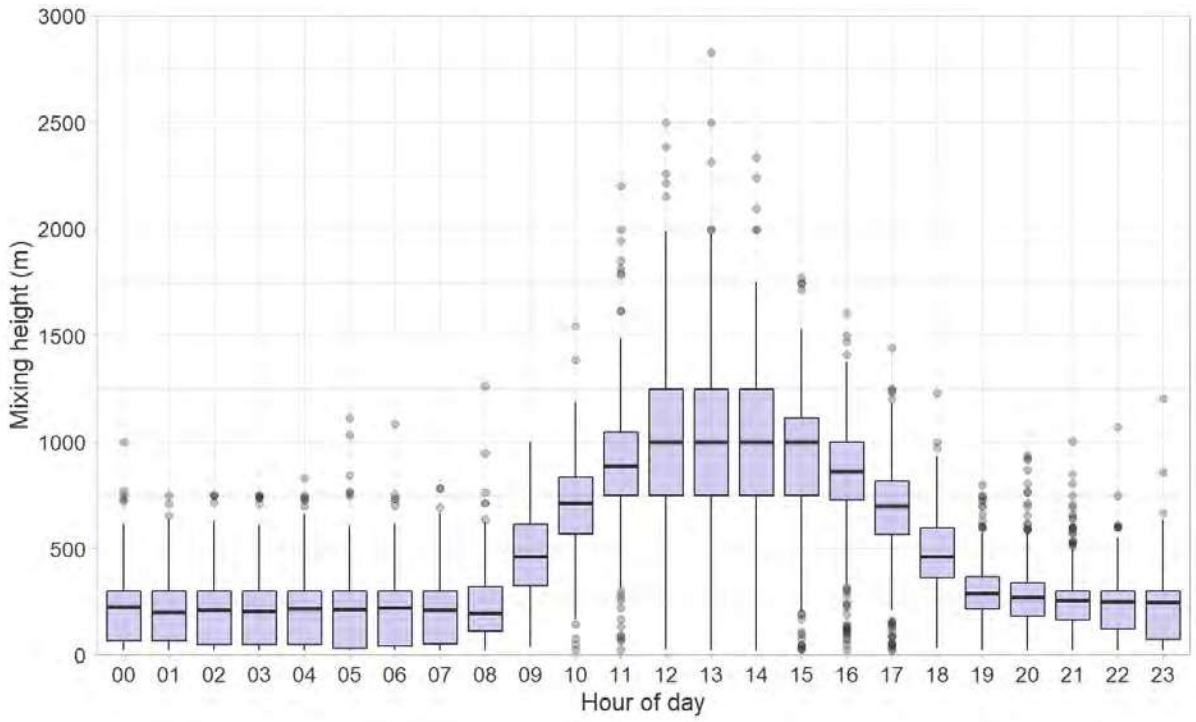


Figure 7 Diurnal distribution of the mixing height at the MCM site (predicted by TAPM)

5.4 Temperature

Figure 8 and Figure 9 provide the hourly and monthly distribution of TAPM predicted temperature at the MCM site. Over the 12-month meteorological simulation, the temperature at the site was predicted to range between 14.6°C and 39.1°C (average of 26.0°C). During winter, the temperature was predicted to range between 14.6°C and 31.1°C (average of 22.0°C), and between 23.2°C and 38.9°C (average of 28.6°C) during the summer.

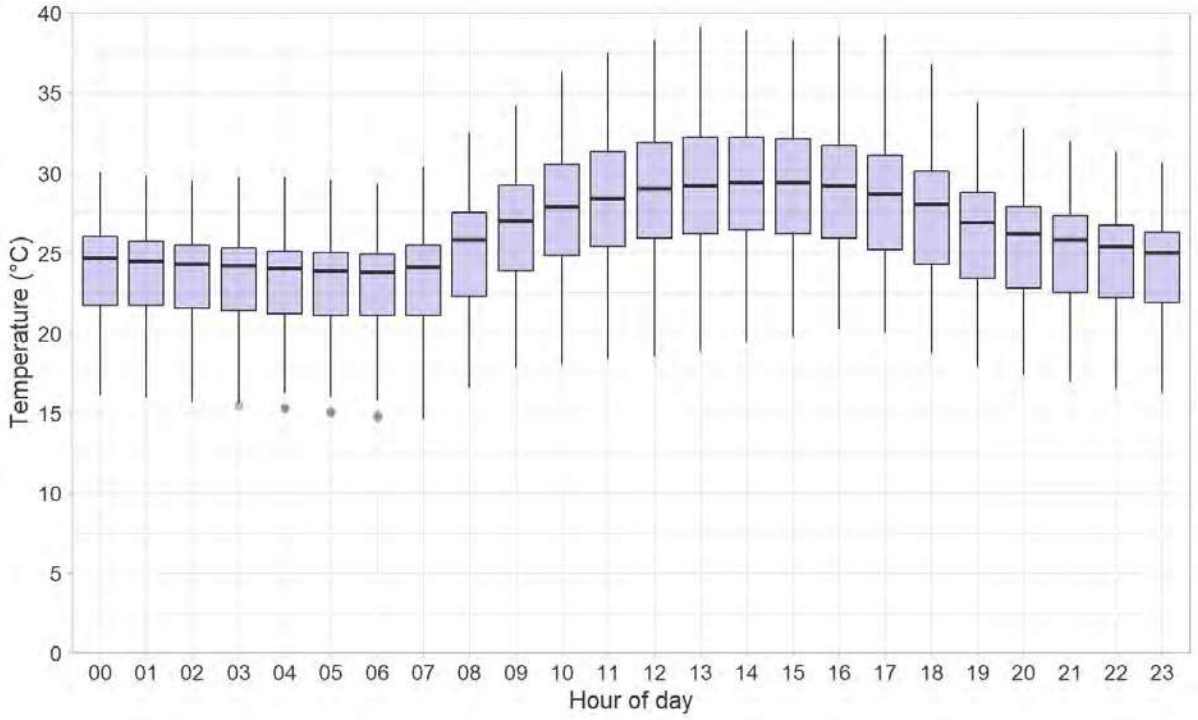


Figure 8 Hourly distribution of temperature at the MCM site (predicted by TAPM)

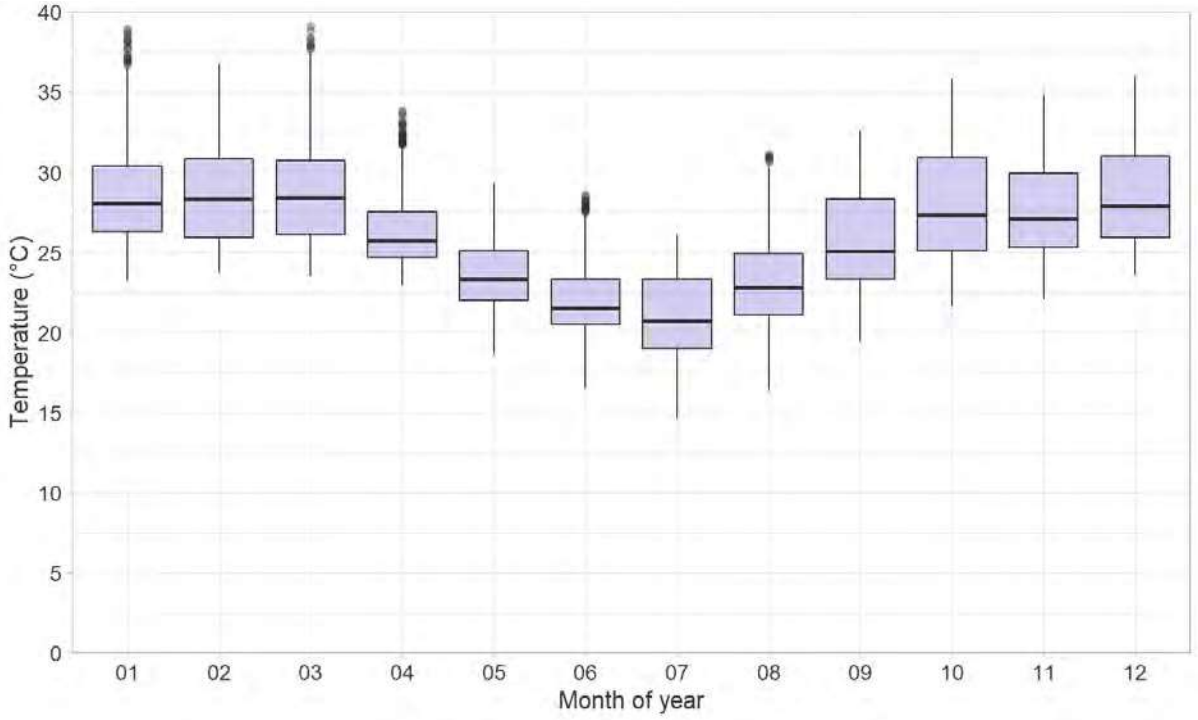


Figure 9 Monthly distribution of temperature at the MCM site (predicted by TAPM)

6. EMISSIONS

6.1 Overview

Table 4 is an exact reproduction of the emission parameters assumed in Katestone's preliminary dispersion modelling assessment (Katestone, 2021). It should be noted that Katestone's preliminary dispersion modelling assessment mistakenly listed the exhaust temperature of 348 degrees as being degrees Celsius, when in fact this is degrees Kelvin.

Table 4 Stack characteristics and emission rates used in preliminary assessment

Parameter	Units	Scenario 1 – Bagasse only	Scenario 2 – Waste Oil and Bagasse
Bagasse feed rate	tonnes/hour	141.7	96.3
Waste oil feed rate	tonnes/hour	-	9.5
Exit velocity	m/s	12	12
Height	m	50	50
Diameter	m	4.4	4.4
Exhaust temperature	°K	348	348
Emission rates			
NOx	g/s	29.91[1]	26.6[1,4]
CO	g/s	102.71[1]	71.5[1,4]
SO_2	g/s	9.84[1]	46.2[1,5]
Cd	g/s	-	0.03[5]
Cr	g/s	-	0.03[5]
Pb	g/s	-	0.18[5]
Ni	g/s	-	0.03[5]
PM_{10}	g/s	11.3[2]	22.8[1,4]
$PM_{2.5}$	g/s	11.3[2]	12.9[1,4]
PAHs	g/s	-[3]	0.000098[4]

Table notes:

[1] Emissions from bagasse combustion calculated using the NPI emission factors for combustion of bagasse in boilers with a wet scrubber (NPI, 2011)

[2] Maximum value of particulate stack tests, or the emission rate calculated using the NPI emission factors for combustion of bagasse in boilers with a wet scrubber (NPI, 2011)

[3] NPI emission factor for PAHs from bagasse combustion has not been used, based on commentary provided by the Australian Sugar Mill Council (ASMC)

[4] Emissions from waste oil combustion calculated using the NPI emission factors for combustion of oil in boilers (NPI, 2011)

[5] Emissions from waste oil are the maximum value of either the emission rate calculated using NPI emission factors for combustion of oil in boilers (NPI, 2011), or the value calculated using a mass balance approach based on fuel oil specifications.

This updated assessment has assumed the physical emission parameters to be robust and representative of conservative full-load operation of MCM, but pollutant emission rates have been updated based on recent sampling carried out at the facility. Table 5 presents a summary of the relevant results of those recent sampling events (the sampling reports have been provided separately in support of the Environment Report).

The recent sampling confirmed the stack diameter used in Katestone's preliminary dispersion modelling assessment (Katestone, 2021) to be correct, and also confirmed the exit velocity and temperature used to be

conservative (i.e. the measured temperatures and exit velocities are all higher than was used in the dispersion modelling). There is considerable variability in emission rates for some pollutants.

Table 5 Summary of recent stack test monitoring conducted on the MCM boiler stack

Parameter	Units	Ektimo - Bagasse and some Waste Oil (waste oil only used during metals sampling)			QUT - Bagasse Only	
		14/09/2021	26/07/2022	27/09/2022	21/09/2021	5/11/2021
Exit velocity	m/s	14.0	13.0	13.0	12.2	13.2
Diameter	m	4.4	4.4	4.4	4.4	4.4
Exhaust temperature	°C	94	90	85	95	96
Volume Flow (Actual)	m^3/s	216.7	200.0	183.3	185.5	200.8
NO_X	g/s	36.7	30.0	45.0	19.3	11.4
SO_2	g/s	0.7	6.0	1.3	0.00	0.00
CO	g/s	113.3	118.3	73.3	116.4	291.7
PM_{10}	g/s	8.2	7.5	3.8	-	6.7
$PM_{2.5}$	g/s	4.0	3.8	2.0	-	2.4
Cadmium	g/s	0.00018	0.00008	0.00010	-	-
Chromium	g/s	0.00042	0.00052	0.00047	-	-
Lead	g/s	0.00233	0.01050	0.00450	-	-
Nickel	g/s	0.00450	0.00132	0.00120	-	-

Table 6 presents the stack characteristics and emission rates used in this final dispersion modelling. The modelling has used the maximum emission rate from Table 5 for all pollutants, which is worst-case, especially considering the variability in measured emission rates. The sampled emission rates in g/s from Table 5 have been applied directly to the lower exit velocity and volume flow rate assumed in Katestone's preliminary dispersion modelling assessment, which is worst-case (especially when combined with the worst-case temperature applied).

Sampling of emissions of NOx, SO_2, CO, PM_{10} and $PM_{2.5}$ was carried out only during firing of the boiler with bagasse, thus for these pollutants the same assumptions regarding emissions generated by the combustion of waste oil as adopted in Katestone's preliminary dispersion modelling assessment have been applied in this assessment. For NOx, CO, PM_{10} and $PM_{2.5}$, the maximum emission rate in g/s from Table 5 has been scaled down to 68% to account for the reduced bagasse throughput in this scenario (96.33 tonnes/hour as compared to 141.67 tonnes/hour when firing bagasse only), with the following additional emissions (taken from the preliminary assessment work) added to account for the combustion of waste oil (calculated using NPI emission factors for combustion of oil in boilers (NPI, 2011)):

- NOx – 6.3 g/s
- CO – 1.66 g/s
- PM_{10} – 16.92 g/s
- $PM_{2.5}$ – 9.54 g/s

For SO_2, the emission rates in g/s from Table 5 have also been scaled down to 68% to account for the reduced bagasse throughput in this scenario, but the additional emissions from the combustion of waste oil have been calculated using a mass balance approach. The maximum sulphur content in the waste oil received by MCM from Veolia (their current supplier) is 0.46% by mass. Assuming that 0.46% of 9.5 tonnes/hour of waste oil converts to

SO_2 (doubling in mass in doing so given that SO_2 has double the mass of S), the additional SO_2 emission from the combustion of waste oil is 24.2 g/s. It is very conservative to assume that all of the sulphur in the waste oil will convert to SO_2.

Table 6 Stack characteristics and emission rates used in this assessment

Parameter	Units	Scenario 1 – Bagasse only	Scenario 2 – Waste Oil and Bagasse
Exit velocity	m/s	12	12
Height	m	50	50
Diameter	m	4.4	4.4
Exhaust temperature	°K	348	348
Emission rates			
NOx	g/s	45.0	36.9
SO_2	g/s	6.0	28.3
CO	g/s	291.7	200.0
PM_{10}	g/s	8.2	22.5
$PM_{2.5}$	g/s	4.0	12.3
Cd	g/s	-	0.0002
Cr	g/s	-	0.0005
Pb	g/s	-	0.0105
Ni	g/s	-	0.0045

The updated pollutant emission rates are higher than in Katestone's preliminary dispersion modelling assessment for NOx and CO, but lower for all other pollutants, especially metals.

7. RESULTS

Table 7 presents the maximum predicted concentration of each air pollutant within the Gordonvale township due to routine operations of the mill in isolation. Table 8 presents cumulative maximum concentrations with background added. Figure 10 is a plot of the maximum concentration of key air pollutants emitted from MCM predicted in the Gordonvale township compared to the Air EPP air quality objectives.

Contour plots are presented in Plate 1, Plate 2, and Plate 3 for cumulative maximum 1-hour average concentrations of NO_2 for scenario 1, maximum 24-hour average concentrations of $PM_{2.5}$ for Scenario 2, and annual average concentrations of $PM_{2.5}$ for Scenario 2, respectively. These pollutants and averaging periods provide the worst-case impacts from the MCM stack in terms of the proportion of the relevant air quality criteria across Scenario 1 and Scenario 2, and contours are presented with the inclusion of ambient background concentrations. Footprints of concentrations of other pollutants with the same averaging periods will be identical in shape to these contour plots, thus they will highlight the locations of maximum concentrations for all pollutants and averaging periods.

No exceedances of the air quality objectives from the Air EPP are predicted in any scenario, despite the worst-case emissions assumptions applied.

Relevant to the results of the ambient air monitoring of PM_{10} and $PM_{2.5}$ that has been carried out by MCM are the maximum predicted 24-hour average concentrations of PM_{10} and $PM_{2.5}$ as a result of emissions from MCM in isolation, which constitute no more than 15% of the objective when firing bagasse only and no more than 46% of the objective when firing bagasse and waste oil.

Table 7 Predicted concentrations from MCM in isolation (µg/m³)

Pollutant	Averaging period	Air quality objective	Maximum concentration in township			
			Scenario 1 – Bagasse only		Scenario 2 – Bagasse and Oil[1]	
			µg/m³	% of objective	µg/m³	% of objective
NO_2	1-hour	250	77.3	31%	63.4	25%
	1-year[2]	62	1.3	2%	1.0	2%
SO_2	1-hour	570	34.4	6%	162.3	28%
	24-hour	230	5.6	2%	26.5	12%
	1-year[2]	57	0.6	1%	2.7	5%
CO	8-hour	11,000	663.5	6%	454.9	4%
PM_{10}	24-hour	50	7.6	15%	21.0	42%
	1-year[2]	25	0.8	3%	2.1	8%
$PM_{2.5}$	24-hour	25	3.7	15%	11.5	46%
	1-year[2]	8	0.4	5%	1.2	14%
Cadmium	1-year[2]	0.005	n/a[3]	n/a[3]	0.00002	0.3%
Chromium	24-hour	0.5	n/a[3]	n/a[3]	0.0005	0.1%
Lead	1-year[2]	0.5	n/a[3]	n/a[3]	0.0010	0.2%
Nickel	1-year[2]	0.02	n/a[3]	n/a[3]	0.0004	2%

Tables notes:

[1] Bagasse and fuel oil co-firing occurs infrequently and for short periods and, consequently, these results represent a conservative overestimate

[2] Annual average concentrations have assumed sugar mill operations for six months of the year, i.e., annual mean model outputs assuming continuous operation throughout the year have been halved

[3] n/a – these pollutants are emitted due to combustion of waste oil only

Table 8 Predicted cumulative concentrations (µg/m³)

Pollutant	Averaging period	Air quality objective	Maximum concentration in township			
			Scenario 1 – Bagasse only		Scenario 2 – Bagasse and Oil[1]	
			µg/m³	% of objective	µg/m³	% of objective
NO_2	1-hour	250	83.5	33%	69.6	28%
	1-year[2]	62	6.6	11%	6.4	10%
SO_2	1-hour	570	37.2	7%	165.1	29%
	24-hour	230	7.8	3%	28.7	12%
	1-year[2]	57	2.0	4%	4.2	7%
PM_{10}	24-hour	50	25.9	52%	39.3	79%
	1-year[2]	25	16.9	68%	18.3	73%
$PM_{2.5}$	24-hour	25	10.3	41%	18.0	72%
	1-year[2]	8	6.2	78%	7.0	88%

Tables notes:

[1] Bagasse and fuel oil co-firing occurs infrequently and for short periods and, consequently, these results represent a conservative overestimate

[2] Annual average concentrations have assumed sugar mill operations for six months of the year

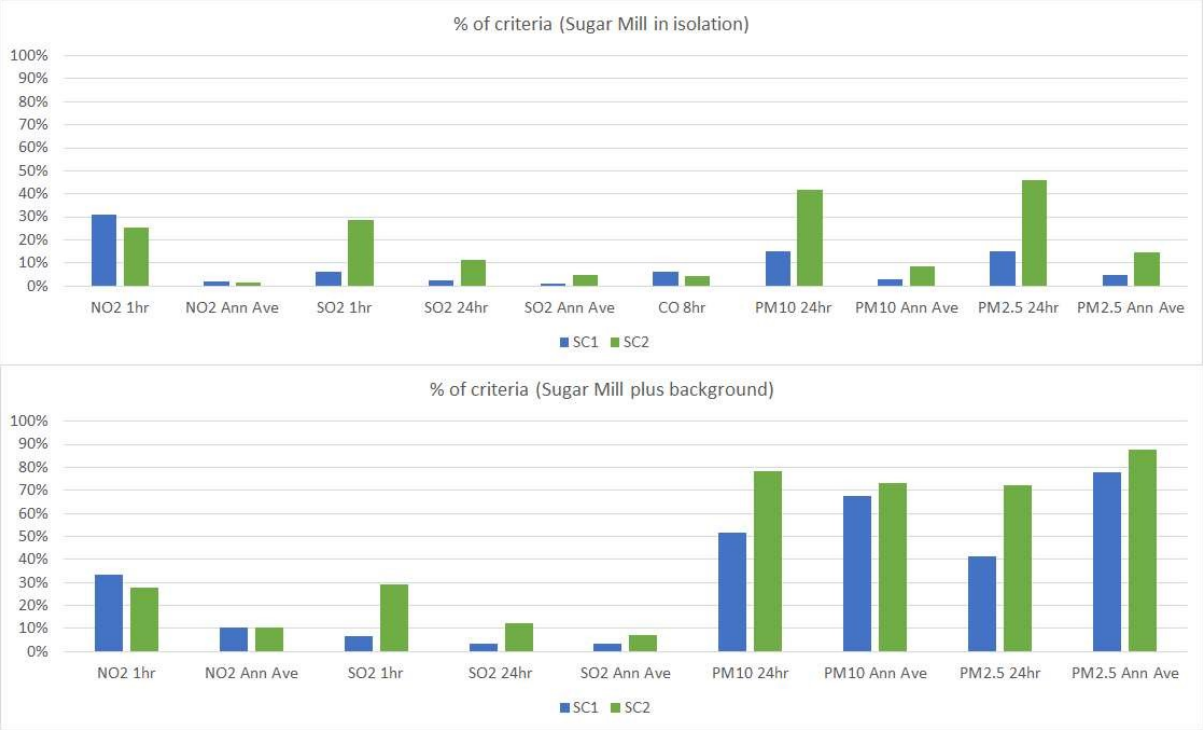


Figure 10 Maximum concentrations of key pollutants emitted by the Mulgrave Sugar Mill in the Gordonvale township as a percentage of the air quality objective

8. REFERENCES

DES, 2019, *Queensland air monitoring 2018, National Environment Protection (Ambient Air Quality) Measure*, prepared by Air Quality Monitoring, Department of Environment and Science, June 2019.

DES, 2020, *Queensland air monitoring 2019, National Environment Protection (Ambient Air Quality) Measure*, prepared by Air Quality Monitoring, Department of Environment and Science, September 2020.

Human Toxicology and Air Standards Section, Technical Assessment and Standards Development Branch, Ontario Ministry of the Environment, Conservation and Parks (MECP). 2020. Ambient Air Quality Criteria. MECP, Toronto, ON, Canada.

Katestone, 2021, D21005-2 Dispersion Modelling Assessment of Mulgrave Sugar Mill

NPI, 2011, *National Pollutant Inventory Emission Estimation Technique Manual for Combustion in Boilers*, Version 3.6, December 2011.

Queensland Government 2019, Environmental Protection (Air) Policy 2019 Subordinate Legislation 2019 No. 153.



Plate 1 **Scenario 1 – Cumulative maximum 1-hour average NO_2 concentration**

Location:	**Averaging period:**	**Data source:**	**Units:**
Gordonvale, Queensland	1-hour	TAPM	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	250 µg/m^3	Sarah Richardson	December 2022

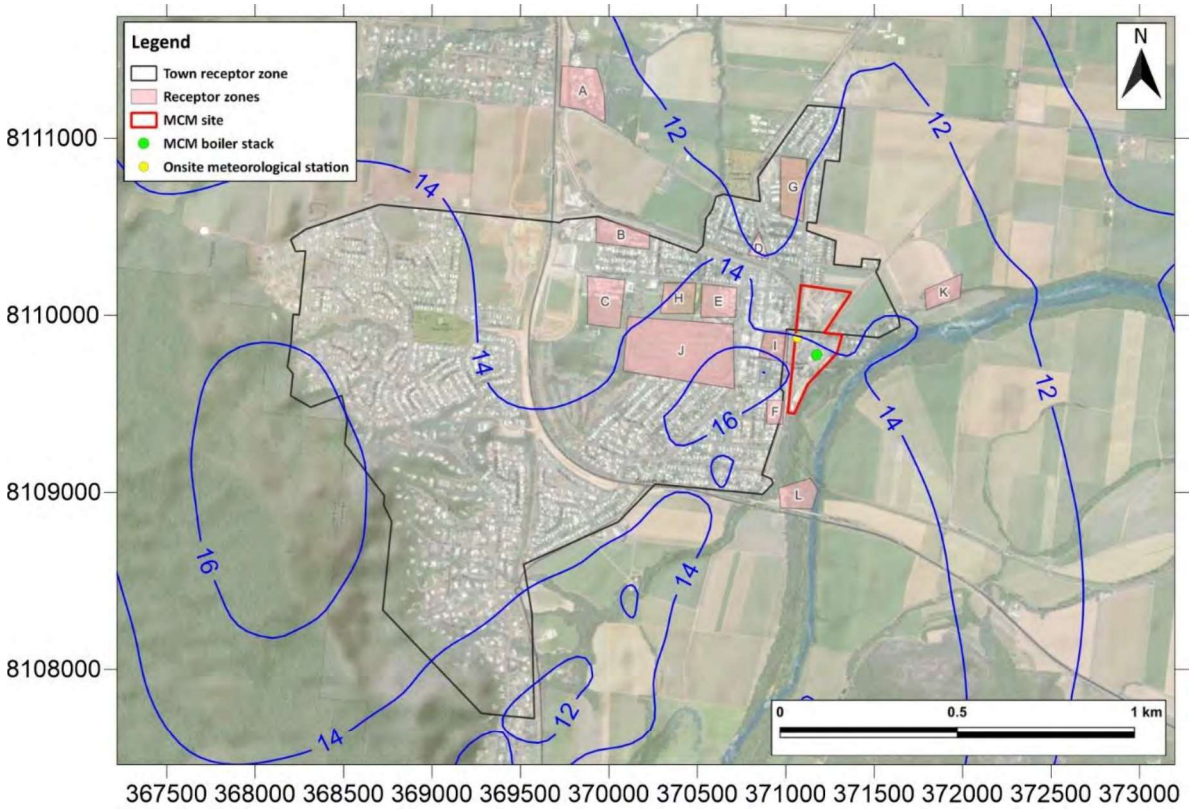


Plate 2 **Scenario 2 – Cumulative maximum 24-hour average $PM_{2.5}$ concentration**

Location:	**Averaging period:**	**Data source:**	**Units:**
Gordonvale, Queensland	24-hour	TAPM	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Maximum contour	25 µg/m^3	Sarah Richardson	December 2022



Plate 3 **Scenario 2 – Cumulative annual average $PM_{2.5}$ concentration**

Location:	**Averaging period:**	**Data source:**	**Units:**
Gordonvale, Queensland	All hours	TAPM	µg/m^3
Type:	**Objective:**	**Prepared by:**	**Date:**
Average contour	8.0 µg/m^3	Sarah Richardson	December 2022

APPENDIX A METEOROLOGICAL AND DISPERSION MODELLING METHODOLOGY

A1 TAPM meteorology

TAPM was configured as follows:

- 1 October 2021 to 30 September 2022 modelled to align with the period of available data from the onsite meteorological monitoring station
- 50 x 50 grid point domain with an outer grid of 20 km and nesting grids of 10 kilometres, 3 kilometres, 1 kilometre, and 500 metres.
- Grid centred approximately 6km north of the MCM site, to include the BoM monitoring site at Cairns Racecourse in the 1km domain.
- Geoscience Australia 9-second digital elevation model terrain data.
- Default land use data edited for consistency with aerial imagery.
- 25 vertical grid levels.
- Advanced options set to default, except for the model advection and gravity-wave time-step, which was set to 0.67 to avoid numerical instability.
- Assimilation of wind speed and wind direction data from onsite MCM meteorological monitoring station.

TAPM output at the MCM site was checked against the TAPM meteorological modelling from the previous assessment as well as against the on-site meteorological monitoring data, all of which showed a close alignment.

A2 TAPM pollution

TAPM Pollution was configured as follows:

- 1 Tracer (TR1) ($\mu g/m^3$) with no chemistry
- Unit emission rate modelled constantly for the entire year (with results scaled in post-processing)
- 65 x 75 pollution grid point domain with 250m grid spacing
- Source representation using Eulerian grid and Lagrangian near-source
- Model advection and gravity-wave time-step adjusted for one month to assist resolving numerical instability
- All other options set as default.

APPENDIX G. Stack Monitoring Reports (Ektimo)

Ektimo

REPORT NUMBER R011589ra

Mulgrave Mill Testing – September 2021
MSF Sugar

Document Information

Template Version; 230621

Client Name:	MSF Sugar
Report Number:	R011589ra
Date of Issue:	4 January 2023
Attention:	Kate Barnes
Address:	-
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Amendment Record

Original Document Number	Initiator	Original Report Date	Section (s)	Reason for revision
R011589	Client	2/11/2021	1.1, 1.3 & 2.1	Licence number and sampling details updated
R011589r	Client	14/11/2022	4	Sampling points selection method updated

Report Authorisation

NATA Accredited Laboratory
No. 14601

Henry Diona
Client Manager

Greg Sceneay
Ektimo Signatory

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

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Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation. This does not include comments, conclusions or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

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1 EXECUTIVE SUMMARY

1.1 *Background*

Ektimo was engaged by MSF Sugar to perform emission testing at their plant. Testing was carried out in accordance with Environmental Licence EPPR00390613 (formerly ENRE00918109).

1.2 *Project Objectives*

The objectives of the project were to conduct a monitoring programme to quantify emissions from one discharge point to determine compliance with MSF Sugar's Environmental Licence.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
Release Point A1 – (50 metre stack)	14 September 2021	Metals (including Cd, Cr, Ni, Pb) Total particulate matter $PM_{2.5}$ and PM_{10}** Combustion gases (NOx, SO_2, CO, CO_2, O_2)

* Flow rate, velocity, temperature and moisture were also determined.

** Method 201A was not performed onsite due to the high level of free moisture in the stack and that particle size analysis (PSA) of a method 5 sampling train filter was chosen as the most reliable method for determining particle size.

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in the report.

1.3 *Results Summary*

The following licence comparison table shows that all analytes highlighted in green are within the licence limit and all analytes highlighted in red are outside the licence limit set by the QLD Department of Environment and Science as per licence EPPR00390613 (formerly ENRE00918109).

Location Description	Pollutant	Units	Licence Limit	Detected Values
Release Point A1- (50 meter stack)	Minimum velocity	m/s	12	14
	Particulates	mg/m^3	250	81

Note: Velocity taken from total particulate matter test.

Please note that the measurement uncertainty associated with the test results was not considered when determining whether the results were compliant or non-compliant.

Refer to the Test Methods table for the measurement uncertainties.

2 RESULTS

2.1 *Release Point A1*

Date	14/09/2021	**Client**	MSF Sugar
Report	R011589	**Stack ID**	50 meter Stack
Licence No.	EPPR00390613	**Location**	Gordonvale
Ektimo Staff	Chris Dryland, Manipal Singh	**State**	QLD
Process Conditions	Please refer to client records.		*210907*

Sampling Plane Details	
Sampling plane dimensions	4400 mm
Sampling plane area	15.2 m^2
Sampling port size, number & depth	4" BSP (x4), 100 mm
Access & height of ports	Fixed ladder 20 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit 6 D
Upstream disturbance	Connection 2.83 D
No. traverses & points sampled	2 20

Comments

Bagasse and oil used as fuel during test
Oil used: 1030 to 1230 - 0.386 tonnes
Bagasse used during shift- 1,037.9 tonnes
The sample plane does not meet the 8D & 2D criterion specified in section 11.2.1 of US EPA Method 1 in relation to minimum distance from disturbance.
The number of traverse points sampled did not meet the requirements of USEPA Method 1. The velocity profile across the stack is however relatively even, and we therefore do not expect a significant impact on test results.

Stack Parameters		
Moisture content, %v/v	28	
Gas molecular weight, g/g mole	26.8 (wet)	30.2 (dry)
Gas density at STP, kg/m^3	1.19 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m^3	0.89	
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1010 & 1658	
Temperature, °C	94	
Velocity at sampling plane, m/s	14	
Volumetric flow rate, actual, m^3/min	13000	
Volumetric flow rate (wet STP), m^3/min	9800	
Volumetric flow rate (dry STP), m^3/min	7000	
Mass flow rate (wet basis), kg/hour	700000	

Date	14/09/2021	**Client**	MSF Sugar
Report	R011589	**Stack ID**	50 meter Stack
Licence No.	EPPR00390613	**Location**	Gordonvale
Ektimo Staff	Chris Dryland, Manipal Singh	**State**	QLD
Process Conditions	Please refer to client records.		210907

Gas Analyser Results	Average
Sampling time	1500 - 1600
	Concentration mg/m³ / Mass Rate g/min
Combustion Gases	
Nitrogen oxides (as NO_2)	310 / 2200
Sulfur dioxide	5.8 / 40
Carbon monoxide	960 / 6800
	Concentration %v/v
Carbon dioxide	10.9
Oxygen	7.6

Isokinetic Results	Results
Sampling time	1453-1633
	Concentration mg/m³ / Mass Rate g/min
Total particulate matter	81 / 560
PM10 (PSA)	70 / 490
PM2.5 (PSA)	34 / 240
Isokinetic Sampling Parameters	
Sampling time, min	115
Isokinetic rate, %	90
Velocity difference, %	2
Gravimetric analysis date (total particulate)	30-09-2021

Date	14/09/2021	**Client**	MSF Sugar
Report	R011589	**Stack ID**	50 meter Stack
Licence No.	EPPR00390613	**Location**	Gordonvale
Ektimo Staff	Chris Dryland, Manipal Singh	**State**	QLD
Process Conditions	Please refer to client records.		*210907*

Stack Parameters		
Moisture content, %v/v	22	
Gas molecular weight, g/g mole	27.5 (wet)	30.2 (dry)
Gas density at STP, kg/m³	1.23 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.91	
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1010 & 1228	
Temperature, °C	96	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/min	12000	
Volumetric flow rate (wet STP), m³/min	8700	
Volumetric flow rate (dry STP), m³/min	6800	
Mass flow rate (wet basis), kg/hour	640000	

Isokinetic Results	Results	
Sampling time	1036-1216	
	Concentration mg/m³	Mass Rate g/min
Cadmium	0.0016	0.011
Chromium	0.0037	0.025
Lead	0.021	0.14
Nickel	0.039	0.27
Isokinetic Sampling Parameters		
Sampling time, min	115	
Isokinetic rate, %	92	

3 PLANT OPERATING CONDITIONS

See MSF Sugar records for complete process conditions.

4 TEST METHODS

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sampling points - Selection	USEPA Method 1	NA	NA	✓	NA
Flow rate, temperature and velocity	USEPA Method 2	USEPA Method 2	8%, 2%, 7%	NA	✓
Moisture	USEPA Method 4	USEPA Method 4	8%	✓	✓
Molecular weight	NA	USEPA Method 3	not specified	NA	✓
Carbon dioxide and oxygen	USEPA Method 3A	USEPA Method 3A	13%	✓	✓
Carbon monoxide	USEPA Method 10	USEPA Method 10	12%	✓	✓
Nitrogen oxides	USEPA Method 7E	USEPA Method 7E	12%	✓	✓
Sulfur dioxide	USEPA Method 6C	USEPA Method 6C	12%	✓	✓
Total particulate matter	AS 4323.2	AS 4323.2	7%	✓	✓††
Particulate matter (PM_{10} and $PM_{2.5}$) by particle size analysis	AS 4323.2	HRL in-house method using Malvern Mastersizer 2000	-	-	x**
Total (gaseous and particulate) metals (Ag, As, Ba, Be, Cd, Co, Cr, Cu, Hg, Mn, Ni, P, Pb, Sb, Se, Tl, Zn)	USEPA Method 29	Envirolab in-house methods Metals-006, Metals-020, Metals-021 & Metals-022	15%	✓	✓‡

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* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

†† Gravimetric analysis conducted at the Ektimo Mitcham, VIC laboratory, NATA accreditation number 14601.

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 5 October 2021 in report 279027.

** Analysis performed by HRL Technology using a laser-diffraction particle size analyser. NATA accreditation does not cover the performance of this service. Results were reported to Ektimo on 15 October 2021 in report 211282.

5 QUALITY ASSURANCE/QUALITY CONTROL INFORMATION

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

Ektimo

6 DEFINITIONS

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American Public Health Association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BSP	British standard pipe
CARB	Californian Air Resources Board
CEM/CEMS	Continuous Emission Monitoring/Continuous Emission Monitoring System
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
D_{50}	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D_{50} method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D_{50} of that cyclone and less than the D_{50} of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
DWER	Department of Water and Environmental Regulation (WA)
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra-red
ISC	Intersociety Committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
ITE	Individual threshold estimate
Lower bound	When an analyte is not present above the detection limit, the result is assumed to be equal to zero.
Medium bound	When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
OU	Odour unit. One OU is that concentration of odorant(s) at standard conditions that elicits a physiological response from a panel equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
PM_{10}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
$PM_{2.5}$	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis
RATA	Relative accuracy test audit
Semi-quantified VOCs	Unknown VOCs (those not matching a standard compound), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration is determined by matching the area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
TM	Test method
TOC	The sum of all compounds of carbon which contain at least one carbon-to-carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity difference	The percentage difference between the average of initial flows and after flows.
Vic EPA	Victorian Environment Protection Authority
VOC	Volatile organic compound. A carbon-based chemical compound with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the given conditions of use. VOCs may contain oxygen, nitrogen and other elements. VOCs do not include carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
XRD	X-ray diffractometry
Upper bound	When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

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Ektimo

MSF Sugar, Gordonvale

Emission Testing – July 2022

Report Number R012487

Document Information

Template Version 190722

Client Name:	MSF Sugar
Report Number:	R012487
Date of Issue:	7 October 2022
Attention:	Kate Barnes
Address:	47 Gordon Street Gordonvale QLD 4865
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Henry Diona
Senior Air Monitoring Consultant

NATA Accredited Laboratory
No. 14601

Greg Sceneay
Ektimo Signatory

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

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Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation as described in the Test Methods table. This does not include calculations that use data supplied by third-parties, comments, conclusions, or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

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1 Executive Summary

1.1 Background

Ektimo was engaged by MSF Sugar to perform emission testing at their Gordonvale plant. Testing was carried out in accordance with Environmental Licence EPPR00390613 (formerly ENRE00918109).

1.2 Project Objective & Overview

The objective of the project was to quantify emissions from one (1) discharge point to determine compliance with MSF Sugar's Environmental Licence.

The monitoring was also aimed to determine the emission level of metal contaminants using the combined fuel: bagasse and oil.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
Release Point A-1 (50 metre Stack)	26 July 2022	Total particulate matter, particulate matter ≤ 10µm, particulate matter ≤ 2.5µm Metals (Cd, Cr, Ni, Pb) Nitrogen oxides, sulfur dioxide, carbon monoxide, carbon dioxide and oxygen

* Flow rate, velocity, temperature and moisture were also determined.

All results are reported on a dry basis at STP.

USEPA Method 201A was not performed due to the high level of free moisture in the stack and that particle size analysis of a USEPA Method 5 sampling train was chosen as most reliable method for determining particle size.

Plant operating conditions have been noted in the report.

1.3 Results Summary

The following licence comparison table shows that all analytes highlighted in green are within the licence limit and all analytes highlighted in red are outside the licence limit set by the QLD Department of Environment and Science as per licence EPPR00390613 (formerly ENRE00918109).

Location Description	Pollutant	Units	Licence Limit	Detected Values
Release Point A1- (50 meter stack)	Minimum velocity	m/s	12	13
	Particulates	mg/m^3	250	83

Please note that the measurement uncertainty associated with the test results was not considered when determining whether the results were compliant or non-compliant.

Refer to the Test Methods table for the measurement uncertainties.

2 Results

2.1 Release Point A1

Date	26/07/2022	**Client**	MSF Sugar
Report	R012487	**Stack ID**	Release Point A-1 (50m-Stack)
Licence No.	EPPR00390613	**Location**	Gordonvale
Ektimo Staff	Henry Diona, Manipal Singh	**State**	QLD
Process Conditions	Bagasse is used as fuel for the boiler.		220725

Sampling Plane Details		
Sampling plane dimensions	4400 mm	
Sampling plane area	15.2 m²	
Sampling port size, number & depth	4" BSP (x4), 100 mm	
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Exit	6 D
Upstream disturbance	Connection	2.83 D
No. traverses & points sampled	2	24

Comments
The sample plane does not meet the 8D & 2D criterion specified in section 11.2.1 of US EPA Method 1 in relation to minimum distance from disturbance, therefore additional points were sampled as determined by Figure 1-1 of the method.

Stack Parameters		
Moisture content, %v/v	30	
Gas molecular weight, g/g mole	26.6 (wet)	30.4 (dry)
Gas density at STP, kg/m³	1.19 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.89	
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1253 & 1515	
Temperature, °C	90	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/min	12000	
Volumetric flow rate (wet STP), m³/min	8600	
Volumetric flow rate (dry STP), m³/min	6000	
Mass flow rate (wet basis), kg/hour	610000	

Date	26/07/2022	**Client**	MSF Sugar
Report	R012487	**Stack ID**	Release Point A-1 (50m-Stack)
Licence No.	EPPR00390613	**Location**	Gordonvale
Ektimo Staff	Henry Diona, Manipal Singh	**State**	QLD
Process Conditions	Bagasse is used as fuel for the boiler.		*220725*

Gas Analyser Results	Average	
Sampling time	1257 - 1356	
	Concentration mg/m³	Mass Rate g/min
Combustion Gases		
Nitrogen oxides (as NO_2)	300	1800
Sulfur dioxide	60	360
Carbon monoxide	1200	7100
	Concentration %v/v	
Carbon dioxide	11.7	
Oxygen	9	

Isokinetic Results		Results	
Sampling time		1253-1500	
		Concentration mg/m³	Mass Rate g/min
Total particulate matter		83	500
PM10	(PSA)	75	450
PM2.5	(PSA)	39	230
Isokinetic Sampling Parameters			
Sampling time, min		120	
Isokinetic rate, %		107	
Gravimetric analysis date (total particulate)		04-08-2022	

Date	26/07/2022	**Client**	MSF Sugar
Report	R012487	**Stack ID**	Release Point A-1 (50m-Stack)
Licence No.	EPPR00390613	**Location**	Gordonvale
Ektimo Staff	Henry Diona, Manipal Singh	**State**	QLD
Process Conditions	Combination of oil and bagasse were used as fuel for the boiler.		*220725*

Stack Parameters		
Moisture content, %v/v	22	
Gas molecular weight, g/g mole	27.7 (wet)	30.4 (dry)
Gas density at STP, kg/m³	1.23 (wet)	1.36 (dry)
Gas density at discharge conditions, kg/m³	0.93	
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1058	
Temperature, °C	87	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/min	12000	
Volumetric flow rate (wet STP), m³/min	9300	
Volumetric flow rate (dry STP), m³/min	7300	
Mass flow rate (wet basis), kg/hour	690000	

Isokinetic Results	Results	
Sampling time	1058-1158	
	Concentration mg/m³	Mass Rate g/min
Cadmium	0.00067	0.0049
Chromium	0.0042	0.031
Lead	0.086	0.63
Nickel	0.011	0.079
Isokinetic Sampling Parameters		
Sampling time, min	60	
Isokinetic rate, %	98	

3 Plant Operating Conditions

The below process conditions were supplied by the personnel from site:

- 26th July 2022 - total oil burnt during 11am -12pm was 0.3157 tonnes.
  Certificate of oil analysis was also appended in this report - see appendix 1.
- 26th July 2022 - the bagasse produced during 8am -4pm was 1133.7 tonnes.

See MSF Sugar records for complete process conditions.

4 Test Methods

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited Sampling	NATA accredited Analysis
Sampling points - Selection	USEPA Method 1	NA	NA	✓	NA
Flow rate, temperature and velocity	USEPA Method 2	USEPA Method 2	8%, 2%, 7%	NA	✓
Moisture	USEPA Method 4	USEPA Method 4	8%	✓	✓
Carbon dioxide and oxygen	USEPA Method 3A	USEPA Method 3A	13%	✓	✓
Carbon monoxide	USEPA Method 10	USEPA Method 10	12%	✓	✓
Nitrogen oxides	USEPA Method 7E	USEPA Method 7E	12%	✓	✓
Sulfur dioxide	USEPA Method 6C	USEPA Method 6C	12%	✓	✓
Total particulate matter	AS 4323.2	AS 4323.2	7%	✓	✓††
Particulate matter (PM_{10} and $PM_{2.5}$) by particle size analysis	AS 4323.2	Ektimo in-house method using Malvern Mastersizer 3000	not specified	×	×†
Total (gaseous & particulate) metals (Cd, Cr, Ni, Pb)	USEPA Method 29	Envirolab in-house methods Metals-006, Metals-020, Metals-021 & Metals-022	15%	✓	✓‡

220809

* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

†† Gravimetric analysis conducted at the Ektimo Mitcham, VIC laboratory, NATA accreditation number 14601.

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 12 August 2022 in report 302384.

† Analysis performed by Ektimo Mitcham, VIC laboratory using a laser-diffraction particle size analyser. NATA accreditation does not cover the performance of this service. Results were reported to on 15 August 2022 in report R012487.
PM_{10} and $PM_{2.5}$ results determined as sample fractions using PSA, are calculated based on the assumption that the density of the sample material is 1 g/cm^3, i.e., no corrections have been made for sample density.

5 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

6 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
AS	Australian Standard
D	Duct diameter or equivalent duct diameter for rectangular ducts
D_{50}	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D_{50} method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D_{50} of that cyclone and less than the D_{50} of the preceding cyclone.
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
NATA	National Association of Testing Authorities
PM_{10}	Particulate matter having an equivalent aerodynamic diameter less than or equal to 10 microns (µm).
$PM_{2.5}$	Particulate matter having an equivalent aerodynamic diameter less than or equal to 2.5 microns (µm).
PSA	Particle size analysis. PSA provides a distribution of geometric diameters, for a given sample, determined using laser diffraction.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
USEPA	United States Environmental Protection Agency
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

7 Appendix 1: Certificate of Oil Analysis

SpecCheck Laboratories

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P.O.Box 835 Mittagong NSW 2575
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Phone/Fax: 4872 4590
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REPORT NUMBER: 22E39913
CUSTOMER NAME: VEOLIA ENVIRONMENTAL SERVICES
CUSTOMER CODE: VEST01

Ph: 07 3246 5352

DATE: 28 Jun 2022
CONTACT: Tim Vollmer
ADDRESS: 879 Commercial Ave
Bohle Qld 4818

Email: tim.vollmer@veolia.com

CERTIFICATE OF ANALYSIS

SAMPLE ID: RO 027
DATE SAMPLED: 24 May 2022
DATE RECEIVED: 7 May 2022

Sample matrix: Oil
Tests commenced: 10 /6/22
Tests completed: 28/6/22

TEST	RESULT	UNITS	METHOD
PCB	<2	ppm	ASTM D6160
Flash point	>90.0	°C	ASTM D93
Viscosity @40C	58.89	mm²/s	ASTM D445
Density@15C	0.8857	kg\l	ASTM D1298
Ash content	0.51	%	ASTM D482
Specific energy	43.50	MJ/kg	ASTM D240
Sulphur	0.46	% w/w	ASTM D129
Filtrate @5 micron	0.042	% w/w	SCL070
Physical state	Liquid	-	Visual
Odour	Mild	-	-
Pour point	<-27	°C	ASTM D97
Solubility in water	Negligible	-	Volumetric
Sediment by extraction	0.04	% w/w	ASTM D473
Vanadium	<1	ppm	ASTM D5185
Copper	11	ppm	ASTM D5185
Lead	9	ppm	ASTM D5185
Silicon	45	ppm	ASTM D5185
Potassium	29	ppm	ASTM D5185
Magnesium	60	ppm	ASTM D5185
Iron	61	ppm	ASTM D5185
Sodium	100	ppm	ASTM D5185
Arsenic	<1	ppm	ASTM D5185
Cadmium	<1	ppm	ASTM D5185
Chromium	<1	ppm	ASTM D5185

Signed: S.Brennan
Chief Chemist

This report shall not be reproduced except in full.
Results relate only to the sample(s) as received and tested.
Measurement Uncertainty available upon request.

8 Appendix 2: Particle Size Analysis Report

Particle Size Analysis Results

Ektimo

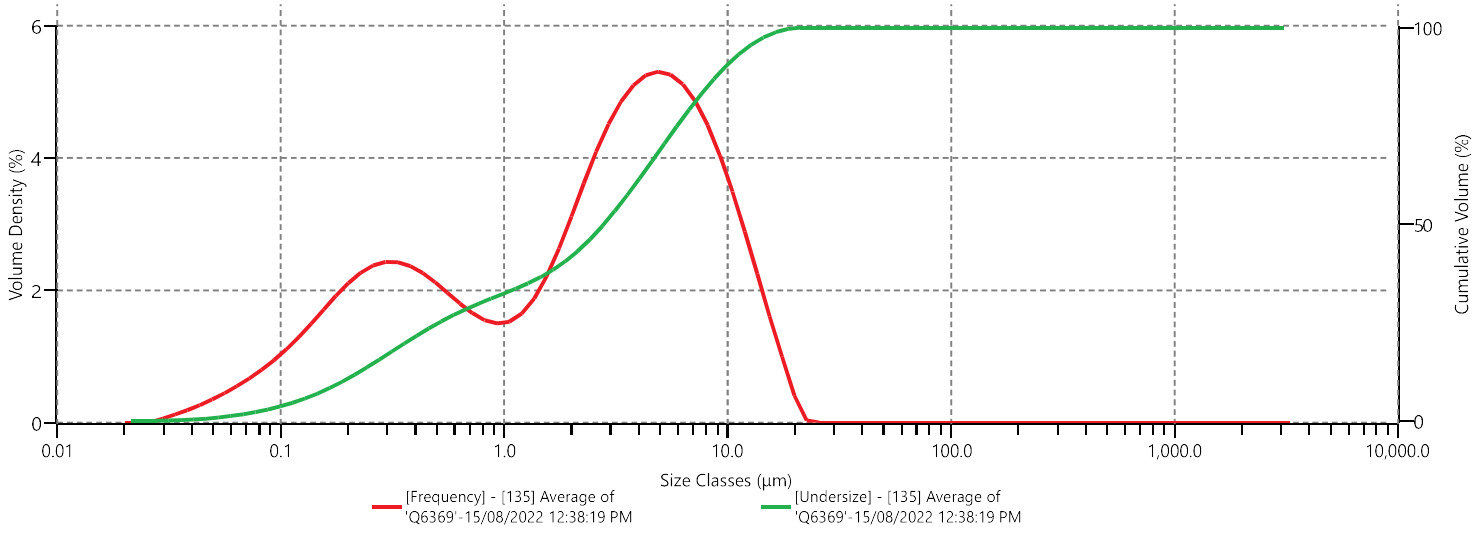
Sample Details	
Sample Name	Average of 'Q6369'
Volume Below (2.5) µm	47.01 %
Volume Below (10) µm	90.63 %

Report Details	
Job Number	R012487
Measurement Date	15/08/2022
Analyst	CTu

Parameters	
Particle Name	Default
Particle Refractive Index	1.520
Particle Absorption Index	1.000
Dispersant Name	Propan-2-ol
Dispersant Refractive Index	1.390
Weighted Residual	0.65 %
Laser Obscuration	5.86 %
Result Units	Volume
Mode	4.92 µm

Results	
Concentration	0.0005 %
Span	3.424
Uniformity	1.087
Specific Surface Area	10980 m^2/kg
D [3,2]	0.547 µm
D [4,3]	3.94 µm
Dv (10)	0.189 µm
Dv (50)	2.79 µm
Dv (90)	9.75 µm

Particle Size Distribution



Result Distribution

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0200	0.00	0.130	5.74	0.727	29.20	4.08	62.02	22.9	100.00	128	100.00	720	100.00
0.0231	0.00	0.150	7.18	0.839	30.69	4.71	66.96	26.4	100.00	148	100.00	832	100.00
0.0267	0.00	0.173	8.84	0.969	32.10	5.44	71.94	30.5	100.00	171	100.00	960	100.00
0.0308	0.04	0.199	10.72	1.12	33.52	6.28	76.83	35.2	100.00	198	100.00	1110	100.00
0.0355	0.15	0.230	12.78	1.29	35.07	7.25	81.51	40.7	100.00	228	100.00	1280	100.00
0.0474	0.59	0.266	14.97	1.49	36.88	8.37	85.86	46.9	100.00	263	100.00	1480	100.00
0.0547	0.94	0.307	17.24	1.72	39.07	10.0	90.63	54.2	100.00	304	100.00	1710	100.00
0.0631	1.40	0.354	19.52	1.99	41.72	11.2	93.12	62.6	100.00	351	100.00	1970	100.00
0.0729	1.97	0.409	21.74	2.30	44.89	12.9	95.80	72.2	100.00	405	100.00	2270	100.00
0.0842	2.67	0.472	23.85	2.50	47.01	14.9	97.79	83.4	100.00	468	100.00	2630	100.00
0.0972	3.52	0.545	25.80	3.06	52.71	17.2	99.13	96.3	100.00	540	100.00	3030	100.00
0.112	4.53	0.630	27.58	3.53	57.22	19.8	99.83	111	100.00	624	100.00	3500	100.00

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Ektimo

MSF Sugar, Gordonvale

Emission Testing – September 2022

Report Number R013618

Document Information

Template Version 190722

Client Name:	MSF Sugar
Report Number:	R013618
Date of Issue:	26 October 2022
Attention:	Kate Barnes
Address:	47 Gordon Street Gordonvale QLD 4865
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Henry Diona
Senior Air Monitoring Consultant

NATA Accredited Laboratory
No. 14601

Zac Xavier
Ektimo Signatory

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

This document is confidential and is prepared for the exclusive use of MSF Sugar and those granted permission by MSF Sugar. The report shall not be reproduced except in full.

Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation as described in the Test Methods table. This does not include calculations that use data supplied by third-parties, comments, conclusions, or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

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1 Executive Summary

1.1 Background

Ektimo was engaged by MSF Sugar to perform emission testing at their Gordonvale plant. Testing was carried out in accordance with Environmental Licence EPPR00390613 (formerly ENRE00918109)

1.2 Project Objective & Overview

The objective of the project was to quantify emissions from 1 discharge point to determine compliance with MSF Sugar's Environmental Licence.

The monitoring was also aimed to determine emission level of metal contaminants using combined fuel: bagasse and oil.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
Release Point A-1 (50 meter Stack)	27 September 2022	Total particulate matter, metals (Cd, Cr, Ni, Pb), particulate matter ≤ 10µm, particulate matter ≤ 2.5µm, nitrogen oxides, sulfur dioxide, carbon monoxide, carbon dioxide and oxygen

* Flow rate, velocity, temperature and moisture were also determined.

All results are reported on a dry basis at STP.

USEPA Method 201A was not performed due to the high level of free moisture. Instead, laser particle size analysis was performed from the USEPA Method 5 sampling train.

Plant operating conditions have been noted in the report.

1.3 Results Summary

The following licence comparison table shows that all analytes highlighted in green are within the licence limit and any analytes highlighted in red are outside the licence limit set by the QLD Department of Environment and Science as per licence EPPR00390613 (formerly ENRE00918109).

Location Description	Pollutant	Units	Licence Limit	Detected Values
Release Point A1- (50 meter stack)	Minimum velocity	m/s	12	13
	Particulates	mg/m^3	250	39

Please note that the measurement uncertainty associated with the test results was not considered when determining whether the results were compliant or non-compliant.

Refer to the Test Methods table for the measurement uncertainties.

2 Results

2.1 Release Point A1

Date	27/09/2022	**Client**	MSF Sugar
Report	R013618	**Stack ID**	Release Point A-1 (50m-Stack)
Licence No.	EPPR00390613	**Location**	Gordonvale
Ektimo Staff	Henry Diona, Manipal Singh	**State**	QLD
Process Conditions	Bagassed is used as fuel for the boiler.		220818

Sampling Plane Details		
Sampling plane dimensions	4400 mm	
Sampling plane area	15.2 m²	
Sampling port size, number & depth	4" BSP (x4), 100 mm	
Duct orientation & shape	Vertical Circular	
Downstream disturbance	Exit 6 D	
Upstream disturbance	Connection 2.83 D	
No. traverses & points sampled	2 24	

Comments
The sample plane does not meet the 8D & 2D criterion specified in section 11.2.1 of US EPA Method 1 in relation to minimum distance from disturbance, therefore additional points were sampled as determined by Figure 1-1 of the method.

Stack Parameters		
Moisture content, %v/v	28	
Gas molecular weight, g/g mole	27.0 (wet)	30.5 (dry)
Gas density at STP, kg/m³	1.21 (wet)	1.36 (dry)
Gas density at discharge conditions, kg/m³	0.92	
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	0820 & 1145	
Temperature, °C	85	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/min	11000	
Volumetric flow rate (wet STP), m³/min	8700	
Volumetric flow rate (dry STP), m³/min	6300	
Mass flow rate (wet basis), kg/hour	630000	

Date	27/09/2022	**Client**	MSF Sugar
Report	R013618	**Stack ID**	Release Point A-1 (50m-Stack)
Licence No.	EPPR00390613	**Location**	Gordonvale
Ektimo Staff	Henry Diona, Manipal Singh	**State**	QLD
Process Conditions	Bagassed is used as fuel for the boiler.		220818

Gas Analyser Results	Average
Sampling time	1034 - 1134
	Concentration mg/m³ / Mass Rate g/min
Combustion Gases	
Nitrogen oxides (as NO_2)	440 / 2700
Sulfur dioxide	12 / 75
Carbon monoxide	710 / 4400
	Concentration %v/v
Carbon dioxide	13.2
Oxygen	7.5

Isokinetic Results	Results
Sampling time	0921-1130
	Concentration mg/m³ / Mass Rate g/min
Total particulate matter	39 / 240
PM10 (PSA)	36 / 230
PM2.5 (PSA)	19 / 120
Isokinetic Sampling Parameters	
Sampling time, min	120
Isokinetic rate, %	97
Gravimetric analysis date (total particulate)	06-10-2022

Date	27/09/2022	**Client**	MSF Sugar
Report	R013618	**Stack ID**	Release Point A-1 (50m-Stack)
Licence No.	EPPR00390613	**Location**	Gordonvale
Ektimo Staff	Henry Diona, Manipal Singh	**State**	QLD
Process Conditions	Combination of oil and bagasse were used as fuel for the boiler.		220818

Stack Parameters		
Moisture content, %v/v	26	
Gas molecular weight, g/g mole	27.2 (wet)	30.5 (dry)
Gas density at STP, kg/m³	1.21 (wet)	1.36 (dry)
Gas density at discharge conditions, kg/m³	0.93	
Gas Flow Parameters		
Flow measurement time(s) (hhmm)	1145 & 1410	
Temperature, °C	84	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/min	12000	
Volumetric flow rate (wet STP), m³/min	8800	
Volumetric flow rate (dry STP), m³/min	6500	
Mass flow rate (wet basis), kg/hour	640000	

Isokinetic Results	Results	
Sampling time	1255-1354	
	Concentration mg/m³	Mass Rate g/min
Cadmium	<0.0009	<0.006
Chromium	0.0043	0.028
Lead	0.042	0.27
Nickel	0.011	0.072
Isokinetic Sampling Parameters		
Sampling time, min	60	
Isokinetic rate, %	104	

3 Plant Operating Conditions

The below process conditions were supplied by the personnel from site:

- 27th September 2022 - total oil burnt during 1245am -2pm was 0.9626 tonnes.
- 27th September 2022 - the bagasse produced during 8am -4pm was 1015.9 tonnes.

See MSF Sugar records for complete process conditions.

4 Test Methods

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited Sampling	NATA accredited Analysis
Sampling points - Selection	USEPA Method 1	NA	NA	✓	NA
Flow rate, temperature and velocity	USEPA Method 2	USEPA Method 2	8%, 2%, 7%	NA	✓
Moisture	USEPA Method 4	USEPA Method 4	8%	✓	✓
Carbon dioxide and oxygen	USEPA Method 3A	USEPA Method 3A	13%	✓	✓
Carbon monoxide	USEPA Method 10	USEPA Method 10	12%	✓	✓
Nitrogen oxides	USEPA Method 7E	USEPA Method 7E	12%	✓	✓
Sulfur dioxide	USEPA Method 6C	USEPA Method 6C	12%	✓	✓
Total particulate matter	AS 4323.2	AS 4323.2	7%	✓	✓††
Particulate matter (PM_{10} and $PM_{2.5}$) by particle size analysis	AS 4323.2	Ektimo in-house method using Malvern Mastersizer 3000	not specified	×	×†
Total (gaseous & particulate) metals (Cd, Cr, Ni, Pb)	USEPA Method 29	Envirolab in-house methods Metals-006, Metals-020, Metals-021 & Metals-022	15%	✓	✓‡

220809

* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

†† Gravimetric analysis conducted at the Ektimo Mitcham, VIC laboratory, NATA accreditation number 14601.

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 11 October 2022 in report 307328.

† Analysis performed by Ektimo Mitcham, VIC laboratory using a laser-diffraction particle size analyser. NATA accreditation does not cover the performance of this service. Results were reported to on 10 October 2022 in report R012487.
PM_{10} and $PM_{2.5}$ results determined as sample fractions using PSA, are calculated based on the assumption that the density of the sample material is 1 g/cm^3, i.e., no corrections have been made for sample density.

5 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

6 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
AS	Australian Standard
D	Duct diameter or equivalent duct diameter for rectangular ducts
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
NATA	National Association of Testing Authorities
PSA	Particle size analysis. PSA provides a distribution of geometric diameters, for a given sample, determined using laser diffraction.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
USEPA	United States Environmental Protection Agency
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

7 Appendix 1: Particle Size Analysis Report

Particle Size Analysis Results

Ektimo

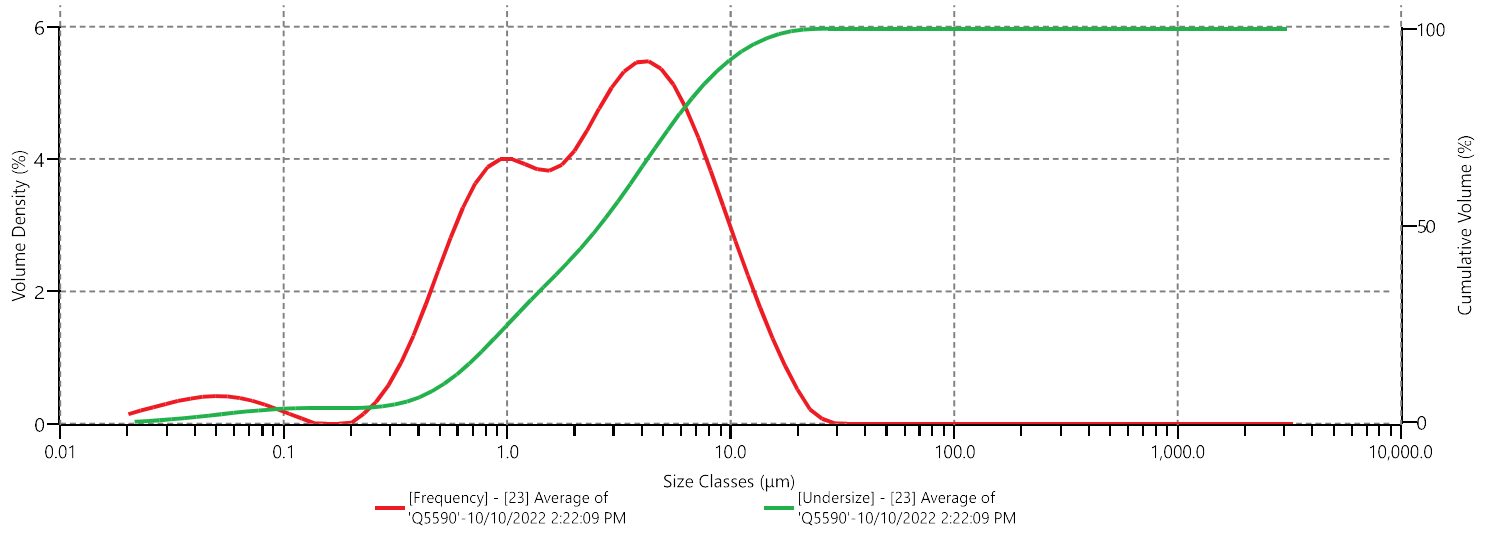
Sample Details	
Sample Name	Average of 'Q5590'
Volume Below (2.5) µm	48.84 %
Volume Below (10) µm	92.18 %

Report Details	
Job Number	R013618PSA
Measurement Date	10/10/2022
Analyst	AKo

Parameters	
Particle Name	Default
Particle Refractive Index	1.520
Particle Absorption Index	1.000
Dispersant Name	Propan-2-ol
Dispersant Refractive Index	1.390
Weighted Residual	0.37 %
Laser Obscuration	6.85 %
Result Units	Volume
Mode	4.11 µm

Results	
Concentration	0.0010 %
Span	3.271
Uniformity	1.038
Specific Surface Area	8757 m^2/kg
D [3,2]	0.685 µm
D [4,3]	3.83 µm
Dv (10)	0.529 µm
Dv (50)	2.59 µm
Dv (90)	9.01 µm

Particle Size Distribution



Result Distribution

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0200	0.05	0.130	3.62	0.727	16.61	4.08	65.45	22.9	99.87	128	100.00	720	100.00
0.0231	0.22	0.150	3.62	0.839	20.17	4.71	70.58	26.4	99.98	148	100.00	832	100.00
0.0267	0.44	0.173	3.62	0.969	23.90	5.44	75.56	30.5	100.00	171	100.00	960	100.00
0.0308	0.70	0.199	3.62	1.12	27.66	6.28	80.24	35.2	100.00	198	100.00	1110	100.00
0.0355	1.02	0.230	3.70	1.29	31.34	7.25	84.51	40.7	100.00	228	100.00	1280	100.00
0.0474	1.76	0.266	3.94	1.49	34.94	8.37	88.27	46.9	100.00	263	100.00	1480	100.00
0.0547	2.15	0.307	4.41	1.72	38.55	10.0	92.18	54.2	100.00	304	100.00	1710	100.00
0.0631	2.53	0.354	5.22	1.99	42.29	11.2	94.14	62.6	100.00	351	100.00	1970	100.00
0.0729	2.88	0.409	6.47	2.30	46.30	12.9	96.22	72.2	100.00	405	100.00	2270	100.00
0.0842	3.17	0.472	8.25	2.50	48.84	14.9	97.78	83.4	100.00	468	100.00	2630	100.00
0.0972	3.40	0.545	10.55	3.06	55.35	17.2	98.87	96.3	100.00	540	100.00	3030	100.00
0.112	3.55	0.630	13.36	3.53	60.32	19.8	99.54	111	100.00	624	100.00	3500	100.00

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APPENDIX H. Stack Monitoring Report (SRI)

Be sure. testo

Testo Pty Ltd, PO Box 2041, Bayswater Village VIC 3153 Australia

Testo Pty Ltd
Unit 11, 114-118 Merrindale Drive
Croydon South, Victoria 3136
Tel: + 61 3 8761 6108
Fax: + 61 3 8761 6109
info@testo.com.au
testo.com.au

ABN 80 007 249 603

3 June 2021

Calibration Certificate

Combustion Gas

Certificate Number: G_01065347_03062021
Description of instrument: Testo 350_XL
Instrument Model No. / Serial No.: 0563 0350 / 01065347

Master Cylinder (1): Air Liquide
Gas Manufacturer: Air Liquide Australia Ltd
Description of Cylinder: Test gas containing O_2, CO, with N_2 Balance
Expiry Date: 27/05/2025
Cylinder No.: 429836

Master Cylinder (2): Air Liquide
Gas Manufacturer: Air Liquide Australia Ltd
Description of Cylinder: Test gas containing NO, with N_2 Balance
Expiry Date: 17/10/2021
Cylinder No.: 303791

Master Cylinder (3): Air Liquide
Gas Manufacturer: Air Liquide Australia Ltd
Description of Cylinder: Test gas containing NO_2, with N_2 Balance
Expiry Date: 21/11/2022
Cylinder No.: 303589

Master Cylinder (4): Air Liquide
Gas Manufacturer: Air Liquide Australia Ltd
Description of Cylinder: Test gas containing SO_2, with N_2 Balance
Expiry Date: 13/11/2022
Cylinder No.: 303791

Master Cylinder (5): Air Liquide
Gas Manufacturer: Air Liquide Australia Ltd
Description of Cylinder: Test gas containing O_2, CO, CO_2, CH_4 with N_2 Balance
Expiry Date: 01/06/2025
Cylinder No.: 346156

Procedure: This instrument has been calibrated against the above listed gases and adjusted where possible to give the most accurate reading. All test gases used are certified to NATA standards

Measuring Results:

Master Cylinder Number	Test Gas	Measuring cell Serial Number	Test gas Composition	Instrument Reading
1	O2	10.411711550421	7.01% ± 0.20%	6.90%
	CO	02.389237111020	499 ppm ± 25 ppm	509 ppm
2	NO	05.398958800920	205 ppm ± 10 ppm	200ppm
3	NO2	02.397222590321	99.8 ppm ± 5 ppm	100.3 ppm
4	SO2	02.363655590719	920 ppm ± 45 ppm	925 ppm

Date of Calibration: 3 June, 2021
Recommended recalibration interval: 6 months
Suggested Maximum recalibration interval: 12 months

Signed by:

Tommy Tai
(Service Department)

No. of pages of Calibration Certificate: 1

This certificate is issued and is valid so long as the instrument is operated in accordance with the manufacturers recommendations. The accuracies stated on this document were recorded on the date of this certificate

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Web : www.sri.org.au
Info : info@sri.org.au

DATE: 23 November 2021

FAX TO: Mulgrave Mill

ATTENTION: John Stampa / Peter Accatino / Dale Flor / Kate Barnes

FAX NO: REF: 7639mulres2021

FROM: Anthony Mann PAGES: 11

MESSAGE: Stack test results for 2021

John / Peter / Dale / Kate,

The results from the dust emission tests performed at Mulgrave Mill during the 2021 crushing season are summarised in table 1 and the concentrations of NO_x, SO_2 and CO measured in the stack flue gas on the days of the dust emission tests are shown in table 2. Data sheets for the dust emission tests and the particle size analysis report for the dust collected on the 5 November 2021 are also included. The assistance of Mulgrave Mill staff with the conduct of the tests was greatly appreciated. Please contact me on 07 3138 1333 (direct) or a.mann@qut.edu.au if you have any further queries.

Regards

Anthony Mann
Sugar Research and Innovation
Queensland University of Technology

SUGAR RESEARCH INSTITUTE
(SUGAR RESEARCH LIMITED, A.C.N. 009 666 899)

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Table 1 Mulgrave dust emission test results

Boilers tested	Steam loads (t/h)	Gas velocity at sampling plane (m/s)	Emission rate (g/s)	Gas volume flow (m^3/s)	$PM_{2.5}$	PM_{10}	Particle concentration at 12% CO_2 (g/Nm^3dry)
Nos. 5, 6 and 7 (21-9-2021)	No. 5: 18 No. 6: 59 No. 7: 166	12.2	6.1	Stack conditions: 185.5 m^3/s Dry STP: 93.4 Nm^3/s			0.071
Nos. 5, 6 and 7 (5-11-2021)	No. 5: 17 No. 6: 58 No. 7: 155	13.2	13.7	Stack conditions: 200.8 m^3/s Dry STP: 111.7 Nm^3/s	17.6	48.6	0.123

Table 2 Mulgrave gas composition measurements

21 September 2021		
Nitrogen oxides (NO_x)	ppm dry basis	115
	mg/m^3 dry at 6% O_2	207
Sulphur dioxide (SO_2)	ppm dry basis	0
	mg/m^3 dry at 6% O_2	0
Carbon monoxide (CO)	ppm dry basis	962
	mg/m^3 dry at 3% O_2	1246
5 November 2021		
Nitrogen oxides (NO_x)	ppm dry basis	69
	mg/m^3 dry at 6% O_2	122
Sulphur dioxide (SO_2)	ppm dry basis	0
	mg/m^3 dry at 6% O_2	0
Carbon monoxide (CO)	ppm dry basis	2549
	mg/m^3 dry at 3% O_2	3123

Test Report for **Mulgrave Mill** Report Number **Mulgrave stack**

Parameter	Result
Stack Identification	stack
Date Tested	21-Sep-21
Method of Test/Sampling Train Configuration	AS4323.2/Type B
Stack dimensions at the sampling plane (m)	4.4 DIA
Number of sampling points	24
Total sampling period (minutes)	120
Number of determinations	1
Approximate time of test	10:23 am - 12:37 pm
Average stack gas velocity at the sampling plane (m/s)	12.2
Average stack gas temperature (K)	368
Stack gas molecular weight (kg/kg-mole)	26.23
Moisture content of stack gas (%v/v)	32.2
Stack gas density (kg/m^3)	0.87
Flow rate at stack conditions (m^3/s)	185.5
Flowrate at wet STP conditions (Nm^3/s)	137.7
Flowrate at dry STP conditions (Nm^3/s)	93.4
Average CO_2 Concentration (%)	11
Average O_2 Concentration (%)	9.1
% Isokinetic sampling	110.5
Particulate matter concentration at dry STP conditions (g/Nm^3)	0.065
Mass emission rate (g/s)	6.115
Particulate matter concentration corrected to 12% CO_2 (g/Nm^3)	**0.071**

Comments

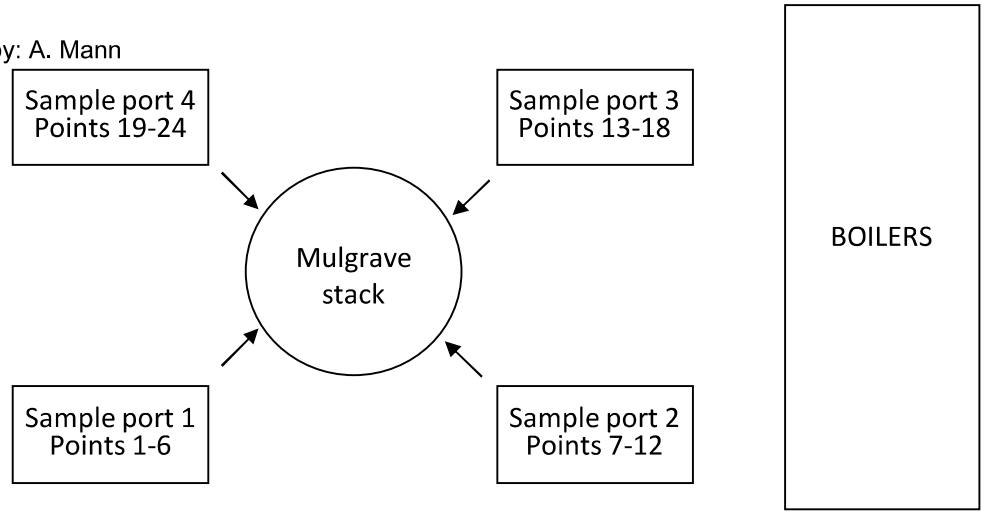
Calculations performed on atmospheric pressure of 101.325 kPa

CO_2 determined using Fyrite analyser. O_2 calculated on CO_2max for fuel of 19.5%

Sample point locations from stack wall (mm): 88, 295, 519, 779, 1100, 1558

Boiler loads during test: No. 5: 18 t/h, No. 6: 59 t/h, No. 7: 166 t/h

Tested by: A. Mann



Test Report for **Mulgrave Mill** Report Number **Mulgrave stack**

Parameter	Result
Stack Identification	stack
Date Tested	5-Nov-21
Method of Test/Sampling Train Configuration	AS4323.2/Type B
Stack dimensions at the sampling plane (m)	4.4 DIA
Number of sampling points	24
Total sampling period (minutes)	120
Number of determinations	1
Approximate time of test	10:20 am - 12:40 pm
Average stack gas velocity at the sampling plane (m/s)	13.2
Average stack gas temperature (K)	369
Stack gas molecular weight (kg/kg-mole)	27.23
Moisture content of stack gas (%v/v)	24.7
Stack gas density (kg/m^3)	0.90
Flow rate at stack conditions (m^3/s)	200.8
Flowrate at wet STP conditions (Nm^3/s)	148.4
Flowrate at dry STP conditions (Nm^3/s)	111.7
Average CO_2 Concentration (%)	12
Average O_2 Concentration (%)	8.1
% Isokinetic sampling	102.1
Particulate matter concentration at dry STP conditions (g/Nm^3)	0.123
Mass emission rate (g/s)	13.699
Particulate matter concentration corrected to 12% CO_2 (g/Nm^3)	**0.123**

Comments

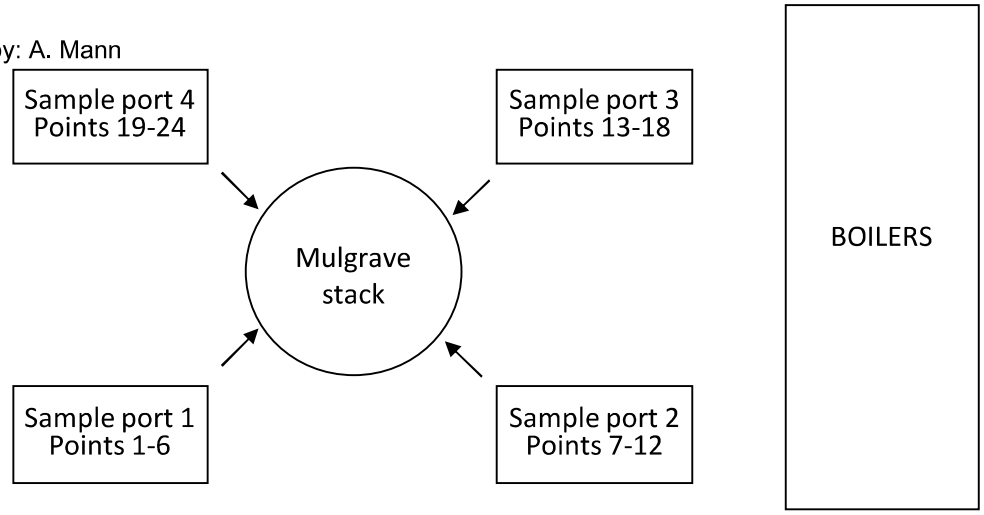
Calculations performed on atmospheric pressure of 101.325 kPa

CO_2 determined using Fyrite analyser. O_2 calculated on CO_2max for fuel of 19.5%

Sample point locations from stack wall (mm): 88, 295, 519, 779, 1100, 1558

Boiler loads during test: No. 5: 17 t/h, No. 6: 58 t/h, No. 7: 155 t/h

Tested by: A. Mann



Particle & Surface Sciences Pty. Limited
PO Box 1926, Gosford, NSW, Australia 2250. Tel: (61) 02 43 237822 Fax: (61) 02 43 237629 Email: info@pss.aus.net

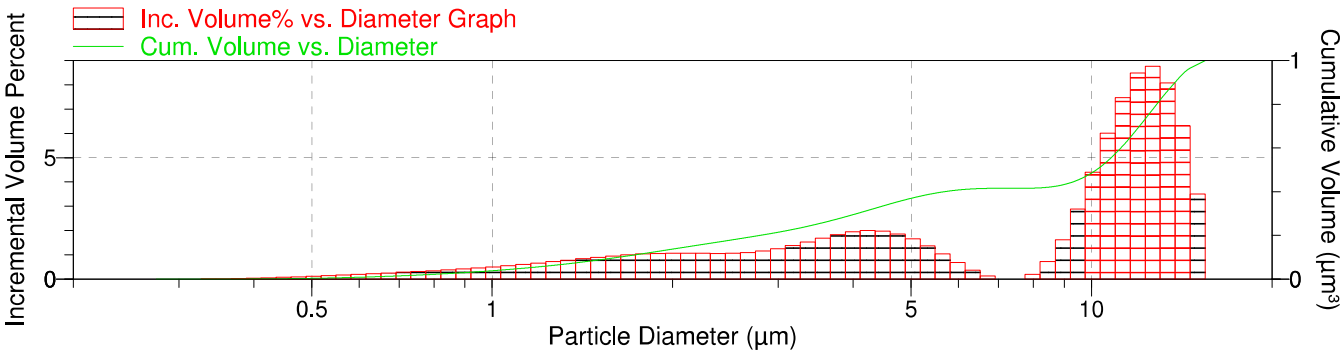
Sample: Mulgrave Stack
Operator: Mike Griffiths
Submitter: QUT
File: Y:\...\SATURN\000-531.SMP

Test Number: 4
Analyzed: 23/11/2021 10:34:16AM
Reported: 23/11/2021 10:39:24AM
Background: 23/11/2021 10:17:50AM

Model: Fraunhofer, 1.331
Material: Faunhoffer / Water - 0.05% Calgon
Background: Water - 0.05% Calgon RI 1.331
Smoothing: Medium

Combined Report

Incremental Volume Percent vs. Particle Diameter Graph



Summary Report

Analysis Conditions

FlowRate: 6.0 l/m
Circulation time: 120 sec
Ultrasonic intensity: 50 %
Ultrasonic time: 120 sec

Particle Properties

Refractive Index: (Re)0.000, (Im)0.000
Density: 1.000 g/cm³
Smoothing: Medium
Truncate intensity data: No
Minimum signal fraction: 16.0 %

Analysis Liquid Properties

Refractive Index: 1.331
Viscosity: 0.798 cp
Temperature: 21.690 ℃

User Parameters

Parameter 1: 0.000
Parameter 2: 0.000
Parameter 3: 0.000

Sample

Sample Concentration: 0.00067 %
Obscuration: 2.5 %

Weighted Statistics (Volume Distribution)

		Std Dev of 4			Std Dev of 4
Mean	8.285	0.149	Mode	12.647	0.000
Median	10.177	0.237			

Selected Percentiles by Volume

Percent Finer	Diameter (µm)
100.0	15.470
90.0	13.768
80.0	12.837
70.0	12.016
60.0	11.188
50.0	10.177
40.0	5.681
30.0	4.061
20.0	2.797

Selected Sizes by Volume

Diameter (µm)	Percent Finer
1000.000	100.0
500.000	100.0
250.000	100.0
100.000	100.0
50.000	100.0
10.000	48.6
5.000	37.0
2.000	13.7
1.000	3.9

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Sample: Mulgrave Stack
Operator: Mike Griffiths
Submitter: QUT
File: Y:\...\SATURN\000-531.SMP

Test Number: 4
Analyzed: 23/11/2021 10:34:16AM
Reported: 23/11/2021 10:39:24AM
Background: 23/11/2021 10:17:50AM

Model: Fraunhofer, 1.331
Material: Faunhoffer / Water - 0.05% Calgon
Background: Water - 0.05% Calgon RI 1.331
Smoothing: Medium

Selected Percentiles by Volume

Percent Finer	Diameter (µm)
10.0	1.624

Selected Sizes by Volume

Diameter (µm)	Percent Finer
0.500	0.4

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Model: Fraunhofer, 1.331
Material: Faunhoffer / Water - 0.05% Calgon
Background: Water - 0.05% Calgon RI 1.331
Smoothing: Medium

Report by Size Class

High Particle Diameter (µm)	Low Particle Diameter (µm)	Average Particle Diameter (µm)	Cumulative Volume Finer Percent	Incremental Volume Percent	Cumulative Volume Percent (StdDev)
15.472	14.607	15.033	96.5	3.5	0.3
14.607	13.790	14.193	90.2	6.3	0.8
13.790	13.018	13.399	82.1	8.1	1.4
13.018	12.290	12.649	73.4	8.8	1.9
12.290	11.603	11.942	64.9	8.5	2.1
11.603	10.954	11.274	57.4	7.5	2.2
10.954	10.341	10.643	51.4	6.0	2.0
10.341	9.762	10.048	47.0	4.4	1.7
9.762	9.216	9.485	44.1	2.9	1.3
9.216	8.701	8.955	42.5	1.6	0.9
8.701	8.214	8.454	41.8	0.7	0.7
8.214	7.755	7.981	41.6	0.2	0.6
7.755	7.321	7.535	41.6	0.0	0.6
7.321	6.911	7.113	41.6	0.0	0.6
6.911	6.525	6.715	41.4	0.1	0.6
6.525	6.160	6.340	41.1	0.4	0.7
6.160	5.815	5.985	40.4	0.7	0.7
5.815	5.490	5.650	39.3	1.0	0.8
5.490	5.183	5.334	38.0	1.4	0.9
5.183	4.893	5.036	36.3	1.7	0.9
4.893	4.619	4.754	34.4	1.9	1.0
4.619	4.361	4.488	32.5	2.0	1.0
4.361	4.117	4.237	30.5	2.0	1.1
4.117	3.887	4.000	28.5	1.9	1.1
3.887	3.669	3.776	26.7	1.8	1.1
3.669	3.464	3.565	25.0	1.7	1.0
3.464	3.270	3.366	23.5	1.5	1.0
3.270	3.087	3.177	22.1	1.4	1.0
3.087	2.914	3.000	20.8	1.3	0.9
2.914	2.751	2.832	19.7	1.2	0.9
2.751	2.598	2.673	18.6	1.1	0.8
2.598	2.452	2.524	17.5	1.1	0.8
2.452	2.315	2.383	16.4	1.1	0.7
2.315	2.186	2.249	15.4	1.1	0.7
2.186	2.063	2.124	14.3	1.1	0.7
2.063	1.948	2.005	13.3	1.1	0.6
1.948	1.839	1.893	12.2	1.1	0.6
1.839	1.736	1.787	11.2	1.0	0.5
1.736	1.639	1.687	10.2	1.0	0.5
1.639	1.547	1.592	9.2	1.0	0.5
1.547	1.461	1.503	8.3	0.9	0.4
1.461	1.379	1.419	7.5	0.8	0.4
1.379	1.302	1.340	6.7	0.8	0.3
1.302	1.229	1.265	6.0	0.7	0.3
1.229	1.160	1.194	5.3	0.7	0.3
1.160	1.095	1.127	4.7	0.6	0.3
1.095	1.034	1.064	4.1	0.6	0.2

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Model: Fraunhofer, 1.331
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Background: Water - 0.05% Calgon RI 1.331
Smoothing: Medium

Report by Size Class

High Particle Diameter (µm)	Low Particle Diameter (µm)	Average Particle Diameter (µm)	Cumulative Volume Finer Percent	Incremental Volume Percent	Cumulative Volume Percent (StdDev)
1.034	0.976	1.005	3.6	0.5	0.2
0.976	0.922	0.949	3.2	0.5	0.2
0.922	0.870	0.895	2.8	0.4	0.1
0.870	0.821	0.845	2.4	0.4	0.1
0.821	0.775	0.798	2.0	0.3	0.1
0.775	0.732	0.753	1.7	0.3	0.1
0.732	0.691	0.711	1.4	0.3	0.1
0.691	0.652	0.672	1.2	0.3	0.2
0.652	0.616	0.634	1.0	0.2	0.2
0.616	0.582	0.598	0.8	0.2	0.2
0.582	0.549	0.565	0.6	0.2	0.2
0.549	0.518	0.533	0.5	0.1	0.2
0.518	0.489	0.504	0.3	0.1	0.2
0.489	0.462	0.475	0.2	0.1	0.2
0.462	0.436	0.449	0.2	0.1	0.2
0.436	0.412	0.424	0.1	0.1	0.2
0.412	0.389	0.400	0.1	0.0	0.1
0.389	0.367	0.378	0.0	0.0	0.1
0.367	0.346	0.357	0.0	0.0	0.1
0.346	0.327	0.337	0.0	0.0	0.1
0.327	0.309	0.318	0.0	0.0	0.0
0.309	0.291	0.300	0.0	0.0	0.0
0.291	0.275	0.283	0.0	0.0	0.0

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Model: Fraunhofer, 1.331
Material: Faunhoffer / Water - 0.05% Calgon
Background: Water - 0.05% Calgon RI 1.331
Smoothing: Medium

Report by Size Table

Low Particle Diameter (µm)	Cumulative Volume Finer Percent	Low Particle Diameter (µm)	Cumulative Volume Finer Percent	Low Particle Diameter (µm)	Cumulative Volume Finer Percent	Low Particle Diameter (µm)	Cumulative Volume Finer Percent
10.000	48.6	6.000	40.8	2.000	13.7	0.500	0.4
8.000	41.6	4.000	29.5	1.000	3.9		

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Material: Faunhoffer / Water - 0.05% Calgon
Background: Water - 0.05% Calgon RI 1.331
Smoothing: Medium

Report by Volume Percent

Low Particle Diameter (µm)	Cumulative Volume Finer Percent	Low Particle Diameter (µm)	Cumulative Volume Finer Percent	Low Particle Diameter (µm)	Cumulative Volume Finer Percent	Low Particle Diameter (µm)	Cumulative Volume Finer Percent
15.470	100.0	12.016	70.0	5.681	40.0	1.624	10.0
14.378	95.0	11.612	65.0	4.696	35.0	1.128	5.0
13.768	90.0	11.188	60.0	4.061	30.0	0.275	0.0
13.276	85.0	10.724	55.0	3.464	25.0		
12.837	80.0	10.177	50.0	2.797	20.0		
12.424	75.0	9.416	45.0	2.141	15.0		

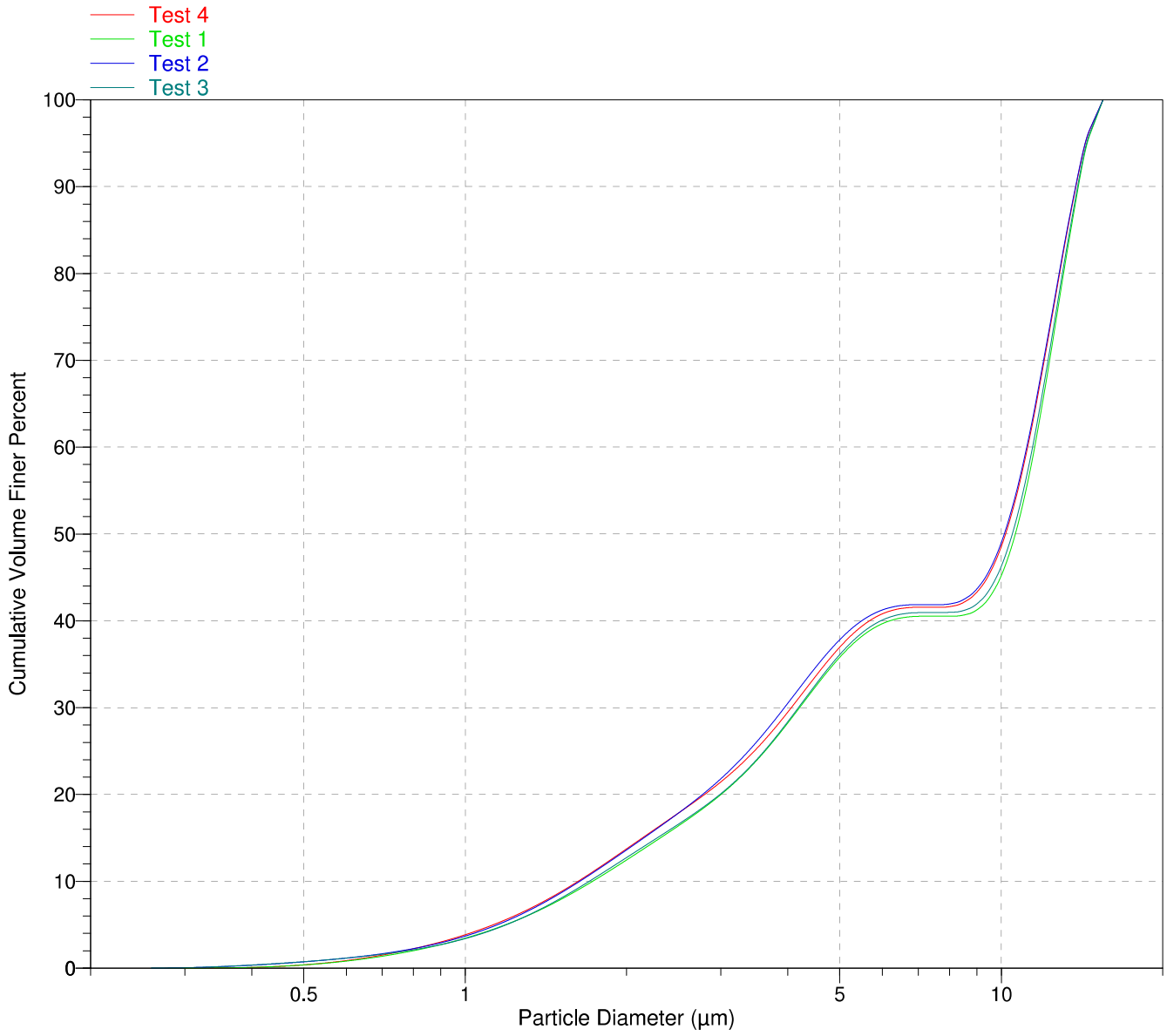
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Smoothing: Medium

Cumulative Volume Finer Percent vs. Particle Diameter Graph



APPENDIX I. Ambient Particulate Matter Monitoring Report (CQG)



Consulting

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Mulgrave Central Mill Pty Ltd (MCM)

Mulgrave Central Mill: Particulate Matter Monitoring

27 March 2023

Document History and Status

Revision	Date	Prepared by	Reviewed by
Rev 3	27/03/2023 (DES RFI update)	C. Miller, E. Rice (CQG), R. Gellatly (Katestone)	P. Brown (CQG), S. Welchman (Katestone)
Name of Project:		Mulgrave Central Mill Particulate Matter Monitoring	
Client:		Mulgrave Central Mill Pty Ltd (MCM)	
Client Project Manager:		Kate Barnes	
Name of Document:		Mulgrave Central Mill Particulate Matter Monitoring	
CQG Project Manager:		Cathee Miller	
CQG Project Number:		20168	

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CQG Consulting's management system has been certified to ISO 9001, ISO 14001 and ISO45001 at our Rockhampton and Gladstone locations. All other locations are aligned to this management system.

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Glossary

Acronym	Meaning
AQMP	Air Quality Monitoring Program
AQOs	Air quality objectives
CQG	CQ Environmental Pty Ltd trading as CQG Consulting
EE Notice	Notice to conduct or commission an environmental evaluation
DES	Department of Environment and Science
LVAS	Low volume air sampler
MCM	Mulgrave Central Mill Company Pty Ltd
NATA	National Association of Testing Authorities
OPC	Optical particle counter
PM	Particulate matter
$PM_{2.5}$	Particulate matter with an equivalent aerodynamic diameter of 2.5 micrometres or less
PM_{10}	Particulate matter with an equivalent aerodynamic diameter of 10 micrometres or less

1 Background

The Mulgrave Central Mill Company Pty Ltd (MCM) owns and operates the Mulgrave Sugar Mill (the Mill) located at 47 Gordon Street, Gordonvale in North Queensland. The Mill receives and crushes sugar cane, processes the extracted juice to produce sugar, and burns the residual fibrous product (bagasse) to generate steam for factory use and electricity. MCM as the holder of the site environmental authority EPPR00390613 received a Notice to conduct or commission an environmental evaluation (EE Notice) issued by the Department of Environment and Science (DES) on 9 June 2021.

An Air Quality Monitoring Program (AQMP) was prepared in response to the EE Notice. The AQMP committed to conducting ambient air monitoring of $PM_{2.5}$ and PM_{10} (particulate matter (PM) with an equivalent aerodynamic diameter of 2.5 micrometres or less and 10 micrometres or less, respectively) at a downwind sensitive receptor during the 2022 crush season, as follows:

- One low volume air sampler (LVAS, MicroVol 1100) compliant with AS/NZS 3580.9.10:2017 and AS/NZS 3580.9.9:2017, with $PM_{2.5}$ and PM_{10} concentrations sampled at a frequency of 1 day in 3 in an alternating sequence using the same sampler (i.e., alternating size selective inlets) for a period of 14 days prior to the commencement of, and for two months during, the 2022 crush season (including the start-up period); and
- One two-fraction optical particle counter (OPC, AirMetER-DX), co-located with the LVAS, capable of recording $PM_{2.5}$ and PM_{10} concentrations concurrently at five-minute intervals with 1-hour and 24-hour rolling averages. This equipment will be installed for a period of 14 days prior to the commencement of the 2022 crush season and remain in place for the duration of the 2022 crush season.

Requirement 4 of the EE Notice is as follows:

> *By **30 January 2023**, you must submit the Environmental Report, including results and interpretation of the Air Quality Monitoring Program, to the department.*

CQG Consulting (CQG) was engaged by MCM to conduct the ambient air monitoring for the 2022 crush season (refer to **Section 2**) with support from MCM staff. Katestone Environmental (Katestone) was sub-contracted to peer review the report. This report presents the cumulative results of ambient air monitoring undertaken including baseline, steam trial, start-up, crush, and closure periods for inclusion in the Environmental Report for submission to DES.

2 2022 Crush Season

MCM advised of the following 2022 crush season periods:

- 31 May to 2 June 2022: steam trials undertaken with boiler warming commencing on the afternoon of 30 May 2022;
- 14 June 2022 – crush season start-up with boiler warming commencing on the afternoon of 13 June 2022;
- 15 June to 14 November 2022 – crush season proper, noting some significant down time was reported during the season due to a combination of wet weather, lack of cane supply and maintenance reasons (requiring boiler shut down / start up); and
- 18 November 2022 – boil out, with the Mill off-steam and transitioned to the maintenance season from 19 November 2022.

MCM reported that approximately 1.2 million tonnes of cane was crushed during the 2022 crushing season, producing 152,000 tonnes of raw sugar.

3 Methodology

3.1 Standards

LVAS siting was undertaken with regard to *AS/NZS 3580.1.1:2016 - Methods for sampling and analysis of ambient air Guide to siting air monitoring equipment* (refer to **Section 3.3**).

LVAS monitoring was undertaken in accordance with:

- *AS/NZS 3580.9.10:2017 – Methods for sampling and analysis of ambient air: Determination of suspended particulate matter – PM2.5 low volume sampler – gravimetric method*; and
- *AS/NZS 3580.9.9:2017 – Methods for sampling and analysis of ambient air: Determination of suspended particulate matter – PM10 low volume sampler – gravimetric method*.

PM concentrations recorded through the monitoring program were assessed against the $PM_{2.5}$ and PM_{10} 24-hour averaging period air quality objectives (AQOs) in the *Environmental Protection (Air) Policy 2019* as summarised in **Table 3.1**.

Table 3.1: 24-hour averaging period AQOs for PM fractions

Pollutant	Environmental Value	AQO (µg/m^3)
$PM_{2.5}$	Health and wellbeing	25
PM_{10}		50

3.2 Monitoring locations

Equipment as identified in **Section 1** was installed approximately at the locations indicated in **Table 3.2**, with locations (in relation to the MCM weather station) presented in **Appendix A**.

Table 3.2: Ambient air monitoring equipment siting locations

Location	Coordinates GDA 2020		Comments
	Latitude	Longitude	
1 – Gordonvale Turf Club	-17.09140	145.78353	Identified as an appropriate downwind location by preliminary air dispersion modelling (Katestone 2021) – approximately 600 metres to the west-north-west of the Mill stack.
2 – North of the Mill	-17.08930	145.78930	Identified by MCM as an additional direction of interest to DES – approximately 400 metres to the north of the Mill stack.

3.3 Equipment siting

As noted in **Section 3.1**, the LVAS was sited in accordance with relevant recommended positioning criteria in Table 2 of AS/NZS 3580.1.1:2016 at both locations identified in **Section 3.2**, except where noted in **Table 3.3**.

Table 3.3: Recommended sampling inlet positioning criteria for neighbourhood $PM_{2.5}$ and PM_{10} monitoring

Location Criteria	Location 1 (Photograph 3.1 and 3.2)	Location 2 (Photograph 3.3 and 3.4)
Clear sky angle 120°	Achieved	Achieved
Unrestricted airflow of 270° around sample inlet	Achieved	Achieved
10 m from any object with a height exceeding 2 m below the height of the sample inlet	Not achieved – refer to justification below.	Achieved
No extraneous sources nearby	Achieved	Achieved
50 m from road	Achieved	Not achieved – refer to justification below.
Co-located high volume samplers 2-4 m apart	Not applicable	Not applicable



Photograph 3.1: LVAS at Location 1, looking east with mill stack visible in the background (27 April 2022)



Photograph 3.2: LVAS and OPC at Location 1 looking east with mill stack visible in the background (source MCM, 24 May 2022)



Photograph 3.3: OPC at Location 2, looking south with mill stack visible in the background (source MCM, 24 May 2022)



Photograph 3.4: LVAS and OPC at Location 2 looking north towards residences (source MCM, Date: 9 September 2022)

In the context of the monitoring objective, which was to detect the contribution of the Mill operations to the concentration of particulate matter in the air, the following observations demonstrate that the deviations from the recommended positioning criteria in Table 2 of AS/NZS 3580.1.1:2016 should not be a concern as follows:

- Location 1 was not 10 m from any object with a height exceeding 2 m below the height of the sample inlet, however, the monitoring location was unobstructed from the direction of the Mill stack (refer to **Photograph 3.1**), thus the signage upon which the instrument is affixed should not affect the transport of the Mill plume to the monitor. Also absorption / adsorption are not considered significant factors in relation to the metal signage; and
- Location 2 was not 50 m from a road, with Digger Street located within 35 m, however, the monitoring location was again unobstructed from the direction of the Mill stack (refer to **Photograph 3.3**). Digger Street is a cul-de-sac with minimal traffic (eight lots fronting the street) classified as a local access road under the Cairns Plan 2016 (Version 3.1).

The locations were considered the best available option, bearing in mind the predicted impacts according to Katestone's dispersion modelling (relevant to Location 1), and the following general instrument siting considerations as per Section 7.2 of AS/NZS 3580.1.1:2016:

- MCM consultation with turf club (Location 1) and Mill site (Location 2) personnel to ensure the location does not restrict site activities;
- Secured to reduce the likelihood of tampering, vandalism, or other potential impact (e.g., golf balls from the adjacent fairway at Location 1); and
- Sited to ensure safe access for MCM personnel to change filters.

3.3.1 Additional siting justification

Following submission of Revision 2 of this report, DES requested further information to justify the siting of equipment at Location 1 (Requirement 2 of DES RFI, dated 13 February 2023).

The monitoring locations were chosen balancing the requirements of the Australian Standard with issues of site access, security and the concerns of the landowners. As noted in the Australian Standard, ideal sites that satisfy all criteria are "rarely achieved". Katestone's opinion is that the inability to achieve all criteria of the Australian Standard do not cause the data or conclusions of the monitoring program regarding the Mill to be invalid.

Location 1 was affixed to signage at the Gordonvale Turf Club. The location was chosen to ensure security and safety of equipment and to not restrict the activities of the Turf Club. The signage is located parallel to air movements towards and away from the Mill stack. Consequently, there would unlikely have been substantial air turbulence induced by the sign with winds towards or away from the Mill. To the extent that the sign may have induced turbulence in the airflow towards the monitor, it will have been under winds blowing perpendicular to the direction of the Mill. Under such circumstances the representativeness of the monitoring results of particulate levels upwind of the Mill would not have been adversely affected.

Location 1 was unobstructed from the direction of the Mill stack, thus the signage upon which the instrument was affixed will not have affected the transport of the Mill plume to the monitor. Further details in relation to the siting assessment against the Australian Standard are provided in **Appendix B**.

3.4 Monitoring duration

The duration of monitoring by location and equipment used is summarised in **Table 3.4.**

Table 3.4: MCM AQMP air monitoring equipment

Equipment	Identifier	Location 1	Location 2
LVAS	03-0560	27 Apr to 6 Sep 2022	7 Sep to 28 Sep 2022
	13-0108	N/A	30 Sep to 28 Nov 2022
OPC[1]	ER0321007	26 May to 7 Jun 2022	8 Jun to 28 Nov 2022
	ER0120007	8 Jun to 27 Sep 2022	26 May to 7 Jun 2022
	0519SDS-018-DX	28 Sep to 28 Nov 2022	N/A

NOTE:

1. OPCs were not operational at times during these periods due to battery, solar panel and / or connection failures. In addition, ER0120007 was identified as defective from 28 June to 27 September 2022 due to a tubing obstruction and 0519SDS-018-DX was defective from 20 November to 29 November 2022 due to a technical malfunction.

The LVAS was programmed to run for 24 hours every third day commencing midnight 27 April 2022 (i.e., the pump was activated at 12:00am / midnight on day one and shut off 24 hours later). This frequency was increased to every second day to capture the steam trial and the start-up week.

The duration of the LVAS monitoring program exceeded the AQMP commitment (refer to **Section 1.1**), extending over the duration of the 2022 crush season and divided between the two locations as identified in **Table 3.4**.

Technical issues were encountered with batteries and / or solar panels resulting in some loss of OPC data (described in Note 1 in **Table 3.4**, refer to **Section 4.2** for further details). The impact of the data loss was partially mitigated through the addition of a second OPC and the extension of the LVAS period, in comparison to the initial AQMP monitoring commitment (refer to **Section 1**).

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3.5 Sampling and analysis

Sampling and analysis are only relevant to the LVAS component of the monitoring program, with the OPC results accessed directly via the suppliers (Air-Met) online data portal.

Sampling and in-field flow rate checks (refer to **Section 3.6**) were performed by MCM's Safety and Environmental Technician (Kate Barnes), who is a qualified industrial chemist with seven years of experience in the sugar industry at the time of the monitoring program commencement.

The MCM Safety and Environment Technician was trained in the requirements of the sampling program by CQG's Senior Environmental Scientist (Edward Rice) on deployment of the LVAS at Location 1 on 27 April 2022. CQG's Senior Environmental Scientist also provided guidance to the MCM Safety and Environment Technician and liaised with equipment suppliers as required, over the duration of the monitoring program (refer to **Section 3.4**).

CVs for these personnel are provided in the MCM Environmental Report, March 2023, as per Requirement 4 of the EE Notice (refer to **Section 1**).

Field sheets were completed for all samples collected (refer to **Appendix C**).

The flow rate was set to three litres per minute to achieve the correct particle size cut-point which was common for both $PM_{2.5}$ and PM_{10} measurements. The air volume displayed on the LVAS display screen (corrected for temperature and atmospheric pressure) was recorded on the field sheet and referenced on the sample chain of custody issued to the laboratory.

Sampling was alternated between $PM_{2.5}$ and PM_{10} at the frequency described in **Section 3.4**. For each sampling day, the filter was collected and replaced with the consecutive pre-weighed filter supplied by the laboratory (kept within an anti-static press-seal plastic bag until ready for immediate use), the battery replaced with a charged battery and the size selective inlet changed over.

Samples were sent to a National Association of Testing Authorities (NATA) accredited laboratory (SGS Australia Pty Ltd, accreditation no. 2562) for analysis of the PM weight and comparison against AQOs, noting the latter service is based on the air volume provided by MCM (as described above) and is not covered by the NATA accreditation.

3.6 Quality assurance / control program

The program was conducted by appropriately qualified persons as identified in **Section 3.5**.

Equipment used was calibrated in accordance with the manufacturers recommended calibration frequency (i.e., six monthly, refer to **Appendix D**).

The following additional quality assurance / control measures were taken as per AS/NZS 3580.9.9:2017 and AS/NZS 3580.9.10:2017 requirements:

- Flow rate verification checks every two months were conducted by MCM for the initially supplied LVAS (03-0560), with the second LVAS (13-0108) verified by the supplier on return of the equipment following two months of equipment use (refer to **Appendix D**);
- Field blanks were taken at a rate of one in five primary samples. Field blanks are filters not used for sampling but taken into the field, placed into the sampler filter holder whilst sampler is not running, then handled, stored, and transported as per all other samples. Field blank pre- and post-weight mass variation of greater than ± 30 µg indicates a problem that requires remedial action;
- Laboratory blanks were taken at a rate of one in five primary samples. Laboratory blanks are filters which are not used for sampling and remain at the laboratory. They are pre- and post-weighed to assess the effect of laboratory conditions and operator techniques. Laboratory blank pre- and post-weight mass variation of greater than ± 20 µg indicates a problem that requires remedial action; and
- Routine maintenance was undertaken as summarised in **Appendix D**.

4 Results Summary

4.1 Low Volume Air Sampler (LVAS)

The LVAS field sheets are provided in **Appendix C**, with a summary of the results presented in **Appendix E** and laboratory reports in **Appendix F**.

None of the LVAS samples reported PM_{10} above the AQO (refer to **Section 3.1**), however, two $PM_{2.5}$ samples at Location 1 in July 2022 did as follows with notation on the type and usage of fuel in the boilers at the time of sampling:

- 24 July 2022 (filter G39) – 40 µg/m^3 (fuel usage: approximately 0.14 tonnes and 3,234 tonnes of fuel oil and bagasse respectively); and
- 30 July 2022 (filter G41) – 60 µg/m^3 (fuel usage: approximately 3,331 tonnes of bagasse).

The MCM "Record keeping checklist" (provided in the MCM Environmental Report as per Requirement 4 of the EE Notice, refer to **Section 1**) indicates the Mill boilers were operating normally at these times, although low oxygen indicator alarms were recorded on 30 July 2022 [1].

Weather station data indicated that Location 1 was downwind of the Mill stack for less than 30% of hours on 24 July 2022 and approximately 17% of hours on 30 July 2022 (refer to daily and hourly wind roses in **Appendix G**). The Mill would have had to contribute very large $PM_{2.5}$ concentrations over these few hours to have caused the concentrations recorded, with the AQMP stack monitoring results and modelling outputs suggesting that this is unlikely under normal operating conditions. It would seem more likely that these high concentrations were a result of external contributing factors, noting MCM did report smoke from fires and harvesting in the area around the time (refer to **Appendix H**). The OPC at Location 1 was not collecting valid data on these dates due to a tube obstruction, thus the data that it collected is not useful in seeking to identify whether concentrations were significantly higher when the Mill was upwind of Location 1. However, it is also relevant to note that Location 1 was not downwind of the Mill stack at the times of the oxygen alarms on 30 July 2022.

More detailed analysis of the events of 24 and 30 July 2022 is provided in **Section 5.4.**

All other LVAS results were below the AQO, noting that:

- Four PM_{10} sample results (one at Location 1 on 8 August 2022, and three at Location 2 on 19 and 25 September and 1 October 2022) exceeded the $PM_{2.5}$ AQO, with these PM_{10} concentrations reporting between 30 and 40 µg/m^3. Given indications from the stack monitoring program that approximately 50% of PM_{10} emissions measured are $PM_{2.5}$ (as discussed in the MCM Environmental Report as per Requirement 4 of the EE Notice, refer to **Section 1**) it is not considered likely that the $PM_{2.5}$ AQO would have been exceeded in these instances; and
- The samples collected on 16 May 2022 (filter G9) and 5 August 2022 (filter G44) were sent to the laboratory for analysis, however, the pump did not activate whilst these filters were installed due to a technical error, so the results were not able to be compared to the AQO.

Field blank and laboratory blank sample results were all within the acceptable variance (i.e., 30 µg and 20 µg respectively, refer to **Section 3.6** and results at **Appendix E** and **Appendix F**). LVAS flow rate verification checks and leak checks were also reported within the acceptable range (refer to **Appendix D**).

[1] MCM further advised that the oxygen alarm on Boiler #7 lasted for 10.5 minutes between 1:30 am and 1:40 am on 30 July 2022, with ten other alarms recorded (seven for less than one minute and three for less than 1.5 minutes) between the hours of 1:20 am to 4:45 am and 10:30 pm to 11:05 pm on the same date. This date reported the highest number of alarms of any day across the 2022 season based on the checklist.

4.2 Optical Particle Counter (OPC)

Concentrations were periodically reported above 25 µg/m^3 for $PM_{2.5}$ and 50 µg/m^3 for PM_{10}, during the program, although not above the AQO (based on a 24-hour average, refer to **Appendix I**) except for results reported at Location 2 for both PM fractions on 9 July 2022 when $PM_{2.5}$ was reported at 42 µg/m^3 and PM_{10} at 64 µg/m^3. This specific event is investigated in more detail in **Section 2.4**, with more detailed analysis of the full OPC datasets provided throughout **Section 2**.

This date aligned with an identified atypical boiler restart, with MCM providing the following details:

- Harvesters had been stopped due to wet weather from 1 July 2022 to 8 July 2022, resulting in the Mill boilers being shut down;
- MCM recommenced a cold boiler warm up on 8 July 2022 at 8:30 am in advance of receipt of cane later that day, but were advised in the afternoon that the harvesters would not be able to operate until the following day, so the boiler was taken offline to conserve fuel;
- MCM recommenced a cold boiler warm up on 8 July 2022 at 10 pm in advance of receipt of cane the following day. The boilers were started again and maintained combustion at low load for approximately six hours, before normal boiler operating parameters at higher loads was able to be maintained with the crush recommenced at 2:50 pm on 9 July 2022; and
- Bagasse was predominately used on the start-up, noting oil used was used as follows:
    - 6:10 am to 6:38 am: 0.384 tonnes; and
    - 10:40 am to 4:47 pm: 22.011 tonnes (approximately 3.67 tonnes per hour).

As noted in **Section 3.4**, technical issues were encountered during the program with batteries and / or solar panels on the OPCs resulting in some loss of data, in addition to more significant data losses i.e. three months of data (28 June to 28 September 2022) reported at ER0120007 (Location 1) subject to a tubing obstruction and nine days of data (20 to 29 November 2022) reported at 0519SDS-018-DX (Location 1) resulting from equipment malfunction (the latter reporting false PM exceedances, with erratic swings in concentrations e.g. PM_{10} ranging from less than -3,000 µg/m^3 to greater than 3,000 µg/m^3) (refer to **Appendix I**).

4.3 OPC data loss and validity of results

Following submission of Revision 2 of this report, DES requested additional comments on the validity of the results (Requirement 2 of DES RFI, dated 13 February 2023), with regards to data loss that was experienced.

As detailed above, data losses, including on 24 and 30 July 2022, occurred for a range of reasons. In Katestone's and CQG's experiences, data losses are often very difficult to avoid despite careful planning and execution of a monitoring program.

Whilst these data losses are unfortunate, meaningful data was collected through the monitoring program that allows reliable conclusions to be drawn despite data loss having occurred. Further detailed analysis of the data is provided in **Section 2**. Based on this, the conclusion is drawn that normal operations at the Mill are unlikely to lead to elevated particulate measurements; this includes during periods when oxygen alarms were recorded, and when the Mill is using waste oil as a fuel, at the volumes that that were used during the 2022 crush season.

However, it would appear that elevated concentrations may in isolated circumstances occur when the Mill starts up following a stop. No such event was recorded on 24 or 30 July 2022, so there is little reason to think that the Mill would have been the cause of the high $PM_{2.5}$ concentrations measured on these days, when no valid data were collected by the OPC at Location 1.

5 Detailed Analysis of Monitoring Results

5.1 OPC and LVAS Measurements

A detailed analysis of the available OPC data from both monitoring locations has been conducted and compared to available LVAS data. Measured 24-hour average concentrations of PM_{10} and $PM_{2.5}$ at each monitoring location are presented in **Figure 5.1** to **Figure 5.4** . The red columns are recorded 24-hour average OPC concentrations, with the blue dots being 24-hour average LVAS concentrations. Where SGS reported a concentration of <10 µg/m^3, these are presented in the plots as being 5 µg/m^3.

There does not appear to be an obvious correlation between the measurements made by the two different types of instruments, except perhaps that when low concentrations (<10 µg/m^3) are measured by the OPCs, concentrations measured by the LVAS also tend to be low.

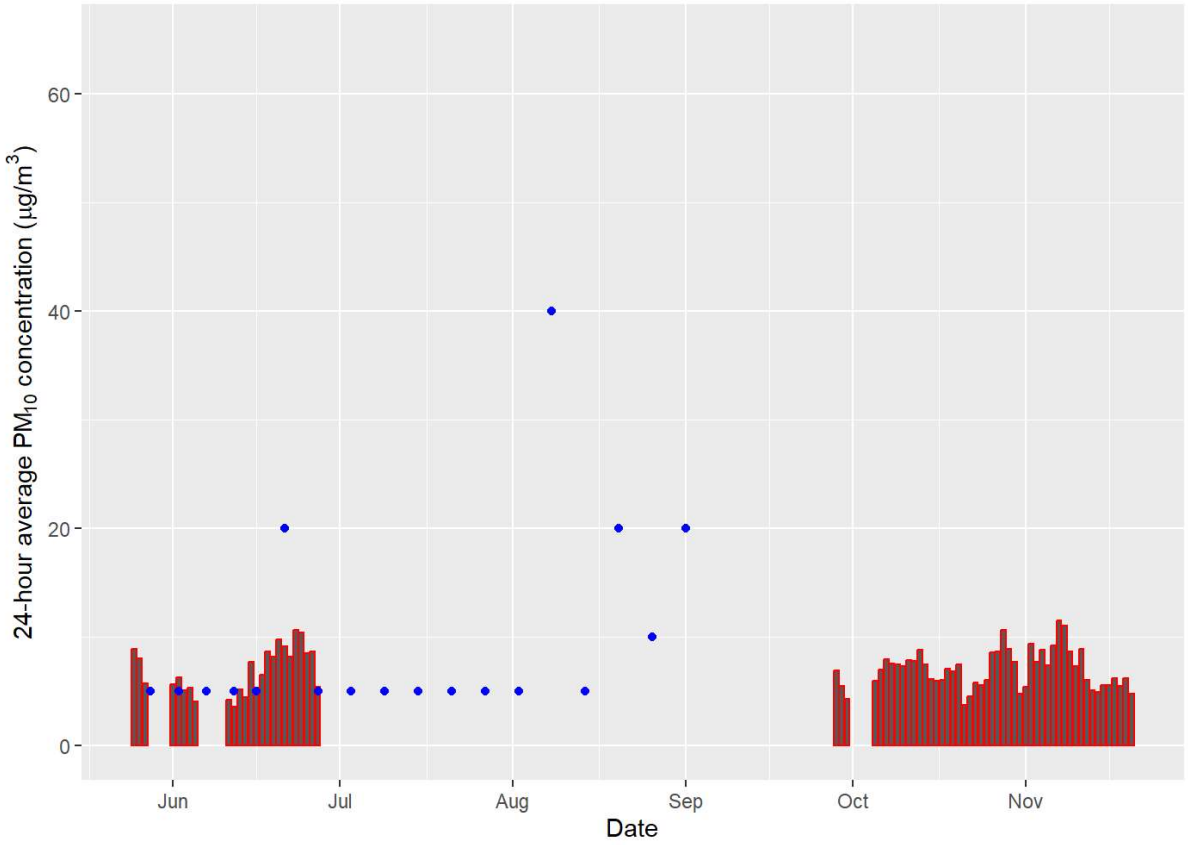


Figure 5.1: 24-hour average PM_{10} concentrations measured by OPC (red columns) and LVAS (blue dots) at Location 1

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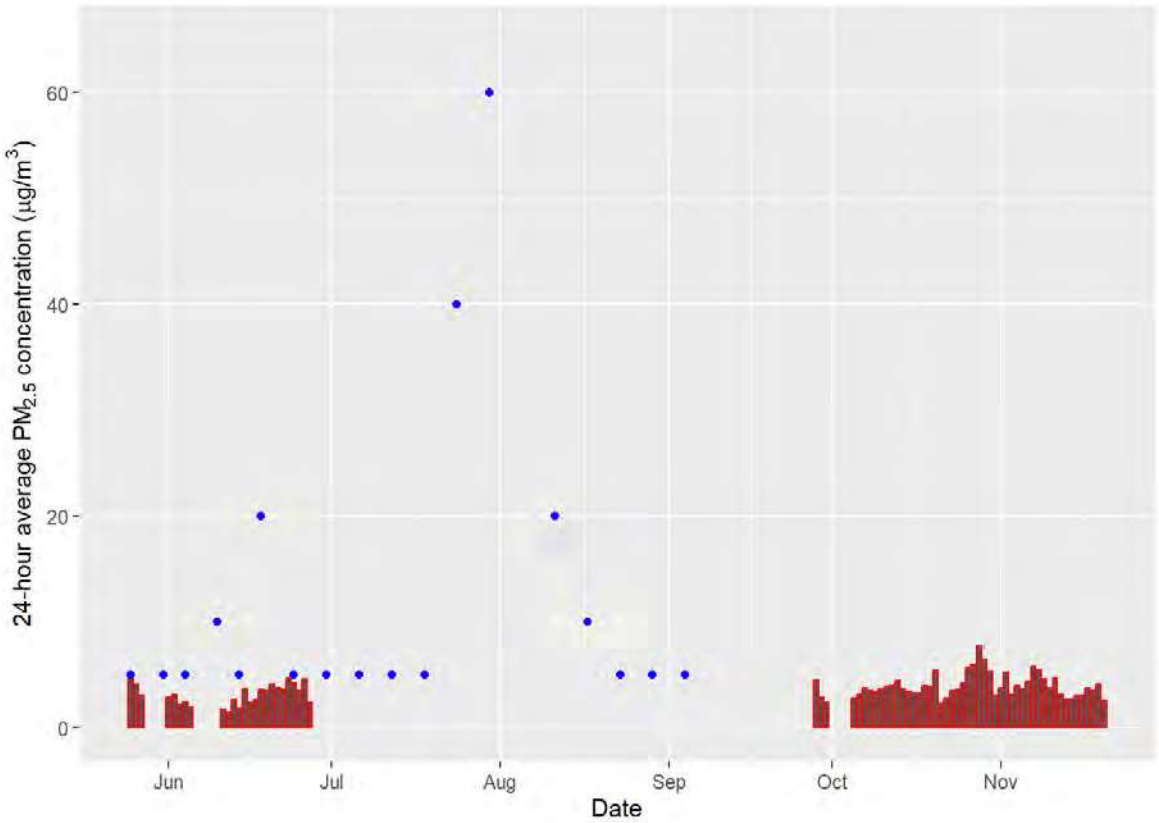


Figure 5.2: 24-hour average $PM_{2.5}$ concentrations measured by OPC (red columns) and LVAS (blue dots) at Location 1

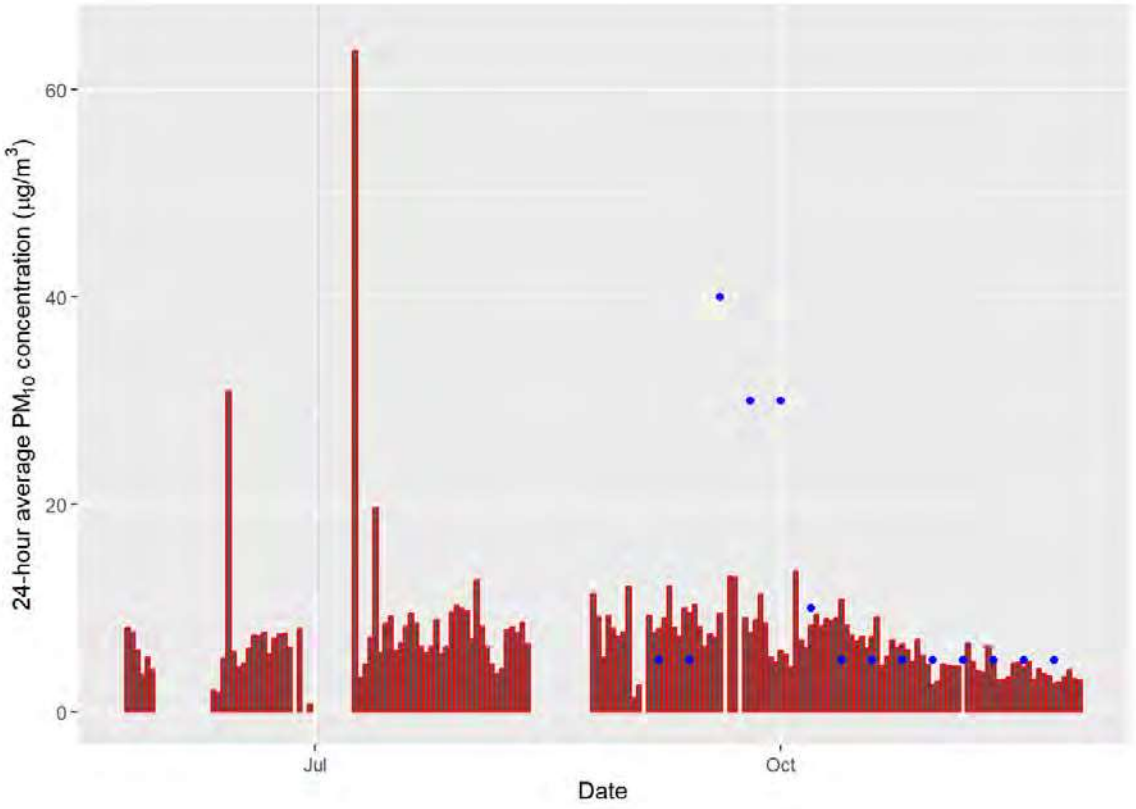


Figure 5.3: 24-hour average PM_{10} concentrations measured by OPC (red columns) and LVAS (blue dots) at Location 2

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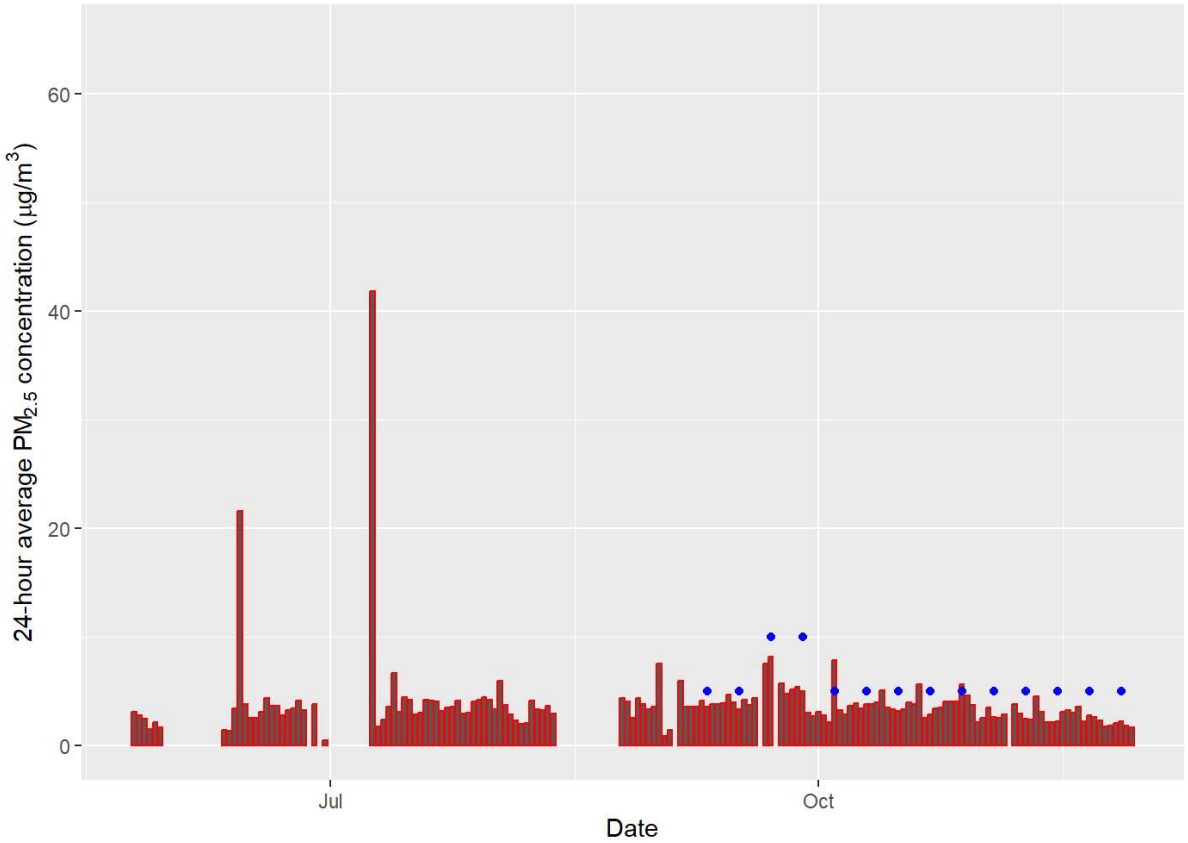


Figure 5.4: 24-hour average $PM_{2.5}$ concentrations measured by OPC (red columns) and LVAS (blue dots) at Location 2

5.2 Directional Analysis

One-hour average concentrations measured by the OPCs have been investigated in greater detail alongside wind speed and direction data collected at the on-site weather station as described below. One tool used in this analysis is polar plots; polar plots present average pollutant concentrations by wind direction and binned wind speed, with colour reflecting the average concentrations and the radial axis reflecting the wind speed. They can be very useful in identifying whether specific wind speed and wind direction combinations lead to elevated average concentrations; for example a 'blob' of colour denoting elevated concentrations that is offset from the centre of the plot likely represents a point source of emissions located in that general direction. The further from the centre of the plot a 'blob' is located, the more distant the source. Another example would be a line of elevated concentrations running across a plot, slightly offset from the centre; this would likely denote a line source, such as a road, on that side of the monitor.

5.2.1 Location 1

The Polar Plot for Location 1 (refer to **Figure 5.5**) demonstrates that the highest average PM_{10} concentrations occurred under strong winds from the south-east, which is roughly the direction of the Mill stack, although contributions from the Mill might be expected to have more of an easterly component (Location 1 is at a bearing of 285 degrees from the Mill stack).

The plot of $PM_{2.5}$ (refer to **Figure 5.6**) shows a similar trend from the southeast, but also demonstrates elevated concentrations under winds from the northwest. It is noted that concentrations measured by the OPC at Location 1 were not especially high (refer to **Figure 5.1** and **Figure 5.2**), so while the Mill might be making a contribution under normal operating conditions, this contribution is small and would not cause an exceedance of the air quality objectives for particulates.

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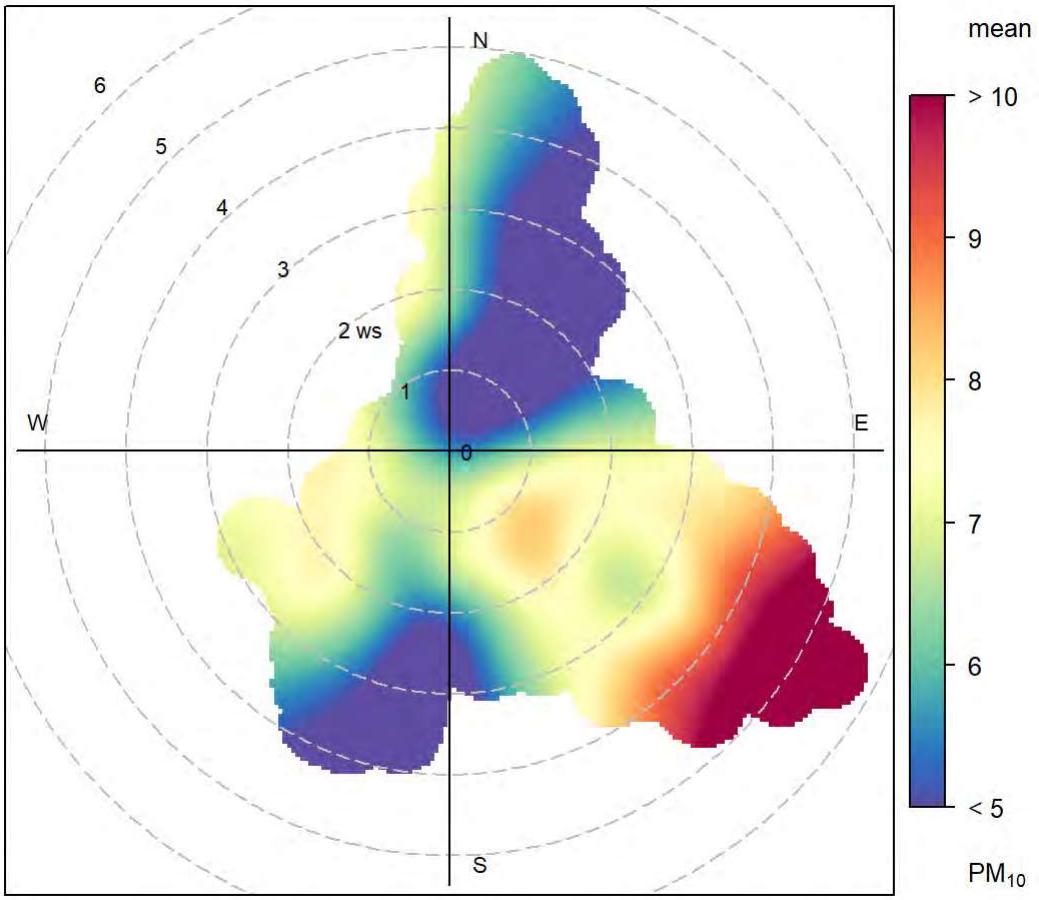


Figure 5.5: Polar plot of 1-hour average PM_{10} concentrations measured by OPC at Location 1

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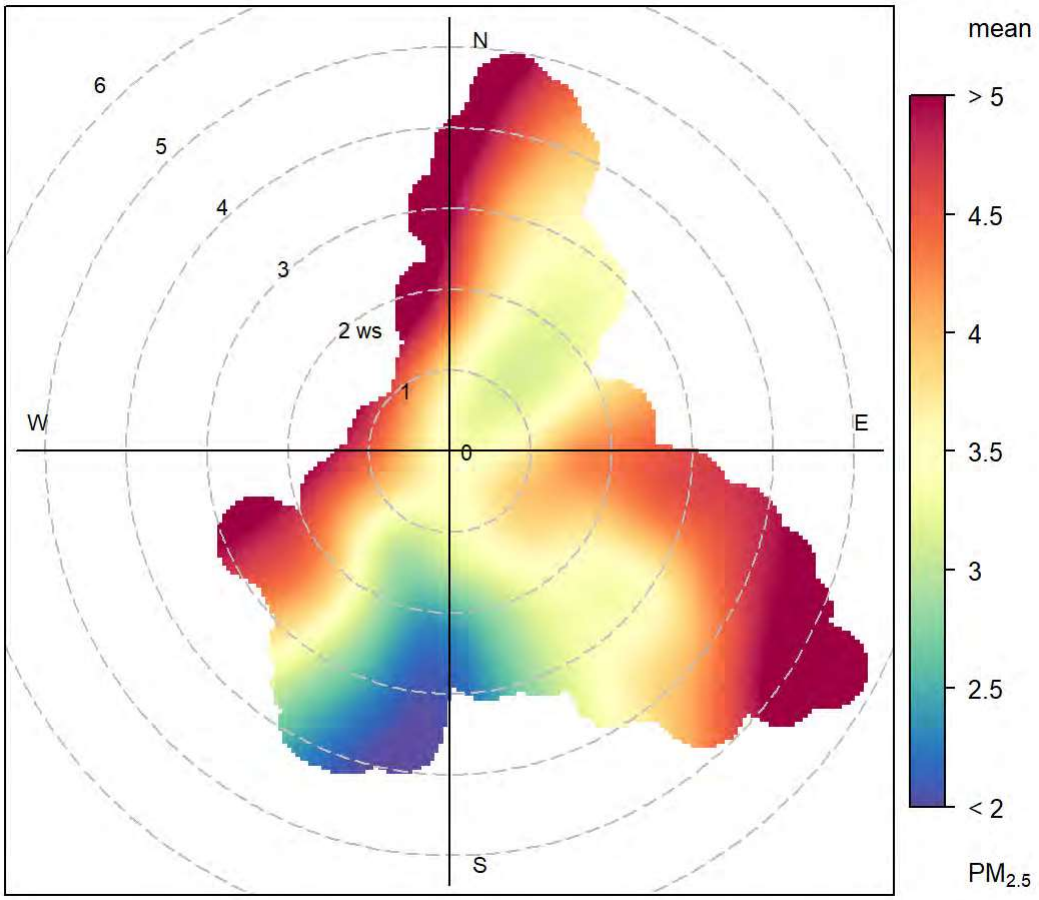


Figure 5.6: Polar plot of 1-hour average $PM_{2.5}$ concentrations measured by OPC at Location 1

5.2.2 Location 2

The Polar Plots for Location 2 (refer to **Figure 5.7** and **Figure 5.8**) demonstrate that the highest average concentrations occurred under strong winds from the south, which is the direction of the Mill stack.

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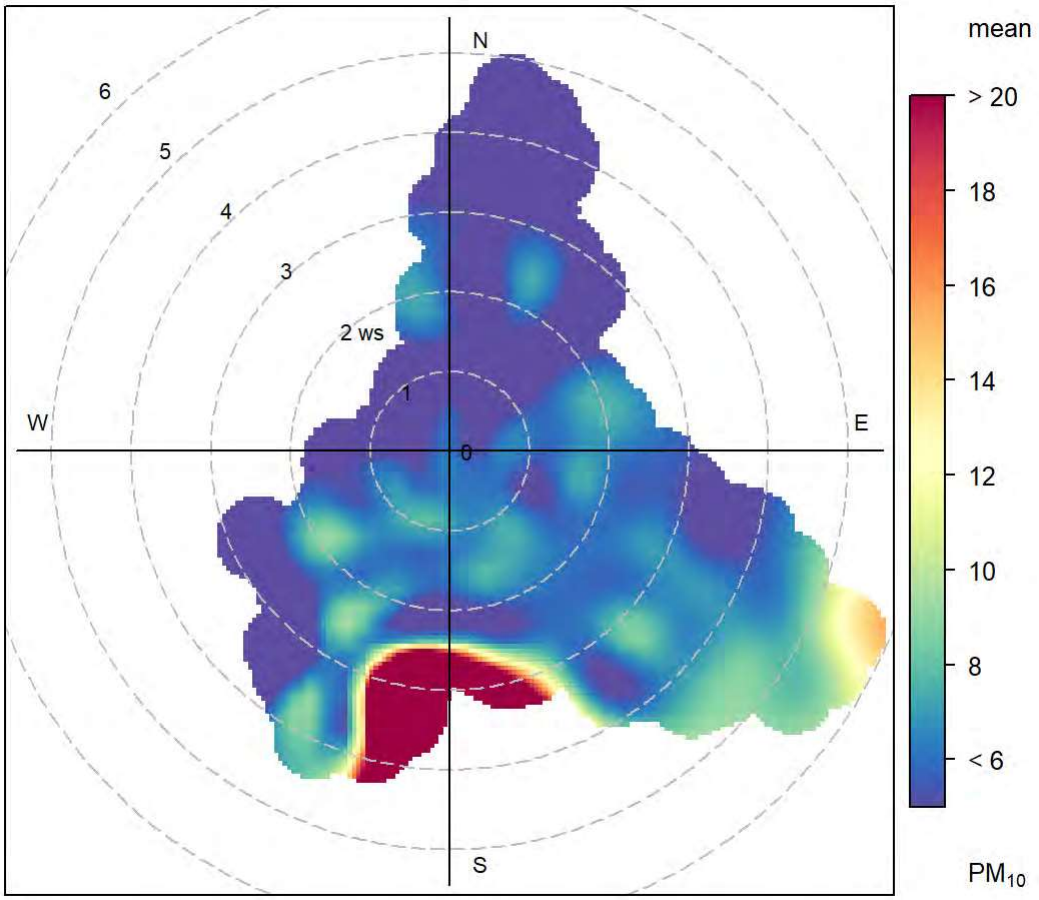


Figure 5.7: Polar plot of 1-hour average PM_{10} concentrations measured by OPC at Location 2

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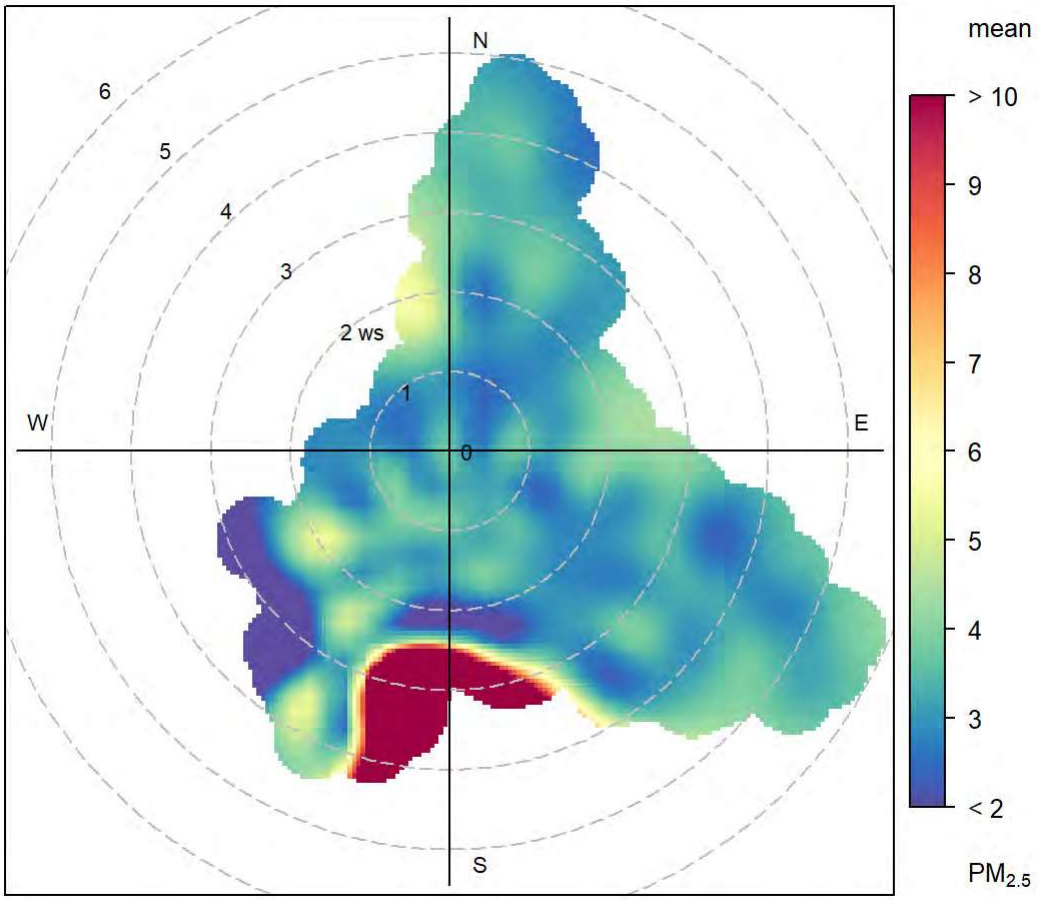


Figure 5.8: Polar plot of 1-hour average $PM_{2.5}$ concentrations measured by OPC at Location 2

5.3 Event Analysis

5.3.1 Location 1

Consideration is given to whether emissions from the Mill might have led to elevated concentrations at Location 1, noting that concentrations measured at Location 1 were generally lower than those at Location 2 (refer to **Section 2.3.2**).

Time series plots of 1-hour average concentrations of PM_{10} and $PM_{2.5}$ measured by the OPC at Location 1 are provided in **Figure 5.9** and **Figure 5.10**, respectively. These demonstrate that 1-hour average PM_{10} concentrations exceeded 25 µg/m^3 on five occasions, while 1-hour average $PM_{2.5}$ concentrations exceeded 15 µg/m^3 on seven occasions, as summarised in **Table 5.1** (these concentration thresholds are arbitrary, being intended simply to highlight the highest 1-hour average concentrations measured during the monitoring period). It is noted that Location 1 is at a bearing of 285° from the Mill stack, making it directly downwind under winds from 105°, although it may be downwind anywhere between approximately 85-125° (with these directions highlighted in green in **Table 5.1**).

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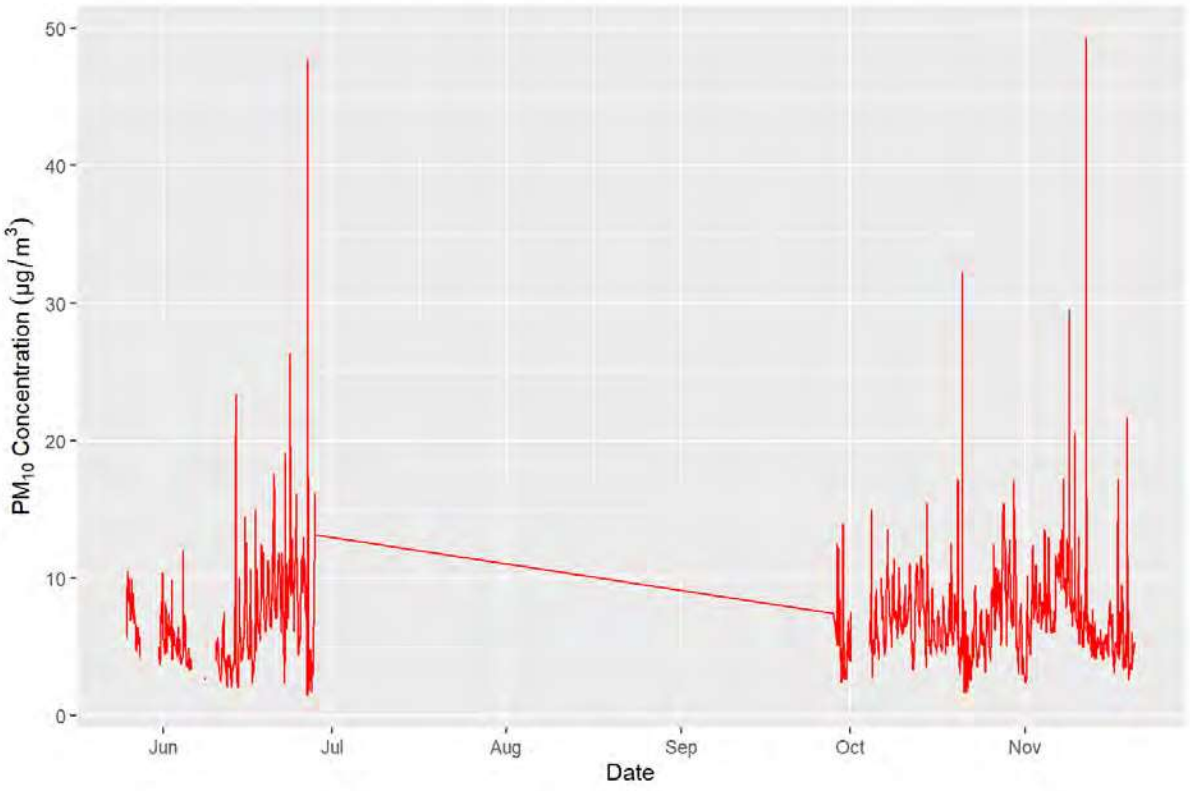


Figure 5.9: Time series of 1-hour average PM_{10} concentrations measured by OPC at Location 1

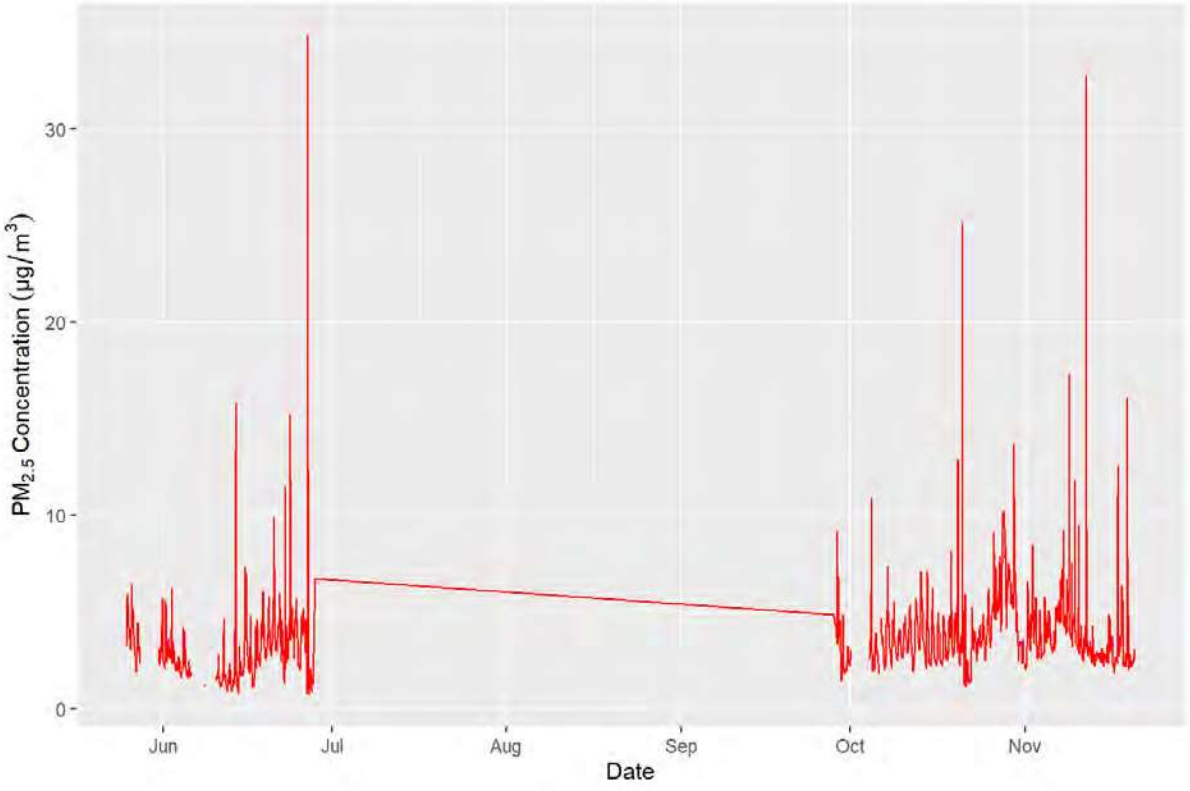


Figure 5.10: Time series of 1-hour average $PM_{2.5}$ concentrations measured by OPC at Location 1

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Table 5.1: Hours with average $PM_{2.5}$ concentrations above 15 µg/m³ at Location 1 OPC

Hour (ending)	Location 1 Concentration		Wind		Location 2 Concentration	
	PM_{10}	$PM_{2.5}$	Speed (m/s)	Direction (°)	PM_{10}	$PM_{2.5}$
14/06/2022 0:00	23.4	15.8	1.25	127.2	2.6	1.9
23/06/2022 14:00	26.3	15.2	4.08	122.5	7.6	3.3
26/06/2022 18:00	47.7	34.8	2.42	121.2	20.9	14.3
20/10/2022 22:00	32.2	25.2	1.47	114.5	7.0	3.3
8/11/2022 20:00	29.5	17.3	2.39	110.8	5.7	3.4
11/11/2022 20:00	49.3	32.8	1.75	96.0	42.0	26.7
19/11/2022 3:00	21.7	16.1	2.19	211.6	18.6	12.9

Note: Time periods with wind directions between about 85-125° are highlighted in green

MCM operational records (refer to the "Record keeping checklist" provided in the MCM Environmental Report) show that:

- A warming fire was lit on 13 June 2022, with the crush commencing on 14 June 2022;
- There was a stop due to wet weather between 05:38 and 17:15 on 23 June 2022;
- There was a maintenance stop between 08:00-23:40 on 20 October 2022; and
- Boil out for the end of the season was taking place until 04:15 on 19 November 2022.

Data suggests that upset conditions at the Mill may have contributed to elevated concentrations on 14 June 2022 at 00:00, 23 June 2022 at 14:00 and 20 October 2022 at 22:00. However, the measured concentrations were not especially high, suggesting only a brief, limited contribution, that could not cause an exceedance of the objectives. Location 1 was not downwind of the Mill on 19 November 2022 at 03:00, thus the elevated concentration that occurred in this hour was almost certainly caused by another source; this is reinforced by the similarly elevated concentration measured at Location 2.

Operational records show no upset conditions on 26 June 2022, 8 November 2022 or 11 November 2022, with emissions from the Mill stack unlikely to have contributed significantly to concentrations in these hours. Elevated $PM_{2.5}$ concentrations also occurred on 26 June 2022 at 18:00 and 11 November 2022 at 22:00 at Location 2, suggesting these events were likely the result of emissions from a source somewhere to the east of Gordonvale.

In summary, it would appear that normal operating conditions at the Mill are highly unlikely to lead to elevated concentrations of PM_{10} or $PM_{2.5}$ in the vicinity of Location 1, and certainly not any exceedances of the objectives. Upset conditions may lead to higher concentrations of particulates, but it would appear unlikely that these would cause exceedances of the objectives at Location 1, even during start-up of the boilers.

5.3.2 Location 2

Twenty four-hour average concentrations of PM_{10} and $PM_{2.5}$ were below the objectives across the available OPC dataset, with the exception of 9 July 2022 (24-hour average concentrations of 64 µg/m³ for PM_{10} and 42 µg/m³ for $PM_{2.5}$ – refer to **Figure 5.3** and **Figure 5.4**). The high 24-hour concentrations on 9 July 2022 were principally the result of a period of high average concentrations that started around 10:30pm on 8 July 2022 and extended until around 1pm on 9 July 2022 (refer to **Figure 5.17** for further detail). Consideration is given to whether the high concentrations measured at Location 2 under strong winds from the south relate only to the identified event, by removing this data for these two days from the dataset used in **Figure 5.7** and **Figure 5.8**. The resulting plots

(refer to **Figure 5.11** and **Figure 5.12**) demonstrate that high concentrations under winds from this direction were not isolated to the 8 / 9 July 2022 event.

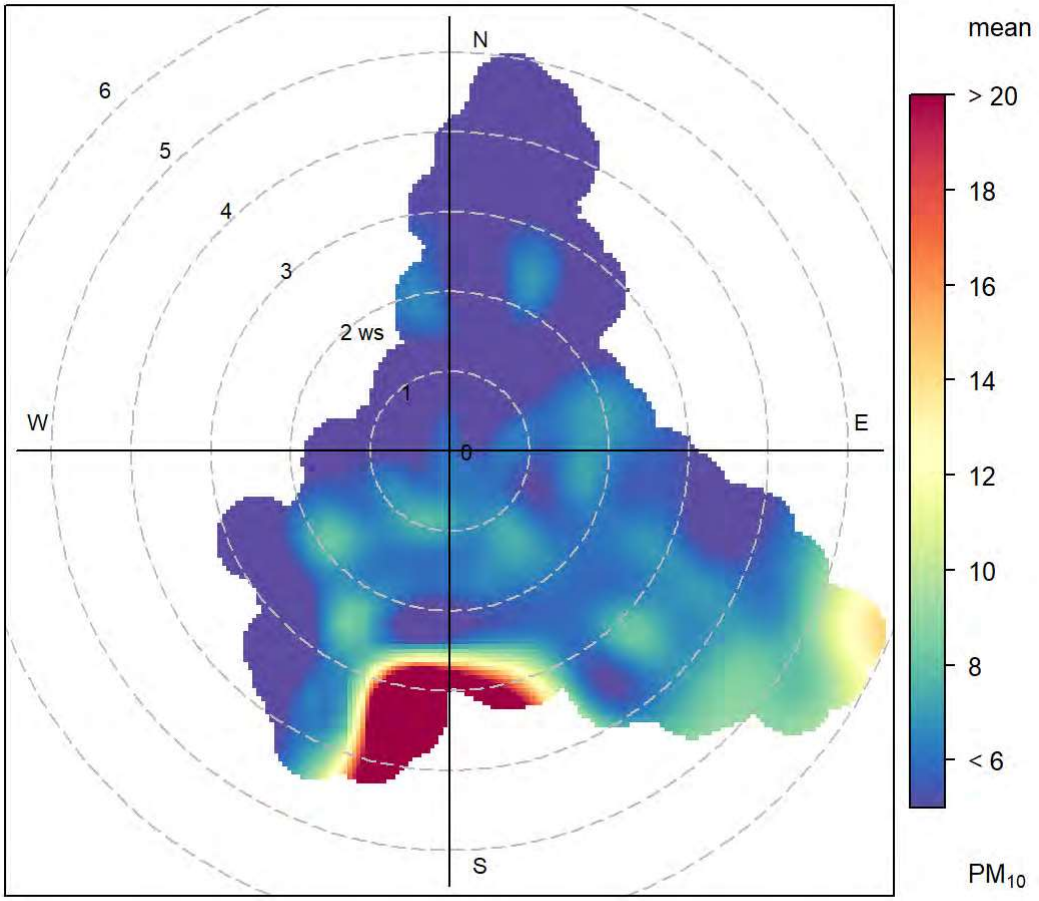


Figure 5.11: Polar plot of 1-hour average PM_{10} concentrations measured by OPC at Location 2 (excluding 8 and 9 July 2022)

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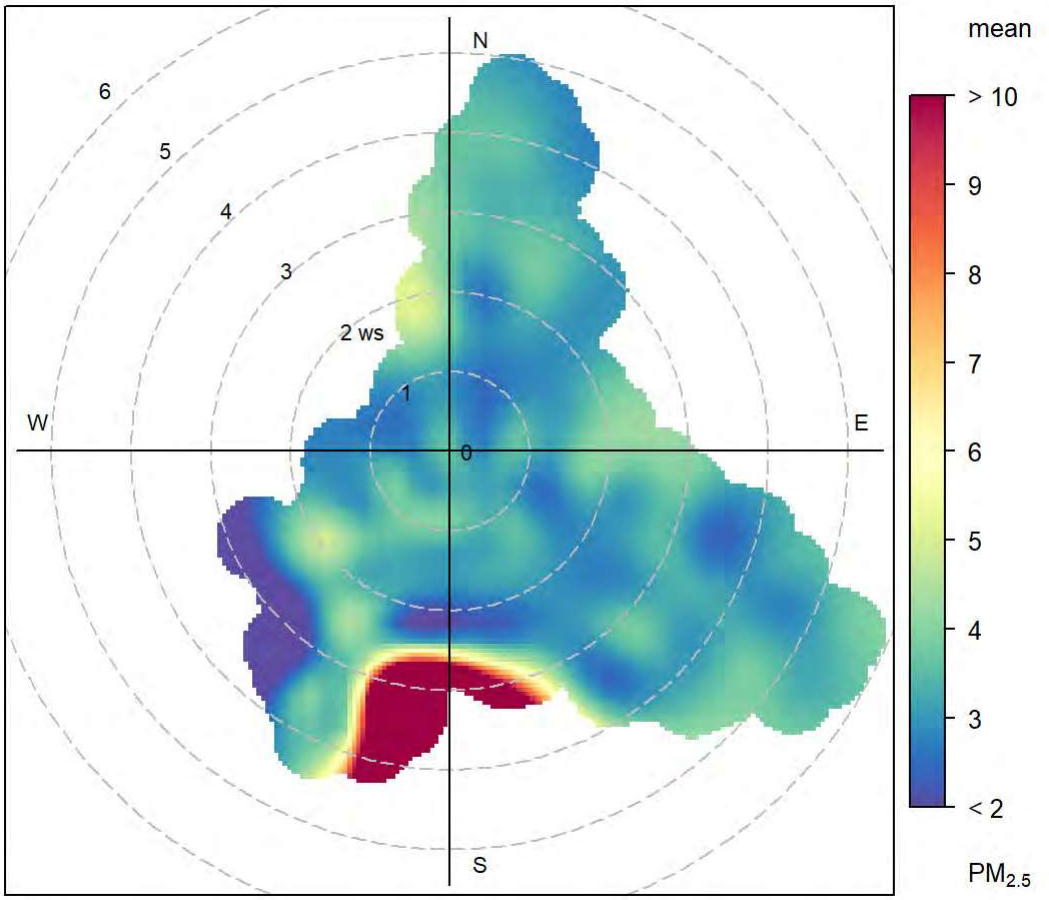


Figure 5.12: Polar plot of 1-hour average $PM_{2.5}$ concentrations measured by OPC at Location 2 (excluding 8 and 9 July 2022)

Time series plots of 1-hour average concentrations of PM_{10} and $PM_{2.5}$ measured by the OPC at Location 2 are provided in **Figure 5.13** and **Figure 5.14**, respectively. **Table 5.2** presents the hours during which the 1-hour average PM_{10} concentration was above 50 µg/m^3 and/or the 1-hour average $PM_{2.5}$ concentration was above 25 µg/m^3 at the OPC at Location 2 (these concentration thresholds are again arbitrary, being intended simply to highlight the highest 1-hour average concentrations measured during the monitoring period, although in this case they do align with the 24-hour average objectives). Location 2 is at a bearing of 1° from the Mill stack, making it directly downwind under winds from 181° and thus is likely to be most impacted by the plume from the Mill stack under wind directions between about 161-201° (with these directions highlighted in green in **Table 5.2**).

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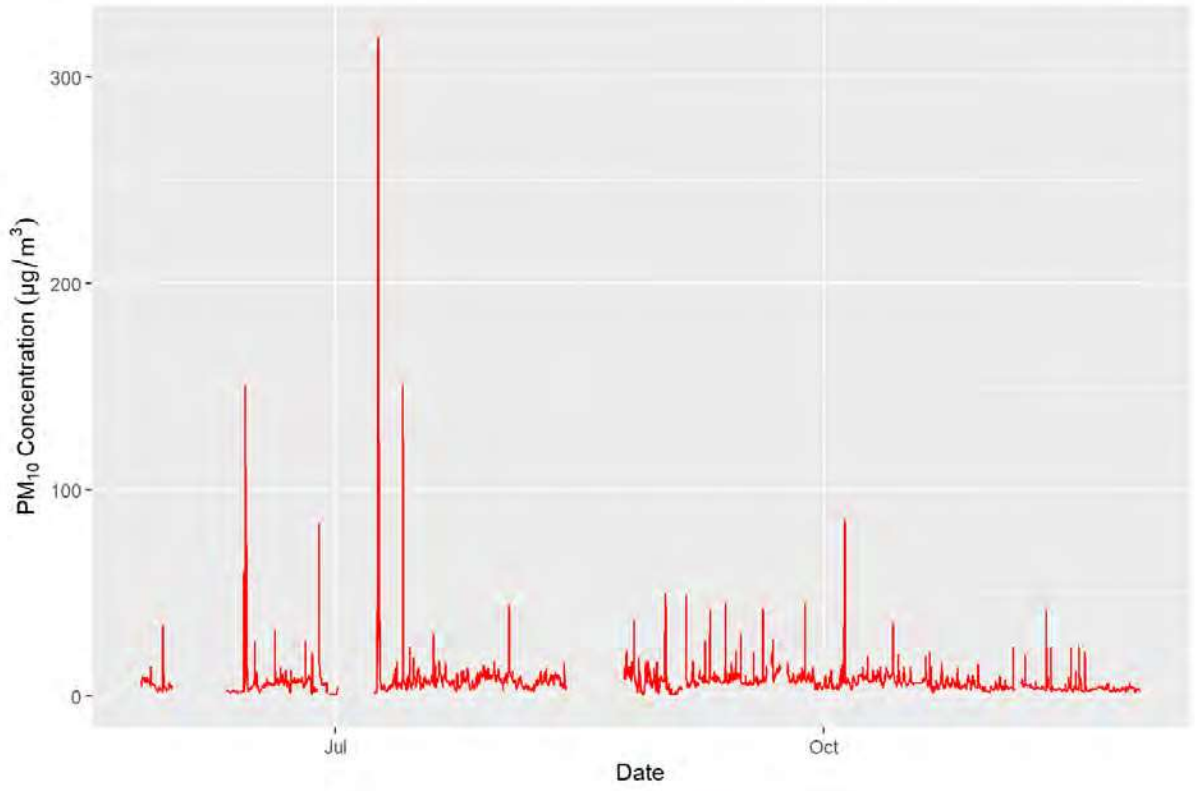


Figure 5.13: Time series of 1-hour average PM_{10} concentrations measured by OPC at Location 2

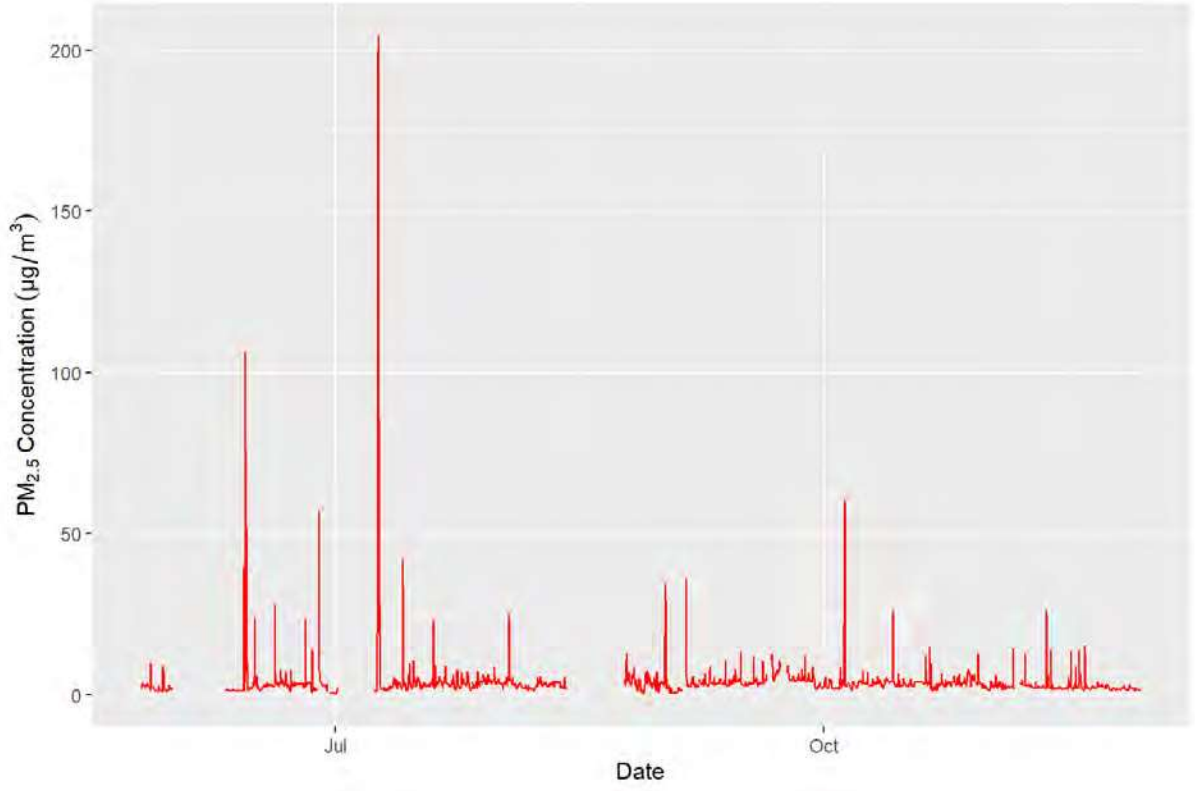


Figure 5.14: Time series of 1-hour average $PM_{2.5}$ concentrations measured by OPC at Location 2

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Table 5.2: Hours with average PM_{10} concentrations above 50 µg/m³ or $PM_{2.5}$ concentrations above 25 µg/m³ at Location 2 OPC

Hour (ending)	Location 2 Concentration		Wind		Location 1 Concentration	
	PM_{10}	$PM_{2.5}$	Speed (m/s)	Direction (°)	PM_{10}	$PM_{2.5}$
13/06/2022 20:00	59.7	39.8	1.17	139.6	20.5	13.3
14/06/2022 3:00	150.6	106.4	3.08	199.1	3.2	1.8
14/06/2022 4:00	149.4	104.7	2.86	190.8	2.9	1.5
14/06/2022 5:00	111.7	75.9	3.22	191.9	2.3	1.2
14/06/2022 6:00	71.9	49.0	3.19	193.5	2.4	1.1
14/06/2022 7:00	49.4	35.2	3.36	196.7	2.1	1.0
14/06/2022 8:00	73.3	52.1	3.42	190.2	2.5	1.1
14/06/2022 10:00	39.5	28.7	-	-	2.3	0.9
19/06/2022 17:00	32.0	27.9	1.56	200.8	11.3	5.2
28/06/2022 0:00	83.4	57.0	0.92	179.1	13.1	6.7
9/07/2022 1:00	78.6	51.6	2.72	197.8	-	-
9/07/2022 2:00	263.7	167.8	2.83	192.0	-	-
9/07/2022 3:00	318.9	199.8	3.06	190.7	-	-
9/07/2022 4:00	317.8	204.5	3.00	189.6	-	-
9/07/2022 5:00	145.6	105.5	3.03	193.2	-	-
9/07/2022 7:00	52.6	36.4	3.47	196.1	-	-
9/07/2022 8:00	122.2	85.1	3.42	195.1	-	-
9/07/2022 9:00	76.8	56.0	2.89	191.9	-	-
9/07/2022 12:00	37.1	27.5	1.56	163.2	-	-
13/07/2022 17:00	84.4	20.7	3.36	121.9	-	-
13/07/2022 18:00	150.9	42.0	2.67	115.3	-	-
13/07/2022 19:00	124.3	34.0	1.86	114.2	-	-
1/09/2022 5:00	49.6	34.2	1.22	208.4	-	-
1/09/2022 6:00	44.0	29.5	1.36	188.2	-	-

Hour (ending)	Location 2 Concentration		Wind		Location 1 Concentration	
	PM_{10}	$PM_{2.5}$	Speed (m/s)	Direction (°)	PM_{10}	$PM_{2.5}$
5/09/2022 1:00	48.8	36.1	2.39	198.4	-	-
5/09/2022 2:00	44.7	33.1	2.86	198.8	-	-
4/10/2022 22:00	85.1	60.2	1.06	221.2	4.3	2.3
14/10/2022 0:00	35.2	26.2	2.39	207.0	7.6	3.4
11/11/2022 20:00	42.0	26.7	1.75	96.0	49.3	32.8

Note: Time periods with wind directions between about 161-201° are highlighted in green

Operational records show that start-ups from a cold, or relatively cool, boiler occurred during the 2022 crush season on the following dates:

- 30 / 31 May 2022 – steam trials;
- 13 / 14 June 2022 – commencement of crush 2022 season, with the warming fire lit on 13 June 2022;
- 23 June 2022 – steam off at 8:19am, back on at 3:00pm - boilers had not fully cooled;
- 8 / 9 July 2022 – start-up after a prolonged stop of 8 days;
- 31 August to 2 September 2022 – boilers were lit from 20:30 on 31 August following a 3-day stop, then taken offline at 06:00 on 1 September before being started up again at 18:00; and
- 4 / 5 September 2022 – steam production commenced at 1:50am on 5 September 2022 (warming fires lit approximately 20:00 on 4 September) following a 3-day wet weather stop and crush commenced at 04:00.

Some dates with start-ups did not coincide with elevated measured concentrations – emissions may not have been especially high on these occasions and / or monitors may not have been downwind of the Mill stack, in which case an elevated measured concentration would not be expected.

Bearing in mind the wind directions presented in **Table 5.2**, it is possible that the elevated concentrations measured at Location 2 on the following dates relate to start-up of the Mill:

- 14 June 2022 (this includes the measurements at 10am when the wind sensor was offline for the 12-month service;
- 9 July 2022;
- 1 September 2022 (noting that at 05:00 the vector averaged wind direction was just outside the 161-201° range, but that the 10-minute data for this hour suggest that Location 1 was within the downwind range for at least a third of this hour); and
- September 2022.

It is unlikely that the events on the following days were related to emissions from the Mill stack:

- 13 July 2022 – operational records identifies a maintenance stop on this day between 12:00 and 17:30, and a harvester operating to the east of the Mill. While it cannot be said with absolute certainty, given the wind direction, it would seem likely that the cause of the elevated concentrations on this day would have been the harvester.
- 4 October and 11 November 2022 - no upset conditions were reported on these days and wind direction was not recorded between 161-201° in any of the 10-minute periods in the hour of interest for each site.

Regarding the remaining events:

- 13 June 2022 – the wind direction was not between 161-201° in any of the 10-minute periods making up this hour and concentrations at Location 1 were also relatively elevated, suggesting another source contributing to concentrations at both monitors. While a contribution from the Mill stack cannot be

completely discounted due to the warming fires burning at this time and the relatively light winds measured, it is considered relatively unlikely that it contributed significantly. It is also possible that activities in the mill laydown yards adjacent to monitoring location 2 (directly south) could have been the source of some of the PM_{10} that was measured;

- 19 June 2022 – concentrations at Location 2 were not especially high and concentrations at Location 1 were relatively elevated, suggesting another source contributing to concentrations at both monitors, but given the wind direction and low wind speed, it is possible that the Mill made some contribution, but again this would have been small and not sufficient to trigger a potential 24-hour average objective exceedance;
- 28 June 2022 – concentrations at Location 2 were higher than on 19 June 2022 at 17:00, but again concentrations at Location 1 were relatively elevated, suggesting another source contributing to concentrations at both monitors, and any contribution from the Mill stack would not have been sufficient to trigger a potential 24-hour average objective exceedance; and
- 14 October 2022 - no upset conditions were recorded on 13 October 2022 between 11pm and midnight (14/10/2022 0:00 in Table 5.2), and while the wind direction was only just outside the arc of influence (161-201°), concentrations in this hour were not especially high.

Based on the analysis presented above, it would seem clear that it is only the start-ups from a cold, or relatively cool, boiler that have the potential to cause elevated PM_{10} and $PM_{2.5}$ emissions to the extent that ambient impacts are distinct in the OPC monitoring data. On the morning of 9 July 2022 1-hour average concentrations were high enough and prolonged enough to lead to 24-hour average concentrations above the objectives. MCM advises that this exceedance of the objectives may have resulted from atypical start-up conditions that were not experienced at any other time during the crushing season (refer to **Section 4.2**).

5.4 24 and 30 July 2022

This section focuses specifically on the occasions when Location 1 LVAS 24-hour average $PM_{2.5}$ concentrations exceeded the objective, specifically 24 and 30 July 2022 (24-hour average concentrations of 40 µg/m^3 and 60 µg/m^3, respectively). No valid OPC data was available from Location 1 on these dates due to a tubing obstruction. The OPC at Location 2 was operational on these dates; 1-hour average $PM_{2.5}$ concentrations were never especially high (concentration did not exceed 7.6 µg/m^3 on 24 July 2022 or 8.6 µg/m^3 on 30 July 2022). The data from this unit have been reviewed for elevated concentrations when downwind of the Mill stack (wind directions between about 161-201°).

Figure 5.15 and **Figure 5.16** present 1-hour average PM_{10} and $PM_{2.5}$ concentrations measured by the OPC at Location 2 alongside 1-hour average (vector averaged) wind direction on 24 and 30 July 2022, respectively.

The plot for 24 July 2022 demonstrates that the monitor was never directly downwind of the Mill Stack on this day. However, it does also seem to demonstrate that higher concentrations tended to align with winds closest to the "downwind" directions; specifically, the six highest concentrations occurred with a wind direction between 204.1° and 210.9°. Concentrations were still low though, at no more than 12.2 µg/m^3 for PM_{10} and 7.6 µg/m^3 for $PM_{2.5}$, suggesting that even if there was some contribution from the Mill on this day, it was small. It is not feasible to draw conclusions as to the cause of the elevated concentrations measured at the Location 1 LVAS on this day based on the Location 2 OPC data.

The plot for 30 July 2022 shows that the monitor would likely have been downwind of the Mill stack over some of the hours on this day, but that concentrations were not especially elevated when it was. The two hours with the highest concentrations at the end of the day (6.3 µg/m^3 at 10-11pm and 8.6 µg/m^3 at 11pm-midnight) had wind directions of 148.8° and 113.0°, respectively. The way concentrations rose sharply as the wind changed from southerly to east-south-easterly would seem to suggest a source to the east or southeast of the monitor as the cause of elevated concentrations, rather than the Mill stack.

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MCM advised that the oxygen alarm on Boiler #7 lasted for 10.5 minutes between 1:30 am and 1:40 am on 30 July 2022, with ten other alarms recorded (seven for less than one minute and three for less than 1.5 minutes) between the hours of 1:20 am to 4:45 am and 10:30 pm to 11:05 pm on the same date. The OPC at Location 2 was only downwind of the Mill stack at the following coinciding times on 30 July 2022 (refer to **Figure 5.16**):

- Between 3 am to 4 am – concentrations at this time (3.9 µg/m^3) and throughout the early hours of 30 July 2022, were very low (no higher than 4.8 µg/m^3), suggesting very little contribution from the Mill stack at the times of the earlier oxygen alarms; and
- Between 8 pm and 10 pm, but not in the two hours at the end of the day with the highest concentrations. Analysis of 10-minute wind direction data (refer to **Table 5.3**) shows that the monitor may have been downwind of the Mill stack for around ten minutes between 10:30 pm and 11:05 pm on 30 July 2022, but was not downwind between 11pm and midnight, when concentrations were highest. This suggests that it is very unlikely that emissions from the Mill stack contributed significantly to measured concentrations on the evening of 30 July 2022.

Location 1 was also not downwind of the Mill in the hours in which oxygen alarms occurred, so it is considered likely that this conclusion also applies to measured concentrations at Location 1 on 30 July 2022.

It is considered most likely that elevated $PM_{2.5}$ concentration measured by the Location 1 LVAS on this day were a result of a source relatively close to the monitor. This cannot be confirmed, but it would seem highly unlikely that the cause was emissions from the Mill stack under normal operations in the middle of the day (wind direction was between 85-125° in most of the hours between 10 am and 6 pm); if normal operations led to elevated concentrations at Location 1 when downwind of the Mill stack then elevated concentrations would have been measured at Location 1 on most afternoons, as afternoon winds were frequently between 85-125° (see diurnal wind rose in Figure 5 of Katestone's final dispersion modelling report, appended to the MCM Environmental Report).

Table 5.3: 10-minute wind direction data for periods of oxygen alarms recorded on 30 July 2022

Date	Time (period ending)	Wind direction (°)
30/07/2022	22:40	120.8
30/07/2022	22:50	175.4
30/07/2022	23:00	146.5
30/07/2022	23:10	115.0
30/07/2022	23:20	116.4
30/07/2022	23:30	134.9
30/07/2022	23:40	109.0
30/07/2022	23:50	104.3
31/07/2022	00:00	107.5

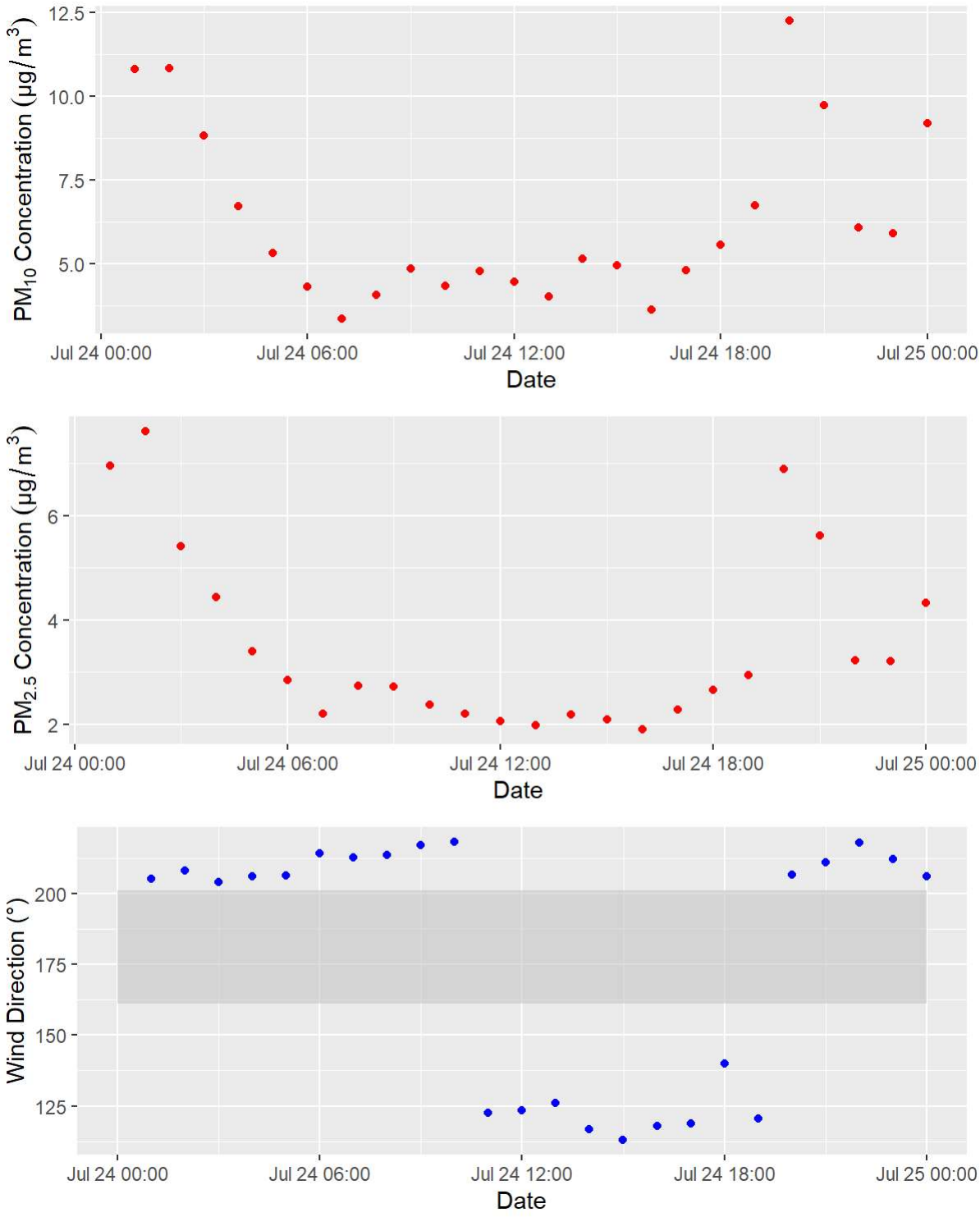


Figure 5.15: Time series of 1-hour average PM_{10} and $PM_{2.5}$ concentrations measured by OPC at Location 2 and MCM weather station wind direction data (downwind direction highlighted) on 24 July 2022

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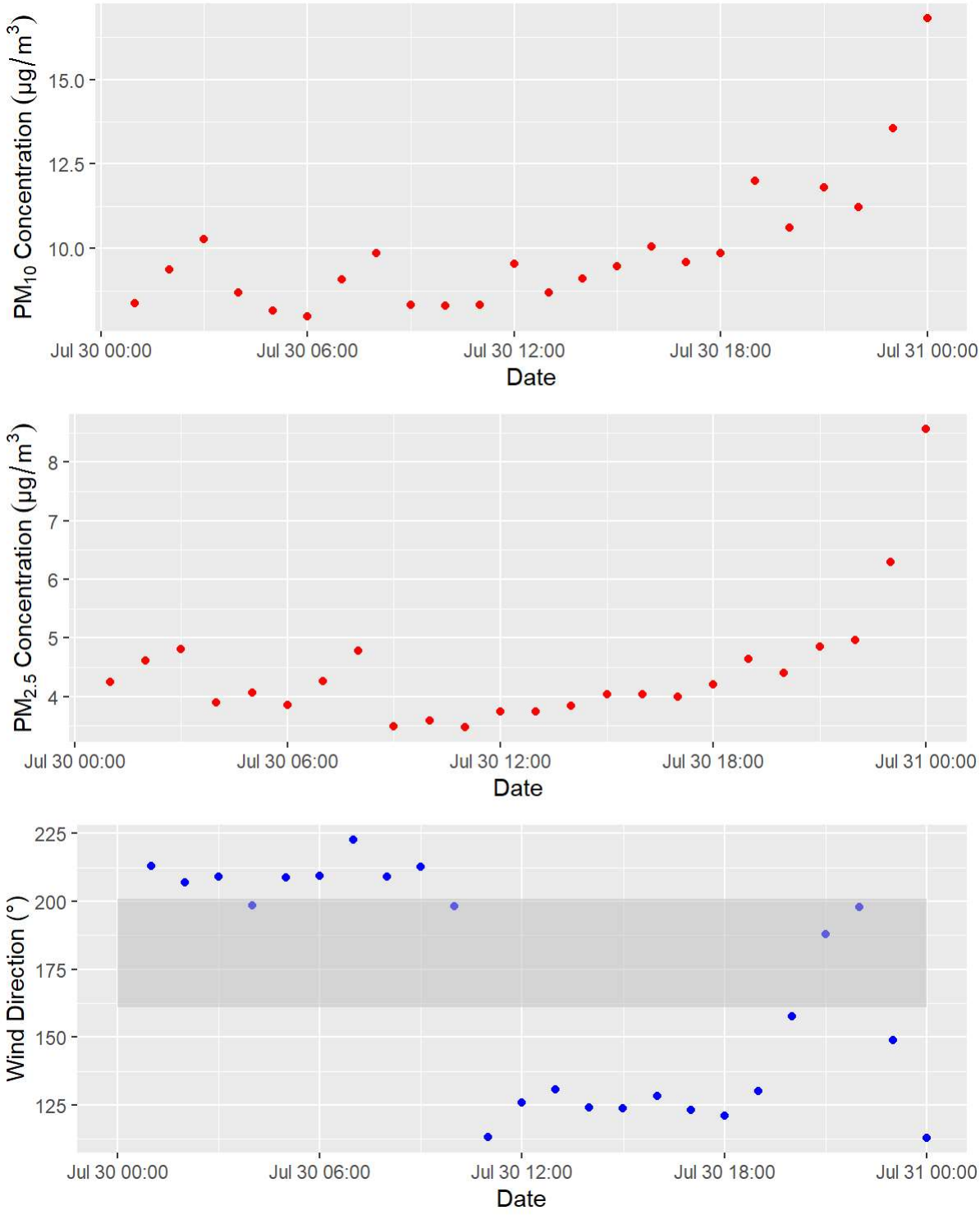


Figure 5.16: Time series of 1-hour average PM_{10} and $PM_{2.5}$ concentrations measured by OPC at Location 2 and MCM weather station wind direction data (downwind direction highlighted) on 30 July 2022

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5.5 9 July 2022

It would appear that elevated concentrations at Location 2 did, for the most part, align with periods of start-up of the Mill.

MCM advised that the event on the 8 / 9 July 2022 where the boilers were lit, then stopped and re-lit a couple of hours later was an unusual event resulting from supply issues. The available data also identifies this as the only event that led to a potential measured exceedance of an objective by an OPC monitor (refer to **Section 5.3.2**).

The 24-hour average concentrations measured at the OPC at Location 2 on 9 July 2022 were 64 µg/m^3 for PM_{10} and 42 µg/m^3 for $PM_{2.5}$. On 9 July, elevated concentrations were only measured during the hours between midnight-midday whereas between midday-midnight the average concentrations were just 4.3 µg/m^3 for PM_{10} and 1.9 µg/m^3 for $PM_{2.5}$.

Figure 5.17 shows how Location 2 OPC concentrations varied through 8, 9 and 10 July 2022, and how these related to wind direction.

Operational records indicates that oil was used between 6:10 am to 6:38 am and 10:40 am to 4:47 pm on 9 July 2022. The concentration measured by the OPC at Location 2 between 6 am and 7 am was actually lower than those from midnight to 5 am and 7 am to 9 am, with concentrations not especially high in the hours after 10 am, suggesting that the use of oil did not cause a significant increase in particulate emissions, and wasn't a factor in the elevated concentrations measured between 1 am and 4 am. Oil was regularly used through the crush season under what would be considered normal operations, yet there is no indication that emissions from the Mill stack led to elevated 24-hour average concentrations under normal operations. Therefore, it is considered likely that the use of oil (at the volumes used during the 2022 crush season) is of little significance in terms of particulate emissions from the Mill.

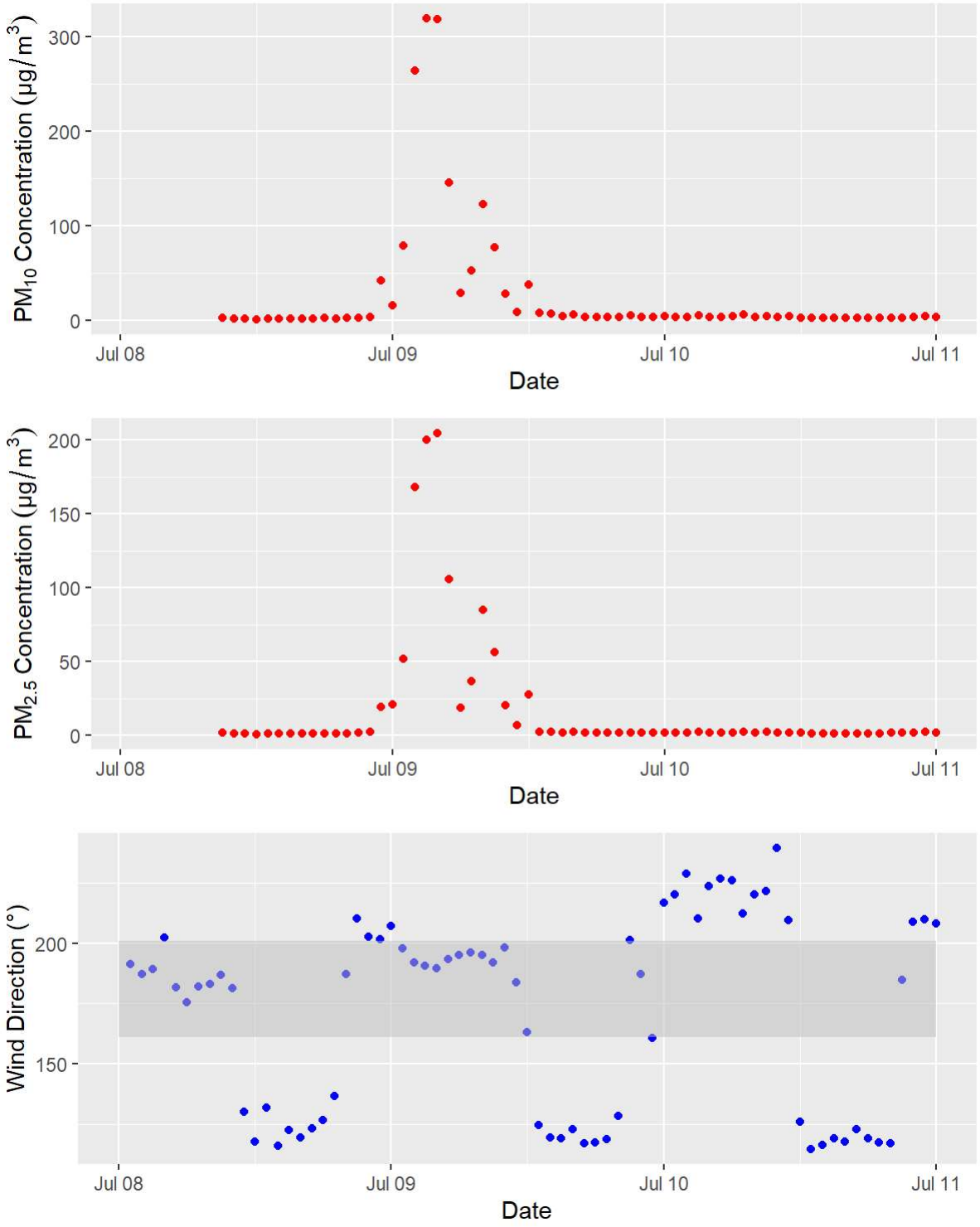


Figure 5.17: Time series of 1-hour average PM_{10} and $PM_{2.5}$ concentrations measured by OPC at Location 2 and MCM weather station wind direction data (downwind direction highlighted) on 8 to 10 July 2022

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6 Conclusions

There was loss of data during the monitoring program, resulting from a range of causes, but the analysis presented above has been able to draw clear conclusions regardless.

Detailed analysis of the results of the PM monitoring program conducted during the 2022 crush season has identified that, under normal operating conditions, including when waste oil is used as a fuel and even during oxygen alarms, the contribution of the Mill to measured concentrations in the township of Gordonvale is small, and there is no risk of objective exceedances associated with normal operations. This conclusion is drawn bearing in mind the high 24-hour average $PM_{2.5}$ concentrations measured on 24 and 30 July 2022 by the AS/NZS 3580.9.10:2017 compliant LVAS at Location 1, when the Mill was operating normally. If normal operations led to high concentrations at Location 1 when downwind of the Mill stack then high concentrations would have been measured at Location 1 on most afternoons. It is, therefore reasonable to conclude that the Mill did not contribute significantly to concentrations on these two days, and that there must have been an alternative local source of $PM_{2.5}$ being recorded by this monitor on these days.

However, the analysis has also identified that upset startup conditions have the potential to lead to elevated concentrations of particulates. This includes the startup on 9 July 2022, when high measured concentrations in some hours of the morning at the Location 1 OPC led to 24-hour average concentrations above the AQOs for both $PM_{2.5}$ and PM_{10}, noting that the background concentrations on that day were very low. Other startup events during the monitoring period also resulted in some of the highest measured concentrations, however, not to the extent that the 24-hour average concentrations exceeded the objectives.

MCM identified the 9 July 2022 was an atypical startup event following an extended wet weather stop and it is understood that measures have been put in place to avoid such a recurrence in the future.

References

Katestone (2021) Dispersion Modelling Assessment of Mulgrave Sugar Mill. V1.0, 9 September 2021.

Mulgrave Central Mill Pty Ltd (MCM 2021) Mulgrave Central Mill: Air Quality Monitoring Program. Rev 2A, dated 9 July 2021.

Limitations

This report has been prepared for the use of the client, Mulgrave Central Mill, for the purpose of this commission only.

CQG [2] takes no responsibility and disclaims all liability for any loss or damage that any party may suffer as a result of using or relying on any such information or recommendations contained in this report.

To the maximum extent permitted by law CQG expressly disclaims responsibility for or liability arising from:

- Any error in, or omission in connection with assumptions, or
- Reliance on the report by a third party, or use of the report other than for the purpose stated.

The report relates only to the project described herein and must be reviewed by a competent expert before being used for any other purpose. CQG accepts no responsibility for other use of the data.

This report does not provide a complete assessment of the environmental status of the site but is limited to the scope defined herein.

Should further information become available regarding the conditions of the Study Area, CQG reserves the right to review the report in the context of the additional information.

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This report is based on information issued and supplied to CQG by others as well as publicly available information.

Where laboratory tests have been performed and data recorded, the responsibility for the accuracy of such data remains with the issuing authority, not with CQG.

[2] *CQ Environmental Pty Ltd (ABN 61 107 574 514) trading as CQG Consulting (CQG)*

Appendix A:

Monitoring Locations



Legend

Monitoring Locations

Name

- Monotoring Locations
- Cadastral Boundaries

N

Scale 1:5,000 (A3)

0 25 50 100 150 200 250

Meters

Coordinate System: GDA2020 MGA Zone 55

Figure A1

Mulgrave Central Mill Particulate Matter Monitoring

Gordonvale

Monitoring Locations

CQG Consulting

180 Quay Street, Rockhampton Q 4700
PO Box 8384, Allenstown 4700
Ph: +61 7 4922 9252 Fax: +61 7 49220195

Project No: 20168
Map No: 20168-01
Figure: 1.1
23 November 2022

Layer Credits- Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community; QSpatial - Cadastral Boundaries.

Appendix B:

Siting Review Against Australian Standard

AS/NZS 3580.1.1: 2016: Methods for sampling and analysis of ambient air: Guide to siting air monitoring equipment states:

- Section 1: Scope – *sets out general guidelines for the siting of ambient air monitoring equipment… In practice, an ideal site satisfying all the criteria is rarely achieved*;
- Section 7.2: *Site considerations: Based on operational experience and experimental data, a number of general guidelines can be listed as follows:*
  - (a) *Avoid sites that have restricted airflows in the vicinity of the sampling inlet, such as sites adjacent to buildings, trees, walls, etc. As a general rule, a sampling inlet should be located away from any nearby structure to the extent that the sampling inlet has a minimum clear sky angle of 120°.* As noted in **Table 3.3** of the report, this was achieved at the monitoring locations;
  - (b) *Avoid sites which are adjacent to objects which may alter pollutant concentrations by adsorption or absorption, such as those near some building surfaces or near leafy vegetation. A*s noted in **Section 3.3** of the report, adsorption / absorption are not considered significant factors in relation to the metal signage upon which Location 1 monitoring equipment was affixed;
  - (c) *Avoid sites where chemical interference with the pollutant being measured may occur*. No sources of chemical interference relevant to particulate monitoring were identified at the monitoring locations;
  - (d) *Avoid sites where physical interference may produce atypical results*. As noted, monitoring Location 1 was unobstructed from the direction of the Mill stack, thus the signage upon which the instrument was affixed would not have affected the transport of the Mill plume to the monitor. Clear line of sight was achieved between the monitoring equipment and the Mill stack at Location 1. This would not have been easily achievable elsewhere at the Gordonvale Turf Club/Golf Club due to the row of tall trees along the eastern boundary of the Golf Club;
  - (e) *Ground level sampling sites (sample inlet less than 5 m above ground level) are generally preferable in low or sparsely built up areas.* The monitoring locations were in sparsely built up areas (i.e. Location 1 at the Turf Club, and Location 2 in open area on mill property with low density residential areas to the north);
  - (f) S*ample sites should not be affected by extraneous emissions.* See other comments to this section of the Australian Standard;
  - (g) *Local activities around a sampling site may change its suitability as a site, either temporarily or permanently*. No ongoing activities were identified that affected the monitoring location suitability, although activities in the mill site laydown area may have influenced results at Location 2 occasionally as discussed in the Environmental Report.
- *Sample sites not meeting the above criteria require a statement in the monitoring data report noting this.* Where siting criteria was not achieved, these details are provided in **Section 3.3** of the report. *Other considerations are as follows:*
  - *(i) Seek sites that are secure and have a low potential for vandalism.* MCM and CQG took into consideration the security and potential for theft and vandalism during site selection. Turf Club representatives advised that installing air quality monitoring equipment near the finish line at the Turf Club (Location 1) was preferred over other locations at the Turf Club, as there was less chance of vandalism at this location, noting that members of the public use the Turf Club as a thoroughfare.

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(ii) *Seek sites that have adequate access for transporting equipment.* Location 1 was deemed accessible for set up of equipment and ongoing battery and filter exchanges, whilst being a suitable distance (>50m) from roads.

(iii) *Seek sites that have reliable electricity supply.* Not applicable as the LVAS used batteries and the OPC used solar power.

(iv) *Seek sites that are not prone to natural disasters.* Not considered in siting selection, locations in Gordonvale are not generally prone to natural disasters in the time period the monitoring was undertaken

(v) *Seek sites that have adequate and reliable communication services.* Not applicable for the LVAS as it did not require communication services. The telemetered OPC required cellular 4G communication which was achieved at Location 1.

(vi) *Seek sites where noise levels generated by pumps or air conditioners, or maintenance and calibration activities do not impose on the local residents / population. The station location should be selected in order to minimise the impact on general activities of the local population and should not be restrictive on the intended usage of the location.* The equipment operation and maintenance activities are not considered to be noisy. A Turf Club representative advised MCM that Location 1 wouldn't interfere with the events or training activities at the Turf Club. Locating the equipment elsewhere on the Gordonvale Golf Club grounds was not necessarily possible without obstructing the golfing and maintenance activities (e.g. slashing) of the Club and increasing the risk of damage to equipment by golf balls, or as a consequence of vandalism or interference with the mechanism of the equipment.

(vii) *Seek sites where access times are aligned with the intended data capture rates.* The site had no time-related access restrictions unlike other sites initially investigated may have had e.g. schools, nursing homes.

(viii) *Seek sites where personnel will be able to perform their activities in a safe environment and workplace in accordance with OHS regulatory requirements.* Location 1 was deemed the safest location at the Turf Club/Golf Club for access, as it did not require traversing fairways and was at the edge of a fairway where there was reduced risk of interaction with airborne golf balls for MCM staff whilst changing filters and batteries.

- Section 8: Position of Sample inlet or sample path:
    - *In many cases the siting of monitoring equipment and event, the position of the sampling inlet need to be related to meteorological conditions, e.g., there should be no impediment to air approaching the sampling inlet particularly in the predominant wind direction.* Refer to commentary above and noting **Table 3.3** of the report identifies both achievement of the clear sky angle of 120° and unrestricted airflow of 270° around the sample inlet, in particular from direction of Mill stack.
    - *Table 2: Recommended Sampling Inlet Positioning Criteria – Other locating criteria (minimum requirements)* – addressed in **Table 3.3** of the report, with the criteria not achieved clearly stated as required by Section 7.2 of the Australian Standard (see above).

Appendix C:

LVAS Field Sheets

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations: Light breeze, small gust. Sunny day.		
	Site weather station:	Temp: 28 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	Filter changed on-site, as second sample head has not arrived yet.
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G2	☐ $PM_{2.5}$ ☑ PM_{10}	28-4-22 00:00	29-4-22 00:00	1439	3	4316.9	3920.9	29.519	756.41	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/~~cleaned~~
☑ Filter exchanged (in laboratory prior to going into field) Filter exchanged on-site (waiting on 2nd head)	☑ Inlet components checked/~~cleaned~~
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

29.04.2022

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations: Drizzling during day. Drizzling stopped during filter change.		
	Site weather station:	Temp: 25 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	Drizzling during sampling day.
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
~~G2~~ G3	☑ $PM_{2.5}$ ☐ PM_{10}	01-05-22 00:00	02/5/22 00:00	1439	3	4316.5	3941.1	25.920	756.43	✓

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/~~cleaned~~
☐ Filter exchanged ~~(in laboratory prior to going into field)~~ on site.	☑ Inlet components checked/~~cleaned~~
☑ Battery replaced	☐ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☐ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:		Name:	Sign:
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

03.05.2022

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 28 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G4	☐ $PM_{2.5}$ ☑ PM_{10}	04.5.22 00:00	05.5.22 00:00	1440	3	4319.8	3925.4	29.559	756.34	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/~~without~~ size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:		Name:	Sign:
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

06.05.2022 KP

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations: Drizzling during day of inlet/filter head swap.		
	Site weather station:	Temp: 24 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	Horse races on during day of 07.05.22.
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G5	☑ $PM_{2.5}$ ☐ PM_{10}	07.05.22 00:00	08.05.22 00:00	1439	3	4316.7	3917.2	24.131	757.62	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:

Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

09.05.22 KP

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 27 °C	Atmos pressure: 1007 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	Raining during sample time.
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G6	☐ $PM_{2.5}$ ☑ PM_{10}	10-5-22 00:00	11-5-22 00:00	1439	3	4316.9	3915.5	28.806	753.04	Filter torn on edge during removal

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (~~in laboratory prior to going into field~~) G7 installed / removed	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G7	CE159277
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

12.05.22 KF

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 28 °C	Atmos pressure: 1005 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results,*
☑ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G8	☑ $PM_{2.5}$ ☐ PM_{10}	13.5.22 00:00	14.5.22 00:00	1439	3	4316.7	3900.4	28.478	753.04	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

15.05.22 KF

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 26 °C	Atmos pressure: 1013 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	Mowing occuring on the morning 18.05
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G9	☐ $PM_{2.5}$ ☑ PM_{10}	16.5.22 00:00	17.5.22 00:00	0	3	0	0	27.012	758.67	Battery failed to connect.

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:

Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

18.05.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: _____ °C	Atmos pressure: ____ HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G10	☑ $PM_{2.5}$ ☐ PM_{10}	19.5.22 00:00	20.5.22 00:00	1439	3	4316.7	3949.1	24.988	3949.1	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

20.5.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MJF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 23 °C	Atmos pressure: 1010 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results,*
☑ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
GN	☐ $PM_{2.5}$ ☑ PM_{10}	22-5-22 00:00	23-5-22 00:00	1439	3	4317.1	3940.1	28.953	756.74	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

23-5-22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 22 °C	Atmos pressure: 1010 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G12	☑ $PM_{2.5}$ ☐ PM_{10}	25-5-22 00:00	26-5-22 00:00	1439	3	4316.7	3949.7	20.356	756.70	✓

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G13 CE159571	
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

27-5-22 KF

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 21 °C	Atmos pressure: 1010 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	MicroVol changed to 1-in-2 for ~~daily~~ steam trials upcoming.
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G14	☐ $PM_{2.5}$ ☑ PM_{10}	28-5-22 00:00	29-5-22 00:00	1439	3	4316.5	3971.9	22.895	756.32	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

30-5-22 KF

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 23 °C	Atmos pressure: 1008 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	Timber until ~ 9pm then bagasse.
☑ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G15	☑ $PM_{2.5}$ ☐ PM_{10}	31-5-22 00:00	01-6-22 00:00	1439	3	4316.8	3947.8	24.660	759.35	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☐ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

01/6/22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Surgical)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 23 °C	Atmos pressure: 1012 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	On bagasse.
☑ Steam trial	MicroVol to go back to 1-in-3 from 4/6.
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G16	☐ $PM_{2.5}$ ☑ PM_{10}	02.6.22 00:00	03.6.22 00:00	1439	3	4317.0	3960.8	26.294	759.61	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**

Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

03.6.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 23 °C	Atmos pressure: 012 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G17	☑ $PM_{2.5}$ ☐ PM_{10}	4-6-22 00:00	5-6-22 00:00	1439	3	4316.7	3956.7	22-063	756.34	"Low input voltage" on display 6-6-22

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑ 1 ☑ 2 ☑ 3 ☑ 4 ☐ 5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

6-6-22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 24 °C	Atmos pressure: 1010 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G18	☐ $PM_{2.5}$ ☑ PM_{10}	7-6-22 00:00	8-6-22 00:00	1439	3	4316.7	3928.8	29.111	756.70	G18 left in while flow rates checked

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☑ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G19	CE 159795
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:** 08-6-22	**Name:** Kate Barnes	**Sign:** K/Barnes
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☑ Yes (no action needed) ☐ No (adjust flow rate)		29.00	756.33

See attached sheet.

8-6-22 K/

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: ~~18~~ 21 °C	Atmos pressure: 1013 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	changed to 1-in-2 sampling
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G20	☑ $PM_{2.5}$ ☐ PM_{10}	10.6.22 00:00	11.6.22 00:00	1445	3	4334.9	4010.9	23.699	757.69	Data not cleared after flow rate checks 05/6.

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

11.6.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 19 °C	Atmos pressure: 1014 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	Golf tournament
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G-21	☐ $PM_{2.5}$ ☑ PM_{10}	12.6.22 00:00	13.6.22 00:00	1439	3	4316.7	3918.0	24.106	759.51	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑ 1 ☑ 2 ☐ 3 ☐ 4 ☐ 5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

13.6.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: ~~[illegible]~~ KP °C	Atmos pressure: ~~984~~ HPA KP

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	A.S. & 12-M service on weather station.
☐ Steam trial	14.6 → End July. Planned burns QPWS
☑ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G22	☑ $PM_{2.5}$ ☐ PM_{10}	14.6.22 00:00	15.6.22 00:00	1439	3	4317.1	4002.3	25.8	759.52	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☐ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

15.6.22 KP

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MJF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 23 °C	Atmos pressure: 1015 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results,*
☐ Mill not operating (baseline sample)	changed to 1-in-3 as of 18.6.22
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G23	☐ $PM_{2.5}$ ☑ PM_{10}	16.6.22 00:00	17.6.22 00:00	1439	3	4316.8	3959.6	25.574	759.29	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☐ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

17.6.22 jmf

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 22 °C	Atmos pressure: 1013 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	QPWS burn offs 14.6 – 30.7 (planned)
☐ Steam trial	20.6 golf course being mowed.
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G24	☑ $PM_{2.5}$ ☐ PM_{10}	18.6.22 00:00	19.6.22 00:00	1439	3	4316.7	3975.8	22.185	756.42	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G25 CE 159998	
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

20.6.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations: Full cloud cover		
	Site weather station:	Temp: 22 °C	Atmos pressure: 1012 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	20-6 golf course being mowed
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G26	☐ $PM_{2.5}$ ☑ PM_{10}	21-6-22 00:00	22-6-22 00:00	1439	3	4316.5	3978.2	25.003	758.39	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 23.6.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations Overcast + drizzly.		
	Site weather station:	Temp: 22 °C	Atmos pressure: 1016 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	26-6 burning off occurring at North of Mill - Digger st
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G7	☑ $PM_{2.5}$ ☐ PM_{10}	24-6-22 00:00	25-6-22 00:00	1439	3	4316.7	3983.5	23.324	756.26	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

26.6.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations: Overcast + drizzly		
	Site weather station:	Temp: 22 °C	Atmos pressure: 1014 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	Mill stopped. (27-6)
☐ Steam trial	
☐ Start-up	
☑ Normal operation - Wet Weather Stop	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G28	☐ $PM_{2.5}$ ☑ PM_{10}	27.6.22 00:00	28.6.22 00:00	1439	3	4316.9	3962.4	22.182	758.32	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

29.6.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations: Over cast - Wet weather		
	Site weather station:	Temp: 22 °C	Atmos pressure: 1013 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	Stopped during day, restarted and stopped again ≈ 10pm - Wet Weather
☐ Steam trial	
☐ Start-up	
☑ Normal operation - Wet Weather Stop	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G29	☑ $PM_{2.5}$ ☐ PM_{10}	30-6-22 00:00	1-7-22 00:00	1439	3	4317.1	3971.1	24.531	756.74	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

1-7-22 KP

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations wet.		
	Site weather station:	Temp: 21 °C	Atmos pressure: 1010 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating ~~(baseline sample)~~	Fully stopped.
☐ Steam trial	
☐ Start-up	
☑ Normal operation – Stopped - Wet Weather	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G30	☐ $PM_{2.5}$ ☑ PM_{10}	3.7.22 00:00	4.7.22 00:00	1439	3	4316.4	3966.4	19.289	756.32	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	

Field blank sample ID: G31 CE160284

Sample number in batch ☑1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)

Flow rate verification (2-monthly)	Date:	Name:	Sign:

Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

4.7.22 KP

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations Wet.		
	Site weather station:	Temp: 16 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating ~~(baseline sample)~~	Stopped due to wet weather
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G37	☑ $PM_{2.5}$ ☐ PM_{10}	6-7-22 00:00	7-7-22 00:00	1352	3	H056-1	3771.6	17.259	759.63	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☐ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

8-7-22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 18 °C	Atmos pressure: 1013 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results,*
☐ Mill not operating (baseline sample)	Boilers lit 1lpm 08.7.22
☐ Steam trial	Crushing commenced 3pm 09.7.22
☑ Start-up	09.7.22 Evening harvester operations photo available
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G33	☐ $PM_{2.5}$ ☑ PM_{10}	9.7.22 00:00	10.7.22 00:00	1439	3	4317.3	4008.9	23.985	759.60	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

11.7.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 17 °C	Atmos pressure: 1014 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	13-7 Harvester creating dust. photo available.
☐ Steam trial	2x Out of cane stops
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G3H	☑ $PM_{2.5}$ ☐ PM_{10}	12-7-22 00:00	13-7-22 00:00	1439	3	4317.0	4018.5	24.049	759.59	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

13-7-22 KP

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 15 °C	Atmos pressure: 1017 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	15-7 Public holiday.
☐ Steam trial	14-7 Aerial spraying noticed.
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G35	☐ $PM_{2.5}$ ☑ PM_{10}	15-7-22 00:00	16-7-22 00:00	1439	3	4316.5	4076.3	24.891	759.52	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

17-7-22 KP

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	LOCATION:	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 20 °C	Atmos pressure: 1014 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	1x out of cane stop
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G36	☑ $PM_{2.5}$ ☐ PM_{10}	18.7.22 00:00	19.7.22 00:00	1367	3	4100.8	3789.9	25.867	758.38	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G37 CE 160611	
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

20.7.22 KM

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 22 °C	Atmos pressure: 1012 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results,*
☐ Mill not operating (baseline sample)	2017 - harvester operating.
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G-18	☐ $PM_{2.5}$ ☑ PM_{10}	21-7-22 00:00	22-7-22 00:00	1439	3	4317.1	~~27.989~~ 3956.0	27.989	756.34	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☐ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

22-7-22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kat Beagley (MSF) Keeste Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 21 °C	Atmos pressure 1014 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G9	☑ $PM_{2.5}$ ☐ PM_{10}	24.7.22 00:00	25.7.22 00:00	1423	3	4268.8	3959.2	26.625	756.29	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

26.7.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 21 °C	Atmos pressure: 1015 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	QPWS during on the Pyramid Maintenance stop
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
GHO	☐ $PM_{2.5}$ ☑ PM_{10}	27-7-22 00:00	28-7-22 00:00	1439	3	4316.5	3991.5	24.122	759.52	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

29.7.22 KP

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Katie Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations 1-8 overcast + drizzly conditions		
	Site weather station:	Temp: _____ °C	Atmos pressure: ____ HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	**Particulate fraction sampled**	**Sample start date/time**	**Sample end date/time**	**Run time (min)**	**Flow rate (L/min)**	**Total sample volume (L)**	**Obtained from display screen**			**Comments (e.g. any damage to filter noted)**
							Corrected sample volume (L)	**Temperature (°C)**	**Atmospheric pressure (mmHG)**	
GH1	☑ $PM_{2.5}$ ☐ PM_{10}	30.7.22 00:00	31.7.22 00:00	1439	3	4316.7	3998.8	23.543	756.34	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☐ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Baines (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions 2.8 Overcast		
	Site weather station:	Temp: 22.4 °C	Atmos pressure: 1013 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G42	☐ $PM_{2.5}$ ☐ PM_{10}	02-8-22 00:00	03-8-22 00:00	1440 1440	3 3	4320 4319.5	3964.2	25.583	759.35	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G43	CE 160874
Sample number in batch ☑1 ☐2 ☐3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

*

Flow rate verification (2-monthly)	**Date:** 04-8-22	**Name:** Kate Baines	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☑ Yes (no action needed) ☐ No (adjust flow rate)		25.71	758.96

* See attached sheet.

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MIF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations *e.g. wind speed / direction, climatic conditions*		
	Site weather station:	Temp: 21.3 °C	Atmos pressure: 1015 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G44	☑ $PM_{2.5}$ ☐ PM_{10}	05/8/22 00:00	06-8-22 00:00	1440	3	4320	0	31.423	753.06	Battery Connector Failed.

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☐ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KBar 6.8.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 21.3 °C	Atmos pressure: 1018 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G45	☐ $PM_{2.5}$ ☑ PM_{10}	8-8-22 00:00	9-8-22 00:00	1439	3	4316.8	3958.8	24.529	759.53	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

10/8/22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 20.2 °C	Atmos pressure: 1017 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	Maintenance stop.
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G46	☑ $PM_{2.5}$ ☐ PM_{10}	11-8-22 00:00	12-8-22 00:00	1439	3	4316.9	3982.0	27.915	757.03	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☐ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☐ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 22 °C	Atmos pressure: 1013 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	**Particulate fraction sampled**	**Sample start date/time**	**Sample end date/time**	**Run time (min)**	**Flow rate (L/min)**	**Total sample volume (L)**	**Obtained from display screen**			**Comments (e.g. any damage to filter noted)**
							Corrected sample volume (L)	**Temperature (°C)**	**Atmospheric pressure (mmHG)**	
G47	☐ $PM_{2.5}$ ☑ PM_{10}	14-8-22 00:00	15-8-22 00:00	1439	4316-7	3	3962-9	28-425	756-30	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 16-8-22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 19.7 °C	Atmos pressure: 1012 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	Maintenance step
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G48	☑ PM_{25} ☐ PM_{10}	17-8-22 00:00	18-8-22 00:00	1439	3	4316.8	4018.1	27.573	~~758~~ 758.90 KF	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G49 CE 161237	
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 19-5-22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed/ direction, climatic conditions		
	Site weather station:	Temp: 20 °C	Atmos pressure: 1016 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G50	☐ $PM_{2.5}$ ☑ PM_{10}	20-8-22 00:00	21-8-22 00:00	1439	3	4316.8	4000.5	25-29.4	757.51	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

22-8-22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 21.4 °C	Atmos pressure: 1015 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, eg. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	Burning around township (QPWS?)
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G51	☑ $PM_{2.5}$ ☐ PM_{10}	23.8.22 00:00	24.8.22 00:00	1440	3	4319.8	3969.6	25-158	759.63	—

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 25-8-22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions: Over cast ~~dry~~ KB		
	Site weather station:	Temp: 20 °C	Atmos pressure: 1016 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G52	☐ $PM_{2.5}$ ☑ PM_{10}	26-8-22 00:00	27-8-22 00:00	1439	3	4316.7	4002.0	23.349	757.90	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 23 °C	Atmos pressure: 1015 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. blowing, harvesting, loading, moving*
☑ Mill not operating (~~baseline sample~~)	Wet weather stoppage.
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G53	☑ $PM_{2.5}$ ☐ PM_{10}	29.8.22 00:00	30.8.22 00:00	1439	3	4316.4	3953.0	27.9 16	756.40	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

31.8.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions: Overcast		
	Site weather station:	Temp: 22.6 °C	Atmos pressure: 1013 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, blasting, unusual dust generating activities moving*
☐ Mill not operating (baseline sample)	Warming fine after stop
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G54	☐ $PM_{2.5}$ ☑ PM_{10}	01.9.22 00:00	02.9.22 00:00	1439	3	4317.0	3961.3	24.106	756.34	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G55	CE161504
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 02.9.22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 23.2 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	Wet Weather stop
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G56	☑ $PM_{2.5}$ ☐ PM_{10}	4.9.22 00:00	5.9.22 00:00	1400	3	4200	3863.8	28.441	756.32	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: ✓ Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 6.9.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale – North
PERSON:	Kate Barnes (MSF)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions: Overcast		
	Site weather station:	Temp: 22.8 °C	Atmos pressure: 1014 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. known vehicle traffic, construction activities, mill upsets, mill not running*
☐ Mill not operating (baseline sample)	MicroVol at Navries 7/9 + 8/9 Heavy trucks moving dirt next MicroVol – All day
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G57	☐ $PM_{2.5}$ ☑ PM_{10}	7-9-22 00:00	8-9-22 00:00	1439	3	4320 4316.8	3957.0	31.579	759.02	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KM 9.9.22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale – North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 24.5 °C	Atmos pressure: 1013 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. upwind bore training, bulldozer mining*
☐ Mill not operating (baseline sample)	Earth moving in vicinity of MicroVol
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G-58	☑ $PM_{2.5}$ ☐ PM_{10}	10.9.22 00:00	11-9-22 00:00	1439	3	4316.8	3928.1	27.447	756.28	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

MF 12.9.22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate MSF Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 23.7 °C	Atmos pressure: 1015 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G59	☐ $PM_{2.5}$ ☑ PM_{10}	13.9.22 00:00	14.9.22 00:00	1439	3	4316.8	3951.4	25.657	756.34	/

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:		Name:	Sign:
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

MS 15.9.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations e.g. wind speed / direction, climatic conditions		
	Site weather station:	Temp: 24.2 °C	Atmos pressure: 1012 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G60	☑ $PM_{2.5}$ ☐ PM_{10}	16.9.22 00:00	17.9.22 00:00	1439	3	4316.6	3909.7	29.223	756.23	—

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G 61 CE 161852	
Sample number in batch ☑ 1 ☑ 2 ☑ 3 ☑ 4 ☑ 5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 18.9.22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations *e.g. wind speed / direction, climatic conditions*		
	Site weather station:	Temp: 27 °C	Atmos pressure 1013 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G-62	☐ $PM_{2.5}$ ☑ PM_{10}	19.9.22 00:00	20.9.22 00:00	1439	3	4316.5	3901.6	32.248	755.93	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

MP 21.9.22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations *e.g. wind speed / direction, climatic conditions*		
	Site weather station:	Temp: 25.4 °C	Atmos pressure: 1012 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G69	☑ $PM_{2.5}$ ☐ PM_{10}	22.9.22 00:00	23.9.22 00:00	1439	3	4317.1	3589.8	30.3	756.34	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KB 23.9.22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 25.5 °C	Atmos pressure: 1010 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, fire/smoke nearby, nuisance odour testing*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	**Particulate fraction sampled**	**Sample start date/time**	**Sample end date/time**	**Run time (min)**	**Flow rate (L/min)**	**Total sample volume (L)**	**Obtained from display screen**			**Comments (e.g. any damage to filter noted)**
							Corrected sample volume (L)	**Temperature (°C)**	**Atmospheric pressure (mmHG)**	
G64	☐ $PM_{2.5}$ ☑ PM_{10}	25.9.22 00:00	26.9.22 00:00	1439	3	4316.7	3902.7	31.56	752.91	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

MJ 27.9.22

Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale – North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations: Overcast		
	Site weather station:	Temp: 25 °C	Atmos pressure: 1010 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	Maintenance Stop
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G65	☑ $PM_{2.5}$ ☐ PM_{10}	28-9-22 00:00	29-9-22 00:00	951	3	2553.0	2517.1	30.294	756.33	Possible battery fail

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due 11/10/2022
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

30.9.22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 24.4 °C	Atmos pressure: 1012 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	MicroVol swapped over (30/9) Race Day.
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G66	☐ $PM_{2.5}$ ☑ PM_{10}	1-10-22 00:00	2-10-22 00:00	1439	3	4316.8	3924.6	25.543	755.93	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 09/03/2023
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G67 CE 162147	
Sample number in batch ☐1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

MP 3.10.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 25 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	Maintenance stop
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G 68	☑ $PM_{2.5}$ ☐ PM_{10}	4·10·22 00:00	5·10·22 00:00	1439	3	4317.2	3937.7	24.284	759.23	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 09/03/22
☐ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KP 6/10·22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 25 °C	Atmos pressure: 1012 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, blasting, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	**Particulate fraction sampled**	**Sample start date/time**	**Sample end date/time**	**Run time (min)**	**Flow rate (L/min)**	**Total sample volume (L)**	**Obtained from display screen**			**Comments (e.g. any damage to filter noted)**
							Corrected sample volume (L)	**Temperature (°C)**	**Atmospheric pressure (mmHG)**	
G69	☐ $PM_{2.5}$ ☑ PM_{10}	7.10.22 00:00	8.10.22 00:00	1439	3	4316.8	3917.7	26.818	755.93	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 09/3/22.
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

MP 9.10.22

CQG Consulting

AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale – North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations Overcast		
	Site weather station:	Temp: 26 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	**Particulate fraction sampled**	**Sample start date/time**	**Sample end date/time**	**Run time (min)**	**Flow rate (L/min)**	**Total sample volume (L)**	**Obtained from display screen**			**Comments (e.g. any damage to filter noted)**
							Corrected sample volume (L)	**Temperature (°C)**	**Atmospheric pressure (mmHG)**	
G70	☑ $PM_{2.5}$ ☐ PM_{10}	10-10-22 00:00	11-10-22 00:00	1439	3	4317.0	3912.2	29.555	755.94	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/22
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KP 12.10.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 25 °C	Atmos pressure: 101 HPA

Operational phase during the 24-hour sampling period	ACTIVITIES ON SITE / OTHER COMMENTS *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results,*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G71	☐ $PM_{2.5}$ ☑ PM_{10}	13.10.22 00:00	14.10.22 00:00	1439	3	4316.8	3916.3	30.058	755.93	✓

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/22
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	Date:	Name:	Sign:
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KP 14.10.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale – North
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 26 °C	Atmos pressure: 1012 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	14.10.22 New battery
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G72	☑ $PM_{2.5}$ ☐ PM_{10}	16.10.22 00:00	17.10.22 00:00	1439	3	4316.9	3906.7	33.111	755.93	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/22
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G73 CE162388	
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 18.10.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations: Overcast		
	Site weather station:	Temp: 26 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	20.10 - Mill stop - Maintenance
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G1H	☐ $PM_{2.5}$ ☑ PM_{10}	19.10.22 00:00	20.10.22 00:00	1439	3	4317.0	3897.4	30.367	754.00	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☐ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

MF 21.10.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 25 °C	Atmos pressure: 1008 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	22:00 - Wet Weather stoppages
☐ Steam trial	23+24 - Wet Weather stoppages.
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G-75	☑ $PM_{2.5}$ ☐ PM_{10}	22.10.22 00:00	23.10.22 00:00	1440	3	4319.9	38878.4	32.806	752.64	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

24.10

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 29 °C	Atmos pressure: bot HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	23+24 - Wet weather stoppage
☐ Steam trial	26.10 - Maintenace stop
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G76	☐ $PM_{2.5}$ ☑ PM_{10}	25.10.22 00:00	26.10.22 00:00	1439	3	4317.0	3856.0	33.732	752.64	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑ 1 ☑ 2 ☑ 3 ☐ 4 ☐ 5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

MF 27.10

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 27 °C	Atmos pressure: 1006 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G-77	☑ $PM_{2.5}$ ☐ PM_{10}	28.10.22 00:00	29.10.22 00:00	1439	3	4316.9	3867.46	30.6	752.63	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 30.10.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSE)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 28 °C	Atmos pressure: 1007 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	31-10 - Out of Cane stop + power outage
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G78	☐ $PM_{2.5}$ ☑ PM_{10}	31.10.22 00:00	01.11.22 00:00	1439	3	4316.8	3855.9	30.942	752.49	✓

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G79 CE 162680	
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☑5 (to dispatch to lab with field blank after every five samples)	

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Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Katie Barnes		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 25 °C	Atmos pressure 1009 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, noise training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G80	☑ $PM_{2.5}$ ☐ PM_{10}	03.11.22 00:00	04.11.22 00:00	1439	3	4317.0	39060	28.788	756.56	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**		**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale – North
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 25 °C	Atmos pressure: 1014 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, weed spraying, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G81	☐ $PM_{2.5}$ ☑ PM_{10}	06.11.22 00:00	07.11.22 00:00	1439	3	4316.6	3924.8	30.948	753.95	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/7/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KP 08.11.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale – North
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 27 °C	Atmos pressure: 1011 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	**Particulate fraction sampled**	**Sample start date/time**	**Sample end date/time**	**Run time (min)**	**Flow rate (L/min)**	**Total sample volume (L)**	**Obtained from display screen**			**Comments (e.g. any damage to filter noted)**
							Corrected sample volume (L)	**Temperature (°C)**	**Atmospheric pressure (mmHG)**	
G82	☑ $PM_{2.5}$ ☐ PM_{10}	09-11-22 00:00	10-11-22 00:00	1439	3	4316.6	3900.9	30.927	755.81	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KP 11-11-22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 26 °C	Atmos pressure: 1010 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G03	☐ $PM_{2.5}$ ☑ PM_{10}	12.11.22 00:00	13.11.22 00:00	1439	3	4316.3	3893.0	35.063	752.57	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☑3 ☑4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KF 14.1.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 27 °C	Atmos pressure: 1007 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	Out of Care for a short period of time
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G84	☑ $PM_{2.5}$ ☐ PM_{10}	15-11-22 00:00	16-11-22 00:00	1439	3	4316.7	3863.1	35.454	757.64	/

Sample checklist	**Maintenance checklist**
☐ Take 5 completed	☐ V-seals / o-rings checked/cleaned
☐ Filter exchanged (in laboratory prior to going into field)	☐ Inlet components checked/cleaned
☐ Battery replaced	☐ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☐ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☐ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☐ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G85 CE 163003	
Sample number in batch ☑1 ☑2 ☐3 ☐4 ☑5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

MP 7.11.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 27.6 °C	Atmos pressure: 1007 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☐ Mill not operating (baseline sample)	Mill not crushing. Wash down occuring. Boil Out occuring.
☐ Steam trial	
☐ Start-up	
☑ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G86	☐ $PM_{2.5}$ ☑ PM_{10}	18.11.22 00:00	19.11.22 00:00	1440	3	4319.9	3871.2	34.536	752.54	

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☐2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KA 20.11.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale – North
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 28.7 °C	Atmos pressure: 1007 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, horse training, bushfire, earth moving*
☑ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G5↑	☑ $PM_{2.5}$ ☐ PM_{10}	21.11.22 00:00	22.11.22 00:00	~~1435~~ 1439	3	4316.8	3849.0	35.084	755.18	

Sample checklist	Maintenance checklist
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑1 ☑2 ☐3 ☐4 ☐5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KP 23.11.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations		
	Site weather station:	Temp: 28 °C	Atmos pressure: 1010 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results, e.g. mowing, noise training, bushfire, earth moving*
☑ Mill not operating (baseline sample)	
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Temperature (°C)	Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G8	☐ $PM_{2.5}$ ☑ PM_{10}	24.11.22 00:00	25.11.22 00:00	1439	3	4317.0	3874.3	31.092	757.99	/

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: Sample number in batch ☑ 1 ☑ 2 ☑ 3 ☐ 4 ☐ 5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	**Within 5% of 3 L/min?**	**Flow rate after**	**Temperature (°C)**	**Atmospheric pressure (mmHG)**
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KP 25.11.22

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AMBIENT DUST SAMPLING FIELD SHEET

PROJECT #:	20168	**LOCATION:**	Gordonvale - North
PERSON:	Kate Barnes (MSF Sugar)		
INSTRUMENT USED:	MicroVol 1100		
WEATHER CONDITIONS:	General observations: light drizzle.		
	Site weather station:	Temp: 26 °C	Atmos pressure: 1007 HPA

Operational phase during the 24-hour sampling period	**ACTIVITIES ON SITE / OTHER COMMENTS** *Include details of activities / events at the monitoring location, mill or surrounds during the sampling period that may affect results.*
☑ Mill not operating (baseline sample)	Season finished.
☐ Steam trial	
☐ Start-up	
☐ Normal operation	

Filter ID e.g. G-1	Particulate fraction sampled	Sample start date/time	Sample end date/time	Run time (min)	Flow rate (L/min)	Total sample volume (L)	Obtained from display screen: Corrected sample volume (L)	Obtained from display screen: Temperature (°C)	Obtained from display screen: Atmospheric pressure (mmHG)	Comments (e.g. any damage to filter noted)
G89	☑ $PM_{2.5}$ ☐ PM_{10}	27-11-22 00:00	28-11-22 00:00	1439	3	4316.8	38671	29.786	752.19	—

Sample checklist	**Maintenance checklist**
☑ Take 5 completed	☑ V-seals / o-rings checked/cleaned
☑ Filter exchanged (in laboratory prior to going into field)	☑ Inlet components checked/cleaned
☑ Battery replaced	☑ Impactor cleaned and regreased after 10 sampling events (at least every 30 days)
☑ Sampler programmed (date, time, flow rate set)	☐ Flow rate verification (at least every 2 months, with test details to be recorded below)
☑ Inlet changed (with/without size selective inlet installed)	☐ Calibration certificate valid (within past 6 months). Next calibration due ~~11/10/2022~~ 9/3/23
☑ Logger data cleared (only after sample data retrieved)	
Field blank sample ID: G90	CE 163193
Sample number in batch ☑1 ☑2 ☑3 ☑4 ☒5 (to dispatch to lab with field blank after every five samples)	

Flow rate verification (2-monthly)	**Date:**	**Name:**	**Sign:**
Flow rate before	Within 5% of 3 L/min?	Flow rate after	Temperature (°C)	Atmospheric pressure (mmHG)
	☐ Yes (no action needed) ☐ No (adjust flow rate)			

KP 28.11.22

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Appendix D:

LVAS Calibration, Flow Rate Verification and Maintenance Records

Table D1: LVAS calibration index (see full records below)

Equipment type	Serial number	Date	Conducted by
MicroVol 1100	03-0560	11/04/2022	Ecotech
Flow rate verification		08/06/2022	MCM
Defender 510 (used for flow rate verification)		23/11/2021	AirMet Scientific
Flow rate verification		04/08/2022	MCM
Defender 510 (used for flow rate verification)		25/01/2022	AirMet Scientific
MicroVol 1100 Entry	13-0108	09/09/2022	Ecotech
MicroVol 1100 Exit		09/12/2022	Ecotech

Table D2: LVAS routine maintenance

Maintenance requirement	Frequency	Comment
Condition of seals (e.g., v-seals and rubber o-rings)	Check every filter change operation	Conducted by MCM Safety and Environment Technician (refer to **Appendix C**).
Cleaning of size selective inlet	Inspect monthly and clean as required	Conducted by MCM Safety and Environment Technician (refer to **Appendix C**)
Pump	Annually or when operation is suspect	Refer to **Appendix D**
Sample tube / sampler cleaning	Six monthly	Refer to **Appendix D**
Site conformance with AS/NZS 3580.1.1	Annual audit of siting criteria	Noting the equipment did not remain in place for longer than 12 months (refer to **Section 3.3** and **Section 3.4**).
Safety inspection	Check every filter change operation	Conducted by MCM Safety and Environment Technician (refer to **Appendix C**).
Pulsation dampener (if equipped)	Inspect every two months for leaks	Not applicable (MicroVol1100 not equipped with pulsation dampener).

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Ecotech

ACOEM Group

Microvol 1100 Calibration Report

Ecotech Document Control
EMS 0633
Date: 28/06/18

This form is based upon the requirements of AS 3580.9.9:2017, AS 3580.9.10:2017

Notes:

Customer	Rental
Instrument	Micro vol
ID No.	03-0560
System/Job No.	

Calibration Performed by	Derick Gomes	
Date	11/04/2022	
Time Begin/End	1:15 PM	2:30 PM
Location	Workshop	

Test Equipment

	TE Number	Cal Due	Pass/Fail
Flow Calibrator	TE-1020	23/05/2022	PASS
Digital Barometer	TE-1008	22/05/2022	PASS
Digital Thermometer	TE-0573	30/05/2022	PASS

Instrument Parameters

Set Flow (lpm)	3.00
Ref Temp (°C)	0.0
Ref BP (mmHg)	760
S/W Version	V2.25

SSI Model	Ecotech
SSI type	PM10

Flow Coeff 0	-2 to +2	-0.6469
Flow Coeff 1	-2 to +2	1.1059
Temp Coeff 0	0.3810	0.3810
Temp Coeff 1	-2 to +2	0.017
Temp Coeff 2	-2 to +2	0.0007

Press Coeff 0	50 to 100	74.3
Press Coeff 1	168.7	168.7
WS Coeff 0	0.0000	0.0000
WS Coeff 1	0.7989	0.7989
WD Coeff 1	0	0.0000
WD Coeff 1	79.2	79.2000

Flow Audit (2-monthly)

	Reference	MicroVol	Error	Result
Ambient Temperature (°C)	28.8	28.1	-0.7	PASS
Ambient Press (mmHg)	759.60	762.90	3.30	PASS

Flow Audit

Reference	MicroVol	Error	Result
3.26	3.00	-8.0%	Calibrate

Notes: Flow check must be performed through the filter, above the filter holder inlet.
Flow must be within ± 4% of the design flow rate for the size selective inlet
If flow error is >4%, complete a multi-point calibration.
If flow error is >10% then data must be invalidated

Leak Check

Pump On	Pump Off	
0.56	0.5	PASS

Note: displayed flow (pump on) should agree with displayed flow (pump off) within 0.08Lpm

Instrument Calibration - Yearly

Perform a flow audit and leak check before calibration.

Pre-Calibration Check

	Reference	MicroVol	Error	Result
Ambient Temperature (°C)	28.8	28.1	-0.7	PASS
Ambient Press (mmHg)	759.60	762.90	3.30	PASS

Note: Temperature must be within ± 2 °C Pressure must be within ± 9.75mmHg (1.3kPa)

Calculated Coefficients

Temp Coeff 1	Temp Coeff 2	Press Coeff 0
0.0166	0.0007	71.0

Note: Change coefficients in Hidden menu and record post calibration check.

Post Calibration Check

	Reference	MicroVol	Error	Result
Ambient Temperature (°C)	28.5	28.3	-0.2	PASS
Ambient Press (mmHg)	759.6	759.6	0.00	PASS

Note: Temperature must be within ±1 Pressure must be within ± 7.5mmHg (1kPa)

Flow Calibration

Pre-Calibration Check

Set Point	Displayed (Lpm)	Reference (Lpm)	Error (Lpm)
Low Flow - 2.7Lpm	2.70	2.84	-0.14
High Flow - 3.3Lpm	3.30	3.61	-0.31
Set Flow - 3.0Lpm	3.00	3.17	-0.17

New Coefficients	
Flow Coeff 0	-1.4552
Flow Coeff 1	1.4192

Note: Change coefficients in hidden menu and record post calibration check

Post Calibration Check

Operating Flow (lpm)	Reference (lpm)	Error (%)	PASS / FAIL
3.00	3.00	0.0%	PASS

Note: Final Flow calibration check shall be within ± 2% of expected value

Final Instrument Parameters

Flow Coeff 0	-2 to +2	-1.4551
Flow Coeff 1	-2 to +2	1.4192
Temp Coeff 0	0.3810	0.3810
Temp Coeff 1	-2 to +2	0.0166
Temp Coeff 2	-2 to +2	0.0007

Press Coeff 0	50 to 100	71.0
Press Coeff 1	168.7	168.7
WS Coeff 0	0.0000	0.0000
WS Coeff 1	0.7989	0.7989
WD Coeff 1	0	0.0000
WD Coeff 1	79.2	79.2000

Single point flow rate verification checks conducted on MicroVol 1100 (Serial No: 03-0560), using Mesa Labs Defender 510-M (Serial No: 151841).

Date: 08/06/2022

4% of 3L/min = ±0.12L/min

Range: 2.88 – 3.12 L/min



Ecotech display

Manual	08/06/2022
Sampling	12:46:37
Flow L/min	3.000
Temp. C	29.00

Flow rate check with a 5 “burst” program, run 5 times

1)

Flow:	2.8903, 2.8862, 2.8961, 2.8919, 2.8982
Avg:	2.8925

2)

Flow:	2.8947, 2.8975, 2.9009, 2.9089, 2.9096
Avg:	2.9023

3)

Flow:	2.9065, 2.9229, 2.9187, 2.9363, 2.9124
Avg:	2.9193

4)

Flow:	2.8737, 2.8773, 2.8896, 2.8940, 2.9049
Avg:	2.8879

5)

Flow:	2.9042, 2.9051, 2.8988, 2.9117, 2.9298
Avg:	2.9099

All checks within range











Leak check conducted on MicroVol 1100 (Serial No: 03-0560), using Mesa Labs Defender 510-M (Serial No: 151841).

Date: 08/06/2022

Hidden menu flow to be ±0.08L/min of the blocked sampler flow rate.

Blocked sampler flow rate		Hidden menu flow rate
Flow rate:	0.473 L/min	Flow: 0.4735 L/min
Flow rate:	0.473 L/min	Flow: 0.4732 L/min

Difference: 0.0005 L/min (checks within range)



Flow rate verification and leak check conducted by Kate Barnes (MCM Safety and Environment Technician) 08/06/2022.

Calibration Certificate

AirMet Scientific P/L
7-11 Ceylon Street
Nunawading
VIC 3131, Australia
Tel: 03 8878 3300
Fax: 03 8878 3344

This document certifies that the instrument detailed has been calibrated to the parameters

Certificate Print Date: 23-Nov-2021
Calibration Date: 23-Nov-2021
Next Calibration Due: 23-Nov-2022

Call ID / Order No: 253315
Job No / Pack No: S2533150001

Customer: AMS - WA Rental-ID 399984 **Serial No:** 151841
Description: Mesalab Defender 510, Medium Flow Range, 50 M

Calibration Summary

Frequency: 365 Days **Temp:** 22°C **As Found:** In Tolerance **Result:** Pass
Humidity: 45% **Certificate:** S2533150001

Desc	As Found		As Left (Cal Status)	
	Actual	Result	Actual	Result
1000 mL/min	999.0	Pass	999.0	Pass
2000 mL/min	2003.0	Pass	2003.0	Pass
3000 mL/min	3005.0	Pass	3005.0	Pass
4000 mL/min	4003.0	Pass	4003.0	Pass
5000 mL/min	5037.0	Pass	5037.0	Pass

Standard Used

Equip ID	Description	Valid Until	Cert
131749	Bios Defender 0-5L	04/01/2022	412438

Completed By: Edwin Caronongan **Signed:**

Single point flow rate verification checks conducted on MicroVol 1100 (Serial No: 03-0560), using Mesa Labs Defender 510-M (Serial No: 120026).

Date: 04/08/2022

4% of 3L/min = ±0.12L/min

Range: 2.88 – 3.12 L/min



Ecotech display

Manual	04/08/2022
Sampling	10:10:55
Flow L/min	3.007
Temp. C	25.71

Flow rate check with a single measurement program, run 10 times

Flow:	2.9512
	2.9514
	2.9542
	2.9576
	2.9512
	2.9499
	2.9549
	2.9621
	2.9628
	2.9571

Avg: 2.9552 L/min (all checks within range)



Leak check conducted on MicroVol 1100 (Serial No: 03-0560), using Mesa Labs Defender 510-M (Serial No: 120026).

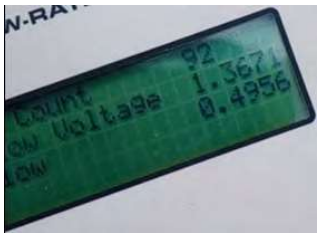
Date: 04/08/2022

Hidden menu flow to be ± 0.08 L/min of the blocked sampler flow rate.

Blocked sampler flow rate		Hidden menu flow rate	
Flow rate:	0.495 L/min	Flow:	0.4956 L/min

Difference: -0.0006 L/min (check within range)





Flow rate verification and leak check conducted by Kate Barnes (MCM Safety and Environment Technician) 04/08/2022.

AirMet Scientific P/L
7-11 Ceylon Street
Nunawading
VIC 3131, Australia
Tel: 03 8878 3300
Fax: 03 8878 3344

Calibration Certificate

This document certifies that the instrument detailed has been calibrated to the parameters

Certificate Print Date: 25-Jan-2022
Calibration Date: 25-Jan-2022
Next Calibration Due: 25-Jan-2023

Call ID / Order No: 254105
Job No / Pack No: S2541050001

Customer: AMS Brisbane Rental-ID 399983 **Serial No:** 120026
Description: Bios Defender Model 510M Electronic Dry-Pisto

Calibration Summary

Frequency: 365 Days **Temp:** 22°C **As Found:** In Tolerance **Result:** Pass
Humidity: 45% **Certificate:** S2541050001

Desc	As Found		As Left (Cal Status)	
	Actual	Result	Actual	Result
1000 mL/min	998.0	Pass	998.0	Pass
2000 mL/min	1996.0	Pass	1996.0	Pass
3000 mL/min	2990.0	Pass	2990.0	Pass
4000 mL/min	3992.0	Pass	3992.0	Pass
5000 mL/min	5002.0	Pass	5002.0	Pass

Standard Used

Equip ID	Description	Valid Until	Cert
131749	Bios Defender 0-5L	02/12/2022	S2534220002

Completed By: Edwin Caronongan **Signed:**

Ecotech

ACOEM Group

Microvol 1100 Calibration Report

Ecotech Document Control
EMS 0633
Date: 28/06/18

This form is based upon the requirements of
AS 3580.9.9:2017, AS 3580.9.10:2017

Notes:

Customer	CQG Consulting
Instrument	Micro Vol 1100
ID No.	13-0108
System/Job No.	

Calibration Performed by	Derick Gomes	
Date	9/09/2022	
Time Begin/End	10:30 AM	11:00 AM
Location	Brisbane Workshop	

Test Equipment

	TE Number	Cal Due	Pass/Fail
Flow Calibrator	TE-1020	2/12/2022	PASS
Digital Barometer	TE-1008	6/12/2022	PASS
Digital Thermometer	TE-0573	2/12/2022	PASS

Instrument Parameters

Set Flow (lpm)	3.00
Ref Temp (°C)	0.0
Ref BP (mmHg)	760
S/W Version	V2.25

SSI Model	Ecotech
SSI type	PM10

Flow Coeff 0	-2 to +2	-1.32
Flow Coeff 1	-2 to +2	1.3284
Temp Coeff 0	0.3810	0.3810
Temp Coeff 1	-2 to +2	0.0173
Temp Coeff 2	-2 to +2	0.0007

Press Coeff 0	50 to 100	70.6
Press Coeff 1	168.7	168.7
WS Coeff 0	0.0000	0.0000
WS Coeff 1	0.7989	0.7989
WD Coeff 1	0	0.0000
WD Coeff 1	79.2	79.1000

Flow Audit (2-monthly)

	Reference	MicroVol	Error	Result
Ambient Temperature (°C)	20.7	20.6	-0.1	PASS
Ambient Press (mmHg)	763.00	762.00	-1.00	PASS

Flow Audit

Reference	MicroVol	Error	Result
2.97	3.00	1.0%	PASS

Notes: Flow check must be performed through the filter, above the filter holder inlet.
Flow must be within ± 4% of the design flow rate for the size selective inlet
If flow error is >4%, complete a multi-point calibration.
If flow error is >10% then data must be invalidated

Leak Check

Pump On	Pump Off	
0.531	0.531	PASS

Note: displayed flow (pump on) should agree with displayed flow (pump off) within 0.08Lpm

Instrument Calibration - Yearly

Perform a flow audit and leak check before calibration.

Pre-Calibration Check

	Reference	MicroVol	Error	Result
Ambient Temperature (°C)				N/A
Ambient Press (mmHg)				N/A

Note: Temperature must be within ± 2 ^{0}C Pressure must be within ± 9.75mmHg (1.3kPa)

Calculated Coefficients

Temp Coeff 1	Temp Coeff 2	Press Coeff 0

Note: Change coefficients in Hidden menu and record post calibration check.

Post Calibration Check

	Reference	MicroVol	Error	Result
Ambient Temperature (°C)				N/A
Ambient Press (mmHg)				N/A

Note: Temperature must be within ±1 Pressure must be within ± 7.5mmHg (1kPa)

Flow Calibration

Pre-Calibration Check

Set Point	Displayed (Lpm)	Reference (Lpm)	Error (Lpm)
Low Flow - 2.7Lpm			
High Flow - 3.3Lpm			
Set Flow - 3.0Lpm			

New Coefficients	
Flow Coeff 0	
Flow Coeff 1	

Note: Change coefficients in hidden menu and record post calibration check

Post Calibration Check

Operating Flow (lpm)	Reference (lpm)	Error (%)	PASS / FAIL
			N/A

Note: Final Flow calibration check shall be within ± 2% of expected value

Final Instrument Parameters

Flow Coeff 0	-2 to +2	
Flow Coeff 1	-2 to +2	
Temp Coeff 0	0.3810	0.3810
Temp Coeff 1	-2 to +2	
Temp Coeff 2	-2 to +2	

Press Coeff 0	50 to 100	
Press Coeff 1	168.7	168.7
WS Coeff 0	0.0000	
WS Coeff 1	0.7989	
WD Coeff 1	0	
WD Coeff 1	79.2	

Ecotech

ACOEM Group

Microvol 1100 Calibration Report

Ecotech Document Control
EMS 0633
Date: 28/06/18

This form is based upon the requirements of AS 3580.9.9:2017, AS 3580.9.10:2017

Customer	Rental
Instrument	Micro vol
ID No.	13-0108
System/Job No.	

Notes:

Exit calibration check

Calibration Performed by	Derick Gomes	
Date	9/12/2022	
Time Begin/End	11:20 AM	11:50 AM
Location	Workshop	

Test Equipment

	TE Number	Cal Due	Pass/Fail
Flow Calibrator	TE-0616	20/03/2023	PASS
Digital Barometer	TE-0897	5/03/2023	PASS
Digital Thermometer	TE-0575	20/03/2023	PASS

Instrument Parameters

Set Flow (lpm)	3.00
Ref Temp (°C)	0.0
Ref BP (mmHg)	760
S/W Version	V2.25

SSI Model	Ecotech
SSI type	PM10

Flow Coeff 0	-2 to +2	-1.318
Flow Coeff 1	-2 to +2	1.3284
Temp Coeff 0	0.3810	0.3810
Temp Coeff 1	-2 to +2	0.0173
Temp Coeff 2	-2 to +2	0.0007

Press Coeff 0	50 to 100	70.6
Press Coeff 1	168.7	168.7
WS Coeff 0	0.0000	0.0000
WS Coeff 1	0.7989	0.7989
WD Coeff 1	0	0.0000
WD Coeff 1	79.2	79.2000

Flow Audit (2-monthly)

	Reference	MicroVol	Error	Result
Ambient Temperature (°C)	26.8	26.3	-0.5	PASS
Ambient Press (mmHg)	758.00	755.94	-2.06	PASS

Flow Audit

Reference	MicroVol	Error	Result
2.87	2.95	2.6%	PASS

Notes: Flow check must be performed through the filter, above the filter holder inlet.

Flow must be within ± 4% of the design flow rate for the size selective inlet

If flow error is >4%, complete a multi-point calibration.

If flow error is >10% then data must be invalidated

Leak Check

Pump On	Pump Off	
0.521	0.5119	PASS

Note: displayed flow (pump on) should agree with displayed flow (pump off) within 0.08Lpm

Appendix E:

LVAS Summary Results

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE159277.001	CE159277.002	CE159277.003	CE159277.004	CE159277.005	CE159277.006	CE159277.007	CE159571.001
			Filter number	G2	G3	G4	G5	G6	G7 (Field Blank)	Lab Blank	G8
			Sample Date	28/4/2022	1/5/2022	4/5/2022	7/5/2022	10/5/2022	12/5/2022		13/5/2022
Dust fraction				**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**			**PM2.5**
AQO[1]	**µg/m³day**			**50**	**25**	**50**	**25**	**50**			**25**
Volume of air[2,3]	L			3920.9	3941.1	3925.4	3917.2	3915.5			3900.4
Dust weight[3]	mg/filter	0.02		<0.02	**0.03**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01	<0.01			<0.01
Dust concentration	µg/m³			<10	<10	<10	<10	<10			<10
Allowable variation in filter mass for blanks[3,4]	mg								0.03	0.02	
Mill operational phase[5]				Offline	Offline	Offline	Offline	Offline			Offline
Monitoring location				Location 1	Location 1	Location 1	Location 1	Location 1	Location 1	Location 1	Location 1
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

[5] As per MCM advice provided in "Record keeping checklist" or noted as offline in dates preceding first entry of 23 May 2022

[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE159571.002	CE159571.003	CE159571.004	CE159571.005	CE159571.006	CE159571.007	CE159795.001
			Filter number	G9[6]	G10	G11	G12	G13 (Field Blank)	Lab Blank	G14
			Sample Date	16/5/2022	19/5/2022	22/5/2022	25/5/2022	27/5/2022		28/05/2022
Dust fraction				**PM10**	**PM2.5**	**PM10**	**PM2.5**			**PM10**
AQO[1]	**µg/m³day**			**50**	**25**	**50**	**25**			**50**
Volume of air[2,3]	L			0.0	3949.1	3940.1	3949.7			3971.9
Dust weight[3]	mg/filter	0.02		<0.02	**0.03**	<0.02	<0.02	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01		N/A	<0.01	<0.01	<0.01			<0.01
Dust concentration	µg/m³			N/A	<10	<10	<10			<10
Allowable variation in filter mass for blanks[3,4]	mg							0.03	0.02	
Mill operational phase[5]				Offline	Offline	Offline	Offline			Offline
Monitoring location				Location 1	Location 1	Location 1	Location 1	Location 1	Location 1	Location 1
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

[5] As per MCM advice provided in "Record keeping checklist" or noted as offline in dates preceding first entry of 23 May 2022

[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE159795.002	CE159795.003	CE159795.004	CE159795.005	CE159795.006	CE159795.007	CE159998.001
			Filter number	G15	G16	G17	G18	G19 (Field Blank)	Lab Blank	G20
			Sample Date	31/05/2022	2/06/2022	4/06/2022	7/06/2022	8/06/2022		10/6/2022
Dust fraction				**PM2.5**	**PM10**	**PM2.5**	**PM10**			**PM2.5**
AQO[1]	**µg/m³day**			**25**	**50**	**25**	**50**			**25**
Volume of air[2,3]	L			3947.8	3960.8	3956.7	3928.8			4010.9
Dust weight[3]	mg/filter	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.05**
Dust concentration[3]	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01			**0.01**
Dust concentration	µg/m³			<10	<10	<10	<10			**10**
Allowable variation in filter mass for blanks[3,4]	mg							0.03	0.02	
Mill operational phase[5]				Steam trial (timber)	Steam trial (bagasse)	Offline	Offline			Offline
Monitoring location				Location 1	Location 1	Location 1	Location 1	Location 1	Location 1	Location 1
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

[5] As per MCM advice provided in "Record keeping checklist" or noted as offline in dates preceding first entry of 23 May 2022

[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE159998.002	CE159998.003	CE159998.004	CE159998.005	CE159998.006	CE159998.007
			Filter number	G21	G22	G23	G24	G25 (Field Blank)	Lab Blank
			Sample Date	12/6/2022	14/6/2022	16/6/2022	18/6/2022	20/6/2022	
Dust fraction				**PM10**	**PM2.5**	**PM10**	**PM2.5**		
AQO[1]	**µg/m³day**			**50**	**25**	**50**	**25**		
Volume of air[2,3]	L			3918	4002.3	3959.6	3975.8		
Dust weight[3]	mg/filter	0.02		<0.02	<0.02	<0.02	**0.07**	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01		<0.01	<0.01	<0.01	**0.02**		
Dust concentration	µg/m³			<10	<10	<10	**20**		
Allowable variation in filter mass for blanks[3,4]	mg							0.03	0.02
Mill operational phase[5]				Offline	Start up (bagasse & fuel oil)	Normal operation (bagasse & fuel oil)	Normal operation (bagasse & fuel oil)		
Monitoring location				Location 1	Location 1	Location 1	Location 1	Location 1	Location 1
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

[5] As per MCM advice provided in "Record keeping checklist" or noted as offline in dates preceding first entry of 23 May 2022

[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE160284.001	CE160284.002	CE160284.003	CE160284.004	CE160284.005	CE160284.006
			Filter number	G26	G27	G28	G29	G30	G31 (Field Blank)
			Sample Date	21/6/2022	24/6/2022	27/6/2022	30/6/2022	3/7/2022	4/7/2022
Dust fraction				**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	
AQO[1]	**µg/m³day**			**50**	**25**	**50**	**25**	**50**	
Volume of air[2,3]	L			3978.2	3983.2	3962.4	3971.1	3966.4	
Dust weight[3]	mg/filter	0.02		**0.09**	<0.02	<0.02	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01		**0.02**	<0.01	<0.01	<0.01	<0.01	
Dust concentration	µg/m³			**20**	<10	<10	<10	<10	
Allowable variation in filter mass for blanks[3,4]	mg								0.03
Mill operational phase[5]				Normal operation (bagasse)	Normal operation (bagasse & fuel oil)	Wet weather issues (bagasse & fuel oil)	Supply / wet weather issues (bagasse & fuel oil)	Shut down (wet weather)	
Monitoring location				Location 1	Location 1	Location 1	Location 1	Location 1	Location 1
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

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[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE160284.007	CE160611.001	CE160611.002	CE160611.003	CE160611.004	CE160611.005
			Filter number	Lab Blank	G32	G33	G34	G35	G36
			Sample Date		6/7/2022	9/7/2022	12/7/2022	15/7/2022	18/7/2022
Dust fraction					**PM2.5**	**PM10**	**PM2.5**	**PM10**	**PM2.5**
AQO[1]	**µg/m³day**				**25**	**50**	**25**	**50**	**25**
Volume of air[2,3]	L				3771.6	4008.9	4018.5	4076.3	3789.9
Dust weight[3]	mg/filter	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01			<0.01	<0.01	<0.01	<0.01	<0.01
Dust concentration	µg/m³				<10	<10	<10	<10	<10
Allowable variation in filter mass for blanks[3,4]	mg			0.02					
Mill operational phase[5]					Shut down (wet weather)	Supply issues (bagasse & fuel oil)	Supply issues (bagasse & fuel oil)	Normal operation (bagasse & fuel oil)	Supply issues (bagasse & fuel oil)
Monitoring location				Location 1	Location 1	Location 1	Location 1	Location 1	Location 1
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

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CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE160611.006	CE160611.007	CE160874.001	CE160874.002	CE160874.003	CE160874.004
			Filter number	G37 (Field blank)	Lab Blank	G38	G39	G40	G41
			Sample Date	20/7/2022		21/7/2022	24/7/2022	27/7/2022	30/7/2022
Dust fraction						**PM10**	**PM2.5**	**PM10**	**PM2.5**
AQO[1]	**µg/m³day**					**50**	**25**	**50**	**25**
Volume of air[2,3]	L					3956.0	3959.2	3991.5	3998.8
Dust weight[3]	mg/filter	0.02	<0.02	<0.02		<0.02	**0.14**	**0.02**	**0.22**
Dust concentration[3]	mg/m³	0.01				<0.01	**0.04**	<0.01	**0.06**
Dust concentration	µg/m³					<10	**40**	<10	**60**
Allowable variation in filter mass for blanks[3,4]	mg		0.03	0.02					
Mill operational phase[5]						Normal operation (bagasse)	Normal operation (bagasse & fuel oil)	Maintenance stop (bagasse & fuel oil)	Normal operation (bagasse)
Monitoring location			Location 1	Location 1		Location 1	Location 1	Location 1	Location 1
MicroVol Serial No.			03-0560	03-0560		03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

[5] As per MCM advice provided in "Record keeping checklist" or noted as offline in dates preceding first entry of 23 May 2022

[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE160874.005	CE160874.006	CE160874.007	CE161237.001	CE161237.002	CE161237.003
			Filter number	G42	G43 (Field blank)	Lab Blank	G44[6]	G45	G46
			Sample Date	2/8/2022	4/8/2022		5/8/2022	8/8/2022	11/8/2022
Dust fraction				**PM10**			**PM2.5**	**PM10**	**PM2.5**
AQO[1]	**µg/m³day**			**50**			**25**	**50**	**25**
Volume of air[2,3]	L			3964.2			0.0	3958.8	3982.0
Dust weight[3]	mg/filter	0.02		<0.02	<0.02	<0.02	**0.11**	**0.17**	**0.08**
Dust concentration[3]	mg/m³	0.01		<0.01			N/A	**0.04**	**0.02**
Dust concentration	µg/m³			<10			N/A	**40**	**20**
Allowable variation in filter mass for blanks[3,4]	mg				0.03	0.02			
Mill operational phase[5]				Normal operation (bagasse)			Normal operation (bagasse & fuel oil)	Normal operation (bagasse & fuel oil)	Maintenance stop (bagasse)
Monitoring location				Location 1	Location 1	Location 1	Location 1	Location 1	Location 1
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

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[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

[5] As per MCM advice provided in "Record keeping checklist" or noted as offline in dates preceding first entry of 23 May 2022

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CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE161237.004	CE161237.005	CE161237.006	CE161237.007	CE161504.001	CE161504.002	CE161504.003
			Filter number	G47	G48	G49 (Field blank)	Lab Blank	G50	G51	G52
			Sample Date	14/8/2022	17/8/2022	19/8/2022		20/8/2022	23/8/2022	26/8/2022
Dust fraction				**PM10**	**PM2.5**			**PM10**	**PM2.5**	**PM10**
AQO[1]	**µg/m³day**			**50**	**25**			**50**	**25**	**50**
Volume of air[2,3]	L			3962.9	4018.1			4000.5	3969.6	4002.0
Dust weight[3]	mg/filter	0.02		**0.03**	**0.06**	<0.02	<0.02	**0.07**	<0.02	**0.06**
Dust concentration[3]	mg/m³	0.01		<0.01	**0.01**			**0.02**	<0.01	**0.01**
Dust concentration	µg/m³			<10	**10**			**20**	<10	**10**
Allowable variation in filter mass for blanks[3,4]	mg					0.03	0.02			
Mill operational phase[5]				Normal operation (bagasse)	Maintenance stop (bagasse & fuel oil)			Normal operation (bagasse)	Normal operation (bagasse)	Normal operation (bagasse)
Monitoring location				Location 1	Location 1	Location 1	Location 1	Location 1	Location 1	Location 1
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

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[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

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[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE161504.004	CE161504.005	CE161504.006	CE161504.007	CE161852.001	CE161852.002
			Filter number	G53	G54	G55 (Field blank)	Lab Blank	G56	G57
			Sample Date	29/8/2022	1/9/2022	2/9/2022		4/9/2022	7/9/2022
Dust fraction				**PM2.5**	**PM10**			**PM2.5**	**PM10**
AQO[1]	**µg/m³day**			**25**	**50**			**25**	**50**
Volume of air[2,3]	L			3953.0	3961.3			3863.8	3957.0
Dust weight[3]	mg/filter	0.02		<0.02	**0.07**	<0.02	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01		<0.01	**0.02**			<0.01	<0.01
Dust concentration	µg/m³			<10	**20**			<10	<10
Allowable variation in filter mass for blanks[3,4]	mg					0.03	0.02		
Mill operational phase[5]				Wet weather issues (bagasse & fuel oil)	Wet weather issues (bagasse & fuel oil)			Wet weather issues (bagasse & fuel oil)	Normal operation (bagasse)
Monitoring location				Location 1	Location 1	Location 1	Location 1	Location 1	Location 2
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

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[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

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CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE161852.003	CE161852.004	CE161852.005	CE161852.006	CE161852.007	CE162147.001	CE162147.002
			Filter number	G58	G59	G60	G61 (Field Blank)	Lab Blank	G62	G63
			Sample Date	10/9/2022	13/9/2022	16/9/2022	18/9/2022		19/9/2022	22/9/2022
Dust fraction				**PM2.5**	**PM10**	**PM2.5**			**PM10**	**PM2.5**
AQO[1]	**µg/m³day**			**25**	**50**	**25**			**50**	**25**
Volume of air[2,3]	L			3928.1	3951.4	3909.7			3901.6	3899.8
Dust weight[3]	mg/filter	0.02		<0.02	<0.02	**0.03**	<0.02	<0.02	**0.14**	**0.04**
Dust concentration[3]	mg/m³	0.01		<0.01	<0.01	<0.01			**0.04**	**0.01**
Dust concentration	µg/m³			<10	<10	<10			**40**	**10**
Allowable variation in filter mass for blanks[3,4]	mg						0.03	0.02		
Mill operational phase[5]				Normal operation (bagasse)	Normal operation (bagasse)	Normal operation (bagasse & fuel oil)			Normal operation (bagasse)	Normal operation (bagasse)
Monitoring location				Location 2	Location 2	Location 2	Location 2	Location 2	Location 2	Location 2
MicroVol Serial No.				03-0560	03-0560	03-0560	03-0560	03-0560	03-0560	03-0560

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

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[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

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[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE162147.003	CE162147.004	CE1621472.005	CE162147.006	CE162147.007	CE162388.001
			Filter number	G64	G65	G66	G67 (Field Blank)	Lab Blank	G68
			Sample Date	25/9/2022	28/9/2022	1/10/2022			4/10/2022
Dust fraction				**PM10**	**PM2.5**	**PM10**			**PM2.5**
AQO[1]	**µg/m³day**			**50**	**25**	**50**			**25**
Volume of air[2,3]	L			3902.7	2317.1	3924.6			3937.7
Dust weight[3]	mg/filter	0.02		**0.12**	**0.03**	**0.12**	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01		**0.03**	**0.01**	**0.03**			<0.01
Dust concentration	µg/m³			**30**	**10**	**30**			<10
Allowable variation in filter mass for blanks[3,4]	mg						0.03	0.02	
Mill operational phase[5]				Normal operation (bagasse)	Maintenance stop (bagasse & fuel oil)	Normal operation (bagasse & fuel oil)			Maintenance stop (bagasse & fuel oil)
Monitoring location				Location 2	Location 2	Location 2	Location 2	Location 2	Location 2
MicroVol Serial No.				03-0560	03-0560	13-0108	13-0108	13-0108	13-0108

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

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[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

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[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE162388.002	CE162388.003	CE162388.004	CE162388.005	CE162388.006	CE1623880.007
			Filter number	G69	G70	G71	G72	G73 (Field Blank)	Lab Blank
			Sample Date	7/10/2022	10/10/2022	13/10/2022	16/10/2022	18/10/2022	
Dust fraction				**PM10**	**PM2.5**	**PM10**	**PM2.5**		
AQO[1]	**µg/m³day**			**50**	**25**	**50**	**25**		
Volume of air[2,3]	L			3917.7	3912.2	3916.3	3906.7		
Dust weight[3]	mg/filter	0.02		**0.05**	<0.02	<0.02	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01		**0.01**	<0.01	<0.01	<0.01		
Dust concentration	µg/m³			**10**	<10	<10	<10		
Allowable variation in filter mass for blanks[3,4]	mg							0.03	0.02
Mill operational phase[5]				Wet weather issues (bagasse & fuel oil)	Wet weather issues (bagasse & fuel oil)	Normal operation (bagasse & fuel oil)	Normal operation (bagasse & fuel oil)		
Monitoring location				Location 2	Location 2	Location 2	Location 2	Location 2	Location 2
MicroVol Serial No.				13-0108	13-0108	13-0108	13-0108	13-0108	13-0108

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

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[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

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CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE162680.001	CE162680.002	CE162680.003	CE162680.004	CE162680.005	CE162680.006
			Filter number	G74	G75	G76	G77	G78	G79 (Field Blank)
			Sample Date	19/10/2022	22/10/2022	25/10/2022	28/10/2022	31/10/2022	2/11/2022
Dust fraction				**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**	
AQO[1]	**µg/m³day**			**50**	**25**	**50**	**25**	**50**	
Volume of air[2,3]	L			3897.4	3878.4	3856.0	3867.8	3855.9	
Dust weight[3]	mg/filter	0.02		**0.02**	<0.02	<0.02	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	
Dust concentration	µg/m³			<10	<10	<10	<10	<10	
Allowable variation in filter mass for blanks[3,4]	mg								0.03
Mill operational phase[5]				Maintenance stop (bagasse & fuel oil)	Wet weather issues (bagasse & fuel oil)	Normal operation (bagasse & fuel oil)	Normal operation (bagasse)	Supply / power issues (bagasse & fuel oil)	
Monitoring location				Location 2	Location 2	Location 2	Location 2	Location 2	Location 2
MicroVol Serial No.				13-0108	13-0108	13-0108	13-0108	13-0108	13-0108

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

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CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR						
SGS Report Reference			CE162680.007	CE163003.001	CE163003.002	CE163003.003	CE163003.004	CE163003.005
Filter number			Lab Blank	G80	G81	G82	G83	G84
Sample Date				3/11/2022	6/11/2022	9/11/2022	12/11/2022	15/11/2022
Dust fraction				**PM10**	**PM2.5**	**PM10**	**PM2.5**	**PM10**
AQO[1]	**µg/m³day**			**50**	**25**	**50**	**25**	**50**
Volume of air[2,3]	L			3906.0	3924.8	3900.9	3893.0	3863.1
Dust weight[3]	mg/filter	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01	<0.01
Dust concentration	µg/m³			<10	<10	<10	<10	<10
Allowable variation in filter mass for blanks[3,4]	mg		0.02					
Mill operational phase[5]				Normal operation (bagasse & fuel oil)	Normal operation (bagasse & fuel oil)	Normal operation (bagasse)	Normal operation (bagasse & fuel oil)	Supply issues (bagasse)
Monitoring location			Location 2	Location 2	Location 2	Location 2	Location 2	Location 2
MicroVol Serial No.			13-0108	13-0108	13-0108	13-0108	13-0108	13-0108

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

[5] As per MCM advice provided in "Record keeping checklist" or noted as offline in dates preceding first entry of 23 May 2022

[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

CQG Consulting

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE163003.006	CE163003.007	CE163193.001	CE163193.002	CE163193.003	CE163193.004
			Filter number	G85 (Field Blank)	Lab Blank	G86	G87	G88	G89
			Sample Date	17/11/2022		18/11/2022	21/11/2022	24/11/2022	27/11/2022
Dust fraction						**PM2.5**	**PM10**	**PM2.5**	**PM10**
AQO[1]	**µg/m³day**					**25**	**50**	**25**	**50**
Volume of air[2,3]	L					3871.2	3849.0	3874.3	3867.1
Dust weight[3]	mg/filter	0.02	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02
Dust concentration[3]	mg/m³	0.01				<0.01	<0.01	<0.01	<0.01
Dust concentration	µg/m³					<10	<10	<10	<10
Allowable variation in filter mass for blanks[3,4]	mg		0.03	0.02					
Mill operational phase[5]						Boil out	Offline	Offline	Offline
Monitoring location			Location 2	Location 2		Location 2	Location 2	Location 2	Location 2
MicroVol Serial No.			13-0108	13-0108		13-0108	13-0108	13-0108	13-0108

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

[5] As per MCM advice provided in "Record keeping checklist" or noted as offline in dates preceding first entry of 23 May 2022

[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

20168 - MCM Particulate Matter Monitoring -
Low Volume Sampler Results
Monitoring Locations: Location 1 (Gordonvale Turf Club) or
Location 2 (Northern Site)

Analyte	Units	LOR	SGS Report Reference	CE163193.005	CE163193.006
			Filter number	G90 (Field Blank)	Lab Blank
			Sample Date	28/11/2022	
Dust fraction				**PM2.5**	
AQO[1]	**µg/m³day**			**25**	
Volume of air[2,3]	L				
Dust weight[3]	mg/filter	0.02		<0.02	<0.02
Dust concentration[3]	mg/m³	0.01			
Dust concentration	µg/m³				
Allowable variation in filter mass for blanks[3,4]	mg			0.03	0.02
Mill operational phase[5]					
Monitoring location				Location 2	Location 2
MicroVol Serial No.				13-0108	13-0108

KEY:

Bold text = above laboratory limit of reporting (LOR)

Exceedance of AQO

PM10 concentration below AQO (but above PM2.5 AQO)

Not applicable

NOTES:

[1] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld)*

[2] As per MCM field sheets / advice to SGS on Chain of Custody forms

[3] Refer to SGS laboratory reports

[4] As per Section 11 of *AS 3580.9.9* and *AS 3580.9.10*

[5] As per MCM advice provided in "Record keeping checklist" or noted as offline in dates preceding first entry of 23 May 2022

[6] Sample results not able to be compared to AQO as sampler pump did not start due to battery wiring error

Appendix F:

LVAS Laboratory Reports

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Kate Barnes	Manager	Anthony Nilsson
Client	MSF SUGAR	Laboratory	SGS Cairns Environmental
Address	MULGRAVE MILL PO BOX 21 QLD 4865	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 7 4043 3323	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	katebarnes@msfsugar.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**20168 - Air Monitoring**	SGS Reference	**CE159277 R3**
Order Number	**7420019008**	Date Received	13 May 2022
Samples	7	Date Reported	18 Jul 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

This report cancels and supersedes the report No.CE159277_R0. dated 03/06/2022 issued by SGS Environment, Health and Safety due to amendment of LOR for Respirable Dust.
This report cancels and supersedes the report No.CE159277_R1 dated 07/06/2022 issued by SGS Environment, Health and Safety due to addition Lab Blank result.
This report cancels and supersedes the report No.CE159277_R2. dated 09/06/2022 issued by SGS Environment, Health and Safety due to amended LOR for Respirable Dust Weight following client requests.

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE159277.001 Air 28 Apr 2022 G2	CE159277.002 Air 01 May 2022 G3	CE159277.003 Air 04 May 2022 G4	CE159277.004 Air 07 May 2022 G5
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 30/5/2022**				
Volume of Air (info supplied with samples)	L	-		**3920.9**	**3941.1**	**3925.4**	**3917.2**
Respirable Dust Weight	mg/Filter	0.02		<0.02	**0.03**	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE159277.005 Air 10 May 2022 G6	CE159277.006 Air 12 May 2022 G7 (Blank)	CE159277.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 30/5/2022**			
Volume of Air (info supplied with samples)	L	-	**3915.5**	-	-
Respirable Dust Weight	mg/Filter	0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE159277

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	MULGRAVE MILL PO BOX 21 QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420019008**
Samples	6

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Fri 13/5/2022
Report Due	Tue 24/5/2022
SGS Reference	**CE159277**

SUBMISSION DETAILS

This is to confirm that 6 samples were received on Friday 13/5/2022. Results are expected to be ready by COB Tuesday 24/5/2022. Please quote SGS reference CE159277 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	6 Air
Date documentation received	13/5/2022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Due to the high volume of samples we are currently processing through the lab, your TAT may be longer than anticipated.
If you have any concerns please contact us.

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SAMPLE RECEIPT ADVICE

CE159277

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G2	9
002	G3	9
003	G4	9
004	G5	9
005	G6	9
006	G7	9

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE159277

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

ID	Sample Date: Start date/time	Sample Date: End Date/time	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric	Comments:
G2	28/04/2022									X	*Plus 1 x laboratory blank also to be analysed
G3	1/05/2022									X	
G4	4/05/2022									X	
G5	7/05/2022									X	
G6	10/05/2022									X	
G7	12/05/2022									X	

Company Name: MSF Sugar

Address: 47 Gordon Street
GORDONVALE Qld 4865

Contact Name: Kate Barnes

Email address:
For invoicing: katebarnes@msfsugar.com.au

For results: cathee.miller@cqgroup.com.au; edward.rice@cqgroup.com.au; admin@cqgroup.com.au; katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:**

Client Order Number: 7420 0190 08

Project Name: Air Monitoring

Project Number: 20168

Results Required By:

Bottles Received - Lab use only

6x 1L VOC
respirable dust.
ICE procedure.

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 13/05/2022 **Time:** 11.45am **Received by:** **Date:** **Time:**

Relinquished by: **Date:** **Time:** **Received by:** **Date:** 13.05.22 **Time:** 12:08

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

SGS Terms and Conditions are available at www.au.sgs.com
Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental, Health & Safety Unit 2, 58 Comport Street, PORTSMITH QLD 4870 www.sgs.com
t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

Barnes, Kate

From: Barnes, Kate
Sent: Monday, 16 May 2022 7:12 AM
To: Zanetich, Jodie (Portsmith); Tremayne, Fiona (Portsmith); Giersch-Dicker, Zac (Eagle Farm)
Cc: Dicker, Jon (Portsmith)
Subject: RE: [EXTERNAL] RE: Analysis of Dust (Low Vol)

Hi Jodie,

This is the data I have been collecting.

Do you need the total volume or corrected volume?

Filter	Sample	Flow set to L/min	Total Vol L	Cor. Vol L	Run time min
G2	28/4	3	4316.9	3920.9	1439
G3	01/5	3	4316.5	3941.1	1439
G4	04/5	3	4319.8	3925.4	1440
G5	07/5	3	4316.7	3917.2	1439
G6	10/5	3	4316.9	3915.5	1439
G7	12/5				

G7 is the field blank

Regards

Kate Barnes
Safety and Environment Technician
Mulgrave Mill

MSF Sugar

MSF Sugar Pty Ltd
47 Gordon Street, Gordonvale QLD 4865
PO Box 21, Gordonvale QLD 4865

Tel +61 7 4043 3373
Fax +61 7 4043 3300
katebarnes@msfsugar.com.au
www.msfsugar.com.au



Confidentiality Statement

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Kate Barnes	Manager	Anthony Nilsson
Client	MSF SUGAR	Laboratory	SGS Cairns Environmental
Address	MULGRAVE MILL PO BOX 21 QLD 4865	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 7 4043 3323	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	katebarnes@msfsugar.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**20168 - Air Monitoring**	SGS Reference	**CE159571 R2**
Order Number	**7420019577**	Date Received	27 May 2022
Samples	7	Date Reported	29 Jul 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

This report cancels and supersedes the report No.CE159571_R0. dated 09/06/2022 issued by SGS Environment, Health and Safety due to amended LOR for Respirable Dust Weight following client requests.
This report cancels and supersedes the report No.CE159571_R1. dated 18/07/2022 issued by SGS Environment, Health and Safety due to amendment of significant figures reported for volume of air.

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon DICKER
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE159571.001 Air 13 May 2022 G8	CE159571.002 Air 16 May 2022 G9	CE159571.003 Air 19 May 2022 G10	CE159571.004 Air 22 May 2022 G11
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 3/6/2022**				
Volume of Air (info supplied with samples)	L	-	**3900.4**	**0.0**	**3949.1**	**3940.1**
Respirable Dust Weight	mg/Filter	0.02	<0.02	<0.02	**0.03**	<0.02
Respirable Dust*	mg/m³	0.01	<0.01	-	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE159571.005 Air 25 May 2022 G12	CE159571.006 Air 27 May 2022 G13 (Blank)	CE159571.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 3/6/2022**			
Volume of Air (info supplied with samples)	L	-		**3949.7**	-	-
Respirable Dust Weight	mg/Filter	0.02		<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE159571

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	MULGRAVE MILL PO BOX 21 QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420019577**
Samples	6

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Fri 27/5/2022
Report Due	Sun 5/6/2022
SGS Reference	**CE159571**

SUBMISSION DETAILS

This is to confirm that 6 samples were received on Friday 27/5/2022. Results are expected to be ready by COB Sunday 5/6/2022. Please quote SGS reference CE159571 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	6 Air
Date documentation received	27/5/2022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Due to the high volume of samples we are currently processing through the lab, your TAT may be longer than anticipated.
If you have any concerns please contact us.

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SAMPLE RECEIPT ADVICE

CE159571

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G8	9
002	G9	9
003	G10	9
004	G11	9
005	G12	9
006	G13	9

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE159571

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

	SAMPLE ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER		Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric											Comments:
	G8	13/05/2022										X											PTO.
	G9	16/05/2022										X											
	G10	19/05/2022										X											
	G11	22/05/2022										X											*Plus 1 x laboratory blank also to be analysed
	G12	25/05/2022										X											
	G13	27/05/2022										X											

Company Name: MSF Sugar

Address: 47 Gordon Street
GORDONVALE Qld 4865

Contact Name: Kate Barnes

Email address:
For invoicing: katebarnes@msfsugar.com.au
For results: cathee.miller@cqgroup.com.au; edward.rice@cqgroup.com.au; admin@cqgroup.com.au; katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:**

Client Order Number: 7420019577

Project Name: Air Monitoring

Project Number: 20168

Results Required By:

Bottles Received - Lab use only

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 27/05/2022 **Time:** 1pm **Received by:** **Date:** 27/5/22 **Time:** 1PM

Relinquished by: **Date:** **Time:** **Received by:** **Date:** **Time:**

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental, Health & Safety Unit 2, 58 Comport Street, PORTSMITH QLD 4870 www.sgs.com
t +61(0)7 4035 5111 f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com

Member of the SGS Group

Air volume data for samples

	Total Vol L	Temp C	Press mmHG	Cor.Vol L	Run time min
G8	4316.7	28.478	753.04	3900.4	1439
G9	0	27.012	758.67	0	0
G10	4316.7	24.988	759.36	3949.1	1439
G11	4317.1	28.953	756.74	3940.1	1439
G12	4316.7	20.356	756.7	3949.7	1439
G13	Field blank				

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Kate Barnes	Manager	Anthony Nilsson
Client	MSF SUGAR	Laboratory	SGS Cairns Environmental
Address	PO BOX 21 GORDONVALE QLD 4865	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 7 4043 3323	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	katebarnes@msfsugar.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**20168 - Air Monitoring**	SGS Reference	**CE159795 R1**
Order Number	**7420020077**	Date Received	08 Jun 2022
Samples	7	Date Reported	22 Jul 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

This report cancels and supersedes the report No.CE159795_R0. dated 16/06/2022 issued by SGS Environment, Health and Safety due to amendment of Respirable dust weight result for Lab Blank.
Limit of Reporting (LOR) for Respirable Dust Weight has also been changed from 0.05mg/filter to 0.02mg/filter following client requests.

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Maristela GANZAN
Quality Coordinator

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE159795.001 Air 28 May 2022 G14	CE159795.002 Air 31 May 2022 G15	CE159795.003 Air 02 Jun 2022 G16	CE159795.004 Air 04 Jun 2022 G17
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 15/6/2022**				
Volume of Air (info supplied with samples)	L	-		**3971.9**	**3947.8**	**3960.8**	**3956.7**
Respirable Dust Weight	mg/Filter	0.02		<0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	Sample Number Sample Matrix Sample Date Sample Name LOR	CE159795.005 Air 07 Jun 2022 G18	CE159795.006 Air 08 Jun 2022 G19 (Field Blank)	CE159795.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 15/6/2022**			
Volume of Air (info supplied with samples)	L	-	**3928.8**	-	-
Respirable Dust Weight	mg/Filter	0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

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SAMPLE RECEIPT ADVICE

CE159795

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	(Not specified)
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Wed 8/6/2022
Report Due	Fri 17/6/2022
SGS Reference	**CE159795**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Wednesday 8/6/2022. Results are expected to be ready by COB Friday 17/6/2022. Please quote SGS reference CE159795 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	7 Filter
Date documentation received	8/6/2022	Type of documentation received	COC
Number of eskies/boxes received	NA	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

CE159795

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G14	3
002	G15	3
003	G16	3
004	G17	3
005	G18	3
006	G19 (Field Blank)	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE159795

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: .....
(Lab use only)

	Sample ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric	Comments:
	G14	28/05/2022									X	*Plus 1 x laboratory blank also to be analysed
	G15	31/05/2022									X	
	G16	2/06/2022									X	
	G17	4/06/2022									X	
	G18	7/06/2022									X	
	G19 (FEILD BLANK)	8/06/2022									X	
Laboratory Blank supplied by SGS	LAB BLANK	—									X	

Company Name: MSF Sugar
Address: 47 Gordon Street
GORDONVALE Qld 4865
Contact Name: Kate Barnes
Email address: For invoicing: katebarnes@msfsugar.com.au
For results: cathee.miller@cqgroup.com.au; edward.rice@cqgroup.com.au; admin@cqgroup.com.au; katebarnes@msfsugar.com.au
Telephone: 4043 3373 **Facsimile:**

Client Order Number:
Project Name: Air Monitoring
Project Number: 20168
Results Required By:

Bottles Received - Lab use only
3x filters

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 8/06/2022 **Time:** 1pm **Received by:** RB **Date:** 8/6/22 **Time:** 1PM

Relinquished by: **Date:** **Time:** **Received by:** **Date:** **Time:**

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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ABN 44 000 964 278
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t +61(0)7 4035 5111 f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

Air volume data for samples

	Total Vol L	Temp C	Press mmHG	**Cor.Vol L**	Run time min
G14	4316.5	22.895	756.32	**3971.9**	1439
G15	4316.8	24.66	759.35	**3947.8**	1439
G16	4317	26.294	759.61	**3960.8**	1439
G17	4316.7	22.063	756.34	**3956.7**	1439
G18	4316.7	29.111	756.30	3928.8	1439
G19	Field blank				

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Kate Barnes	Manager	Anthony Nilsson
Client	MSF SUGAR	Laboratory	SGS Cairns Environmental
Address	PO BOX 21 GORDONVALE QLD 4865	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 7 4043 3323	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	katebarnes@msfsugar.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**20168 - Air Monitoring**	SGS Reference	**CE159998 R1**
Order Number	**7420020077**	Date Received	20 Jun 2022
Samples	7	Date Reported	18 Jul 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

This report cancels and supersedes the report No.CE159998_R0. dated 23/06/2022 issued by SGS Environment, Health and Safety due to amended LOR for Respirable Dust Weight following client requests.

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE159998.001 Air 10 Jun 2022 G20	CE159998.002 Air 12 Jun 2022 G21	CE159998.003 Air 14 Jun 2022 G22	CE159998.004 Air 16 Jun 2022 G23
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 23/6/2022**				
Volume of Air (info supplied with samples)	L	-		**4010.9**	**3918**	**4002.3**	**3959.6**
Respirable Dust Weight	mg/Filter	0.02		**0.05**	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		**0.01**	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE159998.005 Air 18 Jun 2022 G24	CE159998.006 Air 20 Jun 2022 G25	CE159998.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 23/6/2022**			
Volume of Air (info supplied with samples)	L	-	**3975.8**	-	-
Respirable Dust Weight	mg/Filter	0.02	**0.07**	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	**0.02**	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE159998

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420020077**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Mon 20/6/2022
Report Due	Wed 29/6/2022
SGS Reference	**CE159998**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Monday 20/6/2022. Results are expected to be ready by COB Wednesday 29/6/2022. Please quote SGS reference CE159998 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	7 Filter
Date documentation received	20/6/2022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Due to the high volume of samples we are currently processing through the lab, your TAT may be longer than anticipated.
If you have any concerns please contact us.

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SAMPLE RECEIPT ADVICE

CE159998

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G20	3
002	G21	3
003	G22	3
004	G23	3
005	G24	3
006	G25	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE159998

IN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

	.D	Sample Date	Matrix: SOIL	WATER	OTHER		Preservation Method: NONE	ICE	ACID	OTHER	Below 4°C	Analysis Required: Gravimetric											Comments: Volume of air (L) from MicroVol 1100
	G20	10/06/2022										X											4010.9
	G21	12/06/2022										X											3918.0
	G22	14/06/2022										X											4002.3
	G23	16/06/2022										X											3959.6
	G24	18/06/2022										X											3975.8
	G25 (Field blank)	20/06/2022										X											
Lab Blank to be supplied by SGS	Lab Blank											X											

Company Name: MSF Sugar
Address: 47 Gordon Street
GORDONVALE Qld 4865
Contact Name: Kate Barnes
Email address: For invoicing: katebarnes@msfsugar.com.au

For results:
cathee.miller@cqgroup.com.au
edward.rice@cqgroup.com.au
admin@cqgroup.com.au
katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:**

Client Order Number: 7420020077
Project Name: Air Monitoring
Project Number: 20168
Results Required By:

Bottles Received - Lab use only
7 x filters
(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 20/06/2022 **Time:** 3:10pm **Received by:** **Date:** 20/6/22 **Time:** 3p

Relinquished by: **Date:** **Time:** **Received by:** **Date:** **Time:**

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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SGS Australia Pty Ltd
ABN 44 000 964 278

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Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Kate Barnes	Manager	Anthony Nilsson
Client	MSF SUGAR	Laboratory	SGS Cairns Environmental
Address	PO BOX 21 GORDONVALE QLD 4865	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 7 4043 3323	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	katebarnes@msfsugar.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**20168 - Air Monitoring**	SGS Reference	**CE160284 R1**
Order Number	**7420020276**	Date Received	04 Jul 2022
Samples	7	Date Reported	14 Jul 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

This report cancels and supersedes the report No.CE160284_R0. dated 11/07/2022 issued by SGS Environment, Health and Safety due to amended LOR for Respirable Dust Weight (mg/Filter) following client requests.

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE160284.001 Air 21 Jun 2022 G26	CE160284.002 Air 24 Jun 2022 G27	CE160284.003 Air 27 Jun 2022 G28	CE160284.004 Air 30 Jun 2022 G29
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 11/7/2022**				
Volume of Air (info supplied with samples)	L	-		**3978.2**	**3983.2**	**3982.4**	**3971.1**
Respirable Dust Weight	mg/Filter	0.02		**0.09**	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		**0.02**	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE160284.005 Air 03 Jul 2022 G30	CE160284.006 Air 04 Jul 2022 G31 (Field Blank)	CE160284.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 11/7/2022**			
Volume of Air (info supplied with samples)	L	-	**3966.4**	-	-
Respirable Dust Weight	mg/Filter	0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

SAMPLE RECEIPT ADVICE

CE160284

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420020276**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Mon 4/7/2022
Report Due	Mon 11/7/2022
SGS Reference	**CE160284**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Monday 4/7/2022. Results are expected to be ready by COB Monday 11/7/2022. Please quote SGS reference CE160284 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	NA
Samples received in correct containers	Yes	Sample counts by matrix	7 Filter
Date documentation received	4/7/2022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

CE160284

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G26	3
002	G27	3
003	G28	3
004	G29	3
005	G30	3
006	G31	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE160284

IN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: .....

(Lab use only)

ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric	Comments: Volume of air (L) from MicroVol 1100
G26	21/06/2022									X	3978.2
G27	24/06/2022									X	3983.2
G28	27/06/2022									X	3962.4
G29	30/06/2022									X	3971.1
G30	3/07/2022									X	3966.4
G31 (Field blank)	4/07/2022									X	
Lab Blank to be supplied by SGS — Lab Blank										X	

Company Name: MSF Sugar

Address: 47 Gordon Street
GORDONVALE Qld 4865

Contact Name: Kate Barnes

Email address:
For invoicing: katebarnes@msfsugar.com.au

For results: cathee.miller@cqgroup.com.au; edward.rice@cqgroup.com.au; admin@cqgroup.com.au; katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:** .....

Client Order Number: 7420020276

Project Name: Air Monitoring

Project Number: 20168

Results Required By: .....

Bottles Received - Lab use only

7x filters

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 4/07/2022 **Time:** 3pm **Received by:** ..... **Date:** 4/7/22 **Time:** 3p

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** ..... **Time:** .....

* Circle whichever is applicable

Sample Cooler Sealed:	Samples Intact:	Correct Sample Bottles Used:	Temperature:
YES/NO*	YES/NO*	YES/NO*	AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐

Consent given for subcontracting ☐

SGS Terms and Conditions are available at www.au.sgs.com

Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental, Health & Safety Unit 2, 58 Comport Street, PORTSMITH QLD 4870 www.sgs.com
t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com

Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420020276**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE160611 R0**
Date Received	20 Jul 2022
Date Reported	27 Jul 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE160611.001 Air 06 Jul 2022 G32	CE160611.002 Air 09 Jul 2022 G33	CE160611.003 Air 12 Jul 2022 G34	CE160611.004 Air 15 Jul 2022 G35
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 26/7/2022**					
Volume of Air (info supplied with samples)	L	-		**3771.6**	**4008.9**	**4018.5**	**4076.3**
Respirable Dust Weight	mg/Filter	0.02		<0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE160611.005 Air 18 Jul 2022 G36	CE160611.006 Air 20 Jul 2022 G37 (Field blank)	CE160611.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 26/7/2022**			
Volume of Air (info supplied with samples)	L	-	**3789.9**	-	-
Respirable Dust Weight	mg/Filter	0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE160611

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420020276**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Wed 20/7/2022
Report Due	Wed 27/7/2022
SGS Reference	**CE160611**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Wednesday 20/7/2022. Results are expected to be ready by COB Wednesday 27/7/2022.
Please quote SGS reference CE160611 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	6 Filter
Date documentation received	21072022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Due to the high volume of samples we are currently processing through the lab, your TAT may be longer than anticipated.
If you have any concerns please contact us.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx.
Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

CE160611

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G32	3
002	G33	3
003	G34	3
004	G35	3
005	G36	3
006	G37 (Field blank)	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE160611

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

	ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric	Comments: Volume of air (L) from MicroVol 1100
1	G32	6/07/2022									X	3771.6
2	G33	9/07/2022									X	4008.9
3	G34	12/07/2022									X	4018.5
4	G35	15/07/2022									X	4076.3
5	G36	18/07/2022									X	3789.9
6	G37 (Field blank)	20/07/2022									X	
Lab Blank to be supplied by SGS	Lab Blank										X	

Company Name: MSF Sugar
Address: 47 Gordon Street
GORDONVALE Qld 4865
Contact Name: Kate Barnes
Email address: For invoicing: katebarnes@msfsugar.com.au
For results: cathee.miller@cqgroup.com.au; edward.rice@cqgroup.com.au; admin@cqgroup.com.au; katebarnes@msfsugar.com.au
Telephone: 4043 3373 **Facsimile:** .....

Client Order Number: 7420020276
Project Name: Air Monitoring
Project Number: 20168
Results Required By: .....

Bottles Received - Lab use only

6 x H1 VOL

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 20/07/2022 **Time:** 3pm **Received by:** ..... **Date:** ..... **Time:** .....

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** 20/07/22 **Time:** 4:30

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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ABN 44 000 964 278

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t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420021739**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE160874 R0**
Date Received	04 Aug 2022
Date Reported	16 Aug 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE160874.001 Air 21 Jul 2022 G38	CE160874.002 Air 24 Jul 2022 G39	CE160874.003 Air 27 Jul 2022 G40	CE160874.004 Air 30 Jul 2022 G41
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 12/8/2022**				
Volume of Air (info supplied with samples)	L	-		**3956.0**	**3959.2**	**3991.5**	**3998.8**
Respirable Dust Weight	mg/Filter	0.02		<0.02	**0.14**	**0.02**	**0.22**
Respirable Dust*	mg/m³	0.01		<0.01	**0.04**	<0.01	**0.06**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE160874.005 Air 02 Aug 2022 G42	CE160874.006 Air 04 Aug 2022 G43 (Field blank)	CE160874.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 12/8/2022**			
Volume of Air (info supplied with samples)	L	-	**3964.2**	-	-
Respirable Dust Weight	mg/Filter	0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE160874

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420021739**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Thu 4/8/2022
Report Due	Mon 15/8/2022
SGS Reference	**CE160874**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Thursday 4/8/2022. Results are expected to be ready by COB Monday 15/8/2022. Please quote SGS reference CE160874 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	6 Air
Date documentation received	5082022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Due to the high volume of samples we are currently processing through the lab, your TAT may be longer than anticipated.
If you have any concerns please contact us.

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SAMPLE RECEIPT ADVICE

CE160874

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G38	3
002	G39	3
003	G40	3
004	G41	3
005	G42	3
006	G43 (Field blank)	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE160874

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

	SAMPLE ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric	Comments: Volume of air (L) from MicroVol 1100
1	G38	21/07/2022									X	3956.0
2	G39	24/07/2022									X	3959.2
3	G40	27/07/2022									X	3991.5
4	G41	30/07/2022									X	3998.8
5	G42	2/08/2022									X	3964.2
6	G43 (Field blank)	4/08/2022									X	
Lab Blank to be supplied by SGS 7	Lab Blank										X	

Company Name: MSF Sugar

Address: 47 Gordon Street
GORDONVALE Qld 4865

Contact Name: Kate Barnes

Email address:
For invoicing: katebarnes@msfsugar.com.au
For results: cathee.miller@cqgroup.com.au; edward.rice@cqgroup.com.au; admin@cqgroup.com.au; katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:** .....

Client Order Number: 7420021739

Project Name: Air Monitoring

Project Number: 20168

Results Required By: .....

Bottles Received - Lab use only

6XHVOL

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 4/08/2022 **Time:** 3:15pm **Received by:** ..... **Date:** ..... **Time:** .....

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** 04/08/22 **Time:** 3:30

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental, Health & Safety Unit 2, 58 Comport Street, PORTSMITH QLD 4870 www.sgs.com
t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420021739**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE161237 R0**
Date Received	19 Aug 2022
Date Reported	31 Aug 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE161237.001 Air 05 Aug 2022 G44	CE161237.002 Air 08 Aug 2022 G45	CE161237.003 Air 11 Aug 2022 G46	CE161237.004 Air 14 Aug 2022 G47
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 30/8/2022**					
Volume of Air (info supplied with samples)	L	-		**0.0**	**3958.8**	**3982.0**	**3962.9**
Respirable Dust Weight	mg/Filter	0.02		**0.11**	**0.17**	**0.08**	**0.03**
Respirable Dust*	mg/m³	0.01		-	**0.04**	**0.02**	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE161237.005 Air 17 Aug 2022 G48	CE161237.006 Air 19 Aug 2022 G49 (Field blank)	CE161237.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 30/8/2022**			
Volume of Air (info supplied with samples)	L	-	**4018.1**	-	-
Respirable Dust Weight	mg/Filter	0.02	**0.06**	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	**0.01**	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

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SAMPLE RECEIPT ADVICE

CE161237

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420021739**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Fri 19/8/2022
Report Due	Tue 30/8/2022
SGS Reference	**CE161237**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Friday 19/8/2022. Results are expected to be ready by COB Tuesday 30/8/2022. Please quote SGS reference CE161237 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	N/A
Samples received in correct containers	Yes	Sample counts by matrix	6 Air
Date documentation received	19/8/2022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

CE161237

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G44	3
002	G45	3
003	G46	3
004	G47	3
005	G48	3
006	G49 (Field blank)	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

CE161237

...N OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: .....
(Lab use only)

	SAMPLE ID	Sample Date	Matrix: SOIL	WATER	OTHER		Preservation Method: NONE	ICE	ACID	OTHER	Below 4°C	Analysis Required: Gravimetric											Comments: Volume of air (L) from MicroVol 1100
	G44	5/08/2022										X										0.0
	G45	8/08/2022										X										3958.8
	G46	11/08/2022										X										3982.0
	G47	14/08/2022										X										3962.9
	G48	17/08/2022										X										4018.1
	G49 (Field blank)	19/08/2022										X										
Lab Blank to be supplied by SGS	Lab Blank											X										

Company Name: MSF Sugar
Address: 47 Gordon Street
GORDONVALE Qld 4865
Contact Name: Kate Barnes
Email address: For invoicing: katebarnes@msfsugar.com.au
For results: cathee.miller@cqgroup.com.au; edward.rice@cqgroup.com.au; admin@cqgroup.com.au; katebarnes@msfsugar.com.au
Telephone: 4043 3373 **Facsimile:**

Client Order Number: 7420021739
Project Name: Air Monitoring
Project Number: 20168
Results Required By:

Bottles Received - Lab use only
6 x filters
(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 19/08/2022 **Time:** 3:30 **Received by:** RR **Date:** 19/8/22 **Time:** 3:30pm

Relinquished by: **Date:** **Time:** **Received by:** **Date:** **Time:**

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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ABN 44 000 964 278

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t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420022492**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE161504 R0**
Date Received	02 Sep 2022
Date Reported	09 Sep 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon DICKER
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE161504.001 Air 20 Aug 2022 G50	CE161504.002 Air 23 Aug 2022 G51	CE161504.003 Air 26 Aug 2022 G52	CE161504.004 Air 29 Aug 2022 G53
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 9/9/2022**				
Volume of Air (info supplied with samples)	L	-		**4000.5**	**3969.6**	**4002.0**	**3953.0**
Respirable Dust Weight	mg/Filter	0.02		**0.07**	<0.02	**0.06**	<0.02
Respirable Dust*	mg/m³	0.01		**0.02**	<0.01	**0.01**	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE161504.005 Air 01 Sep 2022 G54	CE161504.006 Air 02 Sep 2022 G55 (Field Blank)	CE161504.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 9/9/2022**			
Volume of Air (info supplied with samples)	L	-	**3961.3**	-	-
Respirable Dust Weight	mg/Filter	0.02	**0.07**	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	**0.02**	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE161504

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420022492**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Fri 2/9/2022
Report Due	Fri 9/9/2022
SGS Reference	**CE161504**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Friday 2/9/2022. Results are expected to be ready by COB Friday 9/9/2022. Please quote SGS reference CE161504 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	7 Air
Date documentation received	5092022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Due to the high volume of samples we are currently processing through the lab, your TAT may be longer than anticipated.
If you have any concerns please contact us.

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SAMPLE RECEIPT ADVICE

CE161504

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G50	3
002	G51	3
003	G52	3
004	G53	3
005	G54	3
006	G55 (Field Blank)	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE161504

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: .....
(Lab use only)

	t / Σ ID	Sample Date	Matrix: SOIL	WATER	OTHER	Preservation Method: NONE	ICE	ACID	OTHER	Below 4°C	Analysis Required: Gravimetric	Comments: Volume of air (L) from MicroVol 1100
1	G50	20/08/2022									X	4000.5
2	G51	23/08/2022									X	3969.6
3	G52	26/08/2022									X	4002.0
4	G53	29/08/2022									X	3953.0
5	G54	1/09/2022									X	3961.3
6	G55 (Field blank)	2/09/2022									X	
Lab Blank to be supplied by SGS 7	Lab Blank										X	

Company Name: MSF Sugar
Address: 47 Gordon Street
GORDONVALE Qld 4865
Contact Name: Kate Barnes
Email address: For invoicing: katebarnes@msfsugar.com.au

For results:
cathee.miller@cqgroup.com.au
edward.rice@cqgroup.com.au
admin@cqgroup.com.au
katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:** .....

Client Order Number: 7420022492
Project Name: Air Monitoring
Project Number: 20168
Results Required By: .....

Bottles Received - Lab use only

6 x HI VOL

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 2/09/2022 **Time:** 2-50pm **Received by:** ..... **Date:** ..... **Time:** .....

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** 02.09.22 **Time:** 250

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental, Health & Safety Unit 2, 58 Comport Street, PORTSMITH QLD 4870 www.sgs.com
t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420022492**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE161852 R0**
Date Received	19 Sep 2022
Date Reported	21 Sep 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE161852.001 Air 04 Sep 2022 G56	CE161852.002 Air 07 Sep 2022 G57	CE161852.003 Air 10 Sep 2022 G58	CE161852.004 Air 13 Sep 2022 G59
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 21/9/2022**				
Volume of Air (info supplied with samples)	L	-		**3863.8**	**3957.0**	**3928.1**	**3951.4**
Respirable Dust Weight	mg/Filter	0.02		<0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE161852.005 Air 16 Sep 2022 G60	CE161852.006 Air 18 Sep 2022 G61 (Field Blank)	CE161852.007 Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 21/9/2022**			
Volume of Air (info supplied with samples)	L	-	**3909.7**	-	-
Respirable Dust Weight	mg/Filter	0.02	**0.03**	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

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SAMPLE RECEIPT ADVICE

CE161852

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420022492**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Mon 19/9/2022
Report Due	Thu 29/9/2022
SGS Reference	**CE161852**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Monday 19/9/2022. Results are expected to be ready by COB Thursday 29/9/2022. Please quote SGS reference CE161852 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	6 Air
Date documentation received	20092022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Due to the high volume of samples we are currently processing through the lab, your TAT may be longer than anticipated.
If you have any concerns please contact us.

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SAMPLE RECEIPT ADVICE

CE161852

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G56	3
002	G57	3
003	G58	3
004	G59	3
005	G60	3
006	G61 (Field Blank)	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE161852

AIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

	t LE ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER		Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric											Comments: Volume of air (L) from MicroVol 1100
1	G56	4/09/2022										X											3863.8
2	G57	7/09/2022										X											3957.0
3	G58	10/09/2022										X											3928.1
4	G59	13/09/2022										X											3951.4
5	G60	16/09/2022										X											3909.7
6	G61 (Field blank)	18/09/2022										X											
Lab Blank to be supplied by SGS 7	Lab Blank											X											

Company Name: MSF Sugar

Address: 47 Gordon Street
GORDONVALE Qld 4865

Contact Name: Kate Barnes

Email address:
For invoicing: katebarnes@msfsugar.com.au

For results:
cathee.miller@cqgroup.com.au
edward.rice@cqgroup.com.au
admin@cqgroup.com.au
katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:** .....

Client Order Number: 7420022492
Project Name: Air Monitoring
Project Number: 20168

Results Required By: .....

Bottles Received - Lab use only

6X+1 VOL

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 19/09/2022 **Time:** 3:45. **Received by:** ..... **Date:** ..... **Time:** .....

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** 19.09.22 **Time:** 3:45

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental, Health & Safety Unit 2, 58 Comport Street, PORTSMITH QLD 4870 www.sgs.com
t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Kate Barnes	Manager	Anthony Nilsson
Client	MSF SUGAR	Laboratory	SGS Cairns Environmental
Address	PO BOX 21 GORDONVALE QLD 4865	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 7 4043 3323	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	katebarnes@msfsugar.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**20168 - Air Monitoring**	SGS Reference	**CE162147 R0**
Order Number	**7420023051**	Date Received	05 Oct 2022
Samples	7	Date Reported	13 Oct 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Maristela GANZAN
Quality Coordinator

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE162147.001 Air 19 Sep 2022 G62	CE162147.002 Air 22 Sep 2022 G63	CE162147.003 Air 25 Sep 2022 G64	CE162147.004 Air 28 Sep 2022 G65
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 13/10/2022**				
Volume of Air (info supplied with samples)	L	-		**3901.6**	**3899.8**	**3902.7**	**2317.1**
Respirable Dust Weight	mg/Filter	0.02		**0.14**	**0.04**	**0.12**	**0.03**
Respirable Dust*	mg/m³	0.01		**0.04**	**0.01**	**0.03**	**0.01**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE162147.005 Air 01 Oct 2022 G66	CE162147.006 Air G67 (Field blank)	CE162147.007 Air Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 13/10/2022**		
Volume of Air (info supplied with samples)	L	-	**3924.6**	-	-
Respirable Dust Weight	mg/Filter	0.02	**0.12**	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	**0.03**	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE162147

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420023051**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Wed 5/10/2022
Report Due	Fri 14/10/2022
SGS Reference	**CE162147**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Wednesday 5/10/2022. Results are expected to be ready by COB Friday 14/10/2022. Please quote SGS reference CE162147 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	6 Air
Date documentation received	6102022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Due to the high volume of samples we are currently processing through the lab, your TAT may be longer than anticipated.
If you have any concerns please contact us.

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SAMPLE RECEIPT ADVICE

CE162147

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G62	3
002	G63	3
003	G64	3
004	G65	3
005	G66	3
006	G67 (Field blank)	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE162147

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

	SAMPLE ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric	Comments: Volume of air (L) from MicroVol 1100
1	G62	19/09/2022									X	3901.6
2	G63	22/09/2022									X	3899.8
3	G64	25/09/2022									X	3902.7
4	G65	28/09/2022									X	2317.1
5	G66	1/10/2022									X	3924.6
6	G67 (Field blank)										X	
Lab Blank to be supplied by SGS 7	Lab Blank										X	

Company Name: MSF Sugar

Address: 47 Gordon Street
GORDONVALE Qld 4865

Contact Name: Kate Barnes

Email address:
For invoicing: katebarnes@msfsugar.com.au

For results:
cathee.miller@cqgroup.com.au
edward.rice@cqgroup.com.au
admin@cqgroup.com.au
katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:** .....

Client Order Number: 7420023051

Project Name: Air Monitoring

Project Number: 20168

Results Required By: .....

Bottles Received - Lab use only

6x DUST

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 5/10/2022 **Time:** 3.45pm **Received by:** ..... **Date:** ..... **Time:** .....

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** 05.10.22 **Time:** 3:00

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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ABN 44 000 964 278

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t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Kate Barnes	Manager	Anthony Nilsson
Client	MSF SUGAR	Laboratory	SGS Cairns Environmental
Address	PO BOX 21 GORDONVALE QLD 4865	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 7 4043 3323	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	katebarnes@msfsugar.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**20168 - Air Monitoring**	SGS Reference	**CE162388 R0**
Order Number	**7420023051**	Date Received	18 Oct 2022
Samples	7	Date Reported	21 Oct 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE162388.001 Filter 04 Oct 2022 G68	CE162388.002 Filter 07 Oct 2022 G69	CE162388.003 Filter 10 Oct 2022 G70	CE162388.004 Filter 13 Oct 2022 G71
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 21/10/2022**					
Volume of Air (info supplied with samples)	L	-		**3937.7**	**3917.7**	**3912.2**	**3916.3**
Respirable Dust Weight	mg/Filter	0.02		<0.02	**0.05**	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	**0.01**	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE162388.005 Filter 16 Oct 2022 G72	CE162388.006 Filter 18 Oct 2022 G73	CE162388.007 Filter Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 21/10/2022**			
Volume of Air (info supplied with samples)	L	-		**3906.7**	-	-
Respirable Dust Weight	mg/Filter	0.02		<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE162388

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420023051**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Tue 18/10/2022
Report Due	Tue 25/10/2022
SGS Reference	**CE162388**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Tuesday 18/10/2022. Results are expected to be ready by COB Tuesday 25/10/2022. Please quote SGS reference CE162388 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	7 x filter
Date documentation received	18/10/2022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

CE162388

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G68	3
002	G69	3
003	G70	3
004	G71	3
005	G72	3
006	G73	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE162388

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

		Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric	Comments: Volume of air (L) from MicroVol 1100
1	G68	4/10/2022									X	3937.7
2	G69	7/10/2022									X	3917.7
3	G70	10/10/2022									X	3912.2
4	G71	13/10/2022									X	3916.3
5	G72	16/10/2022									X	3906.7
6	G73 (Field blank)	18/10/2022									X	
Lab Blank to be supplied by SGS 7	Lab Blank										X	

Company Name: MSF Sugar

Address: 47 Gordon Street
GORDONVALE Qld 4865

Contact Name: Kate Barnes

Email address:
For invoicing: katebarnes@msfsugar.com.au

For results:
cathee.miller@cqgroup.com.au
edward.rice@cqgroup.com.au
admin@cqgroup.com.au
katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:** .....

Client Order Number: 7420023051

Project Name: Air Monitoring

Project Number: 20168

Results Required By: .....

Bottles Received - Lab use only

7 x filters

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 18/10/2022 **Time:** 3:30 **Received by:** ..... **Date:** 18/10/22 **Time:** 3:30 pm

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** ..... **Time:** .....

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental, Health & Safety Unit 2, 58 Comport Street, PORTSMITH QLD 4870 www.sgs.com
t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420023820**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE162680 R0**
Date Received	02 Nov 2022
Date Reported	07 Nov 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE162680.001 Dust 19 Oct 2022 G74	CE162680.002 Dust 22 Oct 2022 G75	CE162680.003 Dust 25 Oct 2022 G76	CE162680.004 Dust 28 Oct 2022 G77
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 7/11/2022**				
Volume of Air (info supplied with samples)	L	-		**3897.4**	**3878.4**	**3856.0**	**3867.8**
Respirable Dust Weight	mg/Filter	0.02		**0.02**	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE162680.005 Dust 31 Oct 2022 G78	CE162680.006 Dust 02 Nov 2022 G79 (Field Blank)	CE162680.007 Dust Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 7/11/2022**		
Volume of Air (info supplied with samples)	L	-	**3855.9**	-	-
Respirable Dust Weight	mg/Filter	0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

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SAMPLE RECEIPT ADVICE

CE162680

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	(Not specified)
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Wed 2/11/2022
Report Due	Fri 11/11/2022
SGS Reference	**CE162680**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Wednesday 2/11/2022. Results are expected to be ready by COB Friday 11/11/2022. Please quote SGS reference CE162680 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	7 Dust
Date documentation received	2/11/2022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

CE162680

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G74	3
002	G75	3
003	G76	3
004	G77	3
005	G78	3
006	G79 (Field Blank)	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SGS EHS Cairns COC

CE162680

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

	Client ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric	Comments: Volume of air (L) from MicroVol 1100
1	G74	19/10/2022									X	3897.4
2	G75	22/10/2022									X	3878.4
3	G76	25/10/2022									X	3856.0
4	G77	28/10/2022									X	3867.8
5	G78	31/10/2022									X	3855.9
6	G79 (Field blank)	2/11/2022									X	
Lab Blank to be supplied by SGS 7	Lab Blank										X	

Company Name: MSF Sugar
Address: 47 Gordon Street
GORDONVALE Qld 4865
Contact Name: Kate Barnes
Email address: For invoicing: katebarnes@msfsugar.com.au
For results: cathee.miller@cqgroup.com.au; edward.rice@cqgroup.com.au; admin@cqgroup.com.au; katebarnes@msfsugar.com.au
Telephone: 4043 3373 **Facsimile:** .....

Client Order Number: .....
Project Name: Air Monitoring
Project Number: 20168
Results Required By: .....

Bottles Received - Lab use only

7 x HI VOL

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 2/11/2022 **Time:** 4.00pm **Received by:** ..... **Date:** ..... **Time:** .....

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** 02.11.22 **Time:** 4:00

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

Environmental, Health & Safety Unit 2, 58 Comport Street, PORTSMITH QLD 4870 www.sgs.com
t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Kate Barnes	Manager	Anthony Nilsson
Client	MSF SUGAR	Laboratory	SGS Cairns Environmental
Address	PO BOX 21 GORDONVALE QLD 4865	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 7 4043 3323	Telephone	+61 07 4035 5111
Facsimile	(Not specified)	Facsimile	+61 07 4035 5122
Email	katebarnes@msfsugar.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**20168 - Air Monitoring**	SGS Reference	**CE163003 R0**
Order Number	**7420023820**	Date Received	17 Nov 2022
Samples	7	Date Reported	21 Nov 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE163003.001 Dust 03 Nov 2022 G80	CE163003.002 Dust 06 Nov 2022 G81	CE163003.003 Dust 09 Nov 2022 G82	CE163003.004 Dust 12 Nov 2022 G83
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 21/11/2022**					
Volume of Air (info supplied with samples)	L	-		**3906.0**	**3924.8**	**3900.9**	**3893.0**
Respirable Dust Weight	mg/Filter	0.02		<0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE163003.005 Dust 15 Nov 2022 G84	CE163003.006 Dust 17 Nov 2022 G85 (Field Blank)	CE163003.007 Dust Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**	**Tested: 21/11/2022**			
Volume of Air (info supplied with samples)	L	-	**3863.1**	-	-
Respirable Dust Weight	mg/Filter	0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01	<0.01	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE163003

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420023820**
Samples	7

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Thu 17/11/2022
Report Due	Mon 28/11/2022
SGS Reference	**CE163003**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Thursday 17/11/2022. Results are expected to be ready by COB Monday 28/ 11/2022. Please quote SGS reference CE163003 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	7 Dust
Date documentation received	17/11/2022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

CE163003

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G80	3
002	G81	3
003	G82	3
004	G83	3
005	G84	3
006	G85 (Field Blank)	3
007	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

source: Cairns.pdf page: 1 SGS Ref: CE163003_COC

SGS EHS Cairns COC

CE163003

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: .....
(Lab use only)

Laboratory ID	SAMPLE ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER	Preservation Method: Below 4°C	Analysis Required: Gravimetric	Comments: Volume of air (L) from MicroVol 1100
1	G80	3/11/2022									X	3906.0
2	G81	6/11/2022									X	3924.8
3	G82	9/11/2022									X	3900.9
4	G83	12/11/2022									X	3893.0
5	G84	15/11/2022									X	3863.1
6	G85 (Field blank)	17/11/2022									X	
Lab Blank to be supplied by SGS	Lab Blank										X	

Company Name: MSF Sugar
Address: 47 Gordon Street
GORDONVALE Qld 4865
Contact Name: Kate Barnes
Email address: For invoicing: katebarnes@msfsugar.com.au

For results:
cathee.miller@cqgroup.com.au
edward.rice@cqgroup.com.au
admin@cqgroup.com.au
katebarnes@msfsugar.com.au

Telephone: 4043 3373 **Facsimile:** .....

Client Order Number: 7420023820
Project Name: Air Monitoring
Project Number: 20168
Results Required By: .....

Bottles Received - Lab use only

7 x HI VOL

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 17/11/2022 **Time:** 13:30 **Received by:** ..... **Date:** ..... **Time:** .....

Relinquished by: ..... **Date:** ..... **Time:** ..... **Received by:** ..... **Date:** 17/11/22 **Time:** 1:30

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

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Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

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Member of the SGS Group

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420024357**
Samples	6

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE163193 R0**
Date Received	28 Nov 2022
Date Reported	02 Dec 2022

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(3146/19038)

SIGNATORIES

Anthony NILSSON
Operations Manager

Jon Dicker
Manager Northern QLD

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE163193.001 Filter 18 Nov 2022 G86	CE163193.002 Filter 21 Nov 2022 G87	CE163193.003 Filter 24 Nov 2022 G88	CE163193.004 Filter 27 Nov 2022 G89
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**		**Tested: 2/12/2022**				
Volume of Air (info supplied with samples)	L	-		**3871.2**	**3849.0**	**3874.3**	**3867.1**
Respirable Dust Weight	mg/Filter	0.02		<0.02	<0.02	<0.02	<0.02
Respirable Dust*	mg/m³	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE163193.005 Filter 28 Nov 2022 G90	CE163193.006 Filter Lab Blank
Gravimetric determination of respirable dust and silica	**Method: Australian Standard 2985/AN505**			**Tested: 2/12/2022**	
Volume of Air (info supplied with samples)	L	-		-	-
Respirable Dust Weight	mg/Filter	0.02		<0.02	<0.02
Respirable Dust*	mg/m³	0.01		-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

No QC samples were reported for this job.

METHOD	METHODOLOGY SUMMARY
AN505	Silica (alpha quartz & cristobalite) determined by ashing the respirable dust at 600 degrees C followed by analysis of the re deposited ash by FTIR. Referenced to NIOSH 7603 (2003).
AS 2985	Airborne concentrations of respirable dust in the workplace are determined by passing a measured volume of air through a filter of predetermined weight. By reweighing the filter at the end of the sampling period, the weight of material collected is determined by difference. To separate the respirable fraction, a size selective sampler is used prior to filter.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
***	Indicates that both * and ** apply.	NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

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SAMPLE RECEIPT ADVICE

CE163193

CLIENT DETAILS

Contact	Kate Barnes
Client	MSF SUGAR
Address	PO BOX 21 GORDONVALE QLD 4865
Telephone	61 7 4043 3323
Facsimile	(Not specified)
Email	katebarnes@msfsugar.com.au
Project	**20168 - Air Monitoring**
Order Number	**7420024357**
Samples	6

LABORATORY DETAILS

Manager	Anthony Nilsson
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
Samples Received	Mon 28/11/2022
Report Due	Wed 7/12/2022
SGS Reference	**CE163193**

SUBMISSION DETAILS

This is to confirm that 6 samples were received on Monday 28/ 11/2022. Results are expected to be ready by COB Wednesday 7/12/2022.
Please quote SGS reference CE163193 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	None
Samples received in correct containers	Yes	Sample counts by matrix	6 x Filters
Date documentation received	28/11/2022	Type of documentation received	COC
Number of eskies/boxes received	1	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sufficient sample for analysis	Yes	Turnaround time requested	Standard

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

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SAMPLE RECEIPT ADVICE

CE163193

CLIENT DETAILS

Client MSF SUGAR

Project 20168 - Air Monitoring

SUMMARY OF ANALYSIS

No.	Sample ID	Gravimetric determination of respirable dust and
001	G86	3
002	G87	3
003	G88	3
004	G89	3
005	G90	3
006	Lab Blank	3

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

CHAIN OF CUSTODY & ANALYSIS REQUEST

Job Reference Number: ..... *(Lab use only)*

Laboratory ID	Client SAMPLE ID	Sample Date	Matrix: SOIL	WATER	OTHER		Preservation Method: NONE	ICE	ACID	OTHER	Below 4°C	Analysis Required: Gravimetric											Comments: Volume of air (L) from MicroVol 1100
	G86	18/11/2022										X										3871.2
	G87	21/11/2022										X										3849.0
	G88	24/11/2022										X										3874.3
	G89	27/11/2022										X										3867.1
	X																					X
	G90 (Field blank)	28/11/2022										X										
Lab Blank to be supplied by SGS	Lab Blank											X										

Company Name: MSF Sugar
Address: 47 Gordon Street
GORDONVALE Qld 4865
Contact Name: Kate Barnes
Email address: For invoicing: katebarnes@msfsugar.com.au
For results: cathee.miller@cqgroup.com.au; edward.rice@cqgroup.com.au; admin@cqgroup.com.au; katebarnes@msfsugar.com.au
Telephone: 4043 3373 **Facsimile:**

Client Order Number: 7420024357
Project Name: Air Monitoring
Project Number: 20168
Results Required By:

Bottles Received - Lab use only

(Please specify if AW is Field Filtered or Total)

Relinquished by: Kate Barnes **Date:** 28/11/2022 **Time:** 3:30pm **Received by:** **Date:** **Time:**

Relinquished by: **Date:** **Time:** **Received by:** **Date:** **Time:**

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

SGS Terms and Conditions are available at www.au.sgs.com
Please sign the back of this cofc for T&C

SGS Australia Pty Ltd
ABN 44 000 964 278

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t +61(0)7 4035 5111. f +61(0)7 4035 5122 *e-mail:* au.environmental.cairns@sgs.com
Member of the SGS Group

Appendix G:

Wind Roses 24 and 30 July 2022

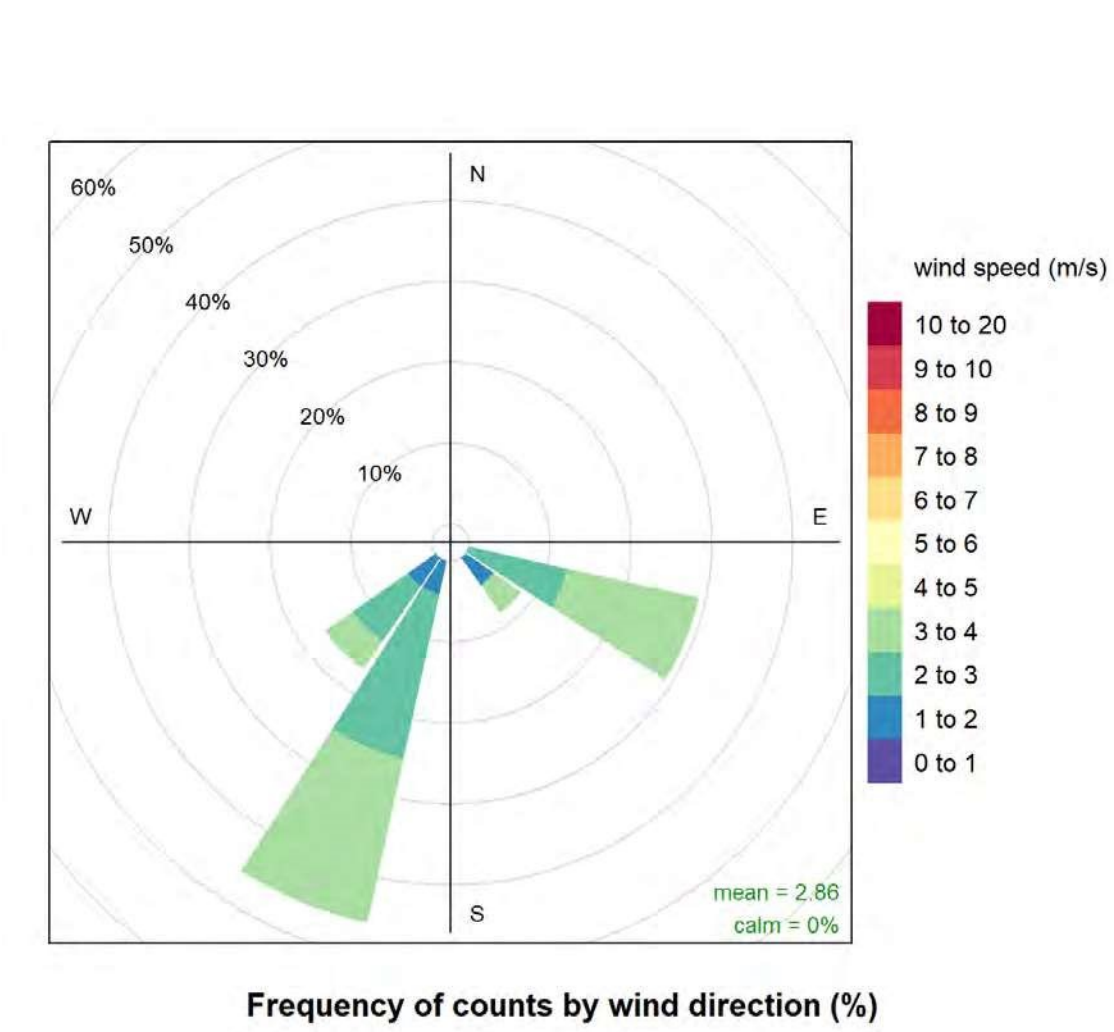


Figure G18: Daily wind rose for 24 July 2022

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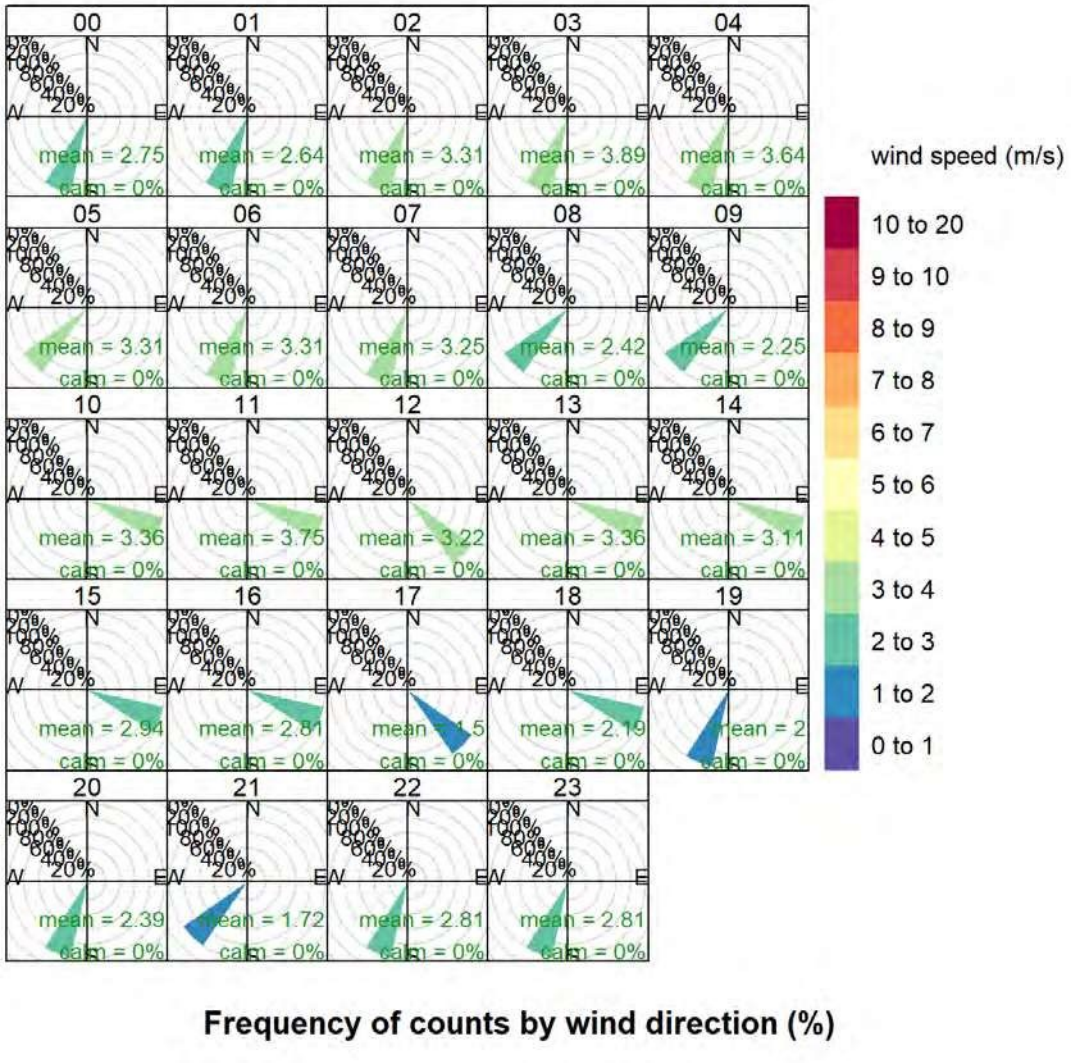


Figure G19: Hourly wind rose for 24 July 2022

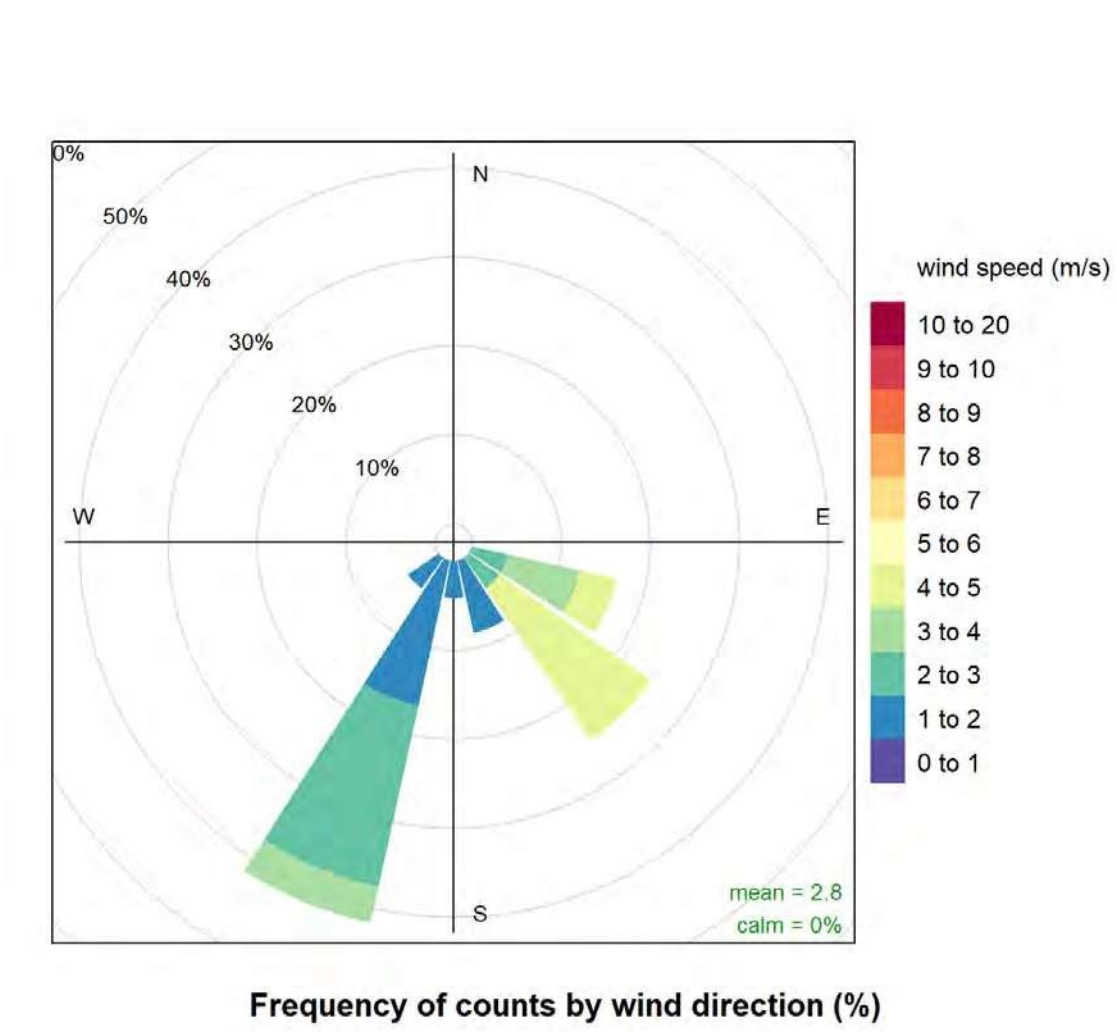


Figure G20: Daily wind rose for 30 July 2022

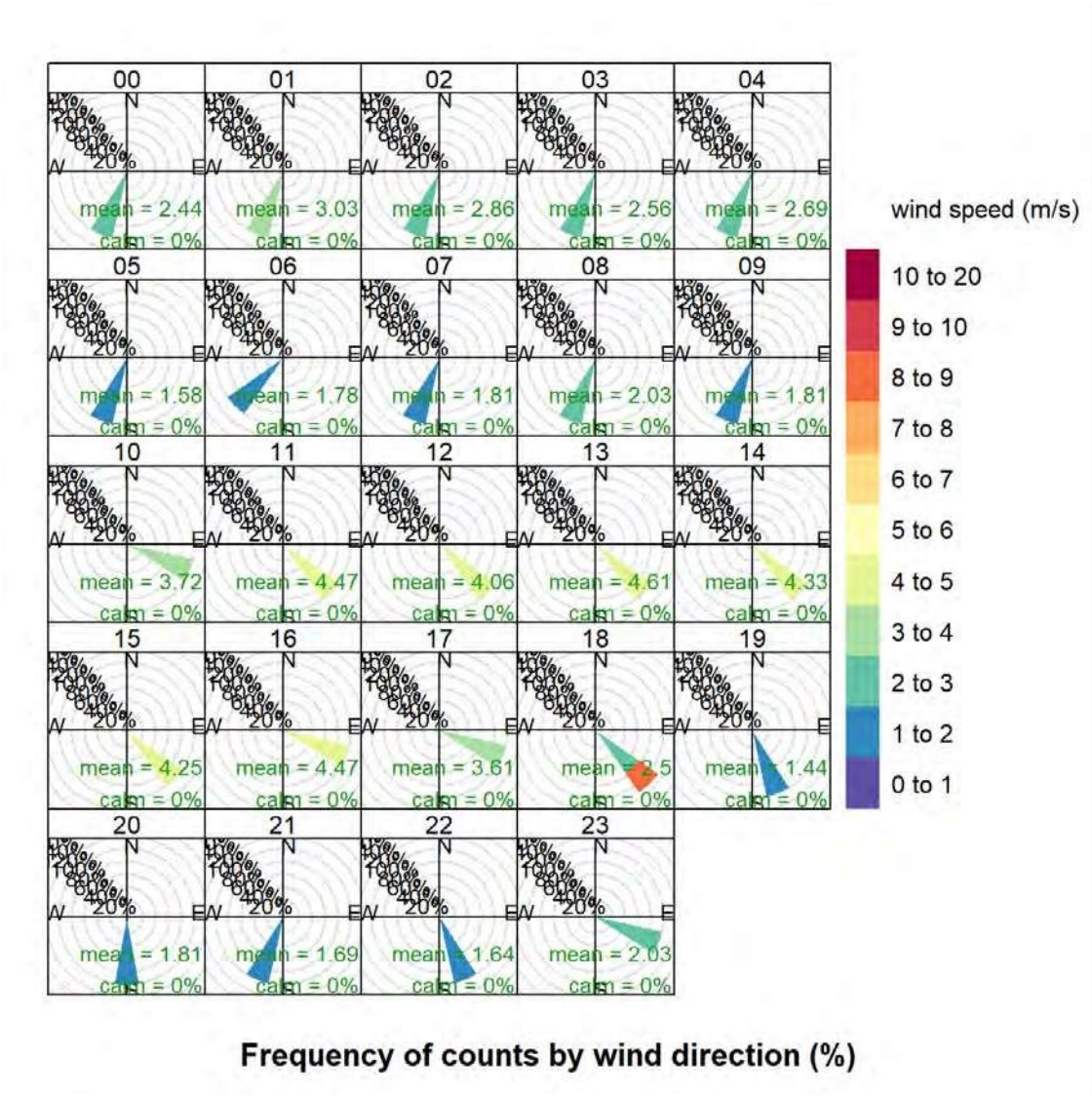


Figure G21: Hourly wind rose for 30 July 2022

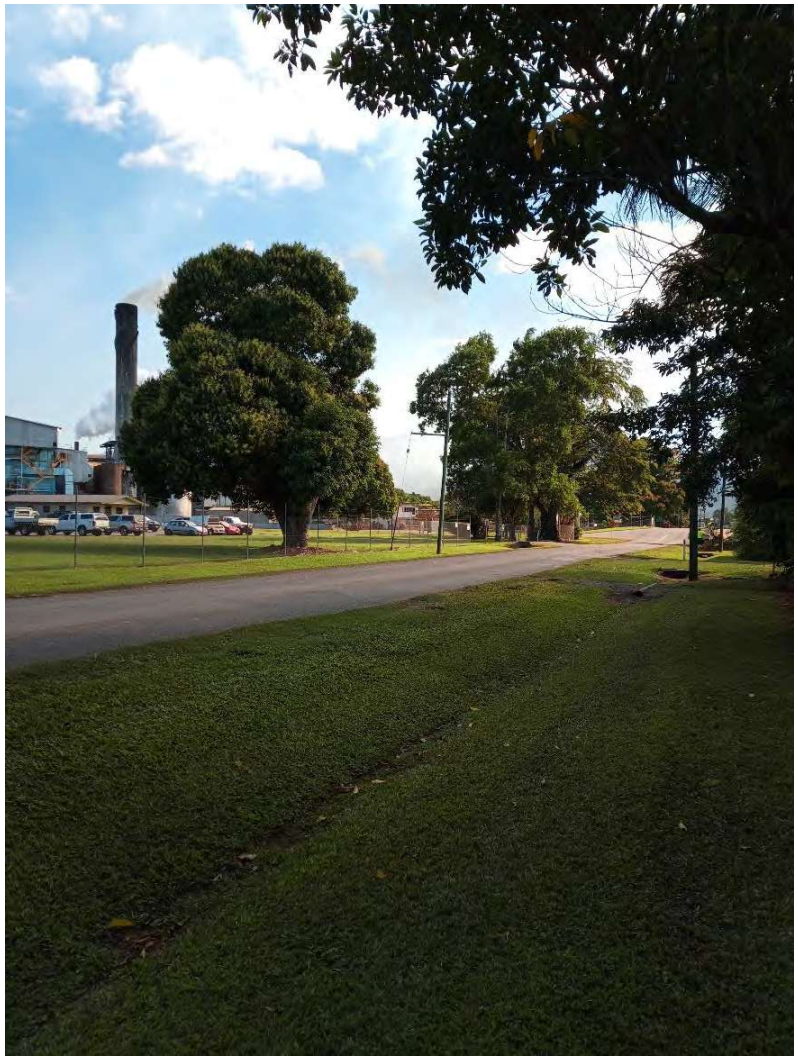
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Appendix H:

Potential PM Contributors Identified by MCM



Photograph H1: Harvester dust, northeast of MCM (recorded on 20/7/2022)



Photograph H2: Walshs Pyramid burn, south-south east of MCM (recorded on 27/7/2022)

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Photograph H3: Smoke from neighbouring property, north of MCM (recorded on 2/8/2022)

Appendix I:

OPC Results

CQG Consulting

Table I1: 24-hour averages[1] - Location 1

Date	OPC Ref	Dust concentration (ug/m^2)	
		PM10	PM2.5
26/05/2022	ER0321007	8.026238	4.120608
27/05/2022	ER0321007	5.744701	3.009254
28/05/2022	ER0321007	NA	NA
29/05/2022	ER0321007	NA	NA
30/05/2022	ER0321007	NA	NA
31/05/2022	ER0321007	NA	NA
1/06/2022	ER0321007	5.562654	2.828025
2/06/2022	ER0321007	6.255957	3.047994
3/06/2022	ER0321007	5.079599	2.220301
4/06/2022	ER0321007	5.305405	2.416756
5/06/2022	ER0321007	4.046457	1.918903
6/06/2022	ER0321007	NA	NA
7/06/2022	ER0321007	NA	NA
8/06/2022	ER0120007	NA	NA
9/06/2022	ER0120007	NA	NA
10/06/2022	ER0120007	NA	NA
11/06/2022	ER0120007	4.155108	1.728609
12/06/2022	ER0120007	3.525156	1.469689
13/06/2022	ER0120007	5.055295	2.561296
14/06/2022	ER0120007	4.403673	1.771065
15/06/2022	ER0120007	7.686420	3.596181
16/06/2022	ER0120007	5.281466	2.335802
17/06/2022	ER0120007	6.498927	2.597361
18/06/2022	ER0120007	8.594645	3.568819
19/06/2022	ER0120007	8.111319	3.477616
20/06/2022	ER0120007	9.707847	4.108889
21/06/2022	ER0120007	9.111979	3.758210
22/06/2022	ER0120007	8.168345	3.506427
23/06/2022	ER0120007	10.639653	4.613958
24/06/2022	ER0120007	10.396798	4.189923
25/06/2022	ER0120007	8.426975	3.448935
26/06/2022	ER0120007	8.631559	4.560390
27/06/2022	ER0120007	5.385824	2.385045
28/06/2022	ER0120007	NA	NA
29/06/2022	ER0120007	NA	NA
30/06/2022	ER0120007	0.031944	0.032014
1/07/2022	ER0120007	NA	NA
2/07/2022	ER0120007	NA	NA
3/07/2022	ER0120007	NA	NA
4/07/2022	ER0120007	NA	NA
5/07/2022	ER0120007	NA	NA
6/07/2022	ER0120007	NA	NA
7/07/2022	ER0120007	NA	NA
8/07/2022	ER0120007	NA	NA
9/07/2022	ER0120007	0.025525	0.024830
10/07/2022	ER0120007	0.007724	0.007847
11/07/2022	ER0120007	0.050855	0.050745
12/07/2022	ER0120007	0.070174	0.069236
13/07/2022	ER0120007	1.966738	0.798519
14/07/2022	ER0120007	1.575903	0.960833
15/07/2022	ER0120007	1.607569	1.195147
16/07/2022	ER0120007	0.259909	0.212542
17/07/2022	ER0120007	0.210849	0.144846
18/07/2022	ER0120007	0.254194	0.141634
19/07/2022	ER0120007	0.869653	0.447685
20/07/2022	ER0120007	0.405139	0.257083
21/07/2022	ER0120007	0.456914	0.323137
22/07/2022	ER0120007	0.416319	0.245417
23/07/2022	ER0120007	0.736961	0.494336
24/07/2022	ER0120007	0.579699	0.393264
25/07/2022	ER0120007	0.346443	0.206937
26/07/2022	ER0120007	0.395081	0.264315
27/07/2022	ER0120007	1.323974	0.834460
28/07/2022	ER0120007	0.652986	0.286389
29/07/2022	ER0120007	0.772145	0.434861
30/07/2022	ER0120007	0.509174	0.254572
31/07/2022	ER0120007	0.195804	0.129129
1/08/2022	ER0120007	0.105417	0.100486

Table I2: 24-hour averages[1] - Location 2

Date	OPC Ref	Dust concentration (ug/m^2)	
		PM10	PM2.5
26/05/2022	ER0120007	7.654473	2.756057
27/05/2022	ER0120007	5.938472	2.457639
28/05/2022	ER0120007	3.565687	1.482890
29/05/2022	ER0120007	5.172778	2.122153
30/05/2022	ER0120007	4.013349	1.652793
31/05/2022	ER0120007	NA	NA
1/06/2022	ER0120007	NA	NA
2/06/2022	ER0120007	NA	NA
3/06/2022	ER0120007	NA	NA
4/06/2022	ER0120007	NA	NA
5/06/2022	ER0120007	NA	NA
6/06/2022	ER0120007	NA	NA
7/06/2022	ER0120007	NA	NA
8/06/2022	ER0321007	NA	NA
9/06/2022	ER0321007	NA	NA
10/06/2022	ER0321007	NA	NA
11/06/2022	ER0321007	2.054127	1.367083
12/06/2022	ER0321007	1.803154	1.282517
13/06/2022	ER0321007	5.085610	3.379670
14/06/2022	ER0321007	30.875282	21.566053
15/06/2022	ER0321007	5.785424	3.813002
16/06/2022	ER0321007	4.251660	2.527585
17/06/2022	ER0321007	4.654753	2.494730
18/06/2022	ER0321007	6.076998	3.087750
19/06/2022	ER0321007	7.332148	4.327045
20/06/2022	ER0321007	7.294946	3.620285
21/06/2022	ER0321007	7.585187	3.623125
22/06/2022	ER0321007	5.515733	2.776111
23/06/2022	ER0321007	7.012099	3.211026
24/06/2022	ER0321007	7.439020	3.402384
25/06/2022	ER0321007	7.508735	4.056173
26/06/2022	ER0321007	6.162798	3.245853
27/06/2022	ER0321007	NA	NA
28/06/2022	ER0321007	7.979190	3.784945
29/06/2022	ER0321007	NA	NA
30/06/2022	ER0321007	0.658977	0.466323
1/07/2022	ER0321007	NA	NA
2/07/2022	ER0321007	NA	NA
3/07/2022	ER0321007	NA	NA
4/07/2022	ER0321007	NA	NA
5/07/2022	ER0321007	NA	NA
6/07/2022	ER0321007	NA	NA
7/07/2022	ER0321007	NA	NA
8/07/2022	ER0321007	NA	NA
9/07/2022	ER0321007	63.719645	41.760910
10/07/2022	ER0321007	3.221586	1.706248
11/07/2022	ER0321007	4.545980	2.352172
12/07/2022	ER0321007	7.147631	3.547188
13/07/2022	ER0321007	19.687045	6.669560
14/07/2022	ER0321007	5.680648	3.021929
15/07/2022	ER0321007	8.497515	4.400802
16/07/2022	ER0321007	9.192765	4.158095
17/07/2022	ER0321007	5.806713	2.792870
18/07/2022	ER0321007	6.572778	2.941107
19/07/2022	ER0321007	8.271682	4.191682
20/07/2022	ER0321007	9.397693	4.065023
21/07/2022	ER0321007	8.480054	3.983657
22/07/2022	ER0321007	6.242832	3.100054
23/07/2022	ER0321007	5.666490	3.448737
24/07/2022	ER0321007	6.269352	3.510849
25/07/2022	ER0321007	8.818102	4.063349
26/07/2022	ER0321007	5.517267	2.902930
27/07/2022	ER0321007	6.215247	3.014784
28/07/2022	ER0321007	9.544174	4.039352
29/07/2022	ER0321007	10.206358	4.169012
30/07/2022	ER0321007	9.966720	4.436120
31/07/2022	ER0321007	9.622882	4.174367
1/08/2022	ER0321007	6.959992	3.280548

Table I1: 24-hour averages[1] - Location 1

Date	OPC Ref	Dust concentration (ug/m^2)	
		PM10	PM2.5
2/08/2022	ER0120007	0.181721	0.106404
3/08/2022	ER0120007	0.389769	0.175671
4/08/2022	ER0120007	0.223788	0.096479
5/08/2022	ER0120007	0.228511	0.083601
6/08/2022	ER0120007	0.299715	0.109174
7/08/2022	ER0120007	0.203472	0.113457
8/08/2022	ER0120007	0.163387	0.068642
9/08/2022	ER0120007	0.355787	0.122616
10/08/2022	ER0120007	0.548981	0.236636
11/08/2022	ER0120007	0.333819	0.216528
12/08/2022	ER0120007	0.344961	0.147014
13/08/2022	ER0120007	0.393021	0.237218
14/08/2022	ER0120007	0.431265	0.234307
15/08/2022	ER0120007	0.549989	0.334579
16/08/2022	ER0120007	0.932662	0.624853
17/08/2022	ER0120007	1.614306	1.185239
18/08/2022	ER0120007	1.064611	0.635712
19/08/2022	ER0120007	0.529942	0.332124
20/08/2022	ER0120007	0.607541	0.336263
21/08/2022	ER0120007	1.133154	0.762844
22/08/2022	ER0120007	0.697932	0.483974
23/08/2022	ER0120007	0.590347	0.386389
24/08/2022	ER0120007	1.385000	0.751991
25/08/2022	ER0120007	0.887778	0.443889
26/08/2022	ER0120007	0.434823	0.330123
27/08/2022	ER0120007	0.186488	0.130077
28/08/2022	ER0120007	0.057616	0.055903
29/08/2022	ER0120007	0.043758	0.027639
30/08/2022	ER0120007	0.016617	0.003156
31/08/2022	ER0120007	0.162014	0.103202
1/09/2022	ER0120007	0.156860	0.118897
2/09/2022	ER0120007	0.019722	0.008958
3/09/2022	ER0120007	NA	NA
4/09/2022	ER0120007	NA	NA
5/09/2022	ER0120007	NA	NA
6/09/2022	ER0120007	NA	NA
7/09/2022	ER0120007	0.139617	0.076110
8/09/2022	ER0120007	0.080502	0.078333
9/09/2022	ER0120007	0.083110	0.081721
10/09/2022	ER0120007	0.094321	0.093140
11/09/2022	ER0120007	0.085918	0.085224
12/09/2022	ER0120007	0.103294	0.102978
13/09/2022	ER0120007	0.125081	0.117285
14/09/2022	ER0120007	0.124738	0.122391
15/09/2022	ER0120007	0.113256	0.113395
16/09/2022	ER0120007	0.098623	0.098750
17/09/2022	ER0120007	0.084190	0.084336
18/09/2022	ER0120007	0.094028	0.093542
19/09/2022	ER0120007	0.083264	0.083117
20/09/2022	ER0120007	0.104375	0.099931
21/09/2022	ER0120007	0.242991	0.142289
22/09/2022	ER0120007	0.177222	0.156251
23/09/2022	ER0120007	0.269094	0.217809
24/09/2022	ER0120007	0.198164	0.159256
25/09/2022	ER0120007	0.233881	0.170770
26/09/2022	ER0120007	0.189653	0.167431
27/09/2022	ER0120007	0.190687	0.163812
28/09/2022	1519SDS-018-DX	6.922088	4.532057
29/09/2022	1519SDS-018-DX	5.446848	2.839253
30/09/2022	1519SDS-018-DX	4.252994	2.350011
1/10/2022	1519SDS-018-DX	NA	NA
2/10/2022	1519SDS-018-DX	NA	NA
3/10/2022	1519SDS-018-DX	NA	NA
4/10/2022	1519SDS-018-DX	NA	NA
5/10/2022	1519SDS-018-DX	5.940930	2.715735
6/10/2022	1519SDS-018-DX	NA	NA
7/10/2022	1519SDS-018-DX	7.874429	3.717623
8/10/2022	1519SDS-018-DX	7.492205	3.478326

Table I2: 24-hour averages[1] - Location 2

Date	OPC Ref	Dust concentration (ug/m^2)	
		PM10	PM2.5
2/08/2022	ER0321007	12.648681	5.949028
3/08/2022	ER0321007	8.196846	3.667014
4/08/2022	ER0321007	6.217146	2.784809
5/08/2022	ER0321007	4.528872	2.274236
6/08/2022	ER0321007	3.606798	1.927454
7/08/2022	ER0321007	4.070446	2.057650
8/08/2022	ER0321007	7.870258	4.068441
9/08/2022	ER0321007	8.156991	3.274761
10/08/2022	ER0321007	7.569996	3.250934
11/08/2022	ER0321007	8.503279	3.609985
12/08/2022	ER0321007	6.494279	2.897760
13/08/2022	ER0321007	NA	NA
14/08/2022	ER0321007	NA	NA
15/08/2022	ER0321007	NA	NA
16/08/2022	ER0321007	NA	NA
17/08/2022	ER0321007	NA	NA
18/08/2022	ER0321007	NA	NA
19/08/2022	ER0321007	NA	NA
20/08/2022	ER0321007	NA	NA
21/08/2022	ER0321007	NA	NA
22/08/2022	ER0321007	NA	NA
23/08/2022	ER0321007	NA	NA
24/08/2022	ER0321007	NA	NA
25/08/2022	ER0321007	11.280108	4.346476
26/08/2022	ER0321007	9.110154	3.989861
27/08/2022	ER0321007	5.235139	2.466150
28/08/2022	ER0321007	9.285795	4.321103
29/08/2022	ER0321007	8.002770	3.760355
30/08/2022	ER0321007	7.166848	3.300247
31/08/2022	ER0321007	7.685710	3.525285
1/09/2022	ER0321007	12.057012	7.521806
2/09/2022	ER0321007	1.322160	0.853549
3/09/2022	ER0321007	2.528998	1.438106
4/09/2022	ER0321007	NA	NA
5/09/2022	ER0321007	9.253843	5.929067
6/09/2022	ER0321007	7.548681	3.553505
7/09/2022	ER0321007	8.015840	3.499889
8/09/2022	ER0321007	9.055546	3.538291
9/09/2022	ER0321007	12.131451	4.066026
10/09/2022	ER0321007	8.074568	3.555340
11/09/2022	ER0321007	7.157955	3.809863
12/09/2022	ER0321007	9.966119	3.733931
13/09/2022	ER0321007	9.497832	3.875806
14/09/2022	ER0321007	10.261112	4.651481
15/09/2022	ER0321007	8.221929	3.957461
16/09/2022	ER0321007	6.234807	3.259472
17/09/2022	ER0321007	7.389522	4.166065
18/09/2022	ER0321007	7.078258	3.725201
19/09/2022	ER0321007	9.441806	4.309007
20/09/2022	ER0321007	NA	NA
21/09/2022	ER0321007	12.947392	7.505311
22/09/2022	ER0321007	12.876619	8.110959
23/09/2022	ER0321007	NA	NA
24/09/2022	ER0321007	8.984684	5.661847
25/09/2022	ER0321007	7.625340	4.762879
26/09/2022	ER0321007	8.843796	5.125293
27/09/2022	ER0321007	11.321834	5.323588
28/09/2022	ER0321007	8.456250	4.977307
29/09/2022	ER0321007	5.217714	2.950371
30/09/2022	ER0321007	4.700388	2.681240
1/10/2022	ER0321007	5.874259	3.027346
2/10/2022	ER0321007	5.415401	2.774514
3/10/2022	ER0321007	4.246264	2.082778
4/10/2022	ER0321007	13.505363	7.813206
5/10/2022	ER0321007	6.843256	3.235355
6/10/2022	ER0321007	6.171073	2.799221
7/10/2022	ER0321007	8.334606	3.607608
8/10/2022	ER0321007	9.366026	3.880486

Table I1: 24-hour averages[1] - Location 1

Date	OPC Ref	Dust concentration (ug/m^2)	
		PM10	PM2.5
9/10/2022	1519SDS-018-DX	7.411085	3.259018
10/10/2022	1519SDS-018-DX	7.256373	3.587971
11/10/2022	1519SDS-018-DX	7.808843	3.817685
12/10/2022	1519SDS-018-DX	7.777162	3.928904
13/10/2022	1519SDS-018-DX	8.769645	4.371752
14/10/2022	1519SDS-018-DX	7.418420	3.638704
15/10/2022	1519SDS-018-DX	6.113495	3.338819
16/10/2022	1519SDS-018-DX	5.892712	3.208356
17/10/2022	1519SDS-018-DX	5.965000	3.207816
18/10/2022	1519SDS-018-DX	6.980077	3.890475
19/10/2022	1519SDS-018-DX	6.809044	3.812797
20/10/2022	1519SDS-018-DX	7.431196	5.358387
21/10/2022	1519SDS-018-DX	3.658094	2.232677
22/10/2022	1519SDS-018-DX	4.503933	2.760226
23/10/2022	1519SDS-018-DX	5.777868	3.426219
24/10/2022	1519SDS-018-DX	5.552554	3.552292
25/10/2022	1519SDS-018-DX	5.982674	4.187500
26/10/2022	1519SDS-018-DX	8.510741	5.626219
27/10/2022	1519SDS-018-DX	8.590656	5.917716
28/10/2022	1519SDS-018-DX	10.615417	7.646690
29/10/2022	1519SDS-018-DX	8.879686	6.385201
30/10/2022	1519SDS-018-DX	7.702886	5.302762
31/10/2022	1519SDS-018-DX	4.752708	2.966898
1/11/2022	1519SDS-018-DX	5.344938	3.723995
2/11/2022	1519SDS-018-DX	9.345849	5.201119
3/11/2022	1519SDS-018-DX	7.684217	3.066756
4/11/2022	1519SDS-018-DX	8.799879	3.907182
5/11/2022	1519SDS-018-DX	7.342465	3.602035
6/11/2022	1519SDS-018-DX	9.137384	4.281242
7/11/2022	1519SDS-018-DX	11.480293	5.734460
8/11/2022	1519SDS-018-DX	10.960988	5.478650
9/11/2022	1519SDS-018-DX	8.619828	4.580577
10/11/2022	1519SDS-018-DX	7.285386	3.735100
11/11/2022	1519SDS-018-DX	8.873650	4.652385
12/11/2022	1519SDS-018-DX	5.971130	3.107190
13/11/2022	1519SDS-018-DX	5.072006	2.660386
14/11/2022	1519SDS-018-DX	4.894179	2.634753
15/11/2022	1519SDS-018-DX	5.553748	2.978110
16/11/2022	1519SDS-018-DX	5.556890	2.969491
17/11/2022	1519SDS-018-DX	6.114637	3.716960
18/11/2022	1519SDS-018-DX	5.427739	3.421005
19/11/2022	1519SDS-018-DX	6.139298	4.119028
20/11/2022	1519SDS-018-DX	-276.508843	291.225532
21/11/2022	1519SDS-018-DX	25.583819	485.821165
22/11/2022	1519SDS-018-DX	NA	NA
23/11/2022	1519SDS-018-DX	-2945.900000	505.723972
24/11/2022	1519SDS-018-DX	-2945.900000	502.596049
25/11/2022	1519SDS-018-DX	-2593.448696	442.562870
26/11/2022	1519SDS-018-DX	4.526443	2.494375
27/11/2022	1519SDS-018-DX	5.031937	2.488567
28/11/2022	1519SDS-018-DX	4.497859	2.110983

Table I2: 24-hour averages[1] - Location 2

Date	OPC Ref	Dust concentration (ug/m^2)	
		PM10	PM2.5
9/10/2022	ER0321007	8.231488	3.360216
10/10/2022	ER0321007	8.917276	3.739082
11/10/2022	ER0321007	8.784745	3.741335
12/10/2022	ER0321007	9.002963	3.917458
13/10/2022	ER0321007	10.705810	5.026559
14/10/2022	ER0321007	8.307299	3.462490
15/10/2022	ER0321007	7.337878	3.314969
16/10/2022	ER0321007	6.823302	3.099560
17/10/2022	ER0321007	7.203337	3.311847
18/10/2022	ER0321007	6.100000	3.900000
19/10/2022	ER0321007	7.208526	3.735332
20/10/2022	ER0321007	9.122888	5.592631
21/10/2022	ER0321007	4.437361	2.503287
22/10/2022	ER0321007	5.246574	2.850116
23/10/2022	ER0321007	6.873179	3.400093
24/10/2022	ER0321007	6.158935	3.455104
25/10/2022	ER0321007	6.485995	4.023557
26/10/2022	ER0321007	5.937051	4.034221
27/10/2022	ER0321007	4.791798	4.031921
28/10/2022	ER0321007	6.938233	5.610571
29/10/2022	ER0321007	5.349907	4.544259
30/10/2022	ER0321007	4.518310	3.726281
31/10/2022	ER0321007	2.571366	2.129097
1/11/2022	ER0321007	2.883227	2.497498
2/11/2022	ER0321007	4.570694	3.445741
3/11/2022	ER0321007	4.390625	2.566250
4/11/2022	ER0321007	4.312245	2.511167
5/11/2022	ER0321007	4.362436	2.806823
6/11/2022	ER0321007	NA	NA
7/11/2022	ER0321007	6.573241	3.772006
8/11/2022	ER0321007	4.840506	2.900194
9/11/2022	ER0321007	3.967485	2.440301
10/11/2022	ER0321007	3.786667	2.312701
11/11/2022	ER0321007	6.379282	4.398094
12/11/2022	ER0321007	4.619190	3.041777
13/11/2022	ER0321007	3.017997	2.079805
14/11/2022	ER0321007	3.090802	2.066713
15/11/2022	ER0321007	3.327948	2.209043
16/11/2022	ER0321007	4.671003	3.054535
17/11/2022	ER0321007	4.769414	3.267670
18/11/2022	ER0321007	4.214938	3.008935
19/11/2022	ER0321007	4.793441	3.563147
20/11/2022	ER0321007	3.020185	2.177010
21/11/2022	ER0321007	4.064830	2.743356
22/11/2022	ER0321007	3.589560	2.550386
23/11/2022	ER0321007	3.489039	2.246142
24/11/2022	ER0321007	2.628704	1.741667
25/11/2022	ER0321007	2.804416	1.805938
26/11/2022	ER0321007	3.296867	2.011829
27/11/2022	ER0321007	3.979599	2.156690
28/11/2022	ER0321007	3.158193	1.806929

KEY

NA	Less than 75% of data available for the day
	Equipment malfunction - recorded data disregarded
	AQO[2] exceedance

NOTES:

[1] 24 hour averages calculated as a calendar day average

[2] Air Quality Objectives *as per Environmental Protection (Air) Policy 2019 (Qld);* 25 µg/m³day for $PM_{2.5}$ and 50 µg/m³day for PM10

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