Respirable Crystalline Silica Study

Templeton 2025-2026

July 2026

PORTHILL

Submitted to:

Fulton Hogan

Submitted by:

Port Hill Limited

Document No: 2024-011-R-009-Jul26

Table of Contents

Appendices

Figures

Tables

1 Introduction

1.1 Background

Roydon Quarry is operated by Fulton Hogan, and quarrying activities include site preparation, overburden removal, aggregate extraction, crushing and screening, stockpiling and associated vehicle movements. These activities have the potential to discharge ambient particulate matter into the air, a sub-fraction of which can include respirable crystalline silica (RCS).

Air discharges from Roydon Quarry are authorised under Air Discharge Consent CRC224104 (the consent). The consent requires the design and implementation of an ambient respirable crystalline silica (RCS) monitoring programme following commencement of quarrying operations. It also requires that this monitoring programme is undertaken at a location between the quarry and Templeton for two 6-month periods over consecutive years. This report provides the results and analysis resulting from the first six-month campaign.

1.2 Consent requirements

Air Discharge Consent CRC224104 (Condition 20) requires the consent holder to design and implement a monitoring programme to assess ambient concentrations of RCS and $PM_{2.5}$ in consultation with the CRC Manager and to evaluate these against specified criteria.

Condition 20 specifies that the monitoring site is to be located at the western edge of the Templeton urban area. The ambient sampling for particulate and RCS is to be undertaken over two six-month periods between 1 October and 31 May (inclusive) within consecutive years. The reporting of methodology, results and analysis from each monitoring campaign is required within two months of completing each monitoring programme.

The consent also requires that the monitoring programme is provided to the Canterbury Regional Council (CRC) Manager for certification prior to commencement.

The ambient concentration criteria specified in the consent are:

- 1-hour average RCS concentration of 47 $\mu g/m^3$
- Annual average RCS concentration of 3 $\mu g/m^3$
- 24-hour average $PM_{2.5}$ concentration of 25 $\mu g/m^3$

1.3 Report scope

This report presents the monitoring and subsequent analysis of ambient data collected during the first RCS monitoring campaign which was conducted during the summer to autumn period of 2025 to 2026. The monitoring data collected and analysed included:

- gravimetrically sampled respirable dust and RCS concentrations
- continuous instrumental monitoring of particulate, including $PM_{2.5}$ and PM_4
- meteorological monitoring of wind speed, direction, temperature and humidity

- quarry operational information

The results and analysis provided in this report pertain to the specified monitoring site and period of sampling for the above listed parameters.

2 Monitoring Programme Design

2.1 Overview

The consent requires assessment against both short-term and long-term ambient RCS concentration criteria as listed in Section 1.2. The monitoring programme therefore combines filter-based respirable dust sampling for RCS analysis with concurrent continuous ambient particulate and meteorological data monitoring.

Gravimetric respirable dust sampling and subsequent laboratory analysis of filters provides measurement of RCS concentrations averaged over defined sampling periods. Continuous particulate monitoring provides higher resolution PM concentrations for shorter timeframes, including $PM_{2.5}$ and PM_4. These data allow for an assessment of 1-hour average RCS concentrations.

The monitoring programme design was reviewed and certified by Canterbury Regional Council prior to commencement.

Further aspects of the monitoring programme design are summarised in the following sections with full design details provided in Appendix A.

2.2 Location

Monitoring was undertaken at the western edge of the Templeton urban area as per the requirements of the air discharge consent.

The location provides a monitoring position between the quarry and the Templeton urban area for measurement of ambient particulate concentrations in the receiving environment.

2.3 Sampling and analysis methods

2.3.1 Respirable dust and RCS sampling

Respirable ambient particulate (or respirable dust) was sampled using a filter-based gravimetric method for collection of the respirable fraction with a 50% cut-point (D_{50})[1] of 4 μm aerodynamic diameter.

Air sampling was undertaken using cyclone sampling heads with a pump operated at a controlled flow rate to achieve the defined respirable fraction in accordance with ISO 7708.

The gravimetric sampling of respirable particulate method was undertaken in accordance with AS 2985:2009, which is a standard method for respirable dust sampling typically applied in workplace exposure monitoring. The method was applied to a fixed ambient monitoring location for air sampling durations of 24 hours and longer, rather than 8-hour durations which are typically used for personal exposure monitoring. Filters were weighed before and after sampling to determine the mass of collected particulate for a known volume of sampled air.

[1] The D_{50} is the aerodynamic particle diameter at which the cyclone has a 50% probability of collecting a particle and a 50% probability of allowing it to pass through to the downstream filter.

The frequency of 24-hour gravimetric sample collections was at least five times per month, which provided the target dataset of at least thirty samples over the 6-month monitoring period. Sampling for 24–hours targeted during weekdays when the quarry operations were most active. The collection of over thirty 24-hour samples covered a wide range of meteorological conditions.

Once collected, the filters for each sample were reweighed to determine respirable particulate mass and filters were subsequently analysed for RCS using X-ray diffraction (XRD) to determine respirable alpha-quartz mass[2]. Based on the local geology (Ministry for Culture and Heritage, 2006) this was expected to be the primary form of crystalline silica for aggregate within the quarry. This was confirmed via sampling and analysis of pit-run aggregate (from the extraction area) and crusher dust (from the processing plant) which identified alpha-quartz as the only crystalline form of silica (Appendix H).

The minimum sampling duration was determined during programme design to achieve an ambient RCS detection limit below 50% of the annual RCS criterion (3 $\mu g/m^3$). Based on the laboratory analytical detection limits and the sampling flow rate, a minimum duration of 20 hours was required. A nominal 24-hour sampling duration was therefore adopted for routine monitoring. The achievable detection limit for each sample is a function of the sampled air volume and the laboratory analytical detection limit, with longer sampling durations providing lower detectable ambient concentrations.

The dataset of over thirty 24-hour average RCS concentrations resulting from the monitoring programme, is expected to provide a reliable estimate of the annual average RCS concentration.

2.3.2 Continuous particulate monitoring

Continuous particulate monitoring was undertaken using a DMP 7000, an optical particle counter (OPC) type instrument measuring $PM_{2.5}$, PM_4 and PM_{10} concentrations, with particulate data recorded at 1-minute intervals.

$PM_{2.5}$ concentrations are measured to enable assessment against the 24-hour $PM_{2.5}$ criterion specified in the consent.

PM_4 concentrations from the DMP 7000 are expected to be closely related to respirable particulate concentrations because both measurements are influenced primarily by particles within a similar aerodynamic size range, although they are based on different measurement principles. The DMP 7000 estimates particle mass from light-scattering measurements, whereas respirable particulate concentrations are determined from gravimetric sampling using a respirable size-selective inlet with a nominal D50 of 4 µm.

Using the DMP 7000 PM_4 data in combination with the XRD based RCS measurements allowed for the estimation of 1-hour average RCS concentrations.

2.3.3 Meteorological data collection

Meteorological data were collected using the existing Roydon Quarry meteorological station, operated in accordance with the consent requirements.

[2] Note the respirable dust mass and RCS mass analysis methods are completely independent. Respirable dust is determined via pre and post filter deployment weighing, and RCS mass is determined at a separate laboratory via a separate x-ray diffraction analysis of the filters.

Meteorological parameters including wind speed, temperature and relative humidity were recorded as 15-minute scalar averages. Wind direction was recorded as a 15-minute vector average.

A Lufft weather station was installed with the DMP 7000 at the monitoring location as a backup data source.

3 Monitoring Programme Implementation

3.1 Monitoring period and data coverage

The monitoring programme was undertaken from 30 November 2025 to 31 May 2026.

Continuous particulate monitoring commenced on 26 November 2025 and continued throughout the study period. The DMP 7000 monitor was removed from the monitoring location in early June 2026. Data capture over the monitoring period was effectively continuous, with only two isolated periods of missing data of approximately 10 minutes each.

Meteorological monitoring was operational for the duration of the study period, with no identified periods of missing data within the primary dataset.

Respirable dust sampling for RCS analysis was undertaken between 5 January 2026 and 29 May 2026.[3]

The quarry's operational records were provided by Fulton Hogan for the period 30 November 2025 to 31 May 2026. Photographs from the ambient monitoring site and looking west towards the quarry were taken at the time of each respirable dust sampling deployment.

3.2 Monitoring site location

The monitoring equipment was installed at a location between Roydon Quarry and the Templeton urban area, consistent with consent requirements for monitoring west of Templeton. The location of the monitor is shown in Figure 3.1. A photograph of the monitoring installation is provided in Figure 3.2.

Key site selection criteria included:

- location between the quarry and the Templeton urban area
- suitability for installation and operation of a stationary monitoring station

Additional site selection detail is provided in Appendix B.

The monitoring site is located on land owned by Christchurch City Council and subject to an agricultural lease. The site is actively farmed.

Establishment of the monitoring location by Fulton Hogan required agreement with both the landowner and the leaseholder to enable access, installation, and operation of the monitoring equipment. Site establishment included installation of a fenced enclosure, camera security system, and solar/battery power supply.

[3] Following establishment of the monitoring site, Port Hill understands that Fulton Hogan Canterbury Laboratory undertook practical setup activities associated with operation of the respirable dust sampler, including establishment of a suitable power supply for the sampling pump. This was followed by the Christmas/New Year quarry shutdown, with respirable dust sampling commencing on 5 January 2026 immediately thereafter. Subsequent assessment indicated that the RCS sampling periods were representative of particulate conditions observed during the broader monitoring period. Further discussion is provided in Section 5.4.

LEGEND

Monitoring location | Hedge | Site Boundary | Central Processing and Stockpile Area

CLIENT AND PROJECT

Fulton Hogan Limited
RCS Study

CONSULTANT

PORTHILL

TITLE

Monitor Location

NOTES

1. Aerial: LINZ Data Service.
2. Schematic only, not to be interpreted as an engineering desgin or construction drawing.
3. Reference Scale: 1:15,000

DOCUMENT NUMBER	FIGURE	DRAWN	APPROVED	DATE
2024-011-009	**3.1**	IX	CN	24/07/2026

0 200 400 m

File Ref: C:\Users\iris8\Port Hill Limited\2024-011 Fulton Hogan Limited Dawsons Road - Project Files\5. Technical Work\Port Hill Data\RCS study\Wind Analysis for siting\GIS\RCS.qgz

(a) (b)

Figure 3.2: Monitoring installation at the Templeton monitoring location: (a) monitoring setup in November 2025, photographed by PortHill; and (b) same monitor on 13 February 2026, showing the respirable sampling cyclone attached to the support arm, photographed by Fulton Hogan.

3.3 Continuous particulate monitoring ($PM_{2.5}$ and PM_4)

Continuous particulate monitoring (PM) was undertaken using a DMP 7000 instrument which recorded various parameters as 1-minute averages. Data capture was effectively continuous across the monitoring period.

The DMP 7000 monitoring was co-located with the respirable dust sampler monitor.

Data were transmitted and stored within the Fulton Hogan data management system. Raw continuous PM data were processed into corrected concentration values using relationships developed through co-location with US EPA-certified ambient PM_{10} monitor (T640x). These relationships were derived using orthogonal regression analysis and were applied to adjust the raw DMP 7000 data to achieve equivalence with reference measurements. Regression relationships generally exhibited slope values close to unity, indicating a strong linear relationship between the DMP 7000 and reference T640x monitor data and supporting the application of these adjustments. This adjusted dataset has been used throughout this assessment.

The equivalency assessment indicated that adjusted DMP measurements achieved equivalence with the reference monitor for the assessed averaging periods and parameters. It is noted that 1-hour $PM_{2.5}$

did not meet equivalency criteria, however this contaminant and averaging period is not used in this assessment. Further details on the equivalency assessment and regression relationships are provided in Appendix C.

3.4 Respirable dust sampling

Respirable dust sampling was undertaken by Fulton Hogan Canterbury Laboratory. This included operation of the pump and cyclone sampling equipment, pre- and post-sampling flow calibration, filter handling, and gravimetric determination of particulate mass from weighing of filters pre- and post-sampling. The same filters were subsequently sent to a laboratory in Australia for X-ray diffraction (XRD)-based measurement of respirable crystalline silica (RCS) mass.

Fulton Hogan Canterbury Laboratory has recently undergone an IANZ audit for the addition of AS 2985:2009 to their scope of accreditation (July 2026). This method includes all aspects of the respirable dust sampling undertaken for this study. PortHill understands that no matters were identified that would impact the reliability of the sampling undertaken by Fulton Hogan Canterbury Laboratory. The updated certificate of accreditation is expected to be issued within the next 3 months.

Fulton Hogan advised that gravimetric filter mass was determined using calibrated laboratory balances with a precision of five decimal places, and that the measurement uncertainty of this balance is 0.1 mg. The operation and calibration records of the balance were included in the IANZ audit.

RCS mass measurement on each filter was undertaken by Agon Environmental (based in Adelaide, Australia) using XRD[4], with analysis limited to alpha-quartz. The analytical detection limit (lower limit of quantification) for RCS is reported by Agon Environmental as being 4 µg of alpha-quartz per filter with an uncertainty of ± 1.5 µg.

PortHill has not independently audited or verified the sampling and analytical procedures undertaken by Fulton Hogan Canterbury Laboratory or Agon Environmental. Reliance has therefore been placed on the laboratories' documented quality systems, calibration procedures, and relevant accreditation or certification processes when considering the suitability of the data for the purposes of this assessment.

A total of 64 respirable dust samples were collected for RCS analysis, of which 57 were classified as valid and 7 were classified as invalid. Sample validity was determined by Fulton Hogan Laboratory, who reported that this determination was made in accordance with the sampling method requirements, which classified samples as invalid where post-sampling air flow rates fell outside the specified ±5% tolerance.

One gravimetric filter-based sampler was collected at a time. Sampling durations were approximately 24 hours on most occasions, with a smaller number of multi-day samples collected during May 2026.

The summary of gravimetric filter-based sampling for each month follows:

- January 2026: 5 samples (2 invalid)
- February 2026: 11 samples (2 invalid)

[4] Agon Environmental are NATA accredited for their in house method LP-006-SOP of XRD Measurement of Crystalline Silica on filters, which is based on ISO 16258-1:2015 Workplace air – Analysis of respirable silica by X-ray diffraction – Part 1: Direct-on-filter method.

- March 2026: 18 samples (2 invalid)
- April 2026: 18 samples (0 invalid)
- May 2026: 12 samples (1 invalid)

Respirable dust concentrations were calculated from the difference between pre- and post-sampling filter mass measurements. At the low particulate concentrations observed during the monitoring programme small differences between these measurements, relative to the precision of the method, occasionally resulted in calculated respirable dust concentrations below zero. These values are invalid and reflect uncertainty inherent in the methodology and measurement accuracy.

The accurate measurement of respirable dust mass was not relied upon for the RCS monitoring method, as the RCS mass on each filter was (as noted above) determined independently of respirable particulate mass. The respirable dust mass and total sampled air volume was used to calculate respirable dust concentration which was compared to the PM_4 measured via the DMP continuous PM monitor. As discussed in Section 2.3.2, these alternative measurements are expected to yield similar concentration values in absolute terms and to be strongly correlated.

According to Agon Environmental, the RCS masses on all filter samples were below laboratory analytical detection limits. As discussed in Section 2.3.1 the minimum sample durations (and associated minimum total sample air volumes) were established by PortHill to ensure that the non-detection concentration for RCS would be well below the annual ambient criteria for RCS.

3.5 Meteorological monitoring

Meteorological data were obtained from the Scottech meteorological station located within the quarry and installed as part of the quarry's consented monitoring infrastructure. This dataset provides the primary source of meteorological records for the monitoring programme.

The station comprises a multi-parameter system recording wind speed and direction, temperature, relative humidity, rainfall, and solar radiation. The anemometer is mounted on a 6 m mast.

A Lufft meteorological station was also installed at the ambient monitoring site as a supplementary source of meteorological data. An appropriate correction factor was applied to raw data received by PortHill to produce directions with respect to true north.

The Scottech station records 1-minute average data as required by the consent and these data were used to produce 15-minute average meteorological data for the full monitoring period.

3.6 Quarry operational data

The quarry operational dataset comprises records indicating operational status of extraction and processing plant activities throughout the monitoring programme. Operational status was defined based on conveyor activity associated with these components of the plant.

The dataset spans the study period.

4 Monitoring Results

4.1 Data handling and alignment

All datasets used in this assessment were recorded and processed using New Zealand local time. Continuous particulate monitoring data, respirable dust sampling records and meteorological datasets were aligned to ensure consistency between monitoring periods and subsequent analyses.

Continuous PM datasets were screened prior to averaging and analysis. One-hour and 24- hour average concentration values were calculated only where at least 75% valid data capture was achieved within the relevant averaging period. This approach is recognised air quality data management practice (Ministry for the Environment, 2009). Minor interruptions in the continuous monitoring datasets were less than 10 minutes; however, all reported averaging periods met the minimum data capture criterion.

Daily $PM_{2.5}$ concentrations were calculated using midnight-to-midnight averaging periods. Hourly average concentrations were calculated on the hour for the previous 60 minutes. PM_4 concentrations used in comparisons with respirable dust and RCS results were calculated as averages for the concurrent RCS sampling period. This enabled direct comparison between filter-based sampling results of respirable particulate with continuous instrumental measurement of corresponding PM_4 concentrations.

Respirable dust filter samples collected for subsequent RCS analysis were assessed by Fulton Hogan Laboratories against the applicable method flow validity requirements. Samples that did not meet the required validity criteria were excluded from subsequent analysis by PortHill. Valid samples were retained for subsequent RCS analysis and compared to the continuous PM_4 measurement for the corresponding sampling period.

Meteorological parameters were matched to the relevant PM and RCS monitoring periods. Wind speed and wind direction averages were calculated using vector averaging to calculate 1-hour averages when required.

4.2 Continuous PM monitoring results

4.2.1 Summary statistics

A summary of concentration statistics for the corrected $PM_{2.5}$, PM_4 and PM_{10} datasets is presented in Table 4.1. These data were collected using continuous instrumental monitoring via the DMP 7000.

Data capture exceeded 99.9% for all reported particulate fractions and averaging periods.

Table 4.1: Summary statistics for continuous PM monitoring results.

Parameter	Averaging period	Data capture (%)	Study period Average ($\mu g/m^3$)	Minimum ($\mu g/m^3$)	95th percentile ($\mu g/m^3$)	99th percentile ($\mu g/m^3$)	Maximum ($\mu g/m^3$)
$PM_{2.5}$	1-hour	99.98%	7.2	0.6	16.7	23.8	38.6
$PM_{2.5}$	24-hour	100%	7.2	1.9	13.9	18.6	22.4
PM_4	1-hour	99.98%	10.1	1.7	20.8	27.4	51.4
PM_4	24-hour	100%	10.1	3.8	16.9	22.6	26.8
PM_{10}	1-hour	99.98%	16.2	3.1	31.1	43.4	113.9
PM_{10}	24-hour	100%	16.2	6.4	26.4	34.8	37.9

4.2.2 $PM_{2.5}$ temporal variation

The variation in recorded 24-hour average $PM_{2.5}$ concentrations during the monitoring period is shown in Figure 4.1.

$PM_{2.5}$ concentrations varied throughout the study period, with most 24-hour average concentrations below 10 $\mu g/m^3$. The highest recorded 24-hour average $PM_{2.5}$ concentration was 22.4 $\mu g/m^3$.

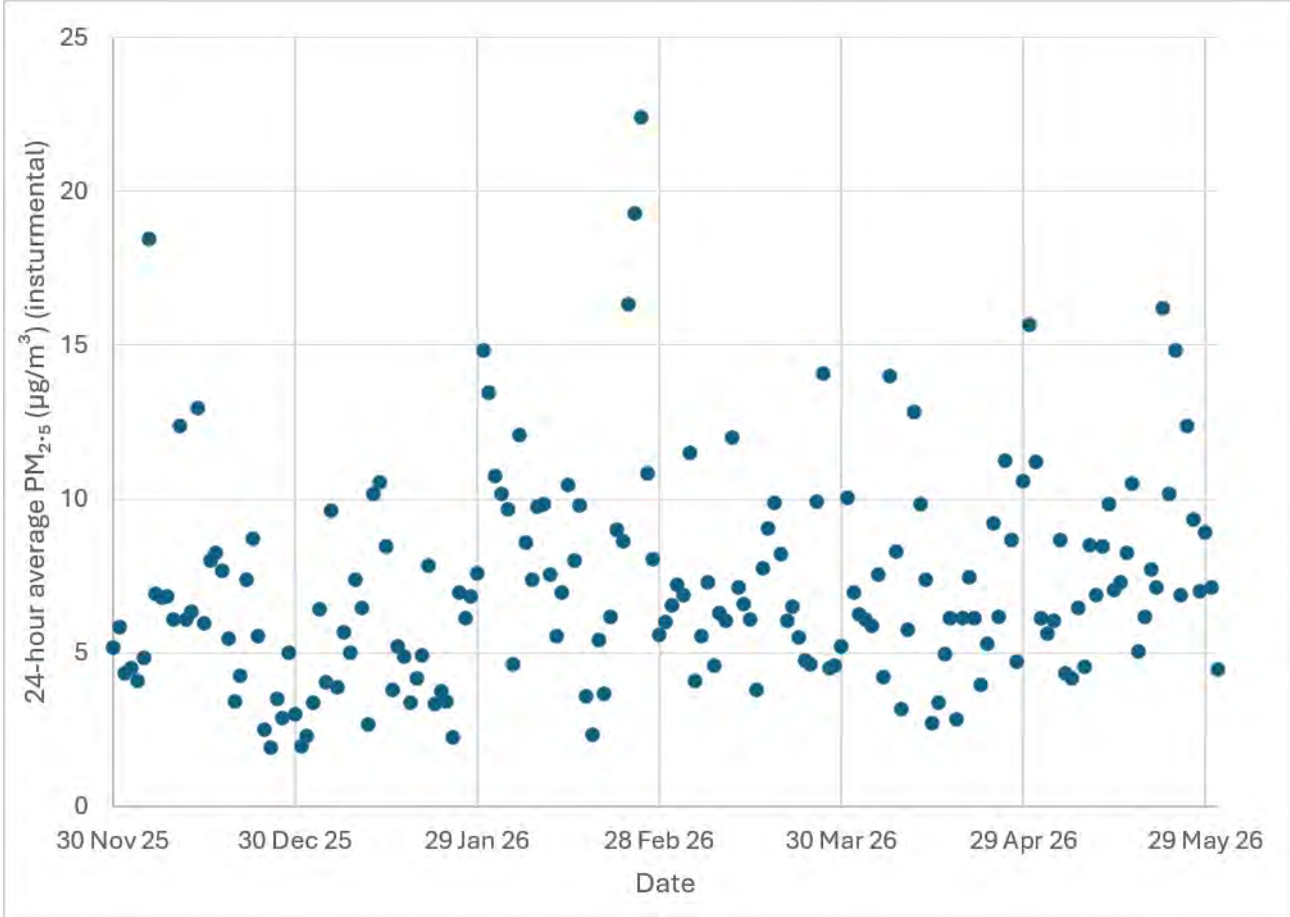


Figure 4.1: 24-hour average $PM_{2.5}$ concentrations during the monitoring period (instrumental).

4.2.3 PM_4 temporal variation

Variation in 1-hour average PM_4 concentrations throughout the monitoring period are shown in Figure 4.2.

Most 1-hour average PM_4 concentrations were below 20 µg/m^3. No significant variation between the values recorded for different months is apparent. The highest recorded 1-hour PM_4 concentration was 51.4 µg/m^3. This occurred on the same day as the highest recorded 24-hour average $PM_{2.5}$ concentration (Figure 4.1).

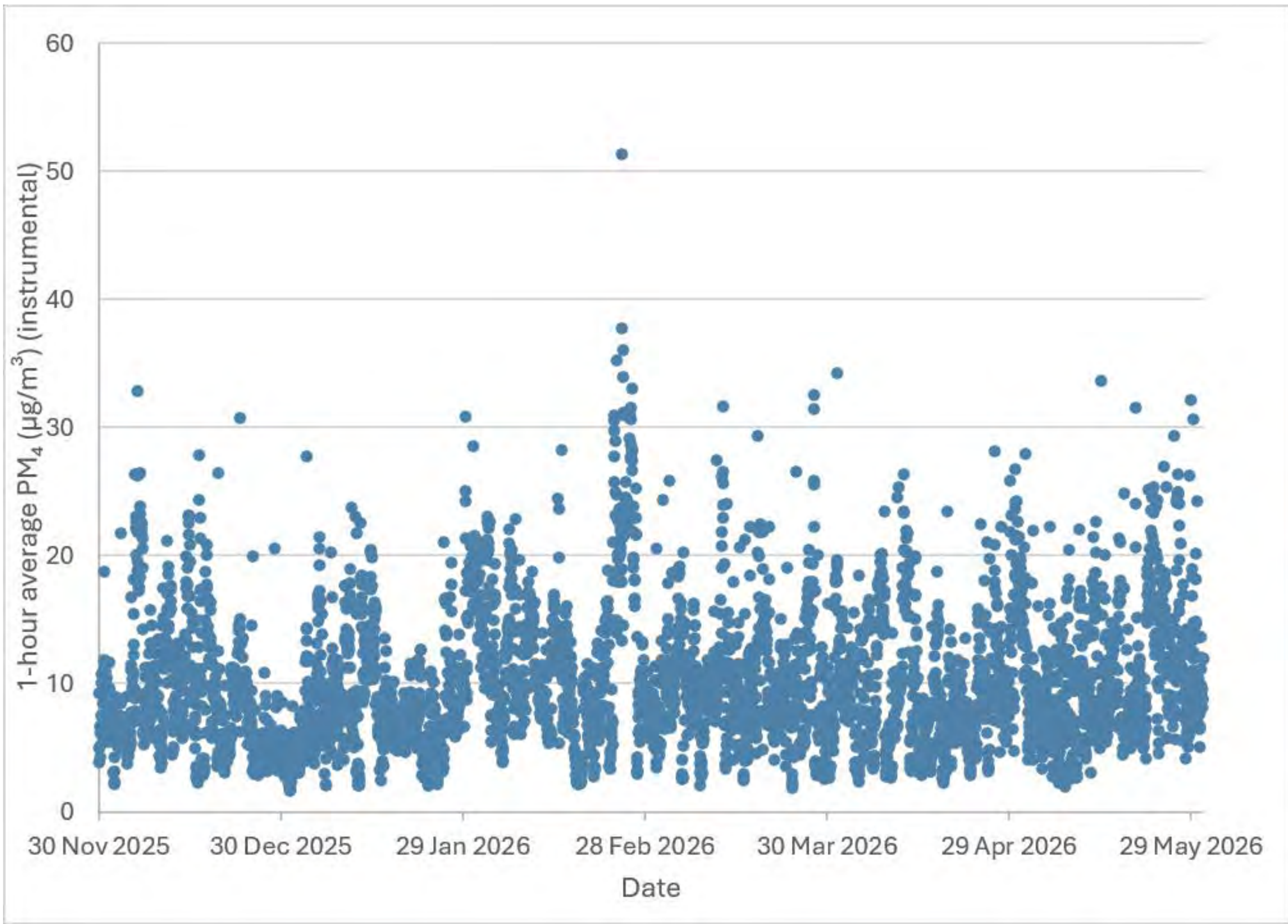


Figure 4.2: 1-hour average PM_4 concentrations during the monitoring period

4.2.4 PM_4 comparisons to concurrent RCS monitoring results

A comparison of PM_4 concentrations during valid RCS sampling periods with PM_4 concentrations across the full monitoring period is provided in Table 4.2.

PM_4 concentrations during valid RCS sampling periods were broadly consistent with those observed across the full monitoring period. This indicates that the RCS sampling periods for all valid respirable particulate sampling runs were likely to be associated with ambient respirable particulate concentrations, which were representative of what typically occurs. For comparison purposes, monitoring-period statistics were calculated using 24-hour average PM_4 concentrations, consistent with the nominal sampling duration adopted for the RCS programme. Individual RCS sampling periods were generally close to, but not exactly, 24 hours in duration. This approach provides a reasonable basis for comparing particulate conditions during RCS sampling periods with those across the broader monitoring period.

Table 4.2: Comparison of PM_4 concentrations during valid RCS sampling periods and the full monitoring period.

Comparison group	Count	Study Period Average (µg/m^3)	Minimum (µg/m^3)	95th percentile (µg/m^3)	99th percentile (µg/m^3)	Maximum (µg/m^3)
Valid RCS sampling periods (sample average)	57	11.0	5.1	18.3	24.3	25.8
Entire monitoring period (24-hour average)	183	10.1	3.8	16.9	22.6	26.8

4.3 RCS sampling results

A total of 64 RCS samples were collected during the monitoring programme, of which 57 met the applicable sample validity requirements. Seven samples were excluded from subsequent analysis because sampling flow rates were not maintained within the ±5% tolerance specified by the sampling method.

All laboratory RCS analytical results were reported below the analytical detection limit of 4 µg per sample (±1.5 µg). Detailed sample records, sample validity assessments and laboratory results, and PortHill calculations are provided in Appendix D and Appendix E respectively.

Table 4.3 summarises the RCS sampling results.

Table 4.3: Summary of RCS sampling results.

Metric	Result
RCS samples collected	64
Valid samples	57
Invalid samples	7
Monitoring period	5 January 2026 to 29 May 2026
Samples reported below analytical detection limit	64 of 64

4.3.1 Maximum theoretical RCS concentrations

Figure 4.3 presents upper-bound RCS concentrations calculated for valid samples when assuming the analytical detection limit mass of RCS and measured total sample air volumes.

Most calculated upper-bound RCS concentrations were between approximately 1.1 and 1.3 µg/m^3. Lower theoretical maximum concentrations were calculated for the extended multi-day samples collected during May 2026, reflecting the larger sampled air volumes associated with those sampling periods.

Uncertainty estimates were calculated using a root-sum-of-squares approach combining the laboratory-reported uncertainty associated with analytical RCS mass determination (±1.5 µg) and estimated uncertainty associated with sampled air volume (5%). Data are provided in Appendix E.

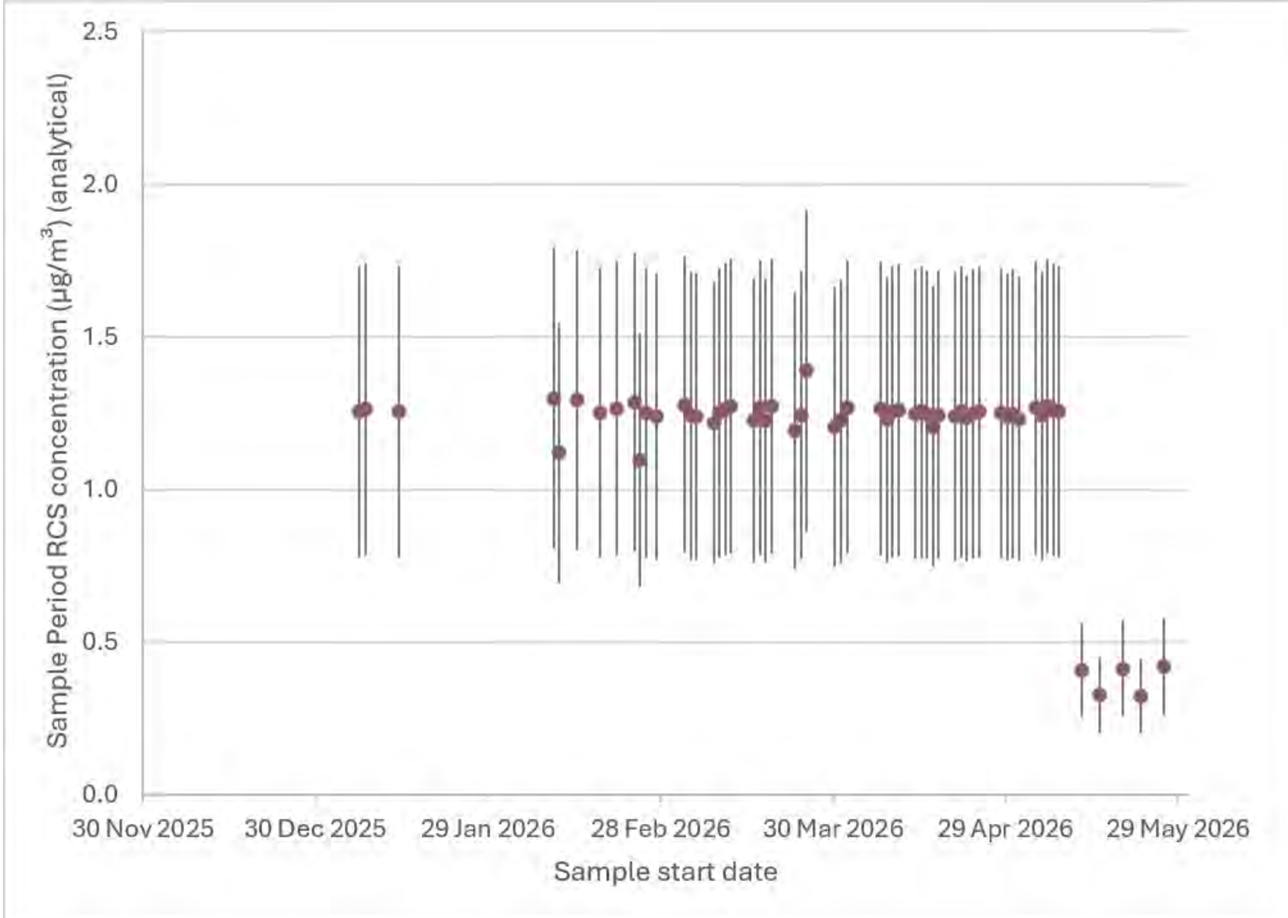


Figure 4.3: Upper-bound RCS concentrations calculated for valid sample periods, including uncertainty estimates.

4.3.2 Relationship between respirable dust and PM_4

A comparison of measured respirable dust concentrations and corresponding PM_4 concentrations measured over the same sampling periods (typically 24 hours) is shown in Figure 4.4.

As discussed in Section 3.4, some calculated respirable dust concentrations were below zero due to the precision of the gravimetric measurement method at the low particulate concentrations observed during the monitoring programme. These values are invalid and have not been plotted in Figure 4.4. The complete dataset is provided in Appendix D.

A general positive relationship was observed between valid respirable dust concentration estimates and instrument PM_4 concentrations, with higher PM_4 concentrations generally corresponding to higher respirable dust concentrations. The two measures also exhibited broadly similar concentrations over the observed range.

The observed relationship supports the use of PM_4 monitoring data as a surrogate indicator for respirable particulate concentrations at the monitoring location.

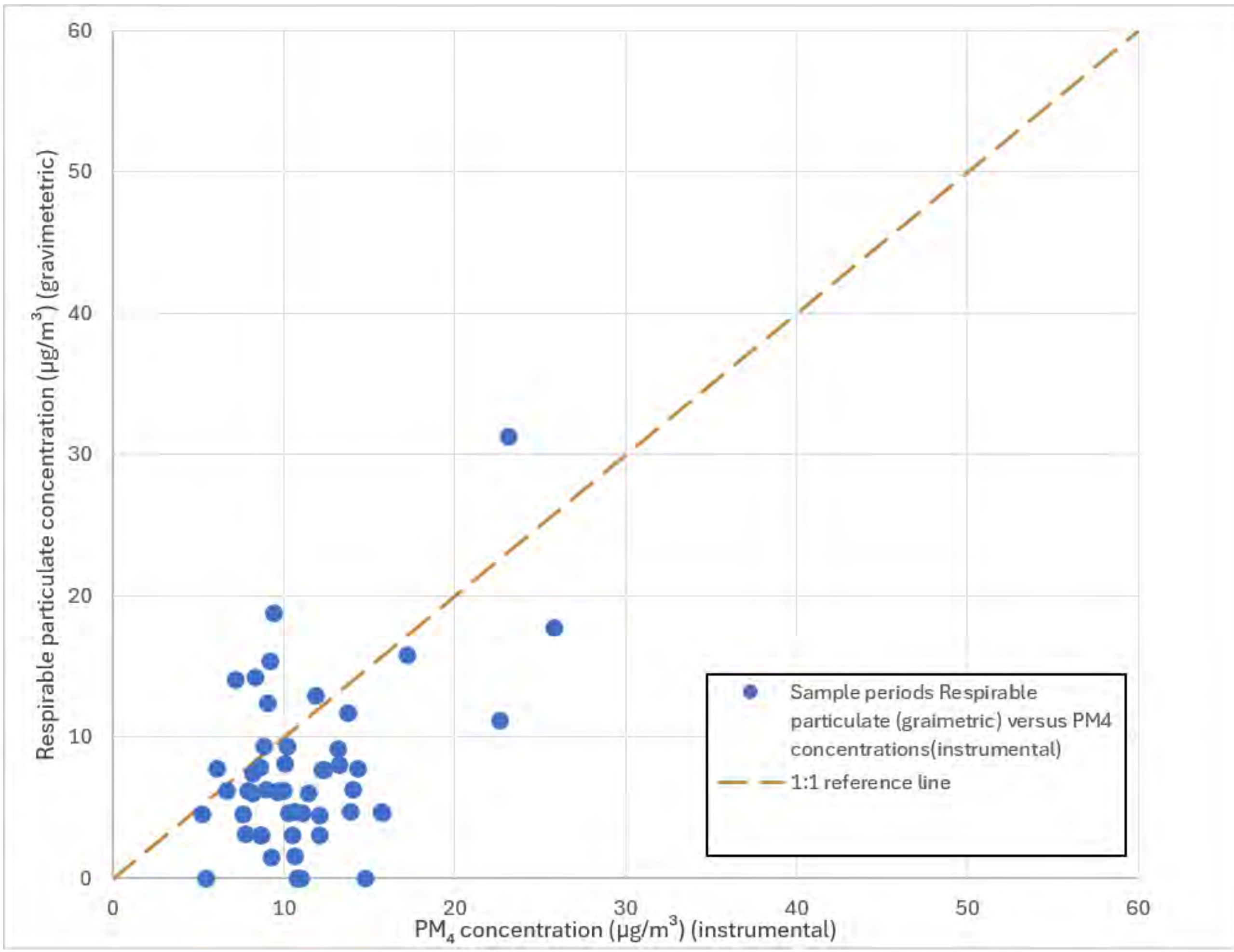


Figure 4.4: Relationship between respirable dust concentration and PM_4 concentration during sampling periods (typically 24 hours)

4.3.3 Upper-bound RCS concentrations relative to PM_4

A comparison of calculated upper-bound RCS concentrations (theoretical maximum) with instrument PM_4 concentrations measured during the corresponding sampling periods is shown in Figure 4.5.

No consistent relationship was observed between calculated upper-bound RCS concentrations and corresponding PM_4 concentrations. Calculated upper-bound RCS concentrations were largely controlled by the analytical detection limit and sampled air volume rather than variations in measured PM_4 concentrations.

The lower upper-bound RCS concentrations calculated for the multi-day samples collected during May 2026 did not correspond to lower PM_4 concentrations but instead reflected the larger sampled air volumes associated with the extended sampling periods.

For valid sampling periods with approximately 24-hour sampling durations, calculated upper-bound RCS concentrations represented approximately 5% to 24% of the corresponding PM_4 concentrations. Lower upper-bound percentages of approximately 3% to 4% were calculated for the extended multi-day samples collected during May 2026.

These results indicate that the available dataset does not support derivation of a clear quantitative relationship between upper-bound RCS concentrations and PM_4 concentrations. Sample-by-sample results are provided in Appendix E.

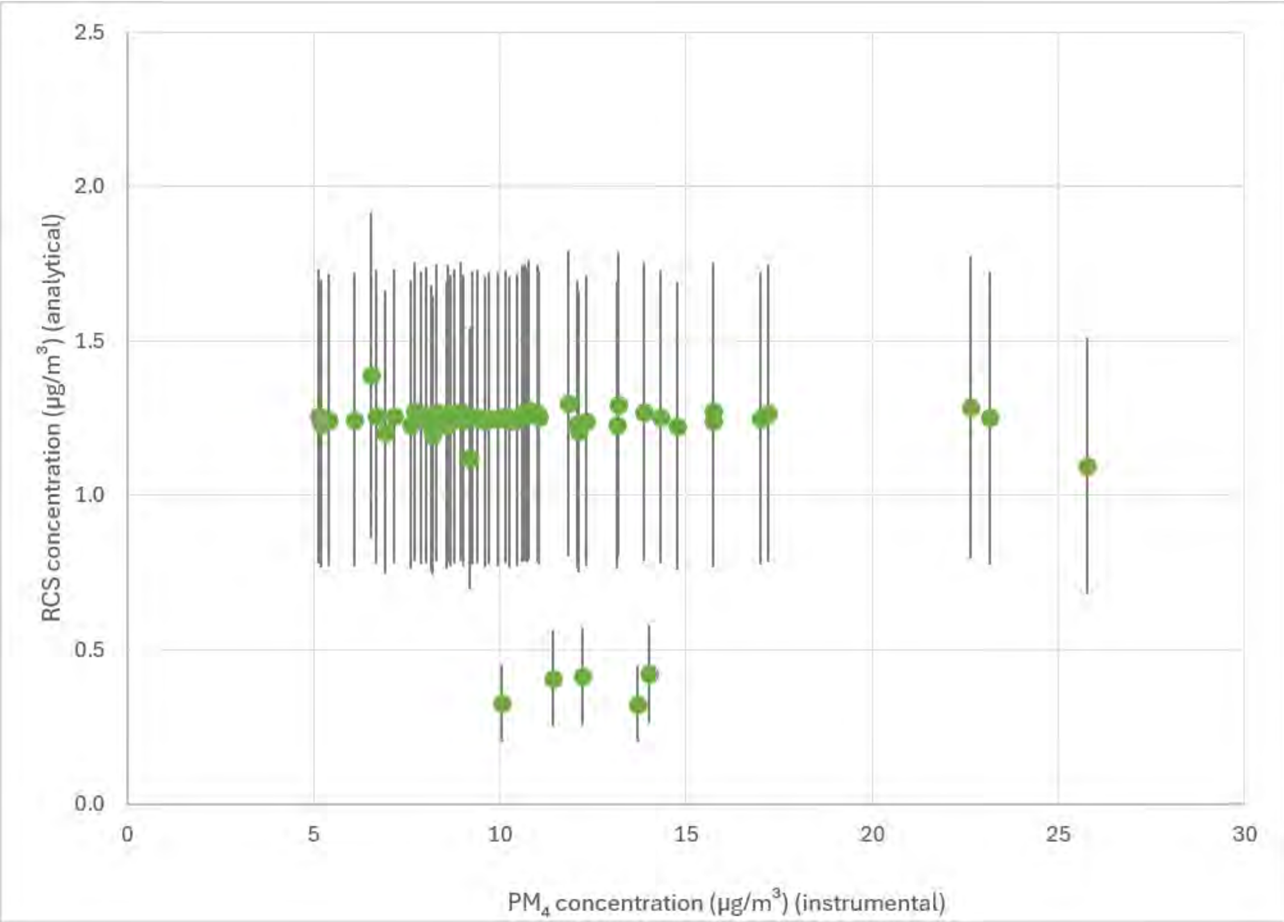


Figure 4.5: Calculated upper-bound RCS concentrations compared with PM_4 concentrations during RCS sampling periods.

4.4 Meteorological data

Wind conditions recorded during the monitoring programme are summarised in Figure 4.6 and Figure 4.7. Figure 4.6 shows the wind rose for the full monitoring period, while Figure 4.7 shows the wind rose for periods during which RCS samples were collected.

Winds during the monitoring period were dominated by northerly to north-easterly flows, with a secondary component from the south to south-west. The observed wind pattern was generally consistent with that identified during the monitoring site selection assessment, with slightly lower frequencies of winds from the western sector and slightly higher frequencies from the south-west sector.

Wind conditions during RCS sampling periods were similar to those observed during the monitoring programme as a whole. Sampling periods included a slightly greater frequency of winds from the quarry sector (236° to 309°) compared to long-term records and a slightly lower frequency of higher wind speed conditions.

Additional wind analyses, including wind roses for individual sampling periods and comparisons between the Scottech and Lufft meteorological stations, are provided in Appendix F. Wind speeds recorded by the Lufft station were generally lower than those recorded by the Scottech station, consistent with the lower mounting height of the instrument. Wind speeds from easterly directions were further reduced. This is expected to be due to sheltering by the adjacent hedge.

After adjustment to true north, wind direction data from the two stations were generally consistent, with the exception of easterly flows where the effects of the hedge on wind direction and speed appear evident.

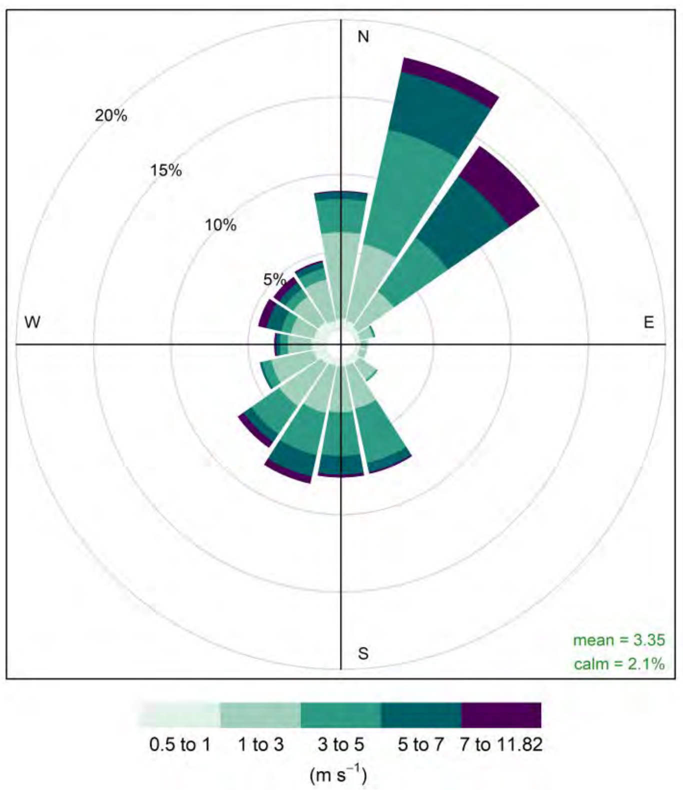


Figure 4.6: Wind rose from the Scottech meteorological station for the full monitoring period, 30 November 2025 to 31 May 2026. Wind rose petals indicate the direction from which the wind was blowing.

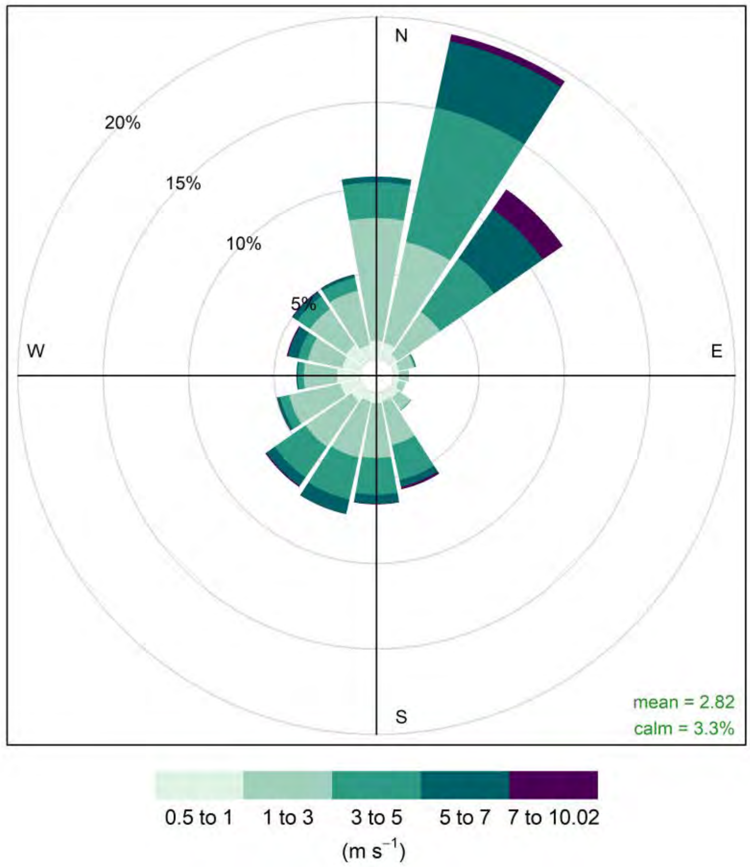


Figure 4.7: Wind rose from the Scottech meteorological station for RCS sampling periods. Wind rose petals indicate the direction from which the wind was blowing.

4.5 Quarry operational data

Quarry operational data were reviewed to provide context for the monitoring results. The operational data identified days when crushing was being undertaken in the central processing and stockpile area, days when the field conveyor was operating, days when both activities were operating, and days when neither activity was recorded as operating. The monthly summary of operational states is provided in Table 4.4. Detailed daily operational records with dates where RCS samples were undertaken are provided in Appendix G.

Table 4.4: Summary of quarry operational states versus number of days during the monitoring period.

Month	Days	Both	Crushing only	Field Conveyor only	No operation	Crushing total	Field Conveyor total
Nov 2025	1	0	0	0	1	0	0
Dec 2025	31	10	0	2	19	10	12
Jan 2026	31	15	0	4	12	15	19
Feb 2026	28	9	0	5	14	9	14
Mar 2026	31	13	1	2	15	14	15
Apr 2026	30	9	0	2	19	9	11
May 2026	30	12	1	2	15	13	14

5 Assessment Against Consent Conditions

This section assesses the monitoring results presented in Section 4 against the applicable consent conditions. The assessment considers the monitoring results, the representativeness of the monitoring programme, and relevant uncertainties and limitations associated with the available data.

5.1 Annual RCS

5.1.1 Assessment approach

The annual RCS assessment is based on the 57 valid RCS samples collected during the monitoring programme and presented in Section 4. All laboratory RCS results were reported below the analytical detection limit. While these results do not allow direct quantification of ambient RCS concentrations, they allow a conservative assessment of upper bound RCS concentrations against the annual RCS consent criterion.

Upper-bound RCS concentrations were calculated using the analytical detection limit and the measured air volume associated with each valid sample. This assumes the unlikely prospect that the mass corresponding to the analytical detection limit was present in each sample. Actual ambient RCS concentrations would most likely be lower than these upper-bound values.

The majority of RCS samples were collected over approximately 24-hour sampling periods. Several extended multi-day samples were collected during May 2026 to increase sampled air volumes. The larger sampled air volumes resulted in lower upper-bound concentration estimates than those calculated for the approximately 24-hour samples. These results provide additional support that actual RCS concentrations are lower than those implied by the upper bound values determined in the earlier periods of the monitoring study

5.1.2 Assessment against consent condition

The annual RCS assessment was undertaken using the upper-bound RCS concentrations presented in Section 4.3.1. A time-weighted average was calculated to account for differences in sampling duration, including the extended multi-day samples collected during May 2026. The resulting time-weighted study-period average upper-bound RCS concentration was 1.0 μg/m^3.

This value is extremely conservative because each laboratory non-detect result was assessed using the analytical detection limit rather than assuming a lower mass. Representativeness of the monitoring programme is considered further in Section 5.4 and uncertainty associated with the assessment is discussed in Section 5.5.

The calculated time-weighted study-period average upper-bound RCS concentration of 1.0 μg/m^3 is well below the annual average RCS criterion of 3 μg/m^3.

5.2 1-hour RCS

5.2.1 Assessment approach

Assessment against the 1-hour RCS criterion requires consideration of particulate concentrations at a shorter timeframe than the filter-based RCS sampling duration of approximately 24 hours and longer. As described in Section 2, comparison of continuous PM_4 monitoring results to daily averaged respirable particulate results enabled 1-hour average RCS concentrations to be inferred and compared to the hourly RCS ambient criterion.

The relationship between respirable dust concentrations and PM_4 concentrations measured over the corresponding sampling period (typically 24 hours) is shown in Figure 4.4. While there is high uncertainty with the respirable dust concentration measurements, it can be seen that instrumentally measured PM_4 concentrations generally tracked variations in measured respirable dust concentration during the monitoring programme. Also, the two measures (respirable particulate via gravimetric sampling versus instrumental PM_4) exhibit broadly similar concentrations over the monitoring programme.

A comparison of the upper-bound RCS concentrations with the corresponding PM_4 concentrations is shown in Figure 4.5. As expected, there is no relationship between upper-bound RCS concentrations and PM_4 concentrations as the former are all theoretical maximum values associated with non-detection of any RCS.

While a robust PM_4 versus RCS relationship could not be established, the monitoring results provide information on the range of upper-bound RCS:PM_4 ratios observed during valid sampling periods. These theoretical calculated ratios provide a basis for conservatively assessing potential 1-hour RCS concentrations using measured PM_4 concentrations (shown in Figure 4.2). This approach is used to assess compliance against the 1-hour RCS criterion in Section 5.2.2.

5.2.2 Assessment against consent condition

The monitoring programme identified upper-bound RCS:PM_4 ratios ranging from approximately 3% to 24% across the valid sampling periods. The lowest ratios were mostly associated with the extended multi-day samples collected during May 2026, while the highest observed ratio was 24% and associated with approximately 24-hour duration sampling time frames.

For assessment purposes, an RCS:PM_4 ratio of 24% was adopted. This provides a very conservative basis for comparison against the 1-hour RCS criterion. Uncertainty associated with the selected ratio and the extrapolation from PM_4 concentrations to RCS concentrations is discussed further in Section 5.5.

Applying the 24% RCS:PM_4 ratio to the maximum observed 1-hour PM_4 concentration of 51.4 µg/m^3 (Figure 4.2) results in an estimated maximum 1-hour upper-bound RCS concentration of 12.3 µg/m^3. The assessment is summarised in Table 5.1.

Table 5.1: Calculation of Study Period Maximum 1-Hour RCS Concentration

Parameter	Value
Maximum 1-hour PM_4 concentration	51.4 µg/m^3
RCS:PM_4 ratio adopted for assessment	24%
Estimated maximum 1-hour upper-bound RCS concentration	12.3 µg/m^3
1-hour RCS criterion	**47 µg/m^3**

The estimated maximum 1-hour upper-bound RCS concentration of 12.3 µg/m^3 is well below the 1-hour RCS criterion of 47 µg/m^3.

On this basis, the monitoring results indicate that 1-hour RCS concentrations were below the ambient concentration criterion. Further as shown in Appendix F, peak and elevated 1 hour average PM_4 concentrations do not appear to be associated with winds from the direction of the quarry.

5.3 24-hour $PM_{2.5}$

The 24-hour average $PM_{2.5}$ concentrations measured during the monitoring programme are shown in Figure 4.1. $PM_{2.5}$ concentrations varied throughout the study period, with most 24-hour average concentrations below 10 µg/m^3 and several intermittent periods of elevated concentrations. The highest recorded 24-hour average $PM_{2.5}$ concentration during the monitoring programme was 22.4 µg/m^3. As shown in Appendix F, elevated 1-hour average $PM_{2.5}$ concentrations do not appear to be associated with winds from the direction of the quarry.

The maximum observed 24-hour $PM_{2.5}$ concentration of 22.4 µg/m^3 is below the 24-hour $PM_{2.5}$ consent criterion of 25 µg/m^3.

On this basis, the monitoring results support assessment of 24-hour $PM_{2.5}$ concentrations as below the consent criterion. Representativeness of the monitoring programme is considered further in Section 5.4, and uncertainty associated with the assessment is discussed in Section 5.5.

5.4 Monitoring representativeness

5.4.1 Overview

The monitoring programme was specifically designed to assess compliance with the RCS and $PM_{2.5}$ criteria specified in Air Discharge Consent CRC224104. As described in Section 2, the programme combined filter-based respirable dust sampling, laboratory analysis for RCS, continuous particulate monitoring, and meteorological monitoring to provide information relevant to both short-term and long-term assessment criteria. The monitoring design also allowed for the possibility of laboratory RCS results being reported below the analytical detection limit and incorporated assessment methods capable of supporting interpretation of non-detect results.

A substantial monitoring dataset was obtained during the study period. Continuous particulate monitoring achieved greater than 99.9% data capture and 57 valid RCS samples were collected during the monitoring programme (Table 4.1 and Table 4.3). The monitoring period was undertaken within the monitoring season specified in the consent and included a range of particulate concentrations, operational conditions and meteorological conditions.

5.4.2 Sample representativeness

The representativeness of the RCS results dataset was assessed by comparing PM_4 concentrations during RCS sampling periods with PM_4 concentrations observed across the broader monitoring programme. Figure 4.2 shows the variation in 1-hour PM_4 concentrations across the monitoring period, and Table 4.2 compares PM_4 concentrations during RCS sampling periods with PM_4 concentrations across the full monitoring period. Together, these indicate that RCS sampling periods were likely to have occurred whilst concurrent ambient PM_4 concentrations were typical of those measured during the full monitoring programme.

5.4.3 Meteorological representativeness

Comparison of the wind data measured during the monitoring programme to the longer-term wind data for the site indicates that the monitoring programme encompassed a representative range of wind conditions. Winds coming from the quarry sector towards the monitoring site also occurred during a number of valid RCS sampling periods.

Review of the PM_4 and respirable particulate versus prevalent wind conditions does not identify any distinguishable increase in ambient particulate being measured when winds were from the quarry sector. The absence of any statistically significant detection of RCS indicates no material source of this air contaminant from the quarry. Therefore, monitoring data from the entire programme does not detect any contribution of RCS from the quarry at the Templeton monitoring site, nor any other source.

5.4.4 Overall assessment of representativeness

This report relates to the first of two consent-required monitoring campaigns. A second monitoring campaign will provide an additional dataset across a further monitoring period and increase the overall evidence base available for assessment. Notwithstanding this, the results from the first monitoring campaign provide a substantial and internally consistent dataset for assessment against the consent criteria.

The monitoring design, monitoring coverage, data capture, valid sample dataset, and conservative assessment methods provide a sound basis for the conclusions presented in Sections 5.1 to 5.3

5.5 Uncertainty and limitations

5.5.1 Detection limits and analytical sensitivity

All laboratory RCS results were reported below the analytical detection limit as shown in Table 4.3 and Appendix D. RCS concentrations could therefore not be quantified directly from the collected samples. The annual and 1-hour RCS assessments are based on upper-bound concentrations calculated using the analytical detection limit and measured sample volumes.

Figure 4.3 includes uncertainty estimates for individual upper-bound RCS concentrations based on laboratory mass uncertainty and sampled air volume uncertainty. Uncertainty for the time-weighted average upper-bound concentration used in the annual assessment has not been calculated separately.

Respirable dust concentrations were subject to uncertainty because particulate mass loadings were often close to the practical limits of measurement, resulting in some invalid or immeasurable results. Nevertheless, the available valid data demonstrated a positive relationship with PM_4 concentrations and were sufficient to support the use of PM_4 as a surrogate indicator of respirable particulate concentrations in this assessment.

The extended-duration samples collected during May 2026 resulted in lower upper-bound RCS concentrations because larger volumes of air were sampled (Figure 4.3). PM_4 concentrations during these sampling periods were similar to those observed during the remainder of the monitoring programme (Figure 4.2). This indicates that the higher upper-bound concentrations calculated for the approximately 24-hour samples were largely a result of analytical detection limits rather than higher RCS concentrations.

5.5.2 1-hour RCS assessment

The assessment uses PM_4 data to estimate worst-case (upper-bound) 1-hour RCS particulate concentrations. Figure 4.4 indicates that PM_4 and respirable dust concentrations generally tracked one another during the monitoring programme. However, Figure 4.5 cannot be used to infer a relationship between RCS and PM_4 concentrations (as the former are based on analytical mass detection limits).

The assessment established a worst case upper bound RCS:PM_4 ratio of 24%. Use of this ratio to establish worst case hourly RCS concentrations at the monitoring site means that the comparison of estimated RCS values against the 1-hour RCS criterion was highly conservative.

5.5.3 Monitoring period representativeness

The monitoring period broadly corresponds with the warmer summer to autumn months of the year, when the potential for dust generation peaks. Therefore, the use of dust monitoring results produced from the monitoring period should provide a reliable, albeit conservative assessment of annual average concentrations.

5.5.4 Meteorological conditions

Meteorological conditions vary naturally between monitoring periods and years. Wind conditions influence the frequency with which emissions from the quarry may be transported towards the monitoring location. Wind conditions observed during the monitoring programme are discussed in Section 4.4 and Appendix F.

Winds blowing from the quarry and towards the monitoring location were represented within the monitoring dataset and multiple RCS sampling periods. The frequency of these conditions was within a normal range with respect to long-term wind monitoring records.

6 Discussion

This report presents the results of the first of two monitoring campaigns required under Air Discharge Consent CRC224104. The monitoring programme was undertaken just off Jones Road between Roydon Quarry and the Templeton urban area in accordance with the consent requirements. The monitoring location, monitoring methodology and assessment framework were developed in consultation with Environment Canterbury and certified prior to commencement of the monitoring programme. The programme was specifically designed to assess compliance with the applicable RCS and $PM_{2.5}$ criteria, including circumstances where ambient RCS concentrations were sufficiently low that laboratory results may remain below analytical detection limits.

The monitoring programme produced a substantial dataset comprising continuous particulate monitoring, meteorological monitoring, quarry operational information and respirable dust sampling for RCS analysis. A total of 64 respirable dust samples were collected for RCS analysis, of which 57 met the applicable validity requirements. This exceeded the minimum sample numbers specified in the approved monitoring programme and provided measurements across a range of operational and meteorological conditions.

All laboratory RCS results were reported below the analytical detection limit. This reflects the very low mass of respirable crystalline silica collected on the sample filters. However, because the sampled air volume associated with each filter was known, the laboratory reporting limit could be expressed as an upper-bound concentration. This allowed assessment of the highest ambient RCS concentration that could have been present (as a theoretical maximum) while still producing a non-detect laboratory result. Extended-duration sampling undertaken during May 2026 increased sampled air volumes and further reduced these upper-bound concentration estimates. The monitoring results indicate that ambient RCS concentrations were sufficiently low that RCS could not be quantified above the laboratory reporting limit, despite the increased sensitivity provided by the extended-duration samples.

A time-weighted study-period upper-bound RCS concentration of 1.0 $\mu g/m^3$ was calculated from the RCS dataset. This value is below the annual-average RCS criterion of 3 $\mu g/m^3$. Actual ambient RCS concentrations would be expected to be lower than this upper-bound concentration. On this basis, annual-average RCS concentrations were assessed as being well below the applicable consent criterion during the monitoring period.

Assessment of the 1-hour RCS criterion incorporated the continuous PM_4 monitoring dataset together with conservative assumptions derived from the monitoring results. Using this approach, the estimated maximum 1-hour upper-bound RCS concentration was 12.3 $\mu g/m^3$, which is also well below the 1-hour RCS criterion of 47 $\mu g/m^3$.

The highest measured 24-hour $PM_{2.5}$ concentration during the monitoring programme was 22.4 $\mu g/m^3$, which was below the consent criterion of 25 $\mu g/m^3$.

7 Conclusions

The monitoring programme produced sufficient data to support the following conclusions:

- Annual-average and 1-hour RCS concentrations were assessed as being less than 30% of the respective consent criteria during the monitoring period.
- All measured 24-hour $PM_{2.5}$ concentrations were below the applicable consent criterion.
- The monitoring results did not identify a detectable contribution of RCS from Roydon Quarry at the Templeton monitoring location.
- Ambient RCS concentrations were sufficiently low that direct quantification above the laboratory detection limit was not achieved; however, the monitoring methodology enabled assessment against the consent criteria using conservative upper-bound concentrations.
- This first monitoring campaign demonstrates the suitability of the monitoring approach for future campaigns.

8 Recommendations

Based on experience from this first monitoring programme, the following recommendations for the second monitoring programme in 2026/2027 are provided.

- The campaign should commence earlier within the consent monitoring period to increase the likelihood of capturing forecast El Niño conditions, which are typically associated with increased north-westerly airflow in Canterbury and may increase the frequency of quarry-to-monitor transport conditions.
- Longer-duration respirable dust samples should continue to be considered where practicable to increase sampled air volumes and reduce upper-bound ambient RCS concentrations associated with laboratory non-detect results.
- Available respirable dust sampling and RCS laboratory analysis options should be reviewed prior to the second monitoring campaign to confirm that the current approach remains the most appropriate balance between analytical sensitivity, quality assurance requirements and preservation of sample integrity.

9 References

Ministry for Culture and Heritage. (2006). *Gemstones and quartz, Te Ara - the Encyclopedia of New Zealand*. Available at: teara.govt.nz [Accessed 24 July 2026].

Ministry for the Environment. (2009). *Good Practice Guide for Air Quality Monitoring and Data Management*. Wellington: Ministry for the Environment. Retrieved from https://www.mfe.govt.nz/sites/default/files/good-practice-guide-for-air-quality.pdf

Limitations

This Report is provided by Port Hill Limited ("PortHill") subject to the following limitations:

- This Report has been prepared for the specific purpose outlined in PortHill's proposal. No responsibility is accepted for the use of this Report, in whole or in part, in other contexts or for any other purpose.
- The scope and the period of PortHill's Services are as described in PortHill's proposal, and are subject to restrictions and limitations. PortHill did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Report. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by PortHill in regards to it.
- Any assessments, designs, and advice provided in this Report are based on the conditions indicated from published sources and the investigation described. No warranty, express or implied, is included that the actual conditions will conform exactly to the assessments contained in this Report.
- Where data supplied by the client or other external sources have been used, it has been assumed that the information is correct unless otherwise stated. PortHill accepts no responsibility for incomplete or inaccurate data supplied by others.
- The Client acknowledges that PortHill may have retained subconsultants affiliated with PortHill to provide Services for the benefit of PortHill. PortHill will be fully responsible to the Client for the Services and work done by all its subconsultants and subcontractors. The Client agrees to assert claims and seek to recover losses, damages, or other liabilities only from PortHill and not from PortHill's affiliated companies. To the maximum extent allowed by law, the Client waives any expense, loss, claim, demand, or cause of action against PortHill's affiliated companies, and their employees, officers, and directors.
- This Report is provided for the sole use by the Client and is confidential to them. No responsibility whatsoever for the contents of this Report will be accepted to any person other than the Client. Any use by a third party, or reliance on or decisions based on this Report, is the responsibility of such third parties. PortHill accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Report.

Appendix A Monitoring Programme Design

RESPIRABLE CRYSTALLINE SILICA (RCS) MONITORING PROGRAMME

DESIGN FOR REVIEW

SURVEY ASPECTS	Approach
Purpose	Fulfilment of requirements for a respirable crystalline silica (RCS) monitoring programme as specified in Condition 20 of Fulton Hogan's Air Discharge Consent CRC224104, issued by the Canterbury Regional Council. https://www.ecan.govt.nz/data/consent-search/consentdetails/CRC224104/CRC224104
Goals	Condition 20(a) of the Consent requires the design to assess compliance with the following ambient criteria: • 47 micrograms per cubic metre (µg/m³) 1-hour level of RCS • 3 µg/m³ annual average level of RCS; and • 25 µg/m³ 24-hour average level of $PM_{2.5}$
Location	Condition 20(a) of the Consent specifies the monitoring location to be the western edge of the Templeton urban area. See attached memorandum regarding established monitoring location.
Sampling & testing methods	The Consent requires measurement of both short and long-term average concentrations. This will be achieved via the sampling of air using an accepted standard gravimetric/filter type method for respirable dust, which will be analysed for RCS composition. The gravimetric/filter sampling of respirable dust will occur in parallel with sampling and measurement using continuous optical particle counter (OPC) type instrument, which can simultaneously measure the concentration of particulate within the 2.5 and 4-micron size fractions (i.e., $PM_{2.5}$ and PM_4). **Respirable Dust sampling** 1. It is proposed to use Fulton Hogan's own Casella pumps (and associated calibrator) and cyclone sampling heads (fitted with a Casella filter) which have a 50% collection efficiency for dust particulate with an aerodynamic particle diameter of 4 microns (i.e., have a D_{50} of 4 microns) when operated at an air flow sample rate of 2.2L/min. This meets the requirement for collection of respirable dust with a D_{50} of 4 microns as specified in ISO 7708. The filter-based sampling and gravimetric

	analysis of respirable dust fraction will be undertaken in accordance with AS 2985:2009. To achieve sufficient sample material for analysis of RCS, it is proposed to operate the gravimetric samplers for 24 hours. 2. Fulton Hogan Laboratories routinely operates this sampling equipment in accordance with AS 2985:2009, and as part of their RCS workplace exposure monitoring programme. Fulton Hogan Labs are not currently IANZ accredited for this method, but this is planned this within the next 6 months. **Analysis** 3. **Mass analysis:** Pre/post filter weighing under controlled temperature and relative humidity (RH). Fulton Hogan Labs operate calibrated 5 decimal point mass scales (i.e., precision of 0.01mg) with associated filter mass weight uncertainty of 0.1 mg. This uncertainty was established by Fulton Hogan from the variability of repeat filter weight measurements. This level of accuracy is considered to be the lowest that can be practicably achieved via laboratories currently based in Christchurch. The expected ambient respirable dust collected on the filters over 24 hours is expected to be less that 0.1 mg, however determining the respirable mass (i.e., mass of particulate with a D_{50} of 4 microns) is not a critical component of the method. 4. **RCS Analysis**: RCS mass will be determined by X-Ray diffraction (XRD). This will be completed by Agon Environmental in Australia. Agon Environmental are NATA accredited, and use XRD to determine alpha quartz weight. Their detection limit is 4 micrograms (µg) of alpha quartz per Casella filter. Note: Only analysis for respirable alpha-quartz is proposed as this is the dominant form of RCS in non-volcanic regions. The Roydon Quarry area is non volcanic like the majority of Canterbury geology (excluding Banks Peninsula). Quarry material will also be sampled and analyses for the forms of RCS as part of this study to confirm the assumption that the primary form of RCS is alpha quartz and not other polymorphs such as cristobalite and tridymite. **Particulate Measurement** 5. The Fulton Hogan owned DMP7000 will also be operated at the monitoring location. This is an optical particle counter (OPC) type continuous PM monitoring instrument. It is expected to meet $PM_{2.5}$ equivalence via previous collocation with the Fulton Hogan's T640x. The DMP7000 device also measures PM_4 and PM_1. Note: that the PM_4 fraction, as measured by an OPC device such as the DMP7000 is an absolute size range, whereas the respirable fraction of dust measured gravimetrically as per AS 2985:2009 is a D_{50} of 4 microns. It is expected that these two measures related to the 4 micron size fraction will correlate and enable the continuous PM_4 concentrations with the 24-hour RCS measurements to be used to provide reliable estimates of 1 hour RCS concentrations.
Calibration of continuous particulate and respirable dust sampling	**Respirable Dust** 6. In accordance with method AS 2985:2009 pre and post filter weighing will be undertaken in an air conditioned environment, and pre-sampling flow calibration of the Casella pumps using a flow calibrator will be undertaken. Post sampling flow rates will also be confirmed.

	Particulate 7. Fulton Hogan's existing US EPA certified T640x monitor has had its software upgraded to enable PM_4 monitoring in addition to continuous monitoring of PM_{10} and $PM_{2.5}$. This monitor was operated during the summer of 2024/2025 to confirm the ability to calibrate the DMP7000's particulate monitoring data against PM_{10}, PM_4 and $PM_{2.5}$ data, as measured by the collocated T640x monitor. 8. The DMP7000 has had orthogonal regressions established, which relate its 24-hour concentrations of $PM_{2.5}$ to those generated by the Fulton Hogan T640x (a US EPA certified equivalent method for monitoring ambient 24-hour concentrations of $PM_{2.5}$). These regressions will be used to correct the continuous PM raw concentration result into known margins of error. From last summer's monitoring, it appears that the DMP7000 's data is equivalent to the T640x for monitoring ambient 24-hour concentrations of $PM_{2.5}$ where equivalency is established in accordance with AS/NZ 3580.9.17:2018: Method 9.17: Demonstration of equivalence for ambient particulate matter monitoring methods[1]. The DMP 7000 also appears to be equivalent to the T640x for ambient 24-hour concentrations of PM_4 using the same method. It is noted that the T640x is not a certified PM_4 device. However, PortHill is unaware of any ambient sampling devices certified for the measurement of PM_4. **Analysis** 9. Gravimetric measurements of RCS mass concentration will be correlated (via an orthogonal regression analysis) to PM_4 results obtained using the OPC-monitor (for same averaging period, and for OPC data which is adjusted to achieve equivalence with a US EPA certified PM monitor). This would include consideration of prevalent wind conditions during the sampling periods.
Sampling frequency	10. The DMP7000 PM monitor's data is continuously recorded in electronic format, with 1 minute average PM_{10}, PM_4 and $PM_{2.5}$ concentrations. This is continuously uploaded to Fulton Hogans internal data management system (HALO). Backup data is maintained on the device. 11. During the 6-month monitoring campaign period, collect at least 5 x 24-hour average respirable dust samples per month using the filter-based sampling method (with 20% on days when no processing occurring), and target days when the prevalent wind is forecast to be blowing from the southwest, westerly through to northwest (i.e., aim for 10 hours per day blowing from these directions – placing Templeton generally downwind of quarrying activities). The collection of 24 hour gravimetric/filter samples is anticipated to allow 24-hour average RCS concentrations in the order of 1.5 µg/m³ to be detected based on the sampling time, airflow sampling rate and laboratory's RCS mass analysis precision. This outcome, supplemented by the DMP7000 measured PM4 concentrations should allow for comparison with both 1-hour and annual-hour RCS ambient criteria.

[1] PortHill has completed a preliminary analysis of collated DMP7000 and T640x data, which will be reported with the results of this study.

Meteorological monitoring	12. The existing Roydon Quarry meteorological station (as required by Condition 16 of Consent CRC224104) is used to provide 10 minute average meteorological data in parallel to the PM monitoring results. Note: This existing station's location requirements are appropriate for the RCS monitoring study and is listed as follows in Condition 16. Located on the Fulton Hogan quarry property or nearby surrounding land in accordance with *AS/NZS 3580:14-2014 Methods for sampling and analysis of ambient air – Part 14 Meteorological monitoring for ambient air quality monitoring applications* Condition 16 also specifies appropriate instrumentation as follows. a. wind speed as 10-minute scalar averages with maximum resolution of 0.1 metres per second (m/s), have an accuracy of at least within +/-0.2 m/s, and a stall speed no greater than 0.5 m/s b. wind direction as 10-minute vector averages with maximum resolution of 1.0 degree and accuracy of at least within +/-1.0 degree, and a stall speed no greater than 0.5 m/s c. screened temperature with accuracy of +/- 0.5 degree d. relative humidity with an accuracy of +/- 5% As a backup, a Luftt weather station is installed at the study location, this will be utilised if data from the onsite station is unavailable.
Analysis of PM4 and RCS levels	13. The RCS concentrations as a function of different prevalent winds and quarrying status will be compared to guideline health criteria. 14. The regression equations (discussed in 6 and 7) would be applied to the results of PM_4 produced by the continuous OPC monitor, so to establish the concentrations of RCS on days including those when gravimetric measurements are not undertaken, and for hourly and annual average time frames. 15. Given sufficient data, the relationship between prevalent wind conditions, site operational status and the RCS concentrations will be investigated. The findings of this analysis will be used to assess the likely RCS concentrations associated with continuous measured 1-hour average concentrations of PM_4 when accounting for different prevalent wind conditions – *this will require multi samples for different prevalent daily wind conditions to highlight any change in RCS content of PM when downwind of the operating quarry versus other prevalent wind directions*

Testing laboratories	The analysis for crystalline silica will be carried out in a laboratory accredited by IANZ or NATA for XRD method of measuring of crystalline silica on filters. Note due to quartz being the expected dominant form of RCS, only alpha quartz will be analysed. RCS forms will be confirmed via quarry material being sampled.
Monitoring campaign timing & duration	Condition 20 of the Consent requires two 6-month duration monitoring programmes (to be designed and implemented following the commencement of quarrying operations. Condition 20 does not prescribe how soon after quarrying operations have commenced, or the extent to which quarrying operations have reached their maximum dust generating potential. It is considered that the intent was for the monitoring to be undertaken when the site activities (particularly aggregate crushing within the central processing area) had reached anticipated capacity and therefore greatest potential to produce an RCS discharge to air. That is, once all fixed crushing plant is fully operational and during the driest months of the year. This is occurring in the 2025/2026 proposed monitoring period. Therefore two consecutive RCS monitoring programmes are proposed to undertaken over 6 months within the months of 1 October and 31 May (inclusive) of 2025-2026 and 2026-2027. The DMP 7000 and associated Luft was installed and operational on 7am on 26 November 2025
Monitoring Design Certification	Condition 20 (e) required the above monitoring programme design to be provided to the CRC Manager for certification prior to being commenced. A draft design was provided and a meeting with ECan was provided in mid-2023 and no feedback was received. Draft methodology was provided in late September 2025, subsequent questions were received on 10 October 2025 and these have been responded to within this updated methodology.
Reporting	Condition 21 of the Consent requires each RCS monitoring campaign to be reported within two months of the completion of, the consent holder must prepare a report outlining the results of the programme and any implications of RCS generated by quarrying operations for human health, particular for that of the residents of Templeton and the occupants of any residential dwellings located with 500 metres of Stage 1 quarrying operations. The report must be provided to the CRC Manager, the Canterbury District Health Board (CDHB) and members of the Community Liaison Group. The report must also be accessible on a publicly available electronic sharing platform. **Comments/Recommendations:** To achieve the Condition 21 reporting requirement, analysis of the RCS fraction within filter collected respirable dust samples would provide the concentration of ambient RCS during days when quarry activities are generally upwind of the monitoring site. This fraction would be applied to same period PM_4 concentrations recorded using the DMP7000 (after equivalence adjustment)

	for these specific periods. Likewise, the RCS concentration will be assessed, for specific days where quarry activities have ceased, or when these activities were not upwind the monitoring site. All hourly RCS, 24-hour $PM_{2.5}$ and annual average $PM_{2.5}$ and RCS will be compared to the criteria specified in Condition 20(a). Note, it would be inappropriate to use NZ WES health criteria, as these relate to results produced by samplers, which are attached on people (not static).

Appendix B Site Selection Memorandum

Technical Memorandum

Ref: 2024-011-009_1-M Oct2025

To:	Laura Aitken, Fulton Hogan Limited
CC:	Richard Smith
From:	PortHill
Date:	21 October 2025
Subject:	Respirable Crystalline Silica (RCS) Study - Monitor Location
Attachment:	Field Deployment Checklist

Introduction

Fulton Hogan's air discharge consent for Roydon Quarry requires two summertime ambient RCS monitoring programmes to confirm the impact of quarrying activities on ambient RCS levels within the urban area of Templeton (Air Discharge Consent CRC224104, Condition 20).

This memorandum provides a recommendation for the location of the RCS Monitoring equipment which includes a calibrated DMP 7000 monitor with Luff Meteorological station and a gravimetric sampling device.

A field siting deployment checklist, detailing these requirements is also attached to this memorandum.

Location considerations

The Christchurch City Council owned land to the east of the quarry and west of the Templeton township has been identified as being a suitable and available location to undertake the monitoring. The property is shown in Figure 1.

Port Hill Limited
45 Winsor Crescent, Spreydon, Christchurch, 8024, New Zealand
Email: admin@port-hill.com

Figure 1: CCC Owned Land

A location on the boundary, indicated via the placemark icon, is expected to have a potential ambient dust exposure from the Roydon Quarry Central Processing Area (CPA) and surrounding quarrying activities (which is visible on the southwest corner of Figure 1), which would be representative of that occurring within the nearest areas of Templeton township. To assist in determining an appropriate location on this boundary, the study period (November to May) wind frequency was reviewed and a site visit undertaken.

Wind frequency and speed during November to May and for the past 4 years is shown in Figure 2. From this, it is clear that out of the general westerly wind conditions that result in the CPSA being upwind of the Templeton township, the WNW winds are the most frequent and strongest and therefore most likely to liberate dust from the CPA and disperse it towards Templeton. Therefore, a monitoring location at the southern end of the eastern boundary indicated in Figure 1 is considered to be appropriate.

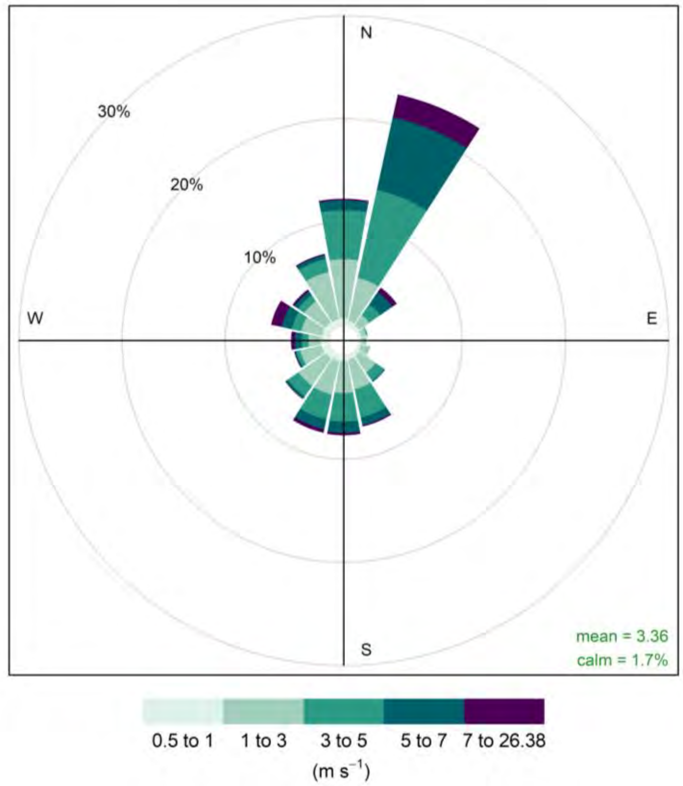


Figure 2: Wind Rose from onsite met station data November to May 2021-2024

A review of aerial imagery and a site visit by PortHill Staff and ECan staff (Teresa Aberkane) on 17 October 2025 identified the following in regard to the southeast corner of the CCC owned land:

- A tall 10 m+ shelterbelt of trees was present on the southern boundary
- Jones Road is approximately 6 m from the southern boundary and the railway line and SH1 are within 100m of the same boundary
- A residential property is located off Jones Road and within 5m of the eastern boundary, no chimney (indicating sold fuel heating) was observed.
- There appeared to be a horse racing/training track adjacent to eastern boundary. It is unclear how frequently this is used.
- The length of the eastern boundary includes an approximately 4m high dense hedge
- The CCC paddock had recently been worked up and had no vegetation. Based on the land use, it is expected that this has been seeded or will be soon.
- A drainage ditch is fenced off from the main paddock. This runs parallel up the eastern boundary approximately 6m from the boundary fence.

Based on the above, and to meet siting guidance[1] a location 50 m from Jones Road (approximately 45 m from the southern boundary fence) and at preferably 10 m from the hedge on the eastern boundary fence is recommended. The above features and recommended location are shown in Figure 3. Note for practical reasons, locating the monitors slightly closer to the eastern boundary i.e., on or immediately adjacent to the drainage ditch fence may be preferable and would be an acceptable monitoring location.

[1] AS/NZS 3580.1.1:2016 Methods for sampling and analysis of air - Guide to siting air monitoring equipment

LEGEND

Residential property
Proposed monitor location
Shelterbelt
Hedge
Horse racing track
Railway
Fenced drainage ditch

CLIENT AND PROJECT					CONSULTANT
Fulton Hogan Limited RCS Study					PORTHILL
TITLE Monitor Location					NOTES 1. Aerial: LINZ Data Service. 2. Schematic only, not to be interpreted as an engineering desgin or construction drawing. 3. Reference Scale: 1:2,000
DOCUMENT NUMBER 2024-011-009	FIGURE 3	DRAWN IX	APPROVED CN	DATE 17/10/2025	0 25 50 m

File Ref: C:\Users\iris8\Port Hill Limited\2024-011 Fulton Hogan Limited Dawsons Road - Project Files\5. Technical Work\Port Hill Data\RCS study\Wind Analysis for siting\GIS\RCS.qgz

Check list for Deployment of Monitors

The previously provided deployment check lists should be completed on deployment, for convenience a copy is attached.

Checklist for Field Deployment

<table>
<tr><td>Date:</td><td>Staff Name:</td></tr>
<tr><td>Monitor Name</td><td>Includes Lufft weather station? ☐ Yes ☐ No</td></tr>
<tr><td>Last colocation date____________________</td><td>Less than 12 months ago? ☐ Yes ☐ No (If no this device needs to be co-located before being redeployed)</td></tr>
<tr><td>Next colocation due____________________</td><td>Check this, as well as any manufactures maintenance requirements are in the consents management scheduling calendar</td></tr>
<tr><td colspan="2">Location (please tick one):
Consent required locations: ☐ Southeast corner ☐ Southwest corner ☐ Northwest corner
Other: ☐ Western boundary ☐ Other____</td></tr>
<tr><td colspan="2">Siting requirements
Distance from road greater than 2m ? ☐ Yes ☐ No
Air inlet height between 2 and 3 m? ☐ Yes ☐ No Air inlet height ________m</td></tr>
<tr><td colspan="2">Manufacture Installation check list. (See TES1000144_DMP Installation Checklist_Rev A or Dust master Pro 7000 series Manual for more detail.)
Physical
Is the DMP system set up on level ground? ☐ Yes ☐ No
Is the DMP setup away from regular flood areas? ☐ Yes ☐ No
Foliage and vegetation cleared from the installation area? ☐ Yes ☐ No
Obstructions
Is distance to any obstructions (shed, structure, bund etc) > 1 m? ☐ Yes ☐ No
Any Obstructions (shed, structure, bund etc) within 50m of DMP taller than the air inlet height? ☐ Yes ☐ No
If yes:
Distance from any solid obstruction_____ m. Height of obstruction above air inlet ____m
Is distance from obstruction more than twice height of obstruction above air inlet? ☐ Yes ☐ No
Is distance to tree(s) >10 m ☐ Yes ☐ No
Minimum clear sky angle >120 degrees ☐ Yes ☐ No
Solar
Solar panel(s) facing true north? (Use compass) ☐ Yes ☐ No
Have the solar panel(s) been placed away from shading (trees, buildings, etc.)? ☐ Yes ☐ No
Solar panels tilt angle_________ (from ground) Optimum: 32° in summer and 57° in winter
Luft Weather station (if applicable)
Has the Lufft been set up facing north? ☐ Yes ☐ No
Confirmed with compass of Lufft sensor? (DMP Main Screen, Press the Left Button, then press the Down Button until the below screen is shown. ‘’Compass: X Deg’’) ☐ Yes ☐ No
Lufft sensor is 2m above ground level? ☐ Yes ☐ No
Confirm Met arm (if fitted) is level ☐ Yes ☐ No</td></tr>
<tr><td colspan="2">Comments (please comment if any answer above is “no”):</td></tr>
<tr><td colspan="2">Office Use: Check maintenance and colocation schedule due dates are recorded, confirm monitor is sending data and GPS is updated for new location.</td></tr>
</table>

Appendix C PM Equivalence

1. Introduction

This appendix describes the process of developing correction factors for PM_{10}, $PM_{2.5}$ and PM_4 measured by DMP7000 using the 1-hour and 24-hour averaged DMP7000 and T640x data.

2. Data collection

The following raw ambient monitoring data from 13 December 2024 to 4 February 2025 , and from 18 June to 6 August 2025 were collected for the development of correction factors:

- 1-minute average PM_{10}, $PM_{2.5}$ and PM_4 concentrations recorded by the USEPA certified T640x monitor.
- 1-minute average PM_{10}, $PM_{2.5}$, PM_4, and PM_1 concentrations recorded by the DMP 7000 monitor No. FH07.0624.536 (DMP 536).

3. Pre-processing raw data

It is noted that while T640x is recording date and time in New Zealand Standard Time (NZST), the DMP7000 monitor was recording date and time in a non-New Zealand time zone during the first summer colocation. Therefore, the raw timestamps from the DMPs raw data set were adjusted to NZST as follows:

- DMP 536 time = NZST – 1:00

Following relevant timestamp adjustment, hourly and daily averages were calculated for each monitor. When data capture was less than 75% during the averaging period, no average value was calculated for that period. This approach is consistent with Ministry for Environment data quality assurance methods (Ministry for the Environment, 2009). Daily (24-hour averages) were calculated based on midnight to midnight time period and reported at midnight each day, in line with the NES requirements.

For subsequent periods the DMPs were configured to record in NZST.

4. Calibration method

The calibration of the DMP 7000 monitor for 1-hour and 24-hour $PM_{10,}$ $PM_{2.5}$ and PM_4 was based on best fit regression equations comparing the DMP measurements with those from the co-located T640x monitor. Orthogonal regressions were used, as this method is most suitable for establishing correlation between two measurements when both x and y variables have associated measurement errors or uncertainties.

Both the T640x and DMP monitors have error in their measured 1-hour and 24-hour $PM_{10,}$ $PM_{2.5}$ and PM_4 values. In such cases, an orthogonal regression is expected to provide a more accurate regression line compared to a linear regression. This regression method is also recommended in standard methods for confirming the equivalency of PM_{10} monitoring devices with NES certified methods[1], and is further discussed by (Aberkane T. , 2019).

[1] AS/NZS 3580.9.17:2018 Demonstration of equivalence for ambient particulate matter monitoring methods

5. Equivalency Test

Equivalency tests have been undertaken to evaluate whether the DMP7000 measured values can pass the equivalency test after calibration. The tests follow the procedures listed in AS/NZS 3580.9.17:2018 *Demonstration of equivalence for ambient particulate matter monitoring methods* and Particulate Matter equivalency testing and co-location guide (Mote 2024).

The T640x uncertainty and limit value used in the tests are presented in Table 1.

Table 1: Uncertainties and limit values used in the equivalency test.

Contaminants	Averaging period	T640x uncertainty µg/m^3	Limit value µg/m^3	Notes
PM_{10}	1-hr	1.25	150	• 1-hour threshold value for dust is used for the limit value • 1.25 µg/m^3 is used for the uncertainty
	24-hr	1.25	50	• 1.25 µg/m^3 is used for the uncertainty • The 24 hr NES criteria is used for the limit value
$PM_{2.5}$	1-hr	1.49	7	• Assume 15% of the average T640x value is the uncertainty • Assume average T640x value is the limit value
	24-hr	1.49	25	• Assume 15% of the average T640x value is the uncertainty • The 24 hr NES criteria is used for the limit value
PM_4	1-hr	1.52	47	• Assume 15% of the average T640x value is the uncertainty • The 1-hr criteria for RCS is used for the limit value
	24-hr	1.51	25	• Assume 15% of the average T640x value is the uncertain • nty

				• The 24-hr criteria for PM2.5 is used for the limit value

6. Results

Contaminants	Averaging period	Correction equation	Expanded uncertainty before correction	Expanded uncertainty after correction	Pass or fail
PM10	1-hr	DMP536c = DMP536r / 1.01+ 1.22 $R^2 = 0.59$	8.58	17.5	PASS (both raw and corrected data)
	24-hr	DMP536c = DMP536r / 1.08+ 2.08 $R^2 = 0.7$	15.3	17.87	PASS (both raw and corrected data)
PM2.5	**1-hr**	**DMP536c = DMP536r / 0.78 - 1.6** $\mathbf{R^2 = 0.55}$	**94.8**	**131.2**	**FAIL**
	24-hr	DMP536c = DMP536r / 1+ 0.32 $R^2 = 0.51$	18.6	23.68	PASS (both raw and corrected data)
PM4	1-hr	DMP536c = DMP536r / 1.02- 0.59 $R^2 = 0.62$	19.96	18.6	PASS (both raw and corrected data)
	24-hr	DMP536c = DMP536r / 1.22+ 1.14 $R^2 = 0.68$	38.62	21.7	PASS (after correction)

7. References

Aberkane, T. (2019). *Evaluation of PM Instruments in New Zealand*. Queenstown, New Zealand: CASANZ19.

Ministry for the Environment. (2009). *Good Practice Guide for Air Quality Monitoring and Data Management*. Wellington: Ministry for the Environment. Retrieved from https://www.mfe.govt.nz/sites/default/files/good-practice-guide-for-air-quality.pdf

Appendix D RCS Sampling and Laboratory Results

Canterbury Laboratory

24 Miners Road, Templeton
PO Box 16 064, Christchurch 8441
Telephone + 64 3 349 9142
0800 Laboratory
Email Cant.Lab@fultonhogan.com
www.fultonhogan.com

Respirable Crystalline Silica Report

Laboratory Reference:	CAN26W0054
Client:	Fulton Hogan Ltd
Sample Location:	Templeton Boundary Monitoring Location -43.5575, 172.4634
Sampling dates:	December 2025 – May 2026
Tested by:	James Piesse BSc(chem), TNZOHS
Test method:	AS 2985:2009 (Respirable Particulate)
Report issue date:	31/07/2026
Report issue number:	2

Report prepared by:

James Piesse. BSc(chem)
(Environmental Laboratory Supervisor)

Report reviewed by:

Liam Brennan, BSc (Geol, Geog)
(Supply Chain Technical Expert)

Important Information

This report has been prepared by Fulton Hogan Canterbury Laboratory on the specific instructions of our Client.
It is solely for the Client's use for the purpose which it is intended with the agreed scope of work.
Any use or reliance by any person contrary to the above, to which Fulton Hogan Canterbury Laboratory has not given its prior, written consent, is at that person's own risk.

Introduction

The Fulton Hogan Ltd Canterbury Laboratory was engaged by Fulton Hogan Ltd to perform the gravimetric sampling and analysis of respirable particulate matter at the Templeton Boundary Monitoring Location (approximately -43.5575, 172.4634) between the months of December 2025 and May 2026.

Sampling Methodology

Sampling was performed in accordance with AS 2985:2009 (Workplace atmospheres - Method for sampling and gravimetric determination of respirable dust) with the exception that the monitor was placed in a static location rather than attached to a person.

A Casella Apex 2 pump was used to draw air through a Casella respirable particulate cyclone containing pre-weighed PVC filters.
Each PVC filter was weighed before and after sampling to determine the mass of particulate captured, and were subsequently analysed for crystalline silica content by a subcontracted laboratory (Agon Environmental).
The flow rate of air was calibrated at the beginning and end of each sampling period using a Casella Flow Detective.

The sampling location and duration was defined by Port Hill Limited. Further definition of the sampling methodology (inclusive of sampling times) was developed between Fulton Hogan Canterbury Laboratory and representatives from Port Hill Limited.

Sample dates from the 12/05/2026 until 29/05/2026 were left out for longer intervals in comparison to the rest of the sampling, however the flow rate was still being checked every 24 hours.

Commentary on Suitability of Sampling:
The Fulton Hogan Canterbury Laboratory is an IANZ (International Accreditation New Zealand) accredited facility for Chemical and Mechanical testing. IANZ accreditation is an internationally recognised standard for Laboratories to perform testing in accordance with the ISO 17025 standard. The 17025 standard sets out strict specifications for adhering to impartiality and confidentiality of testing to the set methodologies held within the organisations scope of testing and sampling. The Fulton Hogan Laboratory is routinely audited on an annual basis by IANZ representatives, most recently as July 2026. The Canterbury laboratory has been an accredited facility since 1983, demonstrating a long-standing commitment to independent testing. With regards to atmospheric dust sampling, the Laboratory was assessed for and granted IANZ accreditation for the AS2985-2009 workplace atmospheres methods for sampling and gravimetric determination of inhalable and respirable dusts at the 2026 audit.

Monitoring Results

Sample ID	Sample Valid?	Sample start date/time	Sample end date/time	Blank corrected weight gain (mg)	Blank corrected respirable dust concentration (mg/m^3)	RCS mass (µg)	RCS concentration (mg/m^3)
CAN26O-0004	FALSE	5/01/2026 15:07	6/01/2026 15:06	0.0150	0.0050	<4	<0.0013
CAN26O-0005	TRUE	6/01/2026 15:15	7/01/2026 15:12	0.0250	0.0078	<4	<0.0013
CAN26O-0006	TRUE	7/01/2026 15:16	8/01/2026 15:00	0.0200	0.0063	<4	<0.0013
CAN26O-0210	TRUE	13/01/2026 10:30	14/01/2026 10:57	0.0200	0.0063	<4	<0.0013
CAN26O-0211	FALSE	14/01/2026 11:11	15/01/2026 11:27	-0.0050	-0.0016	<4	<0.0013
CAN26O-0216	TRUE	9/02/2026 9:45	10/02/2026 9:35	0.0425	0.0138	<4	<0.0013
CAN26O-0217	TRUE	10/02/2026 9:40	11/02/2026 13:00	0.0575	0.0161	<4	<0.0011
CAN26O-0218	TRUE	13/02/2026 13:17	14/02/2026 13:15	0.0275	0.0089	<4	<0.0013
CAN26O-0219	TRUE	17/02/2026 12:00	18/02/2026 12:23	0.0225	0.0070	<4	<0.0012
CAN26O-0220	FALSE	18/02/2026 12:30	19/02/2026 12:30	0.0175	0.0057	<4	<0.0013
CAN26O-0221	FALSE	19/02/2026 12:40	20/02/2026 12:45	0.0575	0.0185	<4	<0.0013
CAN26O-0222	TRUE	20/02/2026 12:27	21/02/2026 12:45	0.0075	0.0024	<4	<0.0013
CAN26O-0223	TRUE	23/02/2026 10:50	24/02/2026 10:35	0.0375	0.0120	<4	<0.0013
CAN26O-0224	TRUE	24/02/2026 10:45	25/02/2026 14:20	0.0675	0.0185	<4	<0.0011
CAN26O-0225	TRUE	25/02/2026 14:30	26/02/2026 14:26	0.1025	0.0320	<4	<0.0013
CAN26O-0226	TRUE	27/02/2026 8:15	28/02/2026 8:35	0.0225	0.0070	<4	<0.0012
CAN26O-0316	FALSE	3/03/2026 7:15	4/03/2026 7:10	0.0175	0.0053	<4	<0.0012
CAN26O-0317	TRUE	4/03/2026 7:15	5/03/2026 7:20	0.0075	0.0024	<4	<0.0013
CAN26O-0318	TRUE	5/03/2026 7:25	6/03/2026 7:18	0.0325	0.0101	<4	<0.0012
CAN26O-0319	TRUE	6/03/2026 7:28	7/03/2026 7:40	0.0225	0.0070	<4	<0.0012
CAN26O-0320	TRUE	9/03/2026 7:00	10/03/2026 7:10	0.0275	0.0084	<4	<0.0012
CAN26O-0321	TRUE	10/03/2026 7:20	11/03/2026 7:20	0.0125	0.0039	<4	<0.0013
CAN26O-0322	TRUE	11/03/2026 7:25	12/03/2026 7:22	0.0075	0.0024	<4	<0.0013
CAN26O-0323	TRUE	12/03/2026 7:30	13/03/2026 7:30	0.0225	0.0072	<4	<0.0013
CAN26O-0324	TRUE	16/03/2026 7:15	17/03/2026 7:15	0.0175	0.0054	<4	<0.0012
CAN26O-0325	TRUE	17/03/2026 7:20	18/03/2026 7:20	0.0225	0.0071	<4	<0.0013
CAN26O-0326	TRUE	18/03/2026 7:25	19/03/2026 7:25	0.0375	0.0115	<4	<0.0012
CAN26O-0327	TRUE	19/03/2026 7:30	20/03/2026 7:30	0.0225	0.0071	<4	<0.0013

Sample ID	Sample Valid?	Sample start date/time	Sample end date/time	Blank corrected weight gain (mg)	Blank corrected respirable dust concentration (mg/m³)	RCS mass (µg)	RCS concentration (mg/m³)
CAN26O-0328	FALSE	20/03/2026 7:40	21/03/2026 7:40	0.0025	0.0008	<4	<0.0012
CAN26O-0329	TRUE	23/03/2026 8:21	24/03/2026 9:30	0.0325	0.0097	<4	<0.0012
CAN26O-0330	TRUE	24/03/2026 9:42	25/03/2026 9:58	0.0175	0.0054	<4	<0.0012
CAN26O-0331	TRUE	25/03/2026 10:01	26/03/2026 8:10	-0.0025	-0.0009	<4	<0.0014
CAN26O-0378	TRUE	30/03/2026 7:35	31/03/2026 8:00	-0.0050	-0.0015	<4	<0.0012
CAN26O-0379	TRUE	31/03/2026 10:15	1/04/2026 10:15	0.0150	0.0046	<4	<0.0012
CAN26O-0380	TRUE	1/04/2026 10:20	2/04/2026 10:22	0.0350	0.0111	<4	<0.0013
CAN26O-0381	TRUE	7/04/2026 7:25	8/04/2026 7:40	0.0650	0.0205	<4	<0.0013
CAN26O-0382	TRUE	8/04/2026 7:45	9/04/2026 8:10	0.0300	0.0092	<4	<0.0012
CAN26O-0383	TRUE	9/04/2026 8:15	10/04/2026 8:15	0.0350	0.0110	<4	<0.0013
CAN26O-0384	TRUE	10/04/2026 8:20	11/04/2026 8:20	0.0100	0.0031	<4	<0.0013
CAN26O-0385	TRUE	13/04/2026 7:30	14/04/2026 7:30	0.0350	0.0109	<4	<0.0012
CAN26O-0386	TRUE	14/04/2026 7:38	15/04/2026 7:40	0.0100	0.0031	<4	<0.0013
CAN26O-0387	TRUE	15/04/2026 7:43	16/04/2026 7:42	0.0400	0.0125	<4	<0.0012
CAN26O-0388	TRUE	16/04/2026 7:50	17/04/2026 9:05	0.0300	0.0090	<4	<0.0012
CAN26O-0389	TRUE	17/04/2026 9:15	18/04/2026 9:30	0.0150	0.0047	<4	<0.0012
CAN26O-0390	TRUE	20/04/2026 7:20	21/04/2026 7:25	0.0250	0.0078	<4	<0.0012
CAN26O-0391	TRUE	21/04/2026 7:30	22/04/2026 7:30	0.0600	0.0188	<4	<0.0013
CAN26O-0392	TRUE	22/04/2026 7:40	23/04/2026 7:43	0.0300	0.0092	<4	<0.0012
CAN26O-0393	TRUE	23/04/2026 7:50	24/04/2026 7:50	0.0350	0.0109	<4	<0.0012
CAN26O-0480	TRUE	24/04/2026 9:00	25/04/2026 9:30	0.0400	0.0125	<4	<0.0013
CAN26O-0481	TRUE	28/04/2026 6:45	29/04/2026 6:50	0.0250	0.0078	<4	<0.0013
CAN26O-0482	TRUE	29/04/2026 6:55	30/04/2026 7:15	0.0250	0.0077	<4	<0.0012
CAN26O-0483	TRUE	30/04/2026 7:20	1/05/2026 7:15	0.0050	0.0016	<4	<0.0012
CAN26O-0484	TRUE	1/05/2026 7:20	2/05/2026 8:00	0.0200	0.0061	<4	<0.0012
CAN26O-0485	TRUE	4/05/2026 7:00	5/05/2026 7:05	0.0550	0.0174	<4	<0.0013
CAN26O-0486	TRUE	5/05/2026 7:10	6/05/2026 7:10	0.0500	0.0155	<4	<0.0012
CAN26O-0487	TRUE	6/05/2026 7:15	7/05/2026 7:15	0.0200	0.0064	<4	<0.0013

Sample ID	Sample Valid?	Sample start date/time	Sample end date/time	Blank corrected weight gain (mg)	Blank corrected respirable dust concentration (mg/m^3)	RCS mass (µg)	RCS concentration (mg/m^3)
CAN26O-0488	TRUE	7/05/2026 7:23	8/05/2026 7:25	0.0050	0.0016	<4	<0.0013
CAN26O-0489	TRUE	8/05/2026 7:30	9/05/2026 7:35	0.0700	0.0219	<4	<0.0013
CAN26O-0490	FALSE	9/05/2026 7:40	12/05/2026 8:28	0.1000	0.0099	<4	<0.0004
CAN26O-0491	TRUE	12/05/2026 8:33	15/05/2026 11:30	0.0700	0.0071	<4	<0.0004
CAN26O-0554	TRUE	15/05/2026 11:35	19/05/2026 10:39	0.1150	0.0094	<4	<0.0003
CAN26O-0555	TRUE	19/05/2026 10:42	22/05/2026 14:26	0.0900	0.0093	<4	<0.0004
CAN26O-0556	TRUE	22/05/2026 14:26	26/05/2026 11:49	0.1600	0.0129	<4	<0.0003
CAN26O-0557	TRUE	26/05/2026 11:51	29/05/2026 10:37	0.0750	0.0079	<4	<0.0004

Appendices

Appendix 1 Raw Data

Sample Number		1	2	3	4	5	6	7	8	9	10
Field Notes	Filter ID	W	X	Y	Z	AI	AQ	AR	AV	AO	AL
	Pump ID	714	714	714	714	714	714	714	714	714	714
	Flow Detective ID	702	702	702	702	702	701	701	701	701	701
	Pre-sampling flow rate (L/min)	2.201	2.205	2.247	2.209	2.060	2.204	2.201	2.153	2.215	2.210
	Name of setup person	James	James	James	James	James	Leon	Leon/Liam	Liam	Liam	Liam
	Sample start date/time	5/01/2026 15:07	6/01/2026 15:15	7/01/2026 15:16	13/01/2026 10:30	14/01/2026 11:11	9/02/2026 9:45	10/02/2026 9:40	13/02/2026 13:17	17/02/2026 12:00	18/02/2026 12:30
	Photo taken	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Sample end date/time	6/01/2026 15:06	7/01/2026 15:12	8/01/2026 15:00	14/01/2026 10:57	15/01/2026 11:27	10/02/202 6 9:35	11/02/2026 13:00	14/02/2026	18/02/2026 12:23	19/02/2026 12:30
	Name of pick-up person	James	James	James	James	James	Leon	Leon	Liam	Liam	Liam
	Post-sampling flow rate (L/min)	1.932	2.232	2.200	2.143	2.241	2.104	2.155	2.146	2.160	2.080
	Sample ID	CAN26O-0004	CAN26O-0005	CAN26O-0006	CAN26O-0210	CAN26O-0211	CAN26O-0216	CAN26O-0217	CAN26O-0218	CAN26O-0219	CAN26O-0220
	Notes	Significant temperature difference between setup and pickup									Earwig in the pump tubing
Volume Calculation	Average Flow Rate (L/min)	2.0665	2.2185	2.2235	2.1760	2.1505	2.1540	2.1780	2.1495	2.1875	2.1450
	Flow rates within 5% of initial flowrate?	FALSE	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE
	Sample time (min)	1439	1437	1424	1467	1456	1430	1640	1438	1463	1440
	Sample volume (m3)	2.97	3.19	3.17	3.19	3.13	3.08	3.57	3.09	3.20	3.09
Respirable Particulate Weights	Weighing date	9/02/2026	9/02/2026	9/02/2026	9/02/2026	9/02/2026	2/03/2026	2/03/2026	2/03/2026	2/03/2026	2/03/2026
	Sample pre-sampling filter weight (g)	0.00675	0.00635	0.005605	0.006645	0.006615	0.00598	0.006145	0.005895	0.00591	0.006045
	Sample post-sampling filter weight (g)	0.00677	0.00638	0.00563	0.00667	0.006615	0.00602	0.0062	0.00592	0.00593	0.00606
	Sample Filter weight gain (mg)	0.02	0.03	0.025	0.025	0	0.04	0.055	0.025	0.02	0.015
	Blank filter 1 ID	AE	AE	AE	AE	AE	AM	AM	AM	AM	AM
	Blank filter 1 pre-sampling weight (g)	0.00658	0.00658	0.00658	0.00658	0.00658	0.006235	0.006235	0.006235	0.006235	0.006235
	Blank filter 1 post-sampling weight (g)	0.00658	0.00658	0.00658	0.00658	0.00658	0.00623	0.00623	0.00623	0.00623	0.00623
	Blank filter 1 weight gain (mg)	0	0	0	0	0	-0.005	-0.005	-0.005	-0.005	-0.005
	Blank filter 2 ID	AF	AF	AF	AF	AF	AN	AN	AN	AN	AN
	Blank filter 2 pre-sampling weight (g)	0.00603	0.00603	0.00603	0.00603	0.00603	0.00577	0.00577	0.00577	0.00577	0.00577
	Blank filter 2 post-sampling weight (g)	0.00604	0.00604	0.00604	0.00604	0.00604	0.00577	0.00577	0.00577	0.00577	0.00577
	Blank filter 2 weight gain (mg)	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0
	Average blank filter weight gain (mg)	0.005	0.005	0.005	0.005	0.005	-0.0025	-0.0025	-0.0025	-0.0025	-0.0025
	Blank corrected weight gain (mg)	0.015	0.025	0.02	0.02	-0.005	0.0425	0.0575	0.0275	0.0225	0.0175
	Blank corrected respirable dust concentration (mg/m3)	0.00504	0.00784	0.00632	0.00627	-0.00160	0.01380	0.01610	0.00890	0.00703	0.00567
RCS calculations	RCS mass (µg)	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
	RCS concentration (mg/m3)	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0011	<0.0013	<0.0012	<0.0013
	RCS as a percentage of respirable dust	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sample Number		11	12	13	14	15	16	17	18	19	20
Field Notes	Filter ID	AP	AS	AK	X	AB	AU	AR	AS	AN	AL
	Pump ID	714	714	714	714	714	714	714	714	714	714
	Flow Detective ID	701	701	701	701	701	701	701	701	701	701
	Pre-sampling flow rate (L/min)	2.221	2.219	2.219	2.222	2.235	2.208	2.226	2.207	2.239	2.225
	Name of setup person	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam
	Sample start date/time	19/02/2026 12:40	20/02/2026 12:27	23/02/2026 10:50	24/02/2026 10:45	25/02/2026 14:30	27/02/2026 8:15	3/03/2026 7:15	4/03/2026 7:15	5/03/2026 7:25	6/03/2026 7:28
	Photo taken	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Sample end date/time	20/02/2026 12:45	21/02/2026 12:45	24/02/2026 10:35	25/02/2026 14:20	26/02/2026 14:26	28/02/2026 8:35	4/03/2026 7:10	5/03/2026 7:20	6/03/2026 7:18	7/03/2026 7:40
	Name of pick-up person	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam
	Post-sampling flow rate (L/min)	2.084	2.120	2.149	2.193	2.221	2.218	2.341	2.126	2.261	2.224
	Sample ID	CAN26O-0221	CAN26O-0222	CAN26O-0223	CAN26O-0224	CAN26O-0225	CAN26O-0226	CAN26O-0316	CAN26O-0317	CAN26O-0318	CAN26O-0319
	Notes										
Volume Calculation	Average Flow Rate (L/min)	2.1525	2.1695	2.1840	2.2075	2.2280	2.2130	2.2835	2.1665	2.2500	2.2245
	Flow rates within 5% of initial flowrate?	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE
	Sample time (min)	1445	1458	1425	1655	1436	1460	1435	1445	1433	1452
	Sample volume (m3)	3.11	3.16	3.11	3.65	3.20	3.23	3.28	3.13	3.22	3.23
Respirable Particulate Weights	Weighing date	2/03/2026	2/03/2026	2/03/2026	2/03/2026	2/03/2026	2/03/2026	1/04/2026	1/04/2026	1/04/2026	1/04/2026
	Sample pre-sampling filter weight (g)	0.006255	0.005735	0.00622	0.005465	0.00683	0.006635	0.00581	0.00578	0.005785	0.00632
	Sample post-sampling filter weight (g)	0.00631	0.00574	0.006255	0.00553	0.00693	0.006655	0.00582	0.00578	0.00581	0.006335
	Sample Filter weight gain (mg)	0.055	0.005	0.035	0.065	0.1	0.02	0.01	0	0.025	0.015
	Blank filter 1 ID	AM	AM	AM	AM	AM	AM	AB	AB	AB	AB
	Blank filter 1 pre-sampling weight (g)	0.006235	0.006235	0.006235	0.006235	0.006235	0.006235	0.00576	0.00576	0.00576	0.00576
	Blank filter 1 post-sampling weight (g)	0.00623	0.00623	0.00623	0.00623	0.00623	0.00623	0.00578	0.00578	0.00578	0.00578
	Blank filter 1 weight gain (mg)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	0.02	0.02	0.02	0.02
	Blank filter 2 ID	AN	AN	AN	AN	AN	AN	AD	AD	AD	AD
	Blank filter 2 pre-sampling weight (g)	0.00577	0.00577	0.00577	0.00577	0.00577	0.00577	0.005595	0.005595	0.005595	0.005595
	Blank filter 2 post-sampling weight (g)	0.00577	0.00577	0.00577	0.00577	0.00577	0.00577	0.00556	0.00556	0.00556	0.00556
	Blank filter 2 weight gain (mg)	0	0	0	0	0	0	-0.035	-0.035	-0.035	-0.035
	Average blank filter weight gain (mg)	-0.0025	-0.0025	-0.0025	-0.0025	-0.0025	-0.0025	-0.0075	-0.0075	-0.0075	-0.0075
	Blank corrected weight gain (mg)	0.0575	0.0075	0.0375	0.0675	0.1025	0.0225	0.0175	0.0075	0.0325	0.0225
	Blank corrected respirable dust concentration (mg/m3)	0.01849	0.00237	0.01205	0.01848	0.03204	0.00696	0.00534	0.00240	0.01008	0.00697
RCS calculations	RCS mass (µg)	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
	RCS concentration (mg/m3)	<0.0013	<0.0013	<0.0013	<0.0011	<0.0013	<0.0012	<0.0012	<0.0013	<0.0012	<0.0012
	RCS as a percentage of respirable dust	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sample Number		21	22	23	24	25	26	27	28	29	30
Field Notes	Filter ID	AQ	AU	X	AM	AT	AF	AG	AJ	AE	AA
	Pump ID	714	714	714	714	714	714	714	714	714	714
	Flow Detective ID	701	701	701	701	701	701	701	701	701	701
	Pre-sampling flow rate (L/min)	2.227	2.221	2.223	2.224	2.225	2.219	2.221	2.220	2.209	2.217
	Name of setup person	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Leon/James
	Sample start date/time	9/03/2026 7:00	10/03/2026 7:20	11/03/2026 7:25	12/03/2026 7:30	16/03/2026 7:15	17/03/2026 7:20	18/03/2026 7:25	19/03/2026 7:30	20/03/2026 7:40	23/03/2026 8:21
	Photo taken	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Sample end date/time	10/03/2026 7:10	11/03/2026 7:20	12/03/2026 7:22	13/03/2026 7:30	17/03/2026 7:15	18/03/2026 7:20	19/03/2026 7:25	20/03/2026 7:30	21/03/2026 7:40	24/03/2026 9:30
	Name of pick-up person	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Leon/James
	Post-sampling flow rate (L/min)	2.308	2.219	2.183	2.145	2.307	2.165	2.311	2.154	2.335	2.224
	Sample ID	CAN26O-0320	CAN26O-0321	CAN26O-0322	CAN26O-0323	CAN26O-0324	CAN26O-0325	CAN26O-0326	CAN26O-0327	CAN26O-0328	CAN26O-0329
	Notes										
Volume Calculation	Average Flow Rate (L/min)	2.2675	2.2200	2.2030	2.1845	2.2660	2.1920	2.2660	2.1870	2.2720	2.2205
	Flow rates within 5% of initial flowrate?	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	TRUE
	Sample time (min)	1450	1440	1437	1440	1440	1440	1440	1440	1440	1509
	Sample volume (m3)	3.29	3.20	3.17	3.15	3.26	3.16	3.26	3.15	3.27	3.35
Respirable Particulate Weights	Weighing date	1/04/2026	1/04/2026	1/04/2026	1/04/2026	1/04/2026	1/04/2026	1/04/2026	1/04/2026	1/04/2026	1/04/2026
	Sample pre-sampling filter weight (g)	0.006235	0.005615	0.00629	0.00624	0.00644	0.006925	0.005715	0.005655	0.00609	0.005895
	Sample post-sampling filter weight (g)	0.006255	0.00562	0.00629	0.006255	0.00645	0.00694	0.005745	0.00567	0.006085	0.00592
	Sample Filter weight gain (mg)	0.02	0.005	0	0.015	0.01	0.015	0.03	0.015	-0.005	0.025
	Blank filter 1 ID	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
	Blank filter 1 pre-sampling weight (g)	0.00576	0.00576	0.00576	0.00576	0.00576	0.00576	0.00576	0.00576	0.00576	0.00576
	Blank filter 1 post-sampling weight (g)	0.00578	0.00578	0.00578	0.00578	0.00578	0.00578	0.00578	0.00578	0.00578	0.00578
	Blank filter 1 weight gain (mg)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	Blank filter 2 ID	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD
	Blank filter 2 pre-sampling weight (g)	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595
	Blank filter 2 post-sampling weight (g)	0.00556	0.00556	0.00556	0.00556	0.00556	0.00556	0.00556	0.00556	0.00556	0.00556
	Blank filter 2 weight gain (mg)	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035
	Average blank filter weight gain (mg)	-0.0075	-0.0075	-0.0075	-0.0075	-0.0075	-0.0075	-0.0075	-0.0075	-0.0075	-0.0075
	Blank corrected weight gain (mg)	0.0275	0.0125	0.0075	0.0225	0.0175	0.0225	0.0375	0.0225	0.0025	0.0325
	Blank corrected respirable dust concentration (mg/m3)	0.00836	0.00391	0.00237	0.00715	0.00536	0.00713	0.01149	0.00714	0.00076	0.00970
RCS calculations	RCS mass (µg)	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
	RCS concentration (mg/m3)	<0.0012	<0.0013	<0.0013	<0.0013	<0.0012	<0.0013	<0.0012	<0.0013	<0.0012	<0.0012
	RCS as a percentage of respirable dust	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sample Number		31	32	33	34	35	36	37	38	39	40
Field Notes	Filter ID	AP	AC	AV	AH	Y	AL	AN	AJ	AP	AC
	Pump ID	714	714	714	714	714	714	714	714	714	714
	Flow Detective ID	701	701	701	701	701	701	701	701	701	701
	Pre-sampling flow rate (L/min)	2.210	2.200	2.218	2.215	2.204	2.209	2.206	2.215	2.215	2.218
	Name of setup person	Leon	Leon	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam
	Sample start date/time	24/03/2026 9:42	25/03/2026 10:01	30/03/2026 7:35	31/03/2026 10:15	1/04/2026 10:20	7/04/2026 7:25	8/04/2026 7:45	9/04/2026 8:15	10/04/2026 8:20	13/04/2026 7:30
	Photo taken	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	TRUE
	Sample end date/time	25/03/2026 9:58	26/03/2026 8:10	31/03/2026 8:00	1/04/2026 10:15	2/04/2026 10:22	8/04/2026 7:40	9/04/2026 8:10	10/04/2026 8:15	11/04/2026 8:20	14/04/2026 7:30
	Name of pick-up person	Leon	James	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam
	Post-sampling flow rate (L/min)	2.206	2.138	2.318	2.323	2.166	2.140	2.240	2.215	2.196	2.241
	Sample ID	CAN26O-0330	CAN26O-0331	CAN26O-0378	CAN26O-0379	CAN26O-0380	CAN26O-0381	CAN26O-0382	CAN26O-0383	CAN26O-0384	CAN26O-0385
	Notes										
Volume Calculation	Average Flow Rate (L/min)	2.2080	2.1690	2.2680	2.2690	2.1850	2.1745	2.2230	2.2150	2.2055	2.2295
	Flow rates within 5% of initial flowrate?	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Sample time (min)	1456	1329	1465	1440	1442	1455	1465	1440	1440	1440
	Sample volume (m3)	3.21	2.88	3.32	3.27	3.15	3.16	3.26	3.19	3.18	3.21
Respirable Particulate Weights	Weighing date	1/04/2026	1/04/2026	24/04/2026	24/04/2026	24/04/2026	24/04/2026	24/04/2026	24/04/2026	24/04/2026	24/04/2026
	Sample pre-sampling filter weight (g)	0.00618	0.00603	0.00526	0.006055	0.00636	0.00545	0.00533	0.005415	0.005985	0.005325
	Sample post-sampling filter weight (g)	0.00619	0.00602	0.00524	0.006055	0.00638	0.0055	0.005345	0.005435	0.00598	0.005345
	Sample Filter weight gain (mg)	0.01	-0.01	-0.02	0	0.02	0.05	0.015	0.02	-0.005	0.02
	Blank filter 1 ID	AB	AB	W	W	W	W	W	W	W	W
	Blank filter 1 pre-sampling weight (g)	0.00576	0.00576	0.006115	0.006115	0.006115	0.006115	0.006115	0.006115	0.006115	0.006115
	Blank filter 1 post-sampling weight (g)	0.00578	0.00578	0.0061	0.0061	0.0061	0.0061	0.0061	0.0061	0.0061	0.0061
	Blank filter 1 weight gain (mg)	0.02	0.02	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015
	Blank filter 2 ID	AD	AD	Z	Z	Z	Z	Z	Z	Z	Z
	Blank filter 2 pre-sampling weight (g)	0.005595	0.005595	0.006095	0.006095	0.006095	0.006095	0.006095	0.006095	0.006095	0.006095
	Blank filter 2 post-sampling weight (g)	0.00556	0.00556	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608
	Blank filter 2 weight gain (mg)	-0.035	-0.035	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015
	Average blank filter weight gain (mg)	-0.0075	-0.0075	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015
	Blank corrected weight gain (mg)	0.0175	-0.0025	-0.005	0.015	0.035	0.065	0.03	0.035	0.01	0.035
	Blank corrected respirable dust concentration (mg/m3)	0.00544	-0.00087	-0.00150	0.00459	0.01111	0.02054	0.00921	0.01097	0.00315	0.01090
RCS calculations	RCS mass (µg)	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
	RCS concentration (mg/m3)	<0.0012	<0.0014	<0.0012	<0.0012	<0.0013	<0.0013	<0.0012	<0.0013	<0.0013	<0.0012
	RCS as a percentage of respirable dust	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sample Number		41	42	43	44	45	46	47	48	49	50
Field Notes	Filter ID	AG	AU	AF	AM	AQ	AR	AA	AI	AE	AH
	Pump ID	714	714	714	714	714	714	714	714	714	714
	Flow Detective ID	701	701	701	701	701	701	701	701	701	701
	Pre-sampling flow rate (L/min)	2.204	2.218	2.217	2.215	2.216	2.205	2.219	2.218	2.219	2.218
	Name of setup person	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam
	Sample start date/time	14/04/2026 7:38	15/04/2026 7:43	16/04/2026 7:50	17/04/2026 9:15	20/04/2026 7:20	21/04/2026 7:30	22/04/2026 7:40	23/04/2026 7:50	24/04/2026 9:00	28/04/2026 6:45
	Photo taken	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Sample end date/time	15/04/2026 7:40	16/04/2026 7:42	17/04/2026 9:05	18/04/2026 9:30	21/04/2026 7:25	22/04/2026 7:30	23/04/2026 7:43	24/04/2026 7:50	25/04/2026 9:30	29/04/2026 6:50
	Name of pick-up person	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam
	Post-sampling flow rate (L/min)	2.218	2.246	2.161	2.208	2.248	2.223	2.278	2.242	2.120	2.210
	Sample ID	CAN26O-0386	CAN26O-0387	CAN26O-0388	CAN26O-0389	CAN26O-0390	CAN26O-0391	CAN26O-0392	CAN26O-0393	CAN26O-0480	CAN26O-0481
	Notes										
Volume Calculation	Average Flow Rate (L/min)	2.2110	2.2320	2.1890	2.2115	2.2320	2.2140	2.2485	2.2300	2.1695	2.2140
	Flow rates within 5% of initial flowrate?	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Sample time (min)	1442	1439	1515	1455	1445	1440	1443	1440	1470	1445
	Sample volume (m3)	3.19	3.21	3.32	3.22	3.23	3.19	3.24	3.21	3.19	3.20
Respirable Particulate Weights	Weighing date	24/04/2026	24/04/2026	24/04/2026	24/04/2026	24/04/2026	24/04/2026	24/04/2026	24/04/2026	15/05/2026	15/05/2026
	Sample pre-sampling filter weight (g)	0.00531	0.005465	0.00505	0.00526	0.0057	0.00549	0.005275	0.00636	0.005925	0.00596
	Sample post-sampling filter weight (g)	0.005305	0.00549	0.005065	0.00526	0.00571	0.005535	0.00529	0.00638	0.005955	0.005975
	Sample Filter weight gain (mg)	-0.005	0.025	0.015	0	0.01	0.045	0.015	0.02	0.03	0.015
	Blank filter 1 ID	W	W	W	W	W	W	W	W	AO	AO
	Blank filter 1 pre-sampling weight (g)	0.006115	0.006115	0.006115	0.006115	0.006115	0.006115	0.006115	0.006115	0.005635	0.005635
	Blank filter 1 post-sampling weight (g)	0.0061	0.0061	0.0061	0.0061	0.0061	0.0061	0.0061	0.0061	0.00562	0.00562
	Blank filter 1 weight gain (mg)	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015
	Blank filter 2 ID	Z	Z	Z	Z	Z	Z	Z	Z	AP	AP
	Blank filter 2 pre-sampling weight (g)	0.006095	0.006095	0.006095	0.006095	0.006095	0.006095	0.006095	0.006095	0.005595	0.005595
	Blank filter 2 post-sampling weight (g)	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608	0.00559	0.00559
	Blank filter 2 weight gain (mg)	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.005	-0.005
	Average blank filter weight gain (mg)	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.01	-0.01
	Blank corrected weight gain (mg)	0.01	0.04	0.03	0.015	0.025	0.06	0.03	0.035	0.04	0.025
	Blank corrected respirable dust concentration (mg/m3)	0.00314	0.01245	0.00905	0.00466	0.00775	0.01882	0.00925	0.01090	0.01254	0.00781
RCS calculations	RCS mass (µg)	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
	RCS concentration (mg/m3)	<0.0013	<0.0012	<0.0012	<0.0012	<0.0012	<0.0013	<0.0012	<0.0012	<0.0013	<0.0013
	RCS as a percentage of respirable dust	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sample Number		51	52	53	54	55	56	57	58	59	60
Field Notes	Filter ID	AI	AN	AA	AR	AQ	AU	AV	AT	AS	AW
	Pump ID	714	714	714	714	714	714	714	714	714	714
	Flow Detective ID	701	701	701	701	701	701	701	701	701	701
	Pre-sampling flow rate (L/min)	2.219	2.213	2.215	2.215	2.221	2.216	2.215	2.213	2.221	2.216
	Name of setup person	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	James
	Sample start date/time	29/04/2026 6:55	30/04/2026 7:20	1/05/2026 7:20	4/05/2026 7:00	5/05/2026 7:10	6/05/2026 7:15	7/05/2026 7:23	8/05/2026 7:30	9/05/2026 7:40	12/05/2026 8:33
	Photo taken	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
	Sample end date/time	30/04/2026 7:15	1/05/2026 7:15	2/05/2026 8:00	5/05/2026 7:05	6/05/2026 7:10	7/05/2026 7:15	8/05/2026 7:25	9/05/2026 7:35	12/05/2026 8:28	15/05/2026 11:30
	Name of pick-up person	Liam	Liam	Liam	Liam	Liam	Liam	Liam	Liam	James	James
	Post-sampling flow rate (L/min)	2.204	2.261	2.182	2.156	2.252	2.155	2.192	2.205	2.415	2.153
	Sample ID	CAN26O-0482	CAN26O-0483	CAN26O-0484	CAN26O-0485	CAN26O-0486	CAN26O-0487	CAN26O-0488	CAN26O-0489	CAN26O-0490	CAN26O-0491
	Notes										
Volume Calculation	Average Flow Rate (L/min)	2.2115	2.2370	2.1985	2.1855	2.2365	2.1855	2.2035	2.2090	2.3180	2.1845
	Flow rates within 5% of initial flowrate?	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	TRUE
	Sample time (min)	1460	1435	1480	1445	1440	1440	1442	1445	4368	4497
	Sample volume (m3)	3.23	3.21	3.25	3.16	3.22	3.15	3.18	3.19	10.13	9.82
Respirable Particulate Weights	Weighing date	15/05/2026	15/05/2026	15/05/2026	15/05/2026	15/05/2026	15/05/2026	15/05/2026	15/05/2026	15/05/2026	15/05/2026
	Sample pre-sampling filter weight (g)	0.005465	0.00531	0.00559	0.00534	0.00546	0.005195	0.005565	0.006	0.00498	0.00642
	Sample post-sampling filter weight (g)	0.00548	0.005305	0.0056	0.005385	0.0055	0.005205	0.00556	0.00606	0.00507	0.00648
	Sample Filter weight gain (mg)	0.015	-0.005	0.01	0.045	0.04	0.01	-0.005	0.06	0.09	0.06
	Blank filter 1 ID	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO
	Blank filter 1 pre-sampling weight (g)	0.005635	0.005635	0.005635	0.005635	0.005635	0.005635	0.005635	0.005635	0.005635	0.005635
	Blank filter 1 post-sampling weight (g)	0.00562	0.00562	0.00562	0.00562	0.00562	0.00562	0.00562	0.00562	0.00562	0.00562
	Blank filter 1 weight gain (mg)	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015
	Blank filter 2 ID	AP	AP	AP	AP	AP	AP	AP	AP	AP	AP
	Blank filter 2 pre-sampling weight (g)	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595	0.005595
	Blank filter 2 post-sampling weight (g)	0.00559	0.00559	0.00559	0.00559	0.00559	0.00559	0.00559	0.00559	0.00559	0.00559
	Blank filter 2 weight gain (mg)	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
	Average blank filter weight gain (mg)	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	Blank corrected weight gain (mg)	0.025	0.005	0.02	0.055	0.05	0.02	0.005	0.07	0.1	0.07
	Blank corrected respirable dust concentration (mg/m3)	0.00774	0.00156	0.00615	0.01742	0.01553	0.00636	0.00157	0.02193	0.00988	0.00713
RCS calculations	RCS mass (µg)	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
	RCS concentration (mg/m3)	<0.0012	<0.0012	<0.0012	<0.0013	<0.0012	<0.0013	<0.0013	<0.0013	<0.0004	<0.0004
	RCS as a percentage of respirable dust	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sample Number		61	62	63	64						
Field Notes	Filter ID	AB	AC	AD	AE						
	Pump ID	714	714	714	714						
	Flow Detective ID	701	701	701	701						
	Pre-sampling flow rate (L/min)	2.150	2.158	2.193	2.217						
	Name of setup person	James	James	James	James						
	Sample start date/time	15/05/2026 11:35	19/05/2026 10:42	22/05/2026 14:26	26/05/2026 11:51						
	Photo taken	TRUE	TRUE	TRUE	TRUE						
	Sample end date/time	19/05/2026 10:39	22/05/2026 14:26	26/05/2026 11:49	29/05/2026 10:37						
	Name of pick-up person	James	James	James	James						
	Post-sampling flow rate (L/min)	2.158	2.111	2.220	2.258						
	Sample ID	CAN26O-0554	CAN26O-0555	CAN26O-0556	CAN26O-0557						
	Notes										
Volume Calculation	Average Flow Rate (L/min)	2.1540	2.1345	2.2065	2.2375						
	Flow rates within 5% of initial flowrate?	TRUE	TRUE	TRUE	TRUE						
	Sample time (min)	5704	4544	5603	4246						
	Sample volume (m3)	12.29	9.70	12.36	9.50						
Respirable Particulate Weights	Weighing date	2/06/2026	2/06/2026	2/06/2026	2/06/2026						
	Sample pre-sampling filter weight (g)	0.00567	0.00535	0.00479	0.00516						
	Sample post-sampling filter weight (g)	0.00577	0.005425	0.004935	0.00522						
	Sample Filter weight gain (mg)	0.1	0.075	0.145	0.06						
	Blank filter 1 ID	AF	AF	AF	AF						
	Blank filter 1 pre-sampling weight (g)	0.005165	0.005165	0.005165	0.005165						
	Blank filter 1 post-sampling weight (g)	0.005145	0.005145	0.005145	0.005145						
	Blank filter 1 weight gain (mg)	-0.02	-0.02	-0.02	-0.02						
	Blank filter 2 ID	AG	AG	AG	AG						
	Blank filter 2 pre-sampling weight (g)	0.00537	0.00537	0.00537	0.00537						
	Blank filter 2 post-sampling weight (g)	0.00536	0.00536	0.00536	0.00536						
	Blank filter 2 weight gain (mg)	-0.01	-0.01	-0.01	-0.01						
	Average blank filter weight gain (mg)	-0.015	-0.015	-0.015	-0.015						
	Blank corrected weight gain (mg)	0.115	0.09	0.16	0.075						
	Blank corrected respirable dust concentration (mg/m3)	0.00936	0.00928	0.01294	0.00789						
RCS calculations	RCS mass (µg)	<4	<4	<4	<4						
	RCS concentration (mg/m3)	<0.0003	<0.0004	<0.0003	<0.0004						
	RCS as a percentage of respirable dust	N/A	N/A	N/A	N/A						

Appendix 2 External Laboratory Results

agon ENVIRONMENTAL

Accredited for compliance with ISO/IEC 17025-Testing. Accreditation No. 20148, Site No. 24777 Melbourne Laboratory, 24010 Darwin Laboratory & 25528 Adelaide Laboratory. The results relate only to the samples tested and are for the sole use by the client. This document shall not be reproduced, except in full.

NATA WORLD RECOGNISED ACCREDITATION

CRYSTALLINE SILICA ON FILTERS RESULTS

Date:	13 March 2026	**Agon Job No:**	JH25.0041-16
Client:	Fulton Hogan Ltd	**Attention:**	James Piesse
Client Contact No:	+64 27 212 7650	**Date Sent:**	3 March 2026
Project No:	CAN26W0054	**Received Date:**	10 March 2026
Sampled By:	As received		

Test Method: All sample analysis was performed using X-ray diffraction, in our Adelaide Laboratory by the in-house method LP-006- SOP of XRD Measurement of Crystalline Silica on Filters.

Sample ID	Mass of Quartz (µg)	Uncertainty (µg)
CAN26O-0004 Filter W 5/1/26	<4	±1.5
CAN26O-0005 Filter X 6/1/26	<4	±1.5
CAN26O-0006 Filter Y 7/1/26	<4	±1.5
CAN26O-0210 Filter Z 13/1/26	<4	±1.5
CAN26O-0211 Filter AI 14/1/26	<4	±1.5
CAN26O-0216 Filter AQ 9/2/26	<4	±1.5
CAN26O-0217 Filter AR 10/2/26	<4	±1.5
CAN26O-0218 Filter AV 13/2/26	<4	±1.5
CAN26O-0219 Filter AO 17/2/26	<4	±1.5
CAN26O-0220 Filter AL 18/2/26	<4	±1.5
CAN26O-0221 Filter AP 19/2/26	<4	±1.5
CAN26O-0222 Filter AS 20/2/26	<4	±1.5
CAN26O-0223 Filter AK 23/2/26	<4	±1.5
CAN26O-0224 Filter X 24/2/26	<4	±1.5
CAN26O-0225 Filter AB 25/2/26	<4	±1.5
CAN26O-0226 Filter AU 27/2/26	<4	±1.5
CAN26O-0227 Filter AM Blank	<4	±1.5
CAN26O-0228 Filter AN Blank	<4	±1.5

The Lower Limit of Quantification is 4µg on the filters provided, which have a 19.5mm diameter dust loading and which have been analysed for an extended time

Testing Officer / Signatory

Michael Till

M J Till

Melbourne Laboratory - H76, 63-85 Turner Street, Port Melbourne, 3207 | **Darwin Laboratory** - 1/41 Jessop Crescent, Berrimah, NT 0828 |
Adelaide Laboratory - 3/224 Glen Osmond Road, Fullarton, SA 5063
Agon Environmental Pty Ltd A.B.N. 29 167 746 063
admin@agonenviro.com.au (08) 8338 1009
www.agonenviro.com.au

agon ENVIRONMENTAL

Accredited for compliance with ISO/IEC 17025-Testing. Accreditation No. 20148, Site No. 24777 Melbourne Laboratory, 24010 Darwin Laboratory & 23528 Adelaide Laboratory. The results relate only to the samples tested and are for the sole use by the client. This document shall not be reproduced, except in full.

NATA WORLD RECOGNISED ACCREDITATION

CRYSTALLINE SILICA ON FILTERS RESULTS

Date:	17 April 2026	**Agon Job No:**	JH25.0041-18
Client:	Fulton Hogan Ltd	**Attention:**	James Piesse
Client Contact No:	+64 27 212 7650	**Date Sent:**	1 April 2026
Project No:	CAN26W0054	**Received Date:**	9 April 2026
Sampled By:	As received		

Test Method: All sample analysis was performed using X-ray diffraction, in our Adelaide Laboratory by the in-house method LP-006- SOP of XRD Measurement of Crystalline Silica on Filters.

Sample ID	Mass of Quartz (µg)	Uncertainty (µg)
CAN26O-0316 Filter AR 3/3/26	<4	±1.5
CAN26O-0317 Filter AS 4/3/26	<4	±1.5
CAN26O-0318 Filter AN 5/3/26	<4	±1.5
CAN26O-0319 Filter AL 6/3/26	<4	±1.5
CAN26O-0320 Filter AQ 9/3/26	<4	±1.5
CAN26O-0321 Filter AU 10/3/26	<4	±1.5
CAN26O-0322 Filter X 11/3/26	<4	±1.5
CAN26O-0323 Filter AM 12/3/26	<4	±1.5
CAN26O-0324 Filter AT 16/3/26	<4	±1.5
CAN26O-0325 Filter AF 17/3/26	<4	±1.5
CAN26O-0326 Filter AG 18/3/26	<4	±1.5
CAN26O-0327 Filter AJ 19/3/26	<4	±1.5
CAN26O-0328 Filter AE 20/3/26	<4	±1.5
CAN26O-0329 Filter AA 23/3/26	<4	±1.5
CAN26O-0330 Filter AP 24/3/26	<4	±1.5
CAN26O-0331 Filter AC 26/3/26	<4	±1.5
CAN26O-0332 Filter AB Blank	<4	±1.5
CAN26O-0333 Filter AD Blank	<4	±1.5

The Lower Limit of Quantification is 4µg on the filters provided, which have a 19.5mm diameter dust loading and which have been analysed for an extended time

Testing Officer / Signatory

Michael Till

M J Till

Melbourne Laboratory - H76, 63-85 Turner Street, Port Melbourne, 3207 | **Darwin Laboratory** - 1/41 Jessop Crescent, Berrimah, NT 0828 |
Adelaide Laboratory - 3/224 Glen Osmond Road, Fullarton, SA 5063
Agon Environmental Pty Ltd A.B.N. 29 167 746 063
admin@agonenviro.com.au (08) 8338 1009
www.agonenviro.com.au

agon ENVIRONMENTAL

Accredited for compliance with ISO/IEC 17025-Testing. Accreditation No. 20148, Site No. 24777 Melbourne Laboratory, 24010 Darwin Laboratory & 25528 Adelaide Laboratory. The results relate only to the samples tested and are for the sole use by the client. This document shall not be reproduced, except in full.

NATA WORLD RECOGNISED ACCREDITATION

CRYSTALLINE SILICA ON FILTERS RESULTS

Date:	11 May 2026	**Agon Job No:**	JH25.0041-19
Client:	Fulton Hogan Ltd	**Attention:**	James Piesse
Client Contact No:	+64 27 212 7650	**Date Sent:**	28 April 2026
Project No:	CAN26W0054	**Received Date:**	5 May 2026
Sampled By:	As received		

Test Method: All sample analysis was performed using X-ray diffraction, in our Adelaide Laboratory by the in-house method LP-006- SOP of XRD Measurement of Crystalline Silica on Filters.

Sample ID	Mass of Quartz (µg)	Uncertainty (µg)
CAN26O-0378 Filter AV 10/3/26	<4	±1.5
CAN26O-0379 Filter AH 31/3/26	<4	±1.5
CAN26O-0380 Filter Y 1/4/26	<4	±1.5
CAN26O-0381 Filter AL 7/4/26	<4	±1.5
CAN26O-0382 Filter AN 8/4/26	<4	±1.5
CAN26O-0383 Filter AJ 9/4/26	<4	±1.5
CAN26O-0384 Filter AP 10/4/26	<4	±1.5
CAN26O-0385 Filter AC 13/4/26	<4	±1.5
CAN26O-0386 Filter AG 14/4/26	<4	±1.5
CAN26O-0387 Filter AU 15/4/26	<4	±1.5
CAN26O-0388 Filter AF 16/4/26	<4	±1.5
CAN26O-0389 Filter AM 17/4/26	<4	±1.5
CAN26O-0390 Filter AQ 20/4/26	<4	±1.5
CAN26O-0391 Filter AR 21/4/26	<4	±1.5
CAN26O-0392 Filter AA 22/4/26	<4	±1.5
CAN26O-0393 Filter AI 23/4/26	<4	±1.5
CAN26O-0394 Filter AB Blank	<4	±1.5
CAN26O-0395 Filter AD Blank	<4	±1.5

The Lower Limit of Quantification is 4µg on the filters provided, which have a 19.5mm diameter dust loading and which have been analysed for an extended time

Testing Officer / Signatory

Michael Till

M J Till

Accredited for compliance with ISO/IEC 17025-Testing.
Accreditation No. 20148, Site No. 24777 Melbourne Laboratory, 24010 Darwin Laboratory & 25528 Adelaide Laboratory.
The results relate only to the samples tested and are for the sole use by the client.
This document shall not be reproduced, except in full.

agon ENVIRONMENTAL

NATA WORLD RECOGNISED ACCREDITATION

CRYSTALLINE SILICA ON FILTERS RESULTS

Date:	9 June 2026	**Agon Job No:**	JH25.0041-20
Client:	Fulton Hogan Ltd	**Attention:**	James Piesse
Client Contact No:	+64 27 212 7650	**Date Sent:**	20 May 2026
Project No:	CAN26W0054	**Received Date:**	29 May 2026
Sampled By:	As received		

Test Method: All sample analysis was performed using X-ray diffraction, in our Adelaide Laboratory by the in-house method LP-006- SOP of XRD Measurement of Crystalline Silica on Filters.

Sample ID	Mass of Quartz (µg)	Uncertainty (µg)
CAN26O-0480 Filter AE	<4	±1.5
CAN26O-0481 Filter AH	<4	±1.5
CAN26O-0482 Filter AI	<4	±1.5
CAN26O-0483 Filter AN	<4	±1.5
CAN26O-0484 Filter AA	<4	±1.5
CAN26O-0485 Filter AR	<4	±1.5
CAN26O-0486 Filter AQ	<4	±1.5
CAN26O-0487 Filter AU	<4	±1.5
CAN26O-0488 Filter AV	<4	±1.5
CAN26O-0489 Filter AT	<4	±1.5
CAN26O-0490 Filter AS	<4	±1.5
CAN26O-0491 Filter AW	<4	±1.5
CAN26O-0492 Filter AO	<4	±1.5
CAN26O-0493 Filter AP	<4	±1.5

The Lower Limit of Quantification is 4µg on the filters provided, which have a 19.5mm diameter dust loading and which have been analysed for an extended time

Testing Officer / Signatory

Michael Till

M J Till

Melbourne Laboratory - H76, 63-85 Turner Street, Port Melbourne, 3207 | **Darwin Laboratory** - 1/41 Jessop Crescent, Berrimah, NT 0828 |
Adelaide Laboratory - 3/224 Glen Osmond Road, Fullarton, SA 5063
Agon Environmental Pty Ltd A.B.N. 29 167 746 063
admin@agonenviro.com.au (08) 8338 1009
www.agonenviro.com.au

agon ENVIRONMENTAL

Accredited for compliance with ISO/IEC 17025-Testing. Accreditation No. 20148, Site No. 24777 Melbourne Laboratory, 24010 Darwin Laboratory & 25528 Adelaide Laboratory. The results relate only to the samples tested and are for the sole use by the client. This document shall not be reproduced, except in full.

NATA WORLD RECOGNISED ACCREDITATION

CRYSTALLINE SILICA ON FILTERS RESULTS

Date:	29 June 2026	**Agon Job No:**	JH25.0041-22
Client:	Fulton Hogan Ltd	**Attention:**	James Piesse
Client Contact No:	+64 27 212 7650	**Received Date:**	26 June 2026
Project No:	CAN26W0054		
Sampled By:	As received		

Test Method: All sample analysis was performed using X-ray diffraction, in our Adelaide Laboratory by the in-house method LP-006- SOP of XRD Measurement of Crystalline Silica on Filters.

Sample ID	Mass of Quartz (µg)	Uncertainty (µg)
CAN26O-0554 Filter AB 15/5/26	<4	±1.5
CAN26O-0555 Filter AC 19/5/26	<4	±1.5
CAN26O-0556 Filter AD 22/5/26	<4	±1.5
CAN26O-0557 Filter AE 26/5/26	<4	±1.5
CAN26O-0558 Filter AF Blank	<4	±1.5
CAN26O-0559 Filter AG Blank	<4	±1.5

The Lower Limit of Quantification is 4µg on the filters provided, which have a 19.5mm diameter dust loading and which have been analysed for an extended time

Testing Officer / Signatory

Michael Till

M J Till

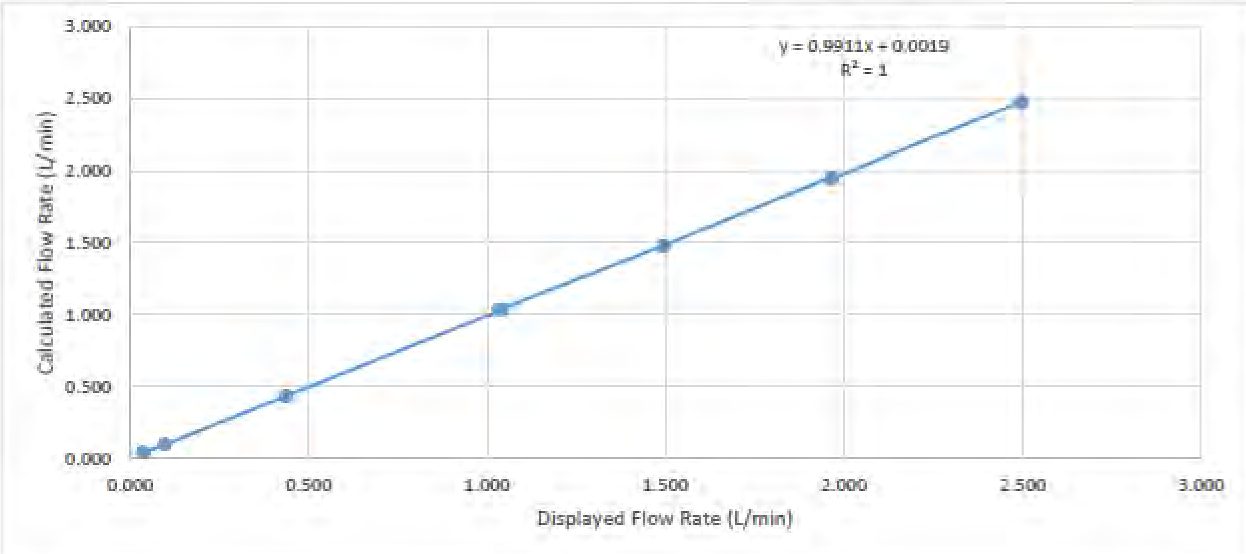
Appendix 3 Pump Secondary Calibrator Calibration Certificates

Calibrator ID	701	Date	9/05/2025	Calibrated by	James Piesse

Burrette Size (L)	Flow Range	Approx flow rate (L/min)	Approx Time (s)	Displayed flow rate (L/min)	Time (s)	Calculated flow rate (L/min)	Difference (%)	Pass?
0.05	Low	0.050	60	0.036	75.21	0.040	-9.75	TRUE
				0.035	77.23	0.039	-9.90	
				0.036	77.93	0.038	-6.48	
0.05	Low	0.100	30	0.096	32.00	0.094	2.40	TRUE
				0.097	32.00	0.094	3.47	
				0.097	31.98	0.094	3.40	
1	Low	0.500	120	0.439	137.75	0.436	0.79	TRUE
				0.437	138.95	0.432	1.20	
				0.434	139.22	0.431	0.70	
1	Normal	1.000	60	1.043	57.80	1.038	0.48	TRUE
				1.030	58.03	1.034	-0.38	
				1.032	57.98	1.035	-0.27	
1	Normal	1.500	40	1.495	40.48	1.482	0.86	TRUE
				1.496	40.53	1.480	1.05	
				1.495	40.46	1.483	0.81	
1	Normal	2.000	30	1.967	30.60	1.961	0.32	TRUE
				1.966	30.85	1.945	1.09	
				1.968	30.81	1.947	1.06	
1	Normal	2.500	24	2.496	24.20	2.479	0.67	TRUE
				2.494	24.31	2.468	1.05	
				2.495	24.26	2.473	0.88	

Acceptance Criteria		
Range	±% of reading	±% of full scale
Low	0.8	0.2
Normal	2	0

Worksheet ID	7351
Version ID	3
Validation Date	18/06/2024
Validated by	James Piesse



Calibrator ID	702

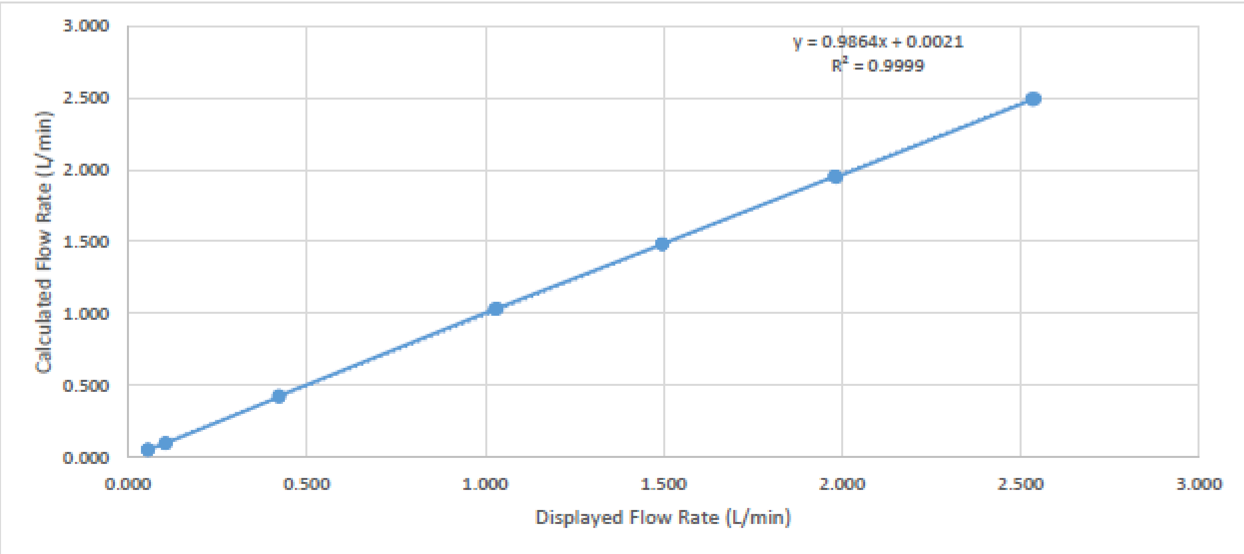
Date	9/05/2025

Calibrated by	James Piesse

Burrette Size (L)	Flow Range	Approx flow rate (L/min)	Approx Time (s)	Displayed flow rate (L/min)	Time (s)	Calculated flow rate (L/min)	Difference (%)	Pass?
0.05	Low	0.050	60	0.055	58.80	0.051	7.80	TRUE
				0.055	58.58	0.051	7.40	
				0.055	58.50	0.051	7.25	
0.05	Low	0.100	30	0.106	31.33	0.096	10.70	TRUE
				0.104	31.38	0.096	8.78	
				0.104	31.68	0.095	9.82	
1	Low	0.500	120	0.423	143.40	0.418	1.10	TRUE
				0.422	140.42	0.427	-1.24	
				0.422	140.98	0.426	-0.84	
1	Normal	1.000	60	1.026	58.25	1.030	-0.39	TRUE
				1.034	58.05	1.034	0.04	
				1.030	58.06	1.033	-0.33	
1	Normal	1.500	40	1.496	40.46	1.483	0.88	TRUE
				1.496	40.45	1.483	0.86	
				1.496	40.41	1.485	0.76	
1	Normal	2.000	30	1.981	30.66	1.957	1.23	TRUE
				1.979	30.66	1.957	1.13	
				1.985	30.76	1.951	1.76	
1	Normal	2.500	24	2.540	24.03	2.497	1.73	TRUE
				2.534	24.10	2.490	1.78	
				2.531	24.03	2.497	1.37	

Acceptance Criteria		
Range	±% of reading	±% of full scale
Low	0.8	0.2
Normal	2	0

Worksheet ID	7351
Version ID	3
Validation Date	18/06/2024
Validated by	James Piesse



Appendix 4 Balance Calibration Certificate

ThermoFisher SCIENTIFIC

BALANCE CALIBRATION CERTIFICATE

Thermo Fisher Scientific New Zealand Limited
244 Bush Road
Albany, Auckland
Phone 0800 933 966
Fax 09 980 6785
ServiceNZ@thermofisher.com
www.thermofisher.co.nz

Client: Fulton Hogan - Canterbury
Address: 24 Miners Road
Templeton
Christchurch

Contact: Martin Clay

Certificate Number:	W7756		
Date of Calibration:	11/06/2025	Location:	Environmental Laboratory
Balance Type:	Semi-Micro	Model Number:	XSR205DU
Manufacturer:	Mettler	Asset / ID Number:	BAL.720
Temperature at time of calibration:	22.6 °C to 22.6 °C	Serial number:	C302531908

Number of Scale Ranges: Dual
Scale Range: 80 g / 220 g
Readability: 0.00001 g / 0.0001 g

AS FOUND CONDITION — Half load error: 0.00001 g — Full load error: -0.00034 g

REPEATABILITY

Scale Range:	80 g / 220 g
Measured nominal a mass of:	50/200 g
Standard Deviation (SD) of 10 repeat readings:	0.000015 / 0.00005 g
Worst case repeatability error in any single reading (2.3 x SD):	0.000035 / 0.00012 g
(if less than 1/2 of resolution, SD = 1/2 resolution)	

BEST ACCURACY OF BALANCE

Best accuracy of balance is the numerical sum of the largest measured error (disregarding +/- signs and including in built weights if applicable) and the uncertainty measurement (for a 95% level of confidence calculated using a coverage factor of 2.2, and taking into account resolution, repeatability, temperature effects, linearity and the uncertainties in the mass values of the reference weights used).

Nominal Load	Error	Expanded Uncertainty	Best Accuracy
20 g	0.000042 g	0.000042 g	0.000084 g
50 g	0.000038 g	0.000100 g	0.000138 g
80 g	0.000001 g	0.000160 g	0.000161 g
100 g	0.00009 g	0.00020 g	0.00029 g
150 g	0.00018 g	0.00030 g	0.00048 g
200 g	0.00034 g	0.00040 g	0.00074 g

Notes:
1. The balance has been calibrated using weights of known mass and density and results are based on weighings in air of density 1.2 kg/m3 against weights of density 8000 kg/m3.
2. All results reported herein are traceable to the SI via the Measurement Standards Laboratory of New Zealand.
3. This instrument has been tested according to the Thermo Fisher Scientific New Zealand Limited balance calibration method E0161.

PAN POSITION ERROR 0.0002 g

Maximum error in reading due to the off centre loading of the pan (to be added to the best accuracy figures above if appropriate).
Pan position error determined using a mass of 100 g placed half way between the centre and outer edges of weigh pan at locations front, back, left and right.

GENERAL COMMENTS ON BALANCE CONDITION AND LOCATION

Unit was found in a clean condition on a concrete plinth in an air-conditioned room.

Signature:
Signatory: Joselito Macaranas
Date: 18 June 2025

ilac-MRA
ACCREDITED IANZ CALIBRATION LABORATORY
No 175

Certificate number W7756

18 Jun 2025

Appendix E PortHill RCS Analysis

Sample Number	Sample Start Date/Time	Sample End Date/Time	Average PM_4 ($\mu g/m^3$)	Respirable Particulate Weight (mg)	Weight Uncertainty (mg)	Sample Volume (m^3)	Volume Uncertainty (%)	RCS Mass (µg)	RCS Uncertainty (µg)	RCS Concentration ($\mu g/m^3$)	RCS Concentration Uncertainty (%)	RCS/PM_4 Ratio
Data Source	Fulton Hogan	Fulton Hogan	Instrument	Fulton Hogan	Fulton Hogan	Fulton Hogan	Fulton Hogan	Agon	Agon	PortHill	PortHill	PortHill
1	5/01/26 15:07	6/01/26 15:06	7.3	0.020	0.1	#N/A	5%	4	1.5	#N/A		#N/A
2	6/01/26 15:15	7/01/26 15:12	8.8	0.030	0.1	3.19	5%	4	1.5	1.3	37.8	0.17
3	7/01/26 15:16	8/01/26 15:00	8.6	0.025	0.1	3.17	5%	4	1.5	1.3	37.8	0.14
4	13/01/26 10:30	14/01/26 10:57	14.3	0.025	0.1	3.19	5%	4	1.5	1.3	37.8	0.15
5	14/01/26 11:11	15/01/26 11:27	8.3	0.000	0.1	#N/A	5%	4	1.5	#N/A		#N/A
6	9/02/26 9:45	10/02/26 9:35	11.8	0.040	0.1	3.08	5%	4	1.5	1.3	37.8	0.16
7	10/02/26 9:40	11/02/26 13:00	9.2	0.055	0.1	3.57	5%	4	1.5	1.1	37.8	0.09
8	13/02/26 13:17	14/02/26 13:15	13.2	0.025	0.1	3.09	5%	4	1.5	1.3	37.8	0.14
9	17/02/26 12:00	18/02/26 12:23	7.9	0.020	0.1	3.20	5%	4	1.5	1.2	37.8	0.09
10	18/02/26 12:30	19/02/26 12:30	7.0	0.015	0.1	#N/A	5%	4	1.5	#N/A		#N/A
11	19/02/26 12:40	20/02/26 12:45	8.2	0.055	0.1	#N/A	5%	4	1.5	#N/A		#N/A
12	20/02/26 12:27	21/02/26 12:45	10.6	0.005	0.1	3.16	5%	4	1.5	1.3	37.8	0.15
13	23/02/26 10:50	24/02/26 10:35	22.6	0.035	0.1	3.11	5%	4	1.5	1.3	37.8	0.12
14	24/02/26 10:45	25/02/26 14:20	25.8	0.065	0.1	3.65	5%	4	1.5	1.1	37.8	0.05
15	25/02/26 14:30	26/02/26 14:26	23.2	0.100	0.1	3.20	5%	4	1.5	1.3	37.8	0.05
16	27/02/26 8:15	28/02/26 8:35	9.6	0.020	0.1	3.23	5%	4	1.5	1.2	37.8	0.05
17	3/03/26 7:15	4/03/26 7:10	10.8	0.010	0.1	#N/A	5%	4	1.5	#N/A		#N/A
18	4/03/26 7:15	5/03/26 7:20	10.8	0.000	0.1	3.13	5%	4	1.5	1.3	37.8	0.12
19	5/03/26 7:25	6/03/26 7:18	12.3	0.025	0.1	3.22	5%	4	1.5	1.2	37.8	0.12
20	6/03/26 7:28	7/03/26 7:40	10.3	0.015	0.1	3.23	5%	4	1.5	1.2	37.8	0.10
21	9/03/26 7:00	10/03/26 7:10	8.2	0.020	0.1	3.29	5%	4	1.5	1.2	37.8	0.12
22	10/03/26 7:20	11/03/26 7:20	9.3	0.005	0.1	3.20	5%	4	1.5	1.3	37.8	0.15
23	11/03/26 7:25	12/03/26 7:22	11.0	0.000	0.1	3.17	5%	4	1.5	1.3	37.8	0.14
24	12/03/26 7:30	13/03/26 7:30	15.7	0.015	0.1	3.15	5%	4	1.5	1.3	37.8	0.12
25	16/03/26 7:15	17/03/26 7:15	8.6	0.010	0.1	3.26	5%	4	1.5	1.2	37.8	0.08
26	17/03/26 7:20	18/03/26 7:20	10.7	0.015	0.1	3.16	5%	4	1.5	1.3	37.8	0.15
27	18/03/26 7:25	19/03/26 7:25	13.1	0.030	0.1	3.26	5%	4	1.5	1.2	37.8	0.12
28	19/03/26 7:30	20/03/26 7:30	13.9	0.015	0.1	3.15	5%	4	1.5	1.3	37.8	0.10
29	20/03/26 7:40	21/03/26 7:40	9.3	-0.005	0.1	#N/A	5%	4	1.5	#N/A		#N/A
30	23/03/26 8:21	24/03/26 9:30	8.2	0.025	0.1	3.35	5%	4	1.5	1.2	37.8	0.13
31	24/03/26 9:42	25/03/26 9:58	10.4	0.010	0.1	3.21	5%	4	1.5	1.2	37.8	0.15
32	25/03/26 10:01	26/03/26 8:10	6.5	-0.010	0.1	2.88	5%	4	1.5	1.4	37.8	0.13
33	30/03/26 7:35	31/03/26 8:00	6.9	-0.020	0.1	3.32	5%	4	1.5	1.2	37.8	0.18

Sample Number	Sample Start Date/Time	Sample End Date/Time	Average PM_4 (µg/m^3)	Respirable Particulate Weight (mg)	Weight Uncertainty (mg)	Sample Volume (m^3)	Volume Uncertainty (%)	RCS Mass (µg)	RCS Uncertainty (µg)	RCS Concentration (µg/m^3)	RCS Concentration Uncertainty (%)	RCS/PM_4 Ratio
Data Source	Fulton Hogan	Fulton Hogan	Instrument	Fulton Hogan	Fulton Hogan	Fulton Hogan	Fulton Hogan	Agon	Agon	PortHill	PortHill	PortHill
34	31/03/26 10:15	1/04/26 10:15	14.8	0.000	0.1	3.27	5%	4	1.5	1.2	37.8	0.18
35	1/04/26 10:20	2/04/26 10:22	9.0	0.020	0.1	3.15	5%	4	1.5	1.3	37.8	0.09
36	7/04/26 7:25	8/04/26 7:40	17.2	0.050	0.1	3.16	5%	4	1.5	1.3	37.8	0.14
37	8/04/26 7:45	9/04/26 8:10	7.6	0.015	0.1	3.26	5%	4	1.5	1.2	37.8	0.07
38	9/04/26 8:15	10/04/26 8:15	6.7	0.020	0.1	3.19	5%	4	1.5	1.3	37.8	0.17
39	10/04/26 8:20	11/04/26 8:20	10.7	-0.005	0.1	3.18	5%	4	1.5	1.3	37.8	0.19
40	13/04/26 7:30	14/04/26 7:30	9.7	0.020	0.1	3.21	5%	4	1.5	1.2	37.8	0.12
41	14/04/26 7:38	15/04/26 7:40	5.1	-0.005	0.1	3.19	5%	4	1.5	1.3	37.8	0.13
42	15/04/26 7:43	16/04/26 7:42	6.1	0.025	0.1	3.21	5%	4	1.5	1.2	37.8	0.24
43	16/04/26 7:50	17/04/26 9:05	12.1	0.015	0.1	3.32	5%	4	1.5	1.2	37.8	0.20
44	17/04/26 9:15	18/04/26 9:30	5.4	0.000	0.1	3.22	5%	4	1.5	1.2	37.8	0.10
45	20/04/26 7:20	21/04/26 7:25	8.7	0.010	0.1	3.23	5%	4	1.5	1.2	37.8	0.23
46	21/04/26 7:30	22/04/26 7:30	7.2	0.045	0.1	3.19	5%	4	1.5	1.3	37.8	0.14
47	22/04/26 7:40	23/04/26 7:43	5.2	0.015	0.1	3.24	5%	4	1.5	1.2	37.8	0.17
48	23/04/26 7:50	24/04/26 7:50	9.9	0.020	0.1	3.21	5%	4	1.5	1.2	37.8	0.24
49	24/04/26 9:00	25/04/26 9:30	10.2	0.030	0.1	3.19	5%	4	1.5	1.3	37.8	0.13
50	28/04/26 6:45	29/04/26 6:50	11.1	0.015	0.1	3.20	5%	4	1.5	1.3	37.8	0.12
51	29/04/26 6:55	30/04/26 7:15	15.7	0.015	0.1	3.23	5%	4	1.5	1.2	37.8	0.11
52	30/04/26 7:20	1/05/26 7:15	17.0	-0.005	0.1	3.21	5%	4	1.5	1.2	37.8	0.08
53	1/05/26 7:20	2/05/26 8:00	12.1	0.010	0.1	3.25	5%	4	1.5	1.2	37.8	0.07
54	4/05/26 7:00	5/05/26 7:05	8.3	0.045	0.1	3.16	5%	4	1.5	1.3	37.8	0.10
55	5/05/26 7:10	6/05/26 7:10	9.0	0.040	0.1	3.22	5%	4	1.5	1.2	37.8	0.15
56	6/05/26 7:15	7/05/26 7:15	7.7	0.010	0.1	3.15	5%	4	1.5	1.3	37.8	0.14
57	7/05/26 7:23	8/05/26 7:25	8.0	-0.005	0.1	3.18	5%	4	1.5	1.3	37.8	0.16
58	8/05/26 7:30	9/05/26 7:35	9.4	0.060	0.1	3.19	5%	4	1.5	1.3	37.8	0.16
59	9/05/26 7:40	12/05/26 8:28	9.4	0.090	0.1	#N/A	5%	4	1.5	#N/A		#N/A
60	12/05/26 8:33	15/05/26 11:30	11.4	0.060	0.1	9.82	5%	4	1.5	0.4	37.8	0.04
61	15/05/26 11:35	19/05/26 10:39	10.0	0.100	0.1	12.29	5%	4	1.5	0.3	37.8	0.03
62	19/05/26 10:42	22/05/26 14:26	12.2	0.075	0.1	9.70	5%	4	1.5	0.4	37.8	0.04
63	22/05/26 14:26	26/05/26 11:49	13.7	0.145	0.1	12.36	5%	4	1.5	0.3	37.8	0.03
64	26/05/26 11:51	29/05/26 10:37	14.0	0.060	0.1	9.50	5%	4	1.5	0.4	37.8	0.03
Study Period Average										**1.0**		

Appendix F Meteorological Data and Wind Analysis

1. Wind data from the Lufft weather station.

Wind conditions recorded by the Lufft meteorological station during the study period and during valid RCS sampling periods are summarised in Figure F-1 and Figure F-2 respectively.

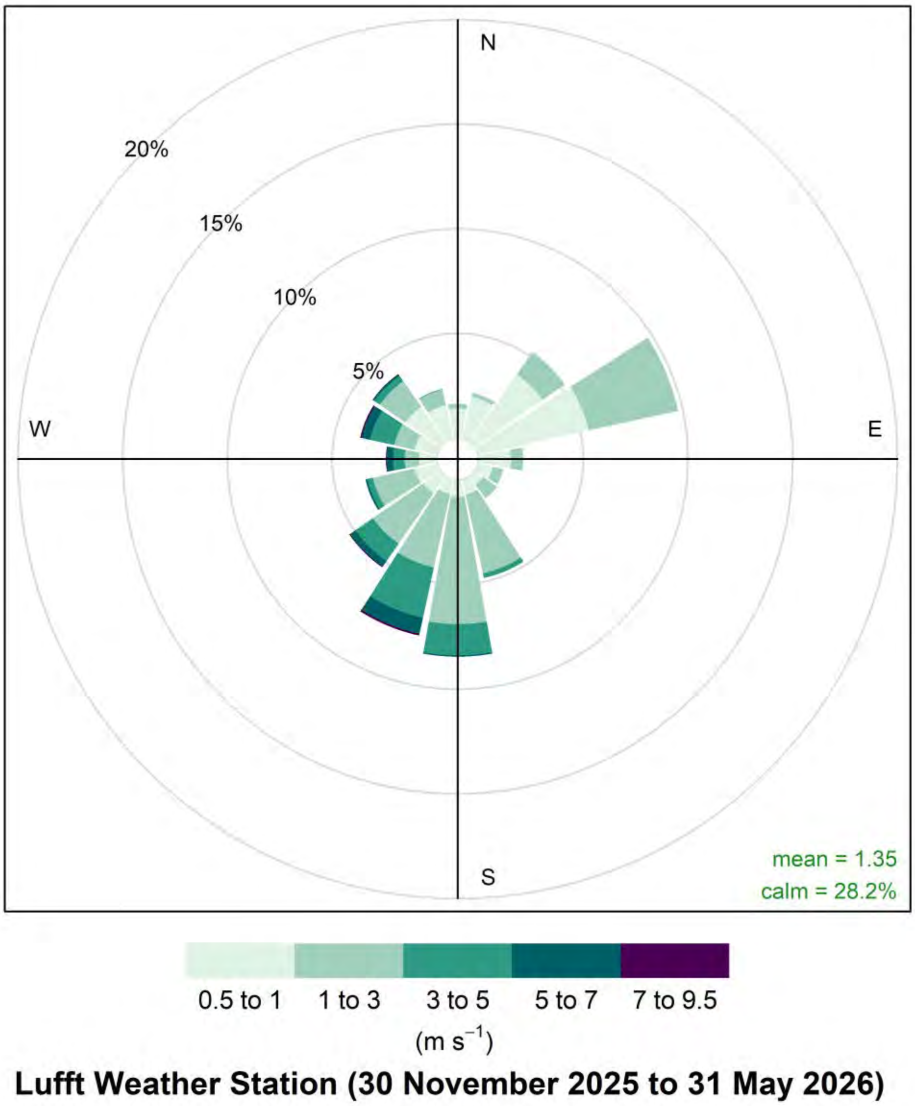


Figure F- 1: Wind rose from the Lufft Weather Station for the study period (30 November 2025 to 31 May 2026)

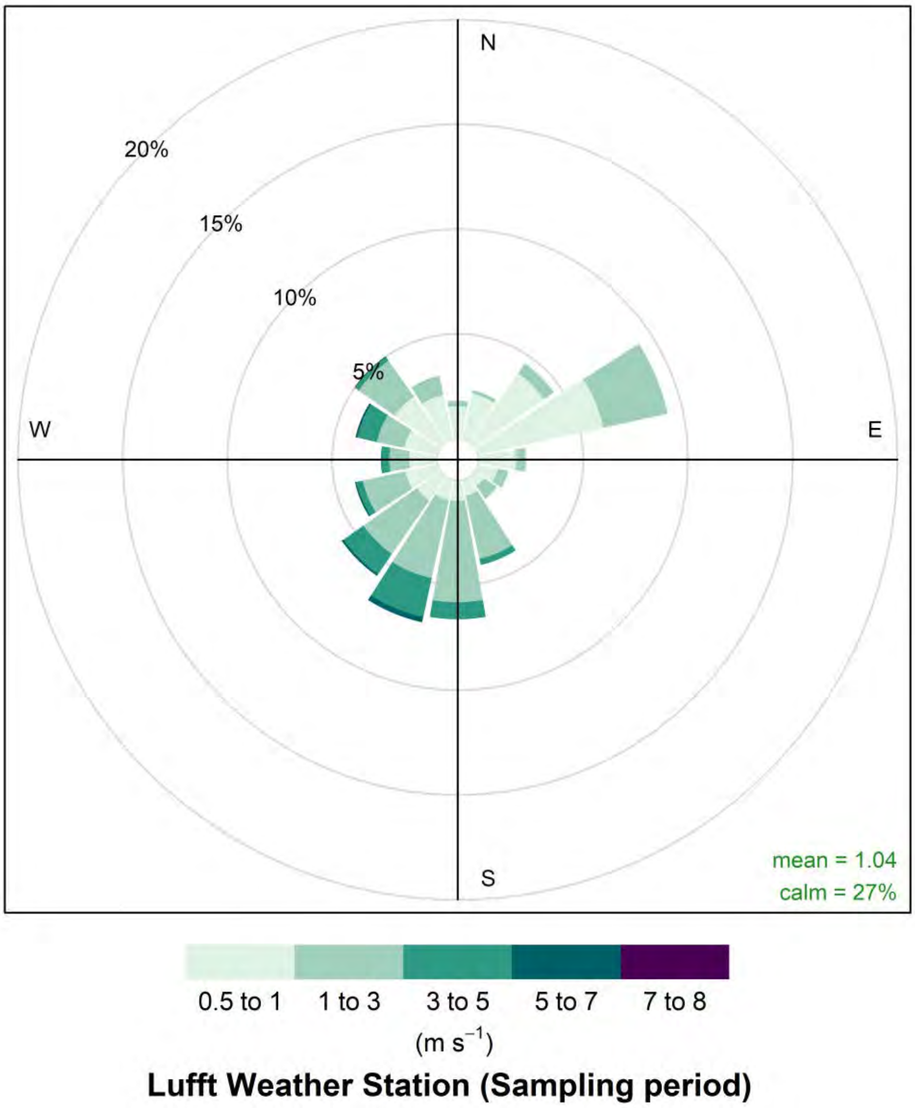


Figure F- 2: Wind rose from the Lufft Weather Station for the sampling period.

2. Comparison of Lufft and Scottech.

Comparisons of wind speed and wind direction measurements recorded by the Scottech and Lufft meteorological stations are presented in Figure F-3 and Figure F-4 respectively.

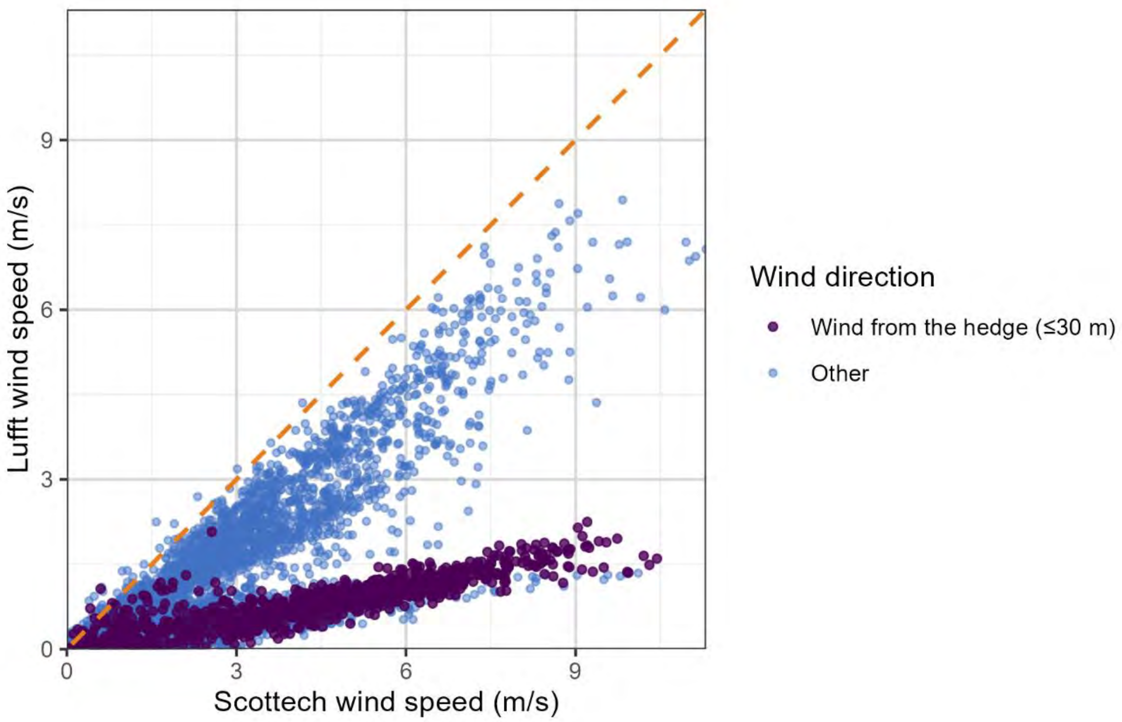


Figure F- 3: Comparison of wind speed measurements from the Scott Tech and Lufft meteorological stations.

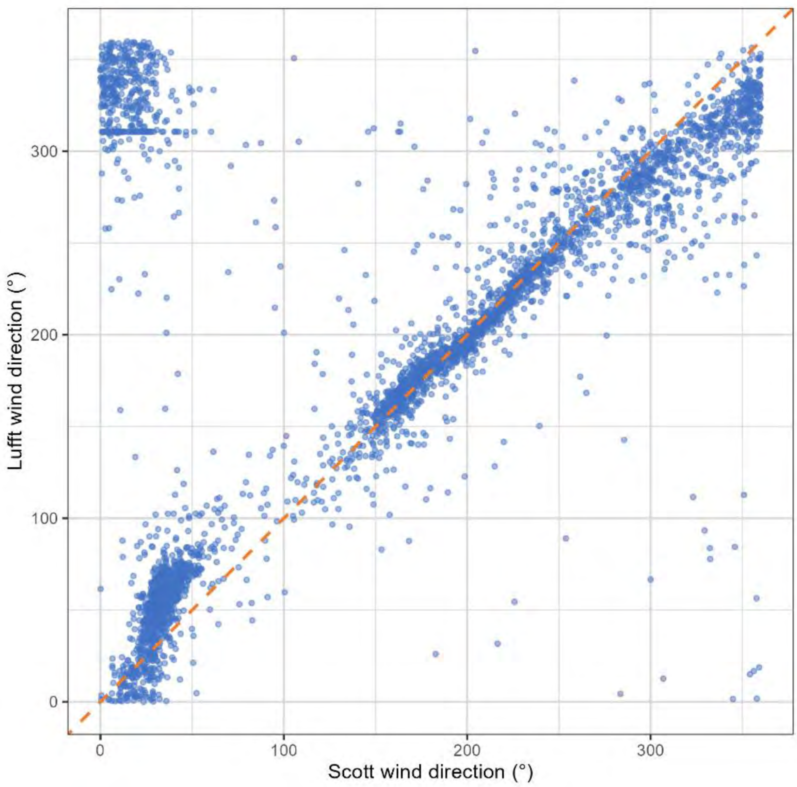


Figure F- 4: Comparison of wind direction measurements from the Scott Tech and Lufft meteorological stations.

3. Comparison of Wind Frequency during Study period Sampling Period and Typical November to May

The frequency of winds from the quarry sector towards the monitoring location during the study period, valid RCS sampling periods and the longer-term November to May period is summarised in Table F-1.

Table F - 1: Percentage of wind blowing from Central Processing and Stockpile Area (CPSA) and the whole quarry site towards the RCS monitor during study period (Nov 25 to May 26), sampling period and Nov to May 2021 to 2024) -Scottech data

Upwind area	Wind range	Study period (Nov to May 26)	Sampling period	Nov to May 2021 to 2024
CPSA	259º N to 275ºN	2.2%	2.9%	2.0%
Whole site	236º N to 309ºN	13.5%	15.3%	12.2%

4. PM₄ data versus Wind direction and Speed

Relationships between PM_4 concentrations and wind direction, and PM_4 concentrations and wind speed, are presented in Figure F-5 and Figure F-6 respectively.

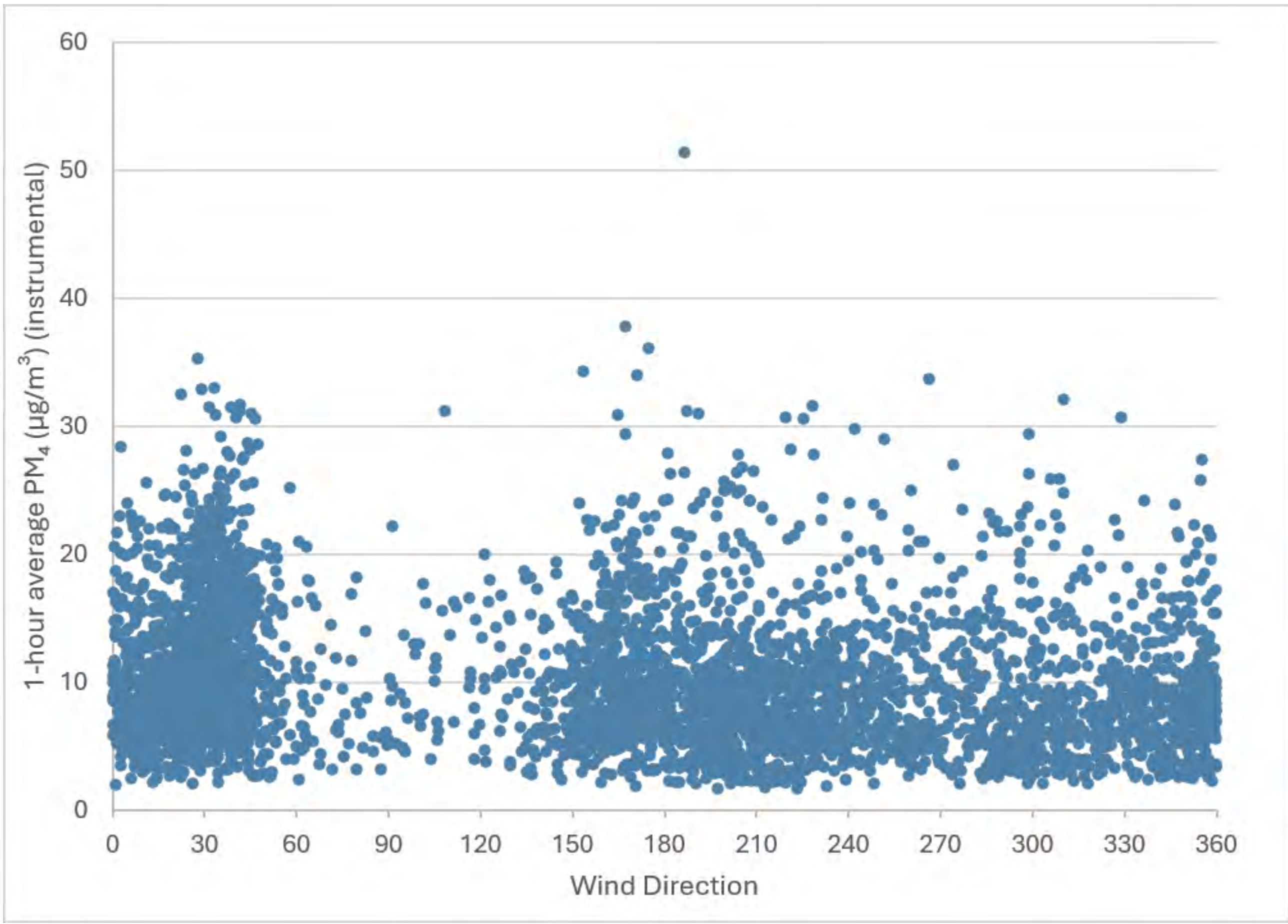


Figure F- 5: 1-hour average PM_4 concentrations in relation to wind direction during the monitoring period.

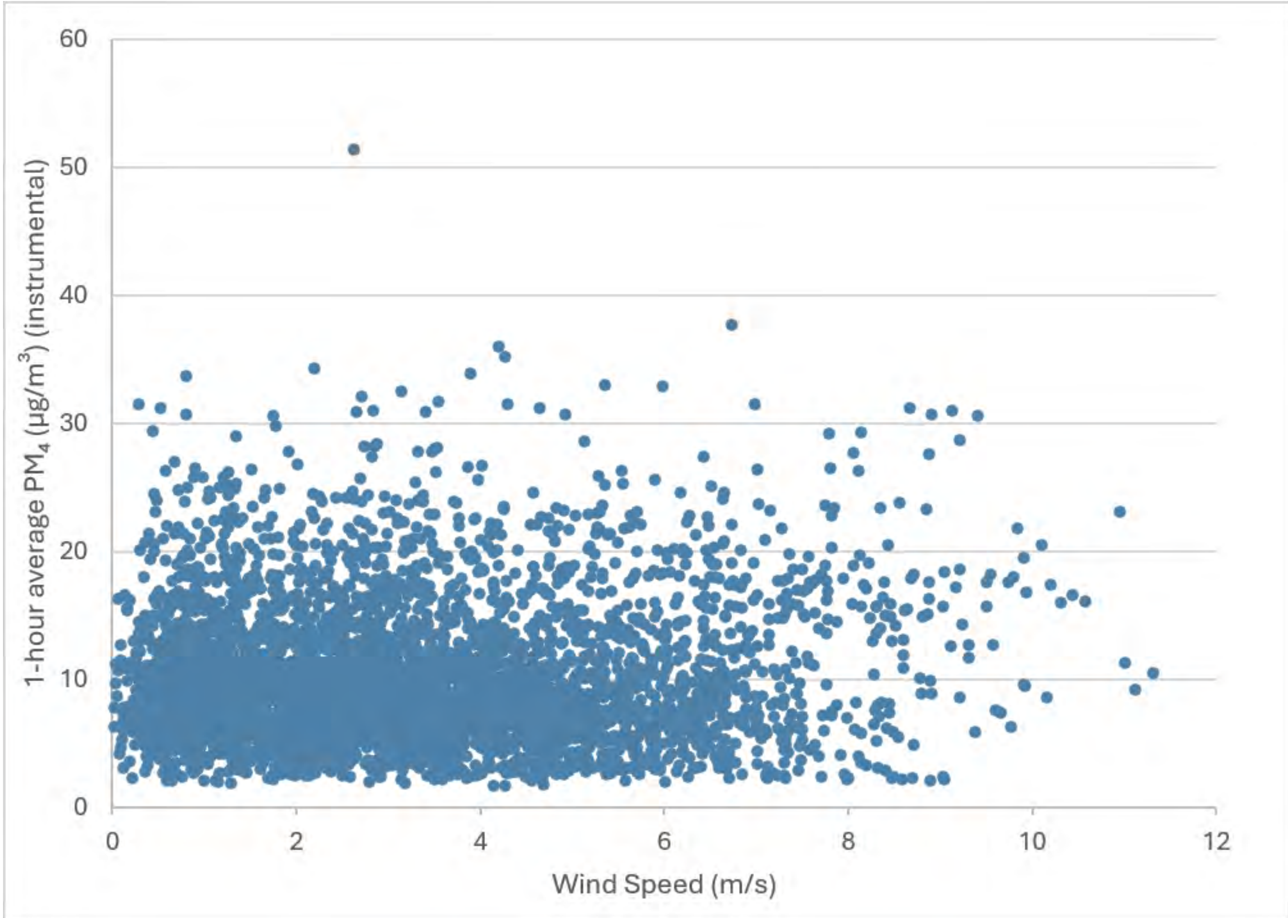


Figure F-6: 1-hour average PM_4 concentrations and wind speed during the monitoring period.

5. $PM_{2.5}$ data versus Wind direction and Speed

Relationships between $PM_{2.5}$ concentrations, wind direction and wind speed during the monitoring period are presented in Figure F-7 and Figure F-8.

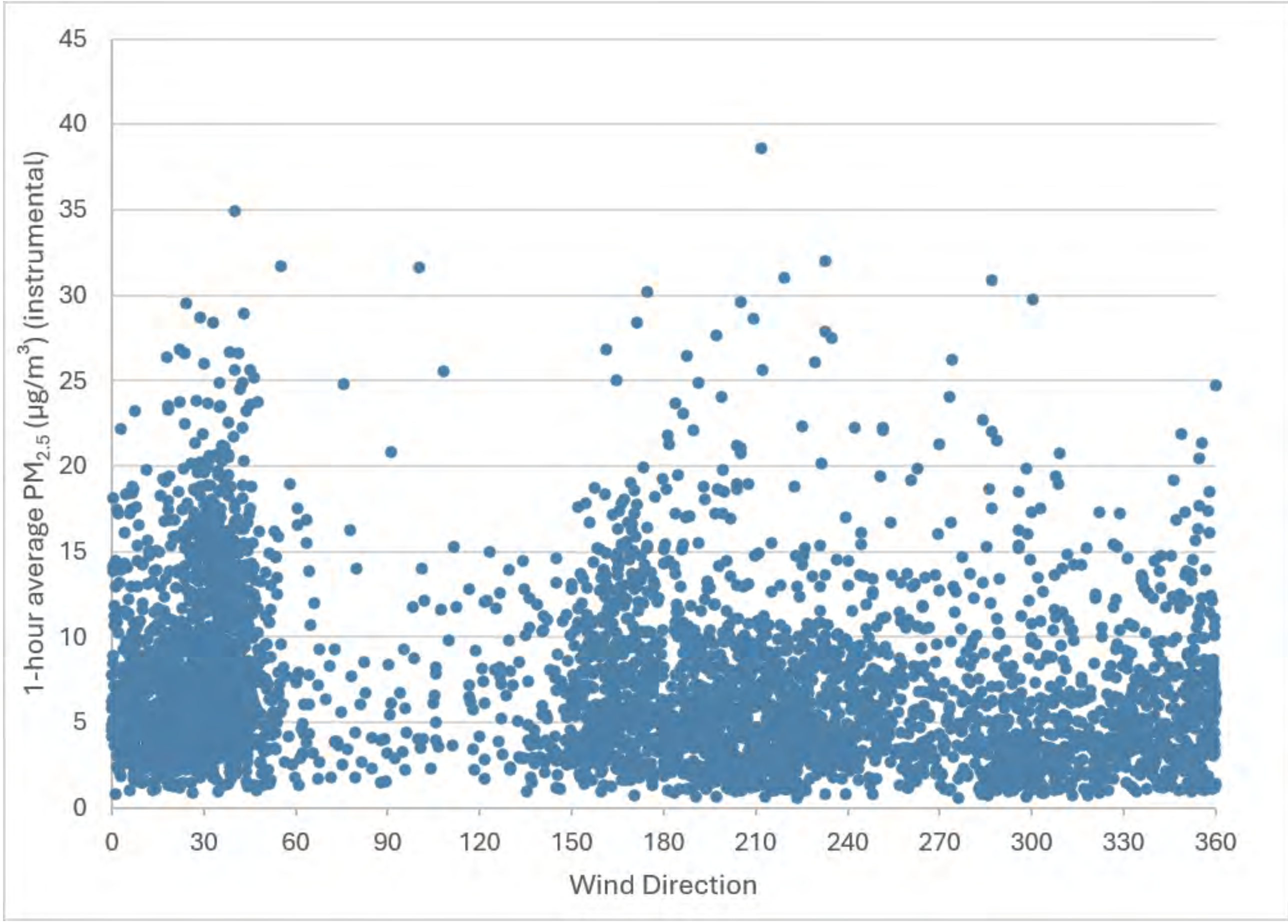


Figure F- 7: 1-hour average $PM_{2.5}$ concentrations and wind direction during the monitoring period.

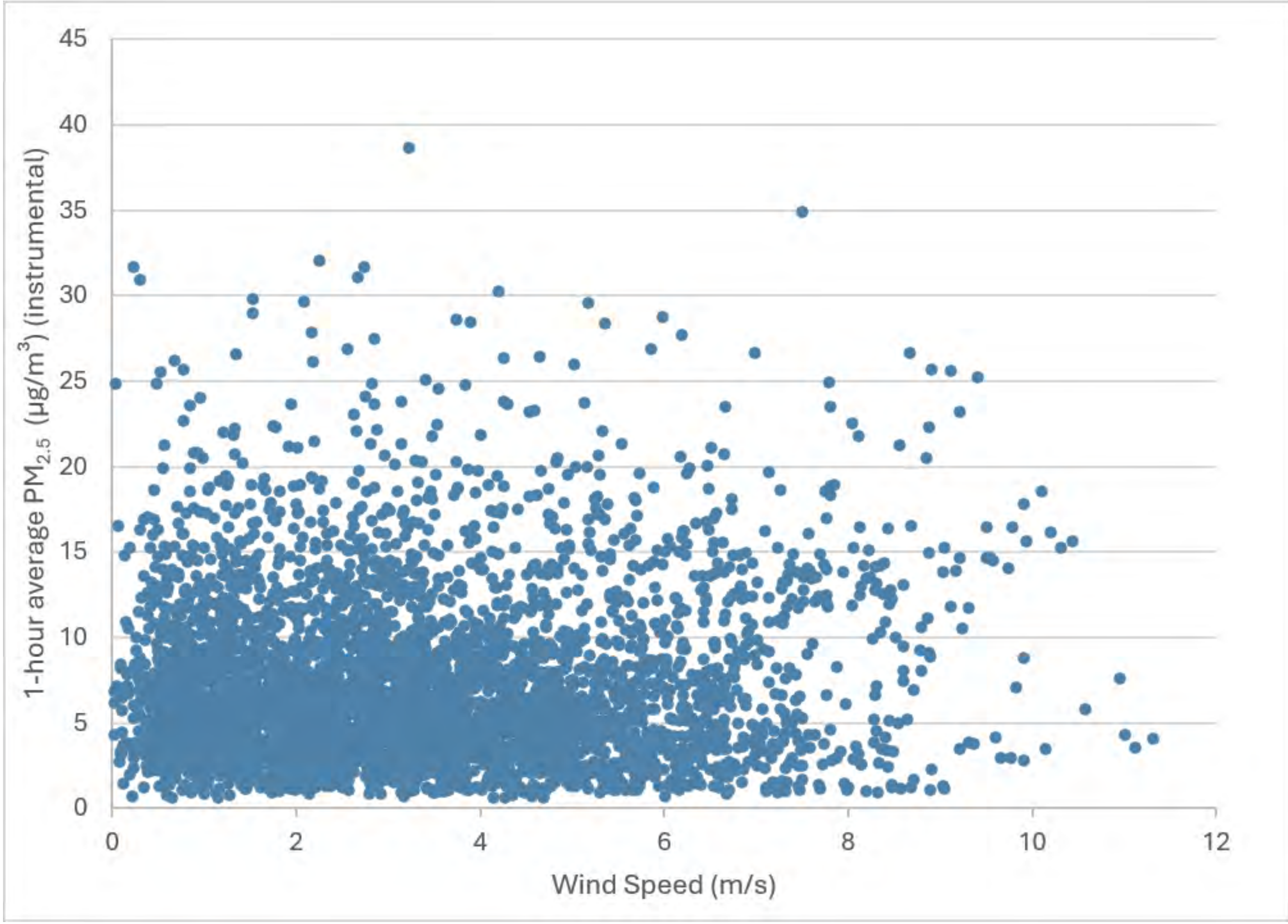


Figure F- 8: 1-hour average $PM_{2.5}$ concentrations and wind speed during the monitoring period.

6. Wind Roses for Sampling Periods – Scottech

Wind conditions recorded during individual valid RCS sampling periods based on Scottech meteorological data are presented in Figures F-9 to F-12.

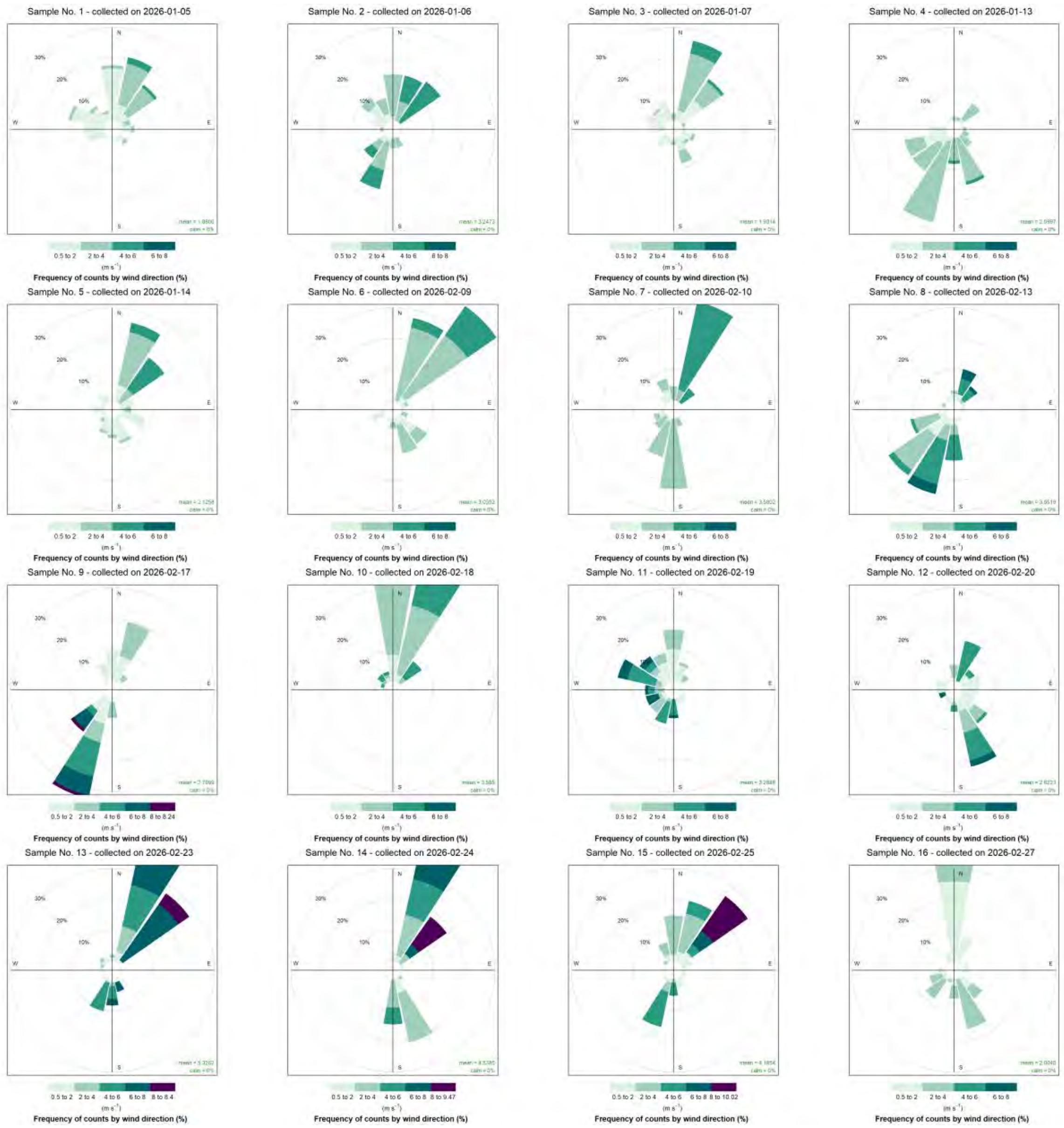


Figure F- 9: Wind roses for individual sampling days (Scott Tech meteorological station, 1of 4).

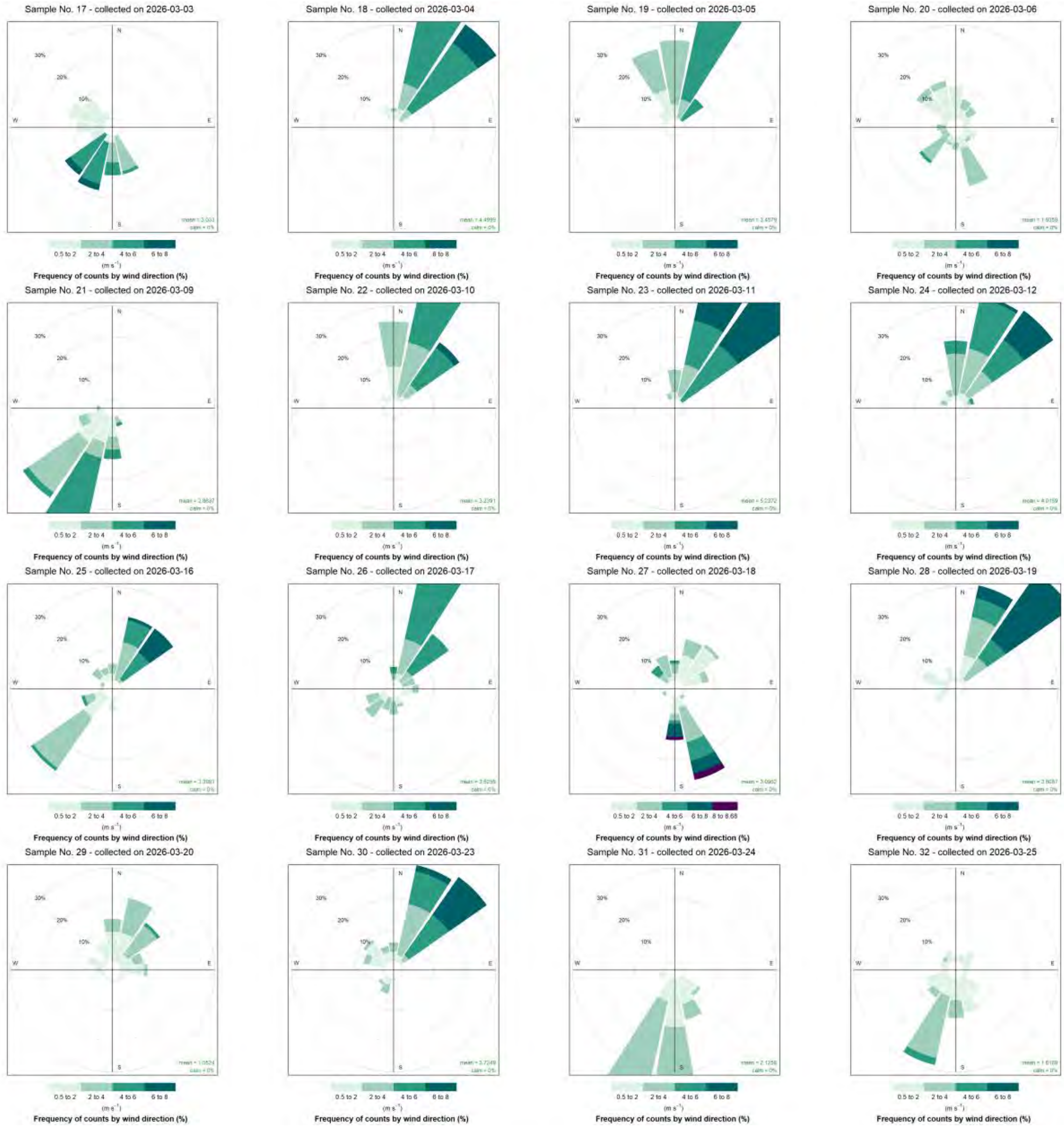


Figure F- 10: Wind roses for individual sampling days (Scott Tech meteorological station, 2 of 4).

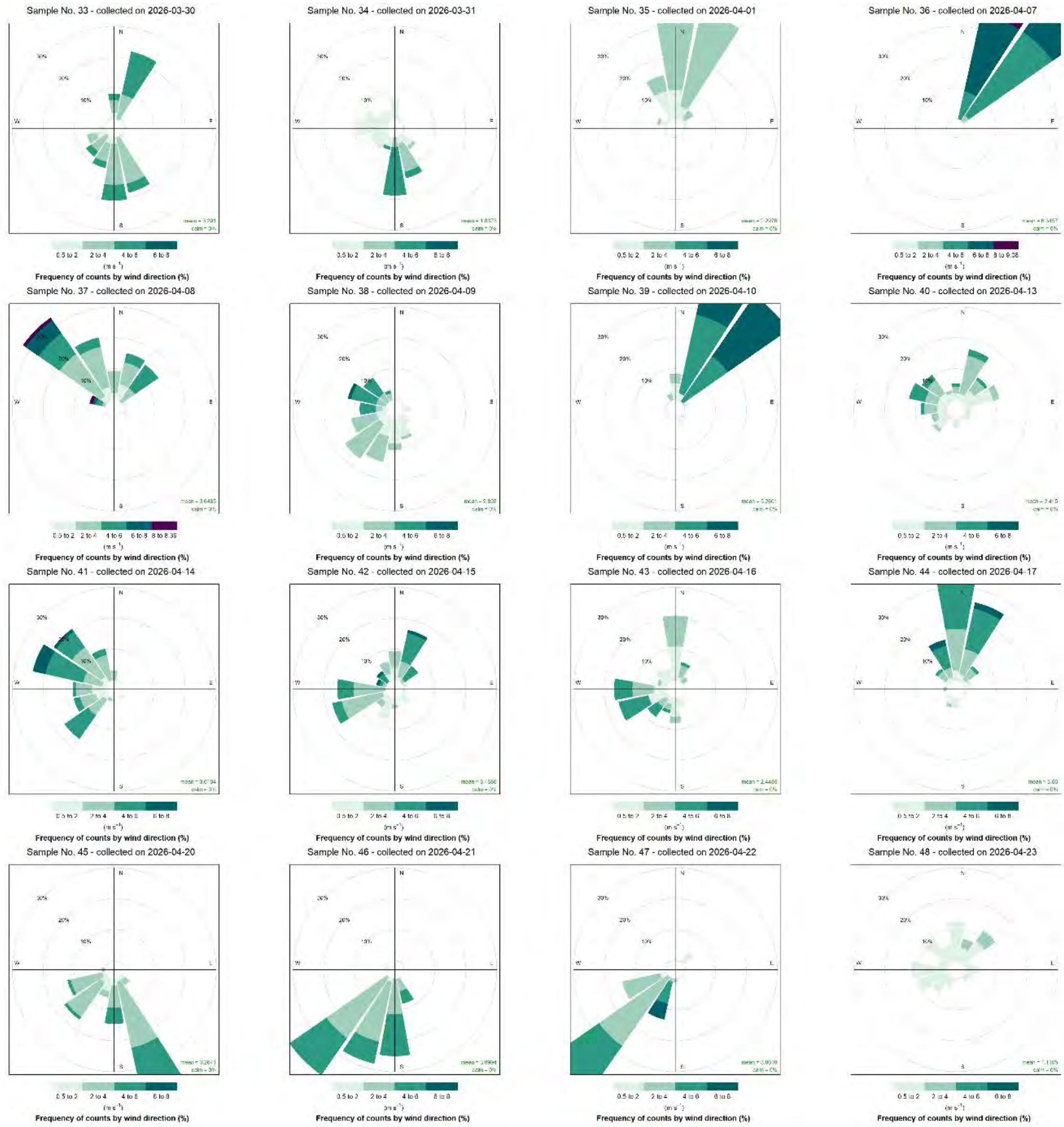


Figure F- 11: Wind roses for individual sampling days (Scott Tech meteorological station, 3of 4).

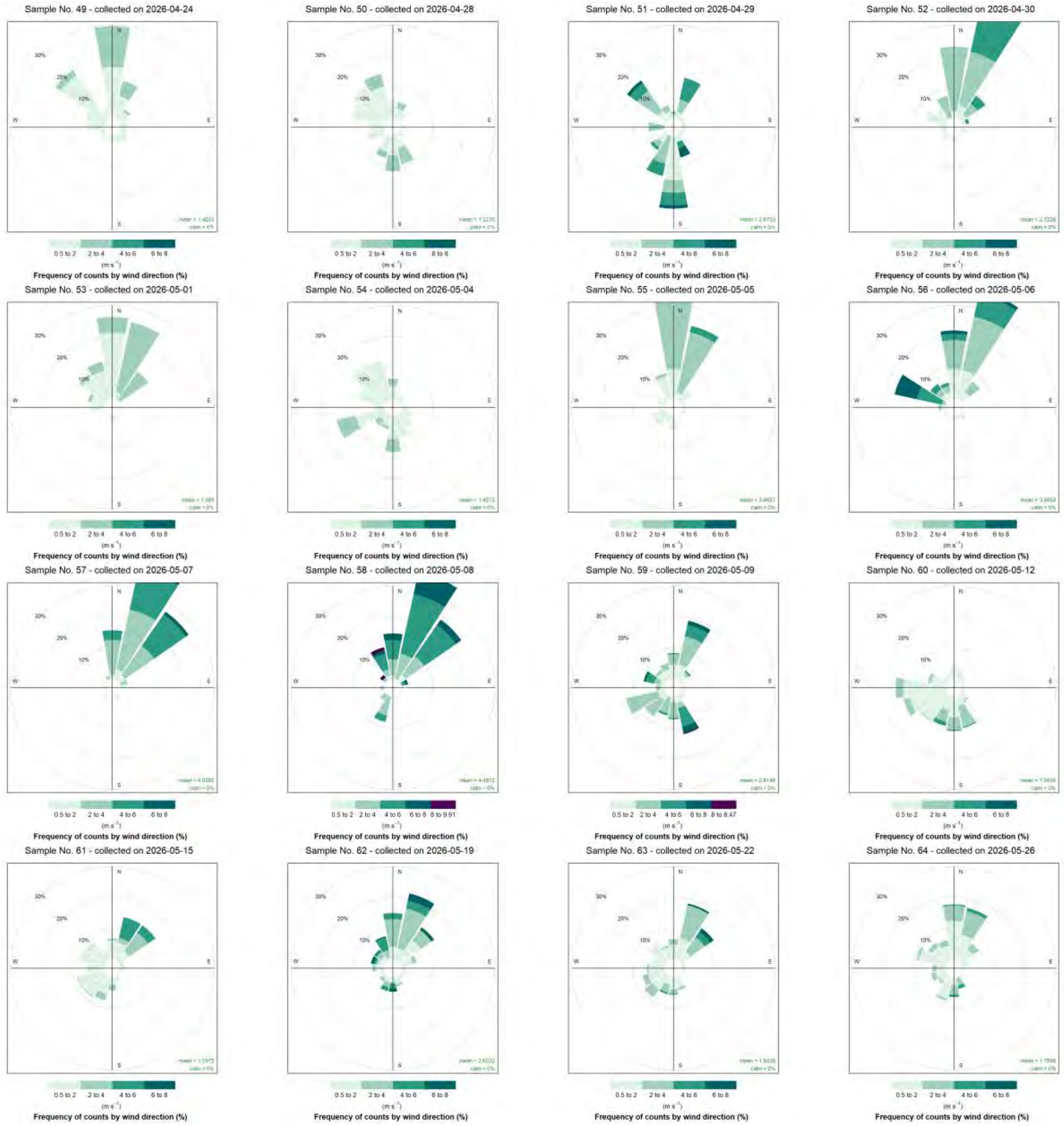


Figure F- 12: Wind roses for individual sampling days (Scott Tech meteorological station, 4of 4).

7. Wind Roses for Sampling Periods - Lufft

Wind conditions recorded during individual valid RCS sampling periods based on Lufft meteorological data are presented in Figures F-13 to F-16.

Figure F- 13: Wind roses for individual sampling days (Lufft meteorological station, 1 of 4).

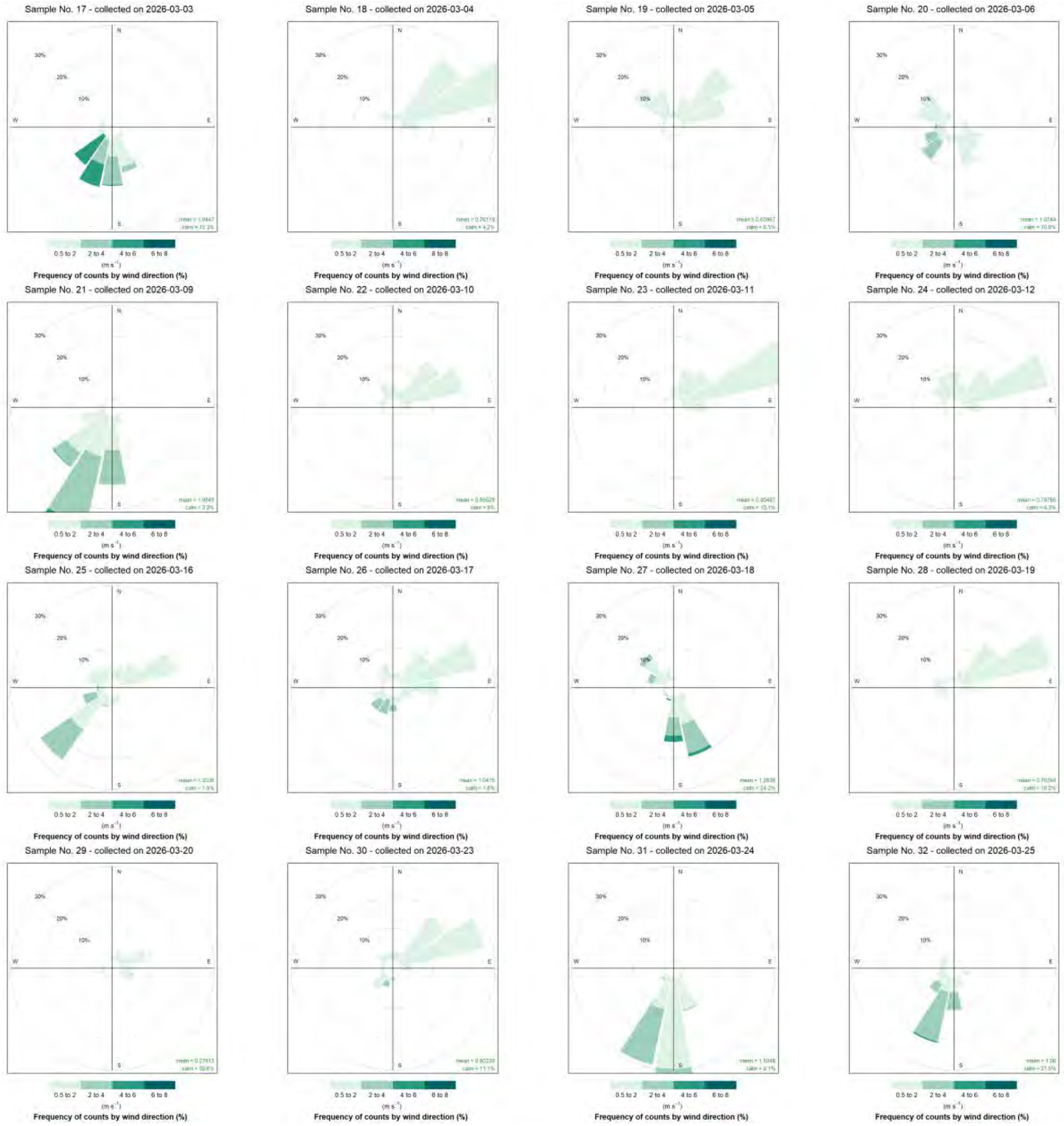


Figure F- 14: Wind roses for individual sampling days (Lufft meteorological station , 2 of 4).

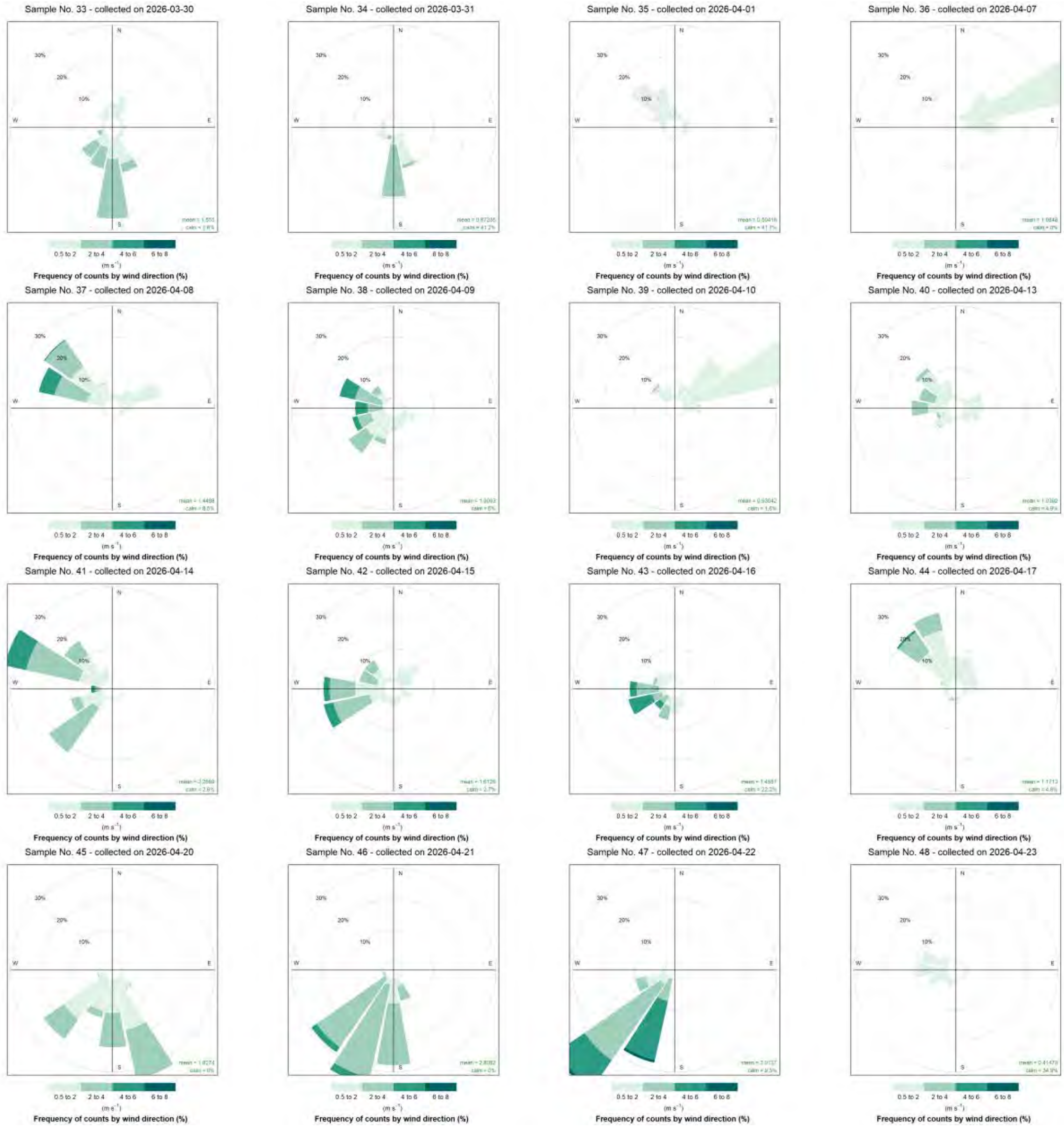


Figure F- 15: Wind roses for individual sampling days (Lufft meteorological station, 3 of 4).

Figure F- 16: Wind roses for individual sampling days (Lufft meteorological station, 4 of 4).

Appendix G Quarry Operational Data

Both	Crushing only	Conveyor only	No operation	★ = Valid RCS sample active

DAILY CALENDAR HEATMAP

Nov-25

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						30 Off

Dec-25

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1 Both	2 Both	3 Both	4 Off	5 Both	6 Off	7 Off
8 Both	9 Both	10 Off	11 Conv	12 Both	13 Off	14 Off
15 Both	16 Both	17 Both	18 Conv	19 Off	20 Off	21 Off
22 Off	23 Off	24 Off	25 Off	26 Off	27 Off	28 Off
29 Off	30 Off	31 Off				

Jan-26

Mon	Tue	Wed	Thu	Fri	Sat	Sun
			1 Off	2 Off	3 Off	4 Off
5 Off	6 Conv★	7 Both★	8 Conv★	9 Conv	10 Off	11 Off
12 Both	13 Both★	14 Both★	15 Both	16 Both	17 Off	18 Off
19 Both	20 Both	21 Both	22 Both	23 Both	24 Off	25 Off
26 Both	27 Both	28 Both	29 Both	30 Conv	31 Off	

Feb-26

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						1 Off
2 Both	3 Both	4 Conv	5 Conv	6 Off	7 Off	8 Off
9 Off★	10 Both★	11 Conv★	12 Both	13 Both★	14 Off★	15 Off
16 Both	17 Both★	18 Off★	19 Both	20 Off★	21 Off★	22 Off
23 Off★	24 Conv★	25 Both★	26 Conv★	27 Off★	28 Off★	

Mar-26

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						1 Off
2 Off	3 Conv	4 Both★	5 Both★	6 Both★	7 Off★	8 Off
9 Off★	10 Off★	11 Both★	12 Both★	13 Off★	14 Off	15 Off
16 Crush★	17 Both★	18 Both★	19 Both★	20 Both★	21 Off	22 Off
23 Both★	24 Both★	25 Conv★	26 Off★	27 Off	28 Off	29 Off
30 Both★	31 Both★					

Apr-26

Mon	Tue	Wed	Thu	Fri	Sat	Sun
		1 Off★	2 Off★	3 Off	4 Off	5 Off
6 Off	7 Both★	8 Both★	9 Both★	10 Both★	11 Off★	12 Off
13 Both★	14 Off★	15 Both★	16 Conv★	17 Off★	18 Off★	19 Off
20 Off★	21 Off★	22 Conv★	23 Both★	24 Both★	25 Off★	26 Off
27 Off	28 Off★	29 Off★	30 Both★			

May-26

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				1 Both★	2 Off★	3 Off
4 Off★	5 Both★	6 Both★	7 Conv★	8 Both★	9 Off★	10 Off
11 Off	12 Off★	13 Both★	14 Both★	15 Both★	16 Off★	17 Off★
18 Both★	19 Both★	20 Both★	21 Both★	22 Conv★	23 Off★	24 Off★
25 Off★	26 Crush★	27 Both★	28 Off★	29 Off★	30 Off	

Appendix H Source Material Analysis

Adelaide XRD Laboratory - 3/224 Glen Osmond Road, Fullarton, SA 5063
Agon Environmental Pty Ltd ABN 29 167 746 063
admin@agonenviro.com.au (08) 8166 2410
www.agonenviro.com.au

Mineral Identification Report

CLIENT:	Fulton Hogan Ltd	**AGON JOB NO:**	JH25.0041-23
ATTENTION:	James Piesse	**RECEIVED IN LAB:**	6 July 2026
CLIENT CONTACT:	+64 27 212 7650		
YOUR REF:	CAN26W4587		

INTRODUCTION

Samples were received with a request for determination of their mineralogy (including crystalline silica) by X-ray diffraction. They were labelled

CAN26O-0698 Bulk Sample -CR1	CAN26O-0701 Bulk Sample – Face 1
CAN26O-0699 Bulk Sample -CR2	CAN26O-0702 Bulk Sample – Face 2
CAN26O-0700 Bulk Sample -BC09	CAN26O-0703 Bulk Sample – Face 3

PROCEDURE

The samples were analysed by X-ray diffraction to identify the minerals present. XRD identifies minerals via their crystal structure.

RESULTS

The mineralogy (estimated wt%) of the samples follows.

Mineral name	0698	0699	0700	0701	0702	0703
Alpha-Quartz	36	42	40	45	42	46
Albite	38	39	40	36	41	39
K-feldspar	5	5	6	8	6	4
Muscovite	13	8	8	7	6	7
Chlorite	8	6	6	4	5	4

Mineral	Composition	Chemical Formula
Alpha-Quartz	Crystalline silica	SiO_2
Albite	Silicate – feldspar group	$NaAlSi_3O_8$
K-feldspar	Silicate	$KAlSi_3O_8$
Muscovite	Silicate – 'white mica'	$KAl_2Si_3AlO_{10}(OH)_2$
Chlorite	Silicate – green flaky mineral	$(Mg,Al,Fe)_{12}(Si,Al)_8O_{20}(OH)_{16}$

admin@port-hill.com

PORTHILL