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Environmental Ltd

Specialists in Air Quality Measurement

Dust Monitoring Report



Hirock *Linton Quarry*

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Site work date(s) 5 May 2023
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Site address 257 Kendalls Line, Linton
Purchase order number 32150

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1.0 EXECUTIVE SUMMARY

Hirock Limited is a subsidiary of Higgins Family Holdings Limited and operates out of the Linton Quarry, near Palmerston North. Hirock supply aggregate to the local region. On site they extract, crush, wash and screen aggregates for supply. Through the process of crushing, screening and transport of aggregate, dust may be generated and disturbed.

The purpose of the report is to provide baseline readings for dust levels along Kendalls Line to help inform a consent application to increase quarry production by providing an indication of expected off-site dust levels that might result from increased production at the site.

The monitoring results within this report are considered to be an indication of ambient levels as the peak dust emission results were found to be often unrelated to site activities and quarry vehicle movements.

It is therefore expected that if the road is well-maintained and there is an increase in frequency of quarry vehicles along Kendalls Line, emissions will not increase substantially. Noting this assumption is limited as background monitoring was carried out during wetter autumn months, whereas the summer season will produce dryer conditions, and therefore potentially an increase in dust disturbance.

To confirm low emission rates once the quarry activity increases, dust level monitoring during 'dry' summer seasons is recommended.

2.0 INTRODUCTION

2.1 Background information

Hirock Limited is a subsidiary of Higgins Family Holdings Limited and operates out of the Linton Quarry, near Palmerston North. Hirock supply aggregate to the local region. On site they extract, crush, wash and screen aggregates for supply. Through the process of crushing, screening and transport of aggregate, dust may be generated and disturbed.

2.2 Quarrying Process Summary

The quarrying of hard rock requires drilling and blasting with explosives. Excavators then load the rock into dump trucks. The rocks are delivered to stockpiles.

Rock is processed into aggregate products, using

- crushing,
- screening,
- washing,
- blending, and
- conveying machinery

The products are moved by trucks, loaders, or conveyor to stockpiles.

Some soil and overburden will be stripped on site to expose rock for quarrying. The material stripped will be placed in designated overburden infill areas.

2.2.1 Operating Times

Monday – Friday 7am – 5pm, Saturday 7am – 3pm. Closed on public holidays and reduced hours over the Christmas period.

2.3 Dust Sources

Transportation/excavation/screening of aggregate. Settled dust on aggregate will be disturbed and made airborne, as aggregate is moved from one location to the next and vibrated through screens.

Crushing aggregate. Breaking aggregate down into smaller sizes will create dust.

Rehabilitation of exposed surfaces. Soil removal and overburden disposal will generate dust temporarily.

Stockpiles. Settled dust on stockpiles is likely to be disturbed whilst aggregate is added or removed from the stockpile. Strong winds may also disturb surface dust.

Vehicle movements. The quarry truck movements in this consent are for up to 250 movements per day. The road (Kendalls Line) has been recently resurfaced and considered to be in good condition with a low amount of dust expected from the road surface itself.

Vehicle movements throughout site and along Kendalls Line may disturb and deposit surface dust on the roads and surrounding properties. Dust may also be disturbed by air movements across the vehicles. Condition of the road and vehicle and speed of the vehicle are key components to dust generation.

Product Details. The majority of the product being moved from site are large rocks (300mm – 2000mm in size). The amount of dust from the large rocks in the truck is considered to be low.

On Site Dust. Due to the distance from site (950m+), receivers that are likely to be downwind of site are not expected to be affected by onsite operations. They are more likely to be affected by dust emissions from traffic movements along Kendalls Line.

2.4 Purpose

The purpose of the report is to provide baseline readings for the dust levels along Kendalls Line and to provide indication of expected dust levels during increased activity at the site

2.5 Other Source of Dust

The quarry is located within a Rural area with production land uses and rural residential properties surrounding the quarry.

While on site a fertiliser truck was observed spreading particulate on a nearby paddock. The dust from this truck blew down the road in the direction of the prevailing wind.

Other activities that occur typically in rural areas that can generate dust include stock movements, cutting grass, dirt or metalled accessways, land cultivation and domestic fires.

2.6 Site Location

The site is located at 257 Kendalls Line, Linton (40°26'10.72"S 175°36'10.76"E).

The terrain of the site location is mostly flat with small undulations. To the south of the site are the Tararua Ranges.

2.7 Receivers

Receivers to dust emissions are the rural residential houses on neighbouring properties and along Kendalls Line. The sensitive receivers are identified on the map below in Figure 1 Satellite image of Linton Quarry. The list of receivers northwest of the quarry along Kendall's Line are:

- 11 Kendalls Line
- 15 Kendalls Line
- 33 Kendalls Line
- 39 Kendalls Line
- 4 Kendalls Line
- 6 Kendalls Line
- 56 Kendalls Line
- 75 Kendalls Line
- 150 Kendalls Line

Three properties along Kendalls Line (#11, #15 and #39) have previously raised concerns about dust from quarry trucks travelling along the road (Kendalls Line). When the road is resealed and the potholes fixed, the residents report the issues are reduced. The nearest property (# 150) has not raised any concerns about dust.

No dust issues have been identified by the receivers from activities within the quarry site.

150 Kendalls Line is likely to be the worst effected by quarry operations and road traffic, due to the proximity to site.

Due to the properties being rural residential the sensitivity of the receivers is considered moderate to high.



Figure 1 Satellite image of Linton Quarry

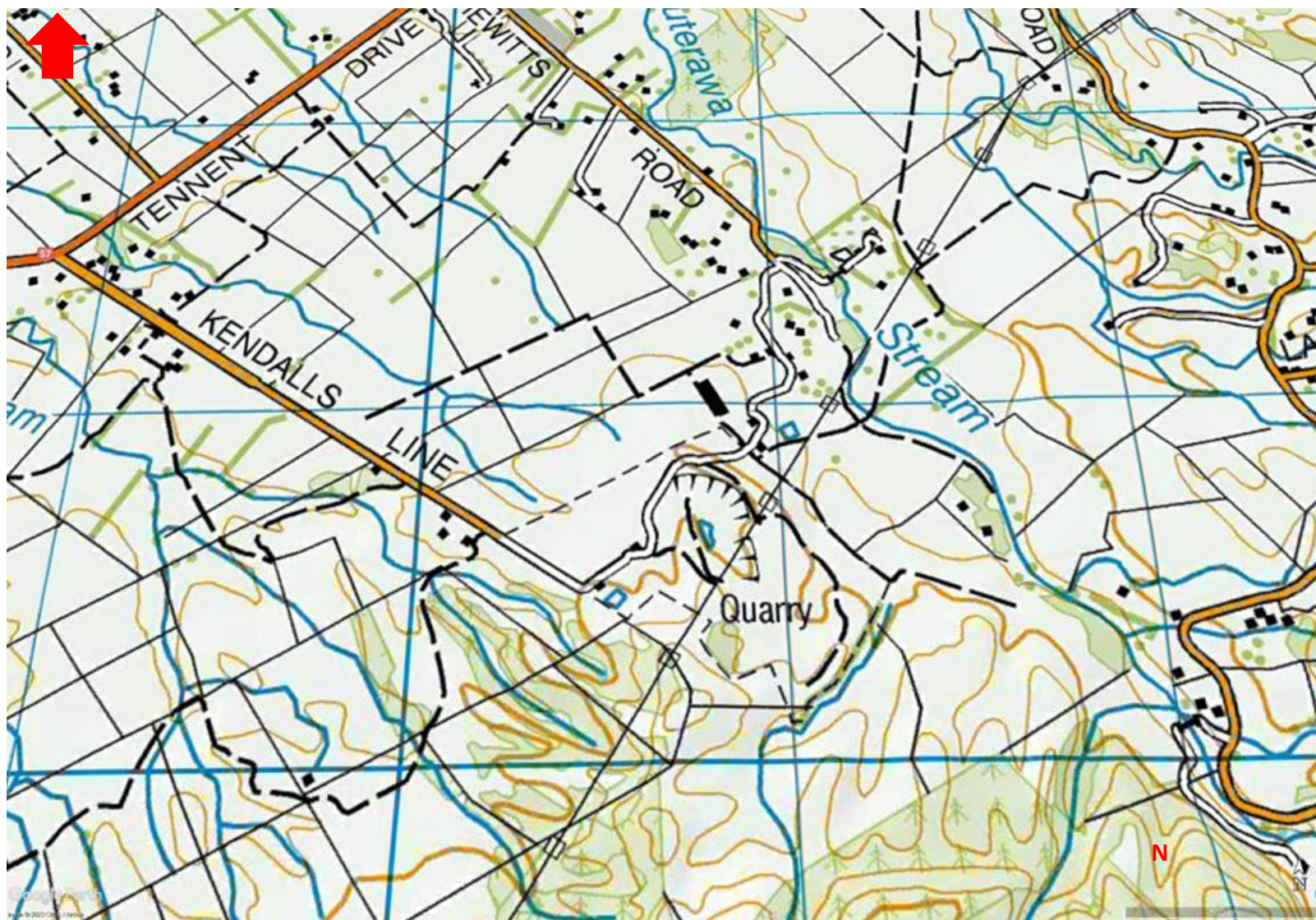


Figure 2 Topographic map of Linton Quarry

3.0 MONITORING METHOD

DustTrak monitors were set up alongside time lapse cameras to record particulate matter with a cut size of 10µm in aerodynamic size (PM10). The monitors were placed along the boundaries of:

- 11 Kendalls Line
- 39 Kendalls Line

A Palas AQ guard¹ was setup beside the dusttrak monitor at 39 Kendalls Line to measure for PM1, PM2.5, PM4, PM10, PM_{Total} and particle size distribution. A meteorological station was also setup at 39 Kendalls Line, although data was not able to be recovered from it. A met station close to the analysers is considered to be more accurate than one locally. The data from a closely located met station will pick up any local weather effects.

The met data used is expected to be fit for purpose.

Measurements from the particulate monitors was graphed and the peaks higher than 50µg/m³ were reviewed against the time lapse monitoring data.

4.0 RESULTS

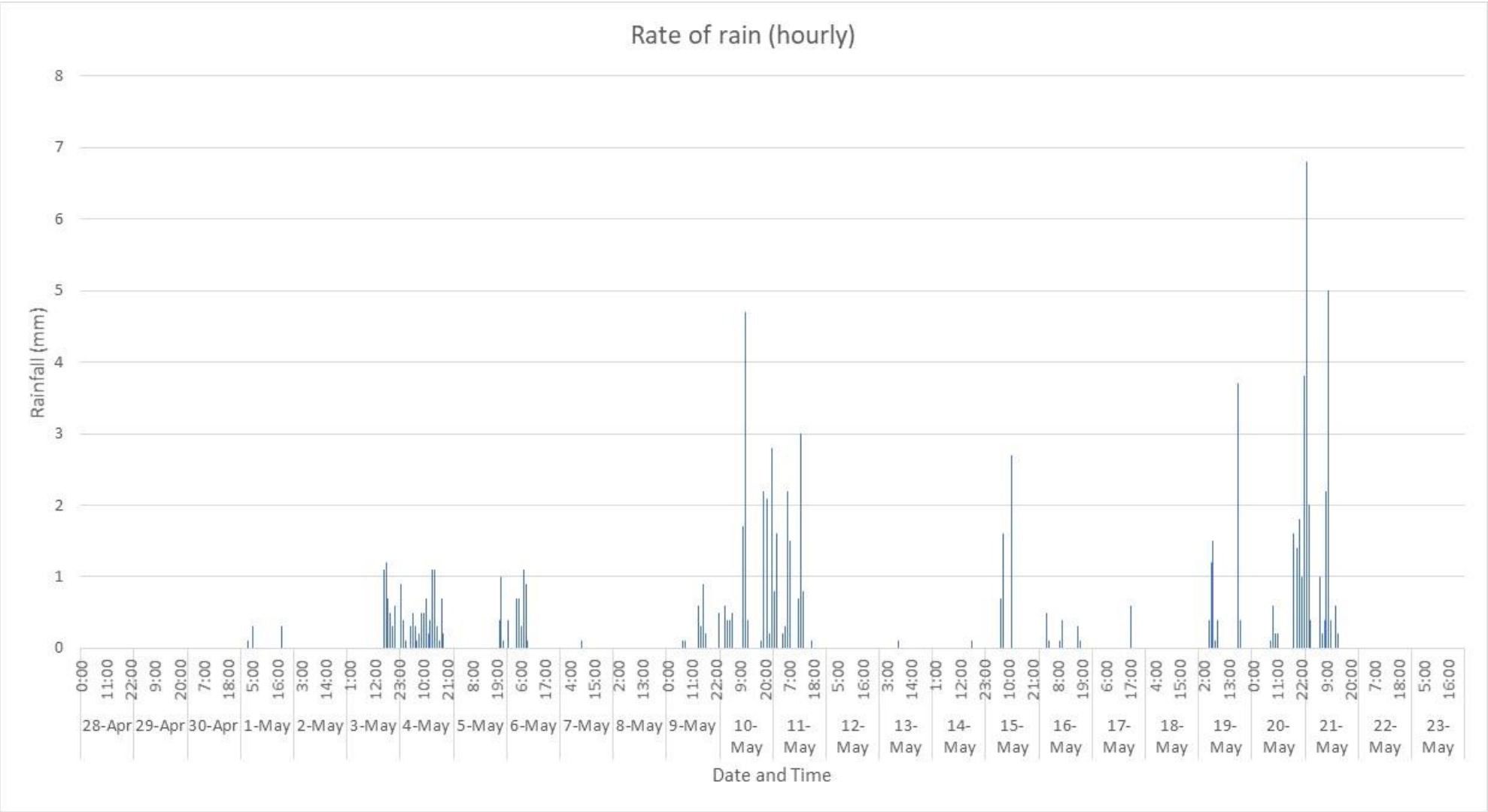
4.1 Meteorological Conditions

Graphs of a wind rose and hourly rain observations have been plotted.

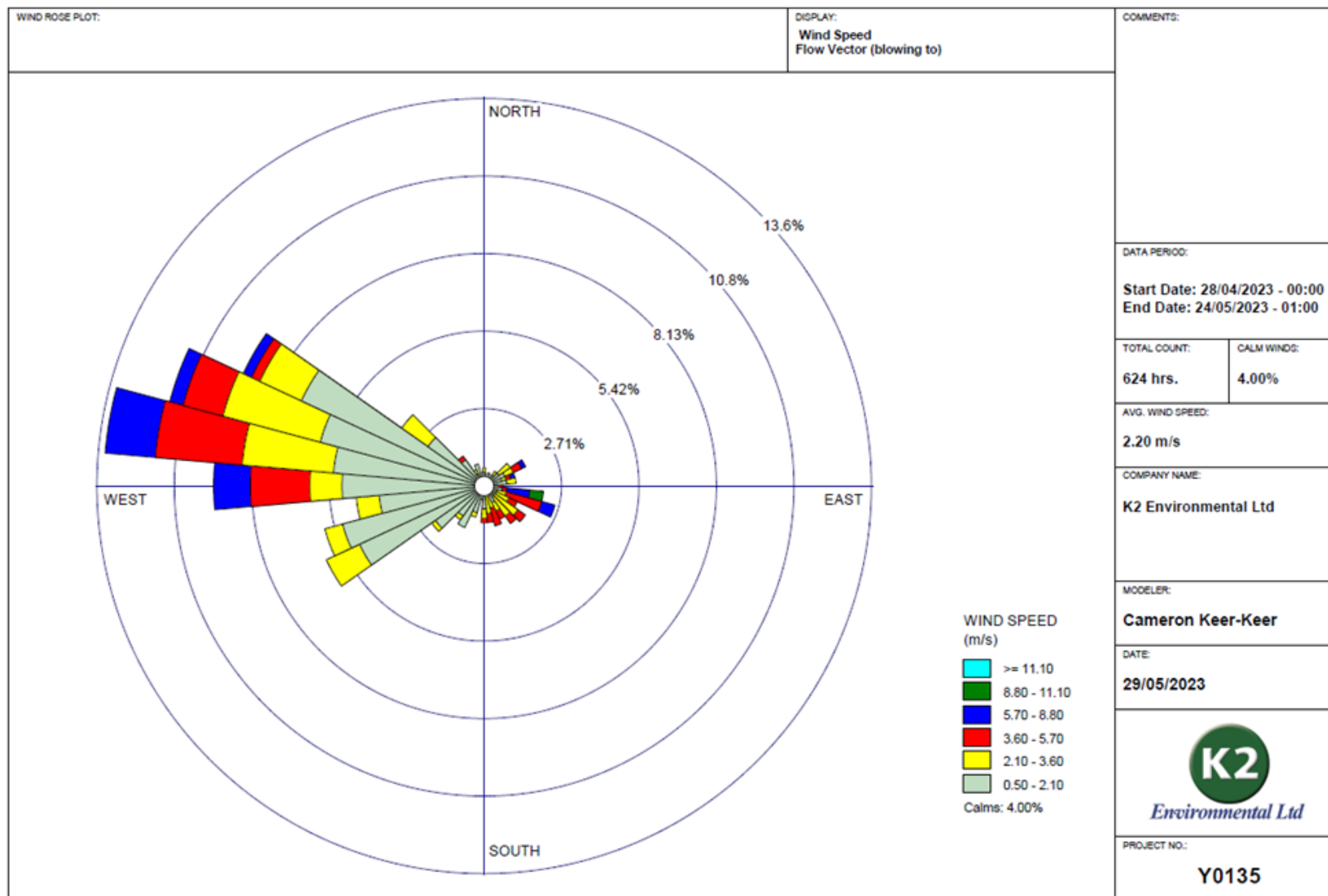
Measurements from NIWA station 21963 (Palmerston North) was reviewed and wind speed and direction as well rain rate was graphed.

Monitoring was undertaken during late autumn; it is expected that the conditions during this time will not be as dry as conditions during the summer months due to reduced radiant heat from the sun.

¹ The instrument also records volatile organic compounds, carbon dioxide, temperature and humidity.

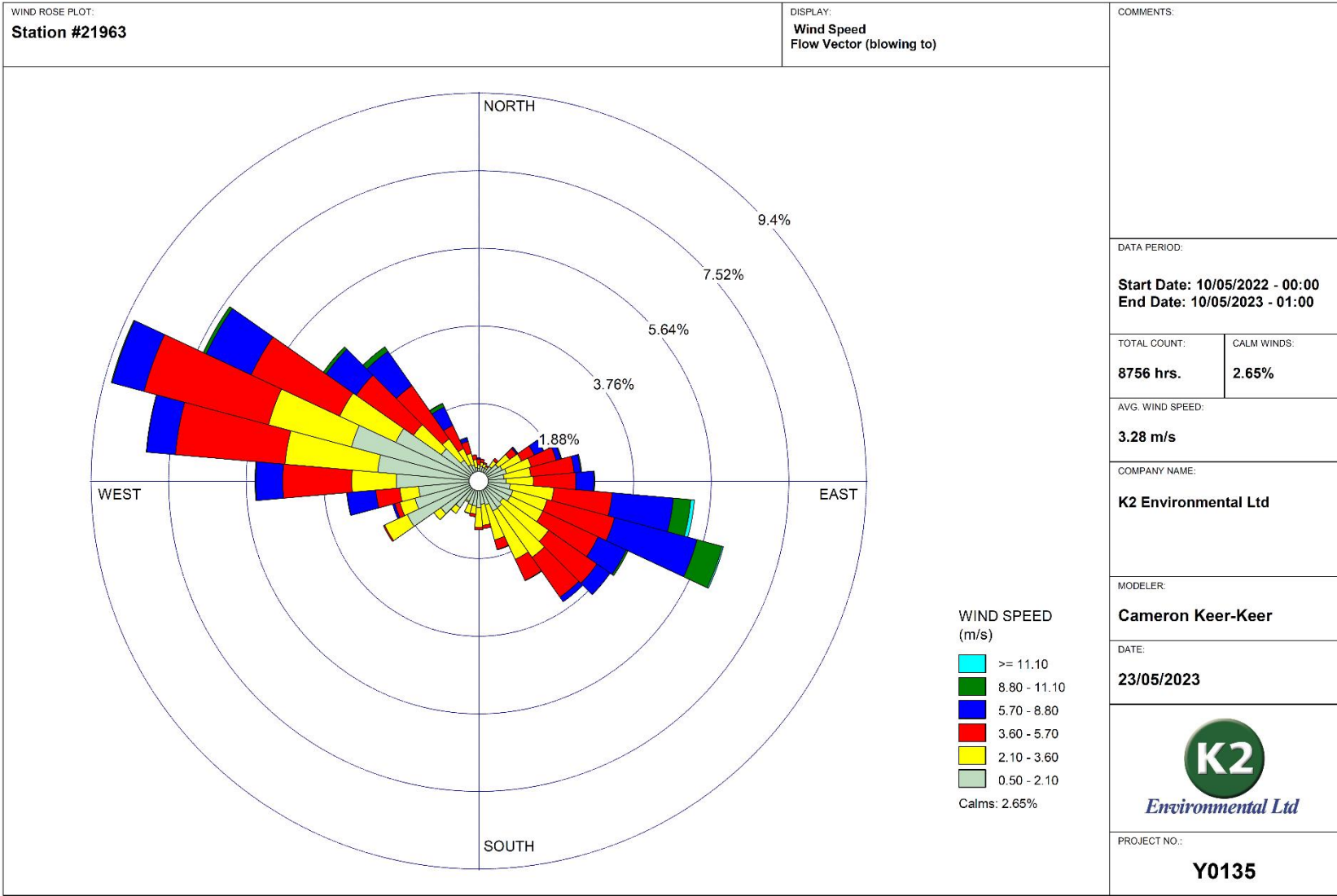


Graph 1 Hourly Rain



WRPLOT View - Lakes Environmental Software

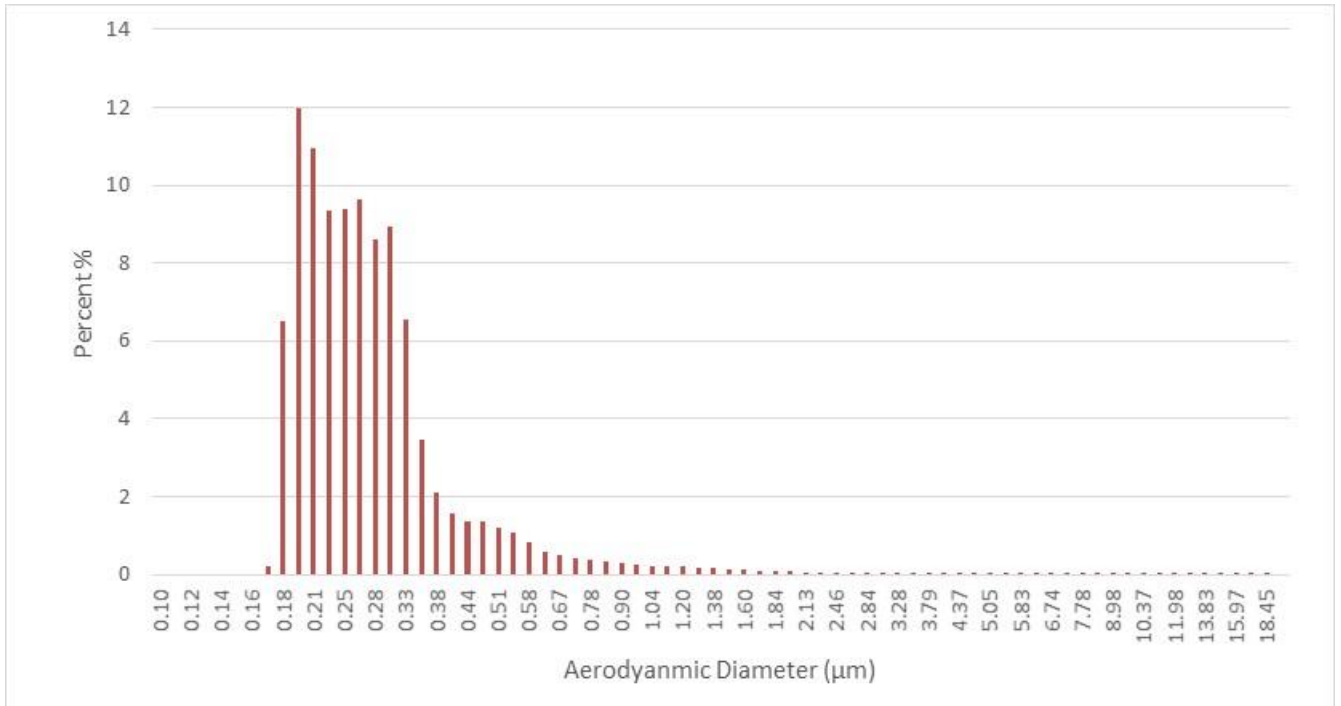
Graph 2 Wind Rose During Monitoring



Graph 3 Wind Rose (Past Year 22/23)

4.2 Particulate Size

The dust found at the monitoring site is shown in the graph below. This graph shows the majority of the dust is less than 0.38 µm in size. The proportion of dust greater than 1µm is low.



4.2.1 Visibility of Dust

A human eye can at best see dust particles of 40 µm or larger. Dust sizes measured at 39 Kendall’s line is not expected to be visible to the human eye.

4.2.2 Deposition of Dust

Dust of the size particles measured at 39 Kendalls Line will not have sufficient mass to readily be readily deposited.

5.0 DUST MONITORING

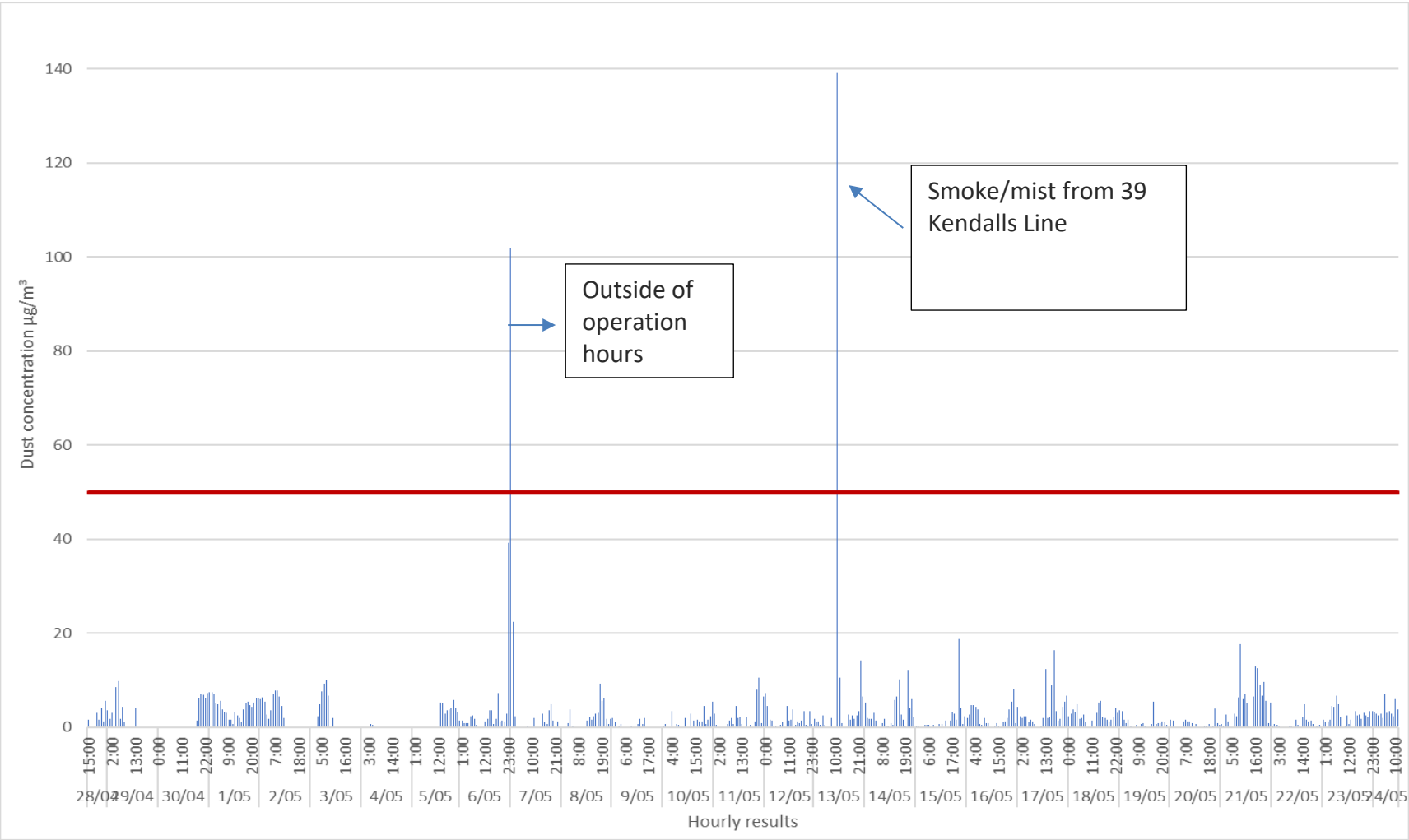
5.1 39 Kendalls Line

The palace AQ guard was used to sample particulate from 39 Kendalls Line. Two parameters are displayed, particulate PM₁₀ and total particulate PM_{total}. The PM_{total} can be expected to capture particles up to 20 µm in size.

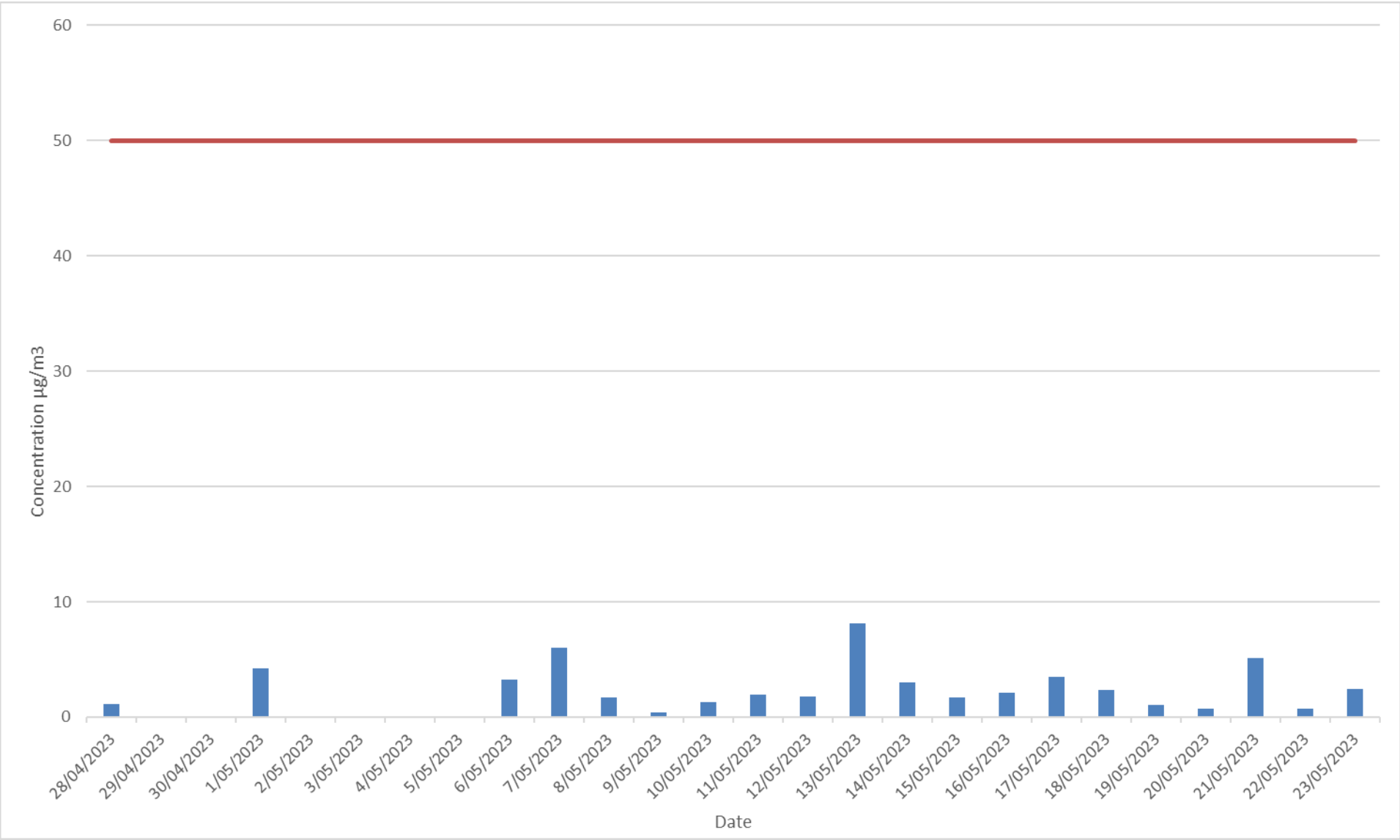
There were two outliers identified in the particulate monitoring. On May 13 there appeared to be large plumes of smoke/mist coming from the direction of 39 Kendalls Line observed from the time lapse monitoring.

Peaks during the 23rd of May happened outside of operational hours of the quarry and are therefore not associated with activities onsite.

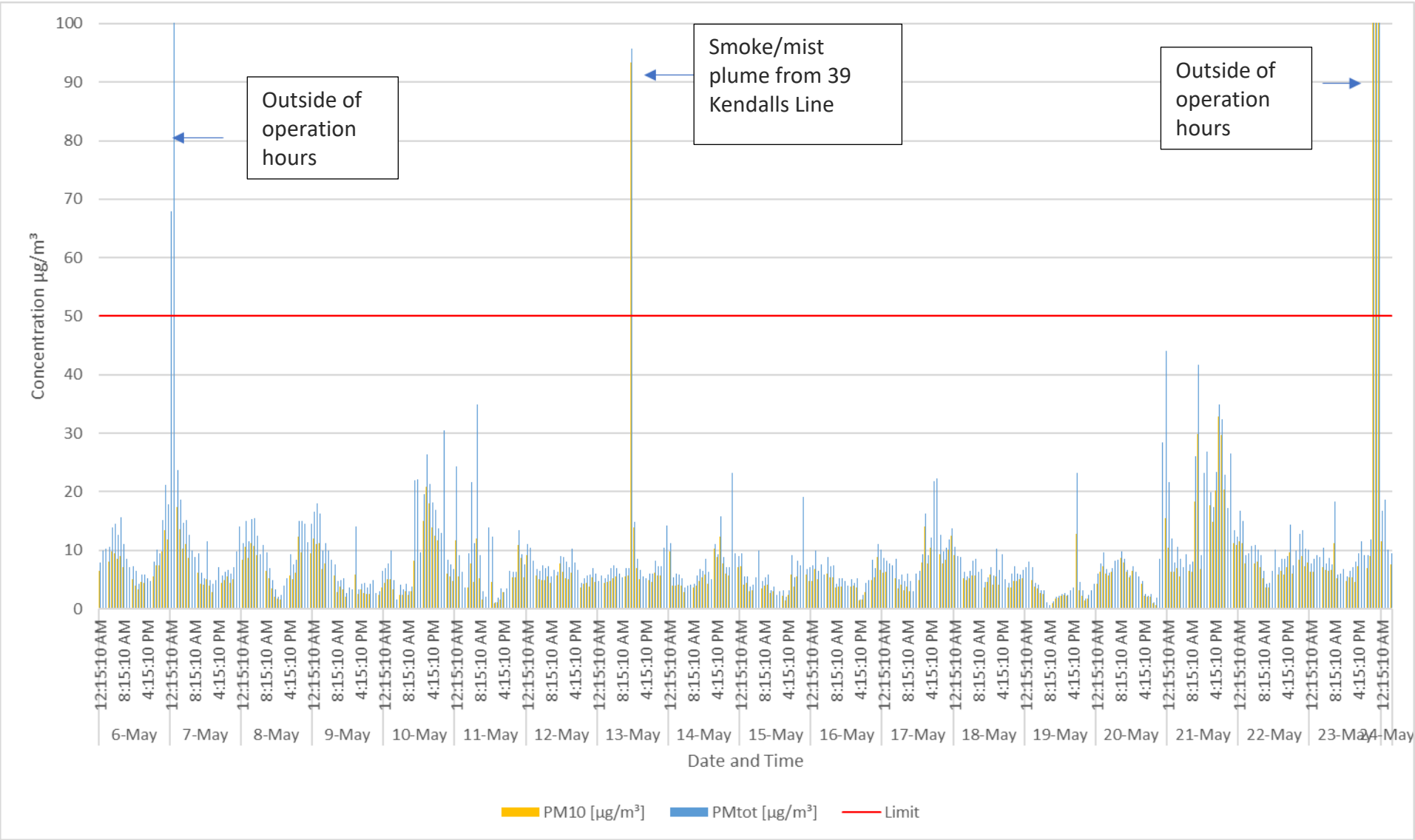




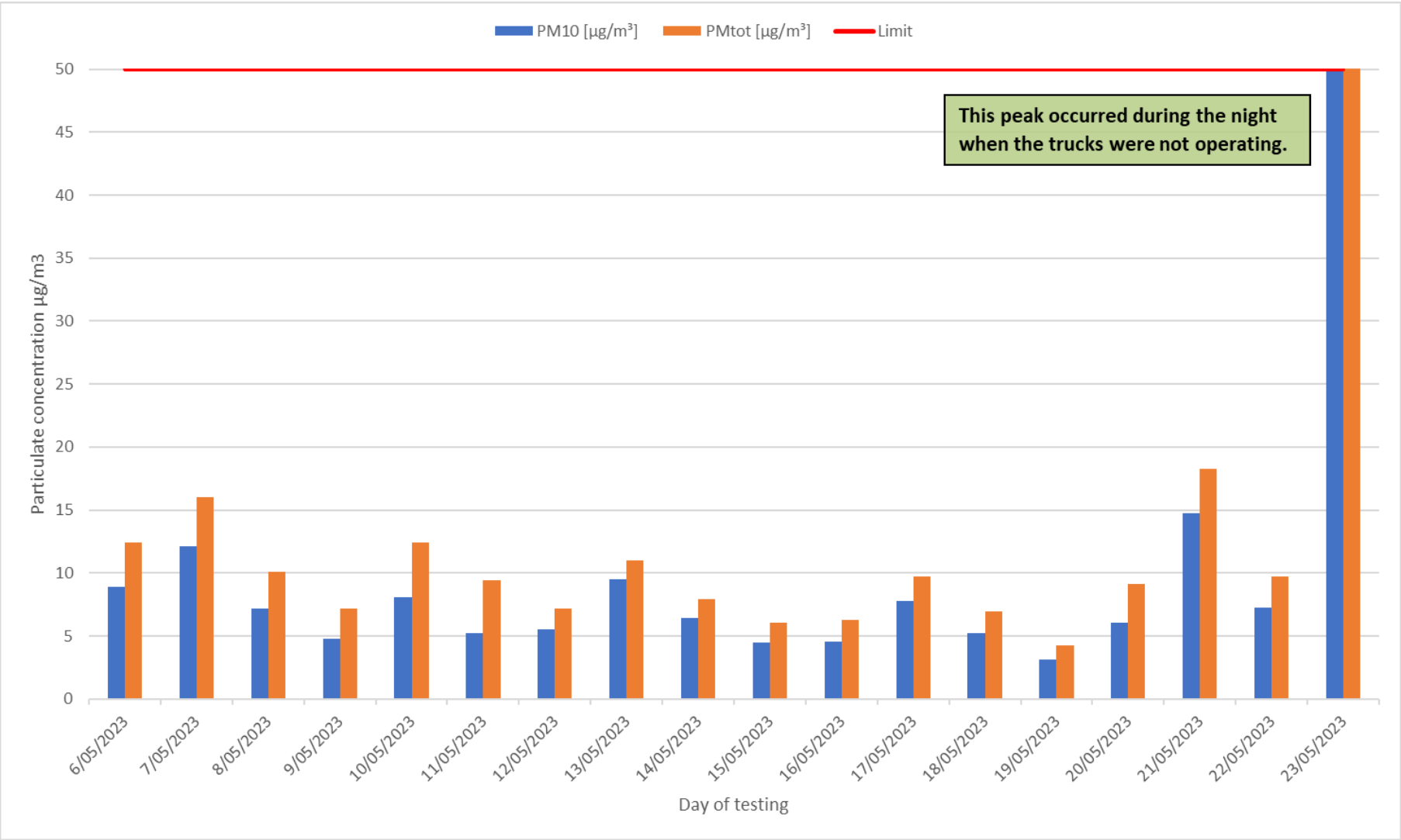
Graph 4 Hourly DustTrak data from 39 Kendalls Line



Graph 5 Daily DustTrak data from 39 Kendalls Line



Graph 6 Hourly AQ Guard data from 39 Kendalls Line



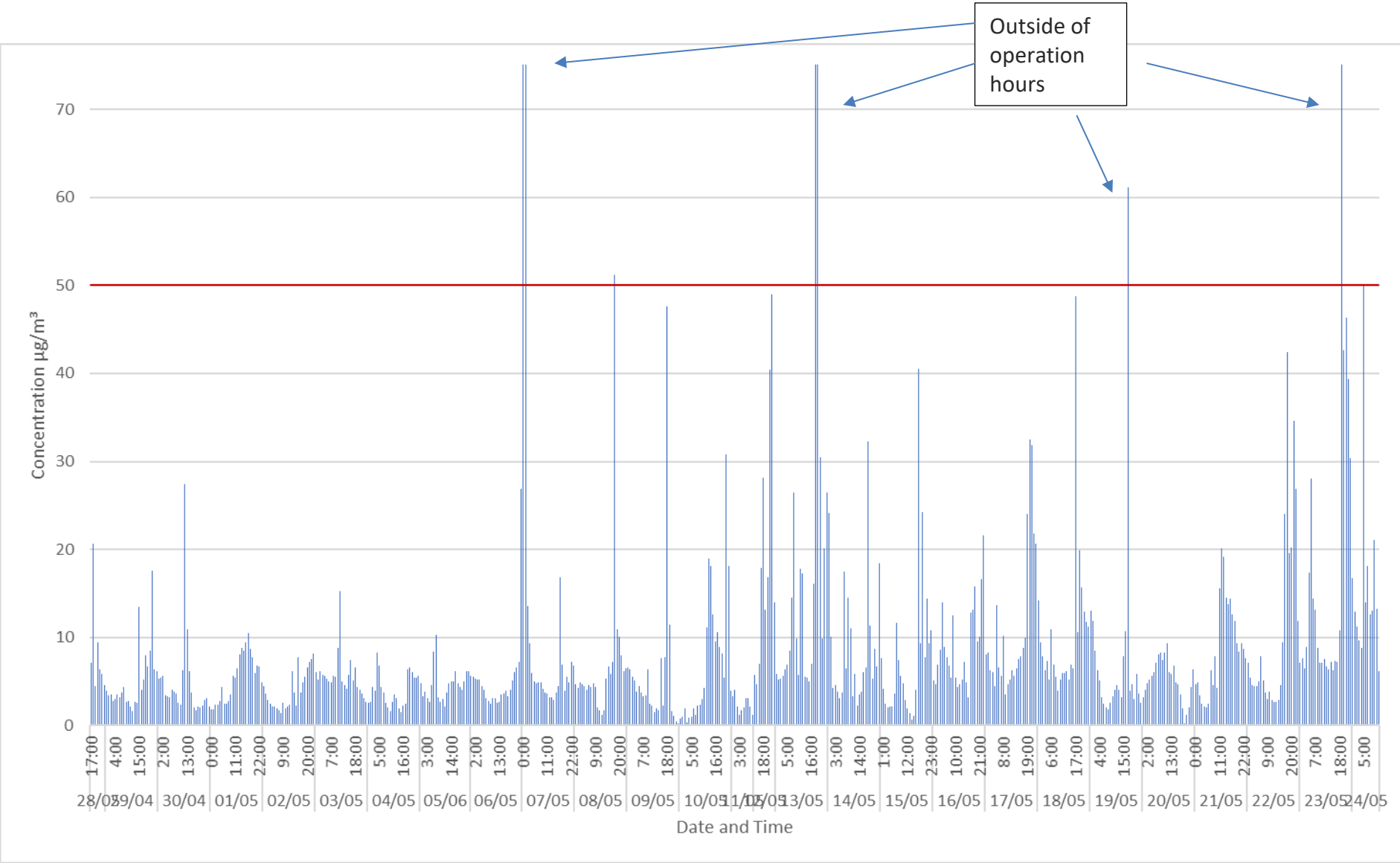
Graph 7 Daily AQ Guard data from 39 Kendalls Line

5.2 11 Kendalls Line

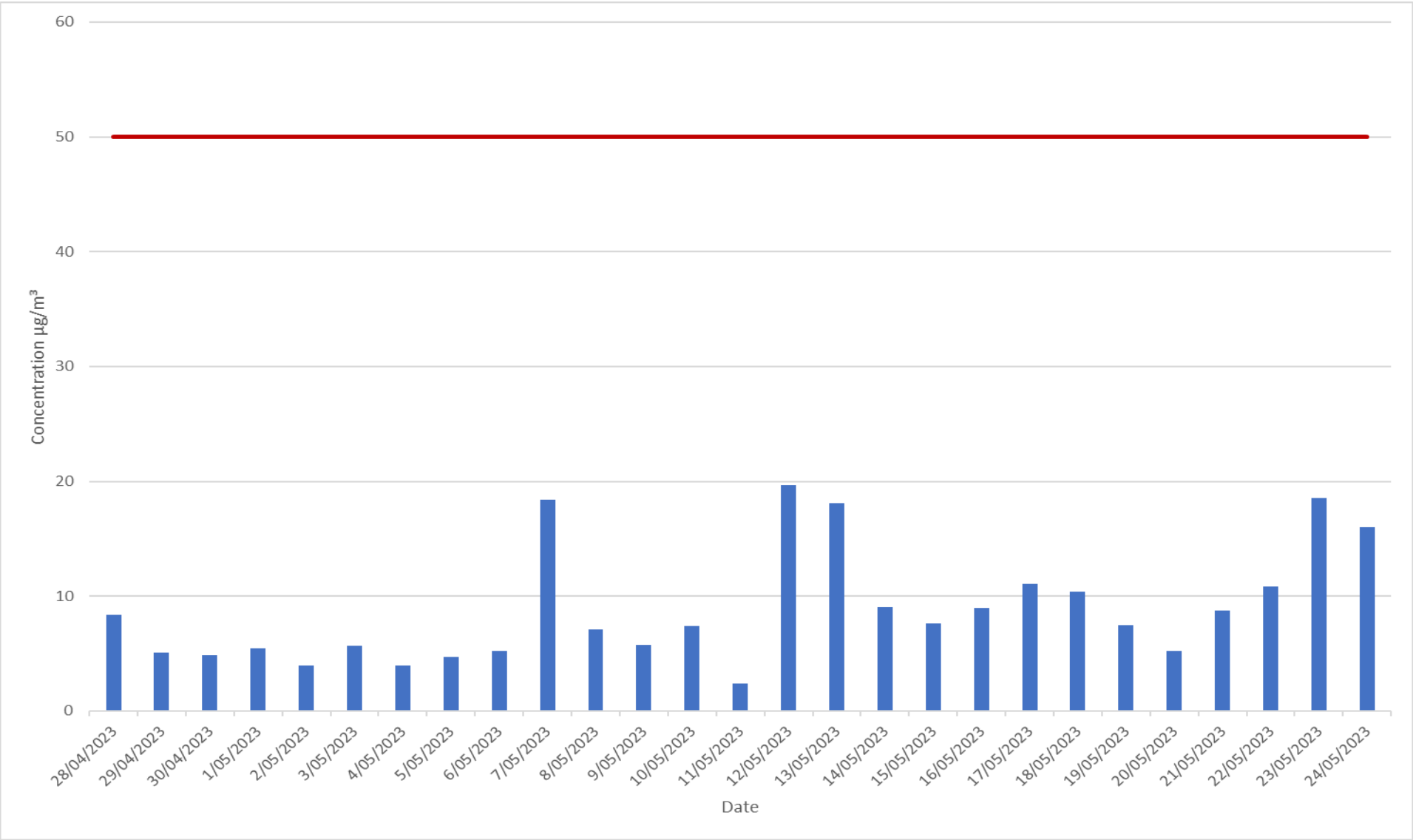
The DustTrak sampler was placed close to the road, in front of the two rural residential properties. Two graphs are provided, one is a one-hour averages, the other 24 hours averages. The 24-hour standard is $50 \mu\text{g}/\text{m}^3$, this is illustrated with a red line on the graph.

There are multiple peaks that are above $50 \mu\text{g}/\text{m}^3$ that are outside of Linton's active hours.



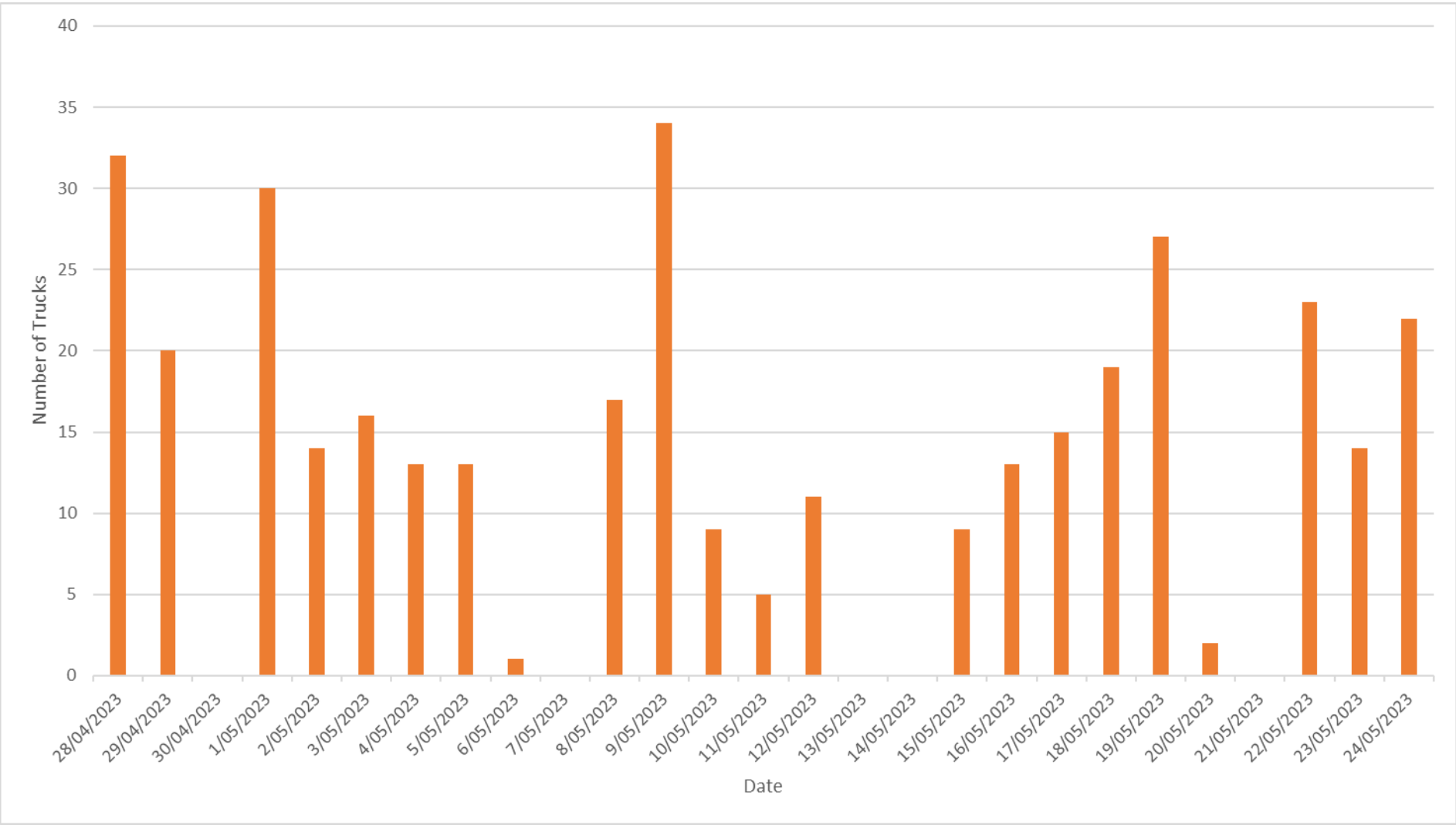


Graph 8 Hourly DustTrak data from 11 Kendalls Line



Graph 9 Daily DustTrak data from 11 Kendalls Line

5.3 Kendall’s Line Quarry Movements



Graph 10 Numbers of quarry vehicles on Kendall's Line during monitoring

6.0 DISCUSSION

Due to the limitations of the DustTrak under low concentration the AQ guard is considered more representative of airborne concentrations (39 Kendalls Line) as it been compared with Environment Canterbury monitoring equipment.

Because there was a higher concentration along the road near 11 Kendalls Line, the DustTrak setup is considered to be representative.

Results from 11 Kendalls Line directly beside the road is considered more representative of emissions from the road.

Emissions of dust from vehicles along Kendalls Line is considered to be low, this is due to:

- Results from monitoring along Kendalls line show that hourly averages are often below $50 \mu\text{g}/\text{m}^3$. Any peak above $50\mu\text{g}/\text{m}^3$ was either not associated with site activities or outside of operational hours.
- The MFE guideline for PM10 for one hour is $150 \mu\text{g}/\text{m}^3$. This was exceeded in the monitoring at 11 Kendalls line at midnight (226) on 7 May.
- Peaks are believed to be from other rural sources such as pollen or high wind disturbing settled dusts.
- There is no clear decrease in dust monitoring results during Sundays (outside of operation hours during the day) and no clear relationship between daily monitoring averages at 11 Kendalls Line and quarry truck numbers.
- Wind direction during monitoring and during the previous year shows that prevailing winds are directed either up or down Kendalls Line. (Northwest and Southeast winds)
- During dry conditions (24 hours since rain events) observed quarry trucks travelling along Kendalls Line (via time lapse) did not significantly increase monitoring results above ambient levels.
- During peaks lower than $50\mu\text{g}/\text{m}^3$ often no vehicle was observed along Kendalls Line (via time lapse)

Dry conditions during the monitoring period are expected to be less dry compared with conditions during summer months, where there is more radiant heat from the sun to evaporate moisture.

6.1 Diesel Fumes

The data below shows that on days where there are greater quarry truck movements the measured PM10 is low. On days where there are no quarry truck movements the PM10 is often higher.

The filters from the dust trak were grey. Areas that have diesel combustion discharges are typically black.

Quarry trucks down Kendalls Line are occurring infrequently in comparison to a steady flow of (a much higher number) of vehicles along a state highway, which has much great potential for diesel emissions.

| Date | Number of Quarry Trucks | PM10 measured $\mu\text{g}/\text{m}^3$ |
|--------|-------------------------|--|
| 6 May | 1 | 5 |
| 7 May | 0 | 18 |
| 9 May | 27 | 6 |
| 13 May | 0 | 18 |
| 14 May | 0 | 9 |
| 19 May | 34 | 7 |
| 20 May | 1 | 5 |
| 21 May | 0 | 9 |

7.0 CONCLUSION

The levels monitored are considered to be an indication of ambient levels and it has been shown that peak concentrations of dust arise from other rural sources are often unrelated to site activities and quarry traffic movements.

It is expected therefore, that if the road is maintained and there is an increase in frequency of quarry vehicles along Kendalls Line that the emissions will not increase substantially, however this is limited by the climatic factors as summer seasons will produce dryer conditions, and therefore potentially increase dust disturbance.

To confirm the expected low emission rates during increased quarrying activity, monitoring during dry seasons is recommended.

APPENDIX A LAB REPORT



Certificate of Analysis



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Test Results

| Sample Type | | 37mm MCE Filters | | | |
|-------------|---------------|---------------------------|-----------------|------------------|-------------------------|
| Sample ID | Filter Number | Sample Details | Pre-Weight (mg) | Post-Weight (mg) | Particulate Weight (mg) |
| Y0135-1 | AD0991 | Week 1 – 11 Kendalls Line | 42.62 | 42.83 | 0.21 |
| Y0135-2 | AD1664 | Week 1 – 39 Kendalls Line | 42.77 | 42.92 | 0.15 |
| Y0135-3 | AD0855 | Week 2 – 11 Kendalls Line | 42.99 | 43.25 | 0.26 |
| Y0135-4 | AD0978 | Week 2 – 39 Kendalls Line | 44.91 | 45.24 | 0.33 |
| Y0135-5 | AD1704 | Week 3 – 11 Kendalls Line | 42.76 | 43.01 | 0.25 |
| Y0135-6 | AD1706 | Week 3 – 39 Kendalls Line | 42.65 | 42.84 | 0.19 |

Sampling Details

| | | | | | |
|------------------------|---|----------------|---------------------|--|--|
| Client Name | HiRock Quarry | | | | |
| Sample Date | May 2023 | Analysis Date | 25-29 May 2023 | | |
| Sampled By | Cameron Keer-Keer Harvey Cudmore-Neame | Analysis By | Stephanie Keer-Keer | | |
| Accreditation Reg Num. | 911 | Report Version | 1 | | |
| Methods Used | NIOSH 0500 | | | | |

*This report must not be altered or reproduced except in full.
Detection limits are calculated using the 95% confidence interval (2x standard deviation)*

| | |
|---------|---|
| Analyst |  Key Technical Person Christchurch Office |
|---------|---|