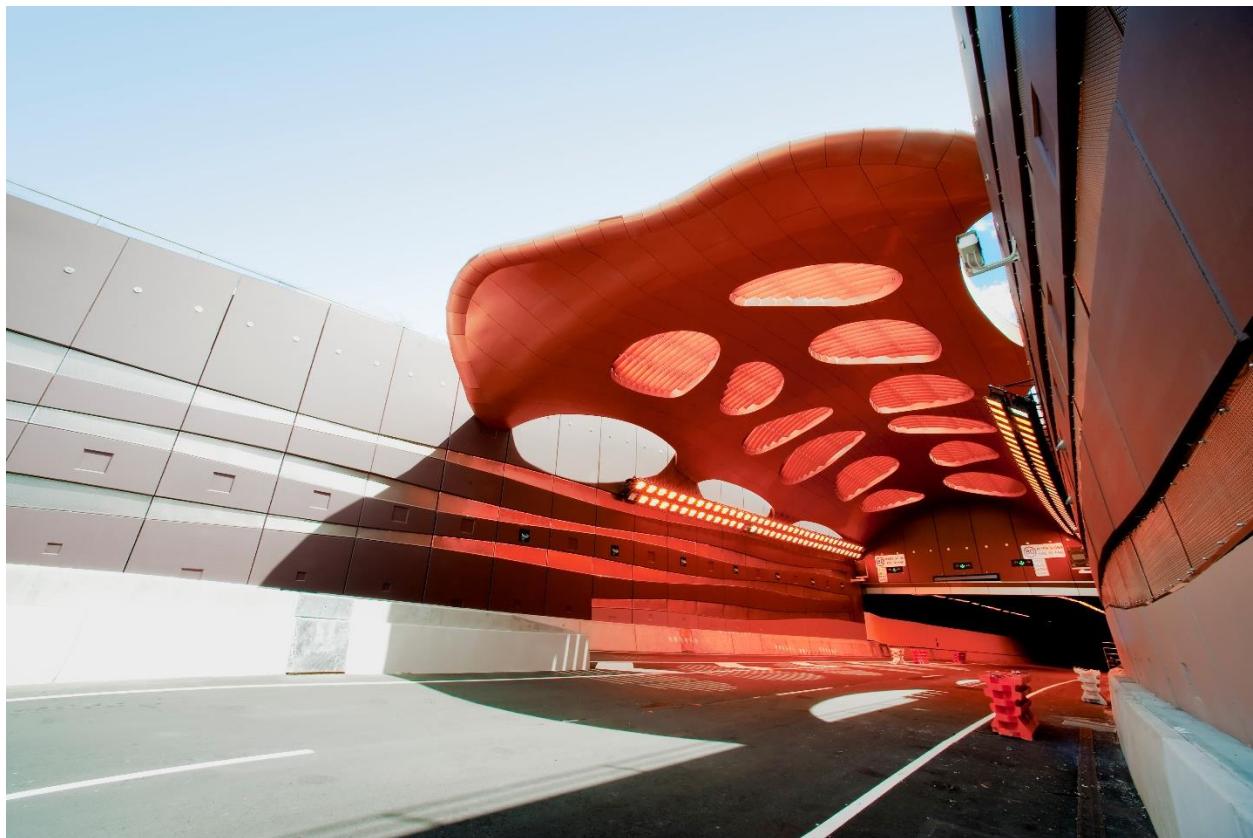


LAFARGE CANADA INC.

# AMBIENT AIR QUALITY MONTHLY REPORT

## MAY 2020

JUNE 22, 2020



WSP



# AMBIENT AIR QUALITY MONTHLY REPORT

## MAY 2020

LAFARGE CANADA INC.

PROJECT NO.: 171-00556-00  
DATE: JUNE 22, 2020

WSP  
SUITE 1000  
840 HOWE STREET  
VANCOUVER, BC, CANADA V6Z 2M1

T: +1 604 685-9381  
F: +1 604 683-8655  
WSP.COM



June 22, 2020

LAFARGE CANADA INC.  
Highway 1A  
Exshaw, AB T0L 2C0

**Attention: Janet Brygger**

Dear Ms. Brygger

**Subject: Ambient Air Quality Monthly Report – May 2020**

The operational uptime for PM<sub>10</sub>, TSP and precipitation was 100% for the month of May. The ambient temperature analyzer and wind speed / wind direction monitor recorded 99.9% data completeness for the month of May due to one hour of equipment malfunction occurring on May 17<sup>th</sup> at 15:00. PM<sub>2.5</sub> recorded 99.2% data completeness for the month of May due one hour of equipment malfunction May 2<sup>nd</sup> at 6:00, three hours of non-routine maintenance occurring on May 29<sup>th</sup> between 13:00 – 15:00. And further, two hours of equipment malfunction occurring on May 28<sup>th</sup> at 2:00 and May 29<sup>th</sup> at 2:00. The SO<sub>2</sub> analyzer had 99.2% data completeness for the month of May due to six hours of non-routine maintenance occurring on May 15<sup>th</sup> from 12:00 – 14:00, and May 17<sup>th</sup> from 12:00 – 14:00. The NO<sub>2</sub> monitor had 98.7% data completeness for the month of May due to ten hours of non-routine maintenance occurring on May 14<sup>th</sup> between 11:00 – 14:00, May 15<sup>th</sup> between 12:00 – 14:00, and May 17<sup>th</sup> between 12:00 – 14:00.

There was no exceedance of the 24-hour TSP Alberta Ambient Air Quality Objective. Further, there was no exceedance of the 24-hour PM<sub>2.5</sub> AAAQOs, nor, the 1-hour PM<sub>2.5</sub> AAAQG in May at the Lagoon monitoring location.

The Windridge station was taken out of operation beginning April 8<sup>th</sup>, 2019 as a result of construction work for flood mitigation along Exshaw Creek. The monitor at this station is expected to be re-installed sometime in 2020, after the completion of the construction work.

Data collected at all of the GRIMM monitors are considered Industrial Ambient Monitors and are meant for assessing the performance of Lafarge Exshaw's Fugitive Dust Control Best Management Practices – Program; the GRIMM monitors are not Air Monitoring Directive (AMD) compliant. The operational uptime at all 3 monitors was as follows: 100% at the West GRIMM, 100% at the Berm GRIMM, and 100% at the Entrance GRIMM. The West GRIMM monitor recorded zero exceedances of the 24-hour TSP AAAQG, and zero exceedances of the 24-hour PM<sub>2.5</sub> AAAQG. The Berm GRIMM had 2 exceedances of the TSP guideline and zero exceedances of the PM<sub>2.5</sub> guideline. The Entrance GRIMM monitor recorded 2 and 0 exceedances for the 24-hour TSP AAAQG and 24-hour PM<sub>2.5</sub> AAAQG, respectively.

I certify that I have reviewed and verified this report and that the information is complete, accurate and representative of the monitoring results, reporting timeframe and the specified analysis, summarization and reporting requirements.

Sincerely,

SUITE 1000  
840 HOWE STREET  
VANCOUVER, BC, CANADA V6Z 2M1

T: +1 604 685-9381  
F: +1 604 683-8655  
[wsp.com](http://wsp.com)

WSP Canada Inc.

Tyler Abel, M.Sc.  
Team Leader, Environmental  
Management, Vancouver Office

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# SIGNATURES

PREPARED BY



June 22, 2020

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Dylan Weyell, B.A.  
Junior Air Quality Specialist, Environment

Date

APPROVED<sup>1</sup> BY (*must be reviewed for technical accuracy prior to approval*)



June 22, 2020

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Tyler Abel, M.Sc.  
Team Leader, Environmental Management,  
Vancouver Region, Environment

Date

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## APPENDICES

### A DATA & CALIBRATION REPORTS

# 1 INTRODUCTION

This report summarizes the ambient air quality and meteorological data collected at the Lagoon, Windridge, and GRIMM monitors in Exshaw, AB. The stations are operated by WSP on behalf of Lafarge Canada Inc. (Lafarge) and are a requirement of Lafarge's Approval 1702-02-04. This report contains data collected between May 1, 2020 and May 31, 2020.

This monthly report was prepared by Dylan Weyell, Junior Air Quality Specialist with WSP, on behalf of Lafarge and was reviewed by Tyler Abel, Team Leader of Environmental Management in the Vancouver Region at WSP.

## 1.1 EXSHAW CREEK FLOOD MITIGATION

Due to flood mitigation construction at Exshaw creek (Figure 1-1), the Windridge monitor was taken out of operation and removed from the site on April 8, 2019. The monitoring station will be re-installed after the completion of construction in 2020.



**Figure 1-1 Photo of Flood Mitigation Construction at Exshaw Creek**

# 2 MAY 2020 REPORT SUMMARY

This summary section provides the pertinent details on data collected and maintenance/calibration activities at each of the monitoring locations. The monitoring results for the stations are described in further detail in their corresponding sections. Maximum hourly concentrations are shown for all particulate matter size fractions, but there are no Alberta Ambient Air Quality Objectives (AAAQO) for 1-hour PM concentrations. The exceedances reported for 1-hour PM<sub>2.5</sub> are those above the 1-hour PM<sub>2.5</sub> Alberta Ambient Air Quality Guidelines (AAAQG).

## 2.1 LAGOON STATION

**Table 2-1** Lagoon station data summary

Parameter	Data Completeness (%)	1-Hour Average		24-hour Average	
		Maximum Concentration	Exceedances of AAAQO or AAAQG	Maximum Concentration	Exceedances of AAAQO
NO <sub>2</sub> (ppb)	98.7	25.1	0	9.5	-
SO <sub>2</sub> (ppb)	99.2	13.0	0	3.0	0
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	99.2	14.4	0*	6.8	0
PM <sub>10</sub> (µg/m <sup>3</sup> )	100.0	136.1	-	29.6	-
TSP (µg/m <sup>3</sup> )	100.0	236.5	-	46.1	0
Temperature (°C)	99.9	26.4	-	17.6	-
Wind Speed (km/hr) /Direction (Degrees)	99.9	38.7/W	-	23.2/WSW	-
Precipitation (mm)	100.0	2.5*	-	66*	-

<sup>1</sup> Any exceedances reported for 1-hour PM<sub>2.5</sub> are over the guideline level (AAAQG) of 80 µg/m<sup>3</sup>.

<sup>2</sup> Maximum Daily Total Accumulation of Precipitation (mm)

<sup>3</sup> Monthly Total Accumulation of Precipitation (mm)

### Data Quality Notes:

- There were no exceedances of the 24-hour PM<sub>2.5</sub> AAAQO.
- There were no exceedances of the 1-hour PM<sub>2.5</sub> AAAQG.
- There were no exceedances of the 24-hour TSP AAAQO.

### Calibration/Maintenance Notes:

- The PM<sub>10</sub>, TSP and Precipitation monitors had 100% uptime during the month of May. The temperature and windspeed / wind direction monitors had 99.9% data completeness during the month of May due to one hour of equipment malfunction occurring on May 17<sup>th</sup> at 15:00. The PM<sub>2.5</sub> analyzer had 99.2% data completeness for

the month of May due to one hour of equipment malfunction on May 2<sup>nd</sup> at 6:00. And further, due to three hours of non-routine maintenance occurring on May 29<sup>th</sup> between 13:00 – 15:00. Moreover, two hours of equipment malfunction occurring on May 28<sup>th</sup> at 2:00 and May 29<sup>th</sup> at 2:00. The SO<sub>2</sub> analyzer had 99.2% data completeness for the month of May due to six hours of non-routine maintenance occurring on May 15<sup>th</sup> from 12:00 – 14:00, and May 17<sup>th</sup> from 12:00 – 14:00. The NO<sub>2</sub> monitor had 98.7% data completeness for the month of May due to ten hours of non-routine maintenance occurring on May 14<sup>th</sup> between 11:00 – 14:00, May 15<sup>th</sup> between 12:00 – 14:00, and May 17<sup>th</sup> between 12:00 – 14:00.

## 2.2 WEST GRIMM

The GRIMM monitors are Industrial Ambient Monitors meant to aid Lafarge in assessing the performance of their Fugitive Dust Control Best Management Practices – Program (FDCBMP-P). The AAAQO are used as Guidelines to evaluate the performance of the FDCBMP-P; however, these Industrial monitors are not Alberta Air Monitoring Directive (AMD) compliant and not required to show compliance with the AAAQO.

**Table 2-2 West station data summary**

Parameter	Data Completeness (%)	1-Hour Average		24-hour Average	
		Maximum Concentration	Exceedances of Guidelines	Maximum Concentration	Exceedances of Guidelines
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	100.0	29.7	0*	8.9	0
PM <sub>10</sub> (µg/m <sup>3</sup> )	100.0	70.3	-	15.7	-
TSP (µg/m <sup>3</sup> )	100.0	153.6	-	42.7	0

\* Any exceedances reported for 1-hour PM<sub>2.5</sub> are over the guideline level (AAAQG) of 80 µg/m<sup>3</sup>.

### Data Quality Notes:

- There were no exceedances of the 24-hour PM<sub>2.5</sub> AAAQG.
- There were no exceedances of the 1-hour PM<sub>2.5</sub> AAAQG.
- There were no exceedances of the 24-hour TSP AAAQG.

### Calibration/Maintenance Notes:

- The West GRIMM had 100% data completeness for the month of May.

## 2.3 BERM GRIMM

The GRIMM monitors are Industrial Ambient Monitors meant to aid Lafarge in assessing the performance of their FDCBMP-P. The AAAQO are used as Guidelines to evaluate the performance of the FDCBMP-P; however, these Industrial monitors are not Alberta Air Monitoring Directive (AMD) compliant and not required to show compliance with the AAAQO.

**Table 2-3 Berm station data summary**

Parameter	Data Completeness (%)	1-Hour Average		24-hour Average	
		Maximum Concentration	Exceedances of Guidelines	Maximum Concentration	Exceedances of Guidelines

<b>PM<sub>2.5</sub> (µg/m<sup>3</sup>)</b>	100.0	17.4	0*	6.2	0
<b>PM<sub>10</sub> (µg/m<sup>3</sup>)</b>	100.0	114.9	-	35.6	-
<b>TSP (µg/m<sup>3</sup>)</b>	100.0	368.7	-	121.1	2

\* Any exceedances reported for 1-hour PM<sub>2.5</sub> are over the guideline level (AAAQG) of 80 µg/m<sup>3</sup>.

#### **Data Quality Notes:**

- There were no exceedances of the 24-hour PM<sub>2.5</sub> AAAQG.
- There were no exceedances of the 1-hour PM<sub>2.5</sub> AAAQG.
- There were 2 days exceeding the 24-hour TSP AAAQG.

#### **Calibration/Maintenance Notes:**

- The Berm GRIMM had 100% data completeness for the month of May.

## 2.4 ENTRANCE GRIMM

The GRIMM monitors are Industrial Ambient Monitors meant to aid Lafarge in assessing the performance of their FDCBMP-P. The AAAQO are used as Guidelines to evaluate the performance of the FDCBMP-P; however, these Industrial monitors are not Alberta Air Monitoring Directive (AMD) compliant and not required to show compliance with the AAAQO.

**Table 2-4      Entrance station data summary**

Parameter	Data Completeness (%)	1-Hour Average		24-hour Average	
		Maximum Concentration	Exceedances of Guidelines	Maximum Concentration	Exceedances of Guidelines
<b>PM<sub>2.5</sub> (µg/m<sup>3</sup>)</b>	100.0	26.9	0*	12.5	0
<b>PM<sub>10</sub> (µg/m<sup>3</sup>)</b>	100.0	191.3	-	71.4	-
<b>TSP (µg/m<sup>3</sup>)</b>	100.0	522.9	-	177.5	2

\* Any exceedances reported for 1-hour PM<sub>2.5</sub> are over the guideline level (AAAQG) of 80 µg/m<sup>3</sup>.

#### **Data Quality Notes:**

- There were no exceedances of the 24-hour PM<sub>2.5</sub> AAAQG.
- There were no exceedances of the 1-hour PM<sub>2.5</sub> AAAQG.
- There were 2 days exceeding the 24-hour TSP AAAQG.

#### **Calibration/Maintenance Notes:**

- The Entrance GRIMM had 100% uptime for the month of May.

# 3 LAGOON STATION

The Lagoon trailer contains NO<sub>x</sub>, SO<sub>2</sub>, TSP, PM<sub>10</sub>, and PM<sub>2.5</sub> analyzers as well as meteorological sensors, and is shown in Figure 3-1. An ambient air quality station has been at this location since 2002, providing a long-term data record for air quality in the Exshaw area.

This section provides a summary of the monitoring activities for the Lagoon ambient air quality station, including: a table of instrumentation (Table 3-1), a data summary table (Table 3-2), site visit notes, a wind rose (Figure 3-2) and tables and graphs illustrating the monitoring results for May 2020.

All of the monitors comply with Alberta Environment and Parks Air Monitoring Directive (2016).

## 3.1 OPERATIONAL SUMMARY

A summary of the station operation for the month is provided in Table 3-1.

**Table 3-1      Instrumentation List at the Lagoon Station**

Parameter Measured	Equipment Description	Notes
<b>PM<sub>2.5</sub> Concentrations</b>	MetOne BAM-1020 FRM Continuous Particulate Monitor	The PM <sub>2.5</sub> monitor was calibrated May 12 <sup>th</sup> .  The monitor had 99.2% uptime in May due to one hour of equipment malfunction on May 2 <sup>nd</sup> at 6:00, one hour of equipment malfunction on May 28 <sup>th</sup> at 2:00. Further, on May 29 <sup>th</sup> , there was one hour of equipment malfunction at 2:00, and three hours of non-routine maintenance between 13:00 – 15:00.
<b>PM<sub>10</sub> Concentrations</b>	MetOne BAM-1020 Continuous Particulate Monitor	The PM <sub>10</sub> monitor was calibrated on May 12 <sup>th</sup> .  The monitor had 100% uptime in May.
<b>TSP Concentrations</b>	MetOne BAM-1020 Continuous Particulate Monitor	The TSP monitor was calibrated on May 12 <sup>th</sup> .  The monitor had 100% uptime in May.
<b>Oxides of Nitrogen</b>	TEI 42C	The NO <sub>x</sub> monitor was calibrated on May 12 <sup>th</sup> . The monitor had 98.7% uptime in May due to 10 hours of non-routine maintenance.
<b>Sulphur Dioxide</b>	Teledyne API 102A	The SO <sub>2</sub> monitor was calibrated on May 12 <sup>th</sup> . The monitor had 99.2% uptime in May due to 6 hours of non-routine maintenance.
<b>Precipitation</b>	MetOne 130 Rain/Snow Gauge	The monitor had 100% uptime in May
<b>Wind Speed</b>	MetOne Wind Sensor	The monitor had 99.9% uptime in May

<b>Wind Direction</b>		due to one hour of equipment malfunction on May 17 <sup>th</sup> at 15:00
<b>Ambient Temperature</b>	MetOne Ambient Temperature Sensor	The monitor had 99.9% uptime in May due to one hour of equipment malfunction on May 17 <sup>th</sup> at 15:00



**Figure 3-1      Inlets on the top of WSP's Lagoon monitor**

## 3.2 MONITORING RESULTS AND TRENDS

The following wind rose (Figure 3-2) illustrates the frequency of wind speed by wind direction for the month of May 2020. The wind rose indicates that the winds predominantly came from the west direction, with lighter prevailing wind from the north-northwest, south-southwest, and east directions.

Table 3-2 summarizes the hourly, daily, and monthly concentrations recorded in May 2020.

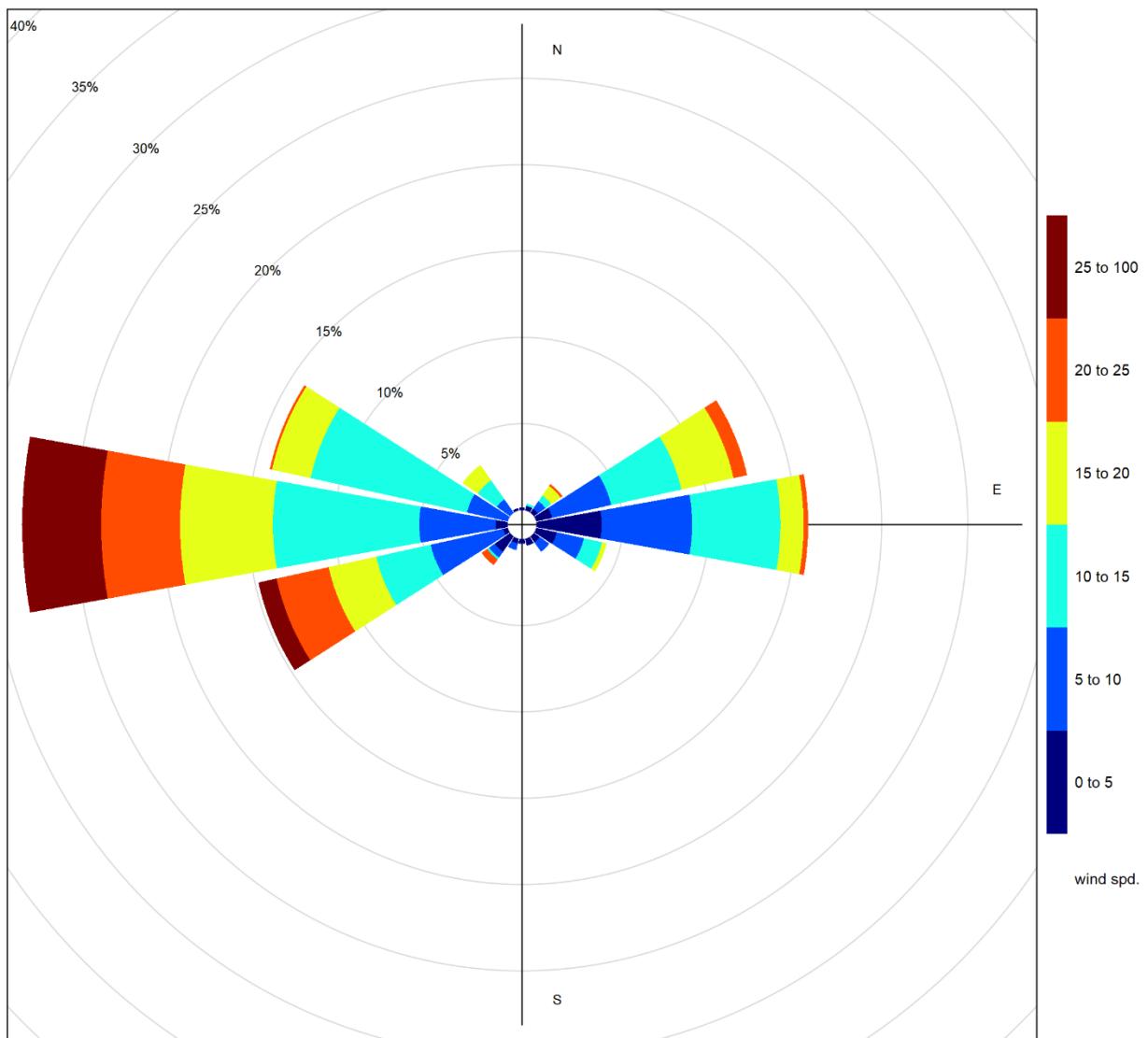
Figure 3-3 graphically illustrates the time series for hourly concentrations as well as wind speed and direction, while Figure 3-9 shows daily average concentrations recorded during May 2020 for the pollutants listed in Table 3-2. Additionally, Figure 3-4 to Figure 3-8 show the histograms of the hourly concentrations of NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, and TSP measured at the Lagoon station.

There were no exceedances of the 24-hour TSP (100 µg/m<sup>3</sup>) AAAQO. Further, there were no exceedances of the 24-hour PM<sub>2.5</sub> (29 µg/m<sup>3</sup>) AAAQO, nor, the 1-hour PM<sub>2.5</sub> AAAQG (80 µg/m<sup>3</sup>). The highest PM<sub>2.5</sub> concentrations recorded during the month were likely, based on wind direction and a corresponding rise in NOx emissions, not attributable to Lafarge operations and could be from industrial emissions to the east.

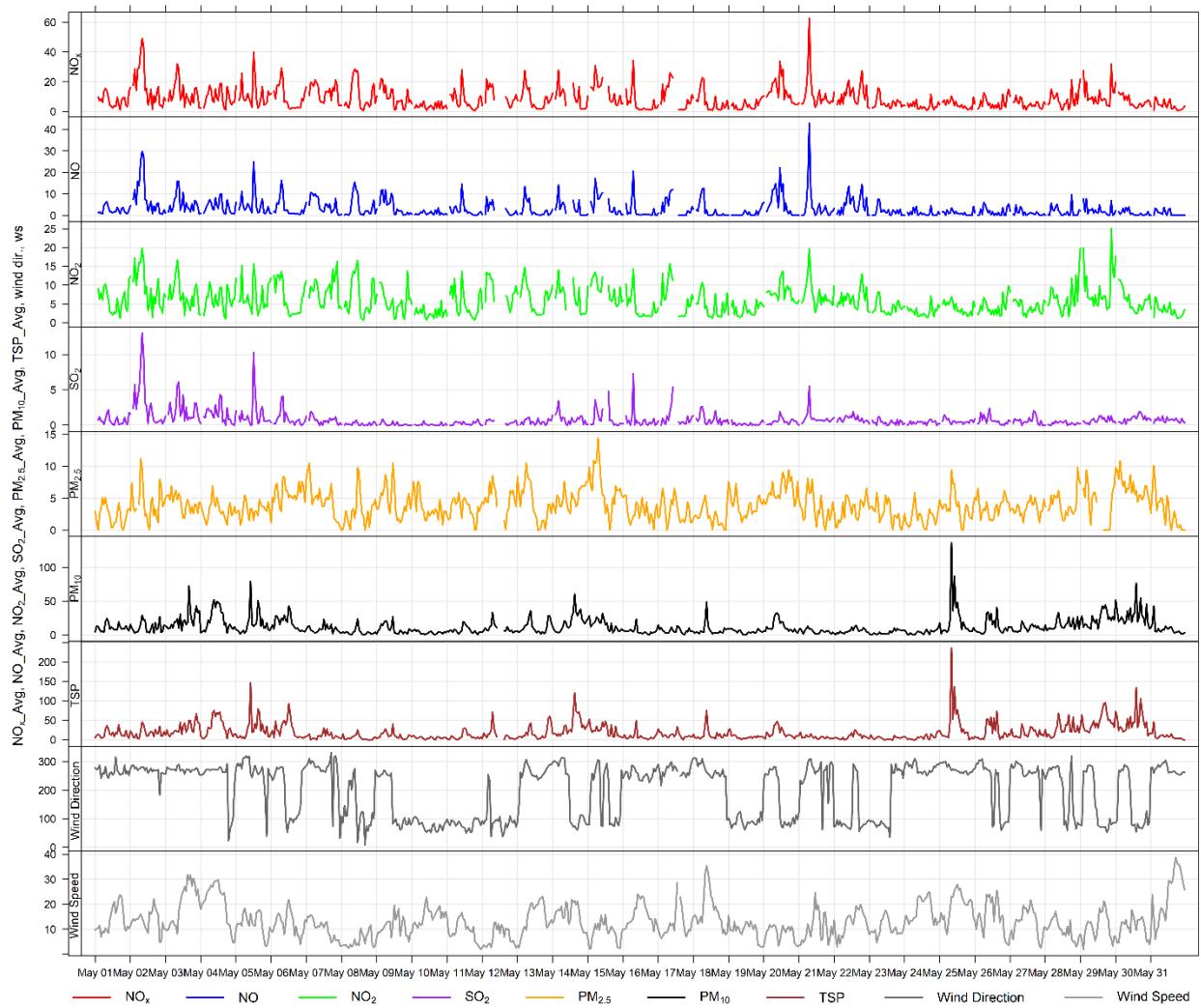
Historically in May, the average number of 24-hour TSP AAAQO exceedances and 24-hour PM<sub>2.5</sub> AAAQO exceedances is zero, respectively.

**Table 3-2      Summary of May 2020 data at Lagoon**

Parameter	Guideline / Objectives		Station	Exceedances		Monthly		1-hour				24-hour		Operational Time (Percent)	
	1-hr	24-hr		1-hr	24-hr	Minimum	Average	Maximum Concentration/Meteorological Variable	Day	Hour	Wind Speed (km/hr)	Wind Direction (degrees)	Maximum Concentration/Meteorological Variable	Day	
NO <sub>2</sub> (ppb)	159	-	Lagoon	0	-	0.6	6.0	25.1	29	22	6.3	78.9	9.5	2	98.7
SO <sub>2</sub> (ppb)	172	48	Lagoon	0	0	0.0	0.8	13.0	2	9	14.5	281.7	3.0	2	99.2
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	80	29	Lagoon	0	0	0.0	3.9	14.4	15	8	12.3	306.0	6.8	30	99.2
PM <sub>10</sub> (µg/m <sup>3</sup> )	-	-	Lagoon	-	-	0.0	11.8	136.1	25	9	23.1	268.7	29.6	30	100.0
TSP (µg/m <sup>3</sup> )	-	100	Lagoon	-	0	0.0	18.4	236.5	25	9	23.1	268.7	46.1	29	100.0
Temperature (°C)	-	-	Lagoon	-	-	-1.7	8.7	26.4	30	16	13.7	81.9	17.6	30	99.9
Wind Speed (km/hr)/Direction (degrees)	-	-	Lagoon	-	-	1.8	13.1	38.7/W	31	18	38.7	259.7	23.2/WSW	31	99.9
Precipitation (mm)	-	-	Lagoon	-	-	0.0	0.1	2.5	12	15	10.7	37.3	66.0	-	100.0



**Figure 3-2      May 2020 wind rose from the Lagoon Station**



**Figure 3-3 1-hour concentrations of NO<sub>x</sub>, SO<sub>2</sub>, particulate matter, wind direction and wind speed at the Lagoon station**

### Histogram of Hourly NO<sub>2</sub> Readings

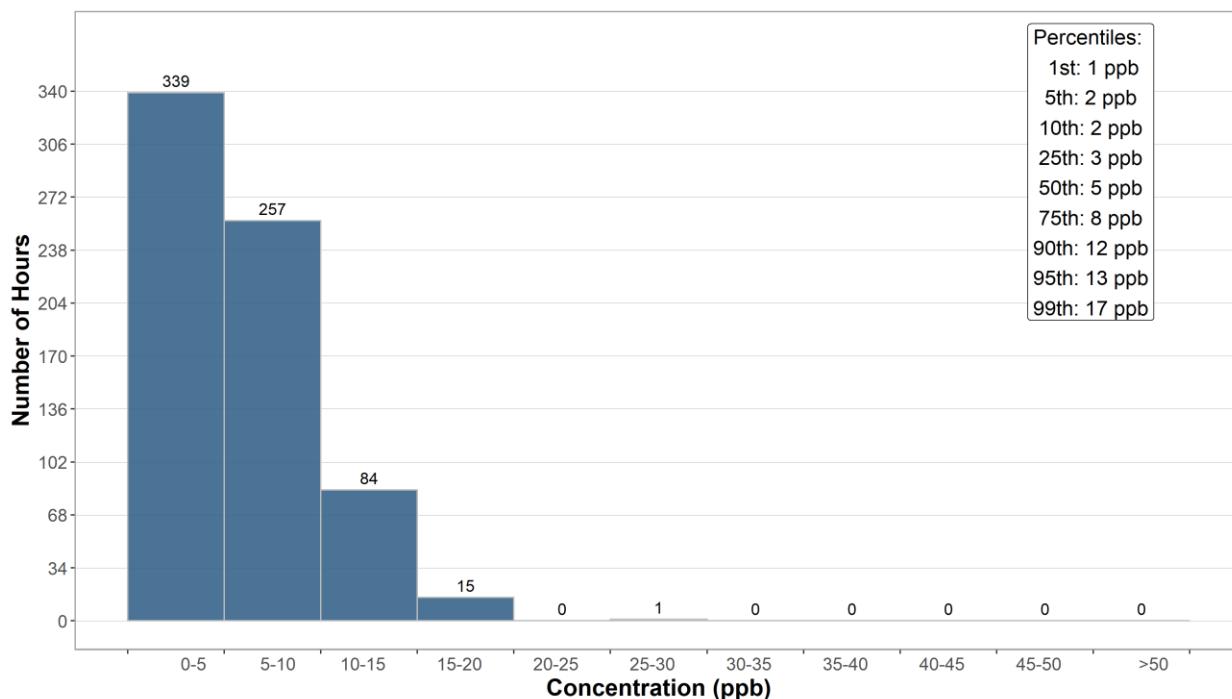


Figure 3-4 Histogram of hourly NO<sub>2</sub> concentrations at the Lagoon station

### Histogram of Hourly SO<sub>2</sub> Readings

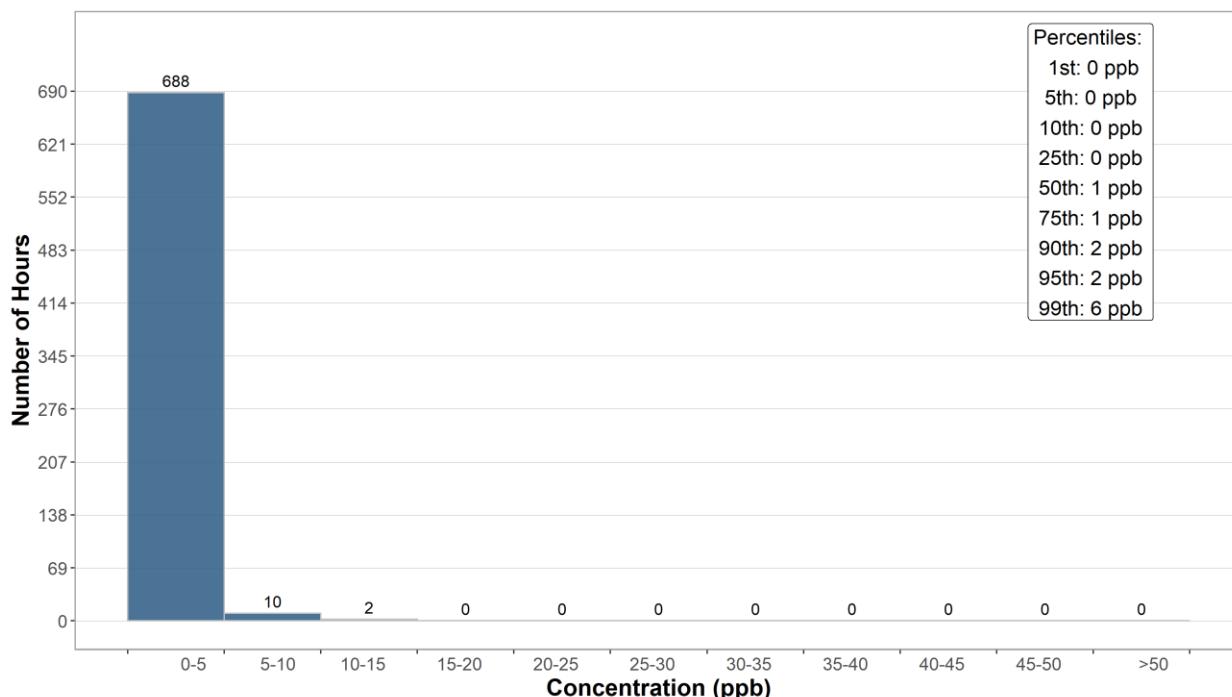


Figure 3-5 Histogram of hourly SO<sub>2</sub> concentrations at the Lagoon station

### Histogram of Hourly PM<sub>2.5</sub> Readings

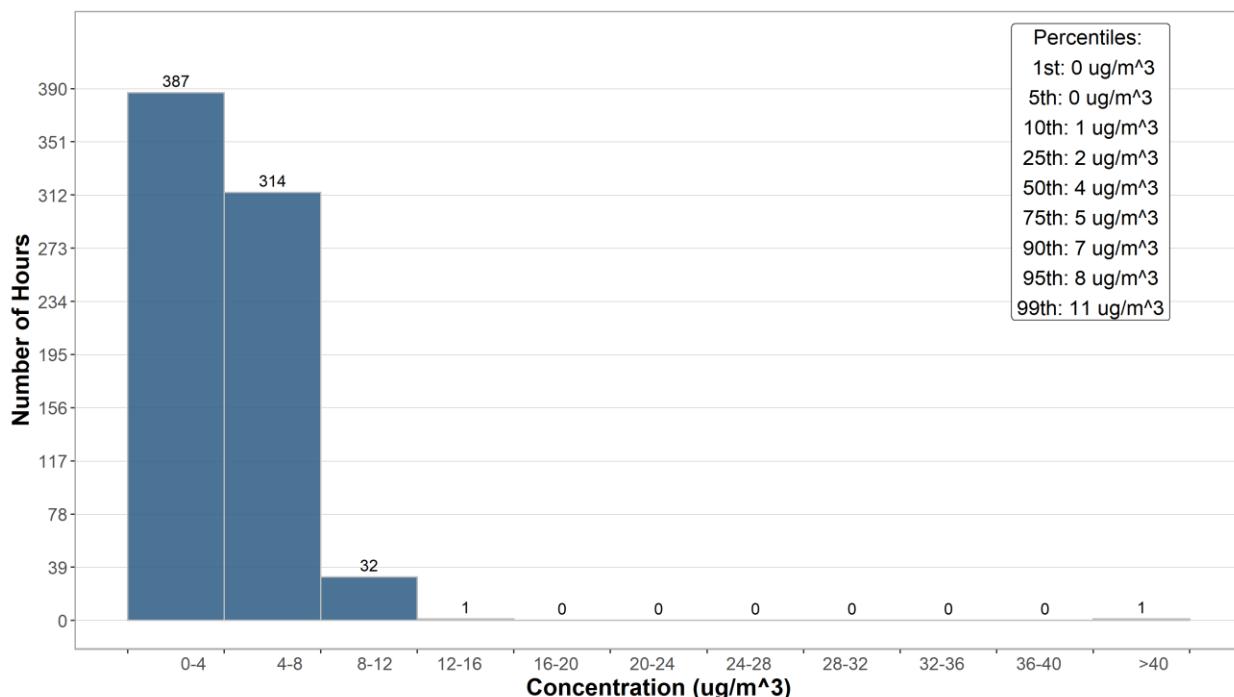


Figure 3-6 Histogram of hourly PM<sub>2.5</sub> concentrations at the Lagoon station

### Histogram of Hourly PM<sub>10</sub> Readings

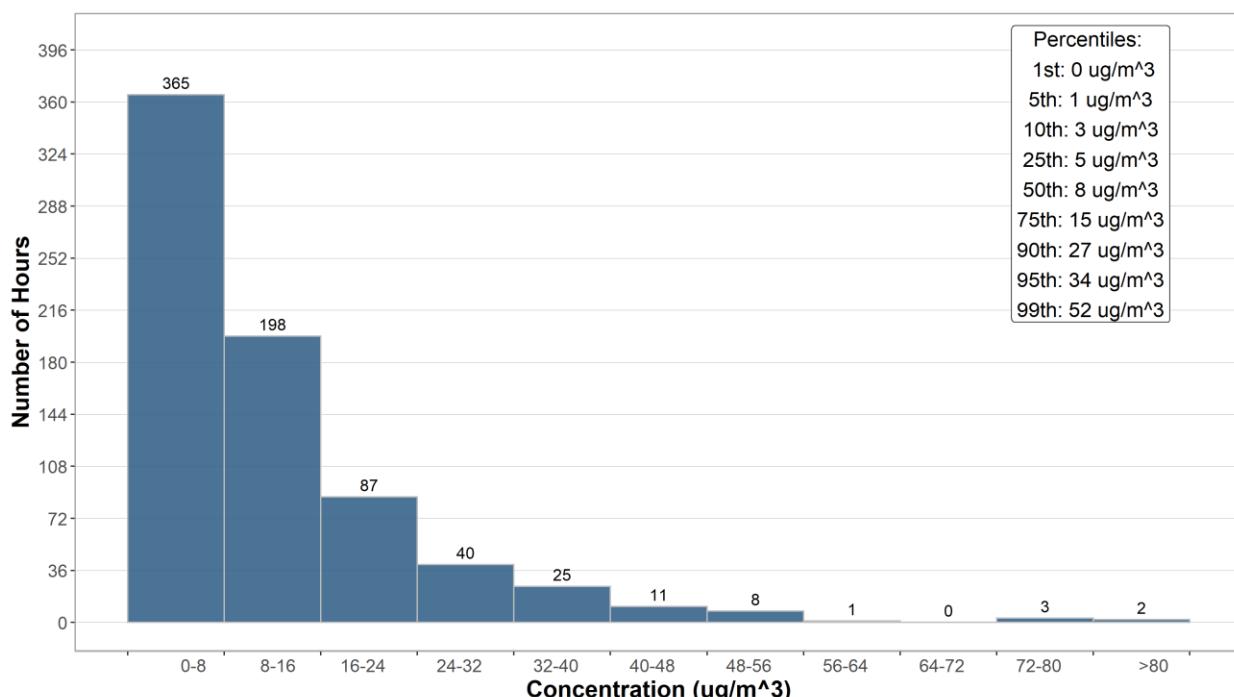


Figure 3-7 Histogram of hourly PM<sub>10</sub> concentrations at the Lagoon station

### Histogram of Hourly TSP Readings

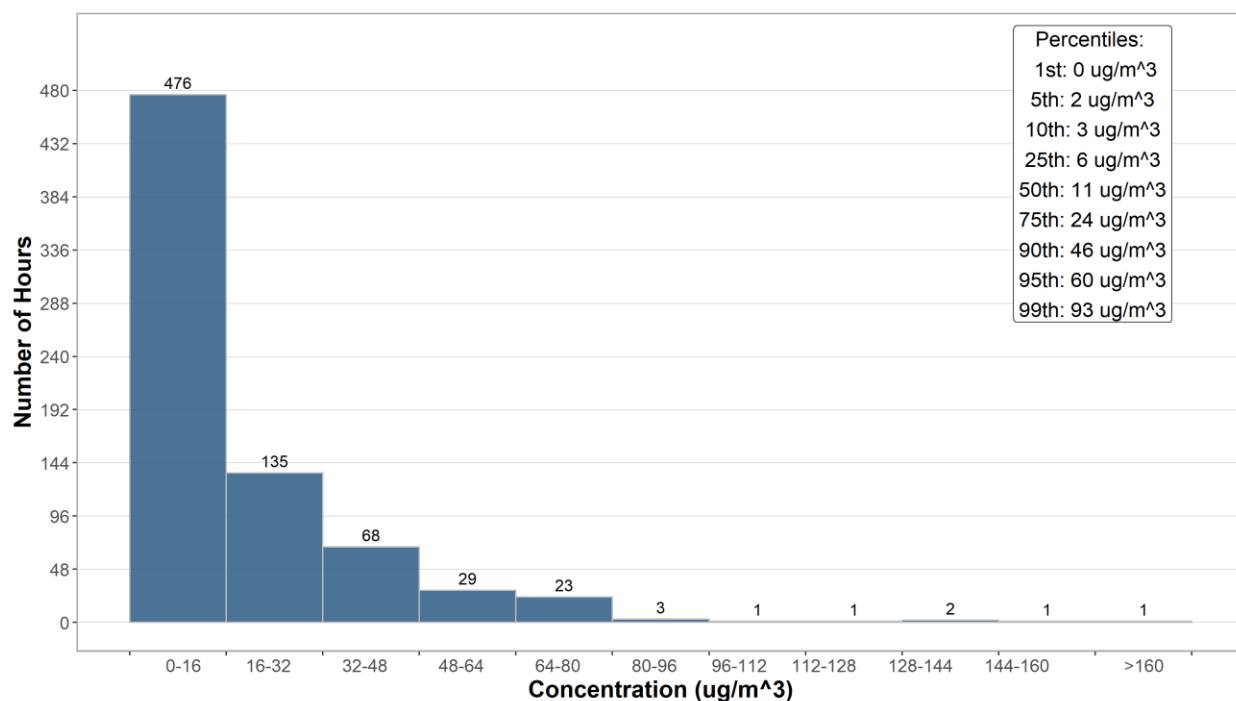
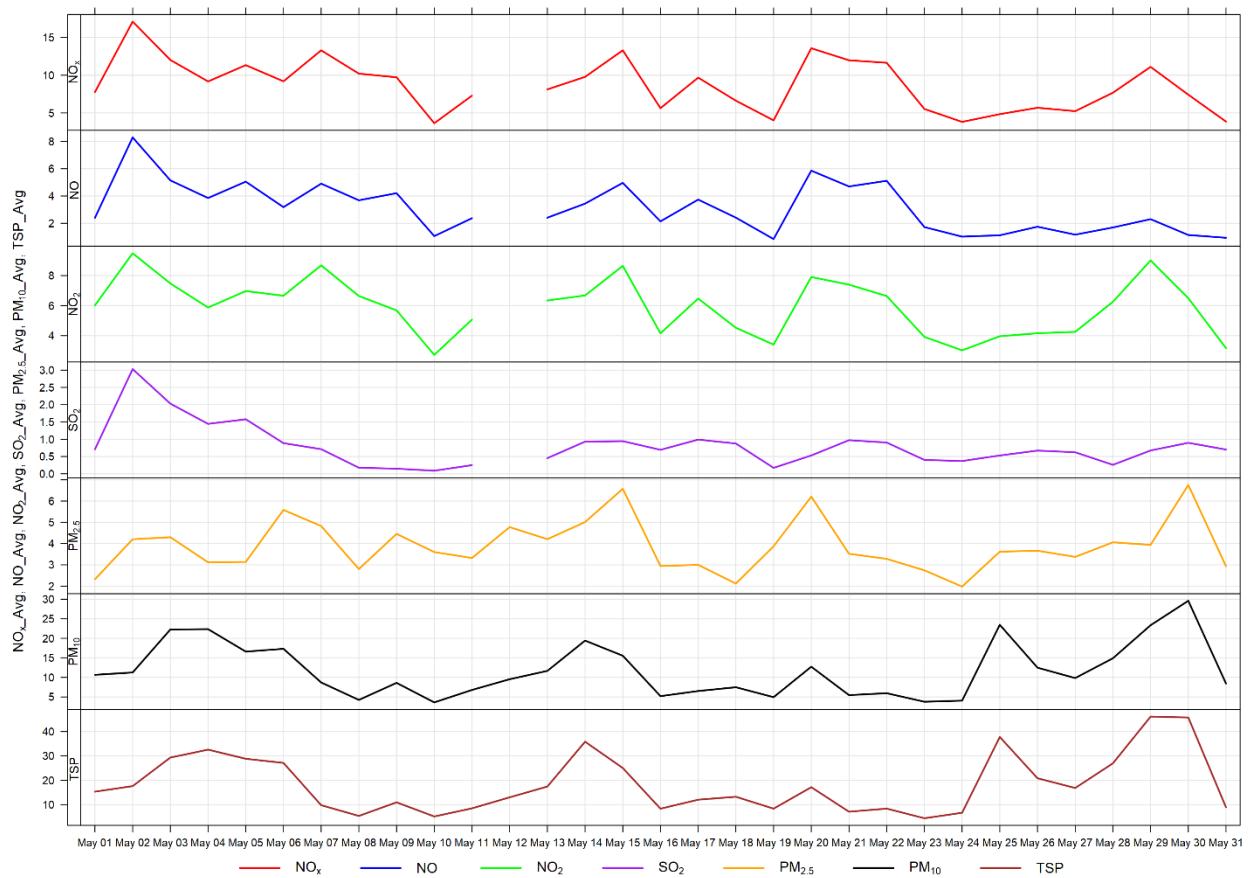


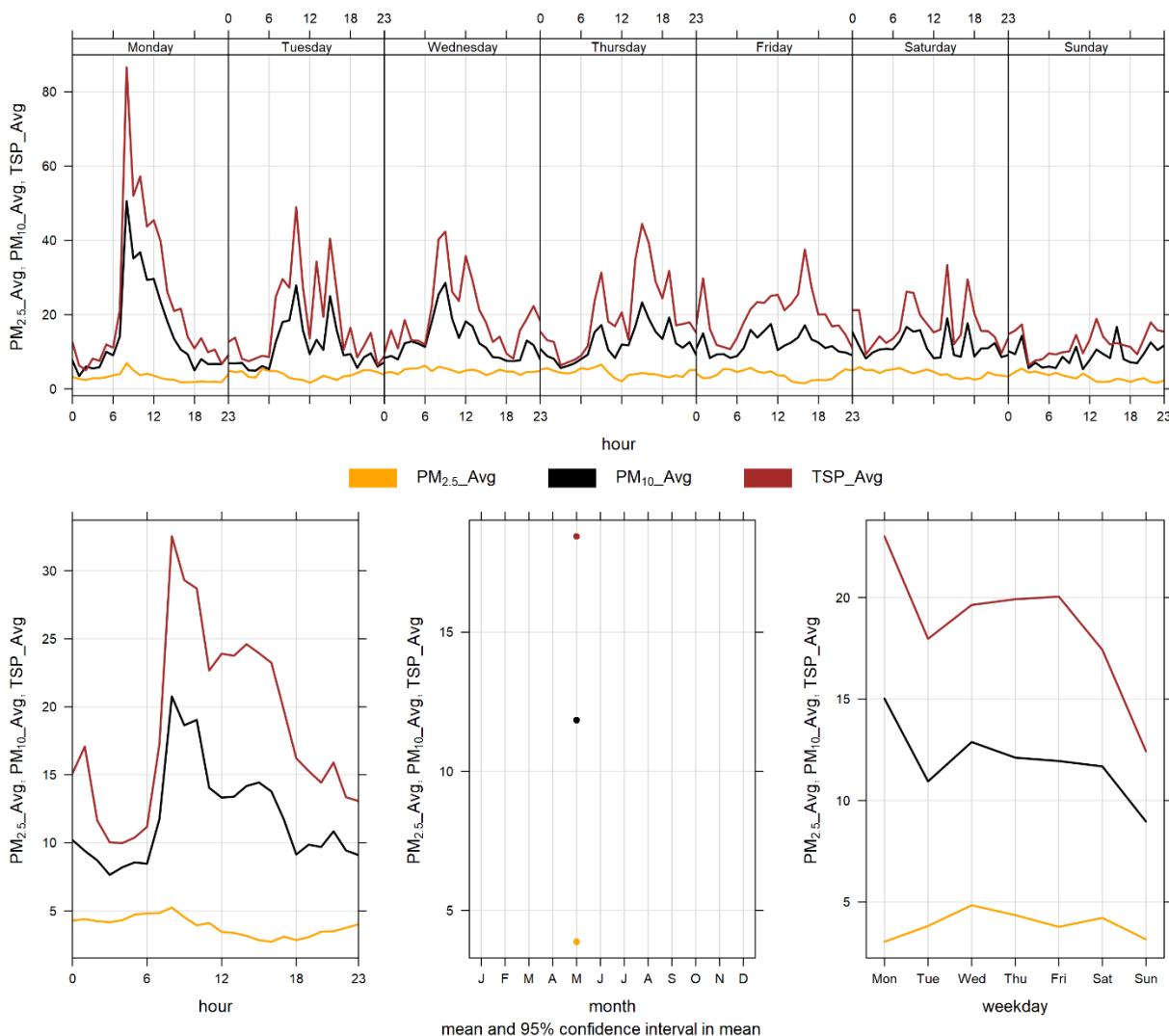
Figure 3-8     Histogram of hourly TSP concentrations at the Lagoon station



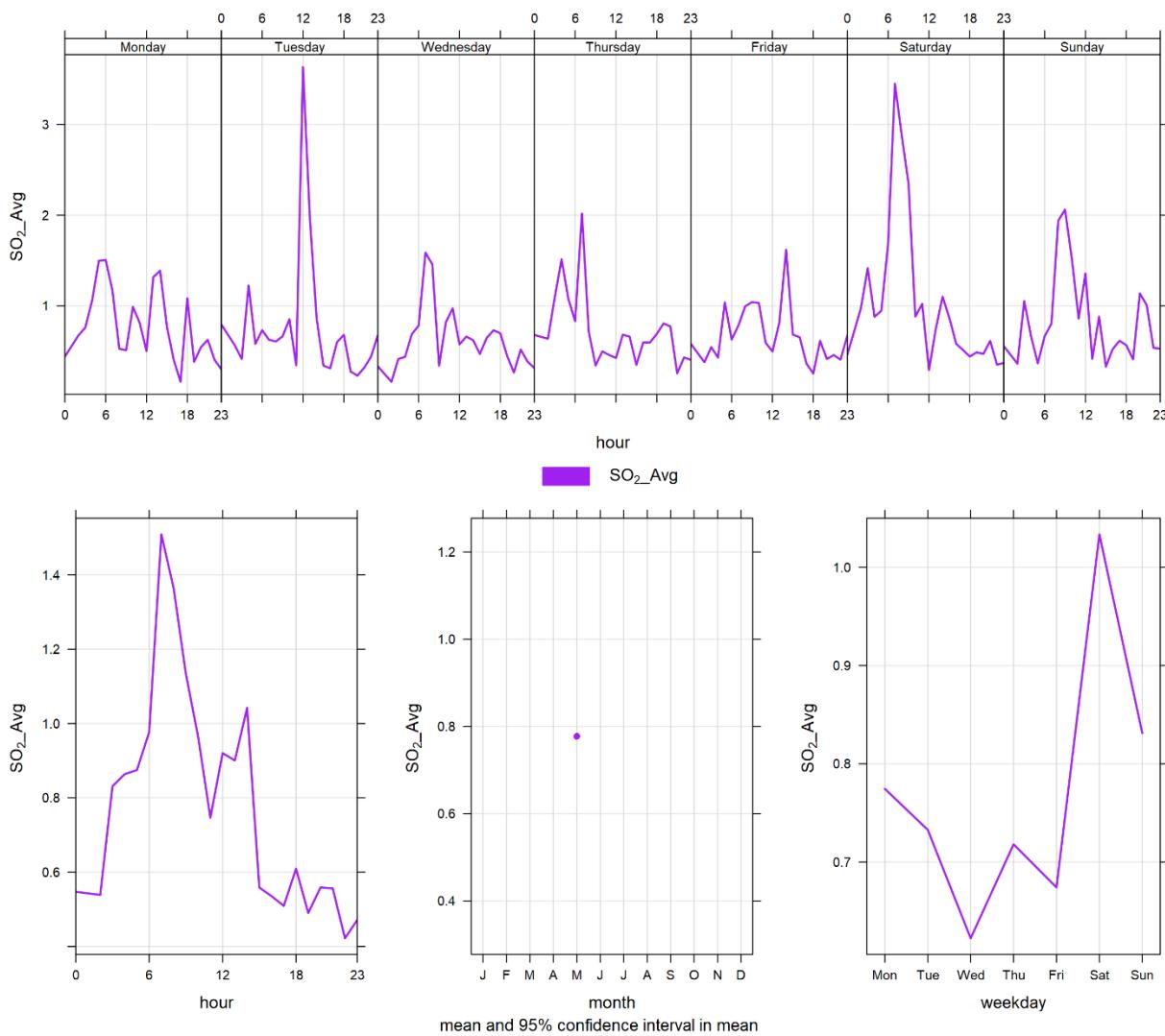
**Figure 3-9      24-hour concentrations of NO<sub>x</sub>, SO<sub>2</sub>, and particulate matter at the Lagoon monitor**

Figure 3-10 through Figure 3-12 show the variation in concentrations over various time averaging periods for PM, SO<sub>2</sub> and NO<sub>x</sub>. The particulate matter plot in Figure 3-10 shows that PM<sub>10</sub> and TSP concentrations shows a diurnal pattern associated with Lafarge operations, daytime emissions from traffic and other activities. The diurnal patterns also follow the diurnal pattern of higher wind speeds during the daytime hours.

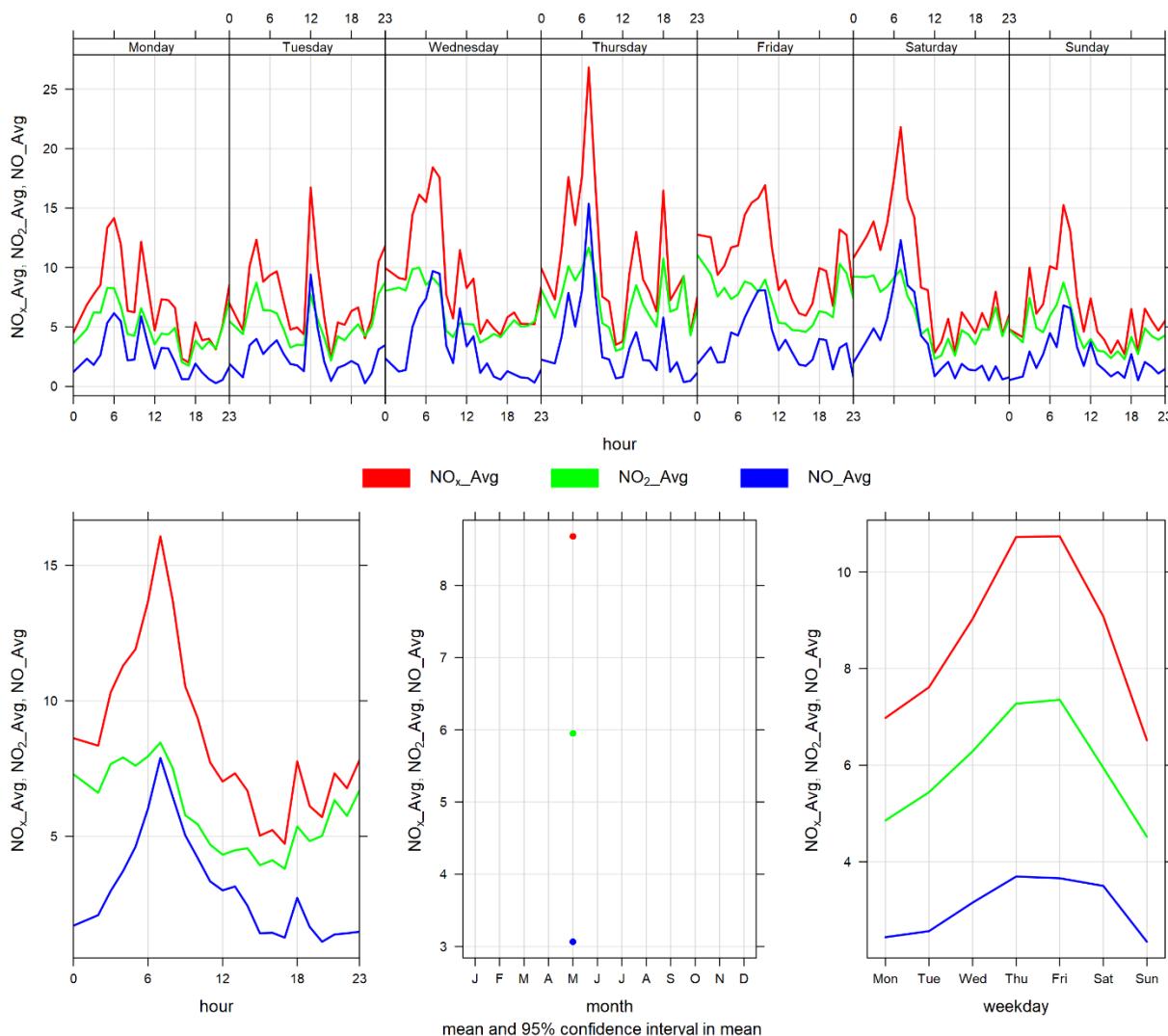
Figure 3-11 shows the variation of SO<sub>2</sub> over various time periods. SO<sub>2</sub> concentrations patterns are dependent on the timing of the highest SO<sub>2</sub> concentrations recorded in the month because in general SO<sub>2</sub> concentrations are very low. Figure 3-12 shows the variation of NO<sub>x</sub>, NO and NO<sub>2</sub>, with the peak of all three pollutants occurring in the early morning. This may be indicative of a peak in traffic.



**Figure 3-10      Lagoon monitor particulate matter time variation**



**Figure 3-11      Lagoon monitor  $\text{SO}_2$  time variation**



**Figure 3-12      Lagoon monitor NO<sub>x</sub> time variation**

# 4 WEST INDUSTRIAL GRIMM

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## 4.1 OPERATIONAL SUMMARY

A summary of the station operation for the month is provided in Table 4-1.

**Table 4-1 Instrumentation List at the West monitoring location**

Parameter Measured	Equipment Description	Notes
<b>PM<sub>2.5</sub>, PM<sub>10</sub>, TSP Concentrations</b>	GRIMM 365 Continuous Particulate Monitor	The West GRIMM monitor had 100% data completeness for the month of May

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## 4.2 MONITORING RESULTS AND TRENDS

The West GRIMM was installed in its current location in order to monitor “background” PM concentrations since the predominant wind pattern is from west to east in the valley. Table 4-2 summarizes the monthly concentrations, and the maximum 1-hour and 24-hour concentrations recorded over the course of the month. This is an industrial monitor that is not Alberta Air Monitoring Directive (AMD) compliant and is not required to show compliance with the AAAQO.

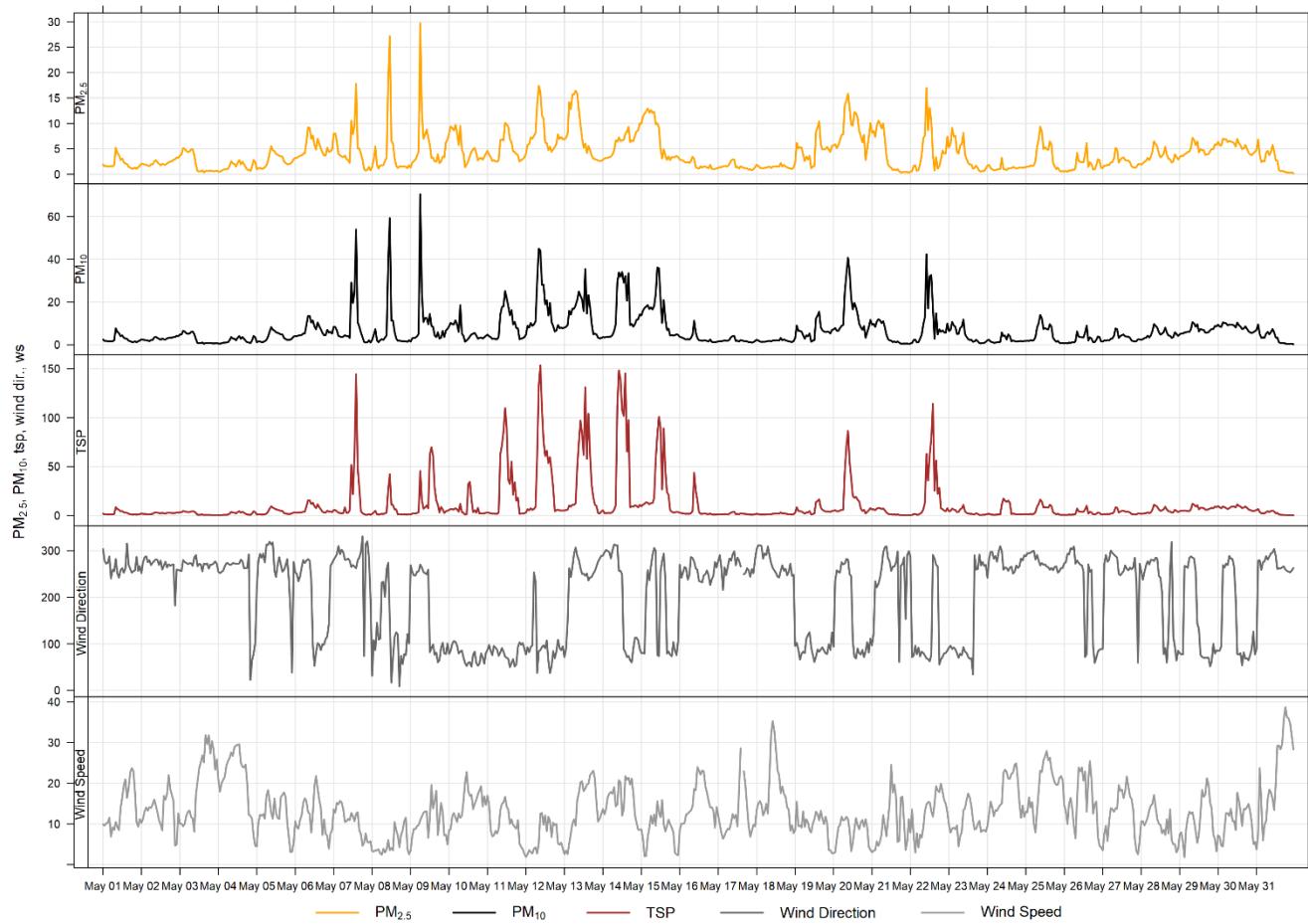
Figure 4-1 and Figure 4-2 show the hourly and daily PM<sub>2.5</sub>, PM<sub>10</sub> and TSP concentrations recorded over the month.

There were no exceedances of the 24-hour TSP guideline (100 µg/m<sup>3</sup>). Further, there was no exceedance of the 24-hour PM<sub>2.5</sub> guideline (29µg/m<sup>3</sup>).

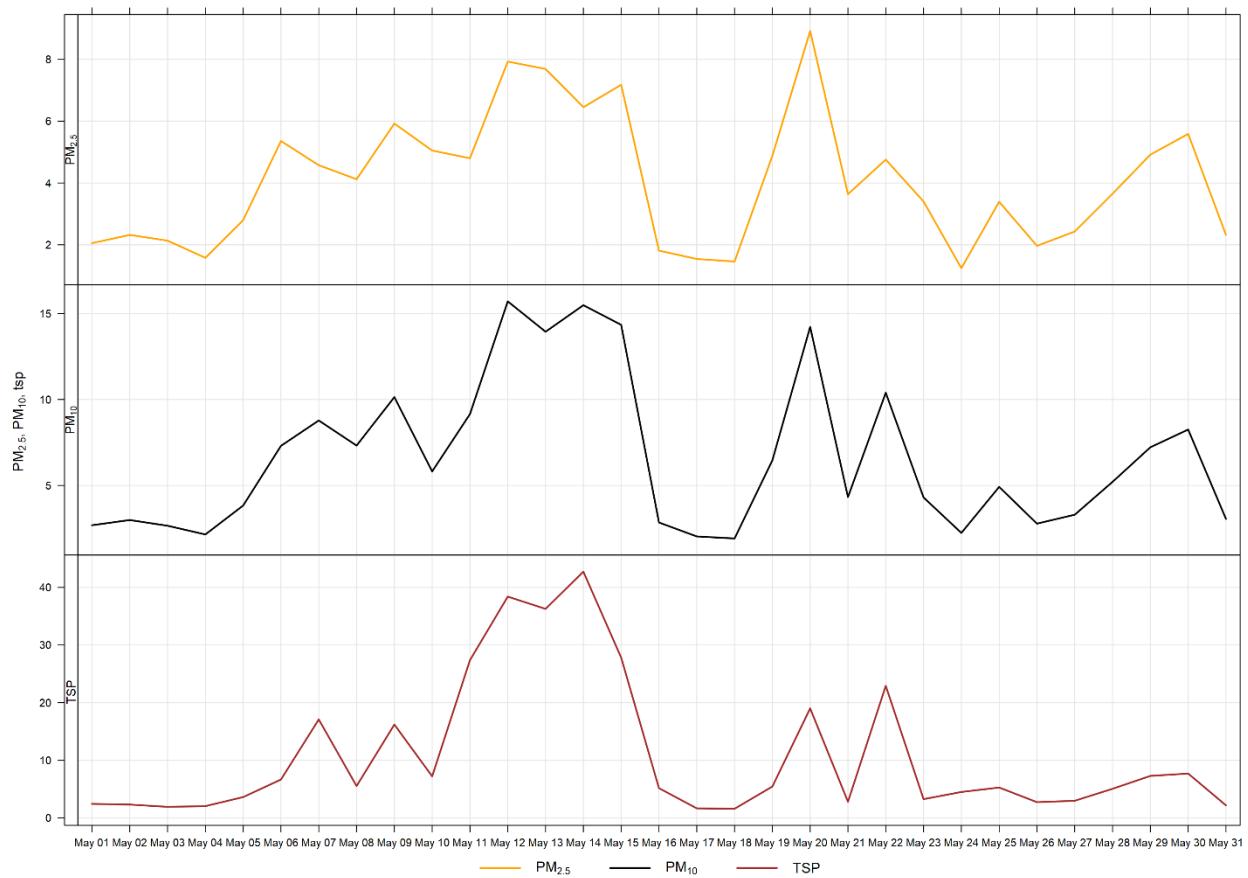
Historically in May, the average number of 24-hour TSP AAAQG exceedances and 24-hour PM<sub>2.5</sub> AAAQG exceedances are zero and zero, respectively. The maximum number of 24-hour AAAQG exceedances was 0 days from 2010-2019 for TSP, and 1 day in 2014 & 2019 for PM<sub>2.5</sub>.

**Table 4-2 Summary of May 2020 data at the West GRIMM**

Parameter	Guideline		Station	Exceedances		Monthly		Maximum 1-hour				Maximum 24-hour		Operational Time (Percent)	
	1-hr	24-hr		1-hr	24-hr	Minimum	Average	Maximum Concentration	Day	Hour	Wind Speed (km/hr)	Wind Direction (degrees)	Maximum Concentration	Day	
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	80	29	West	0	0	0.2	4.1	29.7	9	6	10.9	270.1	8.9	20	100.0
PM <sub>10</sub> (µg/m <sup>3</sup> )	-	-	West	-	-	0.2	6.6	70.3	9	6	10.9	270.1	15.7	12	100.0
TSP (µg/m <sup>3</sup> )	-	100	West	-	0	0.2	10.9	153.6	12	9	12.5	86.5	42.7	14	100.0

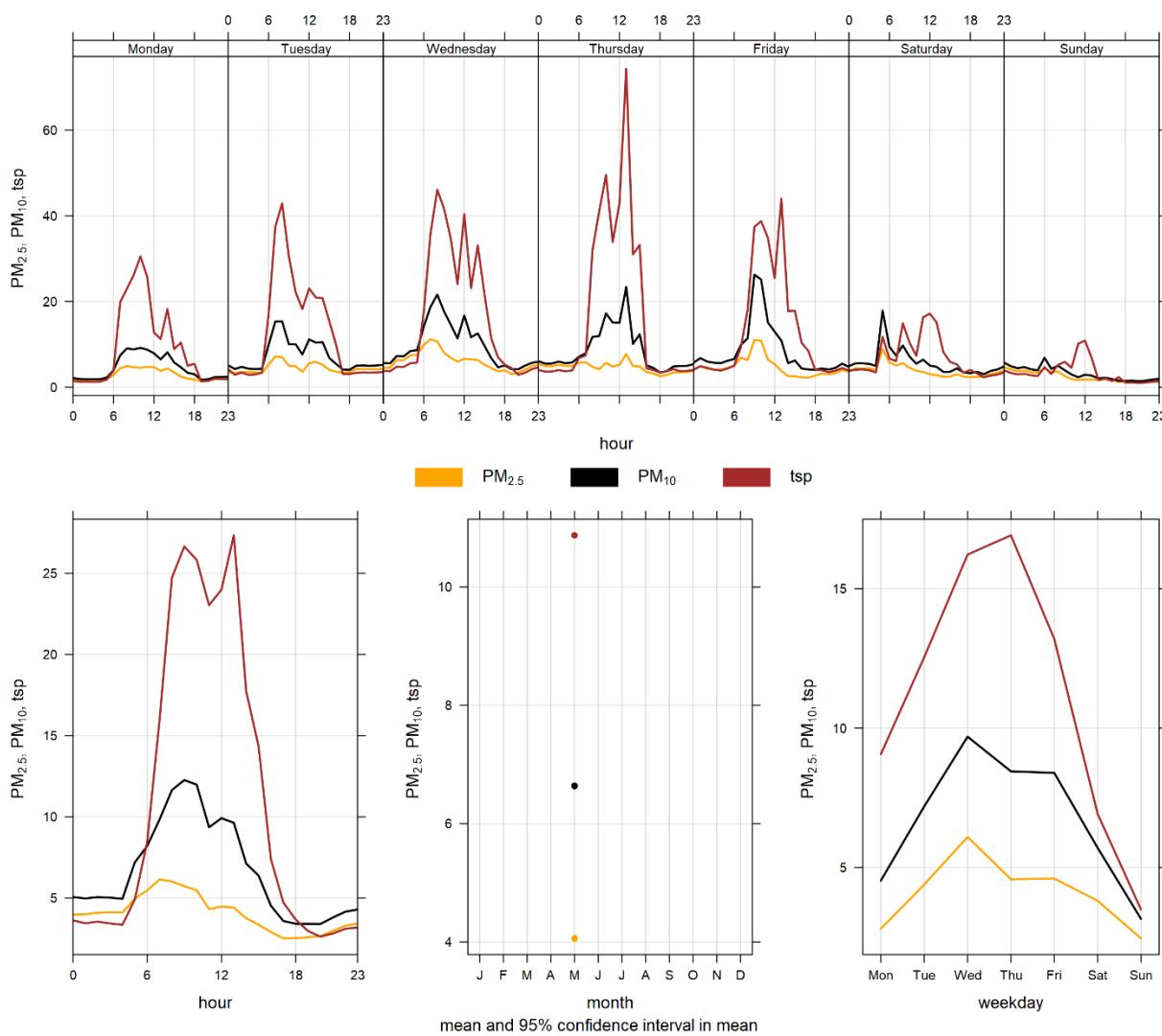


**Figure 4-1      1-hour particulate matter concentrations at the West monitor**



**Figure 4-2 24-hour particulate matter concentrations at the West monitor**

Figure 4-3 below illustrates the hourly PM concentrations recorded at the West monitor, averaged over different time periods. The plot across the top shows the variation of PM over the course of a week, while the bottom three plots show the changes in PM over the course of a day, month and weekday, respectively. Figure 4-3 is based on data collected during May 2020 and indicates a diurnal relationship that could be due to the proximity of the West monitor to the highway. As the monitor is generally ‘up-wind’ of the facility, the daily variations in PM are more likely a result of higher traffic volume during daylight hours than specific Lafarge operations.



**Figure 4-3**      **West particulate matter time variation**

# 5 BERM INDUSTRIAL GRIMM

## 5.1 OPERATIONAL SUMMARY

A summary of the station operation for the month is provided in Table 5-1.

**Table 5-1      Instrumentation List at the Berm monitoring location**

Parameter Measured	Equipment Description	Notes
<b>PM<sub>2.5</sub>, PM<sub>10</sub>, TSP Concentrations</b>	GRIMM 365 Continuous Particulate Monitor	The Berm GRIMM monitor had 100% data completeness for the month of May

## 5.2 MONITORING RESULTS AND TRENDS

The Berm monitor was placed at its current location as a result of the dispersion modelling conducted for the facility in 2009. Figure 5-1 and Figure 5-2 show the hourly and daily PM<sub>2.5</sub>, PM<sub>10</sub> and TSP concentrations recorded over the month. Table 5-2 summarizes the monthly concentrations, and the maximum 1-hour and 24-hour PM concentrations recorded during the month, and Table 5-3 summarizes the 2 recorded exceedances. This is an industrial monitor that is not Alberta Air Monitoring Directive (AMD) compliant and is not required to show compliance with the AAAQO.

There were 2 and 0 exceedances of the 24-hour TSP (100 µg/m<sup>3</sup>) and PM<sub>2.5</sub> (29 µg/m<sup>3</sup>) guidelines, respectively. There were zero hours exceeding the 1-hour PM<sub>2.5</sub> AAAQG.

Historically during the month of May, the Berm monitor records an average of 7 and 0 exceedances of the 24-hour TSP and PM<sub>2.5</sub> guidelines, respectively. The maximum number of TSP exceedances recorded during May occurred in 2010 & 2012 where there were 16 days that exceeded the guideline. On the other hand, the maximum number of PM<sub>2.5</sub> exceedances in May was 1 day in 2019.

It should also be noted that the GRIMM monitors become more conservative in the reported PM concentrations as the size fraction increases. The PM<sub>2.5</sub> size fraction has been shown to match other regulatory approved PM<sub>2.5</sub> monitors, but the TSP concentrations recorded by the GRIMM tend to be higher than regulatory approved monitors (Levelton, 2015).

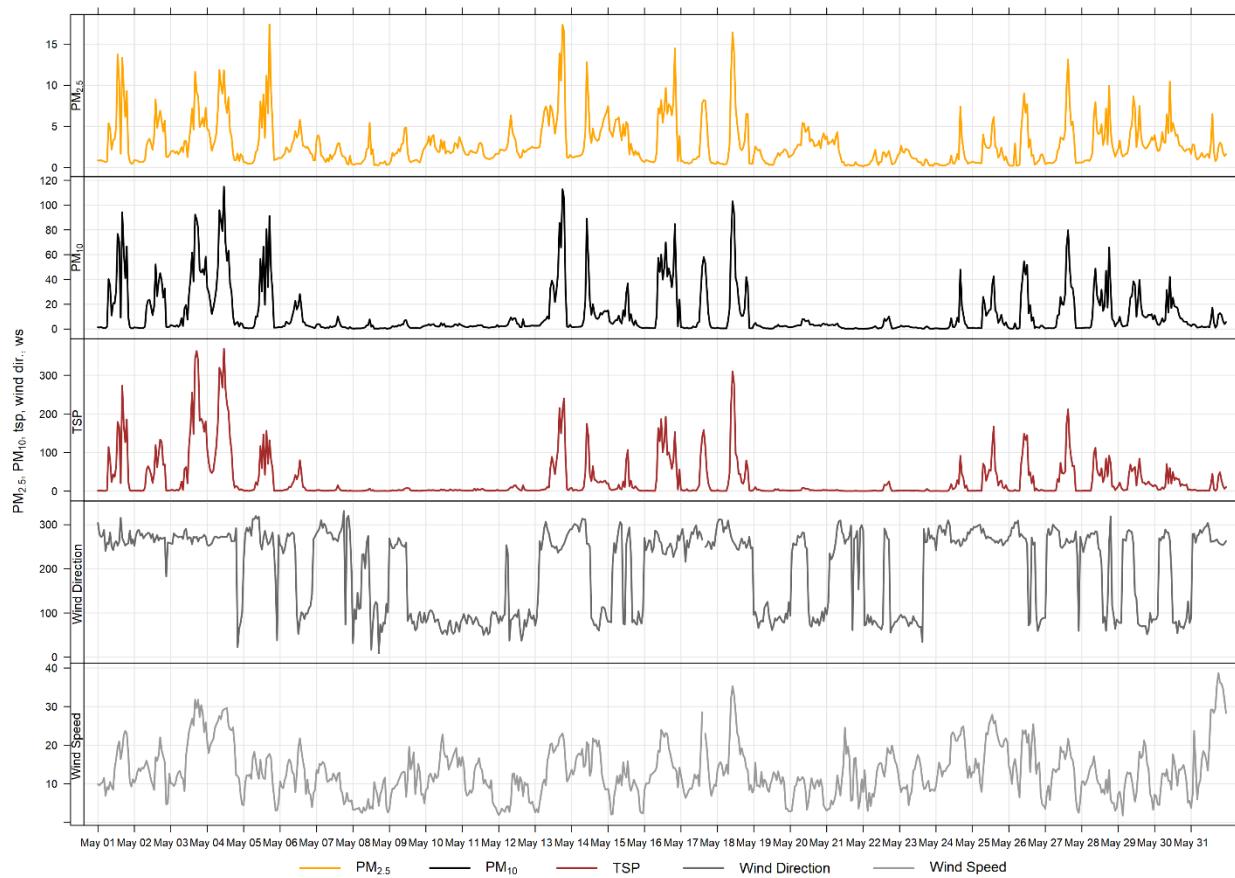
The Berm monitor is located along a ridge at the edge of the Lafarge property and is in an area where on-site trucks drive through site, which can create fugitive dust. Quarry blasting also has the potential to impact short term PM immediately following a blast.

**Table 5-2      Summary of May 2020 data at the Berm GRIMM**

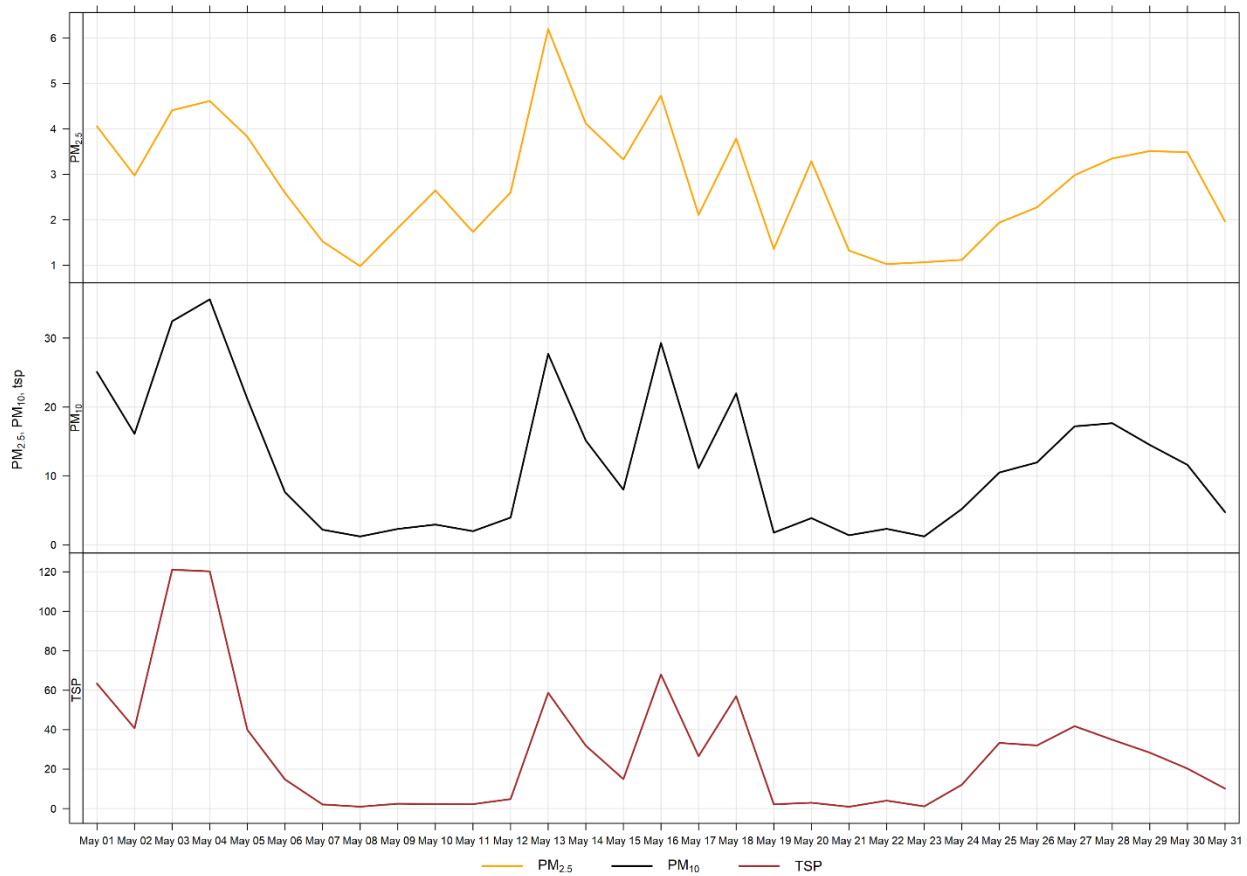
Parameter	Guideline		Station	Exceedances		Monthly		Maximum 1-hour				Maximum 24-hour		Operational Time (Percent)	
	1-hr	24-hr		1-hr	24-hr	Minimum	Average	Maximum Concentration	Day	Hour	Wind Speed (km/hr)	Wind Direction (degrees)	Maximum Concentration	Day	
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	80	29	Berm	0	0	0.1	2.8	17.4	5	17	17.7	259.0	6.2	13	100.0
PM <sub>10</sub> (µg/m <sup>3</sup> )	-	-	Berm	-	-	0.1	11.9	114.9	4	11	29.3	272.4	35.6	4	100.0
TSP (µg/m <sup>3</sup> )	-	100	Berm	-	2	0.1	28.9	368.7	4	11	29.3	272.4	121.1	3	100.0

**Table 5-3 Days exceeding the Guideline for TSP or PM<sub>2.5</sub> at the Berm Monitor**

Date	TSP (ug/m <sup>3</sup> )	PM <sub>2.5</sub> (ug/m <sup>3</sup> )	Average Wind Direction (degrees)	Average Wind Speed (km/hr)	Average RH (%)	Root Cause (Provided by Lafarge)
<b>Entrance</b>						
<b>2020-05-03</b>	121.1	-	270.3	20.3	49.0	High wind event
<b>2020-05-04</b>	120.3	-	271.3	20.7	42.3	High wind event
<b>Total # of Exceedances</b>	<b>2</b>	<b>0</b>				
<b>Maximum # of Exceedances (May)</b>	16 (2010, 2012)	1 (2019)				
<b>Average # of Exceedances (May)</b>	7	0				
<b>Minimum # of Exceedances (May)</b>	2 (2014, 2019)	0 (2010-2018)				



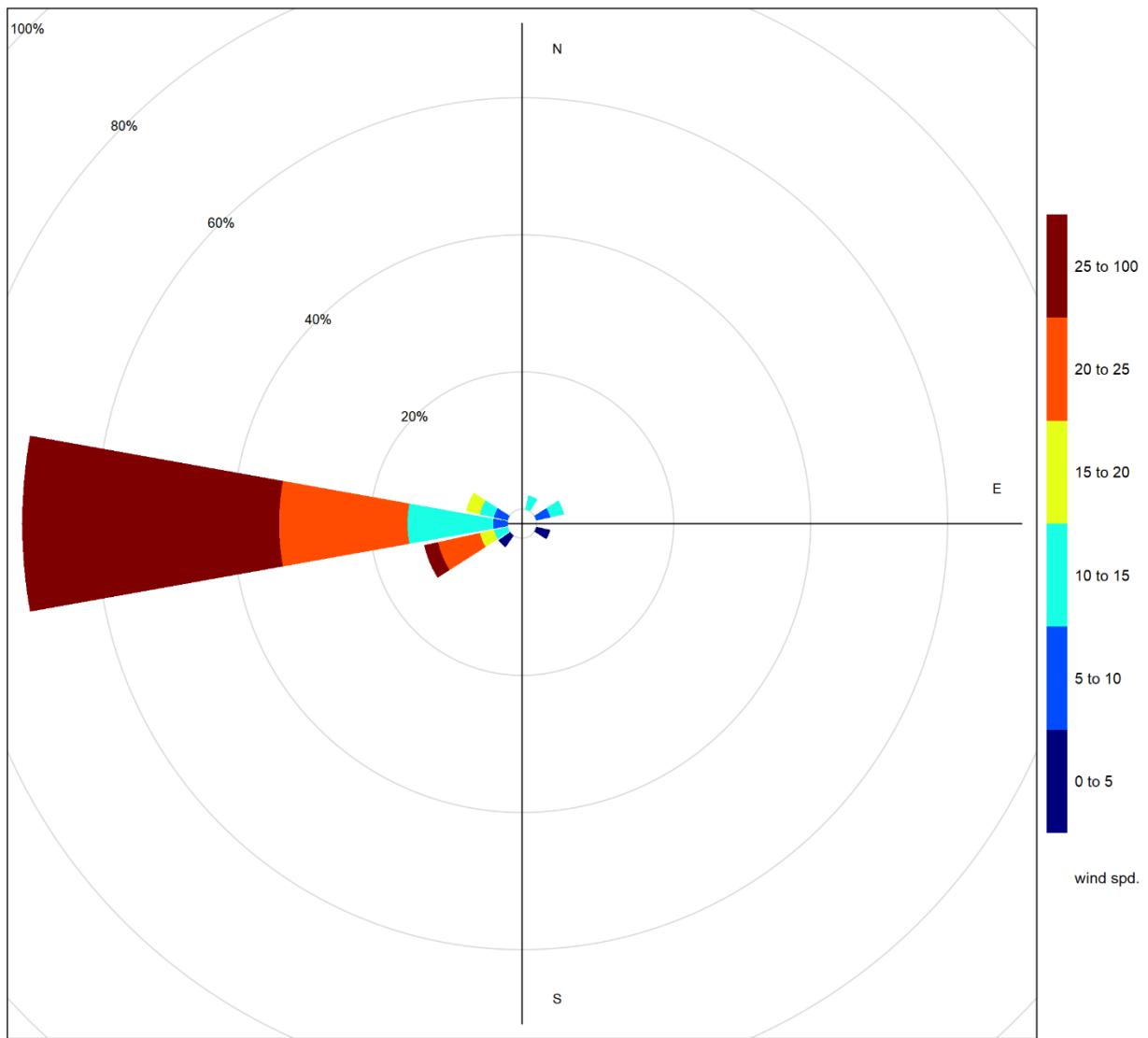
**Figure 5-1      1-hour particulate matter concentrations recorded at the Berm monitor**



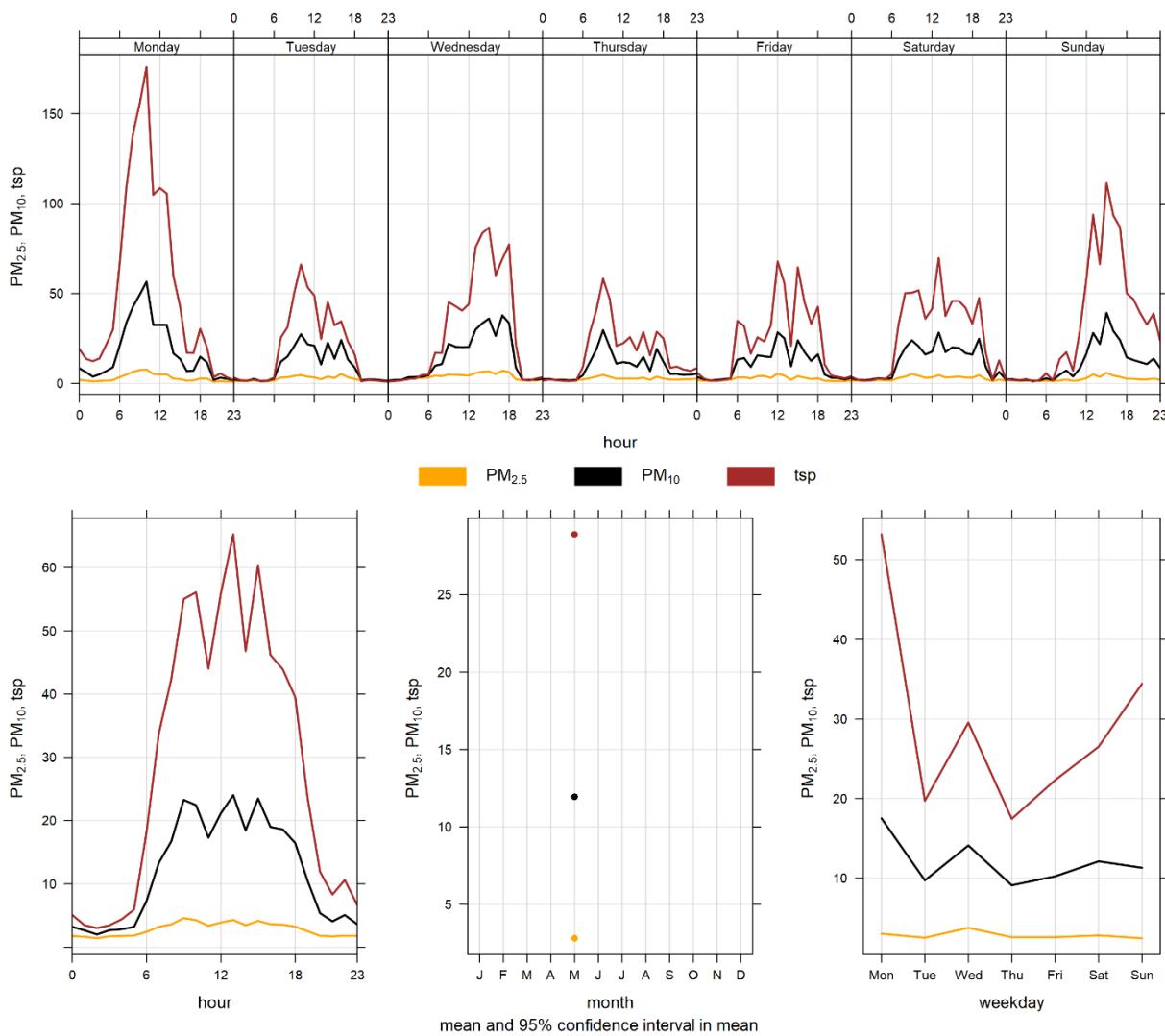
**Figure 5-2      24-hour particulate matter concentrations recorded at the Berm monitor**

Figure 5-3 shows the wind rose for the two days of TSP exceedance recorded this month. The wind rose shows that the winds predominantly came from the west direction.

Figure 5-4 shows the variation of PM recorded at the Berm monitor over various time averaging periods. The Berm monitor diurnal pattern, similar to the Windridge and Lagoon stations, is associated with Lafarge operations, but also daytime emissions from traffic and other activities in Exshaw.



**Figure 5-3      Wind rose for TSP exceedance days recorded at the Berm GRIMM**



**Figure 5-4**      **Berm particulate matter time variation**

# 6 ENTRANCE INDUSTRIAL GRIMM

## 6.1 OPERATIONAL SUMMARY

A summary of the station operation for the month is provided in Table 6-1.

**Table 6-1      Instrumentation List at the Entrance monitoring location**

Parameter Measured	Equipment Description	Notes
<b>PM<sub>2.5</sub>, PM<sub>10</sub>, TSP Concentrations</b>	GRIMM 365 Continuous Particulate Monitor	The Entrance GRIMM monitor had 100% uptime in May

## 6.2 MONITORING RESULTS AND TRENDS

The Entrance monitor was placed at its current location as a result of dispersion modelling conducted in 2009. This area was indicated as being the area where the maximum PM concentrations were expected. Figure 6-1 and Figure 6-2 show the hourly and daily PM<sub>2.5</sub>, PM<sub>10</sub> and TSP concentrations recorded over the month. Table 6-2 summarizes the monthly concentrations, and the maximum 1-hour and 24-hour PM concentrations recorded during the month. Table 6-3 summarizes the recorded exceedances. This is an industrial monitor that is not Alberta Air Monitoring Directive (AMD) compliant and is not required to show compliance with the AAAQO.

During May, there were 2 and zero exceedances of the 24-hour TSP (100 µg/m<sup>3</sup>) and PM<sub>2.5</sub> (29 µg/m<sup>3</sup>) guidelines, respectively.

Historically, the Entrance monitor records an average of 13 and 0 exceedances of the 24-hour TSP and PM<sub>2.5</sub> guidelines respectively, during the month of May. The maximum number of TSP exceedances recorded during May occurred in 2014 (20 days), while the minimum, prior to this year, occurred in 2017 with 7 exceedances. The maximum number of PM<sub>2.5</sub> exceedances in May was 2 days, occurring in 2019.

It should also be noted that the GRIMM monitors become more conservative in the reported PM concentrations as the size fraction increases. The PM<sub>2.5</sub> size fraction has been shown to match other regulatory approved PM<sub>2.5</sub> monitors, but the TSP concentrations recorded by the GRIMM tend to be higher than regulatory approved monitors (Levelton, 2015).

The Entrance monitor is impacted by fugitive dust from plant activities, and high wind events. Trucks also pass near to the Entrance monitor as they enter and exit the Lafarge facility for loading and deliveries. Additionally, the monitor is closely located to Highway 1A. Traffic, particularly large trucks, can create dust while crossing over the railway tracks. This can all lead to the monitor recording high TSP concentrations, which are typically associated with fugitive dust sources.

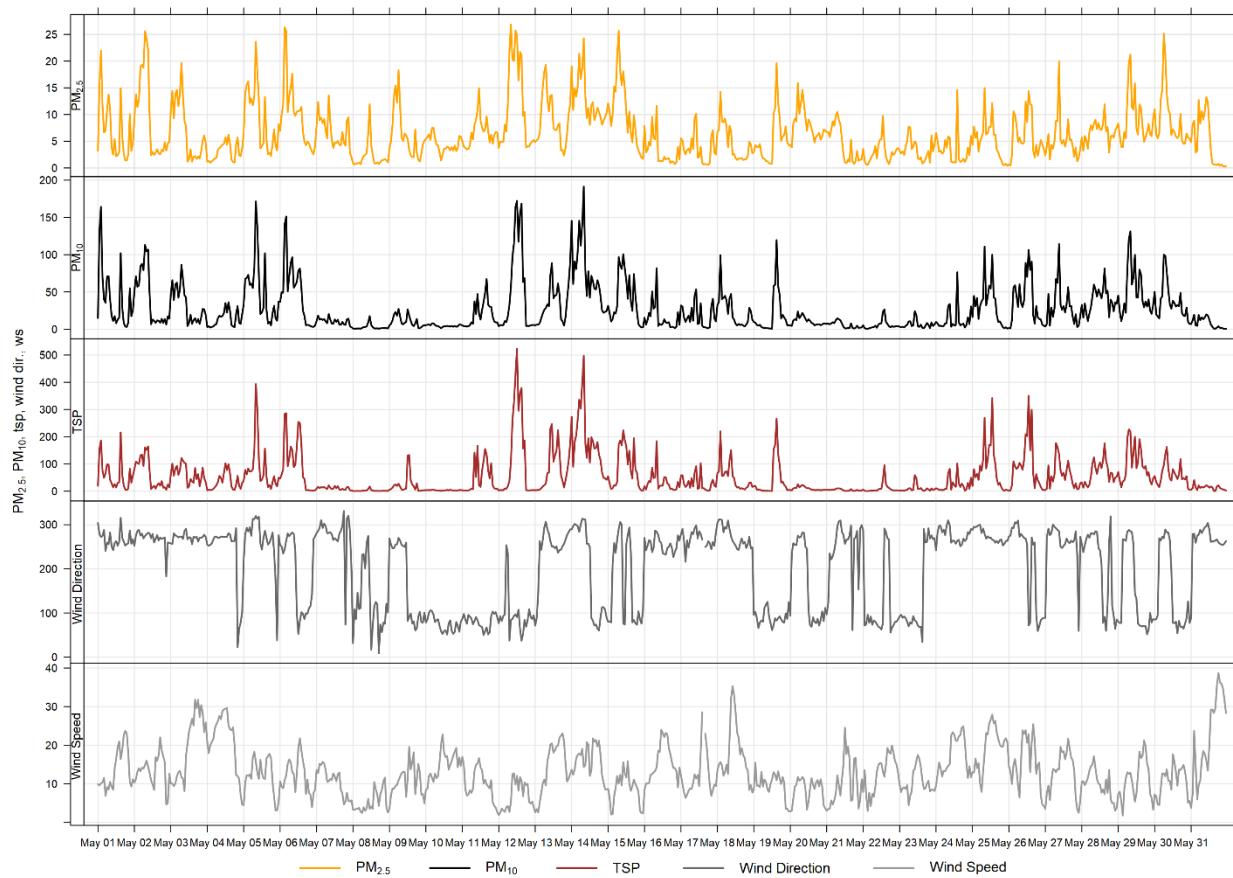
Figure 6-3 shows the wind rose for the 2 days that exceeded the TSP guideline. The wind rose indicates that the winds predominantly came from the east direction.

**Table 6-2      Summary of May 2020 data at the Entrance GRIMM**

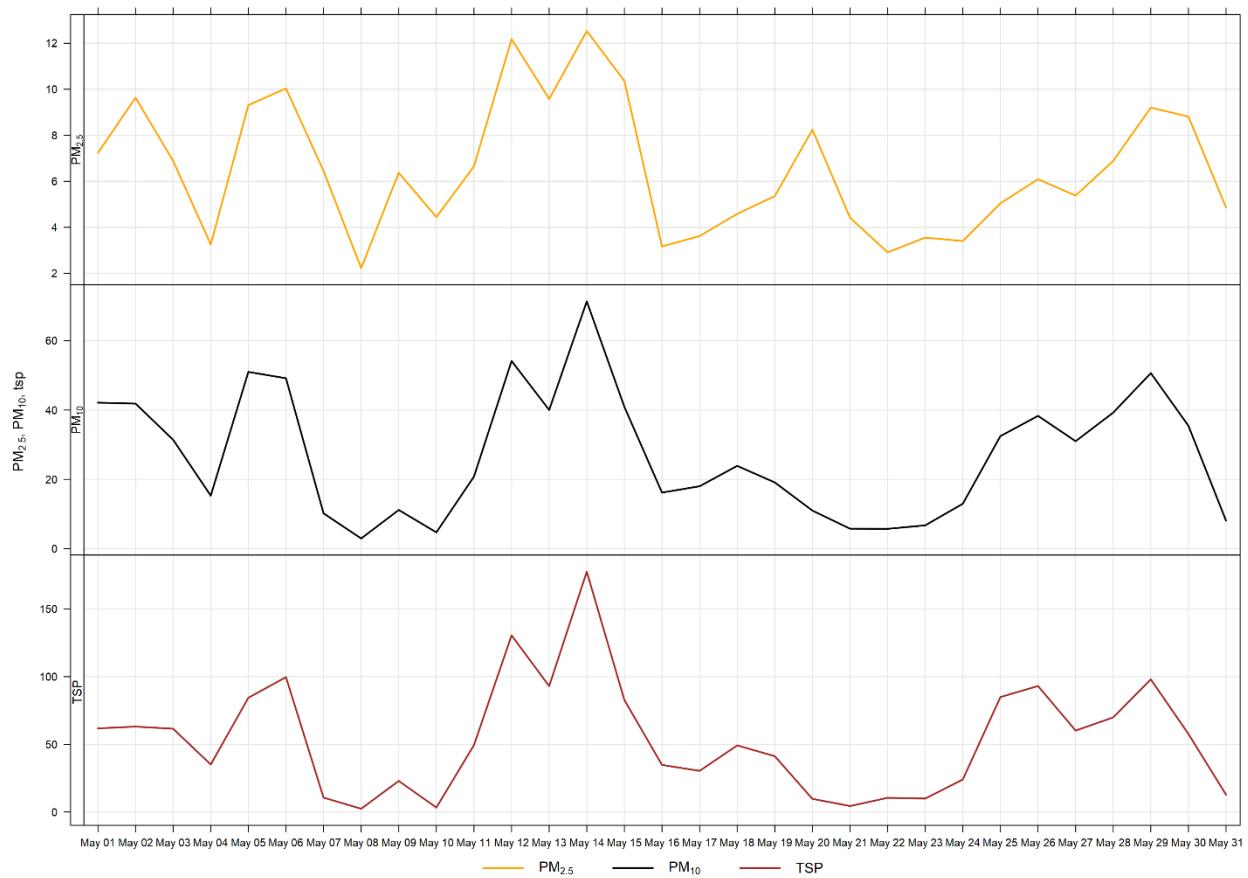
Parameter	Guideline		Station	Exceedances		Monthly		Maximum 1-hour				Maximum 24-hour		Operational Time (Percent)	
	1-hr	24-hr		1-hr	24-hr	Minimum	Average	Maximum Concentration	Day	Hour	Wind Speed (km/hr)	Wind Direction (degrees)	Maximum Concentration	Day	
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	80	29	Entrance	0	0	0.2	6.5	26.9	12	8	5.2	84.2	12.5	14	100.0
PM <sub>10</sub> (µg/m <sup>3</sup> )	-	-	Entrance	-	-	0.5	27.2	191.3	14	8	14.3	311.9	71.4	14	100.0
TSP (µg/m <sup>3</sup> )	-	100	Entrance	-	2	0.4	53.8	522.9	12	12	12.1	90.7	177.5	14	100.0

**Table 6-3 Days exceeding the Guideline for TSP or PM<sub>2.5</sub> at the Entrance Monitor**

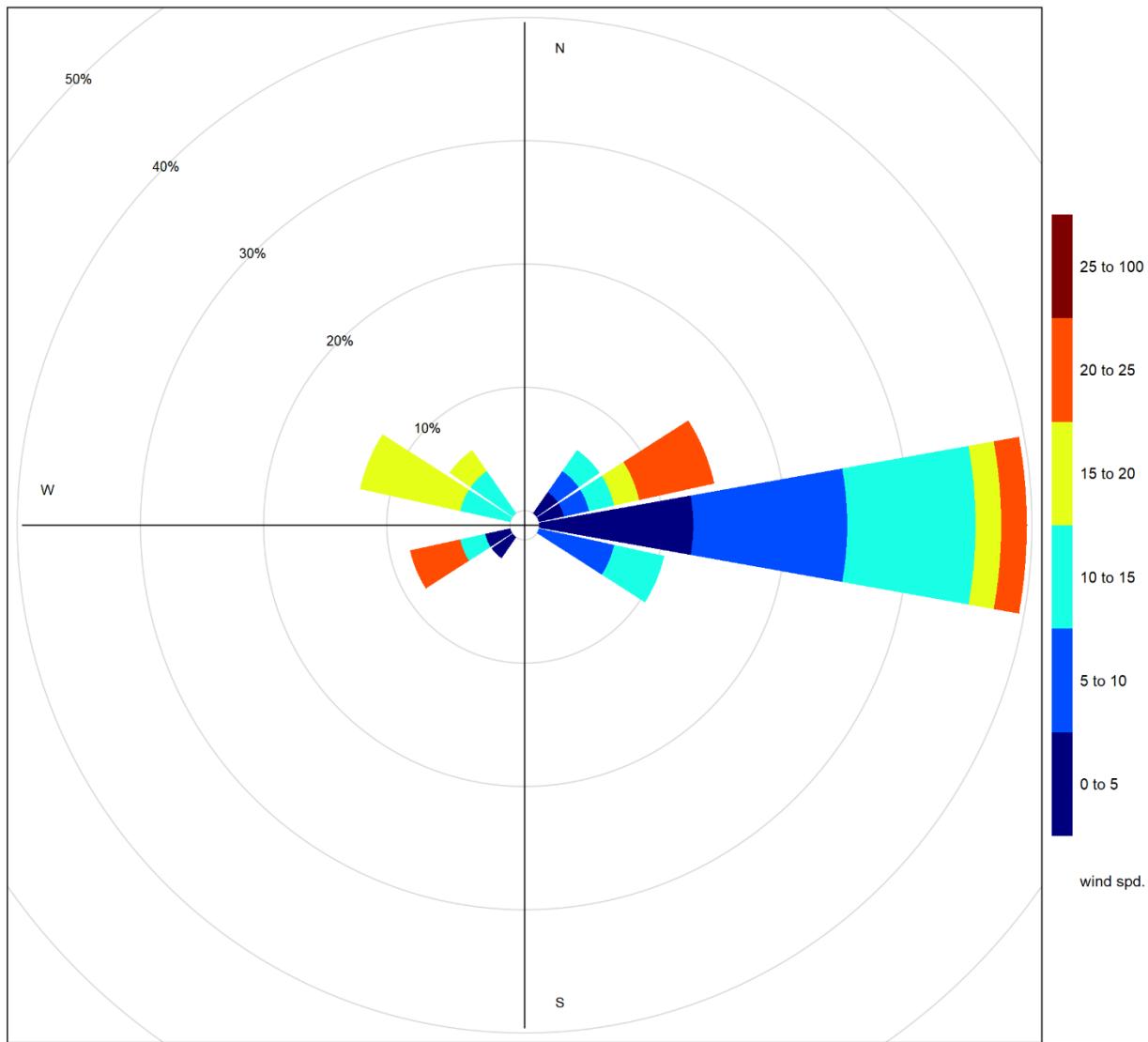
Date	TSP (ug/m <sup>3</sup> )	PM <sub>2.5</sub> (ug/m <sup>3</sup> )	Average Wind Direction (degrees)	Average Wind Speed (km/hr)	Average RH (%)	Root Cause (Provided by Lafarge)
<b>Entrance</b>						
<b>2020-05-12</b>	130.5	-	82.7	6.9	75.0	Winds primarily from the east (unknown source)
<b>2020-05-14</b>	177.5	-	2.3	15.9	44.8	
<b>Total # of Exceedances</b>	<b>2</b>	<b>0</b>				
<b>Maximum # of Exceedances (April)</b>	20 (2014)	2 (2019)				
<b>Average # of Exceedances (April)</b>	13	0				
<b>Minimum # of Exceedances (April)</b>	7 (2017)	0 (2010, 2012, 2013, 2015, 2017, 2018)				



**Figure 6-1      1-hour particulate matter concentrations recorded at the Entrance monitor**

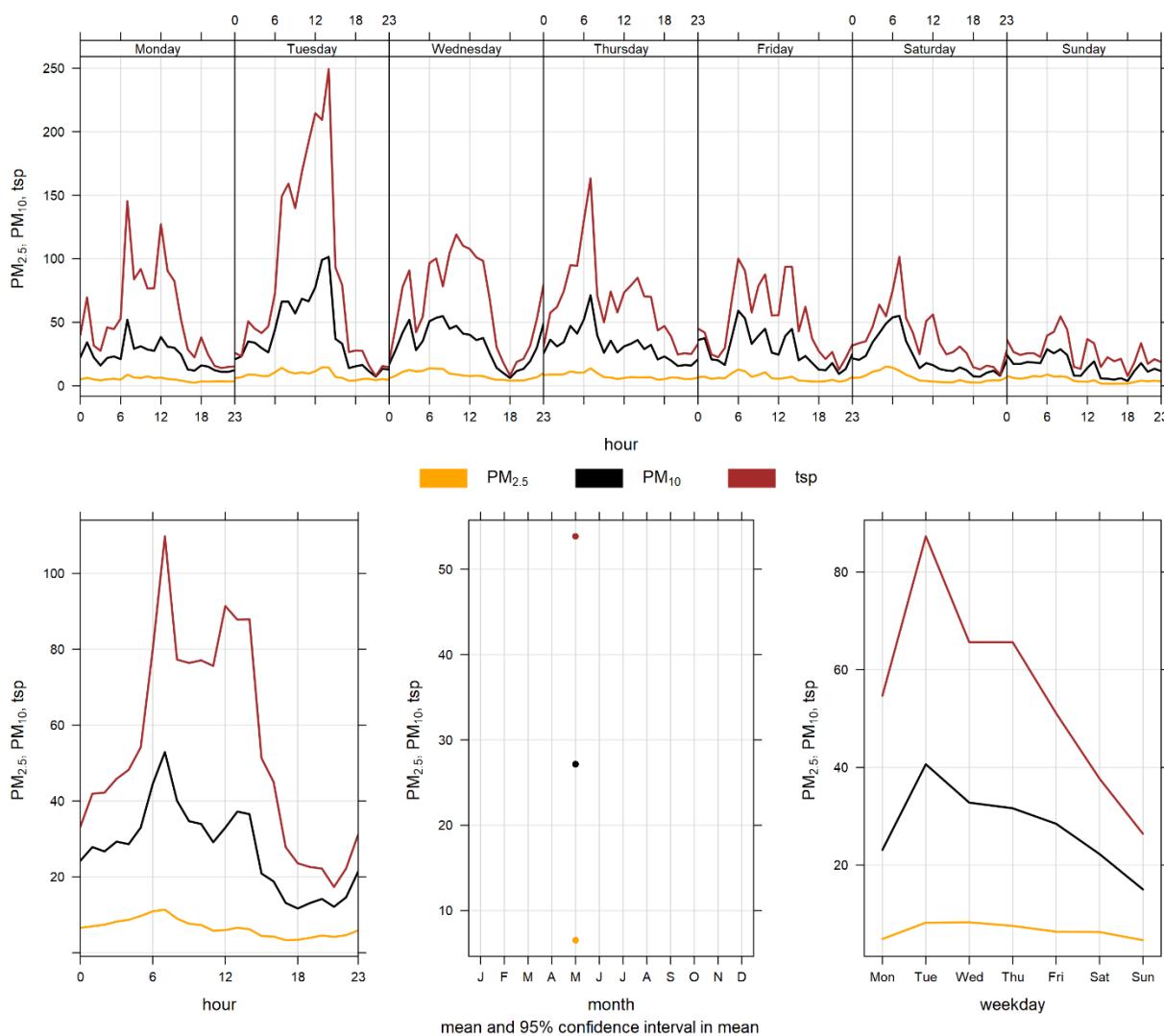


**Figure 6-2      24-hour particulate matter concentrations at the Entrance monitor**



**Figure 6-3      Wind rose for TSP exceedance days recorded at the Entrance GRIMM**

Figure 6-4 illustrates the hourly PM concentrations recorded at the Entrance monitor, averaged over different time periods. The plot across the top shows the variation of PM over the course of a week, while the bottom three plots show the changes in PM over the course of a day, month and weekday, respectively. Figure 6-4 is based on data collected during May 2020. The diurnal pattern is likely more influenced by daytime traffic emission (from vehicles serving Lafarge as well as regular highway traffic) given its location near the highway entrance to Lafarge, but can as well by industry and rail sources.



**Figure 6-4      Entrance particulate matter time variation**

# BIBLIOGRAPHY

- Alberta Environment and Parks. (2019, January). Alberta Ambient Air Quality Objectives and Guidelines Summary. Alberta, Canada.
- Alberta Environment and Parks. (2016, February). Air Monitoring Directive. Alberta, Canada.
- Carslaw, D.C. and K. Ropkins, (2012). Openair — an R package for air quality data analysis. Environmental Modelling & Software. Volume 27–28, 52–61.
- Levelton Consultants Ltd. (2015, June 15). Comparison of GRIMM and E-BAM Data. Alberta, Canada.

# APPENDIX

## A DATA & CALIBRATION REPORTS

# APPENDIX













































