REPORT

ANNUAL TECK COAL LTD. REGIONAL AIR MONITORING PROGRAM REPORT 2020-03-31

SPARWOOD, BC

2019 ANNUAL REPORT

RWDI #2001654
March 31, 2020

SUBMITTED TO

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EXECUTIVE SUMMARY

Teck Coal Ltd. (Teck) operates four open pit coal mine operations: Elkview (EVO), Line Creek (LCO), Greenhills (GHO) and Fording River (FRO) and one open pit coal mine operation in care & maintenance in the Elk Valley: Coal Mountain (CMO). Each mine is authorized by permits issued by the British Columbia Ministry of Environment & Climate Change Strategy (BC ENV) under the *Environmental Management Act* to discharge emissions to the air. There is also a requirement under these permits for a Regional Air Monitoring Program (RAMP) that allows for an ongoing assessment of the efficacy of monitoring and to provide annual reporting summarizing the state of air quality and meteorology in the region.

There are eight monitoring sites that are part of the RAMP where Particulate Matter 10 micrometer diameter and less (PM_{10}), Particulate Matter 2.5 micrometer diameter and less ($PM_{2.5}$) and Total Suspended Particulate (TSP) concentrations are measured. The meteorological conditions of 2019 largely impacted particulate concentrations and exceedances. Decreased forest fire activity in British Columbia led to a significant decrease in regional PM in August and early September compared to previous years. During 2019, daily averaged TSP readings above British Columbia Ambient Air Quality Objectives (BCAAQO) occurred three times; two at LCO – L10A, and one at GHO-Elkford (E290310).

Fifty-eight (58) daily average concentrations of PM_{10} were observed above the BCAAQO at 6 stations: forty-two (42) at South Station (FRO – SS /E297832), one (1) at CMO - Hosmer, three (3) at EVO - DTAM, nine (9) at EVO - MCRR, one (1) at EVO – WWTP and two (2) at GHO - EHS. PM_{10} concentrations above the BCAAQO were recorded most often in the Winter (December, January, February) and spring (March, April and May) months. The BCAAQO for $PM_{2.5}$ is evaluated against the 98^{th} percentile of the daily average $PM_{2.5}$ over 365 days. None of the six stations that record $PM_{2.5}$ observed 98^{th} percentile results above the BCAAQO. In addition, daily average data is compared to the BCAAQO to inform performance. Eight (8) daily average concentrations of $PM_{2.5}$ were observed above BCAAQO at 4 stations: two (2) at CMO-Hosmer, three (3) at EVO – MCRR, one (1) at EVO – WWTP (0250184) and two (2) at CMO – AGWS (E297251).

NO_2 and SO_2 were compared to the updated BCAAQO based on the 2020 CAAQS. There were no 1-hour average concentrations above the 1-hour BCAAQO for NO_2, SO_2 or the 1-hour PCO for CO. The annual average NO_2 concentration and the 8-hour rolling average CO concentrations were both below the annual BCAAQO and 8-hour PCO respectively. The annual average SO_2 concentration was greater than the annual BCAAQO for SO_2 which could be a result of an instrumental performance issue or the siting of the inlet rather than environmental conditions Further investigations are on-going.

Long temporal records of air quality measurements were not available for all monitoring stations, therefore, figures presenting inter-annual variability are presented but the trends are not discernible in all cases. The trend at LCO – L10A (E206189) showed a return of annual TSP concentrations in 2019 toward values more similar to those observed prior to 2011. The GHO – Elkford (E290310) continuous air monitoring station shows a continued increase but gradual increase in annual TSP concentrations. CMO – AGWS (E297251) TSP concentrations have been decreasing since 2016. All stations showed decreases in annual PM_{10} concentrations from the previous year and all showed a decrease in annual $PM_{2.5}$ in 2019.

There were some quarters where data completeness did not achieve the 75% requirement of the BC ENV, outlined in site specific permits. This was a result of instrument malfunctions. There were no parameters that did not meet the 75% completeness requirement on an annual basis at any station.

Meteorological monitoring at sites include: wind speed and direction, air temperature (measured at eight stations) and precipitation (measured at four stations). Meteorological data were compared against 30 – year climate normals measured in Sparwood. Overall, 2019 was found to be colder and drier than normal. All variability in meteorological monitoring between stations can be mainly attributed to differences in elevation, local topography and the siting of each station.

In 2019, there were 241 pieces of feedback related to air quality and dust management. The feedback was related to specific weather events (8), complaints relating to visual impacts, dirty vehicles and dust on personal property (216) or from the highway haul between EVO and CMO (17). Teck's Coal Operations in the Elk Valley continue to recognize dust as a primary concern to nearby communities and takes all feedback seriously.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

Jessica Tremblay, EIT
Lead, Air Quality and Dust Management
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1 INTRODUCTION

Teck Coal Limited (Teck) operates five open pit coal mines (the Sites) within the Elk Valley located in the southeastern Kootenay region of British Columbia (Figure 1). The Elk Valley is characterized by rugged terrain and localized mountain weather patterns. As with similar valleys in British Columbia, the mixing of air and dispersion of any pollutants it may contain is limited by a combination of topographic constraints and meteorological conditions. The communities of Elkford (population 2,500) and Sparwood (population 3,800) are the largest communities located in the vicinity of the Sites. Each mine, as outlined below, is authorized by permits issued by the British Columbia Ministry of Environment & Climate Change Strategy (ENV) under the *Environmental Management Act* to discharge emissions to the air:

- Coal Mountain Operations (CMO) – PA-4751
- Elkview Operations (EVO) – PA-1807
- Fording River Operations (FRO) – PA-1501
- Greenhills Operations (GHO) – PA-6249
- Line Creek Operations (LCO) – PA-5352

In 2014, site specific permits were amended to include a condition which states:

Valley Wide Monitoring Plan

The Permittee must participate in a comprehensive ambient monitoring program that considers emissions from all Teck Coal Limited mines in the Elk Valley. This program must be prepared and implemented by a qualified professional. This program must be conducted to the satisfaction of the Director.

The Regional Air Monitoring Program (RAMP) aims to satisfy this requirement of the Site's individual permits. The monitoring program uses an Adaptive Management Framework to allow for continual assessment and adjustment of the program to ensure it continues to efficiently meet objectives over time.

This report forms part of the requirements of the RAMP. This report will cover air quality and meteorological monitoring conducted by Teck in the Elk Valley under the RAMP, as well as draw in outside sources where necessary and if available. This report will supplement the Mines' reporting according to their individual permits by providing an overall summary and linking back to site specific monitoring and mining activities as required, providing context for the monitoring results for the Elk Valley.

This report includes information on:

- results above provincial or federal ambient air quality objectives or guidelines and,
- temporal trends in ambient air quality concentrations.

In addition, as required to provide context for the ambient results, this report includes:

- public input to visibility or nuisance dusting issues,
- changes in Teck mining operations that may impact air quality,
- changes in Teck's dust management plan, and
- changes in Teck's ambient monitoring program.

Using an adaptive management framework, this annual report will also make recommendations to adjust the RAMP where needed.

2 MONITORING LOCATIONS

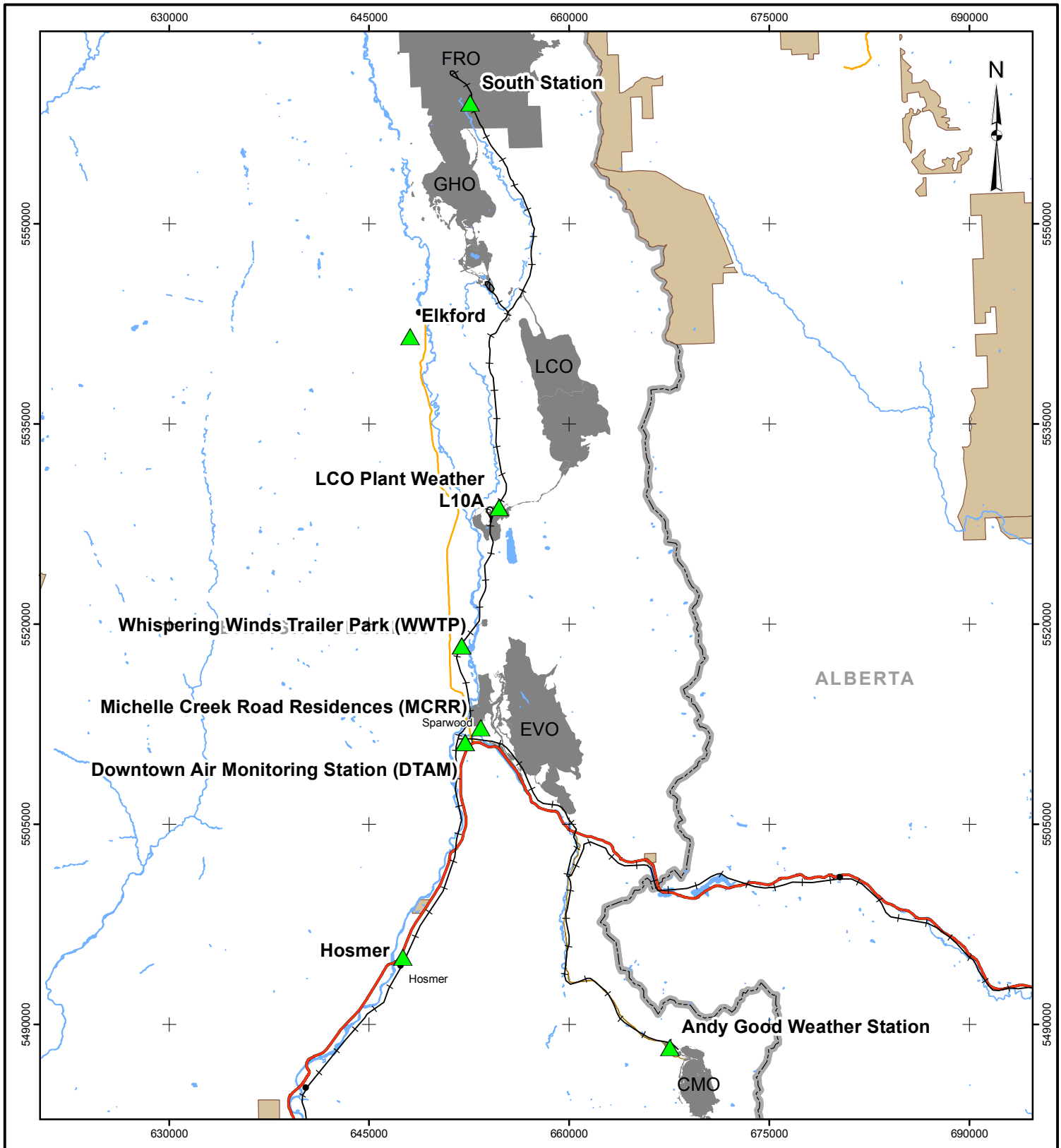
Air quality and meteorological monitoring is conducted at the Sites and in three different communities in the Elk Valley. There are currently eight continuous regional air monitoring stations operated by Teck, at which various parameters are measured and used for different purposes; including research and development, site fugitive dust management plans and ambient air quality monitoring. This section describes the eight stations and all parameters that are included in the RAMP that focus on monitoring and assessing ambient air quality. These eight stations were chosen to provide a representative assessment of air quality and meteorology throughout the Elk Valley region. See Table 1 and Figure 1 for the locations of the monitoring stations and Table 2 for a description of the parameters measured at each of those monitoring stations as required under the RAMP. The criteria air contaminants (CACs) measured at these stations include:

- TSP – Total Suspended Particulate
- PM_{10} – Particulate matter smaller than 10 µm in diameter
- $PM_{2.5}$ – Particulate matter smaller than 2.5 µm in diameter
- NO_2 – Nitrogen dioxide
- SO_2 – Sulphur dioxide
- CO – Carbon monoxide

Table 1: Location in decimal degrees and elevation in metres of the monitoring stations in the Regional Air Monitoring Program.

Station Name		Latitude (decimal degrees)	Longitude (decimal degrees)	Elevation (m)
CMO	Andy Good Weather Station (CMO - AGWS/E297251) [1]	49.523678	-114.684289	1493
	Hosmer	49.590260	-114.959234	1057
EVO	Downtown Air Monitoring Station (EVO - DTAM/E262137))	49.732811	-114.887683	1138
	Whispering Winds Trailer Park (EVO - WWTP/E0250184)	49.798506	-114.888639	1160
	Michel Creek Road Residences (EVO - MCRR)	49.743520	-114.872577	1150
LCO	L10A (LCO - L10A/E206189)	49.891055	-114.845795	1298
	LCO Plant Weather (E297050)	49.891053	-114.845684	1298
GHO	Elkford (GHO – Elkford/E290310) [2]	50.007808	-114.933668	1333
FRO	South Station (FRO - SS/E297832) [3]	50.148679	-114.856601	1582

Notes: Station name abbreviations along with station identifiers are included in parentheses beside the station name. Station names with regards to the valley wide monitoring program differ from those specified in the permits.
(1)- Named “Andy Good Spoils” in the Teck CMO permit PA 4751.
(2)- Named “Rocky Mountain Elementary” in the Teck GHO permit PA 6249.
(3)- Named “Sewage Treatment Facility Air Quality Station” in the Teck FRO permit PA 1501.



LEGEND

- AIR MONITORING STATION
- CITY / TOWN / COMMUNITY
- CANADIAN PACIFIC RAILWAY
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- ROAD
- BRITISH COLUMBIA / ALBERTA PROVINCIAL BOUNDARY
- MINE OPERATIONS
- PROVINCIAL PARK
- WATERBODY

10 0 10

SCALE 1:400,000 KILOMETRES

REFERENCE

Provincial Boundary and communities obtained from The Atlas of Canada, Natural Resources Canada. Alberta Hydrography obtained from CanVec, Government of Canada, Natural Resources Canada. BC Hydrography, Dominion Coal Blocks and project data obtained from Teck Coal Limited. Roads obtained from Geobase. Provincial parks and Railroad data obtained from Geogratis. Projection: UTM Zone 11 Datum: NAD 83

PROJECT

TECK COAL REGIONAL
AIR MONITORING PROGRAM

TITLE

AIR MONITORING STATIONS

PROJECT No. 12-1349-0003			SCALE AS SHOWN	REV. 0
DESIGN	DR	03 Jan. 2014	FIGURE 1	
GIS	DJH	16 Mar. 2017		
CHECK	ABS	16 Mar. 2017		
REVIEW	TAD	16 Mar. 2017		

1500459_Teck_Monitoring_Figure 1_Monitoring Stations.mxd

Table 2: Parameters measured at each of the stations that are part of the Regional Air Monitoring Program.

Station Name		Air Quality Parameters							Meteorological Parameters						
		TSP	PM_{10}	$PM_{2.5}$	NO_2	CO	SO_2	Visual Viewshed	Wind Speed and Direction	Temperature	Relative Humidity	Barometric Pressure	Precipitation	Solar Radiation	Snow Depth
CMO	Andy Good Weather Station (CMO - AGWS/E297251) [3]	X	X	X				X	X	X			X		X
	Hosmer		X	X					X	X	X	X			
EVO	Downtown Air Monitoring Station (EVO - DTAM/E262137)		X[1]	X[1]	X	X	X	X	X	X	X				
	Whispering Winds Trailer Park (EVO - WWTP/E0250184)		X[1]	X[1]					X	X	X				
	Michel Creek Road Residences		X	X					X	X	X				
LCO	L10A (LCO - L10A/E206189)	X[2]													
	LCO Plant Weather (E297050)								X	X			X		
GHO	Elkford (GHO – Elkford/E290310) [4]	X	X	X				X	X	X			X		
FRO	South Station (FRO - SS/E297832) [5]		X[1]						X	X	X	X	X	X	X

Notes: Station name abbreviations along with station identifiers are included in parentheses beside the station name. Station names with regards to the valley wide monitoring program differ from those specified in the permits.
(1)- PM_{10} and $PM_{2.5}$ at these locations measured continuously using a Thermo 5030i SHARP.
(2)- TSP at these locations are measured using a Hi-Volume sampler per the National Air Pollution Surveillance schedule.
(3)- Named “Andy Good Spoils” in the Teck CMO permit PA 4751.
(4)- Named “Rocky Mountain Elementary” in the Teck GHO permit PA 6249.
(5)- Named “Sewage Treatment Facility Air Quality Station” in the Teck FRO permit PA 1501.

3 AIR QUALITY RESULTS

As shown in Table 2, six air quality parameters were measured across Teck's regional monitoring network. The results of the monitoring in 2019 and the longer-term trends are discussed in this section. These results include a discussion of the number of excursions and/or results above applicable BC Provincial Ambient Air Quality Objectives (BCAAQO) for each air contaminant that is monitored (see Table 3 and Table 5), as well as the completeness of the datasets for PM and gases at the monitoring stations. Appendices A and B also provide more detailed information on air quality for 2019.

Figure 2 through Figure 10 and figures in Appendix B show time series of CAC concentrations measured at all stations within the regional monitoring network and Table 4 shows the annual means of particulate matter concentrations at all stations.

Table 3: BC Ambient Air Quality Objectives for each air contaminant that is monitored at any of the stations covered by this report.

Contaminant	BCAAQO / BC PCO	1-Hour	8-Hour	24-Hour	Annual
$PM_{2.5}$ (µg/m^3)	BCAAQO [2]			25[3]	8
PM_{10} (µg/m^3)	BCAAQO [2]			50	
TSP (µg/m^3)	BCAAQO [2]			120	60[6]
NO_2 (µg/m^3)	BCAAQO [2]	113[4]			60
SO_2 (µg/m^3)	BCAAQO [2]	183[5]			5
CO (µg/m^3)	BC PCO [1]	14,300	5,500		

Notes:

(1)- BC PCO refers to the BC Pollution Control Objective (BC MOE, 2016).
(2)- BCAAQO refers to the Provincial Ambient Air Quality Objective (BC MOE, 2016).
(3)- The $PM_{2.5}$ BCAAQO is based on 98th percentile values; therefore, an exceedance is defined as occurring only after six excursions have occurred.
(4)- The NO_2 BC interim AAQO is based on the 98th percentile of the daily maximum 1-hour value. Therefore, an exceedance is defined as occurring only after six excursions have occurred.
(5)- The SO_2 BC interim AAQO is based on the 98th percentile of the daily maximum 1-hour value. Therefore, an exceedance is defined as occurring only after six excursions have occurred.
(6)- The annual TSP BCAAQO is based on the geometric mean.

3.1 Total Suspended Particulate (TSP)

Figure 2 shows the time series of 24-hour average TSP concentrations for the three stations at which TSP is measured as well as the BCAAQO for TSP of 120 µg/m^3. Figure 2 and Table 5 show that there were 3 values greater than the 24-hour objective: two at LCO – L10A (3.33%) and one at GHO – Elkford (0.3%). The TSP concentration above the objective recorded at GHO – Elkford occurred on May 31 when there was forest fire activity in Alberta and coincides with elevated TSP concentrations at CMO – AGWS which did not exceed the BCAAQO. Annual geometric means of TSP concentrations at all three stations remained below the annual BCAAQO of 60 µg/m^3 (see Table 4, Table 6 and Figure 11) in 2019.

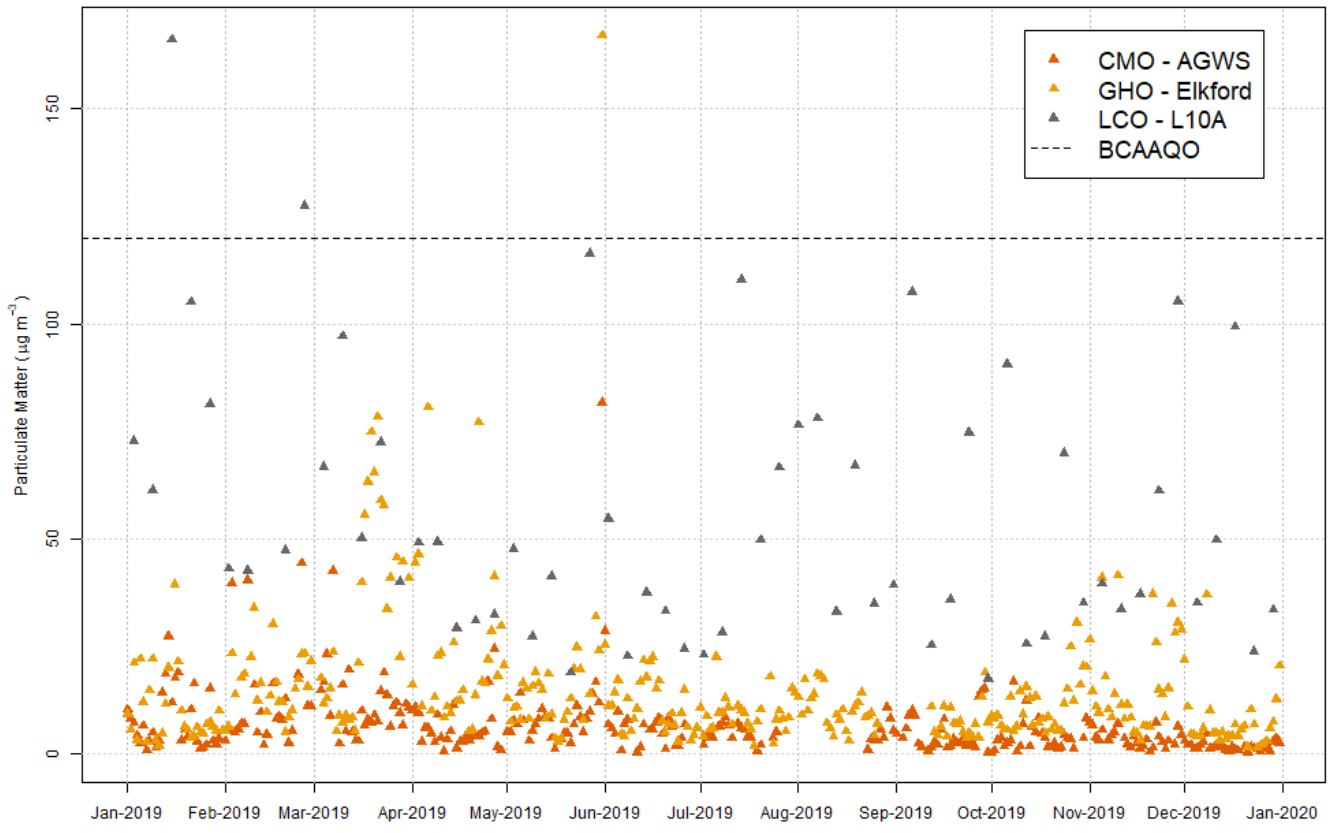


Figure 2: Daily Averaged TSP Concentrations.

Note: The BCAAQO of 120 µg/m^3 is indicated by a dashed line.

3.2 PM_{10}

Figure 3 shows the time series of the 24-hour average PM_{10} concentrations at seven stations as well as the BCAAQO of 50 µg/m^3. Figure 3 and Table 5 show that there were 58 daily average results above the BCAAQO, 42 at FRO- SS (11.9%), one (1) at CMO – Hosmer (0.37%), three (3) at EVO – DTAM (0.98%), nine (9) at EVO – MCRR (2.83%), one (1) at EVO – WWTP (0.29%) and two (2) at GHO – EHS (0.6%).

PM_{10} concentrations above the BCAAQO were recorded most often in the Winter (December, January, February) and spring (March, April and May) months and this is reflected in the seasonal average concentrations in Table A-6 of Appendix A. This is a departure from the usual trend of the greatest number of concentrations above the BCAAQO being recorded in August, when there is normally an active forest fire season in British Columbia; 2019 was less severe than normal. The elevated particulate matter concentrations at EVO-MCRR and GHO - Elkford in February 2019 could be related to the below-average temperatures observed that month (Figure 16) which would have increased home heating through wood burning at nearby dwellings. Figure 4, Figure **5** and Figure 6 plot the mean of the 1-hour PM_{10} concentrations binned by wind speed and direction, separated by month for FRO – SS for all months of 2019, GHO – Elkford for January through April and for EVO – MCRR for January through April respectively.

The greatest concentrations observed at FRO – SS from January through March, May and November coincide with winds from the north-northeast between 4 and 5 m/s. These conditions suggest the mine or the access road as a probable source during this period. Elevated PM_{10} concentrations in July and August don't appear to be associated with any particular wind direction and are likely the result of particulate emissions from both GHO and FRO being mixed throughout the area by up and down valley winds as well as upslope (anabatic) and downslope (katabatic) local flows. Elevated PM_{10} concentrations in December are associated with light winds from the southwest and are likely related to emissions at GHO.

Elevated mean PM_{10} concentrations at GHO – Elkford in January and February were associated with light winds from the northeast are likely related to road-dust emissions in the community of Elkford related to the spreading of abrasives in winter. Similar trends in elevated PM_{10} concentrations were observed in March, however the greatest mean concentrations were associated with moderate winds from the northwest. There are no obvious sources located to the northwest of the station, so it is likely related to regionally elevated PM_{10} concentrations on that day. The highest PM_{10} concentrations in April were associated with light winds from the southeast and are likely related to road-dust emissions within the community due to accumulated abrasives following the winter.

Elevated mean PM_{10} concentrations at EVO – MCRR in February were associated with low winds from the southeast and north-northeast. A number of homes across Michel Creek road lie in this direction and the increased concentrations are likely related to increased emissions due to smoke from heating with wood stoves. Elevated PM_{10} concentrations in March were associated with winds from the west-southwest of 4 to 5 m/s. This PM_{10} likely originated in the trailer park situated below the station and were probably caused by wood smoke from home heating as well.

Forest Fire activity in Alberta in May contributed to PM_{10} concentrations above the BCAAQO on May 31 at FRO – SS, GHO – Elkford, EVO – MCRR and CMO – Hosmer.

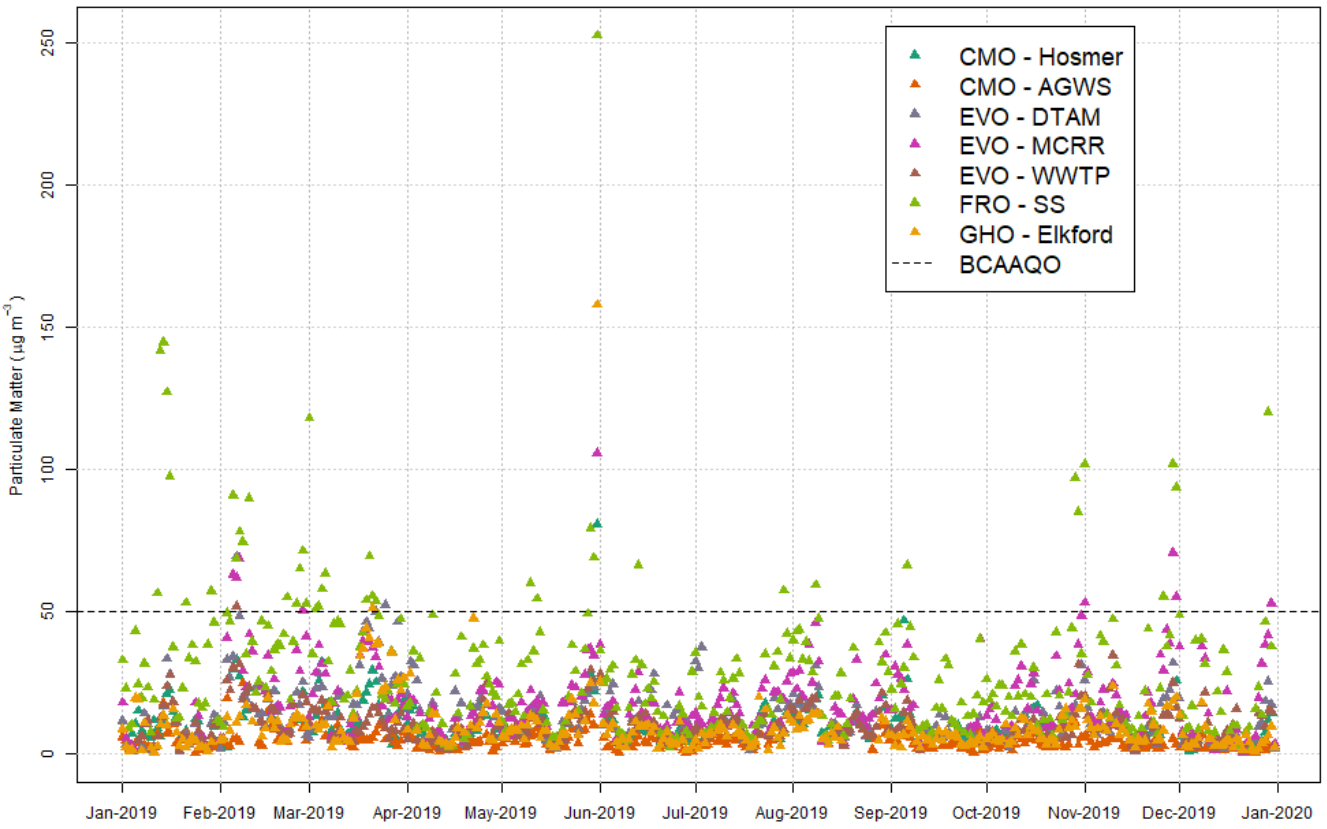


Figure 3: Daily Averaged PM_{10} Concentrations.

Note: The BCAAQO of 50 µg/m3 is indicated by a dashed line.

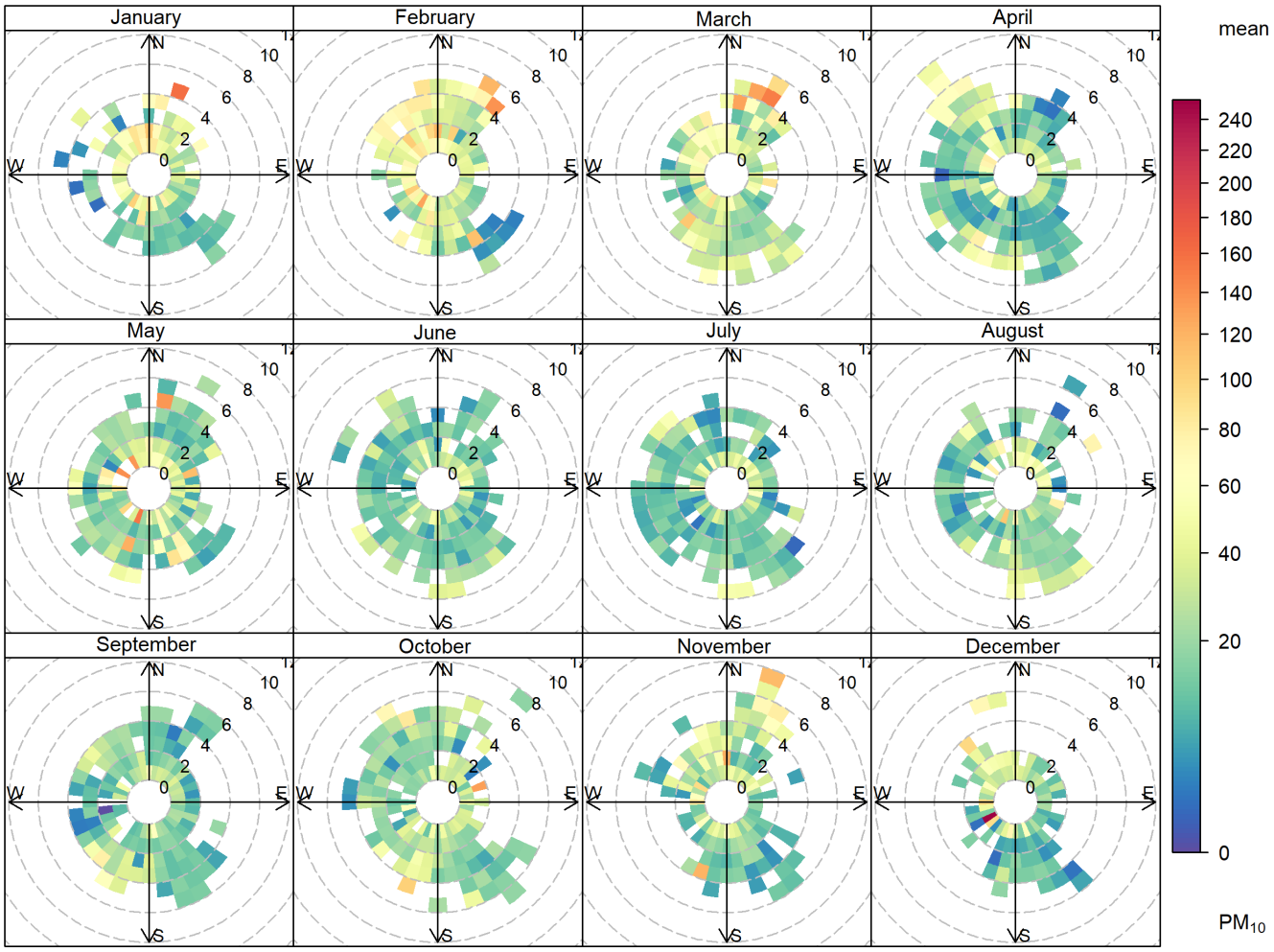


Figure 4: Mean PM_{10} concentrations (µg/m³) observed at FRO – SS by wind speed and direction for each month of 2019.

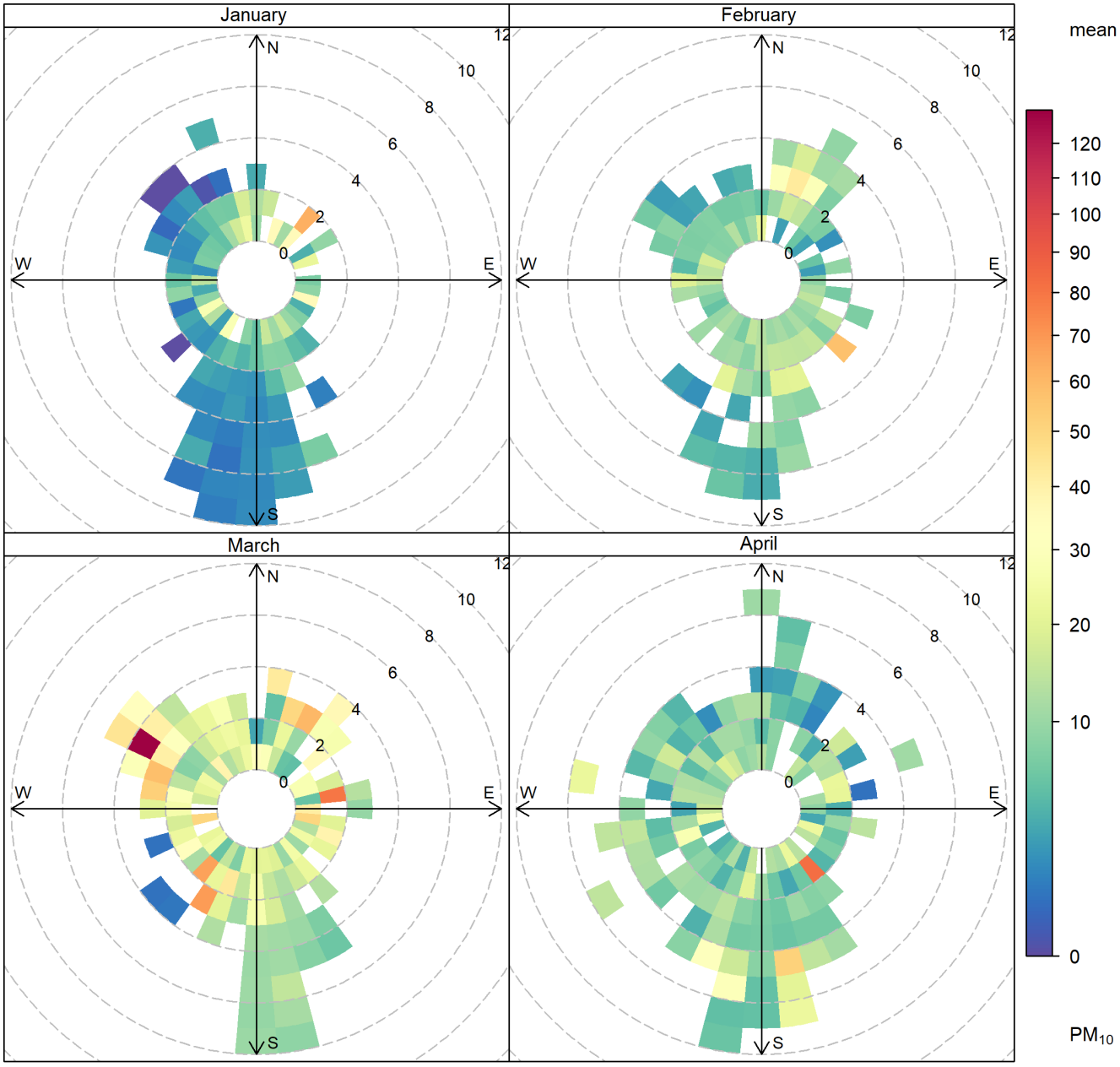


Figure 5: Mean PM_{10} concentrations (µg/m³) observed at GHO - Elkford by wind speed and direction for January through April, 2019.

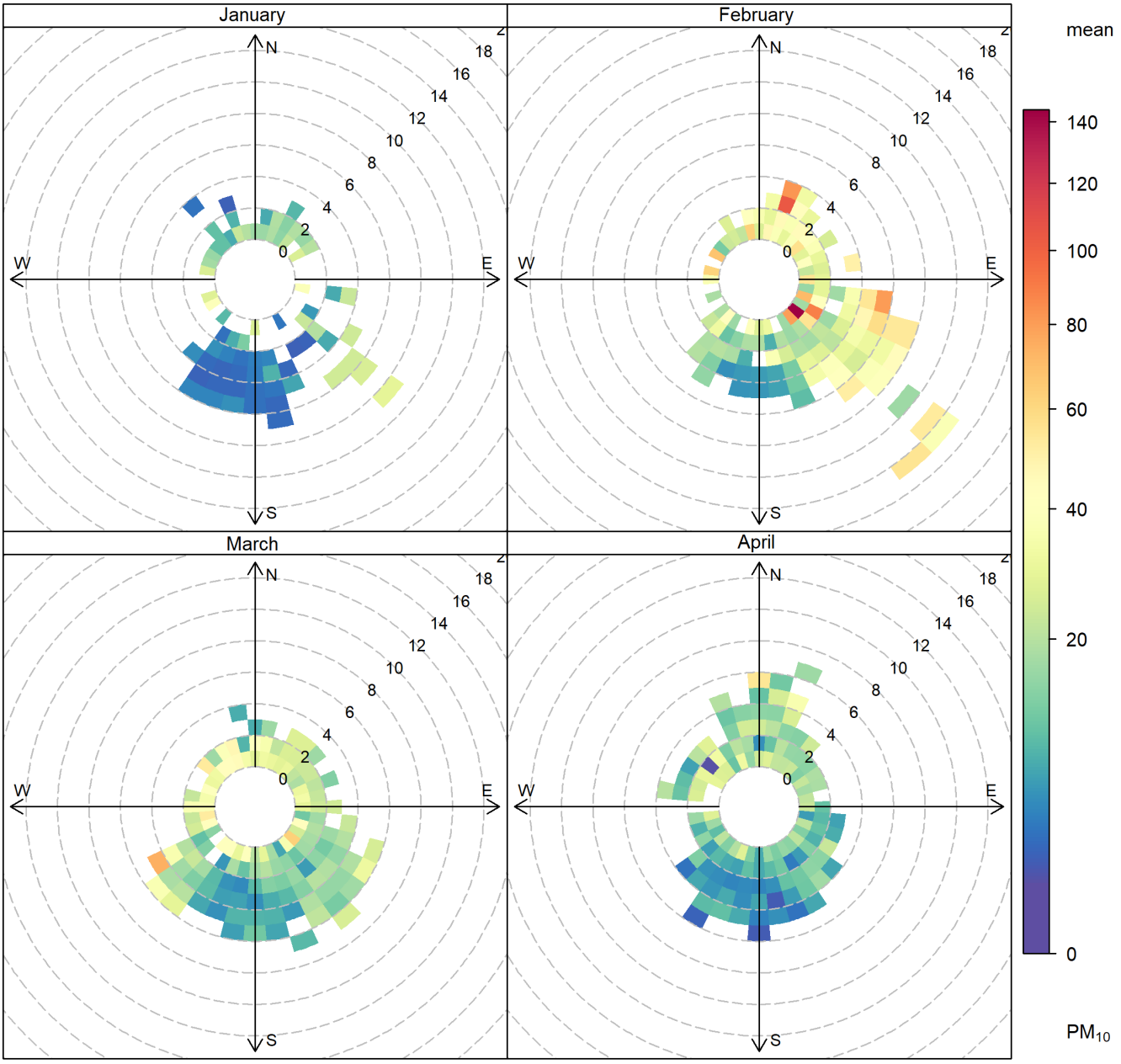


Figure 6: Mean PM_{10} concentrations (µg/m³) observed at EVO - MCRR by wind speed and direction for January through April, 2019.

3.3 $PM_{2.5}$

The term excursion is used here to describe a single 24-hour average that exceeds the BCAAQO. The 24-hour objective for $PM_{2.5}$ defines an exceedance based on the 98th percentile of the daily average over one year. Table A-13 in Appendix A provides the 98th percentile of $PM_{2.5}$ for each station. It is shown that the $PM_{2.5}$ 98th percentiles were below the BCAAQO at all stations for 2019.

Figure 8 shows the time series of the 24-hour average $PM_{2.5}$ concentrations at six stations as well as the BCAAQO of 25 µg/m^3. Figure 8 and Table 5 show that there were 8 excursions above the 24-hour $PM_{2.5}$ BCAAQO, two (2) at CMO – AGWS (0.61%), two (2) at CMO – Hosmer (0.63%), three (3) at EVO – MCRR (0.88%) and one (1) at EVO – WWTP (0.29%). The annually averaged $PM_{2.5}$ concentration at all stations were less than the BCAAQO of 8 µg/m^3 and the annually averaged $PM_{2.5}$ concentrations at EVO - DTAM and EVO - MCRR were greater than the BC planning goal of 6 µg/m^3 (see Table 4). Seven of the eight excursions occurred on May 31, 2019 due to forest fires in Alberta.

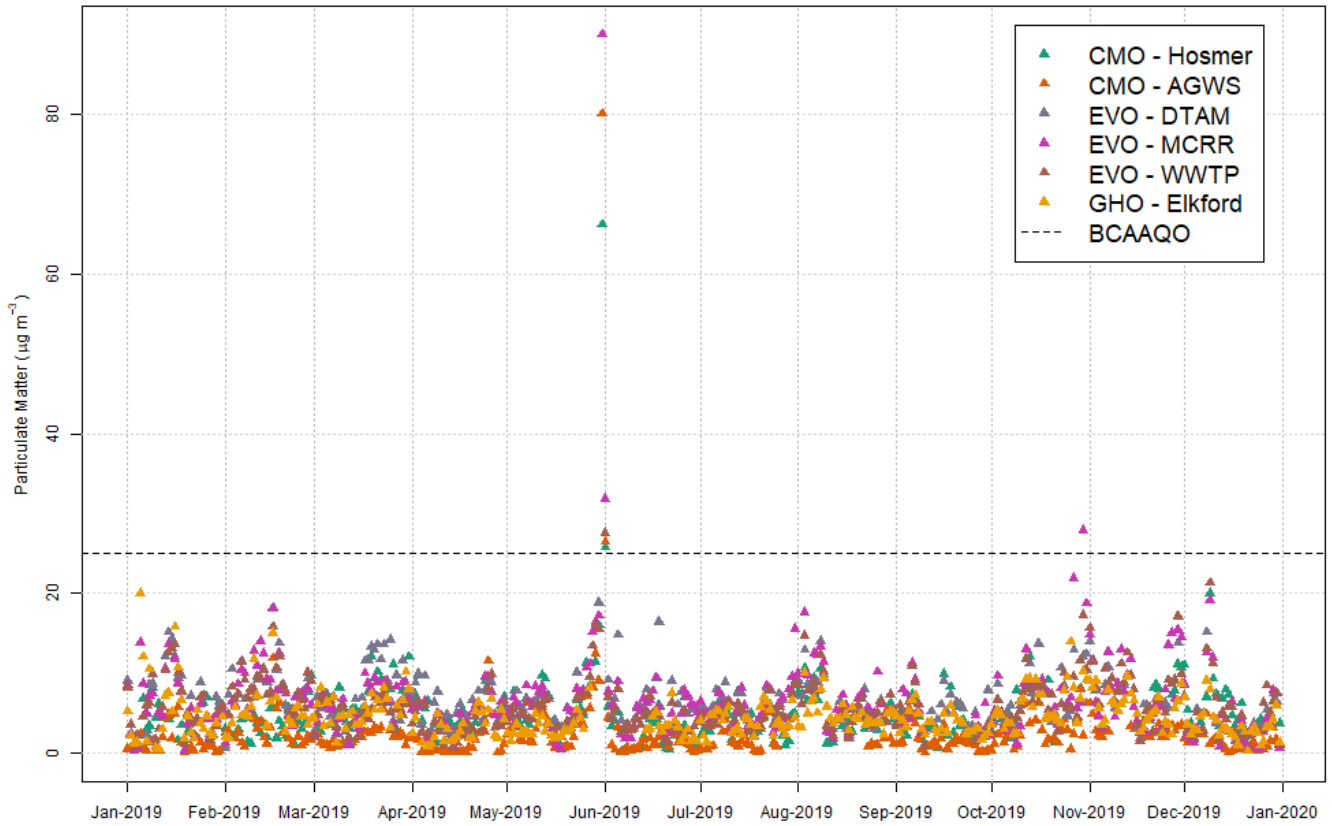


Figure 7: Daily Averaged $PM_{2.5}$ Concentrations.

Note: The BCAAQO of 25 µg/m3 is indicated by a dashed line.

3.4 Gases

Figure 6 through Figure 8 show the time series of concentrations of NO_2, CO and SO_2 respectively at the EVO – DTAM station as well as the relevant BCAAQO for each gas (specified in Table 5). These three figures as well as Table 5 show that the 1-hour NO_2 and SO_2 concentrations (Daily 1-hour Maxima) were below the respective 1-hour BCAAQO for each contaminant, the 1-hour and 8-hour rolling average CO concentrations were below the 1-hour and 8-hour PCO for CO and the annual average NO_2 concentration was below the annual BCAAQO for NO_2. However, the annual average SO_2 concentration was greater than the annual BCAAQO for SO_2. The latter reflects a consistent increase in SO_2 concentrations in 2019 over those observed in previous years which may be related to exposure of the sample inlet to the building furnace exhaust when it was moved in November 2018. Further investigation including but not limited to detailed reanalysis of the dataset and other checks beyond normal calibration such as trying different configurations of the sample inlet is being performed to eliminate possible sources of measurement bias.

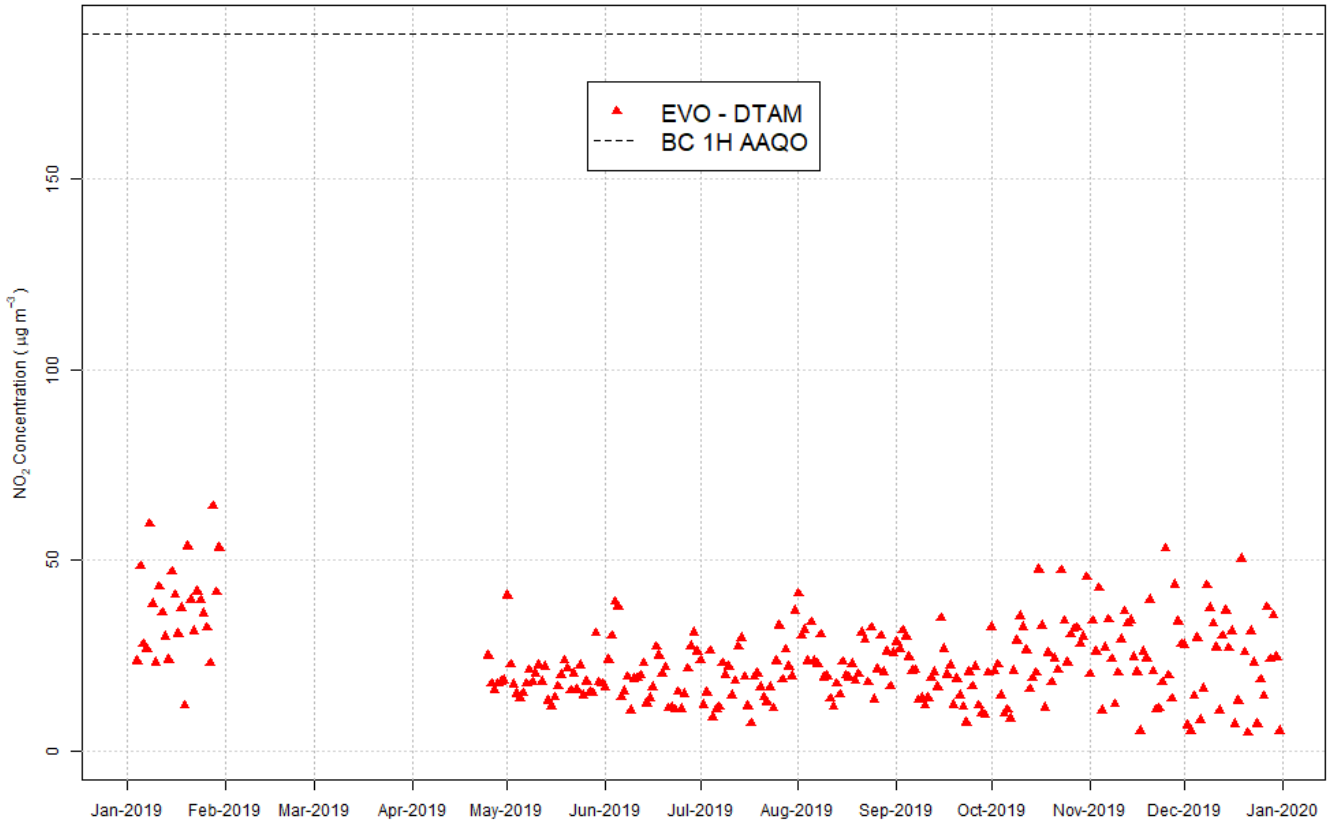


Figure 8: Daily 1-hour Maximum NO_2 Concentrations from EVO – DTAM.

Note: The BCAAQO of 188 µg/m3 is indicated by a dashed line.

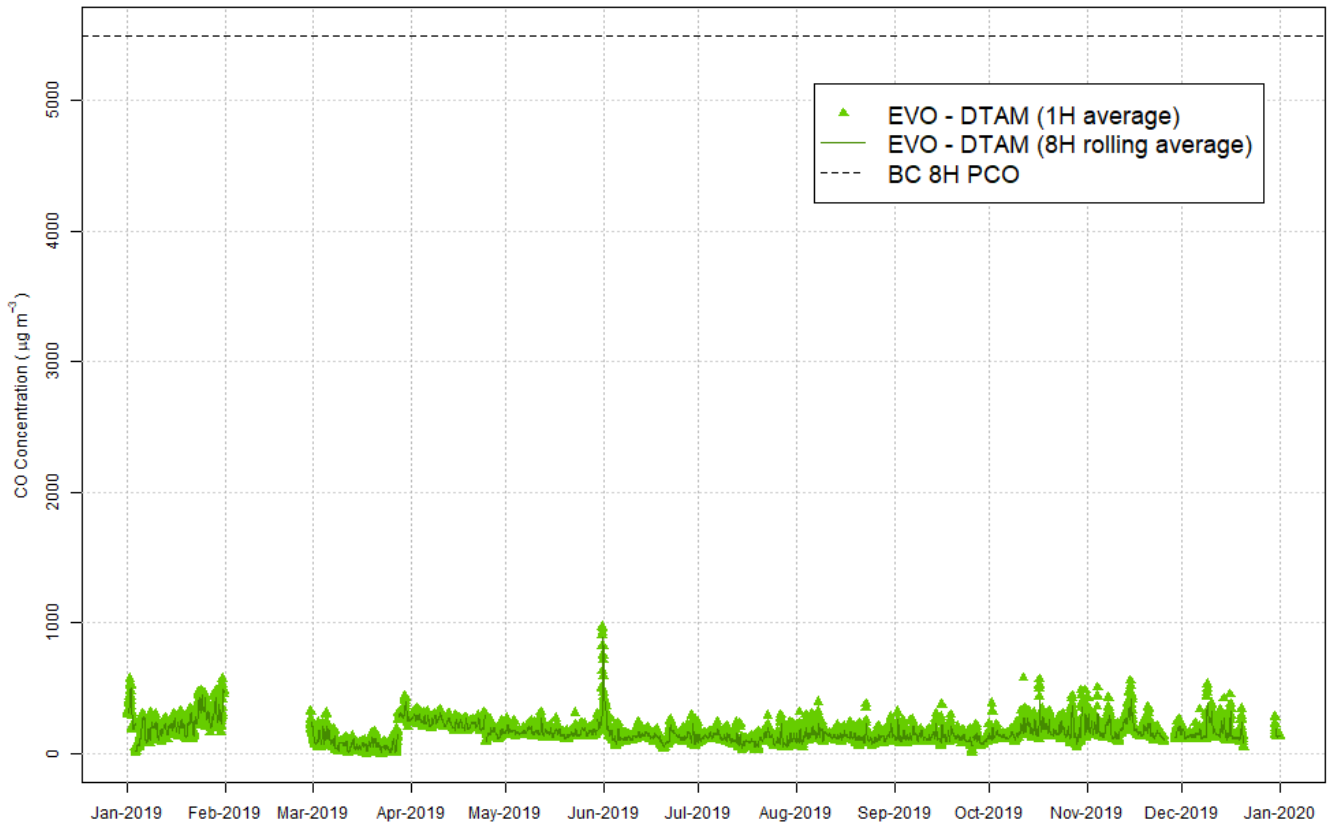


Figure 9: 1-hour and 8-hour Rolling Averaged CO Concentrations from EVO – DTAM.

Notes: The BC 8H PCO of 5500 µg/m^3 is indicated by a dashed line.
The BC 1H PCO of 14300 µg/m^3 was omitted for better presentation of the data.

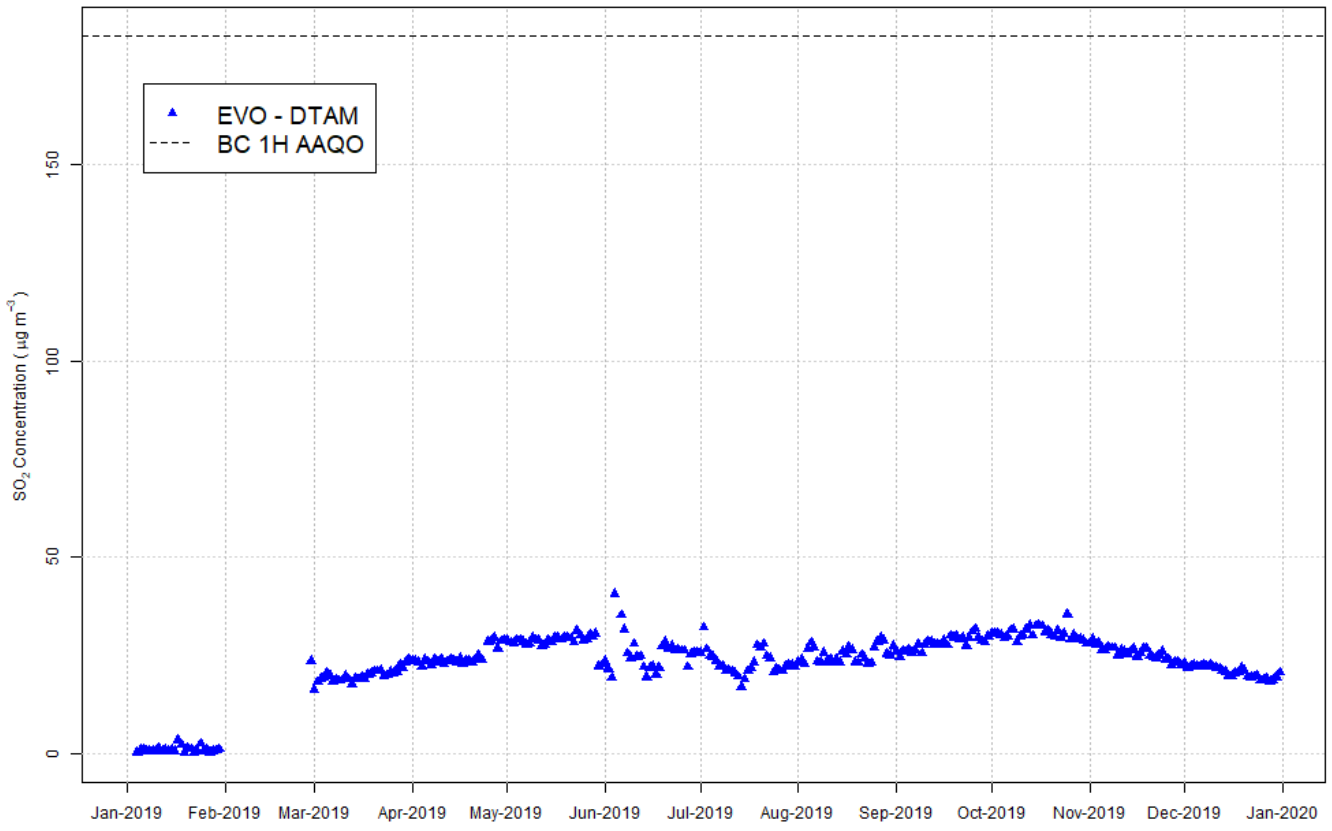


Figure 10: Daily 1-hour Maximum SO_2 Concentrations from EVO – DTAM.

Note: The BCAAQO of 183 µg/m^3 is indicated by a dashed line.

Table 4: Annual Means of Particulate Matter Concentrations from Each Station for 2019

Station Name		TSP [1] (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
		Annual BCAAQO of 60 µg/m³		Annual BCAAQO of 8 µg/m³
CMO	AGWS	3.0	4.6	2.4
	Hosmer		10.1	5.0
EVO	DTAM		13.5	6.6
	MCRR		18.0	6.6
	WWTP		9.8	5.8
LCO [2]	L10A	48.0		
GHO	Elkford	8.4	9.4	4.5
FRO	SS		28.9	

Notes: Annual means for all parameters and stations except LCO – L10A are calculated from hourly values.

(1)- Annual average of TSP is calculated as the geometric mean to allow comparison with the BCAAQO.
(2)- Annual average of daily means was used for LCO due to it being a non-continuous particulate monitor.

Table 5: Total Number Results above BCAAQO for 2019

Station Name		Contaminant	Threshold		Excursions or exceedances	
					Total number	Percentage
CMO	AGWS	TSP	BCAAQO	(120 µg/m³)	0	0.00
		PM_{10}	BCAAQO	(50 µg/m³)	0	0.00
		$PM_{2.5}$	BCAAQO	(25 µg/m³)	2	0.61
	Hosmer	PM_{10}	BCAAQO	(50 µg/m³)	1	0.37
		$PM_{2.5}$	BCAAQO	(25 µg/m³)	2	0.63
EVO	DTAM	PM_{10}	BCAAQO	(50 µg/m³)	3	0.98
		$PM_{2.5}$	BCAAQO	(25 µg/m³)	0	0.00
		NO_2	BCAAQO[2] (CAAQS 2020)	(113 µg/m³)	0	0.00
		CO (1-hour avg)	BC PCO	(14,300 µg/m³)	0	0.00
		CO (8-hour avg)	BC PCO	(5,500 µg/m³)	0	0.00
		SO_2	BCAAQO[3] (CAAQS 2020)	(183 µg/m³)	0	0.00
	MCRR	PM_{10}	BCAAQO	(50 µg/m³)	9	2.83
		$PM_{2.5}$	BCAAQO	(25 µg/m³)	3	0.88
	WWTP	PM_{10}	BCAAQO	(50 µg/m³)	1	0.29
		$PM_{2.5}$	BCAAQO	(25 µg/m³)	1	0.29
LCO	L10A	TSP	BCAAQO	(120 µg/m³)	2	3.33
GHO	Elkford	TSP	BCAAQO	(120 µg/m³)	1	0.30
		PM_{10}	BCAAQO	(50 µg/m³)	2	0.60
		$PM_{2.5}$	BCAAQO[1]	(25 µg/m³)	0	0.00
FRO	SS	PM_{10}	BCAAQO	(50 µg/m³)	42	11.86

Notes:

(1)- The $PM_{2.5}$ BCAAQO is based on 98th percentile values; therefore, an exceedance is defined as occurring only after six excursions have occurred.

(2)- The NO_2 BCAAQO is based on the Canadian Ambient Air Quality Standard (CAAQS): 113 µg/m³, annual 98th percentile daily 1-hour maximum, averaged over 3 years. The CAAQS is set to be adopted in 2020 however it is used in this report to be conservative. Excursions are used because 3 years of data are needed to determine if there was an exceedance.

(3)- The SO_2 BCAAQO is based on the CAAQS: 183 µg/m³, annual 99th percentile daily 1-hour maximum averaged over three years. The CAAQS is set to be adopted in 2020 however it is used in this report to be conservative. Excursions are used because 3 years of data are needed to determine if there was an exceedance.

3.5 Inter-annual Variability of Air Quality Measurements

As part of the analysis of air quality within the Elk Valley region, an examination of inter-annual variability in annual average CAC concentrations at all stations is presented below. A long-term record, dating from the year 2000, using a Hi-Vol intermittent sampler is available from LCO - L10A only. Hi-Vol sampling at other locations has been discontinued. All other locations use continuous Thermo Scientific SHARP PM monitors. The longest records for these types of samplers are from GHO – Elkford, which began operation in late 2010, and CMO - AGWS which began operation in 2011. All other monitors have records that are six years or less in length.

Table 6 and Figure 11 show the inter-annual trends of TSP concentrations. LCO – L10A shows relatively small variation from year to year with no overall trend, except for the years 2011-2014 when the annual TSP concentration was above the objective. CMO – AGWS has shown similar concentrations with no trend until 2016, with slightly decreasing concentrations observed from 2016 to 2019. GHO – Elkford has shown a slight increasing trend in TSP concentrations since inception.

Table 6: Annual Means of TSP Concentrations (geometric means)

Year	CMO AGWS	GHO Elkford	LCO L10A
	TSP (µg/m³)	TSP (µg/m³)	(µg/m³)
2000			42.5
2001			45.4
2002			49.2
2003			39.1
2004			40.8
2005			43.5
2006			41.1
2007			41.0
2008			44.9
2009			47.4
2010		1.7	48.0
2011	7.0	2.6	61.9
2012	7.9	6.2	76.3
2013	7.8	5.9	63.4
2014	7.0	5.9	61.8
2015	8.5	6.9	47.3
2016	5.7	7.1	43.5
2017	5.8	7.9	42.8
2018	4.4	8.6	53.3
2019	3.0	8.4	48.0

Notes: Cells highlighted in pink and red denote values for which the data was less than 75% complete
CMO – AGWS TSP measurements began on 2011-10-03
GHO – Elkford TSP measurements began on 2010-11-03

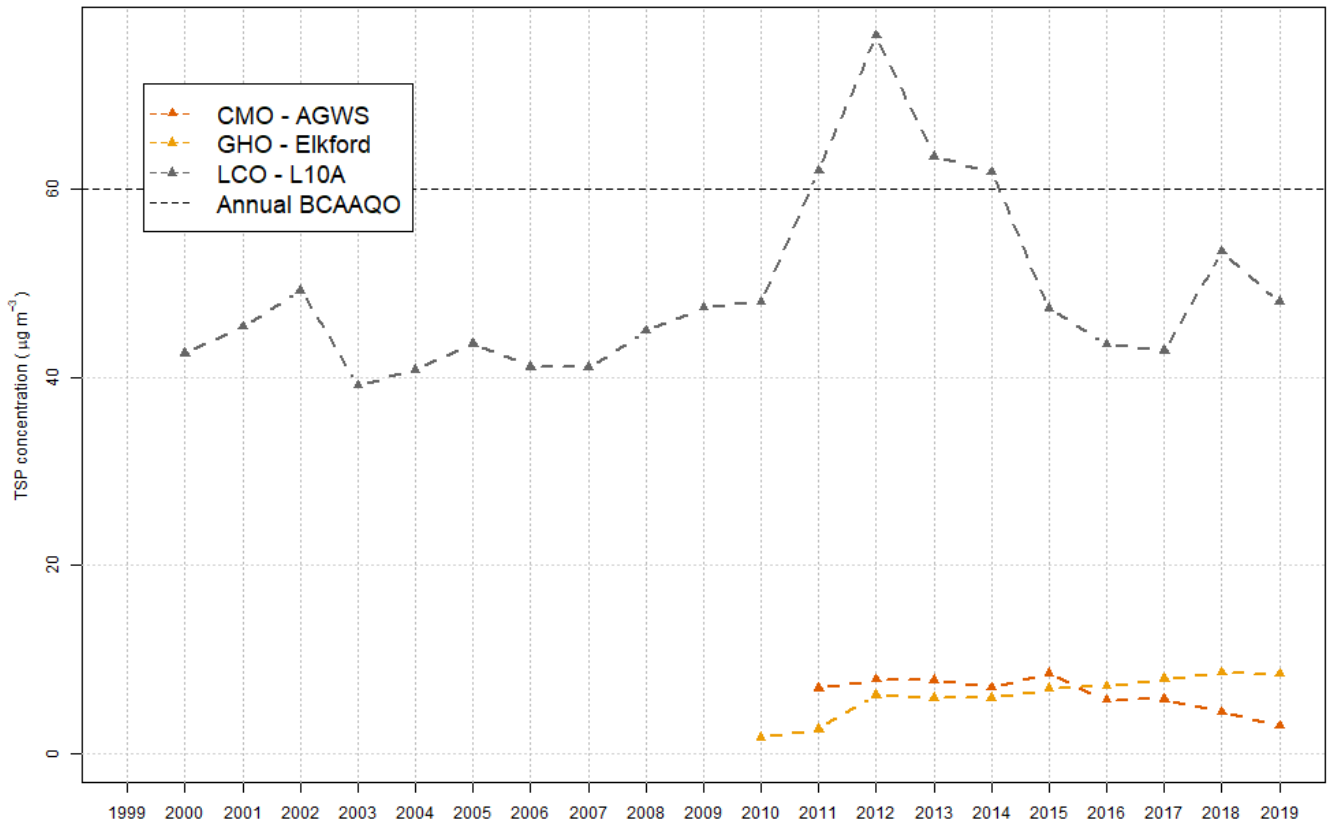


Figure 11: Time Series of Annual Averages of TSP Concentration since Station Inception (geometric mean).

Note: The annual BCAAQO of 60 µg/m^3 is indicated by a dashed line.

Table 7 and Figure 12 show the inter-annual trends of PM_{10} concentrations. All stations except CMO – AGWS and EVO – WWTP show an increasing trend in annually averaged PM_{10} concentrations over the period of record. Annual average PM_{10} concentrations in 2018 increased at all stations, reflecting, in part, the higher regional PM_{10} concentrations observed through the intense forest fire season of that year but they returned to near 2017 levels in 2019.

Table 7: Annual Means of PM_{10} Concentrations

Year	CMO		EVO			FRO	GHO
	Hosmer	AGWS	DTAM	MCRR	WWTP	SS	Elkford
	PM_{10} (µg/m³)	PM_{10} (µg/m³)	PM_{10} (µg/m³)	PM_{10} (µg/m³)	PM_{10} (µg/m³)	PM_{10} (µg/m³)	PM_{10} (µg/m³)
2010							5.8
2011		8.9					7.3
2012		10.4					8.4
2013	6.7	8.9				12.7	8.3
2014	10.0	9.3	14.3	15.1	9.9	25.5	9.8
2015	10.2	12.1	10.1	15.4	7.8	25.1	9.6
2016	8.2	8.4	10.8	12.4	6.4	17.0	7.0
2017	9.3	8.6	14.3	16.7	8.9	31.1	10.6
2018	14.2	8.6	17.2	19.5	9.2	30.0	11.5
2019	10.1	4.6	13.5	18.0	9.8	28.9	9.4

Notes: Cells highlighted in pink and red denote values for which the data was less than 75% complete for the year.
CMO – Hosmer PM_{10} measurements began on 2013-11-07
CMO – AGWS PM_{10} measurements began on 2011-10-03
EVO – DTAM PM_{10} measurements began on 2014-01-18
EVO – MCRR PM_{10} measurements began on 2014-01-23
EVO – WWTP PM_{10} measurements began on 2014-01-23
FRO – SS PM_{10} measurements began on 2013-12-21
GHO – Elkford PM_{10} measurements began on 2010-11-03

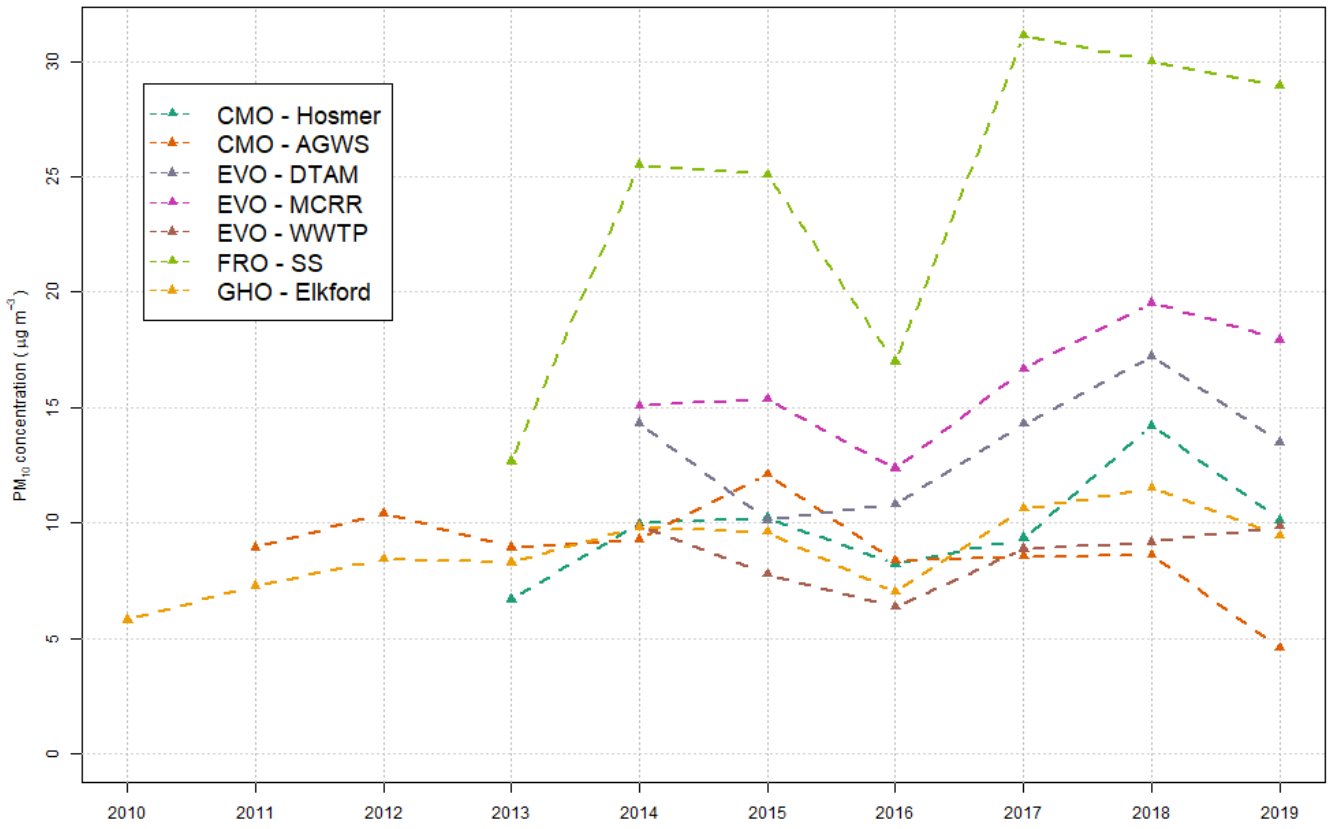


Figure 12: Time Series of Annual Averages of PM_{10} Concentration since Station Inception.

Table 8 and Figure 13 show the inter-annual trends of $PM_{2.5}$ concentrations. Annual average $PM_{2.5}$ concentrations in 2019 decreased at all stations following the intense forest fire season in 2018.

Table 9 shows the annual average gas concentrations for the five years available at the EVO – DTAM location. There are no discernable year-to-year trends in the annual averaged concentrations of NO_2 and CO. There was a marked increase in the annual averaged concentration of SO_2 over previous years which have been caused by the station move.

Table 8: Annual Means of $PM_{2.5}$ Concentrations

Year	CMO		EVO		GHO	
	Hosmer	AGWS	DTAM	MCRR	WWTP	Elkford
	$PM_{2.5}$ (µg/m³)	$PM_{2.5}$ (µg/m³)	$PM_{2.5}$ (µg/m³)	$PM_{2.5}$ (µg/m³)	$PM_{2.5}$ (µg/m³)	$PM_{2.5}$ (µg/m³)
2010						6.4
2011		3.2				3.7
2012		4.2				4.6
2013	6.6	3.9				4.2
2014	6.2	4.2	6.9	5.1	5.2	4.7
2015	6.8	6.1	5.5	5.8	5.4	4.9
2016	5.7	3.7	4.6	4.8	3.7	3.6
2017	9.4	4.2	5.3	7.6	5.8	7.4
2018	7.9	5.1	7.8	7.8	8.6	7.4
2019	5.0	2.4	6.6	6.6	5.8	4.5

Notes: Cells highlighted in pink and red denote values for which the data was less than 75% complete for the year.
CMO – Hosmer $PM_{2.5}$ measurements began on 2013-11-07
CMO – AGWS $PM_{2.5}$ measurements began on 2011-10-03
EVO – DTAM $PM_{2.5}$ measurements began on 2014-01-18
EVO – MCRR $PM_{2.5}$ measurements began on 2014-01-23
EVO – WWTP $PM_{2.5}$ measurements began on 2014-01-23
GHO – Elkford $PM_{2.5}$ measurements began on 2010-11-03

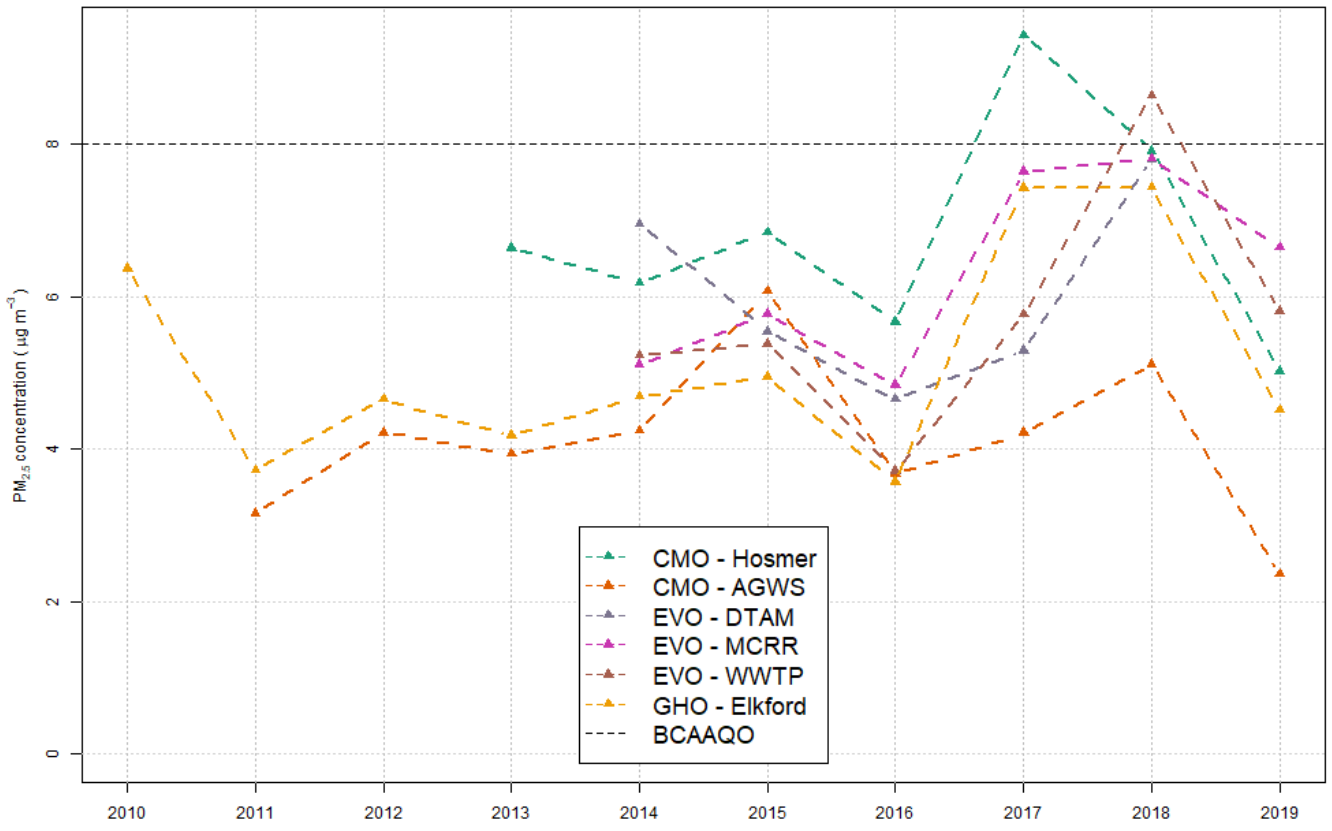


Figure 13: Time Series of Annual Averages of $PM_{2.5}$ Concentration since Station Inception.

Note: The annual BCAAQO of 8 µg/m3 is indicated by a dashed line.

Table 9: Annual Means of Gas Concentrations

Year	EVO - DTAM		
	NO_2	CO	SO_2
	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
2014	8.5	189	0.1
2015	7.6	190	0.2
2016	6.2	287	0.2
2017	10.4	130	0.06
2018	8.1	193	0.3
2019	11.1	162	21.6

Note: Cells highlighted in pink and red denote values for which the data was less than 75% complete.

3.6 Data Completeness

The permit for each of the Sites states that continuous data for a given time period will be considered valid if 75% of the data for that time period has been captured. Non-continuous data for a given time period will be considered valid if 85% of the data for that time period has been captured. Tables A-1 through A-4 (Appendix A) provide the number of valid hours and days of data per time period for TSP, PM_{10}, $PM_{2.5}$ and for the gases respectively. Cells highlighted in pink indicate periods that do not meet completeness requirements to be considered valid. Averages for these pink-highlighted periods are therefore kept for indicative purposes only and should not be used to verify regulatory compliance. Caution must also be exercised in trying to establish trends or draw conclusions from data that do not meet the minimum completeness requirements as they may be biased toward certain conditions prevailing in the part of the period that was collected.

Following an agreement between the Sites and ENV, the days during which annual maintenance were performed or extended maintenance involving notification to the ENV were removed from the possible number of days. The

following periods were removed from the data completeness calculations for an instrument at a given station due to that instrument being removed for annual maintenance:

- CMO – AGWS: July 26 to August 21.
- CMO – Hosmer: October 30 to November 18.
- GHO – Elkford:
    - TSP: August 27 to September 11
    - PM_{10}: August 21 to August 27
    - $PM_{2.5}$: June 5 to June 11
- FRO – SS: August 21 to August 27.
- EVO – DTAM:
    - PM_{10} and $PM_{2.5}$: August 28 to September 11.
    - SO_2 and CO: January 31 to February 27.
    - NO_X: January 31 to April 24.
- EVO – MCRR: September 11 to September 25.
- EVO – WWTP: September 11 to September 25

3.6.1 TSP

TSP measurements at CMO – AGWS and GHO – Elkford met the objective for data completeness during all quarters and the year.

The LCO - L10A Hi-Vol station met the 85% completeness objective based on collection scheduled every six days for all months except February when it only sampled 4 out of 5 days. Completeness was greater than 85% for all other periods considered.

3.6.2 PM_{10}

PM_{10} measurements at CMO – AGWS, EVO – DTAM, EVO – WWTP, FRO – SS and GHO – Elkford met the 75% completeness objectives for all quarters and the year.

PM_{10} measurements at CMO – Hosmer did not meet the 75% completeness objective in the fourth quarter of 2019 due to problems with the instrument's beta detector in October and with the relative humidity sensor in December. Annual maintenance was performed on all three instruments from October 30 to November 18, but these days were removed from the total count for percentage complete.

PM_{10} measurements at EVO – MCRR did not meet the 75% completeness objective in the first quarter of 2019 due to a break in the filter tape and a jammed beta detector chamber.

3.6.3 $PM_{2.5}$

$PM_{2.5}$ measurements at all stations (CMO – AGWS, CMO – Hosmer, EVO – DTAM, EVO – MCRR, EVO – WWTP and GHO – Elkford) met the objective for data completeness during all quarters and for the year.

$PM_{2.5}$ measurements at CMO – Hosmer saw reduced completeness for the month of January due to a problem with the sample heater.

$PM_{2.5}$ measurements at EVO - DTAM saw reduced completeness for the month of May due to a failure of the sample pump.

3.6.4 Gases

All gases at EVO – DTAM (Nitrogen Dioxide (NO_2), Carbon Monoxide (CO) and Sulphur Dioxide (SO_2)) met the 75% completeness objective for all quarters of 2019 when planned outages are removed from the total possible number of days and hours.

This increase in uptime from 2018 may be partially due to the station move from the rooftop to a room on the top floor of the building in November 2018 which allows for better climate control of the instruments and less exposure to the elements which in turn has resulted in more accurate calibrations, more stable measurements and less wear and tear on the sample pumps and cooler assemblies.

4 METEOROLOGY RESULTS

4.1 Wind Speed and Direction

Figure 14 shows wind roses for the eight stations included in the RAMP. The differences between stations in wind speed and direction that are apparent in the wind roses are mainly attributed to differences between local topography and, to a lesser extent, small scale surface features such as proximity to trees and surrounding land use.

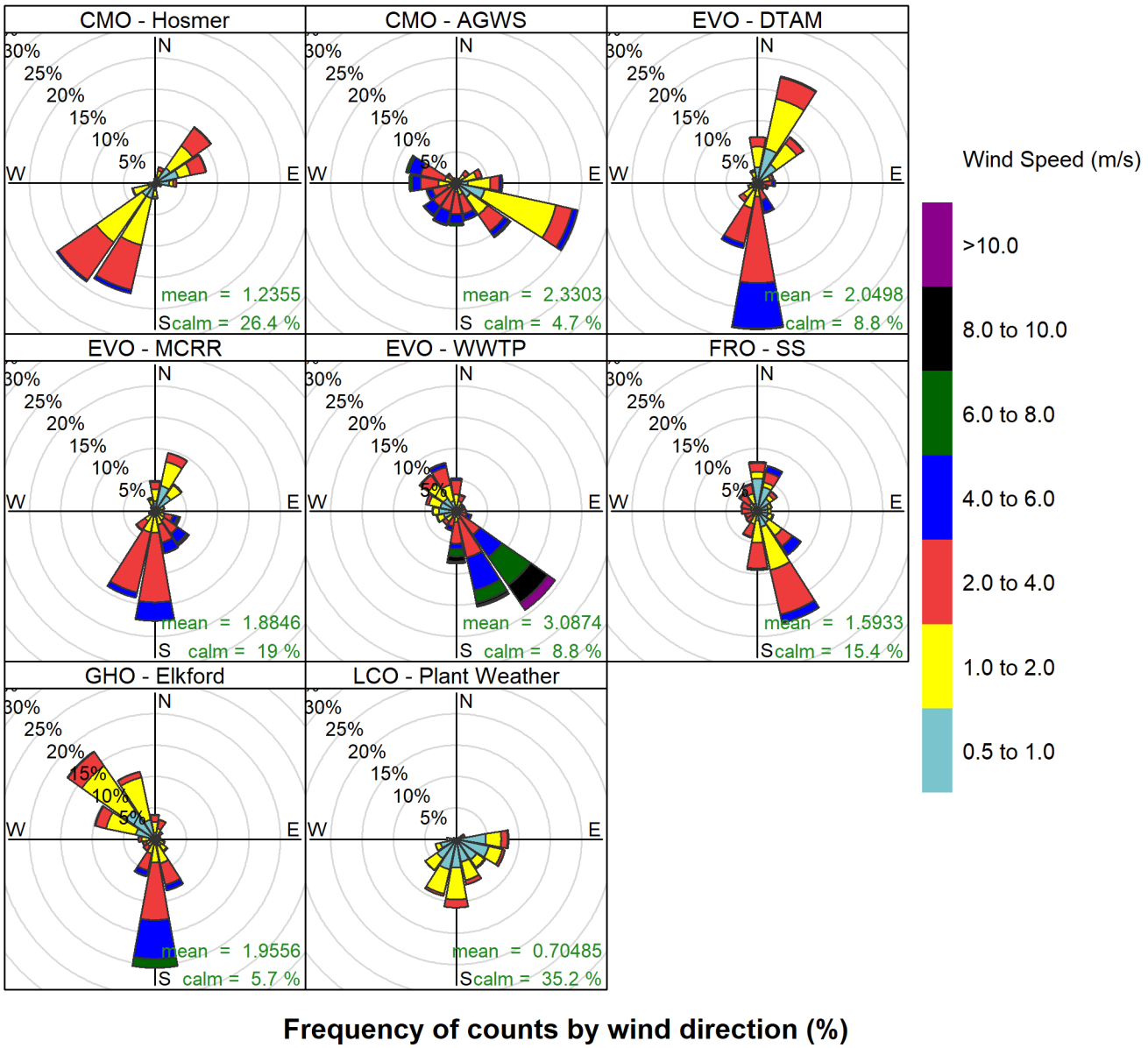


Figure 14: Wind Roses for All Stations in the Regional Air Monitoring Program for 2019.

4.2 Precipitation

Monthly precipitation totals are shown in Figure 15 where they are compared to the 30 year mean and standard deviation of monthly precipitation totals observed at the Environment and Climate Change Canada meteorological station in Sparwood (1981 – 2010).

Precipitation totals for February at CMO - AGWS were excluded from this plot due to the precipitation bucket having frozen and no longer effectively capturing incoming precipitation. There was insufficient valid precipitation data completeness remaining in the month to calculate a valid total. Despite this data being excluded, CMO – AGWS recorded the highest annual total precipitation of any of the 4 sites (586 mm) and the highest monthly totals for the months of January, April, September, October and December. The LCO – Plant Weather station received the least precipitation in 2019; recording a total of 496 mm.

The months of January through March, May and November received less precipitation than the normal at all four stations. Monthly totals were more than one standard deviation below the 30 year mean for all stations in November.

All stations recorded above average monthly precipitation totals in June and July.

The annual precipitation at the Environment and climate change Canada station in Sparwood was 537 mm for 2019 versus the normal value of 613.3 mm. There was less precipitation in 2019 than the 30-year normal.

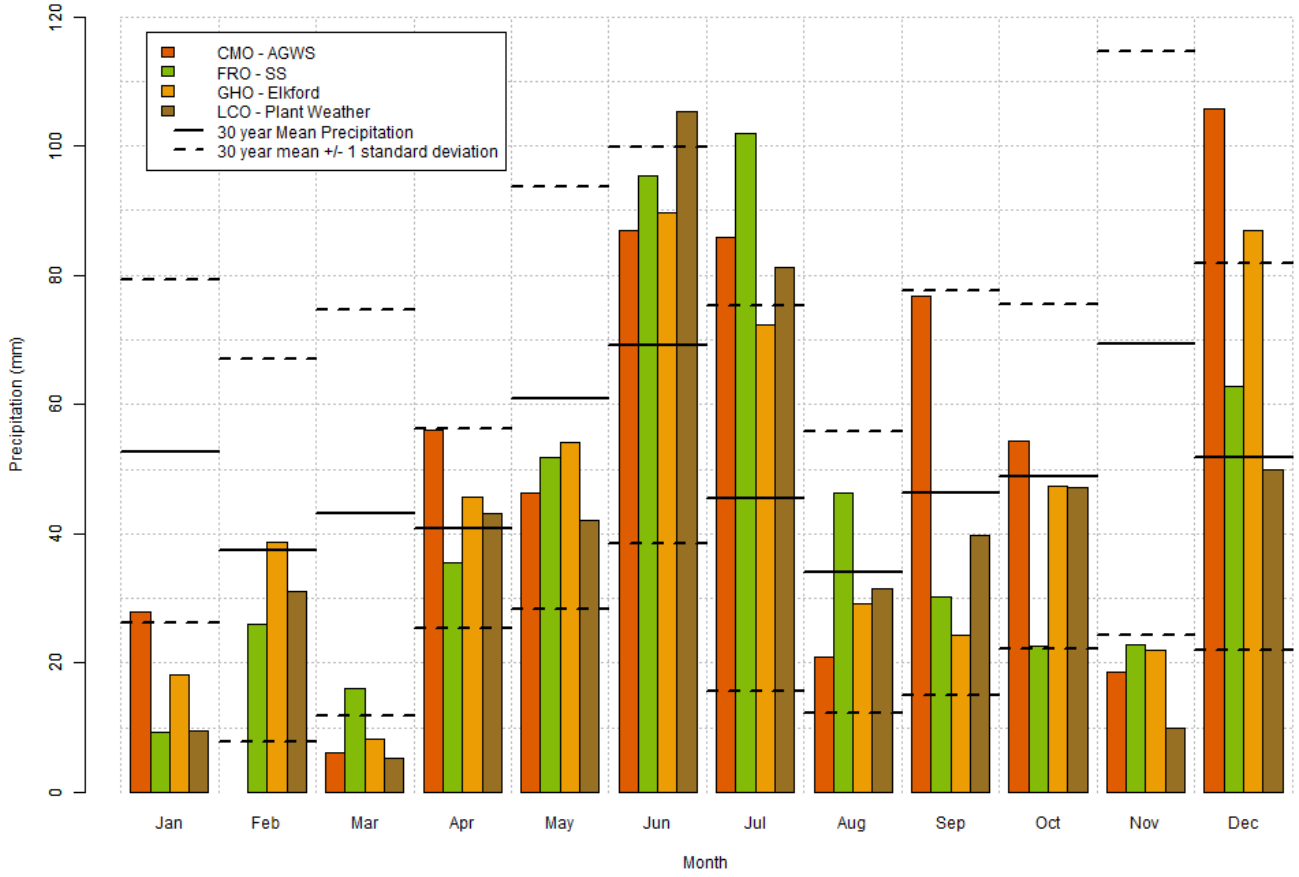


Figure 15: Monthly Precipitation Totals for stations in the Regional Air Monitoring Program for 2019 as Compared to the 30-year Mean +/- 1 standard Deviation Calculated from the Environment Canada Weather Station in Sparwood.

4.3 Air Temperature

Daily averaged air temperatures are presented in Figure 16 where they are compared to the 30 year mean and standard deviation of air temperature measured at the Environment and Climate Change Canada station in Sparwood. Inter-station variation is generally small compared to daily fluctuations, but some change is discernible. Greater day to day variability is observed in the winter months (January to March, and November and December) than in the summer months (April to October). This is also observed in the 30-year averaged data from Sparwood and can be attributed to the passage of warm and cold weather fronts in the winter, bringing with them large variations in temperature. In the summer, the cold arctic air masses which dominate in winter are much farther north and there is less frontal activity in the region, resulting in less extreme temperature fluctuations.

Differences in elevation between stations drives the inter-station differences in temperature that can be observed: CMO – Hosmer EVO – DTAM and EVO – MCRR are among the lowest-lying stations in the monitoring program and they consistently record higher temperatures than the rest. FRO – SS is one of the highest elevation stations and consistently records lower temperatures. CMO – AGWS also frequently observes low temperatures even though it is not at as high of an elevation. This may be explained by the local topography which considerably reduces sun exposure on site.

All stations observed temperatures lower than one standard deviation of the 30-year climate normal during the greater part of February and periods in April, May, September and October.

The annual average temperature in Sparwood in 2019 was 4.0 °C versus the normal value of 4.4 °C.

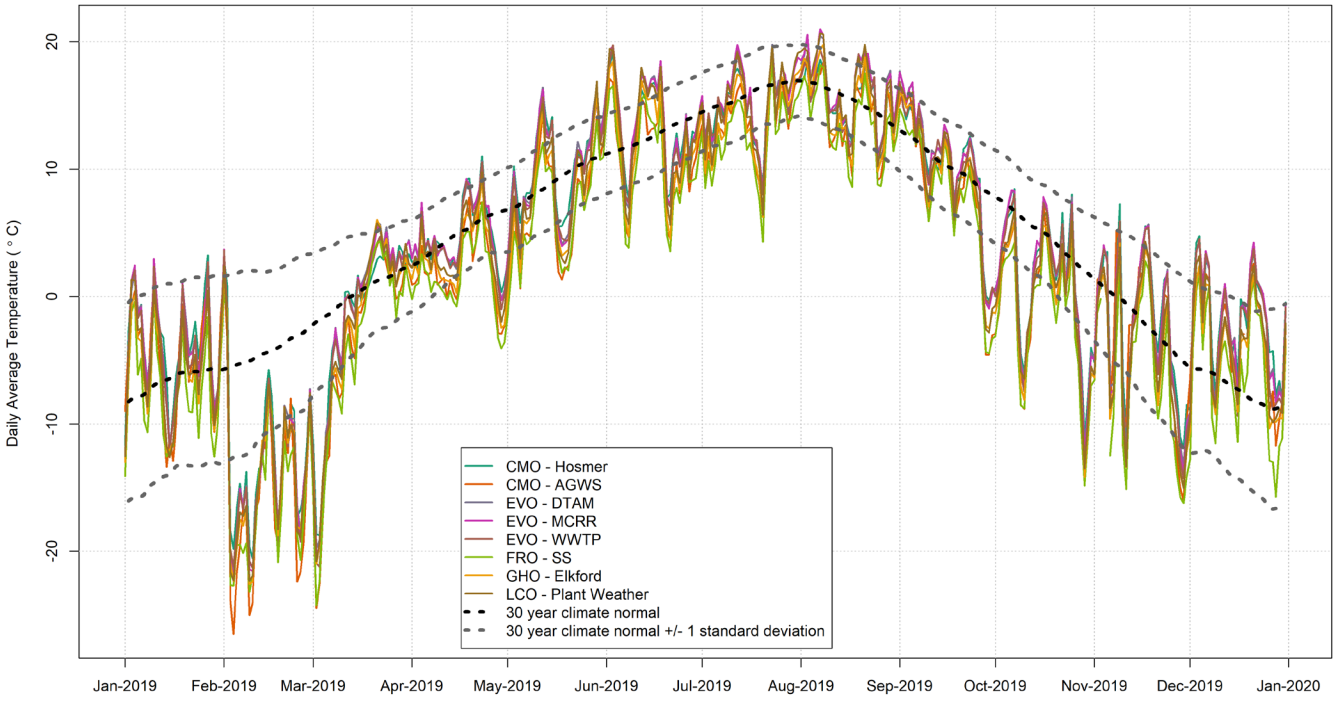


Figure 16: Daily Averaged Temperature for Regional Air Monitoring Program Stations as Compared to the 30-year Mean +/- 1 Standard Deviation Calculated from the Environment Canada Weather Station in Sparwood.

5 MANAGEMENT OF AIR QUALITY

5.1 Public Air Quality Feedback

The Teck Elk Valley Feedback Mechanism helps Teck consistently respond to feedback and maintain strong relationships with community members. Dust related feedback are either forwarded (by mine sites) or received directly by the Teck Social Responsibility group, which has an office in Sparwood. When feedback is received about Teck's activity, Teck's Social Responsibility group works with the relevant operation(s) to investigate the cause and the effect. If contact details have been provided, the Feedback Coordinator or designated respondent will respond to the community member.

Engagement is tracked in Teck's Trackline database, used for documenting engagement with Communities of Interest (residents of local communities, First Nations, etc.) and Regulators. Emails, letters, phone calls, and other communications are tracked here, as are follow-up actions. Teck looks for trends in feedback and uses this information to monitor the effectiveness of mitigations and to gauge the need for further public updates on our work.

In 2019, there were 241 pieces of feedback related to air quality and dust management. The feedback was related to specific weather events (8), complaints relating to visual impacts, dirty vehicles and dust on personal property (216) or from the highway haul between EVO and CMO (17),

Due to an increasing amount of feedback and concern from the community on dust management, the following additional measures were taken in 2019 to provide information on current dust management practices and continual improvement opportunities:

- Ongoing work with the District of Sparwood to respond to community concerns and jointly develop a Socio-Community and Economic Effects Management Plan
- A Focus Group meeting of select Sparwood residents was held to get their feedback on dust and mitigation: March 4, 2019
- Discontinuation of the coal highway haul between EVO and CMO processing plant in March 2019
- Two public meetings on dust and air quality were held in Sparwood: May 14 and May 15, 2019 and participation at local Farmer's Markets

Teck appreciates the opportunity to hear the community's feedback and to talk about the work being undertaken to resolve this issue and will continue to update the community on dust management initiatives in future.

5.2 Fugitive Dust Management Plans

Four of the five mine sites (EVO, LCO, GHO and FRO) are required to maintain Fugitive Dust Management Plans per their site-specific permits. CMO maintains an Air Quality and Dust Control Management Plan as a voluntary commitment. Each mine in the Elk Valley participates in a Regional Air Working Group to identify continual improvement opportunities for fugitive dust management. The mine sites continue to investigate methods to suppress and manage fugitive dust sources from site. In 2020 sites are updating their Fugitive Dust Management plans in consideration of the draft guidance released in joint by the BC ENV and Ministry of Energy, Mines and Petroleum Resources (BC EMPR) for *Developing a Fugitive Dust Management Plan for Industrial Projects*.

6 SUMMARY

In 2019, one of the five open pit coal mining operations, Coal Mountain, went in to Care & Maintenance on May 1. There were no changes to ambient air monitoring programs in 2019. It is recommended that further improvement to instrumental reliability and ease of maintenance could be achieved by moving stations still housed in small shelters (FRO – SS, GHO – EHS, CMO – AGWS and CMO – Hosmer) into walk-in shelters. Also, implementing the Hornet monitoring system where it has not yet been installed (FRO – SS and EVO - DTAM) would result in increased data completeness at these stations.

7 REFERENCES

BC Ministry of Environment. 2018. British Columbia Ambient Air Quality Objectives.

APPENDIX A

AIR QUALITY DATA SUMMARY TABLES

Table A-1: Number of valid TSP data. Red highlighted cells indicate less than 75% data completeness (or 85% for non-continuous monitors).

	Period (Month / Quarter / Year)	CMO		GHO		LCO	
		AGWS (days / hours)		Elkford (days / hours)		L10A (days)	
		Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible
# Valid Monitoring Days per Month	January	31	31	30	31	5	5
	February	24	28	25	28	4	5
	March	28	31	27	31	5	5
	April	29	30	28	30	5	5
	May	29	31	29	31	5	5
	June	23	30	30	30	5	5
	July	19	25	28	31	5	5
	August	9	10	26	26	6	6
	September	28	30	19	19	5	5
	October	29	31	31	31	5	5
	November	27	30	30	30	5	5
	December	30	31	31	31	5	5
# Valid Monitoring Days per Quarter	2019 Q1	83	90	82	90	14	15
	2019 Q2	81	91	87	91	15	15
	2019 Q3	56	65	73	76	16	16
	2019 Q4	86	92	92	92	15	15
# Valid Monitoring Days for Entire Year	2019	306	338	334	349	60	61
# Valid Monitoring Hours per Quarter	2019 Q1	2018	2154	1993	2153		
	2019 Q2	1940	2178	2096	2175		
	2019 Q3	1394	1558	1738	1819		
	2019 Q4	2107	2195	2173	2201		
# Valid Monitoring Hours for Entire Year	2019	7459	8112	8000	8376		

Table A-2: Number of valid PM_{10} data. Red highlighted cells indicate less than 75% data completeness.

	Period (Month / Quarter / Year)	CMO				EVO						FRO		GHO	
		AGWS (days / hours)		Hosmer (days / hours)		DTAM (days / hours)		MCRR (days / hours)		WWTP (days / hours)		SS (days / hours)		Elkford (days / hours)	
		Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible
# Valid Monitoring Days per Month	January	30	31	30	31	25	31	8	31	28	31	31	31	27	31
	February	21	28	14	28	28	28	24	28	28	28	28	28	23	28
	March	28	31	30	31	30	31	31	31	31	31	31	31	28	31
	April	28	30	30	30	28	30	30	30	30	30	30	30	26	30
	May	29	31	23	31	28	31	31	31	30	31	31	31	29	31
	June	27	30	30	30	25	30	29	30	30	30	30	30	30	30
	July	23	25	29	31	22	31	31	31	31	31	31	31	28	31
	August	6	10	24	31	23	28	29	31	26	31	24	24	20	24
	September	29	30	19	30	17	20	15	16	15	16	30	30	30	30
	October	31	31	13	29	26	31	29	31	29	31	30	31	31	31
	November	26	30	7	12	29	30	30	30	30	30	28	30	30	30
	December	30	31	18	31	26	31	31	31	31	31	30	31	31	31
# Valid Monitoring Days per Quarter	2019 Q1	79	90	74	90	83	90	63	90	87	90	90	90	78	90
	2019 Q2	84	91	83	91	81	91	90	91	90	91	91	91	85	91
	2019 Q3	58	65	72	92	62	79	75	78	72	78	85	85	78	85
	2019 Q4	87	92	38	72	81	92	90	92	90	92	88	92	92	92
# Valid Monitoring Days for Entire Year	2019	308	338	267	345	307	352	318	351	339	351	354	358	333	358
# Valid Monitoring Hours per Quarter	2019 Q1	1933	2154	1895	2149	2024	2149	1560	2150	2085	2153	2153	2154	1974	2153
	2019 Q2	2036	2178	1971	2177	1997	2175	2161	2178	2153	2178	2177	2178	2070	2175
	2019 Q3	1431	1558	1835	2204	1571	1892	1802	1866	1751	1869	2050	2064	1850	2036
	2019 Q4	2107	2195	1030	1722	2022	2202	2174	2201	2157	2205	2155	2203	2145	2201
# Valid Monitoring Hours for Entire Year	2019	7507	8112	6731	8280	7614	8448	7697	8424	8146	8424	8535	8592	8039	8592

Table A-3: Number of valid $PM_{2.5}$ data. Red highlighted cells indicate less than 75% data completeness.

	Period (Month / Quarter / Year)	CMO				EVO				GHO			
		AGWS (days / hours)		Hosmer (days / hours)		DTAM (days / hours)		MCRR (days / hours)		WWTP (days / hours)		Elkford (days / hours)	
		Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible	Collected	Maximum possible
# Valid Monitoring Days per Month	January	31	31	18	31	25	31	31	31	30	31	29	31
	February	28	28	28	28	28	28	27	28	28	28	23	28
	March	31	31	31	31	31	31	31	31	31	31	30	31
	April	30	30	30	30	28	30	30	30	30	30	27	30
	May	31	31	30	31	22	31	31	31	30	31	26	31
	June	28	30	30	30	25	30	29	30	30	30	17	23
	July	25	25	31	31	28	31	31	31	31	31	31	31
	August	9	10	27	31	24	28	27	31	31	31	31	31
	September	30	30	30	30	18	20	15	16	15	16	30	30
	October	31	31	22	29	27	31	30	31	30	31	31	31
	November	24	30	11	12	25	30	29	30	30	30	30	30
	December	30	31	31	31	25	31	31	31	31	31	31	31
# Valid Monitoring Days per Quarter	2019 Q1	90	90	77	90	84	90	89	90	89	90	82	90
	2019 Q2	89	91	90	91	75	91	90	91	90	91	70	84
	2019 Q3	64	65	88	92	70	79	73	78	77	78	92	92
	2019 Q4	85	92	64	72	77	92	90	92	91	92	92	92
# Valid Monitoring Days for Entire Year	2019	328	338	319	345	306	352	342	351	347	351	336	358
# Valid Monitoring Hours per Quarter	2019 Q1	2153	2154	1900	2149	2032	2149	2135	2150	2122	2153	1993	2153
	2019 Q2	2144	2178	2133	2177	1881	2173	2160	2178	2154	2178	1728	2007
	2019 Q3	1545	1558	2123	2204	1733	1892	1814	1866	1859	1869	2178	2202
	2019 Q4	2051	2195	1579	1723	1971	2145	2136	2201	2168	2205	2166	2201
# Valid Monitoring Hours for Entire Year	2019	7893	8112	7735	8280	7617	8448	8245	8424	8303	8424	8065	8592

Table A-4: Number of valid gas data. Red highlighted cells indicate less than 75% data completeness.

	Period (Month / Quarter / Year)	EVO - DTAM			Total possible number of days/hours
		NO_2	CO	SO_2	
# Valid Monitoring Days per Month	January	27	30	27	30
	February	0	1	1	1 [1]
	March	0	30	31	31 [1]
	April	6	29	29	30 [1]
	May	31	31	31	31
	June	30	30	29	30
	July	31	31	31	31
	August	31	31	31	31
	September	30	30	30	30
	October	31	30	31	31
	November	30	26	30	30
	December	31	20	31	31
# Valid Monitoring Days per Quarter	2019 Q1	27	61	59	62 [1]
	2019 Q2	67	90	89	91 [1]
	2019 Q3	92	92	92	92
	2019 Q4	92	76	92	92
# Valid Monitoring Days for Entire Year	2019	278	319	332	337
# Valid Monitoring Hours per Quarter	2019 Q1	674	1478	1440	1488 [1]
	2019 Q2	1613	2170	2163	2184 [1]
	2019 Q3	2202	2199	2202	2208
	2019 Q4	2204	1870	2204	2208
# Valid Monitoring Hours for Entire Year	2019	6693	7717	8009	8088 [1]

Note:

1- Due to extended repairs, NO_X was measured for 0 days in February, 0 days in March and 6 days in April.

Table A-5: TSP averaged annually, seasonally and by day of the week.

	Period (Month / Quarter / Year / Day of the Week / Season)	CMO AGWS ($\mu g/m^3$)	GHO Elkford ($\mu g/m^3$)	LCO L10A ($\mu g/m^3$)
Annual Hourly Mean	2019	3.0	8.4	
Annual Hourly Standard Deviation	2019	12.3	27.9	
Annual Daily Mean	2019	4.2	10.6	48.0
Annual Daily Standard Deviation	2019	7.7	15.3	31.5
Daily Average by Day of Week	Monday	6.2	14.0	54.2
	Tuesday	6.3	14.2	70.1
	Wednesday	5.2	15.1	46.9
	Thursday	5.7	13.4	47.5
	Friday	7.8	15.3	63.4
	Saturday	6.8	15.2	40.4
	Sunday	7.6	14.6	63.4
Daily Average by Season	Spring (MAM)	9.2	24.7	51.3
	Summer (JJA)	5.3	10.3	48.7
	Autumn (SON)	4.1	12.3	52.4
	Winter (DJF)	6.8	10.8	70.6

Note: Annual Hourly and Daily means are calculated as geometric means so they are comparable to the provincial pollution control objectives for TSP.

Table A-6: PM_{10} averaged annually, seasonally and by day of the week.

	Period (Month / Quarter / Year / Day of the Week / Season)	CMO		EVO			FRO	GHO
		AGWS	Hosmer	DTAM	MCRR	WWTP	SS	Elkford
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)
Annual Hourly Mean	2019	4.6	10.1	13.5	18.0	9.8	28.9	9.4
Annual Hourly Standard Deviation	2019	6.5	11.3	15.3	17.8	9.1	35.4	15.4
Annual Daily Mean	2019	4.4	10.1	13.3	17.8	9.8	29.0	9.3
Annual Daily Standard Deviation	2019	3.5	7.9	10.0	13.5	6.4	25.7	11.1
Daily Average by Day of Week	Monday	4.7	8.9	15.3	18.1	9.1	28.7	8.7
	Tuesday	4.2	10.5	14.7	18.4	10.0	31.1	8.5
	Wednesday	4.1	11.1	15.2	19.9	11.7	30.6	9.1
	Thursday	4.0	11.0	13.3	18.4	10.3	27.1	9.0
	Friday	4.0	11.8	12.1	18.6	9.3	32.3	11.5
	Saturday	4.5	9.1	10.2	15.1	8.8	23.9	9.2
	Sunday	5.0	8.7	12.0	16.4	9.4	29.2	9.2
Daily Average by Season	Spring (MAM)	5.1	11.5	16.9	17.7	9.4	31.5	15.2
	Summer (JJA)	4.2	9.3	13.2	15.6	9.6	22.3	7.5
	Autumn (SON)	3.7	10.1	10.5	19.4	9.6	25.8	7.9
	Winter (DJF)	4.4	9.4	12.1	19.3	10.7	36.0	6.7

Table A-7: $PM_{2.5}$ averaged annually, seasonally and by day of the week.

	Period (Month / Quarter / Year / Day of the Week / Season)	CMO		EVO			GHO
		AGWS	Hosmer	DTAM	MCRR	WWTP	Elkford
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)
Annual Hourly Mean	2019	2.4	5.0	6.6	6.6	5.8	4.5
Annual Hourly Standard Deviation	2019	5.1	6.4	7.0	7.7	5.7	4.3
Annual Daily Mean	2019	2.4	5.0	6.4	6.7	5.7	4.5
Annual Daily Standard Deviation	2019	4.9	4.6	3.3	6.1	3.4	2.5
Daily Average by Day of Week	Monday	2.0	4.6	6.6	6.5	5.6	4.2
	Tuesday	1.9	4.8	6.3	6.3	5.6	4.2
	Wednesday	2.1	5.0	6.8	7.2	6.4	4.2
	Thursday	2.3	4.7	6.4	6.2	5.6	4.4
	Friday	3.6	6.2	6.0	7.4	5.7	4.3
	Saturday	2.9	5.0	5.9	6.6	5.8	5.2
	Sunday	2.3	4.6	6.5	6.4	5.5	4.9
Daily Average by Season	Spring (MAM)	3.2	6.3	6.5	6.8	5.0	4.0
	Summer (JJA)	2.1	4.0	6.3	6.3	5.1	4.2
	Autumn (SON)	2.4	5.0	6.5	7.5	6.8	5.2
	Winter (DJF)	1.9	4.6	6.2	6.1	6.3	4.6

Table A-8: Gas concentrations averaged annually, seasonally and by day of the week.

	Period (Month / Quarter / Year / Day of the Week / Season)	EVO - DTAM		
		NO_2	CO	SO_2
		($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
Annual Hourly Mean	2019	11.1	161.6	21.6
Annual Hourly Standard Deviation	2019	7.9	79.0	7.4
Annual Daily Mean	2019	11.1	161.1	21.7
Annual Daily Standard Deviation	2019	5.0	64.7	7.2
Daily Average by Day of Week	Monday	11.5	158.6	21.5
	Tuesday	10.9	161.4	21.7
	Wednesday	12.7	163.4	21.5
	Thursday	11.7	163.3	22.2
	Friday	10.9	170.1	21.7
	Saturday	9.9	161.0	21.6
	Sunday	9.9	150.2	21.5
Daily Average by Season	Spring (MAM)	11.9	170.7	23.0
	Summer (JJA)	8.8	127.5	22.5
	Autumn (SON)	11.0	162.1	26.5
	Winter (DJF)	14.1	203.1	10.8

Table A-9: Percentiles of TSP

Averaging Period of Data	Percentile	CMO	GHO	LCO
		AGWS	Elkford	L10A
		(µg/m³)	(µg/m³)	(µg/m³)
Hourly	0	0.0	0.0	
	10	0.5	2.4	
	25	1.4	4.4	
	50	3.3	8.5	
	75	7.2	16.3	
	90	12.5	29.4	
	95	21.1	43.3	
	98	39.0	74.5	
	100	270.2	1087.6	
Daily (24H)	0	0.1	1.4	17.5
	10	1.2	4.3	25.1
	25	2.3	6.3	33.2
	50	4.5	10.2	45.1
	75	8.0	17.1	72.5
	90	13.7	27.6	105.0
	95	16.8	40.9	110.5
	98	26.9	60.4	125.4
	100	81.7	167.2	166.1

Table A-10: Percentiles of PM_{10}

Averaging Period of Data	Percentile	CMO		EVO			FRO	GHO
		AGWS	Hosmer	DTAM	MCRR	WWTP	SS	Elkford
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)
Hourly	0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
	10	1.1	1.9	2.0	2.9	2.0	4.0	1.6
	25	1.8	3.9	4.7	6.2	4.2	8.4	2.7
	50	3.0	7.6	9.7	13.1	7.8	17.3	5.6
	75	5.5	12.6	17.2	23.4	12.6	36.8	11.1
	90	8.7	19.9	27.1	37.8	19.1	66.0	19.7
	95	11.3	26.3	36.9	51.7	25.2	92.2	27.9
	98	18.4	37.2	53.0	69.5	35.8	133.8	41.9
	100	147.2	248.8	223.7	185.2	166.1	453.8	489.4
Daily (24H)	0	0.3	0.9	0.5	0.4	0.7	2.1	0.2
	10	1.5	3.1	3.2	4.2	3.3	7.4	2.5
	25	2.1	5.4	6.4	8.4	5.4	11.9	4.3
	50	3.4	8.3	11.1	14.3	8.6	22.0	6.9
	75	5.5	12.9	17.3	23.1	12.9	38.2	11.2
	90	7.9	18.2	25.5	36.5	17.4	53.8	16.7
	95	10.0	24.0	31.7	40.9	21.5	70.0	22.8
	98	14.9	28.8	44.1	53.0	27.7	101.6	37.5
	100	26.6	80.7	69.3	105.8	51.9	252.8	158.0

Table A-11: Percentiles of $PM_{2.5}$

Averaging Period of Data	Percentile	CMO			EVO		GHO
		AGWS	Hosmer	DTAM	MCRR	WWTP	Elkford
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)
Hourly	0	0.0	0.0	0.0	0.0	0.0	0.0
	10	0.1	0.9	1.6	1.3	1.2	1.3
	25	0.5	1.7	2.9	2.6	2.4	2.2
	50	1.4	3.3	5.3	5.1	4.4	3.5
	75	2.8	6.3	8.7	8.7	7.5	5.7
	90	5.1	10.5	12.9	12.7	11.5	8.4
	95	6.9	14.1	16.2	16.1	14.8	11.1
	98	10.0	20.4	21.3	22.3	20.2	15.0
	100	146.7	116.3	181.8	165.8	161.2	100.1
Daily (24H)	0	0.1	0.2	0.3	0.2	0.5	0.2
	10	0.3	1.7	2.7	2.2	2.5	2.0
	25	0.8	2.8	4.1	3.7	3.4	2.8
	50	1.6	4.2	5.9	5.8	5.1	4.1
	75	2.8	6.4	7.9	8.0	7.2	5.5
	90	4.8	8.2	10.7	11.6	9.9	7.4
	95	6.1	10.0	13.3	13.8	11.7	9.1
	98	8.1	11.8	14.4	17.6	15.5	10.5
	100	80.1	66.2	18.8	90.1	27.5	20.0

Table A-12: Percentiles of gas concentrations.

Averaging Period of Data	Percentile	EVO - DTAM		
		NO_2	CO	SO_2
		(µg/m³)	(µg/m³)	(µg/m³)
Hourly	0	1.3	0.0	0.0
	10	4.0	84.6	16.6
	25	5.4	114.0	19.6
	50	8.8	145.7	22.8
	75	14.1	193.4	26.5
	90	22.0	259.8	28.4
	95	27.1	301.5	29.2
	98	34.1	364.9	30.2
	100	64.1	970.5	40.7
Daily (24H)	0	2.4	41.1	0.1
	10	5.9	93.0	17.3
	25	7.7	124.7	19.8
	50	10.1	148.5	22.7
	75	12.7	189.3	26.5
	90	19.0	242.0	28.4
	95	22.0	274.3	28.8
	98	24.7	331.3	30.0
	100	29.7	581.5	30.7

Table A-13: 98th percentile values of daily averaged $PM_{2.5}$. values above BCAAQO are highlighted in red.

	Station Name	98th percentile of $PM_{2.5}$
CMO	AGWS	8.1
	Hosmer	11.8
EVO	DTAM	14.4
	MCRR	17.6
	WWTP	15.5
GHO	Elkford	10.5

APPENDIX B

PLOTS OF PARTICULATE MATTER CONCENTRATIONS

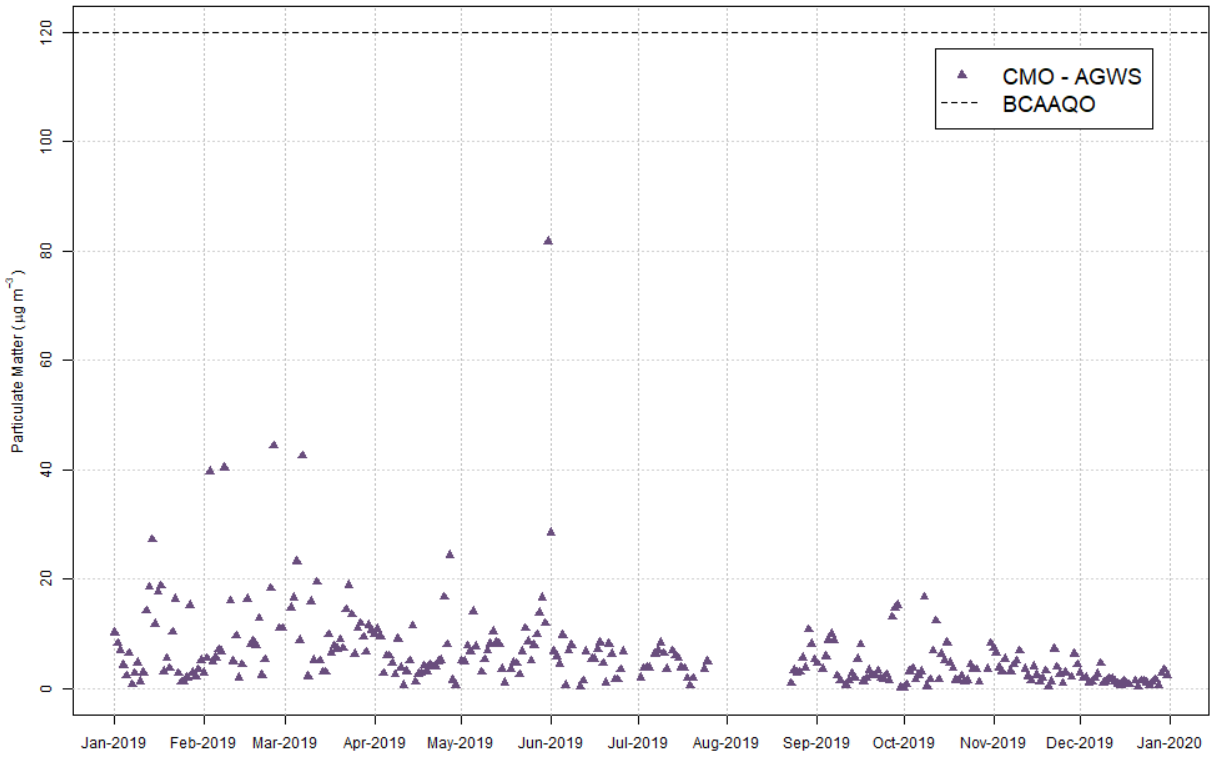


Figure B-1: Daily Averaged TSP Concentrations from CMO – AGWS.

Note: The BCAAQO of 120 µg/m3 is indicated by a dashed line.

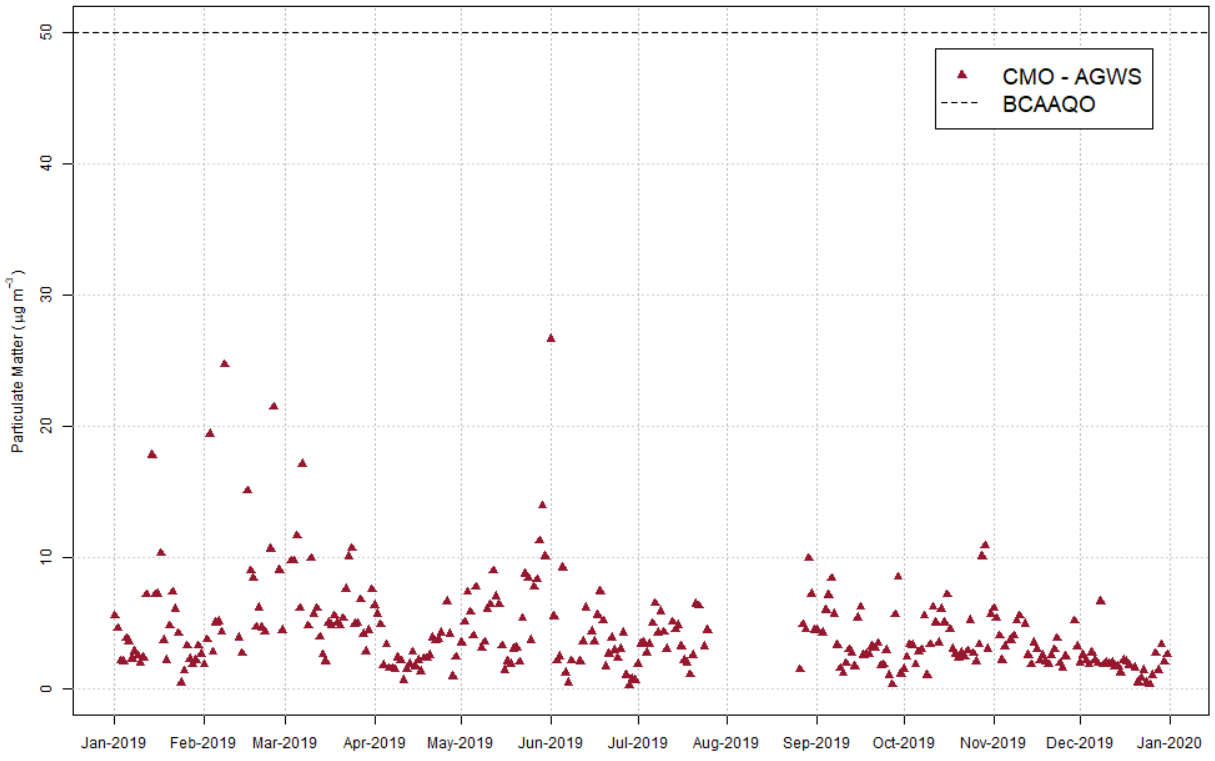


Figure B-2: Daily Averaged PM_{10} Concentrations from CMO – AGWS.

Note: The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

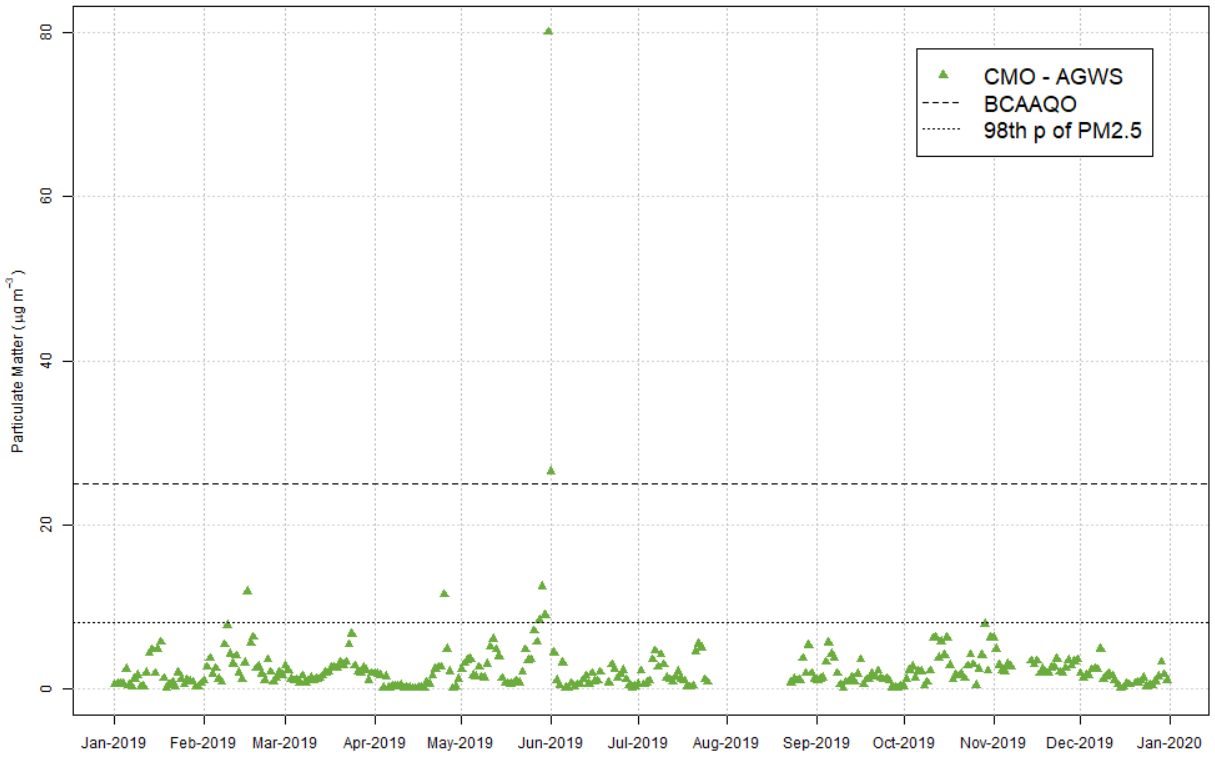


Figure B-3: Daily Averaged $PM_{2.5}$ Concentrations from CMO – AGWS.

Notes:

1) The BCAAQO of 25 µg/m^3 is indicated by a dashed line.
2) The dotted line indicates the 98th percentile of $PM_{2.5}$.

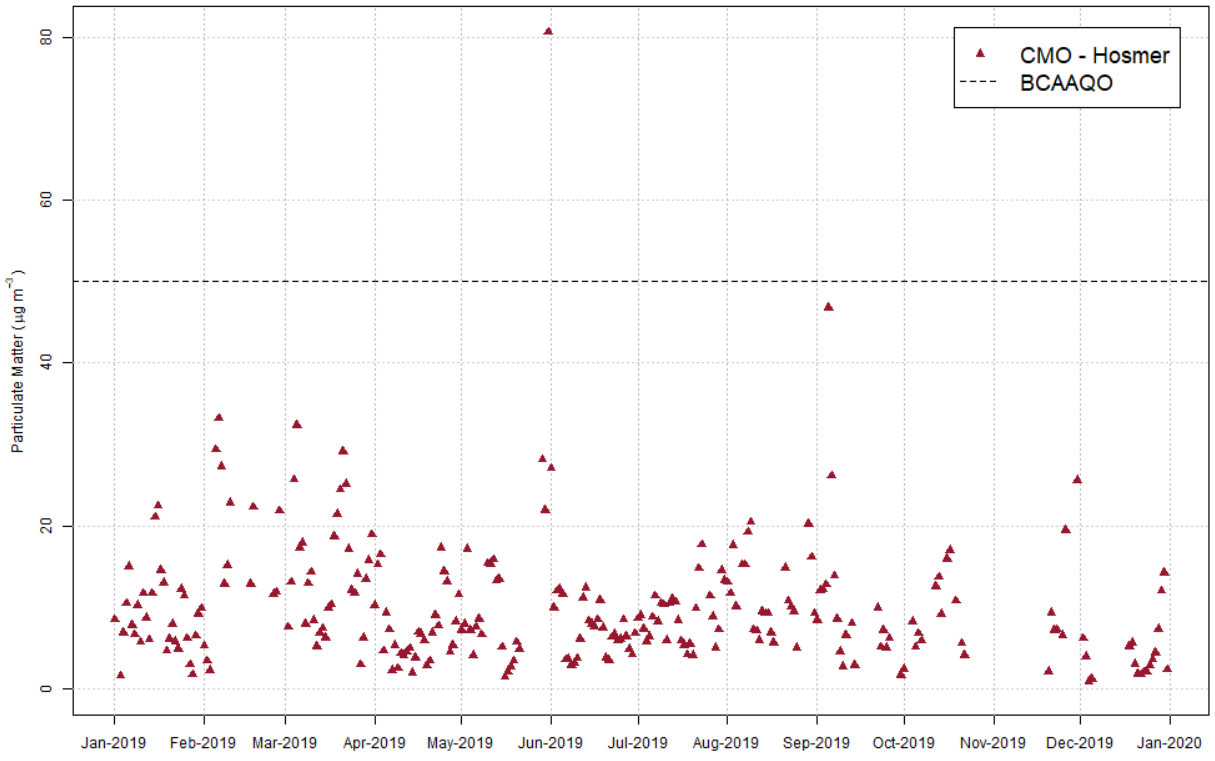


Figure B-4: Daily Averaged PM_{10} Concentrations from CMO – Hosmer.

Note: The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

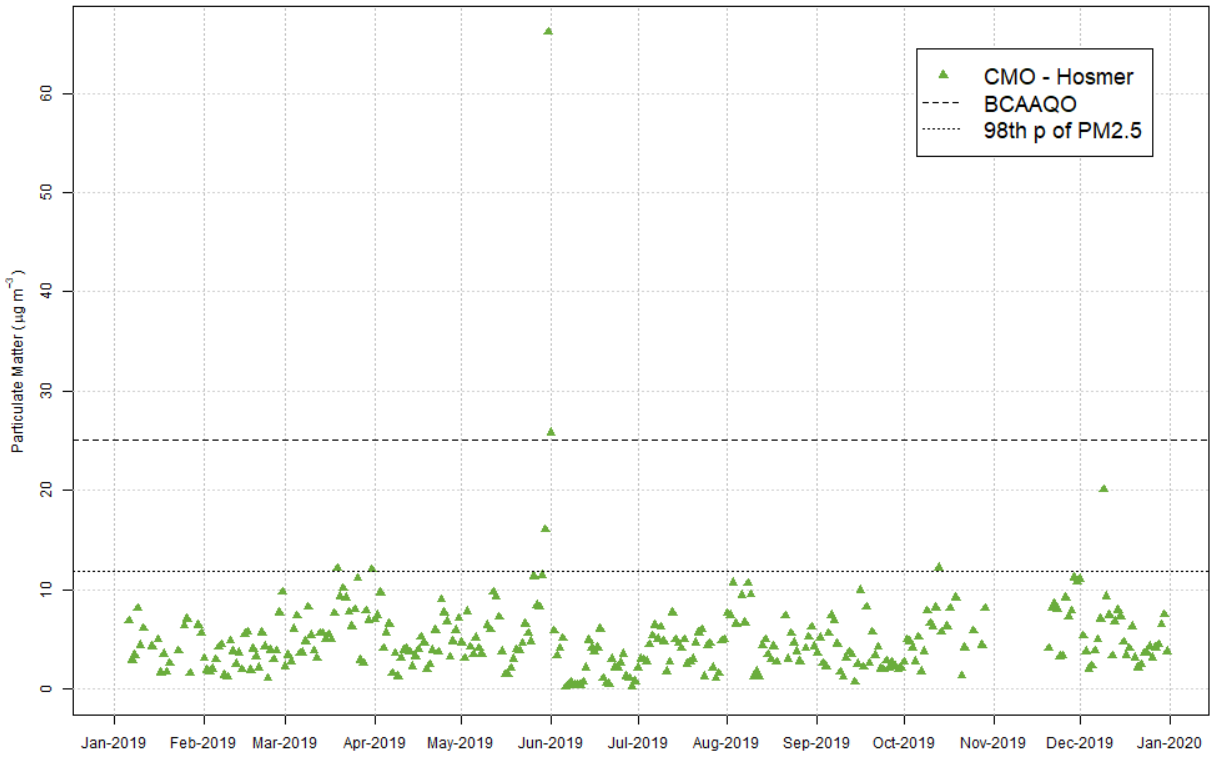


Figure B-5: Daily Averaged $PM_{2.5}$ Concentrations from CMO – Hosmer.

Notes:

1) The BCAAQO of 25 µg/m^3 is indicated by a dashed line.
2) The dotted line indicates the 98th percentile of $PM_{2.5}$.

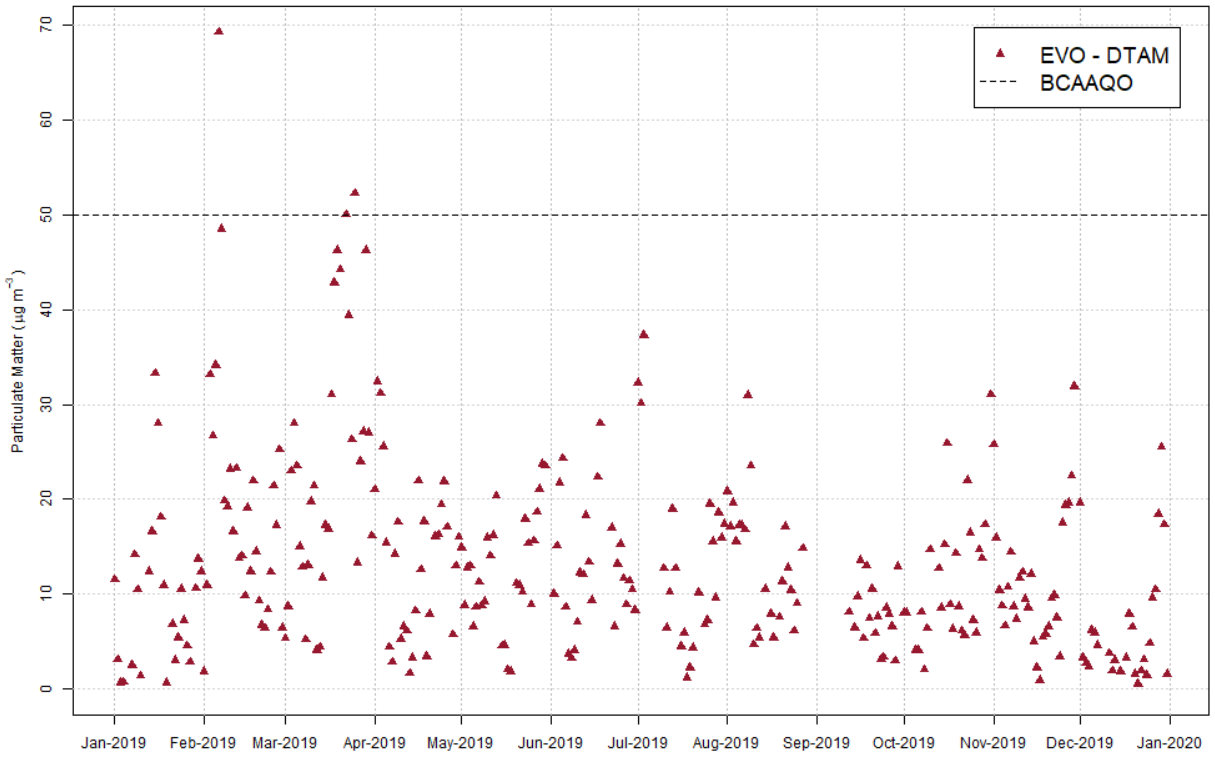


Figure B-6: Daily Averaged PM_{10} Concentrations from EVO – DTAM.

Note: The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

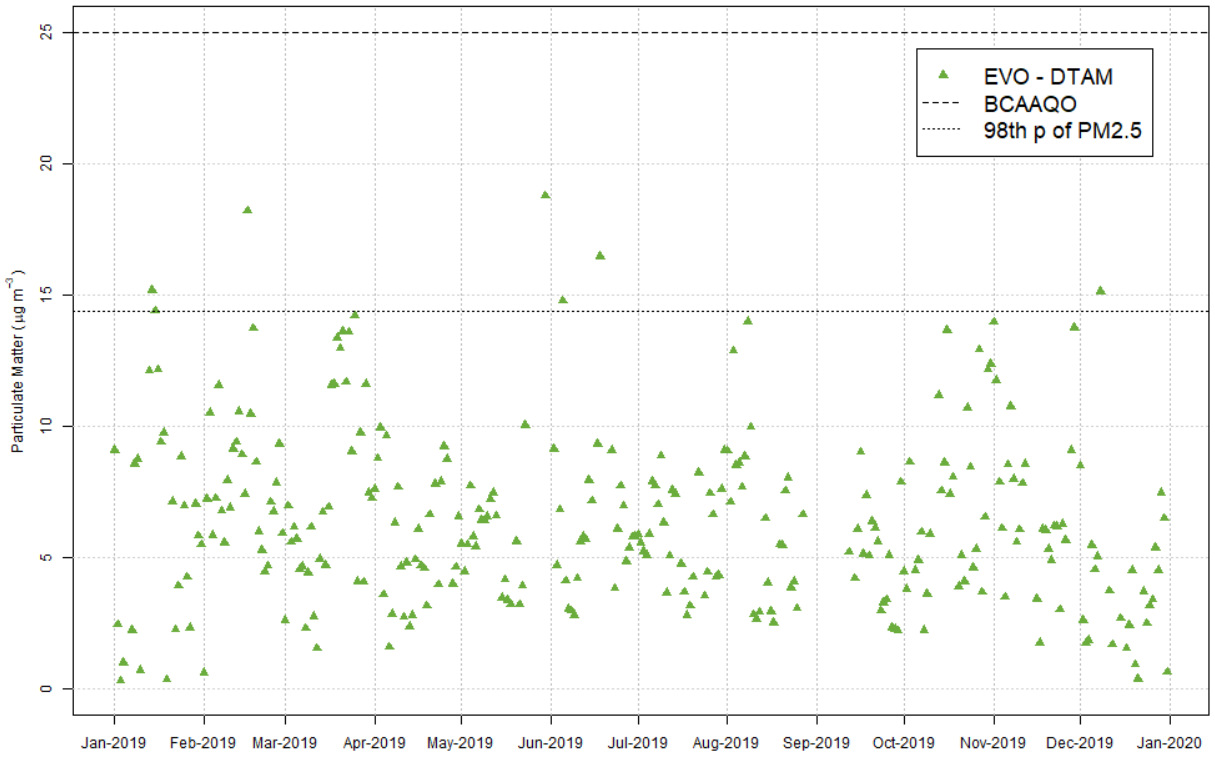


Figure B-7: Daily Averaged $PM_{2.5}$ Concentrations from EVO – DTAM.

Notes:

1) The BCAAQO of 25 µg/m^3 is indicated by a dashed line.
2) The dotted line indicates the 98th percentile of $PM_{2.5}$.

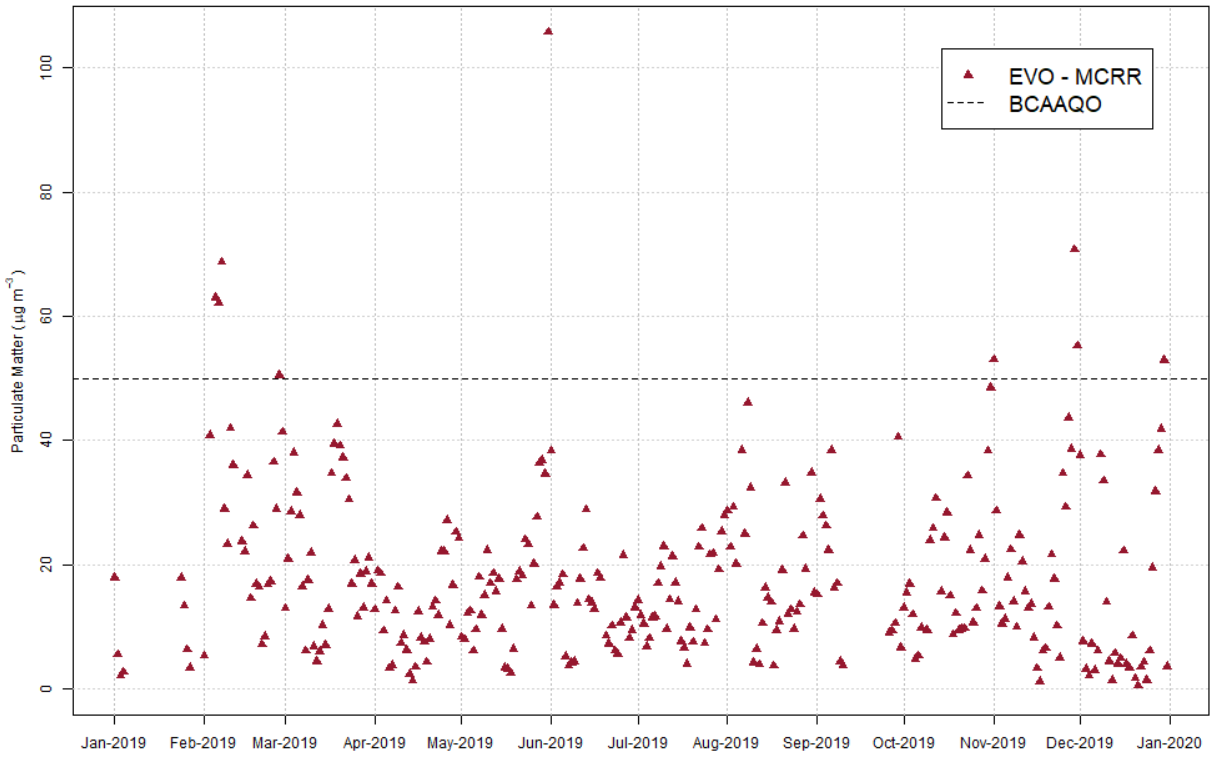


Figure B-8: Daily Averaged PM_{10} Concentrations from EVO – MCRR.

Note: The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

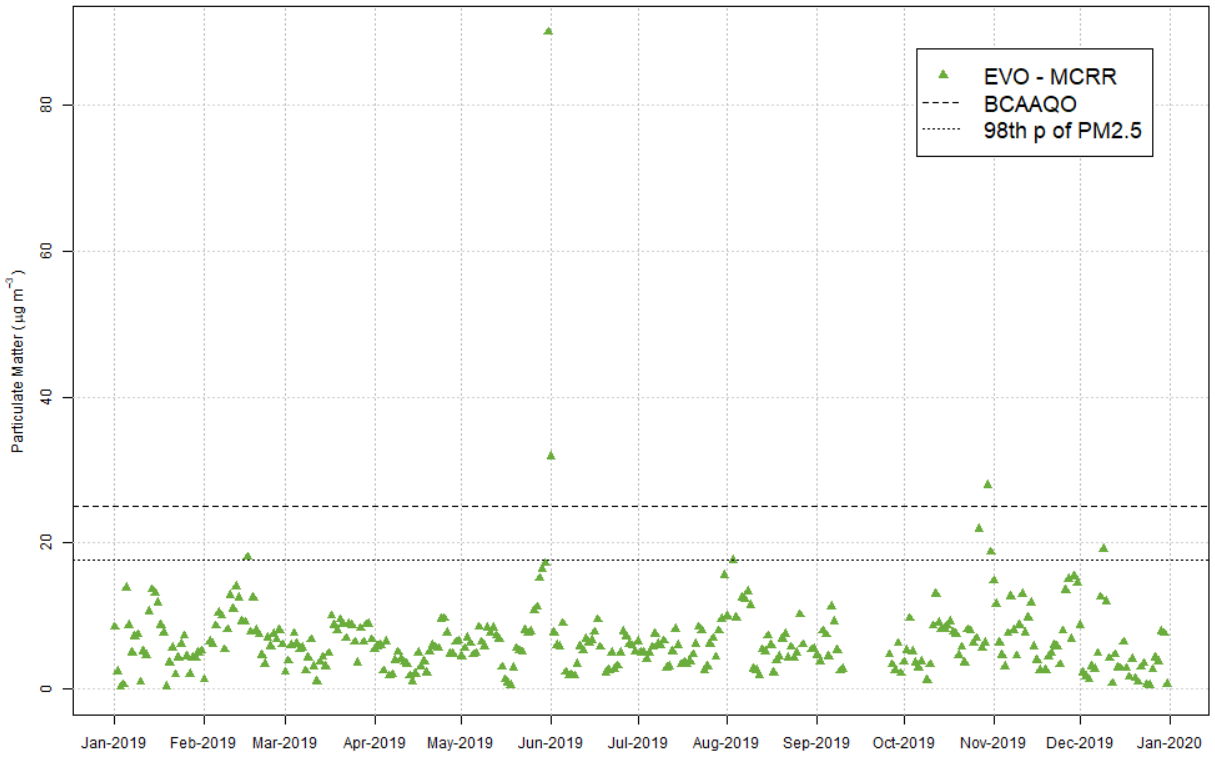


Figure B-9: Daily Averaged $PM_{2.5}$ Concentrations from EVO-MCRR.

Notes:

1) The BCAAQO of 25 µg/m^3 is indicated by a dashed line.
2) The dotted line indicates the 98th percentile of $PM_{2.5}$.

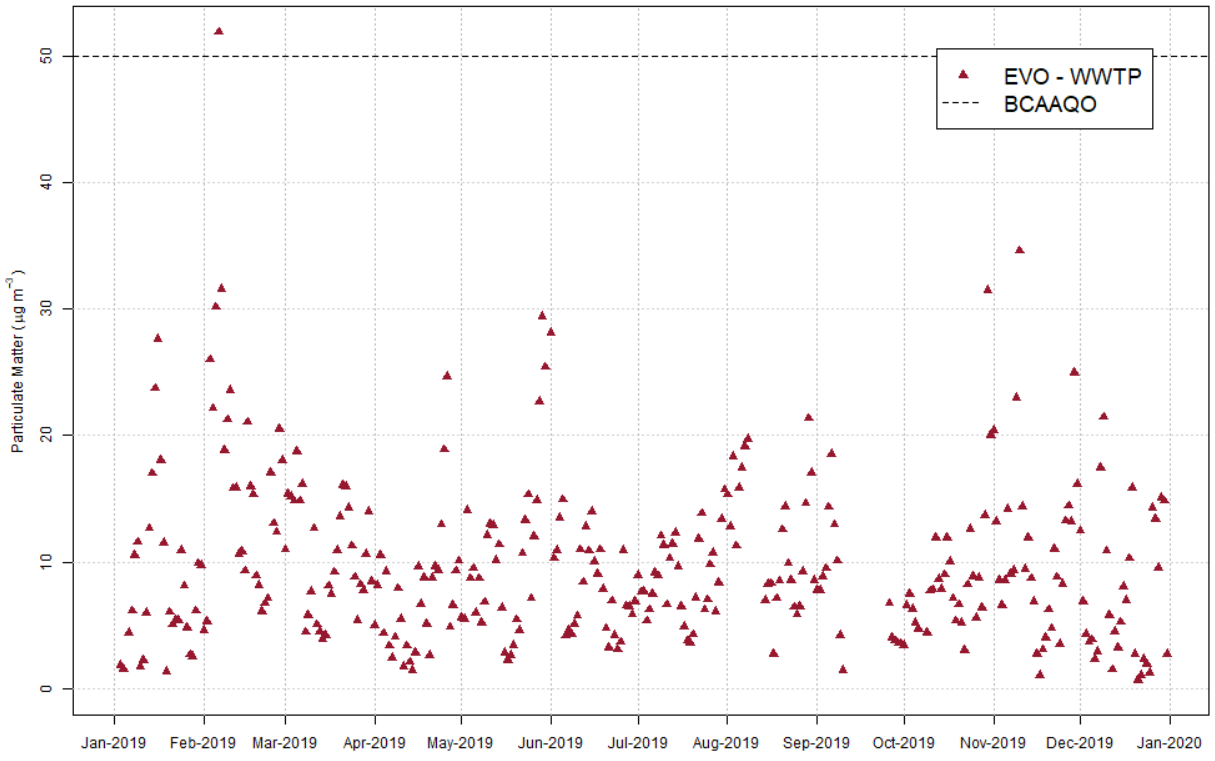


Figure B-10: Daily Averaged PM_{10} Concentrations from EVO – WWTP.

Note: The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

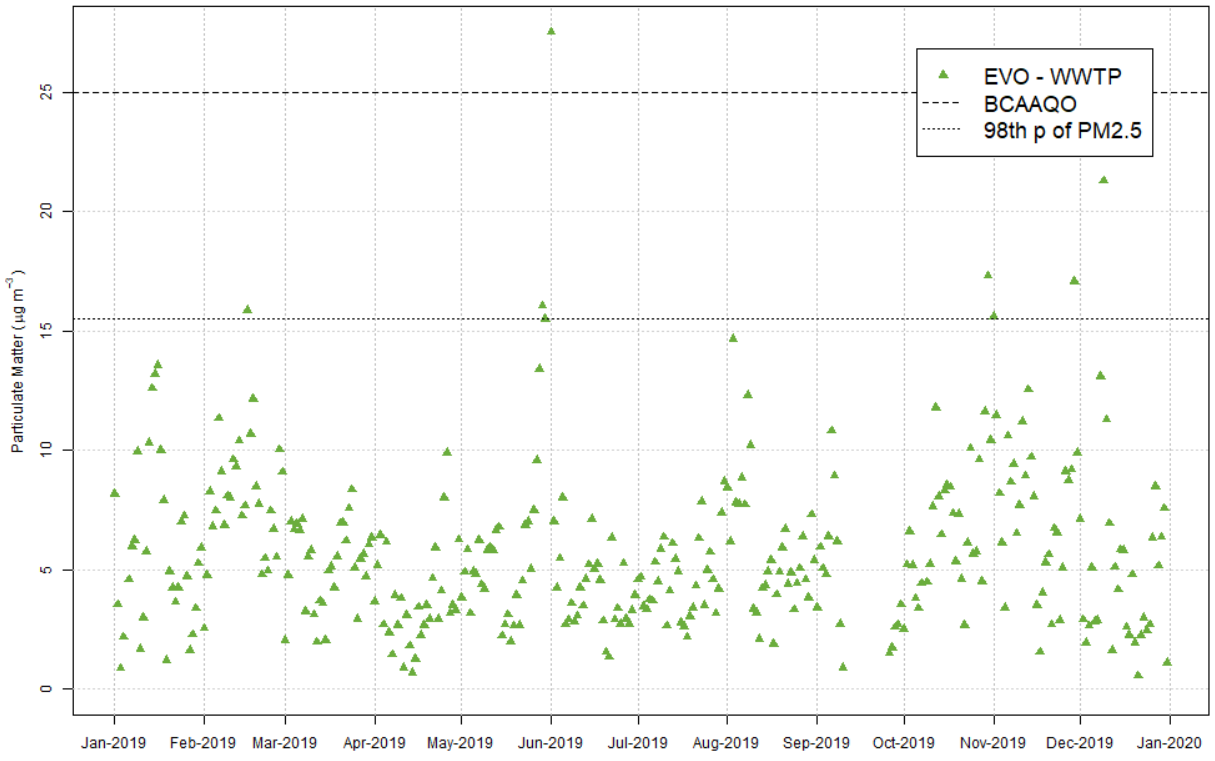


Figure B-11: Daily Averaged $PM_{2.5}$ Concentrations from EVO – WWTP.

Notes:

1) The BCAAQO of 25 µg/m^3 is indicated by a dashed line.
2) The dotted line indicates the 98th percentile of $PM_{2.5}$.

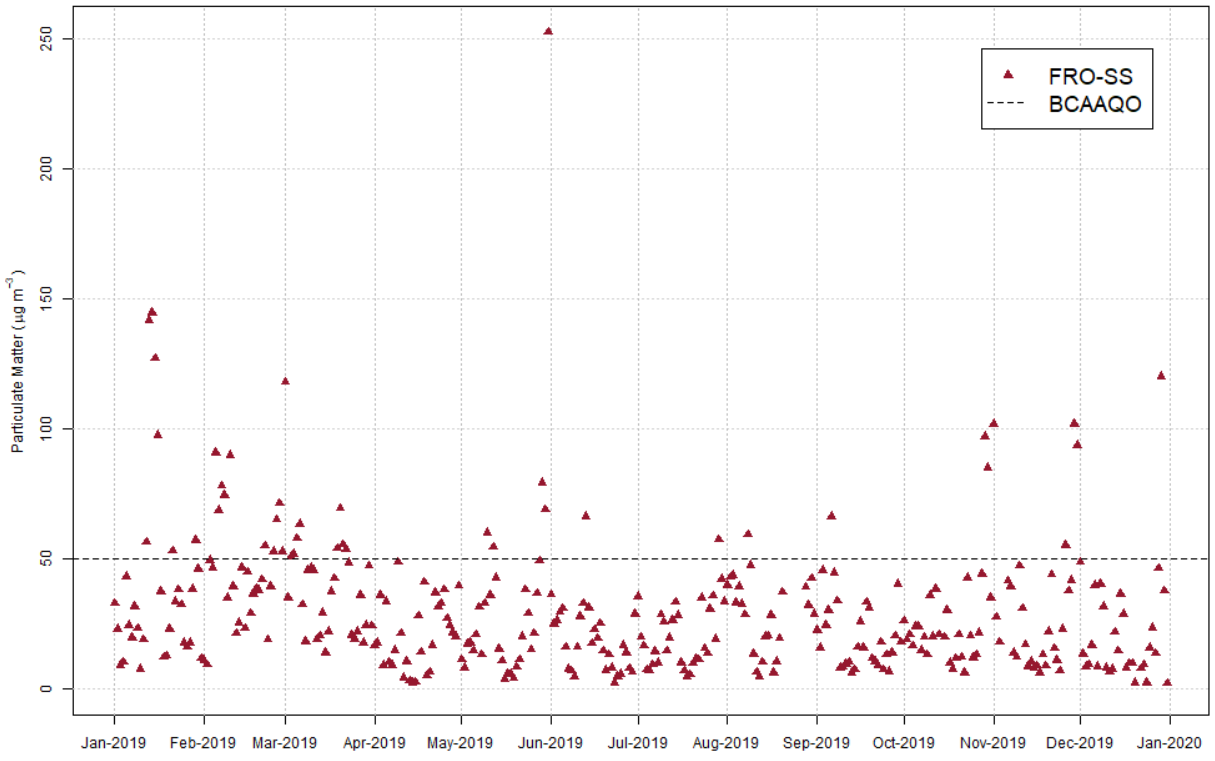


Figure B-12: Daily Averaged PM_{10} Concentrations from FRO – SS.

Note: The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

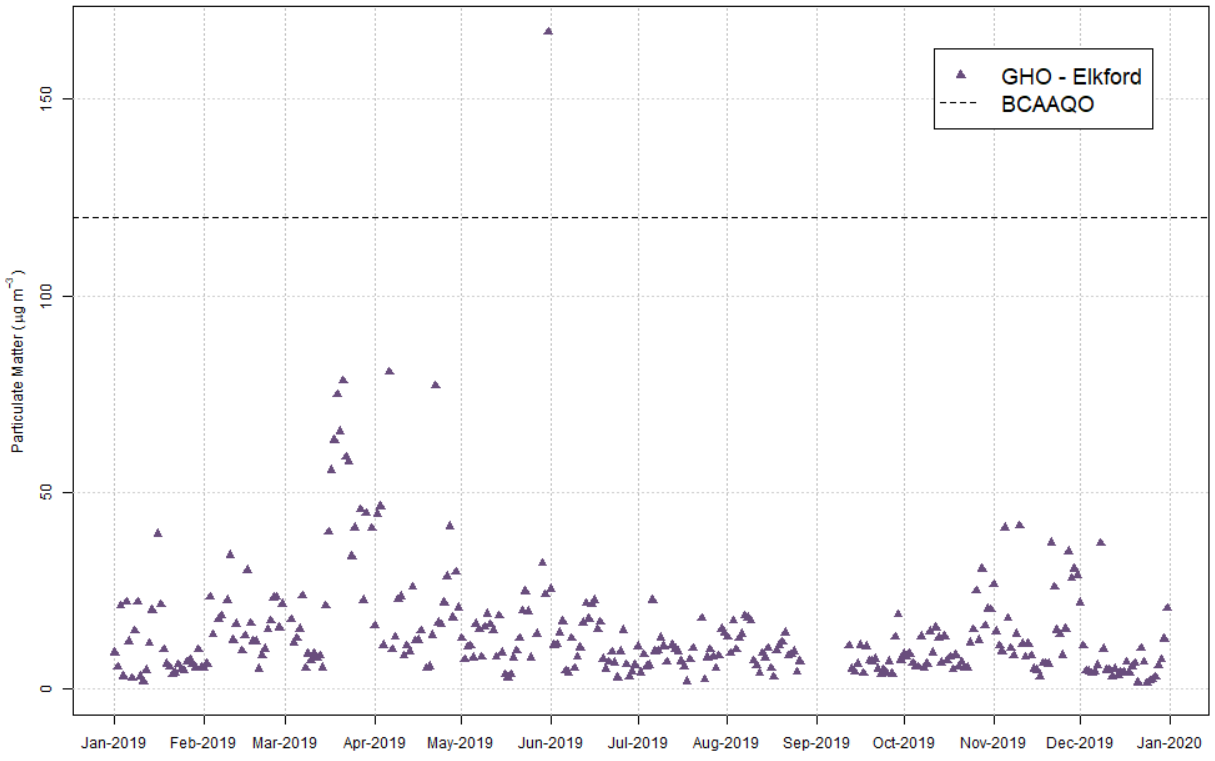


Figure B-13: Daily Averaged TSP Concentrations from GHO – Elkford.

Note: The BCAAQO of 120 µg/m^3 is indicated by a dashed line.

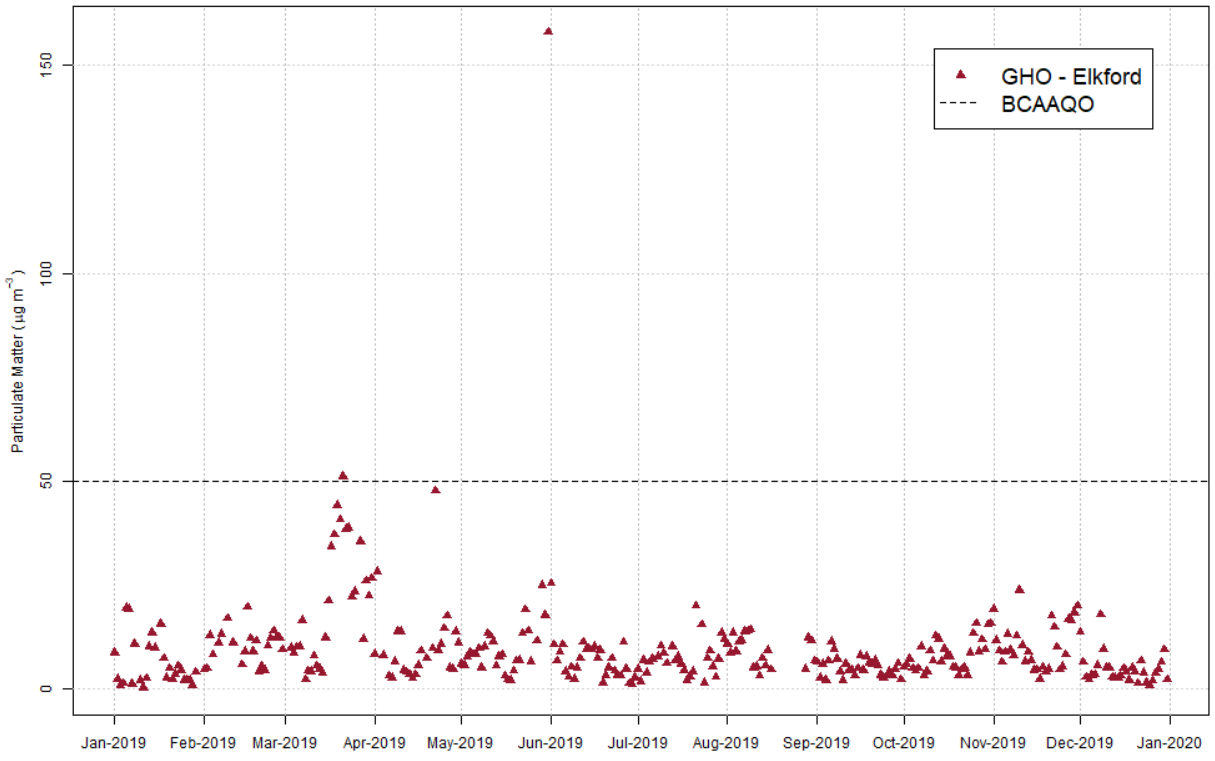


Figure B-14: Daily Averaged PM_{10} Concentrations from GHO – Elkford.

Note: The BCAAQO of 50 µg/m^3 is indicated by a dashed line.

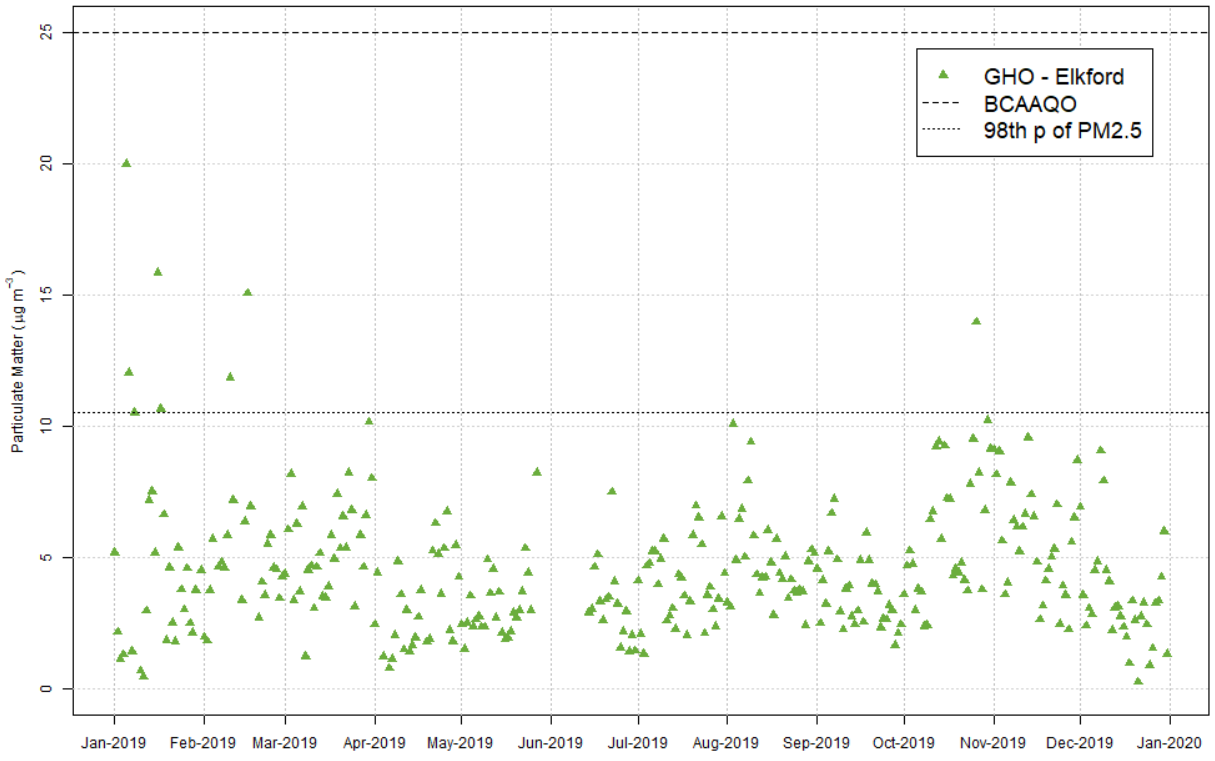


Figure B-15: Daily Averaged $PM_{2.5}$ Concentrations from GHO – Elkford.

Notes:

1) The BCAAQO of 25 µg/m^3 is indicated by a dashed line.
2) The dotted line indicates the 98th percentile of $PM_{2.5}$.

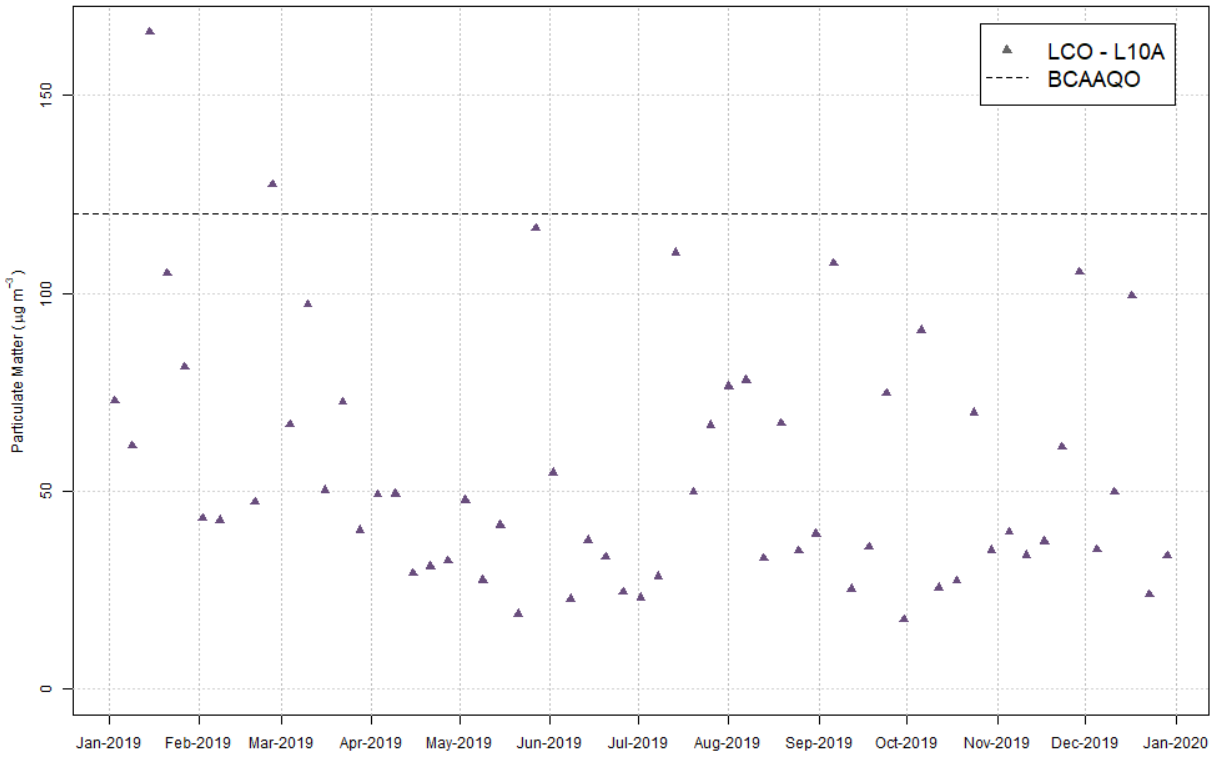


Figure B-16: TSP Concentrations from LCO - L10A.

Notes:

1) Concentrations are collected for 24-hour periods every 6 days based on the NAPS schedule.
2) The BCAAQO of 120 µg/m^3 is indicated by a dashed line.