WYAMZ

2023 ANNUAL REPORT

Western Yellowhead Air Management Zone

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LIST OF TERMS AND DEFINITIONS

24-hour	A calendar day, average is calculated midnight-to-midnight.
30-day	Passive monitoring data is based on a 30-day average concentration
8-Hour	Using for the 8-hour running average for O_3.
SAAQS	Saskatchewan Ambient Air Quality Standards
AIC	Automatic Instrument Check (instrument self-verification process)
AMG	Air Monitoring Guidelines for Saskatchewan, March 2012
Calm	1-hour average wind speed lower than 0.3 km/hour
CWS	Canada-Wide-Standards
ET	Ambient temperature or external temperature
H_2S	Hydrogen sulphide
NO_2	Nitrogen dioxide
NO	Nitric oxide
NOx	Oxides of nitrogen
O_3	Ozone
$PM_{2.5}$	Particulate matter with aerodynamic diameter less than 2.5 µm, referred to as fine or respirable particles
QA/QC	Quality Assurance / Quality Control
RH	Relative humidity
SO_2	Sulphur dioxide
WD	Wind direction
WS	Wind speed

UNITS OF MEASUREMENT

average	arithmetic average = n Xi / n
m/s	meter per second, or mps
µg/m^3	microgram per cubic meter
ppb	part per billion by volume
mm	millimeter of accumulated precipitation
°C	degree centigrade
%	percent of relative humidity, instrument uptime, etc.
Degree	angle of wind direction from the north

MESSAGE FROM THE EXECUTIVE DIRECTOR

On behalf of the Western Yellowhead Air Management Zone (WYAMZ) Board of Directors, I would like to again thank association members for their commitment to air quality improvement and for the ongoing financial support that keeps our association viable and able to respond to the needs of members. 2023 members and a summary of membership benefits is included in Appendix J.

WYAMZ is an independent, collaborative non-profit organization of industry, government, and other representatives formed for the purpose of collecting high quality continuous air quality data. Through diverse stakeholder representation, the association strives to recognize concerns specific to the air zone and encourage solutions to address these needs.

WYAMZ operates, maintains and reports on 4 ambient air quality monitoring stations called Airpointers. These Airpointers work in combination with 2 Airpointer stations operated by Cenovus in the Lloydminster area and the National Air Pollution Surveillance Program (NAPS) station in Saskatoon. This equipment collectively provides an extensive ambient air quality monitoring and data collection network across the air zone. Data for both the WYAMZ and Cenovus stations is available in real time on our website @ www.wyamz.ca. The WYAMZ data for 2023 is summarized in this annual report. This data, as well as data for previous years, is available in electronic form upon request by member organizations, government agencies, and the general public.

WYAMZ also supports the use of Purple Air Monitoring (PAM) devices as a cost-effective way to extend particulate monitoring to more WYAMZ communities. Our intention is to help communities make use of government environmental and Indigenous air quality monitoring initiatives to keep costs to a minimum. A link to a corrected data website for the real time worldwide Purple Air monitoring network is also provided on the WYAMZ website.

WYAMZ is now participating in a Saskatchewan Ministry of the Environment (SK MOE) led 2021 initiative to include air zone associations in the development of Air zone Management Plans (AMP)s. We are progressing on our goal to have our data accepted and used along with NAPS station to better characterize our air zone beyond what is achieved using the NAPS station data alone. Audits were completed in 2023 by SK MOE to both validate the data being collected and to verify proper equipment operation at one of the 4 airpointer sites. These audits will become regular requirements going forward.

We will continue WYAMZ industry and public outreach programs in 2023, taking the opportunities to demonstrate our efforts to ensure good ambient air quality and cost-effective, well managed air quality management programs in our air zone. We also use these opportunities to highlight the names of our current industrial members and look for other opportunities to showcase our efforts to other potential members. Our outreach programs in 2023 will include participation in the Lloydminster Heavy Oil Show in September, sponsoring school science fairs events and awards, as well as making presentations to interested school and community organizations within the air zone where the opportunity presents.

I look forward to reporting back on the success of these initiatives in next year's report.

EXECUTIVE SUMMARY

The Western Yellowhead Air Management Zone (WYAMZ), established in 2012, is the second air management association in Saskatchewan. WYAMZ is a collaborative group of industry, government, non-government organizations, and private citizens. The air management zone covers an area that stretches from east of Saskatoon to the Alberta border, and from north of Meadow Lake to south of Rosetown, as shown in Figure 1 of the main report. Major economic activities in the region include agriculture, oil and gas, mining, power generation, and transportation.

WYAMZ manages a continuous air monitoring network. Figure 1of the main report illustrates spatial distribution of the air monitoring stations in the WYAMZ region. The continuous air monitoring network consists of four airpointers® at the Meadow Lake City, Maidstone, Clavet, and Kerrobert stations. Three additional continuous monitoring stations also operate within the WYAMZ region. A continuous air monitoring NAPS (National Air Pollution Surveillance Program) station is operated by the Ministry of Environment in Saskatoon, and the Cenovus East and West stations in Lloydminster are owned and operated by Cenovus Energy.

The WYAMZ network monitors sulphur dioxide (SO_2), hydrogen sulphide (H2S), nitrogen oxides (NO, NO_2, NO_x), ozone (O_3), fine particulate matter ($PM_{2.5}$), ambient temperature (ET), relative humidity (RH), precipitation, wind speed (WS) and wind direction (WD). The following analyzers did not have annual operation uptimes greater than 90% in 2023:

- Maidstone: NO, NO_2, NO_x and $PM_{2.5}$
- Clavet: NO, NO_2, NO_x, O_3 and $PM_{2.5}$
- Kerrobert: SO_2, H_2S and $PM_{2.5}$
- Meadow Lake: O_3

The following analyzers did not have monthly operation uptimes greater than 90%:

- Maidstone: NO, NO_2, NO_x for August through December and $PM_{2.5}$ for January, February and November
- Clavet: NO, NO_2, NO_x and O_3 for June through August and $PM_{2.5}$ for January, June through September and December
- Kerrobert: SO_2 for January, February, May through August, November and December, H_2S for January, February, May through August and December and $PM_{2.5}$ for January, February, June through August and December.
- Meadow Lake: NO, NO_2, NO_x for July and August and O_3 for May through August

Table 1 summarizes the annual average concentration data for January to December 2023; the measured air quality was within the Saskatchewan Ambient Air Quality Standards (SAAQS), with the exception of $PM_{2.5}$. There were a total of two annual average exceedance events and three 24-hour average exceedance events for $PM_{2.5}$. The air quality at the WYAMZ air monitoring stations was rated Low Risk or Good for more than 89.9% of the time according to the Air Quality Health Index and Air Quality Index.

Table 1. Annual average concentrations for continuous parameters for 2023

Pollutant	Conc. Unit	Annual Average Concentration for Continuous Data			
		Maidstone	Clavet	Kerrobert	Meadow Lake
SO_2	ppb	0.5	-	0.1	-
H_2S	ppb	0.3	-	0.2	-
NO	ppb	0.8	1.1	-	0.8
NO_2	ppb	4.2	3.6	-	3.1
NOx	ppb	4.9	4.7	-	4.0
O_3	ppb	-	28.7	-	27.7
$PM_{2.5}$	$\mu g/m^3$	15.5	5.3	8.8	12.1

"-": Parameter was not monitored. Red font refers to an exceedance of the Saskatchewan Ambient Air Quality Standards (SAAQS).

1.0 INTRODUCTION

The Western Yellowhead Air Management Zone (WYAMZ), established in 2012, is the second air management association in Saskatchewan. WYAMZ is a collaborative group of industry, government, non-government organizations, and private citizens. The WYAMZ design is in-line with the directive from the Canadian Council of Ministers of the Environment under the Canada-wide Air Quality Management System. The association is designed to collect credible, continuous real-time air quality information through collaborative efforts.

Figure 1 illustrates the WYAMZ zone which covers the west central region of the province. The air management zone encompasses an area from east of Saskatoon to the Alberta border, and from north of Meadow Lake to south of Rosetown. Major economic activities in the region include agriculture, oil and gas, mining, forestry, power generation, and transportation.

Membership in the WYAMZ is currently voluntary. The current membership includes members of the agriculture, chemistry, oil and gas, mining and power generation sectors, as well as the public. The Government of Saskatchewan Ministry of Environment, Ministry of Economy, as well as representatives of the City of Saskatoon, University of Saskatchewan, Prairie North Regional Health Authority and the Saskatchewan Environmental Society also participate as members of the Board of Directors. WYAMZ's budget consists of membership fees, environmental footprint, and emissions-based fees assessed to facilities operating within the air management zone.

1.1 WYAMZ Mission

The WYAMZ mission is to collect credible, scientifically defensible air quality data for west central Saskatchewan, and to make this data freely available to all stakeholders. The objective is to bring together stakeholders from all backgrounds to identify local air quality issues and to develop innovative solutions for managing these issues.

1.2 WYAMZ Air Monitoring Network

Figure 1 illustrates a map of the air monitoring stations in the WYAMZ region. Real-time data for these stations is available through the WYAMZ website or the Saskatchewan Ministry of Environment. There are seven continuous air monitoring stations in the region. The Meadow Lake City, Maidstone, Clavet and Kerrobert stations are owned and operated by WYAMZ; the Saskatoon NAPS station is owned and operated by the Ministry of Environment. The Cenovus East and West stations in Lloydminster are owned and operated by Cenovus.

WYAMZ operates four airpointers® at the Meadow Lake City, Maidstone, Clavet and Kerrobert stations. The network measures continuous data for sulphur dioxide (SO_2), hydrogen sulphide (H_2S), nitrogen oxides (NO, NO_2, NO_x), ozone (O_3), fine particulate matter ($PM_{2.5}$), ambient temperature (ET), relative humidity (RH), precipitation, wind speed (WS) and wind direction (WD). Table 2 presents a combination matrix of the monitoring stations and the measured parameters. The airpointers® have been operating since December 1, 2013. Publicly available real-time air monitoring data is available on the WYAMZ website at: www.wyamz.ca.

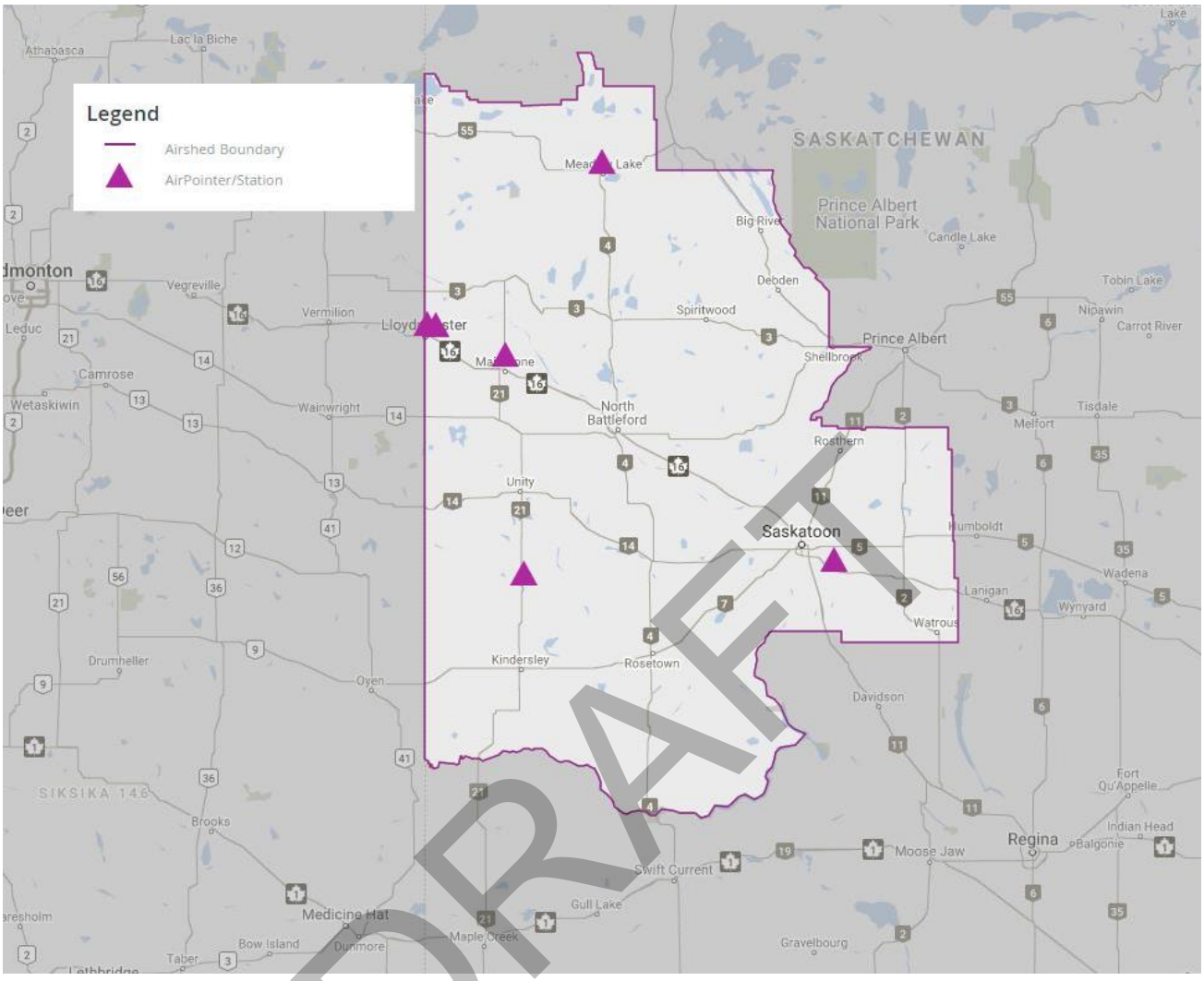


Figure 1. The Western Yellowhead Air Management Zone (WYAMZ) with the locations of the continuous air monitoring stations

Table 2.WYAMZ ambient air continuous monitoring stations and the measurement parameters

Monitoring Parameters	Continuous air quality parameters measured in the WYAMZ network			
	Maidstone	Clavet	Kerrobert	Meadow Lake City
SO_2	√	-	√	-
H_2S	√	-	√	-
NO	√	√	-	√
NO_2	√	√	-	√
NOx	√	√	-	√
O_3	-	√	-	√
$PM_{2.5}$	√	√	√	√
Precipitation	√	√	√	√
Ambient Temperature	√	√	√	√
Relative Humidity	√	√	√	√
Wind Speed	√	√	√	√
Wind Direction	√	√	√	√

"-": parameter was not monitored.

2.0 AIR QUALITY MONITORING

2.1 Summary of Exceedances above the SAAQS

The WYAMZ ambient air monitoring network measures air pollutant concentrations to indicate the general quality of air in the management zone. Comparing measured air quality data with the Saskatchewan Ambient Air Quality Standards guidelines ensures public and environmental health is not impaired. Air quality data is used to evaluate the trends in air quality resulting from emissions of anthropogenic sources (industry, motor vehicles, etc) and natural processes (such as forest fires, decomposition of organic matter, etc).

Table 3 summarizes the Saskatchewan Ambient Air Quality Standards (SAAQS) and the number of exceedances recorded in 2023. A total of three 24-hour $PM_{2.5}$ exceedances were recorded for the WYAMZ air monitoring network.

Table 3. Number of exceedance events for 2023

Parameter	No. of Stations	Average Type	SAAQS	No. of Exceedance
SO_2	2	1-hour	172 ppb	0
		24-hour	48 ppb	0
		Annual	8 ppb	0
H_2S	2	1-hour	11 ppb	0
		24-hour	3.6 ppb	0
NO_2	3	1-hour	159 ppb	0
		24-hour	106 ppb	0
		Annual	24 ppb	0
O_3	2	1-hour	82 ppb	0
		8-hour[a]	63 ppb	0
$PM_{2.5}$	4	24-hour[b]	28 µg/m^3	3
		Annual	10 µg/m^3	2

a. The 3-year average of the annual 4th-highest daily maximum 8-hour average concentrations, however the reported exceedances are just 8-hour averages higher than the SAAQS

b. The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations, however the reported exceedances are just 8-hour averages higher than the SAAQS

2.2 Wind

Wind speed and wind direction, as well as other meteorological parameters, are important factors that influence regional air quality. The diffusion and dispersion of air pollutant emissions are greatly impacted by variations in wind speed and corresponding air turbulence. Different degrees of turbulence are created by variable mixing conditions due to the vertical gradient of ambient temperatures and terrain roughness unique to each station.

Figure 2 presents the wind roses at the WYAMZ continuous monitoring stations. Generally, all station wind speeds were less than 7.8 kph.

The prevailing wind direction was not consistent among the four air monitoring stations. The Meadow Lake station was characterized with winds from the southeast and northwest quadrants. The Clavet station winds were primarily from the east and southwest quadrants. The Maidstone station was characterized with a prevalent wind from the northwest and southeast quadrants. Prevalent winds from the northwest, southwest and east were seen at the Kerrobert station.

The detailed frequency distribution table and wind rose are presented in the Appendices: Table B-11, Table C-10, Table D-8, and Table E-10.

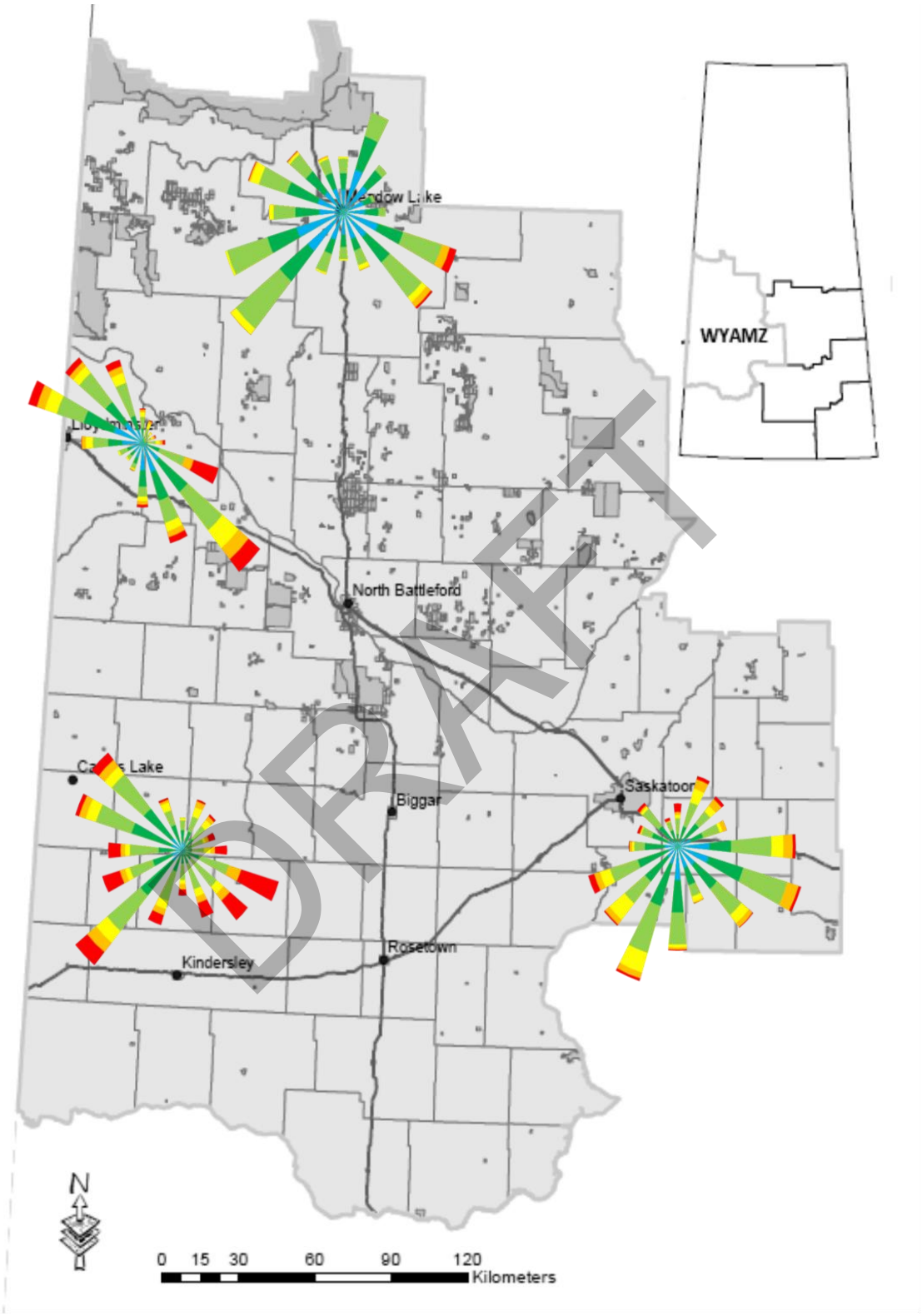


Figure 2: Wind roses for 1-hour average wind data for 2023

2.3 Continuous Air Quality Data

2.3.1 Sulphur Dioxide (SO_2)

Sulphur dioxide (SO_2) is a colourless gas with a strong suffocating odour. It smells like burnt matches. At concentrations above 300 ppb, it can be detected by taste and odour. The health effects caused by exposure to high levels of SO_2 include breathing problems, respiratory illness, changes in lung function, and worsening respiratory and cardiovascular disease. People with asthma or chronic lung or heart disease are the most susceptible to SO_2. SO_2 also damages trees and crops.

SO_2, along with nitrogen oxides, are the main precursors of photochemical smog and acid rain, which contributes to the acidification of lakes and streams, accelerated corrosion of buildings, and reduced visibility. SO_2 in the air can form microscopic acid aerosols, which have serious health implications, as well as, contributing to climate change.

Anthropogenic SO_2 emission sources are primarily from combustion of sulphur containing fuels (e.g. gasoline, natural gas and coal) and processing of sulphur containing ores. The major emission sources for SO_2 include large industrial sources such as power plants, petroleum refineries, iron and steel mills, fertilizer plants, pulp and paper mills, and smelters, as well as small industries, such as small oil and gas plants and battery and well flares.

The Saskatchewan Ambient Air Quality Standards (SAAQS) for sulphur dioxide are:

- 1-hour average SAAQS = 172 ppb
- 24-hour average SAAQS = 48 ppb
- Annual average SAAQS = 8 ppb

Table 4 presents the summary statistics for SO_2 measurement results. The measured concentrations were low at both stations. The concentrations for 2023 were 0.5 ppb and 0.1 ppb at the Maidstone and Kerrobert stations, respectively. Maidstone had the higher concentration of the two stations, with a maximum 1-hour average concentration of 18.8 ppb and a maximum 24-hour average concentration of 5.9 ppb. There were no exceedances of the SAAAQS for 1-hour, 24-hour, and annual average concentrations at either stations (see Table 5).

Figure 3 and Figure 4 present the pollutant roses for 1-hour average concentrations for SO_2 at Maidstone and Kerrobert stations. For more than 88% of the time, the SO2 concentration was less than or equal to 1 ppb (blue petals); the concentration seldom exceeded 1 ppb (green petals). The higher concentration events (>1 ppb) tended to be detected more frequently when wind was from the southeast quadrant for Maidstone and northwest quadrant for Kerrobert.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table B-2 and Table D-2.

Table 4. Summary statistics for SO_2 measurement results for 2023

Monitoring Station	Annual Average	Instrument Uptime	Maximum SO_2 Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
	ppb	%	ppb	Time	ppb	Date
Maidstone	0.5	99.6%	18.8	Jan 10 07:00	5.9	Jan 10
Kerrobert	0.1	66.5%	2.3	Mar 19 12:00	1.1	Mar 19

Red font means an operational time of less than 90%.

Table 5. Number of exceedance events for SO2 for 2023

Monitoring Station	No. of Exceedance of Saskatchewan SO_2 Ambient Air Quality Standard (SAAQS)		
	1-hr SAAQS	24-hr SAAQS	Annual SAAQS
	172 ppb	48 ppb	8 ppb
Maidstone	0	0	0
Kerrobert	0	0	0

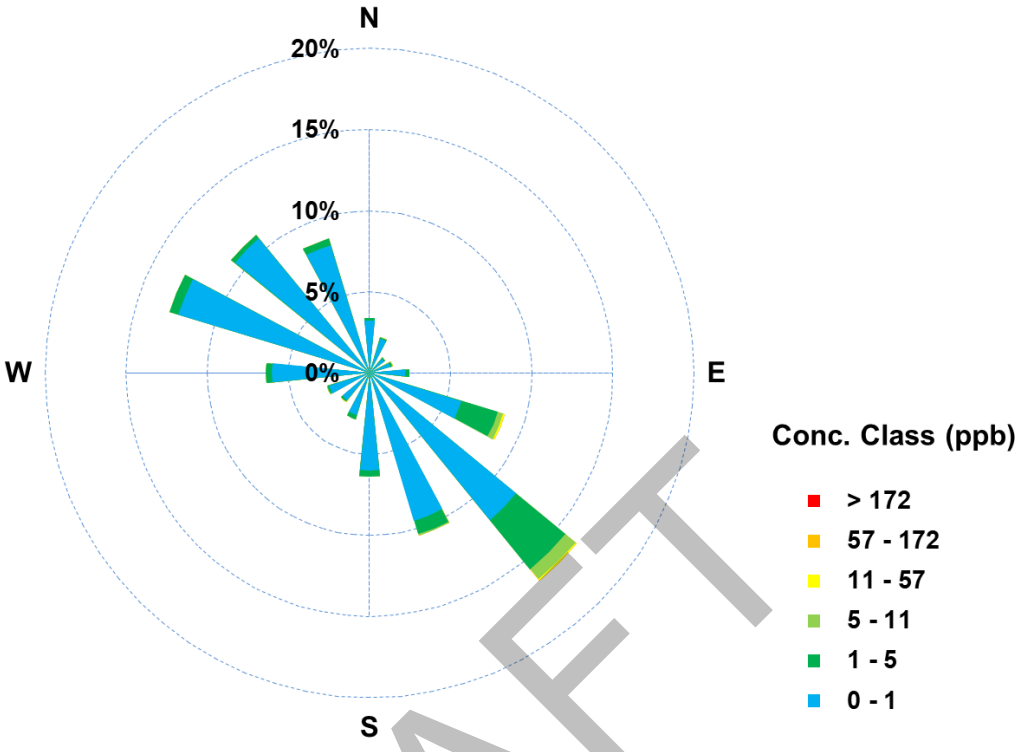


Figure 3: Pollutant rose for 1-hour average SO_2 data at the Maidstone Station

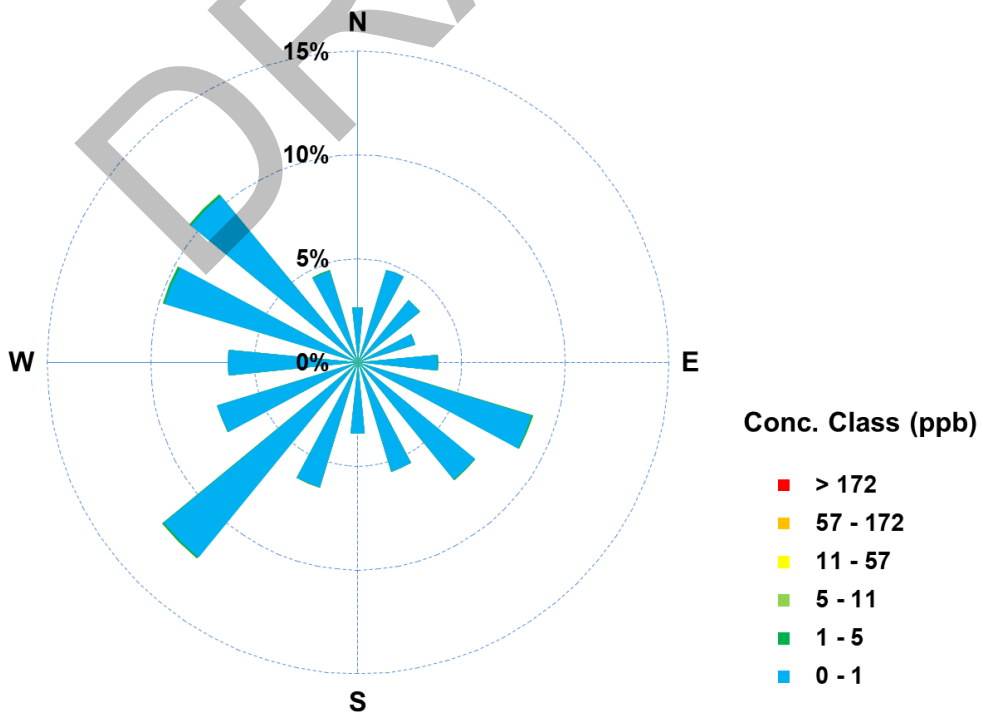


Figure 4: Pollutant rose for 1-hour average SO_2 data at the Kerrobert Station

2.3.2 Hydrogen Sulphide (H_2S)

Hydrogen sulphide (H_2S) is a colourless gas with a characteristic "rotten egg" odour. It is produced both naturally and through anthropogenic emission sources. H2S occurs naturally in coal, crude oil, natural gas, oil, sulphur hot springs, volcanic gases, sloughs, swamps and lakes. The major anthropogenic emission sources include natural gas and petroleum production, wastewater treatment, pulp and paper mills, rayon textile manufacturing, and tar and asphalt manufacturing. Decomposition of organic matter by bacteria under anaerobic conditions releases H_2S as well, forming the characteristic odour commonly associated with sewers, sewage lagoons, and swamps.

Hydrogen sulphide is a highly toxic and flammable gas. It is heavier than air and tends to accumulate at the bottom of poorly ventilated spaces. Although very pungent at first, it quickly deadens the sense of smell. Potential victims may be unaware of its presence until it is too late.

The Saskatchewan Ambient Air Quality Standards (SAAQS) for hydrogen sulphide are:

- 1-hour average SAAQS = 11 ppb
- 24-hour average SAAQS = 3.6 ppb

Table 6 presents the summary statistics for H_2S measurement results. The measured concentrations were low at both stations; the average concentration for 2023 was 0.3 ppb at Maidstone and 0.2 ppb at Kerrobert. Maidstone had the higher concentration of the two stations with a maximum 1-hour average concentration of 7.6 ppb and a maximum 24-hour average concentration of 2 ppb. There were no exceedances of the SAAAQS for 1-hour average concentration at the either station (see Table 7). Operational uptimes were less than 90% at Kerrobert (69.1%).

Figure 5 and Figure 6 present the pollutant roses for 1-hour average H_2S for Maistone and Kerrobert stations. For more than 96% of time, H2S concentration was less than or equal to 1 ppb (blue petals) at both stations. The higher concentrations (>1 ppb) at the Maidstone station tend to be slightly more frequent when wind was from the northwest and southeast directions. The higher concentration events at the Kerrobert station tend to be slightly more frequent when wind was from the northwest and southwest quadrant, however the sample size was small.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table B-3 and Table D-3.

Table 6. Summary statistics for H2S measurement results for 2023

Monitoring Station	Annual Average	Instrument Uptime	Maximum H_2S Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
	ppb	%	ppb	Time	ppb	Date
Maidstone	0.3	99.6%	7.6	Jan 02 04:00	2.0	Jan 2
Kerrobert	0.2	69.1%	2.6	May 09 00:00	0.6	May 5

Red font means an operational time of less than 90%.

Table 7. Number of exceedance events for H2S for 2023

Monitoring Station	No. of Exceedances of Saskatchewan H_2S Ambient Air Quality Standard (SAAQS)	
	1-hr SAAQS	24-hr SAAQS
	11 ppb	3.6 ppb
Maidstone	0	0
Kerrobert	0	0

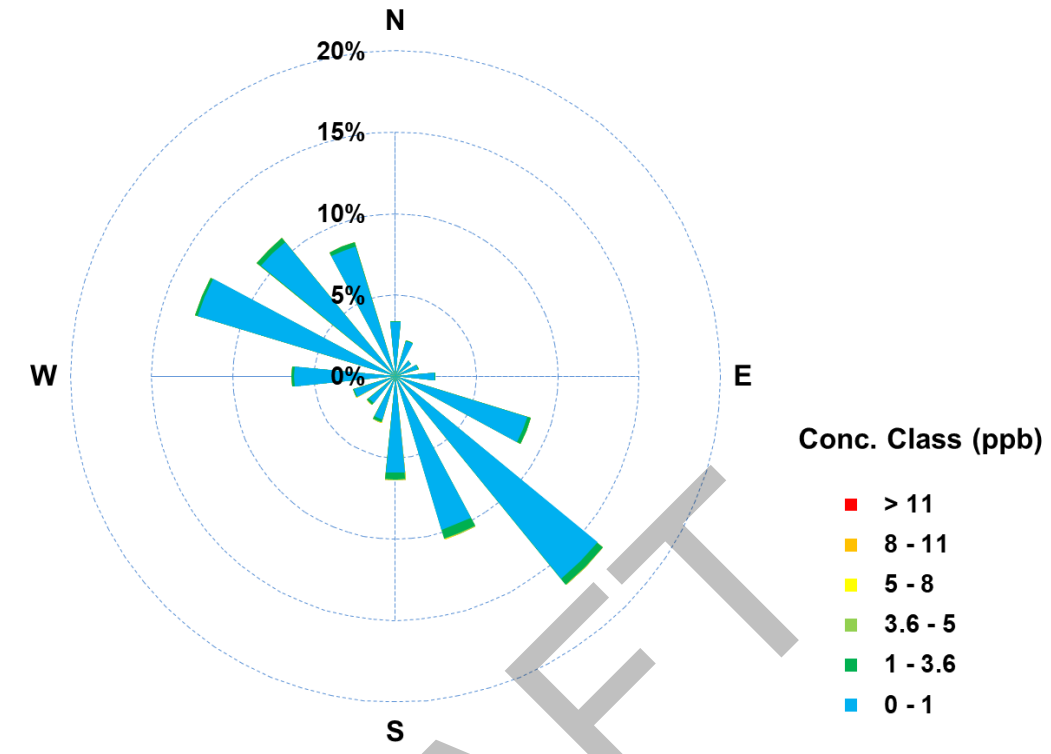


Figure 5: Pollutant rose for 1-hour average H_2S data at the Maidstone Station

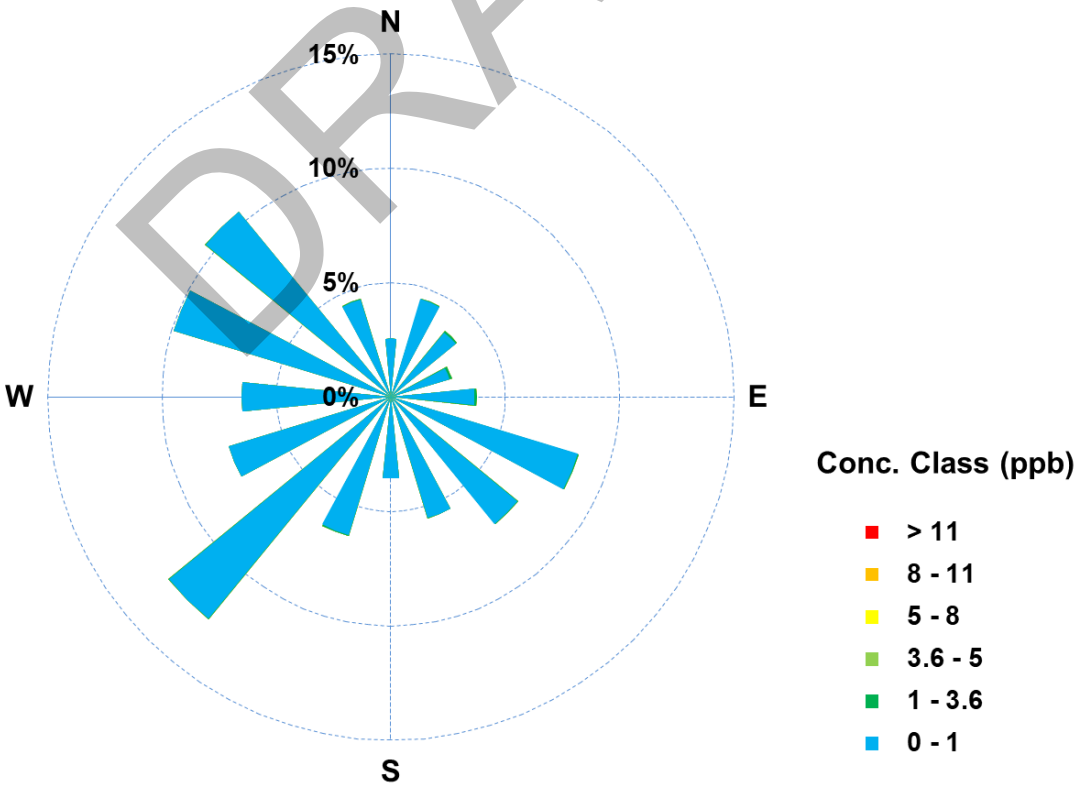


Figure 6: Pollutant rose for 1-hour average H_2S data at the Kerrobert Station

2.3.3 Oxides of Nitrogen (NO_x)

Nitrogen oxides, also known as oxides of nitrogen (NO_X), is a collective term for nitric oxide (NO) and nitrogen dioxide (NO_2). Nitric oxide is a colourless, flammable gas with a slight odour. Nitrogen dioxide is a reddish brown, non-flammable gas with a pungent irritating odour. NO_2 is of more interest than NO from both a health and acid rain perspective.

NO_X can cause respiratory disease, damage vegetation, and reduce visibility. The primary concern with NO_X emissions is their contribution to formation of ground-level ozone, smog and acid rain. To a lesser extent, some NO_X compounds (e.g. N_2O) contribute to stratospheric ozone layer depletion and global warming.

NO_X emissions are mainly produced by fossil fuel combustion. High temperature conditions during combustion result in the formation of NO_X as a by-product. The major anthropogenic emission sources for NO_X are associated with fuel combustion, including both stationary sources, such as power plants, oil and gas industries, incinerators, as well as mobile sources such as automobiles. Non-combustion sources, for example nitric acid manufacture, welding processes and the use of explosives, comprise the smaller emission sources. In large cities, motor vehicle emissions are the major source of NO_X, as well as space heating emissions in the winter.

The Saskatchewan Ministry of Environment regulates ambient air concentration for nitrogen dioxide. The Saskatchewan Ambient Air Quality Standards (SAAQS) for NO_2 are:

- 1-hour average SAAQS = 159 ppb
- 24-hour average SAAQS = 106 ppb
- Annual average SAAQS = 24 ppb

Table 8 presents the summary statistics for NO_2 measurement results. The Clavet station measured a higher annual concentration than the other two stations, with an annual average of 5.4 ppb. The average concentration recorded at the Maidstone station was 4.1 ppb and 3.1 ppb at Meadow Lake City station. Meadow Lake had the higher 1-hour and 24-hour concentrations of the three stations with a maximum 1-hour average concentration of 45.8 ppb and the maximum 24-hour average concentration of 20.0 ppb. There were no exceedances of the 1-hour, 24-hour and annual SAAQS for all stations (see Table 9). Operational uptimes were less than 90% at Maidstone (62.7%) and Clavet (77.2%).

Figure 7 to Figure 9 present the pollutant roses for 1-hour average concentrations for NO_2 at Clavet, Maidstone and Meadow Lake stations. The concentration at the Meadow Lake station was the lowest among the three stations; for more than 82.0% of the time NO_2 concentration was less than 5 ppb. The >5 ppb events tended to be slightly more frequent when wind was from the southwest and southeast quadrants. At the Clavet station, 21.7% of the time NO_2 concentration was higher than 5 ppb. The >5 ppb events tended to be more frequent when

wind was from the southwest, southeast and east directions. The NO_2 concentration was greater than 5 ppb at the Maidstone station 27.9% of the time; these events tend to be more frequent when wind was from the northwest and southeast quadrants. In addition to the directional trends, the regular seasonal cycle of generally higher concentrations in the winter and lower in the summer was observed.

The detailed frequency distribution tables for the NO, NO_2 and NOx pollutant roses are presented in the Appendices: Tables B-4 to B-6, Tables C-2 to C-4, and Tables E-2 to E-4.

Table 8. Summary statistics for NO_2 measurement results for 2023

Monitoring Station	Annual Average	Instrument Uptime	Maximum NO_2 Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
	ppb	%	ppb	Time	ppb	Date
Maidstone	4.1	62.7%	29.6	Mar 01 14:00	17.0	Jan 5
Clavet	5.4	77.2%	35.6	Mar 17 05:00	12.6	Jan 9
Meadow Lake	3.1	92.2%	45.8	Feb 08 08:00	20.0	Jan 3

Red font means an operational time of less than 90%.

Table 9. Number of exceedance events for NO_2 for 2023

Monitoring Station	No. of Exceedances of Saskatchewan NO_2 Ambient Air Quality Standard (SAAQS)		
	1-hr SAAQS	24-hr SAAQS	Annual SAAQS
	159 ppb	106 ppb	24 ppb
Maidstone	0	0	0
Clavet	0	0	0
Meadow Lake	0	0	0

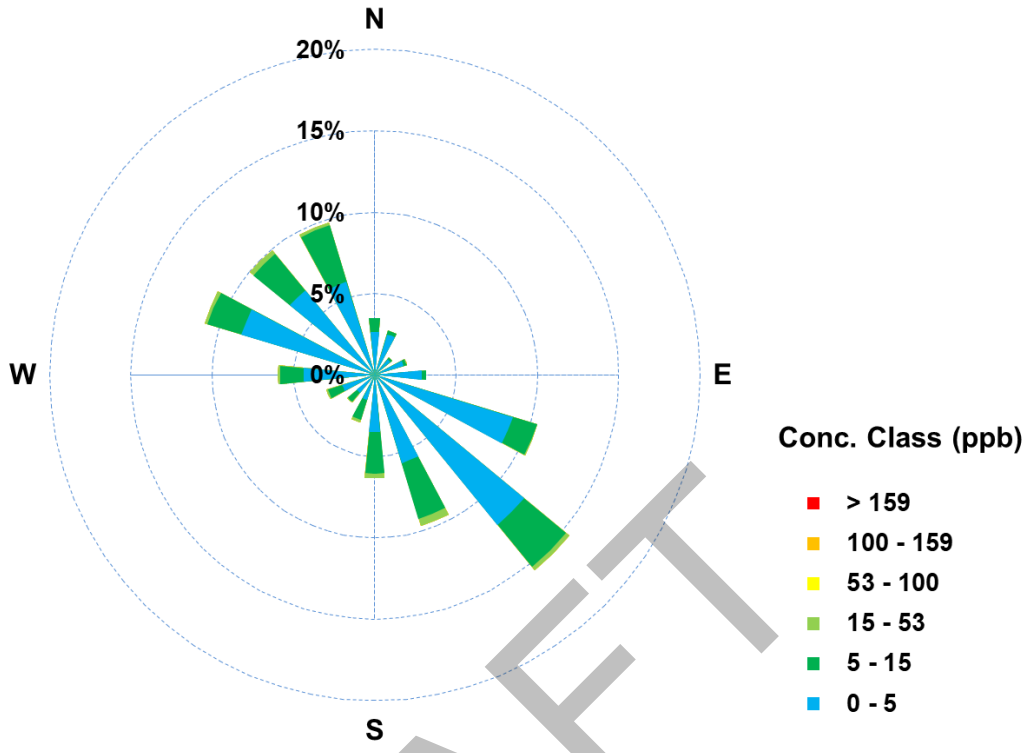


Figure 7: Pollutant rose for 1-hour average NO_2 data at the Maidstone Station

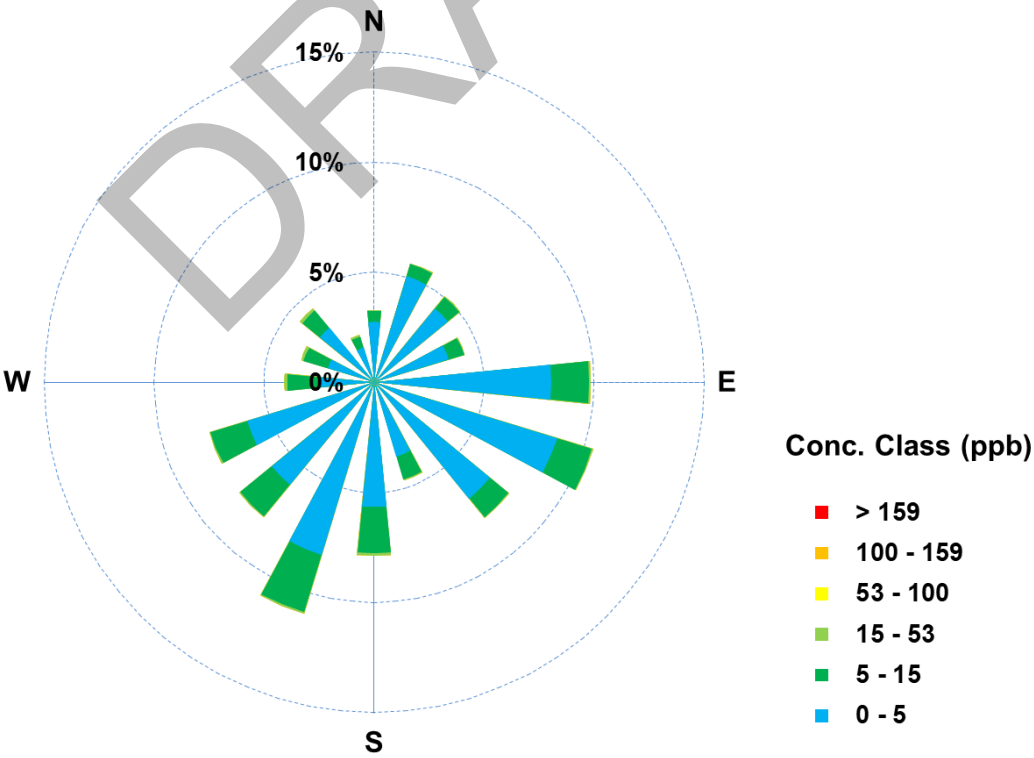


Figure 8: Pollutant rose for 1-hour average NO_2 data at the Clavet Station

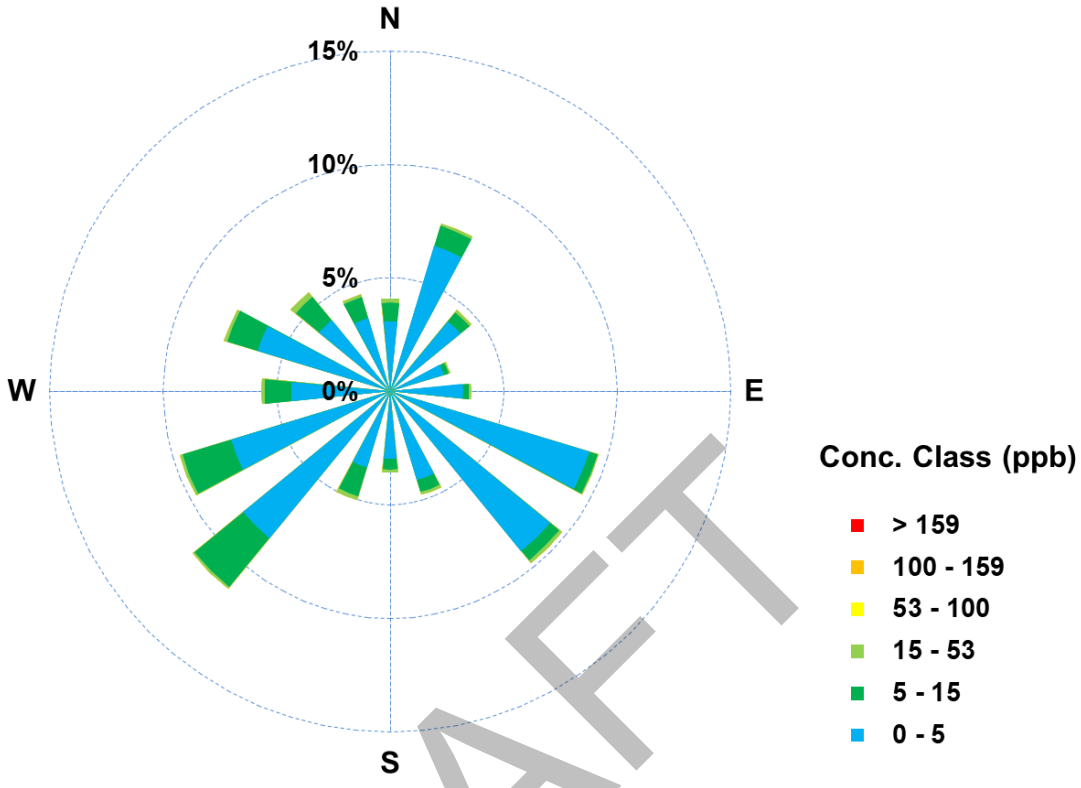


Figure 9: Pollutant rose for 1-hour average NO_2 data at the Meadow Lake Station

2.3.4 Ozone (O_3)

Ozone (O_3) is a pale blue gas, slightly soluble in water. Most people can detect a sharp odour resembling chlorine bleach at about 10 ppb concentration. Ozone can be formed by electrical discharges and high energy electromagnetic radiation. In the indoor environments, ozone can be present as a result of electronic equipment such as ionic air purifiers, laser printers, photocopiers, and arc welders.

In the ambient air, O_3 is a "secondary" pollutant, meaning it is not directly emitted from a source. Instead, ozone is produced from photochemical reactions between oxides of nitrogen (NO_X) and volatile organic compounds (VOC) in the presence of sunlight. Some research suggests that ground-level ozone could be from intrusion of ozone from the stratosphere, mixing from the upper troposphere, local photochemistry and the medium and long-range transport. There are split opinions regarding relative importance of these mechanisms. A study in Regina suggested that high ozone events could be due to downward transport from the stratosphere.

Exposure to ozone has been linked to premature mortality and a range of morbidity health end-points, such as hospital admissions and asthma symptoms. Acute exposure to high concentrations of ozone can cause eye irritation and breathing difficulty. Ozone can significantly impact vegetation and decrease the productivity of some crops. It damages cotton, acetate, nylon, polyester and other textile materials. Ozone can also damage other synthetic materials, cause cracks in rubber, accelerate fading of dyes, and speed deterioration of some paints and coatings.

The Saskatchewan Ambient Air Quality Standard (SAAQS) for ozone is:

- 1-hour average SAAQS = 82 ppb
- 8-hour average SAAQS = 63 ppb; based on the 3-year average of the annual 4th- highest daily maximum 8-hour average concentrations.

Table 10 presents the summary statistics for O_3 measurement results. The average concentration in 2023 was 30 ppb and 28 ppb respectively for Clavet and Meadow Lake stations. Clavet had the higher 1-hour and 8-hour concentrations of the two stations with a maximum 1-hour average concentration of 67 ppb and the maximum 8-hour average concentration of 64 ppb. There were no 8-hour running averages higher than the SAAQS (see Table 11) recorded at Clavet. Operational uptimes were less than 90% at Clavet (77.4%) and Meadow Lake (69.9%).

Figure 10 to Figure 11 present the pollutant roses for 1-hour average concentration of O_3 for Clavet and Meadow Lake. The measured concentrations were within the 20 ppb to 40 ppb range for 50-58% of the time at both stations. At Clavet the >40 ppb events tended to be more frequent when wind was from the southeast and northwest directions. There was no apparent

directional trend for the higher concentration events (>40 ppb) at Meadow Lake. The regular seasonal cycle of generally higher concentrations in the spring months was observed.

The detailed frequency distribution table for the pollutant roses are presented in the Appendices: Table C-5 and Table E-5.

Table 10. Summary statistics for O_3 measurement results for 2023

Monitoring Station	Annual Average	Instrument Uptime	Maximum O_3 Concentration			
			1-hour Max.		8-hour Max.	
	ppb	%	ppb	Date	ppb	Date
Clavet	28.7	77.4%	67.3	Jun 12 17:00	65.4	Mar 23 13:00
Meadow Lake	27.7	69.9%	60.4	May 08 21:00	58.0	May 08 14:00

Red font means an operational uptime of less than 90%

Table 11. Exceedance events for O_3 for 2023

Monitoring Station	$PM_{2.5}$ Ambient Air Quality Standard (SAAQS) Comparison			
	1-hour		8-hour (ppb) [a]	
	SAAQS	No. of Exceedances	SAAQS	No. of Exceedances
Clavet	82	0	63	14
Meadow Lake		0		0

a. These events do not constitute an exceedance because the CWS standard is based on the 4th highest measurement annually, averaged over three consecutive years.

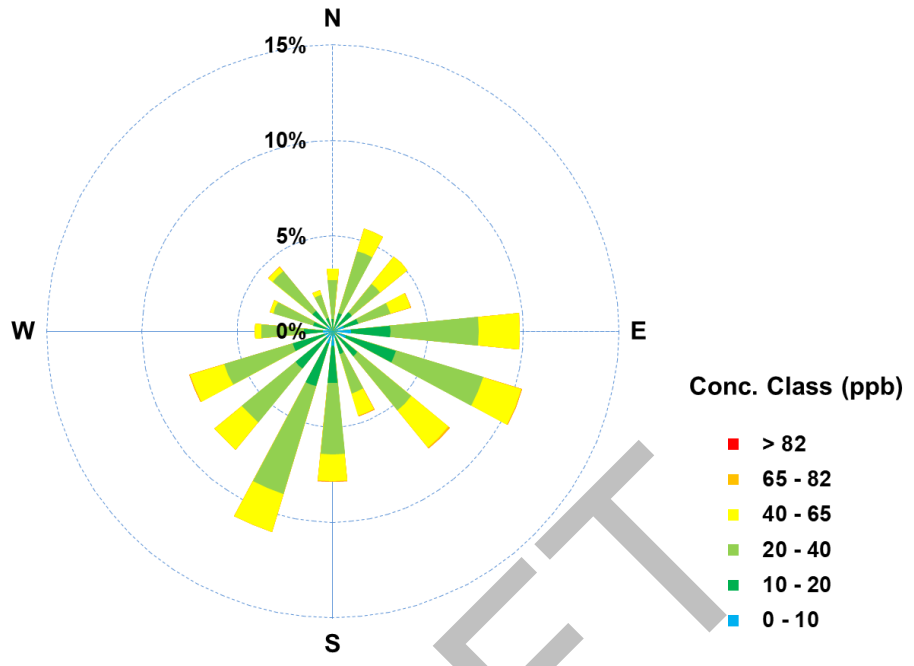


Figure 10: Pollutant rose for 1-hour average O_3 data at the Clavet Station

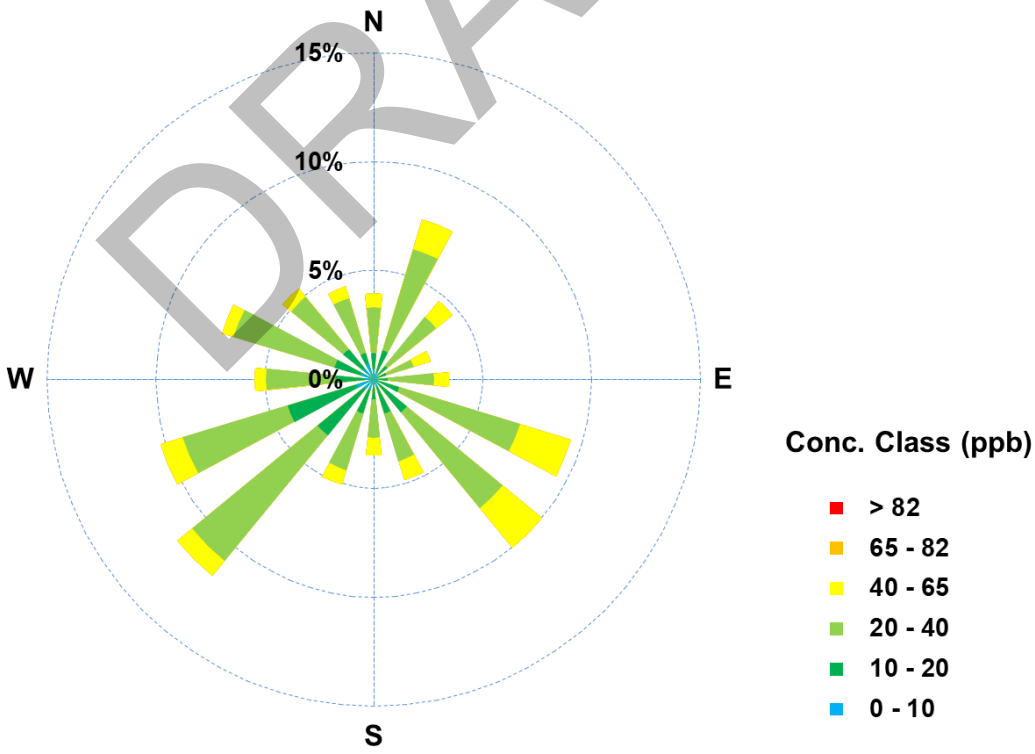


Figure 11: Pollutant rose for 1-hour average O_3 data at the Meadow Lake Station

2.3.5 Fine Particulate Matter ($PM_{2.5}$)

Particulate matter is unique among air pollutants, as it is identified by its size rather than by its composition. The major concern for particulate matter deals with small particles referred to as inhalable particulate, or PM_{10}. PM_{10} is defined as particles that have an aerodynamic diameter less than 10 microns (or 0.01 mm). PM_{10} can be divided into two groups of particles based on size: fine particles and coarse particles. The fine particles are those particles with an aerodynamic diameter smaller than 2.5 microns (0.0025 mm) and are identified as $PM_{2.5}$. In contrast, coarse particles are those with aerodynamic diameter greater than 2.5 microns and less than 10 microns.

Fine particles are generally emitted from activities such as industrial and residential combustion, and from vehicle exhaust. Fine particles are also formed in the atmosphere when gases such as sulphur dioxide, nitrogen oxides, and volatile organic compounds, emitted by combustion activities, are transformed by chemical reactions in the air.

Adverse health effects from breathing air with a high $PM_{2.5}$ concentration include: premature death, increased respiratory symptoms and disease, chronic bronchitis, and decreased lung function particularly for individuals with asthma. Particulate matter can clog stomatal openings of plants and interfere with photosynthesis functions, leading to growth stunting or mortality in some plant species.

The Saskatchewan Ambient Air Quality Standard (SAAQS) for fine particulate matter ($PM_{2.5}$):

- 28 µg/m^3 averaged over a 24-hour period from midnight to midnight; the standard is based on the 98th percentile annually, averaged over three consecutive years.
- Annual average SAAQS = 10 µg/m^3

Table 12 presents the summary statistics for $PM_{2.5}$ measurement results. The average concentration in 2023 ranged between 5 and 16 µg/m^3. Maidstone had the higher 1-hour and 8-hour concentrations of the four stations with a maximum 1-hour concentration of 954 µg/m^3 and the maximum 24-hour concentration of 364 µg/m^3. All stations except for Clavet had a 24-hour exceedance and Maidstone and Meadow Lake had an annual exceedance (see Table 13). Operational uptimes were less than 90% at Maidstone (78.5%), Kerrobert (71.2%) and Clavet (66.6%).

Figure 12 to Figure 15 present the pollutant roses for $PM_{2.5}$ measurement results at Maidstone, Clavet, Kerrobert and Meadow Lake. The measured concentrations were mostly less than 10 µg/m^3 (61.9% to 80.8% of the time for the four stations). Winds from the east and northeast were more prevalent with higher concentration events (>10 µg/m^3) for the Clavet station, while a higher occurrence frequency was observed in summer months due to forest fires. Higher concentration events at Maidstone occur more frequently with northwest and southeast wind and Kerrobert occur more frequently when the wind was from the northwest, southwest and

southeast. Highest concentrations were detected when the wind was from the southwest, southeast and northeast at the Meadow Lake station.

The detailed frequency distribution tables for the pollutant roses are presented in the Appendices: Table B-7, Table C-5, Table D-4, and Table E-6.

Table 12. Summary statistics for $PM_{2.5}$ measurement results for 2023

Monitoring Station	Annual Average	Instrument Uptime	Maximum $PM_{2.5}$ Conc. and Occurrence Time			
			1-hour Max.		24-hour Max.	
	µg/m^3	%	µg/m^3	Time	µg/m^3	Date
Maidstone	15.5	78.5%	954.0	May 20 11:00	363.9	May 20
Kerrobert	8.8	71.2%	269.6	May 20 19:00	138.9	Sep 3
Clavet	5.3	66.6%	466.5	May 16 22:00	35.4	May 16
Meadow Lake	12.1	97.8%	454.1	May 20 08:00	216.5	Sep 3

Red font means an operational time of less than 90%.

Table 13. Exceedance concentrations for $PM_{2.5}$ for 2023

Monitoring Station	$PM_{2.5}$ Ambient Air Quality Standard (SAAQS) Comparison			
	24-hr (µg/m^3) [a]		Annual (µg/m^3)	
	SAAQS	No. of Exceedances	SAAQS	No. of Exceedances
Maidstone	28	32	10	1
Kerrobert		10		0
Clavet		8		0
Meadow Lake		31		1

a. 24-hour concentration that is greater than 28 µg/m^3 is not considered an exceedance, as per the SAAQS. An exceedance only occurs when the standard is compared to the 3-year (2021-2023) average of the annual 98th percentile of daily 24-hour average concentrations.

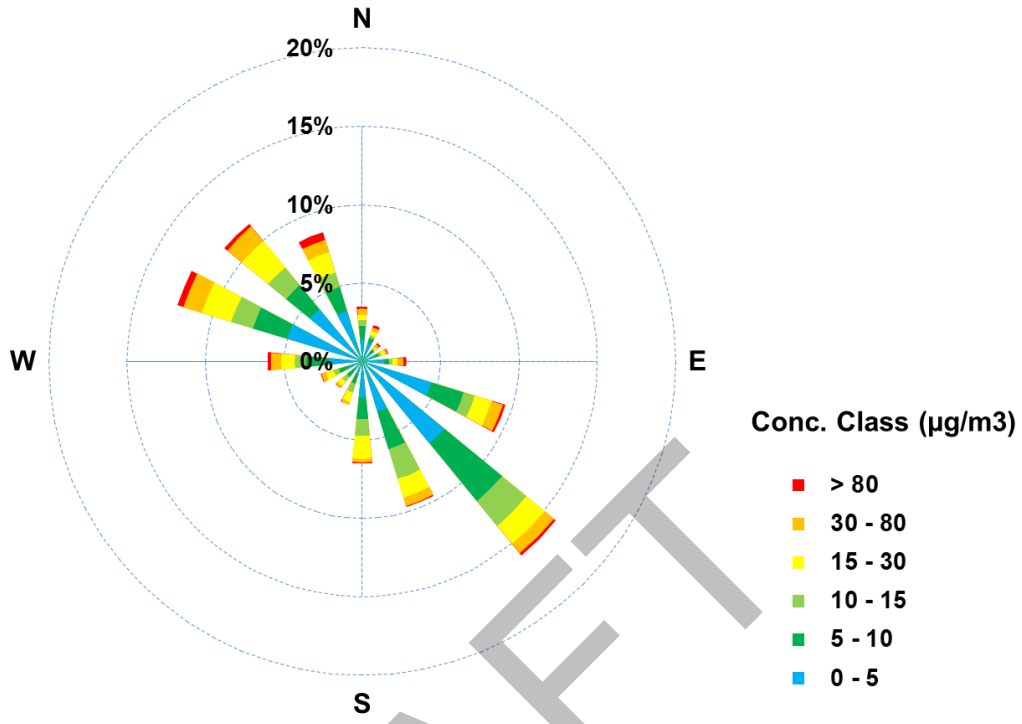


Figure 12: Pollutant rose for 1-hour average $PM_{2.5}$ data at the Maidstone Station

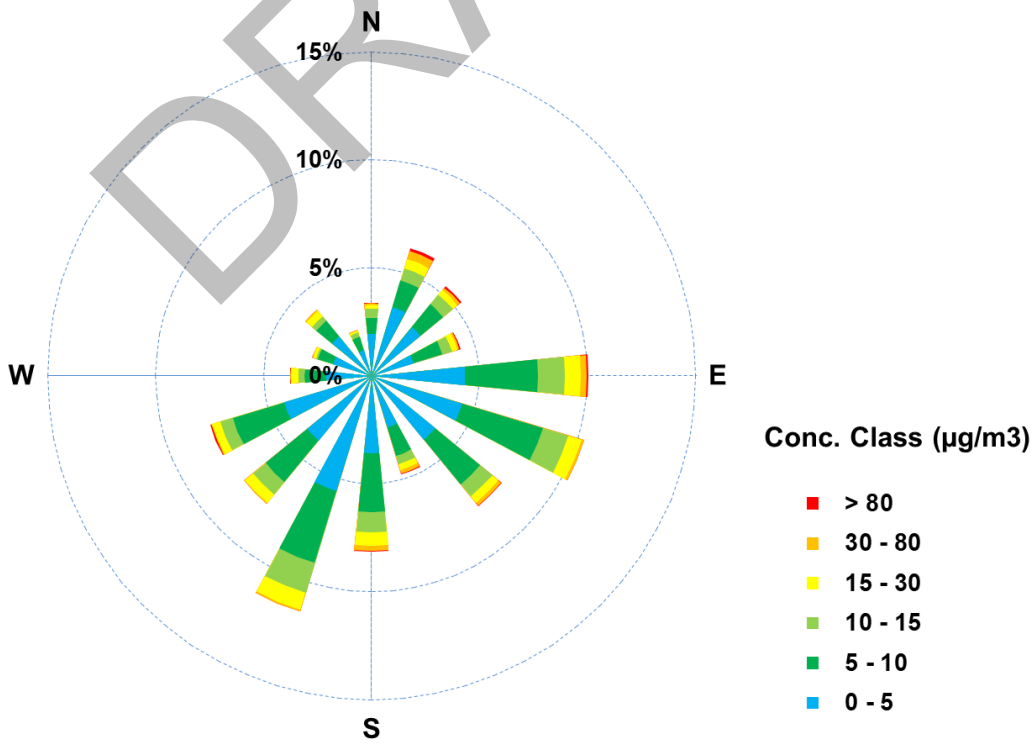


Figure 13: Pollutant rose for 1-hour average $PM_{2.5}$ data at the Clavet Station

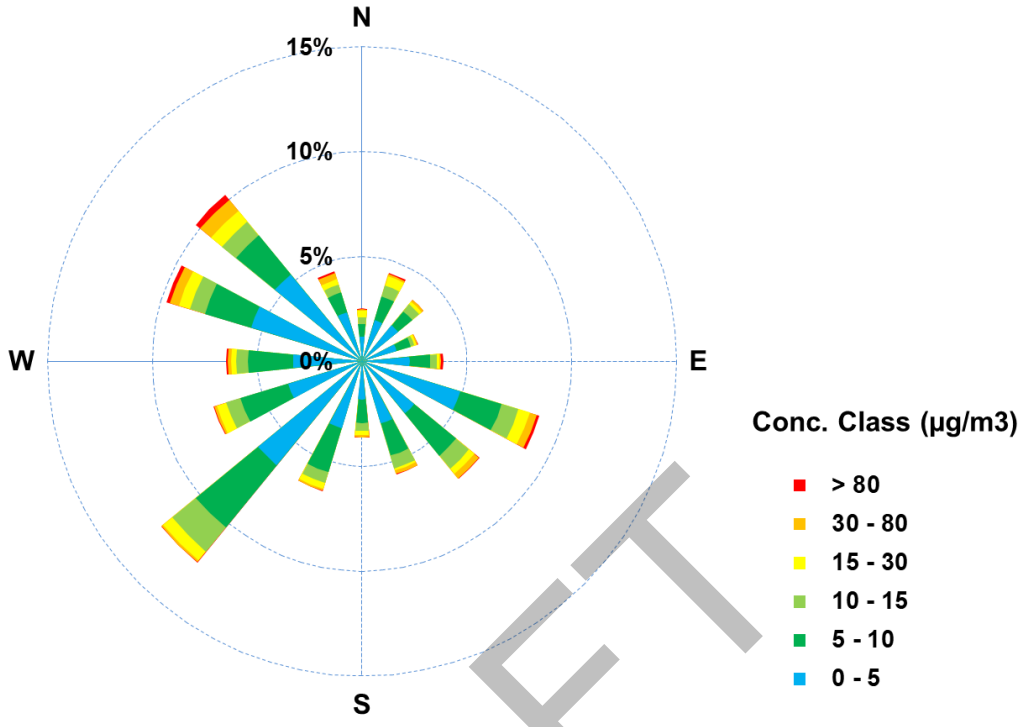


Figure 14: Pollutant rose for 1-hour average $PM_{2.5}$ data at the Kerrobert Station

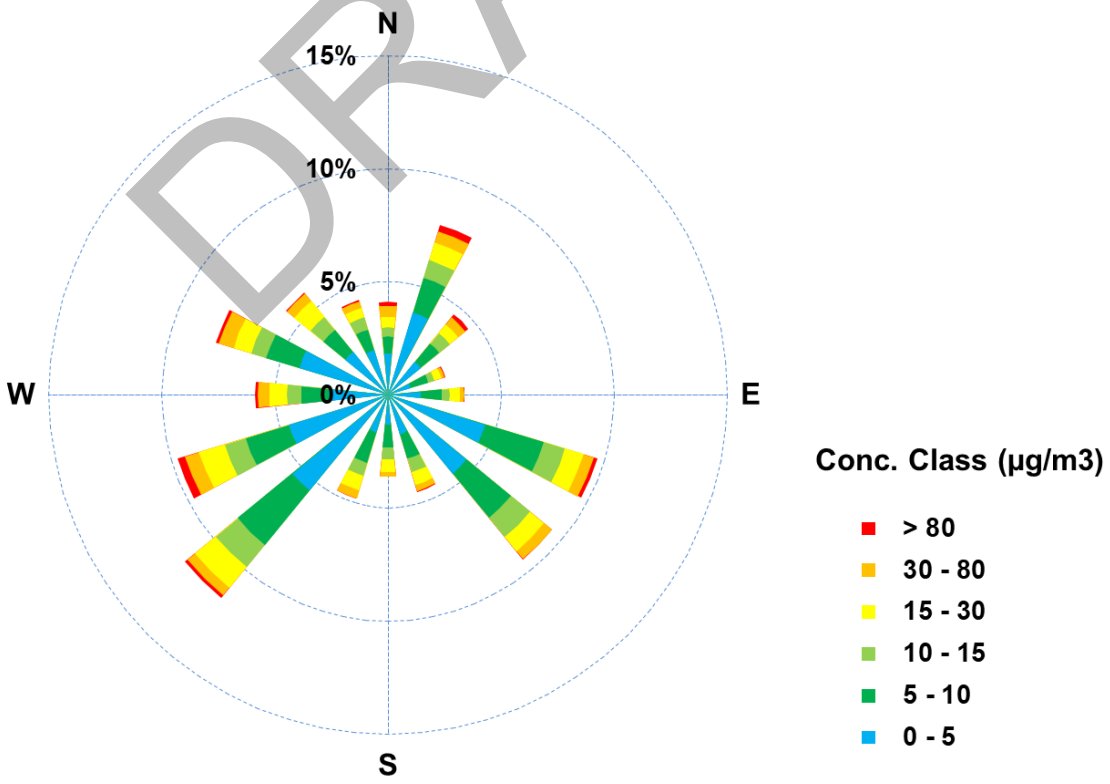


Figure 15: Pollutant rose for 1-hour average $PM_{2.5}$ data at the Meadow Lake Station

2.4 Air Quality Health Index (AQHI)

The Air Quality Health Index (AQHI) is a health protection tool that is designed to help the public make decisions to protect their health by limiting short-term exposure to air pollution and adjusting their activity levels during increased levels of air pollution. The AQHI uses readings from three air pollutants to calculate a single numerical value to evaluate the health risk associated with air pollution. The three pollutants are fine particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2), and ground-level ozone (O_3). All three pollutants are required to calculate AQHI. Among the WYAMZ air monitoring stations, Meadow Lake and Clavet are eligible for AQHI reporting.

Figure 16 illustrates the risk categories and the health messages for the AQHI system. The health risk is classified in four categories: Low Risk (1 to 3), Moderate Risk (4 to 6), High Risk (7 to 10), and Very High Risk (higher than 10).

Table 14 summarizes the summary statistics for AQHI rating. The air quality at both stations was rated Low Risk most of the time. The Meadow Lake station had 4% of time in the Moderate Risk, and no readings in the High-Risk and Very High-Risk categories. The Clavet station had 7% of time in the Moderate Risk category, 0.3% in the High-Risk category and 0.2% in the Very-High Risk category.

Health Risk	Air Quality Health Index	Health Messages	
		At Risk Population	General Population
Low Risk	1 – 3	**Enjoy** your usual outdoor activities.	**Ideal** air quality for outdoor activities.
Moderate Risk	4 – 6	**Consider** reducing or rescheduling strenuous activities outdoors if you are experiencing symptoms.	**No need to modify** your usual outdoor activities unless you experience symptoms such as coughing and throat irritation.
High Risk	7 – 10	**Reduce or reschedule** strenuous activities outdoors. Children and the elderly should also take it easy.	**Consider** reducing or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.
Very High Risk	Above 10	**Avoid** strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.	**Reduce or reschedule** strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation.

Source: Environment Canada. http://www.ec.gc.ca/cas-aqhi/default.asp?Lang=En

Figure 16: Health risk classification and health messages for Air Quality Health Index (Environment Canada)

Table 14. Summary of occurrence statistics for AQHI rating

Station Name	Occurrence Statistics	Occurrence Hours and Frequency by AQHI Risk Rating			
		Low Risk	Moderate Risk	High Risk	Very High Risk
Meadow Lake City	Occurrence Hours	5750	226	17	30
	Occurrence Frequency	95%	4%	0%	0%
Clavet	Occurrence Hours	5382	409	18	13
	Occurrence Frequency	92%	7%	0.3%	0.2%

2.5 Air Quality Index (AQI)

The Maidstone station does not meet the reporting requirements for AQHI, the Air Quality Index (AQI) is used as an alternative index. The Kerrobert station is excluded from index analysis because this station does not meet the reporting requirements of either index system.

The Air Quality Index (AQI) is a system developed to provide the public with a meaningful and comparable measure of air quality. The AQI uses readings from five major air pollutants: SO_2, NO_2, O_3, $PM_{2.5}$, and carbon monoxide (CO), to calculate the AQI. A minimum of three pollutants is required. The AQI is rated in four categories: Good (0 to 25), Fair (26 to 50), Poor (51 to 100), and Very Poor (>100). Table 15 summarizes the effects associated with the AQI ratings.

Table 16 summarizes the occurrence statistics for AQI rating. The air quality at the Maidstone station was rated 89.9% Good, 7.5% Fair, 1.9% High-Risk and 0.7% Very High-Risk. The Fair and Poor air quality was associated with an increased $PM_{2.5}$ concentration.

Table 15. AQI rating and effect description

AQI	Air Quality Rating	Effect Description
0 – 25	Good	Desirable Range: No known harmful effects to soil, water, vegetation, animals, materials, visibility or human health. The long-term goal is for air quality to be in this range all of the time in Canada.
26 – 50	Fair	Acceptable Range: Adequate protection against harmful effects to soil, water, vegetation, animals, materials, visibility and human health.
51 – 100	Poor	Tolerable Range: Not all aspects of human health or the environment are adequately protected from possible adverse effects. Long-term control action may be necessary, depending on the frequency, duration and circumstances of the readings.
>100	Very Poor	Intolerable Range: Continued high readings could pose a risk to public health.

Table 16. Summary of occurrence statistics for AQI rating

Station Name	Occurrence Statistics	Occurrence Hours and Frequency by AQI Rating			
		Good	Fair	Poor	Very Poor
Maidstone	Occurrence Hours	3520	293	74	28
	Occurrence Frequency	89.9%	7.5%	1.9%	0.7%

2.6 QAQC Program

The WYAMZ contracts WSP Canada Inc. (WSP) to manage station maintenance, data validation and reporting. WSP follows standard operating procedures (SOPs) that ensure credible and scientifically defensible air quality data is recorded. The SOPs follow protocols laid out in the Saskatchewan Air Monitoring Guideline (AMG) and the Alberta Air Monitoring Directive (AMD).

WSP's quality assurance and quality control (QAQC) programs are highlighted in the SOPs and ensures multiple levels of review are present. For more information, please contact Sofia Castillo at sofia.castillo@wsp.ca.

APPENDIX A

Saskatchewan Ambient Air Quality Standards

TABLE 20: SASKATCHEWAN AMBIENT AIR QUALITY STANDARDS ($\mu g/m^3$)				
Air Pollutant	**1 Hour**	**8 Hours**	**24 Hours**	**Annual**
Particulate Matter ($PM_{2.5}$)			28[a]	10
Particulate Matter (PM_{10})			50	
Total Suspended Particulates (TSP)			100	60[b]
Nitrogen Dioxide (NO_2)	300 (159 ppb)		200 (106 ppb)	45[c] (24 ppb)
Sulphur Dioxide (SO_2)	450 (172 ppb)		125 (48 ppb)	20[c] (8 ppb)
Hydrogen Sulphide (H_2S)	15 (11 ppb)		5 (3.6 ppb)	
Ozone (O_3)	160 (82 ppb)	124[d] (63 ppb)		
Carbon Monoxide (CO)	15,000 (13,000 ppb)	6,000 (5,000 ppb)		

Footnotes
(a) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.
(b) Geometric means
(c) Arithmetic means
(d) The 3-year average of the annual 4th-highest daily maximum 8-hour average concentrations.

Figure A-1. Saskatchewan Ambient Air Quality Standards.

APPENDIX B

Maidstone Station: Continuous Monitoring Data

Table B-1. Maidstone Station: Summary statistics for continuous air monitoring results for 2023

Parameter	Unit	Calibration & AIC [a]	Valid Data	Uptime	Summary Statistics for Hourly Average Data		
		(hours)	(hours)	(%)	Average	Minimum	Maximum
SO_2	ppb	399	8324	99.6%	0.5	< 0.1	18.8
H_2S	ppb	399	8311	99.6%	0.3	< 0.1	7.6
NO	ppb	246	5326	62.7%	0.8	< 0.1	392.2
NO_2	ppb	246	5326	62.7%	4.2	< 0.1	29.6
NO_x	ppb	246	5326	62.7%	4.9	< 0.1	421.8
$PM_{2.5}$	$\mu g/m^3$	1	6872	78.5%	15.5	< 0.1	954.0
Precipitation	mm	0	8763	99.8%	247.3	< 0.1	17.4
Ambient Temperature	°C	0	8762	99.7%	3.7	-35.7	32.3
Relative Humidity	%	0	8762	99.7%	63.8	0	90.2
Wind Speed	kph	0	8762	99.7%	5.2	Calm	27.1

Note: Calm refers to windspeeds less than 0.3 kph and Red font: an operational uptime less than 90%.

a. Automatic Instrument Check

b. Total precipitation

Table B-2. Maidstone Station: Summary of airpointer® SO_2 monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤1	1 -5	5 - 11	11 - 57	57 - 172	>172
January	713	100.0%	1.3	18.8	0	5.9	0	68.7	25.5	4.2	1.5	0.0	0.0
February	644	100.0%	0.9	10.7	0	3.9	0	78.9	17.4	3.7	0.0	0.0	0.0
March	692	100.0%	0.7	17.0	0	1.8	0	80.8	17.1	1.6	0.6	0.0	0.0
April	690	100.0%	0.8	12.0	0	3.5	0	84.3	11.7	3.8	0.1	0.0	0.0
May	699	99.1%	0.7	10.4	0	2.8	0	83.5	14.6	1.9	0.0	0.0	0.0
June	685	99.0%	0.4	4.7	0	1.4	0	90.7	9.3	0.0	0.0	0.0	0.0
July	710	99.6%	0.4	4.8	0	1.4	0	89.3	10.7	0.0	0.0	0.0	0.0
August	689	97.9%	0.3	7.6	0	1.3	0	93.9	5.8	0.3	0.0	0.0	0.0
September	690	100.0%	0.5	15.0	0	1.9	0	90.0	8.7	1.0	0.3	0.0	0.0
October	713	100.0%	0.2	8.9	0	0.7	0	96.9	2.9	0.1	0.0	0.0	0.0
November	686	100.0%	0.1	2.4	0	0.4	0	99.4	0.6	0.0	0.0	0.0	0.0
December	713	100.0%	0.2	1.5	0	0.7	0	99.2	0.8	0.0	0.0	0.0	0.0
Annual [c]	8324	99.6%	0.5	18.8	0	5.9	0	88.0	10.4	1.4	0.2	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 172 ppb
b. 24-hour Saskatchewan Ambient Air Quality Standard = 48 ppb
c. Annual Saskatchewan Ambient Air Quality Standard = 8 ppb

Table B-3. Maidstone Station: Summary of airpointer® H_2S monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤1	1 - 3.6	3.6 - 5	5 - 8	8 - 11	>11
January	713	100.0%	0.4	7.6	0	2.0	0	92.1	6.7	0.6	0.6	0.0	0.0
February	644	100.0%	0.1	0.9	0	0.4	0	100.0	0.0	0.0	0.0	0.0	0.0
March	683	100.0%	0.2	3.3	0	0.4	0	99.9	0.1	0.0	0.0	0.0	0.0
April	690	100.0%	0.2	2.4	0	0.5	0	99.0	1.0	0.0	0.0	0.0	0.0
May	699	99.1%	0.3	1.8	0	0.7	0	97.4	2.6	0.0	0.0	0.0	0.0
June	685	99.0%	0.3	4.1	0	0.9	0	94.9	5.0	0.1	0.0	0.0	0.0
July	710	99.6%	0.4	2.4	0	0.9	0	95.6	4.4	0.0	0.0	0.0	0.0
August	689	97.9%	0.5	6.0	0	1.3	0	89.3	9.9	0.3	0.6	0.0	0.0
September	690	100.0%	0.4	4.8	0	1.3	0	91.3	8.4	0.3	0.0	0.0	0.0
October	713	100.0%	0.2	1.3	0	0.4	0	99.9	0.1	0.0	0.0	0.0	0.0
November	682	99.9%	0.1	1.0	0	0.3	0	100.0	0.0	0.0	0.0	0.0	0.0
December	713	100.0%	0.2	0.8	0	0.6	0	100.0	0.0	0.0	0.0	0.0	0.0
Annual	8311	99.6%	0.3	7.6	0	2.0	0	96.6	3.2	0.1	0.1	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 11.0 ppb
b. 24-hour Saskatchewan Ambient Air Quality Standard = 3.6 ppb
c. No annual Saskatchewan Ambient Air Quality Standard

Table B-4. Maidstone Station: Summary of airpointer® NO monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤5	5 - 15	15 - 53	53 - 100	100 - 159	>159
January	713	100.0%	1.1	21.8	-	5.8	-	94.4	4.9	0.7	0.0	0.0	0.0
February	644	100.0%	0.8	19.1	-	3.5	-	98.1	1.6	0.3	0.0	0.0	0.0
March	692	100.0%	1.4	392.2	-	17.5	-	97.5	2.3	0.0	0.0	0.0	0.1
April	690	100.0%	0.4	8.0	-	1.3	-	99.4	0.6	0.0	0.0	0.0	0.0
May	699	99.1%	0.6	8.5	-	1.6	-	99.1	0.9	0.0	0.0	0.0	0.0
June	679	98.1%	1.1	16.7	-	2.5	-	96.9	2.5	0.6	0.0	0.0	0.0
July	679	95.0%	0.7	15.7	-	2.6	-	97.2	2.7	0.1	0.0	0.0	0.0
August	530	73.5%	0.4	10.1	-	1.2	-	99.6	0.4	0.0	0.0	0.0	0.0
September	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
October	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
November	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
December	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
Annual	5326	62.7%	0.8	392.2	-	17.5	-	97.7	2.0	0.2	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard
b. No 24-hour Saskatchewan Ambient Air Quality Standard
c. No annual Saskatchewan Ambient Air Quality Standard
Red font means an operational time of less than 90%.

Table B-5. Maidstone Station: Summary of airpointer® NO_2 monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤5	5 - 15	15 - 53	53 - 100	100 - 159	>159
January	713	100.0%	7.5	26.4	0	17.0	0	45.4	43.9	10.7	0.0	0.0	0.0
February	644	100.0%	4.9	25.2	0	9.2	0	64.4	32.9	2.6	0.0	0.0	0.0
March	692	100.0%	5.0	29.6	0	10.1	0	62.6	35.1	2.3	0.0	0.0	0.0
April	690	100.0%	3.1	20.0	0	6.9	0	84.5	15.1	0.4	0.0	0.0	0.0
May	699	99.1%	3.5	17.9	0	7.8	0	75.3	24.5	0.3	0.0	0.0	0.0
June	679	98.1%	4.4	22.6	0	6.9	0	66.7	32.1	1.2	0.0	0.0	0.0
July	679	95.0%	2.4	9.8	0	3.6	0	90.3	9.7	0.0	0.0	0.0	0.0
August	530	73.5%	1.9	8.9	0	3.2	0	92.6	7.4	0.0	0.0	0.0	0.0
September	0	0.0%	-	< 0.1	0	< 0.1	0	-	-	-	-	-	-
October	0	0.0%	-	< 0.1	0	< 0.1	0	-	-	-	-	-	-
November	0	0.0%	-	< 0.1	0	< 0.1	0	-	-	-	-	-	-
December	0	0.0%	-	< 0.1	0	< 0.1	0	-	-	-	-	-	-
Annual	5326	62.7%	4.2	29.6	0	17.0	0	72.1	25.6	2.3	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 159 ppb
b. 24-hour Saskatchewan Ambient Air Quality Standard = 106 ppb
c. Annual Saskatchewan Ambient Air Quality Standard = 24 ppb
Red font means an operational time less than 90%.

Table B-6. Maidstone Station: Summary of airpointer® NOx monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	713	100.0%	8.4	38.8	-	22.9	-	41.8	43.2	15.0	0.0	0.0	0.0
February	644	100.0%	5.7	31.6	-	10.8	-	54.3	41.9	3.7	0.0	0.0	0.0
March	692	100.0%	6.4	421.8	-	23.8	-	55.5	40.5	3.9	0.0	0.0	0.1
April	690	100.0%	3.5	23.5	-	7.7	-	80.4	18.8	0.7	0.0	0.0	0.0
May	699	99.1%	4.1	19.0	-	8.5	-	69.4	29.2	1.4	0.0	0.0	0.0
June	679	98.1%	5.4	29.7	-	8.1	-	59.5	35.6	4.9	0.0	0.0	0.0
July	679	95.0%	3.0	23.5	-	6.1	-	84.5	14.0	1.5	0.0	0.0	0.0
August	530	73.5%	2.3	15.7	-	4.1	-	88.7	11.1	0.2	0.0	0.0	0.0
September	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
October	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
November	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
December	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
Annual	5326	62.7%	4.9	421.8	-	23.8	-	66.1	29.8	4.1	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard
b. No 24-hour Saskatchewan Ambient Air Quality Standard
c. No annual Saskatchewan Ambient Air Quality Standard
Red font means an operational time less than 90%.

Table B-7. Maidstone Station: Summary of airpointer® $PM_{2.5}$ monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(µg/m³)	(µg/m³)	(no.)	(µg/m³)	(no.)	≤5	5 - 10	10 - 15	15 - 30	30 - 80	>80
January	0	0.0%	-	< 0.1	-	< 0.1	0	-	-	-	-	-	-
February	0	0.0%	-	< 0.1	-	< 0.1	0	-	-	-	-	-	-
March	679	91.3%	7.5	39.6	-	17.8	0	51.4	22.5	14.3	10.0	1.8	0.0
April	720	100.0%	4.8	29.0	-	11.7	0	68.1	21.0	9.3	1.7	0.0	0.0
May	741	99.7%	29.1	954.0	-	363.9	7	22.3	22.3	14.4	25.0	10.0	6.1
June	720	100.0%	19.4	211.3	-	126.6	6	33.2	18.1	13.6	17.8	13.5	3.9
July	741	99.6%	20.6	218.6	-	89.7	8	31.7	13.9	8.9	22.8	18.8	3.9
August	729	98.0%	18.4	142.7	-	71.9	6	27.2	21.5	10.6	23.7	14.0	3.0
September	720	100.0%	28.6	355.5	-	255.0	5	20.8	23.2	19.4	16.4	12.6	7.5
October	744	100.0%	5.7	45.0	-	14.1	0	56.9	31.2	7.4	3.8	0.8	0.0
November	334	46.4%	7.6	28.6	-	17.8	0	45.5	23.7	16.2	14.7	0.0	0.0
December	744	100.0%	8.9	65.4	-	22.2	0	46.6	22.8	15.6	9.7	5.2	0.0
Annual	6872	78.5%	15.5	954.0	-	363.9	32	40.0	21.9	12.8	14.6	8.1	2.6

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24- Saskatchewan Ambient Air Quality Standard = 28 µg/m³, however not applicable as an exceedance only occurs when the standard is compared to the 3-year (2021-2023) average of the annual 98th percentile of daily 24-hour average concentrations

c. Annual Saskatchewan Ambient Air Quality Standard = 10 µg/m³

Red font means an operational time less than 90%.

Table B-8. Maidstone Station: Summary of airpointer® precipitation monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Total Precip.	Maximum 1-Hr Precip.	Maximum 24-Hr Precip.	Percent of Data in each Precipitation Range					
	(no.)	(%)	(mm)	(mm)	(mm)	≤5	5 - 10	10 - 25	25 - 50	50 - 75	>75
January	768	100.0%	2.9	1.2	1.6	100.0	0.0	0.0	0.0	0.0	0.0
February	672	100.0%	0.6	0.2	0.3	100.0	0.0	0.0	0.0	0.0	0.0
March	744	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
April	720	100.0%	19.3	4.9	8.1	100.0	0.0	0.0	0.0	0.0	0.0
May	742	99.7%	18.6	3.9	8.8	100.0	0.0	0.0	0.0	0.0	0.0
June	720	100.0%	69.4	15.5	18.5	99.7	0.1	0.1	0.0	0.0	0.0
July	741	99.6%	37.2	8.3	15.7	99.6	0.4	0.0	0.0	0.0	0.0
August	728	97.8%	73.8	17.4	19.6	99.3	0.5	0.1	0.0	0.0	0.0
September	720	100.0%	18.7	6.7	13.0	99.7	0.3	0.0	0.0	0.0	0.0
October	744	100.0%	1.8	0.7	0.8	100.0	0.0	0.0	0.0	0.0	0.0
November	720	100.0%	1.0	0.5	0.5	100.0	0.0	0.0	0.0	0.0	0.0
December	744	100.0%	4.2	1.7	3.7	100.0	0.0	0.0	0.0	0.0	0.0
Annual	8763	99.8%	247.3	17.4	19.6	99.9	0.1	0.0	0.0	0.0	0.0

Table B-9. Maidstone Station: Summary of airpointer® ambient temperature monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Temp.	Minimum 1-Hr Temp.	Maximum 1-Hr Temp.	Percent of Data in each Temperature Range					
	(no.)	(%)	(°C)	(°C)	(°C)	≤-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	768	100.0%	-11.2	4.6	-25.8	0.0	32.3	63.2	4.6	0.0	0.0
February	672	100.0%	-12.4	4.9	-35.7	4.5	31.4	54.0	10.1	0.0	0.0
March	744	100.0%	-11.1	1.5	-23.5	0.0	27.7	71.1	1.2	0.0	0.0
April	720	100.0%	1.9	17.6	-18.0	0.0	2.1	35.0	59.4	3.5	0.0
May	742	99.7%	15.3	29.8	1.4	0.0	0.0	0.0	49.6	50.4	0.0
June	720	100.0%	17.7	28.3	5.9	0.0	0.0	0.0	33.8	66.3	0.0
July	741	99.6%	17.5	30.3	4.0	0.0	0.0	0.0	37.9	61.8	0.3
August	728	97.8%	17.2	32.3	2.7	0.0	0.0	0.0	41.1	57.7	1.2
September	720	100.0%	12.7	27.9	-0.7	0.0	0.0	0.7	65.4	33.9	0.0
October	744	100.0%	4.0	22.7	-12.1	0.0	0.0	33.1	59.5	7.4	0.0
November	719	99.9%	-1.6	10.7	-14.8	0.0	0.0	58.7	41.3	0.0	0.0
December	744	100.0%	-5.7	4.2	-16.7	0.0	1.9	85.5	12.6	0.0	0.0
Annual	8762	99.7%	3.7	32.3	-35.7	0.3	7.9	33.5	34.6	23.4	0.1

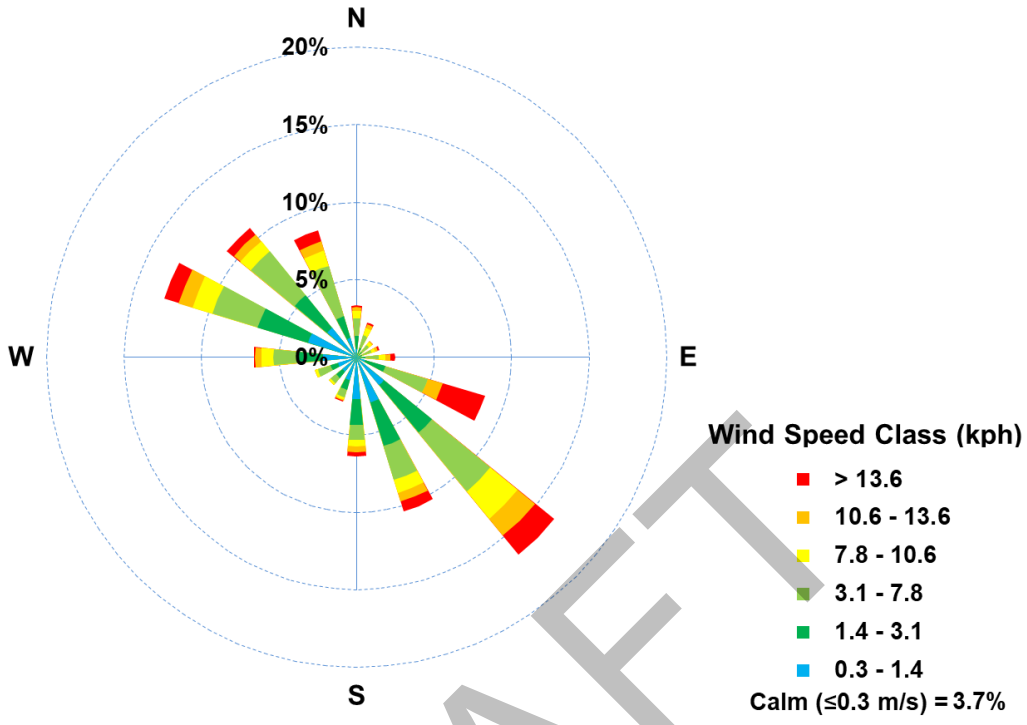
Table B-10. Maidstone Station: Summary of airpointer® relative humidity monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average RH	Minimum 1-Hr RH	Maximum 1-Hr RH	Percent of Data in each Relative Humidity Range (%)					
	(no.)	(%)	(%)	(%)	(%)	≤15	15 - 30	30 - 60	60 - 80	80 - 90	>90
January	768	100.0%	68.0	82.3	52.2	3.1	0.0	7.3	87.8	1.8	0.0
February	672	100.0%	64.5	81.4	47.2	0.0	0.0	25.9	73.4	0.7	0.0
March	744	100.0%	65.0	80.4	37.6	0.0	0.0	28.2	71.4	0.4	0.0
April	720	100.0%	57.7	83.6	16.5	0.0	7.8	41.8	44.6	5.8	0.0
May	742	99.7%	51.8	88.9	14.7	0.4	17.5	45.7	27.6	8.8	0.0
June	720	100.0%	64.3	90.2	24.0	0.0	1.8	37.6	31.4	28.9	0.3
July	741	99.6%	63.8	90.2	29.2	0.0	0.1	41.7	33.5	24.6	0.1
August	728	97.8%	66.3	89.9	26.4	0.0	1.5	35.0	28.8	34.6	0.0
September	720	100.0%	64.8	89.1	18.8	0.0	4.4	34.2	31.7	29.7	0.0
October	744	100.0%	63.4	88.6	25.8	0.0	1.3	35.6	48.1	14.9	0.0
November	719	99.9%	66.4	86.5	27.8	0.0	0.7	29.2	55.2	14.9	0.0
December	744	100.0%	69.7	83.4	40.4	0.0	0.0	14.7	83.3	2.0	0.0
Annual	8762	99.7%	63.8	90.2	14.7	0.3	2.9	31.3	51.5	13.9	0.0

Table B-11. Maidstone Station: Wind frequency table for 2023

Wind Direction	Percent of Data within Wind Speed Range, wind speed unit kph (%)						
Sector	0.3 - 1.4	1.4 - 3.1	3.1 - 7.8	7.8 - 10.6	10.6 - 13.6	>13.6	Totals
North NorthEast	0.1%	0.5%	0.8%	0.5%	0.3%	0.1%	2.3%
NorthEast	0.2%	0.3%	0.5%	0.3%	0.1%	0.0%	1.3%
East NorthEast	0.1%	0.2%	0.6%	0.3%	0.2%	0.1%	1.5%
East	0.2%	0.4%	0.9%	0.4%	0.3%	0.3%	2.4%
East SouthEast	0.5%	1.3%	2.9%	1.0%	1.0%	1.9%	8.5%
SouthEast	2.2%	4.0%	4.9%	2.3%	1.4%	1.6%	16.3%
South SouthEast	2.7%	2.9%	2.3%	0.9%	0.6%	0.7%	10.0%
South	2.3%	1.6%	1.0%	0.4%	0.4%	0.3%	6.0%
South SouthWest	1.2%	0.6%	0.5%	0.1%	0.1%	0.0%	2.6%
SouthWest	0.8%	0.5%	0.4%	0.2%	0.0%	0.0%	1.9%
West SouthWest	1.0%	0.5%	0.9%	0.2%	0.0%	0.0%	2.6%
West	1.7%	1.5%	1.6%	0.8%	0.4%	0.1%	6.1%
West NorthWest	2.8%	3.4%	3.0%	1.4%	0.9%	0.9%	12.5%
NorthWest	2.2%	2.7%	3.7%	0.9%	0.5%	0.6%	10.5%
North NorthWest	1.2%	1.4%	3.4%	1.0%	0.6%	0.7%	8.4%
North	0.5%	0.9%	1.1%	0.5%	0.2%	0.1%	3.3%
Total	19.7%	22.7%	28.5%	11.0%	7.0%	7.3%	96.3%

Percent Calm (≤0.3 kph)	3.7%
Number of Valid Hourly-Average Data	8762
Total Workable Hours in Time Period	8784


N
20%
15%
10%
5%
0%
W
E
S
Wind Speed Class (kph)
> 13.6
10.6 - 13.6
7.8 - 10.6
3.1 - 7.8
1.4 - 3.1
0.3 - 1.4
Calm (≤0.3 m/s) = 3.7%

APPENDIX C

Clavet Station: Continuous Monitoring Data

Table C-1 Clavet Station: Summary statistics for continuous air monitoring results for 2023

Parameter	Unit	Calibration & AIC [a]	Valid Data	Uptime	Summary Statistics for Hourly Average Data		
		(hours)	(hours)	(%)	Average	Minimum	Maximum
NO	ppb	318	6519	77.2%	1.4	< 0.1	49.7
NO_2	ppb	318	6519	77.2%	5.4	< 0.1	35.6
NO_x	ppb	318	6519	77.2%	6.8	< 0.1	60.5
O_3	ppb	321	6528	77.4%	29.7	< 0.1	67.3
$PM_{2.5}$	$\mu g/m^3$	2	5836	66.6%	5.3	< 0.1	466.5
Precipitation	mm	0	6957	79.4%	84.2	< 0.1	5.5
Ambient Temperature	°C	0	6957	79.4%	0.9	-33.3	33.0
Relative Humidity	%	0	6957	79.4%	69.6	12.7	88.9
Wind Speed	kph	0	6942	79.4%	4.5	Calm	36.0

Note: Calm refers to windspeeds less than 0.3 kph and Red font: an operational uptime less than 90%.
a. Automatic Instrument Check
b. Total precipitation

Table C-2. Clavet Station: Summary of airpointer® NO monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range (%)					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤5	5 - 15	15 - 53	53 - 100	100 - 159	>159
January	709	99.4%	1.5	49.7	-	3.9	-	95.5	4.1	0.4	0.0	0.0	0.0
February	636	100.0%	1.3	9.6	-	2.3	-	97.8	2.2	0.0	0.0	0.0	0.0
March	713	100.0%	0.9	10.3	-	2.8	-	98.9	1.1	0.0	0.0	0.0	0.0
April	690	100.0%	0.7	5.2	-	1.6	-	99.7	0.3	0.0	0.0	0.0	0.0
May	695	98.4%	0.5	8.5	-	1.7	-	99.3	0.7	0.0	0.0	0.0	0.0
June	277	39.1%	1.2	9.7	-	2.2	-	96.4	3.6	0.0	0.0	0.0	0.0
July	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
August	23	3.1%	0.1	0.9	-	0.1	-	100.0	0.0	0.0	0.0	0.0	0.0
September	672	98.4%	0.5	18.5	-	1.5	-	99.4	0.4	0.1	0.0	0.0	0.0
October	709	99.9%	1.0	12.0	-	2.8	-	97.0	3.0	0.0	0.0	0.0	0.0
November	683	100.0%	1.2	10.6	-	2.4	-	98.7	1.3	0.0	0.0	0.0	0.0
December	712	99.9%	1.9	32.1	-	10.7	-	94.2	4.5	1.3	0.0	0.0	0.0
Annual [c]	6519	77.2%	1.1	49.7	-	10.7	-	97.8	2.0	0.2	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard
b. No 24-hour Saskatchewan Ambient Air Quality Standard
c. No annual Saskatchewan Ambient Air Quality Standard
Red font means an operational time less than 90%.

Table C-3. Clavet Station: Summary of airpointer® NO_2 monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤5	5 - 15	15 - 53	53 - 100	100 - 159	>159
January	709	99.4%	5.8	25.0	0	12.6	0	50.1	47.0	3.0	0.0	0.0	0.0
February	636	100.0%	5.1	27.2	0	7.5	0	65.3	32.1	2.7	0.0	0.0	0.0
March	713	100.0%	4.4	35.6	0	11.1	0	71.8	26.4	1.8	0.0	0.0	0.0
April	690	100.0%	2.9	14.4	0	5.4	0	87.8	12.2	0.0	0.0	0.0	0.0
May	695	98.4%	3.2	19.8	0	9.0	0	85.2	13.8	1.0	0.0	0.0	0.0
June	277	39.1%	5.6	24.9	0	8.3	0	56.0	39.4	4.7	0.0	0.0	0.0
July	0	0.0%	-	< 0.1	0	< 0.1	0	-	-	-	-	-	-
August	23	3.1%	1.2	3.2	0	1.2	0	100.0	0.0	0.0	0.0	0.0	0.0
September	672	98.4%	1.9	13.0	0	3.5	0	95.1	4.9	0.0	0.0	0.0	0.0
October	709	99.9%	2.2	14.3	0	5.0	0	90.7	9.3	0.0	0.0	0.0	0.0
November	683	100.0%	2.7	14.9	0	5.5	0	91.2	8.8	0.0	0.0	0.0	0.0
December	712	99.9%	3.8	17.0	0	7.7	0	76.1	23.2	0.7	0.0	0.0	0.0
Annual [c]	6519	77.2%	3.6	35.6	0	12.6	0	78.3	20.5	1.2	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 159 ppb
b. 24-hour Saskatchewan Ambient Air Quality Standard = 106 ppb
c. Annual Saskatchewan Ambient Air Quality Standard = 24 ppb
Red font means an operational time less than 90%.

Table C-4. Clavet Station: Summary of airpointer® NO_x monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤5	5 - 15	15 - 53	53 - 100	100 - 159	>159
January	709	99.4%	7.3	60.5	-	16.1	-	36.8	56.1	6.9	0.1	0.0	0.0
February	636	100.0%	6.5	31.5	-	9.8	-	46.2	48.6	5.2	0.0	0.0	0.0
March	713	100.0%	5.2	43.9	-	13.9	-	61.2	35.8	3.1	0.0	0.0	0.0
April	690	100.0%	3.5	16.9	-	6.4	-	79.0	20.9	0.1	0.0	0.0	0.0
May	695	98.4%	3.7	23.9	-	10.6	-	81.7	15.8	2.4	0.0	0.0	0.0
June	277	39.1%	6.8	29.8	-	10.5	-	50.2	43.3	6.5	0.0	0.0	0.0
July	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
August	23	3.1%	1.3	3.9	-	1.3	-	100.0	0.0	0.0	0.0	0.0	0.0
September	672	98.4%	2.4	23.6	-	4.4	-	91.7	7.7	0.6	0.0	0.0	0.0
October	709	99.9%	3.2	19.1	-	7.1	-	78.4	20.7	0.8	0.0	0.0	0.0
November	683	100.0%	3.9	21.9	-	6.9	-	75.4	23.9	0.7	0.0	0.0	0.0
December	712	99.9%	5.7	44.5	-	18.5	-	56.7	38.5	4.8	0.0	0.0	0.0
Annual c	6519	77.2%	4.7	60.5	-	18.5	-	66.8	30.3	2.9	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard
b. No 24-hour Saskatchewan Ambient Air Quality Standard
c. No annual Saskatchewan Ambient Air Quality Standard
Red font means an operational time less than 90%.

Table C-5. Clavet Station: Summary of airpointer® O_3 monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 8-Hr Conc.	Percent of Data in each Concentration Range					
	(no.)	(%)	(µg/m^3)	(µg/m^3)	(no.)	(µg/m^3)	≤10	10 - 20	20 - 40	40 - 65	65 - 82	>82
January	709	99.4%	27.0	38.0	0	37.4	1.1	9.2	89.7	0.0	0.0	0.0
February	636	100.0%	34.6	59.6	0	58.2	0.2	2.0	81.9	15.9	0.0	0.0
March	710	99.6%	45.0	66.1	0	63.6	0.3	1.5	28.2	69.4	0.6	0.0
April	690	100.0%	41.4	66.6	0	63.5	0.0	4.9	33.8	60.6	0.7	0.0
May	700	99.3%	31.9	67.2	0	62.7	4.7	16.6	48.3	29.6	0.9	0.0
June	277	39.1%	34.8	67.3	0	65.4	9.0	15.2	34.3	39.0	2.5	0.0
July	0	0.0%	-	< 0.1	0	0.0	-	-	-	-	-	-
August	23	3.1%	16.6	28.6	0	21.5	0.0	82.6	17.4	0.0	0.0	0.0
September	680	99.6%	22.8	53.3	0	43.9	14.7	28.7	49.7	6.9	0.0	0.0
October	706	99.9%	19.0	41.0	0	36.8	10.6	42.2	47.0	0.1	0.0	0.0
November	684	100.0%	18.8	33.7	0	31.8	7.5	48.5	44.0	0.0	0.0	0.0
December	713	100.0%	16.3	35.2	0	33.4	26.1	39.4	34.5	0.0	0.0	0.0
Annual[b]	6528	77.4%	28.7	67.3	0	65.4	7.4	21.5	49.7	21.1	0.3	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 82 ppb
b. 8-hour Saskatchewan Ambient Air Quality Standard = 63 ppb; However not applicable because it is compared to the 3-year average of the annual 4th- highest daily maximum 8-hour average concentrations.
c. No annual Saskatchewan Ambient Air Quality Standard
Red font means an operational time less than 90%.

Table C-5. lavet Station: Summary of airpointer® $PM_{2.5}$ monitoring results for 2023

Month	Valid 1-Hr (no.)	Operationa Time (%)	Average Conc. (µg/m³)	Maximum 1-Hr (µg/m³)	1-Hour Exceedance (no.)	Maximum 24-Hr (µg/m³)	24-Hour Exceedance (no.)	Percent of Data in each Concentration Range (µg/m³)					
								≤5	5 - 10	10 - 15	15 - 30	30 - 80	>80
January	417	56.0%	6.4	46.2	-	14.3	0	51.8	29.7	11.3	6.7	0.5	0.0
February	672	100.0%	4.6	16.1	-	7.8	0	67.6	28.3	3.9	0.3	0.0	0.0
March	744	100.0%	6.4	26.3	-	11.2	0	47.0	36.0	11.3	5.6	0.0	0.0
April	720	100.0%	5.5	30.4	-	8.7	0	56.4	35.6	5.7	2.2	0.1	0.0
May	737	99.3%	17.5	466.5	-	86.1	5	28.4	29.4	17.0	14.1	7.9	3.3
June	289	40.1%	19.6	160.7	-	45.5	3	16.6	26.6	21.1	20.1	12.5	3.1
July	0	0.0%	-	< 0.1	-	< 0.1	0	-	-	-	-	-	-
August	0	0.0%	-	< 0.1	-	< 0.1	0	-	-	-	-	-	-
Septembe	202	28.1%	9.0	50.1	-	13.3	0	33.7	30.7	18.8	14.4	2.5	0.0
October	743	99.9%	4.8	37.6	-	9.4	0	63.7	27.5	5.9	2.8	0.1	0.0
November	720	100.0%	6.0	39.5	-	16.3	0	53.8	29.3	10.8	5.8	0.3	0.0
December	592	79.6%	6.6	71.2	-	22.0	0	52.9	30.4	8.3	7.3	1.2	0.0
Annual [c]	5836	66.6%	5.3	466.5	-	86.1	8	50.1	30.7	10.2	6.6	1.9	0.6

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24- Saskatchewan Ambient Air Quality Standard = 28 µg/m³, however not applicable as an exceedance only occurs when the standard is compared to the 3-year (2021-2023) average of the annual 98th percentile of daily 24-hour average concentrations

c. Annual Saskatchewan Ambient Air Quality Standard = 10 µg/m³

Red font means an operational time less than 90%.

Table C-7. Clavet Station: Summary of airpointer® precipitation monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Total Precip.	Maximum 1-Hr Precip.	Maximum 24-Hr Precip.	Percent of Data in each Precipitation Range					
	(no.)	(%)	(mm)	(mm)	(mm)	≤5	5 - 10	10 - 25	25 - 50	50 - 75	>75
January	740	99.5%	4.9	3.7	4.9	100.0	0.0	0.0	0.0	0.0	0.0
February	672	100.0%	0.1	0.1	0.1	100.0	0.0	0.0	0.0	0.0	0.0
March	744	100.0%	1.1	1.1	1.1	100.0	0.0	0.0	0.0	0.0	0.0
April	720	100.0%	1.2	0.4	0.5	100.0	0.0	0.0	0.0	0.0	0.0
May	739	99.3%	32.8	5.5	11.8	99.7	0.3	0.0	0.0	0.0	0.0
June	289	40.1%	3.7	2.1	2.7	100.0	0.0	0.0	0.0	0.0	0.0
July	0	0.0%	< 0.1	< 0.1	< 0.1	-	-	-	-	-	-
August	128	17.2%	5.7	1.5	5.3	100.0	0.0	0.0	0.0	0.0	0.0
September	718	99.7%	17.1	3.4	10.8	100.0	0.0	0.0	0.0	0.0	0.0
October	743	99.9%	12.4	5.3	6.9	99.9	0.1	0.0	0.0	0.0	0.0
November	720	100.0%	4.3	1.4	2.6	100.0	0.0	0.0	0.0	0.0	0.0
December	744	100.0%	1.0	0.3	0.6	100.0	0.0	0.0	0.0	0.0	0.0
Annual	6957	79.4%	84.2	5.5	11.8	100.0	0.0	0.0	0.0	0.0	0.0

Red font means an operational time less than 90%.

Table C-8. Clavet Station: Summary of airpointer® ambient temperature monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Temp.	Minimum 1-Hr Temp.	Maximum 1-Hr Temp.	Percent of Data in each Temperature Range (°C)					
	(no.)	(%)	(°C)	(°C)	(°C)	≤-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	740	99.5%	-11.5	4.4	-26.3	0.0	23.6	73.9	2.4	0.0	0.0
February	672	100.0%	-12.4	4.3	-33.3	1.6	35.3	57.1	6.0	0.0	0.0
March	744	100.0%	-11.3	1.3	-25.2	0.0	26.9	72.2	0.9	0.0	0.0
April	720	100.0%	1.3	17.8	-20.6	0.0	3.3	34.6	60.6	1.5	0.0
May	739	99.3%	15.6	30.4	0.5	0.0	0.0	0.0	49.1	50.3	0.5
June	289	40.1%	21.7	33.0	9.3	0.0	0.0	0.0	12.8	78.9	8.3
July	0	0.0%	-	-	-	-	-	-	-	-	-
August	128	17.2%	20.0	31.5	10.7	0.0	0.0	0.0	18.8	76.6	4.7
September	718	99.7%	15.1	30.5	0.9	0.0	0.0	0.0	50.8	48.6	0.6
October	743	99.9%	4.4	21.2	-15.1	0.0	0.1	29.6	63.1	7.1	0.0
November	720	100.0%	-1.2	12.2	-18.4	0.0	1.4	54.6	44.0	0.0	0.0
December	744	100.0%	-3.9	7.8	-15.7	0.0	0.7	77.6	21.8	0.0	0.0
Annual	6957	79.4%	0.9	33.0	-33.3	0.2	9.4	41.8	32.2	16.0	0.5

Red font means an operational time less than 90%.

Table C-9. Clavet Station: Summary of airpointer® relative humidity monitoring results for 2023

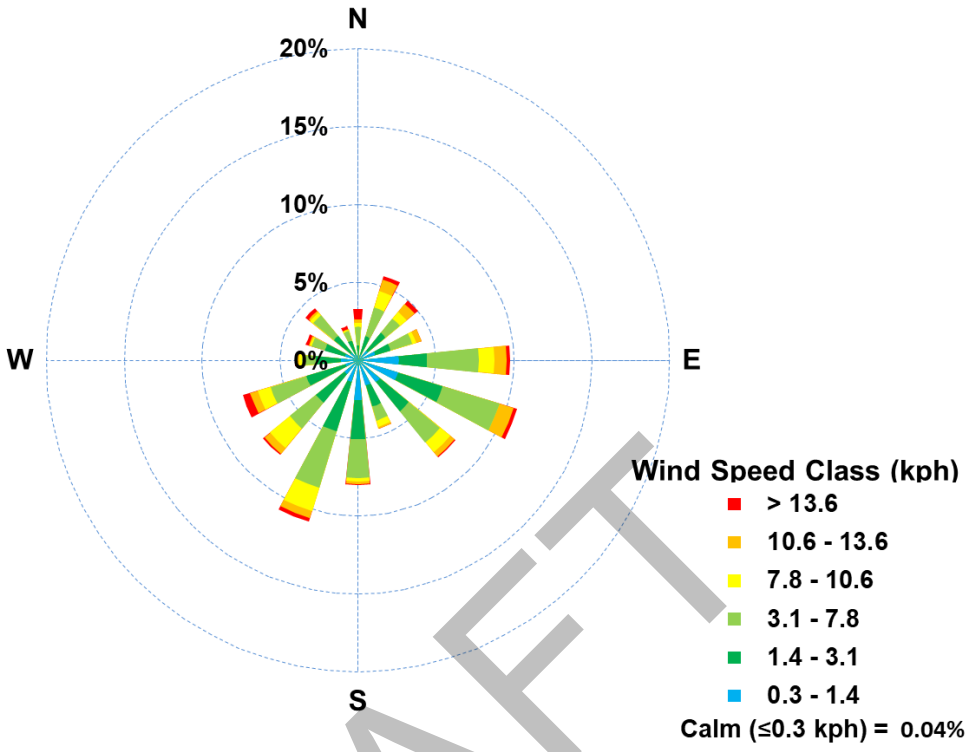
Month	Valid 1-Hr data	Operational Time	Average RH	Minimum 1-Hr RH	Maximum 1-Hr RH	Percent of Data in each Relative Humidity Range (%)					
	(no.)	(%)	(%)	(%)	(%)	≤15	15 - 30	30 - 60	60 - 80	80 - 90	>90
January	740	99.5%	71.6	82.5	46.1	0.0	0.0	2.8	95.5	1.6	0.0
February	672	100.0%	65.6	79.1	50.2	0.0	0.0	16.4	83.6	0.0	0.0
March	744	100.0%	65.7	78.5	19.0	0.0	0.1	17.3	82.5	0.0	0.0
April	720	100.0%	59.9	85.2	16.8	0.0	5.3	35.0	54.0	5.7	0.0
May	739	99.3%	51.2	88.4	12.7	0.7	18.5	44.8	26.4	9.6	0.0
June	289	40.1%	55.6	88.6	22.3	0.0	9.3	47.4	31.5	11.8	0.0
July	0	0.0%	-	-	-	-	-	-	-	-	-
August	128	17.2%	61.6	87.4	26.3	0.0	3.9	35.9	40.6	19.5	0.0
September	718	99.7%	57.7	88.9	12.8	0.4	7.5	43.5	36.2	12.4	0.0
October	743	99.9%	65.5	88.1	24.3	0.0	0.9	30.0	53.2	15.9	0.0
November	720	100.0%	68.4	87.8	27.5	0.0	0.6	22.6	55.7	21.1	0.0
December	744	100.0%	69.5	85.8	20.4	0.0	0.5	19.5	64.4	15.6	0.0
Annual	6957	79.4%	69.6	88.9	0.0	0.1	4.0	26.9	59.6	9.5	0.0

Red font means an operational time less than 90%.

Table C-10. Clavet Station: Wind frequency table for 2023

Wind Direction	Percent of Data within Wind Speed Range, wind speed unit kph						
Sector	0.3 - 1.4	1.4 - 3.1	3.1 - 7.8	7.8 - 10.6	10.6 - 13.6	>13.6	Totals
North NorthEast	0.4%	1.2%	2.0%	1.1%	0.7%	0.3%	5.6%
NorthEast	0.7%	1.5%	1.2%	0.6%	0.6%	0.3%	4.9%
East NorthEast	1.0%	1.0%	1.4%	0.3%	0.4%	0.0%	4.1%
East	2.5%	1.8%	3.3%	1.0%	0.8%	0.2%	9.6%
East SouthEast	2.6%	3.0%	3.8%	1.0%	0.2%	0.0%	10.5%
SouthEast	1.8%	2.4%	2.6%	0.8%	0.4%	0.1%	8.0%
South SouthEast	1.5%	1.4%	0.9%	0.4%	0.1%	0.0%	4.4%
South	2.4%	2.5%	2.5%	0.2%	0.2%	0.1%	7.9%
South SouthWest	1.3%	3.4%	3.8%	1.6%	0.5%	0.2%	10.7%
SouthWest	1.1%	2.4%	2.2%	1.7%	0.5%	0.1%	7.8%
West SouthWest	0.8%	2.6%	2.4%	0.9%	0.5%	0.5%	7.7%
West	1.0%	1.6%	0.9%	0.2%	0.2%	0.1%	4.0%
West NorthWest	0.8%	1.4%	0.9%	0.1%	0.1%	0.2%	3.5%
NorthWest	0.6%	1.4%	1.7%	0.2%	0.1%	0.2%	4.3%
North NorthWest	0.4%	0.9%	0.7%	0.1%	0.0%	0.2%	2.3%
North	0.3%	0.6%	1.2%	0.3%	0.2%	0.7%	3.3%
Total	19.2%	29.1%	31.4%	10.3%	5.6%	3.1%	98.7%

Percent Calm (≤0.3 kph)	0.04%
Number of Valid Hourly-Average Data	6957
Total Workable Hours in Time Period	8760


N
20%
15%
10%
5%
0%
W
E
S
Wind Speed Class (kph)
> 13.6
10.6 - 13.6
7.8 - 10.6
3.1 - 7.8
1.4 - 3.1
0.3 - 1.4
Calm (≤0.3 kph) = 0.04%

APPENDIX D

Kerrobert Station: Continuous Monitoring Data

Table D-1. Kerrobert Station: Summary statistics for continuous air monitoring results for 2023

Parameter	Unit	Calibration & AIC [a]	Valid Data	Uptime	Summary Statistics for Hourly Average Data		
		(hours)	(hours)	(%)	Average	Minimum	Maximum
SO_2	ppb	257	5654	66.5%	0.1	< 0.1	2.3
H_2S	ppb	266	5869	69.1%	0.2	< 0.1	2.6
$PM_{2.5}$	µg/m^3	1	6239	71.2%	8.8	< 0.1	269.6
Precipitation	mm	0	6444	73.6%	38.1	< 0.1	4.7
Ambient Temperature	°C	0	6444	73.6%	0.9	-31.3	31.8
Relative Humidity	%	0	6444	73.6%	64.2	0.0	89.6
Wind Speed	kph	0	6426	73.4%	6.9	Calm	34.8

Note: Calm refers to windspeeds less than 0.3 kph and Red font: an operational uptime less than 90%.
a. Automatic Instrument Check
b. Total precipitation

Table D-2. Kerrobert Station: Summary of airpointer® SO_2 monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤1	1 -5	5 - 11	11 - 57	57 - 172	>172
January	579	80.5%	0.2	1.5	0	0.7	0	97.9	2.1	0.0	0.0	0.0	0.0
February	535	83.3%	0.2	1.0	0	0.4	0	100.0	0.0	0.0	0.0	0.0	0.0
March	713	100.0%	0.2	2.3	0	1.1	0	98.3	1.7	0.0	0.0	0.0	0.0
April	686	99.3%	0.1	1.5	0	0.2	0	99.9	0.1	0.0	0.0	0.0	0.0
May	587	82.0%	0.1	1.7	0	0.2	0	99.3	0.7	0.0	0.0	0.0	0.0
June	0	0.0%	-	-	-	-	-	-	-	-	-	-	-
July	0	0.0%	-	-	-	-	-	-	-	-	-	-	-
August	23	3.1%	0.1	0.4	0	0.1	0	100.0	0.0	0.0	0.0	0.0	0.0
September	690	100.0%	< 0.1	0.6	0	0.2	0	100.0	0.0	0.0	0.0	0.0	0.0
October	713	99.9%	< 0.1	0.7	0	0.3	0	100.0	0.0	0.0	0.0	0.0	0.0
November	502	72.4%	< 0.1	0.3	0	0.1	0	100.0	0.0	0.0	0.0	0.0	0.0
December	626	87.2%	0.1	0.9	0	0.2	0	100.0	0.0	0.0	0.0	0.0	0.0
Annual [c]	5654	66.5%	0.1	2.3	0	1.1	0	99.5	0.5	0.0	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 172 ppb
b. 24-hour Saskatchewan Ambient Air Quality Standard = 48 ppb
c. Annual Saskatchewan Ambient Air Quality Standard = 8 ppb
Red font means an operational time less than 90%.

Table D-3. Kerrobert Station: Summary of airpointer® H_2S monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤1	1 - 3.6	3.6 - 5	5 - 8	8 - 11	>11
January	579	80.5%	0.2	1.3	0	0.5	0	99.5	0.5	0.0	0.0	0.0	0.0
February	535	83.3%	0.1	0.9	0	0.3	0	100.0	0.0	0.0	0.0	0.0	0.0
March	713	100.0%	0.1	0.6	0	0.3	0	100.0	0.0	0.0	0.0	0.0	0.0
April	686	99.3%	0.1	1.9	0	0.3	0	99.7	0.3	0.0	0.0	0.0	0.0
May	621	86.9%	0.3	2.6	0	0.6	0	96.0	4.0	0.0	0.0	0.0	0.0
June	0	0.0%	-	-	-	-	-	-	-	-	-	-	-
July	0	0.0%	-	-	-	-	-	-	-	-	-	-	-
August	23	3.1%	0.2	0.5	0	0.2	0	100.0	0.0	0.0	0.0	0.0	0.0
September	690	100.0%	0.2	0.9	0	0.4	0	100.0	0.0	0.0	0.0	0.0	0.0
October	713	99.9%	0.1	0.8	0	0.4	0	100.0	0.0	0.0	0.0	0.0	0.0
November	683	99.7%	0.1	0.9	0	0.5	0	100.0	0.0	0.0	0.0	0.0	0.0
December	626	87.2%	0.3	0.8	0	0.5	0	100.0	0.0	0.0	0.0	0.0	0.0
Annual [c]	5869	69.1%	0.2	2.6	0	0.6	0	99.5	0.5	0.0	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 11.0 ppb
b. 24-hour Saskatchewan Ambient Air Quality Standard = 3.6 ppb
c. No annual Saskatchewan Ambient Air Quality Standard
Red font means an operational time less than 90%.

Table D-4. Kerrobert Station: Summary of airpointer® $PM_{2.5}$ monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(µg/m³)	(µg/m³)	(no.)	(µg/m³)	(no.)	≤5	5 - 10	10 - 15	15 - 30	30 - 80	>80
January	604	81.2%	6.5	35.5	-	26.9	0	60.6	18.7	10.4	7.9	2.3	0.0
February	565	84.1%	4.0	18.3	-	7.7	0	73.3	23.9	2.5	0.4	0.0	0.0
March	744	100.0%	7.1	35.8	-	23.0	0	47.0	31.9	11.8	8.5	0.8	0.0
April	714	99.2%	4.3	20.0	-	7.6	0	65.7	30.7	2.9	0.7	0.0	0.0
May	741	99.7%	17.5	269.6	-	111.9	4	33.3	25.1	17.4	10.4	9.7	4.0
June	15	2.1%	18.7	74.7	-	< 0.1	0	53.3	20.0	0.0	0.0	26.7	0.0
July	0	0.0%	-	< 0.1	-	< 0.1	-	-	-	-	-	-	-
August	24	3.2%	24.1	70.6	-	24.1	0	37.5	16.7	4.2	8.3	33.3	0.0
September	720	100.0%	22.6	265.4	-	138.9	6	6.9	40.0	21.1	13.6	12.8	5.6
October	743	99.9%	4.4	18.9	-	10.6	0	66.9	29.1	3.5	0.5	0.0	0.0
November	716	99.4%	5.7	30.7	-	15.1	0	58.8	25.3	10.5	5.3	0.1	0.0
December	653	87.8%	4.1	20.0	-	9.7	0	69.2	24.8	5.7	0.3	0.0	0.0
Annual [c]	6239	71.2%	8.8	269.6	-	138.9	10	52.6	28.0	9.7	5.4	3.2	1.1

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24- Saskatchewan Ambient Air Quality Standard = 28 µg/m³, however not applicable as an exceedance only occurs when the standard is compared to the 3-year (2021-2023) average of the annual 98th percentile of daily 24-hour average concentrations

c. Annual Saskatchewan Ambient Air Quality Standard = 10 µg/m³

Red font means an operational time less than 90%.

Table D-5. Kerrobert Station: Summary of airpointer® precipitation monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Total Precip.	Maximum 1-Hr Precip.	Maximum 24-Hr Precip.	Percent of Data in each Precipitation Range					
	(no.)	(%)	(mm)	(mm)	(mm)	≤5	5 - 10	10 - 25	25 - 50	50 - 75	>75
January	604	81.2%	2.5	1.8	2.1	100.0	0.0	0.0	0.0	0.0	0.0
February	565	84.1%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
March	744	100.0%	2.7	2.6	2.6	100.0	0.0	0.0	0.0	0.0	0.0
April	714	99.2%	1.7	0.5	0.9	100.0	0.0	0.0	0.0	0.0	0.0
May	742	99.7%	13.7	4.7	7.5	100.0	0.0	0.0	0.0	0.0	0.0
June	15	2.1%	2.0	1.3	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
July	0	0.0%	-	-	-	-	-	-	-	-	-
August	226	30.4%	1.9	0.8	1.1	100.0	0.0	0.0	0.0	0.0	0.0
September	720	100.0%	9.1	2.2	5.3	100.0	0.0	0.0	0.0	0.0	0.0
October	743	99.9%	1.5	0.4	0.5	100.0	0.0	0.0	0.0	0.0	0.0
November	718	99.7%	1.3	0.7	0.8	100.0	0.0	0.0	0.0	0.0	0.0
December	653	87.8%	2.0	0.7	1.8	100.0	0.0	0.0	0.0	0.0	0.0
Annual	6444	73.6%	38.1	4.7	7.5	100.0	0.0	0.0	0.0	0.0	0.0

Red font means an operational time less than 90%.

Table D-6. Kerrobert Station: Summary of airpointer® ambient temperature monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Temp.	Minimum 1-Hr Temp.	Maximum 1-Hr Temp.	Percent of Data in each Temperature Range (°C)					
	(no.)	(%)	(°C)	(°C)	(°C)	≤-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	604	81.2%	-9.7	3.1	-26.6	0.0	15.4	79.8	4.8	0.0	0.0
February	565	84.1%	-12.0	2.1	-31.3	0.4	29.9	66.5	3.2	0.0	0.0
March	744	100.0%	-11.5	-1.0	-24.8	0.0	26.9	73.1	0.0	0.0	0.0
April	714	99.2%	0.9	17.3	-23.2	0.0	4.6	35.4	57.0	2.9	0.0
May	742	99.7%	15.5	29.9	1.1	0.0	0.0	0.0	49.6	50.4	0.0
June	15	2.1%	18.8	24.1	13.7	0.0	0.0	0.0	13.3	86.7	0.0
July	0	0.0%	-	-	-	-	-	-	-	-	-
August	226	30.4%	18.2	31.8	0.0	0.0	0.0	0.4	35.0	60.6	4.0
September	720	100.0%	14.4	29.7	1.1	0.0	0.0	0.0	57.5	42.5	0.0
October	743	99.9%	4.1	24.7	-16.7	0.0	0.8	31.2	59.9	8.1	0.0
November	718	99.7%	-1.4	12.4	-13.5	0.0	0.0	59.2	40.8	0.0	0.0
December	653	87.8%	-3.2	7.2	-15.6	0.0	0.3	72.7	27.0	0.0	0.0
Annual	6444	73.6%	0.9	31.8	-31.3	0.0	7.8	43.3	34.6	14.1	0.1

Red font means an operational time less than 90%.

Table D-7. Kerrobert Station: Summary of airpointer® relative humidity monitoring results for 2023

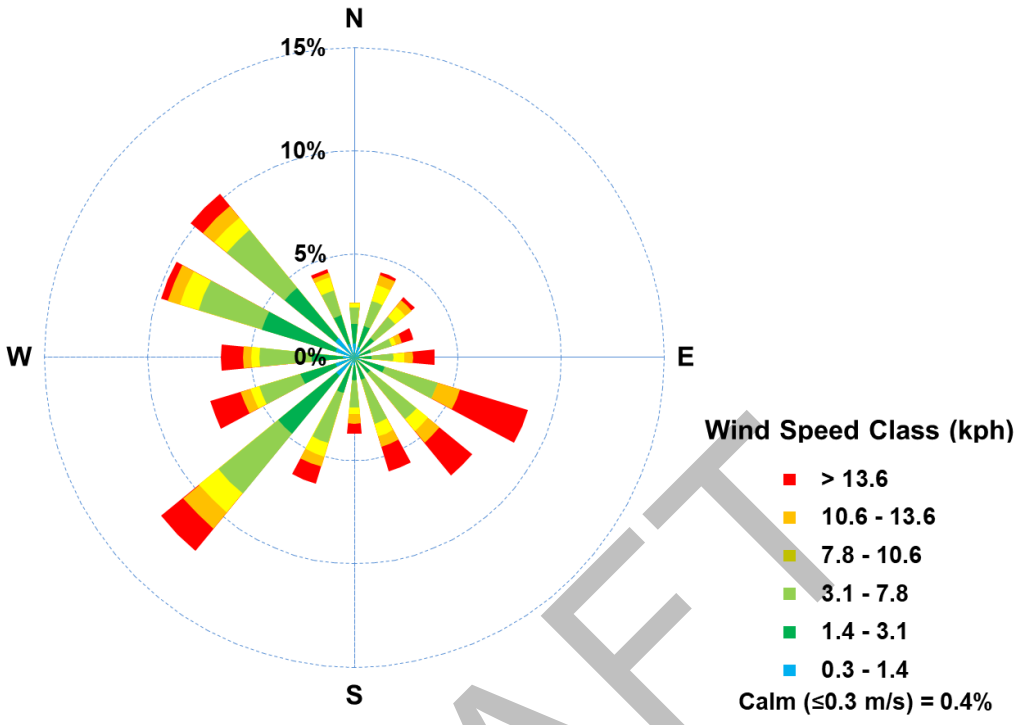
Month	Valid 1-Hr data	Operational Time	Average RH	Minimum 1-Hr RH	Maximum 1-Hr RH	Percent of Data in each Relative Humidity Range (%)					
	(no.)	(%)	(%)	(%)	(%)	≤15	15 - 30	30 - 60	60 - 80	80 - 90	>90
January	604	81.2%	74	83	-	58	-	0.0	0.0	0.2	96.5
February	565	84.1%	71	84	-	29	-	0.0	0.2	0.2	98.8
March	744	100.0%	73	83	-	41	-	0.0	0.0	2.0	95.4
April	714	99.2%	63	85	-	16	-	0.0	7.1	26.3	55.2
May	742	99.7%	50	88	-	13	-	1.6	16.8	48.9	24.0
June	15	2.1%	52	72	-	38	-	0.0	0.0	86.7	13.3
July	0	0.0%	-	0	-	0	-	-	-	-	-
August	226	30.4%	59	90	-	0	-	0.9	8.8	42.5	29.2
September	720	100.0%	52	89	-	14	-	0.4	14.2	50.6	24.4
October	743	99.9%	64	89	-	24	-	0.0	3.2	29.9	53.3
November	718	99.7%	68	88	-	32	-	0.0	0.0	26.3	55.2
December	653	87.8%	68	86	-	35	-	0.0	0.0	19.1	74.0
Annual	6444	73.6%	64	90	-	0	-	0.3	5.0	24.5	61.2

Red font means an operational time less than 90%.

Table D-8. Kerrobert Station: Wind frequency table for 2023

Wind Direction	Percent of Data within Wind Speed Range, wind speed unit kph						
Sector	0.3 - 1.4	1.4 - 3.1	3.1 - 7.8	7.8 - 10.6	10.6 - 13.6	>13.6	Totals
North NorthEast	0.5%	1.0%	1.3%	0.8%	0.5%	0.1%	4.3%
NorthEast	0.4%	0.8%	1.3%	0.6%	0.4%	0.2%	3.8%
East NorthEast	0.2%	0.6%	1.0%	0.2%	0.3%	0.6%	3.0%
East	0.2%	0.6%	1.0%	0.5%	0.4%	1.1%	3.9%
East SouthEast	0.3%	1.2%	2.7%	1.1%	0.9%	2.5%	8.7%
SouthEast	0.2%	0.8%	2.9%	0.7%	0.7%	2.0%	7.4%
South SouthEast	0.2%	0.9%	2.2%	0.6%	0.5%	1.2%	5.7%
South	0.4%	0.7%	1.3%	0.3%	0.5%	0.5%	3.7%
South SouthWest	0.4%	1.4%	2.5%	0.7%	0.5%	0.9%	6.4%
SouthWest	1.1%	3.6%	3.8%	1.2%	1.0%	1.4%	12.1%
West SouthWest	0.9%	1.8%	2.1%	0.4%	0.5%	1.6%	7.3%
West	0.5%	1.5%	2.5%	0.4%	0.4%	1.1%	6.4%
West NorthWest	0.9%	3.7%	3.2%	0.9%	0.6%	0.3%	9.7%
NorthWest	1.2%	3.2%	3.6%	0.8%	0.7%	0.7%	10.2%
North NorthWest	0.7%	1.4%	1.3%	0.7%	0.2%	0.2%	4.5%
North	0.7%	1.0%	0.8%	0.2%	0.0%	0.0%	2.7%
Total	8.7%	24.3%	33.6%	10.4%	8.2%	14.4%	99.6%

Percent Calm (≤0.3 kph)	0.4%
Number of Valid Hourly-Average Data	6426
Total Workable Hours in Time Period	8760


N
15%
10%
5%
0%
W
E
S
Wind Speed Class (kph)
> 13.6
10.6 - 13.6
7.8 - 10.6
3.1 - 7.8
1.4 - 3.1
0.3 - 1.4
Calm (≤0.3 m/s) = 0.4%

APPENDIX E

Meadow Lake Station: Continuous Monitoring Data

Table E-1 Meadow Lake Station: Summary statistics for continuous air monitoring results for 2023

Parameter	Unit	Calibration & AIC [a]	Valid Data	Uptime	Summary Statistics for Hourly Average Data		
		(hours)	(hours)	(%)	Average	Minimum	Maximum
NO	ppb	369	7737	92.2%	0.8	< 0.1	62.5
NO_2	ppb	369	7737	92.2%	3.1	< 0.1	45.8
NO_x	ppb	369	7737	92.2%	4.0	< 0.1	103.8
O_3	ppb	276	5929	69.9%	27.7	0.4	60.4
$PM_{2.5}$	µg/m^3	1	8565	97.8%	12.1	< 0.1	454.1
Precipitation	mm	0	8753	99.9%	373.9	< 0.1	14.1
Ambient Temperature	°C	0	8753	99.9%	4.6	-35.9	32.1
Relative Humidity	%	0	8752	99.9%	60.7	14.8	87.8
Wind Speed	kph	0	8753	99.9%	2.9	Calm	22.3

a. Automatic Instrument Check
b. Total precipitation
Red font means an operational uptime less than 90%.

Table E-2. Meadow Lake Station: Summary of airpointer® NO monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range (ppb)					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤5	5 - 15	15 - 53	53 - 100	100 - 159	>159
January	713	100.0%	1.9	62.5	-	16.5	-	92.3	5.6	2.0	0.1	0.0	0.0
February	637	100.0%	1.1	58.0	-	5.4	-	97.0	2.7	0.2	0.2	0.0	0.0
March	713	100.0%	0.7	19.7	-	2.5	-	98.6	1.3	0.1	0.0	0.0	0.0
April	689	99.9%	0.3	5.0	-	0.5	-	100.0	0.0	0.0	0.0	0.0	0.0
May	704	100.0%	0.3	7.8	-	1.7	-	99.6	0.4	0.0	0.0	0.0	0.0
June	671	97.1%	0.8	24.1	-	3.7	-	97.8	1.6	0.6	0.0	0.0	0.0
July	617	86.4%	0.3	4.4	-	0.7	-	100.0	0.0	0.0	0.0	0.0	0.0
August	196	26.9%	0.6	18.7	-	1.3	-	99.0	0.5	0.5	0.0	0.0	0.0
September	687	99.6%	0.6	23.9	-	2.5	-	98.0	1.7	0.3	0.0	0.0	0.0
October	713	100.0%	0.5	11.1	-	1.6	-	98.9	1.1	0.0	0.0	0.0	0.0
November	684	100.0%	0.6	10.7	-	1.7	-	99.0	1.0	0.0	0.0	0.0	0.0
December	713	100.0%	2.0	36.9	-	11.7	-	91.3	5.9	2.8	0.0	0.0	0.0
Annual [c]	7737	92.2%	0.8	62.5	-	16.5	-	97.5	1.9	0.6	0.0	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard
b. No 24-hour Saskatchewan Ambient Air Quality Standard
c. No annual Saskatchewan Ambient Air Quality Standard
Red font means an operational uptime less than 90%.

Table E-3. Meadow Lake Station: Summary of airpointer® NO_2 monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤5	5 - 15	15 - 53	53 - 100	100 - 159	>159
January	713	100.0%	6.5	35.6	0	20.0	0	55.0	35.3	9.7	0.0	0.0	0.0
February	637	100.0%	5.2	45.8	0	13.1	0	65.0	29.2	5.8	0.0	0.0	0.0
March	713	100.0%	3.6	32.9	0	8.3	0	79.9	16.5	3.5	0.0	0.0	0.0
April	689	99.9%	1.8	17.5	0	4.8	0	94.5	5.1	0.4	0.0	0.0	0.0
May	704	100.0%	2.0	13.6	0	4.2	0	89.6	10.4	0.0	0.0	0.0	0.0
June	671	97.1%	2.2	13.2	0	5.7	0	91.8	8.2	0.0	0.0	0.0	0.0
July	617	86.4%	1.1	6.0	0	2.2	0	99.7	0.3	0.0	0.0	0.0	0.0
August	196	26.9%	1.5	6.5	0	2.3	0	96.9	3.1	0.0	0.0	0.0	0.0
September	687	99.6%	2.0	17.6	0	5.3	0	92.0	7.9	0.1	0.0	0.0	0.0
October	713	100.0%	1.8	16.3	0	3.8	0	93.8	6.0	0.1	0.0	0.0	0.0
November	684	100.0%	2.6	14.9	0	5.8	0	88.9	11.1	0.0	0.0	0.0	0.0
December	713	100.0%	5.8	31.7	0	11.1	0	49.8	45.7	4.5	0.0	0.0	0.0
Annual [c]	7737	92.2%	3.1	45.8	0	20.0	0	82.0	15.8	2.2	0.0	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 159 ppb
b. 24-hour Saskatchewan Ambient Air Quality Standard = 106 ppb
c. Annual Saskatchewan Ambient Air Quality Standard = 24 ppb
Red font means an operational uptime less than 90%.

Table E-4. Maidstone Station: Summary of airpointer® NOx monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤5	5 - 15	15 - 53	53 - 100	100 - 212	>212
January	713	100.0%	8.4	98.1	-	36.5	-	49.4	37.0	12.5	1.1	0.0	0.0
February	637	100.0%	6.3	103.8	-	18.5	-	57.5	34.5	7.8	0.0	0.2	0.0
March	713	100.0%	4.3	52.6	-	10.6	-	74.2	20.6	5.2	0.0	0.0	0.0
April	689	99.9%	2.1	19.6	-	5.2	-	93.6	5.8	0.6	0.0	0.0	0.0
May	704	100.0%	2.3	14.0	-	4.6	-	87.8	12.2	0.0	0.0	0.0	0.0
June	671	97.1%	2.9	37.3	-	6.6	-	85.7	13.0	1.3	0.0	0.0	0.0
July	617	86.4%	1.4	10.0	-	2.8	-	99.0	1.0	0.0	0.0	0.0	0.0
August	196	26.9%	2.1	24.5	-	2.8	-	92.3	7.1	0.5	0.0	0.0	0.0
September	687	99.6%	2.6	34.8	-	6.2	-	88.5	10.5	1.0	0.0	0.0	0.0
October	713	100.0%	2.4	23.2	-	4.5	-	89.5	10.1	0.4	0.0	0.0	0.0
November	684	100.0%	3.2	25.4	-	7.5	-	83.9	15.2	0.9	0.0	0.0	0.0
December	713	100.0%	7.8	50.7	-	21.9	-	41.2	46.8	11.9	0.0	0.0	0.0
Annual [c]	7737	92.2%	4.0	103.8	-	36.5	-	77.4	18.7	3.8	0.1	0.0	0.0

a. No 1-hour Saskatchewan Ambient Air Quality Standard
b. No 24-hour Saskatchewan Ambient Air Quality Standard
c. No annual Saskatchewan Ambient Air Quality Standard
Red font means an operational uptime less than 90%.

Table E-5. Meadow Lake Station: Summary of airpointer® O_3 monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 8-Hr Conc.	8-Hour Exceedance [b]	Percent of Data in each Concentration Range (ppb)					
	(no.)	(%)	(ppb)	(ppb)	(no.)	(ppb)	(no.)	≤10	10 - 20	20 - 40	40 - 65	65 - 82	>82
January	713	100.0%	23.2	39.1	0	37.4	0	10.8	19.4	69.8	0.0	0.0	0.0
February	637	100.0%	31.6	46.8	0	46.2	0	1.6	5.0	85.7	7.7	0.0	0.0
March	713	100.0%	39.1	59.4	0	57.8	0	1.0	2.8	47.8	48.4	0.0	0.0
April	681	98.7%	40.8	56.3	0	54.3	0	0.0	1.2	41.0	57.9	0.0	0.0
May	195	26.4%	41.9	60.4	0	58.0	0	1.5	3.1	32.3	63.1	0.0	0.0
June	0	0.0%	-	< 0.1	0	0.0	0	-	-	-	-	-	-
July	0	0.0%	-	< 0.1	0	0.0	0	-	-	-	-	-	-
August	190	26.1%	23.7	49.0	0	45.1	0	13.2	27.4	52.1	7.4	0.0	0.0
September	690	100.0%	22.0	49.4	0	43.2	0	11.6	32.5	53.2	2.8	0.0	0.0
October	713	100.0%	22.2	37.6	0	34.7	0	4.6	26.4	69.0	0.0	0.0	0.0
November	684	100.0%	21.8	35.7	0	33.7	0	5.6	32.7	61.7	0.0	0.0	0.0
December	713	100.0%	18.5	37.4	0	35.4	0	20.6	34.5	44.9	0.0	0.0	0.0
Annual [c]	5929	69.9%	27.7	60.4	0	58.0	0	7.1	19.2	57.8	15.9	0.0	0.0

a. 1-hour Saskatchewan Ambient Air Quality Standard = 82 ppb

b. 8-hour Saskatchewan Ambient Air Quality Standard = 63 ppb; However not applicable because it is compared to the 3-year average of the annual 4th- highest daily maximum 8-hour average concentrations.

c. No annual Saskatchewan Ambient Air Quality Standard

Red font means an operational uptime less than 90%.

Table E-6. Meadow Lake Station: Summary of airpointer® $PM_{2.5}$ monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Conc.	Maximum 1-Hr Conc.	1-Hour Exceedance [a]	Maximum 24-Hr Conc.	24-Hour Exceedance [b]	Percent of Data in each Concentration Range					
	(no.)	(%)	(µg/m³)	(µg/m³)	(no.)	(µg/m³)	(no.)	≤5	5 - 10	10 - 15	15 - 30	30 - 80	>80
January	744	100.0%	9.8	77.6	-	28.4	1	48.5	18.3	11.7	13.8	7.7	0.0
February	672	100.0%	4.3	82.1	-	10.4	0	73.8	16.1	4.6	4.5	0.9	0.1
March	744	100.0%	7.2	123.5	-	19.4	0	48.8	32.9	10.8	5.8	1.3	0.4
April	719	99.9%	5.0	89.7	-	12.0	0	69.3	20.4	5.3	4.0	0.6	0.4
May	743	100.0%	20.7	454.1	-	113.9	7	25.8	22.7	19.5	18.6	8.5	4.8
June	716	99.4%	18.2	251.2	-	83.1	4	17.0	31.7	16.8	20.5	10.1	3.9
July	744	100.0%	16.9	81.8	-	43.6	5	20.3	24.9	14.5	22.6	17.6	0.1
August	744	100.0%	18.8	126.4	-	59.4	9	19.6	26.2	14.5	18.4	18.5	2.7
September	720	100.0%	28.7	291.4	-	216.5	5	13.3	31.8	19.2	18.1	9.3	8.3
October	744	100.0%	4.4	47.8	-	7.9	1	71.8	24.1	2.4	1.1	0.7	0.0
November	720	100.0%	4.7	22.3	-	17.1	0	69.0	20.0	7.2	3.8	0.0	0.0
December	555	74.6%	4.3	44.3	-	8.3	0	75.1	15.9	5.6	3.2	0.2	0.0
Annual[c]	8565	97.8%	12.1	454.1	-	216.5	32	45.2	24.0	11.2	11.4	6.5	1.8

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24- Saskatchewan Ambient Air Quality Standard = 28 µg/m³, however not applicable as an exceedance only occurs when the standard is compared to the 3-year (2021-2023) average of the annual 98th percentile of daily 24-hour average concentrations

c. Annual Saskatchewan Ambient Air Quality Standard =10 µg/m³

Red font means an operational uptime less than 90%.

Table E-7. Meadow Lake Station: Summary of airpointer® precipitation monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Total Precip.	Maximum 1-Hr Precip.	Maximum 24-Hr Precip.	Percent of Data in each Precipitation Range					
	(no.)	(%)	(mm)	(mm)	(mm)	≤5	5 - 10	10 - 25	25 - 50	50 - 75	>75
January	744	100.0%	14.0	2.2	10.8	100.0	0.0	0.0	0.0	0.0	0.0
February	672	100.0%	1.2	1.2	1.2	100.0	0.0	0.0	0.0	0.0	0.0
March	744	100.0%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
April	719	99.9%	9.1	3.2	6.9	100.0	0.0	0.0	0.0	0.0	0.0
May	744	100.0%	16.9	4.1	8.4	100.0	0.0	0.0	0.0	0.0	0.0
June	716	99.4%	123.7	14.1	30.7	98.7	1.1	0.1	0.0	0.0	0.0
July	744	100.0%	91.0	13.7	22.8	99.3	0.3	0.4	0.0	0.0	0.0
August	744	100.0%	71.0	6.0	14.8	99.9	0.1	0.0	0.0	0.0	0.0
September	719	99.9%	33.3	6.0	10.7	99.6	0.4	0.0	0.0	0.0	0.0
October	744	100.0%	13.2	1.7	6.9	100.0	0.0	0.0	0.0	0.0	0.0
November	720	100.0%	0.6	0.2	0.2	100.0	0.0	0.0	0.0	0.0	0.0
December	743	99.9%	< 0.1	< 0.1	< 0.1	100.0	0.0	0.0	0.0	0.0	0.0
Annual	8753	99.9%	373.9	14.1	30.7	99.8	0.2	0.0	0.0	0.0	0.0

Table E-8. Meadow Lake Station: Summary of airpointer® ambient temperature monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average Temp.	Minimum 1-Hr Temp.	Maximum 1-Hr Temp.	Percent of Data in each Temperature Range					
	(no.)	(%)	(°C)	(°C)	(°C)	≤-30	-30 ~ -15	-15 ~ 0	0 ~ 15	15 ~ 30	>30
January	744	100.0%	-10.3	4.2	-26.3	0.0	23.9	71.6	4.4	0.0	0.0
February	672	100.0%	-11.8	5.6	-35.9	5.2	32.1	49.6	13.1	0.0	0.0
March	744	100.0%	-9.3	7.1	-27.1	0.0	19.6	73.7	6.7	0.0	0.0
April	719	99.9%	3.3	17.5	-14.4	0.0	0.0	28.5	69.3	2.2	0.0
May	744	100.0%	15.8	29.4	2.9	0.0	0.0	0.0	48.3	51.7	0.0
June	715	99.3%	18.7	30.4	8.8	0.0	0.0	0.0	25.2	74.7	0.1
July	744	100.0%	17.7	29.9	7.2	0.0	0.0	0.0	31.3	68.7	0.0
August	744	100.0%	17.2	32.1	4.8	0.0	0.0	0.0	36.4	63.0	0.5
September	720	100.0%	13.7	29.4	4.0	0.0	0.0	0.0	61.0	39.0	0.0
October	744	100.0%	4.6	21.4	-10.5	0.0	0.0	31.5	61.3	7.3	0.0
November	720	100.0%	-1.0	11.5	-13.8	0.0	0.0	52.2	47.8	0.0	0.0
December	743	99.9%	-4.2	7.6	-14.6	0.0	0.0	81.8	18.2	0.0	0.0
Annual	8753	99.9%	4.6	32.1	-35.9	0.4	6.2	32.4	35.3	25.7	0.1

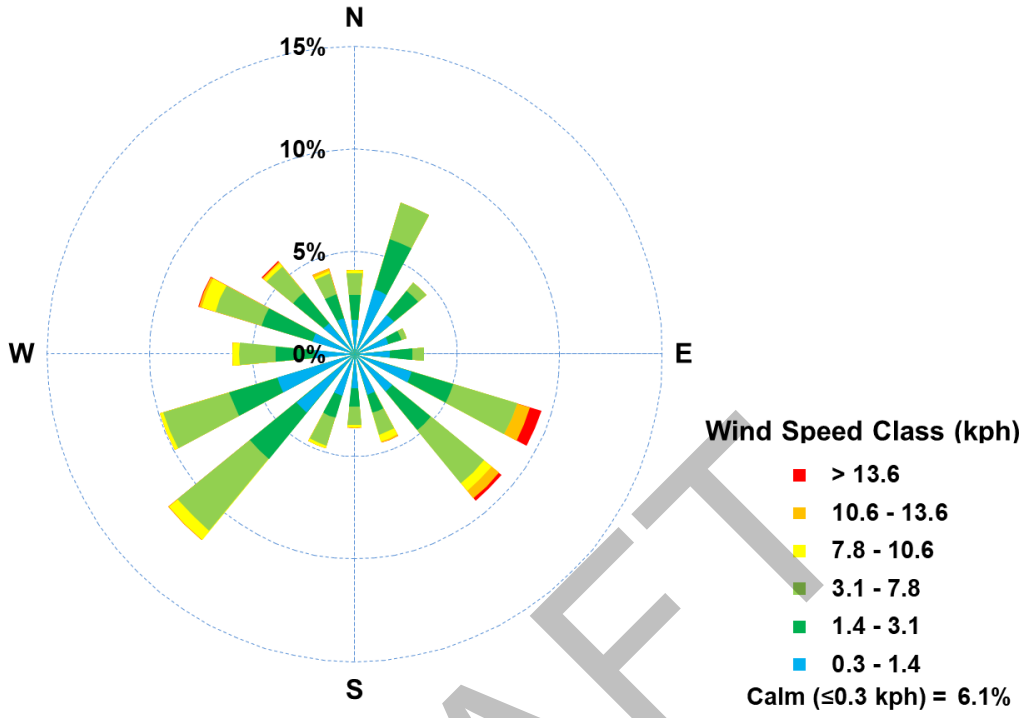
Table E-9. Meadow Lake Station: Summary of airpointer® relative humidity monitoring results for 2023

Month	Valid 1-Hr data	Operational Time	Average RH	Minimum 1-Hr RH	Maximum 1-Hr RH	Percent of Data in each Relative Humidity Range					
	(no.)	(%)	(%)	(%)	(%)	≤15	15 - 30	30 - 60	60 - 80	80 - 90	>90
January	744	100.0%	68	81	49	0.0	0.0	9.5	90.1	0.4	0.0
February	672	100.0%	60	82	39	0.0	0.0	53.0	45.8	1.2	0.0
March	744	100.0%	57	78	29	0.0	0.3	57.4	42.3	0.0	0.0
April	719	99.9%	52	84	15	0.1	9.9	55.8	30.7	3.5	0.0
May	744	100.0%	49	88	16	0.0	19.9	50.0	25.8	4.3	0.0
June	715	99.3%	60	88	26	0.0	2.7	43.9	36.6	16.8	0.0
July	744	100.0%	63	88	26	0.0	0.5	40.2	43.8	15.5	0.0
August	744	100.0%	66	88	25	0.0	0.1	31.6	45.8	22.4	0.0
September	720	100.0%	63	88	18	0.0	2.5	36.9	41.4	19.2	0.0
October	744	100.0%	63	87	27	0.0	0.8	39.8	48.7	10.8	0.0
November	720	100.0%	65	83	35	0.0	0.0	29.6	62.1	8.3	0.0
December	742	99.7%	63	80	24	0.0	0.4	34.4	65.1	0.1	0.0
Annual	8752	99.9%	61	88	15	0.0	3.1	40.0	48.3	8.6	0.0

Table E-10. Meadow Lake Station: Wind frequency table for 2023

Wind Direction	Percent of Data within Wind Speed Range, wind speed unit kph						
Sector	0.3 - 1.4	1.4 - 3.1	3.1 - 7.8	7.8 - 10.6	10.6 - 13.6	>13.6	Totals
North NorthEast	2.7%	2.6%	1.9%	0.0%	0.0%	0.0%	7.1%
NorthEast	1.9%	1.5%	0.5%	0.0%	0.0%	0.0%	4.0%
East NorthEast	1.3%	0.7%	0.3%	0.0%	0.0%	0.0%	2.2%
East	1.3%	1.1%	0.6%	0.0%	0.0%	0.0%	3.0%
East SouthEast	2.6%	2.1%	3.3%	0.7%	0.4%	0.2%	9.2%
SouthEast	2.1%	2.4%	3.3%	0.5%	0.5%	0.2%	9.0%
South SouthEast	1.6%	0.9%	1.1%	0.3%	0.1%	0.0%	4.1%
South	1.2%	0.9%	0.9%	0.1%	0.0%	0.0%	3.2%
South SouthWest	1.7%	1.1%	1.4%	0.1%	0.0%	0.0%	4.4%
SouthWest	3.4%	2.9%	4.6%	0.5%	0.0%	0.0%	11.5%
West SouthWest	3.6%	2.5%	3.4%	0.2%	0.0%	0.0%	9.6%
West	1.7%	1.9%	1.8%	0.3%	0.0%	0.0%	5.7%
West NorthWest	1.8%	2.6%	2.4%	0.7%	0.1%	0.0%	7.6%
NorthWest	1.7%	1.9%	1.6%	0.2%	0.1%	0.0%	5.6%
North NorthWest	1.4%	1.2%	1.1%	0.1%	0.1%	0.0%	3.9%
North	1.3%	1.2%	1.1%	0.1%	0.0%	0.0%	3.8%
Total	31.4%	27.5%	29.1%	4.0%	1.4%	0.4%	93.9%

Percent Calm (≤0.3 kph)	6.1%
Number of Valid Hourly-Average Data	8753
Total Workable Hours in Time Period	8760


N
15%
10%
5%
0%
W
E
S
Wind Speed Class (kph)
> 13.6
10.6 - 13.6
7.8 - 10.6
3.1 - 7.8
1.4 - 3.1
0.3 - 1.4
Calm (≤0.3 kph) = 6.1%

APPENDIX F

WYAMZ Exceedance Summary

Table F-1. Summary of 8-hour exceedances for 2023

1-hour Exceedance Information								Summary of Other Parameters During Exceedance					
Station	**Pollutant**	**Conc.**	**Exceedance Time mm-dd-hh**	**WS (kph)**	**WD**	**AQI**	**Total Rain (mm)**	**NO (ppb)**	**NO_2 (ppb)**	**NOx (ppb)**	**O_3 (ppb)**	**$PM_{2.5}$ ($\mu g/m^3$)**	**SO_2 (ppb)**
Clavet	O3	63.2	03-23 19:00	4.1	SW	4	0	0.2	5.4	5.6	63.2	17	-
	O3	63.6	03-23 20:00	3.7	SSW	4	0	Z	Z	Z	63.6	17	-
	O3	63.0	03-23 21:00	3.4	SSW	4	0	0.0	5.0	4.8	63.0	16	-
	O3	63.4	03-31 17:00	7.2	S	4	0	0.3	3.3	3.6	63.4	14	-
	O3	63.5	03-31 18:00	5.1	SSE	4	0	0.2	3.2	3.5	63.5	13	-
	O3	63.4	04-06 19:00	4.8	ESE	4	0	0.4	4.1	4.5	63.4	13	-
	O3	63.4	04-06 20:00	5.6	SE	4	0	Z	Z	Z	63.4	16	-
	O3	63.5	04-06 21:00	5.2	SE	4	0	0.3	3.4	3.7	63.5	15	-
	O3	63.2	04-06 22:00	5.7	ESE	4	0	0.5	3.4	3.9	63.2	11	-
	O3	63.3	04-07 20:00	10.4	SE	4	0	Z	Z	Z	63.3	16	-
	O3	64.0	06-05 18:00	11.2	S	7	0	1.4	2.0	3.4	64.0	86	-
	O3	64.9	06-05 19:00	7.4	SSE	8	0	1.0	3.0	4.0	64.9	105	-
	O3	65.4	06-05 20:00	4.9	SE	8	0	Z	Z	Z	65.4	95	-
	O3	63.2	06-05 21:00	4.0	SE	8	0	0.6	11.7	12.3	63.2	64	-

Note: O_3 concentrations do not represent actual exceedances. As per the SAAQS, an O_3 exceedance only occurs when the 3-year average of the annual 4th highest daily maximum 8-hour average concentrations is greater than 63 $\mu g/m^3$. See section 2.3.4 for information on O_3 actual exceedances.

Table F-2: Summary of 24-hour exceedances for 2023

24-hour Exceedance Information						Summary of Other Parameters During >28							
Station	**Pollutant**	**Conc.**	**Exceedance Date yy-mm-dd**	**WS (kph)**	**WD**	**Total Rain (mm)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_x (ppb)**	**O_3 (ppb)**	**$PM_{2.5}$ ($\mu g/m^3$)**	**SO_2 (ppb)**	**H_2S (ppb)**
	PM2.5	37	05-16	-	WSW	0.0	0.8	5.9	6.7	-	37	0.4	0.7
	PM2.5	56	05-19	-	SSW	0.0	0.4	5.1	5.4	-	56	0.2	0.3
	PM2.5	364	05-20	-	S	0.0	0.8	7.8	8.5	-	364	1.1	0.4
	PM2.5	31	05-21	-	SE	0.0	0.5	4.1	4.6	-	31	1.5	0.2
	PM2.5	47	05-22	-	ESE	1.5	0.5	4.2	4.7	-	47	1.3	0.2
	PM2.5	35	05-23	-	ESE	0.0	0.3	1.8	2.1	-	35	0.5	0.2
	PM2.5	42	05-30	-	SSE	8.8	0.7	3.3	4.0	-	42	0.1	0.2
	PM2.5	32	06-02	5.5	NW	0.0	1.1	3.7	4.8	-	32	0.1	0.3
Maidstone	PM2.5	36	06-08	5.0	SSE	0.0	2.2	6.0	8.1	-	36	0.4	0.4
	PM2.5	39	06-09	1.4	S	0.0	1.4	6.5	7.9	-	39	0.1	0.5
	PM2.5	73	06-12	0.9	SSE	0.0	1.1	6.1	6.8	-	73	0.4	0.1
	PM2.5	127	06-13	-	SSE	5.3	1.1	6.9	7.9	-	127	1.4	0.7
	PM2.5	28	06-14	-	SSE	0.0	0.6	4.2	4.8	-	28	0.9	0.4
	PM2.5	44	07-09	1.4	SW	0.0	0.2	3.0	3.2	-	44	0.3	0.3
	PM2.5	51	07-13	-	WNW	0.0	0.2	2.8	3.0	-	51	0.3	0.3
	PM2.5	90	07-14	-	WNW	0.0	0.3	3.3	3.7	-	90	0.1	0.2
	PM2.5	62	07-15	-	W	0.0	0.3	3.0	3.4	-	62	0.1	0.4

24-hour Exceedance Information				Summary of Other Parameters During >28									
Station	**Pollutant**	**Conc.**	**Exceedance Date yy-mm-dd**	**WS (kph)**	**WD**	**Total Rain (mm)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_x (ppb)**	**O_3 (ppb)**	**$PM_{2.5}$ ($\mu g/m^3$)**	**SO_2 (ppb)**	**H_2S (ppb)**
Maidstone	PM2.5	29	07-21	-	WNW	0.0	0.5	2.8	3.3	-	29	0.1	0.1
	PM2.5	38	07-22	-	SSW	0.2	0.9	3.4	4.3	-	38	0.3	0.3
	PM2.5	47	07-23	-	SSW	0.0	-	-	-	-	47	0.6	0.4
	PM2.5	39	07-24	-	ESE	1.5	-	-	-	-	39	0.7	0.5
	PM2.5	55	08-03	7.4	SSW	0.0	0.3	1.4	1.6	-	55	0.4	0.3
	PM2.5	42	08-27	-	WNW	0.0	-	-	-	-	42	0.4	0.5
	PM2.5	53	08-28	-	W	0.0	-	-	-	-	53	0.6	1.3
	PM2.5	36	08-29	-	S	0.0	-	-	-	-	36	1.2	0.9
	PM2.5	33	08-30	-	SSE	19.6	-	-	-	-	33	1.3	0.5
	PM2.5	72	08-31	-	WNW	6.7	-	-	-	-	72	0.4	0.6
	PM2.5	74	09-01	1.7	W	0.0	-	-	-	-	74	0.5	0.6
	PM2.5	119	09-02	5.5	W	0.0	-	-	-	-	119	0.2	0.4
	PM2.5	255	09-03	7.4	SSE	0.0	-	-	-	-	255	0.3	1.3
	PM2.5	42	09-04	6.2	NW	0.0	-	-	-	-	42	0.1	0.4
	PM2.5	56	09-18	-	WNW	0.0	-	-	-	-	56	0.3	0.3
Clavet	PM2.5	86	05-16	7.6	SE	0.0	0.6	3.8	4.3	40.6	86	-	-
	PM2.5	86	05-17	12.3	SSW	0.0	0.7	3.6	4.3	30.0	86	-	-
	PM2.5	58	05-20	6.4	ESE	0.0	0.6	4.1	4.7	26.7	58	-	-
	PM2.5	35	05-23	10.4	E	0.1	0.4	2.5	2.8	27.8	35	-	-

24-hour Exceedance Information				Summary of Other Parameters During >28									
Station	**Pollutant**	**Conc.**	**Exceedance Date yy-mm-dd**	**WS (kph)**	**WD**	**Total Rain (mm)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_x (ppb)**	**O_3 (ppb)**	**$PM_{2.5}$ ($\mu g/m^3$)**	**SO_2 (ppb)**	**H_2S (ppb)**
Clavet	PM2.5	31	05-30	2.5	SE	0.0	1.7	9.0	10.6	32.7	31	-	-
	PM2.5	33	06-06	9.2	SE	0.0	1.9	7.0	8.9	31.6	33	-	-
	PM2.5	37	06-09	6.5	ENE	0.0	0.5	5.0	5.4	29.7	37	-	-
	PM2.5	45	06-12	6.6	S	0.0	1.3	4.2	5.3	41.7	45	-	-
Kerrobert	PM2.5	58	05-17	-	SSW	0.0	-	-	-	-	58	0.1	0.3
	PM2.5	112	05-20	-	S	0.0	-	-	-	-	112	0.2	0.3
	PM2.5	58	05-21	-	ESE	0.0	-	-	-	-	58	0.1	0.2
	PM2.5	56	05-22	-	S	0.0	-	-	-	-	56	-	-
	PM2.5	66	09-01	9.7	W	0.0	-	-	-	-	66	0.2	0.4
	PM2.5	47	09-02	-	W	0.0	-	-	-	-	47	0.1	0.2
	PM2.5	139	09-03	8.9	SSW	0.0	-	-	-	-	139	0.0	0.2
	PM2.5	80	09-04	5.0	NW	0.0	-	-	-	-	80	0.0	0.3
	PM2.5	31	09-06	-	SSW	0.0	-	-	-	-	31	0.0	0.2
	PM2.5	56	09-18	-	W	0.0	-	-	-	-	56	0.1	0.1
Meadow Lake	PM2.5	28	01-09	1.4	SSW	0.0	2.5	11.3	13.8	15.5	28	-	-
	PM2.5	94	05-16	-	W	0.0	0.3	4.1	4.5	-	94	-	-
	PM2.5	39	05-17	-	S	0.0	0.1	1.3	1.4	-	39	-	-
	PM2.5	114	05-20	-	SE	0.0	0.4	4.1	4.5	-	114	-	-

24-hour Exceedance Information				Summary of Other Parameters During >28									
Station	**Pollutant**	**Conc.**	**Exceedance Date yy-mm-dd**	**WS (kph)**	**WD**	**Total Rain (mm)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_x (ppb)**	**O_3 (ppb)**	**$PM_{2.5}$ ($\mu g/m^3$)**	**SO_2 (ppb)**	**H_2S (ppb)**
Meadow Lake	PM2.5	41	05-22	-	ENE	8.4	0.2	2.2	2.4	-	41	-	-
	PM2.5	44	05-23	-	E	1.0	0.1	1.3	1.4	-	44	-	-
	PM2.5	30	05-30	-	SSW	2.8	0.3	4.2	4.5	-	30	-	-
	PM2.5	38	05-31	-	ESE	1.2	0.1	2.3	2.4	-	38	-	-
	PM2.5	33	06-08	2.7	SSE	0.0	0.5	3.5	3.9	-	33	-	-
	PM2.5	29	06-09	0.8	SSW	0.0	0.9	4.8	5.6	-	29	-	-
	PM2.5	82	06-12	0.9	S	0.0	1.0	5.7	6.6	-	82	-	-
	PM2.5	83	06-13	-	ESE	0.0	0.3	2.4	2.7	-	83	-	-
	PM2.5	44	07-13	-	W	0.0	0.4	2.2	2.5	-	44	-	-
	PM2.5	29	07-15	-	W	0.0	0.2	1.1	1.3	-	29	-	-
	PM2.5	39	07-22	-	WSW	0.0	0.7	2.2	2.8	-	39	-	-
	PM2.5	36	07-23	-	SSW	0.1	0.4	1.4	1.8	-	36	-	-
	PM2.5	42	07-24	-	ENE	0.0	0.5	1.4	1.9	-	42	-	-
	PM2.5	59	08-03	2.1	ESE	4.4	-	-	-	-	59	-	-
	PM2.5	33	08-06	2.3	W	4.1	-	-	-	-	33	-	-
	PM2.5	30	08-14	-	WSW	0.0	-	-	-	-	30	-	-
	PM2.5	34	08-15	-	SSW	8.9	-	-	-	-	34	-	-
	PM2.5	44	08-27	-	SW	0.0	0.4	1.7	2.1	25.2	44	-	-

24-hour Exceedance Information						Summary of Other Parameters During >28							
Station	**Pollutant**	**Conc.**	**Exceedance Date yy-mm-dd**	**WS (kph)**	**WD**	**Total Rain (mm)**	**NO (ppb)**	**NO_2 (ppb)**	**NO_x (ppb)**	**O_3 (ppb)**	**$PM_{2.5}$ (µg/m^3)**	**SO_2 (ppb)**	**H_2S (ppb)**
Meadow Lake	PM2.5	44	08-28	-	WSW	0.0	0.5	2.3	2.8	22.4	44	-	-
	PM2.5	29	08-29	-	SSE	0.0	1.3	1.3	2.6	21.2	29	-	-
	PM2.5	39	08-30	-	ESE	0.0	0.4	1.6	1.9	34.2	39	-	-
	PM2.5	29	08-31	-	SSW	0.5	0.7	2.1	2.8	22.9	29	-	-
	PM2.5	106	09-01	1.2	SW	0.0	0.5	1.7	2.1	22.4	106	-	-
	PM2.5	122	09-02	2.9	WSW	0.0	0.4	2.6	3.0	27.5	122	-	-
	PM2.5	216	09-03	4.3	SE	0.0	0.6	3.6	4.3	18.9	216	-	-
	PM2.5	37	09-04	4.0	WNW	0.0	0.2	1.2	1.5	15.4	37	-	-
	PM2.5	70	09-18	-	WSW	0.0	0.4	3.0	3.4	30.7	70	-	-

Note: $PM_{2.5}$ concentrations do not represent actual exceedances. As per the SAAQS, a PM2.5 exceedance only occurs when the 3-year average of the annual 98th percentile of the daily 24-hour average concentrations is greater than 28 µg/m^3. See section 2.3.5 for information on $PM_{2.5}$ actual exceedances.

APPENDIX G

WYAMZ 5-year Trends

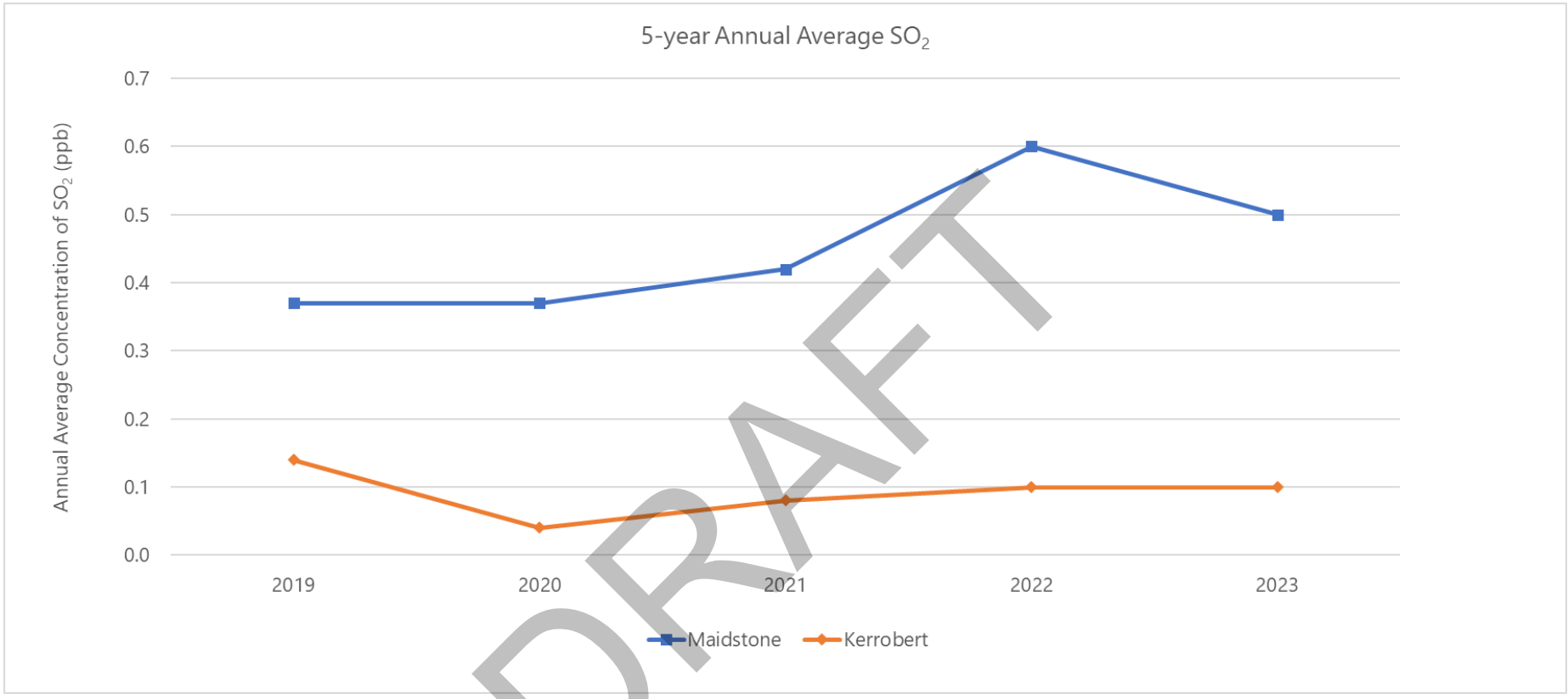


Figure G-1: 5-Year Trend (2019-2023) of the Annual Average Concentration of SO_2 in WYAMZ.

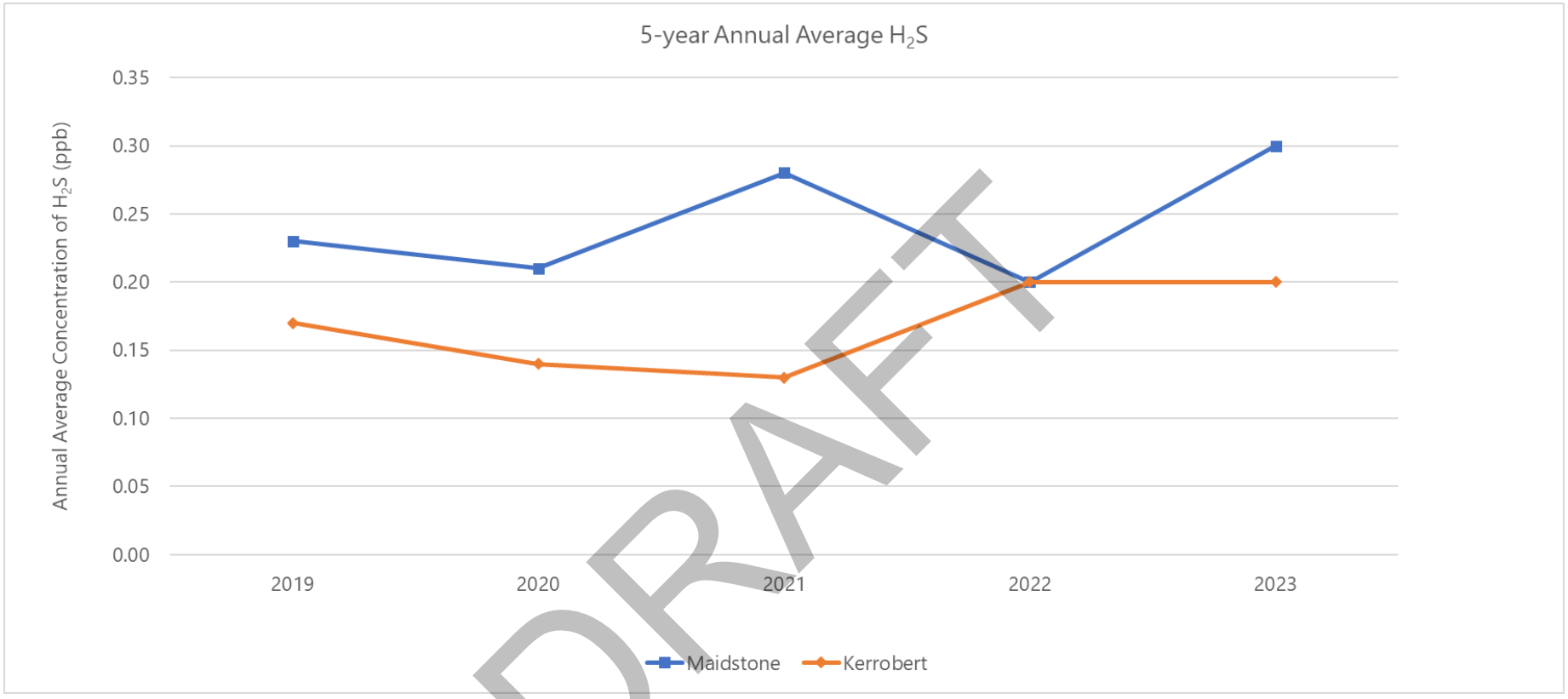


Figure G-2: 5-Year Trend (2019-2023) of the Annual Average Concentration of H_2S in WYAMZ.

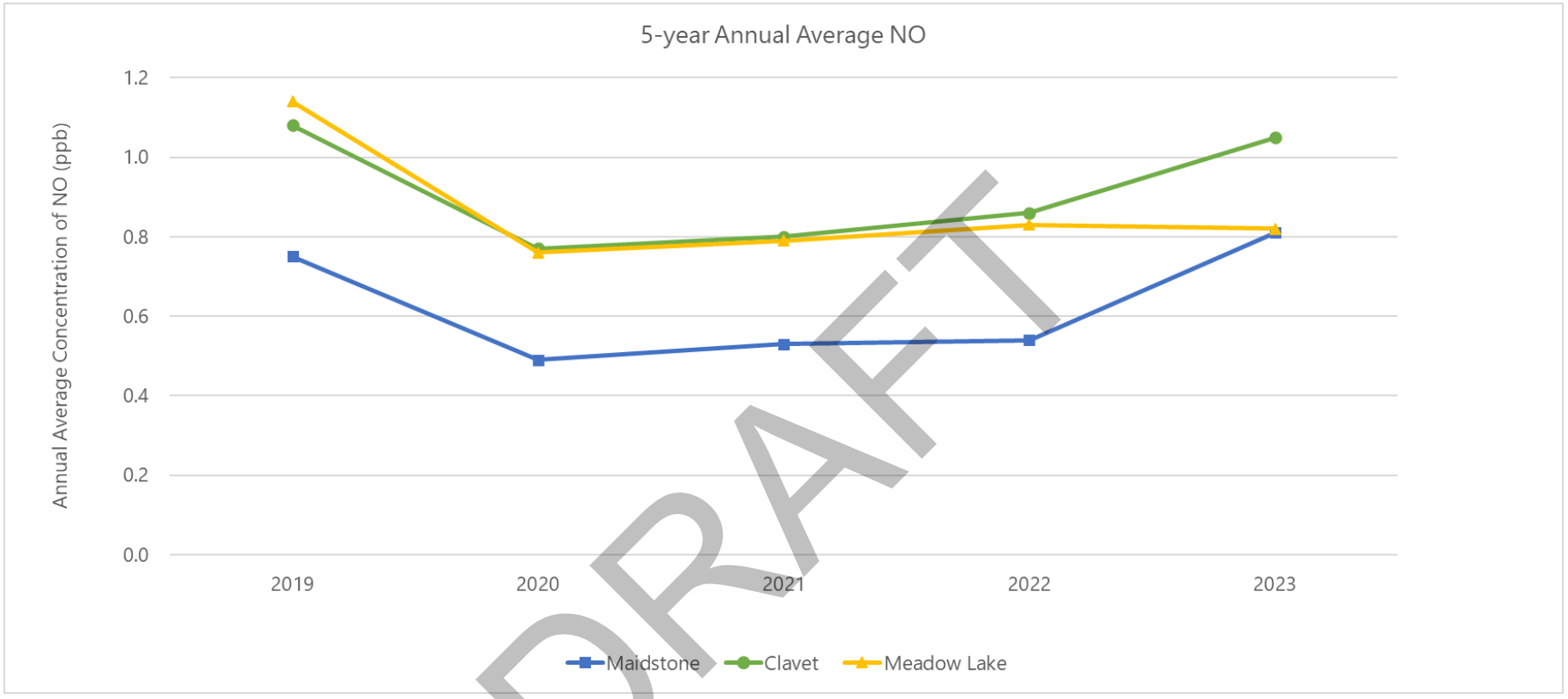


Figure G-3: 5-Year Trend (2019-2023) of the Annual Average Concentration of NO in WYAMZ.

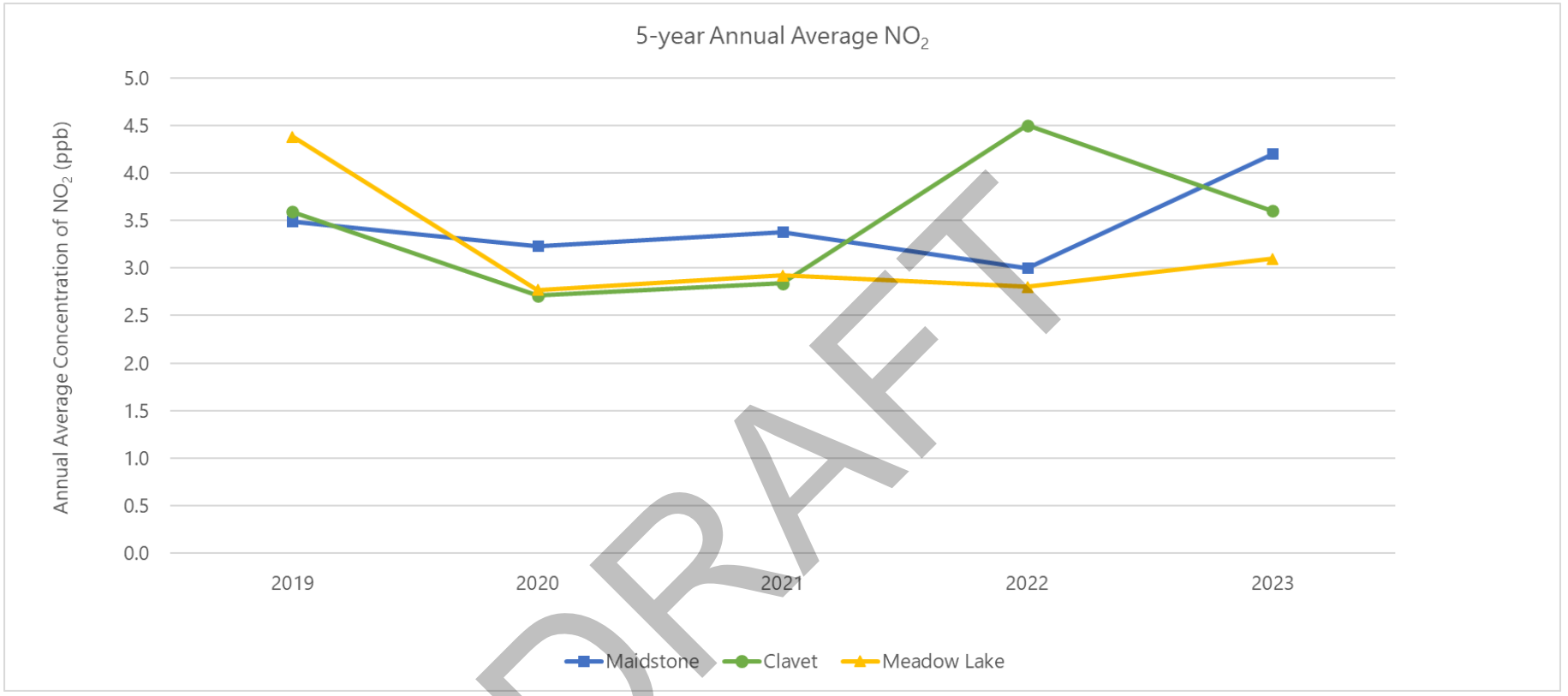


Figure G-4: 5-Year Trend (2019-2023) of the Annual Average Concentration of NO_2 in WYAMZ.

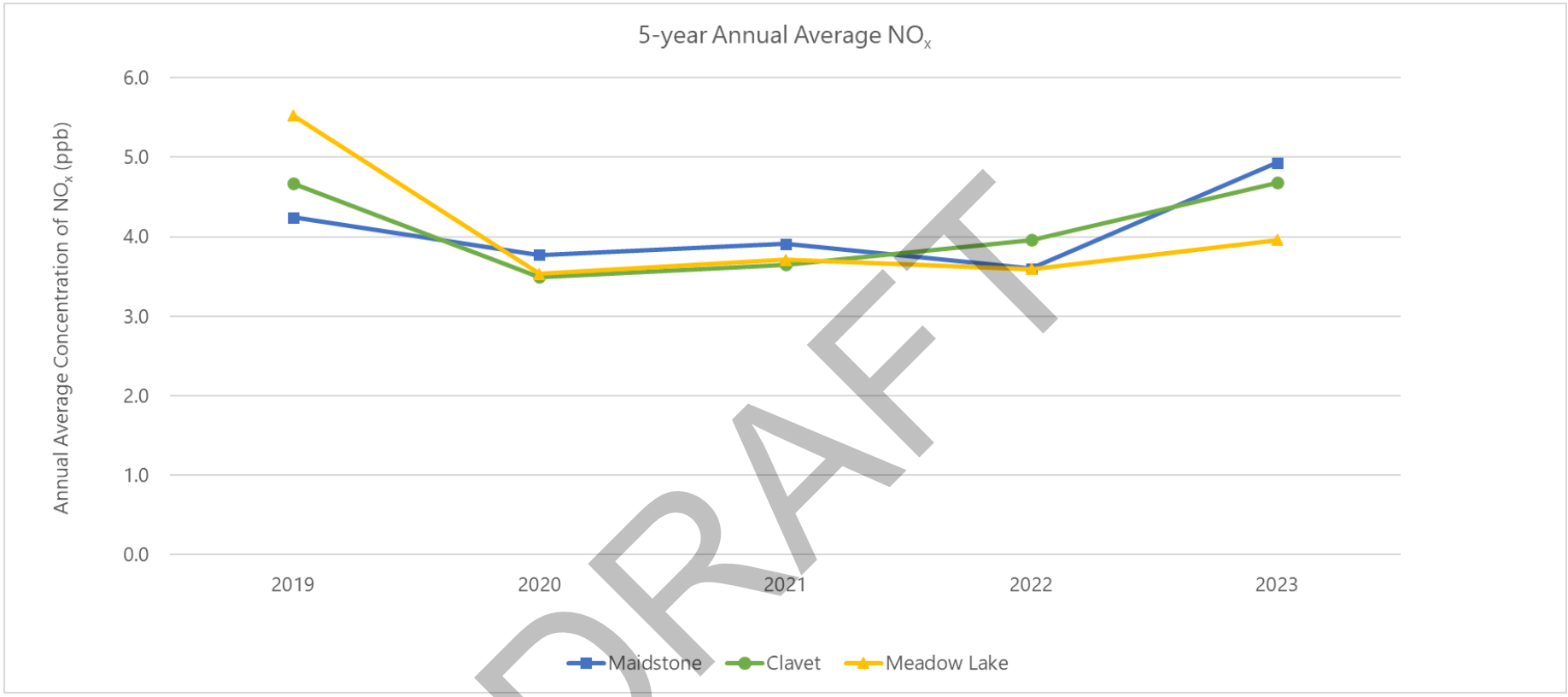


Figure G-5: 5-Year Trend (2019-2023) of the Annual Average Concentration of NO_x in WYAMZ.

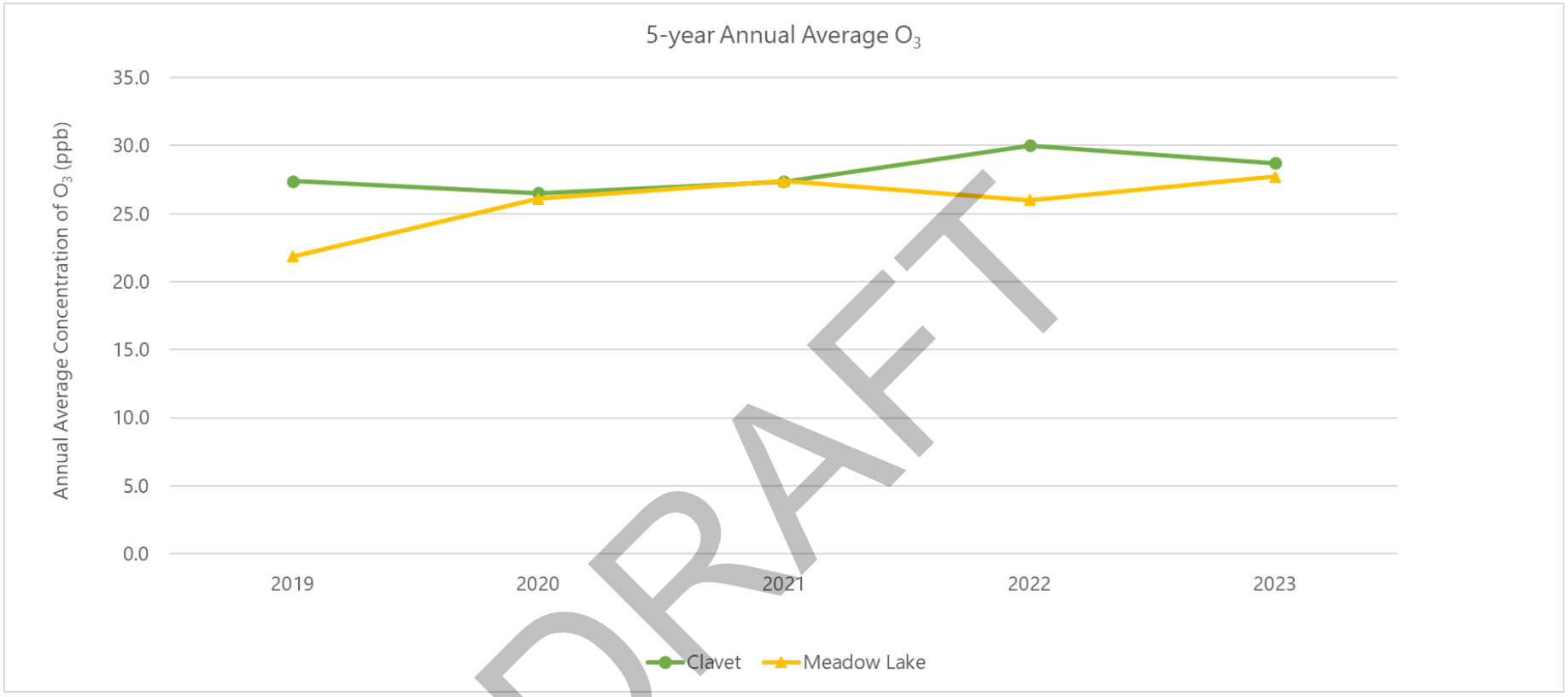


Figure G-6: 5-Year Trend (2019-2023) of the Annual Average Concentration of O_3 in WYAMZ.

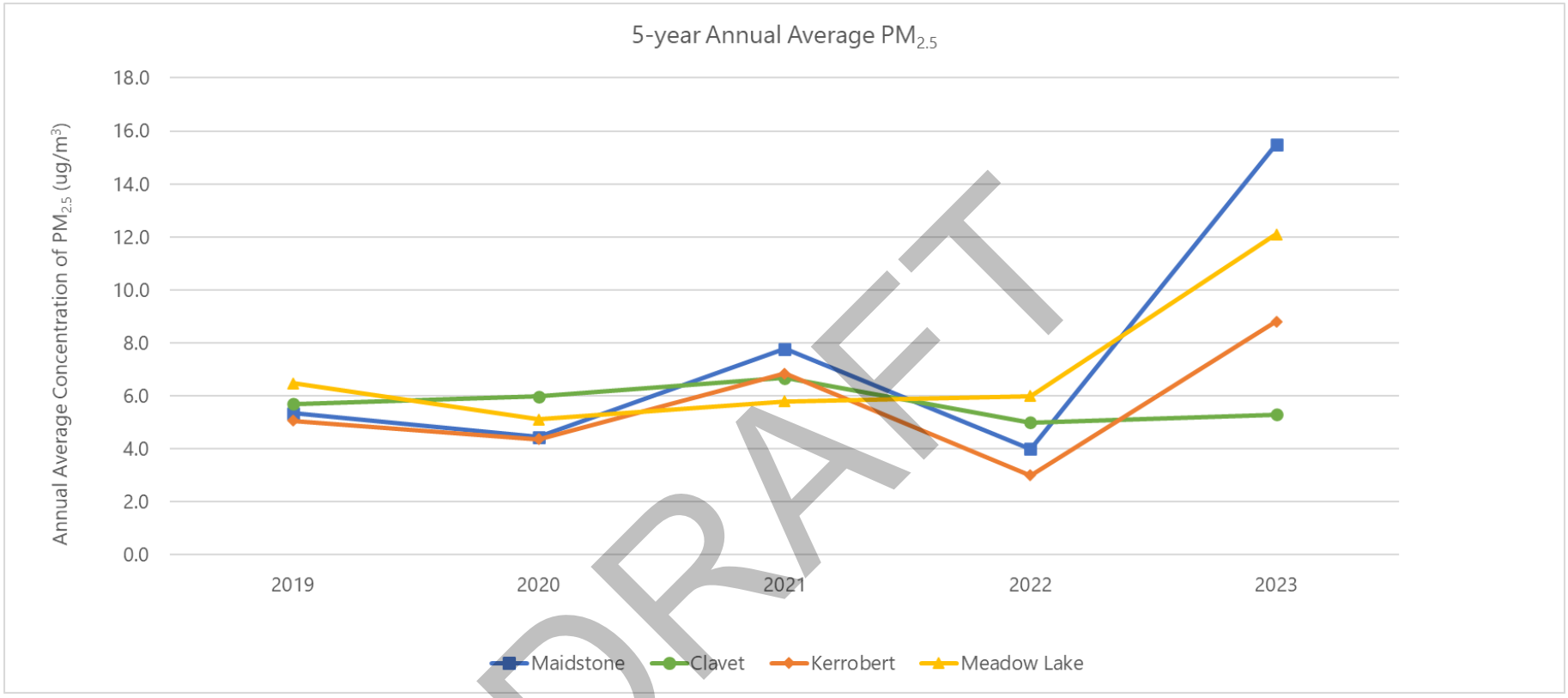


Figure G-7: 5-Year Trend (2019-2023) of the Annual Average Concentration of $PM_{2.5}$ in WYAMZ.

APPENDIX H

2023 Financial Statements

Western Yellowhead Air Management Zone Inc.

Financial Statements

December 31, 2023

Western Yellowhead Air Management Zone Inc.

Contents

For the year ended December 31, 2023

Management's Responsibility

To the Members of Western Yellowhead Air Management Zone Inc.:

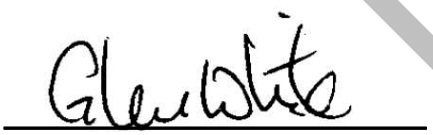
Management is responsible for the preparation and presentation of the accompanying financial statements, including responsibility for significant accounting judgments and estimates in accordance with Canadian accounting standards for not-for-profit organizations. This responsibility includes selecting appropriate accounting principles and methods, and making decisions affecting the measurement of transactions in which objective judgment is required.

In discharging its responsibilities for the integrity and fairness of the financial statements, management designs and maintains the necessary accounting systems and related internal controls to provide reasonable assurance that transactions are authorized, assets are safeguarded, and financial records are properly maintained to provide reliable information for the preparation of financial statements.

The Board of Directors is composed entirely of Directors who are neither management nor employees of the Organization. The Board is responsible for overseeing management in the performance of its financial reporting responsibilities. The Board fulfils these responsibilities by reviewing the financial information prepared by management and discussing relevant matters with management and external auditors. The Board is also responsible for recommending the appointment of the Organization's external auditors.

MNP LLP is appointed by the members to audit the financial statements and report directly to them; their report follows. The external auditors have full and free access to, and meet periodically and separately with, both the Board and management to discuss their audit findings.

May 29, 2024



Executive Director

To the Members of Western Yellowhead Air Management Zone Inc.:

Report on the Audit of the Financial Statements

Opinion

We have audited the financial statements of Western Yellowhead Air Management Zone Inc. (the "Organization"), which comprise the statement of financial position as at December 31, 2023, and the statements of operations, changes in net assets and cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the Organization as at December 31, 2023, and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the Organization in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Organization's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Organization or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Organization's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Organization's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Organization's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Organization to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Saskatoon, Saskatchewan

May 29, 2024

MNP LLP

Chartered Professional Accountants

Western Yellowhead Air Management Zone Inc.
Statement of Financial Position
As at December 31, 2023

	2023	2022
Assets		
Current		
Cash resources	**262,588**	346,611
Short-term investment *(Note 3)*	**112,427**	-
Prepaid expenses	**5,674**	5,426
	380,689	352,037
Tangible capital assets *(Note 4)*	**68,474**	66,336
	449,163	418,373
Liabilities		
Current		
Accounts payable and accruals	**21,595**	13,758
Goods and Services Tax payable	**823**	2,328
	22,418	16,086
Commitments (Note 7)		
Net Assets		
Unrestricted net assets	**426,745**	402,287
	449,163	418,373

Approved on behalf of the Board of Directors

Kari Hamilton

Director

Director

The accompanying notes are an integral part of these financial statements

Western Yellowhead Air Management Zone Inc.
Statement of Operations and Changes in Net Assets
For the year ended December 31, 2023

	2023	*2022*
Revenue		
Membership fees	**188,480**	184,865
Investment income	**7,131**	1,521
	195,611	186,386
Expenses		
Amortization	**15,041**	16,724
Insurance	**7,944**	7,455
Consulting	**1,000**	1,000
Management fees *(Note 5)*	**51,964**	51,625
Meetings	**1,506**	1,640
Monitoring	**54,920**	50,170
Office supplies	**2,662**	1,668
Professional fees	**8,880**	8,665
Promotion	**-**	4,324
Repairs and maintenance	**23,570**	20,002
Telephone	**2,514**	2,458
Utilities	**1,152**	-
	171,153	165,731
Excess of revenue over expenses	**24,458**	20,655
Net assets, beginning of year	**402,287**	381,632
Net assets, end of year	**426,745**	402,287

The accompanying notes are an integral part of these financial statements

Western Yellowhead Air Management Zone Inc.
Statement of Cash Flows
For the year ended December 31, 2023

	2023	*2022*
Cash provided by the following activities		
Operating		
Excess of revenue over expenses	**24,458**	20,655
Amortization	**15,041**	16,724
Investment income receivable	**(5,068)**	-
	34,431	37,379
Changes in working capital accounts		
Prepaid expenses	**(248)**	980
Accounts payable and accruals	**7,837**	3,158
GST Payable	**(1,505)**	413
Net cash flow from operating activities	**40,515**	41,930
Investing		
Purchase of short-term investment	**(107,359)**	-
Proceeds on disposal of short-term investment	**-**	106,559
Purchase of capital assets	**(17,179)**	-
	(124,538)	106,559
(Decrease) increase in cash resources	**(84,023)**	148,489
Cash resources, beginning of year	**346,611**	198,122
Cash resources, end of year	**262,588**	346,611

The accompanying notes are an integral part of these financial statements

1. Incorporation and nature of the organization

Western Yellowhead Air Management Zone Inc. (the "Organization") was incorporated under The Non-Profit Corporations Act of Saskatchewan on February 14, 2012.

The Organization collects and monitors ambient air quality data in Northwest Saskatchewan and makes the data available to all members.

2. Significant accounting policies

The financial statements have been prepared in accordance with Canadian accounting standards for not-for-profit organizations using the following significant accounting policies:

Cash resources

Cash and cash equivalents include cash, term deposits, and marketable securities with maturities of three months or less.

Revenue recognition

The Organization follows the deferral method of accounting for contributions. Restricted contributions are recognized as revenue in the year in which the related expenses are incurred. Unrestricted contributions are recognized as revenue when received. Membership fees are recognized when collected and received.

Financial instruments

The Organization recognizes financial instruments when the Organization becomes party to the contractual provisions of the financial instrument.

Arm's length financial instruments

Financial instruments acquired or issued in an arm’s length transaction (“arm’s length financial instruments”) are initially recorded at their fair value.

At initial recognition, the Organization may irrevocably elect to subsequently measure any arm’s length financial instrument at fair value. The Organization has not made such an election during the year.

The Organization subsequently measures investments in equity instruments quoted in an active market at fair value. Fair value is determined by published price quotations. All other financial assets and liabilities are subsequently measured at amortized cost.

Transaction costs and financing fees are added to the carrying amount for those financial instruments subsequently measured at cost or amortized cost.

2. Significant accounting policies *(Continued from previous page)*

Related party financial instruments

The Organization initially measures the following financial instruments originated/acquired or issued/assumed in a related party transaction ("related party financial instruments") at fair value:

- Investments in equity instruments quoted in an active market
- Debt instruments quoted in an active market
- Debt instruments when the inputs significant to the determination of its fair value are observable (directly or indirectly)
- Derivative contracts.

All other related party financial instruments are measured at cost on initial recognition. When the financial instrument has repayment terms, cost is determined using the undiscounted cash flows, excluding interest, dividend, variable and contingent payments, less any impairment losses previously recognized by the transferor. When the financial instrument does not have repayment terms, but the consideration transferred has repayment terms, cost is determined based on the repayment terms of the consideration transferred. When the financial instrument and the consideration transferred both do not have repayment terms, the cost is equal to the carrying or exchange amount of the consideration transferred or received.

Transaction costs and financing fees directly attributable to the origination, acquisition, issuance or assumption of related party financial instruments are immediately recognized in excess of revenue over expenses.

Financial asset impairment

The Organization assesses impairment of all its financial assets measured at cost or amortized cost. The Organization groups assets for impairment testing when available information is not sufficient to permit identification of each individually impaired financial asset in the group; there are numerous assets affected by the same factors; no asset is individually significant. Management considers whether the issuer is having significant financial difficulty; whether there has been a breach in contract, such as a default or delinquency in interest or principal payments, in determining whether objective evidence of impairment exists. When there is an indication of impairment, the Organization determines whether it has resulted in a significant adverse change in the expected timing or amount of future cash flows during the year.

The Organization reduces the carrying amount of any impaired financial assets to the highest of: the present value of cash flows expected to be generated by holding the assets; the amount that could be realized by selling the assets at the statement of financial position date; and the amount expected to be realized by exercising any rights to collateral held against those assets.

Any impairment, which is not considered temporary, is included in current year excess of revenue over expenses.

The Organization reverses impairment losses on financial assets when there is a decrease in impairment and the decrease can be objectively related to an event occurring after the impairment loss was recognized. The amount of the reversal is recognized in excess of revenue over expenses in the year the reversal occurs.

Tangible capital assets

Purchased tangible capital assets are recorded at cost. Contributed tangible capital assets are recorded at fair value at the date of contribution if fair value can be reasonably determined.

Amortization is provided using the declining balance method at rates intended to amortize the cost of assets over their estimated useful lives.

	Rate
Website	50 %
Equipment	20 %

Long-lived assets

Long-lived assets consist of capital assets. Long-lived assets held for use are measured and amortized as described in the applicable accounting policies.

When the Organization determines that a long-lived asset no longer has any long-term service potential to the Organization, the excess of its net carrying amount over any residual value is recognized as an expense in the statement of operations. Write-downs are not reversed.

2. Significant accounting policies *(Continued from previous page)*

Measurement uncertainty

The preparation of financial statements in conformity with Canadian accounting standards for not-for-profit organizations requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenses during the reporting period.

Amortization is based on the estimated useful lives of capital assets.

These estimates and assumptions are reviewed periodically and, as adjustments become necessary they are reported in excess of revenues and expenses in the periods in which they become known.

3. Short-term investment

Guaranteed Investment Certificate with an interest rate of 4.8% matures on January 6, 2024.

4. Tangible capital assets

	Cost	***Accumulated amortization***	***2023 Net book value***	*2022 Net book value*
Website	**7,956**	**7,863**	**93**	187
Equipment	**479,354**	**410,973**	**68,381**	66,149
	487,310	**418,836**	**68,474**	66,336

5. Related party transactions

The Organization has entered into a contract agreement for management services expiring on May 31, 2025. The contract is based on hours required, to a maximum of a yearly $52,500. Any amount over the maximum rate is required to be approved by the Board of Directors. Included in expenses for the current fiscal year are $51,964 (2022 - $51,625) of management fees. The expenses were incurred in the normal course of operations and measured at the exchange amount, which is the amount of consideration established and agreed to by the related parties.

6. Financial instruments

The Organization, as part of its operations, carries a number of financial instruments. It is management's opinion that the Organization is not exposed to significant interest, currency, credit, liquidity, or other price risks arising from these financial instruments except as otherwise disclosed.

7. Commitments

(a) The Organization has entered into a contract for the operation and maintenance of airpointer monitoring stations expiring July 31, 2024 with minimum annual payments remaining as follows:

2024	28,595

(b) The Organization is committed to the purchase of approximately $94,000 of equipment in fiscal 2024.

APPENDIX I

WYAMZ Board of Directors

Kari Hamilton Board Chair (Saskatchewan Mining Association)

Kari Hamilton is an Environmental Regulatory Lead for The Mosaic Company. She has a B.Sc. in Environmental Science & Biology from the University of Alberta along with over 18 years of environmental, industrial and regulatory experience. In her current role, she supports operations, chairs Fertilizer Canada's Environmental Committee, sits on the Board of Directors for two other air zones within Saskatchewan, and manages various regulatory files including air quality. Kari is passionate about environmental education especially with youth in hopes to inspire them to catch "the science bug".

Jocelan Lundquist Vice-Chair (Cenovus Energy Inc)

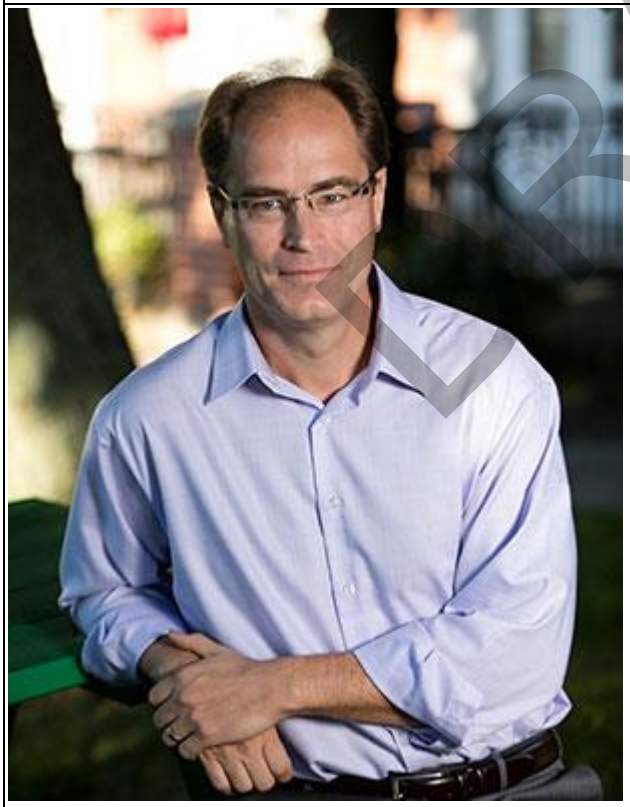
Jocelan holds a BSc in Environmental Science from the University of Alberta, is a Professional Agrologist and has worked in an environmental role within the Western Canadian Oil and Gas Industry for over 20 years. She currently resides in Lloydminster, Alberta and works for Cenovus Energy. Jocelan began her career working on soil/groundwater remediation and reclamation as part of company asset retirement and liability management programs. She now provides technical and regulatory support for operational activities related to air quality, water quality, waste management, spill response, soil remediation and vegetation management.

	**Curtis Ferguson** Member Curtis has been employed with the Ministry of Environment, Mosaic Colonsay, and Nutrien Allan Potash Operations. His current role is Lead Environmental Engineer at Nutrien Allan which duties include the responsibility to maintain the facility license to operate and undertake environmental improvements related to fresh water use, air quality, energy, and waste management.
	**Gary Ericson** Member (Saskatchewan Ministry of the Economy) Mr. Ericson is the Regional Manager of the Lloydminster Office of The Ministry of Economy and holds an AScT. Designation with the Saskatchewan Applied Science Technologists and Technicians. He graduated from Kelsey Institute of Applied Arts and Sciences in Saskatoon with a Diploma in Mechanical Engineering Technology in 1979. He has over 34 years of oil and gas development experience and considered to be one of our Ministry's foremost heavy oil well development and production expert. Mr. Ericson has extensive experience in the upstream Petroleum and Natural Gas Industry relating to drilling, servicing, and production issues gained through his years as a field technician and a manager.

	**Anya Gawor** Member Anya is an air emissions management engineer with Cenovus Energy Inc. She holds a BASc degree in Chemical Engineering Honours – Environmental Engineering Option from the University of Waterloo as well as a MSc in Environmental Chemistry from the University of Toronto. Anya has over 10 years of experience in the environmental field, specializing in air emissions and research and development.
	**Chidiebiere Anokwute** Member Chidi is an Environmental Coordinator with Canadian Natural Resources Limited (CNRL). He holds a Bachelor of Technology degree in geology from Federal University of Technology, Owerri, Nigeria and a Master's degree in Environmental Technology from University of Wolverhampton, United Kingdom. He worked in the environmental industry in the UK for over seven years before relocating to Canada in 2014 to continue his environmental practice in the oil and gas industry. He is located at the CNRL field office in Lloydminster Alberta.

Ryan LeBlanc Science Committee chair

Ryan LeBlanc is a Senior Air Management Specialist and previously worked as an Environmental Protection Officer with the Environmental Protection Branch of the Ministry of Environment and had been with the ministry since 2020. He holds an undergraduate degree in Environmental Geochemistry and a diploma in Environmental Engineering Technology. Ryan brings 8 years of experience in the field of ambient air monitoring to WYAMZ.



Niels Koehncke Secretary Treasurer

Dr. Koehncke is a specialist in Occupational Medicine, practicing in Saskatoon for over 20 years. He completed his residency training in Occupational Medicine at the University of Alberta in 2000. He is an Associate Professor in the Department of Medicine and Faculty member of the Canadian Centre for Health and Safety in Agriculture (CCHSA) at the University of Saskatchewan. He served as Director of CCHSA from 2012-2022, and presently leads the CCHSA Outreach Division. He also served as the Chief Occupational Medical Officer with the Saskatchewan Ministry of Labour Relations and Workplace Safety from 2000-2019. He has an outpatient occupational medicine practice at Royal University Hospital, teaches occupational medicine and health at the undergraduate and graduate level, and is involved in or leads research and outreach projects related to agricultural and occupational health.

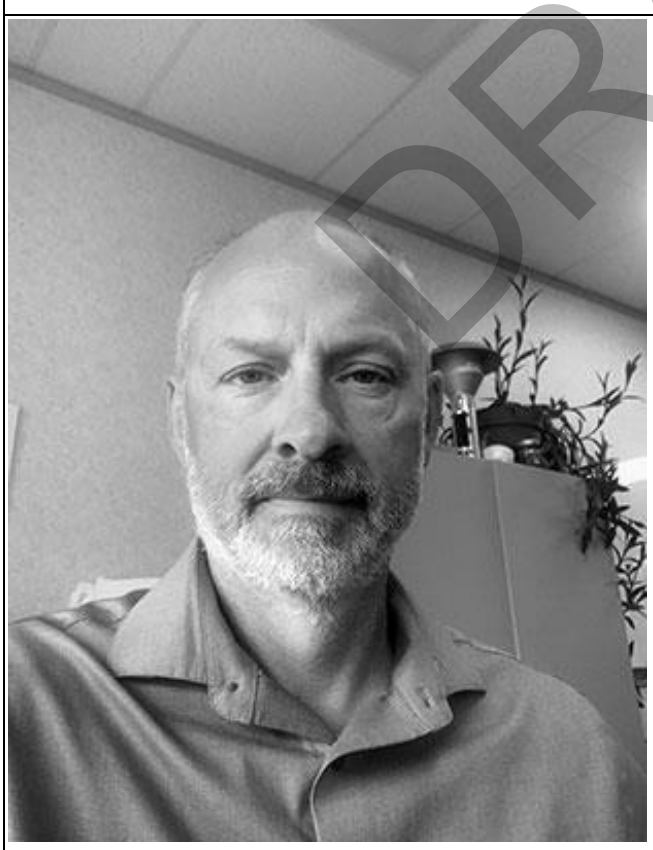
Aaron Rognvaldson Member

Aaron is currently the Manager of the Air Emissions Management Team at Cenovus Energy. He joined Cenovus when Husky Energy and Cenovus merged. Prior to the merge, Aaron was part of Husky's Air Team in Calgary for 2 years, and, Environmental Operations in Husky's Foothills district for 12 years. Aaron's background is in environmental assessment and remediation with experience coordinating regulatory and compliance aspects for environmental issues related to air, water, soils and waste.
He is a registered professional technologist (P.Tech. (Eng.)) with the Alberta Society of Engineering Technologist (ASET) and currently serves on the board of directors of a central Alberta airshed.

Bruce Hesselink Communications Committee Chair

Bruce grew up in the Estevan area and attended the University of Saskatchewan where he earned a Bachelor's Degree in Agriculture.
After twenty-five or so years in agriculture R&D, including Agriculture Canada Research Branch in Saskatoon and the PFRA in Indian Head, Bruce joined SaskPower to manage their Shand Greenhouse Program.

Currently Bruce is a Specialist with the Environmental Strategic Issues Management group of SaskPower's Environment Department, involved in files such as water and waste management, biodiversity, and air emissions. He has been involved in the Southeast Saskatchewan Airshed Association since 2020 and Chair of its Board of Directors since 2021.

	**Glen White** Executive Director Mr. White brings more than 30 years of environmental management experience in the Saskatchewan mining and clean energy industries. His roles have included management of mine site environmental programs, conducting major project federal-provincial environmental assessments for new mining projects, and completing prefeasibility studies for utility scale renewable energy projects. Glen is committed to working with industry, regulatory agencies and other stakeholders to build efficient and effective air management programs based upon consistent, high quality air quality data collected within the WYAMZ.
	**Chris Grey** Member Chris Gray holds a BSc in Environmental Management from Royal Roads university in Victoria, BC. Currently in Regina, Chris has worked in the air quality field for 32 years. He was the National Air Pollution Surveillance manager for the province of Saskatchewan for many years and is the now manager of the Air Quality section with the Ministry of Environment.

Wesley Wizniuk Member

Wesley Wizniuk is a Project Engineer with the City of Saskatoon. His role with the City includes leading project, providing project support to other divisions/departments, and providing technical advisory and regulatory compliance support for City projects and operations.

APPENDIX J

WYAMZ Historical Member Companies

The Western Yellowhead Air Management Zone would like to express our gratitude to our members over the years for their support of WYAMZ, for their very strong support regarding quality air data collection, and for their commitment to the citizens and environment of Saskatchewan.

- 5 Star Resources
- Agrium Inc.
- Akzo Nobel
- Alta Gas
- Bayhurst Gas
- Beaumont Energy
- Black Pearl Resources
- Bruin Oil and Gas
- Buzzard Resources
- Caltex Resources
- Canadian Natural Resources Limited
- Carrier Forest
- Cenovus Energy
- City of Saskatoon
- Compass Minerals
- Conoco Phillips
- Cory Atco Operations
- Crescent Point
- Crocotta Energy
- Crocus Oil
- Devon Canada Corporation
- Bayhurst Gas
- Beaumont Energy
- Black Pearl Resources
- Kaisen Energy
- Leeco Resources
- Longhorn Oil and Gas
- Longview Oil
- Modexco Petroleum
- Meridian Cogeneration Power
- NAL Resources Limited
- Niven Fisher
- North Battleford Power L.P.
- North West Bio Energy
- Northern Blizzard
- Novus Energy Inc.
- P&H Milling
- Palliser Oil and Gas
- Pengrowth Energy Corporation
- Plasti-Fab
- Bruin Oil and Gas
- Buzzard Resources
- Caltex Resources
- Potash Corp
- Prosper Energy
- Raven Resources
- Renegade Petroleum
- Repsol Canada
- Rife Resources
- Saputo Products
- SaskEnergy Incorporated/ TransGas Limited
- Smitty's Farms
- Sojourn Energy
- Spartan Energy
- Sphere Energy
- SSSS Oil Partnership
- Tamarack Valley
- Talisman Energy
- Tuscany Energy
- Twin Butte Energy
- Viterra

CONTRIBUTING MEMBERS THIS YEAR

For information on how to become a member, please contact Glen White, Executive Director at (306) 227-8548.

- Baytex Energy Ltd.
- Caltex Resources Ltd.
- Canadian Natural Resources Ltd.
- Can-Expo Energy Inc.
- Carriere Forest Products Ltd.
- Cenovus Energy Inc. – Downstream
- Cenovus Energy Inc., Meridian Limited Partnership
- Cenovus Energy Inc – Upstream
- City of Saskatoon
- Compass Minerals Canada Corporation
- Edge LRM Operations Ltd.
- IPC Canada Ltd.
- Longhorn Oil & Gas Ltd.
- Meadow Lake Mechanical Pulp
- TransGas Ltd.
- Vermilion Energy Inc.
- Mosaic Potash Colonsay ULC
- Northland Power LP
- Nutrien – Vanscoy
- Potash Corporation of Saskatchewan Inc.
- Saskatchewan Power Corporation
- Secure Energy Services Inc.
- Smitty's Farms Ltd.
- Snake Oil Resources Ltd.
- Viterra Inc.
- Zelmar Energy Ltd.

* A listing and website link to current WYAMZ members can also be found at http://wyamz.ca/member-companies/

Member Benefits

Supporting WYAMZ through membership fees provides several member benefits, including:

- Membership in an association helping to foster a business-friendly environment that promotes future industrial growth.
- A collective voice for members to provide additional input to government mandated air zone management plans.
- Access to Federal Reference Method (FRM) quality regional air quality data.
- Shared monitoring equipment and air quality program operating costs amongst emitters. These efforts also potentially avoid less cost effective and more bureaucratic government mandated operation-based monitoring programs.
- An opportunity to build productive working relationships among industry, government, and public stakeholder groups.
- An effective forum for open discussion at WYAMZ Board meetings and the annual AGM.
- A contribution to building public trust through participation in open association processes and direct public involvement in the Association.
- An opportunity to use the information collected for public relations and education purposes.

End of the Report

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