



Southeast Saskatchewan  
Airshed Association

## 2011 Annual Report



Southeast Saskatchewan  
Airshed Association

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## Message from the Executive Director

2011 has been a very exciting year for the Association.

Plans were made to implement two continuous air quality monitoring stations in 2009. SESAA has been successful in the positioning and the beginning of operations of one of these continuous stations and have more in mind for the future. These stations plus the passive monitoring network will provide high quality data and information regarding our air quality. The continuous data is available live on the internet; it includes hourly concentrations of SO<sub>2</sub>, H<sub>2</sub>S, NO/NO<sub>2</sub>/NO<sub>x</sub>, PM<sub>2.5</sub> and O<sub>3</sub>. The data was made available in early 2011 on the SESAA website: <http://www.sesaa.ca/AirQuality/index.php>. The plan was to locate one air monitoring station in the Weyburn area and one in the southeastern part of the region.

The next step will be to have SESAA's Science Committee select a site for the next airpointer®, purchase it and place it in the region. We expect to see an additional airpointer® to be up and running as early as spring of 2012. The SESAA Board will continue to look at ways of providing more and better value and service to its members.

In June we ended our leasing arrangement of the airpointer® and purchased it outright. We also began discussion with SCL Instrumentation to purchase a second airpointer®. In the fall 2011, we ordered a new airpointer® for March 2012 delivery.

On June 1<sup>st</sup> and 2<sup>nd</sup> SESAA was able to set up at the Weyburn Oil Show and presented to the general audience on June 2<sup>nd</sup>. We have also presented at the Saskatchewan Environmental Industry and Managers Association (SEIMA) in March of 2011 in Regina and Saskatoon respectively, and at the South East Environmental and Safety Seminar (SEESS), also in March of 2011.

On June 8, 2011 SESAA held its Annual General Meeting at Council Chambers, City of Estevan. The Estevan Mercury covered the AGM and wrote a very good article outlining SESAA and the work we do.

In the fall of 2011 the Board of Directors decided to make public presentations and events that showcase SESAA and the members of SESAA a priority. To that end the Executive Director and the Communications and Membership Committee will be hosting a Clean Air Day on June 6, 2012 in Estevan where we will invite the Ministry of Environment, Ministry of Energy and Resources, the Canadian Association of Petroleum Producers (CAPP) and others to present on topics regarding air quality.

We have also developed Committees with respect to Communications and Membership, Science, Board Governance and Financial considerations.

The Communications and Membership Committee directed the Executive Director to develop some display materials. This was done in April and we purchased to full color pull up posters to use during meetings, presentations and any other public event.

The Governance Committee reviewed the SESAA bylaws and made revisions. They will be approved at the 2012 Annual General Meeting.

The Science Committee worked on a 5 year review of the SESAA passive data. There were recommendations from the review for a different data collection protocol which will be implemented in 2012. The 5 year report is on the SESAA website.

SESAA had enjoyed very good Board of Director development in 2010 with the addition of some key Directors. This year, 2012, we will be actively seeking an even broader representation by soliciting for new Board members in local newspapers and by asking specific organizations for their involvement. Please see the complete list of the Board in Appendix F.

A great deal of effort has gone into securing sustainable funding and developing a fair and equitable funding formula. 2011 saw a substantial improvement in the financial picture of the Association as a result of additional memberships. Saskatchewan Environment and Saskatchewan Energy and Resources have made considerable steps to ensure funding sustainability for the Airshed. SESAA thanks SaskPower, Saskatchewan Ministries of Environment, Energy and Resources and Health and all of our members for their support.

SESAA is proud to mention that we served on the Committee to help write the Air Chapter of the new Saskatchewan Environmental Code. We have forged many new relationships while working in this capacity.

Future plans include the placement of the next airpointer®, development of more communication materials, presentations to municipalities, Chambers of Commerce, high school classes, home and school meetings, etc.

Our goal is to collect credible and defensible air quality data and provide excellent service to our members.

## Executive Summary

The Southeast Saskatchewan Airshed Association (SESAA), established in October 2005, is Saskatchewan's first airshed association with a mandate to monitor ambient air quality in the southeast region of the Province. SESAA is a collaborative group of industry, government, non-government organizations, and private citizens. The airshed covers an area of 36,800 square kilometres and includes 45 municipalities. Major economic activities in the region include agriculture, oil & gas, mining, power generation, and transportation.

The SESAA ambient air quality monitoring network consists of one airpointer® continuous monitoring station and 30 passive monitoring stations. The airpointer® measures real-time data for SO<sub>2</sub>, H<sub>2</sub>S, NO/NO<sub>2</sub>/NO<sub>x</sub>, O<sub>3</sub>, fine particulate (PM<sub>2.5</sub>), ambient temperature, relative humidity, accumulated precipitation, and wind speed/wind direction. The passive air quality parameters include SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, and H<sub>2</sub>S. Real-time monitoring data of the airpointer® is available on the SESAA website, which marks an important milestone in the SESAA's development.

The airpointer® was greater than 90% operational for the year of 2011. There were three months where instrument uptime was less than 90% due to power outages. A power surge protection system was installed in October to protect the airpointer®.

The air quality at the Weyburn airpointer® station was within the Saskatchewan Ambient Air Quality Standards (SAAQS), with the exception of hydrogen sulphide (H<sub>2</sub>S). The annual average concentrations were as follows: SO<sub>2</sub> - 2 ppb, H<sub>2</sub>S - 1.5 ppb, NO<sub>2</sub> - 2 ppb, O<sub>3</sub> - 33 ppb, and PM<sub>2.5</sub> - 5.2 µg/m<sup>3</sup>. The concentrations were quite low in comparison with the applicable SAAQS, except for 150 exceedance events for 1-hour average H<sub>2</sub>S and 21 exceedance events for 24-hour average H<sub>2</sub>S. The exceedances were associated with winds from the E-to-SW (east to southwest) directions. It has yet to be determined if the cause of H<sub>2</sub>S emissions are associated with localized industrial or biogenic sources.

According to the Air Quality Index (AQI) and Air Quality Health Index (AQHI), air quality at the Weyburn station was rated Good and Low Risk for 92.8% and 98.8% of the time, respectively.

Among the 30 passive monitoring stations, all 30 stations monitored SO<sub>2</sub>, 28 stations monitored NO<sub>2</sub>, 12 stations monitored O<sub>3</sub>, and 2 stations monitored H<sub>2</sub>S. The sample capture rate was greater than 95% for all parameters. The annual average concentrations for SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, and H<sub>2</sub>S were 1 ppb, 3 ppb, 28 ppb, and 1 ppb, respectively. The concentrations were quite low in comparison with the SAAQS. Spatial distribution of passive SO<sub>2</sub> concentrations exhibited a trend that higher concentrations were detected in the central and southern part of the airshed zone, where more industrial activities exist. The two stations near the Kisbey facility of the ATOC Upstream Ltd. detected the highest annual average concentrations of 1.7 and 2.7 ppb for passive SO<sub>2</sub>. On the other hand, passive NO<sub>2</sub> and passive O<sub>3</sub> results did not show a clear spatial trend.

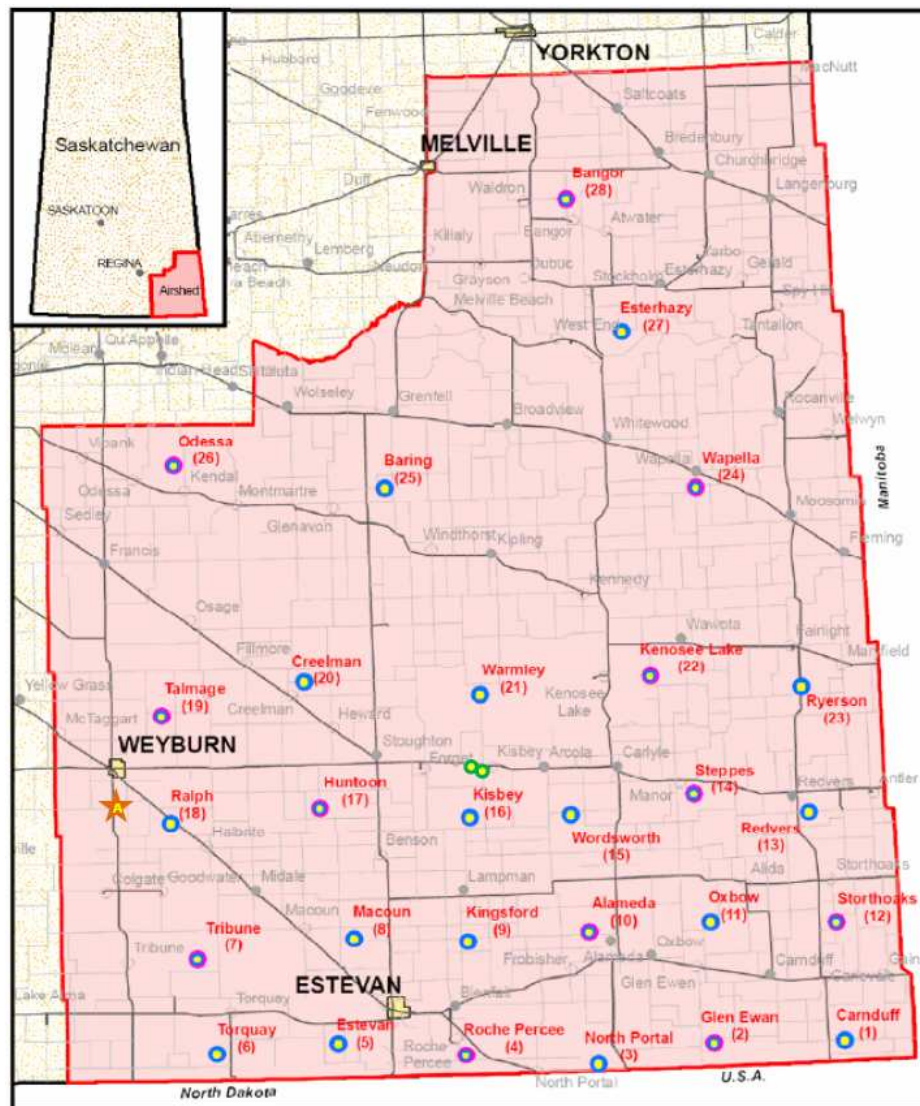
## 1.0 Introduction

The Southeast Saskatchewan Airshed Association (SESAA) was established in October 2005 to manage ambient air quality in southeast Saskatchewan. The SESAA is a consortium of government, industry, non-government organizations, and private citizen stakeholders. The goal of the association is to collect credible, scientifically defensible air quality data for the southeast region of Saskatchewan, and to make this data freely available to all stakeholders. The SESAA objective is to bring together stakeholders from all backgrounds to identify local air quality issues and to develop innovative solutions for managing these issues.

The southeast Saskatchewan airshed is Saskatchewan's first airshed. It covers an area of 36,800 square kilometres, including 45 municipalities. The airshed boundaries were established based on common history, meteorology, and funding considerations. Major economic activities in the region include agriculture, oil and gas, mining, power generation, and transportation.

Membership in the SESAA is currently voluntary. The current membership includes members of the agriculture, oil & gas, mining and power generation sectors, as well as the public. The Government of Saskatchewan Ministries of Environment, Energy & Resources, and Health, as well as representatives of the City of Weyburn and Rural Municipality of Enniskillen Number 3 also participate as members of the board of directors. SESAA's operating budget consists of membership fees, environmental footprint, and emissions-based fees assessed to facilities operating within the airshed boundaries (Figure 1).





### Legend

- Towns
- Villages
- Highways
- Cities
- Airshed Boundary



**Saskatchewan  
Environment**

### SESAA Sites

- NO<sub>2</sub>, SO<sub>2</sub>
- NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>
- SO<sub>2</sub>, H<sub>2</sub>S
- ★ airpointer®

### Map Information

Date: June 2007  
Datum: NAD 83 CSRS98  
Projection: UTM, Extended Zone

25 12.5 0 25 Kilo

**Figure 1. The ambient air quality monitoring network and airshed boundary for the Southeast Saskatchewan Airshed Association**

## 2.0 Air Quality Monitoring

### 2.1 Continuous Air Quality Monitoring

#### 2.1.1 *airpointer*®

The SESAA *airpointer*® is situated approximately 12 kilometres south of Weyburn, just east of highway 35. This station has been in place and operating since March 2010. Real-time data is available on the SESAA website at: [www.sesaa.ca](http://www.sesaa.ca).

The *airpointer*® is a new concept in air quality monitoring. In the past a multi-gas and particle pollution monitoring system would have been housed in a large walk-in shelter; sometimes in a trailer-type unit. The *airpointer*® makes it possible to acquire real-time data in a small vault type, self-contained unit. The *airpointer*® has very low operating costs compared to other analyzers in the industry. This is important to our members because we can provide quality data collection at a considerable saving. Furthermore, it is easy to access the monitoring data. A standard internet connection and web browser is all that is required.

The *airpointer*® measures a wide variety of pollutants in a modular platform. The SESAA *airpointer*® measures SO<sub>2</sub>, H<sub>2</sub>S, NO/NO<sub>2</sub>/NO<sub>x</sub>, O<sub>3</sub>, and PM<sub>2.5</sub>, as well as weather conditions including ambient temperature, relative humidity, precipitation, wind speed and wind direction. These parameters can be used to calculate hourly Air Quality Index (AQI) and Air Quality Health Index (AQHI).

Table 1 summarizes the annual statistics for 1-hour average measurements for the air quality parameters. All analyzer uptime was greater than 90% operational for this year. The measured concentrations were lower than the applicable Saskatchewan Ambient Air Quality Standards (SAAQS, Appendix A), with some exceptions for H<sub>2</sub>S. Please refer to the following Sections for detailed monitoring results.

**Table 1. Summary for 2011 *airpointer*® monitoring data**

| Monitoring Parameters | Conc. Unit        | Annual Average Conc. | Percentage Instrument Uptime | Maximum SO <sub>2</sub> Conc. and Occurrence Time |              |              |          |
|-----------------------|-------------------|----------------------|------------------------------|---------------------------------------------------|--------------|--------------|----------|
|                       |                   |                      |                              | 1-hour Max.                                       |              | 24-hour Max. |          |
|                       |                   |                      |                              | Conc.                                             | Max Time     | Conc.        | Max Date |
| NO                    | ppb               | 1                    | 93.0%                        | 11                                                | Mar-04 11:00 | 3            | Nov-4    |
| NO <sub>2</sub>       | ppb               | 2                    | 93.0%                        | 17                                                | Jan-27 21:00 | 7            | Jan-12   |
| NO <sub>x</sub>       | ppb               | 2                    | 93.0%                        | 19                                                | Nov-16 20:00 | 8            | Jan-12   |
| SO <sub>2</sub>       | ppb               | 2                    | 92.8%                        | 46                                                | Aug-31 01:00 | 11           | Mar-9    |
| O <sub>3</sub>        | ppb               | 33                   | 96.9%                        | 73                                                | May-18 16:00 | 58           | Mar-27   |
| H <sub>2</sub> S      | ppb               | 1.5                  | 93.3%                        | 68.5                                              | May-01 23:00 | 11.1         | Mar-9    |
| PM <sub>2.5</sub>     | µg/m <sup>3</sup> | 5.2                  | 97.2%                        | 62.3                                              | Jul-20 00:00 | 26.8         | Jul-19   |

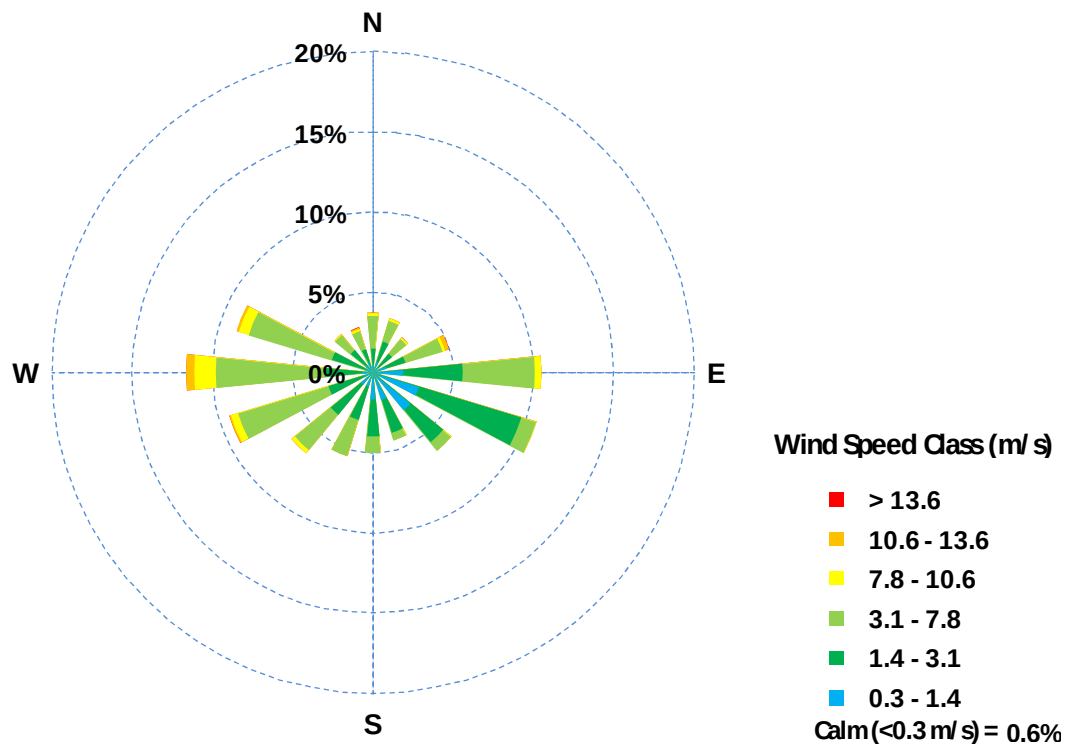
### 2.1.2 Wind

Wind plays an important role in the transportation and dilution of air pollutants. Wind speed and wind direction are main factors that influence regional air quality. The diffusion and dispersion of emissions are greatly impacted by variations in wind speed and corresponding air turbulence. The magnitude of turbulence varies due to the vertical gradient of ambient temperatures, as well as terrain roughness.

Figure 2 presents the wind rose chart at the Weyburn airpointer® station. Prevailing wind was from the E-to-ESE (east to east-southeast) and WNW-to-WSW (west-southwest to west-northwest) directions. According to international wind classification, the wind speed was consist of 18% Light Air (<1.4 m/s), 36% Light Breeze (<3.1 m/s), and 40.4% Moderate Breeze (<7.8 m/s). The wind rose indicates that faster winds (>7.8 m/s) were primarily from the WNW-to-WSW (west-southwest to west-northwest) directions.

The detailed frequency distribution table for the wind rose is presented in Appendix B, Table B-9.

**Figure 2. Wind rose at the Weyburn airpointer® station**



### 2.1.3 Sulphur Dioxide

Sulphur dioxide (SO<sub>2</sub>) 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<sub>2</sub> 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<sub>2</sub>. SO<sub>2</sub> also damages trees and crops.

SO<sub>2</sub>, 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<sub>2</sub> in the air can form microscopic acid aerosols, which have serious health implications, as well as, contributing to climate change.

Anthropogenic SO<sub>2</sub> 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<sub>2</sub> 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, battery and well flares.

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

- 0.17 ppm (172 ppb) averaged over a 1-hour period;
- 0.06 ppm (57 ppb) averaged over a 24-hour period; and
- 0.01 ppm (11 ppb) as an annual arithmetic average.

Table 2 summarizes the monthly statistics for SO<sub>2</sub> monitoring data. The instrument uptime was 92.8% for this year. In June, July, and September, airpointer® uptime was less than 90% due to power outages and subsequent damage to the instrument. A power surge protector was installed in October to protect the airpointer®.

SO<sub>2</sub> concentration at the Weyburn station was quite low in comparison with the SAAQS. There was no exceedance of 1-hour and 24-hour SAAQS in 2011. The annual average concentration of 2 ppb was less than the annual SAAQS. The monthly average concentrations ranged from 1 ppb to 3 ppb. There was no significant monthly or seasonal trend. The maximum 1-hour and 24-hour average concentrations of 46 ppb and 11 ppb were less than the respective SAAQS's.

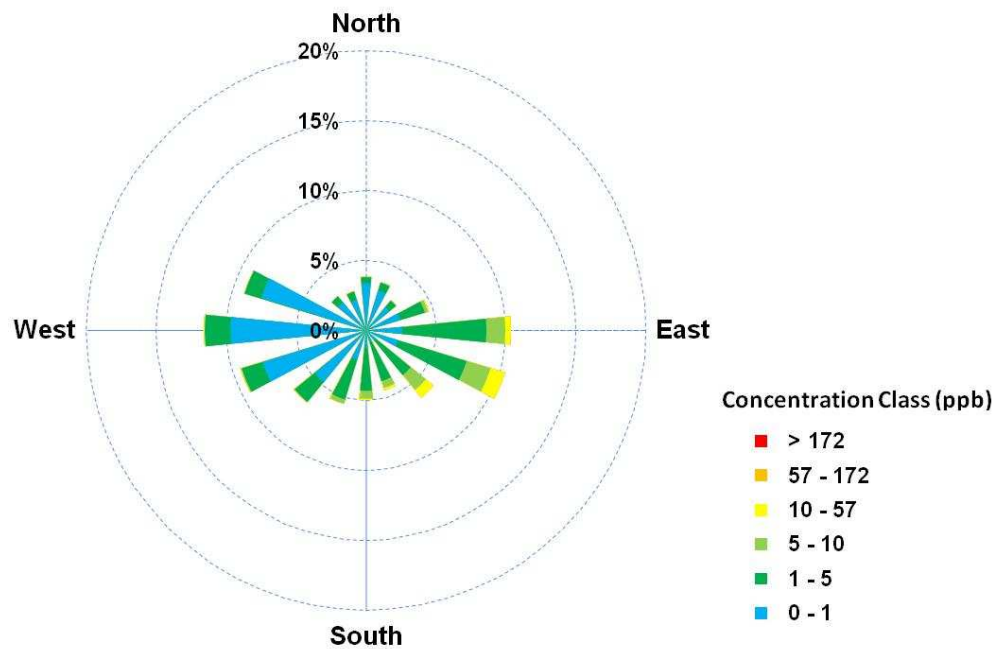
Figure 3 presents the pollutant rose for 1-hour average concentration of SO<sub>2</sub>. The higher concentration petals (>10 ppb) for SO<sub>2</sub> generally pointed toward the E-to-S (east to south) directions, where more industrial activities exist such as coal-fired power plants and upstream oil and gas industry.

The detailed frequency distribution table for the pollutant rose is presented in Appendix B, Table B-2.

**Table 2. Summary of continuous SO<sub>2</sub> monitoring data**

| Month       | Instrument Uptime (%) | Average Conc. (ppb) | Maximum 1-Hr Conc. (ppb) | 1-Hour Exceedance (no.) | Maximum 24-Hr Conc. (ppb) | 24-Hour Exceedance (no.) |
|-------------|-----------------------|---------------------|--------------------------|-------------------------|---------------------------|--------------------------|
| January     | 99.3%                 | 3                   | 22                       | 0                       | 8                         | 0                        |
| February    | 92.4%                 | 2                   | 25                       | 0                       | 8                         | 0                        |
| March       | 100.0%                | 2                   | 32                       | 0                       | 11                        | 0                        |
| April       | 98.6%                 | 1                   | 25                       | 0                       | 6                         | 0                        |
| May         | 100.0%                | 1                   | 13                       | 0                       | 2                         | 0                        |
| June        | 88.1%                 | 2                   | 19                       | 0                       | 3                         | 0                        |
| July        | 71.8%                 | 3                   | 29                       | 0                       | 4                         | 0                        |
| August      | 99.7%                 | 2                   | 46                       | 0                       | 6                         | 0                        |
| September   | 77.2%                 | 3                   | 38                       | 0                       | 9                         | 0                        |
| October     | 90.9%                 | 2                   | 23                       | 0                       | 5                         | 0                        |
| November    | 95.3%                 | 2                   | 23                       | 0                       | 5                         | 0                        |
| December    | 100.0%                | 1                   | 13                       | 0                       | 4                         | 0                        |
| Annual Avg. | 92.8%                 | 2                   | 46                       | 0                       | 11                        | 0                        |

**Figure 3. SO<sub>2</sub> pollutant rose at the Weyburn airpointer® station**



### 2.1.4 Nitrogen Dioxides

Nitrogen oxides, also known as Oxides of Nitrogen ( $\text{NO}_x$ ), is a collective term for nitric oxide ( $\text{NO}$ ) and nitrogen dioxide ( $\text{NO}_2$ ). Nitric oxide is a colorless, flammable gas with a slight odour. Nitrogen dioxide is a reddish brown, non-flammable gas with a pungent irritating odour.  $\text{NO}_2$  is of more interest than  $\text{NO}$  from both a health and acid rain perspective.

$\text{NO}_x$  can cause respiratory disease, damage vegetation, and reduce visibility. The primary concern with  $\text{NO}_x$  emissions is their contribution to formation of ground-level ozone, smog and acid rain. To a lesser extent, some  $\text{NO}_x$  compounds (e.g.  $\text{N}_2\text{O}$ ) contribute to stratospheric ozone layer depletion and global warming.

$\text{NO}_x$  emissions are mainly produced by fossil fuel combustion. High temperature conditions during combustion result in the formation of  $\text{NO}_x$  as a by-product. The major anthropogenic emission sources for  $\text{NO}_x$  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 emission is the major source of  $\text{NO}_x$ .

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

- 0.2 ppm (212 ppb) averaged over a 1-hour period; and
- 0.05 ppm (53 ppb) as an annual arithmetic average.

Table 3 summarizes the monthly statistics for  $\text{NO}_2$  monitoring data. The instrument was 93.0% operational for this year. In June, July, and September, instrument uptime was less than 90% due to power outage as described in Section 2.1.3.

$\text{NO}_2$  concentration at the Weyburn station was quite low in comparison with the SAAQS. There was no exceedance of the 1-hour SAAQS in 2011. The annual average concentration of 2 ppb was less than the SAAQS. The monthly average concentrations of 1-hour average  $\text{NO}_2$  ranged from 1 ppb to 3 ppb. There was no significant monthly or seasonal trend. The maximum 1-hour and 24-hour average concentrations were 17 ppb and 7 ppb, respectively.

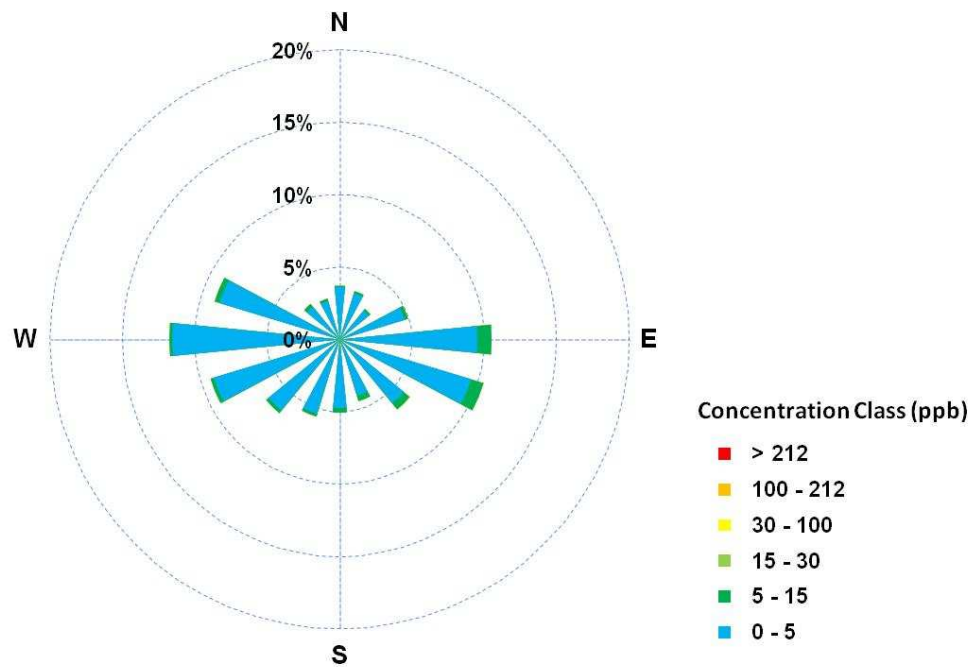
Figure 4 shows the pollutant rose for 1-hour average concentration of  $\text{NO}_2$ . 95% of the monitoring  $\text{NO}_2$  concentration was less than 5 ppb (the blue color petals). There was no clear directional trend within the  $\text{NO}_2$  data.

The detailed frequency distribution table for the pollutant rose is presented in Appendix B, Table B-4. The same tables for  $\text{NO}$  and  $\text{NO}_x$  are in Tables B-3 and B-5.

**Table 3. Summary of continuous NO<sub>2</sub> monitoring data**

| Month       | Instrument Uptime (%) | Average Conc. (ppb) | Maximum 1-Hr Conc. (ppb) | 1-Hour Exceedance (no.) | Maximum 24-Hr Conc. (ppb) |
|-------------|-----------------------|---------------------|--------------------------|-------------------------|---------------------------|
| January     | 99.3%                 | 3                   | 17                       | 0                       | 7                         |
| February    | 100.0%                | 2                   | 11                       | 0                       | 4                         |
| March       | 100.0%                | 2                   | 13                       | 0                       | 5                         |
| April       | 98.6%                 | 1                   | 8                        | 0                       | 3                         |
| May         | 92.7%                 | 1                   | 6                        | 0                       | 2                         |
| June        | 76.9%                 | 1                   | 6                        | 0                       | 2                         |
| July        | 82.1%                 | 2                   | 7                        | 0                       | 3                         |
| August      | 92.2%                 | 2                   | 9                        | 0                       | 4                         |
| September   | 79.7%                 | 3                   | 16                       | 0                       | 7                         |
| October     | 99.2%                 | 2                   | 12                       | 0                       | 4                         |
| November    | 95.3%                 | 2                   | 17                       | 0                       | 5                         |
| December    | 100.0%                | 2                   | 11                       | 0                       | 4                         |
| Annual Avg. | 93.0%                 | 2                   | 17                       | 0                       | 7                         |

**Figure 4. NO<sub>2</sub> pollutant rose at the Weyburn airpointer® station**



## 2.1.5 Ozone

Ozone (O<sub>3</sub>) 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<sub>3</sub> 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<sub>x</sub>) 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 for the reviewed data.

Exposure to ozone has been linked to pre-mature mortality and a range of morbidity health endpoints such as hospital admissions and asthma symptom. 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 for ozone is:

- 0.08 ppm (82 ppb) averaged over a 1-hour period;

The Canada-Wide Standard (CWS) for ozone is:

- 65 ppb averaged over an 8-hour period (the achievement statistics is based on the fourth highest measurement annually averaged over three consecutive years).

Table 4 summarizes the monthly statistics for O<sub>3</sub> monitoring data. The instrument uptime was 97.0% for this year. In June and September, instrument uptime was less than 90% due to power outage as described in Section 2.1.3.

There was no exceedance of the SAAQS at the Weyburn station in 2011. The monthly average concentrations ranged from 23 ppb to 44 ppb. The data seemed to exhibit a seasonal trend, with high O<sub>3</sub> concentration occurring in the spring. The maximum 1-hour average concentration of 73 ppb was detected in May. The 4<sup>th</sup> highest concentration of 8-hour running average was 68 ppb, which did not comprise an exceedance to the CWS standard because the CWS standard is based on three consecutive years of measurements.

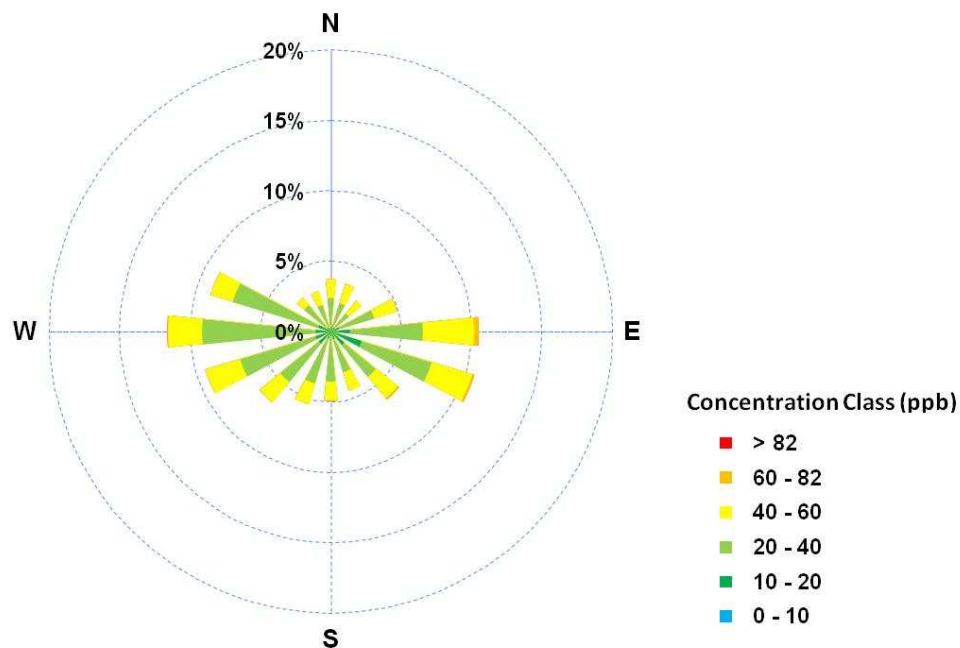


Figure 5 shows the pollutant rose for 1-hour average concentration of O<sub>3</sub>. Likely due to the fact that O<sub>3</sub> is a secondary pollutant, the data does not show a directional trend with winds. The detailed frequency distribution table for the pollutant rose is presented in Appendix B, Table B-6.

**Table 4. Summary of continuous O<sub>3</sub> monitoring data**

| Month       | Instrument Uptime (%) | Average Conc. (ppb) | Maximum 1-Hr Conc. (ppb) | 1-Hour Exceedance (no.) | Maximum 8-Hr Conc. (ppb) |
|-------------|-----------------------|---------------------|--------------------------|-------------------------|--------------------------|
| January     | 99.2%                 | 32                  | 46                       | 0                       | 44                       |
| February    | 100.0%                | 41                  | 54                       | 0                       | 52                       |
| March       | 100.0%                | 44                  | 63                       | 0                       | 62                       |
| April       | 98.6%                 | 44                  | 70                       | 0                       | 63                       |
| May         | 99.7%                 | 39                  | 73                       | 0                       | 71                       |
| June        | 87.9%                 | 38                  | 60                       | 0                       | 57                       |
| July        | 99.7%                 | 33                  | 59                       | 0                       | 52                       |
| August      | 99.7%                 | 30                  | 57                       | 0                       | 52                       |
| September   | 83.3%                 | 25                  | 68                       | 0                       | 60                       |
| October     | 99.5%                 | 23                  | 51                       | 0                       | 48                       |
| November    | 95.3%                 | 23                  | 37                       | 0                       | 35                       |
| December    | 100.0%                | 26                  | 36                       | 0                       | 35                       |
| Annual Avg. | 97.0%                 | 33                  | 73                       | 0                       | 71                       |

**Figure 5. O<sub>3</sub> pollutant rose at the Weyburn airpointer® station**



### 2.1.6 Hydrogen Sulphide

Hydrogen sulphide ( $\text{H}_2\text{S}$ ) is a colourless gas with a characteristic “rotten egg” odour. It is produced both naturally and through anthropogenic emission sources.  $\text{H}_2\text{S}$  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  $\text{H}_2\text{S}$  as well, forming the characteristic odour commonly associated with sewers, sewage lagoons, and swamps.

Hydrogen sulphide is an acutely toxic gas at high levels. Exposure to hydrogen sulphide can irritate the eyes, nose, throat, and lungs and can cause serious health effects, including death.

The Saskatchewan Ambient Air Quality Standards for hydrogen sulphide are:

- 10.8 ppb averaged over a 1-hour period; and
- 3.6 ppb averaged over a 24-hour period;

Table 5 summarizes the monthly statistics for continuous  $\text{H}_2\text{S}$  monitoring data. The instrument uptime was 93.3% for this year. In June, July, and September, instrument uptime was less than 90% due to power outage as described in Section 2.1.3.

$\text{H}_2\text{S}$  concentration at the Weyburn station was lower than the SAAQS most of the time. However, there were occasional spikes causing exceedances of the 1-hour and 24-hour SAAQS. In 2011, there were a total of 150 hours (or 1.8% of the total monitoring hours) and 21 days when average  $\text{H}_2\text{S}$  concentrations exceeded the SAAQS. The maximum 1-hour and 24-hour average concentrations were 68.5 ppb and 11.1 ppb, respectively. A complete list of the exceedance events can be found in Appendix C.

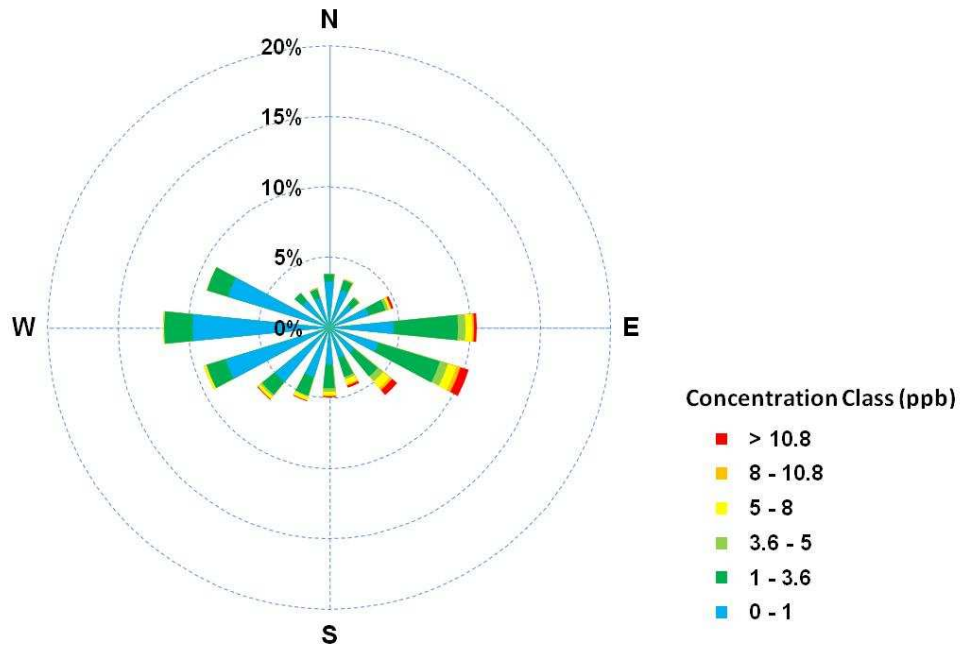
Figure 6 presents the pollutant rose for 1-hour average concentration of  $\text{H}_2\text{S}$ .  $\text{H}_2\text{S}$  concentration at the Weyburn station was less than 3.6 ppb most of the time, as shown in the blue and green petals. The 1-hour exceedance events are presented in the red petals, which indicate exceedances were associated with the E-to-SW (east to southwest) directions. The projected area is where more industrial activities exist such as upstream oil and gas industry. 77% of the exceedance events were detected during light wind conditions ( $<1.4$  m/s) indicating the contribution sources might not be far from the monitoring station. It has yet to be determined if the cause of  $\text{H}_2\text{S}$  emissions are related to localized industrial or biogenic sources. Further investigation is warranted by SESAA’s Science Committee.

The detailed frequency distribution table for the pollutant rose is presented in Appendix B, Table B-7.

**Table 5. Summary of continuous  $\text{H}_2\text{S}$  monitoring data**

| Month       | Instrument Uptime (%) | Average Conc. (ppb) | Maximum 1-Hr Conc. (ppb) | 1-Hour Exceedance (no.) | Maximum 24-Hr Conc. (ppb) | 24-Hour Exceedance (no.) |
|-------------|-----------------------|---------------------|--------------------------|-------------------------|---------------------------|--------------------------|
| January     | 99.2%                 | 1.7                 | 20.1                     | 8                       | 4.0                       | 1                        |
| February    | 100.0%                | 0.8                 | 33.6                     | 10                      | 6.5                       | 1                        |
| March       | 100.0%                | 1.7                 | 43.7                     | 22                      | 11.1                      | 2                        |
| April       | 98.3%                 | 1.1                 | 29.4                     | 13                      | 8.3                       | 2                        |
| May         | 99.9%                 | 0.5                 | 68.5                     | 2                       | 0.2                       | 0                        |
| June        | 87.9%                 | 1.5                 | 32.0                     | 9                       | 4.1                       | 2                        |
| July        | 71.8%                 | 2.5                 | 27.8                     | 9                       | 4.2                       | 3                        |
| August      | 99.7%                 | 2.3                 | 38.2                     | 25                      | 5.9                       | 5                        |
| September   | 77.0%                 | 2.9                 | 50.2                     | 35                      | 10.2                      | 5                        |
| October     | 90.7%                 | 1.2                 | 33.8                     | 7                       | 3.2                       | 0                        |
| November    | 95.3%                 | 1.1                 | 16.2                     | 7                       | 2.4                       | 0                        |
| December    | 100.0%                | 0.8                 | 16.4                     | 3                       | 2.9                       | 0                        |
| Annual Avg. | 93.3%                 | 1.5                 | 68.5                     | 150                     | 11.1                      | 21                       |

**Figure 6. H<sub>2</sub>S pollutant rose at the Weyburn airpointer® station**



### **2.1.7 Fine Particulate Matter (PM<sub>2.5</sub>)**

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<sub>10</sub>. PM<sub>10</sub> is defined as particles that have an aerodynamic diameter less than 10 microns (or 0.01 mm). PM<sub>10</sub> 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<sub>2.5</sub>. In contrast, coarse particles are those with aerodynamic diameter greater than 2.5 microns and smaller 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 sulfur 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<sub>2.5</sub> 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.

Saskatchewan endorses the Canada-Wide Standards (CWS) for fine particulate matters (PM<sub>2.5</sub>):

- 30 µg/m<sup>3</sup> averaged over a 24-hour period from midnight to midnight; the target standard is based on the 98<sup>th</sup> percentile ambient measurement annually, average over three consecutive years.

Table 6 summarizes the monthly statistics for continuous PM<sub>2.5</sub> monitoring data. The instrument uptime was 96.9% for this year. In June and September, instrument uptime was lower than 90% due to power outage as described in Section 2.1.3.

The monthly average concentrations of 1-hour average PM<sub>2.5</sub> ranged from 1.4 µg/m<sup>3</sup> to 9.8 µg/m<sup>3</sup>. The maximum 1-hour average concentration of 62.3 µg/m<sup>3</sup> was detected in July. There was no exceedance of the 24-hour CAS at the Weyburn station for the year of 2011. The 98<sup>th</sup> percentile for 24-hour average concentration was 18.7 µg/m<sup>3</sup>.

The 1-hour average PM<sub>2.5</sub> data exhibited a temporal trend for this year. Between May and October, there was a 60% average probability PM<sub>2.5</sub> concentration would exceed the annual average concentration of 5.2 µg/m<sup>3</sup>. The probability was quite high as compared to a 9% average probability for the remaining months. This temporal trend could be associated with snow covering and rain washout during the winter and spring months.

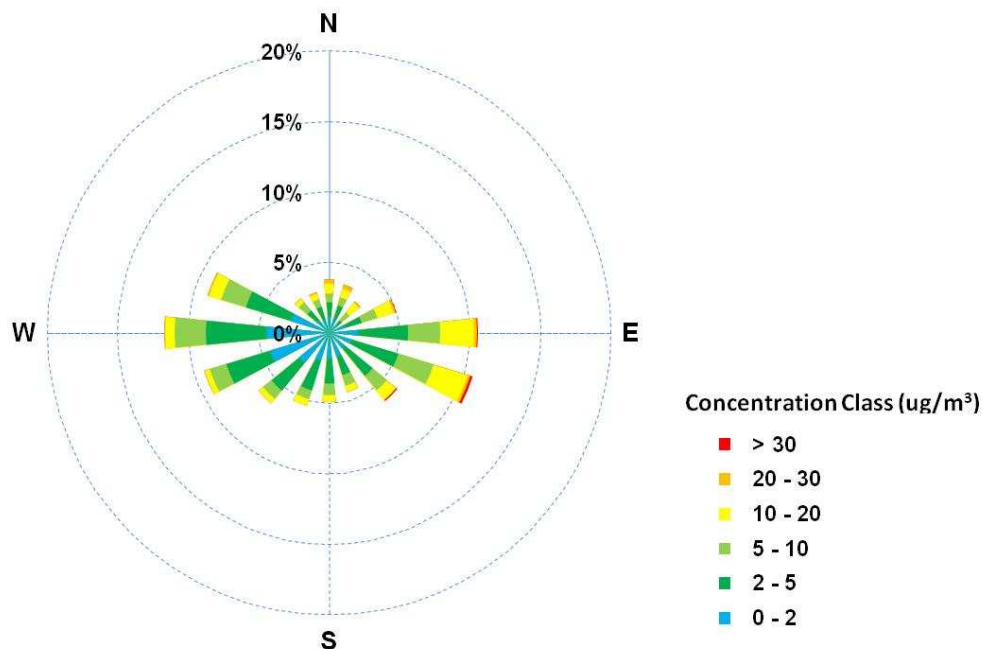
Figure 7 presents a pollutant rose for 1-hour average concentration of PM<sub>2.5</sub>. Generally, the high concentration events (e.g. >10 µg/m<sup>3</sup> in the yellow, orange and red petals) were detected from all

wind directions. There was no significant directional trend in PM<sub>2.5</sub> data. The detailed frequency distribution table for the pollutant rose is presented in Appendix B, Table B-8.

**Table 6. Summary of continuous PM<sub>2.5</sub> monitoring data**

| Month       | Instrument Uptime (%) | Average Conc. (µg/m <sup>3</sup> ) | Maximum 1-Hr Conc. (µg/m <sup>3</sup> ) | Maximum 24-Hr Conc. (µg/m <sup>3</sup> ) | 24-Hour Exceedance (no.) |
|-------------|-----------------------|------------------------------------|-----------------------------------------|------------------------------------------|--------------------------|
| January     | 96.8%                 | 3.0                                | 11.0                                    | 5.8                                      | 0                        |
| February    | 100.0%                | 1.5                                | 8.2                                     | 4.5                                      | 0                        |
| March       | 100.0%                | 3.1                                | 11.9                                    | 6.9                                      | 0                        |
| April       | 98.8%                 | 1.4                                | 8.7                                     | 3.1                                      | 0                        |
| May         | 100.0%                | 7.6                                | 24.8                                    | 23.0                                     | 0                        |
| June        | 89.2%                 | 9.5                                | 34.7                                    | 20.1                                     | 0                        |
| July        | 100.0%                | 8.9                                | 62.3                                    | 26.8                                     | 0                        |
| August      | 99.7%                 | 9.8                                | 43.7                                    | 20.5                                     | 0                        |
| September   | 83.5%                 | 6.8                                | 26.8                                    | 17.1                                     | 0                        |
| October     | 99.5%                 | 5.1                                | 26.7                                    | 14.0                                     | 0                        |
| November    | 95.3%                 | 3.1                                | 19.7                                    | 10.3                                     | 0                        |
| December    | 100.0%                | 2.4                                | 10.9                                    | 7.4                                      | 0                        |
| Annual Avg. | 96.9%                 | 5.2                                | 62.3                                    | 26.8                                     | 0                        |

**Figure 7. PM<sub>2.5</sub> pollutant rose at the Weyburn airpointer® station**



### 2.1.8 Air Quality Index (AQI)

The Air Quality Index (AQI) is a system developed to provide the public with a meaningful and comparable measure of outdoor air quality. The AQI uses readings from five major air pollutants: SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, PM<sub>2.5</sub>, and carbon monoxide (CO), to calculate the AQI index. A minimum of three pollutants is required to calculate AQI. The AQI is rated in four categories: Good (0 to 25), Fair (26 to 50), Poor (51 to 100), and Very Poor (>100). Table 7 summarizes the effects associated with the AQI index ratings.

The Weyburn AQI index is based on SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, and PM<sub>2.5</sub>, as the airpointer® does not measure CO. Table 8 summarizes the occurrence hours and frequency by the AQI rating at the Weyburn airpointer® station. The air quality was rated Good for 92.8% of the time and 7.2% was rated Fair. In 2011, AQI never fell in the Poor and Very Poor category. In the winter months, the AQI rating was always in the Good class, while Fair air quality occurred from March to September. The maximum occurrence frequency for Fair AQI rating was 24.6% (183 hour) and 24.8% (176 hours) in March and April, respectively.

**Table 7. AQI rating and effect description**

| AQI      | Air Quality Rating | Effect Description                                                                                                                                                                                                                                     |
|----------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 25   | Good               | <u>Desirable Range</u> : 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               | <u>Acceptable Range</u> : Adequate protection against harmful effects to soil, water, vegetation, animals, materials, visibility and human health.                                                                                                     |
| 51 – 100 | Poor               | <u>Tolerable Range</u> : 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          | <u>Intolerable Range</u> : Continued high readings could pose a risk to public health.                                                                                                                                                                 |

Source: Clean Air Strategic Alliance (CASA) - [www.casadata.org/airqualityindex/aqi/whatis.asp](http://www.casadata.org/airqualityindex/aqi/whatis.asp)

**Table 8. Summary of occurrence time and frequency by AQI rating for the Weyburn station**

| Parameter            | Number of Occurrence Hours and Frequency by AQI Rating |      |      |           |
|----------------------|--------------------------------------------------------|------|------|-----------|
|                      | Good                                                   | Fair | Poor | Very Poor |
| Occurrence Hours     | 7531                                                   | 586  | 0    | 0         |
| Occurrence Frequency | 92.8%                                                  | 7.2% | 0.0% | 0.0%      |

### 2.1.9 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 as the indicator of health risk. The three pollutants are fine particulate matter (PM<sub>2.5</sub>), nitrogen dioxide (NO<sub>2</sub>), and ground-level ozone (O<sub>3</sub>). All three pollutants are required to calculate the AQHI. The health risk of ambient air is classified in categories by AQHI: Low Risk (1 to 3), Moderate Risk (4 to 6), High Risk (7 to 10), and Very High Risk (higher than 10). Figure 8 summarizes the AQHI rating and the health messages for the at-risk population and the general population.

Table 9 summarizes the occurrence hours and frequency by AQHI rating at the Weyburn airpointer® station. Weyburn air quality was rated Low Risk for 98.8% of the time. There was 1.2% rated Moderate Risk, which occurred in March, May, June, and September.

**Figure 8. AQHI rating and health message**

Air Quality Health Index Scale

|                   |   |   |                  |   |   |               |   |   |                      |   |
|-------------------|---|---|------------------|---|---|---------------|---|---|----------------------|---|
| 1                 | 2 | 3 | 4                | 5 | 6 | 7             | 8 | 9 | 10                   | + |
| Risk: Low (1 - 3) |   |   | Moderate (4 - 6) |   |   | High (7 - 10) |   |   | Very High (Above 10) |   |

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

Source: <http://www.ec.gc.ca/cas-aqhi/default.asp?lang=En&n=79A8041B-1>

**Table 9. Summary of occurrence time and frequency by AQHI rating for the Weyburn station**

| Parameter            | Number of Occurrence Hours and Frequency by AQHI Rating |               |           |                |
|----------------------|---------------------------------------------------------|---------------|-----------|----------------|
|                      | Low Risk                                                | Moderate Risk | High Risk | Very High Risk |
| Occurrence Hours     | 7649                                                    | 90            | 0         | 0              |
| Occurrence Frequency | 98.8%                                                   | 1.2%          | 0.0%      | 0.0%           |

## 2.2 Passive Monitoring Network

The SESAA passive monitoring program was initiated in June 2006. The objective of this program was to collect scientifically credible air quality data for the airshed zone. The passive monitoring network consists of 30 sampling stations in southeast Saskatchewan, as shown in Figure 1, where the yellow, blue, pink, and green color codes represent placement of the SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, and H<sub>2</sub>S passive samplers, respectively. Among the 30 sampling stations, the two H<sub>2</sub>S stations are in close proximity to the Kisbey facility of the ATCO Midstream Ltd. The two ATCO stations (No. 29 and No. 30) were located 0.5 km and 2.9 km west of the ATCO facility. The remaining 28 passive stations are for receptor and/or environmental monitoring. The AEMC Multi-Gas Passive Samplers (MPGS) have been used in the SESAA passive monitoring program since 2008. Passive H<sub>2</sub>S monitoring was commenced in January 2010.

In addition to the passive samples for air quality monitoring, each sampling cycle also collected one field blank and one replicate for QA/QC purposes. The field blank sample monitors filter contamination that could be introduced during sample collection/deployment and laboratory processes. The replicate sample is to quantify variability in the sampling and analytical procedures.

Table 10 summarizes the sample capture rate for the year of 2011. There were 30 stations monitoring SO<sub>2</sub>, 28 stations monitoring NO<sub>2</sub>, 12 stations monitoring O<sub>3</sub>, and 2 stations monitoring H<sub>2</sub>S. All four passive parameters achieved a greater than 95% capture rate for this year. The sample failures were due to damaged samples, caused by flooding, or a damaged diffusive membrane. The detailed passive monitoring data is summarized in Appendix D.

**Table 10. Sample capture rates for the SESAA passive monitoring network**

| Passive Parameter | No of Stations | Number of Valid Passive Samples (no.) |     |     |     |     |     |     |     |     |     |     |     | Total Valid Sample | % Capture |
|-------------------|----------------|---------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------------|-----------|
|                   |                | Jan                                   | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |                    |           |
| SO <sub>2</sub>   | 30             | 30                                    | 30  | 30  | 29  | 25  | 24  | 29  | 30  | 30  | 30  | 30  | 30  | 347                | 96.4%     |
| NO <sub>2</sub>   | 28             | 28                                    | 28  | 28  | 27  | 22  | 22  | 27  | 28  | 28  | 28  | 28  | 28  | 322                | 95.8%     |
| O <sub>3</sub>    | 12             | 12                                    | 12  | 12  | 11  | 10  | 9   | 12  | 12  | 12  | 12  | 12  | 12  | 138                | 95.8%     |
| H <sub>2</sub> S  | 2              | 2                                     | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 24                 | 100.0%    |



### 2.2.1 Sulphur Dioxide

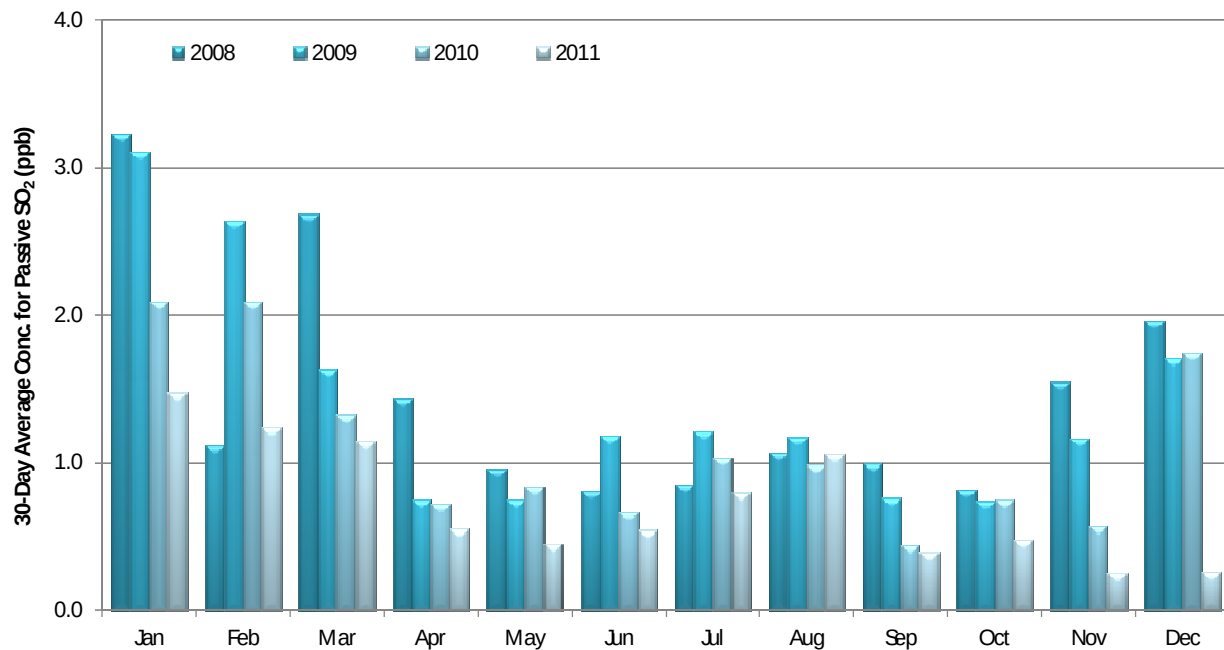
Figure 8 presents 30-day average concentrations for passive SO<sub>2</sub> for the years from 2008 to 2011. The AMEC Multi-gas Passive samplers were used during these four years; potential variation from sampling methodology would be minimal.

SO<sub>2</sub> concentrations within the airshed zone were quite low in comparison to the SAAQS. There was no exceedance of the annual SAAQS (11 ppb) during the past four years. The 30-day average concentrations ranged from 0.3 ppb to 3.2 ppb. The chart seems to exhibit a seasonal trend that SO<sub>2</sub> concentration was higher in winter and early spring.

Figure 9 presents a bubble chart showing spatial distribution of annual average concentration for passive SO<sub>2</sub>. The two sampling stations near the Kisbey facility of the ATCO Midstream Ltd. detected the highest concentrations of 1.7 ppb and 2.7 ppb, likely due to the close proximity of emission sources. For the remaining passive stations, there was a spatial trend, where higher concentrations of passive SO<sub>2</sub> were found in the southern and central parts of the airshed. In this area, more industrial activities are operating, such as coal-fired power plants and upstream oil and gas industry. In contrast, lower concentrations were observed in the northern part of the airshed, where no major industrial sources exist

The measured concentration seems to show a decreasing trend over the past four years. More data is needed to validate this trend.

**Figure 9. Passive SO<sub>2</sub> monitoring results for the years from 2008 to 2011**



**Figure 10. Spatial distribution of passive SO<sub>2</sub> concentration within the SESAA airshed zone**



## 2.2.2 Nitrogen Oxides

Figure 11 presents 30-day average concentrations for passive NO<sub>2</sub> for the years from 2008 to 2011. NO<sub>2</sub> concentration within the airshed zone was quite low in comparison to the SAAQS. There was no exceedance of the annual SAAQS (53 ppb) for the past four years. The 30-day average concentrations ranged from 0.4 ppb to 4.5 ppb. It appears there is a slight upward trend overall.

Figure 12 presents a bubble chart showing spatial distribution of annual average concentration for passive NO<sub>2</sub>. Except for the Roche Percee station (5.1 ppb) and the Huntoon station (5.2 ppb), the annual average concentrations generally ranged from 1.5 ppb to 2.8 ppb. The spatial trend was not as apparent as passive SO<sub>2</sub>.

**Figure 11. Passive NO<sub>2</sub> monitoring results for the years from 2008 to 2011**

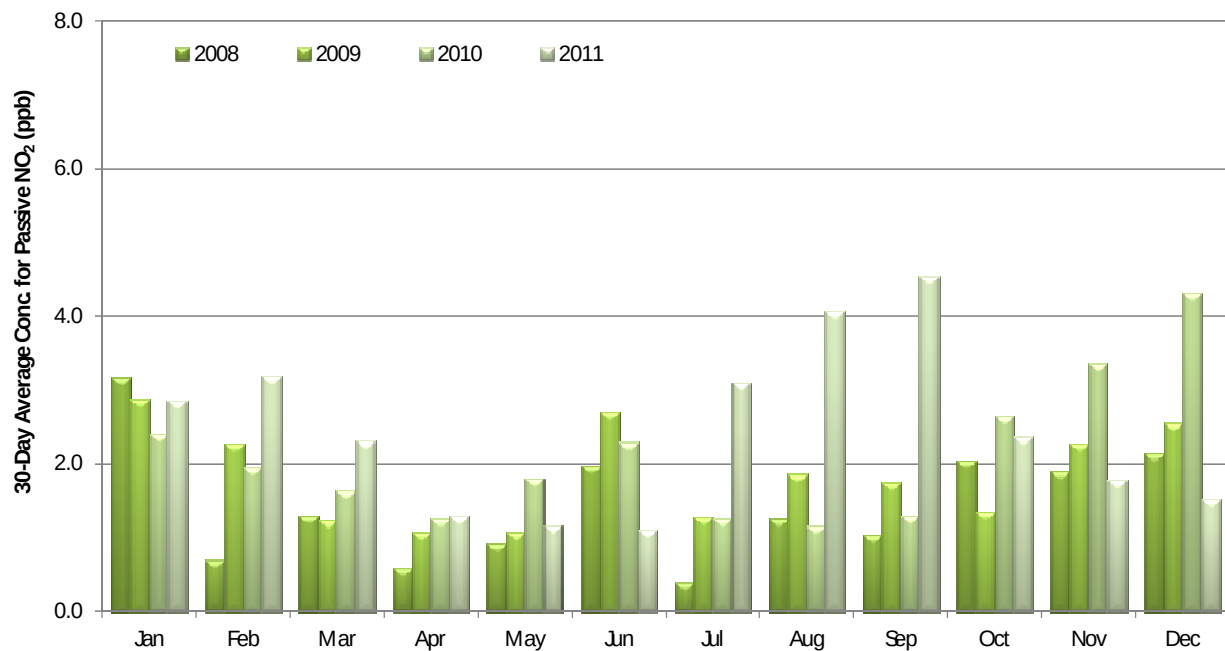
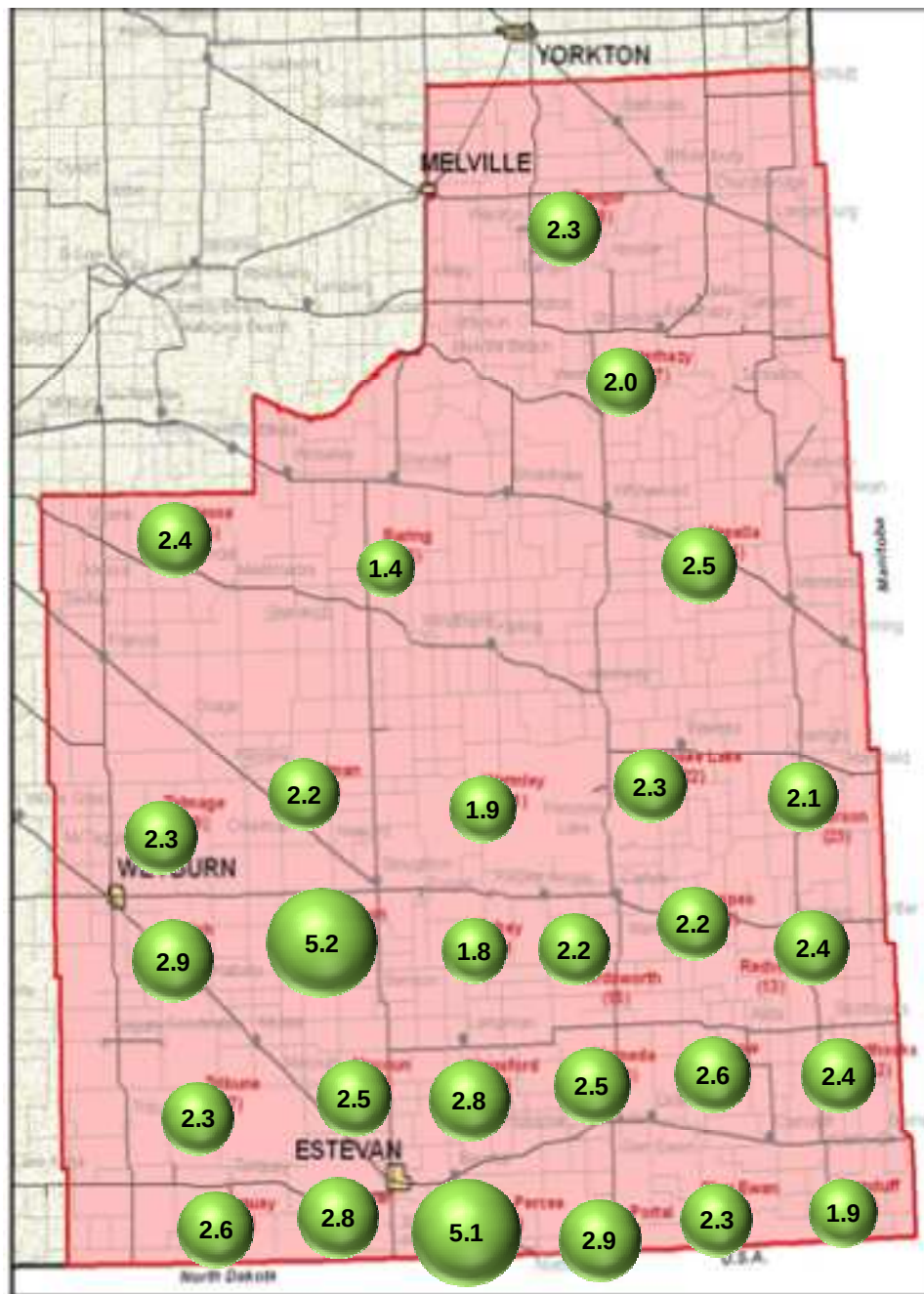


Figure 12. Spatial distribution of passive NO<sub>2</sub> concentration within the SESAA airshed zone



### 2.2.3 Ozone

Figure 13 presents 30-day average concentration for passive O<sub>3</sub> for the years from 2008 to 2011. The O<sub>3</sub> concentration at the Weyburn station was quite low in comparison to the 1-hour SAAQS (82 ppb). The 30-day average concentrations ranged from 13.1 ppb to 54.5 ppb. The data set seems to exhibit a seasonal trend that O<sub>3</sub> concentration tended to be higher in the spring and early-summer months. The concentration of ground-level ozone is the net result of atmospheric formation, transport, and destruction processes. During spring and summer, vertical mixing is stronger and could promote downward propagation of upper air ozone to the ground. However, some research suggests that there are split viewpoints as to the relative importance of contributions from intrusion of ozone from the stratosphere, mixing from the upper troposphere, local photochemistry, and the medium and long-range transport. Further investigation is required by SESAA's Science Committee.

Figure 14 presents a bubble chart showing spatial distribution of annual average concentration for passive O<sub>3</sub>. The annual average concentrations ranged from 23.9 ppb to 30.3 ppb. There was no clear spatial trend within the airshed zone.

**Figure 13. Passive O<sub>3</sub> monitoring results for the years from 2008 to 2011**

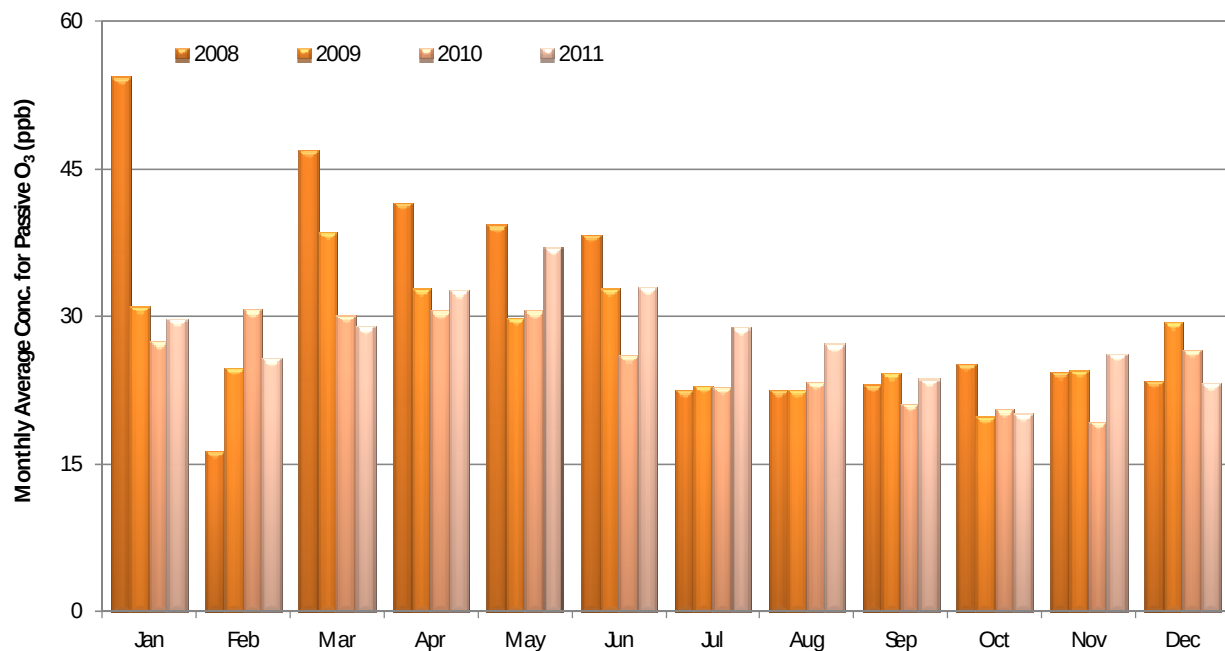
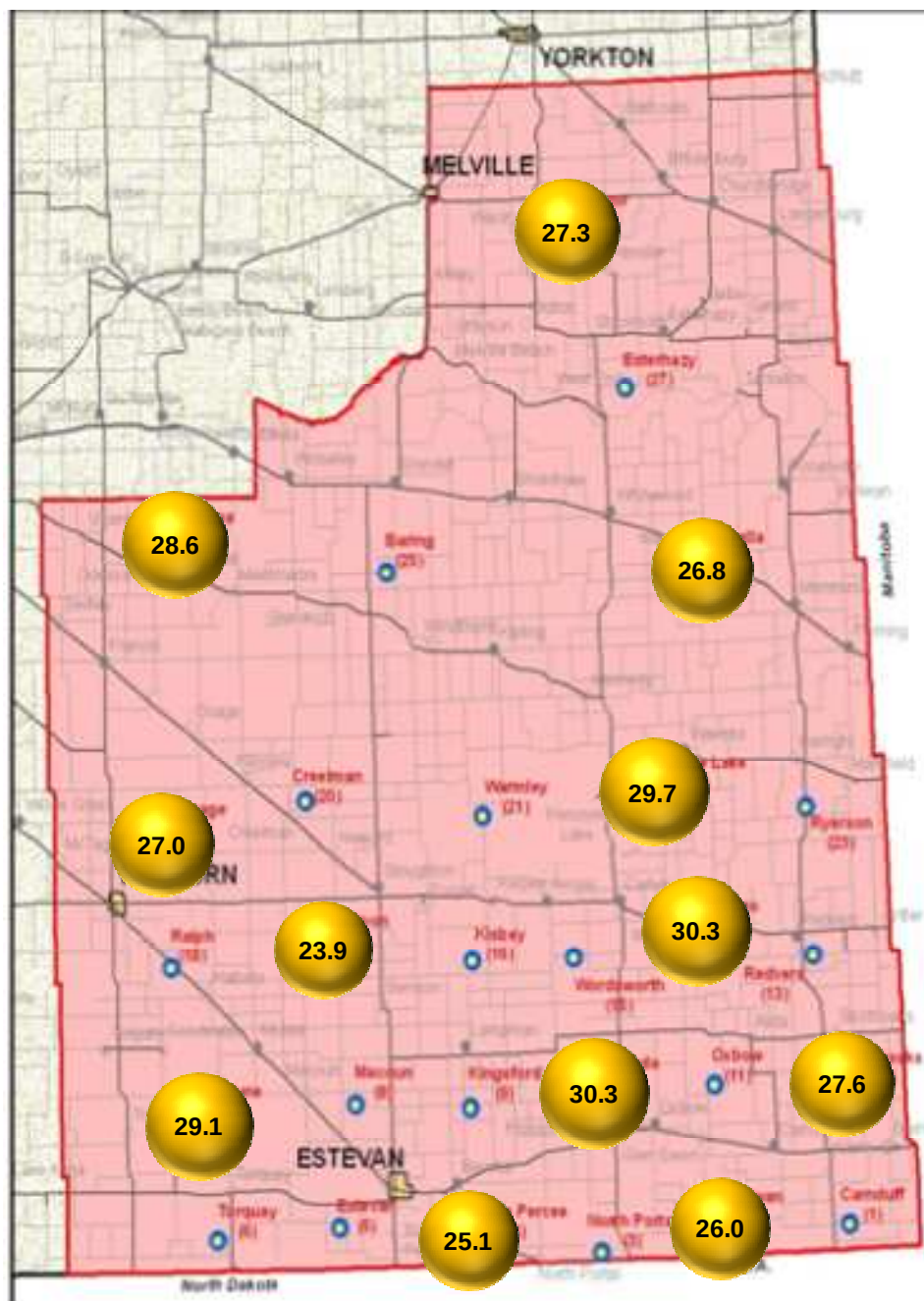




Figure 14. Spatial distribution of passive O<sub>3</sub> concentration within the SESAA airshed zone



## 2.2.4 Hydrogen Sulphide

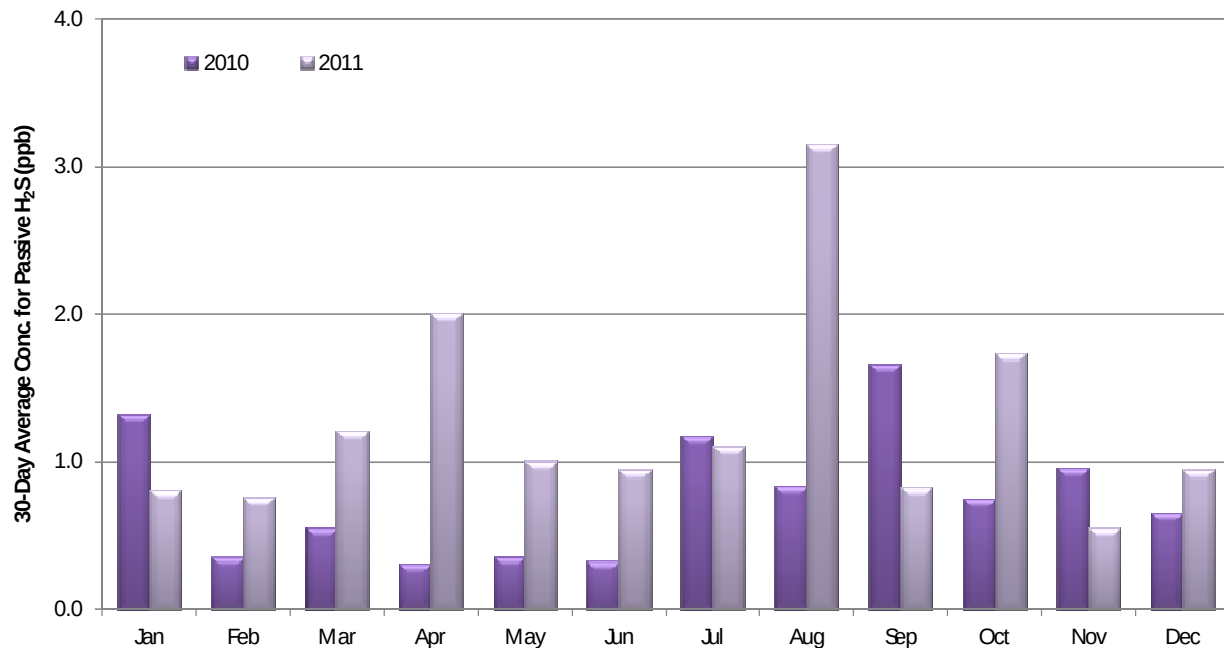
Table 11 summarizes 30-day average concentrations of passive H<sub>2</sub>S for the year of 2011. The concentrations at the two sampling stations were comparable every month. The measured concentrations were low compared to the 1-hour SAAQS. The annual average concentration was 1.2 ppb and 1.3 ppb at station No. 29 and No. 30, respectively.

Figure 15 presents 30-day average concentration for passive H<sub>2</sub>S for 2010 and 2011. The 30-day average concentrations ranged from 0.3 ppb to 3.2 ppb. The data set does not show a monthly or seasonal trend.

**Table 11. Passive H<sub>2</sub>S monitoring results for the year of 2011**

| Passive Site    |          | 30-Day Passive H <sub>2</sub> S Concentration (ppb) |     |     |     |     |     |     |     |     |     |     |     | Average | Max | Min |
|-----------------|----------|-----------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|-----|-----|
| No.             | Location | Jan                                                 | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |         |     |     |
| 29              | ATCO     | 0.8                                                 | 0.7 | 1.2 | 1.9 | 0.9 | 0.9 | 1.0 | 3.1 | 0.5 | 1.6 | 0.5 | 0.9 | 1.2     | 3.1 | 0.5 |
| 30              | ATCO     | 0.8                                                 | 0.8 | 1.2 | 2.1 | 1.1 | 1.0 | 1.2 | 3.2 | 1.2 | 1.9 | 0.6 | 1.0 | 1.3     | 3.2 | 0.6 |
| Network Average |          | 0.8                                                 | 0.8 | 1.2 | 2.0 | 1.0 | 0.9 | 1.1 | 3.2 | 0.8 | 1.7 | 0.6 | 0.9 | 1.3     | 3.2 | 0.5 |

**Figure 15. Passive H<sub>2</sub>S monitoring results for the years of 2010 and 2011**



### 3.0 Audited Financial Statement

The 2011 audited financial summary for the SESAA is presented in the following tables. The complete audited report is presented in Appendix E.

#### Southeast Saskatchewan Airshed Association Statement of Financial Position *As at December 31, 2011*

|                                | 2011    | 2010    |
|--------------------------------|---------|---------|
| <b>Assets</b>                  |         |         |
| <b>Current</b>                 |         |         |
| Cash                           | 164,038 | 140,637 |
| Deposits (Note 3)              | 40,000  | -       |
|                                | 204,038 | 140,637 |
| <b>Equipment (Note 4)</b>      | 79,448  | -       |
|                                | 283,486 | 140,637 |
| <b>Liabilities</b>             |         |         |
| <b>Current</b>                 |         |         |
| Accounts payable and accruals  | 4,501   | 19,486  |
| Goods and Services Tax payable | 1,587   | 2,064   |
|                                | 6,088   | 21,550  |
| <b>Net assets</b>              |         |         |
| <b>Unrestricted net assets</b> | 277,398 | 119,087 |
|                                | 283,486 | 140,637 |

#### Southeast Saskatchewan Airshed Association Statement of Operations and Change in Net Assets *For the year ended December 31, 2011*

|                                         | 2011    | 2010    |
|-----------------------------------------|---------|---------|
| <b>Revenue</b>                          |         |         |
| Membership fees                         | 253,615 | 228,394 |
| Grants                                  | 89,000  | 40,000  |
|                                         | 342,615 | 268,394 |
| <b>Expenses</b>                         |         |         |
| Advertising and promotion               | 4,751   | 2,515   |
| Amortization                            | 8,828   | -       |
| Air monitoring                          | 92,634  | 122,210 |
| Insurance                               | 4,051   | 1,124   |
| Interest and bank charges               | 87      | 62      |
| Lease fees                              | 11,829  | 25,629  |
| Management fees                         | 53,984  | 55,887  |
| Office                                  | 1,856   | 1,136   |
| Professional fees                       | 4,680   | 5,085   |
| Training and education                  | 1,604   | 1,137   |
|                                         | 184,304 | 214,785 |
| <b>Excess of revenues over expenses</b> | 158,311 | 53,609  |
| <b>Net assets, beginning of year</b>    | 119,087 | 65,478  |
| <b>Net assets, end of year</b>          | 277,398 | 119,087 |



## Southeast Saskatchewan Airshed Association

### Statement of Cash Flows

*For the year ended December 31, 2011*

|                                                             | 2011      | 2010      |
|-------------------------------------------------------------|-----------|-----------|
| <b>Cash provided by (used for) the following activities</b> |           |           |
| <b>Operating activities</b>                                 |           |           |
| Cash received from members                                  | 342,615   | 268,394   |
| Cash paid to suppliers                                      | (230,851) | (198,979) |
| Interest paid                                               | (87)      | (62)      |
|                                                             | 111,677   | 69,353    |
| <b>Investing activities</b>                                 |           |           |
| Purchases of property and equipment                         | (88,276)  | -         |
| <b>Increase in cash resources</b>                           | 23,401    | 69,353    |
| <b>Cash resources, beginning of year</b>                    | 140,637   | 71,284    |
| <b>Cash resources, end of year</b>                          | 164,038   | 140,637   |

## APPENDIX A: SASKATCHEWAN AMBIENT AIR QUALITY STANDARDS

Table A-1. Saskatchewan Ambient Air Quality Standards

| POLLUTANT <sup>(1)</sup> | AVERAGE CONCENTRATION FOR APPLICABLE TIME PERIOD |                                  |                                       |                                                                                              |                                        |
|--------------------------|--------------------------------------------------|----------------------------------|---------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------|
|                          | 1 HOUR                                           | 8 HOURS                          | 24 HOURS                              | 30 DAYS                                                                                      | ANNUAL                                 |
| SUSPENDED PARTICULATES   |                                                  |                                  | 120 micrograms per cubic metre        |                                                                                              | *70 micrograms per cubic metre         |
| SETTLEABLE PARTICULATES  |                                                  |                                  |                                       | 2.0 milligrams per square centimetre                                                         |                                        |
| SOIL INDEX               |                                                  |                                  | 1.5 COH units                         |                                                                                              |                                        |
| POTASH                   |                                                  |                                  |                                       | 0.15 milligrams of K per square centimetre OR<br>0.15 milligrams of CL per square centimetre |                                        |
| SULFUR DIOXIDE           | 450 (0.17) micrograms per cubic metre            |                                  | 150 (0.06) micrograms per cubic metre |                                                                                              | **30 (0.01) micrograms per cubic metre |
| SULFATION                |                                                  |                                  |                                       | 30 mg of sulphur trioxide per 100 cm <sup>2</sup>                                            |                                        |
| CARBON MONOXIDE          | 15 (13) milligrams per cubic metre               | 6 (5) milligrams per cubic metre |                                       |                                                                                              |                                        |
| OXIDANTS (OZONE)         | 160 (0.08) micrograms per cubic metre            |                                  |                                       |                                                                                              |                                        |
| NITROGEN DIOXIDE         | 400 (.2) micrograms per cubic metre              |                                  |                                       |                                                                                              | **100 (.05) micrograms per cubic metre |
| HYDROGEN SULPHIDE        | 15 (10.8) micrograms per cubic metre             |                                  | 5 (3.6) micrograms per cubic metre    |                                                                                              |                                        |

NOTE: Volume units, in parts per million or parts per billion for H<sub>2</sub>S, are in brackets.

\* Geometric Means

\*\* Arithmetic Means

<sup>(1)</sup> Sampling will be in a manner and location specified by the Minister.

## APPENDIX B: CONTINUOUS MONITORING DATA

**Table B-1. Weyburn Station: Summary of airpointer® monitoring results for the year 2011**

| Parameter           | Unit              | Hours of Valid Data | Percent Capture | Summary Statistics for 1-Hour Average Data |         |         |
|---------------------|-------------------|---------------------|-----------------|--------------------------------------------|---------|---------|
|                     |                   |                     |                 | Average                                    | Minimum | Maximum |
| SO <sub>2</sub>     | ppb               | 8119                | 92.8%           | 2                                          | 0       | 46      |
| NO                  | ppb               | 8137                | 93.0%           | 1                                          | 0       | 11      |
| NO <sub>2</sub>     | ppb               | 8137                | 93.0%           | 2                                          | 0       | 17      |
| NO <sub>x</sub>     | ppb               | 8137                | 93.0%           | 2                                          | 0       | 19      |
| O <sub>3</sub>      | ppb               | 8482                | 97.0%           | 33                                         | 2       | 73      |
| H <sub>2</sub> S    | ppb               | 8162                | 93.3%           | 1.5                                        | 0.0     | 68.5    |
| PM <sub>2.5</sub>   | µg/m <sup>3</sup> | 8479                | 96.9%           | 5.2                                        | 0       | 62.3    |
| Total Precipitation | mm                | 8517                | 97.2%           | 0.1                                        | 0       | 64.3    |
| Ambient Temperature | C                 | 8547                | 97.6%           | 4.1                                        | -34     | 34.1    |
| Relative Humidity   | %                 | 8547                | 97.6%           | 72.6                                       | 19      | 95.3    |
| Wind Speed          | m/s               | 8547                | 97.6%           | 3.4                                        | Calm    | 17.4    |

**Table B-2. Weyburn Station: Summary of airpointer® SO<sub>2</sub> monitoring results for the year 2011**

| Month     | Valid<br>1-Hr data<br>(no.) | Operational<br>Time<br>(%) | Average<br>Conc.<br>(ppb) | Maximum<br>1-Hr Conc.<br>(ppb) | 1-Hour<br>Exceedance <sup>a</sup> .<br>(no.) | Maximum<br>24-Hr Conc.<br>(ppb) | 24-Hour<br>Exceedance <sup>b</sup> .<br>(no.) | Percent of Data in each Concentration Range |      |       |        |         |      |
|-----------|-----------------------------|----------------------------|---------------------------|--------------------------------|----------------------------------------------|---------------------------------|-----------------------------------------------|---------------------------------------------|------|-------|--------|---------|------|
|           |                             |                            |                           |                                |                                              |                                 |                                               | <=1                                         | >1-5 | >5-10 | >10-48 | >48-172 | >172 |
| January   | 739                         | 99.3%                      | 3                         | 22                             | 0                                            | 8                               | 0                                             | 24.1                                        | 62.0 | 11.0  | 3.0    | 0.0     | 0.0  |
| February  | 621                         | 92.4%                      | 2                         | 25                             | 0                                            | 8                               | 0                                             | 68.8                                        | 20.8 | 6.8   | 3.7    | 0.0     | 0.0  |
| March     | 744                         | 100.0%                     | 2                         | 32                             | 0                                            | 11                              | 0                                             | 55.5                                        | 30.6 | 10.6  | 3.2    | 0.0     | 0.0  |
| April     | 710                         | 98.6%                      | 1                         | 25                             | 0                                            | 6                               | 0                                             | 69.6                                        | 23.1 | 4.9   | 2.4    | 0.0     | 0.0  |
| May       | 744                         | 100.0%                     | 1                         | 13                             | 0                                            | 2                               | 0                                             | 82.1                                        | 14.8 | 2.0   | 1.1    | 0.0     | 0.0  |
| June      | 634                         | 88.1%                      | 2                         | 19                             | 0                                            | 3                               | 0                                             | 54.7                                        | 41.2 | 3.0   | 1.1    | 0.0     | 0.0  |
| July      | 534                         | 71.8%                      | 3                         | 29                             | 0                                            | 4                               | 0                                             | 22.5                                        | 67.2 | 7.5   | 2.8    | 0.0     | 0.0  |
| August    | 742                         | 99.7%                      | 2                         | 46                             | 0                                            | 6                               | 0                                             | 51.3                                        | 37.6 | 7.1   | 3.9    | 0.0     | 0.0  |
| September | 551                         | 77.2%                      | 3                         | 38                             | 0                                            | 9                               | 0                                             | 43.9                                        | 39.0 | 9.1   | 8.0    | 0.0     | 0.0  |
| October   | 676                         | 90.9%                      | 2                         | 23                             | 0                                            | 5                               | 0                                             | 61.8                                        | 31.4 | 3.8   | 3.0    | 0.0     | 0.0  |
| November  | 686                         | 95.3%                      | 2                         | 23                             | 0                                            | 5                               | 0                                             | 62.1                                        | 27.6 | 7.6   | 2.8    | 0.0     | 0.0  |
| December  | 738                         | 100.0%                     | 1                         | 13                             | 0                                            | 4                               | 0                                             | 68.2                                        | 28.5 | 2.7   | 0.7    | 0.0     | 0.0  |
|           |                             |                            |                           |                                |                                              |                                 |                                               |                                             |      |       |        |         |      |
| Annual    | 8119                        | 92.8%                      | 2                         | 46                             | 0                                            | 11                              | 0                                             | 56.2                                        | 34.7 | 6.3   | 2.9    | 0.0     | 0.0  |

*a. 1-hour Saskatchewan Ambient Air Quality Standard = 172 ppb*

*b. 24-hour Saskatchewan Ambient Air Quality Standard = 57 ppb*

*c. Annual Saskatchewan Ambient Air Quality Standard = 11 ppb*

**Table B-3. Weyburn Station: Summary of airpointer® NO monitoring results for the year 2011**

| Month     | Valid<br>1-Hr data<br>(no.) | Operational<br>Time<br>(%) | Average<br>Conc.<br>(ppb) | Maximum<br>1-Hr Conc.<br>(ppb) | 1-Hour<br>Exceedance <sup>a</sup><br>(no.) | Maximum<br>24-Hr Conc.<br>(ppb) | 24-Hour<br>Exceedance <sup>b</sup><br>(no.) | Percent of Data in each Concentration Range |       |        |         |          |      |
|-----------|-----------------------------|----------------------------|---------------------------|--------------------------------|--------------------------------------------|---------------------------------|---------------------------------------------|---------------------------------------------|-------|--------|---------|----------|------|
|           |                             |                            |                           |                                |                                            |                                 |                                             | <=5                                         | >5-15 | >15-30 | >30-100 | >100-212 | >212 |
| January   | 739                         | 99.3%                      | 1                         | 5                              | -                                          | 1                               | -                                           | 100.0                                       | 0.0   | 0.0    | 0.0     | 0.0      | 0.0  |
| February  | 672                         | 100.0%                     | < 1                       | 5                              | -                                          | < 1                             | -                                           | 99.9                                        | 0.1   | 0.0    | 0.0     | 0.0      | 0.0  |
| March     | 744                         | 100.0%                     | < 1                       | 11                             | -                                          | < 1                             | -                                           | 99.7                                        | 0.3   | 0.0    | 0.0     | 0.0      | 0.0  |
| April     | 710                         | 98.6%                      | < 1                       | 2                              | -                                          | < 1                             | -                                           | 100.0                                       | 0.0   | 0.0    | 0.0     | 0.0      | 0.0  |
| May       | 690                         | 92.7%                      | < 1                       | 4                              | -                                          | < 1                             | -                                           | 100.0                                       | 0.0   | 0.0    | 0.0     | 0.0      | 0.0  |
| June      | 554                         | 76.9%                      | < 1                       | 4                              | -                                          | < 1                             | -                                           | 100.0                                       | 0.0   | 0.0    | 0.0     | 0.0      | 0.0  |
| July      | 611                         | 82.1%                      | < 1                       | 2                              | -                                          | 1                               | -                                           | 100.0                                       | 0.0   | 0.0    | 0.0     | 0.0      | 0.0  |
| August    | 686                         | 92.2%                      | 1                         | 4                              | -                                          | 1                               | -                                           | 100.0                                       | 0.0   | 0.0    | 0.0     | 0.0      | 0.0  |
| September | 569                         | 79.7%                      | 1                         | 5                              | -                                          | 2                               | -                                           | 100.0                                       | 0.0   | 0.0    | 0.0     | 0.0      | 0.0  |
| October   | 738                         | 99.2%                      | 1                         | 6                              | -                                          | 2                               | -                                           | 99.7                                        | 0.3   | 0.0    | 0.0     | 0.0      | 0.0  |
| November  | 686                         | 95.3%                      | 2                         | 6                              | -                                          | 3                               | -                                           | 99.9                                        | 0.1   | 0.0    | 0.0     | 0.0      | 0.0  |
| December  | 738                         | 100.0%                     | 1                         | 4                              | -                                          | 2                               | -                                           | 100.0                                       | 0.0   | 0.0    | 0.0     | 0.0      | 0.0  |
|           |                             |                            |                           |                                |                                            |                                 |                                             |                                             |       |        |         |          |      |
| Annual    | 8137                        | 93.0%                      | 1                         | 11                             | -                                          | 3                               | -                                           | 99.9                                        | 0.1   | 0.0    | 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*

**Table B-4. Weyburn Station: Summary of airpointer® NO<sub>2</sub> monitoring results for the year 2011**

| Month     | Valid 1-Hr data (no.) | Operational Time (%) | Average Conc. (ppb) | Maximum 1-Hr Conc. (ppb) | 1-Hour Exceedance <sup>a</sup> (no.) | Maximum 24-Hr Conc. (ppb) | 24-Hour Exceedance <sup>b</sup> (no.) | Percent of Data in each Concentration Range |       |        |         |          |      |
|-----------|-----------------------|----------------------|---------------------|--------------------------|--------------------------------------|---------------------------|---------------------------------------|---------------------------------------------|-------|--------|---------|----------|------|
|           |                       |                      |                     |                          |                                      |                           |                                       | <=5                                         | >5-15 | >15-30 | >30-100 | >100-212 | >212 |
| January   | 739                   | 99.3%                | 3                   | 17                       | 0                                    | 7                         | -                                     | 80.5                                        | 19.2  | 0.3    | 0.0     | 0.0      | 0.0  |
| February  | 672                   | 100.0%               | 2                   | 11                       | 0                                    | 4                         | -                                     | 94.3                                        | 5.7   | 0.0    | 0.0     | 0.0      | 0.0  |
| March     | 744                   | 100.0%               | 2                   | 13                       | 0                                    | 5                         | -                                     | 94.4                                        | 5.6   | 0.0    | 0.0     | 0.0      | 0.0  |
| April     | 710                   | 98.6%                | 1                   | 8                        | 0                                    | 3                         | -                                     | 99.3                                        | 0.7   | 0.0    | 0.0     | 0.0      | 0.0  |
| May       | 690                   | 92.7%                | 1                   | 6                        | 0                                    | 2                         | -                                     | 99.6                                        | 0.4   | 0.0    | 0.0     | 0.0      | 0.0  |
| June      | 554                   | 76.9%                | 1                   | 6                        | 0                                    | 2                         | -                                     | 99.6                                        | 0.4   | 0.0    | 0.0     | 0.0      | 0.0  |
| July      | 611                   | 82.1%                | 2                   | 7                        | 0                                    | 3                         | -                                     | 98.0                                        | 2.0   | 0.0    | 0.0     | 0.0      | 0.0  |
| August    | 686                   | 92.2%                | 2                   | 9                        | 0                                    | 3                         | -                                     | 96.5                                        | 3.5   | 0.0    | 0.0     | 0.0      | 0.0  |
| September | 569                   | 79.7%                | 3                   | 16                       | 0                                    | 7                         | -                                     | 90.2                                        | 9.7   | 0.2    | 0.0     | 0.0      | 0.0  |
| October   | 738                   | 99.2%                | 2                   | 12                       | 0                                    | 4                         | -                                     | 97.6                                        | 2.4   | 0.0    | 0.0     | 0.0      | 0.0  |
| November  | 686                   | 95.3%                | 2                   | 16                       | 0                                    | 5                         | -                                     | 89.8                                        | 10.1  | 0.1    | 0.0     | 0.0      | 0.0  |
| December  | 738                   | 100.0%               | 2                   | 10                       | 0                                    | 4                         | -                                     | 97.8                                        | 2.2   | 0.0    | 0.0     | 0.0      | 0.0  |
|           |                       |                      |                     |                          |                                      |                           |                                       |                                             |       |        |         |          |      |
| Annual    | 8137                  | 93.0%                | 2                   | 17                       | 0                                    | 7                         | -                                     | 94.7                                        | 5.2   | 0.0    | 0.0     | 0.0      | 0.0  |

*a. 1-hour Saskatchewan Ambient Air Quality Standard = 212 ppb*

*b. No 24-hour Saskatchewan Ambient Air Quality Standard*

*c. Annual Saskatchewan Ambient Air Quality Standard = 53 ppb*

**Table B-5. Weyburn Station: Summary of airpointer® NO<sub>x</sub> monitoring results for the year 2011**

| Month     | Valid<br>1-Hr data<br>(no.) | Operational<br>Time<br>(%) | Average<br>Conc.<br>(ppb) | Maximum<br>1-Hr Conc.<br>(ppb) | 1-Hour<br>Exceedance <sup>a</sup><br>(no.) | Maximum<br>24-Hr Conc.<br>(ppb) | 24-Hour<br>Exceedance <sup>b</sup><br>(no.) | Percent of Data in each Concentration Range |       |        |         |          |      |
|-----------|-----------------------------|----------------------------|---------------------------|--------------------------------|--------------------------------------------|---------------------------------|---------------------------------------------|---------------------------------------------|-------|--------|---------|----------|------|
|           |                             |                            |                           |                                |                                            |                                 |                                             | <=5                                         | >5-15 | >15-30 | >30-100 | >100-212 | >212 |
| January   | 739                         | 99.3%                      | 4                         | 17                             | -                                          | 8                               | -                                           | 71.4                                        | 28.3  | 0.3    | 0.0     | 0.0      | 0.0  |
| February  | 672                         | 100.0%                     | 2                         | 13                             | -                                          | 5                               | -                                           | 92.4                                        | 7.6   | 0.0    | 0.0     | 0.0      | 0.0  |
| March     | 744                         | 100.0%                     | 2                         | 15                             | -                                          | 5                               | -                                           | 91.9                                        | 8.1   | 0.0    | 0.0     | 0.0      | 0.0  |
| April     | 710                         | 98.6%                      | 1                         | 10                             | -                                          | 3                               | -                                           | 99.3                                        | 0.7   | 0.0    | 0.0     | 0.0      | 0.0  |
| May       | 690                         | 92.7%                      | < 1                       | 6                              | -                                          | 2                               | -                                           | 99.6                                        | 0.4   | 0.0    | 0.0     | 0.0      | 0.0  |
| June      | 554                         | 76.9%                      | < 1                       | 5                              | -                                          | 2                               | -                                           | 99.6                                        | 0.4   | 0.0    | 0.0     | 0.0      | 0.0  |
| July      | 611                         | 82.1%                      | 2                         | 9                              | -                                          | 3                               | -                                           | 97.9                                        | 2.1   | 0.0    | 0.0     | 0.0      | 0.0  |
| August    | 686                         | 92.2%                      | 3                         | 10                             | -                                          | 4                               | -                                           | 94.6                                        | 5.4   | 0.0    | 0.0     | 0.0      | 0.0  |
| September | 569                         | 79.7%                      | 4                         | 16                             | -                                          | 7                               | -                                           | 85.2                                        | 14.6  | 0.2    | 0.0     | 0.0      | 0.0  |
| October   | 738                         | 99.2%                      | 3                         | 14                             | -                                          | 5                               | -                                           | 88.6                                        | 11.4  | 0.0    | 0.0     | 0.0      | 0.0  |
| November  | 686                         | 95.3%                      | 4                         | 19                             | -                                          | 7                               | -                                           | 74.8                                        | 24.8  | 0.4    | 0.0     | 0.0      | 0.0  |
| December  | 738                         | 100.0%                     | 3                         | 12                             | -                                          | 6                               | -                                           | 89.8                                        | 10.2  | 0.0    | 0.0     | 0.0      | 0.0  |
|           |                             |                            |                           |                                |                                            |                                 |                                             |                                             |       |        |         |          |      |
| Annual    | 8137                        | 93.0%                      | 2                         | 19                             | -                                          | 8                               | -                                           | 90.2                                        | 9.7   | 0.1    | 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*

**Table B-6. Weyburn Station: Summary of airpointer® O<sub>3</sub> monitoring results for the year 2011**

| Month     | Valid<br>1-Hr data<br>(no.) | Operational<br>Time<br>(%) | Average<br>Conc.<br>(ppb) | Maximum<br>1-Hr Conc.<br>(ppb) | 1-Hour<br>Exceedance <sup>a</sup><br>(no.) | Maximum<br>24-Hr Conc.<br>(ppb) | 24-Hour<br>Exceedance <sup>b</sup><br>(no.) | Percent of Data in each Concentration Range |        |        |        |        |     |
|-----------|-----------------------------|----------------------------|---------------------------|--------------------------------|--------------------------------------------|---------------------------------|---------------------------------------------|---------------------------------------------|--------|--------|--------|--------|-----|
|           |                             |                            |                           |                                |                                            |                                 |                                             | <=10                                        | >10-20 | >20-40 | >40-60 | >60-82 | >82 |
| January   | 738                         | 99.2%                      | 31                        | 46                             | 0                                          | 44                              | -                                           | 0.0                                         | 0.1    | 92.5   | 7.3    | 0.0    | 0.0 |
| February  | 672                         | 100.0%                     | 41                        | 54                             | 0                                          | 52                              | -                                           | 0.0                                         | 0.0    | 37.2   | 62.8   | 0.0    | 0.0 |
| March     | 744                         | 100.0%                     | 44                        | 63                             | 0                                          | 62                              | -                                           | 0.0                                         | 0.0    | 31.5   | 64.9   | 3.6    | 0.0 |
| April     | 710                         | 98.6%                      | 44                        | 70                             | 0                                          | 63                              | -                                           | 0.0                                         | 0.6    | 30.6   | 65.8   | 3.1    | 0.0 |
| May       | 742                         | 99.7%                      | 39                        | 73                             | 0                                          | 71                              | -                                           | 0.0                                         | 1.2    | 54.6   | 41.1   | 3.1    | 0.0 |
| June      | 633                         | 87.9%                      | 38                        | 60                             | 0                                          | 57                              | -                                           | 0.2                                         | 2.4    | 52.4   | 44.9   | 0.2    | 0.0 |
| July      | 742                         | 99.7%                      | 33                        | 59                             | 0                                          | 52                              | -                                           | 0.5                                         | 12.4   | 60.6   | 26.4   | 0.0    | 0.0 |
| August    | 742                         | 99.7%                      | 30                        | 57                             | 0                                          | 52                              | -                                           | 0.4                                         | 22.5   | 56.7   | 20.4   | 0.0    | 0.0 |
| September | 595                         | 83.3%                      | 25                        | 68                             | 0                                          | 59                              | -                                           | 4.4                                         | 31.9   | 53.1   | 9.9    | 0.7    | 0.0 |
| October   | 740                         | 99.5%                      | 23                        | 51                             | 0                                          | 48                              | -                                           | 3.8                                         | 37.7   | 55.4   | 3.1    | 0.0    | 0.0 |
| November  | 686                         | 95.3%                      | 23                        | 36                             | 0                                          | 35                              | -                                           | 3.9                                         | 24.1   | 72.0   | 0.0    | 0.0    | 0.0 |
| December  | 738                         | 100.0%                     | 26                        | 36                             | 0                                          | 35                              | -                                           | 0.9                                         | 10.0   | 89.0   | 0.0    | 0.0    | 0.0 |
| Annual    | 8482                        | 97.0%                      | 33                        | 73                             | 0                                          | 71                              | -                                           | 1.1                                         | 11.7   | 57.4   | 28.8   | 0.9    | 0.0 |

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

b. No 24-hour Saskatchewan Ambient Air Quality Standard

c. No annual Saskatchewan Ambient Air Quality Standard

d. 8-hour Canada-Wide Standard = 65 ppb (4<sup>th</sup> highest concentration annually averaged over three consecutive years)



**Table B-7. Weyburn Station: Summary of airpointer® H<sub>2</sub>S monitoring results for the year 2011**

| Month     | Valid<br>1-Hr data<br>(no.) | Operational<br>Time<br>(%) | Average<br>Conc.<br>(ppb) | Maximum<br>1-Hr Conc.<br>(ppb) | 1-Hour<br>Exceedance <sup>a</sup><br>(no.) | Maximum<br>24-Hr Conc.<br>(ppb) | 24-Hour<br>Exceedance <sup>b</sup><br>(no.) | Percent of Data in each Concentration Range |        |        |      |         |       |
|-----------|-----------------------------|----------------------------|---------------------------|--------------------------------|--------------------------------------------|---------------------------------|---------------------------------------------|---------------------------------------------|--------|--------|------|---------|-------|
|           |                             |                            |                           |                                |                                            |                                 |                                             | <=1                                         | >1-3.6 | >3.6-5 | >5-8 | >8-10.8 | >10.8 |
| January   | 738                         | 99.2%                      | 1.7                       | 20.1                           | 8                                          | 4.0                             | 1                                           | 25.5                                        | 67.6   | 3.0    | 1.9  | 0.9     | 1.1   |
| February  | 672                         | 100.0%                     | 0.8                       | 33.6                           | 10                                         | 6.5                             | 1                                           | 82.4                                        | 12.4   | 1.3    | 1.8  | 0.6     | 1.5   |
| March     | 744                         | 100.0%                     | 1.7                       | 43.7                           | 22                                         | 11.1                            | 2                                           | 68.5                                        | 20.4   | 3.0    | 3.4  | 1.7     | 3.0   |
| April     | 708                         | 98.3%                      | 1.1                       | 29.4                           | 13                                         | 8.3                             | 2                                           | 79.0                                        | 13.3   | 2.0    | 2.7  | 1.3     | 1.8   |
| May       | 743                         | 99.9%                      | 0.5                       | 68.5                           | 2                                          | 0.2                             | 0                                           | 91.0                                        | 5.9    | 1.3    | 1.3  | 0.1     | 0.3   |
| June      | 633                         | 87.9%                      | 1.5                       | 32.0                           | 9                                          | 4.1                             | 2                                           | 61.8                                        | 28.9   | 3.9    | 2.7  | 1.3     | 1.4   |
| July      | 534                         | 71.8%                      | 2.5                       | 27.8                           | 9                                          | 4.2                             | 3                                           | 35.8                                        | 45.7   | 6.4    | 8.2  | 2.2     | 1.7   |
| August    | 742                         | 99.7%                      | 2.3                       | 38.2                           | 25                                         | 5.9                             | 5                                           | 44.3                                        | 39.4   | 5.4    | 6.2  | 1.3     | 3.4   |
| September | 549                         | 77.0%                      | 2.9                       | 50.2                           | 35                                         | 10.2                            | 5                                           | 45.2                                        | 34.8   | 4.2    | 6.4  | 3.1     | 6.4   |
| October   | 675                         | 90.7%                      | 1.2                       | 33.8                           | 7                                          | 3.2                             | 0                                           | 72.4                                        | 22.2   | 2.2    | 1.6  | 0.4     | 1.0   |
| November  | 686                         | 95.3%                      | 1.1                       | 16.2                           | 7                                          | 2.4                             | 0                                           | 74.9                                        | 19.1   | 1.7    | 2.5  | 0.7     | 1.0   |
| December  | 738                         | 100.0%                     | 0.8                       | 16.4                           | 3                                          | 2.9                             | 0                                           | 84.7                                        | 12.6   | 1.2    | 0.8  | 0.3     | 0.4   |
|           |                             |                            |                           |                                |                                            |                                 |                                             |                                             |        |        |      |         |       |
| Annual    | 8162                        | 93.3%                      | 1.5                       | 68.5                           | 150                                        | 11.1                            | 21                                          | 64.6                                        | 26.4   | 2.9    | 3.1  | 1.1     | 1.8   |

*a. 1-hour Saskatchewan Ambient Air Quality Standard = 10.8 ppb*

*b. 24-hour Saskatchewan Ambient Air Quality Standard = 3.6 ppb*

**Table B-8. Weyburn Station: Summary of airpointer® PM<sub>2.5</sub> monitoring results for the year 2011**

| Month     | Valid 1-Hr data (no.) | Operational Time (%) | Average Conc. (µg/m <sup>3</sup> ) | Maximum 1-Hr Conc. (µg/m <sup>3</sup> ) | 1-Hour Exceedance <sup>a</sup> (no.) | Maximum 24-Hr Conc. (µg/m <sup>3</sup> ) | 24-Hour Exceedance <sup>b</sup> (no.) | Percent of Data in each Concentration Range |      |       |        |        |     |
|-----------|-----------------------|----------------------|------------------------------------|-----------------------------------------|--------------------------------------|------------------------------------------|---------------------------------------|---------------------------------------------|------|-------|--------|--------|-----|
|           |                       |                      |                                    |                                         |                                      |                                          |                                       | <=2                                         | >2-5 | >5-10 | >10-20 | >20-30 | >30 |
| January   | 720                   | 96.8%                | 3.0                                | 11.0                                    | -                                    | 5.8                                      | 0                                     | 30.4                                        | 58.8 | 10.7  | 0.1    | 0.0    | 0.0 |
| February  | 672                   | 100.0%               | 1.5                                | 8.2                                     | -                                    | 4.5                                      | 0                                     | 70.4                                        | 27.7 | 1.9   | 0.0    | 0.0    | 0.0 |
| March     | 744                   | 100.0%               | 3.1                                | 11.9                                    | -                                    | 6.9                                      | 0                                     | 33.2                                        | 49.7 | 16.8  | 0.3    | 0.0    | 0.0 |
| April     | 711                   | 98.8%                | 1.4                                | 8.7                                     | -                                    | 3.1                                      | 0                                     | 73.3                                        | 25.2 | 1.5   | 0.0    | 0.0    | 0.0 |
| May       | 744                   | 100.0%               | 7.6                                | 24.8                                    | -                                    | 23.0                                     | 0                                     | 28.4                                        | 22.4 | 11.4  | 31.9   | 5.9    | 0.0 |
| June      | 642                   | 89.2%                | 9.5                                | 34.7                                    | -                                    | 20.1                                     | 0                                     | 8.6                                         | 18.7 | 31.9  | 34.4   | 6.1    | 0.3 |
| July      | 744                   | 100.0%               | 8.9                                | 62.3                                    | -                                    | 26.8                                     | 0                                     | 12.9                                        | 20.4 | 32.3  | 28.2   | 3.4    | 2.8 |
| August    | 742                   | 99.7%                | 9.8                                | 43.7                                    | -                                    | 20.5                                     | 0                                     | 1.9                                         | 16.2 | 39.2  | 39.2   | 2.2    | 1.3 |
| September | 596                   | 83.5%                | 6.8                                | 26.8                                    | -                                    | 17.1                                     | 0                                     | 7.4                                         | 34.6 | 37.4  | 18.6   | 2.0    | 0.0 |
| October   | 740                   | 99.5%                | 5.1                                | 26.7                                    | -                                    | 14.0                                     | 0                                     | 11.6                                        | 52.4 | 24.2  | 11.1   | 0.7    | 0.0 |
| November  | 686                   | 95.3%                | 3.1                                | 19.7                                    | -                                    | 10.3                                     | 0                                     | 35.4                                        | 50.1 | 11.2  | 3.2    | 0.0    | 0.0 |
| December  | 738                   | 100.0%               | 2.4                                | 10.9                                    | -                                    | 7.4                                      | 0                                     | 60.8                                        | 25.6 | 13.1  | 0.4    | 0.0    | 0.0 |
| Annual    | 8479                  | 96.9%                | 5.2                                | 62.3                                    | -                                    | 26.8                                     | 0                                     | 31.3                                        | 33.5 | 19.1  | 13.9   | 1.7    | 0.4 |

a. No 1-hour Saskatchewan Ambient Air Quality Standard

b. 24-hour Saskatchewan Ambient Air Quality Standard = 30 µg/m<sup>3</sup>

c. No annual Saskatchewan Ambient Air Quality Standard

**Table B-9. Weyburn Station: Summary of airpointer® precipitation monitoring results for the year 2011**

| Month     | Valid<br>1-Hr data<br>(no.) | Operational<br>Time<br>(%) | Total<br>Precip.<br>(mm) | Maximum<br>1-Hr Precip.<br>(mm) | Maximum<br>24-Hr Precip.<br>(mm) | Percent of Data in each Precipitation Range |      |       |        |        |     |
|-----------|-----------------------------|----------------------------|--------------------------|---------------------------------|----------------------------------|---------------------------------------------|------|-------|--------|--------|-----|
|           |                             |                            |                          |                                 |                                  | <=0                                         | >0-5 | >5-10 | >10-30 | >30-60 | >60 |
| January   | 743                         | 99.9%                      | 0.3                      | 0.0                             | 0.1                              | 98.5                                        | 1.5  | 0.0   | 0.0    | 0.0    | 0.0 |
| February  | 672                         | 100.0%                     | 3.8                      | 1.4                             | 2.0                              | 97.9                                        | 2.1  | 0.0   | 0.0    | 0.0    | 0.0 |
| March     | 744                         | 100.0%                     | 3.4                      | 0.6                             | 1.1                              | 97.0                                        | 3.0  | 0.0   | 0.0    | 0.0    | 0.0 |
| April     | 714                         | 99.2%                      | 19.6                     | 4.2                             | 11.6                             | 89.5                                        | 10.5 | 0.0   | 0.0    | 0.0    | 0.0 |
| May       | 744                         | 100.0%                     | 141.5                    | 5.0                             | 35.0                             | 68.7                                        | 31.3 | 0.0   | 0.0    | 0.0    | 0.0 |
| June      | 630                         | 87.5%                      | 312.8                    | 64.3                            | 220.4                            | 62.9                                        | 35.9 | 0.5   | 0.3    | 0.0    | 0.5 |
| July      | 739                         | 99.3%                      | 24.5                     | 6.8                             | 7.1                              | 85.0                                        | 14.9 | 0.1   | 0.0    | 0.0    | 0.0 |
| August    | 740                         | 99.5%                      | 157.1                    | 44.8                            | 45.8                             | 86.6                                        | 12.7 | 0.3   | 0.1    | 0.3    | 0.0 |
| September | 588                         | 81.7%                      | 25.8                     | 10.8                            | 13.3                             | 93.2                                        | 6.6  | 0.0   | 0.2    | 0.0    | 0.0 |
| October   | 740                         | 99.5%                      | 28.2                     | 4.9                             | 9.7                              | 94.7                                        | 5.3  | 0.0   | 0.0    | 0.0    | 0.0 |
| November  | 720                         | 100.0%                     | 0.2                      | 0.1                             | 0.1                              | 99.3                                        | 0.7  | 0.0   | 0.0    | 0.0    | 0.0 |
| December  | 743                         | 99.9%                      | 4.3                      | 1.8                             | 4.2                              | 98.9                                        | 1.1  | 0.0   | 0.0    | 0.0    | 0.0 |
|           |                             |                            |                          |                                 |                                  |                                             |      |       |        |        |     |
| Annual    | 8517                        | 97.2%                      | 721.5                    | 64.3                            | 220.4                            | 89.5                                        | 10.3 | 0.1   | 0.0    | 0.0    | 0.0 |

**Table B-10. Weyburn Station: Summary of airpointer® ambient temperature monitoring results for the year 2011**

| Month     | Valid<br>1-Hr data<br>(no.) | Operational<br>Time<br>(%) | Average<br>Temp.<br>(°C) | Maximum<br>1-Hr Temp.<br>(°C) | Maximum<br>24-Hr Temp.<br>(°C) | Percent of Data in each Temperature Range |          |        |       |        |     |
|-----------|-----------------------------|----------------------------|--------------------------|-------------------------------|--------------------------------|-------------------------------------------|----------|--------|-------|--------|-----|
|           |                             |                            |                          |                               |                                | <=-30                                     | >-30--15 | >-15-0 | >0-15 | >15-30 | >30 |
| January   | 743                         | 99.9%                      | -14.1                    | 1.7                           | 0.0                            | 0.7                                       | 54.2     | 43.7   | 1.3   | 0.0    | 0.0 |
| February  | 672                         | 100.0%                     | -13.2                    | 5.1                           | 2.4                            | 3.3                                       | 44.9     | 39.1   | 12.6  | 0.0    | 0.0 |
| March     | 744                         | 100.0%                     | -9.1                     | 4.1                           | 1.1                            | 0.0                                       | 29.7     | 57.1   | 13.2  | 0.0    | 0.0 |
| April     | 714                         | 99.2%                      | 3.1                      | 19.7                          | 12.4                           | 0.0                                       | 0.0      | 30.5   | 64.3  | 5.2    | 0.0 |
| May       | 744                         | 100.0%                     | 10.7                     | 21.9                          | 15.7                           | 0.0                                       | 0.0      | 1.9    | 79.8  | 18.3   | 0.0 |
| June      | 639                         | 88.8%                      | 16.5                     | 32.0                          | 25.5                           | 0.0                                       | 0.0      | 0.0    | 39.6  | 59.3   | 1.1 |
| July      | 744                         | 100.0%                     | 21.2                     | 34.1                          | 28.3                           | 0.0                                       | 0.0      | 0.0    | 9.9   | 85.8   | 4.3 |
| August    | 742                         | 99.7%                      | 20.0                     | 33.3                          | 24.3                           | 0.0                                       | 0.0      | 0.0    | 14.2  | 84.5   | 1.3 |
| September | 602                         | 83.6%                      | 15.7                     | 30.6                          | 21.0                           | 0.0                                       | 0.0      | 0.0    | 53.8  | 45.5   | 0.7 |
| October   | 740                         | 99.5%                      | 7.9                      | 25.8                          | 17.7                           | 0.0                                       | 0.0      | 5.3    | 82.3  | 12.4   | 0.0 |
| November  | 720                         | 100.0%                     | -2.8                     | 11.7                          | 4.3                            | 0.0                                       | 7.8      | 57.8   | 34.4  | 0.0    | 0.0 |
| December  | 743                         | 99.9%                      | -4.1                     | 6.5                           | 2.7                            | 0.0                                       | 3.1      | 79.4   | 17.5  | 0.0    | 0.0 |
|           |                             |                            |                          |                               |                                |                                           |          |        |       |        |     |
| Annual    | 8547                        | 97.6%                      | 4.1                      | 34.1                          | 28.3                           | 0.3                                       | 11.8     | 26.8   | 35.0  | 25.5   | 0.6 |

**Table B-11. Weyburn Station: Summary of airpointer® relative humidity monitoring results for the year 2011**

| Month     | Valid<br>1-Hr data<br>(no.) | Operational<br>Time<br>(%) | Average<br>RH<br>(%) | Maximum<br>1-Hr RH<br>(%) | Maximum<br>24-Hr RH<br>(%) | Percent of Data in each Relative Humidity Range |        |        |        |        |      |
|-----------|-----------------------------|----------------------------|----------------------|---------------------------|----------------------------|-------------------------------------------------|--------|--------|--------|--------|------|
|           |                             |                            |                      |                           |                            | <=15                                            | >15-30 | >30-60 | >60-80 | >80-90 | >90  |
| January   | 743                         | 99.9%                      | 81.4                 | 92.1                      | 88.8                       | 0.0                                             | 0.0    | 0.0    | 34.7   | 62.2   | 3.1  |
| February  | 672                         | 100.0%                     | 79.6                 | 93.3                      | 91.3                       | 0.0                                             | 0.0    | 0.0    | 54.9   | 39.0   | 6.1  |
| March     | 744                         | 100.0%                     | 82.2                 | 94.4                      | 93.0                       | 0.0                                             | 0.0    | 0.0    | 32.3   | 57.7   | 10.1 |
| April     | 714                         | 99.2%                      | 73.1                 | 95.3                      | 90.4                       | 0.0                                             | 4.2    | 15.4   | 32.8   | 37.4   | 10.2 |
| May       | 744                         | 100.0%                     | 68.7                 | 94.8                      | 92.8                       | 0.0                                             | 4.4    | 28.0   | 28.6   | 19.2   | 19.8 |
| June      | 639                         | 88.8%                      | 71.0                 | 94.3                      | 87.7                       | 0.0                                             | 0.2    | 27.4   | 34.4   | 28.0   | 10.0 |
| July      | 744                         | 100.0%                     | 65.3                 | 93.1                      | 77.7                       | 0.0                                             | 0.4    | 38.8   | 33.2   | 24.9   | 2.7  |
| August    | 742                         | 99.7%                      | 64.1                 | 93.9                      | 85.1                       | 0.0                                             | 3.8    | 37.5   | 32.9   | 20.5   | 5.4  |
| September | 602                         | 83.6%                      | 63.9                 | 94.1                      | 85.9                       | 0.0                                             | 5.0    | 35.4   | 30.1   | 24.6   | 5.0  |
| October   | 740                         | 99.5%                      | 71.5                 | 94.7                      | 86.5                       | 0.0                                             | 0.0    | 23.2   | 41.8   | 29.1   | 5.9  |
| November  | 720                         | 100.0%                     | 74.4                 | 92.2                      | 88.4                       | 0.0                                             | 0.3    | 9.4    | 52.4   | 35.3   | 2.6  |
| December  | 743                         | 99.9%                      | 74.3                 | 92.7                      | 91.1                       | 0.0                                             | 0.0    | 10.8   | 55.2   | 30.6   | 3.5  |
|           |                             |                            |                      |                           |                            |                                                 |        |        |        |        |      |
| Annual    | 8547                        | 97.6%                      | 72.6                 | 95.3                      | 93.0                       | 0.0                                             | 1.5    | 18.6   | 38.6   | 34.2   | 7.0  |

**Table B-12. Weyburn Station: airpointer® wind frequency table for the year 2011**

| Wind Direction<br>Sector | Percent of Data in each Wind Speed Range, wind speed unit m/s |          |          |           |            |       | Totals |
|--------------------------|---------------------------------------------------------------|----------|----------|-----------|------------|-------|--------|
|                          | >0.3-1.4                                                      | >1.4-3.1 | >3.1-7.8 | >7.8-10.6 | >10.6-13.6 | >13.6 |        |
| North NorthEast          | 0.7%                                                          | 1.3%     | 1.4%     | 0.1%      | 0.0%       | 0.0%  | 3.5%   |
| NorthEast                | 0.4%                                                          | 1.1%     | 1.2%     | 0.1%      | 0.0%       | 0.0%  | 2.8%   |
| East NorthEast           | 0.8%                                                          | 1.2%     | 2.5%     | 0.1%      | 0.3%       | 0.0%  | 4.9%   |
| East                     | 1.8%                                                          | 3.7%     | 4.5%     | 0.4%      | 0.0%       | 0.0%  | 10.4%  |
| East SouthEast           | 3.0%                                                          | 6.7%     | 1.0%     | 0.0%      | 0.0%       | 0.0%  | 10.6%  |
| SouthEast                | 3.0%                                                          | 2.6%     | 0.7%     | 0.0%      | 0.0%       | 0.0%  | 6.3%   |
| South SouthEast          | 1.7%                                                          | 2.2%     | 0.5%     | 0.0%      | 0.0%       | 0.0%  | 4.4%   |
| South                    | 1.6%                                                          | 2.4%     | 1.0%     | 0.0%      | 0.0%       | 0.0%  | 4.9%   |
| South SouthWest          | 0.9%                                                          | 2.2%     | 2.3%     | 0.0%      | 0.0%       | 0.0%  | 5.5%   |
| SouthWest                | 0.9%                                                          | 2.5%     | 2.8%     | 0.3%      | 0.0%       | 0.0%  | 6.5%   |
| West SouthWest           | 0.5%                                                          | 2.3%     | 5.8%     | 0.5%      | 0.1%       | 0.0%  | 9.3%   |
| West                     | 0.6%                                                          | 2.4%     | 6.8%     | 1.4%      | 0.5%       | 0.0%  | 11.6%  |
| West NorthWest           | 0.5%                                                          | 2.2%     | 5.4%     | 0.7%      | 0.1%       | 0.0%  | 8.8%   |
| NorthWest                | 0.5%                                                          | 1.2%     | 1.2%     | 0.1%      | 0.0%       | 0.0%  | 3.1%   |
| North NorthWest          | 0.6%                                                          | 0.8%     | 1.2%     | 0.1%      | 0.1%       | 0.1%  | 2.9%   |
| North                    | 0.4%                                                          | 1.0%     | 2.1%     | 0.2%      | 0.0%       | 0.0%  | 3.7%   |
|                          |                                                               |          |          |           |            |       |        |
| Total                    | 18.0%                                                         | 35.9%    | 40.4%    | 3.9%      | 1.1%       | 0.1%  | 99.4%  |

|                                     |      |
|-------------------------------------|------|
| Percent Calm (<0.3 m/s)             | 0.6% |
| Number of Valid Hourly-Average Data | 8574 |
| Total Workable Hours in Time Period | 8760 |

## APPENDIX C: EXCEEDANCE SUMMARY

**Table C-1. Summary of exceedances for 1-hour Saskatchewan Ambient Air Quality Standards for the year 2011**

| 1-Hour Exceedance Pollutant |              |                                 | Other Parameters During the Exceedance Event |           |          |            |                        |                        |                       |                         |                                        |
|-----------------------------|--------------|---------------------------------|----------------------------------------------|-----------|----------|------------|------------------------|------------------------|-----------------------|-------------------------|----------------------------------------|
| Pollutant                   | Conc.<br>ppb | Exceedance Time<br>mmm-dd hh:mm | WS<br>m/s                                    | WD<br>deg | AQI<br>- | Rain<br>mm | SO <sub>2</sub><br>ppb | NO <sub>2</sub><br>ppb | O <sub>3</sub><br>ppb | H <sub>2</sub> S<br>ppb | PM <sub>2.5</sub><br>µg/m <sup>3</sup> |
| H <sub>2</sub> S            | 13           | Jan-06 11:00                    | 1.3                                          | 104       | 16       | 0.0        | 10                     | 3                      | 33                    | 13                      | 3.4                                    |
| H <sub>2</sub> S            | 18           | Jan-12 03:00                    | 1.6                                          | 115       | 11       | 0.0        | 15                     | 6                      | 22                    | 18                      | 1.6                                    |
| H <sub>2</sub> S            | 15           | Jan-18 19:00                    | 3.0                                          | 174       | 11       | 0.0        | 5                      | 6                      | 23                    | 15                      | 0.0                                    |
| H <sub>2</sub> S            | 20           | Jan-20 10:00                    | 1.4                                          | 149       | 12       | 0.0        | 4                      | 9                      | 24                    | 20                      | 2.5                                    |
| H <sub>2</sub> S            | 17           | Jan-20 11:00                    | 1.5                                          | 128       | 11       | 0.0        | 6                      | 9                      | 22                    | 17                      | 2.5                                    |
| H <sub>2</sub> S            | 17           | Jan-20 12:00                    | 1.7                                          | 125       | 12       | 0.0        | 22                     | 6                      | 25                    | 17                      | 2.7                                    |
| H <sub>2</sub> S            | 16           | Jan-21 23:00                    | 2.6                                          | 65        | 13       | 0.0        | 9                      | 6                      | 26                    | 15                      | 3.0                                    |
| H <sub>2</sub> S            | 13           | Jan-27 23:00                    | 1.9                                          | 165       | 17       | 0.0        | 4                      | 5                      | 34                    | 13                      | 2.2                                    |
| H <sub>2</sub> S            | 34           | Feb-15 03:00                    | 1.5                                          | 103       | 20       | 0.0        | 5                      | 2                      | 41                    | 34                      | 2.8                                    |
| H <sub>2</sub> S            | 15           | Feb-15 04:00                    | 1.5                                          | 135       | 19       | 0.0        | 6                      | 3                      | 38                    | 15                      | 2.6                                    |
| H <sub>2</sub> S            | 15           | Feb-16 08:00                    | 0.8                                          | 331       | 16       | 0.0        | 0                      | 10                     | 32                    | 15                      | 3.6                                    |
| H <sub>2</sub> S            | 21           | Feb-21 02:00                    | 0.5                                          | 70        | 15       | 0.0        | 1                      | 3                      | 30                    | 21                      | 0.9                                    |
| H <sub>2</sub> S            | 18           | Feb-21 03:00                    | 0.7                                          | 156       | 14       | 0.0        | 1                      | 3                      | 28                    | 18                      | 0.6                                    |
| H <sub>2</sub> S            | 24           | Feb-21 04:00                    | 1.2                                          | 105       | 16       | 0.0        | 3                      | 2                      | 31                    | 23                      | 0.3                                    |
| H <sub>2</sub> S            | 24           | Feb-21 05:00                    | 1.8                                          | 90        | 17       | 0.0        | 12                     | 1                      | 34                    | 24                      | 0.1                                    |
| H <sub>2</sub> S            | 11           | Feb-21 06:00                    | 2.6                                          | 91        | 16       | 0.0        | 6                      | 2                      | 32                    | 11                      | 0.2                                    |
| H <sub>2</sub> S            | 11           | Feb-21 07:00                    | 1.6                                          | 108       | 15       | 0.0        | 8                      | 3                      | 30                    | 11                      | 0.0                                    |
| H <sub>2</sub> S            | 14           | Feb-26 10:00                    | 2.1                                          | 120       | 22       | 0.0        | 17                     | 0                      | 45                    | 14                      | 0.0                                    |
| H <sub>2</sub> S            | 28           | Mar-07 03:00                    | 1.1                                          | 106       | 19       | 0.0        | 2                      | 4                      | 37                    | 28                      | 0.0                                    |
| H <sub>2</sub> S            | 14           | Mar-07 04:00                    | 1.3                                          | 120       | 17       | 0.0        | 4                      | 7                      | 35                    | 14                      | 0.0                                    |
| H <sub>2</sub> S            | 15           | Mar-08 21:00                    | 0.9                                          | 123       | 22       | 0.0        | 3                      | 7                      | 44                    | 15                      | 2.4                                    |
| H <sub>2</sub> S            | 15           | Mar-08 22:00                    | 0.9                                          | 130       | 21       | 0.0        | 6                      | 9                      | 41                    | 15                      | 1.8                                    |
| H <sub>2</sub> S            | 25           | Mar-09 02:00                    | 1.3                                          | 138       | 23       | 0.0        | 6                      | 3                      | 47                    | 25                      | 0.5                                    |
| H <sub>2</sub> S            | 25           | Mar-09 03:00                    | 0.9                                          | 122       | 24       | 0.0        | 6                      | 3                      | 47                    | 25                      | 0.4                                    |
| H <sub>2</sub> S            | 28           | Mar-09 04:00                    | 0.5                                          | 118       | 23       | 0.0        | 8                      | 2                      | 47                    | 28                      | 0.5                                    |
| H <sub>2</sub> S            | 16           | Mar-09 05:00                    | 0.8                                          | 99        | 24       | 0.0        | 6                      | 2                      | 48                    | 16                      | 0.3                                    |
| H <sub>2</sub> S            | 14           | Mar-09 09:00                    | 1.3                                          | 71        | 20       | 0.0        | 5                      | 8                      | 39                    | 14                      | 1.3                                    |
| H <sub>2</sub> S            | 11           | Mar-09 13:00                    | 1.4                                          | 69        | 25       | 0.0        | 16                     | 5                      | 51                    | 11                      | 5.5                                    |
| H <sub>2</sub> S            | 12           | Mar-09 14:00                    | 1.0                                          | 94        | 27       | 0.0        | 12                     | 5                      | 52                    | 12                      | 4.0                                    |
| H <sub>2</sub> S            | 11           | Mar-09 15:00                    | 1.0                                          | 71        | 28       | 0.0        | 29                     | 5                      | 54                    | 11                      | 3.7                                    |
| H <sub>2</sub> S            | 17           | Mar-09 19:00                    | 1.3                                          | 120       | 31       | 0.0        | 20                     | 4                      | 57                    | 17                      | 2.6                                    |
| H <sub>2</sub> S            | 13           | Mar-09 22:00                    | 1.7                                          | 116       | 26       | 0.0        | 18                     | 5                      | 51                    | 13                      | 3.0                                    |
| H <sub>2</sub> S            | 19           | Mar-13 00:00                    | 1.0                                          | 126       | 19       | 0.0        | 4                      | 4                      | 38                    | 19                      | 1.9                                    |
| H <sub>2</sub> S            | 11           | Mar-13 01:00                    | 1.9                                          | 118       | 21       | 0.0        | 9                      | 1                      | 41                    | 11                      | 1.8                                    |
| H <sub>2</sub> S            | 19           | Mar-16 12:00                    | 1.5                                          | 126       | 19       | 0.6        | 7                      | 3                      | 37                    | 19                      | 4.7                                    |

**Table C-1. Summary of exceedances for 1-hour Saskatchewan Ambient Air Quality Standards for the year 2011 (continued)**

| 1-Hour Exceedance Pollutant |              |                                 | Other Parameters During the Exceedance Event |           |          |            |                        |                        |                       |                         |                                        |
|-----------------------------|--------------|---------------------------------|----------------------------------------------|-----------|----------|------------|------------------------|------------------------|-----------------------|-------------------------|----------------------------------------|
| Pollutant                   | Conc.<br>ppb | Exceedance Time<br>mmm-dd hh:mm | WS<br>m/s                                    | WD<br>deg | AQI<br>- | Rain<br>mm | SO <sub>2</sub><br>ppb | NO <sub>2</sub><br>ppb | O <sub>3</sub><br>ppb | H <sub>2</sub> S<br>ppb | PM <sub>2.5</sub><br>µg/m <sup>3</sup> |
| H <sub>2</sub> S            | 11           | Mar-23 21:00                    | 0.7                                          | 136       | 24       | 0.0        | 1                      | 2                      | 47                    | 11                      | 1.2                                    |
| H <sub>2</sub> S            | 16           | Mar-23 22:00                    | 1.7                                          | 87        | 22       | 0.0        | 2                      | 3                      | 44                    | 16                      | 0.4                                    |
| H <sub>2</sub> S            | 44           | Mar-24 01:00                    | 0.9                                          | 134       | 21       | 0.0        | 9                      | 4                      | 43                    | 44                      | 0.1                                    |
| H <sub>2</sub> S            | 26           | Mar-24 02:00                    | 1.1                                          | 91        | 21       | 0.0        | 7                      | 4                      | 42                    | 26                      | 0.0                                    |
| H <sub>2</sub> S            | 17           | Mar-31 01:00                    | 1.3                                          | 116       | 19       | 0.0        | 9                      | 3                      | 38                    | 17                      | 3.9                                    |
| H <sub>2</sub> S            | 13           | Apr-02 08:00                    | 1.0                                          | 106       | 18       | 0.0        | 3                      | 2                      | 37                    | 13                      | 1.3                                    |
| H <sub>2</sub> S            | 17           | Apr-02 09:00                    | 1.9                                          | 67        | 18       | 0.0        | 5                      | 2                      | 35                    | 17                      | 1.6                                    |
| H <sub>2</sub> S            | 11           | Apr-04 09:00                    | 4.3                                          | 198       | 24       | 0.0        | 2                      | 1                      | 48                    | 11                      | 1.2                                    |
| H <sub>2</sub> S            | 13           | Apr-05 16:00                    | 1.5                                          | 98        | 32       | 0.0        | 9                      | 2                      | 59                    | 13                      | 1.2                                    |
| H <sub>2</sub> S            | 12           | Apr-05 17:00                    | 1.1                                          | 133       | 31       | 0.0        | 17                     | 2                      | 57                    | 12                      | 1.1                                    |
| H <sub>2</sub> S            | 21           | Apr-05 22:00                    | 1.6                                          | 168       | 21       | 0.0        | 1                      | 1                      | 41                    | 21                      | 0.5                                    |
| H <sub>2</sub> S            | 20           | Apr-07 01:00                    | 1.0                                          | 125       | 15       | 0.0        | 5                      | 2                      | 30                    | 20                      | 0.0                                    |
| H <sub>2</sub> S            | 18           | Apr-07 02:00                    | 0.5                                          | 116       | 14       | 0.0        | 15                     | 3                      | 27                    | 18                      | 0.0                                    |
| H <sub>2</sub> S            | 29           | Apr-07 03:00                    | 0.8                                          | 108       | 13       | 0.0        | 5                      | 4                      | 25                    | 29                      | 0.0                                    |
| H <sub>2</sub> S            | 26           | Apr-07 04:00                    | 0.9                                          | 59        | 13       | 0.0        | 6                      | 3                      | 26                    | 26                      | 0.0                                    |
| H <sub>2</sub> S            | 16           | Apr-07 08:00                    | 0.2                                          | 184       | 11       | 0.0        | 2                      | 8                      | 23                    | 16                      | 0.2                                    |
| H <sub>2</sub> S            | 16           | Apr-07 10:00                    | 1.1                                          | 192       | 15       | 0.0        | 12                     | 4                      | 30                    | 16                      | 0.3                                    |
| H <sub>2</sub> S            | 15           | Apr-19 07:00                    | 0.6                                          | 134       | 11       | 0.0        | 7                      | 2                      | 21                    | 15                      | 2.6                                    |
| H <sub>2</sub> S            | 69           | May-01 23:00                    | 1.0                                          | 162       | 16       | 0.0        | 1                      | 2                      | 32                    | 68                      | 0.2                                    |
| H <sub>2</sub> S            | 11           | May-02 00:00                    | 1.1                                          | 163       | 15       | 0.0        | 2                      | 1                      | 30                    | 11                      | 0.2                                    |
| H <sub>2</sub> S            | 13           | Jun-09 02:00                    | 0.5                                          | 78        | 11       | 0.0        | 11                     | 1                      | 22                    | 13                      | 0.7                                    |
| H <sub>2</sub> S            | 28           | Jun-10 03:00                    | 0.5                                          | 104       | 11       | 0.0        | 1                      | 1                      | 21                    | 28                      | 3.0                                    |
| H <sub>2</sub> S            | 13           | Jun-23 00:00                    | 1.0                                          | 112       | 15       | 0.0        | 2                      | 1                      | 29                    | 13                      | 10.9                                   |
| H <sub>2</sub> S            | 31           | Jun-23 01:00                    | 0.9                                          | 117       | 14       | 0.0        | 4                      | 0                      | 27                    | 31                      | 11.6                                   |
| H <sub>2</sub> S            | 16           | Jun-23 02:00                    | 1.0                                          | 134       | 13       | 0.0        | 4                      | 1                      | 26                    | 16                      | 11.8                                   |
| H <sub>2</sub> S            | 13           | Jun-23 03:00                    | 1.0                                          | 151       | 12       | 0.0        | 3                      | 1                      | 25                    | 13                      | 11.4                                   |
| H <sub>2</sub> S            | 32           | Jun-27 13:00                    | 2.2                                          | 225       | 0        | 0.0        | 1                      | 0                      | 33                    | 32                      | 0.0                                    |
| H <sub>2</sub> S            | 13           | Jun-27 14:00                    | 2.2                                          | 214       | 0        | 0.0        | 2                      | 0                      | 30                    | 13                      | 0.0                                    |
| H <sub>2</sub> S            | 28           | Jun-27 15:00                    | 2.4                                          | 215       | 0        | 0.0        | 3                      | 0                      | 25                    | 28                      | 0.0                                    |
| H <sub>2</sub> S            | 24           | Jul-01 01:00                    | 2.8                                          | 222       | 0        | 0.0        | 2                      | 0                      | 24                    | 24                      | 0.0                                    |
| H <sub>2</sub> S            | 15           | Jul-07 06:00                    | 0.5                                          | 132       | 8        | 0.1        | 3                      | 3                      | 16                    | 15                      | 0.0                                    |
| H <sub>2</sub> S            | 15           | Jul-07 07:00                    | 0.7                                          | 66        | 11       | 0.0        | 12                     | 2                      | 23                    | 15                      | 0.0                                    |
| H <sub>2</sub> S            | 11           | Jul-10 00:00                    | 1.5                                          | 187       | 12       | 0.0        | 1                      | 1                      | 24                    | 11                      | 0.0                                    |
| H <sub>2</sub> S            | 25           | Jul-16 00:00                    | 0.6                                          | 111       | 10       | 0.0        | 24                     | 5                      | 20                    | 25                      | 0.0                                    |
| H <sub>2</sub> S            | 28           | Jul-16 01:00                    | 0.8                                          | 106       | 8        | 0.0        | 27                     | 4                      | 17                    | 28                      | 0.0                                    |



**Table C-1. Summary of exceedances for 1-hour Saskatchewan Ambient Air Quality Standards for the year 2011 (continued)**

| 1-Hour Exceedance Pollutant |              |                                 | Other Parameters During the Exceedance Event |           |          |            |                        |                        |                       |                         |                                        |
|-----------------------------|--------------|---------------------------------|----------------------------------------------|-----------|----------|------------|------------------------|------------------------|-----------------------|-------------------------|----------------------------------------|
| Pollutant                   | Conc.<br>ppb | Exceedance Time<br>mmm-dd hh:mm | WS<br>m/s                                    | WD<br>deg | AQI<br>- | Rain<br>mm | SO <sub>2</sub><br>ppb | NO <sub>2</sub><br>ppb | O <sub>3</sub><br>ppb | H <sub>2</sub> S<br>ppb | PM <sub>2.5</sub><br>µg/m <sup>3</sup> |
| H <sub>2</sub> S            | 14           | Jul-16 02:00                    | 0.7                                          | 116       | 10       | 0.0        | 17                     | 3                      | 19                    | 14                      | 0.0                                    |
| H <sub>2</sub> S            | 19           | Jul-29 01:00                    | 1.1                                          | 191       | 8        | 0.0        | 1                      | 2                      | 16                    | 19                      | 5.5                                    |
| H <sub>2</sub> S            | 19           | Jul-29 02:00                    | 0.9                                          | 204       | 8        | 0.0        | 2                      | 2                      | 16                    | 19                      | 5.3                                    |
| H <sub>2</sub> S            | 11           | Aug-05 05:00                    | 0.9                                          | 72        | 8        | 0.0        | 2                      | 5                      | 14                    | 11                      | 9.3                                    |
| H <sub>2</sub> S            | 15           | Aug-10 04:00                    | 0.7                                          | 117       | 8        | 0.0        | 12                     | 3                      | 16                    | 14                      | 9.6                                    |
| H <sub>2</sub> S            | 15           | Aug-10 05:00                    | 1.0                                          | 104       | 8        | 0.0        | 9                      | 2                      | 13                    | 15                      | 9.6                                    |
| H <sub>2</sub> S            | 13           | Aug-10 06:00                    | 1.0                                          | 109       | 8        | 0.0        | 12                     | 2                      | 14                    | 13                      | 9.5                                    |
| H <sub>2</sub> S            | 14           | Aug-13 04:00                    | 0.5                                          | 138       | 9        | 0.0        | 1                      | 3                      | 11                    | 14                      | 11.4                                   |
| H <sub>2</sub> S            | 13           | Aug-13 05:00                    | 0.6                                          | 146       | 10       | 0.0        | 3                      | 4                      | 11                    | 13                      | 11.8                                   |
| H <sub>2</sub> S            | 18           | Aug-13 07:00                    | 0.6                                          | 109       | 11       | 0.0        | 7                      | 3                      | 13                    | 18                      | 13.4                                   |
| H <sub>2</sub> S            | 18           | Aug-13 08:00                    | 1.2                                          | 117       | 13       | 0.0        | 23                     | 2                      | 17                    | 18                      | 15.3                                   |
| H <sub>2</sub> S            | 14           | Aug-18 00:00                    | 0.6                                          | 93        | 10       | 0.0        | 16                     | 3                      | 20                    | 14                      | 11.1                                   |
| H <sub>2</sub> S            | 13           | Aug-18 01:00                    | 0.5                                          | 102       | 9        | 0.0        | 11                     | 4                      | 18                    | 13                      | 10.2                                   |
| H <sub>2</sub> S            | 29           | Aug-18 02:00                    | 0.5                                          | 91        | 8        | 0.0        | 12                     | 4                      | 16                    | 29                      | 9.9                                    |
| H <sub>2</sub> S            | 21           | Aug-18 03:00                    | 0.8                                          | 96        | 8        | 0.0        | 26                     | 4                      | 16                    | 21                      | 9.2                                    |
| H <sub>2</sub> S            | 12           | Aug-20 07:00                    | 1.6                                          | 213       | 7        | 0.0        | 2                      | 2                      | 14                    | 12                      | 5.4                                    |
| H <sub>2</sub> S            | 15           | Aug-21 00:00                    | 0.6                                          | 136       | 8        | 0.0        | 2                      | 3                      | 15                    | 15                      | 6.7                                    |
| H <sub>2</sub> S            | 38           | Aug-21 01:00                    | 0.5                                          | 124       | 9        | 0.0        | 23                     | 3                      | 17                    | 38                      | 6.9                                    |
| H <sub>2</sub> S            | 35           | Aug-21 02:00                    | 0.5                                          | 103       | 8        | 0.0        | 18                     | 4                      | 16                    | 35                      | 7.0                                    |
| H <sub>2</sub> S            | 13           | Aug-22 02:00                    | 0.7                                          | 128       | 10       | 0.0        | 8                      | 3                      | 20                    | 12                      | 12.4                                   |
| H <sub>2</sub> S            | 18           | Aug-22 04:00                    | 1.2                                          | 105       | 10       | 0.0        | 17                     | 0                      | 18                    | 18                      | 12.6                                   |
| H <sub>2</sub> S            | 16           | Aug-22 07:00                    | 0.8                                          | 126       | 10       | 0.0        | 20                     | 2                      | 17                    | 16                      | 11.5                                   |
| H <sub>2</sub> S            | 11           | Aug-22 08:00                    | 0.9                                          | 119       | 11       | 0.0        | 16                     | 3                      | 18                    | 11                      | 13.0                                   |
| H <sub>2</sub> S            | 12           | Aug-22 09:00                    | 0.7                                          | 130       | 12       | 0.0        | 24                     | 2                      | 25                    | 12                      | 14.1                                   |
| H <sub>2</sub> S            | 14           | Aug-22 23:00                    | 1.9                                          | 203       | 10       | 0.0        | 3                      | 2                      | 19                    | 14                      | 8.8                                    |
| H <sub>2</sub> S            | 14           | Aug-23 00:00                    | 2.1                                          | 209       | 11       | 0.0        | 4                      | 2                      | 22                    | 14                      | 7.9                                    |
| H <sub>2</sub> S            | 12           | Aug-26 22:00                    | 1.0                                          | 89        | 20       | 0.0        | 9                      | 3                      | 26                    | 12                      | 23.5                                   |
| H <sub>2</sub> S            | 11           | Aug-31 01:00                    | 0.9                                          | 116       | 14       | 0.0        | 46                     | 3                      | 25                    | 11                      | 17.1                                   |
| H <sub>2</sub> S            | 18           | Sep-02 01:00                    | 1.8                                          | 215       | 8        | 0.0        | 1                      | 2                      | 16                    | 17                      | 8.2                                    |
| H <sub>2</sub> S            | 15           | Sep-03 04:00                    | 8.1                                          | 280       | 12       | 0.0        | 1                      | 1                      | 23                    | 15                      | 7.9                                    |
| H <sub>2</sub> S            | 12           | Sep-04 07:00                    | 0.8                                          | 177       | 6        | 0.0        | 1                      | 2                      | 12                    | 12                      | 5.5                                    |
| H <sub>2</sub> S            | 13           | Sep-04 08:00                    | 0.8                                          | 115       | 5        | 0.0        | 1                      | 2                      | 11                    | 13                      | 5.7                                    |
| H <sub>2</sub> S            | 12           | Sep-04 09:00                    | 1.3                                          | 121       | 8        | 0.0        | 9                      | 2                      | 16                    | 12                      | 6.7                                    |
| H <sub>2</sub> S            | 19           | Sep-08 01:00                    | 0.6                                          | 115       | 12       | 0.0        | 20                     | 4                      | 24                    | 19                      | 12.8                                   |
| H <sub>2</sub> S            | 18           | Sep-08 02:00                    | 0.8                                          | 76        | 10       | 0.0        | 13                     | 5                      | 18                    | 18                      | 12.0                                   |

**Table C-1. Summary of exceedances for 1-hour Saskatchewan Ambient Air Quality Standards for the year 2011 (continued)**

| 1-Hour Exceedance Pollutant |              |                                 | Other Parameters During the Exceedance Event |           |          |            |                        |                        |                       |                         |                                        |
|-----------------------------|--------------|---------------------------------|----------------------------------------------|-----------|----------|------------|------------------------|------------------------|-----------------------|-------------------------|----------------------------------------|
| Pollutant                   | Conc.<br>ppb | Exceedance Time<br>mmm-dd hh:mm | WS<br>m/s                                    | WD<br>deg | AQI<br>- | Rain<br>mm | SO <sub>2</sub><br>ppb | NO <sub>2</sub><br>ppb | O <sub>3</sub><br>ppb | H <sub>2</sub> S<br>ppb | PM <sub>2.5</sub><br>µg/m <sup>3</sup> |
| H <sub>2</sub> S            | 12           | Sep-08 03:00                    | 1.5                                          | 77        | 10       | 0.0        | 4                      | 5                      | 15                    | 12                      | 12.0                                   |
| H <sub>2</sub> S            | 16           | Sep-08 04:00                    | 1.2                                          | 82        | 10       | 0.0        | 3                      | 5                      | 17                    | 16                      | 12.5                                   |
| H <sub>2</sub> S            | 19           | Sep-08 07:00                    | 1.1                                          | 96        | 10       | 0.0        | 3                      | 5                      | 13                    | 19                      | 12.1                                   |
| H <sub>2</sub> S            | 22           | Sep-08 09:00                    | 1.5                                          | 93        | 15       | 0.0        | 20                     | 3                      | 22                    | 22                      | 18.0                                   |
| H <sub>2</sub> S            | 18           | Sep-09 05:00                    | 0.5                                          | 123       | 13       | 0.0        | 1                      | 6                      | 14                    | 18                      | 15.4                                   |
| H <sub>2</sub> S            | 23           | Sep-09 06:00                    | 0.3                                          | 180       | 12       | 0.0        | 1                      | 5                      | 10                    | 23                      | 14.2                                   |
| H <sub>2</sub> S            | 17           | Sep-09 07:00                    | 0.3                                          | 164       | 12       | 0.0        | 2                      | 7                      | 10                    | 17                      | 14.9                                   |
| H <sub>2</sub> S            | 15           | Sep-09 08:00                    | 0.7                                          | 54        | 17       | 0.0        | 3                      | 8                      | 13                    | 14                      | 19.8                                   |
| H <sub>2</sub> S            | 12           | Sep-10 04:00                    | 0.9                                          | 124       | 11       | 0.0        | 17                     | 5                      | 11                    | 12                      | 13.8                                   |
| H <sub>2</sub> S            | 18           | Sep-11 06:00                    | 0.4                                          | 111       | 10       | 0.0        | 2                      | 4                      | 12                    | 18                      | 11.9                                   |
| H <sub>2</sub> S            | 25           | Sep-11 07:00                    | 0.6                                          | 126       | 9        | 0.0        | 10                     | 0                      | 18                    | 25                      | 11.3                                   |
| H <sub>2</sub> S            | 14           | Sep-11 08:00                    | 1.0                                          | 132       | 11       | 0.0        | 17                     | 5                      | 21                    | 14                      | 12.7                                   |
| H <sub>2</sub> S            | 13           | Sep-21 23:00                    | 1.0                                          | 115       | 7        | 0.0        | 14                     | 3                      | 14                    | 13                      | 2.7                                    |
| H <sub>2</sub> S            | 24           | Sep-23 21:00                    | 1.2                                          | 145       | 10       | 0.0        | 3                      | 6                      | 16                    | 24                      | 12.3                                   |
| H <sub>2</sub> S            | 11           | Sep-23 22:00                    | 1.3                                          | 163       | 11       | 0.0        | 4                      | 6                      | 16                    | 11                      | 13.1                                   |
| H <sub>2</sub> S            | 19           | Sep-24 00:00                    | 0.7                                          | 157       | 12       | 0.0        | 8                      | 7                      | 7                     | 19                      | 14.9                                   |
| H <sub>2</sub> S            | 12           | Sep-24 02:00                    | 0.6                                          | 108       | 7        | 0.0        | 10                     | 3                      | 11                    | 12                      | 7.9                                    |
| H <sub>2</sub> S            | 16           | Sep-24 03:00                    | 0.9                                          | 114       | 6        | 0.0        | 10                     | 3                      | 11                    | 16                      | 7.3                                    |
| H <sub>2</sub> S            | 14           | Sep-24 05:00                    | 1.0                                          | 121       | 7        | 0.0        | 11                     | 2                      | 13                    | 14                      | 7.5                                    |
| H <sub>2</sub> S            | 13           | Sep-24 07:00                    | 0.5                                          | 117       | 6        | 0.0        | 4                      | 3                      | 12                    | 13                      | 6.6                                    |
| H <sub>2</sub> S            | 12           | Sep-24 21:00                    | 1.1                                          | 177       | 10       | 0.0        | 2                      | 4                      | 20                    | 12                      | 7.4                                    |
| H <sub>2</sub> S            | 12           | Sep-25 03:00                    | 1.2                                          | 97        | 10       | 0.0        | 3                      | 7                      | 5                     | 12                      | 11.6                                   |
| H <sub>2</sub> S            | 19           | Sep-25 04:00                    | 0.7                                          | 152       | 9        | 0.0        | 7                      | 8                      | 6                     | 19                      | 10.8                                   |
| H <sub>2</sub> S            | 14           | Sep-25 05:00                    | 1.1                                          | 135       | 8        | 0.0        | 5                      | 8                      | 4                     | 14                      | 9.8                                    |
| H <sub>2</sub> S            | 36           | Sep-25 06:00                    | 0.7                                          | 133       | 7        | 0.0        | 4                      | 7                      | 4                     | 36                      | 8.7                                    |
| H <sub>2</sub> S            | 29           | Sep-25 07:00                    | 0.5                                          | 134       | 6        | 0.0        | 4                      | 5                      | 9                     | 29                      | 7.0                                    |
| H <sub>2</sub> S            | 50           | Sep-25 08:00                    | 0.3                                          | 128       | 6        | 0.0        | 12                     | 6                      | 7                     | 50                      | 7.7                                    |
| H <sub>2</sub> S            | 22           | Sep-25 09:00                    | 0.6                                          | 106       | 7        | 0.0        | 15                     | 5                      | 10                    | 22                      | 8.9                                    |
| H <sub>2</sub> S            | 11           | Oct-01 05:00                    | 0.8                                          | 116       | 9        | 0.0        | 7                      | 2                      | 18                    | 11                      | 3.6                                    |
| H <sub>2</sub> S            | 14           | Oct-21 22:00                    | 1.1                                          | 141       | 12       | 0.0        | 0                      | 5                      | 11                    | 14                      | 13.9                                   |
| H <sub>2</sub> S            | 16           | Oct-21 23:00                    | 0.8                                          | 130       | 12       | 0.0        | 1                      | 4                      | 12                    | 16                      | 14.9                                   |
| H <sub>2</sub> S            | 17           | Oct-22 01:00                    | 0.8                                          | 127       | 7        | 0.0        | 8                      | 2                      | 15                    | 17                      | 6.3                                    |
| H <sub>2</sub> S            | 14           | Oct-22 02:00                    | 1.2                                          | 123       | 7        | 0.0        | 13                     | 3                      | 14                    | 14                      | 5.4                                    |
| H <sub>2</sub> S            | 13           | Oct-26 21:00                    | 1.0                                          | 130       | 7        | 0.0        | 6                      | 4                      | 14                    | 13                      | 2.9                                    |
| H <sub>2</sub> S            | 34           | Oct-28 21:00                    | 1.3                                          | 127       | 8        | 0.0        | 11                     | 2                      | 16                    | 34                      | 2.4                                    |

**Table C-1. Summary of exceedances for 1-hour Saskatchewan Ambient Air Quality Standards for the year 2011 (continued)**

| 1-Hour Exceedance Pollutant |              |                                 | Other Parameters During the Exceedance Event |           |          |            |                        |                        |                       |                         |                                        |
|-----------------------------|--------------|---------------------------------|----------------------------------------------|-----------|----------|------------|------------------------|------------------------|-----------------------|-------------------------|----------------------------------------|
| Pollutant                   | Conc.<br>ppb | Exceedance Time<br>mmm-dd hh:mm | WS<br>m/s                                    | WD<br>deg | AQI<br>- | Rain<br>mm | SO <sub>2</sub><br>ppb | NO <sub>2</sub><br>ppb | O <sub>3</sub><br>ppb | H <sub>2</sub> S<br>ppb | PM <sub>2.5</sub><br>µg/m <sup>3</sup> |
| H <sub>2</sub> S            | 13           | Nov-07 22:00                    | 0.7                                          | 131       | 7        | 0.0        | 2                      | 8                      | 14                    | 13                      | 5.0                                    |
| H <sub>2</sub> S            | 14           | Nov-08 01:00                    | 0.8                                          | 120       | 10       | 0.0        | 6                      | 3                      | 19                    | 14                      | 2.9                                    |
| H <sub>2</sub> S            | 16           | Nov-08 04:00                    | 1.6                                          | 92        | 10       | 0.0        | 5                      | 4                      | 20                    | 16                      | 2.6                                    |
| H <sub>2</sub> S            | 11           | Nov-10 05:00                    | 1.3                                          | 132       | 10       | 0.0        | 3                      | 2                      | 20                    | 11                      | 3.6                                    |
| H <sub>2</sub> S            | 16           | Nov-17 00:00                    | 1.0                                          | 110       | 9        | 0.0        | 5                      | 5                      | 18                    | 16                      | 3.2                                    |
| H <sub>2</sub> S            | 14           | Nov-21 06:00                    | 1.2                                          | 134       | 8        | 0.0        | 15                     | 3                      | 16                    | 14                      | 0.9                                    |
| H <sub>2</sub> S            | 12           | Nov-29 00:00                    | 0.7                                          | 132       | 6        | 0.0        | 1                      | 2                      | 13                    | 12                      | 2.1                                    |
| H <sub>2</sub> S            | 16           | Dec-16 08:00                    | 1.0                                          | 154       | 5        | 0.0        | 3                      | 4                      | 10                    | 16                      | 1.9                                    |
| H <sub>2</sub> S            | 11           | Dec-16 11:00                    | 0.6                                          | 144       | 4        | 0.0        | 1                      | 6                      | 9                     | 11                      | 1.4                                    |
| H <sub>2</sub> S            | 14           | Dec-28 12:00                    | 1.0                                          | 135       | 8        | 0.0        | 11                     | 3                      | 16                    | 14                      | 1.2                                    |

**Table C-2. Summary of exceedances for 24-hour Saskatchewan Ambient Air Quality Standards for the year 2011**

| 24-Hour Exceedance Pollutant |              |                           | Other Parameters During the Exceedance Event |           |          |            |                        |                        |                       |                         |                                        |
|------------------------------|--------------|---------------------------|----------------------------------------------|-----------|----------|------------|------------------------|------------------------|-----------------------|-------------------------|----------------------------------------|
| Pollutant                    | Conc.<br>ppb | Exceedance Date<br>mmm-dd | WS<br>m/s                                    | WD<br>deg | AQI<br>- | Rain<br>mm | SO <sub>2</sub><br>ppb | NO <sub>2</sub><br>ppb | O <sub>3</sub><br>ppb | H <sub>2</sub> S<br>ppb | PM <sub>2.5</sub><br>µg/m <sup>3</sup> |
| H <sub>2</sub> S             | 4.0          | Jan-20                    | 3.4                                          | 169       | 14       | 0.0        | 4                      | 5                      | 28                    | 4.0                     | 2.4                                    |
| H <sub>2</sub> S             | 6.5          | Feb-21                    | 2.2                                          | 121       | 18       | 0.0        | 8                      | 3                      | 36                    | 6.5                     | 0.8                                    |
| H <sub>2</sub> S             | 11.1         | Mar-9                     | 1.2                                          | 108       | 25       | 0.0        | 11                     | 5                      | 49                    | 11.1                    | 2.1                                    |
| H <sub>2</sub> S             | 4.9          | Mar-24                    | 3.5                                          | 88        | 25       | 0.0        | 3                      | 2                      | 48                    | 4.9                     | 2.8                                    |
| H <sub>2</sub> S             | 3.7          | Apr-5                     | 2.2                                          | 202       | 26       | 0.0        | 2                      | 2                      | 50                    | 3.7                     | 1.1                                    |
| H <sub>2</sub> S             | 8.3          | Apr-7                     | 1.5                                          | 75        | 22       | 0.0        | 6                      | 3                      | 42                    | 8.3                     | 0.5                                    |
| H <sub>2</sub> S             | 4.1          | Jun-23                    | 1.7                                          | 130       | 20       | 0.1        | 3                      | 1                      | 39                    | 4.1                     | 8.5                                    |
| H <sub>2</sub> S             | 3.9          | Jun-25                    | 1.7                                          | 136       | -        | 0.0        | 3                      | -                      | 34                    | 3.9                     | -                                      |
| H <sub>2</sub> S             | 3.7          | Jul-7                     | 1.5                                          | 96        | 18       | 0.0        | 4                      | 2                      | 35                    | 3.7                     | -                                      |
| H <sub>2</sub> S             | 3.7          | Jul-15                    | 2.6                                          | 210       | 19       | 0.2        | 3                      | 3                      | 38                    | 3.7                     | -                                      |
| H <sub>2</sub> S             | 4.2          | Jul-29                    | 1.7                                          | 150       | 18       | 0.0        | 4                      | 2                      | 35                    | 4.2                     | 6.3                                    |
| H <sub>2</sub> S             | 3.8          | Aug-10                    | 1.4                                          | 180       | 16       | 0.0        | 5                      | 2                      | 33                    | 3.8                     | 8.5                                    |
| H <sub>2</sub> S             | 3.8          | Aug-13                    | 1.1                                          | 122       | 17       | 0.0        | 3                      | 2                      | 31                    | 3.8                     | 10.8                                   |
| H <sub>2</sub> S             | 4.1          | Aug-18                    | 3.6                                          | 216       | 13       | 0.0        | 5                      | 2                      | 27                    | 4.1                     | 6.3                                    |
| H <sub>2</sub> S             | 4.8          | Aug-21                    | 1.7                                          | 160       | 16       | 0.0        | 5                      | 2                      | 31                    | 4.8                     | 6.4                                    |
| H <sub>2</sub> S             | 5.9          | Aug-22                    | 2.2                                          | 185       | 14       | 0.0        | 6                      | 2                      | 27                    | 5.9                     | 9.0                                    |
| H <sub>2</sub> S             | 6.8          | Sep-8                     | 1.6                                          | 73        | 20       | 0.0        | 9                      | 5                      | 36                    | 7                       | 14.8                                   |
| H <sub>2</sub> S             | 4.1          | Sep-10                    | 0.8                                          | 192       | 17       | 0.0        | 3                      | 3                      | 32                    | 4                       | 9.5                                    |
| H <sub>2</sub> S             | 4.1          | Sep-23                    | 1.3                                          | 186       | 11       | 0.0        | 2                      | 4                      | 21                    | 4                       | 6.0                                    |
| H <sub>2</sub> S             | 5.6          | Sep-24                    | 1.3                                          | 187       | 11       | 0.0        | 4                      | 3                      | 20                    | 6                       | 7.0                                    |
| H <sub>2</sub> S             | 10.2         | Sep-25                    | 1.2                                          | 113       | 13       | 0.0        | 8                      | 5                      | 24                    | 10                      | 8.9                                    |
| H <sub>2</sub> S             | 4.0          | Jan-20                    | 3.4                                          | 169       | 14       | 0.0        | 4                      | 5                      | 28                    | 4.0                     | 2.4                                    |
| H <sub>2</sub> S             | 6.5          | Feb-21                    | 2.2                                          | 121       | 18       | 0.0        | 8                      | 3                      | 36                    | 6.5                     | 0.8                                    |
| H <sub>2</sub> S             | 11.1         | Mar-9                     | 1.2                                          | 108       | 25       | 0.0        | 11                     | 5                      | 49                    | 11.1                    | 2.1                                    |
| H <sub>2</sub> S             | 4.9          | Mar-24                    | 3.5                                          | 88        | 25       | 0.0        | 3                      | 2                      | 48                    | 4.9                     | 2.8                                    |

## APPENDIX D: PASSIVE MONITORING DATA

**Table D-1. 30-day average concentration for passive SO<sub>2</sub> samples for the year 2011**

| Passive Site    |              | 30-Day Passive SO <sub>2</sub> Concentration (ppb) |     |     |     |     |     |     |     |     |     |     |     | AV<br>G | MA<br>X | MI<br>N |
|-----------------|--------------|----------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|---------|---------|
| No.             | Location     | Jan                                                | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |         |         |         |
| 1               | Carnduff     | 2.0                                                | 1.8 | 0.7 | 0.4 | 0.2 | 0.2 | 0.3 | 0.6 | 0.2 | 0.3 | 0.2 | 0.2 | 0.6     | 2.0     | 0.2     |
| 2               | Glen Ewan    | 2.8                                                | 1.3 | 0.8 | 0.3 | 0.3 | -   | 0.3 | 0.6 | 0.2 | 0.3 | 0.1 | 0.3 | 0.7     | 2.8     | 0.1     |
| 3               | North Portal | 1.9                                                | 1.8 | 0.9 | 0.3 | 0.6 | 0.2 | 0.6 | 1.6 | 0.3 | 0.4 | 0.3 | 0.2 | 0.8     | 1.9     | 0.2     |
| 4               | Roche Percee | 1.4                                                | 1.9 | 0.6 | -   | 0.6 | 0.5 | 0.4 | 0.8 | 0.4 | 0.5 | 0.3 | 0.3 | 0.7     | 1.9     | 0.3     |
| 5               | Estevan      | 1.3                                                | 1.7 | 1.0 | 0.1 | -   | -   | 0.6 | 0.7 | 0.2 | 0.2 | 0.1 | 0.2 | 0.6     | 1.7     | 0.1     |
| 6               | Torquay      | 1.5                                                | 1.1 | 0.6 | 0.4 | 0.3 | 0.2 | 0.2 | 1.3 | 0.2 | 0.2 | 0.1 | 0.1 | 0.5     | 1.5     | 0.1     |
| 7               | Tribune      | 2.5                                                | 1.3 | 1.3 | 0.2 | -   | 0.3 | 0.2 | 1.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.7     | 2.5     | 0.2     |
| 8               | Macoun       | 1.7                                                | 1.5 | 1.4 | 0.8 | -   | -   | 0.4 | 1.2 | 0.3 | 0.3 | 0.2 | 0.2 | 0.8     | 1.7     | 0.2     |
| 9               | Kingsford    | 2.2                                                | 2.1 | 1.6 | 0.5 | -   | -   | F   | 0.7 | 0.2 | 0.7 | 0.2 | 0.4 | 1.0     | 2.2     | 0.2     |
| 10              | Alameda      | 2.0                                                | 2.0 | 1.4 | 0.7 | 0.3 | 0.3 | 0.6 | 1.8 | 0.3 | 0.4 | 0.3 | 0.3 | 0.9     | 2.0     | 0.3     |
| 11              | Oxbow        | 2.0                                                | 2.1 | 1.0 | 0.5 | 0.3 | 0.3 | 0.4 | 1.2 | 0.4 | 0.4 | 0.2 | 0.2 | 0.8     | 2.1     | 0.2     |
| 12              | Storthoaks   | 1.6                                                | 1.8 | 2.8 | 0.4 | 0.3 | 0.4 | 0.6 | 1.0 | 0.2 | 0.4 | 0.3 | 0.3 | 0.8     | 2.8     | 0.2     |
| 13              | Redvers      | 1.3                                                | 1.6 | 0.8 | 0.3 | 0.2 | 0.3 | 0.3 | 1.1 | 0.2 | 0.4 | 0.3 | 0.2 | 0.6     | 1.6     | 0.2     |
| 14              | Steppes      | 1.4                                                | 1.4 | 0.9 | 0.2 | 0.6 | 0.4 | 0.6 | 0.9 | 0.3 | 0.5 | 0.3 | 0.2 | 0.6     | 1.4     | 0.2     |
| 15              | Wordsworth   | 1.5                                                | 0.4 | 1.4 | 0.5 | 0.2 | 0.3 | 0.4 | 0.3 | 0.2 | 0.4 | 0.1 | 0.2 | 0.5     | 1.5     | 0.1     |
| 16              | Kisbey       | 1.2                                                | 0.9 | 0.5 | 0.4 | 0.3 | 0.2 | 0.6 | 0.6 | 0.3 | 0.5 | 0.2 | 0.2 | 0.5     | 1.2     | 0.2     |
| 17              | Huntoon      | 1.2                                                | 0.8 | 0.7 | 0.4 | -   | -   | 0.1 | 0.2 | 0.3 | 0.5 | 0.2 | 0.2 | 0.5     | 1.2     | 0.1     |
| 18              | Ralph        | 2.1                                                | 1.2 | 1.0 | 0.7 | 0.5 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 | 0.3 | 0.2 | 0.6     | 2.1     | 0.2     |
| 19              | Talmage      | 0.9                                                | 0.7 | 0.6 | 0.4 | 0.5 | -   | 0.4 | 0.7 | 0.3 | 0.4 | 0.1 | 0.2 | 0.5     | 0.9     | 0.1     |
| 20              | Creelman     | 1.5                                                | 1.0 | 1.4 | 0.3 | 0.3 | 0.3 | 0.4 | 0.7 | 0.4 | 0.5 | 0.1 | 0.2 | 0.6     | 1.5     | 0.1     |
| 21              | Warmley      | 0.9                                                | 1.6 | 1.4 | 0.5 | 0.9 | 0.5 | 0.5 | 0.8 | 0.4 | 0.5 | 0.3 | 0.2 | 0.7     | 1.6     | 0.3     |
| 22              | Kenosse Lake | 1.2                                                | 0.4 | 0.9 | 0.5 | 0.3 | 0.7 | 0.7 | 0.7 | 0.3 | 0.9 | 0.1 | 0.2 | 0.6     | 1.2     | 0.1     |
| 23              | Ryerson      | 0.6                                                | 0.8 | 0.2 | 0.5 | 0.4 | 0.2 | 1.0 | 1.2 | 0.2 | 0.4 | 0.2 | 0.2 | 0.5     | 1.2     | 0.2     |
| 24              | Wapella      | 0.7                                                | 0.3 | 0.3 | 0.2 | 0.4 | 0.2 | 1.1 | 1.4 | 0.3 | 0.3 | 0.2 | 0.3 | 0.5     | 1.4     | 0.2     |
| 25              | Baring       | 1.2                                                | 0.8 | 0.9 | 0.3 | 0.2 | 0.4 | 1.3 | 0.8 | 0.3 | 0.4 | 0.1 | 0.3 | 0.6     | 1.3     | 0.1     |
| 26              | Odessa       | 1.1                                                | 0.8 | 0.9 | 0.1 | 0.2 | 0.2 | 0.5 | 2.5 | 0.4 | 0.2 | 0.2 | 0.2 | 0.6     | 2.5     | 0.1     |
| 27              | Esterhazy    | 0.6                                                | 0.5 | 0.6 | 0.2 | 0.1 | 0.2 | 1.0 | 1.1 | 0.4 | 0.3 | 0.1 | 0.1 | 0.4     | 1.1     | 0.1     |
| 28              | Bangor       | 0.3                                                | 0.3 | 0.2 | 0.0 | 0.1 | 0.2 | 0.2 | 1.0 | 0.3 | 0.4 | 0.2 | 0.1 | 0.3     | 1.0     | 0.0     |
| 29              | ATCO         | 1.4                                                | 1.9 | 3.3 | 2.8 | 1.4 | 2.1 | 2.6 | 1.4 | 1.0 | 0.8 | 0.9 | 0.7 | 1.7     | 3.3     | 0.8     |
| 30              | ATCO         | 2.0                                                | 1.4 | 4.1 | 3.1 | 1.6 | 4.2 | 6.4 | 3.2 | 2.5 | 2.1 | 1.2 | 1.1 | 2.7     | 6.4     | 1.2     |
| Network Average |              | 1.5                                                | 1.2 | 1.1 | 0.6 | 0.4 | 0.5 | 0.8 | 1.1 | 0.4 | 0.5 | 0.3 | 0.3 | 0.7     | 6.4     | 0.0     |

**Table D-2. 30-day average concentration for passive NO<sub>2</sub> samples for the year of 2011**

| Passive Site    |              | 30-Day Passive NO <sub>2</sub> Concentration (ppb) |     |     |     |     |     |      |     |     |     |     |     | AVG | MAX  | MIN |
|-----------------|--------------|----------------------------------------------------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|------|-----|
| No.             | Location     | Jan                                                | Feb | Mar | Apr | May | Jun | Jul  | Aug | Sep | Oct | Nov | Dec |     |      |     |
| 1               | Carnduff     | 2.0                                                | 1.5 | 2.5 | 1.1 | 0.7 | 0.9 | 2.3  | 2.4 | 4.5 | 2.4 | 1.6 | 1.4 | 1.9 | 4.5  | 0.7 |
| 2               | Glen Ewan    | 2.1                                                | 3.7 | 1.4 | 1.2 | 1.5 | -   | 1.8  | 2.9 | 4.0 | 2.3 | 1.9 | 2.1 | 2.3 | 4.0  | 1.2 |
| 3               | North Portal | 2.5                                                | 3.9 | 1.8 | 1.5 | 1.1 | 1.5 | 2.6  | 7.1 | 5.1 | 3.6 | 2.1 | 2.0 | 2.9 | 7.1  | 1.1 |
| 4               | Roche Percee | 5.9                                                | 8.6 | 7.3 | -   | -   | 3.9 | 3.9  | 4.1 | 7.1 | 3.6 | 2.9 | 3.3 | 5.1 | 8.6  | 2.9 |
| 5               | Estevan      | 1.7                                                | 3.7 | 7.6 | 0.4 | -   | -   | 0.8  | 3.6 | 4.4 | 2.7 | 1.6 | 1.5 | 2.8 | 7.6  | 0.4 |
| 6               | Torquay      | 1.2                                                | 2.2 | 4.6 | 1.1 | 1.2 | 1.4 | 2.6  | 5.7 | 4.5 | 2.8 | 1.8 | 1.5 | 2.6 | 5.7  | 1.1 |
| 7               | Tribune      | 1.8                                                | 2.3 | 0.6 | 1.3 | -   | 0.7 | 4.2  | 4.1 | 5.5 | 2.4 | 0.8 | 1.1 | 2.3 | 5.5  | 0.6 |
| 8               | Macoun       | 2.0                                                | 2.3 | 1.0 | 1.8 | -   | -   | 1.3  | 3.9 | 5.9 | 2.5 | 2.2 | 1.7 | 2.5 | 5.9  | 1.0 |
| 9               | Kingsford    | 2.9                                                | 2.4 | 3.6 | 2.0 | -   | -   | -    | 4.6 | 4.1 | 2.1 | 1.9 | 1.9 | 2.8 | 4.6  | 1.9 |
| 10              | Alameda      | 3.7                                                | 3.5 | 0.9 | 1.6 | 1.3 | 1.3 | 3.1  | 3.4 | 5.5 | 2.5 | 1.8 | 1.5 | 2.5 | 5.5  | 0.9 |
| 11              | Oxbow        | 3.2                                                | 1.6 | 4.5 | 3.1 | 0.8 | 0.9 | 2.6  | 4.1 | 3.9 | 2.3 | 1.9 | 1.7 | 2.6 | 4.5  | 0.8 |
| 12              | Storthoaks   | 3.3                                                | 4.9 | 1.9 | 1.2 | 1.0 | 1.1 | 2.6  | 3.2 | 4.0 | 1.9 | 2.0 | 1.4 | 2.4 | 4.9  | 1.0 |
| 13              | Redvers      | 3.1                                                | 3.8 | 4.3 | 1.1 | 0.9 | 0.7 | 2.2  | 3.4 | 3.7 | 2.0 | 2.1 | 1.4 | 2.4 | 4.3  | 0.7 |
| 14              | Steppes      | 2.5                                                | 2.5 | 1.3 | 0.8 | 1.2 | 1.1 | 1.9  | 4.9 | 4.2 | 2.9 | 1.9 | 1.5 | 2.2 | 4.9  | 0.8 |
| 15              | Wordsworth   | 2.1                                                | 2.0 | 1.9 | 1.0 | 0.7 | 1.0 | 2.1  | 3.9 | 4.2 | 2.7 | 2.4 | 2.2 | 2.2 | 4.2  | 0.7 |
| 16              | Kisbey       | 2.9                                                | 0.6 | 0.5 | 0.9 | 0.6 | 0.7 | 2.1  | 3.2 | 4.3 | 2.6 | 1.7 | 1.2 | 1.8 | 4.3  | 0.5 |
| 17              | Huntoon      | 3.8                                                | 2.8 | 3.0 | 1.1 | -   | -   | 18.7 | 7.5 | 8.5 | 2.6 | 2.1 | 1.7 | 5.2 | 18.7 | 1.1 |
| 18              | Ralph        | 2.1                                                | 3.9 | 1.3 | 2.0 | 0.9 | 1.0 | 7.3  | 4.1 | 5.6 | 3.0 | 2.0 | 1.6 | 2.9 | 7.3  | 0.9 |
| 19              | Talmage      | 1.7                                                | 1.7 | 0.7 | 1.9 | 1.4 | -   | 1.8  | 5.3 | 5.1 | 2.2 | 1.8 | 1.5 | 2.3 | 5.3  | 0.7 |
| 20              | Creelman     | 2.2                                                | 2.5 | 0.5 | 1.3 | 0.7 | 1.0 | 2.4  | 4.0 | 5.6 | 3.1 | 1.9 | 1.3 | 2.2 | 5.6  | 0.5 |
| 21              | Warmley      | 3.1                                                | 3.0 | 1.2 | 1.5 | 0.4 | 0.7 | 1.5  | 2.9 | 3.3 | 2.1 | 1.8 | 1.3 | 1.9 | 3.3  | 0.4 |
| 22              | Kenosse Lake | 4.1                                                | 4.6 | 0.8 | 1.1 | 1.4 | 0.8 | 3.1  | 3.2 | 4.1 | 1.9 | 1.6 | 0.9 | 2.3 | 4.6  | 0.8 |
| 23              | Ryerson      | 1.9                                                | 2.1 | 2.7 | 0.7 | 0.8 | 0.6 | 2.3  | 3.7 | 4.7 | 2.5 | 1.8 | 1.3 | 2.1 | 4.7  | 0.6 |
| 24              | Wapella      | 3.6                                                | 3.8 | 4.1 | 1.2 | 1.8 | 1.0 | 2.5  | 4.8 | 3.5 | 1.3 | 1.3 | 1.2 | 2.5 | 4.8  | 1.0 |
| 25              | Baring       | 2.5                                                | 3.1 | 0.7 | 1.2 | 0.6 | 0.6 | 1.4  | 1.7 | 1.7 | 1.3 | 1.4 | 0.8 | 1.4 | 3.1  | 0.6 |
| 26              | Odessa       | 4.4                                                | 4.0 | 1.4 | 1.1 | 1.4 | 0.9 | 2.3  | 4.7 | 4.3 | 1.6 | 1.3 | 1.3 | 2.4 | 4.7  | 0.9 |
| 27              | Esterhazy    | 3.3                                                | 4.0 | 1.2 | 0.4 | 4.1 | 0.8 | 2.0  | 2.9 | 2.7 | 1.3 | 0.8 | 0.7 | 2.0 | 4.1  | 0.4 |
| 28              | Bangor       | 3.9                                                | 4.1 | 1.3 | 1.1 | 0.9 | 1.4 | 2.3  | 4.9 | 3.3 | 2.1 | 1.3 | 1.4 | 2.3 | 4.9  | 0.9 |
| Network Average |              | 2.8                                                | 3.2 | 2.3 | 1.3 | 1.2 | 1.1 | 3.1  | 4.1 | 4.5 | 2.4 | 1.8 | 1.5 | 2.5 | 18.7 | 0.4 |

**Table D-3. 30-day average concentration for passive O<sub>3</sub> samples for the year of 2011**

| Passive Site    |              | 30-Day Passive O <sub>3</sub> Concentration (ppb) |      |      |      |      |      |      |      |      |      |      |      | AVG  | MAX  | MIN  |
|-----------------|--------------|---------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| No.             | Location     | Jan                                               | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |      |      |      |
| 1               | Carnduff     | 23.9                                              | 26.1 | 33.0 | 29.3 | 34.5 | -    | 25.3 | 28.0 | 22.1 | 17.4 | 24.7 | 21.9 | 26.0 | 34.5 | 17.4 |
| 2               | Glen Ewan    | 29.5                                              | 26.5 | 32.1 | -    | 32.1 | 20.8 | 28.1 | 20.3 | 22.9 | 19.0 | 23.9 | 21.1 | 25.1 | 32.1 | 19.0 |
| 3               | North Portal | 35.0                                              | 26.7 | 31.2 | 31.9 | -    | 37.5 | 34.2 | 27.8 | 23.2 | 22.8 | 26.4 | 23.4 | 29.1 | 37.5 | 22.8 |
| 4               | Roche Percee | 36.2                                              | 24.5 | 31.8 | 32.1 | 36.1 | 38.4 | 37.6 | 31.0 | 24.5 | 19.7 | 27.5 | 23.6 | 30.3 | 38.4 | 19.7 |
| 5               | Estevan      | 38.9                                              | 28.4 | 20.5 | 34.3 | 30.9 | 34.9 | 27.6 | 30.3 | 24.7 | 18.3 | 22.3 | 19.9 | 27.6 | 38.9 | 18.3 |
| 6               | Torquay      | 25.7                                              | 23.1 | 29.8 | 33.0 | 53.5 | 36.8 | 34.0 | 29.7 | 24.3 | 21.1 | 27.3 | 24.7 | 30.3 | 53.5 | 21.1 |
| 7               | Tribune      | 26.9                                              | 25.2 | 21.4 | 29.8 | -    | -    | 16.0 | 28.9 | 23.0 | 20.4 | 24.0 | 23.1 | 23.9 | 29.8 | 16.0 |
| 8               | Macoun       | 26.8                                              | 26.8 | 22.4 | 37.8 | 38.0 | -    | 20.4 | 29.8 | 25.3 | 20.8 | 24.7 | 24.4 | 27.0 | 38.0 | 20.4 |
| 9               | Kingsford    | 28.7                                              | 28.2 | 38.9 | 33.1 | 36.6 | 34.3 | 34.8 | 25.0 | 25.4 | 19.9 | 29.6 | 22.4 | 29.7 | 38.9 | 19.9 |
| 10              | Alameda      | 25.4                                              | 29.4 | 25.7 | 32.8 | 36.7 | 30.5 | 25.8 | 23.1 | 21.9 | 21.1 | 25.7 | 23.5 | 26.8 | 36.7 | 21.1 |
| 11              | Oxbow        | 28.9                                              | 24.5 | 33.1 | 34.1 | 39.1 | 28.8 | 32.5 | 25.7 | 23.2 | 18.8 | 29.4 | 25.6 | 28.6 | 39.1 | 18.8 |
| 12              | Storthoaks   | 29.9                                              | 19.6 | 27.4 | 30.1 | 33.2 | 34.2 | 29.8 | 25.6 | 23.2 | 21.4 | 28.7 | 24.0 | 27.3 | 34.2 | 19.6 |
| Network Average |              | 29.7                                              | 25.8 | 28.9 | 32.6 | 37.1 | 32.9 | 28.8 | 27.1 | 23.6 | 20.1 | 26.2 | 23.1 | 27.6 | 53.5 | 16.0 |

**Table D-4. 30-day average concentration for passive H<sub>2</sub>S samples for the year of 2011**

| Passive Site    |          | 30-Day Passive H <sub>2</sub> S Concentration (ppb) |     |     |     |     |     |     |     |     |     |     |     | Average | Max | Min |
|-----------------|----------|-----------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|-----|-----|
| No.             | Location | Jan                                                 | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |         |     |     |
| 29              | ATCO     | 0.8                                                 | 0.7 | 1.2 | 1.9 | 0.9 | 0.9 | 1.0 | 3.1 | 0.5 | 1.6 | 0.5 | 0.9 | 1.2     | 3.1 | 0.5 |
| 30              | ATCO     | 0.8                                                 | 0.8 | 1.2 | 2.1 | 1.1 | 1.0 | 1.2 | 3.2 | 1.2 | 1.9 | 0.6 | 1.0 | 1.3     | 3.2 | 0.6 |
| Network Average |          | 0.8                                                 | 0.8 | 1.2 | 2.0 | 1.0 | 0.9 | 1.1 | 3.2 | 0.8 | 1.7 | 0.6 | 0.9 | 1.3     | 3.2 | 0.5 |

## APPENDIX E: 2011 FINANCIAL STATEMENTS



**Southeast Saskatchewan Airshed  
Association  
Financial Statements**  
*December 31, 2011*



ACCOUNTING › CONSULTING › TAX  
100, 1219 – 5TH STREET, ESTEVAN, SK S4A 0Z5  
P: 306.634.2603 F: 306.634.8706 [mnp.ca](http://mnp.ca)



## Management's Responsibility

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To the Members of Southeast Saskatchewan Airshed Association:

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 generally accepted accounting principles. 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 primarily 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, and for approving the financial information included in the annual report. The Board fulfils these responsibilities by reviewing the financial information prepared by management and discussing relevant matters with management. The Board is also responsible for recommending the appointment of the Organization's external auditors.

MNP LLP, an independent firm of Chartered Accountants, 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.

June 6, 2012

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Executive Director

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The logo for MNP, consisting of the letters "MNP" in a bold, green, sans-serif font.

## Independent Auditors' Report

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To the Members of Southeast Saskatchewan Airshed Association:

We have audited the accompanying financial statements of Southeast Saskatchewan Airshed Association, which comprise the statement of financial position as at December 31, 2011 and the statement of operations and change in net assets and cash flows for the year then ended, and a summary of significant accounting policies and other explanatory information.

### *Management's Responsibility for the Financial Statements*

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian generally accepted accounting principles, 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.

### *Auditors' Responsibility*

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements 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 entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

### *Opinion*

In our opinion, the financial statements present fairly, in all material respects, the financial position of Southeast Saskatchewan Airshed Association as at December 31, 2011 and the results of its operations, changes in net assets and its cash flows for the year then ended in accordance with Canadian generally accepted accounting principles.

Estevan, Saskatchewan

June 6, 2012

Chartered Accountants

**Southeast Saskatchewan Airshed Association**  
**Statement of Financial Position**

*As at December 31, 2011*

|                                | 2011    | 2010    |
|--------------------------------|---------|---------|
| <b>Assets</b>                  |         |         |
| <b>Current</b>                 |         |         |
| Cash                           | 164,038 | 140,637 |
| Deposits (Note 3)              | 40,000  | -       |
|                                | 204,038 | 140,637 |
| <b>Equipment (Note 4)</b>      | 79,448  | -       |
|                                | 283,486 | 140,637 |
| <b>Liabilities</b>             |         |         |
| <b>Current</b>                 |         |         |
| Accounts payable and accruals  | 4,501   | 19,486  |
| Goods and Services Tax payable | 1,587   | 2,064   |
|                                | 6,088   | 21,550  |
| <b>Net assets</b>              |         |         |
| <b>Unrestricted net assets</b> | 277,398 | 119,087 |
|                                | 283,486 | 140,637 |

Approved on behalf of the Board

\_\_\_\_\_  
Director

*the accompanying notes are an integral part of these financial statements*



**Southeast Saskatchewan Airshed Association**  
**Statement of Operations and Change in Net Assets**  
*For the year ended December 31, 2011*

|                                         | 2011           | 2010           |
|-----------------------------------------|----------------|----------------|
| <b>Revenue</b>                          |                |                |
| Membership fees                         | 253,615        | 228,394        |
| Grants                                  | 89,000         | 40,000         |
|                                         | <b>342,615</b> | <b>268,394</b> |
| <b>Expenses</b>                         |                |                |
| Advertising and promotion               | 4,751          | 2,515          |
| Amortization                            | 8,828          | -              |
| Air monitoring                          | 92,634         | 122,210        |
| Insurance                               | 4,051          | 1,124          |
| Interest and bank charges               | 87             | 62             |
| Lease fees                              | 11,829         | 25,629         |
| Management fees                         | 53,984         | 55,887         |
| Office                                  | 1,856          | 1,136          |
| Professional fees                       | 4,680          | 5,085          |
| Training and education                  | 1,604          | 1,137          |
|                                         | <b>184,304</b> | <b>214,785</b> |
| <b>Excess of revenues over expenses</b> | <b>158,311</b> | <b>53,609</b>  |
| <b>Net assets, beginning of year</b>    | <b>119,087</b> | <b>65,478</b>  |
| <b>Net assets, end of year</b>          | <b>277,398</b> | <b>119,087</b> |

The accompanying notes are an integral part of these financial statements.

## Southeast Saskatchewan Airshed Association

### Statement of Cash Flows

*For the year ended December 31, 2011*

|                                                             | 2011           | 2010           |
|-------------------------------------------------------------|----------------|----------------|
| <b>Cash provided by (used for) the following activities</b> |                |                |
| <b>Operating activities</b>                                 |                |                |
| Cash received from members                                  | 342,615        | 268,394        |
| Cash paid to suppliers                                      | (230,851)      | (198,979)      |
| Interest paid                                               | (87)           | (62)           |
|                                                             | <b>111,677</b> | <b>69,353</b>  |
| <b>Investing activities</b>                                 |                |                |
| Purchases of property and equipment                         | (88,276)       | -              |
| <b>Increase in cash resources</b>                           | <b>23,401</b>  | <b>69,353</b>  |
| <b>Cash resources, beginning of year</b>                    | <b>140,637</b> | <b>71,284</b>  |
| <b>Cash resources, end of year</b>                          | <b>164,038</b> | <b>140,637</b> |

The accompanying notes are an integral part of these financial statements



**Southeast Saskatchewan Airshed Association**  
**Notes to the Financial Statements**  
*For the year ended December 31, 2011*

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**1. Incorporation and operations**

Southeast Saskatchewan Airshed Association (the "Organization") was incorporated under the The Non-Profit Corporations Act, 1995 on October 7, 2005. The Organization collects and monitors ambient air quality data in Southeast Saskatchewan and makes this data available to all members.

**2. Significant accounting policies**

The financial statements have been prepared in accordance with Canadian generally accepted accounting principles and include the following significant accounting policies:

**Equipment**

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

|           | Method            | Rate |
|-----------|-------------------|------|
| Equipment | declining balance | 20 % |

In the year of acquisition, amortization is taken at one-half of the above rates.

**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 received. Government grants are recognized when received or receivable.

**Financial Instruments**

**Held for trading:**

The Organization has classified cash as held for trading, which is initially recognized at its fair value. Fair value is approximated by the instrument's initial cost as a transaction between unrelated parties.

Held for trading financial instruments are subsequently measured at their fair value. Gains and losses arising from changes in fair value are recognized immediately in income.

**Other financial liabilities:**

The Organization has classified accounts payable and accruals as other financial liabilities, which are initially recognized at their fair value. Fair value is approximated by the instrument's initial cost in a transaction between unrelated parties.

Other financial liabilities are subsequently measured at amortized cost using the effective interest method. Under this method, estimated future cash payments are exactly discounted over the liability's expected life, or other appropriate period, to their net carrying value. Amortized cost is the amount at which the financial liability is measured at initial recognition less principal repayments, and plus or minus the cumulative amortization using the effective interest method of any difference between that initial amount and the maturity amount. Gains and losses arising from changes in fair value are recognized in net income upon derecognition or impairment.

**Financial asset impairment:**

The Organization assesses impairment of all its financial assets, except those classified as held for trading. Impairment is measured as the difference between the asset's carrying value and its fair value. Any impairment, which is not considered temporary, is included in current year earnings.

**Southeast Saskatchewan Airshed Association**  
**Notes to the Financial Statements**  
*For the year ended December 31, 2011*

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

**Measurement uncertainty**

The preparation of financial statements in conformity with Canadian generally accepted accounting principles 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.

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

**Recent accounting pronouncements**

**Canadian accounting standards for not-for-profit organizations**

In October 2010, the Accounting Standards Board (AcSB) approved the accounting standards for private sector not-for-profit organizations (NFPOs) to be included in Part III of the CICA Handbook-Accounting ("Handbook"). Part III will comprise:

The existing "4400 series" of standards dealing with the unique circumstances of NFPOs, currently in Part V of the Handbook; and

The new accounting standards for private enterprises in Part II of the Handbook, to the extent that they would apply to NFPOs.

Effective for fiscal years beginning on or after January 1, 2012, private sector NFPOs will have the option to adopt either Part III of the Handbook or International Financial Reporting Standards (IFRS). Earlier adoption is permitted. The Organization expects to adopt Part III of the Handbook as its new financial reporting standards. The Organization has not yet determined the impact of the adoption of Part III of the Handbook on its financial statements.

3. **Deposits**

During the current fiscal period the Organization made a \$40,000 deposit on a new Airpointer system that will be purchased in the subsequent year.

4. **Equipment**

|           | <b>Cost</b> | <b>Accumulated<br/>amortization</b> | <b>2011<br/>Net book<br/>value</b> | <b>2010<br/>Net book<br/>value</b> |
|-----------|-------------|-------------------------------------|------------------------------------|------------------------------------|
| Equipment | 88,276      | 8,828                               | 79,448                             | -                                  |

5. **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 or credit risks arising from these financial instruments except as otherwise disclosed.

**Fair value of financial instruments**

The carrying amount of cash, deposits, accounts payable and accruals is approximated by their fair value due to their short-term nature.



**Southeast Saskatchewan Airshed Association**  
**Notes to the Financial Statements**  
*For the year ended December 31, 2011*

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**6. Capital management**

The Organization's objectives when managing capital are to safeguard the entity's ability to continue as a going concern, so that it can continue to provide benefits for its members, maintain a sufficient surplus to ensure they can continue to cover the expenditures of the Organization.

**7. Related party transactions**

Included in expenses for the current year are \$53,984 (2010 - \$55,887) to a Company operated by management of the Organization. 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.

## APPENDIX F: SESAA BOARD OF DIRECTORS

### Current Board & Alternates

**Terry Gibson** Executive Director



Mr. Gibson brings nearly 30 years of Public Health/Environmental Health experience to the position. He has held the positions of President of the Saskatchewan Public Health Association and Vice-Chair of the Saskatchewan Epidemiology Association. He teaches Public Health Protection at the University of Saskatchewan Master of Public Health Program and has served on many provincial and national boards and committees. Terry is committed to working with industry and regulators in a consensus decision making process to ensure that the health of the environment of south east Saskatchewan is always protected.

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**Chuck Bosgoed** Director (Saskatchewan Environment)



Mr. Bosgoed is an Environmental Engineer who has worked with Saskatchewan Environment for over 25 years. He is involved in the airshed because he believes airshed management is an excellent approach to better understand air issues and one more way to resolve regional air quality problems. Mr. Bosgoed writes, "Being a member of the Board provides me, as an environmental regulator, with a new and effective way of dealing with air quality issues."

Alternate: Murray Hilderman

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**Debbie Nielsen** Manager, Environmental Programs, SaskPower



Ms. Nielsen has worked with SaskPower in a variety of capacities dealing with environmental issues and programs for the past 19 years. In her current capacity she manages SaskPower's corporate environmental department which provides technical, analytical, environmental and regulatory decision-making support to the company's business units and support groups.

Engaging with key environmental stakeholders to develop a better understanding of issues is also a key responsibility of her position. She is a strong believer that by working in collaborative partnerships such as the airshed association, more sustainable outcomes can be achieved.

Alternate: Mike Zeleny

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**Dean Pylypuk** Saskatchewan Industry & Resources



Dean Pylypuk is the Regional Manager for Area 4 with The Ministry of Energy and Resources. Dean began his career in the oil and gas industry in 1972 working throughout Western Canada and the Arctic Islands. In 1980 the Pylypuk family moved overseas where Dean was employed as a Rig Manager with Kenting Drilling UK. Returning to Canada, Dean joined the Petroleum Development Branch of the then Department of Energy and Mines in July of 1984 and has been head quartered in Estevan from that time to present. A graduate of the University of Regina Extension Program, Mr. Pylypuk has two certificates in Administration and has been a member of Saskatchewan Applied Science Technologists and Technicians since 1987.

Alternate: Todd Han

---

**Darlene Sakires** Director (Canadian Natural Resources Limited)



Ms. Sakires is an Environmental Coordinator who is responsible for CNRL's Environmental Management Plan and Environmental Operating Guidelines. She manages site decommissioning and remediation projects across the prairies, ensuring compliance with environmental regulatory requirements in all aspects of the company's operations. She is active on a variety of committees, including the Saskatchewan Petroleum Industry Government Environmental Committee and the Saskatchewan Environmental Managers Association.

Alternate: John Hutt

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**Chris Seeley** Saskatchewan Health



Mr. Seeley is the Public Health Engineer with the Ministry of Health. He provides technical and policy advice to Regional Health Authorities in many environmental health areas including drinking water, wastewater, and swimming pools. He is involved with the airshed association to support its activities in providing information about air quality.

Alternate: Grant Paulson

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**Jesse Watanamuk** City of Weyburn SK



Mr. Watanamuk is an Engineering Assistant with the City of Weyburn. He is a Environmental Engineering Technologist and believes that representing Weyburn on the committee benefits the citizens of Weyburn and area. He hopes to learn and provide insight on air shed and air quality issues to others as well as Weyburn City Council.

Alternate: Bob Smith

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**Shane Boyes** Councillor, Rural Municipality of Enniskillen Number 3



Mr. Boyes represents the R. M. of Enniskillen No.3. He has lived in this area for most of his life. He brings the concerns and experiences of living in an area with heavy oil and gas production from both the standpoint of a landowner and resident as well as that of someone who works in the oil and gas industry. He provides input to the Board regarding the people in rural southeast Saskatchewan.

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## APPENDIX G: SESAA MEMBER COMPANIES

SESAA would like to express our gratitude to our members in good standing for their support of SESAA, for their very strong support regarding quality air data collection, and for their commitment to the citizens and environment of south east Saskatchewan:

- 101033165 Saskatchewan Ltd.
- 618555 Saskatchewan Ltd.
- Abenteuer Resources Corp.
- Advantage Oil and Gas
- Aldon Oils
- Antoinway Resources
- Apache Canada Ltd.
- ARC Resources
- ATCO Midstream Ltd.
- Avenex Energy
- Avenir Operating Corp.
- Barracuda Energy
- Base Resources Inc.
- Baytex
- Black Rider Resources Inc.
- Bluebird Resources
- Border Energy Ltd
- Brown Bros. Resources
- Bulldog Oil and Gas
- Cajé Holdings Ltd.
- Canada Capital Energy
- Canadian Natural Resources Limited
- Caprice Resources
- Cenovus Energy Inc.
- Condor Canada
- Conoco Phillips
- Contact Exploration
- Crescent Point Resources Partnership
- Daylight Energy
- Devon Canada Corporation
- Diaz Resources Ltd.
- EERG Energy ULC
- Elkhorn Resources
- Elswick Energy Ltd.
- Enermark Inc.
- Enerplus Corporation
- Fairborne Energy Ltd.
- Flagstone Energy
- Frank R. Lee Investments
- GKN Resources Ltd.
- Gold River Oil and Gas
- Grand Bow Petroleum Limited
- Highrock Energy
- Hillsdale Drilling
- Hummingbird Energy Inc (Virtus group)
- Husky Oil Operations Limited
- JDM Petroleum
- Jedi Exploration & Development
- K and S Investments Ltd.
- Kenwood Resources Ltd.
- Keystone Royalty
- Kinwest 2008 Energy
- Kiwi Resources Ltd.
- Kootenay Energy
- Lakeco Holdings
- Legacy Oil and Gas
- Magellan Resources Ltd.
- Mancal Energy Inc.
- Midale Petroleums Ltd.
- Molopo Energy
- Mosaic
- NAL Resources Limited

- Nexxtep Resources
- Noramera Bioenergy
- Novus Energy Inc.
- Nuloch Resources Inc.
- Omatius Oil & Gas Ltd.
- Oneex Operations
- Painted Pony Petroleum
- Pemoco Ltd.
- Penn West Petroleum Ltd.
- Petrex Energy
- PetroBakken Energy Ltd.
- Pinto Resources
- Primrose Drilling Ventures Ltd.
- Questerre Energy Corporation
- Regent Resources Ltd.
- Renegade Petroleum
- Rife Resources
- Runcible Oil Corp.
- Saskatchewan Environmental Industry and Managers Association
- SaskEnergy Incorporated/ TransGas Limited
- Sask Power
- SEIMA
- Prairie Mines and Royalty (Sherritt Coal)
- Silver Bay Resources Ltd.
- Skywest Energy
- Southern Exploration
- Spartan Exploration
- Sure Energy Inc.
- T-45 Oil Corporation
- TAQA North
- T. Bird Oil Ltd.
- Tetonka Resources
- Texus Petroleum Ltd.
- TransGas/SaskEnergy
- Triwest Exploration
- Valleyview Petroleums Ltd.
- Villanova Resources Inc.
- Viterra Inc.
- Zargon Oil & Gas Ltd.

### **How to Become a Member**

For information on how to become a member, please contact Terry Gibson, Executive Director at (306) 371 2478.