SESAA

Southeast Saskatchewan Airshed Association

# 2010 Annual Report

## Southeast Saskatchewan Airshed Association

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## Message from the Executive Director

2010 has been a very exciting year for the Association. In March 2010 we began the operation of the airshed's first continuous monitoring station, an airpointer® located approximately 12 kilometers south of the City of Weyburn. On June 2, 2010, National Clean Air Day, we had a Grand Opening of the airpointer, with a press conference at Weyburn City Hall, followed by a field trip to the airpointer site. It was a very good day for SESAA. We used the day to showcase the work of SESAA and to generate interest in our Association and in the environment in general.

A great deal of effort has gone into securing sustainable funding and developing a fair and equitable funding formula. 2010 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 Ministry of the Environment and Saskatchewan Ministry of Energy and Resources and all of our members for their support.

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 will be available live on the internet; it will include hourly concentrations of $SO_2$, $H_2S$, $NO_2$, PM 2.5 and $O_3$. The plan was to locate one air monitoring station in the Weyburn area and one in the southeastern part of the region.
The airpointer in Weyburn has been established as mentioned above. Data has been collected and the instrument maintained by the Saskatchewan Research Council. The data was made available in early 2011 on the SESAA website:
http://www.sesaa.ca/AirQuality/index.php

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.

SESAA has enjoyed very good Board of Director development in 2010 with the addition of some key Directors. Presentations at the Saskatchewan Association of Rural Municipalities (SARM) and at the City of Weyburn, City Council Meeting have generated interest in our Association and we are pleased that each of these bodies is now represented on our Board. Please see the complete list of the Board in Appendix C.

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

The SESAA Science Committee and Finance Committee are currently reviewing the funding formula to ensure that it is fair and equitable and supports the Airshed's need for adequate, quality monitoring capacity.

Future plans include the placement of the next airpointer, development of communication materials, presentations to municipalities, chambers of commerce, high school classes, home and school meetings, etc. SESAA is proud to mention that we serve 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. We have been asked to present at the Saskatchewan Environmental Industry and Managers Association (SEIMA) in March of 2011 and at the South East Environmental and Safety Seminar (SEESS), also in March of 2011. In June of 2011 SESAA will present and display at the Weyburn Oil Show.

## 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 kilometers and includes 45 municipalities. Major economic activities in the region are agriculture, oil & gas, mining, power generation, and transportation.

The passive monitoring data was collected at 30 locations for every 30-day period from January 2010 through December 2010. Nitrogen dioxide ($NO_2$) was monitored at the 28 original sites, ozone ($O_3$) was monitored at 12 selected sites, hydrogen sulphide ($H_2S$) was monitored at 2 sites, and sulphur dioxide ($SO_2$) were monitored at all 30 sites.

Average concentrations of $SO_2$, $NO_2$, $O_3$, and $H_2S$ for the entire network were 1.1, 1.9, 24.9, and 0.8 ppb, respectively. Similarly, maximum concentrations of $SO_2$, $NO_2$, and $O_3$ for the entire network were 4.4, 6.9, 38.2, and 1.7 ppb, respectively. All measured $SO_2$ and $NO_2$ concentrations were well below the Saskatchewan annual ambient air quality standards, and $O_3$ concentrations were within the normal and above normal range. Overall, there were no air quality issues with the passive monitoring program in the past year. It is interesting to note that all concentrations are slightly less than last year. It will be important to monitor this going forward to ascertain any trends.

The placement and operation of the airpointer to continuously collect data and have it available on the SESAA website marked an important milestone in the associations' development.

## 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 kilometers, 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. Development of other airsheds in the province is being planned.

Membership in the SESAA is currently voluntary. 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 and emissions-based fees assessed to facilities operating within the airshed boundaries. (Figure 1).


**Figure 1. Passive monitoring network and airpointer location for the Southeast Saskatchewan Airshed.**

## Air Quality Monitoring

### *Passive Monitoring Network*

One of the SESAA's mandates is to collect scientifically credible regional air quality d**a**ta, and to convey this information in a meaningful way to the public and stakeholders. To fulfill the first part of this mandate, SESAA has developed a comprehensive air quality monitoring program. The program was initiated in June 2006 with monthly passive monitoring.

The passive monitoring program was run at 30 locations in southeast Saskatchewan. AEMC's Multigas Passive samplers were deployed to collect 30-day sulphur dioxide ($SO_2$), nitrogen dioxide ($NO_2$) ozone ($O_3$), and hydrogen sulphide ($H_2S$) samples at selected stations. Locations of passive monitoring sites are shown in Figure 1 (above). Symbols with pink, blue, and yellow circles indicate sites where $SO_2$, $NO_2$, and $O_3$ were monitored. Symbols with blue and yellow circles only indicate sites where only $SO_2$ and $NO_2$ were monitored. $SO_2$ and $NO_2$ were monitored at all 28 sites, while $O_3$ was monitored at only 12 out of the 28 sites.

In addition to the monthly samples, a field blank and one replicate for each of the monitored substances was collected every 30 days. The field blank detects filter contamination introduced during sample collection/deployment and laboratory processes. Replicate samples are used to quantify variability in sampling and analytical procedures.

### *Sulphur Dioxide*

Sulphur dioxide ($SO_2$) is a colourless gas with a strong suffocating odour. It smells like burnt matches. At concentrations above 300 ppb, it can be detected by taste and odour.

Health effects caused by exposure to high levels of $SO_2$ include breathing problems, respiratory illness, changes in the lung's defenses, and worsening respiratory and cardiovascular disease. People with asthma or chronic lung or heart disease are the most sensitive to $SO_2$. It also damages trees and crops. $SO_2$, along with nitrogen oxides, are the main precursors of acid rain. This contributes to the acidification of lakes and streams, accelerated corrosion of buildings, and reduced visibility. $SO_2$ also causes formation of microscopic acid aerosols, which have serious health implications, as well as, contributing to climate change.

$SO_2$ emissions come from the burning of sulphur containing fuels (e.g. gasoline, natural gas and coal) and the processing of sulphur containing ores. $SO_2$ atmospheric contributions come from industrial sources such as power plants, petroleum refineries, iron and steel mills, fertilizer plants, pulp and paper mills, and smelters. Other sources include smaller oil and gas plants, battery and well flares. Moreover, small sources include residential, commercial and industrial space heating.

The Saskatchewan ambient air quality standard for sulphur dioxide is:
0.01 ppm (11 ppb) as an annual arithmetic mean.

In 2010, the passive monitoring data indicates the average and maximum $SO_2$ concentrations of the entire network were 1.09 and 4.4 ppb, respectively. These concentrations are well below the Saskatchewan annual ambient standard for $SO_2$ (11 ppb).

Figure 2 (below) shows average concentrations of $SO_2$ by station for the year 2010. Stations corresponding to the reference numbers can be found in Appendix A. Kingsford Station 9 at 2.1, Alameda Station 10 (1.6), Oxbow Station 11 (1.6) and Kenosee Lake Station 22 (1.6) are the locations where maximum $SO_2$ concentrations were observed. In comparison, the lowest average (0.4 ppb) was observed at Bangor (Station 28). In general, higher concentrations were found in the southern and central parts of the airshed where more industrial activities exist, 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 sources of $SO_2$ exist.

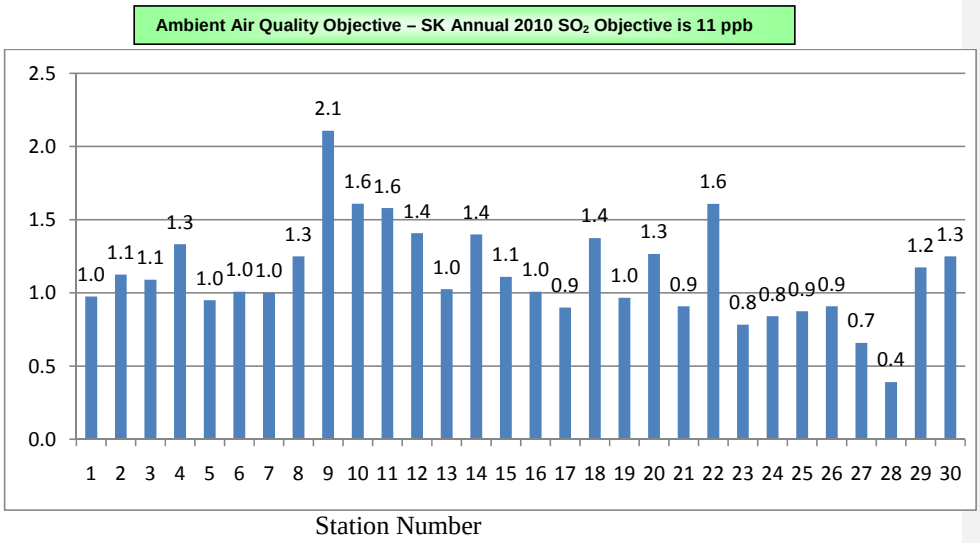


**Figure 2.** Sulphur dioxide ambient air concentrations by station.

Figure 3 (below) shows average $SO_2$ levels by month for the entire airshed. The average monthly concentrations varied from 0.44 ppb in September to 2.09 ppb in January and February. The winter months tended to express a higher concentration of $SO_2$, in comparison to the summer months. The higher concentrations in winter are most likely due to the increased number of inversions that occur in winter. The stable air associated with inversions lessens the exchange of winds between the ground air layer and higher altitude winds, hindering both horizontal and vertical dispersions of pollutants.

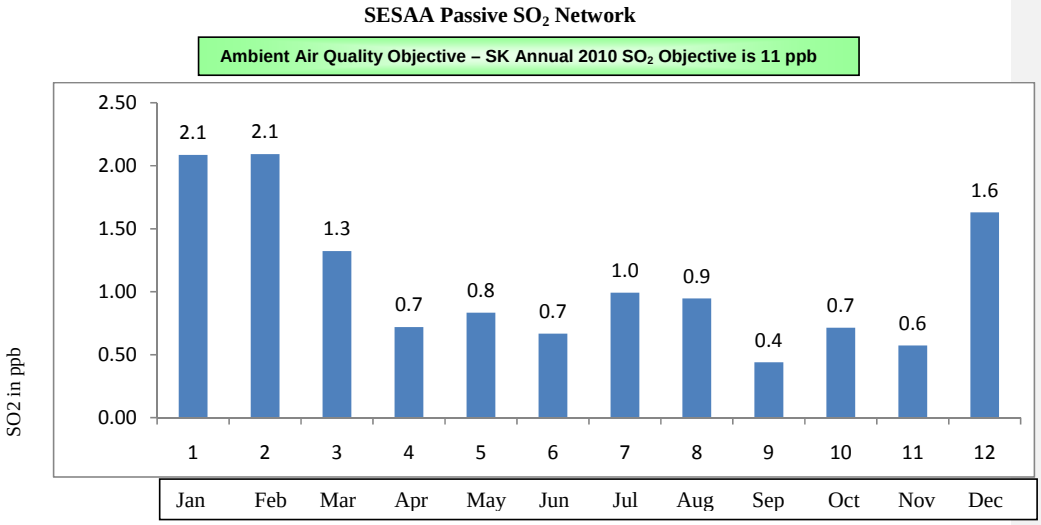


**Figure 3.** Comparison of sulphur dioxide ambient air concentration by month.

### *Nitrogen Oxides*

Nitrogen oxides, also known as Oxides of Nitrogen ($NO_x$), is a collective term used to refer to two species of nitrogen: nitric oxide (NO) and nitrogen dioxide ($NO_2$). Nitric oxide is a colorless, flammable gas with a slight odour. Nitrogen dioxide is a reddish brown, nonflammable gas with a pungent irritating odour. $NO_2$ is of more interest than NO from both a health and acid rain perspective. While $NO_2$ is soluble in water, it is less soluble than $SO_2$.

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

$NO_x$ emissions are mainly produced by fossil fuel combustion. High temperature conditions during combustion result in the formation of $NO_x$ as a byproduct. $NO_x$ atmospheric contributions come from both stationary sources, such as power plants, oil and gas industries, incinerators, as well as, mobile sources such as automobiles. Other atmospheric contributions come from non-combustion processes, for example, nitric acid manufacture, welding processes and the use of explosives. The largest urban source of $NO_x$ is emissions from motor vehicles.

Saskatchewan ambient air quality standards for nitrogen dioxide are:
0.05 ppm (53 ppb) as an annual arithmetic mean.

From January through December, 2010, the average and maximum $NO_2$ concentrations of the entire network were 1.9 and 6.9 ppb, respectively, which are well below the Saskatchewan annual ambient standard of $NO_2$.

Figure 4 (below) shows average concentrations of $NO_2$ from January through December 2010. This past year shows a similar pattern as previous years. The stations with higher $NO_2$ concentrations were Roche Percee (Station 4), Alameda (Station 10), Redvers (Station 13), Huntoon (Station 17), Ralph (Station 18) and Talmage (Station 19). In contrast, the stations with lower $NO_2$ were Carnduff (Station 1), Torquay (Station 6), Warmley (Station 21), Baring (Station 25), and Esterhazy (Station 27). In general, higher concentrations were found in the southern part of the airshed where more industrial activities occur (such as coal-fired power plants and upstream oil & gas industry). Lower concentrations were observed in the northern part of the airshed where no major sources of $NO_x$ exist.

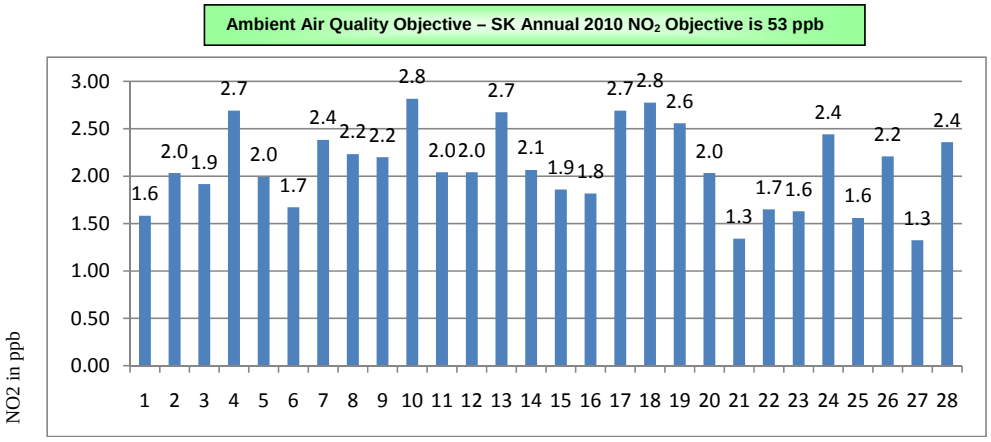


**Figure 4.** Nitrogen dioxide ambient air concentrations by station.

Figure 5 (below) shows average $NO_2$ levels by month for the entire airshed. The average monthly concentrations varied from 1.17 ppb in August to 2.64 ppb in October of 2010. The winter months tended to express a higher concentration of $SO_2$, in comparison to the summer months, minus the anomaly in June. The higher concentrations in winter are most likely due to the increased number of inversions that occur in winter. The stable air associated with inversions lessens the exchange of winds between the ground air layer and higher altitude winds, hindering both horizontal and vertical dispersions of pollutants.

The anomaly in June may be from someone running an engine or an error in the collection of the data.

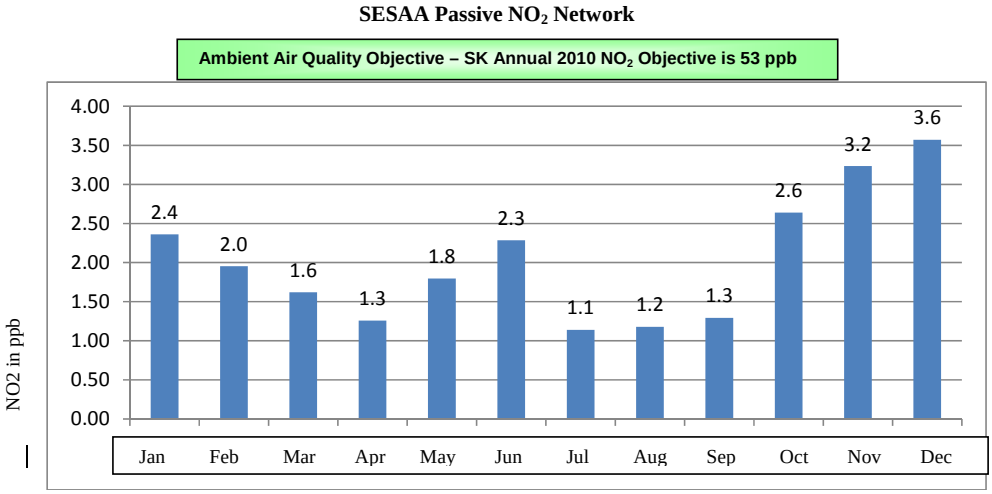


**Figure 5.** Comparison of nitrogen dioxide ambient air concentration by month.

## *Ozone*

Ground-level Ozone ($O_3$) is a colorless gas that at a normal outdoor concentration is odourless. However, ozone does have a distinctive sharp odour when found at higher concentration, such as those associated with electrical discharges from lightning storms or photocopiers. $O_3$ can be detected at an odour threshold above 10 ppb.

Exposure to high levels of ozone can cause eye irritation, breathing difficulty, decreased visibility, and vegetation damage. People with respiratory and heart problems are at a higher risk. $O_3$ has been linked to increased hospital admissions and premature death. It is a key ingredient of urban smog.

$O_3$ is not emitted directly into the atmosphere. Instead, it results from photochemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. High concentration levels typically occur from May to September, between noon and early evening. Emissions of NOx are produced primarily when fossil fuels are burned in motor vehicle engines, power plants, and industrial boilers. The sources of VOC emissions include automobile emissions, gasoline vapors, chemical solvents, and consumer products like paints.

Figure 6 (below) shows Ozone ambient air concentrations by station. From January through December 2010, the average and maximum $O_3$ concentrations of the entire network were 24.9 and 38.2 ppb respectively. These measured levels were within the average range. Figure 6 shows concentrations of ozone ($O_3$) for the January through December 2010 period. The stations with the highest average $O_3$ concentration were Wapella (Station 24) measuring 26.7 ppb, Alameda (Station 10) at 26.4ppb, and Steppes (Station 14) at 26.3ppb, and the lowest average concentration were observed at Roche Percee (Station 4) measuring 24.3 ppb, and Odessa (Station 26), measuring 24.6 ppb.

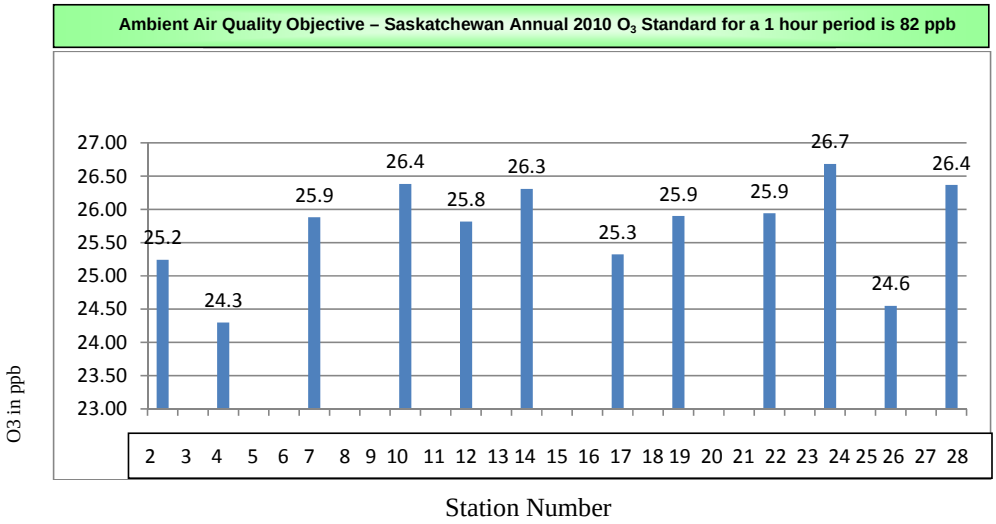


**Figure 6.** Ozone ambient air concentrations by station.

Figure 7 (below) shows a yearly comparison of $O_3$ levels for the entire airshed. The average monthly concentrations varied from 20.5 ppb in October 2010 to 30.6 ppb in February 2010. The winter months tended to express a higher concentration of $O_3$, in comparison to the summer months. This is likely due to there being more temperature inversions in winter months. It also may be due to more combustion sources in the winter and the precursors form more ozone than the summer months.

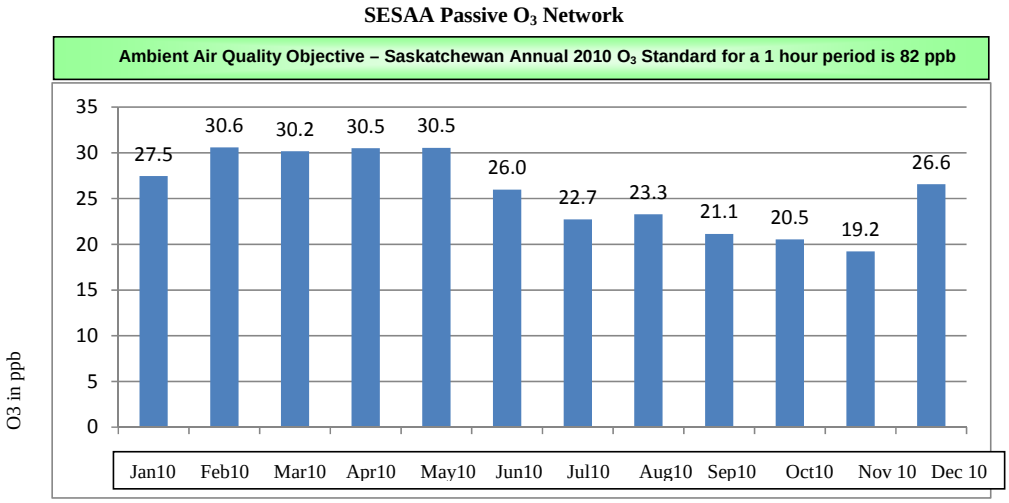


**Figure 7**. Comparison of ozone ambient air concentration by month.

## *Hydrogen Sulphide*

Hydrogen sulphide is a colourless gas with a characteristic “rotten egg” odour. It is produced both naturally and through industrial processes. It occurs naturally in coal, crude oil, natural gas, oil, sulphur hot springs, volcanic gases, sloughs, swamps and lakes. It is produced in industrial activities such as natural gas and petroleum production, tanneries, wastewater treatment, pulp and paper mills, rayon textile manufacturing, and tar and asphalt manufacturing.

The decomposition of organic matter by bacteria under anaerobic conditions results in the release of $H_2S$ and this results in the characteristic odor 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.

SESAA collects and submits samples from 2 passive sampling monitors for the ATCO Midstream, Kisbey Gas Plant at Kisbey, SK.

The stations are Kisbey (East) number 29 and Kisbey West number 30. They are located .5 and 2.9 kilometers west of Kisbey respectively.

**$H_2S$ ppb**

| Station No. | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | AVG | MAX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 1.43 | 0.41 | 0.5 | 0.32 | 0.35 | 0.30 | 1.38 | 0.91 | 1.73 | 0.78 | 0.92 | 0.69 | 0.81 | 1.73 |
| 30 | 1.22 | 0.29 | 0.6 | 0.30 | 0.36 | 0.34 | 0.96 | 0.75 | 1.59 | 0.72 | 0.98 | 0.62 | 0.73 | 1.59 |
| **Average** | **1.33** | **0.35** | **0.55** | **0.31** | **0.36** | **0.32** | **1.17** | **0.83** | **1.66** | **0.75** | **0.95** | **0.66** | **0.77** | **1.73** |
| | | | | | | | | | | | | | | |

**Table 1.** Hydrogen sulphide data chart for January, 2010 through December 2010 from Stations 29 and 30.

The levels appear low at the Kisbey Stations and are consistent with the airpointer readings. Although the airpointer is many kilometers away from these stations it still provides a basis to compare to.

## Air Quality Monitoring

### *Airpointer*

The SESAA airpointer is situated approximately 12 kilometers south of Weyburn, just east of highway 35. It has been in place and operating since March, 2010. The data from the airpointer is available on the SESAA website at: www.sesaa.ca then click on Air Quality Data; a 24 hour report will appear.

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 continuous data self contained in a small vault type container.
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. Further, it is easy to access the monitoring and raw data without special software, a standard internet connection and web browser is all that is required.

The airpointer differs from passive monitoring because it is able to analyze continuously instead of just a monthly average. This can be helpful in determining air pollution sources more accurately and quickly.
The airpointer can measure a wide variety of pollutants in a modular platform - with up to seven ambient air analyzers measuring CO, $NO/NO_2/NO_X$, $O_3$, $SO_2$, $H_2S$, VOC and PM10 and PM2.5 and provides an hourly Air Quality Index (AQI).

Saskatchewan ambient air quality standards 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;
- 0.01 ppm (11 ppb) as an annual arithmetic mean.

Saskatchewan ambient air quality standards for nitrogen dioxide are:
- 0.2 ppm (212 ppb) averaged over a 1-hour period;
- 0.05 ppm (53 ppb) as an annual arithmetic mean.

Saskatchewan ambient air quality standard for ozone is:
- 0.08 ppm (82 ppb) averaged over a 1-hour period;

Canada-wide Standard (CWS) for ozone is:
- 65 ppb 8-hour averaging time (the achievement statistics is based on the fourth highest measurement annually averaged over three consecutive years).

The following pages contain charts of recorded airpointer data for $SO_2$, $NO_2$, $O_3$, and $H_2S$.The monthly averages from the airpointer data for $SO_2$ are quite consistent with passives samples at the 2 nearest passive sample stations and across the region as well. Similarly the results for $NO_2$ are consistent with the 2 closest stations as well. This is also true for the ozone readings and for the $H_2S$ readings. In general the airpointer is showing similar results as the passives are showing across all parameters for the region.

| $SO_2$ | Range | 0 | 20 | 60 | 110 | 170 | 340 |
|---|---|---|---|---|---|---|---|

**Sulphur Dioxide ($SO_2$) Frequency Distribution of 1-hr Averages - SESAA - Airpointer**

| Month | Number of Readings | % of Readings in Concentration Range (ppb) | | | | | | Monthly Average (ppb) |
|---|---|---|---|---|---|---|---|---|
| | | 0 to 20 | 20 to 60 | 60 to 110 | 110 to 170 | 170 to 340 | > 340 | |
| January 2010 | - | - | - | - | - | - | - | - |
| February 2010 | - | - | - | - | - | - | - | - |
| March 2010 | - | - | - | - | - | - | - | - |
| April 2010 | - | - | - | - | - | - | - | - |
| May 2010 | 622 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.4 |
| June 2010 | 681 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.6 |
| July 2010 | 711 | 99.9% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 1.3 |
| August 2010 | 696 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.6 |
| September 2010 | 688 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.5 |
| October 2010 | 708 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.0 |
| November 2010 | 701 | 98.9% | 1.0% | 0.1% | 0.0% | 0.0% | 0.0% | 1.8 |
| December 2010 | 724 | 99.0% | 1.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.9 |
| **Total Hours** | **5,531** | | | | | | | |
| **Average** | | **99.7%** | **0.3%** | **0.0%** | **0.0%** | **0.0%** | **0.0%** | **1.3** |

Table A1 shows almost all readings are in the 0-20 range

**Sulphur Dioxide ($SO_2$) Annual Summary – SESAAirpointer**

| Month | Monthly Average (ppb) | MAXIMUM VALUES | | | | Operational time (%) | Reportable Incidents | |
|---|---|---|---|---|---|---|---|---|
| | | 24-hr (ppb) | Date | 1-hr (ppb) | Date | | 24-hr | 1-hr |
| January 2010 | - | - | - | - | - | - | - | - |
| February 2010 | - | - | - | - | - | - | - | - |
| March 2010 | - | - | - | - | - | - | - | - |
| April 2010 | - | - | - | - | - | - | - | - |
| May 2010 | 0.4 | 2.1 | May 20 | 15.5 | May 19 20:00 | 83.6% | 0 | 0 |
| June 2010 | 1.6 | 5.4 | Jun 30 | 19.9 | Jun 20 11:00 | 94.6% | 0 | 0 |
| July 2010 | 1.3 | 4.6 | Jul 30 | 21.2 | Jul 31 10:00 | 95.6% | 0 | 0 |
| August 2010 | 0.6 | 2.5 | Aug 07 | 16.5 | Aug 08 13:00 | 93.5% | 0 | 0 |
| September 2010 | 0.5 | 3.9 | Sep 29 | 18.6 | Sep 28 03:00 | 95.6% | 0 | 0 |
| October 2010 | 1.0 | 3.1 | Oct 30 | 14.9 | Oct 02 19:00 | 95.2% | 0 | 0 |
| November 2010 | 1.8 | 7.9 | Nov 13 | 60.3 | Nov 12 15:00 | 97.4% | 0 | 0 |
| December 2010 | 2.9 | 9.6 | Dec 09 | 27.3 | Dec 07 11:00 | 97.3% | 0 | 0 |
| **AVERAGE** | **1.3** | | | | | **94.1%** | | |
| | | | | | | | **0** | **0** |
| **MAXIMUM** | **2.9** | **9.6** | **Dec 09** | **60.3** | **Nov 12 15:00** | | | |

Table A2 shows that all readings are well below the 172 ppb standard.

| $NO_2$ | Range | 0 | 25 | 50 | 110 | 150 | 210 |
|---|---|---|---|---|---|---|---|

**Nitrogen Dioxide ($NO_2$) Frequency Distribution of 1-hr Averages - SESAA - Airpointer**

| Month | Number of Readings | % of Readings in Concentration Range (ppb) | | | | | | Monthly Average (ppb) |
|---|---|---|---|---|---|---|---|---|
| | | 0 to 25 | 25 to 50 | 50 to 110 | 110 to 150 | 150 to 210 | > 210 | |
| January 2010 | - | - | - | - | - | - | - | - |
| February 2010 | - | - | - | - | - | - | - | - |
| March 2010 | - | - | - | - | - | - | - | - |
| April 2010 | - | - | - | - | - | - | - | - |
| May 2010 | 622 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.2 |
| June 2010 | 680 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.3 |
| July 2010 | 710 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.0 |
| August 2010 | 701 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.1 |
| September 2010 | 686 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.2 |
| October 2010 | 708 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.9 |
| November 2010 | 701 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.9 |
| December 2010 | 725 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.8 |
| **Total Hours** | **5,533** | | | | | | | |
| **Average** | | **100.0%** | **0.0%** | **0.0%** | **0.0%** | **0.0%** | **0.0%** | **1.9** |

Table A3 shows all readings are in the 0-25 range

**Nitrogen Dioxide ($NO_2$) Annual Summary - SESAA - Airpointer**

| Month | Monthly Average (ppb) | MAXIMUM VALUES | | | | Operational time (%) | Reportable Incidents | |
|---|---|---|---|---|---|---|---|---|
| | | 24-hr (ppb) | Date | 1-hr (ppb) | Date | | 24-hr | 1-hr |
| January 2010 | - | - | - | - | - | - | - | - |
| February 2010 | - | - | - | - | - | - | - | - |
| March 2010 | - | - | - | - | - | - | - | - |
| April 2010 | - | - | - | - | - | - | - | - |
| May 2010 | 1.2 | 2.3 | May 16 | 5.7 | May 14 22:00 | 83.6% | 0 | 0 |
| June 2010 | 2.3 | 3.5 | Jul 01 | 14.8 | Jun 14 23:00 | 94.4% | 0 | 0 |
| July 2010 | 2.0 | 3.4 | Jul 10 | 19.6 | Jul 09 00:00 | 95.4% | 0 | 0 |
| August 2010 | 2.1 | 3.4 | Aug 28 | 13.4 | Aug 26 22:00 | 94.2% | 0 | 0 |
| September 2010 | 1.2 | 2.8 | Sep 05 | 8.6 | Sep 01 15:00 | 95.3% | 0 | 0 |
| October 2010 | 1.9 | 4.2 | Oct 30 | 12.5 | Oct 07 23:00 | 95.2% | 0 | 0 |
| November 2010 | 1.9 | 5.5 | Nov 09 | 21.4 | Nov 27 00:00 | 97.4% | 0 | 0 |
| December 2010 | 2.8 | 7.6 | Dec 16 | 18.5 | Dec 05 19:00 | 97.4% | 0 | 0 |
| **AVERAGE** | **1.9** | | | | | **94.1%** | | |
| | | | | | | | **0** | **0** |
| **MAXIMUM** | **2.8** | **7.6** | **Dec 16** | **21.4** | **Nov 27 00:00** | | | |

Table A4 shows that all readings are well below the 212 ppb standard.

| $O_3$ | Range | 0 | 2 | 10 | 20 | 40 | 82 |
|---|---|---|---|---|---|---|---|

## Ozone ($O_3$) Frequency Distribution of 1-hr Averages - SESAA - Airpointer

| Month | Number of Readings | % of Readings in Concentration Range (ppb) 0 to 2 | 2 to 10 | 10 to 20 | 20 to 40 | 40 to 82 | > 82 | Monthly Average (ppb) |
|---|---|---|---|---|---|---|---|---|
| January 2010 | - | - | - | - | - | - | - | - |
| February 2010 | - | - | - | - | - | - | - | - |
| March 2010 | - | - | - | - | - | - | - | - |
| April 2010 | - | - | - | - | - | - | - | - |
| May 2010 | 622 | 0.0% | 1.3% | 12.7% | 57.9% | 28.1% | 0.0% | 33.6 |
| June 2010 | 658 | 0.0% | 2.9% | 23.1% | 48.6% | 25.4% | 0.0% | 29.8 |
| July 2010 | 710 | 0.1% | 12.5% | 27.2% | 49.3% | 10.8% | 0.0% | 24.7 |
| August 2010 | 689 | 0.7% | 11.2% | 29.2% | 44.7% | 14.2% | 0.0% | 24.7 |
| September 2010 | 689 | 0.0% | 6.2% | 39.2% | 50.8% | 3.8% | 0.0% | 22.8 |
| October 2010 | 708 | 0.3% | 16.4% | 37.7% | 41.9% | 3.7% | 0.0% | 20.3 |
| November 2010 | 637 | 1.6% | 12.2% | 37.7% | 48.5% | 0.0% | 0.0% | 18.5 |
| December 2010 | 725 | 0.0% | 1.1% | 21.2% | 77.7% | 0.0% | 0.0% | 23.9 |
| **Total Hours** | **5,438** | | | | | | | |
| **Average** | | **0.3%** | **8.0%** | **28.5%** | **52.4%** | **10.8%** | **0.0%** | **24.8** |

Table A5 shows a wide variance in the readings.
All readings are below the 82 ppb standard.

## Ozone ($O_3$) Annual Summary - SESAA - Airpointer

| Month | Monthly Average (ppb) | MAXIMUM VALUES 24-hr (ppb) | Date | 1-hr (ppb) | Date | Operational time (%) | Reportable Incidents 24-hr | 1-hr |
|---|---|---|---|---|---|---|---|---|
| January 2010 | - | - | - | - | - | - | - | - |
| February 2010 | - | - | - | - | - | - | - | - |
| March 2010 | - | - | - | - | - | - | - | - |
| April 2010 | - | - | - | - | - | - | - | - |
| May 2010 | 33.6 | 47.2 | May 21 | 63.6 | May 20 17:00 | 83.6% | - | 0 |
| June 2010 | 29.8 | 39.0 | Jun 16 | 57.3 | Jun 21 15:00 | 91.4% | - | 0 |
| July 2010 | 24.7 | 42.8 | Jul 03 | 60.9 | Jul 02 18:00 | 95.4% | - | 0 |
| August 2010 | 24.7 | 36.3 | Aug 13 | 55.4 | Aug 08 13:00 | 92.6% | - | 0 |
| September 2010 | 22.8 | 33.9 | Sep 27 | 50.9 | Sep 26 16:00 | 95.7% | - | 0 |
| October 2010 | 20.3 | 28.0 | Oct 16 | 52.9 | Oct 04 16:00 | 95.2% | - | 0 |
| November 2010 | 18.5 | 26.9 | Nov 26 | 33.1 | Nov 04 16:00 | 88.5% | - | 0 |
| December 2010 | 23.9 | 34.2 | Dec 29 | 38.3 | Dec 27 15:00 | 97.4% | - | 0 |
| **AVERAGE** | **24.8** | | | | | **92.5%** | | |
| | | | | | | | **-** | **0** |
| **MAXIMUM** | **33.6** | **47.2** | **May 21** | **63.6** | **May 20 17:00** | | | |

Table A6 shows that all readings are well below the 82 ppb standard.

| $H_2S$ | Range | 0 | 1 | 2.5 | 5 | 7.5 | 10 |
|---|---|---|---|---|---|---|---|

**Hydrogen Sulphide ($H_2S$) Frequency Distribution of 1-hr Averages - SESAA - Airpointer**

| Month | Number of Readings | % of Readings in Concentration Range (ppb) | | | | | | Monthly Average (ppb) |
|---|---|---|---|---|---|---|---|---|
| | | 0 to 1 | 1 to 2.5 | 2.5 to 5 | 5 to 7.5 | 7.5 to 10 | > 10 | |
| January 2010 | - | - | - | - | - | - | - | - |
| February 2010 | - | - | - | - | - | - | - | - |
| March 2010 | - | - | - | - | - | - | - | - |
| April 2010 | - | - | - | - | - | - | - | - |
| May 2010 | 617 | 95.8% | 2.1% | 1.6% | 0.2% | 0.2% | 0.2% | 0.2 |
| June 2010 | 681 | 81.1% | 12.5% | 4.1% | 1.6% | 0.3% | 0.4% | 0.7 |
| July 2010 | 711 | 65.4% | 21.9% | 9.1% | 2.1% | 0.8% | 0.6% | 1.1 |
| August 2010 | 696 | 84.2% | 10.2% | 3.4% | 0.7% | 0.9% | 0.6% | 0.7 |
| September 2010 | 688 | 91.4% | 7.0% | 1.3% | 0.3% | 0.0% | 0.0% | 0.3 |
| October 2010 | 708 | 71.0% | 19.9% | 6.4% | 1.4% | 0.7% | 0.6% | 1.0 |
| November 2010 | 701 | 78.0% | 13.3% | 5.3% | 1.9% | 0.3% | 1.3% | 0.9 |
| December 2010 | 724 | 80.4% | 12.4% | 3.5% | 2.2% | 0.8% | 0.7% | 0.9 |
| **Total Hours** | **5,526** | | | | | | | |
| **Average** | | **80.9%** | **12.4%** | **4.3%** | **1.3%** | **0.5%** | **0.5%** | **0.7** |

Table A7 shows the distribution of the 1 hour averages.
Note that only.5% on average have a value >10ppb

**Hydrogen Sulphide ($H_2S$) Annual Summary - SESAA - Airpointer**

| Month | Monthly Average (ppb) | MAXIMUM VALUES | | | | Operational time (%) | Reportable Incidents | |
|---|---|---|---|---|---|---|---|---|
| | | 24-hr (ppb) | Date | 1-hr (ppb) | Date | | 24-hr | 1-hr |
| January 2010 | - | - | - | - | - | - | - | - |
| February 2010 | - | - | - | - | - | - | - | - |
| March 2010 | - | - | - | - | - | - | - | - |
| April 2010 | - | - | - | - | - | - | - | - |
| May 2010 | 0.2 | 1.7 | May 16 | 12.3 | May 15 06:00 | 82.9% | 0 | 1 |
| June 2010 | 0.7 | 2.3 | Jun 28 | 11.9 | Jun 02 06:00 | 94.6% | 0 | 3 |
| July 2010 | 1.1 | 3.1 | Aug 01 | 15.3 | Jul 31 03:00 | 95.6% | 1 | 4 |
| August 2010 | 0.7 | 3.7 | Aug 26 | 33.1 | Aug 25 08:00 | 93.5% | 2 | 4 |
| September 2010 | 0.3 | 1.0 | Sep 21 | 6.0 | Sep 08 03:00 | 95.6% | 0 | 0 |
| October 2010 | 1.0 | 3.4 | Oct 18 | 28.8 | Oct 06 21:00 | 95.2% | 1 | 4 |
| November 2010 | 0.9 | 3.7 | Nov 28 | 23.1 | Nov 27 20:00 | 97.4% | 2 | 9 |
| December 2010 | 0.9 | 4.4 | Dec 16 | 15.8 | Dec 21 20:00 | 97.3% | 1 | 5 |
| **AVERAGE** | **0.7** | | | | | **94.0%** | | |
| | | | | | | | **7** | **30** |
| **MAXIMUM** | **1.1** | **4.4** | **Dec 16** | **33.1** | **Aug 25 08:00** | | | |

Table A8 shows summaries. Note that there are some 1 hour exceedences,
These are being investigated.

***Audited Financial Statement*** (Meyers Norris Penney)

## Southeast Saskatchewan Airshed Association
### Statement of Financial Position
*As at December 31, 2010*

| | *2010* | *2009* |
|---|---|---|
| **Assets** | | |
| Current | | |
| Cash | 140,637 | 71,284 |
| **Liabilities** | | |
| Current | | |
| Accounts payable and accruals | 19,487 | 4,001 |
| Goods and Services Tax payable | 2,064 | 1,806 |
| | 21,551 | 5,807 |
| **Net assets** | | |
| Unrestricted net assets | 119,086 | 65,477 |
| | 140,637 | 71,284 |

Approved on behalf of the Board

Director

## Southeast Saskatchewan Airshed Association
### Statement of Operations and Change in Net Assets
*For the year ended December 31, 2010*

| | *2010* | *2009* |
|---|---|---|
| Revenue | | |
| Membership fees | 228,394 | 150,113 |
| Grants | 40,000 | - |
| | 268,394 | 150,113 |
| Expenses | | |
| Advertising and promotion | 2,515 | 1,594 |
| Air monitoring | 122,210 | 76,006 |
| Insurance | 1,124 | - |
| Interest and bank charges | 62 | 56 |
| Lease fees (Note 6) | 25,629 | - |
| Management fees | 55,887 | 53,588 |
| Office | 1,138 | 636 |
| Professional fees | 5,085 | 7,040 |
| Training and education | 1,137 | 1,104 |
| | 214,785 | 140,024 |
| Excess of revenues over expenses | 53,609 | 10,089 |
| Net assets, beginning of year | 65,477 | 55,388 |
| Net assets, end of year | 119,086 | 65,477 |

## Southeast Saskatchewan Airshed Association
### Statement of Cash Flows
*For the year ended December 31, 2010*

| | 2010 | 2009 |
|---|---|---|
| Cash provided by (used for) the following activities | | |
| Operating activities | | |
| Cash received from members | 268,794 | 150,114 |
| Cash paid to suppliers | (199,379) | (153,043) |
| Interest paid | (62) | (56) |
| Increase (decrease) in cash resources | 69,353 | (2,985) |
| Cash resources, beginning of year | 71,284 | 74,269 |
| Cash resources, end of year | 140,637 | 71,284 |

## Southeast Saskatchewan Airshed Association
### Notes to the Financial Statements
*For the year ended December 31, 2010*

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:

*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 or receivable. 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 instruments 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.

*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*

Financial Instrument deferral of Section 3862 and 3863

In December 2006, the Canadian Institute of Chartered Accountants (CICA) issued Section 3862 Financial Instruments – Disclosures and Section 3863 Financial Instruments – Presentation to replace Section 3861 Financial Instruments – Disclosure and Presentation. The effective date for these new Sections was for interim and annual financial statements with fiscal years beginning on or after October 1, 2007, with earlier adoption permitted. However, in light of the uncertainty regarding the future direction in setting standards for not-for-profit organizations, the CICA released a decision to allow deferral of Sections 3862 and 3863 for this sector. As such not-for-profit organizations should continue to apply Section 3861.

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. 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, accounts payable and accruals is approximated by their fair value due to their short term nature.

4. 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.

5. Related party transactions

Included in expenses for the current year are $55,887 (2009 - $53,588) to a Company operated by a director 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.

6. Lease obligations

The Organization has entered into a lease agreement with Saskatchewan Research Council for a 2010 Airpointer. The first lease payment occurred March 22, 2010. The Organization is committed to monthly lease payments of $1,971 plus GST, until December 31, 2012.

## APPENDIX A: AMBIENT AIR MONITORING DATA

**Monthly Average Concentrations from January through December 2010**

| Sample | Station | January 10 | | | February 10 | | | March 10 | | | April 10 | | | May 10 | | | June 10 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | Code | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ |
| **1** | Carnduff | 2.3 | 2.1 | 0 | 2.2 | 1.5 | 0 | 1.5 | 1.0 | 0 | 0.6 | 0.8 | 0 | 0.6 | 2.5 | 0 | 0.5 | 3.2 | 0 |
| **2** | Glen Ewan | 2.1 | 2.4 | 24.7 | 2.8 | 2.3 | 30.2 | 1.5 | 1.6 | 28.5 | 0.7 | 1.2 | 27.5 | 0.8 | 1.9 | 31.4 | 0.7 | 2.4 | 26.0 |
| **3** | North Portal | 2.5 | 2.9 | 0 | 2.9 | 1.7 | 0 | 1.3 | 1.6 | 0 | 0.8 | 1.5 | 0 | 0.9 | 2.1 | 0 | 0.7 | 2.7 | 0 |
| **4** | Roche Percee | 2.0 | 3.3 | 29.5 | 2.6 | 3.1 | 28.3 | 1.9 | 2.1 | 30.6 | 0.7 | 2.0 | 24.9 | 1.1 | 2.5 | 31.7 | 0.9 | 3.2 | 23.6 |
| **5** | Estevan | 1.7 | 2.5 | 0 | 1.7 | 1.9 | 0 | 1.2 | 1.5 | 0 | 0.4 | 1.3 | 0 | 1.4 | 2.2 | 0 | 1.2 | 2.8 | 0 |
| **6** | Torquay | 1.6 | 1..0 | 0 | 1.9 | 1.3 | 0 | 1.1 | 1.7 | 0 | 0.4 | 1.0 | 0 | 0.9 | 2.0 | 0 | 0.7 | 2.5 | 0 |
| **7** | Tribune | 2.3 | 2.6 | 25.6 | 2.4 | 2.3 | 31.8 | 0.9 | 1.7 | 30.7 | 0.6 | 1.7 | 31.0 | 0.4 | 1.9 | 28.2 | 0.4 | 2.4 | 28.8 |
| **8** | Macoun | 2.7 | 3.0 | 0 | 2.5 | 1.8 | 0 | 1.3 | 2.1 | 0 | 0.9 | 1.2 | 0 | 1.0 | 2.2 | 0 | 0.8 | 2.9 | 0 |
| **9** | Kingsford | 3.6 | 2.9 | 0 | 2.9 | 2.2 | 0 | 4.4 | 2.1 | 0 | 1.8 | 1.3 | 0 | 1.6 | 1.9 | 0 | 1.3 | 2.4 | 0 |
| **10** | Alameda | 2.8 | 2.9 | 27.6 | 2.8 | 2.6 | 31.4 | 2.7 | 1.6 | 27.3 | 1.0 | 1.3 | 31.0 | 1.8 | 2.4 | 31.6 | 0.7 | 3.0 | 24.5 |
| **11** | Oxbow | 2.6 | 3.1 | 0 | 2.8 | 1.4 | 0 | 2.5 | 1.9 | 0 | 0.8 | 1.0 | 0 | 1.1 | 1.9 | 0 | 0.9 | 2.4 | 0 |
| **12** | Storthoaks | 2.3 | 2.6 | 27.5 | 2.7 | 2.0 | 30.4 | 2.0 | 1.6 | 34.3 | 0.7 | 1.1 | 30.2 | 0.8 | 1.5 | 34.3 | 0.7 | 1.9 | 20.9 |
| **13** | Redvers | 2.4 | 2.2 | 0 | 2.4 | 1.5 | 0 | 1.3 | 1.5 | 0 | 0.7 | 1.0 | 0 | 0.7 | 3.1 | 0 | 0.6 | 3.9 | 0 |
| **14** | Steppes | 2.4 | 2.4 | 25.2 | 2.2 | 2.1 | 27.9 | 0.9 | 2.1 | 31.8 | 0.2 | 1.0 | 34.7 | 1.6 | 2.1 | 32.6 | 0.8 | 2.4 | 28.6 |
| **15** | Wordsworth | 2.2 | 2.7 | 0 | 2.4 | 1.1 | 0 | 1.3 | 1.1 | 0 | 0.7 | 0.8 | 0 | 0.7 | 1.9 | 0 | 0.6 | 2.5 | 0 |
| **16** | Kisbey | 1.6 | 1.5 | 0 | 2.0 | 2.2 | 0 | 0.9 | 1.1 | 0 | 0.9 | 1.0 | 0 | 0.6 | 1.5 | 0 | 0.6 | 1.9 | 0 |
| **17** | Huntoon | 1.4 | 3.3 | 27.4 | 1.9 | 2.6 | 30.8 | 0.9 | 1.8 | 32.1 | 0.7 | 3.1 | 32.5 | 0.7 | 1.9 | 25.0 | 0.6 | 2.5 | 26.5 |
| **18** | Ralph | 1.9 | 2.8 | 0 | 2.2 | 2.8 | 0 | 1.5 | 1.9 | 0 | 1.0 | 1.8 | 0 | 1.1 | 1.8 | 0 | 0.9 | 2.3 | 0 |
| **19** | Talmage | 2.6 | 3.4 | 28.4 | 2.1 | 2.6 | 31.8 | 0.7 | 1.5 | 30.7 | 0.7 | 1.3 | 29.6 | 0.5 | 1.6 | 31.8 | 0.4 | 2.1 | 29.3 |
| **20** | Creelman | 2.4 | 3.2 | 0 | 2.3 | 1.7 | 0 | 1.1 | 1.3 | 0 | 1.0 | 0.9 | 0 | 1.1 | 2.1 | 0 | 1.0 | 2.6 | 0 |
| **21** | Warmley | 2.8 | 2.5 | 0 | 1.3 | 1.5 | 0 | 0.7 | 1.4 | 0 | 0.5 | 1.0 | 0 | 0.6 | 0.9 | 0 | 0.5 | 1.2 | 0 |
| **22** | Kenosee Lake | 3.0 | 1.4 | 27.5 | 2.8 | 1.7 | 25.5 | 1.7 | 1.3 | 31.1 | 1.5 | 1.2 | 34.8 | 1.2 | 0.8 | 29.9 | 1.0 | 1.0 | 28.2 |
| **23** | Ryerson | 1.2 | 1.2 | 0 | 1.5 | 1.1 | 0 | 1.0 | 1.5 | 0 | 0.4 | 0.8 | 0 | 0.5 | 1.7 | 0 | 0.4 | 2.2 | 0 |
| **24** | Wapella | 1.3 | 1.8 | 30.2 | 1.2 | 3.6 | 37.8 | 0.5 | 1.8 | 25.9 | 0.3 | 1.9 | 30.5 | 0.4 | 1.1 | 30.1 | 0.4 | 1.4 | 22.1 |
| **25** | Baring | 1.6 | 1.6 | 0 | 1.7 | 1.5 | 0 | 1.1 | 1.4 | 0 | 0.4 | 0.7 | 0 | 0.4 | 1.0 | 0 | 0.4 | 1.3 | 0 |
| **26** | Odessa | 2.0 | 2.1 | 23.4 | 1.8 | 1.9 | 30.1 | 0.8 | 1.9 | 27.3 | 0.4 | 1.1 | 29.5 | 0.4 | 1.0 | 28.6 | 0.4 | 1.3 | 27.3 |
| **27** | Esterhazy | 1.1 | 1.4 | 0 | 1.1 | 0.9 | 0 | 0.4 | 1.2 | 0 | 0.2 | 0.7 | 0 | 0.3 | 1.0 | 0 | 0.3 | 1.3 | 0 |
| **28** | Bangor | 0.8 | 2.3 | 32.6 | 0.6 | 1.8 | 31.3 | 0.3 | 2.1 | 31.6 | 0.2 | 1.5 | 29.9 | 0.2 | 1.8 | 31.3 | 0.2 | 2.3 | 25.8 |
| **29** | ATCO | 1.8 | H2S | =1.43 | 1.4 | H2S | =0.41 | 1.2 | H2S | =0.50 | 0.9 | H2S | =0.32 | 1.0 | H2S | =0.35 | 0.9 | H2S | =0.30 |
| **30** | ATCO | 1.6 | H2S | =1.22 | 1.7 | H2S | =0.29 | 1.1 | H2S | =0.60 | 1.5 | H2S | =0.30 | 0.6 | H2S | =0.36 | 0.5 | H2S | =0.34 |

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| Sample | Station | July 10 | | | August 10 | | | September 10 | | | October 10 | | | November 10 | | | December 10 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | Code | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ | $SO_2$ | $NO_2$ | $O_3$ |
| **1** | Carnduff | 1.0 | 0.7 | 0 | 0.5 | 0.8 | 0 | 0.3 | 0.6 | 0 | 0.4 | 1.6 | 0 | 0.3 | 2.1 | 0 | 1.5 | 2.1 | 0 |
| **2** | Glen Ewan | 0.8 | 1.5 | 29.1 | 0.7 | 0.5 | 24.3 | 0.3 | 1.0 | 19.5 | 0.5 | 2.6 | 15.4 | 0.5 | 3.2 | 20.2 | 2.1 | 3.8 | 26.1 |
| **3** | North Portal | 1.2 | 2.8 | 0 | 1.3 | 1.2 | 0 | 0.5 | 1.1 | 0 | 0.5 | 2.4 | 0 | 0.5 | 3.0 | 0 | M | M | 0 |
| **4** | Roche Percee | 1.7 | 1.4 | 23.7 | 1.5 | 2.2 | 23.3 | 0.5 | 2.3 | 19.2 | 0.7 | 3.9 | 17.2 | 0.7 | M | 19.9 | 1.7 | 6.3 | 19.7 |
| **5** | Estevan | 1.2 | 1.7 | 0 | 0.5 | 1.0 | 0 | 0.4 | 0.6 | 0 | 0.3 | 1.5 | 0 | 0.2 | 2.5 | 0 | 1.2 | 4.4 | 0 |
| **6** | Torquay | 1.4 | 0.8 | 0 | 1.6 | 0.8 | 0 | 0.6 | 1.3 | 0 | 0.4 | 1.5 | 0 | 0.4 | 2.3 | 0 | 1.3 | 3.2 | 0 |
| **7** | Tribune | 0.8 | 1.7 | 25.3 | 0.7 | 1.3 | 24.3 | 0.4 | 1.4 | 21.6 | 0.4 | 2.5 | 18.6 | 0.5 | 3.5 | 20.2 | 2.3 | 5.6 | 24.5 |
| **8** | Macoun | 0.8 | 1.2 | 0 | 1.1 | 1.2 | 0 | 0.5 | 1.1 | 0 | 0.6 | 2.5 | 0 | 0.6 | 3.1 | 0 | 2.2 | 4.5 | 0 |
| **9** | Kingsford | 1.3 | 1.3 | 0 | 1.6 | 1.5 | 0 | 0.7 | 1.1 | 0 | 1.2 | 2.1 | 0 | 1.2 | 3.1 | 0 | 2.7 | 4.5 | 0 |
| **10** | Alameda | 1.0 | 1.6 | 27.2 | 0.8 | 1.3 | 26.7 | 0.5 | 1.8 | 23.3 | 0.8 | 4.4 | 18.3 | 0.7 | 5.7 | 19.5 | 2.3 | 5.2 | 28.2 |
| **11** | Oxbow | 1.3 | 0.8 | 0 | 1.7 | 0.7 | 0 | 0.5 | 1.3 | 0 | 0.8 | 2.8 | 0 | 0.7 | 3.1 | 0 | 2.3 | 4.1 | 0 |
| **12** | Storthoaks | 1.1 | 1.1 | 21.8 | 0.8 | 0.9 | 20.4 | 0.5 | 1.3 | 21.9 | 0.8 | 2.4 | 24.7 | 0.8 | 3.2 | 21.8 | 1.7 | 4.9 | 21.6 |
| **13** | Redvers | D | D | 0 | D | D | 0 | 0.5 | 1.0 | 0 | 0.6 | 2.3 | 0 | 0.6 | 3.2 | 0 | 1.2 | 4.2 | 0 |
| **14** | Steppes | 0.9 | 1.2 | 21.3 | 0.6 | 0.9 | 24.0 | 0.6 | 1.0 | 19.7 | 1.3 | 2.5 | 21.1 | 0.8 | 3.1 | 20.3 | 2.2 | 4.0 | 28.5 |
| **15** | Wordsworth | 1.0 | 1.0 | 0 | 0.8 | 0.8 | 0 | 0.0 | 1.0 | 0 | 0.7 | 2.4 | 0 | 0.6 | 3.1 | 0 | 1.3 | 3.9 | 0 |
| **16** | Kisbey | 0.7 | 1.0 | 0 | 0.8 | 0.8 | 0 | 0.4 | 0.9 | 0 | 0.6 | 2.5 | 0 | 0.6 | 3.0 | 0 | 1.9 | 4.4 | 0 |
| **17** | Huntoon | 0.6 | 1.9 | 18.8 | 0.6 | 1.9 | 25.4 | 0.4 | 1.8 | 21.6 | 0.6 | 3.5 | 15.0 | 0.5 | 3.2 | 18.2 | 1.3 | 4.8 | 30.6 |
| **18** | Ralph | 1.0 | 1.3 | 0 | 1.2 | 1.3 | 0 | 0.7 | 1.5 | 0 | 1.2 | 3.4 | 0 | 0.5 | 5.5 | 0 | 2.5 | 6.9 | 0 |
| **19** | Talmage | 0.7 | 1.7 | 21.8 | 0.7 | 1.6 | 19.0 | 0.3 | 1.9 | 22.3 | 0.5 | 2.4 | 20.6 | 0.6 | 4.5 | 16.1 | 2.7 | 6.1 | 29.4 |
| **20** | Creelman | 1.0 | 1.0 | 0 | 0.9 | 0.8 | 0 | 0.5 | 1.1 | 0 | 0.6 | 2.6 | 0 | 0.5 | 2.9 | 0 | 1.7 | 4.2 | 0 |
| **21** | Warmley | 0.8 | 0.7 | 0 | 0.8 | 0.7 | 0 | 0.4 | 1.0 | 0 | 0.3 | 2.3 | 0 | 0.4 | 2.9 | 0 | N/A | N/A | 0 |
| **22** | Kenosee Lake | 1.3 | 1.0 | 23.9 | 1.1 | 1.0 | 23.4 | 0.8 | 1.5 | 22.1 | 1.3 | 2.4 | 24.9 | 1.0 | 3.3 | 14.7 | 2.1 | 3.2 | 25.3 |
| **23** | Ryerson | 1.0 | 0.8 | 0 | 0.6 | 0.8 | 0 | 0.4 | 1.0 | 0 | 0.5 | 2.4 | 0 | 0.5 | 3.2 | 0 | 1.2 | 2.9 | 0 |
| **24** | Wapella | 1.3 | 1.2 | 19.2 | 1.6 | 1.4 | 20.6 | 0.4 | 2.0 | 20.0 | 1.2 | 5.4 | 38.2 | 0.5 | 3.1 | 19.1 | 0.8 | 4.6 | 26.5 |
| **25** | Baring | 1.0 | 0.7 | 0 | 0.9 | 1.0 | 0 | 0.3 | 1.0 | 0 | 0.4 | 2.1 | 0 | 0.5 | 3.9 | 0 | 1.0 | 2.5 | 0 |
| **26** | Odessa | 0.9 | 1.5 | 21.9 | 1.1 | 2.3 | 24.4 | 0.3 | 1.5 | 20.3 | 0.4 | 3.0 | 11.2 | 0.4 | 4.4 | 21.3 | 2.2 | 4.5 | 29.3 |
| **27** | Esterhazy | 1.3 | 0.6 | 0 | 0.9 | 1.0 | 0 | 0.2 | 1.1 | 0 | 0.3 | 1.5 | 0 | 0.2 | 2.3 | 0 | 0.8 | 2.9 | 0 |
| **28** | Bangor | 0.6 | 1.5 | 18.6 | 0.5 | 1.4 | 23.5 | 0.2 | 2.0 | 22.0 | 0.2 | 3.0 | 21.2 | 0.2 | 4.2 | 19.4 | 0.6 | 4.4 | 29.2 |
| **29** | ATCO | 0.9 | H2s | =1.38 | 1.5 | H2S | =0.91 | 0.6 | H2S | =1.73 | 1.0 | H2S | =0.78 | 0.7 | H2S | =0.92 | 1.3 | H2S | =0.69 |
| **30** | ATCO | 1.2 | H2s | =0.96 | 1.0 | H2S | =0.75 | 0.5 | H2S | =1.59 | 2.3 | H2S | =0.72 | 1.0 | H2S | =0.98 | 2.8 | H2S | =0.62 |

**D = Damaged**

**M = Missing**

## APPENDIX B: COMPLETENESS OF MONITORING DATA

Data capture rates for passive monitoring parameters during January through December 2010

| Parameter | Jan 10 | Feb 10 | Mar 10 | Apr 10 | May 10 | Jun 10 | Jul 10 | Aug 10 | Sep 10 | Oct 10 | Nov 10 | Dec 10 | Total Capture | % Capture |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $SO_2$ | 30 | 30 | 30 | 30 | 30 | 30 | 29 | 29 | 30 | 30 | 30 | 29 | 348 | 99.4% |
| $NO_2$ | 28 | 28 | 28 | 28 | 28 | 28 | 27 | 27 | 28 | 28 | 27 | 27 | 334 | 99.4% |
| $O_3$ | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 144 | 96.01% |
| $H_2S$ | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 14 | 100% |

Note: Data capture rates expressed as number of valid samples /total number of samples.
The November 2010 data for Roche Percee (Station 4) is not included and is shown as missing because it was an anomaly. The rest of the year is correct for that station.

## APPENDIX C: SESAA BOARD OF DIRECTORS 2010

Terry Gibson
Executive Director

**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.

Chuck Bosgoed
Saskatchewan Environment
Alternate: Murray Hilderman

**Chuck Bosgoed – Director (Saskatchewan Environment)**
Mr. Bosgoed is an Environmental Engineer who has worked with Saskatchewan Environment for 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 air quality problems in a region. Mr. Bosgoed writes, "Being a member of the Board provides me, as an environmental regulator, with a new and effective way of dealing with regional air quality issues."

Debbie Nielsen
SaskPower
Alternate: Mike Zeleny

**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.

Dean Pylypuk
Saskatchewan Industry &Resources
Alternate: Todd Han

**Dean Pylypuk Regional Manager, 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.

Darlene Sakires
Canadian Natural Resources Limited
Alternate: John Hutt

**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.

Chris Seeley
Saskatchewan Health
Alternate: Grant Paulson

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.

Jesse Watanamuk
City of Weyburn SK
Alternate: Bob Smith

Mr. Watamanuk is an Engineering Assistant with the City of Weyburn. He is an 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.

Shane Boyes
RM of Enniskillen No.3

**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.

## APPENDIX D: SESAA MEMBERSHIP

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:

- Sask Power
- 61855 Saskatchewan Ltd.
- Abenteuer Resources Corp.
- Advantage Oil and Gas
- Aldon Oils
- Apache Canada Ltd.
- ARC Resources
- ATCO Midstream Ltd.
- Avenir Operating Corp.
- Base Resources Inc.
- Baytex
- Black Rider Resources Inc.
- Border Energy Ltd.
- Brown Bros. Resources
- Bulldog Oil and Gas
- Caje 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.
- Elswick Energy Ltd.
- Enermark Inc.
- 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 Ltd.
- JDM Petroleum
- Jedi Exploration & Development
- K and S Investments Ltd.
- Kenwood Resources Ltd.
- Keystone Royalty
- Kinwest 2008 Energy
- Kiwi Resources Ltd.
- Kootenay Energy
- Legacy Oil and Gas
- Magellan Resources Ltd.
- Mancal Energy Inc.
- Midale Petroleums Ltd.
- Mosaic
- NAL Resources Limited
- Nexxtep Resources
- Novus Energy Inc.
- Nuloch Resources Inc.
- Omatius Oil & Gas Ltd.
- Oneex Operations
- Painted PonyPetroleum
- Pemoco Ltd.
- Penn West Petroleum Ltd.
- Petrex Energy
- PetroBakken Energy Ltd
- Pinto Resources
- Prairie Mines and Royalty(Sherritt Coal)
- Primrose Drilling Ventures Ltd.
- Questerre Energy Corporation
- Regent Resources Ltd.
- Runcible Oil Corp.
- Silver Bay Resources Ltd.
- Spartan Exploration
- T-45 Oil Corporation
- TAQA North
- T. Bird Oil Ltd.
- Tetonka Resources
- Texalta Petroleum Ltd.
- TransGas/SaskEnergy
- Triwest Exploration
- Valleyview Petroleums Ltd.
- Villanova Resources 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 or email: tg4air@sasktel.net