

Airshed Association

2009 Annual Report



Southeast Saskatchewan Airshed Association

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TABLE OF CONTENTS

Message from the Chairperson
Executive Summary
Introduction
Air Quality Monitoring
Sulphur Dioxide
Nitrogen Oxides
Ozone
FINANCIAL REPORT

Table of Figures

Figure 1. Boundary of the Southeast Saskatchewan Airshed	4
Figure 2. Passive monitoring network for the Southeast Saskatchewan Airshed	5
Figure 3. Sulphur dioxide ambient air concentrations by station	7
Figure 4. Comparison of sulphur dioxide ambient air concentration by month	7
Figure 5. Nitrogen dioxide ambient air concentrations by station	9
Figure 6. Comparison of nitrogen dioxide ambient air concentration by month	9
Figure 7. Ozone ambient air concentrations by station	11
Figure 8. Comparison of ozone ambient air concentration by month	12

Message from the Chairperson

2009 has been a challenging year for the association. A great deal of effort has gone into securing sustainable funding and developing a fair and equitable funding formula. We are happy to report our support from the Electrical Power sector and the Oil and Gas sector has grown considerably. Saskatchewan Environment and Saskatchewan Energy and Resources have made considerable steps to ensure funding sustainability for the Airshed. Plans were made to implement two continuous air quality monitoring stations in 2009. 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 southern part of the region.

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 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.

In 2009, the passive monitoring data was collected at 30 locations for every 30-day period from January to December. Nitrogen dioxide (NO₂) was monitored at the 28 original sites, ozone (O₃) was monitored at 12 selected sites, hydrogen sulphide (H₂S) was monitored at 2 new sites, and sulphur dioxide (SO₂) were monitored at all 30 sites

Average concentrations of SO₂, NO₂, O₃, and H₂S for the entire network were 1.4, 1.8, 28, and 1.1 ppb, respectively. Similarly, maximum concentrations of SO₂, NO₂, and O₃ for the entire network were 7.9, 8.6, 53, and 3.5 ppb, respectively. All measured SO₂ and NO₂ concentrations were well below the Saskatchewan annual ambient air quality standards, and O₃ concentrations were within the normal and above normal range. In overall, there were no air quality issues with the passive monitoring program in 2009.

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's Ministries Environment, Energy & Resources, and Health also participate as members of the board of directors. The SESAA's operating budget consists of membership fees and emissions-based fees assessed to facilities operating within the airshed boundaries (Figure 1. Boundary of the Southeast Saskatchewan Airshed.).



Figure 1. Boundary of the Southeast Saskatchewan Airshed.

Air Quality Monitoring

One of the SESAA's mandates is to collect scientifically credible regional air quality data, 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 3-day sulphur dioxide (SO₂), nitrogen dioxide (NO₂) ozone (O₃), and hydrogen sulphide (H₂S) samples at selected stations. Locations of passive monitoring sites are shown in Figure 2. Passive monitoring network for the Southeast Saskatchewan Airshed.. Symbols with pink, blue, and yellow circles indicate sites where SO₂, NO₂, and O₃ were monitored. Symbols with blue and yellow circles only indicate sites where SO₂ and NO₂ were monitored. SO₂ and NO₂ were monitored at all 28 sites, while O₃ 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.



Figure 2. Passive monitoring network for the Southeast Saskatchewan Airshed.

Sulphur Dioxide

Sulphur dioxide (SO₂) 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 SO₂ 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 SO₂. It also damages trees and crops. SO₂, 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. SO₂ also causes formation of microscopic acid aerosols, which have serious health implications, as well as, contributing to climate change.

SO₂ emissions come from the burning of sulphur containing fuels (e.g. gasoline, natural gas and coal) and the processing of sulphur containing ores. SO₂ 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.

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.

In 2009, the passive monitoring data indicates the average and maximum SO₂ concentrations of the entire network were 1.4 and 7.9 ppb, respectively. These concentrations are well below the Saskatchewan annual ambient standard for SO₂ (11 ppb).

Figure 3. Sulphur dioxide ambient air concentrations by station. shows average concentrations of SO₂ by town for the year 2009. Roche Percee (Station 4) is the location where maximum SO₂ concentration was observed, measuring 57.9 ppb. The stations with higher average concentrations were North Portal (Station 3), Roche Percee (Station 4), Kingsford (Station 9), and Oxbow (Station 11). In comparison, the lowest average (0.6 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 SO₂ exist.



Figure 3. Sulphur

dioxide ambient air concentrations by station.

Figure 4. Comparison of sulphur dioxide ambient air concentration by month. shows yearly comparisons of SO₂ levels for the entire airshed. The average monthly concentrations varied from 0.74 ppb in May to 3.1 ppb in January for 2009. In 2006, the sampling was carried out from June to December, and in the majority of cases was higher than the 2009 data. Average monthly concentrations for 2009 are slightly lower then the 2008 concentrations. In 2007, the sampling was carried out for 60-day periods, which makes it difficult to compare to the 2009 data. However, looking at the data one can easily make out the season patterns in the 2007, 2008 and 2009 data. The winter months tended to express a higher concentration of SO₂, in comparison to the summer months.



Figure 4. 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 (NO₂). Nitric oxide is a colorless, flammable gas with a slight odour. Nitrogen dioxide is a reddish brown, nonflammable gas with a pungent irritating odour. NO₂ is of more interest than NO from both a health and acid rain perspective. While NO₂ is soluble in water, it is less soluble than SO₂. NO₂ can be detected at concentrations as low as 106 ppb.

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:

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

In 2009, the average and maximum NO₂ concentrations of the entire network were 1.8 and 8.6 ppb, respectively, which are well below the Saskatchewan annual ambient standard of NO₂.

Figure 5. Nitrogen dioxide ambient air concentrations by station. shows average concentrations of NO₂ for the year 2009. The stations with higher NO₂ concentrations were Roche Percee (Station 4), Alameda (Station 10), Huntoon (Station 17) and Talmage (Station 19). In contrast, the stations with lower NO₂ were Carnduff (Station 1), Oxbow (Station 11), 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 5. Nitrogen dioxide ambient air concentrations by station.

Figure 6. Comparison of nitrogen dioxide ambient air concentration by month. shows a yearly comparison of NO₂ levels for the entire airshed. The average monthly concentrations varied from 0.004 ppb in August to 3.2 ppb in January for 2008. In 2006, the sampling was carried out from June to December, and in the majority of cases the concentration was lower compared to the 2009 data. In 2007, the sampling was carried out for 60-day periods, which made it difficult to compare it to the 2009 data. However, looking at the data one can easily make out the season patterns in the 2007, 2008 and 2009 data. The winter months tended to express a higher concentration of NO₂, in comparison to the summer months, minus the anomaly in June.



Figure 6. Comparison of nitrogen dioxide ambient air concentration by month.

Ozone

Ground-level Ozone (O₃) 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 lighting storms or photocopiers. O₃ 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. O₃ has been linked to increased hospital admissions and premature death. It is a key ingredient of urban smog.

O₃ 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.

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).

In 2009, the average and maximum O₃ concentrations of the entire network were 28 and 53 ppb respectively. These measured levels were within the average range. Figure 7. Ozone ambient air concentrations by station. shows concentrations of ozone (O₃) for the 2009 period. The station with the highest average O₃ concentration was Kenosee (Station 22) measuring 31 ppb, and the lowest average concentration was observed at Alameda (Station 10), measuring 25 ppb.



Figure 7. Ozone ambient air concentrations by station.

Figure 6. Comparison of nitrogen dioxide ambient air concentration by month. shows a yearly comparison of O₃ levels for the entire airshed. The average monthly concentrations varied from 19.8 ppb in October to 37.7 ppb in March for 2009. In 2006, the sampling was carried out from June to December, and in the majority of cases the concentration was lower compared to the 2009 data. In 2007, the sampling was carried out for 60-day periods, which made it difficult to compare it to the 2009 data. However, looking at the data one can easily make out the season patterns in the 2007, 2008 and 2009 data. The winter months tended to express a higher concentration of O₃, in comparison to the summer months, minus the anomaly in June.



Figure 8. Comparison

of ozone ambient air concentration by month.

Table 1. Hydrogen sulphide data chart for June – December 2009.

				H₂S	ppb				
Station No.	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG	MAX
29	0.39	0.94	0.45	1.21	1.92	0.78	0.9	0.94	1.92
30	0.39	1.18	0.48	3.46	1.89	0.65	0.9	1.28	3.46
Average	0.39	1.06	0.47	2.34	1.91	0.72	0.90	1.11	3.46

FINANCIAL REPORT

Southeast Saskatchewan Airshed Association Balance Sheet

As of December 31, 2009

	Assets	
	Current	
	Cash	74269
	Liabilities	
	Current	
	Bank indebtedness	
	Account payable and accruals	13312
	Goods and Services Tax payable	5568
	Net Assets	
	Unrestricted net assets	55389
Southeast Saska	tchewan Airshed Association	
Southeast Saska	tchewan Airshed Association	
Statement of Op	erations and Change in Net Assets	
For the year ende	d December 31, 2009	
	Revenue	
	Membership fees	152823
	Grant revenue	25000
	Expenses	
	Advertising and promotion	
	Air monitoring	61980
	Interest and hank charges	55
	Management fees	34564
	Miscellaneous	207
	Professional fees	3000
		5000
	Excess of revenues over expenses	78022
	Net assets, beginning of year	(22633)
	Net assets, end of year	55389

Cash provided by (used for) the	
following activities	
Operating activities	
Cash received from customers	177824
Cash paid to suppliers	(96901)
Interest paid	(55)
Increase (decrease) in cash resources	80868
Cash resources, end of year	74269

Audited Statement for January, 2009 through December, 2009 performed by Meyers Norris Penny: <u>Balance Sheet, Statement of Operations and Change in Net Assets, and Statement of Cash Flow</u>

	Southeast Saskatchewan Airshed Ass Balar As at Decen	ociation tce Sheet
-	2009	2008
Assets		
Cash	71,284	74,269
Liabilities		
Current Accounts payable and accruals Goods and Services Tax payable	4,001 1,806	13,313 5,568
	5,807	18,881
Net assets Unrestricted net assets	65,477	55,388
	71,284	74,269

Southeast Saskatchewan Airshed Association Statement of Operations and Change in Net Assets

For the year ended December 31, 2009

	2009	2008
Revenue Membership fees Grants	150,113	152,823 25,000
A 20 percent of the second sec	150,113	177,823
Expenses Advertising and promotion Air monitoring Interest and bank charges Management fees Office Professional fees Training and education	1,594 76,006 56 53,588 636 7,040 1,104	61,980 55 34,564 202 3,000
	140,024	99,801
Excess of revenues over expenses	10,089	78,022
Net assets, beginning of year	55,388	(22,634)
Net assets, end of year	65,477	55,388

Southeast Saskatchewan Airshed Association

Statement of Cash Flows For the year ended December 31, 2009

	2009	2008
Cash provided by (used for) the following activities		
Operating activities		
Cash received from members	150,113	177.823
Cash paid to suppliers	(153.042)	(96,900)
Interest paid	(56)	(55)
(Decrease) increase in cash resources	(2,985)	80,868
Cash resources (deficiency), beginning of year	74,269	(6,599)
Cash resources, end of year	71,284	74,269



ID	Sample	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	ID	Sample	Monthly	APPENI
Code	Station			Bangor	Esterhazy	Odessa	Baring	Wapella	Ryerson	Kenosee Lake	Warmley	Creelman	Talmage	Ralph	Huntoon	Kisbey	Wordsworth	Steppes	Redvers	Storthoaks	Oxbow	Alameda	Kingsford	Macoun	Tribune	Torquay	Estevan	Roche Percee	North Portal	Glen Ewan	Carnduff	Code	Station	Average Con	JIX A: AMBL
SO_2			3.1	1.9	2	2.3	2.6	2.1	2.5	2.4	2.6	2.5	2.1	2.4	2.2	2.1	2.6	2.4	2.8	3.3	4.5	4	4	3.2	3.2	2.2	2.7	7.9	7	3.7	3.9	SO_2		centrat	ENTA
NO_2	July			2.5	1.7	3.5	2.1	2	2.8	1.7	1.6	2.4	ω	3.1	2.7	3.6	3.2	3.5	2.3	3.4	1.8	8.6	1.9	2.4	2.6	1.2	1.7	6.6	4.8	1.6	1.8	NO_2	Januar	ions	IK MO
O ₃				22.9	0	29.2	0	29.8	0	28.9	0	0	34	0	30.6	0	0	25.8	0	29.3	0	29	0	0	27.8	0	0	49.9	0	34.5	0	03	Ý.		NITOR
SO_2				0.9	1.1	1.7	1.9	1.2	1.6	3.8	2.2	3.6	2.8	3.3	ω	3.1	2.6	2.8	ω	3.2	3.4	0	5.4	3.4	3.4	2.2	2.4	3.5	3.3	2.1	2.9	SO_2			ING D
NO ₂	Augus			2.6	1	2.6	2	3.2	1.4	2.9	2	2	2.7	3.5	2.8	2.3	2	3.1	1.8	2.4	1.8	0	2.4	2.5	3.6	1.8	1.2	3.7	1.6	2.5	1.8	NO_2	Februa		ATA
0,	st			20.8	0	26.8	0	30	0	25.9	0	0	26.8	0	17	0	0	33	0	32.5	0	0	0	0	31.7	0	0	29	0	24	0	0,	ry		
SO_2	S			0.6	0.7	1	1.3	0.9	1.2	2.4	1.1	2.8	1.1	1.6	1.6	1.3	1.3	1.4	2	2.2	2.1	4.1	2.6	1.4	2	1.1	0.7	1.8	2.1	1.7	1.5	SO_2			
NO2	eptem			1.2	0.7	1	0.9	1.6	0.8	1.1	0.9	0.9	1.5	1.7	1.5	0.8	1.5	1.6	0.7	<u> </u>	0.6	ω	1.3	1.2	2	0.9	0.5	2.5	0.8	1.8	0.5	NO ₂	Marc]		
03	ber			41	0	36.7	0	41.9	0	52.7	0	0	40.5	0	32.2	0	0	39.8	0	40.3	0	37	0	0	34.5	0	0	35.6	0	29.7	0	03	Ъ		
SO_2				0.3	0.3	0.5	0.4	0.4	0.4	1.3	0.7	1	0.8	1.3	0.9	0.6	0.6	0.7	0.6	0.7	0.6	0.8	0.6	-	0.9	1.3	0.5	1.2	1	0.9	0.5	SO_2			
NO ₂	Octobe			1.2	0.6	1.2	0.8	1.2	0.5	-	0.5	0.9	1.7	1.5	1.5	0.8	0.7	1.2	0.9	0.9	0.4	1.4	1.3	1.5	1.7	0.9	0.8	1.9	1	1.2	0.5	NO ₂	April		
03	er			39.2	0	31.8	0	28.5	0	38.6	0	0	29	0	30.9	0	0	36.9	0	39	0	33.7	0	0	27.6	0	0	30.9	0	27.2	0	O ₃			
SO_2	Z			0.3	0.3	0.5	0.4	0.4	0.4	1.3	0.7	_	0.8	1.3	0.9	0.6	0.6	0.7	0.6	0.7	0.6	0.8	0.6	<u> </u>	0.9	1.3	0.5	1.2	1	0.9	0.5	SO_2			
NO_2	lovemb			1.2	0.6	1.2	0.8	1.2	0.5	1	0.5	0.9	1.7	1.5	1.5	0.8	0.7	1.2	0.9	0.9	0.4	1.4	1.3	1.5	1.7	0.9	0.8	1.9	1	1.2	0.5	NO ₂	May		
03	er			32.7	0	29.9	0	27.2	0	32.2	0	0	26.7	0	28.5	0	0	32.6	0	32.4	0	25.5	0	0	26.6	0	0	30	0	33.3	0	O ₃			
SO_2	D	2.1	1.1	0.7	1	0.9	0.9	1.2	1	1.2	0.9	1.4	0.9	1.3	0.9	0.9	0.9	1.4	1.7	1.7	1.6	1.7	2.2	1.9	1.5	1.8	0.6	0.8	0.6	0.3	0.3	SO_2			
	ecemb			ω	1.5	2.3	1.3	2.7	2.1	1.8		2.8	3.3	ω	3.6	2.1	2.1	2.4	2.3	3.1	1.8	2.9	3.5	ω	4.1	2.5	4.5	3.7	3.8	2.4	3.1	NO_2	June		
03	er			34.5	0	32.1	0	36.4	0	32.2	0	0	29.8	0	31.6	0	0	38.5	0	31.9	0	29.2	0	0	30.1	0	0	32.9	0	33.8	0	03			

M = Miss	D = Dam	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	L	6	J	4	3	2	1
ing	aged			Bangor	Esterhazy	Odessa	Baring	Wapella	Ryerson	Kenosee Lake	Warmley	Creelman	Talmage	Ralph	Huntoon	Kisbey	Wordsworth	Steppes	Redvers	Storthoaks	Oxbow	Alameda	Kingsford	Macoun	Tribune	Torquay	Estevan	Roche Percee	North Portal	Glen Ewan	Carnduff
		1.9	1.2	0.6	0.9	0.8	 	1.4	-	1.6		 	0.9	1.6	0.9	0.9	 :-	1.4	 	1.4	-	_1 .5	1.8	 	-1 .ω	1.4	2.3	0.7	<u>-</u> 1 .5		0.8
				1.2	0.6	- <u>1</u> .5	0.7	ى. 1	1.6	1.2	0.7	-	Ν	1.2	1.8	- -	0.6	 :-	0.7	1.2	-1 :-1	1.8	-	1.2	N	-1 ω	-1 :-1	2.2	1.8	1.4	-
				20.9	0	20.7	0	21.2	0	24.2	0	0	22.7	0	21.2	0	0	25	0	19.8	0	26.4	0	0	22.5	0	0	24.9	0	25.2	0
		1.4	0.9	0.7	0.9	-1 -1	0.8	1.3	1. .1	2.2	_	1.6	_	1.5	0.9	1.3	0.9	1.2	1.2	1.3	1.6	0.9	2.1		_	1.3	0.7	1.5	 	0.8	0.8
				N	0.6	2.3	-1 -1	2.6	1.6	2.1	1.4	1.7	2.9	2.9	3.2	-1 -1	1.5	1.5	-1 -1	1.9	1.4	2.2	1.3	-1 .8	2.3	1.4	1.8	2.9	1.7	2.1	1.2
				21.8	0	22.8	0	25.6	0	23.4	0	0	21.9	0	20.3	0	0	22.5	0	22.1	0	22.8	0	0	19	0	0	24.1	0	24.3	0
		0.8	0.7	0.3	0.7	0.5	0.5	0.6	0.6	1.7	0.5	<u>ـ</u>	0.6	- <u>-</u> 	0.7	0.7	0.6	0.7	0.5	0.6	-1 -1	0.8	1.2	-1.3	0.7	0.5	0.8	1.3	0.7	0.5	0.4
					0.9	N	-	1.9	1. .1	N	 	1.4	3.7	1.8	2.4	1.3	1.2	2.2	1.4	1.7	 	N	1.6	1.6	2.6	1.3	1.2	3.1	1.2	2.1	0.9
				22.8	0	21.3	0	24.7	0	30	0	0	24.1	0	23.3	0	0	26.8	0	24.2	0	22.6	0	0	21.6	0	0	24.4	0	23.9	0
		0.8	0.7	0.3	0.5	0.4	0.4	0.5	0.5	-	0.6	0.7	0.5	 	0.6	0.8	0.6	0.8	0.7	0.8	_	0.8	1.8	0.7	0.8	0.5	0.4	1.5	_	0.7	0.6
				2.2	0.6	1.5	0.7	1.6	0.7	1.6	<u> </u>	- <u>-</u> -	1.9	1.4	2.5	<u>د</u>	0.9	1.6	0.9	1.4	<u>د</u>	1.9	1.2	1.2	1.8	0.9	0.9	2.6	د	N	0.7
				19.2	0	19.7	0	22.2	0	24.5	0	0	19.6	0	19.2	0	0	17.7	0	19.3	0	19.5	0	0	20.6	0	0	19.2	0	16.7	0
		 	1.2	0.5	1.2	0.7	1.2	0.8	-	1.6	0.8	1.4	 	1.8	0.7	1.2	1.6	1.4	<u>1</u> .5	1.7	1.6	1.6	2.4	0.9	0.7	0.4	0.6	0.8	-	 	1.2
				3.2	1.7	2.5	0.9	2.6	2.2	2.2	2.2	1.9	2.4	2.2	3.6	2.1	ω	2.5	2.1	2.4	2.3	3.5	1.4	N	1.8	- <u>1</u> .57	1.4	2.8	2.2	2.7	1.9
				24.3	0	25.1	0	24.9	0	30.4	0	0	26.5	0	22.7	0	0	22.3	0	19.5	0	23.6	0	0	26	0	0	26.1	0	22.1	0
		N	1.7	0.4	0.6	1.7	1 .1	0.7	0.9	Ν	1.4	1.9	1.3	2	1.7	1.8	1.4	1.4	1.6	2.8	2.4	2.9	2.5	1.9	N	 	1.ω	2.1	2.6	2.2	1.9
				N	1.2	2.5	Ν	2.8	1.4	2.1	2.3	2.7	3.9	3.8	3.6	2.6	2.6	2.5	Ν	2.4	1.9	3.2	3.3 3	ω	2.5	N	1.9	4.1	2.3	2.5	Ν
				32.1	0	30.6	0	30.5	0	27.7	0	0	29.6	0	33.9	0	0	34.9	0	27.8	0	27.2	0	0	30.9	0	0	25.7	0	21.7	0

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APPENDIX B: COMPLETENESS OF MONITORING DATA

*Sample #3 a Note: Data ca	H_2S	O ₃	NO_2	SO_2		Parameter	
nd #4 repoi pture rates		12	28	28		Jan	
expressed		12	28	28		Feb	
as number	-	12	28	28		Mar	
of valid sar		12	28	28		Apr	O P
nples /total	-	12	28	28		May	
in data cap number of	2	12	28	30		Jun	0 - 0
samples.	2	12	28	30		Jul	
	2	12	28	30		Aug	
	2	12	28	30		Sep	
	2	12	28	30		Oct	
	2	12	28	30		Nov	
	2	12	28	30		Dec*	•
	14	144	336	350	Capture	Total	
	100%	94.74%	100%	100%	Capture	0%	

Data capture rates for passive monitoring parameters during 2009

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Xtrm	Avg	Sum	Dec	Nov	Oct	Sep	Aug	Jul	Jun	May	Apr	Mar	Feb	Jan			Month		
	8.29		-12.2		6.3	25.8	24.0	23.6	22.2	17.8	9.3	-4.0	-10.1	-11.5	тетр	Tomn	Mav	Mean	
	1.96		-17		2.5	16.9	17.0	16.5	15.1	9.9	3.6	-9.9	-15.5	-17.5		Temp C	Mean		
1 - -	-4.41		-21.8		-1.4	8.0	9.9	9.4	8.0	1.8	-2.2	-15.8	-20.9	-23.5	теттр С	Tomp	Min	Mean	Latitude
33.2			0.3		20.1	33.2	33.0	31.2	30.9	27.8	25.2	4.7	1.1	4.2	теттр С	Tomp	Mav	Extra	: 49° 13' N
-43.4			-34.2		-7.8	-0.9	4.0	3.6	0.0	-5.4S	-12.6	-34.3	-33.2	-43.4	тетир С	Tomo	Min	Extra	Longitude:
-		269.2	0		42.6	5.2	71.6	37.6	66.4	6.0	39.6	0.2	-	0.0		INAIII	Rain	Total	102° 58' W
		140.5	21		20.6	0.0	0.0	0.0	0.0	-1	1.2	8.3	46.4	43.0	CIII		Snow	Total	Elevation: :
		409.5	20.8		68.6	5.2	71.6	37.6	66.4	6.0	40.8	8.5	44.2	39.8		r reip	Precin	Total	580.60 m
			9		0	0	0	0	0	0	0	ы	24	9	Day cm	Last	Grna	Snow	
34			34		32	30E	32B	31E	25B	32E	7E	31E	30E	30E	10's Deg	Gust	Max	Dir of	
83E			59		63	70E	56B	74E	74B	70E	63E	74E	59E	83E	km/h	Gust	Iviax	Speed of	

Monthly Meteorology Data for Estevan 2009

Source: Environment Canada, <u>http://www.climate.weatheroffice.ec.gc.ca/climateData/monthlydata_e.html</u>

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APPENDIX D: SESAA BOARD OF DIRECTORS 2009

Bob Scotten – Executive Director (SEACOR Environmental Inc.)

Mr. Scotten has extensive experience in airshed development and management. He served as the Executive Director of the Wood Buffalo Environmental Association (WBEA) from 1997 to 2000, and is the current Executive Director of the West Central Airshed Society (WCAS) and the Palliser Airshed Society (PAS) in Alberta. He was instrumental in the design and development of the award-winning WBEA air monitoring network and the first real-time website for public access to air quality data. He has also played key roles in the development of the Peace Airshed Society in Alberta.



Bob Scotten Executive Director



Marian Wilson – Chairperson (Private Business Owner)

Ms. Wilson is a bookkeeper for a construction business that she and her husband have owned and operated for over 23 years in southeast Saskatchewan. She is active in the Estevan community, raising 5 children, volunteering at the long term care centre and other groups, and sitting on the CPR Advisory Committee. As a local resident who has observed the growth of the transportation industry in Estevan, Ms. Wilson is concerned about the quality of air in the area and is pleased to be a director on the SESAA Board.



Chuck Bosgoed Saskatchewan Environment Alternate: Murray Hilderman



Debbie Nielsen SaskPower Alternate: Mike Zeleny

Chuck Bosgoed – Director (Saskatchewan Environment)

Mr. Bosgoed is an Environmental Engineer who has worked with Saskatchewan Environment for 20 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." Debbe 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 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.



Dean Pylypuk Saskatchewan Industry &Resources 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.



Darlene Sakires Canadian Natural Resources Limited Alternate: John Hutt

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.



Chris Seeley Saskatchewan Health Alternate: Grant Paulson

APPENDIX E: 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 Abenteuer Resources Corp. Advantage Oil and Gas Aldon Oils Apache Canada Ltd. ARC Resources 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. Corporation Devon Canada Corporation Diaz Resources Ltd. Elswick Energy Ltd. Enermark Inc. Fairborne Energy Ltd. Flagstone Energy Frank R. Lee Investments GKN Resources Ltd. Grand Bow Petroleum Limited 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. Kootney Energy Magellan Resources Ltd. Mancal Energy Inc. Midale Petroleums Ltd. NAL Resources Limited Nexxtep Resources Novus Energy Inc. Nuloch Resources Inc. Omatius Oil & Gas Ltd. Painted PonyPetroleum Pemoco Ltd. Penn West Petroleum Ltd. Petrex Energy Primrose Drilling Ventures Ltd. Questerre Energy

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 Itd. Valleyview Petroleums Ltd. Villanova Resources Inc. Zargon Oil & Gas Ltd.

How to Become a Member

For more information on how to become a member, please contact Bob Scotten at (780) 446-3277.



Southeast Saskatchewan Airshed Association 2009 ANNUAL REPORT SOUTHEAST SASKATCHEWAN AIRSHED ASSOCIATION