



**STRATHCONA INDUSTRIAL ASSOCIATION
AMBIENT AIR MONITORING NETWORK
ANNUAL REPORT
2000**



March 12, 2001

Alberta Environment
Enforcement and Monitoring Division
11th Floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta, T5K 2J6

**Reference: Strathcona Industrial Association
Ambient Air Monitoring Network - Annual Report 2000**

Dear Sir:

On behalf of the Strathcona Industrial Association, we are pleased to present the 2000 Annual Report of the Ambient Air Monitoring Network.

The Ambient Air Monitoring Network and its operations are structured to meet the requirements of the Air Monitoring Directive (AMD - 1989). Data from the network is used by Association members to assess current and historical air quality.

This report includes an Executive Summary, highlights of the Ambient Air Monitoring Network Operations and an Assessment of Air Quality during 2000.

Summary information on the Strathcona Industrial Association, including its membership, objectives and details on the monitoring network are also appended to this report.

We trust that this report satisfies your requirements and that the data summary presented herein will be useful to you and your colleagues.

Yours truly,

STRATHCONA INDUSTRIAL ASSOCIATION

Gilles Courtemanche
President

Enclosure

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ABBREVIATIONS

24-hours	- a calendar day
AIC	- Automatic Instrument Check (instrument self-verification process)
AMD	- 'Air Monitoring Directive' issued by Alberta Environment in 1989
C.A.E.R.	- Community Awareness and Emergency Response program
calm	- 1-hour average wind speed is lower than 1 km/hour
CASA	- Clean Air Strategic Alliance
CDEF	- Continuous Data Exchange Format (for 5-minute and 1-hour data transfer to the CASA Data Warehouse)
H ₂ S	- hydrogen sulphide
Hi-Vol	- high volume sampler
MST	- Mountain Standard Time
NO ₂	- nitrogen dioxide
NO	- nitric oxide
NO _x	- oxides of nitrogen
PM ₁₀ and PM _{2.5}	- inhalable particulates
RTU	- Remote Terminal Unit (collecting data at each station)
SIA	- Strathcona Industrial Association
SO ₂	- sulphur dioxide
THC	- total hydrocarbons
TSP	- Total Suspended Particulates collected by a Hi-Vol sampler
WDIR	- wind direction
WSPD	- wind speed

UNITS OF MEASUREMENT

µg/m ³	- micrograms per cubic meter
average	- arithmetic average $X = \sum n X_i / \sum n$
geometric average	- $X = \text{antilog of } \sum(n \log X_i) / \sum n$
km/hr	- kilometers per hour
mg SO ₃ eq./day/100 cm ²	- milligrams of SO ₃ equivalent per day per 100 square centimeters
ppb	- parts per billion by volume
ppm	- parts per million by volume

EXECUTIVE SUMMARY

The Strathcona Industrial Association (SIA) is a registered non-profit organization of eleven companies with operating facilities located in east Edmonton and Strathcona County.

The SIA commenced multi-user operation of the Ambient Air Monitoring Network in the early 1980s. The network consists of seven continuous air monitoring stations and twenty one static monitoring stations. The stations are situated throughout an approximate 12 km x 12 km area that consists of large industrial plants surrounded by commercial, light industrial and residential land users. Three of the seven continuous air monitoring stations also contain analyzers which sample air quality on days specified coast-to-coast by Environment Canada.

Results of Ambient Air Monitoring

A) Continuous Monitoring

Parameters measured by the network on a continuous basis include:

- Hydrogen sulphide (H₂S)
- Sulphur dioxide (SO₂)
- Nitrogen oxides (NO, NO_x, NO₂)
- Total hydrocarbons (THC)
- Wind speed and wind direction (WSPD and WDIR).

The concentrations of various parameters recorded by the SIA network are well below the provincial guidelines indicating that the ambient air quality in the region is good. In 2000, two exceedances of the H₂S 1-hour guideline were recorded. The SIA member plants reported stable operations. These situations were likely caused by non-SIA sources.

PARAMETER	NO. OF MONITORING STATIONS	NUMBER OF 1-HOUR EXCEEDANCES				
		2000	1999	1998	1997	1996
Hydrogen Sulphide (H ₂ S)	5	2	2	7	8	0
Sulphur Dioxide (SO ₂)	3	0	0	0	0	0
Nitrogen Dioxide (NO ₂)	2	0	0	0	0	0

The 24-hour and the annual average concentration values for sulphur dioxide and nitrogen dioxide were below the Alberta Ambient Air Quality guideline levels. The hydrogen sulphide 24-hour Alberta Ambient Air Quality guideline level was exceeded once at the Beverly station on February 1, 2000. All SIA members reported normal plant operations during this period.

B) Intermittent Monitoring

Total Suspended Particulates (TSP). A high volume (Hi-Vol) particulate sampler was operated at Beverly and Gold Bar stations in 2000. The Hi-Vol unit collects a 24-hour composite sample of TSP at each location on every sixth day. The annual average and the monthly average particulate levels were about 60 % of the Alberta Ambient Air Quality guidelines.

The TSP 24-hour Alberta Ambient Air Quality guideline level was exceeded once at the Beverly station on March 1, 2000. All SIA members reported normal plant operations during this period.

PARAMETER	NO. OF MONITORING STATIONS	NUMBER OF EXCEEDANCES				
		2000	1999	1998	1997	1996
Total Suspended Particulates (TSP)	2 (from Aug. 1, 1998)	1	0	2	-	-
	3 (till Jul. 31, 1998)	-	-	7	2	1

Inhalable Particulates. The inhalable particulates PM₁₀ and PM_{2.5} were monitored at the Sherwood Park station. PM₁₀ and PM_{2.5} are measured in the same six-day frequency as TSP and the instrument is set up to alternate between sampling of PM₁₀ and PM_{2.5}. The measured concentrations of PM₁₀ varied from 6.706 to 45.721 µg/m³ and the PM_{2.5} varied from 3.638 to 37.889 µg/m³. There are no Alberta Ambient Air Quality guideline levels for PM₁₀ and PM_{2.5}.

C) Static Monitoring.

The SIA also operates a separate static monitoring network that consists of 21 stations. The exposure cylinders are assembled in a grid pattern, which covers approximately the same area as the continuous ambient air monitoring network. Recorded values of both hydrogen sulphide and total sulphation ranged between 2 and 56 % of the Alberta Ambient Air Quality guideline limits.

PARAMETER	NO. OF MONITORING STATIONS	NUMBER OF EXCEEDANCES				
		2000	1999	1998	1997	1996
Exposure Cylinder Network	21	0	0	0	0	0

Network Operational Review and Enhancements.

The average operational time of the continuous monitoring system was 99.1 %. There were no major operating problems with the individual analyzers, telecommunication system or with the central computer.

The particulate samplers and the static monitoring stations also operated reliably.

SIA was very active in the C.A.E.R. (Community Awareness and Emergency Response) program. C.A.E.R. is a North American wide initiative adopted by the SIA to enhance relationships between the community and industry. The SIA participated in approximately 15 activities in 2000 ranging from community safety events to C.A.E.R. fairs. Data from the ambient air monitoring network was on display to the public at the majority of these events.

INTRODUCTION

STRATHCONA INDUSTRIAL ASSOCIATION

The Strathcona Industrial Association (SIA) is an organization of eleven industrial companies operating in east Edmonton and Strathcona County. The SIA was formed in the mid 1970s to represent members on matters of common concern. The historical development of the SIA and the SIA Ambient Air Monitoring Network is described in Appendix A.

Present membership of the SIA is as follows:

- AT Plastics Inc.
- Alberta Envirofuels Inc.
- Alcan Smelters and Chemicals Ltd
- AltaSteel Ltd.
- Celanese Canada Inc.
- The City of Edmonton Gold Bar Wastewater Treatment Plant
- Enbridge Pipelines Inc.
- EPCOR
- Imperial Oil
- Owens-Corning Canada Inc.
- Petro-Canada Products

The Association is incorporated under Alberta's Companies Act as a non-profit organization. It is managed by a Board of Directors, the Environmental Committee and the C.A.E.R. Committee. The Board of Directors establishes and implements policy and manages the finances. The Environmental Committee has a mandate to address environmental matters, to oversee the operation of the Ambient Air Monitoring Network, to deal with any technical matters of concern to the member companies and to liaise with the provincial regulatory authority, Alberta Environment.

The SIA mission statement is:

“....to work with the Community, City, and the County to ensure a safe and healthy working and living environment”.

Expansions and Modifications of Individual Plants

A list of specific expansions and modifications of individual plants that could affect ambient air quality is not compiled in the 2000 SIA Annual Report as required by the AMD-1989, page 37, paragraph 'f'. The SIA member companies report and discuss their individual expansion activities directly with Alberta Environment or applicable regulatory agency.

AMBIENT AIR MONITORING NETWORK

The locations of monitoring stations in the Ambient Air Monitoring Network are shown in Figure 1. A detailed description of the network is included in Appendix B.

Continuous Monitoring

The following is a list of continuous parameters monitored at the seven monitoring stations:

MONITORING STATION	CONTINUOUSLY MONITORED PARAMETERS					
	SO ₂	H ₂ S	NO _x /NO/NO ₂	THC	WSPD	WDIR
1 Clover Bar	-	★	★ ★ ★	-	★	★
2 Sherwood Park	★	★	- - -	★	★	★
3 Elmjay	★	★	- - -	-	★	★
4 Gold Bar	-	★	- - -	-	★	★
5 Beverly	★	★	- - -	★	★	★
6 Forest Heights	-	-	★ ★ ★	-	★	★
7 Clareview	-	-	- - -	-	★	★

Readings are taken every second for each parameter and averaged into 30-second values at each station. The 30-second averages are then transferred into a central computer database. The central computer collects the real-time and historical air monitoring data from all stations, as well as instrument span checks and monthly four-point calibrations of analytical instruments. All authorized users can view the recorded data in graphical images and charts or in user definable LOG reporting formats (Appendix C).

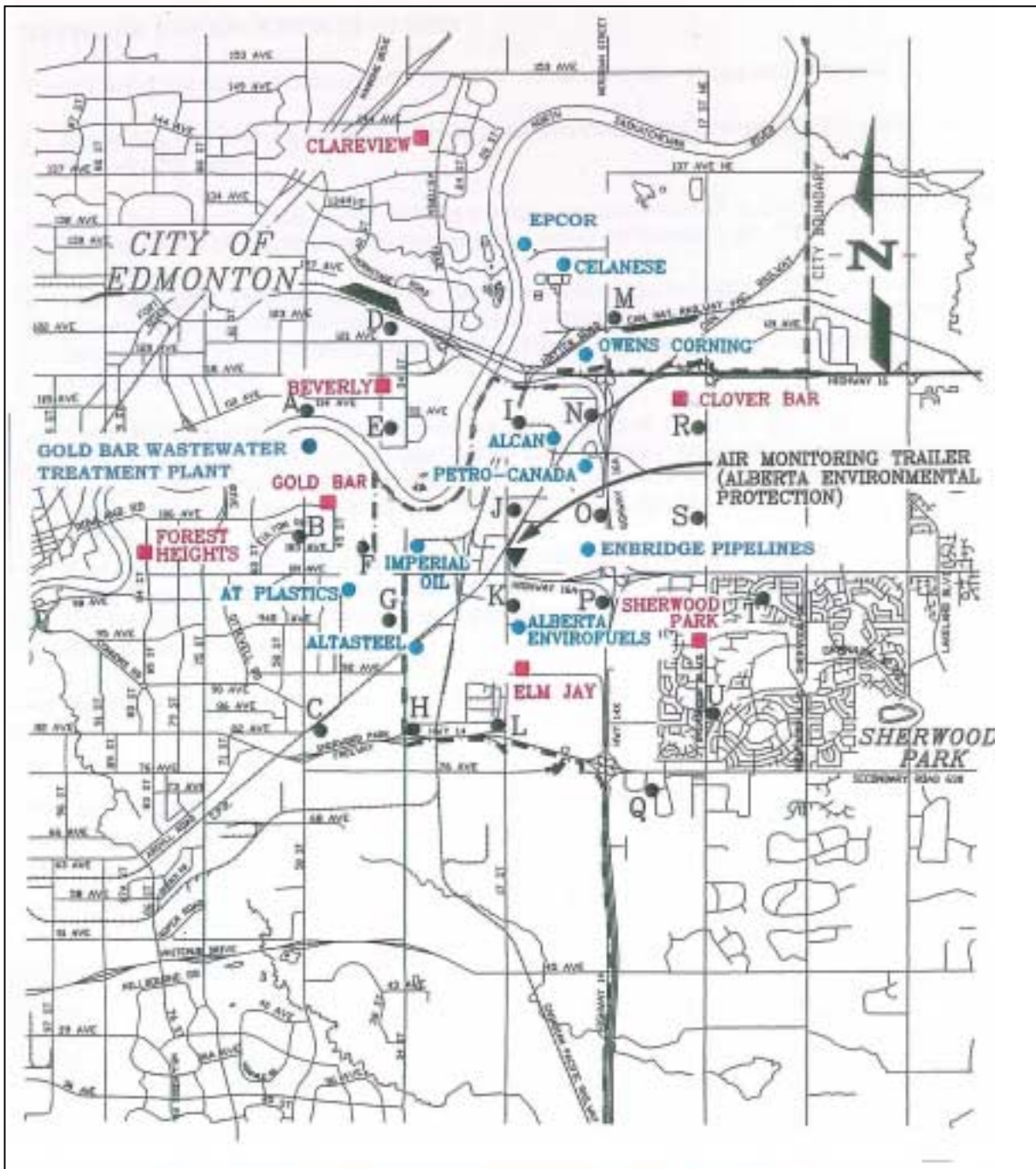
Intermittent Monitoring

Total Suspended Particulates (TSP) were monitored at two stations located in residential areas. The Hi-Vol samplers, which are located in Beverly and Gold Bar stations operate every sixth day and run for a 24-hour period. Four to six filters were collected from each Hi-Vol sampler every month.

Inhalable particulates (PM₁₀ and PM_{2.5}) were monitored at the Sherwood Park station. Inhalable particulates are collected on the same days as TSP and the sampler is set up to alternate between sampling of PM₁₀ and PM_{2.5}.

Static Monitoring

An Exposure Cylinder Network, consisting of 21 exposure cylinders, is evenly distributed throughout the industrial area and nearby residential communities. The cylinders monitor total sulphation and static hydrogen sulphide. Each cylinder is replaced once per month. More details on the Exposure Cylinders Network can be found in Appendix D.



- Legend:**
- Strathcona Industrial Association Members
 - Air Monitoring Sites
 - Exposure Cylinder Network stations
 - ▼ Air Monitoring Site - Alberta Environmental Protection

Figure 1 SIA Ambient Air Monitoring Network

NETWORK ENHANCEMENTS IN 2000

The following is a list of significant enhancements performed during 2000:

- Y2K rollover into the new millennium was smooth. All network components operated reliably. No issues were encountered during the leap year date of February 2000.
- The NOx analyzer at the Clover Bar station was replaced with a new instrument TECO 42C (March 13, 2000).
- Meteorological towers were replaced at the Sherwood Park station on April 18, at the Beverly station on April 25 and at the Clareview station on December 19, 2000.
- The UPS (Uninterruptible Power Source) units were replaced at all stations (June 2000).
- The following SIA stations were audited by the Alberta Environment staff: Forest Heights (May 31), Beverly (June 3), Elmjay and Gold Bar (October 16), Beverly (October 31), Clover Bar and Clareview (November 2).
- Modifications to the Forest Heights station air intake manifold were initiated in July and approved by Alberta Environment inspection on July 21, 2000.
- Roofs and trailers of at the Clover Bar, Beverly and Clareview stations were extensively repaired in August – September 2000.

The day-to-day management and field investigations related to the SIA ambient air monitoring network were carried out by Eco Tech Consulting Ltd. Eco Tech Consulting is an independent environmental company based in Edmonton.

RESULTS OF AIR QUALITY MONITORING

OVERVIEW

The SIA network measures *ambient air quality*, which refers to the general quality of air in a region. Ambient air quality data is used to monitor trends in air quality, which result from emissions from man-made sources (industry, motor vehicles) and natural biological processes. It does not specifically measure emissions from a single source. Weather conditions also influence the quality of ambient air.

The following table lists exceedances of the Alberta Ambient Air Quality guidelines as recorded by the SIA Ambient Air Monitoring Network over the past five years:

TYPE OF SAMPLING / PARAMETER	NO. OF MONITORING STATIONS	NUMBER OF EXCEEDANCES				
		2000	1999	1998	1997	1996
Continuous:*						
Hydrogen Sulphide (H ₂ S)	5	2	2	7	8	0
Sulphur Dioxide (SO ₂)	3	0	0	0	0	0
Nitrogen Dioxide (NO ₂)	2	0	0	0	0	0
Intermittent:**						
Total Suspended Particulates (TSP)	2	1	0	2	-	-
	3	-	-	7	2	1
Static:***						
Hydrogen Sulphide	21	0	0	0	0	0
Total Sulphation	21	0	0	0	0	0

* Number of exceedances of 1-hour guidelines

*** Number of exceedances of 30-day guidelines

** Number of exceedances of 24-hour guidelines

All recorded concentrations for all parameters are well below the Alberta Ambient Air Quality guidelines except for two 1-hour concentrations and one 24-hour concentration of hydrogen sulphide. Alberta Environment was informed of these situations during the year. This degree of compliance indicates good ambient air quality in east Edmonton and nearby residential communities.

Tables 1 to 15 (pages 25 – 42) included at the end of this section summarize ambient air monitoring data measured at individual stations in 2000 as follows:

Table 1	Key Parameters - Continuous Monitoring Data
Tables 2, 3, 4, 5	Hydrogen Sulphide (H ₂ S), Sulphur Dioxide (SO ₂), Nitrogen Dioxide (NO ₂) and Total Hydrocarbons (THC)
Table 6A	Total Suspended Particulates (TSP)
Table 6B	Inhalable Particulates (PM ₁₀ and PM _{2.5})
Tables 7, 8, 13, 14	Total Sulphation and Static Hydrogen Sulphide
Tables 9, 10, 11, 12	Frequency Distributions of a Parameter and Wind Data
Table 15	Alberta Ambient Air Quality Guidelines

A comparison of the 2000 annual averages with the corresponding historical values since 1996 indicates that the overall air quality has remained unchanged in the region. The 2000 average values for all parameters remained extremely low.

TYPE OF SAMPLING / PARAMETER	RANGE OF ANNUAL AVERAGES				
	2000	1999	1998	1997	1996
Continuous: (expressed in ppm)					
Hydrogen Sulphide (H₂S) (5 stations)	0.000 - 0.001	0.000 - 0.001	0.000 - 0.001	0.001	0.000 - 0.001
Sulphur Dioxide (SO₂) (3 stations)	0.002 - 0.003	0.001 - 0.004	0.003 - 0.004	0.002 - 0.004	0.002 - 0.003
Nitrogen Dioxide (NO₂) (2 stations)	0.017 - 0.021	0.014 - 0.021	0.015 - 0.022	0.016 - 0.026	0.012 - 0.036
Total Hydrocarbons (THC) (2 stations)	2.0 - 2.1	2.0 - 2.1	2.0 - 2.1	1.4 - 2.0	1.6 - 2.0
Intermittent: (expressed in µg/m ³)					
Total Suspended Particulates (TSP) (* 2 stations from Aug. 1, 1998) (** 3 stations till July 31, 1998)	30.8 – 33.0*	32.5 - 32.9*	35.0* - 37.4**	29.8 - 35.9**	25.4 - 33.2**
Inhalable Particulates: PM₁₀ PM_{2.5} (1 station)	16.444 10.788	16.458 6.867	15.665 9.074	- -	- -
Static: (mg SO ₃ eq./day/100 cm ²)					
Total Sulphation (21 stations)	0.009 - 0.128	0.010 - 0.116	0.014 - 0.105	0.035 - 0.127	0.019 - 0.124
Static Hydrogen Sulphide (21 stations)	0.003 - 0.014	0.004 - 0.010	0.002 - 0.009	0.004 - 0.012	0.003 - 0.013

Meteorological Information - Wind Speed and Wind Direction

Both wind speed and wind direction are very important factors influencing regional air quality. Even if the wind is blowing from the same direction, diffusion and dispersion of emitted gases and particulates is greatly impacted by variation in wind speed and corresponding air turbulence. Different degrees of turbulence are created by variable mixing conditions due to the vertical gradient of ambient temperatures and terrain roughness unique to each station. Annual frequency distributions of wind speed and wind direction are presented in Table 12.

CONTINUOUS AIR QUALITY MONITORING

HYDROGEN SULPHIDE (H₂S)

Alberta Ambient Air Quality guidelines for hydrogen sulphide are:

- 1-hour average concentration **0.010 ppm**
- 24-hour average concentration **0.003 ppm**
- Annual average concentration Not established

The highest concentrations recorded in 2000 at the individual stations are summarized in the following table. The annual average concentration is also provided.

MONITORING STATION	HIGHEST H ₂ S CONCENTRATIONS RECORDED AT INDIVIDUAL STATIONS			ANNUAL AVERAGE (ppm)
	1-HOUR (ppm)	24-HOURS (ppm)	MONTHLY (ppm)	
Clover Bar	0.011	0.002	0.001	0.001
Sherwood Park	0.005	0.002	0.001	0.000
Elmjay	0.005	0.002	0.001	0.000
Gold Bar	0.009	0.003	0.002	0.001
Beverly	0.012	0.004	0.001	0.001

Hydrogen sulphide levels were extremely low in the region. The annual average concentrations of H₂S show only minute fluctuations during the past several years:

MONITORING STATION	HYDROGEN SULPHIDE (H ₂ S)- ANNUAL AVERAGE CONCENTRATION (ppm)				
	2000	1999	1998	1997	1996
Clover Bar	0.001	0.001	0.001	0.001	0.001
Sherwood Park	0.000	0.001	0.001	0.001	0.000
Elmjay	0.000	0.000	0.000	0.001	0.000
Gold Bar	0.001	0.001	0.001	0.001	0.000
Beverly	0.001	0.001	0.001	0.001	0.001

A frequency distribution of the one-hour averages of hydrogen sulphide is provided in Table 9.

During 2000, there were two occurrences when H₂S concentrations exceeded the 1-hour guideline specified in the Air Monitoring Directive (AMD-1989, Alberta Environment) and in the Alberta Ambient Air Quality guidelines. During these exceedances SIA member companies reported normal operation.

NUMBER OF H ₂ S EXCEEDANCES OF 1-HOUR GUIDELINE	2000	1999	1998	1997	1996
	2	2	7	8	0

Alberta Environment was informed of each occurrence and an Incident File Number was issued. The results of the SIA investigations are described in the following table:

DATE	MONITORING STATION	TIME (MST)	1-HOUR H ₂ S AVERAGES (ppm)	RESULTS OF INVESTIGATION FOR H ₂ S EXCEEDANCES
June 28	Clover Bar	05:00	0.011	Wind was gentle at about 3.7 km/hour from the southwest (272° from north). All SIA member companies reported normal operation and this situation was likely caused by an inversion.
June 28	Beverly	24:00	0.012	Wind was very light at 1.9 km/hour from the southwest (229° from the north). All SIA member companies reported normal operation. There was a mild inversion in the entire area. Ambient concentration of H ₂ S returned to normal level when the wind speed increased (shortly after midnight).

The 24-hour average concentrations for hydrogen sulphide were below the provincial guideline of 0.003 ppm except one day at the Beverly station. On February 1, 2000 the recorded 24-hour concentration of H₂S reached 0.004 ppm. All SIA members reported normal plant operations during this period.

The average operational time of all five H₂S instruments in 2000 was 99.3%.

SULPHUR DIOXIDE (SO₂)

Alberta Ambient Air Quality guidelines for sulphur dioxide are:

- 1-hour average concentration **0.170 ppm**
- 24-hour average concentration **0.060 ppm**
- annual average concentration **0.010 ppm**

The highest concentrations of SO₂ recorded in 2000 at individual stations are shown in the following table. The annual average concentration is also provided.

MONITORING STATION	HIGHEST SO ₂ CONCENTRATION RECORDED AT INDIVIDUAL STATIONS			ANNUAL AVERAGE (ppm)
	1-HOUR (ppm)	24-HOURS (ppm)	MONTHLY (ppm)	
Sherwood Park	0.053	0.009	0.003	0.002
Elmjay	0.040	0.011	0.004	0.003
Beverly	0.061	0.028	0.005	0.003

A comparison of the annual average concentration of SO₂ for the three monitoring stations for the past five years is provided below. SO₂ concentration in the regional air shed is stable with only minute fluctuations from year to year.

MONITORING STATION	SULPHUR DIOXIDE (SO ₂)- ANNUAL AVERAGE CONCENTRATION (ppm)				
	2000	1999	1998	1997	1996
Sherwood Park	0.002	0.002	0.004	0.002	0.002
Elmjay	0.003	0.001	0.003	0.003	0.003
Beverly	0.003	0.004	0.004	0.004	0.003

A frequency distribution of the sulphur dioxide 1-hour averages is provided in Table 10. No exceedances have been recorded during the last 5 years.

NUMBER OF SO ₂ EXCEEDANCES OF 1-HOUR GUIDELINE	2000	1999	1998	1997	1996
	0	0	0	0	0

The average operational time of all three instruments in 2000 was 99.5%.

NITROGEN DIOXIDE (NO₂)

Alberta Ambient Air Quality guidelines for nitrogen dioxide are:

- 1-hour average concentration **0.210 ppm**
- 24-hour average concentration **0.110 ppm**
- annual average concentration **0.030 ppm**

Nitrogen dioxide concentration in the ambient air is a combination of emissions from several sources. The main contributors are vehicular traffic and residential heating, rather than industrial plants. The highest concentrations recorded in 2000 at the individual stations are summarized below:

MONITORING STATION	HIGHEST NO ₂ CONCENTRATION RECORDED AT INDIVIDUAL STATIONS			ANNUAL AVERAGE (ppm)
	1-HOUR (ppm)	24-HOURS (ppm)	MONTHLY (ppm)	
Clover Bar	0.089	0.044	0.029	0.017
Forest Heights	0.117	0.081	0.044	0.021

The following table compares the annual average concentration at the two monitoring stations.

MONITORING STATION	NITROGEN DIOXIDE (NO ₂)- ANNUAL AVERAGE CONCENTRATION (ppm)				
	2000	1999	1998	1997	1996
Clover Bar	0.017	0.014	0.015	0.016	0.012
Forest Heights	0.021	0.021	0.022	0.026	0.036

A frequency distribution of the nitrogen dioxide 1-hour averages is provided in Table 11. There were no exceedances of the 1-hour provincial guideline limit in 2000.

NUMBER OF NO ₂ EXCEEDANCES OF 1-HOUR GUIDELINE	2000	1999	1998	1997	1996
		0	0	0	0

The 1-hour, 24-hour and the annual average NO₂ concentrations were well below the provincial guideline limits.

The average operational time of the two instruments in 2000 was 98.6%.

TOTAL HYDROCARBONS (THC)

Alberta does not have guidelines for ambient air concentrations of total hydrocarbons. However, the background ambient concentration of total hydrocarbons in Alberta is between 1.5 to 2.0 ppm ('Air Quality Monitoring in Alberta, Summary Report 1995', page 15).

'Total hydrocarbons' refer to a broad family of chemicals that contain carbon and hydrogen atoms. Sources include vegetation, natural biological processes, emissions from everyday work (industry, motor vehicles) and leisure activities (fireplaces).

The Sherwood Park and Beverly stations are equipped with total hydrocarbon analyzers. The highest readings recorded in 2000 for different averaging periods were:

MONITORING STATION	HIGHEST TOTAL HYDROCARBONS CONCENTRATION RECORDED AT INDIVIDUAL STATIONS			ANNUAL AVERAGE (ppm)
	1-HOUR (ppm)	24-HOURS (ppm)	MONTHLY (ppm)	
Sherwood Park	4.9	3.3	2.2	2.1
Beverly	8.0	4.2	2.4	2.0

The following table compares the annual average concentration of total hydrocarbons at the two monitoring stations:

MONITORING STATION	TOTAL HYDROCARBONS - ANNUAL AVERAGE CONCENTRATION (ppm)				
	2000	1999	1998	1997	1996
Sherwood Park	2.1	2.1	2.1	2.0	2.0
Beverly	2.0	2.0	2.0	1.4	1.6

In general, total hydrocarbons levels are in the normal ambient background range and only minor fluctuations were registered. Detailed information on total hydrocarbons is listed in Table 5.

The average operating time of the two instruments in 2000 was 99.0%.

INTERMITTENT AIR QUALITY MONITORING

A) TOTAL SUSPENDED PARTICULATES (TSP)

Alberta Ambient Air Quality guidelines for total suspended particulates are:

- 24-hour total loading **100 $\mu\text{g}/\text{m}^3$**
- annual geometric average loading **60 $\mu\text{g}/\text{m}^3$**

Suspended particulates are very fine particles, which range from about 0.001 to 500 microns in diameter. The particles may originate from soil, road and agricultural dust, smoke, forest fires, vehicular emissions and industrial sources.

Total suspended particulates (TSP) are measured by high volume (Hi-Vol) samplers following a six-day cycle. The sampling days are synchronized in all provinces by Environment Canada. On a sampling day, a pump at each station is automatically turned on and air is drawn through a very fine filter for the next 24 hours. The filters are submitted for weight analyses.

The Sherwood Park station ceased monitoring of TSP at the end of July 1998 and initiated monitoring of inhalable particulates. For 2000, the highest daily and monthly loading and annual averages at the individual stations are summarized in the following table:

MONITORING STATION	HIGHEST RECORDED TOTAL SUSPENDED PARTICULATES LOADING AT INDIVIDUAL STATIONS		ANNUAL GEOMETRIC AVERAGE ($\mu\text{g}/\text{m}^3$)
	24-HOURS ($\mu\text{g}/\text{m}^3$)	MONTHLY AVERAGE ($\mu\text{g}/\text{m}^3$)	
Gold Bar	85.3	43.7	30.8
Beverly	106.1	54.0	33.0

The following table compares the historical annual average concentration at the three monitoring stations:

MONITORING STATION	TOTAL SUSPENDED PARTICULATES ANNUAL AVERAGE LOADING ($\mu\text{g}/\text{m}^3$)				
	2000	1999	1998	1997	1996
Sherwood Park*	-	-	35.0*	29.8	25.4
Gold Bar	30.8	32.9	36.8	31.9	25.9
Beverly	33.0	32.5	37.4	35.9	33.2

* Until July 31, 1998

One exceedance of the 24-hour provincial guideline level was recorded at the Beverly station on March 1, 2000. On the same day the concentration of TSP at the Gold Bar station was also elevated. Wind was blowing 4-18 km/hr from the south. The SIA member companies did not report any unusual operating conditions.

NUMBER OF EXCEEDANCES OF 24-HOUR GUIDELINE	2000	1999	1998	1997	1996
	1	0	9	2	1

During 2000, a total of 118 valid samples were collected at the two locations. Geometric annual averages of total suspended particulates were low in the region. Detailed information for total suspended particulates is provided in Table 6A.

B) INHALABLE PARTICULATES (PM₁₀ and PM_{2.5})

Inhalable particulates are very fine particles that may potentially affect human health. PM₁₀ particles have a diameter of less than 10 micrometers and are suspended in the air for an indefinite period of time. Particles with diameters between 2.5 and 10 micrometers are generally removed from inspired air in the nose and throat. Particles that have a diameter of less than 2.5 micrometers (PM_{2.5}) can penetrate into the lungs. The particles may originate from soil, road and agricultural dust, smoke, forest fires, vehicular emissions and industrial sources. Currently, there are no federal or provincial guidelines for inhalable particulates.

The measurement of inhalable particulates at the Sherwood Park station was initiated on August 1, 1998. PM₁₀ and PM_{2.5} samples are collected for a duration of 24-hours every sixth day. The sampling instrument alternates collection of PM₁₀ and PM_{2.5}.

In 2000, the highest 24-hour loading and the highest monthly average are compared with the annual average at the station in the following table:

MONITORING STATION	HIGHEST RECORDED INHALABLE PARTICULATE CONCENTRATIONS		ANNUAL AVERAGE ($\mu\text{g}/\text{m}^3$)
	24-HOURS ($\mu\text{g}/\text{m}^3$)	MONTHLY AVERAGE ($\mu\text{g}/\text{m}^3$)	
Sherwood Park: PM ₁₀ PM _{2.5}	45.721 37.889	34.620 22.520	16.444 10.788

There were 30 samples valid samples of PM₁₀ and 29 valid samples of PM_{2.5} recorded at the Sherwood Park station. Detailed historical data for the inhalable particulates are listed in Table 6B.

MONITORING STATION	INHALABLE PARTICULATES - ANNUAL AVERAGE LOADING ($\mu\text{g}/\text{m}^3$)				
	2000	1999	1998	1997	1996
Sherwood Park: PM ₁₀ PM _{2.5}	16.444 10.788	16.458 6.867	15.665 9.074	- -	- -

STATIC AIR QUALITY MONITORING

EXPOSURE CYLINDER NETWORK

The Exposure Cylinder Network consists of 21 total sulphation and hydrogen sulphide static monitoring stations located in a grid pattern in the Edmonton east industrial area and nearby residential communities. A comprehensive description of the Exposure Cylinder Network is included in Appendix D. Total sulphation and hydrogen sulphide is a measure of loadings accumulated over a 30-day exposure period.

TOTAL SULPHATION

Alberta Ambient Air Quality guideline for total sulphation is:

- total sulphation loading **0.500 mg SO₃ equivalent /day/100 cm²**

The historical range of annual loadings and the highest recorded loadings across all 21 monitoring stations, are listed in the following table:

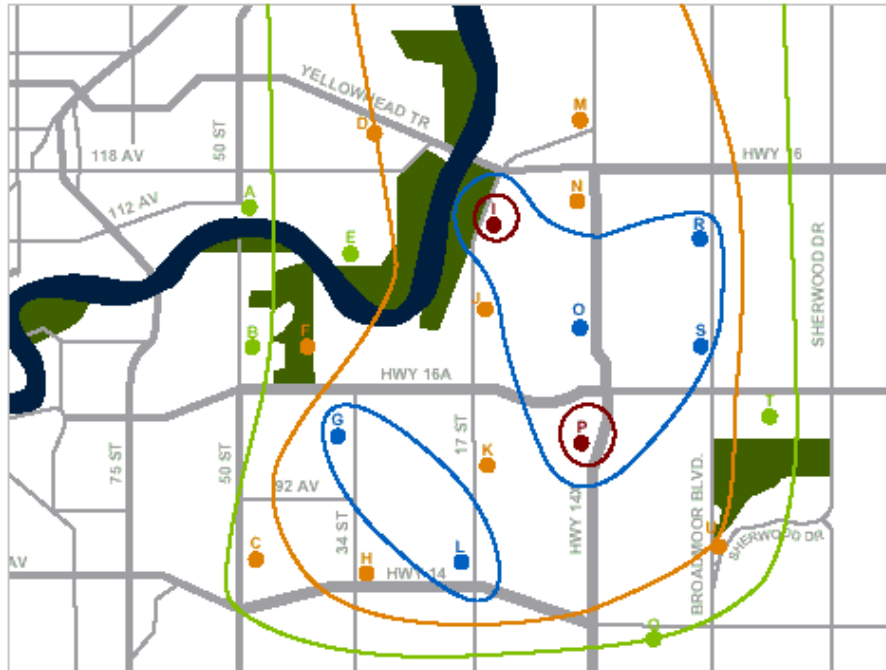
LOADING	TOTAL SULPHATION LOADINGS (mg SO ₃ eq./day/100 cm ²)				
	2000	1999	1998	1997	1996
Range of Annual Averages	0.009 - 0.128	0.010 - 0.116	0.014 - 0.105	0.035 - 0.127	0.019 - 0.124
Highest Recorded Value	0.278	0.219	0.204	0.217	0.233

The recorded loadings at each station and the corresponding annual averages are shown in Table 7. The highest recorded loading was only 55.6 % of the provincial guideline and the average daily loadings were very low in both industrial and residential areas covered by the Exposure Cylinder Network.

The results of total sulphation monitoring for 2000 can be summarized as follows:

- The highest recorded loading was 55.6 % of the guideline.
- The loadings were below 25% of the guideline 97.6 % of the time.
- High traffic areas with nearby industrial activities recorded marginally elevated total sulphation loadings.
- The inner residential areas with very low traffic volume have the lowest loadings (five stations).

The isopleths for different concentration groupings are shown in Figure 2 and listed in Table 13.



CONCENTRATION GROUPINGS (ranges expressed in mg SO₃ eq./day/100 cm²):



FIGURE 2 EXPOSURE CYLINDERS NETWORK
CONCENTRATION GROUPINGS OF TOTAL SULPHATION STATIONS

STATIC HYDROGEN SULPHIDE

Alberta Environment's guideline for static monitoring of hydrogen sulphide is:

- hydrogen sulphide loading **0.100 mg SO₃ equivalent /day/100 cm²**

The range of annual loadings and the highest recorded loadings across all 21 monitoring stations, are listed in the following table:

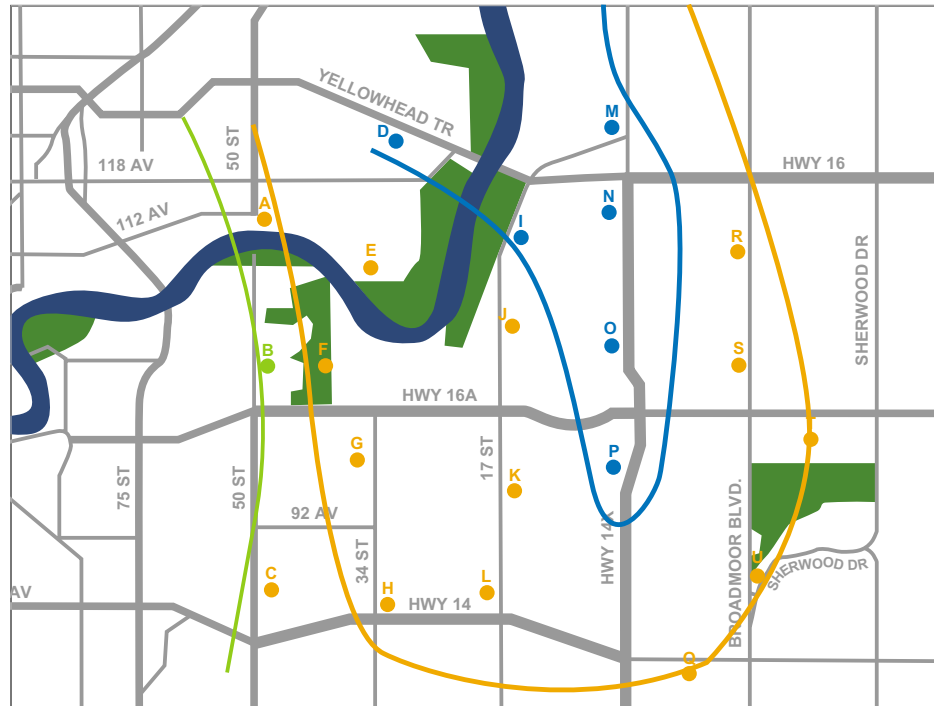
LOADING	STATIC HYDROGEN SULPHIDE LOADINGS (mg SO ₃ eq./day/100 cm ²)				
	2000	1999	1998	1997	1996
Range of Annual Averages	0.003 – 0.014	0.004 - 0.010	0.002 - 0.009	0.004 - 0.012	0.003 - 0.013
Highest Recorded Value	0.031	0.031	0.022	0.045	0.043

The recorded loadings at each station and the corresponding annual averages are shown in Table 8. The highest recorded loading was only 31 % of the provincial guideline and the average daily loadings were very low in both the industrial and residential areas covered by the Exposure Cylinder Network.

The results of total sulphation monitoring in 2000 can be summarized as follows:

- The highest recorded loading was 31 % of the guideline.
- The loadings were below 15% of the guideline 93.1 % of the time.
- High traffic areas with nearby industrial activities recorded marginally elevated total sulphation loadings.

The isopleths for different concentration groupings are shown in Figure 3 and listed in Table 14.



CONCENTRATION GROUPINGS (ranges expressed in mg SO₃ eq./day/100 cm²):

- | | |
|--|---|
| —●— < 0.0050 | —●— 0.151 to 0.0250 |
| —●— 0.0051 to 0.0100 | —●— > 0.0250 |
| —●— 0.0101 to 0.0150 | |

FIGURE 3 EXPOSURE CYLINDERS NETWORK
CONCENTRATION GROUPINGS OF HYDROGEN SULPHIDE STATIONS

AMBIENT AIR NETWORK OPERATION

INSTRUMENT OPERATIONAL TIMES

The Air Monitoring Directive (AMD-1989) stipulates that operational time of each instrument must be at least 90% every month. To qualify a given time interval as a valid operational period, all components of the system, including the instrument, telephone line and the central computer, must be operating satisfactorily. The time required to perform manual monthly calibrations and Automatic Instrument Checks (AIC) is considered a valid operational time.

During 2000, the monthly operational time of all analyzers was above 91.7% except for two instruments. In May 2000, the NO_x instrument at the Forest Heights station was out for repairs for several days and installation of new parts lowered its operating time to 88.3%. The H₂S analyzer at the Gold Bar station had a high voltage source failure between May 28th and June 1st and its operational time was lowered to 89.5%.

The average yearly operational time of every instrument was above 98.4 %. The wind speed and direction sensors had yearly average operational time above 99.6 %.

PERFORMANCE CHECKS

The quality of the data generated by the SIA Ambient Air Monitoring Network is verified by Automatic Instrument Checks (AIC) and manual multi-point instrument calibrations.

AIC is carried out on a 47-hour cycle throughout the year and manual calibrations are performed once a month on all analyzers. Both the AIC and multi-point instrument calibration reports are stored in the central computer and are available for viewing upon request. Another check on proper instrument operation is the automatic 'flagging' of suspected data by the computer.

System alarms are generated for unauthorized door entry, temperature deviations (high and low limits are monitored) or computer malfunctions. Individual alarms are investigated and followed up by the network manager.

The Hi-Vol samplers used for monitoring of total suspended particulates are calibrated every three months. The Partisol 2000[®] air sampler flow is calibrated every four months with a specialized flow meter.

MESSAGE BOARD

The 'Message Board' is used to document deviations detected by the network manager and to inform SIA members and Alberta Environment staff. The Message Board is used in the following manner:

- The network manager checks reasons for a significant deviation, enters the description into the 'Message Board' system and appends it to a given parameter or a station for a specific date, time and time mode (5-min, 1-hour or 24-hours).
- The text is linked to a particular occurrence and can be viewed by all authorized network users. The messages can be viewed by selecting LOG 6.
- The network manager provides a detailed explanation of an environmental deviation or a serious operational problem of the network (e.g. why the operational time of an instrument was below 90%).

TABLE 1 KEY PARAMETERS - CONTINUOUS MONITORING DATA - 2000 SUMMARY

PARAMETER	MONITORING STATION	ANNUAL AVERAGE (ppm)	MAXIMUM VALUES				OPERATIONAL TIME (%)	EXCEEDANCES	
			24-HOURS (ppm)	DATE	1-HOUR (ppm)	DATE		24-HOURS	1-HOUR
HYDROGEN SULPHIDE (H ₂ S)	CLOVER BAR	0.001	0.002	Jan. 18	0.011	Jun. 28	98.7	0	1
	SHERWOOD PARK	0.000	0.002	Jan. 18	0.005	Oct. 24	99.7	0	0
	ELMJAY	0.000	0.002	Jan. 18	0.005	Oct. 9	100.0	0	0
	GOLD BAR	0.001	0.003	Dec. 21	0.009	Oct. 12	98.8	0	0
	BEVERLY	0.001	0.004	Feb. 1	0.012	Jun. 28	99.3	1	1
	OVERALL		0.001				99.3	1	2
SULPHUR DIOXIDE (SO ₂)	SHERWOOD PARK	0.002	0.009	Sep.19	0.053	Jan. 26	99.3	0	0
	ELMJAY	0.003	0.011	Sep. 19	0.040	Sep. 19	100.0	0	0
	BEVERLY	0.003	0.028	Oct. 7	0.061	Oct. 6	99.3	0	0
	OVERALL		0.003				99.5	0	0
NITROGEN DIOXIDE (NO ₂)	CLOVER BAR	0.017	0.044	Feb. 14	0.089	Jan. 13	98.4	0	0
	FOREST HEIGHTS	0.021	0.081	Feb. 5	0.117	Feb. 5	98.8	0	0
	OVERALL		0.019				98.6	0	0
TOTAL HYDROCARBONS (THC)	SHERWOOD PARK	2.1	3.3	Aug. 23	4.9	Oct. 24	98.7	-	-
	BEVERLY	2.0	4.2	Feb.1	8.0	May 27	99.2	-	-
	OVERALL		2.1				99.0	-	-

TABLE 2 HYDROGEN SULPHIDE (H₂S) - 2000 SUMMARY

MONITORING STATION	MONTH	MONTHLY AVERAGE (ppm)	MAXIMUM VALUES				OPERATIONAL TIME (%)	1-HOUR EXCEEDANCES
			24-HOURS (ppm)	DATE	1-HOUR (ppm)	DATE		
CLOVER BAR	JANUARY	0.001	0.002	18	0.004	29	100.0	0
	FEBRUARY	0.000	0.002	1	0.006	21	99.9	0
	MARCH	0.000	0.001	2	0.003	6	99.8	0
	APRIL	0.001	0.002	17	0.004	19	93.2	0
	MAY	0.000	0.001	25	0.002	29	93.5	0
	JUNE	0.001	0.002	28	0.011	28	98.6	1
	JULY	0.001	0.002	1	0.004	1	99.9	0
	AUGUST	0.001	0.002	23	0.006	24	99.8	0
	SEPTEMBER	0.001	0.001	29	0.003	29	99.2	0
	OCTOBER	0.001	0.002	24	0.005	24	100.0	0
	NOVEMBER	0.001	0.001	27	0.004	27	100.0	0
	DECEMBER	0.001	0.002	30	0.003	29	100.0	0
	AVERAGE	0.001					98.7	
MAXIMUM	0.001	0.002		0.011			1	
SHERWOOD PARK	JANUARY	0.001	0.002	18	0.003	18	100.0	0
	FEBRUARY	0.001	0.002	5	0.003	5	99.9	0
	MARCH	0.000	0.001	2	0.002	6	99.9	0
	APRIL	0.000	0.001	20	0.001	20	100.0	0
	MAY	0.000	0.000	1	0.002	1	99.9	0
	JUNE	0.000	0.000	28	0.001	24	99.9	0
	JULY	0.000	0.001	1	0.002	31	99.9	0
	AUGUST	0.000	0.001	23	0.002	24	96.7	0
	SEPTEMBER	0.000	0.001	29	0.001	20	100.0	0
	OCTOBER	0.000	0.001	9	0.005	24	100.0	0
	NOVEMBER	0.001	0.001	27	0.003	27	100.0	0
	DECEMBER	0.001	0.001	21	0.003	30	100.0	0
	AVERAGE	0.000					99.7	
MAXIMUM	0.001	0.002		0.005			0	
ELMJAY	JANUARY	0.001	0.002	18	0.003	18	100.0	0
	FEBRUARY	0.001	0.001	12	0.003	8	100.0	0
	MARCH	0.001	0.001	2	0.002	6	100.0	0
	APRIL	0.000	0.001	20	0.002	20	100.0	0
	MAY	0.000	0.001	1	0.001	1	100.0	0
	JUNE	0.001	0.001	28	0.003	24	99.9	0
	JULY	0.000	0.001	10	0.003	10	99.8	0
	AUGUST	0.000	0.000	23	0.003	24	100.0	0
	SEPTEMBER	0.000	0.001	29	0.002	29	100.0	0
	OCTOBER	0.000	0.001	24	0.005	9	100.0	0
	NOVEMBER	0.000	0.001	27	0.004	27	100.0	0
	DECEMBER	0.001	0.001	21	0.002	21	100.0	0
	AVERAGE	0.000					100.0	
MAXIMUM	0.001	0.002		0.005			0	

Cont'd

TABLE 2 (Cont'd) HYDROGEN SULPHIDE (H₂S) - 2000 SUMMARY

MONITORING STATION	MONTH	MONTHLY AVERAGE (ppm)	MAXIMUM VALUE				OPERATIONAL TIME (%)	1-HOUR EXCEEDANCES
			24-HOURS (ppm)	DATE	1-HOUR (ppm)	DATE		
GOLD BAR	JANUARY	0.001	0.002	18	0.005	18	100.0	0
	FEBRUARY	0.000	0.002	5	0.004	1	100.0	0
	MARCH	0.001	0.001	2	0.003	6	100.0	0
	APRIL	0.000	0.000	10	0.001	10	98.6	0
	MAY	0.000	0.000	17	0.001	27	89.5	0
	JUNE	0.000	0.001	28	0.003	24	98.0	0
	JULY	0.000	0.001	31	0.005	27	99.9	0
	AUGUST	0.000	0.001	1	0.004	23	99.9	0
	SEPTEMBER	0.000	0.002	29	0.006	29	100.0	0
	OCTOBER	0.001	0.002	9	0.009	12	100.0	0
	NOVEMBER	0.001	0.002	15	0.009	29	100.0	0
	DECEMBER	0.002	0.003	21	0.005	21	100.0	0
	AVERAGE	0.001					98.8	
	MAXIMUM	0.002	0.003		0.009			0
BEVERLY	JANUARY	0.001	0.003	18	0.006	18	99.9	0
	FEBRUARY	0.001	0.004	1	0.009	16	100.0	0
	MARCH	0.000	0.001	2	0.004	10	100.0	0
	APRIL	0.000	0.001	20	0.008	20	99.9	0
	MAY	0.000	0.001	2	0.003	2	100.0	0
	JUNE	0.000	0.001	28	0.012	28	100.0	1
	JULY	0.000	0.001	27	0.003	25	99.9	0
	AUGUST	0.001	0.002	23	0.006	23	91.7	0
	SEPTEMBER	0.001	0.003	29	0.008	29	100.0	0
	OCTOBER	0.001	0.002	18	0.009	16	99.9	0
	NOVEMBER	0.001	0.003	29	0.009	1	99.9	0
	DECEMBER	0.001	0.002	29	0.006	21	99.9	0
	AVERAGE	0.001					99.3	
	MAXIMUM	0.001	0.004		0.012			1

TABLE 3 SULPHUR DIOXIDE (SO₂) - 2000 SUMMARY

MONITORING STATION	MONTH	MONTHLY AVERAGE (ppm)	MAXIMUM VALUES				OPERATIONAL TIME (%)	EXCEEDANCES	
			24-HOURS (ppm)	DATE	1-HOUR (ppm)	DATE		24-HOURS	1-HOUR
SHERWOOD PARK	JANUARY	0.002	0.008	17	0.053	26	100.0	0	0
	FEBRUARY	0.003	0.006	13	0.020	2	99.8	0	0
	MARCH	0.002	0.006	19	0.037	4	99.9	0	0
	APRIL	0.001	0.005	24	0.038	24	100.0	0	0
	MAY	0.001	0.007	26	0.022	22	99.9	0	0
	JUNE	0.002	0.008	20	0.033	20	99.9	0	0
	JULY	0.001	0.004	15	0.027	20	99.9	0	0
	AUGUST	0.002	0.005	6	0.028	26	96.7	0	0
	SEPTEMBER	0.003	0.009	19	0.022	19	99.9	0	0
	OCTOBER	0.003	0.008	10	0.029	12	100.0	0	0
	NOVEMBER	0.003	0.009	18	0.022	18	100.0	0	0
	DECEMBER	0.003	0.006	17	0.038	17	95.7	0	0
	AVERAGE	0.002					99.3		
MAXIMUM	0.003	0.009		0.053			0	0	
ELMJAY	JANUARY	0.003	0.007	17	0.037	21	100.0	0	0
	FEBRUARY	0.003	0.006	11	0.020	2	100.0	0	0
	MARCH	0.003	0.006	20	0.029	20	100.0	0	0
	APRIL	0.003	0.006	25	0.032	19	100.0	0	0
	MAY	0.003	0.006	20	0.023	26	100.0	0	0
	JUNE	0.002	0.004	15	0.024	7	99.9	0	0
	JULY	0.002	0.008	24	0.034	24	99.9	0	0
	AUGUST	0.003	0.007	26	0.028	7	100.0	0	0
	SEPTEMBER	0.003	0.011	19	0.040	19	100.0	0	0
	OCTOBER	0.002	0.005	4	0.020	21	100.0	0	0
	NOVEMBER	0.002	0.006	4	0.034	4	100.0	0	0
	DECEMBER	0.004	0.006	25	0.023	6	100.0	0	0
	AVERAGE	0.003					100.0		
MAXIMUM	0.004	0.011		0.040			0	0	
BEVERLY	JANUARY	0.003	0.011	19	0.024	19	99.9	0	0
	FEBRUARY	0.004	0.008	21	0.024	13	100.0	0	0
	MARCH	0.002	0.007	11	0.030	10	100.0	0	0
	APRIL	0.002	0.008	21	0.026	16	99.9	0	0
	MAY	0.001	0.007	31	0.030	31	100.0	0	0
	JUNE	0.002	0.007	1	0.022	1	100.0	0	0
	JULY	0.001	0.005	30	0.020	22	99.9	0	0
	AUGUST	0.002	0.005	18	0.026	19	91.7	0	0
	SEPTEMBER	0.004	0.009	14	0.031	14	100.0	0	0
	OCTOBER	0.005	0.028	7	0.061	6	99.9	0	0
	NOVEMBER	0.004	0.010	21	0.027	7	99.9	0	0
	DECEMBER	0.005	0.011	1	0.027	6	99.9	0	0
	AVERAGE	0.003					99.3		
MAXIMUM	0.005	0.028		0.061			0	0	

TABLE 4 NITROGEN DIOXIDE (NO₂) - 2000 SUMMARY

MONITORING STATION	MONTH	MONTHLY AVERAGE (ppm)	MAXIMUM VALUE				OPERATIONAL TIME (%)	EXCEEDANCES	
			24-HOURS (ppm)	DATE	1-HOUR (ppm)	DATE		24-HOURS	1-HOUR
CLOVER BAR	JANUARY	0.023	0.041	26	0.089	13	100.0	0	0
	FEBRUARY	0.029	0.044	14	0.087	22	99.9	0	0
	MARCH	0.019	0.035	15	0.057	15	99.2	0	0
	APRIL	0.012	0.024	10	0.053	20	93.2	0	0
	MAY	0.013	0.025	1	0.055	21	93.5	0	0
	JUNE	0.009	0.014	14	0.038	1	98.6	0	0
	JULY	0.010	0.015	26	0.033	6	99.9	0	0
	AUGUST	0.010	0.019	4	0.076	30	100.0	0	0
	SEPTEMBER	0.014	0.042	29	0.067	29	99.0	0	0
	OCTOBER	0.018	0.030	12	0.086	17	97.6	0	0
	NOVEMBER	0.022	0.034	21	0.055	15	100.0	0	0
	DECEMBER	0.022	0.033	10	0.053	29	100.0	0	0
	AVERAGE	0.017					98.4		
MAXIMUM	0.029	0.044		0.089			0	0	
FOREST HEIGHTS	JANUARY	0.039	0.074	26	0.101	18	99.9	0	0
	FEBRUARY	0.044	0.081	5	0.117	5	100.0	0	0
	MARCH	0.028	0.061	2	0.095	10	100.0	0	0
	APRIL	0.014	0.032	20	0.060	20	98.2	0	0
	MAY	0.013	0.024	12	0.056	12	88.3	0	0
	JUNE	0.010	0.019	28	0.044	27	99.8	0	0
	JULY	0.012	0.018	6	0.041	30	99.9	0	0
	AUGUST	0.011	0.022	23	0.048	18	100.0	0	0
	SEPTEMBER	0.015	0.035	29	0.055	16	100.0	0	0
	OCTOBER	0.019	0.032	16	0.047	12	100.0	0	0
	NOVEMBER	0.026	0.040	15	0.067	15	100.0	0	0
	DECEMBER	0.025	0.039	18	0.058	21	100.0	0	0
	AVERAGE	0.021					98.8		
MAXIMUM	0.044	0.081		0.117			0	0	

TABLE 5 TOTAL HYDROCARBONS (THC) - 2000 SUMMARY

MONITORING STATION	MONTH	MONTHLY AVERAGE (ppm)	MAXIMUM VALUES		OPERATIONAL TIME (%)		
			24-HOURS (ppm)	DATE		1-HOUR (ppm)	DATE
SHERWOOD PARK	JANUARY	2.2	2.7	18	3.2	18	100.0
	FEBRUARY	2.2	2.9	5	3.4	6	98.9
	MARCH	2.0	2.3	12	2.9	5	95.4
	APRIL	1.9	2.2	20	2.8	19	100.0
	MAY	1.9	2.1	28	4.0	28	97.8
	JUNE	1.9	2.1	3	2.9	3	99.9
	JULY	2.0	2.1	30	2.7	14	99.9
	AUGUST	2.0	3.3	23	2.8	24	93.0
	SEPTEMBER	1.9	2.2	29	2.8	28	100.0
	OCTOBER	2.1	2.9	24	4.9	24	100.0
	NOVEMBER	2.2	2.5	20	4.1	27	100.0
	DECEMBER	2.3	2.8	10	4.5	10	100.0
	AVERAGE	2.1					98.7
	MAXIMUM	2.2	3.3		4.9		
BEVERLY	JANUARY	2.3	3.1	18	5.6	26	99.9
	FEBRUARY	2.4	4.2	1	7.1	1	100.0
	MARCH	2.0	2.5	2	3.6	6	100.0
	APRIL	1.8	2.2	20	3.0	20	99.9
	MAY	1.8	2.5	27	8.0	27	100.0
	JUNE	1.8	2.0	28	3.3	12	100.0
	JULY	1.8	2.2	27	3.6	26	99.9
	AUGUST	1.9	2.2	23	3.7	22	91.7
	SEPTEMBER	2.0	2.7	29	5.4	29	100.0
	OCTOBER	2.0	2.4	18	4.3	18	99.9
	NOVEMBER	2.2	2.6	21	4.7	29	99.5
	DECEMBER	2.2	2.9	29	4.7	29	99.9
	AVERAGE	2.0					99.2
	MAXIMUM	2.4	4.2		8.0		

TABLE 6A TOTAL SUSPENDED PARTICULATES (TSP) - 2000 SUMMARY

MONITORING STATION	TOTAL SUSPENDED PARTICULATES (ug/m ³)												MAX. VALUE	GEOMETRIC AVERAGE	
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC			
GOLD BAR															
FIRST SAMPLE	14.0	55.7	69.9	26.6	20.9	85.3	19.9	57.2	5.1	17.7	55.5	26.9	85.3		
SECOND SAMPLE	17.1	55.5	8.3	19.9	39.1	30.2	19.7	27.1	27.1	78.2	35.9	13.1	78.2		
THIRD SAMPLE	17.0	24.7	17.2	71.4	40.3	21.4	16.2	27.7	67.9	22.3	23.1	51.4	71.4		
FOURTH SAMPLE	25.0	38.7	14.8	40.9	33.8	29.0	35.1	60.5	12.9	32.2	52.2	20.9	60.5		
FIFTH SAMPLE	42.3	-	40.8	50.9	25.2	48.1	32.2	21.8	75.6	55.0	40.1	30.6	75.6		
SIXTH SAMPLE	44.4	-	44.6	-	-	-	-	-	-	-	-	-	44.6		
MONTHLY AVERAGE	26.6	43.7	32.6	41.9	31.9	42.8	24.6	38.9	37.7	41.1	41.4	28.6		30.8	
BEVERLY															
FIRST SAMPLE	15.7	66.8	106.1	27.3	22.5	63.7	21.4	62.3	6.4	19.0	68.2	N/A**	106.1		
SECOND SAMPLE	17.6	61.7	9.5	17.2	44.6	8.8	19.7	27.2	32.0	87.5	47.7	16.9	87.5		
THIRD SAMPLE	9.9	26.7	17.5	50.0	54.1	28.7	18.6	N/A*	68.0	26.7	30.6	55.1	68.0		
FOURTH SAMPLE	26.2	38.8	19.2	41.9	34.6	32.8	41.2	59.3	14.8	36.2	64.0	25.4	64.0		
FIFTH SAMPLE	42.2	-	63.8	49.2	28.5	51.4	32.0	23.2	76.7	58.4	59.2	35.1	76.7		
SIXTH SAMPLE	44.6	-	41.1	-	-	-	-	-	-	-	-	-	44.6		
MONTHLY AVERAGE	26.0	48.5	42.9	37.1	36.9	37.1	26.6	34.4	39.6	45.6	54.0	33.1		33.0	
EXCEEDANCES / MO.	0	0	1	0	0	0	0	0	0	0	0	0			
STATIONS' AVERAGE															
FIRST SAMPLE	14.9	61.3	88.0	27.0	21.7	74.5	20.7	59.8	5.8	18.4	61.9	26.9	88.0		
SECOND SAMPLE	17.4	58.6	8.9	18.6	41.9	19.5	19.7	27.2	29.6	82.9	41.8	15.0	82.9		
THIRD SAMPLE	13.5	25.7	17.4	60.7	47.2	25.1	17.4	27.7	68.0	24.5	26.9	53.3	68.0		
FOURTH SAMPLE	25.6	38.8	17.0	41.4	34.2	30.9	38.2	59.9	13.9	34.2	58.1	23.2	59.9		
FIFTH SAMPLE	42.3	-	52.3	50.1	26.9	49.8	32.1	22.5	76.2	56.7	49.7	32.9	76.2		
SIXTH SAMPLE	44.5	-	42.9	-	-	-	-	-	-	-	-	-	44.5		
AREA AVERAGE	26.3	46.1	37.7	39.5	34.4	39.9	25.6	36.6	38.7	43.3	47.7	30.9		31.9	

NOTES:

1. Units: ug/m³

2. Alberta Air Quality Guideline level: 100 ug/m³

N/A* - not available due to repairs

N/A** - not available, no pen for a flow chart

TABLE 6B INHALABLE PARTICULATES (PM₁₀ AND PM_{2.5}) - 2000 SUMMARY

MONITORING STATION	PM ₁₀ INHALABLE PARTICULATES (ug/m ³)												MAX. VALUE	ANNUAL AVERAGE
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
SHERWOOD PARK														
FIRST SAMPLE	-	-	-	-	7.470	-	7.817	-	3.249	-	34.583	-	34.583	
SECOND SAMPLE	9.371	45.721	3.804	9.969	-	1.638	-	14.690	-	41.724	-	6.706	45.721	
THIRD SAMPLE	-	-	-	-	18.646	-	4.804	-	30.186	-	15.869	-	30.186	
FOURTH SAMPLE	13.174	23.519	7.722	23.896	-	16.273	-	4.623	-	13.872	-	9.731	23.896	
FIFTH SAMPLE	-	-	-	-	9.497	-	12.147	-	35.343	-	14.676	-	35.343	
SIXTH SAMPLE	27.133	-	17.953	-	-	-	-	-	-	-	-	-	27.133	
MONTHLY AVERAGE	16.559	34.620	9.826	16.933	11.871	8.956	8.256	9.657	22.926	27.798	21.709	8.219		16.444

MONITORING STATION	PM _{2.5} INHALABLE PARTICULATES (ug/m ³)												MAX. VALUE	ANNUAL AVERAGE
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
SHERWOOD PARK														
FIRST SAMPLE	4.415	37.889	16.564	7.344	-	6.276	-	12.606	-	3.638	-	15.007	37.889	
SECOND SAMPLE	-	-	-	-	7.817	-	7.081	-	5.665	-	13.202	-	13.202	
THIRD SAMPLE	15.536	7.150	16.340	7.011	-	4.721	-	N/A*	-	6.039	-	23.532	23.532	
FOURTH SAMPLE	-	-	-	-	4.623	-	6.400	-	2.457	-	13.312	-	13.312	
FIFTH SAMPLE	21.036	-	6.317	3.957	-	9.539	-	-	-	5.776	-	19.101	21.036	
SIXTH SAMPLE	-	-	-	-	-	-	-	-	-	-	-	-	-	
MONTHLY AVERAGE	13.662	22.520	13.074	6.104	6.220	6.845	6.741	12.606	4.061	5.151	13.257	19.213		10.788

TABLE 7 TOTAL SULPHATION - 2000 SUMMARY
EXPOSURE CYLINDER NETWORK (21 MONITORING STATIONS)

MONITORING STATION	TOTAL SULPHATION LOADINGS (mg SO ₃ eq./day/100 cm ²)												MAXIMUM VALUE	ANNUAL AVERAGE
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
A	0.032	0.047	0.044	0.012	0.013	0.017	0.020	0.021	0.025	0.056	0.032	0.045	0.056	0.030
B	0.007	0.019	0.011	0.007	0.011	0.009	0.005	0.002	0.008	0.012	0.007	0.010	0.019	0.009
C	0.070	0.067	0.053	0.042	0.081	0.045	0.046	0.059	0.058	0.048	0.047	0.063	0.081	0.057
D	0.089	0.098	0.061	0.056	0.063	0.058	0.041	0.040	0.052	0.097	0.107	0.078	0.107	0.070
E	0.044	0.052	0.020	0.031	0.010	0.046	0.032	0.033	0.044	0.053	0.064	0.042	0.064	0.039
F	0.072	0.086	0.057	0.029	0.120	0.076	0.058	0.068	0.074	0.074	0.057	0.067	0.120	0.070
G	0.081	0.094	0.108	0.081	0.178	0.092	0.076	0.072	0.078	0.074	0.085	0.095	0.178	0.093
H	0.080	0.075	0.063	0.011	0.083	0.052	0.054	0.054	0.048	0.061	0.076	0.084	0.084	0.062
I	0.100	0.133	0.115	0.089	N/A*	N/A*	0.062	0.087	0.081	0.110	0.111	0.118	0.133	0.101
J	0.069	0.094	0.068	0.037	0.089	0.054	0.057	0.053	0.065	0.098	0.074	0.067	0.098	0.069
K	0.077	0.089	0.101	0.058	N/A*	0.065	0.063	0.063	0.079	0.077	0.080	0.077	0.101	0.075
L	0.092	0.084	0.078	0.101	0.067	0.056	0.080	0.082	0.100	0.058	0.103	0.101	0.103	0.084
M	0.071	0.089	0.078	0.066	0.025	0.059	0.104	0.057	0.072	0.078	0.085	0.086	0.104	0.073
N	0.097	0.101	0.087	0.046	0.014	0.046	0.059	0.058	0.075	0.078	0.115	0.057	0.115	0.069
O	0.100	0.130	0.116	0.081	0.104	0.089	0.080	0.097	0.092	0.095	0.136	0.084	0.136	0.100
P	0.278	0.207	0.167	0.020	0.131	0.108	0.099	0.103	0.101	0.111	0.117	0.094	0.278	0.128
Q	0.050	0.049	0.048	0.007	0.013	0.043	0.008	0.020	0.044	0.007	0.041	0.151	0.151	0.044
R	0.096	0.101	0.084	0.012	0.125	0.078	0.063	0.084	0.068	0.081	0.104	0.053	0.125	0.079
S	0.088	0.101	0.091	0.057	0.115	0.089	0.063	0.090	0.068	0.077	0.107	0.084	0.115	0.086
T	0.048	0.014	0.049	0.010	0.011	0.036	0.008	0.011	0.008	0.074	0.051	0.051	0.074	0.031
U	0.069	0.068	0.061	0.011	0.050	0.052	0.042	0.057	0.048	0.061	0.070	0.067	0.070	0.055

NOTES: 1. Units: SO₃ eq. mg/day/100 cm²
2. Alberta Air Quality Guideline Level: 0.500 maximum
3. The 21 station network was in operation from January to December 2000.

N/A - not available
N/A* - station vandalized or stolen

TABLE 8 STATIC HYDROGEN SULPHIDE - 2000 SUMMARY

EXPOSURE CYLINDER NETWORK (21 MONITORING STATIONS)

MONITORING STATION	STATIC HYDROGEN SULPHIDE LOADINGS (mg SO ₃ eq./day/100 cm ²)												MAXIMUM VALUE	ANNUAL AVERAGE
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
A	0.008	0.010	0.009	0.004	<0.001	0.002	<0.001	0.001	<0.001	0.010	0.009	0.003	0.010	0.0062
B	0.006	0.002	0.003	0.003	<0.001	0.001	0.003	0.002	0.001	0.007	0.003	0.002	0.007	0.0030
C	0.017	0.009	0.010	0.004	0.004	0.002	<0.001	0.003	0.009	0.009	0.005	0.002	0.017	0.0067
D	0.023	0.015	0.013	0.012	0.004	0.003	<0.001	0.002	0.010	0.020	0.031	0.010	0.031	0.0130
E	0.011	0.012	0.008	0.010	0.001	0.002	0.001	0.006	0.001	0.016	0.015	0.003	0.016	0.0072
F	0.017	0.014	0.012	0.005	0.006	0.004	0.005	0.004	0.009	0.017	0.013	0.009	0.017	0.0096
G	0.014	0.013	0.015	0.007	0.005	<0.001	0.003	0.006	0.004	0.012	0.011	0.012	0.015	0.0093
H	0.010	0.012	0.010	<0.001	0.004	0.005	0.004	0.003	<0.001	0.011	0.010	0.003	0.012	0.0072
I	0.013	0.017	0.010	0.004	N/A*	N/A*	0.002	0.003	0.005	0.021	0.018	0.010	0.021	0.0103
J	0.009	0.012	0.010	0.004	0.004	0.003	0.004	<0.001	0.002	0.015	0.011	<0.001	0.015	0.0074
K	0.017	0.009	0.020	0.008	N/A*	0.002	0.004	0.005	0.011	0.016	0.014	0.004	0.020	0.0100
L	0.015	0.009	0.007	0.006	0.005	<0.001	0.005	0.001	0.009	0.009	0.021	0.015	0.021	0.0093
M	0.015	0.017	0.013	<0.001	0.001	0.003	<0.001	<0.001	0.005	0.013	0.016	0.014	0.017	0.0108
N	0.020	0.015	0.008	<0.001	0.004	0.002	0.004	<0.001	0.008	0.012	0.018	0.026	0.026	0.0117
O	0.011	0.015	0.007	<0.001	0.001	0.002	0.005	<0.001	0.010	0.019	0.024	0.026	0.026	0.0120
P	0.020	0.025	0.016	0.008	0.008	0.005	<0.001	0.002	0.006	0.022	0.016	0.031	0.031	0.0145
Q	0.007	0.002	0.004	0.001	0.004	0.001	0.003	<0.001	<0.001	0.007	0.007	0.026	0.026	0.0062
R	0.017	0.008	0.007	0.003	<0.001	0.003	<0.001	0.002	0.004	0.021	0.015	0.009	0.021	0.0089
S	0.014	0.015	0.013	0.003	0.004	0.002	<0.001	0.003	0.003	0.007	0.012	0.005	0.015	0.0074
T	0.011	0.009	0.005	0.004	0.001	0.003	0.004	<0.001	0.006	0.012	0.001	0.004	0.012	0.0054
U	0.014	0.015	0.008	0.005	0.002	0.005	<0.001	<0.001	<0.001	0.013	0.012	0.006	0.015	0.0089

NOTES:

1. Units:SO₃ eq. mg/day/100 cm²
2. Alberta Air Quality Guideline Level: 0.100 maximum
3. The 21 station network was in operation from January to December 2000.

N/A - not available

N/A* - station vandalized or stolen

TABLE 9 HYDROGEN SULPHIDE (H₂S) - 2000 SUMMARY

FREQUENCY DISTRIBUTION OF 1-HOUR AVERAGES

MONITORING STATION	MONTH	NUMBER OF READINGS	% READINGS IN CONCENTRATION RANGE (ppm)			
			0.000<=0.003	0.003<=0.010	0.010<=0.050	0.050<=MAX
CLOVER BAR	JANUARY	724	98.8	1.2	0.0	0.0
	FEBRUARY	675	99.0	1.0	0.0	0.0
	MARCH	722	100.0	0.0	0.0	0.0
	APRIL	610	99.7	0.3	0.0	0.0
	MAY	673	100.0	0.0	0.0	0.0
	JUNE	679	98.1	1.8	0.1	0.0
	JULY	721	98.3	1.7	0.0	0.0
	AUGUST	724	99.0	1.0	0.0	0.0
	SEPTEMBER	695	100.0	0.0	0.0	0.0
	OCTOBER	726	98.3	1.7	0.0	0.0
	NOVEMBER	699	98.9	1.1	0.0	0.0
	DECEMBER	725	99.6	0.4	0.0	0.0
	TOTAL HOURS	8,373				
	AVERAGE		99.1	0.9	0.0	0.0
SHERWOOD PARK	JANUARY	725	99.9	0.1	0.0	0.0
	FEBRUARY	676	100.0	0.0	0.0	0.0
	MARCH	724	100.0	0.0	0.0	0.0
	APRIL	701	100.0	0.0	0.0	0.0
	MAY	723	100.0	0.0	0.0	0.0
	JUNE	699	100.0	0.0	0.0	0.0
	JULY	723	100.0	0.0	0.0	0.0
	AUGUST	700	100.0	0.0	0.0	0.0
	SEPTEMBER	696	100.0	0.0	0.0	0.0
	OCTOBER	722	99.4	0.6	0.0	0.0
	NOVEMBER	701	99.9	0.1	0.0	0.0
	DECEMBER	725	100.0	0.0	0.0	0.0
	TOTAL HOURS	8,515				
	AVERAGE		99.9	0.1	0.0	0.0
ELMJAY	JANUARY	725	100.0	0.0	0.0	0.0
	FEBRUARY	678	100.0	0.0	0.0	0.0
	MARCH	724	100.0	0.0	0.0	0.0
	APRIL	701	100.0	0.0	0.0	0.0
	MAY	724	100.0	0.0	0.0	0.0
	JUNE	700	100.0	0.0	0.0	0.0
	JULY	722	99.9	0.1	0.0	0.0
	AUGUST	724	100.0	0.0	0.0	0.0
	SEPTEMBER	699	100.0	0.0	0.0	0.0
	OCTOBER	723	98.9	1.1	0.0	0.0
	NOVEMBER	701	99.9	0.1	0.0	0.0
	DECEMBER	725	100.0	0.0	0.0	0.0
	TOTAL HOURS	8,546				
	AVERAGE		99.9	0.1	0.0	0.0

NOTE: 0.0 indicates that there were no readings in the specified concentration range

Cont'd

TABLE 9 (Cont'd) HYDROGEN SULPHIDE (H₂S) - 2000 SUMMARY

FREQUENCY DISTRIBUTION OF 1-HOUR AVERAGES

MONITORING STATION	MONTH	NUMBER OF READINGS	% READINGS IN CONCENTRATION RANGE (ppm)			
			0.000<=0.003	0.003<=0.010	0.010<=0.050	0.050<=MAX
GOLD BAR	JANUARY	725	99.6	0.4	0.0	0.0
	FEBRUARY	668	99.7	0.3	0.0	0.0
	MARCH	724	100.0	0.0	0.0	0.0
	APRIL	680	100.0	0.0	0.0	0.0
	MAY	648	100.0	0.0	0.0	0.0
	JUNE	685	99.9	0.1	0.0	0.0
	JULY	726	99.6	0.4	0.0	0.0
	AUGUST	724	99.7	0.3	0.0	0.0
	SEPTEMBER	701	99.0	1.0	0.0	0.0
	OCTOBER	724	96.8	3.2	0.0	0.0
	NOVEMBER	701	97.3	2.7	0.0	0.0
	DECEMBER	725	96.6	3.4	0.0	0.0
	TOTAL HOURS	8,431				
AVERAGE		99.0	1.0	0.0	0.0	
BEVERLY	JANUARY	725	93.1	6.9	0.0	0.0
	FEBRUARY	677	92.2	7.8	0.0	0.0
	MARCH	724	99.7	0.3	0.0	0.0
	APRIL	702	99.4	0.6	0.1	0.0
	MAY	725	99.6	0.4	0.0	0.0
	JUNE	700	99.3	0.6	0.0	0.0
	JULY	719	100.0	0.0	0.0	0.0
	AUGUST	662	97.1	2.9	0.0	0.0
	SEPTEMBER	701	95.0	5.0	0.0	0.0
	OCTOBER	721	92.5	7.5	0.0	0.0
	NOVEMBER	696	91.5	8.5	0.0	0.0
	DECEMBER	725	95.7	4.3	0.0	0.0
	TOTAL HOURS	8,477				
AVERAGE		96.3	3.7	0.0	0.0	

NOTE: 0.0 indicates that there were no readings in the specified concentration range

TABLE 10 SULPHUR DIOXIDE (SO₂) - 2000 SUMMARY

FREQUENCY DISTRIBUTION OF 1-HOUR AVERAGES

MONITORING STATION	MONTH	NUMBER OF READINGS	% READINGS IN CONCENTRATION RANGE (ppm)					
			0.00-0.02	0.02-0.06	0.06-0.11	0.11-0.17	0.17-0.34	0.34-MAX
SHERWOOD PARK	JANUARY	725	98.9	1.1	0.0	0.0	0.0	0.0
	FEBRUARY	676	100.0	0.0	0.0	0.0	0.0	0.0
	MARCH	724	99.3	0.7	0.0	0.0	0.0	0.0
	APRIL	701	99.7	0.3	0.0	0.0	0.0	0.0
	MAY	723	99.7	0.3	0.0	0.0	0.0	0.0
	JUNE	699	99.3	0.7	0.0	0.0	0.0	0.0
	JULY	723	99.7	0.3	0.0	0.0	0.0	0.0
	AUGUST	700	99.1	0.9	0.0	0.0	0.0	0.0
	SEPTEMBER	696	99.9	0.1	0.0	0.0	0.0	0.0
	OCTOBER	722	98.9	1.1	0.0	0.0	0.0	0.0
	NOVEMBER	701	99.4	0.6	0.0	0.0	0.0	0.0
	DECEMBER	693	99.7	0.3	0.0	0.0	0.0	0.0
	TOTAL HOURS	8,483						
AVERAGE		99.5	0.5	0.0	0.0	0.0	0.0	
ELMJAY	JANUARY	725	99.3	0.7	0.0	0.0	0.0	0.0
	FEBRUARY	678	100.0	0.0	0.0	0.0	0.0	0.0
	MARCH	724	99.7	0.3	0.0	0.0	0.0	0.0
	APRIL	701	99.4	0.6	0.0	0.0	0.0	0.0
	MAY	724	99.7	0.3	0.0	0.0	0.0	0.0
	JUNE	700	99.7	0.3	0.0	0.0	0.0	0.0
	JULY	723	99.4	0.6	0.0	0.0	0.0	0.0
	AUGUST	723	99.0	1.0	0.0	0.0	0.0	0.0
	SEPTEMBER	694	98.8	1.2	0.0	0.0	0.0	0.0
	OCTOBER	722	100.0	0.0	0.0	0.0	0.0	0.0
	NOVEMBER	700	99.1	0.9	0.0	0.0	0.0	0.0
	DECEMBER	725	99.9	0.1	0.0	0.0	0.0	0.0
	TOTAL HOURS	8,539						
AVERAGE		99.5	0.5	0.0	0.0	0.0	0.0	
BEVERLY	JANUARY	725	99.7	0.3	0.0	0.0	0.0	0.0
	FEBRUARY	677	99.9	0.1	0.0	0.0	0.0	0.0
	MARCH	724	99.9	0.1	0.0	0.0	0.0	0.0
	APRIL	702	99.3	0.7	0.0	0.0	0.0	0.0
	MAY	725	99.7	0.3	0.0	0.0	0.0	0.0
	JUNE	700	99.9	0.1	0.0	0.0	0.0	0.0
	JULY	718	99.7	0.3	0.0	0.0	0.0	0.0
	AUGUST	662	99.5	0.5	0.0	0.0	0.0	0.0
	SEPTEMBER	700	99.1	0.9	0.0	0.0	0.0	0.0
	OCTOBER	721	96.0	3.9	0.0	0.0	0.0	0.0
	NOVEMBER	696	99.4	0.6	0.0	0.0	0.0	0.0
	DECEMBER	725	99.2	0.8	0.0	0.0	0.0	0.0
	TOTAL HOURS	8,475						
AVERAGE		99.3	0.7	0.0	0.0	0.0	0.0	

NOTE: 0.0 indicates that there were no readings in the specified concentration range

TABLE 11 NITROGEN DIOXIDE (NO₂) - 2000 SUMMARY

FREQUENCY DISTRIBUTION OF 1-HOUR AVERAGES

MONITORING STATION	MONTH	NUMBER OF READINGS	% READINGS IN CONCENTRATION RANGE (ppm)			
			0.000<=0.050	0.050<=0.110	0.110<=0.210	0.210<=MAX
CLOVER BAR	JANUARY	720	98.1	1.9	0.0	0.0
	FEBRUARY	674	96.3	3.7	0.0	0.0
	MARCH	714	98.9	1.1	0.0	0.0
	APRIL	623	99.8	0.2	0.0	0.0
	MAY	670	99.9	0.1	0.0	0.0
	JUNE	676	100.0	0.0	0.0	0.0
	JULY	718	100.0	0.0	0.0	0.0
	AUGUST	721	99.9	0.1	0.0	0.0
	SEPTEMBER	689	98.4	1.6	0.0	0.0
	OCTOBER	705	99.3	0.7	0.0	0.0
	NOVEMBER	696	99.9	0.1	0.0	0.0
	DECEMBER	722	99.7	0.3	0.0	0.0
	TOTAL HOURS	8,328				
	AVERAGE		99.2	0.8	0.0	0.0
FOREST HEIGHTS	JANUARY	720	74.3	25.7	0.0	0.0
	FEBRUARY	674	65.3	34.3	0.1	0.0
	MARCH	721	89.2	10.8	0.0	0.0
	APRIL	685	99.7	0.3	0.0	0.0
	MAY	632	99.7	0.3	0.0	0.0
	JUNE	690	100.0	0.0	0.0	0.0
	JULY	723	100.0	0.0	0.0	0.0
	AUGUST	717	100.0	0.0	0.0	0.0
	SEPTEMBER	698	99.6	0.4	0.0	0.0
	OCTOBER	722	100.0	0.0	0.0	0.0
	NOVEMBER	696	99.6	0.4	0.0	0.0
	DECEMBER	723	99.4	0.6	0.0	0.0
	TOTAL HOURS	8,401				
	AVERAGE		93.9	6.1	0.0	0.0

NOTE: 0.0 indicates that there were no readings in the specified concentration range

TABLE 12 WIND SPEED AND WIND DIRECTION - 2000 SUMMARY
 FREQUENCY DISTRIBUTION OF 1-HOUR AVERAGES

MONITORING STATION	DIRECTION	% WIND SPEED RANGE (km/hr)						TOTAL (%)
		1-5	6-11	12-19	20-28	29-38	39+	
CLOVER BAR	N	1.17	1.80	0.95	0.03	0.00	0.00	3.95
	NE	3.85	5.07	1.85	0.16	0.00	0.00	10.93
	E	3.45	4.10	1.58	0.29	0.01	0.00	9.43
	SE	3.90	4.64	3.16	1.04	0.12	0.00	12.86
	S	7.54	11.65	3.55	0.38	0.00	0.00	23.12
	SW	5.77	7.76	1.29	0.06	0.00	0.00	14.88
	W	2.45	7.29	5.35	1.00	0.12	0.01	16.22
	NW	0.20	0.96	2.17	0.42	0.09	0.00	3.84
	TOTAL %	28.33	43.27	19.90	3.38	0.34	0.01	95.23
								CALM 4.77%
SHERWOOD PARK	N	0.56	0.17	0.01	0.00	0.00	0.00	0.74
	NE	4.83	2.76	0.24	0.00	0.00	0.00	7.83
	E	7.52	4.23	0.73	0.02	0.00	0.00	12.50
	SE	10.53	10.88	1.74	0.18	0.00	0.00	23.33
	S	13.26	8.18	0.18	0.00	0.00	0.00	21.62
	SW	9.42	1.65	0.11	0.00	0.00	0.00	11.18
	W	6.86	9.35	3.38	0.30	0.01	0.00	19.90
	NW	0.26	0.71	0.47	0.08	0.00	0.00	1.52
	TOTAL %	53.24	37.93	6.86	0.58	0.01	0.00	98.62
								CALM 1.38%
ELMJAY	N	0.24	1.35	1.96	0.20	0.00	0.00	3.75
	NE	1.25	5.21	2.04	0.19	0.07	0.00	8.76
	E	3.75	6.72	2.70	0.35	0.00	0.00	13.52
	SE	4.45	21.26	4.22	0.11	0.00	0.00	30.04
	S	3.40	8.02	0.73	0.03	0.00	0.00	12.18
	SW	1.57	5.16	3.10	0.48	0.18	0.02	10.51
	W	0.72	4.18	6.89	3.43	1.05	0.08	16.35
	NW	0.01	1.16	2.88	0.64	0.17	0.00	4.86
	TOTAL %	15.39	53.06	24.52	5.43	1.47	0.10	99.97
								CALM 0.03
GOLD BAR	N	1.53	1.66	0.26	0.00	0.00	0.00	3.45
	NE	3.48	4.87	0.57	0.00	0.00	0.00	8.92
	E	3.03	3.34	0.68	0.02	0.00	0.00	7.07
	SE	6.34	4.94	1.18	0.09	0.00	0.00	12.55
	S	22.12	4.38	0.32	0.00	0.00	0.00	26.82
	SW	9.62	3.71	0.24	0.03	0.00	0.00	13.60
	W	6.07	11.90	4.40	0.56	0.00	0.00	22.93
	NW	0.96	1.82	1.09	0.19	0.01	0.00	4.07
	TOTAL %	53.15	36.62	8.74	0.89	0.01	0.00	99.41
								CALM 0.59%

Cont'd

TABLE 12 (Cont'd) WIND SPEED AND WIND DIRECTION - 2000 SUMMARY
 FREQUENCY DISTRIBUTION OF 1-HOUR AVERAGES

MONITORING STATION	DIRECTION	% WIND SPEED RANGE (km/hr)						TOTAL (%)
		1-5	6-11	12-19	20-28	29-38	39+	
BEVERLY	N	0.37	0.50	0.03	0.00	0.00	0.00	0.90
	NE	4.72	6.82	1.01	0.06	0.00	0.00	12.61
	E	4.71	2.98	0.41	0.01	0.00	0.00	8.11
	SE	5.19	4.15	0.56	0.05	0.00	0.00	9.95
	S	16.90	9.12	0.10	0.00	0.00	0.00	26.12
	SW	15.64	6.17	0.30	0.05	0.00	0.00	22.16
	W	5.36	9.57	3.88	0.36	0.00	0.00	19.17
	NW	0.24	0.20	0.07	0.00	0.00	0.00	0.51
	TOTAL %	53.13	39.51	6.36	0.53	0.00	0.00	99.53
								CALM 0.47%
FOREST HEIGHTS	N	1.01	0.77	0.08	0.00	0.00	0.00	1.86
	NE	5.07	3.91	0.28	0.00	0.00	0.00	9.26
	E	5.19	3.52	0.42	0.06	0.00	0.00	9.19
	SE	8.73	6.59	1.69	0.03	0.00	0.00	17.04
	S	23.53	4.75	0.16	0.00	0.01	0.00	28.45
	SW	8.12	3.95	0.48	0.02	0.00	0.00	12.57
	W	6.12	9.94	2.48	0.16	0.00	0.00	18.70
	NW	0.87	0.77	0.24	0.08	0.00	0.00	1.96
	TOTAL %	58.64	34.20	5.83	0.35	0.01	0.00	99.03
								CALM 0.97%
CLAREVIEW	N	1.18	0.77	0.20	0.00	0.00	0.00	2.15
	NE	6.56	6.09	0.96	0.00	0.01	0.00	13.62
	E	4.76	3.07	0.68	0.01	0.01	0.00	8.53
	SE	4.59	3.82	1.00	0.10	0.00	0.00	9.51
	S	10.49	6.75	0.61	0.00	0.00	0.00	17.85
	SW	11.06	10.26	1.16	0.02	0.02	0.00	22.52
	W	4.08	9.50	7.17	1.25	0.14	0.00	22.14
	NW	0.43	0.55	0.30	0.08	0.00	0.00	1.36
	TOTAL %	43.15	40.81	12.08	1.46	0.18	0.00	97.68
								CALM 2.32%

APPENDIX A

STRATHCONA INDUSTRIAL ASSOCIATION HISTORICAL DEVELOPMENT

STRATHCONA INDUSTRIAL ASSOCIATION

HISTORICAL DEVELOPMENT

- 1975
- In the mid seventies, government, industry and the public expressed concern that the airshed capacity in the Edmonton area may be potentially exceeded by future developments. Comprehensive air quality data was needed.
 - Following discussions with Alberta Environment and other industrial groups in Canada, the SIA made a commitment to develop and operate an air monitoring network with the following objectives:
 - consolidate air quality data and determine trends in air quality for specified parameters,
 - provide data for future environmental impact assessment studies,
 - maintain and improve relations with public and government,
 - eliminate redundant air monitoring by individual companies.
- 1979
- The SIA network was commissioned in 1979. At that time the network had no compliance function and each SIA member was required to carry out their own ambient air monitoring to meet government requirements. Thus, the compliance monitoring by individual plants was in addition to monitoring done by the newly established SIA network.
- 1981
- After two years of operation, a joint Alberta Environment/SIA Task Force was set up to achieve integration of existing industry ambient air monitoring into the SIA network and eliminate duplication.
- 1982
- The joint Task Force presented formal recommendations to the SIA and to Alberta Environment in May 1982. The recommended modifications to the SIA network were accepted and operation of the ambient air compliance network commenced on July 1, 1982. Alberta Environment stipulated that the network must operate in accordance with the 'Air Monitoring Directive'.
- 1983
- Alberta Environment was given access to real-time and historical air quality data from the network. This milestone was reached in January 1983 and the SIA became the first multi-industry compliance network in North America.
- 1984
- Joint industry/government discussions were initiated to determine how ambient air exceedances should be reported since many stakeholders had real time access to the data. The discussions culminated in an agreement to develop a 'Message Board' where all significant deviations would be recorded and archived with the air quality data.
- 1985
- The Message Board was implemented and used to report and explain exceedances detected by the SIA Air Monitoring Network. SIA members and Alberta Environment staff have access to the Message Board.

- 1986 • A joint Alberta Environment / SIA Task Force was set up to explore ways to optimize the operation of the Air Monitoring Network. The Task Force examined the technical needs, user needs and the benefits of the Network.
- 1987 • Recommendations of the joint Task Force were implemented in 1986-87:
 - Continuous monitoring of H₂S would be maintained at five stations and continuous monitoring of SO₂ at three stations. The redundant instruments were removed (one H₂S, two SO₂ and four NO_x instruments).
 - Total Suspended Particulates monitoring was required at three residential stations.
 - The Exposure Cylinder Network was reduced from 29 to 21 stations and reorganized into a regular grid pattern.
- 1989 • In May 1989, the central computer was upgraded to increase system reliability and storage capacity for historical data.
- 1992 • The Association reviewed future network operation and discussed an upgrade to modern software and hardware. A concept of consolidating computer system monitoring and environmental surveillance services was also considered.
- 1994 • The major network upgrade was implemented in the summer of 1994. The benefits were:
 - 24-hour coverage complemented by field investigation during deviations.
 - 24-hour access to real time and historical data by all SIA members (on-line access to 16 years of historical data and graphical screens).
 - Switch to regular telephone voice lines to gather data from stations.
 - Consolidation of environmental and security monitoring, reporting, computer maintenance and network administration.
- 1995 • Edmonton Power Generation Inc. joined the SIA and nitrogen oxides monitoring was added to the Clover Bar station (January 1995) and to the Forest Heights station (June 1995).
 - Communication was established with the 17th Street monitoring station (operated by Alberta Environment). The station is located in close proximity to the SIA stations and the instantaneous, 5 min, 1-hour and 24-hour average concentration data are plotted in the same format as the SIA data and can be viewed by SIA members or any authorized user.
- 1996 • New RTUs were installed. The new RTU unit can store data for several days. A new network communication protocol was installed which permits the RTU to download all historical data to the central computer after telephone communication is restored.
- 1997 • Graphical screens were simplified in order to improve comprehension by the general public.
 - Strathcona County Emergency Services staff was granted access to the SIA system.
- 1997 • Data from the Sherwood Park station were provided to the CASA Data Warehouse.

- 1998
- All RTUs were enhanced and each station can operate independently (without real time connection to the central computer) and perform a monthly calibration as well as automatic instrument span checks during communication failures. The central computer hardware was upgraded by 64 M RAM memory and by adding a 3rd hard drive.
 - On October 28, 1998, the Clover Bar monitoring station was relocated to the Strathcona County maintenance yard. This relocation was requested by the property owners and was approved by Alberta Environment.
 - The Partisol Model 2000[®] Air Sampler replaced the Hi-Vol sampler at Sherwood Park station. The reporting of PM₁₀ and PM_{2.5} values started in August 1998.
 - On November 9, 1998, the Forest Heights station was officially transferred from Edmonton Power Generation to the SIA. The station is now maintained and calibrated by SIA staff.
 - Monitoring data from the Sherwood Park station have been forwarded to the CASA (Clean Air Strategic Alliance) Data Warehouse. A new protocol permitting a monthly data file transfer was implemented on January 6, 1998.
- 1999
- A new SO₂ instrument (model TECO 43C) was installed at the Sherwood Park station on February 20, 1999.
 - The NO_x analyzer at the Forest Heights station was replaced with a spare SIA instrument and the first fully computerized calibration was performed on February 26, 1999.
 - The City of Edmonton Gold Bar Wastewater Treatment Plant joined the SIA in August 1999.
 - The “Year 2000” testing and historical data verification was conducted on a new server loaded with new operating software on March 2, 1999 (AlphaServer 800/5, Open VMS 7.2 and Telenium 4.0). The permanent switch to the “Year 2000” compliant system was executed on August 16, 1999.
 - A new EcoWeb Internet access was introduced on August 16, 1999. Using the Microsoft Explorer browser, the authorized user is able to view data in graphical format (concentration trends), in text table format (historical data), review current alarms or alerts, review QA/QC tasks or select data transfer protocols to download data to other applications.
 - A new meteorological instrument was installed at the Forest Heights station in September 1999 (Blue Sky Instruments, Model 805 Wind System).
- 2000
- Y2K rollover into the new millennium was smooth. All network components operated reliably. No issues were encountered during the leap year date of February 2000.
 - The NO_x analyzer at the Clover Bar station was replaced with a new instrument TECO 42C (March 13, 2000).
- 2000
- Meteorological towers were replaced at the Sherwood Park station on April 18, at the Beverly station on April 25 and at the Clareview station on December 19, 2000.

- 2000
- The UPS (Uninterruptible Power Source) units were replaced at all stations (June 2000).
 - The following SIA stations were audited by the Alberta Environment staff: Forest Heights (May 31), Beverly (June 3), Elmjay and Gold Bar (October 16), Beverly (October 31), Clover Bar and Clareview (November 2).
 - Modifications to the Forest Heights station air intake manifold were initiated in July and approved by Alberta Environment inspection on July 21, 2000.
 - Roofs and trailers of at the Clover Bar, Beverly and Clareview stations were extensively repaired in August – September 2000.

APPENDIX B

AMBIENT AIR MONITORING NETWORK DESCRIPTION

AMBIENT AIR MONITORING NETWORK DESCRIPTION

The SIA Ambient Air Monitoring Network consists of seven permanent stations located in residential areas in east Edmonton and Strathcona County (Figure 1, page 9). The requirements for monitoring were determined between Alberta Environment and the Strathcona Industrial Association utilizing a joint Alberta Environment/SIA Task Force, which was set up in 1982.

Thirty parameters are continuously monitored at the seven SIA monitoring stations (16 environmental and 14 meteorological parameters). In addition, two high volume samplers operated every sixth day and four to six samples of total suspended particulates (TSP) were collected per station per month. The inhalable particulates (PM₁₀ and PM_{2.5}) were monitored at the Sherwood Park station. The levels of the PM₁₀ and PM_{2.5} are measured using the same six-day frequency as TSP and the instrument is set up to alternate between sampling of PM₁₀ and PM_{2.5}. The following table lists parameters monitored at the individual stations:

MONITORING STATION	MONITORED PARAMETERS									
	SO ₂	H ₂ S	NO _x /NO/NO ₂			THC	WSPD	WDIR	TSP	PM 2.5/10
1 Clover Bar	-	★	★	★	★	-	★	★	-	-
2 Sherwood Park	★	★	-	-	-	★	★	★	-	★
3 Elmjay	★	★	-	-	-	-	★	★	-	-
4 Gold Bar	-	★	-	-	-	-	★	★	★	-
5 Beverly	★	★	-	-	-	★	★	★	★	-
6 Forest Heights	-	-	★	★	★	-	★	★	-	-
7 Clareview	-	-	-	-	-	-	★	★	-	-

Readings of the continuous parameters at the stations are taken every second. The central computer scans each station every thirty seconds using a modem. For all practical purposes, the 30-second value is called 'real time' data. The five-minute averages and one-hour averages are updated using the 30-second values. The 24-hour average values are updated hourly using the one-hour values. The 5-minute, 1-hour and 24-hour values are stored in the memory indefinitely.

EcoSys™ - Environmental Information Management System is an extension of a robust software application developed by MegaSys Computer Technologies of Calgary. EcoSys™ is a multi-user and multi-tasking system and offers real time data acquisition, access to historical data and handles a variety of alarms and alerts. The computer can page the network manager (or other telephone numbers) when specified limits are approached. EcoSys™ responds to real-time, 5-minute, 1-hour or 24-hour concentration alarms (all defined as sliding averages). Digital alarms are related to the surveillance of equipment, facility and instruments and include alarms for high or low temperature, telecommunication failure, unauthorized door entry and power failures. The network operation can be supervised remotely and appropriate action can be initiated including a field investigation in the case of an environmental alarm.

The network manager monitors operation of the network around the clock (24-hour coverage is retained) and deviation reports and regular operating reviews are submitted to the SIA members and Alberta Environment on as needed bases.

APPENDIX C

REPORTING CAPABILITIES

REPORTING CAPABILITIES

Once an authorized SIA user is logged in the SIA central computer, the Option Selection menu is displayed. The menu offers selection of one or several of the following parameters:

<u>Monitoring Stations</u>	<u>Parameters</u>	<u>Time Modes</u>
CB - Clover Bar	SO ₂	CURRENT (30 sec)
SP - Sherwood Park	H ₂ S	5-MINUTE
EJ - Elmjay	THC	1-HOUR
GB - Gold Bar	NO / NO ₂ / NO _x	24-HOUR
BV - Beverly	WSPD	
FH - Forest Heights	WDIR	
CL - Clareview		

The list of selectable trends and tables illustrates flexibility of the reporting system. A detailed "User Manual" is available from the Network manager.

Log Number	Log Description
1	Summary Exceedance Report
2	Detailed Exceedance Report
3	Current Value Report
4	Spreadsheet Report for PC (coma delimited format)
5	Status Report (all modes) - current, 5min, hourly, daily
6	Messages and Comments List
7	Daily Log Report
8	Monthly Log Report
9	Monthly Summary Report
10	Automatic Instrument Check Detailed Report
11	Automatic Instrument Check Summary Report
12	Monthly Calibration Report
13	Current Alarm Log Report
14	Current Service Log Report
15	AIC Schedules and Duration's Detailed Report
16	RTU Communication Report
17	Alarm/Alert Limits Report
18	Annual Frequency Distribution Report (SO ₂)
19	Annual Frequency Distribution Report (H ₂ S)
20	Annual Frequency Distribution Report (meteorological)
21	CASA - CDEF Data File selection (1-hour data)
22	CASA - CDEF Data File selection (5 minute data)

A user can access the Ambient Air Monitoring Network data from any computer configured with a valid Internet access or connecting to the central computer directly by a modem.

The user can retrieve information in text or table formats. Intuitive parameter and graph selection options permit fast data capture. The EcoWeb Internet access is available since August 1999 and all graphs are auto-updated every 30 seconds.

APPENDIX D

TOTAL SULPHATION AND HYDROGEN SULPHIDE CYLINDERS

TOTAL SULPHATION AND STATIC HYDROGEN SULPHIDE CYLINDERS

The exposure cylinders measure the amount of sulphur compounds present in the atmosphere (principally sulphur dioxide (SO₂) and hydrogen sulphide (H₂S)). Each cylinder consists of two bands:

A. Total Sulphation Cylinder (brown band)

As ambient air passes through the exposure cylinder, the sulphur compounds coming in contact with the band are oxidized to sulphate (SO₄). At the end of the sampling period, the cylinders are returned to a laboratory and analyzed for sulphate (SO₄). The amount of sulphate detected is proportional to the total amount of sulphur compounds deposited on the band and the amount of sulphate is determined by wet chemistry methods. The total sulphation is reported in milligrams of SO₃ equivalent per day per 100 cm² (mg SO₃ eq./day /100 cm²).

B. Hydrogen Sulphide Cylinder (white band)

The white band performs the same function as the brown band, however, the white band reacts to hydrogen sulphide (H₂S) only. The static hydrogen sulphide exposure cylinders are wrapped with strips of filter paper soaked in zinc acetate, which converts the H₂S in the atmosphere to zinc sulphide. The static hydrogen sulphide is reported in milligrams of SO₃ equivalent per day per 100 cm² (mg SO₃ eq./day /100 cm²). The static hydrogen sulphide values must be less than or equal to the total sulphation values.

Test Results

Monthly replacement of the exposure cylinders and the subsequent analyses are subcontracted to a certified laboratory in Edmonton. Laboratory results are submitted to the SIA network manager and included in the regular SIA monthly reports.

Guideline Limits

Alberta Environment's guideline limits are 0.5 mg SO₃ eq./day/100 cm² for the total sulphation loading and 0.1 mg SO₃ eq./day/100 cm² for the static hydrogen sulphide loading. Any value above these limits should be regarded as an exceedance and reasons for the occurrence should be discussed.

General

The static monitoring results represent an average loading of sulphur compounds or H₂S over the period of exposure (usually 30 days), rather than the concentration over a shorter time. Neither value can be converted to measure SO₂ or H₂S in terms of parts per million in the ambient air. These methods are suitable for gaining an appreciation of sulphur compounds loadings over a comparatively large area at relatively low cost. The static exposure cylinder monitoring results provide an indication of:

- The "hot" spots (if any) in the area.
- An indication of whether the total sulphation is increasing or decreasing.

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