PARKLAND AIRSHED MANAGEMENT ZONE

2000 Annual Report

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1. Introduction

The Year 2000 marked the third full year of operation for the Parkland Airshed Management Zone (PAMZ) Association. The association is a multi-stakeholder, non-profit society that was established to identify air quality concerns within the zone and implement management solutions suited to those concerns. By following the Clean Air Strategic Alliance (CASA) model of consensus decision making, PAMZ provides a forum for concerned stakeholders to meet, discuss and resolve their concerns in a productive and collaborative manner.

The air quality concerns that have been identified as being high priority issues for the zone are:

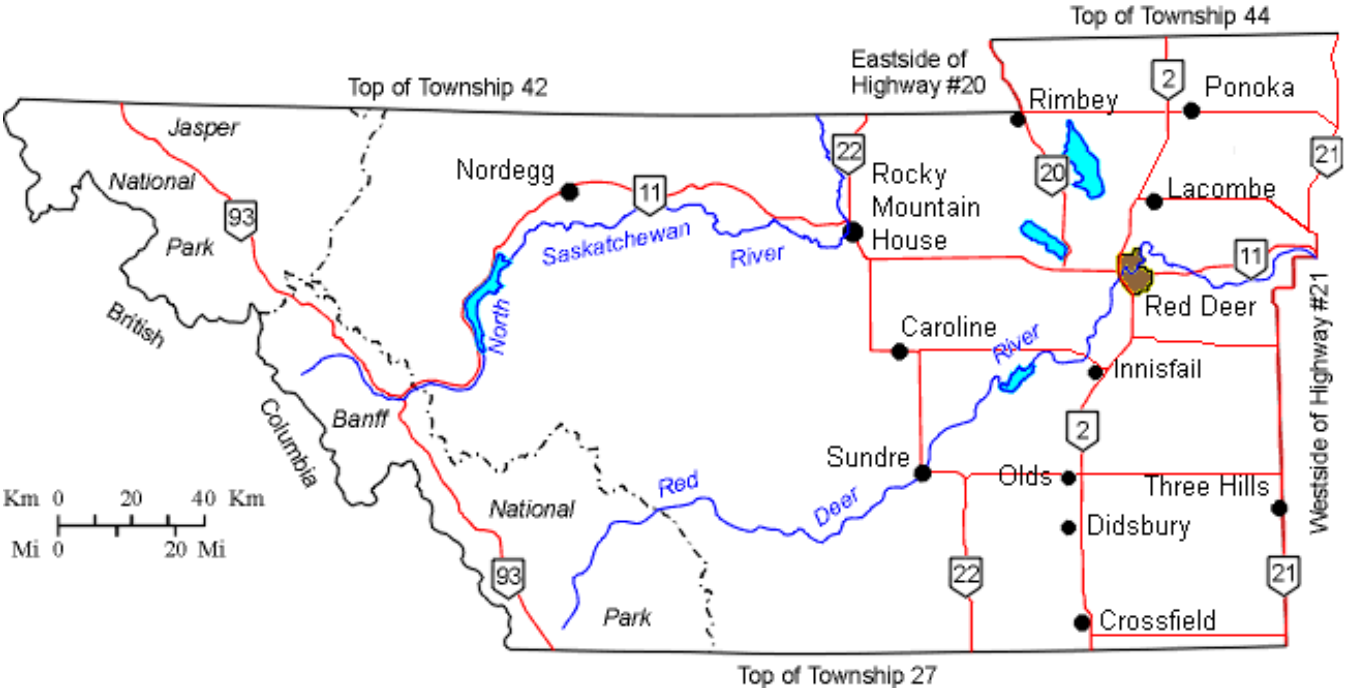
- Human Health Effects
- Livestock Effects
- Flaring

The foundation for developing strategies to address these issues is a comprehensive ambient air quality monitoring program that began operation in 1999 and was expanded and enhanced further in 2000 with the start-up of the continuous monitoring component of the program. The data collected by the program will play a key role in the understanding of air quality in the zone.

Funding of PAMZ is proportioned fairly amongst its members at levels consistent with their contribution to emissions within the Zone, as determined by annual emission inventories. In 2000, PAMZ members' financial and in-kind contributions totaled approximately $412,000 and over 2800 hours, respectively.

In March, the northeast boundary of the zone was expanded, making it conterminous with the David Thompson Health Region and adding another 2,000 square kilometers to the zone.

2000 was a significant and challenging year in the history of the PAMZ. Through the commitment and perseverance of its members and contractors, key goals the association had set for itself were achieved while significant progress was made on others. PAMZ is proud to present its accomplishments and progress in this, its fourth, annual report.



Parkland Airshed Management Zone

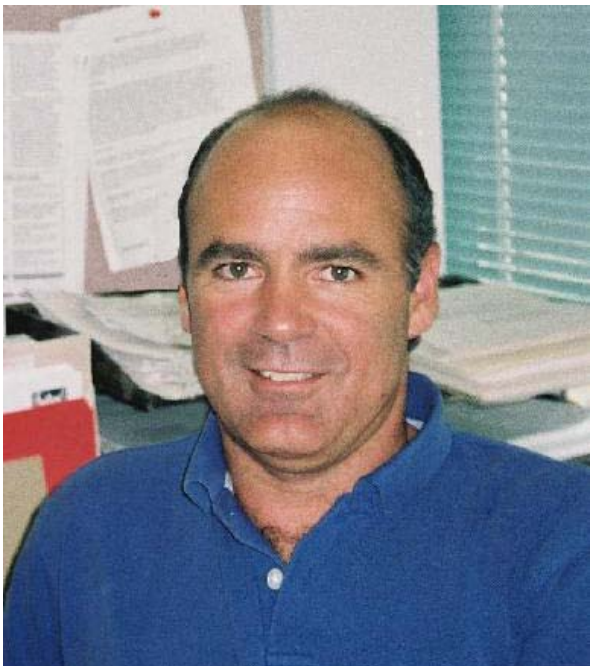
2. Report From the Chair

My first year as Chairman of the PAMZ Board of Directors was a rewarding one. I am thankful for the work of all the committees and the help I received in my new role from other PAMZ members.

The highlight for me in 2000 was the startup of the continuous component of our air quality monitoring program. The PAMZ program, approved by the Board of Directors, is unique from other monitoring programs. It utilizes an extensive network of passive stations to cost effectively provide air quality data over a large area. The results of this monitoring are of great interest to other groups involved in air monitoring. Another unique feature is the use of a portable air monitoring station to collect data from areas with air quality concerns. Consistent with how PAMZ operates, the locations for the portable station were identified through a public meeting to ensure all stakeholders views were considered.

One of the goals of PAMZ was to make better use of funds spent on monitoring air quality. With the startup of the PAMZ program, air monitoring has changed from monitoring just two parameters related to the oil and gas industry to a program which monitors for a wide range of compounds (both man-made and natural) at lower detection limits. Monitoring in the zone has changed to a truly regional monitoring program.

I wish to acknowledge the financial and in-kind support of companies and municipalities. Support for PAMZ continues to grow as various PAMZ initiatives are implemented. I am also pleased with initiatives taken in support of PAMZ by other stakeholder groups such as the Rimbey Multi-stakeholder Group. I wish to thank all the membership for their contributions and support toward PAMZ. It has taken a great deal of effort but we are now seeing the results of those efforts. I look forward to what the future will bring.



Brian Goliss

Brian Goliss
Chairman

3. Organization

The Parkland Airshed Management Zone Association is a non-profit organization whose membership is drawn from four stakeholder groups all united in a common purpose, to improve air quality. This goal is consistent with the objectives of CASA, PAMZ's parent organization. The Parkland Airshed Management Zone Association was incorporated under the Societies Act in April 1997, and operates under guidelines put forth by CASA.

The four stakeholder groups represented in the association are the public, industry, government, and non-government organizations (NGOs). The association's activities are managed by a Board of Directors. Each of the four sectors nominates directors and alternates to serve on the board. Individuals from local municipalities, provincial government departments, regional health authorities, the farming and ranching community, environmental organizations, industry and the general public represent their various sectors on the board which has twelve directors at present. The current makeup of the board is:

- Three public members
- Three industry members
- Four government members
- Two NGO members

Committees for promoting the objectives or functions of the association are appointed and dissolved by the PAMZ

Board. Each committee has a chairperson and reports to the board through that person. Currently there are five PAMZ committees:

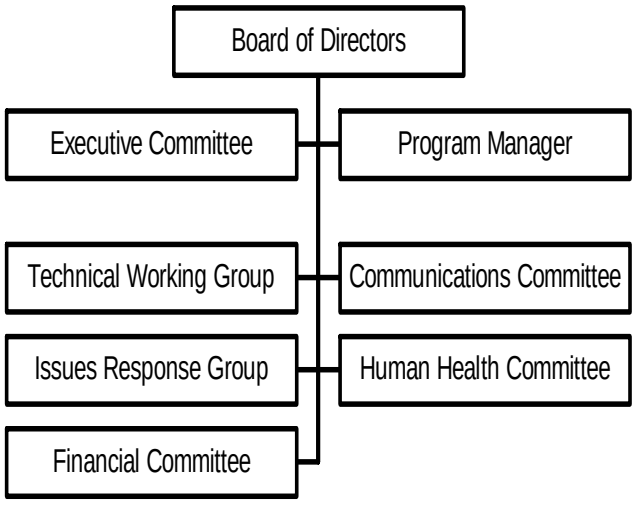
- Technical Working Group
- Human Health Committee
- Issues Response Group
- Communications Committee
- Financial Committee

The board may establish project teams to investigate, evaluate, and provide resolutions to specifically defined issues. These teams report to the board directly or through a manager and are composed of persons appointed by the board. Currently there are no project teams in operation.

A program manager is contracted to manage the PAMZ air quality monitoring program, oversee the implementation and evaluation of zonal air quality management strategies, and perform other tasks as identified in the position's terms of reference. The program manager reports to the board and sits on all of the association's committees.

Operation of the monitoring program has been contracted to a Calgary-based air quality services company, RSLS 2000 Inc., reporting to the Program Manager, with analysis of the passive samplers subcontracted to an Edmonton-based laboratory, Maxxam Analytics Inc.

Parkland Airshed Management Zone



4. Committee Reports

4.1 Technical Working Group

The Technical Working Group's primary task is the operation of the zonal air quality monitoring program, assessing the data collected by the program and making recommendations of management strategies based on that data to the PAMZ Board. This group works closely with the program manager in overseeing the operation of the program to insure that the program is credible, affordable and provides the data required by the association's stakeholders to help them gain an understanding of the region's air quality and its effects.

May 2000, was a milestone for the group and the association also, when after more than a year of review, Alberta Environment (AENV) accepted the group's joint application to amend the operating approvals of seventeen oil and gas facilities. The amendments recognize the companies' participation and support of the PAMZ Zonal Air Quality Monitoring (AQM) Program. The PAMZ Program replaces the co-applicants' existing Compliance Ambient AQM programs and allows them to put the funds and resources that were previously required by these programs into the PAMZ Zonal Program. Two more co-applicant facilities were allowed to replace their existing programs in September while two other facilities will continue to operate separate Compliance Ambient AQM programs specific to them. The review of the application by Alberta Environment considered each facility's AENV and Alberta Energy Utilities Board (AEUB) complaint records, ambient air quality guidelines and source limits exceedences, average ambient air quality levels, local concerns, future throughput, plant upgrades and improvements, etc. throughout the previous five-year period (1995-1999).

Following the receipt of the seventeen amendments in May, the program manager was instructed to proceed with the ordering of continuous monitoring equipment and construction of a portable AQM Station. The continuous portion of the monitoring program started up in August at the Caroline Station and in October for the portable unit, once locations recommended by the Issues Response Group had been finalized.

4.2 Human Health Committee

The PAMZ Human Health Committee (HHC) acts as a forum to explore and address issues affecting human health that may be associated with air pollution. To this end, the HHC is comprised of representatives from a wide variety of interests including health, environment, academics, industry, agriculture and the general public.

The second purpose of the HHC is to assess the feasibility of implementing a human health – air quality monitoring system in a manner similar to that recommended by the Clean Air Strategic Alliance's Human Health Project Team in 1999. This initiative would be a long-range strategy, requiring the goodwill and teamwork of many sectors. The creation of an ongoing monitoring function of this nature would act as a tool to help reduce the impact of air pollution on human health.

In December 2000 the HHC, working with the David Thompson Health Region and Olds College, conducted a telephone survey of zone residents' air quality concerns. The results of the survey are intended to be used as a starting point for future discussions regarding strategic directions that PAMZ may undertake in its efforts to improve air quality in central Alberta and reduce environmental risks to human health.

4.3 Issues Response Group

PAMZ Issues Response Group (L to R)
Jeff Strem, Wayne Johnston, lla Johnston
David McCoy, Martha Kostuch, John Hawkins,
Kevin Warren Missing: Karen McCallion

Throughout the year, work continued on the three top priority issues identified by PAMZ: human health, animal health and flaring. PAMZ members served on the various PAMZ committees and CASA project teams established to specifically address these issues.

In April 2000, a public meeting was held at the Eagle Hill Community hall to solicit input from the public and generate recommendations for the PAMZ Issues Response Group (IRG) on Issues and Locations for the Portable Air Quality Monitoring Trailer's use over its first twelve months. Approximately 35 attendees participated in the meeting, with representation from all four of PAMZ's stakeholder groups; public, NGOs, government (AENV & EUB), and industry.

The meeting resulted in the recommendation of four possible sites for the portable station's first year of operation. These recommendations were adjusted and finalized at an IRG meeting in August and then adopted by the technical working group and implemented in October.

4.4 Communications Committee

2000 was a busy year for the PAMZ communications committee. Membership drives aimed both at municipalities and industries operating within the zone were successful in maintaining the association's membership at the same level as the previous year.

Presentations about the organization and its air quality monitoring program were given to twelve municipalities located fully or partially within the zone's boundaries. Five municipalities continued to recognize their business's and residents' impacts on the airshed and elected to renew their memberships in the association. Various presentations about the association were also given to students, companies, professional organizations, industrial associations, other airshed management zones and to the Clean Air Strategic Alliance's Board of Directors.

Besides securing members, these presentations first sought to create an awareness of the work of the PAMZ and that of its member companies and organizations, and second to raise the awareness in all its audiences of some of the principles of environmental protection including personal environmental responsibility and pollution prevention.

5.0 Air Quality Monitoring Program

The year 2000 was the first full year of operation of the PAMZ Regional Air Quality Monitoring Program which started in December 1999 with the establishment of the Program's Passive Monitoring Component.

The PAMZ AQM Program is the consensus of two year's of work by the PAMZ Board and Technical Working Group. The program's major components are:

- A twenty-nine station passive monitoring network for sampling NO_2, O_3 and SO_2 that began operation in December 1999. (The network was increased to 33 stations in 2001.)
- Two continuous monitoring stations owned and operated by PAMZ.
- One continuous monitoring station owned and operated by Alberta Environment.
- One continuous monitoring station owned and operated by the West Central Airshed Society Zone.

The stations are configured for monitoring a number of parameters from a wide range of natural, industrial, non-industrial and mobile emission sources.

In designing the AQM Program, PAMZ reviewed other zonal monitoring programs, both within and outside of Alberta, and adopted elements of those programs it felt could best serve the PAMZ stakeholders' needs. The parameters that were chosen to be monitored are consistent with those being monitored within the Alberta Ambient Air Quality Monitoring System's (AAAQMS) network .

The program's design has four major attributes:

- It will provide data to address the current and future air quality concerns/issues of the zone's various stakeholders.
- This data will contribute to the body of information required by the scientific community and other users outside of the PAMZ to provide a better understanding of certain pollutants including their sources, behaviors and effects.
- It will be dynamic and evolutionary in nature and, therefore, capable of responding to changing or emerging concerns, issues, technologies, and developments in other management zones/programs.
- It can be effectively funded by the zone's stakeholders while allowing the PAMZ to research, develop and implement other programs and activities.

The primary intent of the PAMZ Regional AQM Program is the provision of high quality data required in the development and evaluation of strategies to address zonal air quality issues.

Fallen Timber Passive Monitoring Station

It is essential therefore that the data are complete, credible and scientifically credible and also that the processes employed to collect data are timely and efficient. Comprehensive and rigorous quality control and quality assurance (QA/QC) is an integral component of the PAMZ AQM program. It includes daily checks of calibration and instrument performance, together with regular multi-point calibrations and government audits. Data are examined for long-term systematic errors and all raw and quality controlled data is archived.

Data collected by the Parkland Airshed Management Zone is part of the new, province-wide, integrated data management system developed through the Clean Air Strategic Alliance. It is available through the Alliance's website, the CASA Data Warehouse (www.casadata.org) where it can be accessed freely. Additionally, hard copy and digital formats of specific data are available upon request, from the PAMZ program manager.

5.1 Continuous Monitoring

Continuous monitoring involves drawing air through a commercial analyzer calibrated to produce an output that is proportional to the ambient concentration of the compound being monitored. This gives the greatest resolution but is costly, due largely to the capital costs involved. Compounds typically measured in this way include sulphur dioxide (SO_2), hydrogen sulphide (H_2S), oxides of nitrogen (NO_X), ozone (O_3), particulates, and others.

The PAMZ continuous monitoring program monitors more types of emissions from a wider range of sources than those historically monitored in the zone. These include: nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), hydrogen sulfide (H_2S), total reduced sulphur compounds (TRS), carbon monoxide (CO), methane, non-methane and total hydrocarbons (CH_4, NMHC, THC), particulate matter 10 microns in diameter and smaller (PM_{10}) and particulate matter 2.5 microns in diameter and smaller ($PM_{2.5}$).

The continuous monitoring program utilizes data collected at four continuous monitoring stations. The first station is a permanently fixed station located approximately 16 kms. south southeast of the town of Caroline. It is situated at a location determined to have a SO_2 high deposition level through past modeling efforts. This station began operation in August 2000.

The second station is housed in a portable trailer that is located northeast of Crossfield for one month of every quarter, and at other locations throughout the zone as recommended by the PAMZ Issues Response Group. Currently the primary use of this station is to gather data to better understand regional air quality issues and to also fill data gaps for specific geographic locations within the zone. The current monitoring schedule has the station on site at a location for a period of approximately 30 days, after which it is relocated to a new site, returning to the first site after an interval of six months so that data is collected during different seasons. This station began operation in October 2000 and for the balance of the year was located at a sites west of Alix, the Crossfield Site, and a site south of Rimbey. The station's current schedule will expire in October 2001.

The third station is located in the City of Red Deer and is currently owned by Alberta Environment and operated by Alberta Environment and the City of Red Deer. In the future the operation of this station may be turned over to PAMZ.

The fourth station is located at Hightower Ridge, a remote area near the border of the Willmore Wilderness Park, northwest of Hinton. The station is owned and operated by the West Central Airshed Society (WCAS). Because of its remote location at long distance from industrial emission sources, data collected by the station is used by WCAS and PAMZ as a regional background monitoring station.

The analyzers used in the program are capable of detecting low level concentrations of pollutants that may be associated with chronic human and livestock health disorders as well as the higher levels associated with the health concerns resulting from acute exposures. The intensive QA/QC program associated with the monitoring and the data management that make it possible to detect subtle changes and trends in data to allow for the assessment of the impacts of various emission-producing operations within the zone. Various meteorological parameters are also monitored continuously to gain a better understanding of possible sources and behaviors of the different pollutants.

For the purposes of this report, data collected from the continuous stations in the PAMZ Program from August through December 2000 has been compared to data collected at stations with similar characteristics (sources, population, etc.) located in other zones or cities.

Portable Continuous Monitoring Station at the Alix Site

5.1.1 Sulphur Dioxide

Sulphur dioxide (SO_2) is a colorless gas with a strong, suffocating odor. It can be detected by taste and odour at concentrations as low as 300 parts per billion (ppb).

Sulphur dioxide is formed during the processing and combustion of fossil fuels that contain sulphur such as natural gas, coal and oil sands; only small quantities of sulphur dioxide come from gasoline fueled motor vehicle exhaust. Other sources of sulphur dioxide include gas plant flares, oil refineries, pulp and paper mills and fertilizer plants. Volcanic eruptions provide a natural source of sulphur dioxide in the atmosphere.
Sulphur dioxide is emitted directly into the atmosphere and can remain suspended for days allowing for wide distribution of the pollutant. In the atmosphere, sulfur dioxide is usually oxidized by ozone and hydrogen peroxide to form sulfur trioxide. Sulfur trioxide, similar to sulfur dioxide, is extremely soluble in water. If these sulfur oxides are present in the atmosphere when condensation occurs, tiny droplets of sulfuric acid (acid rain) are formed. Sulphur dioxide can combine with other atmospheric gases to produce fine particles.

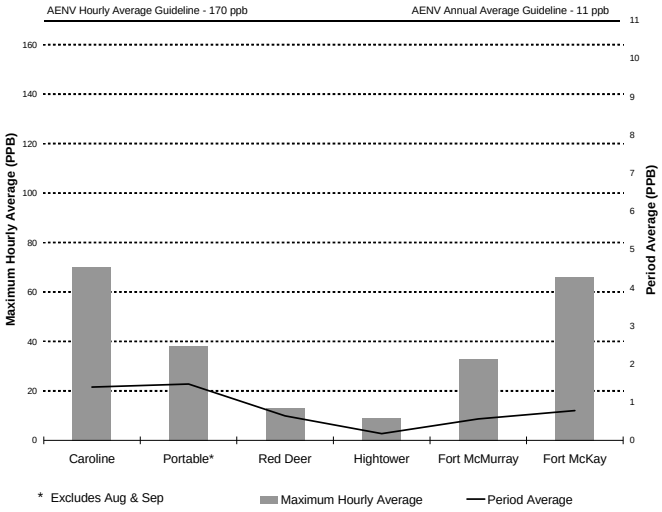
The 2000 inventory of SO_2 emissions within PAMZ was updated based on 1999 data. There was a slight increase in SO_2 emissions within PAMZ from the previous emissions inventory undertaken using 1998 data. It is estimated that sulphur dioxide emissions from sources located within PAMZ totaled 61,948 tonnes in 1999, primarily from the oil and gas sector.

The Alberta Environment guidelines for sulphur dioxide are:

- 172 ppb averaged over a one-hour period
- 57 ppb averaged for one day
- 10 ppb averaged for one year

Short-term (acute) exposures to high concentrations of sulphur dioxide can trigger constriction of the airways, causing particular difficulties for asthmatics. Children can experience increased respiratory tract infections and healthy people may experience sore throats, coughing, and breathing difficulties. Sensitive vegetation may be injured by exposure to high concentrations of sulphur dioxide. Long-term (chronic) exposure has been associated with increased risk of mortality from respiratory or cardiovascular disease.

The average sulphur dioxide concentration observed at the Caroline Station from August through December 2000 was 1.4 ppb. The average sulphur dioxide concentrations observed at the Red Deer Station and Hightower Stations during the same period were 0.6 ppb and 0.2 ppb respectively. These results are consistent with the location of the stations in relation to oil and gas producing operations. The average for Red Deer (0.6 ppb) during this period was the same as the average observed in Fort McMurray, a similarly sized and populated city also located downwind from oil and gas producing operations, during the same time period. The average sulphur dioxide concentration observed with the Portable Station from October through December 2000 was 1.5 ppb, with the highest average concentration of 2.2 ppb observed while the station was located at the Alix site. All of the above results are low and well within the Alberta Environment annual average guideline of 10 ppb.



SO_2 Monitoring
August - December 2000

Sulphur dioxide concentrations during the above time periods reached a maximum of 41% of the Alberta one-hour guideline at Caroline, 22% at the Crossfield-Carstairs location, 8% at Red Deer and 5% at Hightower, again consistent with the stations' proximity to oil and gas producing operations. The highest hourly average sulphur dioxide values at the Caroline Station occurred when the winds were from the west.

The highest average sulphur dioxide values at the Portable Station occurred when the winds were from the east-southeast, northwest, and north winds for the Alix, Crossfield-Carstairs and Rimbey locations respectively. These directions for the Caroline, Alix and Crossfield-Carstairs sites are associated with local sour gas-processing plants.

5.1.2 Hydrogen Sulphide

Hydrogen sulphide (H_2S) is a colourless gas with a rotten egg odour. While most people can detect hydrogen sulphide by odour at approximately 10 ppb there are some individuals who can detect it at concentrations as low as 0.5 ppb. Hydrogen sulphide is heavier than air, so it does not disperse rapidly in enclosed spaces and may collect in low-lying areas such as valleys.

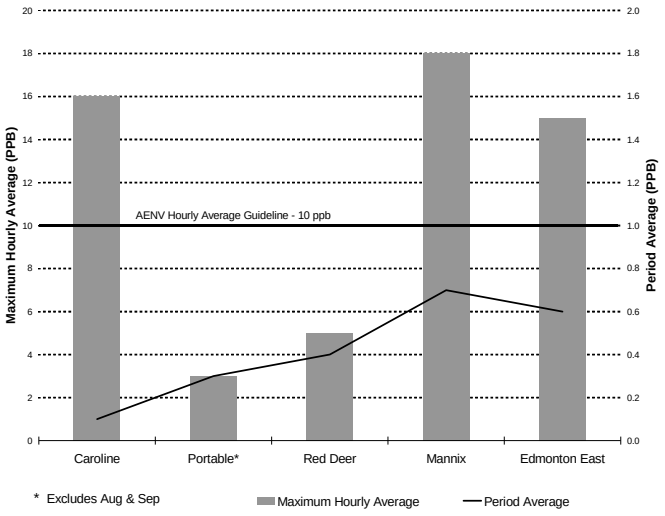
The decomposition of organic matter by bacteria under anaerobic conditions (no oxygen) produces hydrogen sulphide. Natural sources of hydrogen sulphide include sulphur hot springs, sloughs, swamps and lakes. Hydrogen sulphide can also be produced by chemical reactions within sedimentary rocks, particularly in the deeply buried sedimentary rocks such as those found in the foothills of the Canadian Rockies. "Sour" gas is natural gas containing hydrogen sulphide. Industrial sources of hydrogen sulphide include fugitive emissions (leakage) from sour gas processing plants, exploratory wells, petroleum refineries, tank farms, oil sands plants, sewage treatment facilities, pulp and paper plants which use the kraft pulping process and animal feedlots.

Alberta Environment's guidelines for hydrogen sulphide are based on an odour threshold of 10 ppb. The guidelines for hydrogen sulphide are:

- 10 ppb averaged over a one-hour period
- 3 ppb average for one day

At ambient concentrations of 1-5 ppm, H_2S causes a moderate to strong offensive odour and people may experience nausea, tearing of the eyes, headaches or loss of sleep following prolonged exposure. By 10 ppm, the symptoms may increase or persist with lung irritation and damage to eyes occurring at levels of 20 ppm. At levels approaching 100 ppm, the sense of smell is paralyzed and it is no longer possible to smell the gas. At concentrations approaching 500 ppm the sense of reasoning and balance is lost and at concentrations above 700 ppm there is rapid unconsciousness and stoppage of breathing resulting in death without immediate rescue.

The average hydrogen sulphide concentration observed at the Caroline Station from August through December 2000 was 0.1 ppb, The average hydrogen sulphide concentration observed at the Red Deer Station and Hightower Stations during the same period was 0.4 ppb. These values are lower than those observed at two similarly located stations, the first at Mannix, a station located downwind of two large oil sands processing facilities near Fort McMurray with an average concentration during the same time period of 0.7 ppb and a second station, located in East Edmonton with an average concentration during the same time period of 0.6 ppb. The average hydrogen sulphide concentration observed with the Portable Station from October through December 2000 was 0.3 ppb, with the highest average concentration of 0.5 ppb observed while the station was located at the Rimbey site.



H_2S Monitoring
August - December 2000

Hydrogen sulphide concentrations observed from August through December exceeded the Alberta one-hour guideline of 10 ppb on two occasions at the Caroline station. The first exceedence was a one-hour concentration of 16 ppb caused when sour gas was improperly vented during the collection of a condensate sample at a well test in the local area. The cause of the second exceedence of 13 ppb could not be ascertained. No exceedences of the Hydrogen Sulphide Guideline were observed at the Red Deer Station during the same time period nor at the Portable Station from October through December. For comparison, from August through December the highest observed one hour concentrations at the Mannix and Edmonton East stations were 18 and 15 ppb respectively. During this time period there were a total of 8 And 6 exceedences of the one-hour guideline observed at the Mannix and Edmonton East Stations respectively.

5.1.3 Total Reduced Sulphur Compounds

The term "total reduced sulphur compounds" (TRS) is used to collectively describe hydrogen sulphide, mercaptans and other reduced sulphur compounds such as carbonyl suphide (COS) and carbon disulphide (CS_2). All of these compounds have characteristic odours that are readily detectable by people at very low concentrations.

The major component of the TRS observed by the PAMZ continuous monitors is hydrogen sulphide. The sources of hydrogen sulphide have been discussed previously. The sources of the other reduced sulphur compounds are treatment lagoons associated with kraft paper mills, incomplete combustion in sour gas flares, sulphur remelting activities and fugitive emissions from pipelines (mercaptans are used as an odorant in natural gas).

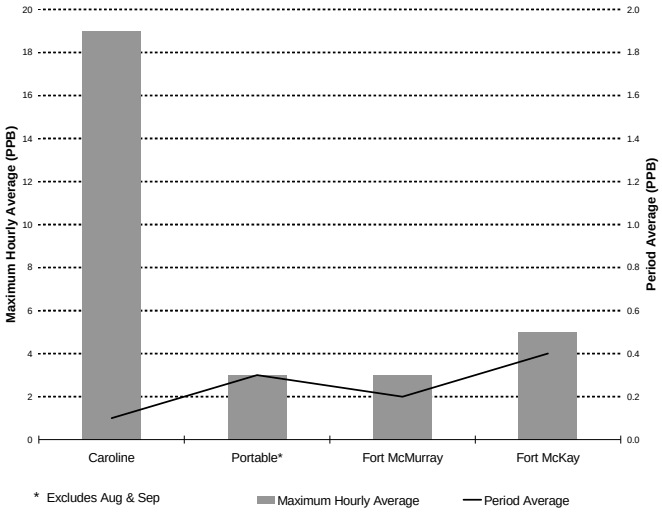
While there are no Alberta Environment Guidelines for TRS in general, there are guidelines for H_2S specifically as reported earlier.

TRS is monitored at the two PAMZ-operated stations but not at Red Deer or Hightower.

The average total reduced sulphur concentration observed at the Caroline Station from August through December 2000 was 0.1 ppb. The average total reduced sulphur concentration observed with the Portable Station during the same period was 0.3 ppb, with the highest average concentration of 0.5 ppb observed while the station was located at the Rimbey Site. Again, it is important to note that the TRS results include H_2S concentrations and that within the Zone H_2S is the primary component of the TRS observed.

These results are also consistent with the observations recorded by co-located TRS analyzers. These values are also similar in magnitude to those observed at two similarly located stations, the first at Fort Mackay, a station located downwind of two large oil sands processing facilities near Fort McMurray, with an average TRS concentration during the same time period of 0.4 ppb. The second station is located in Fort McMurray, a city also situated downwind from oil sands refining operations, that had an average TRS concentration during the same time period of 0.2 ppb.

The highest maximum one hour TRS measurement observed at the Caroline Station was 19 ppb. The maximum one hour average TRS concentration was recorded during the same episode when the maximum H_2S concentration (16 ppb) was recorded, a well test when some sour gas was improperly vented. The highest maximum one hour TRS measurement observed at the Portable Station was the 3 ppb value recorded on December 4 with southeast winds while the station was located at the Crossfield-Carstairs Site. Again, these results are consistent with the observations recorded by co-located TRS analyzers on the same dates.



TRS Monitoring
August - December 2000

During the same time period the maximum one hour TRS measurements observed at the Fort McMurray and Fort McKay stations located in the Wood Buffalo Environmental Association (WBEA) monitoring network (H_2S is not monitored specifically at these sites) were 3 and 5 ppb respectively.

5.1.4 Oxides of Nitrogen

Oxides of nitrogen (NO_X), mostly in the form of nitric oxide (NO) and nitrogen dioxide (NO_2), are products of all types of combustion, but are primarily produced by the high temperature combustion of fossil fuels. For the purposes of air quality monitoring, oxides of nitrogen are considered to be the sum of nitric oxide and nitrogen dioxide. Most oxides of nitrogen are emitted in the form of nitric oxide. Nitric oxide reacts rapidly in the atmosphere through various mechanisms to form nitrogen dioxide. Nitrogen dioxide is a reddish-brown gas with a pungent irritating odor.

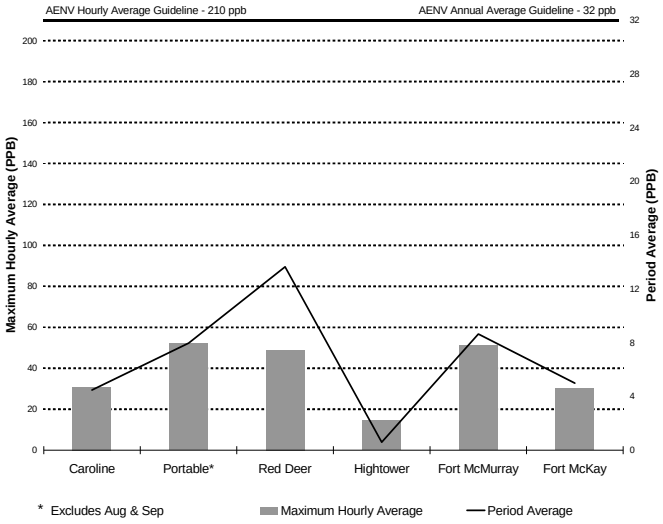
Oxides of nitrogen emissions are produced by transportation (automobiles, trucks, trains), industrial sources (oil and gas industries) and power generation plants. Smaller sources of oxides of nitrogen include natural gas combustion (e.g. home heating), heating fuel combustion and forest fires. The largest urban source of oxides of nitrogen is emissions from motor vehicles.
The 2000 inventory of NO_X emissions within PAMZ was updated based on 1999 data. There was a slight decrease in NO_X emissions within PAMZ from the previous emissions inventory undertaken in 1999 using 1998 data, primarily due to a reduction in emissions from the oil and gas sector. It is estimated that oxides of nitrogen emissions from sources located within the Zone totaled 34,842 tonnes in 1999. The two major contributors were oil and gas and transportation sectors, accounting for 58% and 18%, respectively, of the total emissions.

The Alberta Environment guidelines for nitrogen dioxide, the major component of nitrogen oxides in the ambient atmosphere, are:

- 212 ppb averaged over a one-hour period
- 106 ppb averaged for one day
- 32 ppb averaged for one year

At higher concentrations, nitrogen dioxide is an irritating gas that may constrict the airways of asthmatics and increase the susceptibility to infection in the general population. It is a major component of atmospheric photochemical reactions that lead to smog formation, acid rain and ground level ozone formation and destruction. Exposure of vegetation to high concentrations of oxides of nitrogen results in observable effects such as leaf colouring and impairment of leaf function.

The average nitrogen dioxide concentration observed at the Caroline Station from August through December 2000 was 4.48 ppb. The average nitrogen dioxide concentrations observed at the Red Deer Station and Hightower Stations during the same period were 13.64 and 0.60 ppb respectively. These results are all consistent with the location of the stations in relation to oil and gas facilities and transportation sources. The average for Red Deer during this period is similar to the average observed in Fort McMurray, a similarly sized and populated city during the same time period. The average nitrogen dioxide concentration observed with the Portable Station from October through December 2000 was 7.97 ppb, with the highest average concentration of 11.00 ppb observed while the station was located at the Rimbey site.



NO_2 Monitoring
August - December 2000

These values are less than 45% of the Alberta Guideline of 32 ppb for an annual average nitrogen dioxide concentration in ambient air. These values are substantially lower compared to the averages measured in the downtown areas of Alberta's two largest cities, Edmonton and Calgary, during the same time period where emissions are primarily from motor vehicles.

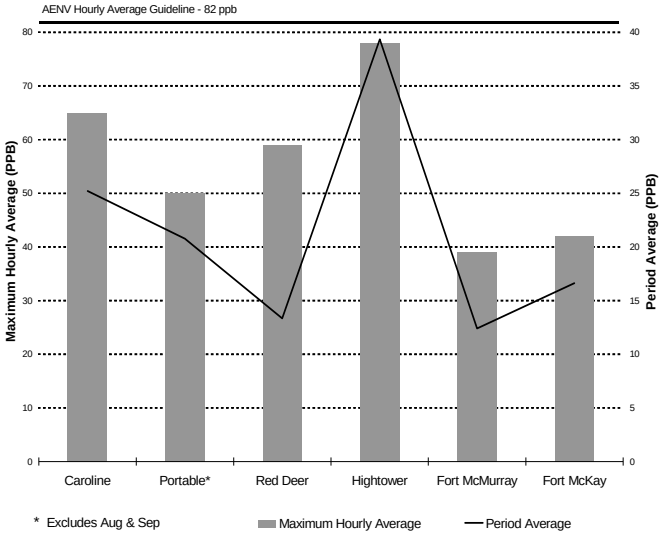
Nitrogen dioxide concentrations during the above time periods reached a maximum of 15% of the Alberta one-hour guideline at Caroline, 25% at the Rimbey location, 28% at Red Deer and 7% at Hightower, again consistent with the stations' proximity to oil and gas producing operations or transportation sources. The highest hourly average nitrogen dioxide values at the Caroline, Portable and Red Deer Stations occurred when the winds were from directions associated with motor vehicle traffic.

5.1.5 Ozone

Ozone (O_3) is a colorless gas that at normal outdoor concentrations is odourless. However, ozone does have a characteristic of sharp odour when found at higher concentrations, such as those associated with electrical discharges from lightning storms or photocopiers.

The ozone layer in the upper atmosphere (stratosphere) absorbs UV radiation and creates a warm layer of air in the stratosphere. The ozone layer is therefore responsible for the thermal structure of the stratosphere. Stratospheric ozone shields the Earth against harmful rays from the sun, particularly ultraviolet B radiation. Ozone that is present at ground level (troposphere) is a pollutant, as it is involved with NO_X in the photochemical production of many of the constituents of air pollution, and is also the primary constituent of smog.

Globally, ground-level ozone is mostly anthropogenic, that is, it is the result of man's activities. However ozone is different from other pollutants in that it is not emitted directly into the air. It is a "secondary" pollutant because it is produced when two "primary" precursor pollutants, nitrogen oxides and volatile organic compounds (VOCs), react in the presence of heat and sunlight under stagnant conditions. VOCs are emitted from a variety of sources, including motor vehicles, chemical plants, refineries, factories, consumer and commercial products, and other industrial sources. Ozone and the precursor pollutants that cause ozone can also be transported into an area from pollution sources, such as urban centers and industrial complexes, that are located hundreds of kilometers upwind. A major source of VOC's in rural areas is natural emissions from trees and vegetation.



O_3 Monitoring
August - December 2000

In Alberta, ozone concentrations are generally lower at urban locations than at rural locations. This is due to the destruction of ozone by nitric oxide that is emitted by motor vehicles. In Alberta, maximum ozone values are generally recorded during the late spring and summer when ozone production in the lower atmosphere is at a maximum due to a peak in incoming sunlight combined with stagnant weather conditions. At other times of the year, high daily average ozone values may be influenced by transport of ozone from the stratosphere by meteorological processes.

A Canada Wide Standard for ozone has been issued and the Province of Alberta has given the Clean Air Strategic Alliance a mandate to develop an implementation plan for Alberta. Several PAMZ members and PAMZ itself are represented on the committee that has been formed to formulate this plan.

Alberta Environment's guideline for ozone is:

- 82 ppb averaged over a one-hour period

At higher concentrations, ozone's health effects can include reduced lung function; aggravated existing respiratory illness; and irritated eyes, nose, and throat as it is a strong oxidizer. High concentrations can reduce crop yields. Chronic exposure can cause permanent damage to the alveoli of the lungs.

During the period from August through December 2000 no exceedences of Alberta Environment's maximum one hour ozone guideline were recorded at any of the continuous stations that comprise the PAMZ AQM Program or at the stations in the WBEA that are used for comparison purposes. The maximum ozone concentrations recorded at the Caroline and Red Deer Stations were 65 ppb and 59 ppb respectively. The maximum ozone concentration observed at the Portable Station was 50 ppb observed in October while the station was located at the Alix site.

All three of these stations are located within the Zone's boundaries. Average concentrations of ozone during the same time periods for these stations were 25 ppb, 21 ppb, and 14 ppb for the Caroline, Portable and Red Deer Stations respectively. At the Hightower station, the background monitoring station, located in an area remote from industrial activity, the maximum one hour and average for the period were 78 ppb and 39 ppb respectively. These values are all consistent with and typical of the values observed at other urban, rural and remote locations where continuous monitoring is conducted in Alberta.

5.1.6 Hydrocarbons

Hydrocarbons are divided into two broad categories, "reactive" and "non-reactive" hydrocarbons. The major non-reactive hydrocarbon in the atmosphere is methane, which is a naturally occurring colorless, odorless gas that is recognized as a major contributor to the greenhouse effect.

Reactive hydrocarbons include many volatile organic compounds such as alkenes, alkynes, benzene, toluene, ethylbenzenes and xylenes and other aromatics. Reactive hydrocarbons are important because they can react with oxides of nitrogen in the presence of sunlight to form ozone and may be toxic to humans, animals or vegetation. Polycyclic aromatic hydrocarbons are of particular interest because they are less volatile and many are known carcinogens.

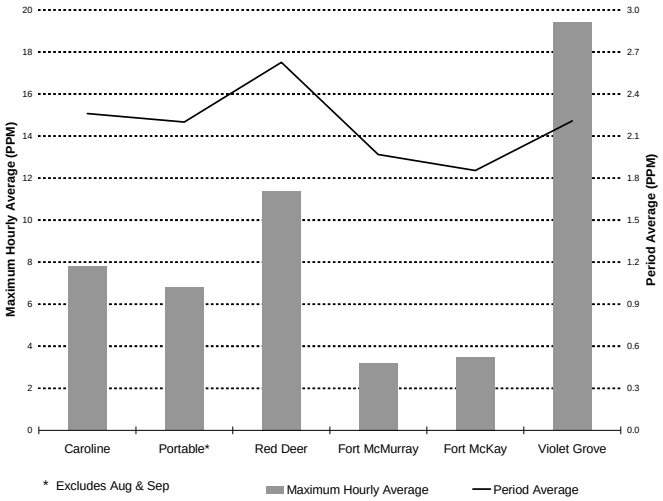
The term "total hydrocarbons" (THC) refers to a broad family of chemicals that contain carbon and hydrogen atoms and includes both reactive and non-reactive hydrocarbons.

Large amounts of methane are produced naturally through the decay of vegetation but human activity is contributing to a worldwide increase in methane concentrations of about 1% per year. Trees and plants are major natural emitters of reactive hydrocarbons with other significant sources being vehicular emissions, gasoline marketing and storage tanks, petroleum and chemical industries, dry cleaning, fireplaces, natural gas combustion and aircraft traffic. Motor vehicles are the major source of hydrocarbons in urban areas.

Alberta does not have guidelines for ambient (outdoor) concentrations of total hydrocarbons. Natural background total hydrocarbon concentration ranges from 1.5 to 2.5 ppm.

From August through December 2000, The PAMZ program monitored both Total Hydrocarbons and Methane concentrations at the Caroline Station and Total Hydrocarbons only at the Portable and Red Deer Stations. Total hydrocarbons are not monitored continuously at the Hightower Station. For comparison purposes, total hydrocarbon monitoring results from similarly-located stations at Violet Grove, Fort McMurray and Fort McKay have been included.

The average total hydrocarbon concentration observed at the Caroline Station from August through December 2000 was 2.3 ppm. This average is very similar to that observed during the same time period at the Violet Grove Station (2.2 ppm), located near Drayton Valley and consistent with both stations' locations with respect to oil and gas producing locations. The total hydrocarbon concentrations observed at the Red Deer Station during the same period was 2.6 ppm, greater than those observed in Fort McMurray, a similar-sized city during the same period, but similar to those observed in Calgary and Edmonton. The average total hydrocarbon concentration observed with the Portable Station from October through December 2000 was 2.2 ppm, with the highest average concentration of 2.7 ppm observed while the station was located at the Rimbey site. This average is higher than normal for a rural site and may be related to vehicle traffic on a major highway located nearby. More hydrocarbon monitoring at the Rimbey site is planned for 2001 that will include both THC and Methane monitoring, in an effort to better determine possible local hydrocarbon sources.



THC Monitoring
August - December 2000

The highest maximum one hour THC measurement observed at the Caroline Station was the 7.8 ppm value observed when winds were from the west, a direction associated with a local pipeline compressor station. The highest maximum one hour THC measurement observed with the Portable Station was 6.8 ppm. The wind vane at the station was frozen in position because of icing conditions at the time of the maximum reading and therefore its possible source cannot be determined. The highest maximum THC concentration observed at the Red Deer Station was 11.3 ppm, which was greater than the maximum of 3.2 ppm observed at the Fort McMurray Station during the same time period, but similar to the maximums observed in Calgary and Edmonton and attributable to motor vehicle traffic.

5.1.7 Inhalable Particulates

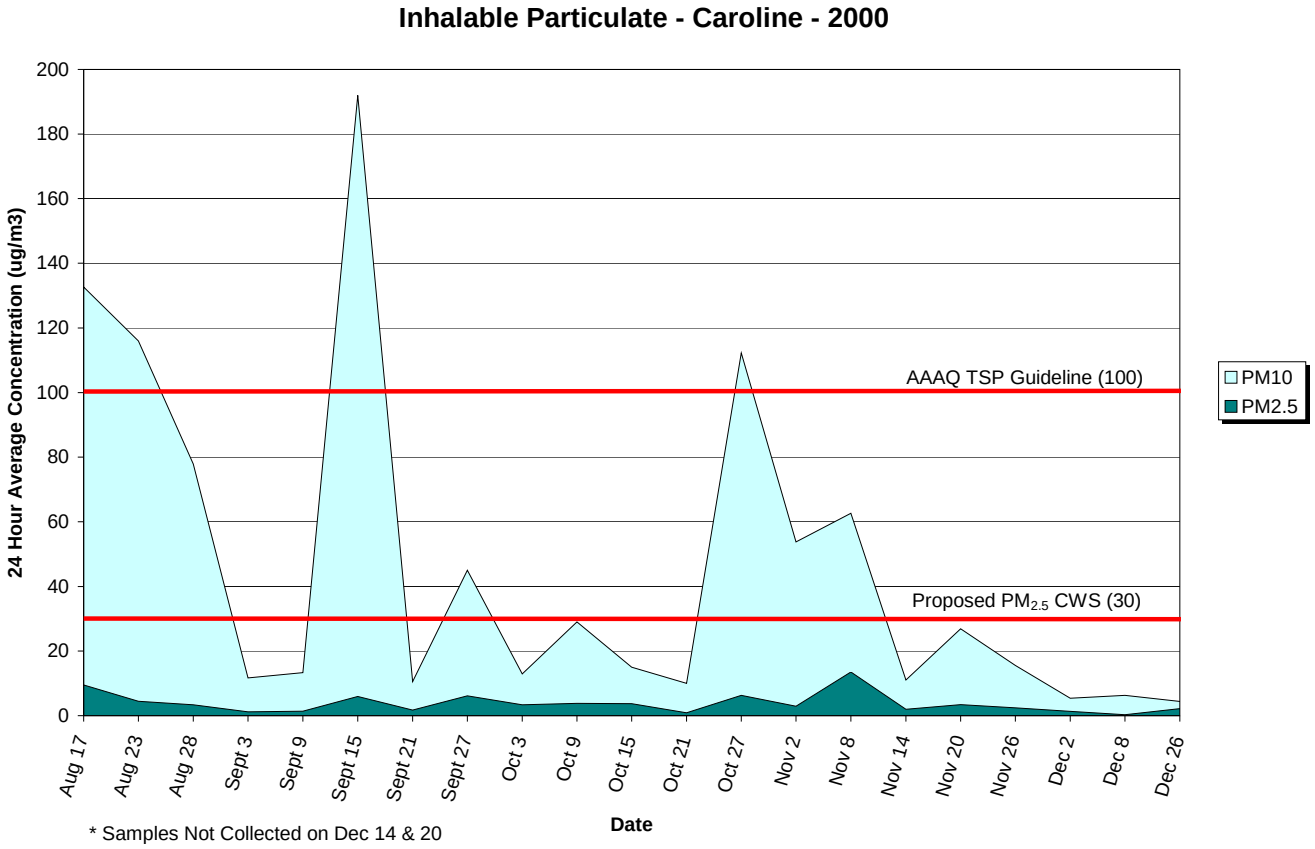
The term inhalable particulates, or PM_{10}, refer to particles that have a diameter of less than 10 microns and are suspended in the air for an indefinite period of time. PM_{10} is a mixture of various substances. These substances occur in the form of solid particles or as liquid drops. Some particles are emitted directly into the atmosphere. Other particles result from gases that are transformed into particles through physical and chemical processes in the atmosphere.

A variety of emission sources and meteorological conditions contribute to ambient PM_{10}. PM_{10} can be divided into two groups of particles based on size: fine particles and coarse particles. The fine particles are those particles that are less than about 2.5 microns in diameter and are known collectively as $PM_{2.5}$. In contrast, the coarse particles are those that are greater than about 2.5 microns in diameter.

A variety of emission sources and meteorological conditions contribute to ambient PM_{10}. In Alberta, sources of inhalable particulates include soil, road dust, dust resulting from other human activities (e.g. harvesting), smoke from forest fires, smoke from recreational sources (e.g. campfires and fireplaces), smoke from other various sources (e.g. stubble-burning), vehicle exhaust emissions, and industrial emission sources (e.g. power plants, cement manufacturing facilities, coal mining operations and the forest products industry).

A variety of emission sources and meteorological conditions contribute to ambient PM_{10}. Generally, the fine particles pose the greater health risk because these particles can be deposited deep in the lung and contain substances that may be harmful to health. In addition to their health impacts, the fine particles are the main contributors to reduced visibility. These particles give smog its colour. Particulate pollution can cause eye, nose and throat irritation and other health problems. Numerous studies have linked PM to aggravated heart and lung diseases such as asthma, bronchitis and emphysema.

The PAMZ Monitoring Program utilizes intermittent particulate samplers to collect both PM_{10} and $PM_{2.5}$ samples at its Caroline and Portable Stations. PM_{10} and $PM_{2.5}$ concentrations were monitored continuously at the Hightower Station, while only PM_{10} was monitored at the Red Deer Station during 2000. Intermittent particulate sam-



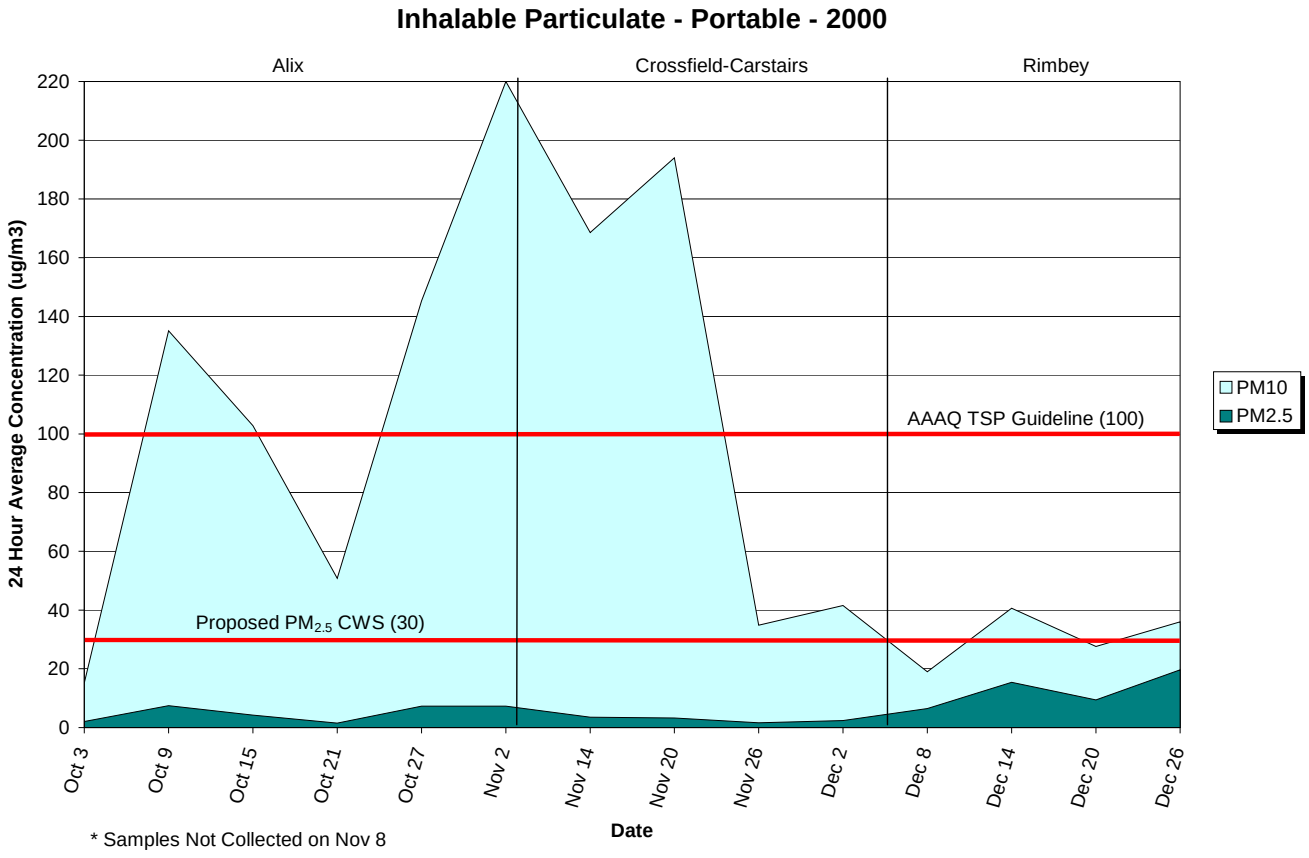
pling involves drawing a known volume of air through a filter to collect a specific pollutant. After a known period of exposure, the filter is analyzed gravimetrically (weighed) in a laboratory to determine the amount of particulate that was collected, from which an average ambient air concentration can be determined.

The PAMZ program collects particulate samples every six days for a twenty-four hour period, on the same schedule (NAPS Schedule) as many other AQM Networks located throughout North America. While the PAMZ program is currently focused on quantitative analysis of the filters, these filters are retained and further analysis can be performed on the collected material to qualify the compounds that are present in the sample for the purposes of source apportionment or other reasons.

There are currently no Alberta Guidelines for PM_{10} and $PM_{2.5}$ but the province does have a guideline for Total Suspended Particulates (TSP), which includes PM_{10} and $PM_{2.5}$. A Canada Wide Standard (CWS) for $PM_{2.5}$ has been issued. As with ozone, the Province of Alberta has given the Clean Air Strategic Alliance a mandate to develop an implementation plan for Alberta. Several PAMZ members and PAMZ itself are represented on the committee that has been formed to formulate the plan. The CWS for $PM_{2.5}$ is a 24 hour average of 30 micrograms per cubic meter based on the 98th percentile ambient measure annually, averaged over 3 consecutive years.

From August through December 2000, there were no exceedences of the proposed $PM_{2.5}$ CWS observed by the PAMZ AQM program with either the intermittent samplers or continuous monitors. The intermittent samples collected and observed continuous data values were all significantly below the proposed CWS standard.

On several occasions, intermittent PM_{10} samples collected by the program exceeded the Alberta TSP Guideline. This occurred on three dates in August and September at the Caroline Station. The source of the episodes were forest fires that were burning in Southwest Alberta and blanketing much of Southern Alberta in haze. On the four dates in October and November when exceedences occurred while the Portable Station was situated at the Alix location, the source of the episodes was most likely stubble-burning in the local area. On the three dates in November when exceedences occurred at the Crossfield-Carstairs location, the source of the episodes was most likely local agricultural activity that released large amounts of wind-blown dust. Once the ground was blanketed in snow in late November, the PM_{10} concentrations dropped significantly at both the Caroline and Portable Stations with no further results above the TSP Guidelines.



5.1.8 Meteorology

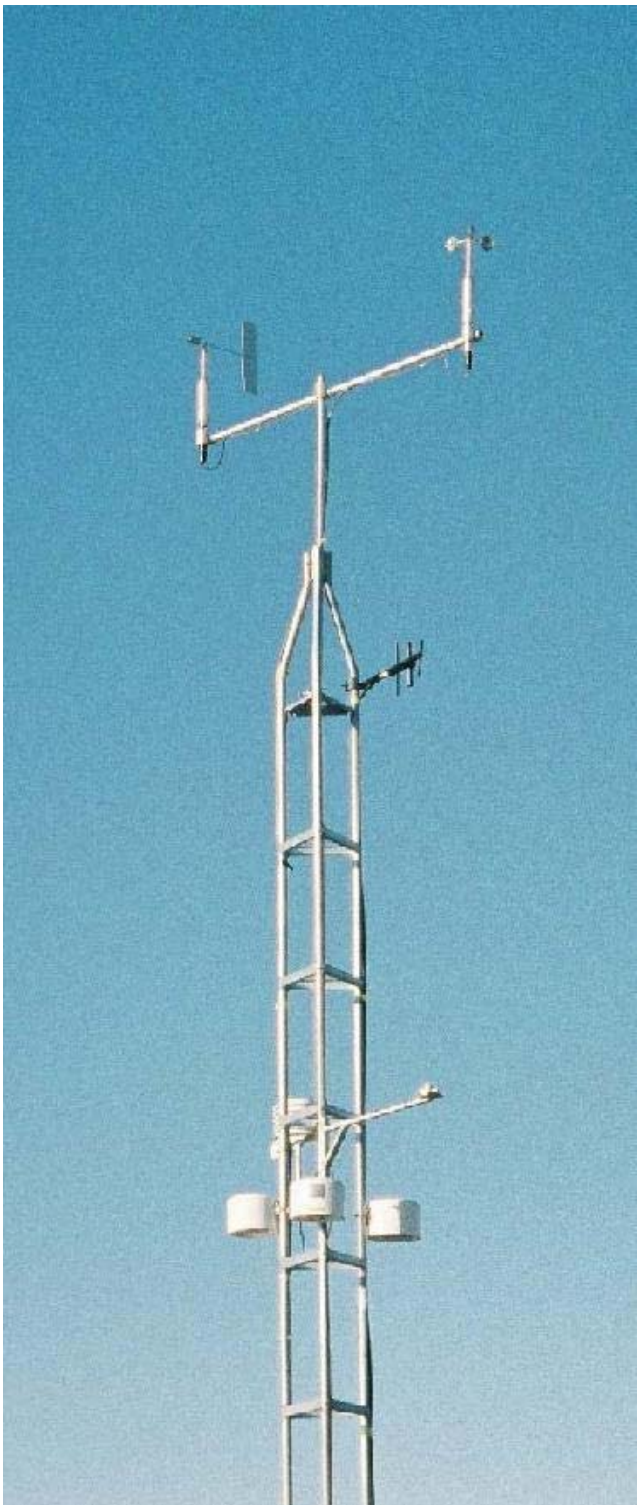
Air quality depends on the rate that pollutants are emitted to the atmosphere and the rate at which these pollutants are dispersed away from the sources. Air pollution transport and dispersion are influenced by wind speed and direction, the temperature structure of the atmosphere, the solar cycle, turbulence and changes in these elements induced by local topography.

The interpretation of the continuous and passive data will be supported by basic meteorological measurements of parameters that affect the transport and dispersion of emissions. Meteorological parameters measured in support of the Parkland Airshed Management Zone's Air Quality Monitoring program are:

- wind speed and direction
- temperature
- solar radiation
- relative humidity

From August through December 2000, the average temperature at the Caroline Station was 6.1 degrees C, with a maximum of 26.2 degrees C and a minimum of -31.7 degrees C. The average temperatures recorded during the same time period at the Red Deer and Hightower Ridge stations were 3.4 and 1.3 degrees C. The average temperatures recorded at Alix, Crossfield, and Rimbey from October through December were 3.0, -2.9 and -4.8 degrees C, respectively.

Winds at the Caroline Station were predominantly from the west and northwest, with winds from the southeast also occurring frequently. While the Portable Station was onsite at Alix, winds were predominantly from the south, with a large component of northwest winds as well. While the Portable Station was onsite at the Crossfield-Carstairs location, the winds were predominantly from the southwest. While the Portable Station was at the Rimbey location, the winds were predominantly from the northwest and southwest due to the influence of the Blindman River Valley in which the station was located. The winds at the Red Deer Station were primarily from the south due to the influence of the Red Deer River valley in which this station is located. Winds at Hightower Ridge were predominantly from the west.



Meteorological Tower and Sensors for the Portable Continuous Monitoring Station

5.2 Passive Monitoring

The PAMZ AQM Program uses passive monitors as a cost-effective method of collecting air quality data over a large region (45,000 sq. km.). The resulting database will be suitable for the identification of long term air quality trends, a typical approach in making regional-scale air quality assessments. The advantages of the passive samplers used by PAMZ are their simple design, low cost and ease of use. No power is required to operate them, making them suitable for remote use; the only major restriction in locating samplers is the ability to access the sampler.

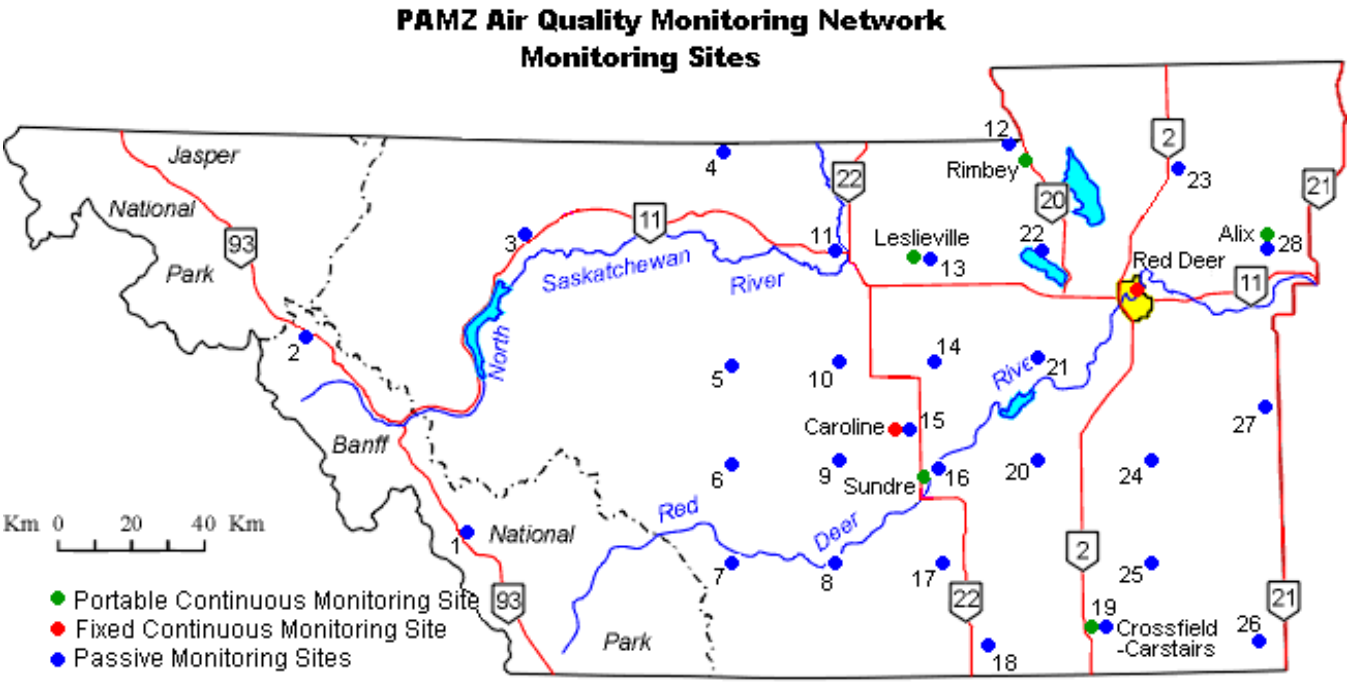
Passive samplers rely on the principles of permeation and diffusion to physically uptake the specific compound being sampled. This method is an alternative to active sampling or continuous monitoring where an air sample is drawn or forced mechanically into or through a collection device or past a detector.

The PAMZ Passive Monitoring Network was commissioned in December 1999 and for 2000 consisted of twenty-eight stations. Currently the parameters included in the passive network are SO_2, NO_2 and O_3. VOC passive monitors may be added in the future, should this technology advance sufficiently. The passive monitoring stations are located throughout the zone on a 3 X 3 township grid system, though there is a bias to the more developed eastern part of the zone, due in part to the limited accessibility of the zone's western regions.

Passive monitoring is conducted on a monthly interval year-round. For the first six months of the program, samples were collected in triplicate. Sampling was switched to a duplicate mode after a review of the results for all three passive parameters collected at the Caroline AQM Station indicated that duplicate sampling is sufficient to obtain an accurate average sample concentration.

A detailed review of the passive data collected at the Caroline and Portable Monitoring Stations during 2000 was undertaken at the year's end to validate the passive data using monthly averages calculated by co-located continuous monitors. This review concluded that the passive data compared closely with the monthly averages obtained from the continuous monitors.

Average monthly concentrations are calculated for each site from an average of the samples collected and analyzed. After review and acceptance by the PAMZ program manager, the passive data is supplied to the CASA Data Warehouse where it can be accessed freely. Post maps are used to summarize the results. The diameter of each circle in the post map is proportional to the monthly average concentration of that pollutant observed at a station. The boundaries of the map roughly coincide with those of PAMZ; some of the zone's major population centers are indicated. Additionally, hard copy and digital formats of the data and post maps of the results are available upon request, from the PAMZ program manager.

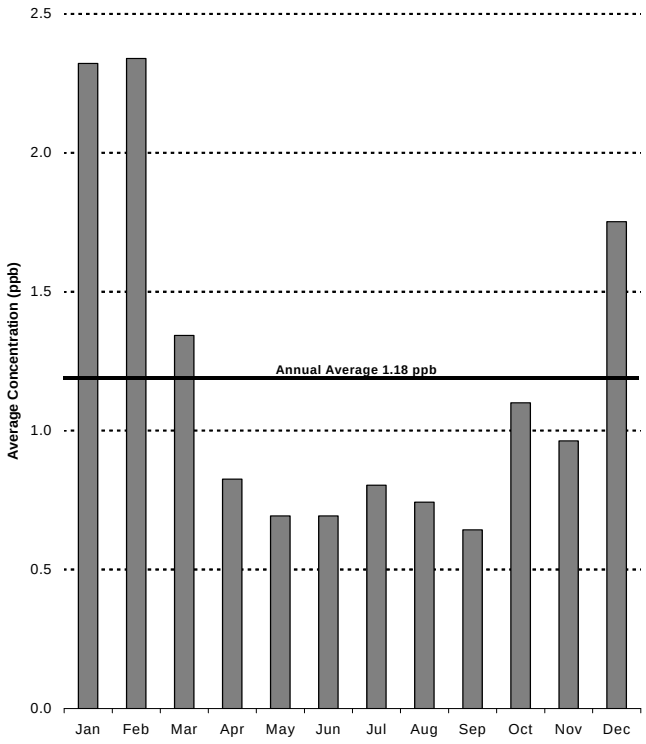


5.2.1 Sulphur Dioxide

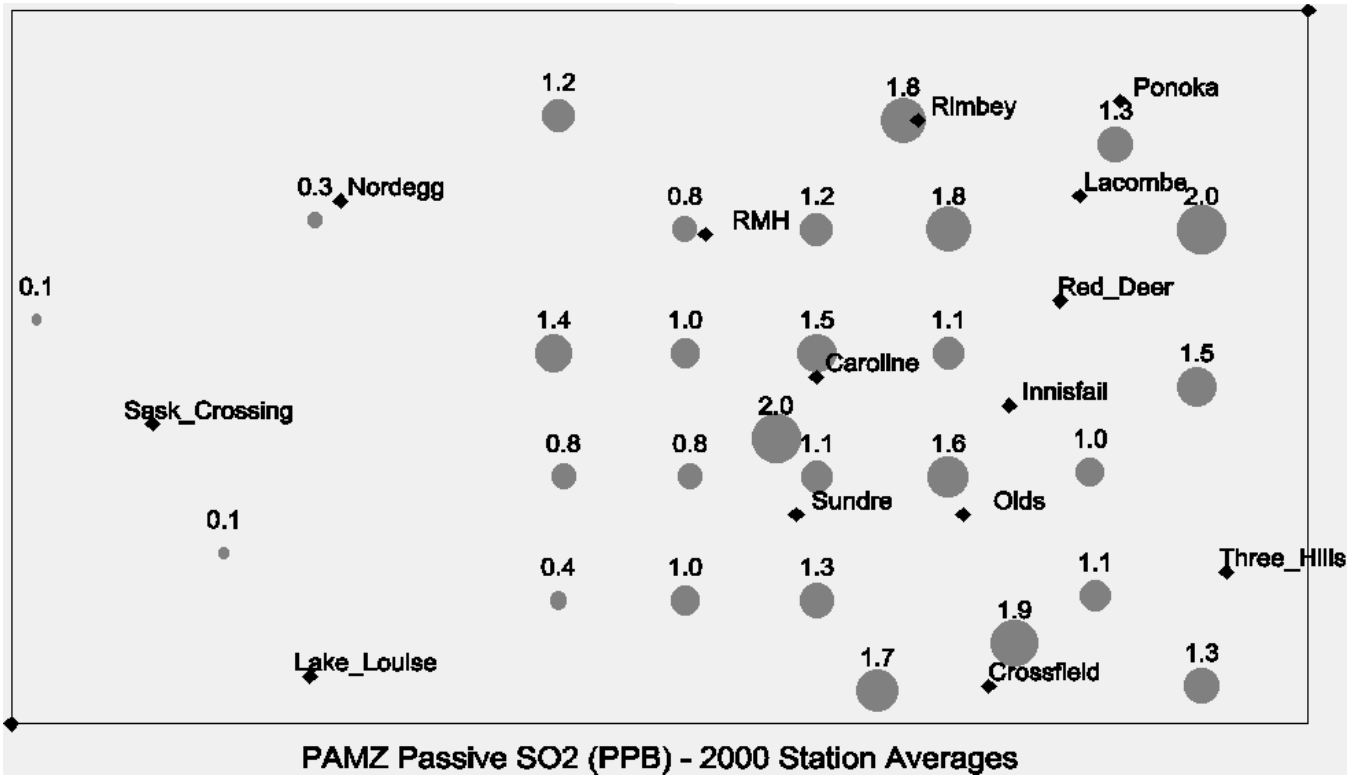
The production levels of the large sour gas processing facilities in the Zone, the major source of SO_2 emissions in the Zone, remained relatively consistent throughout the year. Ambient SO_2 concentrations observed throughout the zone, however, displayed predictable seasonal variations. The highest monthly averages for the passive sulphur dioxide network were observed during the coldest months of the year, when the amount of thermally-induced mixing of the atmosphere was at a minimum. The lowest monthly averages were observed in late spring and early fall when there was much higher dispersion of sulphur dioxide due to the greater amount of thermal mixing brought about by higher solar radiation levels.

The annual average SO_2 concentration for the entire network was 1.2 ppb, significantly below the AENV annual guideline of 11 ppb. The two sites with the greatest annual average concentrations were Sites 15 (Caroline) and 28 (Alix), both measuring 2.0 ppb. These sites are located in areas with a large concentration of sour gas processing facilities located upwind of them.

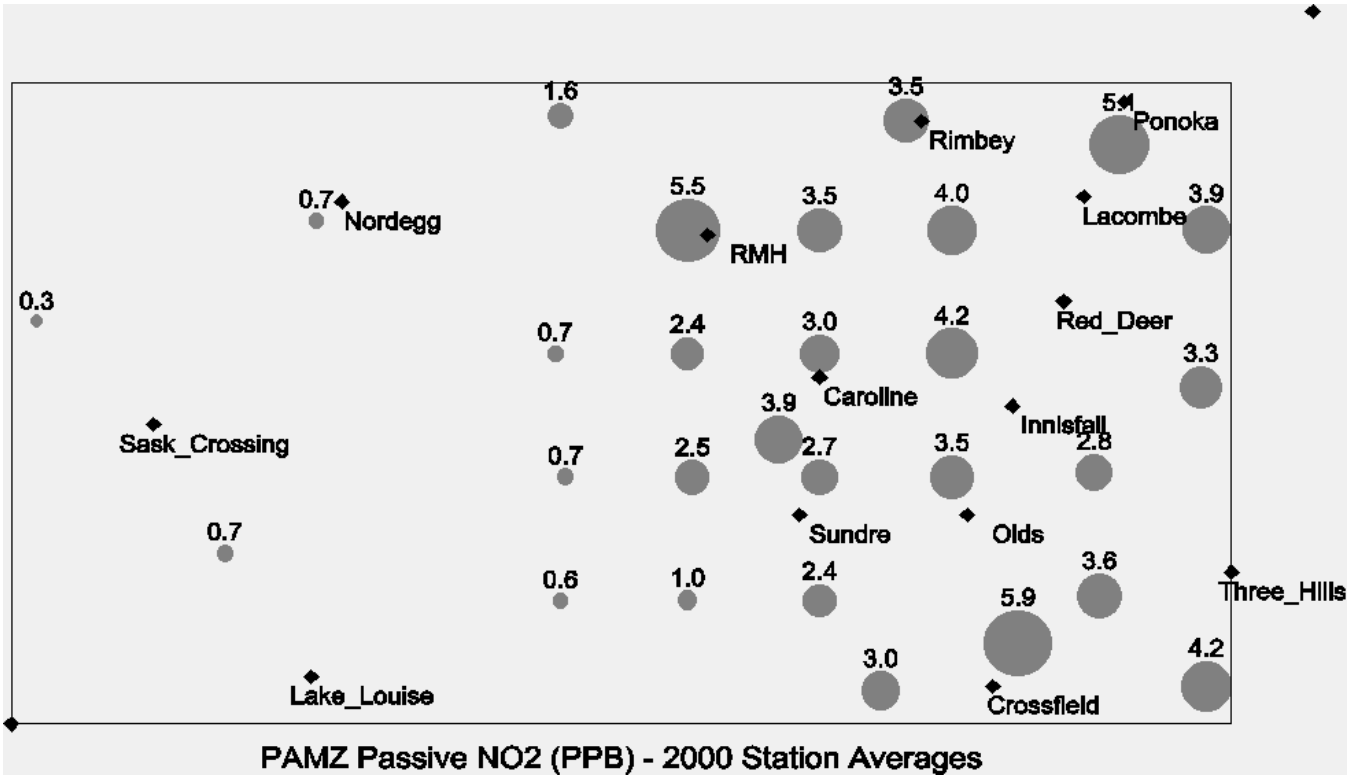
The two sites with the lowest annual average SO_2 concentrations were Sites 1 (Bow Summit) and 2 (Parker Ridge) both measuring 0.1 ppb. Both of these sites are located in Banff National Park, far away from any industrial sources of sulphur dioxide.



Passive SO_2 Monitoring
2000 Monthly Averages



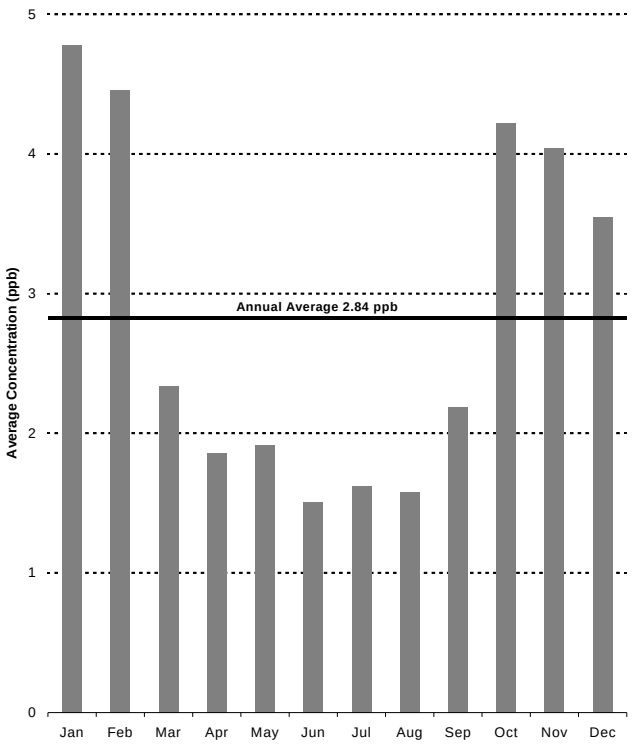
5.2.2 Nitrogen Dioxide



Ambient NO_2 concentrations observed throughout the Zone displayed predictable seasonal variations. The highest monthly averages for the passive nitrogen dioxide network were observed during the coldest months of the year, when the amount of thermally-induced mixing of the atmosphere was at the minimum. The lowest monthly averages were observed in late spring and early fall when there was much higher dispersion of nitrogen oxides due to the greater amount of thermal mixing brought about by higher solar radiation levels.

The annual average NO_2 concentration for the entire network was 2.8 ppb, significantly below the AENV Annual Guideline of 32 ppb. The site with the greatest annual average concentration was Site 19 (Crossfield-Carstairs), measuring 5.9 ppb. This site is located approximately 2 km east of a major transportation corridor, Highway 2, and approximately 25 kms north of the City of Calgary. The high concentrations observed at this site are consistent with the large amount of NO_X emissions from motor vehicle traffic and the southwest winds which are predominant at the site.

The site with the lowest annual average NO_2 concentrations was site 2 (Parker Ridge) measuring 0.3 ppb. This site is located in Banff National Park some distance upwind of the Icefields Highway, the only significant source of NO_X emissions in the area.



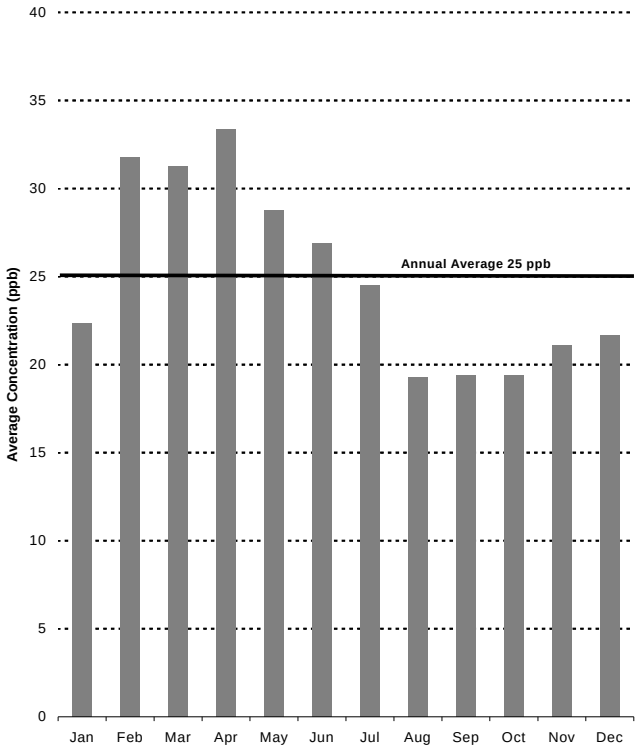
Passive NO_2 Monitoring
2000 Monthly Averages

5.2.3 Ozone

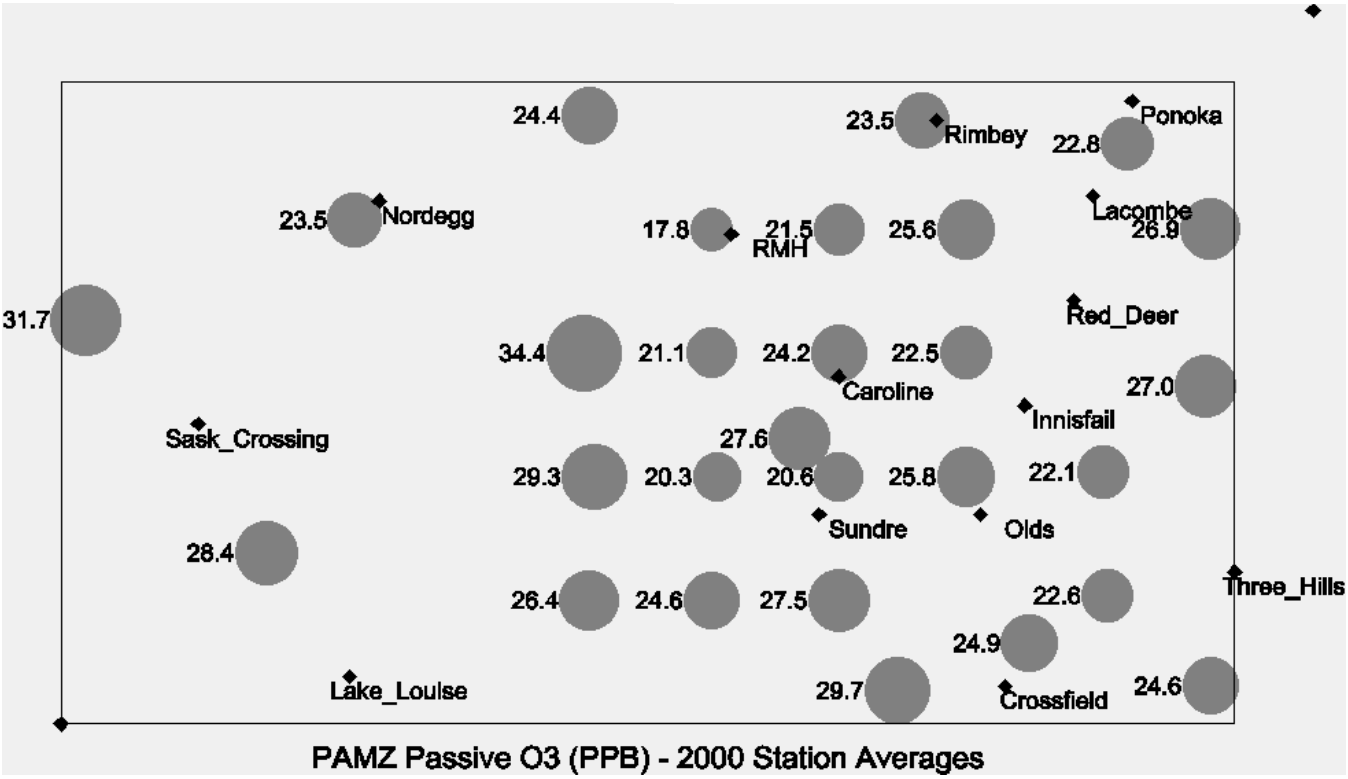
Ambient O_3 concentrations observed in the more populated eastern regions of the zone indicated seasonal variations consistent with anthropogenic ozone, with the highest values observed in late spring. Concentrations observed in the western region of the zone at more remote locations indicated seasonal variations consistent with stratospheric ozone intrusion occurring earlier in the year, as described previously .

The annual average O_3 concentration for the entire network was 25 ppb. There is no AENV Guideline for annual O_3 concentrations. The site with the greatest annual average concentration was Site 5 (Baseline Mountain) measuring 34.4 ppb. This site is located at high altitude at treeline on a mountainous ridge approximately 40 km southwest of Rocky Mountain House. The high concentrations observed at this site are relatively consistent throughout the year and may be associated with stratospheric ozone intrusion. More extensive monitoring with a continuous analyzer may be undertaken at this location in the future to better understand the high concentrations and their possible source(s).

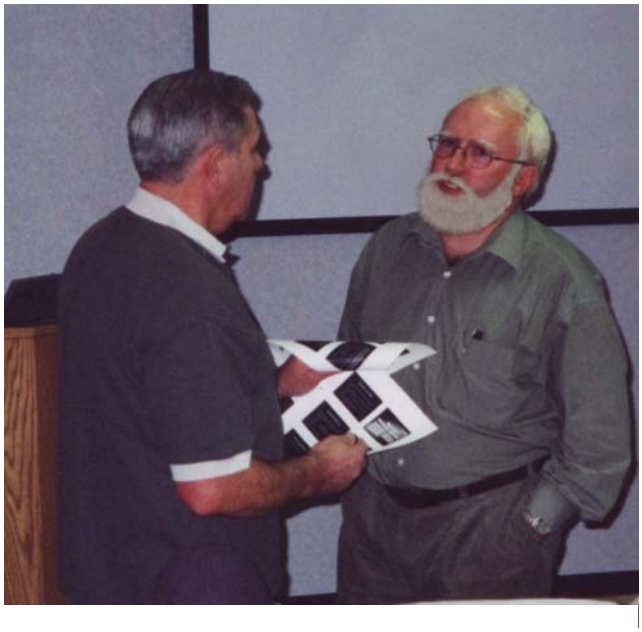
The site with the lowest annual average O_3 concentration was site 11 (Twin Lakes) measuring 17.8 ppb. The lower concentrations observed at this site are consistent with its proximity to a major transportation corridor, Highway 11, and the reaction of ozone with NO_X emissions from motor vehicle traffic.



Passive O_3 Monitoring
2000 Monthly Averages



6. Links to the Clean Air strategic Alliance



Program Manager Kevin Warren discussing the PAMZ AQM Program with Keith Purves of the Fort Air Partnership

The Parkland Airshed Management Zone Association was established under the umbrella of the Clean Air Strategic Alliance (CASA), adopting the CASA principles of consensus-based multi-stakeholder representation and following its Zone Air Quality Management guidelines. PAMZ is an independent entity that provides progress updates to CASA, shares some common members and directors, and whose members contribute significantly to the following CASA project teams:

- Acidifying Emissions Management Implementation Team (AEMIT)
- Ambient Air Quality Monitoring Operations Steering Committee
- Climate Change
- Flaring
- Human Health
- Pollution Prevention
- Animal Health
- Particulate Matter and Ozone.

Through the formative years of PAMZ, CASA provided support and resources to PAMZ for developing and implementing its zonal monitoring and management plans. This support continues today.

The Parkland Airshed Management Zone actively shares information with the other existing regional airshed management zones and new Zones as they establish their management plans and develop their monitoring programs. The West Central Airshed Society (WCAS), shares a significant portion of PAMZ's northern boundary. WCAS was established in January 1995 and was the first air quality management zone to be formed in Alberta. The WCAS zone encompasses about 35,000 square kilometers stretching east from the Alberta/British Columbia border to Highways 20 and 759, as far north as the top of Township 54. In 2001, PAMZ will provide financial support towards the operating costs associated with WCAS's Hightower Ridge AQM Station. The high priority issues identified by this zone's stakeholders are:

- Human Health
- Odours
- Data Management

The Wood Buffalo Zone, operated by the Wood Buffalo Environmental Association, has implemented a monitoring network in the Regional Municipality of Wood Buffalo. This Zone covers an area of 68,500 square kilometers, stretching south from the Alberta/Northwest Territories border to south of Fort McMurray and includes the regions two major population centers, Fort Chipewyan and Fort McMurray. The high priority issues for this zone are:

- Soil Acidification
- Crops and Forests
- Human Health

A fourth Airshed Management Zone was endorsed by CASA in November 2000. It is the Fort Air Partnership, which is currently in the early stages of the process to establish a regional air quality monitoring network for a 6,000 square kilometer area encompassing Fort Saskatchewan and the surrounding area. The area's stakeholders will use the information gathered from the network to manage regional air quality, protect environmental health and influence policy.

A fifth Airshed Management Zone is currently forming in the Peace River/Grande Prairie region and PAMZ is actively supporting that process by providing encouragement and sharing information.

Human health issues have been identified by CASA and all the airshed management zones as a high priority issue. Through its air quality monitoring program, data management system and the work of its Human Health Committee, the Parkland Airshed Management Zone expects to strengthen its links with other organizations through the sharing of the data and information that it collects.

7. Financial Report

	Parkland Airshed Management Zone							
	Financial Report* for the Year Ended December 31, 2000							
				2000			1999	
	Revenue:							
		Membership fees	$	412,120		$	231,030	
		Interest		5,181			3,514	
				417,301			234,544	
	Expenses:							
		Monitoring fees		145,407			—	
		Consultant fees		66,000			53,087	
		Repairs and maintenance		16,299			—	
		Office		10,794			5,435	
		Travel		8,284			2,021	
		Equipment rental		4,800			695	
		Meetings		2,666			1,551	
		Insurance		2,345			331	
		Advertising and promotion		1,439			6,930	
		Professional fees		900			875	
		Interest and bank charges		69			91	
		Amortization		37,177			4,920	
				296,180			75,936	
	Excess of Revenues over Expenses		$	121,121		$	158,608	
	Items not involving cash:							
		Amortization		37,177			4,920	
				158,298			163,528	
		Net change in non-cash working capital		7,254			-3,571	
				165,552			159,957	
	Investing Activities:							
		Purchase of Capital Assets		-273,382			-49,195	
	Increase (Decrease) in Cash			-107,830			110,762	
	Cash, Beginning of Year			147,023			36,261	
	Cash, End of Year		$	39,193		$	147,023	
	* A copy of the audited financial report is available from the treasurer upon request.							

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	Greg Ritz David Thompson Health Region	Darren Barber David Thompson Health Region
	Sheila Lockrem Mountainview County	August Liivam Lacombe County
Non-Gov. Organizations	Martha Kostuch Prairie Acid Rain Coalition	Lenore Harris Red Deer River Naturalists
	Doug Jones Albertans for a Clean Environment	Rose Balcom Albertans for a Clean Environment
Public	Lloyd Cumming Burnstick Lake	Donna Hamilton Olds
	Reg Watson Eagle Hill	Ila Johnston Sundre
	Damien Kajnc Red Deer	Harold Kenney Rimbey
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Hunt Oil Company
Johns Mannville
Mobil Oil Canada
Northstar Energy Corp.
Parkland Refining
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Shell Canada Ltd.
Storm Energy
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Westcan Malting

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Clearwater County
Town of Eckville

Lacombe County
Town of Rocky Mtn House

Mountain View County
Town of Sundre

Committee Members

Executive Committee

Chairman	Brian Goliss	Industry	
1st Vice-Chair	David Lloyd	Government	
2nd Vice-Chair	Reg Watson	Public	
Treasurer	Miles Nystrom	Industry	
Secretary	Martha Kostuch	NGO	
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John Hawkins	Amoco Canada Petroleum	Industry	
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Ila Johnston	Sundre	Public	
Karen McCallion	Alberta Environment	Government	
Jeff Strem	Alberta Energy & Utilities Board	Government	
Kevin Warren	Amarok Consulting	Program Manager	

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Sheila Lockrem	County of Mountainview	Government	
Greg Ritz	David Thompson Health Region	Government	
Martha Kostuch	Prairie Acid Rain Coalition	NGO	
Margaret Coutts	Red Deer River Naturalists	NGO	
Betty Harvey	Rimbey and District Clean Air People	NGO	
Sherry Scheunert	Red Deer	Public	
Elizabeth Gentry	Cremona	Public	
Ila Johnston	Sundre	Public	
Wayne Johnston	Sundre	Public	
Damian Kajnc	Red Deer	Public	
Dr. Abimbola Abiola	Olds College	Public	
Darrell Myroniuk	PetroCanada	Industry	
Kevin Warren	Amarok Consulting	Program Manager	

Communications Committee

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Ila Johnston	Sundre	Public	
Bill Post	Olds	Public	
Beverly Phillips	Keyspan Energy Canada	Industry	
Alice Murray	Shell Canada Ltd.	Industry	
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Technical Working Group

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Ed Szymanek	NAL Resources	Industry	
George Overwater	Canadian Midstream Services	Industry	
Greg Ritz	David Thompson Health Region	Government	

Technical Working Group 'ctd

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John Hawkins	Amoco Canada Petroleum	Industry
John Retallack	TransCanada Midstream	Industry
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Landowners

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Jim & Jackie Anderson - Rimbey
Jim & Marian Cole - Leslieville
Wayne & Ila Johnston - Sundre
Brian & Mary Brietsche - Grainger
Don Buckner - Sundre
Bill Hodgkinson - Elnora
Eskild Jacobsen - Olds
Gail Kinsey - Sylvan Lake
Mr. Page - Sunnyslope
Tony & Cheryl Peresinni - Crossfield
Roy Westfall - Crossfield
Glen & Phyllis Kneiper - Stauffer
Henry Schmiemann - Caroline
Shieling Mountain Lodge - Nordegg
Peter Smith - Leslieville
Mr. Teynor - Bergen
Simon & Ann Swier - Morningside

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Dan Dumaine, Limeco products
Heather Allan, Northrock Resources Ltd.
John Retallack, TransCanada Midstream

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