Particulate Matter and Ozone Management Framework

Prepared by the
Particulate Matter and Ozone Project Team
for the
Clean Air Strategic Alliance
Board of Directors

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Acknowledgements

This report summarizes the work of the Particulate Matter (PM) and Ozone Project Team. The team was formed in November 2000 by the Clean Air Strategic Alliance (CASA). Its purpose was to recommend strategies to achieve the Canada Wide Standards (CWS) for particulate matter and ozone in Alberta.

The team gratefully acknowledges the generous financial support of the following companies, agencies and departments in enabling it to undertake this work:

- Alberta Environment
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- TriMac

The PM and Ozone Project Team would not have been able to fulfill its commitment without the generous support of the volunteers who contributed their time, wisdom and dedication in all aspects of the team's work.

Executive Summary

This final report of the particulate matter (PM) and ozone project team summarizes the team's history, mandate, activities, deliverables and recommendations. It has been prepared for approval by the Board of Directors of the Clean Air Strategic Alliance (CASA), and includes a proposed PM and ozone management framework that will, on approval, add a new component to Alberta's air quality management system and support Alberta in meeting its commitments under the Canada Wide Standard for Particulate Matter (PM) and Ozone.

In June 2000, Canadian environment ministers, with the exception of Quebec, signed the Canada Wide Standard for PM and Ozone (CWS). In November 2000, the PM and ozone team was officially approved by the CASA Board to develop a provincial implementation plan for achieving the CWS in Alberta. The CWS sets out ambient standards for $PM_{2.5}$ and ozone that are to be achieved by 2010. Also included in the CWS are provisions for "Keeping Clean Areas Clean and Continuous Improvement" (KCAC/CI) that apply at ambient concentrations below the numeric CWS, as well as provisions on monitoring and reporting of progress and activities.

Particulate matter refers to microscopic solid and liquid particles that remain suspended in the air for some time. It is either emitted directly (primary PM) or formed in the atmosphere from precursor emissions (secondary PM). Important precursors of secondary PM are nitrogen oxides (NO_x), sulphur dioxide (SO_2), and ammonia (NH_3). The chemical composition of particles depends on location, time of year, and weather. Generally, fine PM is composed of a higher proportion of secondary particles, and coarse PM is composed of a higher proportion of primary particles.

Ground-level ozone is a bluish gas that forms just above the earth's surface. Ozone is not emitted directly into the air but is formed by the reaction of volatile organic compounds (VOCs) and NO_x in the presence of heat and sunlight. Ground-level ozone, to which the CWS applies, forms readily in the atmosphere, usually during hot summer weather. Changing weather patterns contribute to yearly differences in ozone concentrations from city to city. Ozone and the precursor pollutants that cause ozone also can be transported into an area from pollution sources found hundreds of miles upwind. Ozone is associated with human health effects and vegetation damage, including crop damage and greater vulnerability to disease in some tree species.

PM and ozone in various combinations form the pollutant widely known as photochemical smog. Primary PM and PM precursors and ozone precursors share many of the same emission sources. As a result, air quality managers often tackle both pollutants at the same time under a common strategy.

Particulate matter and ozone have become important air quality issues in Alberta and across Canada. Extensive scientific studies indicate that there are significant health and environmental effects associated with these pollutants. By reducing higher concentrations of PM and ozone, and ensuring that areas with lower ambient concentrations are maintained or improved, human health and environmental risks can be reduced or eliminated.

The PM and ozone team involved over 35 stakeholders representing eight industry sectors, four Alberta government departments, Environment Canada, municipal government, airshed zones and key public health and environmental groups. The team met 24 times, held two workshops and formed seven sub-groups over the course of its work.

Various reports, information and data were collected from a variety of sources so that the team could develop a better understanding of PM and ozone sources, concentrations, trends and reduction opportunities in the province. Three major studies were commissioned as part of the team's work, including an update of PM and ozone levels in the province, a provincial and regional emissions forecast

for 1995-2020, and an ozone background demonstration project that examined potential sources of ozone on selected CWS exceedance days. Having encountered certain information gaps and scientific uncertainties, the team has prepared a number of recommendations relating to further scientific investigation and analysis of PM and ozone.

On reaching agreement that the CWS should apply to the whole province, the team recognized that Alberta's management approach would be focused largely on the KCAC/CI provisions of the CWS. This suggested a framework that could support a continuum of actions and activities depending on the air quality found in a particular area. A number of existing air quality management frameworks were reviewed, with the team ultimately choosing a framework with four different action levels that could address areas with high air quality and little human activity as well as those areas that are in exceedance of the CWS and involve many different emitting sources.

The four action levels of the management framework are baseline monitoring and data gathering, surveillance actions, management plans and mandatory plans to reduce below the CWS (CWS exceedance). With the exception of the surveillance action level for ozone, each action level is defined by an "action trigger" equivalent to a specified ambient concentration. At the baseline action level, activities are limited to collecting ambient data. If an area reaches ambient concentrations exceeding the action trigger for surveillance actions, then additional analytical or monitoring activities may take place so that a better understanding of air quality, sources and trends can occur. At the management plan action level, stakeholders come together to develop a plan for managing emissions contributing to PM and ozone and identifying opportunities for reductions where appropriate. When the CWS is exceeded, Alberta Environment must develop and implement a plan to ensure that the CWS is achieved.

Each year, Alberta Environment is tasked with analyzing the ambient PM and ozone data collected from the provincial monitoring system and determining which areas of the province are going to be in baseline, surveillance, etc. This analysis is a two-step process that looks at the raw measured data and then determines whether the corresponding action triggers were exceeded as a result of emissions from anthropogenic sources within Alberta.

Alberta Environment is the lead agency with respect to the PM & ozone management framework, however, airshed zones can also play key roles in the development of mandatory plans to reduce below the CWS and management plans, and emitting sources are under a positive expectation to contribute to plan development and implementation at both levels. Although the framework is based largely on voluntary participation, if it does not achieve its objectives, Alberta Environment may choose to apply additional regulatory tools and mechanisms.

Considerable discussion occurred on the need for new Ambient Air Quality Guidelines for PM and ozone in Alberta. No consensus was achieved on this point, nor was there consensus on what the guidelines should be. The team did agree that Alberta Environment should decide the need for new guidelines and provided six proposals that reflected the range of opinion within the team.

As part of the national CWS process, a recommendation on a standard for coarse fraction particulate matter (PM10) will be made to the Canadian Council of Ministers of the Environment (CCME) in fall 2003. As a consequence of its dry windy climate, unpaved roads and significant agricultural activity, an ambient coarse fraction standard would likely not be achievable in Alberta. As a result, the team has recommended that consideration of an ambient coarse fraction standard be delayed until at least 2005 when additional scientific assessments will be available.

A key component of measuring and evaluating progress on the PM and ozone management framework are the activities relating to monitoring and reporting. Under the proposed requirements, Alberta Environment will report its progress on the CWS both provincially and nationally. National direction on monitoring and reporting for the CWS is provided through the *Guidance Document on Achievement*

Determination (GDAD) and the soon to be completed national *Monitoring Protocol*. To ensure that monitoring and reporting activities meet the specific needs of the PM and ozone management framework, the team developed a *Guidance Document for the Management of Fine Particulate Matter and Ozone in Alberta* ("Alberta Guidance Document"). The Alberta Guidance Document contains many provisions of the GDAD, but has also been adapted to meet the needs of Alberta's framework. It was developed to serve as a comprehensive resource for stakeholders participating in the implementation of the PM and ozone management framework.

The need for communication with interested stakeholders while the framework was being developed was addressed early in the team's process. Team members were asked to consult with their respective constituencies frequently and bring key issues back to the table. Additional strategies were developed later in the team's work for communication of the framework to key stakeholders once it was approved for implementation. A communication recommendation has also been proposed.

Looking from the broad perspective, the management framework developed by the team addresses both the numeric CWS and requirements for KCAC-CI. It is consistent with the CWS, and in some respects goes beyond its provisions. The success of the framework depends on the active participation of stakeholders, and regulatory mechanisms can be used if the framework's goals and objectives are not being met.

The proposed framework balances:

- economic, social, health and environmental considerations;
- the need for clear ground rules and reasonable costs with flexibility to address local circumstances;
- the need for a manageable and accountable system for managing PM and ozone in Alberta and providing opportunities for stakeholders to participate in the system, and;
- the desire to keep clean areas clean and continuously improve air quality.

To address the considerable diversity of sources, air quality trends, and growth patterns across the province, the PM and ozone management framework has been designed to bring stakeholders together in a manner that enables them to identify optimal strategies and management approaches for their air quality situation. Balance, flexibility, transparency, accountability and cost-effectiveness are cornerstones of the framework. The team is confident that it has developed a robust management framework that will help ensure Albertans continue to maintain and improve air quality well into the future.

Summary of Recommendations from the PM and Ozone Project Team

1. Management Framework Recommendations

a) Acceptance of the PM & Ozone Management Framework

It is recommended that the Particulate Matter & Ozone Management Framework be accepted and approved for implementation.

b) Timing of Implementation

It is recommended that the PM & Ozone Management Framework be implemented by Alberta Environment beginning in 2004. This would involve completion of the annual analysis and the assignment of corresponding action levels for $PM_{2.5}$ and ozone to all areas of the province by December 2004 using ambient data collected between 2001 and 2003. Actions under the framework should commence in 2005, conditional upon finding a simplified mechanism for transboundary and background analysis (see recommendation 2).

c) Management Framework Review

It is recommended that the PM & Ozone Management Framework, including the process for annual analysis of ambient data, simplified mechanisms, and trigger levels, be reviewed by Alberta Environment after three years of practical application and implementation experience, and in conjunction with or immediately following the review of the Canada Wide Standard in 2006. This review should involve interested stakeholders and members of the public.

2. Simplified Mechanisms

It is recommended that Alberta Environment lead work on testing simplified mechanisms for determining when episodes are caused by transboundary transport, high background concentrations or natural events, especially for application at trigger levels below the numeric CWS, including simplified methodologies for performing the "Best Efforts Determination" outlined in the *Guidance Document for Achievement Determination*. This work should involve Environment Canada and interested stakeholders, and should be completed by the end of 2004.

3. Alberta Ambient Air Quality Guideline

It is recommended that Alberta Environment decide whether to establish new Ambient Air Quality Guidelines for $PM_{2.5}$ and ozone. Members of the project team provide six proposals for consideration by Alberta Environment. These proposals are presented to show the range of options and opinions within the team. If Alberta Environment determines that new guidelines are desirable, public consultation should be undertaken.

Proposals	Ozone	$PM_{2.5}$
1	65 ppb, 8 hr avg	30 micrograms/m3, 24 hr avg.
2	15 ppb, 1 hr avg	15 micrograms/m3, 24 hr avg.
3	65 ppb, 8 hr avg with CWS metrics or equivalent numerical value	30 micrograms/m3, 24 hr avg. with CWS metric or equivalent numerical value
4	82 ppb, 1 hr (existing guideline)	30 micrograms/m3, 24 hr avg.
5	82 ppb, 1 hr (existing guideline)	No guideline
6	No guideline & withdrawal of current 82 ppb guideline*	No guideline*

*Proposal 6, it was stated that the PM & Ozone Management Framework should be used in place of the AAQG for managing ambient concentrations of PM & ozone.

4. CWS Coarse Fraction Standard

Preamble

There is some evidence of health effects of coarse fraction particulate ($PM_{2.5-10}$), and it is observed that there will be a review of the health science associated with coarse fraction PM in 2005 as part of the national CWS process. A significant portion of coarse particulates in Alberta comes from natural sources or sources such as agricultural land use, sometimes reaching levels of 200µg/m3 or more. Because many primary Alberta sources are not manageable, an ambient coarse fraction standard may be meaningless. It is recognized that the national Joint Action Implementation Coordinating Committee (JAICC) will be making a recommendation to the CCME on a coarse fraction standard in fall 2003.

Recommendation

With respect to consideration of a Canada Wide Standard for coarse fraction particulate, it is recommended that Alberta Environment take forward the following two positions as input to the Canadian Council of Ministers of the Environment recommendation to Ministers in fall 2003:

(a) It is recommended that consideration of an ambient coarse fraction standard be deferred until further health science information is available as part of the national Canada Wide Standard health science review in 2005.

(b) It is recommended that consideration be given to the need for national source standards for sectors and activities that are significant sources of coarse fraction particulate and not currently subject to source standards.

The team recognizes that at the time of writing this report, Environment Canada is still in the process of developing its position regarding a coarse fraction standard, and therefore affirms that this recommendation is made without prejudice to any positions Environment Canada may choose to take in the future.

5. Background PM or Ozone Originating Outside of North America

Preamble

The Alberta Demonstration Project indicated that certain high ozone episodes in Alberta could be related to ozone originating outside of North America.

Recommendation

It is recommended that the Joint Action Implementation Coordinating Committee (JAICC) be asked to examine and identify further actions that should be taken to assess the nature of ozone originating from outside North America as well as any actions that should be pursued at an international level.

6. MERS/MERAF

Preamble

The Multi-Pollutant Emission Reduction Strategy (MERS) and Multi-Pollutant Emission Reduction Analysis Foundation (MERAF) formed a key element of the CCME's Joint Initial Actions under the CWS. A MERS or MERAF is an information gathering and modeling exercise undertaken for each of six major emitting sectors, and will be used to inform jurisdictional plans on PM and ozone and national multi-pollutant analysis.

Recommendation

It is recommended that the sector specific information and data compiled under the national MERS and MERAF (Multi-Pollutant Emission Reduction Strategy and Multi-Pollutant Emission Reduction Analysis Foundation) initiatives be made available by Alberta Environment to all stakeholders involved in implementation of the PM & Ozone Management Framework, including those who participate in the development of mandatory plans or management plans under the Framework.

7. Monitoring

The CASA PM & Ozone Project Team recommends to the Operations Steering Committee that the monitoring system for Alberta be reviewed and evaluated to determine whether changes are required to meet the needs of the proposed PM & Ozone Management Framework for Alberta.

8. Alberta Guidance Document

Preamble

The project team created the *Guidance Document for the Management of Fine Particulates and Ozone in Alberta* for all stakeholders as a guide to implementation and application of the PM & Ozone Framework.

Recommendations

a) Adoption

It is recommended that the *Guidance Document for the Management of Fine Particulates and Ozone in Alberta* be accepted and approved for use in Alberta.

b) Availability

It is recommended that the *Guidance Document for the Management of Fine Particulates and Ozone in Alberta* be made available to stakeholders via the CASA website and by Alberta Environment through linking to the CASA website. Both CASA and Alberta Environment shall provide hard copies of the Alberta Guidance Document on request.

c) Future Reviews

It is recommended that the *Guidance Document for the Management of Fine Particulates and Ozone in Alberta* be reviewed and updated in conjunction with the review of the PM & Ozone Management Framework in 2006/07. Alberta Environment shall coordinate the review and involve interested stakeholders.

9. Communications with Stakeholders and the Public

The team recommends that CASA and Alberta Environment coordinate strategies to ensure Albertans are notified of the PM & Ozone Management Framework, how it works and key recommendations from the project team. As per recommendation PMO3-9(b) the Guidance Document for the Management of Fine Particulate Matter and Ozone in Alberta – which includes the PM & Ozone Management Framework - should be available on the CASA website and Alberta Environment should provide stakeholders with a link from its website to the Alberta Guidance Document on the CASA website.

10. Science and Analysis Recommendations

Preamble

The team commissioned three major reports over the course of its work, including a provincial and regional emissions forecast for 1995-2020, an update on ambient levels of PM and Ozone in Alberta, and a demonstration project applying the methodologies outlined in the national *Guidance Document*

on Achievement Determination to analyzing exceedances of the CWS for ozone in Alberta. As a result of this work and other reports reviewed by the team, a series of science recommendations were identified.

Recommendations

a) It is recommended that Environment Canada, working together with Alberta Environment, model ozone and PM concentrations in Alberta for a range of future emission scenarios. A report on this work to be delivered to the CASA Board in 2005.

b) It is recommended that Environment Canada, working together with Alberta Environment, use regional photochemical models to investigate which geographic regions and emitting sectors are contributing to ozone and secondary PM in Alberta. A report on this work to be delivered to the CASA Board in 2005.

c) It is recommended that Environment Canada conduct research to investigate the vertical structure of ozone in the atmosphere to better determine the contribution of stratospheric intrusion and tropospheric mixing to ground level ozone. A report on this work to be delivered to the CASA Board in 2005.

d) It is recommended that the Operations Steering Committee be asked to investigate the usefulness of and the need for ambient PAN (peroxyacetyl nitrate) and additional ambient VOC monitoring in Alberta as part of its review of the ambient monitoring network.

e) It is recommended that Alberta Environment take the lead in conducting scenario analyses for the provincial and regional Criteria Air Contaminants (CAC) emission forecasts. These analyses could include, among other factors: the potential impact of new performance standards for the electric power sector, the pace and magnitude of oil sands development projects, the potential effects of additional bitumen upgraders, the potential effects of climate change policy initiatives affecting greenhouse gas (GHG) and CAC emissions, the potential effect of new standards for on- and off-road vehicles, and changes to economic projections. A report on this work to be delivered to the CASA Board in 2005.

f) It is recommended that the 1999 recommendation of the Alberta multi-stakeholder group for particulate matter and ozone (MSG) regarding source apportionment be renewed and continued, whereby Alberta Environment takes the lead in:

   i) Conducting further research on source apportionment to ensure that:
      - source profiles are accurate, reliable, comprehensive and appropriate for Alberta emitters,
      - data are gathered on additional ambient species and the way in which they fluctuate over time, and
      - models most appropriate to the Alberta situation are used and that expertise is available to correctly interpret the results.

   ii) Collaborating with other jurisdictions to improve methodologies for source apportionment modelling, data collection, study design and interpretation of results.

11. Dissolution of Team

It is recommended that the PM & Ozone Project Team be dissolved upon the CASA Board's acceptance and approval of the team's final report.

1.0 Introduction

Particulate matter (PM) and ozone (O_3) have become important air quality issues in Alberta and across Canada.[1] Extensive scientific studies indicate that there are significant health and environmental effects associated with these pollutants.[2] By reducing higher levels of PM and ozone, and ensuring that areas with lower ambient levels are maintained or improved, human health and environmental risks can be reduced or eliminated.

In June 2000 the federal, provincial and territorial governments, except Quebec, signed the Canada-Wide Standards (CWS) for PM and ozone, thereby agreeing to national ambient standards for $PM_{2.5}$ and ozone and related provisions. The CWS was established pursuant to the 1998 Canada-wide Accord on Environmental Harmonization of the Canadian Council of Ministers of the Environment (CCME) and its Canada-wide Environmental Standards Sub-Agreement.[3] Each jurisdiction is responsible for meeting the CWS and reporting on achievement once the target dates are reached.

After the CWS was signed, the Clean Air Strategic Alliance (CASA) was asked by Alberta Environment to form a multi-stakeholder project team to make recommendations on implementation of the CWS in the province. Building on the work of its predecessor, the Multi-Stakeholder Group for PM and Ozone (MSG), the PM and Ozone Project Team developed a PM & Ozone Management Framework ("the framework") that addresses the CWS with the goal of ensuring that ambient air quality for all Albertans remains as clean as possible.

About PM and Ozone

Particulate matter refers to microscopic solid and liquid particles that remain suspended in the air for some time. It is either emitted directly (primary PM) or formed in the atmosphere from precursor emissions (secondary PM). Important precursors of secondary PM are nitrogen oxides (NO_x), sulphur dioxide (SO_2), and ammonia (NH_3). The chemical composition of particles depends on contributing sources, location, time of year, and weather. Generally, fine PM is composed of a higher proportion of secondary particles, and coarse fraction PM is composed of a higher proportion of primary particles.[4]

As suggested above, PM can be differentiated on the basis of size. The CWS is aimed at fine PM or $PM_{2.5}$, which refers to particles equal to or less than 2.5 microns in diameter.[5] In Fall 2003, the CCME will consider whether to establish a CWS for coarse fraction PM, also known as PM_{10} or $PM_{2.5\text{-}10}$, which refers to particles larger than 2.5 microns but less than 10 microns. Extensive scientific studies have linked $PM_{2.5}$ with human health effects including chronic bronchitis, asthma, and premature deaths.[6] Other effects include reduced visibility and contribution to smog.

Ground-level ozone is a bluish gas that forms just above the earth's surface.[7] Ozone is not emitted directly into the air but is formed by the reaction of VOCs and NO_x in the presence of heat and sunlight. Ground-level ozone, to which the CWS applies, forms readily in the atmosphere, usually during hot summer weather. Changing weather patterns contribute to yearly differences in ozone concentrations from city to city. Ozone and the precursor pollutants that cause ozone can also be

[1] Alberta Multi-Stakeholder Group For particulate Matter and Ozone, report to Alberta Environment, December 1999
[2] Particulate Matter and Ground-Level Ozone - Overview/Rationale, CCME, http://www.ccme.ca
[3] Both the Harmonization Accord and Environmental Standards Sub-agreement are available at http://www.ccme.ca
[4] As per note 1
[5] A particle 10 micrometers in diameter is about 1/7 the diameter of a human hair
[6] As per note 2
[7] Particulate Matter and Ozone Canada-Wide Standards, CCME, http://www.ccme.ca

transported into an area from pollution sources found hundreds of miles upwind.[8] Ozone is associated with human health effects and vegetation damage.

PM and ozone in various combinations form the pollutant widely known as photochemical smog. Primary PM and PM precursors and ozone precursors share many of the same emission sources. As a result, air quality managers often tackle both pollutants at the same time under a common strategy.

Scientific uncertainties and gaps requiring further investigations remain with respect to the current understanding of PM and ozone. Some of these gaps are addressed by the team's science recommendations found in s.6.0 of this report.

PM and Ozone Levels in Alberta

As illustrated by the figures below, ambient levels of PM and ozone vary across the province. Factors contributing to this variation include the type and intensity of human activities - both upwind and within a particular area, meteorology and variations in seasonal weather patterns, land use and topography.

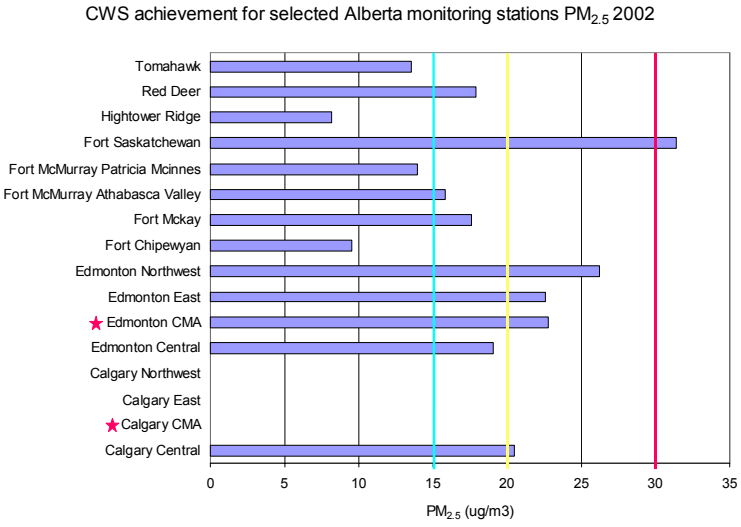


Figure 1: CWS Achievement for $PM_{2.5}$ (20002) [9]

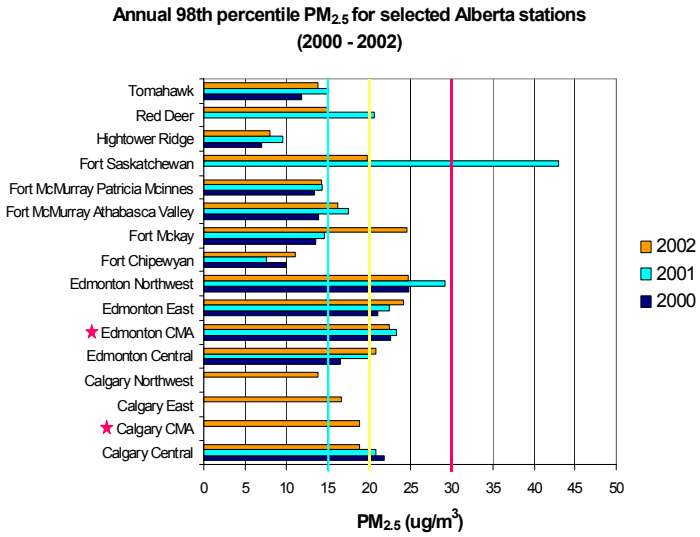


Figure 2: Annual 98th Percentile for $PM_{2.5}$ (2000 - 2002) [10]

[8] U.S. Environmental protection agency, http://www.epa.gov/air/aqtrnd97/brochure/o3.html

[9] The red stars in the figure highlight the two Census Metropolitan Areas in Alberta

[10] As per note 9

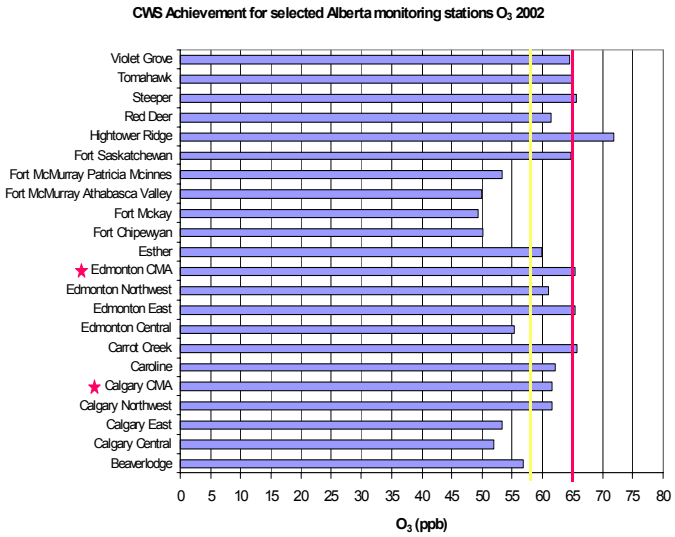


FIGURE 3: CWS ACHIEVEMENT FOR OZONE (2002)[11]

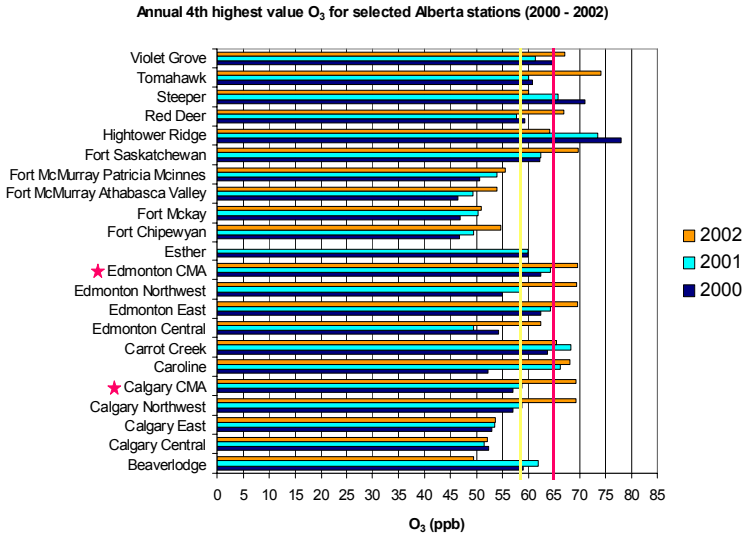


FIGURE 4: ANNUAL 98TH PERCENTILE FOR OZONE (2000 -2002) [12]

Actual monitored ozone concentrations are approaching or exceeding the CWS in several areas in the province, including the Edmonton CMA, and higher elevations in west central Alberta such as Hightower Ridge, Violet Grove and Carrot Creek. However, if the higher ozone concentrations measured in these areas are determined to be caused by natural sources or sources outside of Alberta, the CWS is deemed not exceeded. This annual analysis is part of the formal CWS achievement determination and is also applied at concentrations below the CWS as part of the PM and Ozone Management Framework.

According to the provincial emissions forecast that was commissioned by the team,[13] the major sources of $PM_{2.5}$ and precursors to $PM_{2.5}$ and ozone in 1995 were as follows:

- industrial sources, including electricity generation, were the major emitters of NO_x and SO_2 in the province, at 62% and 99%, respectively,
- area sources, which include road dust, construction, agriculture, prescribed burning and solvent use, among other sources, were the major emitters of primary $PM_{2.5}$ and ammonia in the province, at 64% and 91% respectively.
- natural sources emitted 63% of VOC emissions in the province.

Looking out to 2020, the provincial emissions forecast predicts increases in emissions of primary $PM_{2.5}$ and all precursors to $PM_{2.5}$ and ozone except SO_2. In general, emissions from the transportation sector, with the exception of SO_2 and ammonia, are forecast to drop significantly, with most other sectors seeing changes in emissions ranging from –28% to +98%, depending on the pollutant.

[11] As per note 9

[12] As per note 9

[13] ChemInfo Services Inc., *Forecast of Common Air Contaminants in Alberta, 1995 - 2020.* Prepared for the Clean Air Strategic Alliance

Development of the CWS

In 1998, representatives from federal, provincial and territorial environment ministries, as members of the CCME, joined to develop the CWS for PM and ozone. Alberta Environment, as the agency responsible for developing guidelines and ambient environmental quality objectives for the province, approached CASA to assist in establishing a consultation process for the CWS. The MSG was subsequently formed to provide advice to Alberta Environment on the development of the CWS.

The MSG compiled and evaluated existing information on PM and ozone in Alberta, identified key data gaps and made recommendations for filling those gaps. The group also sought consensus on the level, form and timing of the CWS, but consensus could not be reached. Recommendations from the MSG were forwarded by Alberta Environment as input to the development of the CWS. Having completed its objectives, including agreement on further steps required to address Alberta's Jurisdictional Implementation Plan, the MSG disbanded in 1999. In June 2000 the federal, provincial and territorial governments, except Quebec, signed the CWS.

The Canada-Wide Standard

The CWS sets ambient levels of $PM_{2.5}$ and ground-level ozone to be achieved by all participating jurisdictions by 2010.[14] It also includes provisions for Keeping Clean Areas Clean and Continuous Improvement (KCAC/CI) in areas where ambient levels are already below the CWS, and sets out national reporting requirements.

(A) Numeric Targets and Timeframes

$PM_{2.5}$	$30\mu g/m^3$, averaged over 24 hours, by year 2010. Achievement to be based on the 98th percentile ambient measurement annually, averaged over 3 consecutive years.
Ozone	65 parts per billion (ppb), 8-hour averaging time, by 2010. Achievement to be based on the 4th highest measurement annually averaged over 3 consecutive years.

Annex B of the CWS sets out specific provisions related to the consideration of transboundary flow of PM or ozone, high background or natural events. These are contained in Section B.3.5, "Accounting for Transboundary Pollution," and Section B.3.6, "Accounting for Background and Natural Events."

(B) Annex A: Keeping Clean Areas Clean and Continuous Improvement (KCAC/CI)

The CWS contains a provision on environmental management where ambient air quality is "better" than the levels set out in the standards. The provisions include:

i) *Continuous Improvement (CI)* - the need for jurisdictions to take remedial and preventative actions to reduce emissions from anthropogenic sources in these areas to the extent practicable, and

ii) *Keeping Clean Areas Clean (KCAC*) – the recognition that polluting "up to a limit" is not acceptable and that the best strategy to avoid future problems is keeping clean areas clean.

[14] See Appendix A for full text of the Canada-Wide Standard

(C) Annex B: Reporting Protocol

To ensure that the public and CCME are kept informed of jurisdictional progress on the CWS, Annex B sets out guidance on reporting that encourages consistency, comparability and transparency.

Implementation of the CWS

The CWS calls for the development and implementation of jurisdictional implementation plans ("JIP's") as the primary mechanism for achieving the CWS, as well as programs for pollution prevention, keeping clean areas clean and continuous improvement to manage ambient levels below the CWS. Jurisdictional implementation plans will outline more comprehensive actions being taken within each jurisdiction to achieve the CWS by the 2010 target date. Implementations are to be guided by the "best situated to act" principle as per the Harmonization Accord. The establishment of the CWS called for a set of Joint Initial Actions (JIA) to be undertaken by all Canada's jurisdictions, and completed by 2005.

A federal/provincial/territorial Joint Action Implementation Coordinating Committee (JAICC) was formed to coordinate the national implementation of joint initial actions, including a review of the CWS in 2005. Each jurisdiction is responsible for meeting the CWS and reporting on achievement once the target dates are reached. Comprehensive reports on the CWS will be produced every five years, beginning in 2006 with a report on progress.

1.1 Developing Alberta's Implementation Plan

Following the signing of the CWS in 2000, Alberta Environment asked CASA to form the PM and Ozone Project Team in November 2000 to achieve the following objectives:

A. Recommend strategies to achieve the CWS for particulate matter and ozone;
B. Recommend key components of the strategies; and,
C. Achieve stakeholder support for the implementation plan.

Based on the CASA model for consensus building, the team, with representation from key Alberta stakeholders, worked to address the provisions for the CWS and how they could be most effectively implemented in Alberta.

The team began the process of developing Alberta's jurisdictional implementation plan by identifying and assessing strategic components needed to fulfill the team's objectives. To ensure continuity with previous work on PM and ozone, final recommendations from the MSG were incorporated into the team's work plan.

Between May 2000 and August 2003 the team conducted 24 team meetings and two workshops. Seven sub-groups were formed at various stages of the team's work to focus on specific activities or information gathering, including:

- Air Quality and Emissions Sub-group
- Control Technology/Techniques, Costs Sub-group
- Demonstration Project Sub-group
- Health and Ecological Effects Sub-group
- Monitoring and Reporting Sub-group
- Tools and Mechanisms Sub-group
- Trigger Framework Sub-group

Much of the team's initial activity focused on information gathering and compiling background inputs relating to emissions, emission sources, ambient levels, health and ecological effects and benefits, and control technologies. These efforts are described in greater detail in section 2.0 of this report.

In fall 2001, the team developed a conceptual management framework for the KCAC/CI component of the CWS, agreeing that the CWS should apply to all parts of Alberta, and not just to population centres over 100,000 as is set out in the CWS. This framework originated at a two-day team workshop in September 2001. In early 2002, the team agreed that its Keeping Clean Areas Clean Framework could also address the numeric component of the CWS. With minor revisions, the conceptual framework became the PM & Ozone Management Framework.

Applying the proposed framework to actual scenarios was viewed as critical to enhancing the team's understanding of how the framework would work in practice and to support further team discussions on the details of its implementation. At a Mock Scenarios Workshop in October 2002, actual Alberta scenarios were used to support discussion of each of the four action levels in the framework – Baseline, Surveillance Actions, Management Plans, and Mandatory Plans to Reduce Below the CWS. The process allowed the team to identify key gaps and concerns with the framework, and further assisted the team in assigning ambient trigger concentrations to the various action levels contemplated in the framework. The final framework transforms the various components of the CWS into a practical, principled and integrated implementation plan for Alberta.

Monitoring and reporting requirements, including reporting areas and options for national and provincial reporting, were developed and incorporated into the *Guidance Document for the Management of Fine Particulate Matter and Ozone in Alberta* ("Alberta Guidance Document"). The Alberta Guidance Document was developed to serve as the "one-stop" resource for stakeholders involved in implementation of the framework.

Other aspects of the team's work included consideration of proposals to establish new Ambient Air Quality Guidelines for PM and ozone in Alberta, the development of a communication plan, and recommendations for future scientific research and analysis.

This Final Report was completed and provided to the CASA Board of Directors for approval in September 2003.

2.0 Establishing Background Inputs

With the goal of gathering the best available data on PM and ozone and gaining a better understanding of PM and ozone in the province, the team focused on gathering or developing background inputs to inform its work on an implementation plan. Data was compiled on current PM and ozone levels, gaps were identified and specific projects were carried out to obtain new information. A provincial and regional emissions forecast was completed to predict emission levels to 2020. Additional background inputs were established through the completion of the Ozone Background Demonstration Project. The team also referred to outside studies, including the Stratospheric Ozone Intrusion Project led by the Alberta Research Council and work by a subgroup of CASA's Acidifying Emissions Management Implementation Team (AEMIT) on NO_x/SO_2 abatement opportunities. The team collected and evaluated various studies and data throughout its work, which created the basis for its recommendations on future research and analysis found at the end of this section.

2.1 Sandhu Reports and the PM and Ozone Report

In the late 1990's, Alberta Environment commissioned Dr. Harby S. Sandhu to prepare two reports, *Ambient Particulate Matter in Alberta* (1998) and *Ground Level Ozone in Alberta* (1999). These reports were intended to provide a comprehensive overview of particulate matter (PM) and ground level ozone in Alberta to assist in assessing the potential impacts of national objectives on the province. The reports were prepared as "stand alone" reports, meaning that substantial sections were devoted to background on precursor emissions, chemistry, meteorology, and models.

The Sandhu reports provide a thorough scientific background on the measurement of PM and ozone. These reports also provide a history of PM and ozone monitoring in the province before 1997. An extensive literature set is available for each of these topics, and only select references from outside Alberta Environment were included in the reports. When consulted alongside Dr. Sandhu's comments, these references form a dependable scientific base describing Alberta's air quality.

Since the publication of the Sandhu reports there have been changes to Alberta's air monitoring network. Alberta's ambient air quality data has become more accessible to the public and the establishment of regional airshed zones has led to an increase in the quality and amount of air quality data collected throughout the province.

The purpose of the *PM and Ozone Report*, prepared in 2002, was to inform the team by:

- Providing an up-to-date overview of the monitoring network in the province;
- Where possible, providing comparable current data tables in the same format as the tables provided by Dr. Sandhu;
- Using the most current monitoring data to summarize air quality in the province;
- Determining and visually presenting CWS achievement for applicable stations.

Ambient measurements for all parameters were retrieved for all continuous monitoring stations whose data was available on the CASA Data Warehouse before June 1st, 2002, with the exception of the Caroline and Esther monitoring stations. For the Caroline station, data for 1999 and 2000 (January- August) was retrieved directly from the Parkland Airshed Management Zone. Esther data for years 1999-2001 was provided by Environment Canada.

The figures below provide a snapshot of the type of data that was gathered and presented in the *PM and Ozone Report*, which is available on the CASA website at http://www.casahome.org.

FIGURE 5: NUMBER OF EXCEEDANCES OF THE 65 PPB 8-HOUR AVERAGE FOR OZONE AT 20 STATIONS

Stations	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	E/yr
Calgary Central	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.00**
Calgary East	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.00**
Calgary Northwest	2	2	0	1	0	4	0	0	0	1	0	0	0	**0.77**
Edmonton Central	0	0	0	0	0	2	1	0	0	0	0	0	0	**0.23**
Edmonton East	0	0	0	0	1	0	0	1	0	1	4	0	1	**0.62**
Edmonton Northwest	0	0	4	1	1	2	1	1	6	5	0	0	0	**1.62**
Ft. McMurray Athabasca	5	39	0	0	5	4	0	0	0	0	0	0	0	**4.08**
Fort Saskatchewan	1*	3	9	0		24	15	3	0	2	2	1	1	**5.00**
Violet Grove								0	2	14	6	2	1	**4.17**
Hightower Ridge								1	6	4	32	39	27	**18.17**
Esther									0	3	0	0	0	**0.60**
Tomahawk									3	0	1	0	1	**1.25**
Beaverlodge										0	0	0	0	**0.00**
Steeper										6	3	19	5	**11.00**
Caroline											4	3	4	**3.67**
Carrot Creek											3	1	10	**4.67**
Fort Chipewyan											0	0	0	**0.00**
Fort Mackay											0	0	0	**0.00**
Ft. McMurray Patricia											0	0	0	**0.00**
Red Deer												0	0	**0.00**
E/station	**0.88**	**5.50**	**1.63**	**0.25**	**1.00**	**4.50**	**2.13**	**0.60**	**1.42**	**2.57**	**2.89**	**3.25**	**2.50**	

E/yr = number of exceedances at a given station averaged over the number of years of continuous ozone monitoring. E/station = the total number of exceedances in a given year averaged over the number of stations with continuous ozone montitoring.

Figure 5: PM & O3 Report, Table 2.7: Number of exceedances of the 65 ppb 8-hour average for ozone at 20 stations from 1989 to 2001.

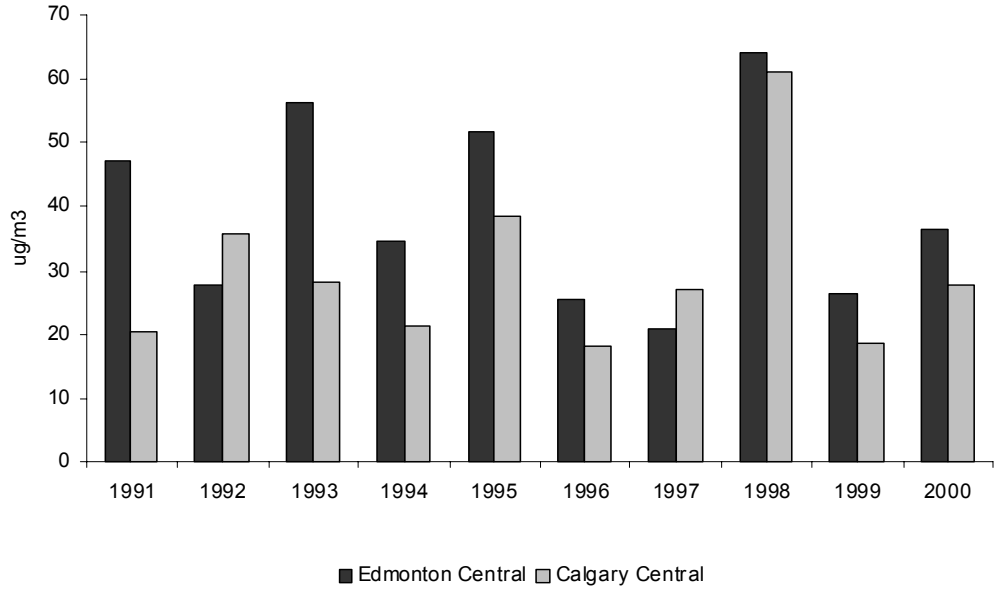


Figure 6: PM & Ozone Report, Figure 2.1(a) - Annual maximum $PM_{2.5}$ concentration at intermittent monitors in Calgary and Edmonton from 1991 through 2001.

FIGURE 6: ANNUAL MAXIMUM $PM_{2.5}$ CONCENTRATION AT INTERMITTENT MONITORS (1991 - 2001)

2.2 Provincial and Regional Emissions Forecast

The *Forecast of Common Air Contaminants in Alberta (1995 to 2020)* was completed for the team by Cheminfo Services in April 2002 and is available on the CASA website at http://www.casahome.org. The report forecasts Alberta emissions of nitrogen oxides (NO_x), sulphur oxides (SO_2), volatile organic compounds (VOC), carbon monoxide (CO), total particulate (PMT), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$) and ammonia (NH_3) to the year 2020. In addition to the provincial emissions forecast, the report also provides forecasts for emissions from each of Alberta's 19 census regions in year 2010.

The report used the *1995 Criteria Air Contaminants Emissions Inventory for Alberta*, prepared by Alberta Environment in collaboration with Environment Canada, as the starting point for the forecast. Where year 2000 data was available for sectors, it was used. Since natural sources were assumed to be constant over the forecast period, the report focused on projected changes in anthropogenic emissions. Emissions were forecast into the future using the population, economic and energy use projections that were used by Natural Resources Canada to forecast greenhouse gas emissions in *Canada's Emission Outlook - An Update*.[15] Specific Alberta industry information such as detailed emissions information from proposed oilsands and electricity generation projects were also incorporated into the forecasts.

The forecast includes the effect on emissions of known government regulatory initiatives, such as the regulations to reduce sulphur in gasoline. The forecast excludes the effects of potential environmental, energy and other government policies and programs that had no associated regulations at time of publication. An example of an excluded initiative would be the results of the CASA Electricity Project Team, since the degree of emission reduction that will arise from that team's work was unknown at time of publication.

The report concluded that under "business-as-usual" assumptions there will be increased emissions of $PM_{2.5}$, NO_x, VOC, and ammonia in 2020 relative to 1995. The report further concluded that there will be decreased emissions of SO_2 and CO in 2020 relative to 1995. The projected increases for $PM_{2.5}$, NO_x, VOC, and ammonia emissions were 46 percent, 27 percent, 12 percent, and 125 percent respectively. The projected decreases for SO_2 and CO emissions are 8 percent and 18 percent respectively. In addition to the emissions projections, the report also included substantial discussion of sources of uncertainty in the forecast.

2.3 Ozone Background Demonstration Project - Alberta

The Alberta Demonstration Project was one of two projects undertaken nationally to evaluate the implementation practicality and resource needs of certain provisions in the *Guidance Document on Achievement Determination* (GDAD).[16] One of the projects was undertaken in Quebec, the other was undertaken in Alberta. The main objective of the Quebec project was to test the GDAD provisions for transboundary transport of ozone. The main objective of the Alberta project was to test both the GDAD provisions and the applicability of alternative approaches for accounting for natural events and high background concentrations of ozone, using actual jurisdictional monitoring data to inform the analyses.

The Alberta Demonstration Project was funded by Environment Canada and the Canadian Petroleum Products Institute, and contracted to Levelton Engineering Ltd. In addition, considerable in-kind analysis, data and support were provided by both Environment Canada and Alberta

[15] Prepared for the Analysis and Modelling Group/Natural Resources Canada, National Climate Change Process, December 1999.

[16] The GDAD is available at the CCME website at http://www.ccme.ca

Environment. The terms of reference for the project were developed by the demonstration project sub-group of the PM and Ozone Project Team.

The demonstration project was conducted in two phases:

Phase One

The first phase of the demonstration project included:

- an analysis of Alberta's ambient monitoring network in relation to the monitoring requirements specified in sections 2 and 3 of the GDAD;
- an analysis of ambient data (1996-2000) from the monitoring network to determine exceedance days, and;
- an analysis of the origin of ozone on ozone exceedance days.

Instead of looking at all monitors in Alberta, a representative subset of monitors was chosen for analysis in Phase One. The Edmonton Census Metropolitan Area (CMA), consisting of four monitors, was chosen to represent an urban area that is required to report CWS achievement. Caroline was chosen to represent a settled rural area with some sources of anthropogenic emissions. Hightower Ridge was chosen to represent a remote site at high elevation. Pollution data to support the Phase One analysis was provided by Alberta Environment and the CASA airshed management zones through the CASA Data Warehouse. Meteorological data and back trajectories used to determine the origin of the ozone were supplied by Environment Canada.

Phase Two

The second phase used photochemical modelling to further evaluate several ozone exceedance events. The GDAD specifies that for exceedances where the primary source is not clearly non-anthropogenic, modelling may be required to identify the contribution of the non-anthropogenic sources. Within the GDAD, any exceedances where the primary source is not clearly non-anthropogenic would therefore have to be modelled. Because of time constraints and limited resources, however, only three pre-selected (by Environment Canada) exceedance events were modelled to evaluate how modelling could be applied within the GDAD context. The three pre-selected episodes included one early spring episode and two mid-summer episodes, one of which had a suspected forest fire influence. The photochemical modelling for Phase Two was performed by Environment Canada using the CMAQ photochemical modelling system implemented on a domain covering western Canada."

Conclusions

The Demonstration Project was valuable in creating a better understanding of the mechanics of applying both the GDAD provisions and alternative approaches to exceedances of the CWS in Alberta, including some of the associated issues and challenges.[17] It showed that the accurate determination of the origins of ozone and/or $PM_{2.5}$ during exceedances of the CWS numeric can be a complex task because of its various possible origins. As such, the determination of the origins, using methodologies outlined in GDAD could at times necessarily require significant financial and human resources, especially if air quality modelling is required.

[17] The GDAD provisions on background/transboundary/natural event determination were designed 1) to be applied in Census Metropolitan Areas (CMAs), and 2) to exceedances of the numeric CWS. As the CWS is proposed to apply to all areas in Alberta and the PM and ozone management framework calls for analysis of episodes for action triggers below the numeric CWS concentrations, it was important for the team to understand any limitations to the GDAD approaches given the need for a significantly expanded application of these approaches to support Alberta's PM and ozone management framework requirements.

The adoption of simplified mechanisms will reduce the level of effort and analysis required for determining when episodes are caused by transboundary transport, high background or natural events.[18] The adoption of simplified mechanisms will reduce the level of effort and analysis required to evaluate action trigger concentrations below the numeric CWS. More information on simplified mechanisms can be found in section 9 of the Alberta Guidance Document. Finally, with respect to the report itself, considerable debate remained among team members about the conclusions that were drawn by the consultant on the origins of certain ozone episodes, which clearly points to the need for additional application and experience of the GDAD methodologies in the Alberta context.

2.4 Emissions Inventories

To gain a better understanding of both emission sources and actual volumes of PM and precursors to PM and ozone being emitted, the team gathered and reviewed various emission inventory inputs, including:

- *1995 Criteria Air Contaminant Emission Inventory Data for Alberta.*[19].
- *Alberta Emission Inventory in support of Particulate Matter and Ozone Modelling*, RWDI West Inc., prepared for Alberta Environment, July 2001.
- *AMG Base Case Forecast of Criteria Air Contaminants (1995 to 2020)*, prepared for the Analysis and Modelling Group (AMG), National Climate Change Secretariat, August 2001.

As noted above, the *1995 Criteria Air Contaminant Emission Inventory* was used as one of the core inputs to the provincial emissions forecast prepared by ChemInfo Services Inc.

2.5 Alberta "Mock Scenarios"

In October 2002, a mock scenarios workshop was held to assist the team in understanding how the proposed PM and ozone management framework would be applied to typical air quality situations. This process allowed the team to identify key gaps and concerns with the framework, and further assisted the team in establishing action triggers.

The following scenarios were explored:

Baseline:	Southern Wood Buffalo
	Athabasca/Cold Lake
Surveillance:	Drumheller
Planning:	Parkland Airshed Management Zone
	Edmonton CMA
Exceedance:	Parkland Airshed Management Zone
	Edmonton CMA

These scenarios were developed to give a reality base for discussion of the draft management framework. Available data compiled for each scenario included a summary of ambient concentrations using the CWS form and metric for each monitor in the scenario, wind speeds on CWS exceedance days, number of CWS exceedances (if applicable), data correlations between monitors (if applicable), and emissions data from the CAC emissions inventory, and emissions from

[18] See team recommendation 2; also, the PM and ozone management framework (described in section 3 of this report) requires some type of analysis to be applied at action trigger concentrations below the numeric CWS.

[19] Inventory can be viewed at http://www.ec.gc.ca/pdb/ape/cape_home_e.cfm

regulated point sources. A workshop package that details the information compiled for the scenarios and the workshop proceedings is available at the CASA website.[20]

2.6 Other Background Inputs

1. Stratospheric Ozone Intrusion Project

   In further analyzing ozone formation in the province, a study was completed by the Alberta Research Council, Alberta Environment and Environment Canada to forecast the formation of tropopause folds in the province. The method used was evaluated against the record of weekly ozone sondes at Stony Plain upper air station from July 1999 through May 2000. The procedure was then tested during a likely episode in the spring of 2000. The resulting document, *Evaluation of a Prediction Procedure For Stratospheric Intrusions In Alberta, Canada* outlines the evaluation methods and subsequent recommendations used in creating prediction procedures for stratospheric injection in Alberta. The results of the study were presented to the team as part of its information gathering process. With further refinement, the prediction procedure used to complete the project could serve as a useful tool in assessing the likelihood of stratospheric injection in Alberta.

2. Analysis of Calgary Transit Strike

   The team identified a unique opportunity to gain a better understanding of PM and ozone in urban air when the Calgary transit strike occurred between February and April 2001. It requested analysis of ambient levels of PM and ozone before, during and after the transit strike and compared this to data for a similar timeframe in preceding years. The preliminary results indicated that levels of pollutants did not exhibit any unusual levels during the strike, although concerns were expressed by some team members that the location of ambient monitors in Calgary may not have been conducive to detecting potential community increases in pollution resulting from the increased traffic and congestion on major and minor roads outside of the downtown core.

3. AEMIT NOx/SO2 Matrices

   The team reviewed information collected and compiled by CASA's Acidifying Emissions Management Implementation Team (AEMIT) relating to NOx/SO2 emissions and costs of control technologies.[21] This information included NOx/SO2 emission inventories for regulated sources in Alberta, control technology and cost information, current NOx/SO2 standards and guidelines, as well as emission reduction opportunities and associated costs.

4. Estimate of Canadian On-Road Vehicle Emissions (1995-2020)

   To gain a better understanding of the impact of new federal regulations aimed at reducing sulphur in both gasoline and diesel fuels, the team reviewed the December 2001 report prepared for Environment Canada by SENES Consultants and Air Improvement Resource Inc, Updated Estimate of Canadian On-Road Vehicle Emissions for the Years 1995-2020. A combination of these regulations in concert with fleet turnovers is predicted to reduce vehicle emissions of PM10, SO2, VOCs and NOx significantly (eg. in the realm of 50 percent) between now and 2010. These findings were also factored into the provincial emissions forecast prepared by ChemInfo Services.

[20] See http://www.casahome.org/uploads/PMO3MockScenariosproceedingsOCT16-17-2002.pdf
[21] See http://www.casahome.org/uploads/AEMITFinalReportandRecommendationsJUN-2002.pdf , Appendix D.

3.0 The PM & O3 Management Framework

3.1 Overview of the PM & Ozone Management Framework

The management framework developed by the team addresses both the numeric CWS and requirements for KCAC-CI. It is consistent with the CWS, and in some respects goes beyond its provisions. The success of the framework depends on the active participation of stakeholders, and regulatory mechanisms can be used if the framework's goals and objectives are not being met.

The framework balances:

- economic, social, health and environmental considerations;
- the need for clear ground rules and reasonable costs with flexibility to address local circumstances;
- the need for a manageable and accountable system for managing PM and ozone in Alberta and providing opportunities for stakeholders to participate in the system; and
- the desire to keep clean areas clean and continuously improve air quality.

The framework sets out four action levels that represent a continuum of analysis and management activities based on measured ambient concentrations in the province.

The action levels are:

- Baseline Monitoring and Data Gathering (baseline)
- Surveillance Actions (surveillance)
- Management Plans (management)
- Mandatory Plans to Reduce Below the CWS (CWS exceedance).

A simplified conceptual diagram of the PM and Ozone Management Framework is found in Figure 9. Further description of the goals, objectives and activities of each action level is found in 3.4.

An annual analysis of ambient PM & ozone concentrations from Alberta's ambient air quality monitoring system determines the appropriate action level for each area of the province. Figure 10 illustrates the process for annual analysis. The ensuing activities will depend on the action level that is assigned.

3.2 Principles of the PM & Ozone Management Framework

In addition to the CASA principles, implementation of the PM and Ozone Management Framework shall take into account the following additional principles:

- ***Protection of Human Health and the Environment***
- ***Flexibility***: the plan will include different strategies for different PM and ozone concentrations, and for different regions and sectors, and will accommodate economic growth
- ***Shared responsibility***
- ***All Albertans deserve the same degree of protection***
- ***Multi-stakeholder approach for regions/sectors that require emission reduction strategies***: to be used for all regions/sectors that require emission reduction strategies
- ***Creative and innovative***
- ***Cost-effective***
- ***Open and transparent***

- ***Existing regulatory mechanisms continue to apply across all levels of the framework***

Given the framework's application to ambient concentrations below the numeric CWS, additional principles were formulated to guide activities occurring at those concentrations. These principles can be found in 3.4.2.

3.3 Existing Initiatives that address PM and Ozone

The PM and Ozone Management Framework builds on many programs, mechanisms and initiatives that are already helping to manage and/or reduce ambient concentrations of PM and ozone in Alberta. These initiatives are occurring at many different levels: regional, national, provincial and federal and are in addition to the regulatory and administrative toolkit already available to government, such as approvals and environmental assessment. The impact of these initiatives will be taken into account when any management plans or mandatory plans are developed, with the need for any additional actions to be identified at that time.

A summary of existing initiatives is found below in *Table 1: Existing Initiatives*, followed by a more detailed description of each. Where appropriate, existing initiatives are described separately from emerging initiatives. While many initiatives are identified, this is not intended to be an exhaustive list.

It should also be pointed out that not all of the initiatives below have the authority to cause emission reductions directly (eg. MERS, federal new source guidelines for thermal electricity generation, the *National Framework on Petroleum Refinery Emissions*, airshed zones, and Operations Steering Committee), yet play distinct and important roles in the overall management of PM and ozone.

Where there is overlapping jurisdiction on matters related to the CWS, clarification of the responsible or lead jurisdiction can occur at the CCME's Joint Action Implementation Coordinating Committee (JAICC) for the CWS, if required, applying the principles of "best situated to act" as per the CCME's Harmonization Accord. This recognizes that provincial and territorial governments are likely better positioned to address industrial discharges, whereas the federal government is likely better positioned to address the import/export or manufacturing of specific products or substances.

TABLE 1: Existing Initiatives

Source	Initiative	Description
Alberta (AENV)	**Industrial Release Limits Policy**	This policy requires that new developments regulated by Alberta Environment use best available economically feasible technology.
	Emissions Trading (prospective)	AENV is assessing the feasibility of emissions trading as a means to reduce emissions of NO_x, SO_2, and CO_2 in the province.
	LEAD	The LEAD program offers industry regulatory flexibility in exchange for enhanced environmental performance.
	Alberta Climate Change Strategy	This strategy is expected to support initiatives that will have a beneficial impact on PM & O3, including energy efficiency, conservation and promoting non-fossil fuel sources of energy.
Alberta (EUB)	**SO2 Degrandfathering**	Implementation of new guidelines on sulphur recovery, reduction of proliferation of small plants with less stringent guidelines, and a 2016 deadline on grandfathered plants.
Alberta (CASA)	**Flaring and Venting**	Implementation of recommendations have substantially reduced flaring and venting.
	Acid Deposition Framework	The framework provides a mechanism for emission minimization, continuous improvement or management planning activities based on modelled or measured deposition levels
	Pollution Prevention/Continuous Improvement Framework	The framework encourages innovative reduction opportunities, a system of incentives for P2/CI, development and implementation of strategies to reduce fossil fuel consumption, and increasing the public's understanding of its role in contributing to and reducing air pollution
	Vehicle Emissions Team	This team's work identifies and pilots programs for reductions in vehicle emissions and will address transportation demand management in the future.
	Electricity Project Team	This team is working on a framework for managing emissions from the electricity generation sector in Alberta, to be completed in fall 2003.
Federal	**Ten Year Action Plan on Vehicles, Engines and Fuels**	The plan includes a variety of initiatives, ranging from tighter vehicle emission standards, reduced sulphur in fuels, cleaner engines, and heavy duty vehicle inspection and maintenance programs.
	Declaration of PM_{10} precursors and ozone and its precursors as CEPA toxic	This provides increased authority for federal actions on emissions of NO_x, SO_2, PM, etc.

Source	Initiative	Description
Federal	**Interim Plan on Particulate Matter and Ozone 2001**	The plan encompasses federal components of the Joint Initial Actions below. It also includes efforts on transboundary air issues, VOCs from consumer and commercial products and pollution prevention.
	New Source Guidelines for Thermal Electricity Generation	These guidelines will help ensure that new coal-fired generating stations minimize emissions of PM and ozone precursors.
	Climate Change Plan for Canada	Focusing on five key areas – including transportation, buildings, and large industrial sources – the plan is expected to have beneficial impacts on PM and ozone by improving energy efficiency and reducing use of fossil fuels.
National (eg. CCME)	**Joint Initial Actions**	A number of actions were identified by the CCME when the CWS was ratified, addressing emission sources in the following sectors: construction and demolition, transportation, residential wood burning appliances.
	Post 2000 Acid Rain Strategy	Contains provisions to minimize growth of emissions of SO_2 and NO_x and seek opportunities for improvements in areas where acid deposition is below critical loads. This has spurred more specific federal and provincial programs.
	National Framework for Petroleum Refinery Emission Reductions	The framework will provide the principles and methods for jurisdictions to establish facility emissions caps for criteria air pollutants and air toxics from petroleum refineries.
	Keeping Clean Areas Clean and Continuous Improvement	Under the CWS, a national guidance document will be developed that provides direction to jurisdictions on KCAC/CI actions.
Other (Regional/ Municipal/ Private/ Other)	**Cumulative Environmental Management Association (CEMA)**	CEMA is a multistakeholder consensus-based organization that was established to help manage cumulative environmental effects of oilsands development. It created a working group to develop a management system for NO_x and SO_2.
	Airshed Zones	Airshed zones perform ambient air monitoring, analysis of local/regional air quality issues, conduct public education, etc.
	Other	Low emission vehicle fleets, "green" buildings, transportation planning, local ordinances, mass transportation initiatives, outdoor burning regulations, vehicle emission limits and inspections, promotions for electric powered lawn equipment, energy efficiency measures, voluntary agricultural management practices.

3.3.1 Alberta Initiatives

The following Alberta initiatives are currently in place and contributing to the management of PM, or precursors to PM and ozone, or both. Initiatives that are still emerging or prospective are noted accordingly.

Industrial Release Limits Policy

The intent of this policy is to provide a clear process for developing industrial release limits that ensures the appropriate level of pollution prevention and control technologies are adopted and that the environment is adequately protected. This involves determining the achievable release limits based on the capability of the most effective demonstrated pollution prevention and control technologies. This policy provides an important mechanism for Alberta Environment to achieve the Best Available Economically Feasible Technology (BAEFT) requirements that are outlined in Annex A of the CWS.

Emissions Trading (prospective)

In 2002, Alberta Environment commissioned an in depth study of emissions trading as an emissions reduction approach for $PM_{2.5}$ precursors NO_x and SO_2, as well as carbon dioxide (CO_2). An example of an emissions trading approach consists of a mass emissions cap that would be applied to a defined geographic area and which would decline over time. Emitters within the region would be permitted to collectively reduce emissions to meet the cap using a trading system that would implement the least cost measure. It is expected that this project will have close tie-ins with the work of CASA's Electricity Project Team and the PM and Ozone Management Framework.

LEAD

LEAD, which stands for "Leaders Environmental Approval Document" program, was devised by Alberta Environment to add new, innovative regulatory tools to approvals with the goal of encouraging further reductions of emissions and environmental performance beyond compliance. The program is aimed at exemplary environmental performers and provides less prescriptive and more behaviour/outcome based approaches to achieving environmental goals. LEAD is in the pilot testing stage. Assessment of the pilot will determine the feasibility of full implementation of the program.

Alberta Climate Change Strategy

Although still in the early stages of development and implementation, Alberta's *Climate Change Strategy* is expected to support initiatives that will have a beneficial impact on PM and ozone levels in the province. Generally speaking, all initiatives aimed at energy conservation, energy efficiency and promoting non-fossil sources of energy will go to reducing emissions of PM and precursors to PM and ozone.

Degrandfathering of SO_2 Recovery Plants

In 1999, the Energy Utilities Board and Alberta Environment embarked on a review of sulphur recovery guidelines for sour gas plants, driven mainly by public concern about plants grandfathered in 1988 that continued to operate. The review of sulphur recovery operations occurred even though Alberta's air quality objectives were being met at current emission levels. The review addressed sulphur recovery for grandfathered sour gas plants, the application of sulphur recovery guidelines to other facilities, and the proliferation guidelines for small gas plants and other facilities. The end result of the review was a plan to phase out grandfathering by 2016, to clarify and broaden the application of guidelines to other facilities, and to remove an unintentional incentive to build a

greater number of smaller, lower sulphur recovery facilities than would otherwise be the case. The new guidelines will result in reductions of SO_2 emissions from a key emitting sector over the coming years, contributing to the management of a significant precursor to $PM_{2.5}$.

Flaring and Venting

The work of CASA project teams on reducing flaring and venting represents a key linkage to the PM and Ozone Management Framework in reducing PM and PM and ozone precursors. Since 1996, opportunities to reduce upstream gas flaring and, more recently, venting have come under scrutiny by CASA project teams. This is largely as a result of public concern about potential adverse health effects and environmental impacts. Historically, some residents in proximity to energy facilities have complained about odour, smoke, noise, and impacts on livestock and humans, as well as aesthetic impacts.

Success of the first flaring framework has been better than expected, with a 30% reduction in solution gas flaring in 1999, 38% by 2000, and 53% by 2001 -- well ahead of the original short-term targets. A key component of the work done was the identification and removal of regulatory barriers or disincentives to improvements/reductions.

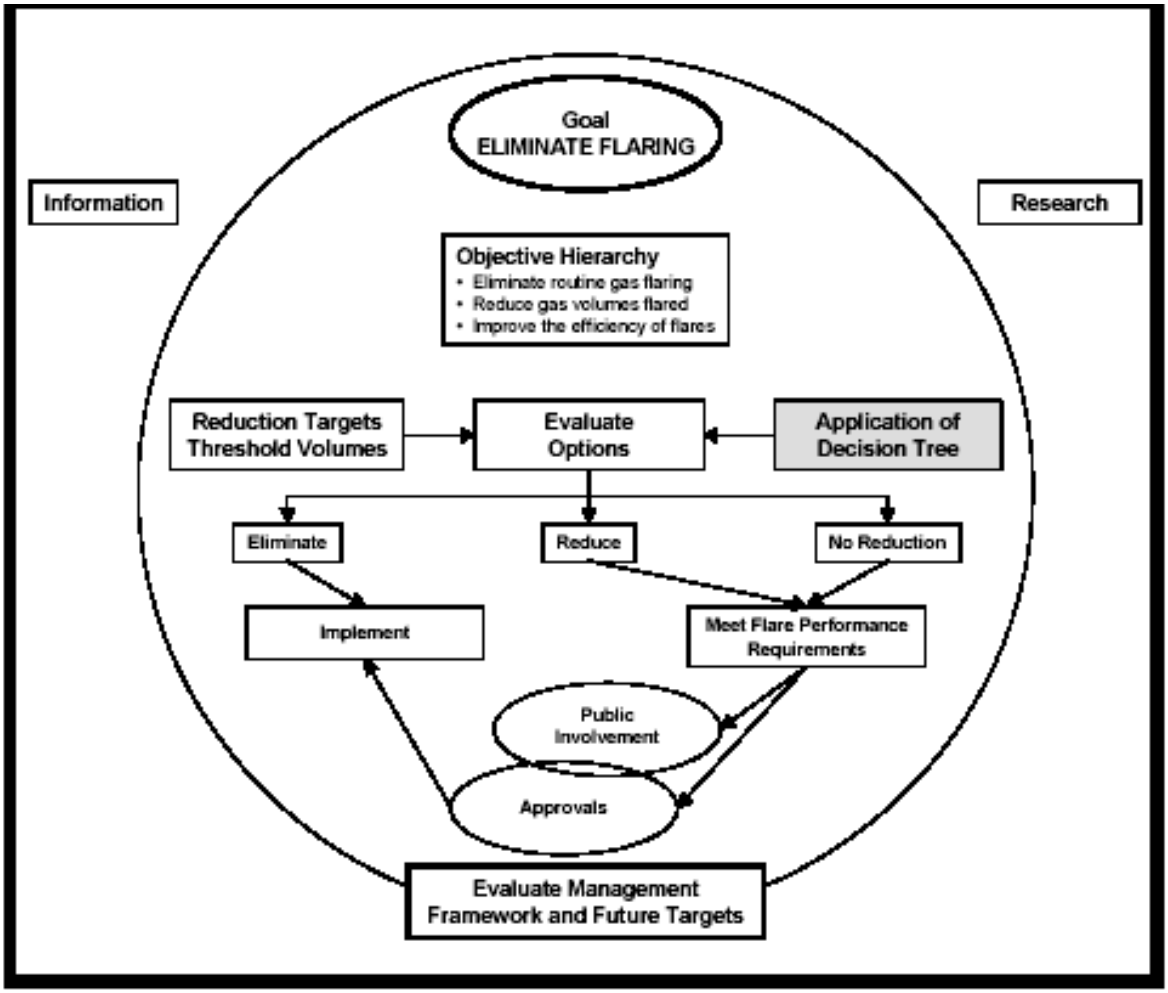


Figure 7: Solution Gas Flaring Management Framework

Acid Deposition Management Framework

This framework came into effect in 1999 to ensure that acid deposition is effectively managed in Alberta. It establishes three levels of management that are contingent on the actual levels of acid deposition relative to critical and target loads. The most aggressive level of management – "emission reduction" -- is applied when an area experiences acid deposition between target and critical loads. At the level, stakeholders are expected to work together to develop a reduction plan. If this is not accomplished within two years, Alberta Environment will impose a reduction plan. "Emission minimization" occurs when acid deposition is below target levels, and involves the application of continuous improvement, voluntary approaches, application of Best Available Demonstrated Technology (BADT) and operating approval conditions. The lowest level of management is called "Continuous Improvement" and applies at levels between current deposition and natural background. It relies solely on voluntary efforts for continuous improvement.

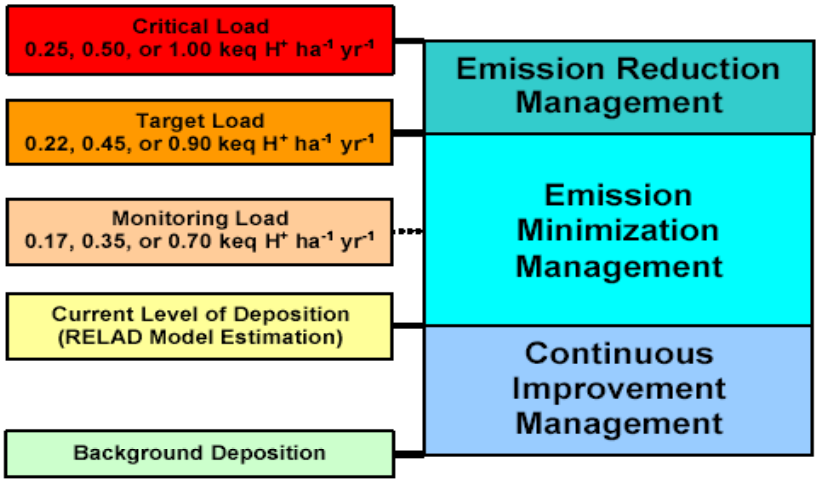


Figure 8: Acid Deposition Management Framework

In addition to tackling the details of implementation of the SO_2 management framework, subsequent discussions by the Acidifying Emissions Management Implementation Team (AEMIT) addressed issues associated with promoting continuous improvement and enhanced performance. AEMIT's resulting work on emissions trading, provincial sectoral emission targets for NO_x and SO_2, and penetration of Best Available Technology has informed the work of the Electricity Project Team, the Pollution Prevention/Continuous Improvement Team and the PM and Ozone Team.

Pollution Prevention/Continuous Improvement Framework (P2/CI)

A CASA project team developed a framework for P2/CI in Alberta that sets out goals, objectives, and potential opportunities for improving air quality. The two goals of the framework are 1) a working environment in which pollution prevention/continuous improvement is used to protect air quality, and 2) the public contributes to pollution prevention by making clean air friendly choices. Among the objectives of the framework are to identify and recommend cost-effective and innovative reduction opportunities, to establish a system of incentives for P2/CI, to promote the development and implementation of strategies to reduce fossil fuel consumption, and to increase the public's understanding of its role in contributing to air pollution and its ability to reduce air pollution.

The framework recognizes the close tie-ins with the work of other CASA activities like flaring, vehicle emissions, etc. Twelve potential opportunities for realizing P2/CI are identified. The team's work represents a key step forward in realizing P2/CI in Alberta and is closely connected with

supporting the PM and Ozone Management Framework on continuous improvement and keeping clean areas clean.

Vehicle Emissions

CASA's Vehicle Emissions teams have examined four areas related to management of emissions from vehicles: 1) vehicle technology (influenced primarily by vehicle manufacturers), 2) fuel formulation (influenced primarily by fuel manufacturers), 3) in-use vehicle emissions reductions (influenced primarily by drivers and vehicle owners), and 4) transportation demand management measures (including infrastructure changes and changes in driver behaviour). The original team made 10 recommendations, focusing mainly on in-use vehicle emission reductions, including emissions inspections, driver education, and gathering additional data on vehicle tampering. The subsequent implementation team conducted pilot programs with vehicle inspections, remote sensing of emissions, vehicle scrappage, and installation of diesel particulate filters on city buses. Work has also been initiated on identifying and assessing additional transportation demand management opportunities. The efforts of these teams in identifying, piloting and/or promoting opportunities for reducing vehicles emissions contribute to the overall goal of KCAC-CI.

Electricity Project Team

The CASA Electricity Project Team (EPT) was established to develop an air emissions management approach for Alberta's electricity sector, including performance expectations and standards. In developing an emissions management approach, the EPT is likely to propose emission objectives and tools that, if implemented, would contribute to the goals of the PM and Ozone Management Framework. The EPT is expected to report to the CASA board in fall 2003.

3.3.2 Federal Initiatives

Ten Year Action Plan on Vehicles, Engines and Fuels

In 2001, as part of the federal *Clean Air Strategy*, Environment Canada launched a ten-year plan for cleaner vehicles, engines and fuels. The plan was initiated because transportation is the largest source of air pollution in Canada. The plan will, among other things, ensure that Canadian emission standards for new vehicles and engines are aligned with those of the U.S and reduce the concentration of sulphur in fuels. In addition, the plan will study the use and impact of the gasoline additive MTBE, develop a code of practice for heavy duty vehicle inspection and maintenance programs, and develop emission control programs for off-road engines, outboard marine engines, and gasoline utility engines used in snowblowers, lawnmowers and chain saws. As these actions are implemented and the current fleet of vehicles and engines is replaced over the next decade or so, there will be significant reductions in the emission of PM & ozone precursors across the country.

Declaration of PM10 Precursors and Ozone and its Precursors as CEPA Toxics[22]

This action on its own will not have any immediate effect on emissions, but does make the full range of tools under the *Canadian Environmental Protection Act* (CEPA) available to the federal government for the management of these substances. Application of these tools in Alberta will consider the implementation of the PM and Ozone Management Framework and whether it is meetings its goals and objectives.

[22] Canada Gazette, Part1, July 27, 2002

Interim Plan 2001 on Particulate Matter and Ozone

The federal government's *Interim Plan 2001 on Particulate Matter (PM) and Ozone* focuses on PM and ozone associated with three major sources: transboundary pollution from the U.S., transportation and industry. In addition to pursuing new provisions on PM in the *US-Canada Air Quality Agreement*, the plan is linked with the federal *Action Plan for Cleaner Vehicles, Engine and Fuels*, and includes a commitment to develop an action plan to reduce emissions of VOCs from consumer and commercial products. There are also many other components to the plan, ranging from actions on wood-burning appliances to green power, that will enhance management of PM and ozone.

New Source Guidelines for Thermal Electricity Generation

The introduction of a new federal guideline for emissions of NO_x, SO_2, and PM from thermal power generation will not have any immediate effect on emissions, since stationary source emissions are typically regulated at the provincial level. It does, however, set a benchmark for new sources - based on BAEFT and generally aligned with U.S. standards - that provinces may use in setting standards.

Climate Change Plan for Canada

Although still in the early stages of development and implementation, the federal government's *Climate Change Plan* is expected to support initiatives that will have a beneficial impact on PM and ozone levels across Canada. Generally speaking, all initiatives aimed at energy conservation, energy efficiency and promoting non-fossil sources of energy will serve to manage or reduce emissions of PM and precursors to PM and ozone

3.3.3 National/CCME Initiatives

Joint Initial Actions (JIA)

On signing the CWS, Ministers agreed to a set of initial actions to reduce the pollutants that cause PM and ozone.[23] These initial actions will be undertaken jointly by provincial/territorial and federal governments. Sectors included in the initial joint actions were selected based on considerations such as:

a. current emission inventories,
b. whether they are significant emitters of the precursor pollutants that cause PM and ozone
c. whether they are common to most jurisdictions,
d. a multi-jurisdictional approach would be more effective, and
e. action could be initiated in the near-term.

It is intended that the full set of initial actions will be completed by 2005. The JIA that relate directly to emissions reductions are:

1. Establish new initiatives to reduce emissions from transportation;
2. Participate in new initiatives to reduce emissions from residential wood burning appliances;

[23] PM & Ozone Joint Initial Actions, CCME, June 2000

3. In consultation with industry and other stakeholders, identify and develop comprehensive, national multi-pollutant emission reduction strategies initially for the following sectors (see also next initiative below – MERS):

   - Pulp and Paper
   - Lumber and Allied Wood Products
   - Electric Power
   - Iron and Steel
   - Base Metals Smelting
   - Concrete Batch Mix and Asphalt Mix Plants

4. Based on the best jurisdictional practices, assemble a model alternative energy (e.g. Green Power) program to aid all jurisdictions as appropriate in promoting and enhancing the availability, development and use of energy alternatives that have the potential to reduce emissions that contribute to PM and ozone.
5. Develop codes of practice and/or model emission management measures for the construction and demolition sectors.

Multi-Pollutant Emission Reduction Strategies (MERS)[24]

As jurisdictional action plans are developed as part of a national implementation strategy, the Multi-Pollutant Emission Reduction Strategies (MERS) have been developed to help jurisdictions address sectoral emissions. A MERS or MERAF (see below) is an information gathering and modelling exercise, built to inform jurisdictional plans on PM and ozone and national multi-pollutant analysis. It is not an emission reduction activity per se.

Six MERS sectors were identified:

- pulp and paper
- lumber and allied wood products
- electric power
- iron and steel
- base metals smelting
- concrete batch mix and asphalt mix plants

MERS is being conducted in partnership with provinces and territories, with stakeholders focusing on three primary activities:

1. National Multi-Pollutant Analysis or Multi-Pollutant Emission Reduction Analysis Foundation (MERAF) reports (e.g. technical feasibility studies on options and costs, competitiveness analysis, policy instruments) as input into the development of sectoral actions within jurisdictional plans;
2. Forum for Information Sharing and Coordination: jurisdictions will share information on how a particular sector is being addressed in different regions of the country; a forum for discussion on the role of federal instruments (i.e. guidelines, codes of practice);
3. National Sector Rollup: a national picture of a sector to be assembled by 2003 based on jurisdictional action plans and national multi-pollutant analysis and information.

National Framework for Petroleum Refinery Emissions Reductions (prospective)

The *National Framework for Petroleum Refinery Emission Reductions* will provide the principles and methods for jurisdictions to establish facility emissions caps for identified criteria air pollutants and air toxics from petroleum refineries.

[24] Summarized from the Overview of Multi-Pollutant Emission Reduction Strategies (MERS) for the PM and Ozone Canada-Wide Standards, Canadian Council of Ministers of the Environment, http://www.ccme.ca, 2000

Keeping Clean Areas Clean/Continuous Improvement

As part of the CWS, a guidance document is being developed to provide jurisdictions with direction on implementation of Annex A, Keeping Clean Areas Clean and Continuous Improvement.

3.3.4 Other Initiatives

Airshed Zones

Airshed zones are local organizations that enable stakeholders in a shared geographical area to identify air quality concerns and implement suitable management solutions. Existing airshed zones conduct air quality monitoring, which is a key input to the PM and Ozone Management Framework.

Current airshed zones include:

- Fort Air Partnership Airshed
- Parkland Airshed Management Zone
- Peace Airshed Zone Association
- West Central Airshed Society
- Wood Buffalo Environmental Association Airshed

As stated in its *Business Plan for 2003-2006*, Alberta Environment "support(s) development of a comprehensive network of airshed alliances."

Cumulative Environmental Management Association (CEMA)

CEMA is a multi-stakeholder organization that was established to help manage cumulative environmental effects of oilsands development in the Fort McMurray region. It has established a working group to develop a management system for NO_x and SO_2. It uses a consensus process.

Operations Steering Committee (OSC)

The Operations Steering Committee coordinates planning and operational activity on ambient air monitoring. The OSC considers all monitoring needs in its work and recommendations to the Department and Zone. The PM and Ozone Project Team provided recommendations to the OSC to review Alberta's current monitoring system against the PM and Ozone Management Framework.

3.4 PM & O3 Management Framework

The following sections outline the key components of the PM and Ozone Management Framework. Figure 9 provides an overview of the framework's major components, including action levels, corresponding action triggers and the conceptual approach to application of regulatory and management tools. Figure 10 illustrates the annual analysis that will be led by Alberta Environment to determine the action level ascribed to an area. This is followed by more detailed descriptions of the action levels and principles that apply below the numeric CWS levels.

3.4.1 Action Triggers

The following action triggers define the action levels in the management framework below the CWS. A description of the activities associated with these action levels is found in 3.4.2.

$PM_{2.5}$:	**Exceedance**:	30 μg/m^3, CWS metric
	Management:	20.0 μg/m^3, CWS metric
	Surveillance:	15.0 μg/m^3, CWS metric
	Baseline:	Below 15.0 μg/m^3, CWS metric
Ozone:	**Exceedance:**	65 ppb, CWS metric
	Management:	58.0 ppb, CWS metric
	Surveillance:	at the discretion of AENV based on considerations described immediately below
	Baseline:	at the discretion of AENV based on considerations described immediately below

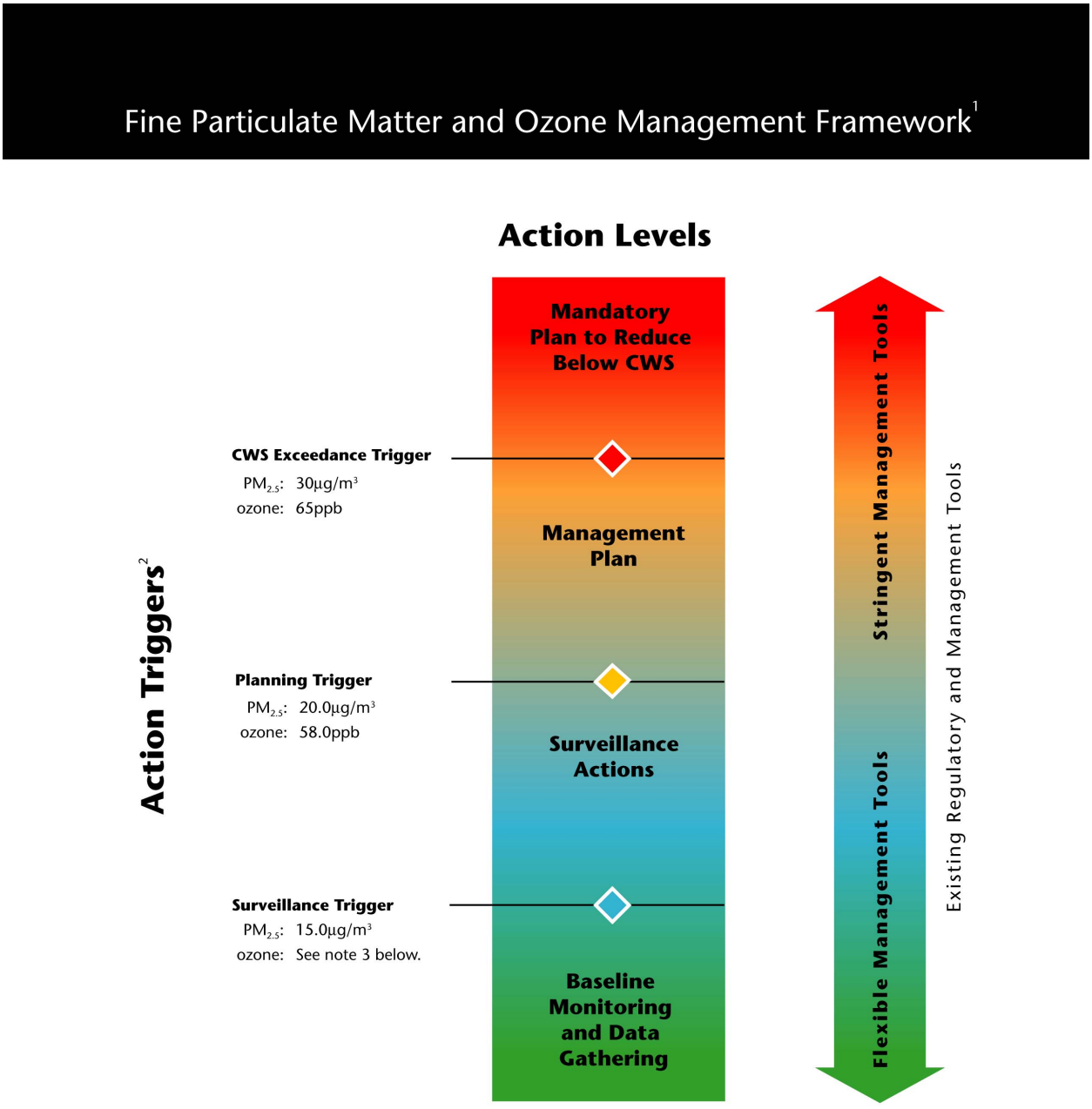
For ozone, Alberta Environment will determine on an annual basis which areas of the province are in baseline and which areas are in surveillance. This determination will take into account the following:

- location of existing monitoring
- ambient ozone data (prepared using the 3 year CWS metric)
- available resources for baseline and surveillance activities
- priorities for improving understanding of ozone sources, formation, concentrations and movement

Rationale

It is recognized that there will be areas of the province that are in baseline, and areas that require surveillance, and that setting a numeric trigger level for what region belongs in which level may not provide the best guide for prioritizing monitoring and analytical activities. Recognizing that Alberta's lowers measured daily maximum concentrations of ozone are currently 46 ppb based on the CWS three year metric, and that global background concentrations may be increasing, it was agreed that the Health Reference Level for ozone does not provide a discriminating tool for delineating baseline/surveillance trigger levels, so it is not part of the framework.

FIGURE 9: FINE PARTICULATE MATTER AND OZONE MANAGEMENT FRAMEWORK



1. *The framework must be applied in the context of its key elements, including guiding principles, existing initiatives and mechanisms that support management of PM & ozone, and the goals and objectives for each action level.*

2. *Action triggers for $PM_{2.5}$ are based on a 24 hour average, and achievement is based on the 98th percentile ambient measurement annually, averaged over 3 consecutive years. Action trigger levels for ozone are based on an 8 hour average, and achievement is based on the 4th highest measurement annually, averaged over 3 consecutive years.*

3. *For ozone, Alberta Environment will determine on an annual basis which areas of the province are in baseline and which are in surveillance.*

3.4.2 Description of Action Levels and Additional Principles

The framework has four action levels, each of which are described below. The team also developed principles to guide activities and decisions under the framework when ambient levels are below the CWS.

3.4.2.1 Mandatory Plans to Reduce Below the CWS (CWS Exceedance Level)

If the Canada Wide Standard is exceeded AENV will develop and implement a management plan containing measures to reduce ambient concentrations to below the numeric CWS. Recognizing Alberta's commitment to achieve the CWS by 2010 and remain below it thereafter, AENV will strive to develop the plan within two years, working with stakeholders to the greatest degree possible.

Notes on the CWS Exceedance level process:

- AENV is the lead agency
- Key stakeholders, including airshed zones, will be identified and consulted, from both emissions sources and receptor communities
- Available information will be assembled including: transboundary contribution, sources, trends, growth, forecasts, reductions from other existing programs. Gaps in the information needed for management planning will be filled
- AENV will ensure that monitoring is adequate
- A management plan will be developed and implemented
- National and provincial reporting requirements will be met
- There will be public communication of the exceedance and the actions to be taken

3.4.2.2 Principles that apply below the Numeric CWS

Recognizing that the focus of the management framework below the numeric CWS is Keeping Clean Areas Clean and Continuous Improvement, the following guiding principles and concepts apply:

a) The action trigger concentrations are neither "pollute up to" levels, nor "not to exceed" levels

b) Activities should be prioritized according to available resources, contextual factors [see (e)], and air quality needs

c) More stringent management tools are to be used as ambient concentrations approach the CWS, more flexible management tools are to be used when ambient concentrations are at baseline or surveillance levels

d) Action triggers will be used for airshed planning. They will not be applied as "point of impingement"[25] concentrations in relation to approval limits and conditions

e) Contextual factors, including but not limited to:

- population growth and density
- trends in ambient levels
- the predicted impact of existing activities and initiatives

[25] Point of impingement concentrations are the ambient concentrations of individual pollutants as measured at the boundary/property line of an emitting facility.

- economic growth forecasts
- age of facilities, and
- any factors related to the overall practicality of actions will be considered in the development of mandatory plans, management plans and other activities in areas with ambient concentrations below the CWS

f) The management framework will work towards the long-term goal of minimizing risks to human health and the environment, balancing the desire to achieve the best health and environmental protection possible in the relative near term and the feasibility and costs of reducing the pollutant emissions that contribute to elevated concentrations of PM and ozone in ambient air.

3.4.2.3 Management Plan (Management Level)

The goal of the management plan level is to prevent an exceedance of the CWS, to maintain air quality and improve air quality wherever possible. Following the additional guidance immediately below, a management plan with actions appropriate to the ambient concentrations, trends, and contextual factors will be developed and implemented by stakeholders from source and receptor areas. AENV or the affected airshed zone(s), as appropriate, may coordinate the development of a plan. If this is not done within two years, AENV may impose a plan.

For $PM_{2.5}$, in addition to principles for the management framework listed above, the decision as to the content and actions under the management plan should take into account the following:

- In areas where ambient concentrations are in the higher end of the management range, where ambient concentrations are indicating a significant upward trend, or where contextual factors indicate a need for action, a more stringent management plan will be developed and implemented.
- In areas where ambient concentrations are in the lower end of the range, are indicating a significant downward trend, or contextual factors indicate little or no additional action is required, a less stringent management plan will be developed and implemented. It is possible that the activities laid out in the surveillance level would be considered sufficient in some cases.

Notes on the process:

- AENV or the affected airshed zone(s), as appropriate, leads identification of key stakeholders, both from the emissions sources and receptor communities
- The consensus model is suggested as a model for plan development
- Where there is an existing airshed zone, or other multi-stakeholder group with similar interests, they may choose to lead the development of a plan
- Existing data and analysis is gathered to inform the management planning process. Additional analysis of transboundary contributions, sources, trends, growth, forecasts, reductions from other programs, existing and required monitoring etc., is performed if necessary
- Develop and implement a management plan
- Develop and implement a public communication/consultation strategy
- If there is not an existing airshed zone, or other multi-stakeholder group with similar interests, a zone formation analysis could occur

3.4.2.4 Surveillance Actions (Surveillance Level)

At the surveillance level steps should be taken by AENV, with the support of the affected airshed zone(s) as appropriate, to ensure that the source(s) of elevated ambient concentrations are determined and that trends in ambient concentrations are analyzed and monitored. The focus at the surveillance level is on ensuring that the ambient air quality monitoring and information required to assess the region's ongoing air quality is in place, and that, where possible, steps be taken to maintain or improve air quality, i.e. "Continuous Improvement" and "Keeping Clean Areas Clean" activities. Information gathered at this level could include emission levels, trends, forecasts, etc.

There will not be a numeric trigger for the surveillance level for ozone. For distinguishing the baseline/surveillance areas below 58 ppb, the principles and process outlined under 3.4.3 - Trigger Process will be used.

Notes on the process:

- AENV reviews ambient air quality monitoring data annually and assesses, in consultation with the Operations Steering Committee (OSC), the adequacy of existing ambient air quality monitoring in the area and other available information relating to air quality
- AENV shares analysis and data with stakeholders
- If an airshed zone or other multi-stakeholder group with similar interests exist AENV will work with them
- Opportunities for KCAC and CI are identified and encouraged

3.4.2.5 Baseline Monitoring and Data Gathering (Baseline Level)

Recognizing that areas in baseline have the best air quality in Alberta, the primary goal at this level of the framework is ongoing monitoring of ambient air quality levels. Therefore, no additional analytical or management activities are required at baseline, although AENV or airshed zones may wish, at their discretion, to undertake additional monitoring or data assessment activities. This could extend to areas where there is currently no monitoring in place. Determination of baseline areas for ozone will occur according to the process outlined in 3.4.3 - Trigger Process/Annual Analysis.

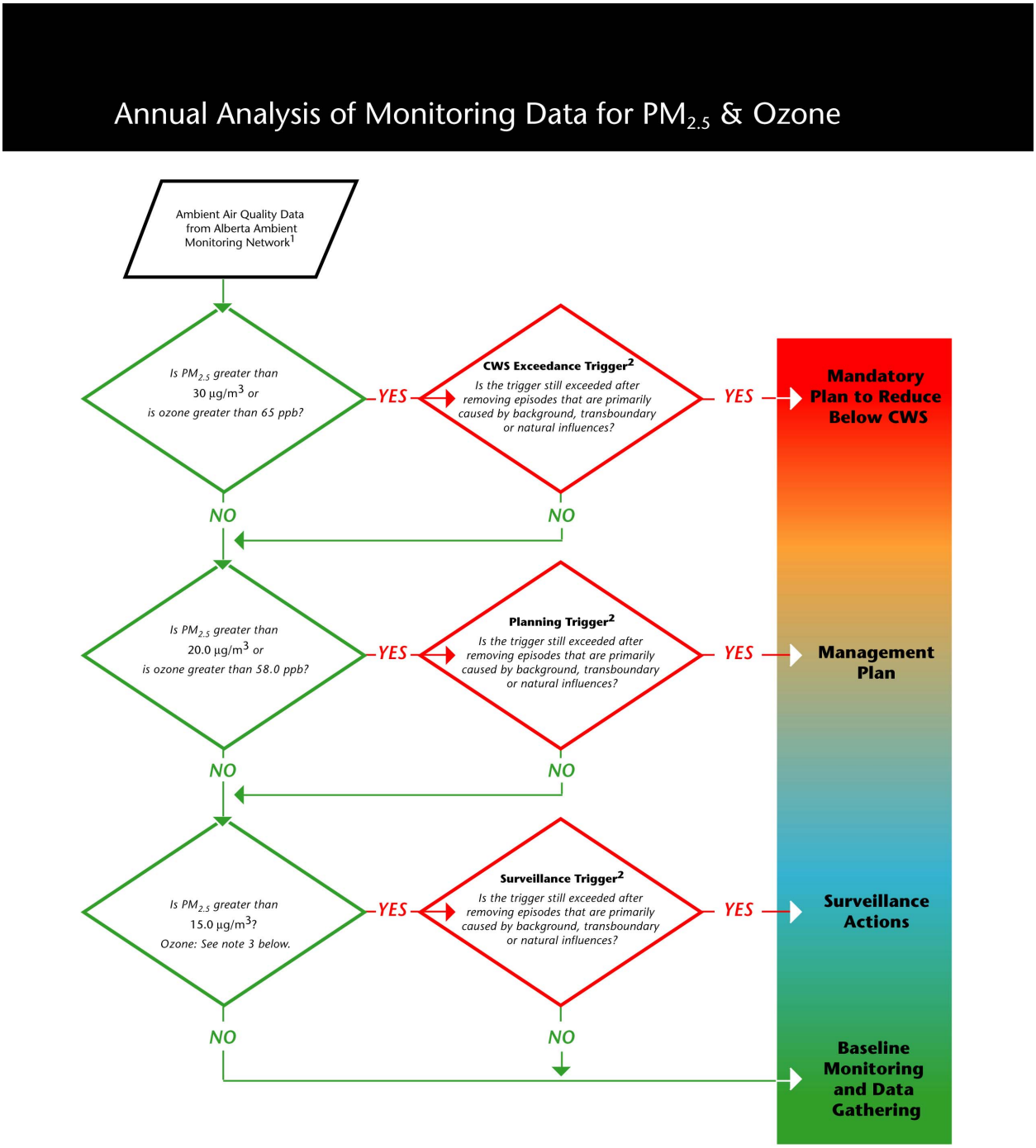
Notes on the Process

- Ongoing ambient monitoring continues
- Any existing KCAC and CI activities continue to apply

3.4.3 Trigger Process and Annual Analysis

The trigger process consists of an annual analysis performed by AENV, with the assistance of Environment Canada, of ambient monitoring data from the Alberta monitoring network – see Figure 10. The analysis applies the CWS three-year metric to the monitoring data to determine the appropriate action level for an area. Episodes that are primarily caused by natural events, high background or transboundary transport are removed from the calculation of the three year metric using the methodologies described in the national *Guidance Document on Achievement Determination* (GDAD) and incorporated into the Alberta Guidance Document. Over the next several years, simplified methodologies will be developed and tested for use with the management framework, recognizing that some form of the best efforts determination outlined in the GDAD should be applicable to all action levels.

FIGURE 10: ANNUAL ANALYSIS OF MONITORING DATA FOR $PM_{2.5}$ & OZONE



1. *The CWS three year metric will be applied to this data.*

2. *See "Guidance Document for the Management of Fine Particulate Matter and Ozone in Alberta" for more information on the application of CWS metric and asociated analysis of high background, transboundary or natural influences.*

3. *For ozone, Alberta Environment will determine on an annual basis which areas of the province are in baseline and which are in surveillance.*

Demonstration of background or natural influence is the responsibility of AENV, while demonstration of transboundary flow, including high background levels originating from sources outside of Alberta, will be a shared responsibility of the federal government and AENV. Alberta Environment is responsible for communicating the annual analysis and any related actions to the public and stakeholders, as appropriate for the action level the area is in.

Notes on the Trigger Process:

- The team identified a need for simplified mechanisms to perform the analysis of episodes caused by high background, transboundary flow or natural influences, especially at levels below the CWS. Recognizing that the team would be unable to test simplified mechanisms before its September 2003 deadline, a recommendation (PMO3-3) was developed to address identification and assessment of simplified mechanisms.
- It is proposed that areas be triggered when they actually reach the action trigger concentration. Therefore, if 20.0 $\mu g/m^3$ is the action trigger for a Management Plan for $PM_{2.5}$, and an area is at 19.7 or 19.9 $\mu g/m^3$, that area is still in Surveillance Actions. However, that area would be in Management Plan if concentrations are 20.0 $\mu g/m^3$or above. For exceedance of the numeric CWS, the framework will use the method outlined in the GDAD.

3.4.4 Roles and Responsibilities

There are a number of parties that are integral to the successful implementation of the management framework. These are AENV, Environment Canada, airshed zones, contributing emitters, interested stakeholders and the public. It is important to acknowledge the framework's emphasis on shared responsibility and the positive expectation on stakeholders to participate in management plans. An overview of the general roles and responsibilities of each party is outlined below.

Alberta Environment is the lead agency for implementation of the PM and Ozone Management Framework. Its main responsibilities include:

- Annual analysis of ambient monitoring data and application of the trigger process
- Development of a plan when the CWS is exceeded
- Ensuring that the framework is implemented consistently across Alberta
- Participating in the development of management plans
- Communication with stakeholders in respect of the results of the annual analysis
- Provide opportunities to stakeholders and the interested public to participate in activities related to the implementation of the management framework, including the development of mandatory plans and management plans
- Initial coordination of stakeholders when an area is identified for management planning or surveillance, with the option of delegating this role to the local airshed zone
- Identifying and executing data gathering and analytical activity as needed
- Ensuring that contributing emitters understand there is a positive expectation to participate in the development and implementation of plans developed for management and CWS exceedance levels

Environment Canada assists Alberta Environment in demonstrating transboundary influences, which includes background arising from transboundary sources, on PM and ozone action trigger exceedances.

The framework does not in any way alter the existing authority of agencies, departments and organizations to use regulatory mechanisms in the event that the goals and objectives of the framework are not being achieved.

Airshed zones can work with Alberta Environment on activities related to mandatory plans, management plans, surveillance actions and additional data gathering/analytical activity. Airshed zones can also lead the coordination of management plan and/or surveillance level activities.

To emphasize the shared responsibility for managing PM and ozone concentrations in Alberta, as well as the diverse number of sources that contribute to higher ambient levels, contributing emitters are under a positive expectation to participate in the development and implementation of plans under the framework. This will ensure that the resulting actions are reasonable and equitable across all contributing sources.

The participation of interested stakeholders and the interested public ensures that implementation of the PM and ozone management framework is transparent and accountable. Both groups may contribute by participating in the development of both mandatory and management plans.

3.4.5 Potential Tools and Mechanisms

Management tools and regulatory mechanisms refer to a wide spectrum of actions and initiatives that can be undertaken to manage or reduce emissions of PM and precursors to PM and ozone from any or all anthropogenic sources in Alberta. These can be compulsory or voluntary in nature. Management tools and mechanisms are not solely within the purview of government, and may be developed and/or applied by the private sector, non-governmental organizations or joint public-private efforts such as CASA or other multi-stakeholder groups such as airshed zones, as may be appropriate for the circumstances. Given this wide definition, a very large number of potential tools and mechanisms are implied.

In addition, concentrations of ambient PM and ozone vary across Alberta, due in part to the type, intensity and location of anthropogenic activities found in any particular area. As a result, management options are most appropriately identified on a case-by-case basis once there is an understanding of the extent and nature of the air quality concern, as well as the scale, cost and effect of the measures themselves. The framework principles outlined in 3.2 and 3.4.2.2 therefore serve as critical guide for any decisions on management options.

Management tools and mechanisms can be sorted into broad and often overlapping categories:

Tools and Mechanisms	Example
Regulatory Tools	approvals, regulations, prohibitions, regulated requirements
Standards, Codes & Guidelines	industry codes of practice, Ambient Air Quality Guidelines, New Source Performance Standards
Programs	pollution prevention planning, education & outreach
Agreements	covenants, memorandums of understanding, letters of agreement
Targets & Objectives	provincial emission targets, sectoral targets

Incentives/ Disincentives	economic instruments, recognition programs, enhanced performance programs
Municipal/ Regional Planning Approaches	zoning, urban and transportation planning
Private Sector Initiatives	voluntary reduction programs, environmental management systems, employee education & awareness programs, commuter programs

Over the course of its work, the project team identified a number of management and analytical tools to support the PM & ozone management framework, which are listed below. This is not a consensus listing, nor should it be viewed as an exhaustive list. There are also some extensive "shopping lists" of management tools and mechanisms available. These are listed as "Additional Resources" at the end of this section.

Potential Management Tools:

- Voluntary programs and approaches
- Existing programs and policies
- Environmental assessment
- Source performance standards
- Pollution prevention planning
- Ambient air quality guidelines
- Codes of Practice
- Industry stewardship initiatives
- Public-private partnerships, Agreements
- Education, raining
- Reward, recognition programs
- Land use policy and planning
- Emissions trading & other market mechanisms
- Offsetting new sources
- Establish reduction targets
- More stringent emission standards/limits
- Air Quality Index & forecasting
- Taxes and fees (used as either incentives or disincentives)
- Promote industrial ecology
- Energy efficiency
- Green energy policies
- Transportation demand management
- Zone formation analysis

Potential Data/Analytical Tools and Approaches

- Assess adequacy of current monitoring and ecological effects modelling
- Examine existing data on air quality trends, forecasts, and inventories
- Source attribution
- Source apportionment
- Emission forecasting
- Trend analysis
- PM speciation
- Economic analysis/cost effectiveness studies
- Model future scenarios, test the proposed plan under different conditions
- Other air quality modelling
- Examine how exceedances have been handled in other jurisdictions

Current guidelines used in Alberta include:

- Alberta Ambient Air Quality Guidelines
- CCME National Emission Guideline for Commercial/Industrial Boilers and Heaters
- EUB Sulphur Recovery Guidelines
- CCME Environmental Guideline for the Control of VOCs Process Emissions From New Organic Chemical Operations
- CCME Environmental Code of Practice for the Measurement and Control of Fugitive VOC Emissions From Equipment Leaks
- EUB Guide 60

Additional Resources:

***Alberta Multi-Stakeholder Group for Particulate Matter and Ozone,* Report to Alberta Environment, (1999)**:

- Appendix J Examples of Management Options Identified in Other Jurisdictions
- Appendix K Potential Actions for Implementation

***Keeping Clean Areas Clean and Continuous Improvement – An Issues Paper,* Final Report to the KCAC/CI Working Group of the JAICC-CAG (2003)**:

- Table 9-1 Identified Examples of Tools and Mechanisms

3.4.6 Management Framework Recommendations

The following recommendations are provided by the team in respect of the PM and Ozone Management Framework:

1. Management Framework Recommendations

a) Acceptance of the PM and Ozone Management Framework

It is recommended that the Particulate Matter and Ozone Management Framework be accepted and approved for implementation.

b) Timing of Implementation

It is recommended that the PM and Ozone Management Framework be implemented by Alberta Environment beginning in 2004. This would involve completion of the annual analysis and the assignment of corresponding action levels for $PM_{2.5}$ and ozone to all areas of the province by December 2004 using ambient data collected between 2001 and 2003. Actions under the framework should commence in 2005, conditional upon finding a simplified mechanism for transboundary and background analysis (see recommendation 2).

c) Management Framework Review

It is recommended that the PM and Ozone Management Framework, including the process for annual analysis of ambient data, simplified mechanisms, and action trigger levels, be reviewed by Alberta Environment after three years of practical application and implementation experience, and in conjunction with or immediately following the review of the Canada Wide Standard in 2006. This review should involve interested stakeholders and members of the public.

2. Simplified Mechanisms

It is recommended that Alberta Environment lead work on testing simplified mechanisms for determining when episodes are caused by transboundary transport, high background concentrations or natural events, especially for application at action trigger levels below the numeric CWS, including simplified methodologies for performing the "Best Efforts Determination" outlined in the *Guidance Document for Achievement Determination*. This work should involve Environment Canada and interested stakeholders, and should be completed by the end of 2004.

3. Alberta Ambient Air Quality Guideline

It is recommended that Alberta Environment decide whether to establish new Ambient Air Quality Guidelines for $PM_{2.5}$ and ozone. Members of the project team provide six proposals for consideration by Alberta Environment. These proposals are presented to show the range of options and opinions within the team. If Alberta Environment determines that new guidelines are desirable, public consultation should be undertaken.

Proposals	Ozone	$PM_{2.5}$
1	65 ppb, 8 hr avg	30 micrograms/m3, 24 hr avg.
2	15 ppb, 1 hr avg	15 micrograms/m3, 24 hr avg.
3	65 ppb, 8 hr avg with CWS metrics or equivalent numerical value	30 micrograms/m3, 24 hr avg. with CWS metric or equivalent numerical value
4	82 ppb, 1 hr (existing guideline)	30 micrograms/m3, 24 hr avg.
5	82 ppb, 1 hr (existing guideline)	No guideline
6	No guideline & withdrawal of current 82 ppb guideline*	No guideline*

* for proposal 6, it was stated that the PM and Ozone Management Framework should be used in place of the AAQG for managing ambient concentrations of PM & ozone.

4. CWS Coarse Fraction Standard

Preamble

There is some evidence of health effects of coarse fraction particulate ($PM_{2.5-10}$), and it is observed that there will be a review of the health science associated with coarse fraction PM in 2005 as part of the national CWS process. A significant portion of coarse particulates in Alberta comes from natural sources or sources such as agricultural land use, sometimes reaching levels of 200µg/m3 or more. Because many primary Alberta sources are not manageable, an ambient coarse fraction standard may be meaningless. It is recognized that the national Joint Action Implementation Coordinating Committee (JAICC) will be making a recommendation to the CCME on a coarse fraction standard in fall 2003.

Recommendation

With respect to consideration of a Canada Wide Standard for coarse fraction particulate, it is recommended that Alberta Environment take forward the following two positions as input to the Canadian Council of Ministers of the Environment recommendation to Ministers in fall 2003:

(a) It is recommended that consideration of an ambient coarse fraction standard be deferred until further health science information is available as part of the national Canada Wide Standard health science review in 2005.

(b) It is recommended that consideration be given to the need for national source standards for sectors and activities that are significant sources of coarse fraction particulate and not currently subject to source standards.

The team recognizes that at the time of writing this report, Environment Canada is still in the process of developing its position regarding a coarse fraction standard, and therefore affirms that this recommendation is made without prejudice to any positions Environment Canada may choose to take in the future.

5. Background PM or ozone originating outside of North America

Preamble

The Alberta Demonstration Project indicated that certain high ozone episodes in Alberta could be related to ozone originating outside of North America.

Recommendation

It is recommended that the Joint Action Implementation Coordinating Committee (JAICC) be asked to examine and identify further actions that should be taken to assess the nature of ozone originating from outside North America as well as any actions that should be pursued at an international level.

6. MERS/MERAF

Preamble

The Multi-Pollutant Emission Reduction Strategy (MERS) and Multi-Pollutant Emission Reduction Analysis Foundation (MERAF) formed a key element of the CCME's Joint Initial Actions under the CWS. A MERS or MERAF is an information gathering and modelling exercise undertaken for each of six major emitting sectors, and will be used to inform jurisdictional plans on PM and ozone and national multi-pollutant analysis.

Recommendation

It is recommended that the sector specific information and data compiled under the national MERS and MERAF (Multi-Pollutant Emission Reduction Strategy and Multi-Pollutant Emission Reduction Analysis Foundation) initiatives be made available by Alberta Environment to all stakeholders involved in implementation of the PM and Ozone Management Framework, including those who participate in the development of management plans under the framework.

4.0 Monitoring and Reporting

Monitoring and reporting activities are essential to measuring progress on implementation of the PM and Ozone Management Framework. Jurisdictions also have obligations to monitor and report activities and progress under the national CWS. The following sections provide an overview of the PM and ozone monitoring and reporting framework proposed for Alberta.

4.1 National Guidance Document on Achievement Determination

Annex B of the CWS and the national *Guidance Document on Achievement Determination* (GDAD) provide the framework for monitoring and reporting of the CWS. The GDAD is intended as a reference tool for jurisdictions and the public, providing information, methodologies, criteria and procedures for reporting on achievement of the CWS for PM and ozone. It also provides the guidelines for ensuring consistency and comparability of data when meeting other CWS reporting requirements.

Applying achievement determination methodologies for the CWS for PM and ozone involves some groundbreaking work, especially with respect to accounting for transboundary flow, background levels and natural events. As was evidenced by the Alberta Demonstration Project, as jurisdictions gain experience applying these methodologies, it will be necessary to review their applicability and effectiveness, and to make appropriate changes to ensure that appropriate accounting is carried out and reported in a fair, consistent and efficient manner.

Under the CWS, it is recommended that jurisdictions follow the guidance in the GDAD when:

- reporting on progress to their respective publics on a regular basis, with the timing and scope of reporting to be determined by each jurisdiction;
- preparing the 5-year comprehensive reports;
- maintaining data on ambient measurements and making it available to the public;
- reporting on other communities (i.e. population centres less than 100,000); and
- reporting on progress for the CWS provisions on Continuous Improvement and Keeping Clean Areas Clean.

The GDAD outlines:

- concepts used to identify CWS reporting areas and gives recommendations and the rationale on who should report on progress toward meeting CWS for PM and ozone;
- recommendations and the rationale for where PM and ozone monitoring sites should be located within CWS reporting communities;
- PM and ozone data requirements and recommended calculation methodologies for determining achievement;
- recommendations for methodologies to take into account the influence of two significant regional circumstances recognized in the CWS for PM and ozone: first, that some areas of Canada are highly affected by transboundary air pollution; and second, that high background levels of PM and ozone may sometimes occur through natural events in some parts of the country.

4.2 Alberta's Approach: Guidance Document on Fine Particulate Matter and Ozone in Alberta

The nature of the PM and Ozone Management Framework, coupled with the team's determination that the CWS should apply to all of Alberta (the CWS requires application to communities over 100,000 only) dictated the need for a "made in Alberta" guidance document. To support implementation of the PM and Ozone Management Framework, the team developed a *Guidance Document for the Management of Fine Particulate and Ozone in Alberta* ("Alberta Guidance Document"). This document is intended to provide all interested stakeholders - from the general public through to government officials - the resources and background to clearly understand, participate in and apply the PM and Ozone Management Framework. The Alberta Guidance Document comprehensively addresses the two core areas associated with implementation of the CWS in Alberta: 1) the management framework, and 2) monitoring and reporting.

The Alberta Guidance Document serves two purposes: a) to equip stakeholders participating in the implementation of the framework with appropriate guidance on how it works and b) to ensure clear and transparent reporting of progress on the framework and achievement of the CWS.

The monitoring and reporting sections of the Alberta Guidance Document integrate key components from the GDAD - such as calculation methodologies, monitoring methods, methodologies for assessing transboundary influences as well as high background and natural influences - with more specific direction from the team that addresses reporting areas in Alberta, reporting on KCAC-CI and the use of simplified mechanisms for assessing transboundary, background or natural source influences.

Recommendations regarding adoption, availability and review of the Alberta Guidance Document are found in section 4.5 of this document.

4.3 Reporting

Given the team's decision that the CWS should apply to all of Alberta, it had to determine how to best integrate Alberta's reporting needs with the options provided under the CWS for reporting nationally. Despite the fact that the GDAD recommends dividing CMAs of greater than 500,000 into reporting sub-areas, the team decided not to follow this approach for two reasons – first because monitoring results were highly correlated across CMAs and, second, because it would be clearer and simpler to report the CMA as one unit for public communication purposes.

The following determination was made:

"Using the achievement determination calculation in the national *Guidance Document on Achievement Determination*, $PM_{2.5}$ will be reported as a spatial average of all reporting stations in each Census Metropolitan Area (CMA), and ozone will be reported on the basis of the station with the highest maximum in the CMA. For greater clarity, zonal monitors inside a CMA will be reported as part of the CMA. Ambient monitoring stations located outside of CMAs are to be reported as individual monitoring stations." As a result, the annual analysis by Alberta Environment will meet both the CWS and management framework reporting needs.

4.4 Ambient Monitoring System

As of May 2003, Alberta's ambient monitoring network is composed of 28 monitoring stations (see Fig. 11 below) and five established airshed zones. The most recent strategic review of Alberta's ambient monitoring system occurred in the late 1990's, prior to the establishment of the CWS.

Wishing to see the next strategic review incorporate the needs of the PM and Ozone Management framework and the CWS, the team made a recommendation to the Operations Steering Committee in October 2002 to undertake a review the Alberta ambient monitoring system to determine whether changes are required to meet the needs of the PM and Ozone Management Framework. The complete text for the recommendation is found in 4.5.

Provincial and Airshed Stations that Continuously Monitor Ozone and/or $PM_{2.5}$ as of January 2003

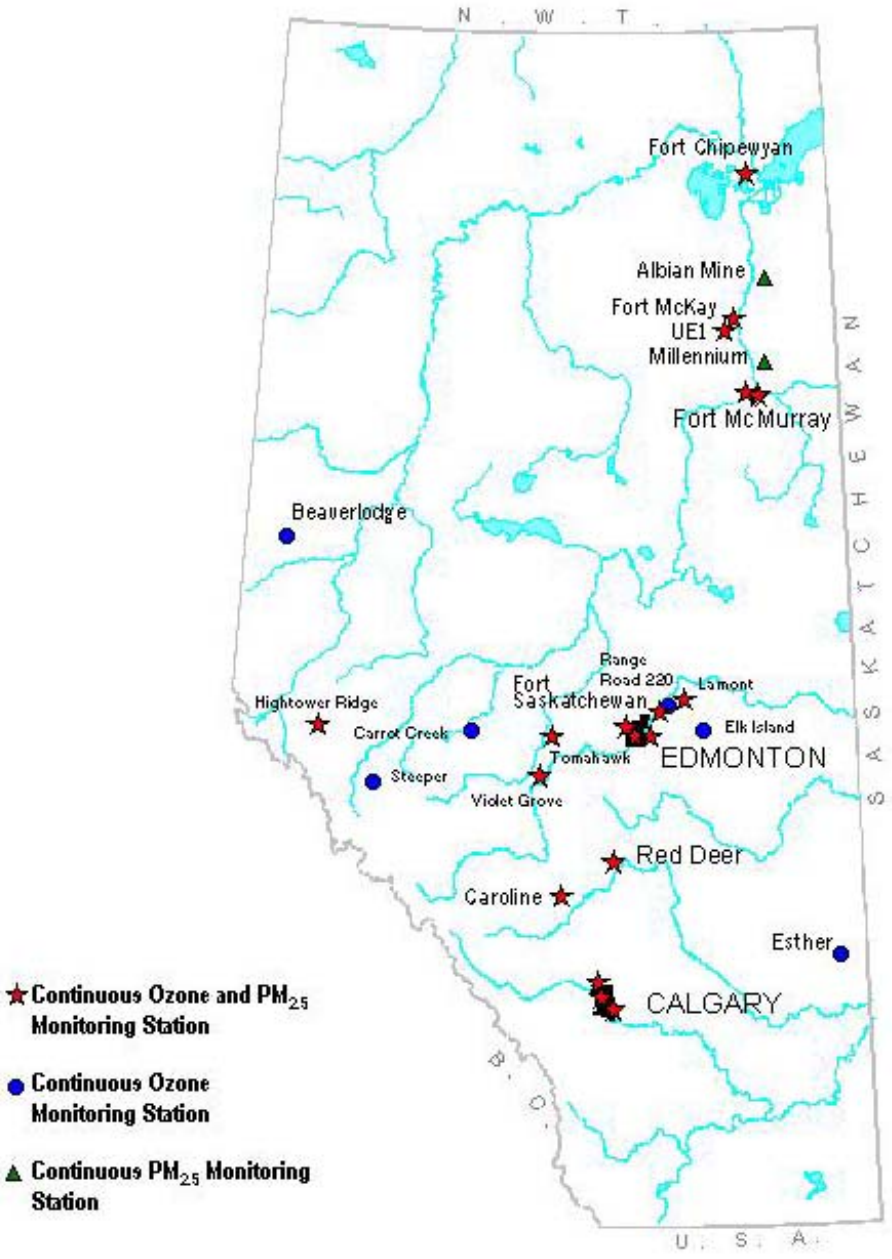


FIGURE 11: ALBERTA'S AMBIENT MONITORING SYSTEM[26]

FIGURE 12: AIRSHED ZONES (JUNE 2003)

4.5 Recommendations

7. Monitoring

The CASA PM & Ozone Project Team recommends to the Operations Steering Committee that the monitoring system for Alberta be reviewed and evaluated to determine whether changes are required to meet the needs of the proposed PM & Ozone Management Framework for Alberta.

[26] This map is illustrative, but not definitive. Changes could have occurred to the monitoring system since this map was produced. Readers are advised to contact Alberta Environment for up to date information on the system.

8. Alberta Guidance Document

Preamble

The *Guidance Document for the Management of Fine Particulates and Ozone in Alberta* has been created for all stakeholders as a guide to implementation and application of the PM and Ozone Management Framework.

Recommendations

a) Adoption

It is recommended that the *Guidance Document for the Management of Fine Particulates and Ozone in Alberta* be accepted and approved for use in Alberta.

b) Availability

It is recommended that the *Guidance Document for the Management of Fine Particulates and Ozone in Alberta* be made available to stakeholders via the CASA website and by Alberta Environment through linking to the CASA website. Both CASA and Alberta Environment shall provide hard copies of the Alberta Guidance Document on request.

c) Future Reviews

It is recommended that the *Guidance Document for the Management of Fine Particulates and Ozone in Alberta* be reviewed and updated in conjunction with the review of the PM & Ozone Management Framework in 2006/07. Alberta Environment shall coordinate the review and involve interested stakeholders.

5.0 Communications Plan and Recommendations

A communications plan was initially developed by the team to achieve the following objectives:

1. To provide team members with communication tools that enable them to properly present the team's recommendations to their respective sectors;
2. To ensure public consultation occurs on the development of any new *Ambient Air Quality Guidelines* for PM and ozone in the event that Alberta Environment determines they are warranted; and
3. To notify all Albertans that the PM and Ozone Management Framework is available.

The plan had both internal and external components as follows:

Internal Communications

An internal communications plan was developed and implemented to target team members and their respective sector/constituencies.

The following key messages were relayed during the course of the team's work:

1. PM and ozone team members need their sector's support;
2. The PM and Ozone Management Framework has been developed;
3. Information on how the framework works and will be implemented;
4. Recommendations from the PM and Ozone Team.

Team members were equipped with tools to assist in communicating these key messages to their respective sectors and CASA board representatives, including a PowerPoint presentation and a printed briefing.

External Communications

An external communications strategy was developed to target all Albertans and inform them that the PM and Ozone Management Framework has been developed and will be implemented beginning in 2004. The primary objectives of the strategy are to:

- Communicate to key audiences the impact of implementing the PM and Ozone Management Framework and how they can participate
- Communicate the benefits of CASA's multi-stakeholder, consensus-based process
- Communicate how changing decisions and behaviour of key and secondary audiences can help reduce PM and ozone concentrations in Alberta
- Strengthen the willingness of environmental organizations, industry, and government to partner on initiatives that contribute to cleaner air for Albertans

Communication tools used to achieve these objectives will include:

- Media release
- CASA Clean Air Bulletin
- Information on the CASA and AENV Websites
- Stakeholder briefing notes
- Speaking platforms such as lunch meetings and conferences

5.1 Recommendations

9. Communications with Stakeholders and the Public

The team recommends that CASA and Alberta Environment coordinate strategies to ensure Albertans are notified of the PM and Ozone Management Framework, how it works and key recommendations from the project team. As per recommendation 8(b) the *Guidance Document for the Management of Fine Particulate Matter and Ozone in Alberta* – which includes the PM and Ozone Management Framework - should be available at the CASA website and Alberta Environment should provide stakeholders with a link from its website to the Alberta Guidance Document on the CASA website.

6.0 Looking Ahead

Implementation of the PM and Ozone Management Framework is proposed to begin in 2004 and will commence with Alberta Environment analyzing measured ambient concentrations of PM and ozone to determine the appropriate action levels to be assigned to different areas in the province. In 2005, if the analysis proceeds as planned, activities under the various action levels will commence. Those areas that are found to be in exceedance of the CWS or at ambient concentrations corresponding to the management plan action level will have stakeholders being asked to come together to develop plans for managing PM and ozone to levels below the CWS and with a view to continuous improvement and keeping clean areas clean. By 2007, areas that were required to develop a plan will begin implementing actions and there will be an opportunity to review the PM and Ozone Management Framework.

The team also developed a number of recommendations related to further scientific research and analysis to address information gaps and uncertainties related to PM and ozone in Alberta. Many of these recommendations require a report to the CASA board in 2005, which will enable stakeholders to stay current with the latest findings. These recommendations are listed below.

There are also a number of activities taking place at the national level, beginning with a recommendation on a coarse fraction standard for PM (PM_{10}) in fall 2003, the issuance of national guidance on Keeping Clean Areas Clean and Continuous Improvement in late 2003, and completion of a national ambient monitoring protocol. In 2005 the first set of Joint Initial Actions will be wrapped up, and there will be a scientific assessment and review of the CWS to reduce information gaps and uncertainties. The first five-year comprehensive report on activities and progress is due from jurisdictions in 2006. Jurisdictions have committed to achieve the CWS in 2010.

Looking ahead, Alberta will have its own unique opportunities and challenges in implementing the PM and Ozone Management Framework and working towards keeping clean areas clean and continuous improvement. Alberta's air quality is already good in most areas, although strong economic growth and the changing face of industry and other emitting sources will have to be monitored carefully into the future to ensure that air quality is maintained and improved where possible. Urban centers like Calgary and Edmonton, and industry-intensive areas like Fort Saskatchewan and the Fort McMurray oilsands region will pose the greatest challenges because of the predicted growth of emissions in these areas.

To address the considerable diversity of sources, air quality trends, and growth patterns across the province, the PM and Ozone Management Framework has been designed to bring stakeholders together in a manner that enables them to identify optimal strategies and management approaches for their air quality situation. Balance, flexibility, transparency, accountability and cost-effectiveness are cornerstones of the framework. The team is confident that it has developed a robust management framework that will help ensure Albertans continue to maintain and improve air quality well into the future.

6.1 Additional Recommendations

10. Science and Analysis Recommendations

a) It is recommended that Environment Canada, working together with Alberta Environment, model ozone and PM concentrations in Alberta for a range of future emission scenarios. A report on this work to be delivered to the CASA board in 2005.

b) It is recommended that Environment Canada, working together with Alberta Environment, use regional photochemical models to investigate which geographic regions and emitting sectors are contributing to ozone and secondary PM in Alberta. A report on this work to be delivered to the CASA board in 2005.

c) It is recommended that Environment Canada conduct research to investigate the vertical structure of ozone in the atmosphere to better determine the contribution of stratospheric intrusion and tropospheric mixing to ground level ozone. A report on this work to be delivered to the CASA board in 2005.

d) It is recommended that the Operations Steering Committee be asked to investigate the usefulness of and the need for ambient PAN (peroxyacetyl nitrate) and additional ambient VOC monitoring in Alberta as part of its review of the ambient monitoring network.

e) It is recommended that Alberta Environment take the lead in conducting scenario analyses for the provincial and regional Criteria Air Contaminant (CAC) emission forecasts. These analyses could include, among other factors: the potential impact of new performance standards for the electric power sector, the pace and magnitude of oil sands development projects, the potential effects of additional bitumen upgraders, the potential effects of climate change policy initiatives affecting greenhouse gas (GHG) and CAC emissions, the potential effect of new standards for on- and off-road vehicles, and changes to economic projections. A report on this work to be delivered to the CASA board in 2005.

f) It is recommended that the 1999 recommendation of the Alberta Multi-stakeholder Group for Particulate Matter and Ozone (MSG) regarding source apportionment be renewed and continued, whereby Alberta Environment takes the lead in:

   i) Conducting further research on source apportionment to ensure that:
      - source profiles are accurate, reliable, comprehensive and appropriate for Alberta emitters,
      - data are gathered on additional ambient species and the way in which they fluctuate over time, and
      - models most appropriate to the Alberta situation are used and that expertise is available to correctly interpret the results.

   ii) Collaborating with other jurisdictions to improve methodologies for source apportionment modelling, data collection, study design and interpretation of results.

11. Dissolution of Team

It is recommended that the PM and Ozone Project Team be dissolved upon the CASA board's acceptance and approval of the team's final report.

Glossary of Acronyms and Abbreviations

AEMIT	Acidifying Emissions Management Implementation Team
AENV	Alberta Environment
BAEFT	Best Available Economically Feasible Technology
CAC	Criteria Air Contaminants
CASA	Clean Air Strategic Alliance
CCME	Canadian Council of Ministers of the Environment
CEMA	Cumulative Environmental Management Association
CEPA	Canadian Environmental Protection Act
CMA	Census Metropolitan Area
CWS	Canada-Wide Standard
EPA	Environmental Protection Agency
EPEA	Environmental Protection and Enhancement Act
EPT	Electricity Project Team
EUB	Alberta Energy and Utilities Board
GDAD	Guidance Document on Achievement Determination
JAICC	Joint Action Implementation Coordinating Committee
JIA	Joint Initial Actions
MERAF	Multi-Pollutant Emission Reduction Analysis Foundation
MERS	Multi-Pollutant Emissions Strategy
MSG	Multi-Stakeholder Group for PM and Ozone
NH_3	Ammonia
NO_x	Nitrogen Oxides
OSC	Operations Steering Committee
PM	Particulate Matter
ppb	parts per billion
SO_2	Sulphur Dioxide
TSP	Total Suspended Particulates
VOC (s)	Volatile Organic Compounds
$\mu g/m^3$	micrograms per cubic metre (a microgram is one-millionth of a gram)
µm	micrometer (one-millionth of a metre)

Glossary of Terms

Action Levels:
A level of the PM and ozone management framework, eg. baseline monitoring and data gathering, surveillance actions, management plan or mandatory plan to reduce below the CWS (see Figure 9).

Action Triggers:
The ambient concentration that triggers an area into a specified action level under the management framework (see Figure 9).

Airshed Zones:
Refers to areas of the province that have established a formal management structure for monitoring and management of an airshed. A list of existing airshed zones can be found in 3.3.4 or Figure 11.

Annual Analysis:
An annual analysis of ambient PM and ozone data collected from Alberta's ambient monitoring network, performed according to provisions in the *Guidance Document for the Management of Fine Particulate Matter and Ozone in Alberta* and used to assign action levels across the province. See 3.4.3.

Background Sources:
PM or ozone resulting from anthropogenic or natural emissions outside of North America and natural sources within North America.

Natural Sources:
Naturally occurring local or regional PM and/or ozone.

Transboundary Sources:
Transboundary flow of PM and/or ozone or their precursors from the U.S. or from another province or territory.

Trigger Process:
See annual analysis.

Appendix A

Canada Wide Standards for Particulate Matter and Ozone

Canadian Council of Ministers of the Environment

CANADA-WIDE STANDARDS

For

PARTICULATE MATTER (PM)
and
OZONE

CANADA-WIDE STANDARDS for PARTICULATE MATTER (PM) and OZONE

These Canada-Wide Standards (CWSs) for particulate matter (PM) and ozone are established pursuant to the 1998 Canada-wide Accord on Environmental Harmonization of the Canadian Council of Ministers of the Environment (CCME) and its Canada-wide Environmental Standards Sub-Agreement.

RATIONALE

Significant adverse effects have been demonstrated for the air pollutants PM and ozone on human health and the environment.

DEFINITIONS

PM10 refers to airborne particles that are 10 microns or less in diameter

$PM_{2.5}$ refers to airborne particles that are 2.5 microns or less in diameter

PM10-2.5 refers to airborne particles in the size range 2.5 to 10 microns in diameter, known as the coarse fraction of PM10

Ozone refers to an oxygen compound (O3) occurring in the form of a gas in the atmosphere at ground level

CONTEXT

The long-term air quality management goal for PM and ozone is to minimize the risks of these pollutants to human health and the environment. However, recent scientific evidence indicates that there is no apparent lower threshold for the effects of these two pollutants on human health.

These CWSs for PM and ozone are an important step towards the long-term goal of minimizing the risks they impose to human health and the environment. They represent a balance between the desire to achieve the best health and environmental protection possible in the relative near-term and the feasibility and costs of reducing the pollutant emissions that contribute to elevated levels of PM and ozone in ambient air. As such, while they will significantly reduce the effect of PM and ozone on human health and the environment, they may not be fully protective and may need to be re-visited at some future date. There are also additional benefits to reducing and maintaining ambient levels below the CWSs where possible.

Uncertainty and gaps exist and new data/information that becomes available will be acknowledged. However, Ministers are confident that taking action now to reduce PM and ozone levels will improve ambient air quality and result in benefits to the environment and to human health. Jurisdictions will have considerable flexibility in the detailed design of implementation plans and sectoral emission reduction strategies over the next few years, and an opportunity to reduce information gaps and uncertainties.

In jurisdictions highly impacted by transboundary air pollution from the United States, achieving the CWSs will be strongly dependent on reductions of this transboundary contribution. Also, high background levels of PM and ozone that may occur through natural events (such as forest fires, natural formation and stratospheric intrusion) will need to be considered in assessing achievement of the CWSs.

The CWS for PM established here is for the fraction of PM recognized as having the greatest effect on human health, the fine fraction or $PM_{2.5}$. The $PM_{2.5}$ CWS has been established for the interim period prior to the planned review of the standard to be completed by 2005, which will incorporate advancements in scientific, technical and economic information and analysis. The $PM_{2.5}$ CWS will ensure that PM management efforts are focused on the sources of PM and PM precursor emissions that provide the greatest health benefit. It is acknowledged that health effects are also associated with the coarser fraction of PM, or PM10-2.5, and that actions to reduce the concentrations of these coarser fractions in the atmosphere are needed. Reductions in ambient PM10 levels will occur as ancillary benefits from reducing $PM_{2.5}$. In addition, some jurisdictions currently have ambient air quality objectives, guidelines or standards related to the coarser fraction of PM. These should continue to be used to design air quality management programs for PM10. CWSs related to the coarser fraction may be a useful addition at a later date.

There are other aspects that should be considered in any future update of these PM and ozone CWSs. Forms of the PM and ozone CWSs other than the relatively short term exposure forms established here, such as seasonal or annual average targets, may also be useful additions at a later date. Since the current CWSs are related primarily to protection of human health, their adequacy for the protection of vegetation, visibility impairment, material damage or other adverse effects may need to be assessed.

PART 1:

NUMERICAL TARGETS and TIMEFRAMES

The CWS and related provisions for PM are:

A CWS for $PM_{2.5}$ of 30 µg/m3, 24 hour averaging time, by year 2010

Achievement to be based on the 98th percentile ambient measurement annually, averaged over 3 consecutive years

The CWS and related provisions for ozone are:

A CWS of 65 ppb, 8-hour averaging time, by 2010

Achievement to be based on the 4th highest measurement annually, averaged over 3 consecutive years

Specific provisions related to transboundary flow of ozone are contained in Section B.3.5, Accounting for Transboundary Flow, of Annex B.

PART 2:

IMPLEMENTATION

Jurisdictions will undertake the following implementation actions:

Development and implementation of jurisdictional implementation plans to achieve the CWSs.

Implementation of continuous improvement, pollution prevention, and keeping-clean-areas-clean programs in areas with ambient concentrations below the CWS levels, in accordance with the guidance provided in Annex A.

In areas where jurisdictional implementation plans need to be augmented by reductions in transboundary flow of pollution from the United States or from other countries to achieve the CWSs, the federal government, with support from the provinces and territories, will aggressively pursue further reductions in the transboundary flow into Canada of PM and ozone and their precursor pollutants.

Establishment and maintenance of the PM and ozone monitoring networks needed to characterize the PM and ozone air quality problems across Canada, design management programs, and track progress.

REVIEW

The CWSs will be reviewed as follows:

(a) by the end of year 2005, complete additional scientific, technical and economic analysis to reduce information gaps and uncertainties and revise or supplement the PM and ozone CWSs as appropriate for year 2015; and report to Ministers in 2003 on the findings of the PM and ozone environmental and health science, including a recommendation on a PM10-2.5 CWS.

(b) by the end of year 2010, assess the need, and if appropriate, revise the CWSs for PM and ozone for target years beyond 2015.

REPORTING on PROGRESS

Progress towards meeting the above provisions will be reported as follows:

(a) to the respective publics of each jurisdiction on a regular basis, the timing and scope of reporting to be determined by each jurisdiction

(b) to Ministers and the public, with comprehensive reports at five year intervals beginning in year 2006 and reports on achievement and maintenance of the CWSs annually beginning in 2011, in accordance with guidance provided in Annex B

ADMINISTRATION

Jurisdictions will review and renew Part 2 and Annexes A and B five years from coming into effect.

Any party may withdraw from these Canada-Wide Standards upon three month's notice.

These Canada-Wide Standards come into effect for each jurisdiction on the date of signature by the jurisdiction.

Canada-wide Standards for Particulate Matter (PM) and Ozone

ANNEX A

GUIDANCE FOR CONTINUOUS IMPROVEMENT AND KEEPING-CLEAN-AREAS-CLEAN PROGRAMS FOR PM AND OZONE

In most areas of Canada, ambient levels are lower than the CWSs for PM and ozone established here. Ministers have agreed to include in the CWSs a provision on environmental management in areas where ambient air quality is "better" than the levels set out in the standards.

(a) Continuous Improvement

There are numerous locations across Canada that have ambient levels of PM and/or ozone below the CWS levels but still above the levels associated with observable health effects. There is a need to ensure that the public recognizes that the CWS levels are only a first step to subsequent reductions towards the lowest observable effects levels. It would be wrong to convey the impression that no action is required in these areas or that it would be acceptable to allow pollutant levels to rise to the CWS levels. Jurisdictions should take remedial and preventative actions to reduce emissions from anthropogenic sources in these areas to the extent practicable.

(b) Keeping Clean Areas Clean

Jurisdictions recognize that polluting "up to a limit" is not acceptable and that the best strategy to avoid future problems is keeping clean areas clean. Jurisdictions should work with their stakeholders and the public to establish programs that apply pollution prevention and best management practices, by, for example:

- developing and implementing strategies consistent with the CCME commitment to pollution prevention
- ensuring that new facilities and activities incorporate the best available economically feasible technologies to reduce PM and ozone levels
- requiring that upgrades carried out in the course of normal capital stock turnover incorporate the best available economically feasible technologies to reduce PM and ozone levels
- reviewing new activities that could contribute to an increase in PM and ozone levels with stakeholders and the public in terms of their social, economic and environmental merits

Canada-wide Standards for Particulate Matter (PM) and Ozone

ANNEX B

REPORTING PROTOCOL FOR CANADA-WIDE STANDARDS FOR PARTICULATE AND OZONE

B.1 Introduction

It is intended under the Harmonization Accord and its Standards Sub-Agreement that all jurisdictions will report on a regular basis to their publics and to Ministers of the Canadian Council of Ministers of the Environment on their progress towards achieving the CWSs for particulate matter (PM) and ozone.

This reporting protocol is intended to provide guidance for reporting on all provisions of the CWSs for PM and ozone. Its provisions are designed to help ensure consistency and comparability in the reporting by jurisdictions, and better understanding by the public on how jurisdictions plan to track and report on progress.

B.2 Frequency, Timing and Scope of Reporting

There will be two types of reporting by jurisdictions:

1) Annual Reporting on Achievement of the CWSs

These reports will be completed by each jurisdiction in a standardized "report card" format, the format to be developed and agreed to by all jurisdictions, and provided to Ministers and the public by 30 September of each year, beginning in 2011. These annual reports will be limited in scope containing mainly summary information on levels and trends in ambient PM and ozone concentrations in communities within each jurisdiction, identifying communities where ambient levels are exceeding or approaching the CWS levels. They may also note the reason for any significant change in ambient levels or trends from previous years.

2) Five-Year Reports

These reports will be completed for the year 2005 and for every fifth year thereafter and provided to Ministers and the public by 30 September of the following year. The report for 2005 will be an interim report on progress towards meeting the CWSs, and subsequent reports will focus on achievement of the CWSs applicable at that time. Five-year reports will be comprehensive, assessing progress on all provisions of the CWSs. The format and general content will be determined and agreed to by all jurisdictions 2 years in advance of the reporting year. They will include, assessment of ambient levels and trends in communities within each jurisdiction, identifying communities where ambient levels are exceeding or approaching the CWS levels,

information on PM and ozone precursor emissions and trends, comprehensive descriptions of smog management efforts, progress with implementation of measures in implementation plans, actions to ensure continuous improvement in areas with ambient levels below the CWS levels but within the effects range, actions to ensure that clean areas are kept clean, actions on co-operation in monitoring and science, and any other provision of the CWSs. The federal government will include in its reports an assessment of trends in U.S. emissions and ambient levels in border regions affecting ambient PM and ozone levels in Canada, and of the effectiveness of U.S. control programs in reducing those emissions and of Canadian efforts to secure such reductions.

The CCME will co-ordinate the collation of the information from the various jurisdictional reports in (1) and (2) above into a national overview report for the public, CCME Ministers and international audiences.

In addition to the reporting in (1) and (2) above, individual jurisdictions may report to their publics on a more frequent basis. The scope and timing of any such reporting would be determined by the jurisdiction.

B.3 Reporting on Achievement of the CWSs

B.3.1 Guidance Document on Achievement Determination

Jurisdictions will co-operate in the preparation and periodic update as required, of a Guidance Document on Achievement Determination for the PM and ozone CWSs. This document will elaborate on information, methodologies, criteria and procedures related to each of the basic elements of achievement reporting identified below.

B.3.2 Communities for CWS Achievement Determination

Jurisdictions will use a community-oriented approach for reporting on achievement of the PM and ozone CWSs. As a basic requirement, jurisdictions will report on CWS achievement for population centres over 100,000. As well, jurisdictions may also report on CWS achievement for communities with population less than 100,000 based on considerations such as regional population density, proximity to sources, local air quality, etc.

To provide consistency and comparability in reporting across jurisdictions, the geographic units for grouping of municipalities (Census Metropolitan Areas (CMAs)/Census Agglomerations (CAs)/Census Subdivisions) established by Statistics Canada will be used as guidance for community identification. Larger CMAs may be subdivided into smaller sub-areas to better capture geographic variation within the CMA. [refer to the Guidance Document for a listing of CMAs and CAs in Canada and suggested criteria for subdividing larger CMAs].

Canada-wide Standards for Particulate Matter (PM) and Ozone

B.3.3 Monitoring Sites for Determining Achievement

CWS achievement will be based on community-oriented monitoring sites i.e. sites located where people live, work and play rather than at the expected maximum impact point for specific emission sources. Rural (or background) and source specific sites will not be included for CWS achievement determination. *[See the **Guidance Document** for guidance on selection of community-oriented monitoring sites]*.

B.3.4 Calculation Methodologies for Determining Achievement

It is important that common statistical parameters be used by all jurisdictions in reporting on CWS achievement so that there will be consistency and comparability in assessing progress in achieving the CWSs. These parameters stem initially from the basic form and achievement statistics specified for the CWSs. That is:

For $PM_{2.5}$***:***

24-hour averaging time, achievement to be based on 98th percentile annual value, averaged over three consecutive years

For Ozone:

8-hour averaging time, achievement to be based on 4th highest annual measurement, averaged over three consecutive years

For PM CWS achievement determination, measurements from each multiple continuous (or daily) population-oriented monitoring station within a CMA/CA or CMA reporting subarea will be spatially averaged for each year (up to three) for which measurements are available.

For ozone CWS achievement determination, the monitoring station with the highest average ozone concentration within a CMA/CA or CMA reporting sub-area will be used.

*[See the **Guidance Document** for methodology for determination of 98th percentile annual levels for* $PM_{2.5}$ *and 4th highest annual levels for ozone from monitors that measure at various frequencies or for which there are less than 365 measurements per year, and methodologies for determining spatial averages]*

B.3.5 Accounting for Transboundary Pollution

Communities for which jurisdictions demonstrate (i) that continued exceedance of the CWS levels is primarily due to transboundary flow of PM and ozone or their precursor pollutants from the U.S. or from another province/territory, and (ii) that "best efforts" have been made to reduce contributions to the excess levels from pollution sources within the jurisdiction, will be identified in reporting as "transboundary influenced communities" that are unable to reach attainment of the CWSs until further reduction in

transboundary air pollution flow occurs. Demonstration of transboundary flow influence will be a shared responsibility of the federal government and the affected province/territory, and demonstration of best efforts will include measures in both provincial/territorial and federal implementation plans. [See the Guidance Document for methodologies for demonstrating the influence of transboundary and criteria on what would constitute "best efforts"]

For the province of Ontario, a 45% reduction in NOx and VOC emissions from 1990 levels by 2010 or earlier, subject to successful negotiations this fall with the U.S. for equivalent reductions, will be considered the province's appropriate level of effort towards achieving the ozone CWS. Any remaining ambient ozone levels above the CWS in Ontario will be considered attributable to the transboundary flow from the U.S. of ozone and its precursor pollutants.

B.3.6 Accounting for Background and Natural Events

Communities for which jurisdictions demonstrate (i) that continued exceedance of the CWS levels is primarily due to naturally occurring local or regional PM and/or ozone and (ii) that "best efforts" have been made to reduce contributions to the excess levels from pollution sources within the jurisdiction, will be identified in reporting as "communities influenced by background or natural events". Demonstration of background or natural influence is the responsibility of the affected jurisdiction, and demonstration of best efforts will include measures in both provincial/territorial and federal implementation plans. *[See the **Guidance Document** for methodologies for demonstrating background or natural influence and criteria on what would constitute "best efforts"]*

B.3.7 Maintenance and Provision of Monitoring Information

It is important to have up-to-date PM and ozone monitoring data. Jurisdictions will maintain their own data on ambient measurements of $PM_{2.5}$, PM10 and ozone and make it publicly accessible. Accessibility may be accomplished by posting on Internet Sites, which would be linked to the CCME Website.

Jurisdictions will also co-operate in establishing and maintaining a Monitoring Protocol, which will ensure the coordination of monitoring data. This will allow for better coordination of monitoring program design and operation, ambient air quality trends analyses, regional source-receptor assessments, transboundary air quality analyses and implementation plan design.

Appendix B
Project Team Terms of Reference

PM and Ozone Project Team **Terms of Reference**
Approved by CASA Board, November 23, 2000

Preamble

The Multi-stakeholder Group (MSG) for PM and Ozone was established by CASA in 1998 to provide input to Alberta Environment on the development of a CWS for particulate matter and ozone. In its final report, the MSG provided advice on the level, form, and application of the CWS, and recommended a plan of action for pursuing Alberta guidelines and standards. The project team will develop an implementation plan that takes into account the recommendations from the final report of the MSG.

Considerations

The project team will take into consideration the following:

1. The need for balanced and appropriate representation of stakeholder interests.
2. Other related air quality initiatives occurring in Alberta and other jurisdictions

Goal

To reach consensus on recommendations for an Alberta implementation plan for achieving the provisions of the Canada Wide Standard for Particulate Matter and Ozone.

Objectives

1. Recommend strategies to achieve the CWS for Particulate Matter and Ozone.
2. Recommend key components of the strategies
3. Achieve stakeholder support for the implementation plan.

Key Task Areas

1. Identify and assess the strategic components of Alberta's implementation plan, including resources needed to implement.
2. Follow up on recommendations from the final report of the MSG for PM and Ozone.
3. Update and gather the best available data on ozone and PM.
4. Identify appropriate mechanisms for tracking and reporting progress in meeting the Canada Wide Standards.
5. Communicate with stakeholders and the public.
6. Develop final report and recommendations for implementation plan.

Timelines

It is anticipated that the project team will deliver its final report and recommendations in June 2002.

Sectors Represented on the Project Team

Alberta Environment
Alberta Health and Wellness
Alberta Infrastructure
Alberta Lung Association
Alfalfa dehydrators
Alberta Resource Development
Canadian Chemical Producers Association
Canadian Petroleum Products Institute
Urban Municipalities
Electrical Utilities
Environment Canada
Fertilizer industry
Industrial minerals
Alberta Forest Products Association
Parkland Airshed Management Zone
Prairie Acid Rain Coalition
Pulp and paper
South Peace Environmental Association
Toxic Watch Society
TransCanada Transmission
Wood Buffalo Airshed Zone

Proposed Project Team Tasks

a) Review recommendations from the MSG for PM and Ozone and determine what needs to be addressed by the project team.

b) Develop work plan and secure resources to carry out work plan.

c) Evaluate information on source sectors that contribute to ambient particulate matter and ozone within Alberta.

d) Evaluate information on regional levels of particulate matter and ozone in Alberta.

e) Evaluate information on human health and ecosystem exposure in Alberta

f) Identify and assess emission management options, by region and provincially, and by source sectors.

g) Develop criteria for selecting management options.

h) Identify and assess Pollution Prevention, Continuous Improvement and Keeping Clean Areas Clean approaches.

i) Select management options.

j) Identify ways to communicate with the public.

k) Identify information needs for future reviews of the Canada Wide Standards, and make recommendations to fill the information gaps.

l) Recommend an implementation plan, including resources needed to implement the CWS in Alberta.

m) Liaise with relevant stakeholders; including CASA project teams, airshed zones and other stakeholders involved in particulate matter and ozone management.

n) Report to the CASA board.

Appendix C

List of Project Team Members

Name	Organization
Dana Atwell	Shell Canada/CPPI
Sandra Barnett	TransCanada
Ron Braun	LaFarge Canada Inc.*
Alan Brownlee	City of Edmonton
Claude Chamberland	Shell Canada/CPPI
Shane Chetner	Alberta Agriculture, Food and Rural Development
Peter Darbyshire	Graymont Western Canada
Keith Denman	Clean Air Strategic Alliance
Jim Dixon	Nova Chemicals
Linda Duncan	LWEPA
Labib El-Ali	Alberta Environment
Randy Ellis	ARHCA
Gerry Ertel	Shell Canada/CPPI
Shannon Flint	Alberta Environment
Rod Frith	Environment Canada
Long Fu	Alberta Environment
Geoff Granville	Shell Canada Limited/CAPP
Dennis Herod	Environment Canada
Chris Kaiser	Graymont Western Canada
Markus Kellerhals	Environment Canada
Wayne Kenefick	Graymont Western Canada
Myles Kitagawa	Toxics Watch Society of Alberta
Brent Korobanik	Inland Cement Limited
Martha Kostuch	Bert Riggall Environmental Foundation & PARC
Tim Lambert	Canadian Public Health Association
Franch Letchford	Environment Canada
Ingrid Liepa	Clean Air Strategic Alliance
Chow-Seng Liu	Alberta Environment
Allan Lowe	Alberta Roadbuilders & Heavy Construction Assoc.
Paije McGrath	TransAlta Corporation
Christine Macken	Clean Air Strategic Alliance
Alex Mackenzie	Albeta Health and Wellness
Domenic Mignacca	Environment Canada
Suzanne Mills	Alberta Environment

List of Project Team Members cont'd

Name	Organization
George Murphy	Alberta Environment
Carmelita Olivotto	Environment Canada
Henry Pirker	South Peace Environmental Association
Ansar Qureshi	Alberta Health and Wellness
Dave Reynolds	City of Calgary*
Kim Sanderson	Consultant
Doug Sasaki	Alberta Agriculture Food and Rural Development
Lisa Schaldemose	Wood Buffalo Environmental Association
Lawrence Schmidt	Alberta Transportation
Bob Scotten	West Central Air Society
Neil Shelly	Alberta Forest Products
Rob Shymanski	Alberta Transportation
John Squarek	Canadian Association of Petroleum Producers*
Dennis Stefani	Calgary Health Region
Tara Tapics	Alberta Environment
Robin Telasky	Consultant
Darcy Walberg	Agrium
Kevin Warren	AMAROK Consulting
Brian Young	NOVA Chemicals*

*Denotes corresponding member

Appendix D

Documents and Reports Prepared for the Team

1. **PM and Ozone Report: An update to Ground Level Ozone in Alberta (1998) and Ambient Particulate Matter in Alberta (1999),** prepared by Alberta Environment, November 2002.

2. **Forecast of Common Air Contaminants in Alberta (1995-2020),** prepared by ChemInfo Services Inc., April 2002.

3. **Alberta Demonstration Project for the CASA PM and Ozone Project Team,** prepared by Levelton Engineering Ltd, June 2003.