

**PRINCE GEORGE AIR QUALITY
MANAGEMENT PLAN
-PHASE ONE-**

Final Draft

Prepared by
Prince George Airshed Technical Management Committee

December 2, 1998

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PM₁₀ Levels with Various Canadian Centers

SUMMARY OF MANAGEMENT RECOMMENDATIONS

This Air Quality Management Plan has been prepared by the Prince George Airshed Technical Management Committee based on input gathered from the public, industry, environmental groups and health professionals. The Management Plan is the first phase of an ongoing process of reducing or preventing increases in emission sources, and monitoring air quality. Subsequent phases will be based on recommendations arising from Phase One actions.

1.2 AIR QUALITY MANAGEMENT PRINCIPLES AND OBJECTIVE

Preparation and implementation of the Management Plan should be guided by the following principles:

- 1. Acceptable air quality is everyone's right; protecting air quality is everyone's responsibility.**
- 2. Acceptable air quality is an important contributor to a healthy community and a sustainable economy.**
- 3. Achieving acceptable air quality requires that local, provincial and federal government agencies work together. Public and industry involvement is also necessary.**

The objective of the Management Plan is:

To achieve and maintain acceptable air quality by reducing the emission of those air contaminants that are causing unacceptable air quality, and by preventing future air quality problems from developing.

To achieve this objective most effectively, the management agencies must:

- 1. Set priorities for emission reductions;**
- 2. Take a staged approach to implementing the management actions;**
- 3. Monitor the effectiveness of the plan and research future needs;**
- 4. Anticipate and take steps to prevent new air quality problems from developing;**
- 5. Find funding to carry out the plan; and**

6. Obtain input from the public, industry, health professionals and environmental groups.

2.0 PHASE ONE MANAGEMENT RECOMMENDATIONS

2.1 FINE PARTICULATE MANAGEMENT ACTIONS

Beehive Burners

1. Burning be eliminated at the following beehive burners according to the schedule set by the provincial cabinet.
 - Northwood Rustad Mill burner
 - Canfor Netherlands Overseas Mill burner
 - Carrier Lumber Mill burner

Dust from Street Sanding, Unpaved Areas and Other Sources

2. The City expand its program to use winter abrasives that generate less fine particulate matter;
3. The City do more frequent sweeping of municipal streets and additional dust control on unpaved high traffic routes, to further reduce dust levels;
4. MELP request the Ministry of Transportation and Highways to implement similar measures on provincial highways within the City Bowl;
5. The management agencies request the Ministry of Forests to set a schedule for hard surfacing the portion of the Willow Cale Forest Road within the Fraser River floodplain;
6. The management agencies request B.C. Rail and C.N. Rail to set schedules for paving, or otherwise effectively controlling dust, on any remaining unpaved traffic areas within the BCR and CNR Industrial Sites;
7. The City require paving of all traffic areas permitted for new industrial and commercial developments; and
8. The City establish guidelines and standards, for all paved commercial and public parking lots, to mitigate the release of fine dust from sanding and sweeping, and from storage and disposal of the sweepings.

Pulpmill Sources

- 9. Further reductions in pulpmill particulate emissions be done according to the plans provided by the operators, as follows:**
 - Canfor upgrade of Intercon power boiler by the end of 1998; and**
 - Northwood reduction of pulpmill particulate emissions from sources that will be chosen following a modelling of dispersion of PM₁₀ from various pulpmill sources.**

Backyard Open Burning

- 9. The City ban all open burning on properties of less than 5 acres, and on all properties in the Bowl; and**
- 10. The Regional District continue to advise residents of the hazards of open burning, and the availability of facilities to reuse, compost or properly dispose of burnable materials at the Foothills Boulevard Regional Landfill.**

Wood Burning Appliances

- 12. The City promote minimization of the use of wood burning appliances in the City;**
- 13. The City prohibit the burning of wood in residential neighbourhoods during PM₁₀ air quality advisories, except where wood is the primary heating source; and**
- 14. The City and Regional District require that any new or replacement wood burning appliance meets the standards in the B.C. *Solid Fuel Burning Domestic Appliance Regulation*.**

2.2 TOTAL REDUCED SULPHUR (TRS) MANAGEMENT ACTIONS

- 15. MELP require the owners of the highest priority TRS sources to prepare pollution prevention plans for additional emission reductions, to achieve full compliance with the Level B ambient objective, and to further reduce the level of exceedances of the Level A objective.**

2.3 COMMUNITY AND REGIONAL PLANNING

16. **Air quality considerations be incorporated into the Prince George Official Community Plan, including transportation efficiency and alternative transportation, and into the Regional District Community Plans during the next plan reviews;**
17. **The City and Regional District identify new areas for heavy industrial development, taking potential air quality effects into account; and**
18. **The City refer all proposals for significant new emissions to MELP for review.**

2.4 PREVENTION OF AIR QUALITY PROBLEMS

19. **MELP evaluate the acceptability of new sources of air contaminants, especially PM₁₀, TRS, SO₂ and NO_x, based on use of the “lowest achievable discharge rate” (See Glossary.); and**
20. **The City promote reductions in vehicle emissions and request the Insurance Corporation of B.C. to conduct a mobile emission testing program.**

2.5 MANAGEMENT OF POOR AIR QUALITY EPISODES

21. **MELP require owners of the most significant fine particulate sources to provide plans for temporarily reducing emissions during air quality advisories (See Glossary.); and**
22. **The feasibility of predicting fine particulate episodes be reviewed by the ATM Committee, and any feasible methods be implemented as soon as available.**

2.6 MONITORING AND RESEARCH

23. That the current air monitoring program be continued until an evaluation of effectiveness and participation is completed in 1998;
24. A health study steering group be established to determine the need for, and to design, any required air quality effects study, and the study be started no later than the year 2000; and
25. Research be initiated, with particular emphasis on determining and controlling the effects of fine particulates (PM₁₀ and PM_{2.5}), to consider the following:
 - monitoring of the contribution to fine particulate levels of those secondary particulates that originate from SO₂ and NO_x emissions;
 - determining the effect of meteorological factors on ambient fine particulate trends;
 - determining the contribution of individual fine particulate sources to ambient levels; and
 - defining “permissible exceedance levels” for PM₁₀ and other priority ambient air quality objectives. (See Glossary.)

3.0 RESPONSIBILITIES OF THE MANAGEMENT AGENCIES

26. Prior to finalizing the Management Plan, the management agencies reach an agreement on responsibilities for consultation and coordination of permitting, community planning, and other administrative and regulatory actions that may affect air quality; and
27. The management agencies establish an Airshed Management Steering Committee to oversee the implementation of the Management Plan Actions and to establish subgroups as needed to manage specific tasks.

4.0 FUNDING NEEDS AND COST SHARING

- 28. Sharing of current and future monitoring costs be based on emission contributions to the airshed, and other factors contributing to unacceptable air quality.**

Comments and Information

The Airshed Technical Management Committee welcomes written comments on this plan. Submissions should be sent to:

**Prince George Airshed Technical Management Committee
c/o Dave Sutherland
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Further information on air quality management and additional copies of this plan can be obtained by calling Dave Sutherland at (250) 565-6465 or Dennis Fudge at (250) 565-4210.

1.0 BACKGROUND

1.1 INTRODUCTION

In December 1995 a working level agreement was reached between the City of Prince George, the Regional District of Fraser-Fort George, and the Ministry of Environment, Lands and Parks (“the management agencies”) to coordinate air quality management in the Prince George Airshed. The Prince George Airshed Technical Management Committee (ATM Committee) was then formed to begin the task of preparing a management plan document.

The ATM Committee consists of members from:

- City of Prince George Public Works and Development Services Departments (the City)
- Regional District of Fraser-Fort George Environmental and Development Services (the Regional District)
- Ministry of Environment, Lands and Parks Environmental Section (MELP)
- Northern Interior Health Unit
- University of Northern British Columbia
- College of New Caledonia

This process was initiated because management of air contaminants requires coordination of government actions and the active involvement of the public. Since the objective is to achieve and maintain acceptable air quality in a community airshed, community priorities needed to take precedence over provincial priorities. Cooperation and coordination of management activities between all management agencies becomes necessary because:

- priority air contaminants originate from many sources, not just the major industrial sources;
- management requires coordination so that the most effective mix of provincial regulatory measures, City and Regional District community planning and regulation, and education and voluntary actions is applied to reducing emissions; and
- a broader range of expertise and funding sources is available to support the necessary management actions, included monitoring and research.

In the last quarter of 1996, City Council and the Regional District Board reviewed a Background Report that identified ambient fine particulate matter

(PM₁₀) and total reduced sulphur (TRS) air quality objectives as being consistently exceeded each year in residential areas of the airshed. The report also identified that, while sulphur dioxide (SO₂) objectives are not exceeded frequently (maximum of 13 hours per year), their average annual levels have increased substantially since 1993 (MELP 1996 Annual Data Report). Finally the report showed that nitrogen dioxide and ozone levels are still within critical ambient objectives.

Episodes of poor air quality are mainly caused by the trapping of air in the valley during temperature inversions and calm wind periods, and account for most of the exceedances of air quality objectives.

TRS levels have declined substantially in response to reductions in pulpmill emissions, but the exceedance of the objectives is an ongoing odour source. No similar pattern of decline has occurred with PM₁₀ levels, although some emission reductions have been achieved in the past five years.

Exceedances of the PM₁₀ objective provide significantly increased risk of health effects, ranging from death to subtle changes in lung function. The importance of PM₁₀, referred to here as “fine particulate” which includes the finer PM_{2.5} fraction, as a contributor to respiratory health effects makes this contaminant the highest management priority in this airshed. The continuing high degree of exceedance of the ambient PM₁₀ objective points to the need for action to significantly reduce emission sources.

Following a review of the Background Report, the management agencies authorized community consultations on the air quality plan. Open houses and stakeholder workshops were held in February 1997, to obtain feedback from the public, industry and environmental and health groups. As a follow-up, a formal public opinion survey was also conducted for the Airshed Committee to gather input on air quality management priorities.

The public must be involved in air quality management because actions by individuals, sometimes involving lifestyle choices, are required to achieve air quality management objectives. Public involvement in preparation of the Plan is critical to its success to encourage participation in executing the management actions.

A glossary of air quality management terms and a map of the core of the airshed are attached as Appendices A and B.

1.2 PRIORITY OF THE PRINCE GEORGE AIRSHED

Prince George ranks among the top B.C. community airsheds for ambient PM₁₀ levels, with annual averages from the Plaza and Van Bien areas in the Bowl ranking only behind Merritt, Golden, Vernon and Williams Lake in 1996 (Figure 1). The Lakewood monitoring site, in the Bowl, and the College Heights site rank in the lower half of those B.C. communities that have been monitored.

The Van Bien and Plaza PM₁₀ levels are also high relative to 14 other Canadian airsheds (Table 2 and Figure 2). The overall averages for 1992-1996 at these Prince George locations ranked only behind Hamilton, Windsor and Toronto, Ontario.

Most importantly, the Level B ambient PM₁₀ objective has been consistently exceeded at the Plaza and Van Bien sites, and at the Lakewood site in most years since monitoring was started in 1990 (MELP, 1996). These comparisons to the ambient objective, and to other B.C. and Canadian locations, indicate the importance of this airshed for continued reduction of PM₁₀ emissions.

To achieve acceptable PM₁₀ levels, this airshed should be given priority not only in local management, but also in provincial and federal government air quality management programs and policies. Priority consideration should be given to funding management studies, to reviewing significant new PM₁₀ emission sources under the *Environmental Assessment Act*, and to controlling Prince George sources under province-wide regulations such as the *Wood Residue Burner and Incinerator Regulation*.

1.3 AIR QUALITY MANAGEMENT PRINCIPLES AND OBJECTIVE

Air Quality Management should be guided by the following principles:

1. Acceptable air quality is everyone's right; protecting air quality is everyone's responsibility.
2. Acceptable air quality is an important contributor to a healthy community and a sustainable economy.

3. Achieving acceptable air quality requires that local, provincial and federal government agencies work together. Public and industry involvement is also necessary.

The objective of the Management Plan is:

To achieve and maintain acceptable air quality by reducing the emission of those air contaminants that are causing unacceptable air quality, and by preventing future air quality problems from developing.

To achieve this objective most effectively, the management agencies must:

1. Set priorities for emission reductions;
2. Take a staged approach to implementing the management actions;
3. Monitor the effectiveness of the plan and research future needs;
4. Anticipate and take steps to prevent new air quality problems from developing;
5. Find funding to carry out the plan; and
6. Obtain input from the public, industry, health professionals and environmental groups.

2.0 PHASE ONE MANAGEMENT RECOMMENDATIONS

2.1 FINE PARTICULATE MANAGEMENT ACTIONS

The Background Report identified fine particulate matter (PM₁₀ and PM_{2.5}) as the highest priority pollutant for reduction in the airshed. Ideally, we would be able to pinpoint the exact contribution of an individual fine particulate source to ambient levels in a particular area of the airshed. In reality, it is not possible to be so precise in establishing source priorities, because our information and understanding of contaminant actions is deficient. Also, contaminants do not move directly from source to receptor, but mix in complex patterns, particularly in the complex terrain and meteorological conditions that characterize this airshed.

The most important information that can be used to select the Phase One sources for emission reductions are the emission inventory, the potential for

exposure to poor air quality, the availability of more effective emission reductions technologies, and airshed meteorology.

The largest contributors of PM₁₀ were identified in the emission inventory (Background Report - pages 30, 31 and 34) as:

- road dust; and
- industrial sources, in particular the sawmill beehive burners and the pulpmills.

In addition to the relative sizes of emission sources, other factors that have been considered in selecting sources for reduction are:

- the potential to contribute to ambient PM₁₀ levels;
- the potential for exposure of residents to unacceptable ambient levels; and
- the potential to upgrade emission prevention or treatment technology.

Estimating the contribution of an individual particulate source to ambient levels, in a particular location such as the Bowl, is not a well-developed science. The two basic available methods, source dispersion modelling and source apportionment, are not yet well developed for particulate sources. Modelling of dispersion of the major sources, such as industrial emissions and road dust, has not been done in this airshed because of the lack of reliable emission estimates for significant contributors. Emission testing has not been done on the beehive burners because of the technical difficulties with getting representative samples of highly variable emissions. Estimates of road dust releases are likely inaccurate because of the low level of sampling in this airshed.

“Source apportionment” is done to relate the chemical and physical characteristics of particles, at various locations in the airshed, to individual emission sources. Separation of wood burning sources from road dust seems feasible, and an initial study being done at UNBC is expected to be completed in 1998. The value of doing additional source apportionment studies will be evaluated in 1998, but at this time such studies are expected to provide only general direction in targeting major sources.

Another factor that must be weighed, particularly for small, widely dispersed sources, is the potential for local effects on air quality. This factor is particularly applicable to sources such as wood burning appliance and fireplace use, and commercial and residential open burning (land clearing

and backyard burning, for example). Although individual contributions from these emissions are small relative to the industrial and road dust sources, they can have a significant effect on local air quality during poor dispersion conditions. Although direct sampling of the effect of these local sources is limited in this airshed, other jurisdictions with more significant sources have demonstrated their ability to produce high ambient fine particulate levels.

In selecting the recommended Phase One Actions, we have considered the availability of technology to reduce the major emission sources identified. When considering technology for reducing emissions from sawmill burners, the major pulp mill sources, road dust reduction and backyard burning, for example, it was only necessary to look at other locations and jurisdictions to identify the potential for significant particulate source reductions. Additional reduction technology and emission prevention methods will undoubtedly be identified for subsequent management phases.

Beehive Burners

RECOMMENDATION:

1. Burning be eliminated at the following beehive burners according to the schedule set by the provincial cabinet.

- | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none">• Northwood Rustad Mill burner• Canfor Netherlands Overseas Mill burner• Carrier Lumber Mill burner |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Given the relatively large size of contributions from these sources, and the relative lack of effective controls on their emissions, these major fine particulate sources should be significantly reduced as soon as possible. The beehive burner emissions have been considered as priorities for elimination for many years because they are:

- outdated combustion technology with poor controls on emission releases, particularly during startup and shutdown;
- emission sources that are not able to escape the valley as effectively as other major airshed sources;
- combustion sources that release other harmful contaminants in addition to fine particulate; and

- a waste of raw materials, particularly for the manufacture of valued-added products.

Since provincial regulations are already in place to require the elimination of these sources, and since some of the burner operators in the airshed have already complied with these requirements, the shutdown of the remaining burners should be done as quickly as possible. Elimination of the airshed burners was required by a provincial regulation that came into effect in January 1996, and was subsequently amended in November 1996 and in January 1998 to accommodate delays in completing the shutdowns. Shutdown of these burners, which are located in the valley at the BCR Industrial Site, is ultimately in the hands of the provincial cabinet, which has final authority over the beehive burner regulation.

The objective of these extensions is to allow more time for development of value-added use of the wood residuals. However, in priority areas such as the Prince George airshed, interim measures are required to enable burning of these residuals to be stopped as soon as facilities to transport them to alternative locations can be provided.

Dust from Street Sanding, Unpaved Areas and Other Sources

RECOMMENDATIONS:

- 2. The City expand its program to use winter abrasives that generate less fine particulate matter;**
- 3. The City do more frequent sweeping of municipal streets and additional dust control on unpaved high traffic routes, to further reduce dust levels;**
- 4. MELP request the Ministry of Transportation and Highways to implement similar measures on provincial highways within the City Bowl;**
- 5. The management agencies request the Ministry of Forests to set a schedule for hard surfacing the portion of the Willow Cale Forest Road within the Fraser River floodplain;**
- 6. The management agencies request B.C. Rail and C.N. Rail to set schedules for paving, or otherwise effectively controlling dust, on any remaining unpaved traffic areas within the BCR and CNR Industrial Sites;**

- 7. The City require paving of all traffic areas permitted for new industrial and commercial developments; and**
- 8. The City establish guidelines and standards, for all paved commercial and public parking lots, to mitigate the release of fine dust from sanding and sweeping, and from storage and disposal of the sweepings.**

Although road dust is a much less concentrated source of fine particulate than the major industrial point sources, the amount of dust that is estimated to enter the air, particularly from street sand prior to spring clean-up, is significant. Because the significance of individual non-point sources, such as street dust, is more difficult to assess than for industrial sources, it is necessary to classify these sources according to size, proximity to residences and ease of reduction.

The highest priority is winter street sanding, given the high fine silt content of the sand, and relatively large amount of material used. Removal of the fine silt following snowmelt is often delayed because of freezing temperatures, allowing release of fine particulate into the air by traffic and wind.

An initial experiment with crushed aggregate in 1997 appeared to help lower spring dust levels, and this effort should be continued and expanded to other areas of the Bowl over the next winter.

Very few unpaved roads still remain in the Bowl. The most significant length of unpaved road, with significant traffic volumes, is the Willow Cale Forest Road. The B.C. Rail and Canadian National Rail Industrial sites also contain relatively large, unpaved areas which are heavily used by loaded trucks and rail cars.

Another source of dust that likely contributes to poor air quality is spring parking lot cleaning. This source is amenable to reduction through use of equipment that is readily available.

Pulpmill Sources

RECOMMENDATION:

9. Further reductions in pulpmill particulate emissions be done according to the plans provided by the operators, as follows:

- **Canfor upgrade of Intercon power boiler by the end of 1998; and**
- **Northwood reduction of pulpmill particulate emissions from sources that will be chosen following a modelling of dispersion of PM₁₀ from various pulpmill sources.**

The most significant pulpmill total particulate sources are the power boilers and recovery boilers. These sources at the Northwood and Canfor pulpmills comprised about 85% of the total particulates permitted for release from all pulpmill sources in 1995 (about 4340 tonnes) (Background Report, page 31). The pulpmill power and recovery boiler sources were allowed to release more total particulates in 1995 than the remaining beehive burners.

The pulpmill power and recovery boilers require upgrading of the combustion and particulate removal technology. Canfor did this upgrade on the Intercon recovery boiler in 1994, significantly reducing its annual emission.

Northwood made an earlier commitment to achieving a significant reduction of pulpmill particulate emissions. It is currently involved in an airshed computer modelling project which is expected to determine which of the various Northwood pulpmill sources are having the most significant impact on PM₁₀ levels in the airshed. The results of this study will be used to determine the air quality benefits from various types of upgrades. Northwood will meet with the Ministry in the Spring of 1999 to discuss the modelling results, and to outline a plan for achieving pulpmill particulate emission reductions.

Backyard Open Burning

RECOMMENDATIONS:

- 10. The City ban all open burning on properties of less than 5 acres, and on all properties in the Bowl; and**
- 11. The Regional District continue to advise residents of the hazards of open burning, and the availability of facilities to re-**

use, compost or properly dispose of burnable materials at the Foothills Boulevard Regional Landfill.

Burning of combustible yard residues (grass, construction debris, cuttings) can be a harmful local source of smoke, wastes useful materials, and is unnecessary in this airshed. Composting of yard and garden residues can be done on site, or by delivering the compostable materials to the Regional District's Foothills Boulevard Regional Landfill centralized compost site. Reusable construction materials can be placed at the Landfill for salvage and re-use by other residents.

Through the Regional Solid Waste Management Plan, the Regional District operates a centralized compost operation for yard and garden materials at the Foothills Boulevard Landfill. The Regional District also supports home composting efforts by funding a compost demonstration garden in Prince George, and by offering volunteer master composter training sessions.

Although a permit to burn yard materials can now be obtained from the City Fire Department, this practice should be terminated. The Ministry of Environment, Lands and Parks and the City Fire Department currently ban all such burning during air quality advisories and, over the past two years, the Ministry has publicized the need to eliminate burning of yard wastes and lawns.

Wood Burning Appliances

RECOMMENDATIONS:

- 12. The City promote minimization of the use of wood burning appliances in the City;**
- 13. The City prohibit the burning of wood in residential neighbourhoods during PM₁₀ air quality advisories, except where wood is the primary heating source; and**
- 14. The City and Regional District require that any new or replacement wood burning appliance meets the standards in the B.C. *Solid Fuel Burning Domestic Appliance Regulation*.**

Some City and Regional District residents continue to burn wood, in heaters, stoves and fireplaces, as a primary or auxiliary source of heat. In the more densely populated areas of the City, wood burning can significantly

contribute to high levels of fine particulate, particularly during the temperature inversions which occur frequently in winter. While the total elimination of domestic and commercial wood burning is not recommended, restrictions are necessary to improve air quality in high density areas.

The effects of commercial wood burning in operations such as bakeries and restaurants must also be restricted where necessary to protect nearby residents from fine particulate pollution. The City should review applications for new and retrofitted operations with MELP to determine if these operations are located appropriately or if emission controls should be installed.

2.2 TOTAL REDUCED SULPHUR (TRS) MANAGEMENT ACTIONS

RECOMMENDATION:

15. MELP require the owners of the highest priority TRS sources to prepare pollution prevention plans for additional emission reductions, to achieve full compliance with the Level B ambient objective, and to further reduce the level of exceedances of the Level A objective.

The major reductions in ambient TRS levels achieved in the early 1990's came from the recovery of gases in pulpmill effluents, which were shown to be the largest TRS source. Further emission reductions have been achieved from sulphur recovery at the Husky Refinery that was started at the end of 1997. However, the degree to which ambient levels can be further reduced has not been assessed. Ambient levels only very rarely exceed the threshold for health effects, although the odour threshold is exceeded at a significant frequency in the Bowl.

2.3 COMMUNITY AND REGIONAL PLANNING

RECOMMENDATIONS:

16. Air quality considerations be incorporated into the Prince George Official Community Plan, including transportation

efficiency and alternative transportation, and into the Regional District Community Plans during the next plan reviews;

17. The City and Regional District identify new areas for heavy industrial development, taking potential air quality effects into account; and

18. The City refer all proposals for significant new emissions for review by MELP.

The Prince George and Regional District land use plans are an absolutely essential part of air quality management in this airshed. Local and regional land use plans should consider air quality management factors such as emission size and quality, dispersion potential and potential health and other effects on residents. Community development plans should also take into account the benefits and constraints of different air quality management options on economic development.

2.4 PREVENTION OF AIR QUALITY PROBLEMS

RECOMMENDATIONS:

19. MELP evaluate the acceptability of new sources of air contaminants, especially PM₁₀, TRS, SO₂ and NO_x, based on use of the “lowest achievable discharge rate” (See Glossary.); and

20. The City promote reductions in vehicle emissions and request the Insurance Corporation of B.C. to conduct a mobile emission testing program.

While the main emphasis in Phase One of the Management Plan is on reduction of fine particulate emission sources, actions should be taken to prevent additional air quality problems from developing. These actions should apply particularly to those types of air contaminants that have the potential to increase significantly with future developments in the airshed, even though their ambient levels are currently acceptable.

The contaminants that have the greatest identified potential for significant emission increases are the nitrogen oxides (NO_x). An increase of about 11% in NO_x was predicted, in the Background Report, to occur by 2001 due to planned cogeneration and MDF projects in the airshed. While these planned

increases were not predicted to cause exceedance of air quality objectives for nitrogen dioxide, the capacity for additional major emissions in the airshed, from increased wood combustion, for example, is limited. These two projects have been delayed and are uncertain; however, until these discharge commitments are withdrawn, the emission rights can still be exercised.

The best means of pollution prevention is to anticipate and mitigate potential air pollution problems before they develop. The difficulties and delays that have been encountered in finding ways to reduce fine particulate levels illustrate the benefits of practicing pollution prevention. Experience with eliminating beehive burners illustrates that the most cost effective methods of pollution reduction can result from the improved planning associated with a prevention approach.

Although the emission inventory did not identify road vehicles as significant sources of PM₁₀ or other contaminants that have exceeded air quality objectives in the overall airshed, they have the potential to affect air quality in high traffic areas. Road vehicles were shown to be significant sources of other contaminants, such as NO_x, carbon monoxide (CO) and volatile hydrocarbons (VOC). (See Background Report, page 33.) These emissions could be reduced through proper vehicle maintenance.

The intent of the emission testing is not to start an “Air Care” program in this airshed, but to provide information that can be used to educate the public, business and industry on ways to reduce vehicle emissions.

2.5 MANAGEMENT OF POOR AIR QUALITY EPISODES

RECOMMENDATIONS:

- 21. MELP require owners of the most significant fine particulate sources to provide plans for temporarily reducing emissions during air quality advisories (See Glossary.); and**
- 22. The feasibility of predicting fine particulate episodes be reviewed by the ATM Committee, and any feasible methods be implemented as soon as available.**

The other area where prevention should be practiced is episode management. Since pollution episodes occur whenever weather conditions prevent

adequate dispersion, prediction of these conditions could enable avoidance of an episode if major emission sources could be temporarily reduced. Although the frequency of episodes is expected to be reduced by the significant source reductions identified in the Plan, extreme meteorological events will likely still produce periods of unacceptable air quality.

Measures to reduce domestic wood burning during air quality advisories are included in this Plan. Reduction in industrial wood burning should also be done where it is predicted to improve air quality during PM₁₀ advisories. If prediction of those meteorological events most responsible for causing episodes can be done accurately, then the major emissions could be reduced prior to the onset of episodes. Diversion of wood residuals to uses outside the airshed may be required during episodes, and could be facilitated by a resource pooling agreement among the major source owners. Episode alleviation plans should link actions to the severity of the episodes.

2.6 MONITORING AND RESEARCH

RECOMMENDATIONS:

- 23. That the current air monitoring program be continued until an evaluation of effectiveness and participation is completed in 1998;**
- 24. A health study steering group be established to determine the need for, and to design, any required air quality effects study, and the study be started no later than the year 2000; and**
- 25. Research be initiated, with particular emphasis on determining and controlling the effects of fine particulates (PM₁₀ and PM_{2.5}), to consider the following:**
 - monitoring of the contribution to fine particulate levels of those secondary particulates that originate from SO₂ and NO_x emissions;**
 - the effect of meteorological factors on ambient fine particulate trends;**
 - determining the contribution of individual fine particulate sources to ambient levels; and**
 - defining “permissible exceedance levels” for PM₁₀ and other priority ambient air quality objectives. (See Glossary).**

The current ambient air quality program is carried out by MELP and the major local industries (pulpmills, refinery and sawmills). This program needs to be continued, and reviewed periodically for effectiveness. Participation in the monitoring program also must be reviewed periodically to ensure that it is effective, that all major source contributors are represented and that costs are being allocated fairly.

The monitoring and research recommended here are needed to determine the effectiveness of current (SO₂), or recommended emission reduction actions (PM₁₀), and to determine the need for future reductions in NO_x emissions (NO₂ and O₃). This monitoring is therefore an integral part of this Plan, and is required to prepare for subsequent management phases.

Our understanding of how individual emission sources affect specific areas of the airshed must be improved if we are to be able to identify sources for future reductions, and to determine the significance of proposed new sources. Airshed-related projects that are already underway or are awaiting funding decisions are:

- initial PM₁₀ source apportionment study (UNBC/MELP);
- testing of a new valley terrain regulatory model (Northwood/MELP/UNBC); and
- meteorology and chemical modelling of pollutant episodes (UNBC/UBC).

In addition to these, the Ministries of Health and Environment and the GVRD are conducting a PM₁₀ source apportionment study on a number of other B.C. airsheds that should help refine the methods used in future studies.

Two air quality-related health studies have been done in this airshed, and both used comparisons of respiratory emergency room visits with ambient TRS levels. Results were inconclusive, likely due to inadequate sample group size and monitoring frequency to demonstrate significant effects. However, some health researchers advise that the population of Prince George is large enough to enable an investigation of the relationship between chronic respiratory effects and continuously monitored air contaminants such as PM₁₀ and SO₂.

Although various attempts have been made with a variety of stakeholders to initiate an effective air-quality related health study, agreement on study design and the procurement of adequate funding have not been achieved.

Such a study may provide a necessary examination of the validity of observations of air quality effects reported by physicians.

3.0 RESPONSIBILITIES OF THE MANAGEMENT AGENCIES

RECOMMENDATIONS:

- 26. Prior to finalizing the Management Plan, the management agencies make an agreement on the responsibilities for consultation on permitting, community planning, and other administrative and regulatory actions that will affect air quality; and**
- 27. The management agencies establish an Airshed Management Steering Committee to oversee the implementation of the Management Plan Actions, and to establish subgroups as needed to manage specific tasks.**

In order to ensure the effectiveness of the management actions outlined in this Plan, communication and coordination is required among the management agencies that must implement the Plan. There are many areas of decision making by the management agencies that have the potential to affect air quality, and to increase the effectiveness of the management actions prescribed in the Plan. Prior to implementing the final Plan, the management agencies should identify ways to maximize the effectiveness of the recommended actions.

4.0 FUNDING NEEDS AND COST SHARING

RECOMMENDATION:

- 28. Sharing of current and future monitoring costs be based on emission contributions to the airshed, and other factors contributing to unacceptable air quality.**

Implementation of the Management Plan will require expenditure of funds for emission reductions, and monitoring and research. Responsibility for assigning costs for emission reductions by private operations should rest with the management agency that has the regulatory authority over that

operation. Examples are the City and parking lot owners, and MELP and sawmill owners.

The success of monitoring and research programs requires that costs be fairly allocated among the government and private parties. Ambient air quality monitoring costs are currently shared among some of the permitted industries (pulpmills, sawmills and refinery) in the airshed and MELP. To date MELP has carried the non-industrial portion of the annual monitoring operating budget of about \$150,000. Since the Management Plan requires reduction of non-industrial emissions, such as dust from roads and smoke from residential burning, the number of participants in the cost-shared monitoring program should expand to cover the broader range of sources.

5.0 CONSULTATION ON THE DRAFT MANAGEMENT PLAN

Various stakeholders participated in February 1997 consultation workshops, and requested the opportunity to provide input to the preparation of the Management Plan. (See the Phase I Consultation Report.) Because all these stakeholders will be affected by the management actions included in the Plan, their input was sought prior to submitting the draft Plan for final approval. Those who contributed to the consultation process have been informed of how this input has been considered in finalizing the Plan.

Contributors to the initial consultation process conducted in 1997 were invited to a second stakeholder consultation session in April 1998. The general public was also asked to provide written comment on the draft Plan. A Consultation Feedback Report was prepared by the workshop facilitator, Raymond Penner (Strategic Action Group, 1998), indicating how input had been used, and this report was circulated to participants for comment. Final input from these consultations has been incorporated into the Management Plan before it was referred to the management agencies for approval.

6.0 REFERENCE SECTION

Ministry of Environment, Lands and Parks. July 22, 1994. *Solid Fuel Burning Domestic Appliance Regulation*. Established under the *Waste Management Act*. SBC 1994.

Ministry of Environment, Lands and Parks. August 1998. 1996 Annual Air Quality Report for Prince George. Prince George, B.C.

Oster, Michelle. July 1997. Survey on Public Perceptions of Outdoor Air Quality Issues in the City of Prince George. Thesis for Master of Science Degree. Natural Resources and Environmental Studies Faculty, University of Northern British Columbia. Prince George, B.C.

Oster, Michelle. June 1997. Prince George Air Quality Management Plan Phase I Consultation Report. Prepared for the Prince George Airshed Technical Management Committee. Prince George, B.C.

Prince George Airshed Technical Management Committee. October 1996. Prince George Air Quality Management Background Report. Prince George, B.C.

Strategic Action Group. October 1998. Prince George Air Quality Management Plan - Consultation Feedback Report. North Vancouver, B.C.

APPENDIX A: GLOSSARY OF TERMS

Acceptable Air Quality is:

“The level of a particular air contaminant that meets an ambient air quality objective.”

An Air Contaminant is:

“An airborne substance that, when present in the air in sufficient concentrations, is capable of causing human health and other harmful environmental effects”

Air Quality is:

“The physical and chemical characteristics of ambient (outside) air that determine its acceptability for human use and environmental protection. Air Quality is generally defined by numerical criteria for individual contaminants, based on human health or other environmental studies. Air quality includes smell and taste as well as the chemical composition of air.”

An Air Quality Advisory is:

“ A notice issued by MELP indicating that an ambient air quality objective has been exceeded, or is predicted to be exceeded, and that current meteorological conditions are predicted to continue for the next six hours or more. Notices are issued to advise the public to heed those precautions that are appropriate to the pollution levels, and to advise or require industry and other source owner, including the public, to take appropriate emission reduction measures.”

Air Quality Management is:

“Administrative activities carried out to implement an air quality management plan, including amendment of permits for industrial and other point contaminant sources, establishment of by-laws and other local and regional regulatory controls on mobile and area contaminant sources, and public education on ways to reduce and eliminate use of air contaminants in everyday activities”

An Air Quality Management Plan is:

“A blueprint for managing community development and for controlling air contaminant sources so as to improve or maintain air quality for the protection of human health and the environment in an airshed”

An Ambient Air Quality Objective is:

“A numerical, non-legal guideline defining an acceptable level of an air contaminant in ambient air. Various levels (A, B and C) are used to define various endpoints (or protection criteria) and degrees of protection. Different averaging periods (1-hour, 24-hour, annual) are also used to indicate the exposure period that is most critical to preventing each defined effect. For example, if protection of vegetation from reduced growth rates is the endpoint, then the Level A, 1-hour SO₂ objective must be attained.”

An Emission Factor is:

“ A numerical factor derived from actual emission measurements from similar sources and normally expressed in a form that allows it to be applied to all similar sources (e.g. kilograms per tonne of finished product). The level of uncertainty in applying emission factors depends on how similar the characteristics of a particular source are to those sources on which the factor is based.”

An Episode is:

“A period of unacceptable air quality, when ambient levels of a particular air contaminant exceed an ambient air quality objective or objectives. For example, a PM₁₀ episode is defined in this airshed as two or more consecutive days of exceedance of the 24 hour, Level B objective.”

Lowest Achievable Discharge Rate is:

“A comparable jurisdiction’s most stringent authorized discharge limitation, unless such limitation is demonstrated to be unachievable, or the most stringent discharge limitation that is achieved in practice,

whichever is most stringent.” (MELP Standards and Guidelines Policy - October 7, 1997)

O₃ is:

“Groundlevel ozone, which is a compound formed in the lower atmosphere through the reaction of NO₂ and other airborne substances, in the presence of ultraviolet light. Reactions between VOC and other highly reactive compounds (free radicals) form NO₂ from NO to increase the formation of ozone. Ozone formed at ground level can cause effects on human health and vegetation, whereas O₃ formed in the upper atmosphere protects the earth from excessive ultraviolet light levels.”

Open Burning is:

“The combustion of materials, including garden and lawn clippings and tree prunings, without control of the combustion air, and without a stack or chimney to vent the products of combustion to the atmosphere. Open burning does not include use of barbeques .”

A Permissible Exceedance Level is:

“The maximum frequency that an air quality objective is allowed to be exceeded (in hours per year or percentage of time, for example) before actions to reduce emissions are required. Exceedances caused by extreme meteorology may be permitted, and the level of permissible exceedances may depend on whether an objective is Level A, B or C.”

Permitted Emission Sources are:

“Releases of contaminants under MELP *Waste Management Act* emission permits, including mostly industrial sources.”

PM₁₀ is:

“Fine particulate matter with a maximum particle diameter of 10 microns (μm = one millionth of a meter). Includes particles that are inhalable into the lungs.”

PM_{2.5} is:

“Ultra-fine particulate matter with a maximum particle diameter of 2.5 μm . The main particulate component of woodsmoke and vehicle emissions.”

The Prince George Airshed is:

“The mass of air contained within the municipal boundaries of Prince George and the immediate surrounding communities of the Regional District, and particularly that air mass contained and affected by the natural topographical features at the confluence of the Nechako and Fraser Rivers”

NO_x is:

“Nitrogen oxides, which include nitric oxide (NO) and nitrogen dioxide (NO_x), and are formed during combustion of fuels from reaction between oxygen and atmospheric nitrogen gas (N₂)”

SO₂ is:

“Sulphur dioxide, formed from the incineration of TRS during combustion of fuels, and pulping chemicals, and the flaring of hydrogen sulphide during oil and gas processing and refining”

TRS is:

“total reduced sulphur, which includes hydrogen sulphide, dimethyl sulphide and disulphide, and methyl mercaptan, is formed in the absence of oxygen during pulping processes and released primarily from effluent disposal, and is entrained in oil and gas deposits and released during transport, gas processing and oil refining.”

VOC is:

“Volatile organic compounds, or carbon containing compounds, are hydrocarbons that form gases when released from combustion, industrial processes, and evaporation of liquid fuel. Natural biological sources release most of the VOC, although man-made sources may predominate in urban airsheds. Some VOC have direct health and environmental effects, other compounds react with other atmospheric gases to promote ozone formation.”

Wood burning is:

“ Combustion of a solid wood fuel.”

TABLE 1: B.C. AMBIENT AIR QUALITY OBJECTIVES ($\mu\text{g}/\text{m}^3$, except as noted)

Contaminant	Averaging Period	Canada	Canada	Canada	B.C.	B.C.	B.C.	Ontario	Alberta	U.S.	California
		maximum desirable	maximum acceptable	maximum tolerable	level A	level B	level C				
		objective	objective	objective	obj/guide.	obj/guide.	obj/guide.	criteria	guideline	standard	standard
Carbon Monoxide	1 hour	15000	35000		14300	28000	35000	36200	15000	40800	23300
	8 hour	6000	15000	20000	5500	11000	14300	15700	6000	10500	10500
Hydrogen Sulphide	1 hour	1	15		7.5 - 14	28 - 45	42 - 45	30	14		
	24 hour		5		4	6 - 7.5	7.5 - 8		4		
Nitrogen Dioxide	1 hour		400	1000				400	400		250 ppb
	24 hour		200	300				200	200		
	annual mean	60	100						60	50 ppb	
Ozone	1 hour	100	160	300				165	160	120 ppb	90 ppb
	24 hour	30	50						50		
	annual mean		30								
PM10	24 hour					50				150	50
	annual mean									50	30
Sulphur Dioxide	1 hour	450	900		450	900	900-1300	690	450		250 ppb
	24 hour	150	300	800	160	260	360	275	150	140 ppb	50 ppb
	annual mean	30	60		25	50	80	55	30	30 ppb	
Total reduced Sulphur	1 hour					28		40			
	24 hour					6					
Particulates	24 hour		120	400	150	200	260	120	100		
	annual mean	60	70		60	70	75	60	60		

Figure 1

Comparison of 1996 Annual Average PM₁₀ Levels at Non-Continuous Monitoring Sites in B.C.

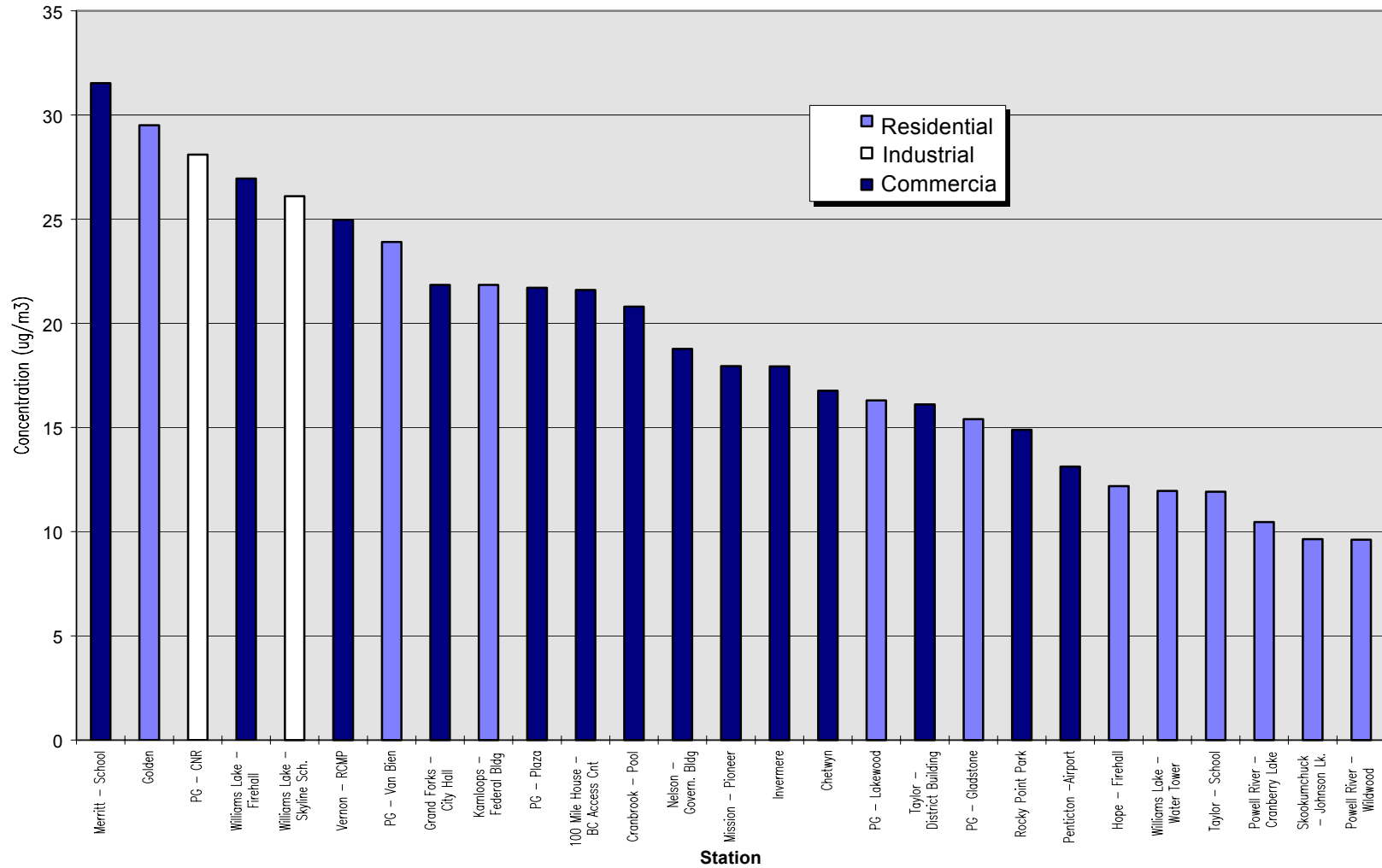


Table 2: Comparison of Prince George Annual Average PM10 Levels with Various Canadian Centers (1992-1996)									
NAPS ID	City	Address	Type	1992	1993	Annual Average [Rank]		1996	Five Year Average [Rank]
						1994	1995		
60512	HAMILTON	EGIN & KELLY	C	N/A	N/A	31	30	29	30 [1]
60211	WINDSOR	COLLEGE/PRINCE	R	30	30	34	27	22	29 [2]
60424	TORONTO	BAY & GROSVENOR	C	34	25	25	22	N/A	27 [3]
100202	PRINCE GEORGE	PLAZA/DOWNTOWN	C	29 [4]	30 [1]	24 [4]	24 [4]	22 [3]	26 [4]
	PRINCE GEORGE	VAN BIEN	R	27 [5]	28 [2]	22 [6]	25 [3]	23 [2]	25 [5]
70119	WINNIPEG	65 ELLEN STREET	C	33	22	23	22	17	23 [6]
90227	CALGARY	611-4TH STREET	C	22	22	24	23	20	22 [7]
50104	MONTREAL	1125 ONTARIO EST	C	29	21	21	21	18	22 [7]
90130	EDMONTON	10255-104TH STREET	C	25	22	20	17	17	20 [9]
	PRINCE GEORGE	COLLEGE HEIGHTS	R	20 [9]	26 [3]	17 [9]	17 [9]	15 [8]	19 [10]
60104	OTTAWA	RIDEAU/WURTEMBURG	C	22	21	17	14	17	18 [11]
100111	VANCOUVER	ROCKY PT. PARK	I	22	23	16	14	14	18 [11]
50308	QUEBEC CITY	DES SABLES	I	N/A	11	20	18	19	17 [13]
100118	VANCOUVER	2550 WEST 10TH AVE.	R	22	24	15	12	13	17 [13]
40203	SAINT JOHN	FOREST HILLS	R	21	16	13	13	11	15 [15]
100303	VICTORIA	1250 QUADRA ST.	C	21	16	14	14	12	15 [15]
30118	HALIFAX	1657 BARRINGTON ST.	C	N/A	N/A	15	14	11	13 [16]
30501	KEJIMKUJIC	NATIONAL PARK	R	16	9	11	6	8	10 [17]

Zoning of Monitor Locations

C = Commercial

R = Residential

I = Industrial

Figure 2: Comparison of Prince George 1992-96 Annual Average PM10 Levels with Various Canadian Centres

