

## THE BC LUNG ASSOCIATION

The BC Lung Association's mission is to promote and improve lung health for all Canadians. As our lung health-and our health in general-depends on clean air, the following provides an overview of some of our past air quality initiatives:

- published three reports on the health and economic impacts of air pollution and options for PM<sub>2.5</sub> objectives,
- launched a new Chinese language educational campaign on the interconnection between air quality, transportation and health, and
- led community-based workshops, presentations, and public forums in the Kootenays, Okanagan, Sunshine Coast, on Vancouver Island, Merritt, and throughout the

Lower Mainland - stay tuned for another community lecture series in the fall of 2006.

*Here is an overview of ongoing and upcoming initiatives:*

- collaborating with governmental and non-governmental agencies to address air quality issues in the province,
- organizing the annual Air Quality and Health Workshop,
- publishing the annual State of the Air Report,
- establishing a BC-wide Air Quality Groups network to allow air quality groups, committees and interested groups to network and promote information-sharing on air quality initiatives, and
- planning a workshop to help integrate the planning sector and the air quality sector.

### FOR MORE INFORMATION, VISIT OR CONTACT THE FOLLOWING AGENCIES:

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(604) 731-5864  
or toll-free at 1-800-665-5864 (in BC  
but outside the Lower Mainland)

**Environment Canada,  
Pacific and Yukon Region**  
www.pyr.ec.gc.ca  
401 Burrard Street  
Vancouver, BC V6C 3S5  
(604) 664-9100

**Health Canada  
Safe Environment Programme**  
www.hc-sc.gc.ca/hecs-ses/air\_quality  
400-4595 Canada Way  
Burnaby, BC V5G 1J9  
(604) 666-2671

### BC MINISTRY OF ENVIRONMENT

**Vancouver Island Region**  
wlapwww.gov.bc.ca/vir/  
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(250) 751-3100

**Kootenay and Okanagan Regions**  
wlapwww.gov.bc.ca/kor/  
#401 333 Victoria Street  
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**Lower Mainland Region**  
wlapwww.gov.bc.ca/sry/  
2nd floor, #10470 152nd Street  
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(604) 582-5200

**Skeena Region**  
wlapwww.gov.bc.ca/ske/  
PO Box #5000 3726 Alfred Avenue  
Smithers, BC V0J 2N0  
(250) 847-7260

**Thompson and Cariboo Regions**  
wlapwww.gov.bc.ca/car/  
#400 640 Borland Street  
Williams Lake, BC V2G 4T1  
(250) 398-4530

**Omineca and Peace Regions**  
wlapwww.gov.bc.ca/nor/  
3rd Floor, 1011 Fourth Avenue  
Prince George, BC V2L 3H9  
(250) 565-6135

### BRITISH COLUMBIA HEALTH AUTHORITIES

**Northern Health Authority**  
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**Vancouver Coastal Health Authority**  
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Vancouver, BC V5Z 4C2  
(604) 875-4252 or 1-866-884-0888

**Interior Health Authority**  
www.interiorhealth.ca  
2180 Ethel Street  
Kelowna, BC V1Y 3A1  
(250) 862-4200

**Fraser Health Authority**  
www.fraserhealth.ca  
300, 10334 - 152A Street  
Surrey, BC V3R 7P8  
(604) 587-4600 or 1-877-935-5669

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# state of the AIR 2006

I N B R I T I S H C O L U M B I A

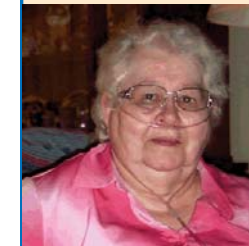
This second annual State of the Air report is a collaboration between government agencies and the BC Lung Association. In this report, we will introduce you to some people whose health is affected by poor air quality. We will discuss the current levels of air pollutants in our communities and how air pollution affects health.

We will focus on two particular sources of fine particulate matter - *diesel exhaust* and *wood smoke* - that are a growing health concern to BC residents. We take a closer look at several local, provincial and national initiatives to reduce these emissions. The various levels of government also discuss what they are doing to improve air quality in BC.

Future editions of this report will provide information about other new or emerging air issues. And we will continue to update you on the most current knowledge about air quality.

  
Scott McDonald,  
Executive Director, BCLA

### When you can't breathe... nothing else matters



For 73-year-old Port Moody resident Jacquie Vance, air quality profoundly affects her freedom of movement. In 2002, Jacquie became one of 74,000 British Columbians to be diagnosed with COPD (Chronic Obstructive Pulmonary Disease). To ease her breathing difficulty she uses a puffer twice a day and supplemental oxygen. Her ability to get around is hampered further by poor air quality. "The oxygen augments my breathing, but I still have to breathe in the local air," she says.

"If the air quality is bad, I just start to seize up. Then I can't get any air, including the oxygen. I start having more trouble breathing."

Every summer Jacquie gets away to Cultus Lake, south of Chilliwack, where she finds some relief from the air pollution that accumulates in the rest of the Fraser Valley. From Jacquie's home, the quickest route to Cultus Lake is the freeway. However, she notes, "The closer you get to the freeway - and all the trucks spewing pollution, the harder the breathing gets." Twice, in heavy traffic, she has had to get off the freeway to use an emergency puffer because she could not breathe. Even at Cultus Lake, however, Jacquie must remain vigilant against poor air quality. "We're in a trailer park during the summer and of course people have campfires," she says. "On the weekend I generally have to stay inside the trailer with the air conditioning on."

COPD has made it impossible for Jacquie to have any spontaneity in her life. "I can't just walk out of my house, get in my car and go somewhere," she says. "You have to plan it; you have to make sure your portable oxygen tank is full, everything including your route has to be thought out. So you tend to stay home a lot more." In addition to the common air pollutants, other challenges come from simple things such as aerosol spray cans, scented candles or anything perfumed that can affect air quality. Another culprit is second hand smoke. "I hate when I have to walk past people standing outside smoking," Jacquie says. "I take a deep breath and go by fast." In spite of the limitations posed by COPD, Jacquie retains an optimistic outlook on life.

## HOW DO FINE PARTICULATE MATTER AND OZONE AFFECT OUR HEALTH?

Research shows that fine particulate matter (PM<sub>2.5</sub>) and ozone (O<sub>3</sub>) can result in serious health effects. Jacquie is only one example of a person whose health is at risk from air pollution. Groups at risk include the elderly, children, those with heart and lung diseases and those with diabetes.

### HEALTH EFFECTS OF PM<sub>2.5</sub>

For the elderly, children and those with existing lung disease, exposure to PM<sub>2.5</sub> can cause inflammation of the airways, resulting in symptoms such as coughing and wheezing. It can lead to more frequent use of medications, increased emergency room visits and hospitalization.

For people with existing heart problems, exposure to PM<sub>2.5</sub> may affect the rhythm of the heart, increasing the risk of heart attacks. Recent studies have shown that diabetics are at greater risk as they may suffer from an underlying heart disease.

Long-term PM<sub>2.5</sub> exposures can lead to reduced lung function, chronic bronchitis and even a shortened life span.

### HEALTH EFFECTS OF O<sub>3</sub>

Exposure to O<sub>3</sub> can cause irritation of the airways. The severity of the health impact depends on the O<sub>3</sub> concentration in the air, the duration of the exposure, the frequency with which we breathe and our individual sensitivity to O<sub>3</sub>. Some individuals, such as people with asthma or other lung diseases, are more sensitive to O<sub>3</sub> exposure. Physical activity can worsen the effects of O<sub>3</sub> exposure due to more rapid breathing.

Recent studies have shown that long-term exposure to high concentrations of O<sub>3</sub> can result in impaired lung development and structural damage to the lungs. It also increases the risk of developing asthma.

## Air Quality and Living with Asthma

Twelve-year-old Vancouver resident Matthew Wong is one of 300,000 British Columbians with asthma. With medication, Matthew is able to keep his asthma under control and live a normal, active life. "Most of the time when I'm taking my medication my asthma is moderate, but if I forget to take my medication, for say a week, it can get worse. The medication does a good job of keeping it under control."

Matthew enjoys sports but poor air quality can greatly affect when he can participate. He lives in Vancouver where air quality is fairly good, but air pollution, pollen, cigarette smoke and cold air worsen his asthma and limit his ability to participate in activities. "I start coughing, my lungs get irritated and inflamed and it gets harder to breathe." Matthew and his family have learned that daily air quality conditions determine whether to do activities indoor or outdoor.

Poor air quality can also affect Matthew's social life. Vehicle exhaust can cause coughing and inflammation of his lungs which makes it difficult to breathe. "If I want to go to a movie and there's an air quality advisory, I have to call it off. It's the same thing for cycling and basketball."

Matthew has had to learn to adapt to his environment in order to keep his asthma under control. By taking his medication and by being on guard against air pollution and other factors that might worsen his asthma, Matthew is able to live a healthy active life.



robust economy. Under the direction of the FVRD board's Air Quality and Environment Committee, the intent of the program is to encourage the adoption of emission reduction strategies by all levels of government and to form partnerships with government agencies, emission sector representatives, businesses, First Nations, and the public to effectively reduce emissions. The FVRD has authority from the provincial government for air quality planning purposes and adopted an *Air Quality Management Plan* in 1998 ([www.fvrd.bc.ca/FVRD/Services/Air+Quality/](http://www.fvrd.bc.ca/FVRD/Services/Air+Quality/)). It is currently being revised. The program is also working to acquire air quality regulatory authority, which would allow the board to provide direct, complementary implementation of the plans it develops.



*Some activities include:*

- pressing for development of a PM annex with a western focus under Georgia Basin Puget Sound International Airshed Strategy
- working with agricultural sector to reduce emissions and partnering with the GVRD in development of air quality monitoring and an airshed emission inventory
- participating in diesel emission reduction projects for school buses and other heavy duty vehicles
- assessing alternate fuel burning



## AIRSHED PLANNING IN LOCAL MUNICIPALITIES

- The *Bulkley Valley Lakes District* has a five-year Community Action Plan for Clean Air ([www.cleanairplan.ca](http://www.cleanairplan.ca)).
- *Grand Forks* recently established the Boundary Air Quality Committee. ([www.grandforks.ca/~cmoslin/](http://www.grandforks.ca/~cmoslin/)).
- In 2003, *Kamloops* formed an Air Quality stakeholder committee.
- The *Kelowna* Regional Air Quality Committee has representatives from the City of Kelowna, the District of Peachland, the District of Lake Country and the Regional District Electoral Areas.
- *Merritt* recently established an Air Quality Stakeholder Committee.
- The *North Okanagan* Air Quality Stakeholder Committee, comprised of representatives from the City of Vernon, the Township of Spallumcheen and Regional District Electoral Areas, approved its Air Quality Action Plan in 2005 ([www.nord.ca](http://www.nord.ca)).
- *Port Alberni* is in the initial stages of forming an Airshed Planning Process.
- *Prince George* approved its Air Quality Management Plan - Phase One in 1998 and is currently working on Phase Two ([www.city.pg.bc.ca](http://www.city.pg.bc.ca)).
- The *Quesnel* Air Quality Roundtable released its Quesnel Airshed Management Plan in December 2004, which is currently being implemented.
- The *Regional District Okanagan Similkameen* Air Quality Committee issued a draft Air Quality Management Plan in May 2006 ([www.rdos.bc.ca](http://www.rdos.bc.ca)).
- The *Sea-to-Sky* communities of Squamish, Whistler, Pemberton and Howe Sound have drafted an Air Quality Management Plan to be released for public consultation in the fall of 2006. ([www.seatoskyairquality.ca](http://www.seatoskyairquality.ca)).
- The *Williams Lake* Air Quality Roundtable has adopted ambient air quality goals and a draft Air Quality Management Plan is being developed.

What Government Agencies...continuation

BC and support local airshed planning efforts. These include:

- operation of an extensive air quality monitoring network and provincial data management system
- technical studies to better inform air management decisions at the provincial or airshed level, such as:

> particle speciation studies in Golden, Prince George and Kelowna to determine particle sources



> modelling studies in areas such as the Bulkley-Valley Lakes District, Prince George and Golden to better understand meteorology's role in degraded air quality

> development of a provincial GIS-based emission inventory

- development of **best management practices** to reduce road dust due to winter traction material and to guide land use decisions near major roadways

- **stakeholder consultation** on the development of a provincial framework for airshed planning and options for new provincial air quality objectives for PM2.5

- support for the first Canadian pilot study of the new health-based **Air Quality Health Index** in four communities of the Thompson and Okanagan Valleys

Over the past year, the BC Ministry of Environment provided direct funding to and technical support for airshed

activities in Port Alberni, the Sea-to-Sky airshed, Merritt, Kelowna, Golden, Quesnel, Williams Lake, Prince George and the Bulkley Valley-Lakes District. The ministry also supported air quality workshops held by the Fraser Basin Council, the BC Lung Association and the Cowichan Green Community.

THE GREATER VANCOUVER REGIONAL DISTRICT

In October 2005, the GVRD adopted a new Air Quality Management Plan ([www.gvrd.bc.ca/air/planning\\_plans.htm](http://www.gvrd.bc.ca/air/planning_plans.htm)) that will guide air quality management in the region over the next decade. It strives to minimize the risk to human health from air pollution, improve visibility and reduce Greater Vancouver's contribution to global climate change. The plan has 33 priority actions aimed at reducing emissions from major sources of pollution, including actions for:

- **marine vessels and port operations:**

> developing comprehensive port-wide emission inventories and establishing cooperative agreements to address the air quality impacts of marine vessels and port operations, in collaboration with other government agencies, port authorities, terminal operators, and shippers

> developing implementation mechanisms for existing and proven control technologies and conducting feasibility studies on new and emerging technologies

> working with the federal government to expedite or strengthen international treaties that govern marine vessel emissions and fuel quality standards

- **cars, trucks, buses and non-road equipment:**

> supporting continuation of AirCare for passenger vehicles and developing an inspection and maintenance program for heavy-duty vehicles

> working with TransLink to achieve emission reductions from the regional transit fleet

> retrofitting heavy-duty on-road vehicles (e.g., trucks and school buses) and non-road equipment (e.g., forklifts, dozers) through the Diesel Emission Reduction Program for Greater Vancouver

- **industrial, commercial and institutional sources:**



> updating the GVRD's Air Quality Bylaw to require continuous improvement from these sources through

incentives, voluntary and mandatory initiatives and innovative approaches

- **communities**

> establishing greenhouse gas reduction strategies with local governments

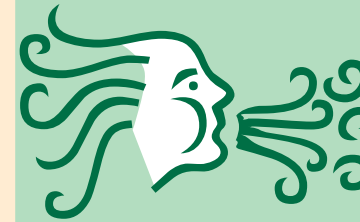
> assessing and monitoring localized air quality impacts and developing and implementing local air quality action plans

THE FRASER VALLEY REGIONAL DISTRICT

The FVRD's Planning and Development Department oversees the district's air quality program. This program strives to develop management plans that will reduce the effects of air contaminants while maintaining public values and a

Here are some tips to help those sensitive to air pollution when active out-of-doors.

Know how sensitive you are to air pollution.



- Monitor your asthma when you are physically active. Do the symptoms happen more often when the air is more polluted? If so, you may be sensitive to air pollution.
- Also notice any asthma symptoms that begin up to a day after you have been outdoors in polluted air. Air pollution can make you more sensitive to asthma triggers, like mold and dust mites. If you are more sensitive than usual, it could be due to air pollution outdoors.

Know when and where air pollution may be bad.

- Ozone is often worst on hot summer days, especially in the afternoons and early evenings.
- Particulate matter can be bad anytime of the year. It can be especially bad when the weather is calm, allowing air pollution to build up. Particle levels can also be high:
  - > near busy roads, during rush hour, and around industrial sources, or
  - > when there is smoke in the air from woodstoves, fireplaces, or burning vegetation.

**Plan activities when and where pollution levels are lower.** Regular exercise is important for staying healthy. By adjusting when and where you exercise, you can lead a healthy lifestyle and help reduce your asthma symptoms when the air is polluted. In summer, plan your most vigorous activities in the morning. Try to exercise away from busy roads or industrial areas. On hot, smoggy days when ozone levels are high, think about exercising indoors. When there's a medical advisory it is best that you stay inside.

**Change your activity level.** When the air is polluted, try to take it easier when you are active outdoors. This will reduce how much pollution you breathe in. Even if you cannot change your schedule, consider changing your activity so it is less intense, for example, go for a walk instead of a jog. Or, spend less time on the activity.

**Listen to your body.** If you experience asthma symptoms when the pollution levels increase, stop your activity. Find another less intense activity or exercise in an area with less pollution.



**Keep your quick-relief medicine on hand when you are active outdoors.** If you do have symptoms, be prepared. This is especially important when you are starting a new activity that is more intense than what you are used to.

**Consult your health care provider.** If you have asthma symptoms or will be exercising more than usual when the air is polluted, talk to your health care provider. Ask whether you should use medicine before you start outdoor activities. If you have symptoms during a certain type of activity, ask your health care provider if you should follow an asthma action plan.

Get up-to-date information about your local air quality.

- Find local air quality forecasts and reports on local TV or radio.
- Visit the BC Ministry of Environment (<http://www.env.gov.bc.ca:8000/pls/aqis/air.summary>) or the GVRD ([www.gvrd.bc.ca/aqi](http://www.gvrd.bc.ca/aqi)) websites for local air quality information.

For more information, contact The British Columbia Lung Association at (604) 731-5864. 1800-665-5864 outside the lower mainland.

# WHAT IS IN THE AIR WE BREATHE?



**Air quality** is measured by the level of pollutants in the air. But what affects air quality? Factors include the type and amount of pollutants released into the air as well as weather conditions (such as wind speed, precipitation and temperature) and local topography (such as nearby mountains) that influence how quickly pollutants are mixed in the air. Air quality is not a constant - it can vary greatly from one location to the next and from one hour to the next. The levels of certain key air pollutants are measured at monitoring stations around the province by the BC Ministry of Environment, the Greater Vancouver Regional District (GVRD), the Fraser Valley Regional District (FVRD), other agencies and industry. This second annual State of the Air report summarizes the 2005 levels of *nitrogen dioxide, sulphur dioxide, fine particulate matter* and *ozone* across BC.

**OXIDES OF NITROGEN (NO<sub>x</sub>)** are a group of highly reactive gases that include nitrogen dioxide (NO<sub>2</sub>) and nitric oxide (NO). In the atmosphere, NO reacts to form nitrogen dioxide (NO<sub>2</sub>), an odorous, brown, highly corrosive gas that is harmful to our health and our environment. NO<sub>2</sub> is also of concern because it contributes to ozone formation. NO<sub>x</sub> forms when fuel is burned at high temperatures. The majority of NO<sub>x</sub> emissions in BC come from transportation sources, including passenger vehicles, commercial trucks, marine vessels and non-road engines. Outside of the Lower Fraser Valley, the pulp and paper industry and the upstream oil and gas industry are also a significant NO<sub>x</sub> sources.

**SULPHUR DIOXIDE (SO<sub>2</sub>)** is a colourless gas that smells like a struck match. It is irritating to the lungs, and in high concentrations, can damage leaves on trees and agricultural crops. SO<sub>2</sub> is emitted by the burning of sulphur-containing fossil fuels and the processing of sulphur-containing ores. In the Lower Fraser Valley, marine vessels and the petroleum products industry are the two largest contributors to SO<sub>2</sub> emissions. In other parts of BC, the upstream oil and gas industry, the pulp and paper industry and the marine transportation sector are the largest contributors.

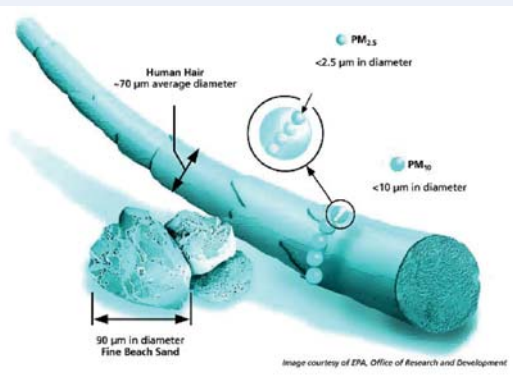
**PARTICULATE MATTER (PM)** refers to a combination of microscopic solid and liquid particles that are suspended in the air we breathe. Particle size is usually measured in units

of one millionth of a metre - a "micron". When inhaled, particles between 2.5 and 10 microns in diameter tend to get trapped in our upper and middle airways. Particles less than 2.5 microns in diameter, referred to as *PM<sub>2.5</sub> or fine particulate matter*, are the biggest concern to our health because they can be inhaled deeply into the lungs.

In most interior communities, wood smoke from prescribed burning and residential wood stoves is a large contributor of PM<sub>2.5</sub>. Industrial sources such as pulp mills and beehive burners also generate PM<sub>2.5</sub> emissions in some BC communities. In more heavily populated areas of BC, such as the Lower Fraser Valley, motor vehicle exhaust especially from diesel powered vehicles is a significant source of PM<sub>2.5</sub>. PM<sub>2.5</sub> is also formed in the air from pollutant gases, including NO<sub>x</sub>, SO<sub>2</sub>, hydrocarbons and ammonia.

**OZONE (O<sub>3</sub>)** is an extremely reactive gas molecule composed of three oxygen atoms. The ozone found high in the upper atmosphere shields us from the sun's ultraviolet rays. However, at ground level, O<sub>3</sub> can cause damage to crops, trees, and materials, and harm to human health. Ground-level O<sub>3</sub> is formed in the air through complex chemical reactions involving NO<sub>x</sub> and hydrocarbons in the presence of sunlight. Ground-level O<sub>3</sub> is a key ingredient of *smog*.

Each of the above pollutants can affect *human health*. Symptoms range from eye, nose and throat irritation, coughing and shortness of breath, to a reduction in lung function, worsening of existing heart and lung diseases, and even premature death. Of these pollutants, the greatest health impacts have been linked to PM<sub>2.5</sub> and O<sub>3</sub>, which we describe in further detail in the following sections.



# WHAT ARE GOVERNMENT AGENCIES DOING TO IMPROVE AIR QUALITY?

The responsibility to manage air emissions is spread across federal (Environment Canada, Health Canada), provincial (BC Ministry of Environment), and local levels of government (Greater Vancouver Regional District, Fraser Valley Regional District and local municipalities).

## ENVIRONMENT CANADA

Environment Canada is working to improve air quality in BC through:

- reducing emissions from *on-road vehicles* by:



- > implementing stricter engine and fuel regulations to reduce vehicle emissions
- > adding technical input and assistance for TransLink's AirCare program

- > funding installation of emission reduction technology for diesel-powered school buses, transit buses and municipal vehicles

- reducing *commercial and industrial emissions* by:

- > developing a regulatory program to reduce hydrocarbon emissions from consumer and commercial products

- > implementing sector-specific initiatives to reduce specific air toxics

- reducing emissions from *marine vessels, ports and railways* by:

- > advancing an international approach

to reduce sulphur in marine vessel fuels



- > collaborating at the international level to address ship emissions

- > working with the railway sector to reduce emissions from trains in Canada

- improving *scientific understanding* of air quality issues by:

- > investigating new air quality science, modelling and monitoring

- > assessing the economic impact of visibility degradation on tourism revenue and quality of life

- > funding air quality and public health research

- > providing information to Canadians about air emissions through the National Pollutant Release Inventory

- > collaboratively supporting the National Air Pollutants Surveillance program, which helps monitor air quality in BC

- > assessing new environmental technologies

- conducting *environmental assessments* for significant new projects, and



- participating in *collaborative initiatives* with other agencies

## HEALTH CANADA

The mandate of Health Canada's Safe Environment Programme is to promote and protect the health of Canadians by managing health risks posed by environmental factors in living, working and recreational environments. In BC, Health Canada is supporting on-going scientific research on health and air quality. This research, conducted by local universities, will help determine sources of



greatest concern in the Georgia Basin-Puget Sound airshed and to develop an understanding regarding transboundary air quality conditions, potential future trends, and associated impacts on human health ([www.cher.ubc.ca/UBCBAQS/welcome.htm](http://www.cher.ubc.ca/UBCBAQS/welcome.htm)). Proposed projects will address particular health and environmental concerns in the airshed. This will include performing detailed mapping, modelling and validation studies with consideration to the local geography and meteorology; and performing life course epidemiological studies in vulnerable populations such as older adults or individuals with compromised health.

## BC MINISTRY OF ENVIRONMENT

The BC Ministry of Environment delivers a range of initiatives and programs to improve air quality in

*cont'd on page 14*

**OUTDOOR WOOD-FIRED BOILERS**

The number of outdoor wood-fired boilers is increasing, due to high energy costs

and the availability of beetle kill wood.

Outdoor boilers are not subject to any provincial emission control requirements.



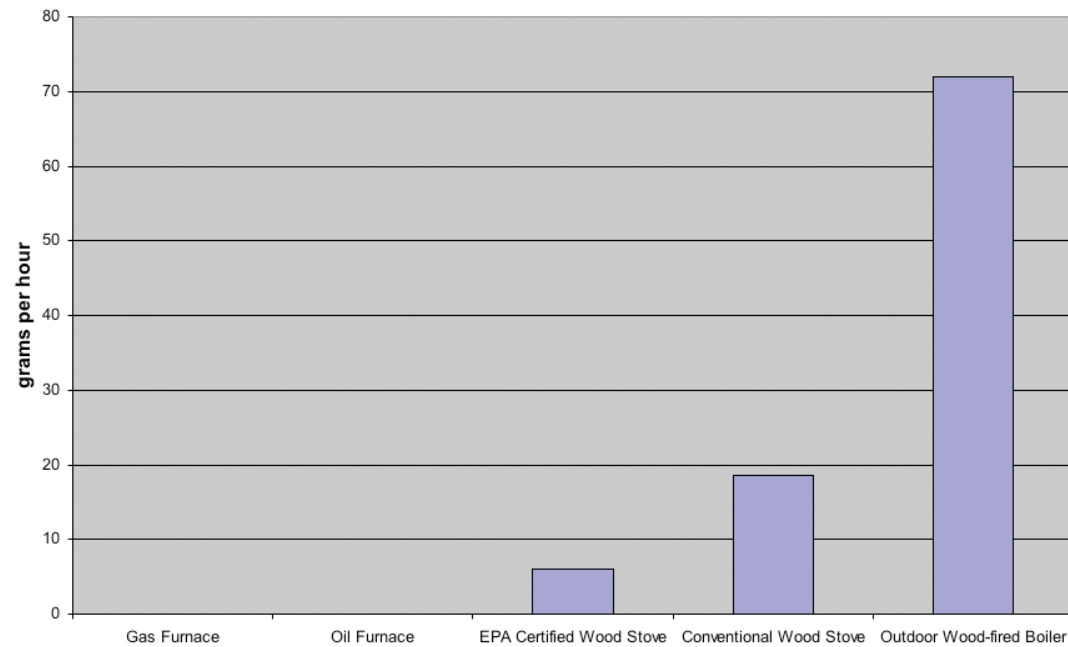
The Cities of Quesnel and Prince George, and the Regional District of Central Okanagan have adopted bylaws that prohibit the installation of non-emission-certified wood-burning appliances within city limits, including woodstoves, wood furnaces and outdoor boilers. *Figure 5* compares PM emissions from outdoor wood-fired boilers to other heating options.

**OTHER LOCAL ACTIONS**

A number of BC communities have enacted bylaws to control wood smoke emissions from sources such as

woodstoves and backyard burning. These communities include Prince George, Quesnel, Kelowna, Golden, Castlegar, Saanich and the GVRD. The City of Kelowna is aggressively addressing outdoor burning by inspecting all fires before they are set to ensure that they do not have prohibited materials and that wood is dry enough. In the central Okanagan, a program to encourage the chipping of orchard stumps as opposed to burning them has prevented an estimated 90 tonnes of particulate matter from being emitted (based on 2004 estimates).

*Figure 5: PM Emissions from Various Heating Options*

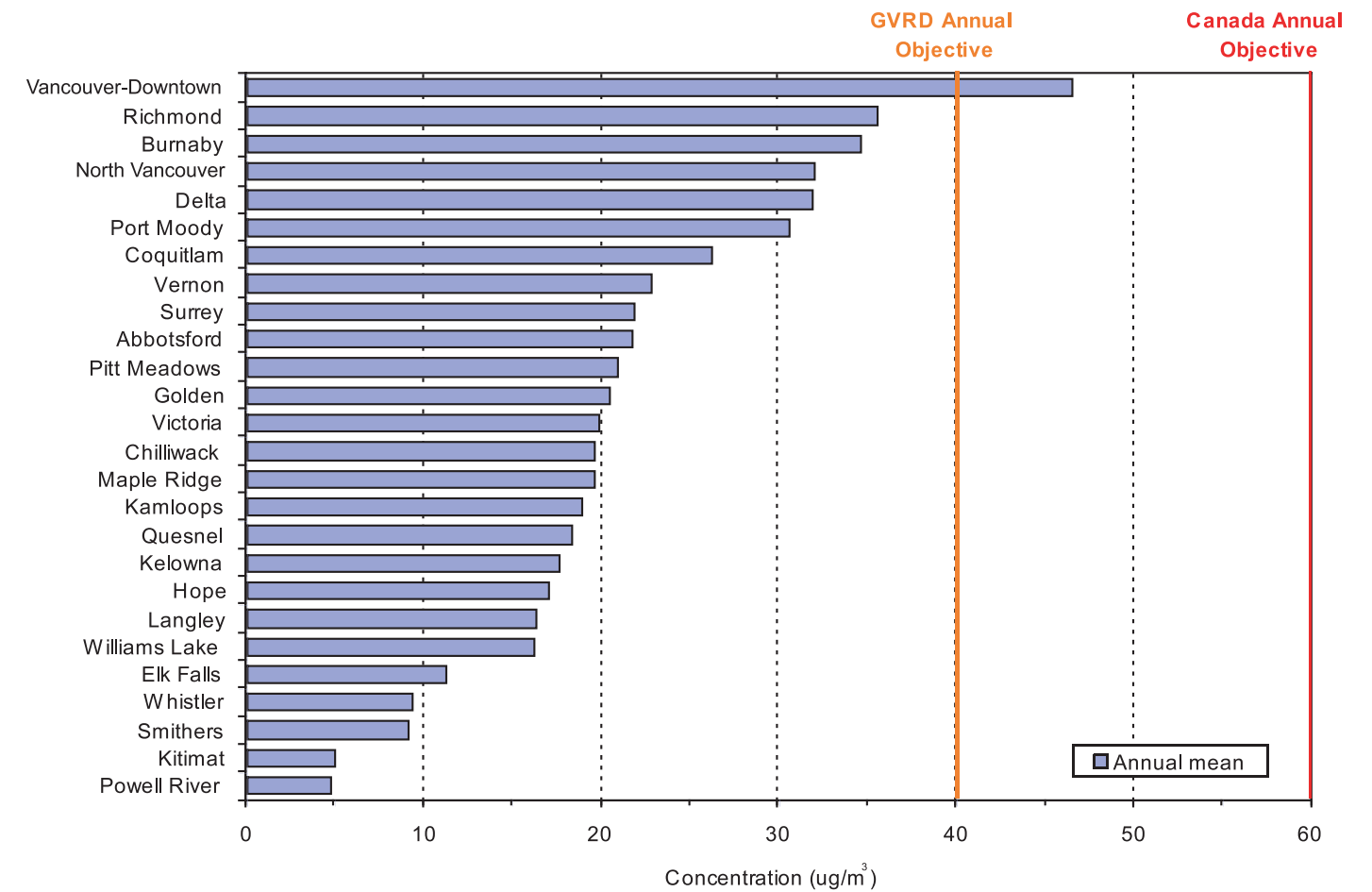


Source: Environmental Protection Bureau of New York State

**WHAT ARE THE AIR POLLUTION LEVELS IN YOUR AREA?**

**NITROGEN DIOXIDE**

Urban communities in BC tend to experience higher levels of NO<sub>2</sub>, due to the influence of traffic. In 2005, the highest annual average NO<sub>2</sub> levels were observed in Vancouver, Richmond and Burnaby and the lowest were observed in Smithers, Kitimat and Powell River (*Figure 1*). In Vancouver, the annual average NO<sub>2</sub> concentration reported for Downtown Vancouver exceeded the new NO<sub>2</sub> objective set by the GVRD for the Greater Vancouver area. However, Vancouver, and all other BC communities where NO<sub>2</sub> was monitored, met the Canadian annual objective for NO<sub>2</sub>.



*Figure 1: Ambient Concentrations of NO<sub>2</sub> across BC in 2005*

If your community does not appear in the figures showing ambient pollutant concentrations, your community may not be equipped with an ambient air quality station.

## SULPHUR DIOXIDE

In 2005, the highest annual average of SO<sub>2</sub> in the air were observed in the following communities: Prince George, Vancouver, Kitimat, North Vancouver, Burnaby, Taylor and Port Moody (Figure 2). Most of these communities have one or more industrial sources of SO<sub>2</sub>, such as a pulp mill or a refinery.

The exceptions are Vancouver and North Vancouver, where marine and port activities, industry and motor vehicles are likely affecting local SO<sub>2</sub> levels. None of the monitoring locations experienced SO<sub>2</sub> levels greater than the BC objective for annual average SO<sub>2</sub> concentrations.



BC Annual Objective

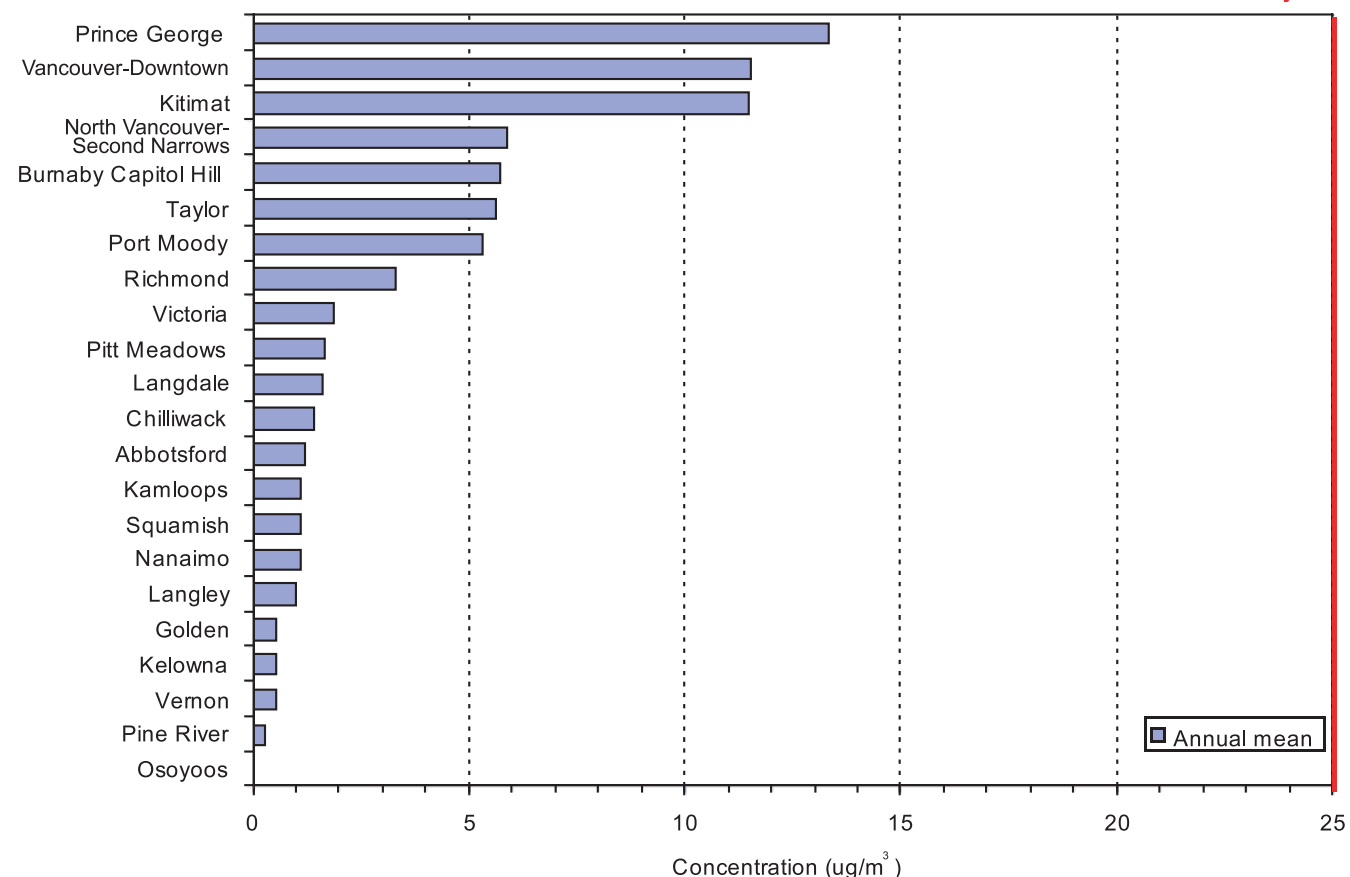


Figure 2: Ambient Concentrations of SO<sub>2</sub> across BC in 2005

## A SOURCE OF CONCERN: WOOD SMOKE

Like cigarette smoke, wood smoke contains many toxic products of combustion, and several studies have related exposure to wood smoke to lung symptoms such as coughing, asthma, congestion, and wheezing.

### WHAT ARE THE SOURCES OF WOOD SMOKE?

An inventory of air emissions in BC indicates that the wood industry, prescribed burning and residential wood burning are major sources of wood smoke. Provincial totals do not necessarily reflect the mixture of sources within individual communities. For example, residential woodstoves account for an estimated 40% of total PM<sub>2.5</sub> emissions in Golden, and only 3% in the Lower Fraser Valley.

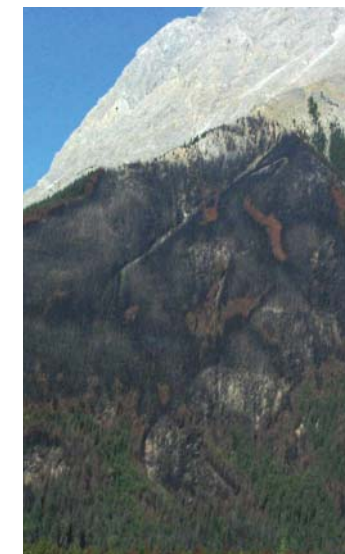
### WHAT IS BEING DONE ABOUT WOOD SMOKE?



### FORESTRY SECTOR

The *BC Open Burning Smoke Control Regulation* encourages the reduction and re-use of land-clearing waste over burning the material. It requires those wanting to start a land-clearing fire to first check that local air ventilation conditions are suitable for burning.

The *mountain pine beetle infestation* in interior forests poses an ongoing air quality challenge. Some beetle-infested trees are burned to prevent the spread of beetle populations to other areas. Logging debris from the harvesting of beetle-infested trees is burned to reduce wildfire risk and ease replanting. This has also resulted in increased logging truck traffic through some interior communities, with associated diesel emissions.



### WOODSTOVES

The *BC Solid Fuel Burning Domestic Appliance Regulation* specifies particulate emission limits and labelling requirements for all new woodstoves, fireplace inserts and factory-built fireplaces for use in BC.

Studies have shown that the emission reductions from removing one old woodstove are equivalent to removing seven diesel buses. Many BC communities have participated in woodstove change-out programs, where financial incentives are provided for users to trade in old woodstoves with new, cleaner-burning stoves. To date, only about 1,200 old woodstoves have been replaced out of an estimated 120,000 conventional woodstoves in BC. A pilot study examining more efficient woodstove change-out programs is underway in the Skeena region.

Proper burning techniques are also important in minimizing smoke from woodstoves. Natural Resources Canada has developed various publications under a program known as Burn-it-Smart ([www.burnitsmart.org](http://www.burnitsmart.org)). In recent years, the Wood Energy Technicians of BC have offered various Burn-it-Smart evening workshops.

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### EMISSION STANDARDS FOR NEW DIESEL ENGINES

The federal government has established national engine and fuel standards for on-road and off-road diesel engines. On-road diesel engine emission standards have progressively become more stringent. New emission standards for non-road diesel engines will be phased in from 2008 to 2014.

New emission standards are only applicable to newly manufactured diesel engines. They will help reduce diesel emissions as old equipment is removed from service and replaced. However, the full emission benefits will not be realized until 20 to 30 years from now because of the durability and the slow turnover rate of existing diesel engines.

### LOCAL ACTIONS

In BC, a number of voluntary incentive programs have been initiated or implemented to further reduce diesel emissions:

- The BC School Bus Emission Reduction Project recently retrofitted about 550 school buses with diesel oxidation catalysts and closed crankcase ventilation.
- In 2005, 70 municipal trucks were retrofitted with diesel oxidation catalysts through a partnership between

Environment Canada, the GVRD, and nine municipalities (North Vancouver, Delta, Vancouver, Maple Ridge, New Westminster, Whistler, Richmond, Coquitlam, and Mission).



- TransLink has purchased many electric trolley and natural gas buses for use in their fleet and will be testing different bus technologies.

- BC Transit and TransLink retrofitted 37 diesel buses with diesel oxidation catalysts.

- Environment Canada, in partnership with GVRD, conducted a diesel emission reduction workshop in September 2005 for fleet and environmental managers and additional workshops are planned for 2006.

- The BC Biodiesel Market Development Project is building awareness of biodiesel as a viable cleaner fuel, helping fleet managers, creating demand and fostering production of biodiesel in BC.

- The GVRD's Air Quality Management Plan calls for diesel engine retrofits and the use of cleaner fuels. To that end, \$200,000 has been allocated annually for 2006, 2007 and 2008 for diesel emissions reduction projects, subject to matching funds from other levels of governments or the private sector. The FVRD will also be a funding partner.

- The Georgia Basin Marine Vessel Working Group is working to advance an international approach to reduce sulphur in marine vessel fuels.

## FINE PARTICULATE MATTER

Many BC communities now measure concentrations of PM<sub>2.5</sub> in the air. Most met the Canada-wide Standard in the three-year period of measurement from 2003 to 2005 (Figure 3). Both Prince George and Golden exceeded the standard. However, the high concentrations in Golden, as well as in other communities such as Kamloops and Kelowna were strongly influenced by 2003 forest fires.

Coastal communities typically experience lower levels of PM<sub>2.5</sub> in the air than interior communities. Many interior communities are located in mountain valleys, where temperature inversions and calm winds periodically lead to a build-up of contaminants in the air.

We do not have a long history of PM<sub>2.5</sub> monitoring - five years or less in many BC communities. An Environment

Canada analysis, based on six stations with five years or more of data, revealed no significant (increasing or decreasing) trend in PM<sub>2.5</sub> levels over time.

*Research has not demonstrated a PM<sub>2.5</sub> concentration that can be considered absolutely safe. A Canada-wide Standard for PM<sub>2.5</sub> has been adopted by federal, provincial and territorial governments to minimize health impacts and protect the environment. In addition to meeting the standard by 2010, governments must develop programs that support continuous air quality improvement.*

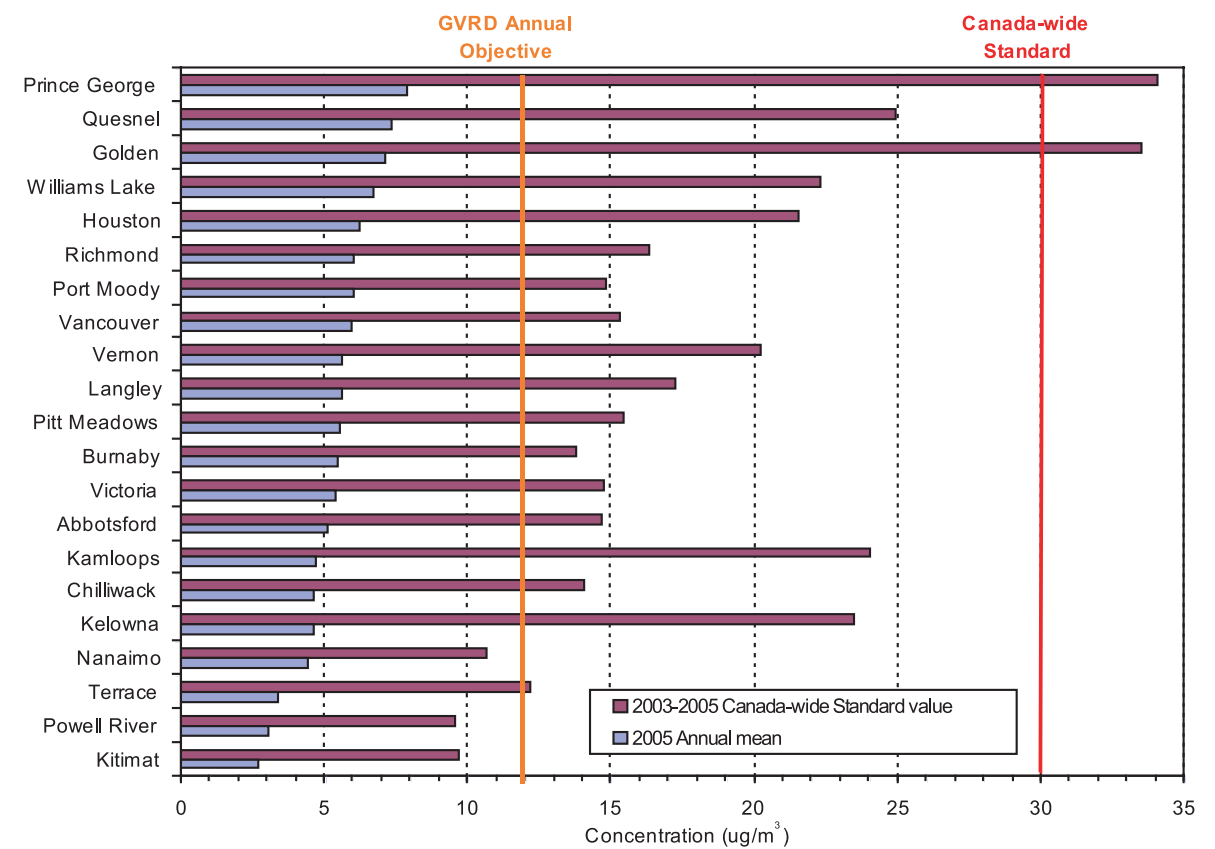


Figure 3: Ambient Levels\* of PM<sub>2.5</sub> across BC

\* The PM<sub>2.5</sub> Canada-wide Standard applies to the three-year average of the annual 98th percentile 24 hour average concentration.

## GROUND-LEVEL OZONE

Between 2003 and 2005, the highest ground-level O<sub>3</sub> concentrations were measured in the eastern Lower Fraser Valley (Hope, Chilliwack, Maple Ridge) (Figure 4). The Hope monitoring station is the only one where the Canada-wide Standard was exceeded. Outside the Lower Fraser Valley, the highest levels of O<sub>3</sub> were observed in Kamloops and Kelowna.

Environment Canada conducted an analysis of long-term O<sub>3</sub> trends in Vancouver, Port Moody, Chilliwack, Hope and Kelowna. The O<sub>3</sub> data were corrected for meteorological conditions that may hide the true long-term trends. In Chilliwack and Kelowna, the daily average O<sub>3</sub> concentra-

tions have increased over the past decade, but by amounts less than 1 ppb per year. No significant trends were reported at the other sites.

*The Canada-wide Standard for O<sub>3</sub> represents a balance between human health and environmental protection and the feasibility and costs of reducing emissions. Research has not demonstrated an O<sub>3</sub> concentration that can be considered absolutely safe for humans. Even areas that meet the standard may require action to reduce exposure levels and potential health impacts.*

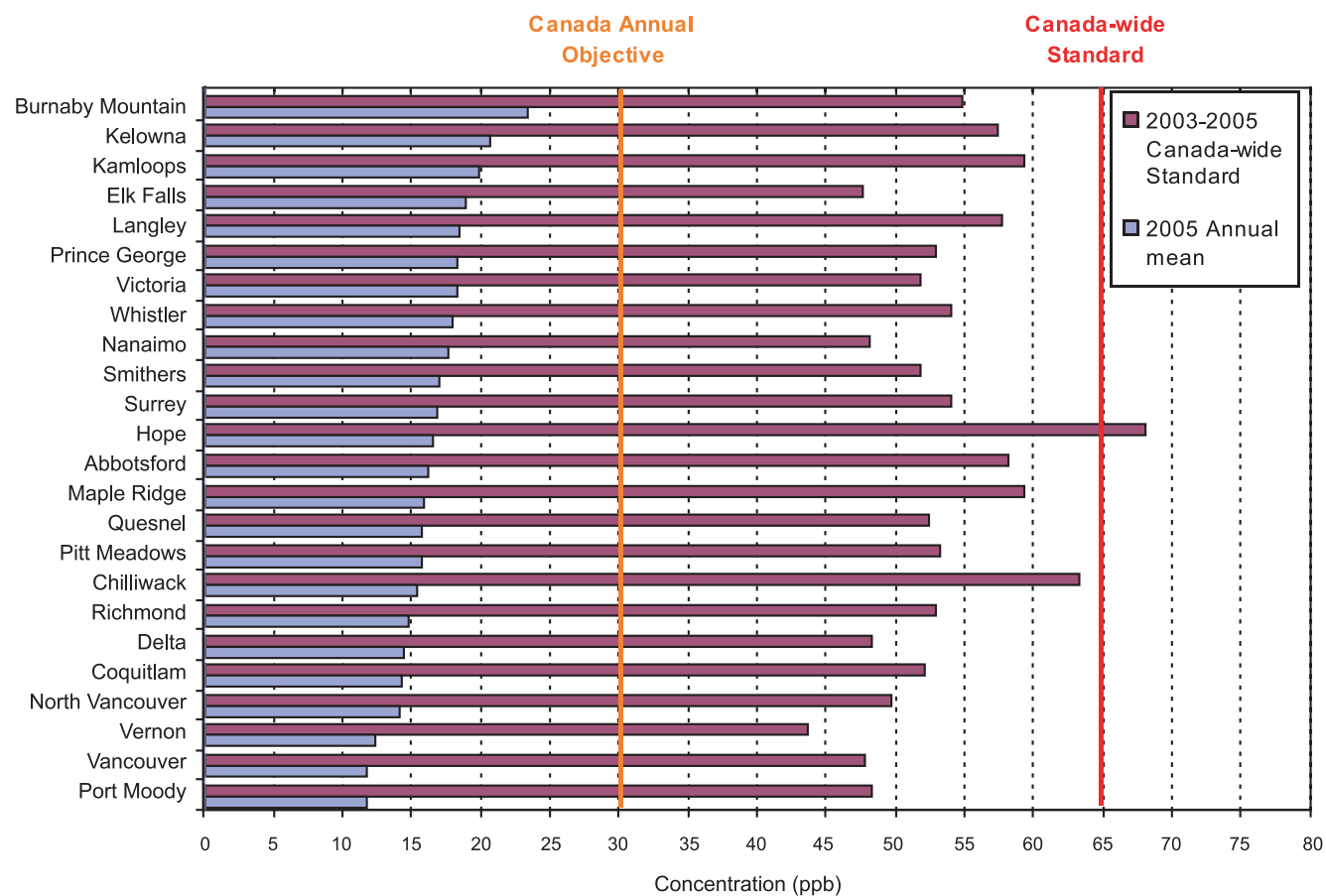
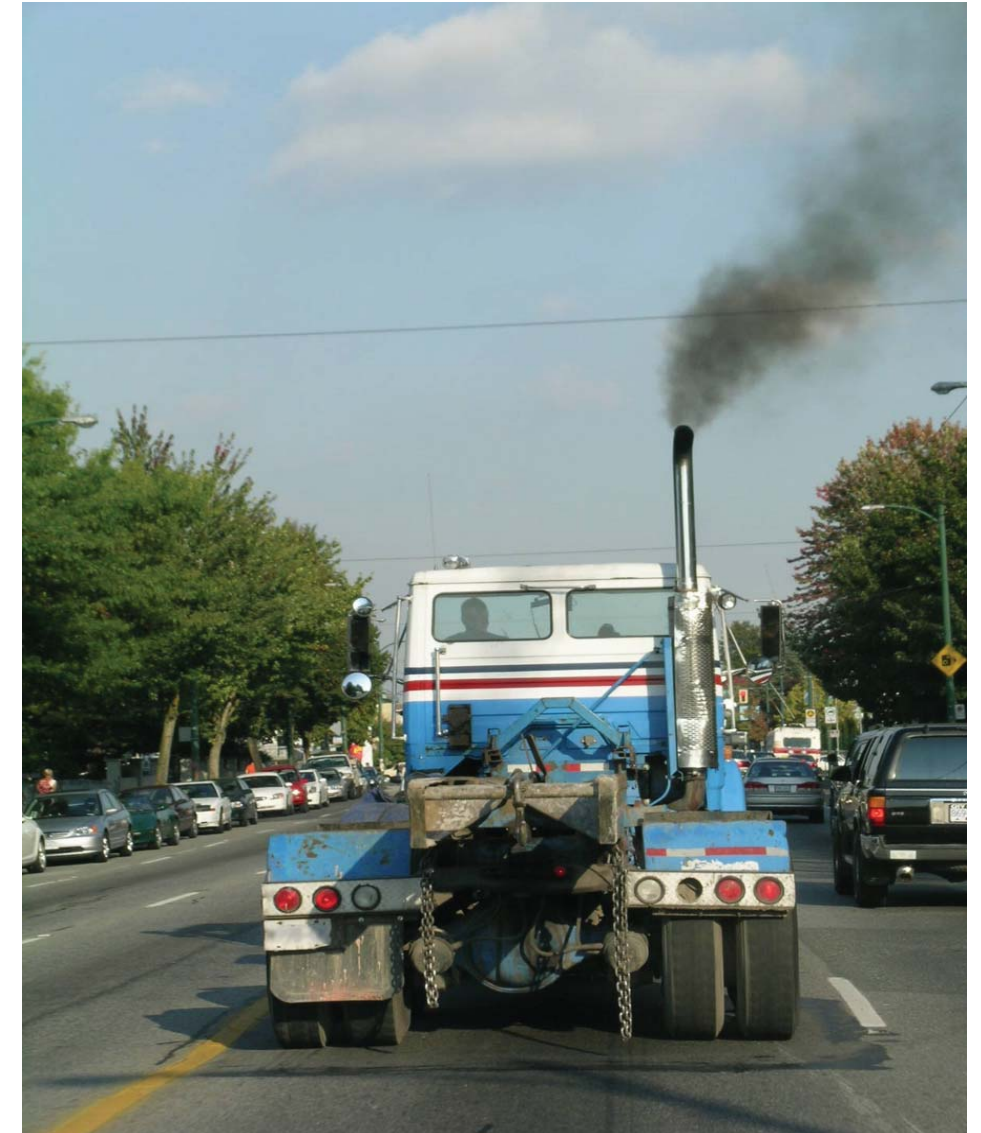


Figure 4: Ambient Levels\* of Ozone across BC

\* The O<sub>3</sub> Canada-wide Standard applies to the three-year average of the annual 4th highest eight-hour average concentration.

## A SOURCE OF CONCERN: DIESEL EMISSIONS

Emissions from diesel engines consist of a complex mixture of particulate matter, smog-forming pollutants, and other toxic ingredients. Diesel exhaust can cause serious health effects in adults and greater harm to children, the elderly and other vulnerable populations. Short-term effects of exposure to diesel exhaust include irritation of the eyes, nose and throat, wheezing, chest tightness, coughing and shortness of breath. Long-term diesel exhaust exposure may worsen many health problems, including heart and lung disease, and may increase cancer risk and premature mortality. The US Environmental Protection Agency has classified diesel particulate matter as a probable cancer-causing substance.



### WHAT ARE THE SOURCES OF DIESEL EMISSIONS?

Because of the reliability, durability, and fuel efficiency of diesel engines, there are many diesel-powered trucks, buses, ships, and non-road vehicles (for example, bulldozers, backhoes and tractors) operating in BC. Diesel vehicles and engines are a significant source of air pollution in BC.

### WHAT IS BEING DONE ABOUT REDUCING DIESEL EMISSIONS IN BC?

Recent studies indicate that every \$1 invested in diesel emission reduction provides an average of \$13 in public health benefits. Strategies for reducing diesel emissions include:

- replacing existing diesel engines with newer and cleaner engines,

- retrofitting existing diesel engines with add-on control technologies, such as diesel particulate filters or diesel oxidation catalysts, and

- switching from diesel to cleaner fuels, such as ultra low-sulphur diesel fuel, reduced sulphur marine fuel, biodiesel or natural gas.