REGIONAL DISTRICT OKANAGAN-SIMILKAMEEN

AIR QUALITY MANAGEMENT PLAN

2006

For further information please contact:
Janice Johnson
RDOS Air Quality Clerk
janicejohnson@rdos.bc.ca
492-0237 or toll free 1-877-610-3737

Regional District Okanagan-Similkameen
Air Quality Management Plan

2006

TABLE OF CONTENTS

Executive Summary

Why do local governments and citizens need to be concerned with Air Quality in the Okanagan-Similkameen? The answer is that although the science of Air Pollution is now definitive, the public and many policy makers do not know what is in the air, what chemicals and toxic compounds human activity introduces into the air, or the effects of those pollutants on human health.

The RDOS Air Quality Committee and RDOS Board of Directors have been acting to protect and improve our air quality and have approved the following vision statement:

Air Quality in the Regional District Okanagan-Similkameen will be safeguarded and improved so that it:

- Consistently protects and promotes human and environmental health
- Promotes excellent visibility
- Addresses issues of global warming and climate change
- Addresses unforeseen negative impacts upon air quality
- Enhances economic development

To achieve these objectives, the Air Quality Committee has identified the following pollutant sources, as those that need to be addressed through a combination of Public Education and Pollution Reduction Programs:

1. Garbage Burning
   Wood Burning
   Yard Waste Burning

2. Engine Emissions

3. Dust

Smoke, fine dust and vehicle emissions have been identified as the three main air pollutants in the Okanagan-Similkameen. Wood smoke contains more than 100 different toxic substances including fine particulate matter, the size of bacteria. When inhaled, these toxins and particulate matter can reach the deepest parts of the lungs and even enter the blood stream. Scientists now believe there is no threshold or “safe” level of exposure to particulate matter (smoke). Research has shown that increased levels of small particulate are responsible for health effects including physical symptoms, days lost from work and school, emergency room visits, hospitalizations, and even premature death.

In addition to these adverse health effects, air pollutants result in poor visibility, unsightly smoke plumes and the haze of smog, all of which negatively impact our quality of life and regional economic development, including tourism.

The RDOS Air Quality Management Plan will serve as an information document for policy and decision makers and will also act as a roadmap for addressing air quality concerns in the RDOS, in a cost effective and common sense manner.

The central recommendations in this Air Quality Management Plan are:

- To utilize the comprehensive, multi-faceted Communication Materials prepared under the Air Quality Committee to promote Education and Awareness of the facts, issues and alternatives concerning smoke.

- To Eliminate Garbage burning by providing educational materials through a public information campaign and pollution reduction programs.

- To minimize smoke from wood and yard waste burning by providing educational materials through a public information campaign and pollution reduction programs.

- To minimize smoke from wood burning appliances by providing educational materials through a public information campaign and pollution reduction programs.

- To continue sponsorship of voluntary vehicle emissions clinics and anti-idling programs.

- To integrate regional air quality goals into all policies including waste management, land use and transportation planning.

Local activities, such as the burning of leaves or a poorly operating wood stove, can have serious health effects on immediate neighbours, although the impact on the overall Airshed may not be apparent.

The science of clean air may be complex, but the conclusions are simple: whatever is in the air will end up in someone's lungs and create health concerns.

Public education and motivation, as well as the extent and source of project funding, will influence the rate and sequence of progression that Air Quality initiatives will be accomplished.

PART 1

RDOS Air Quality Committee - Regional Air Coalition

It has been my honour to Chair the Regional District of Okanagan-Similkameen Air Quality Committee over the past three years. The success of this committee is due to the citizens who unselfishly volunteered their time to better our lives, the Directors who spent hours debating and formulating plans and the past Board of Directors, for supporting not only in words, but through the Budget process, efforts to make this committee the success it is.

This Air Quality Management Plan for the Regional District of Okanagan-Similkameen started in 2001 when Interior Health, B.C. Environment, Environment Canada and the B.C. Lung Association brought together experts and concerned citizens in Penticton. Jane Coady, a Director at the Regional District and City of Penticton Councilor, seized the opportunity to form an advocacy group to address air quality in the RDOS.

From this group came a partnership between the RDOS and North and Central Okanagan Regional Districts, known as the Okanagan Valley Air Shed Coalition, to share experiences and expertise for the betterment of all Valley residents. In 2003 the Board established the RDOS Air Quality Committee with specific guidelines and goals, changing the focus from advocacy to action.

In the course of developing the Air Quality Management Plan, the Committee embarked on several initiatives including teaching residents how to Burn It Smart in their wood stoves, the importance of properly maintained vehicles through Emission Control Clinics, while at the same time analyzing the air quality with the assistance of the Provincial and Federal Governments.

The Committee recognizes the challenges of maintaining and improving air quality while the population of the RDOS and the Okanagan valley continues to grow. The need to address outdoor burning, improper wood stove burning, garbage burning, engine emission reduction and highway and other dust, have been identified as the premier challenges for the coming years.

With the commitment of the 2006 Board, I am confident the Committee will reach the objectives set out in this Air Quality Management Plan. Good luck and thank-you to all participants.

Bill Schwarz
Chair, RDOS Air Quality Committee
Director, RDOS

The RDOS Air Quality Planning Process

The RDOS addresses issues of Air Quality through an Air Quality Committee, currently chaired by Director, Bill Schwarz. The Terms of Reference of the Committee were established as follows:

The Committee is charged with the development and preparation of guidelines for an implementation strategy of an Air Quality Management Plan for the Regional District of the South Okanagan-Similkameen subject to Regional Board approval and includes the following process:

AIR QUALITY PLAN DEVELOPMENT PROCESS

1. Determine the existing state and projected trends for the air quality in the South Okanagan-Similkameen area.
2. Determine the potential health effects related to the state and projected trends of air quality in the South Okanagan-Similkameen area.
3. Develop air quality management goals. Determination that the necessary authorities can be coordinated or put in place to meet air quality management goals.
4. Determine the additional data requirements and research needs necessary to develop the air quality management plan including the identification of potential funding sources and undertake to secure such.
5. Draft the Air Quality Management Plan and prepare implementation strategies to attain the air quality goals.
6. Submit the draft plan and implementation strategies for review and approval of affected agencies.
7. Finalize the plan and co-ordinate the implementation.

The committee is now in Stage 6 of this Development Process and this RDOS Air Quality Management Plan has been submitted to the appropriate Agencies for review.

RDOS Air Quality Management Plan General Objectives

The Vision Statement of the RDOS Air Quality Management Plan is designed to be proactive. It states:

"Air Quality in the Regional District Okanagan-Similkameen will be safeguarded and improved so that it:

- Consistently protects and promotes human and environmental health
- Promotes excellent visibility
- Addresses issues of global warming and climate change
- Addresses unforeseen negative impacts upon air quality
- Enhances economic development

In order to achieve these objectives the Air Quality Committee has identified the following pollutant sources, as those that need to be addressed through a combination of Public Education and Pollution Reduction Programs:

1. Garbage Burning
2. Wood and Yard Waste Burning
3. Engine Emissions
4. Dust
5. Continued research into other sources

Prioritization of Air Pollution Risks

The primary concern of the Air Quality Management Plan is to minimize the effects of air pollution on Human Health. Air Pollution risks will be addressed in the most cost effective manner to minimize harmful exposure. Particulate Matter$_{2.5}$ ($PM_{2.5}$) as defined on page 10 has been identified as the primary risk.

RDOS Air Quality Management Plan Implementation

Responsibility to undertake implementation of the RDOS Air Quality Management Plan remains with the RDOS Air Quality Committee and RDOS Air Quality staff as outlined in the Committee's Terms of Reference, item 7.

Implementation strategies and programs recommended within this Air Quality Management Plan, and at the discretion of the Air Quality Committee, be the responsibility of the RDOS Air Quality staff working in conjunction with all stakeholders, with technical assistance as required.

Air Quality Consultation Partners & Stakeholders

Local Governments within Okanagan-Similkameen Region

Regional District:	Regional District of Okanagan- Similkameen
City:	Penticton
	District: of Summerland
Towns:	Oliver, Osoyoos, Princeton
Village:	Keremeos

Indian Bands within Okanagan-Similkameen Region:

Penticton Indian Band, Osoyoos Indian Band, Upper Similkameen Indian Band, Lower Similkameen Indian Band.

Government outside Okanagan-Similkameen Region:

Okanagan Air Coalition	Regional Districts of North Okanagan, Central Okanagan, and Okanagan-Similkameen
Provincial Government	
Ministries:	Environment, Health, Agriculture & Lands, Forests & Range, Transportation
Crown Corporation:	ICBC
Health Authority:	Interior Health Authority
Federal Government	Natural Resource Canada, Transport Canada, Environment Canada, Health Canada
Private and Public Stakeholders:	BC Lung Association BC Cancer Association BC Transit Okanagan Similkameen Health Region (IHA) School District #67 Okanagan Skaha School District # 53 Okanagan Similkameen CHBC, Cable 17, Shaw, & local media Penticton Breathers Okanagan Society of Independent Film Makers OK in Health University of British Columbia Okanagan College Agricultural Associations

PART 2

The Air We Breathe

Without air, there could be no life on earth. People can live more than a month without food and a week without water, but a person can only live a few minutes without air.

The Earth's air (atmosphere) consists of a mixture of gases that extends from the earth's surface to outer space. The atmosphere is divided into four layers according to differences in temperature. Nearly all the Earth's weather – including rain, snow and most clouds, occur in the first layer (troposphere), which extends about 6 miles (10 Kilometers) over the poles and 10 miles (16 Kilometers) above the equator. At this elevation, air has become too thin (lacking in oxygen) to support life. The air over the Okanagan extends about 7.5 miles above the surface – roughly the length of Skaha Lake. That's not a lot of air.

Air is usually warmest near the earth's surface because sunlight heats the ground and water, which in turn warm the air above. Thus air typically becomes colder at higher elevations. As warm air rises, it carries with it surface generated pollutants and disperses them in the air.

Water vapour, particulate matter and carbon dioxide in the air absorb heat from the sun and prevent some of the surface heat created by sunlight from escaping back into space. This behavior is known as the Greenhouse effect and helps keep the Earth warm.

Sometimes, especially during winter, a layer of warm air settles over a layer of cool air lying near the ground. This situation is called a temperature or thermal inversion.
Thermal inversions often take place in valleys where mountain walls limit the movement of air. The worst air pollution outbreaks occur during thermal inversions because cold air near the ground traps pollutants at the surface level and the warm air acts as a lid, preventing pollutants from rising and scattering. A thermal inversion will last until rain or wind breaks up the overlying layer of warm air.

Airflow near the surface and aloft in the Okanagan Valley is never the same on any two days. That said, in Penticton, the wind blows mostly form the north or the south, in the direction of the valley orientation. In January, winds are mostly (40%) form the south (and relatively strong) and to a lesser degree (25%) from the North. In July the situation is reversed – winds are mostly form the north (60%) and to a lesser degree from the south (12%). Winds at higher elevations often blow perpendicular to the valley.

What Is Air?

Air consists of a mixture of gases. The principal gases of air are nitrogen (78% of dry air) and oxygen (21% of dry air). The remaining 1% of gases in the air are primarily argon with extremely small amounts of carbon dioxide, neon, helium, krypton, hydrogen, xenon and ozone. The other gas in the air is water vapor (water in gaseous form), which occurs in varying degrees we refer to as Relative Humidity. When water vapor turns to liquid, air carries the tiny droplets and crystals in the form of clouds until they become heavy enough to fall as rain or snow.

Many small particles of dust and other pollutants are suspended among the gases of the air. The suspended particulate matter are called aerosols and are also referred to as particulate matter or PM. They are invisible to the human eye even in large numbers. Many aerosols enter the air from volcanoes, automobile exhaust, forest and brush fires, and smoke. Wind carries

particles of dust and sand up from the earth into the air. Other aerosols include pollen from plants, salt from the oceans, the ashes of meteors and tiny living things called microbes.

Aerosols are always being added to the air. But they do not remain there. Rain and snow wash out many aerosols, which is why air is fresher after it rains or snows. Other aerosols slowly fall to the earth. Near the earth's surface, the number of aerosols in the air varies greatly from place to place. The air over the oceans contains about 30 million aerosols per cubic foot (1 billion per cubic meter) and at the other extreme, the polluted air over a large city may contain 3 billion aerosols per cubic foot (100 billion per cubic meter). Fewer aerosols float in the higher regions of the troposphere. For this reason, the air in mountainous regions is usually more pure. When you smell the clean air of the ocean or on a mountain top, that clean air freshness is what you are not smelling – a lack of aerosols in the air.

The Oxygen and Nitrogen in the air are the building blocks of life and also form the basis of a great many chemical reactions. Humans and the other animals obtain oxygen from the air, filtered into the bloodstream through the lungs. Blood then carries oxygen to the cells of the body, where it combines with other chemicals obtained from food to produce energy and to perform the functions of the individual cells. Carbon dioxide is produced in the cells as a waste product and is expelled from the body through the respiratory system. Plants use oxygen much the same way as animals, but Plant cells make oxygen as a by-product in the process of photosynthesis. During this process, cells use energy from sunlight to make sugar, carbon dioxide and water and oxygen is expelled into the atmosphere.

Oxygen is also needed to burn most fuels. During the burning process, oxygen combines with chemicals in the fuel releasing heat in the process. For example, burning the carbon in coal or wood produces carbon dioxide and carbon monoxide (oxides). In oil and coal burning furnaces, the sulfur emissions combine with oxygen to form sulfur dioxide. Sulfur dioxide is a colorless, poisonous gas with a sharp odour that can irritate the eyes and respiratory system. It may also dissolve in water droplets to form acid rain, which can harm or kill wildlife and damage buildings. Metallic oxides combine with water to form hydroxides, while non-metallic oxides combine with water to form oxygen acids. All can be harmful pollutants.

All organisms must have nitrogen to live. Most plants must manufacture protein from simple nitrogen compounds dissolved in the soil. Some of this dissolved nitrogen comes from the atmosphere in the form of nitric acid. Lightning causes nitrogen and oxygen in the air to form compounds called nitrogen oxides. These oxides react with water to form nitric acid, which is carried to the earth dissolved in rainwater.

Some nitrogen compounds contribute to the pollution of both water and air. Nitrogen fertilizer that is not used by plants can cause water pollution. Rainwater carries the unused fertilizer to streams or lakes, where nitrogen compounds increase the rate of growth of algae and other water plants.

Ozone is a form of oxygen. Molecules of ordinary oxygen are made up of two oxygen atoms joined tightly together. Ozone molecules have a third oxygen atom loosely attached to these two. The third atom can easily separate from the molecule and combine with other substances. As a result, ozone is a chemically active gas.
Ozone is a strong cleaning agent, because it reacts with dirt and soot. It is also used to remove unpleasant odours from foods and from the air, to kill germs, and to bleach oils, fats, and textiles.

Every flash of lightning converts some oxygen to ozone. High-energy radiation from the sun, strikes oxygen in the earth's atmosphere and converts some of it to ozone.

The second layer above the earth's surface (stratosphere**)** extends from the troposphere to about 30 miles (48 kilometers) and contains most of the atmosphere's ozone. On average, air at ground level contains less than 1 part of ozone per million parts of air. But, in the stratosphere, 15 miles (24 kilometers) above the ground, there is a more concentrated layer of ozone. This layer contains only about six parts of ozone per million parts of air. This ozone, the upper ozone**,** shields the earth from much of the sun's ultraviolet light. Ultraviolet rays harm living tissue. Without this protective ozone layer, plants, animals and people could not live on the earth as they do today.

Ozone in the troposphere, usually referred to as ground-level ozone, contributes to air pollution.

Air Pollutants - Their Source and Health Risks

Air Pollution is any impurity suspended in the air or any air component existing in an out of balance state. If it isn't Oxygen, Nitrogen, Water Vapor or less than 1% argon and trace amounts of the other air components, its air pollution.

Air pollution consists of a very complex mixture of gases and particles. Some air pollutants are directly released into the air (primary pollutants), and some are formed by chemical and physical reactions that take place in the air (secondary pollutants). Whether the reactions happen, and how quickly, depend upon a number of conditions, such as temperature, humidity, and the presence of other gases.

Activities such as land development, burning fossil fuels for energy and transportation, industrial operations, residential burning, backyard burning and burning debris from forestry and agricultural operations all contribute to air pollution.

Those most vulnerable to the effects of air pollution are children ages 0-5, the elderly, pregnant women, diabetics and individuals with respiratory disease, cardiovascular disease or weakened immune systems.

Natural pollutants include dust, pollen, and soil particles. Road traction material put on roads in winter subsequently gets pulverized by vehicles into tiny particles and later gets blown into the air by wind or vehicles. Other dust sources are unpaved roads and industrial sites such as log sort yards that are unpaved and have constant traffic from heavy equipment that pulverize the soil.

Artificial pollutants are created primarily as the waste products of human activity. They can be in the form of gas or particulate matter (tiny particles of liquid or solid matter). Most air pollution results from the burning of fuel, the burning of solid wastes and from industrial processes. The growth of population and industry, and the increase in the number of automobiles and other means of transportation such as trucks, boats, and airplanes, has made air pollution an increasingly serious problem. With population growth, air quality will generally deteriorate. The air over cities and even in rural areas becomes so filled with pollutants that it harms the health of people, and also harms plants, animals, fabrics, building materials, and the economy. This is why it is essential for all communities to address the issue of air pollution.

Fine Particulate Pollution

Concerns with Human Health and air quality focus on the concentration of fine particulate matter (PM) in the air people breathe. Fine particulate matter includes all solid or liquid particles 10 micrometers (microns) or less in diameter (PM_{10}). A micrometer (micron) is a millionth of a meter. 10 microns (PM_{10}) is roughly the size of bacteria. It is important because like bacteria, it is invisible and small enough to enter the lungs. It is also small enough to seep into homes.

Within PM_{10} are many particulate that are much smaller than 10 microns. In a sample of PM_{10}, approximately 50% of the particulate matter will be equal to or less than 2.5 microns ($PM_{2.5}$).
$PM_{2.5}$ is the most dangerous form of pollution because of the types of chemical compounds included and because $PM_{2.5}$ is capable of penetrating deep into the lungs. It can collect in the air sacs (alveoli) where oxygen enters the bloodstream.

Your respiratory system is designed in part to act like a household vacuum cleaner. The nose and throat filter out particulate greater than PM_{10}. As air and PM_{10} are drawn further into the body, the Trachea and Bronchi filter out particulate greater than $PM_{2.5}$. The remaining particulate ($PM_{2.5}$) is mostly filtered out by the Alveoli of the lungs, allowing oxygen to enter the bloodstream. Many ($PM_{2.5}$) particles are smaller than 0.1 micrometer and can also enter the bloodstream.

Environment Canada scientists now believe that there is no “threshold” or safe level for exposure to $PM_{2.5}$ or PM_{10}.

PM_{10}

The coarse component of PM_{10} includes particles between 2.5 and 10 micrometers in diameter. These particles most frequently come from natural sources such as soil particles, pollen, spores, grinding processes (road dust, tilling soil etc.) and fibers (tire rubber, ground up vegetative matter).

$PM_{2.5}$

The fine component of PM_{10} includes particles 2.5 micrometers in diameter and smaller, about 1/30 the size of human hair. This component consists mainly of particles resulting from combustion (fuel, smoke and industrial emissions) and from physical and chemical reactions of various gasses such as oxides of nitrogen and sulfur with ammonia or volatile organic compounds (VOC’s). It includes very toxic dioxins and furans, which are introduced into the air by burning chemicals such as plastics and painted material. $PM_{2.5}$ can remain in the air for days or even a week and is therefore very mobile and can travel great distances. It can penetrate deep into the lungs and damages lung tissue and reduces lung function.

Although there are many types of $PM_{2.5}$ in the air, wood smoke and diesel engine exhaust are of particular concern. Like cigarette smoke, wood smoke contains many toxic products of combustion, and studies have now linked exposure to wood smoke to respiratory (lung) symptoms such as coughing, asthma, congestion, and wheezing. Diesel exhaust particles contain a mixture of chemicals including elemental carbon, toxic organic compounds, absorbed gases and trace metals. Studies have indicated that diesel exhaust may cause cancer in humans.

$PM_{2.5}$ can travel great distances, concentrating in valley bottoms and contributing to smog and reducing visibility. Other hazardous chemical pollutants may adhere to PM and increase its toxicity.

The main sources of $PM_{2.5}$ vary among regions in BC, with wood smoke being a larger contributor in most Interior communities including the Okanagan-Similkameen. Transportation sources are more significant in heavily populated areas such as the Lower Fraser Valley.

The term Smog was first used to describe the combination of smoke and fog that sometimes hangs over London and other cities with high humidity. Heavy concentrations of smog are poisonous. About 4000 Londoners died within five days as a result of thick smog in 1952.

Today, smog also refers to a condition caused by the action of sunlight on the exhaust gases from automobiles, homes, and factories. This type of smog is called photochemical smog.

London-Type Smog occurs when moisture in the air condenses on smoke particles from factories, homes, and motor vehicles, forming tiny smog droplets. A dangerous part of London-type smog is sulfur dioxide, a gas that attacks the lungs and makes breathing difficult.

Photochemical Smog involves the action of sunlight on hydrocarbons in the air. Hydrocarbons are chemicals found in the exhaust gas of gasoline, oil and other petroleum products burned as fuel. The heat produced by burning these fuels causes nitrogen and oxygen in the air to combine, forming nitrogen compounds. When activated by sunlight, these compounds undergo changes that produce gases called oxidants. One of these oxidants is ozone. Oxidants also combine with partially burned hydrocarbons in the air. One of the substances that result is called peroxyacetyl nitrate (PAN), this substance is the main poisonous product of photochemical smog. In 1948, 20 persons died and nearly 6,000 became ill from a photochemical smog over Donora, Pa. in the USA.

Smoke occurs when finely divided solid particles, particulate matter, become suspended in the air. Most smoke is caused by particles of carbon from the burning of various fuels. Smoke is bad for the health of humans and animals because of the toxic chemicals suspended in the air, which are then introduced into the body through the lungs. The harmful gases in smoke – such as carbon monoxide, nitrogen oxides, dioxins, furans, arsenic, benzapyrene, phenanthrene and acrolein – can trigger respiratory illnesses, angina, headaches and eye irritation, cause cancer and even premature death.

Weather and geographic conditions can cause smoke to collect in an area. Mountain ranges near populated areas can trap smoke in an area and when combined with a thermal inversion, result in the most dangerous accumulations of smoke and smog.

Ground level ozone contributes to air pollution and collects over urban and industrial areas that produce large amounts of VOCs and NOx.

While some ground level ozone is emitted from trees in the Okanagan, most ground level ozone is not directly emitted from sources but is one of the “secondary” pollutants formed in the air through complex chemical reactions when sunlight acts on oxides of nitrogen (Nox) from burned fuels and volatile organic compounds (VOCs). Ground level ozone may contribute to additional pollution by reacting chemically with emissions of hydrocarbons from motor vehicles. Ground level ozone changes these hydrocarbons into the pollutants found in smog. Both reactions are accelerated in areas with more sunlight and higher temperatures – such as in the Okanagan-Similkameen. Last summer ground level ozone concentrations in Osoyoos were somewhat higher than in Kelowna. This could be caused by the fact that Osoyoos has slightly more sunlight and temperatures are slightly higher.

Exposure to ground level ozone for 6-7 hours, even at low concentrations, significantly reduces lung function and can cause respiratory inflammation in healthy people during periods of moderate exercise.

Impacts on persons with heart or respiratory conditions can be very serious. Prolonged exposure can damage lung tissue, cause premature aging of the lungs, and contribute to chronic lung disease.

In low concentrations, it can irritate a person's eyes, nose and throat. In strong concentrations, ozone can damage or kill plants and trees, as well as reduce crop yield.

Because of its light diffusing properties, ozone is also responsible for much of the haze effect of urban smog.

Nitric oxide is formed as a by-product in the combustion of gasoline in automobile engines. Sunlight causes the nitric oxide in the troposphere, to react with oxygen to form ground level ozone, one of the harmful pollutants in smog.

Supersonic airplanes produce nitric oxide in the layer above where we live, the stratosphere, where the chemical compound can act as a catalyst for the decomposition of upper ozone. Upper ozone or what is sometimes referred to as good ozone, benefits humans, animals and plants by shielding the earth from harmful ultraviolet light.

Oxides of Nitrogen

Nitrogen dioxide and nitric oxide are often referred to together as "NOx" or oxides of nitrogen. NOx is formed when fuel is burned, and so is a very common air contaminant, particularly in urban areas. Key sources include combustion of fossil fuel for heat (including natural gas), transportation, and industrial uses, residential and industrial wood burning, as well as other biomass combustion sources such as agriculture burning and forest fires.

From a health perspective, nitrogen dioxide is of concern because it can irritate lung tissue and cause other respiratory problems. NOx is also of concern because of its involvement in photochemical reactions in the air to form the harmful pollutants in smog, one being ground level ozone.

The responsibility to manage air emissions from these activities is spread across federal, provincial, and local levels of government.

The Canadian government has a Federal Agenda on Cleaner Vehicles, Engines and Fuels. This program works with provincial agencies and industry to establish standards such as:

- new heavy diesel emission standards for off-road vehicles and fuels, including a reduction in sulfur content of fuel sold for off-road, rail and marine diesel, starting in 2007 and an even more significant reduction by 2010.
- Federal regulations requiring sulfur levels in gasoline for on-road vehicle to be lowered to an average concentration of less than 30 parts per million, effective Jan. 2005
- Continuing improvements to federal emissions standards for light-duty cars and trucks. For example, NOx emissions were reduced about 93% between 1993 and 2004 and a reduction of 95% is expected by 2010
- New federal standards for small "spark ignition" engines (lawn and garden equipment, snow blowers, etc.) starting with the 2005 model year.

- Regulations being developed to reduce emissions from construction, mining and forestry equipment, recreational vehicles and boats, and larger spark ignition engines (such as forklifts)

Environment Canada worked with school districts in Abbotsford and Chilliwack to install emission-reducing devices on 29 diesel school buses. The result of this pilot project will be evaluated and the program may be expanded in the future to other school districts. Environment Canada is also working with the GVRD and municipal fleet managers to install similar devices on 70 municipal diesel trucks and maintenance vehicles such as garbage trucks, fire trucks and street sweepers.

In March 2005, the Province of BC announced plans to add up to 356 gasoline-electric hybrid vehicles to the government fleet. Kelowna has a hybrid transit bus and is using bio-fuels in some heavy-duty equipment. Seattle's transit system has all hybrid buses and offers free rides in downtown area from early morning to early evening.

The Province of BC offers incentives to people for the purchase of alternative fuels, alternative-fuel vehicles and hybrid cars by reducing or eliminating the amount of provincial tax charged. Bio-diesel is a cleaner burning, non-toxic, biodegradable fuel made from vegetable fats such as canola oil or waste animal fats. Bio-diesel can be blended with conventional petroleum diesel fuel to reduce emission of many air pollutants. There are currently pumps selling bio-diesel in Port Alberni and Burnaby, with more stations to be opened soon.

Volatile organic compounds (VOC's) are any organic compounds that participate in photochemical reactions in the air. They involve chemicals containing hydrogen and carbon and evaporate easily (with the exception of methane). In the presence of sunlight and NOx, VOC's react to form smog. Man-made sources of VOCs include gasoline and diesel emissions from transportation, the burning of industrial fossil fuel, incomplete combustion of petroleum products at mobile and industrial sources and solvent evaporation from products like paints, stains, varnishes, solvents, and thinners. Trees and other vegetation, also produce VOCs that contribute to ozone formation.

Household paints that contain VOC's take approximately 30 days to emit their gases. Research is ongoing and low VOC paints are now available for purchase.
Health effects are similar to those of ground level ozone.

Sulfur oxides (Sox) are created when sulfur-containing fuel is burned. The main sources include petroleum refineries, pulp and paper mills, electric generating plants, smelters and metal refineries. Oil refineries, factories and electric power plants that burn coal or oil also release sulfur dioxide.

Health effects are irritation of the upper respiratory tract, eye irritation and shortness of breath. Governments are working to lower sulfur content in fuels.

Carbon monoxide (CO) is an odourless, tasteless, colourless gas. CO is produced by the incomplete combustion of fuel in engines (mainly from cars). Carbon monoxide is also produced in homes by wood burning and natural gas heating and can increase to dangerous levels from poor ventilation. CO interferes with the blood's ability to carry oxygen to the brain, heart and other tissues. Depending on the amount inhaled, CO can slow reflexes and cause fatigue, headache, confusion, nausea, and dizziness and in large amounts can cause death by suffocation.

Hydrocarbons (HC) refer to the most important class of organic compounds. Hydrocarbons contain only the elements hydrogen and carbon. They occur naturally in petroleum and natural gas, coal tar and coal gas. Hydrocarbons are the building blocks of the petro-chemical industry. Chemical companies use hydrocarbons from crude oil and natural gas to manufacture solvents, plastics, and synthetic fibers and rubbers. Commercial petroleum products such as gasoline, kerosene, airplane fuel, lubricating oils, and paraffin are mixtures of hydrocarbons.
Hydrocarbons can be divided into three classes. 1) aliphatics, 2) alicyclics, and 3) aromatics. Aliphatics are further divided into the paraffin, olefin and acetylenic series. These are used to produce methane, ethane, propane, halogens or hydroxyls and polyethylene, which is used in plastics. Benzene, is the most important aromatic it is a colorless liquid cancer causing material used in industry in the production of plastics, Styrofoam, synthetic rubber, nylon and synthetic detergents to name a few.

Hydrocarbon emissions consist primarily of unburned gasoline. Higher than acceptable levels of carbon monoxide or hydrocarbon emissions may be caused by fuel/air mixture problems or by malfunctioning emissions control systems.

Garbage burning is a major concern as in the South Okanagan as many residents are burning garbage, which includes plastics and treated wood in their back yard or heating appliances. Home garbage fires smolder and burn at temperatures that create dioxins and furans and many other pollutants that are very toxic and are linked to cancer, developmental problems in children and harm to the immune system to name only a few problems. Many of these garbage items being burned are illegal items under the BC Provincial Environmental Management Act – Open Burning Smoke Control Regulation.

Carbon dioxide (CO_2) is the most important greenhouse gas produced by humans and it is the major contributor to climate change, especially through the burning of fossil fuels when we drive, heat homes and other buildings, or run our industries. All vehicles produce CO_2 during the combustion process. The amount of CO2 produced by your vehicle is directly related to your vehicle's fuel consumption. Keeping a vehicle well maintained will decrease fuel consumption. Other ways of reducing the amount of CO_2 that vehicles release into the atmosphere is to buy a vehicle that is more fuel-efficient, drive less, use alternative means of transportation, keep tires properly inflated and practice good driving habits.

Light duty vehicles account for roughly 12 percent of carbon dioxide emissions in Canada. There are over 18 million cars and light trucks on Canadian roads, each emitting an average of 2.5 to 6 tonnes of carbon dioxide per year. That's a Canadian production of 45 to 108 million tonnes of CO_2 annually.

Effects Of Air Pollution

Human Health

From a public health perspective, air-borne small particulate from combustion is now considered to be the single greatest air pollution problem in British Columbia. Scientific research has shown that increased levels of small particulate are responsible for a marked increase in Emergency Room visits, hospitalizations, and days lost from school and work. Small particle pollution from the combustion of organic materials is an extremely serious health threat - it poses much more of a danger to human health than present levels of other common air pollutants such as ozone, sulfur dioxides and carbon monoxide. Two reports, in 1993 and 1995, by Dr. Sverre Vedal of the University of British Columbia connected exposure to increased levels of fine particulates with a significant rise in the number of premature deaths from respiratory and heart disease. The 1995 report states "It is estimated that increases in PM_{10} pollution cause 82 extra deaths in BC every year, of which 24 are due to lung disease and 27 due to heart disease. It is also estimated that 69 extra hospital visitations for lung disorders, 60 for heart disorders and 17 for asthma are caused by PM_{10} pollution increases every year. For emergency room visits, it is estimated that 283 extra visits for asthma and 71 extra visits for chronic bronchitis or emphysema each year are due to increases in PM_{10}. Much larger impacts are estimated for activity restriction, school absenteeism and respiratory systems." These studies have been further confirmed by Bates et al, in May 2003, in a summary report on air pollution in BC, and by Pope et al, 2002, in a 12 year study prepared for the American Cancer Society involving 1.2 million adults. New research in the US links fine particulates with tens of thousands of deaths annually in that country.

People most affected by air pollution include the very young (age 0-5), the elderly and people with lung conditions such as asthma, bronchitis and emphysema and people with heart conditions.

The science of clean air may be very complex, and it takes time just to read about it, but the common sense is really simple: whatever is in the air will end up in someone's lungs and create health concerns – perhaps a day off from school, perhaps a trip to emergency, or worse. Thankfully, $PM_{2.5}$ will diffuse light sufficiently that we usually see it – as smog or smoke. Just remember, clean air is colourless and odourless; if you can see it or smell it, you will also likely breathe it, and its not air.

Monitoring Air Pollution

An Airshed is a part of the atmosphere that behaves in a coherent way with respect to the movement of air and thus the dispersion of emissions. It typically forms an analytical or management unit based on the most common atmospheric conditions.

An Airshed is not fixed or static. It is dependant on topography and current weather conditions. For example, during cold, calm and stable conditions, pollutants remain close to the ground and move only short distances; the Airshed in this case could be limited to one local valley. During summer months with strong solar heating and brisk winds, pollutants will be carried far and wide; the airshed in this case could run from Enderby to Osoyoos and under extreme conditions, could conceivably be the entire southern half of the province form Vancouver to Nelson. Therefore, emissions from one point in the valley could effectively stay in the local area for days, or be spread throughout the entire southern interior. It all depends on the current weather situation.
The atmosphere of the Okanagan Valley typically behaves in a coherent way and thus belongs to one airshed (The Okanagan Airshed) and is defined as stretching 200 Km from Enderby to Osoyoos, following the chain of rivers and lakes that flow through the valley. It is bounded by the mountains to the east and west of the valley floor.

Looking at the topography and weather conditions of the South Okanagan we can see two other airsheds within the RDOS. There is a Similkameen Airshed, running from Princeton through Keremeos and another airshed in the Faulder - Meadow Valley area.

The Provincial Ministry of Environment has set up permanent Air Quality Monitoring stations in the valley, located at Vernon, Kelowna and Osoyoos.

For monitoring purposes, Air Pollution has been categorized by the Ministry of Environment into the following categories:

Natural Source

Air pollution from nature in the RDOS includes wind blown particulate from soil, pollen, spores etc. as well as a biogenic haze from Pine trees.

Point Source

Point source air pollution can be identified as coming from a fixed location and is attributable primarily to industrial sources, such as sawmills, manufacturing and processing plants.

Area Source

Area sources of air pollution are generated throughout an area. They include pollution from wood burning appliances, backyard burning, agricultural burning, natural gas furnaces, vehicle and machinery exhaust, lawnmowers, and road dust, slash and forestry burns etc.

Mobile Source

Mobile source pollution results primarily from transportation emissions.

After defining the source, Air Pollution is categorized into how it affects the Airshed. The categories are Airshed Level and Local Level.

In the Okanagan, Vehicles and forest fires have an airshed level effect. Other sources of pollution (smoke & dust) generally occur at a local level. Because monitoring stations do not record local level emissions, the Ministry of Environment cannot be relied on to take action to reduce this type of pollution. For example, if your neighbor is misusing a wood burning appliance (or burning garbage) and your home is enveloped in smoke (toxic $PM_{2.5}$), there is a major pollution effect and health exposure to you and your family; but this will never be detected by any of the area monitoring stations and regionally, no problem will be identified. As a result, it is up to local rather than provincial governments to identify and control Local Level pollution.

Environment Canada maintains and reports a daily Smoke Control Forecast. It is a Burn Advisory, which uses the regions Venting Index to help prevent open burning when conditions for smoke dispersion are not good. The venting index reports the ability of the atmosphere to disperse pollutants. It is calculated by multiplying the height of the mixed layer of air, by the average wind speed in this layer. The mixed layer is the height at which smoke stops rising and levels out. Stronger wind speeds and a higher mixed layer will produce higher ventilation index values. For convenience, the actual numbers are converted to a scale of 0 to 100.

0 - 33 = POOR	Burning is not acceptable (or permitted by some by-laws)
34 – 54 = FAIR	Burning is not acceptable
55 – 100=GOOD	Conditions are acceptable for burning

For a daily recording of the Venting Index, click on,
www.weatheroffice.pyr.ec.gc.ca/wxhealth/smoke/forecast_e.html?Smoke=YLW

www.weatheroffice.pyr.ec.gc.ca and click Smoke Control Forecast on the Left bar

or call 1-250-861-7405, BC Ministry of Environment Land, Air and Water Branch

The Okanagan is predicted to have the highest rate of population growth in the Province of BC. With this rapid growth, Air Quality in the Okanagan is expected to deteriorate unless actions are taken to mitigate the burden of increased population. The situation is that we may not be able to improve our air quality over the long term. We may be fighting just to be able to preserve the air quality we have today. All Air Quality Partners & Stakeholders have a role to play in preserving our Air Quality.

PART 3

Recommendations

Recommendation – 1: Reduction of Smoke Pollution

a) Educate the homeowners – of what not to burn – in backyard waste piles, burn barrels, and in wood burning appliances. Provide alternatives for a healthier disposal. Educate why the change is needed illustrating the direct relation between harmful emissions, global warming and health.

b) Work with RDOS Solid Waste Management to implement the recycling of plastics #1 through to and including #7.

c) Work with RDOS Solid Waste Management to encourage landfills region wide to participate in a valley wide chipping program of all wood waste at landfills sites.

d) Encourage and lobby for the practice of no burning at landfill sites. Educate as to the reasons why.

e) Work with RDOS Solid Waste Management to create a program for the composting of yard waste (leaves, straw etc). Provide education that composting is a safer and healthier alternative to burning.

f) Work with RDOS Solid Waste Management to incorporate a full on site chipping/tub grinding program of agriculture waste (full tree removal). Provide education to those involved about the benefits of chipping rather than burning and to the general public the importance of such a program.

g) Work with RDOS Solid Waste Management to incorporate a full on-site chipping or flail mowing program of agriculture waste (prune clippings). Provide education to those involved about the benefits of chipping rather than burning and to the general public the importance of such a program.

h) Develop Partnerships with Agricultural Groups and provide information packages.

i) Work with RDOS Solid Waste Management to investigate the benefits of chipping rather than burning of residential wind fallen trees and or tree removal, land development excavated trees and/or building material.

j) Investigate new technological developments in environmentally friendly methods of disposing of wood waste.

k) Educate those homeowners who choose to burn wood as a source of fuel – how to burn wood properly so as to minimize the level of toxic substances being emitted into the air. Educate why the change is needed illustrating the direct relation between harmful emissions, global warming and health.

l) Develop programs that encourage wood stove change outs and proper installations.

m) New Development Bylaws – Require all wood burning appliances in new development to meet CSA and EPA standards.

n) Land Clearing – The RDOS and member municipalities should consider the requirement to approve a developer's plan for land clearing and disposal of waste at the time of land use approval.

o) Encourage and develop a unity of Open Burning By-laws among the entire region. Incorporate smart burning principles and nuisance smoke clauses. Provide education on regulations to the public. All jurisdictions should consider having open burning bylaws in place.

p) Consider implementing a computerized Permit System for each burning period, and supply educational material around smart burning practices when permits are issued.

q) Bylaw Education: RDOS should devote staff time to by-law/air quality education during burning periods to educate the public on open burning by-laws and smart burning practices.

r) Bylaw Enforcement: Investigate alternative methods of air quality by-law enforcement such as partnering with Provincial government conservation officers and private security companies.

s) Improve Communication between all agencies having jurisdictions over burning.

t) Create a toll free hotline for local burning information and venting index. Advertise it.

u) Develop and implement a smoke awareness campaign.

v) Approach Indian Bands about burning practices and commence a dialogue.

w) Approach Ministry of Forests about burning practices and commence a dialogue addressing the issues of slash burning, interface cleanup, forest floor cleanup and pine beetle burning.

x) Restrict outdoor boilers – The RDOS and municipalities within the region should consider developing a by-law that will restrict the use of and sale of outdoor boilers that do not comply with proposed CSA and EPA standards.

y) Work towards the development of an Air Quality Website.

z) Partner with the Okanagan Air Coalition in some or all of the above.

aa) The Air Quality Budget will be developed by the Air Quality staff for approval by the Air Quality Committee and RDOS Board.

bb) Sources of funding for the Air Quality Budget will include RDOS and outside funding.

Recommendation – 2: Reduction of Dust Particulate Matter

Recommendations to Reduce Dust Emissions

a) Road Dust (Paved and Unpaved)
b) Other Dust Sources
c) Wind Reduction
d) Other Recommendations

a) Road Dust

Dust From Paved Roads

1. Street Sweeping: Ministry of Transportation, contractors and local governments should consider undertaking earlier and more frequent street sweeping with water.
2. Traction Material: Local governments should review the size and type of winter traction material they are using in the context of dust emissions.
3. Improve Spring cleanup of road traction material.

Dust From Unpaved Roads

1. Intersection of Paved Roads and Unpaved Roads or Industrial Sites: Dust suppressants should be applied at the confluence of paved and unpaved roads.
2. Choose Dust suppressants that do not pollute the environment or habitat.
3. Haul Road Dust: The use of environmentally friendly dust suppressants should be investigated for use on unpaved roads where dust will affect communities.

b) Other Dust Sources

1. Construction Sites: Actions should be taken to reduce dust from construction sites. These include pre-grade planning, watering before during and after grading, wind fencing, and limiting the height materials are dropped.
2. Parking Lots: Parking lots should be swept if paved, using water and environmentally friendly dust suppression should be used on unpaved lots as also an adequate mixture of coarse and fine materials as too many fines produce excessive dust
3. Industry: Industry should pave or use environmentally friendly dust suppression, particularly at log sort yards, mining sites and mill sites. Spray bars on rock crushing feed belts are essential in urban areas.
4. Industrial Blowers and Leaf Blowers: Municipalities can lead by example and minimize the use of industrial blowers and leaf blowers in public parks and on streets / sidewalks. Gas powered equipment such as leaf blowers typically have very poor emission controls.

c) Wind Reduction

1. Wind Breaks: Windbreaks should be included as part of dust control plans, particularly around land clearing and earth moving activities, construction sites, and storage piles.

2. Phytoremediation - Encourage the use of plants to remediate airborne dust and other pollutants.

3. Arbour Day: RDOS is encouraged to seek private partnerships and participate in Arbour Day and plant trees throughout the region.

d) Other Recommendations to Reduce Dust

1. RDOS and member municipalities should consider including dust emissions under nuisance provisions in their bylaws.
2. Land Use Permits: RDOS and member municipalities should consider incorporating dust suppression measures when evaluating all land use approvals.
3. Permit System: RDOS and member municipalities should consider implementing a dust permit system with associated dust management plans for operations that cause excessive dust

Recommendation – 3: Reduction of Engine Emission Pollutants

(a) Behavior Change
(b) Transportation Alternatives
(c) Other Recommendations to reduce Engine Emission

a) Promote Behavior Change

1. Unnecessary Vehicle Idling: The RDOS, local governments, and corporations with larger vehicle fleets should adopt anti-idling policies.

2. Low-Emission Vehicles: RDOS, municipalities, companies with large vehicle fleets, and government agencies should consider adopting a purchasing policy that includes the requirement to consider hybrid, or low-emission and fuel-efficient vehicles. Research rebates.

3. Vehicle Emissions Clinics: RDOS should continue its sponsorship of the current voluntary vehicle emissions clinics and they should be expanded to include Heavy Duty Vehicles.

4. Low Emitting Fuel: The Committee recommends that RDOS use its influence via UBCM and FCM to lobby the federal government for cleaner fuels, specifically for lower sulfur and higher octane contents. Look into Bio-diesel

5. Partnerships: The RDOS Air Quality Committee is encouraged to develop partnerships with other programs such as Go for Green, ICBC, Cycling Advisory, and Ribbons of Green.

6. Education Campaigns: Create education campaigns that promote anti-idling, maintenance and driving tips that reduce emissions.

7. Diesel Retrofit Program: Local governments and companies with large fleets are encouraged to install pollution-reducing devices on vehicles and use

cleaner-burning diesel fuel. Provide education on diesel fuels, health and solutions.

8. Research hybrid transit system and encourage communities using transit to switch.

9. Encourage the Okanagan Air Coalition to support a valley wide transit system.

10. Gas powered lawnmowers; research, partner and provide incentives to switch to a cleaner and healthier alternative.

11. Promote green energy production and consumption.

12. Lobby for the elimination of No 2 diesel in the RDOS.

b) Promote Transportation Alternatives

1. Inter-Municipal Transportation: Transit Committee should further examine the viability of inter-municipal transportation, for example, connecting OUC campuses.

2. Transit Schedules: Transit Committee is encouraged to regularly review schedules to make service more convenient for riders, and incorporate routes to and from significant employers.

3. Public Transportation Vehicles: BC Transit uses diesel buses while Penticton does not have access to low emission diesel fuel. It is recommended that BC Transit be lobbied to replace diesel busses with hybrid low emission vehicles.

4. Car Share Programs: Communities should promote and provide facilities to support commuting options such as car share, park-and-ride, carpooling and vanpooling programs.

5. Bike Paths and Trails: RDOS and local governments should prioritize the creation of inter-municipal networks of bike paths and trails systems, and encourage increased use by adding bike racks and bike lockers.

6. Carpooling and Vanpooling: Individuals and businesses are encouraged to consider carpooling and vanpooling alternatives for transportation to and from work.

7. Telecommuting: Encourage local government and local businesses to consider telecommuting as an option for employees.

c) Other Recommendations to reduce Engine Emission

1. Land Use and Community Planning: RDOS and local governments should consider instituting planning policies that integrate land use and transportation planning to promote transit, bike and pedestrian friendly communities to reduce vehicle emissions.

2. Commuter Transit: RDOS should cooperate with other Okanagan Regional Districts to support the recommendations of the Okanagan Valley Corridor Transit report that envision a valley-wide commuter transit system.

3. Air Care: In conjunction with the Okanagan Airshed Coalition, examine implementing Air Care valley-wide by evaluating associated costs, feasibility, partnerships and incentive programs.

4. Gas powered lawnmowers: research, partner and provide incentives to switch to a cleaner alternative.

Recommendation – 4: Other Recommendations

1. Research other air pollutants in the RDOS (including industry emissions and pesticide chemical drift).

2. Support federal, provincial and local environmental air quality initiatives that encourage reduction of pollutants.

3. Research and consider incorporating Air Quality in Official Community Plans.

4. Research and consider incorporating Air Quality in Regional Growth Strategies.

5. Work with Planning Departments.

6. The pollutants entering our atmosphere are implicated in more than one environmental problem. In carrying out the recommendations of the Air Quality Management Plan, the Air Quality Committee would also be addressing the issues of global warming, climate change and energy use.

7. The Air Quality Management Plan and its recommendations should be reviewed annually to reflect changes in policy and technology and to ensure the actions are having the desired effect of consistently protecting and promoting human and environmental health and resulting in excellent visibility.

8. Air Quality Committee: It is recommended that responsibility for undertaking the implementation of the RDOS Air Quality Management Plan be continued by the RDOS Air Quality Committee and RDOS staff and that the Air Quality Committee continue to be made up of a broad representation of Stakeholders and technical advisors.

PART 4

Implementation

Responsibility to undertake implementation of the RDOS Air Quality Management Plan remains with the RDOS Air Quality Committee and RDOS Air Quality staff as outlined in the Committee's Terms of Reference, item 7.

Implementation strategies and programs recommended within this Air Quality Management Plan, and at the discretion of the Air Quality Committee, be the responsibility of the RDOS Air Quality staff working in conjunction with all stakeholders, with technical assistance as required.

Implementation Plan

General

1) Review the Draft RDOS Air Quality Management Plan with appropriate agencies; amend as necessary and adopt.

    Who: RDOS and AQ Committee
    When: As soon as possible

2) Adopt the RDOS Burning Bylaw

    Who: RDOS
    When: December 2005 or January 2006

3) Incorporate Air Quality Responsibilities of the RDOS under Solid Waste Management

    Who: RDOS
    When: As soon as possible

4) Consider converting the Air Quality Clerk Part-Time Position to a Full Time Position

    Who: RDOS
    When: Annually

5) Have the Air Quality Committee prepare an annual Budget for implementation of the recommendations contained in the Air Quality Management Plan.

    Who: RDOS Air Quality Staff / Committee
    When: Annually

6) Develop partnerships from provincial and local levels of government and other Air Quality stakeholders including agricultural groups, societies, schools and special interest groups.

Who: RDOS Air Quality Staff
When: 2006

7) Education & Awareness

Utilize the comprehensive, multi faceted Communication Campaign materials prepared under the Air Quality Committee to promote Education and Awareness of the facts, issues and alternatives concerning air quality.

Materials to include:

a. Air Quality Reference Booklet

- This is envisioned as a multi-page booklet for the general public that presents information, concerns and solutions.

b. Pull up display

- Designed for public gatherings and display spaces the Pull Up Display will incorporate two panels – One concerning Air Quality in general and one concerning Smoke specifically.

c. Television public service announcements/commercial(s)

- Scripts for awareness creating television PSA / commercials will be created.
- A distribution strategy researched and created.

d. Newspaper advertising/pre-written articles

9. A series of articles will be written and edited as required for different publications.

e. Portable signage text

f. Smoke Campaign Text And Concept For RDOS Web Site.

g. Smoke information hotline script

h. Ensure education and awareness materials are available in languages other than English.

i. Implement programs that assist in the reduction of air pollutants as outlined below.

Smoke

1. Garbage Burning

The Burning of Garbage has been identified as a serious problem. Burn barrels can be seen smoking profusely. Old mattresses, painted wood, tires, roofing material, and various plastics are seen on burn piles. Chimneys smell of more than wood smoke. Although burning garbage in a wood stoves or the backyard has been a longstanding practice, we now understand the health consequences. Although many substances being burned are illegal to burn under the Provincial Environmental Management Act – Open Burning Smoke Control Regulation, the practice continues.

Eliminate Garbage burning in 2006, by providing educational materials through a public information campaign with information material outlined in Education & Awareness, Page 30, Item 7, and by pollution reduction programs.

Implement the recommendations of Part 3, Recommendation 1.

2. Wood Burning & Yard Waste

Smoke from Wood Burning is a major pollution and health concern in the RDOS. Smoke is made up of a complex mixture of over 100 gases and fine particulate ($PM_{2.5}$) that are produced when wood and other organic matter burn. These microscopic particles get into the eyes and respiratory system, where they can cause health problems leading to work and/or school absenteeism, emergency room treatment, hospitalization and even premature death – not to mention the discomfort, restricted activity and reduced aesthetic quality of life. The science on wood smoke is now very well documented.

Minimize smoke from wood and yard waste burning by providing educational materials through a public information campaign with Information material outlined in Education & Awareness, Page 25, Item 7), and by pollution reduction programs.

Implement the recommendations of Part 3, Recommendation 1.

3. Existing Open Burning By-Laws

Jurisdictions without open burning by-laws currently in place should be encouraged to adopt an open burning by-law that incorporate the following principles.

a. Limit burning to days when the Venting Index is good and start burns later in the morning to allow for better venting (or incorporate revised “Burn”/”Don’t Burn” advisory)

b. Eliminate fall burning periods in favor of slightly extended spring burning periods because venting conditions in the fall are generally poorer than in spring

c. Allow burning only on properties 1 ha or larger if no alternatives are in place

d. Include a nuisance clause for problem smoke to protect the rights of neighboring property owners.

e. Do not allow burning within 500 m of schools or hospitals

f. Encourage all jurisdictions to adopt a common fire, safety, burning, air quality by-law

Who: RDOS, Air Quality Committee, Fire Departments
When: 2006

4. Wood Burning appliances

British Columbia requires that that wood stoves sold in BC must meet CSA and EPA standards. However this requirement does not apply to all wood burning appliances. Outdoor wood fired boilers and wood furnaces are not controlled under the regulations. In addition, there is no requirement for conversion of existing non-conforming wood stoves. The RDOS and municipalities within the region should develop a by-law that will restrict the use and sale of outdoor boilers and any wood burning appliances that do not comply with proposed CSA and EPA standards.

Minimize smoke from wood burning appliances, by providing educational materials through a public information campaign with Information material outlined in Education & Awareness, Page 30, Item 7, and by pollution reduction programs.

Implement the recommendations of Part 3, Recommendation 1. Create regulations on new development such that where a CSA and EPA appliance is being installed, that the installation be controlled by permit which ensures an appropriate size wood burning appliances is being installed with proper chimney height and location and that certification be required by a Wett certified technician prior to approval from for the building inspector. Consider having Building inspectors become Wett Certified.

Who: Air Quality Committee
When: 2006

5. Improve Communication Between Key Forestry Stakeholders

Who: Ministry of Forests, Fire Departments, RDOS, Ministry of Environment, and Forest Tenure Holders

When: 2006

DUST

Implement the recommendations of Part 3, Recommendation 2.

ENGINE EMISSIONS

Implement the recommendations of Part 3, Recommendation 3.

Other

1. Annually review the Air Quality Management Plan and Evaluation of Current Initiatives

   Who: Air Quality Committee / RDOS Air Quality staff
   When: 2006

2. New Data - The RDOS Air Quality staff are to remain current with new data and reports that may affect or enhance the recommendations.

   Who: RDOS Air Quality staff
   When: Ongoing

3. The RDOS and Air Quality Committee adopt an open policy regarding the exchange of information with Air Quality Partners and Stakeholders within the Okanagan, the Province, Federally and Globally.

4. Upon approval of the Air Quality Management Plan, First Nations People will be visited by the Air Quality Coordinator to discuss if and how they would like to participate in the Air Quality Management Plan. It is important that their concerns and suggestions are heard. The goal would be to work together towards minimizing air pollution for all who live here

5. All government jurisdictions covered by the Okanagan Air Coalition are encouraged to recognize and incorporate Air Quality Management Plans in their Official Community Plans and Regional Growth Strategies.

Potential Funding Sources

Partnerships

Partnerships are a key component in the successful implementation of Air Quality initiatives. It is recommended that the RDOS continue funding the Air Quality Committee as it has in the past and that the Air Quality Coordinator continue to source outside funding opportunities. The Air Quality Committee's has a good track record of working together successfully to-date, and its stakeholder groups are well positioned to take advantage of a variety of funding opportunities.

EcoAction Community Funding Program (Environment Canada)
- Grants to a maximum of $100,000
- Clean Air and Climate Change
- Must generate measurable, positive impacts on the environment
- Eligible to non-profit groups

Green Municipal Funds (Federation of Canadian Municipalities)
- Grants and loans from $25,000 to $2 million
- Must generate measurable, positive impacts on the environment

Ministry of Environment
- Planning grants
- Grants for specific, air quality related projects $5,000-$30,000 (e.g. Agricultural Chipping Program)

Environment Canada
- Vehicle Emissions Clinics
- Pilot "Scrap it" Programs to replace old vehicles

Moving On Sustainable Transportation (Transport Canada)
- To a maximum of $100,000
- Funding for demonstration projects of sustainable transportation vehicles
- Funding for public education and workshops on sustainable transportation

The Green Source
- Listing of foundations and for environmental protection

Chawkers Foundation
- Supports environmental education with varying amounts of funding

Henry P. Kendall Foundation
- Grants of $5,000 to $50,000 for focus on the environment of future generations

Special Initiatives Program
- Grants of $5,000 from a private foundation which supports innovative environmental ideas

B.C. Transit
-Grants of $1000 to $2000

APPENDIX A

ACKNOWLEDGEMENTS

The RDOS Air Quality Management Plan was prepared by RNP Consulting Services, in October 2005, in consultation with Janice Johnson, RDOS Air Quality Coordinator. The content and material included in the report were provided by the following individuals and organizations, whose contribution is greatly appreciated.

Bill Schwarz, RDOS Director & Air Quality Committee Chair

Don Hamilton B.A., RDOS Solid Waste Management Superintendent

RDOS Air Quality Committee

Janice Johnson, RDOS Air Quality Coordinator

Dr. Ralph Adams, Environmental Quality Section Head, BC Ministry of Environment

Eric Taylor, Air Quality Meteorologist, Thompson Region, BC Ministry of Environment, Environmental Quality Section

Brian Loughlin, BURPI., Dipl., Junior Planner

Tara D. Johnson, BURPI., Dipl., Junior Planner

Baird McClelland Inc.

Guide to Airshed Planning in British Columbia
British Columbia Ministry of Environment

Air Quality Action Plan – Draft
Regional District North Okanagan

Air Quality in the Central Okanagan, Discussion Paper
Regional District Central Okanagan

Air Quality Management Initiatives, City of Kelowna

Bulkley Valley – Lakes District Airshed Management Plan
BVLD Airshed Management Society

Quesnel Airshed Management Plan, City Of Quesnel

Health, Fine Particles and Current Air Quality Research in B.C.
Melanie Noullett, Environmental Sciences Program, University of Northern B.C.

State if the Air in BC 2005, report of The Lung Association of BC

Summary of Key Air Quality Issues in RDOS, Eric Taylor June 2005

Provincial Health Officer's Annual Report 2003. BC Ministry of Health Services, Office of the Provincial Health Officer

Puget Sound Clean Diesel Program, Report from BC Lung Seminar 2005

ACKNOWLEDGEMENTS (cont'd)

2003 Prov. Health Officer's report
http://www.healthservices.gov.bc.ca/pho/pdf/phoannual2003.pdf

"Acute Effects of Ambient Inhalable Particles in Asthmatic and Nonasthmatic Children". By Sverre Vedal, John Petkau, Rick White, and Jim Blair. Departments of Medicine and Statistics, UBC and Vancouver Hospital and Health Sciences centre, Vancouver, BC, Canada. This was published in the American Journal of Respiratory Critical Care Medicine. 1998; 157:1034-1043

"Health Effects of Wood Smoke: A Report to the Provincial Health Officer of BC". By Sverre Vedal, UBC, 1993

Air Quality Report for British Columbia: Fine Particulate (PM 10 ... Dr. Sverre Vedal, a medical researcher at the University of British Columbia,…GVRD (1995) Ambient Air Quality Annual Report 1994, Greater Vancouver

www.env.gov.bc.ca/air/particulates/aqrfbcfp/aqrfbcp.htm

Particulate Matter: Sources.. That's the conclusion of two reports in 1995 and 1993, by Dr. Sverre Vedal of the University of British Columbia, for the Ministry of Environment and the … wlapwww.gov.bc.ca/ske/skeair/pm.htm

APPENDIX B

LEGISLATIVE AUTHORITY

Control of Air Quality is legislated by various levels of government.

According to the Ministry of Environment, if a community bylaw is more restrictive than a provincial regulation, the bylaw takes precedence. There is no need for the community to get provincial permission to enact a more stringent bylaw. This applies to both industrial emissions and agricultural burning within municipal boundaries.

Most communities use zoning to handle these situations, so that emissions are confined to certain areas of the community. But a community could, for example, insist on better emission controls or more restrictive burning practices than those of the provincial mandates.

"*Local fire departments, municipalities, improvement districts or regional districts may have specific bylaws on open burning. Where these are more stringent, they apply over provincial regulations."*

See:

Environmental Management Act - Open Burning Smoke Control Regulation
http://www.qp.gov.bc.ca/statreg/reg/E/EnvMgmt/145_93.htm

A Guide to the Open Burning Smoke Control Regulation
http://www.env.gov.bc.ca/air/particulates/agttobsc.html

Provincial Farm Act
http://www.qp.gov.bc.ca/statreg/stat/F/96131_01.htm

Right to Farm Info sheet on Burning
http://www.agf.gov.bc.ca/resmgmt/fppa/refguide/activity/870218-28_Burning.pdf

APPENDIX C

ADDITIONAL RESOURCES

1. Complete Alphabetical Listing of B.C. Statutes and Regulations

   http://www.qp.gov.bc.ca/statreg/list_statreg.htm

2. B.C. Air Quality Legislation

   This is a provincial site and contains a lot of information about acts/regs as well as some regulation guidebooks (open burning). It also has links to other government info. http://wlapwww.gov.bc.ca/air/airregs.html

3. Environment Canada's Clean Air Site
   This site contains a lot of federal and international information.
   http://www.ec.gc.ca/cleanair-airpur/

4. UBC site – excellent links

   www.firesmoke.ubc.ca

5. Fraser Basin Council Website, Link to 2005 BC Clean Air Forum

   www.fraserbasin.bc.ca

6. Ministry of Environment: Backyard Burning and Air Quality Health Index

   http://wlapwww.gov.bc.ca/air/particulates/bbsgiyea.html

7. World Health Organization

   www.who.int

8. Center for Disease Control, Air Quality Page

   http://www.cdc.gov/health/airquality.html

   www.cdc.gov

9. For information on how to improve your home or vehicle energy efficiency and reduce GHG'S see:

   Government of Canada Climate Change www.climatechange.gc.ca

10. Natural Resources Canada's Office of Energy Efficiency

    www.oee.nrcan.gc.ca

11. Transportation and the Environment

    www.ec.gc.ca/transport

APPENDIX D

GLOSSARY OF TERMS

Abatement - Reducing the degree or intensity of, or eliminating, pollution.

Air Contaminant - Any particulate matter, gas, or combination thereof, other than water vapor. (See: air pollutant.)

Air Quality Management - 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.

Air Quality Management Plan - 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.

Air Quality Health Index (AQHI)
Together with Health Canada, Environment Canada and the BC Ministry of Environment - Interior Health is participating in a pilot program to report on air quality and the associated health risks in the Thompson and Okanagan valleys of British Columbia. A key part of this pilot is a new website called AirPlay (www.airplaytoday.org) which provides daily readings on air quality.

Air Movement - Air moves across the surface of the earth in the form of wind. The sun causes wind as it heats the earth's surface unevenly. On a sunny day, the air above an ocean shore is warmer than the air over the water. The warmer air expands, becomes lighter and rises and cooler air from the sea moves in and replaces it, producing a sea or lake breeze. As the warm air above the equator is usually rising, cooler air from north and south blow in steadily, replacing the rising air. This movement of air creates two vast belts of wind called the Trade Winds. The trade winds do not blow straight toward the equator because of the earth's rotation. The trade winds north of the equator are twisted to the right of their original direction, (southwest). The trade winds south of the equator are shifted to there left (northwest). There are four other great belts of winds that circle the earth. These winds are the prevailing Westerlies and Polar Easterlies, in each hemisphere north and south of the equator. Bands of fast-moving winds occur about 6 to 9 miles (10-15 kilo) above the earth. These bands are known as Jet Streams. Winds in the core of a jet stream may exceed 200 miles (320 kilometers) per hour. The particles or aerosols suspended in the air are blown about the earth in these and all other winds.

Air Pollutant - Any substance in air that could, in high enough concentration, harm people, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of airborne matter capable of being airborne. They may be in the form of solid particles, liquid droplets, gases, or in combination thereof. Generally, they fall into two main groups: (1) those emitted directly from identifiable sources and (2) those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents, with or without photoactivation. Air pollutants are often grouped in categories for ease in classification; some of the categories are: solids, sulfur compounds, volatile organic chemicals, particulate matter, nitrogen compounds, oxygen compounds, halogen compounds, radioactive compound, and odours.

Air Pollution Episode - A period of abnormally high concentration of air pollutants, often due to low winds and temperature inversion, which can cause illness and death. (See: episode, pollution).

Airborne Particulates - Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include: dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts, and reactions to gases in the atmosphere.

Ambient Air - Any unconfined portion of the atmosphere: open air, surrounding air.

Attenuation: The process by which a compound is reduced in concentration over time, through absorption, adsorption, degradation, dilution, and/or transformation. Can also be the decrease with distance of sight caused by attenuation of light by particulate pollution.

AQI (Air Quality Index) - An AQI is a way of transforming complex air quality measurements into a single number or descriptive term. It describes the measured air quality and the publicly perceived air quality at any given time. AQI numbers are interpreted thus:

0 - 33 = POOR
34 – 54 = FAIR
55 – 100=GOOD
100+ is VERY POOR

An AQI in excess of 50 represents the point at which BC Environment normally becomes concerned about the level of human health impact. The British Columbia AQI is directly comparable to the AQI's issued in all major Canadian cities as it follows the same Federal guidelines.

AQSC (Air Quality Stakeholder Committee) – Acts as an advisory planning group with the technical and administrative assistance to draft goals, objectives, strategies and recommendations for the Air Quality Action Plan.

Area Source - Any source of air pollution that is released over a relatively small area but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities, or biogenic sources such as a forest that releases hydrocarbons.

BACM (Best Available Control Measures) - A term used to refer to the most effective measures (according to EPA guidance) for controlling small or dispersed particulates and other emissions from sources such as roadway dust, soot and ash from woodstoves and open burning of rush, timber, grasslands, or trash.

Benzene is a colorless liquid with a pleasant order. It is used in industry in the production of Polystyrene, Styrofoam, synthetic rubber, nylon, synthetic detergents, and aniline dyes. Benzene's vapor is poisonous and laboratory tests show that it may cause cancer. Originally benzene was produced commercially by heating coal tar and condensing its vapors. Today, most benzene is obtained from petroleum.

Carbon Monoxide (CO) - A colorless, odourless, poisonous gas produced by incomplete fossil fuel combustion.

Cogeneration - The consecutive generation of useful thermal and electric energy from the same fuel source.

Composting - The controlled biological decomposition of organic material in the presence of air to form a humus-like material. Controlled methods of composting include mechanical mixing and aerating, ventilating the materials by dropping them through a vertical series of aerated chambers, or placing the compost in piles out in the open air and mixing it or turning it periodically.

CORD (Central Okanagan Regional District) - Made up of two unincorporated electoral areas and the three member municipalities of Kelowna, Peachland and Lake Country, the Regional District provides basic services such as recreation, park facilities, sewer and garbage collection to the 10,000 homes and businesses located within the Electoral Areas. The District is also responsible for a wide range of regional services including air quality and other environmental concerns.

Ecosystem - The interacting system of a biological community and its non-living environmental surroundings.

Emission - Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys; and from motor vehicle, locomotive, or aircraft exhausts.

Emission Inventory - A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Emission Standard - The maximum amount of air polluting discharge legally allowed from a single source, mobile or stationary.

Emissions Trading - The creation of surplus emission reductions at certain stacks, vents or similar emissions sources and the use of this surplus to meet or redefine pollution requirements applicable to other emissions sources. This allows one source to increase emissions when another source reduces them, maintaining an overall constant emission level. Facilities that reduce emissions substantially may "bank" their "credits" or sell them to other facilities or industries.

Episode (Pollution) - An air pollution incident in a given area caused by a concentration of atmospheric pollutants under meteorological conditions that may result in a significant increase in illnesses or deaths. May also describe water pollution events or hazardous material spills.

Fugitive Dust - A particulate emission made airborne by forces of wind or people's activities. Unpaved roads, construction sites, and tilled land are examples of areas that originate fugitive dust. Fugitive dust is a type of fugitive emission.

Fugitive Emissions - Emissions not caught by a capture system.

Fume - Tiny particles trapped in vapor in a gas stream.

GHG (Greenhouse Gas) - A gas, such as carbon dioxide or methane, which contributes to potential climate change.

Grasscycling - Source reduction activities in which grass clippings are left on the lawn after mowing.

Ground Level Ozone - A gas that occurs both in the Earth's upper atmosphere and at ground level. Ozone can be "good" or "bad" for your health and the environment, depending on its location in the atmosphere. The layer closest to the Earth's surface is the troposphere. Here, ground level or "bad" ozone is an air pollutant that is harmful to breathe and it damages crops, trees and other vegetation. Created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC.

Hydrocarbons
Hydrocarbons refer to the most important class of organic compounds. Hydrocarbons contain only the elements hydrogen and carbon. They occur in petroleum and natural gas. Commercial petroleum products such as gasoline, kerosene, airplane fuel, lubricating oils, and paraffin wax are mixtures of hydrocarbons. Some hydrocarbons are found in coal tar and coal gas. Many other Hydrocarbons are synthesized from hydrocarbons found in nature.

Hydrocarbons are the starting building blocks of the petro-chemical industry. Chemical companies use hydrocarbons from crude oil and natural gas to manufacture solvents, plastics, and synthetic fibers and rubbers. Organic chemistry is sometimes called the “chemistry of hydrocarbons and their derivatives” because all organic compounds are essentially related to hydrocarbons.

Hydrocarbons can be divided into three primary classes 1) aliphatics,
2) alicyclics, and 3) aromatics.

1) Aliphatics: are further divided into the paraffin, olefin and acetylenic series. There are further divided or formed by joining other products, producing Methane - ethane – propane; halogens or hydroxyls; or polyethylene – which is used in plastics.

2) Alicyclics: organic compounds having both aliphatic (see above) and cyclic characteristics or structures.

3) Aromatics: are a small but highly important class of hydrocarbons. They are characterized by a six-carbon ring which differs from alicyclics in that it contains three double bonds. Benzene, is the most important aromatic. Others in the benzene series include toluene and the xylenes.

Inhalable Particles - All dust capable of entering the human respiratory tract.

Inversion (a.k.a. Temperature Inversion) - A layer of warm air that prevents the rise of cooling air and traps pollutants beneath it; can cause an air pollution episode.

Irritant - A substance that can cause irritation of the skin, eyes, or respiratory system. Effects may be acute from a single high level exposure, or chronic from repeated low-level exposures to such compounds as chlorine, nitrogen dioxide, and nitric acid.

M of E Ministry of Environment (formerly Ministry of Water, Land and Air Protection) - the mandate of the Ministry of Water, Land and Air Protection is to protect and enhance the quality of British Columbia's water, land and air in a way that contributes to healthy communities, recreational opportunities, a sustainable environment, and the economic well being of the province. General responsibilities of M of E are:

- Environmental protection of water, land and air quality including climate change and environmental emergencies
- Environmental stewardship of biodiversity, including wildlife, fish and protected areas
- Park and wildlife recreation management, including hunting, angling, park recreation, and wildlife viewing
- Environmental monitoring and enforcement including the Conservation Officer Service, and State of Environment reporting.

Mitigation - Measures taken to reduce adverse impacts on the environment.

Mobile Source - Any non-stationary source of air pollution such as cars, trucks, motorcycles, buses, airplanes, and locomotives.

Monitoring - Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.

Nitrogen
All organisms must have nitrogen to live. Nitrogen makes up an important part of protein molecules, which are found in protoplasm. Protoplasm is the living material in all plant and animal tissues. Human beings and animals get protein by eating animal products and plants. Most plants must manufacture protein from simple nitrogen compounds dissolved in the soil. Some of this dissolved nitrogen comes from the atmosphere in the form of nitric acid (HNO_3). Lightning causes nitrogen and oxygen in the air to form compounds called nitrogen oxides. These oxides react with water to form nitric acid, which is carried to the earth dissolved in rainwater.

Plants of the legume family produce protein from the nitrogen in the air, with the help of certain types of bacteria. Legumes include plants such as alfalfa, peas, and soybeans. The roots of these plants have small swellings called nodules. The nodules contain nitrogen-fixing bacteria, which take nitrogen from the air and convert it into nitrogen compounds. The plants use these compounds to make protein. After the plants die and decay, the nitrogen compounds in the nodules become part of the soil. As nitrogen is used and reused by living things, it goes through a continuous cycle of chemical changes, known as the nitrogen cycle. To enhance this process, Farmers often supply nitrogen to their fields by rotating certain crops or using nitrogen fertilizers.

Nitrogen and Pollution:
Some nitrogen compounds contribute to the pollution of both air and water. Nitrogen fertilizer that is not used by plants can cause water pollution. Rainwater carries the unused fertilizer into streams or lakes, where the nitrogen compounds increase the rate of growth of algae and other water plants.

Nitric oxide (NO)
Nitric oxide is formed as a by-product in the combustion of gasoline in automobile engines. Sunlight causes the nitric oxide in the lower atmosphere to react with oxygen to form ozone, which can be a harmful pollutant.
Supersonic airplanes produce nitric oxide in the stratosphere, where the chemical compound may harm the environment in a different way. Nitric oxide can act as a catalyst for the decomposition of ozone that is present in the stratosphere. This reduces the Earth's ability to protect against the harmful effects of ultraviolet radiation.

Nitrous oxide, (N_20) which should not be confused with nitric oxide, is a colorless, odourless gas that physicians and dentists use to make patients insensitive to pain and is known as laughing gas. It is also called nitrogen monoxide. It is used in industry as a propellant in aerosol products and as a "tracer gas" to locate leaks in vacuum and pressure lines.

Nitrogen Oxide (NO_x) - The result of photochemical reactions of nitric oxide in ambient air; major component of photochemical smog. A product of combustion from transportation and stationary sources and a major contributor to the formation of ozone in the troposphere and to acid deposition.

Non-Point Sources - Diffuse pollution sources (i.e. without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. Common non-point sources are agriculture, forestry, urban, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.

Non-Road Emissions - Pollutants emitted by combustion engines on farm and construction equipment, gasoline-powered lawn and garden equipment, and powerboats and outboard motors.

RDNO (North Okanagan Regional District) – Functions as a partnership of the member municipalities and electoral areas. The Regional District is comprised of the Cities of Armstrong, Enderby and Vernon, District of Coldstream, Village of Lumby, Township of Spallumcheen and surrounding Electoral Area's B, C, D, E and F.

Okanagan Airshed Coalition – Partnership between the Central Okanagan, North Okanagan and the Okanagan-Similkameen Regional Districts to develop strategies for valley-wide improvements in air quality.

Open Burning - Uncontrolled fires in an open dump.

Oxygen
Humans and the other animals obtain oxygen from the air, filtered into the bloodstream through the lungs. Blood then carries oxygen to the cells of the body, where it combines with other chemicals obtained from food to produce energy and to perform the functions of the individual cells. Carbon dioxide is produced in the cells as a waste product and is expelled from the body through the respiratory system.

Plants use oxygen much the same way as animals, but Plant cells make oxygen as a by-product in the process of photosynthesis. During this process, cells use energy from sunlight to make sugar, carbon dioxide and water and Oxygen is expelled into the atmosphere. PM2.5 pollution deposits itself right alongside the O_2 Molecules in the Alveoli of the lungs, obstructing the absorption of O_2 with the smallest components of PM 2.5 being absorbed into the bloodstream.

Oxide: Oxide is a chemical compound of oxygen combined with another element. Oxides are commonly formed when elements are oxidized. For example, burning coal or wood produces carbon dioxide (CO_2) and carbon monoxide (CO). Burning is a process of rapid oxidation. Carbon dioxide is also formed by a slow oxidation processes in animal cells and is exhaled from the lungs. The rusting of iron is slow oxidation producing iron oxide.

Metallic oxides combine with water to form hydroxides, while non-metallic oxides combine with water to form oxygen acids. The oxides of sulfur and nitrogen are important because they can be used to form sulfuric and nitric acids. However sulfur dioxide and nitrogen oxides pollute the air when given off by automobiles, factories and by power plants that burn coal or oil. They also mix with moisture in the air to form sulfuric and nitric acids, which fall to the ground as acid rain. Acid rain damages plants, wildlife and physical structures.

Ozone (O_3) - Found in two layers of the atmosphere, the stratosphere and the troposphere. In the stratosphere (the atmospheric layer 7 to 10 miles or more above the earth's surface) ozone is a natural form of oxygen that provides a protective layer shielding the earth from ultraviolet radiation. In the troposphere (the layer extending up 7 to 10 miles from the earth's surface), ozone is a chemical oxidant and major component of photochemical smog. It can seriously impair the respiratory system and is one of the most wide- spread of all the criteria pollutants for which the Clean Air Act required EPA to set standards. Ozone in the troposphere is produced through complex chemical reactions of nitrogen oxides, which are among the primary pollutants emitted by combustion sources; hydrocarbons, released into the atmosphere through the combustion, handling and processing of petroleum products; and sunlight.

Parts Per Billion (ppb)/Parts Per Million (ppm) - Units commonly used to express contamination ratios, as in establishing the maximum permissible amount of a contaminant in water, land or air.

PM (Particulate Matter) - One of the major components of smog. PM include microscopic particles in the air. These particles, capable of being inhaled by humans, are divided into two size ranges: $PM^{2.5}$ and $PM^{<10}$. Between the two, "fine" particles less than 2.5 micrometers in size ($PM^{2.5}$) are responsible for causing the greatest harm to human health.

PM^{10}/$PM^{2.5}$ - PM^{10} is measure of particles in the atmosphere with a diameter of less than ten or equal to a nominal 10 micrometers. $PM^{2.5}$ is a measure of smaller particles in the air. PM^{10} has been the pollutant particulate level standard against which EPA has been measuring Clean Air Act compliance. On the basis of newer scientific findings, the Agency is considering regulations that will make $PM^{2.5}$ the new “standard”.

Point Source - A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack.

Pollutant - Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollution - Generally, the presence of a substance in the environment that because of its chemical composition or quantity prevents the functioning of natural processes and produces undesirable environmental and health effects. Under the Clean Water Act, for example, the term has been defined as the man-made or man-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.

Precautionary Principle - When information about potential risks is incomplete, basing decisions about the best ways to manage or reduce risks on a preference for avoiding unnecessary health risks instead of on unnecessary economic expenditures.

Prescribed Burning - controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions that allows the fire to be confined to a predetermined area, and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

RDOS (Regional District of Okanagan Similkameen) - Provides the necessary cross-communication venue to promote co-ordination between the activities of the individual municipalities and the rural areas of the region. The Regional District of Okanagan-Similkameen is comprised of the City of Penticton, the District of Summerland, the Town of Osoyoos, the Town of Oliver, the Town of Princeton and the Village of Keremeos. In addition it includes Kaleden/Okanagan Falls, Naramata, Okanagan Lake West/West Bench, Keremeos Rural/Hedley, Cawston, Rural Princeton, Rural Oliver and Rural Osoyoos.

Regional Services Committee - Acts as a liaison between the Air Quality Stakeholder Committee and the decision making body of the North Okanagan Regional District Board.

Risk Assessment - Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants.

Smoke Control Forecast - Designed to predict the capability of the atmosphere to effectively disperse pollutants such as small particulate matter (smoke).

Smoke Dispersion Factors - Two factors control the spread or dispersion of small particles or gases. These factors are the wind speed (controls horizontal spread) and the height of the "mixed layer". The mixed layer is the portion of the atmosphere form the ground up to the level at which gases and small particles freely mix. For example, smoke from a smokestack will tend to rise to the top of the mixed layer and then level off.

Sulfur Dioxide: Sulfur Dioxide is a colorless, poisonous gas with a sharp odour. Sulfur dioxide forms naturally from volcanic activity and from the decay of organic matter. It can be manufactured by burning sulfur dioxide or heating metallic sulfur compounds. Sulfur dioxide is also released into the atmosphere by oil refineries and by factories and electric power plants that burn coal or oil. In the air people breathe, sulfur dioxide can irritate the eyes and respiratory system. It will also dissolve in water droplets to form acid rain, which can harm or even kill wildlife and damage buildings. Acid rain also may form when sulfur dioxide in the air is converted into sulfur trioxide. Government regulations in the US limit the amount of sulfur dioxide that industries can discharge into the air. Manufacturers combine sulfur dioxide with water to make sulfurous acid, which serves as a bleach and as a food preservative, which we eat. Sulfur dioxide is also used to prepare such chemicals as sulfites and sulfuric acid. Sulfuric acid is used chiefly in the manufacture of fertilizer. Manufacturers of petroleum products use sulfuric acid in the refining of petroleum. Other manufacturers use it in the production of such items as automobile batteries, explosives, pigments, iron and other metals, paper pulp, and cellulose fibers used in making rayon.

Ventilation Index - The ventilation index is formed by multiplying the mixed layer height by the average wind speed in this mixed layer. Stronger wind speeds and thicker mixed layers will produce higher ventilation index values. For convenience, the actual numbers are converted to a scale of 0 to 100.

A ventilation index of ’0’ implies no ability of the atmosphere to disperse pollutants while a value of '100' implies an excellent ability to disperse pollutants.

The Environment Canada ventilation index in British Columbia and Yukon is divided into the following categories:

0 - 33 = POOR	Burning is not acceptable (or permitted by some by-laws)
34 – 54 = FAIR	Burning is not acceptable
55 – 100=GOOD	Conditions are acceptable for burning

For most locations, ventilation index values are poor from sunset until late morning.

For locations within valleys, the ventilation index should be lowered if the mixing height is less than the height of the surrounding hills.

VOC (Volatile Organic Compound) - Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity.

Wood-Burning-Stove Pollution - Air pollution caused by emissions of particulate matter, carbon monoxide, total suspended particulates, and polycyclic organic matter from wood-burning stoves.

APPENDIX E

Frequency of Afternoon Venting Indices in the Okanagan

Eric Taylor
Air Quality Meteorologist, Thompson Region
October 27, 2005

The Ventilation Index is a function of the product of (a) the depth of the surface mixed layer of the atmosphere and (b) the average wind speed through this layer. Both of these numbers are forecast (not measured) values. The ventilation index guidelines are:

POOR Venting: Ventilation index of 0-33
FAIR Venting: Ventilation index of 34-54
GOOD Venting: Ventilation Index of 55-100

The following table shows the frequency of afternoon ventilation indices in the Okanagan Valley for a six year period (January 12, 1996 to December 31, 2001). The daily indices were calculated by Environment Canada. For example, in JANUARY the Ventilation Index is above 10 for 99% of the days, above 80 for only 8% of the days, and is FAIR for 33% of the days.

Venting Index exceeds:	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
>10	99%	99%	99%	100%	100%	100%	100%	100%	98%	100%	99%	96%
>20	80%	91%	98%	100%	100%	99%	100%	100%	97%	97%	96%	82%
>30	59%	78%	91%	100%	100%	99%	99%	99%	89%	92%	84%	66%
>40	34%	60%	82%	97%	98%	99%	99%	96%	84%	81%	66%	47%
>50	24%	43%	72%	91%	95%	95%	97%	93%	74%	64%	43%	34%
>60	15%	27%	60%	80%	91%	92%	94%	86%	60%	51%	26%	22%
>70	10%	20%	52%	72%	84%	86%	89%	76%	53%	43%	18%	14%
>80	8%	14%	46%	64%	72%	79%	76%	65%	47%	32%	14%	9%
>90	7%	13%	32%	50%	58%	66%	62%	50%	34%	24%	9%	7%
>100	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
POOR VI	47%	28%	10%	1%	0%	1%	1%	2%	12%	11%	21%	39%
FAIR VI	33%	34%	25%	10%	8%	5%	3%	8%	17%	28%	46%	33%
GOOD VI	20%	38%	65%	89%	92%	94%	96%	90%	70%	61%	34%	28%
TOTAL DAYS	157	169	185	177	178	177	185	181	178	183	179	184