needs footnotes (almost none)
- very little analysis
very simplistic

John Vigod's Comments (416) 960-2284

Draft Report
Public Health Guidelines, Objectives and Standards for Environmental Media in Canadian Great Lakes Basin

Introduction

The Great Lakes Basin ecosystem is an extremely large and complex system that incorporates the surrounding land, water, air and all living creatures. It is the great abundance of these natural resources that has attracted many people to the Great Lakes and encouraged industrial development in the region. To date, over 32 million people in Canada and the United States live within the Great Lakes Basin, utilizing the natural resources on a daily basis. It is this intense use and subsequent misuse of the water, land and air which now threatenes the health and well-being of all creatures within the Great Lakes Basin.

In the early 1970's public attention was drawn to the many rivers, lakes and beaches polluted with everything from industrial chemicals to human waste. The water was fouled by oil slicks, algal growths and dead fish, leaving much of the Great Lakes unfit for public use. Since that time, great effort has been made to clean up the visible pollution. But much more work is needed. Pollutants continue to be emitted into the environment and many of these chemical substances remain, contaminating wildlife and threatening the health of those who live in the Great Lakes Basin.

In an effort to protect the public from exposure to toxic environmental pollutants, Federal and Provincial governments have made commitments to identify pollutants and establish public health guidelines, objectives and standards. In both Canada and the United States, public health guidelines have been established for various environmental contaminants in the Great Lakes Basin. They have been created to help protect the general public from potential health risks. Public health guidelines, however, are often difficult to interpret and vague in their jurisdiction. This report serves as a vehicle to aid the public in its understanding of the environmental health guidelines, objectives and standards currently in effect in Canada.

1.0 Human Exposures to Environmental Contaminants in the Great Lakes Basin

For people throughout the Great Lakes Basin, there is concern not only about the environment but also a concern about the effects that environmental contamination has on their own health and their family's health. The news media often report on matters such as chemical spills which pose the potential for adverse health effects in air and water, or suspected cancer causing agents (carcinogens) in foods. These concerns are legitimate in light of the mounting

scientific evidence that there are an increasing number of toxins in the environment. Most recently, scientific data has linked the persistent toxic chemicals which are often found in the water and food of wildlife with reproductive problems in bird populations and deformities in newly hatched birds. These adverse effects demonstrated in the wildlife give adequate cause for public health concern in the Great Lakes.

1.1 Sources

The sources of environmental pollutants can be natural as well as man-made. Natural sources include smoke from forest fires, wind-blown dust, metals that are naturally occurring in the earth's crust or radiation. Man-made pollutants may be either chemical elements or manufactured chemical substances and can enter into the Great Lakes ecosystem from industrial and municipal point sources, urban and agricultural run-off or atmospheric fallout.

1.2 Pathways and Routes

Humans are exposed to environmental pollutants by a variety of pathways and routes:

- the food we eat;
- the air we breathe into our lungs;
- the water we drink and come in contact with recreationally;
- the soil we come in contact with;
- the consumer products we use.

Aside from any occupational exposure, the overall exposures to environmental contaminants are very complex and usually involve many different contaminants at various levels of concentration.

1.21 Food

Food is considered the largest contributor to the environmental contaminants humans are exposed to. According to recent estimates made by Health and Welfare Canada, 40-90% of the environmental contaminants humans are exposed to comes from food. Food basket surveys conducted within the Great Lakes Basin region of Ontario have shown that most of the food eaten by basin residents is grown outside of the basin. There is potential, however, for residents living within the

basin to be exposed to many environmental contaminants through local food. Research indicates dairy products and meat contribute to the majority of the environmental contaminants consumed. Chemical residues have been found on vegetables from the application of pesticides and from atmospheric fallout. Contaminated Great Lakes fish and wildlife have resulted from persistent toxic chemicals entering the water from industrial and municipal wastes and from agricultural runoff. Although the level of the environmental contaminants in food may vary from location to location, the quantity and frequency of consumption is important in determining the total exposure to environmental contaminants.

1.22 Air

Humans are exposed to environmental pollutants in the air by breathing the contaminants into their lungs. It has been estimated that 5-10% of the environmental contaminants humans are exposed to comes from the air. Outdoor air pollution comes from a variety of sources, but the majority comes from motor vehicles, industrial and public utility smokestacks and homes. The amount and toxicity of contaminants breathed into the lungs may vary from day to day, depending on the weather conditions, the amount of pollutant released and the relative location of the source. Indoor air pollution usually comes from a build-up of smoke, gasses or vapours, due to poor ventilation.

1.23 Water

Humans are exposed to water pollutants by drinking the water and by recreational contact with water. It has been estimated by Health and Welfare Canada that water accounts for about 1% of the environmental contaminants humans are exposed to. Most urban Canadian drinking water is drawn from nearby lakes and rivers and often contains low levels of chemical contaminants. Elevated levels of environmental contaminants are occasionally found in municipal drinking water supplies and are usually the result of ground water contamination or chemical spills. During recreational activities such as boating and swimming, the skin may be exposed to the environmental pollutants, allowing for skin absorption of chemicals.

1.24 Soil

Exposure to contaminated soils is primarily a concern for infants and small children who unintentionally eat soils on toys and other objects. Soils in urban areas may have

high concentrations of lead due to leaded fuel use or an industry associated with lead. Soils in the agricultural areas may have increased concentrations of metals and pesticides.

1.25 Consumer Products

Human exposure to contaminants from consumer products is difficult to determine. Such exposure may be from arts and crafts materials, fabric fire retardants or spray-can propellants to name only a few.

1.3 Multi-Media Exposure

Because of all of the pathways humans are exposed to environmental contaminants, the concept of "multi-media approach" is now being used in assessing the total exposure humans have to environmental contaminants. In this type of approach, there is an attempt by scientists to quantify each of the media's contribution (food, air, water, soil and consumer products) to the total human exposure. As a result, exposure limits established in the health-based guidelines for each media are based on the total exposure that is considered acceptable or tolerable by health experts. By utilizing this kind of approach, it is thought that a more realistic attempt is made in estimating the health risks associated with exposures to environmental contaminants in food, air, water and consumer products.

2.0 Health-Related Environmental Legislation in Canada and Ontario

Both Federal and Provincial legislation exists to protect not only the the environment of Canada but also the health of Canadian citizens within the Great Lakes Basin. Under Canada's constitution, both the Federal and Provincial governments have responsibility to control environmental contaminants, hazardous substances and hazardous products. Within both levels of government, formal legislation has been enacted to empower governmental agencies and departments to provide for protection of public health.

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could be expanded but OK.

2.1 Federal Legislation

The role of the Federal Government is to provide leadership in developing general policies for the Provincial governments and the private sectors. Federal responsibilities in environmental and human health protection are broad. Such responsibilities are included in the administration of Federal legislation, the establishment of

guidelines and objectives for adoption and enforcement by the Provincial governments and providing scientific information and data to Provincial governments and the public.

The following is a brief summary of the Federal environmental legislation that is public health-related.

2.11 Canada Water Act

This legislation was passed in 1969 and it enables the federal government to manage the water resources of Canada. Environment Canada is primarily responsible for the administration of this act. By working with the provinces through Federal-Provincial advisory committees, this act provides for scientific research, data collection, planning and implementation of water management programs and monitoring of water quality. While this act contains many provisions for controlling contaminants in water, it also promulgates the Guidelines for Canadian Drinking Water Quality.

this is never used—

2.12 Canadian Environmental Protection Act

not really comprehensive

This comprehensive legislation was enacted in 1988 and replaces the Environmental Contaminants act, the Clean Air Act and the Ocean Dumping Control Act. This act strengthens the Federal government's ability to protect the environment and human health from the effects of toxic substances. Both Environment Canada and Health and Welfare Canada are responsible for assessing the impact toxic substances have on the environment and evaluating the effects these substances have on human health from various exposures. If there is sufficient evidence that a chemical substance poses a risk to human health, measures for control will be enacted. The control measures may provide regulations for releasing contaminants into the environment or a ban on the manufacture and use of the contaminant. Under this act, the National Ambient Air Quality Objectives are promulgated.

no analysis

too short

→ equivalency provisions problem

2.13 Food and Drugs Act

This legislation was initially enacted in 1920 to control contaminants in foods and drugs in order to preserve and improve the product quality. Revised in 1953, the Food and Drugs Act now provides control of toxic substances in foods, drugs, cosmetics and medical devices. As a means of controlling these substances, maximum residue levels have been established for more than 200 chemical substances in or on food. The Health Protection Branch of Health and Welfare Canada is responsible for assessing the health risks of chemical substances in foods, based on the sources of human exposure.

2.14 Fisheries Act

This legislation was enacted in 1939 and may be considered the first environmentally oriented legislation in Canada. The act was established to protect commercial fisheries by prohibiting release of toxic substances into water inhabited by fish. As a result, this act not only protects the fishing industry but also protects the environment and, ultimately, public health through fish consumption. The administration of this act is primarily by the Department of Fisheries and Oceans.

EC can does s 36 – (anti-pollution sections)

2.15 Atomic Energy Control Act

This legislation, enacted in 1946 and revised in 1976, deals with radioactive substances such as uranium and plutonium. Under the authority of this act, the Atomic Energy Control Board is created to govern the development and use of atomic energy. The board is also responsible for controlling pollution that results from uranium mining and nuclear power production plants. Radionuclides in drinking water is a primary concern for public health.

2.16 Pest Control Products Act

New Regulatory Model

This legislation was enacted in 1969 and is designed to control products that are used for controlling pests. Under the authority of this act, all pesticides must be registered before they can be used in Canada. The Department of Agriculture is primarily responsible for the administration of this act. Under this act, the Pest Control Products Regulations are promulgated. These regulations control the specific use of products that directly or indirectly control pests.

Provinces actually deal c use

2.17 Hazardous Products Act

This legislation was enacted in 1968 to protect consumers from the advertising, sale and importation of hazardous products other than food, drugs, cosmetics or pesticides. The Department of Consumer and Corporate Affairs is primarily responsible for the administration of this act. The Bureau of Chemical Hazards within Health and Welfare Canada assesses any chemical hazards or health risks associated with consumer products. If a product is considered to be a health hazard, a recommendation to limit or ban its use is made to the Minister of Consumer and Corporate Affairs.

associated with consumer products. If a product is considered to be a health hazard, a recommendation to limit or ban its use is made to the Minister of Consumer and Corporate Affairs.

2.2 Provincial Legislation

The Provincial Governments have jurisdiction over their own natural resources and have power to enact legislation that protects the environment as well as public health. Guidelines and objectives promulgated by the Federal Government to protect public health may be adopted as legally binding standards by the Provincial Government. Objectives, guidelines or standards that are more restrictive than those established by the Federal Government, however, may be created by the Provincial Governments and promulgated within the Province. The following is a brief summary of the Ontario environmental legislation that is public health-related.

2.21 Ontario Water Resources Act

This legislation, enacted in 1956 and revised in 1980, provides for the management of water resources in the province of Ontario. Such management includes the control of chemical, bacteriological and physical pollutants in surface and ground water. The Ministry of the Environment is primarily responsible for the administration of this act. Under the Ontario Water Resources Act, the document titled "Water Management - Goals, Policies, Objectives and Implementation Procedures" was created in 1978, and later revised in 1984. This document not only outlines the management programs for surface and ground water, but also provides the Provincial Water Quality Objectives and the Ontario Drinking Water Quality Objectives.

2.22 Environmental Protection Act

This legislation was enacted in 1971 and provides Ontario with the authority to protect and conserve the natural environment. This includes the air, land and water and any combination of these three resources. The Ministry of the Environment is primarily responsible for the administration of this act and enforcing the regulations under it. There are many regulations under this act that deal with the control and monitoring of chemical substances in the environment. Among those regulations that are health-related are the Air Pollution Control Regulations and the Ambient Air Quality Criteria Regulations.

MISA —
CAP. —

2.23 Health Protection and Promotion Act

Enacted in 1983, this legislation provides for the organization and delivery of public health programs and services in Ontario. This includes the prevention of the spread of disease and the promotion and protection of health. Under the authority of the act, local boards of health are empowered to ensure that levels of health protection and health promotion are provided. Public health goals have been established by the Ministry of Health. Among these goals is a Health Environment Goal which states that "...people will be protected from adverse health consequences of exposure to toxic, hazardous substances and conditions in homes, public places and the workplace." Programs that contribute toward achieving this environment goal are the food safety program and the water safety program.

2.24 Pesticides Act

This legislation, enacted in 1974 and revised in 1980, provides Ontario with the authority to control the application and use of all classes of pesticides within the province. The Ministry of the Environment is primarily responsible for the administration of this act and its regulations. Under the authority of the act, the Minister may investigate problems, conduct research, provide educational programs and public information that is related to the application and use of pesticides in controlling pests.

3.0 Environmental Contaminants in the Great Lakes Basin

One of the basic requirements in assessing the quality of the environment is identifying the chemical substances that exist in the water, air, land and food. Once these chemical substances are identified, guidelines and objectives can be established to protect the health of the humans that are exposed to them.

To date, over 400 toxic substances have been identified in a variety of environmental samples such as water, sediment and biota in the Great Lakes Basin. Studies conducted by scientists have determined that many of these chemical substances come from outside the region. They are transported to the basin by air and water. The impact these substances have on the environment and their effects on human health is far from being fully understood. Further research is needed to better understand the behavior of these toxic chemical substances, their relationship to one another and their effects in the environment. Research is also needed on

the potential adverse human health effects that results from long-term exposures to contaminants in drinking water, food, air and soil. Because the number of toxic substances found in the environment is so extreme, efforts have been made by scientists in both Federal and Provincial governments to identify those substances that pose the greatest threat to Great Lakes ecosystem and to human health. As a result, many lists of chemical substances have been made to help focus the priority of governmental agencies in their research on environmental contaminants.

The following is a brief summary of the active lists of environmental contaminants. Each list describes the reason for the creation of the list and the type of chemicals that are included on the list.

3.1 Priority Substances List

The ~~50~~ 44 chemicals that comprise this list were selected in 1988 by an advisory panel to the Ministers of Environment Canada and Health and Welfare Canada, under the authority of the Canadian Environmental Protection Act. The chemicals that were selected were based on their toxicity to humans, their persistence in the environment, how widely spread over a geographic area, their ability to bioaccumulate and their potential for human exposure. The purpose of this list is to systematically incorporate these ~~50~~ 54 chemicals into the Federal environmental assessment and protection programs. Once these chemicals are included into these programs, they can also be used for regulatory action. It is the responsibility of both the Federal and Provincial governments to utilize this list in environmental and public health protection. Public consultation and participation in reviewing the status of this list is invited every two years and updating is recommended every 5 years by the advisory panel.

First document issued on dioxins & dibenzofurans

3.2 11 Persistent 'Critical' Pollutants List

This list of 11 chemical substances was established in 1985 by the International Joint Commission Great Lakes Water Quality Board. The list includes PCBs. TCDD (dioxin), TCDF (furan), Mirex, Benzo(a)pyrene, Hexachlorobenzene, DDT, Dieldrin, Toxaphene, Mercury and Alkylated Lead. The criteria used in selecting these pollutants was based on the pollutant's ability to bioaccumulate in living organisms, to biomagnify in living organisms and to persist at levels that exceed the current water quality objectives for the Great Lakes, as determined in the Great Lakes Water Quality Agreement. The purpose of this list was to identify the most persistent and widespread toxic pollutants in the Great Lakes Basin. The mechanisms for review and updating this list lie with the Water Quality Board of the IJC.

3.3 Great Lakes Water Quality Agreement of 1978 as amended by Protocol, 1987 Annex 1

Annex 1 of the Great Lakes Water Quality Agreement includes a list of organic and inorganic persistent toxic substances and specific numerical objectives for these substances. These specific objectives are considered the minimum levels of water quality desired for the Great Lakes waters. However, they are not meant to conflict with more stringent goals such as zero discharge. The criteria for selecting these substances was based on the direct relationship between the pollutant and adverse effects on the most sensitive use. The mechanisms for review and updating this list are made by the both Canadian and US governments to the Great Lakes Water Quality Agreement on the recommendation by the International Joint Commission (IJC).

3.4 Great Lakes Water Quality Agreement Annex 1 Lists of Substances (1989) Draft

As part of the Specific Objectives Review Process of the Great Lakes Water Quality Agreement (GLWQA), the Canadian and United States Governments are required to compile and maintain three lists of chemical substances. By creating these lists, the objective to identify environmental pollutants and their toxic effects can be achieved. The chemicals on the three lists are selected on the basis of their presence in the Great Lakes Basin and their toxicity to aquatic, animal or human life. The purpose of the lists is to categorize chemical substances that present a real or potential hazard to the Great Lakes ecosystem. To compile these lists, the chemical substances were initially contained on one of three older lists. The older, "working" lists were the 1986 Working List of Chemicals in the Great Lakes Basin, the Ontario MISA Effluent Monitoring Database and the Superfund Toxics Release Inventory Database. Public comment and review has been solicited for these lists of chemical substances by request of the Binational Objectives Development Committee of the IJC.

3.41 List No. 1 (Present and Toxic)

The 173 chemicals on this list are currently present either in the water, sediment or biota of the Great Lakes. Based on laboratory or field studies, these chemicals have been shown to exhibit acute or chronic toxic effects on aquatic or animal life, and may be considered to also have toxic effects on human life. The chemical substances on this list are candidates for the development and adoption of Specific Objectives in the GLWQA. The Specific Objectives

are concentration levels of the pollutant in water to protect the most sensitive use (for example to protect aquatic life or to protect people that eat fish).

3.42 List No. 2 (Present and Potentially Toxic)

The 208 chemicals on this list are currently present either in the water, sediment or biota of the Great Lakes. Based on laboratory or field studies, these chemicals are considered to have the potential to be acutely or chronically toxic to aquatic, animal or human life. These substances are also candidates for additional toxicological studies and any one of these chemical substance may be moved to List No. 1 if found to cause acute or chronic toxicity.

3.43 List No. 3 (Potentially Present and Toxic)

This list of 184 chemicals is considered to have the potential for being discharged into the Great Lakes System, but have not been detected in any environmental sample. Based on laboratory and field studies, these chemicals have demonstrated either acute or chronic toxicity in aquatic or animal life and are considered to be toxic to human life. The chemical substances on this list are candidates for additional monitoring within the Great Lakes system. If they are detected by such monitoring, these chemicals will be moved to List No. 1.

?? MISA lists — EMPPL

3.5 Detection of Chemical Substances

In the past, the ability to measure or even detect extremely low concentrations of environmental contaminants was very difficult. Today many technical advances and refinements have been made in the analysis procedures and chemical instrumentation. As a consequence of these advancements, chemical substances in complex mixtures are being detected and measured in very low concentrations.

The detection limit may be defined as the smallest quantity or concentration of a chemical substance that an analytical method will show a recognizable positive response. As the instrumentation used in chemical analysis becomes more sophisticated, chemicals that were considered non-detectable in environmental samples 10 years ago are now being detected and even measured (quantified). It should be noted that the term 'detection limit' is not the same as the term 'quantifiable limit'. The limit of quantification may be defined as the smallest quantity or concentration of a chemical substance that can be measured in an environmental sample.

When contaminants are measured in environmental samples, it is important to understand how they are expressed and what they mean. Part per million (ppm), part per billion (ppb) and part per trillion (ppt) are the most commonly used terms to express very small amounts of contaminants in environmental samples. These terms are measures of the concentration of one material in a larger amount of another material, for example the weight of a toxic chemical in a known weight of food. Contaminants are usually expressed as concentrations rather than amounts so they can easily be compared to different environmental situations, such as ppm in water and fish.

In terms of the human health effects of toxic substances, the amount of exposure (or dose) to the toxic substance is directly related to the effect produced. Generally speaking, the greater the dose, the more severe the effect. Adverse health effects may result from very low doses of some environmental contaminants.

4.0 Environmental Contaminants and Risks to Human Health: Assessment and Management

Over the past 20 years, there has been an increasing concern about the protection of public health from environmental contaminants. The roots of these concerns began in the workplace, where exposures to certain hazardous chemical substances were directly related to health problems in employees. The knowledge that was gained from occupational exposure to chemical contaminants led to the development of guidelines and standards designed to protect the health of workers exposed to hazardous chemicals. Many of the chemical contaminants found in the environment today are the same chemicals considered hazardous in the workplace. As a result, there has been a desire by the public to have health protection from environmental contaminants. Transferring the knowledge and information gained from occupational exposure to environmental exposure is far from easy. There are many more variables to consider with exposure to environmental contaminants. In order to determine the actual health risk associated with environmental contaminants, several considerations must be made. These include the presence of the toxic substance, the amount or dose of toxic substance or the age and sex of those exposed, to name only a few. Procedures for risk analysis and risk assessment of environmental contaminants have been recently developed to better understand what the potential risks are and what health guidelines and objectives should be established. The development of a multi-stage process of risk assessment and risk management has been instituted by the Health Protection Branch of the Department of Health and Welfare.

4.1 Risk Assessment

Risk assessment includes two areas of assessing health hazards. These areas are termed 'risk analysis' and 'option evaluation'.

4.11 Risk Analysis

Risk analysis involves both the identification of a toxic substance (hazard identification) and the estimation of how great the risk is to humans (risk estimate).

Hazard identification is based on studies of human populations known to be exposed to a certain chemical substance (epidemiology) or on studies of laboratory animals experimentally exposed to the toxic chemical. To identify an environmental hazard, all of the scientific data concerning the toxic chemical is reviewed in determining whether an adverse health effect can result from exposure to the toxic chemical.

Risk estimate includes understanding the amount of chemical that is known to produce an unwanted health effect (dose-response) and the likelihood that humans will be exposed to the toxic chemical (exposure potential). Dose-response estimates for humans exposed to environmental contaminants are usually determined from long-term, low dose (chronic toxicity) studies on laboratory animals. By determining a no-observable-adverse-effect-level (NOAEL) in test animals, a 'safe' exposure level for human exposure can usually be inferred. The frequency of exposure and length of time humans are likely to be exposed to a toxic chemical must also be determined. Differences in population groups - such as children or pregnant women - must be considered in evaluating the exposure potential of an environmental hazard.

4.12 Option Evaluation

When the risk of being exposured to a chemical substance is considered to be significant, all of the various courses of action for control are considered (development of options) and reviewed to determine their likelihood of being implemented (option analysis).

Options that are developed to minimize the risk of exposure to a hazardous chemical may be non-regulatory, which includes such things as advertising to persuade people to avoid the risk (i.e., anti-smoking ads). Or, such options may be regulatory, which may involve legislation to control the use of a chemical substance or prohibit the use of the chemical.

The options that are recommended are then analyzed by considering the benefits and drawbacks of each one. The area of option analysis weighs such matters as the health risk versus the health benefit of a chemical substance, or the

perception the public has about the risk.

4.2 Risk Management

In determining a management program for an environmental hazard, the best option for control is decided upon and then implemented. After implementation, the control option is monitored and evaluated.

There are various approaches in making a decision to manage an environmental hazard. Such approaches may only involve the health risk, such as known cancer causing agent, or may include the best available control technology to reduce the risk. From a general public health perspective, the decisions to manage environmental risks has been by establishing guidelines, objectives and standards.

Public health guidelines are usually defined as recommended numerical concentrations (or sometimes narrative statements) of an chemical substance that should not be exceeded in order to safeguard and maintain the general public's health. Public health objectives are defined as numerical concentrations or narrative statements that have been determined to be the maximum concentration of a chemical substance that can be allowed to support and protect the general public health. Neither guidelines or objectives are enforcable by law. Public health standards are defined as numerical concentrations of chemical substances that are enforcable by law.

Once a management program is in place, surveillance and monitoring activities can be instituted to determine the effectiveness of the option selected and whether goals are being met. Open communication and public participation in evaluating the management programs of environmental contaminants is an important part of the success of risk management. Public participation in this advisory process, however, is limited. There is a critical need for the public to be informed of the environmental health guidelines, objectives and standards in the Great Lakes basin. By being informed, the public can be aware of the daily health risks that exist within their environment and participate in advisory roles.

5.0 Health-Based Guidelines/Objectives/Standards in the Great Lakes Basin

Both Federal and Provincial governments within the Great Lakes Basin have established guidelines, objectives and standards for environmental contaminants in food, water and air. They have been made to protect human health. Many of these objectives and guidelines have been established by 'advisory committees' that review the appropriate scientific data and make recommentations concerning chemical substances

in the food, air, water and consumer products. Although public participation in the decision-making process is a critical step in understanding and accepting a guideline or objective, it is often overlooked. The following section is a summary of the current health-based guidelines, objectives and standards for the various environmental media in the Great Lakes Basin. Within each guideline, objective or standard the jurisdiction of the guideline is discussed, the committees or groups responsible for establishing the guidelines, the health criteria used to create them and the areas where the public can participate in the development and review process. The relationship of the guideline or objective to the Great Lakes Water Quality Agreement is also discussed.

5.10 Food

As noted earlier, food contributes the greatest portion of environmental contaminants that humans are exposed to. In light of this fact, protecting food from either direct or indirect contamination is a primary concern. Various food basket surveys have determined that the food that is consumed in the Great Lakes Basin is grown both outside and within the basin. Products such as dairy, meat and fish contain the majority of the environmental contaminants humans in the basin are exposed to.

5.11 Commercial Food

Under the authority of the Federal Food and Drugs Act and Regulations, food that is sold in Canada may not have any harmful substance in or on it. Such harmful substances may result from either being directly added to the food in the preparation, or indirectly added by the packaging process or by pesticide use.

The Health Protection Branch of Health and Welfare Canada is responsible for assessing the risk of being exposed to chemicals or toxic substances that are found in food. To make health risk assessments, several determinations are made. The Tolerable Daily Intake (TDI) of a chemical is determined first. This is the quantity of undesirable chemical contaminant that an adult can consume on a daily basis, over a lifetime, with no adverse health effect. The Probable Daily Intake (PDI) is determined next. This is the quantity of undesirable chemical contaminant that an adult consumes from all sources, such as the air, the drinking water or other foods. When the Tolerable and Probable Daily Intake levels for a chemical contaminant are determined, the maximum quantity of the chemical contaminant in food can be made. This Maximum Residue Limit (MRL) is made by the

Chemical Evaluation Division of the Food Directorate within Health and Welfare Canada.

The MRLs are listed in the Food and Drugs Regulations. Currently, there are 90 agricultural chemicals that have MRLs established for various foods including meat, fish, vegetables and dairy products. An additional 143 agricultural chemicals have been listed in the regulations in which the chemical may not exceed 0.1 part per million (ppm). The MRLs for contaminants are legally enforcable throughout Canada. If the MRL for a particular chemical substance in food is exceeded, the Health Protection Branch is authorized to take corrective action by controlling the food that contains the toxic substance.

Guidelines, rather than MRLs, have been established for the environmental contaminants PCBs and mercury in food. These guidelines are not legally enforcable under the Regulations of the Food and Drugs Act. If levels of PCB or mercury in food are greater than the guidelines, limited regulatory action can be exercised.

The guideline levels for PCBs in the edible portions of fish are currently set at 2.0 ppm. This is 10 times higher than the PCB levels in meat and 4 times higher than the levels in poultry. Fish may also contain 20 parts per trillion (ppt) or less of the chemical dioxin (TCDD). All other foods do not allow any level of TCDD.

The current MRLs established in the Food and Drugs Regulations are reviewed by an informal group within the Chemical Evaluations Division of the Food Directorate of Health and Welfare Canada. Public comment and review of any existing regulation or proposed change can only be made after the recommendation is made by Health and Welfare Canada to the Governor in Council. Public comments are solicited by notification in the Canada Gazette.

In an effort to protect humans that consume fish caught in the Great Lakes Basin, the Great Lakes Water Quality Agreement (GLWQA) has established objectives for 4 pesticides in the edible portions of fish. These pesticides are Aldrin/Dieldrin, Endrin, Heptachlor/Heptachlor Epoxide and Lindane with concentration limits at 0.3 ppm. These same pesticides, however, do not have MRLs established for fish in the Regulations of tje Food and Drugs Act. The only MRL established for fish is DDT at 5.0 ppm and TCDD at 20 ppt.

The GLWQA has also established specific objectives for PCBs at 0.1 ppm and mercury at 0.5 ppm for whole fish, which includes all of the internal organs. These levels are to protect birds and animals that consume whole fish. The mercury guidelines for the edible portions of fish in the Regulatons of the Food and Drugs Act are the same level as the GLWQA level for whole fish. The PCB guidelines for edible portions of fish, however, are 20 times higher in the Regulations than the GLWQA level for whole fish.

5.12 Sportfish and Wildlife

There are no federal regulations within the Food and Drugs Act that govern the levels of any contaminants in sportfish or wildlife. Yet, there have been numerous studies identifying contaminated fish and wildlife with the Great Lakes Basin. There are many Canadian citizens that consume large quantities of both fish and wildlife. It has been suggested by scientists that the consumption of contaminated fish and wildlife can significantly increase human exposure to PCBS, pesticides, mercury and lead.

5.13 Guide to Eating Ontario Sport Fish

Within the Province of Ontario, the Ministry of the Environment and the Ministry of Natural Resources publish a yearly guide for consumers of sport fish. This guide is designed to give specific information on which species of fish are safe to eat when caught at specific locations within Ontario. Advice is also given on the amount of fish that can be safely eaten without undue risk or harm. Specific recommendations are given for children and pregnant women.

The criteria used in developing these guidelines are based on the amount of contaminant found in the fish through a monitoring program and the levels of chemical substances that are allowable for consumption by the Health Protection Branch of Health Welfare Canada. The contaminants that are of concern are those that bioaccumulate in the fat of fish. This includes mercury, PCBs, Mirex (a pesticide not used in Canada, but used in the US) DDT, TCDD (dioxin), pesticides and metals. Restricted consumption of fish is based on mercury levels greater than 0.5 ppm or the presence of one or more organic contaminants at levels greater than the federal maximum residue levels.

There is no formal mechanism for public participation in the sport fish monitoring program. Public input can be made every three years through a main-in questionaire that is included with the guide. The latest questionaire was included in the 1989 guide, however, only 1% were returned. All public suggestions and concerns are considered by the Water Resources Branch of the Ministry of the Environment.

In the Specific Objectives of Annex 1 of the GLWQA, mercury should not exceed 0.5 ppm for whole fish. This level was established to protect aquatic life and fish-consuming birds. The consumption restriction for humans in the Ontario Sport Fish Guide is also establised at 0.5 ppm for mercury levels in the skinless fillet of fish.

5.2 Air

Humans may be exposed to a variety of environmental contaminants by the air that is breathed into the lungs. Contaminated air may be outdoors as well as indoors and may contain gases, vapors or particulates that have harmful substances attached to them. Ambient air is the air that surrounds us every day. Within the Great Lakes Basin there are Federal Air Quality Objectives and Provincial Air Quality Standards that protect human health.

5.21 National Ambient Air Quality Objectives

There are five air contaminants that the Federal Government has established three ranges of objectives within Canada. These five contaminants are Sulfur Dioxide (SO_2), Suspended Particulate Matter (PM), Carbon Monoxide (CO), Ozone (O_3) and Nitrogen Dioxide (NO_2).

The three objective ranges are "desirable", "acceptable" and "tolerable". The desirable range is the lowest level of the three objective ranges and is considered to be the long term goal for Canadian ambient air quality. To achieve this level, stringent control technology would be required by all generators of air pollutants. The acceptable range is the level that the air contaminant is considered necessary to protect the soil, water, vegetation, animals and humans from any adverse effects. The tolerable level is the highest level of air contaminant that can be allowed without risking human health. Concentrations greater than this level are considered to be a danger to health. These ranges of air contaminants have no legal authority and are not enforcable by the Federal Government. They may, however, be promulgated as legal standards by the Provinces. Ontario includes the five air contaminants as part of their air quality standards.

The ambient air objectives were originally developed by the Federal-Provincial Committee an Air Pollution and a Subcommittee on Air Quality Objectives. The criteria used in establishing a maximum acceptable level for sulfur dioxide and ozone was based on the protecton of vegetation and human health. The criteria used to establish the maximum acceptable level for carbon monoxide, nitrogen oxides and suspended particulates were based solely on the undesirable health effects to humans at higher levels.

Since 1971, there have been name changes and organizational restructuring of the air quality committees. The current committee responsible for ambient air objectives is the Federal-Provincial Advisory Committee on Air Quality. This committee is made up of various governmental representatives from both the Federal and Provincial governments based on their ability and interest in air contaminants. This advisory committee is responsible to the Canadian Council of the Ministers of the Environment (CCME), who make the final approval of any air quality objective.

There is no formal mechanism for public participaton in the review process.

In Annex 15 of the Great Lakes Water Quality Agreement (GLWQA) airborne toxic substances are addressed. This is an effort to better understand the sources, pathways and effects toxic substances, particularly persistent toxic substances, have on human health by aquatic exposure.

Of the five air pollutants in the national ambient air quality objectives, only nitrogen dioxide is listed among the hazardous polluting substances in appendix 1 of the GLWQA. Nitrogen dioxides usually result from combustion, such as in motor vehicles and municipal incinerators. Nitrogen dioxide is easily converted to an acid which contributes to acid rain.

5.22 Air Pollution Control Regulation 308

Under Ontario's Air Pollution Control Regulation 308, standards have been set for 100 air contaminants. These standards are the maximum concentration levels for an air contaminant that are legally allowed in Ontario. Although the Ministry of the Environment is primarily responsible for the administration of the Air Pollution Control Regulations, the Environmental Air Standards Setting Committee (EASSC) is responsible for establishing the standards. This committee is comprised of 9 - 12 members from various governmental departments within Ontario, including Labour, Health and Environment. There are no members representing the public on this committee. Currently, there is no formal means for public comment on the review of the existing standards or development of new standards.

The levels established for 50% of the air contaminants are based on human health criteria. The levels for 24% of the contaminants were based on odor and 26% based on damage to vegetation, corrosion to structures, soiling impairment of vision or suspended particulates. The five air contaminants that are listed in the National Air Quality Objectives are included in Ontario's air standards. The level promulgated by Ontario most closely matches the "acceptable" range of the national objective.

In addition to the 100 standards established in Regulation 308, the EASSC has further identified 200 air contaminants which are set as interim standards, tentative standards, guidelines or provisional guidelines. The significance and effect these contaminants have on human health through aquatic exposure routes (drinking water or fish consumption) are not defined or determined. The proposed Clean Air Program of the Ontario Ministry of the Environment includes a system to classify air contaminants according to their potential to impact the environment and human health. If this proposal is adopted there will be a greater effort by the Province to support Annex 15 in the GLWQA.

5.23 Guidelines for Indoor Air Quality

As more information is gained on the variety of air pollutants inside homes and offices, indoor air quality has been a concern to Canadians. In response to these concerns, Health and Welfare Canada has recently published Guidelines for Indoor Air Quality. These guidelines were prepared by the Federal-Provincial Working Group on Indoor Air Quality at the request of the Federal-Provincial Advisory Committee on Environmental and Occupational Health. The working group is composed of interested governmental representatives from various departments within the provinces and a representative from Health and Welfare Canada. There are no members representing the public on this committee.

The Indoor Air Guidelines were developed to improve the air quality in homes and residences. They have no legal authority within Canada and are not enforcable by law. While the guidelines and recommendations are intended to protect the general population, particularly sensitive people, such as the very young or those with chronic lung disease, may not be protected.

In preparing these guidelines, three groups of contaminants were identified. They are (1) the non-carcinogenic substances that are known to cause adverse health effects, (2) the carcinogenic substances and (3) the substances that can be easily controlled or only have potential for adverse health effects.

The group of contaminants listed as non-carcinogenic substances are carbon monoxide, nitrogen dioxide, ozone, particulate matter, sulphur dioxide, carbon dioxide, aldehydes and water vapour. It should be noted that the first five of these pollutants are the same air pollutants listed in the National Ambient Air Quality Objectives. The criteria used in establishing the indoor air guidelines for these substances was from animal laboratory data, clinical studies and epidemiological studies. This data was then used to determine the lowest-obsevable-adverse-effect-level for each air pollutant. Safety factors were applied to accomodate differences in studies and animal species studied. As a result, two exposure ranges have been established for the non-carcinogenic air pollutants: the Acceptable Long Term Exposure Range (ALTER) and the Acceptable Short Term Exposure Range (ASTER).

Formaldehyde and radon are the two substances in the 'carcinogenic substances' group with guideline levels. Theoretically, there may be no acceptable level of exposure to a known carcinogen. Practically speaking, however, levels of formaldehyde and radon should be reduced to the lowest possible level to protect human health. The exposure guidelines for formaldehyde have been determined at two levels: an action level, which the level that can be practically achieved, and a target level that should be the long term goal. Radon has only an action level listed. This

level was determined by the Federal-Provincial Subcommittee on Radiation Surveillance.

Recommendations to reduce exposures to biological agents, chlorinated hydrocarbons, fibrous materials, lead, pest control products, polycyclic aromatic hydrocarbons, aerosols and tobacco smoke are also given. There are no specific guideline levels given for these contaminants.

There is no procedure for public consultation or participation in the review of these guidelines or in the development of new guidelines.

5.3 Water

Perhaps the greatest collection of scientific data on environmental contaminants in the Great Lakes Basin is on water. Much time, effort and money has been spent on understanding the sources, distribution and fate of numerous environmental pollutants that enter the water. Historically, public health concerns have centered around the bacteria levels in water. Today, however, Canadians are also concerned about the organic and inorganic contaminants that affect the quality of water for recreational use as well as for consumption.

5.31. Guidelnes for Canadian Recreational Water Quality

First published in 1983 and currently under revision, the Guidelines for Canadian Recreational Water Quality were developed by a Federal-Provincial Working Group on Recreational Water Quality. This Working Group was formed at the request of the Federal-Provincial Advisory Committee on Environmental and Occupational Health. The Working Group is comprised of representatives from 8 provinces and one representative each from Environment Canada and Health and Welfare Canada. There are no representatives of the public among the Working Group.

The purpose of these guidelines is to protect the public from health hazards that are associated with recreational use of water. These uses include swimming, boating, fishing and any activity where the body is immersed in natural water. The Guidelines also deal with the aesthetic and nuisance conditions that affect water quality. The Guidelines for Canadian Drinking Water Quality have no legal authority and are not enforceable by law. They have been established to serve as a guide for the Provinces and local health officials. It is considered the responsibility of the local board of health or medical officer within each province to assess recreational water and post health warnings if needed.

The criteria used to develop these guidelines was based on the health hazards that can be transmitted by recreational contact with water. In determining these health hazards,

sanitary surveys, epidemiological studies and actual counts of fecal contamination or pathogenic organisms throughout Canada were made. The proposed 1990 draft Guidelines have established maximum limits for E. coli and fecal coliform bacteria in fresh water. Tests for pathogenic organisms such as Staphylococcus aureus, Shigella. Salmonella, Giardia or viruses are determined when illness has been reported or when levels of indicator bacteria show a continuous health hazard. There are no limits recommended for these pathogenic organisms. The guidelines discuss the description, pathogenicity and occurance of these pathogens in recreational water.

Physical and chemical characteristics of water are also discussed. This includes the pH, temperature, turbidity and presence of chemicals. Although it is known that certain chemicals can be absorbed through the skin, there is no indication by Health and Welfare Canada that such chemicals exist at levels that would pose a health hazard.

There is no mechanism for public consultation or participation in the development or reveiw of these guidelines.

The Specific Objectives in Annex 1 of the Great Lakes Water Quality Agreement states that "Waters used for body contact recreation activities should be substantially free from bacteria, funge, or viruses that produce....human diseases and infections." The Guidelines for Canadian Recreational Water Quality compliment the microbiological objectives in the GLWQA.

5.33 Provincial Water Quality Objectives

Established in 1978 as part of the overall water management program of Ontario, the Provincial Water Quality Objectives are narrative and numerical concentrations for 27 water parameters to protect aquatic life, human consumers of fish and recreational use. The parameters include organic substances, heavy metals and physical characteristics and represent a "desirable level" for ambient surface water.

These objectives were established by a group of selected staff from the Ministry of the Environment. This group reviewed existing water quality objectives and standards created by the Water Quality Objectives Subcommittee of the International Joint Commission and the U.S. Environmental Protection Agency. The Provincial Water Quality Objectives were adopted from the information obtained from these two agencies.

The Provincial Water Quality Objectives do not have legal authority and are not legally enforcable. They are often used, however, as beginning points when determining waste effluent controls. The approach taken in establishing effluent requirements is on the capacity of a particular waterbody to receive waste discharges by dilution, dispersion

or assimulation of the waste.

The criteria used in establishing the objectives for recreational water use was based on public health protection and aesthetics. Objectives for levels of fecal coliforms, total coliforms and fecal streptococci are given for local health authorities to use during surveillance or to confirm a health hazard.

There is no mechanism for public participation in the review of current objectives or establishment of new water quality objectives.

The Provincial Water Qualty Objectives compliment the Microbiological Objectives of Annex 1 of the GLWQA.

5.34 Guidelines for Canadian Drinking Water Quality

Federal guidelines for drinking water were originally established in 1968. Since that time, the drinking water guidelines have been revised and updated on a continuing basis with the 4th edition to the Guidelines for Canadian Drinking Water Quality published in 1989. The Federal-Provincial Subcommittee on Drinking Water is responsible for reviewing and updating the guidelines. This subcommittee is composed of governmental representatives from each Province or Territory, Federal representatives from Health and Welfare Canada and Environment Canada. There are no members representing the public on this subcommittee. This committee is responsible to the Federal-Provincial Advisory Committee on Environmental and Occupational Health, who in tern, advises the Conference of Deputy Ministers of Health on all matters of drinking water.

The Guidelnes for Canadian Drinking Water Quality apply to all drinking water supplies in Canada, both public and private. They are not, however, enforcable by law as they stand alone. Providing legally enforcable drinking water standards is considered a Provincial responsibility. Only the Provinces Alberta and Quebec have such legally enforcable drinking water standards.

The guidelines that are established for chemical substances in drinking water are considered on the basis of how frequently the substance is detected in drinking water, the concentration level of the contaminant and the potential for the substance to be toxic to humans or effect the aesthetic quality of drinking water.

In the 1989 Guidelines, Maximum Acceptable Concentrations (MAC) have been established for 49 chemicals in drinking water. These chemicals are either known or are suspected to cause adverse human health effects. The MAC is based on the carcinogenicity of the chemical. If the chemical is considered non-carcinogenic, data obtained from chemical exposure to laboratory animals is used in determining an Acceptable Daily Intake (ADI) level. The ADI takes into consideration all sources of the chemical (food,

air, etc.) and gives a portion of what is considered allowable to drinking water. This portion is based on an average adult consuming 1.5 L per day. If the chemical substance is considered carcinogenic, the MAC is established based on a lifetime cancer risk of 1 in 100,000 or 1 in 1,000,000 considering the available treatment technology, the analytical methods for detection and multi-exposure routes. Interim Maximum Acceptable Concentrations (IMAC) have been established for 15 chemicals that are either considered potentially harmful to human health or present a greater than 1 in 100,000 lifetime cancer risk.

Aesthetic Objectives (AO) are also given for 26 chemical or physical characteristics. Although they are not considered to be health hazards, they may effect the publics acceptance of drinking water.

There is no formal mechanism for public consultation or review of proposed drinking water guidelines prior to the approval by the Conference of Deputy Ministers.

Because ambient water serves as a source of drinking water for many Canadians in the Great Lakes Basin, the need to protect public water supplies is extremely important. Under Annex 1 in the Great Lakes Water Quality Agreement, Specific Objectives for six persistent and non-persistent toxic substances are listed for the protection of public water supplies. Of these chemicals listed, ammonia is the only chemical that has a Specific Objective in the GLWQA but has no numerical guideline in the Federal Drinking Water Guideline. Although phenolic compounds have concentration levels for both the GLWQA and Drinking Water Guidelines, higher levels of phenolic compounds are permitted in the Drinking Water Guidelines than specified for taste and odor considerations in the GLWQA under Annex 1.

5.35 Ontario Drinking Water Objectives

First published in 1968, the Ontario Drinking Water Objectives have been revised periodically, with the most current edition published in 1984. These objectives were developed from the 1978 Guidelines for Canadian Drinking Water Quality. Staff members from various divisions within the Ministry of the Environment, Ministry of Health and Ministry of Labour reviewed the 1978 Federal guidelines developed by the Federal-Provincial Subcommittee on Drinking water. There were no representatives of the public among this group.

As in the Federal Drinking Water Guidelines, the Ontario Drinking Water Objectives consider the chemical, physical, microbiological and radioactivity characteristics of water that can cause adverse health effects. Maximum Acceptable Concentrations (MAC) have been established for 30 chemicals related to health. The criteria used to establish a MAC for each chemical was based on documented allowable daily intake

levels from all sources. Interim Manimum Acceptable Concentrations (IMAC) have been established for PCBs and Uranium. The criteria used to establish these levels was based on the known chronic effects in laboratory animals but no MAC had been documented. Maximum Desirable Concentrations (MDC) have been given to 13 parameters that are related to the aesthetic quality of water.

Although there was no mechanism for public consultation and participation in the development of the 1984 Ontario Drinking Water Objectives, the Ministry of the Environment has recently formed the Advisory Committee of Environmental Standards. This 12-member committee represents the public, academia and environmental interest groups and provides a non-governmental input in the objective setting process. The Advisory Committee currently reviews all drinking water objectives proposed for Ontario.

Of the persistent toxic substances in Annex 1 of the GLWQA, arsenic, chromium, selenium and fluoride have Specific Objectives for the protection of public water supplies. While these same chemicals have MACs in the Ontario Drinking Water Objectives, the MAC for fluoride is twice as high as the Specific Objective in the GLWQA. Of the non-persistent toxic substances given Specific Objectives for the protection of public water supplies in Annex 1 of the GLWQA, ammonia is the only substance that has no MAC. Higher levels of phenolic compounds are also permited in these drinking water objectives than are specified for taste and odor consideratons in the GLWQA.

6.0 Soil and Sediments

To date, there are no Federal or Provincial guidelines, objectives or standards to protect the public health from environmental contaminants in soils or sediments. Measurable concentrations of lead, mercury, arsenic and a variety of pesticides are often found in agricultural soils within the Great Lakes Basin.

Although there may be a minimal risk to human health by direct contact with contaminated sediments, human health can be indirectly impacted. Exposures to toxic substances in the sediment can result from consuming fish contaminated by the bioaccumulation of persistent toxic chemicals in the sediment. Toxic chemicals can also re-enter the water column and effect drinking water supplies by resuspending contaminated sediments during dredging operations. Annex 14 of the GLWQA addresses the objectives and research programs concerning contaminated sediments.

7.0. Consumer Products

Under the authority of the Hazardous Products Act, all Canadian citizens are protected from hazardous products in items other than food, drugs, cosmetics or prsticides. Evaluations are made by the Bureau of Chemical Hazards within Health and Welfare Canada to estimate health risks associated with the use of hazardous products. If any product is considered hazardous, restricted use or removal is recommended.

8.0 Monitoring and Surveillance of Environmental Contaminants

As research on the Great Lakes Ecosystem continues, more information is gained on the effects various chemical substances have on the environment as well as human health. Pollutants that were once too low to detect in the past are now implicated in causing adverse effects in many biological species. In order to respond to the "cause and effect" relationship between the exosures to environmental pollutants and adverse health, governments have instituted various monitoring and surveillance programs. These programs have been created to define the existance and magnittude of the problems and track the methods used to control the pollution problem. The following is a brief description of the current monitoring and surveillance programs in Canada.

8.1 Air

Since 1970, the Federal and Provincial Governments have joined forces in monitoring the air quality in Canada. The National Air Pollution Surveillance (NAPS) program monitors the five ambient air quality parameters that have Federal Air Quality Guidelines plus the contaminants lead, sulfate and nitrate on suspended particulate material. The monitoring sites are located across Canada in areas where the population is greater than 100,000. In Ontario, the Ministry of the Environment operates the stations and reports to NAPS. Monthly and annual reports are released by NAPS.

The Long Range Transport of Air Pollutants (LRTAP) is a monitoring program that assesses the health risks posed by airborn pollution and monitors the programs instituted to control the airborn pollutants on human health. This program is under the Monitoring and Criteria Division of Health and Welfare Canada.

8.3 Drinking Water

There is no federal systematic monitoring program for

drinking water in Canada. A Drinking Water Surveillance program exists in Ontario which monitors 75 of the 501 municipal drinking water plants. This includes the intake, treatment and distribution system that supplies water to consumers in Ontario. The information collected in this surveillance program is supplied to Health and Welfare Canada Monitoring and Criteria Division.

8.4 Ambient Water

The surveillance and monitoring of ambient, open lake water is through an international program with responsibilites assigned to each country. For the Great Lakes Huron, Surerior and Ontario, monitoring is conducted by Environment Canada Inland Waters Directorate. Lakes Erie and Michigan are monitored by US Environmental Protection Agency in a similar manner. All data collected is analyzed for trends and reported to scientists. Reports on the water quality of the Great Lakes are made through the International Joint Commission Water Quality Board.

8.5 Food

There is a compliance program that monitors pesticides in food but I am waiting for the details. More to follow here.

9.0 Contaminants in Human Tissues

Measuring the chemical substances in food, air and water indicate the potential for human exposure to environmental contaminants. Measuring these same contaminants in the human tissues provides a direct measure of how much bioaccumulation of toxic chemicals has taken place.

Human blood, breast milk and adipose tissue (fatty tissue) usually contain the highest concentrations of environmental contaminants. The amount of contaminant in the tissue type or body fluid indicates the relative level of contaminant the individual has been exposed to. Contaminants that can be measured in the blood indicte a recent, acute exposure to the chemical. Measuring contaminants in adipose tissue, on the other hand, indicate a more constant, chronic exposure that represents the historical exposures to these contaminants. Levels of contaminants in breast milk not only indicate the chronic exposure to environmental contaminants but also the amount of toxic chemical nursing infants are exposed to as well.

To date, there is no routine monitoring or surveillance program for environmental contaminants in human tissues at the Federal or Provincial level.

10.0 Conclusions

Over the last 20 years numerous scientific studies have been conducted on the Great Lakes Ecosystem, creating a wealth of information. Yet, because this dynamic ecosystem is so complex, answers to specific questions relating to environmental contaminants and human health remain unanswered. Canadian citizens within the Great Lakes Basin have been and continue to be exposed to many environmental contaminants through the food, air water and soil. The number of toxic chemicals found in the tissues of wildlife as well as humans has increased over the years. While there appears to be no significant trend in increased mortality in Canadians living within the Great Lakes Basin, some risk to the health exists. Health involves more than simply the absence of disease, but also a state of physical, mental and social well-being.

The role that the Federal and Provincial Governments play in protecting public health is extensive. People look to governments to not only control contaminants that are released into the environment but reduce the source of these toxic substances to protect their health and well-being. Protecting human health through public health guidelines, objectives and standards is one method of control. Public participation in the decision-making process of these guidelines, objectives and standards will ensure protection of the health of Canadians in the Great Lakes Basin.