Environment Canada Environnement Canada

Canadian Environmental Protection Act, 1999

Annual Report

for April 2009 to March 2010

Canada

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Foreword

This Annual Report provides an overview of the results achieved under the *Canadian Environmental Protection Act, 1999* (CEPA 1999) from April 1, 2009, to March 31, 2010. The publication of this report responds to the statutory requirement to provide annual reports to Parliament on the administration and enforcement of the Act.

This report includes the following mandatory information:

- Section 1.1 describes the activities of the National Advisory Committee. There were no other committees established under paragraph 7(1)(*a*) of CEPA 1999 during the reporting period.
- Section 1.2 describes the activities under the Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem.
- Section 1.3 describes the activities under the Canada–Quebec Administrative Agreement.
- Section 1.4 describes the activities under the Canada–Saskatchewan Administrative Agreement.
- Section 1.5 describes the activities under the Canada–Alberta Equivalency Agreement.
- Section 3.2 provides examples of the types of research initiatives under way and their key contributions in the reporting period. Environment Canada and Health Canada scientists published numerous reports, papers, book chapters, articles and manuscripts on subjects related to CEPA 1999. This body of work appeared in books and scientific journals that are available in libraries and from the publishers.
- There were no activities under the international air pollution provisions (Division 6 of Part 7) of CEPA 1999 during the reporting period.
- There were no activities under the international water pollution provisions (Division 7 of Part 7) of CEPA 1999 during the reporting period.

The chapters in this report are organized by the major parts of CEPA 1999, to enable readers to easily find results achieved under the Act and to compare those results from year to year. Each chapter contains introductory remarks that describe the applicable provisions of the Act, followed by a description of the key results achieved under that part in the reporting period.

The Chemicals Management Plan

The Chemicals Management Plan (CMP) is a program that enhances the Government's role in protecting Canadians and their environment from exposure to harmful chemicals. It includes a number of activities for which the obligations or authorities are spread throughout CEPA 1999. As such, the specific results achieved by the CMP under each part of the Act for the 2009–2010 reporting period can be found in the appropriate chapter of this report. However, the following description is provided in order to understand the overall intent of the program.

Between 1999 and 2006, the Government of Canada classified the chemicals used in Canada according to specific criteria, and identified those that required a health and/or environmental risk assessment. Approximately 4300 chemicals were identified as meeting the specified criteria. These were divided into high, medium, or low priority for action to enable the Government to focus on chemicals of greatest concern. The CMP was developed to address these chemicals.

The CMP includes a number of measures to make sure that chemical substances are managed properly. A key initiative called The Challenge addresses approximately 200 chemicals identified as high priorities for action. It challenges industry and other stakeholders to provide information on how these substances are used and managed. The Government uses this and other information to assess risks from the substances to human health and the environment, and develops measures to reduce these risks. Other activities under the CMP include grouping some chemicals by sector to develop comprehensive risk assessment or management approaches. For example, 160 chemicals used in the petroleum sector are being addressed through a sector-based initiative called the Petroleum Sector Stream Approach. In addition, the CMP includes many research and monitoring activities to learn more about the effects of chemical exposure on human health and the environment and to provide the necessary means for measuring the success of actions to control or reduce risks. Finally, the CMP engages stakeholders and the public through regular public information sessions, consultations and a Chemicals Management Plan Stakeholder Advisory Council.

The Chemical Substances website (www.chemicalsubstances.gc.ca) provides more information on activities related to the CMP.

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Executive Summary

This Annual Report provides an overview of the results achieved under the *Canadian Environmental Protection Act, 1999* (CEPA 1999) from April 1, 2009, to March 31, 2010.

In 2009–2010, Environment Canada consulted with the National Advisory Committee on various CEPA 1999 initiatives, and reported on actions under three administrative agreements and one equivalency agreement.

The CEPA Environmental Registry continued to provide public access to all CEPA-related initiatives, with an average of 96 400 visits each month. There were 46 public consultation opportunities published on the Registry in the reporting period.

Results were achieved under 12 environmental quality monitoring initiatives, such as the National Air Pollution Surveillance Network, the Canadian Air and Precipitation Monitoring Network, the Northern Contaminants Program and greenhouse gas (GHG) monitoring. In 2009–2010, Environment Canada and Health Canada scientists published hundreds of articles, reports and papers. Much of this research is carried out in collaboration with other governments, academic institutions and industry, in Canada and abroad. The report provides examples of research activities related to air quality, the climate, water, wildlife and soil, and human health.

In collaboration with provincial and territorial governments, five environmental quality guidelines for water or sediment, four drinking water quality technical guideline documents and one drinking water quality guidance document were finalized in the reporting period.

Public reporting continued in 2009–2010 through the publication of Canadian Environmental Sustainability Indicators for air quality, water quality and GHG emissions; through the National Pollutant Release Inventory, which provides a publicly accessible inventory of pollutant releases (to air, water and land), disposals and transfers for recycling; and through GHG reports.

Through the Canadian Council of Ministers of the Environment, seven pollution prevention awards were presented in 2009–2010 to organizations that have shown leadership and innovation in pollution prevention.

In 2009–2010, significant progress was made on the Challenge program under Canada's Chemicals Management Plan. As of March 31, 2010, all of the batches under the Challenge had been launched, and draft or final assessment decisions had been published for 151 of the substances in batches 1 through 9. Of those assessed, 39 substances were found or proposed to be found to meet the definition of toxic under CEPA 1999. Draft or final assessments were conducted on various other existing substances. In total, draft or final assessment decisions were published for 215 existing substances or groups of substances.

Various risk management measures were undertaken in 2009–2010. Twenty-two substances or groups of substances were proposed to be listed in Schedule 1 of CEPA 1999 (the List of Toxic Substances). Notices of intent to apply Significant New Activity Notices, which require new uses of a substance to be notified and assessed, were published for 26 substances, and final orders amending the Domestic Substances List to apply the Significant New Activity provisions were published for 23 substances. These substances are no longer in commerce in Canada but have hazardous properties that could affect the environment or human health if commercial activity resumes. An additional 484 substances were removed from the Domestic Substances List, meaning that these substances are also subject to notification and assessment prior to any manufacture or import.

Six pollution prevention planning notices were active during the reporting period, including one new notice regarding mercury in dental amalgam. Four regulations were proposed, amended or finalized under Part 5 of CEPA 1999 in 2009–2010. Environment Canada, Health Canada and participating companies signed an Environmental Performance Agreement respecting perfluorinated carboxylic acids in perfluorinated products.

In addition, six risk management instruments were under development to address high-priority substances under the Challenge. Twenty-seven instruments are under development or being amended to control non-Challenge substances.

The Canadian public and environment continued to be protected from the possible risks associated with the introduction of new substances to the Canadian market. Environment Canada and Health Canada conducted 503 assessments of new chemicals or polymers. Of the 503 notifications received, the Minister of the Environment issued 22 Significant New Activity Notices and three Ministerial Conditions.

Work on animate products of biotechnology continued in 2009–2010. Two screening assessment reports were drafted. The Technical Expert Group provided advice and recommendations on the process. During 2009–2010, 13 notifications were received for new animate products of biotechnology and Significant New Activity Notices were published for two of these substances.

Under Part 7 of CEPA 1999, a consultation draft of the planned *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations* was released to seek input from interested parties. Eighty-four permits were issued in Canada for the disposal at sea of 4.16 million tonnes (t) of waste and other matter. Most of this was dredged material that was removed from harbours and waterways to keep them safe for navigation. As required by CEPA 1999, monitoring projects were completed on 15 ocean disposal sites in the reporting period. As well, the Governor in Council made the *Regulations Amending the Phosphorus Concentration Regulations*, which will help limit the proliferation of blue-green algae.

Environment Canada continued to implement the Government's international obligations as a party to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, through CEPA 1999's *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. In calendar year 2009, imports and exports of these materials were 478 651 t and 431 921 t, respectively.

Under the *Environmental Emergency Regulations*, 5478 facilities had filed Notices of Identification of Substance and Place as of March 31, 2010. In addition, 3670 facilities have filed notices indicating that they have prepared and implemented environmental emergency plans.

Promoting compliance with and enforcing CEPA 1999's regulations continues to be a priority. In 2009–2010, the number of designated CEPA enforcement officers was 188, including 42 officers from the Environmental Emergencies Program. The redesign of the Basic Enforcement Training Program was completed during the reporting period. The report also provides examples of the numerous compliance promotion projects undertaken by regional offices to increase the awareness and understanding of the law and its regulations, such as collaboration with First Nations and workshops on individual CEPA 1999 regulations. Enforcement Officers conducted more than 5200 inspections during the reporting period, and more than 40 investigations were in various stages of development. Enforcement measures included 56 Environmental Protection Compliance Orders, among other measures.

In June 2009, the *Environmental Enforcement Act* (Bill C-16) received Royal Assent. It will amend the enforcement scheme of nine Acts administered by Environment Canada and Parks Canada, including CEPA 1999.

1 Administration (Part 1)

Part 1 of CEPA 1999 requires the ministers to establish the National Advisory Committee, composed of one representative for the federal Minister of the Environment and one for the federal Minister of Health, representatives from each province and territory, and not more than six representatives of Aboriginal governments from across Canada.

Part 1 allows the Minister of the Environment to negotiate an agreement with a provincial or territorial government, or an Aboriginal people, with respect to the administration of the Act. It also allows for equivalency agreements, which suspend federal regulations in a province or territory that has equivalent regulatory provisions.

1.1 National Advisory Committee

The National Advisory Committee advises the ministers on certain actions taken under the Act, enables national cooperative action, and seeks to avoid duplication in regulatory activity among governments. The Committee serves as a single window in working with provincial and territorial governments and representatives of Aboriginal governments on consultations and offers to consult.

To carry out its duties in 2009–2010, the National Advisory Committee participated in six conference calls and ongoing correspondence among members throughout the year. Federal initiatives brought to the Committee for discussion included:

- implementation of Canada's Chemicals Management Plan, including risk assessment and risk management activities for batches 4 to 12 of the Challenge under the Chemicals Management Plan;
- development of federal carbon dioxide (CO_2) emission regulations for new cars and light trucks;
- an update on the Environmental Emergencies Program initiatives;
- the Federal Court decision regarding the reporting of mine wastes and 2009 National Pollutant Release Inventory requirements;
- international meetings in which Canada participated; and
- risk management activities, such as developing, amending or repealing regulations; pollution prevention plans; guidelines and codes of practice; proposed options for managing risks to the environment and human health; and other issues related to CEPA 1999.

For more information, please consult www.ec.gc.ca/ceparegistry/gene_info/nac.cfm.

1.2 Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem

Since 1971, Canada and Ontario have worked together through the Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem. This agreement, most recently renewed in March 2010, guides the efforts of Canada and Ontario in achieving a healthy, prosperous and sustainable Great Lakes Basin ecosystem for present and future generations, and is the mechanism for meeting Canada's obligations under the Canada–U.S. Great Lakes Water Quality Agreement. The 2007–2011 Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem comprises 13 goals, 37 results and 183 specific commitments in four priority areas:

- designated Areas of Concern (AOCs) in the Great Lakes Basin;
- harmful pollutants;
- lake and basin sustainability; and
- coordination of monitoring, research and information.

The AOC Annex (Annex 1) comprises two goals, described below.

The first goal is to complete priority actions for delisting four Canadian AOCs (Nipigon Bay, Jackfish Bay, Wheatley Harbour and St. Lawrence

River, Cornwall). In 2009–2010, all of the priority remedial actions in these AOCs were either completed or funding commitments were made toward their completion. Following the International Joint Commission's review of the Wheatley Harbour Remedial Action Plan Stage 3 Report, final preparations were made for delisting this AOC. Federal and provincial infrastructure funding commitments will see the wastewater treatment plant upgrades in the Nipigon Bay and St. Lawrence AOCs completed by 2011. In the Jackfish Bay AOC, studies were completed that will form the basis of a determination as to whether Jackfish Bay can be designated as an Area in Recovery (an area where all required remedial actions have been taken, but time is needed for the ecosystem to recover).

The second goal is to make significant progress toward Remedial Action Plan implementation, environmental recovery, and restoration of beneficial uses in the remaining 11 Canadian AOCs. Work carried out in 2009–2010 included the implementation of contaminated sediment management strategies in the Niagara River (Lyons Creek East site) and Bay of Quinte AOCs; the advancement of contaminated site investigations and assessments in the Thunder Bay, St. Marys River and St. Clair River AOCs; the completion of the contaminated sediment remediation design for the Peninsula Harbour AOC; improvements to municipal wastewater infrastructure such as the City of Niagara Falls' high-rate treatment pilot facility; and scientific assessments such as the examination of fish health in AOCs, which revealed that there have been substantial reductions in the incidence of fish tumours in all AOCs.

The Harmful Pollutants Annex (Annex 2) addresses both past (legacy) and ongoing sources of pollution in the Great Lakes Basin. Annex 2 takes a substance and/or sector approach to reducing and preventing releases throughout the basin, with a goal to virtually eliminate persistent bioaccumulative toxic substances. Environment Canada's efforts under Annex 2 also support the delivery of Canada's Chemicals Management Plan. Efforts include actions undertaken by the Great Lakes Binational Toxics Strategy, a public-private collaborative arrangement between Environment Canada, the U.S. Environmental Protection Agency (EPA) and stakeholders to reduce emissions and releases to the environment of designated Level 1 substances, including mercury, polychlorinated biphenyls (PCBs), dioxins and furans, hexachlorobenzene and benzo(a)pyrene.

Since signing the Great Lakes Binational Toxics Strategy in 1997, 13 of the Challenge goals established for Level 1 substances by Environment Canada and the U.S. EPA have been met. Significant progress has been made toward the remaining four Challenge goals.

In 2009–2010, Canada made progress toward reaching the Great Lakes Binational Toxics Strategy's PCB challenge goals, primarily through implementation of the new Canadian *PCB Regulations* (SOR/2008-273, September 5, 2008). Canada continued to monitor levels of dioxins in the environment, maintained a dioxin release inventory, collaborated with the United States to reduce uncontrolled combustion sources such as burn barrels, and launched a modelling study to better understand the transboundary impacts associated with dioxin and furan releases from North American and global sources. Canada has also made available its report on the testing of newer EPA-certified wood stoves, which confirmed that these have lower benzo(a)pyrene emission factors than predicted.

With financial contributions from the Ontario Ministry of the Environment and support from Health Canada, Environment Canada continued and expanded its outreach activities for the citizens of Thunder Bay on the safe disposal of unused and expired pharmaceutical products. The report from this outreach pilot concludes that educational campaigns and outreach efforts, especially the promotion of "Medicine Cabinet Clean Up Month," increased proper disposal of pharmaceuticals in Thunder Bay. Furthermore, support and resources continued to be offered to other communities along the north shore of Lake Superior. This pilot project supports Canada's Chemicals Management Plan and Canada's commitments under the Lake Superior Binational Program.

Progress was also made on the development of a Canadian framework to identify and prioritize substances of emerging concern in the Great

Lakes. This framework will inform the development and implementation of a binational mechanism to address these new threats. Finally, the Great Lakes Binational Toxics Strategy released its *December 2008 Status Report*, which summarizes binational efforts to address Level 1 substances and provides an update on progress achieved to broaden the Strategy's scope to encompass substances of emerging concern.

Environment Canada worked to achieve commitments, under Annex 3 of the Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem, to restore beneficial uses in open lake waters through Lakewide Management Plan activities. Stakeholders were actively engaged through participation in the development and updating of Lakewide Management Plans. Monitoring and surveillance work also continued toward a better understanding of the state of and trends in the Great Lakes ecosystem. Highlights include the following:

- Ambient environmental quality monitoring programs were carried out in the Great Lakes and in the connecting channels (St. Clair–Detroit corridor and the Niagara and St. Lawrence rivers).
- Measurements of organic contaminants (including emerging chemicals) and trace metals were made in water, whole fish (top predators) and sediment, to assess progress toward specific goals in environmental improvement, identify problems and emerging issues, and support planning and decision making. Although long-term trends indicate declining concentrations of most contaminants, some chemicals continue to exceed water and sediment quality guidelines, as well as guidelines for the protection of piscivorous wildlife; and fish consumption advisories continue throughout the Great Lakes.

Under the binational Cooperative Science and Monitoring Initiative, the federal and provincial partner agencies (Environment Canada and the Ontario Ministry of the Environment) conducted intensive fieldwork and data collection on Lake Erie to determine the impact of mussels and algae on nearshore water quality in the eastern basin. This work was part of a larger binational collaborative monitoring effort to improve the coordination of monitoring in the Great Lakes. A five-year rotational cycle was adopted to focus on one lake per year, with Lake Erie selected for 2009. Additional work carried out on Lake Erie in 2009 included a bioavailable phosphorus study, a project to investigate the impact of nutrient influx and timing of algal bloom appearance, and a farm demonstration/tillage practice study to understand the contribution of nutrients to Lake Erie from different farming practices. As well, the *Lake Erie Lakewide Management Plan State of Nutrient Science Report* was completed, as were draft phosphorus targets.

Through the Lake Huron–Georgian Bay Watershed—A Canadian Framework for Community Action, the federal and provincial partner agencies (Environment Canada, the Ontario Ministry of Natural Resources, Ontario Ministry of the Environment, and Ontario Ministry of Agriculture, Food and Rural Affairs), and local community leaders in Eastern Georgian Bay's Littoral Biosphere Reserve, the Nottawasaga Valley and the North Bayfield Gullies addressed the growing threat of excess algae development in the nearshore zone. For example, preparation of a shoreline stewardship strategy was initiated in the Reserve, livestock exclusion fencing was built along the Nottawasaga River as part of the stewardship program, and a long-term plan to protect the sub-watershed is being developed for the North Bayfield Gullies region.

The Lake Ontario Binational Biodiversity Conservation Strategy was completed through Lakewide Management Plan support to the Nature Conservancy and the Nature Conservancy of Canada.

Following the recommendations of the Canadian Action Plan to Address the Threat of Aquatic Invasive Species, a binational Aquatic Invasive Species Complete Prevention Plan was developed as part of the Lake Superior Lakewide Management Plan.

1.3 Canada–Quebec Administrative Agreement

Administrative agreements concerning the pulp and paper sector have been in place between Quebec and the Government of Canada since 1994. The fourth agreement expired on March 31, 2007. On June 13, 2009, the proposed Canada–Quebec Pulp and Paper and Metal Mining Sectors Administrative Agreement was published in Part I of the *Canada Gazette*. The parties have continued to cooperate in keeping with the spirit of the draft agreement.

The proposed agreement recognizes Quebec as the principal interlocutor for receiving, from the pulp and paper and metal mining sectors, most of the data and information required pursuant to the following four federal regulations:

- *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations* made pursuant to CEPA 1999;
- *Pulp and Paper Mill Defoamer and Wood Chip Regulations* made pursuant to CEPA 1999;
- *Pulp and Paper Effluent Regulations* made pursuant to the *Fisheries Act*; and
- *Metal Mining Effluent Regulations* made pursuant to the *Fisheries Act*.

Under the agreement, the province acts as a "single window" for the gathering of information from Quebec pulp and paper manufacturers, and forwards such information to Environment Canada for the purpose of enabling the Department to implement CEPA 1999 and the *Fisheries Act*, and their regulations. Both levels of government retain full responsibility for carrying out inspections and investigations, and for taking appropriate enforcement measures in order to ensure compliance with their respective requirements of industry.

During this reporting period, more than 80 reports produced by pulp and paper facilities in Quebec were examined against the two regulations pursuant to CEPA 1999. These administrative inspections verified that the facilities were in compliance with the applicable regulations. As well, Environment Canada presented compliance verification reports to Quebec. These presentations are made during meetings of the Management Committee established by the agreement. In 2009–2010, the Management Committee met once, on December 14, 2009.

To view the agreement, consult www.gazette.gc.ca/rp-pr/p1/2009/2009-06-13/html/notice-avis-eng.html#d101.

1.4 Canada–Saskatchewan Administrative Agreement

The Canada–Saskatchewan Administrative Agreement, in force since September 1994, is a work-sharing arrangement covering certain provincial legislation and seven CEPA 1999 regulations, which include two regulations related to the pulp and paper sector, two regulations on ozone-depleting substances, and three regulations on PCBs. Three PCB releases were reported to Environment Canada Emergencies under this agreement; none required an enforcement response. There were no prosecutions under these regulations in Saskatchewan under this agreement in 2009–2010.

To view the agreement, consult www.ec.gc.ca/ee-ue/default.asp?lang=En&n=91B094B6.

1.5 Canada–Alberta Equivalency Agreement

CEPA 1999 provides for Equivalency Agreements where provincial or territorial environmental legislation has provisions that are equivalent to the CEPA 1999 provisions. The intent is to eliminate the duplication of environmental regulations.

In December 1994, the Agreement on the Equivalency of Federal and Alberta Regulations for the Control of Toxic Substances in Alberta came into effect. As a result of the Agreement, the following CEPA 1999 regulations, or parts thereof, are no longer applicable in Alberta:

- *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations* (all sections);
- *Pulp and Paper Mill Defoamer and Wood Chip Regulations* (4(1), 6(2), 6(3)(*b*), 7 and 9);

- *Secondary Lead Smelter Release Regulations* (all sections); and
- *Vinyl Chloride Release Regulations, 1992* (all sections).

There are no longer any operating vinyl chloride plants or lead smelters in Alberta, and therefore no compliance issues to report under the *Vinyl Chloride Release Regulations* or the *Secondary Lead Smelter Release Regulations*.

The Canada–Alberta Agreement is currently under review. Until its renewal, Environment Canada and Alberta Environment continue to work together in the spirit of the agreement.

Alberta Environment indicated that, in 2009–2010, there were no reported violations by the four pulp and paper mills regulated under the pulp and paper regulations.

To view the agreement, consult www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=5CB02789-1.

2 Public Participation (Part 2)

Part 2 of CEPA 1999 outlines public participation requirements under the Act, including the establishment of an environmental registry, whistleblower protection, and the right of an individual to request an investigation and pursue court action.

2.1 CEPA Environmental Registry

The CEPA Environmental Registry was launched on Environment Canada's website with the proclamation of CEPA 1999 on March 31, 2000. Since that time, ongoing efforts have been made to increase the Registry's reliability and user-friendliness.

The content and structure of the Registry continue to evolve as new documents are added and areas of improvement are identified by users. The content of the Registry continues to expand to serve Canadians better and now encompasses thousands of CEPA 1999–related documents and references. It has become an important source of environmental information for the public and private sectors, both nationally and internationally, and has been used as a source of information in university and college curricula. For 2009–2010, the number of visits to the site was, on average, 96 400 per month.

From April 2009 to March 2010, there were over 260 requests for CEPA 1999–related information received in the Registry mailbox (ceparegistry@ec.gc.ca). Many of these requests were for information on the assessment reports of substances from batches 5 and 6 identified under the Challenge, a key element in the Chemicals Management Plan. Other requests involved pollution prevention plans, proposed regulations, guidelines, importing chemicals, biotechnology, permits and the Domestic Substances List. The Registry is located at www.ec.gc.ca/CEPARegistry.

2.2 Public Consultations

During 2009–2010, there were 46 consultation opportunities posted on the CEPA Registry for stakeholders and the public to provide comments or input; this is slightly above the average number usually posted within a given year. Please see www.ec.gc.ca/CEPARegistry/participation.

3 Information Gathering, Objectives, Guidelines and Codes of Practice (Part 3)

Part 3 of CEPA 1999 requires the Minister of the Environment to issue environmental quality objectives and guidelines, substance-release guidelines, and codes of practice. Under this Part, the Minister of Health is required to issue objectives, guidelines and codes of practice with respect to the elements of the environment that may affect the life and health of the people of Canada. Part 3 also provides for research, information gathering, the creation of inventories and reporting.

3.1 Environmental Quality Monitoring

In Canada, air and water quality monitoring is carried out through partnerships among provincial, territorial and federal governments, municipalities, universities, air and water associations, environmental groups and volunteers.

3.1.1 National Air Pollution Surveillance Network

The National Air Pollution Surveillance (NAPS) network is a joint federal, provincial, territorial and municipal network established in 1969. It is primarily an urban network, with nearly 300 air monitoring stations located in 177 communities. Almost 840 instruments, including continuous analyzers, particulate matter (PM) monitors, and samplers, are used to provide air quality measurements for criteria air contaminants and toxic substances. These include polycyclic aromatic hydrocarbons (PAHs), dioxins and furans (which are produced through combustion such as wood burning), and heavy metals such as arsenic, lead and mercury. More than 340 types of chemicals are analyzed in samples collected at typical urban NAPS sites, including more than 167 volatile organic compounds that contribute to smog formation. Over the years, the network has produced one of the longest and most geographically diverse air quality databases with the largest number of pollutants.

NAPS data are used to report on progress toward achieving the Canada-wide Standards for Particulate Matter and Ozone. Ozone and fine PM ($PM_{2.5}$) data are used by the CESI program for its air indicator, while the Canada–U.S. Agreement on Air Quality uses data for discussions relating to transboundary pollution. Sulphur dioxide, nitrogen dioxide, ozone, fine PM and carbon monoxide measurements through the NAPS network are also used by Alberta, Ontario and Quebec to report on their Air Quality Indexes, and by Environment Canada and the remaining provinces to report on the Air Quality Health Index. A large number of requests for NAPS data are received each year by Environment Canada from other governments, academic researchers and Canadians.

In 2009–2010, the NAPS program continued efforts to upgrade data reporting and database infrastructure in order to enable timely reporting of historical results and improve the quality of real-time results.

The analysis of PM was expanded to include levoglucosan, an indicator of biomass combustion, i.e., airborne particles resulting from the burning of wood from forest fires, wood stoves, wood-fired ovens, etc. In addition, focus was placed on replacing standard carbon monoxide instruments with trace-level instruments, and continuous sampling of fine PM was upgraded across the country to the Federal Equivalent Method in an effort to enhance consistency and comparability of fine PM data.

Although concentrations of major pollutants have decreased in the last 40 years, ongoing measurements and research on health effects have made it apparent that pollutants, such as fine PM and ozone, are still of concern. New chemicals are also identified for regulation based on health or environmental risks. As these new priorities are identified, the NAPS network implements methods and procedures to collect data on these chemicals. This process results in a continuously evolving measurement program to track relevant critical air pollutants. Environment Canada is also developing

and implementing analytical methods to address the atmospheric science knowledge gaps linked to the changing characteristics of the volatile and semi-volatile chemicals emitted from new vehicle engines that are fitted with novel emission control technologies and that use a wide array of conventional and renewable fuels.

3.1.2 Canadian Air and Precipitation Monitoring Network

The Canadian Air and Precipitation Monitoring Network (CAPMoN) is a regional/remote monitoring network that has been measuring air quality since 1978. CAPMoN's 33 measurement sites are located in rural and remote areas across the country, to provide a representative sampling of regional air quality. One site in the United States and another in Canada ensure the comparability of measurement methods between the two countries. The network measures a wide range of air pollutants, including several toxic substances under CEPA 1999 (e.g., particulate sulphate, gaseous ammonia, nitrate, gaseous sulphur dioxide and nitric acid).

In 2009–2010, more than 25 000 samples of all types were analyzed in support of Canadian environmental research initiatives. New sites and additional analytical capacity were added to increase the scope of the network in order to support air quality modelling improvements and validation. As a result of this expansion, the impacts of domestic and transboundary air pollutant emissions on air quality, human health and the environment will be better defined.

A new site-identification process was completed in western Canada and a new monitoring site was implemented in Ontario. In addition, CAPMoN was evaluated to determine its future potential in providing measurement data for emission reductions using scenario modelling results. Furthermore, a study was implemented to determine which existing technologies for measuring fine PM in non-urban environments are suitable for CAPMoN, in order to support air quality forecasting and the Air Quality Health Index.

Other CAPMoN activities include the addition of mercury-in-precipitation measurements to three sites (for a total of eight sites) in collaboration with the U.S. Mercury Deposition Network, and the addition of total gaseous measurement to one site (for a total of four sites) in support of mercury model development and the national mercury measurement and assessment program.

As part of ongoing work, major ion analyses in air and precipitation in support of national critical loads exceedances were completed, and PM measurements in support of Canada-wide Standards and CESI were carried out. Continuous gas measurements in support of various air quality initiatives continued. CAPMoN data continue to be unique, as all continuous gas measurements are not only traceable to primary standards but corrected to those standards in order to support research efforts in regional, continental and hemispherical trends.

3.1.3 Integrated Atmospheric Deposition Network

Mandated by Annex 15 of the Great Lakes Water Quality Agreement, the Integrated Atmospheric Deposition Network is a binational venture involving Environment Canada and the U.S. EPA that was established in 1990 to monitor trends and deposition of priority toxic pollutants in the Great Lakes Basin.

The network maintains a monitoring station on the shoreline of each of the five Great Lakes, along with several additional satellite stations. The monitoring stations provide long-term data on regionally representative concentrations of toxic substances in gas, particle and precipitation samples. Environment Canada operates stations on Lake Huron at Burnt Island and on Lake Ontario at Point Petre. Substances monitored included PAHs, current-use and banned organochlorine pesticides, congener-specific PCBs, polybrominated diphenyl ethers (PBDEs), and trace metals.

In 2009–2010, emphasis was placed on continuing measurements of priority toxic substances, data analysis, and development and refinement of methods. Multi-year samples from 2005 to 2008 from Canadian stations have been analyzed for PBDEs, and data have been released for use. In addition, screening of samples for

new flame-retardant compounds is ongoing, and data series for these new chemicals and many others are being established, which will allow their impact to be evaluated and regulatory actions tracked. For the core Integrated Atmospheric Deposition Network substances, data for air and precipitation are available up to 2005 and 2008, respectively, for the Canadian sites. In 2009–2010, data from the network were used to produce peer-reviewed publications and were included in the *Great Lakes Binational Toxics Strategy 2008–2009 Biennial Progress Report*.

3.1.4 Northern Contaminants Program

Environment Canada continued atmospheric measurements of persistent organic pollutants (POPs) and other priority chemicals in the Arctic through the Northern Contaminants Air Monitoring: Organic Pollutant Measurements project, under the Northern Contaminants Program. Led by Indian and Northern Affairs Canada, the Northern Contaminants Program is Canada's National Implementation Plan for the Arctic Monitoring and Assessment Programme and contributes to Canada's obligations under the United Nations Environment Programme's Stockholm Convention on Persistent Organic Pollutants.

Under the Northern Contaminants Program, the most recent temporal trends and seasonal variations of current-use pesticides and PBDEs measured at Alert, Nunavut, were reported in the Arctic Monitoring and Assessment Programme report *Arctic Pollution 2009*. This report updated information about contaminant status for ministers of the eight Arctic countries under the Arctic Council.

Findings in the report indicated that PBDEs were still increasing at Alert as of 2005, with concentrations doubling every 3.5 years in the case of decabrominated diphenyl ethers. Furthermore, concentrations of PBDEs measured in Arctic air were compared with those measured in the Great Lakes under the Integrated Atmospheric Deposition Network. Different inter-annual variations between the Point Petre, Ontario, and Alert, Nunavut, measurement sites indicate that emissions from regions outside of North America could also transport PBDEs to the Arctic. Episodic observations of elevated particle-bound PBDE concentrations in the winter at Alert were likely associated with enhanced inputs through long-range transport during the Arctic-haze period.

In 2009–2010, the Air Measurements of Mercury at Alert and Little Fox Lake project under the Northern Contaminants Program continued to deliver data on atmospheric mercury levels and processes in the Canadian Arctic. The work conducted through this project provides crucial information about key atmospheric transport, transformation and deposition processes of this priority pollutant in the Arctic. Researchers recently published a peer-reviewed article reporting the first observation of a long-term decrease in annual atmospheric mercury concentrations at Alert.

The Northern Contaminants Program *Human Health Assessment Report* was released in June 2009, along with a corresponding Arctic Monitoring and Assessment Programme *Health Assessment Report*. These reports summarize the exposure of Arctic populations to selected environmental chemicals, with time and geographic trends.

3.1.5 Intercontinental Atmospheric Transport of Anthropogenic Pollutants to the Arctic

This is one of 44 Canadian-funded projects—and one of five led by Environment Canada's scientists—under the International Polar Year, which is a large, global, interdisciplinary scientific program focused on the Arctic and Antarctic. The project measures POPs and mercury air concentrations simultaneously in potential source regions along the Pacific coasts and in the Canadian, American and Russian Arctic. It will help determine the geographic source of these chemicals, the proportion contributed by each source region, and the climate conditions influencing their transport to the Arctic. The project is an extension of the networks for measurement of atmospheric POPs and mercury under the Northern Contaminants Program and the Arctic Council's Arctic Monitoring and Assessment Programme. It is a collaboration of a team of

scientists from six countries—Canada, Russia, the United States, China, Vietnam and Japan.

In Canada, POPs and mercury are measured at stations in Alert, Nunavut, and Little Fox Lake, Yukon. Mercury in the air is also measured at Whistler, British Columbia. In 2009–2010, stations on both sides of the Pacific Ocean reported preliminary air concentration data for POPs and mercury. Most data are undergoing quality assurance / quality control to ensure consistency and reliability. A multinational quality assurance / quality control program for POPs analysis with 21 participating laboratories was completed. A report was generated and a scientific article has been accepted for publication in a peer-reviewed journal. Model calculations indicated that transport of mercury from Asia is important but less effective than that from Russia and North America. POPs may be trapped by clouds and transport northwards in the mid-troposphere. An outreach package featuring contaminant-related science under the Intercontinental Atmospheric Transport of Anthropogenic Pollutants to the Arctic project was developed and then distributed to Yukon communities in the summer of 2009.

3.1.6 Global Atmospheric Passive Sampling Network

The Global Atmospheric Passive Sampling (GAPS) Network is a global program for monitoring chemicals in the environment using simple sampling devices that require no electricity. The network builds on a successful two-year pilot study that was initiated in December 2004 at more than 50 sites located on all seven continents. It is a collaborative effort managed by Environment Canada scientists working with a team of international researchers. The results of the study contribute to Canada's obligations pursuant to the Stockholm Convention on Persistent Organic Pollutants under the United Nations Environment Programme, and the Protocol on Persistent Organic Pollutants under the United Nations Economic Commission for Europe.

In 2009–2010, screening efforts were ongoing to identify priority pollutants associated with the Chemicals Management Plan, in archived samples. Samples collected at more than 40 sites globally on a quarterly basis in 2005 were screened for new flame retardants, and provide the first global picture of their atmospheric distribution. In addition, a pilot study was conducted in the summer and fall of 2009 to assess global inputs of Domestic Substances List chemicals to the Canadian environment. This pilot study involved the use of a new passive air-sampling device (a polyurethane foam disk impregnated with sorbent) at a subset of sites in the GAPS network.

Results for the new sorbent-impregnated disk sampler compared well with those from co-deployed traditional disk samplers for PCBs. Furthermore, the sorbent-impregnated disk samplers were capable of capturing perfluoroalkyl compounds and siloxanes, and provide the first picture of the global atmospheric distribution of these compounds. Therefore, the new disk sampler shows promise as a tool for investigating priority contaminants in air. The GAPS network continues to contribute to international efforts on atmospheric POPs through capacity building, technology transfer, participation in workshops, and reporting. Data from the network, which was the only available data for some regions, contributed to the first global monitoring report of the Stockholm Convention on Persistent Organic Pollutants, adopted in May 2009. Quarterly sampling at 55 global sites continued in 2009–2010 for the fifth sampling year for this network.

3.1.7 Greenhouse Gas Monitoring

Environment Canada initiated CO_2 observations in 1975, as part of the global effort to characterize the changing atmospheric composition and understand climate change. The current monitoring network for GHGs includes observations of CO_2, methane, nitrous oxide, and sulphur hexafluoride. There are five sites located in remote regions of Canada providing weekly and hourly concentration information for all of these chemicals. Between 2007 and 2009, an additional five sites were added in western Canada and central Quebec to monitor CO_2 and methane.

The Canadian data are collected and reported in fulfillment of international obligations to the World Meteorological Organization Global Atmosphere Watch and the Global Climate Observing System.

They also meet requirements for monitoring and data sharing under the United Nations Framework Convention on Climate Change. Environment Canada's Dr. Neil Trivett Global Atmosphere Watch Observatory, located at Alert, Nunavut, is one of three global inter-comparison sites used to ensure data comparability and accuracy across the global networks. Data are used to estimate emissions from natural and anthropogenic (human-induced) sources, characterize annual variability in sources and sinks, and improve understanding of the exchange of carbon between the atmosphere and the terrestrial biosphere.

Canadian GHG concentrations and trends are consistent with global patterns. Atmospheric observations in 2008 from Environment Canada's weekly integrated flask network at remote sites were 387.3 parts per million for CO_2 and 1866 parts per billion for methane.

3.1.8 Water Quality Monitoring in Support of the Clean Air Regulatory Agenda

The Freshwater Inventory and Surveillance of Mercury (FISHg) Network is a monitoring component of the national Clean Air Regulatory Agenda (CARA). The FISHg Network, established in 2008, supports the Mercury Science Program of CARA by providing critical data on mercury contamination and trends in aquatic systems, for national ecological risk mapping.

In 2009–2010, mercury concentrations in fish and water were measured at 14 lakes across Canada located in proximity to point-source mercury emissions, as well as at reference lakes. Preliminary results of this program were presented to the scientific community at the 2010 CARA Mercury Workshop held in Downsview, Ontario. The information generated from the FISHg Network will establish a national baseline of ambient levels of mercury exposure, and trends in mercury in predatory and forage fish in the Canadian aquatic environment for national reporting. This baseline information is fundamental for evaluating risk and the efficacy of the regulatory efforts under CARA.

3.1.9 Water Quality Monitoring in Support of the Chemicals Management Plan

To evaluate the presence and level of substances identified under the Chemicals Management Plan as being a concern in water, 35 additional sampling stations were added across Canada to the network of stations used by Environment Canada's Water Quality Monitoring programs. Water samples from these stations are collected on a monthly basis.

A surveillance study was initiated to investigate the mono, di, tri and tetrachloro derivatives of bisphenol A (BPA) in selected water and fish samples in Canada. Initial results show that these chlorinated analytes of BPA are seldom detected in the ambient environment.

In 2009–2010, BPA was detected in 57% of the freshwater samples collected from 35 locations across Canada. The samples containing BPA were mainly from sites associated with urban activities. The maximum concentration measured in water was 3650 nanograms per litre (ng/L) in Hamilton Harbour, downstream of Hamilton's sewage treatment plant. BPA levels in rivers in Canada were in the range of 5–620 ng/L. Overall, BPA levels were higher in water samples from sites that were influenced by wastewater treatment plants and/or urbanization. No seasonal pattern was observed for BPA levels in the sampling locations studied.

Monitoring of perfluorinated chemicals in the aquatic environment focused on the spatial distribution of contamination and levels of exposures. Results from Canadian rivers and streams show that perfluorooctanesulfonic acid and perfluorooctanoic acid were the major perfluorinated compounds present, and that highest concentrations were found in tributaries and streams near urbanized areas.

Monitoring was completed on the long-term temporal and spatial trends of priority toxic chemicals (e.g., perfluoroalkyl compounds and brominated flame retardants) and regulated legacy compounds (e.g., DDT and PCBs) in samples from bioindicator fish species (e.g., trout, walleye) collected from sites across Canada. The project generated information on the presence, status and

trends of these compounds in fish and their food webs. For Great Lakes trout and their aquatic food web, the results show that PFCs and brominated flame retardants are currently in a state of change, with some substances increasing and others decreasing. For example, decreases in PBDE levels have coincided with regulatory action taken in Canada and other jurisdictions.

An International Quality Assurance Study was initiated on volatile methyl siloxanes in fish, to benchmark laboratory procedures and determine appropriate detection limits for the implementation of monitoring methods for continued studies on the status and trends of these compounds in aquatic biota.

3.1.10 Water Quality Monitoring for Pesticides and Pharmaceuticals and Personal Care Products

Water quality monitoring and surveillance on the presence and fate of pesticides in the aquatic environment is conducted under the National Pesticides Science Program. The program implements Environment Canada's commitments stemming from the Pest Management Regulatory Agency–led initiative "Building Public Confidence in Pesticide Regulation," which was associated with the December 2002 passing of the revised *Pest Control Products Act*. The overall objectives of the National Pesticides Science Program are to deliver pesticide surveillance, monitoring, research and assessment activities, and enhance science-based decision making regarding pesticides.

Monitoring and surveillance studies on pesticides in 2009–2010 included a national surveillance study of carbamate insecticides and fungicides, and sulfonylurea herbicides at selected agricultural sites. Samples were collected from spring through to late summer. Timing and frequency of sampling varied by region, depending on, for example, past sampling regimes, timing and frequency of pesticide application, and timing and frequency of rainfall.

Over the past 10 years, there has been growing concern about the release of pharmaceutical and personal care products into the environment and their potential impact on aquatic organisms. Several Canadian studies have revealed the presence of pharmaceutical and personal care products in aquatic environments such as the Detroit River, Niagara River, the Great Lakes and the St. Lawrence River. As a result, since 2006 approximately 30 pharmaceutical and personal care products (including analgesics, anti-inflammatories, antibiotics and caffeine) have been measured monthly in the waters of the St. Lawrence River. Initial analyses at the six sampling stations located between Carillon and Québec detected the presence of 17 pharmaceutical and personal care products and other substances at stations located downstream from Montréal, specifically at Lavaltrie, Trois-Rivières, Bécancour and Québec. In 2009–2010, the Lavaltrie and Québec stations were chosen for a monthly follow-up.

3.1.11 Great Lakes Surveillance Program

As mandated by Annex 11 of the Great Lakes Water Quality Agreement, surveillance and monitoring is undertaken in the Great Lakes to evaluate water quality trends, in order to provide information for measuring local and whole-lake responses to control measures, and in order to assess the effectiveness of management decisions. Activities are also undertaken to determine the presence of new environmental problems in the Great Lakes Basin.

The Great Lakes Surveillance Program maintains water quality monitoring stations within each of the four Canadian Great Lakes, along with several additional stations within basin watersheds. The monitoring stations provide long-term data on regionally representative concentrations of toxic substances in water samples. Substances monitored include PAHs, current-use and banned organochlorine pesticides, congener-specific PCBs, mercury, and trace elements.

In 2009–2010, emphasis was placed on continued measurements of priority toxic substances and continued data analysis. New information on the levels of total mercury in the Great Lakes and Niagara River waters was reported, the spatial trends were described, and, to a more limited extent, the temporal trends were examined. Information about levels in suspended

sediment in the Niagara River was used to provide a longer-term temporal trend. Comparisons were also made between the levels of total mercury in Great Lakes waters, in precipitation, in bottom sediments and in suspended sediments in the connecting channels. Data indicate that mercury concentrations have been declining in the Great Lakes.

3.1.12 Water Quality Monitoring of Transboundary Groundwater Contaminants

Since 1992, water quality sampling of groundwater on the Canadian side of the Abbotsford–Sumas aquifer has been conducted by Environment Canada, with a focus on identifying trends in nitrate concentrations in groundwater flowing from Canada to the United States (British Columbia to Washington State). Environment Canada's monitoring of transboundary nitrate contamination in this aquifer has been ongoing since 1992. Samples are routinely collected using a network of monitoring wells, and analyzed for a range of inorganic water quality parameters, including dissolved nutrients and dissolved metals. The groundwater monitoring network in this aquifer has also been used for research on the persistence and fate of pesticides and pharmaceuticals in groundwater settings. Nitrate concentrations on the Canadian side of the aquifer continue to be elevated and are, on average, 1.5 times higher than the maximum acceptable concentration for nitrate under the *Guidelines for Canadian Drinking Water Quality*, with localized areas of the aquifer showing concentrations as high as six times the maximum acceptable concentration. Environment Canada is currently engaged in collaborative research with Agriculture and Agri-Food Canada to improve the understanding of nitrate leaching dynamics from farm fields over the aquifer and the influence of different nutrient management practices on groundwater quality.

3.2 Research

Environment Canada and Health Canada scientists published hundreds of articles, reports and papers during this reporting period. The following examples illustrate the types and range of research undertaken in 2009–2010.

3.2.1 Air

3.2.1.1 Air Quality Research in Support of the Clean Air Regulatory Agenda

Air quality research in support of CARA provides coordinated, timely, credible and relevant information to Canadians and decision makers about the health risks and environmental impacts of current and future levels of air pollutants, through research, monitoring, modelling and scientific assessment.

The program primarily focuses on the pollutants responsible for smog, acid deposition and mercury pollution (e.g., sulphur dioxide, nitrogen oxides, volatile organic compounds, PM, ozone and mercury).

Information derived from this program also enables Canada to track the effectiveness of measures to improve air quality, such as those implemented under CEPA 1999, the Canada-wide Standards for PM, ozone and mercury, the Canada–United States Air Quality Agreement, and the United Nations Economic Commission for Europe's Convention on Long-range Transboundary Air Pollution.

Activities under the program in 2009–2010 included the following:

- A field study characterizing exposure of pollutants to populations in Montréal's urban area was completed as part of work to determine baseline values under CARA. Preliminary results were to be presented to Montréal Public Health and local collaborators at a workshop in June 2010, and analysis of the data is ongoing.
- New methodologies were developed to link PM measurements to their sources and/or to atmospheric processes that lead to PM formation or chemical transformation. This research will help to understand the source–receptor relationships between air pollutant emissions and ambient concentrations of fine PM, which will help refine air quality models used for forecasting and for evaluation of

emission control options. Overall, these improved capabilities are expected to help prioritize future regulations geared toward reducing PM concentrations in the atmosphere.

- The predictive capacity of the air quality model was enhanced in an effort to assess the long-range transport of pollutants on Canadian air quality. As well, work progressed on developing a system to generate air quality scenarios with input from a regional climate model.
- To determine whether Canada's forests are a net source or sink for aerosol particles, an experiment was conducted with university collaborators to study particles and volatile organic compounds from forests.
- In support of vehicle, engine, equipment and fuel regulations for air pollutants and GHGs, scientific testing and research continued on renewable fuels, with a focus on biofuels, new propulsion systems for on-road vehicles, emissions characterization for marine vessels, locomotives and aviation, and new propulsion systems. Furthermore, Environment Canada and Health Canada, in collaboration with Natural Resources Canada, carried out studies to assess and characterize emissions from diesel engines using various diesel fuels and engine modes.
- Environment Canada is the lead contributor to the World Meteorological Organization's Global Assessment of Precipitation Chemistry and Deposition, a collaborative initiative under the Global Atmosphere Watch Programme to inform the global science and policy communities of the status of precipitation chemistry and atmospheric deposition of major compounds, on global and regional scales.
- Research on precipitation chemistry and deposition was performed in collaboration with the United States to ensure data comparability and consistency. In collaboration with the U.S. EPA, a comparison of Canadian and U.S. dry deposition models was performed to identify discrepancies in dry deposition data between the Canadian and U.S. air monitoring networks (CAPMoN and the Clean Air Status and Trends Network). In addition, a mercury study was initiated in collaboration with Great Lakes scientists from Canada and the United States with the goal of generating a dry deposition map. The study aims to quantify mercury dry deposition over the Great Lakes and surrounding areas as part of the Great Lakes Air Deposition Program.
- Field measurement programs under the International Polar Year projects OASIS (Ocean–Atmosphere–Sea Ice–Snowpack) and INCATPA (INterContinental Atmospheric Transport of Anthropogenic Pollutants to the Arctic) were completed in 2009–2010, including the deployment of an ice-anchored buoy for measurement of ozone, bromine oxide and CO_2. Data quality control and analysis are under way.

3.2.1.2 Air Quality Research in Support of the Chemicals Management Plan

Research studies that were undertaken in support of the Chemicals Management Plan in 2009–2010 included the following:

- Monitoring of various chemicals continued at Alert, Nunavut. A novel passive sampler designed for use in harsh environments was tested in parallel with traditional techniques.
- The first year of PBDEs monitoring for the NAPS network was completed. Environment Canada continued to provide leadership, direction and recommendations on new and existing analytical methods suitable for monitoring and surveillance of chemicals targeted under the Chemicals Management Plan. Furthermore, analytical methods were developed to improve the detection of Chemicals Management Plan compounds in environmental media samples, including air samples.
- Studies were carried out in the waste sector to assess emissions to air of PFCs and siloxanes from wastewater treatment plants and landfills. Passive sampling techniques

were employed to map and characterize waste-sector emissions and demonstrate the importance of these sources to the atmosphere. These studies are supporting research aiming to determine whether the atmosphere is the principal medium through which ionic PFCs are subject to long-range transport.

- The analysis of platinum-group elements from automotive catalytic converters continued. Analytical methods were developed and tested to measure lanthanum and lanthanides in coarse and fine PM. Over 260 PM samples (coarse and fine) collected at four urban and two rural sites within the NAPS network were analyzed. The results obtained showed that for the coarse ($PM_{10\text{-}2.5}$) particulate fraction, the relative concentration pattern of the lanthanides mimics that found in the Earth's crust, whereas for the fine ($PM_{2.5}$) particulate fraction, the relative concentration pattern is similar to that observed in catalysts used in fluidized-bed catalytic cracking in petroleum refining operations. Therefore, lanthanides in $PM_{2.5}$ are excellent tracers of specific industrial emission sources.
- Collaborative research continued with the National Research Council to develop the necessary analytical tools for accurately assessing human exposure to selected trace metals (e.g., silver) in the environment.
- Research was conducted to determine the effect of chemical aging on volatilization potential and bioavailability of chemicals in soil. The study concluded that chemicals become more strongly bound to the soil as they age, which reduces their potential for volatilization and bioavailability. The outcome will improve on existing regional and global atmospheric transport models, by capturing soil–air exchange processes in these models; and it will further the understanding of environmental fate of chemicals in soil in terms of bioavailability.

3.2.2 Climate Research

Environment Canada climate scientists undertake a range of climate research projects, including climate model development, production of future climate scenarios, water and energy process studies, and GHG studies. Activities under the program in 2009–2010 included the following:

- The development of a comprehensive Earth System model that represents physical, chemical and biological processes relevant to climate and climate change. This model is used for historical climate simulations and future climate projections. Versions of this model are also used to make climate predictions at seasonal to decadal time scales, and to provide finer detail using the regional climate model version.
- The investigation of energy, water and carbon exchanges between the atmosphere and terrestrial biosphere, their inter-annual variability, and the impact of disturbances (fire, drought, insect/disease outbreaks) and climate change on Canadian carbon sources and sinks.
- GHG monitoring and research to improve monitoring methodologies and characterize the impact of anthropogenic sources within the continental and global context.

Information derived from these programs informs policies on GHG emissions. This information is also used to characterize climate change impacts and vulnerabilities within Canada, in order to support decision making on climate adaptation. Research activities are coordinated with international efforts under the World Meteorological Organization and World Climate Research Program, and contribute to the Intergovernmental Panel on Climate Change assessments.

3.2.3 Water

3.2.3.1 Metals

Research was undertaken to determine the impacts of metal mixtures in the Spanish Harbour

AOC (Great Lakes), as well as in the Athabasca River and the water and sediment from oil sands tailings ponds. The presence of 35 metals was assessed in water, sediment and invertebrate tissues.

Methods were developed for the analyses of selenium and vanadium in water, tissues and sediment, and analyses were completed in support of field-site and laboratory studies assessing the impact of metal mixtures.

3.2.3.2 Municipal Wastewater Effluents

Research conducted on life-cycle exposures of fish to three municipal wastewater effluents that discharge into Lake Ontario shows that some municipal wastewater effluents can affect fish reproduction. Fathead Minnows (*Pimephales promelas*) grew normally and appeared healthy at 70% / 30% effluent/water mixture, yet in two of the three effluents they produced fewer eggs than reference fish. The municipal wastewater effluents contained a mixture of compounds: ammonia, oils, metals, nutrients and many pharmaceuticals and personal care products. High concentrations of the pharmaceutical drug furosemide (used to control blood pressure and kidney problems) were detected in all three effluents. Studies will next assess which advanced treatment technologies (ultraviolet sterilization, increased nitrification) can remove these compounds.

Life-cycle tests were conducted on freshwater crustaceans (*Hyalella azteca*) exposed to municipal wastewater effluents from Windsor, Ontario. Animals exposed to municipal wastewater effluents had lower survival rates but grew up to 1.8 times larger than control animals, which had not been exposed to effluents. Interestingly, animals exposed to the effluents initially produced more juveniles per adult than the control animals, likely because the former were larger and therefore able to reproduce earlier; however, they produced fewer juveniles per adult by the end of the 10-week exposure. Several pharmaceuticals and personal care products were detected in the effluent at levels above 400 ng/L, namely diclofenac, carbamazepine, sulfamethoxazole, trimethroprim and BPA. Further research is needed to determine which compound or mixture of compounds causes the population-level effects (long-term survival, reproduction) observed in this study.

Wascana Creek, Saskatchewan, is a sewage effluent–dominated aquatic ecosystem. Four water surveys conducted on the creek have indicated that pharmaceuticals and personal care products were consistently present, in nanograms per litre and sometimes micrograms per litre concentrations, downstream of the sewage treatment plant. The mixture included antibiotics, analgesics, anti-inflammatories, a lipid regulator, metabolites of caffeine, cocaine and nicotine, and an insect repellent. Not surprisingly, concentrations of some of these compounds were highest in winter, when creek flow was almost 100% treated sewage effluent. The levels of ibuprofen, naproxen, gemfibrozil, triclosan, erythromycin, trimethoprim and sulfamethoxazole and unionized ammonia in Wascana Creek far exceed Canadian and American water quality guidelines.

The effect of municipal effluents on the health of freshwater mussels in the Grand River, Ontario, was investigated. Mussels collected downstream of Kitchener–Waterloo had reduced hemocyte (blood cell) viability. The phagocytosis activity (immune response) of the hemocytes was elevated in these mussels, which are exposed to multiple municipal effluents, suggesting a stimulation of immune function. These results suggest that chronic exposure to municipal effluents impacts the immune health of native mussels. The relationship between immune health and the mussels' overall health is being investigated.

Results from studies on myxozoan fish parasites (microscopic organisms that infect different fish tissues) have shown an increase in species richness and prevalence of these parasites downstream of the municipal effluents from Montréal. The high organic load stemming from the sewage effluent promotes populations of benthic worms called oligochaetes, which transmit the parasites to fish.

Studies measuring the combined effects of parasites and pollution (including that from the Montréal municipal effluents) on Yellow Perch (*Perca flavescens*) in the St. Lawrence

River demonstrated that fish exposed both to contaminants and to high levels of parasites are under more stress than fish exposed to either stressor alone. Thus, some parasites become more pathogenic in polluted ecosystems, whereas they have little or no detectable effect in unpolluted conditions. These results are important to help evaluate the overall effects of contaminants on ecosystem health, and show that the effects of contaminants should not be evaluated in isolation.

Field studies were conducted to assess the growth, reproductive function, and survival of the Rainbow Darter (*Etheostoma caeruleum*), an indicator fish species, upstream and downstream of a wastewater treatment plant. Fish were collected at two sites upstream and at two sites downstream of the Kitchener, Ontario, wastewater treatment plant. The length and weight of darters did not differ between upstream and downstream sites. However, fish condition (weight relative to length) was highest in fish collected at the site that was further downstream from the treatment plant (far-field site), and condition was lowest at the downstream site that was closer to the treatment plant (near-field site). There were no differences in gonad size in either sex, but male fish at the near-field site had larger livers. Contrary to previous findings, analysis of sex-steroid production capacity in female Rainbow Darters revealed no differences among sites. As well, other reproductive parameters measured in female fish did not differ among the sites. However, male fish from both downstream sites had lower capacity to produce testosterone than fish from the upstream sites. Analysis of males revealed that the intersex condition (eggs in the testes) was present in 60% of the male darters collected at the near-field site and in 75% of the male darters collected at the far-field site.

Greenside Darters (*Etheostoma blennioides*) and Rainbow Darters were collected in the Speed River at an upstream reference site (Silvercreek), downstream of the tertiary plant in Guelph (sewage treatment plant, near-field site), and further downstream at Niska Road (far-field site). There were no site differences in length and weight in either species or either sex. Female Rainbow Darters collected at the near-field site had a lower condition (weight relative to length) than reference fish, but did not differ from fish from the far-field site. Conversely, male Rainbow Darters from the far-field site had greater condition than fish from the other two sites. Rainbow Darters from the far-field site also had a larger gonadosomatic index (gonad weight relative to body weight) than fish from the sewage treatment plant site. There were no site differences in liver size with respect to body weight in either sex of either species. There were no site differences in steroid production capacity of female darters of either species. Stimulated steroid production capacity was significantly reduced in female Greenside Darters collected at the near-field site relative to levels at the reference site, and levels returned to reference levels in fish collected at the far-field site. There were no significant site differences in steroid production capacity of male darters of either species.

3.2.3.3 Pesticides

Research continued to examine the use of short-term in situ (caging in the field) exposures using a freshwater crustacean (*Hyalella azteca*) as a tool to predict long-term effects of current-use pesticides in aquatic ecosystems. Results showed decreased survival and acetylcholinesterase activity (an enzyme that is inhibited by organophosphate and carbamate insecticides) after one-week exposures to streams in the Niagara Region of southern Ontario where organophosphate and carbamate insecticides were detected. Studies are ongoing to identify effects of individual pesticides and pesticide mixtures measured at sites during in situ exposures.

In collaboration with Fisheries and Oceans Canada, work was undertaken on methods that can be used to better define the environmental risk of agricultural pesticides. A chronic sublethal toxicity test (growth) was developed for the Sand Shrimp (*Crangon septemspinosa*), a species that is endemic to eastern Canada and that may be declining in numbers in certain areas. In testing a total of 11 pesticides for acute lethal toxicity, and seven for chronic toxicity, the Sand Shrimp test has proven to be more sensitive than fish tests for most of the pesticides, with the exception of endosulfan and chlorothalonil, where a few of the fish species tested showed higher sensitivity

than the Sand Shrimp. When compared with other crustacean species, Sand Shrimp were usually among the more sensitive crustaceans, and were the most sensitive to chlorpyrifos.

3.2.3.4 Endocrine-disrupting Substances

Randle Reef in Hamilton Harbour is contaminated with PAHs and heavy metals, which impact the health of the harbour's ecosystem. There is a need for tools to track the efficacy and progress of the proposed remediation actions. In this regard, a set of molecular tools was developed to test the hypothesis that changes in gene expression in fish can predict the adverse effects of exposure to contaminated sediment. The research showed that sediment exposure altered the expression of genes in the following categories: cell adhesion, cell morphogenesis, DNA synthesis, immune responses, metabolism, proteolysis, reproduction, cell respiration, response to stimulus, and cell transport. These findings indicate that monitoring gene expression can be a fast, economical tool for assessing efficacy of sediment remediation actions.

Fathead Minnows exposed for one complete life cycle to three Ontario municipal wastewater effluents showed decreases in egg production for two of the effluents. Fish in 70% effluent grew well and appeared normal, but egg production was 40–50% lower than in control fish growing in laboratory water alone. Similar decreases in reproduction were seen with the freshwater crustacean *Hyalella azteca* exposed to one of these municipal wastewater effluents. Measurements of pharmaceuticals and personal care products in the effluents are continuing, as are measurements of other conventional toxicants (pesticides, oils and hydrocarbons, metals, ammonia, etc.).

Exposure of juvenile Fathead Minnows to pulp mill effluent in New Brunswick showed dramatic effects on egg production after 30 days. Fish exposed to 100% effluent produced no eggs, and fish exposed to 30% effluent produced 50% fewer eggs than control fish. Some decreases in egg production were also evident at 10% effluent. The study is part of an investigation into the cause of the small gonads observed in fish exposed to pulp mill effluents. The endocrine-disrupting effects of this effluent will be investigated further by examining the chemicals present in the effluent. The next goal of the study will be to formulate recommended best practices to industry on effluent treatment, spill control, and goals for chemicals present in effluent based on this and other endpoints.

3.2.3.5 Other Chemicals

Fathead Minnow embryos were exposed to three dye and pigment compounds being addressed by the Chemicals Management Plan. Very few effects were seen in hatched larvae after 14 days with Acid Blue 129. Exposure to Sudan Red G caused decreased survival of fry at concentrations of 100 µg/L and above; however, the effects were delayed and fish mortalities occurred after hatch. These factors are important to consider in the development of fish test procedures. For example, many European countries are proposing toxicity tests that end at hatch of larvae, and therefore tested compounds would be determined non-toxic if the test was terminated too soon. Life-cycle exposure of Fathead Minnows to Disperse Yellow 7 is continuing into 2010–2011. This dye was chosen for long-term studies, and concentrations of 10–30 µg/L caused effects on growth in a 21-day exposure period. Results will be assessed in collaboration with water concentrations of the dyes, and with results from invertebrates exposed to these same compounds.

Toxicity tests were conducted to examine the effects of three dyes used in Canadian commerce on survival and growth of *Hyalella azteca*, a freshwater crustacean. No effects on survival or growth were observed after four-week exposures to Acid Blue 80 (up to 10 000 µg/L) or Acid Blue 40 (up to 2500 µg/L). Survival was affected after four-week exposures to Disperse Yellow 7, with lethal concentrations ranging from 50–140 µg/L. Life-cycle tests showed that egg and juvenile production in animals exposed to Disperse Yellow 7 were 25–30% of those of control animals after a 10-week exposure to 20–50 µg/L. Results will be assessed in collaboration with measurement of environmental concentrations of these dyes in Canadian wastewaters, to determine whether dye levels in the Canadian environment pose a threat to aquatic biota.

Work also continued on the assessment of medium-priority compounds (anthracenedione dyes and azo dyes). The environmental mobility and thus potential bioavailability of these compounds were investigated in sediment, and it was revealed that both classes of compounds typically displayed irreversible binding to the sediment. As a result, it would be expected that the risk of exposure is greater to sediment-dwelling organisms than to aquatic organisms living in the water column. Further research was conducted into the susceptibility of anthracenedione dyes (specifically Acid Blue 129) to reductive degradation. The compound was found to degrade at room temperature and produced trimethylaniline as a major product. Given that aromatic amines are thought to have potentially genotoxic effects, this finding constitutes a key focus of ongoing research.

Perfluorinated chemicals are a concern in Canada due to their toxicity, persistence and potential for biomagnification. Research on PFCs in the aquatic environment continued, with a focus on the geographic breadth of contamination and levels of exposures. A survey of Canadian rivers and streams for PFCs showed that perfluorooctane sulfonate and perfluorooctanoate were the major PFCs present, and that highest concentrations were found in tributaries of Lake Erie and Lake Ontario and in the St. Lawrence River downstream of Montréal. A related study also revealed for the first time that other PFCs, perfluoroalkyl phosphates and phosphonates (used as an anti-grease coating on paper products) were present in surface waters at concentrations similar to those of perfluorooctanoate.

Tests were conducted to determine the in vitro toxicity of the flame retardant tetrabromobisphenol-A bis (2,3 dibromopropylether) and its individual degradation products. The least toxic of the flame retardants studied was tetrabromobisphenol-A bis (2,3 dibromopropylether), the parent compound, which appears to be non-toxic to both Rainbow Trout gill and liver cells. Two degradation products showed the highest toxicity (Br4BPA for gill cells and BPA for liver cells). The other breakdown products had a similar toxic potency. These results indicate that the parent compound is virtually non-toxic but the degradation products are toxic, with the first formed being the most toxic.

Studies on the long-range transport and physical-chemical properties of volatile methyl silicones (VMS) were conducted, and a method was developed to conduct trace analysis of these substances. This method was used for the determination of VMS at sites in north-central Ontario (Turkey Lakes research station), Yukon (Little Fox Lake), and Nunavut (near Resolute Bay). VMS were detected in all remote sites in nanogram per cubic metre concentrations. In samples from Resolute Bay, the VMS chemical known as D4 was detected, indicating long-range transport of VMS. These measures appear to be the first determinations of the levels of VMS in the Arctic and indicate possible global distribution of this chemical. In collaboration with scientists at the Université de Montréal, a mass spectrometry method was developed for online determination of VMS in wastewater treatment plant biogases. These gases are thought to be the main pathway of VMS to the environment. Research continues to determine the extent of VMS contamination of water and sediments.

Studies of lake sediment cores, glacial ice cores, and surface waters collected in 2008 in the Arctic continued to reveal new chemical contaminants entering the Arctic from long-range transport and atmospheric deposition. The use of samples from the Arctic allows an assessment of a chemical's potential to contaminate remote environments, which is a characteristic of POPs. Among the brominated flame retardants detected, the predominant chemical was decabromodiphenyl ether, a widely used flame retardant that is currently managed under CEPA 1999. Concentrations of this chemical were found to be increasing in both the ice cap (1995–2008) and in recent (post-1990) lake sediments. Brominated flame retardants were also detected in seawater in Barrow Strait (Lancaster Sound) and Rae Strait (near Gjoa Haven) at parts per quadrillion concentrations. The current-use pesticides endosulfan, chlorthalonil and dacthal were detected at low part per trillion concentrations in the Devon ice cap and in seawater samples.

Operation of a snow storage and disposal facility was investigated over two field seasons with respect to snowmelt flows, fluxes of chemicals contained in snowmelt, and direct effects on the receiving water. Study results indicate that the levels of chloride were highest in early-season snowmelt but were diluted to some extent during passage through the stormwater management system. Cyanide originating from anti-caking additives in road salts was measured in snowmelt and urban runoff samples in a number of areas affected by road salts. The results indicate a potential risk to the environment caused by cyanide compounds in road salts, but also highlight challenges in accurately measuring cyanide concentrations in urban water samples. Information on the winter runoff and snowmelt will be used in developing best management practices and guidance for road salt management and monitoring.

A preliminary study of the prevalence and extent of groundwater contamination discharging to urban streams was expanded to include Greenwood, Nova Scotia, Barrie and Burlington, Ontario, and Jasper, Alberta, making a total of seven urban areas examined across Canada in the last two years. Groundwater samples were obtained from below the stream beds using the new sampling method developed in 2008–2009. Samples were analyzed for a variety of CEPA 1999 substances from the first Priority Substance List (e.g., trichloroethylene and other chlorinated solvents, benzene, toluene, xylenes, inorganic arsenic) and the second Priority Substance List (e.g., road salt), as well as other contaminants. In every stream examined to date, previously unknown zones of contaminated groundwater were found, suggesting that contaminated groundwater discharging to Canadian streams may be more prevalent than currently believed.

3.2.4 Wildlife and Soil

3.2.4.1 Substance-specific Research

Studies continued on the fate and geographic and temporal trends of contaminants in Canadian and circumpolar Polar Bears (*Ursus maritimus*) and their food webs, and in relation to factors influenced by climate change. One study provided the first-known evidence that an earlier sea-ice breakup date, one effect of Arctic warming, has contributed to the dietary shift observed in Polar Bears from western Hudson Bay in the Canadian sub-Arctic. Furthermore, this research suggests that this dietary shift has contributed to accelerate the increase in the levels of some persistent and bioaccumulative contaminants in the bears from this subpopulation. The pollutants studied contain chlorine and bromine, including PCBs, organochlorine pesticides and PBDE flame retardants. To identify the sources of these contaminants, fatty acids and carbon isotopes were measured as dietary tracers. Over time, where the sea ice broke up at an earlier date, the dietary tracers showed that Polar Bears ate more open-water species, which accumulate higher contaminant levels.

Work continued on contaminant stress on thyroid systems in birds and other wildlife, and on biomarker methods to measure such thyroid system change. One in vitro study demonstrated the capacity of environmentally relevant concentrations of selected PCB and PBDE flame retardant congeners, and hydroxylated and methoxylated analogues, to competitively bind with thyroid hormones on human and gull albumin and transthyretin transport proteins. Results suggest that hydroxylated PCB and PBDE analogues may present an exposure concern to the thyroid system in free-ranging gulls and in humans.

Studies continued on emerging contaminants and their fate in marine mammals. One study, conducted in collaboration with Norwegian and Finnish researchers, investigated the concentrations and patterns of organochlorine pesticides as well as PBDE flame retardants and their hydroxylated PBDE analogues and metabolites in tissues and blood of Ringed Seals (*Pusa hispida*) from two populations with contrasting levels of contamination. Findings indicate that levels and patterns of organochlorine pesticides and PBDEs differ between the two populations, and that these differences may be due to their contrasting diet and exposure to contaminants.

Another study, conducted in collaboration with researchers from the United States, reported on the presence and concentrations of several congeners and classes of organohalogen contaminants (and/or their metabolites) in cerebrospinal fluid in dolphins and seals from the western North Atlantic. Cerebellum gray matter was also analyzed in three individual dolphins. The levels of all contaminants detected were higher in the cerebellum gray matter than in the cerebrospinal fluid. A number of organohalogen contaminants identified in the cerebrospinal fluid and cerebellum in this study have been shown to be developmental neurotoxicants in experiments with rodents. Although the possible effects of multiple and concurrent exposures to these contaminants remain unclear, additive and/or synergistic effects on the central nervous system should be considered.

Work continued on the identification, characterization, determination, and spatial and temporal trends of legacy and emerging contaminants in eggs of Herring Gulls (*Larus argentatus*) from sites across the Laurentian Great Lakes, as well as in eggs of fish-eating seabird bioindicator species and in other selected wildlife in the Arctic, Pacific and Atlantic marine environments and the St. Lawrence River–Great Lakes ecosystem. One study reported on the presence of perfluorinated carboxylates and sulfonates, as well as perfluorinated and polyfluorinated precursor compounds, in Herring Gull eggs from 15 colonies across the Great Lakes. The source of these compounds is likely the gull's aquatic diet. The level of contamination varied among gull colonies and lakes, with higher concentrations found in eggs from colonies in proximity to highly urbanized and industrialized sites in Lake Erie and Lake Ontario. This work has been expanded to contribute to an ongoing national contaminants monitoring program that assesses spatial and geographic trends in chemicals of concern in aquatic and terrestrial avian bioindicator species across Canada in industrial, rural and remote, and point-source sites. The findings from this monitoring program are used to evaluate environmental responses to post-regulatory actions, as part of the Chemicals Management Plan. Results from this program show that European Starlings (*Sturnus vulgaris*) nesting near landfill sites show elevated levels of perfluorooctane sulfonate, and Tree Swallows (*Tachycineta bicolor*) nesting near sewage treatment plants have detectable levels of bisphenyl A in their blood plasma but not in their eggs.

A study using the domestic chicken as a surrogate avian species for wild birds found that hexabromocyclododecane affected hatching success at concentrations similar to those detected in wild birds, and that the expression of a number of genes was altered in liver tissue. In another study, Dechlorane Plus, a flame retardant commonly detected in wild avian species, was administered to chicken liver cell cultures and whole embryos. Dechlorane Plus had no effect on hepatic function as measured through the expression of the genes selected. Hatching success was slightly decreased, but only when levels of Dechlorane Plus were 10–15 times greater than environmental levels.

The relative potencies of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and 2,3,4,7,8-pentachlorodibenzofuran (PeCDF) as inducers of cytochrome P4501A (an enzyme used as an environmental biomarker) were determined in Herring Gull liver cell cultures. PeCDF was determined to be approximately 20-fold more potent than TCDD. The findings of the study suggest that, in Herring Gulls, PeCDF was a more important contributor to "dioxin-like" toxic effects than TCDD, and that there is a need to re-evaluate the relative contributions of dioxin, dibenzofuran and PCB congeners in wild avian species.

Laboratory studies with liver cell cultures of three species of birds determined that highly purified (i.e., dioxin-free) hexachlorobenzene caused induction of cytochrome P4501A in each species. This is the first study to confirm that hexachlorobenzene meets one of the criteria for being formally considered a "dioxin-like" chemical for its possible inclusion into the "toxic equivalency" risk assessment scheme for wild birds.

Laboratory studies were conducted to determine the effects of perfluoroalkyl compounds on gene expression in cultured avian liver and brain cells.

The principal focus of the work is to determine and predict the potential toxic effects of current-use perfluoroalkyl compounds.

The Glaucous Gull (*Larus hyperboreus*), an Arctic top predator, was used as a bioindicator for investigating relationships between contaminant levels (organochlorines and PCBs, mercury and selenium) and measures of oxidative stress in Canadian Arctic ecosystems. Contaminant levels were low, and associations between contaminant exposure and oxidative stress were weak. Nevertheless, glutathione peroxidase activity rose with increasing concentrations of selenium in the liver, levels of thiols declined as levels of mercury, organochlorines and PCBs rose, and, at one of the two study sites, levels of lipid peroxidation were elevated with increasing levels of mercury in the liver. These results suggest that contaminants may have a harmful effect on gull physiology even at low exposure levels.

Studies examined the effects and toxicokinetics of selected brominated flame retardants on captive American Kestrels (*Falco sparverius*), Zebra Finches (*Taeniopygia guttata*), Ranch Mink (*Neovison vison*) and Snapping Turtles (*Chelydra serpentina*). In kestrels, exposure to a commercial PBDE mixture and hexabromocyclododecane induced some changes in reproductive success and behaviour, as well as nestling growth and endocrine function. Zebra Finches exposed to a PBDE as nestlings showed effects on song and reproductive behaviours, but these were not associated with significant effects on brain morphology. In mink, a replacement brominated flame retardant (bis(2,4,6-tribromophenoxy) ethane, BTBPE) was found to accumulate largely in abdominal fat but not in the liver. Environmentally relevant exposures had minimal effects on reproduction, juvenile growth or thyroid function in minks. Contaminant uptake and possible oxidative stress in Snapping Turtles exposed to the BTBPE is currently an active area of research.

Work was completed on the exposure of three species of owls to anti-coagulant rodenticides in British Columbia. Very high incidences of exposure to at least one current-use rodenticide were found in all species and were associated with acute poisoning in a number of cases.

An ongoing assessment of the impact of methyl mercury, lake acidity and related stressors on the breeding success of Common Loons (*Gavia immer*) and other wildlife across Canada continued through studies in Nova Scotia, Quebec, Ontario and western Canada. An assessment of the impacts of acid deposition on the biodiversity and abundance of aquatic invertebrates, amphibians and fish in acidic lakes began in Nova Scotia.

Studies of the toxicity of methyl mercury to developing avian embryos continued to be undertaken for a variety of seabird species, to determine the comparative sensitivities of these species to methyl mercury exposure and to estimate toxic-effect concentrations.

Exposure and effects studies of Bald Eagle (*Haliaeetus leucocephalus*) nestlings continued on the Pacific coast of North America. Results show that exposure of eagles to PCBs and dichlorodiphenyltrichloroethane (DDT)-related compounds was highly influenced by trophic level (i.e., level in the food chain). However, levels of brominated flame retardants did not appear to be influenced by trophic level, perhaps suggesting some capability of the animals to metabolize those chemicals. Findings indicate that PCBs continue to have an effect on eagle physiology, more than 30 years after their use was banned. In cooperation with colleagues from the United States, a long-term study of contaminants in Bald Eagles around the Great Lakes region was completed. Results showed that both PCBs and DDT negatively impacted reproductive success up until the early part of the last decade, although the mechanisms of action were not determined.

A collaborative study with colleagues in Wales showed that American (*Cinclus mexicanus*) and European populations of dippers were exposed to different patterns of persistent contaminants. Exposure of American Dippers to PCBs and brominated flame retardants was substantially greater as a result of their feeding on juvenile salmon, compared with the invertebrate diet of their European counterpart. Recent work has shown that the diet of female dippers changes during the breeding season, which has implications for interpretation of contaminants in eggs.

Studies on perfluoroalkyl compounds in the blood plasma of adult Snapping Turtles in AOCs in the Great Lakes revealed unexpectedly high concentrations of perfluorooctane and perfluorohexane sulfonate in turtles at a reference site. Source trackdown is under way, and the toxicity of these concentrations to turtles will be assessed by examining their thyroid function.

The absorption of PAHs from soil by Snapping Turtle eggs was assessed, as this species is known to use PAH-contaminated sites, such as roadsides and railroad beds, as nesting areas. Results indicate that the specific PAHs absorbed by turtle eggs varied depending on the immediate environment of the nest (soil vs. asphalt).

An ongoing assessment of genetic mutation rates of Double-crested Cormorants (*Phalacrocorax auritus*) from colonies downwind of steel mills continued in Hamilton Harbour. Airborne exposure to PAHs is being assessed through analysis of lung tissue, whereas fatty acids are being used to assess potential dietary exposure.

Investigations of the relationships between contaminant levels and parasite load in fish-eating birds (e.g., Double-crested Cormorants from the Great Lakes) continued, with the objective of improving the understanding of how contaminants and parasites may be interacting to affect the health of wildlife.

To provide guidance on the information requirements in the *New Substances Notification Regulations*, the persistence of 10 high-priority Domestic Substances List (DSL) microbial strains was assessed in soil microcosms. Two strains persisted for the entire incubation period of 180 days, while two other strains did not persist past 21 days. All other strains saw a gradual decline within the 180-day incubation period.

The toxicity and pathogenicity of Risk Group 2 high-priority DSL microbial strains to soil organisms and plants were assessed using the protocols recommended in Environment Canada's *Guidance Document for Testing the Pathogenicity and Toxicity of New Microbial Substances to Aquatic and Terrestrial Organisms*. Results demonstrate a reduction in plant growth with exposure to two microbial strains, and a reduction in soil invertebrate reproduction with exposure to four microbial strains. The results also provided data on test method validation, resulting in suggested method improvements and proposed changes to the current guidance document. The toxicity and pathogenicity data will contribute to the risk assessment of the high-priority DSL microbial strains.

Bioaccumulation and soil toxicity tests were completed using medium-priority chemical substances under the Chemicals Management Plan. The study evaluated the bioaccumulation potential of two organic compounds in earthworms in two different soil types. The results demonstrate that bioavailability depended on the soil type, and bioaccumulation depended on the chemical. This study provided bioaccumulation data for the validation of existing and new model estimates. The research also evaluated the toxicity of two organic and two inorganic compounds to a suite of terrestrial organisms (soil invertebrates and plants) in a sandy soil. The results of this study will provide biological response data to allow a more comprehensive assessment of selected priority Chemicals Management Plan substances, and improve the tools used for the assessment and management of other suspected persistent, bioaccumulative and inherently toxic chemicals.

3.2.4.2 Methodology

Work continued on new methods of measuring emerging contaminants in wildlife, including PFCs and replacement brominated flame retardants. A novel method was developed to identify and quantitatively determine perfluorooctane sulfonate in a commercial product and in environmentally relevant biological samples. With this method, perfluorooctane sulfonate-based compounds were identified in the technical product, in the eggs of Herring Gulls from the Great Lakes, and in the liver and blood plasma of Polar Bears from the Canadian Arctic.

Another method was developed to detect a number of emerging brominated flame retardant contaminants in wildlife. This new high-sensitivity analytical method was used to screen Herring Gull eggs collected from several sites in the Great Lakes and from a site in the St. Lawrence

River. Two previously unstudied brominated flame retardant compounds were detected in gull eggs from these populations, indicating that these contaminants bioaccumulate to some degree in the Herring Gull food chain and are transferred to their eggs during development.

Several laboratory studies were conducted to determine and predict the sensitivity of avian species to the toxic effects of dioxins and dibenzofurans. The research resulted in a novel method that can be used to predict the sensitivity of any avian species to dioxins and dibenzofurans. This method is based on the genotype of the aryl hydrocarbon receptor, using small tissue or blood samples. The method will be useful for environmental risk assessments of the effects of dioxins and dioxin-like chemicals on wild birds.

Work continued on a project to develop and validate a practical in vitro and in vivo biomarker platform that can provide a rapid screening tool to assess the potential of chemical substances to cause early neurochemical and neuro-developmental toxicity in birds. The integrated suite of assays making up this biomarker platform will allow priority substances to be rapidly screened, in order to identify chemicals that may require more in-depth toxicological assessment.

A method to measure the stress hormone corticosterone in feathers collected from Herring Gulls was developed and validated. This method will provide a relative measure of ecosystem stress at different gull colonies throughout the Great Lakes Basin.

Work was initiated to develop amphibian laboratory exposures examining biological effects and mode of action of priority compounds of interest, to generate compound-specific risk assessments and risk management models. Methods development included establishing procedure parameters and endpoint measurements, which will lead to screening assays and standard methods for toxicity assessment using amphibians.

To develop guidance for the *New Substances Notification Regulations*, genomic tools are being evaluated to assess the presence of pathogens in bioengineered microbial consortia and to assess microbial community health.

3.2.5 Human Health

3.2.5.1 Air Quality Health Impacts

Analysis of results is ongoing for the Windsor health study, the Toronto case-control study of traffic-related air pollution and childhood asthma, and the east Montréal panel study on the health effects of industrial emissions among asthmatic children:

- The Windsor health study is developing methods to more precisely estimate population exposure to source-specific air pollutants (ozone, sulfur dioxide, PM, nitric oxide, volatile organic compounds). The risks of hospitalization for cardio-respiratory diseases (e.g., asthma) are being estimated, including spatial variability. To date, the sources of air pollution in personal exposure have been distinguished. Analysis has identified eight sources of volatile organic compounds: four were attributed to outdoor sources and four to indoor sources. Vehicle exhaust and combustion products were the most significant sources contributing to personal exposure, followed by industrial emissions.
- The Toronto case-control study analyzed exposure estimates by year of life for 750 asthma cases and 750 controls, and found an association between cumulative lifetime exposures to traffic-related air pollutants and the development of childhood asthma.
- Data were collected for the east Montréal panel study to examine the personal exposure of 60 asthmatic school children (71 in total for the project). Participating children's cardiovascular/cardiopulmonary function was tested daily. Results from this study will assist in determining the impact of oil refinery emissions on the cardio-respiratory health of children living in proximity to the industrial sites.

Other recently initiated studies on air pollution and related health impacts are examining new endpoints not previously associated with

exposure to air pollutants. These include stroke, appendicitis, headache and migraine, otitis media, and certain skin conditions.

Work is under way to establish a Canadian cohort to develop estimates of nitrogen dioxide, sulphur dioxide, ozone, and fine PM exposure based on remote-sensing methods and land-use regression models, as well as estimates of effects on cancer incidence and cause-specific mortality. Approximately 2.7 million Canadians across the country who completed the 1991 long-form census were followed in terms of their vital status, until 2001. This cohort was established by Statistics Canada. Several known mortality risk factors were reported in the long-form census, including education, race, ethnic origin, and income. Contextual mortality risk factors will be obtained from the 1991, 1996 and 2001 censuses.

A study on controlled human exposure to coarse PM is assessing health outcomes in study participants, including measures of inflammation and oxidative stress as well as cardiovascular and autonomic nervous system effects.

A study to assess the adverse cardiovascular effects of air pollution on seniors was completed in 2009. This study followed seniors in Windsor, Ontario, who lived in nursing homes, to examine their exposure to particulate air pollution in indoor, outdoor and personal environments, and daily changes in their cardiovascular function and blood inflammatory mediators. The study found significant associations between daily elevated levels of PM, likely related to emissions from the transportation sector, and increased blood pressure, heart rate, vascular function mediators in blood, and an oxidative stress marker in seniors.

Collection of baseline data for a range of air pollutants typically found in residences was completed for the Halifax indoor air quality study, and data analysis continues. A similar collaborative study was initiated in Edmonton to collect data for a range of air pollutants, including PM, ozone, nitrogen dioxide, volatile organic compounds, formaldehyde, carbon monoxide, dust and fungal contaminants. Similar studies have been carried out in Québec, Windsor and Regina. The results of these studies will provide information on the levels of exposure and sources of indoor air pollutants; this information will be used to develop guidelines and other actions to protect health.

Indoor air quality assessments were undertaken to update existing guidelines (nitrogen dioxide, fine PM) and to produce new guidelines for priority contaminants (toluene, benzene and naphthalene) and for ventilation. These will be published as residential indoor air quality guidelines or as scientific assessment documents, and will support the development of communication/outreach products for public health professionals and the general public.

Spatial monitoring of air pollutants was completed in Ottawa, Windsor, Hamilton and Winnipeg, to develop cost-effective methodologies for characterizing population exposures to outdoor air pollution. Results from these studies will be used to support community-based land-use planning and regulatory initiatives to improve population health.

The Montréal Congestive Heart Failure Study commenced, evaluating the exposures of 100 patients with advanced cardiac disease. It will continue through 2010–2011. In addition, a study investigating the exposure of pregnant women to a number of air pollutants associated with consumer products was initiated in Ottawa. This project will provide novel Canadian data for exposures to a potentially harmful contaminant (naphthalene) during pregnancy, and will be used for risk management decision making.

As part of an epidemiological study on infant/child asthma and allergies, and in support of national surveys of exposure to hazardous chemicals, a new gas chromatography–mass spectrometry method was developed to quantify a range of organic compounds in fine indoor dust. To expand exposure-monitoring methodologies, a new sampling method was developed that uses quartz filter wipes to collect samples from indoor window surfaces. Data generated from both of these approaches are currently being analyzed, while additional samples will continue to be collected.

In collaboration with the Canadian Healthy Infant Longitudinal Development Study, work was initiated to assess exposures during pregnancy to a suite of phthalates in approximately 1600 women

from four locations across Canada. This project will contribute to the development of new methodologies to characterize sources of exposure using biomarkers and dust samples.

A draft of the Canadian Smog Science Assessment was completed. This document is a comprehensive review, co-led by Environment Canada and Health Canada, that considers atmospheric science, human health and ecosystem health, and will assist with decision making as Canada moves forward in the evolution of its air quality policies and development of air quality objectives. The assessment was expected to be released in the fall of 2010.

A health risk assessment evaluated the potential risks and benefits to the health of Canadians from the use of E10, a formulation of gasoline containing 10% ethanol per volume. The risk assessment of E10 fuel focused on the human health implications due to changes in air quality that might arise from its widespread use in Canada. Overall, there were no substantial differences in the predicted health effects for the widespread use of E10 fuel compared with the health effects attributable to conventional gasoline.

A human health risk assessment for inhaled manganese was completed. This assessment provides a detailed technical review of the science of the health effects of manganese, and includes a new health-based reference concentration for manganese in air, to replace the value established in 1994. A *Canada Gazette*, Part I notice of this human heath risk assessment is expected to be published in 2010–2011.

3.2.5.2 Exposure and Biomonitoring

The Canadian Health Measures Survey is a national survey carried out by Statistics Canada, in collaboration with Health Canada and the Public Health Agency of Canada, to collect information from Canadians about their health. Cycle 1 of the survey (2007–2009) included the collection of blood and urine samples from approximately 5600 randomly selected Canadians between the ages of 6 and 79, from 15 collection sites. One of the most important contributions of the survey will be to establish current population levels for a broad range of environmental chemicals. The results will also help focus future research efforts on the links between exposure and health, and provide information to guide action by governments. Biomonitoring data from the first cycle of the survey is expected to be released in August 2010. The second cycle of the survey was launched in September 2009 and includes children aged 3–5. Planning for the third cycle was initiated.

A study on the migration of BPA from plastic baby bottles, baby bottle liners and reusable polycarbonate drinking bottles was conducted. Data from the study were used in the recent CEPA 1999 risk assessment, and findings were published in a peer-reviewed journal. BPA has been measured in house dust samples from the Canadian House Dust Study.

A national survey of contaminants in Canadian drinking water continued. This three-year study is examining levels of disinfection by-products (both new and regulated) and selected emerging contaminants in Canadian drinking water. Sixty water treatment plants and distribution systems are being sampled across Canada. More than 100 water quality parameters and contaminant concentrations are being assessed for each location. The results, which are expected in 2011, will provide updated exposure data to be used in the preparation and update of *Guidelines for Canadian Drinking Water Quality*.

Studies also continued on dermal absorption of substances being assessed under the Chemicals Management Plan. Skin is a major route of entry to the human body for many substances, especially those in consumer products such as cosmetics. As a result, it is important to understand how chemicals are transported from the outer surface of the skin to internal layers and the circulatory system. This knowledge is especially important when trying to determine what types of chemicals individuals are exposed to, and how these may affect human health. This project is establishing routine test methods to measure the dermal absorption of chemicals that have been identified as being of high concern (priority) for human health, which will allow for more accurate estimates of exposure levels. Results are expected in 2011.

A national indoor air survey of chemicals is measuring selected priority chemicals in Canadian residential indoor air. Indoor air samples are being collected and analyzed in a randomly selected national sample of Canadian homes whose occupants are participating in the Canadian Health Measures Survey. At the same time, outdoor (ambient) air concentrations from selected major cities and rural areas are being determined in the sampling sites of NAPS, to generate baseline information for target chemicals in these areas. Results are expected in 2011.

Research continued to examine dietary exposures of young children to emerging POPs and plasticizers. This study is producing child-specific dietary exposure estimates for a number of emerging POPs and plasticizers. Foods frequently consumed by infants and young children are being analyzed for contaminants, including perfluorinated compounds, PBDEs, and BPA. This study will provide needed information on children's exposure to more short-lived contaminants (e.g., BPA) that are rapidly excreted and whose long-term exposure is not well-characterized by measurements in blood or other biological matrices. Results are expected in 2011.

3.2.5.3 Population Studies

Epidemiological studies were conducted to evaluate the relationship between population exposure to air pollution and mortality, hospital admissions, emergency room visits and infant health. Epidemiology panel studies were undertaken, using indoor, outdoor and personal air-pollutant exposure monitoring techniques, to assess children's exposure to source-specific pollutants and the relation to their cardiovascular and respiratory outcomes.

A Canadian study continued to evaluate the importance of sources of lead exposure, such as drinking water in contact with lead service lines as well as dust and paint, by comparing Canadian children aged 1–5 living in areas served by lead service lines to children of the same age living in similar homes served by non-lead pipes. Results are expected in 2011.

A biomonitoring study continued, focusing on environmental lead exposure in children from pre-1970s housing in St. John's, Newfoundland and Labrador. This study is measuring lead exposure (blood lead levels) in young children living in a range of housing ages in St. John's. Concurrent measurement of residential lead levels in the sample households will permit an evaluation of exposure sources. Results are expected in 2011.

Health Canada continued to refine the Air Quality Benefit Assessment Tool (AQBAT) to estimate the health benefits of air pollution reductions and risk management strategies. Methodologies for the analysis of life expectancy and quality-of-life impacts of ozone and PM were developed. A systematic review of the association between air pollution exposure and adverse pregnancy outcomes is under way. Mortality data for Montréal are being analyzed to develop risk estimates for the most highly susceptible population groups. In addition, hospital admission data are being analyzed to update the AQBAT. Other upgrades are under way, including collating 2006 census geography and population counts; updating baseline data on air pollutant levels, population projection, mortality, hospital admissions and emergency-room visits by age and disease category; and interactively mapping AQBAT health outcome estimates for Canada.

The ongoing Maternal-Infant Research on Environmental Chemicals study is assessing the pregnancy health risks that may be associated with environmental exposure to heavy metals (lead, mercury, cadmium, arsenic and manganese). The health risks being assessed include elevated blood pressure and gestational hypertension among the women, and fetal growth retardation. As of March 2010, 1200 pregnant women had been recruited from the 12 selected clinical sites in 10 Canadian cities. Approximately 82 000 biospecimens have been collected and 25 000 chemical analyses performed. Recruitment should be completed by the fall of 2010, and the final report is expected in March 2012.

A study on plastics and personal care products used during pregnancy is recruiting 80 pregnant women from the Ottawa area and collecting multiple maternal urine samples, detailed consumer product/food packaging diaries, infant urine and meconium, and breast milk samples. Meconium is being evaluated as a potential matrix

for measuring in utero exposure. Biospecimens are being analyzed for phthalates and their metabolites, BPA, triclosan and triclocarban. In 2009–2010, researchers continued recruitment for the study, trained research staff, worked on developing analytical methods and a database, pilot-tested and revised the study diary, and began analyzing biospecimens.

A pilot study on chronic lead exposure among Canadians is assessing the feasibility of obtaining bone and blood lead measurements for different age and gender cohorts, to measure acute and chronic non-occupational lead exposure in the Canadian population. During the reporting period, the study protocol and survey instruments were finalized, and participant recruitment and lead assessments were undertaken. Recruitment and the collection and analysis of blood samples and bone scans in the remaining age/gender categories, along with lead assessments, will be completed by March 2011.

3.2.5.4 Mechanistic Studies

Work continued on analyses to identify biomarkers, in human plasma, of oxidative stress and endothelial dysfunction (a pathology of the blood vessels), to further the understanding of mechanistic links between pollutant exposures and pregnancy outcomes. This work was an additional component of the Maternal-Infant Research on Environmental Chemicals study.

Methods to conduct cell transformation assays using serum-free media were refined. This methodology significantly reduces the time required to complete the assay and is expected to reduce inter-laboratory variability. These assays will fill an important regulatory testing gap and improve the early identification of chemicals that are carcinogenic by mechanisms that do not involve direct DNA mutation.

The cardiopulmonary and metabolic responses of mice exposed to titanium dioxide nanoparticles, carbon black particles and diesel exhaust particulates were investigated using toxicogenomic approaches.

Studies examined the quantitative relationships between the outcome of in vitro and in vivo genotoxicity tests that are commonly used for regulatory decision making, to better understand the conditions under which in vitro studies can provide direct predictions of the risks of genotoxicity in vivo.

3.2.5.5 Hazard Identification

Ongoing in vivo studies examined the impact of perinatal exposure to a chemical mixture on the development of brain neuro-immunoinflammatory changes that are associated with age-related neuro-degeneration in diseases like Parkinson's.

Ongoing studies compared the effects of environmental contaminants, administered either separately or as part of a mixture, on rat neuro-development. Potential molecular biomarkers of neurotoxicity identified in previous studies are being monitored to better understand the possible interactions resulting from simultaneous exposure to multiple environmental contaminants.

Ongoing in vivo and in vitro studies were conducted to investigate the mode and mechanism of actions of priority substances (e.g., mixtures of endocrine disrupters) under the Chemicals Management Plan. The objective of these studies is to identify the critical period of development (in utero and/or the postnatal periods) during which these chemicals may induce long-term adverse health effects such as cancer, abnormal adulthood hormonal stress response, and hormonal metabolism.

Studies continued to investigate whether very low doses of BPA and other Chemicals Management Plan priority chemicals can induce the formation of fat cells from precursor cells. In addition, collaborative studies are examining the impact of these substances on the function of pancreatic cells, to identify substances that could cause or exacerbate diabetes. Results of both of these studies will be published by early 2011. These studies will indicate which substances may pose risks of inducing metabolic syndrome.

3.3 Objectives, Guidelines and Codes of Practice

3.3.1 Environmental Quality Guidelines

Environmental quality guidelines specify recommendations in quantitative or qualitative terms to support and maintain particular uses of the environment, such as protection of aquatic life and land uses (including agricultural, industrial, commercial and residential/park land). Table 1 lists the environmental quality guidelines that were published or were being developed nationally through the Canadian Council of Ministers of the Environment (CCME) in 2009–2010. During the same period, Environment Canada embarked on developing federal environmental quality guidelines for various chemicals identified in the Chemicals Management Plan (Table 1). Where federal priorities align with those of the CCME (i.e., those of the various provincial and territorial jurisdictions), the federal environmental quality guidelines will be tabled with the CCME for consideration as national values.

Table 1: Environmental quality guidelines from April 2009 to March 2010

Guideline	Published	In Progress
Canadian Council of Ministers of the Environment (federal, provincial and territorial)		
Water	• Boron • Carbaryl • Endosulfan	• Uranium • Zinc
Soil	• n/a	• N-Hexane • Nickel • Zinc
Chemicals Management Plan (federal)		
Water	• Alcohol ethoxylates* • Siloxanes (D4, D5)*	• Chlorinated paraffins • Cobalt • Hydrazine • Pentachlorophenol • PBDEs • Vanadium oxide
Sediment	• Siloxanes (D4, D5)*	• Chlorinated paraffins • PBDEs
Tissue (fish)	• n/a	• Chlorinated paraffins • PBDEs

*Available on request; formal publication pending.

3.3.2 Drinking Water Quality

Health Canada develops the *Guidelines for Canadian Drinking Water Quality*, as well as Guideline Technical Documents and Guidance Documents, under the authority of CEPA 1999.

Priorities for developing Guideline Technical Documents and Guidance Documents under the *Guidelines for Canadian Drinking Water Quality* are established in consultation with the provinces and territories.

Guideline Technical Documents, which establish a guideline value (usually a maximum acceptable concentration), are developed for drinking water contaminants that meet the following criteria:

- exposure to the contaminant could lead to adverse health effects;
- the contaminant is frequently detected or could be expected to be found in a large number of drinking water supplies throughout Canada; and
- the contaminant is detected, or could be expected to be detected, at a level that is of possible health significance.

Guidance Documents do not establish limits for parameters. They are developed for parameters that do not meet all three of these criteria, either to provide operational or management guidance related to specific drinking water–related issues (such as boil water advisories), or to make risk assessment information available when a guideline is not deemed necessary.

Table 2 lists the technical and guidance documents that were published or in progress in 2009–2010.

Table 2: Guidelines and guidance documents for Canadian drinking water quality from April 2009 to March 2010

Published	In Progress
Guideline Technical Documents	
• 2-methyl-4-chlorophenoxyacetic acid • Benzene • Chlorine • Radiological characteristics	• 1,2-dichloroethane • 2,4-dichlorophenoxyacetic acid • Ammonia • Carbon tetrachloride • Chromium • N-nitrosodimethylamine • Dichloromethane • Enteric viruses • Fluoride • Nitrate/nitrite • N-nitrosodimethylamine • Protozoa • Selenium • Tetrachloroethylene • Vinyl chloride
Guidance Documents	
• Controlling corrosion in drinking water distribution systems	• Heterotrophic plate count

3.3.3 Air Quality Guidelines

In 2009–2010, Health Canada issued a notice for proposed residential indoor air quality guidelines for carbon monoxide, and a notice for proposed residential indoor air quality guidelines for ozone (www.gazette.gc.ca/rp-pr/p1/2009/2009-04-04/pdf/g1-14314.pdf).

3.4 State of the Environment Reporting

State of the environment reports and environmental indicators provide Canadians with information and knowledge about current environmental issues, and establish reliable scientific trend data that support informed policy and decision making. The Canadian Environmental Sustainability Indicators (CESI) are a system of national environmental indicators used to inform citizens about the state of the Canadian environment and to provide policy makers and researchers with a baseline of authoritative, best-available information in relation to key environmental issues.

Environmental indicators provide a simple way to convey complex information on the environment, much like the gross domestic product, the consumer price index and the unemployment rate do for the economy. The CESI, which are produced by Environment Canada in partnership with Health Canada and Statistics Canada and are supported by provincial and territorial contributions, bring together environmental information from federal, provincial and territorial governments, who share responsibilities for environmental management in Canada. A variety of scientists from the three partner departments and elsewhere across the federal government, along with provincial and territorial experts, contribute advice, data and reviews to ensure the best available information is provided.

The selection of environmental indicators is strongly dependent on available long-term data that are consistent across time and geographies. Indicator development includes efforts to improve indicators so that they are more representative, credible, transparent, relevant and understandable. Some of these aspects are also improved through the design of charts and maps, the inclusion of clear source and methods documentation, and the appropriate explanations and linkages to social-economic pressures and implications.

CESI for air quality, water quality, GHG emissions and protected areas were released in the spring of 2010. The Air Quality Indicators track ground-level ozone and fine PM, two key components of smog that are among the most widespread air pollutants. The CESI initiative supports hundreds of monitoring stations to produce the indicators, in particular a core network of 153 water sampling stations. The Water Quality Indicator measures the extent and severity of water pollution by tracking a wide range of substances in water across Canada. The Greenhouse Gas Indicator tracks Canada's GHG emissions. Finally, the Protected Areas Indicator tracks progress in setting aside natural areas across Canada. Findings provide important context for the Government's actions on clean air, clean water, climate change and the conservation of natural environments.

Key national results for the 2009 reporting cycle include the following:

- Air quality – Nationally, ground-level ozone exposure increased approximately 13% from 1990 to 2007, but this increasing trend in annual ozone exposure has slowed in recent years. No trend was detected in fine PM exposure from 2000 to 2007.
- Water quality – From 2005 to 2007, the Water Quality Index for the Protection of Aquatic Life was rated as "excellent" at 10 sites (7%), "good" at 49 sites (32%), "fair" at 66 sites (43%), "marginal" at 22 sites (14%), and "poor" at 6 sites (4%).
- GHGs – Emissions in 2008 were 24% higher than those in 1990. Emissions peaked in 2007 at 750 megatonnes, and declined by 0.8% from 2003 to 2008.
- Protected areas – Canada had protected 9.4% (939 993 square kilometres) of its land as of mid-2009, and approximately 0.6% of its marine territory. Since 1990, the overall area of protected land and water in Canada has increased by approximately 81%.

In 2009–2010, the CESI website was updated and redesigned. This new website features the following enhancements:

- further refinements to text and structure, in order to present information in a more concise and less technical manner;
- simplified links from indicator results to their key social and economic drivers, as well as to the individual or household level;
- a new mapping application that allows users to view and search for local or regional information on a map, select indicators and views, and export to Google Earth; and
- easier and simpler navigation.

The 2008 *Federal Sustainable Development Act* requires Environment Canada to establish the Federal Sustainable Development Strategy in 2010, with goals and targets, and to provide a progress report at least once every three years. A consultation paper was released to the public in March 2010 to provide guidance for implementing the new strategy. As part of the process of developing federal goals and targets for sustainable development and determining which organizations will be responsible for meeting them, Environment Canada is using CESI and other federal government indicators to provide accountability for results.

The Federal Sustainable Development Strategy encompasses broad themes, which cross Canada's national and provincial borders. The themes to be covered are 1) addressing climate change and air quality, 2) maintaining water quality and availability, and 3) protecting nature (plus a theme focused on shrinking the environmental footprint of government operations). Work is under way to expand the suite of indicators under the program, and a relatively large suite of indicators will be covered within the three-year time frame of the first version of the Federal Sustainable Development Strategy.

www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En

3.5 Gathering and Reporting of Pollution and Greenhouse Gas Information

3.5.1 National Pollutant Release Inventory

The National Pollutant Release Inventory (NPRI) is Canada's legislated, publicly accessible inventory of pollutant releases (to air, water and land), disposals and transfers for recycling. The NPRI includes information reported by industrial facilities, and comprehensive emission summaries and trends for key air pollutants in Canada. It is an important source of information for identifying, assessing and managing risks to the environment and human health. Public access to the NPRI encourages industry to prevent and reduce pollutant releases, and improves public understanding about pollution and environmental performance in Canada.

The following publications were released in 2009–2010:

- 2007 Air Pollutant Emissions Data and Updated Trends (June 2009);
- *Environment Canada's Response to the Final Report of the National Pollutant Release Inventory Multi-Stakeholder Work Group on Substances 2008* (February 2010);
- Reviewed NPRI facility data for 2008 was published in November 2009, including NPRI 2008 Highlights, a 2008 Facility Data Summary, resources for accessing NPRI facility data in various formats, and frequently asked questions.

3.5.2 Greenhouse Gas Emissions Reporting Program

This reporting program lays the foundation for the development of a single, domestic, mandatory GHG reporting system, in order to meet the GHG reporting needs for all jurisdictions and minimize the reporting burden for industry and government. The program's main objectives are to provide Canadians with timely information on these emissions, enhance the level of detail in the National Greenhouse Gas Inventory, support the development of GHG regulations for large industrial emitters, and meet provincial and territorial requirements for information on these emissions. The data are collected under three acts: by Environment Canada under CEPA 1999, by Statistics Canada under the *Statistics Act*, and by Alberta Environment under the *Climate Change and Emissions Management Act*.

The *Greenhouse Gas Emissions Reporting Program: Overview of 2008 Facility Data* was released on December 4, 2009. Key data tables and a dynamic search tool to query the reported data were also made available.

For further information, consult www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=8044859A-1.

4 Pollution Prevention (Part 4)

Part 4 of the Act provides the authority for the Minister of the Environment to require the preparation and implementation of pollution prevention plans. The Act also provides the authority for the establishment of a national pollution prevention information clearinghouse to facilitate the collection, exchange and distribution of information regarding pollution prevention. Authority is further provided to create an awards program to recognize significant achievements in the area of pollution prevention.

This part of the Annual Report deals with the latter two activities. The use of pollution prevention planning requirements for risk management is described in Chapter 5, Controlling Toxic Substances (see 5.1.1.4).

4.1 Pollution Prevention Awards

Environment Canada participated in the CCME Pollution Prevention Awards Program, which recognized organizations that have shown leadership and innovation in pollution prevention. In 2009, the award recipients were as follows:

- Small Business Category – Awarded to Calstone Inc. from Scarborough, Ontario, for their greening initiatives and Remanufacturing Program.
- Medium Business Category – Awarded to Frito Lay Canada from Lethbridge, Alberta, for a series of projects to minimize environmental impacts while achieving business and financial success.
- Medium Business Category – Awarded to S.C. Johnson and Son Ltd. from Brantford, Ontario, for reductions in waste and GHG emissions.
- Large Business Category – Awarded to Teknion Corporation from Toronto, Ontario, for their achievements in pursuing sustainable development through their Environmental Charter.
- Organization/Institution/Group Category – Awarded to Cape Breton District Health Authority from Sydney, Nova Scotia, for their Green Today for a Healthy Tomorrow program to green their facilities.
- Greenhouse Gases Reduction Category – Awarded to the City of Toronto, Toronto Environment Office from Toronto, Ontario, for their achievements in GHG emissions reductions.
- Greenhouse Gases Reduction Category Honourable Mention – Awarded to Exhibition Place in Toronto, Ontario, for their environmental stewardship and energy efficiency projects.

For more information on the CCME Pollution Prevention Awards, consult www.ccme.ca/ourwork/pollution.html?category_id=140.

4.2 Canadian Pollution Prevention Information Clearinghouse

The Canadian Pollution Prevention Information Clearinghouse is a public website that provides comprehensive information and tools for Canadians to strengthen their capacity to prevent pollution.

In 2009–2010, 74 new records were added to the clearinghouse, and for most of the year the average number of visits per month was 15 000. The clearinghouse continues to be an important tool for the public, industry and youth researching pollution prevention techniques, case studies and resources. Efforts to promote the clearinghouse continue through website links, articles and newsletters. For more information, consult www.ec.gc.ca/cppic.

5 Controlling Toxic Substances (Part 5)

Part 5 of the Act includes specific provisions for data collection, assessment and management of new and existing substances in Canada. CEPA 1999 introduced a requirement for the Government to sort through, or "categorize," the substances on the Domestic Substances List (DSL). The categorization process identified substances that:

- were suspected to be inherently toxic to humans or to the environment, and are persistent (take a very long time to break down) and/or bioaccumulative (collect in living organisms and end up in the food chain); or
- present the greatest potential for exposure to Canadians.

As a result of the September 2006 completion of the categorization exercise, Environment Canada and Health Canada identified approximately 19 000 substances that needed no further action at that time and approximately 4300 chemical substances that needed further attention, such as screening assessments, research, or measures to control the use or release of the substance. These 4300 substances are being managed under the Government's Chemicals Management Plan. Activities under the Chemicals Management Plan include risk assessment, risk management, research and monitoring/surveillance.

5.1 Existing Substances

Through the Challenge under the Chemicals Management Plan, the Government committed to address the 200 highest-priority substances. These 200 substances have been divided up into a number of smaller groups or "batches" that are being addressed sequentially. Each batch of substances in the Challenge progresses through various information-gathering, screening assessment, management, and compliance promotion and enforcement (where appropriate) stages. Every three months, a batch of 12–20 substances is launched by publishing the names of these substances in the *Canada Gazette*, Part I, for a six-month call for information.

Screening assessments are conducted to assess whether substances meet one or more of the criteria in section 64 of the Act. The results of the screening assessments are published in draft form on the Chemical Substances website (www.chemicalsubstanceschimiques.gc.ca/index-eng.php), and a notice is published in the *Canada Gazette,* Part I. The notice provides for a 60-day public comment period, during which interested parties can file written comments on the notice proposed by the ministers of the Environment and Health. After taking into consideration any comments received, the ministers may, if they deem it appropriate, make revisions to the screening assessment report.

Table 3 lists the assessment decisions that were published during the 2009–2010 reporting period, for a total of 215 existing substances. This includes draft and/or final assessment decisions for 100 substances in batches 4 through 9 of the Challenge, as well as assessment decisions for 115 other existing substances or groups of substances that were not part of the Challenge. Additional details on the draft and final assessment decisions for substances in batches 4 to 9 can be found in Appendix B of this report.

More information can be found at www.chemicalsubstances.gc.ca.

Table 3: Summary of existing substance assessment decisions published from April 2009 to March 2010

(NFA = no further action; PSL1 = First Priority Substances List; PSL2 = Second Priority Substances List; SNAc = Significant New Activity Notice; VE = virtual elimination)

Substances or Number of Substances	Batch Launch Date	Type of Assessment	Meet s. 64 Criteria	Proposed Measure	Draft Notice*	Final Notice*
18 Substances	2007 Nov. 11	Screening – Batch 4	Yes for 3 substances; no for 13 substances	Add to Schedule 1 for 3 substances, including VE for 1 substance; NFA for 13 substances; including SNAcs for 5 substances; further Screening Assessment for 2 substances	2009 Jan. 24	2009 Aug. 01
19 Substances	2008 Jan. 16	Screening – Batch 5	Yes for 2 substances; no for 17 substances	Add to Schedule 1 for 2 substances; NFA for 17 substances including SNAcs for 2 substances	2009 Feb. 21	2009 Aug. 22
18 Substances	2008 May 31	Screening – Batch 6	Yes for 1 substance; no for 17 substances	Add to Schedule 1 for 1 substance; NFA for 17 substances including SNAcs for 11 substances	2009 May 30	2009 Nov. 28 (for 14 of the 18 substances)
14 Substances	2008 Aug. 30	Screening – Batch 7	Yes for 3 substances; no for 11 substances	Add to Schedule 1 for 3 substances; NFA for 11 substances including SNAcs for 9 substances	2009 Sept. 05	2010 Mar. 06
14 Substances	2009 Jan. 31	Screening – Batch 8	Yes for 4 substances; no for 10 substances	Add to Schedule 1 for 4 substances; NFA for 10 substances including SNAcs for 4 substances	2010 Jan. 30	
17 Substances	2009 Mar. 14	Screening – Batch 9	Yes for 5 substances; no for 12 substances	Add to Schedule 1 for 5 substances; NFA for 12 substances including SNAcs for 5 substances	2010 Mar. 20	
6 Pesticides	n/a	Pilot	No for 6 substances	NFA for 6 substances including SNAcs for 6 substances	2007 June 23	2009 Aug. 08
104 Organotins	n/a	PSL1	Yes for 8 substances; no for 96 substances	Add to Schedule 1 for 8 substances; NFA for 96 substances	2007 Apr. 21	2009 Aug. 08
Phenol, 2-methyl-4,6-dinitro-	n/a	Pilot	No for 1 substance	NFA for 1 substance	2007 June 23	2009 Nov. 28
Phenol, 2,2'-methylenebis[6-(1,1-dimethylethyl)-4-methyl-	n/a	Pilot	No for 1 substance	NFA for 1 substance	2007 June 23	2009 Nov. 28
Aluminum chloride, aluminum nitrate and aluminum sulphate	n/a	PSL2	No for 3 substances	NFA for 3 substances	2009 Feb. 07	2010 Jan. 23

* The dates are those on which the draft and final notices were published in the *Canada Gazette*, Part I.

5.1.1 Risk Management

For chemical substances that have been found to meet the definition of toxic after assessment, or for those strongly suspected of being dangerous, steps are taken to control their use and prevent, reduce or eliminate their release into the environment. This is known as "risk management." Risk management instruments include regulations, pollution prevention plans and codes of practice. These instruments can be developed for any aspect of the substance's life cycle, from the research and development stage through manufacture, use, storage, transport and ultimate disposal or recycling.

In addition to the risk management instruments for which activity occurred during the reporting period (described in this section), six risk management instruments were under development to address high-priority substances under the Challenge, and 27 instruments are under development or being amended to control non-Challenge substances.

5.1.1.1 Addition of Substances to Schedule 1

Along with the results of the screening assessment, the ministers must publish in the *Canada Gazette* their final decision as to whether they propose to recommend that the substance be added to Schedule 1 or added to the Priority Substances List for further assessment, or whether they recommend that no further action be taken in respect of the substance.

If a screening assessment shows that a substance meets one or more of the criteria in section 64, the ministers may decide to propose that the substance be added to Schedule 1 of the Act. This recommendation is made to the Governor in Council. The substance will only be formally added to Schedule 1 once the Governor in Council approves an order specifying its addition. The addition of substances to Schedule 1 of CEPA 1999 obliges the ministers to develop risk management instruments.

Table 4 lists the substances or groups of substances that were proposed to be added to Schedule 1 of CEPA 1999 (the List of Toxic Substances) in 2009–2010. No substances were formally added to Schedule 1 from April 2009 to March 2010.

Table 4: Proposed orders adding substances to Schedule 1 of CEPA 1999 from April 2009 to March 2010

Substance	Draft Order*
Tributyltins	2009 Oct. 03
Tetrabutyltins	2009 Oct. 03
Thiourea	2009 May 16
1,3-Butadiene, 2-methyl-	2009 May 16
Phenol, 4,4'-(1-methylethylidene)bis-	2009 May 16
Oxirane, (chloromethyl)-	2009 May 16
Cyclopentasiloxane, decamethyl-	2009 May 16
Cyclotetrasiloxane, octamethyl-	2009 May 16
Phenol, 2,4,6-tris(1,1-dimethylethyl)-	2009 May 16
C.I. Pigment Yellow 34	2009 May 16
C.I. Pigment Red 104	2009 May 16
Ethanol, 2-methoxy-, acetate	2009 May 16
Ethanol, 2-(2-methoxyethoxy)-	2009 May 16
1-Propanol, 2-methoxy-	2009 May 16
2-Naphthalenol, 1-[(4-methyl-2-nitrophenyl) azo]-	2009 May 16
3 Batch 4 substances	2009 Oct. 03
Sulfuric acid, diethyl ester	2009 Oct. 03
Sulfuric acid, dimethyl ester	2009 Oct. 03
Benzenamine, *N*-phenyl-, reaction products with styrene and 2,4,4-trimethylpentene	2009 Oct. 03
2-Propenamide	2009 Oct. 03
Ethanol, 2-chloro-, phosphate (3:1)	2009 Oct. 03
Benzene, (chloromethyl)-	2010 Feb. 27

* The dates are those on which the draft orders were published in the *Canada Gazette*, Part I.

5.1.1.2 Significant New Activity Notices

In 2009–2010, Notices of Intent to apply Significant New Activity Notices were published for 26 substances, and final orders were published for 23 substances (Table 5). A person who intends to use, manufacture or import any of these substances for a significant new activity in quantities exceeding 100 kilograms (kg) per year must provide prescribed information prior to initiating the new activity so that the Government may assess the substance.

Table 5: Significant New Activity Notices for existing substances from April 2009 to March 2010

Assessment	Substances or Number of Substances	Notice of Intent*	Final Order*
Batch 2	4 substances	2008 May 24	2009 May 27
Batch 4	5 substances	2009 Jan. 24	2009 Aug. 19
Organotins	2 substances	2007 Apr. 21	2009 Aug. 19
Pesticides	6 substances	2007 June 23	2009 Aug. 19
Batch 5	Ethanol,2[[4-[(2,6-dichloro-4-nitrophenyl)azo]phenyl] methylamino]-	2009 Feb. 21	2009 Sept. 16
Batch 5	Acetamide, 2-chloro-	2009 Aug. 22	Pending
Batch 6	3 substances	2009 Nov. 28	Pending
Batch 6	8 substances	2010 Mar. 6	Pending
Batch 7	5 substances	2009 Sept. 5	2010 Mar. 31
Batch 8	4 substances	2010 Jan. 30	Pending
Batch 9	5 substances	2010 Mar. 20	Pending

* The dates are those on which the notices of intent and final orders were published in the *Canada Gazette*, Part I and Part II, respectively. Note that registration of final orders usually occurs before the order is published.

5.1.1.3 Regulations

Table 6 lists the proposed and final regulations published under Part 5 of CEPA 1999 in 2009–2010.

Table 6: Regulations from April 2009 to March 2010

Substances	Draft Notice*	Final Order*
Volatile Organic Compound (VOC) Concentration Limits for Automotive Refinishing Products Regulations		2009 July 8
Volatile Organic Compound (VOC) Concentration Limits Architectural Coatings Regulations		2009 Sept. 30
Regulations Amending the Benzene in Gasoline Regulations	2009 Aug. 8	
Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations		2009 June 24

* The dates are those on which the draft notice and final orders were published in the *Canada Gazette*, Part I and Part II, respectively. Note that registration of final orders usually occurs before the order is published.

Chlorinated Paraffins

A consultation document was published to encourage discussion and give interested and affected parties an opportunity to provide input on the proposed risk management for chlorinated paraffins: www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=F36519FE-1.

5.1.1.4 Pollution Prevention Planning

The provisions within Part 4 of the Act allow the Minister of the Environment to require designated persons to prepare, implement and report on pollution prevention (P2) plans for toxic substances. P2 planning notices provide the flexibility for industry to determine the best methods within their processes and activities to meet the risk management objective within the notice.

In 2009–2010, six active P2 planning notices managed 18 substances found on Schedule 1 and affected 229 facilities across Canada, including one new P2 planning notice regarding mercury in dental amalgam (for further information on P2 planning, consult www.ec.gc.ca/planp2-p2plan/default.asp?lang=En&n=F7B45BF5-1).

Dental Amalgam

On April 18, 2009, a proposed P2 planning notice under CEPA 1999 was published in the *Canada Gazette*, Part I, outlining requirements for the owners and/or operators of certain dental facilities to prepare and implement P2 plans in respect of mercury releases from dental amalgam waste.

The notice applies to dental facilities that have not implemented all of the best management practices set out in Appendix A of the notice, or in the Memorandum of Understanding Respecting the Implementation of the Canada-wide Standard on Mercury for Dental Amalgam Waste between the Canadian Dental Association and Environment Canada for the voluntary implementation of the Canada-wide Standard on Mercury for Dental Amalgam Waste. The final notice was expected to be published in the spring of 2010.

Mercury Releases from Mercury Switches in End-of-Life Vehicles

This notice applies to certain vehicle manufacturers and steel mills, and required preparation of a P2 plan by July 2008. The risk management objective is to reduce releases of mercury to the environment through participation in a mercury switch management program. Interim progress reports were submitted in 2009 to Environment Canada. All reporting companies indicated that a total of 64 011 switches were collected in 2008, the first year of the switch collection program. This represented a capture rate of 19.7%. Environment Canada published a progress report outlining the results of the switch recovery program.

Base Metal Smelters and Refineries, and Zinc Plants

This notice applies to 11 facilities. Nine of these facilities are also subject to 2008 and 2015 annual limit targets for air releases of sulphur dioxide and PM. In addition, one of these nine facilities is subject to a 2008 annual limit target for mercury, and another facility is subject to a 2008 annual limit target for dioxins and furans. In 2009–2010, Environment Canada received annual interim reports from the facilities. Analysis of the 2008 data submitted by facilities indicates the following:

- In 2008, facilities reported overall reductions of 15% for sulphur dioxide, 40% for PM, 38% for mercury, 11% for arsenic, 43% for cadmium, 9% for lead and 54% for nickel, compared with 2005 releases.
- Over the same period, total releases of dioxins and furans increased by 61% or from 1.07 grams (g) per year in 2005 to 1.72 g/year in 2008. Two reasons explain the increases in dioxins and furans releases: (1) in 2005 releases were lower than their historical levels because of reduced production, whereas in 2008 production returned to historical levels, and (2) in 2008 the processing of recyclables increased.

Textile Mills that Use Wet Processing

As of March 31, 2010, 44 textile mills that are subject to this notice were still in operation in Canada. This number was 63 in 2005, when the P2 plan was being developed. The significant reduction in the number of facilities is primarily the result of economic factors.

This P2 notice includes the following risk management objectives:

- reduce annual use of nonylphenol and its ethoxyl derivatives by at least 97% by 2009, relative to the annual use in 1998; and
- reduce the toxicity of the effluent in such a way that at least 13% of the volume of sample effluent is required to inhibit 50% of exposed organisms (inhibition concentration of 50% of the value of 13% or more), by 2009.

Mills had until March 1, 2010, to provide a written declaration indicating that a P2 plan had been successfully implemented. Analysis of the interim progress reports submitted by the mills indicates that the use of nonylphenol and ethoxy nonylphenols had significantly decreased by 2005 (reduction of 94%). By March 2010, reduction was 100%. As well, the data appear to indicate that between 2005 and 2010 the toxicity of textile

mill effluents was reduced. However, it is not yet possible to determine whether risk management objectives have been reached. More in-depth analyses are currently under way.

Nonylphenol and its Ethoxylates Contained in Products

This notice applies to certain persons or facilities that manufacture or import soap and cleaning products, or processing aids used in the wet textile industry or pulp and paper industry. Phase 1 sets a reduction target of 50% from base-year levels (typically 1998), of the total mass of nonylphenol and nonylphenol ethoxylates used in the manufacturing of products or imported annually. Phase 2 sets a target of 95% reduction from base-year levels of the total mass used in the manufacturing of products or imported annually.

As of March 31, 2010, 75 facilities had declared that they had prepared and were implementing a P2 plan. In 2010, interim progress reports were received along with 11 submissions declaring that their facility had fully implemented their P2 plan. Analysis of these reports indicates that the annual use of nonylphenol and nonylphenol ethoxylates in manufacturing was reduced to 208 000 kg in 2009 (a 90% reduction from 1998 base year) and imports were reduced to 144 000 kg in 2009 (an 83% reduction from 1998 base year).

Inorganic Chloramines and Chlorinated Wastewater Effluents

This notice applies to owners or operators of certain wastewater systems. The risk management objective is to achieve and maintain a concentration of total residual chlorine that is less than or equal to 0.02 milligrams per litre in the effluent released to surface water, by December 15, 2009.

As of March 31, 2010, 84 facilities had declared that they had prepared and were implementing a P2 plan. Eleven of the 84 facilities declared that they had already fully implemented their P2 plan. The remaining facilities had until June 15, 2010, to submit their declarations.

5.1.1.5 Environmental Performance Agreements

Perfluorinated Carboxylic Acids (PFCAs)

Environment Canada, Health Canada and participating companies signed an Environmental Performance Agreement respecting PFCAs and their precursors in perfluorinated products sold in Canada, on March 30, 2010. A copy of the final agreement is available on the Environmental Performance Agreements website (www.ec.gc.ca/epe-epa/default.asp?lang=En&n=AE06B51E-1).

Hydrochlorofluorocarbons (HCFCs)

Environment Canada entered into a "Performance Agreement Concerning the Production of Hydrochlorofluorocarbons in Canada" with E. I. DuPont Canada Company. This performance agreement came into effect on January 1, 2010. As a result, DuPont agreed to limit its annual production level of HCFCs in Canada to no more than 122.9 ozone-depleting potential tonnes, which represents 15% of Canada's baseline production level (or an 85% reduction). This is well below the 75% reduction required by the Montreal Protocol on Substances that Deplete the Ozone Layer.

5.1.1.6 Use of Monitoring and Surveillance to Measure Performance of Risk Management Activities

The Chemicals Management Plan Monitoring and Surveillance Program collects data on concentrations of 154 environmental contaminants in environmental media at locations across Canada. Environmental media include surface water, sediment, air, aquatic biota and wildlife. Wastewater treatment influent, effluent and biosolids as well as landfill leachate and gas are also monitored at select locations chosen to represent a range of input and treatment system types.

The program has collected data on PBDEs, perfluorinated compounds (including PFOS and PFCAs), bisphenol A and metals in relevant media in order to provide measured environmental data for risk assessment and risk management decision making. Development of analytical methods

will also allow for future monitoring of several substances for which recent risk assessments have been published including: siloxanes D4 and D5, BNST (a substituted diphenylamine used as an engine oil antioxidant) as well as 2,4,6-TTBP and DTBSBP (two alkylphenols also used as antioxidants). Collection of data on these substances will establish baseline information and ultimately allow for the analysis of temporal trends—a key element of measuring the performance of risk management activities.

5.1.1.7 Substance-specific Risk Management Results

Various initiatives have resulted in significant changes in the global use of PBDEs since 2001. The use of the penta-BDE and octa-BDE commercial mixtures has been phased out internationally and in Canada since 2006, and deca-BDE will be phased-out in the United States by 2013. PBDEs show evidence of a decline in environmental media sampled through the Chemicals Management Plan Environmental Monitoring and Surveillance Program that is consistent with Canadian and international risk management actions and industry phase-outs. Analysis of archived fish and wildlife samples from Lake Ontario demonstrate that levels of tetra-, penta- and hexa-PBDEs in fish and wildlife in this area showed a marked increase beginning in the early 1980s. However, in recent years, they show a decreasing trend that seems to coincide with the voluntary and regulatory phase-out of the use of penta and octa commercial formulations. In contrast, sediment core data from the Lake Ontario show a rapid increase in accumulation of deca-BDE over the period between the mid-1980s and the late 1990s, with a decline starting in the early 2000s.

As the remaining PBDE commercial mixture is phased out and products containing PBDEs are no longer in commerce, the quantity of new PBDEs entering the environment will decrease. Regulatory controls proposed in August 2010 covering all three commercial mixtures and products containing them should reduce the amount of PBDEs, including deca-BDE, entering the environment in Canada. Further environmental declines of PBDEs are therefore expected; however, PBDEs will remain in the environment for many years to come because of their persistent nature.

5.1.2 Changes to the Domestic Substances List

By Ministerial Order published on December 23, 2009, 484 substances were deleted from the DSL, as they did not meet the statutory criteria for inclusion in the List. On the same date, those substances were added to the Non-Domestic Substances List, as they were in commercial use in other countries. This means that these substances will be subject to the *New Substances Notification Regulations* if any person intends to manufacture them or import them into Canada.

5.2 New Substances

Substances that are not on the DSL are considered to be new to Canada. New substances may not be manufactured in or imported into Canada unless Environment Canada has been notified with certain prescribed information, and the potential risk to the environment and human health has been assessed, or the period for assessing the information has expired. New substances include living organisms; reporting on living organisms is included in Part 6 of this report.

In 2009–2010, 503 new substance notifications were received pursuant to the *New Substances Notification Regulations (Chemicals and Polymers)*. Of these, the Minister issued 22 Significant New Activity Notices (Table 7), 3 Ministerial Conditions (Table 8) and no prohibitions.

Of the 503 notifications, 67 related to chemicals or polymers intended solely for use in *Food and Drugs Act* products. In 2009–2010, three Significant New Activity Notices were published in relation to these substances. In 2009–2010, Health Canada co-sponsored a workshop on pharmaceuticals and personal care products being released in the Canadian environment. The workshop assessed the current state of Canada's analytical science research on these products in government, academia and industry laboratories.

The principal focus of the workshop was to help standardize analytical methods in Canada, set a priority list of pharmaceuticals and personal care products for monitoring, and develop a web portal that government, academia and industry can use to collaborate, communicate, increase process efficiencies and exchange knowledge.

In March 2010, Health Canada and Environment Canada hosted the Workshop on the Human and Environmental Risk Assessment of Nanomaterials, to provide an open forum for detailed dialogue on nanomaterials among science evaluators, research scientists and regulators. The workshop, attended by 25 international experts, was designed to be complementary to the work of the Organisation for Economic Co-operation and Development Working Party on Manufactured Nanomaterials, and followed from the Workshop on Risk Assessment in a Regulatory Context that took place in September 2009 in Washington, D.C.

Table 7: Significant New Activity Notices for new substances from April 2009 to March 2010

Substance	Final Notice*
2-Propenoic acid, 2-alkyl-, oxiranylmethyl ester, polymer with ethenylbenzene, 4-hydroxybutyl 2-propenoate, 2-methylpropyl 2-propenoate and rel-(1R,2R,4R)-1,7,7-trimethylbicyclo[2.2.1]hept-2-yl 2-propenoate, bis(1,1-dimethylpropyl) peroxide-initiated	2009 Apr. 04
Organic silicone intermediate	2009 Apr. 18
2-Propenoic acid, 2-methyl-, methyl ester, polymer with hydrolyzed poly(vinyl acetate) and polyfluorooctyl acrylate	2009 Apr. 18
Siloxanes and silicones, 3-[(2-aminoethyl)amino]-2-methylpropyl Me, di-Me, polymers with Me silsesquioxanes, hydroxy-terminated	2009 May 02
Butanedioic acid, 2,3-dihydroxy-, mixed alkyl and isoalkyl diesters, (2R,3R)-rel-	2009 May 16
Butanedioic acid, 2,3-dihydroxy-, mixed alkyl diesters, (2R,3R)-rel-	2009 May 16
Dimethyl-2-methyl glutarate	2009 June 27
Vanadium carbide (VC)	2009 June 27
Living organism b/h PIV3/RSV F2	2009 July 25
Oleic acid, compound with alkaneamine	2009 Aug. 22
Benzoic acid, 2-hydroxy-, 2-butyloctyl ester	2009 Aug. 22
Tungsten carbide (W_2C)	2009 Sept. 05
Fatty acids, C_{12-16}, Me esters, reaction products with ethoxylated diamides from C_{12-16} fatty acids and ethylenediamine, sulfates (esters), sodium salts	2009 Oct. 24
Hexane, 1,6-diisocyanato-, homopolymer, polyethylene glycol mono-Me ether- and perhalo-1-alkanol blocked	2009 Nov. 28
2-Propenoic acid, 2-methyl, alkyl ester, polymer with 1,1-dichloroethene, alkyl 2-methyl-2-propenoate and perfluoroalkyl 2-methyl-2-propenoate	2009 Nov. 28
Alkyl dioic acid, polymer with carbonic dichloride and carbopolycyclic diol, substituted phenyl ester	2009 Dec. 26
Cyclopentane, 1,1,2,2,3,3,4-heptafluoro-	2010 Feb. 06
Organism the Cassie line of transgenic *Sus scrofa domestica*	2010 Feb. 20
Benzenamine, *N*-ethyl-*N*-[2-[1-(2-methylpropoxy)ethoxy]ethyl]-4-(2-phenyldiazenyl)-	2010 Feb. 20
Poly(oxy-1,2-ethanediyl), α-[2(or 4)-(tetrapropenyl)phenyl]-ω-hydroxy-	2010 Mar. 20
Living organism *Actinosynnema pretiosum* strain 3-459	2010 Mar. 20
Silica gel, fluorinated	2010 Mar. 27

*The dates are those on which the final notices were published in the *Canada Gazette*, Part I.

Table 8: Notices of Ministerial Conditions for new substances from April 2009 to March 2010

Substance	Final Notice*
Poly[oxy(methyl-1,2-ethanediyl)], α-sulfo-ω-hydroxy-, branched alkyl ethers, sodium salts	2009 July 18
1-Butanol, 2,2-bis[(2-propenyloxy)methyl]-, polymer with 1,1,3,3-tetramethyldisiloxane, 3-(2-hydroxyalkoxy)propyl-terminated	2009 Dec. 05
1,3-Propanediol, 2-methyl-, reaction products with alkylmercaptans	2010 Feb. 06

* The dates are those on which the final notices were published in the Canada Gazette, Part I.

5.3 Export of Substances

The Act allows the Ministers to establish an Export Control List containing substances whose export is controlled because their use in Canada is prohibited or severely restricted, or because Canada has agreed through an international agreement, such as the Rotterdam Convention, to control their export. The Governor in Council may, on recommendation of the Ministers, make regulations regarding substances specified on the Export Control List.

A total of 67 notices of export were received from April 2009 to March 2010.

6 Animate Products of Biotechnology (Part 6)

The Act establishes an assessment process for living organisms that are new animate products of biotechnology, which mirrors provisions in Part 5 of CEPA 1999 respecting new substances that are chemicals or polymers. Part 5 also includes a provision under 74(*b*) requiring that all living organisms on the DSL (about 45 micro-organisms) undergo a screening assessment.

6.1 Existing Animate Products of Biotechnology

In 2009–2010, Environment Canada and Health Canada jointly developed the screening assessment process for micro-organisms listed on the DSL. The first screening assessment report (*Pseudomonas aeruginosa* – three strains) was drafted, testing the validity of the risk assessment framework guidance document finalized in 2008–2009, and underwent external scientific review. A second screening assessment report (*Bacillus cereus* – one strain) was also drafted.

The Technical Expert Group, composed of independent scientific experts from academia, industry, public advocacy groups and other federal government departments, continued providing advice on the process and validating the scientific basis of screening assessments and their conclusions. On October 3, 2009, an information-gathering notice under CEPA 1999 (section 71) was published to obtain basic information on the manufacture, import and use of DSL micro-organisms.

6.2 New Animate Products of Biotechnology

During 2009–2010, 13 notifications were received pursuant to the *New Substances Notification Regulations (Organisms)* for new animate products of biotechnology, including the first notification in Canada of a genetically modified livestock animal. Significant New Activity Notices were published for two of these organisms: *Sus scrofa* (www.gazette.gc.ca/rp-pr/p1/2010/2010-02-20/html/notice-avis-eng.html), and Actinosynnema pretiosum (www.gazette.gc.ca/rp-pr/p1/2010/2010-03-20/html/notice-avis-eng.html).

7 Controlling Pollution and Managing Waste (Part 7)

Part 7 of CEPA 1999 provides the Minister with additional authorities to deal with various substances that have the potential to harm the environment or human health.

7.1 Regulations

Proposed Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations

On April 4, 2009, the Minister of the Environment published a notice in the *Canada Gazette*, Part I, to inform Canadians of the Government of Canada's intent to develop new regulations under CEPA 1999 to limit GHG emissions from new cars and light-duty trucks in alignment with U.S. national standards, to take effect beginning with the 2011 model year. On December 7, 2009, Environment Canada released a consultation draft of the planned *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*, to seek input from interested parties in advance of proceeding with the formal publication of proposed regulations in the *Canada Gazette*, Part I.

Regulations Prescribing Circumstances for Granting Waivers Pursuant to Section 147 of the Act

Proposed regulations published in the *Canada Gazette,* Part I, on November 14, 2009, would allow the Minister of the Environment to grant temporary waivers under the authority of CEPA 1999 if there is an actual or anticipated fuel supply shortage during a declared emergency, and/or at the request of the Minister of National Defence if there is an actual or anticipated fuel shortage that could affect national defence operations.

Regulations Amending the Sulphur in Gasoline Regulations

The *Regulations Amending the Sulphur in Gasoline Regulations (Miscellaneous Program)* made pursuant to section 140 of CEPA 1999 were developed to address recommendations made by the Standing Joint Committee for the Scrutiny of Regulations. The objective of these amendments is to achieve consistency between the English and French versions of the Regulations. These final amendments were published in the *Canada Gazette*, Part II, on April 1, 2009.

7.2 Disposal at Sea

The disposal of waste at sea within Canadian jurisdiction and by Canadian ships in international waters requires a permit issued by the Environment Canada. A permit for disposal at sea will be approved only if it is the environmentally preferable option. CEPA 1999 provides additional controls on disposal at sea, including:

- a prohibition on the export of a substance for disposal in an area of the sea under the jurisdiction of a foreign state or in its internal waters;
- a list of six substances for which a disposal at sea permit can be obtained (Schedule 5 of the Act);
- an assessment framework for reviewing permit applications based on the precautionary principle, which must be followed (Schedule 6 of the Act); and
- a statutory obligation to monitor selected sites.

For further information, consult www.ec.gc.ca/seadisposal/main/index_e.htm.

7.2.1 Disposal at Sea Permits

In 2009–2010, 84 permits were issued in Canada for the disposal of 4.57 million t of waste and other matter (Tables 9 and 10), compared with 96 permits for the disposal of 3.79 million t in 2008–2009. Most of this was dredged material that was removed from harbours and waterways to keep them safe for navigation. The number of permits issued has remained relatively stable since 1995.

Table 9: Disposal at sea quantities permitted (in tonnes) and permits issued in Canada from April 2009 to March 2010

Material	Quantity Permitted	Permits Issued
Dredged material	3 790 150*	33
Geological matter	715 000*	5
Fisheries waste	67 355	45
Vessels	–	–
Organic matter	200	1
Total	**4 572 705**	**84**

* Dredged material and geological matter were converted to tonnes using an assumed density of 1.3 tonnes per cubic metre.

Table 10: Disposal at sea quantities permitted (in tonnes) and permits issued by region from April 2009 to March 2010

Material	Atlantic		Quebec		Pacific and Yukon		Prairie and Northern	
	Quantity Permitted	Permits Issued	Quantity Permitted	Permits Issued	Quantity Permitted	Permits Issued	Quantity Permitted	Permits Issued
Dredged material*	1 143 350	9	370 500	9	2 276 300	15	0	0
Geological matter*	0	0	0	0	715 000	5	0	0
Fish waste	66 185	41	1170	4	0	0	0	0
Vessels	–	–	–	–	–	–	–	–
Organic matter	–	–	–	–	–	–	200	1
Total	**1 209 535**	**50**	**371 670**	**13**	**2 991 300**	**20**	**200**	**1**

* Dredged material and geological matter were converted to tonnes using an assumed density of 1.3 tonnes per cubic metre.

7.2.2 Disposal Site Monitoring Program

As required by CEPA 1999, disposal sites are monitored to verify that permit conditions were met, and that scientific assumptions made during the permit review and site selection process were correct and sufficient to protect the marine environment. In 2009–2010, monitoring projects were completed on 15 disposal sites, specifically involving fieldwork carried out in the summer of 2009. The fieldwork included an analysis of historical data at one site and a stability and chemical concentration analysis at seven sites in the Magdalen Islands, Quebec; a follow-up in the Atlantic Region on a recommendation to conduct a benthic community survey at a past site and to conduct physicochemical monitoring at an irregularly used site; physicochemical monitoring at five sites in Environment Canada's Pacific and Yukon Region; and one baseline study at the site of a proposed vessel sinking. Monitoring data continues to be instrumental in the development of site management plans for Charlottetown, Prince Edward Island, and Saint John, New Brunswick. An analysis of data gaps and information requirements is being conducted for a similar initiative at various sites on the Pacific coast.

Further details can be found in the *Compendium of Monitoring Activities at Ocean Disposal Sites*, which is sent to permittees and submitted to the International Maritime Organization annually (www.ec.gc.ca/iem-das/default.asp?lang=En&n=FC9BCF50-1).

7.3 Control of Movement of Hazardous Waste and Hazardous Recyclable Material and of Prescribed Non-hazardous Waste for Final Disposal

CEPA 1999 enables the making of regulations governing the export and import of hazardous waste, including hazardous recyclable materials. The Act

also enables authorities to make regulations on the export and import of prescribed non-hazardous waste for final disposal. The Act requires exporters of hazardous wastes destined for final disposal to submit export reduction plans, and sets out criteria that may be considered in refusing to issue an export, import or transit permit if the waste or recyclable material will not be managed in a manner that will protect the environment and human health.

Through the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* made under the Act, Canada implements its international obligations as a party to the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal*. In this regard, Canada and other Convention parties have been developing a new strategic framework for 2012–2021 to update the strategic plan of 2002–2010. Parties are also involved in the country-led initiative to develop recommendations for the protection of countries that do not have the capacity to manage hazardous wastes in an environmentally sound manner.

Canada continues to participate in public–private partnerships that have been established to advance the Basel Convention goals and objectives. The Partnership for Action on Computing Equipment, for example, is developing a guidance document on the environmentally sound management of end-of-life electronics.

Canada also participated in the simultaneous Extraordinary Conferences of the Parties (ExCOP) to the Basel, Rotterdam and Stockholm conventions, in February 2010. ExCOP was designed to encourage and improve cooperation and coordination between these Conventions. Key features of this "synergies" process are to ensure maximum coherence, efficiency and effectiveness in the field of chemicals and wastes, and to identify specific administrative and program-level areas for mutual advantage of all three conventions.

During the 2009 calendar year,[1] just over 47 600 individual transboundary shipments of hazardous waste and hazardous recyclable material were reported in movement documents received.

In 2009, the quantity of hazardous waste and hazardous recyclable material imported into Canada was 478 651 t. This represents a decrease of approximately 6% over the total 2008 import quantity, which was 509 501 t. The decrease in the total quantities imported into Canada during 2009 amounted to 30 850 t. Shipments destined for recycling, which reduce reliance on primary resources and benefit Canadian industry, totalled 215 648 t and represented nearly 45% of all imports in 2009, a decrease from 48% in 2008. Used or spent batteries, metal-bearing waste, used or spent liquors from metallurgical processes, used lubricating oils and manufacturing residues made up the majority of imports of hazardous recyclable material into Canada. Hazardous waste imports destined for disposal operations included solid wastes no longer suitable for metal recovery, industrial residues and environmentally hazardous substances.

In 2009, exports of hazardous waste and hazardous recyclable materials amounted to 431 921 t, which represents a decrease of 25 885 t or 5.6% from the 2008 figure. Of this value, the quantity of waste that was exported for recycling in 2009 was 316 172 t, which is a decease from 354 722 t in 2008. Following the trend established over previous years, a quarter of the waste exported in 2009 was destined for disposal, while three quarters was exported for recycling operations.

During 2009, over 4300 notices were processed for proposed imports, exports and transits of hazardous wastes and hazardous recyclable materials. The notices received covered over 22 582 individual waste streams, which exhibited a range of hazardous properties such as being explosive, flammable, acutely toxic, corrosive, dangerously reactive and environmentally hazardous.

The annual statistics for international transboundary movements indicate that, in 2009, nearly 99% of imports and exports, for both hazardous waste and hazardous recyclable materials, occurred between Canada and the United States. No other countries received

[1] To ensure consistency with international reporting mechanisms, export and import quantities set out in section 7.3 of this report represent actual movement values that took place during the 2009 calendar year (from January 1 to December 31, 2009).

shipments of hazardous waste destined for disposal from Canada. Other countries involved in the movement of hazardous recyclable materials in notable quantities include European countries, China and the Republic of Korea.

Imports of hazardous recyclable materials in 2009 were shipped to five provinces. Quebec and Ontario continued to receive the vast majority of all imports into Canada, with smaller quantities imported into British Columbia, Alberta and New Brunswick. The situation was similar for imports of hazardous waste for final disposal, with most destined for Quebec and Ontario, and relatively small quantities imported into Alberta and British Columbia. No imports were received by the territories.

In 2009, exports of hazardous recyclable materials originated from nine provinces, with Ontario and Quebec accounting for 70% of all shipments out of Canada. The bulk of these shipments were sent to authorized facilities located in the northeastern and central United States. The situation was similar for exports of hazardous waste for final disposal, with most originating from Quebec and Ontario, and no materials departing from New Brunswick or Newfoundland and Labrador. For 2009, no exports of hazardous waste, whether destined for disposal or recycling, were shipped from Prince Edward Island or any of the territories.

Tables 11 and 12 list the quantities imported and exported from 2001 to 2009.

Table 11: Hazardous waste and hazardous recyclable material, imports, 2001–2009 (tonnes)

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Recyclables	237 069	193 318	189 110	200 097	174 983	164 903	220 377	247 763	215 648
Total imports	499 758	423 067	417 368	416 136	476 416	408 839	470 136	509 501	478 651

Table 12: Hazardous waste and hazardous recyclable material, exports, 2001–2009 (tonnes)

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Recyclables	237 872	238 597	205 356	187 986	226 380	374 024	352 933	354 722	316 172
Total exports	313 361	340 261	321 294	308 357	327 746	474 538	452 396	457 806	431 921

7.4 Nutrients

On June 11, 2009, the Governor in Council made the *Regulations Amending the Phosphorus Concentration Regulations*. The amendments limit phosphorus in detergents and cleaners to help prevent the proliferation of blue-green algae. The amendments prohibit the manufacture and importation of household laundry and automatic dishwasher detergents and other household cleaning products containing more than 0.5% elemental phosphorus by weight, effective as of July 1, 2010. The existing *Phosphorus Concentration Regulations*, which came into effect in 1989, include a concentration limit of 2.2% for laundry detergents. This limit will remain unchanged for commercial and industrial laundry detergents.

8 Environmental Emergencies (Part 8)

Part 8 of CEPA 1999 addresses the prevention of, preparedness for, response to and recovery from an uncontrolled, unplanned or accidental release of a substance into the environment that poses potential harm to the environment or to human health. Part 8 provides the authority for environmental emergency plans, regulations, guidelines and codes of practice. Part 8 also establishes a regime that makes the person who owns or controls the substance liable for restoring the damaged environment and for the costs and expenses incurred in responding to an environmental emergency.

Under the *Environmental Emergency Regulations* (E2 Regulations), persons who own or manage any of the 174 flammable or toxic substances specified in Schedule 1 of the E2 Regulations at or above certain thresholds must provide required information on the location, substance quantities and container sizes. If the substance quantity equals or exceeds the threshold and is stored in a container with a capacity equal to or exceeding the threshold, an environmental emergency (E2) plan must be prepared, implemented and tested. If only one criterion is met, regulatees are required to submit only a Notice of Identification of Substance and Place.

The environmental emergency plans website includes model E2 plans for propane and ammonia, a common issues section, and online notice filing. The website also provides public access to a database containing basic information about registered facilities (e.g., company names and addresses).

As of March 31, 2010, a total of 3956 facilities had filed Notices Regarding the Identification of Substance and Place under the E2 Regulations. Of these 3956 facilities, 3670 were required to prepare E2 plans. This number represents a 57% increase from the number reported for 2008–2009. Ninety-four of the 174 regulated substances have been reported at least once. The seven most commonly reported substances were propane, anhydrous ammonia, chlorine, gasoline, pentane, butane and hydrochloric acid.

In 2009–2010, regional activities associated with the implementation of the E2 Regulations included hosting substance-specific workshops for the regulated community covering prevention, preparedness and response aspects for propane, liquefied natural gas and ammonia. Other themed workshops addressed E2 plan content and exercise design.

9 Government Operations and Federal and Aboriginal Lands (Part 9)

Part 9 of the Act provides the authority to make regulations, objectives, guidelines and codes of practice that apply to departments, boards and agencies of the Government of Canada; federal works and undertakings; federal land; Aboriginal land; persons on that land and other persons insofar as their activities involve that land; and Crown corporations.

On March 20, 2010, Environment Canada proposed *Wastewater Systems Effluent Regulations* under the *Fisheries Act* in the *Canada Gazette*, Part I, as the federal government's principal instrument to implement the Canada-wide Strategy for the Management of Municipal Wastewater Effluents endorsed by the CCME in February 2009. The proposed regulations include baseline effluent quality standards, compliance timelines, and rules for monitoring and reporting. They would apply to municipal, community and federal wastewater systems, including those on Aboriginal lands across Canada, except, initially, those in far northern regions.

On August 19, 2010, the *Regulations Amending the Federal Halocarbon Regulations, 2003* were published in the *Canada Gazette*, Part II. These regulations consist of amendments that are administrative in nature and do not change the intent or scope of the *Federal Halocarbon Regulations, 2003*.

10 Compliance and Enforcement (Part 10)

CEPA 1999 provides enforcement officers with a wide range of powers to enforce the Act, including the powers of a peace officer. Enforcement officers can carry out inspections to verify compliance with the Act; conduct investigations of suspected violations; enter premises, open containers, examine contents and take samples; conduct tests and measurements; obtain access to information (including data stored on computers); stop and detain conveyances; search, seize and detain items related to the enforcement of the Act; secure inspection warrants to enter and inspect premises that are locked and/or abandoned or where entry has been refused; seek search warrants; and arrest offenders. CEPA analysts can enter premises when accompanied by an enforcement officer and can exercise certain inspection powers.

Enforcement officers can select from a wide range of measures to respond to alleged violations. Many are designed to achieve compliance without resorting to formal court action, including directions, tickets, prohibition orders, recall orders, detention orders for ships, and Environmental Protection Compliance Orders (EPCOs). Measures to compel compliance through court action include injunctions to stop or prevent a violation, prosecutions, and Environmental Protection Alternative Measures (EPAMs).

The *Environmental Enforcement Act*

The recently passed *Environmental Enforcement Act* (EEA) amends nine existing environmental statutes administered by Environment Canada and Parks Canada, including CEPA 1999. It also creates a new Act called the *Environmental Violations Administrative Monetary Penalties Act*.

When the EEA comes into force, it will make a number of changes to Canada's environmental enforcement scheme, including establishing minimum penalties and increasing maximum penalties for environmental offences; providing for different fine amounts for individuals, corporations and vessels; providing sentencing guidance to courts; and creating an administrative monetary-penalty scheme.

10.1 Designations and Training

In 2009–2010, the total number of designated CEPA enforcement officers was 188. An additional 42 emergency officers are designated as CEPA Enforcement Officers with limited powers.

In 2009–2010, Environment Canada completed the redesign of the Basic Enforcement Training program, which produced 37 newly designated officers with full enforcement powers and four emergency officers with limited enforcement powers.

As well, one Limited Powers/Analyst Designation course was delivered, resulting in 17 newly designated CEPA analysts.

Other training accomplishments related to CEPA 1999 regulations in 2009–2010 included:

- the development and delivery of a course to 67 officers on the *PCB Regulations*;
- the development and delivery of an awareness session to 67 officers on the *Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations*;
- the development and delivery of a course to 74 officers on the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*;
- the provision of expertise for the development and delivery of a course on the *Chromium Regulations*; and
- the provision of expertise for updates of existing course material on the *Fuels Regulations*, and delivery of this course.

10.2 Compliance Promotion

Compliance promotion relates to the planned activities that are undertaken to increase the awareness and understanding of the law and its regulations. Through these activities, information is provided on what is required to comply with the law, the benefits of compliance and the consequences of non-compliance.

In 2009–2010, numerous compliance promotion activities were delivered for new and existing control instruments under CEPA 1999. Multiple approaches were used to reach the regulated communities, such as mail-outs and information sessions, and were carried out in collaboration with other federal departments, provinces and territories as well as non-governmental organizations (e.g., the Ontario Petroleum Institute, Hydro-Québec, the Chemistry Industry Association of Canada, and other manufacturers' associations).

10.2.1 Collaboration with First Nations

Environment Canada continued to work closely with First Nations in 2009–2010. Workshops and presentations were delivered on obligations to comply with regulations under CEPA 1999.

To support efforts to improve storage tank management by First Nations, several workshops about the requirements under the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* were delivered. Additionally, compliance promotion materials, newspaper articles and the *Best Management Practices for Small (<2500 L) Tank Systems* CD were delivered to First Nations communities, and activities directed toward storage tank owners promoted the identification of storage tank systems in the Environment Canada FIRSTS database. As a result, reporting rates have improved with the implementation of these initiatives.

Environment Canada coordinated and hosted a Fuel Handling and Contaminated Sites Workshop in Happy Valley – Goose Bay (Labrador) in March 2010. Funding for this session was provided by Indian and Northern Affairs Canada and administered by Environment Canada through a Memorandum of Understanding. Twenty-two participants from Nunatsiavut, the Innu Nation, Sheshatshiu, Natuashish, Miawpukek, Goose Bay, and the Atlantic Policy Congress of First Nations Chiefs, as well as 13 employees of the provincial and federal governments, attended the workshop. Several topics, including fuel storage and handling, contaminated sites, health effects, spills, emergency management and enforcement, were covered over the two-and-a-half-day session. A summary of the workshop along with copies of all the presentations will be distributed in a package that will provide a preliminary guide for operators and managers in the Aboriginal Communities across Newfoundland and Labrador.

10.2.2 Multi-instrument Compliance Promotion

Environment Canada organizes a number of multi-instrument workshops and information booths each year to reach regulatees who must comply with more than one regulation.

For 2009–2010, multi-instrument compliance promotion activities covered a broad range of environmental regulations under CEPA 1999, the *Fisheries Act*, the *Environmental Enforcement Act* and the *Canadian Environmental Assessment Act*. In total, eight multi-instrument workshops and information booths were organized by Environment Canada's regional offices in various locations across Canada. The workshops covered a number of regulations, such as the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations, Polychlorinated Biphenyl (PCB) Regulations, Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations, Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations, and New Substances Notification Regulations*. The workshops also provided information on more general topics like the Chemicals Management Plan.

Environment Canada delivered its first multi-instrument compliance promotion webinar in 2009–2010. The webinar was broadcast to approximately 90 participants throughout Quebec and was considered highly successful, having received a 95% satisfaction rate from participants.

These multi-instrument compliance promotion activities provide a unique opportunity for regulatees to meet Environment Canada staff and gather key information regarding Acts and Regulations affecting their activities. Regulatees also benefit from the knowledge and experience of the on-site staff, the distribution of printed materials on the legislation, and the provision of resources for further inquiries. For example, the Quebec Region reported a 90% satisfaction rate with their multi-instrument compliance promotion activities.

10.2.3 Activities on Individual CEPA Instruments

Compliance promotion activities on individual CEPA 1999 control instruments in 2009–2010 included the following:

- *PCB Regulations* – Several mailings were carried out to inform regulatees about the PCB On-Line Reporting System. Environment Canada also promoted the *PCB Regulations* at trade shows and at a compliance promotion workshop. Three mail-outs were sent to regulatees to inform them of the amendments to the *PCB Regulations*, the extensions to end-of-use deadlines, and the public consultation on the regulatory framework for the transboundary movement of hazardous waste and hazardous recyclable material, including PCBs.
- *Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations* – Compliance promotion included several outreach methods to identify and contact potential regulatees on these new regulations. This included mail-outs, contacts by phone and email, and information sessions in Toronto, Edmonton, Québec, Kitchener, Calgary, Winnipeg, Halifax, Montréal and Moncton.
- *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* – Environment Canada promoted compliance at the annual Canadian Waste and Recycling Expo in Vancouver and gave a presentation at the associated technical seminar. The Department also delivered a mail-out on the regulations and developed a poster illustrating the requirements for the movement of hazardous wastes.
- *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations* – A mailing containing annual reporting forms and information was sent in February 2010 to regulatees in each region. Under the Regulations, regulatees are required to provide an annual report to Environment Canada. Reminder postcards were also sent to approximately 1500 dry cleaners countrywide. Environment Canada presented the Regulations at the Atlantic Fabricare Association annual meeting in Halifax, Nova Scotia, and participated in a Fabricare Canada booth at the Clean 2009 trade show in New Orleans in order to reach potential foreign exporters to Canada.
- *New Substances Notification Regulations (NSNR)* – At several conferences and expositions, Environment Canada staff distributed information kits to participants. The NSNR were highlighted at the Environment Canada booth of the Canadian Offshore Resources Exhibition, a key event to reach the offshore oil and gas industry in the Atlantic region. Additionally, Environment Canada developed and launched the New Substances Online Training website in November 2009. This website (www.on.ec.gc.ca/nsnr/english/login_en.cfm) provides an overview of the notification process, the notification requirements and the post-notification requirements of the notifier, and the responsibilities of the Government.
- *Environmental Emergency Regulations* – Environment Canada worked with industry, municipalities, other governments and firefighting services to provide information on the Regulations and to enhance the quality of environmental emergency plans. Environment Canada continued to conduct compliance-promotion site visits to regulatees. These visits provided an opportunity to promote compliance with the Regulations and for Environment Canada to

assess the level of quality of environmental emergency plans. These plans will be reviewed to gain information that can be used to determine the future direction of the Regulations.

- Fuels regulations – Compliance promotion activities included the distribution of information packages, including reporting forms, to Canadian fuel producers as well as importers and/or blenders of fuels. The packages included information on the following regulations under CEPA 1999:
    - *Fuels Information Regulations, No. 1*;
    - *Benzene in Gasoline Regulations*;
    - *Gasoline Regulations*;
    - *Sulphur in Diesel Fuel Regulations*;
    - *Sulphur in Gasoline Regulations*;
    - *Gasoline and Gasoline Blend Dispensing Flow Rate Regulations*; and
    - *Contaminated Fuel Regulations*.

Site visits were also conducted.

- *Volatile Organic Compound (VOC) Concentration Limits for Automotive Refinishing Products Regulations* – Information sessions, coordinated with Nova Scotia Occupational Health and Safety, were held for industry stakeholders in that province.
- *Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations* – In partnership with L'Association montréalaise des techniciens du revêtement, Environment Canada participated in the Congrès annuel du Conseil des aéroports du Québec to inform stakeholders about these regulations.
- *Federal Halocarbon Regulations, 2003* – Environment Canada conducted six information sessions and nationally distributed an updated fact sheet on the phase-out and disposal of halons in fire-extinguishing systems. In addition, approximately 1200 invitations were sent to regulatees to participate in information sessions held in Winnipeg.
- Vehicle and Engine Regulations – Regulatee lists were updated for the *Off-Road Compression-Ignition Engine Emission Regulations* and the *Off-Road Small Spark-Ignition Engine Emission Regulations*. The development of a regulatee list was initiated for the proposed *Marine Spark and Off-Road Recreational Vehicle Emission Regulations*.
- *Gasoline and Gasoline Blend Dispensing Flow Rate Regulations* – Presentations were delivered to l'Association québecoise des indépendants du pétrole at their annual congress in May 2009. Environment Canada sent fact sheets on the Regulations to 10 000 potential regulatees.
- *Notice requiring the preparation and implementation of pollution prevention plans in respect of effluents from textile mills that use wet processing and nonylphenol and its ethoxylates* – Five teleconferences were organized by Environment Canada with the operators of textile mills. Fact sheets were distributed to textile mills throughout Canada.

10.3 Enforcement Priorities

Each year, a National Enforcement Plan is developed that describes the inspection activities to be carried out that fiscal year for CEPA 1999. To maximize the effectiveness of these activities, priority is given to specific regulations.

Factors that influence the identification of the priority regulations include the risk to the environment and human health represented by the regulated substance or activity, compliance issues, new and amended regulations, the nature of regulatory provisions, operational complexity and capacity, and domestic and international commitments and obligations. In 2009–2010, the National Enforcement Plan identified the following instruments as national priorities:

- *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*;
- *Federal Halocarbon Regulations, 2003*;
- *Off-Road Compression-Ignition Engine Emission Regulations*;

- *Off-Road Small Spark-Ignition Engine Emission Regulations*;
- *On-Road Vehicle and Engine Emission Regulations*; and
- *Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations*.

The number of inspections carried out under the enforcement plan is supplemented by a large number of inspections resulting from responses to spills, complaints, intelligence, or other information. In addition, a number of regulations are identified as regional inspection priorities.

The priority placed on regulations in each region is influenced by a number of factors, including geography, demographic factors, and provincial and territorial environmental sensitivities.

10.4 Enforcement Activities

10.4.1 Enforcement Statistics

Table 13 summarizes the inspections, investigations and enforcement measures undertaken in 2009–2010.

Table 13: Summary of inspections, investigations and enforcement measures from April 2009 to March 2010

CEPA Tool	Inspections			Investigations	Enforcement Measures										
	Total	On-site	Off-site		Tickets	Written Directions	Written Warnings	Injunctions	Ministerial Orders	EPOCs	EPAMs	Prosecutions	Charges	Counts	Convictions
Regulations															
Asbestos Mines and Mills Release															
Benzene in Gasoline	294	252	42												
Chlor-Alkali Mercury Release	1	1													
Chlorobiphenyls (inactive)	3	1	2												
Chromium Electroplating, Chromium Anodizing and Reverse Etching	42	19	23				17								
Disposal at Sea	79	51	28	2			27					2	2	2	3
Environmental Emergency	66	24	42				39			2					
Export and Import of Hazardous Waste and Hazardous Recyclable Material	753	127	626	5			400					9	9	9	4
Export and Import of Hazardous Waste (inactive)	7	5	2												
Export of Substances Under the Rotterdam Convention	1		1												
Federal Halocarbon, 2003	667	341	326	4			519			1					
Federal Halocarbon (inactive)	183	157	26	1			22								
Federal Mobile PCB Treatment and Destruction															
Federal Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands or Aboriginal Lands (inactive)	1		1												

Table 13 (Continued)

CEPA Tool	Inspections			Investigations	Enforcement Measures										
	Total	On-site	Off-site		Tickets	Written Directions	Written Warnings	Injunctions	Ministerial Orders	EPOCs	EPAMs	Prosecutions	Charges	Counts	Convictions
Fuels Information, No. 1	221	214	7				5								
Gasoline and Gasoline Blend Dispensing Flow Rate	146	1	145				16								
Gasoline	38	31	7				3								
Interprovincial Movement of Hazardous Waste	37	17	20	2			2								
New Substances Notification – Biotechnology Products (inactive)	3		3												
New Substances Notification (inactive)	2		2	1											
New Substances Notification (Chemicals and Polymers)	35	11	24	1			13								
New Substances Notification Regulations (Organisms)	17	7	10	1											
Off-Road Compression-Ignition Engine Emission	8	1	7	1			10								
Off-Road Small Spark-Ignition Engine Emission	46	5	41	2		10	14			1		2	2	2	
On-Road Vehicle and Engine Emission	11	2	9	1											
Ozone-Depleting Substances, 1998	53	24	29	2											
PCB	167	98	69	2			8								
PCB Waste Export, 1996	1		1												
Perfluorooctane Sulfonate and its Salts and Certain Other Compounds	1		1												
Phosphorus Concentration	1		1												
Pulp and Paper Mill Defoamer and Wood Chip	54	49	5												
Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans	85	82	3												
Regulations Respecting Applications for Permits for Disposal at Sea															
Secondary Lead Smelter Release	5	2	3		1										
Solvent Degreasing	44	11	33	1			14					1	1	1	1
Storage of PCB Material (inactive)	21	17	4												
Storage Tank Systems for Petroleum Products and Allied Petroleum Products	35	10	25				8								

Table 13 (Concluded)

CEPA Tool	Inspections			Investigations	Enforcement Measures										
	Total	On-site	Off-site		Tickets	Written Directions	Written Warnings	Injunctions	Ministerial Orders	EPOCs	EPAMs	Prosecutions	Charges	Counts	Convictions
Sulphur in Diesel Fuel	336	290	46				12			4					
Sulphur in Gasoline	107	63	44												
Tetrachloro-ethylene (Use in Dry Cleaning and Reporting Requirements)	1216	813	403	15			474			47		7	8	8	3
Vinyl Chloride Release, 1992	5	4	1												
Other tools*															
CEPA 1999	339			12			31			1		4	4	4	
CEPA section 46 notices – greenhouse gases															
CEPA section 56 notices – P2 plans	14						6								
CEPA section 71 notices – toxics	7						1								
Glycol Guidelines (inactive)	1		1												
National Pollutant Release Inventory	127	73	54				166								
Total	**5280**	**2914**	**2366**	**44**	**1**	**10**	**1810**			**56**		**25**	**26**	**26**	**11**

Explanatory Notes:

* Includes activities related to enforceable provisions of CEPA 1999.

Tickets, written warnings, written directions, injunctions, ministerial orders and Environmental Protection Compliance Orders (EPCOs) are tabulated at the section level of a regulation. For example, if the outcome of an inspection is the issuance of a written warning that relates to three sections of a given regulation, the number of written warnings is three.

Inspections – The number of regulatees who were inspected for compliance where inspections were completed during the fiscal year.

Investigations – The total number of investigations is the number of investigation files started in the fiscal year. An investigation file may include activities relating to another law or to more than one regulation. Therefore, the total number of investigations shown does not add up to the total number of investigations by regulation.

EPAMs – The number of regulatees who signed Environmental Protection Alternative Measures, regardless of the number of regulations involved.

Prosecutions – The number of regulatees who were prosecuted, regardless of the number of regulations involved.

Charges – The number of charges (excluding tickets) is tabulated at the section level of the regulation by charge date, by regulatee.

Counts – The number of counts is tabulated at the section level of the regulation, by offence date relating to the regulatee's charge.

Convictions – The number of convictions is represented by the number of counts for which the regulatee was found guilty or pleaded guilty.

Additional Statistics:

There were 22 referrals to other federal, provincial or municipal governments or departments.

Of the 44 investigations started in 2009–2010, 13 ended in 2009–2010 and 31 are ongoing. In addition, of 68 investigations started before 2008–2009, 42 were completed in 2008–2009 and 26 are ongoing.

10.4.2 Environmental Protection Compliance Orders

EPCOs are an enforcement measure to secure an alleged violator's return to compliance, without the use of the court system.

In 2009–2010, 56 EPCOs were issued, 47 to dry cleaners for alleged violations of the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations* and nine for alleged violations of various other regulations.

10.4.3 Environmental Protection Alternative Measures

EPAMs agreements are an enforcement tool that allow for a negotiated return to compliance without a court trial. If an EPAM agreement is successfully negotiated, it is filed with the court and is a public document. The agreement must also appear in the CEPA Environmental Registry.

Further information on EPAMs is available at www.ec.gc.ca/CEPARegistry/enforcement/EPAMs.cfm.

In 2009–2010, as part of an EPAM agreement, Public Works and Government Services Canada (PWGSC) agreed to contribute $50,000 to the Environmental Damages Fund (EDF) and to meet several compliance measures in order to address seven CEPA 1999 violations. The violations leading to the EPAM were noted on March 8, 2007, following an Environment Canada investigation of air conditioning units in a Government of Canada building at 266 Graham Avenue in Winnipeg, Manitoba. Once the court is satisfied that PWGSC has complied with the terms of the EPAM agreement, all charges will be dismissed.

10.4.4 Prosecutions and Court Cases

Key prosecutions and court cases in 2009–2010 included the following:

- On June 4, 2009, the owner of a Nova Scotia company pleaded guilty to violating the *Disposal at Sea Regulations* and was fined $2,000.
- On July 28, 2009, the owner and operator of a company from Saskatchewan pleaded guilty to charges relating to five violations of the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations*. He was ordered to pay $1,900 in fines and contribute $5,000 to the EDF.
- On July 15, 2009, the Crown and an Alberta company agreed to a joint submission, where the company pleaded guilty to one count in relation to the contravention of a provision of the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations*. The company was ordered to pay $200 in fines and contribute $2,300 to the EDF.
- On October 15, 2009, an Ontario man pleaded guilty to one charge of providing a person with false or misleading information under CEPA 1999. The accused was fined $20,000, with the fine directed to the EDF, and he was placed on a one-year probation. In addition, he was sentenced to 100 hours of community service, to be performed within 10 months.
- On October 20, 2009, a company from British Columbia was ordered to pay a $1,000 fine and make a $14,000 contribution to the EDF after pleading guilty to committing an offence under paragraph 272(1)(*a*) of CEPA 1999 for using more solvent than what is allowed under the company's Environment Canada permit.
- On October 21, 2009, a company from Nova Scotia pleaded guilty to violating one section of the Vehicle, Engine and Equipment Emissions Provisions of CEPA 1999. The court-ordered penalty was $3,500, and the company was also ordered to forfeit the non-compliant engines to Environment Canada for destruction at the company's expense.
- On December 21, 2009, an Alberta company pleaded guilty to one count in relation to a contravention of a provision of the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations*. The company was fined $5,000, of which $4,500 was directed to the EDF.

- On January 12, 2010, an Alberta company pleaded guilty to one count in relation to a contravention of a provision of the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations*, and received a $5,000 fine. The fine was directed to the EDF.
- On February 25, 2010, an Ontario company pleaded guilty to one count in relation to the export of hazardous waste or hazardous recyclable material without a permit. The $15,000 fine was directed to the EDF.

10.5 Domestic and International Actions

Enforcement-related activities are carried out under various international and domestic agreements and organizations. Under the auspices of the Commission for Environmental Cooperation's Enforcement Working Group, Canada participates in several enforcement-focused projects with the United States and Mexico. For example, the three countries cooperate under the Non-Compliant Imports Entering North America project, which identifies non-compliant engines subject to on-road vehicle and engine emission regulations in member countries. In addition, the Enforcement Working Group has developed an online hazardous waste training course for use by customs and border inspectors in Canada, Mexico and the United States.

Environment Canada also participates in Interpol's working group aimed at combating illegal traffic of electronic waste to developing nations. In 2009–2010, the Department's Enforcement Branch took part in an international joint operation addressing the illegal transit of hazardous waste between Canada and the United States in southern Ontario.

Appendix A: Contacts

Further information on CEPA 1999 and related activities can be found online at:

- CEPA Environmental Registry website (www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=D44ED61E-1)
- Environment Canada's website (www.ec.gc.ca)
- Health Canada's website (www.hc-sc.gc.ca)
- Environment Canada publications are available from the departmental library or the nearest regional library. Many departmental publications are also available online at www.ec.gc.ca/publications or through Environment Canada's Inquiry Centre:

Inquiry Centre
Environment Canada
351 St. Joseph Boulevard
Place Vincent Massey, 8th Floor
Gatineau QC K1A 0H3

Telephone: 819-997-2800 or 1-800-668-6767
Fax: 819-994-1412
TTY: 819-994-0736 (teletype for the hearing-impaired)
Email: enviroinfo@ec.gc.ca

The following media relations contacts are also available to provide information:

Environment Canada
Media Relations
Toll-free within Canada: 1-888-908-8008
Outside Canada: 1-819-934-8008
Email: media@ec.gc.ca

Health Canada
Media Relations
Telephone: 613-957-2983
Fax: 613-952-7747
Email: info@hc-sc.gc.ca
Address Locator 0900C2
Ottawa ON K1A 0K9

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Email: info.gazette@pwgsc-tpsgc.gc.ca
Telephone: 613-996-1268
Toll-free: 1-866-429-3885
TTY: 1-800-926-9105
Fax: 613-991-3540

Appendix B: Draft and Final Assessment Decisions of Chemicals Management Plan Challenge Substances

Table 14: Assessment decisions of batches 4 through 9 under the Chemicals Management Plan Challenge from April 2009 to March 2010

(NFA: no further action; SNAc: Significant New Activity Notice; VE: virtual elimination)

Substance	Meets Criteria of s. 64	Proposed Measure	Draft Notice*	Final Notice*
Batch 4				
2-Butanone, 4-[[[1,2,3,4,4a,9,10,10a-octahydro-1,4a-dimethyl-7-(1-methylethyl)-1-phenanthrenyl]methyl](3-oxo-3-phenylpropyl)amino]-, [1*R*-(1α,4aβ,10aα)]-	No	SNAc/NFA	24 Jan. 09	01 Aug. 09
5*H*Dibenz[b,f]azepine-5-propanamine, 3-chloro-10,11-dihydro-*N*,*N*dimethyl-,monohydrochloride	No	NFA	24 Jan. 09	01 Aug. 09
Adenosine, *N*-benzoyl-5'-*O*-[bis(4-methoxyphenyl) phenylmethyl]-2'-deoxy-	No	SNAc/NFA	24 Jan. 09	01 Aug. 09
Amines, C18-22-*tert*-alkyl, ethoxylated (ATAE)	No	SNAc/NFA	24 Jan. 09	01 Aug. 09
Amines, tallow alkyl, ethoxylated, phosphates (ATAEP)	No	NFA	24 Jan. 09	01 Aug. 09
Amines, C18-22-tert-alkyl, (chloromethyl)phosphonates (2:1)	No	NFA	24 Jan. 09	01 Aug. 09
Benzamide, 3,5-dichloro-*N*-(3,4-dichlorophenyl)-2-hydroxy-(3,3',4',5-tetrachlorosalicylanilide)	No	SNAc/NFA	24 Jan. 09	01 Aug. 09
Benzenamine, *N*-phenyl-, reaction products with styrene and 2,4,4-trimethylpentene	Yes (64(*a*))	Add to Schedule 1 and VE	24 Jan. 09	01 Aug. 09
Benzoic acid, 2-[(3,5-dibromo-4-hydroxyphenyl)(3,5-dibromo-4-oxo-2,5-cyclohexadien-1-ylidene)methyl]-, ethyl ester	No	SNAc/NFA	24 Jan. 09	01 Aug. 09
Butane	n/a	Screening assessment deferred	24 Jan. 09	01 Aug. 09
Hexane	No	NFA	24 Jan. 09	01 Aug. 09
Isobutane	n/a	Screening assessment deferred	24 Jan. 09	01 Aug. 09
Phenol, 4,4'- (3*H*-2,1-benzoxathiol-3-ylidene)bis[2-bromo-6-methyl-, S,S-dioxide	No	NFA	24 Jan. 09	01 Aug. 09
Phenol, 4,4'- (3*H*-2,1-benzoxathiol-3-ylidene)bis[2,5-dimethyl-, S,S-dioxide	No	NFA	24 Jan. 09	01 Aug. 09
Phenol, 4,4'- (3*H*-1,2-benzoxathiol-3-ylidene)bis[2,6-dibromo-3-methyl-, S,S-dioxide, monosodium salt	No	NFA	24 Jan. 09	01 Aug. 09
Phenol, 4,4'- (3*H*-2,1-benzoxathiol-3-ylidene)bis[2,6-dibromo-, S,S-dioxide	No	NFA	24 Jan. 09	01 Aug. 09
Sulfuric acid, diethyl ester	Yes (64(*c*))	Add to Schedule 1	24 Jan. 09	01 Aug. 09

Table 14 (Continued)

Substance	Meets Criteria of s. 64	Proposed Measure	Draft Notice*	Final Notice*
Sulfuric acid, dimethyl ester	Yes (64(*c*))	Add to Schedule 1	24 Jan. 09	01 Aug. 09
Batch 5				
2-Propenamide	Yes (64(*c*))	Add to Schedule 1	21 Feb. 09	22 Aug. 09
Acetamide, 2-chloro-	No	SNAc/NFA	21 Feb. 09	22 Aug. 09
Acetamide, *N*,*N*-dimethyl-	No	NFA	21 Feb. 09	22 Aug. 09
Acetamide, *N*-[2-[(2-bromo-4,6-dinitrophenyl)azo]-5-(diethylamino)phenyl]-	No	NFA	21 Feb. 09	22 Aug. 09
Acetamide, *N*-[5-[[2-(acetyloxy)ethyl](phenylmethyl)amino]-2-[(2,4-dinitrophenyl)azo]-4-methoxyphenyl]-	No	NFA	21 Feb. 09	22 Aug. 09
Acetamide, *N*-[5-[[2-(acetyloxy)ethyl](phenylmethyl)amino]-2-[(2-chloro-4,6-dinitrophenyl)azo]-4-methoxyphenyl]-	No	NFA	21 Feb. 09	22 Aug. 09
Acetamide, *N*-[5-[bis[2-(acetyloxy)ethyl]amino]-2-[(2-bromo-4,6-dinitrophenyl)azo]-4-ethoxyphenyl]-	No	NFA	21 Feb. 09	22 Aug. 09
Benzamide, *N*-[5-[bis[2-(acetyloxy)ethyl]amino]-2-[(4-nitrophenyl)azo]phenyl]-	No	NFA	21 Feb. 09	22 Aug. 09
Benzenamine, 4-[(2,6-dichloro-4-nitrophenyl)azo]-*N*-(4-nitrophenyl)-	No	NFA	21 Feb. 09	22 Aug. 09
Ethanol, 2,2'-[[3-chloro-4-[(2,6-dichloro-4-nitrophenyl)azo]phenyl]imino]bis-	No	NFA	21 Feb. 09	22 Aug. 09
Ethanol, 2,2'-[[4-[(2,6-dibromo-4-nitrophenyl)azo]phenyl]imino]bis-, diacetate (ester)	No	NFA	21 Feb. 09	22 Aug. 09
Ethanol, 2,2'-[[4-[(2-bromo-6-chloro-4-nitrophenyl)azo]-3-chlorophenyl]imino]bis-	No	NFA	21 Feb. 09	22 Aug. 09
Ethanol, 2-[[4-[(2,6-dichloro-4-nitrophenyl)azo]phenyl]methylamino]-	No	SNAc/NFA	21 Feb. 09	22 Aug. 09
Ethanol, 2-chloro-, phosphate (3:1)	Yes (64(*c*))	Add to Schedule 1	21 Feb. 09	22 Aug. 09
Formamide	No	NFA	21 Feb. 09	22 Aug. 09
Phosphoric acid tributyl ester	No	NFA	21 Feb. 09	22 Aug. 09
Propanamide, *N*-[5-[bis[2-(acetyloxy)ethyl]amino]-2-[(2-chloro-4-nitrophenyl)azo]phenyl]-	No	NFA	21 Feb. 09	22 Aug. 09
Propanenitrile, 3-[[2-(acetyloxy)ethyl][4-[(2,6-dichloro-4-nitrophenyl)azo]phenyl]amino]-	No	NFA	21 Feb. 09	22 Aug. 09
Propanenitrile, 3-[[4-[(2,6-dibromo-4-nitrophenyl)azo]phenyl]ethylamino]-	No	NFA	21 Feb. 09	22 Aug. 09
Batch 6				
Methane, chloro-	No	NFA	30 May 09	28 Nov. 09
2-Naphthalenol, 1-[[4-(phenylazo)phenyl]azo]-	No	NFA	30 May 09	TBD
Benzene, (chloromethyl)-	Yes (64(*c*))	Add to Schedule 1	30 May 09	28 Nov. 09
1-Propene, 3-chloro-	No	NFA/SNAc	30 May 09	28 Nov. 09
1,2-Benzenedicarboxylic acid, bis(2-methoxyethyl) ester	No	NFA/SNAc	30 May 09	28 Nov. 09

Table 14 (Continued)

Substance	Meets Criteria of s. 64	Proposed Measure	Draft Notice*	Final Notice*
2-Naphthalenol, 1-[(2-methoxyphenyl)azo]-	No	NFA/SNAc	30 May 09	28 Nov. 09
2,7-Naphthalenedisulfonic acid, 4-amino-3-[[4'-[(2,4-diaminophenyl)azo][1,1'-biphenyl]-4-yl]azo]-5-hydroxy-6-(phenylazo)-, disodium salt	No	NFA/SNAc	30 May 09	28 Nov. 09
2-Naphthalenol, 1-[(2,4-dimethylphenyl)azo]-	No	NFA/SNAc	30 May 09	28 Nov. 09
Phenol, 4-[[4-(phenylazo)phenyl]azo]-	No	NFA/SNAc	30 May 09	28 Nov. 09
Phenol, 4-[[4-(phenylazo)-1-naphthalenyl]azo]-	No	NFA/SNAc	30 May 09	28 Nov. 09
Phenol, 2-methyl-4-[[4-(phenylazo)phenyl]azo]-	No	NFA/SNAc	30 May 09	28 Nov. 09
2,7-Naphthalenedisulfonic acid, 3-[[2,2'-dimethyl-4'-[[4-[[(4-methylphenyl)sulfonyl]oxy]phenyl]azo][1,1'-biphenyl]-4-yl]azo]-4-hydroxy-, disodium salt	No	NFA	30 May 09	TBD
1-Naphthalenol, 4-[(4-ethoxyphenyl)azo]-	No	NFA/SNAc	30 May 09	28 Nov. 09
Butanamide, 2,2'-[(3,3'-dimethoxy[1,1'-biphenyl]-4,4'-diyl) bis(azo)]bis[*N*-(2-methylphenyl)-3-oxo-	No	NFA	30 May 09	TBD
Phenol, 4-[[2-methoxy-4-[(4-nitrophenyl)azo]phenyl]azo]-	No	NFA	30 May 09	TBD
Phenol, 4,4'-[1,4-phenylenebis(azo)]bis-	No	NFA/SNAc	30 May 09	28 Nov. 09
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters	No	NFA	30 May 09	28 Nov. 09
Phenol, 4-[[2-methoxy-4-[(2-methoxyphenyl)azo]-5-methylphenyl]azo]-	No	NFA/SNAc	30 May 09	28 Nov. 09
Batch 7				
2-Cyclohexen-1-one, 3,5,5-trimethyl-	No	NFA	05 Sept. 09	06 Mar. 10
Methanone, bis[4-(dimethylamino)phenyl]-	Yes (64(*c*))	Add to Schedule 1	05 Sept. 09	06 Mar. 10
2-Butanone, oxime	Yes (64(*c*))	Add to Schedule 1	05 Sept. 09	06 Mar. 10
1,4-Dioxane	No	NFA	05 Sept. 09	06 Mar. 10
1-Naphthalenemethanol, α,α-bis[4-(diethylamino)phenyl]-4-(ethylamino)-	No	NFA/SNAc	05 Sept. 09	06 Mar. 10
Oxirane, (butoxymethyl)-	Yes (64(*c*))	Add to Schedule 1	05 Sept. 09	06 Mar. 10
3H-Pyrazol-3-one, 4-[(2-chlorophenyl)azo]-2,4-dihydro-5-methyl-2-phenyl-	No	NFA/SNAc	05 Sept. 09	06 Mar. 10
3H-Pyrazol-3-one, 4-[(2,4-dimethylphenyl)azo]-2,4-dihydro-5-methyl-2-phenyl-	No	NFA/SNAc	05 Sept. 09	06 Mar. 10
1-Naphthalenemethanol, α,α-bis[4-(dimethylamino)phenyl]-4-(phenylamino)-	No	NFA/SNAc	05 Sept. 09	06 Mar. 10
Propanenitrile, 3-[ethyl[3-methyl-4-[(6-nitro-2-benzothiazolyl) azo]phenyl]amino]-	No	NFA/SNAc	05 Sept. 09	06 Mar. 10
Propanenitrile, 3-[[4-[(5,6-dichloro-2-benzothiazolyl)azo]phenyl] ethylamino]-	No	NFA/SNAc	05 Sept. 09	06 Mar. 10
[1,1'-Biphenyl]-4,4'-diamine, *N,N'*-bis(2,4-dinitrophenyl)-3,3'-dimethoxy-	No	NFA/SNAc	05 Sept. 09	06 Mar. 10

Table 14 (Continued)

Substance	Meets Criteria of s. 64	Proposed Measure	Draft Notice*	Final Notice*
Methanesulfonamide, *N*-[2-[(2,6-dicyano-4-methylphenyl)azo]-5-(dipropylamino)phenyl]-	No	NFA/SNAc	05 Sept. 09	06 Mar. 10
Benzoic acid, 2,3,4,5-tetrachloro-6-cyano-, methyl ester, reaction products with 4-[(4-aminophenyl)azo]-3-methylbenzenamine and sodium methoxide	No	NFA/SNAc	05 Sept. 09	06 Mar. 10
Batch 8				
Methane, nitro-	No	NFA	30 Jan. 10	
Propane, 2-nitro-	Yes (64(*c*))	Add to Schedule 1	30 Jan. 10	
Benzene, 1-methyl-2-nitro-	Yes (64(*c*))	Add to Schedule 1	30 Jan. 10	
Glycine, *N*,N-bis(carboxymethyl)-	No	NFA	30 Jan. 10	
Benzene, 1,3,5-tribromo-	No	NFA/SNAc	30 Jan. 10	
Benzene, 1,2,3,4-tetrachloro-5,6-dimethoxy-	No	NFA/SNAc	30 Jan. 10	
Zinc, bis[*O*,*O*-bis(1,3-dimethylbutyl) phosphorodithioato-*S*,*S*']-, (T-4)-	No	NFA	30 Jan. 10	
Phenol, 2,6-bis(1,1-dimethylethyl)-4-(1-methylpropyl)-	Yes (64(*a*))	Add to Schedule 1	30 Jan. 10	
Phenol, (1,1-dimethylethyl)-4-methoxy-	No	NFA	30 Jan. 10	
Phosphonic acid, [[3,5-bis(1,1-dimethylethyl)-4-hydroxyphenyl] methyl]-, monoethyl ester, calcium salt (2:1)	No	NFA/SNAc	30 Jan. 10	
Fatty acids, C6-19-branched, zinc salts	No	NFA/SNAc	30 Jan. 10	
Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, (1,2-dioxo-1,2-ethanediyl)bis(imino-2,1-ethanediyl) ester	No	NFA	30 Jan. 10	
Methylium, [4-(dimethylamino)phenyl]bis[4-(ethylamino)-3-methylphenyl]-, acetate	Yes (64(*a*))	Add to Schedule 1	30 Jan. 10	
Phosphonium, triphenyl(phenylmethyl)-, salt with 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[phenol] (1:1)	No	NFA	30 Jan. 10	
Batch 9				
2-Pyrrolidinone, 1-ethenyl-	No	NFA	20 Mar. 10	
Benzene, 1,2-dimethoxy-4-(2-propenyl)-	Yes (64(*c*))	Add to Schedule 1	20 Mar. 10	
Benzo[h]benz[5,6]acridino[2,1,9,8-klmna]acridine-8,16-dione	No	NFA/SNAc	20 Mar. 10	
Spiro[isobenzofuran-1(3*H*),9'-[9*H*]xanthen]-3-one, 3',6'-bis(diethylamino)-	No	NFA	20 Mar. 10	
Antimony oxide (Sb2O3)	No	NFA	20 Mar. 10	
Vanadium oxide (V2O5)	Yes (64(*c*))	Add to Schedule 1	20 Mar. 10	
Spiro[isobenzofuran-1(3*H*),9'-[9*H*]xanthen]-3-one, 2',4',5',7'-tetrabromo-3',6'-dihydroxy-, lead salt	No	NFA/SNAc	20 Mar. 10	
Benzoic acid, 2,3,4,5-tetrachloro-6-(2,4,5,7-tetrabromo-6-hydroxy-3-oxo-3*H*-xanthen-9-yl)-	No	NFA	20 Mar. 10	
Benzo[b]thiophen-3(2*H*)-one, 6-chloro-2-(6-chloro-4-methyl-3-oxobenzo[b]thien-2(3*H*)-ylidene)-4-methyl-	No	NFA	20 Mar. 10	

Table 14 (Concluded)

Substance	Meets Criteria of s. 64	Proposed Measure	Draft Notice*	Final Notice*
Oxirane, 2,2',2",2"'-[1,2-ethanediylidenetetrakis(4,1-phenyleneoxymethylene)]tetrakis-	Yes (64(*c*))	Add to Schedule 1	20 Mar. 10	
Bromic acid, potassium salt	Yes (64(*c*))	Add to Schedule 1	20 Mar. 10	
Benzo[b]thiophen-3(2H)-one, 4,7-dichloro-2-(4,7-dichloro-3-oxobenzo[b]thien-2(3H)-ylidene)-	No	NFA/SNAc	20 Mar. 10	
Nickel, bis[1-[4-(dimethylamino)phenyl]-2-phenyl-1,2-ethenedithiolato(2-)-*S*,*S*']-	No	NFA/SNAc	20 Mar. 10	
Decanedioic acid, bis(1,2,2,6,6-pentamethyl-4-piperidinyl) ester	No	NFA	20 Mar. 10	
Benzoic acid, 4-[1-[[(2,4-dichlorophenyl)amino]carbonyl]-3,3-dimethyl-2-oxobutoxy]-	No	NFA/SNAc	20 Mar. 10	
7-Oxa-3,20-diazadispiro[5.1.11.2]heneicosan-21-one, 2,2,4,4-tetramethyl-	No	NFA	20 Mar. 10	
2-Naphthalenesulfonic acid, 7-[[4,6-bis[[3-(diethylamino)propyl]amino]-1,3,5-triazin-2-yl]amino]-4-hydroxy-3-[[4-(phenylazo)phenyl]azo]-, monoacetate (salt)	Yes (64(*c*))	Add to Schedule 1	20 Mar. 10	

* The dates are those on which the draft and final notices were published in the *Canada Gazette*, Part I.

www.ec.gc.ca

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