Environment Canada Environnement Canada

Canadian Environmental Protection Act, 1999

Annual Report

for April 2010 to March 2011

Canada

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Introduction

This Annual Report provides an overview of the results achieved under the *Canadian Environmental Protection Act, 1999* (CEPA 1999) from April 1, 2010, to March 31, 2011. The publication of this report responds to the statutory requirement to provide annual reports to Parliament on the administration and enforcement of the Act.

The chapters in this report are organized based on 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 during the reporting period.

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 underway 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 Chemicals Management Plan

The Chemicals Management Plan (CMP) is a program to protect 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 2010–2011 reporting period can be found in the appropriate chapter of this report.

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, 2010, to March 31, 2011.

In 2010–2011, 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. Under the Memorandum of Understanding on Environmental Cooperation in Atlantic Canada, Environment Canada worked with provincial counterparts to develop annexes and work plans that support CEPA 1999. Environment Canada also entered into environmental occurrences notification agreements with five provinces and two territories.

The CEPA Environmental Registry continued to provide public access to all CEPA-related initiatives. There were 55 public consultation opportunities published on the Registry in the reporting period.

Results were achieved under 14 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 2010–2011, Environment Canada and Health Canada scientists published hundreds of articles, reports and papers. Much of this research is conducted in Canada and abroad in collaboration with other governments, academic institutions and industry. The present report provides examples of research activities related to air quality, water, wildlife and soil, and human health.

In collaboration with provincial and territorial governments, two environmental quality guidelines, one for water and another for soil; four drinking water quality guideline documents; and three air quality guidelines were finalized in the reporting period. As well, many other guidelines were being developed during 2010–2011.

Public reporting continued in 2010–2011 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 the Greenhouse Gas Emissions Reporting Program.

In 2010–2011, draft or final assessment decisions were published for 171 existing substances or groups of substances, including 76 substances in batches 6 through 12 of the Challenge program under the Chemicals Management Plan. Of the substances assessed, 76 were found or proposed to be found to meet the definition of toxic under CEPA 1999.

Various risk management measures were undertaken in 2010–2011. The Minister of the Environment and the Minister of Health proposed listing 12 substances or groups of substances in Schedule 1 of CEPA 1999 (the List of Toxic Substances), and the Governor-in-Council added 29 substances or groups of substances to Schedule 1. Notices of intent to apply Significant New Activity Notices, which require new uses of a substance to be notified and assessed, were published for 18 existing substances, and final orders amending the Domestic Substances List to apply the Significant New Activity provisions were published for 22 substances. Environment Canada published three proposed regulations and one final regulation under Part 5 of CEPA 1999. These included the proposed *Regulations Respecting Products Containing Certain Substances Listed in Schedule 1 to the* Canadian Environmental Protection Act, 1999, which would prohibit, with some exceptions, the manufacture, import, and sale of mercury-containing products.

During the reporting period, four pollution prevention planning notices were proposed, and six pollution prevention planning notices were active, including one new final notice regarding mercury in dental amalgam. Through Environmental Performance Agreements, a number of companies have reduced or are working toward reducing their production, use or release of specific pollutants.

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 received 461 new substance notifications for new chemicals, polymers or living organisms. The Minister of the Environment issued 16 Significant New Activity Notices and three Ministerial Conditions to prevent risks.

Work on animate products of biotechnology continued in 2010–2011. The first screening assessment report for existing microorganisms was finalized and two screening assessment reports were drafted. During 2010–2011, 16 notifications were received for new animate products of biotechnology and eight were completed by fiscal year-end (four were rejected and four remained under assessment).

Under Part 7 of CEPA 1999, the government amended, drafted or finalized three regulations related to vehicle, engine and equipment emissions, including the final *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*. In addition, two regulations related to fuels were finalized or amended. Under Environment Canada's emissions verification testing program, 131 tests were performed on various types of vehicles and engines. Also under Part 7, 83 permits were issued for the disposal at sea of 3.78 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 seven ocean disposal sites in the reporting period.

Environment Canada continued to implement the government's international obligations under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, through the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. In calendar year 2010, imports and exports of these materials were 358 236 t and 425 344 t, respectively.

Under the *Environmental Emergency Regulations*, 4200 facilities had filed Notices of Identification of Substance and Place as of March 31, 2011; of those facilities, approximately 2400 were required to do so.

Promoting compliance with and enforcing CEPA 1999's regulations continues to be a priority. In 2010–2011, the number of designated persons with enforcement powers under CEPA included 185 enforcement officers, 38 officers from the Environmental Emergencies Program and 154 CEPA analysts. All designated officers were trained on the new *Environmental Enforcement Act.* 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 5400 inspections during the reporting period and more than 50 investigations were in various stages of development.

In March 2011, the *Release and Environmental Emergency Notification Regulations* came into force. They provide the regulated community and the public with the names and telephone numbers of the 24-hour authorities operating for the given province or territory to which verbal notifications are to be made.

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 2010–2011, the CEPA National Advisory Committee (NAC) held one teleconference meeting and the NAC Secretariat corresponded regularly with committee members regarding various federal initiatives implemented under CEPA 1999. These initiatives included:

- updates on the implementation of Canada's Chemicals Management Plan (CMP), including various risk assessment and risk management activities of the CMP;
- the development and publication of *Passenger Automobile and Light Truck Greenhouse Gas Emissions Regulations*;
- the proposed *Regulations Amending the Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations*;
- the publication of the *Renewable Fuels Regulations* and of the *Marine Spark-Ignition Engine, Vessel and Off-Road Recreational Vehicle Emission Regulations*;
- consultations related to proposed amendments to the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* and to the proposed amendments to the *Renewable Fuels Regulations;*
- a request for comments on the proposed *Regulations Amending Certain Regulations Made under Subsection 93(1) of the* Canadian Environmental Protection Act, 1999;
- the coming into force of the bulk of the *Environmental Enforcement Act* (Bill C-16);
- the publication plan for the National Pollutant Release Inventory (NPRI) tailings and waste rock data and the 2010 *Canada Gazette* Notice for the NPRI;
- an update on the regulatory framework for the transboundary movement of waste and hazardous recyclable materials;
- an update regarding agreements and regulations on the notification of environmental occurrences under the CEPA 1999 and the *Fisheries Act*;
- teleconference meetings on activities carried out under the CMP and the Challenge Program and on the Canadian Health Measures Survey Cycle 1 Biomonitoring Data Release;
- the *Regulations Amending the PCB (Polychlorinated Biphenyl) Regulations*;
- intergovernmental negotiating committee meetings to prepare a global legally binding instrument on mercury;
- information on international meetings such as the Conference of the Parties of the Stockholm Convention on Persistent Organic Pollutants; and
- other 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 (www.ec.gc.ca/grandslacs-greatlakes/default.asp?lang=En&n=B903EE0D-1). This agreement, now extended to June 2012, 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 principal mechanism for meeting Canada's obligations under the Canada–United States Great Lakes Water Quality Agreement (www.ec.gc.ca/grandslacs-greatlakes/default.asp?lang=En&n=88A2F0E3-1). The 2007–2012 Canada–Ontario Agreement Respecting the Great Lakes Basin Ecosystem comprises 13 goals, 37 results and 189 specific commitments in four priority areas:

- designated Areas of Concern (AOCs[1]) in the Great Lakes Basin;
- harmful pollutants;
- lake and basin sustainability; and
- coordination of monitoring, research and information.

Annex 1: 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 2010–2011, all of the remaining priority remedial actions in these AOCs had either been completed or the necessary funding commitments were made to projects being implemented. Following the International Joint Commission's review of the Wheatley Harbour Remedial Action Plan Stage 3 Report in 2009, Wheatley Harbour was de-listed by Canada as an AOC in April 2010. In the Nipigon Bay AOC, upgrades continued at the Nipigon Bay wastewater treatment plant and the community of Red Rock initiated an evaluation and environmental assessment of wastewater treatment plant upgrade options. The project to upgrade the Cornwall wastewater treatment plant in the St. Lawrence AOC is expected to be completed by September 2014. Canada and Ontario determined that Jackfish Bay is now an Area in Recovery (an area where all required remedial actions have been taken, but time is needed for the ecosystem to recover), which was formally recognized in May 2011.

The second COA Annex 1 goal is to make significant progress toward Remedial Action Plan implementation, environmental recovery, and restoration of beneficial uses in the other 11 Canadian AOCs. In 2010–2011, the Canadian Detroit River AOC Stage 2 Remedial Action Plan Report and the Canadian Niagara River AOC Remedial Action Plan Stage 2 Update Report were accepted by Canada and Ontario and submitted to the International Joint Commission for review and comment pursuant to the requirements of the Canada–United States Great Lakes Water Quality Agreement.

Through the Great Lakes Action Plan's Great Lakes Sustainability Fund, projects were carried out in collaboration with other stakeholders to (1) improve water quality by controlling point and nonpoint sources of contamination, (2) restore fish habitat and wildlife habitat, and (3) characterize contaminated sediment and develop contaminated sediment management plans in AOCs. The projects included the development and implementation of stewardship plans and programs to reduce nutrient inputs to watercourses from urban and rural non-point sources in the Bay of Quinte, Niagara River, St. Lawrence River (Cornwall), Hamilton Harbour, Toronto Region, St. Clair River and Detroit River AOCs; the development and integration of pollution

[1] An Area of Concern is a location that has experienced environmental degradation. Under Annex 2 of the Canada–United States Great Lakes Water Quality Agreement, 42 Areas of Concern were identified and one more (Erie, Pennsylvania) was added later. Currently there are nine Areas of Concern in Canada, 25 Areas of Concern in the United States, and five additional Areas of Concern shared by both countries. For more information on AOCs, see www.ec.gc.ca/raps-pas/default.asp?lang=En&n=A290294A-1.

prevention and control plans for municipalities bordering the Bay of Quinte; the restoration of wetlands and/or habitat in Cootes Paradise and Grindstone Creek in the Hamilton Harbour AOC, the central Windsor waterfront in the Detroit River AOC and in the headwaters wetlands of the Toronto Region AOC; and the development and evaluation of options to remediate contaminated sediments in the Thunder Bay, St. Clair River, Peninsula Harbour and St. Marys River AOCs.

Annex 2: 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-based approach to reducing and preventing releases throughout the basin, with a goal to virtually eliminate persistent bioaccumulative toxic substances. Environment Canada's efforts to assess and manage the risks posed by commercial chemicals under the CMP support the delivery of Annex 2 commitments.

A new commitment to facilitate information sharing between Canada and Ontario's respective chemical management plans was developed for the 2011–2012 extension of the Canada–Ontario Agreement.

Efforts also include actions undertaken by the Great Lakes Binational Toxics Strategy (GLBTS, www.epa.gov/greatlakes/p2/bns.html), a public-private collaborative arrangement between Environment Canada, the U.S. Environmental Protection Agency (U.S. EPA) and stakeholders to reduce environmental releases of designated Level 1 substances, including mercury, polychlorinated biphenyls (PCBs), dioxins and furans, hexachlorobenzene and benzo(a)pyrene.

The GLBTS released its 2009 biennial report documenting achievements made and actions taken to reduce the use and release of GLBTS Level 1 substances. Fourteen of the GLBTS's 17 "challenge goals" have been met. The report also highlights new activities focused on emerging substances of concern and presents environmental trends in GLBTS substances using data collected by Great Lakes monitoring and surveillance programs.

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 is nearing completion of a national modeling study to better understand the transboundary impacts associated with dioxin and furan releases from North American and global sources.

Wastewater treatment research was initiated by the Ontario Ministry of the Environment, Environment Canada, University of Windsor, City of Windsor, University of Waterloo, University of Guelph, University of Trent, Université Laval, University of Victoria, and University of British Columbia. Investigations included the ecological impacts of wastewaters treated by conventional and advanced technologies at pilot and full-scale facilities. Efficacy of treatment is being assessed through chemical analyses for both conventional substances (nutrients and metals) and chemicals of emerging concern such as pharmaceuticals, nonylphenol, and polybrominated diphenyl ethers (PBDEs). Toxicological analyses of treated wastewater comprised a suite of biological indicators. The indicators selected included fish, invertebrates and algae. In addition, in vitro micro-scale tests were conducted to determine whether substances in wastewater have the potential to produce endocrine-disrupting effects in organisms.

With financial contributions from the Ontario Ministry of the Environment and Environment Canada, and in consultation with Health Canada, EcoSuperior (www.ecosuperior.org/) extended its distribution of information about the safe disposal of medicines to four Lake Superior basin communities (Nipigon, Terrace Bay, Marathon, Wawa), and residents of Thunder Bay. Outreach activities included the distribution of posters and leaflets to various medical support groups, displays in all targeted communities, and the delivery of "Medicine Cabinet Clean Up" collection bags to 55 000 households. EcoSuperior also increased awareness of the hazards of burning garbage in the rural townships around Thunder Bay through presentations at council meetings, flyers distributed with burning permits, and an article in resident newsletters.

Finally, work continued on the development of a Canadian framework to identify and prioritize chemical substances of concern in the Great Lakes. This framework will inform the development and implementation of a binational mechanism to address these chemical threats to the Great Lakes.

Annex 3

Environment Canada worked to achieve commitments under Annex 3 of the Canada–Ontario Agreement 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 these plans. Monitoring and surveillance work also continued with the objective of gaining a better understanding of the state of and trends in the Great Lakes ecosystem.

Environment Canada, in collaboration with the U.S. EPA, regularly reports on the health of the Great Lakes ecosystem using a suite of ecological indicators. In 2010–2011, a review of the Great Lakes indicator suite was completed. This included a separate review by an independent panel of indicator experts as well as contributions by staff from over 30 organizations. The result was a new organizational framework for the indicators, new indicator categories and some changes to indicators in the suite. Reporting on the ecological health of the Great Lakes Basin using the revised suite of indicators will begin at the State of the Great Lakes Ecosystem Conference set for October 2011, followed by the release of the State of the Great Lakes reports in 2012.

Environment Canada, with the U.S. EPA, co-chairs binational lakewide management plans under the Canada–United States Great Lakes Water Quality Agreement. The management plans identify binational ecological objectives and management strategies, including scientific priorities for data collection to fill knowledge gaps in ecosystem status and trends. In 2010–2011, a number of Lakewide Management Plan reports and activities were undertaken:

- The first annual Lakewide Management Plan reports were published for each of the Great Lakes.
- The final draft of the Lake Superior Aquatic Invasive Species Complete Prevention Plan was completed, following public workshops that were held throughout the basin to promote the plan and gather input. The purpose of the plan is to prevent new aquatic invasive species from entering and becoming established in Lake Superior.
- The International Biodiversity Conservation Strategy for Lake Huron was finalized following a two-year conservation action planning process that engaged more than 100 organizations from around the Lake Huron watershed. The conservation strategy identifies conservation features that represent the biodiversity of Lake Huron, ranks critical threats and recommends strategies and opportunities for implementation.
- The final draft of the Lake Erie Binational Nutrient Management Strategy was completed. The strategy defines the goals, objectives, targets, indicators, priority watersheds, monitoring and research needed to limit further eutrophication and improve current conditions in Lake Erie.
- Environment Canada continued to participate in a number of key Canadian watershed and coastal initiatives, including the Lake Huron Southeast Shore and Southern Georgian Bay Coastal Initiatives, and the Grand River Water Management Plan. These initiatives seek to develop mechanisms for the protection and restoration of lakes Huron and Erie, respectively.

Great Lakes and Regional Environmental Quality Monitoring and Surveillance Program

The binational Cooperative Science and Monitoring Initiative (CSMI) is a five-year rotational program that coordinates research and monitoring from planning through to data synthesis and reporting. Coordinated field activities occur on each lake once every five years. The complete cycle for each lake involves two years of planning, one year of field activity and two years of analysis, synthesis and reporting. Starting with Lake Huron, in 2012, issues affecting the connecting channels will be included in the assessment of the downstream lakes to the extent these issues affect the lake. The following activities occurred under the CSMI in 2010–2011:

- A special session on Lake Ontario (field year 2008) was held at the 2010 conference of the International Association of Great Lakes Research. The focus of the Lake Ontario program included understanding nearshore-offshore nutrient transport, the status of the offshore lower food web, a lakewide fishery assessment, and the use of biomarkers to identify food-web changes.

- The 2009 intensive field year for Lake Erie was extended into 2010 to assess the impact of invasive species on nutrient transport from nearshore to offshore in the central and eastern basins of the lake.
- Planning continued for Lake Superior (field year 2011). Two key priorities have been identified: (a) the status of Lake Superior chemicals of concern and chemicals of immediate concern to the ecosystem, and (b) the status of the lower food web, the early detection of aquatic invasive species, and a study of native fish species in the lake, including a lakewide juvenile Lake Sturgeon index survey.
- Lake Huron (field year 2012) is in the issue identification year. A binational planning workshop was held in Tobermory, Ontario, in October 2010, with a follow-up workshop in Burlington in November 2010. The identified scientific priorities will be sent to the Lakewide Management Plan Management Committee for vetting and prioritization.

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 the *Canada Gazette*, Part I. 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 gathering regulatory information from Quebec pulp and paper manufacturers and forwards such information to Environment Canada to help the Department implement CEPA 1999 and the *Fisheries Act*, as well as 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.

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, both parties shared compliance verification reports. These presentations are made during meetings of the management committee established by the agreement. In 2010–2011, the management committee met three times, on October 21, 2010, on November 15, 2010, and on March 30, 2011.

To view the draft 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, including two regulations related to the pulp and paper sector, two regulations on ozone-depleting substances, and two regulations on PCBs. There were no prosecutions under these regulations in Saskatchewan under this agreement in 2010–2011.

To view the agreement, consult www.ec.gc.ca/ee-e/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.

Under the 1994 Agreement on the Equivalency of Federal and Alberta Regulations for the Control of Toxic Substances, the following CEPA 1999 regulations, or parts thereof, do not apply 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 2010–2011, 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.

1.6 Memorandum of Understanding on Environmental Cooperation in Atlantic Canada

On June 6, 2008, the Minister of the Environment signed the Memorandum of Understanding on Environmental Cooperation in Atlantic Canada with the ministers of the environment of the four Atlantic provinces. The Memorandum of Understanding (MOU) represents a significant federal-provincial collaborative effort to preserve, protect and enhance the environment in Atlantic Canada.

In 2010–2011, a water annex and an associated work plan were developed, in cooperation with provincial partners, focusing on the goals of the Canadian Council of Ministers of the Environment's (CCME) recently developed document titled *Setting Strategic Directions for Water*. An environmental enforcement annex was also developed. Through a work plan supporting this annex, the parties will work toward establishing arrangements and protocols for environmental enforcement, focusing on training, information sharing and operational support.

1.7 Environmental Occurrences Notification Agreements

Federal, provincial and territorial laws require, in most cases, notification of the same environmental emergency or environmental occurrence, such as an oil or chemical spill. To reduce duplication of effort, Environment Canada and Fisheries and Oceans Canada entered into environmental occurrences notification agreements with the governments of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, the Northwest Territories, and Yukon.

These notification agreements came into effect on March 25, 2011, on the day the *Release and Environmental Emergency Notification Regulations* under CEPA 1999 and the *Deposit out of the Normal Course of Events Notification Regulations* under the *Fisheries Act* came into force.

The purpose of the notification agreements is to establish a streamlined notification system for persons required to notify federal and provincial/territorial governments of an environmental emergency or environmental occurrence. Under these notification agreements, 24-hour authorities operating for the provinces and territories receive notifications of environmental emergencies or environmental occurrences, on behalf of Environment Canada, and transfer this information to the Department.

To view the notification agreements, consult www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=5200AB4B-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 ease of use. The Registry encompasses thousands of CEPA-related documents and references. It has become a primary 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 curriculum.

The Registry was recently revamped—its content and structure being reviewed and updated and new documents being added. The new site was launched in August 2010.

From April 2010 to March 2011, over 250 requests for CEPA-related information were received sent to the registry mailbox (ceparegistry@ec.gc.ca). Many of these requests were for information on the assessment reports of Batch 7 and 8, substances identified under the Challenge program, a key element of the CMP. 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 2010–2011, there were 55 opportunities posted on the Environmental Registry for stakeholders and the public to consult; this is slightly above the average number usually posted within a given reporting period.

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 that the Minister of the Environment issue environmental quality objectives and guidelines, substance-release guidelines, and codes of practice. 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 Canadians. Part 3 of CEPA 1999 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 379 reporting sites in 311 communities, complemented by the CAPMoN network's sites in rural and remote areas. The network conducts continuous measurement of ozone, nitrogen oxides (NO, NO_2, NO_x), sulphur dioxide (SO_2), carbon monoxide, and fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}, respectively), and also operates over 80 active air samplers measuring toxic substances. These include polycyclic aromatic hydrocarbons (PAHs); dioxins and furans (which are produced through combustion such as wood or biomass burning); heavy metals such as arsenic, lead and cadmium; and more than 167 volatile organic compounds (VOCs) that contribute to smog formation. More than 340 chemical substances are analyzed in samples collected at a subset of NAPS sites.

NAPS data are used to report on the achievement of the Canada-wide Standards for PM and ozone as well as the Canadian Environmental Sustainability Indicators (CESI) air quality indicators. NAPS data are also used to report on progress in reducing emissions associated with ozone and acid deposition. The report titled *Canada–United States Air Quality Agreement: Progress Report 2010*, published in November 2010, showed that, from 1990 to 2008, Canada's total SO_2 emissions decreased by 47% and that Canada's total NO_x emissions decreased by 32% in the transboundary ozone region (which includes central and southern Ontario and southern Quebec).

Continuous measurements (SO_2, NO_2, ozone, $PM_{2.5}$ and CO) through the NAPS network are also used by Alberta, Ontario, and Quebec to report on their air quality indexes. Environment Canada and several provinces report on the Air Quality Health Index (AQHI), which uses a combination of NO_2, ozone and $PM_{2.5}$ measurement data to provide current hourly AQHI readings and maximum forecasted values. Continuous $PM_{2.5}$ and ozone data from the NAPS network are also sent to the U.S. AirNow website to provide real-time mapping of ambient air quality across Canada and the United States.

A large number of requests for NAPS data are received annually by Environment Canada from other governments, academic researchers, and Canadians.

In 2010–2011, the NAPS program continued to upgrade data reporting and its database infrastructure to ensure timely daily and annual validated results. Carbon monoxide instruments were replaced with more sensitive trace-level analyzers capable of measuring the lower concentrations now found in most Canadian cities, and continuous $PM_{2.5}$ monitors were upgraded across Canada to newer technologies in an effort to enhance consistency and comparability of fine PM data. The analysis of $PM_{2.5}$ was also expanded to include levoglucosan and its isomers (mannosan, galactosan), indicators of biomass combustion (i.e., airborne particles resulting from the burning of wood from forest fires, wood stoves, wood-fired ovens, etc.). The NAPS $PM_{2.5}$ network compiled its first year of levoglucosan data from 12 sites across the country.

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 like fine PM and ozone are still of concern. Also, the NAPS network responds to new data requirements and priorities on emerging substances of interest. For example, since 2008, in support of the CMP's monitoring and surveillance activities, PBDEs, used as flame-retardants in consumer products, have been monitored and analyzed at 10 selected NAPS sites across Canada. Of all the PBDEs monitored, results indicate that decaBDE (BDE-209) levels are the highest, especially during the colder months. This finding exemplifies the role of NAPS as a continuously evolving measurement program that provides timely, relevant and sound science in support of current and emerging air quality issues.

Although initially begun as a cooperative agreement among monitoring agencies, NAPS evolved into a formal partnership in 2004 with the endorsement of a Memorandum of Understanding between the federal, provincial, territorial and regional governments. This agreement outlined the general terms and conditions of cooperation in the overall management and support of the NAPS air quality monitoring program.

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, in complement to the primarily urban sites of the NAPS network. One site in the United States and another in Canada ensure the comparability of measurement methods between the two countries in support of the Canada–United States Air Quality Agreement. 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, ozone and mercury).

In 2010–2011, more than 25 000 samples were analyzed in support of Canadian environmental monitoring and research initiatives. Major-ion analyses (>18 000) in air and precipitation were performed to determine national critical load exceedances and ozone levels in support of the Canada-wide Standards and CESI programs. Also, continuous gas measurements in support of various research-focused air quality initiatives were continued, including for the AQHI. To ensure that timely, reliable, trace-level data are available for air quality forecasting and for the Air Quality Health Index, a study was completed in 2010 to determine which existing technology for measuring fine PM in non-urban environments is best suited to the CAPMoN network. The selected technology will be deployed in 2011–2012.

CAPMoN continues to respond to current and emerging regional/rural air quality data, information and policy priorities. Its data continue to be highly reliable and representative of remote background locations in order to support research efforts associated with regional, continental and hemispheric trends.

3.1.3 Integrated Atmospheric Deposition Network

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

The network maintains onshore monitoring stations for 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 gaseous, particulate and precipitation samples. Environment Canada operates stations on Lake Huron at Burnt Island and on Lake Ontario at Point Petre. Core substances monitored included PAHs, current-use and banned organochlorine pesticides, congener-specific PCBs and trace metals.

In 2010–2011, measurements of priority toxic substances, data analysis, and development and refinement of methods continued to be of importance. Core IADN substances data and trace metal data for air and precipitation are available to 2008. With support from the CMP, IADN

screens air and precipitation samples for emerging substances of concern to assess their impact on the Great Lakes region. Air samples collected between 2005 and 2009 from Canadian monitoring stations were analyzed for PBDEs, and precipitation samples collected between 2007 and 2009 at sites adjacent to Lake Ontario were analyzed for PBDEs and hexabromocyclododecane (HBCD). Results are available for new flame-retardant species for air samples collected in 2009. Since 2007, precipitation samples are also being screened for new flame retardants. The data from the network continued to be used to produce peer-reviewed publications. Also, the Canadian and U.S. data between 2006 and 2008 for air and precipitation were used to calculate atmospheric deposition of core IADN substances to the Great Lakes Basin. A report entitled *Atmospheric Deposition of Toxic Substances to the Great Lakes IADN Results through 2008* will be published in December 2011.

3.1.4 Northern Contaminants Program

Environment Canada continued atmospheric measurements of persistent organic pollutants (POPs), mercury and other priority chemicals in the Arctic under the Northern Contaminants Program (NCP). Led by Aboriginal Affairs and Northern Development Canada, the Northern Contaminants Program is Canada's National Implementation Plan for the Arctic Monitoring and Assessment Programme (AMAP) and contributes to Canada's obligations under the United Nations Environment Programme's (UNEP) Stockholm Convention on Persistent Organic Pollutants and UNEP's current negotiations to establish a legally binding agreement on the reduction of global mercury emissions.

POPs

The most recent temporal trends and seasonal variations in PCBs, current-use pesticides, PBDEs and polyfluorinated compounds (PFCs) measured at Alert, Nunavut, were reported in the *Canadian Arctic Contaminants Assessment Report III,* which is to be published in late fall 2011. This report will update information about the status of contaminants in the Canadian Arctic environment, as follows:

- Findings indicate that atmospheric concentrations of PCBs at Alert, which were showing a declining trend prior to 2002, increased between 2003 and 2007. One possible explanation for this observation may be re-evaporation from open-ocean water as sea ice extent decreases in the summer throughout the Arctic.
- The pesticide lindane was included in the Stockholm Convention on POPs for global control as of May 2009. Canada, a major user of lindane in North America, deregistered lindane for use on canola seeds in July 2001, and a total ban on pesticidal uses was introduced in 2004. As a result of this risk management action, the air concentration of lindane is decreasing at Alert. At the current rate of decline, the air concentration can be expected to decrease by half over the next four years.
- PBDE levels were still increasing at Alert as of 2007. Although the highest annual levels of this contaminant are usually associated with high summer temperatures, 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, a clear manifestation of hemispheric pollution reaching the Arctic.
- Starting in 2007, a series of new flame retardants were being screened for in air samples taken at Alert. Three new flame retardants—1,2-bis(2,4,6-tribromophenoxy)ethane, 2-ethyl-1-hexyl 2,3,4,5-tetrabromobenzoate and bis(2-ethyl-1-hexyl)tetrabromophthalate—were detected at levels comparable to levels of PBDEs. Their occurrence in air at Alert highlights their potential to be carried by air currents over long distances and reach the remote Canadian Arctic.
- Atmospheric concentrations of precursor PFCs (fluorotelomer alcohols) and perfluorooctane sulfonamidoethanols) have been monitored at Alert since 2006. No consistent temporal trends were found for PFCs except for one of the specific fluorotelomer alcohols, which seems to exhibit a consistent increasing trend. Seasonal variations in air concentrations were observed for various PFCs.

Mercury

The most recent trends for Alert were reported in the scientific literature, in the *Canadian Arctic Contaminants Assessment Report III on Mercury,* and in the Arctic Monitoring and Assessment Programme update on mercury. All these findings show the need for additional monitoring locations for mercury in the Canadian Arctic to accurately assess the trends in various regions. For example, overall, the atmospheric concentration of gaseous elemental mercury was found to be lower in the western Arctic than the eastern Arctic, yet there are gaps in knowledge about the central Arctic and the sub-Arctic in Canada. Notably, concentrations of mercury species measured in the Arctic in springtime are reported to be similar to concentrations in urban and industrialized areas.

Environmental monitoring illustrates that the decrease in mercury levels in the atmosphere of the High Arctic (~0.6% per year since 1995) is much lower than that observed at lower latitudes (~3% per year). This finding suggests that emission reductions in Canada, the United States and European countries may be off-set by increasing emissions in other areas of the world such as Asia, and/or that mercury cycling in the Arctic is confounding the effect of emission reductions.

Atmospheric models of global mercury distribution indicate that the observed decline in mercury air concentrations and deposition in temperate regions of North America were attributed to declining North American mercury emissions. In contrast, models predict that mercury concentrations and deposition in the Canadian Arctic from 1990 to 2005 were influenced more by changes in global emissions and weather patterns than by changes in North American emissions.

Human exposure to contaminants in the North

Health Canada, in partnership with Aboriginal Affairs and Northern Development Canada, established the human health component of the NCP in response to concerns about human exposure to elevated levels of contaminants in wildlife species important to the traditional diets of northern Aboriginal peoples. The key objective is to reduce and, where possible, eliminate contaminants in traditional/country foods, while providing information to assist individuals and communities in making informed decisions about their consumption patterns. Biomonitoring and health outcome studies are undertaken to characterize human exposure to and the health impacts of environmental chemicals in northern populations.

The NCP currently provides Canada's main contribution to the contaminants component under the Arctic Council's Arctic Monitoring Assessment Program (AMAP). A major assessment report that improved understanding of environmental chemicals in Canada's North was published in December 2010. Health Canada contributed to the annual review of NCP proposals, resulting in eight human health projects to be conducted in 2011–2012.

Health Canada also leads the multi-year International Polar Year (IPY) dietary choice and health study in Nunavut that is increasing our understanding of the factors that determine Northern people's food choices. The project allows Health Canada to provide better risk management advice to territorial governments on contaminants and traditional foods. A synopsis of research report (of the four-year research project) was completed and accepted by the IPY Secretariat. Additionally, an educational booklet based on this study was completed for the Nunavut Arctic College. It will be used as teaching material for Northern students.

3.1.5 Intercontinental Atmospheric Transport of Anthropogenic Pollutants to the Arctic (INCATPA)

This project was one of 44 Canadian-funded projects—and one of five led by Environment Canada scientists—carried out as part of International Polar Year. The project, which ended in 2011, simultaneously measured persistent organic pollutants (POPs) and mercury concentrations in the air in potential source regions along the Pacific coasts and in the Canadian, American and Russian Arctic. The results are helping to determine the geographic sources of these chemicals, the proportion contributed by each source region, and the climatic conditions influencing their transport to the Arctic. The project was an extension of the networks for measurement of atmospheric POPs and mercury under the NCP and the Arctic Council's AMAP. The final results of the project will

be summarized for the Montréal 2012 International Polar Year Conference.

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 2010–2011, 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. Measurement results show that a group of toxic combustion by-product, polycyclic aromatic hydrocarbons (PAHs), detected in Yukon air, was related to sources in North America, Asia and northern Europe (e.g., from wildfires in California and Asia), and oil and gas production platforms throughout the Arctic. Atmospheric deposition of mercury at Alert changed between 1995 and 2007, reflecting a complex relationship between mercury deposition and local temperature and wind direction. A warming Arctic may also release POPs previously deposited in ice/snow and oceans back into the air, making them once again available for circulation around the globe and altering human and wildlife exposures. Therefore, the influence of climate change must be considered in order to reduce exposure to toxic chemicals in the Arctic.

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. 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 UNEP's Stockholm Convention on Persistent Organic Pollutants, and the Protocol on POPs under the United Nations Economic Commission for Europe.

In 2010–2011, the GAPS Network continued to contribute to international efforts on atmospheric POPs through capacity building, technology transfer, data sharing, participation in workshops, and reporting. For instance, a GAPS subproject that introduced passive sampling to Indian collaborators generated the first seasonally and spatially resolved data on POPs across India.

Also in 2010, work began on a three-year UNEP-funded project to address data gaps for polychlorinated dioxins and furans in air in Latin America. Under the core GAPS work, quarterly sampling at approximately 55 global sites continued for the sixth consecutive sampling year and samples have been analyzed up to 2008. As well, new measurements conducted under the GAPS Network at a subset of 20 GAPS sites generated the first global-scale data sets and resulting publications for PFCs and volatile methyl siloxanes (VMSs). This sampling provides new information for risk assessment and risk management of these priority chemicals within Canada (e.g., CMP) and internationally, as some PFCs (perfluorooctane sulfonate (PFOS) and its precursors) have recently been added to the Stockholm Convention. Building on the success of the first phase, the second phase of the pilot study at all GAPS sites will focus on further investigating new priority chemicals in the global atmosphere in order to better understand their atmospheric transport and fate.

As the only global-scale air program under the Global Monitoring Plan of the Stockholm Convention, the data generated under the GAPS Network has modernized the integration of measurement data with global-scale emission estimates and predictions from global transport models. This has resulted in a much more integrated and comprehensive framework for evaluating chemical transport and fate in air.

3.1.7 Greenhouse Gas Monitoring

Environment Canada initiated carbon dioxide observations in 1975 as part of the global effort to characterize the changing atmospheric composition and understand climate change. The current monitoring network for greenhouse gases (GHGs) includes observations of carbon dioxide, methane, nitrous oxide, and sulphur hexafluoride. Five sites located in remote regions of Canada provide weekly and hourly concentration information for these GHGs. An additional five sites located in western Canada and central Quebec monitor carbon dioxide and methane.

The Canadian data are collected and reported in fulfillment of international obligations to the World Meteorological Organization Global Atmosphere Watch and to 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 in 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. From Environment Canada's monitoring network at remote sites, annual average carbon dioxide values were 388.3 and 391.1 parts per million for 2009 and 2010, respectively, while annual average methane values were 1870 and 1874 parts per billion for 2009 and 2010, respectively.

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 national aquatic mercury monitoring network that was established in 2008 as part of the Mercury Science Program of the Clean Air Regulatory Agenda (CARA). The network encompasses lakes across Canada that are in proximity to point-source mercury emissions, as well as reference lakes in remote regions. The results of the FISHg Network directly support the ecological risk mapping component of CARA.

In 2010–2011, five additional lakes were added to the FISHg Network (for a total of 20 sites). The additional lakes were chosen to better understand the influence of atmospheric mercury deposition on the spatial variability of mercury levels in fish. In addition to routinely monitoring mercury levels in water and fish (predatory/sport as well as forage species), the FISHg Network also collects ancillary information on other water quality parameters (e.g., sulfate, dissolved organic carbon), food-web dynamics, and watershed attributes (e.g., wetland area, catchment slope) to identify variables influencing mercury levels in each region of the country.

The initial results for the FISHg Network identified that average mercury concentrations in predatory/sport fish varied by over one order of magnitude (0.14 to 2.2 µg/g) among water bodies across the country; however, lakes in all regions contained some individual fish with mercury concentrations that were above advisory consumption levels for wildlife and humans (0.5 µg/g Health Canada guideline). Ongoing analysis of the data set is aimed at using the ancillary information collected from each lake to elucidate the variables responsible for the spatial trends. Within a given lake, mercury levels in fish increased with fish size and trophic position.

The preliminary results of this program were presented to the scientific community at the 2010 Society of Environmental Toxicology and Chemistry conference in Portland, Oregon, and at the 2011 International Conference on Mercury as a Global Pollutant in Halifax, Nova Scotia. The information generated from the FISHg Network will help establish a national baseline of mercury levels in aquatic systems, which is fundamental for evaluating the efficacy of national and international regulatory efforts and determining the impacts of changing global/transboundary atmospheric mercury concentrations on Canada's aquatic environments.

3.1.9 Water Quality Monitoring in Support of the Chemicals Management Plan

Environment Canada's national Chemicals Management Plan (CMP) Environmental Monitoring and Surveillance Program monitors chemicals in multiple environmental compartments (air, water, sediment, fish and wildlife), and also performs source monitoring (wastewater treatment plant effluents and sludge, landfill leachate and biogas). Sensitive fish species continue to be observed as part of water quality monitoring to serve as an "early warning" system for the presence of harmful substances in the ecosystem. In addition to identifying emerging substances that warrant attention, the program also enables monitoring of progression on action being taken under the CMP.

In 2010–2011, Environment Canada reported on the first nationwide study examining concentrations of PBDEs in top predatory fish, with a focus on Lake Trout. Concentrations of the three most abundant

PBDE homolog groups (tetra-, penta-, and hexa-PBDEs) were, for the most part, higher in Great Lakes fish than in fish from other systems. The Canadian Federal Environmental Quality Guideline for the penta-homolog was exceeded in 70% of the fish examined. However, virtually no guideline exceedances were found for other congeners. The study also supported the continued integration of sediment sampling and focused food-web studies so as to provide information on PBDE inputs to the systems and mechanisms of biomagnifications. The ultimate aim is to better understand and communicate ecosystem responses and inform effective risk management.

As well, in 2010–2011, Environment Canada reviewed the approaches and critical factors important to contaminant biomonitoring programs in the Great Lakes in a report reviewed factors that affect the efficacy and credibility of biomonitoring programs and common methods used for dealing with them under three main categories: organism-specific factors, study design, and data analysis. Data from the literature, as well as long-term measurements of PCBs in Lake Trout sampled from Lake Ontario as part of monitoring programs conducted by Environment Canada, the Ontario Ministry of the Environment, and the U.S. EPA, were used to illustrate these factors. In general, there were several defensible methods, ranging from simple to complex, for dealing with the identified factors, with each having specific advantages and disadvantages. The importance of conducting preliminary surveys/pilot studies and regular review of ongoing programs (e.g., through a power analysis) was also emphasized.

In 2010–2011, Environment Canada continued to identify emerging contaminants and for the first time reported on the detection of perfluoroethylcyclohexanesulfonate (PFECHS) in the Great Lakes. PFECHS is a cyclic perfluorinated acid (PFA) that is mainly used as an erosion inhibitor in aircraft hydraulic fluids. For the first time, PFECHS was reported in top predator fish from the Great Lakes and in surface waters. Environment Canada also continued monitoring activities related to the presence of PFOS in the Canadian environment to contribute to the international body of knowledge on perfluorinated substances and to evaluate whether the environmental objective and risk management objective are being achieved. PFOS was the major PFA in fish sampled from the Great Lakes in 2008. Concentrations of most of the PFAs were similar to those measured in Lake Trout sampled from Lake Ontario in 2004.

In support of the *Risk Management Strategy for Mercury* report published by Environment Canada and Health Canada in October 2010, Environment Canada continued to monitor changes in domestic levels of mercury in water, sediment and fish in the Great Lakes Basin and other transboundary watersheds across Canada.

In 2010–2011 Environment Canada collaborated on a binational, multi-partner report on the spatial and temporal trends for mercury in fish from the Laurentian Great Lakes region. The study compiled fish mercury data from multiple sources in the Great Lakes region and assessed spatial and temporal trends in mercury concentrations in two representative top predator fish species (Walleye and Largemouth Bass). The results show a generally declining temporal trend in mercury concentrations in fish in the Great Lakes region from 1970 to 2009, with spatial trends in mercury concentrations increasing from south to north and from west to east in the region. However, mercury levels in Walleye display a flat or upward trend beginning in the 1990s. Ongoing monitoring is required to confirm a sustained decline in fish mercury levels.

In 2010, Environment Canada also collaborated with the Ontario Ministry of the Environment and the academic community to report on the temporal trends in total mercury in four fish species—Walleye, Yellow Perch, Smallmouth Bass and White Bass—in Lake Erie based on 35 years of fish contaminant data. The analysis identified a recent increase in total mercury concentrations, particularly after the mid-1990s. This finding supports the observations for Walleye described above. The analysis also shows lower decline rates and higher rates of increase in Walleye relative to the other three fish species examined. The food-web structural shifts induced by invasive species (dreissenid mussels and Round Goby) may be associated with the recent total mercury trends in Lake Erie fish. This analysis also highlights the importance of continued monitoring to inform binational reduction strategies.

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

Water quality monitoring and surveillance of the presence and fate of pesticides in the aquatic environment is conducted under the government's National Pesticides Science Program. This 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 2010–2011 included a national surveillance study of sulfonylurea herbicides and the herbicide glyphosate at selected agricultural sites in key national watersheds. Samples were collected from spring through late summer.

In 2010–2011, Environment Canada reported on the results of a 2007 national survey, covering 15 watersheds across Canada with varying degrees of urban land use, for a suite of 15 herbicides and one breakdown product. Six herbicides (2,4-DB, MCPB, picloram, 2,3,6-TBA, 2,4,5-T, and 2,4,5-TP(silvex)) were not detected in water samples from any sites. Herbicides detected in 2007 included dicamba, mecoprop, 2,4-D, clopyralid, bromoxynil, MCPA and dichlorprop as well as glyphosate and AMPA. Glufosinate was detected in one sample from Highland Creek, Ontario. With the exception of glyphosate, for which the highest concentrations were found in Prairie rivers, average herbicide concentrations were significantly greater in Ontario than in urban centres in other provinces. On a national basis, the concentrations of all herbicides, with the exception of dicamba, did not differ across the three seasons (spring, summer, and fall), which is likely indicative of a less seasonally focused application in urban areas compared with agricultural applications. Herbicide concentrations in urban rivers were greater during or after significant rainfall events. None of the herbicide concentrations measured in this study exceeded existing Canadian water quality guidelines for the protection of aquatic life. However, four herbicides were commonly found together in a sample, but there are currently no guidelines for herbicide mixtures or for herbicides in combination with other stressors (i.e., insecticides, nutrients, PAHs, metals and pharmaceuticals).

Concentrations of mecoprop, dichlorprop and metolachlor in Ontario streams in 2006–2007 were compared with concentrations measured in 2003–2004. Median concentrations of dichlorprop and metolachlor did not differ between the two sampling periods, but mecoprop was higher in 2006–2007. Concentrations of mecoprop and dichlorprop in Lake Ontario surface water were one to two orders of magnitude lower than average concentrations in Ontario streams. In 2003–2004, 1.2% of the samples exceeded the Canadian Council of Ministers of the Environment's (CCME) Water Quality Guideline (WQG) for mecoprop, but metolachlor did not. In 2006–2007, all samples were below the CCME guideline for mecoprop and metolachlor.

In 2010–2011, Environment Canada reported on the application of a glyphosate-based herbicide to control the Common Reed and the resulting impact on groundwater and nearshore lake water. The herbicide glyphosate was applied to reeds along a beach on the southern shore of Georgian Bay, Ontario. Groundwater and lake water were tested to determine whether glyphosate entered the groundwater and lake water at the beach and how long it persisted. Glyphosate was detected in the groundwater below the reeds two days after application, with concentrations declining rapidly over the next two to three weeks. Glyphosate was also detected in the nearshore lake water, with concentrations peaking one week after application and declining by over 70% four weeks after application. Concentrations of glyphosate never exceeded Canadian water quality guidelines in either the groundwater or lake water.

Environment Canada's surveillance of pharmaceutical and personal care products (PPCPs) in 2010–2011 included a large-scale survey of PPCPs in four watersheds in Canada. Monthly samples were collected to evaluate the influence of seasonality on concentrations and distributions.

3.1.11 Great Lakes Surveillance Program

As mandated by Annex 11 of the Canada–United States Great Lakes Water Quality Agreement,

surveillance and monitoring of water quality trends is undertaken in the Great Lakes to provide information for measuring local and whole-lake responses to control measures and 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 2010–2011, emphasis was placed on continued measurements of priority toxic substances and continued data analysis. Environment Canada reported on the concentration loads and trends in contaminants in the Niagara River from 1986 to 2005. This report was unique because it provided the first look at contaminant trends over both long and short time spans while assessing the source of the contaminant. The results indicate that, although there has been much progress over the course of the monitoring period, with a decreasing trend for many contaminants, a number of contaminants have leveled off. Notably, the PAH class of contaminants, known for their carcinogenic properties, is showing an increase in concentration.

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). 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 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 eight 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. A specific area of focus for Environment Canada under this research initiative includes high-frequency (monthly) monitoring of nitrogen isotopes to examine potential nitrate source dynamics and seasonal effects of existing agricultural practices on groundwater quality. Also, Environment Canada is working with researchers from the University of Calgary on the application of diffusion samplers for detailed profiles of groundwater quality, so as to better understand how nonpoint-source agricultural contaminants propagate through this aquifer.

3.1.13 Coal Mines and Water Quality in Southeastern British Columbia

The Elk Valley in southeastern British Columbia is home to five large open-pit coal mines. Water quality impacts of this activity include the release of nitrate from explosive residue and of sulphate and selenium from waste-rock leachate to the Elk River. Concentrations of these substances have been increasing, with selenium having exceeded the CCME's Canadian water quality guidelines for the protection of aquatic life for over a decade; currently, it is increasing at a rate of approximately 10% per year. Selenium can be detrimental to egg-laying vertebrates (fish, birds, amphibians) because elevated concentrations can cause deformities or reproductive failure in affected populations. The confluence of the Elk River and the southward flowing Kootenay River is near the international boundary. The Kootenay River returns north into Canada at Creston, about 300 km downstream, where selenium levels have also been rising over the past years.

Since 2003, Environment Canada has participated in the Elk Valley Selenium Task Force. This joint

industry-government group has been actively addressing the issue of selenium contamination in the valley through directed research and monitoring programs aimed at establishing effects thresholds and biogeochemical pathways and investigating potential mitigation options.

To examine the downstream attenuation of mine contaminants, a longitudinal water quality sampling program was conducted in the fall of 2010 in the Elk River headwaters and downstream to Creston. The results show that the levels of mine-related contaminants decreased sharply at the confluence with the Kootenay River and that there were no additional downstream sources.

Environment Canada participated in a workshop convened by the Society for Environmental Toxicology and Chemistry examining the state of knowledge of selenium's effects on aquatic environments. A workshop proceedings volume was published in early 2010.

3.1.14 Sensitivity of Surface Waters to Sulphur and Nitrogen Deposition

The bedrock of coastal British Columbia has a low capacity to buffer incoming acidic deposition. Although industrial emissions in the region are a fraction of those in eastern Canada, the release and deposition of reactive nitrogen and sulphur are expected to increase substantially in the future due to population growth and increased coastal marine shipping traffic. Since 2008, Environment Canada has conducted large-scale lake chemistry sampling over southwestern British Columbia to evaluate critical loads for nitrogen and sulphur deposition in water. Critical loads are thresholds below which no detrimental effects would be expected. Waters with high critical loads have high buffering capacities and therefore low sensitivity to acidic deposition. In practice, critical loads are calculated from the results of chemical analyses using any of a number of possible models. These values are then compared with empirical deposition estimates or, more often, predicted deposition fields from atmospheric models. In total, 277 lakes have been sampled, about two-thirds of which are located on the coastal mainland and the remainder on Vancouver Island. These data will make up the western component of an ongoing national aquatic critical load mapping program.

Results of the critical load research program in southwestern British Columbia were highlighted in a workshop on the effects of sulphur and nitrogen deposition in western Canada. This included important work on soil sensitivity, soil critical load mapping, aquatic critical load developments, and temporal trends in precipitation chemistry.

3.2 Research

The following sections provide examples of the type and range of research undertaken in 2010–2011.

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 the Clean Air Regulatory Agenda (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, modeling 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 2010–2011 included the following:

Urban air pollution originates from many sources, and as a result, Canadians inhale a complex mixture of pollutants. The composition and variability of these mixtures were examined in detail across Montréal's urban area. Neighbourhoods affected to varying degrees by an industrial sector (e.g., petrochemical) and/or by heavy traffic were compared to identify better indicators of specific pollution sources. Some compounds, such as

nitrogen oxides, had a tendency to be associated with most mixtures, particularly those related to traffic, and thus show good potential as indicators of population exposure to traffic pollutants. Although other compounds were better indicators of exposure to industrial sector pollutants, nitrogen oxides also exhibited some link to these emissions and therefore they may represent the best single pollutant indicator of the level of exposure. Certain compounds were strongly linked to specific industrial sectors (e.g., sulphur oxides) and thus they were not always part of the common mixtures. Moreover, the ratios of some of the common pollutants varied by neighbourhood (e.g., relative amounts of some hydrocarbons). Pollutant mixtures also showed seasonal variability, which can have an effect on population exposure.

In southern Ontario, Canadians are exposed to a constantly varying mixture of home-grown pollution, pollution from U.S. sources along and near the Great Lakes and long-range-transport pollution from farther upwind of the Great Lakes region. The weather patterns in the Great Lakes make it difficult to determine which of these geographic areas plays a greater role, particularly during smog episodes. During the reporting period, a suite of scientific results was released that document the outcome of an intensive study focused on far-southwestern Ontario. Measurement experts, meteorological researchers and air quality modelers worked closely together to determine the sources of the two main smog ingredients, ozone and $PM_{2.5}$, as well as the factors that influence their levels. Rapid ozone and $PM_{2.5}$ creation was found to occur over the lakes and in long but narrow regions over land. Emissions from relatively local sources, those close to the Great Lakes on both sides of the border, were found to be a major contributor; this will help to focus attention on these areas for future efforts to improve and also to forecast air quality.

New PM formation and transformation pathways were established through laboratory studies, advancing our understanding of how PM and gaseous pollutants interact with each other and how far pollutants are able to be transported. Research into these new pathways will be used to enhance the capacity of air quality models to predict PM levels across Canada. Overall, such research is expected to boost regulatory decision support in the future.

Inventories of PM emissions from commercial ships were validated using ship-borne measurements. Black carbon and sulfur emission levels from ships are being reduced in response to regulations on fuel sulfur contents in emission control areas on the west coast of North America. Black carbon emission reduction is an unanticipated outcome of such regulations. The research demonstrated the effectiveness of fuel-use regulations in improving air quality in coastal cities where commercial shipping is a major source of air pollution.

To investigate the role of Canada's forests as sinks or sources of aerosol particles, an experiment was conducted with university collaborators to measure the fluxes of particles and volatile organic compounds at the Borden Forest Research Station. Surprisingly, this forest appears to act as a net source of particles 60% of the time. The processes responsible for this observation require further study, but may involve the reaction of human-source gaseous pollutants with biogenic organic emissions of the forest.

An intensive field study using ozone sonde (balloon instrumentation) and lidar (laser-based remote sensing technology) instruments was conducted to investigate the production of ozone from boreal forest fires and to quantify the impact of boreal biomass burning on the global tropospheric composition. Satellite sensors were also used to verify the results of this collaborative study. This information will help improve model predictions regarding the long-range transport of these emissions.

Environment Canada is the lead contributor to the World Meteorological Organization's Global Assessment of Precipitation Chemistry and Deposition, a collaborative initiative of the Global Atmosphere Watch Programme aimed at informing the global scientific and policy communities of the chemical composition of precipitation and atmospheric deposition of major compounds, on global and regional scales. During the reporting period, observations from international, national and regional monitoring networks around the globe were gathered and carefully screened for quality and comparability. Models of total global deposition estimates were generated and integrated together with these measurements to fill in spatial gaps and present a more complete picture of global

atmospheric deposition. Assessment chapters are in their draft stage.

The Ocean–Atmosphere–Sea Ice–Snowpack (OASIS) project is one of 44 Canadian-funded projects—and one of five led by Environment Canada scientists—that commenced during International Polar Year (IPY). OASIS focused on the role of atmosphere-surface interactions in the fate of pollutants, such as mercury and ozone, over the Arctic Ocean. In collaboration with American and European scientists, Environment Canada scientists gained new insights into the chemistry responsible for ozone and mercury depletion. The findings of the OASIS study about the important role of the lower Arctic atmosphere in determining the extent to which ozone and mercury affect this area are now documented. The results also show that the retention rate for mercury deposited in the Arctic is higher in the Arctic Ocean than on the snow or on the land, thus affecting the amount of mercury entering the Arctic ecosystem. These findings will help improve forecasting capabilities over the Arctic Ocean. The legacy of IPY includes ongoing deployments of automated buoys that were developed under OASIS. These buoys measure pollutants and meteorology and transmit the data through satellite communications. A network of these buoys will help unravel the processes responsible for ozone and mercury depletion during the Arctic spring.

The trans-Pacific transport of pollutants from Asia, Europe and elsewhere can have a significant influence on the regional air quality. The number of measurement sites on Canada's west coast has been increased in order to better understand the current influences on air quality and to provide a baseline against which to demonstrate changing contributions. Data from a new low-level site on the west coast of Vancouver Island, an elevated site in the Yukon, and a mountain site in Whistler, British Columbia, will provide information on transport events from both the northern and southern west coast at multiple elevations. In addition, intensive field measurements were deployed at two field sites on Whistler Mountain during the summer of 2010 to study the chemical and physical properties of clouds and aerosols in the region. Sources of particles at Whistler come not only from the long-range transport of pollution, but from forest emissions and fires as well. In collaboration with multiple university partners, the summer of 2010 study produced a comprehensive suite of results to describe emissions, chemical transformation, and resultant gas and aerosol products. This new information on aerosol formation and cloud properties will be incorporated into air quality and climate models to increase the predictive capacity of these tools.

Field measurements of ambient ammonia are currently underway in areas of the country associated with extensive agricultural activity. In collaboration with university partners, levels of ammonia are being determined in major Canadian cities and emissions from natural and agricultural surfaces have been studied. Environment Canada has recently published the results of some of their laboratory studies investigating the uptake of ammonia by particulate matter (PM). The field measurements and laboratory studies undertaken in 2010–2011 will assist in the establishment of baseline ambient levels of ammonia, enhance our understanding of the role of ammonia in particle formation, and provide a means to evaluate emission inventories and air quality forecasting models.

In late fall 2010, Environment Canada began conducting ambient air measurements of polycyclic aromatic compounds and selected metals in the Athabasca oil sands region of Alberta. The goal of this project is to calculate the annual atmospheric deposition of these pollutants to the surrounding environment. In the oil sands region, atmospheric deposition is the main pathway for these contaminants to reach sensitive ecosystems.

High-resolution air quality model and trajectory simulations showed that air pollution in the vicinity of Lake St. Clair is sometimes the result of helical (corkscrew) recirculation flow along the lake's southern edge, each return loop taking 1.2 to 3.0 hours. This recirculation resulted in rapid formation of sulphate and organic aerosols, each circulation loop bringing fresh precursor emissions back over the lake.

Environment Canada's air quality forecast model GEM-MACH15 provided special forecast guidance for an international climate and air quality field campaign (CalNex 2010) conducted in the spring of 2010 over southern California. The GEM-MACH15 forecast was also included in a comparative study involving several air quality

forecast centres in North America to identify biases and uncertainties in current air quality model forecasts. The goal was to provide direction for model improvement and to assess the understanding of the processes vital to air quality and climate interactions.

To better understand the impact of climate change on air quality, the air quality model was coupled to a regional climate model and three ten-year summer simulations of air pollution were carried out. The model results suggest that air quality will worsen in the future under a changing climate, but would be greatly improved through the co-benefit reductions of smog precursors expected to occur under the Intergovernmental Panel on Climate Change's recommendations for reducing greenhouse-gas emitting activities.

3.2.1.2 Air Quality Research in Support of the Chemicals Management Plan

Research studies that were undertaken in support of the CMP in 2010–2011 included the following:

Environment Canada continued to provide leadership, direction and recommendations on new and existing air-related analytical testing methods suitable for targeted chemicals under the CMP. A preliminary study was performed on selected personal care products to assess the volatility of methylsiloxanes, which are ingredients in these products. This study will lead to the development of a guidance document to help risk managers evaluate siloxanes in these products.

Earlier research led to the development of new reference methods for chlorinated paraffins. These validated reference methods helped with the determination of the level of quantification (LoQ) for chlorinated paraffins in aqueous and solid matrices in the environment. The LoQ is suggested as a baseline to assist in establishing a virtual elimination target.

The regulatory reference method entitled *Reference method for the analysis of 2-butoxyethanol (2-BE) and other glycol ethers (GEs) in selected products (automotive and household cleaners, paints, paint strippers and solvents)* was published in 2010–2011 in support of the existing *2-Butoxyethanol Regulations*. This reference method for the determination of 2-butoxyethanol and other glycol ethers is available on Environment Canada's website (www.ec.gc.ca/Publications/default.asp?lang=En&xml=EC1E3FFB-61ED-4317-91CC-36FF5F66949C).

The development and evaluation of new analytical capabilities to measure platinum group elements (PGEs), extensively used in automobile catalytic converters, in airborne PM and sediments/sludges continued. The study is supporting research aimed at evaluating whether PGEs in sewage sludge/lake sediments originates from the use of these elements in industrial processes, consumer goods or road/airborne sources. Environment Canada is also developing and implementing analytical methods to address the knowledge gaps in atmospheric science 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 using a wide array of conventional and renewable fuels.

A study was carried out to determine whether certain antioxidants (CMP substances) that are used to stabilize gasoline and diesel fuels could be detected in the exhaust emissions of vehicles using these fuels. These additives, including 2,4,6-tri-tert-butylphenol and selected substitutes, are used to prevent the formation of engine-fouling residues. The results will inform decisions related to risk management of these additives and their alternatives.

An analytical method was developed and tested to measure lanthanum and other lanthanoids (cerium to lutetium) in coarse and fine PM collected at selected sites within the NAPS network. The study concluded that for the coarse ($PM_{10-2.5}$) particulate fraction, the relative concentration pattern of the lanthanoids 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, this study supports the previous reports that lanthanoids are reliable tracers of emissions related to the oil-refining industry.

Research was conducted to determine the effect of aging on the volatilization potential and bioavailability of brominated flame retardants (BFRs) in soil. Some key findings of the study are that the degradation of BFRs in soil occurs in two

phases and that these chemicals are vulnerable to degradation. In addition, the volatility of BFRs lessens over time because they become more strongly bound to the soil as they age. The outcome of this research will help improve existing regional and global atmospheric transport models by capturing soil-air exchange processes. It will also further understanding of the environmental fate (bioavailability) of chemicals in soil.

3.2.2 Climate Research

Environment Canada continued to provide science-based information on the past, present and future climate. It focused on how climate is changing, the causes and effects of this change, and its attribution to natural and human causes. Activities under the climate research program in 2010–2011 included:

- Enhancement and application of global and regional climate models: to simulate global and regional climate change, attribute observed climatic changes to specific causes, and predict seasonal and longer-term climatic variations.
- Transformation of raw climate model output into climate scenarios, including climate extremes, for use in impact assessment and adaptation decision support.
- Monitoring and data analysis, to document and understand climate trends and variations.
- Cold-climate and land-surface process research: to understand the mechanisms of climate change, particularly in northern regions.
- GHG monitoring and research: to improve monitoring methods, quantify anthropogenic and natural sources, and to put these into a continental and global context.

The Department's climate research continues to support GHG mitigation policies and adaptation planning. It is coordinated with international efforts under the World Meteorological Organization and World Climate Research Program and contributes to the Intergovernmental Panel on Climate Change (IPCC). Below are examples of this work.

- Research has been conducted with Environment Canada's Second Generation Canadian Earth System Model (CanESM2), which represents the physical climate system and biogeochemical cycles (carbon and sulphur). The results indicate that climate stabilization near the 2°C limit, as agreed to under the Copenhagen Accord, requires the immediate leveling off of global carbon dioxide (CO_2) emissions, and the implementation of mitigation technologies/strategies within a few decades. This would lead to the net removal of CO_2 from the atmosphere before the end of the century. A 3°C target can be met if emissions level off within a few decades and then decline rapidly to roughly 1970 levels by the end of the century. Minimal effort to reduce emissions will lead to warming of nearly 6°C by the year 2100, with continued warming thereafter.
- Climate simulations indicate that global temperatures stabilize almost immediately following a cessation of emissions and remain at the level reached when emissions ceased. However, irreversible and ongoing climatic changes (temperature and precipitation) are projected to occur at regional scales even after human CO_2 emissions are eliminated, adding to our understanding of the spatial scales of irreversible climate change.
- Detection and attribution studies have shown that human-induced GHG increases have contributed to the observed intensification of heavy precipitation events over large parts of the Northern Hemisphere, including North America, mid-latitude Eurasia, and India. Research results also suggest that the global climate models used in the study may have underestimated the observed trend, suggesting that future changes in extreme precipitation, predicted by the models, may also be underestimated, such that extreme precipitation events may intensify more quickly in the future than projected and that impacts may be more severe than currently estimated. The research made use of outputs from multiple climate models driven by anthropogenic forcing from 1951 to 1999 and the results were compared with observations from the same time period.
- Atmospheric cooling from the effect of anthropogenic carbonaceous aerosol particles on the reflectivity of sunlight by water clouds remains an uncertainty for climate prediction. Observations show, for the first time, that the contribution from carbonaceous material in the

particles to this effect is greater than that from sulphur in the particles, as suggested by a small fraction of global climate model simulations.

- In evaluating the robustness of the standard metrics developed to compare the global warming potential (GWP) of CH_4 and N_2O with that of CO_2, it was found that the global warming effect of CH_4 and N_2O may be 20% higher than indicated using the current metric of 100 year GWP. Research results were obtained using simulations from the coupled carbon version of the University of Victoria's Earth System Climate model to evaluate the feedbacks of warming induced by CH_4 and N_2O on the carbon cycle, and demonstrate that the future evolution of stratospheric ozone will be sensitive to the relative changes in CO_2 and N_2O in the future.

3.2.3 Water

3.2.3.1 Chemicals Management Plan Substances

The Department carried out research to support the assessment of substances under the CMP. The research was synthesized and sent to risk assessors to allow them to make better-informed decisions on substance assessment.

Volatile methyl siloxanes (VMSs)

Studies on the long-range transport and physical-chemical properties of VMSs were accelerated in 2010–2011 to assist in the risk assessment of these chemicals. A method for the determination of VMS in water was finalized and used for the determination of VMS in influent, effluent and receiving waters from municipal wastewater treatment plants in southern Ontario and southern Quebec. Concentrations of decamethylcyclopentasiloxane (D5) ranged from 7.8 to 135 micrograms per litre (µg/L) in wastewater treatment plant effluents and from <0.004 to 1.5 µg/L in surface waters. D5 is a major VMS, which has been assessed as toxic under CEPA 1999, and is used in personal care products and in industrial applications as solvents, lubricants, coatings and sealants. In addition, a method for the determination of VMS in sediment and soil was developed. It was used to determine levels of VMS in sediments in the receiving waters of municipal effluents, soils from sludge-amended agricultural lands, and sediments in Ontario and Quebec. Concentrations of D5 ranged from 0.023 to 5.8 µg/g in sediments and from 26 to 328 µg/g in biosolids from wastewater treatment plants.

Fathead Minnows were exposed to a wide range of concentrations of cyclic siloxane D5. During the 65-day exposure period, few effects were seen. Egg hatching and larval fish survival and growth were normal. Juvenile fish survival and growth were good in all concentrations, being similar to those of the control fish. At environmentally relevant exposure levels, the concentrations of D5 in fish were about 5000 times the concentrations of D5 in water. Fathead Minnows exposed to the highest D5 concentrations had higher condition factors (a measure of general well-being) than the control fish that had not been exposed to D5.

Detailed research reports and data were provided to risk assessors, for use in their risk assessment of D5 in the Canadian environment, and also to a board of review.

Perfluorinated chemicals

Perfluorinated chemicals (PFCs) remain a concern in Canada due to their toxicity, persistence and potential for biomagnification. Research on PFCs in the aquatic environment continued in 2010–2011, with a focus on identifying new fluorinated chemicals. Perfluoroalkylcyclohexane sulfonate (PFECHS), a new class of fluorinated substances that is reportedly used as an erosion inhibitor in aircraft hydraulic fluids, was measured for the first time in Great Lakes fish and waters. The highest concentrations in water were found in Lake Michigan. The actual source of the chemical is unknown, although it likely enters the lakes from wastewater treatment plant effluents. Studies continued on the perfluoroalkyl phosphates and phosphonates that are used as an anti-grease coating on paper products and in floor polishes. A cross-Canada survey showed that these chemicals are present in surface waters at concentrations similar to those of other chemicals such as perfluorooctanoic acid.

Metals

A sediment core sampled from the centre of the western basin of Lake Ontario was analyzed for platinum group elements (PGEs) and rare earth

elements (REEs) as part of a CMP-funded study of metals in the environment. PGEs are widely used in automobile catalytic converters and often detected in road dust; REEs are used in electronic devices and released during burning or recycling. Neither group of elements had been previously determined in the Great Lakes. Platinum and palladium, the major PGEs in automobile catalysts, showed maximum concentrations in sediments dated to the 1990s and early 2000s. REEs were detected in the same sediment core but showed no distinctive historical trends, implying that their current use has little impact on the open lake.

Studies began on zinc pyrithione (ZnP), which has been used to replace tributyl tin as a ship anti-corrosion agent, and on other chemically related zinc-based organic chemicals that are used as commercial lubricants, fuel additives and greases. Initial measurements of zinc in sediment cores from Toronto Harbour and the western basin of Lake Ontario showed major deposition of zinc-based products since the 1940s. Methods for determining ZnP and other specific zinc chemicals are under development.

An impact assessment of inorganic mixtures associated with sediments and waters from the Lac Dassarat area in Quebec was initiated as part of a three-year, three-pronged bioassessment (spatial, temporal and historical). Conducted by the ministère des Ressources naturelles et de la Faune du Québec, this assessment was launched to monitor the effect of remediation of an abandoned metal mining site.

Phosphate ester flame retardants

Research continued on the presence of flame retardants in surface waters. A series of phosphate ester flame retardants, which are replacements for the banned PBDEs, were determined in wastewater treatment plant effluents and surface waters in Canada. The predominant phosphate ester in treated effluent and surface waters was tris(butoxyethyl) phosphate (TBEP), which was present at concentrations ranging from 29 to 6800 ng/L. TBEP is used as a plasticizer in rubber and plastics.

Benzotriazoles

Studies were initiated on benzotriazoles (BTZs) and substituted benzothiazoles (BThZs), widely used as corrosion inhibitors, in surface waters. BTZs are also used in aircraft de-icing fluids and as UV absorbers in polymers, and as household detergent additives. BTZ was detected for the first time in Canada in the surface waters of Hamilton Harbour and western Lake Ontario, at concentrations ranging from 60 to 610 ng/L.

Surfactants

A sediment toxicity system was developed using a test battery of liquid and solid phases for sediments contaminated with brominated derivatives of bisphenol A. Regulators will be able to predict the toxicity of both the solid and liquid phase of sediments based on the physical and chemical characteristic of compounds and sediment properties such as grain size, organic carbon, and interstitial water pH. Results indicate that tetrabrominated bisphenol A was less toxic than its debrominated derivatives. The *Hydra* test proved to be the most sensitive, with an EC50 of 0.1 mg/L for all debrominated derivatives, 0.2 mg/L for tetrabromobiphenol A, and 1.3 mg/L for bisphenol A.

Tetrabromobisphenol A bis(2,3-dibromopropyl ether) (TBBPA-DBPE) is an additive flame retardant for polyolefins and polymers, high-density polyethylene, and low-density polyethylene. TBBPA-DBPE is a potential replacement product for high-volume penta- and octa-BDPE flame retardants that are being phased out of production and use. The substance is also used in fabricated plastic sheet materials. TBBPA-DBPE was chosen for toxicological characterization by the National Institute of Environmental Health Sciences. A study was undertaken to synthesize the potential degradation products of TBBPA-DBPE. Five breakdown products of TBBPA-DBPE have been synthesized in a pure form. These standards will be used to study toxicity, carcinogenicity and genotoxicity.

Dyes and pigments

Environment Canada assessed several dyes to determine their sublethal toxicity to invertebrates (*Hyalella*) and fish (Fathead Minnow). Toxicity to fish was seen at low concentrations (approximately 10–15 µg/L measured) of the dis-azo dye Disperse Yellow 7. Sudan Red G, a mono-azo dye, was also toxic to Fathead Minnow larvae at a concentration of 100 µg/L. The anthracenedione dye Acid Blue 80

was non-toxic at 7.7 mg/L. Data from fish indicate a delayed toxic response, with larval fish succumbing four to five days after hatching. This finding is important to bioassays for the assessment of toxicity in fish embryos or hatchlings, when toxicity of these compounds would be greatly underestimated. Preliminary results from chronic toxicity tests with *Hyalella* indicate that survival was affected by Disperse Yellow 7 and Acid Blue 129 at 120 and 7000 µg/L, respectively. Life-cycle tests (ten weeks) were then conducted with Disperse Yellow 7 at sublethal concentrations, and although survival and growth of *Hyalella* were not affected, reproduction was lower than that of control individuals at the lowest tested concentration (8 µg/L). Chemical analysis is in progress, and based on data from fish toxicity tests, the toxicity estimates for these compounds to *Hyalella* will be lower when they are based on measured water concentrations. Research was also conducted on the overall environmental mobility and fate of various azo dyes. Disperse Yellow 7, Sudan 3, and Sudan Red G were all found to bind strongly to sediment organic matter; only Sudan 3 bound irreversibly, showing that Disperse Yellow 7 and Sudan Red G remain bioavailable and susceptible to environmental transformation. In the case of Disperse Yellow 7, transformation products were identified using a very-high-resolution liquid chromatograph (and included known carcinogens like phenylenediamine and benzidine). These data will be used to support CMP risk assessments and compared with expected or measured environmental concentrations, to determine whether these dyes pose a potential concern to the environment downstream of textile dyeing facilities or municipal wastewater outfalls.

3.2.3.2 Pesticides and Herbicides

Research begun in 2008–2010 was continued in 2010–2011 to examine the use of short-term in situ (caging in the field) exposures using a freshwater crustacean (*Hyalella*) as a indicator to predict long-term effects of current-use pesticides in aquatic ecosystems. Patterns of decreased survival and acetylcholinesterase (AChE) activity have been consistently observed over three field seasons after caging *Hyalella* for one week in streams in the Niagara Region of southern Ontario, where organophosphate and carbamate insecticides (which inhibit AChE activity) were detected. AChE inhibition appears to be an early warning indicator of organophosphate exposure and/or effects occurring in situ; similar results were obtained in laboratory tests with two organophosphates routinely detected at field sites. Maximum AChE inhibition occurred rapidly in *Hyalella* exposed to these same organophosphates (four days), but recovery of AChE activity after *Hyalella* were transferred to clean water was much slower (>14 days). This finding is important when assessing the risk of pesticide use to aquatic organisms, as short-term exposures to pesticides may have effects after the exposure has ceased. Laboratory studies to identify the effects of individual pesticides and pesticide mixtures measured at sites during in situ exposure are ongoing.

A study has been under way since 2009 to understand the transfer and fate of sulfonylurea herbicides between the main environmental compartments (air, precipitation and water) in the catchment of the Yamaska River, in Quebec, which drains a large agricultural watershed. The study sites are located at the mouth of the river, immediately upstream of the Bay Saint-François to Lake Saint-Pierre. Preliminary results indicate the presence of these herbicides, with a short life cycle (<5 days) in surface waters, but not in air or precipitation, suggesting a rapid transfer between the field and the river.

Amphibian populations are in decline worldwide and contaminants such as pesticides have been identified as one of the potential causes of this decline. Juvenile Leopard Frogs were exposed to glyphosate or atrazine for 21 days and then challenged with a chytrid fungus. The fungal infection had no effect. However, exposure to glyphosate significantly reduced the growth of juvenile frogs by the end of the herbicide treatment. Exposure to atrazine significantly reduced frog growth (i.e. weight) 73 days after the herbicide treatment. No other effects were detected. These results suggest that exposure to these herbicides may affect future survival and reproduction of Leopard Frogs, since these factors are both negatively affected in frogs displaying reduced growth. In another experiment, exposure to high concentrations of glyphosate proved fatal to American Toads, indicating that this pesticide is toxic at higher concentrations.

3.2.3.3 Municipal Wastewater Effluents

The Department carried out several research studies to assess the effects of municipal wastewater effluents on wild and laboratory fish and on feral mussels. Chemical characterizations of the effluents were also performed to assess pharmaceutical and personal care products, as well as conventional toxicants such as ammonia, metals, and hydrocarbons, among others.

Fathead Minnows were exposed for a complete life cycle in the laboratory to secondary-treated municipal wastewater effluents from cities in Ontario. Growth, health and reproductive status were assessed in fish at five months of age. Pharmaceutical and personal care products and endocrine-disrupting compounds detected in the municipal wastewater effluents included (in descending order of concentration): trimethoprim, carbamazepine, bisphenol A, sulfamethoxazole, diclofenac, monensin sodium, ciprofloxacin, norfloxacin, clofibric acid and bezafibrate (at 560 to 140 ng/L) and naproxen, gemfibrozil and ketoprofen (at 57 to 32 ng/L). The fish grew well in all three effluents, but reproduction was reduced in two of the three effluents. The long-term exposures show the complex response of fish to municipal wastewater effluents, with normal growth but decreased reproductive output. This is a collaborative study with the Ontario Ministry of the Environment, which is undertaking the detailed measurement of pharmaceutical and personal care products in the municipal wastewater effluents.

Regina treats its wastewater at a modern treatment plant located on Wascana Creek. In winter, treated wastewater effluent makes up almost 100% of the creek's streamflow. Four surveys conducted from 2005 to 2007, during different seasons, indicated that nitrogen (N) and phosphorus (P) concentrations were higher at sites downstream of the treatment plant than at an upstream control site. Results indicate that nitrate and nitrite concentrations far surpassed World Health Organization limits for drinking water and sensitive taxa, while ammonia, nitrate and nitrite concentrations exceed not only the Canadian water quality guidelines for the protection of aquatic life but U.S. EPA guidelines as well. High ammonia concentrations may be responsible for decreases not only in planktonic algal biomass and production observed downstream but also reductions in primary production to bacterial production ratios. The Wascana Creek study highlights the considerable problems associated with excess nutrients in effluent-dominated ecosystems. It also underlines the need for better controls on ammonia inputs from wastewater treatment plants in such ecosystems.

Environment Canada conducted research to evaluate the occurrence and endocrine-disrupting effects of veterinary and human pharmaceutical products and pesticides and to understand their impacts on the health of the aquatic environment. The Grand River watershed was selected for the initial studies under this project, as it represents one of the river systems most affected by agricultural practices and municipal wastes in Canada. Moreover, this watershed was used in previous studies aimed at developing an understanding of the effects of treatment processes on biological responses in receiving environments. Field studies were conducted in November 2010 to assess sentinel fish species under recrudescent conditions in terms of growth, reproduction (gonadosomatic indices and histology) and survival. Only male fish were sampled, which allowed us to expand on this existing study evaluating the presence of the intersex condition while maximizing the number of sites sampled. Male darters along an agricultural gradient in the Conestogo River (Waterloo, Ontario) did not differ significantly between sites for length or body weight, fish condition (fish weight- to-length ratio) or in relative liver size. Histological analyses of pre-spawning males serve to evaluate the reproductive status of male darters and the potential of the intersex condition in male fish in these systems. Passive sampling devices were also deployed along gradients of agricultural activities associated with domestic wastewater discharges for a period of 21 days in November 2010 to allow accumulation of lipophilic compounds and polar organic compounds suspended in the water column. Finally, water samples were taken from each site to measure conductivity, ammonia, total Kjeldahl nitrogen, dissolved phosphorus, total phosphorus, dissolved chloride, nitrite and nitrate. These results confirm that these sites are highly impacted by nonpoint-source agricultural activities.

A new analytical method was developed to allow detection of antibiotics (e.g., ciprofloxacin and enrofloxacin) and organic contaminants at trace

levels in environmental waters subject to discharges of municipal wastewater. While conventional methods allow the detection of antibiotics and other organic contaminants (pharmaceuticals) in municipal wastewater, surface water and drinking water at concentrations between 2 and 289 ng/L, the detection limits of the new method were reduced to levels as low as 0.5–60 ng/L.

In collaboration with the Canadian Water Network, caged mussels and Fathead Minnows were deployed at sites upstream and downstream of municipal effluent outfalls in the St. Lawrence River and in Grand River. The presence of pharmaceutical products in the water column was assessed using semi-permeable membrane devices. Preliminary results revealed that the immune system of mussels exposed to municipal wastewaters was affected and that biotransformation activity was increased after two weeks of exposure at the sites downstream of the effluent outfalls.

The in vitro immunotoxicity and hepatoxicity of untreated and treated municipal wastewater samples from 15 large Canadian cities were examined in an attempt to obtain a clearer picture of the toxic risk of municipal wastewater effluents to fish. Special emphasis was put on xenobiotic biotransformation, oxidative stress, genotoxicity and estrogenic activity. A toxicogenomic approach using gene expression arrays was also used to understand the basic risk potential of municipal wastewater effluents.

Studies of the Johnny Darter, a small bottom-dwelling fish, upstream and downstream of the Montréal wastewater effluent outfall in the St. Lawrence River demonstrated that parasite species composition differs between polluted and reference sites. This result corroborates previous results on Spottail Shiners and Yellow Perch. Furthermore, the number of parasite species is lower in fish exposed to the municipal effluents than in those upstream. These results support previous studies that suggest the food web in the effluents is altered, possibly due to the high organic input from the wastewater treatment plant.

Wastewater discharges into the aquatic environment affect the quality and functioning of ecosystems by creating toxic stress, which affects the health of animal populations and changes the energy transfers supporting aquatic biological production. Research conducted in 2009 and 2010 focused on identifying the effects of municipal wastewater discharges on populations of Muskellunge, a top predator fish in the St. Lawrence River. The analysis of the levels of trace metals and stable isotopes in fish captured upstream and downstream of the Montréal effluent outfall shows that fish exposed to wastewater have characteristic contamination profiles. The levels of 15 pharmaceuticals measured in three fish organs (muscle, liver and brain) were also significantly higher in fish caught downstream of the discharge point, which shows a continuous exposure of organisms to these substances in the natural environment.

Studies in the Grand River, Ontario, have shown that freshwater mussels living downstream of the outfalls of multiple wastewater treatment plants and urban runoff discharge points have significantly lower condition factors, impacted immune responses, and shorter life spans than mussels living upstream. The steady increase in the amount of bioaccumulated metals (Pb, Cu, Cr, Zn, Al) in wild mussels reflects the increase in urban inputs moving downstream. These results indicate that freshwater mussels living downstream of urban areas experience cumulative negative effects. Current studies are investigating whether the observed trend of increased proportions of egg-carrying females downstream of municipal effluents indicates feminization of the mussel population.

3.2.3.4 Nanoparticles

Various studies conducted in collaboration with the OECD community were designed to assess the toxicity of cadmium-based quantum dots, nano-silver, dendrimers (a drug vector) and nanozinc, to better understand the potential environmental risk of these nano compounds to aquatic life.

A method was developed for the physical characterization (size distribution) of nanoparticles. More methods are still needed for the chemical characterization of nanoparticles and their degradation/transformation products.

Progress was made in 2010–2011 on evaluating the bioaccumulation and toxicity of nano iron, nano-silver, nano titanium and nano zinc in the benthic crustacean *Hyalella azteca*. The research was conducted as part of Environment Canada's risk assessment of these materials and in support of Canada's commitment to the Organisation for

Economic Co-operation and Development. The toxicity of all nano forms was either lower than or similar to that of simple ionic forms of the same metal. Nano forms of silver and iron were not toxic; however, the ionic forms of these nanomaterials did not cause effects on aquatic organisms. A preliminary report was submitted to the Canadian Working Group on Nano Materials.

3.2.3.5 Fate of Mercury

As part of the research program on mercury pollution, research on the transportation and deposition of atmospheric mercury along the St. Lawrence Valley continued in 2010–2011 with continuous measurements at two sampling sites: Longue-Pointe-de-Mingan and Saint-Anicet). This study aims to evaluate the importance of sources of mercury on the receiving environment. The mercury data are correlated with meteorological data at each site to develop models of changes in atmospheric concentrations of mercury according to the different points of known sources. The results provide information that is useful for monitoring and modeling the fate of mercury in the environment.

A study on the mechanisms of transport and transfer of total mercury and methyl mercury inside a maple tree was conducted at an experimental site in Saint-Anicet, near Lake Saint-François, Quebec. The study aims to describe and understand the cycle of mercury and different chemical forms present in the deciduous forest and to evaluate the toxic impacts of mercury on the aquatic environment.

3.2.4 Wildlife and Soil

3.2.4.1 Substance-specific Research

Research continued on the fate and geographic and temporal trends in contaminants in Canadian and circumpolar Polar Bears and their food webs, in relation to factors influenced by climate change. One study provided the first known evidence that the earlier onset of sea-ice breakup, 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 a more rapid increase in the levels of some persistent and bioaccumulative contaminants found in the Polar Bears from this subpopulation. The pollutants studied contain the compounds chlorine and bromine, and include 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 prey species, which accumulate higher contaminant levels. Another effect of warming waters in Hudson Bay has been to alter the diet of a seabird species, the Thick-billed Murre. Stable isotope analyses of murre eggs over a 17-year period has shown a shift in prey to lower trophic-level (lower level in the food chain) fish species, resulting in a reduced exposure to chemical contaminants. This change in exposure has affected the temporal trends in levels of monitored contaminants.

Work continued on the effects of contaminants on the thyroid systems of birds and other wildlife, and on biomarker methods that could be used to measure thyroid system change. One in vitro study demonstrated the binding of selected PCB and PBDE flame retardant congeners, and their hydroxylated and methoxylated analogues, to human and gull blood albumin and transthyretin transport proteins, which demonstrates potential displacement of natural hormones at the binding sites. The results suggest that hydroxylated PCB and PBDE analogues may present an exposure concern to the thyroid system in free-ranging gulls.

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 from two populations with differing 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 diets and related differences in 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 of

dolphins and seals from the western North Atlantic. Cerebellum grey matter was also opportunistically analyzed in three individual dolphins. The levels of all contaminants detected were higher in the cerebellum grey 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 on 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 to identify and characterize and to determine the spatial and temporal trends in legacy and emerging contaminants in eggs of Herring Gulls 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 in 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 on 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 areas, in rural and remote areas, and at point-source sites. The findings from this monitoring program are used to evaluate environmental responses following regulatory actions on chemicals, and contribute to the CMP. The results of this program show that European Starlings nesting near landfill sites show elevated levels of perfluorooctane sulfonate, while Tree Swallows nesting near wastewater treatment plants have detectable levels of bisphenol A in their blood plasma but not in their eggs.

A multi-tiered in vitro/in vivo toxicity screening approach was used to determine the toxic effects of four brominated flame retardants (BFRs) and their influence on gene expression in domestic chicken liver cells and whole embryos. The chicken is used as a surrogate avian species for wild birds. The four BFRs were hexachlorocyclopentadienyl-dibromocyclooctane (HCDBCO), bis(2-ethylhexyl) tetrabromophthalate (BEHTBP), 1,2-bis(2,4,6-tribromophenoxy)ethane (BTBPE) and decabromodiphenylethane (DBDPE); the latter three have been detected in biota, including wild birds. None of the BFRs were toxic to liver cells or embryos at levels exceeding those detected in the environment. However, they did alter the expression of genes associated with xenobiotic metabolism and the thyroid hormone pathway. A preliminary study on two polybrominated diphenyl ether-replacement organophosphate flame retardants, tris(1,3-dichloro-2-propyl) phosphate (TDCPP) and tris(1-chloro-2-propyl) phosphate (TCPP), did reveal cytotoxicity (cell damage) and significant changes in genes associated with xenobiotic metabolism, thyroid hormone regulation, and growth and lipid metabolism in chicken liver and brain cells. These results were similar to those observed for hexabromocyclododecane, a compound that is now being phased out due to its toxicity.

Studies were completed that compared the effects of two isomers (linear and technical grade) of perfluorooctane sulfonate (PFOS) on gene expression in cultured avian liver cells. The results indicate that technical-grade PFOS affected the expression of more genes than did linear PFOS. The technology used for this research (DNA microarrays) was highly successful and is currently being used to determine the biochemical and molecular effects of in-use perfluoralkyl compounds (PFCs). Two PFOS-replacement PFCs, perfluorohexane sulfonate (PFHxS) and perfluorohexanoic acid (PFHxA), were injected into the eggs of developing chicken embryos. Both compounds decreased hatching success at levels exceeding those detected in the environment and PFHxS negatively affected embryonic growth.

Laboratory studies on liver cell cultures of three species of bird determined that highly purified (i.e., dioxin-free) hexachlorobenzene caused induction of cytochrome P4501A (an enzyme used as an environmental biomarker) in each species. These studies were the first to confirm that hexachlorobenzene meets one of the criteria for being formally considered a "dioxin-like" chemical, which would influence its possible inclusion in the "toxic

equivalency" risk assessment scheme for wild birds. The results of this work are being used as part of an environmental risk assessment in the United States.

Laboratory studies were conducted on the effects of perfluoroalkyl compounds on gene expression in cultured avian liver and brain cells to determine and predict the potential toxic effects of current-use perfluoroalkyl compounds. The Glaucous Gull, an Arctic top predator, was used as a bioindicator species 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 continued to examine the effects and toxicokinetics of selected BFRs on captive American Kestrels, Zebra Finches, Ranch Mink, and Snapping Turtles. In American Kestrels, exposure to beta-tetrabromoethylcyclohexane (TBECH), one of two isomers found in the commercial flame retardant TBECH, induced changes in reproductive success and behaviour as well as nestling growth. Earlier research on the American Kestrel was instrumental to the acceptance of the United Nation's Stockholm Convention Draft Risk Profile of hexabromocyclododecane in October 2010; it demonstrated long-term, multi-generational effects following short-term exposure to the commercial flame retardant mixture DE-71. 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 BFR (bis[2,4,6-tribromophenoxy] ethane, BTBPE) was found to accumulate largely in abdominal fat but not in the liver, while environmentally relevant exposures had minimal effects on reproduction, juvenile growth or thyroid function. Contaminant uptake and possible oxidative stress in Snapping Turtles and mink exposed to BTBPE is currently an area of active research.

Research was completed on the exposure of Tree Swallows to various chemicals associated with wastewater treatment plants, particularly current-use flame retardants and those flame retardants recently banned but still persistent in the environment. Nearly all of the measured flame retardants were detected in the eggs of Tree Swallows, and some were associated with reproductive and developmental changes in the birds.

Research was also conducted to examine the exposure of Peregrine Falcons to flame retardants. Dechlorane Plus and several other halogenated flame retardants were detected for the first time in falcon eggs, and comparisons were made with results obtained from falcon eggs collected in Spain. Generally, Peregrine Falcon eggs in Canada had higher concentrations of the measured flame retardants than did eggs from Spain. These contaminants were also measured in the blood plasma of nestling Peregrine Falcons from the Great Lakes–St. Lawrence River Basin. Preliminary assessments indicate significant regional differences and associations with some of the flame retardants, thyroid hormones and retinol, measured in the falcon nestlings. Stable isotope data will also be analyzed to identify the possible role of trophic level in contaminant and biomarker patterns.

An ongoing assessment of the impact of methyl mercury, lake acidity and related stressors on the breeding success of Common Loons 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 lakes in Nova Scotia continued.

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. Analysis of mercury trends (from 1972 to 2008) in seabird eggs collected along the Atlantic coast began.

Exposure and effects studies of Bald Eagle nestlings continued on the Pacific coast of North America. Results show that exposure of Bald Eagles to PCBs and dichlorodiphenyltrichloroethane (DDT)-related

compounds was highly influenced by trophic level (i.e., place in the food chain). However, levels of BFR retardants did not appear to be influenced by trophic level, perhaps suggesting some capacity 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 project with colleagues in Wales revealed that American and European populations of dippers were exposed to different patterns of persistent contaminants. Exposure of American Dippers to PCBs and BFRs was substantially greater as a result of their feeding on juvenile salmon, compared with the invertebrate diet of their European counterparts. Recent work has shown that the diet of female dippers changes during the breeding season, which has implications for the interpretation of contaminants in eggs.

Studies on perfluoroalkyl compounds in the blood plasma of adult Snapping Turtles, amphipods, and surface waters in Areas of Concern in the Great Lakes revealed unexpectedly high concentrations of perfluorooctane and perfluorohexane sulfonate in biota and water at a site downstream from an international airport. Efforts to identify the source of the contaminants are underway and the toxicity of these concentrations to Snapping Turtles will be assessed by examining their thyroid function following exposure.

An ongoing assessment of genetic mutation rates of Double-crested Cormorants 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 like the Great Lakes cormorants continued, with the objective of improving the understanding of how contaminants and parasites may be interacting to affect the health of wildlife.

Monitoring of contaminant (PAHs, mercury, arsenic) levels in fish-eating bird eggs from the oil sands region of Alberta revealed spatial differences and temporal changes in concentrations. Most notably, eggs collected from sites closer to oil sands operations had higher levels of some contaminants, and mercury levels in gull eggs from Lake Athabasca increased 40% from 1977 to 2009. More research is required to identify the sources of these contaminants.

To provide guidance on the information requirements in the risk assessments under CEPA 1999, previous research assessed the persistence of high-priority Domestic Substances List (DSL) microbial strains in soil microcosms. As a follow-up to this research, a draft guidance document was produced recommending a method for assessing the persistence of microbial strains in soil microcosms. Additionally, previously developed DNA genetic fingerprints of the DSL strains were used to assess new genetic tools for detecting nine DSL strains in pure culture, mixed blends and soil samples. Research was also completed on the evaluation of methods for assessing microbial consortia products. The data and methods will contribute to the risk assessment of the high-priority DSL microbial strains and consortia and potentially provide methods useful for enforcement responsibilities.

Soil toxicity tests were completed using medium-priority chemical substances under the CMP. Studies on the toxic effects of three xanthene dye compounds on a suite of soil organisms were conducted to evaluate their potential to predict the toxicity of other medium-priority substances within this class of dyes. Another CMP study evaluated the toxicity of two inorganic compounds (cobalt and silver) using a suite of terrestrial organisms (soil invertebrates, plants and microbial community) in a sandy soil. Similar studies evaluated the acute toxicity of one azo dye to Snapping Turtle eggs exposed in soil and three azo dyes to benthic invertebrates exposed in treated sediment. Work continued to examine the bioaccumulative potential of azo dyes. The results of these studies will provide biological response data to allow a more comprehensive assessment of selected priority CMP 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 perfluorinated compounds and replacement BFRs. 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 BFR contaminants in wildlife. This new highly sensitive analytical method was used to screen Herring Gull eggs collected from several sites in the Great Lakes and one site in the St. Lawrence River. Two previously unstudied BFR compounds were detected in gull eggs from these populations, indicating that these contaminants bioaccumulate to some degree in the Herring Gull's food chain and transferred to their eggs.

Several laboratory studies were conducted to determine and predict the sensitivity of avian species to the toxic effects of dioxins, PCBs and other dioxin-like compounds. The research resulted in a novel method that can be used to predict the sensitivity of any avian species to any dioxin-like compounds. This method is now being considered by the U.S. EPA to provide risk assessment decision support at contaminated sites. Work continued on a project to develop and validate a practical in vitro and in vivo biomarker platform that acts as a rapid screening tool for assessing 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.

Methods to measure thyroid and growth hormone concentrations in blood plasma samples collected from chickens and Herring Gulls were developed and validated. These methods will provide a relative measure of ecosystem health at different gull colonies throughout the Great Lakes Basin in combination with the use of a previously designed method to determine stress hormone levels in bird feathers.

Research continued towards the development of laboratory test methods using native amphibians to examine the biological effects and modes of action of priority compounds of interest and to generate compound-specific risk assessments and risk management models. Methods development included establishing procedure parameters, artificially induced reproduction, and endpoint measurements, which will lead to screening assays and standard methods for toxicity assessments 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

Health Canada continues to undertake research and assessments to support the development of regulations, guidelines and air quality objectives with the goal of reducing population exposures to indoor and outdoor air pollutants and improving human health.

3.2.5.1 Air Quality Health Impacts

As part of the Government of Canada's Clean Air Agenda, Health Canada is conducting research and developing tools that support regulatory and non-regulatory actions under CEPA 1999 aimed at improving air quality and human health, including the development of a national ambient air quality management system. Studies undertaken in 2010–2011 include investigations of the health risks associated with exposure to air pollutants emitted from industrial, transportation and indoor sources; mortality and morbidity risks associated with long-term exposure to air pollutants; and characterization of the spatial variability of ambient air pollutants.

Ambient air pollution

A number of complex outdoor monitoring studies have been conducted to characterize the spatial variability of ambient air pollutants and to examine the effect of land use (e.g., roadways, industry) on

local ambient air pollution. Statistical models have been developed to predict air pollution levels in a given region based on land-use characteristics. These models are useful in large environmental health studies, as they can be used to provide cost-effective exposure measures. Activities in 2010–2011 included:

- Health Canada conducted spatial monitoring studies in Ottawa, London, Calgary, Halifax, and Montréal, building on the body of evidence of studies previously completed in Winnipeg and Hamilton. These studies took place over the winter and summer seasons. A study in Windsor was completed that will allow comparisons among seasons and years. The suite of pollutants examined for spatial variability in urban areas include nitrogen dioxide (NO_2), sulphur dioxide (SO_2), volatile organic compounds (VOCs), PAHs and PM.
- A study in Vancouver was completed that monitored for ultrafine particles and nitrogen oxides (NO_x).
- In Sault Ste Marie, a study was initiated to investigate the health effects of daily exposure to air pollutants emitted from the coke ovens at a local steel mill. This is a cross-over study in which about 60 participants are exposed to ambient air and filtered air at a location near the plant, as well as ambient air away from the plant. The study uses protective equipment that can selectively filter out components of air pollutants and hence the participants' exposure can be more precisely characterized and the health effects better assessed. Participants' personal and outdoor exposure to ambient levels of SO_2, NO_2, PM, VOCs and PAHs, except when they are breathing filtered air (no exposure), is being assessed. The health parameters being assessed include lung function, biomarkers of oxidative stress and inflammation, blood pressure, and heart rate. This study is one of the first of its kind to systematically examine the effects of industrial air pollutants on healthy subjects without the effects of confounding factors.

Changes and expansion in the use of renewable or conventional fuels in Canada requires the assessment of potential human health risks and benefits associated with fuel production, transport, storage and use. Assessments addressing the life cycle of fuels are used to inform policy and regulatory decisions. As part of the health components of the federal Biofuels Lifecycle Risk Assessment, an assessment of the health risks and benefits associated with the use of biofuels in Canada was carried out and is near completion. This study focused on emissions characterization and population exposure and addressed the health implications associated with biofuels production, transport, storage, as well as its use in the transportation sector. The results of this work were used to support the further development of the *Renewable Fuels Regulations*.

Knowledge of the health effects of traffic-related air pollutants can be applied to the development of management tools and information that can be used by municipalities for urban planning. Activities in this area in 2010–2011 included:

- Health Canada initiated a series of studies examining exposure experienced using different modes of public transit in several urban centres. In Ottawa, a study examined the acute health effects of air pollution among cyclists. The exposure data from these studies are undergoing analysis.
- Additionally, research was undertaken in collaboration with the University of Windsor to establish the impact of traffic on surrounding areas by conducting monitoring and dispersion modeling of traffic-related air pollutants.

Emission reductions by industry are required to improve air quality, resulting in health and environmental benefits. A sector-based approach enables an understanding of the toxicity of the sector's emissions and its impact on the health of Canadians in order to inform technological options that are most cost-effective in reducing sources that represent the greatest health risk. Health impact assessments provide a means to evaluate specific regulatory and non-regulatory actions and to compare their impact across sectors. In 2010–2011 these assessments included:

- Sectoral air quality assessment modeling was completed for electricity, iron and steel, base metal smelters, cement, aluminum, and pulp and paper sectors.

- A human health risk assessment for carbon black, completed and published in the *Canada Gazette,* Part I (Vol. 145, No. 2, January 8, 2011).
- A health-based reference concentration for inhaled manganese, completed and published in the *Canada Gazette,* Part I (Vol. 144, No. 19, May 8, 2010).

Developed by Health Canada, the Air Quality Benefits Assessment Tool (AQBAT) is a computer simulation tool designed to estimate the human health and welfare benefits or damages associated with changes in Canada's ambient air quality. The program is applied to federal government policy proposals on air quality. Work involving the AQBAT in 2010–2011 included the following:

- AQBAT was used to assess the health benefits of different regulatory scenarios to reduce air pollution and greenhouse gases for the proposed regulatory framework for the proposed Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations and was also used to conduct a comparison of biofuels and diesel.
- AQBAT is being updated to include a number of enhancements including population, air pollution, and baseline incidence data as well as revised concentration response functions and valuation parameters for selected outcomes and a mapping capability. Additional outcomes for consideration in this version include life expectancy, quality-of-life impacts in relation to chronic morbidity, and adverse pregnancy outcomes.

The Population Improvement Approach was developed by Health Canada, using atmospheric models provided by Environment Canada, as a tool to assist in setting national ambient air quality standards. The PIA identifies the percentage of Canadians that are exposed to ambient levels of PM and ozone above a given standard (e.g., a Canada-wide standard), and can be used to estimate changes in that percentage if the standard were changed (e.g., made more stringent).

Indoor air quality

As part of a comprehensive agenda to address air quality, Health Canada continued to assess the health impacts of indoor air contaminants to inform the development of risk management actions aimed at reducing indoor exposure. Final residential indoor air quality guidelines and scientific assessment documents are used as the basis for communication products for public health professionals and the public, aimed at guiding interventions to improve indoor air quality and reduce negative health impacts. In 2010–2011, the Department worked on draft residential indoor air guidelines for fine PM, nitrogen dioxide, benzene and naphthalene.

Further understanding of the health impacts and sources of exposure to indoor contaminants (released from household products, building materials, combustion appliances, or entering the home from outside) is vital given that Canadians spend 90% of their time indoors. Exposure studies provide a snapshot of different exposures experienced across the country in various indoor environments and help to pinpoint sources of exposure to inform risk management actions to protect health. In 2010–2011, residential exposure studies to collect data on a range of indoor air pollutants (e.g., PM, ozone, nitrogen dioxide, VOCs, formaldehyde, carbon monoxide, dust and fungal contaminants) were completed in Edmonton and Halifax, and in an apartment building in Ottawa. Corresponding outdoor monitoring was also completed at these locations to assist in determining the extent to which outdoor air quality influences indoor air levels; the data on this aspect and other factors is currently being analyzed. These data sets complement earlier exposure studies of Canadian homes and daycares conducted in Montréal, Regina and Québec.

3.2.5.2 Exposure and Biomonitoring

The Canadian Health Measures Survey (CHMS) is a national survey carried out by Statistics Canada, in partnership 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 years, from 15 collection sites. The objectives of the biomonitoring component of the CHMS are to establish nationally representative blood and urine concentrations for a range of

environmental chemicals and provide baseline data for tracking trends and comparisons with subpopulations in Canada and internationally. Through personal interviews and the collection of physical measurements, the survey provided benchmark data on indicators of environmental exposures, chronic diseases, infectious diseases, fitness, and nutritional status, as well as risk factors and protective characteristics related to these areas. In August 2010, Health Canada published the *Report on Human Biomonitoring of Environmental Chemicals in Canada*, which provides full biomonitoring results for chemicals measured during Cycle 1. Except for lead, these results provide the first-ever nationally representative biomonitoring data of all the chemicals measured. The second cycle (2009–2011) of CHMS includes children aged 3–5 years and an indoor air component. In 2010–2011, Cycle 2 data were collected from 18 sites across Canada. Planning for Cycles 3 and 4 was initiated.

A three-year national survey of contaminants in Canadian drinking water is examining levels of disinfection by-products, both new and regulated, and selected emerging contaminants in drinking water. Sixty water treatment plants and distribution systems have been sampled across Canada. More than 100 water quality parameters and contaminant concentrations are being determined for each location. The data analysis continued in 2010–2011. This work will provide updated exposure data to be used in the preparation/update of the Guidelines for Canadian Drinking Water Quality.

Phase 1 of the multi-year Canadian House Dust Study was completed in 2010–2011. This project will provide nationally representative baseline estimates of chemicals found in urban house dust, with the initial determination of bioaccessible lead. Vacuum samples were collected from 1025 urban homes across Canada. Wipe sampling methodologies were also evaluated. This study will continue in 2011–2012 with examination of other important metals and organic chemicals. Canada is the first country to develop a national baseline for chemicals in house dust.

Studies are also underway on dermal absorption of substances being assessed under the CMP. Skin is a major route of entry to the human body for many substances, especially those in consumer products such as cosmetics. The study will increase our understanding of how chemicals are transported from the outer surface of the skin to internal layers and the circulatory system. This project is establishing routine test methods to measure the dermal absorption of chemicals that have been identified as a priority for assessment of their effects on human health. Results are expected in 2011.

There is also a national indoor air survey of chemicals focusing on selected priority chemicals in Canadian residential indoor air. Indoor air samples are being collected and analyzed in a national representative sample of Canadian homes whose occupants are participating in the CHMS, Cycle 2. Sample collection began in September 2009 and will be completed in December 2011. Results are expected to be released to the public through Statistics Canada in 2012. This project will continue in cycles 3 and 4 of the CHMS.

A toxicokinetic modeling study was initiated in 2009 to determine the Canadian population's exposure to pyrethroids. This study involved the development of human toxicokinetic models that were applied to two commonly used pyrethroid pesticides, permethrin and cypermethrin. Levels of metabolites from these pesticides were measured to determine the absorbed chemical dose. Such toxicokinetic models can be used to measure the relationship between the chemical by-products (biomarkers) measured in people and the amount of chemical absorbed. The results of the study will be available in 2011–2012.

3.2.5.3 Population Studies

A number of the population studies are largely multi-year research projects that were completed in 2010–2011. Various epidemiological studies were also conducted to assess exposure of targeted populations to specific chemicals.

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 among their infants. The study reached its recruitment target of 2000 pregnant women from the 10 selected

clinical sites in 10 Canadian cities. Approximately 53 000 biomonitoring results have been uploaded to a database for analysis. Follow-up of participants through delivery is ongoing. The final report is expected in March 2012.

A Health Canada study on plastics and personal care product use in pregnancy has recruited 80 pregnant women from the Ottawa area and is collecting multiple maternal urine samples, detailed consumer product/food packaging diaries, infant urine and meconium, and breast milk samples. In 2010–2011, the participant questionnaires were collected and the collection and analyses of biospecimens for phthalates, BPA, triclosan and triclocarbon began. In addition, meconium was evaluated as a potential matrix for measuring in utero exposure.

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 both acute and chronic non-occupational lead exposure in the Canadian population. As of March 2011, 263 participants had been recruited into the study (97% of target), and lead assessments began, including analysis of blood samples and bone scans.

A three-year study was completed in Montréal 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. The study compares 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. Another biomonitoring study focusing on lead exposure in young children living in a range of housing ages is underway in St. John's, Newfoundland and Labrador. Publication of the results of both studies is expected in 2011–2012.

A two-year biomonitoring study was initiated in 2008 to assess exposure to arsenic in drinking water from private wells in the Abitibi-Témiscamingue region of Quebec. The potential relationship between the arsenic concentrations in well waters and the internal doses in people, the prevalence of diabetes and the levels of thyroid hormones was evaluated. Preliminary results suggest associations between concentrations of arsenic in drinking water from private wells, internal doses in people, and thyroid function and diabetes. However, these observations need to be validated through other health studies. This study was completed in 2010–2011, and a final report is expected to be released in 2011–2012.

Another biomonitoring study on arsenic in rural Nova Scotia communities was conducted in 2009 and 2010 to develop and test a group of biomarkers of exposure and to explore both short- and long-term exposure to arsenic. The biomarkers are related to well-water concentrations of both total arsenic and inorganic arsenic species, which have different toxicity. In addition, a novel and recently developed non-invasive method for analysing concentrations of total arsenic in skin and nails was tested. The results are being analyzed and a final report is expected to be released in 2011–2012.

A two-year study initiated in 2009 on the assessment of long-term indoor residential pollution exposures among Canadian children is designed to provide estimates of exposure to contaminants in young children, through the analysis of data and information obtained as part of the Canadian Healthy Infant Longitudinal Development study biological samples (meconium, cord serum, and urine) and house dust. Samples were analysed for cotinine as a biomarker for tobacco smoke exposure, and a variety of phthalate metabolites and preliminary data interpretation was completed.

3.2.5.4 Mechanistic Studies

Health Canada led international efforts towards the establishment of an Organisation for Economic Co-operation and Development test guideline for transgenic rodent mutation assays, culminating in the international acceptance of a harmonized method. This test will allow better identification of those chemicals that cause genetic mutations with the potential to affect human health.

Toxicogenomic studies, which investigate changes in the function of all the genes of an organism in response to exposure to a chemical, were employed to assess the effects of exposure to engineered nanoparticles, such as nano-titanium dioxide and nano carbon black. Toxicogenomic approaches were determined to be effective in identifying biological perturbations very soon after exposure and before the appearance of any visible changes in health in the exposed animal model.

Studies to determine the characteristics and pathogenicity of various biotechnology microbes

continued. Results achieved during 2010–2011 for four different microbial species were used in the corresponding Health Canada risk assessments of existing animate products of biotechnology. This research filled key gaps with data that would otherwise be unavailable.

A three-year project to develop "biomonitoring equivalents" is underway using physiological pharmacokinetic models for interpreting Canadian biomonitoring data. Health Canada is developing biomonitoring equivalents for several priority chemicals, for both risk assessment and management, and evaluating them for their application in biomonitoring surveillance initiatives. The first capacity development initiative was completed in March 2011 and the results are expected in 2011–2012.

3.2.5.5 Hazard Identification

In vivo studies examining the impact of perinatal exposure to a chemical mixture on the development of brain neuroimmunoinflammatory changes were completed. These changes are associated with age-related neurodegeneration in diseases such as Parkinson's. The results of this study should be available in 2011–2012.

A number of studies were completed comparing the effects of methylmercury on neurodevelopment with the use of molecular biomarkers of neurotoxicity. The results highlighted the complexity of contaminant-nutrient interactions, as co-administration of a phytochemical nutrient increased, decreased or had no effect on methylmercury pertubations, depending on the endpoint assessed.

A number of other in vivo and in vitro studies were conducted examining the effects of exposures to mixtures of endocrine disruptors to identify critical periods of development (in utero and/or postnatal) during which long-term adverse health effects might be induced. Components of these mixtures, as well as PBDEs, vanadium and nickel are tested on human cells in vitro to investigate mechanism of action and to identify potential predictive indicators of chemical-induced health impairments in humans.

Studies also investigated the effects of very low doses of bisphenol A and other CMP priority chemicals in the formation of fat cells from precursor cells. In addition, collaborative studies examined the impact of these substances on pancreatic beta cell function to identify substances that could cause or exacerbate diabetes. These studies suggested that bisphenol A may pose a risk 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. Table 1 lists the environmental quality guidelines that were published or being developed nationally through the Canadian Council of Ministers of the Environment (CCME) in 2010–2011. During the same period, Environment Canada developed federal environmental quality guidelines for various chemicals identified in the CMP (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 2010 to March 2011

Canadian Council of Ministers of the Environment (federal, provincial and territorial)

Environmental Compartment	Published	In Progress
Water	• Uranium	• 2,4-dichlorophenoxyacetic acid • Cadmium • Chloride • Glyphosate • Nitrate • Trichlorfon • Zinc
Soil	• N-Hexane	• Nickel • Zinc

Chemicals Management Plan (federal)

Environmental Compartment	Approved	In Progress
Water		• Bisphenol A • Chlorinated paraffins • HBCD • PBDEs • PFOS • TBBPA • Triclosan
Sediment		• Chlorinated paraffins • PBDEs • HBCD • TBBPA • Cobalt • Hydrazine • Pentachlorophenol • Vanadium oxide
Tissue		• Bisphenol A • Chlorinated paraffins • HBCD • PBDEs • PFOS
Soil		• HBCD • TBBPA

Note: Hexabromocyclododecane (HBCD); polybrominated diphenylethers (PBDEs); perfluorooctane sulphonate (PFOS); tetrabromobisphenol (TBBPA).

3.3.2 Drinking Water Quality

Health Canada develops the Guidelines for Canadian Drinking Water Quality and their supporting documents under the authority of CEPA 1999. Priorities for developing guidelines are established in consultation with the provinces and territories.

Health-based guideline values are developed for microbiological, chemical and radiological contaminants that are found or expected to be found in drinking water supplies across Canada at levels that could lead to adverse health effects.

Documents are also developed under the Guidelines for Canadian Drinking Water Quality 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 (such as controlling corrosion in drinking water distribution systems).

Table 2 lists the documents that were completed or in progress in 2010–2011.

Table 2: Guideline documents for Canadian drinking water quality from April 2010 to March 2011

Published	In Progress
• N-Nitrosodimethylamine (NDMA) • Fluoride • Carbon tetracholoride • Dichloromethane • Viruses	• 1,2-dichloroethane • 2,4-dichlorophenoxyacetic acid • Ammonia • Chromium • Enteric viruses • Nitrate/nitrite • Protozoa • Selenium • Tetrachloroethylene • Vinyl chloride • Lead • Bromate • Aluminum • Manganese • pH • Atrazine • Heterotrophic plate count • Bacterial waterborne pathogens • Microbiological quality

3.3.3 Air Quality Guidelines

In 2010–2011, Health Canada published the following notices in the *Canada Gazette,* Part I:

- Finalized Air Health Assessment for Inhaled Manganese on May 8, 2010 (www.gazette.gc.ca/rp-pr/p1/2010/2010-05-08/pdf/g1-14419.pdf#page=31, pp. 31–34).
- Finalized Residential Indoor Air Quality Guideline for Carbon Monoxide on July 24, 2010 (www.gazette.gc.ca/rp-pr/p1/2010/2010-07-24/pdf/g1-14430.pdf#page=13, pp. 13–14).
- Finalized Residential Indoor Air Quality Guideline for Ozone on July 24, 2010 (www.gazette.gc.ca/rp-pr/p1/2010/2010-07-24/pdf/g1-14430.pdf#page=14, pp. 14–16).
- Proposed Residential Indoor Air Quality Guideline for Toluene on December 11, 2010 (www.gazette.gc.ca/rp-pr/p1/2010/2010-12-11/pdf/g1-14450.pdf#page=34, pp. 34–38).

3.4 State of the Environment Reporting

Environmental indicators provide a straightforward and transparent way to convey the state of Canada's environment. The Canadian Environmental Sustainability Indicators (CESI) are a system of national environmental indicators used to inform citizens about current environmental trends and to provide policy makers and researchers with a baseline of comprehensive, unbiased and authoritative information in relation to key environmental issues. Following the release of the first Federal Sustainable Development Strategy (FSDS) in 2010, CESI has been identified as the prime instrument for measuring progress of the FSDS via an expanded suite of indicators.

The selection of environmental indicators is based on a number of key criteria. Indicators must be relevant to the government's policy direction. They must be useful and easily understood by decision makers and the public, built on consistent and solid methodology that is comparable over time and across geographies, and based on high-quality data that is expected to be maintained and updated for the foreseeable future.

The indicators are prepared by Environment Canada with the support of other federal departments, including Health Canada, Statistics Canada, Natural Resources Canada, and Fisheries and Oceans Canada, as well as their relevant provincial and territorial counterparts. CESI publishes extensive environmental baseline data from statistical surveys, environmental measurement networks, and research that supports the government's environmental initiatives. The CESI website presents national and

regional results, along with the methodology that explains the indicator, and links to related socio-economic issues and information. It provides results and information for 20 environmental indicators, including coverage of areas such as GHG emissions, air quality, water quality and protected areas. Below are the national results for some of the key CESI indicators published in 2010–2011:

- Air quality: Nationally, ground-level ozone exposure increased by approximately 11% from 1990 to 2008, but the increasing trend in annual ozone exposures has slowed in recent years. No trend was detected in fine PM exposure from 2000 to 2008.
- Freshwater quality: In water sampled from 2006 to 2008, freshwater quality for the protection of aquatic life was rated as excellent at nine sites (5%), good at 64 sites (37%), fair at 71 sites (40%), marginal at 27 sites (15%), and poor at five sites (3%).
- Protected areas: Canada had protected 9.4% of its land area and about 0.6% of its marine territory as of mid-2009. This represents an increase of 81% in all protected areas since 1990.

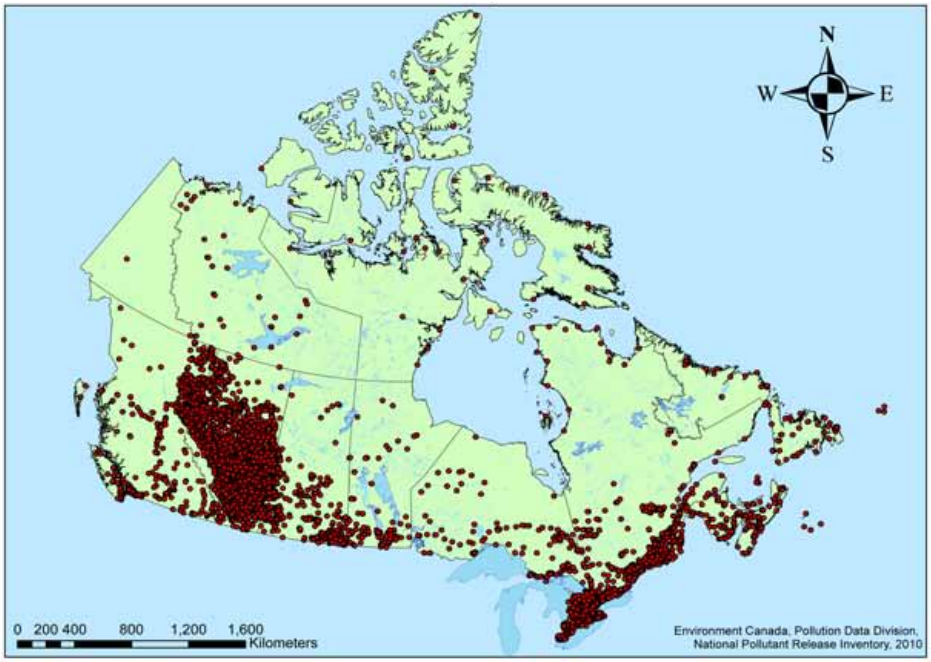
3.5 Gathering and Reporting of Pollution and Greenhouse Gas Information

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 that meet certain criteria. It also includes emission estimates for a number of key air pollutants from other sources such as motor vehicles, residential heating, forest fires and agriculture. Over 8400 facilities, located in every province and territory, reported to the NPRI for 2009 (see Figure 1).

The NPRI supports the identification and management of risks to the environment and human health, including the development of policies and regulations on toxic substances and air quality. Public access to the NPRI encourages industry to prevent and reduce pollutant releases and improves public understanding about pollution and environmental performance in Canada.

Figure 1: Location of facilities that reported to the NPRI in 2009



The following NPRI data were made publicly available in 2010–2011:

- The 2009 NPRI facility data and summary report were published in December 2010. This included first-time data on pollutants disposed of in tailings impoundments and waste-rock management areas following the implementation of new NPRI reporting requirements in 2009.
- The 2008 and 2009 national air pollutant emissions data and trends (published in October 2010 and March 2010, respectively).

Environment Canada undertook a number of initiatives to improve the quality of NPRI data in 2010–2011. For example, the Department worked with industrial sectors and provincial governments to improve technical guidance information for facilities that report to the NPRI and conducted emissions tests to help enhance the consistency and accuracy of reporting. In addition, a multi-stakeholder consultation session was held with NPRI data users to gain a better understanding of their needs. The Department also published information to promote the effective use of NPRI data.

For further information, consult www.ec.gc.ca/inrp-npri.

3.5.2 Greenhouse Gas Emissions Reporting Program

The Greenhouse Gas Emissions Reporting Program (GHGRP) lays the foundation for the development of a single, domestic, mandatory GHG reporting system, in order to meet the GHG reporting needs of all jurisdictions and to minimize the reporting burden for industry and government.

Starting with 2009 facility data, the threshold for mandatory reporting of emissions to the program was lowered, resulting in an increase in the number of reporting facilities.

The main objectives of the GHGRP are to provide Canadians with timely information on GHG emissions, support the development of regulations, support provincial and territorial requirements for GHG emissions information, and validate estimates presented in the National Greenhouse Gas Inventory. The data are reported through a single reporting system, by facilities, to Environment Canada. For 2009, 522 facilities reported to the GHGRP, up from 350 for 2008 due to the reporting threshold change. The report entitled *Greenhouse Gas Emissions Reporting Program*: *Overview of 2009 Facility Data* was released on December 16, 2010. Data tables, an online query tool and a downloadable file were also made available.

For further information, consult www.ec.gc.ca/ges-ghg/.

4 Pollution Prevention (Part 4)

Part 4 of CEPA 1999 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.

Part 4 of the Act also provides the authority for the Minister of the Environment to require the preparation and implementation of pollution prevention plans. 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 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 2010–2011, 203 new records were added to the clearinghouse. Record views ranged from 13 000 to 35 000 per month, with a monthly average of 24 500. Overall, Canadian Pollution Prevention Information Clearinghouse records were viewed 293 935 times this past year, an increase of 30% from the previous highest recorded totals.

5 Controlling Toxic Substances (Part 5)

Part 5 of CEPA 1999 includes specific provisions for data collection, assessment and management on 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 screening assessments. These 4300 substances are being addressed under the initiative called the Chemicals Management Plan (CMP). Activities under the CMP include risk assessment, risk management, research, compliance promotion, enforcement and monitoring/surveillance.

5.1 Existing Substances

Through the Challenge program of the CMP, the government committed to addressing the 200 highest-priority substances. These 200 substances were divided into a number of smaller groups or "batches" that are addressed sequentially. Each batch of substances in the Challenge progresses through various information-gathering, screening-assessment, risk-management, and compliance promotion and enforcement (where appropriate) stages. Every three months, the program launches a batch of 12–20 substances 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[2] of CEPA 1999. The results of the screening assessments are published in draft form on the Chemical Substances website (www.chemicalsubstanceschimiques.gc.ca/indexeng), and the ministers of the Environment and Health propose a notice in the *Canada Gazette*, Part I. Interested parties can file written comments on the notice during a 60-day public comment period. After taking into consideration comments received, the ministers may, if they deem it appropriate, revise the screening assessment report.

Table 3 lists the 2010–2011 assessment decisions for 171 existing substances. This total reflects draft and/or final assessment decisions for 76 substances in batches 6 through 12 of the challenge, as well as assessment decisions for 94 other existing substances or groups of substances that were not part of the batches. Additional details on the draft and final assessment decisions for substances in batches 6 to 12 are provided in Appendix B of this report.

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

[2] Under Section 64 of CEPA 1999, a substance is toxic if it is entering or may enter the environment in a quantity or concentration or under conditions that:

(*a*) have or may have an immediate or long-term harmful effect on the environment or its biological diversity;
(*b*) constitute or may constitute a danger to the environment on which life depends; or
(*c*) constitute or may constitute a danger in Canada to human life or health.

Table 3: Summary of existing substance assessment decisions published from April 2010 to March 2011

(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*
Aniline	n/a	PSL1 follow-up	No for 1 substance	NFA for 1 substance	2010 Nov. 6	
CHPD	n/a	Screening – Batch 1	No for 1 substance	NFA for 1 substance	2010 July 3	
4 Substances	2008 May 31	Screening – Batch 6	Yes for 1 substance; no for 3 substances	Add to Schedule 1 for 1 substance; NFA for 3 substances including SNAc for 1 substance	2010 Oct. 2	
1 Substance	2009 Jan. 31	Screening – Batch 8	No for 1 substance	NFA for 1 substance	2010 Oct. 2	
13 Substances	2009 Jan. 31	Screening – Batch 8	Yes for 4 substances; no for 9 substances	Add to Schedule 1 for 4 substances; NFA for 9 substances including SNAcs for 3 substances	2010 Jan. 30	2010 July 31
17 Substances	2009 Mar. 14	Screening – Batch 9	Yes for 4 substances; no for 13 substances	Add to Schedule 1 for 4 substances; NFA for 13 substances, including SNAcs for 7 substances	2010 Mar. 20	2010 Sept. 18
13 Substances	2009 June 20	Screening – Batch 10 (including cobalt salt supplement)	Yes for 1 substance; no for 12 substances	Add to Schedule 1 for 1 substance; NFA for 12 substances, including SNAcs for 2 substances	2010 June 26	2011 Jan. 15
16 Substances	2009 Sept. 26	Screening – Batch 11	Yes for 4 substances; no for 12 substances	Add to Schedule 1 for 4 substances; NFA for 12 substances, including SNAcs for 6 substances	2010 Oct. 2	
12 Substances	2009 Dec. 26	Screening – Batch 12	Yes for 1 substance; no for 11 substances	Add to Schedule 1 for 1 substance; NFA for 11 substances, including SNAcs for 3 substances	2011 Jan. 8	
DecaBDE	n/a	State of the Science	n/a	n/a	2009 Mar. 28	2010 Aug. 28
Ethylene glycol	n/a	PSL2	No for 1 substance	NFA for 1 substance	2007 Dec. 1	2010 Apr. 17
HBCD	n/a	Screening Pilot Project	Yes for 1 substance	Add to Schedule 1 for 1 substance, including VE for 1 substance	2010 Aug. 28	
10 Substances	n/a	Screening – Petroleum Sector Stream 1 – heavy fuel oils and gas oils	No for 10 substances	NFA for 10 substances including SNAcs for 10 substances	2010 May 29	
20 Substances	n/a	Screening – Petroleum Sector Stream 1 – low-boiling-point naphthas	No for 20 substances	NFA for 20 substances including SNAcs for 20 substances	2010 Aug. 14	

Table 3 (Concluded)

Substances or Number of Substances	Batch Launch Date	Type of Assessment	Meet s. 64 Criteria	Proposed Measure	Draft Notice*	Final Notice*
40 Substances	n/a	Screening – Petroleum Sector Stream 1 – petroleum refinery gases	Yes for 40 substances	Add to Schedule 1 for 40 substances	2011 Jan. 15	
Assessment covers broad group of substances of which 14 are on the DSL	n/a	Screening – PFCAs	Yes for group covered	Add to Schedule 1 for 14 substances, including VE for 14 substances	2010 Oct. 30	
Assessment covers broad group of substances of which 5 are on the DSL	n/a	Screening – PFOA	Yes for group covered	Add to Schedule 1 for 5 substances	2010 Oct. 30	
Quinoline	n/a	Pilot	Yes for 1 substance	Add to Schedule 1 for 1 substance	2010 July 31	

* 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 assessment finds to meet the definition of toxic, 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, environmental performance agreements, permits, charges, substance lists, guidelines and codes of practice. These instruments can address any aspect of the substance's life cycle, from the research and development stage through manufacture, use, storage, transport and ultimate disposal or recycling. Besides the risk management instruments for which activity occurred during the reporting period (described in this section), 15 proposed CEPA 1999 instruments were published to address high-priority substances under the challenge.

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 recommendation regarding adding a substance to Schedule 1 (the List of Toxic Substances), adding it to the Priority Substances List for further assessment, or concluding that no further action is necessary for the substance.

Ministers may recommend the addition of a substance to Schedule 1 of CEPA 1999 to the Governor in Council if a screening assessment shows that a substance meets one or more of the criteria in Section 64. The Governor in Council may then approve an order specifying its formal addition to Schedule 1. 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 in 2010–2011. Table 5 lists the substances or groups of substances that were added to Schedule 1 of CEPA 1999 (the list of toxic substances) in 2010–2011.

Table 4: Proposed orders adding substances to Schedule 1 of CEPA 1999 from April 2010 to March 2011

Substance	Draft Order*
Methanone, bis[4-(dimethylamino)phenyl]-	2010 May 1
2-Butanone, oxime	2010 May 1
Oxirane, (butoxymethyl)-	2010 May 1
Propane, 2-nitro-	2010 Oct. 2
Benzene, 1-methyl-2-nitro-	2010 Oct. 2
Phenol, 2,6-bis(1,1-dimethylethyl)-4-(1-methylpropyl)-	2010 Oct. 2
Methylium, [4-(dimethylamino)phenyl]bis[4-(ethylamino)-3-methylphenyl]-, acetate	2010 Oct. 2
Benzene, 1,2-dimethoxy-4-(2-propenyl)-	2010 Oct. 30
Vanadium oxide (V2O5)	2010 Oct. 30
Oxirane, 2,2',2'',2'''-[1,2-ethanediylidenetetrakis(4,1-phenyleneoxymethylene)]tetrakis-	2010 Oct. 30
Bromic acid, potassium salt	2010 Oct. 30
Hydrazine	2011 Feb. 26

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

Table 5: Orders adding substances to Schedule 1 of CEPA 1999 from April 2010 to March 2011

Substance	Final Order*
Oxirane, methyl-	2010 May 12
Benzene, 1,3-diisocyanato-2-methyl-	2010 May 12
Naphthalene	2010 May 12
Oxirane, ethyl-	2010 May 12
1,2-Benzenediol	2010 May 12
1,4-Benzenediol	2010 May 12
Benzene, 2,4-diisocyanato-1-methyl-	2010 May 12
Benzene, 1,3-diisocyanatomethyl-	2010 May 12
Hexane, 1,6-diisocyanato-, homopolymer, reaction products with alpha-fluoro-omega-2-hydroxyethyl-poly(difluoro- methylene), C16-20-branched alcohols and 1-octadecanol	2010 Oct. 13
2-Propenoic acid, 2-methyl-, hexadecyl ester, polymers with 2-hydroxyethyl methacrylate, gamma-omega-perfluoro-C10-16-alkyl acrylate and stearyl methacrylate	2010 Oct. 13
2-Propenoic acid, 2-methyl-, 2-methylpropyl ester, polymer with butyl 2-propenoate and 2,5-furandione, gamma-omega-perfluoro-C8-14-alkyl esters, tert-Bu benzenecarboperoxoate-initiated	2010 Oct. 13
2-Propen-1-ol reaction products with pentafluoroiodoethane tetrafluoroethylene telomer, dehydroiodinated, reaction products with epichlorohydrin and triethylenetetramine	2010 Oct. 13
Phenol, 4,4'-(1-methylethylidene)bis-	2010 Oct. 13
Thiourea	2011 Feb. 16
1,3-Butadiene, 2-methyl-	2011 Feb. 16
Oxirane, (chloromethyl)-	2011 Feb. 16
Cyclotetrasiloxane, octamethyl-	2011 Feb. 16
Phenol, 2,4,6-tris(1,1-dimethylethyl)-	2011 Feb. 16
C.I. Pigment Yellow 34	2011 Feb. 16
C.I. Pigment Red 104	2011 Feb. 16
Ethanol, 2-methoxy-, acetate	2011 Feb. 16
Ethanol, 2-(2-methoxyethoxy)-	2011 Feb. 16
1-Propanol, 2-methoxy-	2011 Feb. 16
2-Naphthalenol, 1-[(4-methyl-2-nitrophenyl)azo]-	2011 Feb. 16
Sulfuric acid, diethyl ester	2011 Mar. 2
Sulfuric acid, dimethyl ester	2011 Mar. 2
Benzenamine, N-phenyl-, reaction products with styrene and 2,4,4-trimethylpentene	2011 Mar. 2
2-Propenamide	2011 Mar. 2
Ethanol, 2-chloro-, phosphate (3:1)	2011 Mar. 2

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

5.1.1.2 Significant New Activity Notices

Significant New Activity Notices can be issued for a chemical substance so that any major changes in the way it is used are reported to the Government of Canada. This approach ensures that government experts can evaluate whether a new use poses a risk to human health or the environment, and determine the conditions under which the new use will be allowed, if at all.

In 2010–2011, Notices of Intent to apply Significant New Activity Notices were published for 18 substances and final orders were published for 22 substances (Table 6). A person who intends to use, manufacture or import any of these substances in quantities exceeding 100 kilograms (kg) per year must provide prescribed information prior to initiating the new activity.

Table 6: Significant New Activity Notices for existing substances from April 2010 to March 2011

Assessment	Substances or Number of Substances	Notice of Intent*	Final Order*
Batch 1	4 substances	2010 July 3	Pending
Batch 2	5 substances	2011 Jan. 22	Pending
Batch 3	1 substance	2009 Mar. 7	2010 Nov. 10
Batch 5	1 substance	2009 Aug. 22	2010 Nov. 10
Batch 6(1)	3 substances	2009 Nov. 28	2010 Nov. 10
Batch 6(2)	8 substances	2010 Mar. 6	2010 Nov. 10
Batch 8	3 substances	2010 Jan. 30	2010 Aug. 18
Batch 9(1)	1 substance	2010 Sept. 18	Pending
Batch 9(2)	5 substances	2010 Mar. 20	2010 Sept. 29
Batch 10(1)	1 substance	2010 June 26	2011 Feb. 2
Batch 10(2)	1 substance	2011 Jan. 15	Pending
Batch 11	6 substances	2010 Oct. 2	

* 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. The table reflects substances that meet the criteria set out in Section 64 of CEPA 1999 and substances that do not meet the criteria.

5.1.1.3 Regulations

On February 26, 2011, Environment Canada published the proposed *Regulations Respecting Products Containing Certain Substances Listed in Schedule 1 to the* Canadian Environmental Protection Act, 1999. Mercury and mercury compounds are the only substances targeted by the proposed regulations. The regulations would prohibit the manufacture, import, and sale of mercury-containing products, with some exemptions for essential products that have no viable alternatives, such as lamps and dental amalgam (fillings); require labeling and reporting for permitted and exempt products; limit the mercury content in some exempted products such as fluorescent lamps; allow the possibility of permits for mercury-containing products to be in the marketplace, after an assessment of the product's purpose, available alternatives, risks and benefits for human health and the environment, and end-of-life management practices for the product. The proposed regulations were published for a 75-day comment period ending May 12, 2011. Environment Canada and Health Canada will be summarizing the comments received and publishing a response in 2011. The final regulations are expected to be published in 2012, with a delayed entry into force.

On June 23, 2010, Canada announced its intention to develop a regulation that will establish a performance standard to limit GHG emissions from coal-fired electricity generation units.

Table 7 lists all of the proposed and final regulations published under Part 5 of CEPA 1999 in 2010–2011.

Table 7: Regulations from April 2010 to March 2011

Substances	Draft Notice*	Final Regulations*
Regulations Amending the Prohibition of Certain Toxic Substances Regulations, 2005 (Four New Fluorotelomer-based Substances)		2010 Sept. 30
Proposed Regulations Amending the Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements)	2010 May 22	
Proposed Regulations Amending the 2-Butoxyethanol Regulations	2010 Oct. 9	
Regulations Respecting Products Containing Certain Substances Listed in Schedule 1 to the Canadian Environmental Protection Act, 1999	2011 Feb. 26	

* The dates are those on which the draft notice and final regulations 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.

Regulations Amending the Benzene in Gasoline Regulations (Miscellaneous Program)

The Regulations Amending the Benzene in Gasoline Regulations (Miscellaneous Program) were developed, under Part 11 of CEPA 1999, to address a recommendation made by the Standing Joint Committee for the Scrutiny of Regulations. The objective of the amendments is to remove redundant wording in the *Benzene in Gasoline Regulations*.

5.1.1.4 Pollution Prevention Planning

The provisions within Part 4 of CEPA 1999 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 2010–2011, four proposed notices and one final notice were published; five other P2 planning notices were active. For further information on P2 planning, consult www.ec.gc.ca/planp2-p2plan/default.asp?lang=En&n=F7B45BF5-1.

Pollution Prevention Planning Notices published

Polyurethane and other foam sector (except polystyrene) – toluene diisocyanates

A proposed P2 planning notice published in the *Canada Gazette,* Part 1, on July 3, 2010, addresses harmful substances implicated in the polyurethane and other foam sector (except polystyrene). This sector-based P2 planning notice will allow the addition of other substances, as may be required in the future, with substance-specific risk management objectives and requirements.

The first group of substances to be addressed is toluene diisocyanates, which are used in household furniture, automotive upholstery, and packaging. This P2 planning notice may affect up to 60 facilities.

Bisphenol A in industrial effluents

A proposed notice was published in the *Canada Gazette*, Part 1, on October 16, 2010. The notice requires industrial facilities whose use of BPA exceeds a given threshold to develop and implement a plan to keep any effluent below a set standard. BPA is imported for use in a number of sectors such as investment casting, epoxy resin, polyvinyl chloride compounding, wire cable coating and can coatings. The P2 plan is expected to apply only to a few facilities that continue to generate effluent containing BPA.

Resin and synthetic rubber manufacturing sector – Isoprene

A proposed notice published in the *Canada Gazette*, Part 1, on January 1, 2011, addresses harmful substances that are released from resin and synthetic rubber manufacturing industries. This sector-based P2 planning notice will allow the addition of other substances, as may be required in the future, with substance-specific risk management objectives and requirements.

The first substance addressed by the notice is isoprene or 1,3 butadiene, 2-methyl-. The substance is used mainly in the production of vehicle tires and a wide variety of products including medical equipment, toys, shoe soles, textiles and paints. This P2 planning notice will currently have an impact on one facility within the resin and synthetic rubber sector.

Cyclotetrasiloxane, octamethyl- (siloxane D4) in industrial effluents

A proposed notice was published in the *Canada Gazette*, Part I, on January 15, 2011. The notice requires that industrial facilities manufacturing or using D4 or a mixture containing D4 above a given threshold develop and implement a plan to keep effluents below a set standard. The substance is found in personal care products and is also used in other applications such as textiles, paints and coatings, sealants, lubricants and plastics. Thirty-four facilities are expected to be subject to this P2 planning notice, mostly in Ontario and Quebec.

Active Pollution Prevention Planning Notices

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 with respect to mercury releases from dental amalgam waste.

The final notice was published on May 8, 2010. 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 deadlines for declarations of development and implementation were September 13 and December 13, 2010, respectively. Three requests for time extensions for the implementation of P2 plans were received and granted, each for less than five months. The number of declarations submitted by March 31, 2011, was far lower than expected—approximately 258 declarations of development were received out of an estimated 2500 subject facilities. Compliance promotion is underway and enforcement activities are being planned.

Mercury releases from mercury switches in end-of-life vehicles

This notice applies to certain vehicle manufacturers and steel mills and it 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 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 in June 2010. The submission deadline for declarations of implementation is in January 2012.

Base metal smelters and refineries, and zinc plants

This notice applies to 11 base metal smelters and refineries, and zinc plants. Nine of these facilities are 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; another facility is subject to a 2008 annual limit target for dioxins and furans. Environment Canada received annual interim reports from the facilities; analysis of the 2009 data submitted by facilities indicates the following:

- In 2009, facilities reported overall reductions of 40% for sulphur dioxide, 54% for PM, 51% for mercury, 18% for arsenic, 45% for cadmium, 13% for lead, 79% for nickel and 18% for dioxins and furans, compared with 2005 releases.
- The sector reported greater reductions in 2009 for sulphur dioxide, PM and certain metals compared with reductions reported for 2008. These reductions are mostly attributed to lower emissions from one facility that was not in operation for an extended period in 2009.
- Another facility, the largest emitter in the sector, accounts for the reported decrease in mercury emissions for 2009 compared with 2008.

Most of facilities have met the 2008 annual limit target for sulphur dioxide and particulate matter. In 2010–2011, three facilities submitted their declarations of implementation. This indicates that these facilities have declared that the P2 plan requirements have been fully implemented either because all the tasks set out in their P2 plan had been completed or because of a partial or complete cessation of their operations.

Textile mills that use wet processing

Mills subject to this notice had until March 1, 2010, to provide a written declaration indicating that a P2 plan had been successfully implemented. The P2 planning notice for textile mills has been successful. The risk management objective to reduce the use of nonylphenol and its ethoxyl derivatives by 97% relative to 1998 levels by 2010 has been fully achieved. This has contributed significantly to reducing the impacts of the toxicity of textile effluents on the environment.

Nonylphenol and its ethoxylates contained in products

This notice applies to persons who (*i*) own or operate facilities that manufacture soap and cleaning

products, or processing aids used in wet textile processing, or pulp and paper processing aids; or (*ii*) import soap and cleaning products, or processing aids used in wet textile processing or pulp and paper processing aids. Persons are required to consider reducing the total quantity of nonylphenol and its ethoxylates used to manufacture products and imported in products in the base year (typically 1998) by 50% and 95% in Phase 1 and Phase 2, respectively.

January 31, 2011, was the deadline to submit the declarations that the plans had been completed and fully implemented. Analysis of the submissions indicates that overall on-site use of nonylphenol and its ethoxylates was reduced to 38 200 kg in 2010 (a 98% reduction from the base-year level). Importation of nonylphenol and its ethoxylates in 2010 was reduced to 32 477 kg (a 96% reduction from the base-year level).

Inorganic chloramines and chlorinated wastewater effluents

This notice applies to owners or operators of 84 wastewater systems that in 2004 or 2005 discharged, to surface waters, 5000 cubic metres per day or more of effluent with a total residual chlorine concentration of greater than 0.02 mg/L. The risk management objective is to achieve and maintain a concentration of total residual chlorine that is less than or equal to 0.02 mg/L in the effluent released to surface water, by December 15, 2009. The deadline for submitting a declaration that the pollution prevention plan had been implemented was July 15, 2010. As of March 31, 2011, 61 wastewater system operators had declared that they had fully implemented their plans, while an additional 10 systems have been granted time extensions to implement their plans for which the deadlines have not yet passed.

5.1.1.5 Environmental Performance Agreements

Environment Canada uses a range of tools to protect the environment, including non-regulatory agreements with industry that commit certain sectors or companies to specific challenges or performance levels. An Environment Performance Agreement is negotiated around the key principles and design criteria outlined in Environment Canada's Policy Framework for Environmental Performance Agreements (www.ec.gc.ca/epe-epa/default.asp?lang=En&n=564C0963-1).

Environmental performance agreement on 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.

In January 2011, E.I. DuPont Canada submitted its first annual report under this agreement. DuPont's production level of HCFCs in Canada conforms to the performance objective of the agreement.

Environmental Performance Agreement with Alcoa concerning atmospheric emissions of polycyclic aromatic hydrocarbons (PAHs)

This agreement with Alcoa was completed in December 2009; in 2010, Environment Canada published the final report for this agreement (see www.ec.gc.ca/epe-epa/default.asp?lang=En&n=3C7FB073-1). As a result of this agreement, Alcoa's Baie-Comeau, Quebec, facility reduced its PAH emissions intensity (in kilograms of PAHs per tonne of aluminum) by 45% since 2005. Environment Canada has publicly recognized Alcoa's accomplishments pursuant to this agreement in a letter of acknowledgement.

Environmental Performance Agreement with Rio Tinto Alcan concerning atmospheric emissions of polycyclic aromatic hydrocarbons (PAHs)

The performance objectives outlined in the agreement are being achieved at all covered facilities. Since 2007, Rio Tinto Alcan's PAH emissions have been reduced by more than 110 tonnes and further reductions are expected before the agreement ends in 2015. Environment Canada publishes an annual report update that is available at www.ec.gc.ca/epe-epa/default.asp?lang=En&n=5BE979CD-1#X-201006160806394.

Environmental Performance Agreement with the Vinyl Council of Canada and the Tin Stabilizers Association

Under this five-year agreement (2008–2013), the two industrial organizations implement a good-management-practices guideline to minimize releases of the organotin-based stabilizers used in polyvinyl chloride processing. In December 2010, Environment Canada published the third annual progress report pertaining to the Environmental Performance Agreement Respecting the Use of Tin Stabilizers in the Vinyl Industry.

A key element of this agreement is a requirement to verify compliance by the approximately 35 affected facilities with the practices set out in the guideline. Environment Canada will conduct verification of compliance at each participating facility during the duration of the agreement. For any non-compliance that is still unresolved when each final report is issued, parties will agree upon remedial action plans. All facilities visited by the verification team to date are either in full compliance with the guideline or have in place an action plan and schedule to address and remedy any issues identified by the team.

Environmental Performance Agreement respecting perfluorinated carboxylic acids (PFCAs) and their precursors in perfluorinated products sold in Canada

In March 2010, the Environmental Performance Agreement respecting long-chain PFCAs and their precursors in perfluorinated products was finalized. This agreement is a key component of a comprehensive risk management strategy for PFCAs. The agreement is intended to incite participating companies to:

- Work towards the elimination of residual perfluorooctanoic acid (PFOA), residual long-chain PFCAs and residual precursors in their perfluorochemical products sold in Canada, and
- Collect and report information on their perfluorochemical products sold in Canada that contain PFOA, long-chain PFCAs and precursors (residual and non-residual).

Data have been received by companies participating in the agreement and are being considered. A copy of the final agreement is available at www.ec.gc.ca/epe-epa/default.asp?lang=En&n=AE06B51E-1.

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

The CMP Monitoring and Surveillance Program collects data on the concentration of chemical substances in environmental compartments at locations across Canada. Environmental compartments 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 representing 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 compartments, to provide measured environmental data for risk assessment and risk management decision making. The 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

Canada has reduced its domestic sources of anthropogenic (human-induced) mercury releases by approximately 90% since the 1970s. However, transboundary mercury emissions are rising and now account for more than 95% of mercury deposition in Canada. Accelerated global efforts will be critical to meeting Canadian environmental and human health goals. Accordingly, the Government of Canada is committed to taking further actions at home and internationally to minimize and, where feasible, eliminate anthropogenic mercury releases.

A risk management strategy for mercury was published by the Government of Canada in October 2010. The strategy provides a comprehensive description of the government's progress to date in managing mercury, and outlines current and anticipated mercury-management activities. These include regulations that are expected to reduce mercury emissions from electrical power generation; regulations that will prohibit the import, manufacture and sale of mercury-containing products; and ongoing participation in negotiations under the United Nations Environment Programme towards a global, legally binding instrument on mercury.

In February 2009, the Governing Council of the United Nations Environment Programme agreed to the preparation of a global, legally binding treaty on mercury to drive all countries to reduce their mercury emissions and minimize health and environmental impacts associated with these emissions. Since negotiations were launched in 2010, two sessions have taken place. Negotiations are to be completed by 2013. Canada has been an active participant on the international negotiating committee, represented by the federal government with observers from environmental non-governmental organizations and Aboriginal groups. More information on the mercury negotiations can be found at www.unep.org/hazardoussubstances/Mercury/Negotiations/tabid/3320/Default.aspx.

5.1.2 Consultations

The following public consultations were held in 2010–2011:

An email consultation took place from November 12, 2009, to December 23, 2009, with urethane and miscellaneous foam sector (excluding polystyrene) companies on the Working Document for the Pollution Prevention Planning Notice for the Urethane and Miscellaneous Foam Sector (excluding Polystyrene). A multi-stakeholder workshop reviewed the proposed approach on March 22, 2010. The Proposed Pollution Prevention Planning Notice published in the *Canada Gazette*, Part I, on July 3, 2010, for a 60-day public comment period, considered comments received on the working document and on the draft proposed Planning Notice (www.ec.gc.ca/planp2-p2plan/default.asp?lang=En&n=60B26E6A-1).

In August 2010, a final version of the Ecological State of the Science Report on Decabromodiphenyl Ether (decaBDE) and a final revised risk management strategy for polybrominated diphenyl ethers (PBDEs) was published for a 60-day comment period (www.ec.gc.ca/toxiques-toxics/Default.asp?lang=En&n=98E80CC6-1&xml=5046470B-2D3C-48B4-9E46-735B7820A444).

In September 2010, a Notice of Intent was published to solicit the views of the public on the intent of the Minister of the Environment and the Minister of Health to recommend to the Governor in Council to develop export controls for perfluorooctane sulfonate, its salts and certain other compounds that contain the $C_8F_{17}SO_2$, $C_8F_{17}SO_3$ or $C_8F_17SO_2N$ groups (PFOS) and lindane for a 60-day public comment period (www.gazette.gc.ca/rp-pr/p1/2010/2010-09-11/html/notice-avis-eng.html).

In October 2010, Environment Canada undertook consultations on a Draft Order Amending Schedule 3 to CEPA 1999. Schedule 3, or the *Export Control List*, includes substances that are prohibited or restricted for use in Canada or are subject to an international agreement that requires the notification or the consent of the country of destination before they are exported from Canada (www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=B0C2EF8E-1).

In November 2010, Environment Canada published a consultation document to give interested and affected parties in the chemical production sector an opportunity to provide input on the proposed addition of BNST to the *Prohibition of Certain Toxic Substances Regulations* (www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=51858519-1).

Environment Canada published a consultation document to give interested and affected parties an opportunity to provide input on the proposed risk management instruments for D4 in industrial effluents and personal care products. A multi-stakeholder consultation took place on August 10 and 11, 2010 (www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=D259C573-1).

In January 2011, Environment Canada published a consultation document for comment on the proposed risk management measure for tetrabutyltin (www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=B7045781-1).

In January 2011, Environment Canada published a consultation document for comments on the proposed risk management measure for the non-pesticidal uses of tributyltin. The document outlines the proposal for adding tributyltins to the *Prohibition of Certain Toxic Substances Regulations* (www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=B9059212-1).

The working document for the Pollution Prevention Planning Notice for Isoprene in the Resin and Synthetic Rubber Manufacturing Sector was prepared for stakeholder review and comment from August 23, 2010, to September 20, 2010, in preparation for the Proposed Notice. Environment

Canada published the Pollution Prevention Planning Notice in the *Canada Gazette*, Part I, on January 1, 2011, for a 60-day comment period (www.ec.gc.ca/planp2-p2plan/default.asp?lang=En&n=956B3E8C-1#X-201009211000093).

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 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 2010–2011, 461 new substance notifications were received pursuant to the *New Substances Notification Regulations (Chemicals and Polymers) and the New Substances Notification Regulations (Organisms)*. Of these, the Minister issued 16 Significant New Activity Notices (Table 8), three Ministerial Conditions (Table 9), and no prohibitions.

Some of the 461 new substances notifications related to nanomaterials and substances that have the potential to be manufactured in the nanoscale. Of these, the Minister issued three Significant New Activity Notices.

Table 8: Significant New Activity Notices for new substances from April 2010 to March 2011

Substance	Final Notice*
Fatty acids, unsatd., dimers, polymers with fatty acids, polyethylenepolyamine and polyethylenepolyamine, compds. with unsatd. fatty acid trimers	2010 May 29
Resin acids and rosin acids, cobalt salts	2010 June 19
Fatty acids, C_{16-18} and C_{18-} unsatd., esters with acetaldehydeformaldehyde reaction by products	2010 June 19
Fatty acids, esters with polyalkanol	2010 July 10
Alkyl acrylic acid, (alkoxysilyl)alkyl ester, reaction products with silica	2010 July 17
1-Propanaminium, N,N,N-trimethyl-3-(octadecyloxy)-, chloride (1:1)	2010 Aug. 7
Poly(oxy-1,2-ethanediyl), α-monoalkyl ethers-ω-mono(hydrogen maleate)-	2010 Aug.21
Short tangled multi-walled carbon nanotubes obtained by catalytical chemical vapour deposition	2010 Sept. 25
2-Propenoic acid, 2-methyl-, polymer with 2-(substituted)alkyl 2-methyl-2-propenoate, 2-propenoic acid and polyfluoroalkyl 2-methyl-2-propenoate, acetate	2010 Oct. 23
Aromatic isocyanate polymer, alkoxy-alkylamine blocked	2010 Nov. 13
Cellulose sulphate	2010 Dec. 18
Carbopolycyclic diol polymer with carbonic dichloride and substituted phenol ester	2010 Dec. 25
2-Propenoic acid, 2-methyl-, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl ester, polymer with 1,1-dichloroethene and alkyl 2-propenoate	2010 Dec. 25
1-Alkanol, polyfluoro-, reaction products with phosphorus oxide (P_2O_5), ammonium salts	2011 Mar. 12
1,4-Benzenedicarboxylic acid, 1,4-dibutyl ester	2011 Mar. 19
5,5′-(Polyalkenylalkanediyl)bis(3-substituted-4H-1,2,4-triazole)	2011 Mar. 26

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

Table 9: Notices of Ministerial Conditions for new substances from April 2010 to March 2011

Substance	Final Notice*
Tetrahalidearomaticdione, reaction product with 2-ethyl-1-hexanol	2010 July 10
Formaldehyde, polymer with N1-(2-aminoethyl)-N2[2-[(2-aminoethyl)amino]ethyl]-1,2-ethanediamine, alkane bis oxymethyleneoxirane, 4,4′-(1-methylethylidene)bis[phenol] and 2,2′-[(1-methylethylidene)bis(4,1-phenyleneoxymethylene)] bis [oxirane], reaction products with Bu glycidyl ether and 1-[[2-[(2-aminoethyl)amino]ethyl]amino]-3-phenoxy-2-propanol, acetates (salts)	2010 July 24
1-Propanamine, *N,N*-dimethyl-3-(alkoxy)-	2010 Oct. 9

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

Of the 461 notifications, 43 notifications were related to chemical or polymer substances and eight notifications were related to living organisms intended solely for use in products regulated under the *Food and Drugs Act*. In 2010–2011, three Significant New Activity Notices, one re-evaluation of a Significant New Activity Notice, one Ministerial Request for additional information, and two Ministerial Conditions were published for substances in products regulated under the *Food and Drugs Act*.

As announced on September 4, 2010 in the *Canada Gazette,* Part I, the nomination process for the revised In Commerce List of *Food and Drugs Act* substances was opened on July 1, 2010 and scheduled to end in July 2011. The first phase of the process involved 10 volunteer companies. Representatives of these companies attended a training session that included an information package with a detailed guidance document, frequently asked questions, contact information for enquiries, and nomination forms for chemicals and polymers and micro-organisms.

5.3 Export of Substances

Under CEPA 1999, the Export Control List (ECL) includes 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. CEPA 1999 requires exporters to submit prior notice of export substances on the ECL.

In 2010–2011, 91 export notices were submitted to the Minister of the Environment.

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. Paragraph 74(*b*) requires that all living organisms on the DSL (about 68 micro-organisms) undergo a screening assessment to determine whether the living organism is toxic or capable of becoming toxic.

6.1 Existing Animate Products of Biotechnology

In 2010–2011, Environment Canada and Health Canada jointly developed the screening assessment process for microorganisms listed on the DSL. The first screening assessment report (*Pseudomonas aeruginosa* – three strains) was prepared and finalized in 2010, with publication scheduled for July 2, 2011. Two additional screening assessment reports (*Bacillus* sp. and *Pseudomonas fluorescens*) were also drafted and reviewed by external scientific experts. Their publication is planned for 2011–2012. Initial drafting of several other DSL microorganism screening assessment reports also began in 2010–2011.

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.

6.2 New Animate Products of Biotechnology

During 2010–2011, 16 notifications were received pursuant to the *New Substances Notification Regulations (Organisms)* for new animate products of biotechnology. In addition, there were eight preliminary assessments of information for prospective regulatory clients. None of the living organisms assessed under the regulations in 2010–2011 were the subject of a Significant New Activity Notice.

In June 2010, Health Canada, in collaboration with Environment Canada, organized and conducted a multi-stakeholder workshop meeting to solicit feedback from stakeholders on proposed amendments to the portion of the regulations dealing with "higher organisms" of the *New Substances Notification Regulations (Organisms).* Approximately 40 participants from different stakeholder groups (industry, academia, government, non-governmental organizations) reviewed, discussed and provided feedback and recommendations on the latest amendment proposals. This was the third and final multi-stakeholder consultation, building on feedback received from stakeholders in workshops conducted in 2006 and 2007. Drafting of the amended regulations will continue in 2011.

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 Vehicle, Engine and Equipment Emissions

Canada has developed and will continue to develop a series of regulations to reduce smog-forming air pollutant emissions and greenhouse gas emissions from vehicles and engines in alignment with the standards of the U.S. EPA.

Currently, there are regulations in place to reduce emissions from passenger cars and light-duty trucks, heavy-duty vehicles, motorcycles, marine engines, recreational vehicles as well as construction and agricultural equipment, and small engines such as lawnmowers and chainsaws.

Greenhouse Gas Emissions Regulations

The *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations* were published in the *Canada Gazette*, Part II, on October 13, 2010. These regulations introduce GHG emission standards for new cars and light trucks beginning with the 2011 model year, in alignment with the U.S. national standards. The regulated standards become more stringent with each model year over the 2011 to 2016 model-year period and will generate progressively larger emission reductions. A Notice of Intent was published in the *Canada Gazette*, Part I, on October 16, 2010, stating the government's intention to continue working with the United States toward the development of tighter standards for light-duty vehicles of the 2017 and later model years. In May 2010, the Government of Canada and the United States each announced that they would regulate GHG emissions from on-road heavy-duty vehicles. The Minister of the Environment's announcement specified that Canada's regulations under CEPA 1999 would be aligned with those of the United States. On October 25, 2010, Environment Canada released a regulatory framework consultation document to seek early views from interested parties on key elements being considered for these future regulations.

Air Pollutant Emissions Regulations

The *Marine Spark-Ignition Engine, Vessel and Off-Road Recreational Vehicle Emission Regulations* were published in the *Canada Gazette*, Part II, on February 16, 2011. Under these standards, and for the first time in Canada, vehicles such as snowmobiles, personal watercraft, outboard motors and off-road motorcycles will be subject to regulations on smog-forming emissions. These emission standards will apply to most classes of vehicles and engines beginning with the 2012 model year.

On February 12, 2011, the proposed *Regulations Amending the Off-Road Compression-Ignition Engine Emissions Regulations* were published in the *Canada Gazette*, Part I. These amendments will result in further reductions of smog-forming emissions from the off-road diesel engine sector, which includes engines typically found in construction, farming, forestry, and some mining machinery. On December 18, 2010, the Minister of the Environment issued an Interim Order pursuant to subsection 163(1) of CEPA 1999 to maintain alignment between Canadian requirements and the slightly modified U.S. EPA provisions for engines manufactured under the flexibility program.

Fuel Regulations

The *Renewable Fuels Regulations* were published in the *Canada Gazette*, Part II, on September 1, 2010. These regulations require fuel producers and importers to have an average annual renewable fuel content of at least 5% of the volume of gasoline that they produce or import, commencing in December 2010.

Regulations amending the *Renewable Fuels Regulations* were published in the *Canada Gazette*, Part I, on February 26, 2011. The amended regulations include provisions requiring an average 2% renewable fuel content in diesel fuel and heating

distillate oil, as well as some minor revisions to the initial regulations that address technical issues, minor inconsistencies and lack of clarity in the original regulations. The proposed implementation date for the average 2% renewable fuel content in diesel fuel and heating distillate oil was July 2011.

Regulations amending Canada's *Gasoline Regulations* were published in the *Canada Gazette*, Part II, on July 7, 2010. The amended regulations provide an exemption for the production, import and sale of leaded gasoline in Canada for use in competition vehicles for an indeterminate period. Persons producing, importing, or selling such fuel for use in Canada are still required to report their activities so that Environment Canada can continue to monitor the use of leaded gasoline in competition vehicles. Environment Canada, with the support of Health Canada, will conduct a five-year review, and will assess if further action is warranted based on science, technology, and fuel-replacement developments.

Vehicle and Engine Compliance Program

The Department administers a program to verify compliance with regulations. To further realize the benefits of aligned emissions standards, the Department works closely with the U.S. EPA.

Vehicles and engines subject to Canadian regulations must comply with emission standards to qualify for importation or interprovincial transport. Despite the best efforts of manufacturers, defects in the design, construction or functioning of a vehicle/engine that affects or could affect compliance with a prescribed standard can occur, given the complexity of vehicle/engine designs, the variety of parts and different component suppliers. Where defects do occur, CEPA 1999 provides a non-judicial mechanism through the notice of defect provisions for companies to take corrective action by issuing a notice of defect.

In 2010–2011, 131 emission tests were performed on various types of vehicles and engines. The program also reviewed 65 submissions for products unique to the Canadian market for the 2010 and 2011 model years. During this period, 25 notices of defect and other notifications covering approximately 78 000 products were processed. These actions resulted in product recalls and warranty extensions by their manufacturers or importers.

Suspected non-compliance cases were transferred to the Enforcement Branch. See Chapter 10 for information on compliance and enforcement activities.

7.2 Disposal at Sea

The disposal of waste at sea within Canadian jurisdiction and by Canadian ships in Canadian jurisdiction and international waters requires a permit issued by Environment Canada. A permit for disposal at sea will be approved only if it is the environmentally preferable and practical 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 CEPA 1999);
- an assessment framework for reviewing permit applications based on the precautionary principle, which must be followed (Schedule 6 of CEPA 1999); and
- a statutory obligation to monitor selected sites.

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

Through the *Disposal at Sea Regulations* pursuant to CEPA 1999, Canada implements its international obligations as a party to the 1996 Protocol to the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. In this regard, Canada and other Convention and Protocol parties have been supporting the continuation of a major project on the reduction of barriers to compliance to the treaty. Workshops, guidance and technical assistance are offered to countries to aid their acceding to the London Protocol or to coming into compliance with it. Canada currently chairs the new "Compliance Group" that was struck under the Protocol to deal with systemic compliance issues.

Canada has also been active with other parties, research organizations and environmental groups in developing options for creating a transparent, global

regulatory mechanism for ocean fertilization and potentially for other forms of marine geo-engineering where there is potential to cause harm to the marine environment. Cooperation with other international bodies, including the Convention on Biological Diversity, calling for such global regulation is ongoing. Canada will host a working group meeting in June 2011 to allow the better consideration of these options.

Canada participates actively in the development of international guidance material relevant to disposal at sea. Current projects include developing action levels (levels of concern) for fish waste, revising dredged material assessment guidance, developing low-tech assessment guidance for dredged material, and guidance on assessment of CO_2 streams for sub-seabed geological storage.

7.2.1 Disposal at Sea Permits

In 2010–2011, 83 permits were issued in Canada for the disposal of 3.78 million tonnes of waste and other matter (tables 10 and 11), compared with 83 permits for the disposal of 4.57 million tonnes in 2009–2010. Most of the material permitted for disposal was dredged material that was removed from harbours and waterways to keep them safe for navigation. Also permitted was excavated native till (geological matter) that is disposed of at sea in the lower mainland of British Columbia, where on-land disposal options for clean fill are extremely limited. A small amount of fish-processing waste is also permitted in remote communities where there is no access to reuse-and-recycling opportunities. The number of permits issued has remained relatively stable since 1995, although there has been a slight reduction in 2008–2009 and 2009–2010.

Table 10: Disposal at sea quantities permitted (in tonnes) and permits issued in Canada from April 2010 to March 2011

Material	Quantity permitted	Permits issued
Dredged material	3 321 370*	35
Geological matter	390 000*	2
Fisheries waste	70 385	46
Vessels	–	–
Organic matter	–	–
Total	**3 781 755**	**83**

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

Table 11: Disposal at sea quantities permitted (in tonnes) and permits issued by region from April 2010 to March 2011

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*	1 190 670	9	79 300	10	2 051 400	16	0	0
Geological matter*	0	0	0	0	390 000	2	0	0
Fish waste	68 885	42	1500	4	0	0	0	0
Vessels	–	–	–	–	–	–	–	–
Organic matter	–	–	–	–	–	–	–	–
Total	**1 259 555**	**51**	**80 800**	**14**	**2 441 400**	**18**	**–**	**–**

* 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

The program monitors representative disposal sites 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. By monitoring disposal sites, Environment Canada is able to verify that the permitting of disposal is sustainable and that permit holders can have continued access to suitable sites. Where monitoring indicates a problem or where the site has reached its capacity over time, management action in the form of closing, moving or altering the site use can occur. In 2010–2011, monitoring projects were completed on seven disposal sites, specifically involving fieldwork carried out in the summer of 2010. No management action was required at these sites.

In Environment Canada's Atlantic Region, sediment chemical analysis and benthic community structure studies were conducted at two smaller disposal sites. In the Quebec Region, bathymetric and underwater video surveys were conducted in the Magdalen Islands, and additional work was conducted on adding historical data to the Department's Geo-information on Sediment (GISE) database.

In the Pacific and Yukon Region, monitoring work focused on two large disposal sites in the Vancouver area. Chemical analysis of sediments was conducted at both sites, and a benthic biota survey was conducted at one. Much of the work undertaken in 2010–2011 was in support of changes to permit assessment in areas that have been designated as critical habitat for Killer Whales under the *Species at Risk Act*.

Further details can be found in the *Compendium of Monitoring Activities at Ocean Disposal Sites*, which is sent to permit holders 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 waste (including both hazardous and non-hazardous waste) and hazardous recyclable materials. It also enables authorities to make regulations that set out criteria that may be considered in refusing to issue an export, import or transit permit, should the waste or hazardous recyclable material not be managed in a manner that will protect the environment and human health.

Through the *Export and Import of Hazardous Waste and Hazardous Recyclables Material Regulations* and the *PCB Waste Export Regulations*, Canada implements its international obligations as a party to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal and the Canada–United States Agreement on the Transboundary Movement of Hazardous Waste. Other activities related to Canada's commitment to the Basel Convention include playing a leading role in the development of a new strategic framework for the period 2012–2021 and supporting the participation of developing countries in this process. Canada also participated in an initiative to develop recommendations for the protection of countries that do not have the capacity to manage hazardous wastes in an environmentally sound manner; provided scientific and policy expertise in the development of guidelines for the management of mercury, used tires and cement kilns; and played a leadership role in the development of guidance on the environmentally sound management of end-of-life electronics under the public-private Partnership for Action on Computing Equipment, established to advance the goals of the Basel Convention.

During the 2010 calendar year,[3] just over 42 100 individual transboundary shipments of

[3] 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 2010 calendar year (from January 1 to December 31, 2010).

hazardous waste and hazardous recyclable material were reported in movement documents received by Environment Canada.

In 2010, the quantity of hazardous waste and hazardous recyclable material imported into Canada was 358 236 tonnes (t). This represents a decrease of 120 415 t or 25% over the total 2009 import quantity, which was 478 651 t. Shipments destined for recycling, which reduce reliance on primary resources and benefit Canadian industry, totaled 212 053 t and represented about 59% of all imports in 2010, an increase from 45% in 2009. 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 2010, exports of hazardous waste and hazardous recyclable materials amounted to 425 334 t, which represents a decrease of 6587 t or 2% from the 2009 figure. Of this value, the quantity of waste that was exported for recycling in 2010 was 355 003 t, which is an increase from 316 172 t in 2009.

During 2010, over 2500 notices were processed for proposed imports, exports and transits of hazardous wastes and hazardous recyclable materials. The notices received covered 17 978 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 2010, 99% of imports and 96% of exports for both hazardous waste and hazardous recyclable materials occurred between Canada and the United States. No other countries received shipments of hazardous waste destined for disposal from Canada. Other regions involved in the movement of hazardous recyclable materials in notable quantities include certain European countries and the Republic of Korea.

In 2010, exports of hazardous recyclable materials originated from seven provinces, with Ontario and Quebec accounting for nearly 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 Ontario and Quebec. No exports of hazardous waste, whether destined for disposal or recycling, were shipped from Newfoundland and Labrador, Prince Edward Island or any of the territories.

Imports of hazardous recyclable materials in 2010 were shipped to six provinces. Quebec and Ontario continued to receive the vast majority of all imports into Canada, with a smaller number of shipments imported into British Columbia, Alberta, New Brunswick, and Nova Scotia. 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 of hazardous waste, whether destined for disposal or recycling, were received by Manitoba, Saskatchewan, Newfoundland and Labrador, Prince Edward Island or any of the territories.

Tables 12 and 13 list the quantities imported and exported from 2002 to 2010.

Table 12: Hazardous waste and hazardous recyclable material, imports, 2002–2010 (tonnes)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Recyclables	193 318	189 110	200 097	174 983	164 903	220 377	247 763	215 648	212 053
Total imports	423 067	417 368	416 136	476 416	408 839	470 136	509 501	478 651	358 236

Table 13: Hazardous waste and hazardous recyclable material, exports, 2002–2010 (tonnes)

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Recyclables	238 597	205 356	187 986	226 380	374 024	352 933	354 722	316 172	355 003
Total exports	340 261	321 294	308 357	327 746	474 538	452 396	457 806	431 921	425 334

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.

The *Environmental Emergency Regulations* (E2 Regulations), created under Part 8 of CEPA 1999, require any person responsible for substances listed in the regulations to prepare and implement an environmental emergency plan for their facility, if the total quantity of the substance on site, and the maximum capacity of the container storing the substance, are equal to or greater than the regulated threshold quantity for the substance.

Environment Canada's Environmental Emergencies website (www.ec.gc.ca/ee-ue/default.asp?lang=En&n=8A6C8F31-1) includes implementation guidelines for E2 plans, 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, 2011, approximately 4200 facilities had filed Notices Regarding the Identification of Substance and Place under the E2 Regulations. Of these facilities, approximately 2400 were required to prepare E2 plans. The notices submitted by facilities indicate that 94 of the 174 regulated substances are in use in Canada. The seven most commonly used substances were propane, anhydrous ammonia, chlorine, gasoline, pentane, butane and hydrochloric acid.

In 2010–2011, 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 CEPA 1999 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.

In June 2010, the first major performance milestone for the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* came into force. These regulations, which seek to reduce the risk of contaminating soil and groundwater as a result of spills and leaks of petroleum products and allied petroleum products from storage tank systems, include a number of mandatory requirements that come into force through to 2012. Analysis of compliance data for the first major performance milestone, the identification requirements, has indicated a high compliance rate to date. This data will establish a comprehensive inventory of federal storage tank systems and continue to be used to support performance analysis, compliance promotion efforts and enforcement activities to ensure continued compliance with the regulations, including the upcoming requirements for product transfer areas and removal of high-risk systems.

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 1999 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 and prosecutions. In addition, compliance can be achieved through Environmental Protection Alternative Measures (EPAMs), a program for diverting offenders away from the formal court process.

10.1 Designations and Training

The number of active designated persons with enforcement powers under CEPA 1999 within Environment Canada is as follows:

- 185 CEPA enforcement officers;
- 38 emergency officers from the Environmental Emergencies Program designated as CEPA enforcement officers with limited powers; and
- 154 CEPA analysts.

In the fall of 2010, the Basic Enforcement Training program produced 10 newly designated officers with full enforcement powers, and two emergency officers with limited enforcement powers.

With the coming into force of many provisions of the new *Environmental Enforcement Act* (EEA), in December 2010, Environment Canada developed and delivered a one-day regional seminar intended for all its designated officers. This seminar was held in 25 different locations to ensure that all designated officers, including emergencies officers, received training in the new and amended provisions of CEPA 1999 introduced by the EEA and in the newly created *Environmental Violations Administrative Monetary Penalties Act* (EVAMPA). Environment Canada is developing the regulations and policy needed for the implementation of provisions of CEPA 1999 (and other legislation) introduced or amended by the EEA. Training will be provided for these provisions in 2011–2012.

In 2010–2011, the existing Limited Powers/Analyst Designation course was also updated to reflect the amendment of CEPA 1999 related to the EEA. It was delivered in the National Capital Region and resulted in 13 newly designated CEPA analysts. More sessions are to be delivered in 2011–2012.

Other accomplishments related to training on CEPA 1999 regulations in 2010–2011 include:

- the development and delivery of a course to 11 officers on the *Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations*
- the assessment of requirements and initiation of the development of training modules covering the vehicles and engines regulations, as follows:
    - *Off-Road Small Spark-Ignition Engine Emission Regulations and Amendment*
    - *Off-Road Compression Ignition Engine Emission Regulations and Amendment*
    - *On-Road Vehicles and Engine Emission Regulations*
    - *Marine Spark Ignition Engine and Off-road Recreational Vehicle Emission Regulations*
    - *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations* (Light Duty Vehicle Regulations)

- the development of the upgraded course for all fuels regulations as a result of the new *Fuel Waiver Regulations* (i.e. the *Regulations respecting Circumstances for Granting Waivers pursuant to section 147 of the Act*). The course will include the following regulations:
    - *Regulations Respecting the Concentration of Lead and Phosphorus in Gasoline* (known as the *Gasoline Regulations*)
    - *Benzene in Gasoline Regulations*
    - *Sulphur in Gasoline Regulations*
    - *Sulphur in Diesel Fuel Regulations*
    - *Regulations Respecting the Import and Export of Contaminated Fuels* (known as the *Contaminated Fuel Regulations*)
    - *Fuels Information Regulations, No. 1*
    - *Gasoline and Gasoline Blend Dispensing Flow Rate Regulations*
    - *Fuel Waiver Regulations* (new regulations)
- the assessment of requirements and initiation of the development of an enhanced course on *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*

10.2 Compliance Promotion

Compliance promotion relates to the planned activities that are undertaken to increase 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 2010–2011, numerous compliance-promotion activities were delivered for new and existing control instruments under CEPA 1999. Multiple approaches were used to reach the regulated communities, including 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., Parks Canada, Hydro-Québec, the Canadian Fertilizer Institute, and manufacturers' associations).

10.2.1 Collaboration with First Nations

Environment Canada continued to work closely with First Nations and Aboriginal Affairs and Northern Development Canada in 2010–2011. Workshops, training and presentations were delivered on obligations to comply with regulations under CEPA 1999.

Compliance-promotion activities were carried out in support of the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*. An online training program was developed to aid First Nations in registering their storage tank systems in Environment Canada's database (FIRSTS). This training was delivered, on-site, to reserves in the Atlantic Region by Aboriginal Affairs and Northern Development Canada. Several workshops on the requirements of the regulations were delivered to the regulated community among First Nations across Canada. Furthermore, storage tank contingency planning workshops were held at the Kettle and Stony Point First Nation and at the Northern Ontario Environmental Conference. Compliance-promotion packages, including posters, background information and identification information in support of the storage tank system identification process, were also distributed through information sessions, conferences and meetings, and by mail to First Nations.

Several presentations were made on the proposed *Wastewater Systems Effluent Regulations* to the First Nations Circuit Rider Training Program, the Atlantic First Nations Housing & Infrastructure Network's Water & Wastewater Sub-Committee, the First Nations wastewater treatment operators hosted by the Atlantic Policy Congress of First Nations Chiefs, the Ontario First Nations Technical Services Corporation annual conference, and the Alberta First Nations Technical Advisory Group.

Environmental compliance workshops and meetings on the *Federal Halocarbon Regulations, 2003,* were delivered twice in Ottawa, Ontario, and once in Cole Harbour, Nova Scotia. The workshops were attended by the Atlantic First Nations Housing and Infrastructure Regional Technical Committee as well as other federal departments, boards, agencies and Crown corporations.

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 2010–2011, multi-instrument compliance-promotion activities covered a broad range of environmental regulations under CEPA 1999, the *Fisheries Act*, and the *Canadian Environmental Assessment Act*. In total, nine 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, including *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations, Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations, Volatile Organic Compound (VOC) Concentration Limits for Automotive Refinishing Products Regulations, New Substances Notification Regulations, Federal Halocarbon Regulations, 2003, Environmental Emergency Regulations, Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations.*

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.

10.2.3 Activities on Individual CEPA Instruments

Compliance-promotion activities on individual CEPA 1999 control instruments in 2010–2011 included the following:

Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations – Compliance-promotion activities included site visits, presentations, training sessions, meetings and information sessions held across Canada, promoting the regulations to over 1000 Canadians from different associations, other federal departments, and provincial and municipal governments. Three mail-outs containing information about the regulations were made, reaching approximately 2200 Canadians.

Notice Requiring the Preparation and Implementation of Pollution Prevention Plans in Respect of Mercury Releases from Dental Amalgam Waste – Presentations were made and an Environment Canada information booth was displayed during key events of different dental associations to promote the Notice Requiring the Preparation and Implementation of Pollution Prevention Plans. These activities reached approximately 1300 Canadian dentists. Provincial dental associations and the Alberta Dental Association and College's Dental Congress were contacted to assist in the emailing of a compliance-promotion package to their members. Posters promoting the regulations and best practices on mercury handling were mailed out to dental offices. In August 2010, emails and mail-outs were sent to remind dental offices of the deadline for completing Schedule 1: Declaration That a Pollution Prevention Plan Has Been Prepared and Is Being Implemented in Respect of Mercury Releases from Dental Amalgam Waste (subsection 58(1) of CEPA 1999). These mail-outs reached over 8000 professionals from the dental industry.

PCB Regulations and the *PCB Waste Export Regulations, 1996* – Presentations and targeted site visits were conducted to promote compliance with the regulations. Mail-outs containing information on the regulations were conducted across the country, reaching over 5200 corporate citizens potentially dealing with PCB. As well, several compliance promotion documents on the regulations' requirements and on the use of the PCB online reporting system were developed and made available to regulatees through Environment Canada's PCB web pages.

Environmental Emergency Regulations – Environment Canada gave presentations to and participated in workshops for several different associations and stakeholder groups to promote the regulations. Through these activities Environment Canada reached over 500 associations and groups, who, in turn, disseminated the information to members of their respective associations.

Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations – Mail-outs of annual report packages were sent to dry cleaners, sellers, importers, and recyclers of tetrachloroethylene, reaching over 4000 business owners. In addition, an Environment Canada information booth was displayed during the Saskatchewan Professional Dry Cleaners Association convention to promote compliance with the

regulations, and two presentations were made to the Alberta Textile and Cleaning Association.

Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations – Compliance promotion focused on delivering information through presentations and workshops about the regulations to fire-fighter associations, since aqueous film-forming foams that contain perfluorooctane sulfonate are used in fighting fires. These events reached over 100 participants. Efforts were made to contact, by phone and by mail-outs, organizations that may use aqueous film-forming foams such as provincial associations of fire marshals, fire chiefs, and fire departments; airports; ferry services; Transport Canada; oil refineries and fire emergency training schools. These efforts reached over 1800 members of different organizations and companies.

Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations – Compliance promotion focused on delivering information about the regulations through presentations, information sessions and mail-outs. Presentations were made to the Montréal Society of Coatings Technology, which encompasses most of the paint manufacturers in eastern Canada, and the Comité permanent de liaison environnement-municipalités (COPLEM) in Quebec. Information sessions held in different regions reached over 400 participants. Compliance-promotion packages containing a cover letter, fact sheet and questionnaire were mailed and emailed to approximately 10 000 manufacturers and importers.

Volatile Organic Compound (VOC) Concentration Limits for Automotive Refinishing Products Regulations – Compliance promotion for these regulations consisted of presentations, information sessions and mail-outs about the regulations including up to 100 participants in regional information sessions. Compliance-promotion packages containing a cover letter, fact sheet, and questionnaire were mailed and emailed to over 1500 manufacturers, importers and sellers. An advertisement to promote compliance with the regulations was placed in two specialized magazines (*Le Carrossier* and *Bodyshop Magazine*) to reach car finishing products manufacturers, importers, sellers and users. These two magazines have a distribution of 16 000 printed copies.

Federal Halocarbon Regulations, 2003 – Twenty information sessions, training sessions and presentations were given across Canada to various groups, including federal departments, boards, agencies and Crown corporations; First Nations; refrigeration mechanic students; and fire-extinguishing service contractors. To reach more Canadians, an advertisement campaign was done in the magazine *Inter-Mécanique du Bâtiment* of the Corporation des Maîtres mécaniciens en tuyauterie du Québec. Mail-out activities to targeted audiences were also made. These compliance-promotion activities reached approximately 10 000 Canadians.

Renewable Fuels Regulations – Mail-outs to 25 targeted Canadian fuel producers and importers were carried out. Information sessions and presentations were made to over 85 corporate citizens in the fuel industry.

Marine Spark-Ignition Engine and Off-Road Recreational Vehicle Emission Regulations – Mail-outs of fact sheets and information regarding the regulations were sent to over 2400 Canadians. Information sessions were conducted at boat trade shows, motorcycle trade shows and off-road recreational vehicles trade shows to promote compliance with the regulations to approximately 200 participants.

Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations – Mail-outs were sent to remind targeted regulatees about upcoming deadlines for reporting under the regulations; in total, 120 reminders were sent out. Meetings with industries took place to promote compliance with the regulations.

Phosphorus Concentration Regulations (i.e. the *Concentration of Phosphorus in Certain Cleaning Products Regulations*) – Prior to the coming into force of new requirements under the regulations, the Environment Canada laboratory in Edmonton determined the phosphorus concentration of a number of detergents and household cleaners to provide information for compliance promotion purposes. Some products were identified as having a phosphorus concentration exceeding the level prescribed in the amendments. Compliance promotion letters were mailed out to the companies that manufacture these products.

Gasoline and Gasoline Blend Dispensing Flow Rate Regulations – Mail-outs of fact sheets and

a compliance promotion information package for federal fuel regulations were sent to 600 gasoline retailers in Canada, including those on aboriginal land.

Vehicle and engine regulations – For the *Off-Road Compression-Ignition Engine Emission Regulations*, regulatee lists were updated and two information packages were sent to regulatees and potential regulatees. The first mail-out informed them of the interim order that modified the current regulations and included supplemental guidance related to compliance options. A subsequent mail-out campaign was conducted following publication of the proposed amendments to the regulations in the *Canada Gazette*, Part I, to solicit comments. Both mail-outs included a response form to encourage individuals to provide email contacts to reduce costs related to paper mail-outs. Mail-outs were sent to approximately 2500 companies.

10.3 Enforcement Priorities

Each year, a National Enforcement Plan describing the enforcement activities to be carried out in that fiscal year, including activities addressing non-compliance with CEPA 1999, is developed. To maximize the effectiveness of these activities, priority is given to specific regulations or instruments.

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 2010–2011, the National Enforcement Plan priorities included the following CEPA 1999 instruments:

- *PCB Regulations;*
- *Federal Halocarbon Regulations, 2003*;
- *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations*; and
- *Storage Tank Systems for Petroleum Products and Allied Petroleum Products 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 for regional enforcement focus.

The focus placed on regulations in each region is influenced by a number of factors, including geography, the prevalence of the regulated sectors, and provincial and territorial environmental sensitivities.

10.4 Enforcement Activities

10.4.1 Enforcement Statistics

Table 14 summarizes the inspections, investigations and enforcement measures undertaken in 2010–2011.

Table 14: Summary of inspections, investigations and enforcement measures from April 2010 to March 2011

CEPA Tool	Inspections			Investigations	Enforcement Measures										
	Total	On-site	Off-site		Tickets	Written Directions	Written Warnings	Injunctions	Ministerial Orders	EPCOs	EPAMs	Prosecutions	Charges	Counts	Convictions
Regulations															
Asbestos Mines and Mills Release															
Benzene in Gasoline	250	57	193				3								
Chlor-Alkali Mercury Release															
Chromium Electroplating, Chromium Anodizing and Reverse Etching	79	43	36				9								
Disposal at Sea	101	56	45				3			1					
Environmental Emergency	180	86	94	1			27			2					
Export and Import of Hazardous Waste and Hazardous Recyclable Material	279	214	65	6		1	19								
Export of Substances under the Rotterdam Convention	1	1													
Federal Halocarbon, 2003	646	296	350	3			85			4					
Federal Mobile PCB Treatment and Destruction															
Fuels Information, No. 1	143	7	136				1								
Gasoline and Gasoline Blend Dispensing Flow Rate	149	149					15			1					
Gasoline	19	6	13												
Interprovincial Movement of Hazardous Waste	51	43	8	1											
New Substances Notification (Chemicals and Polymers)	8	4	4												
New Substances Notification (Organisms)	12	9	3												
Off-Road Compression-Ignition Engine Emission	13	12	1	2							1	1	7	7	
Off-Road Small Spark-Ignition Engine Emission	20	19	1	1			6			1		1	7	7	
On-Road Vehicle and Engine Emission	24	19	5	3			4			3					
Ozone-depleting Substances, 1998	62	47	15	4			2								
PCB	551	332	219	5		1	39			3					
PCB Waste Export, 1996	1	1													
Perfluorooctane Sulfonate and its Salts and Certain Other Compounds	1	1													
Phosphorus Concentration															
Pulp and Paper Mill Defoamer and Wood Chip	39	2	37												
Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans	76	3	73												
Regulations Respecting Applications for Permits for Disposal at Sea															
Secondary Lead Smelter Release															
Solvent Degreasing	29	19	10				7								
Storage Tank Systems for Petroleum Products and Allied Petroleum Products	385	364	21	2			90		8						
Sulphur in Diesel Fuel	271	73	198				23								

Table 14 (Concluded)

CEPA Tool	Inspections			Investigations	Enforcement Measures										
	Total	On-site	Off-site		Tickets	Written Directions	Written Warnings	Injunctions	Ministerial Orders	EPCOs	EPAMs	Prosecutions	Charges	Counts	Convictions
Sulphur in Gasoline	88	56	32				1								
Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements)	1636	432	1204	10		1	173			19					
Vinyl Chloride Release, 1992	6	1	5												
Concentration of Phosphorus in Certain Cleaning Products	6	6													
Renewal Fuels	27	1	26				1								
Contaminated Fuel	2	2													
Volatile Organic Compound (VOC) Concentration Limits for Automotive Refinishing Products	1	1													
Chlor-Alkali Mercury Release															
Other tools*															
CEPA 1999 – Section(s)	86	54	32	13			8								
CEPA Section 46 Notices – Greenhouse Gases															
CEPA Section 56 Notices – P2 Plans	12	6	6				2								
CEPA Section 71 Notices – Toxics	4	2	2				1								
National Pollutant Release Inventory	188	23	165				87								
Total	**5446**	**2447**	**2999**	**51**		**3**	**606**			**42**		**2**	**14**	**14**	

Explanatory Notes:

* Includes activities related to enforceable provisions of CEPA 1999.

Inspections: Only closed files using the end date are tabulated. The number of inspections relates to the number of regulatees inspected for compliance under each of the applicable regulations.

Investigations: Investigations are tabulated by number of investigations files, based on the start date of the investigation. An investigation file may include activities relating also to other legislation and may include one or more regulations. Therefore, the total number of investigations shown by regulation may not add to the total at the legislative level.

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.

EPAMs: The number of EPAMs is represented by the number of regulatees who signed EPAMs by the charge date, regardless of the number of regulations involved.

Prosecutions: The number of prosecutions is represented by the number of regulatees that were prosecuted by the charge date, regardless of the number of regulations involved (including tickets).

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

Counts: The number of counts (excluding tickets) is tabulated at the section level of the regulation, by the offence date relating to the regulatee's charge.

Convictions: The number of convictions (excluding tickets) is represented by the number of counts to which the regulatee was found guilty or pleaded guilty, using the end date of the investigation.

10.4.2 Environmental Protection Compliance Orders

Environmental Protection Compliance Orders (EPCOs) are an enforcement response that may be issued to put an immediate stop to a CEPA violation, prevent a violation from occurring, or require action to be taken to correct a violation, without the use of the court system.

In 2010–2011, 42 EPCOs were issued: 19 to dry cleaners for alleged violations of the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations,* 8 to owners or operators subject to the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*, and 15 for alleged violations of various other regulations.

10.4.3 Environmental Protection Alternative Measures

Environmental Protection Alternative Measures (EPAMs) are an alternative to court prosecution for a violation of CEPA 1999, which divert the accused away from the court process after a charge is laid. If an EPAM agreement is successfully negotiated, it is filed with the court to become 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 2010–2011, following an investigation conducted by Environment Canada, a Montréal, Quebec, company and its president accepted responsibility for the illegal importation of approximately 120 000 kg of chlorodifluoromethane (HFCF-22), a regulated gas used in the refrigeration industry. The company and the president were charged with four counts of illegal importation of HFCF-22 in contravention of the *Ozone-depleting Substances Regulations, 1998*. Following consultation with Environment Canada, legal counsel representing the Attorney General of Canada negotiated an EPAM with the accused. Among its provisions, the alternative measures imposed by the agreement provide consent to forfeit to Her Majesty in right of Canada the 5315 cylinders of HCFC-22 seized (of which the market value is estimated at more than $1 million), the production and publication of an article about the case and the terms of the Agreement in a specialized magazine and on the company's website, and a voluntary payment of $4,500 to the Environmental Damages Fund.

10.4.4 Prosecutions and Court Cases

Key prosecutions and court cases in 2010–2011 included the following:

On July 20, 2010, a Fogo, Newfoundland and Labrador, company pleaded guilty to charges of improperly loading fish waste onto a vessel for the purpose of disposal at sea. The company was ordered to pay a $2,500 penalty for disposal at sea violations. The court ordered that $2,000 of the penalty be directed to the Environmental Damages Fund and $500 be paid to the court as a fine.

On July 26, 2010, an Edmonton, Alberta, dry cleaning company pleaded guilty to one count under the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations*. The company was fined $10,000 for not storing perchloroethylene (perc) waste in closed containers and for not having tetrachloroethylene-impermeable floor drain plugs readily available in the event of a spill. The Environmental Damages Fund will receive $9,500 of the fine.

On August 9, 2010, a Watrous, Saskatchewan, dry cleaning company pleaded guilty to two counts under the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations* and one count under CEPA 1999. The company was sentenced to penalties totaling $1,650 for not having proper secondary containment, for not completing an annual report, and for failing to comply with an Environmental Protection Compliance Order. The Environmental Damages Fund is to receive $950 of the penalty amount.

On January 27, 2011, a Halifax, Nova Scotia company pleaded guilty to charges of exporting electronic waste to Hong Kong—a violation of the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations.* The court ordered a payment of $9,500 to the Environmental Damages Fund for use in Nova Scotia. A fine of $500 will be paid to the court.

On January 28, 2011, a Toronto, Ontario, company pleaded guilty and was fined $18,000 for violations

under the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* and $12,000 for violating the *Transportation of Dangerous Goods Act, 1992*. Of this, $18,000 will be directed to the Environmental Damages Fund, $10,000 to the Technical Research and Development Fund, and $2,000 to the Receiver General of Canada and credited to the Consolidated Revenue Fund.

On February 23, 2011, a Red Deer, Alberta, dry cleaning company pleaded guilty to one count of having open containers of waste perc, a violation of the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations* made pursuant to CEPA 1999. The owner of the company also pleaded guilty to one count of providing false information to an enforcement officer under the Act. The company was ordered to pay $600 with an additional penalty of $5,400 to be paid to the Environmental Damages Fund. The owner was personally ordered to pay $250 and an additional penalty of $2,250 to the Environmental Damages Fund. Both penalties are for the specific purpose of environmental work in Alberta.

On March 14, 2011, an owner of an Estevan, Saskatchewan, company pleaded guilty to five charges and was fined $9,000 for exporting waste oil to the United States without a permit. Four counts were laid for contraventions of the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* and one for a contravention of CEPA 1999. The penalty consisted of a $4,000 fine, and the remaining $5,000 will go to the Environmental Damages Fund.

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 (EWG), Environment Canada participates in several enforcement-focused projects with the United States and Mexico. In 2010–2011, the EWG developed a five-year strategic vision and a two-year implementation plan aimed at enhancing operational cooperation among the three countries. The three countries committed to working together to develop and implement a regional approach to intelligence-led enforcement with a specific focus on preventing the illegal movements of electronic waste, non-compliant imports, ozone-depleting substances, and hazardous waste. The expected outcome over the next five years will be enhanced and more effective environmental compliance and enforcement, both domestically and as a region.

Environment Canada also actively participates in Interpol's Environmental Crimes working groups, which are focused on issues such as developing institutional forensic capacity and stopping the illegal movement of electronic waste. As well, the Department's Enforcement Branch participates in border blitzes with organizations such as Interpol and the International Network for Environmental Compliance and Enforcement. For example, in 2010 the Enforcement Branch participated in two international border blitzes targeting the illegal movement of hazardous waste and electronic waste. During the border blitzes Environment Canada worked in cooperation with the Canada Border Services Agency and the Province of 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
10 Wellington Street, 23rd 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
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Ottawa ON K1A 0K9

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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 15: Assessment decisions of batches 6 through 12 under the Chemicals Management Plan Challenge from April 2010 to March 2011

Substance	Meets Criteria of s. 64	Proposed Measure	Draft Notice*	Final Notice*
Batch 6				
2-Naphthalenol, 1-[[4-(phenylazo)phenyl]azo]-	Yes (64(*c*))	Add to Sch. 1 / SNAc	2010 Oct. 2	TBD
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 / SNAc	2010 Oct. 2	TBD
Butanamide, 2,2'-[(3,3'-dimethoxy[1,1'-biphenyl]-4,4'-diyl)bis(azo)] bis[N-(2-methylphenyl)-3-oxo-	No	NFA	2010 Oct. 2	TBD
Phenol, 4-[[2-methoxy-4-[(4-nitrophenyl)azo]phenyl]azo]-	No	NFA	2010 Oct. 2	TBD
Batch 8				
Propane, 2-nitro-	Yes (64(*c*))	Add to Sch. 1 / SNAc	2010 Jan. 30	2010 July 31
Benzene, 1-methyl-2-nitro-	Yes (64(*c*))	Add to Sch. 1 / SNAc	2010 Jan. 30	2010 July 31
Phenol, 2,6-bis(1,1-dimethylethyl)-4-(1-methylpropyl)-	Yes (64(*a*))	Add to Sch. 1	2010 Jan. 30	2010 July 31
Methane, nitro-	No	NFA	2010 Jan. 30	2010 July 31
Methylium, [4-(dimethylamino)phenyl]bis[4-(ethylamino)-3-methylphenyl]-, acetate	Yes (64(*a*))	Add to Sch. 1 / SNAc	2010 Jan. 30	2010 July 31
Glycine, N,N-bis(carboxymethyl)-	No	NFA	2010 Jan. 30	2010 July 31
Benzene, 1,3,5-tribromo-	No	NFA / SNAc	2010 Jan. 30	2010 July 31
Benzene, 1,2,3,4-tetrachloro-5,6-dimethoxy-	No	NFA / SNAc	2010 Jan. 30	2010 July 31
Zinc, bis[0,0-bis(1,3-dimethylbutyl) phosphorodithioato-S,S']-, (T-4)-	No	NFA	2010 Jan. 30	2010 July 31
Phenol, (1,1-dimethylethyl)-4-methoxy-	No	NFA	2010 Jan. 30	2010 July 31
Fatty acids, C6-19-branched, zinc salts	No	NFA / SNAc	2010 Jan. 30	2010 July 31
Benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, (1,2-dioxo-1,2-ethanediyl)bis(imino-2,1-ethanediyl) ester	No	NFA	2010 Jan. 30	2010 July 31
Phosphonium, triphenyl(phenylmethyl)-, salt with 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]bis[phenol] (1:1)	No	NFA	2010 Jan. 30	2010 July 31
Phosphonic acid, [[3,5-bis(1,1-dimethylethyl)-4-hydroxyphenyl] methyl]-, monoethyl ester, calcium salt (2:1)	No	NFA	2010 Oct. 2	TBD
Batch 9				
Benzene, 1,2-dimethoxy-4-(2-propenyl)-	Yes (64(*c*))	Add to Sch. 1 / SNAc	2010 Mar. 20	2010 Sept. 18
Vanadium oxide (V_2O_5)	Yes (64(*c*))	Add to Sch. 1 / SNAc	2010 Mar. 20	2010 Sept. 18
Oxirane, 2,2',2'',2'''-[1,2-ethanediylidenetetrakis(4,1-phenyleneoxymethylene)]tetrakis-	Yes (64(*c*))	Add to Sch. 1 / SNAc	2010 Mar. 20	2010 Sept. 18
2-Pyrrolidinone, 1-ethenyl-	No	NFA	2010 Mar. 20	2010 Sept. 18
Bromic acid, potassium salt	Yes (64(*c*))	Add to Sch. 1 / SNAc	2010 Mar. 20	2010 Sept. 18
Benzo[h]benz[5,6]acridino[2,1,9,8-klmna]acridine-8,16-dione	No	NFA / SNAc	2010 Mar. 20	2010 Sept. 18
Spiro[isobenzofuran-1(3H),9'-[9H]xanthen]-3-one, 3',6'-bis(diethylamino)-	No	NFA / SNAc	2010 Mar. 20	2010 Sept. 18
Antimony oxide (Sb_2O_3)	No	NFA	2010 Mar. 20	2010 Sept. 18

Table 15 (Continued)

Substance	Meets Criteria of s. 64	Proposed Measure	Draft Notice*	Final Notice*
Spiro[isobenzofuran-1(3H),9'-[9H]xanthen]-3-one, 2',4',5',7'-tetrabromo-3',6'-dihydroxy-, lead salt	No	NFA / SNAc	2010 Mar. 20	2010 Sept. 18
Benzoic acid, 2,3,4,5-tetrachloro-6-(2,4,5,7-tetrabromo-6-hydroxy-3-oxo-3H-xanthen-9-yl)-	No	NFA	2010 Mar. 20	2010 Sept. 18
Benzo[b]thiophen-3(2H)-one, 6-chloro-2-(6-chloro-4-methyl-3-oxobenzo[b]thien-2(3H)-ylidene)-4-methyl-	No	NFA	2010 Mar. 20	2010 Sept. 18
Benzo[b]thiophen-3(2H)-one, 4,7-dichloro-2-(4,7-dichloro-3-oxobenzo[b]thien-2(3H)-ylidene)-	No	NFA / SNAc	2010 Mar. 20	2010 Sept. 18
Nickel, bis[1-[4-(dimethylamino)phenyl]-2-phenyl-1,2-ethenedithiolato(2-)-S,S']-	No	NFA / SNAc	2010 Mar. 20	2010 Sept. 18
Decanedioic acid, bis(1,2,2,6,6-pentamethyl-4-piperidinyl) ester	No	NFA	2010 Mar. 20	2010 Sept. 18
Benzoic acid, 4-[1-[[(2,4-dichlorophenyl)amino]carbonyl]-3,3-dimethyl-2-oxobutoxy]-	No	NFA / SNAc	2010 Mar. 20	2010 Sept. 18
7-Oxa-3,20-diazadispiro[5.1.11.2]heneicosan-21-one, 2,2,4,4-tetramethyl-	No	NFA	2010 Mar. 20	2010 Sept. 18
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)	No	NFA / SNAc	2010 Mar. 20	2010 Sept. 18
Batch 10				
Hydrazine	Yes (64(*a*, *c*))	Add to Sch. 1 / SNAc	2010 June 26	2011 Jan. 15
Urea, N'-(3,4-dichlorophenyl)-N,N-dimethyl-	No	NFA	2010 June 26	2011 Jan. 15
Cobalt	No	NFA	2010 June 26	2011 Jan. 15
Cobalt chloride ($CoCl_2$)	No	NFA	2010 June 26	2011 Jan. 15
Sulfuric acid, cobalt(2++) salt (1:1)	No	NFA	2010 June 26	2011 Jan. 15
Nickel, bis[2,3-bis(hydroxyimino)-N-(2-methoxyphenyl) butanamidato]-	No	NFA / SNAc	2010 June 26	2011 Jan. 15
Resin acids and Rosin acids, hydrogenated, esters with pentaerythritol	No	NFA	2010 June 26	2011 Jan. 15
Rosin, hydrogenated	No	NFA	2010 June 26	2011 Jan. 15
Resin acids and Rosin acids, hydrogenated, esters with glycerol	No	NFA	2010 June 26	2011 Jan. 15
Resin acids and Rosin acids, hydrogenated, esters with triethylene glycol	No	NFA	2010 June 26	2011 Jan. 15
2,9,11,13-Tetraazanonadecanethioic acid, 19-isocyanato-11-(6-isocyanatohexyl)-10,12-dioxo-, S-[3-(trimethoxysilyl)propyl] ester	No	NFA	2010 June 26	2011 Jan. 15
Resin acids and Rosin acids, fumarated, barium salts	No	NFA / SNAc	2010 June 26	2011 Jan. 15
Sulfuric acid, Cobalt salt	No	NFA / SNAc	2010 June 26	2011 Jan. 15
Batch 11				
Hexanedioic acid, bis(2-ethylhexyl) ester	Yes (64(*a*, *c*))	Add to Sch. 1	2010 Oct. 2	TBD
2-Propanone, reaction products with diphenylamine	Yes (64(*a*))	Add to Sch. 1	2010 Oct. 2	TBD
1,4-Benzenediamine, N,N'-mixed tolyl and xylyl derivs.	Yes (64(*a*))	Add to Sch. 1	2010 Oct. 2	TBD
1,4-Benzenediamine, N,N'-mixed Ph and tolyl derivs.	Yes (64(*a*))	Add to Sch. 1	2010 Oct. 2	TBD
2-Furancarboxaldehyde	No	NFA	2010 Oct. 2	TBD
Ethanedial	No	NFA	2010 Oct. 2	TBD
2-Propenoic acid, ethyl ester	No	NFA	2010 Oct. 2	TBD

Table 15 (Concluded)

Substance	Meets Criteria of s. 64	Proposed Measure	Draft Notice*	Final Notice*
Hexanoic acid, 2-ethyl-	No	NFA	2010 Oct. 2	TBD
Bismuthine, triphenyl-	No	NFA / SNAc	2010 Oct. 2	TBD
Cyclotetrasiloxane, heptamethylphenyl-	No	NFA / SNAc	2010 Oct. 2	TBD
Benzene, 1,1'-(chlorophenylmethylene)bis[4-methoxy-	No	NFA / SNAc	2010 Oct. 2	TBD
Phenol, 2-phenoxy-, trichloro deriv.	No	NFA / SNAc	2010 Oct. 2	TBD
Siloxanes and Silicones, Me 3,3,3-trifluoropropyl, Me vinyl, hydroxy-terminated	No	NFA	2010 Oct. 2	TBD
Siloxanes and Silicones, di-Me, reaction products with Me hydrogen siloxanes and 1,1,3,3-tetramethyldisiloxane	No	NFA / SNAc	2010 Oct. 2	TBD
Siloxanes and Silicones, di-Me, hydrogen-terminated	No	NFA	2010 Oct. 2	TBD
Phenol, 4,4'-(1-methylethylidene)bis-, reaction products with hexakis(methoxymethyl)melamine	No	NFA / SNAc	2010 Oct. 2	TBD
Batch 12				
Trisiloxane, octamethyl-	Yes (64(*a*))	Add to Sch. 1	2011 Jan. 8	TBD
Guanidine, N,N'-diphenyl-	No	NFA	2011 Jan. 8	TBD
1H-Indene, 2,3-dihydro-1,1,3,3,5-pentamethyl-4,6-dinitro-	No	NFA / SNAc	2011 Jan. 8	TBD
Carbon black	No	NFA	2011 Jan. 8	TBD
Trisiloxane, 1,1,1,5,5,5-hexamethyl-3,3-bis[(trimethylsilyl)oxy]-	No	NFA	2011 Jan. 8	TBD
Cristobalite (SiO_2)	No	NFA	2011 Jan. 8	TBD
Quartz (SiO_2)	No	NFA	2011 Jan. 8	TBD
β-Alanine, N-[4-[(2-bromo-6-chloro-4-nitrophenyl)azo]phenyl]-N-(3-methoxy-3-oxopropyl)-, methyl ester	No	NFA	2011 Jan. 8	TBD
Pyridine, alkyl derivs.	No	NFA	2011 Jan. 8	TBD
Ethanamine, N-ethyl-N-hydroxy-, reaction products with hexamethylcyclotrisiloxane, silica and 1,1,1-trimethyl-N-(trimethylsilyl)silanamine	No	NFA / SNAc	2011 Jan. 8	TBD
Silanamine, 1,1,1-trimethyl-N-(trimethylsilyl)-, reaction products with ammonia, octamethylcyclotetrasiloxane and silica	No	NFA	2011 Jan. 8	TBD
Pyridine, 2-[3-(3-chlorophenyl)propyl]-	No	NFA / SNAc	2011 Jan. 8	TBD

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

www.**ec.gc.ca**

Additional information can be obtained at:

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