

STATUS OF ACTIVITIES RELATED TO DIOXINS AND FURANS CANADA- WIDE STANDARDS

Prepared by the CCME Dioxins and Furans CWS Development Committee

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1 BACKGROUND

1.1 CANADA-WIDE ACCORD ON ENVIRONMENTAL HARMONIZATION

In 1998, the Canadian Council of Ministers of the Environment (CCME), with the exception of Québec, signed the Canada-Wide Accord on Environmental Harmonization. The objectives of the Accord are to enhance environmental protection, promote sustainable development, and achieve greater effectiveness, efficiency, accountability, predictability and clarity of environmental management. Through the Accord, governments agree that their environmental management activities will reflect:

- The polluter pays principle;
- The precautionary principle;
- Pollution prevention as the preferred approach to environmental protection;
- Environmental measures that are performance-based, results-oriented and science-based; and
- Other considerations, including open, transparent and accountable public consultation respect for jurisdictional authority and consensus decision-making.

1.2 CANADA-WIDE STANDARDS

Under this Accord, CCME Ministers, except Québec, signed the Sub-Agreement on Environmental Canada-Wide Standards (CWS), which sets out principles for governments to jointly agree on priorities, develop standards, and prepare workplans to achieve those standards. Priority substances for CWS include mercury, dioxins and furans, benzene, particulate matter (PM) and ground level ozone, and petroleum hydrocarbons (in soil). The objective of the CWS process is to provide a high level of environmental quality and consistency in environmental management across the country.

1.3 DIOXINS AND FURANS CWS

The Dioxins and Furans CWS Development Committee has based its strategy to reduce releases of dioxins and furans to the atmosphere and soil on the national Inventory of Releases maintained by Environment Canada (<http://www.ec.gc.ca/dioxin/english/inventory.cfm>). To date, the Development Committee has focused on sources of atmospheric releases. The objective of the committee is to make significant strides towards the virtual elimination of anthropogenic releases of dioxins and furans.

1.3.1 *CWS For Waste Incineration, Coastal Pulp and Paper Boilers That Burn Salt Laden Hogged Fuel, Steel Electric Arc Furnaces, Iron Sintering Plants and Conical Waste Combustion*

Five Dioxins and Furans CWS have been prepared for consideration by CCME. In June 2001, Ministers signed CWS for waste incineration and for coastal pulp and paper boilers that burn salt laden hogged fuel. Ministers will endorse CWS for steel electric arc furnaces and for iron sintering plants and will receive a CWS for conical waste combustion of municipal waste in early 2003. These five CWS address sectors

that account for about 65% of the national releases to the atmosphere. The CWS are posted on the CCME website (www.ccme.ca).

1.4 ADDRESSING THE REMAINING SECTORS

In combination, the initiatives taken to address the aforementioned five sectors are predicted to reduce overall dioxins and furans emissions as much as 60% compared to 1999 levels. The national release inventory continues to evolve, with release values being reassessed due to new test data or improved emission factors. In addition, the Development Committee has identified some new sectors as potential sources and has added them to the release inventory. A review of the recently published NPRI data for year 2000 and 2001 may provide additional information to improve the national Inventory of Releases. There remain at least 18 sectors that are potential sources of releases to the atmosphere, and five sectors that release dioxins and furans to the soil. The remaining sectors include those that are non-point source emissions, those exclusive to a particular region or province, those that are being addressed by other processes and those with low levels of emissions. The Development Committee has considered whether a CWS would be the most efficient and effective approach for addressing each of the remaining sector. This report summarizes the available information for each sector and any guidance and recommendations from the Development Committee.

In recommending a course of action for remaining sectors, the Development Committee was guided by the CWS Sub-Agreement, which defines Canada-Wide approaches as qualitative or quantitative standards, guidelines, objectives or criteria for protecting the environment and human health. The goal of the Development Committee is to develop approaches under the CWS framework that make a significant contribution to the achievement of virtual elimination, as defined by the *Canadian Environmental Protection Act (CEPA)* and the *CCME Toxic Substances Management Policy*. The Limit of Quantification (LoQ) has been determined to be 32 pg TEQ/m³ for atmospheric releases.¹ According to the draft Environment Canada report “Determination of Level of Quantification for Measuring HCB and PCDD/PCDF in Soil”, the estimated LOQ for PCDD/PCDF in soils is 9 pg/g.

The Development Committee also took into consideration the most recent test data and information from all available domestic or international sources relating to emission factors or the potential for dioxins and furans formation for any given sector.

Finally, the Development Committee was mindful of the guidance provided by CCME’s Environmental Planning and Protection Committee and Deputy Ministers’ Committee:

- that, wherever feasible, collaboration with other stakeholder processes is desirable to avoid overlap and duplication of process for stakeholders and jurisdictions;

¹ Picograms of Toxic Equivalency/cubic metre: this is the international standard that expresses the toxicity of all dioxins and furans congeners in relation to the most toxic one

- That the Development Committee's efforts on coastal pulp & paper boilers, incineration, steel EAF manufacturing, iron sintering and conical waste combustors have made a significant contribution to the virtual elimination of dioxins and furans; and,
- That the Development Committee should complete its work as soon as possible, delivering an investigation of approaches for barrel burning and trench burning.

Taking these factors into consideration, the Development Committee has divided the remaining sectors of the national inventory into five groups:

1. **Sectors that are significant sources of dioxins and furans and require action by jurisdictions.** The Development Committee recommends that jurisdictions take the appropriate steps to address these sources either collectively or individually.
2. **Sectors that are the subjects of other ongoing initiatives that can either address the issue of dioxins and furans releases directly, or will yield results that can be the basis of future analysis and action.** The Development Committee will encourage these initiatives to ensure that releases of dioxins and furans are addressed appropriately in these sectors and recommends that these sectors be reassessed in the 2006 review of the dioxins and furans CWSs.
3. **Sectors that do not merit the development of an approach under the CWS framework because best available test data indicates that releases of dioxins and furans are at or below the LoQ.** The Development Committee will not take any further action with respect to these sectors and encourages jurisdictions and facilities to maintain levels at or below the LoQ.
4. **Sectors for which there are no test data or emission factors available to determine the potential for releases of dioxins and furans.** The Development Committee will take no further action with respect to these sectors. If new information becomes available that indicates they are a source of dioxins and furans releases, jurisdictions should address them accordingly.
5. **Sectors that are not currently reported in the National Inventory but may have potential to release dioxins and furans.** The Development Committee recommends that information be collected and analyzed to determine whether these sectors should be included in the national inventory.

For these sectors, the status of knowledge and the Development Committee's guidance and recommendations are described below, with some further detail provided in the Annexes.

2 SECTORS THAT REQUIRE FURTHER ACTION

2.1 ON-SITE COMBUSTION OF RESIDENTIAL WASTE

2.1.1 *Background and Development Committee Recommendations*

Although currently estimated to contribute releases of 20 g/yr of dioxins and furans to the atmosphere (12% of national release inventory), the distribution of this practice and the volumes of waste involved are not accurately known in Canada. Environment Canada is carrying out a study to estimate the dioxin/furan release in Canada and in the provinces/territories. The US EPA now identifies this activity as

the single largest source of releases in the U.S., estimated to be 628 g/yr.

Reducing emissions from this non-point source will present a special challenge, as the development of emission concentration targets is impractical and not the most effective approach. Jurisdictions need to consider a wider range of tools and approaches, both regulatory and non-regulatory, including the development of materials and programs that will raise public awareness of the generation of dioxins and furans from these sources, and the linkage with human health. In some cases, encouraging changes in behaviour may be the key element of an emission reduction strategy. Also, municipalities play an important role in controlling household waste burning and should be directly involved in developing strategies to alter this behaviour. The Development Committee can provide general guidance and information on reducing backyard burning but the specific steps taken will vary between and within jurisdictions.

The Development Committee has supported an initiative being conducted in the Great Lakes by the Great Lakes Binational Toxics Strategy (GLBTS) Dioxins and Furans Working Group. This initiative is surveying the extent of the practice in regions of Ontario, and developing a three-pronged response to this source that includes education, infrastructure and enforcement. The Development Committee will have access to all materials produced by the GLBTS.

The Development Committee is currently in the process of updating the dioxin and furan release estimates from residential household combustion (barrel burning, fireplaces and woodstoves). It is anticipated that this work will be completed in March 2003. The Development Committee has also contracted a study that suggests messages and methods to encourage behavioural change away from burning waste in the household.

2.1.2 Regulatory Approaches

In many Canadian jurisdictions, a regulatory approach to either prohibit open burning, including backyard burning of household waste, or permit it only under pre-approved conditions has been adopted. Legislation has been used at both the provincial and municipal levels. Nova Scotia has included a ban on in their Solid Waste Resource Management Regulations under the Environment Act (www.gov.ns.ca/just/regulations/regs/envsolid.htm). British Columbia's provincial government provides municipalities with a model municipal by-law to regulate residential backyard burning (<http://wlapwww.gov.bc.ca/air/particulates/bylaw.pdf>).

2.1.3 Non-Regulatory Approaches

Public education and awareness are used widely both domestically and internationally to curb backyard burning, even in jurisdictions that have regulations in place. British Columbia has provided information on health impacts from backyard burning on its website (<http://wlapwww.gov.bc.ca/air/particulates/bbsgiyea.html>). Backyard burning has been identified as a significant issue in the Great Lakes area and has been taken on by states and provinces surrounding the lakes through the Great Lakes Binational Toxics Strategy

2.1.3.1 Great Lakes Binational Toxics Strategy²

The Great Lakes Binational Toxics Strategy (GLBTS), signed in April 1997, is a collaborative process that provides a forum for stakeholders in Canada and the US to exchange information on a set of quantitative challenges for certain persistent, anthropogenic toxic substances that threaten the Great Lakes Basin. The Strategy recognizes the long-term nature of virtual elimination of toxic substances, and provides the framework for actions to achieve quantifiable reduction "challenges" from 1997 to 2006 for specific toxics. The shared information empowers stakeholders to take responsible and best practice actions that go beyond compliance and encourage pollution prevention. The Strategy is not a regulatory process but rather complements federal, state, and provincial activities. Flexibility is provided to allow for the revision of challenges, timeframes and the list of substances. The development of baseline measurements for tracking and measuring progress toward reductions is also a key element of the Strategy. A "Technical Support Document" appended to the Strategy provides action items that will be undertaken to pursue reductions.

The Strategy was developed under the auspices of the Binational Executive Committee (BEC), which is charged with coordinating the implementation of the binational aspects of the 1987 Great Lakes Water Quality Agreement. The BEC is co-chaired by Environment Canada and the U.S Environmental Protection Agency, and includes representatives from the Great Lakes states, the Province of Ontario, as well as other federal agencies in Canada and the US. From the beginning, USEPA and Environment Canada have involved state, provincial, tribal, industrial, environmental and other interested parties.

The Strategy establishes reduction challenges for an initial list of persistent toxic substances targeted for virtual elimination, including dioxins and furans. These substances have been associated with widespread, long-term adverse effects on wildlife in the Great Lakes, and, through their bioaccumulation, are of concern for human health. This is the first time specific reduction targets have been set jointly by the two countries. The initial Canadian commitment was to reduce dioxins and furans by 90% by 2000. Current reductions are 80%, and the commitment for 90% reductions was extended to 2005 through the recently negotiated Canada-Ontario Agreement.

2.1.3.2 GLBTS Dioxins and Furans Working Group

The Dioxins and Furans Working Group (WG), formed under the GLBTS, was created to identify and address gaps in initiatives to reduce dioxins and furans emissions. As a first step, the WG reviewed national inventories and identified the sectors with highest releases of dioxins and furans. The WG then prioritized these sectors according to the level of emissions and whether existing initiatives to reduce dioxins and furans were already in place. Specific priorities differ slightly between Canada and the US, but priority sectors are the same.

² GLBTS Information Sources: http://www.on.ec.gc.ca/laws/tenth-ijc-response/toxics_strategy-e.html and <http://www.epa.gov/glnpo/p2/bnsintro.html>

The high priority sector identified was Household Garbage Burning. A Burn Barrel Subgroup was formed to conduct research and to develop and implement a strategy for this sector. Other sectors that the workgroup are addressing are pentachlorophenol treated wood, incinerator ash management and landfill fires. Many information gaps remain to be filled in the dioxins/furans release inventories from both countries. The workgroup is currently reviewing these information gaps and will identify and prioritize sectors for further work.

2.1.3.3 Great Lakes Barrel Burning Project

Burning of domestic-type trash, particularly in barrels, is a major source of dioxins and furans to the environment in rural areas, as well as a source of fine PM, polyaromatic hydrocarbons (PAHs) and other toxic pollutants. The Burn Barrel Subgroup of the Dioxins and Furans Working Group is working on a strategy to reduce household garbage burning, mainly in rural communities where it is practiced most. A survey, prepared for Environment Canada, Ontario Region, indicated that the percentage of the rural population in the Great Lakes Basin that practices garbage burning is as high as 24%.

The current GLBTS strategy for barrel burning focuses on three elements:

1. Education for public officials and the general public
2. Infrastructure: reasonable alternatives to burning garbage, such as collection and recycle/disposal
3. Development of an enforceable regulation as a tool required for those who will not voluntarily change their behaviour and enforce existing regulations that ban backyard trash burning

A pilot project is underway, and focuses on the Lake Superior region because of the geographic applicability of previous pilot projects undertaken in Minnesota (and to a lesser extent Wisconsin and Michigan), and the potential for expansion to a larger region encompassing both countries. However, the group is cognizant of the fact that programs will work differently in different regions, and need to be customized to suit the target audience and their needs.

A broad public education campaign began in fall 2002 on the Canadian side of Lake Superior, Environment Canada has contracted EcoSuperior Environmental programs in Thunder Bay. Through the CCME CWS, an individual with expertise in community-based social marketing (CBSM) was contracted to propose a pilot to encourage alternatives to barrel burning based on surveys of communities in the Lake Superior area. The overall project goal is a reduction in household garbage burning. CCME has hired a consultant to gather current information and update the Canadian inventory of dioxins and furans from on-site residential waste combustion.

2.2 OPEN BURNING OF MUNICIPAL SOLID WASTE

2.2.1 Background and Development Committee Recommendations

Open burning of municipal solid waste (in trenches or at landfills) has been identified as a potentially significant source of dioxins and furans. The Development Committee is gathering information on the extent of this activity. It is anticipated that this work will be completed in March 2003.

2.3 AGRICULTURAL/RESIDENTIAL FUEL COMBUSTION

2.3.1 Background and Development Committee Recommendations

According to the February 2001 inventory, this sector accounts for 7g ITEQ/year, or 4% of national emissions of dioxins and furans. Alberta and Nova Scotia show levels that are much higher than other provinces and there is some question as to the accuracy of the values from these two provinces. Alberta and Nova Scotia will work bilaterally with the federal government to confirm emissions from this sector.

3 SECTORS THAT ARE SUBJECTS OF OTHER INITIATIVES

3.1 OTHER INITIATIVES

3.1.1 The MERS Process

In June 2000, CCME Ministers endorsed the CWS for PM and Ozone. At that time, Ministers also committed to seven Joint Initial Actions (JIAs) aimed at reducing levels of PM and ozone. The JIAs included the development of Multi-pollutant Emission Reduction Strategies (MERS) for the following sectors:

- Electric power generation (EPG)
- Base metals smelting
- Iron and steel production
- Concrete ready-mix
- Asphalt hot-mix
- Pulp and paper
- Lumber and allied wood products

Except for concrete ready-mix plants, these sectors are also listed as sources of dioxins and furans in the national inventory.

A MERS is considered to be a national picture of sectoral emission reduction plans on PM and ozone. Development of a MERS involves three general phases and activities: national multi-pollutant analysis; information sharing and coordination; and national roll-up for sectors.

An extensive MERS process for the EPG sector is underway. For the remaining non-energy, industrial sectors, a common approach has been adopted for the first phase of the MERS: the development of Multi-pollutant Emission Reduction Analysis Foundation (MERAF) reports. These reports include: a profile of the sector; processes and sources of emissions; types, quantities, and forecasts of emissions; national and international standards and best available pollution prevention and control techniques; quantification of possible emission reductions; and, identification of areas for further analysis. The reports incorporate readily available information, and focus primarily on technically feasible emission reduction options for

PM, ozone, and their precursors, as well as current emission standards and best practices. Information on emissions of dioxins and furans is included in the reports where it is available.

The MERAf reports have been shared with stakeholders and jurisdictions, to be used as information for consideration during the development of the PM and ozone implementation plans.

3.1.2 The Strategic Options Process

The Strategic Options Process (SOP), launched by Environment Canada in December 1994, is a participatory approach to managing *CEPA* toxic substances from assessments of Priority Substances List 1 (PSL1) that is designed to generate, through multistakeholder consultations (called Issue Tables), the best possible information and advice for decision makers. Issue Tables are chaired by Environment Canada and made up of representatives from government (federal and provincial), industry, and non-government organizations. Fourteen Issue Tables have been established.

Based on the origins and uses of each substance, each Issue Table review involves either a "substance" or "sector" approach. In the substance approach, all routes of exposure and how to reduce levels of a specific pollutant in the environment are examined. Substance SOPs have been written for 1,2-dichloroethane, 3,3'-dichlorobenzidine, benzidine, bis(2-ethylhexyl) phthalate (DEHP), dichloromethane, hexachlorobenzene, and refractory ceramic fibres. A substance SOP is underway for short chain chlorinated paraffins. In the sector approach, SOP participants examine how a specific industrial sector can reduce the releases of pollutants that have been identified to be of concern. Sector SOPs have been written for base metals smelting, thermal power generation, dry cleaning, metal finishing, solvent degreasing, steel manufacturing and wood preservation.

3.2 DIESEL FUEL COMBUSTION

3.2.1 Background and Development Committee Recommendations

Diesel fuel combustion is estimated to release 9 g/yr of dioxins and furans to the atmosphere, about 5% of the national Inventory of Releases. Vehicle engines and stationary facilities that burn diesel fuel are widespread throughout Canada. The Government of Canada has authority under *CEPA* to regulate the formulation of diesel fuel and the operating standards for diesel engines.

The Development Committee recommends that the federal government exercise its authority under *CEPA* as new fuel formulation or engine pollution control technology becomes available.

3.2.2 Status of *CEPA* Regulatory Initiatives

The Federal Government finalized the *Sulphur in Diesel Fuel Regulations* in 2002. These regulations limit the level of sulphur in diesel fuel used in on-road vehicles to a maximum of 15 mg/kg (or 15 parts per million). The limit comes into effect on June 1, 2006 for producers and importers, and on September 1, 2006 for sellers. In the Arctic regions, the limit on sales comes into effect a year later. The new limit

will replace the current limit of 500 mg/kg. Environment Canada also intends to develop new emission standards for diesel-powered vehicles in the next few years.

Environment Canada officials do not anticipate that either of these initiatives will reduce dioxins and furans. Although the introduction of lower-sulphur, on-road diesel fuel will reduce emissions of several ambient air pollutants (including sulphur dioxide, sulphate, and PM), there is no known correlation between emissions of dioxins and furans and either lower sulphur fuel or the new emission control technologies that will be needed to comply with the upcoming new emissions standards for diesel-powered vehicles.

3.3 BIOSOLIDS

3.3.1 Background and Development Committee Recommendations

Sewage biosolids application to land has been identified as the largest source of dioxins and furans releases to soil. However, biosolids application is becoming a more widespread waste management practice and is often considered a beneficial use, recycling nutrients and organic matter into the soil and reducing the amount of sludge being landfilled or incinerated.

Currently, biosolids are applied to land by seven provinces including Alberta, British Columbia, Manitoba, New Brunswick, Ontario, Quebec and Saskatchewan. Total combined application is estimated at 704.3 dry metric tonnes per day.

In Canada, the dioxin input into the environment from biosolids applied on the land is estimated to be 7 g/yr (I-TEQ). Land application includes application on all types of land, including agricultural, forested, reclamation and urban land.

Research being done in a number of jurisdictions on sewage biosolids application to land continues to provide new information regarding the characteristics of the activity. A number of jurisdictions are also exploring regulatory options or best management practices for biosolids application. The Development Committee encourages jurisdictions to pursue this sector and share information as appropriate.

3.3.2 Status of Complementary Initiatives

A number of initiatives have been undertaken with regard to the application of sewage biosolids to land. The Ontario Biosolids Report completed in April 2001 by the Water Environment Association of Ontario provides a literature review of the fate and effects of dioxins and furans in sewage biosolids applied to agricultural land. In June 2002, Ontario passed the Nutrient Management Act, to provide comprehensive and clear environmental protection guidelines to regulate all land-applied materials containing nutrients, including biosolids. Ontario is now developing and consulting on regulations under the Act which should be in force by March 2003. British Columbia's Organic Matter Recycling Regulation, passed in February 2002, strengthens human health standards by limiting the use of biosolids in drinking water watersheds.

In December 2001, the U.S. Environmental Protection Agency released its decision not to regulate dioxins in sewage sludge that is placed in a surface disposal unit or fired in a sewage sludge incinerator. The EPA will address at a later time the proposed provisions related to dioxins and dioxin-like compounds in sewage sludge that is land applied.

Two approaches to managing biosolids, and in fact dioxins and furans emissions overall, have emerged. One approach, the virtual elimination (VE) approach, supports controlling dioxins and furans at source. The other, the exposure approach, supports controlling human exposure to dioxins and furans.

The VE approach would set a number or a standard that the producers of biosolids would have to meet. This would encourage municipalities to look at source separation or treatment of biosolids to produce topsoil and compost, both of which are valuable products. The exposure approach would dictate that biosolids not be applied to lands that would increase the risk of human exposure (e.g. land used for dairy cattle and possibly other agricultural lands). Both approaches could encourage the application of biosolids to lands that have few options for adding organic matter.

3.4 ELECTRIC POWER GENERATION

3.4.1 Background and Development Committee Recommendations

Electric power generation is estimated to release 5 g/yr of dioxins and furans to the atmosphere, about 3% of the national release inventory. A proposed CWS for Mercury is under development and this sector is engaged in the development of a MERS. Available test data indicate dioxins and furans emissions at EPG facilities are below 80 pg/m³, which, to date, is the lowest emission limit established by a CWS based on available technology and feasibility. Some thermal power generators reported dioxins and furans releases to the NPRI in the years 2000 and 2001. Environment Canada will be analyzing this data to update the dioxins and furans release inventory.

If the available data are representative of the industry as a whole in Canada, a CWS approach would not be the most effective means for obtaining further reductions to achieve the LoQ or for maintaining emissions at or below the LoQ. With a view to continuous improvement towards the goal of virtual elimination, jurisdictions are encouraged to pursue opportunities to obtain additional reductions in this sector and assess any reductions in dioxins and furans gained through actions taken to address mercury and particulate matter.

3.4.2 Status of EPG MERS and Mercury Initiatives

There is a significant lack of data on dioxins and furans emissions from the EPG sector. The nature of combustion in fossil fuel fired power plants is such that high dioxins and furans emissions would not be expected, and the data that do exist support this view. Environment Canada has undertaken a limited number of studies, such as stack test emission studies, for the EPG sector. During these studies they have attempted to investigate dioxins and furans, but identified almost undetectable levels.

A proposed CWS for Mercury is under development and this sector is engaged in the development of a MERS to address emissions that contribute to PM and Ozone. Priority substances in the MERS include SO₂, NO_x, PM and Hg. The MERS also accounts for other possible emission reductions, such as GHGs.

While there is a real chance that the MERS and Hg initiatives in EPG will reduce dioxins and furans, the lack of data precludes making any judgements or estimates on the magnitude or type of reductions.

3.5 BASE METALS SMELTING

3.5.1 Background and Development Committee Recommendations

Emissions from the base metals smelting sector (BMSS) have been estimated at 3 g/yr, or 2% of the national Inventory of Releases. This sector is engaged in a Strategic Options Process (SOP) for various Priority Substances List 1 (PSL1) substances assessed as toxic under *CEPA*. The SOP for base metals smelting is a multi-stakeholder process that engages industry, non-government organizations, and federal, provincial and territorial governments in an effort to identify and evaluate options regarding the management of toxic substances. Ten recommendations were put forward in the June 1997 Strategic Options Report (SOR) for the sector to address *CEPA*-toxic substances, one of which focuses on releases of dioxins and furans. This recommendation called for testing and reporting of dioxins and furans from smelters processing chlorinated scrap or chlorinated substances. The BMSS SOP is now in the implementation phase.

With respect to the second Priority Substances List (PSL2), the Final Decision on the Assessment of *Releases from Primary and Secondary Copper Smelters and Copper Refineries and Releases from Primary and Secondary Zinc Smelters and Zinc Refineries* was published in the Canada Gazette on September 28, 2002.

The Ministers of the Environment and of Health intend to recommend that the following substances be added to the List of Toxic Substances under *CEPA* 1999:

- *Particulate matter containing metals that is released in emissions from copper smelters or refineries, or from both*
- *Particulate matter containing metals that is released in emissions from zinc plants*
and
- *Sulphur dioxide that has the molecular formula SO₂*

In an effort to address the SOR recommendation respecting dioxins and furans, as well as other drivers such as the CWS for Dioxins and Furans, a Smelters Emissions Testing Program (SET Program) was established to assist in the characterization and quantification of dioxins and furans releases from this sector. A SET Technical Advisory Network (SET Network) was formed to aid its implementation and exchange information on dioxins and furans emissions testing of base metals smelters and refineries. All primary facilities had committed to conduct emission testing for dioxins and furans by the end of 2002. Data received to date indicate that releases to air in 2001 were approximately 2.6 grams from the sector.

The BMSS was also involved in the MERS process as part of CCME's action plan on CWS for PM and Ozone. The first stage of the MERS process was the development of a MERAF report. While the primary focus of the MERAF report is on pollutants contributing to PM and Ozone, it includes information on dioxins and furans emissions available through the SET Program. The MERAF report will serve as technical background information for consideration by jurisdictions when formulating plans to achieve the ambient CWS for PM and Ozone, and other air quality initiatives. It is unclear whether actions to reduce PM and ozone will influence reductions of dioxins and furans.

The results of the SET Program and other work under the SOP, together with the ongoing analysis under the BMSS MERS process, will help determine if further work is appropriate for this sector. The Development Committee will work with Environment Canada to communicate the results of the SOP related initiatives with respect to dioxins and furans to CCME.

3.5.2 Description and Status of SOP Recommendations and Related Initiatives

Annex 2 provides a summary of the ten base metals smelting SOP recommendations. Only one of these recommendations explicitly addresses dioxins and furans, stating that smelters having chlorinated plastics or other chlorinated substances in their feeds should test for and report any emissions of dioxins and furans to the Federal-Provincial Task Force on Dioxins and Furans by December 1997, using standardized testing and analytical procedures, and that if found, releases of these substances should be appropriately managed as TSMP Track 1 substances. This recommendation is being addressed through the SET program described above. The remaining recommendations are all at different stages of implementation, except for #9 (Public Education and Communication), which is at a much earlier stage. A draft report on the status of implementation has been prepared, and was tabled for review and comments by stakeholders at a multi-stakeholder workshop in March 2002.

With respect to the two PSL2 substances relevant to the BMSS, CEPA 1999 subsections 91(1) and 92(1) require that a regulation or an instrument respecting preventive or control actions in relation to these substances be proposed no later than September 28, 2004 and be made no later than March 28, 2006.

3.6 RESIDENTIAL WOOD COMBUSTION

3.6.1 Background and Development Committee Recommendations

The use of woodstoves is the fourth most common type of home heating in Canada. Wood is a renewable energy source and a traditional form of heating. Combustion of wood in home appliances releases an estimated 3g/yr (I-TEQ) of dioxins and furans.

The Hearth Products Association collaborated with the governments of Canada and Ontario to test releases from one conventional woodstove and one advanced technology woodstove. The results of this test and the revision of the quality of wood being burned reduced the previous estimated release of 30g/yr (I-TEQ) by a factor of 10, and diminished the priority of this source from the 3rd position to the 13th position, in relation to others in the national inventory.

This sector is subject to joint initial actions under the Particulate Matter and Ozone CWS. An intergovernmental working group is addressing these actions with support and participation by representatives of the Development Committee.

Advanced technology woodstoves dramatically reduce emissions of particulate matter, VOC, PAH and other air pollutants that are human health concerns. The Development Committee supports the net benefits achieved through the use of advanced technology woodstoves and recommends that a CWS approach is not the most effective means for obtaining further reductions in dioxins and furans emissions to achieve the LoQ. With a view to continuous improvement towards a goal of virtual elimination, jurisdictions are encouraged to pursue opportunities to achieve additional reductions in this sector.

3.6.2 Status of Joint Initial Actions

The joint initial actions for the Particulate Matter and Ozone CWS related to reducing emissions from residential wood burning appliances include developing standards for new appliances, public education, regulation and assessment of a national change-out or upgrade program. The Intergovernmental Working Group on Residential Wood Combustion (IGWGRWC) is leading work on these actions. The results of the joint initial actions will be reported to CCME through the Joint Action Implementation Coordination Committee (JAICC).

The Canadian Standards Association (CSA) has published a new standard in 2000 (CSA B415.1-00). With the help of EC, the standard will be made available in French in April 2003 which will allow its incorporation into a regulation. A revision of the standard is planned for 2004-2005. The working group has identified national regulatory options to promote new, clean burning residential wood heating appliances and is consulting with stakeholders on the concerns and benefits of these options.

Natural Resources Canada is leading "Burn-it-Smart!", a national education campaign to promote safer, cleaner and more efficient wood burning practices that will operate in the 2002-03 heating season. Information on wood burning practices as well as promotional materials is available on the website (www.burnitsmart.org).

Environment Canada will be evaluating change-out programs that have occurred across Canada. Using the results of the winter 2002 and 2003 Burn-it-Smart education and change out projects, the evaluation will document the feasibility of implementing change-out programs to reduce particulate matter (PM) and to reach the CWS objective for PM.

The IGWGRWC has established a Stakeholders Advisory Group and held its first national consultation meeting in October 2002 to obtain feedback on proposed options for reducing emissions from residential wood burning appliances.

3.7 BEEHIVE BURNERS

3.7.1 Background and Development Committee Recommendations

Beehive burners are utilized primarily by the western forest industry as a means of disposing of clean wood wastes. The design and operating characteristics of beehive burners make testing for dioxins and furans virtually impossible. Despite the lack of specific knowledge, beehive burners are recognized as emitters of dioxins and furans. Releases to the atmosphere are based on estimates of emission factors and volumes of wood waste disposed of in this manner. Emissions are estimated at 3 g/yr, or 2% of the national Inventory of Releases`.

Environment Canada is working with PAPRICAN to finalize a set of emission factors for beehive burners and silo burners for use by mills reporting to NPRI.

The phasing out of beehive burners in B.C. and Alberta over the next few years will reduce the amount of wood waste being burned in this type of process by 1,425,000 tonnes. The Development Committee supports these activities and the revision of the national inventory of dioxins & furans releases to provide an accurate picture of emissions from this sector.

3.7.2 Description and Status Within MERS for Lumber and Allied Wood Products

The MERAF report for lumber and allied wood products was completed in the fall of 2002 and includes information on emissions from beehive burners. Since the primary focus of the MERAF report is on pollutants contributing to PM and ground-level ozone, it does not discuss beehive burners as a source of dioxins and furans emissions. However it notes that the majority of facilities are in British Columbia and Alberta which both have phase out programs in place. With respect to wood residue management (e.g. incineration in beehive burners), the MERAF report recommended that further work be done to refine emission factors and noted that better residual management will be key to reducing particulate matter emissions. Alternatives to incineration as well as better combustion practices were identified as options to improve management of wood waste residue with phase out of beehive burners having a large impact on emission reductions.

3.8 CEMENT KILNS

Available test data from this sector indicate that releases of dioxins and furans from cement kilns are below 80 pg/m³, with one exception. To date, 80 pg/m³ is the lowest emission limit established by a CWS based on available technology and feasibility.

Environment Canada is considering development of a comprehensive Environmental Code of Practice for Cement Manufacturing facilities. The Code could include emission limits and operating practices with respect to various pollutants, including dioxins and furans. Development will take place in a multi-stakeholder forum. The Development Committee supports this initiative and proposes that other jurisdictions work closely with Environment Canada in the development of this code of practice.

3.9 WOOD PRESERVATIVES

3.9.1 Background and Development Committee Recommendations

3.9.1.1 Wood Preservative Plants (air and soil)

Air emissions from wood preservation plants are estimated to be 2 g/yr, or 1% of the atmospheric releases of dioxins and furans, according to the national release inventory. Soil releases from wood preservative plants are estimated to be 2 g/yr, or 10% of the releases to soil documented in the national release inventory. This sector is engaged in an SOP under *CEPA* led by Environment Canada. Dioxins and furans are one of the priority pollutants being addressed in the SOP. The SOP for wood preservation is a multi-stakeholder process that engages provincial and territorial governments as well as other stakeholders. Best Management Practices for preservative plants are one of many recommendations being implemented through this process.

The Development Committee sees the SOP as the most effective means for achieving significant reductions from this sector, rather than pursuing a separate approach under the CWS framework, and will ensure that the possible impacts of the SOP with respect to dioxins and furans are communicated to CCME. In addition, the Development Committee encourages jurisdictions to pursue opportunities to achieve additional reductions in this sector, with a view to continuous improvement towards the goal of virtual elimination.

3.9.1.2 In-Service Utility Poles (air and soil)

Air emissions from in-service utility poles are estimated to be 2 g/yr, or 1% of the atmospheric releases of dioxins and furans, according to the national release inventory. Soil releases from in-service utility poles are estimated to be 9 g/yr, or 47% of the releases to soil documented in the national release inventory. If the wood preservative applied to the in-ground portion of utility poles contains dioxins and furans, these can gradually evaporate if above ground. In-service utility poles treated with wood preservatives contaminated with dioxins and furans can be a source of releases to the surrounding soil. The quantities are very small when considered on a per pole basis, but their presence is widespread throughout Canada. Treatment of new utility poles is addressed within the wood preservatives SOP under *CEPA*.

The Development Committee sees the SOP as the most effective means for achieving significant reductions from this sector, rather than pursuing a separate approach under the CWS framework, and will ensure that the possible impacts of the SOP with respect to dioxins and furans are communicated to CCME. In addition, the Development Committee encourages jurisdictions to pursue opportunities to achieve additional reductions in this sector, with a view to continuous improvement towards the goal of virtual elimination.

3.9.1.3 In-Service Railway Ties (soil)

Soil releases from in-service railway ties are estimated to be 0.3 g/yr, or 2% of the national release inventory (soil). In-service railway ties treated with wood preservatives contaminated with dioxins and furans can be a source of releases to the surrounding soil. The quantities are very small when considered on a per tie basis, but their presence is widespread throughout Canada. Treatment of new railway ties is addressed within the wood preservatives SOP under *CEPA*.

The Development Committee sees the SOP as the most effective means for achieving significant reductions from this sector, rather than pursuing an approach under the CWS framework. In addition, the Development Committee encourages jurisdictions to pursue opportunities to achieve additional reductions in this sector, with a view to continuous improvement towards the goal of virtual elimination.

3.9.2 Status of Wood Preservative SOP Recommendations and Related Initiatives

Only plants using pentachlorophenol (PCP), and therefore only wood treated by this chemical, emit dioxins and furans. Processes using other preservatives such as creosote and chromated copper arsenate (CCA) emit PAH, creosoted waste material, chromium(VI) and arsenic, but do not emit chlorinated dioxins and furans. PCP is not manufactured in Canada; therefore, there are no releases of dioxins and furans in Canada from the manufacturing component of the sector. Canada imports most of the PCP used by the industry from the U.S. The US EPA regulates the dioxin and furan content of end-use pesticide products manufactured in the U.S., including PCP. In Canada, the Pest Management Regulatory Agency (PMRA) is responsible for regulating use of PCP as a pesticide and preservative. Use of PCP is now almost exclusively specified for treatment of utility poles and cross arms.

There are many methods that have attempted to estimate the quantities of dioxins and furans that are released from in-use PCP-treated wood and the potential risk posed by that release. According to Barry Munson (Environment Canada, Prairie and Northern Region), the use and release data is not robust enough to justify any conclusions, especially estimates of risk to human health that are based on the available release data.

A brief summary of the wood preservative SOP recommendations is provided in Annex 3, and their status is discussed below.

The Technical Recommendation Document (TRD) for the Design and Operation of Wood Preservation Facilities was initially published in 1988. As part of implementing the SOP recommendations, it was updated and republished in 1999 by Environment Canada and the Canadian Institute of Treated Wood. Although the TRD recommendations are not part of any environmental legislation, it is the intent that all new facilities should incorporate these practices and that all existing facilities should strive to upgrade their design and operational practices to conform to the recommended practices. It should be noted that the implementation of these recommendations might not absolve a facility from any locally applicable regulatory requirements (http://www.ec.gc.ca/nopp/wood/wood_e.pdf). The provinces are not

implementing the TRD in and of themselves, but some are using them as a basis for license and permits in addition to addressing site-specific issues.

The SOP recommended that all existing wood treating plants meet the objectives of the TRD through a voluntary, continuous improvement program, a condition of which is participation in an assessment program and submission of a TRD Implementation Plan under the SOP. Plants not participating in the voluntary program by January 2002 must submit an implementation plan, based on an approved assessment, at their own expense, for the end of 2002. Only one plant, a small trucking company, falls into this mandatory program category. It does not contribute any dioxins and furans release, using only CCA in its wood treatment process.

A baseline assessment to measure the level of conformance with the TRD objectives was conducted in 2000. The assessment does not provide baseline data on dioxins and furans releases, but provides a baseline for compliance with the TRD. All plants voluntarily participated in the assessment, and overall there was 65% compliance with the elements contained in the TRD (ranging from approximately 30% to approximately 90% for the 66 facilities). Sixty-five of the 66 plants have prepared TRD implementation plans. These plans do not contain release data. Rather, they outline the plant's strategy for meeting the TRD objectives.

The Manufacturers/Treaters Steering Committee is proceeding with a national outreach labeling program to provide retailers with Consumer Information Sheets regarding the proper use, handling and storage of treated wood. These sheets are made available to their customers. All treatment plants that provide treated lumber for commercial purposes have agreed to voluntarily label their products.

The Industrial Users Steering Committee is developing an Industrial Treated Wood Users Guidance Document, outlining proper handling, storage, transportation, use and reuse/recycling of treated wood. Included in this process is the development of a national waste management strategy for waste treated wood. As part of this strategy, industrial treated wood users have committed as a group to reduce the volume of material going to landfill by 20% by the end of 2005, based on baseline data from 1990. However, there is no way of tracking the commitment until the Users Guidance Document is completed.

Implementation of the recommended program has been planned to June 2006, but it is expected that the program will continue beyond this period. Costs for implementation are estimated to be in excess of \$33 million during the implementation period.

4 SECTORS THAT DO NOT REQUIRE A CWS APPROACH

4.1 PULP AND PAPER POWER BOILERS AND KRAFT LIQUOR BOILERS

4.1.1 Background and Development Committee Recommendations

4.1.1.1 Pulp and Paper Boilers

Recent test data demonstrates that dioxins and furans emissions from pulp and paper mill power boilers burning clean waste wood as fuel are well below 80 pg/m³, and are likely below the LoQ at many facilities. In total, these emissions are estimated as 1 g/yr, or 1% of the national Inventory of Releases. Environment Canada is completing a study to recommend emission factors for dioxins and furans from all major combustion sources in pulp and paper mills.

Based on the available data from this sector, the Development Committee recommends that a CWS is not necessary to achieve the LoQ. The Development Committee encourages jurisdictions and facilities to maintain emissions at or below the LoQ.

4.1.1.2 Kraft Liquor Boilers

Recent test data suggests that dioxins and furans emissions from kraft liquor boilers are well below 80 pg/m³, and are likely below the LoQ at many facilities. Emissions are estimated as 1 g/yr, or 1% of the national release inventory.

Based on the available data from this sector, the Development Committee recommends that a CWS is not necessary to achieve the LoQ. Jurisdictions and facilities are encouraged to maintain emissions at or below the LoQ.

4.1.2 Description and Status of Other Initiatives Related to Kraft Liquor Boilers and Pulp and Paper Boilers

The MERAf report for Pulp and Paper was completed in fall 2002. Environment Canada is working with PAPRICAN to finalize a set of emission factors for use by mills reporting to NPRI. The report will propose emission factors for the following types of facilities:

- Power boilers burning clean wood waste (with or without wastewater effluent treatment plant sludges), de-inking process sludges
- Recovery boilers burning black liquor
- Lime kilns fired with natural gas and heavy fuel oil
- Smelt dissolving tanks

4.2 PESTICIDE APPLICATION (SOIL)

4.2.1 Background and Development Committee Recommendations

Soil releases from pesticide application are estimated to be 1 g/yr, or 5% of the national release inventory (soil). Dioxins and furans can be contaminants in pesticides, and can be released when the pesticides are applied. The Pesticide Management Regulatory Agency (PMRA) has responsibility for the formulation and content of pesticides, and is taking steps to eliminate dioxins and furans from commercial pesticides.

The Development Committee sees the PMRA as the most effective means for achieving significant reductions from this sector, rather than pursuing a separate approach under the CWS framework, and will ask that the PMRA provide status reports to CCME on its progress. Jurisdictions are encouraged to pursue opportunities to achieve additional reductions in this sector with a view to continuous improvement towards the goal of virtual elimination.

4.2.2 Status of PMRA Initiatives to Address Dioxins and Furans in Pesticides

Where 2,3,7,8-substituted PCDDs and PCDFs significantly occur in individual pesticides, PMRA will, in partnership with registrants, establish best available technology targets for virtual elimination. Reduction beyond the 1g will be difficult because the concentrations in the individual pesticides that make up for that 1g already each contain less than 0.1 TEQppm. PMRA also conducts ongoing monitoring of registered and new pest control products to demonstrate compliance with established targets for virtual elimination and manage them according to PMRA's implementation strategy. In 2000, PMRA identified registered pest control products containing dioxins and furans and confirmed information with registrants, as well as estimated releases of dioxins and furans to the environment from registered pest control products (Annex 1 summarizes the estimates).

Annex 4 presents a summary of PMRA's initiatives and data on dioxins and furans.

5 SECTORS THAT REQUIRE FURTHER RESEARCH OR TESTING

5.1 FOUNDRIES

5.1.1 Background and Development Committee Recommendations

Foundries are estimated to release 1 g/yr of dioxins and furans to the atmosphere, or 1% of the national Inventory of Releases. This sector is comprised of small operators with diverse products, processes and capacities. Limited test data are available for this sector, or comparative operations in other countries. Testing to determine the potential for the formation and releases of dioxins and furans from this sector is the first priority before a decision can be reached on whether an approach under the CWS framework will yield an environmental benefit.

The Development Committee recommends that regulatory agencies within each jurisdiction where these foundries operate and the Canadian Foundries Association better characterize this sector and undertake testing at representative facilities. The test data and a more accurate estimate of emissions should be included in any future updates of the national inventory.

5.1.2 Summary of Current Data, Emission Factors, Available Information and Gaps in Understanding for the Foundry Sector

Currently, there are little emission data available for Canadian ferrous foundry operations. The Ontario Region of Environment Canada has recently conducted emissions testing, including sampling and analysis for dioxins and furans, at a steel foundry in Ontario. This emissions testing was conducted under the Voluntary Stack Testing Program that was initiated through the Great Lakes Binational Toxics Strategy. The final results from this emission test showed low emission levels of dioxins and furans (0.63 picogram ITEQ/m³). Also, some foundries reported dioxins and furans releases to the NPRI for year 2000 and 2001 which could raise this sector's ranking to become an important source of dioxins and furans. One company reported an air emission of 2.5 grams ITEQ per year. Environment Canada will be analyzing this data to help update the dioxins and furans release inventory.

As mentioned above, there is not a good understanding of this sector in Canada. Data gaps include processes used, current emission control, current emission concentrations and/or releases, and available pollution prevention and control techniques for the sector. Various documents describe the different production processes. However, as stated earlier, there is a lack of understanding of which processes are being used at Canadian operations (i.e., distribution of use of the different processes throughout the Canadian sector).

There is also poor understanding of appropriate emissions factors to use to estimate emissions from this sector. The February 2001 Inventory of Dioxins and Furans Releases lists Canadian facilities, and also provides an order of magnitude estimate of releases from the sector, based on a US Environmental Protection Agency (US EPA) emission factor. Other emission factors for steel foundries exist from the United Kingdom and the Netherlands. The NPRI also provides an emission factor for releases of dioxins and furans from ferrous foundries, as based on the US EPA emission factor. Little information is known about these emission factors and how they were developed. Together with the lack of knowledge of the Canadian ferrous foundry sector, it is not possible to determine how applicable these emission factors are to Canadian operations.

References of interest include the following:

- (1) US EPA. *The Inventory of Dioxins and Furans in the United States. External Review Draft* (not to be quoted or cited). EPA/600-P98/002Aa. April 1998. (pg. 259-261)
- (2) Environment Australia. *Sources of Dioxins and Furans in Australia: Air Emissions*. August 5, 1998. (pg. 50-52.)
- (3) Environment Canada. *National Pollutant Release Inventory: Emission Factors for Alternate Threshold Substances - Primary Steel Production and Ferrous Foundries, Electric Arc Furnace, Alloy or Carbon Steel Stack*. June 2001.

5.2 ASPHALT PLANTS

5.2.1 Background and Development Committee Recommendations

The Development Committee does not have any Canadian, American or international evidence to indicate that there are significant releases of dioxins and furans from these operations. This sector was engaged in the development of a MERS.

The Development Committee recommends that a CWS approach is not the most effective means for obtaining further reductions to achieve the LoQ. Jurisdictions are encouraged to pursue opportunities to achieve additional reductions in this sector with a view to continuous improvement towards the goal of virtual elimination.

5.2.2 Description and Status of the MERS for the Asphalt Sector

The MERAF report for this sector has been completed. Part of this report includes a literature search of pollutant emissions and emission factors. As a result of the MERAF report, the industry plans to develop a national Environmental Practices Guide for the Hot-Mix Asphalt Sector.

Only two published references in the U.S. were found on the topic of dioxins and furans from hot-mix asphalt dryers and mixers. The data does not definitively indicate that dioxins and furans are associated with the plant processes. Many of the individual components have not been detected, and the U.S. EPA AP-42 emission factors are assigned the lowest quality reliability ratings because they are based on a limited number of stack tests. The most likely source of dioxins and furans from hot-mix asphalt plants is the combustion of fuel oil and waste oil. The MERAF report recommends development of more reliable pollutant emission factors through a program of source testing.

5.3 MAGNESIUM PRODUCTION

5.3.1 Background and Development Committee Recommendations

There are two magnesium production facilities operating in Québec, and one in Ontario. Test data is being collected as part of the permitting process for the new facility in Québec. The Ontario facility, Timminco Ltd., reported dioxins and furans releases to the air of 0.416 gTEQ/y. Data received from the NPRI reports will be updated in the national dioxin and furan release inventory.

The province of Québec has indicated that it will act within its area of jurisdiction in a manner consistent with the CWS. Therefore the Development Committee does not see merit in pursuing the development of a CWS.

5.3.2 Summary of Test Results and Regulatory Status of The New Facility in Québec

The permit for the new facility imposes strict requirements concerning production processes, efficiencies and emission controls. It also requires regular monitoring for dioxins and furans emissions within various stages of the process, and various dioxins and furans air emissions and dioxins and furans concentration in the sediments of nearby waterways. The permit establishes yearly average ambient air criteria for dioxins and furans of 0.5 ng TEQ/Rm³. The 2001 monthly reports for the various emission sources all ranged from .001 to .06 pg TEQ/Rm³, which were levels well below the requirement.

Magnola reported a dioxin/furan annual air release of 0.04 g through the 2001 NPRI reporting year. However, in 2002, additional potential sources of releases were tested (i.e. roof vents) and the estimated annual release to air was raised to 5.4 grams in August 2002. The latest data publicly reported by Magnola in November 2002 (based on their most recent emission testing) was an estimated annual release of 2.2 grams. In January of 2003, Noranda Inc. announced plans to temporarily shut-down the Magnola Métallurgie plant until magnesium prices increase and the resumption of operations is financially justified.

5.4 CHEMICAL PRODUCTION

5.4.1 Background and Development Committee Recommendations

Changes in the production processes at chemical production plants have removed the primary sources of the formation and releases of dioxins and furans from this sector. The Development Committee does not have any Canadian, American or international evidence to indicate that an environmental benefit can be achieved from an approach taken within the CWS framework. The Development Committee recommends that regulatory agencies require assessment of the potential for dioxins and furans formation and release if new production processes are proposed at chemical production facilities.

5.4.2 Summary of Current Data, Emission Factors and Available Information and Gaps in Understanding for the Chemical Sector

Dioxins and furans have been on the CCPA (Canadian Chemical Producers Association) NERM (National Emissions Reduction Masterplan) list since 1992 with a 1 kg reporting threshold, but this threshold has been removed as of 2000 with the new reporting guidelines for dioxins and furans under NPRI. With the new reporting rules, members reported 35.6 g TEQ of dioxins and furans emissions in 2000. Of the 35.6 g reported, 0.02 g were released to air, while the remainder were contained in waste, sent for approved on-site disposal. In 2000, the CCPA projected these emissions to peak at 92 g TEQ in 2001, and then fall to 29 g TEQ by 2005. (CCPA, Reducing Emissions: 2000 Emissions Inventory and Five Year Projections: <http://www.ccpa.ca/english/library/document/index.html>).

According to the Environment Canada's Inventory of Releases, DOW Canada is the only chemical production facility to report air emissions, accounting for all of the measured emissions in 1999 (0.02 g ITEQ/yr). This accounts for less than 1% of dioxins and furans atmospheric releases in the national inventory. DOW Canada has reported dioxins air emissions in their Public Report since 1995, and in 1994 made a commitment to the ARET Challenge to reduce dioxins emissions by 90% by 2000. (Note: in DOW's reports, "dioxins" refers to both dioxins and furans). DOW identified air emissions as the priority because these emissions presented the most potential for human exposure. Testing in 1994 revealed air emissions from the Fort Saskatchewan Site were 1.7 g ITEQ. By 2000, these emissions had been reduced 98% to 0.02 g ITEQ, via emission reduction technology applied to incinerators at the Fort Saskatchewan Site.

5.5 SECONDARY ALUMINUM SMELTING

5.5.1 Background and Development Committee Recommendations

The Development Committee does not have any Canadian, American or international evidence to indicate that an environmental benefit can be achieved from an approach taken within the CWS framework. The Development Committee recommends that regulatory agencies require assessment of the potential for dioxins and furans formation and release if new production processes are proposed at secondary aluminium smelters.

5.6 PETROLEUM REFINERIES

5.6.1 Background and Development Committee Recommendations

The Development Committee does not have any Canadian, American or international evidence to indicate that an environmental benefit can be achieved from an approach taken within the CWS framework. The Development Committee recommends that regulatory agencies require assessment of the potential for dioxins and furans formation and release if new production processes are proposed at petroleum refineries.

5.6.2 Summary of Current Data, Emission Factors and Available Information and Gaps in Understanding for the Petroleum Refining Sector

The key source of dioxins and furans from this sector is from the regeneration of spent catalyst from the reforming process at some petroleum refineries. The Ontario Ministry of Environment did some testing in the late 1980s and found low quantities in internal process streams, but could not detect dioxins and furans releases to surface water. They also did some stack testing, but concentrations were not reported in TEQ, nor by individual congener, so they cannot be quickly converted and compared to the LoQ. (Thompson TS et al.: Formation and emission of PCDDs/PCDFs in the petroleum refining industry. Chemosphere 20(10-12): 1524-1532, 1990.)

The US EPA document “[Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-*p*-Dioxin \(TCDD\) and Related Compounds](#)” cites emissions factors in terms of barrel of reformer feed: 3.04 ng I-TEQ/barrel, based on a study at one refinery with a continuous regeneration process in 1998, and 1.01E-03 ng ITEQ/barrel in 1991 from a refinery with a semi-regenerative reformer unit. For their most recent inventory, EPA applied the average of these two factors (1.52 ng ITEQ/barrel) to the annual catalytic reforming capacity in the US to estimate that this source released 2.14 g ITEQ in the US in 1995. Using Canadian refineries' reforming capacity in 2000 of 340,100 barrels per day (Oil and Gas Journal, Dec.1999), this would equate to 0.2 g ITEQ released to air in Canada. A European best practices document which mentions dioxins from catalytic reforming units may also be helpful and is available at the following website: <http://eippcb.jrc.es/pages/FActivities.htm>.

The 2000 TRI data for the US indicates that the petroleum industry reported 30.1 g of dioxins and furans releases to air. The TRI does not require dioxins and furans to be reported in TEQ. This sector was not required to report dioxins and furans to NPRI in 2000 and onwards due to lack of data and applicable emission factors. However, Canada is reviewing the inclusion of this sector (catalyst regeneration) for reporting dioxins and furans in future NPRI reports.

Environment Canada - Ontario Region has been investigating the possibility of stack testing with the Canadian Petroleum Products Institute (CPPI) at one or more Canadian refineries. However, the CPPI is currently focusing on criteria air contaminants emissions from refineries.

6 SECTORS THAT HAVE POTENTIAL TO BE SOURCES OF DIOXINS & FURANS

6.1 CREMATORIA

Crematoria are not identified in the Canadian inventory of dioxins and furans releases but have been identified as dioxins and furans source by the U.S. and UNEP. Due to this international concern and the increase in the use of crematoria, the Development Committee believes that this sector may warrant further investigation. The Development Committee is gathering some initial information on the extent of this activity in Canada and initiatives ongoing to address crematoria emissions.

A recent stack test conducted by Environment Canada at a crematoria located in Maitland, Ontario detected a dioxins and furans concentration of 227 picograms ITEQ/m³ resulting in an annual emission rate of .079 milligram/year. Environment Canada will continue to gather information to estimate dioxins and furans releases from this sector.

6.2 COPPER WIRE RECYCLING

This sector may be an important source of dioxins and furans as it has process conditions which favour their formation. It may be worthwhile adding this sector onto the national release inventory. The Quebec region of Environment Canada is gathering more information on this sector.

6.3 OTHER SECTORS

To support the Stockholm Convention on Persistent Organic Pollutants, which includes dioxins and furans, UNEP developed a toolkit to assist countries in developing standardized inventories of dioxins and furans releases. This toolkit identifies potential sources of dioxins and furans. These sectors are listed in Annex 5. The US EPA also maintains an inventory of dioxins and furans releases. The sectors listed in the US inventory are found in Annex 6.

Canada also plays an active role in the North American initiative to address dioxins and furans. The North American Commission for Environmental Cooperation is developing a North American Regional Action Plan for Dioxins and Furans. This plan documents how Canada, the United States and Mexico will cooperate on implementation of international, binational and domestic commitments with respect to reducing dioxins and furans releases. Phase 1 of the action plan does not identify specific sectors, however one of the plan's objectives is to improve characterization of new sources and work towards comparability of data between the three countries.

As international information evolves, Canada should continue to assess its inventory to ensure that it is consistent and current with international efforts.

ANNEX 1: SUMMARY OF APPROACHES TO SECTORS RELEASING DIOXINS AND FURANS TO AIR AND SOIL

Source Releases to Atmosphere	ITEQ g/yr (2001)	% of Total	Cumulative %	Sectoral Approach
Conical Burners	44	27	27	CWS proposed in early 2003: Newfoundland phase out by 2010; no new facilities for all jurisdictions
Incineration – All Sectors	41	25	52	CWS signed in June 2001: 80 pg by 2006 (sewage sludge incinerators 100pg by 2005)
Steel EAF	11	7	59	CWS signed in early 2003: 150 pg by 2006; 100 pg by 2010
Iron Sintering Plants	6	4	63	CWS signed in early 2003: 1350 pg by 2002; 500 pg by 2005; 200 pg by 2010
Salt Laden Hogged Fuel	5	3	66	CWS signed in June 2001: 500 pg by 2006
Sectors That Require Further Action				
Combustion of Household Wastes	20	12	78	Three pronged approach: education; infrastructure and enforcement.
Ag/Res Fuel Combustion	7	4	82	Inventory numbers to be confirmed by jurisdictions.
Open Burning of Municipal Waste				Information on extent of practice needed in order to determine significance of emissions
Sectors That Are Subjects Of Other Processes				
Diesel Fuel Combustion	9	5	89	CEPA regulation
Electric Power Generation	5	3	92	Assess co-benefits for D/F releases from Hg & MERS initiatives
Base Metal Smelting	3	2	94	SOP initiatives to identify opportunities for D/F release reductions
Residential Wood Combustion	3	2	96	PM & O CWS (IGWGRWC)
Beehive Burners	3	2	84	BC, AB phase out programs; revision of emission factors by EC and industry
Cement Kilns	2	1	97	Environment Canada to develop Code of Practice
In-Service Utility Poles	2	1	98	Wood Preservation SOP addressing alternatives and disposal
Wood Preservative Plants	2	1	98	Wood Preservation SOP addressing D/F release reductions, established BMPs
Sectors That Do Not Require A CWS Approach				
Pulp & Paper/Allied Wood	1	1	99	Test data at or below LoQ, jurisdictions to ensure performance continues
Kraft Liquor Boilers	1	1	99	No environmental benefit through CWS approach
Sectors That Require Further Research Or Testing				
Foundries	1	1	99	Testing and research required to determine significance of emissions
Asphalt Plants				Testing and research required to determine significance of emissions
Magnesium Production				Testing and research required to determine significance of emissions
Chemical Production				Testing and research required to determine significance of emissions
Secondary Aluminum Smelting				Testing and research required to determine significance of emissions
Petroleum Refineries				Testing and research required to determine significance of emissions
Crematoriums				Testing and research required to determine significance of emissions
Copper Wire Recycling				Testing and research required to determine significance of emissions
Atmosphere Total	164			
Source Releases to Soil				
Sectors That Are Subjects Of Other Processes				
In-Service Utility Poles	9	47	47	Wood Preservative SOP addressing alternatives and disposal
Application of Sewage Sludge	7	36	83	Initiatives ongoing in individual jurisdictions; information to be shared
Wood Preservative Plants	2	10	93	Wood Preservation SOP addressing D/F release reductions, established BMPs
In-Service Railway Ties	0.3	2	95	Wood Preservation SOP addressing alternatives and disposal
Sectors That Do Not Require A CWS Approach				
Pesticide Application	1	5	100	PMRA addressing through its regulatory authorities

ANNEX 2: SUMMARY OF BASE METALS SMELTING SOP RECOMMENDATIONS

Recommendation #1 - Release Reduction Targets and Schedules

Total releases of the *CEPA* Substances from the BMSS should be reduced from 1988 levels by 80% by the year 2008 and by 90% beyond 2008 through technically and economically feasible methods.

Recommendation #2 - Environmental Standards

CCME, in cooperation with the *CEPA* Federal-Provincial Advisory Committee (FPAC), should continue their efforts to develop Canada-Wide environmental ambient air and water quality guidelines for substances of relevance to the BMSS.

CCME should develop appropriate environmental source performance guidelines for discharges to air and water, taking into account best available pollution prevention techniques and control technologies economically achievable for new and existing smelters. These guidelines should be developed as soon as practicable but not later than the year 2000.

CCME should develop protocols for the measurement and reporting of releases to promote consistent approaches to source sampling, analysis, release estimation and reporting, while retaining the flexibility to accommodate site-specific environmental needs and priorities.

Stakeholders should have appropriate opportunities to assist in the development of the CCME environmental guidelines and protocols. Existing standards and protocols implemented by federal or provincial regulations, guidelines, approvals and other mechanisms should be considered, in part to avoid duplication and to improve effectiveness and efficiency. Other initiatives that may influence the development of the CCME guidelines and protocols include the proposed Canada-Wide Accord on Environmental Harmonization and the Environmental Standards Sub-Agreement to the Accord, the government response to the AQUAMIN initiative, the work of CCME Task Forces on the Development of Ambient Air and Water Quality Guidelines and international developments.

Recommendation #3 - Site-Specific Environmental Management Plans

Site-specific environmental management plans should be developed and implemented by each facility in concert with governments, local communities and other affected stakeholders. The effectiveness of this site-specific environmental management planning process will be evaluated in 2001.

Recommendation #4 - Consistent Data and Reporting

Standard reference methods for release monitoring, quality assurance/quality control programs, and independent verification of the system for monitoring and reporting of data should be developed and implemented to support the CCME guidelines.

Recommendation #5 - Federal-Provincial Cooperation

Governments should develop a coordinated approach that avoids duplication in the implementation of environmental measures for the BMSS. For example, Environment Canada could explore with the provinces of British Columbia, Manitoba, Ontario, Québec and New Brunswick the delivery of the *Secondary Lead Smelter Release Regulations* with a view to concluding administrative or equivalency agreements as soon as practicable and not later than 1999.

Recommendation #6 - Recycling

The federal government, within its jurisdictional responsibilities and resources, should, among other things, work with provinces and territories, industry, and other stakeholders to enhance the efficiency and effectiveness of regulations and remove unnecessary impediments to metal recycling, and encourage development of products that take into account recyclability in their design. Efforts should continue to identify and address barriers to recycling, such as regulatory mechanisms or inequities in the tax system.

Recommendation #7 - Dioxins and Furans

Smelters that have chlorinated plastics or other chlorinated substances in their feeds should test for and report any emissions of dioxins and furans to the Federal-Provincial Task Force on Dioxins and Furans by December 1997, using standardized testing and analytical procedures, and that if found, releases of these substances be appropriately managed as TSMP Track 1 substances.

Recommendation #8 - Research and Development

Industry, governments and other stakeholders should undertake cooperative scientific research programs to characterize smelter releases, validate predictive models, investigate environmental behaviours and effects, and identify and develop pollution prevention opportunities and technologies.

Recommendation #9 - SOR Public Education and Communication

Governments, in cooperation wherever possible with industry and other stakeholders, should establish ongoing public education and communication programs, such as outreach programs for communities in the vicinity of BMSS facilities, to ensure public awareness of the recommendations and commitments contained in this SOR and to support public accountability and review of the efforts made to respond to these recommendations and to accomplish these commitments.

Recommendation #10 - Public Review

The Ministers of Environment and Health should initiate a public review process in 2001 to assess the implementation and the effectiveness of the recommendations of this SOR. The evaluation should focus on the management of the *CEPA* Substances released by the BMSS to determine if further regulatory or non-regulatory action is needed, taking into account the federal policy on sustainable development.

ANNEX 3: SUMMARY OF WOOD PRESERVATIVE SOP RECOMMENDATIONS

A. General Recommendations

Two recommendations have been developed by the Issue Table to recognize the potential contribution of the Pest Management Regulatory Agency (PMRA) and the Provinces to the implementation of all recommendations in this report. It is recognized that the provinces should play a significant role in development of the waste management strategies for post-use treated wood and implementation of best management practices. In particular, it is recognized that the PMRA's expertise and contribution might be mutually beneficial to the implementation of these recommendations.

B. Recommendations for Chemical Manufacturing and Wood Treatment in the Wood Preservation Sector

Ten recommendations have been developed by the Issue Table as a comprehensive program for the chemical manufacturing and wood treating components of the Wood Preservation Sector. The program initially is a balanced combination of both regulatory and voluntary initiatives, but allows for mandatory components to be developed and implemented if the voluntary component is unsuccessful.

B1. Steering Committee: The implementation of these recommendations will be overseen by a steering committee made up of representatives from industry, environmental group(s), Environment Canada, Health Canada and other key people.

B2. Acceptance of the TRDS: It is recommended that the technical recommendation documents (TRDs) be recognized as a comprehensive approach to managing all releases and wastes from wood treating facilities. All provinces should implement the objectives of the TRDs in a uniform and consistent manner.

B3. Annual Reporting for All Plants: It is recommended that all wood treating facilities and wood preservative chemical manufacturers report their emissions of the *CEPA*-toxic substances listed below to NPRI. Reporting will commence in 2001 for 2000 releases. The NPRI list will be expanded for this sector to include dioxins, furans, PAHs specific to the sector, and hexachlorobenzene. The industry will also report on chromium and its compounds, arsenic and its compounds, naphthalene and anthracene, which are already listed on NPRI.

B4. Existing Chemical Manufacturing Plants: It is recommended that the manufacturers of creosote and chromated copper arsenate (CCA) continue their existing efforts to reduce emissions of *CEPA*-toxic substances (PAH, creosoted waste material, chromium(VI) and arsenic) from their Canadian chemical manufacturing plants, consistent with existing regulations and reporting requirements and the use of environmental management systems.

B5. Existing Wood Treating Plants:

B5.0 Voluntary Program – It is recommended that all existing wood treating plants meet the objectives of the TRDs through a voluntary, continuous improvement program, a condition of which is participation in an assessment program and submission of a TRD Implementation Plan. The program will continue on a five-year cycle as deemed appropriate by the steering committee.

B5.1 Assessment Program – This program will measure the level of compliance with the TRDs. The baseline assessment will be conducted in the year 2000, followed by another assessment in 2005. The assessments will be completed by third party auditors and will be jointly funded by the Government of Canada and industry for those companies meeting the conditions of the voluntary program.

B5.2 Implementation Plan Submission – It is recommended that TRD implementation plans be prepared by each wood treating plant based on the baseline assessment and submitted to Environment Canada by end of 2001. Implementation plans will describe the plant's program to meet the TRD objectives, and the initial plan will cover 2001 to 2005. A progress report will be submitted annually to the Steering Committee for review. Should reporting to NPRI not occur as outlined in recommendation B3, release data, beginning in the year 2000, will be required as part of both the initial and annual implementation plan submissions, in accordance with recommendation B3 above.

B6. Outreach: It is recommended that outreach programs to inform and assist treaters in meeting the objectives of the TRDs, preparing the implementation plan and reporting to the NPRI be made available. Such programs will be delivered in the 2000 jointly by industry and Environment Canada. All treaters will be given reasonable access to the outreach programs.

B7. Mandatory Program: It is recommended that the steering committee review and measure the success of the voluntary program twice within the five years following its commencement. Following these reviews the steering committee will be required to decide whether to continue with the program on a voluntary basis or to implement a mandatory program.

B7.1 Mandatory Implementation Plans – Treating plants that are not participating in the voluntary program by January 2002, must submit an implementation plan, based on an approved assessment, at their own expense, for the end of 2002.

B7.2 Mandatory TRD Implementation – In 2005, the success of the above program (recommendation 5) will be reviewed to determine individual plant progress towards meeting the commitments in their TRD implementation plans for 2001 to 2005, and the overall progress made by the industry towards meeting the objectives of the TRDs. Should a level of success as defined by the Steering Committee be met, the assessment program will continue on a five-year cycle. If the defined level of success is not met, a guideline, regulation or mandatory requirement under *CEPA* or other legislation will be implemented.

B8. Evaluation: It is recommended that the Steering Committee evaluate the effectiveness of the TRDs in reducing *CEPA*-toxic substance releases at the end of the first five-year cycle.

B9. New and/or Expanding Chemical Manufacturing Plants: It is recommended that all new and/or expanding facilities associated with wood preservative manufacturing meet a level of performance equivalent to existing plants through an effective environmental management system.

B10. New and/or Expanding Wood Preservation Plants: It is recommended that newly constructed wood preservation plants, or plant additions, meet all objectives of the TRDs on start up.

C. Recommendations for Consumer Treated Wood Products

The implementation of the following four recommendations will be overseen by the Chemical Manufacturing and Treating Steering Committee.

C1. Consumer Information Sheets: It is recommended that all treating plants provide distributors of consumer pressure treated wood products with Consumer Information Sheets that will be made available to purchasers at the point of sale of these products.

C2. Education Program: It is recommended that all distributors of consumer treated wood products be informed through an education program about the Consumer Information Sheets, relevant purchasing specifications and recommended storage, handling and disposal practices for these products.

C3. Update of Consumer Information Sheets: It is recommended that the Consumer Information Sheets be updated with relevant information on best management practices for treated wood products.

C4. Recycling of Consumer Products: It is recommended that a strategy and process be developed for dealing with the volume of waste consumer lumber that will arise in the future. The strategy will include technology, education, research and development, and logistics and delivery mechanisms. As a first step an evaluation of the current status of collection and recycling opportunities in Canada for consumer lumber will be completed in approximately 2 years.

D. Recommendations for In-Service Use and Post-Use of Industrial Treated Wood

These recommendations have been developed to address the release of CEPA-toxic substances from industrial treated wood products while in service and when taken out of service. Industrial users include the railways, electricity industry, telecommunications industry and government highway and roads departments. This set of recommendations describes a comprehensive continuous improvement program designed to reduce the releases of the CEPA-toxic substances used by the wood preservation industry. An immediate benefit of these recommendations is the achievement of a consistent approach to the management of industrial treated wood both in service and when taken out of service. The goal for the future is for users to continue to use treated wood in a manner which is better for the environment while actively seeking alternative products and assessing their impact on the environment throughout their entire lifecycle (production to disposal).

D1. Steering Committee: It is recommended that a steering committee composed of representatives from industry, federal and provincial governments, non-government environmental group(s), and other key stakeholders be convened to oversee the implementation of these recommendations.

D2. Steering Committee Role: It is recommended that the steering committee undertake the following:

- a. Facilitate the development of guidance with respect to industrial user treated wood management system, auditing procedures, and evaluation tools
- b. Identify and organize work required to fill data gaps. For example the following needs were identified by the SOP Issue Table:
 - creosote rail tie impact assessment (fate and effect of released PAH); and
 - fate and impact of arsenic releases from treated wood (note: the Issue Table concluded that sufficient information was available on dioxins and furans and hexachlorobenzene released from poles)
- c. Facilitate the development of technical guidance
- d. Develop and deliver an outreach program
- e. Review and evaluate the progress of the program in 2006 based on the percentage of industry participation and compliance and the trends observed.
- f. Publication of a report in 2006 describing the progress made by industrial users and summarizing the overall effectiveness of the program. The report will also make recommendations for the continued management of treated wood.

D3. Environment Management System: It is recommended that individual industrial user companies undertake the following:

- a. develop a treated wood management system by the end of 2000;
- b. implement the management system by the end of 2002;
- c. conduct a first self audit and complete an interim progress report by end of 2003;
- d. conduct a third-party audit and public report by end of 2005;

- e. continue to evaluate alternatives that minimize the release of toxic substances to the environment. Public reporting should outline the progress made towards implementing an environmental management system for treated wood including the track one and track two substances in treated wood (As, Cr (VI), PAHs, PCDD, PCDF and hexachlorobenzene) that are:
- purchased annually, and
 - removed from service annually; and including
 - estimated releases from in-service treated wood during the reporting year, and
 - tracking and documenting out of service treated wood material (% to landfill, % to reuse, % to recycle, etc.).

The form of the public reporting can be via corporate annual and environmental reports, industry sector reports or Internet sites.

D4. Alternative Wood Preservatives and Materials: It is recommended that the Steering Committee facilitate the exchange of information and the building of partnerships for lifecycle assessment and analysis of alternative materials and wood preservative chemicals.

D5. Waste Management Strategy: It is recommended that the steering committee facilitate the development of an Industrial Treated Wood Waste Management Strategy and make recommendations regarding its implementation. In the interim it is recommended that industrial treated wood users, as a group, commit to reducing the volume of material going to landfill by 20% by the end of 2005, based on baseline data from 1990. More recent data may be used if 1990 data are not available. Future targets will be developed as part of the wood waste management strategy.

ANNEX 4: SUMMARY OF PMRA INITIATIVES AND DATA ON DIOXINS AND FURANS

PMRA Initiatives to Reduce Dioxins and Furans:

Activity	Status
Develop and publish PMRA's strategy to implement the TSMP	Done, published on March 12, 1999 www.hc-sc.gc.ca/pmra-arla/english/pdf/dir/dir9903-e.pdf
Develop PMRA's internal standard operating procedure (SOP) to include TSMP criteria in the evaluation of pest control products	Done, posted on PMRA's intranet on December 2, 1999 (for PMRA's use only)
Train PMRA staff, and raise awareness of TSMP	Done in 1999
Identify <i>new</i> pest control products (including active ingredients, formulants, and micro-contaminants) that contain 2,3,7,8-substituted PCDDs and PCDFs and manage them according to PMRA's implementation strategy	Ongoing For example, see the Proposed Regulatory Decision Document on Trinexapac-ethyl, PRDD2001-05 at: www.hc-sc.gc.ca/pmra-arla/english/pdf/prdd/prdd2001-05-e.pdf PMRA requires that registrants provide chemistry specification data, a discussion on formation of impurities, and data on impurities of toxicological concern (if applicable) with their applications to register new pest control products. PMRA's Registration Handbook and specific required data are available at: www.hc-sc.gc.ca/pmra-arla/english/pdf/hdbook/part18-e.pdf and www.hc-sc.gc.ca/pmra-arla/english/appregis/daco-e.html PMRA also proposed a policy on formulants (Pro2000-04) on May 29, 2000, which includes TSMP considerations. It is available at: www.hc-sc.gc.ca/pmra-arla/english/pdf/pro/pro2000-04-e.pdf
Identify <i>currently registered</i> pest control products that contain 2,3,7,8-substituted PCDDs and PCDFs, and confirm information with registrants	Done in 2000
Estimate releases of 2,3,7,8-substituted PCDDs and PCDFs to environment from <i>currently registered</i> pest control products	Done on September 15, 2000 The PMRA published the estimates in February 2001 at: www.ec.gc.ca/dioxin/download/inventory.pdf Annex 1 summarizes the estimates.
Where 2,3,7,8-substituted PCDDs and PCDFs significantly occur in individual pesticides, PMRA will, in partnership with registrants, establish best available technology targets for virtual elimination. Note: Reduction beyond the 1 g will be difficult because the concentrations in the individual pesticides that make up for that 1 g already each contain less than 0.1 TEQ ppm.	Ongoing
Monitor registered pest control products to demonstrate compliance with established targets for virtual elimination	Ongoing

Source: PMRA, February 2002

PMRA data on dioxins and furans:**Estimates of 2,3,7,8 Substituted PCDDs/PCDFs in Antimicrobial/Wood Preservation Products***

Pest Control Use	Yearly Quantities of 2,3,7,8 Substituted PCDDs/PCDFs (TEQg/y) in Treated Wood
Antimicrobial/Wood Preservation	956

Source: PMRA, February 2002

*Note: This estimate was based on the sales volumes of technical grade active ingredients (TGAIs) and on contamination levels of active ingredients (AIs). It was calculated with the assumption that all contaminants present in AIs are eventually encountered in end-use products, and that all sales lead to use.

Estimates of 2,3,7,8 Substituted PCDDs/PCDFs in the Environment from the Use of Other Pest Control Products*

Pest Control Use	Yearly Quantities of 2,3,7,8 Substituted PCDDs/PCDFs (TEQg/y) to Environment, Predominantly Soil
Herbicide/Algicide	0.0001
Fungicide	1.0924
Insecticide/Acaricide	0.0076
Total	1.1001

Source: PMRA, February 2002

*Note: These estimates were based on the sales volumes of technical grade active ingredients (TGAIs) and on contamination levels of active ingredients (AIs). They were calculated with the assumption that all contaminants present in AIs are eventually encountered in end-use products, that all sales lead to use, and that all uses lead to entry into the environment.

ANNEX 5: POTENTIAL SOURCES IDENTIFIED BY UNEP

1. Waste Incineration

MSW Incineration
Hazardous Waste Incineration
Medical Waste Incineration
Light-fraction Shredder Waste incineration
Sewage Sludge Incineration
Waste Wood & Waste Biomass Incineration
Combustion of Animal Carcasses

2. Ferrous & Non-Ferrous Metal Production

Iron Ore Sintering
Coke Production
Iron & Steel Production and Foundries
Copper Production
Aluminum Production
Lead Production
Zinc Production
Brass Production
Magnesium Production
Other Non-Ferrous Metal Production
Shredders
Thermal Wire Reclamation

3. Power Generation and Heating

Fossil Fuelled Power Plants
Biomass Power Plants
Landfill & Biogas Combustion
Household Heating & Cooking (Biomass)
Domestic Heating (Fossil Fuels)

4. Production of Mineral Products

Cement Production
Lime Production
Brick Production
Glass Production
Ceramics Production
Asphalt Mixing

5. Transportation

4-Stoke Engines
2-Stoke Engines
Diesel Engines
Heavy Oil Fired Engines

6. Uncontrolled Combustion Processes

(Clean) Biomass Burning
Waste Burning & Accidental Fires

7. Production and Use of Chemical and Consumer Goods

Pulp and Paper Mills
Chemical Industry
Petroleum Industry
Textile Plants
Leather Plants

8. Miscellaneous

Drying of Biomass
Crematoria
Smoke Houses
Dry Cleaning
Tobacco Smoking

9. Disposal

Landfills and Waste Dumps
Sewage and Sewage Treatment
Open Water Dumping
Waste Oil Disposal (Non-thermal)

10. Identification of Potential Hot Spots

Production sites of chlorinated organics
Production sites of chlorine
Formulation sites of chlorinated phenols
Application sites of chlorinated phenols
Timber manufacture and treatment sites
PCB-filled transformers and capacitors
Dumps of wastes/residues from categories 1-9
Sites of relevant accidents
Dredging of sediments
Kaolinitic or ball clay sites

ANNEX 6: LIST OF US EPA INVENTORY SECTORS

Waste Incineration

- Municipal waste incineration
- Hazardous waste incineration
- Boilers/industrial furnaces
- Medical waste/pathological incineration
- Crematoria
- Sewage sludge incineration
- Tire combustion
- Pulp and paper mill sludge incinerators
- Biogas combustion

Power/Energy Generation

- Vehicle fuel combustion (leaded, unleaded & diesel)
- Wood combustion (residential & industrial)
- Coal combustion (utility boilers, residential & commercial/industrial)
- Oil combustion (industrial/utility & residential)

Other High Temperature Sources

- Cement kilns (hazardous waste burning)
- Lightweight aggregate kilns burning hazardous waste
- Cement kilns (non-hazardous waste burning)
- Asphalt mixing plants
- Petroleum refining catalyst regeneration
- Cigarette combustion
- Carbon reactivation furnaces
- Kraft recovery boilers

Minimally Controlled or Uncontrolled Combustion

- Backyard barrel burning
- Combustion of landfill gas
- Landfill fires
- Accidental fires (structural & vehicles)
- Forest and brush fires

Metallurgical Processes

Ferrous metal smelting/refining (sintering plants, coke production, electric arc furnaces, foundries)

Nonferrous metal smelting/refining (primary copper, secondary aluminum, secondary copper, secondary lead, primary magnesium)

Drum and barrel reclamation

Chemical Manufacturing/Processing Sources

Ethylene dichloride/vinyl chloride

Bleached chemical wood pulp and paper mills

Municipal wastewater & treatment sludge

Commercially marketed sewage sludge

2,4-Dichlorophenoxyacetic acid

Reservoir Sources

Urban runoff to surface water

Rural soil erosion to surface water

ANNEX 7: LIST OF SECTORAL CONTACTS

This appendix lists the people interviewed to obtain the information provided in this report.

- **Conical Waste Burners:** Geoff Dawe (DC representative) 709-729-2564
- **Barrel Burning:** Anita Wong (EC ON) 416-739-5885 and Bruce Gillies (EC ON) 416-739-5890
- **Beehive Burners:** Mary Trudeau (Marbek) 613-523-0784 x244 (plus some comments from Environment Canada)
- **Diesel Fuel Combustion:** Ross White (EC HQ) 819-953-1120
- **Electric Power Generation:** Geoff Ross (EC HQ) 819-997-1222
- **Base Metals Smelting:** Serge Langdeau (EC HQ) 819-994-0457 and Sarah Ternan (EC HQ)
- **Wood Preservatives:** Barry Munson (EC Prairie and Northern) 780-951-8733
- **Pulp and Paper and Kraft Liquor Boilers:** Mary Trudeau (Marbek) 613-523-0784 x244; also some comments from EC as well (provided by Jean-Francois Levasseur)
- **Pesticide Application:** Frank Wandelmaier (PMRA) and Francine Brunet (PMRA) francine_brunet@hc-sc.gc.ca
- **Foundries:** Patrick Finlay (EC HQ) and Sarah Ternan. Also note that we contacted Judith Arbour, Canadian Foundry Association, but she declined to discuss this with us
- **Asphalt Plants:** Ed Wituschek (EC HQ) 819-994-4415
- **Magnesium Production:** Jean-Francois Banville 514-283-6066
- **Chemical Production:** Art Stelzig (EC HQ) 819-994-2335) and Ken Tsang (Dioxins and furans for Dow Canada 780-998-8440)
- **Secondary Aluminum Smelting:** Patrick Finlay (EC HQ) and Sarah Ternan
- **Petroleum Refineries:** Lynne Patenaude (EC HQ)

ANNEX 8: LIST OF ACRONYMS

BEC – Binational Executive Committee (under GLBTS)
BMSS – base metals smelting sector
CCA – chromated copper arsenate
CCME – Canadian Council of Ministers of the Environment (CCME)
CCPA – Canadian Chemical Producers Association
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CPPI – Canadian Petroleum Products Institute
CWS – Canada-Wide Standards
EPCRA – Emergency Planning and Community Right-to-Know Act
EPG – electric power generation
GLBTS – Great Lakes Binational Toxics Strategy
HCB – hexachlorobenzene
JIA – Joint Initial Actions
LoQ – Limit of Quantification
MERAF – Multi-pollutant Emission Reduction Analysis Foundation
MERS – Multi-pollutant Emission Reduction Strategies
NERM – National Emissions Reductions Masterplan (CCPA)
NPDES – National Pollutant Discharge Elimination System
NPRI – National Pollutant Release Inventory
PAH – polycyclic aromatic hydrocarbons
PCDD – polychlorinated dibenzo-p-dioxins
PCDF – polychlorinated dibenzofurans
PCP – pentachlorophenol
PM – particulate matter
PMRA – Pest Management Regulatory Agency
SARA – Superfund Amendments and Reauthorization Act
SET – Smelters Emissions Testing
SOP – Strategic Options Process
SOR – Strategic Options Report
TRD – Technical Recommendation Document
TRI – Toxics Release Inventory
US EPA – US Environmental Protection Agency
US USWAG – US Utility Solid Waste Activities Group
WG – Working Group (Dioxins and Furans, under GLBTS)