Binational Toxics Strategy
Draft Step 3 Report:
Options for Reducing PCBs

July 14, 2000

Prepared by:

Ross & Associates
Environmental Consulting, Ltd.

TABLE OF CONTENTS

I. INTRODUCTION 1

II. BACKGROUND INFORMATION ON PCBs 2
- A. POTENTIAL SOURCES OF PCBs 2
- B. REGULATORY OVERVIEW 3
- C. TRENDS IN PCB DISPOSAL 4

III. OPTIONS TO ACCELERATE REDUCTIONS OF PCBs 6
- A. CREATING AVOIDABLE COSTS 6
- B. OVERCOMING BARRIERS TO THE PCB CHALLENGE GOALS 7

IV. A PROPOSED FRAMEWORK FOR PCB REDUCTIONS 7

Binational Toxics Strategy
Options for Reducing PCBs
07/14/00 DRAFT

I. INTRODUCTION

Polychlorinated biphenyls (PCBs) are a class of highly toxic chemical compounds that bioaccumulate in the environment. When PCBs are found at high concentrations (greater than 50 parts-per-million, or ppm) or when there is the potential for their discharge from water outfalls, they are one of the most tightly regulated and controlled group of pollutants in the United States (U.S.) and Canada. Despite existing controls, sufficient quantities of PCBs have been released into the environment over time to warrant the issuance of fish consumption advisories in most of the Great Lakes. As a result of ongoing public health and environmental concerns, various local, state, Provincial, regional, and national efforts are focusing on reducing PCB contamination in the Great Lakes.

Under the Great Lakes Water Quality Agreement of 1978, the U.S. and Canada pledged to seek the virtual elimination of the discharge of persistent toxic substances to the Great Lakes. In 1993, the U.S. Environmental Protection Agency (EPA) Great Lakes National Program Office (GLNPO) launched its "Virtual Elimination Pilot Project" to meet this challenge, focusing its initial efforts on mercury and PCBs.

In 1994, Canada and the Province of Ontario signed the "Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem" (COA). COA provides the framework for systematic and strategic coordination of shared Federal and Provincial responsibilities for environmental management in the Great Lakes Basin. The purpose of COA is to renew and strengthen planning, cooperation, and coordination between Canada and Ontario in implementing actions to restore and protect the Great Lakes ecosystem, to prevent the release of pollutants into the ecosystem, and to conserve species, populations, and habitats in the Great Lakes Basin. COA seeks to decommission 90 percent of high level PCBs, destroy 50 percent of the high level PCBs in storage, and to accelerate the destruction of low level PCB waste in Canada by the year 2000.

In 1995, Prime Minister Chrétien of Canada and President Clinton announced that the two countries would work together to develop a binational toxics strategy, targeting a common set of toxic substances in the Great Lakes. On April 7, 1997, the "Canada-U.S. Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin" (the Binational Toxics Strategy), was signed by the environmental administrators of the U.S. and Canada. The strategy targets many toxic substances for virtual elimination, including PCBs. Under the Strategy, Environment Canada (EC) and EPA, working in cooperation with their partners, accepted the following challenges as significant milestones on the path toward virtual elimination of PCBs:

- Canada's challenge: Seek by 2000, a 90% reduction of high-level PCBs (>1% PCB) that were once, or are currently, in service and accelerate destruction of stored high-level PCB waste which have the potential to enter the Great Lakes Basin, consistent with the 1994 Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA).

- U.S.'s challenge: Seek by 2006, a 90% reduction nationally of high-level PCBs (>500 ppm) used in electrical equipment, and to ensure that all PCBs retired from use are properly managed and disposed of to prevent accidental releases within or to the Great Lakes Basin.

Originally drafted in 1995, this revised options paper discusses potential reduction opportunities for PCBs. Section II contains a brief overview of PCB sources and regulations and a discussion of trends in PCB disposal, in order to provide some background for new readers. Section III discusses specific options to reduce PCB contamination and accelerate disposal. Section IV identifies a proposed framework to help stimulate additional reductions of PCBs.

As an "options" paper, this document does not recommend a specific path of action for EPA or EC. Rather, it is designed to catalogue different ways to achieve elimination goals, recognizing that EPA and EC will still need to evaluate where involvement could be most effective, and make strategic investments where appropriate.

II. BACKGROUND INFORMATION ON PCBs

PCBs were produced in the U.S. from 1929 to 1977 and used in a wide range of applications (electrical transformers and capacitors, hydraulic systems, heat transfer systems, and carbonless copy paper, among others), owing to a rare combination of properties, including high dielectric constant (good insulator), low flammability, high heat capacity, low chemical reactivity, and long-term resistance to degradation. The Monsanto Company, the sole manufacturer of PCBs in the U.S., produced 700,000 tons (1.4 billion pounds) of pure PCBs during this period. In the late 1970s, Monsanto voluntarily ceased the production of PCBs and EPA banned their manufacture, import, export, distribution in commerce, and use except under limited circumstances. EPA also restricted disposal options and required the phaseout of certain types of equipment that contain PCBs. The U.S. Department of Transportation also restricted transportation options.

Although never manufactured in Canada, approximately 40,000 tons of PCBs were imported into Canada from the U.S. prior to the ban of their manufacture in 1977. EC and Transport Canada regulate the export, import, storage, disposal, and transportation of PCBs within Canada.

A. POTENTIAL SOURCES OF PCBS

The majority of PCBs were used in dielectric fluids for use in transformers, capacitors, and other electrical equipment. However, some of the largest direct releases to the environment have come from the use of PCB hydraulic fluids (e.g., in metal casting machines), since many hydraulic systems were designed to leak slowly to provide lubrication. While PCBs are no longer produced in the U.S., they are still used in certain applications, and can be released into the environment from different sources, some of which are included below.

- Items that contain PCBs introduced intentionally for their useful chemical properties such as transformers, capacitors, and other electrical equipment;
- Combustion or incineration of materials containing PCBs;

- Environmental sinks of past PCB contamination;
- Inadvertent generation during certain production processes; and
- Storage and disposal facilities.

For additional information on the above sources of PCBs, see the "Report on PCB Sources and Regulations (2000 Update)" dated March 1, 2000, prepared in support of the Binational Toxics Strategy.

B. REGULATORY OVERVIEW

In Canada, the Canadian Environmental Protection Act (CEPA) controls the processing, export, import, destruction, storage, use, sale, and labeling of machinery or equipment containing PCBs. CEPA regulations define how PCB owners must keep track of their equipment which contain PCBs.

In the U.S., PCBs are regulated primarily by the Toxic Substances Control Act (TSCA), which has one section devoted solely to PCBs. TSCA regulations define: how PCBs may be used, processed, distributed, manufactured, exported, and/or imported; storage and disposal options; spill clean-up requirements; and how PCB owners must keep track of their equipment which contain PCBs. Developing options to enhance PCB disposal requires a basic understanding of the current regulatory structure, including the barriers that might inhibit the elimination of PCBs. Under TSCA, all uses or other activities involving PCBs are banned unless they are specifically allowed by EPA in one of three categories:

1. *Totally Enclosed Activities*: These are defined in TSCA regulations as activities that result in "no exposure to humans or the environment" such as the distribution in commerce of intact, non-leaking electrical equipment (40 CFR 761.20).

2. *Authorized Uses*: Those uses that are non-totally enclosed and that are specifically authorized by rule (40 CFR 761.30). In general, authorized uses are based on a finding that the use will not pose an unreasonable risk of injury to health or the environment.

3. *Exemptions*: Are required for activities that are not considered totally enclosed activities or are not authorized specifically by rule. EPA may grant exemptions if it determines that the activity would not result in an unreasonable risk of injury to health or the environment and that the applicant has made good faith efforts to develop a chemical substitute.

The most significant remaining authorized use of PCBs is as a dielectric fluid in electrical equipment such as transformers and capacitors. Regulatory burdens and management requirements increase with each higher level of PCB concentration.

- Electrical equipment and oils containing PCBs in concentrations <50 ppm are generally excluded from regulation, with the exception of certain prohibitions on using and burning used oil with <50 ppm PCBs (40 CFR 761.20(d) and (e)); disposal is still regulated if waste streams are diluted to <50 ppm (40 CFR 761.1(b)). In addition, PCB concentrations in oils in heat transfer and hydraulic equipment must be less than 50 ppm.

< Electrical equipment containing PCBs in concentrations between 50 - 500 ppm are known as "PCB-contaminated" electrical equipment. These items have some recordkeeping and disposal requirements, along with specifications for storage, cleanup, and possible notification; and

< PCBs found in transformers and large capacitors at concentrations >500 ppm are known as "PCB transformers" and "PCB capacitors". These items have requirements for marking, recordkeeping, inspection, cleanup, location, possible notification and registration, and limited disposal options.

EPA has recently finalized a comprehensive modification of the PCB regulations. The final rules were issued on June 29, 1998. EPA's revisions to the PCB regulations will hopefully change the underlying incentives for companies to accelerate PCB reductions. The goal of these revisions is to "provide flexibility in addressing the disposal of PCBs...while still providing protection from unreasonable risk of injury." Although these rules do not impose mandatory phaseout deadlines, the amendments provide individuals with more flexibility in their PCB disposal practices. The amendments added sections establishing standards and procedures for disposing of PCB remediation waste and certain products manufactured with PCBs and established standards and procedures for decontamination in addition to expanding the list of available decontamination procedures. They also provided less burdensome mechanisms for obtaining EPA permits for a variety of activities by streamlining procedures, focusing on self-implementing requirements for certain disposal activities, and no longer requiring approvals for some decontamination and disposal activities. In addition, controls over the storage of PCBs for reuse were established, and more options for the storage of PCBs for disposal were provided.

The major changes to the PCB regulations concerning the disposal of PCBs are described below:

< **Disposal of PCB Remediation and Bulk Product Waste**. The amended rule allows the disposal of remediation wastes, or materials such as soil, concrete, or sediments, contaminated as a result of a spill or release of PCBs, on the basis of risk rather than its original PCB concentration. The amendments also provide additional disposal options for PCB bulk product waste, such as automobile shredder fluff.

< **Decontamination**. The amendments allow the decontamination, without a PCB disposal approval, of many materials that are contaminated with PCBs.

< **Research & Development**. Most small-scale R&D studies are now exempt from permitting. Volume and concentration limits were established with provisions for modification by EPA, thus allowing for the development of innovative disposal technologies without needing to obtain approval from EPA.

C. TRENDS IN PCB DISPOSAL

Within Canada, options for PCB disposal were limited until 1995 when an approved incinerator began accepting PCB waste for final destruction. Since 1995, other facilities have received approval for the destruction of PCBs. EC and the Provincial Ministry annually track on a voluntary basis the quantity of PCBs in service and in storage.

In the U.S., PCB disposal has continued at a steady pace since EPA began tracking disposal quantities and volumes in 1990. Through the Annual Reports submitted by commercial storage and disposal companies, EPA is able to calculate the volume of PCB wastes and the quantity of transformers, capacitors, and other PCB items disposed of annually. Information is available on annual disposal between 1990 - 1994 (EPA has not compiled the data for a national report since 1994, but plans to in the near future).

Volume of PCBs. From 1990 - 1994, 7.5 billion pounds of PCB waste were disposed of at TSCA-permitted facilities. In 1994 alone, a total of 1.85 billion pounds of PCB waste were disposed of in TSCA disposal facilities. This volume represents the greatest annual amount of waste disposed of since EPA began tracking this information. On a total volume basis for the five reporting years, 90% of the PCB waste was bulk waste, most likely from remediation activities. The other 10% of waste came from PCB containers, transformers, capacitors and article containers. Since the disposal estimates are based on the total weight of the PCB-containing items or "bulk" materials, the actual amount of disposed PCBs cannot be accurately determined.

Capacitors. A 1988 inventory found 1.8 million large PCB capacitors with PCB concentrations greater than 500 ppm remaining in service. Between 1990 - 1994, the U.S. disposed of a total of 320,000 capacitors, with over 100,000 capacitors being disposed in 1993. Based on the 1988 inventory and the average disposal rates of PCB capacitors as reported in the annual reports, an estimated 1,473,000 PCB capacitors remained in service in 1994.

Transformers. Over 125,000 transformers have been disposed of since 1990, although annual disposal quantities have decreased from the 30,000 disposed of in 1990. According to a 1988 inventory, 20,842,000 askarel and mineral oil transformers were in service. Of this total, 108,000 askarel transformers contained PCBs well over 500 ppm. Of the 20,734,000 mineral oil transformers remaining in service, approximately 1,825,000 contained PCBs with concentrations between 50 ppm and 500 ppm, and 250,000 contained PCBs in concentrations greater than 500 ppm. Based on the 1988 inventory and the average disposal rates of PCB transformers (askarel transformers and mineral oil transformers containing greater than 500 ppm), an estimated 200,000 PCB transformers remained in service in 1994.

EPA developed a database of PCB transformers registered with EPA as of December 1998. The registration requirement was intended to protect the environment by requiring a uniform, nationwide registration in which the data would be made available to emergency or fire response personnel and building owners. The database provides the best existing and current information on the number of PCB transformers remaining in use. It shows that there are around 20,700 PCB transformers currently registered in use, nationally, with about 27% of the PCB transformers and 19% of the pounds of PCBs located in the Great Lakes States. While this represents a substantial decline since 1994, it should be noted that the database is new, does not include registrations submitted after its initial development, and has not been thoroughly quality controlled. In addition, some owners of PCB transformers may have not yet registered their PCB transformers.

Containers. EPA also tracks the disposal of "article containers" (containers that hold PCB-containing items) and "PCB containers" (containers that hold oils or other PCB-contaminated material). While it is not possible to determine what is in these containers, some variability in the rate of disposal can be attributed to regulatory provisions that required phaseout of certain PCB equipment, which would have resulted in increased disposal of drained PCB oils. For example, the 4.8 million PCB containers disposed of in 1991 was 30 times the total quantity disposed of in any other reporting year. This may be attributable to transformer owners opting to reclassify or remove their units from service rather than install the enhanced electrical protection required on certain types of PCB transformers in 1990 and 1991. Such actions would have generated a large volume of oil, most of which would have been containerized.

III. OPTIONS TO ACCELERATE REDUCTIONS OF PCBs

Regulations alone will not bring about the elimination of PCBs. All existing regulatory phaseout deadlines have expired for mandating the removal of PCBs from service. Therefore, the PCB regulatory framework must be augmented by voluntary actions to increase the pace of PCB removal. EPA and EC will need to continue creating opportunities that encourage owners of PCB-containing equipment to remove PCBs from service, even though such actions may not be required by regulation. This section identifies a framework for developing such reduction opportunities. **Appendix A** summarizes the suggestions for accelerated reductions included in this and the next section.

A. CREATING AVOIDABLE COSTS

The Binational Toxics Strategy was originally built around a "pollution prevention equation" which describes how opportunities to achieve additional reductions of any substance occur when avoidable costs are created in one or more of the following situations:

< Increased regulatory costs which could be avoided by generating less waste;
< Increased public concern/public pressure as compared to increased public support from polluting less;
< Alternatives that make pollution prevention (or appropriate waste management) less expensive.

By concentrating on regulatory costs, public concern, and alternatives, EPA and EC may find several opportunities to create avoidable costs and shift burdens to encourage faster phaseout of PCBs. EPA and EC can help create avoidable costs within the current regulatory structure in the following ways:

1. **Regulatory Costs.** Increase the costs associated with keeping PCBs in use by:
   < focusing compliance monitoring activities and subsequent enforcement actions (if warranted) on companies that have not phased out PCBs; and/or
   < reducing regulatory costs for those companies that take extra steps to reduce PCBs.

2. **Public Awareness**. Facilitate outreach efforts that:
   < increase awareness of the different sources of PCBs;
   < support and recognize companies that voluntarily reduce PCBs; and/or
   < increase public awareness of facilities that have PCBs remaining in use.

3. **Lower Cost of Disposal Alternatives**. Help reduce the cost of PCB removal and disposal by:
   < making requirements for disposal alternatives less expensive; and/or
   < investigating the effectiveness of and promoting new disposal alternatives.

B. OVERCOMING BARRIERS TO THE PCB CHALLENGE GOALS

Throughout the Binational Toxics Strategy process, PCB stakeholder participants have identified certain barriers that may limit the ability of EPA and EC to achieve their PCB challenge goals. Lack of deadlines to phase out remaining uses and the high economic costs associated with early decommissioning of equipment (i.e. for commercial storage and disposal) potentially serve as barriers to PCB elimination. Restricted options for PCB clean-up have also been identified by stakeholders as an inhibiting factor in meeting the challenge goal.

Binational Toxics Strategy participants have also suggested several ideas that could help overcome some of the identified barriers. Reduction ideas fall into two general categories:

1. *Educational activities* that focus on public and private sector outreach that encourages proper disposal of PCBs and helps obtain a more complete inventory of remaining PCB sources and uses; and

2. *Incentives* that encourage PCB owners to increase the pace of PCB disposal by increasing the cost of keeping PCBs in service, or by allowing companies to avoid certain costs by removing PCBs from service.

For the most part, the options recommended by Binational Toxics Strategy participants emphasize activities that would complement existing and potential regulatory programs. The overarching goal is to help PCB owners recognize why it is in their best interests (and that of the general public) to dispose of PCBs more rapidly than required by regulations alone.

IV. A PROPOSED FRAMEWORK FOR PCB REDUCTIONS

There are several existing actions EPA and EC are taking under the Binational Toxics Strategy and other programs which can be built upon and expanded. These actions and other PCB reduction opportunities cover four areas which can be used as a framework for achieving additional PCB reductions.:

1. Supporting and expanding existing PCB reduction efforts;
2. Expanding PCB outreach efforts;.

3. Maintaining and supporting a regulatory program and regulatory changes; and
4. Targeting grant funds for PCB reduction efforts.

1) Supporting and expanding existing PCB reduction efforts: Great Lakes stakeholders can support the existing PCB reduction efforts that have been established to encourage PCB reductions and can expand the efforts to include additional stakeholders and participants. These endeavors take many forms and range from regional efforts such as the Lake Superior Pollution Prevention Strategy and the Lakewide Management Plans (LaMPs) to national efforts like EPA's proposed Persistent, Bioaccumulative and Toxics (PBT) initiative for PCBs. Additional efforts in the U.S. include EPA Region 5's PCB Phasedown Program which is designed to encourage more rapid removal of PCBs from utilities and the Cook County PCB/Mercury CleanSweep program organized by EPA and partners in the State of Illinois which is designed to help small businesses and local governments in the county identify PCB and mercury-containing items and encourage them to properly remove and dispose of or recycle these items.

As part of the Binational Toxics Strategy, both EPA and EC have sent PCB reduction commitment letters to major companies with PCB transformers and capacitors within the Great Lakes Basin, and are receiving positive responses and commitments from many of the targeted companies. This effort should continue, and focus on obtaining additional commitments.

2) Expanding PCB Outreach Efforts: There is a need for continued outreach and education to Great Lakes stakeholders on the Strategy, PCB Challenge, and the numerous issues associated with achieving PCB reductions. Participants have noted that not all facilities have registered their transformers, and some facilities aren't yet aware they have equipment with PCBs. Sharing partner "success stories" and case studies that articulate real life instances of financial benefits associated with PCB elimination could help attract participation. Efforts such as EC's Small Quantity Outreach Program can be very effective in explaining the options available for the destruction and decommissioning of PCBs and developing partnerships with new stakeholders. In the U.S., use of the PCB Transformer Database can potentially help target facilities for outreach and partnerships. Research and outreach into lesser-known sources of PCBs (e.g., submersible well pumps and oil-filled cable) may also help increase awareness and participation in the strategy's goals.

3) Maintaining and supporting a regulatory program and regulatory changes: EPA's modifications to the PCB rules are designed to provide substantial cost-savings for PCB disposal, offer flexibility in disposal options, and close some of the gaps in existing regulations. EPA anticipates that the revisions will potentially save industry between $4 billion and $5 billion annually. For example, the rules provide self-implementing disposal options for large volume PCB wastes, and clarify the one-year storage limit to restrict "storage for reuse." Many of these changes will help advance PCB reduction objectives. Renewal of the CEPA is anticipated in 2000, and certain issues such as time limitations on the use and storage of PCBs may be addressed.

4) Targeting grant funds for PCB reduction efforts: Funding could be provided for additional research and data collection efforts to identify ongoing sources of PCB contamination in the Great Lakes. Funding may also be made available to wastewater treatment plants that have PCBs appearing in their discharges.

APPENDIX A: Options for PCB Reductions

Identified Problems/ Concerns / Barriers	Suggestions for Accelerated Reductions		Regulatory Changes
	Education	**Incentives**	
High Cost of Disposal	Public education on benefits to removal Educate PCB equipment owners of potential liability risks Educate investment firms about lower liability from pollution prevention improvements Educate PCB equipment owners on decommissioning transformers Educate PCB equipment owners on spill prevention and proper management techniques	Targeted enforcement to encourage disposal Reward facilities that conduct audits and inventories and accelerate disposal Good public relations for companies that remove PCBs Support innovative PCB destruction technology Provide tax credits or other financial benefits for PCB removal Use supplemental environmental projects (SEPs) to obtain increased PCB removal Use economies of scale, e.g., larger utilities share expertise with/smaller companies (mentoring programs); smaller coops join together to reduce PCBs Companies with PCB pollution prevention programs move to top of permit / licensing list Reduce licensing / permitting fees for voluntary PCB reduction programs	Additional disposal options, e.g. self-implementing and risk based disposal options for large volume PCB wastes Simplified permitting process

APPENDIX A: Options for PCB Reductions

Identified Problems/ Concerns / Barriers	**Suggestions for Accelerated Reductions**		**Regulatory Changes**
	Education	**Incentives**	
Limits on Storage for Reuse	Establishing mentoring programs Publicize one-year limit on storage for disposal	Tax credits for PCB removal and destruction financial awards or public recognition Increased Inspections Fees structured to encourage accelerated reductions and pollution prevention	Strengthened storage rules to regulate "storage for reuse"
Incomplete Information Such as Sources of PCBs, Location of Remaining PCBs	Outreach to municipalities, cooperatives, small utilities Pilot inventory of PCBs in use Work with trade organizations to identify potential PCB owners Building inspections to identify potential PCB sources Develop list of abandoned locations where PCB activity has occurred Educate potential PCB owners about PCB items' proper disposal	Amnesty programs similar to pesticide "clean sweeps" Provide tax credits for PCB removal Conduct on-site inspections	Transformer registration required
Regulatory Barriers: No Phaseouts, Unrestricted Uses, No Management Requirements <50 Items	Education about proper management of fluorescent lamps, including potential future liability Work with trade organizations to identify potential PCB owners Building inspections Mentoring programs Pilot inventory of PCBs in use	Ballast rebate program Offer incentives to federal facilities	Clarifies disposal requirements Proposed clarification of management requirements