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May 28, 1998

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**NGO Petition to the North American Commission For Environmental Cooperation
for an Investigation and Creation of a Factual Record**

Submitted To	Copies To
<p>Ms. Janine Ferretti</p> <p>Interim Executive Director North American Commission for Environmental Cooperation 393 Saint Jacques St., W., Suite 200 CANADA H2Y 1N9 Montreal, Quebec</p>	<p>Hon. Christine Stewart, MP Hon. Carol Browner, Admin</p> <p>Hon. Julia Carabias, Minister</p> <p>Joint Public Advisory Comm.</p>

Submitting Organizations and Individuals: (Signatures Page 11) **Executive Summary**
US Failure to Enforce Domestic Laws and Treaty Obligations With Regard to Regulation
of Solid Waste and Medical Incinerator Air Pollution

We assert that the US Environmental Protection Agency’s regulations drafted and
programs adopted to control airborne emissions of dioxin/furan, mercury and other
persistent toxic substance from solid waste and medical waste incinerators violate and
fail to enforce both:

1) US domestic laws, and; 2) the ratified US-Canadian treaties designed to protect the
Great Lakes that are partly referenced in the US Clean Air Act. The US EPA
incinerator regulations specifically conflict with the “virtual elimination of persistent
toxic substances” and “zero emission” standards for Great Lakes pollution control of the
Great Lakes Water Quality Agreement. Ratified treaties also constitute laws of the land
by virtue of ratification by the US Senate.

Specific US Domestic Laws and US-Canada Treaties Not Being Enforced

Specifically, we maintain that the present US Environmental Protection Agency
regulations and programs violate and fail to enforce key provisions of the following laws
and treaties. 1) The Clean Air Act as amended in 1990.

42 Section 7401©: Pollution prevention.

42 Section 7415(a)(b): Endangerment of public health or welfare in foreign countries from pollution emitted in the United States.

42 Section 7429(a)(2): Maximum degree of reduction in emissions of air pollutants from solid waste incinerators.

2) The Pollution Prevention Act of 1990. 42 Section 13101 et seq: All provisions.

3) The Great Lakes Water Quality Agreements of 1972, 1978 and the Protocol of 1987 and the 1997 Great Lakes Binational Strategy.

4) The Agreement Between the Government of Canada and the Government of the United States Concerning Transboundary Movement of Hazardous Waste of 1986.

The exact wording of the specific provisions of these laws and treaties violated by the present US Environmental Protection Agency's regulations and programs for solid waste and medical incinerator air emission control are presented in Appendices 2 and 3.

Article 14 - Submission on Enforcement Matters

The North American Commission for Environmental Cooperation has already produced a Secretariat Report under Article 13, Continental Pollutant Pathways, and there is no need to duplicate this 1997 report.

This NGO petition asks the North American Commission for Environmental Cooperation for an investigation under Article 14 of the failure of the US Environmental Protection Agency to enforce US law and treaty provisions with regard to air pollution from municipal solid waste and medical waste incinerators, and secondly, requests the creation of a factual report under Article 15.

The International Joint Commission has already commented on the failure of the parties to adopt programs capable of achieving the "virtual elimination of persistent toxic substances" discharges to the Great Lakes.

May 28, 1998

Ms. Janine Ferretti
Executive Director,
Interim Commission for Environmental Cooperation
393 Saint Jacques St. W., Suite 200 Montreal, Quebec
CANADA H2Y 1N9
RE: NGO Petition North American

Dear Ms. Ferretti,

On July 5, 1997, we petitioned Administrator Carol Bowner of the US Environmental Protection Agency to undertake a program to phase out solid waste and medical incinerators, and 106 sources of air pollution that were responsible for 86 percent of airborne dioxin discharges into the Great Lakes.

A copy of our petition to the Environmental Protection Agency is enclosed. A copy was also sent to Hon. Christine Stewart of Canada.

1) Intention to Petition CEC Declared: In this petition to EPA, we announced our intention to petition the North American Commission for Environmental Cooperation, if we did not receive a reply to our petition to the Environmental Protection Agency within a sixty day period - a standard period in the United States to receive replies to petitions.

2) No Response from US Environmental Protection Agency: Administrator Browner did not respond to this petition, even though a reply is indeed required by US law and regulation. 3) Response from Environment Canada: We did receive a letter (see Panel 1) on behalf of Hon. Christine Stewart, Environmental Minister of Canada. The letter describes some of the activities of the United States and Canada to deal with long distance transport of air pollution and transboundary pollution.

“You indicate your intention to ‘petition’ the Commission for Environmental Cooperation (CEC) to formally address the issue of cross boundary air pollution...Specifically, the Agreement provides that citizens can make submissions to the Secretariat of the CEC asserting that a Party is failing to effectively enforce its environmental laws. If you feel that your petition relates to this, then you should take advantage of this tool...”

Part 1

Commoner Reports on Airborne Sources of Dioxin into the Great Lakes

The general outlines of this petition to CEC is based on work of many experts, but particularly that of Dr. Barry Commoner and colleagues at the Center for the Biology of Natural Systems. The Center is located at Queens College in Flushing, New York. We

also draw heavily upon the work of Dr. Paul Connett and Ellen Connett of Work on Waste of Canton, New York.

1) Prevention of Airborne Dioxin Contamination of Great Lakes: In June 1996, the Center for the Biology of Natural Systems issued two reports on prevention of airborne dioxin pollution of the Great Lakes and particularly the pollution of Lake Michigan. The reports conclude that about 86 percent of airborne dioxin sources into the Great Lakes could be eliminated without economic sacrifice, and indeed with possible economic gains. An estimated 70 percent of airborne dioxin delivered to the Great Lakes comes from solid waste and medical incinerators. (Appendix 1- Figure 1)

Dioxin Fallout in the Great Lakes, Where It Comes From; How to Prevent It; At What Cost, (June 1996): Zeroing Out Dioxin in the Great Lakes Within Our Reach, (June 1996) A two page summary of the findings of these reports by Dr. Peter Montague is presented in Chart 1. Copies of the full original reports are enclosed with this petition. And Appendix 1 presents summary maps, charts and cost estimates from the two reports.

2) Costs and Economic Returns of Prevention: The reports go into considerable detail concerning the costs and returns of pollution prevention approaches that could zero out about 86 percent of dioxin discharges to the Great Lakes by air at costs equivalent or lower to what is being done now. ³This is even after paying off the bonds of abandoned municipal trash incinerators.

3) Job Creation: As summarized by Appendix 1-Figure 7, the Center projects a net increase of 23,470 regional jobs from conversion of all of the five industries to dioxin free production approaches, and also a net \$160million net annual money savings to the regions where the conversion would take place. The later sum represents 0.008 percent of the Great Lakes states' gross product.

4) Confirming Studies: Other estimates of dioxin/furan production sources confirm the Center for Biology of Natural Systems findings. Thomas and Spiro summarize what is known about dioxin production and environmental distribution - - medical waste and municipal waste incinerators rank at top in U.S. annual dioxin emissions. (Appendix 1- Figure 8)

The study of Western Europe by J.W. Wormgoor of the TNO Institute of Environmental and Energy Technology shows a very similar percentage breakdown of sources for air pollution borne dioxin. (Appendix 1-Figure 9)

Trash incineration has a major impact on levels of environmental and food contamination. A 1996 study of cow's milk in Ireland - a nation lacking any trash incinerators and with little transboundary pollution - shows milk dioxin levels in the range of .13 to 0.51 pg 1-TEQ/g of fat. (1) (It's a very low figure, and some congeners were at the sensitivity level of the equipment.)

In contrast, a ten year old study of milk from dairy areas of New York State where trash incinerators were operating found that mean dioxin levels averaged 3 to 4 times higher than those found in Ireland and 8 times higher at the high end. (At that time, the New York's Niagara Falls trash incinerator was the third largest source of airborne dioxins entering the Great Lakes.) (2)

Health and Environmental Effects of Dioxin Well Documented

In 1994, the US Environmental Protection Agency published a massive reassessment of the health and environmental effects of dioxin/furans. EPA's Dioxin Assessment documents provide ample substantive health and environmental grounds for phaseouts of incinerators producing dioxin. Additional health evidence comes from the studies of Agent Orange soldiers, industrial accidents and people exposed to dioxin from Seveso and elsewhere. Effects of dioxin on endocrine disruption and impairment of thyroid and immune system responses are well documented. The IARC of the World Health Organization has recently listed dioxin as a cancer agent, due to the convincing human evidence.

(1) & (2) Waste Not, "Ireland, low dioxin levels in Irish milk reveal how high dioxin levels are in other countries", #421 and New York, ... dioxin in cow's milk" #422, (March 1998) 82 Judson St., Canton, New York 13617

Part 2

These Same Incinerators Are Also Major Mercury Pollution Sources

A primary source of mercury in the northern lakes comes from air pollution. Particularly large sources of mercury air pollution include solid waste incinerators and medical incinerators. These are generally the same incinerator facilities that produce the airborne dioxin contamination of the US-Canadian border waterways and pastures. For example, a June 1996 report by C. Mark Smith and Carol Rowan-West, Mercury in Massachusetts finds that solid waste combustors were the largest sources of mercury releases followed by coal and oil combustion and by medical waste incinerators. (See Chart 2.)

Incinerators accounted for about 66 percent of all mercury emissions in Massachusetts in 1995 or 3.4 tons annually based on actual stack measurements. The Environmental Protection Agency's "draft" mercury study of June 1996 estimated that 50 percent of all mercury emissions in the nation came from medical or municipal incinerators. But in its final report, the Agency drastically reduced its estimates for solid waste and medical incinerators to 29 percent of total emissions and also reduced estimated mercury tonnage from all man-made US sources from 275 to 158 tons yearly. (Appendix 1, Figure 11)

Reduction of mercury levels in batteries, lamps, and paint are primary reasons for the lower figures. (See Appendix 1, Panel 3.) In addition, the Agency points out that strict regulations of medical incinerators by the state governments of New York, California and Texas has caused many hospitals to abandon incineration of medical waste, and that some states, such as Florida, New Jersey and Minnesota have required the use of activated carbon injection to capture mercury after combustion, or issued recycling

requirements or bans on the sale of certain mercury-containing products. (3) But, forty six tons of mercury emitted into the atmosphere annually from US solid waste and medical waste incinerators still constitutes a severe environmental threat. Unfortunately, the 90 percent control of incinerator mercury emissions projected by EPA by the year 2005 does not amount to “virtual elimination” of mercury as required by the Great Lakes Water Quality Agreement. In addition, the unaddressed problem of incinerator (3) U.S. Environmental Protection Agency (Research Triangle Park, N.C.), Mercury Study Report to Congress. Vol. 2. An Inventory of Anthropogenic Mercury Emissions in the United States. NTIS PB96-184635 (June 1996) malfunction makes some experts doubt that 90 percent reduction will be feasible in practice as proposed. (See Appendix 5.) In an acid environment as has become so typical of the northern lakes of the US - Canadian border region, mercury is converted by bacterial action to the more toxic methylmercury, which is the primary form found in fish. This later compound is extremely neurotoxic and has every potential of injuring both the young, particularly if exposed during pregnancy, as well as older populations who consume contaminated fish. Methylmercury also bioaccumulates. (Appendix 7 describes recent research on mercury’s chemistry in the Everglades that illustrates the general principles.)

Proposal to Restrict Mercury Intake by Environmental Protection Agency

The Environmental Protection Agency’s comprehensive report on mercury pollution of December 1997 - mandated by the US Congress - provides ample health and environmental grounds for phaseouts of medical and solid waste incinerators. There is much additional published health and environmental material about mercury’s toxicological effects and about the very high levels found in Inuit people of Canada. (4)

A November 1997 Danish study found that very low levels of mercury measured in the umbilical cord and blood of more than 900 Faeroe Island babies and in their mother’s hair, were correlated with a reduced performance at age six or seven of these children on eleven tests measuring language, attention, memory, spatial perception and motor skills. (The mercury came from the consumption of fish and whales.) See Appendix 1, Charts 3.)

“The more mercury the children had, the more poorly they performed”, noted Philippe Grandjean of Odense University. In response to utility lobbyists claims that reducing mercury emissions would cost \$10 billion for mercury scrubbers, a New Scientist editorial asked the question:

“This sounds like a lot, but spread over a decade it would add a mere 30 cents a week to each household’s electricity bill. And there is no reason suspect that the cost to consumers elsewhere would be any greater. Is 30 cents a week too much to pay for a couple of points on a child’s IQ? “

(4) See: Neurotoxicology, 17/1 (1996) Entire issue.

The initial proposal of the Environmental Protection Agency is that the maximum daily dose of mercury should be limited to 0.1 micrograms per kilogram of body weight, which translates to about 1 ppm in the hair. The present WHO limit is 10 ppm. The Danish study referenced above, showed neurotoxic effects in children at less than 10 ppm in the hair of the mother during pregnancy. Barbosa et al, finds that as much as 20 percent of the mother's mercury burden can be transferred to the fetus during pregnancy. (5) Infants are known to be 5 to 10 times more sensitive to adverse effects of mercury than adults. Other studies have shown that even at the 2.5 ppm or less hair contamination level of school children, behavior and intelligence could be altered. Mercury also interacts with other metals to provide synergistically toxic effects. (See Marlowe) Achievement of the new EPA proposed limits for mercury daily intake will require a much altered regulatory approaches for waste incineration than the ones presently in place - with a particular focus on pollution prevention. Action to Abate Dioxin and Mercury Will Also Reduce Other Toxins

Successful programs to eliminate dioxin/furan and mercury air pollution originating from solid waste and medical incinerators would also substantially reduce toxin emissions like cadmium and lead at no extra cost. With the advent of the cadmium based battery, growing emissions of cadmium from incinerators poses a serious health issue. Contamination of grains and farm produce with cadmium air pollution has been shown to damage kidney function of the general population in studies from Belgium and Japan. (See Buchett & Nakashima) The Environmental Protection Agency projects that cadmium and lead contamination of solid waste will continue to rise in the next years. And so, incineration of solid waste can generate a continuing increase of toxic metal contamination of the border environment and of the Great Lakes. (See Appendix 1 - Figure 14.) Already, those consuming fish from the Great Lakes have been shown to have higher blood levels of cadmium and lead as a result. (Hovinga) (5) Barbosa, A.C. et al, "Concentration of mercury in hair of indigenous mothers and infants from Amazon Basin", Arch. Environ. Contam. Toxicol. 34 (1998) 100-105

Part 3

Virtual Elimination and Zero Discharge of Persistent Toxic Substances Including Dioxin/Furans and Mercury Requires a Complete Revision of Regulatory Approaches
The proposal by the Center for Natural Systems to eliminate 86 percent of dioxin airborne emissions to the Great Lakes at a profit is consistent with the thrust of the Great Lakes Water Quality Agreement of 1972 and 1978, and the Protocol of 1987 and the Strategy of 1997.

In these agreements, the United States and Canada have agreed to the strategies of "virtual elimination" and "zero discharge" of persistent toxic substances. Unfortunately, practical programs have not matched the treaty pledges during the past twenty years. The International Joint Commission has repeatedly stated that there is a need to cut much more deeply if the persistent toxic pollutant loadings of the Great Lakes are to be reduced to virtual elimination.

- 1) With regard to the industry of incineration, the phaseout of vinyl chloride plastics in solid and medical waste has been specifically suggested by many experts as a priority, to prevent the production of dioxin and the release of heavy metals from these plastics. Indeed, the IJC has called for a phaseout of chlorine and chlorine-containing compounds as industrial feedstocks and that the means of reducing or eliminating other uses be examined.
- 2) The conclusions of the IJC about the dominant role of the growth of chlorine use in manufacturing as a source of dioxin is confirmed by the sediment cores of historical dioxin flux to remote Siskiwitt Lake located on an island in the middle of Lake Superior. (See Appendix 1-Figure 10. Also Alcock and Jones)
- 3) The IJC has also called for a grouping of the organochlorine toxins, to deal with phaseouts as a group rather than individually, and the abandonment of the risk-assessment approach for persistent toxic substances that bioaccumulate because this is an inappropriate approach.
- 4) Specifically with regard to incineration, the IJC in 1992 and 1994 stated unequivocally that incineration could not achieve “virtual elimination”. This same conclusion was drawn by the Virtual Elimination Task Force of experts in 1993. 8

Part 4

Violations of Domestic Law and Treaty Provisions by US Regulatory Programs for Municipal Solid Waste and Medical Incinerators

As has been noted, municipal solid waste and medical incinerators are major contributors to the airborne dioxin/furan and mercury pollution of the Great Lakes, the lakes and pasture lands along the border of the United States and Canada, and the entire northern region including the Arctic. These incinerators are also major contributors of air pollution deposition of other persistent toxic substances, including lead and cadmium and polycyclic organic substances.

This citizen petition asserts that the U.S. Environmental Protection Agency’s regulations for solid waste and medical waste incinerators conflict with the domestic laws of the United States, as listed below, as well as the requirements of the ratified US-Canadian treaties, also listed below. In short, the Environmental Protection Agency has failed to enforce the requirements of domestic law and US-

Canadian ratified treaties with regard to incinerator pollution Where the Violations of US Law and Ratified Treaties Exist

A. Violations of US Domestic Law: We assert that the recent regulatory programs developed by the US Environmental Protection to control the emissions from US based municipal solid waste (MSW) and medical incinerators violate US domestic law - - in

particular provisions of the Clean Air Act, as amended in 1990, and the Pollution Prevention Act of 1990.

Appendix 2 of this petition presents the exact wording of the provisions of the Clean Air Act and the Pollution Prevention Acts that are violated by present US incinerator air pollution control regulations. We assert that the regulations and programs developed to control incinerator air pollution fail to enforce the following portions of these domestic laws:

- 1) Clean Air Act: 42 Section 7401(c); Pollution prevention.
- 2) Clean Air Act: 42 Section 7415(a)(b); Endangerment of public health or welfare in foreign countries from pollution emitted in the United States.
- 3) Clean Air Act: 42 Section 7429(a)(2); Maximum degree of reduction in emissions of air pollutants from solid waste incinerators. 4) Pollution Prevention Act: 42 Section 13101 et seq; All provisions.

B. Violations of US-Canada Treaty Requirements: Virtual Elimination Not Addressed: The regulatory program of the US Environmental Protection Agency also fails to address the “virtual elimination of persistent toxic substances” and “zero emission” requirements of the Great Lakes Water Quality Agreements 1972 and 1978 governing the Great Lakes, and the Protocol of 1987 and the Strategy of 1997.

We also assert that the US regulatory program violates the 1986 Agreement Between the Government of Canada and the Government of the United States Concerning Transboundary Movement of Hazardous Waste.

Appendix 3 of this petition outlines in detail the exact wording of these treaties that are violated by the present US regulatory program for MSW and medical incinerators. We assert that both of these treaties are embodied in US domestic law by virtue of ratification by the US Senate and both constitute laws of the land. C. Failure to Tailor Incinerator Air Pollution Regulations to Great Lakes Water Quality to Meet Treaty Requirements: The Environmental Protection Agency must tailor its regulatory program for incinerators that are located within the Great Lakes airshed to the “virtual elimination of persistent toxic substances” requirements of the Great Lakes as laid out by the Great Lakes Water Quality Agreement whenever this is relevant.

The study of incinerator air deposition into the Great Lakes by the Center for the Biology of Natural Systems indicates that the Great Lakes airshed is large. (Appendix 1 - Figure 3) This is clearly relevant for MSW and medical incinerators. There is now abundant evidence that MSW and medical waste incinerators are significant sources of persistent toxic substance pollution of the Great Lakes, through air pollution deposition.

Part 5

Request for Investigation by the North American Commission for Environmental Cooperation and for Creation of a Factual Report:

- 1) We and the undersigned groups and individuals request that the Commission for Environmental Cooperation investigate the above violations of US domestic law and treaties embodied in US domestic law by ratification, and issue a factual report.
- 2) In view of the present three year backup of business at the Commission for Environmental Cooperation, we also request that this be done in a timely fashion.
- 3) And finally, we are asking the CEC to use its good offices to persuade the US and Canadian governments that it would be economically wise and a good environmental and public health move to undertake the following programs laid out by the Center for the Biology of Natural Systems in June 1996 to eliminate dioxin air source pollution of the Great Lakes.

Details of this program are presented in Appendix 1 and in the full reports from the Center for the Biology of Natural Systems which are enclosed with this petition:

- A) To adopt a high priority phaseout of 106 sources of airborne dioxin responsible for 86 percent of airborne dioxin deposition into the Great Lakes and a large portion of airborne mercury pollution.
- B) To reduce dioxin and mercury pollution fallout into the Great Lakes, to pastures, to lakes along the US-Canadian border, and to the Arctic regions by zeroing out five major source categories - at a profit. (See figures 1 to 7 in Appendix 1 of this petition.)
- C) To specifically phase out solid waste and medical incinerators. D) It is expected that this program will have the additional benefit of substantially reducing cadmium, lead, polycyclic organic material, and other toxin deposits into the Great Lakes, the US-Canadian border lakes, to pastures of the border area and to the Arctic.

Summary of Our Request to CEC- An Investigation and a Report and Signature Page

- 1) This citizen petition asks the North American Commission for Environmental Cooperation under Article 14 to undertake an investigation of violations of US domestic law requirements and of US-Canadian ratified treaty requirements by the published regulations of the US Environmental Protection Agency for control of air pollution emissions from municipal solid waste (MSW) incinerators and medical waste incinerators. (Treaties ratified by the US Senate are also laws of the nation.)
- 2) We are also asking CEC to create a factual report under Article 15.

Thank you for your help in advance. With best regards,

Erik Jansson, Exec. Dir. Dept. of the Planet Earth, Wash. D.C.

Elizabeth May, Exec. Dir. Sierra Club of Canada, Ottawa, Ont.

Dr. Brent Blackwelder, PhD, Pres. Friends of the Earth, Wash. D.C.

Carol Dansereau, Acting. Dir. Washington Toxics Coalition Seattle, Wash.

Jay Feldman, Exec. Dir. Nat. Coal. Against Misuse of Pesticides Wash. D.C.

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Appendix 6: The Ash Toxicity Problem That US EPA Tries To Hide By Dilution.

Appendix 7: Bio-Chemistry of Mercury in the Everglades Illustrates General Principles of How Methylmercury Is Produced in the Environment.

Appendix 1 Center for Biology of Natural Systems Analysis of Airborne Dioxin Sources to the Great Lakes, Supporting Studies. and Mercury, Lead, Cadmium - - Summary Charts

Figure 1-7: Dioxins: Center for Biology of Natural Systems maps, charts, and cost analysis concerning 86 Percent airborne dioxin elimination to Great Lakes and Lake Michigan.

Figures 8-9: Estimates of sources of airborne emissions of dioxins in the United States and Europe.

Figure 10: Trends of dioxin flux to Siskiwit Lake, on an island in northern Lake Superior, where all dioxin contamination comes from air sources.

Figure 11: Mercury: US Environmental Protection Agency's estimate of the sources of airborne mercury.

Charts 3: Effect of mercury on childhood mental development.

Chart 4. Lead and Cadmium: Projection of sharp increase in lead and cadmium discards.

Panel 2: Dioxin: Size of dioxin air pollution and deposition - even larger, and possible atmospheric conversion.

Panel 2 Size of Dioxin Air Pollution and Deposition - Even Larger and Possible Atmospheric Conversions: The above charts and figures present percentage contributions of dioxin air pollution contamination by type of source. But, Louis Brzuzy and Ronald Hites' 1996 study demonstrates that the global deposition of dioxin compounds has been underestimated by a factor of four.

This much higher measured dioxin fallout levels than expected would indicate is that the emission factors used by regulatory agencies like the Environmental Protection Agency have been much too low. 1) For example, Work on Waste of Canton, New York (Dr. Paul Connett & Ellen Connett) estimates that trash incinerators in the United States may

be emitting as much as 13,500 to 15,000 grams of dioxin per year (TEQs) in 1993, compared to the Environmental Protection Agency estimate of only 3,000 grams per year at that time. (Waste Not, #275)

The estimate is based upon actual records of emissions from eleven trash plants which use hot sided electrostatic precipitators. The single incinerator from Norfolk, Virginia was putting out 2,425 grams of dioxin in 1994, which just about equaled the entire EPA estimate for the entire United States at that time. (Waste Not #345)

2) Most of this airborne dioxin is carried by particulates. Dioxin fallout tends to be the more highly chlorinated dioxin compounds, which will be more durable in the environment and bioaccumulate to a greater degree.

3) Studies around the world show that environmental levels of dioxins, furans, and dioxin type of compounds have dropped sharply over the decades to 1990. But, more recently, contamination levels have reached a steady state, indicating the need for more drastic control of sources. (Huestis, Coleman)

4) Some of the lesser chlorinated dioxins emitted by combustion sources are semi-volatile and can evaporate much like PCB's. (Wania and MacKay) But, the deposition record, tending towards the more highly chlorinated dioxins, suggests that chemical reactions during transport in the air may alter these lesser chlorinated dioxins and possibly convert them to more chlorinated forms. As Tysklind put it with regard to Swedish measurements:

“..Trajectory calculations confirm long-range transport of PCDD/Fs as an important factor for regional and even global environmental contamination by these compounds. The correlation between PCDD/Fs and the inorganic pollutants, such as SO₂, NO₂, and soot, provides additional evidence for the assumption that heavy industrialized and urbanized areas are the major source regions for PCDD/Fs. A congener profile with a typical domination of higher chlorinated dioxins is found in air samples considered to be ‘background’...This profile might be explained by photolytic degradation and/or hydroxyl radical reactions...” Pearson et al, attempted to estimate the proportion of dioxin/furan accumulations that have come from local (subregional) air pollution and/or non-atmospheric pollution, compared to longer distance deposition for three of the Great Lakes: Lake Superior, Lake Michigan and Lake Ontario. It was estimated most of the dioxin deposition to Lake Superior comes from longer distance air pollution. Southern Lake Michigan received about 80 percent from longer distance, whereas there is a local source for northern Lake Michigan. And less than 10 percent of dioxin in Lake Ontario is distant. Over 70 percent of current inputs to Lake Ontario was estimated to originate from non-atmospheric sources. The authors note an urban gradient, and that “suburban air” can support the accumulation of PCDD/F in southern Lake Michigan.

Appendix 2 Failure to Enforce Domestic Laws - - Exact Wording of Statutes Ways That Present US Regulations of Solid Waste and Medical Waste Incinerators Violate US Domestic Laws

Part 1 US EPA Violates U.S. Clean Air Act in Regulation of Solid Waste and Medical Incinerators - General Clean Air Act Provisions

The US Clean Air Act, as amended in 1990, calls for several programs relating to incinerators that are not being implemented by the U.S. Environmental Protection Agency. Secondly, a series of agreements signed with Canada and relating documents stress “virtual elimination” and “zero discharge” of pollutants with regard to the Great Lakes. These agreements modify the Clean Air Act provisions for air pollution management relating to the Great Lakes. The U.S. Environmental Protection Agency has not adopted regulatory programs with regard to solid waste and medical incinerators that would have the capacity of achievement of virtual elimination or zero discharge, even though these incinerators account for a large percentage of the airborne toxic contamination sources of the Great Lakes.

Here in Appendix 2, we will review the provisions of the Clean Air Act as amended in 1990, and the Pollution Prevention Act of 1990. In Appendix 3, we review the ways that the US Environmental Protection Agency falls short of the requirements laid out by ratified US-Canadian treaties.

Pollution Prevention - EPA’s Lack of Required Program for Incinerators

The U.S. Congress in the Clean Air Act as amended in 1990, declared that pollution prevention would be a primary focus: 42 Section 7401(c) “Pollution Prevention. A primary goal of this Act is to encourage or otherwise promote reasonable Federal, State, and local government actions, consistent with the provisions of this Act, for pollution prevention.”

The pollution prevention opportunities for dioxin and mercury pollution generated by incinerators require either: 1) the elimination and removal of toxic precursors in the solid waste or medical waste, such as polyvinyl chloride plastics and mercury containing instruments prior to burning, and/or; 2) the use of alternative treatment approaches such as a recycling as an alternative to solid waste incineration or steam sterilizing autoclaves, chemical sterilization, or microwave sterilization in the case of medical incinerators.

It is fair to conclude that in the case of dioxin and mercury emitted by incinerators, the US Environmental Protection Agency lacks an effective pollution prevention program. The Agency violates the 1990 Clean Air Act’s “Congressional findings and declaration of purpose” in this regard.

EPA Has General Jurisdiction to Act to Promote Prevention

The Great Lakes Water Quality Board concluded in 1993, that both the United States and Canada had adequate mandates and authority to implement virtual elimination of persistent toxic substances discharges to the Great Lakes and meet the requirements of the Great Lakes Water Quality Agreement between the US and Canada. Our review of the US laws leads us to concur with the Board’s conclusions. For example:

1) Removal of Precursors With Fuel Cleaning: Removal of precursors of dioxin and mercury pollution prior to incineration of solid or medical waste is consistent with Section 7411 of the Clean Air Act, “Standards for performance for new stationary sources”. It allows the Administrator of EPA to approve a “technological process for continuous reduction of pollution generated by a source before such pollution is emitted into the ambient air, including precombustion cleaning or treatment of fuels”. In this section of the Clean Air Act, the Administrator may approve but may not require any particular type of technological system. However, we would argue that the treaty provisions for the Great Lakes modifies the Clean Air Act, and requires the Administrator to take much more aggressive action with regard to emissions when it comes to the airshed of the Great Lakes. The Agency has failed to distinguish the Great Lakes from other parts of the nation in its regulatory approach to incinerators. Ratified treaties are also laws of the nation.

2) Hazardous Air Pollutants - In 1990 US Congress Acknowledges Some Relevant Incinerator Chemicals and Metals and Lists Control Approaches That Are Consistent With “Virtual Elimination”

In 1990, the Congress listed some of the hazardous air pollutants that would be of concern for a “major source” stationary source such as an incinerator or for a group of stationary sources of air pollution, including hydrochloric acid, phosgene, and 2,3,7,8 tetrachlorodibenzo-p-dioxin, cadmium, lead, mercury and polycyclic organic matter. Section 7412(b). The Congress also intended that the Administrator would specifically deal with some of the persistent pollutants typically emitted by incinerators. The Act provides in Section 7412 (c)(6) for action by EPA by 1995 and the year 2000: “...With respect to alkylated lead compounds, polycyclic organic matter, hexachlorobenzene, mercury, polychlorinated biphenyl, 2,3,7,8 - tetrachlorodibenzofurans and 2,3,7,8 - tetrachlorodibenzo-p-dioxin, the Administrator shall not later than 5 years after the date of the enactment of the Clean Air Act Amendments of 1990, list categories and subcategories of sources assuring that sources accounting for not less than 90 percent of the aggregate emissions of each such pollutant are subject to standards under subsection (d)(2) or (d)(4). Such standards shall be promulgated not later than 10 years after such enactment...”

And under provision (d)(2) it is provided:

“..Emission standards promulgated under this subsection and applicable to new or existing sources of hazardous air pollutants shall require the maximum degree of reduction in emissions of the hazardous air pollutants subject to this section (including a prohibition of such emissions, where achievable)...”

3) Range of General Options Provided in Clean Air Act Allows For Virtual Elimination Approaches

Under 7412 (d)(2), five options are suggested by the Clean Air Act, which are listed below. Some are capable of achieving “virtual elimination and others are not. We

suggest that reduction of the volume outlined in category A and the provisions of category C below are not consistent with the additional requirements of the US-Canadian treaty obligations for “virtual elimination of persistent toxic substances” applicable to the Great Lakes. Virtual elimination requires a more dramatic and aggressive approach than mere volume or emission reduction. The elimination of emissions, listed in category A is exactly the type of program required by the Great Lakes treaties for persistent toxic substances. The five options provided in the Clean Air Act are these:

“(A) reduce the volume of, or eliminate emissions of, such pollutants through process changes, substitution of materials or other modifications,

(B) enclose systems or processes to eliminate emissions,

(C) collect, capture or treat such pollutants when released from a process, stack, storage or fugitive emissions point, (D) are design, equipment, work practice, or operational standards (including requirements for operator training or certification) as provided in subsection (h), or

(E) are a combination of the above.

Section 7412 (d)(4) provides that where a health threshold has been developed for a pollutant, the Administrator may consider such a threshold, with an ample margin of safety, when considering emission standards. Of course, the EPA review of 1994 found that no such threshold exists with regard to dioxins and furans. Available studies also indicate that mercury’s neurotoxicity threshold during pregnancy, if it exists, is very low indeed.

The capacity of both dioxins and furans and organic mercury to bioaccumulate also makes thresholds less than useful and “inappropriate” as noted by the experts of the Virtual Elimination Task Force, whose recommendations we will review in Appendix 3. And finally, the monitoring of mercury and dioxin “emissions” has been difficult technologically, which is why maximum available control technology, MACT, has been the general thrust of control strategies. In summary, while provided as an option in the Clean Air Act, use of health thresholds to regulate persistent and bioaccumulative toxins emitted from incinerators is also not consistent with the “virtual elimination” and “zero discharge” provisions of the treaties applying to the Great Lakes. Failure by EPA to Tailor New Emission Controls for Great Lakes and Coastal Waters Consistent With Virtual Elimination And Failure

To Establish a Regulatory Approach for Virtual Elimination

The Clean Air Act of 1990 specifically required the Administrator of EPA to produce a report to Congress within three years of enactment and biennially thereafter concerning the contribution of atmospheric deposition to pollution loadings in the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters. 1) Report: The Agency has complied with this requirement, with the first report submitted in 1994. The Second

Report to Congress, Deposition of Air Pollutants to the Great Waters was published by EPA in June 1997.

2) Evaluation of Impact: The Agency was required to evaluate whether this air pollution caused exceedance of the Safe Drinking Water Act or water quality standards with respect to the Great Lakes, and exceedance of the specific objectives of the Great Lakes Quality Agreement.

The 1997 report lists the fish consumption advisories for the Great Lakes and Lake Champlain for both mercury and dioxins - clearly indicating a severe health and ecological problem for these two incinerator generated persistent pollutants and an exceedance of specific objectives. (Chart 5)

3) Environmental Lawsuit Filed - EPA's Failure to Evaluate Regulatory Needs for the Great Waters: Also, the Agency was required to evaluate by 1995 whether additional regulation of hazardous pollutant emissions or control measures may be necessary to prevent serious adverse effects to public health or serious or widespread environmental effects, including those associated indirectly with atmospheric deposition. Capacity of pollutants to bioaccumulate should be taken into consideration.

On July 18, 1996 three environmental groups filed a lawsuit against the Agency for failing to meet this requirement. The suit, brought by the Sierra Club, the National Wildlife Federation and the Chesapeake Bay Foundation filed in US District Court for the District of Columbia charged that EPA had failed to protect the ecosystems of the Great Lakes, the Chesapeake Bay, Lake Champlain and certain coastal waters by not implementing provisions of the Clean Air Act.

4) Regulatory Proposals in EPA's 1997 Report on the Great Waters Incapable of Achieving Virtual Elimination: The Great Lakes Water Quality Agreement of 1978 between the United States and Canada called for the "virtual elimination" of the discharge of persistent toxic substances, especially those which bioaccumulate, from the Great Lakes basin.

EPA's 1997 report Deposition of Air Pollutants to the Great Waters, lists several programs that are supposed to achieve "virtual elimination" for mercury and PCBs but don't have this capability in practice. A virtual elimination program for dioxins/furans is apparently not in the works. These proposed or ongoing programs are:

A pilot project sponsored by EPA to develop the framework to achieve virtual elimination of mercury and PCBs, but which actually fails to achieve such a conceptual framework. Development of the Great Lakes Binational Toxic Strategy of April 1997, signed by environmental officers from Canada and the United States, which again calls for measures far short of virtual elimination.

In Chart 6 from the 1997 report, the Agency lists the "regulatory and voluntary options that may prevent or reduce atmospheric mercury contamination". These measures

include management of municipal and medical waste incinerators which are believed to generate about over half of total national air emissions of mercury, primarily by burning mercury containing wastes such as batteries and thermometers.

The objective was by the year 2002, to “reduce” mercury emissions from solid waste and medical incinerators by 95 and 80 percent respectively. This is a strategy is clearly not aimed at “virtual elimination”, which is a much more stringent approach than mere end-of-the-pipe air pollution regulation. (The Binational Strategy of 1997, pushes the date of accomplishment out to the year 2006.)

As the International Joint Commission pointed out in 1992, “We have not yet virtually eliminated, nor achieved zero discharge of any persistent toxic substance”, and that remains the case today and into the distant future with the present programs. Furthermore as will be noted in Part 2, the Environmental Protection Agency is not requiring incinerators to use the maximum available control technology. Such is being required in Europe but not in the United States. Failure to Act on International Air Pollution Requirements

42 Section 7415 (a) of the Clean Air Act provides:

(a) Endangerment of public health or welfare in foreign countries from pollution emitted in United States...”Whenever the Administrator, upon receipts of reports, surveys or studies from any duly constituted international agency has reason to believe that any air pollutant or pollutants emitted in the United States cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare in a foreign country...the Administrator shall give formal notification thereof to the Governor of the State in which such emission originate.

(b)...”The notice of the Administrator shall be deemed to be a finding under ...42 Section 7410(a)(2)(H)(ii) which requires a plan revision with respect to much of the applicable implementation plan as is inadequate to prevent or eliminate the endangerment referred to in section (a)...”

There have been numerous reports from the International Joint Commission that have indicated serious Great Lakes pollution problems stemming from dioxin and mercury and specifically from incinerators. The CEC released a report on long-range transport of pollutants in 1997, with similar conclusions.

Yet the U.S. Administrator of the Environmental Protection Agency has failed to require state implementation plan upgrades that are consistent with “virtual elimination” as required by US-Canada agreements, or upgrades that could prevent or eliminate the “endangerment” of health and welfare.

Quite similar international provisions are also provided in the US law applying to discharges of pollution to navigable waters. 33 Section 1320 (a).

Failure to Act to Replace Incinerators on Federal Facilities

Section 7418(a) of the Clean Air Act requires control of pollution from Federal facilities, to comply with all Federal, State, interstate and local requirements. Incinerators at federal facilities discharging hazardous air pollutants to the Great Lakes are presently not being required to achieve “virtual elimination”. This is also a violation of the law.

Part 2

US EPA Fails to Implement Specific Requirements of the Clean Air Act Relating to Solid Waste and Medical Waste Incineration (The Additional Issue of Great Lakes Water Quality Agreements)

The pledge of the United States to follow the principles of “virtual elimination” and “zero discharge” for control of persistent toxic substances that contaminate the Great Lakes was established in the Great Lakes Water Quality Agreements of 1972 and 1978, and the subsequent Protocol of 1987 and Strategy document of 1997. To summarize the basic issues:

- 1) There has been very little progress towards virtual elimination in the past twenty years. The toxic substance control regulations of the US Environmental Protection Agency have focused on rather loose emissions controls rather than upon virtual elimination. In this, the Agency violates specific incinerator provisions of the Clean Air Act, as described below.
- 2) Ratified treaties are also part of the law of the United States, and there is a need for the Environmental Protection Agency to meet their standards. The treaties for the Great Lakes, which we review later, require a focus on “virtual elimination” and “zero discharge”.
- 3) Virtual elimination requires the removal of toxic substance sources from the incineration waste stream, or use of alternative processes such as recycling or in the case of medical waste, steam autoclaves sterilization, shredding and chemical disinfection or shredding and microwaving.

Environmental Protection Agency Fails To Require Maximum Degree of Reduction of Air Pollution As Required for Solid Waste Incinerators

The Clean Air Act as amended in 1990, requires the following air pollution management of emissions from solid waste incinerators:

“7429 (a)(2) Emission standard. Standards applicable to solid waste incineration units promulgated under ... 42 USCS 7411 and this section shall reflect the maximum degree of reduction in emissions of air pollutants listed under section...(a)(4) that the Administrator, taking into consideration the cost of achieving such emission reduction,

and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing units in each category...”

But when we compare the dioxin/furan standard with European control standards, it becomes amply clear that the Environmental Protection Agency has not implemented the required programs laid out in the Clean Air Act. EPA’s emissions standards for dioxin/furan emissions from incinerators are 3 to 30 times less stringent than those of Germany, the Netherlands, Austria and Sweden.

1) Chart 7 summarizes the EPA program in comparison with European standards for solid waste incinerators. Not only is the Agency requiring less than maximum available control technology (MACT), but virtual elimination for incinerators that pollute the Great Lakes is not considered.

2) Chart 8 shows similar proposals for toxic metals including mercury. Once again, an 85 percent reduction in mercury is not virtual elimination. In addition, Europe is now using better mercury control processes than required in the United States by the federal government. 3) Not only has the Agency failed to require MACT for control of incinerator emissions, but there are no provisions in the present regulations for special consideration of the needs of the Great Lakes.

Technical Problems of Achievement Not Considered in EPA’s Program The Agency claims that their program will reduce dioxin output from MSW incinerators by 99 percent. Unfortunately, the Agency has very little information on how much dioxin is being emitted by existing incinerators, and past estimates have been vastly understated. (99 percent of what?)

For example, a 1992 dioxin emission test at the Columbus, Ohio MSW incinerator measured emissions of 984 grams of dioxin -TEQ, which was five times the total dioxin TEQ estimated by the Environmental Protection Agency for all the 140 MSW incinerators in the entire the United States at that time. Obviously, EPA’s emission estimates have been wildly off the mark. (The Columbus, Ohio incinerator recently shut down because it also proved uneconomic.) Technical problems can also drastically increase dioxin emission outputs. For example, a Rotterdam, Holland trash incinerator was fitted with \$240 million of modern air pollution equipment. Yet, in the first year of operation, the equipment was by-passed 10 percent of the time, which means that they are only getting only 90 percent control of dioxin. (Appendix 5) And mercury control would be even worse.

The Environmental Protection Agency regulations have been allowing municipal waste combustors periods of downtime, shutdown or malfunction where the operator is exempt from the regulatory requirements for emission control. Some MSW incinerators have been also burning industrial wastes. This is an industry with traditionally with a high level of corruption which can defeat any regulatory program.

Dr. Paul Connett and Ellen Connett of Work on Waste, located in Canton, New York have done some of the best analyses of the limitations of incinerator control technology - "back ended control" - to achieve real reductions in contamination emitted from incinerators. In Appendix 5, several analyses of the practical problem of maintaining high emission controls from incinerators from their publication Waste Not are presented and from the Ecologist. Further analysis is included from the Environmental Defense Fund. In summary, the US program as laid out by the 1995 Environmental Protection Agency regulations for MSW incinerators is a direct challenge to the "virtual elimination" provisions of the US-Canadian treaties for the Great Lakes, and also represents a violation of the US Clean Air Act.

The International Joint Commission was very clear about what virtual elimination meant in its review of air quality in the Detroit-Windsor/Port Huron-Sarnia region in 1992, :

"13) Incineration facilities in the region be phased out of use or required to eliminate the production and emissions of dioxins, furans, PCBs and inorganic materials, especially mercury and hydrochloric acid.

14) Uniform state and provincial requirements be established for incineration facilities in the Reference region based on the principle of zero discharge of persistent toxic substances."

First US Federal Regulation for Medical Waste Incinerators Falls Short

Proposed in February 1995, the EPA rule on control of emissions from medical incinerators sets federal emission standards for nine air pollutants: particulate matter, sulfur dioxide, hydrogen chloride, nitrogen oxides, carbon monoxide, lead, cadmium, mercury, and dioxins and furans. (Chart 9)

The rule became effective September 15th, 1997. States have six months to comply with the rule. Spokesmen for E.P.A. expect 50 to 80 percent of the estimated 2400 medical incinerators to shut down as a result of the regulation. The cost of an air pollution device to meet federal standards ranges from \$50,000 to \$500,000 with a ballpark of \$200,000, according to Jim

McLarney, associate vice president of the American Hospital Association.

(Environ. Sci. Technol. 1997)

The regulation does require a waste management plan which presents one of the components of virtual elimination, but implementation is not mandatory:

"The owner or operator of an affected facility shall prepare a waste management plan. The waste management plan shall identify both the feasibility and the approach to separate certain components of solid waste from the health care waste stream in order to reduce the amount of toxic emissions from incinerated waste...The American Hospital

Association publication entitled “An Ounce of Prevention: Waste Reduction Strategies for Health Care Facilities...shall be considered in the development of the waste management plan.”

The air pollution emission requirements for dioxin/furan and mercury emissions from medical waste incinerators are very similar to those for solid waste incinerators. (See Chart 9.) Dioxins/furans are to be controlled to a mandatory 125 ng/dscm for small incinerators, and 25 ng/dscm for medium and large medical incinerators. And mercury emissions are to be reduced by 85 percent. The problem is that the Environmental Protection Agency does not propose virtual elimination of these toxins for the Great Lakes airshed in this regulation. Emission controls cannot achieve virtual elimination even if they are expensive. The Natural Resources Defense Council and the Earth-Justice Legal Defense Fund are filing a lawsuit to challenge these proposed EPA standards because they also violate the Clean Air Act.

In July 1997, Browning-Ferris medical waste incinerator in the South Bronx of New York City, was replaced with a sterilizer. In autoclaving, 85 to 90 percent of medical waste is sterilized and rendered into normal solid municipal trash. The much lower temperature of sterilization dramatically reduces dioxin/furan formation and mercury emissions. (Halbfinger)

Presently Intractable Problem of Mercury Emissions from Incinerators Compared to the Other Toxic Metals

The Environmental Protection Agency had been trying to avoid the release of a major study of mercury required by Congress. Members of the US Senate in May, 1997 formally pressed EPA to release this report that was required by the Clean Air Act Amendments of 1990. It was released in December 1997.

1) Currently, six of eight Great Lake states have issued advisories restricting consumption of fish from some state waters due to mercury contamination. This is also the number one reason for advisories in Ontario. 2) Nationwide in the United States this is also true. In 1995, mercury fish advisories totalled 1,308 nationwide, up from 899 a year earlier. (Lee) And in 1993, 60 percent of fish consumption advisories were issued for mercury compared to 4 percent for dioxin, 21 percent for PCBs, 6 percent for chlordane, 2 percent for DDT, and 7 percent for all other chemicals. (Cunningham) Two years later, mercury has become even more dominant.

3) Mercury in fish is largely in its methylmercury form, which is much more neurotoxic and dangerous to the health. The Virtual Elimination Task Force estimated that as much as 14,700 pounds of mercury are deposited from air pollution into the five Great Lakes each year. 4) Nationwide emissions of mercury from MSW incinerators was estimated in 1990 at 74,356 pounds by Clean Water Action, and were estimated to have doubled over the decade. (Chart 10)

5) Slemr and Langer found that global atmospheric concentrations of mercury had increased over the Atlantic Ocean by 1.46 percent a year in the Northern Hemisphere and 1.17 percent a year in the Southern Hemisphere between 1977 to 1990. Fallout over the Arctic regions has dramatically increased. (Chart 12) Projections by Resources for the Future indicate that humans are likely to double their mercury releases during the next 50 years.

6) Forty percent of all mercury used in the United States has been in household batteries (Chart 10). Recycling programs for these batteries have been ineffective. But other programs, previously summarized by Chart 6, such as reduction of mercury levels in batteries have more potential. This is the type of source reduction that virtual elimination requires. Unfortunately, the use of cadmium based batteries and lead and cadmium contamination of solid waste is climbing. EPA projects a sharp increase in the quantity of lead and cadmium containing products discharged to solid waste in the United States from 1986 to the year 2000. (Chart 4) Where incineration is allowed, this increased contamination will also pose a chronic and increasing problem.

A number of authors point out the difficulty of removal of mercury with emission control on incinerators. For example, the 1990 Environmental Defense Fund book edited by Richard A. Denison and John Ruston, Eds., *Recycling & Incineration* describes the problem in the following way:

“...Mercury, for example, volatilizes and condenses at a relatively low temperature; good particulate control alone will not be effective at controlling mercury emissions. Lead, on the other hand, vaporizes and condenses at a higher temperature, and efficient particulate control will have a substantial impact on lead emissions.. ...Mercury, because of its exceptionally low condensation temperature, requires very careful attention; even modern facilities with baghouses and scrubbers have considerable difficulty in routinely achieving efficient mercury removal. Based on the limitations of current air pollution control technology to adequately control mercury, EPA has recently proposed to require that incinerators be accompanied by programs to remove household batteries from wastes to be incinerated, as part of BACT (best available control technology) for mercury emissions.”

An Agency report in 1975 optimistically projected that mercury pollution from MSW incinerators would decrease at the same time that trash incineration doubled. This was based on the optimistic assumption that batteries and other objects containing batteries and other objects containing mercury would be removed prior to burning and that air pollution control devices would remove 50 percent of mercury from the flue gases. Neither assumption proved to be correct. Cooling the gas after it leaves the incinerator can assist in control of metal emissions. But once again, we see that EPA has not required MACT for incinerators, in violation of the Clean Air Act. Such technology is being used in Europe but not here, as Denison and Ruston pointed out.

“...As a result, EPA has recently proposed to require all new and existing incinerators to cool flue gases to at least 450 degrees F prior to entry into the particulate control device.

But, scrubbers that achieve even lower flue gas temperature (approaching 250 degrees F) and better metals and organic control are being employed at MSW incinerators in Europe.”

Likewise, Paul and Ellen Connett remark on the practical problem of mercury control from incinerators:

“The elimination of mercury from emissions has been another recurrent problem. In experiments carried out by Environment Canada in Quebec City in 1985, very good results were obtained for the removal of dioxins and heavy metals using a combination of semi-dry scrubber and fabric filter. However, when this approach was tried on a newer plant in Sanislaus County, California, it did not remove any mercury.

One of the reasons suggested was that the ageing Quebec City plant was not completely burning the rubbish in the furnace and the carbon in the resulting soot was capturing the mercury. The modern plant with better combustion resulted in less soot and thus no mercury capture...” (Connett, 1994)

The modern thinking about mercury control after combustion is that activated carbon must be injected into the combustion gases to capture the mercury and then removed by the air pollution equipment. The Environmental Protection Agency points out that some states such as Florida, New Jersey and Minnesota have required the use of activated carbon injection after combustion in incinerators, or issued recycling requirements on bans on the sale of certain mercury-containing products. (1) Unfortunately, there are no such national requirements by the Environmental Protection Agency. They are not requiring MACT.

(1) U.S. Environmental Protection Agency (Research Triangle Park, N.C.) Mercury Study Report to Congress. Vol. 2. An Inventory of Anthropogenic Mercury Emissions in the United States. NTIS PB96-184635 (June 1996)

Part 3

US EPA’s Incinerator Regulatory Program Violates the Provisions of the Pollution Prevention Act of 1990 The US Congress in 1990 passed the Pollution Prevention Act (42 USC 13101 et seq), which provided for a clear hierarchy of pollution prevention programs for all of the management programs of the Environmental Protection Agency. This act was also referenced in the Clean Air Act: “(b) Policy. - The Congress hereby declares it to be the national policy of the United States that pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmental safe manner.”

The list of toxic chemicals include any substance generated as defined by section 313(c) of the Superfund Amendments and Reauthorization Act of 1986. (The court case law defining hazardous substances has become quite broad under Superfund. See 42 USCS Section 9601, note 5.) The Pollution Prevention Act's definition of source reduction is also very straightforward:

“(5)(A) The term ‘source reduction’ is defined as any practice which: (i) reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal; and (ii) reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants”.

Facility by facility reports are required concerning source reduction and recycling annually.

EPA Creates Regulations on Pollution Prevention

On May 30, 1995, EPA proposed regulations pursuant to the Pollution Prevention Act, summarizing: “...In short, preventing pollution before it is created is preferable to trying to manage, treat or dispose of it after it is created. ...In effect, source reduction means reducing the amount of a pollutant that enters a waste stream or that is otherwise released into the environment prior to out-of-process recycling, treatment, or disposal.”

1) For mercury pollution, source reduction might include a substitution of alternative mercury free approaches to thermometers, and the elimination of mercury from batteries. For dioxins/furans, it should require manufacturers to substitute non-chlorinated materials for PVC plastics.

2) Recycling, of course, comes second in the hierarchy. For mercury, this would include capture of mercury based thermometers and return of the mercury to the factory. For dioxins/furans reduction, the recycling of PVC plastics is presently impractical because of the heavy metals stabilizers and the chlorine content of PVC.

3) The disposal or release into the environment “should be employed only as a last resort”, according to the EPA proposed rule.

Agency Violates Act In Regulatory Program for Incinerators The failure of the Environmental Protection Agency to propose source reduction as a mandatory component of the incineration regulations, we maintain, is a violation of the Pollution Prevention Act of 1990. There is a need for EPA to require the phasing out PVC plastics where ever they do routinely enter the waste stream, as well as other chlorinated compounds. It has been shown in combustion studies that where ordinary salt from food and other products is burned with chlorinated plastics, the production of dioxins and furans is enhanced in a synergistic manner. (Thornton 1997) There are alternatives for virtually every use of PVC plastics.

Secondly, there is a need to phase out the use of mercury consumer and medical goods where alternatives are readily available. Alternatives are readily available in most instances.

As President George Bush was quoted in EPA's initial Pollution Prevention Strategy of February 26, 1991: "Environmental programs that focus on the end of the pipe or the top of the stack, on cleaning up after the damage is done, are no longer adequate. We need new policies, technologies, and processes that prevent or minimize pollution - that stop it from being created in the first place." The Great Lakes' needs were specifically mentioned in this document.

Appendix 3

Failure to Enforce US-Canadian Ratified Treaty Requirements - - Exact Wording of Treaty Provisions Violated by US Regulation of Solid Waste and Medical Incinerators

Part 4

International and Bilateral Treaties of Relevance, Signed and Ratified by the United States Bearing on Environmental Protection Agency's Regulations of Incinerator Air Pollution The air pollution borne dioxin, mercury and other toxic persistent pollution of the Great Lakes and the US-Canadian border regions concerns two nations, but is also a matter of global importance. These compounds have also been long-standing issues for the Great Lakes and the US-Canadian border region. The early treaty agreements between Canada and the United States concerning pollution of the Great Lakes were drafted just at the beginning of the dioxin era. They foresaw the hazardous pollution problem of the lakes and spelled out the general approaches still pursued today, of virtual elimination, of zero discharge, and of chemical phaseouts. These concepts developed by ratified treaty and protocol are the law of the land with regard to Great Lakes water quality. Yet, the Environmental Protection Agency has failed to tailor its regulatory program for incinerators in the Great Lakes airshed to these concepts.

1) Previously, we have asserted that the US Environmental Protection Agency has violated domestic law, specifically the Clean Air Act and the Pollution Prevention Act, in its regulatory approach to MSW incinerators and medical incinerators. 2) We now assert that the failure of the Agency to tailor the regulation of persistent toxic substances contained in incinerator air emissions to the special requirements of the Great Lakes laid out by the ratified US-Canadian treaties is also a violation of U.S. law.

n Great Lakes Water Quality Agreements of 1972, 1978, and 1987 Protocol

The Great Lakes Water Quality Agreement of 1972 was signed by President Richard Nixon and Prime Minister Pierre Trudeau and revised in 1978 during President Carter's administration and again in 1987. The 1978 Agreement Revisions: The 1978 reaffirmation and revision of the Agreement was signed by US Secretary of State Cyrus

Vance and US EPA Administrator Barbara Blum, and Canadian Ministers Don Jamieson and L.S. Marchand. Mercury compounds and dioxin containing compounds PCBs, 2,4,5-T, and pentachlorophenol were specifically listed as priority pollutants in Appendix 1, Hazardous Polluting Substances. So were cadmium and lead. 1) Dioxin Contamination Anticipated: The age of dioxin was soon to follow in 1979, when the herbicide 2,4,5-T was removed from the American market by emergency suspension of its registration by the US EPA during President Carter's term in office. Monitoring equipment was substantially upgraded to be able to detect dioxin in parts per trillion and quadrillion. Open uses of pentachlorophenol were also banned in 1986.

There was anticipation of the dioxin problem in the 1978 Agreement. In Annex 1 which lists specific objectives for persistent toxic substances, there was a category called "Unspecified Organic Compounds".

"For other organic contaminants, for which Specific Objectives have not been defined, but which can be demonstrated to be persistent and are likely to be toxic, the concentrations of such compounds in water or aquatic organisms should be substantially absent, i.e., less than detection levels as determined by the best scientific methodology available." 2) Persistent Toxic Substances: In the 1978 Agreement, Annex 12 defined "persistent toxic substances" as any toxic substance with a half-life in water of greater than eight weeks. It is quite similar to the expanded definition used by the International Joint Commission in their 1992 Sixth Biennial Report on Great Lakes Water Quality that a "persistent toxic substance" was a substance with a half-life eight weeks in any media including water, air, sediment, soil or biota. IJC in that same 1992 report spelled out a second parallel concept of a "persistent toxic substance" as those which "bioaccumulate in the tissue of living organisms". 3) Precautionary Principle: The program of 1978 also echoed the issues of today. A precautionary principle was set forth in the concept of an early warning system that called for a procedure to anticipate future environmental contaminants. 4) Virtual Elimination: The general principle laid out in 1978 was to virtually eliminate the input of persistent toxic substances, and the philosophy outlined for control of persistent toxic substances was that there should be zero discharge.

5) Protocol of 1987 Expands Into Air Pollution Sources: In the Protocol of 1987, upgrading the Agreement on Great Lakes Water Quality, air pollution sources were acknowledged: "ACKNOWLEDGING that many of these toxic substances enter the Great Lake System from the air, from ground water infiltration, from sediments in the Lakes and from the runoff of non-point sources."

The 1987 Protocol also reaffirmed the General Principles, that the objective is that the "discharge of any or all persistent substances be virtually eliminated..." The concept of synergistic and additive effects was also noted in the upgrade of lists of priority toxins. "List 1 shall consist of all substances... believed to be present in the water, sediment or aquatic biota of the Great Lakes System and... believed, singly or in synergistic or additive combination with another substances, to have acute or chronic toxic effects on aquatic, animal or human life". Remedial plans and lakewide management plans were proposed. It was agreed that lakewide management plans should evaluate "information

available on concentrations, sources and pathways of the Critical Pollutants in the Great Lakes System, including all information on loadings of the Critical Pollutants from all sources, and an estimation of total loadings of the Critical Pollutants by modeling or other identified methods..”

In Annex 15, Airborne Toxic Substances, an “Integrated Atmospheric Deposition Network” monitoring system was proposed to identify the toxic substances fallout into the Lakes from air pollution.

6) Control of Airborne Toxins and Elimination of Persistent Toxic Substance Sources Proposed: And finally, the following control strategy for airborne toxic substances was proposed in the 1987 Protocol:

“(a) The Parties, in cooperation with State and Provincial Governments, shall develop, adopt and implement measures for the control of the sources of emissions of toxic substances and the elimination of the sources of emissions of persistent toxic substances in cases where atmospheric deposition of these substances, singly or in synergistic or additive combination with other substances, significantly contributes to pollution of the Great Lakes System. Where such contributions arise from sources beyond the jurisdiction of the Parties, the Parties shall notify the responsible jurisdiction and the Commission of the problem and seek a suitable response.

(b) The parties shall also assess and encourage the development of pollution control technologies and alternative products to reduce the effects of airborne toxic substances on the Great Lakes System.”

The 1987 Protocol also proposed to undertake research to “(j) encourage the development of control technologies for treatment of municipal and industrial effluents, atmospheric emissions and the disposal of wastes, including wastes deposited in landfills...” North American Commission For Environmental Cooperation Report on Long Range Pollution In September 1997, a panel of 30 scientists from Canada, Mexico and the United States reviewed the impact of cross-border air pollutants for the Continental Pollutant Pathways report. The scientific panel found widespread fallout from acid rain, smog, pesticides and highly toxic chemicals like mercury.

“Cases developed were for acid rain, ozone, particulant matter, mercury, dioxin and other persistent organic pollutants. Evidence that these and other pollutants are transported long range from the emission sources. Certain physiochemical characteristics of these agents make them more prone for transport and they are described.

Of the evidence gathered from the expert panel, this is best documented in arctic areas where no local sources of POPs are identified, but where newborn babies have high concentrations in umbilical cord samples. SO₂, particulate and ozone are similarly transported. Shorter regional range exist for dioxin and other agents.

The report called for early action, noting that air pollution drifting great distances across North America is “wreaking havoc on human health and the environment”, that there is little doubt that the health of people in all three nations is being harmed by air pollution, and that “enough is already known on most fronts for us to say, unequivocally, that significant emission reductions from present levels are needed now”. (Calgary Herald, 1997)

The report also specifically mentioned municipal and medical waste incinerators as “major sources of continental pollutants”...and...”significant sources of particulate matter, mercury and dioxins...”

The recent findings of Bill Schroeder of Environment Canada, that a toxic rain of mercury falls on the Arctic every spring (Chart 12), and findings of dramatically high levels of organochlorines in wildlife, polar bear, seals, fish and the Inuit people of the Arctic underscores the severity of the persistent pollutant problem. (Macdonald and Bewers, Oehme, Muir, Barrie, Stone et al)

Summary

“Virtual elimination of persistent toxic substances” and “zero discharge” have become the yardstick to assess the adequacy of pollution management programs by the United States and Canada when it comes to the Great Lakes. 1) We assert that the present air pollution regulations of the US Environmental Protection Agency relating to emissions of persistent toxic substances, such as dioxins and furans and mercury, from solid waste and medical waste incinerators are not tailored to the requirements of the Great Lakes Water Quality Agreement, and therefore, are in violation of these treaty requirements.

2) We assert that ratified treaties are the law of the land. Failure to tailor emission controls of these incinerators so as to “virtually eliminate persistent toxic substances” discharge by air pollution to the Great Lakes is a violation of the treaty provisions but is also a violation of US law.

3) The International Joint Commission and more recently the Commission for Environmental Cooperation have made the Administrator of the Environmental Protection Agency aware in statements and reports that air pollution crossing the border from US facilities poses an endangerment to the health and welfare of Canadians by contaminating waterways and fish stock. (It also poses an endangerment to US citizens.)

4) The Clean Air Act of 1990 requires the Administrator to notify the Governors of States where such offending facilities are located, and request a change of their State air pollution implementation plans to correct the problem. This has not been done.

Part 5

Virtual Elimination Strategy for Persistent Chemicals Polluting the Great Lakes
Reaffirmed by US and Canada in 1997

On April 7th, 1997, US Environmental Protection Agency Administrator Carol Browner and Canadian Minister of the Environment, Sergio Marchi signed The Great Lakes Binational Toxic Strategy. This cooperative agreement reaffirmed the “Canada—United States for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes.

It was pointed out that this strategy “reaffirms the two countries’ commitment to the sound management of chemicals, as stated in Agenda 21: A Global Action Plan for the 21st Century” which was signed by both nations.

Also, the Strategy will be guided by the principles articulated by the International Joint Commission’s (IJC) Virtual Elimination Task Force in the Seventh Biennial Report on Great Lakes Quality. The UN sponsored Agenda 21 of 1992, committed the United States and Canada to a range of actions - many of which are consistent with virtual elimination, where appropriate (as it is for the Great Lakes):

“undertake concerted activities to reduce risks for toxic substances, taking into account the entire life-cycle of the chemicals. These activities could encompass both regulatory and non-regulatory measures, such as promotion of the use of cleaner products and technologies; emissions inventories; product labeling; use limitation; economic incentives; and the phasing out or banning of toxic chemicals that pose an unreasonable and otherwise unmanageable risk to human health and the environment, including those that are toxic, persistent and bioaccumulative and whose use cannot be adequately controlled...”

US and Canadian Challenges - Program Falls Short of Virtual Elimination

The Great Lakes Binational Toxic Strategy of 1997 lists a series of action challenges assumed by the United States and Canada towards the achievement of “virtual elimination” of persistent toxic substances. Mercury: For example, the United States seeks to achieve a 50 percent reduction nationally of the deliberate use of mercury and a 50 percent reduction of the release of mercury from sources resulting from human activity by the year 2006.

And Canada, seeks by the year 2000, to achieve a 90 percent reduction in the release of mercury, or where warranted the use of mercury, from polluting sources resulting from human activity in the Great Lakes Basin.

Dioxins and Furans: The US seeks by the year 2006, a 75 percent reduction of the total releases of dioxins and furans, as measured by TCDD dioxin toxicity equivalents, from sources resulting from human activity.

The Canadian challenge is a 70 percent reduction in dioxin and furans from sources resulting from human activity in the Great Lakes Basin. Yet, these programs focus on emission control and reductions rather than virtual elimination. The documentation leading up to the 1997 protocol agreement has asserted that virtual elimination of persistent toxins like dioxin and mercury will require dramatically different approaches

than the programs presently being pursued by the two nations. Indeed, the Virtual Elimination Task Force experts in 1993, pointed out that the regulatory programs recently adopted to reduce emissions from MSW incinerators and medical waste incinerators cannot achieve “virtual elimination”. EPA’s Proposal to Control Mercury Intake From Fish More Consistent With Virtual Elimination Provisions

The recent proposal of the Environmental Protection Agency to reduce mercury levels in fish sold in the United States to a maximum daily dose in the diet of 0.1 micrograms per kilogram of body weight is more on target with virtual elimination. This translates to about 1 ppm of mercury in the hair of the consumer, compared to the present WHO limit of 10 ppm.

Such a goal could not be achieved through emission control, considering the difficulties in capture of mercury with present technology. The pollution prevention measures needed to achieve this goal would require a very different approach than that embodied in the present EPA regulations to control solid waste and medical waste incinerator air emissions.

IJC Concludes No Virtual Elimination Actions Yet in 1992 and 1994 1) The Sixth Biennial Report on Great Lakes Water Quality of the International Joint Commission in 1992, pointed out “We have not yet virtually eliminated, nor achieved zero discharge of any persistent toxic substance”. “Specifically, the Commission concludes that attempts to regulate persistent toxic substances have not resulted in an efficient or successful set of programs...Surely it is time to ask whether we really want to continue attempts to manage persistent toxic substances after they have been produced or used, or whether we want to begin to eliminate and prevent their existence in the ecosystem in the first place.”

Chart 13 lists a series of IJC recommendations in 1992 that are consistent with a “virtual elimination” and “zero discharge” strategy for persistent chemical discharges to the Great Lakes. The Commission defined a persistent toxic substances as any with a half-life in any medium including water, air, sediment, soil or biota of greater than eight weeks or those that bioaccumulate in the tissue of living organisms.

The Commission specifically recommended that “the Parties, in consultation with industry and other affected interests, alter production processes and feedstock chemical so that dioxin, furan and hexachloro-benzene no longer result as byproducts”.

The Commission also proposed a series of chemical sunsets, including that of “the use of chlorine and chlorine containing compounds as industrial feedstocks...” A zero discharge program for point sources was recommended for Lake Superior. 2) The Seventh Biennial Report of 1994: This IJC report formally endorsed the recommendations of the fifth and sixth biennial reports, as well as the report on the incinerators in the region around Detroit and Port Huron Chart 14 summarizes IJC’s recommendations in 1994.

IJC Calls for Evolution in Thinking in 1994 7th Biennial Report

The International Joint Commission called in 1994 for an “evolution in thinking” for persistent toxic substances. There is a need to move beyond controlling releases, to prevention of use or generation of persistent toxic substances and to sustainable industry and product/material use.

The IJC also called for a broad approach to dealing with the organochlorines as a class, and appropriate pollution prevention based upon that concept. In 1992, IJC had called for the sunset of chlorine as an industrial feedstock as part of this broader approach.

“The federal governments have not accepted the Commission’s recommendations for a broad approach to deal with organochlorines, rather than the present approach of dealing with these thousands of compounds individually...

The federal governments prefer to focus on individual chemicals. The Commission is concerned that, despite the worldwide concern for the use and discharge of organochlorines and both countries’ commitment to the virtual elimination of persistent toxic substances, many of which are organochlorines, there is reticence in both governmental and industry declarations to beginning consulting on a bold alternative to the widespread production and use of these compounds. The Commission remains confident that, as the federal governments seek to find an effective, comprehensive strategy to meet their Agreement obligations as well as general sustainable development strategies, they will need to embrace such a broad new approach to preventing the formation of hazardous substances.”

Concerns of IJC About Inaction Towards Virtual Elimination

The IJC expressed particular concern about the inaction of the United States and Canada in moving ahead towards the virtual elimination of persistent toxic substances and zero discharge in 1994. “As research findings demonstrate linkages between persistent toxic substances and biological injury, they continue to reinforce the Commission’s conclusions, which are fundamental to its proposed policy approach:

persistent toxic substances are too dangerous to the biosphere and to humans to permit their release in any quantity, and

all persistent toxic substances are dangerous to the environment, deleterious to the human condition, and can no longer be tolerated in the ecosystem, whether or not unassailable scientific proof of acute or chronic damage is universally accepted...

The characteristics of persistent toxic substances make them much less amenable to traditional pollution control efforts such as discharge limits to set acceptable levels in the environment, end-of-the-pipe technology and disposal regulations. The idea of a non-zero “assimilative” capacity in the environment or in our bodies (and hence allowable discharges) for such chemicals are no longer relevant. The Great Lakes Water Quality

Board shares this view...It states, therefore, that the only appropriate water quality objective is zero, even though interim objectives may be needed....

...Moreover, conventional scientific concepts of dose-response and acceptable “risk” can no longer be defined as “good” scientific and management bases for defining acceptable levels of pollution. They are outmoded and inappropriate ways of thinking about persistent toxics.”

Part 6 Specific Recommendations of International Joint Commission in 1992 and 1994 Concerning Incinerators

1) The International Joint Commission did not mince words about incinerators in the Seventh Biennial Report of 1994. “Incinerators; Burning the Evidence

Various pollutants, including heavy metals and other persistent toxic substances enter the Great Lakes ecosystem through atmospheric fallout. In Lake Superior and Huron, especially, a major portion of some pollutants enter in this manner, often originating thousands of kilometers/miles away. It is ironic that this fact is then used to argue for a delay or inaction or, in some cases, forgiveness of toxic loads from sources within the basin. Such a reason for delay was given in the governmental responses to the Commission’s recommendation for a virtual elimination in the Lake Superior basin.

The Commission has increasingly received expressions of public concern about the number of large incinerators and their impacts on public and environmental health. While many specific sources lie outside the basin, they are in a real sense within the Great Lakes ecosystem. A growing number of incinerators operate within the Great Lakes region, contributing significantly to the load of contaminants, especially from the low-temperature incineration of industrial, commercial and household refuse containing plastics and solvents, coated papers and many other products....

Any strategy towards virtual elimination and zero discharge of persistent toxic substances must address the significant inputs from incinerators. It is an issue that can only become more urgent as the pressures against landfill operations grow. The Commission urges the stringent regulation of existing facilities through North America, taking into account the need to ensure the zero discharge of persistent toxic substances from those stacks to the Great Lakes...”

2) The International Joint Commission had also proposed in its previous February 1992 study, Air Quality in the Detroit-Windsor/Port Huron-Sarnia Region the need to phase out incinerators in the region, as described below:

“...The survey identified 1,678 incinerators in the four Michigan counties...Among the most serious toxic pollutants emitted by incinerators are dioxins, furans, PCBs, hydrochloric acid, mercury and other metals...The Commission recommends that:

“...incinerator facilities in the region be phased out of use or required to eliminate the production and emissions of dioxins, furans, PCBs and inorganic materials, especially mercury and hydrochloric acid...uniform state and provincial requirements be established for incinerator facilities in the Reference region based on the principle of zero discharge of persistent toxic substances...”

Part 7

Recommendations of the Virtual Elimination Task Force Experts in 1993 and Great Lakes Water Quality Board

The Virtual Elimination Task Force established by the International Joint Commission had in 1993 received a series of management reports and recommendations from subgroups, related organizations, as well as civic groups on how to achieve virtual elimination of the discharge of persistent chemicals into the Great Lakes.

The report of the Virtual Elimination Task Force to IJC, *A Strategy for Virtual Elimination of Persistent Toxic Substances*, Vol. 1 and 2, made a series of recommendations that paralleled the history of the program, and also looked at implementation needs:

“Do the governments in the Great Lakes basin have the legal authority to implement the goal of virtual elimination?...A number of studies examining that question give an unequivocally positive response.” The Task Force points to the failure of the parties to the Great Lakes Water Quality Agreement to implement a virtual elimination program:

“Despite having the legal authority to implement the virtual elimination strategy, there is a broad consensus that the governments have not fully acted on their authority. The implementation of the laws in the United States and Canada have been a failure, from the standpoint of developing a comprehensive and effective virtual elimination strategy. Despite progress that has resulted from existing laws, goals such as zero discharge have been overlooked and practically forgotten. TSCA has become, at best, a tool to screen the introduction of new chemicals. It has only been used to limit the use and manufacture of PCBs. CEPA has been incredibly slow and cumbersome, and seemingly ineffective.”

Inability of Incineration Control Programs to Achieve Virtual Elimination

Likewise, the expert reports on PCBs and mercury pollution concluded in Volume 2 of that same publication that existing programs and approaches cannot achieve virtual elimination. Specifically, they also addressed the inability of the present US and Canadian programs for control of incinerator pollution to achieve “virtual elimination”. “...Treatment-based technological solutions are available to reduce many of the direct discharges of PCBs and mercury to the Great Lakes and their tributaries from municipal and industrial point sources. Similar treatment-based technological solutions are available to reduce point discharges to the atmosphere, for example from incineration processes or combustion of fossil fuels.

However, many existing treatment technologies, for example Venturi scrubbers or electrostatic precipitators for mercury removal from stack discharges, are relatively ineffective. Newer and more effective treatment technologies - activated carbon absorption, ultraviolet radiation-ozonation, and reverse osmosis - are available for PCBs in wastewater and other discharges. More effective technologies such as activated carbon injection, activated carbon/lime injection, sodium sulfide injection, and wet scrubbers are also available for mercury with removal efficiencies as high as 95%.

Although some treatment technologies are relatively effective in reducing the concentration of PCBs and mercury from sources at the point of discharge, they will not achieve virtual elimination; rather they will remove PCBs and mercury to levels limited either by the removal efficiency of the technology or by deductibility.

Virtual elimination can only occur via approaches that ultimately eliminate the contaminants from pathways and sources prior to the point where treatment and control are applied, thus preventing the release and discharge in any amount.

Discharge elimination for sources of PCBs and mercury can occur through pollution prevention...through reduction and elimination of the use of the chemical. Use reduction and elimination may be accomplished through chemical bans or phase-outs, product modification or bans, and behavior changes which affect product consumption or use. They may also be effected through industrial process modifications which include more efficient chemical use, chemical substitutions, and recycling, although U.S. EPA does not recognize recycling alone as a component of pollution prevention.”

The report of the Great Lakes Water Quality Board to the Virtual Elimination Task Force in 1993, made a series of recommendations. The report concluded that there was sufficient mandate and authority by the governments of the United States and Canada to achieve “virtual elimination of discharges of any or all persistent toxic substances, through control of products and control of discharges. The Board, however, recognizes that there are significant barriers to the effective implementation of this authority.” Chart 15 lists the recommendations of the Great Lakes Water Quality Board to the Virtual Elimination Task Force in 1993.

Part 8

Other Treaties of Relevance to Cross Border Incineration Air Pollution of Dioxin and Mercury

Several other treaties or agreements, signed or in negotiation, are also of relevance to this petition: The Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Their Disposal of 1989: Incineration of medical waste and solid waste transforms that waste into airborne hazardous waste. Some of this airborne hazardous waste from the United States is inevitably transported over the border into Canada, falling, raining or snowing out into soils and waterways.

Incineration air pollution from Canada also pollutes the United States with hazardous airborne toxic waste - though prevailing winds from southwest directions reduce the quantity of Canadian generated airborne dioxin that reaches United States' waterways and soils. (Appendix 1-Figure 5)

The legal relationship of atmospheric pollution to water pollution has been explored by a series of treaties and regional agreements, as the Encyclopedia of Public International Law describes:

“Pollution from or through the atmosphere is dealt with generally by the 1979 Convention on Long Range Transboundary Air Pollution... The 1982 Law of the Sea Convention specifically deals with this form of pollution and states general obligations of States in terms similar to those used for land-based pollution in Arts. 212 and 222. Several regional conventions consider atmospheric pollution as part of land-based pollution (e.g. Helsinki Convention, Arts. 5 and 6; Kuwait Convention, Art. 6; Jeddah Convention, Art. 6). The other regional conventions deal with the matter in a single short article: the parties are to take all appropriate measures to prevent, reduce and control pollution of the convention area which results from discharges into the atmosphere from activities under their jurisdiction (West and Central African Region Convention, Art. 9; Wider Caribbean Region Convention, Art. 9)” The Basel Convention has not been signed by the United States, but a parallel agreement between the United States and Canada exists, as below:

The Agreement Between the Government of Canada and the Government of the United States Concerning Transboundary Movement of Hazardous Waste A bilateral parallel agreement was signed in Ottawa on October 28, 1986.

It requires that the “designated authority of the country of export shall notify the designated authority of the country of import of proposed transboundary shipment of hazardous waste”.

And the country of import may either accept or object to the export of the hazardous waste within 30 days. The country of import shall have “the right to amend the terms of the proposed shipment(s) as described in the notice”. And the country of import may withdraw or modify consent for good cause.

The parties may also require financial guarantees with regard to damage to third parties from the cross border shipment of hazardous waste.

1) Incinerators Generate Hazardous Waste and Transport It By Air:

We submit to CEC in this petition that from a practical standpoint, it makes little difference whether hazardous dioxin or mercury containing toxic waste is carried by truck, rail or by contaminated waterways to be discharged into the Great Lakes or onto soils of dairy and farm animal pastures, or whether the hazardous toxic waste is delivered

to the Great Lakes or other waterways and to pastures by transboundary air pollution from incinerators.

2) EPA's Treatment of the Ash Is Proof Of This: The persistent toxic substances that are not emitted from the smokestack of incinerators are collected in the ash. The more efficient the air pollution control equipment, the more toxic the ash. (Appendix 6)

This has been a very inconvenient problem, because it is expensive to dispose of toxic ash in a specialty toxic waste dump with its liners and leaching control, as compared to a municipal solid waste dump. And so, the Agency in 1995, allowed incinerators to mix the more toxic fly ash from the smokestack with the less toxic bottom ash before testing, to dilute the dioxins/furans, mercury and other persistent toxic substances before testing was done. The objective was to make the ash look safe enough to dispose of along side of household trash in the municipal dump.

“We have decided that ash should be tested at the point when it leaves the combustion building”, Administrator Carol Browner addressed the U.S. Conference of Mayors in January 1995. This action is a violation of the Pollution Prevention Act. Appendix 6 presents more information.

The incineration process clearly converts solid waste or medical waste into hazardous waste in the combustion process. Dioxins are formed, and toxic metals are concentrated and evaporated into the environment. Memorandum of Intent on Transboundary Air Pollution

In August 1980, the United States and Canada signed a memorandum of intent concerning transboundary air pollution. It was signed by Secretary of State Edmund Muskie, Administrator of E.P.A. Douglas Costle and Ministers P.M. Towe and John Roberts for Canada.

It was noted that the two governments are “convinced that the best means to protect the environment from the effects of transboundary air pollution is through the achievement of necessary reductions in pollutant loadings...” A work plan was established to monitor and model air pollution loadings and develop control strategies.

Agreement Between the United States and Canada on Air Quality

In 1991, an agreement was signed between the United States and Canada to address transboundary air pollution between the two nations. Specific objectives listed in Annex 1 concerned sulphur dioxide and nitrogen oxide emissions from both stationary and moving sources. Noted was the tradition of environmental cooperation, as reflected in the Boundary Waters Treaty of 1909, the Trail Smelter Arbitration of 1941, the Great Lakes Water Quality Agreement of 1978, as amended, the Memorandum of Intent Concerning Transboundary Air Pollution, the 1986 Joint Report of the Special Envoys on Acid Rain, as well as the ECE Convention on Long-Range Transboundary Air Pollution of 1979.

While the Annex listed two specific objectives agreed upon by the Parties, “air pollution” was defined more broadly as “the introduction by man, directly or indirectly, of substances into the air resulting in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems and material property and impair or interfere with amenities and other legitimate uses of the environment...”

The general objective of the Parties was “to control air pollution between the two countries”. The Parties were “convinced that transboundary air pollution can cause significant harm to natural resources of vital environmental, cultural and economic importance, and to human health in both countries”. The Agreement excluded global warming and ozone depletion which would be addressed in other venues. But, while it specifically emphasized the issue of acid rain, the Agreement does not exclude consideration of toxic or persistent substances crossing the US-Canadian border. Negotiations of the United Nations Environment Program Global Organochlorine Phaseout Treaty and the UN Economic Commission for Europe Treaty on Long-Range Transport of Atmospheric Pollutants Another relevant treaty presently under negotiation is the worldwide phaseout of 12 organochlorine chemicals, including dioxins and furans, that is working its way through the United Nations Environment Programme negotiations - slowed only by lack of funding. This worldwide treaty - calling for a “legally binding” phaseout program - has had the support of the United States and Canadian delegation and includes the phaseout of DDT, PCBs, dioxins and furans, aldrin, dieldrin, endrin, chlordane, hexachlorobenzene, mirex, toxaphene and heptachlor.

A parallel treaty, being negotiated by 42 countries, including the United States, Canada, Russia, all the members of the European Union and most of Eastern Europe focuses on 15 persistent organic pollutants. There was unanimous agreement on aldrin, dieldrin, endrin, toxaphene, mirex, PCBs hexabromobiphenyl and hexachlorobenzene. (Chart 16) The final draft protocol also proposes the ban of chlordane and chlordecone, limits heptachlor to underground control of fire ants on transformers, kept public health uses of DDT pending research on tropical disease control, kept some uses of HCH and ignored pentachlorophenol. Russia’s announcement that they still manufacture PCB’s lengthened the final phaseout schedule.

It is expected that this UN Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution will be signed in June 1998, and provide a format to move forward the global phaseout treaty for the 12 organochlorines mentioned above, which would be signed by a larger number of nations. A parallel agreement on heavy metals including mercury is moving through the same European process. Part 9

Summary: The Commission for Environmental Cooperation Needs to Investigate US Regulatory Programs for MSW and Medical Incinerators That Fail to Enforce Only The US Clean Air Act and the Pollution Prevention Act, But Also US/Canadian Ratified Treaties As provided in Article 14 of the North American Agreement on Environmental Cooperation: Submissions on Enforcement Matters:

“1) The Secretariat of the Commission for Environmental Cooperation may consider a submission from any nongovernmental organization or person asserting that a Party is failing to effectively enforce its environmental law, if the Secretariat” finds that the submission” (meets certain criteria).

Hon. Christine Stewart, Environmental Minister of Canada urged us to petition the Commission for Environmental Cooperation, if we feel that a Party is failing to effectively enforce its environmental laws. We so assert that the United States is failing to enforce the Clean Air Act, the Pollution Prevention Act, as well as treaty requirements ratified by the US Senate relating to the Great Lakes with regard solid waste and medical incinerator regulations.

Failure of the US Environmental Protection Agency to Live Up to The Requirements of the Clean Air Act and Other Domestic Laws Regarding Incinerators In Appendix 2, we reviewed the ways that the present regulatory approach of the US Environmental Protection Agency for MSW incinerators and medical waste incinerators violate the intent and the provisions of the Clean Air Act as amended in 1990 and the Pollution Prevention Act of 1990. Specifically:

1) Lack of Required Pollution Prevention Priority: The regulatory program for MSW and medical incinerators lacks a pollution prevention focus, though this is a primary goal of the Clean Air Act as provided by 42 USCS 7401(c). Such a priority is also required by the Pollution Prevention Act of 1990.

The US program focuses almost exclusively on emission control, even though that makes “virtual elimination” of air pollution or “zero discharges” to the Great Lakes impossible to achieve - as has been noted by the Virtual Elimination Task Force experts and others.

2) Failure to Act on Reports of International Bodies: The Agency has failed to act upon the receipt of reports from the International Joint Commission, as provided by Section 7415 (a) of the Clean Air Act. Air pollution from incinerators located in the United States cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare in a foreign country.

The Administrator is then supposed to notify the Governors of states where such emissions originate, and require a state plan revision to eliminate the endangerment outlined by the international statement of notification. Such notification is considered to be a finding.

For example, the 1992 publication of the International Joint Commission, Air Quality in the Detroit-Windsor/ Port Huron-Sardinia Region clearly outlined hazardous air pollution problems with the MSW incinerator of Detroit, and made strong recommendations for a better program. 3) MACT Not Required by US EPA In Violation of the Law: The Clean Air Act as amended in 1990, requires the maximum degree of reduction of air pollutants from solid waste incinerators. The Environmental

Protection Agency has not adopted the MACT or maximum available control technology that is in widespread use in Europe in its 1995 regulations for MSW incinerators. Nor did the Agency require MACT in its 1997 regulations for medical incinerators. This European technology gets 3 to 30 times better control of dioxin/furan emissions than what is being required, as well as much better control of mercury. And so quite obviously, the US Environmental Protection Agency has not been requiring a maximum degree of reduction of air pollutants for solid waste incineration, as required by the Clean Air Act. Failure of the US Environmental Protection Agency to Tailor Incineration Regulations to the Requirements of the US-Canadian Great Lakes

Treaty Requirements Ratified treaties are also laws of the nation, yet the Environmental Protection Agency has failed to tailor its regulations of MSW incinerators and medical incinerators to the specific requirements of the Great Lakes. Failure of US EPA to Propose Regulations Capable of Virtual Elimination: We assert that the Great Lakes Water Quality Agreement of 1972, 1978, the 1987 Protocol, the 1997 Great Lakes Binational Strategy and other treaties amend the Clean Air Act with regard to the Great Lakes. The Environmental Protection Agency must tailor its domestic regulations for incinerators under the Clean Air Act to fit the Great Lakes ratified treaty requirements. The Great Lakes agreements, protocols, and strategies require an emphasis on “virtual elimination” and “zero discharge” of persistent toxic substances. But a focus on virtual elimination is sorely lacking from the Environmental Protection Agency’s regulations governing the air pollutant emissions of MSW incinerators and medical incinerators. In 1992, International Joint Commission criticized efforts to regulate persistent toxic substances rather than eliminate or prevent their existence in the ecosystem in the first place. The Virtual Elimination Task Force expert reports of 1993, also pointed out that “treatment based technological solutions” can reduce pollutant discharges, but they will not achieve virtual elimination. And the experts specifically concluded that incineration emission control strategy for persistent toxic substances was inconsistent with a “virtual elimination” strategy. Elimination of the contaminants through pollution prevention is the strategy that has the chance to achieve “virtual elimination” of persistent toxic substances. And in 1994, the International Joint Commission once again emphasized the need to ensure “zero discharge” of persistent toxic substances from the stacks of incinerators.

No Distinction of Policy for Great Lakes Airshed

The present regulatory program for incinerators does not make such a distinction for the Great Lakes, does not develop its program to pursue “virtual elimination” of persistent toxic substances for the Great Lakes, and is therefore in violation of the law. Once again, we assert that ratified treaties are in fact laws of the nation.

Failure of the Environmental Protection Agency to Honor the 1986 US-Canada Agreement Concerning Transboundary Movement of Hazardous Waste

The bilateral agreement between Canada and the United States, signed in Ottawa in October 1986, requires the “designated authority of the country of export to notify the

country of import of proposed transboundary shipment of hazardous waste”, give the country of import 30 days to accept or object to receiving the hazardous waste, and require financial guarantees for potential damages to third parties.

1) We assert that MSW incinerators and medical incinerators through the process of combustion convert the burned solid waste and medical waste into “hazardous waste” which is then shipped across the border in the form of air pollution. Indeed, if these air pollutants were captured with pollution control equipment, much of the resulting ash would require special hazardous waste designation. The incinerator converts solid waste into dioxin or other hazardous toxins that are emitted from the stacks, and evaporates the toxic metals or where captured in ash, concentrates these toxic substances.

2) It is commonly asserted by a series of international treaties and regional agreements that atmospheric pollution is part of land based pollution. 3) In practical substantive terms, it makes little difference whether hazardous waste is carried by truck, rail, or by contaminated waterways to be discharged in the Great Lakes or border waterways, or if that hazardous waste is delivered to the Great Lakes or waterways by transboundary air pollution from incinerators. The ecological and health results are identical.

In summary, the US government has violated this treaty by not notifying Canada about the transboundary shipment of hazardous waste from incinerator air pollution. Nor has Canada been given a choice to receive or reject this airborne toxic waste. Financial guarantees have not been provided. Appendix 4

Economics of Virtual Elimination Appear Quite Favorable

Part 10

Economics of Virtual Elimination Approaches to Incinerator Air Pollution Very Favorable

Incremental changes are not always the most economic and profitable strategies. As the Rocky Mountain Institute points out, “..big savings can be easier and cheaper to achieve than small ones if you combine the right ingredients in the right way”. Tinkering with improvements to parts of a problem does not allow you to capture all the benefits from the entire system. “One of the great myths of our time is that technology has reached such an exalted plateau that only modest, incremental improvements remain to be made. The builders of steam locomotives and linotype machines probably felt the same way about their handiwork...Why settle for small savings when you can tunnel through to big ones? Think big.”

This similar idea was posed by Osborne and Gaebler in their pathfinding book on Reinventing Government. The noted management expert, W. Edwards Deming, points out that it is the “system” that needs to be changed we are to make big progress towards quality and profitability. The idea of zero defects, considered impossible and even undesirable by American industrial statisticians, is what made Japan an economic power.

Barry Commoner's Proposal For Incinerator Phaseout and Recycling Replacement Yields Jobs and Net Regional Money Savings

1) The Center for Biology of Natural Systems, located at Queens College in Flushing, New York, proposed in 1996 that 86 percent of airborne dioxin sources into the Great Lakes could be eliminated without economic sacrifice, and indeed with possible economic gains.

Detailed analysis of how to achieve this is presented in the two enclosed reports. Phaseout of solid waste and medical incinerators in the Great Lakes airshed, which stretches as far as Utah and Florida, is a key portion of these proposals.

2) These MSW incinerators are to be replaced by intensive recycling, and the medical incinerators by autoclaves. As Appendix 1-Figure 7 summarizes, the Center's proposals for control of airborne dioxin sources to the Great Lakes would be very profitable to regional economies. 3) The Center projects a net increase of 23,470 regional jobs by conversion of five industries to dioxin free production and emission approaches. Most of these jobs originate from the recycling program. Also, they project a net \$160 million net annual money savings to the regions where this conversion would take place. (This is 0.008 percent of the Great Lakes states' gross product.)

4) This program would be profitable even after paying off the bonds of abandoned municipal trash incinerators.

Economics of Recycling - Incinerators Are Financial Disasters

Florida in 1996 was aiming at 30 percent recycling. Martin and Martin analyzed progress, with several conclusions. First of all for the local government, it costs more to collect material for recycling than the value of the product. In the early 1990's, three programs in New Jersey lost between \$6.89 and \$21.81 a ton, and costs for four California cities were greater. But secondly, they found that recycling works in Florida, saves resources, and is "an obvious improvement" over previous strategies.

But unprofitability is characteristic of all municipal waste programs including incineration, which in many communities poses a severe financial drain. The Wall Street Journal on August 11, 1993, warned its readers that municipal trash incinerators were financial disasters for local governments. (Chart 17)

1) The problem is that some municipalities locked themselves into contracts with incinerator companies that required governments to deliver a fixed amount of trash each year or pay a cash penalty for the life of the incinerator.

2) The plunge of trash disposal prices as new dumps opened up made the problem even worse. In Broward County, Florida in 1993, trash burned at \$55 a ton at two big incinerators, but waste was disposed of as cheaply as \$42 a ton in landfills. The same

with Montgomery County, Pennsylvania - \$63.50 per ton for the incinerator but outsiders can dump for \$41 per ton.

3) The expensive air pollution equipment needed to reduce toxic pollutant emissions is making this financial burden even worse.

4) And the deregulation of the electricity market is undermining revenues from sale of electricity. Prices were locked in with utilities with the expectation that oil prices were going to skyrocket. They didn't, and utilities are now pressuring governments to get out from beneath these contracts.

5) The disposal of toxic ash is going to pose an additional financial problem, although the Environmental Protection Agency has approved procedures to test MSW incinerator ash that give it a much better chance to be classified as non-hazardous waste. A January 1995 EPA ruling allows the incinerator industry to mix bottom ash and fly ash together prior to toxicity testing - diluting the dioxin and metals and adding large amounts of lime which interferes with simulation of acidic leaching studies. (See Appendix 6)

The financial issue here, of course, is profound. As David Sussman, Vice President of Ogden Martin wrote in the September 10, 1996 Waste-To-Energy Report about the implications of incinerator ash being considered hazardous material:

“It means finito, morte, the end for the resource recovery industry if ash is treated as hazardous waste...Either that or widespread violations. There is simply no room for four million additional tons of ash waste. It would overwhelm all existing hazardous waste fills.”

Columbus, Ohio Incinerator Shuts Down Because of Financial Losses

In November 1994, the taxpayers of Columbus voted to shut down the municipal solid waste incinerator. The reasons were clear: The incinerator was a multi-million dollar money loser each year. Taxpayers had subsidized the incinerator by \$174 million from 1983 to 1992.

And citizens were concerned about the health problem posed by the incinerator - when it was shown that it emitted 984 grams of dioxin TEQ. Revelations that testing for dioxin emissions had been fraudulent made the matter worse.

In late 1992, Rachel's Hazardous Waste News summarized some of the long-term financial problems facing incinerators:

“1) The basic fact is, the price of trash disposal is dropping.

2) But communities with incinerators are locked into high prices they often can't afford.

3) The biggest waste haulers have built more landfill capacity than the nation needs.

4) Recycling and waste reduction have begun to cut into the availability of trash.

5) Many public officials have realized that governments can usually manage waste more cheaply than private companies can, and are able to drive down costs as a result.

As Martin and Martin put it, a huge amount of material is being recycled today, with substantial savings in energy. But, there are bureaucratic problems in getting maximum recycling. Many communities will be recycling at over the 50 percent level. By 1991, Seattle had already achieved 36 percent recycling, and is climbing towards its goal of 65 percent. Incinerators are just not needed.

Analysis of the Economics by Dr. Paul and Ellen Connett

In the January/February 1994 issue of the Ecologist, Paul and Ellen Connett summarized the economic issues involved in incineration:

“Quite apart from their environmental problems, incinerators are extremely expensive to install and run, yet show little economic return. The modern waste-to-energy incinerator with more sophisticated air-pollution equipment is much dearer than its predecessors....

Little employment is created for the large capital investment needed, most of the jobs being temporary ones during the construction of the facility. Much local public money involved is moved out of the area into the hands of multi-national engineering firms, financiers, legal teams and consultants.

For example, Seattle paid at least \$1,325,000 to consultants..GBB of Falls Church, Virginia, for planning a proposed 2,000 ton-per-day municipal waste incinerators. GBB also received approximately \$2 million from the Solid Waste Development Authority of St. Lawrence County, a poor rural district in New York State. Because of local citizen opposition, neither incinerator was built.

There is little evidence to support claims that placing a rubbish incinerator in a community attracts other companies to site their facilities nearby....”

Product Development As Pollution Prevention

In 1992, the International Joint Commission proposed the elimination of the use of chlorine and chlorine containing compounds as industrial feedstocks. The polyvinyl chloride has long been known to be a major source of dioxin in trash incinerators. The Greenpeace report by Dr. Pat Costner, The Burning Question, Chlorine & Dioxins put to rest the concept that PVC feedstock in incinerators does not produce dioxin emissions.

Using the raw figures of Rigo, she showed that for the majority of studies of MSW incinerators and medical incinerators there was a positive correlation between HCl, a measure of chlorine input, and dioxin in the incinerator emissions.

There are substantial efforts in parts of Europe to phase out PVC plastics, in favor of less dangerous alternatives.

Economics of Medical Incinerator Alternatives Also Very Favorable

Health Care Without Harm in their recent publication on medical incinerators, *First Do No Harm*, also described a series of case studies where hospital waste minimization and the use of alternatives to incineration reduced costs. For example, Naples Community Hospital in Florida shut down its incinerator in favor of autoclaving. Operating costs for waste disposal dropped more than 80 percent from 24 cents to only 4 cents a pound.

The Beth Israel Medical Center in Manhattan, New York saves \$600,000 per year in waste haulage fees through better management of waste to sharply reduce the red bag volume. The center is working towards becoming a mercury free facility. Sharps are contracted out, autoclaved and landfilled.

Dartmouth-Hitchcock Medical Center in New Hampshire finds that autoclave technology is cheaper, even when the cost of shifting to oil fuel was considered. Red bag volume has been reduced from 35 percent of total to 12 percent of waste. The pathological waste, 2 percent, is still shipped off the site for disposal.

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Appendix 7

Bio-Chemistry of Mercury in the Everglades Illustrates General Principles of How Methylmercury is Produced in the Environment

Bio-Chemistry of Mercury in the Everglades Illustrates The General Principles of How Methylmercury Is Produced

February 6, 1998, presentation of Dr. Cindy Gilmour, Academy of Natural Sciences of Philadelphia at Lusby, Maryland facility

Industrial pollution and acid rain in the 1980’s has produced high levels of mercury in the Everglades as is true in other parts of the nation. Now 3 to 5 times more mercury is found in the atmosphere than would be the natural levels, and mercury has a long residence in the atmosphere, indeed as long as one year. The organic form, methylmercury is highly toxic and neurotoxic. Mercury has an affinity for sulfur and sticks to muscle and fat. Bioaccumulation in the environment can be extreme - a 10 million factor from water to top predators like the Florida panther, the racoon and the

alligator. Combustion of coal and incineration of solid waste and medical waste are primary sources of mercury, though in Florida there is a beginning effort to remove mercury from trash before combustion. African long distance sources of mercury air pollution appear to be important to Florida.

Mercury levels in the Florida panther are very high, and they don't mate if have high mercury levels. Only 50 to 60 panthers are left. Monitoring programs are run. If a panther is found with very high levels, the animal is tranquilized and captured to be fed on clean food until mercury levels are reduced. And then, it is released back into the wild.

First rain mercury levels in Florida run 50 times higher than surface water levels.

The Bell Shaped Curve Where Mercury Becomes Methylmercury Studies of the Everglades provide information about how mercury is converted to its most toxic methylmercury form. Sulfur reducing bacteria are primarily responsible for this conversion. This bacteria also thrives in anaerobic conditions.

And so, high levels of sulfuric acid in the rain will feed this bacteria. But too much sulfur will stop the process - conversion of sulfates to high levels of sulfite will stop the conversion of mercury to methylmercury. ii

Control of sulfur dioxide in air pollution will be beneficial. While sulfur dependent bacteria are responsible for the conversion of mercury to methylmercury, too much sulfur interferes with the process and stops it. We can see this by region of the Everglades.

An excess of sulfate occurs where ocean water penetrates into the Everglades, because ocean water contains 1000 times more sulfate than fresh water. Here the rate of conversion of mercury to methylmercury is reduced. Sulfate is also abundant close to the cane fields in the north, where some of the fertilizers contain high levels, and so production of methylmercury is depressed in this region.

And so the most efficient conversion of mercury to methylmercury takes place in the middle of the Everglades, halfway between the cane fields and the ocean. Here the bacteria has been stimulated by the sulfur, but levels of sulfite are not too high to suppress the methylmercury chemistry. And water conditions are anaerobic. And so, in summary the production of methylmercury in the Everglades forms a bell shaped curve, with a low rate of mercury conversion to methylmercury in the north part of the Everglades, the peak in the middle, and a low point near the ocean.

It appears that the mats of algae provide primary platforms for the methylmercury bacteria. However, the reaction takes place in the shade, since sunlight also stops the process. The reaction also takes place in the sediment.

Control of mercury emissions and sulfur emissions will reduce the methylmercury contamination of the Everglades. But, mercury can be transported for thousands of miles in the air, which means that there is a need for international controls of mercury

emissions in addition to control of local sources. And control of sulfur dioxide sources are also important.

These basic conversion factors should also apply to other parts of North America.