Remediation of Sydney Tar Ponds and Coke Ovens Site

Submissions by Sydney Tar Ponds Agency in Response to Presentations Made by Sierra Club of Canada to the Joint Review Panel on 13 and 15 May 2005

submitted to

Joint Review Panel

submitted by

Sydney Tar Ponds Agency

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1.0 INTRODUCTION

This document contains comments from STPA on the information presented to the Joint Panel by the Sierra Club of Canada. The EIS was prepared according to Guidelines issued by CEAA and Nova Scotia Department of the Environment and Labour. As such, certain elements of the EIS were stipulated and the approach to effect identification and assessment were mandated by provincial and federal agencies. Deviation from these approaches would have led to a finding of non-compliance with the guidelines.

The core message from the Sierra Club witnesses and their senior representative is that they do not have faith in risk assessment as a mechanism for predicting risk nor do they agree with the approach to risk management described by the Canadian Council of Ministers of Environment. While disagreeing with the existing accepted and indeed mandated approaches to such matters, the Sierra Club's witnesses were unable to identify any more appropriate and tested analytical and decision support mechanisms.

Finally, much of the criticism leveled against the EIS by Sierra Club, including almost all of Dr. Lambert's comments, refers to aspects of the Sydney environment either in terms of time or space that are outside of scope with the project as defined. While STPA disagrees with much of the out of scope information that has been presented, and the conclusions of the Sierra Club witnesses on these issues, little purpose is served by debating issues that are irrelevant to this proceeding. For the most part, STPA does not intend to respond to these issues.

More specific comments on the matters raised by the Sierra Club's witnesses are set out in the submissions that follow.

2.0 HUMAN HEALTH RISK ASSESSMENT ("HHRA")

2.1 QUALIFICATIONS

Dr. Carman's doctorate is in botany, with a claimed emphasis on analytical organic chemistry. In his submission, he indicated that he had experience in the area of air quality regulation from the years 1980-1992. It appears that he has not worked in governmental regulatory compliance since 1992. It is noted that since the 1990's, changes have been in incinerator technology in several areas, including air emissions control systems for dioxins and heavy metals, electronic lock-out and data logging systems, and continuous monitoring and direct reading instrumentation of stack emissions.

Dr. Connett does not appear to have a university degree in toxicology. He is self-described as a chemist, not a toxicologist.

2.2 RELEVANCE OF CITED INFORMATIONS

Most of the data presented in Dr. Carman's submission describe events that occurred at incinerators in the 1980's and early 1990's. It does not appear that any of the listed events *occurred* since the year 2000.

The source of much of the information in Dr. Carman's submission was cited as "Rachel's Environmental and Health News" and "Waste Not Newsletter." These are not peer-reviewed scientific journals. These are advocacy newsletters. Few, if any, of Dr. Carman's conclusions are based on information published in peer-reviewed scientific journals.

2.3 INCORRECT STATEMENTS

1. Several of the Sierra Club presenters incorrectly stated that the EIS was deficient in that only incremental risks were estimated from the proposed project activities. For non-carcinogenic risks, the HHRA in the EIS assumed that the community members around the proposed incinerator were exposed to each non-carcinogenic chemical already at 80% of each chemical's Tolerable Daily Dose. Only 20% of the Tolerable Daily Dose was allocated to the exposures resulting from the proposed incinerator. Thus, the HHRA in the EIS estimated the *total* noncarcinogenic risk, not simply incremental risks from the proposed project.

For carcinogenic risks, the Sierra Club is correct that the estimated cancer risks are incremental. Health Canada and U.S. EPA guidance documents specifically require that incremental cancer risks be estimated. The approach followed in the HHRA is totally in compliance with governmental guidance. Health Canada has specifically determined that an incremental lifetime cancer risk from a proposed project of 1/100,000 (0.00001) is acceptable when added to the background lifetime cancer risk, which is stated by Health Canada as 0.40000.

2. Dr. Carman stated in his submission (Item G, page 9) that the HHRA assumed that no mercury would be emitted from the proposed incinerator. In fact, mercury emissions were assumed. The assumed emission rate of 1.9X10-5 g/sec can be seen on Table 2.2 of Volume 4 of the EIS stated and the hazard index estimates for mercury can be seen in Tables 5.2 -5.7 of Volume 4 of the EIS.

3. In Item D, Page 7, Dr. Carman stated that the EIS assumed one upset once a month for 1 minute. This is incorrect. The Executive Summary and Section 5 of Volume 4 of the EIS that the risk assessment clearly indicates that the risk assessment assumed one 30-minute upset condition per month for 5 years even though the proposed incinerator would only operate for three years. This matter was also addressed in the response to IR-30 follow-up.

4. In Dr. Connett's presentation, he stated that one single incinerator mishap would cause the proposed facility to emit more constituents than the entire permitted amount for the entire project. Dr.Connett did not support his statement with any objective data or calculations, and his proposition is incorrect. This is not correct. To address this allegation, STPA has performed several worst case "what if" exercises.

In the case of constituents that are responsible for the majority of the noncarcinogenic risk, mercury was identified as the major issue. Risk assessment calculations demonstrate that the facility could emit mercury at levels 100 times higher than the levels assumed in the EIS for a total of more than 17 hours a year, either at one time or at various times summed over the course of the year, and the resulting noncarcinogenic Hazard Index would still be less than the Health Canada level of concern.

In the case of constituents that are responsible for the majority of the carcinogenic risk, dioxins and furans were identified as the major issue. Risk assessment calculations demonstrate that the facility could emit dioxins and furans at levels 1,000 times higher than the levels assumed in the EIS for a total of more than 100 hours per year and the resulting excess incremental carcinogenic risk would

still be less than the Health Canada level of concern. Similarly, the proposed incinerator could emit dioxins and furans at levels 100 times higher than levels assumed in the EIS for a total of more than 1000 hours a year with the same result.

5. Dr. Connett also incorrectly stated that the most toxic congeners of the 2,3,7,8-substituted dioxins and furans cannot be eliminated from the human body. This is incorrect. According to the U.S. EPA, for instance, the only half-life listed in the Human Health Risk Assessment Protocol for Hazardous Waste Combustors is the one for the most toxic congener. All dioxin and furan congeners are eliminated from the human body, both males and females, with half-lives on the order of seven or eight years.

2.4 RISK ASSESSMENT

1. The EIS Guidelines required the proponent to evaluate the future health impacts associated with emissions that may occur if the proposed project were executed. Elizabeth May stated that "reality-based assessment" should have been done instead of computer modeling. However, it is impossible for a "reality-based assessment," such as an epidemiology study that uses current or past disease incidence or mortality data to assess the health impacts of a *proposed* project. Predictive modeling must be done using risk assessment in accordance with government guidelines.

2. Elizabeth May stated that HHRA *"contains a value judgment about what is an acceptable level of risk."* The fact of the matter is that Health Canada determined that for all risk assessments throughout Canada an incremental lifetime risk of 0.00001 (one in one hundred thousand) is an acceptable risk to add to a baseline cancer risk (Health Canada, 2004, Federal Contaminated Site Risk Assessment in Canada, Appendix B). Health Canada goes further to state that a 1-in-100,000 incremental risk level is "negligible." In this case, Health Canada agrees with the conclusions in the EIS that there are no risks to human health (Transcript, May 4, 2006, p 1030).

3. On page 1 of Dr. Carman's submission (bullet # 3), he stated that the EIS was flawed because it used "overly conservative assumptions." Conservative assumptions were used intentionally to take into account a number of uncertainties and additional concerns, such as the fact that communities such as Sydney are concerned with historical exposures and the potential for an existing body burden of highly fat-soluble constituents, such as dioxins and furans.

4. On page 1 of Dr. Carman's submission (bullet # 4), he stated that the emissions were expected from waste disposal removal handling and transport operations. STPA agrees, and all of these potential emissions were quantitatively evaluated. The risk assessment specifically evaluated emissions from waste excavation, transfers to trucks, transfers to dewatering facilities, dewatering operations, transfers onto rail cars, delivery of capping materials, stockpiling of capping materials, grading of capping materials, emissions from vehicles and heavy equipment, and so forth.

5. On page 1 (bullet #3), Dr. Carman stated: "Community Impacts are a chief concern due to close proximity of local community and bioaccumulation potential." The HHRA focused on the closest resident and the closest farm. The bioaccumulation potential of dioxins and furans, PCBs, PAHs, mercury and other constituents were explicitly addressed by the use of strict regulatory guidance (EPA, 2005, Human Health Risk Assessment Protocol for Hazardous Waste Combustion. Final). In addition, all of the human exposure assumptions, such as food ingestion amounts are the most

recent Canadian risk assessment assumptions (Health Canada, 2004, Federal Contaminated Site Risk Assessment in Canada).

6. In his presentation, Dr. Connett stated that the HHRA was deficient because it did not use a DRAFT cancer slope factor for dioxins and furans that is currently being debated by the U.S. National Academy of Sciences. The Health Canada position on the risk assessment of dioxins and furans is that estimated lifetime cancer risk should not be calculated using a cancer slope factor but rather the estimated average daily doses should be compared to a Tolerable Daily Intake assuming a threshold for toxicity. The HHRA took the health-protective position of using *both* the Health Canada Tolerable Daily Dose and the current U.S. EPA cancer slope factor.

Because the cancer risk posed by dioxin and furan emissions from the incinerator are so vanishingly small, if the DRAFT cancer slope factor from the United States was used, the estimated risks would still be much lower than Health Canada's acceptable excess lifetime cancer risk level. (Specifically, the estimated excess lifetime cancer risk due to dioxin for the most sensitive receptor (toddler farmer) using the EPA's draft cancer slope factor is 7E-07, over 10 times less than Health Canada's acceptable risk level.)

7. Dr. Connett stated in his presentation that he was absolutely sure that the required 99.9999% DRE for PCBs would not be attained all of the time. However, STPA notes that the estimated lifetime excess cancer risk for the most sensitive receptor (toddler farmer, Lingan Road farm) from PCB emissions at 99.9999% DRE is 7E-12, or one million times less than Health Canada's acceptable risk level. Regardless, STPA is committed to achieving a 99.9999% operating efficiency.

8. Dr. Connett stated in his presentation that the HHRA assumed overly optimistic emission factors. For the Panel's information, STPA notes that the HHRA assumed that PCBs would be destroyed with a DRE of 99.9999% whereas the PAHs were assumed to be destroyed with a DRE of only 99.99%. It is health-protective to assume that PAHs will be destroyed to a lesser degree than the chlorinated PCBs.

In addition, the HHRA assumes that 100% of the chromium emitted from the proposed incinerator is the most toxic form, hexavalent chromium. This is health-protective, not an "optimistic assumption."

Also, the HHRA assumed that the incinerator emits cadmium at the CCME standard for cadmium emissions, even though the amount of cadmium in the sediments is so low that it is impossible to emit that much even if there was no removal of cadmium in the air pollution control system.

9. Dr. Connett stated in his presentation that the HHRA for the proposed incinerator was deficient in that it did not evaluate the risks to a developing fetus. However, the Human Health Risk Assessment Protocol for Hazardous Waste Combustors (EPA, 2005) does not have methods and procedures for evaluating risks to developing fetuses.

Despite the fact that the EPA guidance does not call for a separate assessment of the developing fetus, STPA has calculated as a response to this comment what the *worst case* total dose to a fetus would be if 100% of the dose taken in by a woman over the course of three years ended up directly in the fetus at birth. This total body burden in the newborn infant would be 2E-8 mg/kg body weight. The total body burden associated with Health Canada's Tolerable Daily Dose for dioxins and furans

would be 7E-7 mg/kg body weight. This is 37 times lower than the total body burden associated with Health Canada's Tolerable Daily Intake assuming no excretion of the dioxins and furans. With this extreme worst case calculation, STPA has demonstrated that the risks to developing fetuses do not exceed regulatory levels of concern.

10. Elizabeth May stated in her presentation that risk assessment was a new policy tool. This is not correct. Human health risk assessment has been performed for many decades. For instance, the basic methods and procedures of risk assessment were summarized and formalized in a 1983 document prepared by the U.S. National Research Council (Risk Assessment in the Federal Government: Managing the Process.)

2.5 HEALTH EFFECTS OF INCINERATORS

1. Elizabeth May quoted several paragraphs from a position paper written by two British doctors entitled "Health Effects of Waste Incineration." This position paper was not published in a peer-reviewed journal. Of the 257 references cited in the position paper, only 13 are peer-reviewed articles about the health effects of incinerator emissions.

2. Of the 13 peer-reviewed scientific studies, two were not about the health of people who work at or live around incinerators. For instance, the following paper is not relevant to the issue of the health of people who live around hazardous waste incinerators. (ten Tusscher GW, Stam GA, Koppe JG. Open chemical combusting resulting in a localized increased incidence of orofacial clefts. Chemosphere 2000; 40(9-11): 1263-70.)

The discussion of the ten Tusser et al. (2000) paper in the position paper is as follows: *"Orofacial defects and other midline defects were found to be more than doubled near an incinerator in Zeeburg, Amsterdam (139)."* However, this peer-reviewed paper does not describe the health of people living around an incinerator given the following quotation directly from ten Tusscher et al. (2000):

> *"Drums of chemicals were lined up, to at times more than a hundred metres long, tens of metres wide and eight to ten barrels high. A number of the drums were then pierced, allowing the contents to flow out and this was then ignited. According to the official report of the City of Amsterdam (DOW GRM, 1987) this was quite an impressive scene to witness, with drums flying high into the sky as the chemicals and drums exploded! (ten Tusscher et al."(2000)*

The emissions from a twenty first century hazardous waste incinerator that meets governmental emission standards would clearly not be equivalent to the emissions from the uncontrolled open burning of hundreds of drums of chemicals.

3. Another example is reference # 136 from the position paper of the British doctors. (Ohta S, Kuriyama S, Nakao et al. Levels of PCDDs, PCDFs and non-ortho coplanar PCBs in soil collected from high cancer-causing area close to batch-type municipal solid waste incinerator in Japan. Organohalogen Compounds 1997; 32: 155-60.)

This peer-reviewed scientific paper does not provide data from a health survey or an epidemiology study as can be seen by reading the title of the paper, which indicates that the paper presents data

merely from a soil sampling effort. STPA has confirmed that this paper does not present data from any health studies or epidemiology studies.

4. Of the remaining 11 peer-reviewed studies that were about people who worked in or lived around incinerators, 7 were not actually studies of the health of people who worked at or lived around incinerators. Instead, they were studies of the health of people who lived in areas with multiple sources of pollution, including chemical plants, ship yards, power plants, etc. Any conclusions from such studies cannot demonstrate that the incinerator in the area was the cause of any effects observed.

For instance, authors of one such study concluded: "Evidence linking increased cancer incidence with emissions from incinerators is weak and indirect…"(reference 131 of the British doctors' position paper). Similarly, the authors of another study cited by the British doctors stated: "The facilities in Barrow in Furness and Dalton in Furness are located near to industrial sites defined as hazardous by the Environment Agency. Hence, there is some potential for confounding between proximity to incinerators/crematoriums and proximity to hazardous industrial sites." (reference 142 of the British doctors' position paper). Also, the authors of another of these papers state:
“all the most ‘toxic’ incinerators were close to industrial sources of kinds implicated in earlier studies, as were the few exceptional landfill sites….For the time being we must probably suppose that the effect stems from large-scale combustion processes as a whole, of which the incinerators are but one component.” (reference 133 of the British doctors' position paper.)

5. Some of the studies that the British doctors reported as positive studies that found an increase in health effects of people living around incinerators were actually negative studies if one takes the time to obtain the paper and check the original source. For instance, the British doctors say the following about reference # 140 (Van Lorebeke N. Health effects of a household waste incinerator near Wilrijk, Belgium. *In* Health Impacts of Waste Management Policies, Hippocrates Foundation, Kos, Greece, 2000): "In the Neerland area, Belgium, there was a 26% increase in congenital anomalies in an area situated between two incinerators (140)."

In reality, the 26% increase in congenital anomalies reported in the position paper were not statistically significantly elevated compared to controls. The scientific convention in the field of epidemiology is that observed effects that are likely to be caused by chance, that is those that do not show statistical significance, are not reported. The exact quotation from the original source document is as follows:

> *"Another study found no difference between the whole of Flanders and the Neerland neighbourhood as to perinatal death. There was, however, a statistically non-significant difference in the incidence of congenital malformations, with an odds ratio of 1.26 (0.80-1.99), confined to children born from parents who had not resided for a long time in Neerland."* (reference 140 of the British doctors' position paper)

6. Another example of a negative study reported as positive is reference # 138 of the position paper (Gustavsson P, Evanoff B, Hogstedt C. Increased risk of esophageal cancer among workers exposed to combustion products. Archives Environ Med 1993; 48(4): 243-5.) The British doctors' position paper reports that this author found a *"1.5 fold increase in oesophageal cancer in combustion workers, including those working in incinerators (138)."* First of all, the study is not specifically about incineration workers. However, the more important fact from this study is that the

authors followed worker from 1951 to 1985 and compared their esophageal cancer rates to Stockholm males as the reference group. The expected value was 0.67 in this worker population and they observed 1 case. From this they calculated a Relative risk of 1.5. Of course, the expected value was essentially 1 and they observed 1 over 34 years. This result is actually a negative result.

7. Of the entire list of 13 peer-reviewed scientific papers, there were really only two that should be properly classified as providing suggestive evidence of health effects in people who work at or live around incinerators. In one, reference 141 (Cordier S, Chevrier C, Robert-Gnansia E et al. Risk of congenital anomalies in the vicinity of municipal solid waste incinerators. Occup Environ Med 2004: 61(1): 8-15.), the authors concluded the following:

> *"It should also be stressed that some of the effects observed in relation to exposure to municipal solid waste incinerator emissions should, if real, be attributed to old-technology municipal solid waste incinerators and the persistent pollution they generate."*

Clearly, the results do not apply to twenty first century technology.

8. STPA concludes from closely examining the scientific papers that are cited in the position paper of two British medical doctors which was presented by the Sierra Club that there is very little scientific literature to support the Sierra Club's claim that adverse health effects have been repeatedly documented in people who live around incinerators of any type. In fact, STPA's expert toxicologist has performed a complete *de novo* search and analysis of the scientific literature and has obtained and evaluated all papers that have been identified by computer literature searches and examination of review articles on the topic. Over 50 peer-reviewed scientific articles have been obtained and carefully evaluated.

The conclusions of reviewing all of these articles are several: (1) there are many studies that are flawed because of their design, such as studies that evaluate health effects in areas with may sources of air pollution; (2) there are several high-quality studies that are properly designed and which conclude that there are no observed adverse effects in the community; and (3) there are several studies with design issues that show statistically significant adverse effects in the community that should be classified as "suggestive positive" studies. So, while one cannot conclude that there are absolutely no epidemiology studies showing adverse effects in communities around incinerators, one can conclude that there are more negative studies than positive ones, and the evidence from the few positive studies is weak.

Specifically, STPA would like to bring to the Panel's attention the following epidemiology studies that show no adverse effects in the communities around incinerators that were not cited by the British doctors' position paper:

- Takata, T. 2003. Survey on the Health Effects of Chronic Exposure to Dioxins and Its Accumulation on Workers of a Municipal Solid Waste Incinerator, Rural Part of Osaka Prefecture, and the Results of Extended Survey Afterwards. *Industrial Health* 41: 189–196.

- Bresnitz EA, Roseman J, Becker D, Gracely E. 1992. Morbidity among municipal waste incinerator workers. *Am J Ind Med* 22:363-78.

- Lee, J.T. and Shy, C.M. 1999. Respiratory function as measured by peak expiratory flow rate and PM10: six communities study. *J Expo Anal Environ Epidemiol* 9(4): 293-299.

- Shy CM, Degnan D, Fox DL, Mukerjee S, Hazucha MJ, Boehlecke BA, Rothenbacher D, Briggs PM, Devlin RB, Wallace DD, Stovens RK, Bromberg PA. 1995. Do waste incinerators induce adverse respiratory effects? An air quality and epidemiological study of six communities. *Environ Health Perspect* 103:714-24.

- Hazucha MJ, Rhodes V, Boehlecke BA, Southwick K, Degnan D, and Shy CM. 2002. Characterization of spirometric function in residents of three comparison communities and of three communities located near waste incinerators in North Carolina. *Arch Environ Health* 57(2):103-12.

- Pleus RC and Kelly KE. 1996. Health effects from hazardous waste incineration facilities: five case studies. *Toxicol Ind Health* 12(2):277-87.

- Michelozzi P, Fusco D, Forastiere F, Ancona C, Dell'Orco V, Perucci CA. 1998. Small area study of mortality among people living near multiple sources of air pollution. *Occup Environ Med* 55:611-15.

- Johnson, B.L. 1994. Health Impacts of Incineration. Congressional Testimony Before the Subcommittee on Human Resources and Intergovernmental Relations, Committee on Governmental Operations, U.S. House of Representatives.

- Elliott P, Hills M, Beresford J, Kleinschmidt I, Jolley D, Pattenden S, Rodrigues L, Westlake A, and Rose G. 1992. Incidence of cancers of the larynx and lung near incinerators of waste solvents and oils in Great Britain. *Lancet* 339(8797):854-8.

- Rydhstroem H. 1998. No obvious spatial clustering of twin births in Sweden between 1973 and 1990. *Environ Res* 76:27-31.

9. In Dr. Lambert's presentation, he stated that no health studies of Sydney residents were cited in the EIS. This is not correct. Section 5.9.6.4 of Volume 1 of the EIS cited a variety of studies when summarizing the baseline health status of residents. Specific studies cited in the EIS included:

Cancer Care Nova Scotia. 1999. A Report from the Nova Scotia Cancer Registry, Cancer Care Nova Scotia. Presented to: The Health Studies Working Group, Sydney, NS; Presented by: Ron Dewar; Date: 26 October 1999.

aka. Nova Scotia Cancer Registry. 1999. Cancer Incidence in Sydney and Cape Breton County, 1980-1998.

Health Canada, 2002. Assessment of Environmental Risk Factors for Breast, Colon and Lung Cancer in Sydney, report prepared by Dr. Pierre Band and Dr. Michel Camus as part of the Toxic Substances Research Initiative.

aka. Band, P., Camus, M., Dewar, R. and Krewski, D. 2002. Assessment of Environmental Risk Factors for Breast, Colon and Lung Cancer in Sydney, Nova Scotia. Final Report. TSRI Project Number 43. October 28, 2002.

aka. TSRI #43: Assessment of Environmental Risk Factors for Breast, Colon and Lung Cancer in Sydney, Nova Scotia. Executive Summary listed at www.hc-sc.gc.ca/hecs-sesc/tsri/research /tsri_43.htm.

Health Canada. 1999. Analysis of Mortality Ratios in Cape Breton County and Sydney, Nova Scotia. 1951-1994. H46-2/99-236E. Official Health Canada Report.

aka: Health Canada. 1999. Analysis of Mortality Ratios in Cape Breton County and Sydney, NS: 1951-1994. Not a full report. Appears to be a draft presentation. Also marked HEA-01 and CRA-142. aka Aka Band, P. and Camus, M. (1999).

aka: Band,P. and Camus, M. 1999. Mortality Study of Cape Breton County and Sydney, Nova Scotia: Standardized Comparisons with Canada, 1951-1994 Environmental Health Directorate, Health Canada, September 1999.

Band, P., Camus, M., Henry, J., Zielinski, J., Jiang, H., and Semenciw, R. 2003. Mortality Rates Within Sydney, Nova Scotia, by Exposure Areas to Airborne Coke Ovens and Steel Mill Emissions, 1961-1988.

aka. Health Canada, 2003. Mortality Rates within Sydney by Exposure Areas to Airborne Coke Ovens and Steel Mill Emissions, 1961-1988, report prepared by Dr. Pierre Band and Dr. Michel Camus.

Cancer Care Nova Scotia, 2000. Cancer Statistics in Nova Scotia, A focus on 1995-1999.

Cape Breton District Health Authority (CBDHA), 2004a. On the Road to Better Health, Annual Report 2003-2004, Sydney, NS.

Hayward, K and R Colman, July 2003. The Tides of Change: Addressing Inequity and Chronic Disease in Atlantic Canada, a Discussion Paper, prepared for Health Canada. July 2003.

Nova Scotia Department of Health (NSDOH), 2002a. Healthy People and Healthy Communities Using the Population Health Approach in Nova Scotia, NS.

Nova Scotia Public Health Services, 2002. Nova Scotia Public Health Services Survey.

3.0 INCINERATOR AND AIR QUALITY

3.1 INVERSIONS

The issue of inversions has been addressed in the EIS, and in IRs (IR-22 and IR-22 Follow-up). Dr. Carman alleged that they had not been analyzed. STPA would like to affirm that the dataset used

for the assessment included all data in the dispersion modeling, and, therefore, accounted for all inversions that occur in the time series.

Further, we have used AERMOD as the model for the incinerator impact analysis, and AERMOD was developed with several objectives, but the one relevant one being to better address the issues of inversions and inversion penetration by the plume.

There is another transient inversion issue that occurs in the dynamic transition of the atmosphere from stable conditions overnight to unstable, or convective, conditions during the day. There will be a version of AERMOD issued, perhaps later this year, that will address these transient "fumigation" cases. We have verified that any transient cases are no worse than the worst case dispersion conditions modelled.

In an analysis of the fumigation worst-case, which we emphasize is a transient phenomenon lasting a few minutes sometime after dawn, we calculate the worst-case effect of the incinerator to be about 10% higher than the worst-case one-hour concentration; however, this concentration would not persist, and the resulting one-hour average concentration at the location of this occurrence would be less than the predicted overall one-hour maximum.

3.2 DATA ELEMENTS AND PROCESSING IN DISPERSION MODELLING

Different roughness lengths are applicable for the two project areas, the Victoria Junction site and the Tar Ponds/Coke Ovens site. This is because these sites are different. The Tar Ponds/Coke Ovens area is in an urban area, whereas the Victoria Junction site is a clearing in the centre of a generally forested area.

Yarmouth upper air data were used in the dispersion modeling; there are only a limited number of upper air stations in the region, including Yarmouth, Sable Island, and Stephenville in Newfoundland. Previous use of the Yarmouth data had provided a high degree of confidence that the Yarmouth upper air data were a suitable choice, especially in light of a multiple year data gap in the Stephenville data set.

Sensitivity analysis was conducted on the precipitation data used for wet deposition estimates. Yarmouth data was adequate for this analysis given the relative magnitude of the term that is affected by this data. Given that the wet deposition represents about 10%, or less, of the total deposition, and that the precipitation data sets differ by about 25%, it is estimated that the difference of 10% of 25%, or 2.5%, is not significant, and that the results are sound.

3.3 EMERGENCY BYPASS STACK

It is important to recognize that the location of an emergency bypass stack is a key factor on what releases may result under uncontrolled events. The bypass is to be located after the secondary combustion chamber, prior to the air pollution control system, or APC. Air passing this point in the system will have been at 1200 C in the secondary combustion chamber, subjected to conditions necessary and sufficient to destroy the PCBs. The CCME guidelines recognizes this. In the EIS, Volume 2, on page 21 of Section 5.2, "Review of U.S. Data", it is stated that results show "DRE of

organics was achieved principally by incineration rather than removal in APC system". What this means is that the air at the bypass stack, if at normal operational temperature, has been cleaned of trace organic contaminants; that is, the gas stream is virtually free of PAH, dioxins, furans, and PCBs.

The most likely reason to bypass the APC is a problem within the APC system itself. For example, a failure of water pumps and backup water pumps in the quench tower could require a shutdown because the quench tower is essential to cool the gases quickly, and the 1200 C gases would damage components of the APC. The released gas would contain some dust, and the metals associated with that dust, but it would not contain the organic contaminants.

At the same time that the emergency situation is detected, the material feed system would stop, with no further supply of waste material. The system would enter a controlled shutdown mode. The heat would be shut down in the primary to eliminate the desorption of organic matter from the sludge, but the secondary chamber would continue to ensure that whatever material continued to evolve from the sludge was thoroughly destroyed in the hot zone. As the primary cooled, the desorption would cease, and the secondary system shut down. At this last stage, the secondary would only be emitting the combustion products of the auxiliary fuel – propane, or oil. During this time, the 1200 C temperature of the exhaust gases would result in a high buoyancy, and a strong vertical dispersion of whatever material was in the exhaust.

A failure of a component in the primary combustor, or in the secondary chamber would also require a controlled shutdown and repair of the facility. However, this would not necessitate a release from the bypass stack. The feed system would cease immediately, but the APC would continue in operation until the excess heat was removed from the system. The APC for this system does provide secondary protection against acidic, particulate, and organic releases.

A number of scenarios have been submitted by the Sierra Club that imply, incorrectly, that the bypass stack would be the first step in handling any upset condition in the incinerator. This is not correct. As discussed above, the bypass is an emergency relief to be used in certain limited situations to protect the system. The immediate relief in upset conditions is a full stop on the incinerator feed, usually automatic, and referred to as the "Automatic Waste Feed". This is a protective mechanism, terminating the feedstock and allowing the thermal destruction side and APC side of the equipment to regain equilibrium operating conditions.

Because of the extensive conditioning of the feedstock, it is anticipated that many of these interruptions will be avoided, but it is still prudent to have this protective mechanism in place. The submissions of intervenors that suggest that the feed interruption is a malfunction of the incinerator are disputed – this is a protective mechanism that inherently follows a precautionary principle – turn off the feed if things may be abnormal. Some facilities will have a more frequent operation of this mechanism because of the variable, and potentially highly exogenic thermal nature of the feedstock. In these facilities, this must be recognized as the precautionary and prudent step that we would commend.

The incinerator proposed by STPA will not receive highly variable materials, and it is clearly in the interest of the operator to maintain a high degree of control on the feedstock. Nevertheless, the frequency of operation of all incinerator control systems, system diagnostics, and production rates will be on the public record throughout the project.

3.4 SWAN HILL SPECIAL WASTE TREATMENT CENTER

Very recent information from the Province of Alberta on the Swan Hill Special Waste Treatment Center is included with these submissions. Studies conducted on the effects of the incinerator operation conclude:

- Overall levels of all contaminants have declined since 1997.
- Distribution patterns of contaminants were consistent with those observed in 1997 study.
- Exposure ratios for estimating daily consumption of wild game and fish have decreased since 1997.

For further details refer to a power point presentation provided in Appendix A submissions.

3.5 INCINERATOR DIOXIN MONITORING

Continuous dioxin monitors were mentioned by the Sierra Club's witnesses, but without a detailed explanation of the benefits and drawbacks. It is essential to understand that the samplers quoted by intervenors are samplers, not analyzers. This equipment performs constant sampling of the airstream, absorbing the contaminants in a filter material that must be sent to a laboratory on an occasional basis. This does not mean that the dioxin readings are continuous. It means that an average result is available over the sampling period.

These samplers must operate on a dilution basis, adding dry air to the sample to avoid condensation. The actual sample is a small fraction of the stack gas flow, much less than the 1% that Dr. Carmen criticized as being too small. As an aside, this criticism is not valid, as virtually no form of environmental sampling captures anything near 1% of the medium. The need for dilution air compromises the detection limits and requires a longer sampling time.

The manufacturers of the equipment cited provide ample information through the Internet. They provide an example of 14 days sampling, for about 28 samples each year. The detection limits are high, relative to the performance targets of the incinerator; future improvements in sampler technology and laboratory techniques would make this equipment better for this application. Each sample would cost about $1500 for laboratory analysis and quality control, and a few hours of senior technician time for equipment handling. In principle, these samplers can provide useful information and reassurance for the public, but they do not resolve the emissions at a detection limit low enough to satisfy Canadian federal regulators.

The application of federal reference methods for formal source testing would still be required during commission testing, and on regular intervals to be determined by NSEL. The reference method used in Canada involves manual sampling by a team of technicians using equipment that the continuous sampler is based upon. The main differences are that the team traverses the equipment across the stack to account for flow variations and the system has traps to take out the moisture so that dilution is not necessary. As a result, the detection levels and required sampling time are much lower. Generally, the tests take a full day for set up, sampling, and sample recovery. The actual sampling takes 4 to 6 hours. The tests must be repeated three times to qualify as a valid source test, and a number of quality assurance procedures must be accomplished, and this is generally witnessed by an expert from Environment Canada.

There will be a commissioning test at the beginning of the project and it is anticipated that NSEL will require annual testing. This will be supplemented by continuous emission monitoring of other emissions during the intervening period. The source testing for dioxin, furan, PCBs and PAHs will also be conducted concurrently with RATA (relative accuracy test audit) testing of the CEM equipment, again according to Canadian federal test protocol.

4.0 STABILIZATION AND SOLIDIFICATION, CONTAMINANT FLUX

Dr. Lee has stated that the Sydney Tar Ponds Agency has failed to properly evaluate the potential for cement based S/S treatment to prevent the continued release of pollutants such as PCBs that are a threat to public health and the environment. He argues that the proposed approach is not a secure approach for containing or managing residual pollutants that can be mobilized from the solidified sediments. The Agency believes that the approach presented provides multiple and overlapping systems to protect the receiving environment.

While Dr. Lee has considerable knowledge in many areas, his career as an academic was very research oriented. His practical experience is somewhat more limited than his research endeavors. Further, the scope of information that Dr. Lee provided to the Joint Panel extend to areas where he had no real practical experience, and in which he had done very little research work. One significant example of this was his comment on the viability of the proposal S/S process is the presence of organic compounds. His primary support for this is based on papers more than a decade old, supplemented with a more recent personal communication with the author of one such paper. The recent experiences of the person making this statement are unknown. In contrast, the panel has heard the opinion of Mr. Shosky that based on his experience the S/S process can work in the presence of organics. The Joint Panel also received the presentation prepared by Mr. Conner, suggests that organic contaminants can be physically bound in the cement matrix. Mr. Conner's past work was cited by Dr. Lee, who presumably views him as an authority.

4.1 TCLP TESTS

Dr. Lee has argued that the TCLP test is not appropriate for evaluating the potential for contaminants to be leached from the concrete waste form. However, despite his experience, he is not able to recommend an alternative, more appropriate test. The TCLP test is in fact highly conservative. A sample of the treated waste is ground up and shaken in a weak acid solution for 24 hours, before being filtered to measure the dissolved constituents. This is a far more aggressive approach, yielding a more concentrated leachate, than would be expected from leaching of the monolith by rainwater, seawater, or groundwater.

4.2 DURABILITY OF HDPE LINER

Dr. Lee has expressed concern about the durability of the standard HDPE material used to cover or line waste cells. However, in the present approach, the HDPE will be used as part of an engineered cover system, located above the waste. It will not be located beneath the waste, or directly exposed to leachate from the waste, and will itself be covered by a layer of low-permeability clay. Covers can readily be inspected, repaired, or replaced if necessary.

Further it is of note that the prime purpose of the cover is to protect the "monolith" against adverse weather influences.

4.3 CONTAMINANT FLUX

Dr. Lee emphasizes the concept that it is the flux of contaminants leaving the Tar Ponds that needs to be managed, yet he refuses to acknowledge that the proposed works, including removal and destruction of the most serious contaminants, with S/S immobilization of the remaining sediments, will be far more secure and have a greatly reduced flux than the status quo. In addition, Dr. Lee downplays the role of predictive modeling, without suggesting alternative approaches to determine what the critical flux rate might be.

4.4 CCME GUIDELINES

Dr. Lee writes that the most significant error made by STPA is the use of sediment quality guidelines based on the work of Long and co-workers, alleging that their approach is technically invalid. We also heard Ms. May of the Sierra Club state that her organization supports Dr. Lee in this opinion. The CCME sediment quality guidelines were developed following Long's approach, which identifies threshold values at which biological effects may be, but are not necessarily observed. In this sense, they are inherently conservative, and this is consistent with the overall philosophy of the EIS. We recognize that lower bioavailability of contaminants in sediments might occur, and could be used to argue for higher acceptable levels of contaminants, but we have not done so.

As an alternative to the CCME guidelines, Dr Lee recommends the use of the *triad* approach, in which chemical concentrations, aquatic life toxicity measured on the sediment, and aquatic organism assemblage information are used to estimate site-specific guidelines taking into account local conditions (including bioavailability) and biological assemblages. This approach was used by JDAC (2002) to develop SSTL values for the protection of aquatic life within the North and South Tar Ponds. The resulting SSTL values were substantially higher than the CCME guideline values.

To protect human health, Dr. Lee promotes the use of a US EPA (2002) water quality guideline of 0.000064 ug/L. However, this is a theoretical number, based upon risk modelling of questionable validity. The risk level associated with this number is 10^{-6} (not the standard value of 10^{-5}), and the uptake pathway for fish is incorrectly assumed to be directly from water to fish (not from sediment to fish, via food chain pathways). The uptake factor from water to fish, in fact, dates back to 1980.

4.5 HEALTH CANADA CONSUMPTION GUIDELINE

Dr. Lee writes that there is a need to conduct site-specific evaluations of whether the chemicals in the sediments can bioaccumulate to excessive levels through the food web to cause edible organisms to have excessive concentrations compared to human health guidelines. Yet he was uncertain about the Health Canada consumption guideline of 2 mg/kg for PCBs in fish, and unaware that JDAC (2002) measured PCB concentrations in crabs and fish collected from the Tar Ponds. The measured values for crabs and fish resident in the ponds ranged from 0.21 mg/kg to 1.30 mg/kg. These biota would be far more exposed to PCBs than free-ranging biota in the harbour. We therefore see no credible basis for the concerns expressed by Dr. Lee. We have heard from DFO and Environment Canada scientists that the harbour is already recovering naturally, and the STPA has shown that this Project will accelerate the rate of this recovery

APPENDIX A:

Swan Hills Special Waste Treatment Center
Long-term Follow-up Health Assessment Program;
Wild Game and Fish Monitoring
1997-2005

Alberta
HEALTH AND WELLNESS

Swan Hills Special Waste Treatment Center

Long-term Follow-up Health Assessment Program

Wild Game and Fish Monitoring 1997-2005

May 3, 2006

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Dr. Weiping Zhang	(Alberta Health and Wellness)
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Dr. Donald Schopflocher	(Alberta Health and Wellness)
Alex MacKenzie	(Alberta Health and Wellness)
Dr. Michael Ikonomou	(Institute of Ocean Science)

Alberta Environment
D.S. Prince

Location


60 North
Ft McMurray
Grande Prairie
Swan Hills
54 43' North
115 24' West
Edmonton
120 West
Red Deer
Calgary
Medicine Hat
Lethbridge
KM
0 50 100 150 200
49 North
110 West

The Incident

- A malfunction of a transformer furnace was discovered in October 16, 1996
- Elevated levels of PCBs and PCDD/Fs were found in deer, moose and fish from the area immediately surrounding the facility
- As a result, wildgame and fish consumption advisories were issued

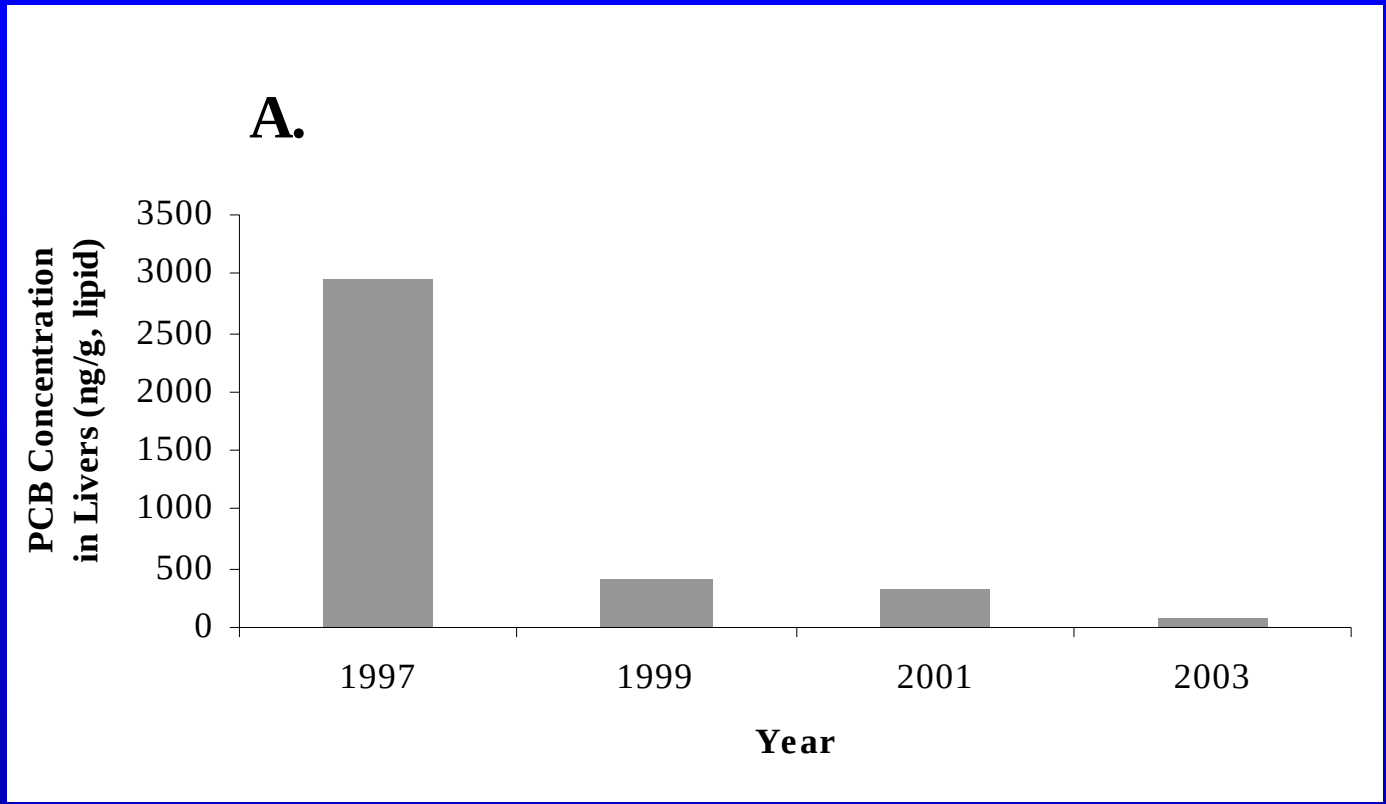
Samples

	Deer	Fish
Species	Whitetail, Mule	Brook trout
Location	30 km radius	Chrystina Lake
Sample Type	Muscle, liver, fat	Muscle, liver
Sample Size		
1999	9	-
2000	-	12
2001	6	-
2003	7	12

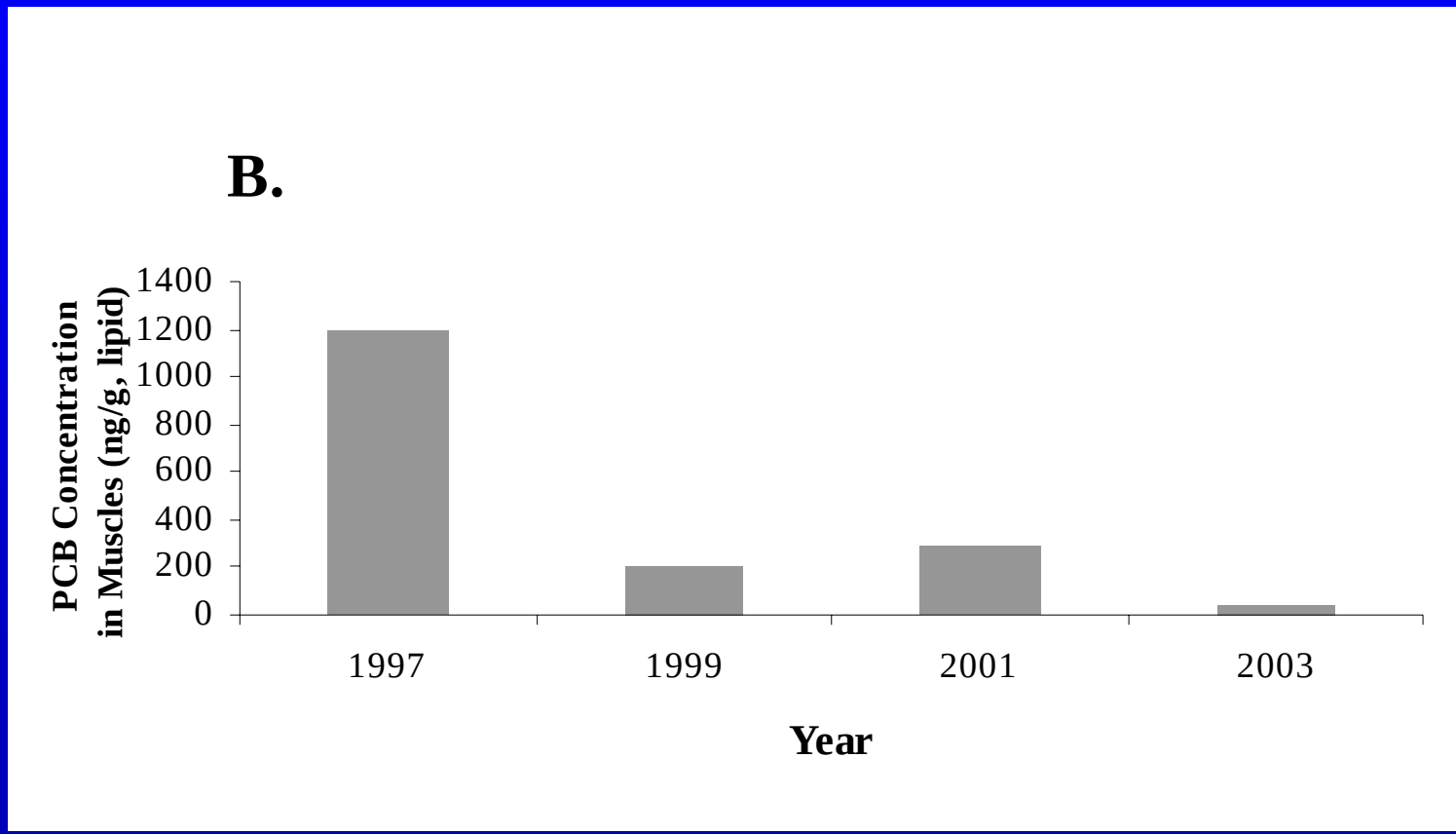
Chemical Analysis

- A Dioxin Lab, Canada
- Analyses of all possible 209 CB congeners and 17 PCDD/F isomers were conducted by HRGC/HRMS

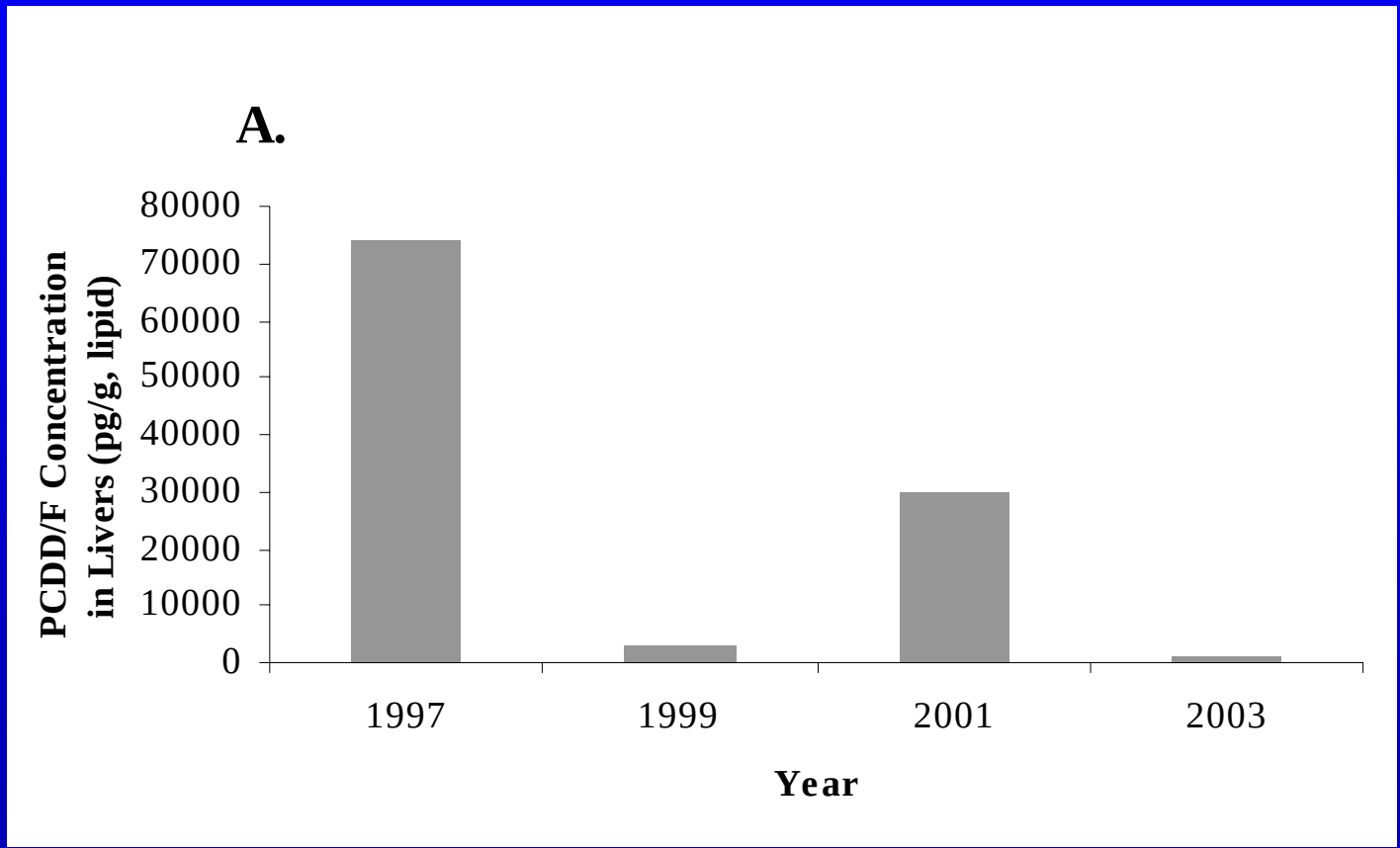
PCB Concentrations in Deer Liver



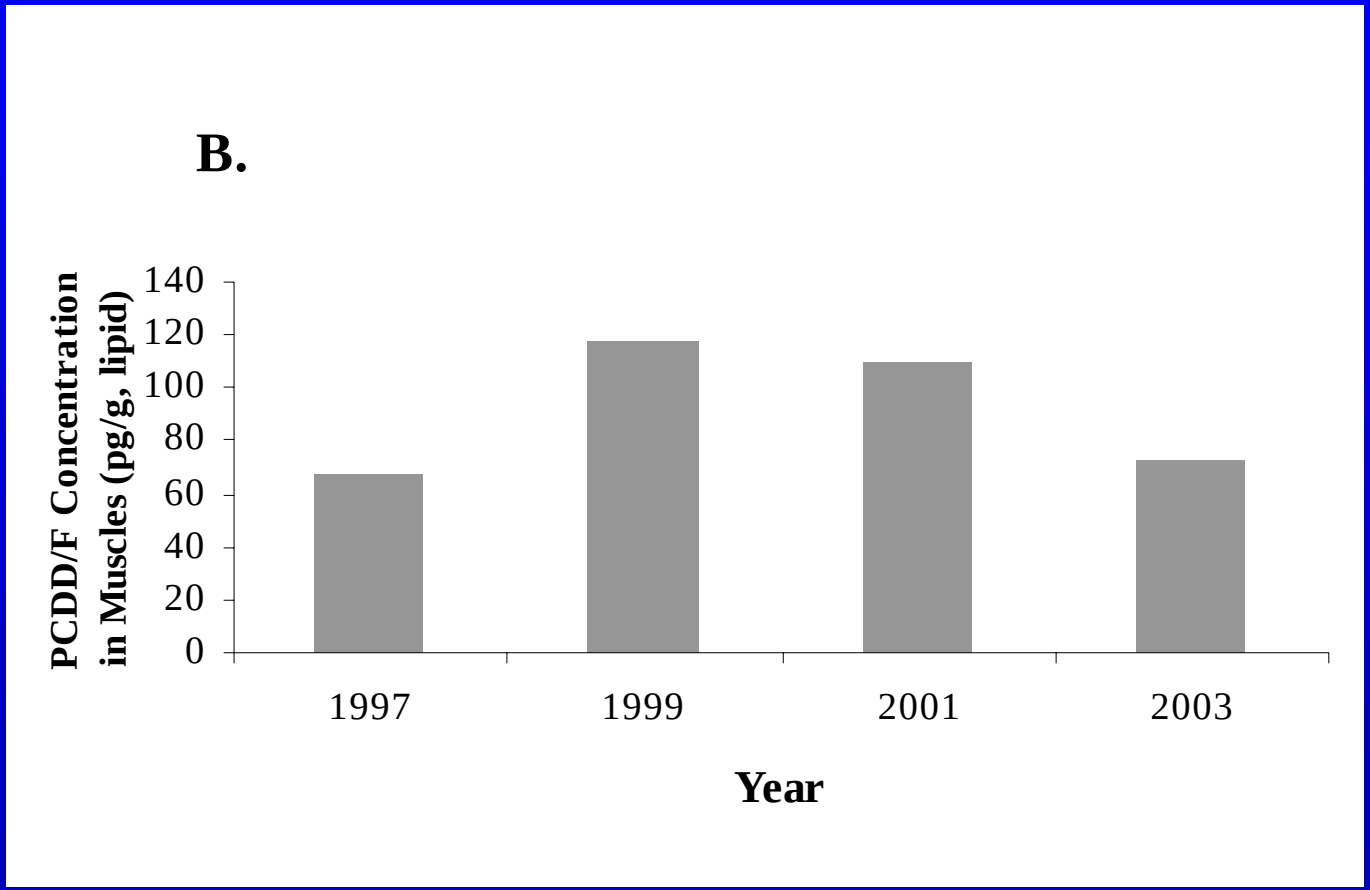
PCB Concentrations in Deer Muscle



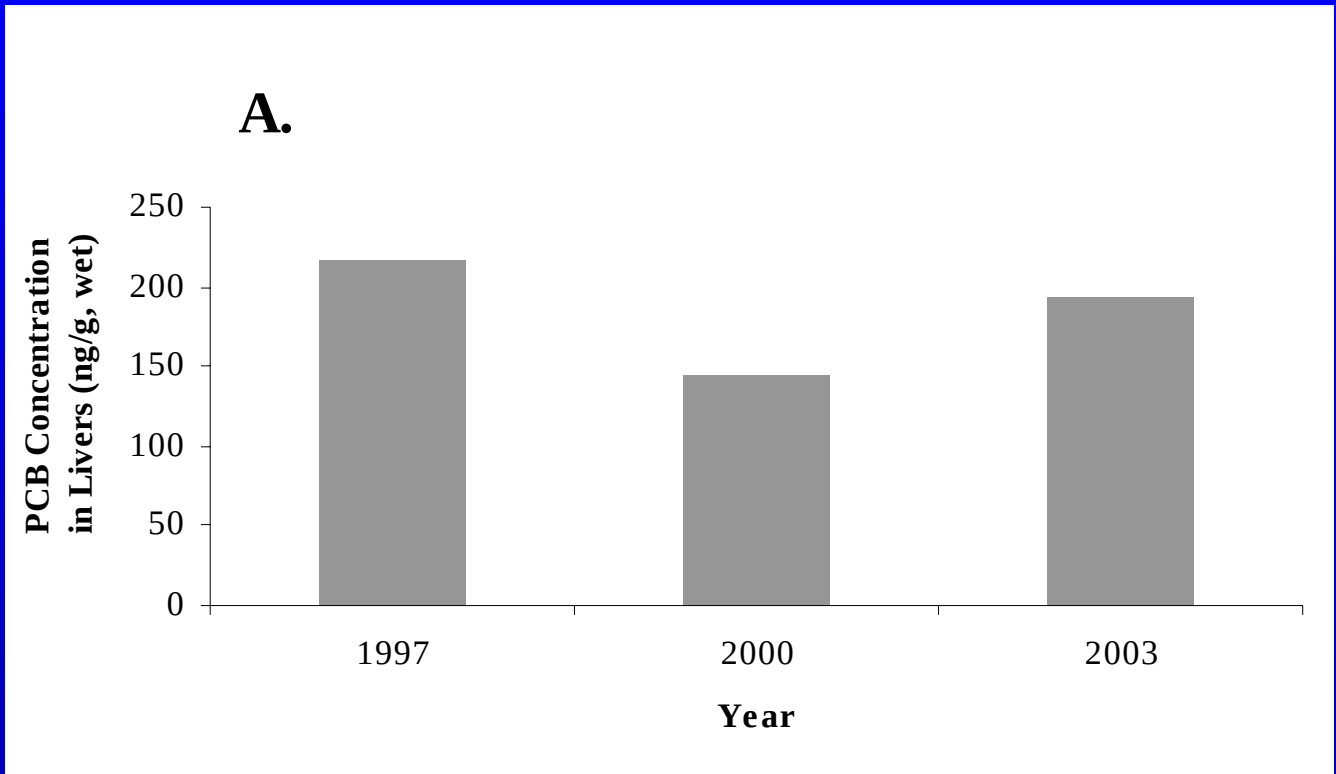
PCDD/F Concentrations in Deer Liver



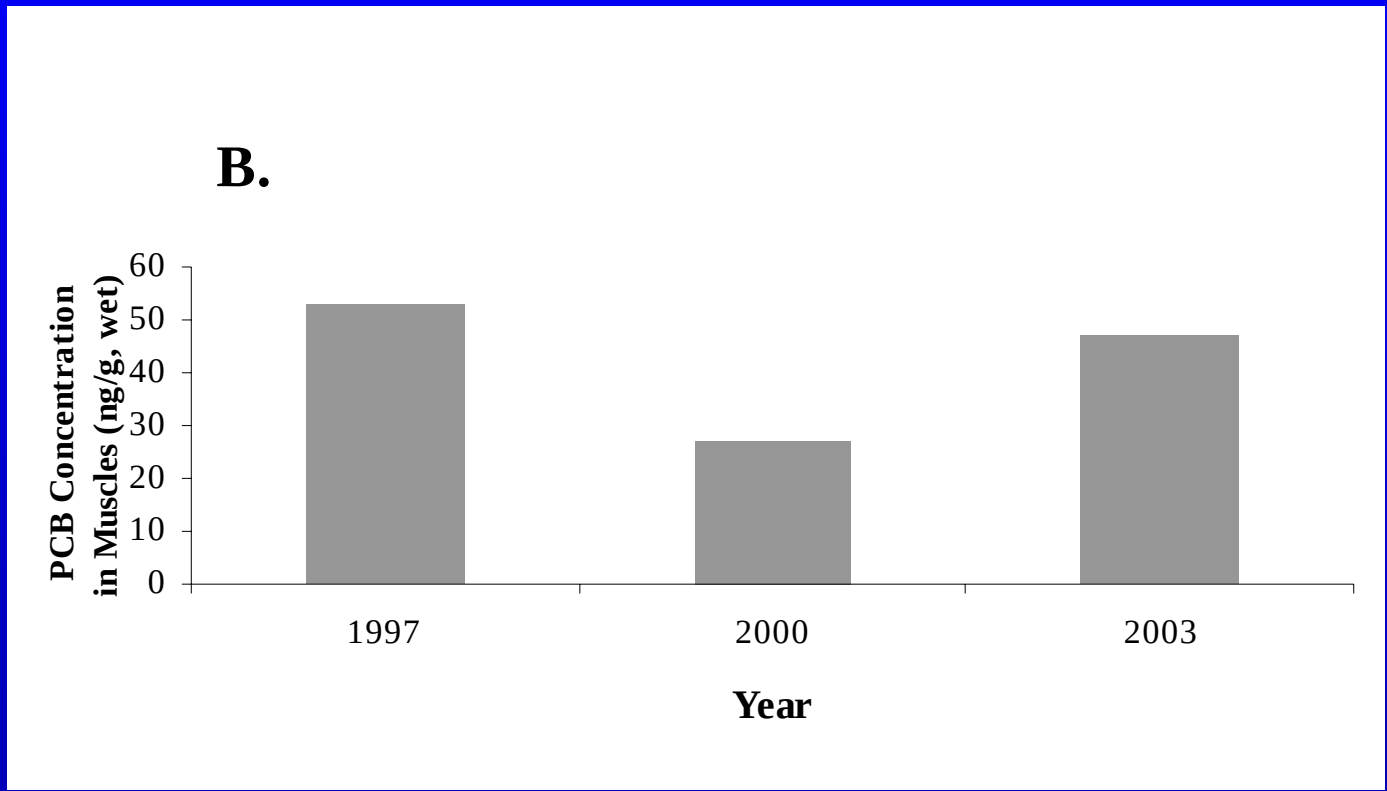
PCDD/F Concentrations in Deer Muscle



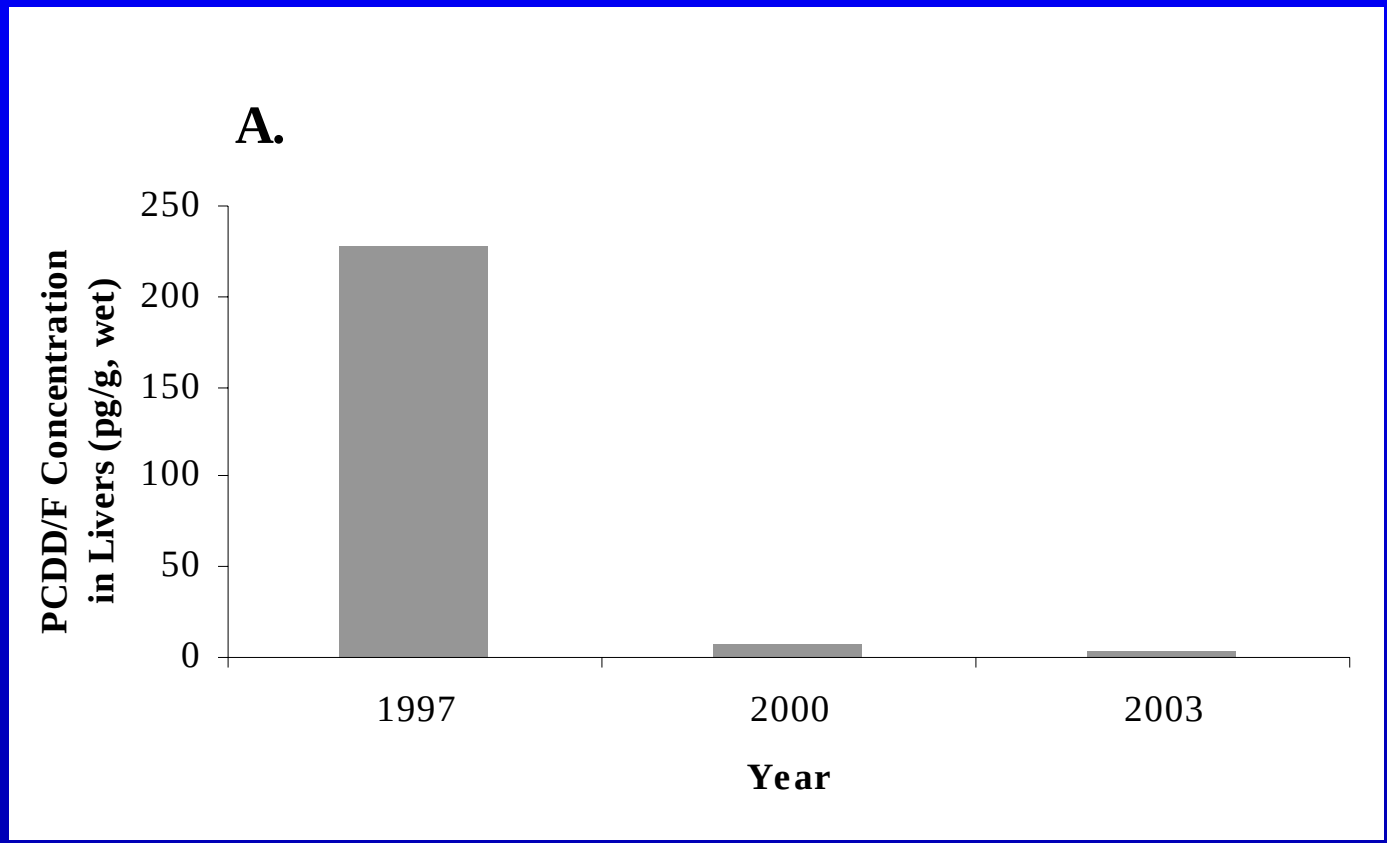
PCB Concentrations in Fish Liver



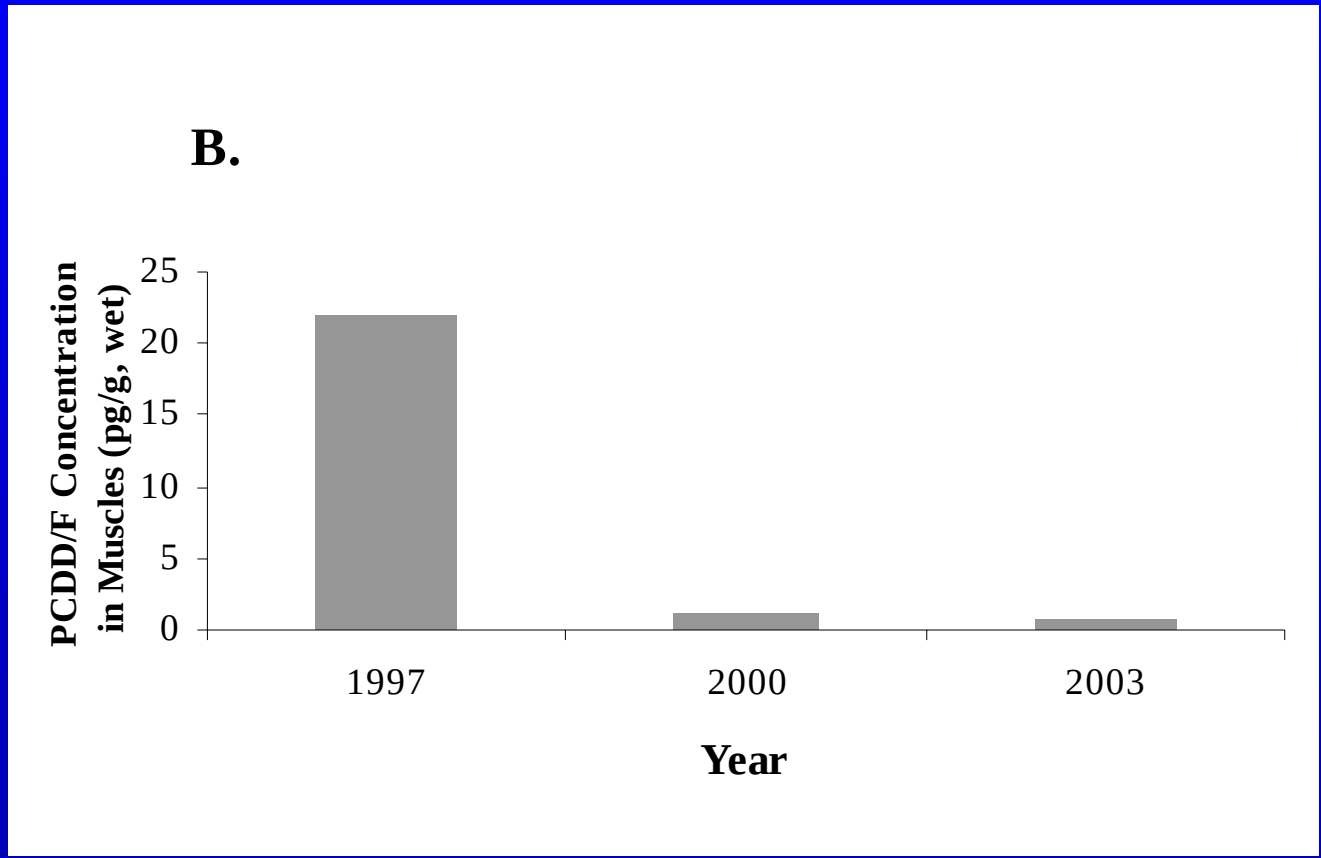
PCB Concentrations in Fish Muscle



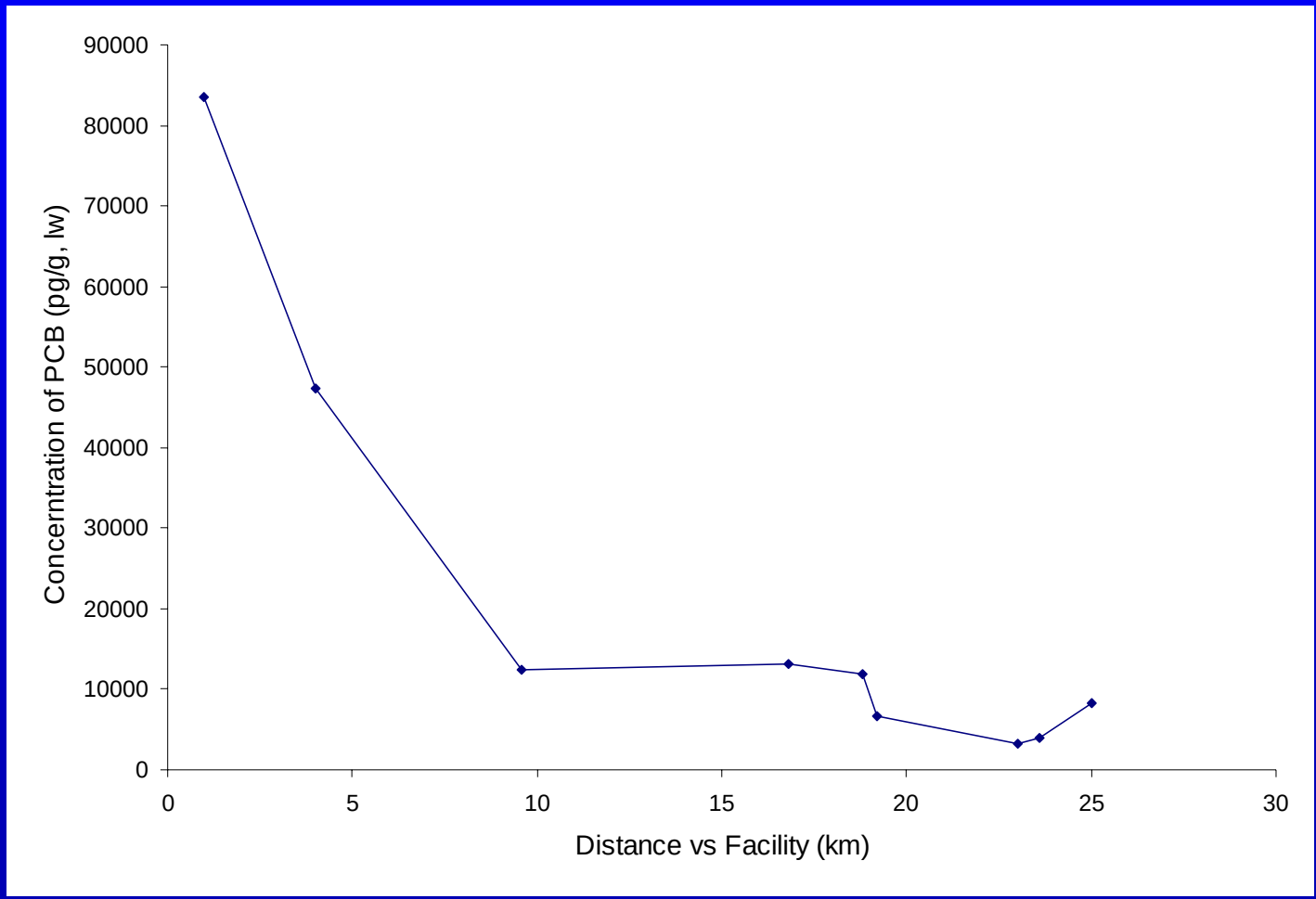
PCDD/F Concentrations in Fish Liver



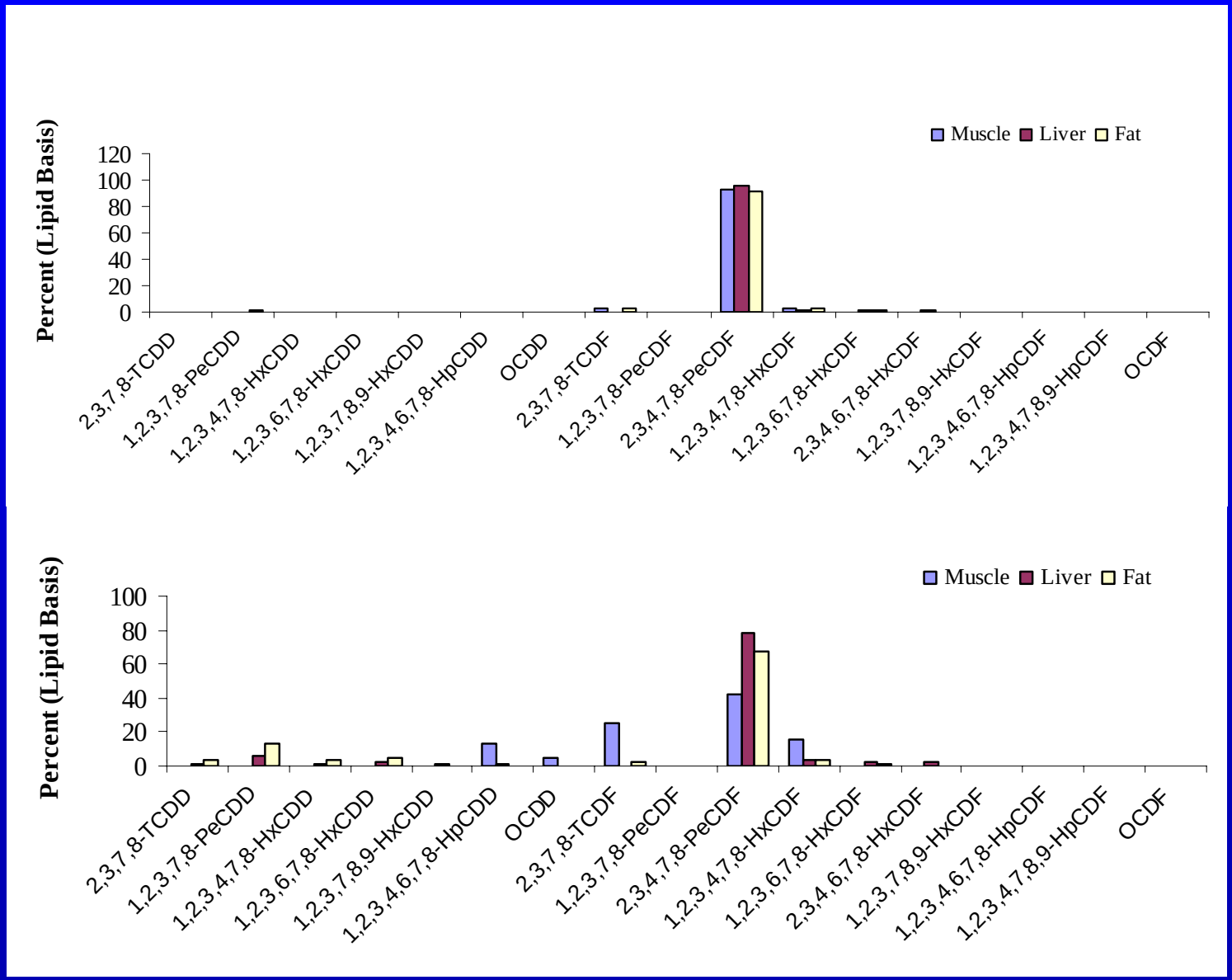
PCDD/F Concentrations in Fish Muscle



PCB Levels in Deer Muscle vs. Distance



PCDD/F TEQ Patterns in Deer in 2001/03



Exposure Ratios

	Wild Game		Fish	
Intake	**>100 g/d**	**30-99 g/d**	**>100 g/d**	**30-99 g/d**
1997	17.5	5.3	6.6	1.8
1999	0.07	0.02		
2000			0.35	0.10
2001	0.28	0.08		
2003	0.02	0.01	0.80	0.20

Review of Food Consumption Advisories

- Human Exposure Assessment Report
- Science Advisory Committee
- Public Health Advisory Committee
- Provincial Public Health Officer

Conclusion

- Overall levels of all contaminants have declined since 1997.
- Distribution patterns of contaminants were consistent with those observed in 1997 study.
- Exposure ratios for estimating daily consumption of wild game and fish have decreased since 1997.
- The results will be submitted to Science Advisory Committee for review.

To Get Reports

http://www.health.gov.ab.ca/resources/publications/SwanHillsReportJune_04.pdf