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TRACE ORGANIC CONTAMINANTS IN THE ST. LAWRENCE RIVER AT WOLFE ISLAND (Report No. EHD 98-02/I)

Prepared By: John Merriman
Ecosystem Health Division
June 1998

Canada

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ISBN 978-1-100-17524-9
Cat. no.: En83-5/98-02-1E-PDF

Aussi disponible en français

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Environmental Conservation Branch
Ontario Region
EHD
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TABLE OF CONTENTS

Trace Organic Contaminants in the St. Lawrence River at Wolfe Island

1.0 Introduction

In 1976, Environment Canada established a monitoring station on the St. Lawrence River at Wolfe Island, near Kingston, Ontario (Figure 1). This was undertaken as part of DOE's commitment to the Canada United States Great Lakes Water Quality Agreement (GLWQA) under the auspices of the International Joint Commission (IJC, 1989). The monitoring program is intended to aid in the evaluation of the effectiveness of pollution control programs carried out in the Great Lakes Basin which have resulted in improvements in water quality. Specifically, data generated from this sampling station are used to identify exceedences of water quality guidelines, to assess current water quality conditions, and to evaluate trends. This report assesses water quality conditions and guideline exceedences for trace organic contaminants in water and solids from 1989 to present. It provides an up to date assessment on data collected at the Wolfe Island station that have been previously summarized for the 1989 to 1993 period (Biberhofer, 1995).

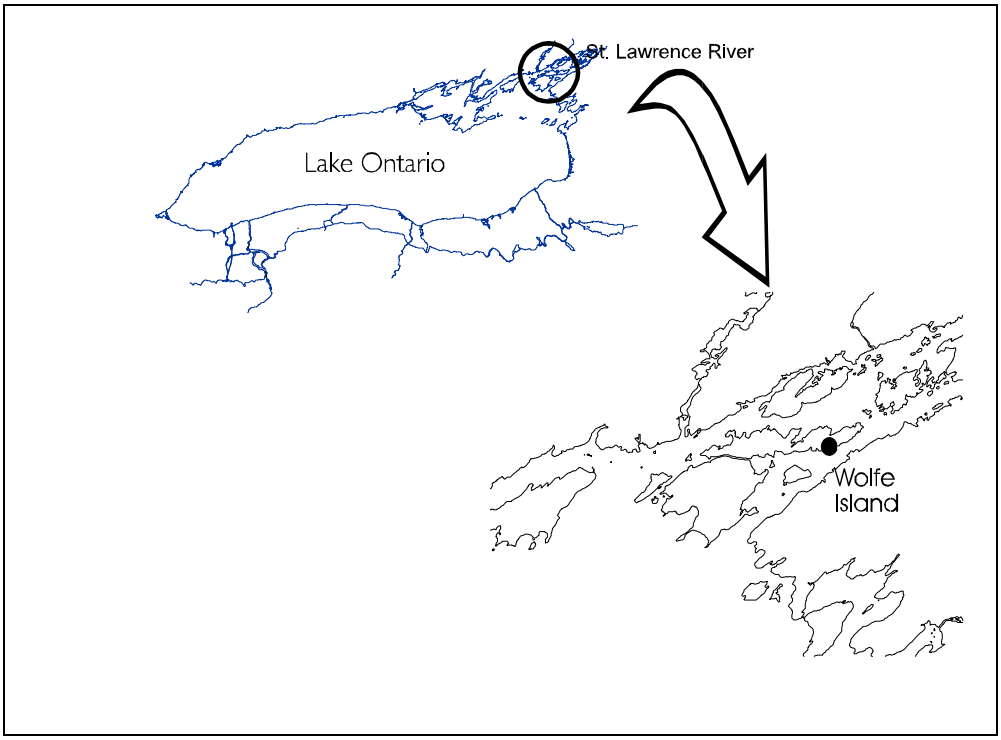


Figure 1. Wolfe Island Sampling Location.

2.0 Methods

2.1 Sampling Methods

The Wolfe Island sampling site is located along the south shore of Wolfe Island at Banford Point. Approximately 60% of the St. Lawrence River flow is in the south channel, while the north channel accounts for the remaining 40% (Casey and Salbach, 1974). The water intake is located 120m from shore and is positioned at approximately mid-depth in the water column at 11m. Water delivery to the on-shore field laboratory is by a submersible pump. A programmable timer located in the trailor/field laboratory, flushes out the intake line daily and also controls an automated sampler which collects water samples on a weekly frequency for major ions, nutrients and trace metals (Fig. 2). A more detailed description of the sampling site describing the water delivery system and sampling methodology may be found in "Wolfe Island Sampling Protocol" (Kuntz, 1996). Presently, Ecosystem Health Division staff visit the site on a monthly basis to collect trace organic contaminant samples.

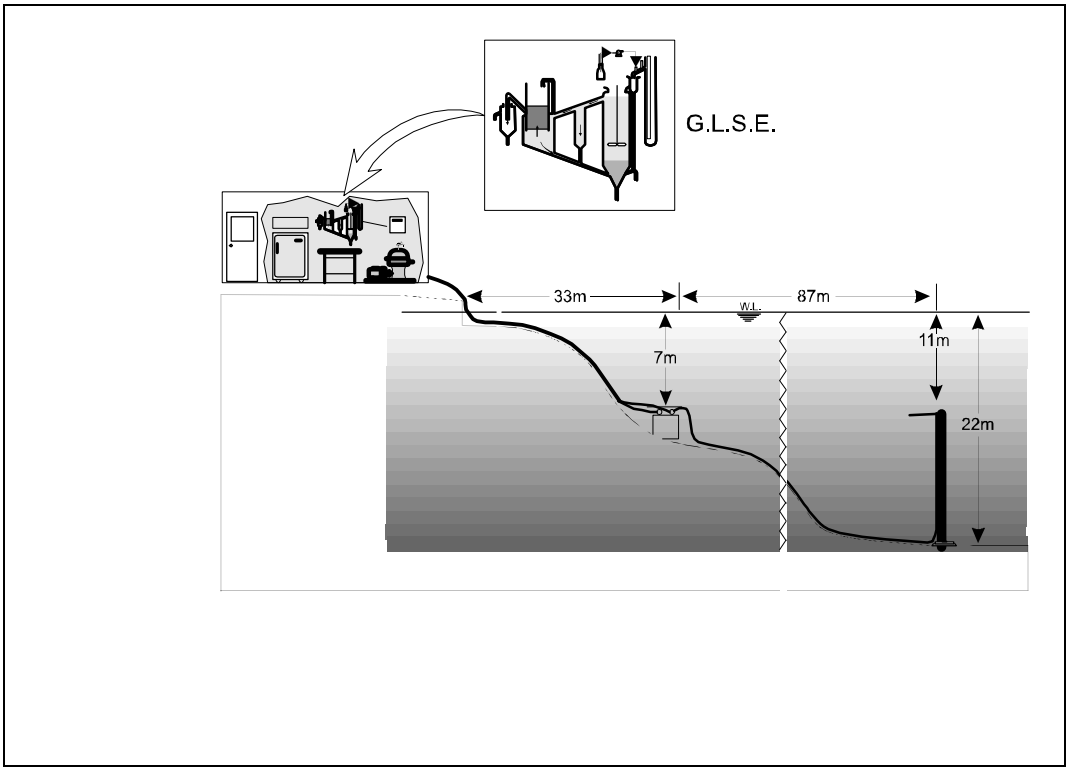


Figure 2. Wolfe Island Water Delivery System.

Contaminant samples are collected using a flow through centrifuge which separates the sample into solid and aqueous fractions. River water is pumped at a rate of six litres per minute through the centrifuge over a 24 hour period to collect the suspended particulate

matter. The centrifugate, or the aqueous phase, is subsampled at a rate of 40 ml/min over a 24 hour period and solvent extracted with dichloromethane (DCM) using the Goulden Large Sample Extractor (GLSE)(Goulden and Anthony, 1985). Over a 24 hour period, this results in a sample size of approximately 55 litres. Field surrogate spikes are metered into the sample on site in order to assess extraction and recovery efficiencies. At the end of the sampling period, the DCM extract is drained from the GLSE into an amber glass bottle and returned to the laboratory in Burlington for processing and analysis.

Approximately 8600 L of water are centrifuged over a 24 hour sampling period. Suspended particulate matter is removed from the centrifuge bowl then pressure filtered and sub-sampled for submission for analysis. The solids weight is obtained for back-calculating an estimated suspended solids concentration in the water column.

2.2 Analytical Methods

As reported in Biberhofer 1995, both water and solids samples are processed using the Niagara River Analytical Protocol (Niagara River Monitoring Committee, 1992) with the exception of PCBs, which were analyzed using capillary column, rather than packed column GC from July 1991 onwards. PCBs and the other organochlorine compounds were measured using an electron capture detector. PAHs, phthalates, atrazine and metolachlor were separated and measured using gas chromatography and mass spectrometry. Analytical detection limits for water and solids variables as set out in the Niagara River Analytical Protocol and reported by Biberhofer (1995) are provided in Table 1.

2.3 Data Analysis Methods

Mean concentrations and mean loads were calculated on an annual basis using the Maximum Likelihood Estimation (MLE) statistical method developed for the Niagara River (El-Shaarawi, 1989). This procedure assumes the data is lognormal and produces estimates of the censored data for each compound that has a minimum of three or more values greater than the analytical detection limit. It also estimates the confidence interval for the lognormal mean.

Loading estimates are based on annual mean discharge rates calculated from daily mean values. Flow data is collected at the Moses-Saunders control structure located in Cornwall. In order to estimate flow at the Wolfe Island site, a nine day time of travel factor between Wolfe Island and Cornwall is incorporated. Between 1977 and 1995, annual median flow rates have varied from a low of 6850 m^3/s in 1995 to a high of 9200 m^3/s in 1986 (Fig. 3). Within year variability is indicated by the 10th and 90th percentile bars in the figure.

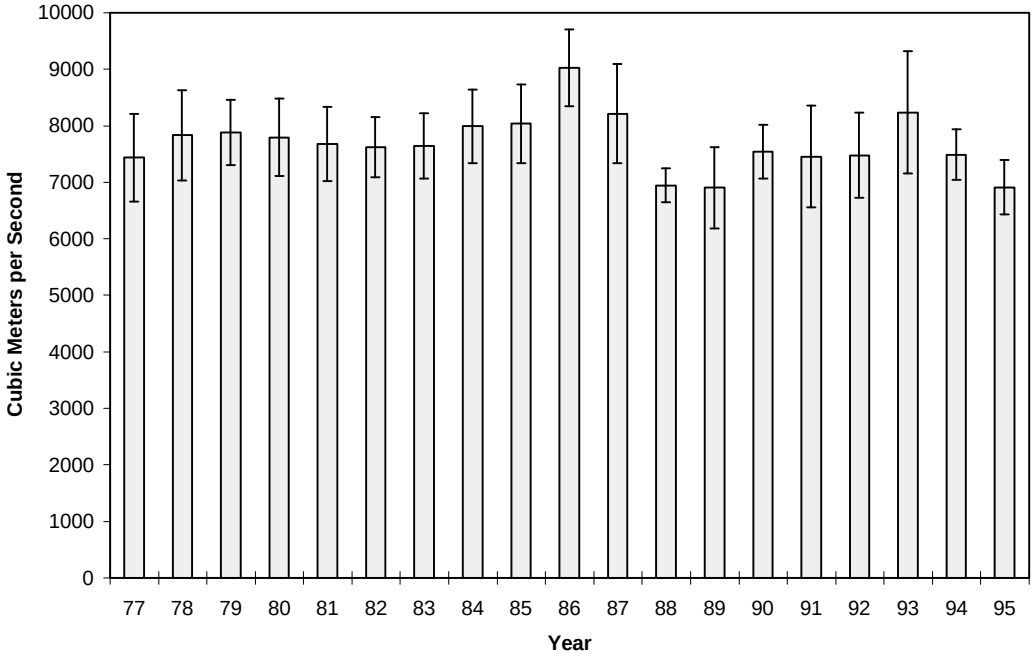


Figure 3. Wolfe Island Annual Mean Flow

3.0 Results and Discussion

3.1 Aqueous Phase

Tables 1-7 presented in Appendix A present data summaries for those compounds which had a minimum of three values greater than the detection limit in each year, enabling the calculation of concentrations and loads using the MLE. Each table contains detection limits, the total number of samples, annual mean concentrations with 90% confidence interval, and the estimated annual mean load with the 90% confidence interval. All data presented for the 1989 to 1993 time period are from Biberhofer (1995).

MLE annual mean and load data for those parameters which had three or more values above the detection limit in each year from 1989-90 to 1995-96 were evaluated. Organochlorine pesticides, including alpha hexachlorocyclohexane (alpha-BHC), gamma hexachlorocyclohexane (lindane), dieldrin and total PCBs did indicate overall decreasing trends in concentration over the seven year period of record. Annual mean concentrations for alpha-BHC decreased from 1.57 ng/L in 1989-90 to 0.43 ng/L in 1995-96. Similar decreasing trends were observed for lindane which decreased from 0.43 ng/L to 0.22 ng/L, dieldrin which decreased from 0.32 ng/L in 1989-90 to 0.16 in 1995-96, and also for total PCBs decreasing from 3.13 ng/L in 1989-90 to 1.2 ng/L in 1995-96 (Figure 4).

Table 1. Detection Limits

Compound	Water (ng/L)	Solids (ng/g)
1,3-Dichlorobenzene	0.26	11.30
1,4-Dichlorobenzene	0.27	10.40
1,2-Dichlorobenzene	0.25	11.40
1,3,5-Trichlorobenzene	0.03	1.20
1,2,4-Trichlorobenzene	0.03	2.50
1,2,3-Trichlorobenzene	0.03	1.30
1,2,3,4-Tetrachlorobenzene	0.03	3.00
Pentachlorobenzene	0.03	2.70
Hexachlorobenzene	0.04	3.50
Hexachlorobutadiene	0.04	1.50
Hexachlorocyclopetadiene	0.04	1.80
Heptachlor	0.03	3.50
Aldrin	0.05	2.10
Octachlorosytrene	0.07	2.70
p,p'-DDE	0.08	6.40
p,p'-TDE (p,p'-DDD)	0.38	16.70
o,p'-DDT	0.15	9.40
p,p'-DDT	0.17	9.30
Photomirex	0.06	4.10
Mirex	0.05	4.40
alpha-BHC	0.04	2.30
gamma-BHC	0.05	3.50
Heptachlor Epoxide	0.03	3.20
gamma-Chlordane	0.07	2.80
alpha-Endosulfan	0.04	3.10
alpha-Chlordane	0.09	2.90
Dieldrin	0.08	6.80
Endrin	0.18	7.30
beta-Endosulfan	0.10	5.90
Endrin Aldehyde	0.13	4.20
Methoxychlor	0.84	48.00
PCB	0.78	89.00

Compound	Water (ng/L)	Solids (ng/g)
2-Methylnaphthalene	0.61	281.00
1-Methylnaphthalene	0.31	80.00
Naphthalene	0.23	82.00
Acenaphthylene	0.19	89.00
Fluorene	0.55	160.00
Phenanthrene	0.19	193.00
Anthracene	0.18	169.00
Dimethyl phthalate	0.44	204.00
Diethyl phthalate	0.38	1382.00
Di-n-butyl phthalate	2.20	368.00
2-Chloronaphthalene	0.70	378.00
Atrazine	3.24	856.00
Metolachlor	0.49	441.00
Fluoranthene	0.26	90.00
Pyrene	0.30	168.00
Benzo(a)anthracene	0.25	137.00
Chrysene	0.23	193.00
Benzo(b+k)fluoranthene	0.30	191.00
Benzo(a)pyrene	0.17	161.00
Indeno(1,2,3-c,d)pyrene	0.83	161.00
Dibenzo(a,h)anthracene	0.95	148.00
Benzo(g,h,i)perylene	0.54	149.00
Butylbenzyl phthalate	2.03	416.00
Bis-2-ethylhexyl phthalate	7.65	1780.00
Di-n-octyl phthalate	0.44	348.00
TCDD	0.02	21.00

Corresponding decreases in estimated mean annual loads were observed for the same variables. Estimated mean daily loads for alpha-BHC decreased from 0.97 kg/d in 1989-90 to 0.26 in 1995-96. Gamma-BHC, dieldrin and total PCB also indicated decreased loadings for the same time period from 0.26 to 0.13 kg/d, 0.20 to 0.10 kg/d, and 1.94 to 0.73 kg/d respectively (Appendix A).

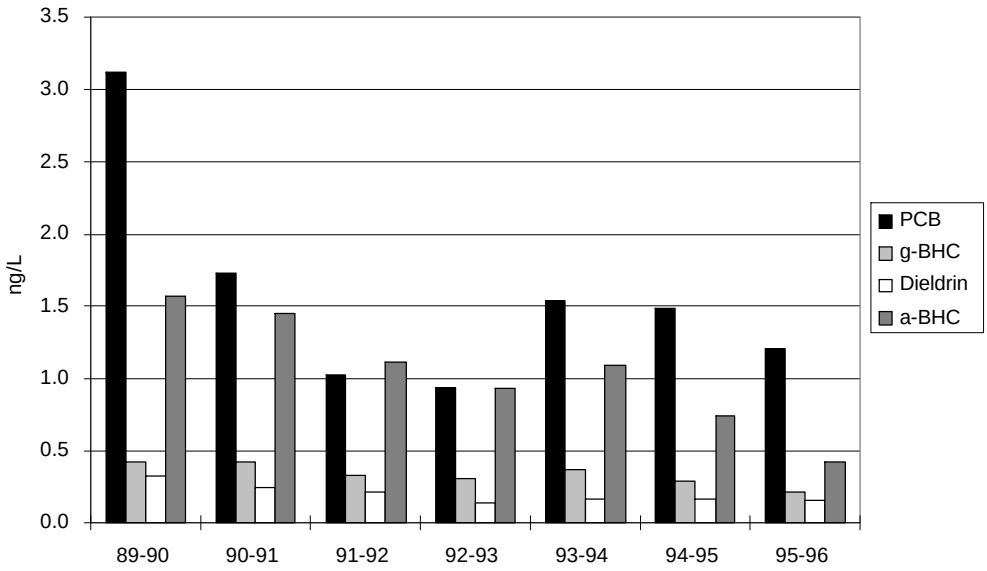


Figure 4. Organochlorine Pesticides and PCB Concentrations.

Of all the PAHs that were analyzed, fluoranthene, naphthalene, and phenanthrene were the only PAH compounds that had at least three observations greater than the detection limit for each year between 1989-90 and 1995-96. Decreasing concentrations were evident for each of these PAHs (Figure 5). Fluoranthene concentrations dropped from 0.65 ng/L in 1989-90 to 0.36 ng/L. Corresponding decreases in estimated loads were also found with a decrease from 0.40 kg/d in 1989-90 to 0.22 kg/d in 1995-96. Concentrations of naphthalene decreased from 1.04 ng/L to 0.80 ng/L while loads were found to decrease from 0.65 kg/d to 0.48 kg/d for the 1989-90 1995-96 time period. Phenanthrene concentrations decreased from 1.37 ng/L in 1989-90 to 0.77 ng/L in 1995-96, while estimated mean daily loads dropped from 0.85 kg/d in 1989-90 to 0.46 kg/d in 1995-96.

Atrazine and metolachlor, two in-use herbicides both have shown overall concentration increases for the 1989-90 to 1995-96 time period. Herbicide use patterns in Ontario indicate that metolachlor has begun to replace atrazine as the herbicide of choice in Ontario (Figure 6), but to date there has not been a corresponding decrease in atrazine concentrations. The most recent data suggests there may be a faster rate of increase for metolachlor concentrations. There are significant inputs of both these compounds from the American side of the watershed, which may explain why there has been no apparent

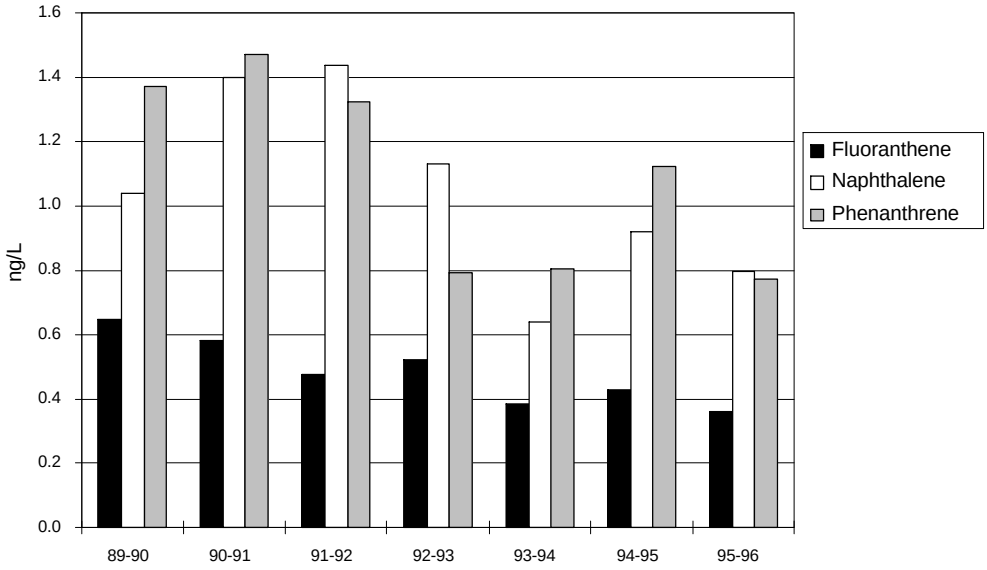


Figure 5. PAH Concentrations

decrease in atrazine concentrations. In contrast to Ontario use patterns, there does not appear to be a corresponding switch from atrazine to metolachlor use in the United States (pers. comm. J. Struger).

Concentrations of atrazine ranged from 56.4 ng/L in 1989-90 to 67.4 ng/L in 1995-96, while metoachlor rose from an annual mean of 6.6 ng/L to 23.8 ng/L over the same time span. Metolachlor concentrations doubled between 1994-95 and 1995-96. It is difficult to explain why there was such a dramatic increase over a one year period, but there appears to be considerably more variability in the data. There were only 10 observations in 1995-96 compared to 20 observations for the year before. Recently obtained data for 1996-97 indicate an annual mean of 19.3 ng/L based on 11 observations. Although the mean is considerably less than the previous year, it does still indicate an increasing trend in concentration for metolachlor.

Phthalates that had at least three detections per year enabling the use of the MLE for annual mean concentrations and loadings estimates, included diethyl, dimethyl, di-n-butyl, and di-n-octyl phthalate. Phthalates are widespread in the environment and due to their ubiquitous nature are difficult to analyze for with recurring blank problems and resultant variable data sets. Sampling for phthalates ceased in 1997-98 due to unreliable results. Data collected in 1995-96 is suspect and is currently being reviewed because of the significantly higher concentrations found in that year. More recent 1996-97 data suggests concentrations more in line with what was found prior to 1995-96.

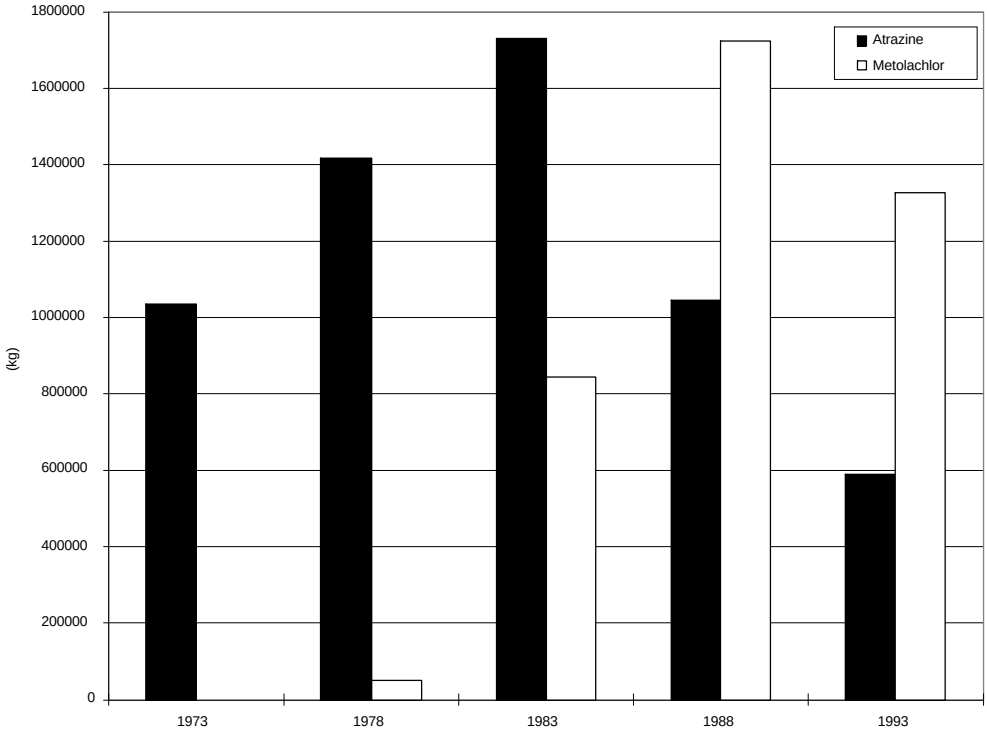


Figure 6. Atrazine and Metolachlor Use in Ontario.

Taking this into account, and if the suspect data points are not included in the calculation for mean concentrations, as they are included in Figure 7, the data indicates an overall decrease for all the phthalates over the period of record between 1989 and 1996. As is the case for the other compounds, the aqueous or dissolved fraction loading mirrors the concentrations trends. Phthalate compounds for which there are guidelines, indicated that all concentrations are well below the guidelines (Table 2).

3.1.1 Guideline Exceedances

Dissolved phase results collected for the 1989-90 to 1995-96 time period were evaluated against existing water quality guidelines for the protection of aquatic life. Table 2 contains the list of compounds for which there are guidelines, their detection limit, the guideline and the percent exceedance. With the exception of mirex, all but one of the Ministry of Environment and Energy objectives are interim objectives and thus have not been finalized (MOEE, 1994). The remaining compounds that are listed are Canadian Water Quality Guidelines prepared by the Canadian Council of Resource and Environment Ministers (CCREM, 1987).

Seven of 41 compounds displayed some frequency of exceedance. DDT and it's metabolites exceeded the guideline on one occasion or 0.9% of the time. The

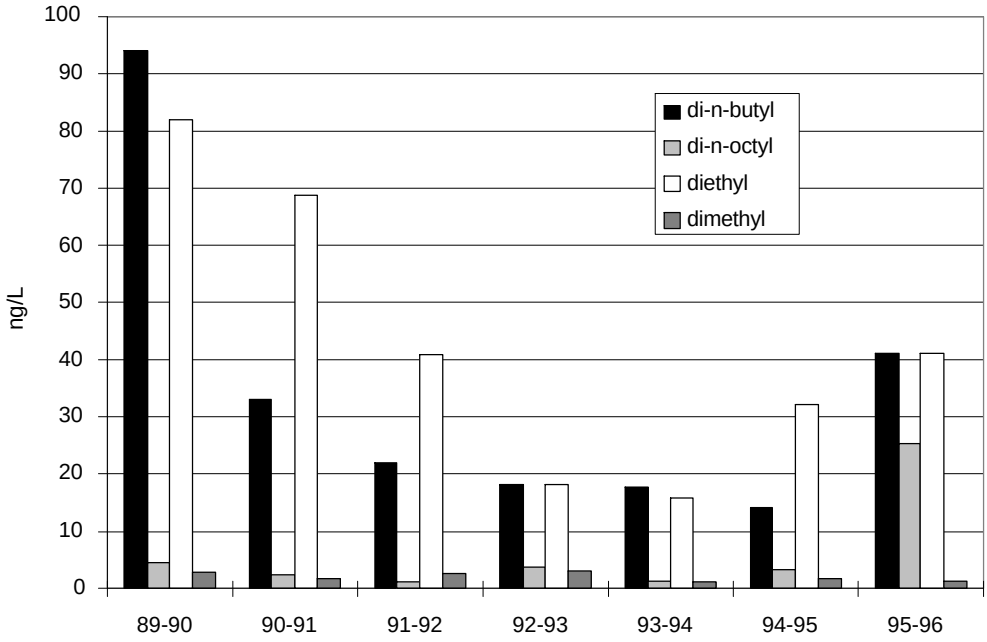


Figure 7. Phthalate Concentrations.

concentration reported for that particular sample is considered suspect as it is almost 10 times that of the next highest sample.

Total PCBs which have become ubiquitous in the environment, exceeded the 1 ng/L guideline for 72.9% of the samples analyzed. Annual means from 1990-91 to 1995-96 were in the 1.0 to 1.5 ng/L range which is fairly close to the guideline (Figure 4). With toxics reduction programs in place, it is possible that these concentrations will gradually decrease over time to levels below the 1 ng/L guideline.

Four PAH compounds, namely anthracene, fluoranthene, benzo(a)anthracene, and benzo(b+k)fluoranthene had exceedances of 1.8, 7.3, 6.4 and 19.3% respectively. The exceedances are for MOEE interim objectives that were established in 1994. To date there has been no change in their interim status and it is difficult to state whether these compounds will remain in exceedance of the objectives when they are finalized.

3.2 Solids Phase

Suspended particulate matter, as calculated from solids concentrations obtained from monthly centrifugation over a 24 hour period at the Wolfe Island site, has declined from 1.4 mg/L in 1991 to less than 0.2 mg/L in 1995 (Fig. 8). There have also been corresponding decreases in particulate organic carbon and particulate nitrogen recorded

Table 2. Guideline Exceedances

Compound	Det. Limit ng/L	Guideline ng/L	Exceedance %
1,3-Dichlorobenzene	0.26	2500	0
1,4-Dichlorobenzene	0.27	4000	0
1,2-Dichlorobenzene	0.25	2500	0
1,3,5-Trichlorobenzene	0.03	650	0
1,2,4-Trichlorobenzene	0.03	500	0
1,2,3-Trichlorobenzene	0.03	900	0
1,2,3,4-Tetrachlorobenzene	0.03	100	0
Pentachlorobenzene	0.03	30	0
Hexachlorobenzene	0.04	6.5	0
Hexachlorobutadiene*	0.04	9	0
Hexachlorocyclopetadiene*	0.04	70	0
Heptachlor	0.03	1	0
Aldrin	0.05	1	0
DDT & metabolites	0.05	1	0.9
Mirex[a]	0.05	1	0
alpha-BHC	0.04	10	0
gamma-BHC	0.05	10	0
Heptachlor Epoxide	0.03	1	0
gamma-Chlordane	0.07	6	0
alpha-Endosulfan	0.04	20	0
alpha-Chlordane	0.09	6	0
Dieldrin	0.08	1	0
Endrin	0.18	2	0
beta-Endosulfan	0.1	20	0
Methoxychlor	0.84	40	0
Total PCB	0.78	1	72.9
2-Methylnaphthalene*	0.61	2000	0
1-Methylnaphthalene*	0.31	2000	0
Naphthalene*	0.23	7000	0
Fluorene*	0.55	200	0
Phenanthrene*	0.19	30	0
Anthracene*	0.18	0.8	1.8
Di-n-butyl phthalate	2.2	4000	0
2-Chloronaphthalene*	0.7	200	0
Atrazine	3.24	2000	0
Metolachlor*	0.49	3000	0
Chrysene*	0.23	0.1	44
Fluoranthene*	0.26	0.8	7.3
Benzo(a)anthracene*	0.25	0.4	6.4
Benzo(b+k)fluoranthene*	0.3	0.2	19.3
Butylbenzyl phthalate*	2.03	200	0

[a] MOEE Objective

* Interim Objective

at this station. Both POC and PN have decreased overall in the order of 50% from 1992 to1996, although in 1995 there were increases evident (Merriman, 1997). Environment Canada surveillance data from Lake Ontario shows that mean summer open lake chlorophyll *a* concentrations have declined from in excess of 0.004 mg/l in the early 1980's to less than 0.002 mg/l in 1993, the last year for which there is data available (L'Italien, 1997). This downward trend is also corroborated by Fisheries and Oceans who have a historical database for Lake Ontario which shows significant decreases in chlorophyll *a* over the April to October sampling period between 1987 and 1995 (DFO Bioindex Data Base, Ora Johannsson, unpubl. data).

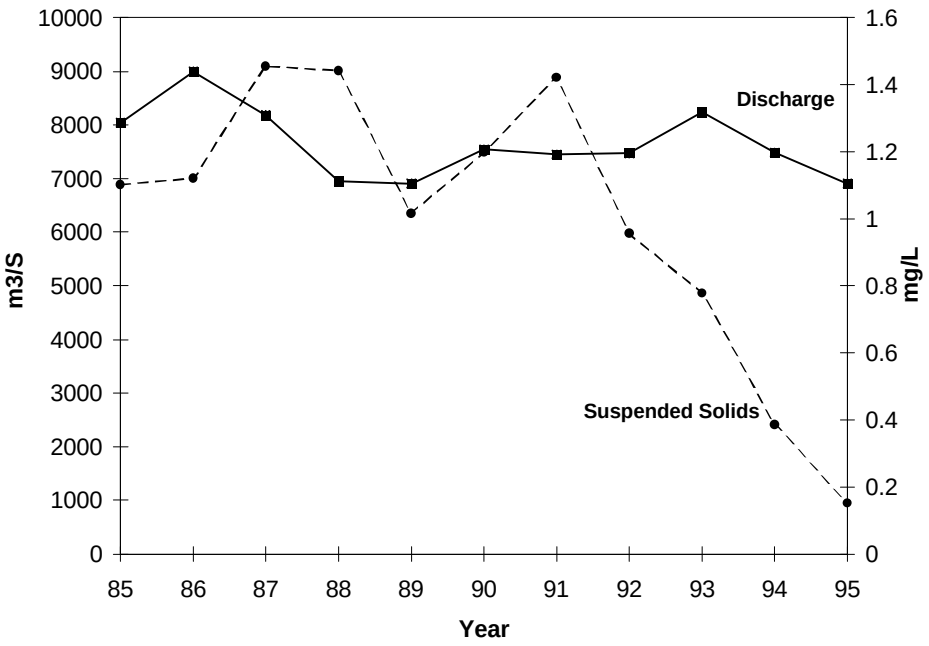
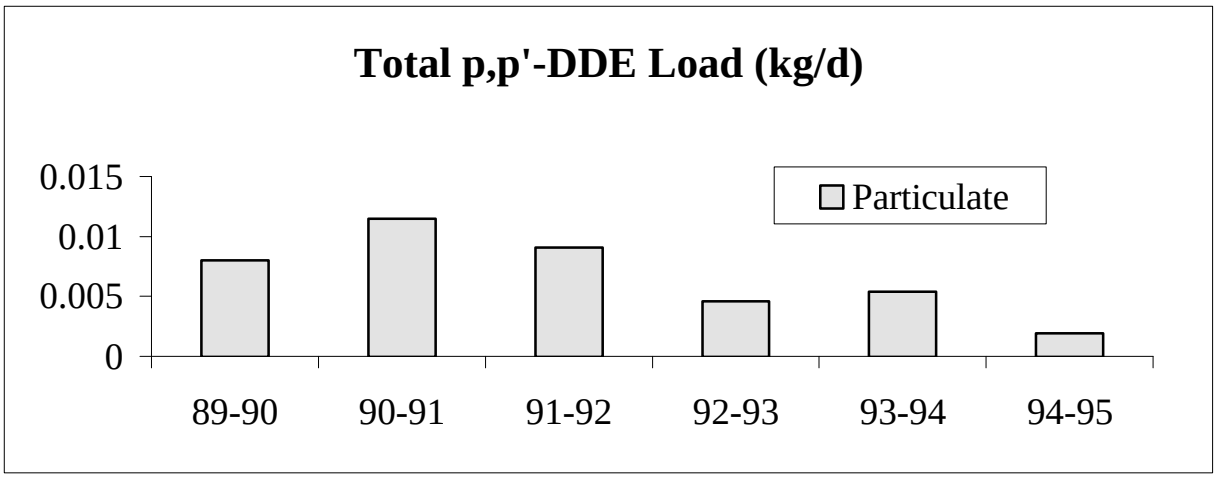


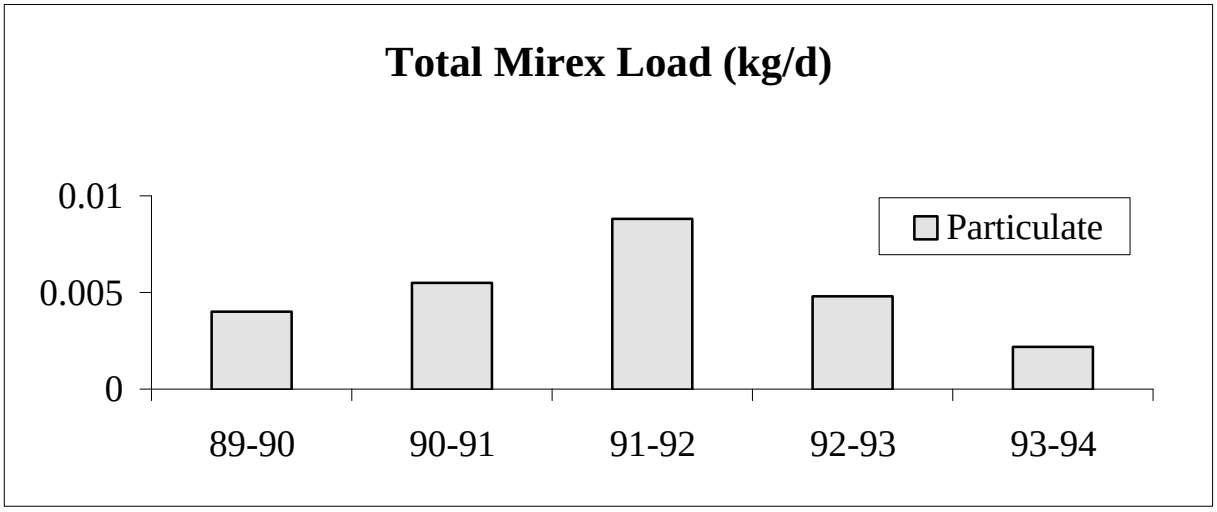
Figure 8. Suspended Solids Concentration vs Discharge

Tables 1-7 presented in Appendix B present data summaries for those compounds which had at least three values greater than the detection limit in each year, enabling the calculation of concentrations and loads using the MLE. Each Table contains detection limits, the total number of samples, annual mean concentrations with 90% confidence interval, and the estimated annual mean load with the 90% confidence interval. All data presented for the 1989 to 1993 time period are from Biberhofer (1995).

Variables that had three or more values above the detection limit for each year of the period of record from 1989-90 to 1994-95 were evaluated to determine the relative contribution of the dissolved and particulate phases to the total estimated loadings.

Figures 8 and 9 present the proportion or contribution of the dissolved and particulate phases to the total estimated loadings exiting Lake Ontario. As reported by Biberhofer





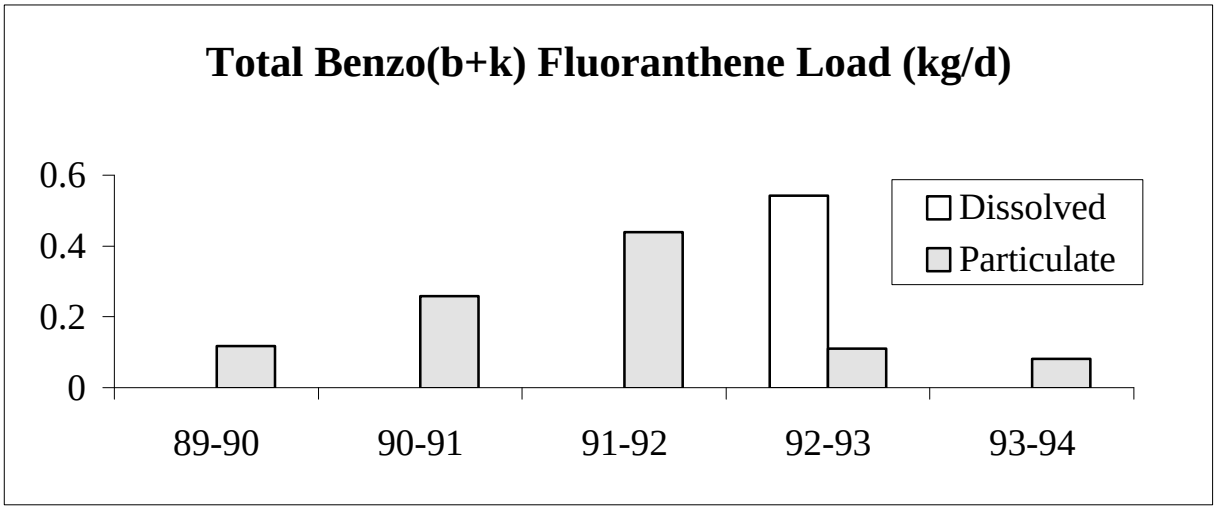


Figure 8. Variables with loadings primarily in particulate phase.

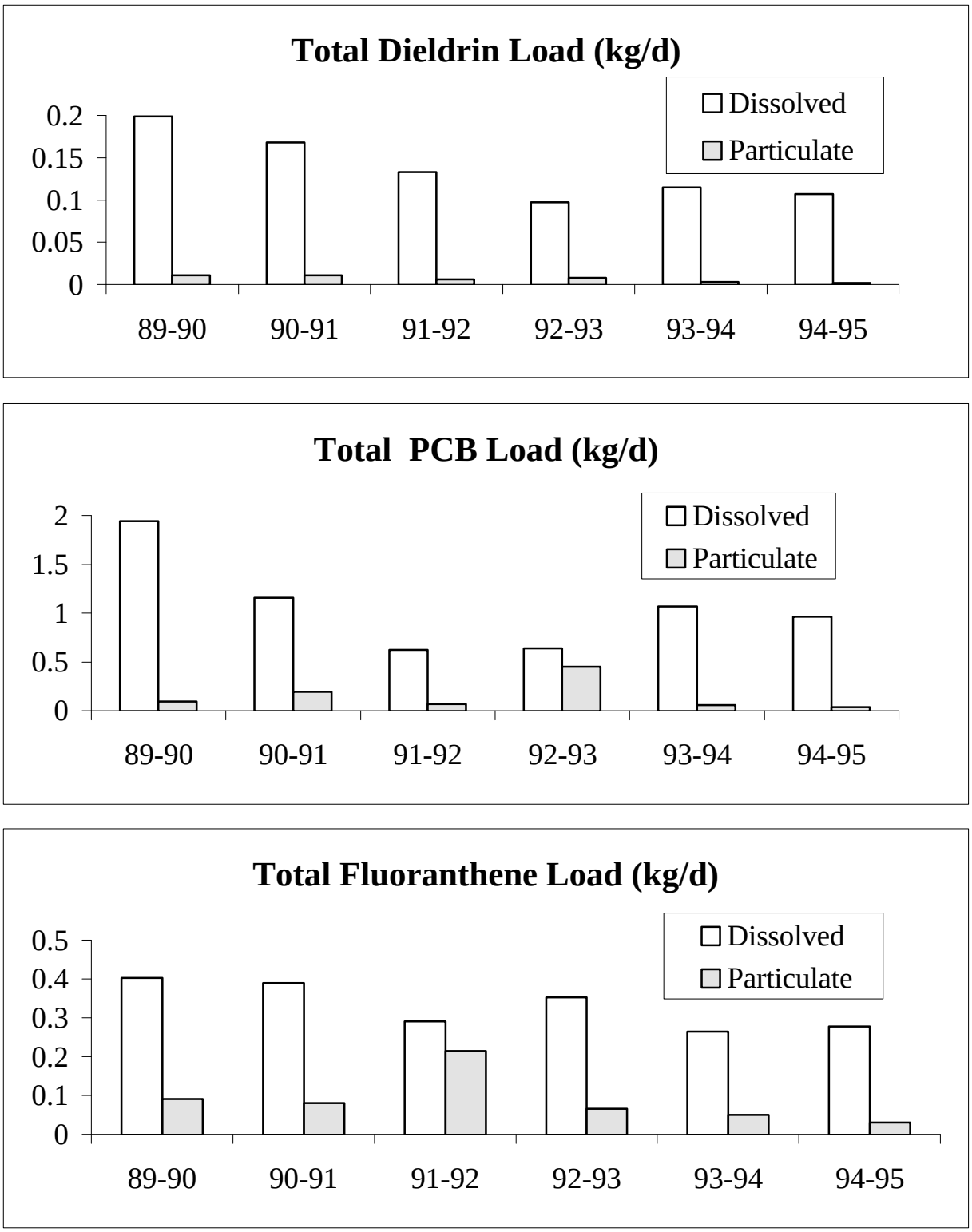


Figure 9. Variables with loadings primarily in dissolved phase.

(1995), some compounds are found primarily in the solids phase, namely p,p'DDE, mirex and benzo(b+k) fluoranthene, as indicated in Figure 8. Although benzo(b+k) fluoranthene is usually found in solids only, for reasons unknown it was detected in the aqueous phase in 1992-93, while for all other years, it was found only in the particulate phase. Some compounds such as dieldrin, PCBs, and fluoranthene exhibit a higher proportion of dissolved versus particulate phase in the total loadings estimates (Figure 9). There is an overall decreasing trend in loadings over time for p,p'-DDE, mirex, dieldrin, total PCB and fluoranthene. Loadings attributable to the solids phase are also decreasing over time as the particulate concentration in the water column decreases.

4.0 Summary

Compounds for which there was sufficient data to calculate the MLE for each year in the period of record, indicated that for all groups of compounds with the exception of atrazine and metolachlor, namely, OCs and PCB, PAHs and phthalates, there were overall decreases in concentration over time. Concurrent with these decreases in concentration, are corresponding decreases for estimated loads which mirror very closely the trends found in concentration data. Atrazine and metolachlor, two in-use herbicides have indicated increasing trends in concentration at the Wolfe Island site.

Of the forty-one compounds for which there are guidelines for the protection of aquatic life, PCBs had the highest frequency of exceedance. Almost 73% of samples collected were above the 1 ng/L guideline. Annual means from 1990 to 1996 were in the 1.0 to 1.5 ng/L range, which is relatively close to the guideline. With toxic reduction programs in place, it is likely that the frequency of exceedance will decline over time. The exceedances for PAHs are based on interim objectives established by MOE. At this time it is not known when the objectives will be finalized.

The portion of estimated total loadings attributable to the particulate phase has shown a decrease over time which corresponds to decreasing concentrations of particulate matter in the water column.

5.0 Acknowledgments

Special thanks are extended to Bruce Harrison for overseeing the operation of the site, his technical support, and collection of monthly samples at the station; Mrs. Elizabeth Woodman for the use of her property where the sampling station is located; Mary Lou Archer for keeping everyone organized; and Maxxam Analytical Inc. for their analysis of the samples.

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Appendix A

St. Lawrence River at Wolfe Island
April 1989 to March 1990
Aqueous Phase

Year	Parameter	Detection Limit	> Det Limit	# Samples	Mean Conc. (ng/L)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
89-90	1,2,3,4-Tetrachlorobenzene	0.03	4	12	0.028	0.023	0.033	0.017	0.014	0.021
89-90	1,2,3-Trichlorobenzene	0.03	8	12	0.035	0.031	0.040	0.022	0.019	0.025
89-90	1,2,4-Trichlorobenzene	0.03	11	12	0.127	0.099	0.160	0.079	0.061	0.099
89-90	1,2-Dichlorobenzene	0.25	6	12	0.318	0.214	0.450	0.197	0.133	0.279
89-90	1,4-Dichlorobenzene	0.27	12	12	1.024	0.869	1.207	0.636	0.540	0.749
89-90	1-Methylnaphthalene	0.31	10	12	0.537	0.429	0.660	0.333	0.267	0.410
89-90	alpha-BHC	0.04	12	12	1.568	1.212	2.029	0.973	0.752	1.259
89-90	alpha-Chlordane	0.09	3	12	0.075	0.041	0.122	0.046	0.025	0.076
89-90	alpha-Endosulfan	0.04	6	12	0.066	0.036	0.106	0.041	0.023	0.066
89-90	Atrazine	3.24	6	12	56.490	47.330	67.430	35.058	29.374	41.848
89-90	Bis-2-ethylhexyl phthalate	7.65	12	12	201.400	139.600	290.500	125.000	86.630	180.300
89-90	Butylbenzyl phthalate	2.03	12	12	6.722	4.766	9.479	4.172	2.958	5.884
89-90	Chrysene	0.23	6	12	0.244	0.208	0.283	0.151	0.129	0.176
89-90	Di-n-butyl phthalate	2.2	12	12	93.900	57.990	152.000	58.280	35.990	94.360
89-90	Di-n-octyl phthalate	0.44	11	12	4.588	2.572	7.381	2.847	1.596	4.581
89-90	Dieldrin	0.08	12	12	0.321	0.282	0.366	0.199	0.175	0.227
89-90	Diethyl phthalate	0.38	12	12	81.900	43.040	155.900	50.830	26.710	96.730
89-90	Dimethyl phthalate	0.44	11	12	2.927	1.826	4.371	1.817	1.134	2.713
89-90	Fluoranthene	0.26	12	12	0.647	0.530	0.791	0.402	0.329	0.491
89-90	gamma-BHC	0.05	12	12	0.425	0.341	0.530	0.264	0.212	0.329
89-90	gamma-Chlordane	0.07	6	12	0.208	0.064	0.469	0.129	0.040	0.291
89-90	Heptachlor	0.03	12	12	0.091	0.082	0.101	0.057	0.051	0.063
89-90	Hexachlorobenzene	0.04	6	12	0.039	0.037	0.041	0.024	0.023	0.026
89-90	Hexachlorobutadiene	0.04	4	12	0.037	0.025	0.054	0.023	0.015	0.033
89-90	Metolachlor	0.49	12	12	6.603	5.702	7.647	4.099	3.539	4.747
89-90	Naphthalene	0.23	11	12	1.039	0.689	1.485	0.645	0.428	0.922
89-90	Phenanthrene	0.19	11	12	1.372	0.908	1.961	0.851	0.563	1.217
89-90	Pyrene	0.3	6	12	0.411	0.262	0.606	0.255	0.163	0.376
89-90	Total PCB	0.78	10	10	3.126	2.122	4.605	1.940	1.317	2.858

St. Lawrence River at Wolfe Island
April 1990 to March 1991
Aqueous Phase

Year	Parameter	Detection Limit	> Det Limit	# Samples	Mean Conc. (ng/L)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
90-91	1,2,3,4-Tetrachlorobenzene	0.03	11	12	0.049	0.036	0.065	0.033	0.024	0.043
90-91	1,2,3-Trichlorobenzene	0.03	11	12	0.044	0.036	0.053	0.029	0.024	0.035
90-91	1,2,4-Trichlorobenzene	0.03	12	12	0.184	0.155	0.219	0.123	0.104	0.146
90-91	1,4-Dichlorobenzene	0.27	10	12	1.027	0.714	1.415	0.687	0.478	0.946
90-91	1-Methylnaphthalene	0.31	10	12	0.490	0.401	0.590	0.328	0.269	0.395
90-91	2-Methylnaphthalene	0.61	3	12	0.521	0.411	0.649	0.349	0.275	0.434
90-91	alpha-BHC	0.04	12	12	1.447	1.365	1.535	0.968	0.913	1.026
90-91	Atrazine	3.24	12	12	53.470	48.020	59.530	35.750	32.110	39.810
90-91	Benzo(a)anthracene/Chrysene	0.23	3	12	0.198	0.153	0.250	0.132	0.103	0.167
90-91	Bis-2-ethylhexyl phthalate	7.65	12	12	154.500	112.900	211.400	103.300	75.500	141.300
90-91	Butylbenzyl phthalate	2.03	12	12	5.674	4.584	7.024	3.794	3.065	4.697
90-91	Di-n-butyl phthalate	2.2	12	12	33.050	29.330	37.250	22.100	19.610	24.910
90-91	Di-n-octyl phthalate	0.44	12	12	2.441	1.965	3.031	1.632	1.314	2.027
90-91	Dieldrin	0.08	12	12	0.251	0.239	0.263	0.168	0.160	0.176
90-91	Diethyl phthalate	0.38	12	12	68.720	55.970	84.390	45.960	37.430	56.430
90-91	Dimethyl phthalate	0.44	12	12	1.712	1.438	2.037	1.145	0.962	1.363
90-91	Fluoranthene	0.26	10	12	0.581	0.453	0.729	0.389	0.303	0.488
90-91	gamma-BHC	0.05	12	12	0.426	0.406	0.447	0.285	0.272	0.299
90-91	Heptachlor	0.03	12	12	0.088	0.081	0.096	0.059	0.054	0.064
90-91	Hexachlorobenzene	0.04	9	12	0.046	0.037	0.056	0.031	0.025	0.037
90-91	Metolachlor	0.49	12	12	10.260	8.860	11.890	6.864	5.925	7.953
90-91	Naphthalene	0.23	11	12	1.401	0.803	2.221	0.937	0.537	1.485
90-91	Pentachlorobenzene	0.03	4	12	0.026	0.016	0.040	0.018	0.011	0.027
90-91	Phenanthrene	0.19	12	12	1.472	1.320	1.641	0.984	0.883	1.097
90-91	Pyrene	0.3	4	12	0.274	0.226	0.329	0.183	0.151	0.220
90-91	Total PCB	0.78	11	12	1.732	1.341	2.188	1.158	0.897	1.463

St. Lawrence River at Wolfe Island
April 1991 to March 1992
Aqueous Phase

Year	Parameter	Detection Limit	> Det Limit	# Samples	Mean Conc. (ng/L)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
91-92	1,2,3-Trichlorobenzene	0.03	7	18	0.030	0.023	0.038	0.018	0.014	0.023
91-92	1,2,4-Trichlorobenzene	0.03	18	18	0.101	0.087	0.117	0.062	0.053	0.071
91-92	1,4-Dichlorobenzene	0.27	5	18	0.295	0.133	0.543	0.179	0.081	0.331
91-92	1-Methylnaphthalene	0.31	6	18	0.282	0.233	0.336	0.172	0.142	0.205
91-92	Acenaphthylene	0.19	12	18	0.438	0.293	0.621	0.266	0.178	0.378
91-92	alpha-BHC	0.04	18	18	1.113	1.023	1.210	0.678	0.623	0.737
91-92	Atrazine	3.24	18	18	48.170	35.060	66.180	29.320	21.340	40.290
91-92	Benzo(a)anthracene/Chrysene	0.25	5	18	0.585	0.055	1.926	0.356	0.033	1.173
91-92	Benzo(a)pyrene	0.17	3	18	0.998	0.000	1.135	0.608	0.000	0.691
91-92	Bis-2-ethylhexyl phthalate	7.65	15	18	80.050	33.590	153.800	48.730	20.450	93.640
91-92	Butylbenzyl phthalate	2.03	10	18	3.346	2.164	4.867	2.037	1.317	2.963
91-92	Di-n-butyl phthalate	2.2	18	18	21.910	16.260	29.520	13.340	9.900	17.970
91-92	Di-n-octyl phthalate	0.44	14	18	1.252	0.900	1.680	0.762	0.548	1.022
91-92	Dieldrin	0.08	16	18	0.218	0.165	0.281	0.133	0.100	0.171
91-92	Diethyl phthalate	0.38	17	18	40.800	19.860	71.870	24.840	12.090	43.750
91-92	Dimethyl phthalate	0.44	16	18	2.660	1.728	3.857	1.619	1.052	2.348
91-92	Fluoranthene	0.26	14	18	0.478	0.377	0.595	0.291	0.229	0.362
91-92	gamma-BHC	0.05	18	18	0.327	0.305	0.351	0.199	0.186	0.214
91-92	Heptachlor	0.03	8	18	0.054	0.021	0.108	0.033	0.013	0.065
91-92	Metolachlor	0.49	18	18	9.404	8.401	10.530	5.725	5.114	6.408
91-92	Naphthalene	0.23	16	18	1.436	0.930	2.087	0.874	0.566	1.271
91-92	Phenanthrene	0.19	17	18	1.324	0.988	1.722	0.806	0.602	1.049
91-92	Total PCB	0.78	11	18	1.025	0.847	1.225	0.624	0.515	0.746

St. Lawrence River at Wolfe Island
April 1992 to March 1993
Aqueous Phase

Year	Parameter	Detection Limit	> Det Limit	# Samples	Mean Conc. (ng/L)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
92-93	1,2,4-Trichlorobenzene	0.03	8	15	0.084	0.038	0.153	0.057	0.026	0.103
92-93	1,2-Dichlorobenzene	0.25	3	15	0.198	0.149	0.257	0.134	0.101	0.174
92-93	1,4-Dichlorobenzene	0.27	7	15	0.320	0.236	0.421	0.217	0.160	0.285
92-93	1-Methylnaphthalene	0.31	5	15	0.363	0.192	0.607	0.246	0.130	0.411
92-93	2-Methylnaphthalene	0.61	4	15	0.509	0.402	0.633	0.345	0.272	0.428
92-93	Acenaphthylene	0.19	12	15	0.572	0.396	0.790	0.387	0.268	0.535
92-93	alpha-BHC	0.04	15	15	0.932	0.641	1.355	0.631	0.434	0.917
92-93	alpha-Endosulfan	0.04	4	15	0.033	0.024	0.043	0.022	0.016	0.029
92-93	Anthracene	0.18	4	15	0.238	0.060	0.582	0.161	0.041	0.394
92-93	Atrazine	3.24	15	15	75.180	46.020	122.800	50.880	31.150	83.120
92-93	Benzo(a)anthracene	0.25	6	15	0.312	0.180	0.493	0.211	0.122	0.333
92-93	Benzo(a)pyrene	0.17	6	15	0.416	0.101	1.035	0.281	0.068	0.700
92-93	Benzo(b+k)fluoranthene	0.3	10	15	0.801	0.449	1.290	0.542	0.304	0.873
92-93	Benzo(g,h,i)perylene	0.54	4	15	2.419	0.024	9.153	1.637	0.016	6.195
92-93	Bis-2-ethylhexyl phthalate	7.65	11	15	1559.000	19.400	5948.000	1055.000	13.130	4025.000
92-93	Butylbenzyl phthalate	2.03	11	15	2.849	2.487	3.242	1.928	1.683	2.194
92-93	Chrysene	0.23	5	15	0.213	0.136	0.312	0.144	0.092	0.211
92-93	Di-n-butyl phthalate	2.2	14	15	18.170	12.050	25.950	12.300	8.154	17.560
92-93	Di-n-octyl phthalate	0.44	14	15	3.631	1.753	6.430	2.457	1.186	4.351
92-93	Dibenzo(a,h)anthracene	0.95	3	15	4.440	0.002	10.750	3.005	0.001	7.273
92-93	Dieldrin	0.08	11	15	0.143	0.108	0.184	0.097	0.073	0.125
92-93	Diethyl phthalate	0.38	15	15	18.090	11.890	27.530	12.240	8.045	18.630
92-93	Dimethyl phthalate	0.44	11	15	3.021	1.271	5.795	2.044	0.860	3.922
92-93	Fluoranthene	0.26	12	15	0.521	0.383	0.685	0.352	0.260	0.464
92-93	Fluorene	0.55	5	15	0.495	0.366	0.650	0.335	0.247	0.440
92-93	gamma-BHC	0.05	14	15	0.311	0.233	0.403	0.210	0.158	0.273
92-93	Heptachlor	0.03	11	15	0.035	0.030	0.040	0.024	0.020	0.027
92-93	Indeno(1,2,3-c,d)pyrene	0.83	3	15	2.467	0.010	8.621	1.669	0.007	5.834
92-93	Metolachlor	0.49	15	15	9.480	7.235	12.420	6.416	4.896	8.406
92-93	Naphthalene	0.23	12	15	1.130	0.606	1.873	0.765	0.410	1.268
92-93	Phenanthrene	0.19	12	15	0.792	0.486	1.197	0.536	0.329	0.810
92-93	Pyrene	0.3	7	15	0.502	0.247	0.880	0.340	0.167	0.595
92-93	Total PCB	0.78	9	15	0.942	0.794	1.106	0.638	0.537	0.749

St. Lawrence River at Wolfe Island
April 1993 to March 1994
Aqueous Phase

Year	Parameter	Detection Limit	> Det Limit	# Samples	Mean Conc. (ng/L)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
93-94	1,2,3-Trichlorobenzene	0.03	6	22	0.026	0.022	0.031	0.018	0.015	0.021
93-94	1,2,4-Trichlorobenzene	0.03	22	22	0.079	0.068	0.092	0.055	0.047	0.063
93-94	1,4-Dichlorobenzene	0.27	19	22	0.484	0.430	0.541	0.335	0.298	0.375
93-94	1-Methylnaphthalene	0.31	10	22	0.321	0.275	0.371	0.222	0.191	0.257
93-94	alpha-BHC	0.04	22	22	1.095	0.967	1.240	0.759	0.670	0.860
93-94	alpha-Endosulfan	0.04	3	22	0.023	0.012	0.037	0.016	0.009	0.026
93-94	Atrazine	3.24	22	22	65.640	60.280	71.460	45.490	41.780	49.530
93-94	Bis-2-ethylhexyl phthalate	7.65	16	22	39.640	20.600	67.030	27.480	14.280	46.460
93-94	Butylbenzyl phthalate	2.03	3	22	1.158	0.645	1.872	0.803	0.447	1.298
93-94	Di-n-butyl phthalate	2.2	22	22	17.690	13.570	23.070	12.260	9.404	15.990
93-94	Di-n-octyl phthalate	0.44	18	22	1.291	0.899	1.776	0.895	0.623	1.231
93-94	Dieldrin	0.08	21	22	0.167	0.153	0.181	0.115	0.106	0.125
93-94	Diethyl phthalate	0.38	22	22	15.920	13.780	18.390	11.030	9.552	12.750
93-94	Dimethyl phthalate	0.44	22	22	1.243	1.082	1.430	0.862	0.750	0.991
93-94	Fluoranthene	0.26	20	22	0.383	0.350	0.418	0.265	0.242	0.290
93-94	gamma-BHC	0.05	22	22	0.370	0.326	0.420	0.256	0.226	0.291
93-94	Heptachlor	0.03	21	22	0.057	0.050	0.065	0.039	0.034	0.045
93-94	Metolachlor	0.49	22	22	11.330	10.620	12.090	7.853	7.361	8.378
93-94	Naphthalene	0.23	17	22	0.639	0.478	0.831	0.443	0.331	0.576
93-94	Pentachlorobenzene	0.03	4	22	0.023	0.018	0.029	0.016	0.012	0.020
93-94	Phenanthrene	0.19	22	22	0.805	0.739	0.877	0.558	0.513	0.608
93-94	Total PCB	0.78	22	22	1.543	1.425	1.671	1.070	0.988	1.158

St. Lawrence River at Wolfe Island
April 1994 to March 1995
Aqueous Phase

Year	Parameter	Detection Limit	> Det Limit	# Samples	Mean Conc. (ng/L)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
94-95	alpha-BHC	0.04	18	20	0.739	0.642	0.836	0.478	0.415	0.541
94-95	alpha-Endosulfan	0.04	6	20	0.017	0.013	0.023	0.011	0.008	0.015
94-95	Atrazine	3.24	20	20	64.206	60.117	68.572	41.549	38.903	44.374
94-95	Di-n-butyl phthalate	2.2	20	20	14.221	11.847	17.070	9.203	7.667	11.046
94-95	Di-n-octyl phthalate	0.44	19	20	3.363	1.726	6.554	2.176	1.117	4.241
94-95	Dieldrin	0.08	20	20	0.166	0.147	0.186	0.107	0.095	0.120
94-95	Diethyl phthalate	0.38	20	20	32.174	25.884	39.993	20.820	16.750	25.880
94-95	Dimethyl phthalate	0.44	20	20	1.756	1.555	1.983	1.136	1.006	1.283
94-95	Fluoranthene	0.26	20	20	0.427	0.391	0.467	0.277	0.253	0.302
94-95	gamma-BHC	0.05	20	20	0.293	0.270	0.318	0.190	0.175	0.206
94-95	Heptachor Epoxide	0.03	7	20	0.024	0.015	0.040	0.016	0.010	0.026
94-95	Metolachlor	0.49	20	20	12.102	11.518	12.716	7.832	7.454	8.229
94-95	Naphthalene	0.23	14	20	0.920	0.599	1.411	0.595	0.388	0.913
94-95	Phenanthrene	0.19	20	20	1.123	1.004	1.256	0.726	0.649	0.813
94-95	Pyrene	0.3	7	20	0.157	0.130	0.189	0.102	0.084	0.123
94-95	Total PCB	0.78	19	20	1.486	1.286	1.716	0.962	0.833	1.111

St. Lawrence River at Wolfe Island
April 1995 to March 1996
Aqueous Phase

Year	Parameter	Detection Limit	> Det Limit	# Samples	Mean Conc. (ng/L)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
95-96	alpha-BHC	0.04	8	10	0.427	0.368	0.495	0.256	0.221	0.297
95-96	Atrazine	3.24	10	10	67.417	50.315	90.333	40.434	30.177	54.178
95-96	Butylbenzyl phthalate	2.03	9	10	8.259	5.496	12.410	4.953	3.296	7.443
95-96	Di-n-butyl phthalate	2.2	10	10	41.155	27.316	62.006	24.683	16.383	37.188
95-96	Di-n-octyl phthalate	0.44	10	10	25.375	12.802	50.298	15.219	7.678	30.167
95-96	Dieldrin	0.08	10	10	0.158	0.134	0.185	0.095	0.081	0.111
95-96	Diethyl phthalate	0.38	9	10	41.057	35.521	47.457	24.624	21.304	28.463
95-96	Dimethyl phthalate	0.44	9	10	1.467	1.279	1.682	0.880	0.767	1.009
95-96	Fluoranthene	0.26	9	10	0.362	0.278	0.470	0.217	0.167	0.282
95-96	gamma-BHC	0.05	9	10	0.221	0.189	0.258	0.132	0.113	0.155
95-96	Metolachlor	0.49	10	10	23.759	16.457	34.302	14.250	9.870	20.573
95-96	Naphthalene	0.23	9	10	0.797	0.563	1.127	0.478	0.338	0.676
95-96	Phenanthrene	0.19	10	10	0.772	0.616	0.967	0.463	0.369	0.580
95-96	Pyrene	0.3	3	10	0.151	0.105	0.217	0.091	0.063	0.130
95-96	Total PCB	0.78	9	10	1.208	1.040	1.405	0.725	0.623	0.842

Appendix B

St. Lawrence River at Wolfe Island
April 1989 to March 1990
Solids Phase

Year	Parameter	Detection Limit	> Det. Limit	# Samples	Mean Conc. (ng/g)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
89-90	alpha-Endosulfan	3.1	3	12	3.510	0.920	8.460	0.002	0.001	0.006
89-90	Benzo(b+k)fluoranthene	191	3	12	168.200	78.230	304.500	0.117	0.054	0.211
89-90	Bis-2-ethylhexyl phthalate	1780	10	12	5728.000	2951.000	9740.000	3.970	2.045	6.751
89-90	Butylbenzyl phthalate	416	4	12	635.400	194.600	1433.000	0.440	0.135	0.993
89-90	Di-n-butyl phthalate	368	7	12	530.400	363.300	738.800	0.368	0.252	0.512
89-90	Di-n-octyl phthalate	348	4	12	342.000	214.700	508.300	0.237	0.149	0.352
89-90	Dieldrin	6.8	7	12	15.680	8.230	26.340	0.011	0.006	0.018
89-90	Fluoranthene	90	5	12	131.500	69.390	220.200	0.091	0.048	0.153
89-90	Heptachlor	3.2	3	12	2.550	1.490	3.990	0.002	0.001	0.003
89-90	Hexachlorobenzene	3.5	5	12	4.990	2.610	8.380	0.004	0.002	0.006
89-90	Mirex	4.4	6	12	5.710	3.840	8.060	0.004	0.003	0.006
89-90	p,p'-DDE	6.4	7	12	11.610	7.020	17.730	0.008	0.005	0.012
89-90	Phenanthrene	193	6	12	667.200	183.300	1578.000	0.462	0.127	1.094
89-90	Total PCB	89	5	12	137.000	66.130	242.700	0.095	0.046	0.168

St. Lawrence River at Wolfe Island
April 1990 to March 1991
Solids Phase

Year	Parameter	Detection Limit	> Det. Limit	# Samples	Mean Conc. (ng/g)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
90-91	1,2,4-Trichlorobenzene	2.5	6	12	3.750	2.350	5.600	0.004	0.002	0.005
90-91	Benzo(b+k)fluoranthene	191	8	12	280.200	214.800	356.900	0.258	0.198	0.328
90-91	Bis-2-ethylhexyl phthalate	1780	8	12	2323.000	1881.000	2825.000	2.136	1.730	2.597
90-91	Butylbenzyl phthalate	416	7	12	877.600	484.700	1426.000	0.807	0.446	1.311
90-91	Di-n-butyl phthalate	368	8	12	1149.000	511.300	2136.000	1.057	0.470	1.964
90-91	Dieldrin	6.8	8	12	12.090	8.070	17.170	0.011	0.007	0.016
90-91	Fluoranthene	90	4	12	87.810	56.800	127.700	0.081	0.052	0.117
90-91	Hexachlorobenzene	3.5	10	12	5.750	4.730	6.890	0.005	0.004	0.006
90-91	Mirex	4.4	8	12	5.980	5.030	7.020	0.006	0.005	0.007
90-91	p,p'-DDE	6.4	10	12	12.500	9.960	15.400	0.012	0.009	0.014
90-91	Phenanthrene	193	8	12	809.400	332.900	1573.000	0.744	0.306	1.446
90-91	Total PCB	89	8	12	213.200	126.100	330.700	0.196	0.116	0.304

St. Lawrence River at Wolfe Island
April 1991 to March 1992
Solids Phase

Year	Parameter	Detection Limit	> Det. Limit	# Samples	Mean Conc. (ng/g)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
91-92	1,2,3-Trichlorobenzene	1.3	5	20	1.060	0.710	1.510	0.001	0.001	0.001
91-92	1,2,4-Trichlorobenzene	2.5	14	20	3.890	3.190	4.690	0.003	0.003	0.004
91-92	1,3,5-Trichlorobenzene	1.2	3	20	0.820	0.540	1.180	0.001	0.000	0.001
91-92	Atrazine	856	5	20	18950.000	1.690	29630.000	15.460	0.001	24.170
91-92	Benzo(a)anthracene/Chrysene	193	7	20	474.500	111.200	1198.000	0.387	0.091	0.977
91-92	Benzo(a)pyrene	161	7	20	359.800	96.630	859.600	0.294	0.079	0.701
91-92	Benzo(b+k)fluoranthene	191	9	20	538.000	191.600	1128.000	0.439	0.156	0.920
91-92	Benzo(g,h,i)perylene	149	5	20	404.500	24.830	1430.000	0.330	0.020	1.167
91-92	Butylbenzyl phthalate	416	4	20	313.000	151.600	553.000	0.255	0.124	0.451
91-92	Di-n-butyl phthalate	368	7	20	1637.000	135.600	5517.000	1.336	0.111	4.500
91-92	Di-n-octyl phthalate	348	7	20	427.400	247.300	673.100	0.349	0.202	0.549
91-92	Dieldrin	6.8	7	20	7.420	4.820	10.740	0.006	0.004	0.009
91-92	Fluoranthene	90	9	20	263.000	86.650	572.900	0.215	0.071	0.467
91-92	Hexachlorobenzene	3.5	8	20	3.670	2.800	4.690	0.003	0.002	0.004
91-92	Indeno(1,2,3-c,d)pyrene	161	5	20	388.900	31.430	1316.000	0.317	0.026	1.074
91-92	Metolachlor	441	7	20	14840.000	24.630	45920.000	12.100	0.020	37.460
91-92	Mirex	4.4	8	20	10.810	2.940	25.690	0.009	0.002	0.021
91-92	p,p'-DDE	6.4	13	20	11.130	8.600	14.090	0.009	0.007	0.012
91-92	Phenanthrene	193	10	20	961.400	242.300	2358.000	0.784	0.198	1.923
91-92	Pyrene	168	4	20	121.000	65.170	199.900	0.099	0.053	0.163
91-92	Total PCB	89	7	20	82.900	73.680	92.820	0.068	0.060	0.076

St. Lawrence River at Wolfe Island
April 1992 to March 1993
Solids Phase

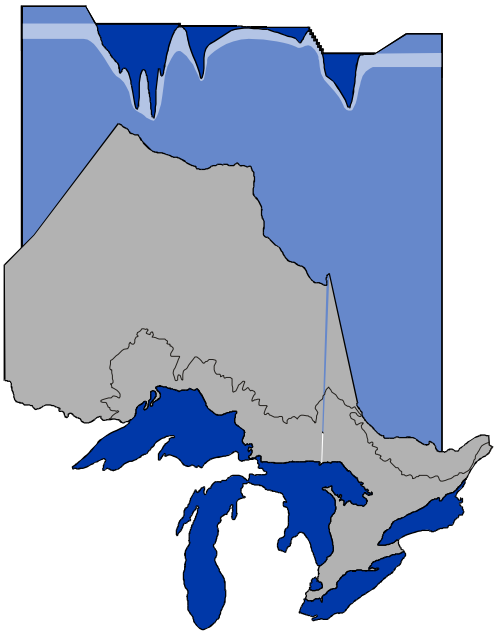
Year	Parameter	Detection Limit	> Det. Limit	# Samples	Mean Conc. (ng/g)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
92-93	1,2,4-Trichlorobenzene	2.5	8	16	2.960	2.360	3.660	0.002	0.002	0.003
92-93	Benzo(b+k)fluoranthene	191	4	16	157.300	117.400	205.000	0.110	0.082	0.143
92-93	Bis-2-ethylhexyl phthalate	1780	3	16	1182.000	598.700	2030.000	0.825	0.418	1.417
92-93	Di-n-butyl phthalate	368	5	16	1026.000	113.400	3256.000	0.716	0.079	2.272
92-93	Dieldrin	6.8	8	16	11.380	6.660	17.760	0.008	0.005	0.012
92-93	Fluoranthene	90	7	16	94.960	74.070	119.200	0.066	0.052	0.083
92-93	Hexachlorobenzene	3.5	6	16	4.990	2.080	9.600	0.004	0.002	0.007
92-93	Mirex	4.4	6	16	6.840	3.000	12.830	0.005	0.002	0.009
92-93	p,p'-DDE	6.4	4	10	6.600	4.750	8.830	0.005	0.003	0.006
92-93	Phenanthrene	193	5	16	368.300	75.720	976.000	0.257	0.053	0.681
92-93	Pyrene	168	6	16	173.500	125.000	232.500	0.121	0.087	0.162
92-93	Total PCB	89	7	16	643.600	47.320	2214.000	0.449	0.033	1.545

St. Lawrence River at Wolfe Island
April 1993 to March 1994
Solids Phase

Year	Parameter	Detection Limit	> Det. Limit	# Samples	Mean Conc. (ng/g)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
93-94	1,2,4-Trichlorobenzene	2.5	9	23	6.080	2.210	12.600	0.003	0.001	0.006
93-94	1,2-Dichlorobenzene	11.4	5	23	8.670	6.270	11.580	0.004	0.003	0.006
93-94	1,4-Dichlorobenzene	10.4	4	23	8.370	2.790	18.140	0.004	0.001	0.009
93-94	Benzo(a)pyrene	161	3	23	83.430	41.050	146.000	0.043	0.021	0.075
93-94	Benzo(b+k)fluoranthene	191	6	23	159.800	126.500	198.300	0.082	0.065	0.101
93-94	Di-n-butyl phthalate	368	9	23	454.700	278.700	687.600	0.232	0.142	0.351
93-94	Dieldrin	6.8	6	23	6.160	3.580	9.670	0.003	0.002	0.005
93-94	Fluoranthene	90	8	23	97.950	66.530	137.300	0.050	0.034	0.070
93-94	Hexachlorobenzene	3.5	14	23	4.450	3.760	5.210	0.002	0.002	0.003
93-94	Mirex	4.4	9	23	4.390	3.470	5.440	0.002	0.002	0.003
93-94	p,p'-DDE	6.4	19	23	10.530	8.940	12.280	0.005	0.005	0.006
93-94	Phenanthrene	193	8	23	206.400	141.100	288.000	0.106	0.072	0.147
93-94	Total PCB	89	15	23	112.100	98.400	126.800	0.057	0.050	0.065

St. Lawrence River at Wolfe Island
April 1994 to March 1995
Solids Phase

Year	Parameter	Detection Limit	> Det. Limit	# Samples	Mean Conc. (ng/g)	Lower 90% CI	Upper 90% CI	Mean Load (kg/d)	Lower 90% CI	Upper 90% CI
94-95	1,2,3,4-Tetrachlorobenzene	3	3	18	1.000	0.780	1.280	0.0002	0.0002	0.0003
94-95	1,2,4-Trichlorobenzene	2.5	10	18	4.580	2.850	7.360	0.0011	0.0007	0.0018
94-95	1,4-Dichlorobenzene	10.4	3	18	8.340	3.950	17.610	0.0021	0.0010	0.0044
94-95	Benz(a)anthracene	137	6	18	69.840	65.100	74.920	0.0173	0.0161	0.0186
94-95	Benzo(a)pyrene	161	5	18	110.450	68.110	179.100	0.0274	0.0169	0.0444
94-95	Bis 2-ethylhexyl phthalate	1780	12	18	3423.640	2217.120	5286.720	0.8485	0.5495	1.3103
94-95	Di-n-octyl phthalate	348	7	18	534.900	189.820	1507.290	0.1326	0.0470	0.3736
94-95	Dieldrin	6.8	11	18	6.340	5.420	7.420	0.0016	0.0013	0.0018
94-95	Fluoranthene	90	12	18	121.350	102.560	143.600	0.0301	0.0254	0.0356
94-95	gamma-BHC	3.5	8	18	4.440	3.160	6.220	0.0011	0.0008	0.0015
94-95	Hexachlorobenzene	3.5	7	18	2.700	2.260	3.240	0.0007	0.0006	0.0008
94-95	Hexachlorobutadiene	1.5	3	18	1.030	0.930	1.130	0.0003	0.0002	0.0003
94-95	p,p'-DDD	9.3	4	18	3.860	2.810	5.300	0.0010	0.0007	0.0013
94-95	p,p'-DDE	6.4	12	18	7.730	6.660	8.970	0.0019	0.0017	0.0022
94-95	Pentachlorobenzene	2.7	3	18	1.490	1.180	1.890	0.0004	0.0003	0.0005
94-95	Total PCB	89	15	18	144.260	123.650	168.320	0.0358	0.0306	0.0417



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