NIAGARA POWER PROJECT

RELICENSING

DESCRIBING CONTAMINANT LEVELS IN FISH IN LEWISTON RESERVOIR

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EXECUTIVE SUMMARY

The New York Power Authority is in the process of relicensing the Niagara Power Project, located in Lewiston, New York. As part of this process, stakeholders to the relicensing requested a study to describe the contaminant levels in fish in the Lewiston Reservoir. The study objective was to describe the concentration of contaminants, if any, in Lewiston Reservoir fish and to document available information regarding contamination of upper Niagara River fish.

The Lewiston Reservoir has a gross storage capacity of 74,250 acre-feet. The usable storage capacity is 69,500 acre-feet, or 94% of the gross storage capacity. When the reservoir is at maximum water surface elevation, the water depth is approximately 42 feet. At maximum reservoir drawdown, the average water depth of the wetted areas is just over 3 feet. Typically, the reservoir is drawn down during weekdays and refilled at night (although it is not fully refilled each day), with a gradual drawdown through the week to its lowest level at the end of the week. It is fully refilled on Saturday and Sunday.

Study components to meet the objectives included an evaluation of the sediment quality in the Lewiston Reservoir, the water quality in the reservoir and Niagara River, sedimentation processes in the reservoir, and an assessment of the bioavailability of any contaminants to selected Lewiston Reservoir species of fish, to provide a qualitative assessment of potential contaminant levels in these fish. This approach was chosen, in lieu of sampling fish tissue in the reservoir, due to the dynamic nature of the system. Specifically, the constant reservoir filling and water withdrawal during pumping and generation may affect fish residency time. Because residence time and past habitat utilization of fish prior to being pumped into the reservoir is unknown, it is uncertain whether contaminant levels observed in short-term fish sampling would be representative of the longer-term contaminant levels of reservoir fish.

Sediment Quality in Lewiston Reservoir

Sediment quality data are available from samples collected from the upper 6 inches of the sediment column in the Lewiston Reservoir in 1983, 2002, and 2003. Sediments in the reservoir were analyzed for metals, organic compounds, and grain size. On average, the upper sediments consisted of

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95% silt and clay with minor fractions of sand and gravel. Contaminant concentrations detected in the sediments were compared to New York State Department of Environmental Conservation (NYSDEC) guidelines for human health bioaccumulation, which relate to an assumed risk associated with estimates of consumption and bioaccumulation of contaminants in fish (NYSDEC 1999a). In addition, data were compared to probable effects concentrations (PEC) and threshold effects concentrations (TEC), which relate contaminant concentrations in sediment to biological effects on bottom-dwelling aquatic organisms (MacDonald et al. 2000); similar guidelines for aquatic life are available for metals from NYSDEC (1999a).

Contaminants that exceeded these guidelines in one or more samples included arsenic, lead, mercury, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, and mirex. Similar concentrations of these contaminants also were detected in some of the Niagara River samples collected in 2002. A comparison with other published sediment quality data from sediments in the Niagara River, compiled in Environmental Standards, Inc. (ESI) 2005, shows that the contaminant concentrations in the sediments of the Lewiston Reservoir are well within the range of concentrations measured in the sediments of the Niagara River.

Water Quality in Lewiston Reservoir and Niagara River

Water quality studies in the Niagara River have been conducted for more than 20 years by Environment Canada and NYSDEC. Environment Canada has maintained stations in the upper and lower Niagara River at Fort Erie and Niagara-on-the-Lake, respectively. NYSDEC has maintained a station in the lower Niagara River at Fort Niagara. Water quality data also were obtained by the URS Corporation in 2003. Contaminant concentrations in the surface water were compared to NYSDEC standards for survival and propagation of aquatic life and standards for the protection of human health from the consumption of fish (NYSDEC 1999b).

None of the measurements from these studies of organic compounds and heavy metals in the Niagara River since 1997 exceeded the NYSDEC water quality criteria for aquatic life effects, with the exception of iron. Several organic compounds (hexachlorobenzene, octachlorostyrene, dichloro-diphenyl-trichloroethane and metabolites, mirex, chlordane, dieldrin, and polychlorinated biphenyls) in

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the river exceeded the NYSDEC water quality criteria for human health (consumption of fish). However, heavy metal and organic compound concentrations measured by the URS Corporation in 2003 in the river (at the New York Power Authority river intake structure) and in the Lewiston Reservoir were all below the detection limit with the exception of monomethyl mercury and the organic compound delta-BHC.

Turbidity and suspended sediment data also were compiled. The suspended sediment concentrations are typically highest in the late fall and winter months as a result of storms stirring up sediments in Lake Erie and increasing sediment runoff from the tributaries to the Niagara River.

Sedimentation in Lewiston Reservoir

The net deposition rate in the Lewiston Reservoir was determined by comparing reservoir bottom topography/elevations between surveys conducted in September 1961 and in May 2001. In this 39.7-year period, the average sediment deposition rate for the entire reservoir was approximately 0.29 inches/year. Sediment is not deposited uniformly in the reservoir. The reservoir has areas of deposition and areas of no deposition or minor erosion. The primary depositional areas are located in the central parts of the reservoir. Generally, deposition also does not occur on shallow areas in the northern parts of the reservoir; these areas are exposed at low water levels during drawdown. Erosion of bottom sediment due to the pumping/draining of water in the reservoir appears to be limited to the immediate vicinity of the Lewiston Pump Generating Plant. One of the reasons for the limited erosion in this area is likely the large rock apron that was placed on the reservoir floor in front of the plant during construction.

Waves in the Lewiston Reservoir are generally not expected to generate scour of the bottom sediments. In the shallow areas of the reservoir that are exposed at low water elevations, the wave energy prevents settling sediment particles from permanent deposition. Particles settle in the deeper part of the reservoir. These settled particles are expected to contain chemical concentrations that reflect recent concentrations in suspended matter within the Niagara River. Minor scour, if any, of sediment may only occur in the reservoir within a few yards of the dikes.

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Bioavailability of Contaminants

Chemical or contaminant residues in fish are a function of chemical concentrations in the water and sediment in which they live, and the prey they ingest. Fish take up chemicals in the water column via respiration through the gills and dermal contact (Connell 1989, USEPA 2000). Chemicals in prey items are ingested. Chemicals in sediment can be ingested incidentally while the fish is preying on benthic macroinvertebrates such as insect larvae. Particulates, such as suspended sediment in the water column, can also be ingested. Sediment and water column phases are interconnected in an ecosystem through fate and transport processes such as hydrodynamics, diffusion, particle deposition, and resuspension.

The potential source of contaminants in the water column is Niagara River water that is pumped into the reservoir. Resuspension of sediment is likely limited to recent unconsolidated particulate matter that has settled to the reservoir floor, but has not become part of the permanent sediment column. Scour of older sediments from the reservoir floor appears to be very minor. In addition, dissolved contaminants leached from bottom sediments into the water column are expected to be an insignificant source due to the high exchange rate of water in the reservoir. Therefore, it appears that the exposure of contaminants to fish in the Lewiston Reservoir is generally similar to the exposure to contaminants in the upper Niagara River and its tributaries, in areas of lower flow velocity and fine-grained sediment.

Contaminant Levels of Lewiston Reservoir Fish

Contaminant levels in fish living in the reservoir were evaluated using water quality and sediment data collected from the river and the reservoir, probable exposure pathways, existing fish tissue data for the river, and the life histories of the fish that occur in the reservoir. Tissue analyses from fish in the Niagara River detected mercury and organic compounds. Contaminant levels of Lewiston Reservoir fish are expected to be similar to the range of levels exhibited in fish living in fine-grained sediment areas of the upper Niagara River, based on the comparable contaminant levels in the water and in the fine-grained sediment of the reservoir and river. Exposure pathways for fish in the Lewiston Reservoir and Niagara River are also similar in regard to water, sediment, and prey items. Additionally, fish in the reservoir may not be permanent long-term residents of the reservoir.

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There are no tissue data available for fish collected from the reservoir. However, based on an evaluation of the available fish tissue data from the river, it is expected that carp, which is a bottom-feeding omnivore, would contain the highest relative concentration of polychlorinated biphenyls and certain pesticides, when compared to other fish species. Other species such as yellow perch, rock bass, and smallmouth bass are expected to contain lower levels than carp, based on existing river tissue data.

Because contaminant levels in fish living in the reservoir are expected to be similar to fish in the upper Niagara River, the current health advisory provided by the New York State Department of Health for consumption of carp caught from the upper Niagara River should also be observed for carp caught from the Lewiston Reservoir. In addition, any future health advisories that may be developed for the upper Niagara River by the Ontario Ministry of the Environment and the New York State Department of Health should be considered applicable to Lewiston Reservoir fish.

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ABBREVIATIONS

Agencies

EC	Environment Canada
IJC	International Joint Commission
NOAA	National Oceanic and Atmospheric Administration
NYPA	New York Power Authority
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OMOE	Ontario Ministry of the Environment
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

Units of Measure

cfs	cubic feet per second
cm	centimeter
ft/s	feet per second

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gpm	gallons per minute
h	hour
kg	kilogram
km	kilometer
l	liter
mg	milligram
m/s	meters per second
ng	nanogram
NTU	Nephelometric Turbidity Unit
s	second
µg	microgram
USLSD	U.S. Lake Survey Datum 1935

Environmental

LEL	lowest effects level
PAH	polynuclear aromatic hydrocarbon
PEC	probable effects concentration
PCB	polychlorinated biphenyl

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RWW	recombined whole water
SEL	severe effects level
SVOC	semivolatile organic compound
TEC	threshold effects concentration
TOC	total organic carbon
TVS	total volatile solids
VOC	volatile organic compound

Miscellaneous

LPGP	Lewiston Pump Generating Plant
NPP	Niagara Power Project
NRTMP	Niagara River Toxics Management Plan
PID	Photoionization Detector
RIBS	Rotating Intensive Basin Study
RMNPP	Robert Moses Niagara Power Plant

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1.0 INTRODUCTION

The New York Power Authority (NYPA) is engaged in the relicensing of the Niagara Power Project (NPP), located in Lewiston, Niagara County, New York. The present operating license of the plant expires in August 2007. As part of its preparation for the relicensing of the Project, NYPA is developing information related to the ecological, engineering, recreational, cultural, and socioeconomic aspects of the Project.

1.1 Objective

The objective of the study was to describe the concentration of contaminants, if any, in Lewiston Reservoir fish and to document available information on contamination of upper Niagara River fish.

Study components to meet the objectives included an evaluation of the sediment quality in the Lewiston Reservoir, the water quality in the reservoir and Niagara River, sedimentation processes in the reservoir, and an assessment of the bioavailability of any contaminants to selected Lewiston Reservoir species of fish, to provide a qualitative assessment of potential contaminant levels in these fish. This approach was chosen, in lieu of sampling fish tissue in the reservoir, due to the dynamic nature of the reservoir, the uncertainty of fish residency time in the reservoir, and past habitat utilization in the upper river.

1.2 Project Description

The 1,880-MW (firm capacity) NPP is one of the largest non-federal hydroelectric facilities in North America. The NPP was licensed to the Power Authority of the State of New York (now NYPA) in 1957. Construction of the Project began in 1958, and electricity was first produced in 1961.

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1.2.1 Project Components

The NPP has several components that are described below and shown in Figure 1.2.1-1.

NYPA Intakes: Two adjacent intakes are located approximately 2.6 miles upstream of Niagara Falls, and have a total withdrawal capacity of 110,000 cfs.

Water Intake Conduits: Intake water bypasses Niagara Falls through two conduits with a length of 4.3 miles. Travel time is less than 30 minutes at an average velocity of approximately 14 feet per second (ft/s) (Norm Stessing, NYPA, pers. comm., 10/3/03). The conduits decrease in elevation by 11 feet between the intake and the forebay. The conduits have a width of 46 feet and a maximum height of 66 feet. The floor of the conduits is flat, and the ceiling is arched. The conduits are closed structures, built with reinforced concrete, and the wall and floor thickness is 2.5 feet. The total capacity of each conduit is 55,000 cfs.

Forebay: The forebay has an area of 71 acres and a capacity of 1.8 billion gallons. It is approximately 4,200 feet long, 500 feet wide, and 110 feet deep. The depth of water in the forebay varies between 35 and 63 feet, depending on operating conditions.

Robert Moses Niagara Power Plant: The Robert Moses Niagara Power Plant (RMNPP) is NYPA's main generating plant at the NPP with a head of approximately 300 feet. The plant has 13 turbine generators with a total discharge capacity of 102,000 cfs.

Lewiston Pump Generating Plant (LPGP): This plant is located at the east end of the forebay. Generally, water is pumped into the Lewiston Reservoir during non-peak-usage conditions (i.e., at night and on weekends). The water stored in the Lewiston Reservoir is used for power generation during peak-usage periods (i.e., daytime Monday through Friday). The plant has 12 pump turbines, although not all units are necessarily used during pumping or power generation. The total generating capacity of the station under normal conditions is approximately 330 MW, and the forebay serves as the tailwater during power generation.

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1.2.2 Lewiston Reservoir

The reservoir was built above ground and is surrounded by a rock-filled dike with an impervious clay core (Figure 1.2.2-1). It has a circumference of 6.5 miles. The reservoir has a gross storage capacity of 74,250 acre-feet (24 billion gallons). The usable storage capacity is 69,500 acre-feet, or 94% of the gross storage capacity. The maximum water surface elevation is 658 feet U.S. Lake Survey Datum 1935 (USLSD). When the reservoir is at maximum water elevation, the water depth is about 42 feet and the surface area is 1,900 acres (Figure 1.2.2-2). At maximum reservoir drawdown to an elevation of 620 feet, the average water depth of the wetted areas is just over 3 feet (NYPA 2002).

In general, from Monday through Friday, the daily net drawdown in the reservoir is approximately 6 to 7 feet. The water level of the reservoir is usually at its lowest near the end of the week (Figure 1.2.2-3). During the weekend, the reservoir is typically refilled, bringing the reservoir water level back to its maximum elevation on Monday morning. Typically, in the summer and fall, the reservoir is drawn down to an elevation of approximately 625 feet by Friday (see Appendix A for detailed water level data). At this elevation, 15% of the gross storage capacity remains in the reservoir. The withdrawal and regeneration pattern from July 16 to 23, 2001, reflects the typical high replacement rate of water in the reservoir (Figure 1.2.2-3). The changes in the storage capacity based on the pattern in Figure 1.2.2-3 relative to the total storage capacity are as follows:

Day	Time	Elevation (USLSD 1935)	Percent of Gross Storage Capacity Remaining
Monday	6:00h	658.0	100%
Monday	21:00h	636.4	44%
Tuesday	6:00h	648.9	76%
Tuesday	22:00h	630.1	28%
Wednesday	6:00h	643.3	62%
Wednesday	21:00h	623.7	12%
Thursday	6:00h	639.1	51%
Thursday	21:00h	622.8	10%
Friday	7:00h	639.3	51%

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Friday	20:00h	628.3	23%
Saturday	7:00h	644.3	64%
Saturday	19:00h	639.8	53%
Sunday	7:00h	655.8	94%
Sunday	19:00h	644.6	65%

During the non-tourist season (i.e., November through March), drawdown of the Lewiston Reservoir to 625 feet is less common since water levels are higher because storage in the lowest part of the reservoir is held in reserve in case it is needed to compensate for reduced diversion caused by ice problems (URS et al. 2005a; see Appendix A for water level data for year 2002).

On average, the water surface elevation in the reservoir is approximately two thirds of the maximum elevation. Between years 1991 and 2002, the mean annual water elevation in the reservoir ranged from 641.3 to 646.4 feet USLSD; the minimum annual water elevation ranged from 620.2 to 626.9 feet; the maximum elevation ranged from 658.5 to 658.8 feet (Table 1.2.2-1).

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TABLE 1.2.2-1

LEWISTON RESERVOIR - WATER LEVEL STATISTICS (IN FEET USLSD 1935)

Year	January			February			March			April		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
1991												
1992	629.1	658.2	647.3	639.6	658.1	649.4	632.8	658.2	649.2	625.5	658.2	641.8
1993	631.7	658.3	650.5	630.3	658.2	649.1	634.5	657.9	647.4	625.9	658.4	643.3
1994	632.6	658.2	647.9	637.7	658.2	648.1	637.0	657.5	648.1	622.0	658.6	639.6
1995	624.2	654.6	640.9	625.8	658.4	646.7	627.5	657.5	643.7	621.8	658.3	640.5
1996	628.0	658.2	646.8	633.2	658.4	647.2	633.0	658.0	646.1	627.5	658.2	642.6
1997	628.7	658.4	647.4	636.4	658.3	650.6	639.9	658.0	653.1	631.4	658.5	647.9
1998	636.3	658.5	649.7	631.5	657.2	649.7	630.8	658.1	648.3	631.0	658.4	644.2
1999	626.1	658.3	644.0	625.6	657.3	643.3	627.2	658.0	644.5	621.9	658.5	641.4
2000	627.3	656.9	643.8	624.4	658.2	643.5	630.0	658.6	644.3	635.2	658.3	648.3
2001	633.4	658.5	648.9	633.4	658.6	649.6	632.2	658.4	648.6	627.1	658.5	646.1
2002	628.6	657.9	648.2	632.0	658.3	649.3	629.2	658.0	646.0	626.3	657.9	643.5

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TABLE 1.2.2-1 (CONT.)

LEWISTON RESERVOIR - WATER LEVEL STATISTICS (IN FEET USLSD 1935)

Year	May			June			July			August		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
1991				623.4	657.8	642.1	626.3	655.9	641.2	622.1	658.5	640.4
1992	621.3	658.3	640.6	621.6	658.4	641.3	621.3	658.3	640.8	621.9	658.5	640.8
1993	621.7	658.2	640.4	621.1	658.2	640.6	624.3	658.0	640.2	621.0	658.5	640.4
1994	621.5	658.3	640.5	620.6	658.1	639.2	620.5	658.1	640.0	620.2	658.0	640.5
1995	622.0	658.2	640.3	621.7	658.4	639.7	620.7	658.6	640.6	620.3	658.3	640.0
1996	626.0	658.1	642.3	626.8	657.8	643.1	627.3	658.3	643.3	626.9	658.5	642.6
1997	628.8	658.6	646.3	630.7	658.2	645.6	630.4	657.8	645.3	627.9	657.8	642.5
1998	621.9	654.9	637.6	627.5	657.7	641.5	628.5	658.1	641.7	628.8	657.8	642.5
1999	626.0	658.3	642.6	625.8	658.2	641.4	624.1	658.4	642.5	623.9	658.6	642.6
2000	629.1	658.0	645.8	634.9	658.6	648.0	626.1	658.3	644.5	625.2	658.0	644.1
2001	629.1	658.8	645.1	621.4	658.2	640.9	622.8	658.6	640.9	622.4	658.5	642.2
2002	624.1	658.4	646.0	629.2	658.6	646.6	626.3	658.2	642.8	624.8	658.4	643.2

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TABLE 1.2.2-1 (CONT.)

LEWISTON RESERVOIR - WATER LEVEL STATISTICS (IN FEET USLSD 1935)

Year	September			October			November			December			Annual		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
1991	623.2	658.5	641.0	620.6	657.7	639.8	624.7	655.7	641.2	626.3	657.8	643.3	620.6	658.5	641.3
1992	626.1	658.0	642.7	622.9	658.2	640.7	630.5	657.9	647.2	640.1	656.6	650.1	621.3	658.5	644.3
1993	622.4	658.0	639.9	621.7	658.2	640.6	627.4	656.5	642.7	630.2	657.3	644.4	621.0	658.5	643.3
1994	620.6	658.3	640.7	621.6	658.4	642.7	622.0	657.1	640.8	620.3	653.5	637.2	620.2	658.6	642.1
1995	621.0	658.3	639.3	620.7	658.1	640.5	622.0	658.3	639.2	620.6	658.2	645.8	620.3	658.6	641.4
1996	627.7	658.5	643.4	626.6	658.2	644.5	627.2	657.0	642.2	629.1	657.2	646.8	626.0	658.5	644.2
1997	630.3	657.9	643.4	628.0	657.7	642.1	626.9	657.3	645.0	636.1	658.4	648.3	626.9	658.6	646.4
1998	624.0	658.4	640.9	626.6	658.0	641.3	625.1	658.3	643.3	625.9	657.9	642.6	621.9	658.5	643.6
1999	625.6	658.6	641.8	624.2	658.4	641.9	623.7	658.6	642.7	624.2	657.1	641.6	621.9	658.6	642.5
2000	624.4	658.6	642.0	629.0	658.2	645.0	628.3	656.8	646.0	632.5	657.8	647.4	624.4	658.6	645.2
2001	621.8	657.5	639.7	623.0	657.9	642.7	624.0	658.4	645.6	626.5	657.9	646.7	621.4	658.8	644.7
2002	622.8	658.4	640.7	621.9	658.3	641.7	625.1	657.4	642.2	632.3	658.5	648.1	621.9	658.6	644.8

Data from URS et al. 2005a.

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Non-Internet Public (NIP) information has been removed from the following page(s).

This material is contained in:
Volume 2
Section: Describing Contaminant Levels in Fish in Lewiston Reservoir

FIGURE 1.2.1-1

NIAGARA POWER PROJECT FEATURES

[NIP – General Location Maps]

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FIGURE 1.2.2-1

AERIAL PHOTOGRAPH OF NIAGARA POWER PROJECT LOOKING EAST

[NIP – General Location Maps]

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FIGURE 1.2.2-2

WATER DEPTHS AT FULL RESERVOIR – WATER ELEVATION AT 658 FEET

[NIP – General Location Maps]

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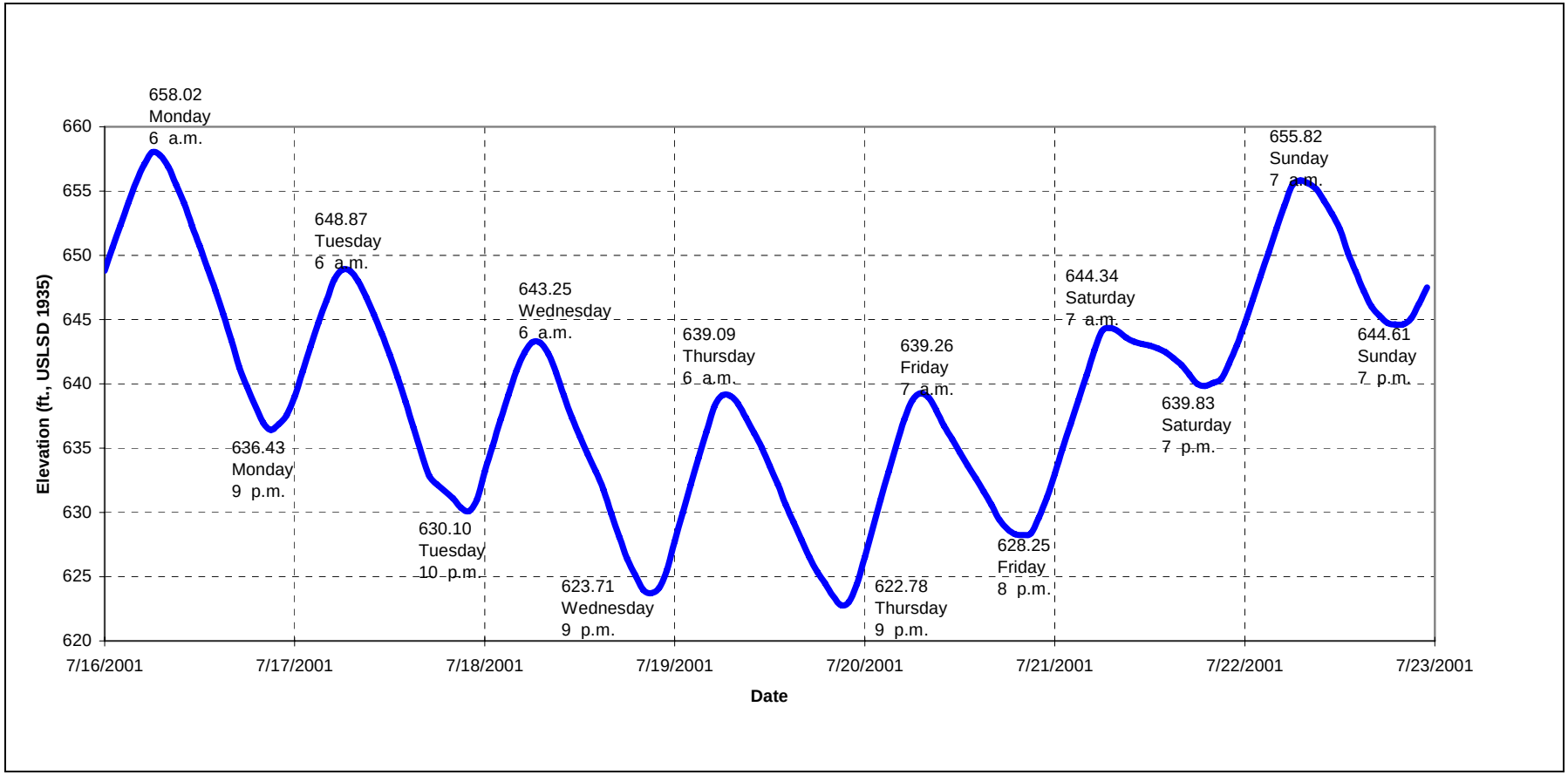
FIGURE 1.2.2-3

LEWISTON RESERVOIR – HOURLY WATER LEVEL GRAPH FOR JULY 16-23, 2001



Source: URS et al. 2005a

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2.0 SOURCES OF INFORMATION

This report relied primarily on the review of existing data and information. Data were obtained from the following key sources:

NYPA: Reports, book citations, unpublished data, scientific journal articles, photographs, maps, and other information relevant for this study; these sources are referenced in the appropriate report sections below. NYPA also provided copies of the First Stage Consultation Report (NYPA 2002), and the Water Level Report (URS et al. 2005a). NYPA further provided electronic data for a topographic survey conducted in the Lewiston Reservoir on September 6, 1961, and a bathymetric survey on May 14-21, 2001 (TVGA and C&C 2002). These survey data were processed to provide detailed information on sediment accumulation. In addition, the data were used to calculate the average annual sediment accumulation rate in the reservoir.

Literature Search: A computer literature search was conducted for references related to the Niagara River and Lewiston Reservoir, relevant for this study. Databases accessed included: Biological Sciences, Water Resources Abstracts, Aquatic Sciences and Fisheries Abstracts, and GeoRef.

Agency Contacts: Regulatory agencies were contacted for data on water quality, sediment quality, and fish tissue contaminants in the Niagara River and Lewiston Reservoir. These agencies included the following:

- New York State Department of Environmental Conservation (NYSDEC)
- New York State Department of Health (NYSDOH)
- Environment Canada (EC)
- U.S. Geological Survey (USGS)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Army Corps of Engineers (USACE)
- International Joint Commission (IJC)

In addition, a site visit was conducted on October 3, 2003. The visit included discussions of detailed operational procedures for the Lewiston Reservoir and review of the photo archive for the construction period. Additional observations of the reservoir surface were made on September 5, 2003, at low reservoir water surface elevations, as well as on October 15, 2003, during a high-wind event.

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3.0 SEDIMENT QUALITY IN LEWISTON RESERVOIR

Sediment studies in the Lewiston Reservoir were conducted in 1983, 2002, and 2003.

3.1 Sample Collection and Analysis

3.1.1 1983 Sediment Study

Sediment samples were collected on October 18, 1983 (Ecological Analysts 1984a). Samples were collected from the bottom of the Lewiston Reservoir at a proposed expansion intake construction area, located approximately 600 feet north of the Lewiston Pump Generating Plant (Figure 3.1.1-1). Three grab samples were collected at points approximately 10 feet apart from each other.

Samples were analyzed for polychlorinated biphenyls (PCBs) and USEPA Extraction Procedure toxicity (referred to as 'EP toxicity') to evaluate disposal options. The EP toxicity extract was tested for Primary Drinking Water Regulations metals, pesticides, and herbicides. However, the EP toxicity analyses are not suitable for comparison with current guidelines for sediment toxicity. Current sediment guidelines require analyses of the complete sample, or data analyses using the Equilibrium Partitioning (EqP) approach. Only the PCB data from the 1983 study are suitable for comparison.

3.1.2 2002 Sediment Study

Sediment grab samples were collected from October 1 to 3, 2002, at five locations in the Lewiston Reservoir using a Ponar dredge (RES-SED 05 to 09; Figure 3.1.1-1) (ESI 2005). Stations were located in areas of highest sediment accumulation rates in the reservoir. These grab samples represent the upper 6 inches of the sediment column.

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In addition, two samples from the upper Niagara River and two samples from the lower Niagara River were analyzed (Figure 3.1.2-1). The upper Niagara River samples were collected with a corer. The lower Niagara River samples were collected by stainless-steel trowel from shallow water. Samples submitted for analyses were representative of the upper 6 inches of the sediment column. Samples were analyzed for the following parameters:

Priority toxic pollutants of the Niagara River Toxics Management Plan (NRTMP): Eighteen pollutants were identified in 1987 for abatement by USEPA, NYSDEC, EC, and Ontario Ministry of the Environment (OMOE) (arsenic, lead, mercury, tetrachloroethylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, PCBs, mirex, chlordane, dieldrin, toxaphene, hexachlorobenzene, DDT and metabolites, dioxin (2,3,7,8-TCDD), and octachlorostyrene). These pollutants were selected based on their exceedances of water, fish, and sediment criteria values in the Niagara River.

Other Parameters: Other parameters consisted of total polynuclear aromatic hydrocarbons (PAHs), cadmium, total organic carbon (TOC), total volatile solids, and grain size.

Refer to ESI 2005 for the comprehensive analytical results including reporting detection limits.

3.1.3 2003 Sediment Study

Additional sediment samples were collected in the Lewiston Reservoir at 5 stations (RES-SED 13 to 17) (Figure 3.1.1-1) on October 30, 2003 (URS 2005). These additional samples were collected for two reasons: (1) to supplement the 2002 sediment study, which analyzed for limited volatile and semivolatile organic compounds; and (2) to estimate the volatization of contaminants from reservoir sediment that is exposed during low water levels. Samples were collected from the upper 6 inches of the sediment column. Samples were analyzed for 48 volatile organic compounds (VOCs), 70 semivolatile organic compounds (SVOCs), and total organic carbon (TOC). These compounds are listed in Tables 3.1.3-1 and 3.1.3-2. Comprehensive analytical results including reporting detection limits are provided in URS 2005.

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3.2 Sediment Quality Criteria

Sample analysis data were compared to the following sediment guidelines:

NYSDEC Technical Guidance for Screening Contaminated Sediments (NYSDEC 1999a): The criteria under the NYSDEC guidelines are based on two classes of contaminants: non-polar organic contaminants and metals.

Organic Contaminants: The non-polar organic contaminant approach is an equilibrium approach to estimate the biological impacts of a contaminant due to its affinity to sorb to organic carbon in the sediment. The criteria are normalized for organic carbon content. The NYSDEC guidelines for organic contaminants identify separate values for human health, bioaccumulation, and benthic aquatic life toxicity (both acute and chronic).

Metals: Metals criteria are derived from the guidelines of OMOE (Persaud et al. 1992) and the National Oceanographic and Atmospheric Administration (NOAA) (Long and Morgan 1990). The NYSDEC guidelines distinguish between lowest effect levels (LEL) and severe effect levels (SEL). The LEL is the level of sediment contamination that can be tolerated by the majority of benthic organisms, but still causes toxicity to a few species; the SEL is the concentration at which pronounced disturbance of the sediment dwelling community can be expected (Persaud et al. 1992).

Probable Effects Concentrations (PEC) and Threshold Effects Concentrations (TEC) (MacDonald et al. 2000): These guidelines are based on an evaluation of contaminant concentrations in sediments and observed biological effects on bottom-dwelling organisms. PECs are contaminant concentrations in the sediment, above which harmful effects are likely to be observed. TECs are contaminant concentrations in the sediment, below which adverse effects on bottom-dwelling organisms are not expected to occur, or above which toxicity may be observed.

3.3 Data Evaluation

Sediments in the Lewiston Reservoir studied in 2002 and 2003 consisted on average of 94.8% silt and clay, 4.7% sand, and 0.5% gravel (Table 3.3-1). This corresponds to the description of the sediment

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in the 1983 study, which was described as visually uniform, consisting of black mud 6 to 10 inches thick (Ecological Analysts 1984a). The silt and clay fraction in the sediments from the upper Niagara River stations, collected in 2002, was on average 30.5%; the silt and clay fraction in the lower Niagara River sediments was on average 12.0% (Table 3.3-1).

The TOC content in the Lewiston Reservoir samples ranged from 1.3 and 1.7%; the TOC content in the river samples ranged from 0.02 to 1.2% (Table 3.3-2). The total volatile solids (TVS) content in the Lewiston Reservoir samples ranged from 2.2 and 2.7%; the TVS content in the river samples ranged from 1.9 and 2.5% by weight.

A total of 19 contaminants were detected in the Lewiston Reservoir (Tables 3.3-2 and 3.3-3). Contaminant concentrations in the Lewiston Reservoir are discussed in more detail below based on the data presented in ESI (2005), Ecological Analysts (1984a), and URS (2005). Available sediment data from the Niagara River also are discussed.

3.3.1 Metals

All metals data were collected during the 2002 sediment study.

Arsenic: The mean arsenic concentration in the Lewiston Reservoir samples was below TEC and PEC guideline values, although sample RES-SED08 had an arsenic concentration above the TEC guideline value. The mean arsenic concentrations were slightly above the NYSDEC LEL guideline value. Arsenic concentrations in the Niagara River were below the guideline values.

Lead: The mean lead concentration and the concentrations of three individual samples in the Lewiston Reservoir samples were above the TEC and NYSDEC LEL guideline values. None of the samples exceeded the NYSDEC SEL and PEC values. Lead was also detected in the Niagara River samples with one lower Niagara River sample exceeding NYSDEC LEL and TEC guideline values.

Mercury: The mean mercury concentration in the Lewiston Reservoir samples was below TEC and PEC guideline values, although one sample exceeded the TEC value. However, the mean and individual mercury concentrations exceeded the NYSDEC LEL guideline value slightly. Two of the Niagara River

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samples also exceeded the TEC and NYSDEC LEL values. The highest mercury concentration of all samples was measured in the lower Niagara River.

3.3.2 Volatile Organic Compounds

During the 2002 study, one VOC was analyzed (tetrachloroethylene) (ESI 2005). Concentrations in the Lewiston Reservoir sediments were below the detection limit (Table 3.3-2). Tetrachloroethylene was detected in one of the lower Niagara River samples.

During the 2003 study (URS 2005) of 48 VOCs, only two VOCs had detectable concentrations. Acetone was detected at a mean concentration of 30 µg/kg; methyl ethyl ketone (2-butanone) was detected at a mean concentration of 6.3 µg/kg. There are no sediment NYSDEC or TEC/PEC guideline values for these compounds. Please note, however, that these two compounds are common laboratory contaminants, which could explain their detection at these low concentrations.

3.3.3 Semivolatile Organic Compounds

All analyzed SVOCs with detectable concentrations were PAHs. In the 2002 study (ESI 2005), only PAHs were analyzed. All analyzed PAH concentrations exceeded the NYSDEC guideline values for human health bioaccumulation. There are no benthic aquatic life toxicity guideline values from NYSDEC. PAHs in the Lewiston Reservoir also exceeded the TEC (but not the PEC) for those compounds with available guideline values. PAH concentrations in one of the lower Niagara River stations exceeded PEC guideline values and were higher than the average concentrations in the Lewiston Reservoir. The other three Niagara River stations had lower or no detectable PAH concentrations. Note that sample UNR-SED01, near the shoreline at the intakes, was diluted 200-fold due to interfering non-target compounds which increased the reporting detection limit to 71,000 µg/kg. This dilution probably explains the lack of PAH detections in the sample, which, based on field observations and Photoionization Detector (PID) readings, was expected to have detectable levels of PAHs. The PID measurement for this sample is 4.8 ppm. There was an organic odor associated with this sample.

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In the 2003 study (URS 2005) of 70 SVOCs, twelve compounds had detectable concentrations (Table 3.3-3). These PAHs were acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. All concentrations of PAHs for which NYSDEC guideline values for human health bioaccumulation are available exceeded their respective guideline values. (Please note that the guideline values vary between the 2002 and 2003 studies, as they are a function of the organic carbon content in the respective sediment samples.) NYSDEC guideline values for benthic aquatic life toxicity are available for anthracene, fluoranthene, phenanthrene, and pyrene; none of the detected PAHs exceeded their respective guideline values. The TEC guideline values were exceeded by anthracene, benzo(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, and pyrene. None of the PAHs exceeded the PEC guideline values.

3.3.4 PCBs

PCB concentrations measured in the Lewiston Reservoir in the 2002 study ranged from 44 to 190 µg/kg with a mean of 114 µg/kg. The mean concentrations exceeded the TEC guideline value of 60 µg/kg. However, concentrations were well below the PEC guideline value. PCB concentrations of all samples exceeded NYSDEC guideline values for human health bioaccumulation, as well as the NYSDEC LEL guideline value.

PCB concentrations in the two lower Niagara River stations were comparable or higher than concentrations in the Lewiston Reservoir. PCB analyses were below the detection limit in the upper Niagara River samples. The NYSDEC SEL guideline value was only exceeded by one of the lower Niagara River samples.

PCB concentrations in the 1983 study were slightly above the range of concentrations in the 2002 study with a mean concentration of 221 µg/kg (Table 3.3-2).

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3.3.5 Pesticides

Among the eight priority pollutant pesticides analyzed in the sediment, only mirex was detected in one sample in the Lewiston Reservoir during the 2002 study (Table 3.3-2). There are no TEC/PEC guideline values for mirex. The concentration exceeded the NYSDEC guideline value for both human health bioaccumulation and benthic aquatic life chronic toxicity. DDT compounds were reported as below the detection limits (ranging from 21 to 40 µg/kg) in sediment from the Lewiston Reservoir.

One of the upper Niagara River samples contained mirex at a significantly elevated concentration, similar to what was found in the Lewiston Reservoir samples. In addition, one upper and one lower Niagara River sample contained hexachlorobenzene (HCB); this compound was not detected in the Lewiston Reservoir samples.

3.3.6 Other Parameters

Octachlorostyrene and dioxin were not detected in either the Lewiston Reservoir or Niagara River samples that were collected in the 2002.

3.4 Sediment Quality – Discussion

Several contaminants detected in one or more sediment samples from the Lewiston Reservoir exceeded the NYSDEC and TEC guideline values, including arsenic, lead, mercury, PAHs, mirex, and PCBs. Elevated concentrations of some of these contaminants also were detected in Niagara River samples.

A comparison was made by ESI (2005) between 2002 sediment data from the Lewiston Reservoir and historic sediment data from the Niagara River (Table 3.4-1). The historic river data were collected by USEPA, NYSDEC, OMOE, and are published in technical journal articles (NYSDEC 1994a). Data were collected largely during the previous two decades from areas in the upper Niagara River including at the

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head of the river near Buffalo Harbor, Tonawanda Channel, near Bird Island and near Twomile Creek. Table 3.4-1 shows that contaminant concentrations measured in Lewiston Reservoir sediments were well within the range of contaminant concentrations measured in Niagara River sediments in the past. The maximum concentration in river sediments was higher than the maximum concentration of reservoir sediment for all compared compounds. This finding is logical since the only source of sediment in the Lewiston Reservoir is the Niagara River. Therefore, contaminants in sediment deposited in the Lewiston Reservoir are also expected to be found in the sediment in some locations in the Niagara River.

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TABLE 3.1.3-1

VOLATILE ORGANIC COMPOUNDS ANALYZED IN THE SEDIMENT IN 2003

1,1,1-Trichloroethane	Bromomethane
1,1,2,2-Tetrachloroethane	Carbon disulfide
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	Carbon tetrachloride
1,1,2-Trichloroethane	Chlorobenzene
1,1-Dichloroethane	Chloroethane
1,1-Dichloroethene	Chloroform
1,2-Dichloroethane	Chloromethane
1,2,4-Trichlorobenzene	Cyclohexane
1,2-Dibromo-3-chloropropane	Dibromochloromethane
1,2-Dibromoethane (Ethylene dibromide)	Dichlorodifluoromethane (Freon 12)
1,2-Dichlorobenzene	Ethylbenzene
cis-1,2-Dichloroethene	Isopropylbenzene (Cumene)
trans-1,2-Dichloroethene	Methyl acetate
1,2-Dichloropropane	Methylcyclohexane
1,3-Dichlorobenzene	Methyl ethyl ketone (2-Butanone)
cis-1,3-Dichloropropene	Methyl tert-butyl ether
trans-1,3-Dichloropropene	Methylene chloride
1,4-Dichlorobenzene	Styrene
2-Hexanone	Tetrachloroethene
4-Methyl-2-pentanone	Toluene
Acetone	Trichloroethene
Benzene	Trichlorofluoromethane (Freon 11)
Bromodichloromethane	Vinyl chloride
Bromoform	Xylene (total)

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TABLE 3.1.3-2

SEMIVOLATILE ORGANIC COMPOUNDS ANALYZED IN THE SEDIMENT IN 2003

1,1'-Biphenyl	Benzo(a)pyrene
1,2-4-Trichlorobenzene	Benzo(b)fluoranthene
1,2-Dichlorobenzene	Benzo(g,h,i)perylene
1,3-Dichlorobenzene	Benzo(k)fluoranthene
1,4-Dichlorobenzene	bis(2-Chloroethoxy)methane
2,4,5-Trichlorophenol	bis(2-Chloroethyl)ether
2,4,6-Trichlorophenol	bis(2-Chloroisopropyl)ether
2,4-Dicholorophenol	bis(2-Ethylhexyl)phthalate
2,4-Dimethylphenol	Butylbenzylphthalate
2,4-Dinitrophenol	Caprolactam
2,4-Dinitrotoluene	Carbazole
2,6-Dinitrotoluene	Chrysene
2-Chloronaphthalene	Dibenz(a,h)anthracene
2-Chlorophenol	Dibenzofuran
2-Methylnaphthalene	Diethylphthalate
2-Methylphenol (o-cresol)	Dimethylphthalate
2-Nitroaniline	Di-n-butylphthalate
2-Nitrophenol	Di-n-octylphthalate
3,3'-Dichlorobenzidine	Fluoranthene
3-Nitroaniline	Fluorene
4,6-Dinitro-2-methylphenol	Hexachlorobenzene
4-Bromophenyl-phenylether	Hexachlorobutadiene
4-Chloro-3-methylphenol	Hexachlorocyclopentadiene
4-Chloroaniline	Hexachloroethane
4-Chlorophenyl-phenylether	Indeno(1,2,3-cd)pyrene
4-Methylphenol (p-cresol)	Isophorone
4-Nitroaniline	Naphthalene
4-Nitrophenol	Nitrobenzene
Acenaphthene	N-Nitrosodimethylamine
Acenaphthylene	N-Nitroso-di-n-propylamine
Acetophenone	N-Nitrosodiphenylamine
Anthracene	Pentachlorophenol
Atrazine	Phenanthrene
Benzaldehyde	Phenol
Benzo(a)anthracene	Pyrene

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TABLE 3.3-1

GRAIN SIZE OF LEWISTON RESERVOIR AND NIAGARA RIVER SEDIMENTS

Grain Size	Percent by Weight of Total Sample																
	Upper Niagara River			Lower Niagara River			Lewiston Reservoir										
	UNR-SED 01	UNR-SED 02	Mean	LNR-SED 03	LNR-SED 04	Mean	RES-SED 05	RES-SED 06	RES-SED 07	RES-SED 08	RES-SED 09	RES-SED 13	RES-SED 14	RES-SED 15	RES-SED 16	RES-SED 17	Mean
Gravel	10.1	10.7	10.4	15.3	7.2	11.3	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.2	2.6	0.5
Sand	65.3	53.0	59.2	72.5	81.0	76.8	7.4	4.1	1.2	0.3	0.1	1.3	13.6	1.0	3.1	15.2	4.7
Coarse	*11.1*	*18.9*	*15.0*	*10.8*	*23.7*	*17.3*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*1.7*	*0.0*	*0.7*	*1.3*	*0.4*
Medium	*11.6*	*12.6*	*12.1*	*21.9*	*39.8*	*30.9*	*0.4*	*0.5*	*0.2*	*0.1*	*0.0*	*0.5*	*4.2*	*0.3*	*0.6*	*3.5*	*1.0*
Fine	*42.7*	*21.6*	*32.2*	*39.9*	*17.6*	*28.8*	*7.0*	*3.6*	*1.0*	*0.2*	*0.1*	*0.8*	*7.8*	*0.7*	*1.8*	*10.4*	*3.3*
Silt	19.3	7.8	13.6	10.2	9.9	10.1	59.0	63.1	61.4	55.9	44.5	98.7	84.1	99.0	96.7	82.2	94.8
Clay	5.3	28.5	16.9	2.0	1.8	1.9	33.6	32.9	37.4	43.9	55.4						
Total	100.0	100.0	100.0	100.0	99.9	100.0	100.0	100.1	100.0	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: Data source for Niagara River and Lewiston Reservoir (SED01 to 09) samples: ESI 2005. Data source for Lewiston Reservoir (SED13 to 17) samples: URS 2005.

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TABLE 3.3-2

CONTAMINANTS IN SEDIMENTS IN THE NIAGARA RIVER AND LEWISTON RESERVOIR – 2002 AND 1983 STUDIES

Parameter		Priority Pollutant	Units	Upper Niagara River		Lower Niagara River		Lewiston Reservoir						Range of Applicable NYSDEC Guidelines for Individual Samples (3, 5)						TEC/PEC Guideline Values (4)	
														Human Health Bioaccumulation		Benthic Aquatic Life Acute Toxicity		Benthic Aquatic Life Chronic Toxicity			
				UNR-SED01	UNR-SED02	LNR-SED03	LNR-SED04	RES-SED05	RES-SED06	RES-SED07	RES-SED08	RES-SED09	Mean – Lewiston Reservoir	Lowest Criterion	Highest Criterion	Lowest Criterion	Highest Criterion	Lowest Criterion/ LEL	Highest Criterion/ SEL	Threshold Effect Concentration (TEC)	Probable Effects Concentration (PEC)
Sediment Study - October 2002 (1)																					
Metals	Arsenic	●	mg/kg	1.6	4.7	4.9	2.2	5.0	5.4	5.9	**14.5**	**8.7**	**7.9**					6.0	33	9.8	33
	Lead	●	mg/kg	22.2	6.8	**39.7**	4.2	**36.8**	**32.6**	**31.6**	**72.4**	**46.6**	**44.0**					31.0	110	35.8	128
	Mercury	●	mg/kg	**0.265**		**0.577**		**0.206**	**0.169**	**0.171**	**0.175**	**0.173**	**0.179**					0.15	1.30	0.18	1.06
VOCs	Tetrachloroethylene (TCE)	●	µg/kg			0.62								9.44		na		na		na	
SVOCs (PAHs)	Benzo(a)anthracene	●	µg/kg			**2,100**		**480**	**360**	**280**	**450**	**260**	**366**	15.34	21.84	na		na		108	1,050
	Benzo(a)pyrene	●	µg/kg		**26**	**2,900**		**710**	**570**	**490**	**840**	**560**	**634**	0.35	21.84	na		na		150	1,450
	Benzo(b)fluoranthene	●	µg/kg		**27**	**2,600**		**860**	**670**	**670**	**1,100**	**750**	**810**	0.35	21.84	na		na		na	
	Benzo(k)fluoranthene	●	µg/kg			**2,400**		**630**	**540**	**380**	**690**	**480**	**544**	15.34	21.84	na		na		na	
	Chrysene	●	µg/kg		**55**	**2,200**		**800**	**640**	**620**	**1,100**	**640**	**760**	0.35	21.84	na		na		166	1,290
	Total PAHs		µg/kg		405	**22,000**		**7,400**	**6,100**	**5,500**	**9,500**	**6,000**	**6,900**	na		na		na		1,610	22,800
PCBs	Total PCBs	●	µg/kg			**470**	**120**	**190**	**170**	**110**	**44**	**57**	**114**	0.0002	0.0134	687	46,381	5	324	59.8	676
Pesticides	Mirex	●	µg/kg	**6,400**				**53**						0.28	1.06			3	11	na	
	Chlordane (alpha, gamma, oxychlordane)	●	µg/kg																	3.24	17.6
	Dieldrin	●	µg/kg																	1.9	61.8
	Toxaphene	●	µg/kg																	na	
	Hexachlorobenzene (HCB)	●	µg/kg	**21,000**		**190**								0.04	2.52	36,506	107,156	22,391	65,726	na	
	4,4'-DDD	●	µg/kg																	4.88	28
	4'4-DDE		µg/kg																	5.28	31
	4,4'-DDT		µg/kg																	4.16	572
Dioxin	2,3,7,8-TCDD	●	µg/kg																	na	
Others	Octachlorostyrene (OCS)	●	µg/kg																	na	
Parameters	Total Organic Carbon		%	0.40	0.03	1.18	0.02	1.51	1.34	1.68	1.53	1.66	1.54							na	
	Total Volatile Solids		%WW	1.89	2.08	2.23	2.52	2.67	2.67	2.32	2.21	2.46	2.47							na	
Sediment Study – October 1983 (2)							Sample No.:	1	2	3											
PCBs		●	µg/kg					**232**	**241**	**189**			**221**	nd		nd		nd		59.8	676

(1) ESI 2005; (2) Ecological Analysts 1984a; (3) NYSDEC 1999a; (4) MacDonald et al. 2000. (5) For organics, the lowest and highest criteria were calculated based on the organic carbon concentrations of the collected samples with detected concentrations. For metals, Lowest Effects Levels (LEL) and Severe Effects Levels (SEL) apply. Blank data fields = Concentrations are below the detection limit. Bold values = Value exceeds any of one of the NYSDEC or PEC/TEC guidelines. na = Not available. nd = Not available due to missing organic carbon concentration data in the sediment; concentrations most likely exceed guideline values.

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TABLE 3.3-3

CONTAMINANTS IN SEDIMENTS IN NIAGARA RIVER AND LEWISTON RESERVOIR - 2003 STUDY

Parameter		Priority Pollutant	Units	Lewiston Reservoir						Range of Applicable NYSDEC Guidelines Values for Individual Samples (2, 4)						TEC/PEC Guideline Values (3)	
										Human Health Bioaccumulation		Benthic Aquatic Life Acute Toxicity		Benthic Aquatic Life Chronic Toxicity			
				RES-SED13	RES-SED14	RES-SED15	RES-SED16	RES-SED17	Mean - Lewiston Reservoir	Lowest Criteria	Highest Criteria	Lowest Criteria	Highest Criteria	Lowest Criteria	Highest Criteria	Threshold Effect Concentration (TEC)	Probable Effects Concentration (PEC)
Sediment Study – October 2003 (1)																	
VOCs	Acetone		µg/kg	25.5	26.0	25.6	31.1	44.0	30.4	na		na		na		na	
	Methyl Ethyl Ketone (2-Butanone)		µg/kg	5.23	5.64	4.79	6.45	9.23	6.27	na		na		na		na	
SVOCs	Acenaphthylene		µg/kg	94		113		130		na		na		na		na	
(PAHs)	Anthracene		µg/kg	**79**		**101**		**107**		na		15,973	19,128	1,733	2,076	57.2	845
	Benzo(a)anthracene	●	µg/kg	**217**	**54**	**129**	**64**	**300**	**153**	15	25	na		na		108	1,050
	Benzo(a)pyrene	●	µg/kg	**250**	**66**	**167**	**93**	**356**	**186**	15	25	na		na		150	1,450
	Benzo(b)fluoranthene	●	µg/kg	**259**	**70**	**162**	**141**	**393**	**205**	15	25	na		na		na	
	Benzo(g,h,i)perylene		µg/kg	**299**		**269**		**255**		21	25	na		na		na	
	Benzo(k)fluoranthene	●	µg/kg	**176**		**117**	**114**	**269**		15	25	na		na		na	
	Chrysene	●	µg/kg	**261**	**70**	**181**	**102**	**386**	**200**	15	25	na		na		166	1,290
	Fluoranthene		µg/kg	**439**	103	262	144	**576**	305	na		na		12,138	19,788	423	2,230
	Indeno(1,2,3-cd)pyrene		µg/kg	**573**		**347**		**569**		21	25	na		na		na	
	Phenanthrene		µg/kg	144		90		197		na		na		1,944	2,328	423	1,170
	Pyrene		µg/kg	**307**		**202**	140	**364**		na		104,423	170,235	11,436	18,643	195	1,520
Others	Total Organic Carbon		%	1.94	1.66	1.93	1.19	1.62	1.54	na							

(1) URS 2005; (2) NYSDEC 1999a; (3) MacDonald et al. 2000; (4) For organics, the lowest and highest criteria were calculated based on the organic carbon concentrations of the collected samples with detected concentrations. Blank data fields = Concentrations are below the detection limit. Bold values = Values exceeds any of one of the NYSDEC or PEC/TEC guidelines. na = Not available.

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TABLE 3.4-1

COMPARISON OF CONSTITUENT LEVELS IN LEWISTON RESERVOIR WITH HISTORIC NIAGARA RIVER DATA

Compound	Units	Range in Reservoir Samples (ESI 2005)	Median Historical Data Range (various sources)	Maximum Historical Data Range (various sources)
PAHs	µg/kg	5,500 - 9,500	710 - 39,000	6901 - 210,000
PCBs	µg/kg	44 - 190	23 - 2,140	136 - 26,000
Lead	mg/kg	32 - 72	13 - 250	32 - 1,760
Mercury	mg/kg	0.16 - 0.21	0.02 - 0.65	0.11 - 1.83
Mirex	µg/kg	53	4 - 86 *(1)*	6,400 *(2)*

Notes: Data from ESI 2005. (1) Actual range, not the median range. (2) Concentration of single sample collected in the upper Niagara River.

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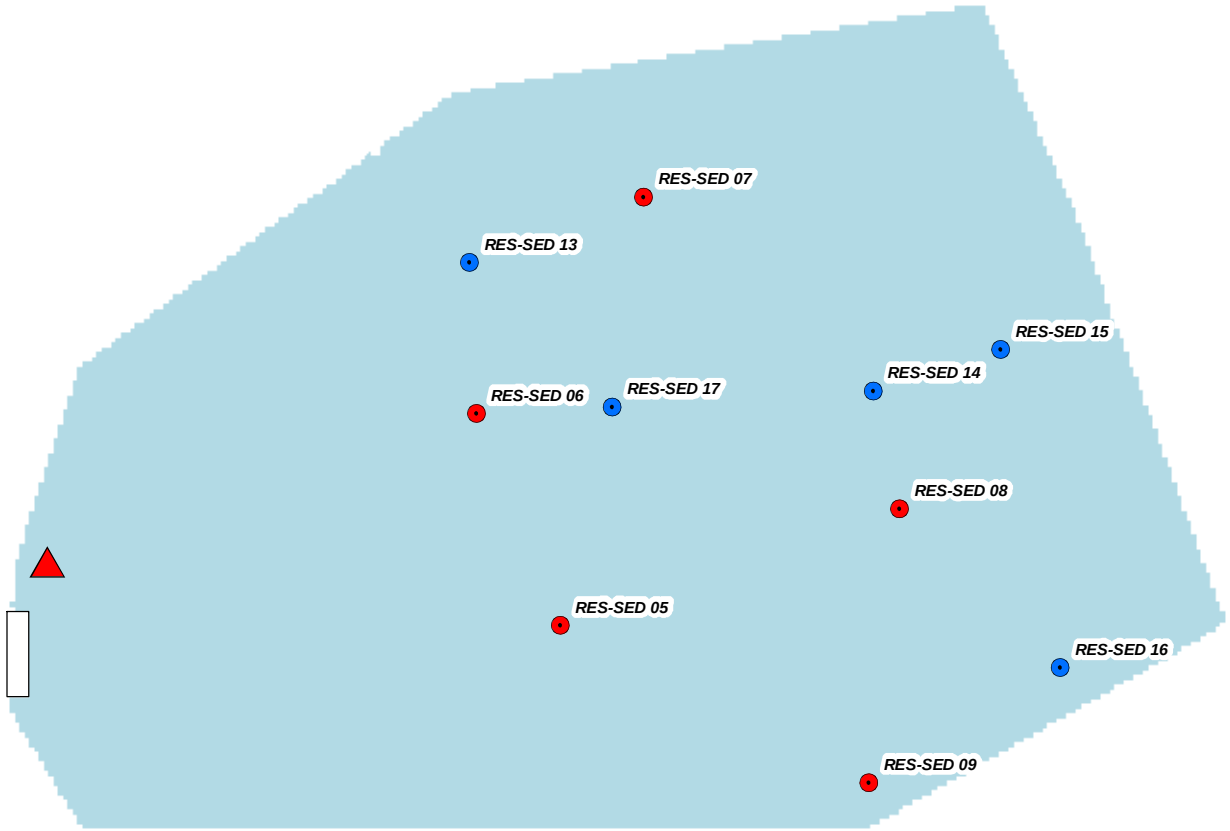
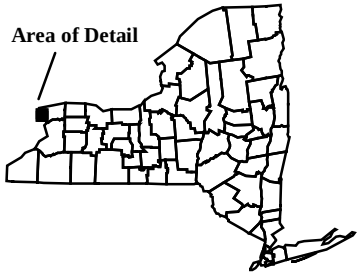


NIAGARA POWER PROJECT (FERC NO. 2216)
DESCRIBE CONTAMINANT LEVELS
IN FISH IN LEWISTON RESERVOIR

Lewiston Reservoir
Sediment Sampling Locations

LEGEND

- Lewiston Pump Generating Station
- Environmental Standards, 2003
- URS et al. Air Quality Impact report [in prep.]
- Ecological Analysts, 1984a



0 1,000 2,000 3,000 4,000 Feet

Figure 3.1.1-1

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Non-Internet Public (NIP) information has been removed from the following page(s).

This material is contained in:
Volume 2
Section: Describing Contaminant Levels in Fish in Lewiston Reservoir

FIGURE 3.1.2-1

NIAGARA RIVER SEDIMENT SAMPLING LOCATIONS

[NIP – General Location Maps]

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4.0 WATER QUALITY

4.1 Water Quality Studies

Water quality data from the Niagara River and Lewiston Reservoir have been collected through the following ongoing programs or short-term studies:

Environment Canada: Upstream/Downstream Niagara River Monitoring Program (ongoing)

NYSDEC: Rotating Intensive Basin Survey (RIBS) (ongoing)

NYSDEC: Compliance surveys (1993)

URS: Surface water quality monitoring program (2003)

Ecological Analysts (for American Bechtel): Lewiston Reservoir Aquatic Ecology and Water Quality Studies (1982/83)

These programs or studies are summarized below.

4.1.1 Environment Canada: Upstream/Downstream Niagara River Monitoring Program (1975-present)

EC established a water quality monitoring station at Niagara-on-the-Lake at the mouth of the Niagara River in 1975, and a second station at Fort Erie at the head of the river in 1983 (Figure 4.1.1-1). The monitoring program, also known as the Upstream/Downstream Program, was designed to monitor the concentrations and loads of toxic contaminants in the river over time. Monitoring data and trend analyses from these stations were a key component in the NRTMP, which was set up to reduce the toxic contaminant load in the river.

Data were collected at weekly intervals between 1986 and 1997 (EC 2000). The interval was changed to biweekly thereafter. Sampling between the two stations is offset by 15 to 18 hours to allow for travel time of the Niagara River water from the upstream to the downstream station. Sample analyses

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and their detection limits are listed in Table 4.1.1-1. Organics were analyzed in the dissolved and suspended particulate phases, following EC methodologies (NLET 1997). Metals were only analyzed as whole water (i.e., combined particulate and dissolved phases) also following EC methodologies (NLET 1994); the exception was mercury, which was tested in the particulate phase only. The EC methodologies are comparable to USEPA methods and were approved by USEPA for this Niagara River program (Don Williams, Environment Canada, pers. comm., 2/10/04).

Data are available up to March 1999; data collected subsequently have not yet been released (Don Williams, Environment Canada, pers. comm., 10/16/03). Based on these analytical data, EC estimated the annual mean concentrations and loads using the Maximum Likelihood Estimation method (MLE), as described in El-Shaarawi (1989) and EC (2000). Mean flow rates and suspended particulate matter concentrations for this period are presented in Table 4.1.1-2. Contaminant concentrations from the period 4/1997 to 3/1999 are presented in Table 4.1.1-3 (from Merriman and Kuntz 2002). Data from each sampling event during this period are attached as Appendix B. Loads computed from 1986 to 1997 data are attached as Appendix C.

4.1.2 NYSDEC: Rotating Intensive Basin Survey (ongoing)

NYSDEC monitors the water quality of the Niagara River through the RIBS program. On the upper Niagara River, water quality monitoring has not been conducted since at least 1988. On the lower Niagara River, water quality sampling has been conducted at a station at Fort Niagara (river mouth at Lake Ontario) since at least 1983 (Figure 4.1.1-1). Samples are collected approximately six times during a sample year. Measured parameters have changed over the years; they include physical properties (temperature, turbidity, pH, specific conductance), as well as nutrients, metals (total and dissolved), and selected organic compounds. Water quality data are available through 2001. Monitoring data from 1999 through 2001 are presented in Table 4.1.2-1.

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4.1.3 NYSDEC: Compliance Surveys on Niagara River (1993)

In addition to the RIBS program, NYSDEC collects data on the river through compliance surveys (James Vogel, NYSDEC, pers. comm., 9/26/03). Specifically, water quality testing for priority pollutants is conducted at irregular intervals for industries along the Niagara River. Aside from the effluent, the intake water is tested for comparison with the effluent quality. Station locations and data sheets for these samples are provided in Appendix D. Analyzed compounds included VOCs, SVOCs, pesticides, PCBs, and metals. Concentrations for these compounds were largely below the detection limit. Specifically, data from the following water intake surveys were provided by NYSDEC:

Dupont, City of Niagara Falls (9/10/93): Detected compounds consisted of dichlorobenzoic acid derivate (estimated), bis(2-ethylhexyl)phthalate (estimated), and endosulfan sulfate.

Occidental Chemical Company, City of Niagara Falls (9/28/93): Detected compounds consisted of substituted cycloalkanes and alkenes (estimated), gamma-BHC (estimated), delta-BHC, and heptachlor epoxide.

Dupont Yerkes, Town of Tonawanda (9/23/93): Detected compounds consisted of diethylphthalate (estimated), substituted cycloalkane (estimated), alcohols (estimated), and zinc.

FMC Corporation, Town of Tonawanda (9/28/93): Detected compounds consisted of diethylphthalate (estimated), substituted cycloalkane (estimated), alcohols (estimated), lead, and zinc.

General Motors Corporation, Town of Tonawanda (9/23/93): Detected compounds consisted of diethylphthalate (estimated) and recoverable oil and grease.

4.1.4 URS: Surface Water Quality Monitoring Program – Niagara River and Lewiston Reservoir (2003)

As part of Project relicensing, NYPA through its consultant URS, collected water quality data for the waters within the Project area (URS et al. 2005b, URS and Gomez and Sullivan 2005). Concentrations of heavy metals (cadmium, lead, mercury), arsenic, VOCs (28 compounds), SVOCs (65 compounds), pesticides (19 compounds), PCBs, dioxins, and furans were measured at the following stations (Figure 4.1.4-1) (URS et al. 2005b): Niagara River at the NYPA intake, conduits (one station in

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each conduit), forebay, and the Lewiston Reservoir (two stations). A full list of the parameters is presented in URS et al. 2005b. Samples were collected on October 7 at all stations with the exception of the eastern reservoir station, which was sampled on October 9, 2003, and during November of 2003. The concentrations of most of the heavy metals and organic compounds were below the detection limit. The concentration of monomethyl mercury, an organic form of mercury, was detected above detection limits in the eastern reservoir surface water sample collected on October 9, 2003. In addition, the organic compound delta-BHC was detected in the November 2003 samples.

Turbidity data were collected from the upper and lower Niagara River, tributaries to the river, and the Lewiston Reservoir between May and October 2003 (Figure 4.1.4-2) (URS and Gomez and Sullivan 2005). Data are summarized for the seven turbidity stations from the river and reservoir (Table 4.1.4-1).

4.1.5 Lewiston Reservoir Aquatic Ecology and Water Quality Studies (1982/83)

Water quality surveys were conducted in the Lewiston Reservoir in November 1982 and June/July 1983 for physical and chemical properties, including temperature, pH, dissolved oxygen, conductivity, transparency, alkalinity, hardness, nutrients, suspended sediments, turbidity, chlorophyll, and coliform (Ecological Analysts 1984b). Only the suspended sediment and turbidity values are relevant for this study. The water was not analyzed for heavy metals and organic compounds.

4.1.6 Other Water Quality Surveys along the Niagara River

Aside from these studies, there are no regular monitoring programs (Bill Andrews, NYSDEC, pers. comm., 9/29/03; Don Williams, EC, pers. comm., 9/29/03). Also, USACE does not conduct any monitoring (David Melfy, USACE, Great Lakes and Ohio River Division, pers. comm., 9/29/03). Additional data may be available through more sporadic agency programs or through universities, but were not located. However, none of these programs are likely to be as comprehensive or relevant as the programs discussed above.

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4.2 Water Quality Standards

Water quality data of this study were compared to NYSDEC standards for survival and propagation of aquatic life (chronic and acute) and standards for the protection of human health from the consumption of fish (NYSDEC 1999b). The water classification assigned to the Niagara River is Class A-Special. Class A-Special waters are used as a source of drinking water and food preparation, primary and secondary contact recreation, and fishing. Class A-Special waters shall also allow for the propagation and survival of fish.

4.3 Data Evaluation

4.3.1 Organic Compounds and Metals

None of the organic compounds and metals measured by EC and NYSDEC in the Niagara River since 1997 exceeded the NYSDEC water quality standards for aquatic life with the exception of iron in the EC data set (Tables 4.1.1-3 and 4.1.2-1). However, several organic compounds exceeded the NYSDEC criteria for the protection of human health from consumption of fish (there are no criteria for metals). These compounds were hexachlorobenzene, octachlorostyrene, DDT and metabolites, mirex, chlordane, dieldrin, and PCB.

Heavy metals and organic compound concentrations measured by URS et al. (2005b) on October 7 and 9, 2003, in the Lewiston Reservoir and at the NYPA intake in the Niagara River were not detected with the exception of monomethyl mercury and the pesticide delta-BHC. The detection limits for most of the parameters were lower than the NYSDEC water quality standards for aquatic health (acute and chronic) and human health (fish consumption). The detection limits for the following compounds were above the NYSDEC standards, although none of them were detected in the surface water samples: hexachlorobenzene, hexachlorobutadiene, hexachlorocyclopentadiene, hexachloroethane, pentachlorophenol, DDD, DDE, DDT, aldrin, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, methoxychlor, toxaphene, and PCBs.

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In general, the water quality in the Lewiston Reservoir is similar to the water quality in the upper Niagara River near the intake for the following reasons:

Turnover Rate: The turnover rate of the water in the reservoir is high (see Section 1.2).

Contaminant Sources: Niagara River water is the principal source of contaminants in the water column. Resuspension of bottom sediments in the reservoir is considered a limited source (see Section 5.0).

Transport: Lack of settling of sediments in the conduits between the river and the reservoir due to high flow velocities.

4.3.2 Turbidity and Suspended Matter

In the upper Niagara River, just downstream from Lake Erie (Station TUNR-03), the turbidity ranged from 1.3 to 16.4 NTU with a mean of 4.1 NTU in the monitoring period between May and October 2003 (Table 4.1.4-1; Figure 4.3.2-1). Near the NYPA intake (Station TUNR-02), the turbidity range in the Niagara River was similar (1.2 to 16.1 NTU) to the upstream station, but the mean was higher (5.2 NTU). The higher mean value was likely caused by suspended sediment contributions from tributaries that discharge into the Niagara River. These tributaries had turbidity values that often exceeded 10 NTU during the same survey period (URS and Gomez and Sullivan 2005).

The turbidity in the Lewiston Reservoir ranged from 1.5 to 7.1 NTU with a mean of 2.6 NTU in the monitoring period between May 30 and October 16, 2003 (Table 4.1.4-1; Figure 4.3.2-1). The mean turbidity was substantially lower than the mean turbidity measured in the Niagara River at the intake. The lower turbidity in the reservoir could be a result of natural variability, or partial settling of the suspended matter in the reservoir.

Turbidity and suspended sediment data for the Lewiston Reservoir are also available from the water quality survey in 1982/83 (Ecological Analysts 1984b). The turbidity ranged from 1 to 6 NTU, with the exception of one sample reaching 15 NTU; the mean turbidity was 2.6 NTU. The suspended sediment concentrations ranged from 1 to 8 mg/l, with the exception of one sample reaching 31 mg/l; the mean concentration was 3.8 mg/l.

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Particulate matter concentrations in the Niagara River are typically highest during the late fall and winter months, as shown in the data from EC from 1997 to 1999 (Figure 4.3.2-2). This variability is a result of high winds stirring up Lake Erie sediments, heavy rainfall, and/or runoff from melting snow during this period. The mean suspended particulate matter concentration (equivalent to 'total suspended matter') was 3.9 mg/l in the upper Niagara River at the Fort Erie station, and 6.8 mg/l in the lower Niagara River at the Niagara-on-the-Lake station. During the peak months from October to February, the suspended particulate matter concentrations reached a maximum of 73 mg/l.

4.4 Water Quality – Discussion

The Lewiston Reservoir was built by surrounding a large area of land with a dike. It therefore represents a high point in the local water table and is a source of groundwater. Groundwater is not seeping into the reservoir (URS et al. 2005b). In addition, the reservoir does not have a watershed with the exception of the minor slope of the dike. None of the area outside of the reservoir drains into the reservoir. Therefore, the principal source of water is the Niagara River water that is pumped into the Lewiston Reservoir.

Contaminants enter the Niagara River from Lake Erie, which is shown in the water quality data at the Fort Erie station. In addition, the comparison between the water quality monitoring data between the Fort Erie station and the Niagara-on-the-Lake station shows that contaminants are added to the water from various sources along the river. This contribution is reflected in the ratio between the lower and upper Niagara River concentrations for specific contaminants (Table 4.1.1-3).

There are numerous industrial facilities along the upper Niagara River, which have historically contributed to the impaired water quality in the river through effluent discharges. Other sources of pollution include municipal point sources, as well as non-point source runoff from urban, industrial, and hazardous waste areas. Further, the Buffalo River discharges into Lake Erie close to the headwaters of the Niagara River. NRTC (1984) and IJC (2002) describe details of the various historic discharges.

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Contaminants that are added along the river include various benzenes, mirex, hexachlorobutadiene, and several other organic compounds. The contribution of metals from sources along the river appears to be comparatively small. Contribution of organic compounds from sources along the river was also observed by El-Shaarawi et al. (1985) and Warry and Chan (1981), who stated that contaminants such as PCBs, mirex, and p,p'-DDT in suspended sediment in the river originate primarily from sources between Grand Island and Niagara-on-the Lake.

The concentrations and loads of many organic compounds in the water of the Niagara River have decreased over the past decades, due to considerable efforts from many agencies and organizations (e.g., Niagara River Secretariat 1999; IJC 2002). The rates of decline vary for individual parameters (see Appendix C for details). Metals concentrations have decreased for cadmium, lead, nickel, and zinc. The decrease in contaminant loading in the river was also observed in 1995 in sediment deposited in Lake Ontario around the mouth of the river; concentrations of 2,3,7,8 TCDD, hexachlorobenzene, benzo(a)pyrene, and mirex were lower by up to several orders of magnitude in recent deposits near the surface as compared to deeper deposits from the 1960s (Niagara River Secretariat 1999). These data suggest that "the suspended sediment flowing through the Niagara River are becoming cleaner and cleaner" (p. 3, Niagara River Secretariat 1999). On the other hand, Williams and O'Shea (2003) states that the loads of priority toxics (particularly PAHs) from Lake Erie may again be increasing, based on the yet unpublished EC water quality data from 1999 to 2001.

Fine-grained suspended sediment in the Niagara River remains largely in suspension due to the high current velocity. Much of the bottom sediment in the river consists of sand and gravel (Mudroch and Williams 1989). Fine-grained bottom sediments occur in a few areas in the lower Niagara River, in nearshore areas and in tributaries. The supply of suspended sediments is substantially higher during the late fall and winter months than during the summer months as a result of high winds, heavy rainfall, and/or runoff from melting snow (Kuntz and Tsanis 1993; Figure 4.3.2-2).

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TABLE 4.1.1-1

PRACTICAL DETECTION LIMITS FOR WATER QUALITY DATA FROM NIAGARA RIVER, ENVIRONMENT CANADA

	Priority Pollutant	Phase	
		Dissolved (ng/l)	Particulate (ng/g)
Organic Compounds			
1,2-Dichlorobenzene		0.58	11.40
1,3-Dichlorobenzene		0.30	11.30
1,4-Dichlorobenzene		0.51	10.40
1,3,5-Trichlorobenzene		0.02	1.20
1,2,4-Trichlorobenzene		0.24	2.50
1,2,3-Trichlorobenzene		0.09	1.30
1,2,3,4-Tetrachlorobenzene		0.09	3.00
Pentachlorobenzene		0.04	2.70
Hexachlorobenzene	●	0.04	3.50
Hexachlorobutadiene		0.03	1.50
Hexachlorocyclopetadiene		0.02	1.80
Heptachlor Epoxide		0.02	3.20
Aldrin		0.01	2.10
Octachlorosytrene		0.05	2.70
p,p-DDE		0.06	6.40
p,p-TDE (p,p-DDD)		0.10	16.70
o,p-DDT		0.09	9.40
p,p-DDT		0.10	9.30
DDT (total)	●		
Mirex	●	0.04	4.40
alpha-BHC		0.30	2.30
gamma-BHC		0.14	3.50
Chlordane (total)	●	0.03-0.06	2.8-2.9
Endosulfan (total)		0.02-0.06	3.1-5.9
Dieldrin	●	0.05	6.80
Endrin		0.03	7.30
Methoxychlor		0.22	48.00
PCB	●	0.81	89.00
Total Congener PCB		0.21	60.30
2-Methylnaphthalene		0.51	281.00
1-Methylnaphthalene		0.61	80.00

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TABLE 4.1.1-1 (CONT.)

PRACTICAL DETECTION LIMITS FOR WATER QUALITY DATA FROM NIAGARA RIVER, ENVIRONMENT CANADA

	Priority Pollutant	Phase	
		Dissolved (ng/l)	Particulate (ng/g)
Organic Compounds (cont.)			
Naphthalene		0.33	82.00
Fluorene		0.59	160.00
Phenanthrene		0.12	193.00
Anthracene		0.23	169.0
2-Chloronaphthalene		1.20	378.0
Atrazine		6.04	856.0
Metolachlor		0.82	441.0
Fluoranthene	●	0.18	90.0
Pyrene		0.17	168.0
Benzo(a)anthracene	●	0.24	137.0
Benzo(a)pyrene	●	0.24	161.0
Indeno(1,2,3-c,d)pyrene		0.36	161.0
Dibenz(a,h)anthracene		0.51	148.0
Benzo(g,h,i)perylene		0.22	149.0
Metals (1)	**Priority Pollutant**	**Phase**	
		Dissolved (mg/l)	**Particulate (mg/kg)**
Aluminum		0.0020	
Antimony		0.0002	
Arsenic	●	0.0001	
Barium		0.0002	
Beryllium		0.0500	
Cadmium		0.0001	
Chromium		0.0002	
Cobalt		0.0001	
Copper		0.0002	
Iron		0.0004	
Lithium		0.0001	
Manganese		0.0001	
Molybdenum		0.0001	
Nickel		0.0002	
Lead	●	0.0002	

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TABLE 4.1.1-1 (CONT.)

PRACTICAL DETECTION LIMITS FOR WATER QUALITY DATA FROM NIAGARA RIVER, ENVIRONMENT CANADA

	Priority Pollutant	Phase	
		Dissolved (mg/l)	Particulate (mg/kg)
Metals (cont.)			
Selenium		0.0001	
Strontium		0.0001	
Vanadium		0.0001	
Zinc		0.0002	
Mercury (particulate phase only)	●		0.0040

Notes: Data from Merriman and Kuntz 2002. Note the change in units for metals. (1) Limits for metals are for the total sample (dissolved and particulate) with the exception of mercury (Don Williams, Environment Canada, pers. comm., 2/10/04).

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TABLE 4.1.1-2

ANNUAL FLOW AND SUSPENDED PARTICULATE MATTER (4/1997 – 3/1999), ENVIRONMENT CANADA

	Period	Fort Erie			Niagara-on-the-Lake		
		Mean	Median	St. Dev.	Mean	Median	St. Dev.
Flow (cfs)							
	4/1997 - 3/1998	245,200	245,500	13,600	246,500	246,100	14,100
	4/1998 - 3/1999	218,800	217,700	18,600	220,100	217,500	19,200
Suspended Particulate Matter (mg/l)							
	4/1997 - 3/1998	3.65	1.61	6.43	5.04	2.97	4.88
	4/1998 - 3/1999	3.94	1.47	5.06	8.78	3.92	14.74

Notes: Data from Merriman and Kuntz 2002.

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TABLE 4.1.1-3

WATER QUALITY FOR THE UPPER AND LOWER NIAGARA RIVER (1), ENVIRONMENT CANADA

Parameter	Priority Pollutant	Units	Mean Concentration (2)				Ratio: Lower vs Upper Niagara River (4)	Concentration for Upper 90% Confidence Interval (2)				NYSDEC Water Quality Standard		
			Upper Niagara River		Lower Niagara River			Upper Niagara River		Lower Niagara River				
			1997/98	1998/99	1997/98	1998/99		1997/98	1998/99	1997/98	1998/99	Aquatic Life (Acute)	Aquatic Life (Chronic)	Health - Fish Consumption
Organic Compounds (Particulate+dissolved phases)														
1,2-Dichlorobenzene		ng/l	0.348	0.178	0.454	0.497	1.8	0.452	0.216	0.534	0.550		Sum: 5,000	
1,3-Dichlorobenzene		ng/l	0.222	0.086	0.293	0.347	2.1	0.235	0.123	0.652	0.386			
1,4-Dichlorobenzene		ng/l	0.574	0.420	1.450	0.990	2.5	0.674	0.485	1.658	1.050			
1,3,5-Trichlorobenzene		ng/l	0.012	0.012	0.069	0.062	5.3	0.017	0.013	0.105	0.077		Sum: 5,000	
1,2,4-Trichlorobenzene		ng/l	0.043	0.041	0.473	0.454	11.0	0.048	0.048	0.549	0.495			
1,2,3-Trichlorobenzene		ng/l	0.021	0.010	0.148	0.117	8.4	0.027	0.010	0.169	0.126			
1,2,3,4-Tetrachlorobenzene		ng/l	0.020	0.012	0.274	0.285	17.8	0.026	0.013	0.314	0.313			
Pentachlorobenzene		ng/l	0.017	0.016	0.110	0.095	6.2	0.017	0.013	0.105	0.077			
Hexachlorobenzene	●	ng/l	0.019	0.016	**0.830**	**0.068**	25.8	0.021	0.019	**0.110**	**0.085**		1,000	0.03
Hexachlorobutadiene		ng/l	0.001		0.067	0.054	100.3	0.001		0.079	0.065		450	10
Hexachlorocyclopetadiene		ng/l			0.018	0.003				0.029	0.004			
Heptachlor Epoxide		ng/l	0.066	0.045	0.067	0.054	1.1	0.075	0.053	0.077	0.061			0.3

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TABLE 4.1.1-3 (CONT.)

WATER QUALITY FOR THE UPPER AND LOWER NIAGARA RIVER (1), ENVIRONMENT CANADA

Parameter	Priority Pollutant	Units	Mean Concentration (2)				Ratio: Lower vs Upper Niagara River (4)	Concentration for Upper 90% Confidence Interval (2)				NYSDEC Water Quality Standard		
			Upper Niagara River		Lower Niagara River			Upper Niagara River		Lower Niagara River				
			1997/98	1998/99	1997/98	1998/99		1997/98	1998/99	1997/98	1998/99	Aquatic Life (Acute)	Aquatic Life (Chronic)	Health - Fish Consumption
Organic Compounds (Particulate+dissolved phases) (cont.)														
Aldrin		ng/l												0.001
Octachlorostyrene		ng/l			0.004	**0.019**				0.005	**0.021**			0.006
p,p-DDE		ng/l	**0.165**	**0.078**	**0.073**	**0.046**	0.5	**0.211**	**0.092**	**0.093**	0.056			0.007
p,p-TDE (p,p-DDD)		ng/l	**0.176**	0.070	0.059	0.043	0.4	**0.302**	**0.081**	0.066	0.051			0.08
o,p-DDT		ng/l	0.034	0.024	0.052	0.020	1.2	0.043	0.028	0.069	0.023			
p,p-DDT		ng/l	**0.065**	**0.018**	**0.061**	**0.015**	0.9	**0.085**	**0.024**	**0.083**	**0.021**			0.01
DDT (total)	●	ng/l												
Mirex	●	ng/l	0.001		**0.007**	**0.014**	9.5	**0.002**		**0.010**	**0.027**		1	0.001
alpha-BHC		ng/l	0.434	0.339	0.576	0.492	1.4	0.487	0.404	0.627	0.553			
gamma-BHC		ng/l	0.330	0.310	0.407	0.366	1.2	0.372	0.389	0.448	0.401			
Chlordane (total)	●	ng/l	**0.023**	**0.026**	**0.040**	**0.024**	1.3	**0.027**	**0.028**	**0.050**	**0.029**			0.02
Endosulfan (total)		ng/l											9	
Dieldrin	●	ng/l	**0.159**	**0.123**	**0.192**	**0.157**	1.2	**0.178**	**0.134**	**0.228**	**0.166**	24	56	0.0006
Endrin		ng/l		0.024		0.032	1.3		0.026		0.039	86	36	2
Methoxychlor		ng/l	0.010					0.020					30	

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TABLE 4.1.1-3 (CONT.)

WATER QUALITY FOR THE UPPER AND LOWER NIAGARA RIVER (1), ENVIRONMENT CANADA

Parameter	Priority Pollutant	Units	Mean Concentration (2)				Ratio: Lower vs Upper Niagara River (4)	Concentration for Upper 90% Confidence Interval (2)				NYSDEC Water Quality Standard		
			Upper Niagara River		Lower Niagara River			Upper Niagara River		Lower Niagara River				
			1997/98	1998/99	1997/98	1998/99		1997/98	1998/99	1997/98	1998/99	Aquatic Life (Acute)	Aquatic Life (Chronic)	Health - Fish Consumption
Organic Compounds (Particulate+dissolved phases) (cont.)														
PCB	●	ng/l	**0.896**		**1.174**		1.3	**0.988**		**1.286**				0.001
Total Congener PCB		ng/l		**1.433**		**1.773**	1.2		**1.758**		**2.009**			0.001
2-Methylnaphthalene		ng/l	0.953	0.966	0.937	1.453	1.2	1.253	1.130	1.223	1.679			
1-Methylnaphthalene		ng/l	0.518	0.543	0.558	0.886	1.4	0.636	0.624	0.706	1.018			
Naphthalene		ng/l												
Fluorene		ng/l	0.463	0.430	0.724	0.915	1.8	0.530	0.497	0.800	1.048			
Phenanthrene		ng/l	2.011	1.801	4.332	4.936	2.4	2.374	2.073	5.173	6.011			
Anthracene		ng/l	0.217	0.186	0.542	0.571	2.8	0.254	0.217	0.764	0.753			
2-Chloronaphthalene		ng/l												
Atrazine		ng/l	58.164	73.276	63.609	59.809	0.9	68.921	110.330	71.441	65.355			
Metolachlor		ng/l	25.689	27.436	25.877	22.274	0.9	30.850	41.507	28.590	24.622			
Fluoranthene	●	ng/l	2.044	1.785	4.720	5.160	2.6	2.521	2.084	6.198	6.754			
Pyrene		ng/l	1.523	1.360	4.052	4.403	2.9	1.894	1.603	5.215	5.620			
Benzo(a)anthracene	●	ng/l	0.601	0.398	1.474	1.642	3.1	0.812	0.482	1.932	2.245			
Benzo(a)pyrene	●	ng/l	0.597	0.511	1.663	1.911	3.2	0.809	0.629	2.202	2.646			

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TABLE 4.1.1-3 (CONT.)

WATER QUALITY FOR THE UPPER AND LOWER NIAGARA RIVER (1), ENVIRONMENT CANADA

	Priority Pollutant	Units	Mean Concentration (2)				Ratio: Lower vs Upper Niagara River (4)	Concentration for Upper 90% Confidence Interval (2)				NYSDEC Water Quality Standard		
			Upper Niagara River		Lower Niagara River			Upper Niagara River		Lower Niagara River				
			1997/98	1998/99	1997/98	1998/99		1997/98	1998/99	1997/98	1998/99	Aquatic Life (Acute)	Aquatic Life (Chronic)	Health - Fish Consumption
Organic Compounds (Particulate+dissolved phases) (cont.)														
Indeno(1,2,3-c,d)pyrene		ng/l	0.567	0.619	1.692	1.781	2.9	0.831	0.798	2.347	2.427			
Dibenz(a,h)anthracene		ng/l	0.075	0.058	0.259	0.259	3.9	0.100	0.070	0.376	0.319			
Benzo(g,h,i)perylene		ng/l	0.410	0.513	1.547	1.583	3.4	0.642	0.731	2.224	2.699			
Metals (Particulate+dissolved phases) (3)														
Aluminum		µg/l	116.7	333.7	235.2	250.8	1.1	154.1	568.0	302.7	350.9			
Antimony		µg/l	0.2	0.2	0.2	0.1	0.8	0.3	0.2	0.2	0.2			
Arsenic	●	µg/l	0.6	0.5	0.6	0.5	1.0	0.6	0.6	0.7	0.6	340	150	
Barium		µg/l	20.9	22.0	21.8	23.0	1.0	21.3	22.9	22.2	24.2			
Beryllium		µg/l				33.0					38.4		1,100	
Cadmium		µg/l	0.1	0.1	0.1	0.1	1.0	0.1	0.1	0.1	0.1	4.85	2.46	
Chromium		µg/l	0.3	0.5	0.5	0.8	1.6	0.3	0.8	0.5	1.3	675	87.8	
Cobalt		µg/l	0.2	0.3	0.2	0.3	1.0	0.2	0.4	0.3	0.3		5	
Copper		µg/l	1.1	1.6	1.4	1.6	1.1	1.3	1.9	1.5	1.8	16.33	10.69	
Iron		µg/l	196.0	**566**	**429**	**466**	1.2	266	**990**	**558**	**656**		300	

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TABLE 4.1.1-3 (CONT.)

WATER QUALITY FOR THE UPPER AND LOWER NIAGARA RIVER (1), ENVIRONMENT CANADA

	Priority Pollutant	Units	Mean Concentration (2)				Ratio: Lower vs Upper Niagara River (4)	Concentration for Upper 90% Confidence Interval (2)				NYSDEC Water Quality Standard		
			Upper Niagara River		Lower Niagara River			Upper Niagara River		Lower Niagara River				
			1997/98	1998/99	1997/98	1998/99		1997/98	1998/99	1997/98	1998/99	Aquatic Life (Acute)	Aquatic Life (Chronic)	Health - Fish Consumption
Metals (Particulate+dissolved phases) (cont.)														
Lithium		µg/l	2.3	2.4	2.6	2.4	1.1	2.4	2.6	2.8	2.7			
Manganese		µg/l	6.7	17.6	12.3	12.3	1.0	9.0	29.8	15.9	16.4			
Molybdenum		µg/l	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.1	1.1			
Nickel		µg/l	0.9	1.3	1.1	1.3	1.1	1.0	1.6	1.2	1.5	558	62	
Lead	●	µg/l	0.4	0.8	0.6	0.6	1.0	0.6	1.5	0.8	0.8	121.6	4.74	
Selenium		µg/l	0.2	0.2	0.2	0.2	1.0	0.2	0.2	0.2	0.2		4.6	
Strontium		µg/l	147.4	147.8	146.9	146.0	1.0	148.8	149.9	148.4	147.6			
Vanadium		µg/l	0.4	0.8	0.6	0.7	1.1	0.5	1.0	0.7	0.8		14	
Zinc		µg/l	1.3	3.2	2.9	3.0	1.3	1.8	5.3	4.1	4.1	140	98.5	
Mercury (Particulate phase only)	●	mg/kg	0.1140	0.0741	0.1348	0.1104	1.3	0.1243	0.0822	0.1521	0.1199			

Notes: Data from Merriman and Kuntz, 2002. (1) The upper Niagara River station is located at Fort Erie; the lower Niagara River station is at Niagara-on-the Lake. (2) Values exceeding any of the NYSDEC standards are flagged in bold. Blank data fields indicate no detection. (3) The hardness used for calculating NYSDEC criteria for metals was 123 mg/l. (4) Ratio between the mean concentration of 1997/98 and 1998/99 from the lower Niagara River and the respective mean concentrations from the upper Niagara River.

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TABLE 4.1.2-1

WATER QUALITY MONITORING, LOWER NIAGARA RIVER AT FORT NIAGARA, 1999-2001, NYSDEC

	Sampling Date	Aluminum, Total	Aluminum, Dissolved	Cadmium, Total	Cadmium, Dissolved	Copper, Total	Copper, Dissolved	Iron
		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Concentrations - Metals								
	4/22/1999	*32.4*	*8.1*	*0.05*	*0.05*	3.4	2.6	54.7
	5/25/1999	*101.0*	*5.3*	*0.06*	*0.06*	*2.0*	*1.3*	*179.0*
	6/30/1999	133.0	*5.2*	*0.19*	*0.06*	*1.6*	*1.4*	198.0
	8/11/1999	*72.1*	*8.0*	*0.05*	*0.05*	*2.1*	*1.3*	107.0
	9/29/1999	*28.8*	*4.3*	*0.05*	*0.05*	*2.5*	*1.0*	*42.7*
	10/26/1999	120.0	56.4	*0.11*	*0.03*	*2.1*	*1.5*	239.0
	5/4/2000	26.7	*11.1*	*0.02*	*0.02*	*1.7*	*1.3*	39.9
	5/31/2000	*46.5*	*5.0*	*0.02*	*0.09*	*1.7*	*1.3*	69.3
	7/19/2000	50.8	*8.3*	*0.02*	*0.02*	*1.5*	*2.4*	78.5
	8/16/2000	*71.9*	*18.7*	*0.03*	*0.17*	*1.7*	*1.5*	96.1
	10/23/2000	*33.1*	*8.3*	*0.03*	*0.03*	*1.9*	*1.2*	47.1
	5/8/2001	44.8	*14.8*	*0.04*	*0.04*	3.2	3.1	57.0
	6/7/2001	50.9	*20.0*	*0.04*	*0.04*	3.3	*1.7*	72.3
	7/26/2001	56.8	10.9	*0.04*	*0.04*	*1.7*	*1.4*	79.8
	8/16/2001	29.9	*10.7*	*0.02*	*0.02*	*1.7*	*1.7*	*47.0*
	9/18/2001	35.2	*12.2*	*0.02*	*0.02*	*1.6*	*1.2*	45.5
	10/23/2001	73.0	*14.3*	*0.21*	*0.04*	*1.7*	2.5	96.7
Mean		59.2	13.0	0.06	0.05	2.1	1.7	91.2
Minimum		26.7	4.3	0.02	0.02	1.5	1.0	39.9
Maximum		133.0	56.4	0.21	0.17	3.4	3.1	239.0
Data Qualifiers (1)		J	**T**	**U,** T	**U,** T	**T**	**T**	V
NYSDEC Standards								
Aquatic Life (Acute)					4.94		16.58	
Aquatic Life (Chronic)					2.49		10.84	300.0
Health - Fish Consumption								

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TABLE 4.1.2-1 (CONT.)

WATER QUALITY MONITORING, LOWER NIAGARA RIVER AT FORT NIAGARA, 1999-2001, NYSDEC

	Sampling Date	Lead, Total	Lead, Dissolved	Magnesium	Manganese	Mercury	Nickel, Total	Nickel, Dissolved	Zinc
		µg/l	µg/l	mg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Concentrations - Metals									
	4/22/1999	*0.11*	*0.11*	8.17	2.9	*0.04*	*1.00*	*0.89*	*6.0*
	5/25/1999	0.70	*0.18*	7.54	6.5	0.07	*0.97*	*0.84*	7.2
	6/30/1999	*0.18*	*0.18*	7.72	6.3	*0.05*	*1.00*	*0.74*	4.9
	8/11/1999	*0.13*	*0.13*	8.34	4.8	*0.05*	*0.91*	*0.70*	*9.2*
	9/29/1999	0.81	*0.13*	7.89	3.1	*0.04*	*0.72*	*0.46*	9.3
	10/26/1999	0.30	*0.10*	7.77	8.0	*0.04*	*1.20*	*0.84*	7.7
	5/4/2000	*0.23*	*0.23*	7.24	2.5	*0.01*	*0.83*	*0.42*	5.3
	5/31/2000	5.40	*0.29*	8.22	3.4	*0.01*	*0.87*	*0.68*	3.1
	7/19/2000	*0.29*	*0.29*	7.35	3.9	*0.02*	*0.79*	*0.69*	6.3
	8/16/2000	*0.17*	2.50	7.86	4.4	*0.03*	*0.72*	*0.97*	5.7
	10/23/2000	*0.14*	*0.14*	8.09	2.6	*0.03*	*0.69*	*0.55*	2.1
	5/8/2001	*0.25*	*0.25*	7.86	3.2	*0.02*	*0.76*	*0.74*	5.4
	6/7/2001	*0.23*	*0.23*	8.71	4.4	*0.04*	*1.00*	*0.59*	*3.2*
	7/26/2001	*0.23*	*0.23*	7.64	4.3	*0.04*	*0.99*	*0.57*	*18.1*
	8/16/2001	0.95	0.50	6.96	3.0	*0.04*	*0.79*	*1.00*	*6.3*
	9/18/2001	*0.24*	*0.16*	7.46	2.3	*0.02*	*1.00*	*0.71*	*7.3*
	10/23/2001	0.75	0.86	8.01	3.8	*0.02*	*1.50*	*0.83*	5.8
Mean		0.65	0.38	7.81	4.1	0.03	0.93	0.72	6.6
Minimum		0.11	0.10	6.96	2.3	0.01	0.69	0.42	2.1
Maximum		5.40	2.50	8.71	8.0	0.07	1.50	1.00	18.1
Data Qualifiers (1)		**U, T**	**U**			**U**	**T**	**T**	J
NYSDEC Standards									
Aquatic Life (Acute)			123.72					565.52	141.57
Aquatic Life (Chronic)			4.82					62.81	99.89
Health – Fish Consumption									

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TABLE 4.1.2-1 (CONT.)

WATER QUALITY MONITORING, LOWER NIAGARA RIVER AT FORT NIAGARA, 1999-2001, NYSDEC

	Sampling Date	Alkalinity, Total	Calcium	Chloride	Conductivity	Dissolved Oxygen	Fluoride	pH	Sodium
		mg/l	mg/l	mg/l	umhos/cm	mg/l	mg/l		mg/l
Concentrations – Other Parameters									
	4/22/1999		30.2	17.2		13.2	*0.10*	7.8	9.60
	5/25/1999	86.2	30.8	16.5		12.2	*0.10*	8.4	8.67
	6/30/1999	90.3	29.2	13.0		9.3	0.12	7.7	8.71
	8/11/1999	82.6	31.9	13.3		9.5	*0.20*	8.2	9.16
	9/29/1999	90.7	31.3	14.3		10.4	0.11	8.0	9.05
	10/26/1999	91.4	31.6	14.6		11.1	0.11	7.8	8.50
	5/4/2000	92.0	27.2	14.5	280	12.9	0.11	8.1	8.63
	5/31/2000	92.2	30.1	14.8	270	11.3	0.13	7.9	9.22
	7/19/2000	92.3	30.7	15.8	270	9.0	0.12	7.9	9.38
	8/16/2000	93.0	30.3	16.2	270	8.8	0.12	7.9	8.87
	10/23/2000	92.3	31.2	16.1	270	10.4	0.14	7.8	9.00
	5/8/2001	90.0	31.3	16.6	260	12.8	0.14	7.7	9.80
	6/7/2001	91.6	31.9	17.9	260	11.1	0.11	8.1	9.73
	7/26/2001	92.4	30.5	18.2	270	9.6	*0.10*	8.2	8.60
	8/16/2001	95.2	27.3	15.1	280	9.0	*0.10*	8.2	8.00
	9/18/2001	92.4	29.6	15.4	280	8.9	0.13	7.8	8.50
	10/23/2001	90.4	27.3	16.2	270	10.3	0.13	7.3	7.73
Mean		90.8	30.1	15.6	271	10.6	0.12	7.9	8.89
Minimum		82.6	27.2	13.0	260	8.8	0.10	7.3	7.73
Maximum		95.2	31.9	18.2	280	13.2	0.20	8.4	9.80
Data Qualifiers (1)							U		
NYSDEC Standards									
Aquatic Life (Acute)						6.0	13.0	6.5-8.5	
Aquatic Life (Chronic)						*(2)*	2.6	*(3)*	
Health – Fish Consumption									

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TABLE 4.1.2-1 (CONT.)

WATER QUALITY MONITORING, LOWER NIAGARA RIVER AT FORT NIAGARA, 1999-2001, NYSDEC

	Sampling Date	Sulfate	Total Dissolved Solids	Total Hardness	Total Solids	Total Suspended Solids	Total Volatile Solids	Turbidity	Water Temperature
		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	deg C
Concentrations – Other Parameters									
	4/22/1999	23.3	509	121	154	2.0	61	1.6	6.6
	5/25/1999	23.2	132	111	182	6.1	74	0.8	12.4
	6/30/1999	20.8	145	108	149	7.4	61	1.8	21.4
	8/11/1999	21.8	168	108	209	2.9	91	1.3	23.3
	9/29/1999	23.7	147	121	175	*1.0*	86	1.6	19.6
	10/26/1999	24.6	145	114	155	8.8	73	4.2	12.1
	5/4/2000	23.6	145	126	164	*1.0*	81	0.9	9.0
	5/31/2000	23.2	147	113	155	1.9	76	1.7	13.7
	7/19/2000	24.3	167	119	165	2.0	66	1.7	21.3
	8/16/2000	24.8	158	115	158	3.3	37	1.3	23.2
	10/23/2000	23.8	153	120	151	1.1	28	1.3	14.0
	5/8/2001	22.9	159	120	162	1.6	36	2.1	9.5
	6/7/2001	23.3	158	120	173	1.7	42	3.1	14.0
	7/26/2001	23.8	175	240	196	2.0	66	3.1	23.6
	8/16/2001	21.5	166	120	168	1.6	41	4.0	24.4
	9/18/2001	22.5	161	116	159	1.1	23	2.5	21.0
	10/23/2001	23.0	150	125	164	2.6	30	2.5	13.9
Mean		23.2	176	125	167	2.8	57	2.1	16.6
Minimum		20.8	132	108	149	1.0	23	0.8	6.6
Maximum		24.8	509	240	209	8.8	91	4.2	24.4
Data Qualifiers (1)				**U**		U			
NYSDEC Standards									
Aquatic Life (Acute)									
Aquatic Life (Chronic)								5.0	
Health – Fish Consumption									

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TABLE 4.1.2-1 (CONT.)

WATER QUALITY MONITORING, LOWER NIAGARA RIVER AT FORT NIAGARA, 1999-2001, NYSDEC

	Sampling Date	Bromodichloro-methane	Chloroform	Chloromethane	Dibromodichloro-methane	Methylene Chloride	Tetrachloroethane	Phenolics, Total	Trichloroethene	Vinyl Chloride
		µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Concentrations - Organic Compounds										
	4/22/1999	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	5/25/1999	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	6/30/1999	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	8/11/1999	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.005*	*0.1*	*0.3*
	9/29/1999	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	10/26/1999	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	5/4/2000	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.001*	*0.0*	*0.0*
	5/31/2000	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	0.2	*0.3*
	7/19/2000	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	8/16/2000	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	10/23/2000	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	5/8/2001	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.002*	*0.1*	*0.3*
	6/7/2001	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.002*	*0.1*	*0.3*
	7/26/2001	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	8/16/2001	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	9/18/2001	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
	10/23/2001	0.2	*0.1*	*0.2*	*0.1*	*0.5*	*0.2*	*0.001*	*0.1*	*0.3*
Mean		0.2	0.1	0.2	0.1	0.5	0.2	0.001	0.1	0.3
Minimum		0.0	0.0	0.0	0.0	0.0	0.0	0.001	0.0	0.0
Maximum		0.2	0.1	0.2	0.1	0.5	0.2	0.005	0.2	0.3
Data Qualifiers (1)		**W**	**W**	**W**	**W**	**W**	**W**	**U**	**W**	**W**
NYSDEC Standards										
Aquatic Life (Acute)										
Aquatic Life (Chronic)										
Health - Fish Consumption						200			40.0	

Notes: (1) Data qualifiers for at least two data points of the data set. Values with qualifiers are presented in italics. U= Non-Detect; T= Less than reportable level; J= Estimated due to interference, etc.; V= QA/QC Problem; W= actual value is less. Frequent qualifiers are in bold. (2) Minimum concentration. (3) Acceptable level of pH values.

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TABLE 4.1.4-1

TURBIDITY IN THE NIAGARA RIVER AND LEWISTON RESERVOIR

Date	TUNR-03 (Upper Niagara River, near Lake Erie)		TUNR-04 (Upper Niagara River, north of Grand Island)		TUNR-02 (Upper Niagara River, upstream of NYPA Intakes)		TLEW-01 (Lewiston Reservoir)		LNR-01 (Lower Niagara River, upstream of tailrace)		LNR-02 (Lower Niagara River, near Lewiston)		LNR-05 (Lower Niagara River, near Youngstown Yacht Club)	
	Time (h)	Turbidity (NTU)	Time (h)	Turbidity (NTU)	Time (h)	Turbidity (NTU)	Time (h)	Turbidity (NTU)	Time (h)	Turbidity (NTU)	Time (h)	Turbidity (NTU)	Time (h)	Turbidity (NTU)
5/7/2003											10:07	1.74	8:20	1.86
5/30/2003	15:25	2.39	12:37	3.21	10:51	2.97	8:40	1.63	10:07	3.11	9:32	2.33	8:41	2.01
6/2/2003	14:00	2.91	9:15	7.46	11:42	10.3	12:40	3.66	13:25	1.77	9:32	2.03	8:40	2.55
6/26/2003	7:26	1.68	11:00	3.04	13:41	16.1	8:05	2.08	7:10	1.12	9:12	2.1	9:58	1.19
7/11/2003	15:20	16.4	10:45	2.46	9:35	15.6	9:00	2.73	8:12	12.7	9:03	3.98	8:03	3.42
7/24/2003	7:25	1.73	10:05	16.2	13:50	3.12	11:25	1.72	8:22	2.68	9:12	2.87	9:53	1.75
8/19/2003	8:00	1.34	9:45	2.44	14:00	2.35	11:15	1.62	8:25	3.12	10:00	2.42	9:05	1.33
8/28/2003	8:10	2.79	10:25	6.04	13:36	2.09	11:55	1.45	8:30	1.58	9:26	2.06	10:04	1.29
9/11/2003	7:23	2.45	9:00	2.69	12:20	3.35	10:15	7.08	7:15	2.02	7:57	1.57	8:40	1.44
9/16/2003	12:00	3.17	7:20	-	9:13	2.26	10:11	1.78	11:10	2.17	12:05	2.32	13:00	1.71
9/24/2003	11:24	5.07	7:54	2.83	11:40	2.66	10:15	2.43	7:09	6.87	7:54	4.03	8:34	3.13
10/2/2003	12:30	4.64	7:56	2.71	13:55	2.23	9:23	2.92	10:05	5.75	11:18	7.12	11:55	6.12
10/10/2003	12:45	1.94	9:07	1.75	12:10	1.19	10:35	1.89	7:51	4.2	8:25	2.12	9:02	1.83
10/16/2003	14:07	6.76	7:50	3.73	7:42	3.08	11:30	2.34	8:27	6.41	9:05	6.89	9:45	6.65
Mean		**4.10**		**4.55**		**5.18**		**2.56**		**4.12**		**3.11**		**2.59**
Min		1.34		1.75		1.19		1.45		1.12		1.57		1.19
Max		16.40		16.20		16.10		7.08		12.70		7.12		6.65

Notes: Data from URS and Gomez and Sullivan 2005.

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This material is contained in:
Volume 2
Section: Describing Contaminant Levels in Fish in Lewiston Reservoir

FIGURE 4.1.1-1

WATER QUALITY SAMPLING LOCATIONS

[NIP – General Location Maps]

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FIGURE 4.1.4-1

SURFACE WATER SAMPLING LOCATIONS

[NIP – General Location Maps]

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FIGURE 4.1.4-2

TURBIDITY MONITORING SITE LOCATIONS (2003)

[NIP – General Location Maps]

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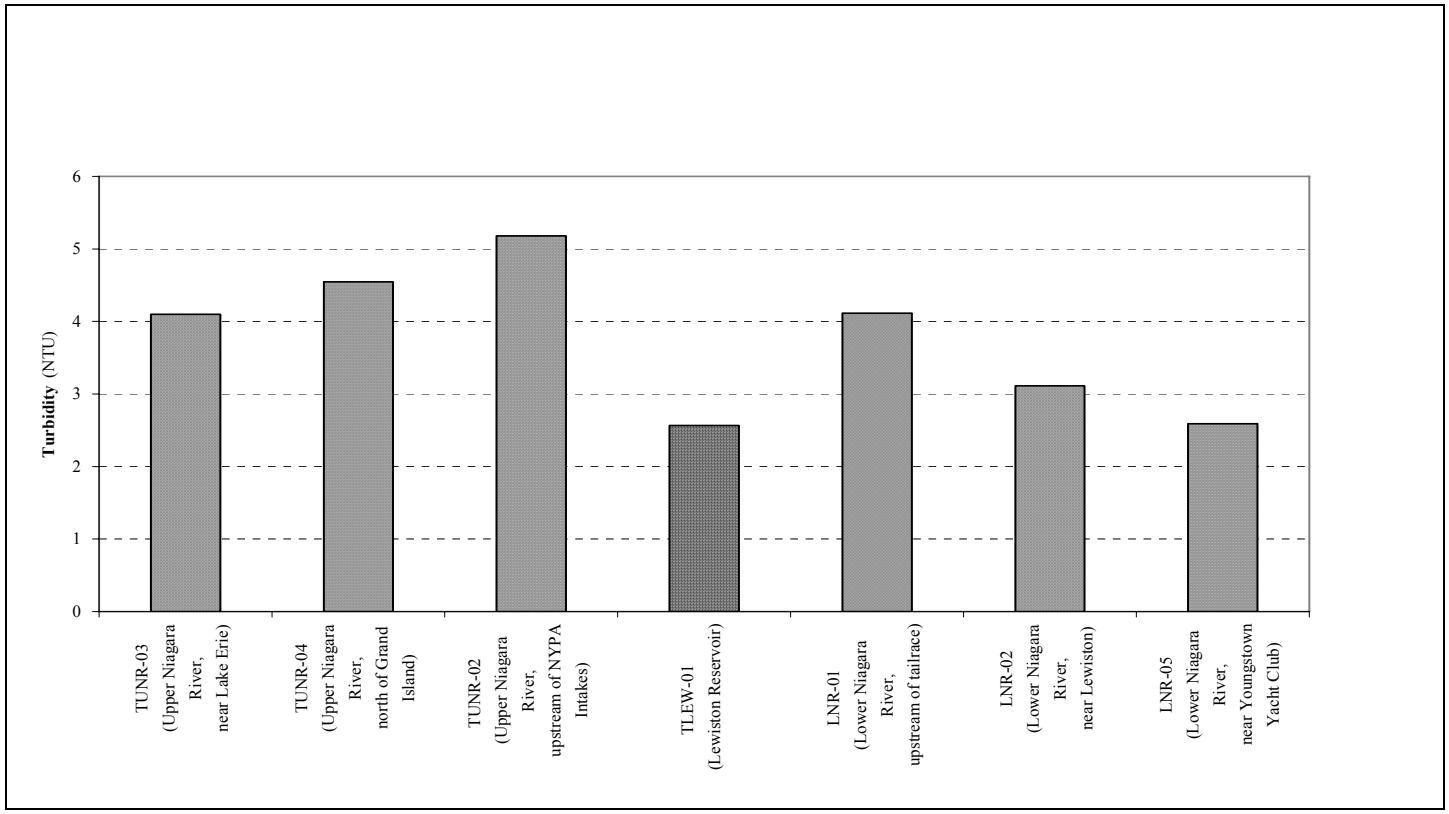
FIGURE 4.3.2-1

MEAN TURBIDITY IN NIAGARA RIVER AND LEWISTON RESERVOIR (MAY – OCTOBER 2003)



Notes: Based on data in URS and Gomez and Sullivan 2005.

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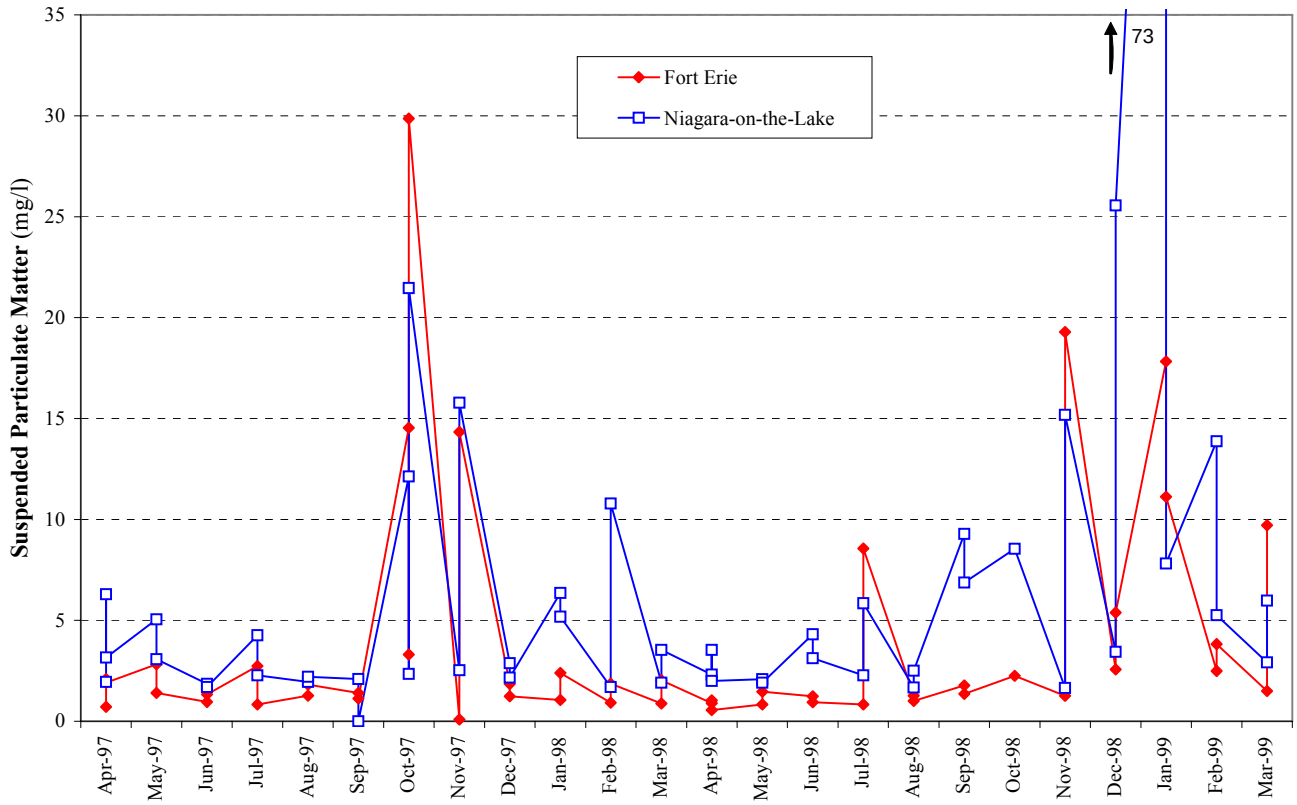
FIGURE 4.3.2-2

SUSPENDED PARTICULATE MATTER IN NIAGARA RIVER, 1997 - 1999



Data from Merriman and Kuntz 2002.

5.0 SEDIMENTATION IN LEWISTON RESERVOIR

A potential source of bioavailable contaminants in the Lewiston Reservoir is sediments that were deposited on the reservoir floor since reservoir construction in 1961. Therefore, reservoir sedimentation patterns, as well as the potential for scour and resuspension of bottom sediments, were investigated.

5.1 Topography of Reservoir

Ground elevation surveys of the Lewiston Reservoir were conducted in 1961 and 2001. On September 6, 1961, a topographic survey was conducted prior to flooding of the reservoir. On May 14-21, 2001, a bathymetric survey was conducted. The elevations of the surveys are presented in Figures 5.1-1 and 5.1-2. The maps identify the following topographic features (areas discussed below are marked in Figure 5.1-2):

Topographic Highs: Two topographic highs within the northern half of the reservoir (Areas 1 and 2) and a topographic high in the southeastern corner (Area 3).

Former Fish Creek Riverbed: Topographic low in the northeast corner (Area 4).

Former Gill Creek Riverbed: Topographic low in the southeast corner (Area 10).

Topographic Lows: Two topographic lows near the southern border of the reservoir (Areas 5 and 6).

Central Area of Reservoir (Area 7).

Area in front of Lewiston Pump Generating Plant (Area 8).

Alignments within the Reservoir: These alignments reflect some former roads on the property (Area 9).

A comparison between the elevations of the two surveys was made using a map of the net erosion/deposition between September 1961 and May 2001 (Figure 5.1-3). In general, this figure reveals the following pattern: There was generally no substantial sediment deposition on the topographic highs (Areas 1-3) (within the margin of error). Most of the deposition has occurred in the central part of the reservoir (Area 7) and in the topographic lows in the south (Areas 5 and 6), as well as just to the north of Area 1. There is an area of no sediment deposition and pockets of erosion just to the east of the Lewiston

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Pump Generating Plant (Area 8). There were small isolated deep erosional pockets and narrow alignments at the location of former haul roads in the west (Area 9 [several locations]).

5.2 Exposure of Sedimentary Surface during Drawdown

Drawdown of the reservoir during power generation exposes topographic highs in the southeastern, northeastern, and northwestern corners of the reservoir (Figures 5.2-1 and 5.2-3); please refer to Figure 1.2.2-3 to relate the reservoir elevations in Figure 5.2-1 to a specific day and time in the week. The topographic high starts to be exposed at a water elevation of 633 feet USLSD (1935). At a water elevation of 621 feet, a substantial portion of the northern half of the reservoir bottom is exposed.

5.3 Sediment Accumulation Rate

Using a uniform water surface elevation of 658 feet, the total storage volume in the reservoir in September 1961 was calculated to be 75,700 acre-feet. Similarly, the total volume in May 2001 was 73,907 acre-feet). Accordingly, the volume in the reservoir decreased by 1,793 acre-feet during the 39.7-year period.

Given that the reservoir surface area is 1,900 acres, the net accumulation for the entire reservoir is 0.95 feet over the 39.7-year period, or 0.29 inches/year. This rate is strikingly similar to the rate computed for the Sir Adam Beck Reservoir (on the Canadian side of the Niagara River) of 0.25 inches/year for the period 1958 to 1990 (Williams et al. 2003); this study was also based on a comparison of bathymetric surveys.

5.4 Sediment Sources

The sediment in the Lewiston Reservoir is supplied entirely by the Niagara River; eolian particles (i.e., wind-blown dust) are not considered a relevant source; Don Williams, EC, pers. comm., 2/12/04. Sediment that enters the intakes along the Niagara River does not settle in the conduits due to high average flow rates. The average annual water velocity in the Niagara River near the intake is 2.3 ft/s

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(URS et al. 2005a). The average water velocity in the conduits is 14 ft/s (Norm Stessing, NYPA, pers. comm., 10/3/03).

Using average total suspended sediment concentrations, the amount of sediment entering the Lewiston Reservoir can be determined. The average total suspended sediment concentration in the upper Niagara River measured between 1997 and 1999 was 3.80 mg/l; the average concentration in the lower Niagara River was 6.91 mg/l based on data in Appendix B. Using the mean suspended sediment concentration between the upper and lower Niagara River of 5.35 mg/l, and an average volume of Niagara River water pumped into the Lewiston Reservoir of 345,122 million cubic feet between 2000 and 2003 (Table 5.4-1), the total weight of suspended sediment entering the reservoir was 52,412 metric tons/year (dry weight). Only a fraction of this suspended sediment volume settles out of the water column and remains in the reservoir; the remaining fraction is discharged out of the reservoir during power generation.

The sediment supply to the reservoir varies seasonally. Specifically, suspended sediment concentrations in the NYPA intakes may be affected depending on the following factors:

Variability in suspended sediment concentration in Lake Erie: Typically, suspended sediment concentrations in Lake Erie are highest in the late fall and winter. Highest suspended sediment concentrations occur from November to January due to erosion from storms and ice scour (Figure 4.3.2-2). Lowest suspended sediment concentrations occur in the summer months.

Wind conditions and rainfall in the Niagara River region (Norm Stessing, NYPA, pers. comm., 10/3/03). High rainfall increases the suspended sediment concentrations in the tributaries entering the Niagara River, such as Tonawanda Creek, Ellicott Creek, and the Grand Island tributaries. If the wind blows from the prevailing southwesterly direction (Figure 5.4-2), the turbid waters entering the river remain close to the American shore and enter the NYPA intakes. A similar process is also observed for the Canadian Power plant if the wind blows from the north (Norm Stessing, NYPA, pers. comm., 10/3/03).

As a result of variability in the suspended sediment concentrations in the river, the water entering the forebay through the conduits may be higher or lower in suspended sediment concentration than the water in the Lewiston Reservoir. This condition is illustrated in Figure 1.2.2-1, where the water entering the forebay from the conduits is turbid compared to the water in the reservoir. It appears that the

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Lewiston Pump Generating Plant is generating electricity at the time, discharging less turbid water into the forebay.

5.5 Resuspension of Bottom Sediments

Resuspension of sediment is primarily a function of the following factors: forces acting on the sediment (natural and man-made), sediment types (grain size and cohesiveness), and circulation. These factors are discussed in more detail below.

5.5.1 Natural Forces

Natural forces consist of wind-induced currents and waves. The prevailing wind direction is from the southwest (Figure 5.4-2). Winds blow in from this direction on average 30% of the time in a year. In addition, winds from the southwest clearly reach the highest velocities of over 25 mph (approximately 11 m/s).

Waves generated on the water may reach elevations of 3 feet (Norm Stessing, NYPA, pers. comm., 10/3/03; Neil Patterson, Tuscarora Environment Program, pers. comm., 10/3/03). Waves on the reservoir were observed by staff from the Louis Berger Group, Inc. during two events: October 3 and October 15, 2003. The effect of these waves on bottom sediments is discussed in Section 5.5.5.

October 3, 2003: During the site visit on October 3, 2003 (12:00h), the wind blew out of the southwest at a velocity of 21 mph (9.25 m/s) (NOAA 2003). Winds were calmer earlier in the day and during the previous night. Winds remained strong during the afternoon. This airflow generated waves of a few inches at the southwestern end of the reservoir (Figure 5.5.1-1), approximately 1-foot waves in the southeastern corner (Figure 5.5.1-2), and 2 to 3-foot waves in the northeastern corner of the reservoir (Figures 5.5.1-3 and 5.5.1-4). There were small whitecaps in the central area of the reservoir (Figure 5.5.1-5) with a wave height of approximately 1 foot. Wave conditions later in the day at 16:00h were similar to the noon conditions. Waves in the northeastern corner of the reservoir were higher due to the shallow topography and because they had a chance to build as the wind blew across the reservoir.

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October 15, 2003: On October 15, 2003, the wind blew out of the west at around 30 mph (13.4 m/s). Winds had been blowing consistently at high velocities since 2:00h. At the time of the site visit at 15:00h, this airflow had generated waves of approximately 1 foot at the southwestern end of the reservoir (Figure 5.5.1-6). Waves increased in size toward the east reaching 3 feet along the entire eastern dike (Figures 5.5.1-7 and 5.5.1-8). There were small whitecaps throughout the reservoir. The water in the reservoir was colored suggesting elevated concentrations of suspended sediment. However, the water in the Niagara River was also colored as a result of stormwater runoff and resuspended sediment in Lake Erie. Specifically, westerly gales blew over Lake Erie with 10-foot waves resulting in erosion along the shore. Further, heavy rain fell over Buffalo between 17:00h and 21:00h on 10/14/03 with lingering rain till 8:00h the next morning. The stormwater runoff with likely elevated suspended sediment concentrations occurred at the time of pumping of water into the reservoir. Therefore, there was no indication that the colored water in the reservoir at the time of the site visit at 15:00h on 10/15/03 was caused by resuspension of sediment within the reservoir as a result of higher wind-related shear stress, but instead appeared to have been caused by inflow of turbid Niagara River water.

Based on 1992 wind data for the Buffalo International Airport (Figure 5.4-2), winds with the velocity experienced during the site visit on October 3, 2003, occur roughly 5 to 10% of the time at the Lewiston Reservoir. These wind data correspond with the observation that waves are commonly highest in the eastern and northeastern part of the reservoir (Norm Stessing, NYPA, pers. comm., 10/3/03; Neil Patterson, Tuscarora Environment Program, pers. comm., 10/3/03). Winds with the velocity experienced during the site visit on October 15, 2003 occur approximately 2% of the time at the Lewiston Reservoir and therefore can be considered near-worst-case scenario.

Waves and currents exert a shear stress on the sediment surface, potentially resuspending sediment particles. Resuspended sediment on the water surface was observed from the top of the dike during the site visit only in the southeastern corner of the reservoir for a distance of approximately 30 feet from the dike toward the center of the reservoir (Figures 5.5.1-3 and 5.5.1-4) and along a narrow band on the eastern and northern edge of the reservoir for a distance of less than 10 feet from the dike toward the center of the reservoir (Figure 5.5.1-4).

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5.5.2 Man-made Forces

Man-made forces consist of pumping of water into the reservoir at the Lewiston Pump Generating Plant, commonly at night and on weekends, and of drawing down the reservoir during power generation during the day. The forces acting on the sediment surface are expected to be limited to the vicinity of the Lewiston Pump Generating Plant. Figure 5.1-3 shows a narrow and shallow eroded channel to the east of the Pump Generating Plant (Area 8 in Figure 5.1-2). However, erosion in the immediate vicinity of the Pump Generating Plant is comparatively minor. This is likely due to the presence of an apron of crushed rock, placed during construction of the reservoir (see Appendix E for aerial photographs from 1961). The apron has a semi-circular shape and extends for approximately 1,000 feet from the Pump Generating Plant. Outside of the immediate area of the Lewiston Pump Generating Plant, flow velocities generated in other parts of the reservoir as a result of the pumping/generating operations are considered small.

There is no information about velocities generated in the water column; however, relative to the natural forces acting on the reservoir, potential erosional effects on the sediment surface from the turbulent flow into and out of the generating plant appear to be limited to the vicinity of the reservoir immediately adjacent to the plant.

The potentially greatest effect of the operation of the generating plant is the frequent change in water elevation in the reservoir, exposing the sediments to varying intensities of wave energy. The effect on sediment resuspension is discussed in Section 5.5.5.

5.5.3 Sediment Type

As described in Section 3.3, the sediments consist of 95% silt and clay and minor fractions of sand and gravel (Table 3.3-1). Sediments collected in October 1983, approximately 600 feet north of the Lewiston Pump Generating Plant, were not analyzed quantitatively but were described as “black mud, approximately 6-10 inches thick” (Ecological Analysts, 1984a).

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5.5.4 Circulation

There is no information about a circulation pattern in the reservoir. However, given the constant change in water elevation due to pumping of water into the reservoir and withdrawal of water during power generation, it is likely that there is no typical circulation pattern in the reservoir.

5.5.5 Resuspension of Sediments

Based on the wave observations from October 3 and 15 as well as on other existing information, waves in the Lewiston Reservoir are not expected to generate scour of the bottom sediments in most areas (Michael Bruno, Stevens Institute of Technology, pers. comm., 10/23/03). The orbital velocity generated by waves is quickly attenuated with depth. In the shallow areas of the reservoir that are exposed at low water elevations, the wave energy will prevent settling sediment particles from permanent deposition. Sediment that may have settled in this area during calmer periods would likely have been resuspended as the water elevation in the reservoir decreased. This effect is reflected in the pattern shown on the net erosion/deposition map (Figure 5.1-3). In the deeper central areas of the reservoir, the orbital velocity of the waves may result in horizontal back-and-forth motion of settled but still comparatively unconsolidated particulate matter within the upper inch of the sediment column. These comparatively recent sediments would contain contaminant concentrations that reflect recent concentrations in the Niagara River water. Therefore, grab samples that were collected during the recent sediment surveys (ESI 2005; URS 2005) with a penetration depth of approximately 6 inches should be adequate for the characterization of the sediment contaminants potentially bioavailable to aquatic organisms.

Scour of sediment may only be expected in shoaling areas with a rapid change in water depth, or in locations where waves are reflected along man-made structures. Comparatively rapid shoaling occurs close to shore in the northeastern and southeastern corners of the reservoir. Reflection of waves by the dike during the strong prevailing southwesterly winds occurs along the northeastern and eastern dikes. On October 3, 2003, resuspended sediment in the water column was observed only in a narrow zone along these dikes (Figures 5.5.1-3 and 5.5.1-4). The width of this zone is not expected to be wider during lower water elevations in the reservoir because the exposure of the shallow areas in the northern section of the reservoir will reduce the wave height by shortening the fetch for the waves. On October 15, 2003,

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resuspended sediment along the dike could not be observed since the water that had been pumped into the reservoir the night before was turbid.

Processes in the Lewiston Reservoir are expected to be similar to processes in the Sir Adam Beck Reservoir in Canada. Wave-induced scour of consolidated bottom sediments is not likely either in the Canadian reservoir (Don Williams, Environment Canada, pers. comm., 10/22/03 and 2/12/04).

5.6 Sedimentation in Lewiston Reservoir - Discussion

5.6.1 Sedimentation

The existing data and information, as well as the observations during the site visits, suggest the following pattern of erosion and deposition in the Lewiston Reservoir:

Net Deposition Rate: The reservoir experiences a net deposition rate for the entire reservoir of approximately 0.29 inches/year.

Deposition/Erosion Pattern: The reservoir has areas of deposition and areas of no deposition or minor erosion. Deposition has occurred primarily in the center of the reservoir (Area 7 in Figure 5.1-2) and along the southern border (Areas 5 and 6). Due to comparatively higher forces on the topographic highs (Areas 1 to 3), sediment did not accumulate there. Instead, sediment was deposited in the deeper areas adjacent to these highs (Area 7, and in an area to the north of Area 1). In addition, deposition in Areas 5 and 6 may have occurred because these areas were topographic lows where the effect of wave energy is comparatively lower. All depositional areas are located in the central and southern parts of the reservoir, rather than in the eastern part of the reservoir, where the wave energy is strongest from the prevailing southwesterly winds.

Deposition/Erosion from Reservoir Operation: Erosion and resuspension of bottom sediment due to the pumping/withdrawal of water into/from the reservoir appears to be minor. The effect is limited to the immediate vicinity of the Lewiston Pump Generating Plant.

Erosion along Former Roads: Apparent areas of erosion along former roads (Area 9) are likely a result of lack of detail in the original surveying data from 1961, rather than actual erosion zones.

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Erosion in Former Fish Creek and Gill Creek Riverbed: The area of erosion in the former Fish Creek and Gill Creek riverbeds may also be an artifact of insufficient survey data from 1961. Based on aerial photographs from 1961, these two creeks were depressions at the time of filling of the reservoir with water in October 1961 (see Appendix E). Apparent erosion in the riverbed may be a result of absent elevation data for the bed in the 1961 survey.

5.6.2 Bioavailability of Contaminants

Contamination in fish is a function of bioavailability of contaminants in the water and sediment. Based on the existing data and information, it appears that the greatest source of contaminants in reservoir water and sediments of the Lewiston Reservoir is water from the upper Niagara River.

Dissolved Phase: Due to the high turnover rate of the reservoir water, fish would be exposed to dissolved contaminant concentrations similar to those in the upper Niagara River. Leaching rates of adsorbed contaminants from bottom sediments into the water column are too small to be significant.

Particulate Phase: Due to the high turnover rate, the suspended sediment concentration during filling of the reservoir is expected to be similar to the concentration in the upper Niagara River. Due to the comparatively low energy conditions in the reservoir, part of the suspended matter settles to the reservoir bottom. Initially, this material is flocculent and unconsolidated. As a result, this material is easily resuspended and transported within the reservoir until is remains in an area of lower wave energy, where it becomes part of the more consolidated sediment column.

While there may be some areas of elevated suspended sediment concentrations near the reservoir floor as a result of this process, the suspended sediment concentration in the water column will have decreased due to the removal of particles to the reservoir floor during settling. Therefore, it is possible that the suspended sediment concentration in the reservoir is the same or somewhat lower than the concentration in the Niagara River water. Lower suspended sediment concentrations may be suggested by the lower turbidity in Lewiston Reservoir water as compared to Niagara River water during the URS survey in 2003 (Figure 4.3.2-1), although the available amount of data is limited.

Although resuspension of older sediments may occur during occasional peak events with high waves due to strong winds, these events are infrequent. Since bioavailability is a function of frequency

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and concentration, the frequent exchange with Niagara River water appears to be the dominant source of both dissolved and particulate contaminants for fish in the Lewiston Reservoir. The current quality of the Niagara River water is the primary factor affecting contaminant availability to fish in the reservoir.

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TABLE 5.4-1

VOLUME OF NIAGARA RIVER WATER FLOWING INTO LEWISTON RESERVOIR DURING PUMPING

Month	Volume of Water Pumped into Lewiston Reservoir									
	Year 2000		Year 2001		Year 2002		Year 2003		Mean	
	million cu-ft	million m^3	million cu-ft	million m^3	million cu-ft	million m^3	million cu-ft	million m^3	million cu-ft	million m^3
1	28,277	802	23,061	654	26,605	755	22,269	632	25,053	711
2	25,651	728	20,257	575	21,475	609	22,108	627	22,373	635
3	26,510	752	23,873	677	26,250	745	23,455	665	25,022	710
4	27,366	776	29,282	831	26,779	760	27,693	786	27,780	788
5	32,211	914	31,699	899	25,702	729	33,218	942	30,707	871
6	31,265	887	32,534	923	30,496	865	33,522	951	31,954	907
7	31,262	887	34,950	992	32,822	931	35,925	1,019	33,740	957
8	32,268	916	36,940	1,048	33,656	955	35,124	997	34,497	979
9	31,451	892	36,395	1,033	32,059	910	32,593	925	33,125	940
10	31,970	907	32,856	932	28,456	807			31,094	882
11	23,895	678	27,911	792	23,569	669			25,125	713
12	24,348	691	28,283	802	21,325	605			24,652	699
Total	346,475	9,830	358,040	10,159	329,195	9,340			345,122	9,792

Data from Norm Stessing, NYPA, pers. comm., 10/3/03.

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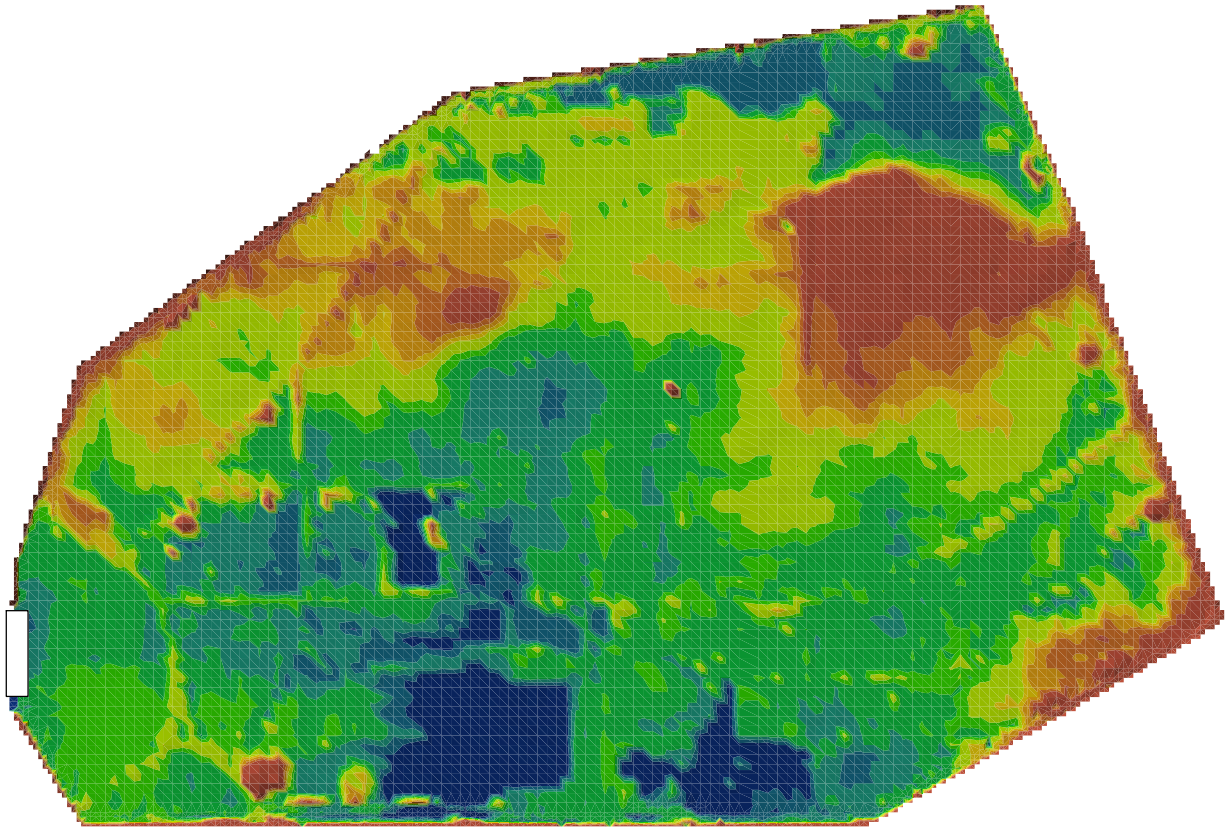


NIAGARA POWER PROJECT (FERC NO. 2216)
DESCRIBE CONTAMINANT LEVELS
IN FISH IN LEWISTON RESERVOIR

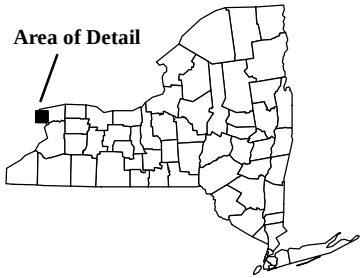
Topographic Elevation of
Lewiston Reservoir Bottom in 1961

LEGEND

Lewiston Pump Generating Station

Elevation (Feet USLSD 1935)

- > 626
- 624 - 626
- 622 - 624
- 620 - 622
- 618 - 620
- 616 - 618
- 614 - 616
- 612 - 614
- 610 - 612
- < 610



0 1,000 2,000 3,000 4,000 Feet

Figure 5.1-1

N

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NIAGARA POWER PROJECT

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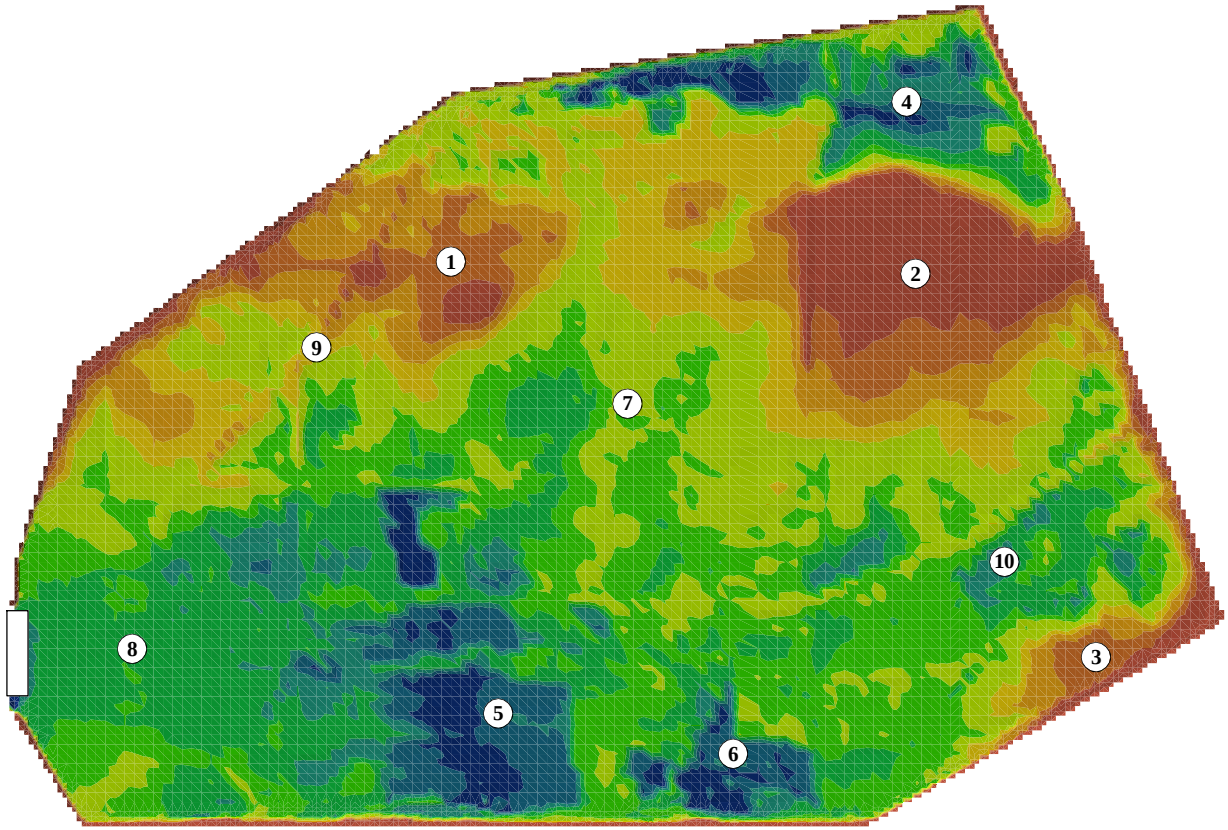


NIAGARA POWER PROJECT (FERC NO. 2216)
DESCRIBE CONTAMINANT LEVELS
IN FISH IN LEWISTON RESERVOIR

Topographic Elevation of
Lewiston Reservoir Bottom in 2001

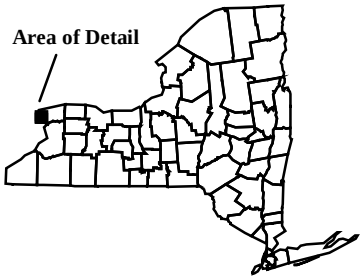
LEGEND

Areas Discussed in Text

Lewiston Pump Generating Station

Elevation (Feet USLSD 1935)

- > 626
- 624 - 626
- 622 - 624
- 620 - 622
- 618 - 620
- 616 - 618
- 614 - 616
- 612 - 614
- 610 - 612
- < 610



0 1,000 2,000 3,000 4,000 Feet

Figure 5.1-2

N

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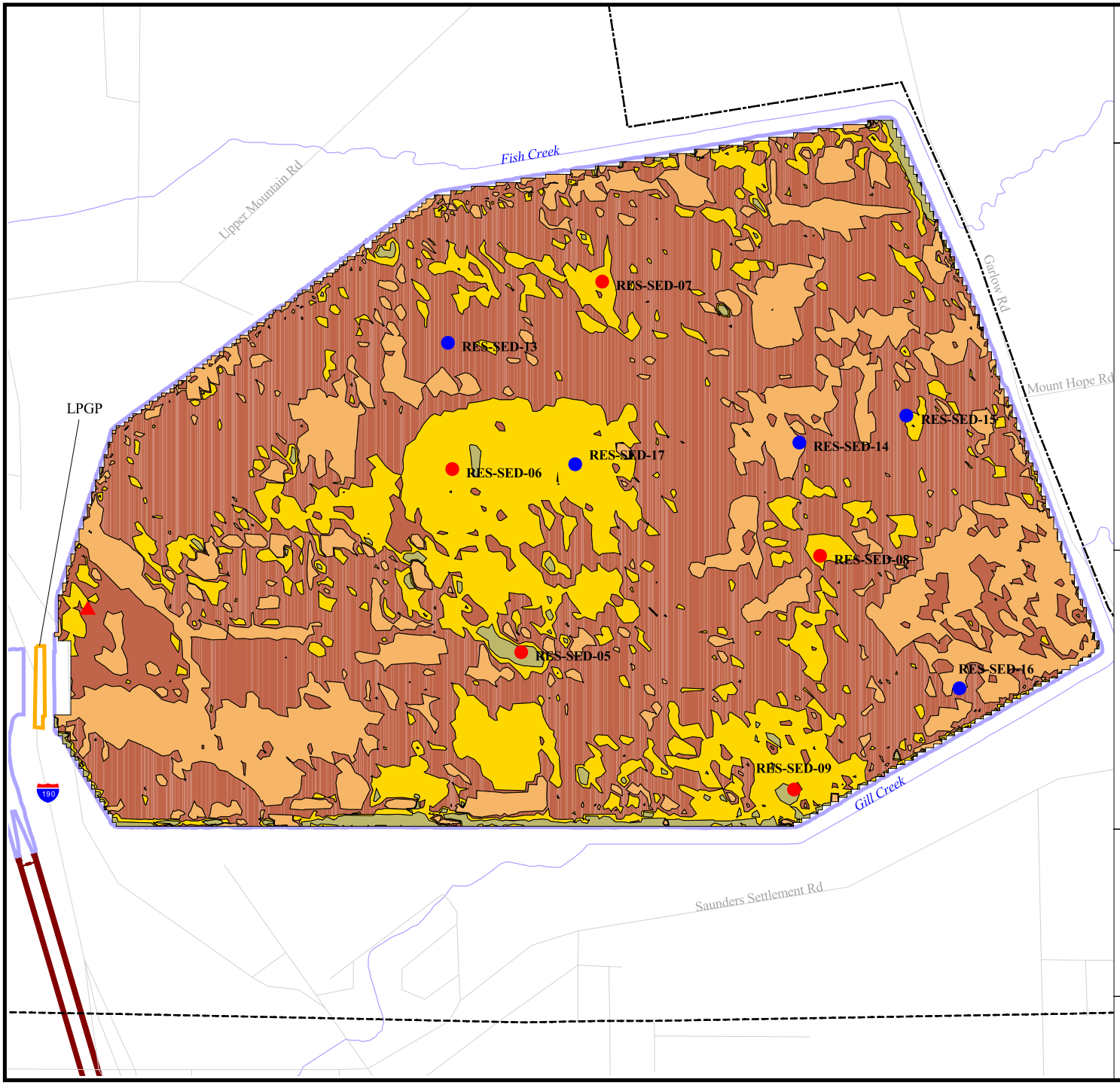
NIAGARA POWER PROJECT (FERC N0. 2216)
DESCRIBE CONTAMINANT LEVELS
IN FISH IN LEWISTON RESERVOIR

Net Erosion/Deposition in Lewiston Reservoir
from 1961 to 2001



LEGEND

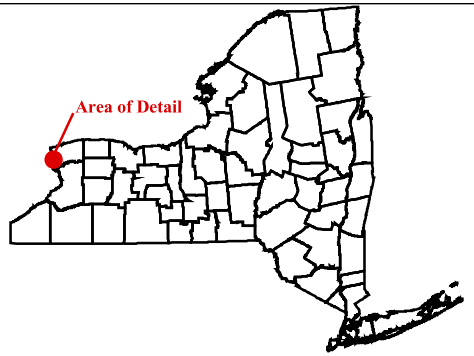
- Sediment Sampling Location 2003
- Sediment Sampling Location 2002
- Sediment Sampling Location, Ecological Analysts 1984

Sedimentation Contours (Intervals in Feet)

- 0 - 2 ft.
- 2 - 4 ft.
- > 4 ft.
- Erosion

- Project Structure
- Conduits
- Municipal Boundary
- Water Bodies
- Roads

LPGP = Lewiston Pump Generating Plant



0 1750 3500 Feet

1" = 1,750'

N

FIGURE 5.1-3

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NIAGARA POWER PROJECT

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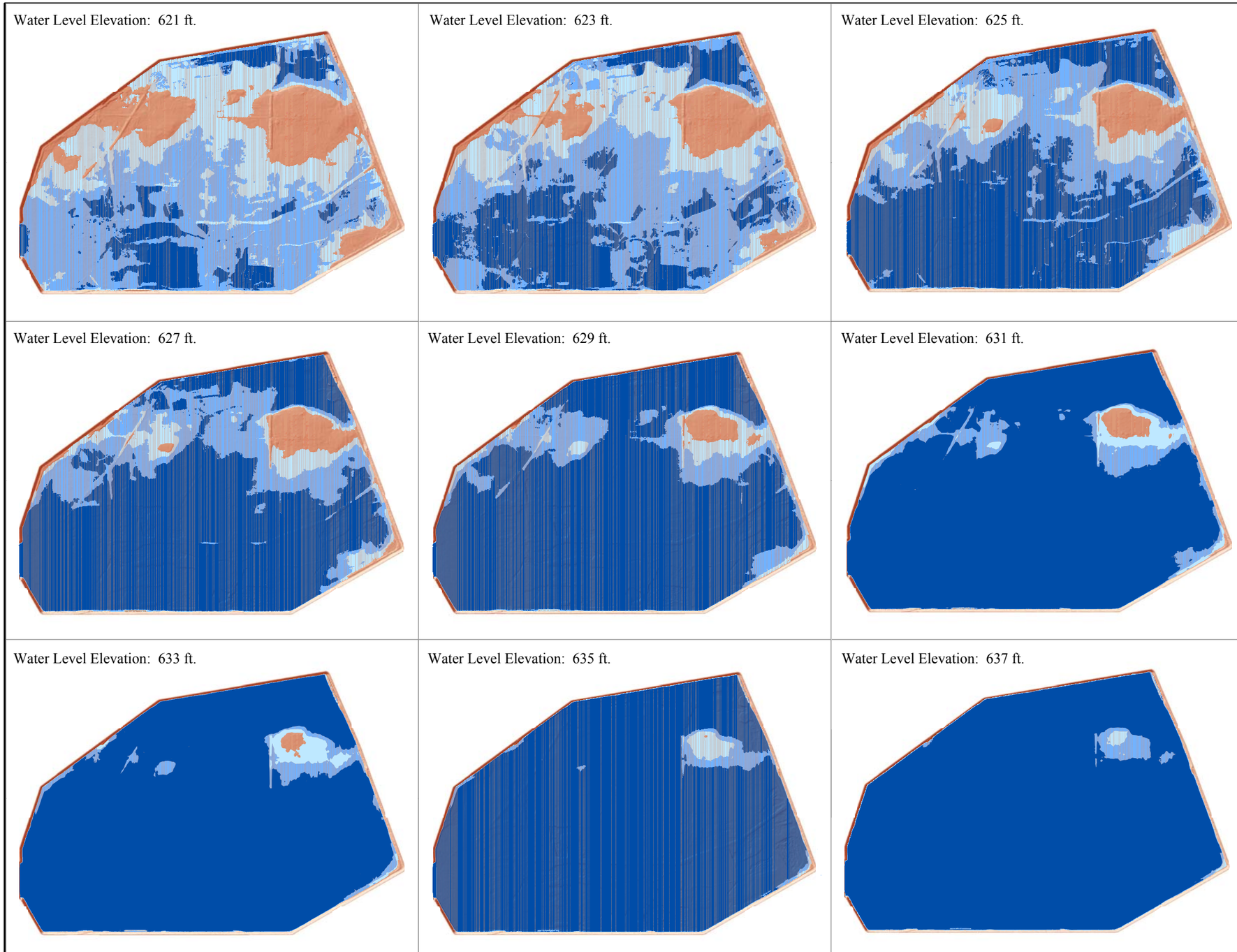

NIAGARA POWER PROJECT (FERC NO. 2216)
DESCRIBE CONTAMINANT LEVELS
IN FISH IN LEWISTON RESERVOIR

Reservoir Bathymetry at Different Water Level Elevations

LEGEND

Water Depth in Feet

- 0 - 3
- 4 - 6
- > 7

Reservoir Bottom

0 1,750 3,500 7,000 Feet

1" = 3,500'

N

FIGURE 5.2-1

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NIAGARA POWER PROJECT

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FIGURE 5.2-2

EXPOSURE OF TOPOGRAPHIC HIGH AREAS IN THE NORTHEASTERN AREA OF THE RESERVOIR AT APPROXIMATELY 18:00H ON FRIDAY, SEPTEMBER 5, 2003

Note: The approximate water elevation at the time of photograph was 624.11 feet.

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FIGURE 5.2-3

EXPOSURE OF AREAS IN THE SOUTHEASTERN CORNER OF THE RESERVOIR AT APPROXIMATELY 17:00H ON FRIDAY, SEPTEMBER 5, 2003

Note: The approximate water elevation at the time of photograph was 625.05 feet

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FIGURE 5.4-2

WIND SPEED (M/S) FOR BUFFALO GREATER INTERNATIONAL AIRPORT IN 1992

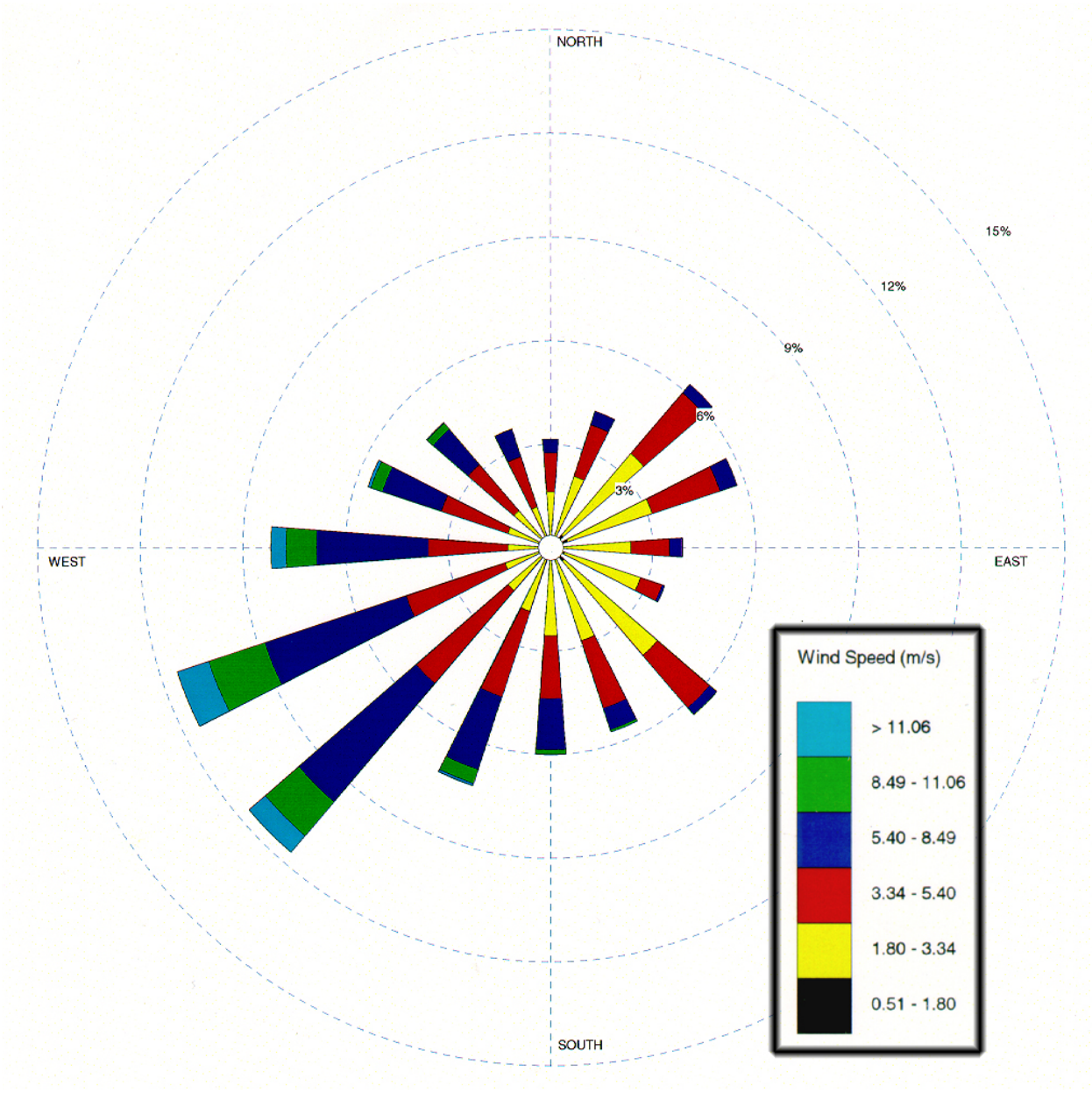

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FIGURE 5.5.1-1

WATER SURFACE OF THE SOUTHWESTERN END OF LEWISTON RESERVOIR AT APPROXIMATELY 12:00H ON FRIDAY, OCTOBER 3, 2003

Notes: Waves generated by strong southwesterly winds were only a few inches high. The approximate water elevation at the time of photograph was 638.9 feet.

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FIGURE 5.5.1-2

WATER SURFACE OF THE SOUTHEASTERN END OF LEWISTON RESERVOIR AT APPROXIMATELY 12:00H ON FRIDAY, OCTOBER 3, 2003

Note: Waves generated by strong southwesterly winds were approximately 1 foot high in the area close to the dike. The approximate water elevation at the time of photograph was 638.9 feet.

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FIGURE 5.5.1-3

WATER SURFACE OF THE NORTHEASTERN END OF LEWISTON RESERVOIR AT APPROXIMATELY 12:00H ON FRIDAY, OCTOBER 3, 2003

Notes: Looking to the west. Waves generated by strong southwesterly winds were approximately 2 to 3 feet high in the area close to the dike. Further toward the center of the reservoir, waves were smaller. The approximate water elevation at the time of photograph was 638.9 feet.

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FIGURE 5.5.1-4

WATER SURFACE OF THE NORTHEASTERN END OF LEWISTON RESERVOIR AT APPROXIMATELY 12:00H ON FRIDAY, OCTOBER 3, 2003, LOOKING TO THE SOUTHWEST

Note: The approximate water elevation at the time of photograph was 638.9 feet.

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FIGURE 5.5.1-5

WATER SURFACE OF THE NORTHEASTERN AREA OF LEWISTON RESERVOIR AT APPROXIMATELY 12:00H ON FRIDAY, OCTOBER 3, 2003, LOOKING TO THE SOUTHWEST

Notes: The southwesterly winds generated whitecaps that also covered the shoal area (brown area in center of the photograph). This shoal area was about to become exposed due to the drawdown of the water from power generation. The approximate water elevation at the time of photograph was 638.9 feet.

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FIGURE 5.5.1-6

WATER SURFACE OF THE SOUTHWESTERN END OF LEWISTON RESERVOIR AT APPROXIMATELY 15:00H ON WEDNESDAY, OCTOBER 15, 2003

Notes: Waves generated by strong westerly winds were approximately 1 foot high. The approximate water elevation at the time of photograph was 640.92 feet.

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FIGURE 5.5.1-7

WATER SURFACE OF THE SOUTHEASTERN END OF LEWISTON RESERVOIR AT APPROXIMATELY 15:00H ON WEDNESDAY, OCTOBER 15, 2003

Notes: Waves generated by strong westerly winds were approximately 3 feet high. The approximate water elevation at the time of photograph was 640.92 feet.

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FIGURE 5.5.1-8

WATER SURFACE OF THE NORTHEASTERN END OF LEWISTON RESERVOIR AT APPROXIMATELY 15:00H ON WEDNESDAY, OCTOBER 15, 2003

Notes: Waves generated by strong westerly winds were approximately 3 feet high. The approximate water elevation at the time of photograph was 640.92 feet

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6.0 FISH CONTAMINATION

6.1 Fish Species Studied

The fish species composition in the Lewiston Reservoir was characterized using existing information. Fish surveys were conducted in the Lewiston Reservoir in June 1975; November 1982; May, July, and August 1983; and May, July, and October 2000. In addition, NYSDEC (1984) and NYPA (Stantec 2005) surveys were used to identify fish species targeted by anglers in the Niagara River and Lewiston Reservoir. The existing information was used to determine dominant and representative fish species, as well as seasonal abundance and spawning patterns, so that potential contamination levels in fish could be assessed. The study focused on the most abundant sport and forage species in the reservoir and did not attempt to evaluate the potential contamination of all fish species present in the reservoir.

6.2 Approach to Bioaccumulation Assessment

6.2.1 Identification of Trophic Positions/Feeding Habitats

The trophic position and feeding habits of selected species present within the reservoir were determined from review of the scientific literature. Trophic level and feeding habits have an impact on the uptake and bioaccumulation of contaminants. Feeding habits differ not only between species but also among different size or age classes of fish of the same species. Therefore, different life stages of fish may feed on different prey and therefore occupy different trophic levels.

Trophic levels considered from lowest to highest include:

Bottom (or benthic) detritivores, which feed on detrital matter on the sediment.

Omnivores, which feed on a variety of food items, including plant and animal matter.

Planktivores, which feed on zooplankton (e.g., copepods and rotifers) in the water column.

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Bottom (or benthic) predators, which feed on benthic invertebrates including insect larvae.

Piscivores, which feed on other fish.

6.2.2 Bioavailability and Exposure Pathways of Contaminants

Chemical or contaminant residues in fish are a function of chemical concentrations in their environment (water and sediment), concentrations in the prey that the fish ingest, and loss rates through metabolism or excretion. Chemicals in the water column are taken up via respiration through the gills and dermal contact (Connell 1989, USEPA 2000). Chemicals in prey items are ingested. Chemicals in sediment can be ingested incidentally while feeding, for example, on benthic macroinvertebrates such as insect larvae. Particulates, such as suspended sediment in the water column can also be ingested. Sediment and water column phases are interconnected in an ecosystem through fate and transport processes such as hydrodynamics, diffusion, particle deposition, and resuspension as described in Section 5.0.

Terms and concepts utilized in assessing chemical uptake in fish include:

Bioavailability: For chemicals, the state of being potentially available for biological uptake by an aquatic organism when that organism encounters a given environmental medium.

Bioconcentration: Bioconcentration is the increase in chemical concentration in fish relative to the ambient water concentration resulting from uptake of a chemical through the gills or skin.

Bioaccumulation: Bioaccumulation is the increase in chemical concentration in fish resulting from bioconcentration and uptake from the diet (e.g., prey items).

Biomagnification: Biomagnification is the result of the processes of bioconcentration and bioaccumulation by which tissue concentrations of bioaccumulated chemicals increase as the chemical passes up through two or more trophic levels. The term implies an efficient transfer of chemicals from food to consumer so that residue concentrations increase systematically from one trophic level to the next. Up to 90% or more of the total bioaccumulation of biomagnifying chemicals (e.g., PCBs, mercury, and DDT) comes from food-chain exposure (Campfens and Mackay 1997).

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Biota-Sediment Accumulation Factors (BSAFs): BSAFs are transfer coefficients that relate concentrations in biota to concentrations in sediment. They are calculated as the ratio of the concentration of a nonpolar organic chemical in fish tissue (normalized by lipid content) to the concentration in sediment (normalized to total organic carbon). They are the relative concentration of a substance in the tissues of an organism compared to the concentration of the same substance in the sediment (USEPA 2000). BSAFs allow a qualitative assessment of contaminant levels in fish in the reservoir; however, BSAFs are not available for all the chemical contaminants examined in this study (USEPA 2000). BSAFs vary depending on the biota, dynamics of chemical loadings to the water body, food chain effects, and rate of sediment-water exchange. For this study, we utilized BSAF values published by USEPA (1996, 2000). BSAF values can also be measured on a site-specific basis.

Endogenous and exogenous factors affect bioaccumulation in fish. The endogenous factors or traits specific to an individual fish include growth rate, lipid content, age/size, and gender. The exogenous factors include chemical concentration in the prey, prey population dynamics, food chain length, and limnological factors (e.g., sediment grain size, total organic carbon, water quality, temperature, and sediment deposition rate) that affect chemical concentrations in water, sediment, and prey.

The final concentration of a chemical contaminant in a fish is equal to the difference between the quantity of chemical ingested and the quantity of chemical excreted or metabolized, divided by the total fish mass. Because excretion and metabolism of biomagnifying chemicals are both very low, this simplistic bioaccumulation equation can be further simplified into setting bioaccumulation equal to the mass of a chemical assimilated, divided by body mass accreted. Thus, chemical concentrations in fish are a negative function of fish growth rate. It is widely recognized in the literature that bioaccumulation is lower in "fast-growing" fish compared to "slow-growing" fish (Stow and Carpenter 1994, Madenjian et al. 1995). For example, a rapidly growing fish accumulates body mass at a greater rate than its accumulation of chemicals (growth dilution), resulting in lower concentrations of contaminants than fish with a slow rate of growth.

However, this widely held paradigm obscures a complicated relationship. For one, it is not growth rate that is important, but growth efficiency (Borgmann and Whittle 1992; Madenjian and

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Carpenter 1993; Jackson and Schindler 1996; Madenjian et al. 1995, 1998), which is the ratio of biomass consumed to biomass accreted. Total chemical intake is also related to the mass of prey biomass consumed. As a result, if a fish's growth efficiency is low, higher rates of bioaccumulation may result.

6.2.2.1 Exposure Pathways

For lower trophic-level fish, diet and direct contact with water or sediment by the gills are the primary exposure pathways (USEPA 1997). For higher trophic-level fish species, diet can be an important exposure pathway for contaminants of concern that are bioaccumulated or biomagnified such as PCBs. Uptake of PCBs from diet is the most important pathway for consumers higher in aquatic food chains, although uptake from direct contact with sediment can also occur. Also, direct bioconcentration from PCBs in water may be significant (USEPA 1997).

6.2.2.2 Factors Affecting Bioavailability

A wide range of chemical, physical and biological factors have the potential to influence the bioavailability of sediment contaminants. The bioavailability of contaminants in sediment is a function of the type of chemical and the chemical speciation as well as the behavior and physiology of the organism, as described above. The characteristics of a chemical such as its molecular size and polarity determine to an extent the degree of association of the chemical with particles. Large, nonpolar chemicals such as highly chlorinated PCBs have low aqueous solubilities and a strong tendency to be associated with dissolved and particulate organic matter.

The concentration of metals in sediments may not be predictive of the bioavailability of these elements (USEPA 2000). Metals concentrations in interstitial water have been correlated with biological effects. Key factors that affect the portioning and speciation and therefore the bioavailability of sediment metals include redox conditions (i.e., whether the conditions are oxic or anoxic), pH, interstitial water hardness, organic carbon content of the sediment, and pore water concentration of dissolved organic carbon (USEPA 2003).

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6.2.3 Predictive Bioaccumulation Assessment

6.2.3.1 Data Sources

Three primary sets of data and information were used to assess the contamination levels in fish within the Lewiston Reservoir relative to the Niagara River: concentrations of contaminants in the water and sediment of the reservoir relative to the river as described in Sections 3.0 and 4.0; existing tissue results for fish collected in the river; and the feeding habits of fish species that are present within the reservoir. In addition, we utilized published BSAFs for the specific compounds to evaluate qualitatively the potential bioaccumulation of contaminants in the fish (USEPA 1996).

There are limited fish tissue data available for the upper and lower Niagara River, and none available for the Lewiston Reservoir. In addition, much of the available information on the contaminant levels in fish within the Niagara River were collected several years ago in the upper Niagara River, some distance from the intakes for the Niagara Project, or collected with a focus on a specific contaminant within a tributary as part of a remediation project (Tom Preddice, NYSDEC, pers. comm., 11/25/03; Mike Wilkinson, NYSDEC, pers. comm., 12/01/03). Contaminant levels in fish collected from the river in the 1970's and 1980's were also published by Yurawecz (1979), Suns et al. (1983), and Jaffe and Hites (1986).

NYSDEC (1994b, 2002) utilized primarily young-of-year spottail shiner (*Notropis hudsonius*) for their biomonitoring program because the species has a limited home range nearshore and are of known age. NYSDEC (2002) collected young-of-year fish from 35 nearshore areas in 1997 within the New York Great Lakes Basin extending from Dunkirk, New York, on Lake Erie, to Massena, NY, on the St. Lawrence River. Five NYSDEC stations were selected for use in this assessment based on their proximity to the Lewiston Reservoir (Figure 6.2.3-1). NYSDEC has recognized that young-of-year spottail shiners are useful indicators of local, recent chemical inputs into an aquatic system (NYSDEC 1994b). In addition to spottail shiner, NYSDEC used bluntnose minnow (*Pimephales notatus*) and emerald shiners (*Notropis atherinoides*) at stations where spottails were not present or were collected in insufficient numbers.

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OMOE has collected young-of-year fish at several Canadian and U.S. locations at least every other year since the early 1980s (Williams and O'Shea 2003). Williams and O'Shea (2003) reported values for 1999, 2001, and 2002 (in the upper and lower Niagara River). In 2000, OMOE collected spottail shiners from eight locations in the upper and lower Niagara River. Common shiners (*Notropis cornutas*) were collected as an alternative species at one location in the upper river, where spottail shiners were not available. In 2001, OMOE collected spottail shiners from eleven locations in the upper and lower river.

In addition, OMOE has collected and analyzed contaminants in skinless, boneless fillets of a variety of sportfish from the upper Niagara River (in the vicinity of Frenchman's Creek) since 1975 and from the lower Niagara River (in the vicinity of the Queenston boat launch) since 1978 (OMOE 2004).

6.2.3.2 Assumptions

Given the frequent input of water from the upper river to the reservoir, we assumed that fish living within the reservoir are exposed to the same levels of chemical constituents that are present in the upper river water column (see Section 4.0). Based on results of the sediment surveys described in Section 3.0 for the reservoir, we have assumed that sediment contaminant levels in the reservoir are relatively uniform. Given that the river is the primary source of sediment deposited in the reservoir, and based on the sediment data (see Section 3.0), we also have assumed that the sediment in the reservoir is representative of fine-grained habitats in the river, such as low flow tributaries and embayments. If contaminant levels in the waters and sediments of the Lewiston Reservoir and the upper Niagara River are similar, it is likely that contaminant levels in Lewiston Reservoir fish are similar to those in the Niagara River for the same species.

6.2.3.3 Limitations and Reliability

One complicating factor in estimating contaminant levels in fish from the reservoir is the residence time of fish within the reservoir. Fish may not live their entire lives within the reservoir. NYPA (2002) notes that reservoir fish communities are maintained by movement of fish from the upper Niagara River through the conduits and the Lewiston Pump Generating Plant. The residence time of

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these fish in the reservoir, however, is not known. As described by Suns et al. (1983), for fish examined from the Niagara River, individuals of a particular species that were sampled in different locations showed trends in contaminant levels that related to discharges from certain sites. With constant water exchange and introduction and removal of individuals from the reservoir population, fish of different age classes are exposed to the sediments and water of the reservoir for varying amounts of time.

Another complicating factor is that, within a particular fish species, individuals of different ages often feed on different prey. For example, a fish may feed on zooplankton as a juvenile and switch to benthic macroinvertebrates or small fish as they grow.

A direct proportional relationship between contaminant concentrations in sediment and water and fish tissue is often presumed to exist, based on the chemical properties of the contaminant (e.g., its lipophilicity) and the assumption that chemical equilibrium is rapidly attained. However, several other factors may affect the relationship between contaminant concentration in the sediment or water and fish. These include: (1) whether the exposure pathway is direct (e.g., dermal contact or incidental ingestion of sediment while feeding) or indirect (e.g., via the food chain); and (2) whether biological processes (e.g., active degradation) act to regulate fish body burdens of the contaminant.

Exponent (2003) noted an absence of any apparent empirical relationship between PCB concentrations in fish and sediment in the Fox River, Wisconsin, indicating that the sediment PCB concentration alone is not an adequate predictor of fish PCB concentration. Tissue PCB concentrations may be affected by past exposures outside the area of interest or study, multiple food web pathways, and active degradation. Food web transfers may result in higher trophic level fish being exposed to several dietary sources, each of which may in turn have had different exposures.

6.3 Data Evaluation

Contaminants have been documented in fish from the upper and lower Niagara River. As described in NYPA (2002), contaminants have been detected in numerous fish species in the Niagara River over the years. Yurawecz (1979) detected chlorotoluenes in yellow perch, white bass, and smallmouth bass from the river. Jaffe and Hites (1986) detected pesticides and polyhalogenated organic

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compounds in common carp from the river. In addition, the NYSDEC (1994b, 2002) reported on contaminant levels in young-of-year spottail shiners collected from the Niagara River. Williams and O'Shea (2003) reported on the concentration of organochlorine compounds in spottail shiners collected from Canadian and U.S. sites in the upper and lower Niagara River. OMOE has collected and analyzed contaminants in skinless, boneless fillets of a variety of sportfish from the upper Niagara River (in the vicinity of Frenchman's Creek) since 1975 and from the lower Niagara River (in the vicinity of the Queenston boat launch) since 1978 (OMOE 2004).

Tissue data are not available for fish in the Lewiston Reservoir. As noted above, fish populations in the reservoir are probably maintained through entrainment from the river during reservoir filling operations (NYPA 2002).

The water quality of the reservoir is similar to the water quality of the river (see Section 4.0), but the bottom substrates of the reservoir and river are different. The surface sediment in the reservoir is comprised of predominantly fine-grained sediment (95% silts and clays) (see Section 3.0). The predominant sediment type in the main river is sand and gravel. Fine-grained sediment in the river is located only in low velocity areas such as embayments and tributaries; such sediments are often associated with higher contaminant levels than coarser-grained sediments. As a result, fish in the reservoir would be expected to be exposed to similar concentrations of sediment contaminants as those in the fine-grained river habitats, given that the river is the primary source of sediment that is deposited into the reservoir.

In the following sections, we evaluate the potential for contaminant bioaccumulation in selected fish species within the reservoir relative to species in the river, and will further explore the assumptions described above.

6.3.1 Target Species and Life Histories

As previously described, fish species that occur in the reservoir are similar to those present in the upper Niagara River (Tables 6.3.1-1 and 6.3.1-2).

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The fish community of the upper Niagara River is comprised of primarily coolwater and warmwater fish (NYPA 2002). Primary game species include smallmouth bass, largemouth bass, yellow perch, muskellunge, northern pike, and walleye. In addition, the upper river contains non-sport fish species such as freshwater drum, alewife, bullhead, American eel, and rainbow smelt (URS et al. 2002). Rough species include common carp and white sucker.

Fish surveys were conducted in the Lewiston Reservoir in 1975, 1982, 1983, and 2000, as stated above (NYPA 2002; Table 6.3.1-2). A total of 39 species were recorded in the reservoir during the three combined surveys. During the 2000 survey, 29 species of fish were collected from the reservoir; the most abundant species in relative order were yellow perch (*Perca flavescens*), rock bass (*Ambloplites rupestris*), northern pike (*Esox lucius*), carp (*Cyprinus carpio*), and smallmouth bass (*Micropterus dolomieui*). Spottail shiner (*Notropis hudsonius*), which was targeted in the NYSDEC young-of-year studies (1994b, 2002), was also present.

NYPA (2002) reported that the total number of fish collected in the 1982-83 and 2000 surveys was highest during the spring, lower in summer, and lowest in the fall. The lowest numbers of yellow perch and rock bass were captured in the late fall and the highest during the spring (NYPA 2002). Smallmouth bass abundance increased from late fall to spring and reached a maximum in the summer.

The reservoir is not stocked. Larval fish surveys conducted from May through August 1983, indicate that spawning occurs only on a limited basis in the reservoir (NYPA 1984). It appears that there is very limited suitable substrate (gravel, rock, or sand bottom) and aquatic vegetation. Frequent water level fluctuations and dewatering of substrate also result in suboptimal spawning conditions (NYPA 2002). The primary aquatic habitats in the reservoir are comprised of deep open water, and the riprap shorelines of the dike (NYPA 2002). The reservoir bottom is covered by fine-grained sediment (Table 3.3-1).

The upper river recreational fishery is similar to the Lake Erie fishery and is comprised of predominantly coolwater/warmwater species. Smallmouth bass, muskellunge, northern pike, and yellow perch represent the four most targeted species. In the Lewiston Reservoir, yellow perch and smallmouth bass are the species most frequently targeted by anglers (NYPA 2003). Therefore, we included these two

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species as target species for evaluation. In addition, we included rock bass, which was the most dominant species in the reservoir during surveys conducted in July and October 2000. We also included the spottail shiner, which is primarily a planktivore but has been utilized by NYSDEC and others (e.g., Williams and O'Shea 2003) in monitoring programs as described in Section 6.2.3, and carp, which is a benthic omnivore and is included in the current New York State and Ontario sport fish consumption health advisories.

6.3.1.1 Yellow Perch (*Perca flavescens*)

Young-of-year yellow perch are planktivores and feed on zooplankton. As they grow, they switch to benthic macroinvertebrates and finally fish (Gerking 1994). In Lake Erie and other lakes, young-of-year switch from mainly zooplankton to benthos during midsummer, when zooplankton biomass typically declines (Post and McQueen 1994; Roseman 1996). Adults feed on aquatic insects, larger invertebrates, and fish.

Yellow perch have small backward slanting teeth lining the jaws and gill rakers that strain out small pelagic food sources from the water (Herman et al. 1959). Their mouth is subterminal, which makes it easy for them to feed at the bottom (Parrish and Margraf 1991). Yellow perch swallow their food whole; therefore, their gape limits the maximum prey size (Weatherly 1972). They switch to prey longer than approximately 0.06 inches when they reach total lengths of approximately 2.4 – 3.0 inches (Schneberger 1991). In large fish, the net energy gained by eating large prey, such as benthos and fish, outweighs the disadvantages of capture and digestion (Mills et al. 1989).

Yellow perch move from deep water where they overwinter to shallow water spawning areas in the spring. Males arrive on the spawning grounds first. Spawning occurs over sand, gravel, rubble, and vegetation in water depths from 1.6 to 26 feet (Craig 1987; Herman 1959). Although suitable substrates occur in the reservoir, submerged aquatic vegetation and submerged brush are uncommon (Stantec et al. 2005). Yellow perch spawn from mid-April to early May by depositing their eggs over vegetation or the substrate.

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Young juvenile yellow perch prefer shallower water (1.6 – 2.0 feet) than older juveniles and adults (5.0 – 20.0 feet). Juveniles and adults prefer little to no velocity, silt, gravel, and cobble substrates, and moderate vegetation (Krieger et al 1983; Robillard and Marsden 2001).

6.3.1.2 Smallmouth Bass (*Micropterus dolomieui*)

Young smallmouth bass consume insect larvae, zooplankton, and small insects. Adult smallmouth bass are upper trophic level predators that feed on larger fish or invertebrates such as crayfish.

Spawning generally occurs during late May and throughout June at water temperatures of 55º to 65° F. The spawning nest is typically built on a gravel bottom beside a large boulder, log, stump, or other object in 2 to 20 feet of water. Little gravel substrate occurs in the reservoir (Stantec et al. 2005). The female deposits 2,000 to 15,000 eggs. The male guards the nest and the fry for a short time, until the fry leave the nest.

Juvenile smallmouth bass prefer shallower water depths than adults. Juveniles prefer a depth of 2.4 feet or greater while adults prefer depths of 4.0 feet or greater (Edwards et al. 1983). Juvenile and adult smallmouth bass prefer low current velocities. Optimal water velocities for both juveniles and adults are between 0 and 0.5 ft/s (Edwards et al. 1983). Both prefer coarse substrates, primarily cobble and boulders.

6.3.1.3 Rock Bass (*Ambloplites rupestris*)

The main food sources for adult rock bass are aquatic insects, small crayfish, minnows, tadpoles, worms, and terrestrial insects. The diet of young rock bass consists of crustaceans and insects, and also vegetation. Some rock bass become cannibalistic in early life, with the larger fish eating the smaller fish (Bergman 1942). They can grow up to 7.5 inches in three years.

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Spawning occurs in spring and early summer, requiring a temperature above 50º F. Rock bass are colonial spawners with males making nests in the sand or gravel at a water depth of about 6 feet in a slight current. Females then deposit up to 10,000 eggs in a nest, often with more than one female using the same nest. Males remain over the nest to fan the eggs and maintain water flow over the eggs until they hatch in three to four days.

Rock bass prefer a gravel substrate and instream cover such as logs, boulders, root wads, and emergent vegetation (Bovee et al. 1994; Smith 1985). Juvenile rock bass prefer water depths between 1.1 and 2.5 feet for summer and between 2.5 and 3.5 for winter (Bovee et al. 1994). Adult rock bass prefer water depths slightly deeper in the summer, between 1.3 and 2.8 feet, with similar depths in the winter (Bovee et al. 1994).

6.3.1.4 Common Carp (*Cyprinus carpio*)

Carp are primarily selective benthivorous omnivores that specialize on invertebrates that live in the sediments (Lammens and Hoogenboezem 1991). Newly hatched carp initially feed on zooplankton (specifically rotifers and copepods) and algae (MacCrimmon 1968). Young-of-year carp feed on a variety of macroinvertebrates including chironomids, caddisflies, mollusks, ostracods, and crustaceans (MacCrimmon 1968). Adult carp are known to eat a wide variety of organisms including, insects, crustaceans, annelids, mollusks, fish eggs, fish remains, and plant tubers and seeds (MacCrimmon 1968; Lammens and Hoogenboezem 1991). Carp feed by sucking up mud from the bottom, ejecting it, and then selectively consuming items while they are suspended (MacCrimmon 1968). The feeding galleries of carp are easily recognized in shallow waters as depressions in the sediment (Cahn 1929).

The spawning period for this species can last from April to August, but generally spawning occurs in late May and June. Shallow and weedy areas of lakes, ponds, tributaries, streams, swamps, floodplains, and marshes are suitable spawning grounds. They segregate into groups in the shallows to spawn. Large females deposit between 100,000 and 500,000 eggs in vegetation with water depths between 1 and 4 feet. Young carp remain in these vegetated areas until they are 3 to 4 inches in length and eat primarily small crustaceans. Carp usually live between 9 and 15 years.

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6.3.1.5 Spottail Shiner *(Notropis hudsonius)*

The spottail shiner is primarily planktivorous. They feed on immature midges, fish eggs, and zooplankton. Their diet is dependant on availability, region, and the season. Spottail shiners may also feed on snails, leeches, ostracods, insects, and caddisfly larvae but in much smaller quantities.

The spottail shiner reproduces by means of pelagic spawning, scattering its eggs over the open substrate. Spawning typically occurs in the shoreline littoral zone up to a water depth of 30 feet, with the heaviest spawning occurring at a depth of less than 16 feet. The spottail shiner matures only after it reaches a total length of about 2.7 inches, and age at maturity is a function of growth rate. The females can produce up to 700 eggs and the number of eggs generally increases with increasing length of fish. Spawning occurs in the spring through June or July over sandy bottom and often at the mouths of streams where the ripe fish assemble in large aggregations. There is no evidence of nest building. The spottail shiner is often used as bait and is an important forage species for game fishes.

6.3.2 Bioavailability of Contaminants of Concern

6.3.2.1 Water Column

Fish can be exposed to contaminants in the water column through uptake via respiration and via dermal contact, as described above. As described in Section 4.3.1, the water quality in the Lewiston Reservoir is expected to be similar to the water quality in the upper Niagara River due to the high turnover rate of the water in the reservoir and the absence of other major water sources. In the summer and fall, the reservoir may be drawn down weekly to 15% of its gross storage capacity and then refilled (see Section 1.2.6). Heavy metals and organic compounds were not detected in the water column of the river and the reservoir during the October 2003 survey (URS et al. 2005b).

As described in Section 5.6, suspended sediments in the water column of the Lewiston Reservoir may partially settle to the bottom in the reservoir due to lower water velocities in the reservoir than in the river. As a result, fish in the river may be exposed to slightly greater concentrations of suspended

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sediment in the water column, and thus have a correspondingly greater exposure to contaminants bound to the suspended sediment. In general, the suspended sediment concentrations in the river vary seasonally, being lower in the summer and higher in the winter.

6.3.2.2 Sediments

Table 3.3-2 provides a comparison of sediment contaminants in the Niagara River and Lewiston Reservoir for samples collected in October 2002. The contaminant concentrations in the Lewiston Reservoir sediment samples exceeded the guideline values for arsenic, lead, mercury, PAHs, PCBs, and mirex. Similar concentrations also were detected in some of the Niagara River samples collected in 2002. The total organic carbon (TOC) concentration in the sediment in the upper Niagara River was 0.4 and 0.03% at stations UNR-SED01 and UNR-SED02, respectively. The mean TOC of the reservoir samples was higher at 1.5%. TOC is an important parameter to be considered in the exposure pathway via sediment. For example, PCB is a nonpolar compound and is expected to preferentially associate with TOC in the sediment and with lipid in tissue. As described previously, sediment within the reservoir is comprised of 95% silt and clay, whereas the upper Niagara River sample mean concentrations were approximately 31% silt and clay (Table 3.3-1). The upper Niagara River samples do not represent the finer-grained sediments in the low velocity habitats such as the tributaries, embayments, and back waters. Typically, finer-grained sediment with higher organic carbon content has higher contaminant concentrations than coarser-grained inorganic sediment.

6.4 Contaminant Levels in Lewiston Reservoir Fish - Discussion

Exposure pathways in the Lewiston Reservoir and the Niagara River are similar, in regard to prey items, water, and sediments. Fish, including those in the reservoir and the river, can be exposed to contaminants in the water column through uptake via respiration and via dermal contact (Connell 1989, USEPA 2000). As discussed in Section 5.0, given that the river is the primary source of fine-grained sediments, which are dominant in the reservoir, fish in the reservoir are likely being exposed to similar contaminant levels as those present in the fine-grained sediments in the low velocity habitats of the upper Niagara River.

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All fish are exposed to contaminants in the water column. Fish that feed primarily on zooplankton will be susceptible to contaminants present within the water column. Fish that feed on benthic invertebrates will be susceptible to contaminants present within both the water column and sediment. Another potential exposure pathway for benthic feeders is ingestion of sediment during feeding. Top predators or piscivores that feed on other fish will be exposed to contaminants bioaccumulated by the prey organisms.

Existing sediment and water quality data indicate that the fish in the reservoir may potentially bioaccumulate lead, mercury, arsenic, PCBs, pesticides, octachlorostyrene and mirex. Tissue data collected by NYSDEC (1994b, 2002) and Williams and O'Shea (2003) in whole fish samples of spottail shiner collected from the Niagara River showed the bioaccumulation of similar compounds (Table 6.4-1). Recent tissue data (1998 – 2002) from skinless, boneless fillets from carp, yellow perch, rock bass, and smallmouth bass collected by OMOE show bioaccumulation of mercury and PCBs, with other contaminants such as toxaphene and HCB bioaccumulated by carp (Tables 6.4-2 and 6.4-3). In addition, BSAF estimations of contaminants, where data are available, and existing literature on the potential uptake and bioaccumulation of various contaminants support these observations.

Pesticides were only detected in the Niagara River water column by EC, but not in the sediments of the reservoir. Mirex was also detected in the water column, and in one of five sediment samples in the reservoir (Table 3.3-2). Dioxin (2,3,7,8-TCDD) was not detected in sediment collected at any of the river or reservoir stations.

All the PAH compounds reported in the reservoir sediments exceeded TEC guideline values. PAHs are generally hydrophobic compounds and must be metabolized to more water-soluble forms before they are excreted. In most fish, PAHs are rapidly taken up, metabolized, and excreted so that concentrations found in edible tissues are generally low. The major route of elimination is through excretion into bile. The biotransformation and excretion rates can vary widely among fish species.

The contaminants that have the potential to be present within Lewiston Reservoir fish are identified in Table 6.4-4. This table also qualitatively estimates the relative fish tissue contaminant levels in Lewiston Reservoir compared to upper Niagara River fish.

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Benthic Feeders and Piscivorous Fish: Considering the fine-grained composition of the reservoir sediment, and the feeding habits of these species, the levels of the identified contaminants in the reservoir fish are likely similar to levels in upper Niagara River fish.

Planktivorous Fish: The water column is assumed to be the primary exposure pathway for planktivorous fish, such as spottail shiners. Therefore, Lewiston Reservoir planktivorous fish likely contain the same or slightly lower contaminant levels to fish residing in the upper Niagara River. The levels may be slightly lower as compared to the river fish due to partial settling of the suspended sediment to the reservoir floor.

Spottail shiners contained measurable levels of various contaminants in the upper river (Table 6.4-1), but these levels were believed to be primarily as a result of site-specific contaminant inputs, resulting in locally high bioaccumulation in fish tissues. For example, one of the stations (NYSDEC-15) depicted on Figure 6.2.3-1 and in Table 6.4-1 was collected downstream of the Olin industrial welding site, which is a source of PCBs (NYSDEC 2002). Fish collected from this station contained a mean concentration of 1,100 ppb PCBs in their tissue. These data highlight the sensitivity of this relatively non-mobile species to contaminant levels from site-specific inputs.

The OMOE data provided in Tables 6.4-2 and 6.4-3 for the upper and lower Niagara River respectively, show that carp, which is a benthic omnivore, bioaccumulates several contaminants including PCBs at higher levels than yellow perch, rock bass, and smallmouth bass. The data also reveal a relatively large range of tissue contaminant levels, which could be due to a variety of factors including age and size of the fish.

The degree of bioaccumulation of contaminants in fish in the reservoir relative to the river also depends on the residence time of the fish in the reservoir. As a result of the high turnover rate of the water in the reservoir, fish may be continuously pumped into the reservoir as well as discharged from the reservoir into the forebay during power generation. Rates of this transfer are not known. If, for example, a fish spends only a short period of his life in the reservoir, bioaccumulation of contaminants present within the reservoir sediment may be comparatively small. The same reasoning applies to forage species. That is, forage fish may be entrained into the reservoir where they are consumed by piscivores, such as yellow perch. As a result, higher trophic levels are not likely exposed to food chains that originate solely with organisms that were exposed to Lewiston Reservoir sediments.

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6.5 Comparison to Niagara River Fish Consumption Health Advisories

NYSDOH issues health advisories on consumption of sportfish because of elevated chemical levels that may be potentially harmful to human health (NYSDOH 2003). For the Niagara River above the Falls, NYSDOH has issued a recommendation for consumption of no more than one meal per month of carp. The chemical of concern is PCBs. For the Niagara River below the Falls, NYSDOH has issued a recommendation for no consumption of white perch, American eel, channel catfish, carp, lake trout over 25", brown trout over 20" and chinook salmon. The chemicals of concern are PCBs, mirex, and dioxin. Also for the lower Niagara River, NYSDOH has issued a recommendation for consumption of no more than one meal per month, due to the same chemicals of concern, of smallmouth bass, white sucker, rainbow trout, smaller lake trout, smaller brown trout and coho salmon over 25". No changes to New York State fish consumption advisories for the Niagara River have been issued since 1999.

OMOE also issues fish consumption advisories for fish caught from the river (OMOE 2003). Retesting of several species of fish from the upper and lower river in 2002 by OMOE resulted in the issuance of a mixture of less restrictive and more restrictive fish consumption advisories for some size classes and species of fish (OMOE 2003) (Table 6.5-1).

Because contaminant levels in fish living in the reservoir are expected to be similar to fish in the upper Niagara River, the current health advisory provided by the NYSDOH for consumption of carp caught from the upper Niagara River also should be observed for carp caught from the Lewiston Reservoir. In addition, any future health advisories that may be developed for the river by OMOE and NYSDOH should be considered applicable to Lewiston Reservoir fish.

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TABLE 6.3.1-1

FISH COMMUNITY COMPOSITION OF THE NIAGARA RIVER, NEW YORK AND ONTARIO

Common Name	Scientific Name	Circa 1927	1960-2000	2001
Alewife	*Alosa pseudoharengus*	x	x	x
American brook lamprey	*Lethenteron lamottenii*		x	
American eel	*Anguilla rostrata*	x	x	x
Banded killifish	*Fundulus diaphanus*	x	x	x
Black bullhead	*Ameiurus melas*		x	
Black crappie	*Pomoxis nigromaculatus*		x	x
Black redhorse	*Moxostoma duquesnei*		x	
Blackchin shiner	*Notropis heterodon*	x		x
Blacknose dace	*Rhinichthys atratulus*		x	
Blacknose shiner	*Notropis heterolepis*	x	x	
Blue pike	*Sander vitreus*	x	x	
Bluegill	*Lepomis macrochirus*		x	x
Bluntnose minnow	*Pimephales notatus*	x	x	x
Bowfin	*Amia calva*		x	x
Bridle shiner	*Notropis bifrenatus*		x	x
Brindled madtom	*Noturus miurus*		x	x
Brook silverside	*Labidesthes sicculus*	x	x	x
Brook stickleback	*Culaea inconstans*	x	x	x
Brown bullhead	*Ameiurus nebulosus*	x	x	x
Brown trout	*Salmo trutta*		x	

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TABLE 6.3.1-1 (CONT.)

FISH COMMUNITY COMPOSITION OF THE NIAGARA RIVER, NEW YORK AND ONTARIO

Common Name	Scientific Name	Circa 1927	1960-2000	2001
Burbot	*Lota lota*		x	
Central mudminnow	*Umbra limi*	x	x	x
Central stoneroller	*Campostoma anomalum*	x	x	
Channel catfish	*Ictalurus punctatus*	x	x	
Chinook salmon	*Oncorhynchus tshawytscha*		x	
Coho salmon	*Oncorhynchus kisutch*		x	
Common carp	*Cyprinus carpio*	x	x	x
Common shiner	*Luxilus cornutus*	x	x	x
Creek chub	*Semotilus atromaculatus*	x	x	x
Emerald shiner	*Notropis atherinoides*	x	x	x
Fallfish	*Semotilus corporalis*		x	
Fantail darter	*Etheostoma flabellare*		x	
Fathead minnow	*Pimephales promelas*	x	x	
Freshwater drum	*Aplodinotus grunniens*	x	x	x
Gizzard shad	*Dorosoma cepedianum*		x	x
Golden redhorse	*Moxostoma erythrurum*		x	
Golden shiner	*Notemigonus crysoleucas*	x	x	x
Goldfish	*Carrassius auratus*		x	x
Grass pickerel	*Esox americanus*	x	x	
Greater redhorse	*Moxostoma valenciennesi*		x	x
Green sunfish	*Lepomis cyanellus*		x	

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TABLE 6.3.1-1 (CONT.)

FISH COMMUNITY COMPOSITION OF THE NIAGARA RIVER, NEW YORK AND ONTARIO

Common Name	Scientific Name	Circa 1927	1960-2000	2001
Greenside darter	*Etheostoma blennioides*		x	
Hornyhead chub	*Nocomis biguttatus*	x	x	x
Hybrid Carp x Goldfish	NA		x	
Iowa darter	*Etheostoma exile*	x	x	x
Johnny darter	*Etheostoma nigrum*	x	x	x
Lake chub	*Couesius plumbeus*		x	
Lake chubsucker	*Erimyzon sucetta*	x		
Lake sturgeon	*Acipenser fulvescens*	x	x	
Lake trout	*Oncorhynchus namaycush*		x	
Largemouth bass	*Micropterus salmoides*		x	x
Logperch	*Percina caprodes*	x	x	x
Longnose dace	*Rhinichthys cataractae*	x	x	
Longnose gar	*Lepisosteus osseus*	x	x	x
Mimic shiner	*Notropis volucellus*	x	x	
Mooneye	*Hiodon tergisus*		x	
Mottled sculpin	*Cottus bairdi*	x	x	x
Muskellunge	*Esox masquinongy*	x	x	x
Nine-spine stickleback	*Pungitius pungitius*		x	
Northern hog sucker	*Hypentelium nigricans*	x	x	x

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TABLE 6.3.1-1 (CONT.)

FISH COMMUNITY COMPOSITION OF THE NIAGARA RIVER, NEW YORK AND ONTARIO

Common Name	Scientific Name	Circa 1927	1960-2000	2001
Northern pike	*Esox lucius*	x	x	X
Pumpkinseed	*Lepomis gibbosus*	x	x	x
Quillback	*Carpiodes cyprinus*		x	x
Rainbow darter	*Etheostoma cearuleum*	x	x	
Rainbow smelt	*Osmerus mordax*		x	x
Rainbow trout/Steelhead	*Oncorhynchus gairdneri*		x	x
Redfin shiner	*Notropis umbratilis*	x	x	
River chub	*Nocomis micropogon*	x	x	
Rock bass	*Ambloplites rupestris*	x	x	x
Round goby	NA		x	
Rudd	*Scardinius erthrophthalamus*		x	x
Sand shiner	*Notropis stramineus*	x	x	
Satinfin shiner	*Cyprinella analostana*	x	x	
Sauger	*Stizostedion canadense*	x	x	
Sea lamprey	*Petromyzon marinus*		x	
Shorthead redhorse	*Moxostoma macrolepidotum*	x	x	x
Silver redhorse	*Moxostoma anisurum*	x	x	x
Smallmouth bass	*Micropterus dolomieui*	x	x	x
Spotfin shiner	*Notropis spilopterus*	x	x	x
Spottail shiner	*Notropis hudsonius*	x	x	x
Stonecat	*Noturus flavus*	x	x	

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TABLE 6.3.1-1 (CONT.)

FISH COMMUNITY COMPOSITION OF THE NIAGARA RIVER, NEW YORK AND ONTARIO

Common Name	Scientific Name	Circa 1927	1960-2000	2001
Striped shiner	*Luxilus chrysocephalus*	x	x	
Tadpole madtom	*Noturus gyrinus*		x	x
Threespine stickleback	*Gasterosteus aculeatus*	x		x
Trout perch	*Percopsis omiscomaycus*	x	x	
Walleye	*Sander vitreus*	x	x	x
White bass	*Morone chrysops*	x	x	x
White crappie	*Pomoxis annularis*		x	x
White perch	*Morone americana*		x	x
White sucker	*Catostomus commersoni*	x	x	x
Yellow bullhead	*Ameiurus natalis*		x	
Yellow perch	*Perca flavescens*	x	x	x

Data from NYPA 2002.

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TABLE 6.3.1-2

FISH SPECIES IDENTIFIED IN THE LEWISTON RESERVOIR

Common Name	Scientific Name	Number of Individuals Collected (% composition of fish community)				
		June 1975	November 1982	May 1983	July 1983	May 2000
Yellow perch	*Perca flavescens*	3,444 (81)	123 (44)	1,103 (59)	233 (40)	270 (53)
White sucker	*Catostomus commersoni*	287 (7)	34 (12)	72 (4)	20 (3)	1(<1)
Rock bass	*Ambloplites rupestris*	230 (5)	71 (25)	626 (33)	241 (42)	60 (12)
Spottail shiner	*Notropis hudsonius*	90 (2)	11 (4)	10 (1)	-	7 (3)
Pumpkinseed	*Lepomis gibbosus*	53 (1)	-	1 (<1)	10 (2)	5 (1)
Carp	*Cyprinus carpio*	43 (1)	-	-	-	18 (4)
Alewife	*Alosa pseudoharengus*	28 (1)	-	-	1 (<1)	4 (1)
Freshwater drum	*Aplodinotus grunniens*	20 (1)	1 (1)	3 (<1)	5 (1)	-
Smallmouth bass	*Micropterus dolomieui*	9 (<1)	1 (<1)	15 (1)	35 (6)	13 (3)
Shorthead redhorse	*Moxostoma macrolepidotum*	8 (<1)	3 (1)	13 (1)	6 (1)	5 (1)
Brown trout	*Salmo trutta*	5 (<1)	-	-	-	-

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TABLE 6.3.1-2 (CONT.)

FISH SPECIES IDENTIFIED IN THE LEWISTON RESERVOIR

Common Name	Scientific Name	Number of Individuals Collected (% composition of fish community)				
		June 1975	November 1982	May 1983	July 1983	May 2000
White bass	*Morone chrysops*	4 (<1)	7 (3)	-	-	1 (<1)
Logperch	*Percina caprodes*	3 (<1)	5 (2)	10 (1)	22 (4)	7 (1)
Rainbow smelt	*Osmerus mordax*	2 (<1)	18 (7)	4 (<1)	-	1 (<1)
Common shiner	*Notropis cornutus*	2 (<1)	-	1 (<1)	-	12 (2)
Rainbow trout	*Oncorhynchus gairdneri*	1 (<1)	1 (<1)	3 (<1)	2 (<1)	3 (1)
Johnny darter	*Etheostoma nigrum*	1 (<1)	-	2 (<1)	-	-
Coho salmon	*Oncorhynchus kisutch*	1 (<1)	-	1 (<1)	-	-
Northern pike	*Esox lucius*	1 (<1)	-	1 (<1)	-	32 (6)
Muskellunge	*Esox masquinongy*	1 (<1)	-	1 (<1)	-	2 (<1)
American eel	*Anguilla rostrata*	1 (<1)	-	1 (<1)	-	-
Goldfish	*Carassius auratus*	1 (<1)	-	-	-	-

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TABLE 6.3.1-2 (CONT.)

FISH SPECIES IDENTIFIED IN THE LEWISTON RESERVOIR

Common Name	Scientific Name	Number of Individuals Collected (% composition of fish community)				
		June 1975	November 1982	May 1983	July 1983	May 2000
Brown bullhead	*Ameiurus nebulosus*	1 (<1)	-	-	-	-
Channel catfish	*Ictalurus punctatus*	1 (<1)	-	-	-	-
Trout-perch	*Percopsis omiscomaycus*	1 (<1)	-	-	-	-
Largemouth bass	*Micropterus salmoides*	-	-	-	-	1 (<1)

Data from NYPA 2002.

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TABLE 6.4-1

CONTAMINANT CONCENTRATIONS IN YOUNG-OF-YEAR SPOTTAIL SHINER (*NOTROPIS HUDSONIUS*) AND BLUNTNOSE MINNOW (*PIMEPHALES NOTATUS*)

Compounds (all in ng/g, wet weight)		Priority Pollutant	Upper Niagara									Lower Niagara			BSAF Values
			NYSDEC-7 (SS)	NYSDEC-8 (SS)	NYSDEC-10 (BN)	NYSDEC-15 (BN)	WS-1 (SS)	WS-2 (SS)	WS-3 (SS)	WS-4 (SS)	WS-5 (SS)	NYSDEC-16 (BN)	WS-6 (SS)	WS-7 (SS)	
Metals	Arsenic *(1)*	●		nd											na
	Lead	●													na
	Mercury (Total)	●		22/24	46							18			na
PAHs	Benzo(a)anthracene	●													0.29
	Benzo(a)pyrene	●													0.29
	Benzo(b)fluoranthene	●													0.29
	Benzo(k)fluoranthene	●													0.29
	Chrysene	●													0.29
	Total PAHs *(1)*			nd											na
VOCs	Tetrachloroethylene (TCE)	●													na
Semivolatile	Octachlorostyrene (OCS)	●					nd	nd	nd	nd	nd		nd	nd	na
PCBs	Total PCBs	●	143	7.3	121	1,100	18 - 168	41 - 132	79 - 216	26 - 116	17 - 84	23.9	14 - 60	23 - 68	1.85

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TABLE 6.4-1 (CONT.)

CONTAMINANT CONCENTRATIONS IN YOUNG-OF-YEAR SPOTTAIL SHINER (*NOTROPIS HUDSONIUS*) AND BLUNTNOSE MINNOW (*PIMEPHALES NOTATUS*)

Compounds (all in ng/g, wet weight)		Priority Pollutant	Upper Niagara									Lower Niagara			BSAF Values
			NYSDEC-7 (SS)	NYSDEC-8 (SS)	NYSDEC-10 (BN)	NYSDEC-15 (BN)	WS-1 (SS)	WS-2 (SS)	WS-3 (SS)	WS-4 (SS)	WS-5 (SS)	NYSDEC-16 (BN)	WS-6 (SS)	WS-7 (SS)	
Pesticides	Mirex	●	nd	<2/ nd	8 - 10	2 - 3	nd	nd	nd	nd	nd	nd	nd	nd	1.31
	Chlordane (alpha, gamma & oxychlordane)	●	nd	nd	nd	nd						nd			4.77
	Dieldrin	●	nd	nd	nd	nd						nd			1.80
	Toxaphene	●													1.80
	Hexachlorobenzene (HCB)	●	<2.3	0.50/ nd	0 - 2	3 - 7	0 - 2	1 - 2	1 - 3	1 - 2	nd	nd	1 - 1	0 - 1	0.09
	4,4'-DDD	●	<2	<2/<2	2 - 3	20 - 22						<2			0.28
	4,4'-DDE	●	6 - 7	6/<2-2	6 - 8	17 - 18						4-9			7.7
	4,4'-DDT	●	<2	2	<2	5 - 6						<2			1.67
	Total DDT	●	8.3	3.1	10.2	44	2 - 9	2 - 7	4 - 11	2 - 6	1 - 4	8.2	3 -10	13 - 16	7.7
Dioxin	2,3,7,8-TCDD	●	0.61 - 0.67		<0.1 - 4.1										0.059

Notes: Data from NYSDEC 1994b, 2002; Williams and O'Shea 2003. BSAF values from USEPA 2000. (SS) = Spottail shiner, (BN) Bluntnose minnow. Where two values shown (#/#), NYSDEC (1994b) first, followed by NYSDEC (2002). (1) Arsenic and total PAHs were only analyzed in 1994. Where data/information not entered, no analysis conducted. nd = Not detected. na = Value not available.

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TABLE 6.4-2

CONTAMINANT CONCENTRATIONS IN CARP, YELLOW PERCH, ROCK BASS, AND SMALLMOUTH BASS SAMPLED IN UPPER NIAGARA RIVER BY OMOE (1)

		Priority Pollutant	Units, Wet Weight	Upper Niagara River										
				Carp			Yellow Perch			Rock Bass			Smallmouth Bass	
				17 June 2002	12 July 2000	12 August 1998	17 June 2002	12 July 2000	12 August 1998	17 June 2002	12 July 2000	12 August 1998	12 July 2000	22 Sept 1999
	No. Fish Sampled			8	12	10	10	9	8	12	5	8	4	20
	Weight Range of Fish Sampled		g	1,398 - 6,581	275 - 7,785	1,693 - 5,486	52 - 208	49 - 247	47 - 160	76 - 272	183 - 276	77 - 331	99 - 224	155 - 1520
	Length Range of Fish Sampled		cm	44.6 - 71.8	26.7 - 78.5	48.3 - 71.3	16.2 - 25.4	16.5 - 26.4	15.0 - 21.5	15.5 - 22.9	20.2 - 24.8	15.0 - 24.8	19.1 - 24.3	21.1 - 43.8
Compounds (2)														
Metals	Arsenic	●												
	Lead	●												
	Mercury (Total)	●	ng/g	50 - 300	20 - 270	100 - 320	90 - 130	60 - 180	50 - 80	80 - 350	140 - 200	60 - 350	100 - 180	50 - 320
PAHs	Benzo(a)anthracene	●												
	Benzo(a)pyrene	●												
	Benzo(b)fluoranthene	●												
	Benzo(k)fluoranthene	●												
	Chrysene	●												
	Total PAHs													
VOCs	Tetrachloroethylene (TCE)	●												
SVOCs	Octachlorostyrene (OCS)	●	ng/g	nd - 10	nd	nd - 150		nd	nd		nd	nd	nd	nd - 2
PCBs	Total PCBs	●	ng/g	40 - 2300	20 -780	100 - 10,000		nd - 80	nd		20 - 80	nd - 60	40 - 60	40 – 980
Pesticides	Mirex	●	ng/g	nd	nd	nd		nd	nd		nd	nd	nd	nd
	Chlordane (alpha, gamma, oxychlordane)	●	ng/g	nd - 60										
	Dieldrin	●												
	Toxaphene	●	ng/g	nd - 580	nd	nd		nd	nd		nd	nd	nd	nd
	Hexachlorobenzene (HCB)	●	ng/g	nd - 4	nd	nd - 9		nd	nd		nd	nd	nd	nd - 2
	4,4'-DDD	●	ng/g	nd - 80	nd - 35	15 - 120		nd	nd		nd	nd	nd	nd - 10
	4'4-DDE	●	ng/g	7 - 510	6 - 310	59 - 540		nd - 2	nd - 9		nd - 9	nd - 5	2 - 5	nd - 77
	4,4'-DDT	●	ng/g	nd	nd	nd - 20		nd	nd		nd	nd	nd	nd
	Total DDT	●												
Dioxin	2,3,7,8-TCDD	●												

Notes: Data from OMOE 2004. (1) Samples are skinless, boneless fillets. (2) Where data/information not entered, no analysis conducted. nd = not detected.

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TABLE 6.4-3

CONTAMINANT CONCENTRATIONS IN CARP, YELLOW PERCH, ROCK BASS, AND SMALLMOUTH BASS SAMPLED IN LOWER NIAGARA RIVER BY OMOE (1)

		Priority Pollutant	Units, Wet Weight	Lower Niagara River										
				Carp			Yellow Perch		Rock Bass			Smallmouth Bass		
				18 June 2002	14 June 2000	21 July 1998	14 June 2000	21 July 1998	18 June 2002	14 June 2000	21 July 1998	18 June 2002	14 June 2000	21 July 1998
	No. Fish Sampled			5	9	11	7	10	10	5	8	10	10	2
	Weight Range of Fish Sampled		g	2,279 - 10,294	1,087 - 9,184	1,430 - 14,295	38 - 140	39 - 133	61 - 442	64 - 428	61 - 169	97 - 1233	95 - 1583	128 - 148
	Length Range of Fish Sampled		cm	53.2 - 89.8	41.4 - 85.3	43.9 - 87.7	14.4 - 21.2	14.0 - 21.5	13.8 - 26.4	14.1 - 28.0	14.5 - 20.1	19.6 - 43.2	19.6 - 45.7	21.3 - 22.0
Compounds(2)														
Metals	Arsenic	●												
	Lead	●												
	Mercury (Total)	●	ng/g	80 - 240	40 - 330	110 - 350	40 - 170	60 - 140	80 - 360	80 - 480	90 - 180	110 - 550	100 - 670	110 - 130
PAHs	Benzo(a)anthracene	●												
	Benzo(a)pyrene	●												
	Benzo(b)fluoranthene	●												
	Benzo(k)fluoranthene	●												
	Chrysene	●												
	Total PAHs													
VOCs	Tetrachloroethylene (TCE)	●												
SVOCs	Octachlorostyrene (OCS)	●	ng/g	nd - 10	nd - 24	nd - 71	nd	nd		nd	nd		nd	nd
PCBs	Total PCBs	●	ng/g	140 - 1,300	80 - 2,800	100 - 4,100	40 - 120	20 - 60		40 - 120	nd - 100		60 - 540	40 - 60
Pesticides	Mirex	●	ng/g	nd - 80	nd - 60	nd - 100	nd	nd		nd	nd		nd - 20	nd
	Chlordane (alpha, gamma & oxychlordane)	●	ng/g	nd - 138										
	Dieldrin	●												
	Toxaphene	●	ng/g	nd - 80	nd	nd	nd	nd		nd	nd		nd	nd
	Hexachlorobenzene (HCB)	●	ng/g	3 - 24	nd - 29	nd - 48	nd	nd		nd	nd		nd - 2	nd
	4,4'-DDD	●	ng/g	nd - 85	nd - 140	nd - 90	nd	nd		nd	nd		nd	nd
	4'4-DDE		ng/g	86 - 860	12 - 930	58 - 930	3 - 14	3 - 11		3 - 21	nd - 10		7 - 65	nd - 6
	4,4'-DDT		ng/g	nd - 10	nd - 10	nd - 15	nd	nd		nd	nd		nd	nd
	Total DDT													
Dioxin	2,3,7,8-TCDD	●												

Notes: Data from OMOE 2004. (1) Samples are skinless, boneless fillets. (2)Where data/information not entered, no analysis conducted. nd = not detected.

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TABLE 6.4-4

CHEMICAL CONTAMINANTS WITH POTENTIAL OCCURRENCE IN FISH WITHIN LEWISTON RESERVOIR

Species	Size/Age Group	Trophic Level	Potential Contaminants of Concern (based on existing water quality, sediment, and tissue studies)		Estimated Relative Levels versus Upper Niagara River Fish
			Water Column	Bottom Sediment	
Yellow Perch	Juvenile	Benthic Predator	PCBs, Pesticides, Octachloro-styrene, Mirex	Arsenic, Lead, Mercury, PCBs, PAHs (Polynuclear Aromatic Hydrocarbons)	same
	Adult	Omnivore			
Smallmouth Bass	Juvenile	Planktivore/Benthic Predator			
	Adult	Piscivore			
Rock Bass	Juvenile	Omnivore			
	Adult	Omnivore			
Carp	Juvenile	Benthic Detritivore			
	Adult	Benthic Detritivore			
Spottail Shiner	Juvenile	Planktivore		none	same (to slightly lower)
	Adult	Planktivore			

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TABLE 6.5-1

FISH CONSUMPTION ADVISORIES ISSUED BY OMOE FOR UPPER NIAGARA

Species	Fish Length (cm)								
	15-20	20-25	25-30	30-35	35-45	45-55	55-65	65-75	>75
Smallmouth bass	1	1	1	1	2	2			
Yellow perch	1	1	1	1					
Rock bass	1	1							
Carp			1	1	1	1	2	3	3

Notes: 1 = Eight meals of fish per month and four meals for women of childbearing age and children under 15. 2 = Four meals of fish per month and zero for women of childbearing age and children under 15. 3 = Two meals of fish per month and zero for women of childbearing age and children under 15. Data from OMOE 2003.

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This material is contained in:
Volume 2
Section: Describing Contaminant Levels in Fish in Lewiston Reservoir

FIGURE 6.2.3-1

YOUNG-OF-YEAR FISH SAMPLING STATIONS

[NIP – General Location Maps]

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7.0 SUMMARY

The chemical composition of the sediments deposited in the Lewiston Reservoir reflects the chemical composition of the suspended sediments in the Niagara River, since the river is the only relevant source of sediment to the reservoir. Similarly, the water quality in the reservoir reflects the water quality of the Niagara River at the NYPA river intakes since the river is the primary source of reservoir water. The water in the reservoir is frequently exchanged as a result of the drawdown during power generation and subsequent filling.

The bottom sediments (uppermost 6 inches of the sediment column) in the reservoir contain contaminants (arsenic, lead, mercury, organic compounds). The range of contaminant concentrations in the sediments is within the range of concentrations that were measured historically in the sediments of the Niagara River. Water samples from the reservoir only contained monomethyl mercury and the pesticide delta-BHC.

The contaminants in the uppermost sediment layer and in the water column of the reservoir are the potential sources for bioaccumulation in fish residing in the reservoir, although the residence time for reservoir fish is not known. Once again, these two potential sources are similar in chemical composition to the sources for bioaccumulation in fish in the Niagara River. Scour of deeper sediments in the reservoir is not likely.

There are no tissue data available for fish in the Lewiston Reservoir. Tissue analyses from fish in the Niagara River detected mercury and organic compounds. Given that the reservoir operation is dynamic with frequent filling and discharge of its water (as much as 85% in the summer), that fish (predator as well as prey) may only have spent part of their life in the reservoir, and that the water and bioavailable sediments in the reservoir contain similar contaminant concentrations as the water and sediments in the river, contaminant concentrations in fish caught in the Lewiston Reservoir are likely similar to the contaminant concentrations of the same species in the upper Niagara River.

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Therefore, current and future health advisories for fish consumption for the upper Niagara River should also be observed for the Lewiston Reservoir.

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PERSONAL COMMUNICATION

Bill Andrews, New York State Department of Environmental Conservation, Albany, NY, September 29, 2003 (spoke with Bernward Hay, The Louis Berger Group, Inc.).

Michael Bruno, Stevens Institute of Technology, Davidson Laboratory, Hoboken, NJ, October 23, 2003 (spoke with Bernward Hay, The Louis Berger Group, Inc.).

David Melfy, U.S. Army Corps of Engineers, Great Lakes and Ohio River Division, Buffalo, NY, September 29, 2003 (spoke with Bernward Hay, The Louis Berger Group, Inc.).

Neil Patterson, Director, Tuscarora Environment Program, NYPA Environmental Studies Team, Tuscarora Nation, via Sanborn, NY, October 3, 2003 (spoke with Bernward Hay, The Louis Berger Group, Inc.).

Norman Stessing, Operations Superintendent, New York Power Authority, Niagara Power Project, Lewiston, NY, October 3, 2003 (spoke with Bernward Hay, The Louis Berger Group, Inc.).

James Vogel, NYSDEC, Buffalo Regional Headquarters, Buffalo, NY 14203, September 26, 2003 (spoke with Bernward Hay, The Louis Berger Group, Inc.).

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Don Williams, Head – Aquatic Sciences and Reporting, Environment Canada, Canada Center for Inland Waters, Burlington, Ontario, Canada, September 29, 2003, and February 10 and 12, 2004 (spoke with Bernward Hay, The Louis Berger Group, Inc.).

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APPENDICES

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APPENDIX A

Water Levels in Lewiston Reservoir in Year 2002

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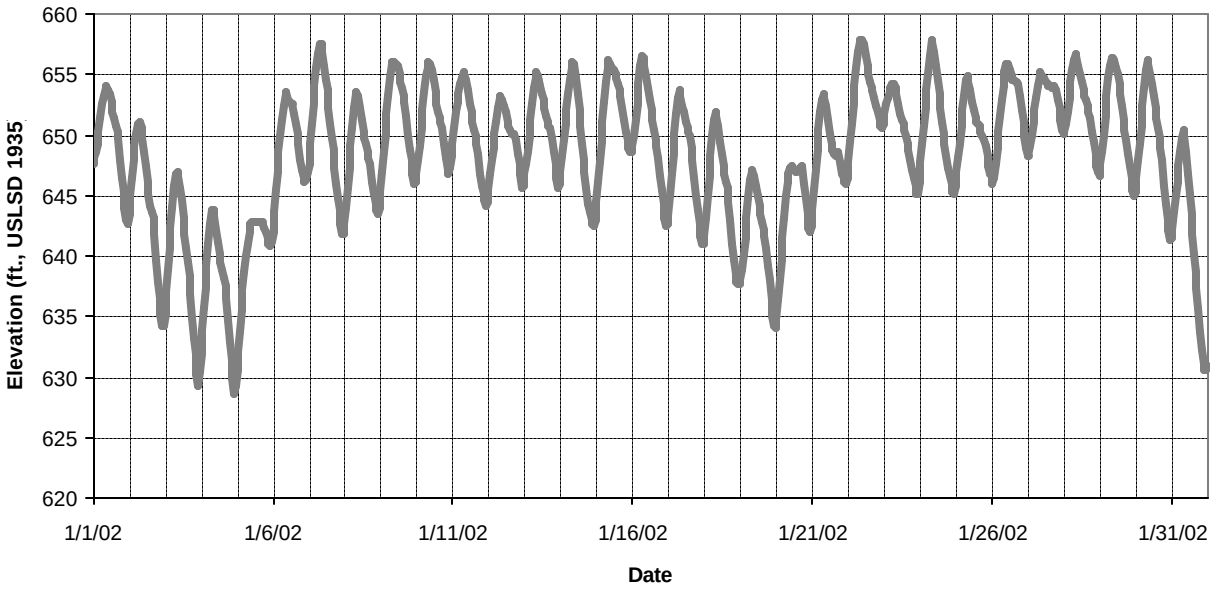
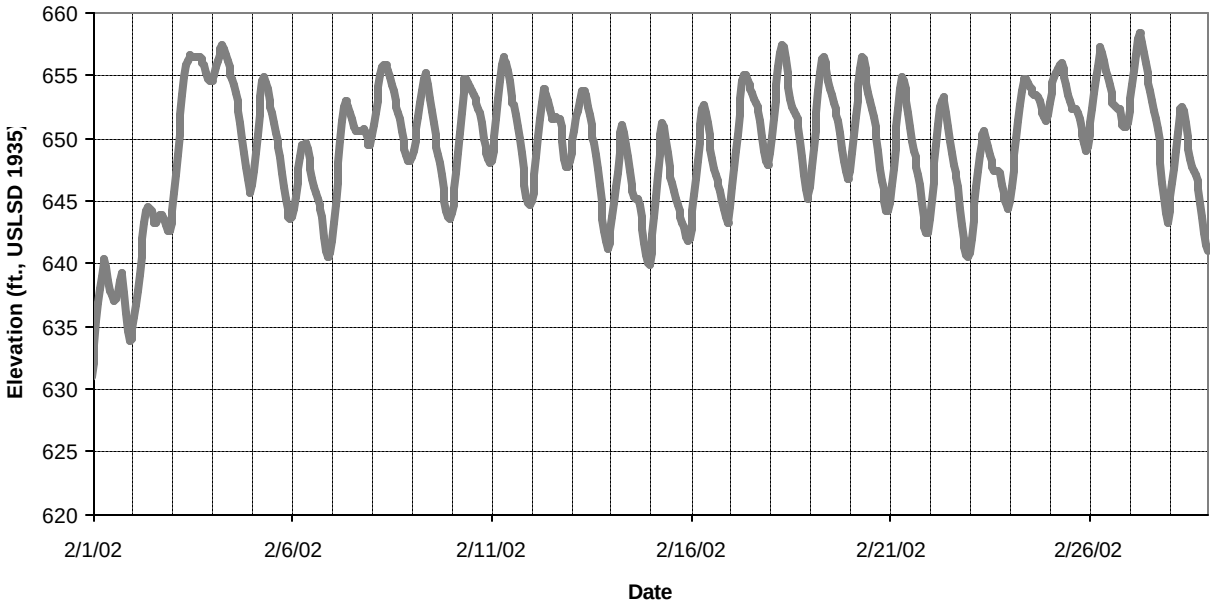
Water Elevations in Lewiston Reservoir (Source: NYPA)

January 2002



February 2002



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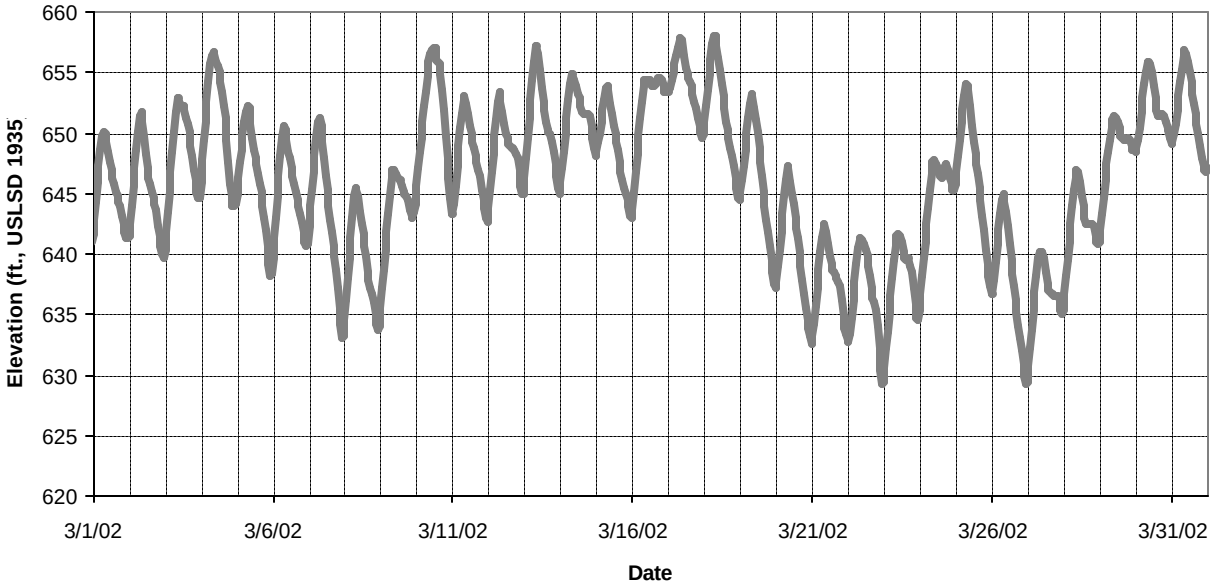
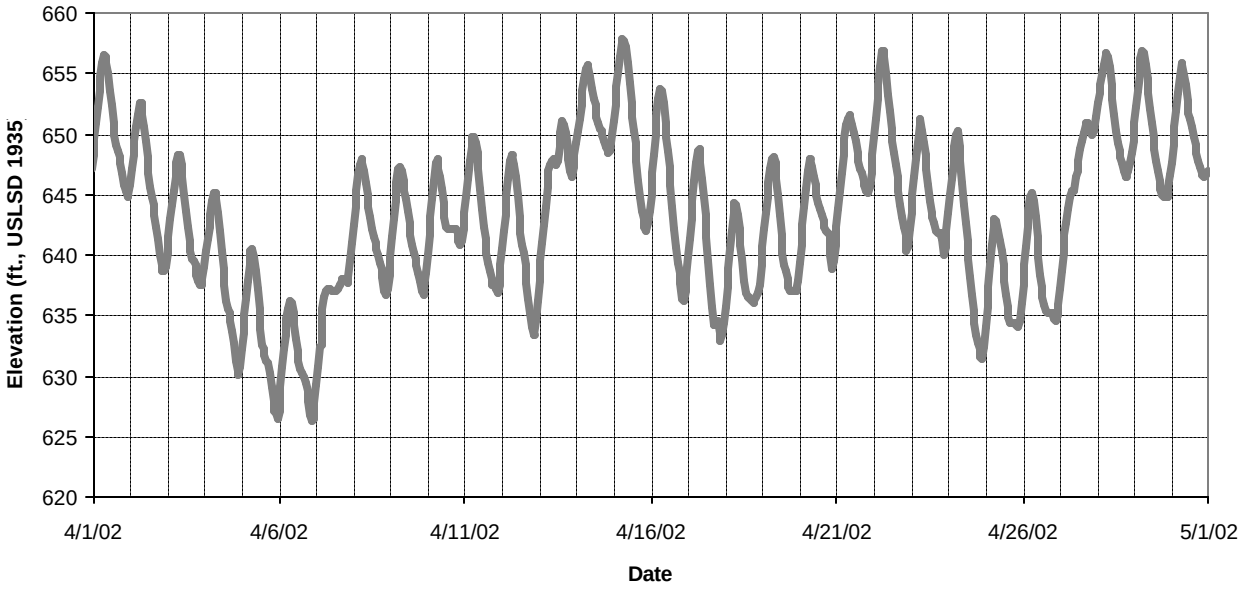
Water Elevations in Lewiston Reservoir (Source: NYPA)

March 2002



April 2002



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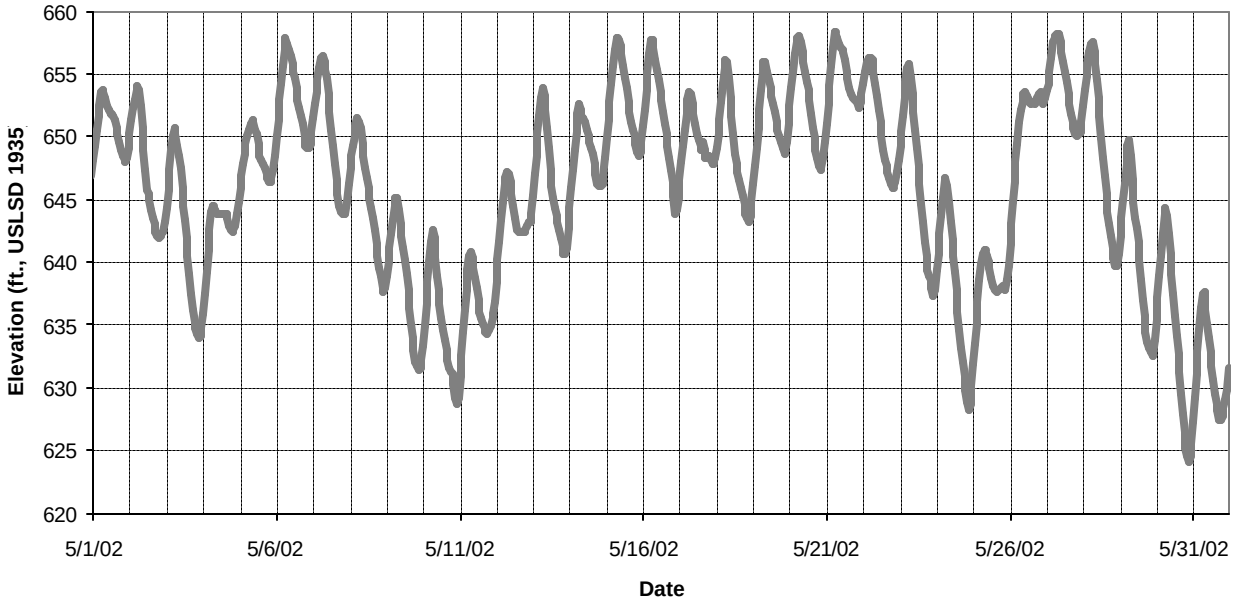
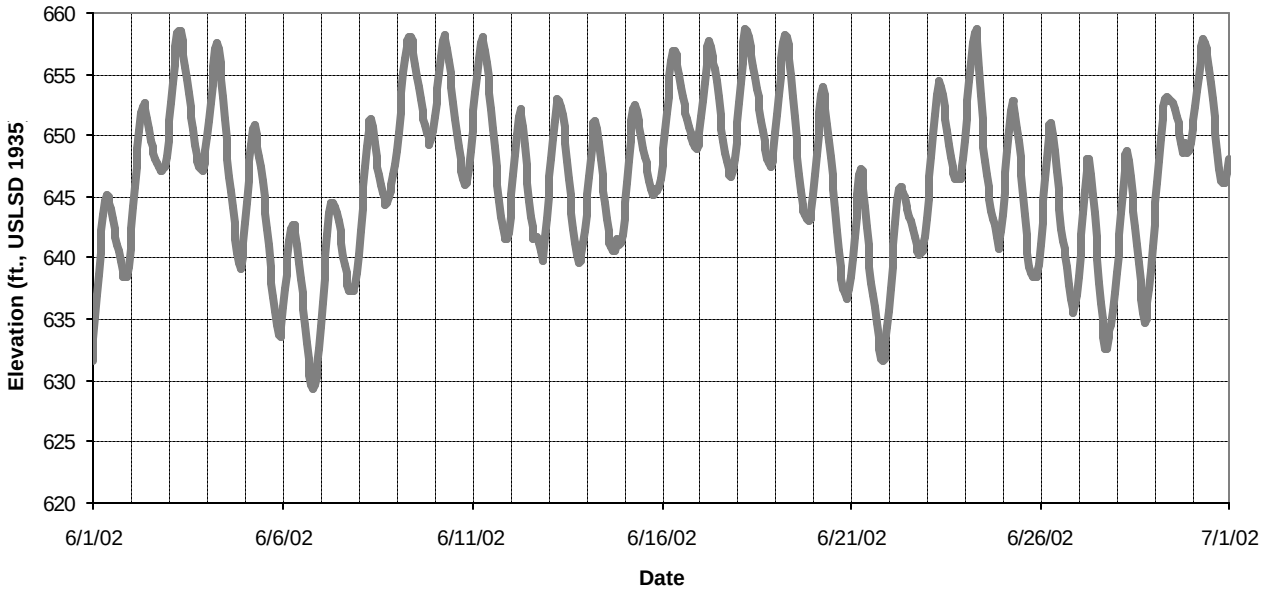
Water Elevations in Lewiston Reservoir (Source: NYPA)

May 2002



June 2002



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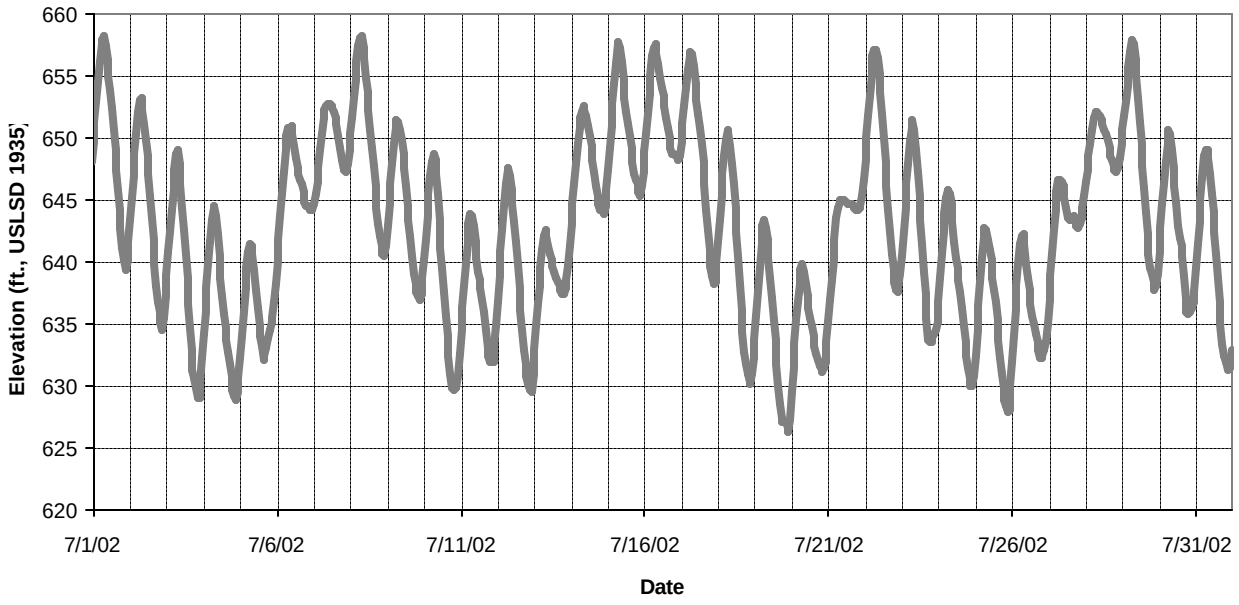
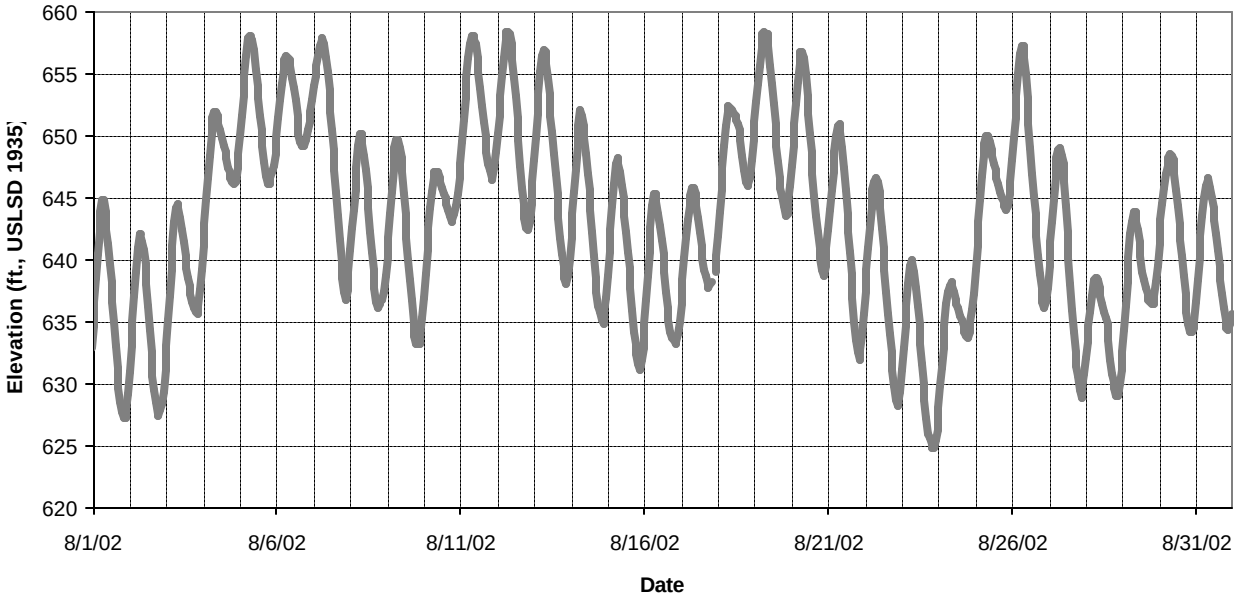
Water Elevations in Lewiston Reservoir (Source: NYPA)

July 2002



August 2002



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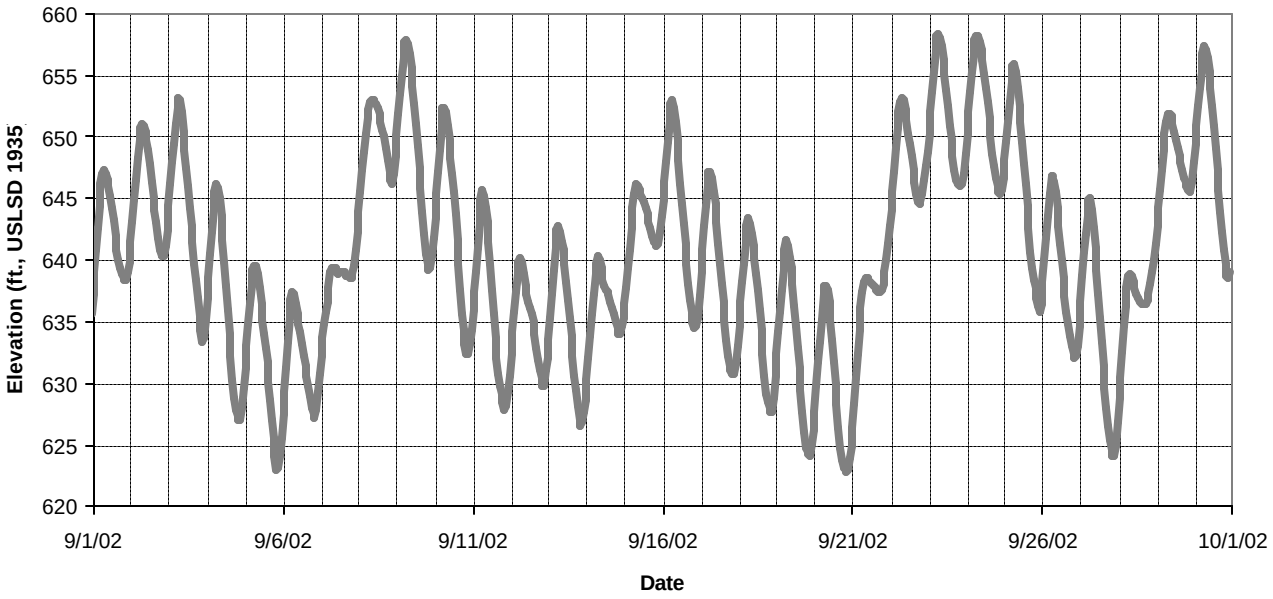
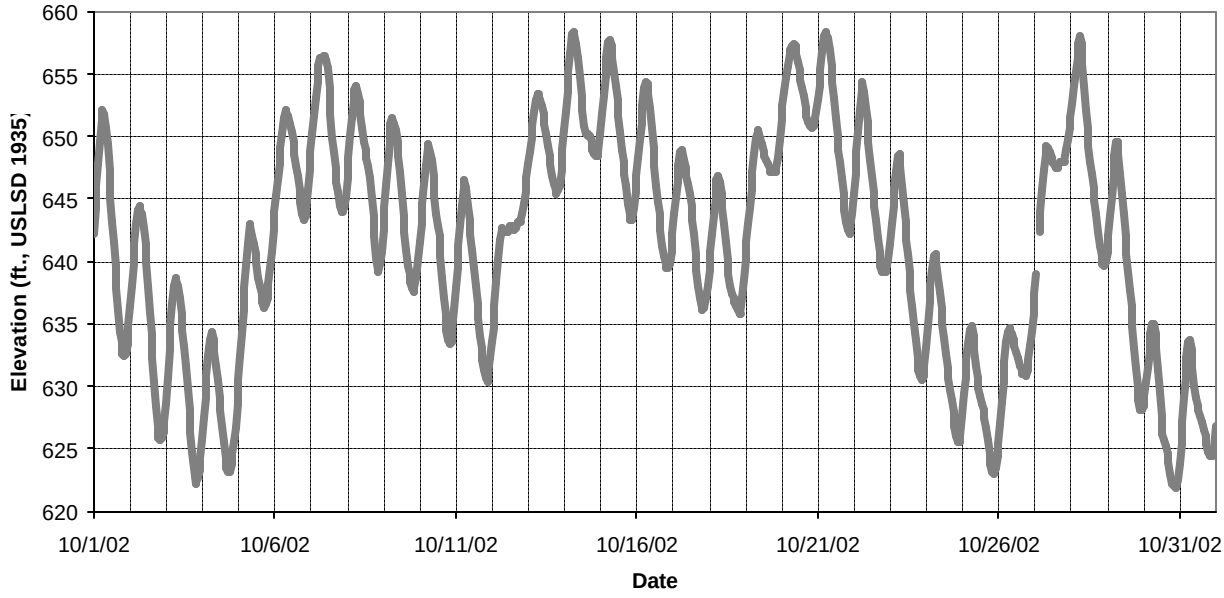
Water Elevations in Lewiston Reservoir (Source: NYPA)

September 2002



October 2002



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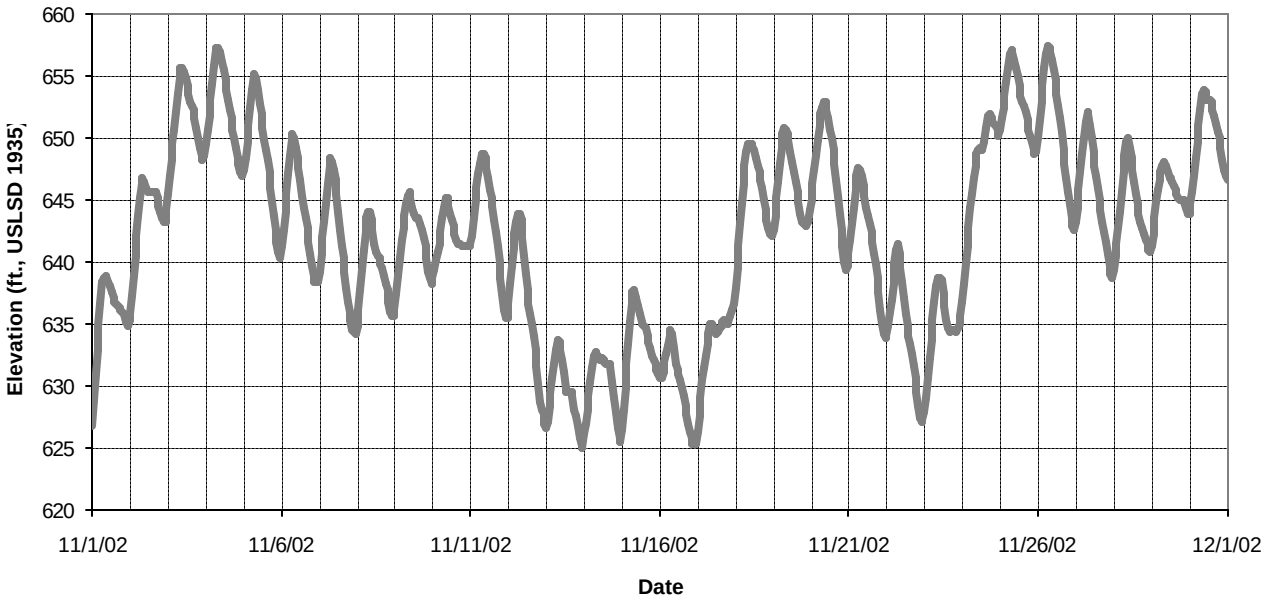
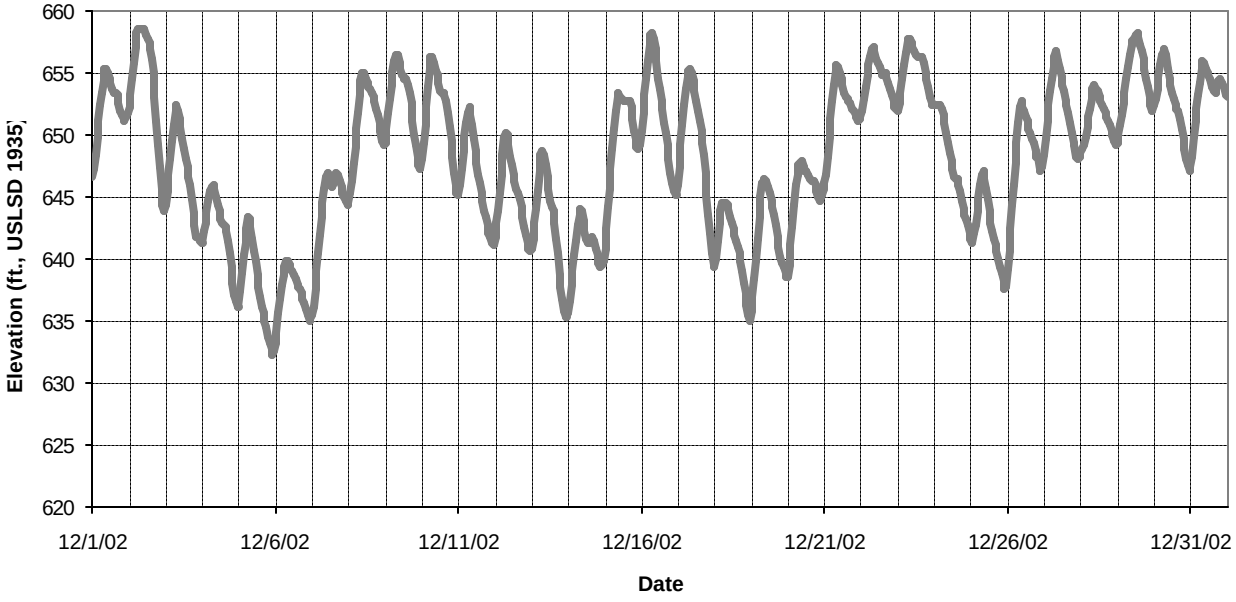
Water Elevations in Lewiston Reservoir (Source: NYPA)

November 2002



December 2002



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APPENDIX B

Water Quality Data

Stations:

- Niagara-on-the-Lake
- Fort Erie

Source: Merriman and Kuntz 2002 (Reproduced with permission.)

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	1,3-DICHLORO BENZENE	1,4-DICHLORO BENZENE	1,2-DICHLORO BENZENE	1,3,5-TRICHLORO BENZENE	1,2,4-TRICHLORO BENZENE	1,2,3-TRICHLORO BENZENE	1,2,3,4-TETRACHLORO BENZENE	PENTA-CHLORO BENZENE	ENDRIN ALDEHYDE	HEXACHLORO CYCLOPENTADIENE
	96288	96281	96282	96283	96284	96285	96286	96287	96152	96153
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
Detection Limit	**0.30**	**0.51**	**0.58**	**0.02**	**0.24**	**0.09**	**0.09**	**0.04**	**0.03**	**0.02**
3-Apr-97	0.30 L	1.58	0.42T	0.02 L	0.36	0.12	0.1	0.07	0.05 L	0.02 L
24-Apr-97	0.30 L	1.41	0.58 L	0.02 L	0.44	0.15	0.17	0.07	0.05 L	0.02 L
1-May-97	0.30 L	1.48	0.58 L	0.02 L	0.33	0.09	0.12	0.14	0.05 L	0.02 L
15-May-97	0.30 L	1.31	0.58 L	0.02 L	0.3	0.12	0.14	0.13	0.05 L	0.02 L
29-May-97	0.30 L	2.09	0.58 L	0.02 L	0.39	0.17	0.24	0.1	0.05 L	0.02 L
12-Jun-97	0.30 L	1.35	0.63	0.02 L	0.43	0.17	0.34	0.13	0.05 L	0.02 L
26-Jun-97	0.30 L	1.88	0.58 L	0.15	0.46	0.17	0.34	0.12	0.05 L	0.02 L
10-Jul-97	0.30 L	1.99	0.58 L	0.08	0.33	0.11	0.24	0.09	0.05 L	0.02 L
24-Jul-97	0.30 L	1.49	0.52T	0.11	0.38	0.14	0.28	0.09	0.05 L	0.02 L
7-Aug-97	0.30 L	1.18	0.4T	0.09	0.32	0.12	0.22	0.09	0.05 L	0.02 L
21-Aug-97	0.30 L	1.94	0.64	0.08	0.55	0.21	0.31	0.12	0.05 L	0.02T
4-Sep-97	0.30 L	1.11	0.58 L	0.1	0.35	0.14	0.26	0.12	0.05 L	0.02 L
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	0.30 L	0.95	0.58 L	0.06	0.45	0.13	0.2	0.09	0.05 L	0.02 L
16-Oct-97	0.30 L	0.84	0.58 L	0.06	0.34	0.1	0.22	0.08	0.05 L	0.02 L
30-Oct-97	0.30 L	1.59	0.58 L	0.06	0.57	0.14	0.44	0.12	0.05 L	0.05
13-Nov-97	--	--	--	--	--	--	--	--	--	--
14-Nov-97	0.30 L	0.81	0.58 L	0.05	0.45	0.14	0.32	0.09	0.05 L	0.01T
27-Nov-97	0.6	1.17	0.58 L	0.02 L	0.61	0.17	0.29	0.08	0.05 L	0.02 L
11-Dec-97	1.4	1.55	--	0.09	0.85	0.22	0.34	0.13	0.05 L	0.02 L
24-Dec-97	0.30 L	1.48	0.58 L	0.09	0.65	0.18	0.3	0.1	0.05 L	0.02 L
8-Jan-98	1.14	2	0.58 L	0.07	0.74	0.18	0.25	0.1	0.05 L	0.12
22-Jan-98	0.52	1.35	1.61	0.07	0.62	0.16	0.33	0.12	0.05 L	0.04
5-Feb-98	0.30 L	0.51 L	0.58 L	0.02 L	0.24 L	0.09 L	0.09 L	0.03	0.05 L	0.02 L
19-Feb-98	--	--	--	--	--	--	--	--	--	--
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	--	--	--	--	--	--	--	--	--	--
13-Mar-98	0.30 L	0.51 L	0.58 L	0.02 L	0.09T	0.03T	0.15	0.09	0.05 L	0.02 L
19-Mar-98	--	--	--	--	--	--	--	--	--	--
2-Apr-98	0.30 L	0.93	0.49T	0.04	0.37	0.11	0.19	0.09	0.05 L	0.02 L
16-Apr-98	0.24T	0.81	0.41T	0.02 L	0.35	0.11	0.26	0.12	0.05 L	0.02 L
30-Apr-98	0.17T	0.55	0.22T	0.02 L	0.24	0.08T	0.2	0.1	0.05 L	0.02 L
14-May-98	0.39	0.84	0.4T	0.02 L	0.36	0.1	0.24	0.12	0.05 L	0.02 L
28-May-98	0.49	0.84	0.37T	0.04	0.35	0.09 L	0.34	0.11	0.05 L	0.02 L
11-Jun-98	0.38	1.06	0.37T	0.09	0.47	0.15	0.4	0.11	0.05 L	0.02 L
25-Jun-98	0.37	0.76	0.46T	0.02 L	0.24 L	0.12	0.34	0.11	0.05 L	0.02 L
9-Jul-98	0.4	1.26	0.47T	0.02 L	0.48	0.1	0.29	0.04 L	0.05 L	0.02 L
23-Jul-98	0.2T	0.74	0.29T	0.07	0.3	0.07T	0.23	0.1	0.05 L	0.02 L
7-Aug-98	0.28T	0.93	0.34T	0.1T	0.4	0.1	0.27	0.1	0.05 L	0.02 L
20-Aug-98	0.39	0.8	0.3T	0.1T	0.27	0.07T	0.18	0.08	0.05 L	0.02 L
3-Sep-98	--	--	--	--	--	--	--	--	--	--
17-Sep-98	0.73	1.16	0.55T	0.13	0.48	0.13	0.32	0.12	0.05 L	0.02 L
15-Oct-98	0.49	0.78	0.4T	0.08	0.37	0.08T	0.2	0.07	0.05 L	0.02 L
29-Oct-98	0.38	0.86	0.4T	0.08	0.46	0.12	0.31	0.09	0.05 L	0.02 L
5-Nov-98	0.51	1.05	0.47T	0.1	0.55	0.14	0.62	0.16	0.05 L	0.02 L
26-Nov-98	0.38	1.05	1.09	0.06	0.83	0.21	0.21	0.07	0.05 L	0.02 L
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	0.30 L	0.97	0.45T	0.07	0.42	0.12	0.22	0.06	0.05 L	0.02 L
23-Dec-98	0.30 L	0.84	0.35T	0.04	0.41	0.1	0.34	0.09	0.05 L	0.05
7-Jan-99	0.33	1.11	0.87	0.06	0.62	0.12	0.18	0.07	0.05 L	0.02 L
21-Jan-99	0.27T	1.02	0.66	0.04	0.52	0.14	0.29	0.08	0.05 L	0.02 L
4-Feb-99	0.28T	1.2	0.7	0.04	0.52	0.11	0.26	0.07	0.05 L	0.02 L
10-Feb-99	0.28T	1.07	0.52T	0.04	0.4	0.1	0.17	0.05	0.05 L	0.02 L
18-Feb-99	0.22T	0.88	0.42T	0.05	0.41	0.1	0.2	0.07	0.05 L	0.02 L
25-Feb-99	0.23T	0.87	0.46T	0.04	0.41	0.1	0.17	0.05	0.05 L	0.02 L
4-Mar-99	0.36	1.17	0.57T	0.05	0.41	0.11	0.17	0.05	0.05 L	0.02 L
11-Mar-99	0.24T	1.03	0.48T	0.05	0.52	0.15	0.3	0.06	0.05 L	0.02 L
18-Mar-99	0.23T	1.11	0.52T	0.05	0.41	0.11	0.19	0.06	0.05 L	0.02 L

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	PHOTOMIREX	OCTACHLORO-STYRENE	HEXACHLORO-BUTADIENE	HEXA-CHLORO-BENZENE	ALPHA-BHC	GAMMA-BHC (LINDANE)	HEPTCHLOR	ALDRIN	HEPTACHLOR EPOXIDE	GAMMA CHLORDANE
	96154	96260	96261	96001	96014	96013	96007	96016	96008	96012
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
Detection Limit	**0.04**	**0.05**	**0.03**	**0.04**	**0.30**	**0.14**	**0.03**	**0.01**	**0.02**	**0.03**
3-Apr-97	0.04 L	0.05 L	0.05	0.03T	0.51	0.26	0.03 L	0.01 L	0.05	0.03 L
24-Apr-97	0.04 L	0.05 L	0.05	0.04	0.57	0.37	0.03 L	0.01 L	0.09	0.03 L
1-May-97	0.04 L	0.05 L	0.05	0.04	0.7	0.47	0.03	0.01 L	0.1	0.03 L
15-May-97	0.04 L	0.05 L	0.04	0.03T	0.68	0.53	0.03 L	0.01 L	0.1	0.03 L
29-May-97	0.04 L	0.05 L	0.05	0.03T	0.66	0.49	0.03 L	0.01 L	0.08	0.03 L
12-Jun-97	0.04 L	0.05 L	0.04	0.03T	0.55	0.45	0.03 L	0.01 L	0.1	0.03 L
26-Jun-97	0.04 L	0.05 L	0.06	0.04	0.55	0.44	0.03 L	0.01 L	0.08	0.03 L
10-Jul-97	0.04 L	0.05 L	0.06	0.04	0.45	0.35	0.03 L	0.01 L	0.07	0.03 L
24-Jul-97	0.04 L	0.05 L	0.07	0.04	0.57	0.39	0.03 L	0.01 L	0.05	0.03 L
7-Aug-97	0.04 L	0.05 L	0.05	0.03T	--	0.41	0.03 L	0.01 L	0.16	0.03 L
21-Aug-97	0.04 L	0.05 L	0.11	0.05	0.28T	0.25	0.03 L	0.01 L	0.03	0.03 L
4-Sep-97	0.04 L	0.05 L	0.07	0.04	0.31	0.25	0.03 L	0.01 L	0.04	0.03 L
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	0.04 L	0.05 L	0.04	0.03T	0.55	0.4	0.03 L	0.01 L	0.05	0.03 L
16-Oct-97	0.04 L	0.05 L	0.03	0.03T	0.37	0.35	0.03 L	0.01 L	0.04	0.03 L
30-Oct-97	0.04 L	0.05 L	0.05	0.03T	0.58	0.36	0.03 L	0.01 L	0.08	0.03 L
13-Nov-97	--	--	--	--	--	--	--	--	--	--
14-Nov-97	0.04 L	0.05 L	0.04	0.02T	0.56	0.37	0.03 L	0.01 L	0.04	0.03 L
27-Nov-97	0.04 L	0.05 L	0.05	0.03T	0.74	0.4	0.03 L	0.01 L	0.05	0.03 L
11-Dec-97	0.04 L	0.05 L	0.05	0.03T	0.8	0.59	0.03 L	0.01 L	0.07	0.03 L
24-Dec-97	0.04 L	0.05 L	0.05	0.05	0.77	0.74	0.03 L	0.01 L	--	0.03 L
8-Jan-98	0.04 L	0.05 L	0.08	0.03T	0.46	0.18	0.03 L	0.01 L	0.03	0.03 L
22-Jan-98	0.04 L	0.05 L	0.09	0.05	0.61	0.39	0.03 L	0.01 L	0.06	0.03 L
5-Feb-98	0.04 L	0.05 L	0.03 L	0.02T	0.58	0.45	0.03 L	0.01 L	0.05	0.03 L
19-Feb-98	--	--	--	--	--	--	--	--	--	--
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	--	--	--	--	--	--	--	--	--	--
13-Mar-98	0.04 L	0.05 L	0.01T	0.03T	0.54	0.38	0.03 L	0.01 L	0.05	0.03 L
19-Mar-98	--	--	--	--	--	--	--	--	--	--
2-Apr-98	0.04 L	0.05 L	0.03	0.03T	0.93	0.48	0.03 L	0.01 L	0.07	0.01T
16-Apr-98	0.04 L	0.05 L	0.02T	0.03T	0.82	0.47	0.03 L	0.01 L	0.06	0.03 L
30-Apr-98	0.04 L	0.05 L	0.06	0.03T	0.76	0.49	--	0.01 L	0.06	0.03 L
14-May-98	0.04 L	0.05 L	0.04	0.03T	0.8	0.5	--	0.01 L	0.06	0.03 L
28-May-98	0.04 L	0.05 L	0.04	0.03T	0.8	0.58	0.03 L	0.01 L	0.06	0.03 L
11-Jun-98	0.04 L	0.05 L	0.04	0.03T	0.57	0.45	0.03 L	0.01 L	0.05	0.03 L
25-Jun-98	0.04 L	0.05 L	0.07	0.04	0.83	0.66	0.03 L	0.01 L	0.08	0.03 L
9-Jul-98	0.04 L	0.02T	0.06	0.05	0.57	0.47	0.03 L	0.01 L	0.07	0.03 L
23-Jul-98	0.04 L	0.05 L	0.03	0.04	0.5	0.46	0.03 L	0.01 L	0.08	0.03 L
7-Aug-98	0.04 L	0.02T	0.05	0.04	0.34	0.27	0.03 L	0.01 L	0.08	0.03 L
20-Aug-98	0.04 L	0.05 L	0.03	0.03T	0.4	0.38	0.03 L	0.01 L	0.07	0.03 L
3-Sep-98	--	--	--	--	--	--	--	--	--	--
17-Sep-98	0.04 L	0.05 L	0.05	0.07	0.39	0.31	0.03 L	0.01 L	0.07	0.03 L
15-Oct-98	0.04 L	0.05 L	0.04	0.03T	0.31	0.26	0.03 L	0.01 L	0.05	0.03 L
29-Oct-98	0.04 L	0.05 L	0.04	0.03T	0.34	0.3	0.03 L	0.01 L	0.06	0.03 L
5-Nov-98	0.04 L	0.05 L	0.13	0.03T	0.34	0.27	0.03 L	0.01 L	0.06	0.03 L
26-Nov-98	0.04 L	0.05 L	0.03	0.03T	0.37	0.28	0.03 L	0.01 L	0.06	0.03 L
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	0.04 L	0.05 L	0.03	0.02T	0.38	0.29	0.03 L	0.01 L	0.06	0.03 L
23-Dec-98	0.04 L	0.05 L	0.04	0.03T	0.58	0.34	0.03 L	0.01 L	0.03	0.03 L
7-Jan-99	0.04 L	0.05 L	0.04	0.02T	0.3	0.32	0.03 L	0.01 L	0.03	0.01T
21-Jan-99	0.04 L	0.05 L	0.03	0.02T	0.4	0.34	0.03 L	0.01 L	0.03	0.03 L
4-Feb-99	0.04 L	0.05 L	0.03	0.02T	0.39	0.34	0.03 L	0.01 L	0.03	0.03 L
10-Feb-99	0.01T	0.01T	0.03	0.02T	0.39	0.3	0.03 L	0.01 L	0.03	0.03 L
18-Feb-99	0.04 L	0.05 L	0.03	0.02T	0.39	0.29	0.03 L	0.01 L	0.03	0.03 L
25-Feb-99	0.04 L	0.05 L	0.03	0.02T	0.32	0.28	0.03 L	0.01 L	0.02	0.03 L
4-Mar-99	0.04 L	0.05 L	0.03	0.03T	0.35	0.27	0.03 L	0.01 L	0.04	0.03 L
11-Mar-99	0.04 L	0.05 L	0.03	0.02T	0.28T	0.22	0.03 L	0.01 L	0.03	0.03 L
18-Mar-99	0.04 L	0.05 L	0.03	0.03T	0.36	0.26	0.03 L	0.01 L	0.04	0.03 L

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	ALPHA CHLORDANE	ALPHA ENDOSLUPHAN	PP-DDE	HEOD (DIELDRIN)	ENDRIN	OP-DDT	PP-DDD	PP-DDT	BETA ENDOSLUPHAN	MIREX
	96011	96009	96005	96018	96017	96003	96004	96002	96010	96015
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
Detection Limit	**0.06**	**0.02**	**0.06**	**0.05**	**0.03**	**0.09**	**0.10**	**0.10**	**0.06**	**0.04**
3-Apr-97	0.02T	0.02 L	0.02T	0.13	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
24-Apr-97	0.06 L	0.02	0.03T	0.21	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
1-May-97	0.06 L	0.02	0.06	0.21	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
15-May-97	0.02T	0.08	0.07	0.23	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
29-May-97	0.04T	0.06	0.02T	0.2	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
12-Jun-97	0.06 L	0.02 L	0.03T	0.23	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
26-Jun-97	0.02T	0.02 L	0.04T	0.24	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
10-Jul-97	0.06 L	0.11	0.03T	0.21	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
24-Jul-97	0.06 L	0.07	0.06 L	0.17	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
7-Aug-97	0.06 L	0.08	0.01T	0.29	0.03 L	0.09 L	0.10 L	0.05T	0.06 L	0.04 L
21-Aug-97	0.06 L	0.04	0.06 L	0.11	0.03 L	0.09 L	0.10 L	0.05T	0.06 L	0.04 L
4-Sep-97	0.06 L	0.01T	0.04T	0.03T	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	0.06 L	0.06	0.03T	0.2	0.03 L	--	0.10 L	0.01T	0.06 L	0.04 L
16-Oct-97	0.06 L	0.04	0.02T	0.23	0.03 L	0.1	0.10 L	0.10 L	0.06 L	0.04 L
30-Oct-97	0.06 L	0.07	0.02T	0.15	0.03 L	0.11	0.04T	0.10 L	0.06 L	0.04 L
13-Nov-97	--	--	--	--	--	--	--	--	--	--
14-Nov-97	0.06 L	0.03	0.01T	0.16	0.03 L	0.06T	0.04T	0.10 L	0.06 L	0.04 L
27-Nov-97	0.06 L	0.04	0.02T	0.17	0.03 L	0.07T	0.05T	0.10 L	0.06 L	0.04 L
11-Dec-97	0.06 L	0.06	0.04T	0.21	0.03 L	0.07T	0.04T	0.10 L	0.06 L	0.01T
24-Dec-97	0.06 L	0.08	0.06 L	0.05 L	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
8-Jan-98	0.06 L	0.02 L	0.05T	0.13	0.03 L	0.07T	0.10 L	0.10 L	0.06 L	0.04 L
22-Jan-98	0.06 L	0.02 L	0.05T	0.18	0.03 L	0.01T	0.05T	0.10 L	0.06 L	0.04 L
5-Feb-98	0.06 L	0.02 L	0.03T	0.19	0.03 L	0.01T	0.03T	0.10 L	0.06 L	0.04 L
19-Feb-98	--	--	--	--	--	--	--	--	--	--
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	--	--	--	--	--	--	--	--	--	--
13-Mar-98	0.06 L	0.02 L	0.03T	0.17	0.03 L	0.01T	0.04T	0.10 L	0.06 L	0.04 L
19-Mar-98	--	--	--	--	--	--	--	--	--	--
2-Apr-98	0.06 L	0.02	0.02T	0.18	0.03 L	0.09 L	0.02T	0.10 L	0.06 L	0.04 L
16-Apr-98	0.06 L	0.03	0.02T	0.18	0.03 L	0.01T	0.04T	0.10 L	0.06 L	0.04 L
30-Apr-98	0.06 L	0.04	0.02T	0.17	0.03 L	0.01T	0.02T	0.10 L	0.03T	0.04 L
14-May-98	0.06 L	0.05	0.02T	0.15	0.03 L	0.09 L	0.02T	0.10 L	0.02T	0.04 L
28-May-98	0.06 L	0.03	0.01T	0.17	0.03 L	0.09 L	0.02T	0.10 L	0.01T	0.04 L
11-Jun-98	0.06 L	0.02	0.02T	0.14	0.03 L	0.09 L	0.02T	0.10 L	0.01T	0.04 L
25-Jun-98	0.06 L	0.03	0.01T	0.19	0.03 L	0.03T	0.04T	0.10 L	0.06 L	0.04 L
9-Jul-98	0.06 L	0.04	0.05T	0.17	0.03 L	0.09 L	0.10 L	0.10 L	0.02T	0.01T
23-Jul-98	0.06 L	0.03	0.06 L	0.14	0.03 L	0.09 L	0.10 L	0.10 L	0.01T	0.04 L
7-Aug-98	0.06 L	0.01T	0.05T	0.12	0.03 L	0.09 L	0.10 L	0.10 L	0.01T	0.04 L
20-Aug-98	0.06 L	0.01T	0.06 L	0.18	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
3-Sep-98	--	--	--	--	--	--	--	--	--	--
17-Sep-98	0.06 L	0.01T	0.06 L	0.19	0.03 L	0.09 L	0.10 L	0.10 L	0.01T	0.04 L
15-Oct-98	0.01T	0.01T	0.06 L	0.12	0.03 L	0.09 L	0.02T	0.10 L	0.06 L	0.04 L
29-Oct-98	0.01T	0.02 L	0.06 L	0.14	0.03 L	0.09 L	0.01T	0.10 L	0.06 L	0.04 L
5-Nov-98	0.01T	0.02 L	0.06 L	0.13	0.03 L	0.09 L	0.01T	0.10 L	0.06 L	0.04 L
26-Nov-98	0.01T	0.01T	0.02T	0.13	0.03 L	0.09 L	0.02T	0.10 L	0.06 L	0.04 L
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	0.01T	0.02 L	0.06 L	0.14	0.03 L	0.09 L	0.02T	0.10 L	0.06 L	0.04 L
23-Dec-98	0.01T	0.01T	0.06 L	0.15	0.03 L	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
7-Jan-99	0.06 L	0.01T	0.03T	0.16	0.03	0.09 L	0.05T	0.10 L	0.06 L	0.04 L
21-Jan-99	0.02T	0.02 L	0.01T	0.2	0.05	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
4-Feb-99	0.03T	0.02 L	0.03T	0.15	0.04	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
10-Feb-99	0.01T	0.02 L	0.03T	0.15	0.04	0.02T	0.04T	0.10 L	0.06 L	0.01T
18-Feb-99	0.05T	0.02 L	0.03T	0.15	0.08	0.09 L	0.06T	0.10 L	0.06 L	0.04 L
25-Feb-99	0.01T	0.01T	0.01T	0.14	0.03 L	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
4-Mar-99	0.06 L	0.02 L	0.03T	0.09	0.05	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
11-Mar-99	0.01T	0.01T	0.02T	0.11	0.05	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
18-Mar-99	0.06 L	0.02 L	0.02T	0.13	0.05	0.09 L	0.04T	0.10 L	0.06 L	0.04 L

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	METHOXYCHLOR	PCB (TOTAL)	TOTAL POLYCH LORINATED BI PHENYL-CONGENER	FLUORANTHENE	PYRENE	BENZ(A) ANTHRACENE	BENZO (A) PYRENE	2-METHYL NAPHTALENE	1-METHYL-NAPHTHALENE	BETA-CHLORO-NAPHTHALENE
	96006	96019	103388	96201	96202	96203	96209	96272	96273	96274
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
Detection Limit	**0.22**	**0.81**	**0.21**	**0.18**	**0.17**	**0.24**	**0.24**	**0.51**	**0.61**	**1.20**
3-Apr-97	0.22 L	0.81 L	--	1.03	0.56	0.06T	0.24 L	0.14T	0.1T	1.20 L
24-Apr-97	0.22 L	1.09	--	1	0.63	0.08T	0.24 L	0.3T	0.18T	1.20 L
1-May-97	0.22 L	0.75T	--	1.11	0.71	0.1T	0.07T	0.37T	0.25T	1.20 L
15-May-97	0.22 L	0.83	--	1.21	1.23	0.24 L	0.05T	0.46T	0.25T	1.20 L
29-May-97	0.22 L	0.81 L	--	0.8	0.66	0.24 L	0.24 L	0.46T	0.27T	1.20 L
12-Jun-97	0.22 L	0.64T	--	0.76	0.93	0.24 L	0.24 L	1.66	0.89	1.20 L
26-Jun-97	0.22 L	0.8T	--	0.85	1.33	0.06T	0.24 L	0.53	0.31T	1.20 L
10-Jul-97	0.22 L	1.07	--	1.7	1.86	0.14T	0.24 L	1.14	0.74	1.20 L
24-Jul-97	0.22 L	1.61	--	1.2	1.65	0.24 L	0.24 L	1.35	0.81	1.20 L
7-Aug-97	0.21T	1.07	--	1.26	2.03	0.24 L	0.24 L	1.4	0.79	1.20 L
21-Aug-97	0.22 L	0.83	--	1.28	2.18	0.24 L	0.24 L	1.43	0.86	1.20 L
4-Sep-97	0.22 L	0.97	--	0.72	1.43	0.24 L	0.24 L	0.74	0.46T	1.20 L
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	0.22 L	1.01	--	--	--	0.71	0.64	--	--	1.20 L
16-Oct-97	0.22 L	0.71T	--	--	--	0.15T	0.11T	--	--	1.20 L
30-Oct-97	0.22 L	0.62T	--	--	--	1.11	0.34	--	--	1.20 L
13-Nov-97	--	--	--	--	--	--	--	--	--	--
14-Nov-97	0.22 L	0.81 L	--	--	--	0.25	0.16T	--	--	1.20 L
27-Nov-97	0.22 L	0.81 L	--	--	--	0.28	0.25	--	--	1.20 L
11-Dec-97	0.22 L	0.7T	--	--	--	0.21T	0.24 L	--	--	1.20 L
24-Dec-97	0.22 L	1.31	--	--	--	--	--	--	--	1.20 L
8-Jan-98	0.22 L	1.26	--	--	--	0.24 L	0.41	--	--	1.20 L
22-Jan-98	0.22 L	0.95	--	--	--	0.15T	0.13T	--	--	1.20 L
5-Feb-98	0.22 L	0.72T	--	--	--	0.11T	0.24 L	--	--	1.20 L
19-Feb-98	--	--	--	--	--	--	--	--	--	--
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	--	--	--	--	--	--	--	--	--	--
13-Mar-98	0.22 L	0.79T	--	2.21	1.3	0.17T	0.16T	0.16T	0.13T	1.20 L
19-Mar-98	--	--	--	--	--	--	--	--	--	--
2-Apr-98	0.22 L	--	1.12	2.01	1.47	0.17T	0.08T	0.91	0.58T	1.20 L
16-Apr-98	0.22 L	--	1.41	1.46	1.07	0.12T	0.04T	1.26	0.66	1.20 L
30-Apr-98	0.22 L	--	1.3	1.12	0.95	0.09T	0.24 L	1.08	0.52T	1.20 L
14-May-98	0.22 L	--	1.09	1.53	1.16	0.1T	0.24 L	2.28	1.2	1.20 L
28-May-98	0.22 L	--	1.26	0.89	1.11	0.08T	0.24 L	2.41	1.15	1.20 L
11-Jun-98	0.22 L	--	1.21	1.12	1.62	0.07T	0.24 L	1.29	0.72	1.20 L
25-Jun-98	0.22 L	--	1.01	0.81	1.13	0.04T	0.24 L	3.15	1.56	1.20 L
9-Jul-98	0.22 L	--	2.77	1.89	2.41	0.15T	0.24 L	1.36	0.72	1.20 L
23-Jul-98	0.22 L	--	1.89	1.65	2.58	0.08T	0.03T	1.01	0.56T	1.20 L
7-Aug-98	0.22 L	--	2.74	1.32	1.95	0.07T	0.04T	1.19	0.72	1.20 L
20-Aug-98	0.22 L	--	1.45	1.29	2.38	0.07T	0.24 L	0.9	0.51T	1.20 L
3-Sep-98	--	--	--	--	--	--	--	--	--	--
17-Sep-98	0.22 L	--	1.76	1.78	3.42	0.19T	0.13T	1.09	0.61	1.20 L
15-Oct-98	0.22 L	--	1	0.92	1.62	0.08T	0.04T	0.59	0.33T	1.20 L
29-Oct-98	0.22 L	--	0.82	2.27	2.79	0.21T	0.07T	0.59	0.38T	1.20 L
5-Nov-98	0.22 L	--	0.74	1.37	1.86	0.12T	0.04T	1.06	0.64	1.20 L
26-Nov-98	0.22 L	--	1.07	2.15	2.15	0.22T	0.12T	1.18	0.71	1.20 L
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	0.22 L	--	0.89	0.67	0.73	0.05T	0.02T	0.66	0.43T	1.20 L
23-Dec-98	0.22 L	--	1.01	1.55	1.32	0.18T	0.12T	0.85	0.59T	1.20 L
7-Jan-99	0.22 L	--	1.27	5.18	4.02	0.69	0.44	2.89	1.98	1.20 L
21-Jan-99	0.22 L	--	0.88	0.47	0.36	0.06T	0.03T	0.7	0.44T	1.20 L
4-Feb-99	0.22 L	--	1.24	1.51	1.07	0.14T	0.12T	1.74	1.18	1.20 L
10-Feb-99	0.22 L	--	0.77	1.51	0.91	0.12T	0.07T	0.8	0.54T	1.20 L
18-Feb-99	0.22 L	--	1.27	0.92	0.56	0.24 L	0.05T	1.31	0.87	1.20 L
25-Feb-99	0.22 L	--	0.39	0.45	0.22	0.03T	0.02T	1.16	0.77	1.20 L
4-Mar-99	0.22 L	--	1.02	2.83	1.5	0.21T	0.11T	1.64	1.12	1.20 L
11-Mar-99	0.22 L	--	1.47	1.14	0.61	0.24 L	0.24 L	0.97	0.7	1.20 L
18-Mar-99	0.22 L	--	0.99	1.36	0.57	0.24 L	0.05T	0.94	0.66	1.20 L

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	ACENAPH-THYLENE	FLUORENE	PHENAN-THRENE	INDENO (1,2,3-C,D)	BENZO (G,H,I) PERYLENE	NAPHTHALENE	ANTHRACENE	DIBENZO(AH) ANTHRACENE	ATRAZINE	METOLACHLOR
	96275	96277	96278	96279	96280	96143	96144	96145	96150	96151
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
Detection Limit	**0.16**	**0.59**	**0.12**	**0.36**	**0.22**	**0.33**	**0.23**	**0.51**	**6.04**	**0.82**
3-Apr-97	0.09T	0.32T	1.26	0.36 L	0.22 L	--	0.23 L	0.51 L	49.3	18.1
24-Apr-97	0.1T	0.46T	1.62	0.36 L	0.22 L	--	0.23 L	0.51 L	51.3	21.7
1-May-97	0.12T	0.52T	1.84	0.09T	0.08T	--	0.23 L	0.51 L	50.3	21.8
15-May-97	0.12T	0.52T	2.46	0.36 L	0.22 L	--	0.23 L	0.51 L	51.4	21.9
29-May-97	0.13T	0.45T	1.62	0.36 L	0.22 L	--	0.23 L	0.51 L	48.1	23.8
12-Jun-97	0.15T	0.58T	2.2	0.36 L	0.22 L	--	0.23 L	0.51 L	43.8	17.9
26-Jun-97	0.11T	0.52T	2.33	0.36 L	0.22 L	--	0.23 L	0.51 L	51.2	20.8
10-Jul-97	0.13T	0.55T	2.55	0.36 L	0.22 L	--	0.23 L	0.51 L	53.9	24.1
24-Jul-97	0.15T	0.61	2.91	0.36 L	0.22 L	--	0.23 L	0.51 L	57	29.7
7-Aug-97	0.15T	0.71	3.74	0.36 L	0.22 L	--	0.23 L	0.51 L	63.3	30.8
21-Aug-97	0.17	0.69	3.26	0.36 L	0.22 L	--	0.23 L	0.51 L	55.9	26.3
4-Sep-97	0.16 L	0.39T	2.04	0.36 L	0.22 L	--	0.23 L	0.51 L	41.7	20
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	--	--	--	0.63	0.66	--	0.89	0.51 L	63.5	33.1
16-Oct-97	--	--	--	0.1T	0.22 L	--	0.42	0.51 L	47.5	17.9
30-Oct-97	--	--	--	0.44	0.22 L	--	0.67	0.51 L	44.1	16.6
13-Nov-97	--	--	--	--	--	--	--	--	--	--
14-Nov-97	--	--	--	0.15T	0.22 L	--	0.62	0.51 L	60.3	23.4
27-Nov-97	--	--	--	0.34T	0.22 L	--	0.47	0.51 L	62.3	24.6
11-Dec-97	--	--	--	0.36 L	0.22 L	--	0.23 L	0.51 L	65.9	26.6
24-Dec-97	--	--	--	--	--	--	--	--	--	--
8-Jan-98	--	--	--	0.15T	0.47	--	0.23 L	0.51 L	45.4	16.3
22-Jan-98	--	--	--	0.15T	0.22 L	--	0.23 L	0.51 L	135	49.1
5-Feb-98	--	--	--	0.12T	0.22 L	--	0.23 L	0.51 L	126	40.9
19-Feb-98	--	--	--	--	--	--	--	--	--	--
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	--	--	--	--	--	--	--	--	--	--
13-Mar-98	0.22	1.05	4.25	0.23T	0.22 L	--	0.23 L	0.51 L	150	46
19-Mar-98	--	--	--	--	--	--	--	--	--	--
2-Apr-98	0.24	1	4.17	0.16T	0.14T	--	0.23 L	0.51 L	66.3	28.3
16-Apr-98	0.36	0.97	3.63	0.36 L	0.22 L	--	0.23 L	0.51 L	50.3	22.6
30-Apr-98	0.21	0.92	2.98	0.36 L	0.22 L	--	0.14T	0.51 L	50.2	22.2
14-May-98	0.34	1.1	3.28	0.36 L	0.22 L	--	0.23 L	0.51 L	71.2	33.5
28-May-98	0.18	0.74	2.61	0.36 L	0.22 L	--	0.16T	0.51 L	57.3	24.9
11-Jun-98	0.15T	0.7	2.45	0.36 L	0.22 L	--	0.16T	0.51 L	75.2	31.8
25-Jun-98	0.21	0.55T	2.05	0.36 L	0.22 L	--	0.13T	0.51 L	53.7	20.7
9-Jul-98	0.16 L	0.64	3.43	0.36 L	0.22 L	--	0.21T	0.51 L	85.4	41.5
23-Jul-98	0.16 L	0.63	3.05	0.07T	0.22 L	--	0.24	0.51 L	70.6	28.6
7-Aug-98	0.16 L	0.67	3.23	0.36 L	0.22 L	--	0.14T	0.51 L	74.6	20.6
20-Aug-98	0.16 L	0.66	2.75	0.36 L	0.22 L	--	0.11T	0.51 L	76.6	22.4
3-Sep-98	--	--	--	--	--	--	--	--	--	--
17-Sep-98	0.13T	0.81	5.8	0.12T	0.22 L	--	0.31	0.51 L	76.1	20.4
15-Oct-98	0.11T	0.47T	2.18	0.04T	0.22 L	--	2.05	0.51 L	38.8	13.8
29-Oct-98	0.11T	0.86	3.69	0.07T	0.22 L	--	0.32	0.01T	70.1	25.6
5-Nov-98	0.19	0.67	2.48	0.04T	0.05T	--	0.23 L	0.51 L	62	23.3
26-Nov-98	0.28	0.99	3.69	0.13T	0.22 L	--	0.44	0.02T	47	16.2
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	0.17	0.41T	1.4	0.03T	0.03T	--	0.23 L	0.51 L	40.4	15.2
23-Dec-98	0.21	0.66	2.07	0.15T	0.22 L	--	0.23 L	0.02T	67	24.7
7-Jan-99	0.56	2.83	8.34	0.47	0.41	--	2	0.08T	90.3	26.7
21-Jan-99	0.09T	0.24T	0.96	0.04T	0.22 L	--	0.07T	0.51 L	37	11.1
4-Feb-99	0.23	0.54T	2.09	0.15T	0.15T	--	0.23 L	0.02T	36	14.4
10-Feb-99	0.23	0.61	2.57	0.1T	0.1T	--	0.23 L	0.51 L	58.5	20.1
18-Feb-99	0.23	0.55T	2.25	0.07T	0.07T	--	0.23 L	0.51 L	46.9	15.7
25-Feb-99	0.14T	0.3T	0.88	0.02T	0.02T	--	0.23 L	0.51 L	30	10.9
4-Mar-99	0.34	0.92	4.48	0.14T	0.12T	--	0.23 L	0.51 L	57.1	22.4
11-Mar-99	0.29	0.67	2.03	0.06T	0.05T	--	0.23 L	0.51 L	61.8	22
18-Mar-99	0.22	0.79	3.04	0.08T	0.07T	--	0.23 L	0.51 L	61.3	21

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	BENZO(B AND/ OR K)FLUORAN THENE	CHRYSENE AND /OR TRIPHENY LENE	1,3-DICHLORO BENZENE SEDIMENT	1,4-DICHLORO BENZENE SEDIMENT	1,2-DICHLORO BENZENE SEDIMENT	1,3,5-TRI- CHLOROBENZE- NE SEDIMENT	1,2,4-TRI- CHLOROBENZE- NE SEDIMENT	1,2,3-TRI- CHLOROBENZE- NE SEDIMENT	1,2,3,4-TET- RACHLOROBEN- ZENE SEDIM.	PENTACHLORO- BENZENE SEDIMENT
	2672	2670	96829	96830	96831	96832	96833	96834	96835	96836
	NG/L	NG/L	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G
Detection Limit	**0.26**	**0.29**	**11.3**	**10.4**	**11.4**	**1.2**	**2.5**	**1.3**	**3.0**	**2.7**
3-Apr-97	0.09T	0.25T	11.3 L	10.8	11.4 L	1.3	4.6	0.7T	3.8	6.9
24-Apr-97	0.11T	0.27T	11.3 L	10.4 L	11.4 L	1.2 L	4.8	0.7T	4.5	5.7
1-May-97	0.13T	0.34	11.3 L	8.3T	11.4 L	1.2 L	4	0.8T	4	7.2
15-May-97	0.1T	0.34	11.3 L	11.5	11.4 L	0.9T	4.7	1T	5.3	5.7
29-May-97	0.07T	0.27T	11.3 L	9.3T	11.4 L	1.2 L	4.1	0.9T	6.6	6
12-Jun-97	0.07T	0.24T	11.3 L	9.6T	11.4 L	1.2 L	4.7	1.3	15.5	11.1
26-Jun-97	0.05T	0.24T	11.3 L	13	11.4 L	1.2 L	6.1	1.3	7.8	7
10-Jul-97	0.25T	0.43	11.3 L	20.8	11.4 L	1.2 L	2.5 L	1.3 L	0.1T	0.5T
24-Jul-97	0.26 L	0.27T	18.8	43.6	11.4 L	7.8	19.8	4.6	21.3	27.2
7-Aug-97	0.13T	0.27T	13.8	27.7	11.4 L	2.4	7.7	1.4	8.1	6.9
21-Aug-97	0.16T	0.28T	15	31.7	11.4 L	4.6	28.9	6.2	36.5	18
4-Sep-97	0.26 L	0.07T	14.9	33.4	11.4 L	2.6	7.8	1.4	5.9	5.2
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	1.04	0.66	10.5T	16.1	11.4 L	0.8T	3.3	0.6T	1.9T	2T
16-Oct-97	0.33	0.38	11T	20.1	11.4 L	1.2	5.5	0.9T	3.8	4
30-Oct-97	0.92	0.75	11.3 L	11.3	11.4 L	0.3T	1.7T	0.3T	2.2T	2.3T
13-Nov-97	--	--	11.3	11.9	11.4 L	1T	4.2	0.7T	13.7	8.5
14-Nov-97	0.42	0.29 L	--	--	--	--	--	--	--	--
27-Nov-97	0.75	0.56	3T	9.1T	11.4 L	0.5T	2.3T	0.4T	1.4T	1.6T
11-Dec-97	0.33	0.18T	13.2	13.7	11.4 L	0.8T	4.9	1T	2.4T	3.7
24-Dec-97	--	--	9.4T	18.8	11.4 L	1.4	4.7	1.3 L	4.7	8.5
8-Jan-98	0.26 L	0.29 L	5T	11.9	5T	1.5	8.7	2.4	7.6	7.6
22-Jan-98	0.52	0.41	11.3 L	6.4T	4.3T	0.4T	2.9	0.5T	2.8T	3.6
5-Feb-98	0.34	0.3	11.3 L	7.7T	7.4T	0.6T	3.7	0.7T	2.8T	3.4
19-Feb-98	--	--	7T	7.7T	11T	0.3T	2.3T	0.5T	1.7T	2T
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	--	--	5.9T	5.5T	7.4T	0.4T	2.3T	0.4T	2.5T	2.8
13-Mar-98	0.61	0.48	2.6T	10.5	3.1T	0.3T	2.3T	0.6T	1.7T	2.1T
19-Mar-98	--	--	3.2T	8.2T	1.7T	1.2 L	3.5	0.4T	3.2	1.9T
2-Apr-98	0.39	0.33	2.2T	8T	1.9T	0.6T	4	0.7T	4.5	4.6
16-Apr-98	0.24T	0.24T	1.4T	7.1T	8T	0.5T	7.7	2.6	8.7	5.2
30-Apr-98	0.17T	0.18T	11.3 L	5.2T	1.4T	0.5T	3.4	1T	9	5.8
14-May-98	0.25T	0.25T	1.7T	6.9T	2T	0.7T	5.2	1.5	4.7	4.8
28-May-98	0.14T	0.17T	4.6T	7.2T	2T	0.9T	4.2	0.8T	3.8	4.2
11-Jun-98	0.17T	0.18T	3.1T	8T	2.3T	1T	4.2	0.7T	4.2	3.7
25-Jun-98	0.11T	0.13T	5.7T	9.7T	2.9T	1.3	4.6	0.9T	3.9	3.9
9-Jul-98	0.21T	0.39	4T	5.3T	2.6T	1T	4.3	1T	7.6	8.4
23-Jul-98	0.15T	0.22T	1.6T	10.4 L	1.8T	0.8T	2.5	0.5T	2.6T	3.2
7-Aug-98	0.13T	0.21T	3T	10.4 L	2.2T	0.9T	3.7	1.1T	4	3.2
20-Aug-98	0.12T	0.24T	1.5T	5.7T	11.4 L	1T	3.1	0.9T	3.7	3.9
3-Sep-98	--	--	7T	10T	4T	3.6	11.8	2.7	11.5	8.9
17-Sep-98	0.29	0.46	--	--	--	--	--	--	--	--
15-Oct-98	0.13T	0.16T	11.3 L	10.4 L	11.4 L	1.2 L	0.2T	1.3 L	3.0 L	0.1T
29-Oct-98	0.25T	0.35	--	--	--	--	--	--	--	--
5-Nov-98	0.15T	0.23T	12	10.4 L	5.1T	1.7	7.7	1.3 L	54.7	103
26-Nov-98	0.37	0.34	11.3 L	4.6T	1T	0.3T	1.8T	0.2T	0.6T	0.6T
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	0.09T	0.12T	1.4T	4.8T	1.1T	0.5T	2.5	0.4T	3.0 L	2.7 L
23-Dec-98	0.44	0.37	0.9T	2.8T	1.3T	0.3T	2.4T	0.4T	2.7T	2.7
7-Jan-99	1.27	1.01	2.5T	9.4T	3.8T	0.5T	2.4T	0.3T	0.4T	0.7T
21-Jan-99	0.12T	0.1T	0.5T	1.3T	0.3T	0.3T	1.8T	0.2T	2.3T	2.3T
4-Feb-99	0.42	0.37	1.3T	1.7T	1T	0.5T	5	0.6T	2.6T	2T
10-Feb-99	0.29	0.29	--	--	--	--	--	--	--	--
18-Feb-99	0.21T	0.2T	1.2T	1.3T	0.5T	0.5T	3.1	0.4T	2.5T	2T
25-Feb-99	0.07T	0.07T	--	--	--	--	--	--	--	--
4-Mar-99	0.56	0.61	2.8T	3.9T	1.3T	0.6T	3.9	0.6T	2.8T	2.6T
11-Mar-99	0.19T	0.21T	--	--	--	--	--	--	--	--
18-Mar-99	0.26 L	0.28T	0.5T	1.1T	0.3T	0.2T	1.9T	0.2T	1T	0.9T

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	ENDRIN ALDEHYDE IN SEDIMENT	HXCCYCLO PENTADIENE IN SEDIMENT	PHOTO-MIREX IN SEDIMENT	HEXACHLORO-BUTADIENE IN SEDIMENT	OCTACHLORO-STYRENE IN SEDIMENT	HEXACHLORO-BENZENE IN SEDIMENT	ALPHA-BENZEN EHEXACHLORO IN SEDIMENT	GAMA-BENZENE HEXACHLORO IN SEDIMENT	HEPTACHLOR IN SEDIMENT	ALDRIN IN SEDIMENT
	287	288	289	96800	96801	96810	96811	96812	96813	96814
	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G
Detection Limit	**4.2**	**1.8**	**4.1**	**1.5**	**2.7**	**3.5**	**2.3**	**3.5**	**4.3**	**2.1**
3-Apr-97	4.2 L	1.8 L	4.1 L	3.8	2.7 L	16	0.5T	3.5 L	4.3 L	2.1 L
24-Apr-97	4.2 L	1.8 L	4.1 L	1.9	2.7 L	7.9	2.3 L	3.5 L	4.3 L	2.1 L
1-May-97	4.2 L	1.8 L	4.1 L	2.5	2.7 L	78	2.3 L	3.5 L	4.3 L	2.1 L
15-May-97	4.2 L	0.6T	4.1 L	3.8	2.7 L	30.8	0.6T	3.5 L	4.3 L	2.1 L
29-May-97	4.2 L	1.8 L	4.1 L	2.3	2.7 L	7.5	0.9T	3.5 L	4.3 L	2.1 L
12-Jun-97	4.2 L	1.8 L	4.1 L	5.8	2.7 L	8.3	3.6	3.5 L	4.3 L	2.1 L
26-Jun-97	4.2 L	1.8 L	4.1 L	3.3	2.7 L	13.1	1.7T	3.5 L	4.3 L	2.1 L
10-Jul-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.7T	0.3T	3.5 L	4.3 L	2.1 L
24-Jul-97	4.2 L	1.8 L	4.1 L	6.7	1T	22.1	0.8T	3.5 L	4.3 L	2.1 L
7-Aug-97	4.2 L	3.4	4.1 L	4.5	1.8T	18.4	0.3T	3.5 L	4.3 L	2.1 L
21-Aug-97	4.2 L	1.8 L	4.1 L	11.7	2.7	28	2.4T	1.5T	4.3 L	2.1 L
4-Sep-97	4.2 L	1.8 L	4.1 L	5.3	1.7T	8.9	2.2T	3.5 L	4.3 L	2.1 L
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	4.2 L	1.8 L	4.1 L	0.6T	2.7 L	3.4T	0.6T	3.5 L	4.3 L	2.1 L
16-Oct-97	4.2 L	1.8 L	4.1 L	2.1	0.8T	7.3	0.8T	3.5 L	4.3 L	2.1 L
30-Oct-97	4.2 L	1.8 L	4.1 L	0.6T	2.7 L	1.7T	0.3T	3.5 L	4.3 L	2.1 L
13-Nov-97	4.2 L	1.8 L	4.1 L	1.4	2.7 L	11.4	1.5T	3.5 L	4.3 L	2.1 L
14-Nov-97	--	--	--	--	--	--	--	--	--	--
27-Nov-97	4.2 L	1.8 L	4.1 L	0.3T	2.7 L	1.7T	0.7T	0.8T	4.3 L	2.1 L
11-Dec-97	4.2 L	1.8 L	4.1 L	0.7T	0.4T	3.6	9.7	3.5 L	4.3 L	2.1 L
24-Dec-97	4.2 L	1.8 L	4.1 L	57.9	3.9	67	5.5	3.5 L	4.3 L	2.1 L
8-Jan-98	4.2 L	0.5T	4.1 L	6.8	1.6T	12.2	16.3	0.9T	4.3 L	2.1 L
22-Jan-98	4.2 L	1.8 L	4.1 L	0.4T	2.7 L	2.9T	1T	0.4T	4.3 L	2.1 L
5-Feb-98	4.2 L	1.8 L	4.1 L	0.5T	2.7 L	2.8T	28.3	0.7T	4.3 L	2.1 L
19-Feb-98	4.2 L	1.8 L	4.1 L	0.8T	2.7 L	6.6	3	0.6T	4.3 L	2.1 L
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	4.2 L	1.8 L	4.1 L	0.7T	2.7 L	2.4T	0.6T	0.7T	4.3 L	2.1 L
13-Mar-98	4.2 L	1.8 L	4.1 L	0.4T	2.7 L	2.1T	2.1T	0.3T	4.3 L	2.1 L
19-Mar-98	4.2 L	1.8 L	4.1 L	2.1	2.7 L	2.6T	1.5T	0.4T	4.3 L	2.1 L
2-Apr-98	4.2 L	1.8 L	4.1 L	1.4T	2.7 L	13.2	3.8	3.5 L	4.3 L	2.1 L
16-Apr-98	4.2 L	0.4T	4.1 L	1.3T	2.7 L	4.1	1T	0.2T	4.3 L	2.1 L
30-Apr-98	4.2 L	1.8 L	4.1 L	1.6	0.4T	5.6	1.1T	0.7T	4.3 L	2.1 L
14-May-98	4.2 L	1.8 L	4.1 L	1.3T	0.3T	30.8	1.4T	0.7T	4.3 L	2.1 L
28-May-98	4.2 L	1.8 L	4.1 L	1.1T	0.2T	5.2	0.5T	0.5T	4.3 L	2.1 L
11-Jun-98	4.2 L	1.8 L	4.1 L	17.9	0.2T	5.7	0.6T	0.2T	4.3 L	2.1 L
25-Jun-98	4.2 L	1.8 L	4.1 L	1.4T	0.4T	5.4	0.3T	0.2T	4.3 L	2.1 L
9-Jul-98	4.2 L	0.9T	4.1 L	2.6	1.6T	16.1	2.1T	0.3T	4.3 L	2.1 L
23-Jul-98	4.2 L	0.8T	4.1 L	1.4T	0.5T	7.3	0.6T	0.1T	4.3 L	2.1 L
7-Aug-98	4.2 L	1.8 L	4.1 L	5.6	0.4T	6.9	0.8T	0.2T	4.3 L	2.1 L
20-Aug-98	4.2 L	1.8 L	4.1 L	1.4T	1.1T	5.6	1.1T	0.2T	4.3 L	2.1 L
3-Sep-98	4.2 L	--	4.1 L	34.3	1.4T	15.5	1.1T	3.5 L	4.3 L	2.1 L
17-Sep-98	--	--	--	--	--	--	--	--	--	--
15-Oct-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.2T	2.3 L	0.1T	4.3 L	2.1 L
29-Oct-98	--	--	--	--	--	--	--	--	--	--
5-Nov-98	4.2 L	1.8 L	4.1 L	16.6	4.7	163	2.3 L	3.5 L	4.3 L	2.1 L
26-Nov-98	4.2 L	1.8 L	4.1 L	0.1T	2.7 L	1.7T	0.2T	3.5 L	4.3 L	2.1 L
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	4.2 L	0.2T	4.1 L	0.5T	2.7 L	2.5T	0.2T	0.1T	4.3 L	2.1 L
23-Dec-98	4.2 L	1.8 L	4.1 L	0.6T	0.1T	1.4T	1.6T	0.1T	4.3 L	2.1 L
7-Jan-99	4.2 L	0.3T	4.1 L	0.1T	2.7 L	1T	0.3T	3.5 L	4.3 L	2.1 L
21-Jan-99	4.2 L	1.8 L	4.1 L	0.2T	0.2T	4.2	0.1T	3.5 L	4.3 L	2.1 L
4-Feb-99	4.2 L	1.8 L	4.1 L	0.3T	2.7 L	1.2T	0.2T	3.5 L	4.3 L	2.1 L
10-Feb-99	--	--	--	--	--	--	--	--	--	--
18-Feb-99	4.2 L	1.8 L	4.1 L	0.4T	2.7 L	1.5T	0.1T	0.1T	4.3 L	2.1 L
25-Feb-99	--	--	--	--	--	--	--	--	--	--
4-Mar-99	0.1T	1.8 L	4.1 L	0.6T	0.5T	2.9T	1T	0.1T	4.3 L	2.1 L
11-Mar-99	--	--	--	--	--	--	--	--	--	--
18-Mar-99	4.2 L	1.8 L	4.1 L	0.2T	0.1T	0.9T	0.7T	3.5 L	4.3 L	2.1 L

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	HEPTACHLOR-EPOXIDE SEDIMENT 96815 NG/G	GAMA-CHLORDANE SEDIMENT 96816 NG/G	ALPHA-CHLORDANE SEDIMENT 96817 NG/G	ALPHA-ENDOSULFAN SEDIMENT 96818 NG/G	PP-DDE SEDIMENT 96819 NG/G	DIELDRIN SEDIMENT 96820 NG/G	ENDRIN SEDIMENT 96821 NG/G	OP-DDT SEDIMENT 96822 NG/G	PP-DDD SEDIMENT 96823 NG/G	PP-DDT SEDIMENT 96824 NG/G
Detection Limit	**3.2**	**2.8**	**2.9**	**3.1**	**6.4**	**6.8**	**7.3**	**9.4**	**16.7**	**9.3**
3-Apr-97	3.2 L	2.8 L	1.7T	3.1 L	3.6T	6.8 L	7.3 L	9.4 L	3.2T	9.3 L
24-Apr-97	3.2 L	3.2	4	3.1 L	7.2	6.8 L	7.3 L	9.4 L	9T	9.3 L
1-May-97	3.2 L	2T	8.8	3.1 L	6.6	6.8 L	7.3 L	9.4 L	4.5T	9.3 L
15-May-97	3.2 L	5.1	4.8	10	6T	1T	7.3 L	9.4 L	4.4T	9.3 L
29-May-97	3.2 L	4.8	2.9 L	1.9T	8.1	6.8 L	7.3 L	9.4 L	16.7 L	9.3 L
12-Jun-97	3.2 L	--	2.9 L	3.1 L	8.8	6.8 L	7.3 L	9.4 L	9.4T	45.2
26-Jun-97	3.2 L	0.5T	2.9 L	3.1 L	10.9	6.8 L	7.3 L	9.4 L	4.8T	9.3 L
10-Jul-97	3.2 L	2.8 L	2.9 L	3.1 L	30.3	6.8 L	7.3 L	2.8T	1.1T	22.1
24-Jul-97	1.1T	2.8 L	2.9 L	1.8T	5.9T	0.9T	7.3 L	1.8T	2.8T	2T
7-Aug-97	0.7T	2.8 L	2.9 L	1.1T	4.9T	1.1T	7.3 L	9.4 L	2.6T	1.6T
21-Aug-97	3.2 L	2.8 L	2.9 L	2.4T	5.9T	1.2T	7.3 L	1.1T	2.6T	3.2T
4-Sep-97	3.2 L	2.8 L	2.9 L	3.1 L	4.8T	1.1T	7.3 L	1.9T	2.7T	3.6T
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	3.2 L	2.8 L	2.9 L	1.2T	5.4T	1.2T	7.3 L	0.4T	3.1T	2.8T
16-Oct-97	3.2 L	2.8 L	2.9 L	2T	4.5T	1.3T	7.3 L	9.4 L	3.3T	2.7T
30-Oct-97	3.2 L	2.8 L	2.9 L	0.6T	4T	1.3T	7.3 L	0.3T	2.6T	2.1T
13-Nov-97	3.2 L	2.8 L	2.9 L	3.1 L	3.9T	1.4T	7.3 L	9.4 L	2.6T	9.3 L
14-Nov-97	--	--	--	--	--	--	--	--	--	--
27-Nov-97	3.2 L	2.8 L	2.9 L	3.1 L	4.7T	1.2T	7.3 L	0.2T	3.3T	1.5T
11-Dec-97	3.2 L	2.8 L	2.9 L	3.1 L	18.2	1.8T	7.3 L	0.7T	3.5T	2.7T
24-Dec-97	3.2 L	2.8 L	2.9 L	3.1 L	4.7T	2.2T	7.3 L	9.4 L	4.3T	3.4T
8-Jan-98	3.2 L	2.5T	4.3	2.8T	28.1	2T	7.3 L	3.4T	4.1T	25.2
22-Jan-98	3.2 L	2.8 L	1.9T	3.1 L	3.9T	1.1T	7.3 L	9.4 L	3T	9.3 L
5-Feb-98	3.2 L	0.5T	2.2T	3.1 L	5.1T	1.7T	7.3 L	9.4 L	2.9T	2.7T
19-Feb-98	3.2 L	0.9T	2T	1.2T	13	1.2T	7.3 L	2.3T	2.5T	13.3
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	3.2 L	2.8 L	1.7T	3.1 L	3.8T	1.4T	7.3 L	9.4 L	1.7T	5T
13-Mar-98	3.2 L	2.8 L	1.5T	3.1 L	5.3T	1.3T	7.3 L	0.9T	2.2T	6.2T
19-Mar-98	3.2 L	0.5T	1.4T	3.1 L	6.5	1.4T	7.3 L	9.4 L	2.7T	5.4T
2-Apr-98	3.2 L	2.8 L	1.2T	1T	3.8T	1.2T	7.3 L	9.4 L	2.4T	1.4T
16-Apr-98	3.2 L	2.8 L	1T	3.1 L	2.7T	1.1T	7.3 L	9.4 L	1.3T	1.5T
30-Apr-98	3.2 L	2.8 L	1.1T	0.9T	3.2T	1.3T	7.3 L	9.4 L	1.8T	1.9T
14-May-98	0.2T	2.8 L	1.8T	1.6T	4.4T	2.1T	7.3 L	9.4 L	2.4T	2.6T
28-May-98	3.2 L	2.8 L	2.9 L	0.6T	3.9T	1.4T	7.3 L	9.4 L	2.2T	1.3T
11-Jun-98	3.2 L	2.8 L	1.1T	0.2T	3.7T	1.1T	7.3 L	9.4 L	1.9T	1.9T
25-Jun-98	3.2 L	2.8 L	2.9 L	3.1 L	4.7T	1T	7.3 L	9.4 L	2T	1.2T
9-Jul-98	3.2 L	0.1T	2.9 L	1.5T	8.6	1.3T	7.3 L	1.8T	3T	8T
23-Jul-98	0.2T	0.1T	0.5T	0.6T	3.1T	1T	7.3 L	0.3T	2T	1.7T
7-Aug-98	3.2 L	0.1T	2.9 L	3.1 L	3.1T	1T	7.3 L	9.4 L	2.2T	2T
20-Aug-98	3.2 L	0.2T	2.9 L	0.7T	3.5T	0.9T	7.3 L	9.4 L	2.3T	2.3T
3-Sep-98	3.2 L	0.4T	2.9 L	1.9T	3.3T	0.7T	7.3 L	0.4T	2.6T	3.4T
17-Sep-98	--	--	--	--	--	--	--	--	--	--
15-Oct-98	3.2 L	0.6T	2.9 L	3.1 L	24.4	1.4T	7.3 L	0.6T	16.6T	5T
29-Oct-98	--	--	--	--	--	--	--	--	--	--
5-Nov-98	3.2 L	0.6T	2.9 L	3.1 L	3.8T	0.1T	7.3 L	9.4 L	2.2T	1.9T
26-Nov-98	0.1T	0.3T	0.2T	3.1 L	2.5T	0.2T	7.3 L	9.4 L	1.3T	1.2T
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	0.3T	0.2T	0.4T	3.1 L	6.4 L	0.5T	7.3 L	9.4 L	1.6T	9.3 L
23-Dec-98	3.2 L	0.5T	2T	3.1 L	3.2T	0.8T	0.5T	9.4 L	1.9T	1.4T
7-Jan-99	3.2 L	2.8 L	0.1T	3.1 L	2.7T	0.9T	7.3 L	9.4 L	2.3T	1.2T
21-Jan-99	3.2 L	0.2T	0.6T	3.1 L	1.9T	0.4T	0.7T	9.4 L	1.4T	9.3 L
4-Feb-99	3.2 L	0.6T	1.9T	3.1 L	2.5T	0.4T	0.9T	0.3T	1.2T	2.5T
10-Feb-99	--	--	--	--	--	--	--	--	--	--
18-Feb-99	3.2 L	0.5T	0.6T	3.1 L	2.4T	0.4T	0.8T	0.2T	1.5T	1.9T
25-Feb-99	--	--	--	--	--	--	--	--	--	--
4-Mar-99	3.2 L	1T	1.5T	3.1 L	4.7T	0.9T	0.3T	0.3T	2.4T	4.9T
11-Mar-99	--	--	--	--	--	--	--	--	--	--
18-Mar-99	3.2 L	0.4T	0.6T	3.1 L	2T	0.4T	0.3T	9.4 L	1.4T	1.6T

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	BETA-ENDOSULFAN SEDIMENT	MIREX SEDIMENT	METHOXYCHLOR SEDIMENT	POLYCHLORINATED BIPHENYL SEDIMENT	TOTAL POLYCHLORINATED BIPHENYL-CONGE	FLUOR-ANTHENE	PYRENE	BENZ(A) ANTHRACENE	BENZO(A) PYRENE	NAPHTHALENE IN SEDIMENT
	96825	96826	96827	96828	103389	96510	96511	96512	96518	290
	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G
Detectiom Limit	**5.9**	**4.4**	**48.0**	**89.0**	**60.3**	**90.0**	**168**	**137**	**161**	**82**
3-Apr-97	5.9 L	1.1T	48.0 L	53.5T	--	457	328	151	192	38T
24-Apr-97	5.9 L	4.4 L	48.0 L	39.2T	--	372	286	122T	141T	30T
1-May-97	5.9 L	3.8T	48.0 L	58T	--	435	314	170	197	42T
15-May-97	6.4	4.4 L	48.0 L	38.2T	--	505	376	195	223	35T
29-May-97	2.9T	1.2T	48.0 L	61.3T	--	511	402	191	218	33T
12-Jun-97	5.9 L	1.5T	48.0 L	65.4T	--	610	474	241	255	32T
26-Jun-97	5.9 L	2.6T	48.0 L	63.3T	--	576	455	245	303	26T
10-Jul-97	5.9 L	4.4 L	15.6T	55.5T	--	3650	2460	--	--	91
24-Jul-97	5.9 L	2T	48.0 L	71.4T	--	699	509	366	398	53T
7-Aug-97	5.9 L	3.1T	48.0 L	76.9T	--	585	449	313	376	43T
21-Aug-97	5.9 L	7.1	48.0 L	111	--	673	519	359	405	46T
4-Sep-97	5.9 L	2.4T	48.0 L	79.9T	--	610	455	291	352	47T
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	0.3T	0.4T	48.0 L	78.8T	--	405	334	216	194	33T
16-Oct-97	5.9 L	1.9T	48.0 L	94	--	447	388	242	220	37T
30-Oct-97	0.4T	0.4T	48.0 L	89.0 L	--	392	328	183	180	22T
13-Nov-97	0.8T	0.5T	48.0 L	46T	--	590	504	327	283	46T
14-Nov-97	--	--	--	--	--	--	--	--	--	--
27-Nov-97	1.3T	0.1T	48.0 L	44T	--	543	464	234	274	34T
11-Dec-97	0.9T	0.4T	48.0 L	52T	--	479	436	230	266	47T
24-Dec-97	5.9 L	1.6T	48.0 L	89.0 L	--	597	493	272	343	49T
8-Jan-98	3.3T	2.9T	48.0 L	130	--	1670	1320	621	896	45T
22-Jan-98	5.9 L	4.4 L	48.0 L	64.3T	--	511	417	192	253	40T
5-Feb-98	5.9 L	0.4T	48.0 L	75.5T	--	725	556	247	310	40T
19-Feb-98	1.9T	2.2T	48.0 L	91.5	--	1810	1350	592	776	35T
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	0.4T	0.5T	48.0 L	61.5T	--	707	553	320	323	63T
13-Mar-98	0.4T	0.4T	48.0 L	46.6T	--	429	343	166	199	21T
19-Mar-98	0.5T	5.2	48.0 L	72T	--	654	502	236	287	30T
2-Apr-98	5.9 L	4.7	48.0 L	--	114	672	537	262	322	31T
16-Apr-98	5.9 L	0.7T	48.0 L	--	110	303	268	135T	160T	14T
30-Apr-98	5.9 L	1T	48.0 L	--	134	485	421	255	246	18T
14-May-98	1.1T	0.9T	48.0 L	--	122	620	581	276	330	82. L
28-May-98	5.9 L	0.8T	48.0 L	--	127	404	341	206	257	20T
11-Jun-98	5.9 L	1.1T	48.0 L	--	104	400	340	197	240	20T
25-Jun-98	5.9 L	1.6T	48.0 L	--	128	404	321	208	251	18T
9-Jul-98	1T	2.9T	48.0 L	--	152	907	751	438	586	39T
23-Jul-98	5.9 L	1.3T	48.0 L	--	79.3	415	345	199	271	21T
7-Aug-98	5.9 L	1.2T	48.0 L	--	91.6	409	353	206	269	36T
20-Aug-98	5.9 L	5.8	48.0 L	--	95.7	804	677	403	443	37T
3-Sep-98	5.9 L	62.4	48.0 L	--	108	1310	914	650	528	129
17-Sep-98	--	--	--	--	--	--	--	--	--	--
15-Oct-98	5.9 L	4.4 L	48.0 L	--	38.6T	390	303	122T	249	82. L
29-Oct-98	--	--	--	--	--	--	--	--	--	--
5-Nov-98	5.9 L	6.5	48.0 L	--	95.2	636	494	312	282	194
26-Nov-98	5.9 L	0.1T	48.0 L	--	39T	401	302	115T	245	28T
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	5.9 L	4.4 L	48.0 L	--	61.1	459	368	200	370	64T
23-Dec-98	5.9 L	0.6T	48.0 L	--	59.3T	351	302	153	183	25T
7-Jan-99	5.9 L	0.4T	48.0 L	--	61.9	341	265	155	175	27T
21-Jan-99	0.2T	0.1T	48.0 L	--	43.6T	260	205	89T	106T	19T
4-Feb-99	0.5T	0.4T	48.0 L	--	49.5T	582	419	187	233	40T
10-Feb-99	--	--	--	--	--	--	--	--	--	--
18-Feb-99	0.3T	0.2T	48.0 L	--	48.3T	389	285	138	145T	22T
25-Feb-99	--	--	--	--	--	--	--	--	--	--
4-Mar-99	0.7T	1.2T	48.0 L	--	106	1600	1140	573	681	50T
11-Mar-99	--	--	--	--	--	--	--	--	--	--
18-Mar-99	0.3T	4.4 L	48.0 L	--	35.4T	250	183	91T	106T	15T

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	2-METHYL NAPHTHALENE IN SEDIMENT	1-METHYL NAPHTHALENE IN SEDIMENT	B-CHLORO NAPHTHALENE IN SEDIMENT	ACE NAPHTHYLENE IN SEDIMENT	FLUORENE IN SEDIMENT	PHENANTHRENE IN SEDIMENT	ANTHRACENE IN SEDIMENT	INDENO(123-CD)PYRENE IN SEDIMENT	DIBENZO(AH) ANTHRACEN IN SEDIMENT	BENZO(GHI) PERLENE IN SEDIMENT
	291	292	293	294	295	296	297	298	299	300
	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G
Detection Limit	**281**	**80**	**378**	**89**	**160**	**193**	**169**	**161**	**148**	**149**
3-Apr-97	17T	10T	378. L	21T	24T	206	48T	156T	32T	143T
24-Apr-97	22T	16T	378. L	16T	28T	229	42T	122T	26T	119T
1-May-97	21T	14T	378. L	16T	28T	215	56T	145T	32T	133T
15-May-97	24T	16T	378. L	28T	35T	279	64T	178	34T	166
29-May-97	19T	14T	378. L	22T	28T	267	66T	178	29T	163
12-Jun-97	20T	15T	378. L	24T	33T	253	62T	185	37T	174
26-Jun-97	17T	12T	378. L	28T	25T	255	60T	233	44T	230
10-Jul-97	92T	62T	378. L	29T	161	2640	269	--	--	1600
24-Jul-97	28T	20T	378. L	32T	41T	400	92T	317	71T	281
7-Aug-97	20T	13T	378. L	33T	25T	310	68T	275	55T	243
21-Aug-97	26T	17T	378. L	31T	36T	372	83T	318	63T	283
4-Sep-97	23T	15T	378. L	31T	29T	319	61T	269	50T	223
18-Sep-97	--	--	--	--	--	--	--	--	--	--
2-Oct-97	20T	13T	378. L	13T	19T	195T	36T	221	148. L	180
16-Oct-97	22T	15T	378. L	15T	20T	240	48T	255	37T	201
30-Oct-97	16T	11T	378. L	15T	13T	166T	44T	182	27T	158
13-Nov-97	31T	19T	378. L	26T	34T	326	68T	275	50T	219
14-Nov-97	--	--	--	--	--	--	--	--	--	--
27-Nov-97	23T	15T	378. L	15T	23T	272	40T	335	47T	249
11-Dec-97	27T	18T	378. L	89. L	29T	283	49T	282	44T	215
24-Dec-97	29T	19T	378. L	23T	30T	313	51T	422	71T	314
8-Jan-98	34T	21T	378. L	16T	56T	814	105T	1030	205	843
22-Jan-98	22T	15T	378. L	14T	23T	226	50T	234	148. L	198
5-Feb-98	31T	20T	378. L	16T	36T	386	56T	286	148. L	229
19-Feb-98	29T	16T	378. L	25T	53T	859	124T	825	154	652
2-Mar-98	--	--	--	--	--	--	--	--	--	--
5-Mar-98	32T	21T	378. L	14T	50T	438	96T	231	148. L	191
13-Mar-98	16T	11T	378. L	12T	19T	219	35T	174	148. L	151
19-Mar-98	27T	18T	378. L	15T	29T	334	49T	276	148. L	227
2-Apr-98	18T	12T	378. L	21T	28T	297	46T	343	148. L	289
16-Apr-98	9T	7T	378. L	89. L	15T	138T	26T	167	148. L	143T
30-Apr-98	11T	10T	378. L	17T	26T	249	54T	218	148. L	186
14-May-98	281. L	80. L	378. L	89. L	22T	247	36T	318	148. L	149. L
28-May-98	13T	11T	378. L	15T	19T	194	34T	233	148. L	149. L
11-Jun-98	16T	11T	378. L	19T	18T	182T	34T	221	148. L	149. L
25-Jun-98	11T	80. L	378. L	19T	17T	179T	38T	228	58T	149. L
9-Jul-98	23T	17T	378. L	49T	51T	437	105T	571	142T	467
23-Jul-98	281. L	80. L	378. L	33T	20T	183T	50T	241	51T	149. L
7-Aug-98	14T	17T	378. L	42T	25T	189T	75T	267	57T	149. L
20-Aug-98	24T	80. L	378. L	47T	52T	385	141T	364	75T	149. L
3-Sep-98	264T	180	378. L	--	--	1560	--	416	112T	325
17-Sep-98	--	--	--	--	--	--	--	--	--	--
15-Oct-98	281. L	80. L	378. L	17T	11T	247	41T	231	47T	149. L
29-Oct-98	--	--	--	--	--	--	--	--	--	--
5-Nov-98	34T	20T	378. L	54T	40T	301	87T	305	51T	263
26-Nov-98	13T	10T	378. L	20T	14T	233	54T	208	148. L	187
9-Dec-98	--	--	--	--	--	--	--	--	--	--
10-Dec-98	16T	14T	378. L	31T	21T	284	70T	289	61T	255
23-Dec-98	10T	8T	378. L	19T	17T	149T	31T	151T	148. L	143T
7-Jan-99	13T	9T	378. L	22T	19T	153T	47T	170	148. L	145T
21-Jan-99	9T	6T	378. L	9T	14T	125T	21T	100T	148. L	92T
4-Feb-99	18T	9T	378. L	15T	22T	250	31T	236	148. L	215
10-Feb-99	--	--	--	--	--	--	--	--	--	--
18-Feb-99	13T	9T	378. L	12T	18T	148T	28T	135T	148. L	123T
25-Feb-99	--	--	--	--	--	--	--	--	--	--
4-Mar-99	28T	18T	378. L	32T	56T	639	97T	770	49T	654
11-Mar-99	--	--	--	--	--	--	--	--	--	--
18-Mar-99	10T	8T	378. L	8T	13T	114T	15T	103T	148. L	88T

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	ATRAZINE IN SEDIMENT	METOLACHLOR IN SEDIMENT	CHRYSENE AND /OR TRIPHENY LENE	BENZO(B AND/ OR K)FLUORAN THENE	ALUMINUM TOTAL - ICP	BARIUM TOTAL - ICP	BERYLLIUM TOTAL - ICP	CADMIUM TOTAL - ICP	COBALT TOTAL - ICP	CHROMIUM TOTAL - ICP
	305	306	2671	2673	100216P	100217P	100218P	100219P	100220P	100221P
	NG/G	NG/G	NG/G	NG/G	MG/L	MG/L	MUG/L	MG/L	MG/L	MG/L
Detection Limit	**856**	**441**	**193**	**191**	**0.002**	**0.0002**	**0.05**	**0.0001**	**0.0001**	**0.0002**
3-Apr-97	856. L	441. L	255	472	0.095	0.0205	0.05 L	0.0001 L	0.0001	0.0003
24-Apr-97	856. L	441. L	208	344	0.377	0.0209	0.05 L	0.0001	0.0004	0.0009
1-May-97	856. L	441. L	247	418	0.11	0.0203	0.05 L	0.0001 L	0.0001	0.0002 L
15-May-97	856. L	441. L	283	498	0.128	0.0198	0.05 L	0.0001 L	0.0001	0.0004
29-May-97	856. L	441. L	291	498	0.373	0.0216	0.05 L	0.0001	0.0003	0.0007
12-Jun-97	856. L	441. L	320	551	0.129	0.0207	0.05 L	0.0001 L	0.0001	0.0003
26-Jun-97	856. L	441. L	362	651	0.118	0.0216	0.05 L	0.0001 L	0.0001	0.0003
10-Jul-97	856. L	441. L	2030	4680	0.378	0.0218	0.05 L	0.0001	0.0003	0.0007
24-Jul-97	856. L	441. L	337	851	0.22	0.0214	0.05 L	0.0001 L	0.0002	0.0005
7-Aug-97	856. L	441. L	298	729	0.033	0.0206	0.05 L	0.0001 L	0.0001 L	0.0002
21-Aug-97	856. L	441. L	385	895	0.237	0.0222	0.05 L	0.0001	0.0003	0.0005
4-Sep-97	856. L	441. L	309	769	0.3	0.0225	0.05 L	0.0001	0.0003	0.0007
18-Sep-97	--	--	--	--	0.306	0.0229	0.05 L	0.0001	0.0003	0.0006
2-Oct-97	856. L	441. L	173T	454	0.17	0.023	0.05 L	0.0001	0.0002	0.0003
16-Oct-97	856. L	441. L	180T	480	0.097	0.0222	0.05 L	0.0001 L	0.0001	0.0002
30-Oct-97	856. L	441. L	172T	407	0.643	0.0242	0.05	0.0001	0.0006	0.001
13-Nov-97	856. L	441. L	263	665	--	--	--	--	--	--
14-Nov-97	--	--	--	--	0.098	0.0213	0.05 L	0.0001 L	0.0002	0.0002
27-Nov-97	856. L	441. L	314	693	0.445	0.0231	0.05 L	0.0001 L	0.0004	0.0008
11-Dec-97	856. L	441. L	298	611	0.132	0.0211	0.05 L	0.0001 L	0.0001	0.0003
24-Dec-97	856. L	441. L	378	860	0.106	0.0212	0.05 L	0.0001 L	0.0001	0.0003
8-Jan-98	856. L	441. L	1100	2270	--	--	--	--	--	--
22-Jan-98	856. L	441. L	310	643	0.056	0.0259	0.05 L	0.0001 L	0.0001	0.0002
5-Feb-98	856. L	441. L	408	824	0.49	0.0225	0.05 L	0.0001	0.0005	0.0008
19-Feb-98	856. L	441. L	897	2140	0.358	0.0218	0.05 L	0.0001 L	0.0002	0.0005
2-Mar-98	--	--	--	--	0.247	0.0218	0.05 L	0.0001	0.0002	0.0004
5-Mar-98	856. L	441. L	389	703	0.146	0.0212	0.05 L	0.0001	0.0002	0.0003
13-Mar-98	856. L	441. L	243	466	--	--	--	--	--	--
19-Mar-98	856. L	441. L	213	753	0.2	0.021	0.05 L	0.0001 L	0.0002	0.0003
2-Apr-98	856. L	441. L	364	884	--	--	--	--	--	--
16-Apr-98	856. L	441. L	170T	392	0.206	0.0213	0.05 L	0.0001	0.0003	0.0006
30-Apr-98	856. L	441. L	257	610	0.065	0.0196	0.05 L	0.0001	0.0002	0.0002
14-May-98	856. L	441. L	336	861	0.167	0.0192	0.05 L	0.0001	0.0003	0.0007
28-May-98	856. L	441. L	246	575	0.16	0.0205	0.05 L	0.0001 L	0.0003	0.0004
11-Jun-98	856. L	441. L	235	560	0.271	0.0216	0.05 L	0.0001 L	0.0003	0.0004
25-Jun-98	856. L	441. L	274	547	0.136	0.0203	0.05 L	0.0001 L	0.0001	0.0003
9-Jul-98	856. L	441. L	592	1230	0.186	0.0219	0.05 L	0.0001 L	0.0001	0.0002 L
23-Jul-98	856. L	441. L	301	634	0.164	0.0221	0.05 L	0.0001 L	0.0003	0.0096
7-Aug-98	856. L	441. L	328	602	0.158	0.0324	0.05 L	0.0001 L	0.0001	0.0002
20-Aug-98	856. L	441. L	506	928	0.134	0.0215	0.05 L	0.0001 L	0.0001	0.0003
3-Sep-98	856. L	441. L	578	1100	0.025	0.0205	0.05 L	0.0001 L	0.0001	0.0002 L
17-Sep-98	--	--	--	--	0.046	0.0354	0.05 L	0.0001	0.0002	0.0024
15-Oct-98	856. L	441. L	177T	467	0.112	0.0196	0.05 L	0.0001 L	0.0001	0.0003
29-Oct-98	--	--	--	--	0.187	0.0207	0.05 L	0.0001 L	0.0001	0.0002
5-Nov-98	856. L	441. L	341	635	0.158	0.0213	0.05 L	0.0001 L	0.0002	0.0003
26-Nov-98	856. L	441. L	199	483	0.436	0.0218	0.05 L	0.0001	0.0004	0.0008
9-Dec-98	--	--	--	--	0.561	0.0243	0.05 L	0.0001	0.0004	0.0009
10-Dec-98	856. L	441. L	312	699	0.076	0.0218	0.05	0.0001 L	0.0001	0.0002
23-Dec-98	856. L	441. L	216	407	1.34	0.0285	0.07	0.0004	0.0012	0.0025
7-Jan-99	856. L	441. L	219	393	1.3	0.0293	0.07	0.0004	0.0011	0.0025
21-Jan-99	856. L	441. L	142T	252	0.23	0.0232	0.05 L	0.0001 L	0.0002	0.0004
4-Feb-99	856. L	441. L	310	609	0.213	0.024	0.05 L	0.0001 L	0.0002	0.0002 L
10-Feb-99	--	--	--	--	--	--	--	--	--	--
18-Feb-99	856. L	441. L	212	359	0.142	0.0223	0.05 L	0.0001 L	0.0001	0.0003
25-Feb-99	--	--	--	--	--	--	--	--	--	--
4-Mar-99	856. L	441. L	901	1990	0.102	0.0213	0.05 L	0.0001 L	0.0002	0.0002
11-Mar-99	--	--	--	--	--	--	--	--	--	--
18-Mar-99	856. L	441. L	140T	272	0.106	0.022	0.05 L	0.0001 L	0.0001	0.0003

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	COPPER TOTAL - ICP 100222P MG/L	IRON TOTAL - ICP 100223P MG/L	LITHIUM TOTAL - ICP 100224P MG/L	MANGANESE TOTAL - ICP 100225P MG/L	MOLYBDENUM TOTAL - ICP 100226P MG/L	NICKEL TOTAL - ICP 100227P MG/L	LEAD TOTAL - ICP 100228P MG/L	STRONTIUM TOTAL - ICP 100229P MG/L	VANADIUM TOTAL - ICP 100230P MG/L	ZINC TOTAL - ICP 100231P MG/L
Detection Limit	**0.0002**	**0.0004**	**0.0001**	**0.0001**	**0.0001**	**0.0002**	**0.0002**	**0.0001**	**0.0001**	**0.0002**
3-Apr-97	0.0014	0.155	0.002	0.0052	0.0011	0.0011	0.0002 L	0.14	0.0004	0.0017
24-Apr-97	0.0019	0.776	0.003	0.0307	0.001	0.0016	0.0014	0.14	0.0009	0.005
1-May-97	0.0014	0.18	0.0024	0.0057	0.0011	0.0008	0.0002 L	0.147	0.0003	0.0012
15-May-97	0.0011	0.263	0.0025	0.0091	0.0011	0.001	0.0003	0.154	0.0004	0.0018
29-May-97	0.0016	0.644	0.003	0.0184	0.0011	0.0015	0.0013	0.158	0.0008	0.0033
12-Jun-97	0.0011	0.225	0.0026	0.0069	0.0011	0.0009	0.0002 L	0.154	0.0003	0.0012
26-Jun-97	0.0011	0.222	0.0025	0.0077	0.0011	0.001	0.0006	0.148	0.0004	0.0012
10-Jul-97	0.002	0.71	0.0028	0.0201	0.0012	0.0015	0.001	0.143	0.0008	0.0044
24-Jul-97	0.0011	0.319	0.0024	0.0092	0.0012	0.001	0.0003	0.146	0.0006	0.0016
7-Aug-97	0.0007	0.0485	0.0022	0.0019	0.0012	0.0007	0.0002 L	0.148	0.0002	0.0004
21-Aug-97	0.0014	0.456	0.0026	0.0162	0.0011	0.0011	0.001	0.147	0.0007	0.0031
4-Sep-97	0.0017	0.514	0.0029	0.0173	0.0011	0.0014	0.0011	0.145	0.0008	0.0032
18-Sep-97	--	0.656	0.0029	0.0225	0.001	0.0015	0.0008	0.146	0.0008	0.0195
2-Oct-97	0.0012	0.316	0.0025	0.0088	0.001	0.0008	0.0004	0.149	0.0006	0.0009
16-Oct-97	0.0011	0.176	0.0024	0.0059	0.0011	0.0009	0.0002	0.144	0.0004	0.0002 L
30-Oct-97	0.0014	1.18	0.0039	0.0287	0.0011	0.002	0.0014	0.144	0.0014	0.0041
13-Nov-97	--	--	--	--	--	--	--	--	--	--
14-Nov-97	0.0009	0.183	0.0021	0.0058	0.0011	0.0007	0.0002	0.149	0.0004	0.0008
27-Nov-97	0.0018	0.834	0.0032	0.0184	0.0012	0.0015	0.0005	0.154	0.001	0.0038
11-Dec-97	0.0012	0.245	0.0025	0.006	0.0011	0.0009	0.0003	0.142	0.0004	0.0012
24-Dec-97	0.001	0.197	0.0024	0.0052	0.0011	0.0007	0.0004	0.151	0.0005	0.0012
8-Jan-98	--	--	--	--	--	--	--	--	--	--
22-Jan-98	0.0009	0.109	0.0022	0.0023	0.0012	0.0007	0.0002 L	0.144	0.0002	0.0006
5-Feb-98	0.0019	0.984	0.0034	0.024	0.0011	0.0015	0.0007	0.149	0.001	0.0047
19-Feb-98	0.0013	0.384	0.0026	0.0065	0.0011	0.001	0.0003	0.146	0.0008	0.0021
2-Mar-98	0.0026	0.51	0.0027	0.0143	0.0009	0.0011	0.0006	0.141	0.0005	0.0031
5-Mar-98	0.0013	0.285	0.0023	0.0089	0.0011	0.001	0.0002 L	0.142	0.0005	0.0022
13-Mar-98	--	--	--	--	--	--	--	--	--	--
19-Mar-98	0.0013	0.321	0.0027	0.0079	0.0011	0.0011	0.0002 L	0.149	0.0005	0.0019
2-Apr-98	--	--	--	--	--	--	--	--	--	--
16-Apr-98	0.0015	0.426	0.0027	0.0147	0.0009	0.0014	0.0005	0.145	0.0006	0.0033
30-Apr-98	0.0012	0.138	0.0019	0.0055	0.0011	0.0009	0.0004	0.155	0.0004	0.0009
14-May-98	0.0013	0.31	0.0022	0.0101	0.001	0.0011	0.0003	0.143	0.0006	0.0018
28-May-98	0.0014	0.282	0.0021	0.0081	0.0012	0.0013	0.0003	0.143	0.0006	0.0015
11-Jun-98	0.0014	0.53	0.0024	0.0158	0.0011	0.0011	0.0004	0.141	0.0007	0.0024
25-Jun-98	0.0012	0.228	0.0026	0.0069	0.001	0.0009	0.0002	0.139	0.0006	0.0017
9-Jul-98	0.0021	0.281	0.0023	0.0059	0.0011	0.0009	0.0002	0.144	0.0005	0.0048
23-Jul-98	0.0016	0.293	0.0022	0.0083	0.0013	0.0017	0.0006	0.148	0.0006	0.001
7-Aug-98	--	0.246	0.0021	0.0054	0.0011	0.0008	0.0003	0.143	0.0005	0.0102
20-Aug-98	0.0037	0.261	0.0021	0.0085	0.0011	0.0009	0.0002 L	0.144	0.0005	0.0015
3-Sep-98	0.0008	0.0419	0.0017	0.0021	0.0011	0.0006	0.0002	0.143	0.0003	0.0005
17-Sep-98	0.0013	0.14	0.0018	0.012	0.0011	0.0017	0.0008	0.139	0.0004	0.0035
15-Oct-98	0.0008	0.184	0.002	0.0055	0.0011	0.0007	0.0002 L	0.14	0.0004	0.0007
29-Oct-98	0.0013	0.331	0.0025	0.0072	0.0011	0.001	0.0002 L	0.143	0.0006	0.0014
5-Nov-98	0.0013	0.286	0.0024	0.0078	0.0012	0.0009	0.0006	0.151	0.0005	0.0018
26-Nov-98	0.0014	0.801	0.0024	0.0164	0.0012	0.0016	0.0011	0.136	0.0011	0.0032
9-Dec-98	0.002	0.971	0.0027	0.0321	0.001	0.0022	0.0011	0.153	0.0013	0.0053
10-Dec-98	0.0012	0.142	0.0022	0.0043	0.0012	0.0009	0.0004	0.147	0.0004	0.0021
23-Dec-98	0.0035	2.93	0.0049	0.0589	0.0012	0.0036	0.0029	0.152	0.0024	0.0114
7-Jan-99	0.0035	2.67	0.0046	0.0636	0.001	0.0033	0.0025	0.15	0.0026	0.0112
21-Jan-99	0.0013	0.384	0.003	0.0087	0.0011	0.0012	0.0002 L	0.146	0.0007	0.0016
4-Feb-99	0.0016	0.382	0.0023	0.0087	0.001	0.0015	0.0003	0.15	0.0005	0.0019
10-Feb-99	--	--	--	--	--	--	--	--	--	--
18-Feb-99	0.001	0.24	0.0022	0.007	0.0011	0.0011	0.0002 L	0.15	0.0004	0.0015
25-Feb-99	--	--	--	--	--	--	--	--	--	--
4-Mar-99	0.0013	0.166	0.0022	0.0049	0.0012	0.0016	0.0002 L	0.151	0.0003	0.0017
11-Mar-99	--	--	--	--	--	--	--	--	--	--
18-Mar-99	0.0012	0.181	0.002	0.0052	0.0012	0.0009	0.0006	0.153	0.0004	0.0013

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NIAGARA RIVER AT NIAGARA-ON-THE-LAKE (1997 - 1999)

	ARSENIC TOTAL	SELENIUM TOTAL	ANTIMONY TOTAL	MERCURY TOTAL SEDIMENT	SUSPENDED SEDIMENT	DISCHARGE DAILY MEAN
	100250	100251	100252	100404	97290	97163
	MG/L	MG/L	MG/L	MG/KG	MG/L	CFS
Detection limit	**0.0001**	**0.0001**	**0.0002**	**.004ng/g**		
3-Apr-97	0.0007	0.0003	0.0002	--	1.95	261296
24-Apr-97	0.0009	0.0002	0.0002	0.071	6.3	264403
1-May-97	0.0006	0.0003	0.0002	0.083	3.16	278953
15-May-97	0.0005	0.0002	0.0002	0.075	5.05	276057
29-May-97	0.0006	0.0002	0.0002 L	--	3.07	256669
12-Jun-97	0.0004	0.0002	0.0002 L	--	1.85	264792
26-Jun-97	0.0006	0.0003	0.0002	0.104	1.69	264686
10-Jul-97	0.0009	0.0002	0.0002	0.239	4.26	260130
24-Jul-97	0.0006	0.0002	0.0002 L	0.199	2.28	255327
7-Aug-97	0.0005	0.0002	0.0003	0.184	1.95	254621
21-Aug-97	0.0006	0.0002	0.0002	0.246	2.2	260166
4-Sep-97	0.0007	0.0002	0.0002	0.181	2.1	246534
18-Sep-97	0.0009	0.0001	0.0002	--	--	247276
2-Oct-97	0.0005	0.0002	0.0002 L	0.11	12.13	246146
16-Oct-97	0.0005	0.0003	0.0002 L	0.148	2.35	228947
30-Oct-97	0.0008	0.0002	0.0002 L	0.085	21.46	233573
13-Nov-97	--	--	--	0.122	--	229088
14-Nov-97	0.0005	0.0001	0.0002 L	--	2.53	212738
27-Nov-97	0.0005	0.0001	0.0002 L	0.101	15.79	230430
11-Dec-97	0.0005	0.0001	0.0002 L	0.155	2.88	222343
24-Dec-97	0.0007	0.0002	0.0002 L	--	2.17	224709
8-Jan-98	--	--	--	0.224	6.35	230572
22-Jan-98	0.0006	0.0002	0.0003	0.109	5.18	229265
5-Feb-98	0.0008	0.0002	0.0002	--	1.7	226758
19-Feb-98	0.0007	0.0006	0.0002	0.111	10.79	252961
2-Mar-98	0.0007	0.0002	0.0002 L	--	--	254197
5-Mar-98	0.0006	0.0003	0.0002 L	0.111	1.91	250101
13-Mar-98	--	--	--	0.084	6.47	257694
19-Mar-98	0.0007	0.0002	0.0002	0.096	3.53	250701
2-Apr-98	--	--	--	0.178	2.31	268217
16-Apr-98	0.0008	0.0001	0.0002 L	0.093	3.53	263803
30-Apr-98	0.0005	0.0002	0.0002 L	0.1	2	257270
14-May-98	0.0004	0.0003	0.0002 L	0.104	2.08	255751
28-May-98	0.0004	0.0002	0.0002 L	0.072	1.91	242084
11-Jun-98	0.0005	0.0001	0.0002 L	0.079	4.31	238447
25-Jun-98	0.0006	0.0002	0.0002 L	--	3.12	243320
9-Jul-98	0.0005	0.0001	0.0002 L	0.137	2.28	240636
23-Jul-98	0.0004	0.0002	0.0002 L	0.087	5.85	247028
7-Aug-98	0.0004	0.0001	0.0002 L	0.178	1.67	226263
20-Aug-98	0.0003	0.0003	0.0002	0.145	2.51	228912
3-Sep-98	0.0004	0.0002	0.0002 L	0.129	9.29	229512
17-Sep-98	0.0005	0.0002	0.0002 L	--	6.88	217364
15-Oct-98	0.0005	0.0001	0.0002 L	0.095	--	212349
29-Oct-98	0.0007	0.0003	0.0002 L	--	8.55	207405
5-Nov-98	0.0006	0.0002	0.0002 L	--	1.65	203344
26-Nov-98	0.0006	0.0002	0.0002 L	0.123	15.18	203414
9-Dec-98	0.0006	0.0001	0.0002 L	--	--	201366
10-Dec-98	0.0006	0.0001	0.0002 L	0.123	3.44	210513
23-Dec-98	0.0005	0.0002	0.0002 L	0.107	25.56	208606
7-Jan-99	0.0005	0.0002	0.0002 L	0.097	72.88	195186
21-Jan-99	0.0006	0.0002	0.0002 L	0.075	7.82	186145
4-Feb-99	0.0008	0.0002	0.0002 L	0.087	13.87	208076
10-Feb-99	--	--	--	--	--	203026
18-Feb-99	0.0006	0.0002	0.0002	0.088	5.25	206346
25-Feb-99	--	--	--	--	--	198329
4-Mar-99	0.0004	0.0001	0.0002	0.137	2.92	220189
11-Mar-99	--	--	--	--	--	207546
18-Mar-99	0.0007	0.0003	0.0004	--	5.98	214609
18-Mar-99	--	--	--	0.087	--	--
					6.8388	

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	1,3-DICHLORO BENZENE	1,4-DICHLORO BENZENE	1,2-DICHLORO BENZENE	1,3,5-TRICHLORO BENZENE	1,2,4-TRICHLORO BENZENE	1,2,3-TRICHLORO BENZENE	1,2,3,4-TETRACHLORO BENZENE	PENTA-CHLORO BENZENE	ENDRIN ALDEHYDE	HEXACHLORO CYCLOPENTADIENE
	96288	96281	96282	96283	96284	96285	96286	96287	96152	96153
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
Detection Limit	**0.30**	**0.51**	**0.58**	**0.02**	**0.24**	**0.09**	**0.09**	**0.04**	**0.03**	**0.02**
2-Apr-97	0.30 L	0.86	0.58 L	0.02 L	0.06T	0.09 L	0.09 L	0.02T	0.05 L	0.02 L
23-Apr-97	0.30 L	0.79	0.58 L	0.02 L	0.06T	0.09 L	0.09 L	0.02T	0.05 L	0.02 L
30-Apr-97	0.30 L	0.67	0.16T	0.02 L	0.04T	0.08T	0.09 L	0.02T	0.05 L	0.02 L
11-May-97	0.30 L	0.51 L	0.45T	0.02 L	0.03T	0.09 L	0.09 L	0.03T	0.05 L	0.02 L
14-May-97	--	--	--	--	--	--	--	--	--	--
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	--	--	--	--	--	--	--	--	--	--
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	0.30 L	0.51 L	0.58 L	0.02 L	0.03T	0.09 L	0.09 L	0.02T	0.05 L	0.02 L
25-Jun-97	0.30 L	1.17	0.85	0.02 L	0.03T	0.09 L	0.09 L	0.02T	0.05 L	0.02 L
9-Jul-97	0.30 L	0.81	0.2T	0.02 L	0.06T	0.09 L	0.09 L	0.02T	0.05 L	0.02 L
23-Jul-97	0.30 L	0.68	0.31T	0.02 L	0.06T	0.09 L	0.09 L	0.02T	0.05 L	0.02 L
6-Aug-97	0.30 L	0.33T	0.16T	0.02 L	0.03T	0.09 L	0.09 L	0.01T	0.05 L	0.02 L
20-Aug-97	0.30 L	0.25T	0.13T	0.02 L	0.24 L	0.09 L	0.09 L	0.04 L	0.05 L	0.02 L
3-Sep-97	--	--	--	--	--	--	--	--	--	--
17-Sep-97	0.30 L	0.51 L	0.16T	0.02 L	0.03T	0.09 L	0.09 L	0.02T	0.05 L	0.02 L
1-Oct-97	0.30 L	0.32T	0.58 L	0.02 L	0.02T	0.09 L	0.01T	0.02T	0.05 L	0.02 L
15-Oct-97	0.30 L	0.44T	0.58 L	0.02 L	0.03T	0.09 L	0.09 L	0.01T	0.05 L	0.02 L
29-Oct-97	0.30 L	0.21T	0.58 L	0.02 L	0.24 L	0.09 L	0.01T	0.01T	0.05 L	0.02 L
12-Nov-97	--	--	--	--	--	--	--	--	--	--
13-Nov-97	0.30 L	0.22T	0.58 L	0.02 L	0.03T	0.09 L	0.01T	0.01T	0.05 L	0.02 L
26-Nov-97	0.30 L	0.24T	0.58 L	0.02 L	0.03T	0.09 L	0.1T	0.01T	0.05 L	0.02 L
10-Dec-97	0.30 L	0.54	0.58 L	0.02 L	0.03T	0.01T	0.01T	0.01T	0.05 L	0.02 L
23-Dec-97	0.30 L	0.62	0.58 L	0.03	0.05T	0.01T	0.01T	0.02T	0.05 L	0.02 L
7-Jan-98	0.29T	0.64	0.58 L	0.07	0.24 L	0.01T	0.09 L	0.01T	0.05 L	0.02 L
21-Jan-98	0.2T	0.62	0.58 L	0.02 L	0.05T	0.01T	0.09 L	0.02T	0.05 L	0.02 L
4-Feb-98	0.16T	0.76	1.62	0.02 L	0.06T	0.02T	0.09 L	0.02T	0.05 L	0.02 L
18-Feb-98	0.24T	0.69	0.95	0.02	0.04T	0.09 L	0.09 L	0.02T	0.05 L	0.02 L
4-Mar-98	0.28T	0.6	0.22T	0.01T	0.05T	0.03T	0.09 L	0.02T	0.05 L	0.02 L
18-Mar-98	0.30 L	0.51 L	0.58 L	0.02 L	0.24 L	0.09 L	0.09 L	0.03T	0.05 L	0.02 L
1-Apr-98	0.30 L	0.57	0.58 L	0.02 L	0.04T	0.09 L	0.01T	0.03T	0.05 L	0.02 L
15-Apr-98	0.2T	0.77	0.58 L	0.02 L	0.06T	0.09 L	0.02T	0.04	0.05 L	0.02 L
29-Apr-98	0.19T	0.91	0.58 L	0.02 L	0.07T	0.09 L	0.02T	--	0.05 L	0.02 L
13-May-98	0.27T	0.7	0.58 L	0.02 L	0.1T	0.09 L	0.02T	0.06	0.05 L	0.02 L
27-May-98	0.08T	0.36T	0.58 L	0.02 L	0.02T	0.09 L	0.09 L	0.01T	0.05 L	0.02 L
10-Jun-98	0.30 L	0.29T	0.58 L	0.02 L	0.24 L	0.09 L	0.09 L	0.04 L	0.05 L	0.02 L
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	0.30 L	0.26T	0.58 L	0.02 L	0.03T	0.09 L	0.01T	0.02T	0.05 L	0.02 L
8-Jul-98	0.30 L	0.43T	0.58 L	0.02 L	0.03T	0.09 L	0.01T	0.02T	0.05 L	0.02 L
22-Jul-98	0.30 L	0.33T	0.46T	0.02 L	0.03T	0.09 L	0.01T	0.01T	0.05 L	0.02 L
6-Aug-98	0.30 L	0.4T	0.15T	0.02 L	0.02T	0.09 L	0.01T	0.01T	0.05 L	0.02 L
19-Aug-98	0.30 L	0.25T	0.15T	0.02 L	0.03T	0.09 L	0.01T	0.01T	0.05 L	0.02 L
2-Sep-98	0.30 L	0.36T	0.26T	0.02 L	0.02T	0.09 L	0.01T	0.01T	0.05 L	0.02 L
15-Sep-98	--	--	--	--	--	--	--	--	--	--
16-Sep-98	0.30 L	0.3T	0.09T	0.02 L	0.02T	0.09 L	0.01T	0.01T	0.05 L	0.02 L
30-Sep-98	0.30 L	0.16T	0.16T	0.01T	0.02T	0.09 L	0.01T	0.01T	0.05 L	0.02 L
14-Oct-98	0.30 L	0.16T	0.06T	0.01T	0.02T	0.09 L	0.01T	0.04 L	0.05 L	0.02 L
28-Oct-98	0.30 L	0.25T	0.12T	0.01T	0.02T	0.09 L	0.09 L	0.04 L	0.05 L	0.02 L
4-Nov-98	0.30 L	0.24T	0.04T	0.02 L	0.03T	0.09 L	0.09 L	0.01T	0.05 L	0.02 L
25-Nov-98	0.01T	0.3T	0.1T	0.01T	0.03T	0.09 L	0.01T	0.04 L	0.05 L	0.02 L
9-Dec-98	0.01T	0.24T	0.07T	0.01T	0.02T	0.09 L	0.09 L	0.04 L	0.05 L	0.02 L
22-Dec-98	--	--	--	--	--	--	--	--	--	--
6-Jan-99	0.03T	0.28T	0.26T	0.02 L	0.05T	0.01T	0.01T	0.02	0.05 L	0.02 L
20-Jan-99	0.05T	0.59	0.21T	0.02 L	0.05T	0.01T	0.01T	0.02	0.05 L	0.02 L
3-Feb-99	0.04T	0.5T	0.18T	0.01T	0.05T	0.01T	0.01T	0.02	0.05 L	0.02 L
17-Feb-99	0.03T	0.51	0.22T	0.01T	0.05T	0.01T	0.01T	0.02	0.05 L	0.02 L
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	0.07T	0.48T	0.22T	0.02	0.05T	0.01T	0.01T	0.02	0.05 L	0.02 L
17-Mar-99	0.07T	0.55	0.15T	0.01T	0.06T	0.01T	0.01T	0.02	0.05 L	0.02 L
31-Mar-99	0.11T	0.5T	0.24T	0.02	0.08T	0.01T	0.01T	0.01	0.05 L	0.02 L

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	PHOTOMIREX	OCTACHLORO-STYRENE	HEXACHLORO-BUTADIENE	HEXA-CHLORO-	ALPHA-BHC	GAMMA-BHC (LINDANE)	HEPTCHLOR	ALDRIN	HEPTCHLOR EPOXIDE	GAMMA CHLORDANE
Detection Limit	**0.04**	**0.05**	**0.03**	**0.04**	**0.30**	**0.14**	**0.03**	**0.01**	**0.02**	**0.03**
	96154	96260	96261	96001	96014	96013	96007	96016	96008	96012
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
2-Apr-97	0.04 L	0.05 L	0.03 L	0.02T	0.5	0.34	0.03 L	0.01 L	0.07	0.03 L
23-Apr-97	0.04 L	0.05 L	0.03 L	0.02T	0.57	0.35	0.03 L	0.01 L	0.06	0.03 L
30-Apr-97	0.04 L	0.05 L	0.03 L	0.02T	0.6	0.33	0.03 L	0.01 L	0.07	0.03 L
11-May-97	0.04 L	0.05 L	0.03 L	0.02T	0.62	0.42	0.03 L	0.01 L	0.1	0.03 L
14-May-97	--	--	--	--	--	--	--	--	--	--
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	--	--	--	--	--	--	--	--	--	--
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	0.04 L	0.05 L	0.03 L	0.02T	0.54	0.4	0.03 L	0.01 L	0.07	0.03 L
25-Jun-97	0.04 L	0.05 L	0.03 L	0.01T	0.56	0.48	0.03 L	0.01 L	0.1	0.03 L
9-Jul-97	0.04 L	0.05	0.03 L	0.03T	0.5	0.45	0.03 L	0.01 L	0.13	0.03 L
23-Jul-97	0.04 L	0.05 L	0.03 L	0.02T	0.45	0.37	0.03 L	0.01 L	0.1	0.03 L
6-Aug-97	0.04 L	0.05 L	0.03 L	0.01T	0.36	0.28	0.03 L	0.01 L	0.08	0.03 L
20-Aug-97	0.04 L	0.05 L	0.03 L	0.04 L	0.19T	0.15	0.03 L	0.01 L	0.05	0.03 L
3-Sep-97	--	--	--	--	--	--	--	--	--	--
17-Sep-97	0.04 L	0.05 L	0.03 L	0.01T	0.26T	0.22	0.03 L	0.01 L	0.05	0.03 L
1-Oct-97	0.04 L	0.05 L	0.03 L	0.01T	0.31	0.34	0.03 L	0.01 L	0.04	0.03 L
15-Oct-97	0.04 L	0.05 L	0.03 L	0.01T	0.29T	0.27	0.03 L	0.01 L	0.04	0.03 L
29-Oct-97	0.04 L	0.05 L	0.03 L	0.01T	0.36	0.27	0.03 L	0.01 L	0.04	0.03 L
12-Nov-97	--	--	--	--	--	--	--	--	--	--
13-Nov-97	0.04 L	0.05 L	0.03 L	0.01T	0.14T	0.12T	0.03 L	0.01 L	0.02	0.03 L
26-Nov-97	0.04 L	0.05 L	0.03 L	0.02T	0.52	0.19	0.03 L	0.01 L	0.08	0.03 L
10-Dec-97	0.04 L	0.05 L	0.03 L	0.01T	0.42	0.28	0.03 L	0.01 L	0.08	0.03 L
23-Dec-97	0.04 L	0.05 L	0.03 L	0.01T	0.47	0.62	0.03 L	0.01 L	0.04	0.03 L
7-Jan-98	0.04 L	0.05 L	0.03 L	0.01T	0.48	0.47	0.03 L	0.01 L	0.06	0.03 L
21-Jan-98	0.04 L	0.05 L	0.03 L	0.01T	0.47	0.33	0.03 L	0.01 L	0.05	0.03 L
4-Feb-98	0.04 L	0.05 L	0.03 L	0.02T	0.48	0.33	0.03 L	0.01 L	0.05	0.03 L
18-Feb-98	0.04 L	0.05 L	0.03 L	0.02T	0.45	0.34	0.03 L	0.01 L	0.06	0.03 L
4-Mar-98	0.04 L	0.05 L	0.03 L	0.01T	0.34	0.22	0.03 L	0.01 L	0.04	0.03 L
18-Mar-98	0.04 L	0.05 L	0.03 L	0.01T	0.42	0.31	0.03 L	0.01 L	0.05	0.03 L
1-Apr-98	0.04 L	0.05 L	0.01T	0.02T	0.53	0.4	0.03 L	0.01 L	0.06	0.03 L
15-Apr-98	0.04 L	0.05 L	0.03 L	0.02T	0.66	0.46	0.03 L	0.01 L	0.04	0.03 L
29-Apr-98	0.04 L	0.05 L	0.03 L	0.03T	0.72	0.55	0.03 L	0.01 L	0.08	0.03 L
13-May-98	0.04 L	0.05 L	0.03 L	0.02T	0.65	0.48	0.03 L	0.01 L	0.06	0.01T
27-May-98	0.04 L	0.05 L	0.03 L	0.01T	0.65	0.53	0.03 L	0.01 L	0.06	0.01T
10-Jun-98	0.04 L	0.05 L	0.03 L	0.04 L	0.30 L	0.02T	0.03 L	0.01 L	0.02 L	0.01T
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	0.04 L	0.05 L	0.03 L	0.01T	0.49	0.47	0.03 L	0.01 L	0.03	0.03 L
8-Jul-98	0.04 L	0.05 L	0.03 L	0.02T	0.48	0.44	0.03 L	0.01 L	0.07	0.03 L
22-Jul-98	0.04 L	0.05 L	0.03 L	0.01T	0.35	0.25	0.03 L	0.01 L	0.06	0.03 L
6-Aug-98	0.04 L	0.05 L	0.03 L	0.01T	0.27T	0.29	0.03 L	0.01 L	0.05	0.03 L
19-Aug-98	0.04 L	0.05 L	0.03 L	0.01T	0.28T	0.3	0.03 L	0.01 L	0.06	0.03 L
2-Sep-98	0.04 L	0.05 L	0.03 L	0.01T	0.26T	0.27	0.03 L	0.01 L	0.05	0.03 L
15-Sep-98	--	--	--	--	--	--	--	--	--	--
16-Sep-98	0.04 L	0.05 L	0.03 L	0.01T	0.25T	0.27	0.03 L	0.01 L	0.06	0.03 L
30-Sep-98	0.04 L	0.05 L	0.03 L	0.02T	0.22T	0.23	0.03 L	0.01 L	0.03	0.03 L
14-Oct-98	0.04 L	0.05 L	0.03 L	0.01T	0.23T	0.25	0.03 L	0.01 L	0.05	0.03 L
28-Oct-98	0.04 L	0.05 L	0.03 L	0.01T	0.24T	0.23	0.03 L	0.01 L	0.05	0.03 L
4-Nov-98	0.04 L	0.05 L	0.03 L	0.01T	0.24T	0.23	0.03 L	0.01 L	0.04	0.03 L
25-Nov-98	0.04 L	0.05 L	0.03 L	0.01T	0.27T	0.24	0.03 L	0.01 L	0.03	0.03 L
9-Dec-98	0.04 L	0.05 L	0.03 L	0.01T	0.27T	0.23	0.03 L	0.01 L	0.03	0.03 L
22-Dec-98	--	--	--	--	--	--	--	--	--	--
6-Jan-99	0.04 L	0.05 L	0.03 L	0.02T	0.24T	0.22	0.03 L	0.01 L	0.03	0.03 L
20-Jan-99	0.04 L	0.05 L	0.03 L	0.02T	0.26T	0.22	0.03 L	0.01 L	0.03	0.03 L
3-Feb-99	0.04 L	0.05 L	0.03 L	0.01T	0.23T	0.21	0.03 L	0.01 L	0.03	0.03 L
17-Feb-99	0.04 L	0.05 L	0.03 L	0.01T	0.23T	0.24	0.03 L	0.01 L	0.03	0.03 L
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	0.04 L	0.05 L	0.03 L	0.01T	0.25T	0.24	0.03 L	0.01 L	0.05	0.03 L
17-Mar-99	0.04 L	0.05 L	0.03 L	0.02T	0.2T	0.19	0.03 L	0.01 L	0.02	0.03 L
31-Mar-99	0.04 L	0.05 L	0.03 L	0.01T	0.06T	0.07T	0.03 L	0.01 L	0.01T	0.03 L

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	ALPHA CHLORDANE	ALPHA ENDOSLUPHAN	PP-DDE	HEOD (DIELDRIN)	ENDRIN	OP-DDT	PP-DDD	PP-DDT	BETA ENDOSLUPHAN	MIREX
	96011	96009	96005	96018	96017	96003	96004	96002	96010	96015
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
Detection Limit	**0.06**	**0.02**	**0.06**	**0.05**	**0.03**	**0.09**	**0.10**	**0.10**	**0.06**	**0.04**
2-Apr-97	0.02T	0.03	0.07	0.19	0.03 L	0.09 L	0.1	0.10 L	0.06 L	0.04 L
23-Apr-97	0.06 L	0.02	0.03T	0.21	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
30-Apr-97	0.02T	0.02	0.06	0.18	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
11-May-97	0.02T	0.02	0.07	0.23	0.03 L	0.07T	0.10 L	0.10 L	0.06 L	0.04 L
14-May-97	--	--	--	--	--	--	--	--	--	--
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	--	--	--	--	--	--	--	--	--	--
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	0.06 L	0.03	0.07	0.19	0.03 L	0.09 L	0.07T	0.10 L	0.06 L	0.04 L
25-Jun-97	0.06 L	0.02 L	0.08	0.24	0.03 L	0.04T	0.10 L	0.10 L	0.06 L	0.04 L
9-Jul-97	0.06 L	0.09	0.12	0.28	0.03 L	0.07T	0.12	0.1	0.06 L	0.04 L
23-Jul-97	0.06 L	0.07	0.06	0.2	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
6-Aug-97	0.06 L	0.01T	0.06 L	0.16	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
20-Aug-97	0.06 L	0.02 L	0.06 L	0.07	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
3-Sep-97	--	--	--	--	--	--	--	--	--	--
17-Sep-97	0.06 L	0.02 L	0.06 L	0.13	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
1-Oct-97	0.06 L	0.04	0.04T	0.15	0.03 L	0.03T	--	0.01T	0.06 L	0.04 L
15-Oct-97	0.06 L	0.03	0.03T	0.15	0.03 L	0.09 L	0.04T	0.01T	0.06 L	0.04 L
29-Oct-97	0.06 L	0.03	0.03T	0.14	0.03 L	0.09 L	0.02T	0.10 L	0.06 L	0.04 L
12-Nov-97	--	--	--	--	--	--	--	--	--	--
13-Nov-97	0.06 L	0.02	0.02T	0.08	0.03 L	0.09 L	0.02T	0.10 L	0.06 L	0.04 L
26-Nov-97	0.06 L	0.02 L	0.02T	0.08	0.03 L	0.01T	0.08T	0.10 L	0.06 L	0.04 L
10-Dec-97	0.06 L	0.03	0.04T	0.13	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
23-Dec-97	0.06 L	0.03	0.04T	0.15	0.03 L	0.09 L	0.06T	0.10 L	0.06 L	0.04 L
7-Jan-98	0.02T	0.02 L	0.03T	0.13	0.03 L	0.01T	0.06T	0.10 L	0.06 L	0.04 L
21-Jan-98	0.01T	0.02 L	0.03T	0.14	0.03 L	0.01T	0.06T	0.10 L	0.06 L	0.04 L
4-Feb-98	0.06 L	0.02 L	0.02T	0.12	0.03 L	0.09 L	0.05T	0.10 L	0.06 L	0.04 L
18-Feb-98	0.01T	0.02 L	0.05T	0.14	0.03 L	0.09 L	0.08T	0.10 L	0.06 L	0.04 L
4-Mar-98	0.06 L	0.02 L	0.03T	0.1	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
18-Mar-98	0.06 L	0.02 L	0.04T	0.12	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
1-Apr-98	0.06 L	0.02	0.03T	0.15	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
15-Apr-98	0.06 L	0.02	0.03T	0.14	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
29-Apr-98	0.01T	0.07	0.06 L	0.16	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
13-May-98	0.01T	0.03	0.04T	0.14	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
27-May-98	0.03T	0.03	0.02T	0.13	0.03 L	0.09 L	0.05T	0.10 L	0.06 L	0.04 L
10-Jun-98	0.06 L	0.02 L	0.02T	0.05 L	0.03 L	0.09 L	0.10 L	0.10 L	0.06 L	0.04 L
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	0.01T	0.01T	0.04T	0.13	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
8-Jul-98	0.02T	0.01T	0.06	0.16	0.03 L	0.04T	0.10 L	0.10 L	0.06 L	0.04 L
22-Jul-98	0.06 L	0.01T	0.05T	0.1	0.03 L	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
6-Aug-98	0.06 L	0.01T	0.05T	0.12	0.03 L	0.09 L	0.06T	0.10 L	0.06 L	0.04 L
19-Aug-98	0.06 L	0.02	0.05T	0.13	0.03 L	0.09 L	0.07T	0.10 L	0.06 L	0.04 L
2-Sep-98	0.06 L	0.02	0.05T	0.12	0.03 L	0.09 L	0.06T	0.10 L	0.06 L	0.04 L
15-Sep-98	--	--	--	--	--	--	--	--	--	--
16-Sep-98	0.06 L	0.01T	0.06 L	0.12	0.03 L	0.09 L	0.05T	0.10 L	0.06 L	0.04 L
30-Sep-98	0.06 L	0.01T	0.06 L	0.12	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
14-Oct-98	0.06 L	0.01T	0.04T	0.11	0.03 L	0.01T	0.05T	0.10 L	0.06 L	0.04 L
28-Oct-98	0.06 L	0.02 L	0.02T	0.11	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
4-Nov-98	0.06 L	0.02 L	0.06 L	0.11	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
25-Nov-98	0.06 L	0.01T	0.02T	0.11	0.03 L	0.09 L	0.04T	0.10 L	0.06 L	0.04 L
9-Dec-98	0.06 L	0.02 L	0.02T	0.12	0.03 L	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
22-Dec-98	--	--	--	--	--	--	--	--	--	--
6-Jan-99	0.01T	0.02 L	0.03T	0.12	0.03 L	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
20-Jan-99	0.01T	0.02 L	0.03T	0.12	0.03 L	0.02T	0.03T	0.10 L	0.06 L	0.01T
3-Feb-99	0.01T	0.01T	0.02T	0.11	0.02T	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
17-Feb-99	0.01T	0.01T	0.02T	0.13	0.03	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	0.01T	0.01T	0.02T	0.13	0.03 L	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
17-Mar-99	0.01T	0.01T	0.02T	0.11	0.02T	0.09 L	0.03T	0.10 L	0.06 L	0.04 L
31-Mar-99	0.06 L	0.02 L	0.01T	0.05	0.03 L	0.09 L	0.01T	0.10 L	0.06 L	0.04 L

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	METHOXYCHLOR	PCB (TOTAL)	TOTAL POLYCH LORINATED BI PHENYL-CONGENER	FLUORANTHENE	PYRENE	BENZ(A) ANTHRACENE	BENZO (A) PYRENE	2-METHYL NAPHTALENE	1-METHYL-NAPHTHALENE	BETA-CHLORO-NAPHTHALENE
	96006	96019	103388	96201	96202	96203	96209	96272	96273	96274
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
Detection Limit	**0.22**	**0.81**	**0.21**	**0.18**	**0.17**	**0.24**	**0.24**	**0.51**	**0.61**	**1.20**
2-Apr-97	0.22 L	0.79T	--	0.64	0.19	0.24 L	0.24 L	0.25T	0.18T	1.20 L
23-Apr-97	0.22 L	0.75T	--	0.83	0.25	0.24 L	0.24 L	0.51	0.35T	1.20 L
30-Apr-97	0.22 L	0.81 L	--	0.73	0.19	0.24 L	0.02T	0.16T	0.13T	1.20 L
11-May-97	0.22 L	0.81	--	0.64	0.37	0.24 L	0.24 L	0.1T	0.09T	1.20 L
14-May-97	--	--	--	--	--	--	--	--	--	--
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	--	--	--	--	--	--	--	--	--	--
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	0.22 L	0.96	--	0.58	0.23	0.24 L	0.24 L	0.58	0.33T	1.20 L
25-Jun-97	0.22 L	0.81	--	0.57	0.37	0.06T	0.24 L	0.54	0.36T	1.20 L
9-Jul-97	0.05T	0.81 L	--	1.63	0.9	0.24 L	0.24 L	1.1	0.61	1.20 L
23-Jul-97	0.22 L	1.14	--	0.94	0.43	0.24 L	0.24 L	1.85	0.94	1.20 L
6-Aug-97	0.22 L	1.67	--	0.73	0.39	0.24 L	0.24 L	1.23	0.65	1.20 L
20-Aug-97	0.22 L	0.8T	--	0.23	0.17 L	0.24 L	0.24 L	0.95	0.46T	1.20 L
3-Sep-97	--	--	--	--	--	--	--	--	--	--
17-Sep-97	0.22 L	1.37	--	0.83	0.82	0.24 L	0.24 L	1.59	0.8	1.20 L
1-Oct-97	0.22 L	1.07	--	1.05	0.89	0.24 L	0.07T	0.56	0.33T	1.20 L
15-Oct-97	0.22 L	1.05	--	0.4	0.35	0.24 L	0.24 L	0.95	0.53T	1.20 L
29-Oct-97	0.22 L	0.81 L	--	1.2	0.96	0.12T	0.15T	0.78	0.44T	1.20 L
12-Nov-97	--	--	--	--	--	--	--	--	--	--
13-Nov-97	0.22 L	0.52T	--	0.57	0.39	0.24 L	0.01T	0.8	0.44T	1.20 L
26-Nov-97	0.22 L	0.81 L	--	--	--	0.24 L	--	1.4	0.75	1.20 L
10-Dec-97	0.22 L	0.82	--	--	0.52	0.06T	0.24 L	--	--	1.20 L
23-Dec-97	0.22 L	0.59T	--	--	0.6	0.24 L	0.24 L	--	--	1.20 L
7-Jan-98	0.22 L	0.67T	--	--	0.4	0.24 L	0.24 L	--	--	1.20 L
21-Jan-98	0.22 L	0.53T	--	--	0.74	0.24 L	0.24 L	--	--	1.20 L
4-Feb-98	0.22 L	0.65T	--	--	0.87	0.24 L	0.24 L	--	--	1.20 L
18-Feb-98	0.02T	0.66T	--	--	1.06	0.24 L	0.24 L	--	--	1.20 L
4-Mar-98	0.22 L	0.6T	--	--	0.43	0.24 L	0.24 L	--	--	1.20 L
18-Mar-98	0.22 L	0.51T	--	--	0.92	0.1T	0.24 L	--	--	1.20 L
1-Apr-98	0.22 L	--	0.94	--	0.65	0.09T	0.04T	--	--	1.20 L
15-Apr-98	0.22 L	--	1.32	--	1.56	0.04T	0.24 L	--	--	1.20 L
29-Apr-98	0.22 L	--	9.22	--	--	--	--	--	--	1.20 L
13-May-98	0.22 L	--	1.48	--	1.27	0.07T	0.06T	--	--	1.20 L
27-May-98	0.22 L	--	0.62	0.98	0.71	0.02T	0.24 L	1.36	0.76	1.20 L
10-Jun-98	0.22 L	--	1.01	0.24	0.36	0.04T	0.24 L	0.61	0.24T	1.20 L
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	0.22 L	--	1.1	0.74	0.6	0.05T	0.24 L	1.54	0.74	1.20 L
8-Jul-98	0.22 L	--	7.22	0.78	0.48	0.04T	0.24 L	0.97	0.5T	1.20 L
22-Jul-98	0.22 L	--	1.06	0.84	0.52	0.24 L	0.02T	1.57	0.84	1.20 L
6-Aug-98	0.22 L	--	1.1	0.62	0.37	0.24 L	0.24 L	1.71	0.88	1.20 L
19-Aug-98	0.22 L	--	1.02	0.61	0.41	0.02T	0.24 L	1	0.59T	1.20 L
2-Sep-98	0.22 L	--	0.94	0.83	0.57	0.24 L	0.24 L	1.59	0.82	1.20 L
15-Sep-98	--	--	--	--	--	--	--	--	--	--
16-Sep-98	0.22 L	--	0.7	1.37	1.33	0.13T	0.24 L	1.51	0.7	1.20 L
30-Sep-98	0.22 L	--	0.89	0.67	0.41	0.24 L	0.01T	0.84	0.42T	1.20 L
14-Oct-98	0.22 L	--	0.76	0.5	0.5	0.04T	0.24 L	0.58	0.29T	1.20 L
28-Oct-98	0.22 L	--	0.63	0.15	0.09T	0.01T	0.24 L	0.41T	0.21T	1.20 L
4-Nov-98	0.22 L	--	0.56	0.73	0.43	0.05T	0.24 L	0.76	0.42T	1.20 L
25-Nov-98	0.22 L	--	0.6	0.76	0.51	0.06T	0.05T	0.44T	0.28T	1.20 L
9-Dec-98	0.22 L	--	0.82	0.48	0.26	0.02T	0.24 L	0.27T	0.21T	1.20 L
22-Dec-98	--	--	--	--	--	--	--	--	--	--
6-Jan-99	0.22 L	--	1.02	1.71	1.11	0.21T	0.19T	0.54	0.4T	1.20 L
20-Jan-99	0.22 L	--	1.01	0.63	0.32	0.05T	0.04T	0.8	0.54T	1.20 L
3-Feb-99	0.22 L	--	0.64	1.07	0.6	0.05T	0.03T	0.71	0.49T	1.20 L
17-Feb-99	0.22 L	--	0.71	0.84	0.34	0.04T	0.24 L	0.79	0.51T	1.20 L
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	0.22 L	--	1.05	1.27	0.39	0.04T	0.02T	0.84	0.52T	1.20 L
17-Mar-99	0.22 L	--	0.83	0.79	0.17	0.03T	0.02T	0.98	0.58T	1.20 L
31-Mar-99	0.22 L	--	0.7	0.34	0.11T	0.24 L	0.24 L	0.55	0.28T	1.20 L

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	ACENAPH-THYLENE	FLUORENE	PHENAN-THRENE	INDENO (1,2,3-C,D)	BENZO (G,H,I) PERYLENE	NAPHTHALENE	ANTHRACENE	DIBENZO(AH) ANTHRACENE	ATRAZINE	METOLACHLOR
	96275	96277	96278	96279	96280	96143	96144	96145	96150	96151
	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L	NG/L
Detection Limit	**0.16**	**0.59**	**0.12**	**0.36**	**0.22**	**0.33**	**0.23**	**0.51**	**6.04**	**0.82**
2-Apr-97	0.08T	0.19T	0.64	0.36 L	0.22 L	--	0.23 L	0.51 L	55.2	18.8
23-Apr-97	0.09T	0.3T	0.81	0.36 L	0.22 L	--	0.23 L	0.51 L	45.3	18.7
30-Apr-97	0.06T	0.29T	0.84	0.36 L	0.22 L	--	0.23 L	0.51 L	42.2	18.1
11-May-97	0.05T	0.27T	0.85	0.36 L	0.22 L	--	0.23 L	0.51 L	32.1	16
14-May-97	--	--	--	--	--	--	--	--	--	--
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	--	--	--	--	--	--	--	--	--	--
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	0.06T	0.33T	1.29	0.36 L	0.22 L	--	0.23 L	0.51 L	48.9	16.3
25-Jun-97	0.08T	0.4T	1.08	0.36 L	0.22 L	--	0.23 L	0.51 L	55.2	23.3
9-Jul-97	0.16 L	0.56T	2.07	0.36 L	0.22 L	--	0.24	0.51 L	58.2	35.5
23-Jul-97	0.16 L	0.42T	1.3	0.36 L	0.22 L	--	0.23 L	0.51 L	67.2	40.5
6-Aug-97	0.16 L	0.35T	1.03	0.36 L	0.22 L	--	0.23 L	0.51 L	70.4	44.6
20-Aug-97	0.16 L	0.14T	0.5	0.36 L	0.22 L	--	0.23 L	0.51 L	17.7	7.4
3-Sep-97	--	--	--	--	--	--	--	--	--	--
17-Sep-97	0.12T	0.46T	1.41	0.36 L	0.22 L	--	0.23 L	0.51 L	64.6	32.1
1-Oct-97	0.16 L	0.49T	2.2	0.2T	0.22 L	--	0.12T	0.51 L	66.3	47.2
15-Oct-97	0.07T	0.29T	1.16	0.36 L	0.22 L	--	0.05T	0.51 L	19.1	9.47
29-Oct-97	0.25	0.73	3.17	0.29T	0.22 L	--	0.09T	0.51 L	63.6	28.8
12-Nov-97	--	--	--	--	--	--	--	--	--	--
13-Nov-97	0.18	0.42T	1.66	0.36 L	0.22 L	--	0.08T	0.51 L	28.7	12.1
26-Nov-97	0.22	0.88	--	--	--	--	0.23 L	0.51 L	18.5	6.83
10-Dec-97	--	--	--	0.36 L	0.22 L	--	0.19T	0.51 L	53.7	21.6
23-Dec-97	--	--	--	0.36 L	0.22 L	--	0.23 L	0.51 L	43.9	19.2
7-Jan-98	--	--	--	0.36 L	0.22 L	--	--	0.51 L	48.9	19.6
21-Jan-98	--	--	--	0.36 L	0.22 L	--	0.23 L	0.51 L	110	44.5
4-Feb-98	--	--	--	0.36 L	0.22 L	--	0.23 L	0.51 L	91.7	35.2
18-Feb-98	--	--	--	0.36 L	0.22 L	--	0.23 L	0.51 L	94	34.6
4-Mar-98	--	--	--	0.36 L	0.22 L	--	0.23 L	0.51 L	68.2	20.1
18-Mar-98	--	--	--	0.36 L	0.22 L	--	0.23 L	0.51 L	114	37
1-Apr-98	--	--	--	0.36 L	0.11T	--	0.14T	0.51 L	78.8	33
15-Apr-98	--	--	--	0.11T	0.18T	--	0.19T	0.51 L	85.8	36.8
29-Apr-98	--	--	--	--	--	--	--	--	--	--
13-May-98	--	--	--	0.12T	0.22 L	--	0.19T	0.51 L	74	33.7
27-May-98	0.16 L	0.91	1.83	0.27T	1.2	--	0.23 L	0.51 L	69.3	29.7
10-Jun-98	0.16 L	0.11T	0.54	0.36 L	0.63	--	0.07T	0.51 L	0.39T	0.16T
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	0.16 L	0.48T	1.14	0.36 L	0.38	--	0.11T	0.51 L	61.3	23
8-Jul-98	0.16 L	0.35T	1.38	0.36 L	0.22 L	--	0.13T	0.51 L	50.7	21.4
22-Jul-98	0.16 L	0.39T	1.29	0.06T	0.22 L	--	0.09T	0.51 L	65.4	24.3
6-Aug-98	0.16 L	0.37T	1.03	0.36 L	0.22 L	--	0.04T	0.51 L	51	20.2
19-Aug-98	0.09T	0.34T	1.03	0.03T	0.22 L	--	0.23 L	0.51 L	50.6	19
2-Sep-98	0.16 L	0.39T	1.3	0.36 L	0.22 L	--	0.09T	0.51 L	35.4	12.8
15-Sep-98	--	--	--	--	--	--	--	--	--	--
16-Sep-98	0.16 L	0.58T	2.71	0.05T	0.22 L	--	0.23 L	0.51 L	65.8	23.1
30-Sep-98	0.16 L	0.39T	1.39	0.36 L	0.22 L	--	0.05T	0.51 L	60.6	24.3
14-Oct-98	0.08T	0.31T	1.51	0.36 L	0.22 L	--	0.06T	0.51 L	26.3	9.33
28-Oct-98	0.01T	0.12T	0.27	0.36 L	0.03T	--	0.23 L	0.51 L	15.4	4.44
4-Nov-98	0.13T	0.37T	1.33	0.36 L	0.22 L	--	0.23 L	0.51 L	49.4	19.4
25-Nov-98	0.16 L	0.25T	0.79	0.1T	0.22 L	--	0.23 L	0.01T	52.3	20.4
9-Dec-98	0.09T	0.23T	0.67	0.03T	0.22 L	--	0.04T	0.51 L	39.7	14.5
22-Dec-98	--	--	--	--	--	--	--	--	--	--
6-Jan-99	0.19	0.57T	2.32	0.24T	0.22 L	--	0.28	0.04T	56.8	18.2
20-Jan-99	0.13T	0.38T	1.17	0.07T	0.08T	--	0.23 L	0.51 L	61.5	17.1
3-Feb-99	0.19	0.41T	1.58	0.06T	0.06T	--	0.23 L	0.51 L	73.2	26.5
17-Feb-99	0.19	0.41T	1.3	0.04T	0.04T	--	0.23 L	0.51 L	64.7	23.4
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	0.18	0.52T	2	0.03T	0.04T	--	0.23 L	0.51 L	72.9	25.1
17-Mar-99	0.13T	0.38T	1.38	0.03T	0.22 L	--	0.23 L	0.51 L	47.5	16.9
31-Mar-99	0.04T	0.2T	0.61	0.36 L	0.22 L	--	0.23 L	0.51 L	31	10.2

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	BENZO(B AND/ OR K)FLUORAN THENE	CHRYSENE AND /OR TRIPHENY LENE	1,3-DICHLORO BENZENE SEDIMENT	1,4-DICHLORO BENZENE SEDIMENT	1,2-DICHLORO BENZENE SEDIMENT	1,3,5-TRI- CHLOROBENZE- NE SEDIMENT	1,2,4-TRI- CHLOROBENZE- NE SEDIMENT	1,2,3-TRI- CHLOROBENZE- NE SEDIMENT	1,2,3,4-TET- RACHLOROBEN- ZENE SEDIM.	PENTACHLORO- BENZENE SEDIMENT
	2672	2670	96829	96830	96831	96832	96833	96834	96835	96836
	NG/L	NG/L	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G
Detection Limit	**0.26**	**0.29**	**11.3**	**10.4**	**11.4**	**1.2**	**2.5**	**1.3**	**3.0**	**2.7**
2-Apr-97	0.04T	0.13T	11.3 L	11.2	11.4 L	1.2 L	0.9T	1.3 L	3.0 L	1T
23-Apr-97	0.05T	0.15T	11.3 L	8.2T	11.4 L	1.2 L	0.8T	1.3 L	0.4T	0.6T
30-Apr-97	0.07T	0.18T	11.3 L	9.5T	11.4 L	1.2 L	0.9T	1.3 L	3.0 L	0.8T
11-May-97	0.05T	0.17T	--	--	--	--	--	--	--	--
14-May-97	--	--	11.3 L	4.5T	11.4 L	1.2 L	2.5 L	1.3 L	3.0 L	2.7 L
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	--	--	11.3 L	10.4 L	11.4 L	1.2 L	2.5 L	1.3 L	3.0 L	2.7 L
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	0.26 L	0.12T	11.3 L	7.2T	11.4 L	1.2 L	2.5 L	1.3 L	3.0 L	1T
25-Jun-97	0.05T	0.18T	11.3 L	4.5T	11.4 L	1.2 L	2.5 L	1.3 L	3.0 L	2.7 L
9-Jul-97	0.24T	0.32	11.3 L	30.4	11.4 L	--	5.9	1.3 L	--	--
23-Jul-97	0.26 L	0.13T	11.3 L	26.6	11.4 L	1.2 L	0.5T	0.1T	0.8T	2T
6-Aug-97	0.26 L	0.11T	2.5T	20.5	11.4 L	1.2 L	0.5T	1.3 L	0.2T	0.4T
20-Aug-97	0.26 L	0.29 L	11.3 L	14.8	11.4 L	1.2 L	0.4T	1.3 L	0.4T	0.6T
3-Sep-97	--	--	11.3 L	18.3	11.4 L	1.2 L	0.6T	1.3 L	0.2T	0.5T
17-Sep-97	0.26 L	0.29 L	11.3 L	30	11.4 L	1.2 L	0.5T	1.3 L	0.4T	2.7 L
1-Oct-97	0.3	0.29 L	11.3 L	10T	9.3T	0.2T	0.6T	1.3 L	0.1T	0.4T
15-Oct-97	0.06T	0.29 L	11.3 L	8.6T	11.4 L	1.2 L	0.4T	1.3 L	0.1T	0.4T
29-Oct-97	0.49	0.14T	11.3 L	9.4T	11.4 L	1.2 L	0.4T	1.3 L	3.0 L	0.3T
12-Nov-97	--	--	11.3 L	12.4	11.4 L	1.2 L	4.2	0.9T	0.2T	0.4T
13-Nov-97	0.08T	0.29 L	--	--	--	--	--		--	--
26-Nov-97	0.26 L	0.29 L	11.3 L	8.6T	11.4 L	1.2 L	0.5T	1.3 L	0.1T	0.3T
10-Dec-97	0.14T	0.14T	11.3 L	11.7	11.4 L	0.5T	0.8T	1.3 L	0.2T	0.7T
23-Dec-97	0.09T	0.06T	11.3 L	12.5	11.4 L	1.2 L	0.6T	1.3 L	0.9T	0.7T
7-Jan-98	0.08T	0.09T	3.3T	5.5T	11.4 L	1.2 L	0.7T	1.3 L	0.3T	0.4T
21-Jan-98	0.19T	0.17T	11.3 L	4T	11.4 L	0.2T	0.5T	1.3 L	0.1T	0.4T
4-Feb-98	0.26 L	0.14T	2.5T	7.1T	2T	0.2T	0.7T	1.3 L	3.0 L	0.3T
18-Feb-98	0.27	0.26T	1.3T	3T	11.4 L	1.2 L	0.2T	1.3 L	3.0 L	0.4T
4-Mar-98	0.11T	0.14T	1.8T	2.7T	3.6T	1.2 L	0.3T	1.3 L	0.1T	0.3T
18-Mar-98	0.23T	0.28T	11.3 L	5T	11.4 L	0.3T	0.6T	1.3 L	0.2T	0.5T
1-Apr-98	0.23T	0.23T	11.3 L	4T	11.4 L	1.2 L	0.4T	1.3 L	0.2T	0.6T
15-Apr-98	0.24T	0.16T	11.3 L	10.4 L	11.4 L	1.2 L	0.4T	1.3 L	0.1T	0.4T
29-Apr-98	--	--	11.3 L	10.4 L	11.4 L	1.2 L	0.6T	1.3 L	0.6T	0.6T
13-May-98	0.17T	0.14T	0.5T	3.1T	11.4 L	1.2 L	0.2T	1.3 L	0.2T	0.5T
27-May-98	0.13T	0.1T	11.3 L	2.1T	11.4 L	1.2 L	0.3T	1.3 L	3.0 L	0.3T
10-Jun-98	0.09T	0.09T	11.3 L	1.9T	11.4 L	1.2 L	0.3T	1.3 L	3.0 L	0.4T
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	0.17T	0.16T	11.3 L	10.4 L	11.4 L	1.2 L	0.3T	1.3 L	0.1T	0.3T
8-Jul-98	0.09T	0.14T	11.3 L	3.3T	11.4 L	1.2 L	0.3T	1.3 L	0.2T	0.4T
22-Jul-98	0.11T	0.15T	11.3 L	2.5T	11.4 L	1.2 L	2.5 L	1.3 L	3.0 L	0.1T
6-Aug-98	0.05T	0.1T	11.3 L	2.7T	1.5T	1.2 L	0.2T	1.3 L	3.0 L	0.2T
19-Aug-98	0.06T	0.09T	11.3 L	5.8T	11.4 L	1.2 L	0.2T	1.3 L	3.0 L	0.2T
2-Sep-98	0.06T	0.1T	11.3 L	10.4 L	11.4 L	1.2 L	0.1T	1.3 L	3.0 L	0.2T
15-Sep-98	--	--	11.3 L	3.6T	11.4 L	1.2 L	0.2T	1.3 L	3.0 L	0.3T
16-Sep-98	0.19T	0.36	--	--	--	--	--	--	--	--
30-Sep-98	0.06T	0.09T	11.3 L	3.7T	11.4 L	1.2 L	0.2T	1.3 L	3.0 L	0.2T
14-Oct-98	0.08T	0.13T	2.8T	4.7T	1.5T	0.6T	2.6	0.4T	2.7T	--
28-Oct-98	0.02T	0.03T	1T	2.8T	0.5T	1.2 L	0.2T	1.3 L	3.0 L	0.3T
4-Nov-98	0.08T	0.13T	11.3 L	10.4 L	11.4 L	1.2 L	0.3T	1.3 L	0.1T	0.1T
25-Nov-98	0.22T	0.19T	11.3 L	2.9T	0.3T	0.1T	0.5T	1.3 L	3.0 L	0.2T
9-Dec-98	0.06T	0.07T	11.3 L	3T	0.2T	1.2 L	0.3T	1.3 L	0.1T	0.3T
22-Dec-98	--	--	0.8T	1T	0.2T	1.2 L	0.2T	1.3 L	3.0 L	0.3T
6-Jan-99	0.61	0.43	11.3 L	0.7T	11.4 L	1.2 L	0.3T	1.3 L	3.0 L	0.1T
20-Jan-99	0.15T	0.14T	0.2T	0.9T	11.4 L	1.2 L	0.2T	1.3 L	3.0 L	0.2T
3-Feb-99	0.07T	0.15T	11.3 L	10.4 L	--	--	2.5 L	1.3 L	3.0 L	2.7 L
17-Feb-99	0.11T	0.12T	0.5T	0.8T	11.4 L	1.2 L	0.2T	1.3 L	0.1T	0.2T
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	0.11T	0.14T	0.8T	1.1T	11.4 L	0.2T	0.4T	1.3 L	0.2T	0.4T
17-Mar-99	0.1T	0.11T	11.3 L	3.3T	0.3T	1.2 L	0.2T	1.3 L	3.0 L	0.3T
31-Mar-99	0.26 L	0.05T	1.3T	5.6T	2.8T	0.2T	0.1T	1.3 L	0.2T	0.3T

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	ENDRIN ALDEHYDE IN SEDIMENT	HXCCYCLO PENTADIENE IN SEDIMENT	PHOTO-MIREX IN SEDIMENT	HEXACHLORO-BUTADIENE IN SEDIMENT	OCTACHLORO-STYRENE IN SEDIMENT	HEXACHLORO-BENZENE IN SEDIMENT	ALPHA-BENZEN EHEXACHLORO IN SEDIMENT	GAMA-BENZENE HEXACHLORO IN SEDIMENT	HEPTACHLOR IN SEDIMENT	ALDRIN IN SEDIMENT
	287	288	289	96800	96801	96810	96811	96812	96813	96814
	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G
Detection Limit	**4.2**	**1.8**	**4.1**	**1.5**	**2.7**	**3.5**	**2.3**	**3.5**	**4.3**	**2.1**
2-Apr-97	4.2 L	1.8 L	4.1 L	0.4T	2.7 L	1.8T	2.3 L	3.5 L	4.3 L	2.1 L
23-Apr-97	4.2 L	1.8 L	4.1 L	0.2T	2.7 L	1.3T	2.3 L	3.5 L	4.3 L	2.1 L
30-Apr-97	4.2 L	1.8 L	4.1 L	0.3T	2.7 L	1.5T	2.3 L	3.5 L	4.3 L	2.1 L
11-May-97	--	--	--	--	--	--	--	--	--	--
14-May-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.7T	2.3 L	3.5 L	4.3 L	2.1 L
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	1.2T	2.3 L	3.5 L	4.3 L	2.1 L
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	1.4T	2.3 L	3.5 L	4.3 L	2.1 L
25-Jun-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.9T	2.3 L	3.5 L	4.3 L	2.1 L
9-Jul-97	4.2 L	1.8 L	4.1 L	1.6	--	7.8	0.2T	3.5 L	4.3 L	2.1 L
23-Jul-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	2.3T	1.1T	3.5 L	4.3 L	2.1 L
6-Aug-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	2.2T	0.4T	3.5 L	4.3 L	2.1 L
20-Aug-97	4.2 L	1.8 L	4.1 L	1.3T	2.7 L	1.8T	0.7T	3.5 L	4.3 L	2.1 L
3-Sep-97	4.2 L	1.8 L	4.1 L	0.2T	2.7 L	1.3T	0.9T	3.5 L	0.3T	2.1 L
17-Sep-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	2.3T	2.3 L	3.5 L	4.3 L	2.1 L
1-Oct-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	1T	0.3T	3.5 L	4.3 L	2.1 L
15-Oct-97	4.2 L	1.8 L	4.1 L	0.2T	2.7 L	3.5 L	0.3T	3.5 L	4.3 L	2.1 L
29-Oct-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.7T	2.3 L	3.5 L	4.3 L	2.1 L
12-Nov-97	4.2 L	1.8 L	4.1 L	0.1T	2.7 L	0.5T	0.3T	3.5 L	4.3 L	2.1 L
13-Nov-97	--	--	--	--	--	--	--	--	--	--
26-Nov-97	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.7T	2.3 L	3.5 L	4.3 L	2.1 L
10-Dec-97	4.2 L	1.8 L	4.1 L	0.2T	2.7 L	0.9T	0.4T	3.5 L	4.3 L	2.1 L
23-Dec-97	4.2 L	1.8 L	--	1.5 L	--	3.5 L	1.3T	3.5 L	4.3 L	2.1 L
7-Jan-98	4.2 L	1.8 L	4.1 L	0.3T	2.7 L	0.5T	0.5T	0.2T	4.3 L	2.1 L
21-Jan-98	4.2 L	1.8 L	4.1 L	0.1T	2.7 L	0.6T	0.3T	0.2T	4.3 L	2.1 L
4-Feb-98	4.2 L	1.8 L	4.1 L	0.1T	2.7 L	0.6T	0.5T	0.6T	4.3 L	2.1 L
18-Feb-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.4T	0.4T	0.2T	4.3 L	2.1 L
4-Mar-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	1.9T	0.5T	0.6T	4.3 L	2.1 L
18-Mar-98	4.2 L	1.8 L	4.1 L	0.1T	2.7 L	1.1T	0.6T	3.5 L	4.3 L	2.1 L
1-Apr-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	3.5 L	0.4T	3.5 L	4.3 L	2.1 L
15-Apr-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	3.5 L	0.7T	0.2T	4.3 L	2.1 L
29-Apr-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	1T	0.4T	3.5 L	4.3 L	2.1 L
13-May-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	1.1T	0.8T	0.4T	4.3 L	2.1 L
27-May-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	3.5 L	0.4T	0.2T	4.3 L	2.1 L
10-Jun-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	3.5 L	0.2T	3.5 L	4.3 L	2.1 L
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	3.5 L	0.2T	3.5 L	4.3 L	2.1 L
8-Jul-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.7T	2.3 L	3.5 L	4.3 L	2.1 L
22-Jul-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.6T	2.3 L	3.5 L	4.3 L	2.1 L
6-Aug-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.4T	2.3 L	0.5T	4.3 L	2.1 L
19-Aug-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.4T	0.4T	0.4T	4.3 L	2.1 L
2-Sep-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	3.5 L	2.3 L	3.5 L	4.3 L	2.1 L
15-Sep-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	3.5 L	0.5T	0.2T	4.3 L	2.1 L
16-Sep-98	--	--	--	--	--	--	--	--	--	--
30-Sep-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.3T	0.4T	3.5 L	4.3 L	2.1 L
14-Oct-98	4.2 L	1.8 L	4.1 L	1T	--	4.1	0.3T	0.1T	4.3 L	2.1 L
28-Oct-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.5T	2.3 L	0.1T	4.3 L	2.1 L
4-Nov-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.2T	2.3 L	3.5 L	4.3 L	2.1 L
25-Nov-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.5T	0.2T	3.5 L	4.3 L	2.1 L
9-Dec-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.6T	2.3 L	3.5 L	4.3 L	2.1 L
22-Dec-98	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.4T	2.3 L	3.5 L	4.3 L	2.1 L
6-Jan-99	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.2T	2.3 L	3.5 L	4.3 L	2.1 L
20-Jan-99	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.3T	2.3 L	3.5 L	4.3 L	2.1 L
3-Feb-99	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.6T	2.3 L	3.5 L	4.3 L	2.1 L
17-Feb-99	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.4T	2.3 L	3.5 L	4.3 L	2.1 L
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	4.2 L	1.8 L	4.1 L	0.1T	2.7 L	0.6T	0.2T	3.5 L	4.3 L	2.1 L
17-Mar-99	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.7T	0.1T	3.5 L	4.3 L	2.1 L
31-Mar-99	4.2 L	1.8 L	4.1 L	1.5 L	2.7 L	0.5T	2.3 L	3.5 L	4.3 L	2.1 L

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	HEPTACHLOR-EPOXIDE SEDIMENT	GAMA-CHLORDANE SEDIMENT	ALPHA-CHLORDANE SEDIMENT	ALPHA-ENDOSULFAN SEDIMENT	PP-DDE SEDIMENT	DIELDRIN SEDIMENT	ENDRIN SEDIMENT	OP-DDT SEDIMENT	PP-DDD SEDIMENT	PP-DDT SEDIMENT
	96815	96816	96817	96818	96819	96820	96821	96822	96823	96824
	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G
Detection Limit	**3.2**	**2.8**	**2.9**	**3.1**	**6.4**	**6.8**	**7.3**	**9.4**	**16.7**	**9.3**
2-Apr-97	3.2 L	2.3T	2.9 L	3.1 L	356	6.8 L	7.3 L	17.1	357	144
23-Apr-97	3.2 L	1.6T	1.7T	3.1 L	8.2	6.8 L	7.3 L	9.4 L	6.7T	4.9T
30-Apr-97	3.2 L	2.1T	5.6	3.1 L	80.9	6.8 L	7.3 L	9.4	116	67.8
11-May-97	--	--	--	--	--	--	--	--	--	--
14-May-97	3.2 L	8.2	1.7T	3.1 L	24.7	6.8 L	7.3 L	2.2T	23.2	18.4
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	3.2 L	8.9	2.1T	3.1 L	56	6.8 L	7.3 L	3.1T	4.1T	25.6
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	3.2 L	4.6	2.4T	3.1 L	113	9.1	7.3 L	8.7T	57.6	61.2
25-Jun-97	3.2 L	5.2	2.9 L	3.1 L	92.8	6.8 L	7.3 L	5.8T	45	50.2
9-Jul-97	1.1T	2.8 L	2.9 L	3.1 L	6.2T	0.8T	7.3 L	1.1T	1T	4.9T
23-Jul-97	1.7T	2.8 L	2.9 L	3.1 L	29.2	1T	7.3 L	1.4T	10.6T	7.7T
6-Aug-97	0.7T	2.8 L	2.9 L	3.1 L	23.4	0.5T	7.3 L	1T	7.9T	5T
20-Aug-97	3.2 L	2.8 L	2.9 L	3.1 L	102	1.3T	7.3 L	2.8T	40.9	22.4
3-Sep-97	3.2 L	2.8 L	2.9 L	3.1 L	59.3	0.7T	7.3 L	3.3T	27.7	22.8
17-Sep-97	3.2 L	2.8 L	2.9 L	3.1 L	135	0.9T	7.3 L	2.6T	59	26.2
1-Oct-97	3.2 L	2.8 L	2.9 L	3.1 L	11.2	1T	7.3 L	9.4 L	5.4T	6.9T
15-Oct-97	0.6T	2.8 L	2.9 L	3.1 L	14.8	1.1T	7.3 L	9.4 L	10.7T	2.7T
29-Oct-97	3.2 L	2.8 L	2.9 L	3.1 L	8.3	1.1T	7.3 L	0.4T	4.4T	4.2T
12-Nov-97	3.2 L	2.8 L	2.9 L	3.1 L	15.7	1.8T	7.3 L	0.3T	11.5T	2.1T
13-Nov-97	--	--	--	--	--	--	--	--	--	--
26-Nov-97	0.5T	2.8 L	2.9 L	3.1 L	13	1.7T	7.3 L	0.3T	9.3T	3.2T
10-Dec-97	3.2 L	2.8 L	2.9 L	3.1 L	48.2	1.5T	7.3 L	1.4T	33.2	9.6
23-Dec-97	3.2 L	2.8 L	2.9 L	3.1 L	338	2.2T	7.3 L	5.7T	399	34.7
7-Jan-98	3.2 L	2.8 L	1.4T	3.1 L	28.2	1.1T	0.7T	1.1T	24.4	11.7
21-Jan-98	3.2 L	2.8 L	0.5T	3.1 L	29.1	0.8T	7.3 L	0.7T	26.8	5.1T
4-Feb-98	3.2 L	2.8 L	1.7T	3.1 L	40.8	1.3T	7.3 L	1.3T	35.8	12.5
18-Feb-98	3.2 L	1.3T	2.1T	3.1 L	111	0.9T	0.8T	3.2T	73.1	13
4-Mar-98	3.2 L	0.4T	2.9 L	3.1 L	57	1.7T	7.3 L	9.4 L	23.4	10.5
18-Mar-98	3.2 L	0.4T	1.1T	3.1 L	24	0.6T	7.3 L	1.7T	0.2T	11.2
1-Apr-98	3.2 L	2.8 L	1.1T	3.1 L	89.9	2T	7.3 L	9.4 L	34	29.4
15-Apr-98	3.2 L	0.3T	1.5T	3.1 L	41	2.4T	7.3 L	9.4 L	18.6	16.4
29-Apr-98	0.5T	2.8 L	1.5T	0.6T	49.3	3.7T	7.3 L	9.4 L	24.9	21.7
13-May-98	1.7T	2.8 L	2.7T	2.1T	42.1	5.8T	7.3 L	9.4 L	18.3	15.5
27-May-98	3.2 L	0.5T	0.7T	3.1 L	101	1.5T	7.3 L	9.4 L	48.2	28.8
10-Jun-98	3.2 L	2.8 L	0.9T	3.1 L	117	2.2T	7.3 L	9.4 L	72.2	33.2
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	3.2 L	0.4T	2.9 L	3.1 L	61.1	1.5T	7.3 L	9.4 L	30.4	14.5
8-Jul-98	0.7T	0.6T	0.3T	0.2T	23	0.8T	7.3 L	1T	5.6T	12.2
22-Jul-98	3.2 L	0.1T	2.9 L	3.1 L	5.6	0.8T	7.3 L	9.4 L	4.1T	4.7T
6-Aug-98	3.2 L	0.2T	0.5T	3.1 L	43.7	1.2T	7.3 L	9.4 L	61.3	14
19-Aug-98	3.2 L	0.4T	0.6T	3.1 L	33.6	1.2T	7.3 L	9.4 L	33.7	8.5T
2-Sep-98	3.2 L	0.6T	0.9T	3.1 L	31.5	1T	7.3 L	9.4 L	28.8	11.2
15-Sep-98	3.2 L	0.6T	1.1T	3.1 L	18	1.5T	7.3 L	9.4 L	15.8T	9.7
16-Sep-98	--	--	--	--	--	--	--	--	--	--
30-Sep-98	0.7T	0.6T	0.2T	0.2T	29.4	1.3T	7.3 L	0.4T	17.7	5.4T
14-Oct-98	3.2 L	0.3T	0.4T	3.1 L	3.4T	0.5T	7.3 L	9.4 L	1.7T	1.6T
28-Oct-98	3.2 L	0.4T	2.9 L	3.1 L	14.2	0.9T	7.3 L	0.2T	8.3T	2.6T
4-Nov-98	0.6T	0.5T	0.4T	3.1 L	25.9	1.2T	7.3 L	0.5T	14.7T	3.4T
25-Nov-98	0.1T	0.3T	0.2T	3.1 L	3.8T	0.5T	7.3 L	0.3T	1.9T	1.1T
9-Dec-98	3.2 L	0.4T	2.9 L	3.1 L	10.3	0.9T	7.3 L	0.3T	6.4T	3T
22-Dec-98	3.2 L	0.6T	1.6T	3.1 L	22.9	0.5T	0.7T	0.5T	10.3T	13.5
6-Jan-99	3.2 L	2.8 L	0.3T	0.1T	1.5T	0.5T	0.3T	9.4 L	1T	0.5T
20-Jan-99	3.2 L	2.8 L	0.2T	3.1 L	3T	0.4T	0.4T	9.4 L	2.1T	9.3 L
3-Feb-99	3.2 L	2.8 L	0.8T	3.1 L	7.6	1.3T	7.3 L	9.4 L	10.7T	9.3 L
17-Feb-99	3.2 L	0.1T	0.2T	3.1 L	4.7T	0.2T	0.2T	9.4 L	4T	9.3 L
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	3.2 L	0.8T	1.7T	3.1 L	14.2	1.1T	0.2T	0.6T	10.7T	10
17-Mar-99	3.2 L	0.5T	0.6T	0.1T	3.7T	0.4T	0.2T	9.4 L	3.1T	9.3 L
31-Mar-99	3.2 L	2.8 L	0.1T	3.1 L	3.5T	0.5T	7.3 L	9.4 L	3.4T	9.3 L

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	BETA-ENDOSULFAN SEDIMENT	MIREX SEDIMENT	METHOXYCHLOR SEDIMENT	POLYCHLORINATED BIPHENYL SEDIMENT	TOTAL POLYCHLORINATED BIPHENYL-CONGENER	FLUOR-ANTHENE	PYRENE	BENZ(A) ANTHRACENE	BENZO(A) PYRENE	NAPHTHALENE IN SEDIMENT
	96825	96826	96827	96828	103389	96510	96511	96512	96518	290
	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G
Detectiom Limit	**5.9**	**4.4**	**48.0**	**89.0**	**60.3**	**90.0**	**168**	**137**	**161**	**82**
2-Apr-97	5.9 L	4.4 L	48.0 L	89.0 L	--	496	374	164	193	44T
23-Apr-97	5.9 L	4.4 L	48.0 L	29.4T	--	243	185	78T	104T	26T
30-Apr-97	5.9 L	4.4 L	48.0 L	32.6T	--	283	216	86T	106T	34T
11-May-97	--	--	--	--	--	--	--	--	--	--
14-May-97	5.9 L	4.4 L	48.0 L	33.3T	--	379	265	136T	131T	16T
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	5.9 L	4.4 L	48.0 L	89.0 L	--	487	333	150	156T	19T
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	5.9 L	4.4 L	48.0 L	59.2T	--	304	218	96T	124T	82. L
25-Jun-97	5.9 L	4.4 L	48.0 L	89.0 L	--	499	395	180	224	17T
9-Jul-97	5.9 L	1.4T	48.0 L	68T	--	1120	798	586	606	45T
23-Jul-97	5.9 L	4.4 L	1.4T	89.0 L	--	473	345	251	232	27T
6-Aug-97	5.9 L	4.4 L	0.5T	89.0 L	--	257	188	121T	127T	21T
20-Aug-97	5.9 L	4.4 L	34.7T	89.0 L	--	555	401	267	250	21T
3-Sep-97	5.9 L	4.4 L	48.0 L	41.1T	--	1640	1140	681	639	62T
17-Sep-97	5.9 L	4.4 L	1T	89.0 L	--	781	580	357	357	23T
1-Oct-97	5.9 L	4.4 L	48.0 L	81.4T	--	278	214	140	136T	16T
15-Oct-97	5.9 L	0.2T	48.0 L	89.0 L	--	237	185	101T	103T	15T
29-Oct-97	5.9 L	4.4 L	48.0 L	89.0 L	--	229	182	93T	101T	15T
12-Nov-97	5.9 L	4.4 L	48.0 L	89.0 L	--	242	202	103T	107T	27T
13-Nov-97	--	--	--	--	--	--	--	--	--	--
26-Nov-97	5.9 L	0.1T	48.0 L	89.0 L	--	180	141T	68T	86T	25T
10-Dec-97	5.9 L	0.1T	48.0 L	89.0 L	--	483	406	192	201	41T
23-Dec-97	5.9 L	0.6T	48.0 L	89.0 L	--	831	709	336	252	28T
7-Jan-98	5.9 L	4.4 L	48.0 L	44.7T	--	525	472	188	243	20T
21-Jan-98	5.9 L	4.4 L	48.0 L	42.5T	--	259	212	102T	139T	20T
4-Feb-98	5.9 L	4.4 L	48.0 L	45.9T	--	463	544	166	221	27T
18-Feb-98	1.3T	4.4 L	48.0 L	46.5T	--	1070	834	310	369	21T
4-Mar-98	5.9 L	4.4 L	11.7T	35.6T	--	337	246	112T	109T	12T
18-Mar-98	5.9 L	4.4 L	5.4T	63.2T	--	628	456	200	242	24T
1-Apr-98	5.9 L	4.4 L	48.0 L	--	87.4	811	647	311	369	29T
15-Apr-98	5.9 L	4.4 L	48.0 L	--	95.6	1100	960	407	472	33T
29-Apr-98	5.9 L	4.4 L	48.0 L	--	81.7	394	356	153	173	82. L
13-May-98	5.9 L	4.4 L	48.0 L	--	83.4	374	365	134T	144T	19T
27-May-98	5.9 L	4.4 L	48.0 L	--	97	372	304	175	218	82. L
10-Jun-98	5.9 L	4.4 L	48.0 L	--	84.7	657	710	236	280	22T
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	5.9 L	4.4 L	48.0 L	--	76.4	414	375	173	199	82. L
8-Jul-98	5.9 L	4.4 L	48.0 L	--	49.4T	1590	930	286	553	36T
22-Jul-98	5.9 L	4.4 L	48.0 L	--	36.7T	162	126T	59T	88T	82. L
6-Aug-98	5.9 L	4.4 L	48.0 L	--	37.3T	575	452	229	309	38T
19-Aug-98	5.9 L	4.4 L	48.0 L	--	61	450	363	169	228	82. L
2-Sep-98	5.9 L	4.4 L	48.0 L	--	57.1T	663	523	243	326	82. L
15-Sep-98	5.9 L	4.4 L	48.0 L	--	60.4	896	679	301	377	82. L
16-Sep-98	--	--	--	--	--	--	--	--	--	--
30-Sep-98	5.9 L	4.4 L	48.0 L	--	41.3T	627	451	160	401	82. L
14-Oct-98	5.9 L	0.8T	48.0 L	--	69.5	446	366	203	304	106
28-Oct-98	5.9 L	4.4 L	48.0 L	--	36.8T	240	195	91T	139T	12T
4-Nov-98	5.9 L	4.4 L	48.0 L	--	44.5T	252	195	99T	162	82. L
25-Nov-98	5.9 L	4.4 L	48.0 L	--	38.9T	126	103T	50T	78T	82. L
9-Dec-98	5.9 L	4.4 L	48.0 L	--	35.5T	173	202	85T	202	16T
22-Dec-98	0.2T	4.4 L	48.0 L	--	42.8T	443	359	158	184	13T
6-Jan-99	0.2T	4.4 L	48.0 L	--	20.7T	96	73T	30T	33T	8T
20-Jan-99	0.2T	4.4 L	48.0 L	--	22.6T	109	86T	36T	42T	8T
3-Feb-99	5.9 L	4.4 L	48.0 L	--	165	600	437	171	167	18T
17-Feb-99	5.9 L	4.4 L	48.0 L	--	37.5T	163	121T	50T	55T	11T
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	0.4T	4.4 L	48.0 L	--	50.1T	749	524	193	194	18T
17-Mar-99	0.2T	4.4 L	48.0 L	--	41.6T	192	140T	62T	84T	10T
31-Mar-99	5.9 L	4.4 L	48.0 L	--	35.6T	113	77T	36T	47T	82. L

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	2-METHYL NAPHTHALENE IN SEDIMENT	1-METHYL NAPHTHALENE IN SEDIMENT	B-CHLORO NAPHTHALENE IN SEDIMENT	ACE NAPHTHYLENE IN SEDIMENT	FLUORENE IN SEDIMENT	PHENANTHRENE IN SEDIMENT	ANTHRACENE IN SEDIMENT	INDENO(123-CD)PYRENE IN SEDIMENT	DIBENZO(AH) ANTHRACEN IN SEDIMENT	BENZO(GHI) PERLENE IN SEDIMENT
	291	292	293	294	295	296	297	298	299	300
	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G	NG/G
Detection Limit	**281**	**80**	**378**	**89**	**160**	**193**	**169**	**161**	**148**	**149**
2-Apr-97	17T	80. L	378. L	89. L	19T	194	37T	147T	30T	126T
23-Apr-97	16T	12T	378. L	89. L	13T	124T	20T	90T	16T	84T
30-Apr-97	17T	12T	378. L	89. L	13T	135T	28T	82T	18T	71T
11-May-97	--	--	--	--	--	--	--	--	--	--
14-May-97	12T	8T	378. L	13T	17T	189T	52T	89T	21T	75T
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	17T	12T	378. L	17T	21T	239	50T	104T	22T	85T
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	14T	12T	378. L	89. L	13T	145T	169. L	106T	148. L	96T
25-Jun-97	18T	13T	378. L	89. L	18T	239	48T	188	35T	171
9-Jul-97	29T	21T	378. L	45T	46T	650	102T	549	97T	412
23-Jul-97	22T	18T	378. L	28T	26T	328	62T	177	26T	149. L
6-Aug-97	13T	11T	378. L	15T	12T	159T	27T	102T	18T	76T
20-Aug-97	17T	12T	378. L	11T	21T	331	46T	200	36T	149. L
3-Sep-97	38T	27T	378. L	23T	59T	1060	124T	462	89T	149. L
17-Sep-97	22T	19T	378. L	27T	49T	79T	103T	297	54T	239
1-Oct-97	18T	12T	378. L	8T	13T	153T	28T	173	148. L	193
15-Oct-97	14T	10T	378. L	89. L	10T	133T	18T	124T	148. L	149. L
29-Oct-97	16T	12T	378. L	89. L	10T	111T	12T	144T	148. L	113T
12-Nov-97	17T	12T	378. L	89. L	11T	137T	22T	130T	148. L	149. L
13-Nov-97	--	--	--	--	--	--	--	--	--	--
26-Nov-97	16T	10T	378. L	89. L	9T	104T	11T	95T	148. L	149. L
10-Dec-97	30T	20T	378. L	89. L	24T	314	37T	226	148. L	191
23-Dec-97	36T	23T	378. L	14T	41T	513	62T	291	45T	237
7-Jan-98	27T	12T	378. L	89. L	20T	254	30T	285	54T	269
21-Jan-98	18T	12T	378. L	89. L	11T	130T	16T	151T	130T	149. L
4-Feb-98	26T	16T	378. L	8T	28T	315	169. L	241	148. L	198
18-Feb-98	22T	13T	378. L	9T	29T	485	57T	380	65T	331
4-Mar-98	13T	9T	378. L	89. L	17T	183T	36T	103T	148. L	149. L
18-Mar-98	24T	15T	378. L	10T	21T	289	39T	243	148. L	202
1-Apr-98	28T	22T	378. L	89. L	31T	382	46T	427	148. L	363
15-Apr-98	28T	22T	378. L	11T	44T	553	65T	447	148. L	411
29-Apr-98	281. L	80. L	378. L	17T	23T	225	39T	161. L	148. L	132T
13-May-98	15T	80. L	378. L	89. L	21T	204	169. L	161. L	148. L	149. L
27-May-98	13T	80. L	378. L	89. L	20T	180T	29T	209	148. L	149. L
10-Jun-98	23T	80. L	378. L	12T	28T	334	43T	244	148. L	149. L
11-Jun-98	--	--	--	--	--	--	--	--	--	--
24-Jun-98	15T	80. L	378. L	89. L	17T	182T	33T	184	28T	149. L
8-Jul-98	281. L	80. L	378. L	39T	45T	814	123T	1070	152	149. L
22-Jul-98	281. L	80. L	378. L	89. L	160. L	75T	13T	116T	148. L	149. L
6-Aug-98	20T	80. L	378. L	31T	26T	288	55T	319	148. L	149. L
19-Aug-98	21T	80. L	378. L	89. L	17T	212	45T	255	148. L	149. L
2-Sep-98	281. L	80. L	378. L	25T	21T	331	57T	323	148. L	288
15-Sep-98	281. L	16T	378. L	36T	32T	477	89T	417	76T	149. L
16-Sep-98	--	--	--	--	--	--	--	--	--	--
30-Sep-98	11T	80. L	378. L	89. L	15T	334	48T	426	148. L	149. L
14-Oct-98	22T	11T	378. L	34T	29T	183T	56T	267	148. L	180
28-Oct-98	12T	10T	378. L	89. L	10T	102T	19T	143T	148. L	149. L
4-Nov-98	10T	10T	378. L	89. L	12T	130T	22T	164	148. L	149. L
25-Nov-98	281. L	80. L	378. L	89. L	7T	100T	17T	158T	148. L	105T
9-Dec-98	9T	7T	378. L	12T	9T	96T	16T	113T	22T	103T
22-Dec-98	11T	8T	378. L	9T	16T	178T	32T	184	148. L	174
6-Jan-99	5T	3T	378. L	89. L	4T	39T	7T	35T	148. L	33T
20-Jan-99	5T	4T	378. L	89. L	6T	47T	8T	46T	148. L	44T
3-Feb-99	21T	12T	378. L	13T	22T	264	40T	196	148. L	178
17-Feb-99	9T	6T	378. L	5T	9T	78T	11T	58T	148. L	55T
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	20T	13T	378. L	15T	22T	277	41T	226	148. L	211
17-Mar-99	9T	6T	378. L	89. L	9T	92T	12T	84T	148. L	78T
31-Mar-99	5T	80. L	378. L	4T	4T	52T	7T	51T	148. L	48T

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	ATRAZINE IN SEDIMENT	METOLACHLOR IN SEDIMENT	CHRYSENE AND /OR TRIPHENY LENE	BENZO(B AND/ OR K)FLUORAN THENE	ALUMINUM TOTAL - ICP	BARIUM TOTAL - ICP	BERYLLIUM TOTAL - ICP	CADMIUM TOTAL - ICP	COBALT TOTAL - ICP	CHROMIUM TOTAL - ICP
	305	306	2671	2673	100216P	100217P	100218P	100219P	100220P	100221P
	NG/G	NG/G	NG/G	NG/G	MG/L	MG/L	MUG/L	MG/L	MG/L	MG/L
Detection Limit	**856**	**441**	**193**	**191**	**0.002**	**0.0002**	**0.05**	**0.0001**	**0.0001**	**0.0002**
2-Apr-97	856. L	441. L	267	456	0.039	0.0206	0.05 L	0.0001 L	0.0001	0.0003
23-Apr-97	856. L	441. L	152T	272	0.055	0.0189	0.05 L	0.0001 L	0.0001	0.0002 L
30-Apr-97	856. L	441. L	148T	236	0.056	0.0196	0.05 L	0.0001 L	0.0001	0.0002 L
11-May-97	--	--	--	--	--	--	--	--	--	--
14-May-97	856. L	441. L	181T	283	0.079	0.0197	0.05 L	0.0001 L	0.0001	0.0002
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	856. L	441. L	208	338	0.046	0.0198	0.05 L	0.0001 L	0.0001	0.0002 L
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	856. L	441. L	162T	285	0.07	0.0212	0.05 L	0.0001	0.0001	0.0002
25-Jun-97	856. L	441. L	274	514	0.076	0.0199	0.05 L	0.0001 L	0.0001	0.0002
9-Jul-97	856. L	441. L	580	1450	0.219	0.0219	0.05 L	0.0001	0.0002	0.0006
23-Jul-97	856. L	441. L	234	510	0.041	0.0199	0.05 L	0.0001 L	0.0001 L	0.0003
6-Aug-97	856. L	441. L	135T	280	0.044	0.0206	0.05 L	0.0001 L	0.0001 L	0.0002
20-Aug-97	856. L	441. L	268	575	0.067	0.0206	0.05 L	0.0001 L	0.0001	0.0002
3-Sep-97	856. L	441. L	715	1560	0.343	0.0235	0.05 L	0.0001	0.0004	0.0007
17-Sep-97	856. L	441. L	333	834	0.101	0.0216	0.05 L	0.0001 L	0.0003	0.0003
1-Oct-97	856. L	441. L	123T	328	0.254	0.023	0.05 L	0.0001	0.0003	0.0004
15-Oct-97	856. L	441. L	86T	238	0.037	0.021	0.05 L	0.0001 L	0.0001 L	0.0002
29-Oct-97	856. L	441. L	94T	250	0.576	0.0247	0.05 L	0.0001	0.0005	0.0008
12-Nov-97	856. L	441. L	94T	255	0.076	0.0208	0.05 L	0.0001 L	0.0001	0.0002 L
13-Nov-97	--	--	--	--	--	--	--	--	--	--
26-Nov-97	856. L	441. L	90T	217	0.292	0.0224	0.05 L	0.0001 L	0.0003	0.0004
10-Dec-97	856. L	441. L	198	487	0.055	0.0202	0.05 L	0.0001 L	0.0001	0.0002 L
23-Dec-97	856. L	441. L	300	766	0.054	0.0209	0.05 L	0.0001 L	0.0001	0.0002 L
7-Jan-98	856. L	441. L	342	650	--	--	--	--	--	--
21-Jan-98	856. L	441. L	180T	330	0.13	0.0206	0.05 L	0.0001 L	0.0001	0.0003
4-Feb-98	856. L	441. L	301	544	0.137	0.0205	0.05 L	0.0001 L	0.0002	0.0002 L
18-Feb-98	856. L	441. L	536	1100	0.054	0.0202	0.05 L	0.0001 L	0.0001	0.0002 L
4-Mar-98	856. L	441. L	159T	315	0.046	0.0202	0.05 L	0.0001 L	0.0001	0.0002 L
18-Mar-98	856. L	441. L	331	625	0.136	0.0206	0.05 L	0.0001 L	0.0001	0.0003
1-Apr-98	856. L	441. L	462	968	0.25	0.023	0.05 L	0.0001	0.0002	0.0004
15-Apr-98	856. L	441. L	591	1240	0.259	0.0225	0.05 L	0.0001	0.0002	0.0007
29-Apr-98	856. L	441. L	201	389	0.153	0.0203	0.05 L	0.0001	0.0003	0.0004
13-May-98	856. L	441. L	200	387	0.041	0.0188	0.05 L	0.0001 L	0.0001	0.0002 L
27-May-98	856. L	441. L	218	488	0.05	0.0191	0.05 L	0.0001 L	0.0001	0.0002 L
10-Jun-98	856. L	441. L	345	654	--	--	--	--	--	--
11-Jun-98	--	--	--	--	0.052	0.0192	0.05 L	0.0001 L	0.0001	0.0002 L
24-Jun-98	856. L	441. L	239	501	0.038	0.0191	0.05 L	0.0001 L	0.0001 L	0.0002 L
8-Jul-98	856. L	441. L	394	1240	0.044	0.0199	0.05 L	0.0001 L	0.0001 L	0.0002 L
22-Jul-98	856. L	441. L	102T	220	1.41	0.0279	0.07	0.0003	0.001	0.0022
6-Aug-98	856. L	441. L	306	645	0.26	0.0214	0.05 L	0.0001 L	0.0003	0.0003
19-Aug-98	856. L	441. L	256	532	0.485	0.0223	0.05 L	0.0001	0.0004	0.0008
2-Sep-98	856. L	441. L	356	735	0.011	0.0193	0.05 L	0.0001 L	0.0001	0.0002 L
15-Sep-98	856. L	441. L	473	893	--	--	--	--	--	--
16-Sep-98	--	--	--	--	0.056	0.0202	0.05 L	0.0001 L	0.0001	0.0002
30-Sep-98	856. L	441. L	222	805	0.045	0.0194	0.05 L	0.0001 L	0.0001	0.0002 L
14-Oct-98	856. L	441. L	299	608	0.114	0.0198	0.05 L	0.0001 L	0.0001	0.0002
28-Oct-98	856. L	441. L	148T	329	0.399	0.0216	0.05 L	0.0001	0.0004	0.0005
4-Nov-98	856. L	441. L	150T	348	0.031	0.0203	0.05 L	0.0001 L	0.0001 L	0.0002 L
25-Nov-98	856. L	441. L	91T	201	0.43	0.0224	0.05 L	0.0001 L	0.0003	0.0006
9-Dec-98	856. L	441. L	149T	385	--	--	--	--	--	--
22-Dec-98	856. L	441. L	211	460	0.407	0.0243	0.05 L	0.0001	0.0004	0.0007
6-Jan-99	856. L	441. L	54T	95T	1.74	0.0324	0.09	0.0005	0.0013	0.0029
20-Jan-99	856. L	441. L	65T	112T	0.295	0.024	0.05 L	0.0001	0.0002	0.0003
3-Feb-99	856. L	441. L	263	506	0.192	0.0219	0.05 L	0.0001 L	0.0002	0.0003
17-Feb-99	856. L	441. L	87T	149T	0.358	0.0227	0.05 L	0.0001	0.0003	0.0007
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	856. L	441. L	320	605	0.08	0.0209	0.05 L	0.0001 L	0.0001	0.0003
17-Mar-99	856. L	441. L	110T	201	0.747	0.0264	0.05 L	0.0002	0.0007	0.0014
31-Mar-99	856. L	441. L	69T	123T	0.213	0.0232	0.05 L	0.0001 L	0.0002	0.0004

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	COPPER TOTAL - ICP 100222P MG/L	IRON TOTAL - ICP 100223P MG/L	LITHIUM TOTAL - ICP 100224P MG/L	MANGANESE TOTAL - ICP 100225P MG/L	MOLYBDENUM TOTAL - ICP 100226P MG/L	NICKEL TOTAL - ICP 100227P MG/L	LEAD TOTAL - ICP 100228P MG/L	STRONTIUM TOTAL - ICP 100229P MG/L	VANADIUM TOTAL - ICP 100230P MG/L	ZINC TOTAL - ICP 100231P MG/L
Detection Limit	**0.0002**	**0.0004**	**0.0001**	**0.0001**	**0.0001**	**0.0002**	**0.0002**	**0.0001**	**0.0001**	**0.0002**
2-Apr-97	0.0009	0.0549	0.002	0.0022	0.001	0.0009	0.0003	0.144	0.0003	0.0013
23-Apr-97	0.0009	0.0873	0.002	0.0032	0.001	0.0009	0.0002 L	0.138	0.0003	0.0005
30-Apr-97	0.001	0.089	0.0021	0.0029	0.001	0.0007	0.0002 L	0.144	0.0003	0.0005
11-May-97	--	--	--	--	--	--	--	--	--	--
14-May-97	0.0008	0.148	0.0022	0.0059	0.001	0.0009	0.0002 L	0.156	0.0004	0.0012
15-May-97	--	--	--	--	--	--	--	--	--	--
28-May-97	0.0008	0.06	0.0022	0.002	0.0011	0.0007	0.0002	0.153	0.0003	0.0003
29-May-97	--	--	--	--	--	--	--	--	--	--
11-Jun-97	0.0009	0.114	0.0025	0.0041	0.0011	0.0009	0.0004	0.152	0.0004	0.0007
25-Jun-97	0.0009	0.121	0.002	0.0052	0.001	0.001	0.0002 L	0.147	0.0003	0.0005
9-Jul-97	0.002	0.396	0.0026	0.0146	0.001	0.0012	0.0017	0.149	0.0007	0.005
23-Jul-97	0.0008	0.0483	0.0019	0.0024	0.0012	0.0008	0.0002 L	0.143	0.0002	0.0005
6-Aug-97	0.0009	0.0465	0.0022	0.0019	0.0013	0.0008	0.0002	0.146	0.0003	0.0005
20-Aug-97	0.0008	0.116	0.0021	0.0042	0.0011	0.0007	0.0004	0.145	0.0003	0.0006
3-Sep-97	0.0034	0.622	0.0029	0.0294	0.0011	0.0015	0.0024	0.149	0.0008	0.0056
17-Sep-97	0.0011	0.191	0.0021	0.0076	0.0009	0.0013	0.0002	0.151	0.0003	0.0009
1-Oct-97	0.0013	0.423	0.0027	0.0123	0.0011	0.0009	0.0002 L	0.151	0.0007	0.0018
15-Oct-97	0.0009	0.0555	0.0021	0.002	0.0011	0.0007	0.0002 L	0.143	0.0003	0.0002 L
29-Oct-97	0.0013	0.933	0.0034	0.0242	0.001	0.0019	0.0011	0.15	0.0012	0.0035
12-Nov-97	0.0007	0.111	0.0021	0.0034	0.0011	0.0007	0.0002 L	0.148	0.0003	0.0006
13-Nov-97	--	--	--	--	--	--	--	--	--	--
26-Nov-97	0.0013	0.424	0.0026	0.0114	0.0011	0.0012	0.0002 L	0.158	0.0007	0.0022
10-Dec-97	0.001	0.102	0.0021	0.0022	0.0011	0.0008	0.0004	0.142	0.0003	0.0005
23-Dec-97	0.0009	0.0792	0.0023	0.0024	0.0011	0.0007	0.0003	0.148	0.0003	0.0006
7-Jan-98	--	--	--	--	--	--	--	--	--	--
21-Jan-98	0.001	0.261	0.0024	0.0073	0.0011	0.0008	0.0002 L	0.145	0.0005	0.0013
4-Feb-98	0.0015	0.215	0.0024	0.0096	0.0011	0.0007	0.0002 L	0.145	0.0004	0.0011
18-Feb-98	0.0011	0.0917	0.0022	0.0042	0.0011	0.0006	0.0002 L	0.145	0.0003	0.0007
4-Mar-98	0.001	0.0794	0.002	0.0039	0.0012	0.0009	0.0002 L	0.146	0.0003	0.0005
18-Mar-98	0.0013	0.228	0.0025	0.0063	0.0011	0.0009	0.0006	0.146	0.0005	0.0022
1-Apr-98	0.0013	0.412	0.0028	0.0125	0.001	0.0011	0.0006	0.155	0.0007	0.004
15-Apr-98	0.0013	0.492	0.0028	0.0205	0.001	0.0012	0.0014	0.155	0.0008	0.0028
29-Apr-98	0.0014	0.296	0.0023	0.0181	0.0011	0.001	0.0002	0.163	0.0005	0.0021
13-May-98	0.0009	0.0643	0.0019	0.0025	0.001	0.0009	0.0002 L	0.148	0.0002	0.0005
27-May-98	0.0007	0.086	0.0017	0.0028	0.0011	0.0008	0.0002 L	0.141	0.0002	0.0003
10-Jun-98	--	--	--	--	--	--	--	--	--	--
11-Jun-98	0.001	0.0844	0.0018	0.0032	0.001	0.0007	0.0002 L	0.139	0.0003	0.0004
24-Jun-98	0.001	0.0863	0.0021	0.002	0.001	0.0006	0.0002 L	0.137	0.0002	0.0003
8-Jul-98	0.0014	0.0504	0.0019	0.0021	0.0011	0.0007	0.0002 L	0.144	0.0003	0.0004
22-Jul-98	0.0036	2.19	0.0041	0.0776	0.0011	0.0035	0.0029	0.152	0.0027	0.01
6-Aug-98	0.0023	0.458	0.0022	0.0156	0.0012	0.0011	0.0002	0.153	0.0008	0.0051
19-Aug-98	0.0016	0.724	0.0026	0.0287	0.0011	0.0015	0.0014	0.147	0.0011	0.0043
2-Sep-98	0.001	0.0176	0.0018	0.0006	0.0012	0.0006	0.0004	0.145	0.0003	0.0003
15-Sep-98	--	--	--	--	--	--	--	--	--	--
16-Sep-98	0.001	0.0819	0.0019	0.0032	0.0012	0.0007	0.0002 L	0.148	0.0003	0.0005
30-Sep-98	0.001	0.0669	0.0017	0.0026	0.0011	0.0009	0.0002 L	0.142	0.0003	0.0005
14-Oct-98	0.0007	0.146	0.0021	0.0049	0.0011	0.0008	0.0005	0.143	0.0004	0.0004
28-Oct-98	0.0015	0.672	0.0029	0.0205	0.0012	0.0014	0.0014	0.148	0.0011	0.0034
4-Nov-98	0.0004	0.0354	0.002	0.0014	0.0013	0.0006	0.0002 L	0.149	0.0003	0.0005
25-Nov-98	0.0012	0.646	0.002	0.0143	0.0012	0.0013	0.0008	0.141	0.001	0.0024
9-Dec-98	--	--	--	--	--	--	--	--	--	--
22-Dec-98	0.0015	0.635	0.0025	0.0166	0.0012	0.0015	0.001	0.145	0.001	0.0032
6-Jan-99	0.004	3.08	0.005	0.0683	0.0012	0.0039	0.003	0.152	0.0032	0.0133
20-Jan-99	0.0016	0.498	0.0028	0.0107	0.0011	0.0012	0.0008	0.149	0.0007	0.0026
3-Feb-99	0.0012	0.318	0.002	0.0092	0.0011	0.0011	0.0002 L	0.146	0.0006	0.002
17-Feb-99	0.0016	0.641	0.0025	0.0214	0.001	0.0017	0.0007	0.143	0.0009	0.0032
17-Feb-99	--	--	--	--	--	--	--	--	--	--
3-Mar-99	0.0019	0.141	0.0018	0.0051	0.0011	0.0022	0.0002	0.143	0.0004	0.0017
17-Mar-99	0.0024	1.43	0.0033	0.0548	0.0009	0.0029	0.0018	0.152	0.0018	0.0086
31-Mar-99	0.0034	0.269	0.0018	0.0067	0.001	0.001	0.0006	0.163	0.0005	0.0043

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NIAGARA RIVER AT FORT ERIE (1997 - 1999)

	ARSENIC TOTAL	SELENIUM TOTAL	ANTIMONY TOTAL	MERCURY TOTAL SEDIMENT	SUSPENDED SEDIMENT	DISCHARGE DAILY MEAN
	100250	100251	100252	100404	97290	97163
	MG/L	MG/L	MG/L	MG/KG	MG/L	CFS
Detection limit	**0.0001**	**0.0001**	**0.0002**	**.004ng/g**		
2-Apr-97	0.0008	0.0002	0.0003	0.117	0.71	251973
23-Apr-97	0.0007	0.0004	0.0002	0.117	2.09	250948
30-Apr-97	0.0006	0.0003	0.0002	0.13	1.91	249995
11-May-97	--	--	--	--	--	259212
14-May-97	0.0004	0.0002	0.0004	--	2.82	253103
15-May-97	--	--	--	0.115	--	275669
28-May-97	0.0005	0.0002	0.0004	--	1.4	251513
29-May-97	--	--	--	0.135	--	254268
11-Jun-97	0.0004	0.0001	0.0002	0.207	0.96	263556
25-Jun-97	0.0005	0.0002	0.0002	--	1.33	256281
9-Jul-97	0.0006	0.0003	0.0002 L	0.169	2.74	260625
23-Jul-97	0.0005	0.0002	0.0002 L	--	0.83	246499
6-Aug-97	0.0005	0.0002	0.0004	--	1.27	246146
20-Aug-97	0.0004	0.0002	0.0003	0.102	1.81	239471
3-Sep-97	0.0007	0.0002	0.0002	0.131	1.4	239965
17-Sep-97	0.0006	0.0002	0.0003	--	1.13	243956
1-Oct-97	0.0005	0.0001	0.0002	0.086	14.54	238306
15-Oct-97	0.0005	0.0002	0.0002	0.082	3.31	232691
29-Oct-97	0.0008	0.0002	0.0002	0.074	29.87	243850
12-Nov-97	0.0006	0.0001	0.0002 L	0.094	--	237281
13-Nov-97	--	--	--	--	0.09	221248
26-Nov-97	0.0006	0.0002	0.0003	0.068	14.33	242826
10-Dec-97	0.0005	0.0001	0.0002 L	0.107	1.85	204827
23-Dec-97	0.0006	0.0001	0.0002 L	0.128	1.24	237599
7-Jan-98	--	--	--	--	1.05	226193
21-Jan-98	0.0008	0.0001	0.0003	0.094	2.4	235975
4-Feb-98	0.0006	0.0001	0.0004	--	0.92	217258
18-Feb-98	0.0006	0.0006	0.0002 L	--	1.87	240601
4-Mar-98	0.0006	0.0002	0.0002 L	--	0.88	249783
18-Mar-98	0.0006	0.0002	0.0003	0.098	2.03	239365
1-Apr-98	0.0005	0.0002	0.0004	--	0.89	250489
15-Apr-98	0.0005	0.0001	0.0002 L	0.04	1.04	259424
29-Apr-98	0.0006	0.0002	0.0002 L	--	0.56	253032
13-May-98	0.0005	0.0004	0.0002 L	--	0.83	255681
27-May-98	0.0004	0.0002	0.0002 L	--	1.47	239294
10-Jun-98	--	--	--	--	1.24	237988
11-Jun-98	0.0005	0.0001	0.0002 L	--	--	235480
24-Jun-98	0.0006	0.0002	0.0002 L	--	0.94	239047
8-Jul-98	0.0005	0.0001 L	0.0002 L	--	0.83	243744
22-Jul-98	0.0004	0.0001	0.0002	0.032	8.56	247805
6-Aug-98	0.0004	0.0001	0.0002	--	1.27	223650
19-Aug-98	0.0004	0.0003	0.0002 L	0.089	1	221637
2-Sep-98	0.0004	0.0002	0.0002	0.074	1.78	234845
15-Sep-98	--	--	--	--	--	223367
16-Sep-98	0.0005	0.0002	0.0002 L	0.127	1.36	212526
30-Sep-98	0.0004	0.0003	0.0002 L	--	0.99	216869
14-Oct-98	0.0004	0.0001	0.0002 L	0.079	2.9	220012
28-Oct-98	0.0007	0.0002	0.0002 L	0.092	2.25	206416
4-Nov-98	0.0006	0.0002	0.0002 L	--	1.26	198929
25-Nov-98	0.0006	0.0001	0.0002 L	0.062	19.29	191549
9-Dec-98	--	--	--	0.063	2.57	197941
22-Dec-98	0.0007	0.0002	0.0002 L	0.066	5.39	222131
6-Jan-99	0.0006	0.0002	0.0002 L	0.079	17.83	204297
20-Jan-99	0.0007	0.0002	0.0002 L	0.059	11.12	185792
3-Feb-99	0.0007	0.0002	0.0002 L	0.087	2.5	200589
17-Feb-99	0.0006	0.0002	0.0002 L	--	3.82	204509
17-Feb-99	--	--	--	0.06	--	--
3-Mar-99	0.0005	0.0001	0.0002	0.099	1.5	196952
17-Mar-99	0.0006	0.0003	0.0002	0.073	9.71	202284
31-Mar-99	0.0006	0.0003	0.0002 L	--	3.36	199353

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APPENDIX C

Loads of Contaminants in the Niagara River at

Stations Fort Erie and Niagara-on-the-Lake

Source: (EC 2000). (Figures 3 to 8) (Reproduced with permission.)

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Figure 3. Total Loads ("90% CI) of Chlorobenzenes at NOTL (□) and FE (◆), 1986/87 - 1996/97 (kg/d) .

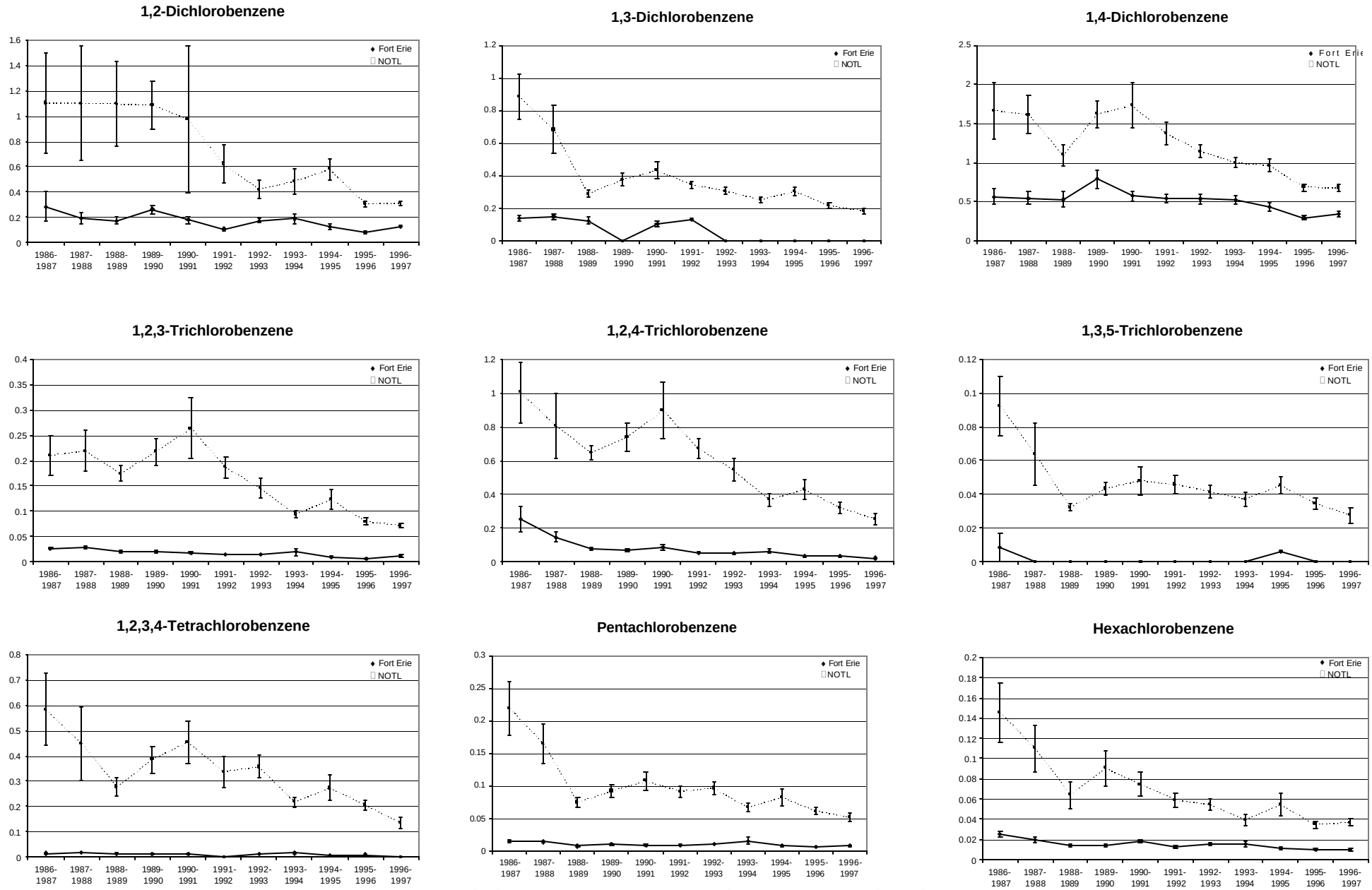

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Figure 4. Total Loads ("90% CI) of Organochlorine Pesticides and PCBs at NOTL (□) and FE (◆), 1986/87 - 1996/97 (kg/d) .

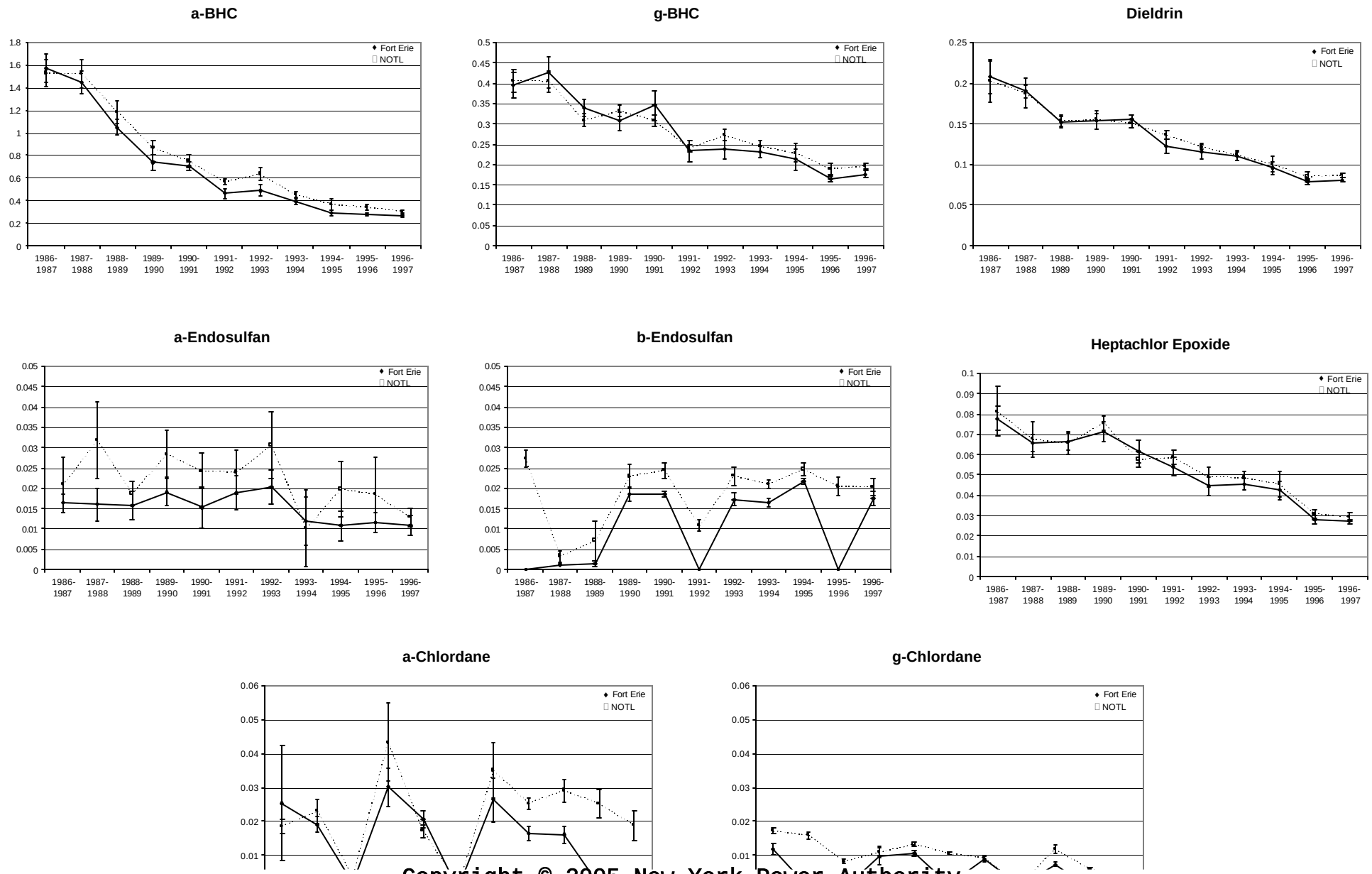

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Figure 4 (cont'd). Total Loads (" 90% CI) of Organochlorine Pesticides and PCBs at NOTL (☐) and FE (◆), 1986/87 - 1996/97 (kg/d) .

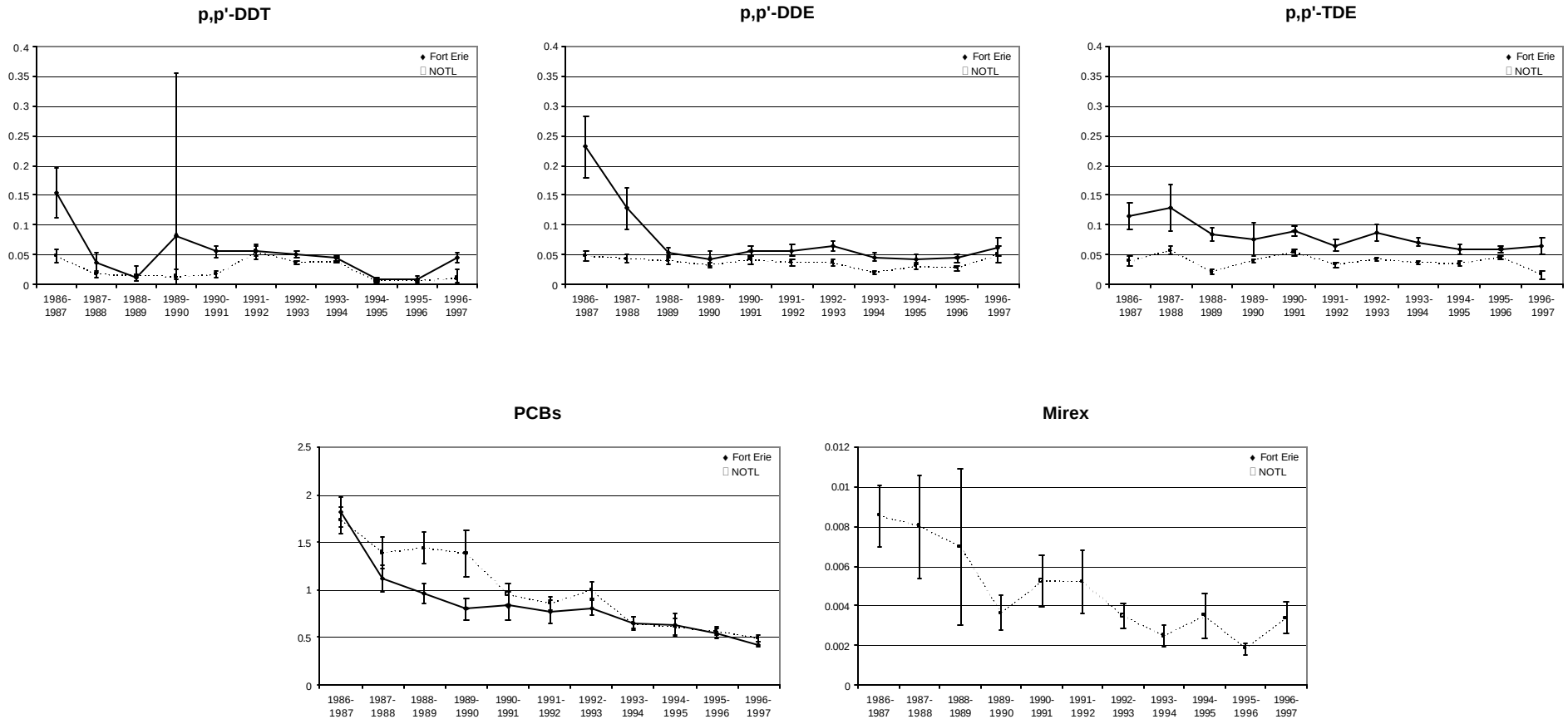

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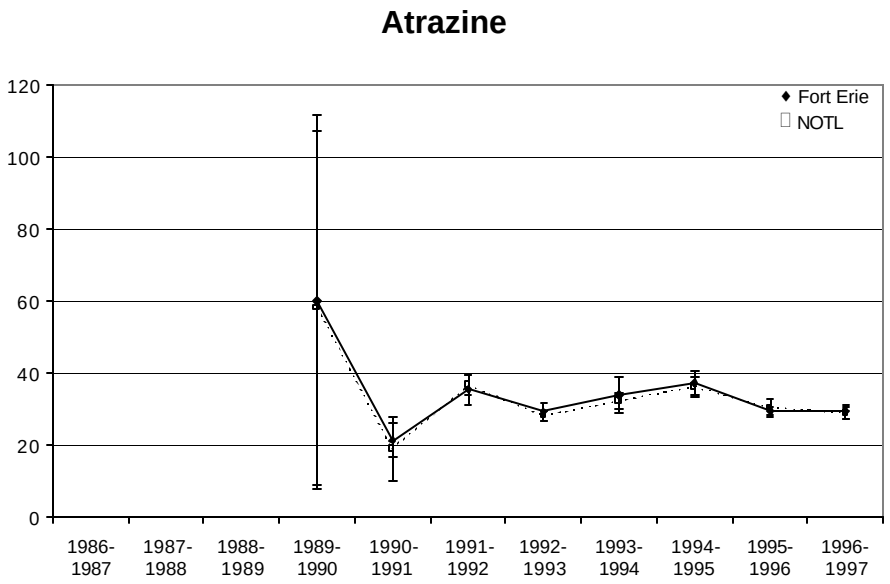
Figure 5. Total Loads (" 90% CI) of Herbicides at NOTL (☐) and FE (◆), 1986/87 - 1996/97 (kg/d).



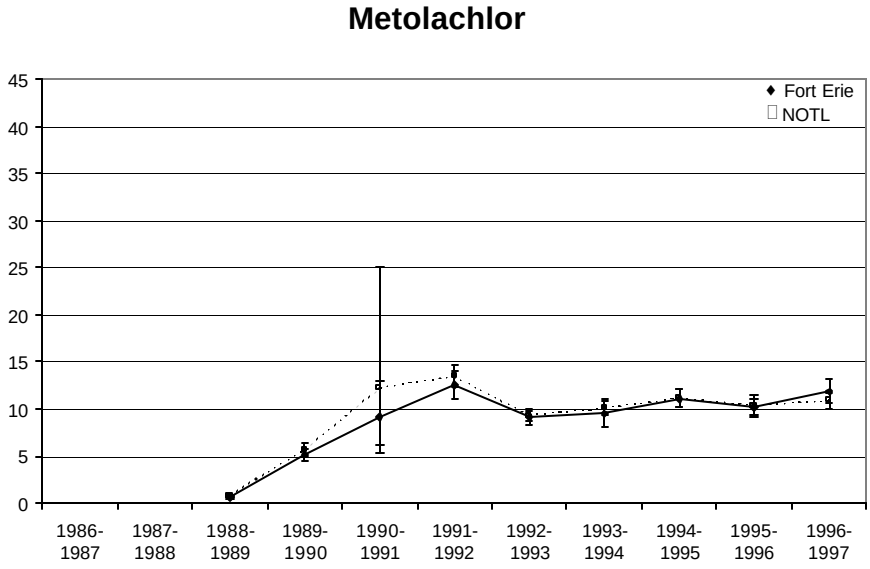


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Figure 6. Total Loads ("90% CI) of Selected PAHs at NOTL (☐) and FE (◆), 1986/87 to 1996/97 (kg/d) .

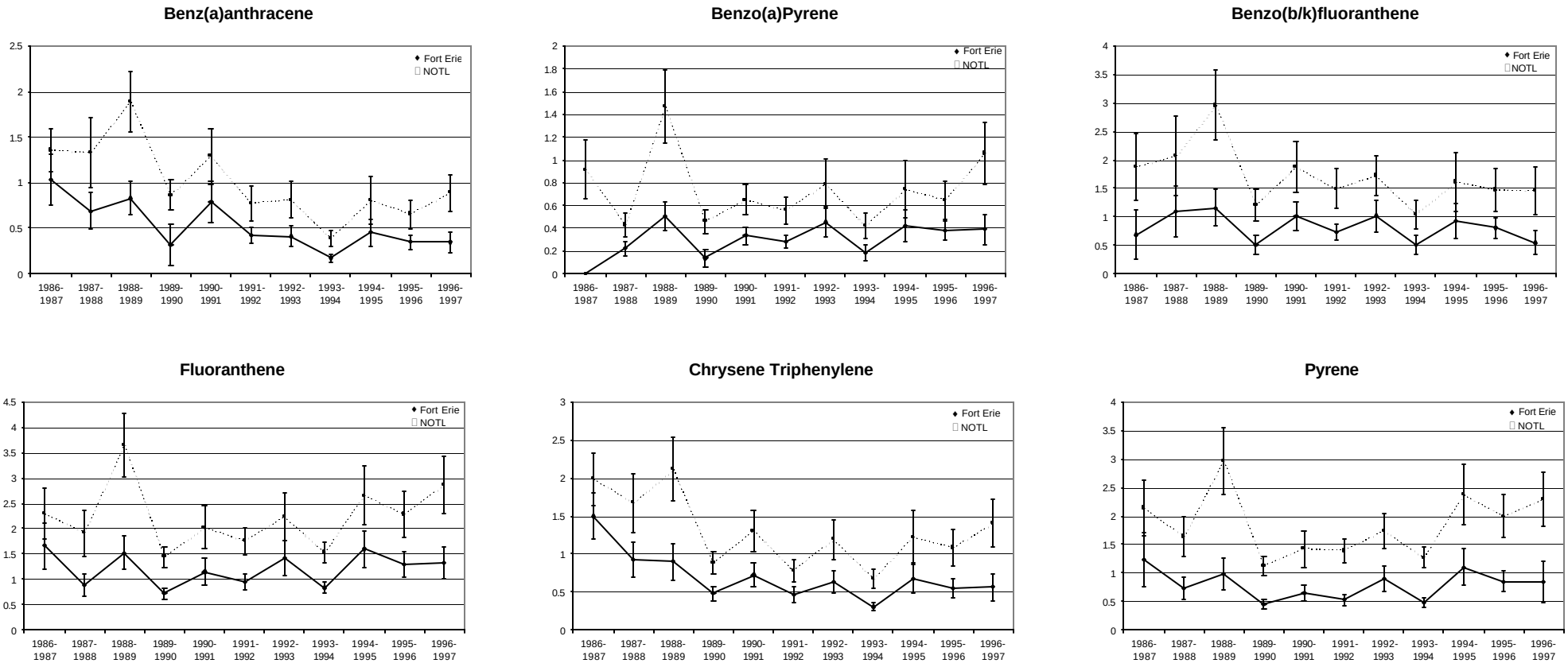

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Figure 6 (cont'd). Total Loads (" 90% CI) of Selected PAHs at NOTL (□) and FE (◆), 1986/87 to 1996/97 (kg/d) .

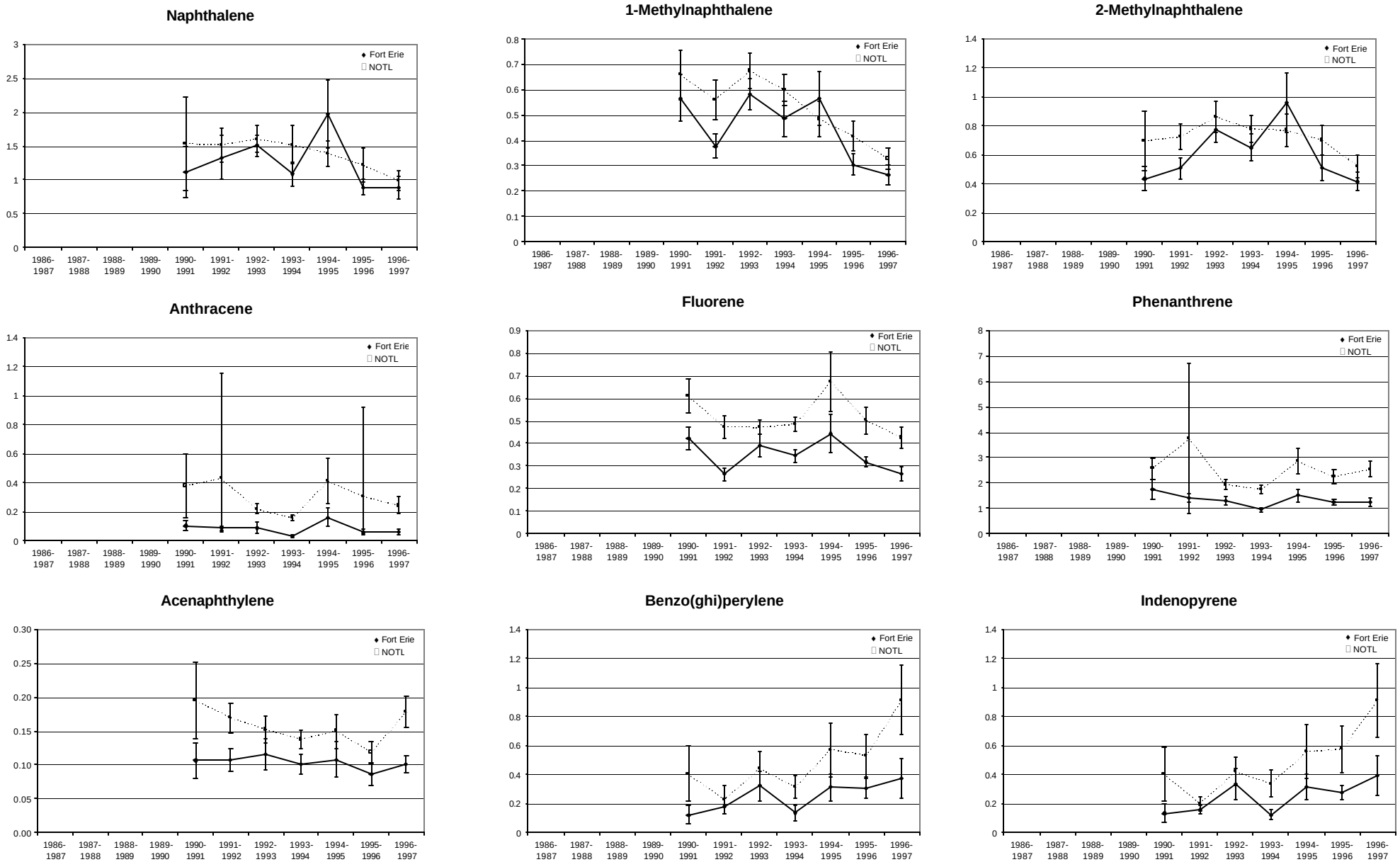

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Figure 7. Total Loads ("90% CI) of Industrial By-product Chemicals at NOTL (□) and FE (◆), 1986/87 - 1996/97 (kg/d).

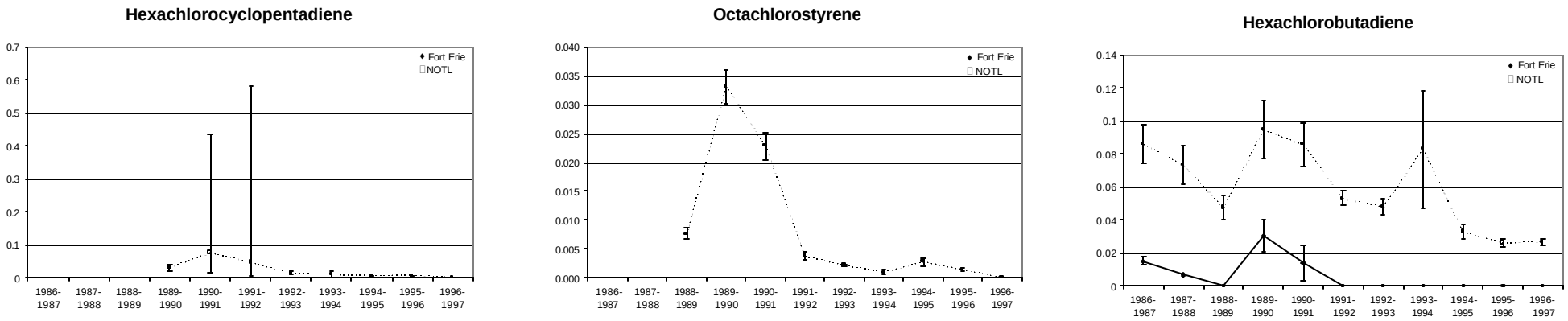

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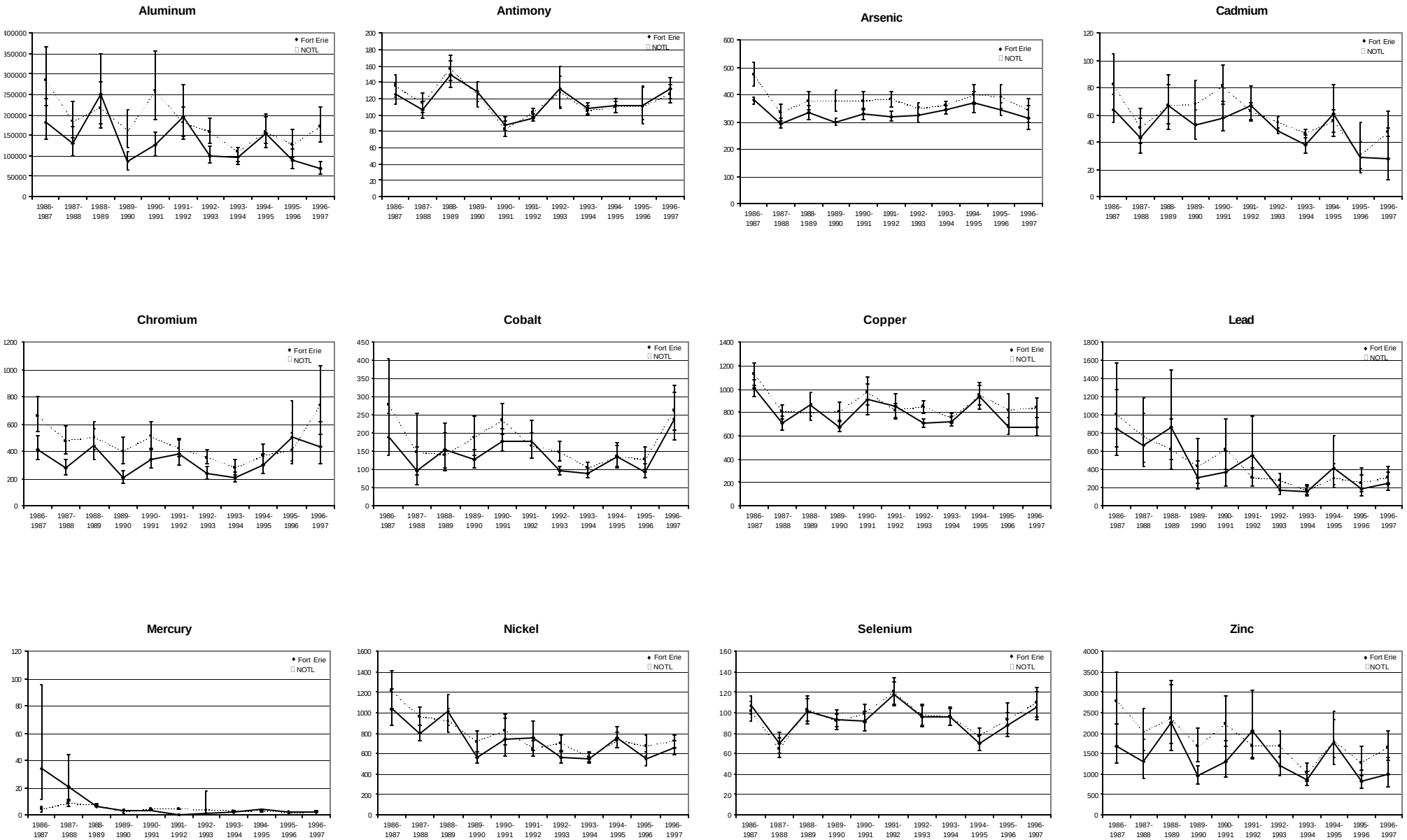
Figure 8. Total Loads (" 90% CI) of Metals at NOTL (□) and FE (◆), 1986/87 - 1996/97 (kg/d).



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APPENDIX D

NYSDEC Compliance Surveys of Intakes for Industries along Niagara River

Surveys:

- Dupont, City of Niagara Falls, 9/10/93
- Occidental Chemical Company, City of Niagara Falls, 9/28/93
- Dupont Yerkes, Town of Tonawanda, 9/23/93
- FMC Corporation, Town of Tonawanda, 9/28/93
- General Motors Corporation, Town of Tonawanda, 9/23/93

Source: Jim Vogel, NYSDEC, pers. comm., 9/26/03.

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DATA COMMENT PAGE

ORGANIC DATA QUALIFIERS

ND or U	Indicates compound was analyzed for, but not detected.
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the data indicates the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.
C	This flag applies to pesticide results where the identification has been confirmed by GC/MS.
B	This flag is used when the analyte is found in the associated blank, as well as in the sample.
E	This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.
D	This flag identifies all compounds identified in an analysis at the secondary dilution factor.
N	Indicates presumptive evidence of a compound. This flag is used only for tentatively identified compounds, where the identification is based on the Mass Spectral library search. It is applied to all TIC results.
P	This flag is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on the data page and flagged with a "P"
A	This flag indicates that a TIC is a suspected aldol-condensation product.
1	Indicates coelution.
*	Indicates analysis is not within the quality control limits.

INORGANIC DATA QUALIFIERS

ND or U	Indicates element was analyzed for, but not detected. Report with the detection limit value
J or B	Indicates a value greater than or equal to the instrument detection limit, but less than the quantitation limit
N	Indicates spike sample recovery is not within the quality control limits.
K	Indicates the post digestion spike recovery is not within the quality control limits
S	Indicates value determined by the Method of Standard Addition
M	Indicates duplicate injection results exceeded quality control limits
W	Post digestion spike for Furnace AA analysis is out of quality control limits (85-115%) while sample absorbance is less than 50% of spike absorbance
F	Indicates a value estimated or not reported due to the presence of interferences
H	Indicates analytical holding time exceedance. The value obtained should be considered an estimate
*	Indicates analysis is not within the quality control limits.
+	Indicates the correlation coefficient for the Method of Standard Addition is less than 0.995

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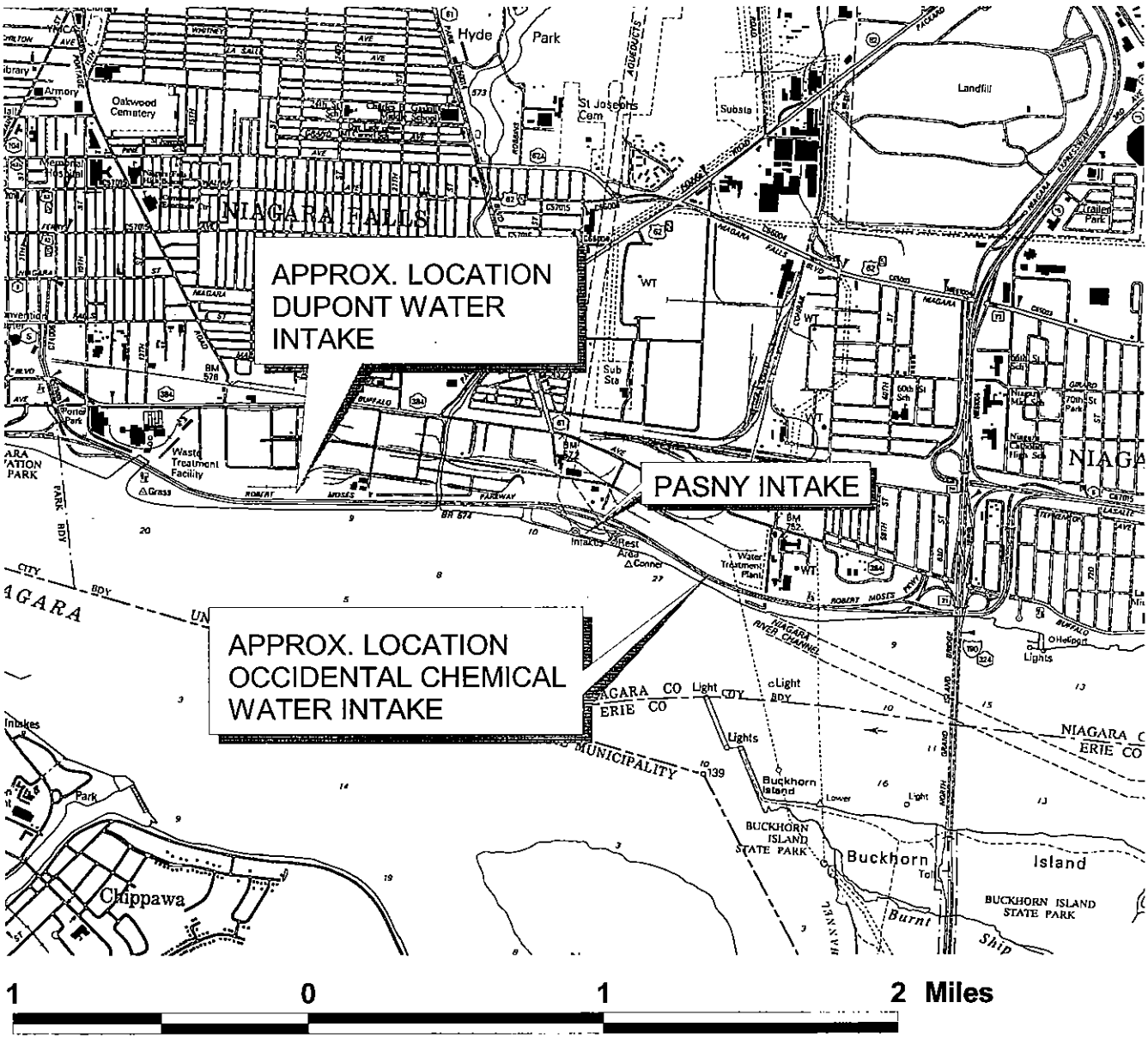

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DUPONT WATER INTAKE

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NIAGARA FALLS (C)

1X

ORGANICS ANALYSIS DATA SHEET

0684
SAMPLE NO.

408

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00005

Matrix: (soil/water) WATER Lab Sample ID: AS044782

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: L5678

Level: (low/med) LOW Sample Date Received: 09/10/93

% Moisture: not dec. ____ Heated Purge: N Date Analyzed: 09/14/93

GC Column: DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
110-75-8	2-Chloroethylvinyl ether	10	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-dichloropropene	5	U
75-25-2	Bromoform	5	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
541-73-1	1,3-Dichlorobenzene	10	U
12/14DCLB	1,2-& 1,4-Dichlorobenzene	10	U
75-69-4	Trichlorofluoromethane	10	U

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ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

408

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00005

Matrix: (soil/water) WATER Lab Sample ID: AS044782

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: L5678

Level: (low/med) LOW Date Received: 09/10/93

% Moisture: not dec. ____ Heated Purge: N Date Analyzed: 09/14/93

GC Column: DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
100-42-5	Styrene	10	U
1330-20-7	Total Xylenes	10	U

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ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

408

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00005

Matrix: (soil/water) WATER Lab Sample ID: AS044782

Sample wt/vol: 920.0 (g/mL) ML Lab File ID: 15168Y

Level: (low/med) LOW Date Received: 09/10/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/15/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/18/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
108-95-2	Phenol	11	U
111-44-4	bis(2-Chloroethyl)Ether	11	U
95-57-8	2-Chlorophenol	11	U
541-73-1	1,3-Dichlorobenzene	11	U
106-46-7	1,4-Dichlorobenzene	11	U
95-50-1	1,2-Dichlorobenzene	11	U
108-60-1	2,2'-oxybis(1-Chloropropane)	11	U
621-64-7	N-Nitroso-Di-n-Propylamine	11	U
67-72-1	Hexachloroethane	11	U
98-95-3	Nitrobenzene	11	U
78-59-1	Isophorone	11	U
88-75-5	2-Nitrophenol	11	U
105-67-9	2,4-Dimethylphenol	11	U
111-91-1	bis(2-Chloroethoxy)Methane	11	U
120-83-2	2,4-Dichlorophenol	11	U
120-82-1	1,2,4-Trichlorobenzene	11	U
91-20-3	Naphthalene	11	U
87-68-3	Hexachlorobutadiene	11	U
59-50-7	4-Chloro-3-Methylphenol	11	U
77-47-4	Hexachlorocyclopentadiene	11	U
88-06-2	2,4,6-Trichlorophenol	11	U
91-58-7	2-Chloronaphthalene	11	U
131-11-3	Dimethyl Phthalate	11	U
208-96-8	Acenaphthylene	11	U
606-20-2	2,6-Dinitrotoluene	11	U
83-32-9	Acenaphthene	11	U
51-28-5	2,4-Dinitrophenol	54	U
100-02-7	4-Nitrophenol	54	U
121-14-2	2,4-Dinitrotoluene	11	U
84-66-2	Diethylphthalate	11	U
7005-72-3	4-Chlorophenyl-phenylether	11	U
86-73-7	Fluorene	11	U
534-52-1	4,6-Dinitro-2-Methylphenol	54	U

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ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

408

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00005

Matrix: (soil/water) WATER Lab Sample ID: AS044782

Sample wt/vol: 920.0 (g/mL) ML Lab File ID: 15168Y

Level: (low/med) LOW Date Received: 09/10/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/15/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/18/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
86-30-6	N-Nitrosodiphenylamine (1)	11	U
101-55-3	4-Bromophenyl-phenylether	11	U
118-74-1	Hexachlorobenzene	11	U
87-86-5	Pentachlorophenol	54	U
85-01-8	Phenanthrene	11	U
120-12-7	Anthracene	11	U
84-74-2	Di-n-Butylphthalate	11	U
206-44-0	Fluoranthene	11	U
62-75-9	N-Nitrosodimethylamine	11	U
92-87-5	Benzidine	87	U
129-00-0	Pyrene	11	U
85-68-7	Butylbenzylphthalate	11	U
91-94-1	3,3'-Dichlorobenzidine	22	U
56-55-3	Benzo(a)Anthracene	11	U
218-01-9	Chrysene	11	U
117-81-7	Bis(2-Ethylhexyl)Phthalate	0.4	J
117-84-0	Di-n-Octyl Phthalate	11	U
205-99-2	Benzo(b)Fluoranthene	11	U
207-08-9	Benzo(k)Fluoranthene	11	U
50-32-8	Benzo(a)Pyrene	11	U
193-39-5	Indeno(1,2,3-cd)Pyrene	11	U
53-70-3	Dibenz(a,h)Anthracene	11	U
191-24-2	Benzo(g,h,i)Perylene	11	U

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ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

408

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00005

Matrix: (soil/water) WATER Lab Sample ID: AS044782

Sample wt/vol: 920.0 (g/mL) ML Lab File ID: 15168Y

Level: (low/med) LOW Date Received: 09/10/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/15/93

Concentrated Extract Volume: 1000(uL) Date Analyzed: 09/18/93

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
95-95-4	2,4,5-Trichlorophenol	27	U

FORM I X-8 3/90

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ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.: 1706

408

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00005

Matrix: (soil/water) WATER Lab Sample ID: AS044782

Sample wt/vol: 920.0 (g/mL) ML Lab File ID: 15168Y

Level: (low/med) LOW Date Received: 09/10/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/15/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/18/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	DICHLOROBENZOIC ACID DERIVAT	19.30	23	J

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METHOD 608 - P.P. P/PCBS PLUS ADDITIONAL COMPOUND
ANALYSIS DATA SHEET

Client No.

408

Lab Name: Recra Environmental Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00005

Matrix: (soil/water) WATER Lab Sample ID: AS044782

Sample wt/vol: 1000.00 (g/mL) ML Lab File ID: _____

% Moisture: _____ decanted: (Y/N) N Date Samp/Recv: 09/10/93 09/10/93

Extraction: (SepF/Cont/Sonc/Soxh): SEPF Date Extracted: 09/15/93

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 09/21/93

Injection Volume: 1.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) N pH: 7.00 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
309-00-2	Aldrin	0.005	U
319-84-6	alpha-BHC	0.005	U
319-85-7	beta-BHC	0.005	U
58-89-9	gamma-BHC (Lindane)	0.005	U
319-86-8	delta-BHC	0.005	U
57-74-9	Chlordane	0.050	U
72-54-8	4,4'-DDD	0.010	U
72-55-9	4,4'-DDE	0.010	U
50-29-3	4,4'-DDT	0.010	U
60-57-1	Dieldrin	0.010	U
959-98-8	Endosulfan I	0.005	U
33213-65-9	Endosulfan II	0.010	U
1031-07-8	Endosulfan Sulfate	0.016	
72-20-8	Endrin	0.010	U
7421-93-4	Endrin aldehyde	0.010	U
76-44-8	Heptachlor	0.005	U
1024-57-3	Heptachlor epoxide	0.005	U
8001-35-2	Toxaphene	0.10	U
12674-11-2	Aroclor 1016	0.065	U
11104-28-2	Aroclor 1221	0.065	U
11141-16-5	Aroclor 1232	0.065	U
53469-21-9	Aroclor 1242	0.065	U
12672-29-6	Aroclor 1248	0.065	U
11097-69-1	Aroclor 1254	0.065	U
11096-82-5	Aroclor 1260	0.065	U
2385-85-5	Mirex	0.10	U

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NYSDEC ASP

12297

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INORGANIC ANALYSES DATA SHEET

NYSDEC SAMPLE NO.

408

Lab Name: RECRA_ENVIRONMENTAL_INC._ Contract: C002412___

Lab Code: RECNY_ Case No.: E993_ SAS No.: _____ SDG No.: 00005_

Matrix (soil/water): WATER Lab Sample ID: 1346

Level (low/med): LOW__ Date Received: 09/10/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	5.0	U		F
7440-38-2	Arsenic__	5.0	U		F
7440-39-3	Barium___				NR
7440-41-7	Beryllium	5.0	U		A
7440-43-9	Cadmium__	0.20	U	N	F
7440-70-2	Calcium__				NR
7440-47-3	Chromium_	12.0			A
7440-48-4	Cobalt___				NR
7440-50-8	Copper___	16.0	B		A
7439-89-6	Iron_____				NR
7439-92-1	Lead_____	2.0	U	N	F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury__	0.20	U	N	CV
7440-02-0	Nickel___	40.0	U		A
7440-09-7	Potassium				NR
7782-49-2	Selenium_	3.0	U	WN	F
7440-22-4	Silver___	0.40	U	WN	F
7440-23-5	Sodium___				NR
7440-28-0	Thallium_	4.0	U	W	F
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_____	26.0			A
	Cyanide__	10.0	U	N	C

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ___

Comments:

LAB_SAMPLE_ID:_AS044782-SG000016

FORM I - IN

12/91

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N Y S DEC
Wet Chemistry Analysis

Client Sample No.

408

Lab Name: Recra Environmental, Inc. Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00005

Matrix (soil/water): WATER Lab Sample ID: AS044782

% Solids: 0.0 Date Samp/Recv: 09/10/93 09/10/93

Parameter Name	Units of Measure	Result	C	Q	M	Method Number	Analyzed Date
Chemical Oxygen Demand	MG/L	62.4				410.1	09/21/93
Filterable Residue (180°C)	MG/L	165				160.1	09/10/93
Non-Filterable Residue (103°C)	MG/L	4.0	U			160.2	09/13/93
Total Recoverable Oil & Grease	MG/L	5.0	U			413.1	10/04/93
Total Recoverable Phenolics	MG/L	0.0050	U			420.2	09/16/93

Comments:

FORM I - WC

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OCCIDENTAL CHEMICAL WATER INTAKE

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NIAGARA FALLS (C)
1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

206

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046139

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: L6001

Level: (low/med) LOW Sample Date Received: 09/28/93

% Moisture: not dec. ____ Heated Purge: N Date Analyzed: 09/29/93

GC Column: DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
110-75-8	2-Chloroethylvinyl ether	10	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-dichloropropene	5	U
75-25-2	Bromoform	5	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
541-73-1	1,3-Dichlorobenzene	10	U
12/14DCLB	1,2-& 1,4-Dichlorobenzene	10	U
75-69-4	Trichlorofluoromethane	10	U

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ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

206

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046139

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: L6001

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: not dec. ____ Heated Purge: N Date Analyzed: 09/29/93

GC Column: DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
O,M CLTOL	o & m-Chlorotoluene	5	U
106-43-4	p-Chlorotoluene	5	U
88-16-4	2-Monochlorobenzotrifluoride	5	U
98-15-7	3-Monochlorobenzotrifluoride	5	U
98-56-6	4-Monochlorobenzotrifluoride	5	U

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ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

206

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046139

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15415Y

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 10/01/93

Concentrated Extract Volume: 1000(uL) Date Analyzed: 10/11/93

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
108-95-2	Phenol	10	U
111-44-4	bis(2-Chloroethyl)Ether	10	U
95-57-8	2-Chlorophenol	10	U
541-73-1	1,3-Dichlorobenzene	10	U
106-46-7	1,4-Dichlorobenzene	10	U
95-50-1	1,2-Dichlorobenzene	10	U
108-60-1	2,2'-oxybis(1-Chloropropane)	10	U
621-64-7	N-Nitroso-Di-n-Propylamine	10	U
67-72-1	Hexachloroethane	10	U
98-95-3	Nitrobenzene	10	U
78-59-1	Isophorone	10	U
88-75-5	2-Nitrophenol	10	U
105-67-9	2,4-Dimethylphenol	10	U
111-91-1	bis(2-Chloroethoxy)Methane	10	U
120-83-2	2,4-Dichlorophenol	10	U
120-82-1	1,2,4-Trichlorobenzene	10	U
91-20-3	Naphthalene	10	U
87-68-3	Hexachlorobutadiene	10	U
59-50-7	4-Chloro-3-Methylphenol	10	U
77-47-4	Hexachlorocyclopentadiene	10	U
88-06-2	2,4,6-Trichlorophenol	10	U
91-58-7	2-Chloronaphthalene	10	U
131-11-3	Dimethyl Phthalate	10	U
208-96-8	Acenaphthylene	10	U
606-20-2	2,6-Dinitrotoluene	10	U
83-32-9	Acenaphthene	10	U
51-28-5	2,4-Dinitrophenol	25	U
100-02-7	4-Nitrophenol	25	U
121-14-2	2,4-Dinitrotoluene	10	U
84-66-2	Diethylphthalate	10	U
7005-72-3	4-Chlorophenyl-phenylether	10	U
86-73-7	Fluorene	10	U
534-52-1	4,6-Dinitro-2-Methylphenol	25	U

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ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

206

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046139

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15415Y

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 10/01/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/11/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
86-30-6	N-Nitrosodiphenylamine (1)	10	U
101-55-3	4-Bromophenyl-phenylether	10	U
118-74-1	Hexachlorobenzene	10	U
87-86-5	Pentachlorophenol	25	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
84-74-2	Di-n-Butylphthalate	10	U
206-44-0	Fluoranthene	10	U
62-75-9	N-Nitrosodimethylamine	10	U
92-87-5	Benzidine	10	U
129-00-0	Pyrene	10	U
85-68-7	Butylbenzylphthalate	10	U
91-94-1	3,3'-Dichlorobenzidine	10	U
56-55-3	Benzo(a)Anthracene	10	U
218-01-9	Chrysene	10	U
117-81-7	Bis(2-Ethylhexyl)Phthalate	10	U
117-84-0	Di-n-Octyl Phthalate	10	U
205-99-2	Benzo(b)Fluoranthene	10	U
207-08-9	Benzo(k)Fluoranthene	10	U
50-32-8	Benzo(a)Pyrene	10	U
193-39-5	Indeno(1,2,3-cd)Pyrene	10	U
53-70-3	Dibenz(a,h)Anthracene	10	U
191-24-2	Benzo(g,h,i)Perylene	10	U

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1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

206

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046139

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15415Y

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 10/01/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/11/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
95-95-4	2,4,5-Trichlorophenol	25	U
320-60-5	Dichlorobenzotrifluorides	10	U
611-19-8	alpha,2-Dichlorotoluene	10	U
620-20-2	alpha,3-Dichlorotoluene	10	U
104-83-6	alpha,4-Dichlorotoluene	10	U
95-73-8	2,4-Dichlorotoluene	10	U
118-69-4	2,6-Dichlorotoluene	10	U
95-75-0	3,4-Dichlorotoluene	10	U
98-87-3	alpha,alpha-Dichlorotoluene	10	U
19398-61-9	2,5-Dichlorotoluene	10	U

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1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

206

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046139

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15415Y

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: _____ decanted: (Y/N) ___ Date Extracted: 10/01/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/11/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

Number TICs found: 13

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	CYCLOHEXEN-1-OL ISOMER	5.68	45	J
2.	CHLOROCYCLOHEXENE ISOMER	6.02	6	J
3. 930-68-7	2-CYCLOHEXEN-1-ONE	6.60	19	JN
4.	CHLORINATED COMPOUND	6.93	3	J
5.	OXYGENATED COMPOUND	8.67	2	J
6.	OXYGENATED COMPOUND	9.52	7	J
7.	DICHLOROCYCLOHEXANE ISOMER	9.72	8	J
8.	UNKNOWN	10.57	5	J
9.	OXYGENATED COMPOUND	11.30	10	J
10.	UNKNOWN	29.25	6	J
11.	SATURATED HYDROCARBON	31.43	2	J
12.	SATURATED HYDROCARBON	32.40	3	J
13.	SATURATED HYDROCARBON	33.33	2	J

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METHOD 608 - P.P. P/PCBS PLUS ADDITIONAL COMPOUND
ANALYSIS DATA SHEET

Client No.

206

Lab Name: Recra Environmental Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046139

Sample wt/vol: 1000.00 (g/mL) ML Lab File ID: _____

% Moisture: _____ decanted: (Y/N) N Date Samp/Recv: 09/28/93 09/28/93

Extraction: (SepF/Cont/Sonc/Soxh): SEPF Date Extracted: 10/01/93

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 10/16/93

Injection Volume: 1.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) N pH: 7.00 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
309-00-2	Aldrin	0.005	U
319-84-6	alpha-BHC	0.003	J
319-85-7	beta-BHC	0.005	U
58-89-9	gamma-BHC (Lindane)	0.004	J
319-86-8	delta-BHC	0.007	
57-74-9	Chlordane	0.050	U
72-54-8	4,4'-DDD	0.010	U
72-55-9	4,4'-DDE	0.010	U
50-29-3	4,4'-DDT	0.010	U
60-57-1	Dieldrin	0.010	U
959-98-8	Endosulfan I	0.005	U
33213-65-9	Endosulfan II	0.010	U
1031-07-8	Endosulfan Sulfate	0.010	U
72-20-8	Endrin	0.010	U
7421-93-4	Endrin aldehyde	0.010	U
76-44-8	Heptachlor	0.005	U
1024-57-3	Heptachlor epoxide	0.005	
8001-35-2	Toxaphene	0.10	U
12674-11-2	Aroclor 1016	0.065	U
11104-28-2	Aroclor 1221	0.065	U
11141-16-5	Aroclor 1232	0.065	U
53469-21-9	Aroclor 1242	0.065	U
12672-29-6	Aroclor 1248	0.065	U
11097-69-1	Aroclor 1254	0.065	U
11096-82-5	Aroclor 1260	0.065	U
2385-85-5	Mirex	0.10	U

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METHOD 608 - DECHLORANE PLUS
ANALYSIS DATA SHEET

Client No.

206

Lab Name: Recra Environmental Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046139

Sample wt/vol: 1000.00 (g/mL) ML Lab File ID: _____

% Moisture: _____ decanted: (Y/N) N Date Samp/Recv: 09/28/93 09/28/93

Extraction: (SepF/Cont/Sonc/Soxh): SEPF Date Extracted: 10/01/93

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 10/14/93

Injection Volume: 1.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) N pH: 7.00 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
	DECHLORANE----Dechlorane Plus	0.010	U

FORM I - GC EXT

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NYSDEC ASP

1

INORGANIC ANALYSES DATA SHEET

NYSDEC SAMPLE NO.

206

Lab Name: RECRA_ENVIRONMENTAL_INC._ Contract: C002412___

Lab Code: RECNY_ Case No.: E993_ SAS No.: _____ SDG No.: 00008_

Matrix (soil/water): WATER Lab Sample ID: 1870

Level (low/med): LOW__ Date Received: 09/28/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	5.0	U		F
7440-38-2	Arsenic__	5.0	U		F
7440-39-3	Barium___				NR
7440-41-7	Beryllium	3.0	U		P
7440-43-9	Cadmium__	0.20	U	W	F
7440-70-2	Calcium__				NR
7440-47-3	Chromium_	10.0	U		P
7440-48-4	Cobalt___				NR
7440-50-8	Copper___	10.0	U		P
7439-89-6	Iron_____				NR
7439-92-1	Lead_____	2.0	U	W	F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	30.0	U		P
7440-09-7	Potassium				NR
7782-49-2	Selenium_	3.0	U		F
7440-22-4	Silver___	10.0	U		P
7440-23-5	Sodium___				NR
7440-28-0	Thallium_	4.0	U		F
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_____	11.5	B		P
	Cyanide__	10.0	U		C

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ___

Comments:

LAB_SAMPLE_ID:_AS046139-SG000016

FORM I - IN

12/91

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N Y S DEC
Wet Chemistry Analysis

14434

Client Sample No.

206

Lab Name: Recra Environmental, Inc. Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix (soil/water): WATER Lab Sample ID: AS046139

% Solids: 0.0 Date Samp/Recv: 09/28/93 09/28/93

Parameter Name	Units of Measure	Result	C	Q	M	Method Number	Analyzed Date
Total Organic Carbon	MG/L	2.0				415.1	10/12/93
Total Recoverable Phenolics	MG/L	0.0050	U			420.2	09/29/93

FORM I - WC

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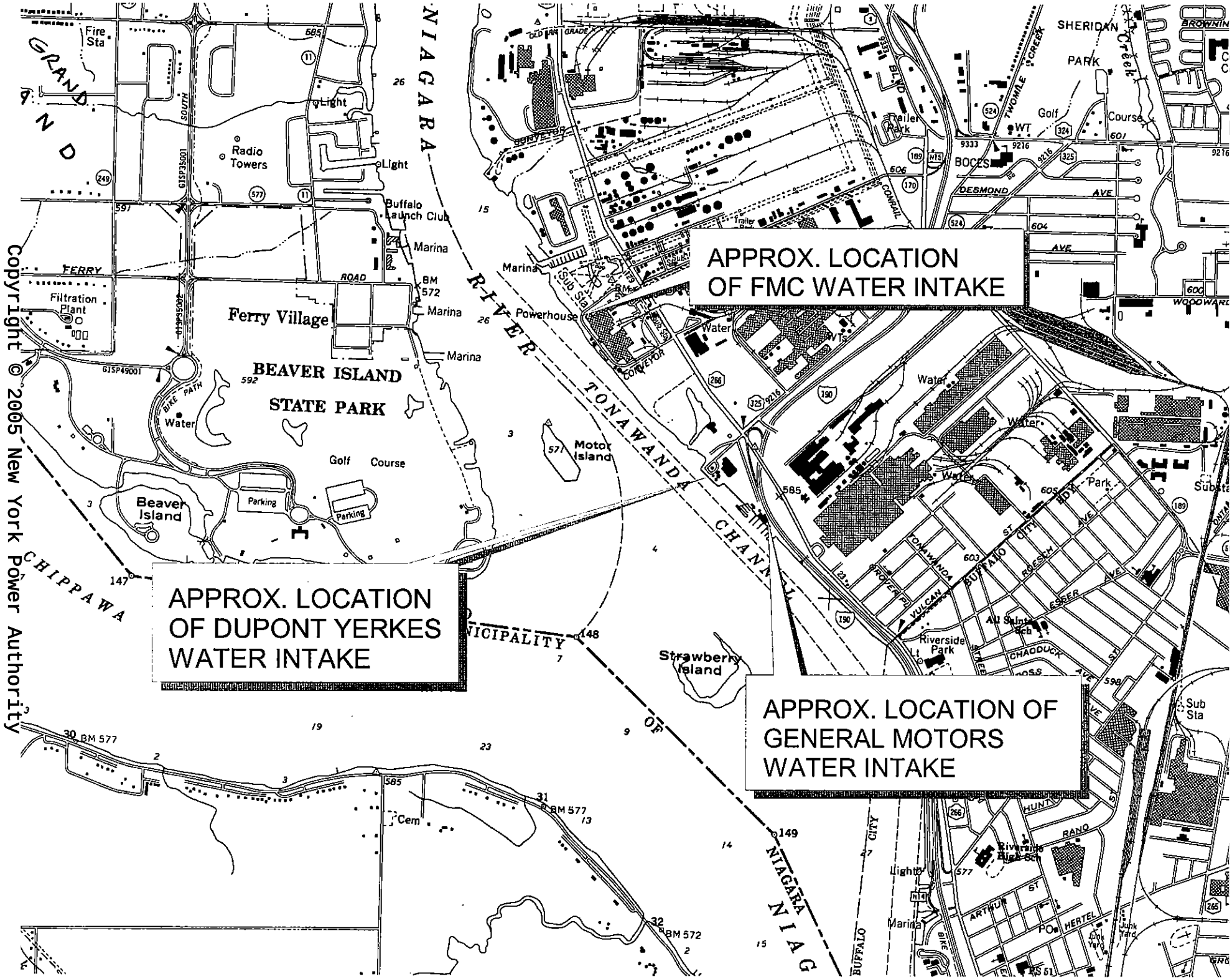

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1X
ORGANICS ANALYSIS DATA SHEET

(0056
SAMPLE NO.

601

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045836

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: K7288

Level: (low/med) LOW Sample Date Received: 09/23/93

% Moisture: not dec. ____ Heated Purge: N Date Analyzed: 09/24/93

GC Column: DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
110-75-8	2-Chloroethylvinyl ether	10	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-dichloropropene	5	U
75-25-2	Bromoform	5	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
541-73-1	1,3-Dichlorobenzene	10	U
12/14DCLB	1,2-& 1,4-Dichlorobenzene	10	U
75-69-4	Trichlorofluoromethane	10	U

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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

601

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045836

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: K7288

Level: (low/med) LOW Date Received: 09/23/93

% Moisture: not dec. ____ Date Analyzed: 09/24/93

GC Column: DB-624 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
100-42-5	Styrene	10	U
1330-20-7	Total Xylenes	10	U

FORM I VOA 3/90

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1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

601

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045836

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15305Y

Level: (low/med) LOW Date Received: 09/23/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/27/93

Concentrated Extract Volume: 1000(uL) Date Analyzed: 09/30/93

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
108-95-2	Phenol	10	U
111-44-4	bis(2-Chloroethyl)Ether	10	U
95-57-8	2-Chlorophenol	10	U
541-73-1	1,3-Dichlorobenzene	10	U
106-46-7	1,4-Dichlorobenzene	10	U
95-50-1	1,2-Dichlorobenzene	10	U
108-60-1	2,2'-oxybis(1-Chloropropane)	10	U
621-64-7	N-Nitroso-Di-n-Propylamine	10	U
67-72-1	Hexachloroethane	10	U
98-95-3	Nitrobenzene	10	U
78-59-1	Isophorone	10	U
88-75-5	2-Nitrophenol	10	U
105-67-9	2,4-Dimethylphenol	10	U
111-91-1	bis(2-Chloroethoxy)Methane	10	U
120-83-2	2,4-Dichlorophenol	10	U
120-82-1	1,2,4-Trichlorobenzene	10	U
91-20-3	Naphthalene	10	U
87-68-3	Hexachlorobutadiene	10	U
59-50-7	4-Chloro-3-Methylphenol	10	U
77-47-4	Hexachlorocyclopentadiene	10	U
88-06-2	2,4,6-Trichlorophenol	10	U
91-58-7	2-Chloronaphthalene	10	U
131-11-3	Dimethyl Phthalate	10	U
208-96-8	Acenaphthylene	10	U
606-20-2	2,6-Dinitrotoluene	10	U
83-32-9	Acenaphthene	10	U
51-28-5	2,4-Dinitrophenol	50	U
100-02-7	4-Nitrophenol	50	U
121-14-2	2,4-Dinitrotoluene	10	U
84-66-2	Diethylphthalate	0.4	BJ
7005-72-3	4-Chlorophenyl-phenylether	10	U
86-73-7	Fluorene	10	U
534-52-1	4,6-Dinitro-2-Methylphenol	50	U

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1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

601

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045836

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15305Y

Level: (low/med) LOW Date Received: 09/23/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/27/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/30/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
86-30-6	N-Nitrosodiphenylamine (1)	10	U
101-55-3	4-Bromophenyl-phenylether	10	U
118-74-1	Hexachlorobenzene	10	U
87-86-5	Pentachlorophenol	50	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
84-74-2	Di-n-Butylphthalate	10	U
206-44-0	Fluoranthene	10	U
62-75-9	N-Nitrosodimethylamine	10	U
92-87-5	Benzidine	80	U
129-00-0	Pyrene	10	U
85-68-7	Butylbenzylphthalate	10	U
91-94-1	3,3'-Dichlorobenzidine	20	U
56-55-3	Benzo(a)Anthracene	10	U
218-01-9	Chrysene	10	U
117-81-7	Bis(2-Ethylhexyl)Phthalate	10	U
117-84-0	Di-n-Octyl Phthalate	10	U
205-99-2	Benzo(b)Fluoranthene	10	U
207-08-9	Benzo(k)Fluoranthene	10	U
50-32-8	Benzo(a)Pyrene	10	U
193-39-5	Indeno(1,2,3-cd)Pyrene	10	U
53-70-3	Dibenz(a,h)Anthracene	10	U
191-24-2	Benzo(g,h,i)Perylene	10	U

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SAMPLE NO.

601

1X
ORGANICS ANALYSIS DATA SHEET

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045836

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15305Y

Level: (low/med) LOW Date Received: 09/23/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/27/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/30/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
95-95-4	2,4,5-Trichlorophenol	25	U

FORM I X-2 3/90

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1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

601

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045836

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15305Y

Level: (low/med) LOW Date Received: 09/23/93

% Moisture: _____ decanted: (Y/N) ___ Date Extracted: 09/27/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/30/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

Number TICs found: 3

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	CYCLOHEXEN-1-OL ISOMER	5.87	3	J
2.	(2BUTOXYETHOXY)ETHANOL ISOME	12.48	6	J
3. 124-17-4	2(2BUTOXYETHOXY)ACETATE ETHA	15.73	18	JN

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ANALYSIS DATA SHEET

Client No.

601

Lab Name: Recra Environmental Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045836

Sample wt/vol: 1000.00 (g/mL) ML Lab File ID: _____

% Moisture: _____ decanted: (Y/N) N Date Samp/Recv: 09/23/93 09/23/93

Extraction: (SepF/Cont/Sonc/Soxh): SEPF Date Extracted: 09/27/93

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 10/16/93

Injection Volume: 1.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) N pH: 7.00 Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND	UG/L	Q
309-00-2	Aldrin	0.005	U
319-84-6	alpha-BHC	0.005	U
319-85-7	beta-BHC	0.005	U
58-89-9	gamma-BHC (Lindane)	0.005	U
319-86-8	delta-BHC	0.005	U
57-74-9	Chlordane	0.050	U
72-54-8	4,4'-DDD	0.010	U
72-55-9	4,4'-DDE	0.010	U
50-29-3	4,4'-DDT	0.010	U
60-57-1	Dieldrin	0.010	U
959-98-8	Endosulfan I	0.005	U
33213-65-9	Endosulfan II	0.010	U
1031-07-8	Endosulfan Sulfate	0.010	U
72-20-8	Endrin	0.010	U
7421-93-4	Endrin aldehyde	0.010	U
76-44-8	Heptachlor	0.005	U
1024-57-3	Heptachlor epoxide	0.005	U
8001-35-2	Toxaphene	0.10	U
12674-11-2	Aroclor 1016	0.065	U
11104-28-2	Aroclor 1221	0.065	U
11141-16-5	Aroclor 1232	0.065	U
53469-21-9	Aroclor 1242	0.065	U
12672-29-6	Aroclor 1248	0.065	U
11097-69-1	Aroclor 1254	0.065	U
11096-82-5	Aroclor 1260	0.065	U
2385-85-5	Mirex	0.10	U

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NYSDEC-ASP

1

INORGANIC ANALYSES DATA SHEET

NYSDEC SAMPLE NO.

601

Lab Name: RECRA_ENVIRONMENTAL_INC._ Contract: C002412___
Lab Code: RECNY_ Case No.: E993_ SAS No.: _____ SDG No.: 00007_
Matrix (soil/water): WATER Lab Sample ID: 1546
Level (low/med): LOW__ Date Received: 09/23/93
% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	5.0	U		F_
7440-38-2	Arsenic__	5.0	U		F_
7440-39-3	Barium___				NR
7440-41-7	Beryllium	3.0	U		P_
7440-43-9	Cadmium__	0.20	U		F_
7440-70-2	Calcium__				NR
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___				NR
7440-50-8	Copper___	19.8	B		P_
7439-89-6	Iron____				NR
7439-92-1	Lead____	2.0	U		F_
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	30.0	U		P_
7440-09-7	Potassium				NR
7782-49-2	Selenium_	3.0	U	N	F_
7440-22-4	Silver___	0.40	U	N	F_
7440-23-5	Sodium___				NR
7440-28-0	Thallium_	3.0	U	W	F_
7440-62-2	Vanadium_				NR
7440-66-6	Zinc____	67.1			P_
	Cyanide__	10.0	U		C_
	AmenCN___				NR

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____
Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:
LAB_SAMPLE_ID:_AS045836-SG000016

FORM I - IN

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N Y S DEC
Wet Chemistry Analysis

Client Sample No.

601

Lab Name: Recra Environmental, Inc. Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix (soil/water): WATER Lab Sample ID: AS045836

% Solids: 0.0 Date Samp/Recv: 09/23/93 09/23/93

Parameter Name	Units of Measure	Result	C	Q	M	Method Number	Analyzed Date
Chemical Oxygen Demand	MG/L	82.3				410.1	09/30/93
Non-Filterable Residue (103°C)	MG/L	4.0	U			160.2	09/27/93
Total Recoverable Phenolics	MG/L	0.0050	U			420.2	09/29/93

FORM I - WC

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FMC TONAWANDA WATER INTAKE

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TONAWANDA (T)

)0381

SAMPLE NO.

1X

ORGANICS ANALYSIS DATA SHEET

104

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046128

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: L5985

Level: (low/med) LOW Sample Date Received: 09/28/93

% Moisture: not dec. _____ Heated Purge: N Date Analyzed: 09/28/93

GC Column: DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
110-75-8	2-Chloroethylvinyl ether	10	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-dichloropropene	5	U
75-25-2	Bromoform	5	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
541-73-1	1,3-Dichlorobenzene	10	U
12/14DCLB	1,2-& 1,4-Dichlorobenzene	10	U
75-69-4	Trichlorofluoromethane	10	U

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SAMPLE NO.

104

1X
ORGANICS ANALYSIS DATA SHEET

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046128

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: L5985

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: not dec. ____ Heated Purge: N Date Analyzed: 09/28/93

GC Column: DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
100-42-5	Styrene	10	U
1330-20-7	Total Xylenes	10	U

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70551

1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

104

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046128

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15375Y

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 10/01/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/05/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
108-95-2	Phenol	10	U
111-44-4	bis(2-Chloroethyl)Ether	10	U
95-57-8	2-Chlorophenol	10	U
541-73-1	1,3-Dichlorobenzene	10	U
106-46-7	1,4-Dichlorobenzene	10	U
95-50-1	1,2-Dichlorobenzene	10	U
108-60-1	2,2'-oxybis(1-Chloropropane)	10	U
621-64-7	N-Nitroso-Di-n-Propylamine	10	U
67-72-1	Hexachloroethane	10	U
98-95-3	Nitrobenzene	10	U
78-59-1	Isophorone	10	U
88-75-5	2-Nitrophenol	10	U
105-67-9	2,4-Dimethylphenol	10	U
111-91-1	bis(2-Chloroethoxy)Methane	10	U
120-83-2	2,4-Dichlorophenol	10	U
120-82-1	1,2,4-Trichlorobenzene	10	U
91-20-3	Naphthalene	10	U
87-68-3	Hexachlorobutadiene	10	U
59-50-7	4-Chloro-3-Methylphenol	10	U
77-47-4	Hexachlorocyclopentadiene	10	U
88-06-2	2,4,6-Trichlorophenol	10	U
91-58-7	2-Chloronaphthalene	10	U
131-11-3	Dimethyl Phthalate	10	U
208-96-8	Acenaphthylene	10	U
606-20-2	2,6-Dinitrotoluene	10	U
83-32-9	Acenaphthene	10	U
51-28-5	2,4-Dinitrophenol	25	U
100-02-7	4-Nitrophenol	25	U
121-14-2	2,4-Dinitrotoluene	10	U
84-66-2	Diethylphthalate	0.7	BJ
7005-72-3	4-Chlorophenyl-phenylether	10	U
86-73-7	Fluorene	10	U
534-52-1	4,6-Dinitro-2-Methylphenol	25	U

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1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

104

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046128

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15375Y

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 10/01/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/05/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
86-30-6	N-Nitrosodiphenylamine (1)	10	U
101-55-3	4-Bromophenyl-phenylether	10	U
118-74-1	Hexachlorobenzene	10	U
87-86-5	Pentachlorophenol	25	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
84-74-2	Di-n-Butylphthalate	10	U
206-44-0	Fluoranthene	10	U
62-75-9	N-Nitrosodimethylamine	10	U
92-87-5	Benzidine	10	U
129-00-0	Pyrene	10	U
85-68-7	Butylbenzylphthalate	10	U
91-94-1	3,3'-Dichlorobenzidine	10	U
56-55-3	Benzo(a)Anthracene	10	U
218-01-9	Chrysene	10	U
117-81-7	Bis(2-Ethylhexyl)Phthalate	10	U
117-84-0	Di-n-Octyl Phthalate	10	U
205-99-2	Benzo(b)Fluoranthene	10	U
207-08-9	Benzo(k)Fluoranthene	10	U
50-32-8	Benzo(a)Pyrene	10	U
193-39-5	Indeno(1,2,3-cd)Pyrene	10	U
53-70-3	Dibenz(a,h)Anthracene	10	U
191-24-2	Benzo(g,h,i)Perylene	10	U

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1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

104

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046128

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15375Y

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 10/01/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/05/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
95-95-4	2,4,5-Trichlorophenol	25	U

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1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

104

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046128

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15375Y

Level: (low/med) LOW Date Received: 09/28/93

% Moisture: _____ decanted: (Y/N) ___ Date Extracted: 10/01/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/05/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

Number TICs found: 3

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	CYCLOHEXEN-1-OL ISOMER	5.78	7	BJ
2. 930-68-7	2-CYCLOHEXEN-1-ONE	6.73	4	JN
3. 124-17-4	2(BUTOXYETHOXY)ETHANOL ACETA	15.55	3	JN

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N Y S DEC
METHOD 608 - P.P. P/PCBS PLUS ADDITIONAL COMPOUND 12707
ANALYSIS DATA SHEET

Client No.

104

Lab Name: Recra Environmental Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix: (soil/water) WATER Lab Sample ID: AS046128

Sample wt/vol: 1000.00 (g/mL) ML Lab File ID: _____

% Moisture: _____ decanted: (Y/N) N Date Samp/Recv: 09/28/93 09/28/93

Extraction: (SepF/Cont/Sonc/Soxh): SEPF Date Extracted: 10/01/93

Concentrated Extract Volume: 10000(uL) Date Analyzed: 10/16/93

Injection Volume: 1.00(uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) N pH: 7.00 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
309-00-2	Aldrin	0.005	U
319-84-6	alpha-BHC	0.005	U
319-85-7	beta-BHC	0.005	U
58-89-9	gamma-BHC (Lindane)	0.005	U
319-86-8	delta-BHC	0.005	U
57-74-9	Chlordane	0.050	U
72-54-8	4,4'-DDD	0.010	U
72-55-9	4,4'-DDE	0.010	U
50-29-3	4,4'-DDT	0.010	U
60-57-1	Dieldrin	0.010	U
959-98-8	Endosulfan I	0.005	U
33213-65-9	Endosulfan II	0.010	U
1031-07-8	Endosulfan Sulfate	0.010	U
72-20-8	Endrin	0.010	U
7421-93-4	Endrin aldehyde	0.010	U
76-44-8	Heptachlor	0.005	U
1024-57-3	Heptachlor epoxide	0.005	U
8001-35-2	Toxaphene	0.10	U
12674-11-2	Aroclor 1016	0.065	U
11104-28-2	Aroclor 1221	0.065	U
11141-16-5	Aroclor 1232	0.065	U
53469-21-9	Aroclor 1242	0.065	U
12672-29-6	Aroclor 1248	0.065	U
11097-69-1	Aroclor 1254	0.065	U
11096-82-5	Aroclor 1260	0.065	U
2385-85-5	Mirex	0.10	U

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NYSDEC ASP

1

INORGANIC ANALYSES DATA SHEET

NYSDEC SAMPLE NO.

104

Lab Name: RECRA_ENVIRONMENTAL_INC._ Contract: C002412___

Lab Code: RECNY_ Case No.: E993_ SAS No.: _____ SDG No.: 00008_

Matrix (soil/water): WATER Lab Sample ID: 1807

Level (low/med): LOW__ Date Received: 09/28/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	5.0	U		F
7440-38-2	Arsenic__	5.0	U		F
7440-39-3	Barium___				NR
7440-41-7	Beryllium	3.0	U		P
7440-43-9	Cadmium__	0.40	B		F
7440-70-2	Calcium__				NR
7440-47-3	Chromium_	10.0	U		P
7440-48-4	Cobalt___				NR
7440-50-8	Copper___	10.7	B		P
7439-89-6	Iron____				NR
7439-92-1	Lead____	4.0			F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	40.0	U		A
7440-09-7	Potassium				NR
7782-49-2	Selenium_	3.0	U	W	F
7440-22-4	Silver___	0.20	U		F
7440-23-5	Sodium___				NR
7440-28-0	Thallium_	4.0	U		F
7440-62-2	Vanadium_				NR
7440-66-6	Zinc____	29.0			A
	Cyanide__	10.0	U		C

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ___

Comments:

LAB_SAMPLE_ID:_AS046128-SG000016

REDIGESTION_NUMBER:_1953

FORM I - IN

12/91

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N Y S DEC
Wet Chemistry Analysis

94426

Client Sample No.

104

Lab Name: Recra Environmental, Inc. Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00008

Matrix (soil/water): WATER Lab Sample ID: AS046128

% Solids: 0.0 Date Samp/Recv: 09/28/93 09/28/93

Parameter Name	Units of Measure	Result	C	Q	M	Method Number	Analyzed Date
Filterable Residue (180°C)	MG/L	163				160.1	09/28/93
Non-Filterable Residue (103°C)	MG/L	17.2				160.2	09/28/93
Total Recoverable Oil & Grease	MG/L	5.0	U			413.1	10/18/93
Total Recoverable Phenolics	MG/L	0.0050	U			420.2	09/29/93

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GENERAL MOTORS WATER INTAKE
TONAWANDA (T)
1X
ORGANICS ANALYSIS DATA SHEET

:0050
SAMPLE NO.

501

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045834

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: K7286

Level: (low/med) LOW Sample Date Received: 09/23/93

% Moisture: not dec. ____ Heated Purge: N Date Analyzed: 09/24/93

GC Column: DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
110-75-8	2-Chloroethylvinyl ether	10	U
71-43-2	Benzene	5	U
10061-02-6	trans-1,3-dichloropropene	5	U
75-25-2	Bromoform	5	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
541-73-1	1,3-Dichlorobenzene	10	U
12/14DCLB	1,2-& 1,4-Dichlorobenzene	10	U
75-69-4	Trichlorofluoromethane	10	U

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0051
EPA SAMPLE NO.

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

501

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045834

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: K7286

Level: (low/med) LOW Date Received: 09/23/93

% Moisture: not dec. ____ Date Analyzed: 09/24/93

GC Column: DB-624 ID: 0.530 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
100-42-5	Styrene	10	U
1330-20-7	Total Xylenes	10	U

FORM I VOA 3/90

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1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

501

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045834

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15303Y

Level: (low/med) LOW Date Received: 09/23/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/27/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/30/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
108-95-2	Phenol	10	U
111-44-4	bis(2-Chloroethyl)Ether	10	U
95-57-8	2-Chlorophenol	10	U
541-73-1	1,3-Dichlorobenzene	10	U
106-46-7	1,4-Dichlorobenzene	10	U
95-50-1	1,2-Dichlorobenzene	10	U
108-60-1	2,2'-oxybis(1-Chloropropane)	10	U
621-64-7	N-Nitroso-Di-n-Propylamine	10	U
67-72-1	Hexachloroethane	10	U
98-95-3	Nitrobenzene	10	U
78-59-1	Isophorone	10	U
88-75-5	2-Nitrophenol	10	U
105-67-9	2,4-Dimethylphenol	10	U
111-91-1	bis(2-Chloroethoxy)Methane	10	U
120-83-2	2,4-Dichlorophenol	10	U
120-82-1	1,2,4-Trichlorobenzene	10	U
91-20-3	Naphthalene	10	U
87-68-3	Hexachlorobutadiene	10	U
59-50-7	4-Chloro-3-Methylphenol	10	U
77-47-4	Hexachlorocyclopentadiene	10	U
88-06-2	2,4,6-Trichlorophenol	10	U
91-58-7	2-Chloronaphthalene	10	U
131-11-3	Dimethyl Phthalate	10	U
208-96-8	Acenaphthylene	10	U
606-20-2	2,6-Dinitrotoluene	10	U
83-32-9	Acenaphthene	10	U
51-28-5	2,4-Dinitrophenol	50	U
100-02-7	4-Nitrophenol	50	U
121-14-2	2,4-Dinitrotoluene	10	U
84-66-2	Diethylphthalate	0.6	BJ
7005-72-3	4-Chlorophenyl-phenylether	10	U
86-73-7	Fluorene	10	U
534-52-1	4,6-Dinitro-2-Methylphenol	50	U

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1X
ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

501

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045834

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15303Y

Level: (low/med) LOW Date Received: 09/23/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/27/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/30/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
86-30-6	N-Nitrosodiphenylamine (1)	10	U
101-55-3	4-Bromophenyl-phenylether	10	U
118-74-1	Hexachlorobenzene	10	U
87-86-5	Pentachlorophenol	50	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
84-74-2	Di-n-Butylphthalate	10	U
206-44-0	Fluoranthene	10	U
62-75-9	N-Nitrosodimethylamine	10	U
92-87-5	Benzidine	80	U
129-00-0	Pyrene	10	U
85-68-7	Butylbenzylphthalate	10	U
91-94-1	3,3'-Dichlorobenzidine	20	U
56-55-3	Benzo(a)Anthracene	10	U
218-01-9	Chrysene	10	U
117-81-7	Bis(2-Ethylhexyl)Phthalate	10	U
117-84-0	Di-n-Octyl Phthalate	10	U
205-99-2	Benzo(b)Fluoranthene	10	U
207-08-9	Benzo(k)Fluoranthene	10	U
50-32-8	Benzo(a)Pyrene	10	U
193-39-5	Indeno(1,2,3-cd)Pyrene	10	U
53-70-3	Dibenz(a,h)Anthracene	10	U
191-24-2	Benzo(g,h,i)Perylene	10	U

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SAMPLE NO.

501

1X
ORGANICS ANALYSIS DATA SHEET

Lab Name: RECRA ENVIRON Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045834

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 15303Y

Level: (low/med) LOW Date Received: 09/23/93

% Moisture: _____ decanted: (Y/N) N Date Extracted: 09/27/93

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/30/93

Injection Volume: 2.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
95-95-4	2,4,5-Trichlorophenol	25	U

FORM I X-9 3/90

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N Y S DEC

METHOD 608 - P.P. P/PCBS PLUS ADDITIONAL COMPOUND
ANALYSIS DATA SHEET

Client No.

501

Lab Name: Recra Environmental Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix: (soil/water) WATER Lab Sample ID: AS045834

Sample wt/vol: 1000.00 (g/mL) ML Lab File ID: _____

% Moisture: _____ decanted: (Y/N) N Date Samp/Recv: 09/23/93 09/23/93

Extraction: (SepF/Cont/Sonc/Soxh): SEPF Date Extracted: 09/27/93

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 10/16/93

Injection Volume: 1.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) N pH: 7.00 Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND	UG/L	Q
309-00-2	Aldrin	0.005	U
319-84-6	alpha-BHC	0.005	U
319-85-7	beta-BHC	0.005	U
58-89-9	gamma-BHC (Lindane)	0.005	U
319-86-8	delta-BHC	0.005	U
57-74-9	Chlordane	0.050	U
72-54-8	4,4'-DDD	0.010	U
72-55-9	4,4'-DDE	0.010	U
50-29-3	4,4'-DDT	0.010	U
60-57-1	Dieldrin	0.010	U
959-98-8	Endosulfan I	0.005	U
33213-65-9	Endosulfan II	0.010	U
1031-07-8	Endosulfan Sulfate	0.010	U
72-20-8	Endrin	0.010	U
7421-93-4	Endrin aldehyde	0.010	U
76-44-8	Heptachlor	0.005	U
1024-57-3	Heptachlor epoxide	0.005	U
8001-35-2	Toxaphene	0.10	U
12674-11-2	Aroclor 1016	0.065	U
11104-28-2	Aroclor 1221	0.065	U
11141-16-5	Aroclor 1232	0.065	U
53469-21-9	Aroclor 1242	0.065	U
12672-29-6	Aroclor 1248	0.065	U
11097-69-1	Aroclor 1254	0.065	U
11096-82-5	Aroclor 1260	0.065	U
2385-85-5	Mirex	0.10	U

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1
INORGANIC ANALYSES DATA SHEET

NYSDEC SAMPLE NO.
501

Lab Name: RECRA_ENVIRONMENTAL_INC._ Contract: C002412___
Lab Code: RECNY_ Case No.: E993_ SAS No.: _____ SDG No.: 00007_
Matrix (soil/water): WATER Lab Sample ID: 1544
Level (low/med): LOW__ Date Received: 09/23/93
% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	5.0	U	W	F_
7440-38-2	Arsenic__	5.0	U		F_
7440-39-3	Barium___				NR
7440-41-7	Beryllium	3.0	U		P_
7440-43-9	Cadmium__	0.20	U		F_
7440-70-2	Calcium__				NR
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___				NR
7440-50-8	Copper___	10.0	U		P_
7439-89-6	Iron____				NR
7439-92-1	Lead____	2.0	U		F_
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	30.0	U		P_
7440-09-7	Potassium				NR
7782-49-2	Selenium_	3.0	U	N	F_
7440-22-4	Silver___	0.40	U	N	F_
7440-23-5	Sodium___				NR
7440-28-0	Thallium_	3.0	U	W	F_
7440-62-2	Vanadium_				NR
7440-66-6	Zinc____	10.0	U		P_
	Cyanide__	10.0	U		C_
	AmenCN___				NR

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____
Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:
LAB_SAMPLE_ID:_AS045834-SG000016

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N Y S DEC
Wet Chemistry Analysis

Client Sample No.
501

Lab Name: Recra Environmental, Inc. Contract: C002412

Lab Code: RECNY Case No.: E993 SAS No.: _____ SDG No.: 00007

Matrix (soil/water): WATER Lab Sample ID: AS045834

% Solids: 0.0 Date Samp/Recv: 09/23/93 09/23/93

Parameter Name	Units of Measure	Result	C	Q	M	Method Number	Analyzed Date
Non-Filterable Residue (103°C)	MG/L	4.0	U			160.2	09/27/93
Total Recoverable Oil & Grease	MG/L	6.1				413.1	10/11/93
Total Recoverable Phenolics	MG/L	0.0050	U			420.2	09/29/93

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Non-Internet Public (NIP) information has been removed from the following page(s).

This material is contained in:
Volume 2
Section: Describing Contaminant Levels in Fish in Lewiston Reservoir

APPENDIX E

Aerial Photographs of Construction of Lewiston Reservoir in 1961

Photograph 1: Aerial view of reservoir looking east, showing the topography in the reservoir prior to filling, including haul roads and rock apron (July 26, 1961). **[NIP – General Location Maps]**

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Photograph 2: Aerial view of reservoir looking west, showing a close-up of the rock apron in front of the Lewiston Pump Generating Plant (September 18, 1961). **[NIP – General Location Maps]**

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Photograph 3: Aerial view of reservoir looking west during partial filling of Lewiston Reservoir with water. Seen further is the depression of the Fish Creek riverbed in the lower right corner (i.e., northeastern corner) of the reservoir. The northern side of the reservoir bottom remains exposed due to higher topographic elevations (October 27, 1961). **[NIP – General Location Maps]**

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