MI/DEQ/SWQ-02/025

MICHIGAN WATER CHEMISTRY TREND MONITORING
1998-1999 Report

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SECTION 1.0

HIGHLIGHTS

- The Michigan Water Chemistry Trend Monitoring Project (WCTMP) was designed to address 4 goals consistent with the January 1997 report entitled, "A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters." These goals are:

    1. Assess the current status and condition of individual waters of the state and determine whether standards are being met;
    2. Measure temporal and spatial trends in the quality of Michigan's surface waters;
    3. Provide data to support MDEQ water quality programs and evaluate their effectiveness; and
    4. Detect new and emerging water quality problems.

- Ten streams tributary to Lake Erie/Lake Huron were sampled in 1998; 8 streams tributary to Lake Michigan/Lake Superior were sampled in 1999. One sampling station was located at or near the mouth of each tributary.

- Contaminants of interest at all tributaries included nutrients, conventionals, base/neutral organics, MTBE, BTEX, and low level mercury and trace metals. The PCBs and chlorinated organic pesticides were also sampled at a subset of tributaries.

- Samples were collected during periods of high flow and base/low flow, with an emphasis on the former.

- Data analysis focused on spatial comparisons, loading rate estimates, and comparisons against Michigan Rule 57 water quality values. As additional data are collected in future years, data will also be analyzed for temporal trends. Sample size permitting, spatial comparison analysis used contaminant concentrations normalized to stream discharge, as will future temporal trend analysis.

- Among tributaries sampled for PCBs, concentrations were lowest overall at the Manistique River and highest at the Clinton River.

- Median total mercury concentrations were lowest at the AuSable and Thunder Bay Rivers, and highest at the Kalamazoo River.

- Median total phosphorus and total suspended solids concentrations were lowest at the AuSable and Thunder Bay Rivers, while median total chloride concentrations were lowest at the Manistique and Tahquamenon Rivers. The Clinton, Tittabawassee, and Shiawassee Rivers yielded the highest median concentrations of total phosphorus, total chloride and total suspended solids, respectively.

- When tributaries were grouped by Great Lakes watershed, total mercury concentrations were generally lower in the Lake Huron watershed, with the Erie, Michigan and Superior watersheds yielding similarly higher concentrations of total mercury. Trace metal concentrations were generally lower in the Lake Superior watershed, and higher in the Lake Erie watershed. Total phosphorus, total chloride and total suspended solids concentrations

were generally lower in the Lake Superior watershed, and higher in the Lake Erie watershed.

- Loading rate estimates were calculated for the Lake Michigan and Lake Superior tributaries sampled in 1999. In 1998, project delays combined with lower than average rainfall throughout the region resulted in an inadequately representative sampling period and an insufficient number of samples collected during high flow. For these reasons loading rate estimates were not calculated for the Lake Huron and Lake Erie tributaries sampled in 1998.

- The Grand River was the most significant contributor of total phosphorus, total chloride and total suspended solids, followed by the St. Joseph and Kalamazoo Rivers. The Tahquamenon River was the least significant contributor of total phosphorus and total chloride, while the Escanaba River was the least significant contributor of total suspended solids.

- In general, the Grand River was the most significant contributor of total mercury and trace metals, typically followed by the St. Joseph and Kalamazoo Rivers. The Pere Marquette River was the least significant contributor of total mercury, cadmium, copper, lead, and nickel, while the Tahquamenon and Manistique Rivers were the least significant contributors of chromium and zinc, respectively.

- All samples analyzed for base/neutral organics, MTBE and BTEX met applicable Michigan Rule 57 water quality values.

- All samples analyzed for total cadmium, chromium, lead, nickel and zinc met applicable Michigan Rule 57 water quality values. Only one sample analyzed for total copper exceeded the applicable Michigan Rule 57 water quality value; this sample was collected from the Clinton River during a high flow event.

- Most samples (193 of 218) analyzed for total mercury exceeded the Michigan Rule 57 water quality value for mercury. The lowest exceedance rates were found at the AuSable River (2 of 11 samples) and Thunder Bay River (4 of 11 samples). All mercury samples from 13 of 18 tributaries exceeded the Michigan Rule 57 water quality value for mercury.

- All samples (58) analyzed for total PCB exceeded the applicable Michigan Rule 57 water quality value, as did most samples (30 of 33) analyzed for total DDT.

- All samples analyzed for total chlordane, lindane, apparent toxaphene and HCB met applicable Michigan Rule 57 water quality values.

SECTION 2.0

INTRODUCTION

In June 1998, the Michigan Department of Environmental Quality-Surface Water Quality Division (MDEQ-SWQD) initiated partial implementation of its Water Chemistry Trend Monitoring Project (WCTMP) using part of a $500,000 appropriation by the state legislature to the MDEQ-SWQD. This project was a first step towards improving water quality monitoring in Michigan since funding reductions resulted in severely restricted monitoring capabilities. Past limitations in analytical quantitation levels further restricted the effectiveness of MDEQ-SWQD monitoring activities. Recent technological advances in affordable, low-concentration analytical techniques have been incorporated into the WCTMP, making it possible to assess Michigan's surface waters for bioaccumulative chemicals of concern (BCCs) such as mercury and polychlorinated biphenyls (PCBs) at environmentally relevant levels.

The WCTMP is an important component of the statewide surface water quality monitoring activities outlined in the January 1997 report prepared by the MDEQ-SWQD and the Land and Water Management Division entitled, "A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (Strategy). The WCTMP incorporates the goals of the Strategy, which are as follows:

1. Assess the current status and condition of individual waters of the state and determine whether standards are being met;
2. Measure temporal and spatial trends in the quality of Michigan's surface waters;
3. Provide data to support the MDEQ water quality programs and evaluate their effectiveness; and
4. Detect new and emerging water quality problems.

The WCTMP calls for annual water chemistry monitoring on selected Michigan streams tributary to the Great Lakes (tributaries), Great Lakes connecting waters, Saginaw Bay and Grand Traverse Bay. The purpose of this report is to describe the preliminary study design of that portion of the WCTMP which targeted tributaries, and to present and discuss the results from monitoring efforts undertaken June 1998 through September 1999 on tributaries. Results obtained from monitoring efforts undertaken during this period on Saginaw Bay and Grand Traverse Bay are presented and discussed with previously unpublished results in the January 2001 report entitled "Water Quality Monitoring of Saginaw Bay and Grand Traverse Bay." Results obtained from monitoring undertaken during this period on Great Lakes connecting waters will be presented and discussed with previously unpublished results in a report currently being written. Both reports are, or will be, available upon request from the MDEQ-SWQD.

The November 1998 passage of the Clean Michigan Initiative (CMI) bond proposal resulted in a substantial increase in annual funding for statewide surface water quality monitoring beginning in 2000. The CMI bond also offers the availability of consistent, reliable funding for surface water quality monitoring over a period of approximately 15 years, a fact that is essential to realizing the second goal of the Strategy: i.e., measuring temporal and spatial trends in the quality of Michigan's surface waters. Following passage of the CMI bond proposal, the study design of the WCTMP was modified and expanded to facilitate use of the CMI funding source in a manner that will help ensure implementation of statewide water chemistry trend monitoring activities capable of more fully realizing the goals set forth in the Strategy. Details of the

expanded WCTMP are presented in the April 2001 report prepared by the MDEQ-SWQD and the United States Geological Survey (USGS) entitled, "The Ambient Surface Water Chemistry Monitoring Project in Michigan" (Appendix A, available upon request).

In accordance with one of the key principles of the Strategy, the WCTMP was planned and conducted in partnership with several outside organizations. In 1998 and 1999 these included the USGS, the University of Michigan Air Quality Laboratory (UMAQL), the Wisconsin State Laboratory of Hygiene (WSLH), and the Grand Traverse Bay Watershed Initiative. The WCTMP is coordinated by the MDEQ-SWQD.

SECTION 3.0

STUDY DESIGN AND METHODS

A total of 18 Great Lake tributaries were monitored between June 1998 and September 1999 as part of the WCTMP. This report includes all analytical results from samples collected during this period.

3.1 TRIBUTARY SELECTION

Eighteen tributaries were selected for monitoring (Figure 1). Tributary selection was based in part on stability of flow regime, insofar as stable flows generally yield more precise contaminant loading estimates and more readily detectable contaminant concentration and loading trends with fewer samples. High flow volume and known or expected contamination were also important criteria as these combined factors are associated with the most significant sources of contaminant loading to the Great Lakes.

3.2 STATION SELECTION

One sampling station was established on each tributary (Table 1). Stations were generally located at or near the tributary mouth. Stations were selected in part to avoid stream reaches subject to flow reversals (although this objective was not achievable on the Saginaw River). Surrounding land use, availability of historical water quality data, proximity to USGS stream flow gauging stations, and accessibility were also considered as part of the station selection criteria.

3.3 MONITORING SCHEDULE

Of the 18 monitoring stations, project funding in 1998 and 1999 would allow for sampling at only a subset each year: 10 during 1998, and 8 during 1999. Sampling in 1998 took place at selected tributaries on the eastern side of Michigan's lower peninsula; sampling in 1999 took place at selected tributaries on Michigan's upper peninsula and the western side of the lower peninsula. Approximately 12 samples were to be collected from each tributary during the period beginning with the first significant snowmelt or spring rain event and continuing through autumn rainfall. Of these 12 samples, 75% were to be collected from each tributary during high flow events, and the remaining 25% were to be collected during base/low flow. This schedule was adopted for nutrients and conventionals; base/neutral organics; methyl *tert*-butyl ether (MTBE); benzene, toluene, ethylbenzene and xylene (BTEX); mercury and trace metals based on its application in the Lake Michigan Mass Balance Project (USEPA 1997a; USEPA 1997b). Sample collection for chlorinated organic BCCs followed a different schedule, which is explained in detail in Section 3.4.3 of this report.

Funding delays in 1998 prevented sampling from commencing until June of that year, resulting in a sampling period considered inadequately representative of the entire year. Additionally, lower than average rainfall throughout the region resulted in an insufficient number of samples being collected during high flow events.

Sampling planned for 1999 began on schedule. Although another year of lower than average rainfall throughout the region resulted in fewer than the targeted 75% high flow samples collected from most stations, the period of sampling was considered representative of the entire year.

A breakdown of total samples, total high flow event samples, and percent high flow event samples collected at each monitoring station is presented in Table 2. A high flow event is defined by one or more of the following conditions: stream flow at or above the 20% exceedance flow; an increase in stream flow of approximately 100% above the preceding base flow condition; or an increase in stream flow following a lengthy period of discharge at base flow and considered likely to produce a measurable change in the concentration of sampled constituents.

3.4 SAMPLE COLLECTION AND CHEMICAL ANALYSES

Sample collection and chemical analyses are discussed below by analyte category. All participating analytical laboratories have quality assurance programs and use peer-reviewed analytical methods.

3.4.1 Nutrients and Conventionals, Base/Neutral Organics, MTBE and BTEX

The nutrient and conventional parameters identified in Table 3 were measured at all stations during each sampling event. Table 3 also provides quantitation levels, where applicable. Field measurements of dissolved oxygen, temperature, pH and conductivity were taken during each sampling event using a Hydrolab Surveyor II™ (Model SRV2) or a YSI™ water quality monitoring sonde (Model 600XL), unless equipment problems prevented this.

Samples for analysis of base/neutral organics, MTBE and BTEX were added to the WCTMP in 1999 to support the Strategy's goal to detect new and emerging water quality problems. Specifically with regard to MTBE, monitoring was incorporated into the WCTMP in response to mounting national concerns and a heightened awareness of the pollution problems caused by this chemical. The base/neutral organics analyzed are identified in Table 4, along with analytical quantitation levels. Base/neutral organics are used by industry in a wide range of applications, many involving petroleum products such as fuels and plastics. MTBE and BTEX are listed with analytical quantitation levels in Table 5. MTBE is an octane-enhancing replacement for lead that has been used as a gasoline additive since 1979. A study conducted in 1999 found that only 4 percent of all Michigan fuels tested had MTBE added as an octane booster, and those that did contain the additive generally had an MTBE content of 6 percent or less (MDEQ 2000). BTEX chemicals are common components of gasoline.

In most cases, samples were collected from a single point in the flow of the stream at approximately 0.3 – 1.0m depth. A subset of samples were collected using the method described for chlorinated organic BCCs in Section 3.4.3. All samples were handled in accordance with standard MDEQ procedures (MDNR 1994), and were analyzed by the MDEQ Environmental Laboratory.

3.4.2 Total Mercury and Trace Metals

Samples for total mercury (Hg) and trace metals were collected at all stations during each sampling event, and were analyzed by the UMAQL. All metals analyzed are shown in Table 6 with analytical detection and quantitation levels. Sample collection and handling was carried out in accordance with U. S. Environmental Protection Agency (USEPA) Method 1669, "Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels" (USEPA 1996a). Samples were collected from a single point in the flow of the stream at approximately 0.3 – 1.0m depth.

Total Hg samples were analyzed by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry, consistent with USEPA Method 1631 (USEPA 1996b). Samples were analyzed for the trace metals cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), and zinc (Zn) by Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) consistent with USEPA Method 1638 (USEPA 1996c).

3.4.3 Chlorinated Organic Bioaccumulative Chemicals of Concern

Monitoring for chlorinated organic BCCs included total PCB and selected pesticides. Samples for chlorinated organic BCCs were collected at a subset of tributary stations during only a subset of sampling events at those stations. Monitoring stations sampled for total PCB are shown in Table 7; also shown in this table are the number of total PCB samples collected at each station, and the subset number of total PCB samples also analyzed for pesticides. This sampling rate would allow spot checks for these contaminants, and would enable limited spatial comparisons and comparisons with Michigan Rule 57 water quality values. All samples analyzed for chlorinated organic BCCs were analyzed for total PCB. Table 8 shows all PCB congeners analyzed, along with their analytical detection and quantitation levels. A subset of samples analyzed for total PCB were also analyzed for the following pesticides: total dichlorodiphenyl trichloroethane (DDT), total chlordane, hexachlorobenzene (HCB), *gamma*-HCH (lindane), *alpha*-HCH (*alpha*-BHC) and (in 1998 only) apparent toxaphene. Table 9 shows the pesticides analyzed, along with analytical detection and quantitation levels.

Samples for chlorinated organic BCCs were collected in accordance with the sample collection and handling protocol described in the "Lake Michigan Mass Balance Study Methods Compendium, Volume 1: Sample Collection Techniques" (USEPA 1997a). A 160L sample volume was obtained by drawing water from 2 depths (at 0.2 and 0.8 of the total stream depth) at each of 3 points in a transect (at 0.25, 0.5 and 0.75 of the stream channel width). The WSLH performed the chemical analyses in accordance with the analytical protocol described in the "Lake Michigan Mass Balance Study Methods Compendium, Volume 2: Organic and Mercury Sample Analysis Techniques" (USEPA 1997b), with the exception that dissolved and particulate fractions were combined.

Throughout this report, toxaphene is referred to as "apparent toxaphene" because although the analytical method can identify a residue with chromatographic characteristics similar to toxaphene, it cannot specifically identify the residue as the pesticide toxaphene. Analyses for apparent toxaphene were dropped from the WCTMP after 1998. This decision was made based on the analytical difficulties with isolating true toxaphene, and based on the absence of environmentally relevant detection and quantitation levels for the contaminant.

3.5 SUMMARY STATISTICS

Summary statistics presented in this report include measures of central tendency; spatial comparisons; contaminant loading rate estimates; and comparisons with Michigan Rule 57 water quality values. One final category of summary statistic, that of temporal trend analysis, is discussed; however, temporal trend analyses are not yet possible due to the early stage of the WCTMP.

Detecting trends in stream water quality is not a simple task. Large changes in contaminant concentrations caused by both short- and long-term changes in stream discharge serve to obscure smaller non-climatological temporal trends, and spatial trends when comparisons involve waterbodies sampled in different years (Harned et al. 1981). To control for the effects of stream discharge, spatial trend analyses were prepared with data normalized to stream discharge using locally weighted scatterplot smoothing (LOWESS) where sample sizes were sufficient to support such manipulations (Helsel 1991). Temporal trend analyses presented in future WCTMP reports will also be prepared with concentrations normalized to stream discharge using LOWESS.

3.5.1 Handling of Coded and Censored Data

Coded data and data below analytical quantitation or detection levels (censored data), and the handling of these data in the development of summary statistics are discussed by analyte category, below. Table 10 provides a comprehensive list of laboratory result remark codes referenced in this report, along with their definitions.

3.5.1.1 Nutrients and Conventionals, Base/Neutral Organics, MTBE and BTEX

In many cases, the MDEQ Environmental Laboratory does not report observed concentrations if they are below analytical quantitation. Often in such cases, the laboratory reports either the analyte's quantitation level coded with a K, or (as with base/neutral organics, MTBE and BTEX) it reports only ND. In other cases, however, the laboratory will report the lowest normally reportable value, coded with a W. Lowest normally reportable values represent the lowest concentration that the analytical device can read, rounded to the appropriate number of significant figures. In cases where the laboratory does report observed concentrations below quantitation, such results are reported with a T code.

Occasionally due to travel distances and day or time of sample collection, field staff were unable to deliver samples to the laboratory in time to meet the recommended maximum holding times before analysis for certain analytes; the analytical results for such samples are coded HT by the laboratory. The prevalence in 1998 of holding time exceedances for analytes such as total phosphorus and total nitrate were the result of a staffing shortage at the laboratory, which caused certain analyses to be delayed. Results coded HT were considered reliable for use in the calculation of all summary statistics prepared for the WCTMP (MDEQ 1999).

Calculating true average concentrations of nutrients or conventionals was not possible when K codes were present in a data set for a given analyte. In such cases, average concentrations were calculated using half the quantitation level in place of unknown concentrations. Calculated averages were then footnoted to indicate that estimated values were used when actual concentrations were not available. Estimated values were likewise used in the development of spatial comparisons and in calculations made for loading rate estimates. In contrast,

base/neutral organics, MTBE and BTEX results below quantitation (coded ND) were assigned a value of zero for purposes of calculating means. It was determined that unlike nutrient and conventional pollutants which are naturally occurring and ubiquitous in the environment, base/neutral organics, MTBE and BTEX are entirely anthropogenically derived and may reasonably be presumed absent from a waterbody. Results coded with a T, W, or HT were used in all calculations.

3.5.1.2 Total Mercury and Trace Metals

Total Hg and trace metal concentrations below analytical quantitation or detection levels were reported and were used in all calculations. Samples in which total Hg or trace metals were detected at concentrations below those detected in the UMAQL's instrument calibration blank were reported as zero by the UMAQL; these zero values were used in all calculations.

3.5.1.3 Chlorinated Organic Bioaccumulative Chemicals of Concern

Total PCB concentrations were estimated by summing the concentrations of the individual and coeluting congeners identified in Table 8. Total DDT concentration was estimated by summing the concentrations of three DDT metabolites: dihydrochloride (4,4'-DDE), 1,1-bis(4-chlorophenyl)-2,2-dichloroethane (4,4'-DDD), and 4,4'-DDT. Total chlordane concentration was estimated by summing the concentrations of five isomers: *alpha*-chlordane, *gamma*-chlordane, *cis*-nonachlor, *trans*-nonachlor and oxychlordane.

Congener, metabolite and isomer concentrations below analytical quantitation or detection levels were reported and were used in calculating total PCB, DDT and chlordane concentrations, respectively. Congener, metabolite, and isomer concentrations not detected above noise were reported as zero by the WSLH, and zero values were used for the purpose of calculating total concentrations. If the concentrations of all congeners, metabolites or isomers in a sample were reported as zero, then total PCB, DDT or chlordane concentration was reported as zero. In samples where the presence of uncontrollable interference made analysis impossible, the WSLH reported NAI in place of a result. Such congeners, metabolites or isomers were assigned a value of zero for the purpose of calculating total concentrations. If all congeners, metabolites or isomers in a given sample were coded NAI, then total PCB, DDT or chlordane for that sample was reported as NAI, and that sample was not counted in developing summary statistics. In some cases, sample dilution was necessary to bring congener concentration ranges within the instrument calibration range and certain congeners could not be detected as a result of this dilution. In such cases the WSLH reported NDD in place of a result. Such congeners were assigned a concentration equal to zero for the purpose of calculating total concentrations. Congener, metabolite or isomer results coded FMS or EST were used for the purpose of calculating total concentrations. Congener, metabolite or isomer results coded FBK were used unadjusted for the purpose of calculating total concentrations. FBK-coded results represented only 0.34 percent of the 1998 data set and only 0.14 percent of the total data set, and it was determined that such a small percentage would have little impact on calculated total concentrations. The 1999 data set contained no congener, metabolite or isomer results coded FBK.

Concentrations of HCB, *alpha*-BHC, lindane and apparent toxaphene below analytical quantitation or detection levels were reported and were used in developing summary statistics. Analyte concentrations not detected above noise were reported as zero by the WSLH, and zero values were used in developing summary statistics. In samples where the presence of

uncontrollable interference made analysis impossible, the NAI code was reported in place of a result and those samples were not counted in developing summary statistics. In samples where dilution was necessary and where certain analytes were not detected as a result of this dilution, the NDD code was reported in place of a result. Such samples were assigned a concentration equal to zero and were counted in developing summary statistics. HCB, *alpha*-BHC, lindane and apparent toxaphene results coded FBK, FMS, or EST were used in developing summary statistics.

3.5.2 Measures of Central Tendency

Where sufficient data were available, average and median concentrations were calculated for each analyte at each sampling station.

3.5.3 Spatial Comparisons

Graphs were developed showing median tributary concentrations of total phosphorus, chloride, TSS, Hg, trace metals, and PCB. Within each graph, tributaries were ranked lowest to highest according to median contaminant concentration. With the exception of total PCB (for which actual contaminant concentrations were used), all graphs represent contaminant concentrations normalized to stream discharge. Additionally, box plot graphs were developed to further describe the characteristics of the data sets for these contaminants. Box plots developed for total phosphorus, chloride, TSS, Hg, and trace metals were grouped by Great Lakes watershed, and were ranked lowest to highest within each watershed based on median normalized tributary contaminant concentration. A similar box plot graph was developed for total PCB. Box plots in this graph were ranked lowest to highest based on median actual tributary concentration, and were not grouped by Great Lakes watershed.

As stated previously, contaminant concentrations used in spatial comparisons were first normalized to stream discharge using LOWESS, unless sample sizes were not sufficient to support such manipulations. Normalization provides a means of controlling for the effects of stream discharge on contaminant concentrations and supports comparisons among tributaries monitored in different years. Where necessary, data were logarithmically transformed to render differences among data groups more readily discernible. Despite these measures, spatial comparisons presented in this report should be interpreted with caution. The WCTMP did not use a randomized sampling design and this fact diminishes its ability to yield spatial comparison information. The feasibility and value of incorporating a randomized sampling design component into future implementations of the WCTMP are currently being evaluated.

Due to the relatively small size of the data sets for each tributary at this stage of the WCTMP, tests for statistical significance would not yield meaningful results and therefore no such tests were made. Statistical significance will be tested when the data sets become large enough to support such determinations.

3.5.4 Loading Rate Estimates

Loading rate estimates were calculated for total phosphorus, chloride, TSS, Hg and trace metals for tributaries sampled in 1999. Calculations were performed using the Stratified Beale Ratio Estimator (Richards 1994). Loading rate estimates were not calculated for tributaries monitored in 1998 due to a non-representative sampling period coupled with an insufficient number of samples collected during high flow events as a result of lower than average rainfall that year.

3.5.5 Comparisons Against Michigan Rule 57 Water Quality Values

Of the contaminants monitored as part of the WCTMP, Rule 57 water quality values have been developed for a subset of base/neutral organics, MTBE, BTEX, Hg, trace metals, total PCB, total chlordane, total DDT, lindane, toxaphene, and HCB. Where the data allowed, comparisons for these contaminants were made against the most restrictive Rule 57 water quality value applicable to a waterbody that is not protected as a drinking water source.

For MTBE and BTEX, the most restrictive Rule 57 water quality value is the final chronic value (FCV). For base/neutral organics, the most restrictive Rule 57 water quality value differs among the 27 of 49 chemicals in this category for which these values have been developed; this will be addressed fully in Section 4.4.1. Base/neutral organics for which Rule 57 water quality values have been developed are listed in Table 4 (see Groups 1-3).

For Hg, total DDT and lindane, the most restrictive Rule 57 water quality value is the wildlife value (WV); for the trace metals, the most restrictive Rule 57 water quality value is the FCV; and for total PCB, total chlordane, toxaphene and HCB, the most restrictive Rule 57 water quality value is the human cancer value (HCV). The FCV for trace metals is hardness dependent and was calculated for each tributary using tributary-specific hardness data. Trace metal concentrations used in these comparisons are for *total* metal, whereas the FCVs for trace metals were developed based on *dissolved* metal toxicity criteria. For this reason, a direct comparison between trace metal concentrations and Rule 57 water quality values cannot be made. This is not an important consideration when a given total trace metal concentration meets the applicable Rule 57 water quality value; however when it exceeds the Rule 57 water quality value, it cannot be known whether the concentration of metal in the dissolved fraction also exceeds the Rule 57 water quality value. In such cases, more sophisticated monitoring would be necessary to address these situations, and caution must be exercised when drawing conclusions based on the available data.

3.5.6 Temporal Trend Analyses

Measurement of temporal trends is one of the key goals of the WCTMP. However, in this early stage of the WCTMP, temporal trend analysis is not yet possible. These analyses will be prepared and presented in future WCTMP reports when a sufficient number of years of data are available to support temporal trend measurements. The WCTMP will evaluate temporal trends in annual loading rates of total phosphorus, chloride, TSS, Hg and selected trace metals, consistent with existing federal and state guidelines on selecting water quality indicators. Loading rates used to evaluate temporal trends will be calculated with the Stratified Beale Ratio Estimator using contaminant concentrations normalized to stream discharge using LOWESS.

SECTION 4.0

RESULTS AND DISCUSSION

Field staff collected a total of 218 samples between June 1998 and September 1999. Of these 218 samples, 117 were collected in 1998, and 101 were collected in 1999.

4.1 MEASURES OF CENTRAL TENDENCY

Analytical results and measures of central tendency are presented for all analytes (Appendix B, available upon request).

4.2 SPATIAL COMPARISONS

Spatial comparisons were made for total phosphorus, chloride, TSS, Hg, trace metals, and PCB, and are discussed below. With the exception of total PCB (for which sample sizes were not sufficient), contaminant concentrations used in all spatial comparisons were normalized to stream discharge. The box plot diagram shown in Figure 2 gives an explanation of the features of a typical box plot and provides a means of interpreting the box plot graphs presented.

4.2.1 Total Phosphorus, Total Chloride and Total Suspended Solids

Monitoring for total phosphorus, chloride, and TSS took place at all tributaries identified in Figure 1. The graphs presented in Figures 3.1 – 3.3 show these tributaries ranked lowest to highest according to median normalized contaminant concentration. Median normalized total phosphorus (Figure 3.1) was lowest at the AuSable River (0.013 mg/L), and highest at the Clinton River (0.16 mg/L); median normalized total chloride (Figure 3.2) was lowest at the Manistique River (2.0 mg/L), and highest at the Tittabawassee River (169 mg/L); and median normalized TSS (Figure 3.3) was lowest at the AuSable River (2.0 mg/L), and highest at the Shiawassee River (51 mg/L). Box plot graphs presented in Figures 4 – 6 show similar rankings grouped by Great Lakes watershed.

4.2.2 Total Mercury and Trace Metals

Monitoring for total Hg and trace metals took place at all tributaries identified in Figure 1. The graphs presented in Figures 3.4 – 3.10 show these tributaries ranked lowest to highest according to median normalized contaminant concentration. The AuSable River ranked lowest in total Hg (0.36 ng/L), Cd (0.00032 ug/L), Cr (0.43 ug/L), Cu (0.22 ug/L), Pb (0.028 ug/L) and Zn (0.71 ug/L); and the Tahquamenon River ranked lowest in total Ni (0.69 ug/L). In contrast with low rankings, high rankings were considerably more variable. Median normalized total Hg (Figure 3.4) was highest at the Kalamazoo River (9.2 ng/L); Cd (Figure 3.5) was highest at the Clinton River (0.068 ug/L); Cr (Figure 3.6) was highest at the Tittabawassee River (3.3 ug/L); Cu (Figure 3.7) was highest at the River Rouge (3.5 ug/L); Ni (Figure 3.8) was highest at the Clinton River (7.4 ug/L); Pb (Figure 3.9) was highest at the Huron River (3.0 ug/L); and Zn (Figure 3.10) was highest at the Thunder Bay River (18 ug/L). Box plot graphs presented in Figures 7 - 13 show similar rankings grouped by Great Lakes watershed.

4.2.3 Total PCB

Monitoring for total PCB took place at the tributaries identified in Table 7. The graph presented in Figure 3.11 shows these tributaries ranked lowest to highest according to median actual total PCB concentration, which was lowest at the Manistique River (0.82 ng/L), and highest at the Clinton River (1.1 ng/L). The box plot graph in Figure 14 shows a similar ranking.

4.3 LOADING RATE ESTIMATES

Loading rate estimates were calculated only for tributaries sampled in 1999. These calculations were made for total phosphorus, chloride, and TSS in metric tons/year, and for total Hg and trace metals in kg/year; and are shown in Tables 11-12. Discussion is restricted to actual annual loading rate estimates; however, tables also provide the normalized annual loading rate estimates that will be used for trend analysis in future years. Also shown are actual mean contaminant concentrations, annual stream flows, and the 95% confidence intervals associated with actual annual loading rate estimates. Tributaries listed in the tables are shown ranked from lowest to highest actual annual loading rate for each contaminant.

4.3.1 Total Phosphorus, Total Chloride and Total Suspended Solids

Loading rate estimates for total phosphorus, chloride and TSS are presented in Table 11. Of the tributaries sampled in 1999, the least significant contributor of annual total phosphorus and chloride loadings to the Great Lakes was the Tahquamenon River (total phosphorus = 21 mt/year; total chloride = 1,390 mt/year). The least significant contributor of annual TSS loadings was the Escanaba River (TSS = 3,820 mt/year). The most significant contributor of annual loadings of all these contaminants was the Grand River (total phosphorus = 391 mt/year; total chloride = 118,000 mt/year; and TSS = 122, 000 mt/year).

4.3.2 Total Mercury and Trace Metals

Loading rate estimates for total Hg and trace metals are presented in Table 12 for each tributary. Of the tributaries sampled in 1999, the least significant contributor of annual total Hg loadings to the Great Lakes was the Pere Marquette River (Hg = 2 kg/year). The most significant contributor of annual total Hg loadings was the Grand River (Hg = 26 kg/year).

Of the trace metals analyzed, the Pere Marquette River was the least significant contributor of annual loadings of total Cd (4 kg/year), Cu (221 kg/year), Ni (564 kg/year) and Pb (127 kg/year); the Tahquamenon River was the least significant contributor of annual loadings of total Cr (329 kg/year); and the Manistique River was the least significant contributor of annual loadings of total Zn loadings (1,670 kg/year). The Grand River was the most significant contributor of annual loadings of total Cr (5,870 kg/year), Cu (7,410 kg/year), Ni (11,010 kg/year) and Pb (5,590 kg/year); and the St. Joseph River was the most significant contributor of annual loadings of total Cd (129 kg/year) and Zn (25,500 kg/year).

4.4 COMPARISONS AGAINST MICHIGAN RULE 57 WATER QUALITY VALUES

Individual sample concentrations and the calculated mean concentration of each analyte were compared to their most restrictive Rule 57 water quality value. Where exceedances did occur,

the mean was split to show the base/low flow mean and the high flow mean concentrations, along with ranges and exceedance rates applicable specifically to samples collected during these flow conditions. Exceedance rate is represented by the number of individual samples in exceedance of the applicable Rule 57 water quality value / the total number of analyses completed for that contaminant at each tributary.

4.4.1 Base/Neutral Organics, MTBE and BTEX

Table 4 identifies the base/neutral organics analyzed. Rule 57 water quality values are provided in this table, where available. A total of 101 samples were collected for base/neutral organics in 1999. Of these, only 9 contained concentrations above analytical quantitation. The base/neutral organics for which some samples were found above analytical quantitation included diethyl phthalate, di-n-butyl phthalate, and bis(2-ethylhexyl)phthalate. Of these, only di-n-butyl phthalate and bis(2-ethylhexyl)phthalate have Rule 57 water quality values (see Group 1 of Table 4). Samples for which di-n-butyl phthalate and bis(2-ethylhexyl)phthalate were found above analytical quantitation were collected at the Pere Marquette, Escanaba and St. Joseph Rivers. Individual sample and mean concentrations for these contaminants at these tributaries are compared with applicable Rule 57 water quality values at the Pere Marquette, Escanaba and St. Joseph Rivers in Table 13. No exceedances were seen in any samples for these contaminants at these tributaries. Group 2 of Table 4 shows the base/neutral organics for which all sample results were below analytical quantitation and which have quantitation levels below the applicable Rule 57 water quality value. Sample results for these contaminants also did not exceed Rule 57 water quality values. Finally, Group 3 of Table 4 shows the base/neutral organics (carbazole, dibenzofuran, hexachlorobutadiene, and hexachlorocyclopentadiene) for which all sample results were below analytical quantitation, but which have quantitation levels *above* the Rule 57 water quality value. Although a definitive comparison against Rule 57 water quality values cannot be made for these contaminants, exceedances are not suspected.

Table 5 lists MTBE and BTEX with their quantitation levels and Rule 57 water quality values. All MTBE samples were below analytical quantitation (RDL = 5.0 ug/L). All MTBE samples were therefore well below the MTBE Rule 57 water quality value (FCV = 730 ug/L). Likewise, all BTEX samples were below analytical quantitation (RDL range: 1.0 – 2.0 ug/L). All BTEX samples were therefore well below the applicable Rule 57 water quality values (Rule 57 water quality value range: 18 – 200 ug/L).

4.4.2 Total Mercury and Trace Metals

Mean Hg and trace metal sample concentrations are compared with applicable Rule 57 water quality values at each tributary in Table 14. Also shown in this table are the range of concentrations and the exceedance rate for each contaminant. Additionally, individual and mean total Hg sample concentrations are shown with the Hg Rule 57 water quality value and the hydrograph of stream discharge for each tributary in Figures 26 - 43.

No exceedances were found in any samples analyzed for total Cd, Cr, Ni, Pb or Zn. Only 1 Cu sample collected at 1 tributary was found to exceed the Cu Rule 57 water quality value of 24 ug/L. This sample, from the Clinton River, was collected during a high flow event and had a Cu concentration of 40.6 ug/L. Total Hg exceeded the Hg Rule 57 water quality value of 1.3 ng/L in all samples collected at 13 of 18 tributaries, listed here with their range of Hg concentrations: Clinton (2.4 – 107 ng/L), Huron (1.8 – 3.3 ng/L), Escanaba (3.3 – 55.4 ng/L), Grand (2.2 – 21.8 ng/L), Kalamazoo (6.5 – 13.1 ng/L), Manistique (2.0 – 6.1 ng/L), Pere Marquette (1.5 – 5.3

ng/L), Raisin (1.8 – 7.0 ng/L), Rouge (3.2 – 29.6 ng/L), Saginaw (2.1 – 5.2 ng/L), St. Joseph (1.7 – 16.0 ng/L), Tahquamenon (2.0 – 9.6 ng/L) and Tittabawassee (1.7 – 11.8 ng/L). At the remaining 5 tributaries, 2 of 11 Hg samples collected at the AuSable River, and 8 of 12 Hg samples collected at the Muskegon River were found to exceed the Hg Rule 57 water quality value; all concentrations in exceedance at these tributaries were from samples collected during high flow events. The range of Hg concentrations found during high flow at these tributaries was 0.17 – 4.6 ng/L at the AuSable River, and 0.84 – 34.0 ng/L at the Muskegon River. Exceedances in samples collected at the Thunder Bay River (4 of 11), Rifle River (7 of 11), and Shiawassee River (12 of 13) were distributed among high flow and base/low flow events, although high flow events were associated with higher exceedance rates at these tributaries.

4.4.3 Chlorinated Organic Bioaccumulative Chemicals of Concern

Mean total PCB, total chlordane, total DDT, lindane, apparent toxaphene and HCB are compared with applicable Rule 57 water quality values at each tributary in Table 15. Also shown in this table are the range of concentrations and the sample exceedance rate for each contaminant.

No exceedances were found in any samples analyzed for total chlordane, lindane or HCB. Likewise, no samples analyzed for apparent toxaphene exceeded the applicable Rule 57 value. In fact, none of the samples analyzed for apparent toxaphene gave chromatographic evidence of the contaminant's presence. However, apparent toxaphene has an analytical quantitation level of 16 ng/L, well above its Rule 57 value of 0.068 ng/L. Because of this a definitive comparison against Rule 57 water quality values cannot be made for this contaminant with the data obtained. Total DDT exceeded the Rule 57 water quality value of 0.011 ng/L in all samples collected at 6 of the 9 tributaries sampled for this contaminant, as listed here with their ranges of concentrations: AuSable (0.014 – 0.03 ng/L), Clinton (0.664 – 1.78 ng/L), Grand (1.34 – 2.65 ng/L), Kalamazoo (0.316 – 0.394 ng/L), Raisin (0.64 – 1.15 ng/L) and Saginaw (1.11 – 1.75 ng/L). One of 2 DDT samples analyzed from the Escanaba, Manistique and Tahquamenon Rivers exceeded the DDT Rule 57 water quality value, although each of the samples was collected during a high flow event. DDT concentrations in exceedance at these tributaries were 0.13 ng/L at the Escanaba River, 0.06 ng/L at the Manistique River, and 0.17 ng/L at the Tahquamenon River. Note that as with apparent toxaphene, analytical quantitation levels applicable to the individual DDT metabolites are above the Rule 57 value for total DDT, and therefore a definitive comparison against the Rule 57 value cannot be made for this contaminant with the data obtained. Total PCB exceeded the PCB Rule 57 water quality value of 0.026 ng/L in all samples analyzed at all tributaries sampled for PCB, as listed here with their range of concentrations: AuSable (0.756 – 1.87 ng/L), Clinton (5.76 – 10.7 ng/L), Raisin (55.9 – 256 ng/L), Saginaw (20.9 – 39 ng/L), Escanaba (0.292 – 0.83 ng/L), Grand (1.94 – 4.06 ng/L), Kalamazoo (8.31 – 24.5 ng/L), Manistique (0.266 – 1.01 ng/L), and Tahquamenon (0.202 – 1.44 ng/L).

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SECTION 5.0

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Figure 1. Tributary sampling stations monitored in 1998-1999.

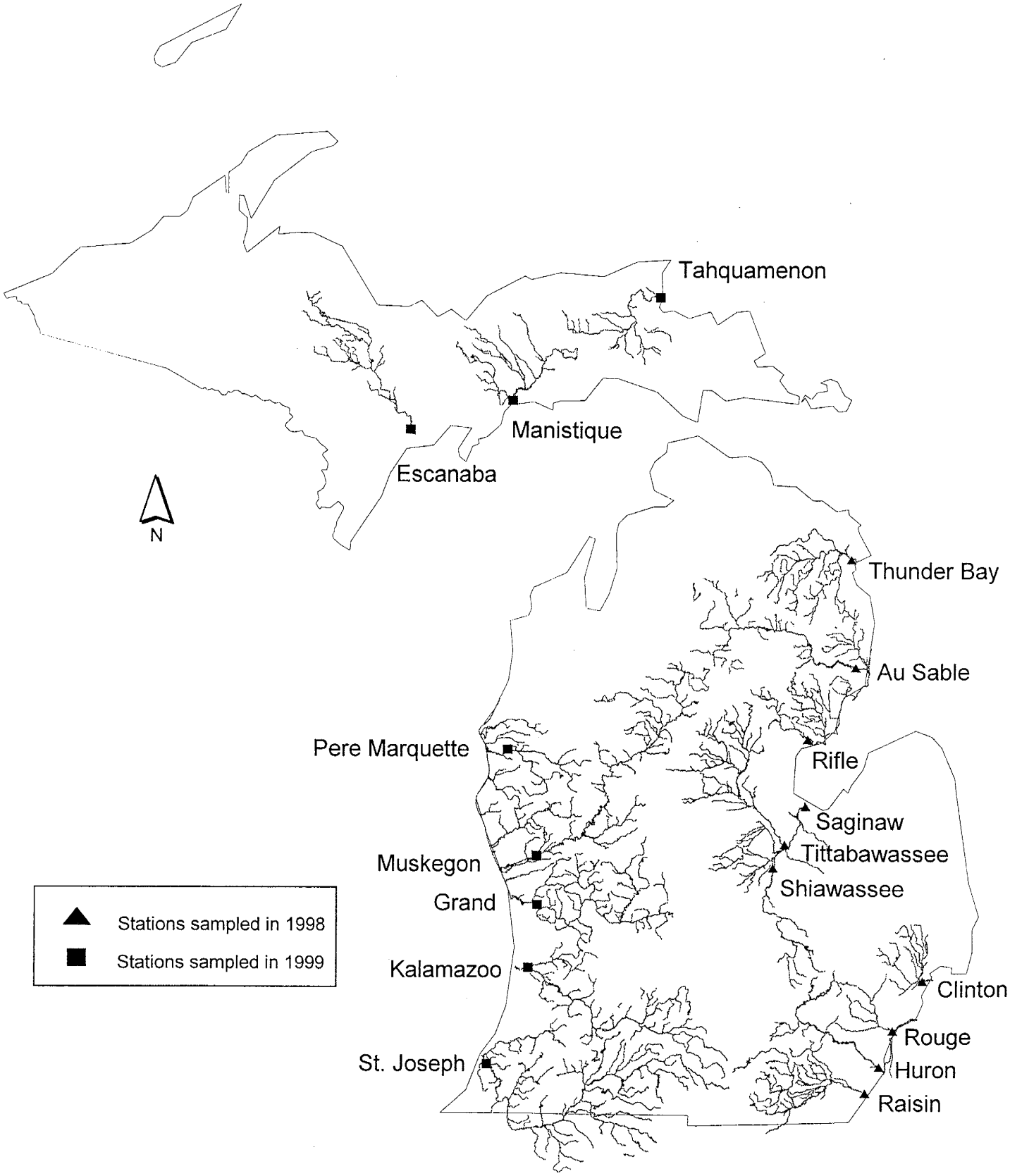


Figure 2. Diagram of a box plot.

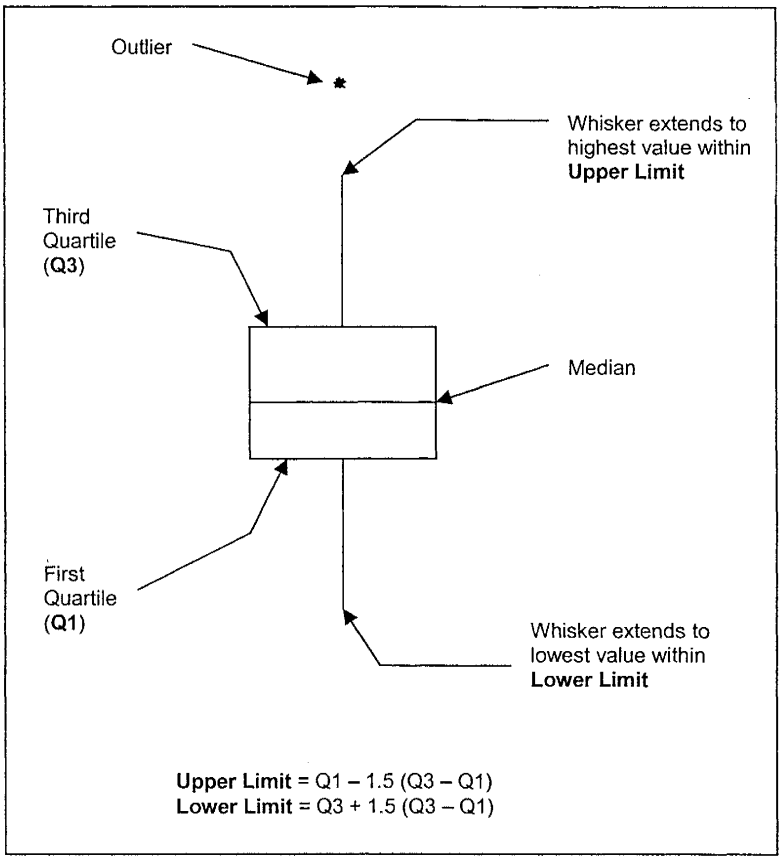
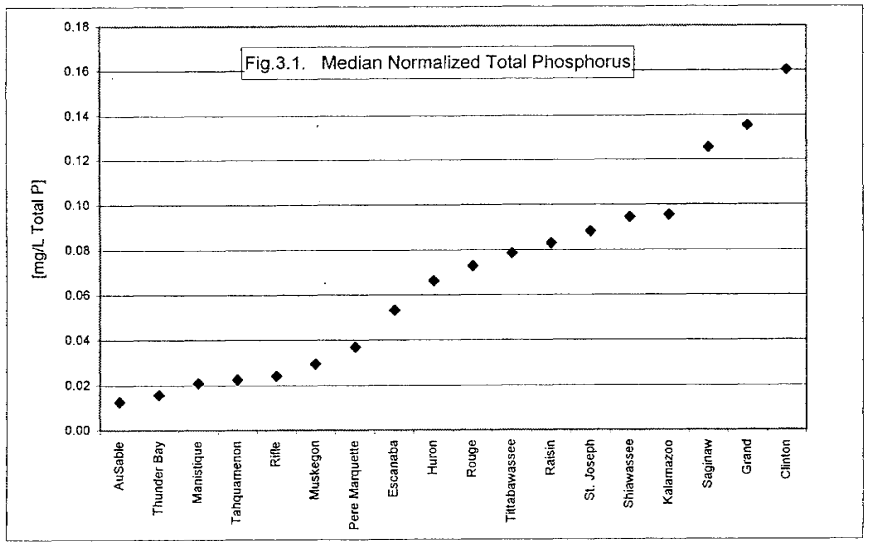
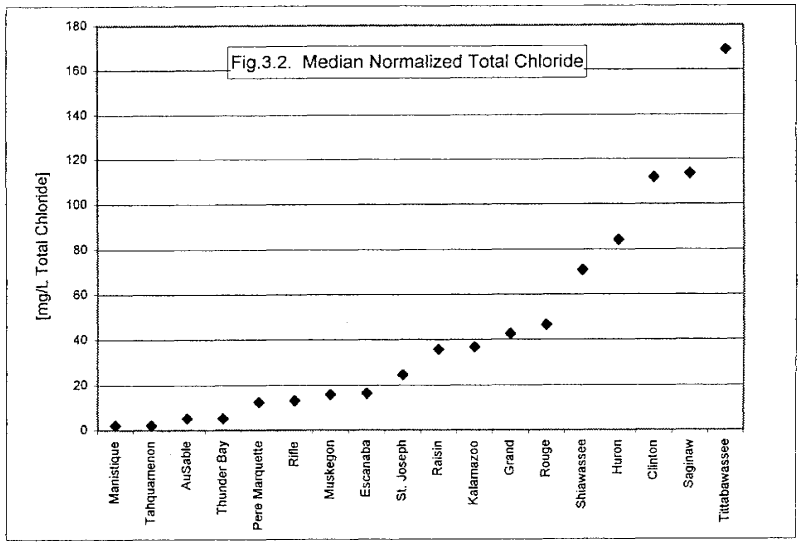
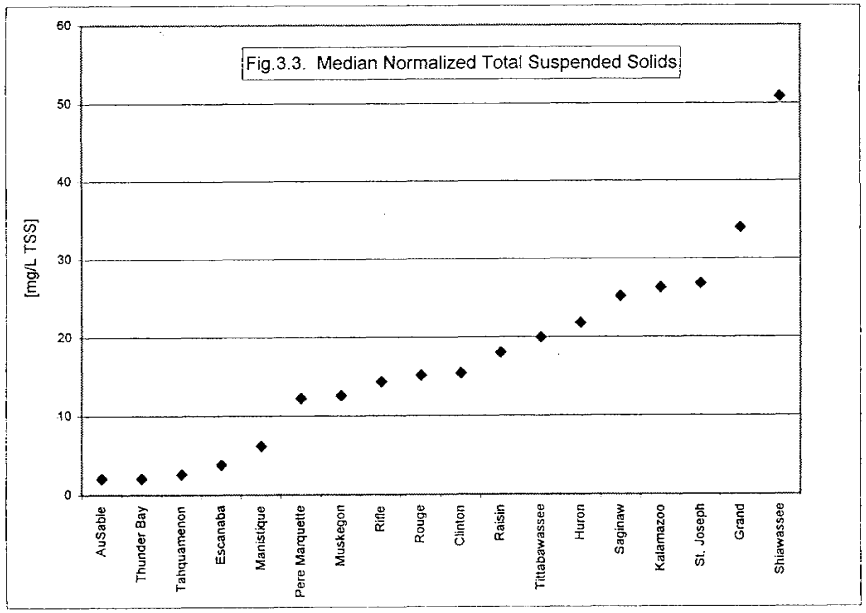
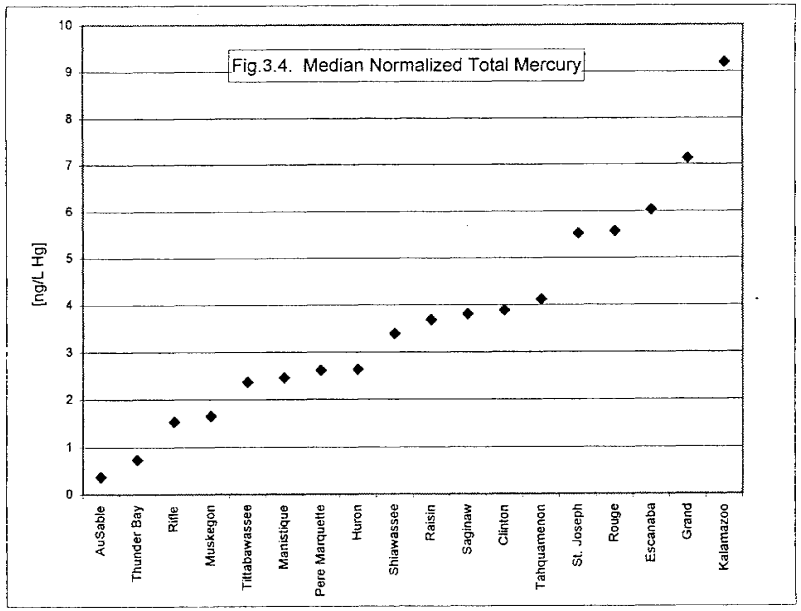


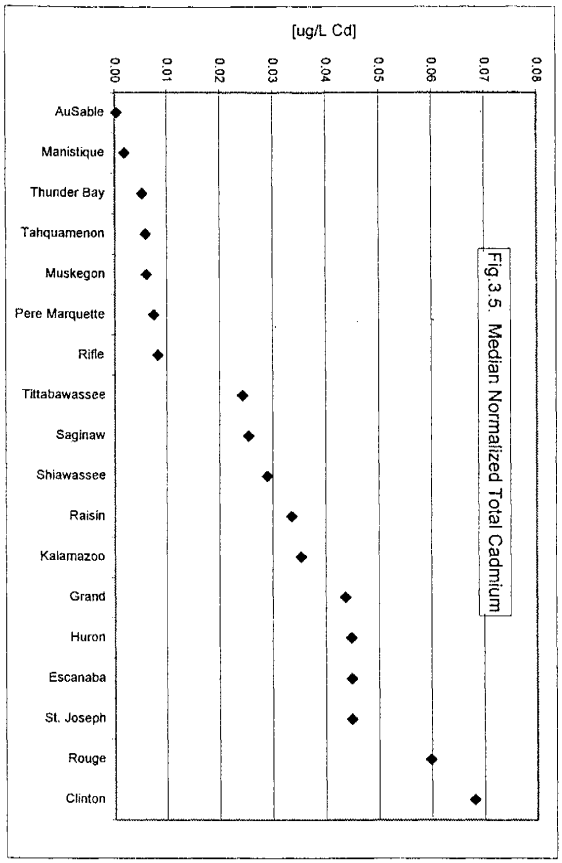
Figure 3. Median ranked total phosphorus, chloride, suspended solids, Hg, trace metal and PCB concentrations. With the exception of PCB, concentrations shown have been normalized to stream discharge.

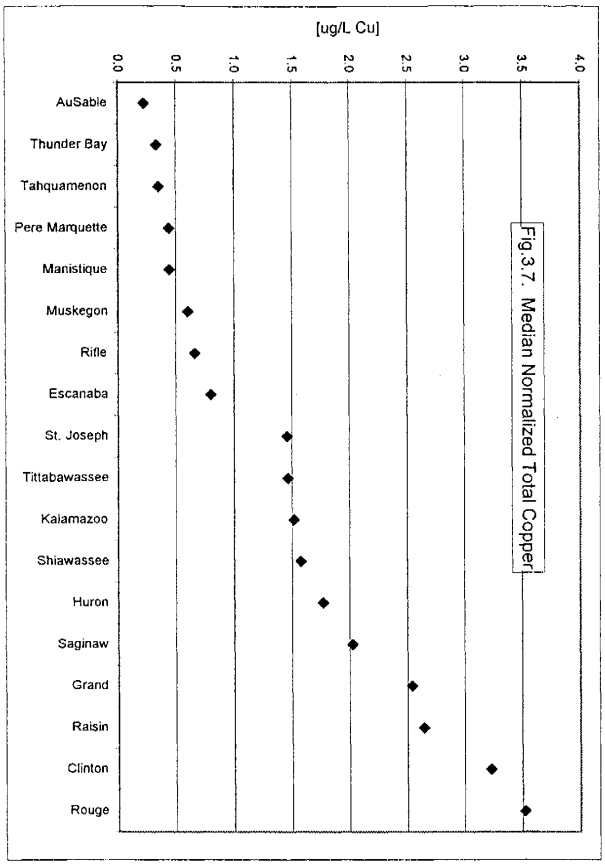


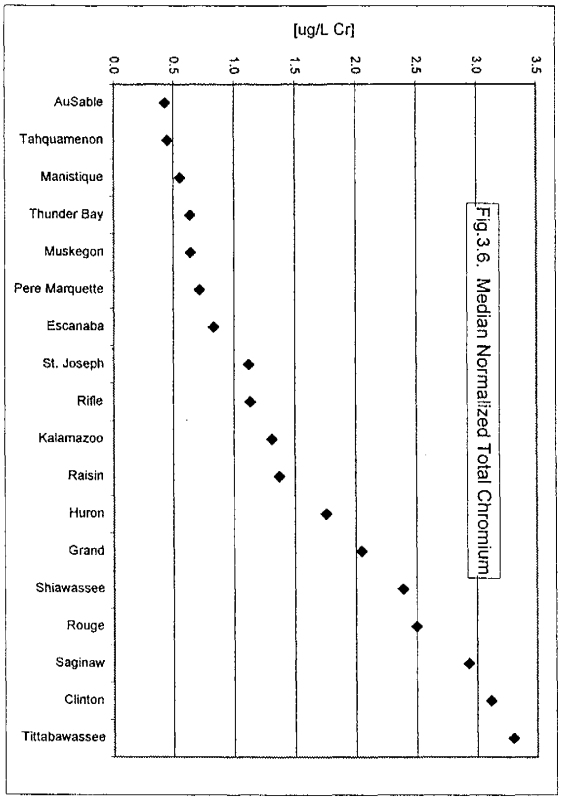












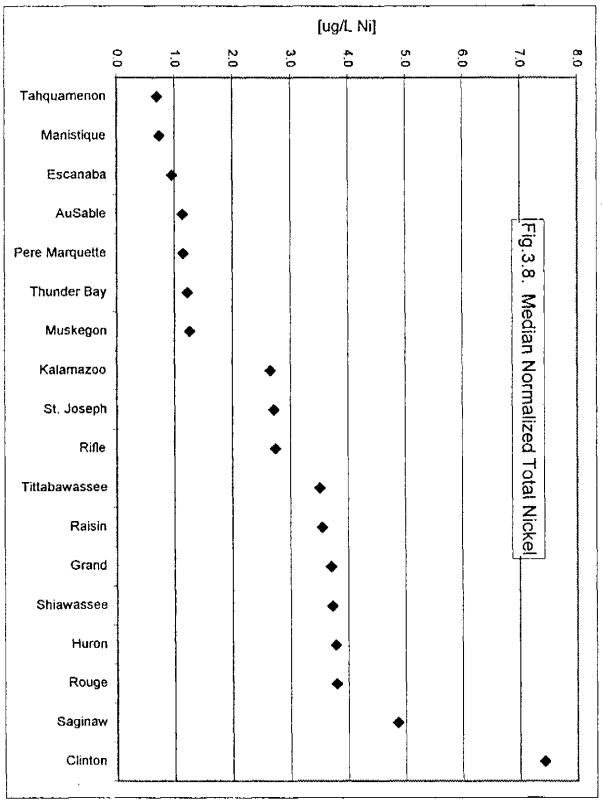


Figure 3. Median ranked total phosphorus, chloride, suspended solids, Hg, trace metal and PCB concentrations. With the exception of PCB, concentrations shown have been normalized to stream discharge.

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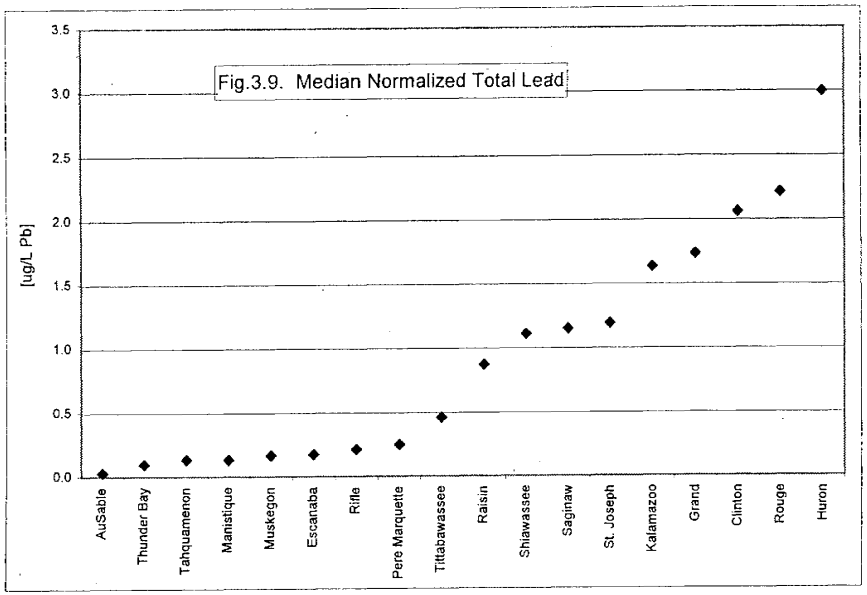
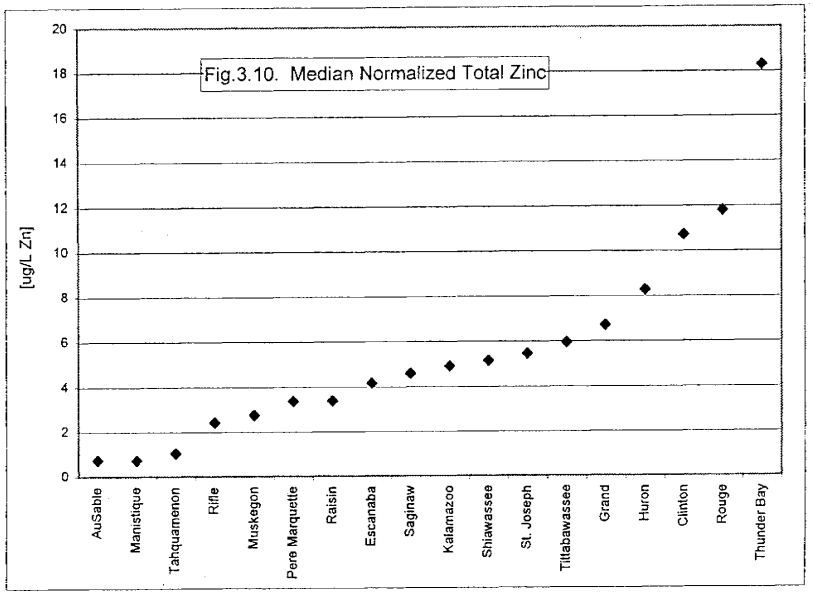




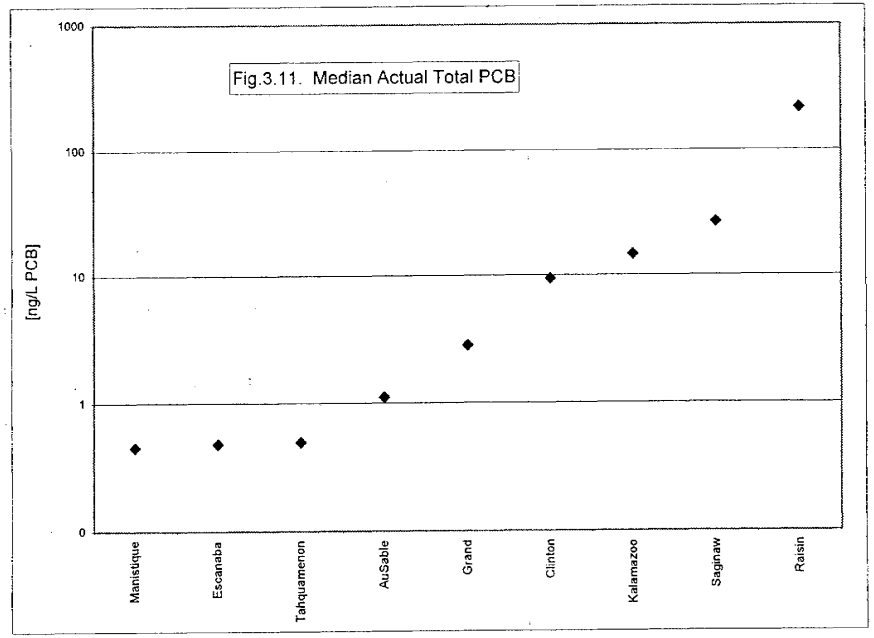


Figure 4. Total phosphorus data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

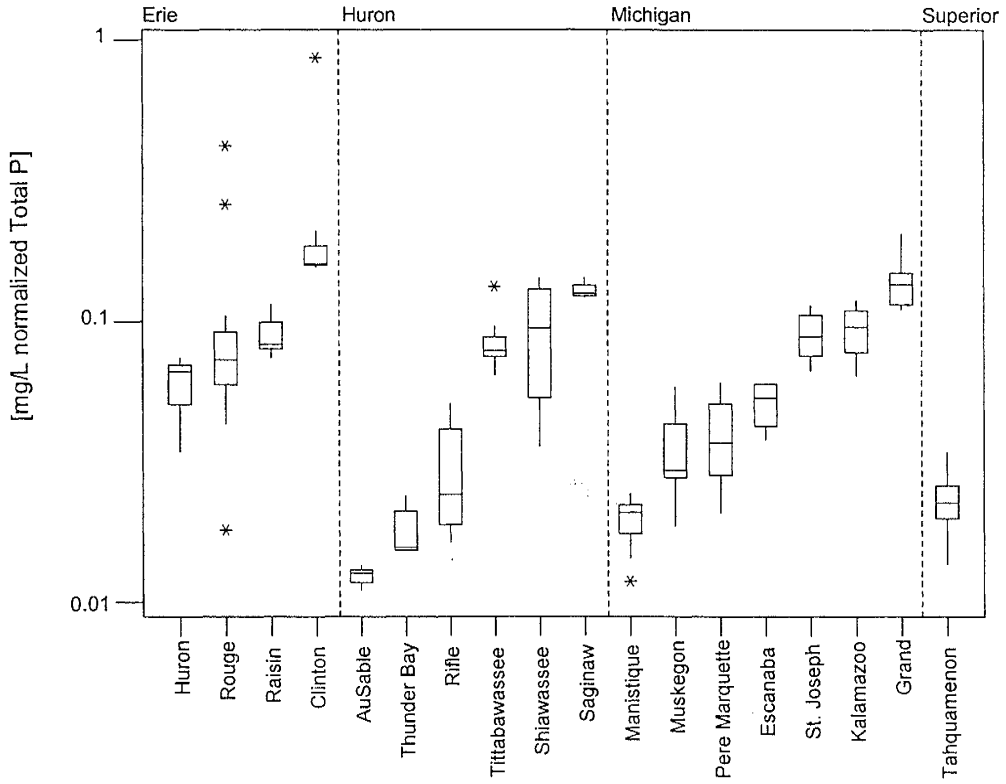


Figure 5. Total chloride data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

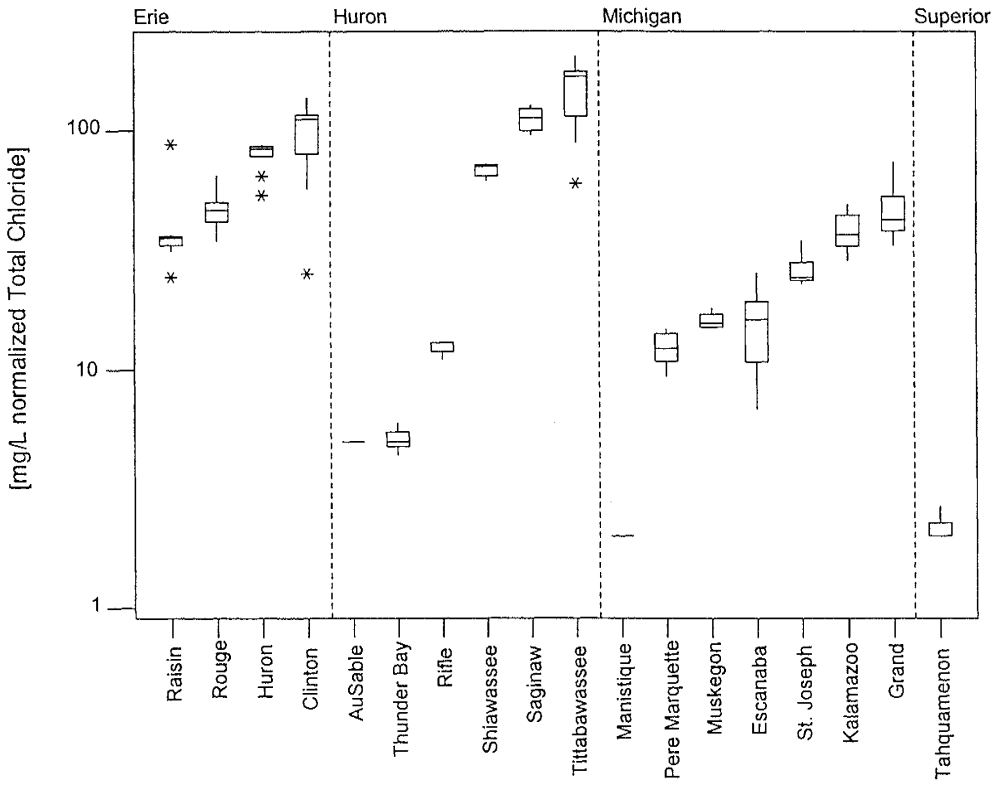


Figure 6. Total suspended solids data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

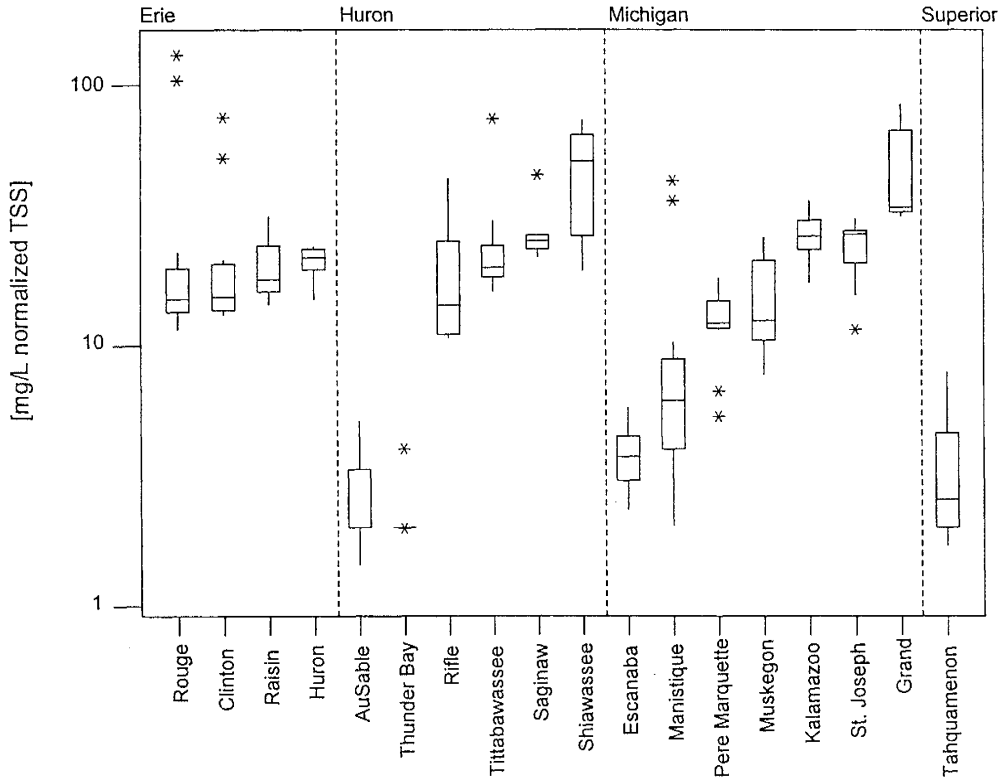


Figure 7. Mercury data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

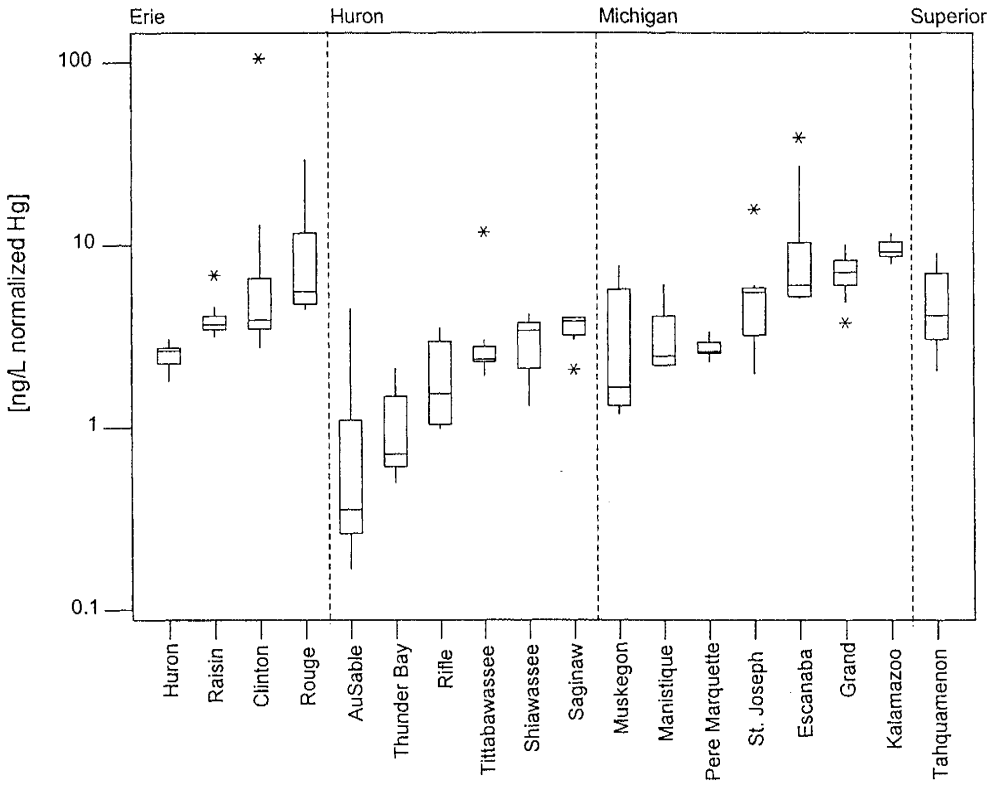


Figure 8. Cadmium data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

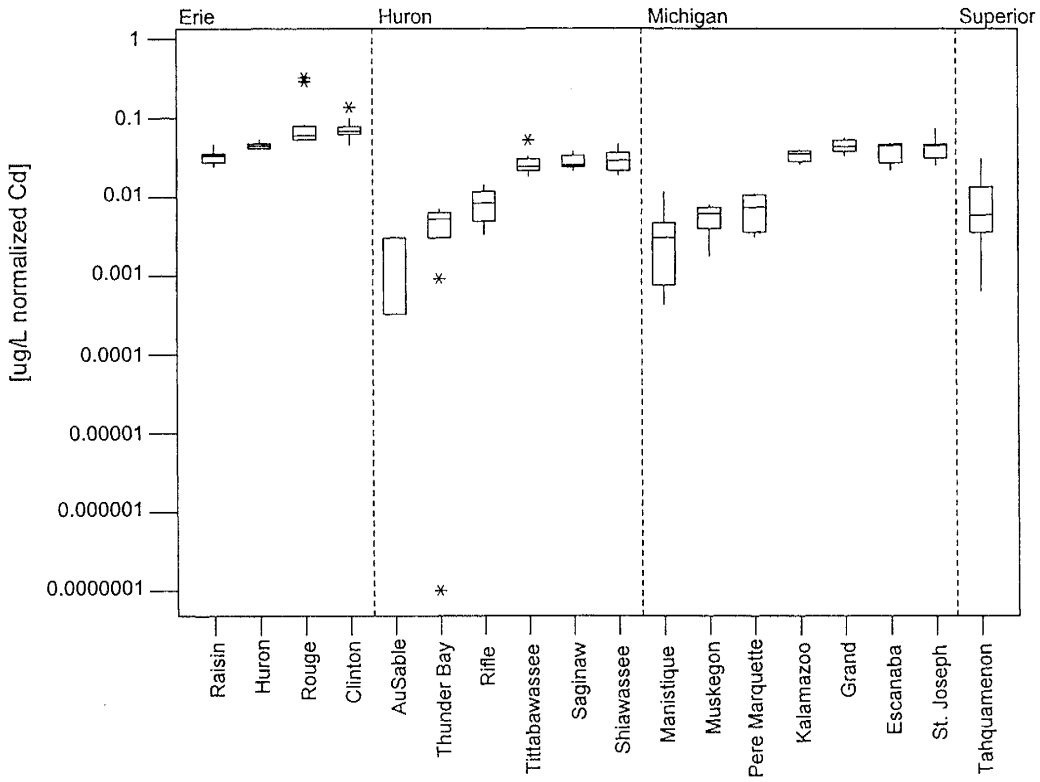


Figure 9. Chromium data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

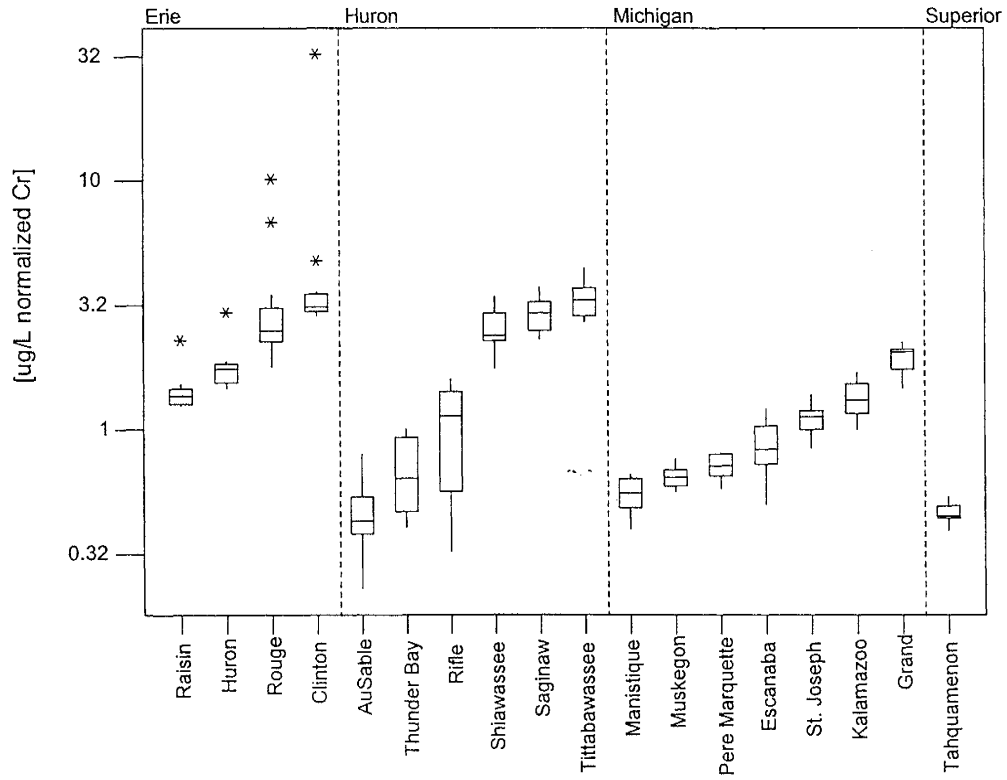


Figure 10. Copper data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

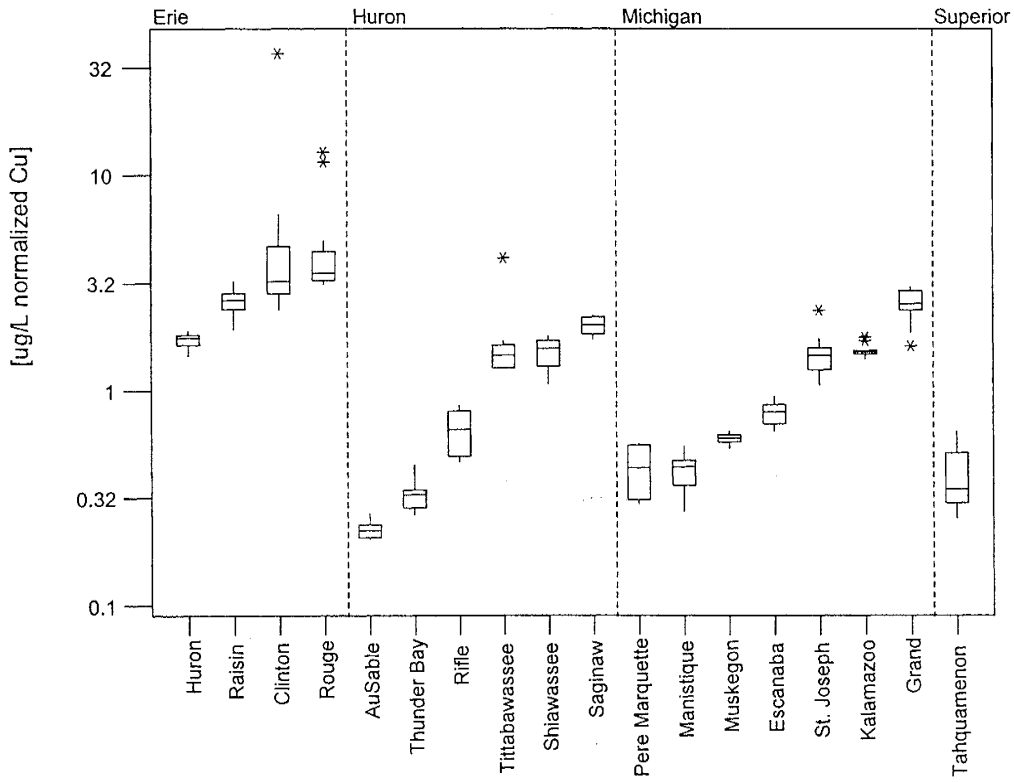


Figure 11. Nickel data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

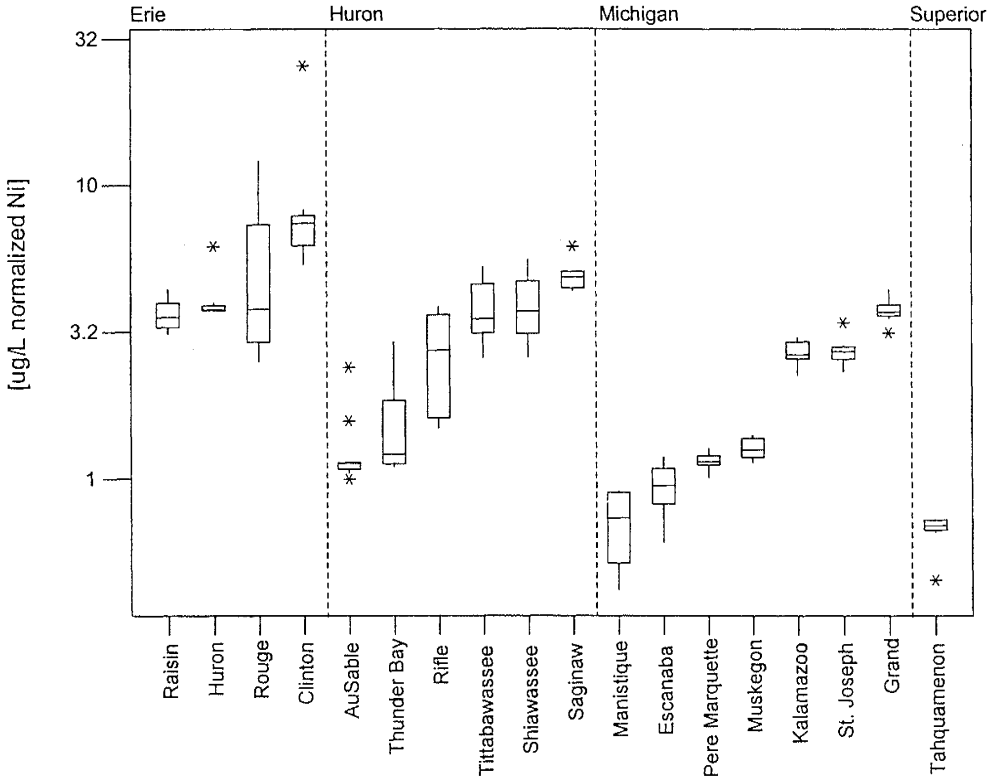


Figure 12. Lead data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

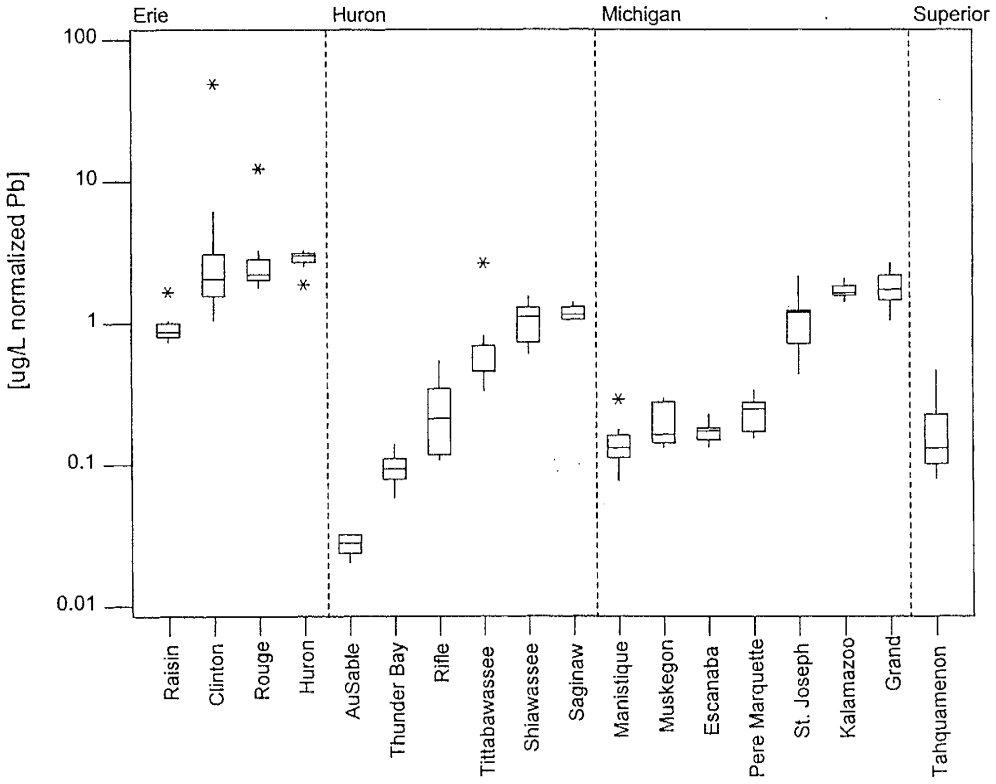


Figure 13. Zinc data grouped by Great Lakes watershed. Box plots represent concentrations normalized to stream discharge and then logarithmically transformed, to facilitate spatial comparisons using data from different years.

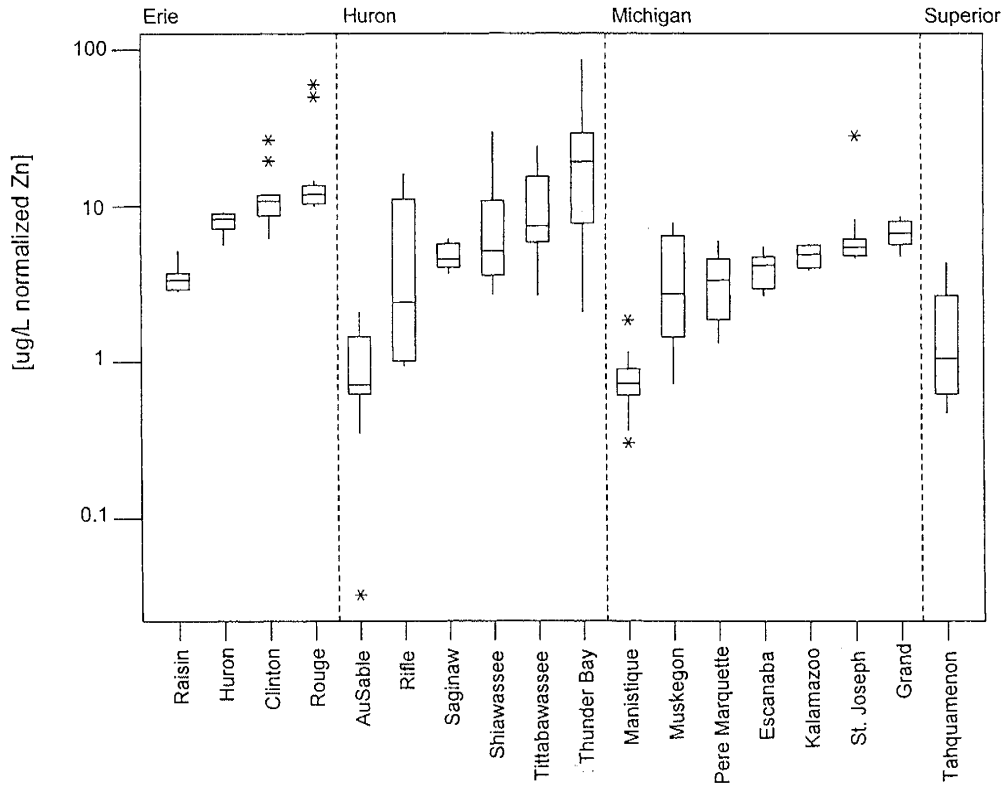


Figure 14. Total PCB data by tributary. Box plots represent actual concentrations that have been logarithmically transformed.

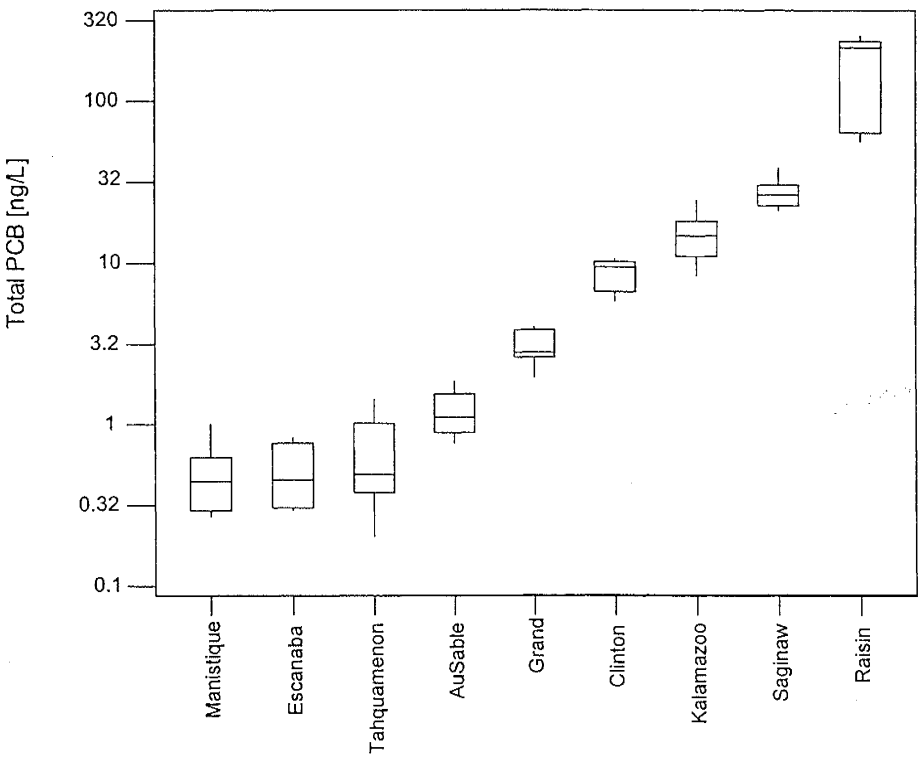


Figure 15. AuSable River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

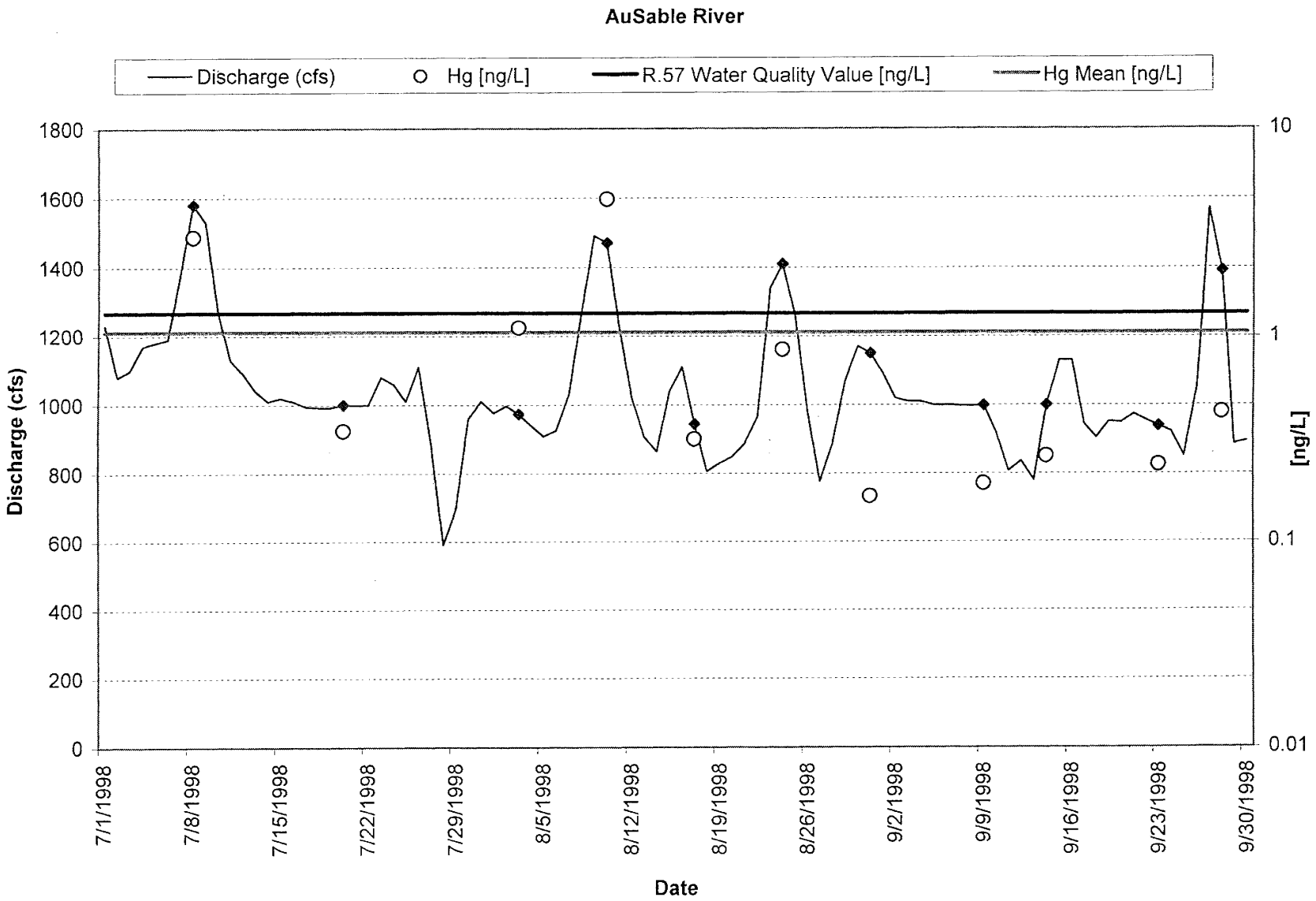


Figure 16. Clinton River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

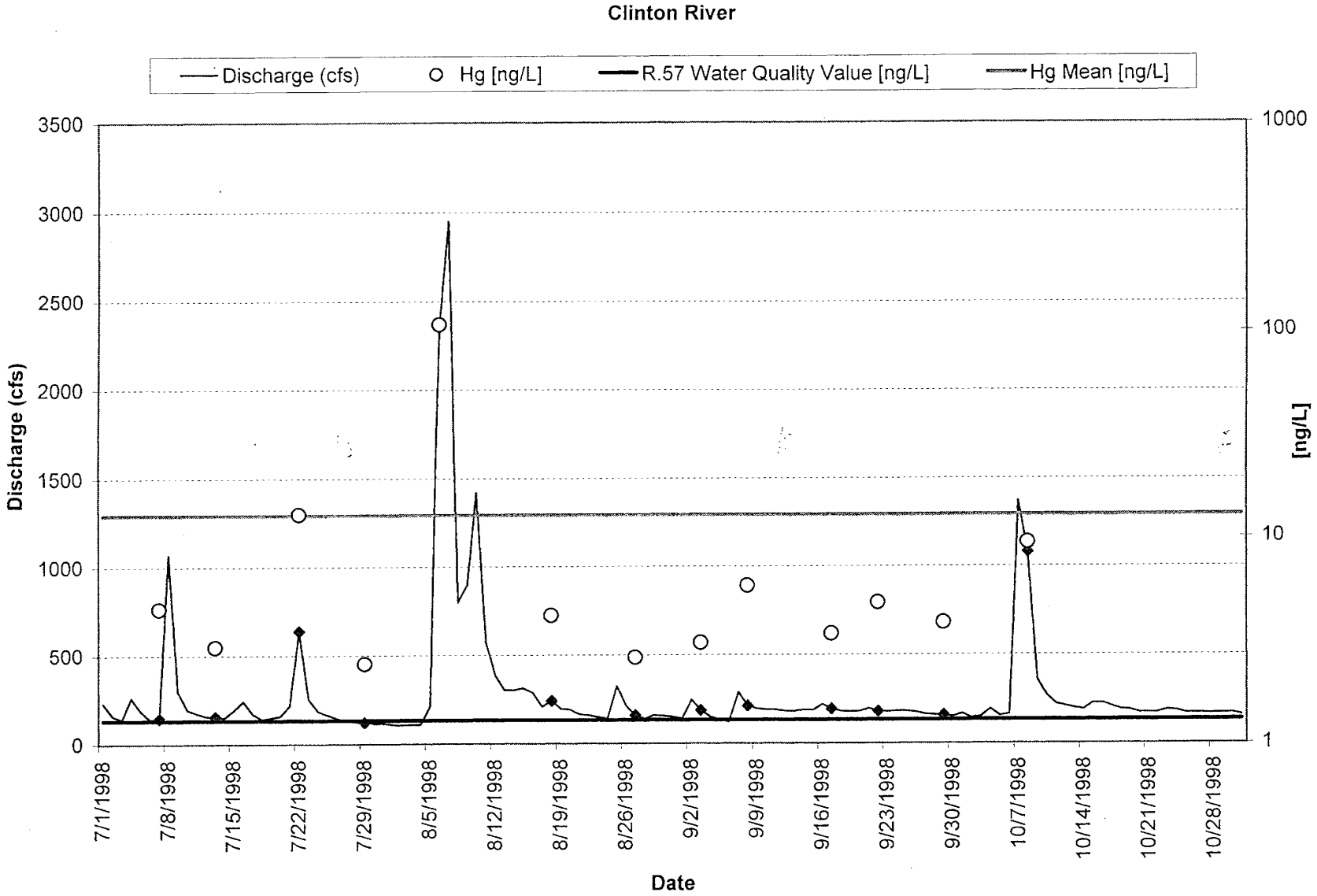


Figure 17. Huron River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

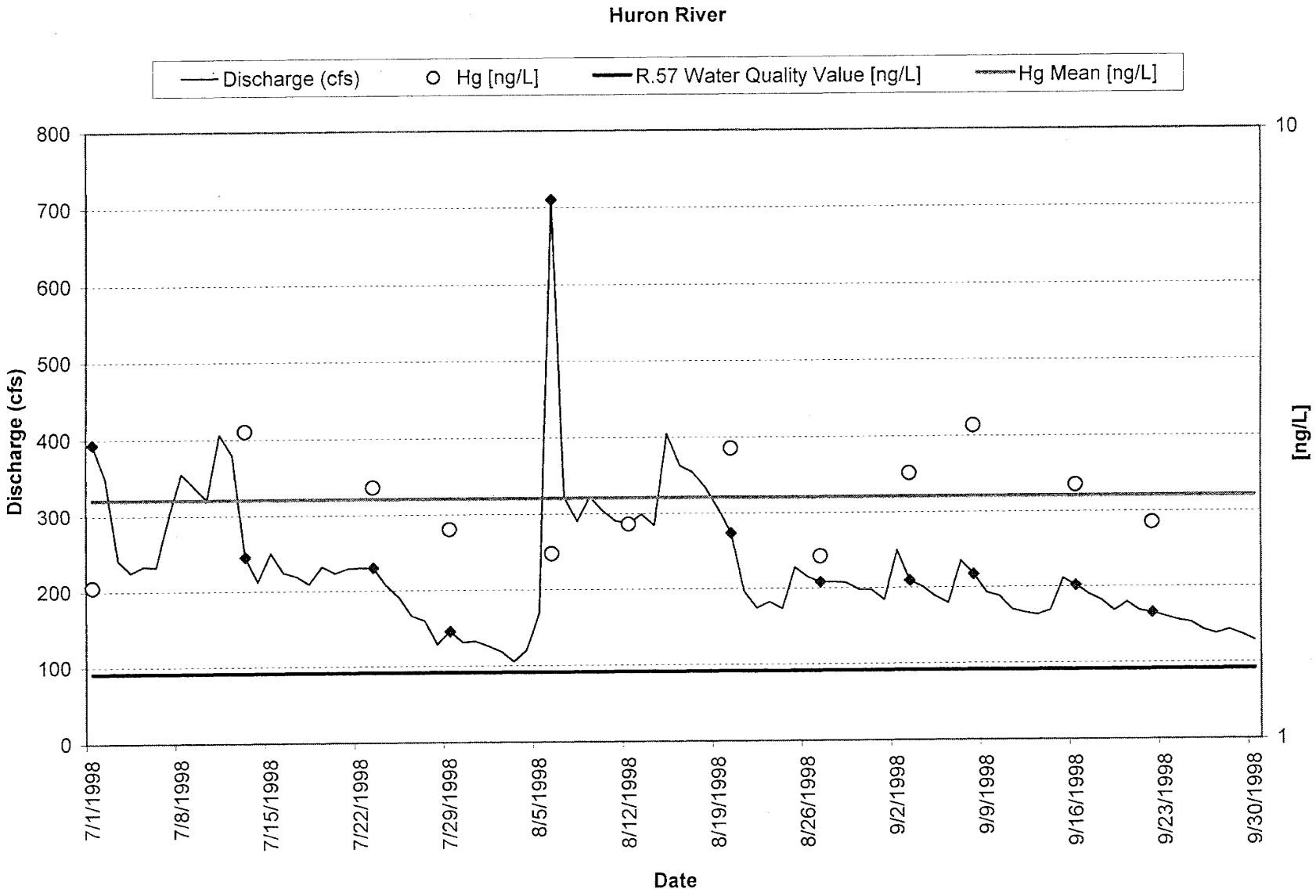


Figure 18. River Raisin hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

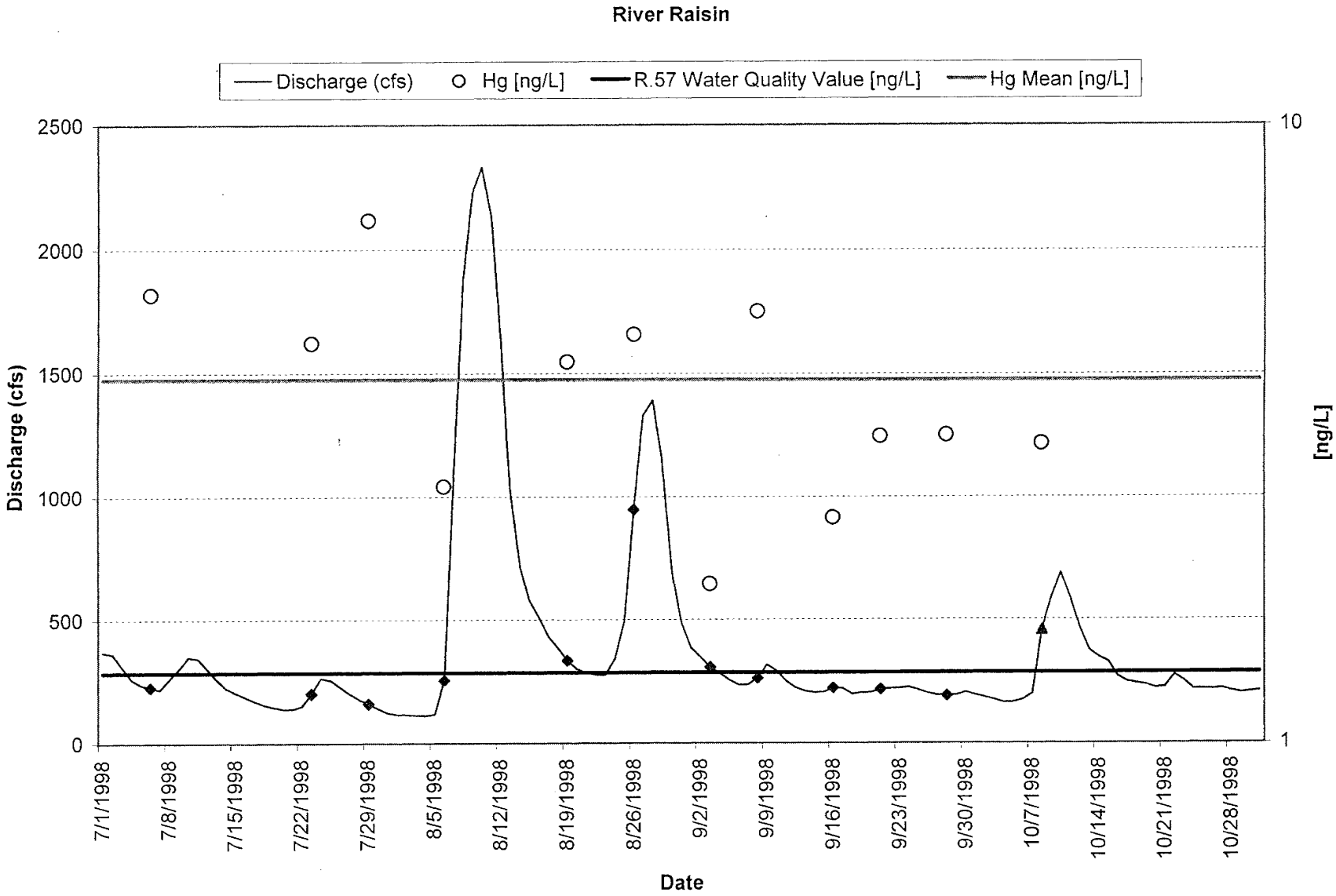


Figure 19. Rifle River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentrations. Solid diamonds indicate points on hydrograph at which samples were collected.

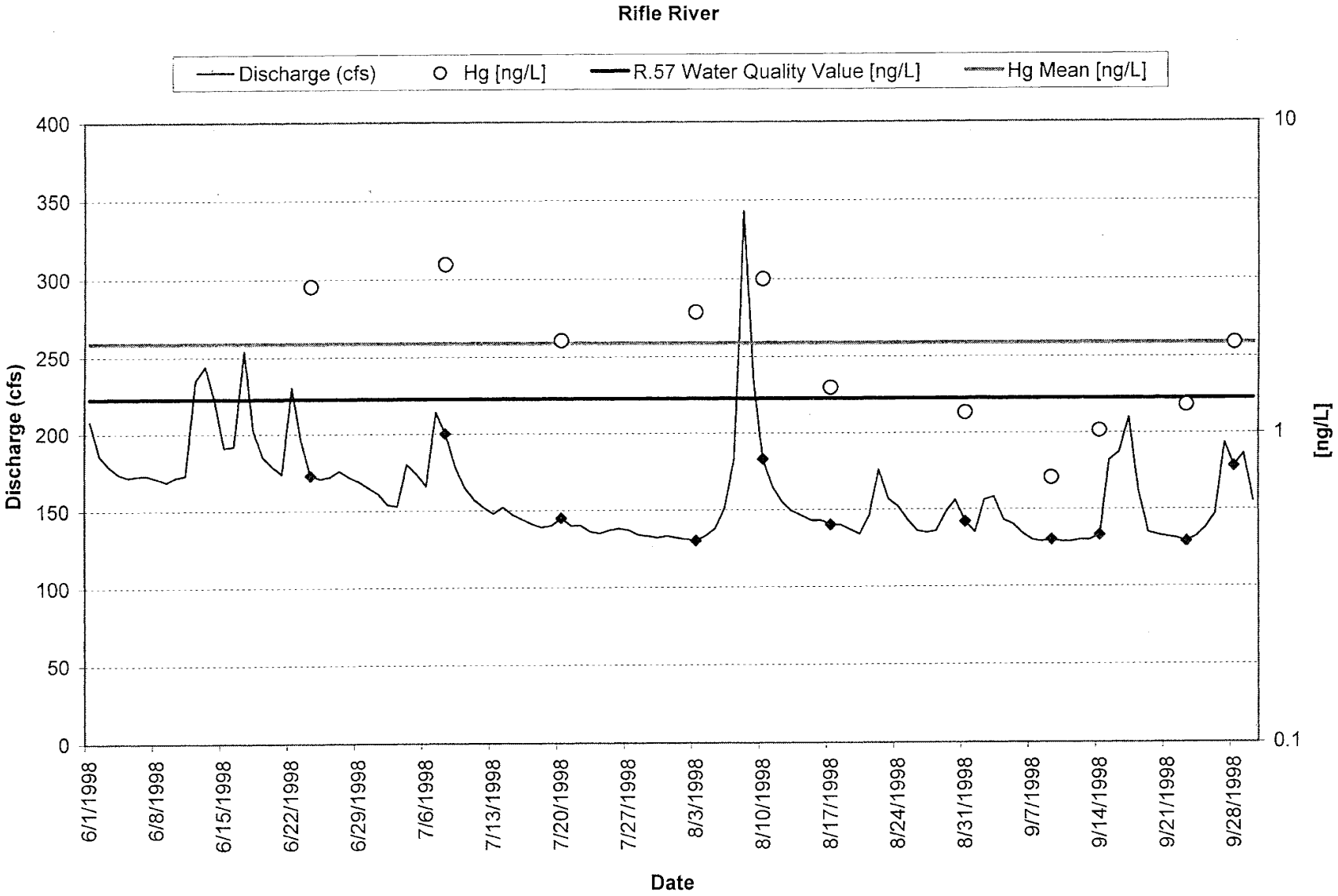


Figure 20. River Rouge hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

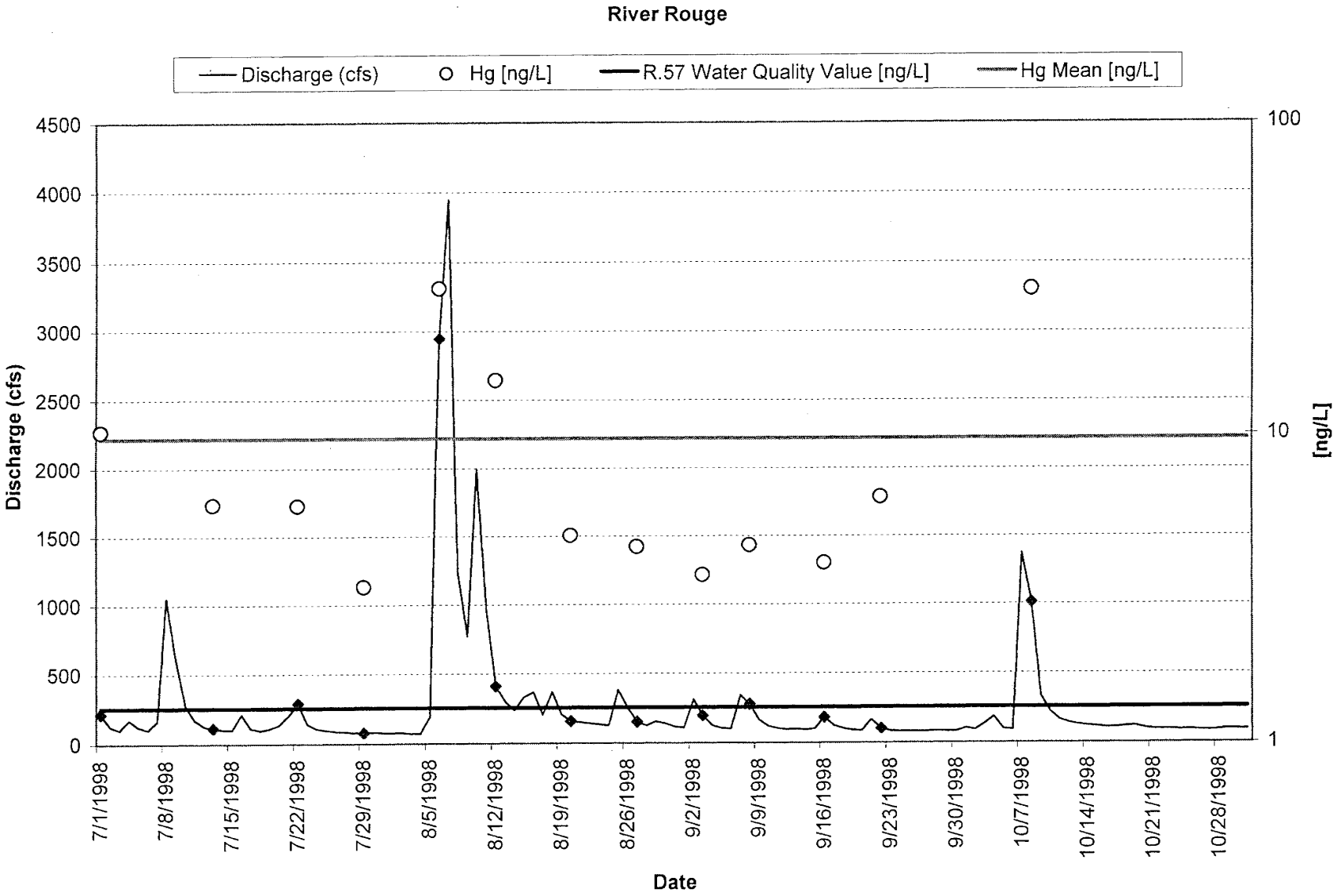


Figure 21. Saginaw River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

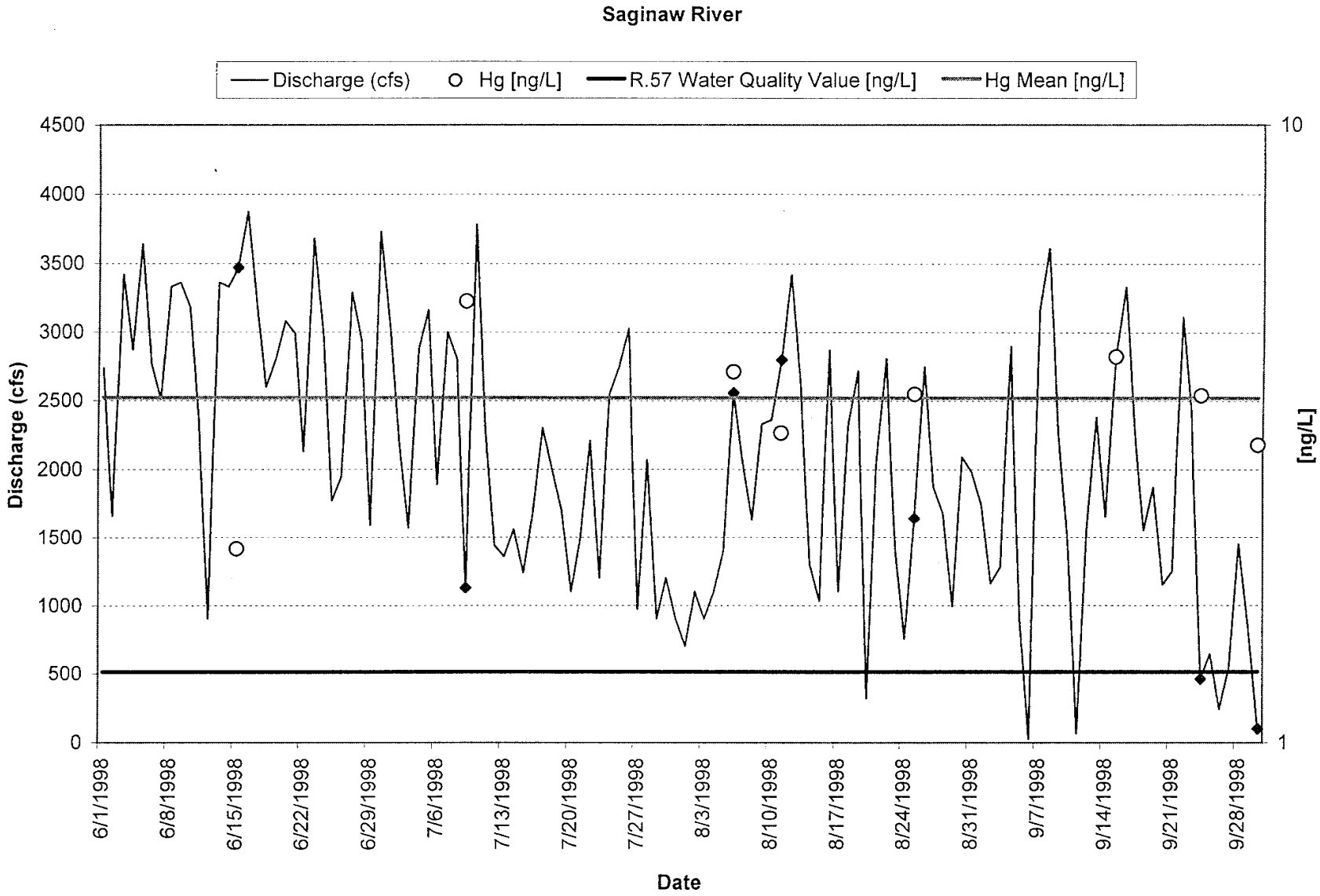


Figure 22. Shiawassee River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

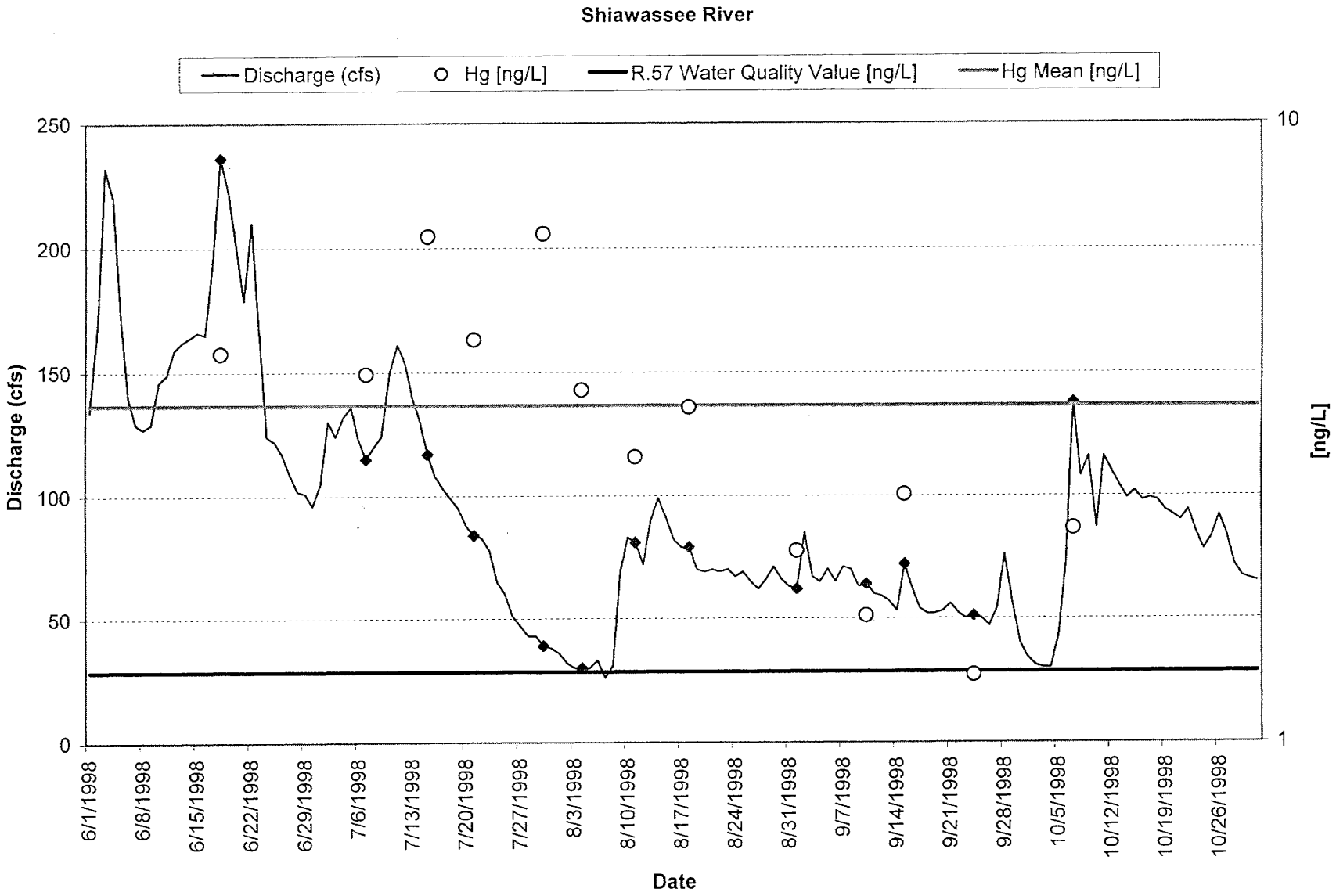


Figure 23. Thunder Bay River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

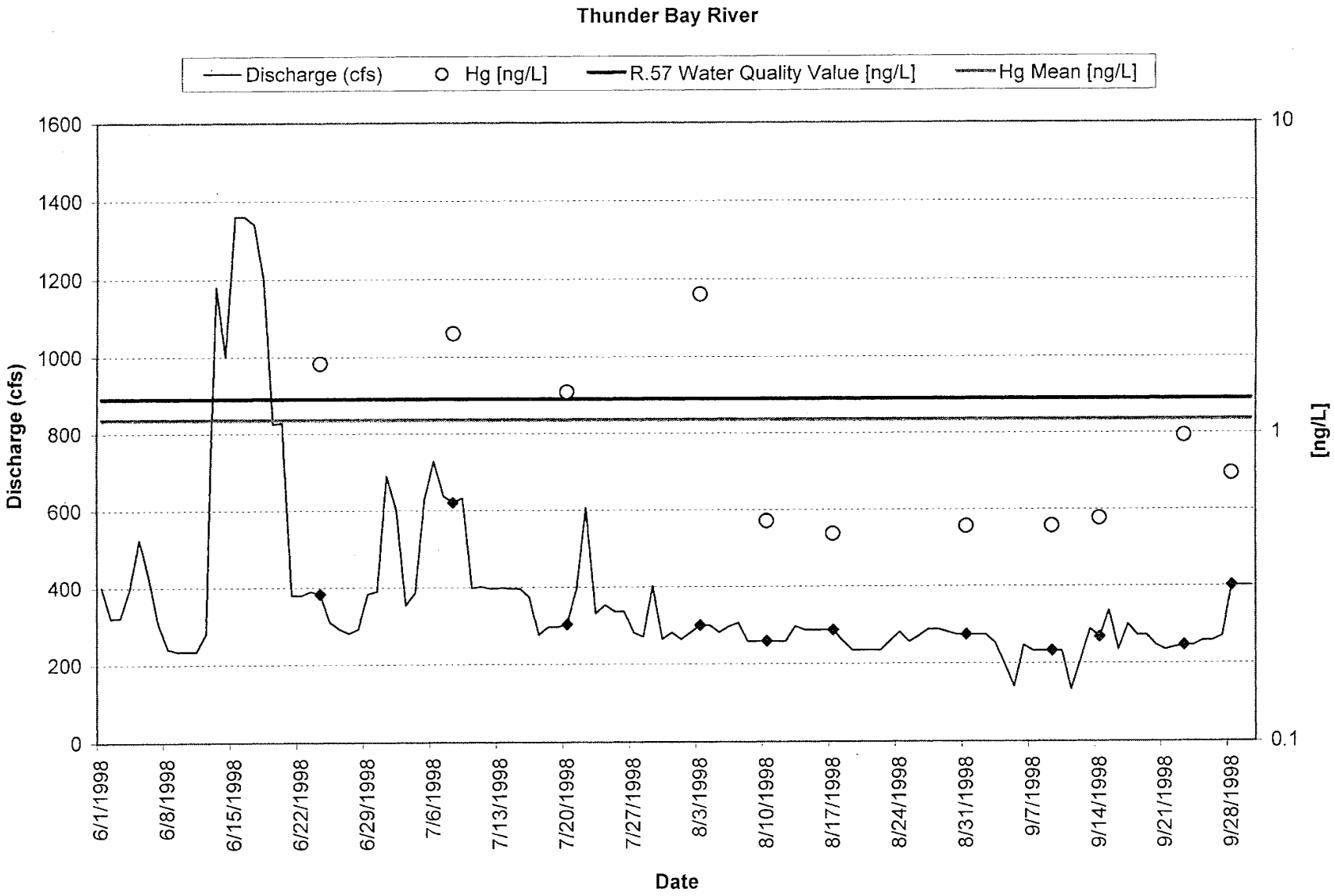


Figure 24. Tittabawassee River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

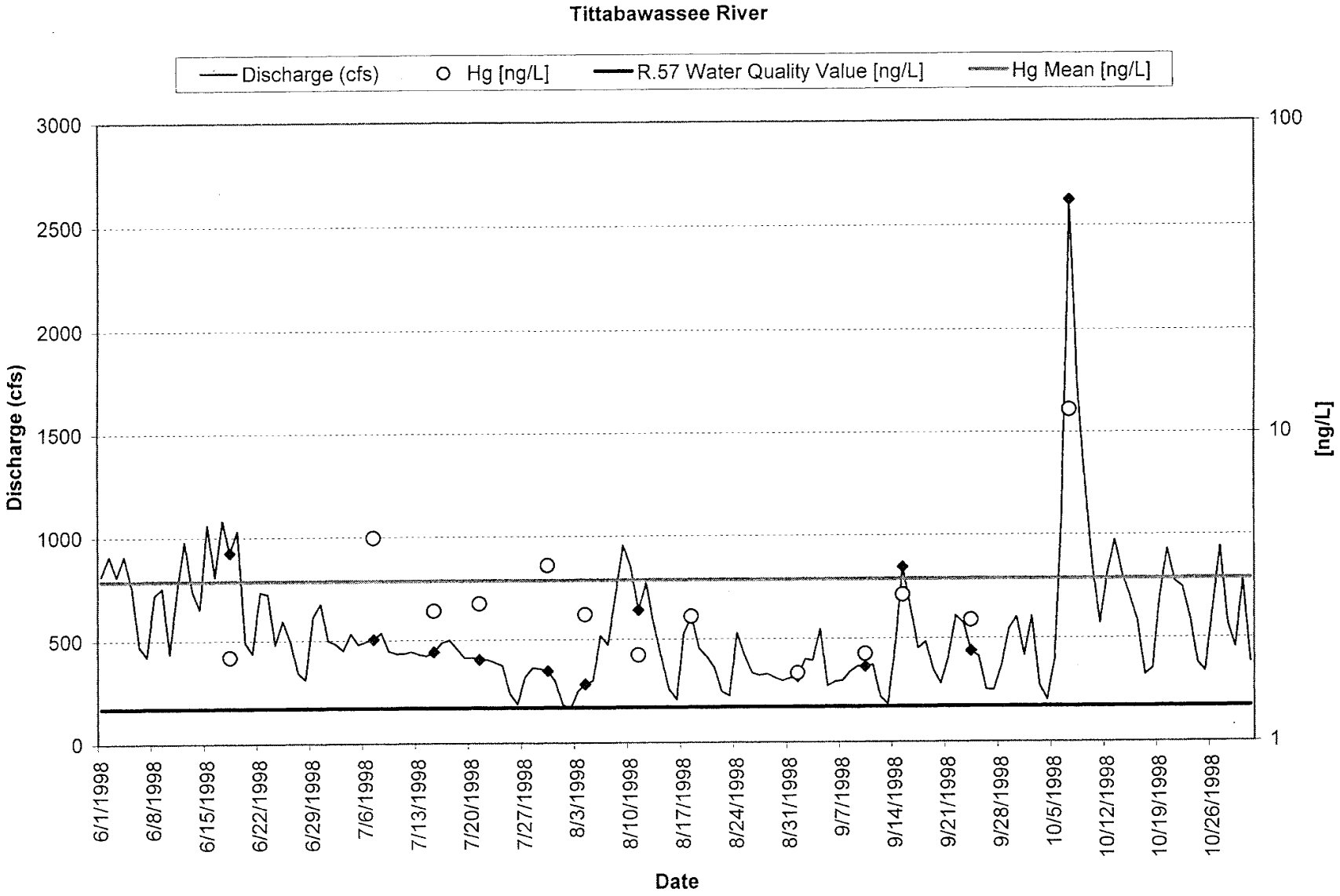


Figure 25. Escanaba River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

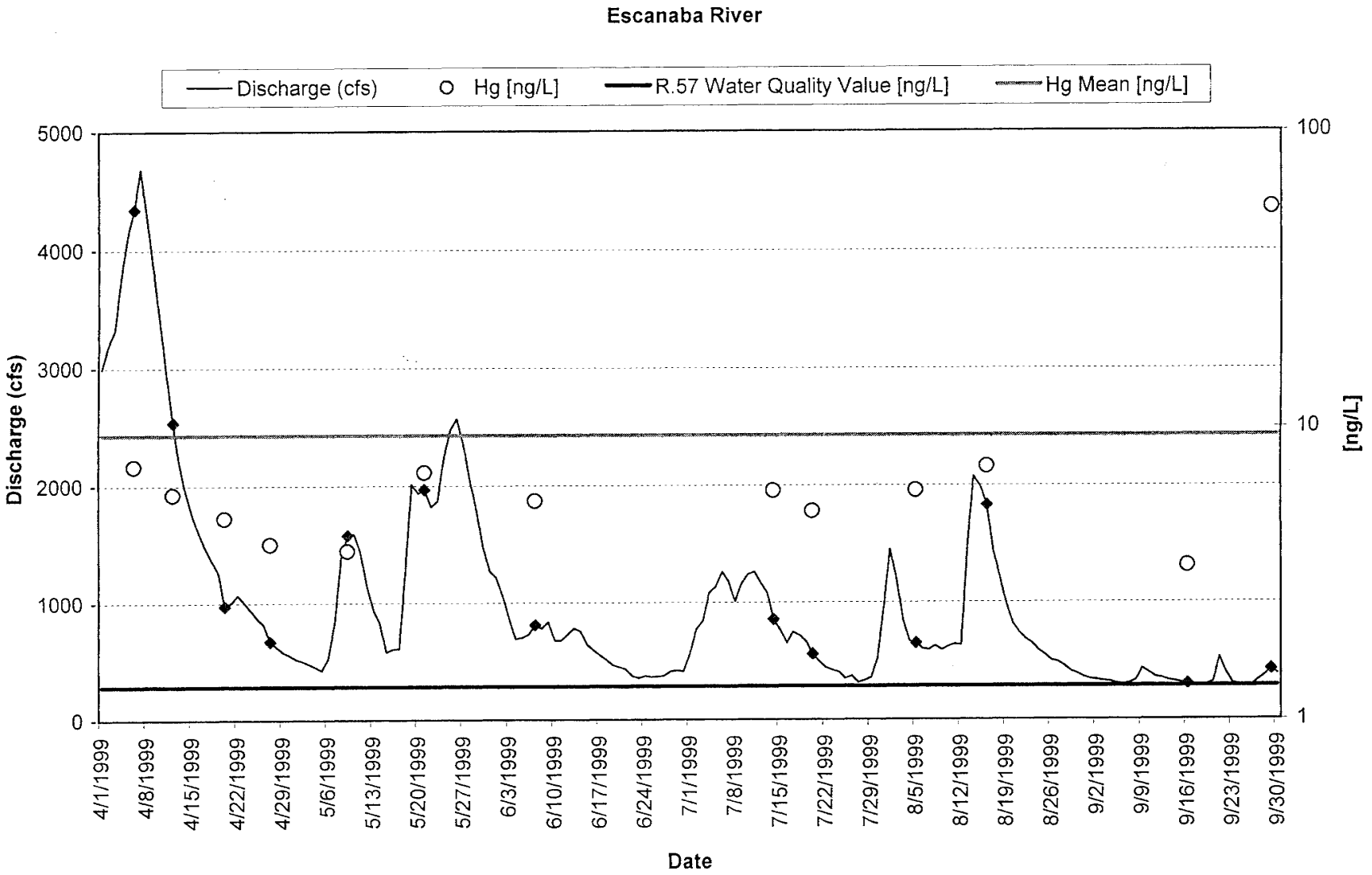


Figure 26. Grand River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

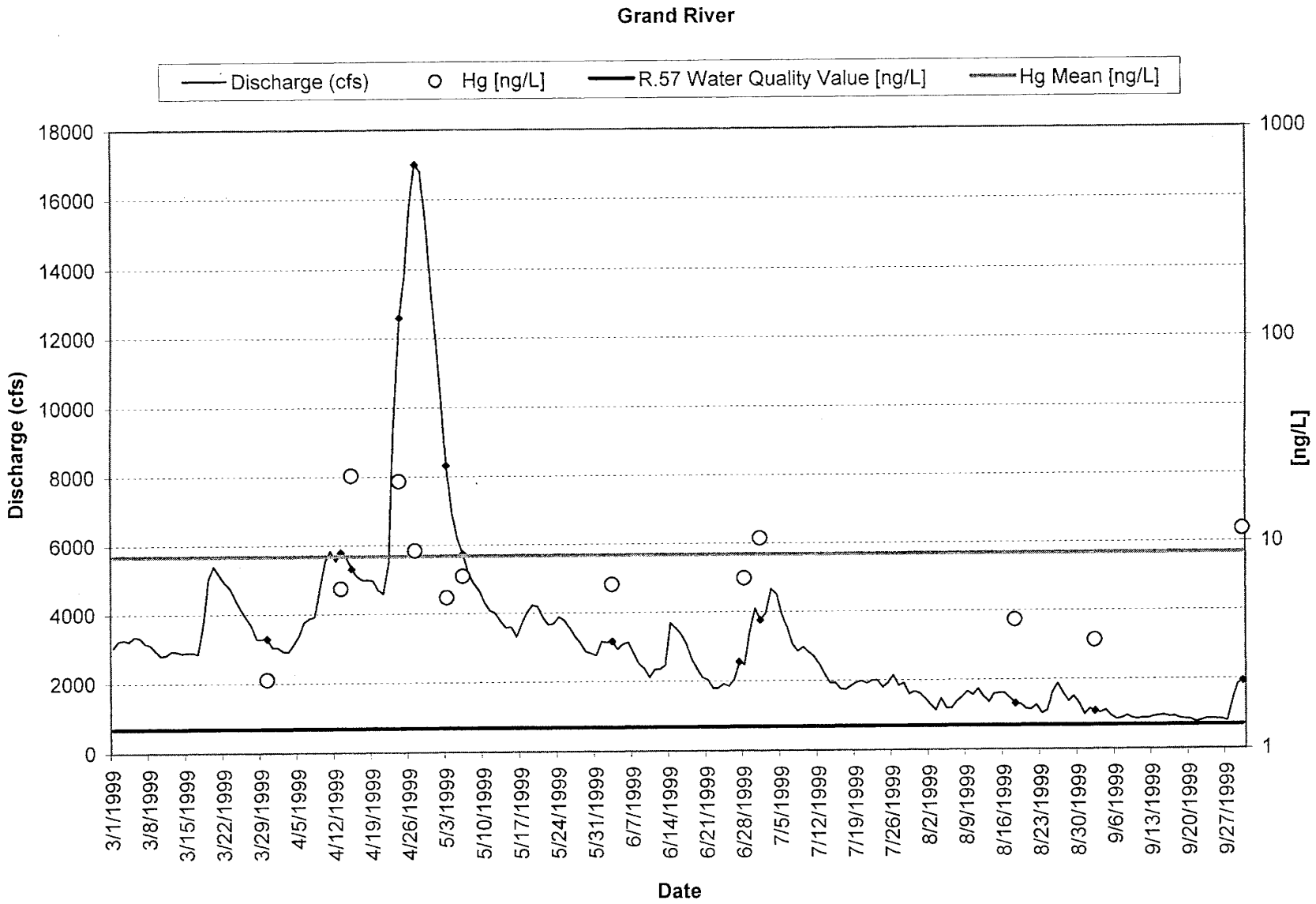


Figure 27. Kalamazoo River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

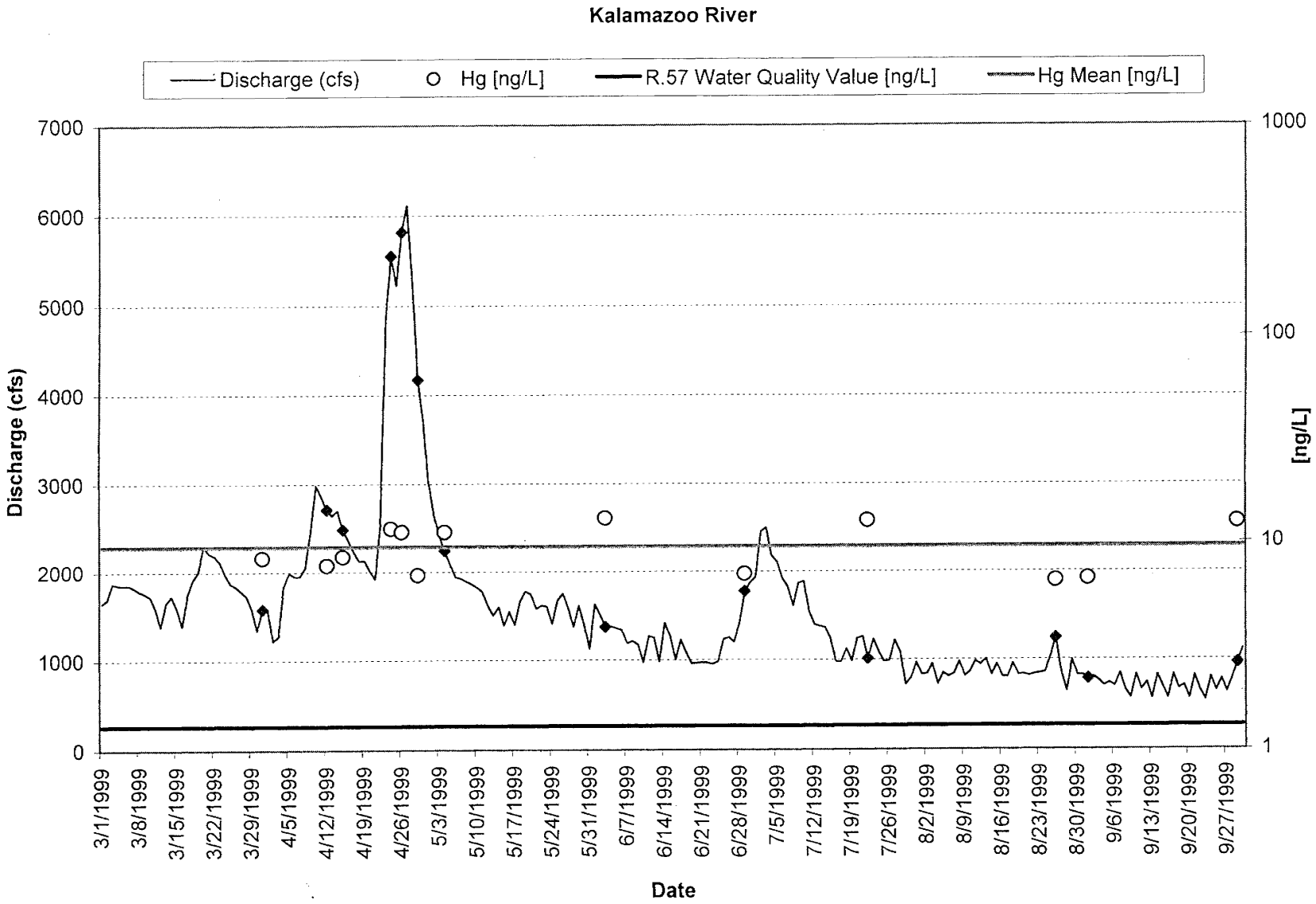


Figure 28. Manistique River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

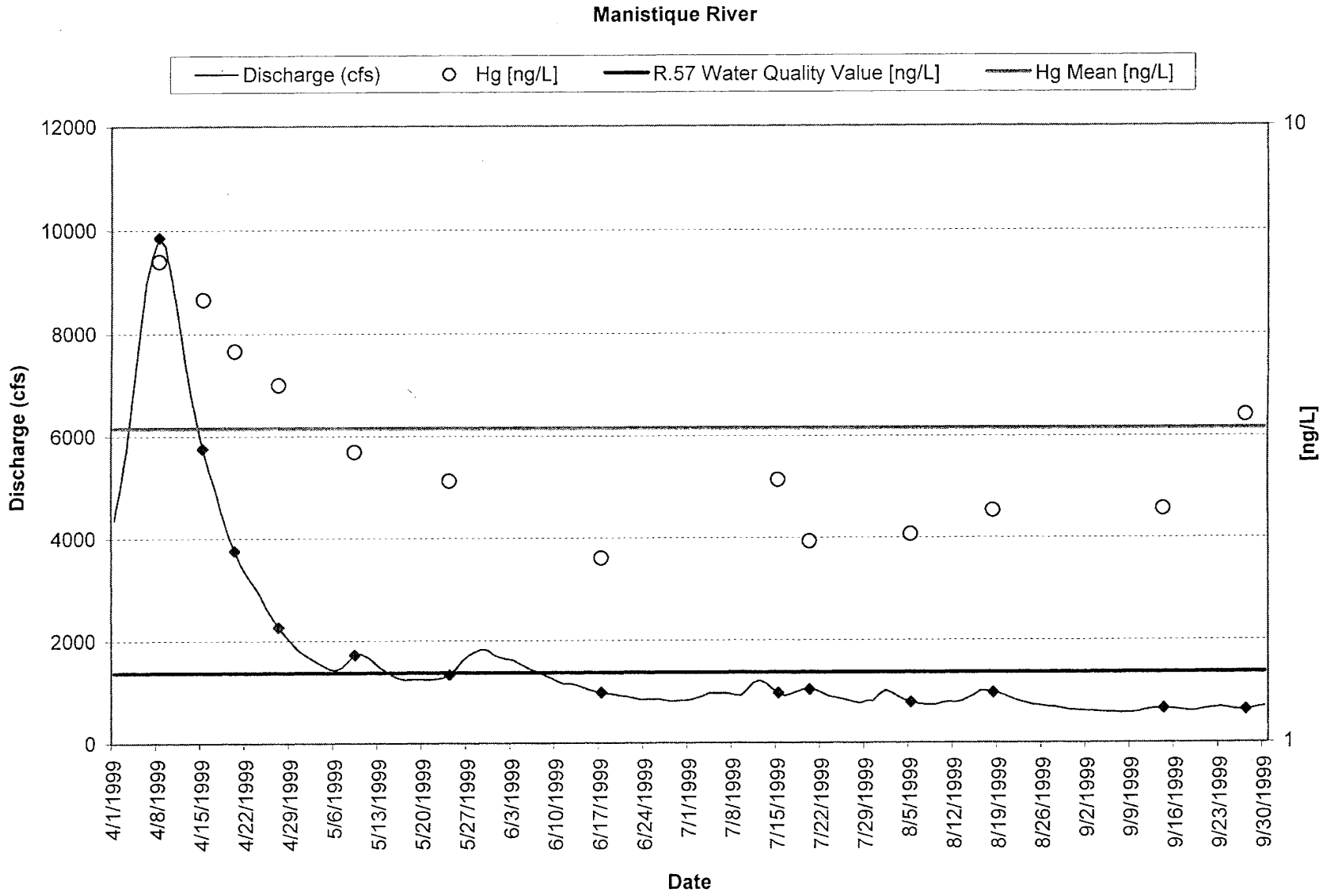


Figure 29. Muskegon River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

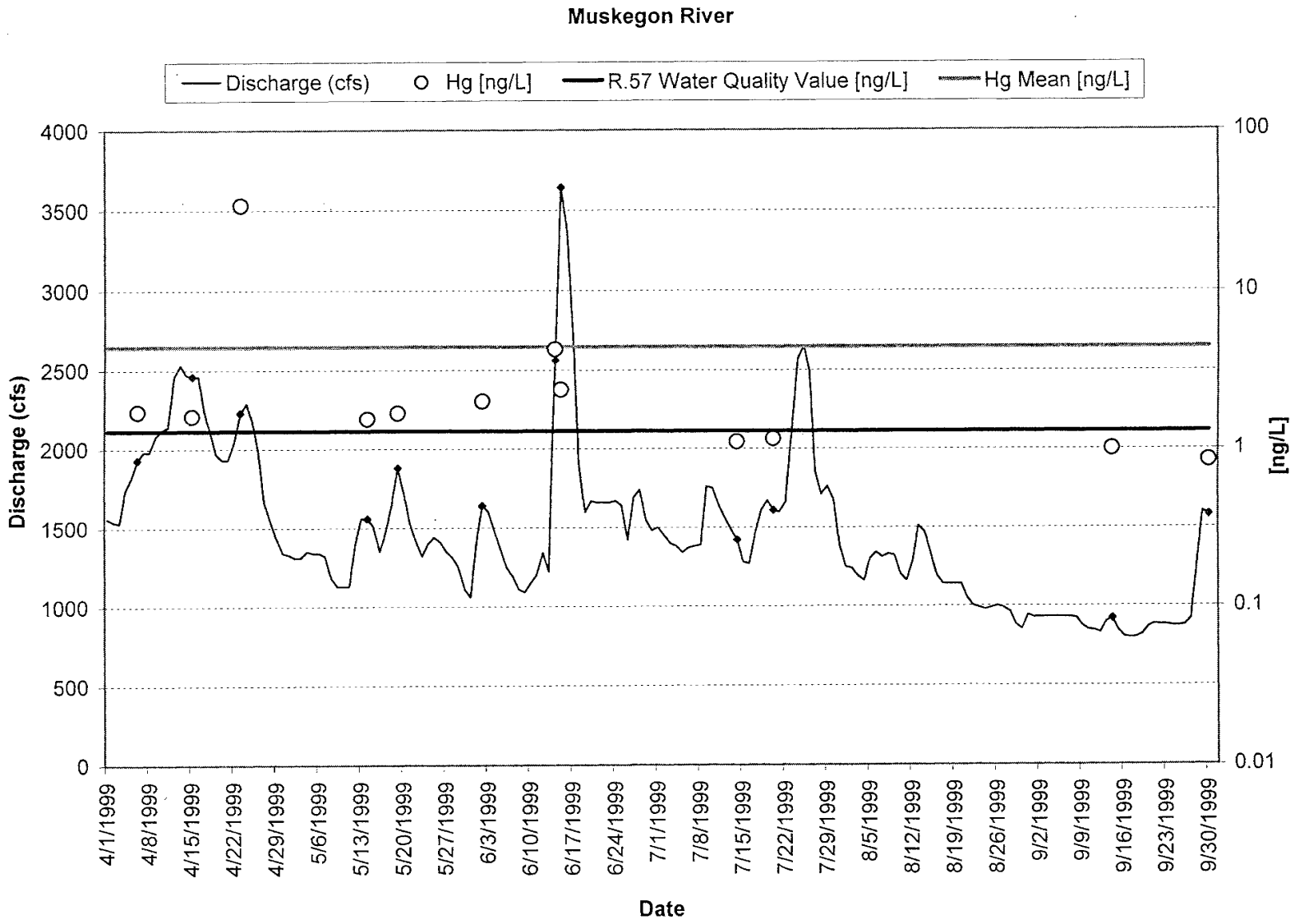


Figure 30. Pere Marquette River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

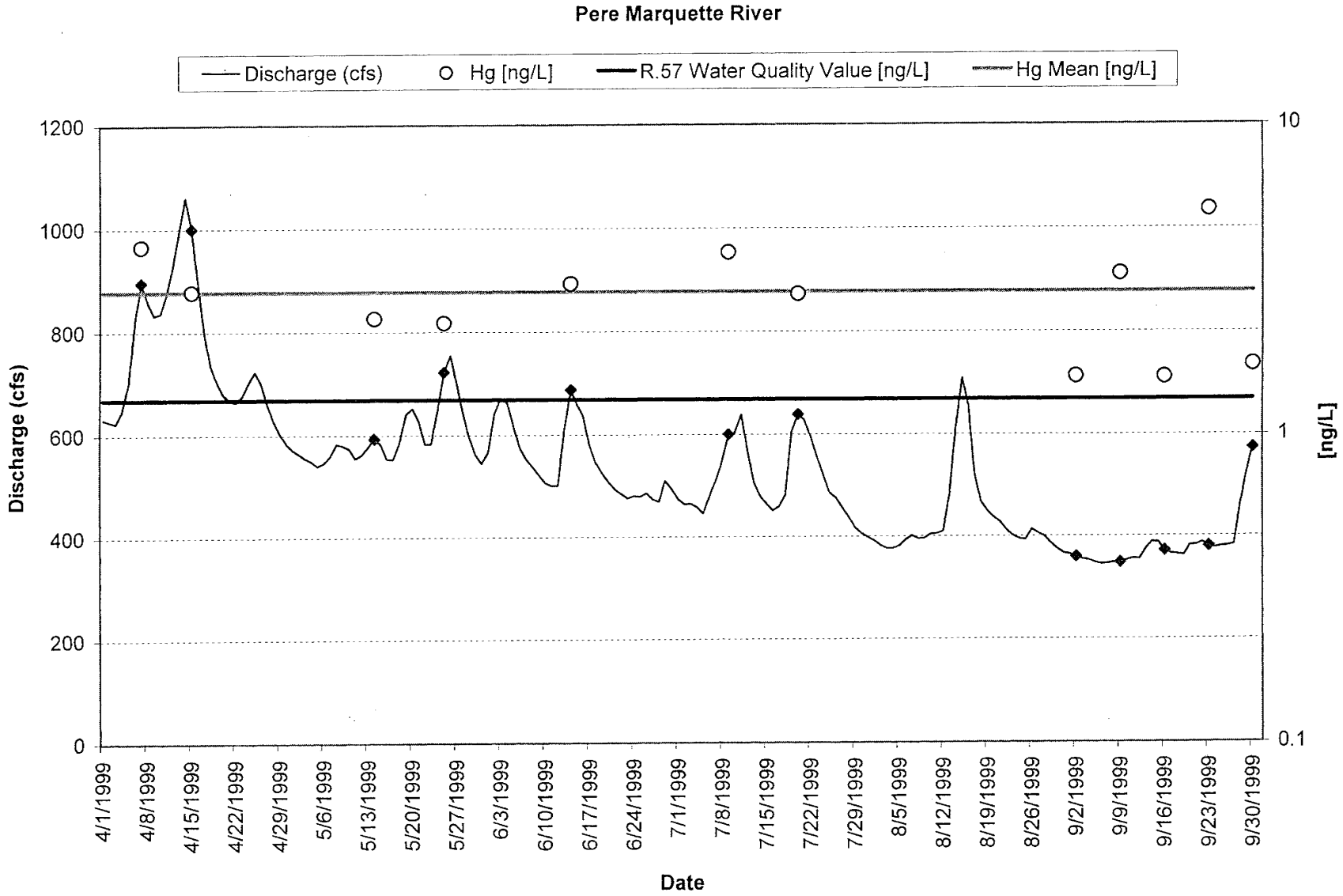


Figure 31. St. Joseph River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

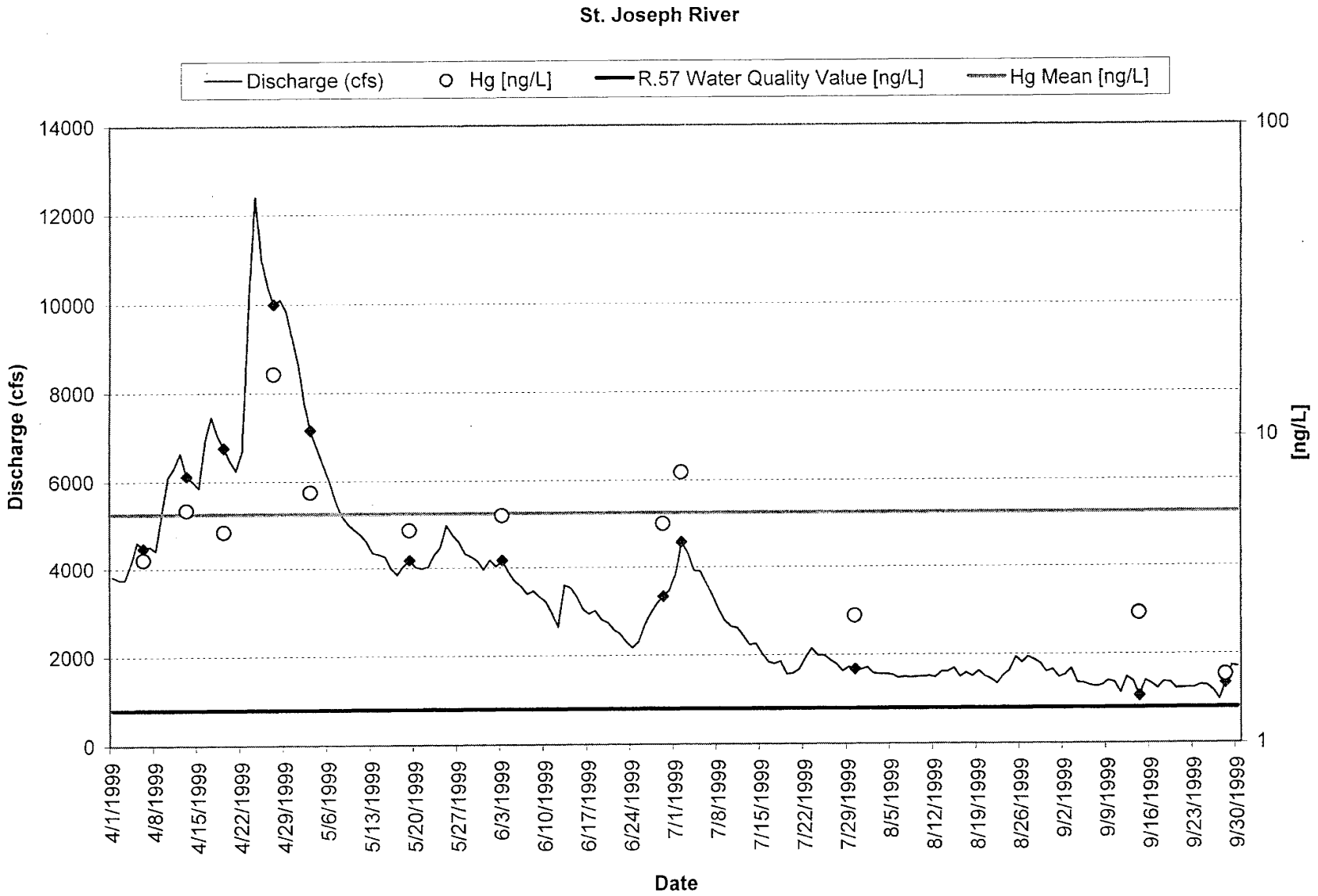


Figure 32. Tahquamenon River hydrograph, mercury sample concentrations, R. 57 water quality value, and mean mercury concentration. Solid diamonds indicate points on hydrograph at which samples were collected.

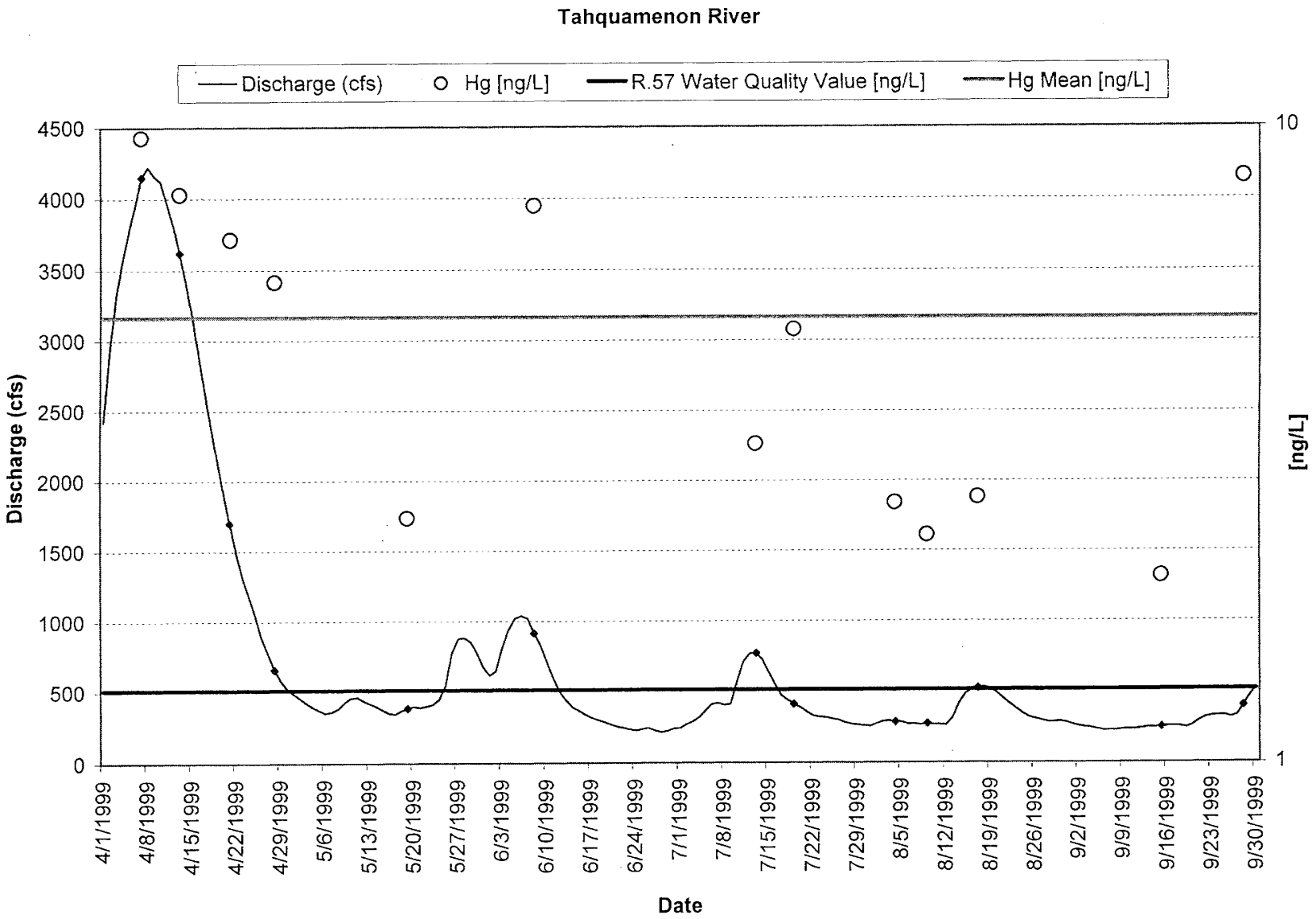


Table 1. Tributary and station location information.

Tributary	Great Lakes Watershed	Station Location	County	STORET ID Number	Latitude Longitude
Year Sampled: 1998					
AuSable	Huron	Rea Rd. below Foote Dam, Oscoda Twp.	Iosco	350061	44.43611 °N, - 83.43417 °W
Clinton	Erie	Shadyside Pk., Gratiot Ave., City of Mt. Clemens	Macomb	500233	42.58417 °N, - 82.88278 °W
Huron	Erie	2000' DS of Rockwood WWTP, Berlin Twp.	Monroe	580364	42.04528 °N, - 83.21417 °W
Raisin	Erie	ERA Dock, City of Monroe	Monroe	580046	41.90056 °N, - 83.35444 °W
Rifle	Huron	Stover Rd. Bridge, Arenac Twp.	Arenac	060061	44.01222 °N, - 83.82389 °W
Rouge	Erie	W. Jefferson Ave. Bridge	Wayne	820070	42.28056 °N, - 83.12889 °W
Saginaw	Huron	Main St., City of Essexville	Bay	090177	43.61750 °N, - 83.84278 °W
Shiawassee	Huron	Fergus Rd. Bridge, St. Charles Twp.	Saginaw	730023	43.25472 °N, - 84.10556 °W
Thunder Bay	Huron	Bagley St. Bridge, Alpena Twp.	Alpena	040123	45.06694 °N, - 83.47194 °W
Tittabawassee	Huron	Central Rd. Bridge, Spaulding Twp.	Saginaw	730025	43.39278 °N, - 84.01111 °W
Year Sampled: 1999					
Escanaba	Michigan	0.35mi US of Soo Line RR Bridge	Delta	210102	45.80028 °N, - 87.09583 °W
Grand	Michigan	Riverside Pk., vic. of Ottawa Ctr., Robinson Twp.	Ottawa	700123	43.02667 °N, - 86.03389 °W
Kalamazoo	Michigan	57th St., vic. New Richmond, Manlius Twp.	Allegan	030077	42.65111 °N, - 86.10611 °W
Manistique	Michigan	Vic.Old RR Bridge N.of Old US-2, City of Manistique	Schoolcraft	770073	45.96889 °N, - 86.24611 °W
Muskegon	Michigan	Maple Island Rd.	Muskegon	610273	43.31778 °N, - 86.03889 °W
Pere Marquette	Michigan	Main St., City of Scottville, Custer/Amber Twp.	Mason	530027	43.94444 °N, - 86.28000 °W
St. Joseph	Michigan	River Pk. off Zollar Dr.	Berrien	110628	42.06333 °N, - 86.44889 °W
Tahquamenon	Superior	State Campground on U.S.123	Chippewa	170141	46.55583 °N, - 85.03889 °W

Table 2. Total samples, number of high flow samples, and percent high flow samples collected at tributaries.

Tributary	Total Samples	High Flow Samples	% High Flow Samples
Year Sampled: 1998			
AuSable	11	5	45
Clinton	13	3	23
Huron	12	4	33
Raisin	12	2	17
Rifle	11	3	27
Rouge	13	5	38
Saginaw	8	0	0
Shiawassee	13	5	38
Thunder Bay	11	2	18
Tittabawassee	13	5	38
Year Sampled: 1999			
Escanaba	13	7	54
Grand	13	9	69
Kalamazoo	13	9	69
Manistique	13	5	38
Muskegon	12	10	83
Pere Marquette	12	7	58
St. Joseph	12	7	58
Tahquamenon	13	7	54

Table 3. Nutrients and conventionals analyzed for the WCTMP, and their analytical quantitation levels.

Nutrients and Conventionals	Quantitation Level (mg/L)
Hardness (Ca2CO3)	5
Total Alkalinity	20
Total Ammonia	0.01
Total Calcium	1
Total Chloride	1
Total Kjeldahl Nitrogen	0.1
Total Magnesium	1
Total Nitrite	0.002
Total Organic Carbon	0.5
Total Ortho Phosphate	0.01
Total Phosphorous	0.005
Total Sulfate	2
Total Suspended Solids	4
Total Dissolved Solids	NA
Total Nitrate	NA
Temperature	NA
pH	NA
Conductivity	NA
Dissolved Oxygen	NA

NA = Not applicable: analyte is either calculated or field measured.

Table 4. Base/neutral organics analyzed for the WCTMP, and their analytical quantitation levels and Michigan Rule 57 water quality values.

Base / Neutral Organics	Quantitation Level (ug/L)	R. 57 Water Quality Value (ug/L)
	Group 1	
Bis(2-ethylhexyl)phthalate	2.0	HCV = 32
Di-n-butyl phthalate	1.0	FCV = 9.7
	Group 2	
1,2,4-Trichlorobenzene	2.0	FCV = 30
1,2-Dichlorobenzene	1.0	FCV = 16
1,3-Dichlorobenzene	1.0	FCV = 38
1,4-Dichlorobenzene	1.0	FCV = 13
2-Methylnaphthalene	5.0	FCV = 12
Acenaphthene	1.0	FCV = 19
Acenaphthylene	1.0	FCV = 7.2
Anthracene	1.0	FCV = 2.8
Benzo(a)anthracene	1.0	FCV = 2.6
Bis(2-chloroisopropyl)ether	1.0	HCV = 290
Butyl benzyl phthalate	1.0	FCV = 14
Chrysene	1.0	HCV = 1.5
Di-n-octyl phthalate	2.0	HNV = 300
Fluoranthene	1.0	FCV = 1.6
Fluorene	1.0	FCV = 12
Hexachloroethane	1.0	HCV = 6.7
Isophorone	1.0	FCV = 570
Naphthalene	1.0	FCV = 13
Nitrobenzene	2.0	HCV = 180
Phenanthrene	1.0	FCV = 2.4
Pyrene	1.0	FCV = 2.5
	Group 3	
Carbazole	10	FCV = 4
Dibenzofuran	5.0	FCV = 4
Hexachlorobutadiene	2.0	WV = 0.053
Hexachlorocyclopentadiene	10	FCV = 0.07
	Group 4	
2,4-Dinitrotoluene	5.0	*
2,6-Dinitrotoluene	5.0	*
2-Chloronaphthalene	2.0	*
2-Nitroaniline	20	*
3-Nitroaniline	20	*
4-Bromophenyl phenylether	2.0	*
4-Chlorophenyl phenylether	1.0	*
4-Nitroaniline	20	*
Azobenzene	2.0	*
Benzo(a)pyrene	2.0	*
Benzo(b)fluoranthene	2.0	*
Benzo(g,h,i)perylene	2.0	*
Benzo(k)fluoranthene	2.0	*
Bis(2-chloroethoxy)methane	2.0	*
Bis(2-chloroethyl)ether	1.0	*
Dibenz(a,h)anthracene	2.0	*
Diethyl phthalate	1.0	*
Dimethyl phthalate	2.0	*
Indeno(1,2,3-cd)pyrene	2.0	*
N-Nitrosodimethylamine	5.0	*
N-Nitrosodi-n-propylamine	2.0	*
N-Nitrosodiphenylamine	2.0	*

FCV = Final Chronic Value
HCV = Human Cancer Value - Non-Drinking Water
HNV = Human Non-Cancer Value - Non-Drinking Water
* = Michigan Rule 57 water quality value has not been developed for this analyte.

Table 5. BTEX and MTBE, and their analytical quantitation levels and Michigan Rule 57 water quality values.

BTEX / MTBE	Quantitation Level (ug/L)	R. 57 Water Quality Value (ug/L)
Benzene	1.0	FCV = 200
Toluene	1.0	FCV = 140
Ethylbenzene	1.0	FCV = 18
m- & p-Xylene	2.0	FCV = 35*
o-Xylene	1.0	
Methyl *tert* butyl ether	5.0	FCV = 730

* = Value applies to total xylene. (Total xylene = m- & p-xylene + o-xylene).

Table 6. Mercury and trace metals analyzed for the WCTMP, and their analytical detection and quantitation levels.

Analyte	Detection Level	Quantitation Level	Units
Hg	0.13	0.41	ng/L
Cd	0.0098	0.031	ug/L
Cr	0.027	0.086	ug/L
Cu	0.18	0.57	ug/L
Pb	0.0054	0.017	ug/L
Ni	0.023	0.073	ug/L
Zn	0.056	0.18	ug/L

Table 7. Number of PCB and pesticide samples collected and analyzed, and the tributaries sampled for these analytes.

Tributary	PCB Analyses	Pesticide Analyses
Year Sampled: 1998		
AuSable River	5	4
Clinton River	6	6
River Raisin	6	6
Saginaw River	8	7
Year Sampled: 1999		
Escanaba River	4	2
Grand River	8	2
Kalamazoo River	9	2
Manistique River	6	2
Tahquamenon River	6	2

Table 8. PCB congeners analyzed for the WCTMP, and the analytical detection and quantitation levels for a 160 liter sample.

Congener #	Detection Level (ng/L)	Quantitation Level (ng/L)	Congener #	Detection Level (ng/L)	Quantitation Level (ng/L)
3	0.22	0.72	97	0.0030	0.010
4/10	0.025	0.083	87	0.0050	0.017
7/9	0.0055	0.018	85	0.0055	0.018
6	0.011	0.037	136	0.015	0.050
8/5	0.024	0.080	77/110	0.011	0.037
19	0.0035	0.012	82	0.0035	0.012
18	0.0070	0.023	151	0.0050	0.017
15/17	0.015	0.050	135/144	0.0065	0.022
24/27	0.0035	0.012	123/149	0.0050	0.017
16/32	0.011	0.037	118	0.0080	0.027
26	0.0070	0.023	146	0.0055	0.018
25	0.0060	0.020	132/153/105	0.010	0.033
28/31	0.020	0.070	141	0.0040	0.013
33	0.0075	0.025	137/176	0.0065	0.022
53	0.0040	0.013	163/138	0.011	0.037
51	0.0035	0.012	158	0.0075	0.025
22	0.011	0.037	178	0.0070	0.023
45	0.0045	0.015	187/182	0.0050	0.017
46	0.0045	0.015	183	0.0055	0.018
52	0.0075	0.025	128	0.0045	0.015
49	0.0050	0.017	167	0.0060	0.020
47/48	0.0090	0.030	185	0.0035	0.012
44	0.0065	0.022	174	0.0055	0.018
37/42	0.010	0.033	177	0.0060	0.020
41/71/64	0.010	0.033	202/171	0.0040	0.013
40	0.0050	0.017	172	0.0075	0.025
63	0.012	0.040	180	0.0065	0.022
74	0.0065	0.022	193	0.0075	0.025
70/76	0.012	0.040	199	0.0045	0.015
66	0.012	0.040	170/190	0.0055	0.018
95	0.0060	0.020	198	0.0075	0.025
91	0.0055	0.018	201	0.0090	0.030
56/60	0.0080	0.027	203/196	0.014	0.047
92/84	0.012	0.040	208/195	0.0040	0.013
89	0.0030	0.010	207	0.0035	0.012
101	0.0055	0.018	194	0.0055	0.018
99	0.0040	0.013	206	0.0035	0.012
83	0.0045	0.015			

Note: Coelution is signified by "/ " notation. Coeluting congeners cannot be separated analytically.

Table 9. Pesticides analyzed for the WCTMP, and their analytical detection and quantitation levels for a 160 liter sample.

Pesticide	Detection Level (ng/L)	Quantitation Level (ng/L)
HCB	0.003	0.01
alpha-BHC	0.025	0.082
Lindane	0.025	0.082
oxychlordane	0.01	0.033
gamma-chlordane	0.011	0.037
alpha-chlordane	0.01	0.033
cis-nonachlor	0.01	0.033
trans-nonachlor	0.0085	0.028
4,4'-DDD	0.025	0.082
4,4'-DDT	0.025	0.082
4,4'-DDE	0.015	0.05
Toxaphene	5.0	16.0

Table 10. Summary of laboratory result remark codes applicable to WCTMP data, and their definitions.

Analyte Category	Code	Definition
Nutrients and Conventionals, Base/Neutral Organics, MTBE and BTEX		
	A	Value reported is the mean of two or more determinations.
	DM	Dilution required due to matrix problems.
	HT	Recommended laboratory holding time was exceeded before analysis.
	ID	Insufficient data for calculation.
	K	Observed result was below the level of quantitation shown.
	ND	Observed result was below the level of quantitation.
	T	Value reported is less than the quantitation level.
	W	Observed result was below the lowest normally reportable value shown.
Mercury and Trace Metals	None	
Chlorinated Organic BCCs		
	EST	Estimated value; analyte present above detection limit but not quantified within expected limits of precision. Actual value may be above quantitation.
	FBK	Analyte had measurable value above established QC limit when blank was analyzed using same equipment and analytical method.
	FMS	Failed matrix spike criteria; recovery of matrix spike was outside of established QC limits.
	NAI	Not analyzed due to uncontrollable interference.
	NDD	Not detected due to dilution.

Table 11. 1999 loading rate estimates for total chloride, total phosphorus and total suspended solids.

Parameter	Tributary	Actual Loading+	95% C.I.	Actual Mean Conc.	Mean Annual Flow	Normalized Loading+
Tot Chloride		metric tons/year	(+/-)	mg/L	cfs	metric tons/year
	Grand River (Lower)	117,983	5%	46.12	3,286	134,033
	St. Joseph River (Lower)	78,660	5%	27.67	3,336	78,042
	Kalamazoo River (Lower)	52,671	6%	39.37	1,518	51,022
	Muskegon River (Lower)	21,589	2%	17.17	1,464	20,791
	Escanaba River	12,096	11%	23.58	976	11,568
	Pere Marquette River	5,353	5%	11.78	538	6,031
	Manistique River	3,092	4%	2.06	1,681	3,051
	Tahquamenon River	1,386	3%	2.13	743	1,371
Tot Phosphorus		metric tons/year	(+/-)	mg/L	cfs	metric tons/year
	Grand River (Lower)	391	14%	0.14	3,286	373
	St. Joseph River (Lower)	289	18%	0.09	3,336	268
	Kalamazoo River (Lower)	123	13%	0.10	1,518	124
	Muskegon River (Lower)	43	19%	0.04	1,464	43
	Escanaba River	39	13%	0.07	976	41
	Manistique River	37	25%	0.02	1,681	26
	Pere Marquette River	23	11%	0.04	538	16
	Tahquamenon River	21	25%	0.02	743	12
TSS		metric tons/year	(+/-)	mg/L	cfs	metric tons/year
	Grand River (Lower)	122,162	27%	40.79	3,286	120,864
	St. Joseph River (Lower)	73,734	20%	21.00	3,336	71,723
	Kalamazoo River (Lower)	32,273	13%	26.37	1,518	35,783
	Manistique River	27,792	9%	9.81	1,681	13,000
	Muskegon River (Lower)	16,253	33%	12.61	1,464	21,248
	Pere Marquette River	9,332	64%	16.39	538	5,561
	Tahquamenon River	7,727	79%	6.19	743	1,633
	Escanaba River	3,822	36%	5.16	976	3,624

+ = Calculated values; not rounded to appropriate number of significant figures.
C.I. = Confidence interval of loading rate estimate. True loading rate = estimated loading rate +/- (estimated loading rate * confidence interval).

Table 12. 1999 loading rate estimates for total mercury and trace metals.

Parameter	Tributary	Actual Loading+	95% C.I.	Actual Mean Conc.	Mean Annual Flow	Normalized Loading+
Cadmium		kg/year	(+/-)	ug/L	cfs	kg/year
	St. Joseph River (Lower)	129	15%	0.04	3,336	135
	Grand River (Lower)	127	20%	0.04	3,286	132
	Kalamazoo River (Lower)	45	8%	0.03	1,518	45
	Tahquamenon River	41	111%	0.02	743	11
	Escanaba River	30	13%	0.05	976	29
	Manistique River	8	88%	0.00	1,681	7
	Muskegon River (Lower)	7	34%	0.01	1,464	8
	Pere Marquette River	4	18%	0.01	538	4
Chromium		kg/year	(+/-)	ug/L	cfs	kg/year
	Grand River (Lower)	5,871	12%	1.86	3,286	5,597
	St. Joseph River (Lower)	3,321	8%	0.96	3,336	3,305
	Kalamazoo River (Lower)	1,723	13%	1.15	1,518	1,764
	Muskegon River (Lower)	906	16%	0.51	1,464	839
	Manistique River	798	8%	0.47	1,681	815
	Escanaba River	732	6%	0.85	976	688
	Pere Marquette River	346	6%	0.62	538	338
	Tahquamenon River	329	18%	0.43	743	317
Copper		kg/year	(+/-)	ug/L	cfs	kg/year
	Grand River (Lower)	7,412	10%	2.59	3,286	7,695
	St. Joseph River (Lower)	4,679	15%	1.51	3,336	4,557
	Kalamazoo River (Lower)	2,164	7%	1.62	1,518	2,092
	Muskegon River (Lower)	812	8%	0.61	1,464	776
	Manistique River	705	6%	0.40	1,681	697
	Escanaba River	688	3%	0.99	976	665
	Tahquamenon River	332	12%	0.46	743	350
	Pere Marquette River	221	10%	0.50	538	221

+ = Calculated values; not rounded to appropriate number of significant figures.
C.I. = Confidence interval of loading rate estimate. True loading rate = estimated loading rate +/- (estimated loading rate * confidence interval).

Table 12. 1999 loading rate estimates for total mercury and trace metals.

Parameter	Tributary	Actual Loading+	95% C.I.	Actual Mean Conc.	Mean Annual Flow	Normalized Loading+
Lead		kg/year	(+/-)	ug/L	cfs	kg/year
	Grand River (Lower)	5,590	24%	1.96	3,286	5,421
	St. Joseph River (Lower)	3,218	19%	1.01	3,336	3,558
	Kalamazoo River (Lower)	2,389	12%	1.64	1,518	2,318
	Manistique River	282	33%	0.14	1,681	273
	Muskegon River (Lower)	242	33%	0.20	1,464	243
	Tahquamenon River	177	30%	0.16	743	177
	Escanaba River	174	20%	0.17	976	162
	Pere Marquette River	127	26%	0.27	538	116
Mercury		kg/year	(+/-)	ng/L	cfs	kg/year
	Grand River (Lower)	26	22%	7.19	3,286	21
	St. Joseph River (Lower)	18	33%	5.08	3,336	18
	Kalamazoo River (Lower)	13	13%	8.47	1,518	13
	Escanaba River	6	52%	7.27	976	6
	Manistique River	6	15%	2.85	1,681	6
	Tahquamenon River	4	22%	4.39	743	5
	Muskegon River (Lower)	4	135%	3.26	1,464	4
	Pere Marquette River	2	20%	2.52	538	1
Nickel		kg/year	(+/-)	ug/L	cfs	kg/year
	Grand River (Lower)	11,010	9%	3.61	3,286	10,565
	St. Joseph River (Lower)	8,211	4%	2.58	3,336	8,176
	Kalamazoo River (Lower)	3,670	6%	2.60	1,518	3,675
	Muskegon River (Lower)	1,722	4%	1.19	1,464	1,697
	Manistique River	889	5%	0.60	1,681	920
	Tahquamenon River	864	93%	0.78	743	230
	Escanaba River	809	3%	0.84	976	757
	Pere Marquette River	564	4%	1.21	538	550

+ = Calculated values; not rounded to appropriate number of significant figures.
C.I. = Confidence interval of loading rate estimate. True loading rate = estimated loading rate +/- (estimated loading rate * confidence interval).

Table 12. 1999 loading rate estimates for total mercury and trace metals.

Parameter	Tributary	Actual Loading+	95% C.I.	Actual Mean Conc.	Mean Annual Flow	Normalized Loading+
Zinc		kg/year	(+/-)	ug/L	cfs	kg/year
	St. Joseph River (Lower)	24,537	80%	6.95	3,336	25,420
	Grand River (Lower)	19,760	23%	7.51	3,286	20,146
	Muskegon River (Lower)	7,074	51%	4.13	1,464	4,549
	Escanaba River	3,510	26%	4.89	976	3,524
	Pere Marquette River	2,633	56%	4.02	538	1,841
	Kalamazoo River (Lower)	2,164	4%	5.19	1,518	6,387
	Tahquamenon River	1,719	27%	1.43	743	1,937
	Manistique River	1,670	40%	0.79	1,681	1,624

+ = Calculated values; not rounded to appropriate number of significant figures.
C.I. = Confidence interval of loading rate estimate. True loading rate = estimated loading rate +/- (estimated loading rate * confidence interval).

Table 13. Rule 57 water quality values, mean and range of concentrations, and exceedance rates for Group 1 base/neutral organics.

STORET ID	Tributary	Analyte (ug/L)
110628	St. Joseph	Bis(2-ethylhexyl)phthalate
R. 57 Water Quality Value+		32.0
Mean Concentration+		15.1
Range of Concentrations		ND - 23
Exceedance Rate*		0 / 12
210102	Escanaba	Bis(2-ethylhexyl)phthalate
R. 57 Water Quality Value+		32.0
Mean Concentration+		6.0
Range of Concentrations		ND - 9.4
Exceedance Rate*		0 / 13
530027	Pere Marquette	Di-n-butyl phthalate
R. 57 Water Quality Value+		9.7
Mean Concentration+		1.3
Range of Concentrations		ND - 1.3
Exceedance Rate*		0 / 12

+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding R. 57 water quality value / number of samples analyzed.
ND = Observed result was below the quantitation level.

Table 14. 1 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
350061	**Au Sable River**							
R.57 Water Quality Value@		1.3	6.0	150	18.0	140	66	330
Mean Concentration+		1.045	0.002	0.496	0.230	1.437	0.028	1.120
Range of Concentration		0.167 - 4.579	0 - 0.009	0.229 - 0.884	0.19 - 0.291	1.04 - 3.592	0.02 - 0.039	0.059 - 5.813
Exceedance Rate*		2 / 11	0 / 11	0 / 11	0 / 11	0 / 11	0 / 11	0 / 11
Mean Concentration,Base/Low Flow+		0.409			0.243			
Range of Concentration		0.192 - 1.097			0.201 - 0.291			
Exceedance Rate*		0 / 6			0 / 6			
Mean Concentration,High Flow+		1.808			0.214			
Range of Concentration		0.167 - 4.579			0.19 - 0.223			
Exceedance Rate*		2 / 5			0 / 5			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 2 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
500233	**Clinton River**							
R.57 Water Quality Value@		1.3	7.7	190	24.0	180	95	430
Mean Concentration+		12.830	0.159	5.733	6.391	8.582	6.073	28.063
Range of Concentration		2.433 - 106.9	0.037 - 1.207	2.701 - 32.74	2.409 - 40.58	5.362 - 25.87	1.025 - 50.77	6.378 - 222.9
Exceedance Rate*		13 / 13	0 / 13	0 / 13	1 / 13	0 / 13	0 / 13	0 / 13
Mean Concentration,Base/Low Flow+		3.753			3.007			
Range of Concentration		2.433 - 5.799			2.409 - 3.746			
Exceedance Rate*		10 / 10			0 / 10			
Mean Concentration,High Flow+		43.084			17.670			
Range of Concentration		9.401 - 106.9			5.809 - 40.58			
Exceedance Rate*		3 / 3			1 / 3			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 3 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
210102	**Escanaba River**							
R.57 Water Quality Value@		1.3	4.4	100	13.0	96	42	230
Mean Concentration+		9.364	0.042	0.874	0.786	0.946	0.176	4.031
Range of Concentration		3.34 - 55.36	0.022 - 0.086	0.466 - 1.29	0.607 - 0.994	0.6 - 1.305	0.11 - 0.238	2.519 - 6.96
Exceedance Rate*		13 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13
Mean Concentration,Base/Low Flow+		13.246			0.858			
Range of Concentration		3.34 - 55.36			0.691 - 0.994			
Exceedance Rate*		6 / 6			0 / 6			
Mean Concentration,High Flow+		6.037			0.723			
Range of Concentration		3.774 - 7.333			0.607 - 0.877			
Exceedance Rate*		7 / 7			0 / 7			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 4 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
700123	**Grand River (Lower)**							
R.57 Water Quality Value@		1.3	8.7	220	27.0	210	110	500
Mean Concentration+		8.863	0.047	2.130	2.560	3.882	2.105	7.739
Range of Concentration		2.237 - 21.81	0.021 - 0.094	1.454 - 3.408	1.632 - 4.126	3.135 - 5.147	0.734 - 5.192	3.4 - 16.10
Exceedance Rate*		13 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13
Mean Concentration,Base/Low Flow+		4.018			1.926			
Range of Concentration		2.237 - 6.335			1.632 - 2.726			
Exceedance Rate*		4 / 4			0 / 4			
Mean Concentration,High Flow+		11.017			2.842			
Range of Concentration		5.54 - 21.81			2.302 - 4.126			
Exceedance Rate*		9 / 9			0 / 9			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 5 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
580364	**Huron River**							
R.57 Water Quality Value@		1.3	8.4	210	26.0	200	110	480
Mean Concentration+		2.517	0.046	1.996	1.750	4.300	2.918	8.136
Range of Concentration		1.804 - 3.286	0.04 - 0.062	1.441 - 3.509	1.358 - 2.043	3.727 - 6.888	1.861 - 3.661	5.639 - 11.06
Exceedance Rate*		12 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12
Mean Concentration,Base/Low Flow+		2.632			1.799			
Range of Concentration		2.007 - 3.286			1.358 - 2.043			
Exceedance Rate*		8 / 8			0 / 8			
Mean Concentration,High Flow+		2.287			1.652			
Range of Concentration		1.804 - 3.029			1.56 - 1.781			
Exceedance Rate*		4 / 4			0 / 4			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 6 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
030077	**Kalamazoo River (Lower)**							
R.57 Water Quality Value@		1.3	8.7	220	27.0	210	110	500
Mean Concentration+		9.574	0.034	1.325	1.553	2.709	1.718	4.780
Range of Concentration		6.477 - 13.12	0.022 - 0.052	0.825 - 1.912	1.239 - 2.029	2.034 - 3.569	1.162 - 2.263	2.712 - 6.354
Exceedance Rate*		13 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13
Mean Concentration,Base/Low Flow+		10.240			1.540			
Range of Concentration		6.621 - 13.12			1.239 - 2.029			
Exceedance Rate*		4 / 4			0 / 4			
Mean Concentration,High Flow+		9.278			1.559			
Range of Concentration		6.477 - 12.53			1.347 - 1.876			
Exceedance Rate*		9 / 9			0 / 9			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 7 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
770073	**Manistique River**							
R.57 Water Quality Value@		1.3	3.9	91	11.0	85	35	200
Mean Concentration+		3.257	0.003	0.520	0.418	0.658	0.153	0.832
Range of Concentration		1.997 - 6.068	0 - 0.012	0.363 - 0.703	0.266 - 0.55	0.419 - 0.918	0.067 - 0.293	0.313 - 1.848
Exceedance Rate*		13 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13
Mean Concentration,Base/Low Flow+		2.482			0.373			
Range of Concentration		1.997 - 3.421			0.266 - 0.507			
Exceedance Rate*		8 / 8			0 / 8			
Mean Concentration,High Flow+		4.498			0.490			
Range of Concentration		2.978 - 6.068			0.432 - 0.55			
Exceedance Rate*		5 / 5			0 / 5			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 8 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
610273	**Muskegon River (Lower)**							
R.57 Water Quality Value@		1.3	7.0	170	22.0	160	84	400
Mean Concentration+		4.445	0.006	0.677	0.637	1.294	0.233	5.675
Range of Concentration		0.843 - 34.00	0 - 0.016	0.501 - 1.102	0.36 - 1.051	1.107 - 1.746	0.063 - 0.686	0.741 - 17.82
Exceedance Rate*		8 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12
Mean Concentration,Base/Low Flow+		1.051			0.484			
Range of Concentration		1 - 1.102			0.36 - 0.608			
Exceedance Rate*		0 / 2			0 / 2			
Mean Concentration,High Flow+		5.124			0.668			
Range of Concentration		0.843 - 34.00			0.442 - 1.051			
Exceedance Rate*		8 / 10			0 / 10			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 9 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
530027	**Pere Marquette River**							
R.57 Water Quality Value@		1.3	6.5	160	20.0	150	75	360
Mean Concentration+		2.903	0.007	0.712	0.465	1.159	0.250	4.925
Range of Concentration		1.529 - 5.312	0 - 0.013	0.526 - 0.878	0.241 - 0.775	0.985 - 1.455	0.108 - 0.426	0.9 - 16.84
Exceedance Rate*		12 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12
Mean Concentration,Base/Low Flow+		2.814			0.319			
Range of Concentration		1.529 - 5.312			0.241 - 0.378			
Exceedance Rate*		5 / 5			0 / 5			
Mean Concentration,High Flow+		2.966			0.570			
Range of Concentration		1.682 - 4.065			0.372 - 0.775			
Exceedance Rate*		7 / 7			0 / 7			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 10 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
060061	**Rifle River**							
R.57 Water Quality Value@		1.3	7.6	190	23.0	180	94	430
Mean Concentration+		1.969	0.008	0.979	0.670	2.462	0.264	5.210
Range of Concentration		0.712 - 3.527	0 - 0.017	0.323 - 1.652	0.446 - 1.075	1.488 - 4.267	0.109 - 0.633	0.519 - 23.68
Exceedance Rate*		7 / 11	0 / 11	0 / 11	0 / 11	0 / 11	0 / 11	0 / 11
Mean Concentration,Base/Low Flow+		1.626			0.605			
Range of Concentration		0.712 - 3			0.446 - 0.792			
Exceedance Rate*		4 / 8			0 / 8			
Mean Concentration,High Flow+		2.883			0.845			
Range of Concentration		1.964 - 3.527			0.603 - 1.075			
Exceedance Rate*		3 / 3			0 / 3			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 11 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
580046	**River Raisin**							
R.57 Water Quality Value@		1.3	8.1	200	25.0	190	100	460
Mean Concentration+		3.892	0.033	1.445	2.474	3.807	0.906	3.290
Range of Concentration		1.809 - 7.022	0.016 - 0.048	0.709 - 2.352	1.874 - 3.257	2.509 - 6.381	0.464 - 1.718	1.767 - 5.18
Exceedance Rate*		12 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12
Mean Concentration,Base/Low Flow+		3.949			2.516			
Range of Concentration		1.809 - 7.022			1.874 - 3.257			
Exceedance Rate*		10 / 10			0 / 10			
Mean Concentration,High Flow+		3.606			2.263			
Range of Concentration		2.61 - 4.602			2.161 - 2.365			
Exceedance Rate*		2 / 2			0 / 2			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 12 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
820070	**River Rouge**							
R.57 Water Quality Value@		1.3	5.6	130	16.0	120	60	300
Mean Concentration+		9.679	0.096	3.375	4.819	4.826	3.731	17.373
Range of Concentration		3.177 - 29.58	0.042 - 0.32	1.482 - 10.12	2.645 - 12.7	2.329 - 12.16	1.358 - 12.36	6.765 - 59.67
Exceedance Rate*		13 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13
Mean Concentration,Base/Low Flow+		5.210			3.405			
Range of Concentration		3.177 - 10.18			2.645 - 3.886			
Exceedance Rate*		8 / 8			0 / 8			
Mean Concentration,High Flow+		16.830			7.080			
Range of Concentration		4.33 - 29.58			3.011 - 12.7			
Exceedance Rate*		5 / 5			0 / 5			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 13 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
090177	**Saginaw River**							
R.57 Water Quality Value@		1.3	8.6	220	27.0	210	110	500
Mean Concentration+		3.639	0.027	2.982	1.923	4.949	1.241	4.461
Range of Concentration		2.064 - 5.205	0.021 - 0.038	2.293 - 3.989	1.722 - 2.245	3.791 - 6.285	1.05 - 1.679	3.658 - 6.152
Exceedance Rate*		8 / 8	0 / 8	0 / 8	0 / 8	0 / 8	0 / 8	0 / 8
Mean Concentration,Base/Low Flow+		3.639			1.923			
Range of Concentration		2.064 - 5.205			1.722 - 2.245			
Exceedance Rate*		8 / 8			0 / 8			
Mean Concentration,High Flow+								
Range of Concentration		-			-			
Exceedance Rate*		0 / 0			0 / 0			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 14 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
730023	**Shiawassee River**							
R.57 Water Quality Value@		1.3	8.4	210	26.0	200	110	480
Mean Concentration+		3.518	0.030	2.596	1.517	3.865	1.029	7.470
Range of Concentration		1.282 - 6.646	0.015 - 0.055	1.743 - 3.483	1.036 - 2.048	2.564 - 5.689	0.403 - 1.638	1.781 - 30.07
Exceedance Rate*		12 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13
Mean Concentration,Base/Low Flow+		3.226			1.468			
Range of Concentration		1.282 - 6.646			1.125 - 1.821			
Exceedance Rate*		7 / 8			0 / 8			
Mean Concentration,High Flow+		3.985			1.596			
Range of Concentration		2.223 - 6.582			1.036 - 2.048			
Exceedance Rate*		5 / 5			0 / 5			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 15 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
110628	**St. Joseph River (Lower)**							
R.57 Water Quality Value@		1.3	9.5	240	30.0	230	130	560
Mean Concentration+		5.615	0.043	1.089	1.531	2.718	1.083	7.098
Range of Concentration		1.65 - 15.98	0.02 - 0.075	0.8 - 1.404	0.865 - 2.376	2.301 - 3.399	0.342 - 2.173	2.307 - 28.51
Exceedance Rate*		12 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12	0 / 12
Mean Concentration,Base/Low Flow+		3.462			1.232			
Range of Concentration		1.65 - 5.519			0.865 - 1.538			
Exceedance Rate*		5 / 5			0 / 5			
Mean Concentration,High Flow+		7.152			1.744			
Range of Concentration		3.986 - 15.98			1.281 - 2.376			
Exceedance Rate*		7 / 7			0 / 7			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 16 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
170141	**Tahquamenon River**							
R.57 Water Quality Value@		1.3	3.5	79	9.4	72	29	170
Mean Concentration+		5.050	0.021	0.466	0.410	0.860	0.185	1.649
Range of Concentration		1.961 - 9.632	0.001 - 0.171	0.344 - 0.605	0.202 - 0.682	0.449 - 3.174	0.055 - 0.516	0.365 - 4.841
Exceedance Rate*		13 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13
Mean Concentration,Base/Low Flow+		3.736			0.314			
Range of Concentration		1.961 - 8.351			0.202 - 0.498			
Exceedance Rate*		6 / 6			0 / 6			
Mean Concentration,High Flow+		6.176			0.492			
Range of Concentration		2.618 - 9.632			0.305 - 0.682			
Exceedance Rate*		7 / 7			0 / 7			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 17 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
040123	**Thunder Bay River**							
R.57 Water Quality Value@		1.3	6.8	170	21.0	160	80	380
Mean Concentration+		1.110	0.006	0.677	0.331	1.723	0.092	30.349
Range of Concentration		0.469 - 2.822	0 - 0.01	0.308 - 1.022	0.248 - 0.494	1.093 - 3.144	0.042 - 0.14	0.356 - 119.7
Exceedance Rate*		4 / 11	0 / 11	0 / 11	0 / 11	0 / 11	0 / 11	0 / 11
Mean Concentration,Base/Low Flow+		1.041			0.311			
Range of Concentration		0.469 - 2.822			0.248 - 0.45			
Exceedance Rate*		3 / 9			0 / 9			
Mean Concentration,High Flow+		1.425			0.419			
Range of Concentration		0.736 - 2.113			0.343 - 0.494			
Exceedance Rate*		1 / 2			0 / 2			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 14. 18 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for mercury and trace metals.

STORET ID	Tributary	Mercury (ng/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Nickel (ug/L)	Lead (ug/L)	Zinc (ug/L)
730025	**Tittabawassee River**							
R.57 Water Quality Value@		1.3	8.4	210	26.0	200	110	480
Mean Concentration+		3.354	0.027	3.435	1.652	3.823	0.662	20.362
Range of Concentration		1.666 - 11.8	0.011 - 0.052	2.033 - 5.636	1.129 - 4.128	2.59 - 6.398	0.318 - 2.642	3.781 - 122.9
Exceedance Rate*		13 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13	0 / 13
Mean Concentration,Base/Low Flow+		2.809			1.456			
Range of Concentration		1.666 - 4.614			1.129 - 1.862			
Exceedance Rate*		8 / 8			0 / 8			
Mean Concentration,High Flow+		4.226			1.964			
Range of Concentration		1.901 - 11.8			1.309 - 4.128			
Exceedance Rate*		5 / 5			0 / 5			

@ = Rule 57 water quality values for mercury were developed based on total metal toxicity criteria; all others were developed based on dissolved metal toxicity criteria.
+ = Calculated value; not rounded to appropriate number of significant figures.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 15. 1 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for chlorinated organic BCCs.

STORET ID	Tributary	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT^ (ng/L)	Lindane (ng/L)	Toxaphene#^ (ng/L)	HCB (ng/L)
350061	**Au Sable River**						
R.57 Water Quality Value		0.026	0.25	0.011	26	0.068	0.45
Mean Concentration+		1.210	0.003	0.020	0.134	0.000	0.015
Range of Concentrations		0.756 - 1.870	0 - 0.013	0.014 - 0.03	0.058 - 0.319	0 - 0	0.008 - 0.024
Exceedance Rate*		5 / 5	0 / 4	4 / 4	0 / 4	0 / 4	0 / 4
Mean Concentration, Base/Low Flow+		0.929		0.030			
Range of Concentrations		0.756 - 1.103		0.03 - 0.03			
Exceedance Rate*		2 / 2		1 / 1			
Mean Concentration, High Flow+		1.397		0.017			
Range of Concentrations		1.044 - 1.870		0.014 - 0.019			
Exceedance Rate*		3 / 3		3 / 3			

+ = Calculated value; not rounded to appropriate number of significant figures.
# = Residue exhibits chromatographic characteristics similar to toxaphene.
^ = Parameter has quantitation level above its Rule 57 water quality value.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 15. 2 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for chlorinated organic BCCs.

STORET ID	Tributary	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT^ (ng/L)	Lindane (ng/L)	Toxaphene#^ (ng/L)	HCB (ng/L)
500233	**Clinton River**						
R.57 Water Quality Value		0.026	0.25	0.011	26	0.068	0.45
Mean Concentration+		8.698	0.700	1.274	1.347		0.084
Range of Concentrations		5.757 - 10.7	0.241 - 0.977	0.664 - 1.778	0.784 - 1.58	-	0.06 - 0.093
Exceedance Rate*		6 / 6	5 / 6	6 / 6	0 / 6	0 / 0	0 / 6
Mean Concentration, Base/Low Flow+		8.698		1.274			
Range of Concentrations		5.757 - 10.7		0.664 - 1.778			
Exceedance Rate*		6 / 6		6 / 6			
Mean Concentration, High Flow+							
Range of Concentrations		-		-			
Exceedance Rate*		0 / 0		0 / 0			

+ = Calculated value; not rounded to appropriate number of significant figures.
# = Residue exhibits chromatographic characteristics similar to toxaphene.
^ = Parameter has quantitation level above its Rule 57 water quality value.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 15. 3 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for chlorinated organic BCCs.

STORET ID	Tributary	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT^ (ng/L)	Lindane (ng/L)	Toxaphene#^ (ng/L)	HCB (ng/L)
210102	**Escanaba River**						
R.57 Water Quality Value		0.026	0.25	0.011	26	0.068	0.45
Mean Concentration+		0.516	0.005	0.064	0.190		0.016
Range of Concentrations		0.292 - 0.83	0 - 0.009	0 - 0.128	0.169 - 0.21	-	0.01 - 0.019
Exceedance Rate*		4 / 4	0 / 2	1 / 2	0 / 2	0 / 0	0 / 2
Mean Concentration, Base/Low Flow+		0.471		0.000			
Range of Concentrations		0.344 - 0.598		0 - 0			
Exceedance Rate*		2 / 2		0 / 1			
Mean Concentration, High Flow+		0.561		0.128			
Range of Concentrations		0.292 - 0.83		0.128 - 0.128			
Exceedance Rate*		2 / 2		1 / 1			

+ = Calculated value; not rounded to appropriate number of significant figures.
# = Residue exhibits chromatographic characteristics similar to toxaphene.
^ = Parameter has quantitation level above its Rule 57 water quality value.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 15. 4 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for chlorinated organic BCCs.

STORET ID	Tributary	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT^ (ng/L)	Lindane (ng/L)	Toxaphene#^ (ng/L)	HCB (ng/L)
700123	**Grand River (Lower)**						
R.57 Water Quality Value		0.026	0.25	0.011	26	0.068	0.45
Mean Concentration+		3.035	0.724	1.996	0.757		0.061
Range of Concentrations		1.938 - 4.062	0.442 - 1.005	1.341 - 2.65	0.514 - 1	-	0.05 - 0.069
Exceedance Rate*		8 / 8	2 / 2	2 / 2	0 / 2	0 / 0	0 / 2
Mean Concentration, Base/Low Flow+		2.391					
Range of Concentrations		1.938 - 2.643		-			
Exceedance Rate*		3 / 3		0 / 0			
Mean Concentration, High Flow+		3.421		1.996			
Range of Concentrations		2.770 - 4.062		1.341 - 2.65			
Exceedance Rate*		5 / 5		2 / 2			

+ = Calculated value; not rounded to appropriate number of significant figures.
# = Residue exhibits chromatographic characteristics similar to toxaphene.
^ = Parameter has quantitation level above its Rule 57 water quality value.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 15. 5 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for chlorinated organic BCCs.

STORET ID	Tributary	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT^ (ng/L)	Lindane (ng/L)	Toxaphene#^ (ng/L)	HCB (ng/L)
030077	**Kalamazoo River (Low**						
R.57 Water Quality Value		0.026	0.25	0.011	26	0.068	0.45
Mean Concentration+		15.063	0.150	0.355	0.300		0.021
Range of Concentrations		8.313 - 24.48	0.123 - 0.177	0.316 - 0.394	0.291 - 0.309	-	0.02 - 0.021
Exceedance Rate*		9 / 9	0 / 2	2 / 2	0 / 2	0 / 0	0 / 2
Mean Concentration, Base/Low Flow+		18.478		0.394			
Range of Concentrations		13.22 - 24.48		0.394 - 0.394			
Exceedance Rate*		3 / 3		1 / 1			
Mean Concentration, High Flow+		13.356		0.316			
Range of Concentrations		8.313 - 18.37		0.316 - 0.316			
Exceedance Rate*		6 / 6		1 / 1			

+ = Calculated value; not rounded to appropriate number of significant figures.
# = Residue exhibits chromatographic characteristics similar to toxaphene.
^ = Parameter has quantitation level above its Rule 57 water quality value.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 15. 6 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for chlorinated organic BCCs.

STORET ID	Tributary	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT^ (ng/L)	Lindane (ng/L)	Toxaphene#^ (ng/L)	HCB (ng/L)
770073	**Manistique River**						
R.57 Water Quality Value		0.026	0.25	0.011	26	0.068	0.45
Mean Concentration+		0.499	0.000	0.029	0.179		0.010
Range of Concentrations		0.266 - 1.008	0 - 0	0 - 0.057	0.178 - 0.18	-	0.007 - 0.013
Exceedance Rate*		6 / 6	0 / 2	1 / 2	0 / 2	0 / 0	0 / 2
Mean Concentration, Base/Low Flow+		0.386		0.000			
Range of Concentrations		0.266 - 0.53		0 - 0			
Exceedance Rate*		4 / 4		0 / 1			
Mean Concentration, High Flow+		0.725		0.057			
Range of Concentrations		0.441 - 1.008		0.057 - 0.057			
Exceedance Rate*		2 / 2		1 / 1			

+ = Calculated value; not rounded to appropriate number of significant figures.
# = Residue exhibits chromatographic characteristics similar to toxaphene.
^ = Parameter has quantitation level above its Rule 57 water quality value.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 15. 7 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for chlorinated organic BCCs.

STORET ID	Tributary	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT^ (ng/L)	Lindane (ng/L)	Toxaphene#^ (ng/L)	HCB (ng/L)
580046	**River Raisin**						
R.57 Water Quality Value		0.026	0.25	0.011	26	0.068	0.45
Mean Concentration+		172.995	0.135	0.872	0.694	0.000	0.028
Range of Concentrations		55.85 - 256.2	0.06 - 0.196	0.64 - 1.154	0.549 - 0.865	0 - 0	0.02 - 0.036
Exceedance Rate*		6 / 6	0 / 6	6 / 6	0 / 6	0 / 6	0 / 6
Mean Concentration, Base/Low Flow+		161.896		0.848			
Range of Concentrations		55.85 - 256.2		0.64 - 1.154			
Exceedance Rate*		5 / 5		5 / 5			
Mean Concentration, High Flow+		228.492		0.991			
Range of Concentrations		228.5 - 228.5		0.991 - 0.991			
Exceedance Rate*		1 / 1		1 / 1			

+ = Calculated value; not rounded to appropriate number of significant figures.
# = Residue exhibits chromatographic characteristics similar to toxaphene.
^ = Parameter has quantitation level above its Rule 57 water quality value.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 15. 8 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for chlorinated organic BCCs.

STORET ID	Tributary	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT^ (ng/L)	Lindane (ng/L)	Toxaphene#^ (ng/L)	HCB (ng/L)
090177	**Saginaw River**						
R.57 Water Quality Value		0.026	0.25	0.011	26	0.068	0.45
Mean Concentration+		27.362	0.144	1.399	1.765	0.000	0.235
Range of Concentrations		20.89 - 38.99	0.087 - 0.205	1.106 - 1.745	0.962 - 2.43	0 - 0	0.20 - 0.299
Exceedance Rate*		8 / 8	0 / 7	7 / 7	0 / 7	0 / 7	0 / 7
Mean Concentration, Base/Low Flow+		27.362		1.399			
Range of Concentrations		20.89 - 38.99		1.106 - 1.745			
Exceedance Rate*		8 / 8		7 / 7			
Mean Concentration, High Flow+							
Range of Concentrations		-		-			
Exceedance Rate*		0 / 0		0 / 0			

+ = Calculated value; not rounded to appropriate number of significant figures.
# = Residue exhibits chromatographic characteristics similar to toxaphene.
^ = Parameter has quantitation level above its Rule 57 water quality value.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

Table 15. 9 Rule 57 water quality values, mean and range of concentrations, and exceedance rates for chlorinated organic BCCs.

STORET ID	Tributary	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT^ (ng/L)	Lindane (ng/L)	Toxaphene#^ (ng/L)	HCB (ng/L)
170141	**Tahquamenon River**						
R.57 Water Quality Value		0.026	0.25	0.011	26	0.068	0.45
Mean Concentration+		0.664	0.013	0.085	0.103		0.009
Range of Concentrations		0.202 - 1.442	0 - 0.026	0 - 0.17	0.044 - 0.161	-	0.006 - 0.013
Exceedance Rate*		6 / 6	0 / 2	1 / 2	0 / 2	0 / 0	0 / 2
Mean Concentration, Base/Low Flow+		0.333		0.000			
Range of Concentrations		0.202 - 0.463		0 - 0			
Exceedance Rate*		2 / 2		0 / 1			
Mean Concentration, High Flow+		0.830		0.170			
Range of Concentrations		0.480 - 1.442		0.17 - 0.17			
Exceedance Rate*		4 / 4		1 / 1			

+ = Calculated value; not rounded to appropriate number of significant figures.
# = Residue exhibits chromatographic characteristics similar to toxaphene.
^ = Parameter has quantitation level above its Rule 57 water quality value.
* = Number of samples exceeding Rule 57 water quality value / number of samples analyzed.

APPENDIX A

The Ambient Surface Water Chemistry Monitoring Project in Michigan
April 2001

Ambient Surface Water Chemistry

Monitoring in Michigan

Michigan Department of Environmental Quality
Surface Water Quality Division

United States Geological Survey
Water Resources Division, Michigan District

April 2001

Introduction

Environmental monitoring is an essential component of the Michigan Department of Environmental Quality (DEQ) and the U.S. Geological Survey (USGS) missions. The DEQ and USGS recognize that comprehensive water quality monitoring is necessary to improve natural resource management, maintain sustainable ecosystems, and protect public health. Assessment of the environmental impacts of point and nonpoint source discharges, the latter being diverse and more difficult to measure, is critical. Because bioaccumulative chemicals (e.g. dioxins, PCBs, mercury) can have serious impacts on aquatic systems when present at extremely low concentrations, monitoring techniques must be sophisticated and sensitive. Therefore, water quality monitoring programs must be expanded and improved to more effectively address changing environmental conditions and issues.

Past limitations in analytical quantification levels and funding reductions have restricted the overall effectiveness of DEQ and USGS water monitoring programs. The number of DEQ long-term water quality sites declined from over 100 in the late 1980's to just 13 on the Detroit River and 8 on Saginaw Bay in 1997. This reduction was noted in a 1995 report by the Auditor General, which stated that the Surface Water Quality Division (SWQD) does not have a monitoring program in place to evaluate overall water quality conditions in Michigan. Similarly, the number of sites monitored under the USGS National Ambient Surface Water Quality Network (NASQAN) has declined dramatically in the last decade. Partly in response to these criticisms, and partly because of a DEQ commitment to develop a monitoring plan, a report titled "A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (Strategy), was completed in January 1997. This Strategy describes the monitoring activities that are necessary for a comprehensive assessment of water quality in Michigan's surface waters. One component of the Strategy is an expanded and improved water chemistry monitoring program. Recent technological advances (i.e. low-level analytical techniques for metals and organics) now make it possible to collect high-quality water chemistry data at a reasonable cost.

In November 1998, the citizens of Michigan approved the Clean Michigan Initiative, a $675 million bond to clean up, protect, and enhance Michigan's environmental quality, natural resources, and infrastructure. Some of these funds were allocated for the implementation of the water quality monitoring program outlined in the Strategy, produced by the SWQD and the Land and Water Management Division, of the DEQ. The USGS also performs extensive water quality and stream flow activities, and has matching funds available for water quality monitoring. As a result, a partnership was formed by the two agencies to jointly monitor water chemistry in Michigan.

The resulting plan, described in this document, addresses the goals described in the Strategy. Specifically, these goals are to:

- assess the current status and condition of waters of the state and determine whether water standards are being met;
- measure spatial and temporal water quality trends;
- evaluate the effectiveness of water quality prevention and protection programs; and
- identify new and emerging water quality problems.

Watershed Management Units

One objective of the enhanced water chemistry monitoring is to be consistent, to the extent possible, with existing DEQ programs and activities. Therefore, the DEQ and USGS will continue to use the existing 5-year basin units defined by the NPDES permitting program. This plan, consistent with the NPDES program, defines 45 watershed units based on drainage to the four Great Lakes (Figure 1). Thirty-one of these units have been selected for placement of water chemistry stations. Monitoring activities within the watersheds include macroinvertebrate and fish evaluations, water chemistry, fish and wildlife contaminant studies, and sediment chemistry. Integrating the enhanced water chemistry monitoring with the other activities, within the framework of the five-year permitting cycle, will ensure that the monitoring is closely linked with other DEQ programs and contributes to resource management decisions.

Water Chemistry Description

The water chemistry element consists of several components that, in combination, provide data necessary to achieve the four goals listed above. Water chemistry monitoring will be fully coordinated with the other program elements in the Strategy, especially stream flow, inland lake quality, sediment chemistry, and biological integrity. The water chemistry components are described below. The overall plan is summarized in Attachment 1.

Bays and Connecting Channels

Saginaw Bay and Grand Traverse Bay represent water quality conditions resulting from interactions among land-use, point source and nonpoint sources of pollution, and geological and other natural influences in their respective watersheds. Saginaw Bay represents a largely agricultural, industrial, and urbanized watershed impacted by pesticides, nutrients, suspended solids, and other surface water contaminants typically associated with agriculture and urban runoff. Seven sites on Saginaw Bay are assessed, located at nearshore and offshore areas south of Point AuGres-Sand Point (Figure 2). Grand Traverse Bay, on the other hand, represents a minimally impacted watershed which is experiencing increasing development. Four sites on Grand Traverse Bay are monitored, located at a northern and southern point in both the east and west arms (Figure 2). Since 1998, these sites have been sampled three times per year (April, July, and October) for nutrients and conventionals, and once per year (July) for mercury, trace metals, and selected organic compounds. Monthly samples will be collected from Saginaw Bay in the year 2001 to determine whether three samples per year is sufficient given natural variability, or whether a greater number of samples are necessary to identify trends.

The Great Lakes connecting channels (St. Mary's River, St. Clair River, and Detroit River) are subject to intense commercial and industrial activity. These waters represent large watersheds also affected by interactions among land-use, point and nonpoint pollution sources, and geological and other natural influences. They serve as conduits for water quality impacts between the Great Lakes. Six sites, consisting of the headwaters and mouth of the St. Mary's, St. Clair, and Detroit Rivers (Figure 2), are evaluated every year for mercury, trace metals, nutrients, conventional parameters, and PCB congeners. The sites are sampled monthly during ice-free time periods (usually April through November).

Lake St. Clair Watershed

Monitoring for bacteria and nutrients in waters of the Lake St. Clair watershed is a priority for the Macomb County Health Department (County) and the DEQ to assess water quality trends and to identify sources of contaminants in the watershed, particularly sanitary sewer overflows, combined sewer overflows, and illicit connections. The DEQ has provided grants to the County in 1998 and 2000 for water quality monitoring. The County has monitored bacteria, nutrients, and metals at a number of locations in the Clinton River and Lake St. Clair (nearshore and open water) in 1998-2001. Additional testing will be conducted in areas not attaining water quality standards due to exceedences of *E. coli*. These efforts will be linked with TMDL requirements. A number of waterbodies in Macomb County are not attaining standards due to high bacteria levels and associated beach closings. The development and implementation of TMDLs will require extensive monitoring of these waters and control measures to reduce pollutant inputs to the affected waterbody.

Intensive Sites

Beginning in the year 2000, six sites are sampled 12 times per year on a flow-stratified schedule, with approximately two-thirds of the samples collected during high-flow. High-flow is defined as one of the following: greater than 20% exceedance flow; an increase in stream flow of 100% above the preceding base flow condition; or an increase in stream flow following a long period of discharge at base flow and considered likely to produce a measurable change in the concentration of sampled parameters. These locations include the Au Sable, Clinton, Grand, Kalamazoo, Muskegon, and Saginaw Rivers (Figure 3). The Saginaw River was not sampled in 2000, due to the extensive sediment remediation scheduled to take place there. It will be sampled starting in 2001. Intensive sites were selected based on large flow volumes and/or expected contaminant loads to the Great Lakes, except for the Au Sable River, which was chosen as a high-quality, background river. Data on contaminant concentrations and flow are collected from each river for loading calculations. For temporal trend analysis, measured loads are flow-normalized to account for variation that may be due strictly to precipitation changes from year to year. Samples typically are analyzed for mercury, trace metals, nutrients, conventional parameters, and PCBs congeners.

Integrator Sites

The twenty-five integrator sites represent water quality conditions of major streams and rivers in large, heterogeneous basins (Figure 4). Integrator sites generally are located near the outlet of large basins at or near flow gauging stations. Four integrator sites are located in the mid-reaches of the largest watersheds, including the St. Joe, Kalamazoo, Grand, and Muskegon Rivers. These sites are sampled intensively on a staggered 5-year rotation. Once every five years (consistent with the NPDES permitting program), each integrator site is sampled 12 times on a flow-stratified schedule identical to the intensive sites described above. Contaminant loads are calculated for these years. During the other four years in the 5-year cycle, the integrator site will be sampled 4 times per year. These samples are pre-scheduled throughout the period from ice breakup to ice cover and may include samples during spring snowmelt and low flow. Trends are evaluated on the combined data sets. Samples typically are analyzed for mercury, trace metals, nutrients, conventional parameters, PCBs congeners, and other selected parameters that may be of interest in each watershed.

Issue Sites

Issue sites are chosen by DEQ and USGS to understand how specific activities or conditions affect water quality. Issue sites are a flexible component of water chemistry program element that focuses on known or suspected problems as well as emerging issues. There are no fixed issue sites. Each year, starting in 2001, the DEQ and USGS will prioritize data needs and choose issue sites accordingly. While data requirements may focus on the NPDES-targeted basins, these sites may be anywhere in the state. Issue sites may be chosen to collect data prior to and after a nonpoint source project, assess the effects of land use on water quality, evaluate the impacts of pesticides and herbicides, and/or collect data on an emerging issue. Sites monitored for the development of Total Maximum Daily Loads (TMDLs) fall into this category. Depending upon the rationale for monitoring, an issue site may be monitored for one or a few years or perhaps for a longer time period. The suite of parameters collected at each indicator site varies based upon the issue being addressed.

Minimally Impacted Sites

One minimally impacted site is located in each of the 31 watershed management unit with an intensive or integrator station. These sites are sampled once every five years, consistent with the NPDES 5-year rotating basin schedule, to provide data on the best water quality that can be expected in each watershed. This information allows for a comparison of water chemistry data collected at other locations in a watershed to the minimally impacted site. It should be noted that the term "minimally impacted" varies by watershed. A minimally impacted site in the Rouge River watershed differs from a minimally impacted site in the Au Sable River watershed. These locations are sampled four times during the year for mercury, trace metals, conventionals, nutrients, and selected organic compounds.

Status Sites

The DEQ and USGS may incorporate a probabilistic component into the water chemistry network. We are evaluating the feasibility and value of such a component. The monitoring of randomly selected sites, either across the entire state or in selected watersheds, would allow for an overall assessment of water quality in Michigan and assist with the preparation of the state 305(b) report and the identification of emerging water quality problems. Each year, status sites could be randomly chosen within the rotating 5-year NPDES targeted watersheds. Stratified random selection of the sites incorporates statistical variability into the water quality assessment and over the years would supply water chemistry data on an increasing number of sites in Michigan. A list of river reaches in targeted watersheds could be compiled from the U.S. Environmental Protection Agency River Reach 3 File and used as the population for selection. Field personnel judgements on accessibility, suitability to sampling, and safety considerations would modify the selection somewhat.

5-Year Basin Sampling

SWQD biologists routinely collect water samples each year from many biological survey locations as part of the 5-year rotating basin assessments. These generally are one-time grab samples, and the parameters of interest most often include nutrients and conventional parameters. A small subset of these samples is analyzed for chemicals such as metals and/or a variety of organic contaminants, as local conditions warrant. We expect that additional watershed samples will be collected in 2001 and beyond due to CMI funding. Samples can be collected from sites

identified by the biologists, and if appropriate several samples can be collected from sites during the year. SWQD staff and consultants collect the samples.

Grants to Local Governments
Starting in 2001, the DEQ will make grants available to local governments for water quality monitoring. These entities will submit proposals that will be evaluated by DEQ. Proposals will be selected based on defined criteria, including watershed priority, the parameter/issue(s) being addressed, cost, and amount of local match. We expect that these projects will produce data for many areas of the state similar to the information generated in the Lake St. Clair watershed, described above, which was largely supported by DEQ grants.

Other Sites
Samples also are taken at selected locations that are sampled for other components of the monitoring strategy, including inland lake sediments, fish contaminants, and trends in biological integrity. The locations vary each year, and the parameter list varies on a site-specific basis.

Parameters

Data on nutrients (phosphorus, nitrogen, ions) and conventional parameters (temperature, conductivity, suspended solids, pH, dissolved oxygen) will be collected from all of the sites identified above. These are basic measures of water quality, and the DEQ and USGS frequently get requests for such information. In addition, these analyses are relatively inexpensive.

Total mercury and trace metals (cadmium, chromium, copper, lead, nickel, zinc) also will be measured at most of the sites, except perhaps at some of the issue sites that are specifically chosen for other reasons. Samples will not routinely be analyzed for dissolved metals, given that such analysis adds additional expense and that sample collection for dissolved metals is more time-consuming. The DEQ recently completed a project establishing ratios of total and dissolved metals in several Michigan rivers. This information can be used to convert total metal concentrations to dissolved concentrations if necessary. In addition, if data for total metals concentrations indicate possible exceedance of water quality standards, then follow-up sampling using dissolved techniques can be conducted.

Each year, one sample from the connecting channels, intensive sites, integrator sites, and reference sites are analyzed for PCBs. Because the use of PCBs has been phased out, the fact that low PCB levels in water make trend detection unlikely, and the expense of analysis, the DEQ and the USGS do not believe that more frequent PCB analysis is warranted. Extensive sampling in 1998 and 1999 for other organics, such as base neutrals and MTBE, from several rivers, were almost all non-detects. Therefore, only one sample per year from each location is analyzed for these substances, as a spot check. Pesticides/herbicide analyses may be conducted at selected sites, most likely at issue sites.

Data are reviewed each year to determine whether additional parameters should be added, removed, or analyzed at a greater or lesser frequency. An intricate part of the water chemistry program element is the development and use of indicators to reduce cost. To identify statistically valid indicators, historical and new data will be examined. If feasible, lower cost indicator parameters will be substituted in future sampling.

Data Management and Reporting

Data management and reporting are integral parts of the water chemistry program element. All water chemistry data will be entered into the STORET database. Data from the intensive, integrator, and minimally impacted sites (and status sites if these are added to the network) will be summarized in an annual trend report produced by the SWQD by September 1 of each year. The information from the specific issue sites will be summarized in individual reports as appropriate. Data collected as part of the 5-year basin sampling will be summarized in the GLEAS biosurvey reports. Data collected as part of TMDL sampling will be summarized in individual reports prepared for each waterbody for which TMDLs are developed. The data also will be used in preparation of the state 305(b) report. Each local government that receives a grant for water quality monitoring will be required to produce a final report of their findings at the conclusion of the project.

ATTACHMENT 1
Water Chemistry Monitoring Program

Bays

Saginaw Bay (7 locations)
Grand Traverse Bay (4 locations)

These stations have been sampled 3 times per year (April, July, October) since 1998. This will continue at Grand Traverse Bay. Monthly samples will be collected from Saginaw Bay in 2001 to determine if more frequent sampling is necessary.

Connecting Channels

St. Mary's River (upstream and downstream)
St. Clair River (upstream and downstream)
Detroit River (upstream and downstream)

These stations are sampled monthly during the open water portion of each year.

Intensive Sites

AuSable River
Clinton River
Grand River
Kalamazoo River
Muskegon River
Saginaw River

Stations are sampled near their mouths 12 times annually, on a flow-stratified schedule, to calculate loads.

Integrator Sites

Ontonagon River	Muskegon River (upper)	Cass River
Sturgeon River	Grand River (upper)	Flint River
Tahquamenon River	Kalamazoo River	Shiawassee River
Menominee River	St. Joe River (upper/lower)	Tittabawassee River
Escanaba River	Raisin River	Thunder Bay River
Manistique River	Huron River	Cheboygan River
Pine River (Mackinac County)	Rouge River	Manistee River
Pere Marquette River	Black River (St. Clair County)	Boardman River

Each site is sampled 12 times per year once in a 5-year cycle (during its basin year). In the other 4 years, a site is sampled 4 times per year.

Issue Sites

Sites and sampling frequency are determined each year.

Minimally Impacted Sites

Sites to be determined for each intensive and integrator watershed.

Stations will be sampled 4 times per year.

Status Sites

If incorporated, sites will be randomly selected each year and sampled four times in selected watersheds.

5-Year Basin

Locations and sampling frequency are identified each year in the target watersheds (consistent with the 5-year basin cycle).

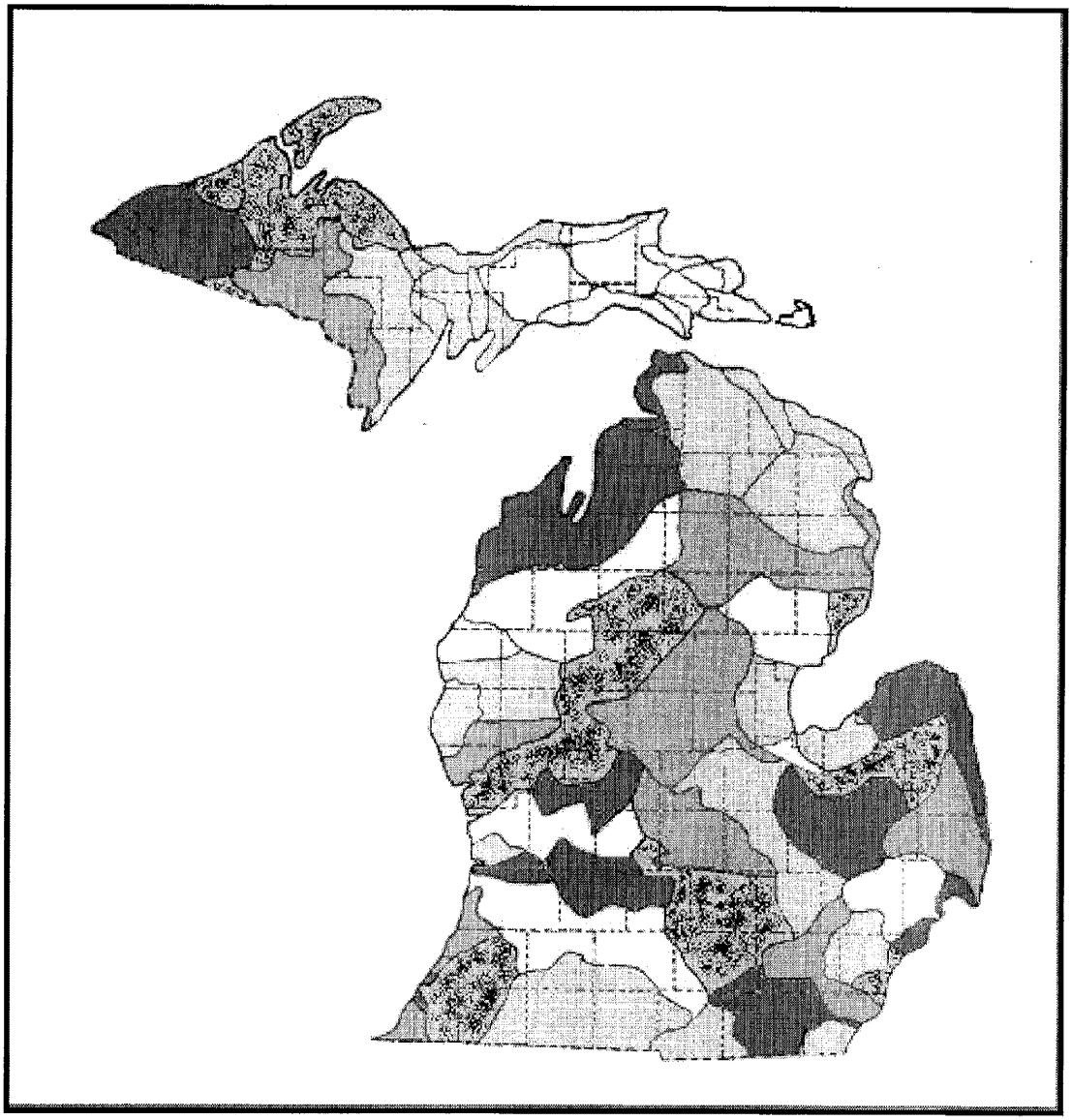


Figure 1. NPDES permit five-year reissuance basin schedule.

Figure 2. Water chemistry trend monitoring locations: Saginaw Bay, Grand Traverse Bay, and the Connecting Channels

Bay and Connecting Channel Locations

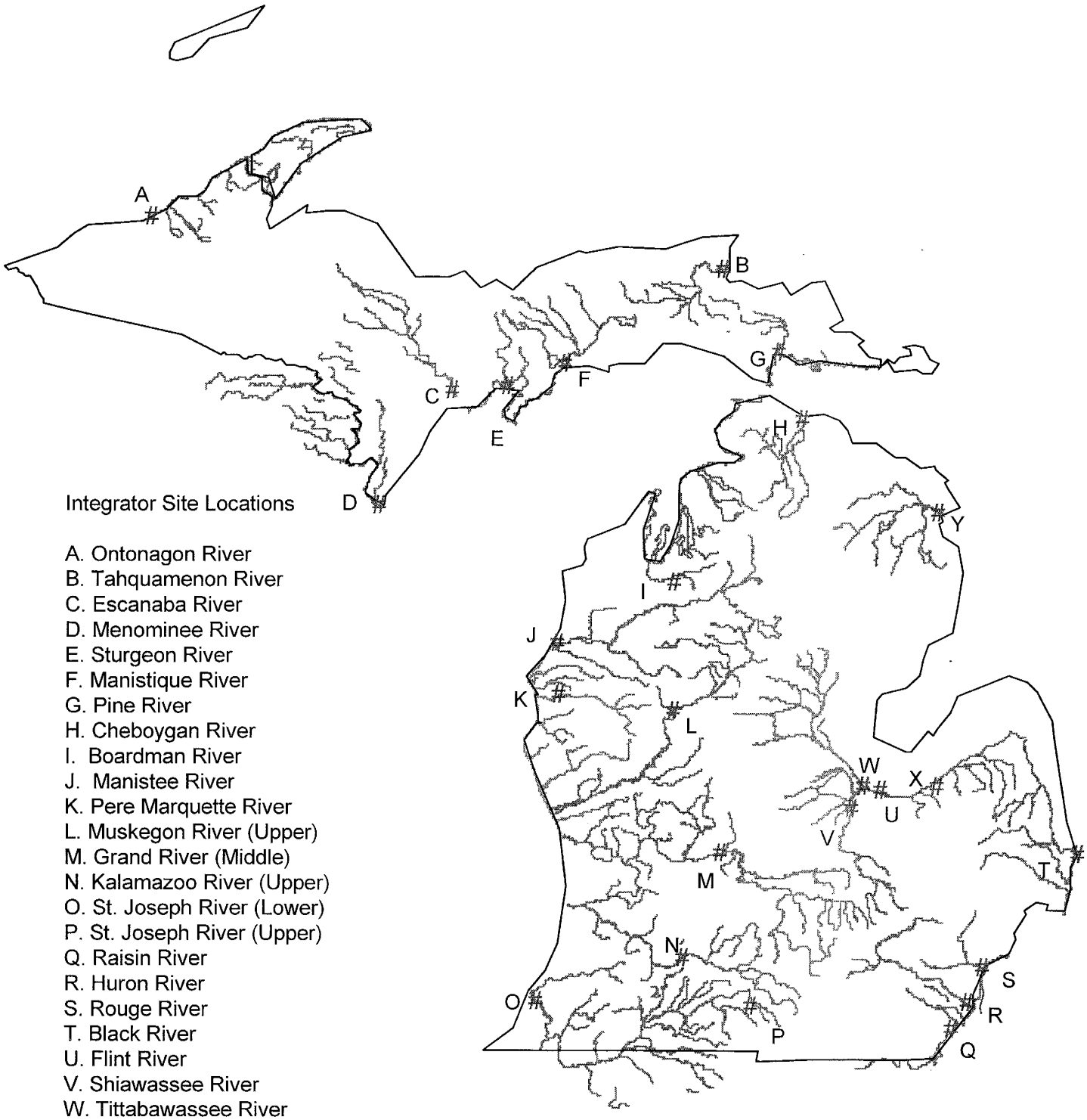
A. St. Marys River
B. Grand Traverse Bay
C. Saginaw Bay
D. St. Clair River
E. Detroit River

Figure 3. Water chemistry trend monitoring locations: intensive sites

Intensive Site Locations

A. Au Sable River
B. Saginaw River
C. Muskegon River (Lower)
D. Grand River (Lower)
E. Kalamazoo River (Lower)
F. Clinton River

Figure 4. Water chemistry trend monitoring locations: integrator sites



Integrator Site Locations

A. Ontonagon River
B. Tahquamenon River
C. Escanaba River
D. Menominee River
E. Sturgeon River
F. Manistique River
G. Pine River
H. Cheboygan River
I. Boardman River
J. Manistee River
K. Pere Marquette River
L. Muskegon River (Upper)
M. Grand River (Middle)
N. Kalamazoo River (Upper)
O. St. Joseph River (Lower)
P. St. Joseph River (Upper)
Q. Raisin River
R. Huron River
S. Rouge River
T. Black River
U. Flint River
V. Shiawassee River
W. Tittabawassee River
X. Cass River
Y. Thunder Bay

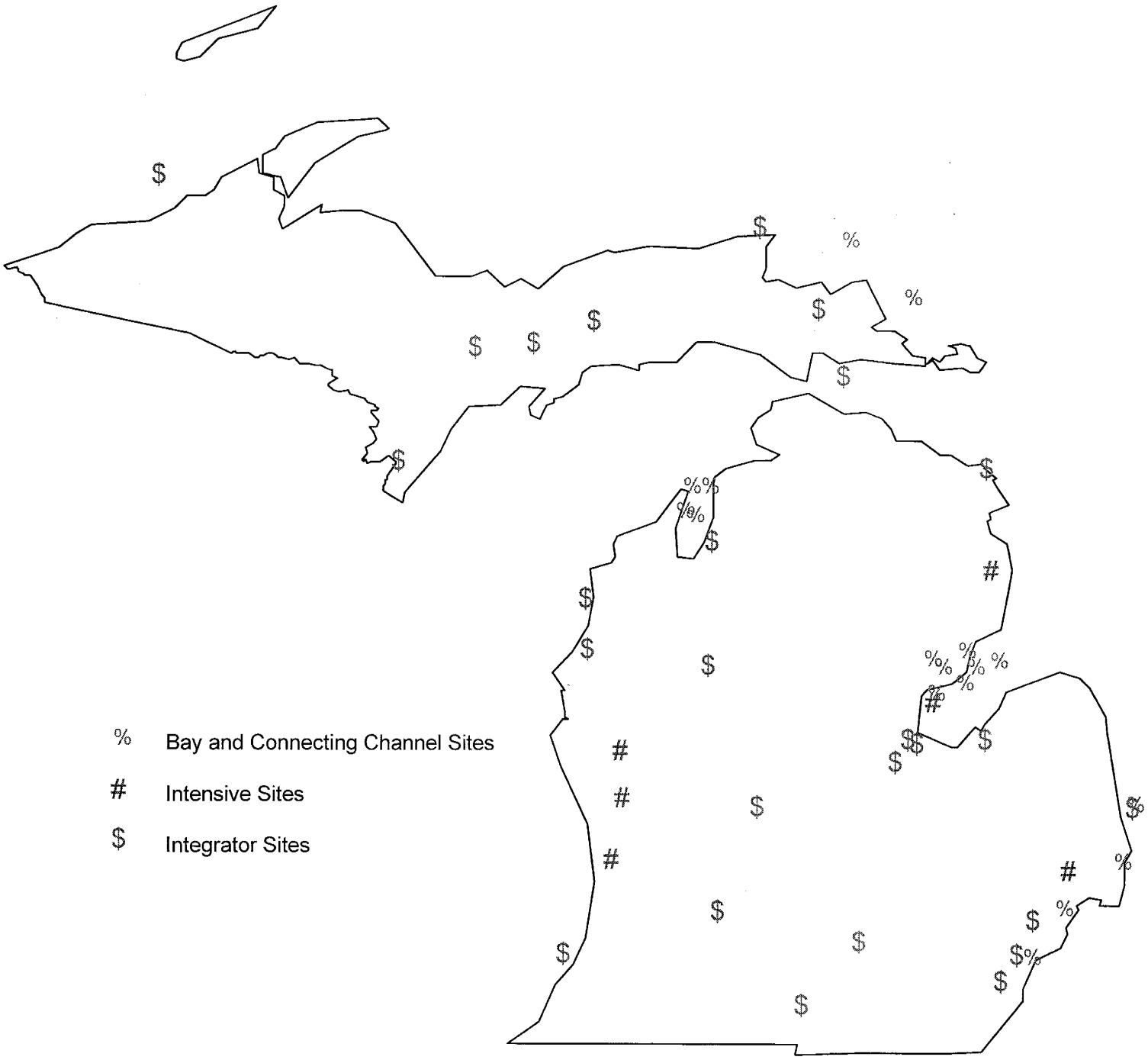


Figure 5. Water chemistry monitoring locations: bay and connecting channels, intensive, and integrator sites

APPENDIX B

Water Chemistry Data Summarized in the 1998-1999 Report

Tributary: AuSable River
STORET #: 350061
Year: 1998

PARAMETER	Units	7/8/1998	7/20/1998	8/3/1998	8/10/1998	8/17/1998	8/24/1998	8/31/1998	9/9/1998	9/14/1998	9/23/1998	9/28/1998	Mean+	Median+
Total Ammonia	mg N/L	0.025	0.017	0.022	0.018 HT	0.018 HT	0.012 HT	0.009 HT	0.012 HT	0.006 HT	0.005 HT	0.010	0.014	0.012
Total Nitrate	mg N/L	0.011	0.006	0.008	0.008 HT	0.006 HT	0.007 HT	0.002 HT	0.005 HT	0.002 HT	0.001 HT	0.003	0.005	0.006
Total Nitrite	mg N/L	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001 HT	0.001	0.001	0.001	0.001
Total Kjeldahl Nitrogen	mg N/L	0.18	0.16	0.16	0.21	0.23	0.25	0.15 HT	0.26 HT	0.24 HT	0.17 HT	0.22 HT	0.203	0.210
Total Phosphorus	mg P/L	0.014	0.010	0.013	0.011	0.011 HT	0.010	0.011 HT	0.015 HT	0.011 HT	0.014 HT	0.017 HT	0.012	0.011
Total Ortho Phosphate	mg P/L	0.003	0.006	0.004	0.003	0.003	0.004	0.003 HT	0.008	0.003 HT	0.005	0.004	0.004	0.004
Total Sulfate	mg/L	4	2	4	4	3	5	4	5	5	7	5	4.364	4.000
Total Calcium	mg/L	37.8	37.6	36.5	37.4	38.8	37.7	37.7	37.5	37.1	37.2	38.1	37.582	37.600
Total Chloride	mg/L	5.0	5.0	5.0	6.0	5.0	5.0	5.0	5.0	5.0	6.0	5.0	5.182	5.000
Total Magnesium	mg/L	10.9	10.9	10.8	10.7	11.1	11.2	10.9	11.4	11.3	11.2	11.2	11.055	11.100
Total Organic Carbon	mg/L	3	2.9	3.6	3.4	2.8	2.9	2.9	3.2	2.7	2.8	2.9	3.009	2.900
Total Dissolved Solids	mg/L	198	194	195	196	195	193	193	194	196	193	200	195.182	195.000
Total Suspended Solids	mg/L	4 K	4 K	4 K	4 K	4 K	4	4 K	4 K	4 K	4 K	6	2.545 @	4.000 K
Hardness (Ca_2CO_3)	mg/L	139	139	136	138	143	140	139	141	139	139	141	139.455	139.000
Conductivity	umho/cm	305	334	314	300	306	297	747	298	296	272	307	343.273	305.000
Dissolved Oxygen	mg/L	7.10	7.40	7.40	7.18	7.70	7.40	NA	8.1	7.93	7.93	8.2	7.634	7.550
pH	pH	8.30	7.60	7.60	7.74	7.30	8.25	7.50	8.10	8.12	8.04	7.80	7.850	7.800
Temperature of Water	°C	22.5	25.0	23.6	24.1	23.9	23.9	23.3	21.0	21.2	20.6	20.0	22.645	23.300

+ = Calculated value; not rounded to appropriate number of significant digits.
@ = Mean includes samples with concentrations below quantitation, which were assigned a value equal to 1/2 the quantitation level.
§ = Mean includes samples with concentrations below quantitation, which were assigned a value of zero.
A = Value reported is the mean of two or more determinations.
DM = Dilution required due to matrix problems.
HT = Recommended laboratory holding time was exceeded before analysis.
K = Observed result was below the quantitation level shown.
ND = Observed result was below the quantitation level.
T = Value reported is less than the quantitation level.
W = Observed result was below the lowest normally reportable value shown.

Tributary: Clinton River
STORET #: 500233
Year: 1998

PARAMETER	Units	7/7/1998	7/13/1998	7/22/1998	7/29/1998	8/6/1998	8/18/1998	8/27/1998	9/3/1998	9/8/1998	9/17/1998	9/22/1998	9/29/1998	10/8/1998	Mean+	Median+
Total Ammonia	mg N/L	0.120	0.059	0.200	0.050 K DL	0.300	0.082 HT	0.100 HT	0.067 HT	0.174 HT	0.085 HT	0.096 HT	0.060	0.080	0.111 @	0.085
Total Nitrate	mg N/L	2.0	2.5	0.88	3.0	0.7	2.2 HT	2.8 HT	1.6 HT	1.7 HT	1.5 HT	1.8 HT	2.2	0.91	1.827	1.780
Total Nitrite	mg N/L	0.053	0.041	0.058	0.053	0.028	0.039	0.042	0.045	0.047	0.053	0.038	0.028	0.030	0.043	0.042
Total Kjeldahl Nitrogen	mg N/L	1.02	1.01	1.32	1.32	2.60	0.96 HT	0.99 HT	1.09 HT	1.03 HT	0.97 HT	0.96 HT	0.90 HT	1.08	1.173	1.020
Total Phosphorus	mg P/L	0.170	0.152	0.200	0.154	0.870	0.171 HT	0.152 HT	0.148 HT	0.167 HT	0.133 HT	0.183 HT	0.220 HT	0.2100	0.225	0.170
Total Ortho Phosphate	mg P/L	0.107	0.082	0.046	0.079	0.095	0.104	0.085	0.073	0.079	0.071	0.116	0.148	0.065	0.088	0.082
Total Sulfate	mg/L	29	38	15	37	10	35	37	30	26	29	25	29	22	27.846	29.000
Total Calcium	mg/L	55.4	65.0	28.3	64.9	18.6	67.6	57.7	53.8	46.6	53.5	52.2	55.8	34.2	50.277	53.800
Total Chloride	mg/L	106	129	61	139	25	124	99	117	97	113	111	107	57	98.846	107.000
Total Magnesium	mg/L	17.3	21.4	6.3	19.7	2.8	20.7	16.4	15.2	12.7	20.5	20.5	22.4	8.8	15.746	17.300
Total Organic Carbon	mg/L	6.9	6.9	9.2 DM	6.9	13 DM	6.6	7.9	7.3	7.1	8.2	7.2	6.4	7.2	7.754	7.200
Total Dissolved Solids	mg/L	499	567	260	593	108	548	496	486	411	503	500	514	284	443.769	499.000
Total Suspended Solids	mg/L	12	13	75	14	470	21	14	15	20	15	16	17	52	58.000	16.000
Hardness (Ca_2CO_3)	mg/L	210	250	97	245	58	255	210	197	169	220	215	230	122	190.615	210.000
Conductivity	umho/cm	768	902	432	928	210	881	787	748	632	775	757	747	437	692.615	757.000
Dissolved Oxygen	mg/L	5.95	7	2.9	11.1	5.50	6.89	6.40	5.5	5.6	5.55	5.66	5.83	5.3	6.091	5.660
pH	pH	NA	7.4	6.9	8.1	7.3	8.2	7.6	7.7	7.5	7.6	7.6	7.6	7.4	7.578	7.600
Temperature of Water	°C	NA	22.4	23.8	25.7	21.6	24.2	23.0	21.0	19.5	21.4	21.5	19.3	16.0	21.617	21.550

+ = Calculated value; not rounded to appropriate number of significant digits.
@ = Mean includes samples with concentrations below quantitation, which were assigned a value equal to 1/2 the quantitation level.
§ = Mean includes samples with concentrations below quantitation, which were assigned a value of zero.
A = Value reported is the mean of two or more determinations.
DM = Dilution required due to matrix problems.
HT = Recommended laboratory holding time was exceeded before analysis.
K = Observed result was below the quantitation level shown.
ND = Observed result was below the quantitation level.
T = Value reported is less than the quantitation level.
W = Observed result was below the lowest normally reportable value shown.

Tributary: Huron River
STORET #: 580364
Year: 1998

PARAMETER	Units	7/1/1998	7/13/1998	7/23/1998	7/29/1998	8/6/1998	8/12/1998	8/20/1998	8/27/1998	9/3/1998	9/8/1998	9/16/1998	9/22/1998	Mean+	Median+
Total Ammonia	mg N/L	0.049	0.013	0.031	0.019	0.141	0.027 HT	0.029 HT	0.038 HT	0.065 HT	0.026 HT	0.078 HT	0.040 HT	0.046	0.035
Total Nitrate	mg N/L	0.330	0.115	0.074	0.029	0.101	0.127 HT	0.106 HT	0.188 HT	0.172 HT	0.106 HT	0.190 HT	0.170 HT	0.142	0.121
Total Nitrite	mg N/L	0.011	0.009	0.008	0.006	0.006	0.012	0.009	0.008	0.007	0.006	0.009	0.007	0.008	0.008
Total Kjeldahl Nitrogen	mg N/L	0.73	0.76	0.90	0.82	0.94	0.56	1.05 HT	0.98 HT	1.01 HT	0.86 HT	0.93 HT	0.84 HT	0.865	0.880
Total Phosphorus	mg P/L	0.048	0.058	0.086	0.061	0.061	0.034	0.074 HT	0.070 HT	0.072 HT	0.070 HT	0.066 HT	0.078 HT	0.065	0.068
Total Ortho Phosphate	mg P/L	0.018	0.011	0.006	0.006	0.011	0.006	0.007	0.005 HT	0.009	0.006	0.015	0.010	0.009	0.008
Total Sulfate	mg/L	37	39	57	38	49	36	44	36	36	35	34	42	40.250	37.500
Total Calcium	mg/L	62.3	55.5	58.3	52.6	53.8	52.2	59.5	52.7	51.8	50.9	49.1	47.2	53.825	52.650
Total Chloride	mg/L	77	78	81	80	83	86	88	89	86	87	84	41	80.000	83.500
Total Magnesium	mg/L	21.2	20.9	22.7	20.8	21.5	19.8	22.1	20.1	20.1	19.4	19.6	19.7	20.658	20.450
Total Organic Carbon	mg/L	7.0	7.0	7.6	6.9	7.2	6.8	6.4	7.3	6.8	6.7	6.4	5.9	6.833	6.850
Total Dissolved Solids	mg/L	436	427	464	436	410	439	448	429	424	421	411	432	431.417	430.500
Total Suspended Solids	mg/L	16	18	26	22	15	18	23	14	21	28	24	26	20.917	21.500
Hardness (Ca_2CO_3)	mg/L	245	225	240	215	225	210	240	215	210	205	205	199	219.500	215.000
Conductivity	umho/cm	718	679	714	688	682	676	703	669	653	647	633	665	677.250	677.500
Dissolved Oxygen	mg/L	5.6	7.9	6.4	6.9	5.2	7.8	7.5	6.4	7.2	6.7	6.1	6.7	6.700	6.700
pH	pH	7.6	7.5	7.99	7.7	7.3	8.31	7.6	7.5	8.0	7.93	7.5	7.7	7.719	7.650
Temperature of Water	°C	25.9	26.4	26.6	26.1	23.6	28.0	24.2	25.7	23.0	22.0	23.0	23.0	24.792	24.950

+ = Calculated value; not rounded to appropriate number of significant digits.
@ = Mean includes samples with concentrations below quantitation, which were assigned a value equal to 1/2 the quantitation level.
§ = Mean includes samples with concentrations below quantitation, which were assigned a value of zero.
A = Value reported is the mean of two or more determinations.
DM = Dilution required due to matrix problems.
HT = Recommended laboratory holding time was exceeded before analysis.
K = Observed result was below the quantitation level shown.
ND = Observed result was below the quantitation level.
T = Value reported is less than the quantitation level.
W = Observed result was below the lowest normally reportable value shown.

Tributary: River Raisin
STORET #: 580046
Year: 1998

PARAMETER	Units	7/6/1998	7/23/1998	7/29/1998	8/6/1998	8/19/1998	8/26/1998	9/3/1998	9/8/1998	9/16/1998	9/21/1998	9/28/1998	10/8/1998	Mean+	Median+
Total Ammonia	mg N/L	0.033	0.182	0.052	0.180	0.053 HT	0.058 HT	0.022 HT	0.091 HT	0.087 HT	0.037 HT	0.086	0.100	0.082	0.072
Total Nitrate	mg N/L	1.62	0.41	1.17	0.69	0.74 HT	0.56 HT	0.63 HT	0.59 HT	0.70 HT	0.43 HT	0.46	0.420	0.702	0.610
Total Nitrite	mg N/L	0.026	0.024	0.020	0.016	0.014	0.015	0.016	0.012	0.015	0.013	0.013	0.012	0.016	0.015
Total Kjeldahl Nitrogen	mg N/L	0.86	0.91	0.62	0.80	1.17 HT	1.02 HT	0.79 HT	0.94 HT	0.76 HT	0.89 HT	0.66 HT	0.71	0.844	0.830
Total Phosphorus	mg P/L	0.085	0.088	0.085	0.072	0.121 HT	0.105 HT	0.075 HT	0.098 HT	0.079 HT	0.074 HT	0.067 HT	0.080	0.086	0.083
Total Ortho Phosphate	mg P/L	0.014	0.026	0.007	0.020	0.029	0.024	0.016	0.015	0.014	0.010	0.023	0.025	0.019	0.018
Total Sulfate	mg/L	50	47	32	37	37	40	23	38	37	38	41	45	38.750	38.000
Total Calcium	mg/L	63.3	NA	41.8	40.4	69.0	67.1	36.3	65.9	59.2	55.1	57.4	62.1	56.145	59.200
Total Chloride	mg/L	35	38	24	28	31	36	17	35	36	37	36	88	36.750	35.500
Total Magnesium	mg/L	17.5	NA	13.7	14.2	17.9	19.2	10.5	18.1	18.2	17.4	18.2	20.2	16.827	17.900
Total Organic Carbon	mg/L	6.2	6.2	5.1	5.0	7.8	8.6	5.0	7.1	5.1	5.7	5.1	4.4	5.942	5.400
Total Dissolved Solids	mg/L	374	358	265	220	357	370	214	363	348	352	354	380	329.583	355.500
Total Suspended Solids	mg/L	21	15	14	10	35	24	16	20	22	9	17	23	18.833	18.500
Hardness (Ca_2CO_3)	mg/L	230	NA	161	159	245	245	134	240	225	210	220	240	209.909	225.000
Conductivity	umho/cm	576	550	507	434	580	583	329	559	395	544	339	585	498.417	547.000
Dissolved Oxygen	mg/L	8.43	NA	6.80	5.50	6.39	6.50	10.2	6.7	6.90	8.09	6.92	7.7	7.285	6.900
pH	pH	8.38	7.88	7.7	7.2	8.3	7.9	8.3	7.7	8.0	8.0	8.0	8.0	7.946	7.985
Temperature of Water	°C	NA	27.2	25.9	24.1	24.8	25.9	24.0	22.0	23.6	24.5	22.0	17.0	23.727	24.100

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A = Value reported is the mean of two or more determinations.
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Tributary: Rifle River
STORET #: 060061
Year: 1998

PARAMETER	Units	6/24/1998	7/8/1998	7/20/1998	8/3/1998	8/10/1998	8/17/1998	8/31/1998	9/9/1998	9/14/1998	9/23/1998	9/28/1998	Mean+	Median+
Total Ammonia	mg N/L	0.012	0.013	0.017	0.008	0.017	0.011 HT	0.005 HT	0.007 HT	0.005 HT	0.004 HT	0.007	0.010	0.008
Total Nitrate	mg N/L	0.177	0.240	0.046	0.034	0.220	0.022 HT	0.068 HT	0.017 HT	0.021 HT	0.020 HT	0.078	0.086	0.046
Total Nitrite	mg N/L	0.005	0.006	0.003	0.002	0.006	0.001	0.003	0.001	0.002	0.002	0.002	0.003	0.002
Total Kjeldahl Nitrogen	mg N/L	0.38	0.41	0.32	0.20	0.51	0.30	0.20 HT	0.30 HT	0.36 HT	0.21 HT	0.38 HT	0.325	0.320
Total Phosphorus	mg P/L	0.039	0.051	0.026	0.022	0.055	0.022 HT	0.021 HT	0.018 HT	0.026 HT	0.015 HT	0.024 HT	0.029	0.024
Total Ortho Phosphate	mg P/L	0.010	0.008	0.012	0.005	0.012	0.001	0.003 HT	0.008	0.005	0.017	0.005	0.008	0.008
Total Sulfate	mg/L	19	16	18	17	21	19	18	19	16	16	20	18.091	18.000
Total Calcium	mg/L	50.7	50.7	49.7	48.4	50.7	51.4	52.3	51.1	50	52.6	54.1	51.064	50.700
Total Chloride	mg/L	11	13	13	13	12	13	13	12	13	13	13	12.636	13.000
Total Magnesium	mg/L	14.9	15.0	15.6	15.7	14.4	16.4	15.9	16.3	16.1	15.6	15.4	15.573	15.600
Total Organic Carbon	mg/L	5.3	4.0	3.5	2.5	5.1	3.2	3.7	3.4	3.2	3.1	3.5	3.682	3.500
Total Dissolved Solids	mg/L	272	274	265	265	268	267	271	261	266	278	274	269.182	268.000
Total Suspended Solids	mg/L	23	44	17	17	44	14	12	12	11	6	18	19.818	17.000
Hardness (Ca_2CO_3)	mg/L	188	188	188	186	186	196	196	195	191	196	199	191.727	191.000
Conductivity	umho/cm	411	429	456	423	412	420	449	401	409	427	422	423.545	422.000
Dissolved Oxygen	mg/L	8.1	8.4	8.2	8.8	8.1	8.6	9.3	10.4	8.5	10.4	9.4	8.927	8.600
pH	pH	8.3	7.7	7.8	8.2	8.14	7.6	7.8	8.2	8.1	8.2	7.9	7.995	8.100
Temperature of Water	°C	23.9	19.1	24.3	23.1	24	22.2	19.5	18.5	20.0	16.0	19.0	20.873	20.000

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Tributary: River Rouge
STORET #: 820070
Year: 1998

PARAMETER	Units	7/1/1998	7/13/1998	7/22/1998	7/29/1998	8/6/1998	8/12/1998	8/20/1998	8/27/1998	9/3/1998	9/8/1998	9/16/1998	9/22/1998	10/8/1998	Mean+	Median+
Total Ammonia	mg N/L	0.191	0.117	0.390	0.071	0.450	0.200 HT	0.136 HT	0.126 HT	0.125 HT	0.147 HT	0.105 HT	0.122 HT	0.129	0.178	0.129
Total Nitrate	mg N/L	0.46	0.46	0.29	0.42	0.94	0.63 HT	0.51 HT	0.62 HT	0.91 HT	0.99 HT	0.65 HT	0.60 HT	0.62	0.623	0.620
Total Nitrite	mg N/L	0.026	0.023	0.047	0.017	0.055	0.032	0.023	0.029	0.023	0.024	0.013	0.016	0.022	0.027	0.023
Total Kjeldahl Nitrogen	mg N/L	0.67	0.46	1.76	0.37	1.99	0.84	0.62 HT	0.62 HT	0.59 HT	0.68 HT	0.49 HT	0.48 HT	1.00	0.813	0.620
Total Phosphorus	mg P/L	0.066	0.062	0.420	0.051	0.420	0.105	0.083 HT	0.084 HT	0.096 HT	0.112 HT	0.060 HT	0.079 HT	0.260	0.146	0.084
Total Ortho Phosphate	mg P/L	0.021	0.027	0.023	0.017	0.035	0.042	0.026	0.018 HT	0.041	0.033	0.021	0.026	0.046	0.029	0.026
Total Sulfate	mg/L	17	21	19	18	23	26	20	20	23	22	16	18	16	19.923	20.000
Total Calcium	mg/L	34.2	33.1	37.3	30.5	33.6	38.6	37.6	38.2	40.5	40.4	34.2	32.6	29.4	35.400	34.200
Total Chloride	mg/L	42	41	51	34	65	55	50	56	60	63	45	40	43	49.615	50.000
Total Magnesium	mg/L	9.4	8.9	9.5	8.7	7.6	8.9	9.4	10	10.5	10	9.2	8.8	6.4	9.023	9.200
Total Organic Carbon	mg/L	4.5	3.8	5.6 DM	2.7	8.0 DM	6.6	3.5	4.2	3.8	4.0	3.0	2.6	5.8 DM	4.469	4.000
Total Dissolved Solids	mg/L	248	243	281	224	240	306	280	294	308	313	257	248	229	267.000	257.000
Total Suspended Solids	mg/L	17	20	68	8	130	23	17	11	17	12	13	18	104	35.231	17.000
Hardness (Ca_2CO_3)	mg/L	124	119	132	112	115	133	133	137	144	142	123	118	100	125.538	124.000
Conductivity	umho/cm	441	374	458	265	449	470	435	452	474	482	395	382	352	417.615	441.000
Dissolved Oxygen	mg/L	4.7	4.8	2.8	6.8	2.4	4.1	4.9	5.1	6.1	5.9	6.3	6.1	5.6	5.046	5.100
pH	pH	7.2	7.0	6.7	7.6	6.9	7.67	6.9	7.2	7.6	7.6	7.5	7.7	7.5	7.317	7.500
Temperature of Water	°C	27.3	26.5	27.8	28.1	23.4	26.0	26.1	26.9	26.0	22.5	25.0	24.0	18.0	25.200	26.000

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Tributary: Saginaw River
STORET #: 090177
Year: 1998

PARAMETER	Units	6/15/1998	7/9/1998	8/6/1998	8/11/1998	8/25/1998	9/15/1998	9/24/1998	9/30/1998	Mean+	Median+
Total Ammonia	mg N/L	0.033	0.50	0.32	0.18 HT	0.22 HT	0.20 HT	0.18 HT	0.28	0.239	0.210
Total Nitrate	mg N/L	0.62	0.56	0.50	0.42 HT	0.49 HT	0.85 HT	0.65 HT	0.74	0.604	0.590
Total Nitrite	mg N/L	0.034	0.066	0.046	0.046	0.04	0.047	0.042	0.044	0.046	0.045
Total Kjeldahl Nitrogen	mg N/L	1.34	1.46	1.52	1.28	1.43	1.51 HT	1.40 HT	1.50 HT	1.430	1.445
Total Phosphorus	mg P/L	0.143	0.123	0.122	0.116	0.125	0.132 HT	0.115 HT	0.139 HT	0.127	0.124
Total Ortho Phosphate	mg P/L	0.008	0.058	0.045	0.021	0.033	0.016	0.027	0.034	0.030	0.030
Total Sulfate	mg/L	35	29	31	30	31	31	37	30	31.750	31.000
Total Calcium	mg/L	62.0	55.2	53.3	49.4	51.9	52.1	53.7	52.9	53.813	53.100
Total Chloride	mg/L	95	96	108	84	97	138	133	121	109.000	102.500
Total Magnesium	mg/L	20.8	20.6	20.2	19.2	19.4	19.9	21.0	21.6	20.338	20.400
Total Organic Carbon	mg/L	12	8.4	7.7	7.2	13	7.4	7.5	6.8	8.750	7.600
Total Dissolved Solids	mg/L	NA	466	486	430	439	526	525	502	482.000	486.000
Total Suspended Solids	mg/L	45	19	22	23	29	28	23	27	27.000	25.000
Hardness (Ca_2CO_3)	mg/L	240	225	215	295	210	210	220	220	229.375	220.000
Conductivity	umho/cm	733	752	701	669	710	837	797	752	743.875	742.500
Dissolved Oxygen	mg/L	12	4.9	4.7	5.62	5.5	6.3	5.9	5.9	6.295	5.745
pH	pH	8.33	8.00	5.20	7.73	8.20	7.84	7.91	7.82	7.629	7.875
Temperature of Water (field)	°C	20.3	25.0	24.2	24.9	24.2	21.7	20.6	19.9	22.600	22.950

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Tributary: Shiawassee River
STORET #: 730023
Year: 1998

PARAMETER	Units	6/18/1998	7/7/1998	7/15/1998	7/21/1998	7/30/1998	8/4/1998	8/11/1998	8/18/1998	9/1/1998	9/10/1998	9/15/1998	9/24/1998	10/7/1998	Mean+	Median+
Total Ammonia	mg N/L	0.019	0.013	0.018	0.017	0.014	0.020 HT	0.018 HT	0.019 HT	0.027 HT	0.022 HT	0.036 HT	0.021 HT	0.019	0.020	0.019
Total Nitrate	mg N/L	0.38	0.00	0.001	0.00	0.005	0.017 HT	0.30 HT	0.07 HT	0.42 HT	0.14 HT	0.24 HT	0.36 HT	0.71	0.203	0.142
Total Nitrite	mg N/L	0.010	0.004	0.002	0.005	0.002	0.006	0.010 HT	0.005	0.011	0.005	0.006	0.005	0.009	0.006	0.005
Total Kjeldahl Nitrogen	mg N/L	0.82	1.04	1.41	1.32	1.09	1.06	0.99	0.91	0.80 HT	0.70 HT	0.66 HT	0.63 HT	0.64	0.928	0.910
Total Phosphorus	mg P/L	0.088	0.121	0.172	0.169	0.121	0.115	0.086	0.089 HT	0.057 HT	0.020 HT	0.045 HT	0.016 HT	0.050	0.088	0.088
Total Ortho Phosphate	mg P/L	0.012	0.017	0.007	0.013	0.007	0.012	0.007 HT	0.009	0.010	0.010	0.010	0.007	0.005	0.010	0.010
Total Sulfate	mg/L	32	26	26	21	27	32	32	29	29	29	29	31	30	28.692	29.000
Total Calcium	mg/L	58.8	45.0	27.0	33.0	46.6	44.4	47.5	44.7	47.4	43.7	40.9	46.5	49.4	44.223	45.000
Total Chloride	mg/L	61	60	56	66	71	73	71	59	66	70	73	73	71	66.923	70.000
Total Magnesium	mg/L	26.9	24.2	23.7	26.1	28.4	27.3	25.8	25.9	26.9	27.6	26.1	27.2	25.9	26.308	26.100
Total Organic Carbon	mg/L	6.3	7.3	8.4	10	7.5	7.1	6.6	6.6	6.5	5.8	5.8	5.8	5.8	6.885	6.600
Total Dissolved Solids	mg/L	416	390	325	359	450	424	427	379	406	402	391	432	418	401.462	406.000
Total Suspended Solids	mg/L	47	57	81	85	73	58	44	50	25	16	24	10	22	45.538	47.000
Hardness (Ca_2CO_3)	mg/L	260	210	165	190	233	225	225	220	230	225	210	230	230	219.462	225.000
Conductivity	umho/cm	616	600	523	606	639	674	657	595	624	619	602	664	643	620.154	619.000
Dissolved Oxygen	mg/L	7.02	NA	7.1	8	NA	6.8	7.7	7.8	NA	8.9	6.8	8.3	7.9	7.632	7.750
pH	pH	7.68	8.44	7.7	7.9	8.30	7.7	8.28	7.4	7.0	8.3	7.8	8.2	8.2	7.915	7.900
Temperature of Water	°C	22.9	23.1	25.1	26.7	23.3	23.5	23.0	23.4	21.0	20.0	22.5	16.0	17.0	22.115	23.000

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Tributary: Thunder Bay River
STORET #: 040123
Year: 1998

PARAMETER	Units	6/24/1998	7/8/1998	7/20/1998	8/3/1998	8/10/1998	8/17/1998	8/31/1998	9/9/1998	9/14/1998	9/23/1998	9/28/1998	Mean+	Median+
Total Ammonia	mg N/L	0.016	0.024	0.010	0.016 HT	0.013 HT	0.018 HT	0.009 HT	0.009 HT	0.013 HT	0.009 HT	0.015	0.014	0.013
Total Nitrate	mg N/L	0.013	0.015	0.008	0.002 HT	0.010 HT K	0.008 HT	0.005 HT	0.004 HT	0.006 HT	0.009 HT	0.009	0.008 @	0.008 K
Total Nitrite	mg N/L	0.002	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total Kjeldahl Nitrogen	mg N/L	0.36	0.48	0.39	0.43	0.34	0.36	0.30 HT	0.29 HT	0.45 HT	0.34 HT	0.35 HT	0.372	0.360
Total Phosphorus	mg P/L	0.024	0.021	0.016	0.015	0.017	0.016 HT	0.015 HT	0.015 HT	0.013 HT	0.017 HT	0.023 HT	0.017	0.016
Total Ortho Phosphate	mg P/L	0.005	0.003	0.003	0.001	0.003	0.001	0.001 HT	0.004	0.003	0.003	0.001	0.003	0.003
Total Sulfate	mg/L	3	2 K	2	2	2	2	4	3	3	3	7	2.909 @	3.000 K
Total Calcium	mg/L	41.1	43.0	39.2	35.5	37.6	37.4	37.5	39.5	39.4	40.1	41.2	39.227	39.400
Total Chloride	mg/L	5	6	4	5	5	6	4	5	5	5	6	5.091	5.000
Total Magnesium	mg/L	13.8	13.8	14.1	14.2	14.3	14.8	14.9	15.0	15.0	15.1	15.3	14.573	14.800
Total Organic Carbon	mg/L	6.0	8.7	6.7	6.3	5.0	5.0	5.2	5.4	5.4	6.0	5.1	5.891	5.400
Total Dissolved Solids	mg/L	226	231	212	205	214	209	205	213	216	226	229	216.909	214.000
Total Suspended Solids	mg/L	4	4 K	5	9	4 K	4 K	4 K	4 K	4 K	4 K	4 K	3.500 @	4.000 K
Hardness (Ca_2CO_3)	mg/L	160	164	156	147	153	154	155	160	160	162	166	157.909	160.000
Conductivity	umho/cm	341	360	360	331	329	327	316	327	332	348	352	338.455	332.000
Dissolved Oxygen	mg/L	8	7.2	6.5	7.2	7.6	7.6	8.1	8.9	7.9	8.4	8.5	7.809	7.900
pH	pH	8.2	7.6	7.6	7.7	8.2	7.4	7.0	8.1	8.0	8.1	7.8	7.795	7.800
Temperature of Water	°C	23.9	22.9	25.6	24.5	25.0	23.2	22.0	19.0	20.0	19.0	18.0	22.100	22.900

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Tributary: Tittabawassee River
STORET #: 730025
Year: 1998

PARAMETER	Units	6/18/1998	7/7/1998	7/15/1998	7/21/1998	7/30/1998	8/4/1998	8/11/1998	8/18/1998	9/1/1998	9/10/1998	9/15/1998	9/24/1998	10/7/1998	Mean+	Median+
Total Ammonia	mg N/L	0.027	0.020	0.016	0.014	0.012	0.013 HT	0.014 HT	0.021 HT	0.014 HT	0.026 HT	0.072 HT	0.040 HT	0.090	0.029	0.020
Total Nitrate	mg N/L	1.44	0.25	0.36	0.35	0.33	0.26 HT	0.44 HT	0.43 HT	0.44 HT	0.61 HT	0.91 HT	0.52 HT	0.40	0.518	0.430
Total Nitrite	mg N/L	0.062	0.007	0.015	0.008	0.010	0.005	0.011	0.021	0.037	0.023	0.020	0.040	0.020	0.021	0.020
Total Kjeldahl Nitrogen	mg N/L	0.98	1.39	1.11	0.86	1.03	1.11	0.81	1.14	1.03 HT	0.93 HT	0.90 HT	1.16 HT	0.93	1.029	1.030
Total Phosphorus	mg P/L	0.076	0.115	0.082	0.066	0.089	0.078	0.063	0.079 HT	0.071 HT	0.067 HT	0.086 HT	0.098 HT	0.133	0.085	0.079
Total Ortho Phosphate	mg P/L	0.009	0.010	0.005	0.006	0.011	0.006	0.011	0.005	0.004	0.020	0.040	0.006	0.022	0.012	0.009
Total Sulfate	mg/L	28	22	27	21	35	25	26	25	29	30	24	28	22	26.308	26.000
Total Calcium	mg/L	62.0	47.6	58.1	49.5	58.3	54.6	52.5	63.4	66.2	62.0	50.8	62.8	43.3	56.238	58.100
Total Chloride	mg/L	86	121	154	39	154	197	96	214	217	191	107	203	60	141.462	154.000
Total Magnesium	mg/L	18.8	18.3	19.4	17.7	20.5	18.7	17.6	20.8	20.3	20.9	19.3	19.1	14.4	18.908	19.100
Total Organic Carbon	mg/L	7.5	8.6	8.4	7.4	7.3	7.8	6.6	7.2	7.1	6.4	6.0	7.2	5.6	7.162	7.200
Total Dissolved Solids	mg/L	439	477	565	326	567	627	443	672	722	634	464	662	330	532.923	565.000
Total Suspended Solids	mg/L	14	38	21	20	20	24	17	26	10	13	28	25	74	25.385	21.000
Hardness (Ca_2CO_3)	mg/L	230	194	225	197	230	215	205	245	250	240	205	235	168	218.385	225.000
Conductivity	umho/cm	646	734	877	552	873	990	681	1053	1110	975	714	1019	507	825.462	873.000
Dissolved Oxygen	mg/L	7.58	15.1	10.7	8.3	NA	10.9	7.1	9.7	NA	8.0	6.7	9.2	7.4	9.153	8.300
pH	pH	7.7	8.74	8.1	7.8	7.8	8.3	8.36	7.8	7.0	8.2	7.8	8.2	7.8	7.964	7.800
Temperature of Water	°C	23.4	23.1	27.9	26.6	24.6	24.2	25.0	24.4	23.0	19.0	23.0	18.0	18.0	23.092	23.400

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Tributary: Escanaba River
STORET #: 210102
Year: 1999

PARAMETER	Units	4/6/1999	4/12/1999	4/20/1999	4/27/1999	5/9/1999	5/21/1999	6/7/1999	7/13/1999	7/20/1999	8/5/1999	8/16/1999	9/16/1999	9/29/1999	Mean+	Median+
Total Ammonia	mg N/L	0.04	0.041	0.048	0.069	0.053	0.073	0.079	0.066	0.061	0.061	0.044	0.055	0.065	0.058	0.061
Total Nitrate	mg N/L	0.28	0.2	0.139	0.122	0.11	0.096 HT	0.11	0.095	0.108	0.113	0.101	0.119	0.084	0.129	0.110
Total Nitrite	mg N/L	0.005	0.006	0.007	0.011	0.008	0.012 HT	0.012	0.03	0.016	0.017	0.01	0.012	0.012	0.012	0.012
Total Kjeldahl Nitrogen	mg N/L	0.75	0.59	0.57	0.7	0.62	0.81	0.75	0.89	0.87	0.91	1.06	0.58	0.65	0.750	0.750
Total Phosphorus	mg P/L	0.038	0.038	0.04	0.038	0.044	0.047	0.077	0.059	0.061	0.06	0.038	0.059	0.058	0.051	0.047
Total Ortho Phosphate	mg P/L	0.008	0.008	0.011	0.011	0.016	0.012 HT	0.039	0.026	0.025	0.03	0.009	0.032	0.028	0.020	0.016
Total Sulfate	mg/L	15	20	24	27	23	14	19	19	18	20	16	53	57	25.000	20.000
Total Calcium	mg/L	14.8	15.7	16.8	22.5	24.3	17.7	25.4	22.5	27.7	24.8	21.9	30	30.5	22.662	22.500
Total Chloride	mg/L	7	8	15	16	14	11	19	15	20	18	8	24	26	15.462	15.000
Total Magnesium	mg/L	6.1	6.2	6.7	8.6	10.4	6.4	9.2	8.5	10	9.4	7.9	10.6	10.9	8.531	8.600
Total Organic Carbon	mg/L	17	17	18	17	14	28	18	24	25	24	28	21	15	20.462	18.000
Total Dissolved Solids	mg/L	116	119	160	193	199	135	221	175	220	206	158	321	315	195.231	193.000
Total Suspended Solids	mg/L	6	4 K	4 K	4 K	4 K	6	6	8 HT	6 HT	4 K	4 K	4 K	8	4.154 @	4.000 K
Hardness (Ca_2CO_3)	mg/L	62	65	69	92	104	71	101	91	110	101	87	119	121	91.769	92.000
Conductivity	umho/cm	156	170	229	288	300	207	328	280	345	318	236	481	493	294.692	288.000
Dissolved Oxygen	mg/L	13.2	12.3	10.9	9.75	10.02	NA	6.87	7.13	6.81	7.3	8.49	7.8	8.38	9.079	8.435
pH	pH	7.25	7.35	7.77	7.77	8	7.57	7.71	7.5	7.83	7.8	7.85	8.11	7.93	7.726	7.770
Temperature of Water	°C	2.5	5.5	9.1	11.1	12.4	NA	20.8	21	24.2	21	19	15.6	14.5	14.725	15.050
MTBE	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BTEX	ug/L	ND	ND	ND	ND	ND	ND	ND					ND	ND	ND	ND
Base/Neutral Organics																
Bis(2-ethylhexyl)phthalate	ug/L	ND	ND	ND	9.4	ND	ND	ND	ND	ND	ND	2.6	ND	ND	0.923 §	ND
Other B/N Organics	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Tributary: Grand River
STORET #: 700123
Year: 1999

PARAMETER	Units	3/30/1999	4/13/1999	4/15/1999	4/24/1999	4/27/1999	5/3/1999	5/6/1999	6/3/1999	6/28/1999	7/1/1999	8/18/1999	9/2/1999	9/30/1999	Mean+	Median+
Total Ammonia	mg N/L	0.075	0.15	0.12	0.11	0.092	0.046	0.082	0.016	0.022	0.028	0.012	0.016	0.108	0.061	0.061
Total Nitrate	mg N/L	2.5	2.2	2.7	1.54	3.4	3.3	2.5	1.27	1.06	0.69	0.42	1.07	0.82	1.773	1.405
Total Nitrite	mg N/L	0.023	0.029	0.03	0.03	0.038	0.036	0.033	0.031	0.03	0.026	0.02	0.031	0.037	0.030	0.031
Total Kjeldahl Nitrogen	mg N/L	1.11	1.14	1.35	1.46	1.23	1.12	1.38	1.25	1.08	1.5	1.4	1.35	0.96	1.266	1.300
Total Phosphorus	mg P/L	0.08	0.114	0.115	0.26	0.186	0.109	0.122	0.134	0.105	0.21	0.127	0.118	0.146	0.143	0.125
Total Ortho Phosphate	mg P/L	0.008 HT	0.018	0.016	0.079	0.056	0.016	0.023	0.01	0.001 W	0.008	0.009	0.012	0.016	0.021	0.014
Total Sulfate	mg/L	59	56	54	33	31	39	53	34	41	39	44	51	47	43.750	42.500
Total Calcium	mg/L	76.0	67.3	74.9	52.4	52.2	60	70.4	66.5	57.5	58.5	54	58.1	54.3	61.233	58.300
Total Chloride	mg/L	51	46	48	28	28	35	39	46	46	40	60	75	54.3	45.858	46.000
Total Magnesium	mg/L	21.8	21.7	22.2	15.5	15.2	18.1	20	21.3	20	23	22.1	23.2	19.4	20.150	20.650
Total Organic Carbon	mg/L	7.4	8.1	8.3	11	9.6	9.8	10	7.8	6.9	6.5	6.8	6.3	5.9	8.025	7.600
Total Dissolved Solids	mg/L	437	414	418	294	292	358	388	399	365	371	398	461	369	379.167	379.500
Total Suspended Solids	mg/L	27	32 A	42	123	60	30	37	39	31	78	37	31	31	47.167	37.000
Hardness (Ca_2CO_3)	mg/L	280	260	280	195	193	225	260	166	225	240	225	240	215	228.667	225.000
Conductivity	umho/cm	622	638	647	446	446	559	597	618	571	554	586	680	559	573.750	578.500
Dissolved Oxygen	mg/L	13	9.66	10.4	9.8	8.5	8.85	8.17	9.19	7.64	7.77	10.34	11.5	7.45	9.418	9.020
pH	pH	8.07	8.00	8.11	7.86	7.65	7.83	7.9	8.22	7.77	8.07	8.04	7.82	7.55	7.908	7.880
Temperature of Water	°C	8.8	10.1	11.8	9.37	11.4	16.4	18.1	20.3	25.1	23.1	23.3	22.6	16.2	17.206	17.250
MTBE	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BTEX	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Base/Neutral Organics																
Diethyl Phthalate	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1	1.6	ND	0.285 §	ND
Other B/N Organics	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Tributary: Kalamazoo River
STORET #: 030077
Year: 1999

PARAMETER	Units	3/31/1999	4/12/1999	4/15/1999	4/24/1999	4/26/1999	4/29/1999	5/4/1999	6/3/1999	6/29/1999	7/22/1999	8/26/1999	9/1/1999	9/29/1999	Mean+	Median+
Total Ammonia	mg N/L	0.01	0.052	0.021	0.07	0.047	0.011	0.015	0.061	0.071	0.036	0.014	0.121	0.03	0.042	0.033
Total Nitrate	mg N/L	1.03	1.48	1.22	1.09	1.56	1.06	0.95	0.65	0.52	0.38	0.55 HT	0.54	0.44	0.833	0.800
Total Nitrite	mg N/L	0.01	0.027	0.019	0.024	0.032	0.016	0.016	0.018	0.018	0.014	0.014 HT	0.015	0.013	0.017	0.016
Total Kjeldahl Nitrogen	mg N/L	0.75	0.96	0.98	0.95	0.95	0.86	1.1	1.11	0.84	1.2	1.03	0.99	1.01	0.981	0.985
Total Phosphorus	mg P/L	0.059	0.101	0.071	0.127	0.114	0.065	0.094	0.096	0.066	0.117	0.098	0.089	0.081	0.090	0.092
Total Ortho Phosphate	mg P/L	0.005	0.02	0.009	0.055	0.054	0.012	0.007	0.003	0.007	0.016	0.011 HT	0.008	0.006	0.016	0.009
Total Sulfate	mg/L	40	38	41	34	29	28	30	30	38	37	37	36	47	35.583	36.500
Total Calcium	mg/L	66.2	59.4	67.6	62.4	51.3	54.7	60.3	59.3	59.1	52.8	55.4	51.2	54.6	57.908	57.250
Total Chloride	mg/L	38	35	34	31	23	24	26	39	47	43	52	53	59	39.083	38.500
Total Magnesium	mg/L	20.7	19.1	21	19.2	15.2	17.1	18.2	22.7	23	21	22.8	23.4	22.7	20.583	21.000
Total Organic Carbon	mg/L	5.9	7.5	7.1	7.2	8.7	8.1	8.9	6.3	5	6.2	5	4.8	5.2	6.533	6.250
Total Dissolved Solids	mg/L	396	365	368	349	281	310	337	382	394	360	398	401	410	365.500	375.000
Total Suspended Solids	mg/L	20	20 A	19	27	22	18	27	35	25	43 HT	38	16	29	26.583	26.000
Hardness (Ca_2CO_3)	mg/L	250	225	255	235	191	205	225	242	240	220	230	225	230	229.000	230.000
Conductivity	umho/cm	578	550	575	532	454	476	516	590	580	559	603	590	597	554.167	576.500
Dissolved Oxygen	mg/L	10	9.54	9.46	9.05	8.51	8.4	7.82	8.12	6.59	6.99	6.85	8.1	8.44	8.194	8.260
pH	pH	8.22	8.00	8.18	7.83	7.75	7.54	8.01	7.83	7.82	7.82	7.55	7.98	7.88	7.868	7.830
Temperature of Water	°C	9.3	9.6	11	9.01	11.4	12.6	16.9	18.9	23.7	25.7	21.7	21.3	17.2	16.559	17.050
MTBE	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BTEX	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Base/Neutral Organics																
Diethyl Phthalate	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.3	1.7	ND	0.308 §	ND
Other B/N Organics	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Tributary: Manistique River
STORET #: 770073
Year: 1999

PARAMETER	Units	4/8/1999	4/15/1999	4/20/1999	4/27/1999	5/9/1999	5/24/1999	6/17/1999	7/15/1999	7/20/1999	8/5/1999	8/18/1999	9/14/1999	9/27/1999	Mean+	Median+
Total Ammonia	mg N/L	0.025	0.015	0.02	0.021	0.027	0.027	0.025	0.013	0.012	0.019	0.011	0.01	0.014	0.018	0.019
Total Nitrate	mg N/L	0.167	0.058	0.048	0.039	0.068	0.072	0.073	0.05	0.065	0.046	0.059	0.05	0.05	0.065	0.058
Total Nitrite	mg N/L	0.005	0.004	0.003	0.004	0.003	0.003	0.002	0.003	0.003	0.003	0.003	0.002	0.01 K	0.004	0.003
Total Kjeldahl Nitrogen	mg N/L	0.65	0.48	0.47	0.5	0.54	0.45	0.47	0.5	0.44	0.5	0.45	0.28	0.29	0.463	0.470
Total Phosphorus	mg P/L	0.034	0.024	0.021	0.019	0.023	0.021	0.021	0.018	0.023	0.02	0.018	0.012	0.014	0.021	0.021
Total Ortho Phosphate	mg P/L	0.006	0.004	0.001 T	0.001 T	0.003	0.002 T	0.003	0.004	0.004	0.003	0.001 T	0.003	0.01 K	0.003	0.003
Total Sulfate	mg/L	7	12	14	8	20	14	14	20	16	18	18	17	19	15.154	16.000
Total Calcium	mg/L	9	12.6	15.2	16.9	23.8	23.5		27.1	28.6	28.1	27.3	27.2	31.4	22.558	25.450
Total Chloride	mg/L	2	2	2	2	2	2	2	3	2	2	2	2	2	2.077	2.000
Total Magnesium	mg/L	2.3	3.4	3.6	3.9	5.7	5.8		5.9	6.3	6.8	6.1	6.5	6.6	5.242	5.850
Total Organic Carbon	mg/L	13	13	12	12	8.8	8.8	8.9	9.9	9.5	9.8	8.5	6.3	5.8	9.715	9.500
Total Dissolved Solids	mg/L	47	65	78	78	113	115	125	125	131	136	128	135	138	108.769	125.000
Total Suspended Solids	mg/L	41	39	8	4 K	6	4 K	4 K	8 HT	6 HT	4 K	6	4 K	11	10.385 @	6.000 K
Hardness (Ca_2CO_3)	mg/L	32	45	53	58	83	83		92	97	98	93	95	106	77.917	87.500
Conductivity	umho/cm	66	80	106	113	174	158	192	191	202	210	199	198	210	161.462	191.000
Dissolved Oxygen	mg/L	10.4	11.9	10.1	9.6	9.7	9.6	8.6	7.38	7.3	7.52	8.15	8.85	9.72	9.140	9.600
pH	pH	6.69	6.79	7.06	7.06	7.5	7.6	7.69	7.5	7.69	7.5	7.78	7.88	7.51	7.404	7.500
Temperature of Water	°C	4.6	8.8	8	11.1	12	12.9	15.5	21.7	22.8	20.5	19	15.8	15	14.438	15.000
MTBE	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BTEX	ug/L	ND	ND	ND	ND	ND	ND	ND				ND	ND		ND	ND
Base/Neutral Organics	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Tributary: Muskegon River
STORET #: 610273
Year: 1999

PARAMETER	Units	4/6/1999	4/15/1999	4/23/1999	5/14/1999	5/19/1999	6/2/1999	6/14/1999	6/15/1999	7/14/1999	7/20/1999	9/14/1999	9/30/1999	Mean+	Median+
Total Ammonia	mg N/L	0.011	0.015	0.024	0.016	0.024	0.019	0.034	0.03	0.008 T	0.008 T	0.012	0.027	0.019	0.018
Total Nitrate	mg N/L	0.39	0.35	0.25	0.31 HT	0.31	0.31	0.34	0.25	0.24	0.161	0.107	0.178	0.266	0.280
Total Nitrite	mg N/L	0.003	0.004	0.006	0.006 HT	0.006	0.007	0.008	0.007	0.005	0.005	0.006	0.015	0.007	0.006
Total Kjeldahl Nitrogen	mg N/L	0.38	0.48	0.56	0.42	0.51	0.54	0.58	0.6	0.44	0.46	0.44	0.49	0.492	0.485
Total Phosphorus	mg P/L	0.017	0.027	0.048	0.033	0.031	0.122	0.065	0.043	0.03	0.026	0.021	0.037	0.042	0.032
Total Ortho Phosphate	mg P/L	0.003	0.002 T	0.009	0.001 T HT	0.002 T	0.003	0.009	0.002 T	0.002 T	0.002 T	0.005	0.01	0.004	0.003
Total Sulfate	mg/L	13	18	15	15	20	15	9	9	19	13	13	13	14.333	14.000
Total Calcium	mg/L	40.9	41.5	40.6	43.3	41.4	41.5	40.5	41.9	44.2	42.4	42.4	45.1	42.142	41.700
Total Chloride	mg/L	18	17	15	17	15	16	15	15	17	15	18	18	16.333	16.500
Total Magnesium	mg/L	13.6	13.4	12.3	14	13.3	13	13.2	13.7	14.8	13.5	14.7	14.7	13.683	13.550
Total Organic Carbon	mg/L	6.3	5.8	5.8	5.8	7	6.3	6	6.3	6.7	6.2	8.3	5.7	6.350	6.250
Total Dissolved Solids	mg/L	240	232	210	239	229	233	230	234	242	232	247	251	234.917	233.500
Total Suspended Solids	mg/L	14	17	30	6	11	12	40	16	5	14	6	14	15.417	14.000
Hardness (Ca_2CO_3)	mg/L	158	159	152	166	158	157	156	161	171	162	166	173	161.583	160.000
Conductivity	umho/cm	369	351	331	350	353	361	366	369	385	340	380	380	361.250	363.500
Dissolved Oxygen	mg/L	10.8	11.7	11.3	9.29	NA	8.4	8.7	9	7.8	8.69	6.42	10.8	9.355	9.000
pH	pH	7.4	7.6	7.4	8.23	8	7.12	7.4	7.5	7.7	8.23	7.89	8.08	7.713	7.650
Temperature of Water	°C	8.5	8.9	8.3	14.4	NA	17.9	19.7	19.3	22.15	23.34	18.86	15.7	16.095	17.900
MTBE	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BTEX	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Base/Neutral Organics	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Tributary: Pere Marquette River
STORET #: 530027
Year: 1999

PARAMETER	Units	4/7/1999	4/15/1999	5/14/1999	5/25/1999	6/14/1999	7/9/1999	7/20/1999	9/2/1999	9/9/1999	9/16/1999	9/23/1999	9/30/1999	Mean+	Median+
Total Ammonia	mg N/L	0.024	0.017	0.026	0.02	0.043	0.046	0.018	0.015	0.016	0.014	0.016	0.025	0.023	0.019
Total Nitrate	mg N/L	0.122	0.079	0.062 HT	0.106	0.32	0.125	0.153	0.059	0.065	0.064	0.074	0.166	0.116	0.093
Total Nitrite	mg N/L	0.004	0.003	0.003 HT	0.002	0.008	0.005 HT	0.005	0.002	0.002	0.002	0.002	0.005	0.004	0.003
Total Kjeldahl Nitrogen	mg N/L	0.61	0.57	0.36	0.43	0.51	0.56	0.5	0.26	0.26	0.29	0.17	0.34	0.405	0.395
Total Phosphorus	mg P/L	0.052	0.033	0.051	0.046	0.068	0.069	0.046	0.026	0.023	0.025	0.019	0.033	0.041	0.040
Total Ortho Phosphate	mg P/L	0.01	0.007	0.006 HT	0.009	0.02	0.018 HT	0.013	0.008	0.006	0.007	0.007	0.009	0.010	0.009
Total Sulfate	mg/L	11	15	13	12	8	14	14	17	16	17	14	18	14.083	14.000
Total Calcium	mg/L	31.7	35.3	40.6	39.6	39.7	36.8	38.2	44.2	41.7	44.1	42.9	40.6	39.617	40.150
Total Chloride	mg/L	8	8	12	11	11	13	9	15	15	14	14	12	11.833	12.000
Total Magnesium	mg/L	11.5	12.2	14.8	13.7	13.8	13.5	13.1	15	15.2	14.7	14.9	14.4	13.900	14.100
Total Organic Carbon	mg/L	9.7	8.9	3.8	5.3	5.4	6.7	5.4	2.7	4.1	4.6	2.8	3.5	5.242	4.950
Total Dissolved Solids	mg/L	183	187	232	224	225	218	209	248	252	244	245	226	224.417	225.500
Total Suspended Solids	mg/L	24	12	7	75	16	19 HT	14	12	8 HT	9	4 K	6	17.000 @	12.000 K
Hardness (Ca_2CO_3)	mg/L	127	138	162	155	156	148	149	172	167	171	169	161	156.250	158.500
Conductivity	umho/cm	282	285	340	320	360	345	305	370	380	370	330	340	335.583	340.000
Dissolved Oxygen	mg/L	9.4	10.06	9.42	9.7	8.8	9.4	8.16	10.3	10.12	9.6	11.1	11.8	9.822	9.650
pH	pH	7.4	7.22	8.04	8	7.4	7	7.96	8.09	8.06	8.18	8	7.97	7.777	7.985
Temperature of Water	°C	8	9.29	13	11.6	19	19.7	20.03	16.6	15.6	12.25	12.3	11.5	14.073	12.650
MTBE	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BTEX	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Base/Neutral Organics															
Di-n-butyl Phthalate	ug/L	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	ND	ND	0.108 §	ND
Other B/N Organics	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Tributary: St. Joseph River
STORET #: 110628
Year: 1999

PARAMETER	Units	4/6/1999	4/13/1999	4/19/1999	4/27/1999	5/3/1999	5/19/1999	6/3/1999	6/29/1999	7/2/1999	7/30/1999	9/14/1999	9/28/1999	Mean+	Median+
Total Ammonia	mg N/L	0.01	0.086	0.062	0.056	0.009 T	0.015	0.014	0.012	0.014	0.026	0.004 T	0.004 T	0.026	0.014
Total Nitrate	mg N/L	1.63	2.4	2.2	2	1.64	1.42	1.52	1.39	1.64	0.91 HT	1.21	1.37	1.611	1.575
Total Nitrite	mg N/L	0.016	0.026	0.017	0.02	0.008	0.011	0.01	0.012	0.015	0.011 HT	0.013	0.014	0.014	0.014
Total Kjeldahl Nitrogen	mg N/L	0.76	0.87	0.84	1.06	0.82	0.87	0.77	0.59	0.75	0.76	0.67	0.43	0.766	0.765
Total Phosphorus	mg P/L	0.114	0.109	0.095	0.167	0.085	0.084	0.088	0.064	0.095	0.067	0.07	0.047	0.090	0.087
Total Ortho Phosphate	mg P/L	0.006	0.028	0.022	0.039	0.007	0.004	0.006	0.013	0.009	0.002 T HT	0.008	0.011	0.013	0.009
Total Sulfate	mg/L	30	35	34	31	32	37	34	33	35	36	38	36	34.250	34.500
Total Calcium	mg/L	68.5	63.2	66.3	61.6	66.3	70.6	74.5	68.1	60.9	60.8	62.8	64.9	65.708	65.600
Total Chloride	mg/L	28	23	23	18	21	26	24	28	26	31	35	38	26.750	26.000
Total Magnesium	mg/L	21.5	19.2	19.5	17.5	20.1	21.8	21.4	21.2	22.5	22.9	23.3	23.3	21.183	21.450
Total Organic Carbon	mg/L	4.8	6.1	6.6	7.5	7.1	6.7	5.4	4.2	4.7	4.6	4.2	4	5.492	5.100
Total Dissolved Solids	mg/L	370	344	340	306	341	375	370	368	358	356	384	391	358.583	363.000
Total Suspended Solids	mg/L	24	19	22	41	29	19	23	31 HT	40 HT	14	12	8	23.500	22.500
Hardness (Ca_2CO_3)	mg/L	260	235	245	225	285	265	275	255	245	245	255	260	254.167	255.000
Conductivity	umho/cm	570	515	516	471	517	577	571	556	547	542	590	600	547.667	551.500
Dissolved Oxygen	mg/L	9.2	10.9	11.2	9.4	10.1	NA	7.7	7.5	7.4	6.6	7.62	9.25	8.806	9.200
pH	pH	6.8	7.6	7	7.5	7.1	8.4	7.2	8.2	7.3	7.6	8	7.92	7.552	7.550
Temperature of Water	°C	16	11	10	13	16.24	NA	20.5	24.3	23.6	28.3	19.84	19.31	18.372	19.310
MTBE	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BTEX	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Base/Neutral Organics															
Bis(2-ethylhexyl)phthalate	ug/L	ND	ND	ND	ND	ND	ND	7.2	ND	ND	ND	23	ND	2.517 §	ND
Other B/N Organics	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Tributary: Tahquamenon River
STORET #: 170141
Year: 1999

PARAMETER	Units	4/7/1999	4/13/1999	4/21/1999	4/28/1999	5/19/1999	6/8/1999	7/13/1999	7/19/1999	8/4/1999	8/9/1999	8/17/1999	9/15/1999	9/28/1999	Mean+	Median+
Total Ammonia	mg N/L	0.027	0.013	0.015	0.015	0.026	0.044	0.01	0.031	0.016	0.016	0.021	0.015	0.011	0.020	0.016
Total Nitrate	mg N/L	0.094	0.04	0.017	0.039	0.097	0.105	0.073	0.087	0.084	0.073	0.07	0.106	0.077	0.074	0.077
Total Nitrite	mg N/L	0.005	0.004	0.004	0.005	0.004	0.007	0.004	0.005	0.003	0.003	0.003	0.002	0.003	0.004	0.004
Total Kjeldahl Nitrogen	mg N/L	0.72	0.66	0.66	0.64	0.46	0.95	0.54	0.79	0.62	0.54	0.46	0.39	0.4	0.602	0.620
Total Phosphorus	mg P/L	0.042	0.03	0.022	0.023	0.021	0.037	0.025	0.027	0.019	0.021	0.02	0.014	0.014	0.024	0.022
Total Ortho Phosphate	mg P/L	0.007	0.004	0.004	0.004	0.002 T	0.006 HT	0.007	0.005	0.003	0.004	0.002 T	0.002 T	0.003	0.004	0.004
Total Sulfate	mg/L	5	10	7	9	10	10	14	9	6	7	6	7	11	8.538	9.000
Total Calcium	mg/L	6.4	8.3	10.7	14.5	20.3	17.3	23.7	20.8	23.1	23.6	21.7	22.9	24.7	18.308	20.800
Total Chloride	mg/L	2	2	2	2	2	2	3	3	2	2	2	2	2	2.154	2.000
Total Magnesium	mg/L	1.9	2.3	2.8	3.6	5.8	4.3	6	5.3	6.4	6.4	6.1	6.5	7	4.954	5.800
Total Organic Carbon	mg/L	18	17	19	18	10	23	12	22	14	11	11	9.5	6.9	14.723	14.000
Total Dissolved Solids	mg/L	34	41	54	64	103	79	120	98	114	140	117	116	122	92.462	103.000
Total Suspended Solids	mg/L	24	8	4 K	4 K	4 K	6	5 HT	4 K HT	4 K	4 K	12	4 K	4 K	5.462 @	4.000 K
Hardness (Ca_2CO_3)	mg/L	24	30	34	51	75	61	84	74	84	85	79	84	91	65.846	75.000
Conductivity	umho/cm	44	54	70	91	144	124	190	150	190	179	176	170	186	136.000	150.000
Dissolved Oxygen	mg/L	14.5	13.8	10.7	9.5	8.8	7.8	7.95	6.8	NA	7.3	8	7.82	8.6	9.298	8.300
pH	pH	6.51	6.64	6.9	7.12	7.8	7.18	7.6	7.17	7.94	7.46	7.54	7.74	7.8	7.338	7.460
Temperature of Water	°C	3.4	7.3	8.9	11.5	16.7	19.5	21.9	23	21	19.6	19	16.5	14.4	15.592	16.700
MTBE	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BTEX	ug/L	ND	ND	ND	ND	ND	ND							ND	ND	ND
Base/Neutral Organics	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Date	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	STORET	River
	[ng/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]		
8-Jul-98	3.007	0.001	0.828	0.219	0.020	2.409	0.330	350061	AuSable River
20-Jul-98	0.347	0.009	0.884	0.291	0.026	3.592	1.778		
3-Aug-98	1.097	0.003	0.229	0.267	0.028	1.040	0.346		
10-Aug-98	4.579	0.000	0.440	0.222	0.039	1.068	0.064		
17-Aug-98	0.317	0.000	0.446	0.224	0.021	1.113	1.515		
24-Aug-98	0.859	0.000	0.399	0.215	0.027	1.061	0.059		
31-Aug-98	0.167	0.000	0.428	0.223	0.025	1.137	2.088		
9-Sep-98	0.192	0.002	0.517	0.234	0.033	1.131	0.116		
14-Sep-98	0.262	0.003	0.531	0.241	0.036	1.127	0.121		
23-Sep-98	0.238	0.000	0.357	0.201	0.025	1.058	0.095		
28-Sep-98	0.429	0.000	0.400	0.190	0.033	1.073	5.813		
Mean	1.045	0.002	0.496	0.230	0.028	1.437	1.121		
Median	0.347	0.000	0.440	0.223	0.027	1.113	0.330		
7-Jul-98	4.510	0.055	4.359	2.409	1.474	8.536	6.816	500233	Clinton River
13-Jul-98	2.947	0.061	5.275	2.409	1.311	10.551	8.406		
22-Jul-98	12.977	0.136	4.762	6.625	6.200	5.570	26.443		
29-Jul-98	2.433	0.045	2.701	2.447	1.025	8.146	6.378		
6-Aug-98	106.875	1.207	32.739	40.575	50.766	25.867	222.879		
18-Aug-98	4.168	0.070	3.535	3.746	2.202	7.958	11.871		
27-Aug-98	2.601	0.037	2.772	3.130	1.139	7.410	8.383		
3-Sep-98	3.067	0.069	2.935	3.059	1.744	6.461	10.068		
8-Sep-98	5.799	0.065	2.823	3.518	2.306	5.887	11.692		
17-Sep-98	3.387	0.064	3.113	2.912	1.868	5.759	9.839		
22-Sep-98	4.792	0.081	2.960	3.445	2.574	6.763	12.366		
29-Sep-98	3.829	0.074	2.973	2.999	2.136	7.295	10.420		
8-Oct-98	9.401	0.100	3.576	5.809	4.198	5.362	19.262		
Mean	12.830	0.159	5.733	6.391	6.072	8.582	28.063		
Median	4.168	0.069	3.113	3.130	2.136	7.295	10.420		
1-Jul-98	1.804	0.045	2.964	1.678	1.861	6.185	5.639	580364	Huron River
13-Jul-98	3.254	0.062	3.509	2.021	2.317	6.888	7.553		
23-Jul-98	2.632	0.051	1.735	1.769	2.770	4.040	7.451		
29-Jul-98	2.238	0.042	1.697	1.358	2.530	3.735	6.242		
6-Aug-98	2.036	0.040	1.781	1.560	2.514	3.965	6.484		
12-Aug-98	2.277	0.041	1.862	1.590	3.031	3.752	7.623		
20-Aug-98	3.029	0.042	1.894	1.781	3.615	4.072	9.673		
27-Aug-98	2.007	0.040	2.051	1.714	2.818	3.755	7.636		
3-Sep-98	2.748	0.050	1.441	2.043	3.661	3.769	11.060		
8-Sep-98	3.286	0.053	1.638	1.860	3.636	3.821	10.083		
16-Sep-98	2.623	0.040	1.485	1.756	2.803	3.727	8.666		
22-Sep-98	2.270	0.049	1.897	1.870	3.457	3.896	9.517		
Mean	2.517	0.046	1.996	1.750	2.918	4.300	8.135		
Median	2.450	0.043	1.821	1.762	2.810	3.859	7.629		

Date	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	STORET	River
	[ng/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]		
6-Jul-98	5.339	0.048	2.232	2.641	0.889	6.381	3.436	580046	River Raisin
23-Jul-98	4.451	0.029	1.549	2.126	0.951	3.787	2.875		
29-Jul-98	7.022	0.046	2.352	2.822	1.718	4.550	5.180		
6-Aug-98	2.610	0.030	1.000	2.365	0.542	2.619	2.476		
19-Aug-98	4.159	0.030	1.583	2.678	1.184	4.506	4.235		
26-Aug-98	4.602	0.024	1.479	2.161	1.052	4.168	3.759		
3-Sep-98	1.809	0.016	0.709	2.336	0.473	2.509	1.767		
8-Sep-98	5.022	0.033	1.387	2.417	1.118	4.107	3.643		
16-Sep-98	2.318	0.030	0.956	2.839	0.464	2.644	2.329		
21-Sep-98	3.147	0.029	1.381	2.170	0.885	3.701	2.672		
28-Sep-98	3.162	0.043	1.204	3.257	0.768	2.938	3.690		
8-Oct-98	3.064	0.033	1.508	1.874	0.828	3.773	3.417		
Mean	3.892	0.033	1.445	2.474	0.906	3.807	3.290		
Median	3.661	0.030	1.433	2.391	0.887	3.780	3.427		
24-Jun-98	3.000	0.017	1.436	0.792	0.299	4.027	16.203	060061	Rifle River
8-Jul-98	3.527	0.015	1.652	0.856	0.545	4.174	2.281		
20-Jul-98	2.007	0.011	1.207	0.693	0.218	4.267	2.904		
3-Aug-98	2.471	0.013	0.761	0.573	0.203	1.488	2.014		
10-Aug-98	3.159	0.010	1.221	1.075	0.633	2.395	2.664		
17-Aug-98	1.405	0.002	0.901	0.661	0.206	1.881	3.264		
31-Aug-98	1.165	0.000	1.047	0.634	0.220	1.990	1.963		
9-Sep-98	0.712	0.002	0.337	0.446	0.115	1.559	0.519		
14-Sep-98	1.015	0.005	1.289	0.585	0.151	2.057	1.155		
23-Sep-98	1.232	0.010	0.323	0.455	0.109	1.621	0.662		
28-Sep-98	1.964	0.002	0.593	0.603	0.207	1.621	23.678		
Mean	1.969	0.008	0.979	0.670	0.264	2.462	5.210		
Median	1.964	0.010	1.047	0.634	0.207	1.990	2.281		
1-Jul-98	10.176	0.054	2.854	3.222	1.966	4.660	9.862	820070	River Rouge
13-Jul-98	5.901	0.069	2.913	3.865	2.348	4.131	11.784		
22-Jul-98	5.852	0.057	2.412	3.178	1.737	10.108	12.200		
29-Jul-98	3.177	0.042	1.482	2.645	1.358	2.329	6.765		
6-Aug-98	29.584	0.320	10.118	12.698	12.356	12.157	59.668		
12-Aug-98	14.942	0.082	3.527	5.029	3.312	4.412	14.511		
20-Aug-98	4.667	0.057	2.716	3.518	2.249	3.129	10.660		
27-Aug-98	4.284	0.061	2.428	3.482	2.175	2.989	10.607		
3-Sep-98	3.461	0.047	2.064	2.883	2.150	3.206	8.866		
8-Sep-98	4.330	0.048	2.021	3.011	1.836	3.058	9.197		
16-Sep-98	3.784	0.051	2.233	3.886	1.973	2.903	9.878		
22-Sep-98	6.232	0.070	2.302	3.741	2.814	2.908	11.929		
8-Oct-98	29.442	0.287	6.808	11.484	12.234	6.742	49.921		
Mean	9.679	0.096	3.375	4.819	3.731	4.825	17.373		
Median	5.852	0.057	2.428	3.518	2.175	3.206	10.660		

Date	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	STORET	River
	[ng/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]		
15-Jun-98	2.064	0.025	3.727	1.722	1.145	6.174	3.658	090177	Saginaw River
9-Jul-98	5.205	0.027	3.989	1.811	1.195	6.285	4.301		
6-Aug-98	4.007	0.021	2.453	2.097	1.050	4.490	4.366		
11-Aug-98	3.185	0.025	2.318	1.768	1.060	3.791	3.731		
25-Aug-98	3.689	0.026	2.477	1.739	1.157	4.027	3.783		
15-Sep-98	4.243	0.038	3.728	2.245	1.679	5.671	6.152		
24-Sep-98	3.671	0.029	2.872	1.914	1.231	4.665	4.270		
30-Sep-98	3.048	0.022	2.293	2.091	1.410	4.491	5.430		
Mean	3.639	0.027	2.982	1.923	1.241	4.949	4.461		
Median	3.680	0.025	2.674	1.863	1.176	4.578	4.285		
18-Jun-98	4.264	0.032	3.314	1.597	1.069	5.689	3.405	730023	Shiawassee River
7-Jul-98	3.952	0.044	3.450	1.749	1.087	5.452	4.937		
15-Jul-98	6.582	0.055	3.294	2.048	1.533	4.488	19.623		
21-Jul-98	4.492	0.047	3.483	1.736	1.638	5.372	5.661		
30-Jul-98	6.646	0.035	2.558	1.539	1.435	3.712	6.222		
4-Aug-98	3.724	0.025	2.316	1.676	1.211	3.627	5.785		
11-Aug-98	2.906	0.030	2.601	1.548	1.175	3.814	5.830		
18-Aug-98	3.492	0.021	2.326	1.821	1.228	3.456	5.173		
1-Sep-98	2.043	0.022	2.288	1.389	0.812	3.302	3.528		
10-Sep-98	1.602	0.015	2.208	1.184	0.568	2.910	2.043		
15-Sep-98	2.524	0.020	2.289	1.271	0.652	3.041	3.046		
24-Sep-98	1.282	0.018	1.880	1.125	0.403	2.812	1.781		
7-Oct-98	2.223	0.022	1.743	1.036	0.570	2.564	30.070		
Mean	3.518	0.030	2.596	1.517	1.029	3.865	7.470		
Median	3.492	0.025	2.326	1.548	1.087	3.627	5.173		
24-Jun-98	1.694	0.009	1.022	0.337	0.076	2.896	119.681	040123	Thunder Bay River
8-Jul-98	2.113	0.003	1.007	0.343	0.094	2.943	5.783		
20-Jul-98	1.369	0.005	0.663	0.305	0.140	3.144	31.578		
3-Aug-98	2.822	0.005	0.600	0.283	0.135	1.279	4.114		
10-Aug-98	0.516	0.010	0.461	0.295	0.130	1.137	2.293		
17-Aug-98	0.469	0.009	0.732	0.259	0.064	1.202	29.032		
31-Aug-98	0.495	0.007	0.578	0.248	0.087	1.208	0.817		
9-Sep-98	0.496	0.003	0.375	0.310	0.102	1.093	0.356		
14-Sep-98	0.526	0.006	0.308	0.312	0.084	1.115	75.560		
23-Sep-98	0.978	0.006	0.811	0.450	0.042	1.471	0.620		
28-Sep-98	0.736	0.000	0.889	0.494	0.056	1.463	64.004		
Mean	1.111	0.006	0.677	0.330	0.092	1.723	30.349		
Median	0.736	0.006	0.663	0.310	0.087	1.279	5.783		

Date	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	STORET	River
	[ng/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]		
18-Jun-98	1.901	0.027	3.119	1.425	0.318	4.986	50.061	730025	Tittabawassee River
7-Jul-98	4.614	0.042	4.905	1.845	0.616	6.398	122.859		
15-Jul-98	2.673	0.037	5.636	1.556	0.355	5.854	25.301		
21-Jul-98	2.818	0.024	2.033	1.351	0.398	5.098	7.462		
30-Jul-98	3.737	0.011	2.578	1.443	0.481	2.590	6.526		
4-Aug-98	2.587	0.022	3.272	1.319	0.448	2.911	5.073		
11-Aug-98	1.916	0.025	2.319	1.587	0.823	2.675	4.370		
18-Aug-98	2.544	0.020	3.891	1.373	0.566	3.350	10.494		
1-Sep-98	1.666	0.034	4.436	1.144	0.435	3.445	7.161		
10-Sep-98	1.919	0.015	3.203	1.129	0.481	2.969	3.815		
15-Sep-98	2.972	0.020	2.465	1.309	0.462	2.786	5.497		
24-Sep-98	2.458	0.022	3.615	1.862	0.576	3.135	3.781		
7-Oct-98	11.796	0.052	3.187	4.128	2.642	3.496	12.308		
Mean	3.354	0.027	3.435	1.652	0.662	3.823	20.362		
Median	2.587	0.024	3.203	1.425	0.481	3.350	7.161		
6-Apr-99	7.333	0.022	0.580	0.651	0.624	0.238	5.626	210102	Escanaba River
12-Apr-99	5.886	0.022	0.466	0.607	0.600	0.110	2.519		
20-Apr-99	4.886	0.039	0.684	0.730	0.732	0.118	3.608		
27-Apr-99	3.979	0.059	0.666	0.691	0.740	0.145	4.305		
9-May-99	3.774	0.024	0.710	0.624	0.827	0.123	2.697		
21-May-99	7.002	0.027	0.707	0.811	0.751	0.222	3.141		
7-Jun-99	5.597	0.044	0.806	0.797	0.953	0.178	4.299		
14-Jul-99	6.052	0.050	1.169	0.877	1.227	0.222	4.220		
20-Jul-99	5.145	0.046	1.114	0.893	1.269	0.204	4.513		
5-Aug-99	6.058	0.051	1.068	0.874	1.175	0.199	3.962		
16-Aug-99	7.327	0.033	0.972	0.763	1.115	0.226	2.988		
16-Sep-99	3.340	0.046	1.134	0.900	0.976	0.139	3.566		
29-Sep-99	55.357	0.086	1.290	0.994	1.305	0.161	6.960		
Mean	9.364	0.042	0.874	0.785	0.946	0.176	4.031		
Median	5.886	0.044	0.806	0.797	0.953	0.178	3.962		
30-Mar-99	2.237	0.021	1.623	1.632	3.287	0.734	3.400	700123	Grand River
13-Apr-99	6.139	0.038	1.718	2.302	3.522	1.715	5.975		
15-Apr-99	21.813	0.044	1.784	2.350	3.689	1.746	6.238		
24-Apr-99	20.471	0.094	3.408	4.126	4.428	5.192	16.104		
27-Apr-99	9.388	0.051	2.093	2.858	3.552	2.698	8.649		
3-May-99	5.540	0.034	1.454	2.419	3.135	1.355	4.734		
6-May-99	7.028	0.044	1.685	2.563	3.499	1.500	5.845		
3-Jun-99	6.335	0.048	2.101	2.726	3.678	2.239	8.011		
28-Jun-99	6.751	0.046	2.159	2.785	3.988	1.980	7.548		
1-Jul-99	10.552	0.076	3.002	3.365	5.147	3.578	14.240		
18-Aug-99	4.184	0.025	1.910	1.690	3.959	0.914	4.117		
2-Sep-99	3.316	0.037	2.107	1.655	4.786	1.174	5.314		
30-Sep-99	11.469	0.058	2.649	2.808	3.798	2.545	10.429		
Mean	8.863	0.047	2.130	2.560	3.882	2.105	7.739		
Median	6.751	0.044	2.093	2.563	3.689	1.746	6.238		

Date	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	STORET	River
	[ng/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]		
31-Mar-99	8.422	0.028	1.009	1.239	2.274	1.414	4.283	030077	Kalamazoo River
12-Apr-99	7.757	0.030	1.199	1.559	2.564	1.552	4.203		
15-Apr-99	8.549	0.024	1.103	1.404	2.553	1.481	3.704		
24-Apr-99	11.723	0.044	1.471	1.602	2.735	2.198	6.023		
26-Apr-99	11.294	0.036	1.277	1.876	2.519	1.950	5.439		
29-Apr-99	6.929	0.022	0.825	1.376	2.034	1.455	2.712		
4-May-99	11.249	0.023	0.992	1.636	2.461	2.192	3.876		
3-Jun-99	13.124	0.043	1.361	1.519	2.767	1.802	4.635		
29-Jun-99	6.994	0.044	1.609	1.616	3.269	1.162	4.529		
22-Jul-99	12.792	0.052	1.888	2.029	3.569	2.263	5.753		
26-Aug-99	6.477	0.031	1.195	1.347	2.557	1.313	5.591		
1-Sep-99	6.621	0.024	1.388	1.371	2.648	1.334	5.038		
29-Sep-99	12.533	0.044	1.912	1.617	3.273	2.220	6.354		
Mean	9.574	0.034	1.325	1.553	2.710	1.718	4.780		
Median	8.549	0.031	1.277	1.559	2.564	1.552	4.635		
8-Apr-99	6.068	0.012	0.554	0.550	0.419	0.293	1.848	770073	Manistique River
15-Apr-99	5.267	0.003	0.502	0.523	0.456	0.177	1.155		
20-Apr-99	4.346	0.003	0.453	0.500	0.516	0.168	0.949		
27-Apr-99	3.829	0.008	0.604	0.443	0.517	0.156	0.834		
9-May-99	2.978	0.000	0.426	0.432	0.599	0.282	0.894		
24-May-99	2.671	0.000	0.395	0.330	0.521	0.124	0.597		
17-Jun-99	1.997	0.000	0.363	0.301	0.553	0.100	1.241		
15-Jul-99	2.679	0.003	0.703	0.507	0.904	0.173	0.736		
20-Jul-99	2.123	0.000	0.675	0.463	0.918	0.138	0.736		
5-Aug-99	2.180	0.000	0.585	0.399	0.897	0.101	0.620		
18-Aug-99	2.385	0.010	0.553	0.431	0.854	0.130	0.566		
14-Sep-99	2.401	0.000	0.420	0.266	0.652	0.067	0.313		
27-Sep-99	3.421	0.006	0.526	0.286	0.744	0.080	0.330		
Mean	3.257	0.004	0.520	0.418	0.658	0.153	0.832		
Median	2.679	0.003	0.526	0.432	0.599	0.138	0.736		
6-Apr-99	1.725	0.002	0.662	0.608	1.217	0.132	17.815	610273	Muskegon River
15-Apr-99	1.610	0.002	0.553	0.599	1.173	0.152	0.741		
23-Apr-99	34.004	0.003	0.646	0.832	1.272	0.472	8.745		
14-May-99	1.551	0.003	0.541	0.589	1.155	0.137	1.577		
19-May-99	1.689	0.006	0.617	0.645	1.114	0.192	2.607		
2-Jun-99	2.008	0.007	0.501	0.626	1.205	0.236	4.985		
14-Jun-99	4.279	0.016	1.102	1.051	1.746	0.686	6.159		
15-Jun-99	2.372	0.010	0.672	0.689	1.326	0.323	10.949		
14-Jul-99	1.102	0.008	0.663	0.608	1.472	0.113	0.799		
20-Jul-99	1.154	0.006	0.712	0.595	1.415	0.138	3.991		
14-Sep-99	1.000	0.000	0.537	0.360	1.107	0.063	2.138		
30-Sep-99	0.843	0.006	0.917	0.442	1.323	0.155	7.597		
Mean	4.445	0.006	0.677	0.637	1.294	0.233	5.675		
Median	1.650	0.006	0.654	0.608	1.245	0.154	4.488		

Date	Mercury	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	STORET	River
	[ng/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]	[ug/L]		
7-Apr-99	4.065	0.007	0.647	0.629	1.177	0.360	9.423	530027	Pere Marquette River
15-Apr-99	2.903	0.003	0.636	0.534	1.107	0.187	4.083		
14-May-99	2.380	0.004	0.613	0.378	0.987	0.271	12.800		
25-May-99	2.301	0.012	0.533	0.435	0.985	0.221	1.867		
14-Jun-99	3.079	0.009	0.733	0.613	1.176	0.382	3.105		
9-Jul-99	3.883	0.013	0.812	0.775	1.455	0.426	2.062		
20-Jul-99	2.851	0.013	0.836	0.633	1.380	0.330	16.835		
2-Sep-99	1.539	0.001	0.613	0.278	1.056	0.197	0.942		
9-Sep-99	3.310	0.006	0.841	0.336	1.229	0.168	0.900		
16-Sep-99	1.529	0.007	0.877	0.360	1.210	0.180	3.699		
23-Sep-99	5.312	0.000	0.526	0.241	1.000	0.108	2.107		
30-Sep-99	1.682	0.009	0.878	0.372	1.148	0.166	1.274		
Mean	2.903	0.007	0.712	0.465	1.159	0.250	4.925		
Median	2.877	0.007	0.690	0.406	1.162	0.209	2.606		
6-Apr-99	3.986	0.033	1.000	1.281	2.636	0.983	5.495	110628	St. Joseph River
13-Apr-99	5.776	0.036	0.957	1.542	2.594	0.959	4.251		
19-Apr-99	4.898	0.041	0.944	1.542	2.430	0.964	4.622		
27-Apr-99	15.980	0.075	1.226	2.376	2.763	2.173	28.506		
3-May-99	6.624	0.046	0.805	1.595	2.301	1.277	4.761		
19-May-99	4.945	0.045	0.800	1.368	2.554	1.056	4.477		
3-Jun-99	5.519	0.047	1.040	1.538	2.476	1.218	5.714		
29-Jun-99	5.171	0.044	1.404	1.743	3.399	1.267	8.356		
2-Jul-99	7.630	0.060	1.398	2.126	3.281	1.547	5.588		
30-Jul-99	2.580	0.030	1.090	1.205	2.835	0.589	6.280		
14-Sep-99	2.616	0.042	1.328	1.185	2.840	0.621	4.819		
28-Sep-99	1.650	0.020	1.077	0.865	2.511	0.342	2.307		
Mean	5.615	0.043	1.089	1.530	2.718	1.083	7.098		
Median	5.058	0.043	1.058	1.540	2.615	1.020	5.157		
7-Apr-99	9.632	0.031	0.595	0.607	0.494	0.413	3.881	170141	Tahquamenon River
13-Apr-99	7.855	0.171	0.414	0.682	3.174	0.516	4.841		
21-Apr-99	6.680	0.015	0.391	0.466	0.449	0.177	2.741		
28-Apr-99	5.735	0.013	0.446	0.453	0.564	0.191	2.081		
19-May-99	2.429	0.005	0.344	0.302	0.573	0.106	0.582		
8-Jun-99	7.534	0.013	0.449	0.589	0.675	0.280	2.685		
13-Jul-99	3.180	0.003	0.605	0.343	0.884	0.132	0.746		
19-Jul-99	4.829	0.007	0.499	0.498	0.784	0.162	1.053		
4-Aug-99	2.566	0.005	0.448	0.310	0.768	0.108	0.599		
9-Aug-99	2.279	0.001	0.481	0.320	0.776	0.094	0.715		
17-Aug-99	2.618	0.004	0.457	0.305	0.771	0.106	0.758		
15-Sep-99	1.961	0.007	0.470	0.251	0.631	0.055	0.365		
28-Sep-99	8.351	0.003	0.453	0.202	0.637	0.061	0.393		
Mean	5.050	0.021	0.465	0.410	0.860	0.185	1.649		
Median	4.829	0.007	0.453	0.343	0.675	0.132	0.758		

STORET ID	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT (ng/L)	Lindane (ng/L)	Toxaphene# (ng/L)	alpha BHC (ng/L)	HCB (ng/L)
350061 Au Sable River							
7/8/1998	1.044	0.013	0.014	0.099	0.000	FMS	0.013
8/10/1998	1.870	0.000	0.018	0.058	0.000	0.000	0.024
8/24/1998	1.276	0.000	0.019	0.319	0.000	0.037	0.016
9/14/1998	0.756	0.000	0.030	0.060	0.000	0.000	0.008
9/23/1998	1.103						
No. of Samples:		4	4	4	4	3	4
Mean+:	1.210	0.003	0.020	0.134	0.000	0.012	0.015
Median+:	1.103	0.000	0.019	0.080	0.000	0.000	0.015

= Residue exhibits chromatographic characteristics similar to toxaphene; analyzed only in samples collected in 1998.
+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT (ng/L)	Lindane (ng/L)	Toxaphene# (ng/L)	alpha BHC (ng/L)	HCB (ng/L)
500233 Clinton River							
7/7/1998	6.951	0.241	0.664	1.380	NAI	FMS 0.046	0.063
8/18/1998	9.734	0.977	1.778	1.430	NAI	0.099	0.092
8/27/1998	5.757	0.699	0.982	1.470	NAI	0.090	0.081
9/17/1998	9.087	0.604	1.268	1.580	NAI	0.126	0.088
9/22/1998	10.699	0.972	1.521	0.784	NAI	0.049	0.088
9/29/1998	9.961	0.709	1.430	1.440	NAI	0.085	0.093
No. of Samples:		6	6	6	0	6	6
Mean+:	8.698	0.700	1.274	1.347	0.000	0.083	0.084
Median+:	9.410	0.704	1.349	1.435	0.000	0.088	0.088

= Residue exhibits chromatographic characteristics similar to toxaphene; analyzed only in samples collected in 1998.
+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
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STORET ID	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT (ng/L)	Lindane (ng/L)	Toxaphene# (ng/L)	alpha BHC (ng/L)	HCB (ng/L)
210102 Escanaba River							
4/6/1999	0.830	0.009	0.128	0.169		0.065	0.013
4/12/1999	0.292						
6/7/1999	0.598						
9/29/1999	0.344	0.000	0.000	0.210		0.071	0.019
No. of Samples:		2	2	2	0	2	2
Mean+:	0.516	0.005	0.064	0.190	0.000	0.068	0.016
Median+:	0.471	0.005	0.064	0.190	0.000	0.068	0.016

= Residue exhibits chromatographic characteristics similar to toxaphene; analyzed only in samples collected in 1998.
+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT (ng/L)	Lindane (ng/L)	Toxaphene# (ng/L)	alpha BHC (ng/L)	HCB (ng/L)
700123 Grand River (Lower)							
3/30/1999	2.643						
4/13/1999	3.451						
4/27/1999	4.062	0.442	1.341	0.514		0.138	0.052
5/3/1999	2.825						
6/28/1999	3.997	1.005	2.650	1.000		0.097	0.069
8/18/1999	1.938						
9/2/1999	2.591						
9/30/1999	2.770						
No. of Samples:		2	2	2	0	2	2
Mean+:	3.035	0.724	1.996	0.757	0.000	0.118	0.061
Median+:	2.798	0.724	1.996	0.757	0.000	0.118	0.061

= Residue exhibits chromatographic characteristics similar to toxaphene; analyzed only in samples collected in 1998.
+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
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STORET ID		Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT (ng/L)	Lindane (ng/L)	Toxaphene# (ng/L)	alpha BHC (ng/L)	HCB (ng/L)
030077	Kalamazoo River (Lower)							
	3/31/1999	13.221	0.177	0.394	0.291		0.035	0.021
	4/12/1999	14.318						
	4/26/1999	8.313						
	4/29/1999	9.049	0.123	0.316	0.309		0.067	0.020
	6/29/1999	15.482						
	7/22/1999	24.477						
	8/26/1999	14.606						
	9/1/1999	17.737						
	9/29/1999	18.366						
No. of Samples:			2	2	2	0	2	2
Mean+:		5.063	0.150	0.355	0.300	0.000	0.051	0.021
Median+:		4.606	0.150	0.355	0.300	0.000	0.051	0.021

= Residue exhibits chromatographic characteristics similar to toxaphene; analyzed only in samples collected in 1998.
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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
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STORET ID	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT (ng/L)	Lindane (ng/L)	Toxaphene# (ng/L)	alpha BHC (ng/L)	HCB (ng/L)
770073 Manistique River							
4/8/1999	1.008	0.000	0.057	0.178		0.085	0.013
4/15/1999	0.441						
5/24/1999	0.266						
7/15/1999	0.530						
8/18/1999	0.445						
9/14/1999	0.302	0.000	0.000	0.180		0.041	0.007
No. of Samples:		2	2	2	0	2	2
Mean+:	0.499	0.000	0.029	0.179	0.000	0.063	0.010
Median+:	0.443	0.000	0.029	0.179	0.000	0.063	0.010

= Residue exhibits chromatographic characteristics similar to toxaphene; analyzed only in samples collected in 1998.
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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
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STORET ID	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT (ng/L)	Lindane (ng/L)	Toxaphene# (ng/L)	alpha BHC (ng/L)	HCB (ng/L)
580046 River Raisin							
7/6/1998	66.587	0.196	0.640	0.865	0.000	FMS 0.080	0.036
8/19/1998	55.850	0.187	0.764	0.549	0.000	0.070	0.032
8/26/1998	228.492	0.157	0.991	0.600	0.000	0.090	0.031
9/16/1998	213.344	0.107	1.154	0.601	0.000	0.121	0.027
9/21/1998	256.180	0.060	0.931	0.734	0.000	0.111	0.020
9/28/1998	217.518	0.101	0.750	0.815	0.000	0.106	0.021
No. of Samples:		6	6	6	6	6	6
Mean+:	2.995	0.135	0.872	0.694	0.000	0.096	0.028
Median+:	5.431	0.132	0.848	0.668	0.000	0.098	0.029

= Residue exhibits chromatographic characteristics similar to toxaphene; analyzed only in samples collected in 1998.
+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
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STORET ID	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT (ng/L)	Lindane (ng/L)	Toxaphene# (ng/L)	alpha BHC (ng/L)	HCB (ng/L)
090177 Saginaw River							
6/15/1998	25.234						
7/9/1998	20.893	0.131	1.396	1.410	0.000	FMS 0.190	0.240
8/6/1998	38.993	0.145	1.312	2.130	0.000	FMS 0.120	0.230
8/11/1998	28.705	0.137	1.106	0.962	0.000	0.067	0.234
8/25/1998	24.548	0.087	1.390	1.530	0.000	0.118	0.211
9/15/1998	30.890	0.205	1.745	2.110	0.000	0.206	0.229
9/24/1998	22.007	0.155	1.404	1.780	0.000	0.165	0.203
9/30/1998	27.630	0.150	1.440	2.430	0.000	0.203	0.299
No. of Samples:		7	7	7	7	7	7
Mean+:	7.362	0.144	1.399	1.765	0.000	0.153	0.235
Median+:	6.432	0.145	1.396	1.780	0.000	0.165	0.230

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
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STORET ID	Total PCB (ng/L)	Total Chlordane (ng/L)	Total DDT (ng/L)	Lindane (ng/L)	Toxaphene# (ng/L)	alpha BHC (ng/L)	HCB (ng/L)
170141 Tahquamenon River							
4/7/1999	1.442	0.026	0.170	0.161		0.069	0.013
4/13/1999	0.480						
5/19/1999	0.463						
6/8/1999	0.496						
7/13/1999	0.899						
9/15/1999	0.202	0.000	0.000	0.044		0.000	0.006
No. of Samples:		2	2	2	0	2	2
Mean+:	0.664	0.013	0.085	0.103	0.000	0.035	0.009
Median+:	0.488	0.013	0.085	0.103	0.000	0.035	0.009

= Residue exhibits chromatographic characteristics similar to toxaphene; analyzed only in samples collected in 1998.
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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
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NDD = Not detected due to dilution.

STORET ID	Cong. 101 (ng/L)	Cong. 118 (ng/L)	Cong. 123+149 (ng/L)	Cong. 128 (ng/L)	Cong. 132+153+105 (ng/L)	Cong. 135+144 (ng/L)	Cong. 136 (ng/L)	Cong. 137+176 (ng/L)	Cong. 141 (ng/L)	Cong. 146 (ng/L)	Cong. 15+17 (ng/L)	Cong. 151 (ng/L)
350061 Au Sable River												
7/8/1998	0.019	0.012	0.008	0.002	NAI	0.000	0.000	0.000	0.003	NAI	0.052	0.000
8/10/1998	0.031	0.020	0.011	0.000	0.012	0.005	0.000	0.000	0.004	0.000	0.085	0.006
8/24/1998	0.022	0.011	0.009	0.000	0.019	0.000	0.000	0.000	0.003	0.000	0.066	0.000
9/14/1998	0.013	0.006	0.005	0.001	0.009	0.002	0.000	0.000	0.001	0.001	0.056	0.002
9/23/1998	0.015	0.008	0.006	0.002	0.012	0.003	0.000	0.000	0.002	0.000	0.094	0.003
No. of Samples:	5	5	5	5	5	5	5	5	5	5	5	5
Mean+:	0.020	0.011	0.008	0.001	0.013	0.002	0.000	0.000	0.003	0.000	0.071	0.002
Median+:	0.019	0.011	0.008	0.001	0.012	0.002	0.000	0.000	0.003	0.000	0.066	0.002

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NDD = Not detected due to dilution.

STORET ID	Cong. 158 (ng/L)	Cong. 16+32 (ng/L)	Cong. 163+138 (ng/L)	Cong. 167 (ng/L)	Cong. 170+190 (ng/L)	Cong. 172 (ng/L)	Cong. 174 (ng/L)	Cong. 177 (ng/L)	Cong. 178 (ng/L)	Cong. 18 (ng/L)	Cong. 180 (ng/L)	Cong. 183 (ng/L)	Cong. 185 (ng/L)
350061 Au Sable River													
7/8/1998	0.000	0.045	0.016	0.000	0.003	0.000	0.004	0.002	0.000	0.036	0.008	0.002	0.000
8/10/1998	0.000	0.078	NAI	0.000	0.005	0.000	0.006	0.003	0.000	0.071	0.013	0.000	0.000
8/24/1998	0.000	0.058	NAI	0.000	0.003	0.000	0.004	0.000	0.000	0.055	0.008	0.000	0.000
9/14/1998	0.000	0.046	0.008	0.000	0.001	0.000	0.002	0.001	0.000	0.032	0.002	0.000	0.000
9/23/1998	0.000	0.078	0.012	0.000	0.002	0.000	0.002	0.001	0.000	0.036	0.004	0.002	0.000
No. of Samples:	5	5	5	5	5	5	5	5	5	5	5	5	5
Mean+:	0.000	0.061	0.012	0.000	0.003	0.000	0.004	0.001	0.000	0.046	0.007	0.001	0.000
Median+:	0.000	0.058	0.012	0.000	0.003	0.000	0.004	0.001	0.000	0.036	0.008	0.000	0.000

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FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
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STORET ID	Cong. 187+182 (ng/L)	Cong. 19 (ng/L)	Cong. 193 (ng/L)	Cong. 194 (ng/L)	Cong. 198 (ng/L)	Cong. 199 (ng/L)	Cong. 201 (ng/L)	Cong. 202+171 (ng/L)	Cong. 203+196 (ng/L)	Cong. 206 (ng/L)	Cong. 207 (ng/L)	Cong. 208+195 (ng/L)	Cong. 22 (ng/L)
350061 Au Sable River													
7/8/1998	0.005	NAI	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024
8/10/1998	0.005	0.000	0.000	0.004	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.051
8/24/1998	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.034
9/14/1998	0.002	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020
9/23/1998	0.003	0.019	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.001	0.000	0.001	0.022
No. of Samples:	5	5	5	5	5	5	5	5	5	5	5	5	5
Mean+:	0.003	0.006	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.030
Median+:	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024

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FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
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NDD = Not detected due to dilution.

STORET ID	Cong. 47+48 (ng/L)	Cong. 49 (ng/L)	Cong. 51 (ng/L)	Cong. 52 (ng/L)	Cong. 53 (ng/L)	Cong. 56+60 (ng/L)	Cong. 6 (ng/L)	Cong. 63 (ng/L)	Cong. 66 (ng/L)	Cong. 7+9 (ng/L)	Cong. 70+76 (ng/L)	Cong. 74 (ng/L)	Cong. 77+110 (ng/L)
350061 Au Sable River													
7/8/1998	0.022	FBK0.030	0.005	0.055	NAI	0.030	0.000	0.000	0.063	0.013	0.043	NAI	0.026
8/10/1998	0.027	0.058	0.005	0.102	NAI	0.047	NAI	0.000	0.112	0.017	0.072	0.016	0.040
8/24/1998	0.015	0.035	0.000	0.062	0.000	0.026	NAI	0.000	0.053	0.015	0.038	0.000	0.027
9/14/1998	0.010	0.017	0.003	0.030	NAI	0.011	0.017	0.000	0.020	0.009	0.016	0.006	0.018
9/23/1998	0.018	0.023	0.005	0.041	NAI	0.018	NAI	0.000	0.033	0.010	0.022	0.000	0.021
No. of Samples:	5	5	5	5	5	5	5	5	5	5	5	5	5
Mean+:	0.018	0.033	0.004	0.058	0.000	0.026	0.009	0.000	0.056	0.013	0.038	0.006	0.026
Median+:	0.018	0.030	0.005	0.055	0.000	0.026	0.009	0.000	0.053	0.013	0.038	0.003	0.026

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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STORET ID		Cong. 24+27 (ng/L)	Cong. 25 (ng/L)	Cong. 26 (ng/L)	Cong. 28+31 (ng/L)	Cong. 3 (ng/L)	Cong. 33 (ng/L)	Cong. 37+42 (ng/L)	Cong. 4+10 (ng/L)	Cong. 40 (ng/L)	Cong. 41+71+64 (ng/L)	Cong. 44 (ng/L)	Cong. 45 (ng/L)	Cong. 46 (ng/L)
350061	Au Sable River													
7/8/1998		NAI	0.000	0.000	0.117	0.000	0.024	0.039	0.020	0.008	0.034	FBK0.046	0.006	0.000
8/10/1998		NAI	0.013	0.018	0.219	0.000	0.048	0.054	0.040	0.015	0.071	0.085	0.010	0.009
8/24/1998		0.006	0.007	0.011	0.144	0.000	0.037	0.026	0.041	0.007	0.035	0.048	0.007	0.005
9/14/1998		NAI	0.000	NAI	0.077	0.000	0.021	0.014	0.035	0.000	0.020	0.024	0.004	0.000
9/23/1998		0.008	0.008	0.014	0.096	0.000	0.018	0.022	0.121	0.007	0.029	0.032	0.007	0.004
No. of Samples:		5	5	5	5	5	5	5	5	5	5	5	5	5
Mean+:		0.007	0.005	0.011	0.131	0.000	0.030	0.031	0.052	0.008	0.038	0.047	0.007	0.004
Median+:		0.007	0.007	0.012	0.117	0.000	0.024	0.026	0.040	0.007	0.034	0.046	0.007	0.004

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STORET ID	Cong. 8+5 (ng/L)	Cong. 82 (ng/L)	Cong. 83 (ng/L)	Cong. 85 (ng/L)	Cong. 87 (ng/L)	Cong. 89 (ng/L)	Cong. 91 (ng/L)	Cong. 92+84 (ng/L)	Cong. 95 (ng/L)	Cong. 97 (ng/L)	Cong. 99 (ng/L)
350061 Au Sable River											
7/8/1998	0.139	0.003	0.002	0.005	0.013	0.000	0.005	0.019	0.023	0.006	0.008
8/10/1998	0.251	0.004	0.003	0.008	0.021	0.000	0.008	0.028	0.038	0.008	0.013
8/24/1998	0.251	0.000	0.000	0.005	0.017	0.001	0.004	0.019	0.029	0.005	0.007
9/14/1998	0.142	0.002	0.001	0.003	0.008	0.002	0.003	0.000	0.018	0.003	0.004
9/23/1998	0.156	0.002	0.002	0.004	0.008	0.001	0.004	0.015	0.018	0.004	0.006
No. of Samples:	5	5	5	5	5	5	5	5	5	5	5
Mean+:	0.188	0.002	0.001	0.005	0.013	0.001	0.005	0.016	0.025	0.005	0.008
Median+:	0.156	0.002	0.002	0.005	0.013	0.001	0.004	0.019	0.023	0.005	0.007

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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STORET ID	4,4'-DDD (ng/L)	4,4'-DDE (ng/L)	4,4'-DDT (ng/L)	oxychlordane (ng/L)	alpha-chlordane (ng/L)	cis-nonachlor (ng/L)	gamma-chlordane (ng/L)	trans- nonachlor (ng/L)
350061 Au Sable River								
7/8/1998	0.000	0.014	0.000	0.000	0.013	0.000	0.000	0.000
8/10/1998	0.000	0.018	0.000	0.000	0.000	0.000	0.000	0.000
8/24/1998	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.000
9/14/1998	0.000	0.030	0.000	0.000	0.000	0.000	0.000	0.000
9/23/1998								
No. of Samples:	5	5	5	5	5	5	5	5
Mean+:	0.000	0.020	0.000	0.000	0.003	0.000	0.000	0.000
Median+:	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.000

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 101 (ng/L)	Cong. 118 (ng/L)	Cong. 123+149 (ng/L)	Cong. 128 (ng/L)	Cong. 132+153+105 (ng/L)	Cong. 135+144 (ng/L)	Cong. 136 (ng/L)	Cong. 137+176 (ng/L)	Cong. 141 (ng/L)	Cong. 146 (ng/L)	Cong. 15+17 (ng/L)	Cong. 151 (ng/L)
500233 Clinton River												
7/7/1998	0.203	0.098	0.192	0.053	0.330	0.066	NAI	0.006	0.072	0.034	0.145	0.070
8/18/1998	0.281	0.166	0.318	0.079	0.482	0.088	0.033	0.008	0.105	0.076	0.215	0.105
8/27/1998	0.151	0.082	0.137	0.039	0.245	0.047	0.029	0.004	0.043	0.042	0.221	0.051
9/17/1998	0.266	0.154	0.241	0.073	0.442	0.087	0.041	0.008	0.085	0.072	0.316	0.092
9/22/1998	0.322	0.190	0.281	0.094	0.536	0.103	0.053	0.009	0.102	0.085	0.351	0.106
9/29/1998	0.261	0.196	0.312	0.099	0.561	0.113	0.051	0.010	0.111	0.087	0.307	0.116
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.247	0.148	0.247	0.073	0.433	0.084	0.041	0.007	0.086	0.066	0.259	0.090
Median+:	0.264	0.160	0.261	0.076	0.462	0.088	0.041	0.008	0.093	0.074	0.264	0.098

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FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 158 (ng/L)	Cong. 16+32 (ng/L)	Cong. 163+138 (ng/L)	Cong. 167 (ng/L)	Cong. 170+190 (ng/L)	Cong. 172 (ng/L)	Cong. 174 (ng/L)	Cong. 177 (ng/L)	Cong. 178 (ng/L)	Cong. 18 (ng/L)	Cong. 180 (ng/L)	Cong. 183 (ng/L)	Cong. 185 (ng/L)
500233 Clinton River													
7/7/1998	0.040	0.154	0.400	0.016	0.107	0.025	0.109	0.065	0.034	0.102	0.209	0.056	0.011
8/18/1998	0.062	0.211	0.510	0.023	0.125	0.036	0.152	0.094	0.046	0.132	0.305	0.079	0.014
8/27/1998	0.032	0.212	0.269	0.010	0.067	0.015	0.064	0.043	0.019	0.102	0.151	0.037	0.006
9/17/1998	0.062	0.294	0.519	0.022	0.138	0.034	0.125	0.083	0.038	0.121	0.288	0.071	0.013
9/22/1998	0.077	0.314	0.644	0.028	0.175	0.042	0.150	0.099	0.045	0.129	0.354	0.086	0.016
9/29/1998	0.076	0.273	0.624	0.028	0.174	0.043	0.160	0.106	0.049	0.107	0.369	0.092	0.017
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.058	0.243	0.494	0.021	0.131	0.033	0.127	0.082	0.038	0.115	0.279	0.070	0.013
Median+:	0.062	0.243	0.514	0.023	0.132	0.035	0.137	0.088	0.042	0.114	0.297	0.075	0.014

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 187+182 (ng/L)	Cong. 19 (ng/L)	Cong. 193 (ng/L)	Cong. 194 (ng/L)	Cong. 198 (ng/L)	Cong. 199 (ng/L)	Cong. 201 (ng/L)	Cong. 202+171 (ng/L)	Cong. 203+196 (ng/L)	Cong. 206 (ng/L)	Cong. 207 (ng/L)	Cong. 208+195 (ng/L)	Cong. 22 (ng/L)
500233 Clinton River													
7/7/1998	0.101	0.016	0.017	0.052	0.000	0.009	0.096	0.029	0.104	0.022	0.002	0.023	0.082
8/18/1998	0.143	0.016	0.024	0.075	0.000	0.011	0.146	0.040	0.150	0.031	0.003	0.033	0.123
8/27/1998	0.065	0.025	0.011	0.030	0.000	0.004	0.053	0.015	0.056	0.012	0.000	0.013	0.074
9/17/1998	0.121	0.038	0.022	0.061	0.000	0.008	0.101	0.030	0.117	0.024	0.000	0.026	0.101
9/22/1998	0.143	0.036	0.027	0.078	0.000	0.010	0.127	0.037	0.151	0.027	0.003	0.032	0.115
9/29/1998	0.155	0.047	0.028	0.077	0.000	0.011	0.136	0.041	0.155	0.031	0.003	0.034	0.100
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.121	0.029	0.022	0.062	0.000	0.009	0.110	0.032	0.122	0.025	0.002	0.027	0.099
Median+:	0.132	0.030	0.023	0.068	0.000	0.009	0.114	0.033	0.134	0.026	0.003	0.029	0.100

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 47+48 (ng/L)	Cong. 49 (ng/L)	Cong. 51 (ng/L)	Cong. 52 (ng/L)	Cong. 53 (ng/L)	Cong. 56+60 (ng/L)	Cong. 6 (ng/L)	Cong. 63 (ng/L)	Cong. 66 (ng/L)	Cong. 7+9 (ng/L)	Cong. 70+76 (ng/L)	Cong. 74 (ng/L)	Cong. 77+110 (ng/L)
500233 Clinton River													
7/7/1998	0.050	FBK0.101	0.015	0.870	0.037	0.098	0.020	0.007	0.177	0.022	0.107	0.045	0.281
8/18/1998	0.081	0.137	0.023	0.878	0.054	0.132	0.046	0.011	0.235	0.030	0.152	0.066	0.390
8/27/1998	0.071	0.102	0.021	0.335	0.046	0.074	0.044	0.007	0.144	0.020	0.091	0.035	0.244
9/17/1998	0.101	0.143	0.032	0.453	0.060	0.117	0.048	0.012	0.201	0.024	0.135	0.063	0.436
9/22/1998	0.106	0.152	0.033	0.552	0.065	0.137	0.054	0.012	0.267	0.024	0.153	0.068	0.575
9/29/1998	0.095	0.133	0.031	0.467	0.056	0.121	0.046	0.010	0.212	0.024	0.135	0.064	0.420
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.084	0.128	0.026	0.593	0.053	0.113	0.043	0.010	0.206	0.024	0.129	0.057	0.391
Median+:	0.088	0.135	0.027	0.509	0.055	0.119	0.046	0.010	0.206	0.024	0.135	0.063	0.405

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 24+27 (ng/L)	Cong. 25 (ng/L)	Cong. 26 (ng/L)	Cong. 28+31 (ng/L)	Cong. 3 (ng/L)	Cong. 33 (ng/L)	Cong. 37+42 (ng/L)	Cong. 4+10 (ng/L)	Cong. 40 (ng/L)	Cong. 41+71+64 (ng/L)	Cong. 44 (ng/L)	Cong. 45 (ng/L)	Cong. 46 (ng/L)
500233 Clinton River													
7/7/1998	0.012	NAI	NAI	0.305	0.000	0.076	0.095	0.099	0.037	0.136	FBK0.149	0.028	0.020
8/18/1998	0.017	NAI	NAI	0.390	0.000	0.112	0.132	0.153	0.049	0.196	0.200	0.042	0.025
8/27/1998	0.019	NAI	NAI	0.323	0.000	0.067	0.096	0.142	0.033	0.137	0.145	0.030	0.020
9/17/1998	0.027	NAI	NAI	0.440	0.000	0.092	0.137	0.204	0.049	0.203	0.205	0.043	0.028
9/22/1998	0.030	NAI	NAI	0.501	0.000	0.104	0.144	0.195	0.054	0.219	0.210	0.045	0.028
9/29/1998	0.026	NAI	NAI	0.434	0.000	0.089	0.137	0.281	0.050	0.188	0.186	0.041	0.027
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.022	0.000	0.000	0.399	0.000	0.090	0.123	0.179	0.045	0.180	0.183	0.038	0.025
Median+:	0.022	0.000	0.000	0.412	0.000	0.091	0.135	0.174	0.049	0.192	0.193	0.041	0.026

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 8+5 (ng/L)	Cong. 82 (ng/L)	Cong. 83 (ng/L)	Cong. 85 (ng/L)	Cong. 87 (ng/L)	Cong. 89 (ng/L)	Cong. 91 (ng/L)	Cong. 92+84 (ng/L)	Cong. 95 (ng/L)	Cong. 97 (ng/L)	Cong. 99 (ng/L)
500233 Clinton River											
7/7/1998	0.273	0.023	0.020	0.039	0.075	0.015	0.043	0.146	0.289	0.045	0.047
8/18/1998	0.550	0.029	0.028	0.055	0.117	0.012	0.080	0.258	0.370	0.053	0.088
8/27/1998	0.410	0.017	0.015	0.033	0.062	0.006	0.044	0.149	0.207	0.035	0.054
9/17/1998	0.416	0.031	0.029	0.060	0.113	0.014	0.079	0.248	0.342	0.069	0.101
9/22/1998	0.508	0.038	0.035	0.074	0.135	0.016	0.092	0.285	0.409	0.083	0.120
9/29/1998	0.417	0.041	0.030	0.062	0.108	0.015	0.083	0.247	0.358	0.069	0.099
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.429	0.030	0.026	0.054	0.102	0.013	0.070	0.222	0.329	0.059	0.085
Median+:	0.416	0.030	0.029	0.057	0.110	0.014	0.079	0.247	0.350	0.061	0.093

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	4,4'-DDD (ng/L)	4,4'-DDE (ng/L)	4,4'-DDT (ng/L)	oxychlordane (ng/L)	alpha-chlordane (ng/L)	cis-nonachlor (ng/L)	gamma-chlordane (ng/L)	trans- nonachlor (ng/L)
500233 Clinton River								
7/7/1998	0.154	0.420	0.090	0.000	0.091	0.000	0.064	0.086
8/18/1998	0.751	0.677	0.350	0.022	0.421	0.053	0.306	0.175
8/27/1998	0.508	0.319	0.155	0.023	0.280	0.050	0.195	0.151
9/17/1998	0.763	0.505	NAI	0.026	0.349	NAI	0.229	NAI
9/22/1998	0.901	0.620	NAI	0.023	0.394	0.061	0.272	0.222
9/29/1998	0.569	0.568	0.293	0.018	0.231	0.059	0.181	0.220
No. of Samples:	6	6	6	6	6	6	6	6
Mean+:	0.608	0.518	0.222	0.019	0.294	0.045	0.208	0.171
Median+:	0.660	0.537	0.224	0.023	0.315	0.053	0.212	0.175

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 101 (ng/L)	Cong. 118 (ng/L)	Cong. 123+149 (ng/L)	Cong. 128 (ng/L)	Cong. 132+153+105 (ng/L)	Cong. 135+144 (ng/L)	Cong. 136 (ng/L)	Cong. 137+176 (ng/L)	Cong. 141 (ng/L)	Cong. 146 (ng/L)	Cong. 15+17 (ng/L)	Cong. 151 (ng/L)
210102 Escanaba River												
4/6/1999	0.018	0.010	0.018	0.000	0.036	0.007	0.004	0.000	0.007	0.000	0.033	0.007
4/12/1999	0.007	0.008	0.003	0.000	0.008	0.002	0.000	0.000	0.000	0.000	0.019	0.000
6/7/1999	0.006	0.005	0.005	0.001	0.011	0.000	0.000	0.000	0.000	0.000	0.053	0.000
9/29/1999	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	NAI	NAI	0.000
No. of Samples:	4	4	4	4	4	4	4	4	4	4	4	4
Mean+:	0.010	0.006	0.007	0.000	0.014	0.002	0.001	0.000	0.002	0.000	0.035	0.002
Median+:	0.007	0.007	0.004	0.000	0.010	0.001	0.000	0.000	0.000	0.000	0.033	0.000

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 158 (ng/L)	Cong. 16+32 (ng/L)	Cong. 163+138 (ng/L)	Cong. 167 (ng/L)	Cong. 170+190 (ng/L)	Cong. 172 (ng/L)	Cong. 174 (ng/L)	Cong. 177 (ng/L)	Cong. 178 (ng/L)	Cong. 18 (ng/L)	Cong. 180 (ng/L)	Cong. 183 (ng/L)	Cong. 185 (ng/L)
210102 Escanaba River													
4/6/1999	0.003	0.101	0.035	0.000	0.011	0.000	0.009	0.014	0.004	0.019	0.023	0.007	0.000
4/12/1999	0.000	NAI	0.009	0.000	0.001	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.000
6/7/1999	0.000	0.038	0.011	0.000	0.003	0.000	0.000	0.013	0.002	0.025	0.005	0.000	0.000
9/29/1999	0.000	NAI	0.011	0.000	0.000	0.000	0.000		0.000	0.010	0.002	0.000	0.000
No. of Samples:	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean+:	0.001	0.069	0.017	0.000	0.004	0.000	0.002	0.009	0.001	0.016	0.008	0.002	0.000
Median+:	0.000	0.069	0.011	0.000	0.002	0.000	0.000	0.013	0.001	0.015	0.004	0.000	0.000

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 187+182 (ng/L)	Cong. 19 (ng/L)	Cong. 193 (ng/L)	Cong. 194 (ng/L)	Cong. 198 (ng/L)	Cong. 199 (ng/L)	Cong. 201 (ng/L)	Cong. 202+171 (ng/L)	Cong. 203+196 (ng/L)	Cong. 206 (ng/L)	Cong. 207 (ng/L)	Cong. 208+195 (ng/L)	Cong. 22 (ng/L)
210102 Escanaba River													
4/6/1999	0.012	0.000	0.002	0.005	0.000	0.000	0.008	0.003	0.008	0.000	0.001	0.002	0.024
4/12/1999	0.003	0.000	0.000	0.001	0.000	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.020
6/7/1999	0.003	0.004	0.000	0.002	0.000	0.000	0.003	0.000	0.003	0.001	0.000	0.000	0.045
9/29/1999	0.002	NAI	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021
No. of Samples:	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean+:	0.005	0.001	0.001	0.002	0.000	0.000	0.004	0.001	0.003	0.000	0.000	0.001	0.028
Median+:	0.003	0.000	0.000	0.001	0.000	0.000	0.003	0.000	0.002	0.000	0.000	0.000	0.022

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 47+48 (ng/L)	Cong. 49 (ng/L)	Cong. 51 (ng/L)	Cong. 52 (ng/L)	Cong. 53 (ng/L)	Cong. 56+60 (ng/L)	Cong. 6 (ng/L)	Cong. 63 (ng/L)	Cong. 66 (ng/L)	Cong. 7+9 (ng/L)	Cong. 70+76 (ng/L)	Cong. 74 (ng/L)	Cong. 77+110 (ng/L)
210102 Escanaba River													
4/6/1999	0.010	0.018	0.002	0.040	NAI	0.010	0.008	0.000	0.021	0.009	0.017	0.006	0.023
4/12/1999	0.008	0.005	0.001	0.014	NAI	0.010	0.000	0.000	0.018	0.000	0.011	0.004	0.013
6/7/1999	0.011	0.017	0.000	0.025	0.000	0.000	0.013	0.000	0.017	0.013	0.011	0.002	0.012
9/29/1999	0.010	NAI	0.000	0.022	NAI	0.005	0.000	0.000	0.016	0.015	NAI	0.000	0.015
No. of Samples:	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean+:	0.010	0.013	0.001	0.025	0.000	0.006	0.005	0.000	0.018	0.009	0.013	0.003	0.016
Median+:	0.010	0.017	0.001	0.024	0.000	0.007	0.004	0.000	0.018	0.011	0.011	0.003	0.014

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 24+27 (ng/L)	Cong. 25 (ng/L)	Cong. 26 (ng/L)	Cong. 28+31 (ng/L)	Cong. 3 (ng/L)	Cong. 33 (ng/L)	Cong. 37+42 (ng/L)	Cong. 4+10 (ng/L)	Cong. 40 (ng/L)	Cong. 41+71+64 (ng/L)	Cong. 44 (ng/L)	Cong. 45 (ng/L)	Cong. 46 (ng/L)
210102 Escanaba River													
4/6/1999	0.000	0.000	0.000			0.040	0.000	0.021	0.000	0.016	0.024	NAI	NAI
4/12/1999	0.000	0.000	NAI	0.025	0.000	0.006	0.000	0.000	NAI	NAI	0.012	0.000	0.000
6/7/1999	0.000	0.000	0.000	0.050	0.000	0.018	NAI	0.028	NAI	NAI	0.016	0.000	0.000
9/29/1999	NAI	0.000	0.000	0.037	0.000	0.028	0.000	0.000	NAI	0.000	0.031	0.000	0.000
No. of Samples:	4	4	4	4	4	4	4	4	4	4	4	4	4
Mean+:	0.000	0.000	0.000	0.037	0.000	0.023	0.000	0.012	0.000	0.008	0.021	0.000	0.000
Median+:	0.000	0.000	0.000	0.037	0.000	0.023	0.000	0.010	0.000	0.008	0.020	0.000	0.000

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 8+5 (ng/L)	Cong. 82 (ng/L)	Cong. 83 (ng/L)	Cong. 85 (ng/L)	Cong. 87 (ng/L)	Cong. 89 (ng/L)	Cong. 91 (ng/L)	Cong. 92+84 (ng/L)	Cong. 95 (ng/L)	Cong. 97 (ng/L)	Cong. 99 (ng/L)
210102 Escanaba River											
4/6/1999	0.067	0.000	0.001	0.004	0.009	0.003	0.005	0.014	0.021	0.004	0.006
4/12/1999	0.042	0.002	0.000	0.003	0.005	0.000	0.000	0.000	0.009	0.003	0.004
6/7/1999	0.105	0.000	0.000	0.003	0.003	0.000	0.000	0.000	0.011	0.002	0.000
9/29/1999	0.084	0.003	0.000	0.000	0.006	0.000	0.004	0.000	0.011	0.003	0.003
No. of Samples:	4	4	4	4	4	4	4	4	4	4	4
Mean+:	0.074	0.001	0.000	0.002	0.006	0.001	0.002	0.003	0.013	0.003	0.004
Median+:	0.075	0.001	0.000	0.003	0.005	0.000	0.002	0.000	0.011	0.003	0.004

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	4,4'-DDD (ng/L)	4,4'-DDE (ng/L)	4,4'-DDT (ng/L)	oxychlordane (ng/L)	alpha-chlordane (ng/L)	cis-nonachlor (ng/L)	gamma-chlordane (ng/L)	trans- nonachlor (ng/L)
210102 Escanaba River								
4/6/1999	0.040	0.057	0.031	0.000	0.000	0.000	0.000	0.009
4/12/1999								
6/7/1999								
9/29/1999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. of Samples:	4	4	4	4	4	4	4	4
Mean+:	0.020	0.029	0.016	0.000	0.000	0.000	0.000	0.005
Median+:	0.020	0.029	0.016	0.000	0.000	0.000	0.000	0.005

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 101 (ng/L)	Cong. 118 (ng/L)	Cong. 123+149 (ng/L)	Cong. 128 (ng/L)	Cong. 132+153+105 (ng/L)	Cong. 135+144 (ng/L)	Cong. 136 (ng/L)	Cong. 137+176 (ng/L)	Cong. 141 (ng/L)	Cong. 146 (ng/L)	Cong. 15+17 (ng/L)	Cong. 151 (ng/L)
700123 Grand River (Lower)												
3/30/1999	0.073	0.056	0.043	0.020	0.093	0.016	0.005	0.000	0.014	0.014	0.079	0.014
4/13/1999	0.104	0.091	0.079	0.034	0.155	0.030	0.012	0.000	0.023	NAI	0.092	0.025
4/27/1999	0.139	0.097	0.094	0.036	0.181	0.033	0.000	NDD	0.025	NAI	0.087	0.029
5/3/1999	0.110	0.064	0.065	0.027	NAI	0.026	0.000	0.000	0.021	NAI	0.079	0.023
6/28/1999	0.132	0.104	0.087	0.037	0.174	0.031	0.000	0.000	0.026	0.030	0.129	0.027
8/18/1999	0.073	0.056	0.050	0.021	0.098	0.017	0.000	0.000	0.018	0.031	0.049	
9/2/1999	0.108	0.083	0.060	0.028	0.122	0.024	0.012	0.001	0.021	NAI	0.058	0.019
9/30/1999	0.084	0.079	0.055	0.027	0.116	0.021	0.009	0.000	0.019	NAI	0.042	0.017
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.103	0.079	0.067	0.029	0.134	0.025	0.005	0.000	0.021	0.025	0.077	0.022
Median+:	0.106	0.081	0.062	0.028	0.122	0.025	0.003	0.000	0.021	0.030	0.079	0.023

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 158 (ng/L)	Cong. 16+32 (ng/L)	Cong. 163+138 (ng/L)	Cong. 167 (ng/L)	Cong. 170+190 (ng/L)	Cong. 172 (ng/L)	Cong. 174 (ng/L)	Cong. 177 (ng/L)	Cong. 178 (ng/L)	Cong. 18 (ng/L)	Cong. 180 (ng/L)	Cong. 183 (ng/L)	Cong. 185 (ng/L)
700123 Grand River (Lower)													
3/30/1999	0.013	0.070	0.114	0.006	0.016	0.000	0.017	0.011	0.006	0.044	0.029	0.009	0.001
4/13/1999	0.024	0.093	0.197	0.011	0.031	0.000	0.032	0.021	0.010	0.072	0.058	0.016	0.004
4/27/1999	0.026	1.192	0.221	0.011	0.038	0.000	0.036	0.024	0.011	0.059	0.073	0.018	0.003
5/3/1999	0.020	0.107	0.156	0.008	0.020	0.000	0.025	0.018	0.008	0.052	0.044	0.014	0.002
6/28/1999	0.026	0.110	0.212	0.011	0.033	0.008	0.031	0.021	0.011	0.096	0.055	0.017	0.003
8/18/1999	0.016	0.035	0.124	0.007	0.022	0.004	0.021	0.014	0.007	0.045	0.033	0.012	0.002
9/2/1999	0.020	0.037	0.165	0.009	0.023	0.006	0.028	0.015	0.008	0.041	0.042	0.014	0.000
9/30/1999	0.020	0.143	0.153	NAI	0.024	0.006	0.023	0.015	0.008	0.029	0.041	0.012	0.002
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.021	0.223	0.168	0.009	0.026	0.003	0.027	0.017	0.009	0.055	0.047	0.014	0.002
Median+:	0.020	0.100	0.161	0.009	0.023	0.002	0.026	0.017	0.008	0.048	0.043	0.014	0.002

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID		Cong. 187+182 (ng/L)	Cong. 19 (ng/L)	Cong. 193 (ng/L)	Cong. 194 (ng/L)	Cong. 198 (ng/L)	Cong. 199 (ng/L)	Cong. 201 (ng/L)	Cong. 202+171 (ng/L)	Cong. 203+196 (ng/L)	Cong. 206 (ng/L)	Cong. 207 (ng/L)	Cong. 208+195 (ng/L)	Cong. 22 (ng/L)
700123	Grand River (Lower)													
	3/30/1999	0.016	NAI	0.003	0.009	0.000	0.001	0.017	0.013	0.018	0.007	0.000	0.005	0.031
	4/13/1999	0.031	NAI	0.005	0.017	0.000	0.002	0.032	0.013	0.032	0.015	0.000	0.010	0.047
	4/27/1999	0.036	NAI	0.006	0.021	NDD	0.000	0.044	0.013	0.037	0.017	NDD	0.012	0.047
	5/3/1999	0.025	0.028	0.004	0.012	NAI	0.002	0.025	0.011	0.030	0.009	0.000	0.007	0.049
	6/28/1999	0.031	0.012	0.005	0.017	0.000	0.002	0.037	0.012	0.036	0.020	0.000	0.012	0.065
	8/18/1999	0.021	NAI	0.004	0.012	0.000	0.002	0.021	0.009	0.020	0.009	0.000	0.007	0.044
	9/2/1999	0.022	0.026	0.005	0.015	0.000	0.002	0.034	0.011	0.033	0.015	0.001	0.010	0.033
	9/30/1999	0.022	NAI	0.005	0.015	0.000	0.003	0.040	0.012	0.040	0.028	0.002	0.014	0.025
	No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8	8
	Mean+:	0.025	0.022	0.005	0.015	0.000	0.002	0.031	0.012	0.031	0.015	0.000	0.010	0.043
	Median+:	0.024	0.026	0.005	0.015	0.000	0.002	0.033	0.012	0.032	0.015	0.000	0.010	0.045

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 47+48 (ng/L)	Cong. 49 (ng/L)	Cong. 51 (ng/L)	Cong. 52 (ng/L)	Cong. 53 (ng/L)	Cong. 56+60 (ng/L)	Cong. 6 (ng/L)	Cong. 63 (ng/L)	Cong. 66 (ng/L)	Cong. 7+9 (ng/L)	Cong. 70+76 (ng/L)	Cong. 74 (ng/L)	Cong. 77+110 (ng/L)
700123 Grand River (Lower)													
3/30/1999	0.026	0.027	0.008	0.313	NAI	0.027	0.000	0.000	0.052	0.056	0.034	0.019	0.111
4/13/1999	0.019	0.054	0.005	0.536	NAI	0.032	0.015	0.000	0.064	0.026	0.050	0.018	0.162
4/27/1999	0.028	0.066	0.006	NAI	NAI	0.035	NAI	NDD	0.082	0.054	0.176	0.022	0.194
5/3/1999		0.088	0.004	0.354	NAI	0.033	0.000	0.000	0.066	0.045	0.058	0.020	0.181
6/28/1999	0.029	NAI	0.008	0.314	NAI	0.048	NAI	0.000	0.135	0.024	NAI	0.030	0.218
8/18/1999	0.015	NAI	0.000	0.132	NAI	0.019	0.018	0.000	0.096	0.025	0.084	NAI	0.131
9/2/1999	0.020	0.072	0.003	0.171	NAI	0.031	0.000	0.000	0.085	0.033	0.058	0.021	0.164
9/30/1999	0.018	NAI	0.004	NAI	NAI	0.027	0.000	0.000	0.060	0.026	0.045	0.015	0.135
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.022	0.061	0.005	0.303	0.000	0.031	0.006	0.000	0.080	0.036	0.072	0.021	0.162
Median+:	0.020	0.066	0.004	0.314	0.000	0.031	0.000	0.000	0.074	0.029	0.058	0.020	0.163

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 24+27 (ng/L)	Cong. 25 (ng/L)	Cong. 26 (ng/L)	Cong. 28+31 (ng/L)	Cong. 3 (ng/L)	Cong. 33 (ng/L)	Cong. 37+42 (ng/L)	Cong. 4+10 (ng/L)	Cong. 40 (ng/L)	Cong. 41+71+64 (ng/L)	Cong. 44 (ng/L)	Cong. 45 (ng/L)	Cong. 46 (ng/L)
700123 Grand River (Lower)													
3/30/1999	0.006	NAI	NAI	0.120	0.369	0.025	NAI	0.053	0.016	0.049	0.060	0.009	0.006
4/13/1999	0.009	NAI	NAI	0.138	0.000	0.058	NAI	0.057	0.020	0.066	0.088	NAI	0.008
4/27/1999	NAI	NAI	NAI			NAI	NAI	0.164	NAI	NAI	0.114	NAI	NAI
5/3/1999	0.008	NAI	NAI	0.160	0.000	0.071	NAI	0.053	NAI	NAI	NAI	NAI	NAI
6/28/1999	0.011	NAI	NAI	0.213	0.000	0.071	0.063	0.076	0.034	0.074	0.096	NAI	0.008
8/18/1999	NAI	NAI	NAI	0.082	0.000	NAI	NAI	NAI	NAI	0.051	NAI	NAI	0.000
9/2/1999	NAI	NAI	NAI	0.088	0.000	0.030	NAI	0.037	0.015	0.046	0.069	0.010	0.000
9/30/1999	NAI	NAI	NAI	0.064	0.461	0.053	NAI	0.051	NAI	0.036	0.059	0.005	0.000
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.009	0.000	0.000	0.124	0.119	0.052	0.063	0.070	0.021	0.054	0.081	0.008	0.004
Median+:	0.009	0.000	0.000	0.120	0.000	0.056	0.063	0.053	0.018	0.050	0.079	0.009	0.003

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 8+5 (ng/L)	Cong. 82 (ng/L)	Cong. 83 (ng/L)	Cong. 85 (ng/L)	Cong. 87 (ng/L)	Cong. 89 (ng/L)	Cong. 91 (ng/L)	Cong. 92+84 (ng/L)	Cong. 95 (ng/L)	Cong. 97 (ng/L)	Cong. 99 (ng/L)
700123 Grand River (Lower)											
3/30/1999	0.127	0.010	0.007	0.018	0.034	0.007	0.015	0.054	0.056	0.020	0.028
4/13/1999	0.202	0.017	0.010	0.027	0.052	0.013	0.023	0.094	0.107	0.028	0.037
4/27/1999		NAI	0.010	0.032	0.064	0.025	0.032	0.100	0.114	0.034	0.045
5/3/1999	0.194	0.016	0.000	0.025	0.057	0.016	0.025	0.087	0.103	0.032	0.038
6/28/1999	0.345	0.043	0.011	0.033	0.066	0.028	0.026	0.109	0.141	0.033	0.048
8/18/1999	0.122	NAI	0.005	0.019	0.038	NAI	0.015	0.055	0.076	0.019	0.028
9/2/1999	0.132	0.013	0.011	0.026	0.052	NAI	0.022	0.080	0.082	0.027	0.040
9/30/1999	0.270	0.014	0.009	0.021	0.042	0.007	0.017	0.066	0.062	0.024	0.030
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.199	0.019	0.008	0.025	0.051	0.016	0.022	0.081	0.093	0.027	0.037
Median+:	0.194	0.015	0.009	0.026	0.052	0.015	0.023	0.084	0.093	0.027	0.037

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID		4,4'-DDD (ng/L)	4,4'-DDE (ng/L)	4,4'-DDT (ng/L)	oxychlordane (ng/L)	alpha-chlordane (ng/L)	cis-nonachlor (ng/L)	gamma-chlordane (ng/L)	trans- nonachlor (ng/L)
700123	Grand River (Lower)								
	3/30/1999								
	4/13/1999								
	4/27/1999	0.260	0.644	0.437	0.000	0.150	0.031	0.146	0.115
	5/3/1999								
	6/28/1999	0.450	1.100	1.100	0.024	0.350	0.081	0.310	0.240
	8/18/1999								
	9/2/1999								
	9/30/1999								
	No. of Samples:	8	8	8	8	8	8	8	8
	Mean+:	0.355	0.872	0.769	0.012	0.250	0.056	0.228	0.178
	Median+:	0.355	0.872	0.769	0.012	0.250	0.056	0.228	0.178

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 101 (ng/L)	Cong. 118 (ng/L)	Cong. 123+149 (ng/L)	Cong. 128 (ng/L)	Cong. 132+153+105 (ng/L)	Cong. 135+144 (ng/L)	Cong. 136 (ng/L)	Cong. 137+176 (ng/L)	Cong. 141 (ng/L)	Cong. 146 (ng/L)	Cong. 15+17 (ng/L)	Cong. 151 (ng/L)
030077 Kalamazoo River (Lower)												
3/31/1999	0.395	0.293	0.168	0.066	0.365	0.063	0.040	0.003	0.039	0.075	0.516	0.052
4/12/1999	0.511	0.344	0.218	0.086	0.460	0.083	0.048	0.004	0.055	0.093	0.523	0.067
4/26/1999	0.248	0.214	0.137	0.056	0.272	0.050	0.025	0.000	0.038	0.172	0.296	0.042
4/29/1999	0.289	0.232	0.128	0.056	0.268	0.049	0.026	0.002	0.035	NAI	0.359	0.040
6/29/1999	0.452	0.329	0.184	0.071	0.395	0.070	0.046	0.003	0.046	0.078	0.664	0.057
7/22/1999	0.844	0.569	0.380	0.139	0.774	0.146	0.085	NDD	0.093	0.192	0.919	0.118
8/26/1999	0.480	0.328	0.220	0.082	0.450	0.082	0.052	NDD	0.051	0.104	0.607	0.068
9/1/1999	0.590	0.415	0.261	0.095	0.548	0.101	0.065	0.004	0.058	NAI	0.702	0.083
9/29/1999	0.628	0.375	0.251	0.095	0.529	0.098	0.073	0.004	0.060	0.114	0.692	0.080
No. of Samples:	9	9	9	9	9	9	9	9	9	9	9	9
Mean+:	0.493	0.344	0.216	0.083	0.451	0.082	0.051	0.002	0.053	0.118	0.586	0.068
Median+:	0.480	0.329	0.218	0.082	0.450	0.082	0.048	0.003	0.051	0.104	0.607	0.067

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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NDD = Not detected due to dilution.

STORET ID	Cong. 158 (ng/L)	Cong. 16+32 (ng/L)	Cong. 163+138 (ng/L)	Cong. 167 (ng/L)	Cong. 170+190 (ng/L)	Cong. 172 (ng/L)	Cong. 174 (ng/L)	Cong. 177 (ng/L)	Cong. 178 (ng/L)	Cong. 18 (ng/L)	Cong. 180 (ng/L)	Cong. 183 (ng/L)	Cong. 185 (ng/L)
030077 Kalamazoo River (Lower)													
3/31/1999	0.041	0.394	0.397	0.015	0.051	0.011	0.049	0.034	0.017	0.358	0.099	0.029	0.004
4/12/1999	0.048	0.403	0.498	0.018	0.074	0.018	0.073	0.048	0.024	0.411	0.155	0.040	0.006
4/26/1999	0.033	0.252	0.342	0.013	0.053	0.013	0.053	0.036	0.017	0.230	0.110	0.029	0.005
4/29/1999	0.033	0.281	0.337	0.012	0.045	0.010	0.044	0.030	0.015	0.283	0.089	0.023	0.004
6/29/1999	0.045	0.427	0.424	0.017	0.051	0.013	0.051	0.037	0.018	0.517	0.098	0.030	0.004
7/22/1999	0.090	0.447	0.849	0.031	0.107	0.027	0.106	0.076	0.039	0.688	0.214	0.063	0.010
8/26/1999	0.052	0.324	0.503	0.018	0.072	0.017	0.062	0.047	0.023	0.458	0.137	0.038	0.006
9/1/1999	0.061	0.372	0.601	NAI	0.074	0.019	0.073	0.055	0.027	0.530	0.147	0.044	0.007
9/29/1999	0.060	0.361	0.576	0.022	0.072	0.019	0.071	0.052	0.026	0.541	0.133	0.041	0.006
No. of Samples:	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean+:	0.051	0.363	0.503	0.018	0.066	0.016	0.065	0.046	0.023	0.446	0.131	0.037	0.006
Median+:	0.048	0.372	0.498	0.018	0.072	0.017	0.062	0.047	0.023	0.458	0.133	0.038	0.006

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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STORET ID	Cong. 187+182 (ng/L)	Cong. 19 (ng/L)	Cong. 193 (ng/L)	Cong. 194 (ng/L)	Cong. 198 (ng/L)	Cong. 199 (ng/L)	Cong. 201 (ng/L)	Cong. 202+171 (ng/L)	Cong. 203+196 (ng/L)	Cong. 206 (ng/L)	Cong. 207 (ng/L)	Cong. 208+195 (ng/L)	Cong. 22 (ng/L)
030077 Kalamazoo River (Lower)													
3/31/1999	0.054	0.032	0.008	0.023	0.000	0.004	0.048	0.014	0.050	0.016	0.000	0.013	0.176
4/12/1999	0.074	NAI	0.012	0.044	0.000	0.007	0.078	0.019	0.084	0.023	0.000	0.021	0.221
4/26/1999	0.053	0.032	0.009	0.031	0.000	0.005	0.065	0.015	0.066	0.019	0.000	0.016	0.090
4/29/1999	0.046	0.028	0.007	0.023	0.000	0.004	0.044	0.012	0.050	0.016	0.001	0.013	0.110
6/29/1999	0.058	0.063	0.008	0.023	0.000	0.004	0.042	0.015	0.045	0.015	NDD	0.013	0.237
7/22/1999	0.117	0.066	0.017	0.051	NDD	0.008	0.099	0.031	0.098	0.033	NDD	0.026	0.324
8/26/1999	0.072	0.063	0.011	0.034	NAI	0.005	0.063	0.020	0.064	0.022	NDD	0.018	0.204
9/1/1999	0.082	0.050	0.013	0.037	0.000	0.005	0.088	0.021	0.086	0.024	NDD	0.019	0.236
9/29/1999	0.079	NAI	0.012	0.032	0.000	0.006	0.067	0.020	0.069	0.021	0.002	0.018	0.294
No. of Samples:	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean+:	0.071	0.048	0.011	0.033	0.000	0.005	0.066	0.018	0.068	0.021	0.000	0.017	0.210
Median+:	0.072	0.050	0.011	0.032	0.000	0.005	0.065	0.019	0.066	0.021	0.000	0.018	0.221

+ = Calculated value; not rounded to appropriate number of significant digits.
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FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID		Cong. 47+48 (ng/L)	Cong. 49 (ng/L)	Cong. 51 (ng/L)	Cong. 52 (ng/L)	Cong. 53 (ng/L)	Cong. 56+60 (ng/L)	Cong. 6 (ng/L)	Cong. 63 (ng/L)	Cong. 66 (ng/L)	Cong. 7+9 (ng/L)	Cong. 70+76 (ng/L)	Cong. 74 (ng/L)	Cong. 77+110 (ng/L)
030077	Kalamazoo River (Lower)													
	3/31/1999	0.222	0.442	0.031	0.731	0.083	0.256	0.059	0.030	0.748	0.019	0.362	0.154	0.545
	4/12/1999	0.227	0.492	0.029	0.790	NAI	0.260	0.060	0.033	0.815	0.023	0.386	0.173	0.683
	4/26/1999	0.108	0.248	0.016	0.413	0.042	0.138	NAI	0.016	0.504	0.029	0.231	0.079	0.356
	4/29/1999	0.130	0.295	0.017	0.484	0.051	0.173	0.052	0.019	0.555	0.018	0.250	0.099	0.407
	6/29/1999	0.261	0.542	0.031	0.857	0.093	0.291	0.099	0.038	0.922	0.053	0.437	0.195	0.604
	7/22/1999	0.404	0.915	0.041	1.343	0.136	0.476	0.104	0.057	1.346	0.032	0.665	0.294	1.038
	8/26/1999	0.253	0.655	0.027	0.841	0.088	0.253	0.084	0.034	0.749	0.026	0.390	0.170	0.630
	9/1/1999	0.318	0.643	0.030	1.049	0.111	0.307	0.086	0.043	1.022	0.025	0.467	0.203	0.737
	9/29/1999	0.334	0.783	0.025	1.094	0.114	0.333	0.052	0.050	1.032	NAI	0.466	0.234	0.812
	No. of Samples:	9	9	9	9	9	9	9	9	9	9	9	9	9
	Mean+:	0.251	0.557	0.027	0.845	0.090	0.276	0.075	0.035	0.855	0.028	0.406	0.178	0.646
	Median+:	0.253	0.542	0.029	0.841	0.091	0.260	0.072	0.034	0.815	0.025	0.390	0.173	0.630

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FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 24+27 (ng/L)	Cong. 25 (ng/L)	Cong. 26 (ng/L)	Cong. 28+31 (ng/L)	Cong. 3 (ng/L)	Cong. 33 (ng/L)	Cong. 37+42 (ng/L)	Cong. 4+10 (ng/L)	Cong. 40 (ng/L)	Cong. 41+71+64 (ng/L)	Cong. 44 (ng/L)	Cong. 45 (ng/L)	Cong. 46 (ng/L)
030077 Kalamazoo River (Lower)													
3/31/1999	0.042	0.090	0.175	1.297	0.283	0.150	0.357	0.086	0.117	0.474	0.532	0.093	0.051
4/12/1999	0.044	0.086	0.167	1.324	0.000	NAI	0.372	0.100	0.123	0.502	0.559	0.099	0.056
4/26/1999	0.027	0.042	0.085	0.611	0.000	0.070	0.242	0.088	0.062	0.254	0.283	0.052	0.028
4/29/1999	0.028	0.054	0.112	0.784	0.000	0.083	0.268	0.080	0.067	0.303	0.331	0.061	0.032
6/29/1999	0.056	0.103	0.205	1.628	NDD	0.194	0.416	0.166	0.135	0.546	0.610	0.114	0.063
7/22/1999	0.071	0.162	0.306	2.406	NDD	0.268	0.636	0.169	0.202	0.844	0.935	0.167	0.092
8/26/1999	0.054	0.097	0.188	0.920	NDD	0.163	0.397	0.120	0.128	0.518	0.571	0.104	0.059
9/1/1999	0.061	0.110	0.213	1.706	NDD	0.185	0.491	0.149	0.143	0.593	0.679	0.131	0.071
9/29/1999	0.063	0.118	0.222	1.827	NDD	0.196	0.507	0.100	0.171	0.614	0.733	0.137	0.073
No. of Samples:	9	9	9	9	9	9	9	9	9	9	9	9	9
Mean+:	0.050	0.096	0.186	1.389	0.031	0.164	0.409	0.118	0.128	0.517	0.581	0.107	0.058
Median+:	0.054	0.097	0.188	1.324	0.000	0.174	0.397	0.100	0.128	0.518	0.571	0.104	0.059

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 8+5 (ng/L)	Cong. 82 (ng/L)	Cong. 83 (ng/L)	Cong. 85 (ng/L)	Cong. 87 (ng/L)	Cong. 89 (ng/L)	Cong. 91 (ng/L)	Cong. 92+84 (ng/L)	Cong. 95 (ng/L)	Cong. 97 (ng/L)	Cong. 99 (ng/L)
030077 Kalamazoo River (Lower)											
3/31/1999	0.368	0.044	0.039	0.098	0.132	0.015	0.102	0.313	0.370	0.105	0.193
4/12/1999	0.373	0.058	0.048	0.115	0.154	0.028	0.120	0.359	0.403	0.123	0.247
4/26/1999	0.252	0.030	0.024	0.071	0.083	0.012	0.059	0.189	0.241	0.065	0.125
4/29/1999	0.277	0.031	0.027	0.084	0.094	0.011	0.068	0.200	0.239	0.072	0.148
6/29/1999	0.588	0.052	0.042	0.111	0.145	0.020	0.115	0.348	0.413	0.115	0.228
7/22/1999	0.697	0.112	0.073	0.186	0.246	0.034	0.209	0.597	0.727	0.197	0.411
8/26/1999	0.500	0.068	0.042	0.113	0.149	0.024	0.123	0.362	0.492	0.118	0.242
9/1/1999	0.577	0.060	0.055	0.130	0.174	NDD	0.153	0.437	0.554	0.138	0.295
9/29/1999	0.518	0.079	0.057	0.146	0.186	0.029	0.162	0.488	0.540	0.157	0.313
No. of Samples:	9	9	9	9	9	9	9	9	9	9	9
Mean+:	0.461	0.059	0.045	0.117	0.151	0.019	0.124	0.366	0.442	0.121	0.245
Median+:	0.500	0.058	0.042	0.113	0.149	0.020	0.120	0.359	0.413	0.118	0.242

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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STORET ID	4,4'-DDD (ng/L)	4,4'-DDE (ng/L)	4,4'-DDT (ng/L)	oxychlordane (ng/L)	alpha-chlordane (ng/L)	cis-nonachlor (ng/L)	gamma-chlordane (ng/L)	trans- nonachlor (ng/L)
030077 Kalamazoo River (Lower)								
3/31/1999	0.141	0.214	0.039	0.000	0.064	0.017	0.057	0.039
4/12/1999								
4/26/1999								
4/29/1999	0.095	0.151	0.070	0.000	0.045	0.012	0.037	0.029
6/29/1999								
7/22/1999								
8/26/1999								
9/1/1999								
9/29/1999								
No. of Samples:	9	9	9	9	9	9	9	9
Mean+:	0.118	0.183	0.055	0.000	0.055	0.015	0.047	0.034
Median+:	0.118	0.183	0.055	0.000	0.055	0.015	0.047	0.034

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 101 (ng/L)	Cong. 118 (ng/L)	Cong. 123+149 (ng/L)	Cong. 128 (ng/L)	Cong. 132+153+105 (ng/L)	Cong. 135+144 (ng/L)	Cong. 136 (ng/L)	Cong. 137+176 (ng/L)	Cong. 141 (ng/L)	Cong. 146 (ng/L)	Cong. 15+17 (ng/L)	Cong. 151 (ng/L)
770073 Manistique River												
4/8/1999	0.020	0.012	0.007	0.000	0.010	0.000	0.000	0.000	0.000	NAI	0.068	0.003
4/15/1999	0.010	0.008	0.003	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.036	0.000
5/24/1999	0.005	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.030	0.000
7/15/1999	0.007	0.004	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.061	0.000
8/18/1999	0.007	0.005	0.003	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.046	0.000
9/14/1999	0.007	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.034	0.000
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.009	0.005	0.002	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.046	0.000
Median+:	0.007	0.004	0.001	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.041	0.000

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FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 158 (ng/L)	Cong. 16+32 (ng/L)	Cong. 163+138 (ng/L)	Cong. 167 (ng/L)	Cong. 170+190 (ng/L)	Cong. 172 (ng/L)	Cong. 174 (ng/L)	Cong. 177 (ng/L)	Cong. 178 (ng/L)	Cong. 18 (ng/L)	Cong. 180 (ng/L)	Cong. 183 (ng/L)	Cong. 185 (ng/L)
770073 Manistique River													
4/8/1999	0.000	0.179	0.020	0.000	0.000	0.000	0.004	0.000	0.000	0.029	0.006	0.000	0.000
4/15/1999	0.000	0.022	0.009	0.000	0.001	0.000	0.000	0.000	0.000	0.017	0.000	0.000	0.000
5/24/1999	0.000	0.019	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.000	0.000
7/15/1999	0.000	0.034	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.000	0.000	0.000
8/18/1999	0.000	0.034	0.008	0.000	0.000	0.000	0.001	0.000	0.000	0.017	0.000	0.000	0.000
9/14/1999	0.000	0.026	0.006	0.000	0.003	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.000	0.052	0.009	0.000	0.001	0.000	0.001	0.000	0.000	0.019	0.001	0.000	0.000
Median+:	0.000	0.030	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.000	0.000	0.000

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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NDD = Not detected due to dilution.

STORET ID	Cong. 187+182 (ng/L)	Cong. 19 (ng/L)	Cong. 193 (ng/L)	Cong. 194 (ng/L)	Cong. 198 (ng/L)	Cong. 199 (ng/L)	Cong. 201 (ng/L)	Cong. 202+171 (ng/L)	Cong. 203+196 (ng/L)	Cong. 206 (ng/L)	Cong. 207 (ng/L)	Cong. 208+195 (ng/L)	Cong. 22 (ng/L)
770073 Manistique River													
4/8/1999	0.005	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
4/15/1999	0.002	0.009	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.009
5/24/1999	0.001	0.004	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
7/15/1999	0.001	NAI	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017
8/18/1999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
9/14/1999	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.002	0.004	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.012
Median+:	0.001	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011

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FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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NDD = Not detected due to dilution.

STORET ID	Cong. 47+48 (ng/L)	Cong. 49 (ng/L)	Cong. 51 (ng/L)	Cong. 52 (ng/L)	Cong. 53 (ng/L)	Cong. 56+60 (ng/L)	Cong. 6 (ng/L)	Cong. 63 (ng/L)	Cong. 66 (ng/L)	Cong. 7+9 (ng/L)	Cong. 70+76 (ng/L)	Cong. 74 (ng/L)	Cong. 77+110 (ng/L)
770073 Manistique River													
4/8/1999	0.040	0.025	0.013	0.047	NAI	0.014	0.011	0.000	0.028	0.021	0.019	0.008	0.022
4/15/1999	0.012	0.017	0.003	0.026	NAI	0.010	0.000	0.000	0.020	0.012	0.013	0.005	0.015
5/24/1999	0.008	0.010	0.003	0.018	0.000	0.000	0.000	0.000	0.011	0.007	0.000	0.000	0.006
7/15/1999	0.015	0.027	0.005	0.024	NAI	0.000	0.000	0.000	0.027	NAI	0.011	0.000	0.010
8/18/1999	0.013	0.012	0.014	0.022	0.000	0.000	0.000	0.000	0.014	0.011	0.011	0.004	0.011
9/14/1999	0.008	0.012	0.008	0.021	NAI	0.000	0.000	0.000	0.009	0.008	0.000	0.000	0.009
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.016	0.017	0.008	0.026	0.000	0.004	0.002	0.000	0.018	0.012	0.009	0.003	0.012
Median+:	0.012	0.014	0.006	0.023	0.000	0.000	0.000	0.000	0.017	0.011	0.011	0.002	0.010

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 24+27 (ng/L)	Cong. 25 (ng/L)	Cong. 26 (ng/L)	Cong. 28+31 (ng/L)	Cong. 3 (ng/L)	Cong. 33 (ng/L)	Cong. 37+42 (ng/L)	Cong. 4+10 (ng/L)	Cong. 40 (ng/L)	Cong. 41+71+64 (ng/L)	Cong. 44 (ng/L)	Cong. 45 (ng/L)	Cong. 46 (ng/L)
770073 Manistique River													
4/8/1999	NAI	NAI	0.000			0.075	NAI	0.048	NAI	0.045	0.043	NAI	NAI
4/15/1999	0.000	0.000	0.000	0.039	0.000	0.011	0.000	0.021	NAI	NAI	0.014	0.000	0.000
5/24/1999	0.000	0.000	0.000	0.027	0.000	0.010	NAI	0.000	0.000	NAI	0.009	0.000	0.000
7/15/1999	NAI	0.000	0.000	0.051	0.000	0.018	NAI	0.029	NAI	0.000	0.014	0.000	0.000
8/18/1999	0.000	0.000	0.000	0.050	0.000	NAI	0.000	0.000	0.000	0.014	0.016	0.000	0.000
9/14/1999	NAI	0.000	0.000	0.026	0.000	0.000	0.014	0.000	0.000	NAI	0.012	0.000	0.000
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.000	0.000	0.000	0.039	0.000	0.023	0.005	0.016	0.000	0.020	0.018	0.000	0.000
Median+:	0.000	0.000	0.000	0.039	0.000	0.011	0.000	0.010	0.000	0.014	0.014	0.000	0.000

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 8+5 (ng/L)	Cong. 82 (ng/L)	Cong. 83 (ng/L)	Cong. 85 (ng/L)	Cong. 87 (ng/L)	Cong. 89 (ng/L)	Cong. 91 (ng/L)	Cong. 92+84 (ng/L)	Cong. 95 (ng/L)	Cong. 97 (ng/L)	Cong. 99 (ng/L)
770073 Manistique River											
4/8/1999	0.096	0.003	0.000	0.005	0.009	NAI	0.008	0.016	0.025	0.006	NAI
4/15/1999	0.066	0.000	0.000	0.003	0.006	0.001	0.002	0.000	0.010	0.003	NAI
5/24/1999	0.055	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.001	0.002
7/15/1999	0.123	0.000	0.000	0.000	0.000	0.000	0.000	NAI	0.014	0.000	0.002
8/18/1999	0.089	0.000	0.000	0.002	0.004	0.000	0.000	0.000	0.011	0.002	0.003
9/14/1999	0.065	0.000	0.000	0.000	0.000	0.000	0.000	NAI	0.007	0.000	0.000
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.083	0.000	0.000	0.002	0.003	0.000	0.002	0.004	0.012	0.002	0.002
Median+:	0.078	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.011	0.001	0.002

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	4,4'-DDD (ng/L)	4,4'-DDE (ng/L)	4,4'-DDT (ng/L)	oxychlordane (ng/L)	alpha-chlordane (ng/L)	cis-nonachlor (ng/L)	gamma-chlordane (ng/L)	trans- nonachlor (ng/L)
770073 Manistique River								
4/8/1999	0.000	0.025	0.032	0.000	0.000	0.000	0.000	0.000
4/15/1999								
5/24/1999								
7/15/1999								
8/18/1999								
9/14/1999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. of Samples:	6	6	6	6	6	6	6	6
Mean+:	0.000	0.013	0.016	0.000	0.000	0.000	0.000	0.000
Median+:	0.000	0.013	0.016	0.000	0.000	0.000	0.000	0.000

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 101 (ng/L)	Cong. 118 (ng/L)	Cong. 123+149 (ng/L)	Cong. 128 (ng/L)	Cong. 132+153+105 (ng/L)	Cong. 135+144 (ng/L)	Cong. 136 (ng/L)	Cong. 137+176 (ng/L)	Cong. 141 (ng/L)	Cong. 146 (ng/L)	Cong. 15+17 (ng/L)	Cong. 151 (ng/L)
580046 River Raisin												
7/6/1998	0.983	0.822	0.247	0.087	0.578	0.089	0.047	0.006	0.096	0.059	7.049	0.098
8/19/1998	0.750	0.710	0.216	0.074	0.476	0.083	0.054	0.006	NAI	0.066	4.879	0.077
8/26/1998	2.248	2.406	0.519	0.190	1.160	0.196	0.113	0.015	NAI	0.163	3.586	0.184
9/16/1998	2.498	2.415	0.609	0.189	1.205	0.243	0.162	0.017	0.170	0.183	1.729	0.210
9/21/1998	2.631	2.423	0.589	0.182	1.162	0.234	0.172	0.015	0.162	0.176	8.313	0.215
9/28/1998	2.378	2.424	0.541	0.183	NAI	0.205	0.148	0.013	0.158	0.155	4.083	0.185
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	1.915	1.867	0.454	0.151	0.916	0.175	0.116	0.012	0.146	0.134	8.273	0.161
Median+:	2.313	2.410	0.530	0.183	1.160	0.201	0.131	0.014	0.160	0.159	2.658	0.184

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 158 (ng/L)	Cong. 16+32 (ng/L)	Cong. 163+138 (ng/L)	Cong. 167 (ng/L)	Cong. 170+190 (ng/L)	Cong. 172 (ng/L)	Cong. 174 (ng/L)	Cong. 177 (ng/L)	Cong. 178 (ng/L)	Cong. 18 (ng/L)	Cong. 180 (ng/L)	Cong. 183 (ng/L)	Cong. 185 (ng/L)
580046 River Raisin													
7/6/1998	0.059	4.009	0.429	0.020	0.124	0.029	0.143	0.082	0.038	1.164	0.340	0.073	0.011
8/19/1998	0.054	3.324	0.454	0.018	0.111	0.024	0.094	0.066	0.033	1.129	0.245	0.059	0.009
8/26/1998	0.140	8.042	1.131	0.045	0.296	0.057	0.234	0.170	0.081	3.677	0.642	0.145	0.021
9/16/1998	0.141	6.110	1.222	0.052	0.313	0.077	0.253	0.188	0.102	4.321	0.649	0.156	0.026
9/21/1998	0.134	1.071	1.141	0.046	0.281	0.067	0.237	0.172	0.092	5.473	0.595	0.145	0.024
9/28/1998	0.125	7.978	1.147	0.041	0.268	0.058	0.226	0.162	0.074	4.133	0.576	0.133	0.021
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.109	3.422	0.921	0.037	0.232	0.052	0.198	0.140	0.070	3.316	0.508	0.118	0.018
Median+:	0.130	7.044	1.136	0.043	0.275	0.057	0.230	0.166	0.078	3.905	0.585	0.139	0.021

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FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 187+182 (ng/L)	Cong. 19 (ng/L)	Cong. 193 (ng/L)	Cong. 194 (ng/L)	Cong. 198 (ng/L)	Cong. 199 (ng/L)	Cong. 201 (ng/L)	Cong. 202+171 (ng/L)	Cong. 203+196 (ng/L)	Cong. 206 (ng/L)	Cong. 207 (ng/L)	Cong. 208+195 (ng/L)	Cong. 22 (ng/L)
580046 River Raisin													
7/6/1998	0.154	0.694	0.017	0.081	NDD	0.008	0.145	0.032	0.142	0.033	NDD	0.031	0.862
8/19/1998	0.111	0.359	0.015	0.067	NDD	0.007	0.110	0.024	0.119	0.031	NDD	0.028	0.983
8/26/1998	0.274	2.629	0.040	0.182	0.005	0.017	0.272	0.056	0.288	0.058	0.005	0.070	3.944
9/16/1998	0.303	1.600	0.047	0.197	NDD	0.022	0.287	0.062	0.325	0.079	NDD	0.074	3.452
9/21/1998	0.283	2.789	0.042	0.176	NDD	0.019	0.252	0.059	0.287	0.063	NDD	0.067	4.102
9/28/1998	0.270	3.340	0.037	0.160	NAI	0.016	0.235	0.055	0.262	0.056	NDD	0.062	3.502
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.233	1.902	0.033	0.144	0.001	0.015	0.217	0.048	0.237	0.053	0.001	0.055	2.808
Median+:	0.272	2.114	0.039	0.168	0.000	0.016	0.243	0.055	0.275	0.057	0.000	0.065	3.477

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FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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NDD = Not detected due to dilution.

STORET ID	Cong. 47+48 (ng/L)	Cong. 49 (ng/L)	Cong. 51 (ng/L)	Cong. 52 (ng/L)	Cong. 53 (ng/L)	Cong. 56+60 (ng/L)	Cong. 6 (ng/L)	Cong. 63 (ng/L)	Cong. 66 (ng/L)	Cong. 7+9 (ng/L)	Cong. 70+76 (ng/L)	Cong. 74 (ng/L)	Cong. 77+110 (ng/L)
580046 River Raisin													
7/6/1998	1.314	FBK2.057	0.268	3.716	0.543	1.872	0.348	0.178	3.594	0.159	2.013	1.157	1.560
8/19/1998	1.345	1.861	0.225	3.126	0.435	1.351	0.629	0.164	2.616	0.139	1.498	0.956	1.305
8/26/1998	6.045	6.486	1.082	0.301	1.718	4.826	2.496	0.594	9.850	0.603	5.460	3.541	4.116
9/16/1998	5.334	6.864	1.012	0.046	1.611	5.086	2.422	0.636	0.514	0.486	5.762	3.568	4.817
9/21/1998	6.760	8.129	1.328	3.822	2.263	5.465	2.617	0.666	0.987	0.543	6.248	4.000	4.983
9/28/1998	5.162	5.982	1.174	9.452	1.703	5.033	1.976	0.548	0.110	0.474	5.547	3.625	4.254
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	4.327	5.230	0.848	8.411	1.379	3.939	1.748	0.464	7.945	0.401	4.421	2.808	3.506
Median+:	5.248	6.234	1.047	9.749	1.657	4.929	2.199	0.571	9.980	0.480	5.504	3.554	4.185

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FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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NDD = Not detected due to dilution.

STORET ID	Cong. 24+27 (ng/L)	Cong. 25 (ng/L)	Cong. 26 (ng/L)	Cong. 28+31 (ng/L)	Cong. 3 (ng/L)	Cong. 33 (ng/L)	Cong. 37+42 (ng/L)	Cong. 4+10 (ng/L)	Cong. 40 (ng/L)	Cong. 41+71+64 (ng/L)	Cong. 44 (ng/L)	Cong. 45 (ng/L)	Cong. 46 (ng/L)
580046 River Raisin													
7/6/1998	0.324	0.660	1.032	6.664	NDD	0.530	1.997	3.162	0.627	2.851	FBK3.085	0.462	0.301
8/19/1998	0.301	0.935	1.274	5.922	NDD	0.723	1.626	1.113	0.495	2.264	2.366	0.308	0.216
8/26/1998	1.401	3.085	3.961	2.043	1.536	2.644	5.900	0.821	1.586	7.950	8.032	0.987	0.914
9/16/1998	1.227	3.479	4.873	2.455	NAI	2.437	6.005	5.934	1.679	8.502	8.091	1.083	0.859
9/21/1998	1.763	3.676	5.431	4.904	0.801	2.688	6.940	2.175	1.977	9.653	9.411	1.360	1.188
9/28/1998	1.517	3.021	4.066	0.469	0.991	2.251	6.063	4.687	1.654	8.148	7.731	1.153	0.967
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	1.089	2.476	3.440	7.076	0.666	1.879	4.755	7.982	1.336	6.561	6.453	0.892	0.741
Median+:	1.314	3.053	4.014	1.256	0.801	2.344	5.952	8.377	1.620	8.049	7.881	1.035	0.886

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STORET ID	Cong. 8+5 (ng/L)	Cong. 82 (ng/L)	Cong. 83 (ng/L)	Cong. 85 (ng/L)	Cong. 87 (ng/L)	Cong. 89 (ng/L)	Cong. 91 (ng/L)	Cong. 92+84 (ng/L)	Cong. 95 (ng/L)	Cong. 97 (ng/L)	Cong. 99 (ng/L)
580046 River Raisin											
7/6/1998	2.410	0.201	0.110	0.398	0.498	0.056	0.374	1.194	1.154	0.316	0.520
8/19/1998	4.046	0.146	0.096	0.325	0.372	0.037	0.319	0.933	0.853	0.237	0.428
8/26/1998	5.791	0.450	0.293	0.963	1.124	0.111	0.986	2.927	2.333	0.823	1.411
9/16/1998	5.946	0.482	0.355	1.107	1.286	0.154	1.121	3.303	2.688	0.896	1.540
9/21/1998	8.519	0.513	0.366	1.143	1.346	0.162	1.203	3.712	2.921	0.967	1.656
9/28/1998	4.494	0.489	0.310	1.006	1.187	0.140	0.990	2.991	2.419	0.855	1.468
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6
Mean+:	3.534	0.380	0.255	0.824	0.969	0.110	0.832	2.510	2.061	0.682	1.170
Median+:	5.220	0.466	0.301	0.985	1.156	0.126	0.988	2.959	2.376	0.839	1.439

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STORET ID	4,4'-DDD (ng/L)	4,4'-DDE (ng/L)	4,4'-DDT (ng/L)	oxychlordane (ng/L)	alpha-chlordane (ng/L)	cis-nonachlor (ng/L)	gamma-chlordane (ng/L)	trans- nonachlor (ng/L)
580046 River Raisin								
7/6/1998	0.251	0.320	0.069	0.017	0.074	0.013	0.051	0.041
8/19/1998	0.272	0.303	0.189	0.000	0.077	0.020	0.062	0.028
8/26/1998	0.295	0.488	0.208	0.000	0.075	0.020	0.062	NAI
9/16/1998	0.347	0.624	0.183	0.000	NAI	0.020	0.068	0.019
9/21/1998	0.325	0.461	0.145	0.000	NAI	0.014	0.046	NAI
9/28/1998	0.269	0.403	0.078	NAI	0.050	0.013	0.038	NAI
No. of Samples:	6	6	6	6	6	6	6	6
Mean+:	0.293	0.433	0.145	0.003	0.069	0.017	0.055	0.029
Median+:	0.284	0.432	0.164	0.000	0.075	0.017	0.057	0.028

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 101 (ng/L)	Cong. 118 (ng/L)	Cong. 123+149 (ng/L)	Cong. 128 (ng/L)	Cong. 132+153+105 (ng/L)	Cong. 135+144 (ng/L)	Cong. 136 (ng/L)	Cong. 137+176 (ng/L)	Cong. 141 (ng/L)	Cong. 146 (ng/L)	Cong. 15+17 (ng/L)	Cong. 151 (ng/L)
090177 Saginaw River												
6/15/1998	0.438	0.320	0.256	0.079	0.491	0.095	0.038	0.006	NAI	0.065	1.362	0.104
7/9/1998	0.308	0.231	0.143	0.051	0.288	0.057	0.026	NDD	NAI	NAI	1.592	0.063
8/6/1998	0.382	0.327	0.216	0.067	0.407	0.084	0.044	NDD	NAI	0.058	3.117	0.090
8/11/1998	0.450	0.311	0.251	0.074	0.483	0.088	0.038	NDD	NAI	0.062	1.800	0.098
8/25/1998	0.406	0.293	0.241	0.071	0.458	0.088	0.036	NDD	NAI	0.043	1.440	0.095
9/15/1998	0.506	0.432	0.222	0.072	0.433	0.091	0.045	0.005	NAI	0.076	2.280	0.084
9/24/1998	0.378	0.319	0.182	0.061	0.364	0.077	0.042	0.005	NAI	0.060	1.371	0.067
9/30/1998	0.459	0.400	0.216	0.069	0.432	0.089	0.050	0.005	NAI	0.072	1.694	0.079
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.416	0.329	0.216	0.068	0.419	0.084	0.040	0.003	0.000	0.062	1.832	0.085
Median+:	0.422	0.320	0.219	0.070	0.432	0.088	0.040	0.002	0.000	0.062	1.643	0.087

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STORET ID	Cong. 158 (ng/L)	Cong. 16+32 (ng/L)	Cong. 163+138 (ng/L)	Cong. 167 (ng/L)	Cong. 170+190 (ng/L)	Cong. 172 (ng/L)	Cong. 174 (ng/L)	Cong. 177 (ng/L)	Cong. 178 (ng/L)	Cong. 18 (ng/L)	Cong. 180 (ng/L)	Cong. 183 (ng/L)	Cong. 185 (ng/L)
090177 Saginaw River													
6/15/1998	0.045	1.124	0.423	NAI	0.111	0.024	0.013	0.082	0.032	0.817	0.308	0.068	0.010
7/9/1998	0.034	1.273	0.259	NAI	0.071	0.016	0.085	0.051	0.025	0.710	0.192	0.043	0.006
8/6/1998	0.045	1.953	0.352	NAI	0.096	0.023	0.112	0.069	0.034	1.992	0.267	0.058	0.009
8/11/1998	0.042	0.993	0.421	NDD	0.108	0.023	0.121	0.076	0.030	0.979	0.310	0.059	NDD
8/25/1998	0.045	0.886	0.404	NDD	0.102	0.023	0.120	0.073	0.037	0.780	0.293	0.065	NDD
9/15/1998	0.055	1.265	0.454	NAI	0.099	0.024	0.089	0.066	0.039	0.832	0.215	0.054	0.009
9/24/1998	0.044	0.895	0.378	NAI	0.080	0.019	0.076	0.057	0.029	0.572	0.170	0.046	0.007
9/30/1998	0.051	1.233	0.437	NAI	0.095	0.021	0.087	0.064	0.034	0.906	0.201	0.054	0.008
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.045	1.203	0.391	0.000	0.095	0.022	0.088	0.067	0.033	0.948	0.244	0.056	0.006
Median+:	0.045	1.178	0.413	0.000	0.098	0.023	0.088	0.068	0.033	0.824	0.241	0.056	0.008

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STORET ID	Cong. 187+182 (ng/L)	Cong. 19 (ng/L)	Cong. 193 (ng/L)	Cong. 194 (ng/L)	Cong. 198 (ng/L)	Cong. 199 (ng/L)	Cong. 201 (ng/L)	Cong. 202+171 (ng/L)	Cong. 203+196 (ng/L)	Cong. 206 (ng/L)	Cong. 207 (ng/L)	Cong. 208+195 (ng/L)	Cong. 22 (ng/L)
090177 Saginaw River													
6/15/1998	0.141	0.114	0.019	0.068	0.000	0.007	0.131	0.034	0.130	0.034	0.000	0.037	0.369
7/9/1998	0.085	0.136	0.012	0.046	0.000	0.004	0.079	0.027	NAI	0.023	NDD	0.024	0.301
8/6/1998	0.124	0.273	0.015	0.064	NDD	0.006	0.114	0.033	NAI	0.028	NDD	0.030	0.449
8/11/1998	0.137	0.105	NAI	0.071	NDD	NDD	0.122	0.035	0.121	0.033	NDD	0.033	0.426
8/25/1998	0.134	0.083	0.016	0.066	NDD	NDD	0.120	0.035	0.127	0.032	NDD	0.035	0.384
9/15/1998	0.102	0.089	0.019	0.061	NDD	NAI	0.103	0.025	0.114	0.030	NDD	0.032	0.449
9/24/1998	0.085	0.129	0.015	0.046	0.000	0.005	0.083	0.024	0.092	0.025	NDD	0.026	0.309
9/30/1998	0.098	0.176	0.017	0.054	NDD	0.006	0.091	0.031	NAI	0.028	NDD	0.030	0.387
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.113	0.138	0.016	0.060	0.000	0.004	0.105	0.030	0.117	0.029	0.000	0.031	0.384
Median+:	0.113	0.122	0.016	0.063	0.000	0.005	0.109	0.032	0.121	0.029	0.000	0.031	0.385

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FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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NDD = Not detected due to dilution.

STORET ID	Cong. 47+48 (ng/L)	Cong. 49 (ng/L)	Cong. 51 (ng/L)	Cong. 52 (ng/L)	Cong. 53 (ng/L)	Cong. 56+60 (ng/L)	Cong. 6 (ng/L)	Cong. 63 (ng/L)	Cong. 66 (ng/L)	Cong. 7+9 (ng/L)	Cong. 70+76 (ng/L)	Cong. 74 (ng/L)	Cong. 77+110 (ng/L)
090177 Saginaw River													
6/15/1998	0.438	0.888	0.089	1.501	0.127	0.422	0.416	0.065	0.893	0.067	0.552	0.282	0.688
7/9/1998	0.256	FBK0.896	0.076	1.607	0.196	0.294	0.358	0.048	0.558	0.060	0.333	0.191	0.457
8/6/1998	0.516	FBK1.672	0.126	2.982	0.362	0.378	0.760	0.101	0.708	0.098	0.449	0.261	0.989
8/11/1998	0.468	1.220	0.076	2.190	0.241	0.420	0.443	0.079	0.898	0.099	0.527	0.260	0.710
8/25/1998	0.385	0.969	0.066	1.770	0.189	0.416	0.366	0.064	0.889	0.083	0.460	0.268	0.628
9/15/1998	0.612	1.355	0.108	1.796	0.232	0.467	0.512	0.091	0.902	0.053	0.537	0.325	0.974
9/24/1998	0.426	0.889	0.071	1.240	0.164	0.341	0.370	0.061	0.651	0.044	0.389	0.225	0.708
9/30/1998	0.553	1.052	0.086	1.705	0.223	0.413	0.401	0.078	0.811	0.045	0.480	0.290	0.844
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.457	1.118	0.087	1.849	0.217	0.394	0.453	0.073	0.789	0.069	0.466	0.263	0.750
Median+:	0.453	1.010	0.081	1.738	0.210	0.414	0.408	0.071	0.850	0.063	0.470	0.265	0.709

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FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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STORET ID	Cong. 24+27 (ng/L)	Cong. 25 (ng/L)	Cong. 26 (ng/L)	Cong. 28+31 (ng/L)	Cong. 3 (ng/L)	Cong. 33 (ng/L)	Cong. 37+42 (ng/L)	Cong. 4+10 (ng/L)	Cong. 40 (ng/L)	Cong. 41+71+64 (ng/L)	Cong. 44 (ng/L)	Cong. 45 (ng/L)	Cong. 46 (ng/L)
090177 Saginaw River													
6/15/1998	0.110	0.377	0.804	2.322	0.000	0.269	0.757	0.553	0.234	1.044	1.080	0.192	0.127
7/9/1998	0.118	0.371	0.962	1.948	NDD	0.203	0.596	0.580	0.189	0.819	FBK0.864	0.135	0.115
8/6/1998	0.210	0.772	1.840	4.691	NDD	0.299	1.341	1.517	0.302	1.298	FBK1.360	0.256	0.215
8/11/1998	0.128	0.567	1.360	2.635	NDD	0.301	0.854	0.601	0.272	1.167	1.257	0.207	0.143
8/25/1998	0.102	0.455	1.103	2.135	NDD	0.272	0.690	0.481	0.224	0.947	1.012	0.174	0.114
9/15/1998	0.193	0.782	1.672	3.247	NDD	0.260	0.931	0.388	0.275	1.260	1.246	0.197	0.129
9/24/1998	0.119	0.480	1.082	2.089	NDD	0.179	0.685	0.511	0.209	0.904	0.902	0.145	0.102
9/30/1998	0.149	0.642	1.313	2.814	NDD	0.216	0.866	0.730	0.274	1.152	1.196	0.201	0.139
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8	8	8
Mean+:	0.141	0.556	1.267	2.735	0.000	0.250	0.840	0.670	0.247	1.074	1.115	0.188	0.135
Median+:	0.123	0.524	1.208	2.479	0.000	0.264	0.805	0.567	0.253	1.098	1.138	0.194	0.128

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FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 8+5 (ng/L)	Cong. 82 (ng/L)	Cong. 83 (ng/L)	Cong. 85 (ng/L)	Cong. 87 (ng/L)	Cong. 89 (ng/L)	Cong. 91 (ng/L)	Cong. 92+84 (ng/L)	Cong. 95 (ng/L)	Cong. 97 (ng/L)	Cong. 99 (ng/L)
090177 Saginaw River											
6/15/1998	1.297	0.081	0.064	0.147	0.197	0.047	0.209	0.575	0.602	0.120	0.204
7/9/1998	0.956	0.048	0.045	0.094	0.127	0.034	0.127	0.345	0.417	0.079	0.127
8/6/1998	1.624	0.070	0.082	0.139	0.173	0.039	0.301	0.857	0.957	0.115	0.193
8/11/1998	1.389	0.066	0.068	0.147	0.197	0.025	0.211	0.601	0.662	0.111	0.209
8/25/1998	1.207	0.068	0.058	0.136	0.188	0.026	0.180	0.517	0.587	0.104	0.187
9/15/1998	1.256	0.088	0.085	0.178	0.231	0.034	0.283	0.688	0.619	0.154	0.261
9/24/1998	0.962	0.077	0.057	0.128	0.169	0.035	0.193	0.501	0.465	0.110	0.185
9/30/1998	0.990	0.086	0.071	0.154	0.198	0.033	0.217	0.607	0.573	0.133	0.225
No. of Samples:	8	8	8	8	8	8	8	8	8	8	8
Mean+:	1.210	0.073	0.066	0.140	0.185	0.034	0.215	0.586	0.610	0.116	0.199
Median+:	1.231	0.074	0.066	0.143	0.192	0.034	0.210	0.588	0.594	0.113	0.198

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FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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STORET ID	4,4'-DDD (ng/L)	4,4'-DDE (ng/L)	4,4'-DDT (ng/L)	oxychlordane (ng/L)	alpha-chlordane (ng/L)	cis-nonachlor (ng/L)	gamma-chlordane (ng/L)	trans- nonachlor (ng/L)
090177 Saginaw River								
6/15/1998								
7/9/1998	0.984	0.370	0.042	0.000	0.087	0.000	0.044	NAI
8/6/1998	0.859	0.410	0.043	0.000	0.103	0.000	0.042	NAI
8/11/1998	0.644	0.408	0.054	0.000	0.082	0.000	0.033	EST0.022
8/25/1998	0.906	0.414	0.070	NAI	NAI	0.011	0.052	EST0.024
9/15/1998	1.000	0.492	0.253	0.000	0.122	0.017	0.066	NAI
9/24/1998	0.912	0.414	0.078	0.015	0.071	0.015	0.054	NAI
9/30/1998	0.920	0.440	0.080	0.000	0.081	0.015	0.054	NAI
No. of Samples:	8	8	8	8	8	8	8	8
Mean+:	0.889	0.421	0.089	0.003	0.091	0.008	0.049	0.023
Median+:	0.912	0.414	0.070	0.000	0.085	0.011	0.052	0.023

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EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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STORET ID	Cong. 101 (ng/L)	Cong. 118 (ng/L)	Cong. 123+149 (ng/L)	Cong. 128 (ng/L)	Cong. 132+153+105 (ng/L)	Cong. 135+144 (ng/L)	Cong. 136 (ng/L)	Cong. 137+176 (ng/L)	Cong. 141 (ng/L)	Cong. 146 (ng/L)	Cong. 15+17 (ng/L)	Cong. 151 (ng/L)
170141 Tahquamenon River												
4/7/1999	0.031	0.024	0.016		0.028	0.006	0.000	0.000		NAI	0.097	0.005
4/13/1999		0.010	0.004	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.039	0.001
5/19/1999	0.005	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.055	0.000
6/8/1999	0.006	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.055	0.000
7/13/1999	0.008	0.000	0.000	0.001	0.005	0.000	0.000	0.000	0.001	0.000	0.100	0.000
9/15/1999	0.004	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.024	0.000
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.011	0.006	0.003	0.000	0.010	0.001	0.000	0.000	0.000	0.000	0.062	0.001
Median+:	0.006	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.055	0.000

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FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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NDD = Not detected due to dilution.

STORET ID	Cong. 158 (ng/L)	Cong. 16+32 (ng/L)	Cong. 163+138 (ng/L)	Cong. 167 (ng/L)	Cong. 170+190 (ng/L)	Cong. 172 (ng/L)	Cong. 174 (ng/L)	Cong. 177 (ng/L)	Cong. 178 (ng/L)	Cong. 18 (ng/L)	Cong. 180 (ng/L)	Cong. 183 (ng/L)	Cong. 185 (ng/L)
170141 Tahquamenon River													
4/7/1999	0.000	0.078	0.035	0.000	0.004	0.000	0.005	0.000	0.000	0.038	0.008	0.000	0.000
4/13/1999	0.000	NAI	0.013	0.000	0.002	0.000	0.000	0.000	0.000	0.027	0.004	0.000	0.000
5/19/1999	0.000	0.039	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.000	0.000	0.000
6/8/1999	0.000	0.039	0.006	0.000	0.001	0.000	0.000	0.000	0.000	0.022	0.002	0.000	0.000
7/13/1999	0.000	0.068	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.000	0.000	0.000
9/15/1999	0.000	0.015	0.004	0.000	0.002	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.000
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.000	0.048	0.011	0.000	0.001	0.000	0.001	0.000	0.000	0.026	0.002	0.000	0.000
Median+:	0.000	0.039	0.006	0.000	0.001	0.000	0.000	0.000	0.000	0.025	0.001	0.000	0.000

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STORET ID	Cong. 187+182 (ng/L)	Cong. 19 (ng/L)	Cong. 193 (ng/L)	Cong. 194 (ng/L)	Cong. 198 (ng/L)	Cong. 199 (ng/L)	Cong. 201 (ng/L)	Cong. 202+171 (ng/L)	Cong. 203+196 (ng/L)	Cong. 206 (ng/L)	Cong. 207 (ng/L)	Cong. 208+195 (ng/L)	Cong. 22 (ng/L)
170141 Tahquamenon River													
4/7/1999	0.007	0.011	0.000	0.003	0.000	0.000	0.005	0.000	0.000	0.002	0.000	0.002	0.021
4/13/1999	0.004	NAI	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.029
5/19/1999	0.002	0.005	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.012
6/8/1999	0.002	NAI	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.011
7/13/1999	0.000	NAI	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.025
9/15/1999	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.002	0.006	0.000	0.001	0.000	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.017
Median+:	0.002	0.005	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.016

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NDD = Not detected due to dilution.

STORET ID	Cong. 47+48 (ng/L)	Cong. 49 (ng/L)	Cong. 51 (ng/L)	Cong. 52 (ng/L)	Cong. 53 (ng/L)	Cong. 56+60 (ng/L)	Cong. 6 (ng/L)	Cong. 63 (ng/L)	Cong. 66 (ng/L)	Cong. 7+9 (ng/L)	Cong. 70+76 (ng/L)	Cong. 74 (ng/L)	Cong. 77+110 (ng/L)
170141 Tahquamenon River													
4/7/1999	0.047	0.040	0.013	0.072	NAI	0.031	0.014	0.000	0.049	0.020	0.034	0.013	0.056
4/13/1999	0.014	NAI	0.005	0.030	NAI	0.012	0.000	0.000		NAI	0.020	NAI	0.020
5/19/1999	0.019	0.015	0.005	0.023	0.000	0.000	0.000	0.000	0.011	0.012	0.007	0.000	0.008
6/8/1999	0.015	0.013	0.005	0.025	NAI	0.000	0.000	0.000	0.015	0.011	0.009	0.000	0.008
7/13/1999	0.018	0.023	0.007	0.039	0.005	0.008	0.016	0.000	0.021	0.026	0.010	0.000	0.011
9/15/1999	0.006	0.007	0.007	0.012	NAI	0.000	0.000	0.000	0.005	0.006	0.003	0.000	0.004
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.020	0.020	0.007	0.033	0.003	0.009	0.005	0.000	0.020	0.015	0.014	0.003	0.018
Median+:	0.017	0.015	0.006	0.028	0.003	0.004	0.000	0.000	0.015	0.012	0.010	0.000	0.010

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FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 24+27 (ng/L)	Cong. 25 (ng/L)	Cong. 26 (ng/L)	Cong. 28+31 (ng/L)	Cong. 3 (ng/L)	Cong. 33 (ng/L)	Cong. 37+42 (ng/L)	Cong. 4+10 (ng/L)	Cong. 40 (ng/L)	Cong. 41+71+64 (ng/L)	Cong. 44 (ng/L)	Cong. 45 (ng/L)	Cong. 46 (ng/L)
170141 Tahquamenon River													
4/7/1999	0.007	0.010	0.019	0.098	0.000	0.022	0.041	0.041	0.013	0.048	0.058	0.000	0.005
4/13/1999	0.000	0.000	0.000	0.049	0.000	0.012	0.017	0.022	NAI	NAI	0.017	0.004	0.000
5/19/1999	0.004	0.000	0.000	0.042	0.000	0.013	NAI	0.039	NAI	0.000	0.023	0.000	0.000
6/8/1999	NAI	0.004	0.000	0.052	0.000	0.014	0.014	0.028	NAI	0.011	0.018	0.000	0.002
7/13/1999	0.007	0.000	NAI	0.086	0.000	0.024	0.019	0.052	0.006	0.019	0.027	0.000	0.000
9/15/1999	0.000	0.000	0.000	0.022	0.000	0.000	NAI	0.000	0.000	NAI	0.009	0.000	0.000
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.004	0.002	0.004	0.058	0.000	0.014	0.023	0.030	0.006	0.020	0.025	0.001	0.001
Median+:	0.004	0.000	0.000	0.050	0.000	0.014	0.018	0.034	0.006	0.015	0.020	0.000	0.000

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FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
NDD = Not detected due to dilution.

STORET ID	Cong. 8+5 (ng/L)	Cong. 82 (ng/L)	Cong. 83 (ng/L)	Cong. 85 (ng/L)	Cong. 87 (ng/L)	Cong. 89 (ng/L)	Cong. 91 (ng/L)	Cong. 92+84 (ng/L)	Cong. 95 (ng/L)	Cong. 97 (ng/L)	Cong. 99 (ng/L)
170141 Tahquamenon River											
4/7/1999	0.113	0.007	0.003	0.010	0.019	0.004	0.009	0.041	0.036	0.011	0.013
4/13/1999	0.067	0.006	0.000	0.005	0.011	0.004	0.000	0.000	NAI	0.006	0.007
5/19/1999	0.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.002
6/8/1999	0.082	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.009	0.002	0.002
7/13/1999	0.189	0.000	0.000	0.002	0.003	0.000	0.000	0.013	0.013	0.002	0.000
9/15/1999	0.046	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.004	0.000	0.000
No. of Samples:	6	6	6	6	6	6	6	6	6	6	6
Mean+:	0.097	0.002	0.001	0.003	0.006	0.001	0.002	0.009	0.014	0.003	0.004
Median+:	0.083	0.000	0.000	0.002	0.003	0.000	0.000	0.000	0.009	0.002	0.002

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FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
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STORET ID	4,4'-DDD (ng/L)	4,4'-DDE (ng/L)	4,4'-DDT (ng/L)	oxychlordane (ng/L)	alpha-chlordane (ng/L)	cis-nonachlor (ng/L)	gamma-chlordane (ng/L)	trans- nonachlor (ng/L)
170141 Tahquamenon River								
4/7/1999	0.065	0.056	0.049	0.000	0.014	0.000	0.012	0.000
4/13/1999								
5/19/1999								
6/8/1999								
7/13/1999								
9/15/1999	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. of Samples:	6	6	6	6	6	6	6	6
Mean+:	0.033	0.028	0.025	0.000	0.007	0.000	0.006	0.000
Median+:	0.033	0.028	0.025	0.000	0.007	0.000	0.006	0.000

+ = Calculated value; not rounded to appropriate number of significant digits.
EST = Estimated value; analyte present above detection limit but not quantified within expected limits of precision.
FBK = Analyte had a measurable value above the established QC limit when blank was analyzed using the same equipment and analytical method.
FMS = Failed matrix spike criteria; recovery of matrix spike was outside established QC limits.
NAI = Not analyzed due to uncontrollable interference.
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