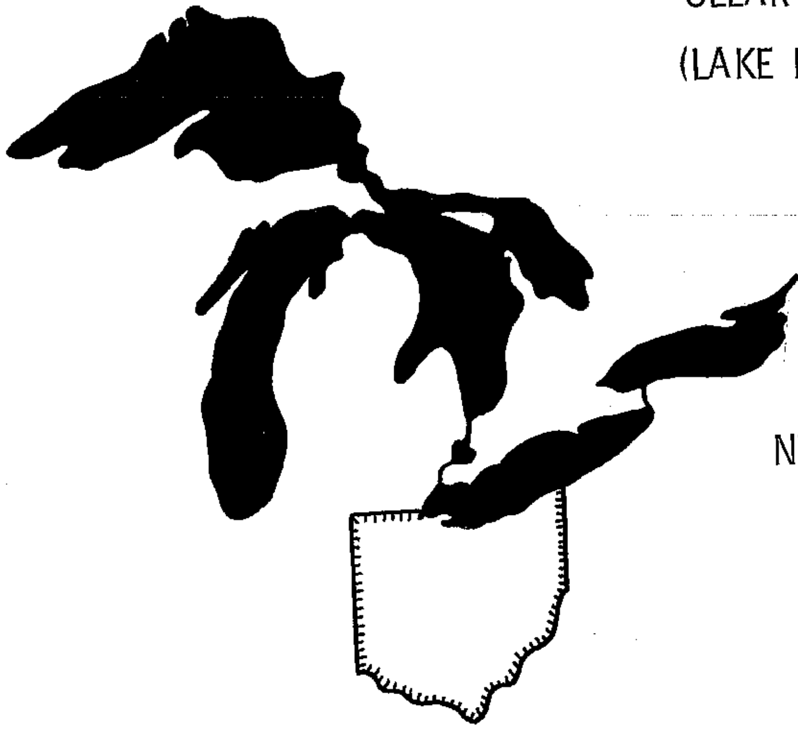
CLEAR TECHNICAL REPORT NO. 248

(LAKE ERIE TAT CONTRIBUTION NO. 23)



LAKE ERIE INTENSIVE STUDY: NEARSHORE WATER QUALITY TRENDS

Prepared by

Audrey A. Rush
and
C. Lawrence Cooper

Prepared for

U.S. Environmental Protection Agency
Great Lakes National Program Office
Region V - Chicago, Illinois
Grant No. R005516001

THE OHIO STATE UNIVERSITY
CENTER FOR LAKE ERIE AREA RESEARCH
COLUMBUS, OHIO

DECEMBER 1981

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Since the late 1960's, much concern has developed regarding the water quality of Lake Erie. Researchers and the public in general became alarmed when the lake showed signs of eutrophication, i.e., increasing phosphorus inputs and prolonged anoxic conditions in the central basin. Indicators of eutrophication were readily apparent through biological changes such as a transition from cold water fish species to warm water species and changes in predominant phytoplankton forms. This new "ecological awareness" era spawned action by governmental agencies at the local, state, federal and international levels.

In 1964, the governments of the United States and Canada informed the International Joint Commission (IJC) that sewage and industrial wastes were polluting Lake Erie. The United States subsequently began a surveillance program and submitted a final report in 1969. As a direct result of this report, the U.S. and Canada signed the Great Lakes Water Quality Agreement on April 15, 1972. Deterioration of Great Lakes water was thus recognized and resulted in formulation of a set of common objectives to restore and enhance Great Lakes water quality (Gregor and Ongley 1978).

Since the majority of Lake Erie's usage lies on the coastline, results of remedial measures as well as further degradation of water quality are more likely to first appear in nearshore monitoring programs than from open lake programs. This chapter, then, deals with a preliminary analysis of water quality in the nearshore zone of Lake Erie in an attempt to assess trends which may have occurred in the last decade.

Trend analysis of long-term data bases has recently attracted the attention of many Great Lakes research groups. Two major problems have arisen in attempting to analyze large data bases through time: a satisfactory definition of what exactly constitutes a "trend" and, more importantly, developing an adequate method to remove large variations in raw data due to seasonality and general limnological nearshore conditions. Such variation could tend to mask a trend that really exists, or, conversely, it could indicate a trend where none actually exists.

In 1978, the IJC defined trend as a linear regression equation having a slope significantly different than zero as determined by a t-test. Recently, the Data Management and Interpretation Work Group (1980) recommended the following definition of trend in Lake Erie water quality:

> "To relieve any ambiguity and to provide a uniform methodology of testing for trend we propose an operational definition of a trend which narrows it to a change at a constant rate, that is, trend will be understood as simple linear trend. Trend can thus be assessed by regressing the characteristic of interest upon time:
>
> $$y=b_0+b_{1x}+e$$

where b_o is the characteristic of interest and x is time; coefficient b_1 is tested for statistical significance."

However, the work group expanded this definition somewhat and suggested further analysis of second and third order coefficients of time if a trend is present to determine if the rate of change is itself changing.

Previous investigations of trend analysis date back to Beeton (1965) whose work can be found cited in almost every paper dealing with Lake Erie changes. Beeton seems to be the only source of information for long-term modifications dating back to the turn of the century. His data base must be regarded with skepticism, however, since the sources of raw data used in his figures have not yet been completely reassembled.

In 1978, the IJC published an analysis of trends of the nearshore water quality data in the Canadian Great Lakes, 1967-1973 (Gregor and Ongley 1978). In this study, the authors adopt an aggregation procedure for each of nine nearshore geographic regions which were chosen _a priori_ in an attempt to homogenize the effects of limnological processes while retaining large data populations in each subset to enhance statistical significance. The aggregation procedure involves separating the time span into three time frames and analyzing each by season (spring, summer and fall) and by depth (surface and subsurface). Of eight parameters analyzed, the summary of water quality trends indicates that the following parameters have generally decreased through time in Lake Erie: conductivity, total phosphorus, chloride, chlorophyll _a_, secchi depth and total coliforms; total nitrogen and oxygen saturation have increased.

Another method of analyzing long-term data bases involved removing seasonal variation by averaging monthly residuals of all years and subtracting this average from the linear model (Richards, unpublished manuscript). This analysis was performed with the assumption that the seasonal effect remains constant for each year. Using data collected at the City of Cleveland's Division Water Supply Intake over a period of record extending from 1968-1979, Richard's regression analysis with seasonal filtering indicated a significant decrease in total phosphorus, soluble reactive phosphorus, ammonia-nitrogen, specific conductance, and chlorides. No significant trends were found to exist for nitrate plus nitrite, soluble reactive silica, alkalinity, pH or sulfate.

The following preliminary analysis deals with eight locations in the nearshore zone of Lake Erie. It is a first-order attempt to discern which parameters are significantly changing in the lake by applying the Data Management and Work Group's recommendation.

METHODS

Study Sites

Eight general locations consisting of sixteen stations comprised the present analysis. A general, all-parameter (chemical and physical) retrieval from

STORET was reviewed to ascertain which stations showed the greatest sampling frequency, the longest time period for analysis, and contained parameters most representative for evaluating water quality status. Stations chosen for analysis are depicted in Figure 1. Agencies which sampled the stations, station descriptions and locations are listed in Table 1.

Of nine stations located in the Detroit River, three were chosen as representative of the main influx of water into Lake Erie. Station 2 (in the center of the Livingstone Channel) is considered most representative of input from upper lakes water since it is the deepest section of the Detroit River. Station 1 was chosen to reveal water quality changes due to land and water use of the industrial United States shoreline, while station 3 is representative of the Canadian shore. Station 4 is located near Monroe, Michigan and thus can be considered representative of the western basin. Stations 5 and 6 are located near the mouth of the Maumee River and were chosen to represent changes that may be occurring as a result of Maumee River usage in the greater Toledo area, while station 7, which is located upstream from Toledo, may be considered representative of agriculturally-related Maumee River input above the Toledo industrial inputs.

Locust Point near the Davis-Besse nuclear power station (station 8, Figure 1) was sampled by Toledo Edison to determine if the power plant operation has a significant impact on the aquatic environment. The data in Table 2 indicates that plant operation was minimal during the sampling period. Thus power generation was not a consideration for possible differences in trends.

Stations 9, 10 and 11 (Sandusky, Crown and Erie, respectively, Figure 1) are all city water intake locations and are considered to be the least impacted nearshore areas.

Station 12, the Buffalo River, was chosen as representative of final input into the lake before drainage through the Niagara River. The Black Rock Canal (station 13) is a channel bypassing the Niagara River. Its waters are used primarily for industrial purposes; thus the station may show water quality changes induced by changes in industrial usage in the Buffalo area.

Station 14 (Figure 1) was chosen as representative of Niagara River water mixed with industrial waste from the Black Rock Canal. Finally, station 15 was chosen to represent total Lake Erie outflow and Greater Buffalo-Niagara Falls inputs for possible determination of trends in water quality affecting the major source of influx into Lake Ontario.

Water Quality Parameters

A total of twenty-two parameters were chosen to represent general water quality conditions in Lake Erie (Table 3). Physical parameters such as turbidity, conductivity, residue, and total dissolved solids may indicate changes due to sediment loading. Chloride, which is considered a conservative parameter, may indicate sources of increased or decreased chemical loading and build-up; pH and alkalinity are reflective of acid conditions and buffering capacities. Since the Lake Erie basin is of primarily limestone substrate, no change in these two parameters is expected. Dissolved oxygen and biochemical oxygen demand were chosen to reflect changes which may be occurring due to biologically oxidizable organic matter.

The nutrient parameters consist of various forms of nitrogenous and phosphorus compounds. Of these two groups, trend analysis of phosphorus compounds may be considered more important since phosphorus is a limiting nutrient and its loading rates have been of primary concern in recent years.

Appendix A contains all of the data reviewed for all stations retrieved from STORET. Overall, the period of record under consideration extends from 1962-1981. Considerable inconsistency exists in the period of record between parameters recorded at any given station. Therefore, trend analyses are reported for variable time frames.

Statistical Methods

Preliminary statistical analysis of the data consisted of testing a linear regression equation by use of a t-test or F-test (P .05) to see if the slope of the line was significantly different than zero. On all but two of the data sets reviewed, raw data was plotted against time for all parameters using a STORET REG procedure. Figures 3-6 and Figures 11-12 depict plot printouts from the STORET procedure. Accompanying the plot printout is a summary page containing number of observations, r^2 values and t-values for the slope. If the t-value of the slope was greater than the corresponding tabular "t" value for n-1 degrees of freedom, a slope significantly different than zero was reported (Nie et al. 1975).

The data bases used for the C and O Dock and Davis-Besse locations were not obtained from STORET. Raw data was entered on tape and an SAS (79.5) General Linear Models (GLM) procedure was run on monthly means to test for significant trends. Significance of slope was determined using an F-test (P .05).

Linearity of trend was attempted by plotting the residuals of regression line for parameters found to have significant trends in the C and O Dock and Davis-Besse data bases. A relatively straight band of residuals may be indicative of an actual linear trend during the period of record (Draper and Smith 1966).

RESULTS AND DISCUSSION

A summary of linear regression trends for each parameter and station analyzed can be found in Table 3. Trend analysis at station 1 (STORET code 820011) on the U.S. shore of the Detroit River indicates a decreasing trend in alkalinity, dissolved oxygen, conductivity, turbidity, total dissolved solids, residue, biochemical oxygen demand, ammonia plus ammonium, total Kjeldahl nitrogen, total organic carbon, total phosphorus, ortho-phosphorus, phenols, iron and chlorides. No trends could be detected by this analysis for silica, organic nitrogen, nitrate plus nitrite, or total and fecal coliforms.

Preliminary analysis indicates no parameter at this site is increasing significantly through time. Thus, a general increase in the quality of water can be said to be occurring at this site.

Station 000024 in the Livingstone Channel, which is considered representative of upper Great Lakes water, showed significant decreases in conductivity, NH_3+NH_4, total Kjeldahl nitrogen, total organic carbon, total phosphorus, ortho-phosphorus, phenols and chlorides. Significant increases were found only in pH and dissolved oxygen. No significant trends were found for temperature, turbidity, residue, silica, BOD, organic nitrogen, nitrate plus nitrite or iron. Again, a general increase in water quality can be said to be occurring here.

The Canadian shore of the Detroit River (Station 000029) shows significant decreases in total organic carbon, total phosphorus, ortho-phosphorus, total coliforms and phenols. No significant trends were observed for temperature, DO, turbidity, total dissolved solids, residue, silica, BOD, organic N, NH_3+NH_4, total Kjeldahl nitrogen, nitrate plus nitrite, iron or chlorides. Increases through time were observed for pH, conductivity, and fecal coliforms. Thus, while not as many parameter trends are significant at this site than at the other two stations in the Detroit River, a general increase in water quality can be ascertained by decreases in major nutrient concentrations, total coliforms and phenols.

Monroe, Michigan water intake data shows only an increasing trend in phenols; all other parameters of interest were either not present in the data set or showed no significant change. Although the data set is limited, the analyses of existing nutrient and major ion parameters leads to an initial conclusion that water quality at this site in the lake may not have changed significantly within the period of record.

The data set accumulated from samples collected at the mouth of the Maumee River at the C and O Dock was analyzed using the SAS-GLM procedure. This procedure detected significant decreases in nitrate and total phosphorus. These results may be indicative of decreased nutrient loading into the Maumee River. This analytic procedure also revealed decreasing trends in pH and alkalinity, suggesting that acid deposition is occurring. Dissolved oxygen is decreasing while BOD is increasing through time, indicating an increase in the amount of biologically oxidizable organic matter in the Maumee River estuary. No significant trends were evident in analysis of temperature, conductivity, turbidity, total dissolved solids, or ammonia data.

Few parameters were recorded at the Maumee River mouth at Toledo (STORET station 04194023). Of these, pH, alkalinity, conductivity, total dissolved solids, residue and chlorides showed no significant change, while analysis indicates an increasing trend in nitrate levels. Not enough parameters were sampled to adequately characterize water quality.

Since the Maumee River at Waterville (STORET station 0419350) is sufficiently upstream, it can be considered representative of river water, free of lake interferences, municipal runoff or industrial discharge. Significant increases in pH and chlorides were indicated by the regression procedures. One may hypothesize that acid deposition is occurring somewhere between this station and those at the river mouth since a significant decrease in pH and alkalinity was found to exist at the C and O Dock station. Analysis of the NH_3+NH_4 and total phosphorus parameters indicated significant decreases, while analysis of remaining parameters sampled at the site resulted in no apparent trend.

Significant changes were determined for three parameters at the Davis-Besse site. Increasing levels of magnesium (Figure 10) and NO_2+NO_3 concentrations as well as decreasing levels of chlorides were detected in the analysis. Since Davis-Besse was sampled only monthly during the ice-free periods of the year, degrees of freedom in the analysis are much less, thus producing a more conservative conclusion.

Analysis of Sandusky water intake data indicates significant increases in temperature, conductivity, residue, nitrates and total organic carbon. No change was detected for dissolved oxygen, turbidity, NH_3+NH_4, total Kjeldahl nitrogen, total phosphorus, fecal coliforms or chlorides. Decreasing trends were observed in the regression analysis for pH, alkalinity, and orthophosphorus data. Preliminary conclusions derived from this initial analysis of Sandusky water intake data must be regarded with skepticism. The period of record is one of the shortest presented (Appendix A). The possibility of detecting a true trend in a data base is dubious at best.

Analysis of data collected from the City of Cleveland's Crown water intake (located approximately 4 km offshore, Figure 1) indicated significant increases in temperature, alkalinity, total organic carbon and fecal coliforms, as well as significant decreases in pH and turbidity. No significant trend was evident in dissolved oxygen, conductivity, nitrates, NH_3+NH_4, total phosphorus or chlorides. Thus the water quality at this location does not appear to be changing over the period of record, 1974-1980.

The data base retrieved from the Erie water intake revealed a rather large gap from mid-1976 to early 1978. After preliminary discussion with City of Erie and Pennsylvania Department of Environmental Resources personnel, contact with the U.S. Environmental Protection Agency, Region III staff has resulted in the promise of proper entry of the missing data. The preliminary results presented below do not include data from the 1976-1978 period (Figures 11 and 12).

Table 3 summarizes analyses performed and shows a significant decrease in pH, alkalinity, total and fecal coliforms, iron and chloride values. No significant trends were evident for temperature or total phosphorus values. The only parameters for which the analyses indicate an increase through time were dissolved oxygen and turbidity.

Analysis of data from the Black Rock Canal at Buffalo indicated a significant increase in pH and a significant decrease in chlorides. No other changes were evident indicating no detectable changes in water quality parameters over the period of record (1969-1980).

Decreasing trends in pH, organic nitrogen and chlorides resulted from linear regression analysis of data from the Niagara River just beyond Black Rock Canal (station 010007). Ortho-phosphorus was the only parameter for which an increasing trend was discerned. No significant trend could be found for temperature, alkalinity, conductivity, turbidity, residue, BOD, nitrates, NH_3+NH_4, NO_3-NO_2, total coliforms, phenols or iron.

The Niagara River at Lake Ontario (station 04214640) showed no significant increase or decrease in pH, alkalinity, dissolved oxygen, turbidity, organic nitrogen, NO_3, NH_3+NH_4, NO_2-NO_3, total coliforms or iron. The only significant trends which could be discerned were an increase in temperature and decreases in conductivity and chlorides. Thus, the Niagara River system does not appear to have changed significantly during the last decade.

In general, temperature is not changing throughout the lake. However, where significant changes were discerned during this analysis, the trend was an increasing one.

Significant trends in pH values were evident but inconsistent between stations. Analyses from the Detroit River, Maumee River at Waterville, Buffalo River and Black Rock Canal at Buffalo all indicated significant increases while the Maumee River Mouth (C and O Dock), Sandusky, Crown and Erie water intakes, and the Niagara River just downstream of the Canal indicated significant decreases. For the most part, alkalinity is not changing throughout Lake Erie. Where trends are significant, alkalinity was decreasing. The only exception to this generality was an increasing trend observed for Crown water intake data.

In general, no lake-wide trend in dissolved oxygen values was noted. Where significant, the analysis indicated decreasing trends in dissolved oxygen on the U.S. shore of the Detroit River (station 00011) and at the C and O Dock near Toledo, while increases were indicated in the Livingstone Channel, at the Erie water intake and in the Buffalo River.

Conductivity was decreasing at more sites than increasing. However, it is apparent that no significant trend throughout the lake was occurring. Significant trends in turbidity were only evident at three locations: decreasing in the Detroit River and at Crown water intake, while an increasing trend was observed at Erie. Total dissolved solids changed significantly at only two sites, decreasing both at the U.S. shore of the Detroit River and at Erie water intake. Trends in residue values were significant at three out of nine locations: decreasing at the U.S. shore of the Detroit River, decreasing on the Buffalo River and increasing at Sandusky water intake.

Biochemical oxygen demand analyses revealed a decreasing trend in the Detroit and Buffalo Rivers and an increasing trend at the C and O Dock near Toledo. BOD was not changing significantly elsewhere.

Organic nitrogen was unchanging at all sites with the exception of the Buffalo and the Niagara Rivers where a decreasing trend was noted. Of the remaining nitrogen compounds, nitrate increased at three locations (Toledo, Sandusky and Buffalo Rivers) and decreased at the C and O Dock, NH_3+NH_4 decreased wherever a trend was observed (U.S. shore and Livingstone Channel in the Detroit River, Maumee River at Waterville, and Buffalo River) as was total Kjeldahl nitrogen (decreasing at the U.S. shore and Livingstone Channel in the Detroit River and in the Buffalo River). Analyses of NO_3+NO_2 data indicated a significant trend at only one site -- Davis-Besse, where an increase was reported. Total organic carbon was observed to decrease at all three locations in the Detroit River and increased at Sandusky and Crown water intakes.

Total phosphorus analyses indicated a decreasing trend throughout most of the stations in the western basin, including all three station locations in the Detroit River, the C and O Dock and the Maumee River at Waterville. Davis-Besse, Sandusky, and Crown on Erie showed no significant total phosphorus trends. Total phosphorus was not reported at the remaining sites. Analyses of ortho-phosphorus data revealed a decreasing trend in the Detroit River and at Sandusky. Niagara River, just downstream from the Black Rock Canal, indicated a significant increase.

Total coliform bacteria were decreasing at the Livingstone Channel and the Canadian shore of the Detroit River and also at Erie water intake. Increases in total coliforms were not observed at any locations. Fecal coliforms, on the other hand, indicated significant increases at two locations; the Canadian shore of the Detroit River and at the Crown water intake, while the C and O Dock at the mouth of the Maumee and the Erie water intake exhibited significant decreases. Silica was the only parameter sampled which indicated no significant increasing or decreasing trend at any location.

Phenols were decreasing in the Detroit and Buffalo Rivers and were increasing at Monroe. Significant change in iron concentrations were noted at only three locations: increasing at Sandusky and decreasing in the Detroit River (U.S. shore) and Erie water intake. Most of the stations sampled for chlorides show a general decreasing lakewide trend. Only the C and O Dock and Waterville stations on the Maumee River revealed significant increases; the Livingstone Channel and the Canadian shore of the Detroit River as well as Toledo, Sandusky and Crown water intakes showed no significant change. The rest of the locations indicated significantly decreasing chloride concentrations.

Figures 3-6 and 11-12 are representative of STORET retrieval plots and are inserted into this chapter to illustrate various problems encountered in this preliminary analysis of trends. Figures 3, 4, 6 and 12 clearly show a narrowing variation through time. The values plotted from about 1978 to 1981 show less variability than previous years. This phenomenon is possibly due to refinement of technique. If the variability in the early portions of these data sets is due to factors other than random error (i.e. inadequate sampling and/or analytic technique), the significant trends resulting from the analyses of these data sets reported herein may not be accurately assessing changes in Lake Erie water quality.

Figure 11 indicates that the decreasing trend found for total chlorides at the Erie water intake may not be linear. Inspection of the data reveals a potentially cubic relationship of total chloride values with time. The problem with this analysis was compounded by the gap in the data set.

Figures 7-9 depict monthly means plotted through time at the C and O Dock (mouth of the Maumee River). Visual inspection of total phosphorus (Figure 7) data at this site reveals that concentrations may have remained stable until 1975, then declined. The extreme variation present in the 1974 portion of the phosphorus data could have very possibly influenced the regression line. Figure 9 illustrates a potentially non-linear relationship for total chloride over the period of record. An apparent decline is visually evident for the 1970-1973 period, an increase for the 1974-1978 period and another decrease in 1979.

Figure 13 is representative of analyses performed on all parameters found to exhibit significant trends at Davis-Besse and the C and O Dock. Plotting of residuals is a preliminary attempt to identify the existing trends as linear through time; a straight band of residuals may indicate linearity (Draper and Smith 1966). Residuals for all parameters were found to display a relatively straight band through time, indicating that on a preliminary basis, the trends at these sites are linear.

Appendix A lists all parameters sampled at each study site. R^2 values are reported for parameters found to exhibit a significant trend. Inspection of r^2 values indicates that in most cases, they are rather low; this suggests that not much of the variability may be explained by time. An exception to low r^2 values can be found in cyanide trends. These high values are not indicative of actual cyanide phenomena; inspection of the STORET plots reveals that the detection limit was probably lowered during the period of record.

CONCLUSIONS AND RECOMMENDATIONS

It is obvious from the above discussion that further analysis is needed to determine if discerned trends actually exist and if they are indeed linear. One method has been attempted at two locations for preliminary testing of linearity. Plotting of residuals at all locations can reinforce or deny existence of linearity in reported trends. If a trend is found to be present, the Data Management and Interpretation Work Group recommended that second and third order coefficients of time be tested for significance to discern if the rate of change (time) is itself changing.

Variability in the data sets is the leading analytic problem. If the variance about the regression line is greater than the estimated population variance (S^2) then the postulated model suffers lack of fit. Several methods for determining lack of fit are outlined by Draper and Smith and should be pursued in order to test the validity of the regression model.

One of the most obvious methods for removing much of the variability in the data set is to somehow filter the seasonal component. The authors have attempted to separate the months into seasons and regress the seasons on years. This procedure proved ineffective as most parameters showed increases in trends in some seasons and decreases in others, thus making overall trends more difficult to ascertain.

Another method to remove seasonal variability involves averaging monthly residuals and subtracting the average from the regression equation (Richards, unpublished manuscript). The results of Richards' paper, however, indicate very little improvement in significance levels or r^2 values. Averaging residuals may prove effective in increasing r^2 and significance levels for data sets presented here.

Perhaps the most effective method is to describe the seasonal variability of each parameter by a polynomial and subtracting this equation from the linear regression equation. This could be effective in removing the seasonal component of the variability.

Finally, when trends are adequately described according to variability and linearity, further investigation is necessary to discern probable causes for each parameter exhibiting significant change. Loading data, flow data of major tributaries, as well as water level data, may be incorporated to illustrate any correlations which may exist between trends and general physical and limnological phenomena. Trends may also be correlated against one another to see if perhaps a trend in one parameter is accounted for by a trend in another.

REFERENCES CITED

Beeton, A. M. 1965. Eutrophication of the St. Lawrence Great Lakes. Limnol. and Oceanogr. 10(2):240-254.

Draper, N. R. and H. Smith. 1966. Applied Regression Analysis. John Wiley and Sons, New York. 407 p.

Gregor, D. J. and E. D. Ongley. 1978. Analysis of Nearshore Water Quality Data in the Canadian Great Lakes, 1967-1973, part I. International Joint Commission. 270 p.

Nie, N. H., C. H. Hull, J. G. Jendino, K. Steinbrenner and D. H. Bent. 1975. Statistical Package of the Social Sciences, 2nd ed. McGraw-Hill, New York.

Richards, P. R. 1981. Historical trends in water chemistry in the U.S. nearshore zone, central basin, Lake Erie. Center for Lake Erie Area Research; The Ohio State Univ. Unpubl. manuscript.

Richardson, W.L. 1980. Data management and interpretation component of the Lake Erie international surveillance plan. Internat. Joint Comm., Great Lakes Water Quality Board. Windsor Regional Office, Windsor, Ontario. 27 p.

TABLES

TABLE 1

NUMBER ASSIGNMENTS, AGENCIES AND LOCATIONS FOR SELECTED STATIONS

ASSIGNED NUMBER	STATION STORET CODE	AGENCY	STATION DESCRIPTION	LATITUDE	LONGITUDE
1	820011	MDNR	U.S. shore of Detroit River	42° 03' 13.5"	83° 10' 40.1"
2	000024	MDNR	Middle of the Detroit River	43° 03' 16.2"	83° 08' 00.5"
3	000029	MDNR	Canadian shore of Detroit River	42" 03' 17.5"	83° 07' 08.3"
4	580048	MDNR	Monroe water intake	41° 56' 12.3"	83° 13' 24.3"
5	not obtained from STORET	City of Toledo	Maumee River at C and O Dock	41° 41' 46.0"	83° 21' 39.0"
6	04194023	City of Toledo	Maumee River at Toledo	40° 41' 36.0"	83° 28' 20.0"
7	0419350	USGS	Maumee River at Waterville	41° 30' 00.0"	83° 42' 46.0"
8	not obtained from STORET	Toledo Edison	Locust Point near Davis-Besse	41° 35' 57.0" (cooling tower)	83° 05' 28.0"
9	504030	OEPA	Sandusky water intake	41° 27' 51.0"	82° 38' 50.0"
10	504090	OEPA	Crown water intake	41° 31' 08.0"	81° 52' 46.0"
11	J4108	Erie Co. Dept. of Health	Erie water intake	42° 09' 24.0"	80° 09' 12.0"
12	01 0006	NY DEC	Buffalo River	41° 51' 42.3"	78° 52' 04.0"
13	01 C 005	NY DEC	Black Rock Canal	42° 54' 54.4"	78° 54' 10.0"
14	01 0007	NY DEC	Niagara River	42° 57' 02.0"	78° 54' 10.0"
15	04219640	NY DEC	Niagara River near Lake Ont.	43° 15' 40.0"	79° 03' 47.0"

MDNR Michigan Department of Natural Resources

USGS United States Geological Survey

OEPA Ohio Environmental Protection Agency

NY DEC New York Department of Environmental Conservation

TABLE 2

POWER LEVEL AND PERCENT FULL POWER
OF DAVIS-BESSE NUCLEAR POWER PLANT DURING SAMPLING DATES

YEAR	MONTH	SAMPLING DATE (Julian)	DAILY AVG. POWER LEVEL (MWe-net)	PERCENT FULL POWER (MWe-NetX.115)
1977	May	146	0	0.0
1977	June	173	0	0.0
1977	July	194	0	0.0
1977	August	242	0	0.0
1977	September	255	0	0.0
1977	October	298	0	0.0
1977	November	326	73	8.4
1978	May	131	0	0.0
1978	June	180	0	0.0
1978	July	206	0	0.0
1978	August	299	0	0.0
1978	September	256	799	91.9
1978	October	290	0	0.0
1978	November	305	0	0.0
1979	April	120	0	0.0
1979	May	144	0	0.0
1979	June	172	0	0.0
1979	July	212	870	100.0
1979	August	241	870	100.0
1979	September	270	0	0.0
1979	October	303	0	0.0
1979	November	332	0	0.0

TABLE 3 SUMMARY OF LINEAR REGRESSION TRENDS

OF WATER QUALITY PARAMETERS AT SELECTED STATIONS ON LAKE ERIE

STATION LOCATION	TEMP.	pH	ALKALINITY	DO	CONDUCTIVITY	TURBIDITY	TOTAL DISSOLVED SOLIDS	RESIDUE	SILICA	BOD	ORGANIC N
820011 (U.S. shore)	0		-	-	-	-	-	-	0	-	0
000024 (Livingstone Channel)	0	+		+	-	0		0	0	0	0
000029 (Canadian shore)	0	+		0	+	0	0	0	0	0	0
Monroe	0	0	0		0			0			
C and O Dock	0	-	-	-	0	0	0			+	
Toledo		0	0		0		0	0			
Waterville	0	+	0	0	0	0	0		0		0
Davis-Besse	0	0	0	0		0	0		0	0	
Sandusky	+	-	-	0	+	0		+			
Crown	+	-	+	0	0	-					
Erie	0	-	-	+		+	-				
Buffalo	0	+	0	+	-	0		-		-	-
Black Rock Canal	0	+		0	0	0		0		0	0
Niagara River (0007)	0	-	0		0	0		0		0	-
Niagara at Lake Ontario	+	0	0	0	-	0					0

TABLE 3 CONT.

STATION LOCATION	NO_3	NH_3+NH_4	TOTAL KJEDAHL N	NO_3-NO_2	TOTAL ORGANIC C	P-TOTAL	ORTHO P	TOTAL COLIFORMS	FECAL COLIFORMS	PHENOLS	IRON	CHLORIDES
820011 (U.S. shore)		-	-	0	-	-	-	0	0	-	-	-
000024 (Livingstone Channel)		-	-	0	-	-	-	-		-	0	-
000029 (Canadian shore)		0	0	0	-	-	-	-	+	-	0	0
Monroe		0				0		0	0	+		0
C and O Dock	-	0 (NH_3)				-			-			+
Toledo	+											0
Waterville		-	0	0	0	-						+
Davis-Besse				+		0						-
Sandusky	+	0	0		+	0	-		0		+	0
Crown	0	0	0		+	0			+			0
Erie						0		-	-		-	-
Buffalo	+	-	-	0			0	0	0	-	0	-
Black Rock Canal	0	0		0			0	0			0	-
Niagara River (0007)	0	0		0			+	0		0	0	-
Niagara at Lake Ontario	0	0		0				0			0	-

+ = A significant increasing trend ($P<.05$)

- = A significant decreasing trend

0 = No significant trend observed

A blank indicates the parameter was not sampled at the station

FIGURES

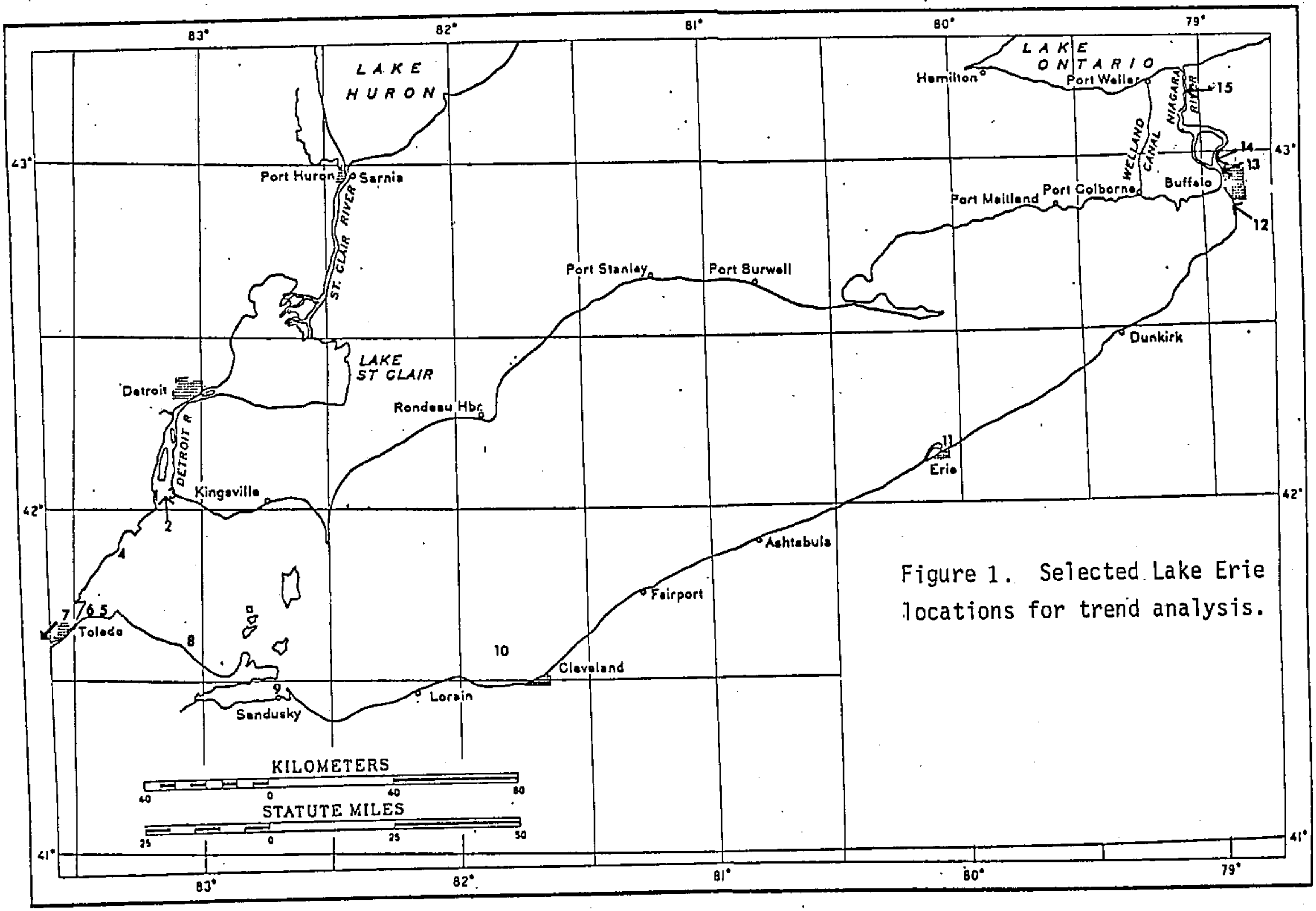


Figure 1. Selected Lake Erie locations for trend analysis.

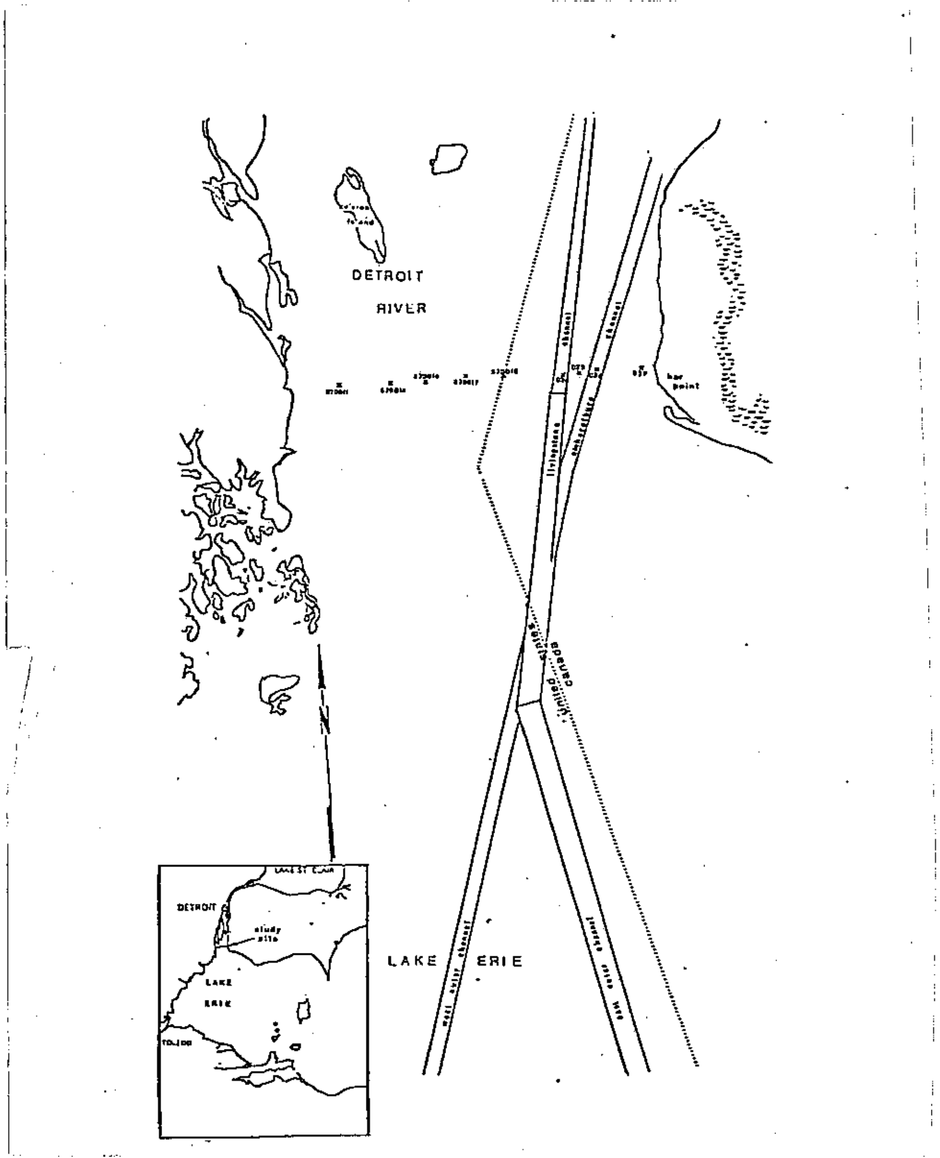


Figure 2. Station Locations in the Detroit River.

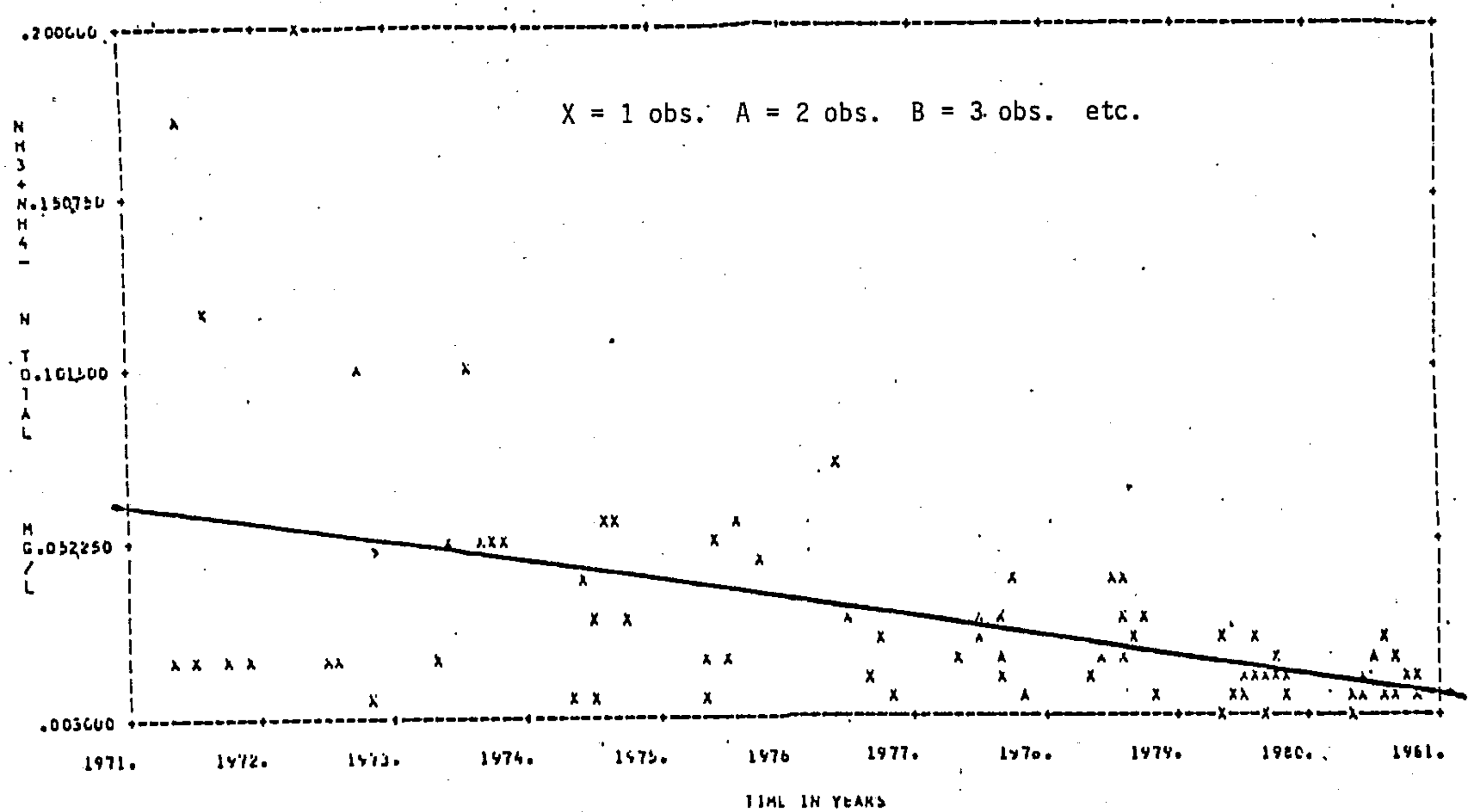


Figure 3. Linear long term trend for NH3+NH4. Station 000024 (LIvingstone Channel) at Range 3.9 in the Detroit River.

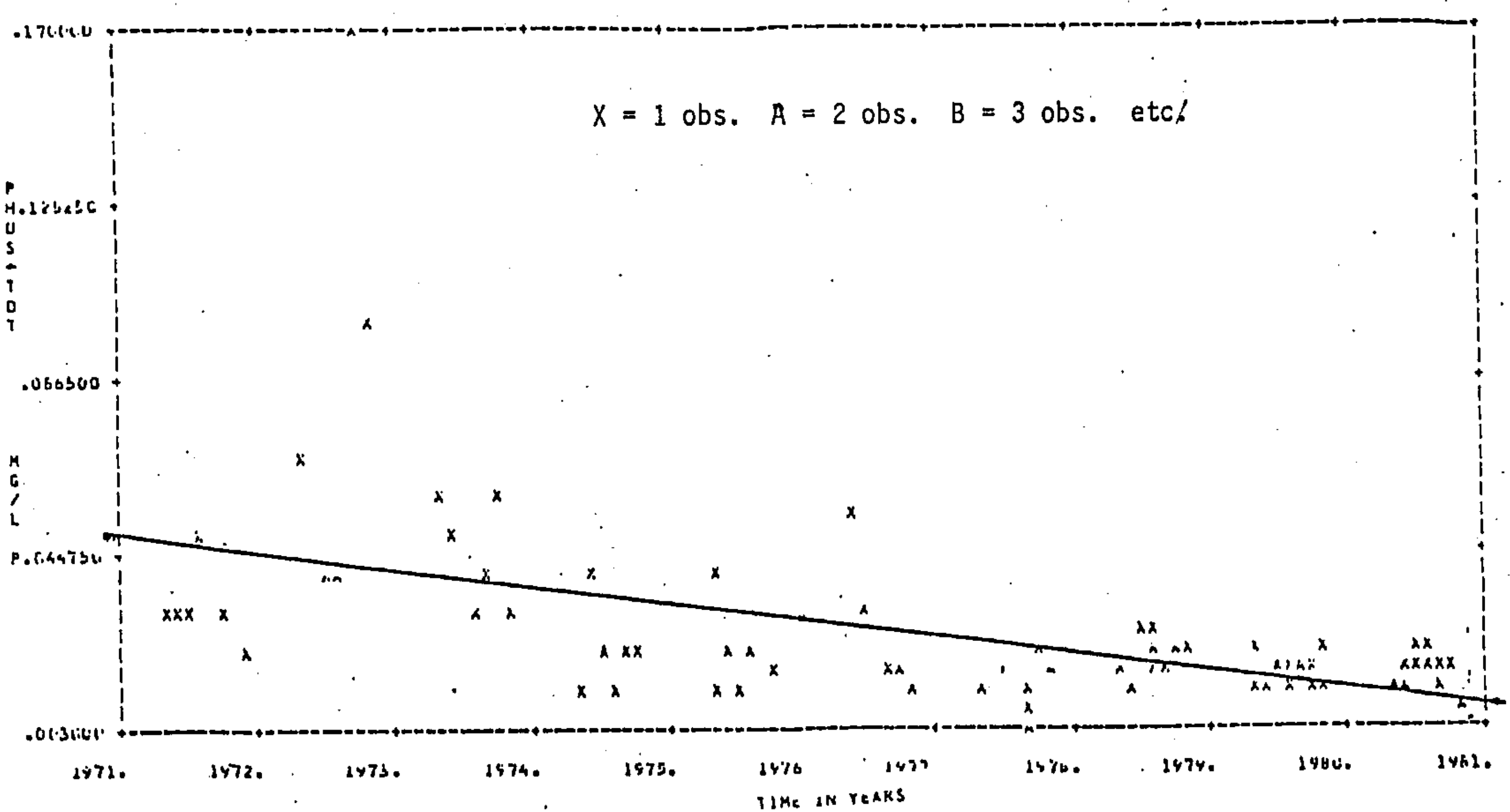


Figure 4. Linear long term trend for total phosphorus. Station 000024 (Livingstone Channel) at Range 3.9 in the Detroit River.

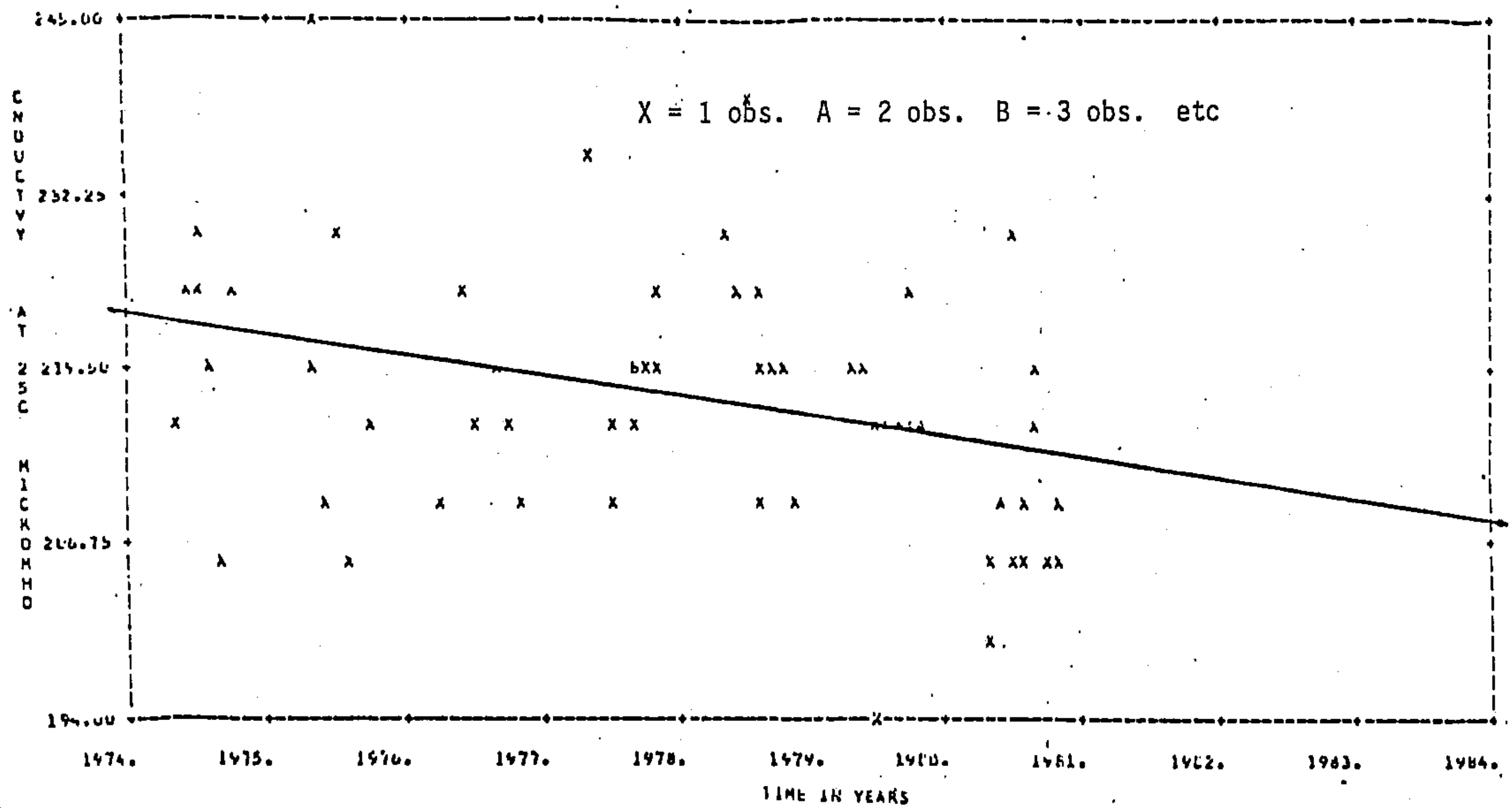


Figure 5. Linear long term trend for conductivity. Station 000024 (Livingstone Channel) at Range 3.9 in the Detroit River.

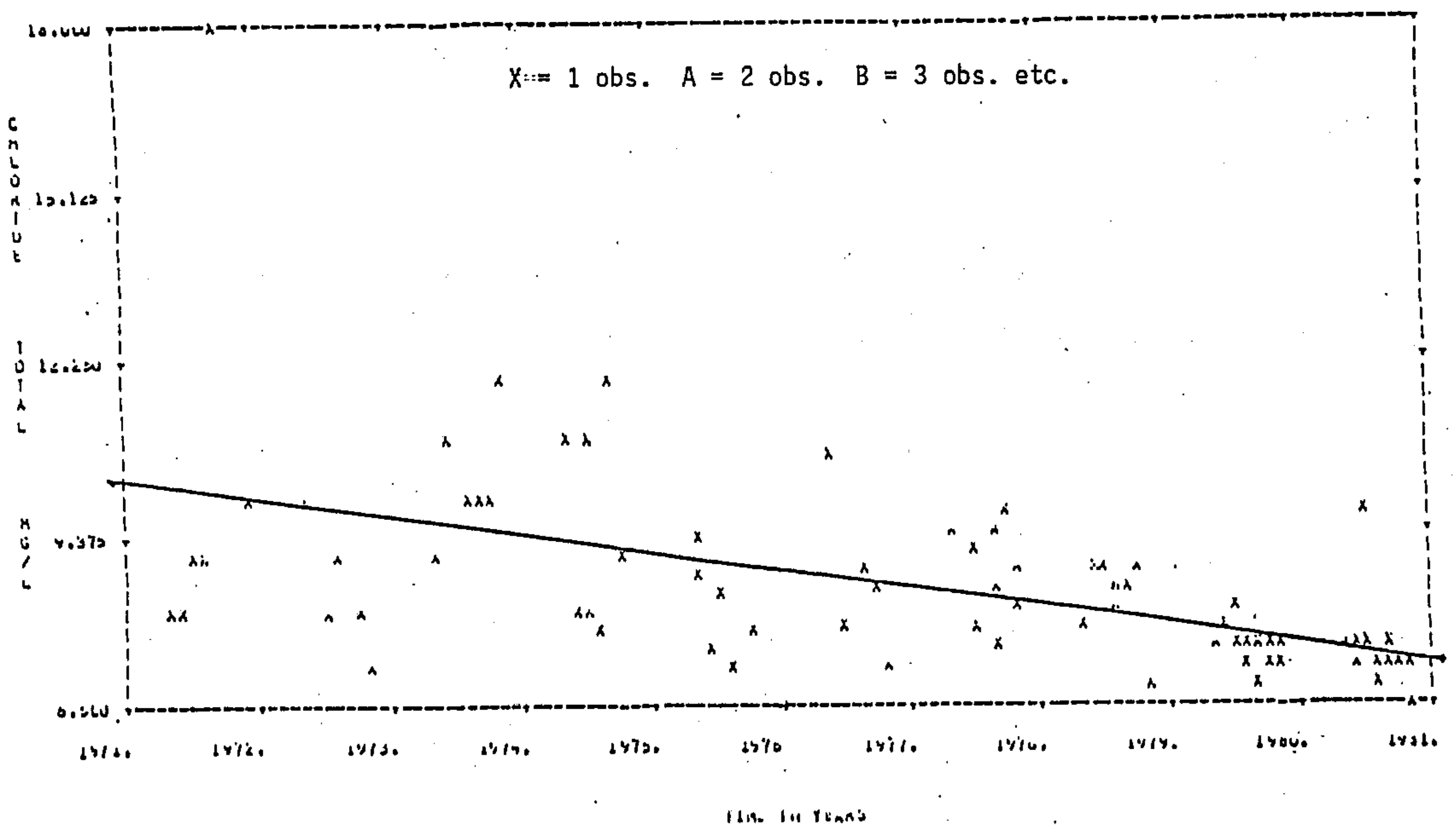


Figure 6. Linear long term trend for chloride. Station 00024 (Livingstone Channel) at Range 3.9 in the Detroit River.

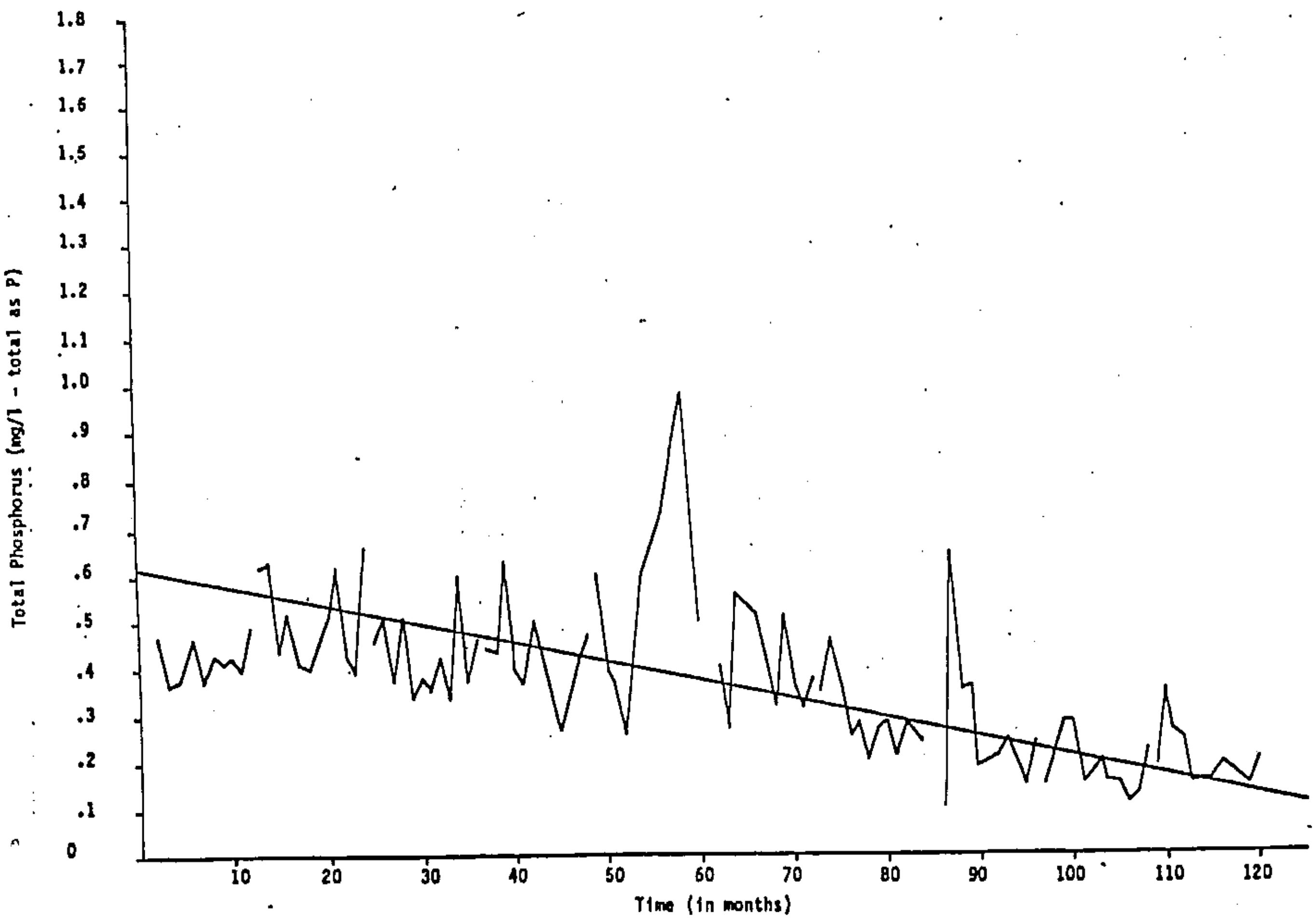


Figure 7. Total Phosphorus Monthly Means for C and O Dock, 1970-1979. Intercept at January 1970.

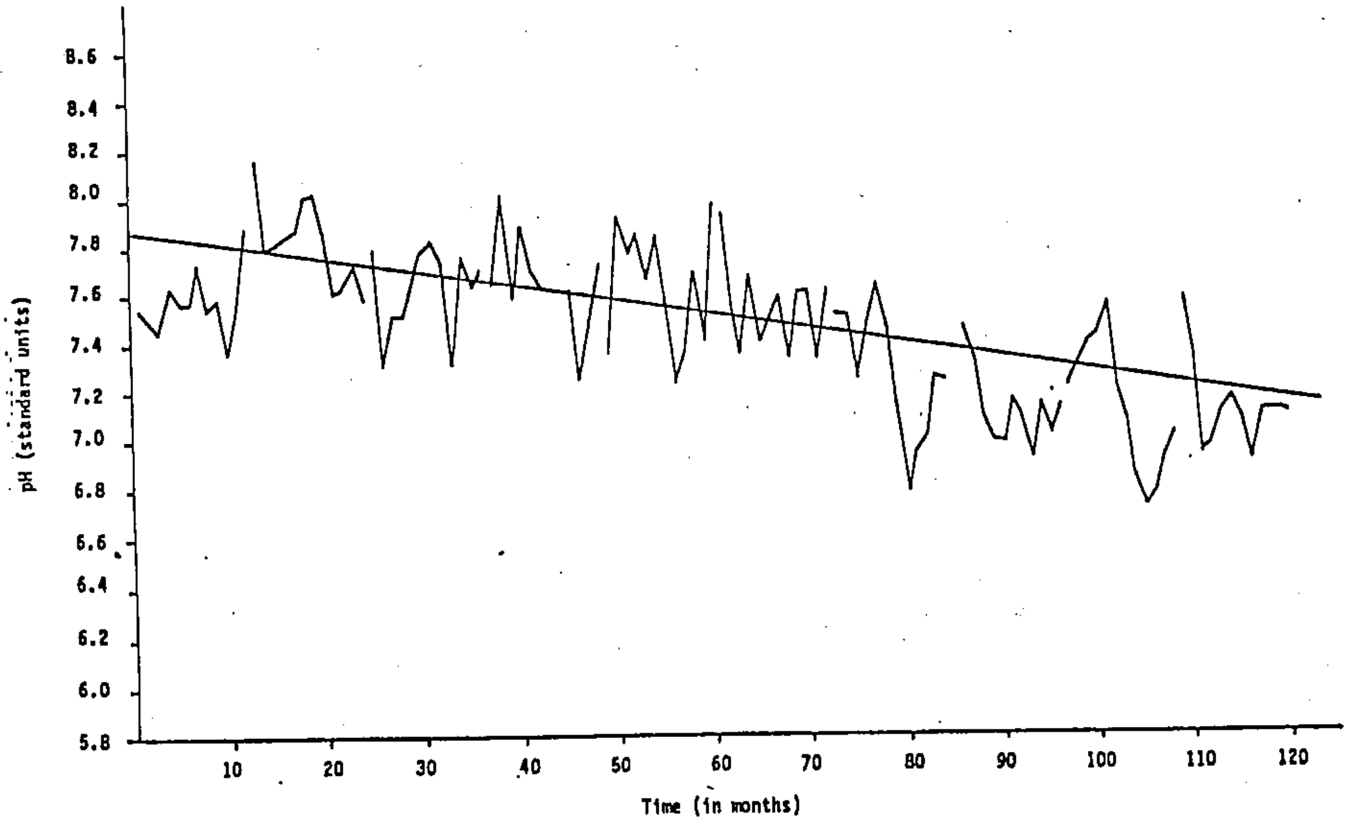


Figure 8. pH Monthly Means for C and O Dock, 1970-1979. Intercept at January 1970.

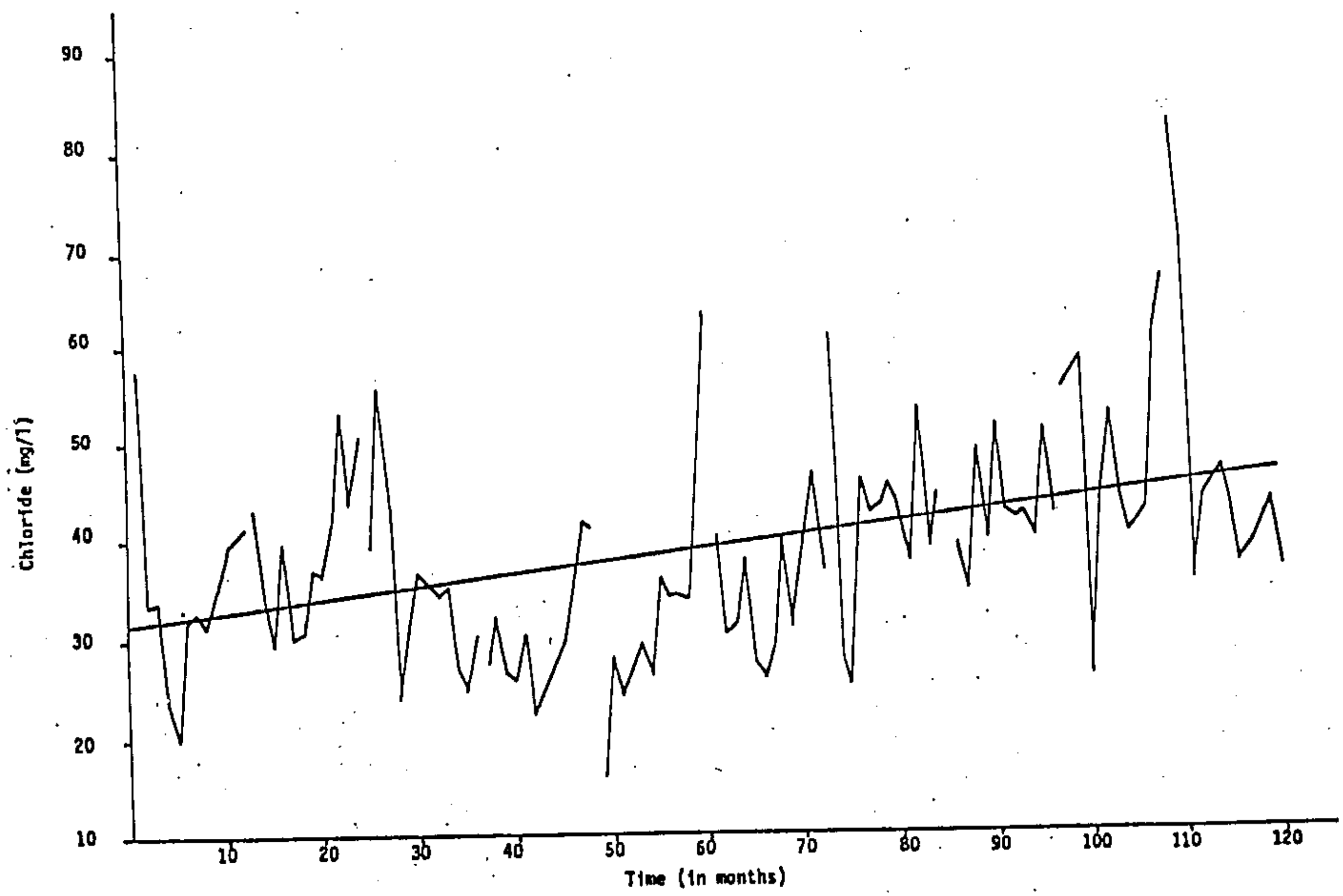


Figure 9. Chloride ion Monthly Means for C and O Dock, 1970-1979. Intercept at January 1970.

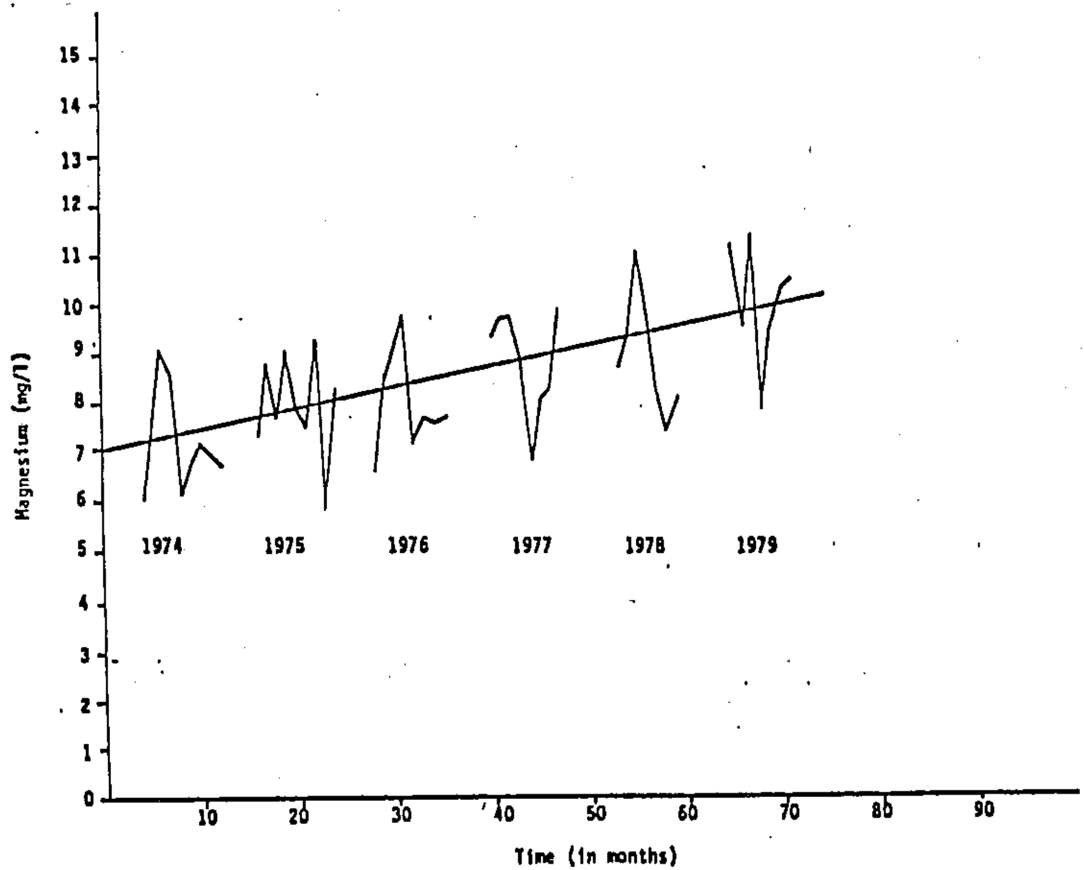


Figure 10. Magnesium ion Monthly Means for Davis-Besse.

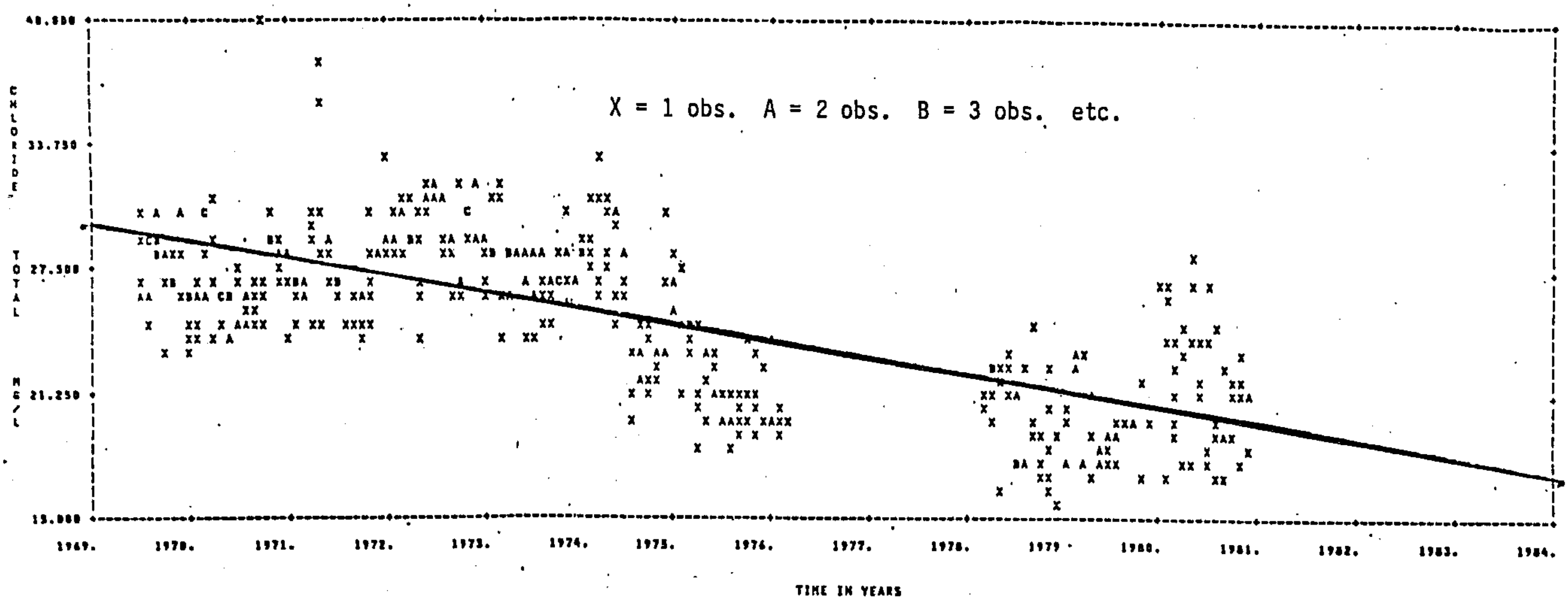


Figure 11. Linear long term trend for total chlorides at Erie, Pa water supply intake.

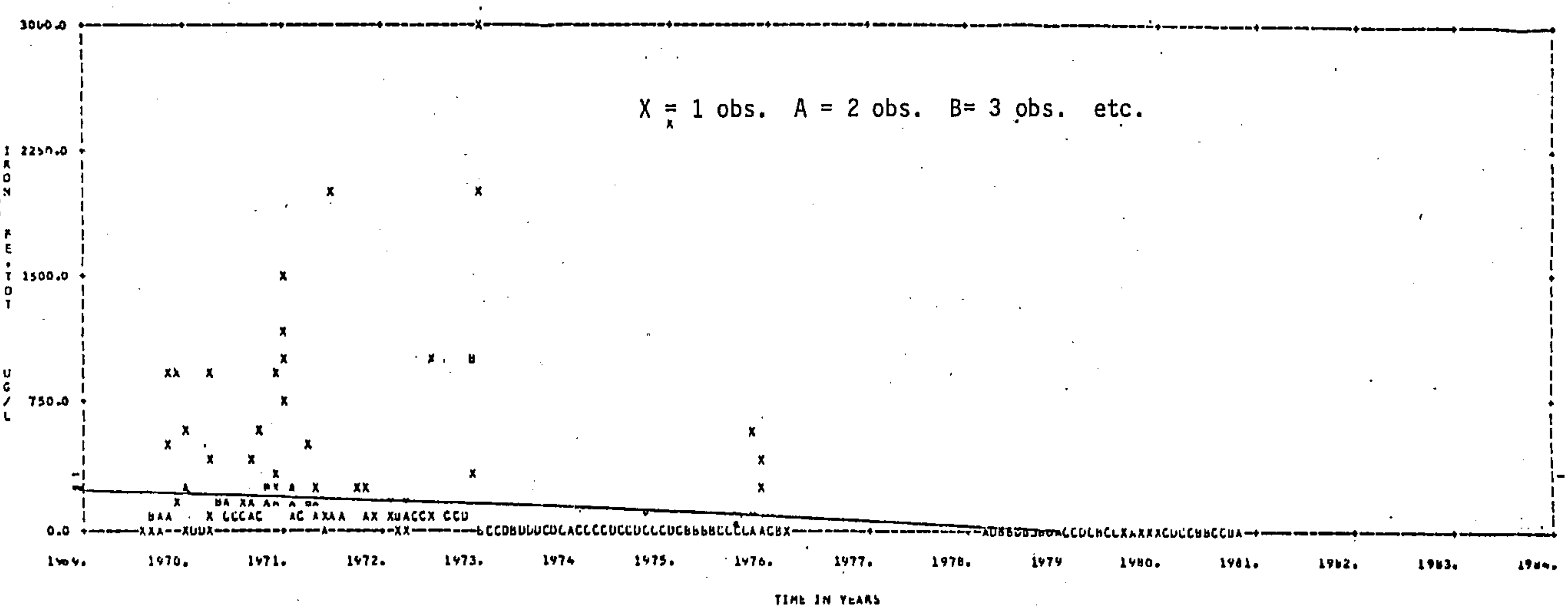


Figure 12. Linear long term trend for total iron at Erie, Pa water supply intake.

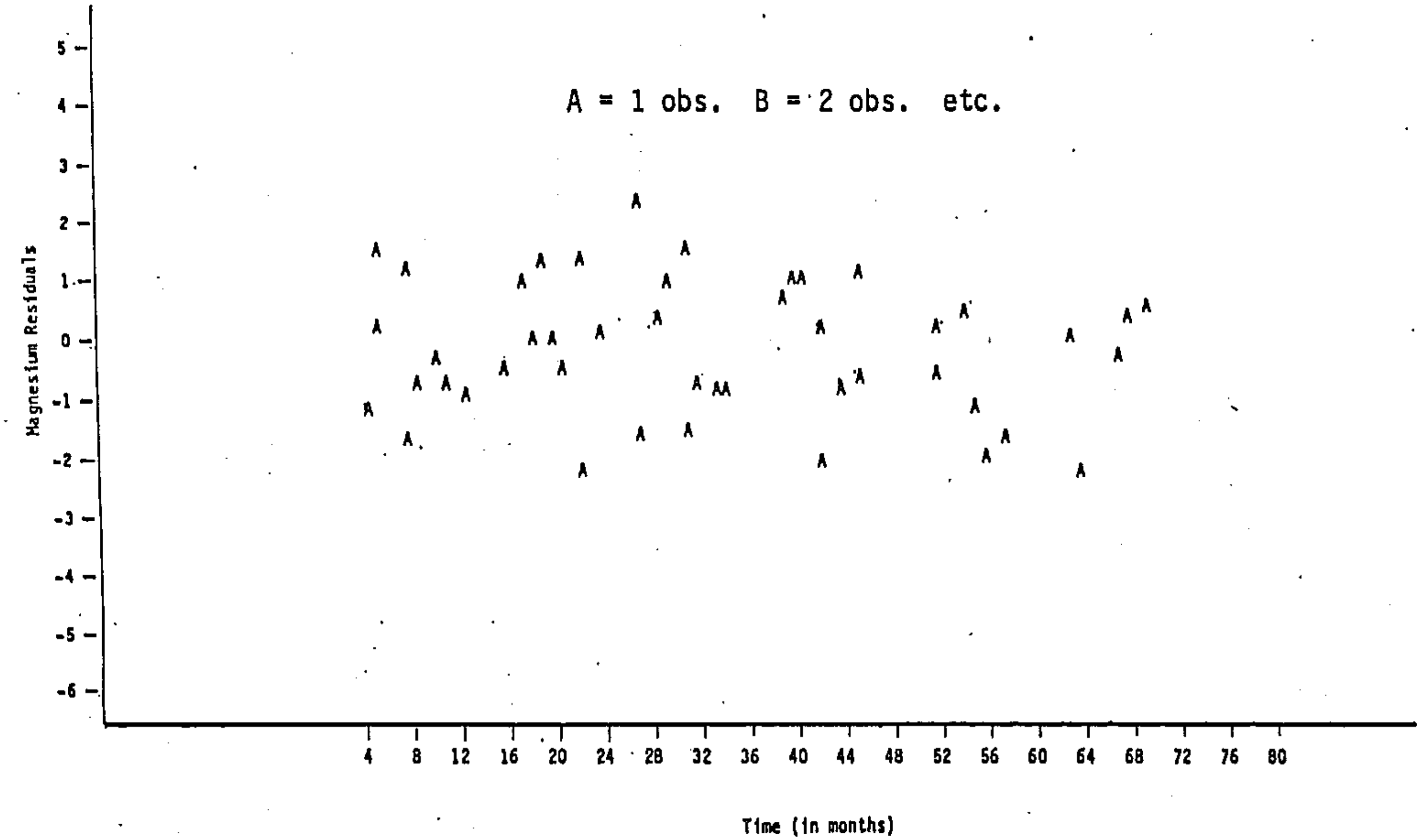


Figure 13. Residuals of the linear regression line for magnesium concentration at Davis Besse (Locust Point) versus time (1974-1979).

APPENDIX

All data retrieved including station description, station STORET codes, latitudes and longitudes, parameter, units reported, period of record, statistical significance, r^2 values for significant parameters, and number of observations for each parameter.

Detroit River at Range 3.9

STORET Station No. 820011

42° 03' 13.5" 83° 10' 40.1"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	5/10/66-11/5/80	0		115
Total Alkalinity	mg/l $CaCO_3$	5/21/74-11/5/80	-	.52	28
DO	mg/l	5/10/66-11/5/80	-	.19	112
Conductivity	25°C umhos	5/1/74-11/5/80	-	.25	64
Chloride	Total mg/l	6/22/66-11/5/80	-	.63	102
Turbidity	Turb Mtr Hach FTU	7/9/74-11/5/80	-	.09	61
Tot. Diss. Solids	E.C. mg/l	5/4/71-11/5/80	-	.07	81
Residue	Total mg/l	11/16/71-11/5/80	-	.16	70
Residue	Total NFLT mg/l	5/10/66-11/5/80	-	.10	103
Residue	Settlble mg/l	4/29/75-7/18/78	-	.20	26
Chlorophyll *a*	ug/l	4/29/75-11/5/80	-	.20	54
Silicate	UNF REAT mg/l SI	5/21/74-11/5/80	0		63
BOD	5-day mg/l	8/18/66-11/5/80	-	.10	60
Organic N	N mg/l	5/1/74-11/5/80	0		45
NH_3+NH_4	N total mg/l	6/22/66-11/5/80	-	.47	102
Total Kjeldahl	N mg/l	11/5/73-11/5/80	-	.12	58
NO_2+NO_3	N-total mg/l	9/20/72-11/5/80	0		72
Tot. Organic C	C mg/l	4/29/75-11/5/80	-	.41	57
Total Phosphorus	mg/l P	4/30/68-11/5/80	-	.69	95
Phosphorus-T	Ortho mg/l P	5/10/66-11/5/80	-	.65	103
Total Coliform	MFIM LES/100 ml	6/22/66-10/31/79	0		90
Fecal Coliform	MFM-FCBR/100 ml	5/4/71-11/5/80	0		82
Phenols	Total ug/l	5/10/66-11/5/80	-	.19	97
Iron	FE, Total ug/l	5/10/66-11/5/80	-	.15	103
Cyanide	CN-Total mg/l	5/10/66-11/5/80	-	.21	99

Detroit River at Range 3.9

STORET Station No. 820014

42° 03' 14.0" 83° 10' 00.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	5/10/66-11/5/80	0		114
Total Alkalinity	mg/l $CaCO_3$	5/21/74-11/5/80	-	.34	28
DO	mg/l	5/10/66-11/5/80	+	.08	109
Conductivity	25°C umhos	5/1/74-11/5/80	-	.29	64
Chloride	Total mg/l	6/22/66-11/5/80	-	.46	102
Turbidity	Turb mtr Hach FTU	7/9/74-11/5/80	0		61
Tot. Diss. Solids	E.C. mg/l	5/4/71-11/5/80	0		81
Residue	Total mg/l	11/6/71-11/5/80	-	.08	70
Residue	Total NFLT mg/l	5/10/66-11/5/80	-	.15	103
Residue	Settleble mg/l	4/29/75-7/18/78	0		26
Chlorophyll a	ug/l	4/29/75-11/5/80	-	.27	54
Silicate	UNF REACT mg/l SI	5/21/74-11/5/80	0		63
BOD	5 day mg/l	8/18/66-11/5/80	-	.14	61
Organic N	N mg/l	5/1/74-11/5/80	0		45
NH_3+NH_4	N Total mg/l	6/22/66-11/5/80	-	.18	102
Total Kjeldahl	N mg/l	11/5/73-11/5/80	-	.08	58
NO_2+NO_3	N-Total mg/l	9/20/72-11/5/80	0		72
Tot. Organic C	C mg/l	4/29/75-11/5/80	-	.38	57
Total Phosphorus	mg/l P	4/30/68-11/5/80	-	.65	95
Phosphorus-T	Ortho mg/l P	5/10/66-11/5/80	-	.61	103
Total Coliform	MFIM LES/100ml	6/22/66-10/31/77	-	.09	90
Fecal Coliform	MFM-FCBR/100ml	5/4/71-11/5/80	0		82
Phenols	Total ug/l	5/10/66-11/5/80	-	.12	97
Iron	Total ug/l	5/10/66-11/5/80	-	.27	103
Cyanide	CN-Total mg/l	5/10/66-11/5/80	-	.44	98

Detroit River at Range 3.9

STORET Staion No. 820016

42° 03' 14.5" 83°09' 35.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	5/10/66-11/5/80	0		100
Total Alkalinity	mg/l $CaCO_3$	5/21/74-11/5/80	-	.33	28
DO	mg/l	5/10/66-11/5/80	-	.09	101
Conductivity	25°C umhos	5/1/74-11/5/80	-	.28	64
Chloride	Total mg/l	6/22/66-11/5/80	-	.38	102
Turbidity	Turb mtr Hach FTU	7/9/74-11/5/80	0		61
Tot. Diss. Solids	E.C. mg/l	5/4/71-11/5/80	-	.05	81
Residue	Total mg/l	11/16/71-11/5/80	-	.16	70
Residue	Total NFLT mg/l	5/10/66-11/5/80	-	.17	103
Residue	Settleble mg/l	4/29/75-7/18/80	-	.18	26
Chlorophyll a	ug/l	4/29/75-11/5/80	-	.32	54
Silicate	UNF REACT mg/l SI	5/21/74-11/5/80	0		63
BOD	5 day mg l	7/9/74-11/5/80	0		59
Organic N	N mg/l	5/1/74-11/5/80	0		45
NH_3+NH_4	N Total mg/l	6/22/66-11/5/80	-	.14	102
Total Kjedahl	N mg/l	11/5/73-11/5/80	-	.08	58
NO_2+NO_3	N-Total mg/l	9/20/72-11/5/80	0		72
Tot. Organic C	C mg/l	4/29/75-11/5/80	-	.35	57
Total Phosphorus	mg/l P	4/30/68-11/5/80	-	.71	95
Phosphorus-T	Ortho mg/l P	5/10/66-11/5/80	-	.24	103
Total Coliform	MGIM LES/100ml	6/22/66-10/31/79	-	.09	90
Fecal Coliform	MFM-FCBR/100ml	5/4/71-11/5/80	0		82
Phenols	Total ug/l	5/10/66-11/5/80	-	.09	97
Iron	Total ug/l	5/10/66-11/5/80	-	.18	103
Cyanide	CN-Total mg.l	5/10/66-11/5/80	-	.72	98

Detroit River at Range 3.9
STORET Station No. 820018
42° 03' 15.0"   83° 08' 44.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	5/10/66-11/5/80	0		100
Total Alkalinity	mg/l $CaCO_3$	5/21/74-11/5/80	-	.15	28
DO	mg/l	5/10/66-11/5/80	-	.07	101
Conductivity	25°C umhos	5/1/74-11/5/80	-	.12	64
Chloride	Total mg/l	6/22/66-11/5/80	-	.43	102
Turbidity	Turb mtr Hach FTU	7/9/74-11/5/80	0		61
Tot. Diss. Solids	E.C. mg/l	5/4/71-11/5/80	0		81
Residue	Total mg/l	11/16/71-11/5/80	0		70
Residue	Total NFLT mg/l	5/10/66-11/5/80	-	.15	102
Residue	Settleble mg/l	4/29/75-7/18/78	0		26
Chlorophyll a	ug/l	4/29/75-11/5/80	-	.28	54
Silicate	UNF REAT mg/l Si	5/21/74-11/5/80	+	.06	63
BOD	5 day mg/l	7/9/74-11/5/80	0		59
Organic N	N mg/l	5/1/74-11/5/80	0		45
NH_3+NH_4	N-Total mg/l	6/22/66-11/5/80	-	.07	102
Total Kjedahl	N mg/l	11/5/73-11/5/80	0		58
NO_2+NO_3	N-Total mg/l	9/20/72-11/5/80	0		72
Tot. Organic C	C mg/l	4/29/75-11/5/80	-	.22	57
Total Phosphorus	mg/l P	4/30/68-11/5/80	-	.51	95
Phosphorus-T	Ortho mg/l P	10/27/66-11/5/80	-	.44	101
Total Coliform	MFIM LES/100ml	10/27/66-10/31/79	0		89
Fecal Coliform	MFM-FCBR/100ml	5/4/71-11/5/80	0		82
Phenols	Total ug/l	5/10/66-11/5/80	0		97
Iron	Total ug/l	5/10/66-11/5/80	-	.15	103
Cyanide	CN Total ug/l	5/10/66-11/5/80	-	.72	98

Detroit River at Range 3.9

STORET station No. 000024

43° 03' 16.2" 83° 08' 00.5"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	5/4/71-11/5/80	0		78
DO	mg/l	5/4/71-11/5/80	+	.06	77
Conductivity	25°C umhos	5/1/74-11/5/80	-	.12	64
Chloride	Total mg/l	5/4/71-11/5/80	-	.29	81
Turbidity	Turb mtr Hach FTU	7/9/74-11/5/80	0		61
Residue	Total mg.l	11/16/76-11/5/80	0		70
Residue	Total NFLT mg/l	5/4/71-11/5/80	0		81
Residue	Settleble mg/l	4/29/75-7/18/78	0		26
Silicate	UNF REAT mg/l SI	5/21/74-11/5/80	0		63
BOD	5 day mg/l	7/9/74-11/5/80	0		59
pH	Standard Units	5/4/71-11/5/80	+	.10	81
Organic N	N mg/l	5/1/74-11/5/80	0		45
NH_3+NH_4	N-Total mg/l	5/4/71-11/5/80	-	.27	81
Total Kjeldahl	N mg/l	5/1/73-11/5/80	0		58
NO_2+NO_3	N-Total mg/l	9/20/72-11/5/80	0		72
Tot. Organic C	C mg/l	4/29/75-11/5/80	-	.30	57
Total Phosphorus	mg/l P	5/4/71-11/5/80	-	.27	81
Phosphorus-T	Ortho mg/l P	5/4/71-11/5/80	-	.16	81
Total Coliform	MFIM LES/100ml	5/4/71-10/31/79	-	.12	69
Phenols	Total ug/l	5/4/71-11/5/80	-	.09	77
Iron	Total ug/l	5/4/71-11/5/80	0		81
Cyanide	CN Total mg/l	5/4/71-11/5/80	-	.80	76

Detroit River at Range 3.9

STORET Station No. 000025

42° 03' 16.5"   83° 07' 54.5"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	5/10/66-11/5/80	0		100
pH	SU	5/10/66-11/5/80	+	.12	103
DO	mg/l	5/10/66-11/5/80	+	.06	100
Conductivity	25°C umhos	5/1/74-11/5/80	-	.17	64
Chloride	Total mg/l	6/22/66-11/5/80	-	.27	102
Turbidity	Turb mtr Hach FTU	7/9/74-11/5/80	0		61
Tot. Diss. Solids	E.C. mg/l	5/4/71-11/5/80	0		81
Residue	Total mg/l	11/16/71-11/5/80	0		70
Residue	Total NFLT mg/l	5/10/66 11/5/80	-	.09	102
Residue	Settleble mg/l	4/29/75-7/18/78	0		26
Chlorophyll <u>a</u>	ug/l	4/29/75-11/5/80	-	.25	52
Silicate	UNF REAT mg/l SI	5/2/74-11/5/80	0		63
BOD	5-day mg/l	7/9/74-11/5/80	0		59
Organic N	N mg/l	5/1/74-11/5/80	0		45
NH_3+NH_4	N Total mg/l	6/22/66-11/5/80	-	.12	102
Total Kjeldahl	N mg/l	11/5/73-11/5/80	0		58
NO_2+NO_3	N-Total mg/l	9/20/72-11/5/80	0		72
Total Organic C	C mg/l	4/29/75-11/5/80	-	.23	57
Total Phosphorus	mg/l P	4/30/68-11/5/80	-	.40	95
Phosphorus-T	Ortho mg/l	10/27/66-11/5/80	0		101
Total Coliform	MFIM LES/100ml	10/27/66-10/31/79	-	.09	89
Fecal Coliform	MFM-FCBR/100ml	5/4/71-11/5/80	-	.69	82
Phenols	Total ug/l	5/10/66-11/5/80	-	.09	97
Iron	Total ug/l	5/10/66-11/5/80	-	.13	103
Cyanide	CN Total mg/l	5/10/66-11/5/80	-	.71	98

Detroit River at Range 3.9
STORET Station No. 000026
42° 03' 17.0"   83° 07' 38.3"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	5/4/71-11/5/80	0		78
pH	SU	5/4/71-11/5/80	+	.11	81
DO	mg/l	5/4/71-11/5/80	+	.06	78
Conductivity	25°C umhos	5/1/74-11/5/80	-	.11	64
Chloride	Total mg/l	5/4/71-11/5/80	-	.15	81
Turbidity	Turb mtr Hach FTU	7/9/74-11/5/80	0		61
Tot. Diss. Solids	E.G. mg/l	4/5/71-11/5/80	0		80
Residue	Total mg/l	11/16/71-4/5/80	0		70
Residue	Total NFLT mg/l	5/4/71-11/5/80	0		80
Residue	Settleble mg/l	4/29/75-7/18/78	0		26
Chlorophyll a	ug/l	4/29/75-11/5/80	-	.22	54
Silicate	UNF REAT mg/l SI	5/21/74-11/5/80	0		63
BOD	5-day mg/l	7/9/74-11/5/80	0		59
Organic N	N mg/l	5/1/74-11/5/80	0		45
NH_3+NH_4	N Total mg/l	5/4/71-11/5/80	-	.20	81
Total Kjeldahl	N mg/l	11/5/73-11/5/80	0		58
NO_2+NO_3	N-Total mg/l	9/20/72-11/5/80	0		72
Inorganic C	C mg/l	4/29/75-11/5/80	-	.30	57
Total Phosphorus	mg/l P	5/4/71-11/5/80	-	.13	81
Phosphorus-T	Ortho mg/l	5/4/71-11/5/80	-	.58	81
Total Coliform	MFIM LES/100ml	5/4/71-10/31/79	-	.15	68
Fecal Coliform	MFM-FCBR/100ml	5/4/71-11/5/80	0		81
Phenols	Total ug/l	5/4/71-11/5/80	0		76
Iron	Total ug/l	5/4/71-11/5/80	0		81
Cyanide	CN Total mg/l	5/4/71-11/5/80	-	.79	76

Detroit River at Range 3.9
STORET Station No. 000027
42° 03' 17.0"   83° 07' 34.5"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	5/10/66-11/5/80	0		100
pH	SU	5/10/66-11/5/80	+	.15	102
DO	mg/l	5/10/66-11/5/80	+	.06	101
Conductivity	25°C umhos	5/1/72-11/5/80	-	.26	64
Chloride	Total mg/l	6/22/66-11/5/80	0		101
Turbidity	Turb mtr Hach FTU	7/9/74-11/5/80	0		61
Tot. Diss. Solids	E.C. mg/l	5/4/71-11/5/80	- ✓ -	.06	80
Residue	Total mg/l	11/16/71-11/5/80	-	.15	70
Residue	Total NFLT mg/l	5/10/66-11/5/80	-	.07	101
Residue	Settleble mg/l	4/29/75-7/18/78	0		76
Chlorophyll a	ug/l	4/29/75-11/5/80	-	.17	53
Silicate	UNF REAT mg/l SI	5/21/74-11/5/80	0		63
BOD	5-day mg/l	7/9/74-11/5/80	0		60
Organic N	N mg/l	5/1/74-11/5/80	0		45
NH_3+NH_4	N Total mg/l	6/22/66-11/5/80	-	.14	102
Total Kjeldahl	N mg/l	11/5/73-11/5/80	0		58
NO_2+NO_3	N-Total mg/l	9/20/72-11/5/80	0		71
Inorganic C	C mg/l	4/29/75-11/5/80	-	.23	57
Total Phosphorus	mg/l P	4/30/68-11/5/80	-	.41	95
Phosphorus-T	Ortho mg/l P	10/27/66-11/5/80	-	.42	101
Total Coliform	MFIM LES/100ml	10/27/66-10/31/79	-	.20	89
Fecal Coliform	MFM FCBR/100ml	5/4/71-11/5/80	0		82
Phenols	Total ug/l	5/10/66-11/5/80	-	.14	97
Iron	Total ug/l	5/10/66-11/5/80	-	.05	103
Cyanide	CN Total mg/l	5/10/66-11/5/80	-	.71	98

Detroit River ât Range 3.9
STORET Station No. 000029
42° 03' 17.5"   83° 07' 8.3"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	5/10/66-11/5/80	+	.04	99
pH	SU	5/10/66-11/5/80	+	.12	103
DO	mg/l	5/10/66-11/5/80	0		101
Conductivity	25°C umhos	5/1/74-11/5/80	+	.16	64
Chloride	Total mg/l	6/22/66-11/5/80	0		102
Turbidity	Turb mtr Hach FTU	7/9/74-11/5/80	0		61
Tot. Diss. Solids	E.C. mg/l	5/4/71-11/5/80	0		81
Residue	Total mg/l	11/16/71-11/5/80	0		70
Residue	Total NFLT mg/l	5/10/66-11/5/80	-	.05	101
Residue	Settleble mg/l	4/29/75-7/18/78	0		26
Chlorophyll a	ug/l	4/29/75-11/5/80	-	.12	83
Silicate	UNF REAT mg/l SI	5/21/74-11/5/80	0		63
BOD	5-day mg/l	7/9/74-11/5/80	0		58
Organic N	N mg/l	5/1/74-11/5/80	0		45
NH_3+NH_4	N Total mg/l	6/22/66-11/5/80	0		102
Total Kjeldahl	N mg/l	11/5/73-11/5/80	0		58
NO_2+NO_3	N-Total mg/l	9/20/72-11/5/80	0		72
Total Organic C	C mg/l	4/30/68-11/5/80	-	.28	95
Total Phosphorus	mg/l P	4/29/75-11/5/80	-	.29	57
Phosphorus-T	Ortho mg/l P	10/27/66-11/5/80	-	.34	101
Total Coliform	MFIM LES/100ml	10/27/66-10/31/79	-	.25	88
Fecal Coliform	MFM FCBR/100ml	5/4/71-11/5/80	+	.05	81
Phenols	Total ug/l	5/10/66-11/5/80	-	.05	96
Iron	Total ug/l	5/10/66-11/5/80	0		103
Cyanide	CN Total mg/l	5/10/66-11/5/80	-	.71	98

Monroe Michigan Water Intake

STORET Station No. 580048

41° 56' 12.3"   83° 14' 24.3"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	11/2/67-7/30/79	0		34
pH	SU	9/11/67-7/30/79	0		23
Total Alkalinity	mg/l $CaCO_3$	11/2/67-7/30/79	0		23
Conductivity	25°C umhos	9/15/69-7/30/79	0		22
Residue	Total NFLT mg/l	11/2/67-7/30/79	0		23
Chloride	Total mg/l	11/2/67-7/30/79	0		23
Sulfate	SO_4-Diss mg/l	11/2/67-7/30/79	0		23
Total Phosphorus	mg/l P	11/2/67-7/30/79	0		23
NH_3+NH_4	N Total mg/l	11/2/67-7/30/79	0		23
NH_3-NH_3	Unionized mg/l	11/2/67-7/30/79	0		23
Cyanide	CN Total mg/l	11/2/67-7/30/79	0		20
Phenols	Total ug/l	11/2/67-7/30/79	+	.23	20
Fecal Coliform	MFM FCBR/100ml	11/2/67-7/30/79	0		22
Total Coliform	MFIM LES/100ml	11/2/67-7/30/79	0		21

Maumee River at Toledo, Ohio
STORET Station No. 04194023
40° 01' 36.0"   83° 78' 20.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
pH	SU	12/5/67-2/5/75	0		70
Total Alkalinity	mg/l $CaCO_3$	12/5/67-2/5/75	0		154
HCO_3 Ion	mg/l	12/5/67-2/5/75	0		154
CO_3 Ion	mg/l	12/5/67-2/5/75	0		152
Total Hardness	mg/l $CaCO_3$	12/5/67-2/5/75	0		143
NC Hardness	mg/l $CaCO_3$	12/5/67-2/5/75	0		144
Dissolved Solids	Tons/acre ft	12/5/67-2/5/75	0		132
Conductivity	25°C umhos	12/5/67-2/5/75	0		153
Residue	Diss-180°C mg/l	12/5/67-2/5/75	0		130
Chloride	Total mg/l	12/5/67-2/5/75	0		153
Sulfate	Total mg/l	12/5/67-2/5/75	-	.04	153
Nitrate	Diss-NO_3 mg/l	12/5/67-2/5/75	+	.05	130

Maumee River at Waterville
STORET Station No. 04193500
41° 30' 00.0"   83° 42' 46.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	10/21/66-12/1/80	0		272
pH	SU	9/19/66-12/1/80	+	.12	156
Total Alkalinity	mg/l $CaCO_3$	10/2/66-9/12/80	0		206
Total Hardness	mg/l $CaCO_3$	10/2/65-12/1/80	-	.02	249
NC Hardness	mg/l $CaCO_3$	10/2/65-12/1/80	-	.06	249
Conductivity	25°C umhos	10/2/65-12/1/80	0		284
Chloride	Total mg/l	10/2/65-12/1/80	+	.08	257
Sulfate	Total mg/l	10/2/65-12/1/80	-	.05	256
DO	mg/l	12/27/72-12/1/80	0		84
Turbidity	JTU	1/8/74-6/12/78	0		24
CO_2	mg/l	7/5/73-9/5/79	0		47
HCO_3	mg/l	10/2/65-6/12/78	0		227
CO_3	mg/l	10/2/65-6/12/78	0		225
Total Nitrogen	mg/l	1/8/74-1/12/80	0		81
Organic N	mg/l	1/24/78-1/12/80	0		36
NH_3+NH_4	Total mg/l	10/25/77-12/1/80	-	.10	39
Kjeldahl-N	Diss. mg/l	10/25/77-12/1/80	0		38
Kjeldahl-N	Susp. mg/l	1/24/78-12/1/80	0		36
Total Kjeldahl	mg/l N	1/8/74-12/1/80	0		81
NO_2+NO_3	mg/l N-Total	8/10/73-12/18/80	0		103
Total N as NO_3	mg/l	1/8/74-12/1/80	0		170
Total Phosphorus	mg/l P	10/5/71-12/1/80	-	.05	144
Diss. Phosphorus	mg/l P	10/25/77-12/1/80	-	.12	39
Total Organic C	mg/l C	10/6/70-12/1/80	0		49
Fecal Coliform	MFM FCBR mg/l	1/8/74-9/22/76	0		33

Maumee River at Waterville
STORET Station No. 04193500
41° 30' 00.0"   83° 42' 46.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Algae	Total /ml	4/2/74-11/7/80	0		60
Phenols	Total ug/l	10/2/65-9/30/66	0		24
Dissolved Solids	Tons/day	10/2/66-9/12/80	0		186
Dissolved Solids	Tons/acre ft	10/2/66-12/1/80	0		190
Calcium	mg/l CA, Diss.	10/1/73-12/1/80	0		65
Magnesium	mg/l MG, Diss.	10/1/73-12/1/80	0		65
Sodium	mg/l NA, Diss.	1/8/74-12/1/80	0		54
Sodium	Adsbtion Ratio	1/8/74-12/18/80	0		54
Potassium	mg/l K, Diss.	1/8/74-12/1/80	0		54
Silica	mg/l Diss.	1/8/74-12/1/80	0		54
Iron	Total ug/l	1/8/74-10/15/80	0		27
CD, Total	ug/l	1/8/74-10/15/80	0		27
CR, Total	ug/l	1/8/74-10/15/80	+	.25	28
Pb, Total	ug/l	1/8/74-10/15/80	0		27
Manganese	ug/l	1/8/74-10/15/80	0		27
Zinc	Total ug/l	1/8/74-10/15/80	0		27
Arsenic	Total ug/l	1/8/74-10/15/80	-	.23	28
Copper	Total ug/l	1/8/74-10/15/80	0		28
Mercury	Total ug/l	10/6/70-10/15/80	0		36
Selenium	Total ug/l	1/8/74-10/15/80	-	.33	28
Stream Flow	INST-CFS	10/5/71-9/12/80	0		170
Susp. Sed. Dis.	Tons/day	3/7/63-9/12/80	-	.08	122
Susp. Sed. Conc.	mg/l	3/7/63-9/12/80	-	.14	122
Fecal Coliform	M-FCAGAD/100ml	10/26/76-12/1/80	0		51
Fecal Strep.	M FKFAGAR/100ml	10/26/76-12/1/80	0		51

Maumee River at the C and O Dock
Not Obtained from STORET
41° 41' 46.0"   83° 21' 39.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Conductivity	umhos/cm	1/7/70-12/28/77	0		302
pH	SU	1/7/70-12/26/79	-	.50	408
CL	mg/l	1/7/70-12/26/79	+	.16	423
NO_2	mg/l	1/7/70-12/19/79	0		371
NO_3	mg/l	1/7/70-12/19/79	-	.19	368
NH_3-N	mg/l	5/7/75-12/26/79	0		207
Total Phosphorus	mg/l	1/7/70-12/19/79	-	.24	377
DO	mg/l	1/7/70-12/26/79	0		428
BOD	5-day mg/l	1/7/70-12/26/79	+	.09	410
Total Solids	mg/l	1/7/70-12/26/79	0		424
Suspended Solids	mg/l	1/7/70-12/26/79	0		426
Dissolved Solids	mg/l	1/7/70-12/26/79	0		416
Temperature	Centigrade	1/7/70-12/26/79	0		428
Total Alkalinity	mg/l $CaCO_3$	1/7/70-12/26/79	-	.12	418
Sol. Phosphorus	mg/l	1/7/70-12/19/79	-	.25	353
Insol. Phosphorus	mg/l	1/7/70-12/19/79	0		303
Turbidity	JTU	1/7/70-12/26/79	0		367
Fecal Coliform	no./100ml	1/7/70-12/26/79	-	.16	374

Davis Besse (Locust Point)

Not Obtained from STORET

41° 35' 57.0" 83° 05' 28.0" (Cooling Tower)

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	4/18/74-12/4/80	0		348
DO	ppm	4/18/74-12/4/80	0		348
Conductivity	umhos/cm	4/18/74-12/4/80	0		348
Trans.	meters	4/18/74-12/4/80	0		174
Calcium	mg/l	4/18/74-12/4/80	0		300
Magnesium	mg/l	4/18/74-12/4/80	+	.34	300
Sodium	mg/l	4/18/74-12/4/80	0		300
Chloride	mg/l	4/18/74-12/4/80	-	.31	348
Nitrate	mg/l	4/18/74-12/4/80	+	.09	348
Sulfate	mg/l	4/18/74-12/4/80	0		348
Total Phosphorus	mg/l	4/18/74-12/4/80	0		348
Silicate	mg/l	4/18/74-12/4/80	0		348
Total Alkalinity	mg/l $CaCO_3$	4/18/74-12/4/80	0		348
BOD	5-day mg/l	4/18/74-12/4/80	-	.07	348
Tot. Susp. Sol.	mg/l	4/18/74-12/4/80	0		348
Dissolved Solids	mg/l	4/18/74-12/4/80	0		348
Turbidity	FTU	4/18/74-12/4/80	0		348
pH	SU	4/8/74-12/4/80	0		348

Sandusky Water Intake

Station No. 504030

41° 27' 51" 82° 38' 50.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	10/1/74-3/29/79	+	.01	279
Temperature	Fahr	10/1/74-3/29/79	+	.01	279
pH	SU Lab	10/1/74-3/27/80	-	.40	295
Total Alkalinity	mg/l $CaCO_3$	10/1/74-3/27/80	-	.03	290
Total Hardness	mg/l $CaCO_3$	10/1/74-3/27/80	0		232
Conductivity	umhos @ 25°C	10/1/74-3/27/80	+	.10	235
Chloride	Total mg/l	10/1/74-3/27/80	0		143
Sulfate	Total mg/l	10/1/74-3/27/80	+	.05	124
DO	mg/l	10/1/74-1/17/79	0		187
DO	Saturation-%	10/1/74-1/17/79	-	.03	187
Turbidity	JKSN-JTU	10/1/74-12/4/78	0		275
$NH_3 + NH_4$	N Total mg/l	6/19/75-3/27/80	0		48
NO_2-N	Total mg/l	6/19/75-3/27/80	0		47
NO_3-N	Total mg/l	6/19/75-3/27/80	+	.11	63
Total Kjeldahl	N mg/l	6/19/75-3/27/80	0		47
Ortho Phosphorus	mg/l	6/19/75-2/27/79	-	.26	28
Total Phosphorus	mg/l P	6/19/75-3/27/80	0		45
Total Organic C	mg/l C	6/19/75-3/27/80	+	.10	42
Fecal Coliform	MFM-FCBR/100 ml	10/1/74-3/27/80	0		213
Fecal Strep.	MFM-ENT/100 ml	10/1/74-5/1/79	0		191
CL_2 DMD	15 min. mg/l	10/1/74-3/1/78	0		250
Iron	Fe-Total ug/l	10/1/74-3/27/80	0		104
Iron	Fe-Total ug/l	6/19/75-3/27/80	+	.06	69

Sandusky Water Intake

Station No. 504030

41° 27' 51" 82° 38' 50.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Manganese	Mn ug/l	10/1/74-3/27/80	+	.19	103
Residue	Total mg/l	10/1/74-3/1/78	+	.09	201
Arsenic	ug/l	6/19/75-3/27/80	0		24
Cadmium	ug/l	6/19/75-3/27/80	-	.48	24
Chromium	Cr-Total ug/l	6/19/75-3/27/80	0		24
Copper	Cu-Total ug/l	6/19/75-3/27/80	0		24
Lead	Pb-Total ug/l	6/19/75-3/27/80	-	.38	24
Zinc	Zn-Total ug/l	6/19/75-3/27/80	0		24
Alpha	Total pc/l	4/17/70-3/27/80	+	.36	70
Alpha	Dissolved pc/l	6/11/71-11/22/74	0		41
Alpha	Suspended pc/l	6/11/71-11/22/74	0		41
Beta	Total pc/l	4/17/70-3/27/80	-	.16	70
Beta	Dissolved pc/l	6/11/71-11/22/74	-	.43	41
Beta	Suspended pc/l	6/11/71-11/22/74	-	.24	41

Crown Water Supply Intake

Station No. 504090

41° 31' 08"   81° 52' 46"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	2/1/74-9/23/80	+	.03	424
Total Alkalinity	$CaCO_3$ mg/l	2/1/74-11/25/80	+	.05	429
pH	SU	2/1/74-9/23/80	-	.06	428
Dissolved Oxygen	mg/l	2/1/74-9/23/80	-	.01	418
Dissolved Oxygen	Saturated-%	2/1/74-9/23/80	0		413
Total Hardness	$CaCO_3$ mg/l	2/1/74-11/25/80	+	.03	416
Turbidity	JKSN-JTU	2/1/74-2/19/80	-	.01	419
Conductivity	µmhos @ 25°C	2/1/74-8/14/79	0		391
Sulfate	SO_4-Total mg/l	11/29/78-11/25/80	0		22
Chloride	Total mg/l	11/29/78-11/25/80	0		23
Silica	Dissolved mg/l	11/29/78-11/25/80	0		24
$NH_3 + NH_4$	N Total mg/l	11/29/78-11/25/80	0		24
NO_2-N	Total mg/l	11/29/78-11/25/80	0		21
NO_3-N	Total mg/l	11/29/78-11/25/80	0		24
Total Kjeldahl	N mg/l	11/29/78-11/25/80	0		24
Total Phosphorus	mg/l P	11/29/78-11/25/80	+	.25	22
Fecal Coliform	MFM-FCBR/100 ml	2/1/74-11/25/80	+	.01	410
Fecal Strep.	MFM-ENT/100 ml	2/3/75-11/25/80	0		279

Erie Water Intake

Station No. J 4108

42° 09' 24" 80° 09' 10"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Temperature	Centigrade	6/18/69-12/18/74	0		912
pH	SU	6/18/69-12/31/80	-	.03	2382
Total Alkalinity	mg/l $CaCO_3$	6/18/69-12/31/80	-	.01	2342
Total Hardness	mg/l $CaCO_3$	6/18/69-12/15/80	-	.12	2300
Dissolved Oxygen	mg/l	6/18/69-12/31/80	+	.01	2351
Turbidity	JKSN JTU	6/18/69-12/31/80	+	.02	2357
Residue	Diss.-105 C mg/l	7/22/69-12/15/80	-	.52	1352
Dissolved Solids	Tons/day	1/3/72-1/30/76	-	.06	883
Chloride	Total mg/l	7/1/69-12/8/80	-	.50	448
Sulfate	SO_4-Total mg/l	7/2/69-12/8/80	-	.45	441
Iron	Fe Total mg/l	8/13/69-10/27/80	-	.07	405
Manganese	Mn µg/l	9/8/69-1/19/76	-	.35	244
Dissolved Oxygen	Saturated-%	7/23/69-4/22/75	-	.68	27
Total Phosphorus	P-Col mg/l	7/23/69-12/15/70	0		28
Soluble Phos.	TP-Col mg/l	7/23/69-12/15/70	0		28
Odor	THRSH No. Rm Temp.	6/18/69-12/31/80	-	.02	2220
Cl_2 DMD	15 min. mg/l	1/2/69-12/31/80	-	.02	2149
Cl_2 DMD	30 min. mg/l	7/14/69-6/30/70	-	.11	45
Total Coliform	MFIM ENDO/100 ml	6/18/69-12/15/80	-	.00	2394
Fecal Coliform	MFM-FCBR/100 ml	8/6/69-9/24/74	-	.59	60
Total Count	TPC 35 C 24/ml	8/6/69-9/24/74	0		53
Algae	Total ml	6/18/69-11/26/80	+	.05	1176

Buffalo River

Station No. 01 0006

42° 51' 42.3" 78° 52' 4.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Total Coliform	MFIMENDO/100 ml	11/3/71-11/17/80	0		85
Fecal Coliform	M-FCAGAR/100 ml	10/15/75-11/17/80	0		41
Phenols	Total µg/l	4/15/68-11/17/80	-	.22	140
Chloride	Total mg/l	4/15/68-11/17/80	-	.30	145
Conductivity	µmhos @ 25°C	4/15/68-11/17/80	-	.21	143
Total Phosphorus	P-Col mg/l	3/30/77-11/17/80	+	.36	26
Dissolved Phos.	Ortho mg/l P	10/15/75-9/8/80	0		33
BOD	5 day mg/l	4/15/68-1/2/80	-	.30	118
DO	mg/l	4/15/68-11/17/80	+	.04	139
Turbidity	JKSN JTU	4/15/68-9/9/76	0		107
Temperature	Centigrade	4/15/68-11/17/80	0		142
NO_2-N	Total mg/l	4/15/68-11/17/80	0		134
$NH_3 + NH_4$	N-Total mg/l	4/15/68-11/17/80	-	.35	142
Organic N	N mg/l	4/15/68-9/9/76	-	.17	101
Residue	FIX NFLT mg/l	4/15/68-11/17/80	0		134
Residue	Total NFLT mg/l	4/15/68-11/17/80	0		143
Iron	Fe Total µg/l	4/15/68-9/8/71	0		57
Manganese	Mn µg/l	4/15/68-5/27/75	0		99
Sulfate	SO_4-Total mg/l	4/15/68-5/27/78	-	.30	99
Potassium	K Total mg/l	4/15/68-5/27/75	-	.12	93
Sodium	Na Total mg/l	4/15/68-5/27/75	-	.24	94
Magnesium	Mg Total mg/l	4/15/68-5/27/75	0		97
Calcium	Ca Total mg/l	4/15/68-5/27/75	0		99

Buffalo River

Station No. 01 0006

42° 51' 42.3" 78° 52' 4.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Total Hardness	$CaCO_3$ mg/l	4/15/68-5/27/75	0		99
$NO_2 + NO_3$	N Total mg/l	3/30/77-11/17/80	0		29
Total Kjeldahl	N mg/l	7/16/73-11/17/80	-	.15	48
NO_3-N	Total mg/l	4/15/68-9/9/76	+	.06	113
Residue	Total mg/l	4/15/68-5/27/75	-	.19	98
HCO_3 Alkalinity	$CaCO_3$ mg/l	4/15/68-12/14/78	+	.27	107
pH	SU	4/15/68-11/17/80	+	.39	138
Total Alkalinity	$CaCO_3$ mg/l	6/14/78-11/17/80	0		21
COD	Low Level mg/l	4/15/68-12/14/77	-	.23	120

Black Rock Canal

Station No. 01 6005

42° 54' 54.4" 078° 54' 10.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Calcium	Ca-Total mg/l	3/4/69-5/27/75	0		59
Magnesium	Mg-Total mg/l	3/4/69-5/27/75	0		59
Sodium	Na-Total mg/l	3/4/69-5/27/75	0		56
Potassium	K-Total mg/l	3/4/69-4/21/75	0		55
Sulfate	SO_4 Total mg/l	3/4/69-5/27/75	0		59
Chloride	Total mg/l	3/4/69-11/18/80	-	.05	95
$NH_3 + NH_4$	N Total mg/l	3/4/69-11/18/80	-	.05	92
$NO_2 + NO_3$	N Total mg/l	4/25/77-11/18/80	0		23
Ortho Phosphorus	PO_4 mg/l	3/4/69-9/8/71	0		29
Total Phosphorus	PO_4 mg/l	11/3/71-9/7/76	0		41
NO_3-N	Total mg/l	3/4/69-9/7/76	0		70
Temperature	Centigrade	3/4/69-11/18/80	0		95
Turbidity	JKSN JTU	3/4/69-9/7/76	0		70
Conductivity	µmhos @ 25°C	3/4/69-11/18/80	0		95
Dissolved Oxygen	mg/l	3/4/69-11/18/80	0		96
BOD	5 day mg/l	3/4/69-11/28/79	0		68
pH	SU	3/4/69-11/18/80	+	.07	94
Residue	Total FIX µg/l	3/4/69-9/24/74	0		57
Residue	Total NFLT mg/l	3/4/69-11/18/80	-	.06	99
Residue	FIX NFLT mg/l	3/4/69-11/18/80	0		89
HCO_3 Alkalinity	$CaCO_3$ mg/l	3/4/69-9/19/77	0		68
Organic N	N mg/l	3/4/69-9/7/76	0		62
Iron	Fe µg/l	3/11/71-5/27/75	0		30
Manganese	Mn µg/l	3/4/69-5/27/75	0		58
Phenols	Total µg/l	3/4/69-11/18/80	0		92
Total Coliform	MFIMENDO/100 ml	11/3/71-11/18/80	0		67

Niagara River

Station No. 01 0007

42° 57' 02.0" 78° 55' 15.0"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Calcium	Ca-Total mg/l	4/20/71-5/27/75	0		50
Magnesium	Mg-Total mg/l	4/20/71-5/27/75	+	.22	50
Sodium	Na-Total mg/l	4/20/71-5/27/75	0		50
Potassium	K Total mg/l	4/20/71-5/27/75	-	.09	50
Sulfate	SO_4-Total mg/l	4/20/71-5/27/75	+	.31	50
Chloride	Total mg/l	4/20/71-5/27/75	-	.46	103
$NH_3 + NH_4$	N Total mg/l	4/20/71-11/18/80	0		100
$NO_2 + NO_3$	N Total mg/l	3/3/77-11/18/80	0		36
Total Phosphorus	PO_4 mg/l	11/11/71-9/7/76	+	.11	60
NO_3-N	Total mg/l	4/20/71-9/7/76	0		65
Temperature	Centigrade	4/20/71-11/18/80	0		81
Stream Flow	CFS	11/3/71-9/24/74	+	.32	34
Turbidity	JKSN JTU	4/20/71-3/3/77	0		67
Conductivity	µmhos @ 25°C	4/20/71-11/18/80	0		102
BOD	5 day mg/l	4/20/71-1/2/80	0		65
pH	SU	4/20/71-11/18/80	-	.14	98
Total Alkalinity	$CaCO_3$ mg/l	6/12/78-11/18/80	0		24
Residue	Total FIX mg/l	4/20/71-9/24/74	0		43
Residue	Total NFLT mg/l	4/20/71-11/18/80	0		105
Residue	FIX NFLT mg/l	4/20/71-11/18/80	0		93
HCO_3 Alkalinity	$CaCO_3$ mg/l	4/20/71-3/15/78	0		65
Organic N	N mg/l	4/20/71-9/7/76	-	.31	53
Iron	Fe µg/l	11/11/71-5/27/75	0		44
Manganese	Mn µg/l	4/20/71-5/27/75	+	.23	50
Phenols	Total µg/l	4/20/71-11/18/80	+	.07	99
Total Coliform	MFIMENDO/100 ml	3/11/71-11/18/80	0		98

Niagara River (Lake Ontario)
Station No. 04219640
43° 15' 40" 79° 03' 47"

PARAMETER	UNITS	TIME PERIOD	SIGNIFICANCE	r^2	N
Sulfate	SO_4-Total mg/l	10/13/70-10/29/80	0		59
Chloride	Total mg/l	10/13/70-10/29/80	-	.48	58
Total N	N mg/l	5/15/74-10/29/80	0		52
$NH_3 + NH_4$	N Total mg/l	10/31/77-10/29/80	0		24
$NO_2 + NO_3$	N Total mg/l	5/15/74-10/29/80	0		52
Total Phosphorus	mg/l P	5/8/73-10/29/80	0		57
Dissolved Phos.	mg/l P	10/31/77-10/29/80	0		23
pH	SU	10/13/70-10/29/80	0		67
Total Alkalinity	$CaCO_3$ mg/l	10/13/70-9/3/80	0		57
Temperature	Centigrade	10/13/70-10/29/80	+	.07	734
Stream Flow	CFS	10/24/73-9/3/80	0		61
Turbidity	JKSN JTU	5/8/73-5/17/78	0		34
Conductivity	µmhos @ 25°C	10/13/70-10/29/80	-	.08	717
Dissolved Oxygen	mg/l	10/13/70-10/29/80	0		164
Organic N	N mg/l	10/31/77-10/29/80	0		24
Iron	Fe Total µg/l	7/18/73-10/29/80	0		29
Manganese	Mn µg/l	5/8/73-10/29/80	0		31