



*Water management in Ontario*

Ontario  
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Commission

Great Lakes  
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Surveys Program

**WATER CHEMISTRY  
NANTICOKE AREA  
LAKE ERIE**

1969



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Water Quality Surveys  
Ontario Water Resources Commission  
135 St. Clair Ave. W.  
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April 1970

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**ABSTRACT**

Monthly evaluation of the water chemistry characteristics at eight buoy marked in the Nanticoke area of Lake Erie for the period April to December 1969 are presented. The survey area extends 2.4 km offshore and 8.8 km along the shore. The bottom is hard clay and water depths do not exceed 12 m. It was found that the area is generally homogeneous in water chemistry with little or no stratification with depth during the survey period.

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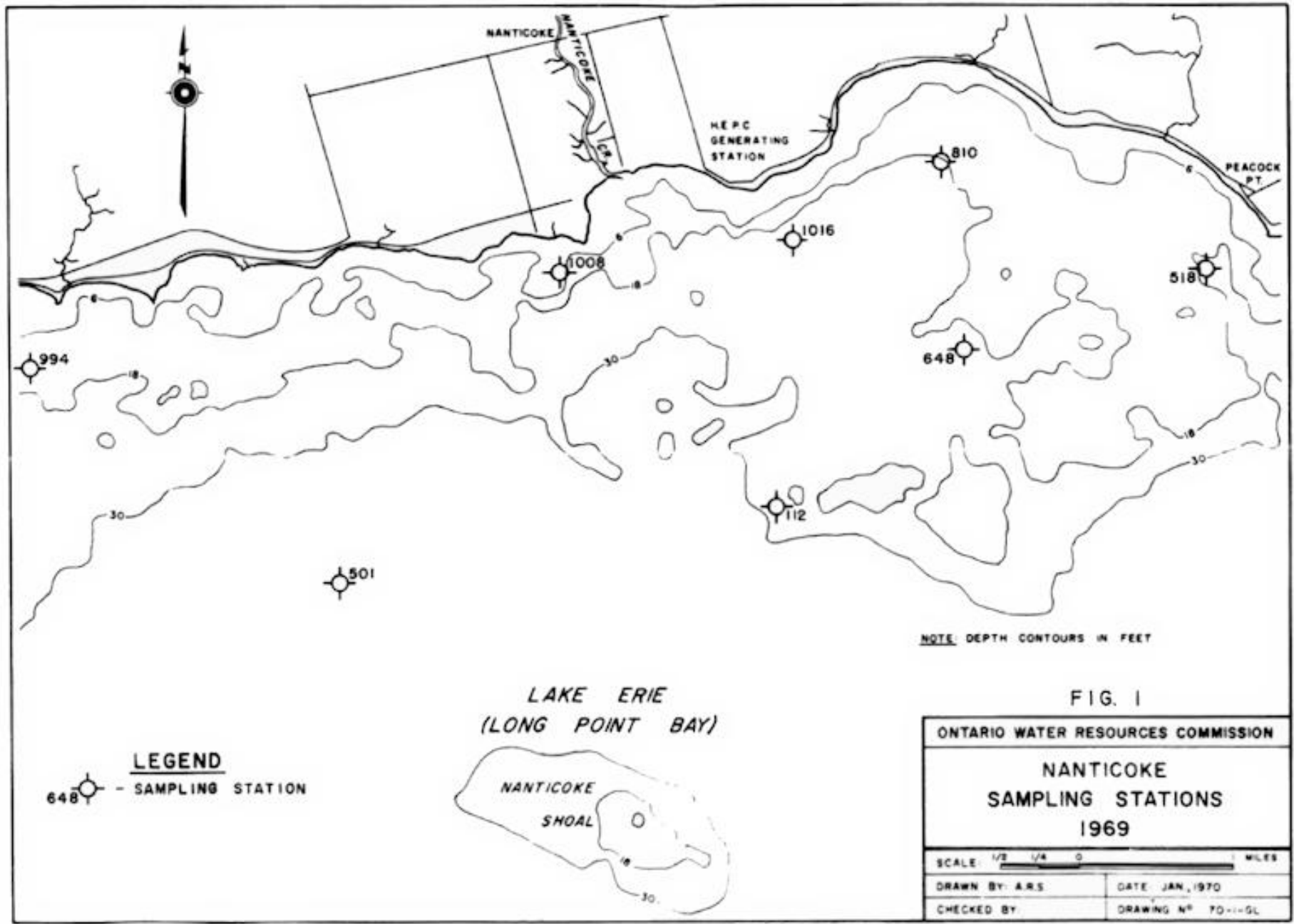
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**INTRODUCTION**

A study of the existing water chemistry, biological and physical characteristics of the aquatic environment in the Nanticoke area was initiated in 1968. This is a co-operative study carried out by the Steel Company of Canada (Stelco), the Hydro-Electric Power Commission of Ontario (HEPCO), the Department of Lands and Forests (L & F), and the Ontario Water Resources Commission (OWRC). It was agreed that most of the study activity would be concentrated at eight designated stations in the area which were selected on the basis of statistical analysis of 24-hour water chemistry surveys on a dense sampling grid carried out in 1968 (Required Density of Water Quality Sampling Stations at Nanticoke, Lake Erie 1968, OWRC Report). By concentrating the study activities of all agencies on the eight stations, the data collected could easily be interrelated. HEPCO assumed the responsibility of gathering chemical water samples at these locations. The analyses of the samples was carried out by the Department of Lands and Forests and OWRC.





This report summarizes the chemical analysis of the samples taken on the Nanticoke station sampling grid (see Figure 1). A listing of the chemical results by sampling time and location appears in Appendix 2. The respective summary is contained in Appendix 1. The results were assessed by employing statistical methods to validate the selection of the station density determined in 1968.

## **ANALYSIS OF RESULTS**

The dissolved oxygen, pH, and temperature were determined at the time of sampling, and all other chemical parameters for the collected grab samples were measured employing standard methods (American Public Health Association, 1965) in a laboratory. The values of the 1969 results for the respective stations noted in Tables, Appendix 2, were subjected to various statistical tests.

Analysis of variance (both parametric and non-parametric) was carried out on the survey data to determine whether differences occurred between stations and between dates for the chemical characteristics measured. Testing of results was restricted to samples collected at the same depth for one-way tests. The appropriate degrees of freedom for the various tests were obtained from Appendix 2. All block plans for the analysis of variance were complete and no data was generated to fill missing elements in the blocks. The analysis of variance was carried out by dropping stations with an incomplete number of readings. No effort was made to carry out pair-testing either by time or by location.

The results of the parametric two-way analysis of variance appears in Table 1. It is observed that a significant difference between the stations were restricted to alkalinity and turbidity, while a significant time variance was present for pH and alkalinity. The non-parametric one-way analysis of variance test (Kruskal-Wallis) in Table 2 demonstrated that the only significant difference is between the stations in turbidity and weakly in alkalinity. Statistical analysis of group sample results in 1968 indicated that it was advisable to use non-parametric analysis (Palmer, 1968). The 1969 results indicate that the station selection for monitoring was reasonable and should be maintained in 1970. No significant difference with depth was found for any

of the parameters tested. It would appear that there is little value in taking both shallow and deep samples at the stations. The same information can be collected from one mid-depth sample.

This study is intended to provide baseline information on the water environment in the Nanticoke area before the operation of the industrial complex commences. The summary in Appendix 1 provides the information concerning the seasonal and between station variations as detected in the 1969 survey. Seasonal trends from Appendix 1 are plotted in Figures 2A and 2B. It should be noted in examining these tables that many of the concentrations appearing in the tables are at the limit of the sensitivity range for the evaluation techniques (American Public Health Association, 1965 and Palmer, 1968). In particular, ammonia,  $\text{NO}_2$ ,  $\text{NO}_3$ , and soluble phosphorus are below the sensitivity levels of the test and consequently, the variations recorded are doubtful. Similarly, the total phosphorus is in the range of 10 to 30 ppb which is at the lower sensitivity extreme of the total phosphorus test. Consequently, it is subjected to errors.

**TABLE 1.** Parametric Two-way Analysis Of Variance.

Parameter	Source of Variance	F Test	F	Significant Difference
Alkalinity	Stations	339.8/ 7.1 = 47.8	F 0.05; 3; 3 = 9.28	SD*
	Depths	25.8/ 7.1 = 3.6	F 0.05; 1; 3 = 10.1	NSD
	Time	356.8/ 153 = 2.3	F 0.05; 6; 24 =2.51	NSD
	Station & Time	83.4/ 153 = 0.54	F 0.04; 18; 24 =2.05	NSD
pH	Stations	0.2/ 0.6 = 0.33	F 0.05; 2; 2 = 19.0	NSD
	Depths	0.7/ 0.6 = 1.17	F 0.05; 1; 2 = 18.5	NSD
	Time	10.6/ 1.48 = 7.1	F 0.05; 6; 18 =2.66	SD
	Station & Time	1.8/ 1.48 = 1.21	F 0.05; 12; 18 =2.34	NSD
Turbidity	Station	4.3/ 7.0 = 0.6	F 0.05; 2; 2 = 19.0	NSD
	Depths	15.2/ 7.0 = 2.2	F 0.05; 1; 2 = 18.5	NSD
	Time	7.7/ 6.3 = 1.2	F 0.05; 5; 15 = 2.90	NSD
	Station & Time	1.4/ 6.3 = 0.22	F 0.05; 10; 15 = 2.54	NSD

\* SD - significantly different  
 NSD - not significantly different

**TABLE 2A.** Non-Parametric Kruskal-Wallis One-way Analysis Of Variance Deep Samples Between Stations.

Parameter	Test Statistic (Adjusted)	Degrees of Freedom	Probability
pH	0.430	5	0.99
Alkalinity	3.8	5	0.70
NH <sub>3</sub>	1.01	4	0.98
NO <sub>2</sub>	4.02	5	0.70
NO <sub>3</sub>	0.777	5	0.98
Dissolved P		5	
Kjeldahl	2.71	5	0.80
Turbidity	4.82	5	0.50

**TABLE 2B.** Non- Parametric Kruskal-Wallis One-Way Analysis Of Variance; Shallow Samples Between Stations.

Parameter	Test Statistic (Adjusted)	Degrees of Freedom	Probability
pH	1.38	7	0.99
Alkalinity	7.03	7	0.50
NH <sub>3</sub>	4.43	7	0.80
NO <sub>2</sub>	1.89	7	0.98
NO <sub>3</sub>	0.91	7	0.99
Dissolved P	2.25	7	0.95
Kjeldahl	4.01	7	0.80
Turbidity	9.76	7	0.30

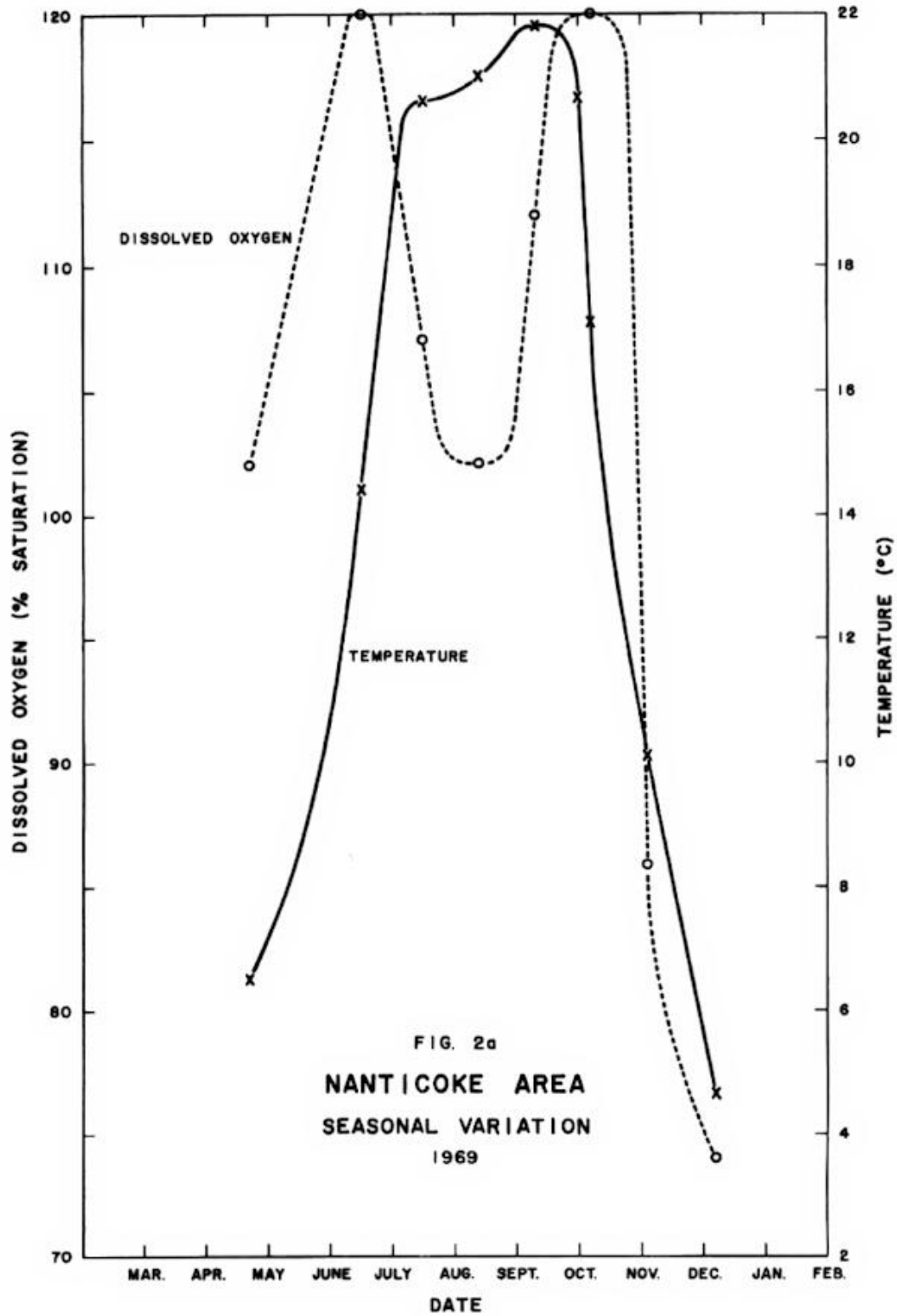


FIG. 2a. Nanticoke Area, Seasonal Variation, 1969.

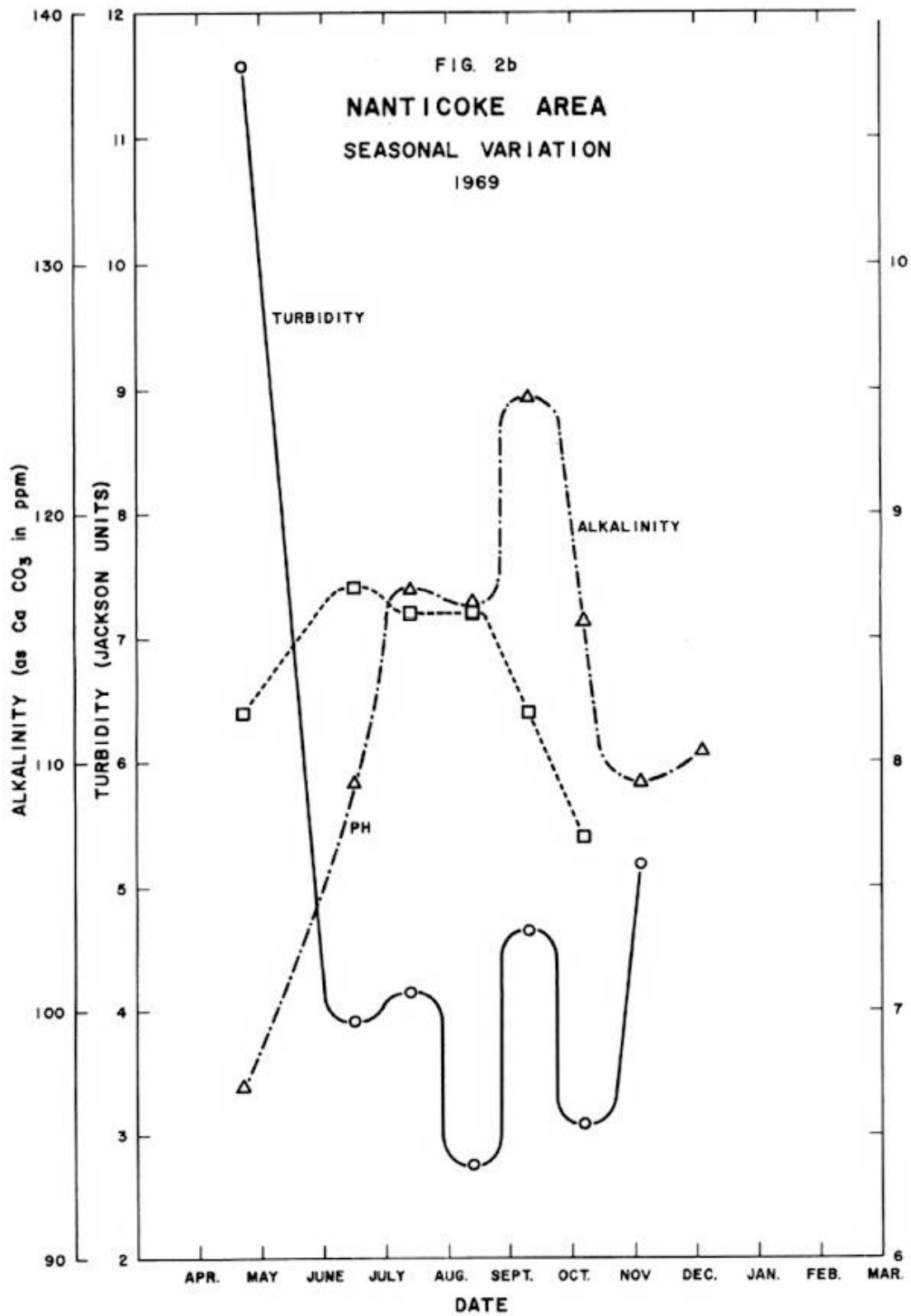


FIG. 2b. Nanticoke Area, Seasonal Variation, 1969.

## **CONCLUSIONS**

The water quality sampling in 1969 has revealed that the water chemistry in the area represented in Figure 1 is reasonably homogeneous with only small differences occurring between stations in alkalinity and turbidity. There appears to be no significant chemical variations with depth and no appreciable stratification between the months of April and December. There is a significant seasonal variation occurring in the area particularly with respect to pH and alkalinity. The measured chemical parameters of ammonia, NO<sub>2</sub>, NO<sub>3</sub>, soluble and total phosphorus are at the lower sensitivity limits of the analytical procedures used in determining the concentrations. Consequently, concentrations of these measured parameters must be interpreted with some discretion.

## **RECOMMENDATIONS**

It is recommended that the sampling grid be used in 1970 and that the sampling at the stations be reduced to one mid-depth sample.

## **REFERENCES**

- American Public Health Association Inc., 1965. Standard Methods for the Examination of Water and Wastewater.
- Palmer, M.D., 1968. Review of Water Quality Station Density Statistical Procedures. Ontario Water Resources Commission.



## APPENDIX 1

**TABLE 1.** Summary Of Results By Station.

Station	Depth (ft.)		Avg. Cond. $\mu\text{mho/cm}$		Avg. Temp. $^{\circ}\text{C}$		Avg. DO ppm		Avg. pH (Su)		Avg. Alk. ppm $\text{CaCO}_3$		Avg. $\text{NH}_3$ ppm N		Avg. $\text{NO}_2$ ppm N		Avg. $\text{NO}_3$ ppm N		Avg. Diss. P. ppm P		Avg. Phenols ppb		Avg. Kjel. ppm N		Avg. Tot. P. ppm P		Avg. Turbidity Jackson Unit	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
112	1.0	12.0	325	324	15.1	14.9	9.6	8.2	8.1	8.2	111	115	.04	.06	.005	.006	.06	.06	.01	.01	0	2	.25	.31	.02	.02	4.0	3.6
501	1.0	9.0	325	327	15.2	14.3	10.3	8.6	8.4	8.3	114	118	.04	.04	.005	.007	.06	.07	.01	.01	0	0	.25	.29	.02	.02	3.3	5.9
518	3.0		327		13.7		8.9		8.4		109		.05		.006		.09		.01		0		.27		.02		7.3	
648	1.0	7.0	324	324	13.1	13.7	10.5	10.7	8.2	8.0	114	112	.04	.05	.005	.004	.07	.06	.01	.01	0	0	.30	.27	.02	.02	4.2	3.8
810	1.0	8.0	324	323	13.9	14.2	9.9	9.0	8.5	8.5	104	108	.06	.05	.006	.006	.07	.06	.01	.01	0	0	.28	.26	.02	.02	5.2	4.2
994	1.0	7.0	327	327	14.3	14.6	10.7	10.0	8.3	8.3	114	116	.05	.05	.006	.006	.07	.02	.01	.01	0	0	.29	.28	.03	.02	5.3	5.2
1008	3.0		329	330	14.2		11.4		8.3		117		.05		.006		.07		.01		0		.34		.02		6.7	
1016	1.0	9.0	325	321	14.1	14.1	9.6	8.8	8.2	8.1	114	110	.04	.05	.005	.005	.07	.06	.01	.01	0	0	.29	.24	.02	.02	6.0	4.0

**TABLE 2.** Summary Of Results By Date.

DATE	Avg. Cond. $\mu\text{mho/cm}$		Avg. Temp. $^{\circ}\text{C}$		Avg. DO ppm		Avg. pH (Su)		Avg. Alk. ppm $\text{CaCO}_3$		Avg. $\text{NH}_3$ ppm N		Avg. $\text{NO}_2$ ppm N		Avg. $\text{NO}_3$ ppm N		Avg. Diss. P. ppm P		Avg. Phen. ppb		Avg. Kjel. ppm N		Avg. Tot. P. ppm P		Avg. Turbidity Jackson Units	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Apr. 20	330		6.5		12.0		8.2		97		.05		.006		.18		.00		0		.37		.03		11.6	
June 16	327	328	14.4	11.4	12.0	11.6	8.7	8.5	109	112	.06	.08	.005	.005	.05	.07	.01	.01	0	0	.18	.20	.01	.02	3.9	5.1
July 14	331.1	332	20.6	17.7	9.3	7.6	8.6	8.5	117	110	.07	.08	.005	.006	.04	.06	.01	.01	0	0	.35	.36	.02	.03	4.1	5.9
Aug. 12	328.1	329	21.0	20.0	8.9	7.4	8.6	8.5	116	114	.05	.05	.010	.010	.03	.05	.01	.01	0	0	.28	.28	.01	.01	2.7	2.8
Sept. 8	320	316	21.8	21.4	9.5	8.5	8.2	8.1	125	125	.04	.04	.004	.005	.02	.03	.01	.01	0	2	.26	.28	.01	.02	4.6	4.3
Oct. 6	321	321	17.1	17.0	11.4	8.4	7.7	7.6	116	114	.01	.01	.004	.004	.02	.02	.01	.01	0	0	.33	.26	.02	.02	3.1	2.9
Nov. 3	323	324	10.1	9.9	9.3	9.6	7.9	7.9	109	111	.02	.03	.004	.003	.13	.13	.01	.01	0	0			.03	.02	5.2	4.9
Dec. 4			4.7	5.2	9.1	10.8			111	109																

## APPENDIX 2

**TABLE 1.** Temperature (°C).

Station	Depth (ft)		1969																	
			22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
112	1.0	12.0	5.5		15.0	11.0	22.0	17.5	21.0	20.0	23.2	22.7	17.5	17.0	9.8	10.0	6.4	6.4	15.1	14.9
501	1.0	9.0	6.5		15.5	10.0	21.0	17.5	21.0	19.5	22.9	20.4	17.0	17.0	10.8	10.3	5.5	5.4	15.2	14.3
518	3.0		7.0		13.5		19.0		22.0		21.0				10.0		3.4		13.7	
648	1.0	7.0	6.8		14.5	13.5	21.0	18.5			20.9	20.9			9.6	9.5	6.1	6.0	13.1	13.7
810	1.0	8.0	7.0		13.5	11.0	19.5								10.0	10.0	4.2	4.0	13.9	14.2
994	1.0	7.0	6.6		14.5	12.0	21.0	17.5	19.0	18.5	22.2	22.4	17.0	17.0	10.0	10.0	4.5	4.7	14.3	14.6
1008	3.0		6.0		15.0		20.0		20.0		21.9		17.0		10.5		3.5		14.2	
1016	1.0	9.0	6.8		13.5	11.0	21.0	17.6	22.0	21.0	21.4	20.7			9.8	9.7	4.4	4.8	14.1	14.1
Mean			6.5		14.4	11.4	20.6	17.7	21.0	20.0	21.8	21.4	17.1	17.0	10.1	9.9	4.7	5.2		

**TABLE 2.** Dissolved Oxygen (ppm).

		1969																			
Station	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean		
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
112	1.0	12.0	12.6		11.6	12.8	6.0	5.7	9.8	6.0	9.1	7.3	10.2	7.5	6.5	8.7	10.7	9.4	9.6	8.2	
501	1.0	9.0	12.4		12.3	11.3	9.4	8.3	7.3	7.9	8.8	7.4	15.0	9.7	9.8		7.0	8.2	10.3	8.6	
518	3.0		11.6		8.9		7.2		6.7		9.0				7.9		10.6		8.9		
648	1.0	7.0	12.4		11.2	10.4	9.7	9.0			9.4	8.8			8.7	13.4	11.5	12.1	10.5	10.8	
810	1.0	8.0	11.0		10.0	8.0	8.6	6.7	12.0	7.9	8.4	8.9			7.0	6.9	11.5	15.4	9.9	9.0	
994	1.0	7.0	11.8		13.7	15.9	12.9	7.8	8.6	7.3	13.0	10.9	10.1	8.0	8.2		7.5	10.9	10.7	10.1	
1008	3.0		11.6		15.0		11.8		7.5		10.5		10.2		16.6		7.6		11.4		
1016	1.0	9.0	12.0		13.5	11.0	8.6	7.9	10.0	8.1	7.7	7.6			9.5	9.4	6.0	8.7	9.6	8.8	
Mean			12.0		12.0	11.6	9.3	7.6	9.0	7.4	9.5	8.5	11.4	8.4	9.3	9.6	9.1	10.8			

**TABLE 3.** pH (Su).

Station	1969																			
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
112	1.0	12.0	8.1		8.9	8.7	8.6	8.4	8.4	8.3	8.3	8.3	7.5	7.5	7.2	7.8			8.1	8.2
501	1.0	9.0	8.4		8.9	8.6	8.9	8.6	8.7	8.6	8.3	7.7	7.7	7.7	8.0	8.3			8.4	8.3
518	3.0		8.1		8.6		8.3		8.8		8.1				8.3				8.4	
648	1.0	7.0	8.1		8.4	8.7	8.5	8.4			8.0	8.0			7.8	7.0			8.2	8.0
810	1.0	8.0	8.1		8.7	8.7	8.7	8.9	8.6	8.7	8.7	8.1			8.3	8.2			8.5	8.5
994	1.0	7.0	8.3		8.7	8.6	8.8	8.4	8.6	8.4	8.2	8.2	7.7	7.7	8.1	8.5			8.3	8.3
1008	3.0		8.1		8.6		8.6				8.1		8.1		8.0				8.3	
1016	1.0	9.0	8.2		8.6	8.0	8.6	8.6	8.5	8.6	7.7	7.6			7.7	7.9			8.2	8.1
Mean			8.2		8.7	8.5	8.6	8.5	8.6	8.5	8.2	8.1	7.7	7.6	7.9	7.9				

**TABLE 4.** Alkalinity as CaCO<sub>3</sub> (ppm).

Station	1 9 6 9																			
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
122	1.0	12.0	96		82	120	132	115	122	115	132	128	107	106	113	111	106	107	111	115
501	1.0	9.0	98		122	125	114	110	114	121	134	129	106	127	116	112	106	105	114	118
518	3.0		96		108		112		120		115		109		95		114		109	
648	1.0	7.0	96		111	114	117	112			119	120			112	106	131	107	114	112
810	1.0	8.0	97		110	108	105	85	108	105	113	125	104	107	89	112	107	111	104	108
994	1.0	7.0	98		111	114	125	125	114	115	126	132	125	110	112	108	103	108	114	116
1008	3.0		98		111		119		118		134		125		124		105		117	
1016	1.0	9.0	97		119	90	111	110	118	112	124	113			114	116	113	116	114	110
Mean			97		109	112	117	110	116	114	125	125	116	114	109	111	111	109		

**TABLE 5.** Conductivity ( $\mu\text{mhos/cm}$ ).

Station	1969																			
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
112	1.0	12.0	329		329	324	330	335	327	328	315	315	322	319	326	324			325	324
501	1.0	9.0	329		326	330	330	330	327	330	315	324	322	321	324	324			325	327
518	3.0		332		329		330		327		315				326				327	
648	1.0	7.0	327		324	327	333	330			313	313			324	324			324	324
810	1.0	8.0	327		329	329	330	330	327	328	307	306			322	324			324	323
994	1.0,	7.0	337		329	329	330	333	327	330	316	321			323	324			327	327
1008	3.0		332		332		333	336	332	333	356		322	322	311				329	330
1016	1.0	9.0	327		327	326	333		330	313	320		317		324	324			325	321
Mean			330		327	328	331	332	328	327	320	316	321	321	323	324				

**TABLE 6.** Turbidity, Jackson Units.

Station	1969																			
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
112	1.0	12.0	7.0		4.3	3.4	3.4	7.2	2.2	3.1	6.0	2.0	2.2	2.2	3.1	3.6			4.0	3.6
501	1.0	9.0	5.5		3.1	8.3	3.4	7.0	2.7	2.0	2.0	10.0	2.2	3.4	3.9	4.6			3.3	5.9
518	3.0		19.0		3.9		5.1		2.0		4.0				9.5				7.3	
648	1.0	7.0	8.0		3.4	3.9	3.4	3.6			3.0	3.0			3.4	4.6			4.2	3.8
810	1.0	8.0	11.0		3.9	4.3	3.9	4.6	2.2	2.2	4.0	4.0			6.4	5.9			5.2	4.2
994	1.0	7.0	11.0		4.1	4.8	4.6	8.6	3.4	4.3	4.0	4.0	3.6	3.1	6.1	6.1			5.3	5.2
1008	3.0		20.0		4.6		4.6		3.6		4.0		4.3		5.6				6.7	
1016	1.0	9.0	11.0		3.9	5.9	4.6	4.6	2.9	2.5	10.0	3.0			3.4	4.6			6.0	4.0
Mean			11.6		3.9	5.1	4.1	5.9	2.7	2.8	4.6	4.3	3.1	2.9	5.2	4.9				



**TABLE 7.** Free Ammonia As N (ppm).

Station	1969																			
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
112	1.0	12.0	.04		.04	.07	.07	.12	.06	.05	.03	.04	.01	.01	.02	.04			.04	.06
501	1.0	9.0	.04		.05	.09	.04	.02	.04	.05	.03	.03	.01	.01	.04	.03			.04	.04
518	3.0		.06		.05		.07		.04		.03				.02				.05	
648	1.0	7.0	.04		.04	.08	.07	.07			.03	.03			.02	.02			.04	.05
810	1.0	8.0	.05		.10	.07	.08	.08	.04	.04	.04	.04			.02	.02			.06	.05
994	1.0	7.0	.05		.08	.08	.09	.12	.07	.05	.06	.03	.01	.01	.02	.03			.05	.05
1008	3.0		.07		.05		.08		.06		.03		.01		.02				.05	
1016	1.0	9.0	.04		.05	.06	.07	.07	.05	.05	.04	.04			.01	.01			.04	.05
Mean			.05		.06	.08	.07	.08	.05	.05	.04	.04	.01	.01	.02	.03				

**TABLE 8.** Nitrite As N (ppm).

Station	1969																				
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean		
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
112	1.0	12.0	.005		.005	.005	.005	.007	.011	.012	.004	.004	.004	.004	.004	.004			.005	.006	
501	1.0	9.0	.004		.005	.005	.004	.007	.011	.010	.003	.013	.004	.004	.004	.004			.005	.007	
518	3.0		.009		.005		.004		.011		.004				.004				.006		
648	1.0	7.0	.006		.005	.005	.005	.004			.004	.004			.003	.003			.005	.004	
810	1.0	8.0	.007		.005	.005	.006	.006	.010	.010	.004	.004			.003	.003			.006	.006	
994	1.0	7.0	.006		.005	.004	.005	.007	.010	.011	.004	.003	.004	.004	.004	.004			.006	.006	
1008	3.0		.008		.006		.005		.010		.004		.004		.003				.006		
1016	1.0	9.0	.006		.005	.005	.005	.004	.009	.008	.004	.004			.003	.002			.005	.005	
Mean			.006		.005	.005	.005	.006	.010	.010	.004	.005	.004	.004	.004	.003					

**TABLE 9.** Nitrate as N (ppm).

Station	1969																			
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
112	1.0	12.0	.14		.04	.08	.03	.07	.01	.03	.02	.02	.02	.02	.14	.14			.06	.06
501	1.0	9.0	.11		.04	.09	.05	.06	.03	.05	.01	.08	.02	.02	.13	.13			.06	.07
518	3.0		.28		.06		.05		.02		.01				.13				.09	
648	1.0	7.0	.16		.04	.04	.03	.05			.01	.01			.13	.13			.07	.06
810	1.0	8.0	.19		.06	.07	.03	.05	.01	.04	.02	.02			.13	.13			.07	.06
994	1.0	7.0	.20		.05	.07	.05	.07	.07	.09	.01	.01	.02	.02	.12	.12			.07	.02
1008	3.0		.19		.05		.05		.04		.02		.02		.12				.07	
1016	1.0	9.0	.15		.06	.07	.01	.06	.03	.03	.02	.02			.12	.12			.07	.06
Mean			.18		.05	.07	.04	.06	.03	.05	.02	.03	.02	.02	.13	.13				

**TABLE 10.** Dissolved Phosphorus As P (ppm).

Station	1969																				
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean		
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
112	1.0	12.0	.00		.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.03	.01			.01	.01
501	1.0	9.0	.00		.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.02	.01			.01	.01
518	3.0		.01		.01		.01		.01		.01		.01		.01					.01	
648	1.0	7.0	.01		.01	.01	.01	.01			.01	.01			.01	.01				.01	.01
810	1.0	8.0	.00		.01	.01	.01	.01	.01	.01	.01	.01			.01	.01				.01	.01
994	1.0	7.0	.00		.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01			.01	.01
1008	3.0		.01		.01		.01		.01		.01		.01		.01					.01	
1016	1.0	9.0	.00		.01	.01	.01	.01	.01	.01	.01	.01			.01	.01				.01	.01
Mean			.00		.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01				

**TABLE 11.** Total Kjeldahl Nitrogen As N (ppm).

Station	1 9 6 9																			
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
112	1.0	12.0	.40		.08	.24	.25	.41	.24	.33	.24	.33	.31	.23					.25	.31
501	1.0	9.0	.34		.10	.18	.31	.33	.24	.32	.27	.31	.26	.32					.25	.29
518	3.0		.37		.17		.46		.17		.20								.27	
648	1.0	7.0	.31		.24	.18	.38	.35			.27	.28							.30	.27
810	1.0	8.0	.39		.12	.16	.39	.37	.22	.33	.30	.19							.28	.26
994	1.0	7.0	.43		.18	.27	.36	.39	.22	.20	.23	.30	.33	.24					.29	.28
1008	3.0		.34		.37		.31		.28		.33		.40						.34	
1016	1.0	9.0	.35		.17	.15	.32	.30	.37	.21	.26	.29							.29	.24
Mean			.37		.18	.20	.35	.36	.25	.28	.26	.28	.33	.26						

**TABLE 12.** Total Phosphorus As P (ppm).

Station	1 9 6 9																			
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
112	1.0	12.0	.04		.01	.02	.02	.03	.01	.01		.02	.02	.02	.03	.02			.02	.02
501	1.0	9.0	.02		.01	.01	.02	.02	.01	.01	.01	.03	.02	.02	.02	.02			.02	.02
518	3.0		.03		.02		.03		.01		.01				.03				.02	
648	1.0	7.0	.02		.01	.01	.02	.02			.01	.01			.02	.02			.02	.02
810	1.0	8.0	.03		.01	.02	.02	.02	.01	.01	.01	.01			.03	.03			.02	.02
994	1.0	7.0	.05		.01	.02	.03	.04	.02	.02	.01	.01	.02	.02	.02	.02			.03	.02
1008	3.0		.02		.02		.02		.02		.03		.02		.03				.02	
1016	1.0	9.0	.02		.02	.03	.02	.02	.01	.01	.01	.01			.02	.02			.02	.02
Mean			.03		.01	.02	.02	.03	.01	.01	.01	.02	.02	.02	.03	.02				

**TABLE 13.** Phenols (ppb).

Station	1 9 6 9																					
	Depth (ft)		22 Apr		16 June		14 July		12 Aug		8 Sept		6 Oct		3 Nov		4 Dec		Mean			
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B		
112	1.0	12.0	0		0	0	0	0	0	0	0	12	0	0	0	0			0	2		
501	1.0	9.0	0		0	0	0	0	0	0	0	0	0	0	0	0			0	0		
518	3.0		0		0		0		0		0				0				0	0		
648	1.0	7.0	0		0	0	0	0			0	0			0	0			0	0		
810	1.0	8.0	0		0	2	0	0	0	0	0	0			0	0			0	0		
994	1.0	7.0	0		0	0	0	0	0	0	0	0	0	0	0	0			0	0		
1008	3.0		0		0		0		0		0			0		0			0			
1016	1.0	9.0	0		0	0	0	0	0	0	0	0			0	0			0	0		
Mean			0		0	0	0	0	0	0	0	2	0	0	0	0						