Publication No. 76-e50

WA-35-1010

MEMORANDUM

November 19, 1976

State of Washington Department of Ecology

To: Ron Pine

From: Mike Morhous MM

Subject: Lower Granite Lock Intensive Receiving Water Study
and ASOTIN & CLARKSTON STP SURVEY

On August 24 I arrived at Clarkston to conduct a special two day monitoring survey in conjunction with the above referenced study. The purpose of this survey was to collect water quality data from the Clarkston and Asotin STP effluents. The results of all laboratory analyses are enclosed.

Manning S-4000 automatic composite samplers were used to monitor the effluents for two separate 24 hour periods. Daily plant flows were also recorded for the respective composite periods.

On the morning of August 25 composite samplers were installed at Clarkston's influent and chlorinated effluent. The third sampler was installed at Asotin's chlorinated effluent. The chlorinated effluent samplers were located at the chlorine contact chamber outfall of each STP. The influent sampler was located in the wet well lift station prior to Clarkston's headworks. All three samplers were adjusted to take a 250 ml aliquot every thirty minutes.

The following morning the composited samples were collected and the composite samplers were reset for the second 24 hour monitoring period. The chlorinated effluent sampling stations remained the same. The third sampler was installed at Asotin's headworks to composite the influent flow. The sample aliquot and time interval remained the same for all composite samplers.

The first set of composited samples were shippped to the DOE lab in Olympia by air freight. The second set of samples were transported to the Olympia lab by myself. All samples were iced and the nutrient samples were also preserved with sulfuric acid.

During the two day monitoring survey coliform samples were collected from the chlorinated effluents. Total and fecal coliform analyses were conducted by the Idaho State Department of Health and Welfare in Lewiston, Idaho.

The following table lists field data compiled from individual grab samples taken at the Asotin and Clarkston chlorinated effluent sample stations.

Total chlorine residual was analyzed with a a LaMotte DPD Test Kit. An IBC D.O. meter was used for D.O. analyses.

	pH	Temp (°C)	Conductivity (umhos/cm)	Chl. Resid. (ppm)	D.O. (mg/L)
Asotin STP					
8/25 @ 0850	6.6	21	480	0.9	
@ 0925					3.0
@ 1530	6.6	20	500	0.4	2.7
8/26 @ 1155	6.8	18.5	500	0.5	3.5
@ 1445	6.8	19	520	0.5	3.5
Clarkston STP					
8/25 @ 1050	6.7	25	500	1.7	4.6
8/26 @ 1120	6.7	24.5	480		4.4
@ 1645	6.6	25	505	2.7	4.2

As previously mentioned, total plant flows were recorded from totalizer readings taken each morning. The results are as follows:

	Clarkston STP	Asotin STP
8/25-26	0.58 mgd	.038 mgd
8/26-27	0.57 mgd	.036 mgd

In conjunction with these total flows, the accuracy of each flow recorder was checked. Clarkston's flow measuring device is a 9 inch Parshall flume. The flume dimensions met standard construction criteria for a 9 inch flume. Two instantaneous flows through the flume were calculated ($Q = 3.07\ Ha^{1.53}$) and compared with the strip chart recorder. The checks showed the strip chart was recording 87% and 93% of the actual flow.

Asotin's flow measuring device is a 3 inch Parshall flume. The flume dimensions met standard construction criteria for a 3 inch flume. Five instantaneous flows through the flume were calculated ($Q = .992\ Ha^{1.55}$) and compared with the strip chart recorder. The checks showed the strip chart was recording between 65% and 76% of the instantaneous flow. A linear correlation between the instantaneous flow and recorded flow could not be shown. Therefore, the % error (35%-24%) should be taken into consideration when using the previously mentioned flow data. Asotin is in the process of modifying the recorder in accordance with the manufacturer's specifications to correct the existing error.

MM:ee

Attachments

cc: Dick Cunningham
Doug Houck
Central Files

STP Survey Report Form

Efficiency Study

City Clarkston Plant Type Act. Sludge Pop. Served _____ Design Capacity _____

Receiving Water Lower Granite Reservoir Perennial X Intermittent _____

Date 8/25-27/76 Survey Period 2 - 24 hr. periods Survey Personnel Morhous

Comp. Sampling Frequency 30 min. Sampling Alequot 250 mls

Weather Conditions (24 hr) Dry Are facilities provided for complete by-pass of raw sewage? _____ Yes _____ No/Frequency of bypass _____

Reason for bypass _____ Is bypass chlorinated? _____ Yes _____ No

Was DOE Notified? _____ Discharge - Intermittent _____ Continuous _____

Plant Operation

	8/25-26	8/26-27
Total flow	0.58 mgd	0.57 mgd

How measured 9" Parshall flume

Maximum flow _____ Time of Max. _____

Minimum flow _____ Time of Min. _____

Pre Cl_2 _____ #/day Post Cl_2 _____ #/day

Field Results

Determinations	Influent Max.	Influent Min.	Influent Mean	Influent Median	Effluent Max.	Effluent Min.	Effluent Mean	Effluent Median
Temp °C								
pH (Units)								
Conductivity (µmhos/cm²)								
Settleable Solids (mls/l)								

Laboratory Results on Composites

	8/25-26 Influent	8/25-26 Effluent	8/26-27 Eff.	8/25-26 % Reduction	25-26 lbs/day	26-27 lbs/day
Laboratory No.	76-3376	77	78			
5-Day BOD ppm	160	43	5	73	208.0	23.8
COD ppm	320	31	47			
T.S. ppm	471	381	383			
T.N.V.S. ppm	320	316	309			
T.S.S. ppm	108	4	1	96	19.3	4.8
N.V.S.S. ppm	6	0	0			
pH (Units)	7.3	7.1	6.9			
Conductivity (µmhos/cm²)						
Turbidity (JTU's)						

Laboratory Bacteriological Results

Lab No.		Sampling Time	Colonies/100 ml (MF) Total Coliform	Fecal Coliform	Fecal Strep	Cl_2 Residual
8/25	13	0758	15	1		
	14	1050	140	36		
	15	1450	31	2		
8/26	4	0810	1100	42		
	5	1120	3400	26		
	6	1345	20	4		

Additional Laboratory Results

	Inf. 8/25-26	Eff. 3/25-26	Eff. 8/26-27
NO_3-N ppm -	* <0.02	10.6	12.5
NO_2-N ppm -	* <0.02	0.90	0.50
NH_3-N ppm -	26.0	2.3	1.3
T. Kjeldahl-N ppm	30.0	4.5	2.9
O-PO_4-P ppm -	6.5	7.8	7.6
T-PO_4-P ppm -	9.4	8.5	8.3

Operator's Name Russ Millard Phone No. 509-758-8191

Furnish a flow diagram with sequence and relative size and points of chlorination.

Type of Collection System

___ Combined ___ Separate ___ Both

Estimate flow contributed by surface or ground water (infiltration)

_____ MGD

Plant Loading Information

Annual average daily flow rate (mgd)

Dry _____

Wet _____

Peak flow rate (mgd)

Dry _____

Wet _____

COMMENTS: _____

* "<" is "less than" and ">" is "greater than"

STP Survey Report Form

Efficiency Study

City Asotin Plant Type Oxid. ditch Pop. Served _____ Design Capacity _____

Receiving Water Lower Granite Reservoir Perennial X Intermittent _____

Date 8/25-27/76 Survey Period 2 - 24 hr. periods Survey Personnel Morhous

Comp. Sampling Frequency 30 min. Sampling Alequot 250 mls

Weather Conditions (24 hr) Dry Are facilities provided for complete by-pass of raw sewage? _____ Yes _____ No/Frequency of bypass _____

Reason for bypass _____ Is bypass chlorinated? _____ Yes _____ No

Was DOE Notified? _____ Discharge - Intermittent _____ Continuous _____

Plant Operation

	8/25-26	8/26-27
Total recorded flow	.038 mgd	.036 mgd

How measured 3" Parshall flume

Maximum flow _____ Time of Max. _____

Minimum flow _____ Time of Min. _____

Pre Cl_2 _____ #/day Post Cl_2 _____ #/day

Field Results

Determinations	Influent Max.	Influent Min.	Influent Mean	Influent Median	Effluent Max.	Effluent Min.	Effluent Mean	Effluent Median
Temp °C								
pH (Units)								
Conductivity (μmhos/cm²)								
Settleable Solids (mls/l)								

Laboratory Results on Composites

	8/26-27 Influent	8/25-26 Effluent	8/26-27	8/26-27 % Reduction	25-26 lbs/day	26-27 lbs/day
Laboratory No.	76-3379	76-3375	76-3380		(.054) mgd	(.051) mgd
5-Day BOD ppm	186	5	*<4	>98	2.3	<1.7
COD ppm	420	23	19			
T.S. ppm	505	399	395			
T.N.V.S. ppm	321	318	330			
T.S.S. ppm	190	2	4	98	0.9	1.7
N.V.S.S. ppm	24	0	0			
pH (Units)	7.3	6.8	6.8		30% error in flow indicated	
Conductivity (μmhos/cm²)						
Turbidity (JTU's)						

* "<" is "less than" and ">" is "greater than"

Laboratory Bacteriological Results

Lab No.		Sampling Time	Colonies/100 ml (MF) Total Coliform	Fecal Coliform	Fecal Strep	Cl_2 Residual
8/25	16	0840	14	2		
	17	1250	69	38		
8/26	7	0720	98	16		
	8	1155	136	24		

Additional Laboratory Results

	Inf. 8/26-27	Eff. 8/25-26
NO_3-N ppm -	<0.02	23
NO_2-N ppm -	<0.02	< 0.02
NH_3-N ppm -	29.0	0.80
T. Kjeldahl-N ppm -	38.0	2.0
O-PO_4-P ppm -	8.4	10.4
T-PO_4-P ppm -	11.8	10.2

Operator's Name Jack Gross Phone No. 509-243-4411

Furnish a flow diagram with sequence and relative size and points of chlorination.

Type of Collection System

___ Combined ___ Separate ___ Both

Estimate flow contributed by surface or ground water (infiltration)

_____ MGD

Plant Loading Information

Annual average daily flow rate (mgd)

Dry _____

Wet _____

Peak flow rate (mgd)

Dry _____

Wet _____

COMMENTS: _____

DEPARTMENT OF ECOLOGY

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OLYMPIA LABORATORY

DATA SUMMARY

Source CLARKSTON STP

Collected By Morhous + Andrews

Date Collected 8/25-28/76

Log Number:	76-3376	77 (8-25 & 26)	78 (8-26 & 27)							
Station:	COMP INF	COMP. Cl2 EFF	COMP Cl2 EFF							
pH	7.3	7.1	6.9							
Turbidity (NTU)										
Sp. Conductivity (umhos/cm)										
COD	320.	31.	47.							
BOD (5 day)	160.	43.	5.							
Total Coliform (Col./100ml)										
Fecal Coliform (Col./100ml)										
NO3-N (Filtered)	<0.02	10.6	12.5							
NO2-N (Filtered)	<0.02	0.90	0.50							
NH3-N (Unfiltered)	26.	2.3	1.3							
T. Kjeldahl-N (Unfiltered)	30.	4.5	2.9							
O-PO4-P (Filtered)	6.5	7.8	7.6							
Total Phos.-P (Unfiltered)	9.4	8.5	8.3							
Total Solids	471	381	383							
Total Non. Vol. Solids	320	316	309							
Total Suspended Solids	108	4	1							
Total Sus. Non Vol. Solids	6	0	0							

Note: All results are in PPM (mg/L) unless otherwise specified. ND is "None Detected"
"<" is "Less Than" and ">" is "Greater Than"

ECY 040-2-32

Stephen O. D. H.

9-22-76

DEPARTMENT OF ECOLOGY

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OLYMPIA LABORATORY

DATA SUMMARY

Source Asotin STP

Collected By Morhoos ~~[illegible]~~

Date Collected 8/25-28/76

Log Number: 71-3375 (8-25 & 26) 79 80 (8-26 & 27)

Station:	COMP. Cl2 EFFLV.	COMP. INF	COMP. Cl2 EFFLUE.							
pH	6.8	7.3	6.8							
Turbidity (NTU)										
Sp. Conductivity (umhos/cm)										
COD	23.	420.	19.							
BOD (5 day)	5.	186.	<4.							
Total Coliform (Col./100ml)										
Fecal Coliform (Col./100ml)										
NO3-N (Filtered)	23.	<0.02	Bottle broken							
NO2-N (Filtered)	<0.02	<0.02								
NH3-N (Unfiltered)	0.80	29.								
T. Kjeldahl-N (Unfiltered)	2.0	38.								
O-PO4-P (Filtered)	10.4	8.4								
Total Phos.-P (Unfiltered)	10.2	11.8								
Total Solids	399	505	395							
Total Non. Vol. Solids	318	321	330							
Total Suspended Solids	2	190	4							
Total Sus. Non Vol. Solids	0	24	0							

Note: All results are in PPM (mg/L) unless otherwise specified. ND is "None Detected"
"<" is "Less Than" and ">" is "Greater Than"

ECY 040-2-32

Summary By Stephen D. Roll Date 9-22-76

WA-35-1010

DEPARTMENT OF THE ARMY
WALLA WALLA DISTRICT, CORPS OF ENGINEERS
BLDG. 602, CITY-COUNTY AIRPORT
WALLA WALLA, WASHINGTON 99362

NPWEN-PL

28 February 1977

Mr. Ron Pine
Department of Ecology
Southwest Regional Office
Olympia, Washington 98504

Dear Ron:

Inclosed are the compiled results of the diurnal water quality investigation conducted on the Lower Granite Lock and Dam on 1 and 2 September 1976.

I would like to take this opportunity to thank you for your participation. I feel the data collected during our intensive sampling on the major industrial and domestic waste inputs and on the Snake River will probably not be duplicated in the near future.

If you have any questions regarding the information and its presentation or any comments relative to this sampling program, please call.

Sincerely yours,

Gene Buglewicz

EUGENE G. BUGLEWICZ
Limnologist

1 Incl
As stated

Bacteriology
Biochemistry
Food Research

University of Idaho
College of Agriculture
Agricultural Experiment Station
Department of Bacteriology & Biochemistry
Moscow, Idaho/83843

July 16, 1976

Mr. Gene Buglewicz, Limnologist
Department of the Army
Walla Walla District
Corps of Engineers
Bldg. 602, City-County Airport
Walla Walla, Washington 99362

Dear Gene;

Enclosed is a synopsis of the sampling done at Swallows and Chief Timothy over the fourth of July. The overall means, medians and ranges are as follows:

	Swallows			Chief Timothy		
	TC/100	FC/100	FS/100	TC/100	FC/100	FS/100
$\bar{x}$	279	72	534	220	42	322
m	76	40	90	205	19	130
range	30-2150	7-510	5-23,000	17-1215	4-505	7-5700

According to the Washington State standards (June, 1973) both areas meet the bacterial requirements for Class A water (TC not to exceed a median of 240 with less than 20% exceeding 1000). These waters are deemed suitable for swimming and primary contact sports.

The fecal coliform numbers and the fecal streptococci numbers are disconcerting to me. Swallows would not meet Idaho State standards for primary contact water since the geometric mean exceeds 50 FC/100 ml. In addition, (although as you know, I am not a proponent of FC/FS ratio usage) the FC/FS ratio at Swallows leans more to human sources than at Chief Timothy.

In general, I think my evaluation to this point in time would be as follows:

1. Swallows

   a. Bacterial water quality is marginal at best.

   b. From limited sampling the site appears to be characterized by slugs of material from some source that often causes counts to be extremely high. If it were not for these increases, the swim area would be in reasonably good shape. The likely candidates for the pulses of material that enters the swim area would be the marina immediately upstream and/or the Asotin STP.

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2. Chief Timothy

a. Bacterial water at Chief Timothy is satisfactory for contact sports.

b. There is, however, a high enough level of fecal coliforms and fecal streptococci to warrant further monitoring, particularly as flows decrease and usage increases. The pulses of organisms is also evident at Chief Timothy but the intensity of the pulses is not as great.

General observations:

1. Samples were taken during high flow time.

2. Water level flucuated at least a foot during the sampling time.

3. Bacterial numbers at Snake River mile 154 on 15 June 76 were as follows:

   TC - 16/100 ml FC - 8/100 ml FS - 11/100 ml

   On 1 July 76 they were:

   TC - 125/100 ml FC - 16/100 ml FS - 11/100 ml

   These figures would indicate some input between RM-154 and the Swallows swim area.

4. The allowable numbers for municipal swimming pools is 0 bacteria.

5. Water usage was not great in either Swallows or Chief Timothy since the water is still quite cold.

6. Weather - warm, no precipitation during sampling period.

In general, I think the picture will be clarified when we do our low flow sampling: Because of flow the counts may increase, particularly since dilution effect of some source will be less. In this case there may be need for consideration to limit usage at Swallows which would have to be done in conjunction with the local health units.

Mr. Charles J. Carelli, DOE, Olympia, Wash. 98504 requested the date from this study. I told him to contact you or you can send it to him if you wish.

Any questions that you may have are welcome. I hope you have a good vacaction.

Sincerely,

A. J. Lingg
Assoc. Professor
Dept. of Bacteriology
and Biochemistry

AJL/ir

.Swimming Beach Samples

July 1 - 6, 1976

Samples were taken from Swallows Park swim area and Chief Timothy swim area according to the following regime:

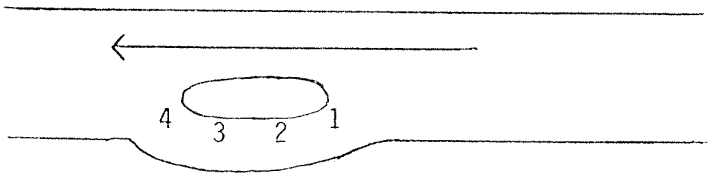
1. Samples were collected from all sites on Thursday, July 1; Saturday, July 3: and Tuesday, July 6 at 12:00 noon, 3:00 p.m. and 6:00 p.m.

2. Samples were collected from all sites at 9:00 a.m., 12:00 noon, 3:00 p.m., 6:00 p.m. and 9:00 p.m. on Sunday, July 4.

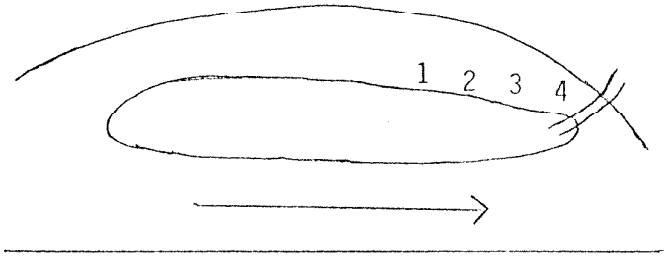
3. All samples were analyzed for fecal coliforms, total coliforms and fecal streptococci according to standard methods.

4. The sampling sites were as follows:

   a. Swallows park



   b. Chief Timothy



Results: All counts are per 100 ml and are the mean of duplicate samples.

	Swallows			Chief Timothy		
Thurs. July 1 12:00 noon						
Site	TC	FC	FS	TC	FC	FS
1	125	17	11	230	17	11
2	75	17	6	220	20	11
3	95	20	10	330	18	13
4	150	20	36	235	20	7
3:00 p.m.						
1	35	12	9	225	12	31
2	75	25	11	250	13	11
3	180	11	10	40	16	13
4	55	18	11	270	13	13
6:00 p.m.						
1	30	8	14	48	21	140
2	55	12	5	72	10	30
3	65	16	15	30	10	25
4	55	14	16	55	16	12
Sat. July 3 12:00 noon						
1	340	150	245	235	80	200
2	215	115	85	145	27	165
3	1800	250	805	55	24	50
4	160	55	80	180	31	595
3:00 p.m.						
1	165	41	65	495	265	495
2	175	85	145	115	11	100
3	300	170	445	175	11	60
4	225	95	220	255	25	565

	Swallows			Chief Timothy		
Sat. July 3 6:00 p.m.						
Site	TC	FC	FS	TC	FC	FS
1	140	9	25	195	29	430
2	275	25	100	170	12	295
3	95	12	65	195	9	150
4	230	55	125	325	23	230
Sun. July 4 9:00 a.m.						
1	170	60	90	440	70	515
2	190	60	90	260	90	305
3	270	60	100	250	38	150
4	135	43	55	220	33	265
12:00 noon						
1	80	20	80	320	51	445
2	130	39	57	260	26	170
3	705	140	46	235	25	1180
4	330	105	100	225	46	600
3:00 p.m.						
1	240	135	120	285	45	205
2	780	370	260	35	15	80
3	215	90	135	42	11	64
4	160	61	105	64	33	315
6:00 p.m.						
1	95	29	62	395	81	380
2	2150	510	470	28	5	42
3	125	80	130	21	7	36
4	610	385	23,000	28	11	50
9:00 p.m.						
1	65	18	45	325	60	500
2	280	105	110	43	14	33
3	90	25	52	17	7	21
4	165	115	65	59	13	280

	Swallows			Chief Timothy		
Tues. July 6						
12:00 noon						
Site	TC	FC	FS	TC	FC	FS
1	295	19	100	1215	505	5700
2	270	7	160	175	37	55
3	655	9	385	21	5	130
4	330	50	80	150	7	190
3:00 p.m.						
1	305	18	210	365	127	320
2	90	12	100	170	67	280
3	390	96	275	26	4	80
4	390	70	115	190	5	95
6:00 p.m.						
1	270	25	100	765	175	1700
2	175	30	165	345	15	50
3	200	18	275	370	6	115
4	190	18	290	405	2	45

Observations and Conclusions on Swimming Beach Samples
July 2-7, 1976 and Sept. 2-7, 1976
(Swallows and Chief Timothy)

1. On the basis of Washington State standards, the Swallows and Chief Timothy swim areas meet Class A (primary contact) standards. The bacterial levels (TC, FC and FS) during the September 2-7 period were much lower than in July.

2. Certain patterns were detected for the individual sites and sampling periods. These are as follows:

   a. Swallows, July: Total coliforms, Fecal coliforms and Fecal streptococci reached peaks on Sunday of the sampling period. These values are based on means of all counts on a particular day (mean day count)(Fig. 1). Highest counts were on days of greatest use. It is possible that the reduced flow in the swimming area causes sedimentation of organisms and particulates to which organisms are adsorbed. Use of the area caused these sediments to be dispersed back into the water column resulting in higher counts. This possibility is enforced by the fact that the mean TC, FC and FS count for all sampling points was lowest at the entrance site (Site 1) as listed below.

Swallows - July

Means

	TC	FC	FS
Site 1	168.2	40.0	84.0
Site 2	352.6	100.8	126.0
Site 3	370.4	71.2	196.3
Site 4	227.5	78.9	99.9

In spite of the appearance in Figure 1, no statistical correlation could be shown between TC and FC or FS, nor could correlations be established between FC and FS fluctuations. In other words FC and FS numbers did not depend on TC numbers suggesting that the source of the FC and FS were different. It should be emphasized that this indication is not documented but only suggested by statistical inferences.

   b. Chief Timothy, July: Mean TC, FC and FS counts rose steadily throughout the sampling period indicating a deterioration of the water quality throughout the period (Fig. 2). Mean overall entrance samples were highest at this swim area as seen below:

Chief Timothy

Means

	TC	FC	FS
Site 1	367.4	109.8	790.9
Site 2	163.4	25.9	116.2
Site 3	129.1	14.0	149.1
Site 4	176.5	19.7	233.0

I don's have a good explanation for the above mentioned observation unless again settling is taking place. There was little swimming and water usage of this area during the sampling period and perhaps redistribution was not occuring. Again speculation. Again no correlations between TC, FC and FS were evident.

c. Swallows, September: Counts of all the indicator organisms were much lower in September than in July and generally were decling further (Fig. 3). No significant differences were apparent between sampling site means although entrance samples (Site 1) were slightly lower than two of the other sites. Again there were no significant correlations between the parameters.

d. Chief Timothy, September: Mean day counts of the three parameters exhibited less of a pattern than at the July sample times. The means of the three parameters were more or less constant during the first three days of the sampling but declined on the last day of that period. As before, there were no statistically significant correlations between the parameters.

Swimming Beach Samples - Sept. 2-7, 1976

Results: All counts are per 100 mls and are the mean of duplicate samples.

	Swallows Park			Chief Timothy		
Thurs. Sept. 2						
12:00 noon						
Site	TC	FC	FS	TC	FC	FS
1	100	5.5	16	70	3.0	21.0
2	60	3.5	12	150	1.0	1.5
3	70	5.0	2	50	1.5	21.0
4	25	9.5	14	8	3.5	17.0
3:00 p.m.						
1	40	4.0	9.5	115	28.5	4.0
2	10	3.5	3.5	55	2.5	4.5
3	35	9.0	8.5	55	1.0	10.0
4	25	5.5	49.5	125	4.0	144.0
6:00 p.m.						
1	45	4.5	27.5	45	2.0	22.0
2	115	31.0	50.5	35	1.0	13.5
3	15	18.0	50.0	80	1.0	10.0
4	1300	2.5	2600.0	20	14.5	61.0
Sat. Sept. 4						
12:00 noon						
1	80	3.0	12.5	15	10.5	2.5
2	100	26.5	220.0	30	7.0	15.0
3	95	12.0	50.0	30	16.0	20.0
4	60	11.5	50.0	35	15.5	18.5
3:00 p.m.						
1	35	13.5	39.5	50	18.0	17.5
2	55	21.0	150.0	65	12.0	21.5
3	180	550.0	55.0	40	8.5	33.0
4	70	87.0	40.0	95	6.5	130.0
6:00 p.m.						
1	50	10.0	48	95	13	12.0
2	400	125.0	210	115	8	17.5
3	55	14.5	90	95	10	40.0
4	70	25.0	145	75	5	72.0
Sun. Sept. 5						
9:00 a.m.						
1	420	3.5	37.5	175	7.5	13.5
2	300	1.0	7.5	150	10.5	15.0
3	125	6.0	24.0	135	5.5	12.5
4	240	9.0	30.5	130	15.0	45.5

	Swallows Park			Chief Timothy		
Sun. Sept. 5 - cont.						
12:00 noon						
Site	TC	FC	FS	TC	FC	FS
1	75	14.5	30.0	75	7.0	15
2	140	2.0	25.5	105	9.5	15
3	85	25.0	16.5	75	5.5	35
4	75	27.5	35.5	165	15.0	35
3:00 p.m.						
1	70	7.5	85	695	14	48.5
2	130	15.5	80	105	4	14.5
3	100	19.0	110	335	5	15.0
4	115	23.0	75	185	14	115.0
6:00 p.m.						
1	270	5.5	20.5	165	2.5	17.0
2	25	9.5	50.0	115	5.5	14.5
3	70	20.0	150.0	130	4.0	17.5
4	65	12.0	160.0	145	25.5	75.0
Tues. Sept. 7						
12:00 noon						
1	55	2	25.0	55	1.0	5.5
2	80	5	20.0	100	3.5	8.5
3	45	2	10.0	100	1.5	5.5
4	85	5	7.5	70	1.5	11.0
3:00 p.m.						
1	45	2.5	15.5	85	4.0	4.5
2	35	1.5	12.5	85	4.5	2.5
3	40	2.0	13.0	95	2.5	3.5
4	50	3.0	4.0	35	4.5	21.0
6:00 p.m.						
1	45	4.5	9.0	50	4.0	4.0
2	35	4.5	11.5	105	3.5	4.5
3	40	3.5	0	45	3.0	6.5
4	80	1.0	2.5	40	0.5	4.0
Arithmetic Mean	115.96	23.8	117.59	101.88	7.26	25.26
Geometric Mean	72.82	8.02	28.06	77.09	6.67	14.51
Median	70.0	6.75	28.75	85.0	5.0	15.0

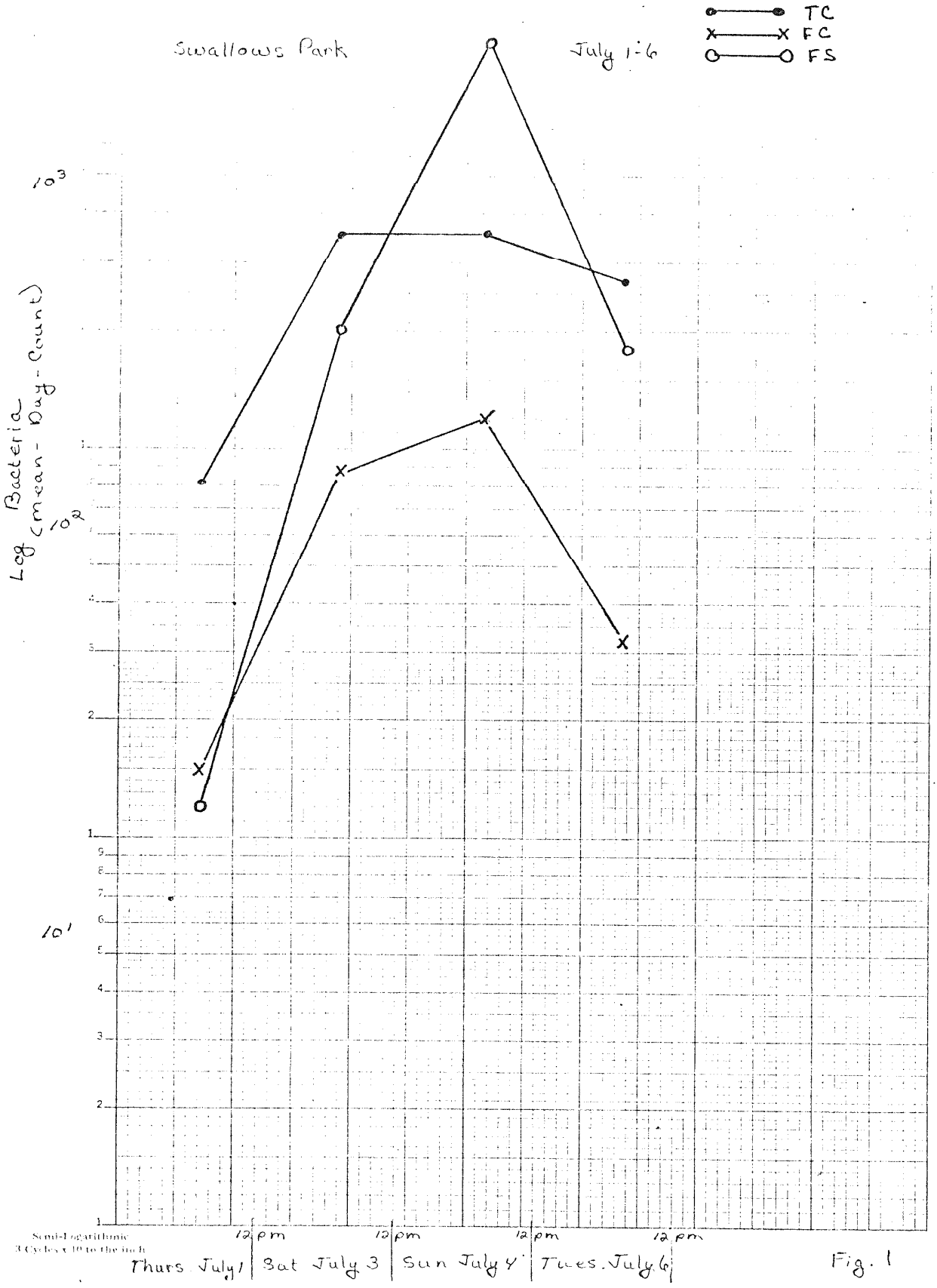
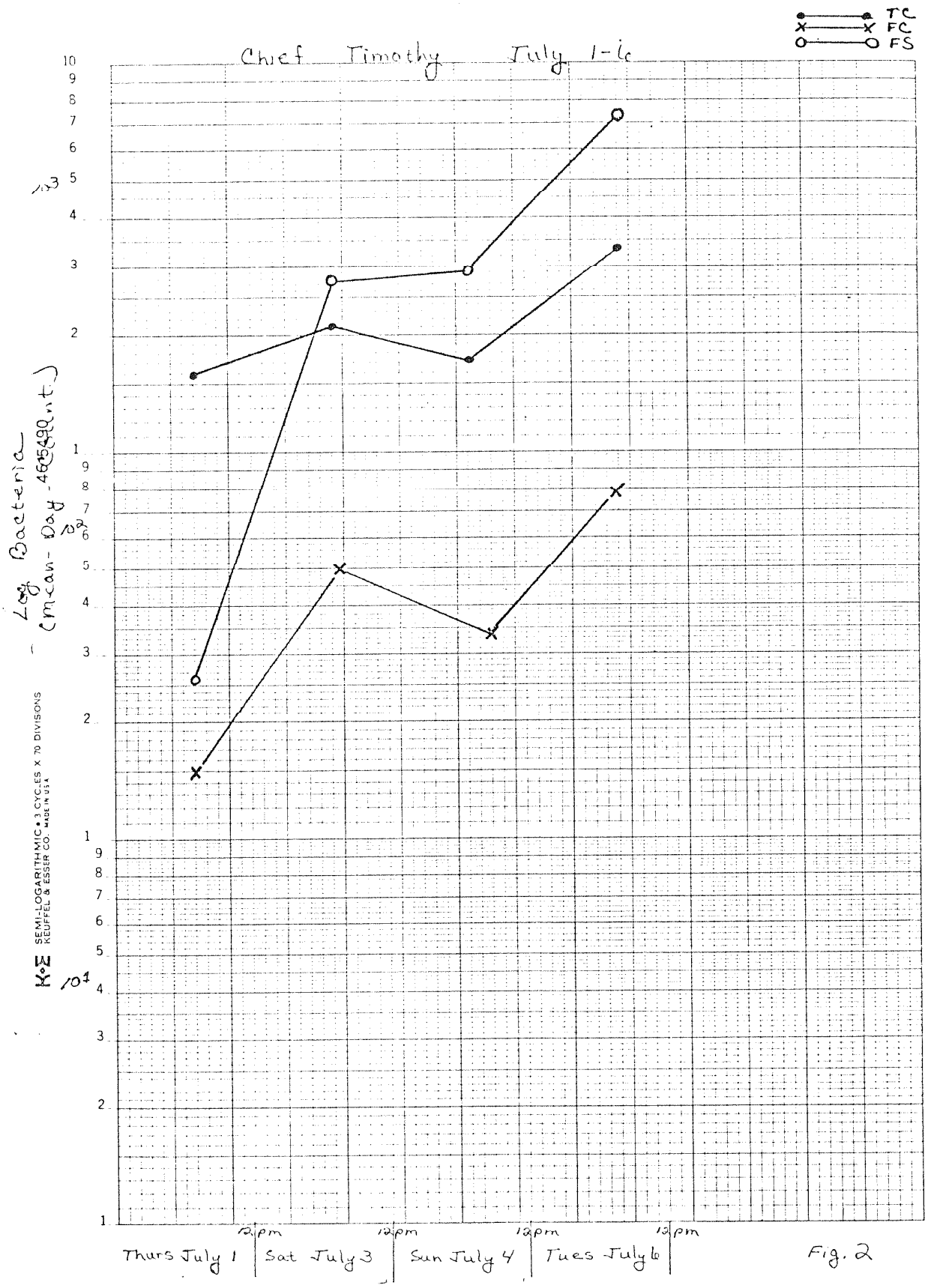

Swallows Park
July 1-6
TC
FC
FS
Log Bacteria (Mean-Day-Count)
10^3
10^2
10^1
Semi-Logarithmic
3 Cycles x 10 to the inch
12 pm
12 pm
12 pm
12 pm
Thurs. July 1
Sat July 3
Sun July 4
Tues. July 6

Fig. 1



Chief Timothy July 1-6
TC
FC
FS
Log Bacteria
(Mean-Day-46 5490 nt.)
10³
10²
10¹
12pm
12pm
12pm
12pm
Thurs July 1
Sat July 3
Sun July 4
Tues July 6
K+E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN USA

Fig. 2

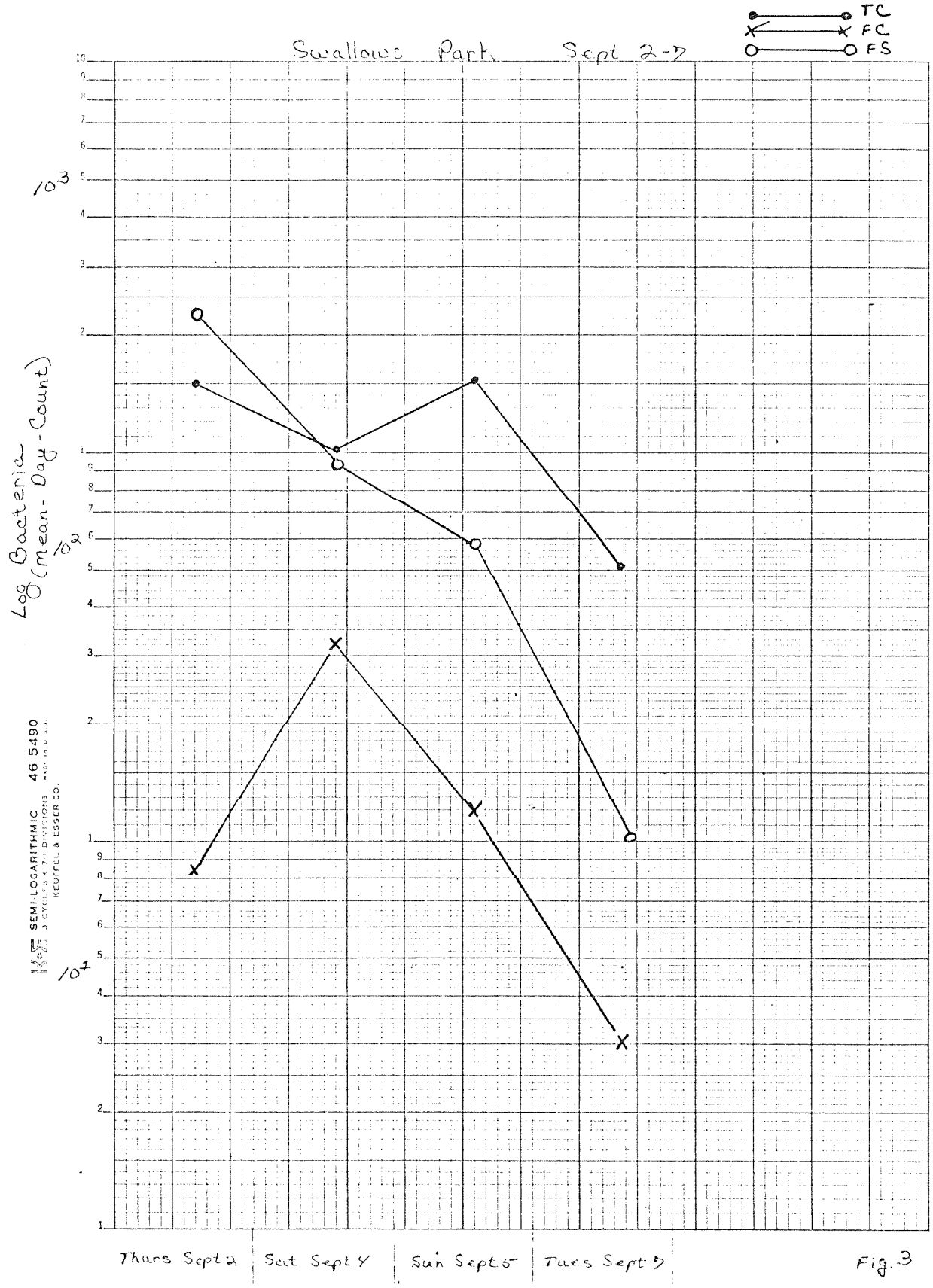

Swallows Park Sept 2-7
TC
FC
FS
Log Bacteria (Mean-Day-Count)
10^3
10^2
10^1
SEMI-LOGARITHMIC 46 5490
3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
Thurs Sept 2
Sat Sept 4
Sun Sept 5
Tues Sept 7

Fig. 3

Chief Timothy Sept 2-7

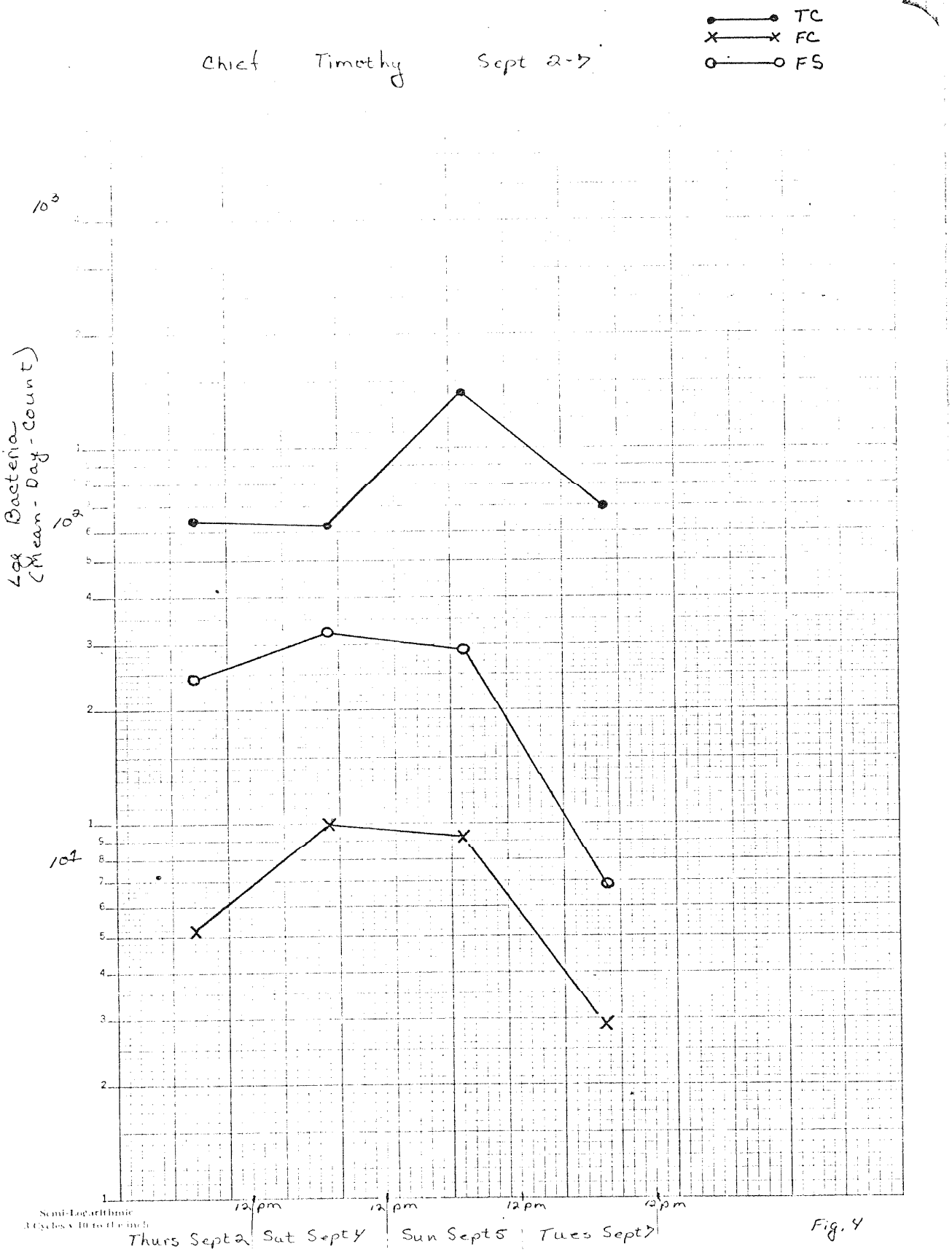


Fig. 4

R.M. 83

Temperature ($^{o}C/^{o}F$)

Depth	1200	1600	2000	2400	0400	0800	1200
				Time			
Surface	24.5/76.1	23.0/73.4	21.5/70.7	21.0/69.8	20.9/69.6	21.0/69.8	21.25/70.25
3 m	21.1/70.0	22.0/71.6	21.2/70.2	21.0/69.8	20.9/69.6	20.5/68.9	21.0/69.8
6	20.8/69.4	21.0/69.8	21.0/69.8	21.0/69.8	20.9/69.6	20.5/68.9	20.75/69.4
9	20.5/68.9	20.5/68.9	21.0/69.8	20.8/69.4	20.9/69.6	20.5/68.9	20.75/69.4
12	20.2/68.4	20.25/68.5	20.9/69.6	20.8/69.4	20.9/69.6	20.25/68.5	20.5/68.9
15	20.0/68.0		20.5/68.9		20.8/69.4		20.5/68.9
18	19.9/67.8		20.5/68.9		20.2/68.4		20.5/68.9
21	19.5/67.1		20.2/68.4		20.0/68.0		20.25/68.4
24	19.2/66.6	20.0/68.0	20.1/68.2	20.5/68.9	20.0/68.0	20.0/68.0	20.25/68.4
27			20.0/68.0		20.0/68.0		20.0/68.0
Bottom	19.1/66.4	19.0/66.2	20.0/68.0	20.8/69.4	19.9/67.8	19.75/67.6	

pH

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	8.7	8.55	8.8	8.3	8.6	8.0	8.1
3 m	8.4	8.7	8.8	8.7	8.6	8.3	8.2
6	8.0	8.15	8.7	8.7	8.7	8.4	8.0
9		8.4		8.6		8.3	
12	7.9	8.3	8.3	8.5	8.6	8.35	8.1
24	7.7	8.25	8.2	8.35		7.95	
27							8.0
29	7.8		8.0		8.2		
Bottom		8.15		8.25		7.8	

Conductivity (uMHOS)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	290	263	250	200	230	180	265
3 m	260	205	260	260	255	195	270
6	260	245	255	140	255	205	270
9		228		200		245	
12	260	200	260	180	255	190	270
24	240	252	260	238		185	
27							265
29	240		250		245		
Bottom		200		250		178	

Dissolved Oxygen (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	10.9	12.0	10.1	8.9	8.7	8.5	8.4
3 m	10.8	10.3	10.0	8.9	8.5	8.8	9.0
6	9.3	9.2	9.5	8.3	8.0	8.0	8.2
9	8.4	8.8	8.8	7.6	7.9	7.8	8.0
12	7.1	7.5	8.7	7.3	7.5	7.4	7.5
15	6.8		7.3		7.0		6.9
18	6.8		7.1		6.5		6.5
21	6.4		6.7		6.0		6.7
24	6.5	8.0	6.4	7.2	5.8	7.3	6.4
27	6.5		6.4		5.5		6.4
Bottom		7.2	5.6	7.2	5.0	6.8	

R.M. 83 (CONTINUED)

Alkalinity (M.O./ppth) mg/l

Depth	Time 1200	1600	2000	2400	0400	0800	1200
Surface	75.66/6.24	89.7/7.8	78.0/4.68	90.48/7.8	78.78/3.12		
3 m	78.0/3.9	93.6/9.36	82.68/3.9	91.26/9.36	81.12/3.12		
6	82.68/	85.8/3.9	81.12/4.68	88.14/7.8	81.9/3.12		
9		90.48/3.9		88.14/7.8			
12	83.46/	88.14/3.12	84.24/	85.02/5.46	81.9/3.9		
24	78.78/	85.8/0	85.8/	81.9/1.56	/0		
29	79.56/		80.34/		80.34/		
Bottom		85.02/		79.56/0			

CO_2 (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	0	0	0	0	0	0	3
3 m	0	0	0	0	0	0	0
6	0.5		0	0	0	0	0
9				0		0	
12	2		1	0	0	0	0.5
24	2	3	1	0		1	
27							2
29	2		2		1		
Bottom		2		1		2	

Light (In Footcandles)

Depth	1200 (9/1)	1200 (9/2)
Surface	4000	5000
0.5 m	2600	2300
1	850	1300
2	275	300
3	112.5	112.5
4	36.3	37.5
5	17.5	15
6	8.8	6.25
7	4.4	4
8	2.6	1.6
9	1.4	1
10	.8	.4
11	.3	.2
12	.2	0
13	0	

Secchi Disc

1200 (9/1)	1200 (9/2)
1.5 m	1.3 m

Verticle Light Extinction Coefficient between Surface and 4 m

1200 (9/1)	1200 (9/2)
1.18	1.22

DIURNAL ALGAE COUNTS OF THE LOWER SNAKE RIVER
9/1/76 - 9/2/76

	9/1/76			9/2/76		
Diatoms:	83/1200/C[1]	83/1600/C	83/2400/C	83/0400/C	83/0800/0	83/1200/C
Cocconeis sp.				12		
Cyclotella sp.	2,294	555	1,129	703	777	691
Fragilaria crotonensis				37		
Melosira spp.	49	37		37		49
Navicula sp.				12	12	
Stephanodiscus sp.					12	
Synedra sp.	49	12	25	99	37	25
Green:						
Actinastrum sp.		296				
Ankistrodesmus sp.		37	111			37
Geminella sp.	1,838	4,884	3,016	1,906	2,627	1,110
Pandorina sp.			12			12
Pediastrum sp.			12			
Scenedesmus sp.		49	99		99	
Schroederia sp.		12		12	12	
Selenastrum sp.			99			
Blue Green:						
Aphanizomenon flos-aquae		117		74	33	
TOTAL	4,230	6,000	4,502	2,892	3,610	1,924

1 - River mile/time/depth in meters C = composite

R.M. 107 - RIGHT BANK
9/1

Depth	Temperature (°C/°F) 1200	pH 1200
Surface	24.0/75.2	7.8
3 m	22.6/72.7	7.6
6	22.0/71.6	7.5
9	22.0/71.6	
12	21.8/71.2	7.6
15	21.2/70.2	
18	21.0/69.8	
21	21.4/70.5	
24	21.4/70.5	7.2
27	21.2/70.2	
29	21.0/69.8	7.5

Conductivity (uMHOS)

Depth	1200
Surface	230
3 m	222
6	224
12	223
24	222
29	229

D.O. (mg/l)

Depth	1200
Surface	9.4
3 m	8.6
6	7.9
9	7.8
12	7.6
15	7.1
18	6.5
21	6.8
24	6.8
27	6.6
29	6.5

Alkalinity (MO/ppth) mg/l

Depth	1200
Surface	97.8/
3 m	94.0/
6	95.9/
12	103.4/
24	93.1/
29	108.5/

Secchi Disk

1.7 m

Turbidity (FTU)

Surface-1200 hours - 2.4

Total Coliform (#/100 ml)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	160	1460	400				
Bottom	120	1620					

Fecal Coliform (#/100 ml)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	8	2	22				
Bottom	10	<2					

R.M. 107 - CHANNEL

Temperature ($^{o}C/^{o}F$)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	25.0/77.0	22.0/71.6	20.2/68.4		20.0/68.0	20.6/69.1	21.0/69.8
3 m	23.5/74.3	22.5/72.5	20.2/68.4		20.0/68.0	20.6/69.1	21.0/69.8
6	22.0/71.6	22.0/71.6	20.3/68.5		20.0/68.0	20.6/69.1	20.8/69.4
9	21.8/71.2	22.0/71.6	20.3/68.5		20.0/68.0	20.7/69.3	21.0/69.8
12	22.0/71.6	22.0/71.6	20.3/68.5		20.0/68.0	20.4/68.7	20.8/69.4
15	21.4/70.5	21.8/71.2	20.3/68.5		20.0/68.0	20.3/68.5	21.8/71.2
18	21.2/70.2	21.8/71.2	20.1/68.2		20.0/68.0	20.3/68.5	20.8/69.4
21	21.0/69.8	21.8/71.2	20.5/68.9		20.0/68.0	20.4/68.7	21.0/69.8
24	21.2/70.2	21.8/71.2	20.2/68.4		19.8/67.6	20.3/68.5	21.0/69.8
27	20.6/69.1	21.0/69.8	20.1/68.2		19.8/67.6	20.3/68.5	21.0/69.8
30	20.5/68.9	21.0/69.8	20.1/68.2		19.7/67.5	19.9/67.7	20.7/69.3
33	20.4/68.7	21.0/69.8	20.2/68.4		19.6/67.3	20.2/68.4	20.8/69.4
35	20.2/68.4	21.0/69.8	20.3/68.5		19.4/66.9	20.0/68.0	20.9/69.6

pH

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	7.7	7.7	8.15		7.8	8.65	8.1
3 m	7.8	7.7	8.15		8.4	8.78	
6	7.6	7.7	7.85		8.25	8.88	8.2
12	7.8	7.7	7.95		8.2	8.7	7.9
24	7.6	7.5	7.9		8.4	8.5	7.4
30			7.65				
33			7.9				
35	7.4	7.3	7.95		7.35	8.0	7.6

Conductivity (uMHOS)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	228	215	217		210	215	219
3 m	225	215	218		210	212	220
6	225	212	217		212	213	218
12	229	215	217		210	213	215
24	225	220	212		209	213	213
30			218				
33			219				
35	220	215	212		209	212	220

Dissolved Oxygen (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	8.6	8.7	7.3		7.09	7.8	7.4
3 m	8.6	8.4	7.2		7.1	7.45	7.4
6	7.8	7.8	7.3		7.2	7.4	7.3
9	7.9	7.8	7.3		7.65	7.19	7.0
12	7.8	7.7	7.2		7.66	7.15	7.0
15	6.7	7.4	7.25		7.2	7.1	7.1
18	6.6	7.5	6.8		6.89	7.0	6.8
21	6.6	6.8	6.65		6.7	6.9	6.9
24	6.6	6.8	6.25		6.6	6.65	6.8
27	6.6	6.7	6.35		6.51	6.35	7.0
30	6.6	6.6	6.2		6.5	6.3	6.4
33	5.9	6.5	6.0		6.39	6.3	6.4
35	5.8	6.5	6.15		6.35	6.1	6.5

R.M. 107 - CHANNEL (CONTINUED)

Alkalinity (M.O./ppth) mg/l

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	108.5/	109.2/	101.5/		101.5/	102.5/	103.4/
3 m	94.9/	109.8/	100.6/		110.9/	101.5/	101.5/
6	107.2/	112.6/	95.4/		100.6/	100.6/	105.3/
12	109.9/	109.9/	99.6/		102.5/	102.5/	97.8/
24		107.9/	99.6/		99.6/	101.5/	103.4/
35	108.5/	109.9/	102.5/		100.6/	104.3/	99.6/

Secchi Disc

	1200	1600	2000	2400	0400	0800	1200
	1.98 m	19.8 m				2.13 m	2.13 m

Turbidity (FTU)

	1200	1600	2000	2400	0400	0800	1200
Surface	2.2	3.9	1.7		2.0	1.6	

Chemical Oxygen Demand (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	10.67	7.85	8.25		8.66	7.85	8.25
12 m	7.85	7.85	7.45		7.85	7.85	7.85
35 m	7.04	7.04	7.45		8.75	7.45	7.04

Chlorophyll A (ug/l)

Depth	1200	0400
Surface	28.1	8.7
1 m	28.7	
3	17.4	12.9
6	16.0	11.9
12		10.6
24		4.0
35		2.1

Total Organic Carbon Composite-Left & Middle (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	4.40	4.67	3.43		3.50	3.73	3.73

R.M. 107 - CHANNEL (CONTINUED)

NH_3 (as NH_3) (mg/l)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	0.01	0.05	0.04		0.06	0.04	0.01
12 m	0.02	0.05	0.04		0.04	0.07	0.03
35	0.09	0.08	0.06		0.07	0.06	0.06

NO_3 (as NO_3) (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	0.25	0.23	0.54		0.89	0.59	0.52
12 m	0.53	0.44	0.55		0.59	0.64	0.60
35	0.77	0.65	0.72		0.69	0.74	0.71

NO_2 (as NO_2) (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	0.016	0.014	0.016		0.018		0.016
12 m	0.014	0.014	0.015		0.017	0.014	0.014
35	0.048	0.070	0.038		0.036	0.024	0.017

TKN (as N) (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	1.3	1.1	0.5		0.9	1.0	0.7
12 m	0.9	1.7	0.6		1.0	0.6	1.2
35	0.9	1.1	0.7		0.6	0.4	0.5

Total Inorganic PO_4 (as PO_4) (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	0.18	0.21	0.16		0.24	0.16	0.16
12 m	0.14	0.23	0.16		0.13	0.12	0.22
35	0.18	0.29	0.21		0.22	0.19	0.18

TP (as P) (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	0.06	0.09	0.06		0.09	0.07	0.06
12 m	0.04	0.10	0.06		0.05	0.05	0.08
35	0.06	0.10	0.08		0.07	0.07	0.07

R.M. 107 - CHANNEL (CONTINUED)

O-PO_4 (as PO_4) (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	<0.01	<0.01	<0.01		<0.01		<0.01
12 m	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
35	0.03	<0.01	<0.01		<0.01	<0.01	<0.01

Total Solids (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	166	170	172		208		184
12 m	174	171	167		202	190	181
35	192	172	204		196	176	184

Total Coliform (#/100 ml)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	120	280	60		280	320	780
Bottom		120	1280		1000	1560	7560

Fecal Coliform (#/100 ml)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	<2	<2	10		<2	2	<2
Bottom		282	46		10	<2	<2

DIURNAL ALGAE COUNTS OF THE LOWER SNAKE RIVER
9/1/76 - 9/2/76

	9/1/76				9/2/76	
	107/1200/0	107/1200/1	107/1200/3	107/1200/6	107/0400/0	107/0400/3
Diatoms:						
Cocconeis sp.						
Cyclotella sp.	2,664	2,849	2,035	3,959	666	1,554
Fragilaria crotonensis		197			37	395
Melosira spp.	567	407	123	456	357	246
Navicula sp.		12				
Stephanodiscus sp.		12	12			
Synedra sp.	12	25	12	136	86	62
Green:						
Actinastrum sp.						
Ankistrodesmus sp.		86	37	86	25	
Geminella sp.	2,738	2,812	1,850	1,591	481	703
Micractinium sp.			197			
Pandorina sp.	12				12	
Pediastrum sp.		12	12	12		
Scenedesmus sp.			49			
Schroederia sp.	25					
Selenastrum sp.						
Blue Green:						
Aphanizomenon flos-aquae						
TOTAL	6,019	6,413	4,329	6,241	1,665	2,960

9/2/76

Diatoms:	107/0400/6	107/0400/12m	107/0400/24m	107/0400/Bottom
Cocconeis sp.			12	
Cyclotella sp.	1,270	2,683	715	620
Fragilaria crotonensis	49	222		
Melosira spp.	220	136	87	124
Navicula sp.			12	
Stephanodiscus sp.				
Synedra sp.	12	25	12	
Green:				
Actinastrum sp.				
Ankistrodesmus sp.	25	12	25	
Geminella sp.	456	469	197	236
Miractum			86	
Pediastrum sp.				
Scenedesmus sp.	49			50
Schroederia sp.			12	
Selenastrum sp.				
Staurastrum			12	
Blue Green:				
Aphanizomenon flos-aquae	18			
TOTAL:	2,201	3,546	1,172	1,030

R.M. 107 (LEFT BANK)

Temperature (°C/°F)

Depth	1200	1600	2000	2400	0400	0800	1200
				Time			
Surface	22.1/71.8	23.5/74.3	21.8/71.2		20.1/68.2	20.5/68.9	21.2/70.2
3 m	22.0/71.6	23.0/73.4	21.0/69.8		20.2/68.4	20.9/69.6	21.0/69.8
6	21.5/70.7	22.0/71.6	21.0/69.8		20.2/68.4	20.9/69.6	21.2/70.2
9	21.2/70.2	22.0/71.6	21.0/69.8				21.0/69.8
12	21.0/69.8	22.0/71.6	21.0/69.8		20.2/68.4	20.7/69.3	20.6/69.1
15	21.0/69.8	21.1/70.0	20.9/69.6				20.5/68.9
18	20.9/69.6	21.0/69.8	20.4/68.7				20.5/68.9
21	22.0/71.6	21.0/69.8	20.1/68.2				21.0/69.8
24	22.0/71.6	21.0/69.8	20.1/68.2		20.1/68.2	20.5/68.9	21.0/69.8
27	21.9/71.4	21.0/69.8	20.0/68.0				20.8/69.4
29	21.2/70.2	22.0/71.6			20.4/68.7	20.4/68.7	21.0/69.8

pH

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	8.2	7.8	8.25		7.6	8.4	8.2
3 m	8.2	7.8	8.4		7.5	8.3	8.2
6	8.1	7.5	8.6		7.8	8.49	8.2
12	7.9	7.7	8.6		7.95	8.59	7.5
24	8.0	7.5	8.7		7.45	8.5	7.5
27			8.0				
29	8.0	7.5			7.85	8.5	7.5

Conductivity (uMHOS)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	220	222	219		217	216	223
3 m	220	219	219		218	219	215
6	220	220	219		213	219	215
12	220	220	219		214	219	215
24	235	230	217		211	215	211
29	230	228	218		210	209	212

Dissolved Oxygen (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	8.8	9.2	7.5		7.4	7.35	8.2
3 m	7.8	9.1	7.5		7.46	7.3	7.8
6	7.4	7.8	7.5		7.4	7.29	7.6
9	7.5	8.1	7.51				7.4
12	7.8	7.4	7.29		7.38	7.1	7.5
15	7.0	7.0	6.9				7.2
18	7.1	6.6	6.2				6.7
21	7.4	6.5	6.41				6.6
24	7.1	6.5	6.8		6.8	6.6	6.6
27	6.8	6.5	6.59				6.4
29	6.8	6.2			7.1	6.5	6.6

R.M. 107 LEFT BANK (CONTINUED)

Alkalinity (M.O./ppth) mg/l

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	107.2/	109.9/					
3 m	108.5/	113.9/					
6	107.2/	111.9/					
12	112.6/	109.2/					
24	113.9/	108.5/					
29	108.9/	106.5/			105.3/		

Secchi Disc

	1200	1600	2000	2400	0400	0800	1200
	1.5 m	1.5 m				3.05 m	2.13 m

Turbidity (FTU)

	Time
Surface	1200 - 3.0

Total Coliform (#/100 ml)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	460	1620	620		780	340	28
29 m	200	240	40		420	3200	960

Fecal Coliform (#/100 ml)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	10	<2	12		<2	24	10
29 m	<2	28	<2		2	2	<2

R.M. 119 - RIGHT BANK

Temperature ($^{o}C/^{o}F$)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	21.0/69.8	22.5/72.5	21.0/69.8	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
3 m	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
6	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
9	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
12	20.0/68.0	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
15	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9
18	20.0/68.0	19.5/67.1	20.0/68.0	20.0/68.0	20.5/68.9	20.0/68.0	20.0/68.0
21	20.0/68.0	19.5/67.1	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0
24	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	20.0/68.0	20.0/68.0	19.5/67.1
27	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1
29	19.5/67.1						

pH

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	7.9	7.9	7.9	7.9	8.0	8.0	7.9
3 m	7.8	7.8	7.9	7.9	8.0	8.0	7.9
6	7.8	7.8	7.9	7.9	8.0	7.9	7.9
9	7.8	7.8	7.8	7.9	8.0	7.9	7.8
12	7.8	7.8	7.8	7.9	8.0	7.9	7.8
15	7.7	7.8	7.8	7.8	8.0	7.8	7.8
18	7.7	7.7	7.7	7.8	7.9	7.8	7.8
21	7.7	7.7	7.7	7.7	7.8	7.8	7.8
24	7.6	7.6	7.6	7.7	7.8	7.8	7.7
27	7.7	7.3	7.3	7.8	7.7	7.7	7.6
29	7.7						

Conductivity (uMHOS)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	220	235	235	220	220	205	235
3 m	240	245	235	230	230	230	240
6	240	245	240	230	230	230	240
9	240	245	235	230	230	230	240
12	240	240	235	230	230	230	240
15	240	240	235	230	230	230	240
18	240	240	235	230	230	230	235
21	240	240	230	230	230	230	235
24	240	235	230	225	225	230	230
27	240	235	235	225	220	225	230
29	235	240					

R.M. 119 - RIGHT BANK (CONTINUED)

Dissolved Oxygen (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	9.1	9.4	8.6	8.3	8.8	8.8	8.7
3 m	8.9	8.75	8.6	8.2	8.7	8.7	8.7
6	8.8	8.55	8.6	8.1	8.6	8.6	8.5
9	8.6	8.5	8.3	8.1	8.5	8.4	8.1
12	8.6	8.5	8.2	8.0	8.5	8.3	8.0
15	8.5	8.4	8.2	7.8	8.4	8.0	8.0
18	8.3	7.9	8.2	7.8	8.1	8.0	8.0
21	8.3	7.9	8.2	7.5	7.9	8.0	7.9
24	7.8	7.8	7.8	7.4	7.9	8.0	7.7
27	7.9	6.4	7.4	7.2	7.6	7.4	7.4
29	7.9						

Alkalinity (M.O./ppth) mg/l

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	91/	91/	92/	90/	90/	91/	92
3 m	90/	93/	88/	90/	93/	92/	91/
6	92/	89/	93/	90/	92/	87/	91/
12	88/	89/	90/	91/	94/	93/	92/
24	89/	86/	90/		92/	91/	90/
27		90/	91/		92/	90/	92/
29	89/						

R.M. 119 - CHANNEL

Temperature ($^{o}C/^{o}F$)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	20.5/68.9	22.2/72.0	21.0/69.8	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
3 m	20.5/68.9	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
6	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
9	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
12	20.0/68.0	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
15	20.0/68.0	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
18	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0
21	19.5/67.1	19.5/67.1	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0
24	19.5/67.1	19.5/67.1	19.5/67.1	20.0/68.0	20.0/68.0	20.0/68.0	19.5/67.1
27	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1
30	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1	19.5/67.1

pH

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	7.9	7.9	7.9	7.8	7.9	8.0	7.9
3 m	7.8	7.8	7.9	7.8	7.9	8.0	7.9
6	7.7	7.7	7.9	7.8	8.0	8.0	7.9
9	7.7	7.7	7.8	7.9	8.0	7.9	7.8
12	7.7	7.7	7.8	7.9	7.9	7.9	7.8
15	7.7	7.7	7.8	7.7	7.9	7.9	7.8
18	7.7	7.6	7.8	7.8	7.9	7.8	7.8
21	7.6	7.6	7.7	7.7	7.9	7.8	7.7
24	7.6	7.5	7.7	7.7	7.8	7.8	7.7
27	7.55	7.2	7.5	7.7	7.7	7.7	7.6
30	7.15	6.9	7.0	7.8	7.5	8.0	7.5

Conductivity (uMHOS)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	230	230	240	225	210	220	240
3 m	230	240	240	230	220	230	240
6	230	240	240	230	230	230	240
9	230	240	240	230	230	230	240
12	230	240	230	230	230	230	240
15	230	240	235	230	230	230	240
18	230	240	235	230	230	230	240
21	220	240	235	230	230	230	235
24	220	240	230	230	225	225	235
27	220	240	230	225	220	220	230
30	225	240	230	220	220	220	230

R.M. 119 - CHANNEL (CONTINUED)

Dissolved Oxygen (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	9.1	9.4	8.5	8.2	8.4	8.9	8.7
3 m	8.8	8.7	8.6	8.1	8.2	8.8	8.7
6	8.5	8.4	8.6	8.1	8.0	8.5	8.3
9	8.5	8.5	8.2	8.0	8.0	8.4	8.3
12	8.5	8.5	8.1	8.0	8.0	8.3	8.3
15	8.4	8.4	8.1	7.9	7.9	8.1	8.3
18	8.3	8.0	8.2	7.6	7.6	8.0	8.0
21	8.2	7.8	7.9	7.7	7.7	7.9	7.8
24	7.9	7.6	7.7	7.7	7.4	7.9	7.7
27	7.8	5.9	7.1	7.4	7.1	7.6	7.1
30	4.5	4.6	6.0	6.8	5.8	7.5	7.1

Alkalinity (MO/ppth) (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	92/	92/	94/	92/	91/	91/	92/
3 m	91/	91/	90/	96/	92/	92/	92/
6	88/	91/	93/	91/	90/	91/	91/
12	87/	90/	92/	88/	91/	90/	92/
24	91/	90/	91/	88/	91/	90/	92/
31	91/	92/	92/	88/	89/	91/	91/

Turbidity (FTU)

Surface	1200	1600	2000	2400	0400	0800	1200
	1.8	2.0			2.3	2.8	2.2

R.M. 119 - LEFT BANK

Temperature (°C/°F)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	20.5/68.9	22.2/72.0	21.0/69.8	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
3 m	20.5/68.9	20.0/68.0	21.0/69.8	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
6	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
9	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9	20.5/68.9
12	20.0/68.0	20.0/68.0	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.5/68.9
15	20.0/68.0	19.5/67.1	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.0/68.0
18	19.5/67.1	19.5/67.1	20.0/68.0	20.0/68.0	20.5/68.9	20.5/68.9	20.0/68.0
21	19.5/67.1	19.5/67.1	20.0/68.0	19.5/67.1	20.0/68.0	20.5/68.9	20.0/68.0

pH

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	7.8	7.7	7.9	7.9	8.0	7.9	7.9
3 m	7.8	7.8	7.9	7.9	8.0	7.9	7.9
6	7.8	7.7	7.9	7.9	8.0	7.9	7.9
9	7.7	7.6	7.8	7.9	8.0	8.0	7.9
12	7.7	7.6	7.7	7.8	8.0	7.9	7.8
15	7.7	7.6	7.7	7.7	7.9	7.8	7.7
18	7.7	7.5	7.7	7.7	7.8	7.8	7.7
21	7.6	7.4	7.6	7.7	7.7	7.7	7.6

Conductivity (uMHOS)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	230	230	220	220	215	205	240
3 m	230	240	230	230	225	225	245
6	235	240	240	230	230	230	245
9	240	240	240	230	230	230	245
12	240	240	240	230	230	230	245
15	235	240	240	230	230	230	245
18	235	240	235	230	230	230	235
21	235	240	235	230	230	230	235

Dissolved Oxygen (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	9.0	8.6	8.6	8.5	8.3	8.8	9.0
3 m	8.8	8.7	8.6	8.5	8.0	8.7	8.8
6	8.5	8.4	8.7	8.4	8.0	8.7	8.5
9	8.4	8.3	8.35	8.3	8.0	8.6	8.5
12	8.4	8.4	8.1	7.8	7.9	8.5	8.5
15	8.2	8.1	8.2	7.8	7.9	8.1	7.9
18	8.0	8.0	8.1	7.5	7.5	8.0	7.6
21	7.9	7.5	7.7	7.8	6.9	7.8	7.5

R.M. 129 - RIGHT BANK

Temperature ($^{o}C/^{o}F$)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	25.0/77.0	26.0/78.8	22.8/73.0	23.0/73.4	22.8/73.0	22.8/73.0	23.0/73.4
3 m	23.0/73.4	24.4/75.9	22.8/73.0	22.8/73.0	22.8/73.0	22.8/73.0	22.6/72.7
6	22.6/72.7	23.6/74.5	22.2/72.0	22.8/73.0	22.8/73.0	22.8/73.0	22.4/72.3
12	22.4/72.3	23.0/73.4	22.0/71.6	22.4/72.3	22.8/73.0	22.8/73.0	22.2/72.0
15	22.1/71.8	23.0/73.4	21.9/71.4	22.4/72.3	22.6/72.7	22.8/73.0	22.2/72.0

pH

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	8.0	7.9	7.9	7.9	7.9	7.9	7.8
3 m	7.8	7.8	7.9	7.9	7.9	7.9	7.8
6	7.8	7.8	7.8	7.9	7.9	7.9	7.8
12	7.8	7.8	7.8	7.8	7.9	7.9	7.8
15	7.7	7.8	7.8	7.8	7.8	7.9	7.7

Conductivity (uMHOS)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	284	278	272	260	262	278	284
3 m	288	284	268	260	264	278	282
6	288	282	270	260	262	276	282
12	288	284	272	260	258	278	282
15	288	284	274	264	258	278	282

Dissolved Oxygen (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	9.7	9.0	8.7	8.7	8.9	8.6	8.7
3 m	8.2	7.6	8.7	8.8	8.8	8.6	8.3
6	8.3	7.7	8.4	8.8	8.8	8.6	8.3
12	8.2	7.9	8.2	8.5	8.8	8.6	8.2
15	8.3	7.9	8.1	8.3	8.7	8.5	8.2

Alkalinity (M.O./ppth) mg/l

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	93.0/	93.5/	91.5/	89.0/	91.0/	96.0/	94.0/
6 m	95.0/	92.5/	93.0/	89.5/	91.0/	97.0/	93.5/
15	95.0/	93.0/	92.0/	90.0/	91.0/	97.0/	95.5/

R.M. 129 - CHANNEL

Temperature ($^{o}C/^{o}F$)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	22.6/72.7	25.4/77.7	25.0/77.0	23.4/74.1	23.0/73.4	22.8/73.0	23.8/74.8
3 m	22.8/73.0	23.0/73.4	24.2/75.6	23.2/73.8	22.8/73.0	22.8/73.0	23.2/73.8
6	22.6/72.7	22.6/72.7	23.6/74.5	23.2/73.8	22.8/73.0	23.0/73.4	22.6/72.7
12	22.5/72.5	22.2/72.0	22.8/73.0	22.6/72.7	22.8/73.0	23.0/73.4	22.4/72.3
20	21.8/71.2	22.0/71.6	22.4/72.3	22.4/72.3	22.0/71.6	23.0/73.4	22.2/72.0

pH

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	8.1	8.0	7.9	7.9	7.9	7.9	7.9
3 m	7.8	7.9	7.9	7.9	7.9	7.9	7.9
6	7.8	7.7	7.9	7.9	7.9	7.9	7.8
12	7.8	7.8	7.8	7.8	7.9	7.9	7.8
20	7.6	7.8	7.8	7.8	7.8	7.9	7.8

Conductivity (uMHOS)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	270	280	262	260	262	276	280
3 m	280	280	262	260	262	274	282
6	286	280	262	260	260	272	280
12	288	282	260	260	258	272	280
20	282	280	268	262	256	270	282

Dissolved Oxygen (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	10.2	9.1	8.2	8.8	8.8	8.8	8.7
3 m	8.5	8.4	8.4	8.9	8.8	8.6	8.7
6	8.5	8.2	8.5	8.8	8.8	8.6	8.6
12	8.6	8.1	8.2	8.5	8.8	8.6	8.3
20	7.7	8.1	8.2	8.5	8.7	8.6	8.2

Alkalinity (M.O./ppth) mg/l

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	95.0/	93.0/	91.0/	89.0/	91.0/	94.5/	93.5/
6 m		93.0/	91.0/	90.0/	88.0/	95.0/	94.0/
12	94.5/						
20	92.0/	95.5/	95.0/	90.0/	88.0/	95.0/	94.0/

Turbidity (FTU)

	1200	1600	2000	2400	0400	0800	1200
Surface	3.4	2.4	2.6	2.0	2.5	2.7	2.4

R.M. 129 - LEFT BANK

Temperature ($^{o}C/^{o}F$)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	24.8/76.6	25.4/77.7	26.4/79.5	24.0/75.2	22.8/73.0	22.6/72.7	23.0/73.4
3 m	23.0/73.4	24.2/75.6	25.2/77.4	23.6/74.5	22.8/73.0	22.6/72.7	22.8/73.0
6	22.8/73.0	23.0/73.4	24.0/75.2	23.5/74.3	22.8/73.0	22.8/73.0	22.6/72.7
12	22.5/72.5	22.6/72.7	23.5/74.3	23.2/73.8	22.8/73.0	22.8/73.0	22.6/72.7
14	22.4/72.3	22.0/71.6	23.2/73.8	22.8/73.0	22.8/73.0	22.8/73.0	22.2/72.0

pH

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	8.1	8.0	7.9	7.9	7.9	7.9	7.9
3 m	7.9	8.0	8.0	7.9	7.9	7.9	7.8
6	7.8	7.8	7.9	7.9	7.9	7.8	7.8
12	7.8	7.8	7.9	7.9	7.9	7.9	7.8
14	7.8	7.8	7.9	7.8	7.9	7.9	7.8

Conductivity (uMHOS)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	278	278	263	262	260	272	278
3 m	286	275	266	260	260	272	278
6	284	272	262	260	260	270	281
12	284	276	268	262	258	266	284
14	284	275	268	268	256	264	282

Dissolved Oxygen (mg/l)

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	9.5	9.3	8.3	8.6	8.9	8.8	9.6
3 m	8.9	9.1	8.2	8.7	8.9	8.7	9.0
6	8.4	8.3	8.1	8.7	8.8	8.7	8.7
12	8.4	8.2	8.0	8.4	8.8	8.7	8.6
14	8.4	8.1	7.9	8.1	8.8	8.7	8.6

Alkalinity (M.O./ppth) mg/l

Depth	1200	1600	2000	2400	0400	0800	1200
Surface	92.0/	91.5/	90.0/	92.0/	89.0/	96.0/	93.0/
6	95.0/	93.0/	90.0/	91.0/	87.0/	93.5/	93.0/
14	94.0/	95.0/	92.0/	91.0/	89.0/	92.0/	95.0/

CLEARWATER RIVER - R.M. 9

Temperature ($^{o}C/^{o}F$)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
Surface	19.9/67.8	21.4/70.5	21.2/70.2	19.7/67.5	18.3/65.0	16.4/61.5	16.9/62.5

pH

Surface	7.3	8.2	8.3	7.7	7.4	7.1	7.6

Conductivity (uMHOS)

Surface	25	21	25	25	21	21	25

Dissolved Oxygen (mg/l)

Surface	8.12	7.93	7.64	7.35	7.74	7.74	8.49

Alkalinity (M.O./ppth) mg/l

Surface	21.42/0	17.18/0	19.32/1.07	23.56/0	19.29/0	14.99/0	17.14/0

CO_2 (mg/l)

Surface	7.04	0.88	3.52	4.18	4.29	4.18	3.08

Turbidity (FTU)

Surface	1.2	1.1	1.1	5.1	6.4	3.4	3.0

Chemical Oxygen Demand (mg/l)

Surface	6.64	6.24	7.04	7.04	6.64	6.24	5.83

Total Organic Carbon (mg/l)

Surface	2.90	3.08	3.13	3.63	3.73	3.43	3.08

NH_3 (as NH_3) (mg/l)

Surface	0.03	0.01	0.01	0.01	0.03	0.02	0.02

NO_3 (as NO_3) (mg/l)

Surface	0.05	0.03	0.03	0.05	0.08	0.08	0.06

NO_2 (as NO_2) (mg/l)

Surface	0.001	0.002	0.003	0.004	0.004	0.003	0.003

CLEARWATER RIVER - R.M. 9 (CONTINUED)

Depth	1200	1600	2000	Time 2400	0400	0800	1200
				TKN (as N)			
Surface	0.7	1.3	1.1	0.5	1.4	1.1	1.0
				Total Inorganic PO_4 (as PO_4)			
Surface	0.06	0.08	0.15	0.16	0.12	0.14	0.13
				TP (as P)			
Surface	0.05	0.02	0.05	0.07	0.05	0.06	0.04
				O-PO_4 (as PO_4)			
Surface	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
				Total Solids			
Surface	55	46	56	63	65	54	49

R.M. 154

Depth	1200	1600	2000	2400	0400	0800	1200
				Time			
				Temperature ($^{o}C/^{o}F$)			
Surface	21.5/70.7	22.0/71.6	22.5/72.5	21.4/70.7	21.0/69.8	20.9/69.6	21.0/69.8
				pH			
Surface	8.4	8.3	8.3	8.3	8.2	8.2	8.2
				Conductivity (uMHOS)			
Surface	315	310	250	290	295	310	315
				Dissolved Oxygen (mg/l)			
Surface	7.6	7.6	7.9	7.6	7.7	7.6	7.5
				Alkalinity (M.O./ppth) mg/l			
Surface	112/	118/	110/	112/	116/	112/	116/
				Turbidity (FTU)			
Surface	1.4	1.8	1.5	1.7	1.7	1.3	1.7
				Chemical Oxygen Demand (mg/l)			
Surface	7.45	7.04	7.04	6.64	7.04	7.04	7.04
				Total Organic Carbon (mg/l)			
Surface	3.40	3.08	3.37	3.17	3.23	3.58	3.37
				NH_3 (as NH_3) (mg/l)			
Surface	0.03	0.03	0.03	0.01	0.02	0.01	0.01
				NO_3 (as NO_3) (mg/l)			
Surface	1.51	1.49	1.34	1.54	1.73	1.66	1.69
				NO_2 (as NO_2) (mg/l)			
Surface	0.009	0.009	0.009	0.010	0.008	0.008	0.009

R.M. 154 (CONTINUED)

Depth	1200	1600	2000	2400	0400	0800	1200
				Time			
				TKN (as N)			
Surface	0.6	0.9	1.3	1.5	1.2	1.1	0.1
				Total Inorganic PO_4 (as PO_4)			
Surface	0.19	0.20	0.16	0.18	0.19	0.22	0.56
				TP (as P)			
Surface	0.07	0.06	0.06	0.06	0.06	0.07	0.18
				O-PO_4 (as PO_4)			
Surface	0.05	0.05	0.08	0.14	0.07	0.05	0.05
				Total Solids			
Surface	201	208	203	204	204	214	211