NWRI CONTRIBUTION NO 85-42

LRTAP Intercomparison Study No. L-5
Major Ions, Nutrients and Physical Properties in Water

K.I. Aspila and S. Todd

LRTAP INTERCOMPARISON STUDY L-5:

MAJOR IONS, NUTRIENTS AND PHYSICAL PROPERTIES IN WATER

by

K. I. Aspila and S. Todd

Quality Assurance and Methods Section

Analytical Methods Division

National Water Research Institute

Burlington, Ontario. L7R 4A6

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EXECUTIVE SUMMARY

The Canadian LRTAP program (long range transport of atmospheric pollutants) involves many different laboratories who individually produce data for regional or national objectives. If these data are to be merged or if they are to be used to establish long-term trends it is imperative that the data be verified as comparable between laboratories and that laboratories have produced data in a controlled and unbiased manner. This report describes a fifth interlaboratory study that addresses these issues.

This study consisted of 10 water samples and was distributed to 54 laboratories who were requested to analyze for 12 different constituents. Data provided were analyzed for bias by the rank order method of Youden. Results which deviated significantly from interlaboratory medians were flagged.

This report is a compilation of all results received and evaluated. The individual laboratory appraisals that were provided to participants on April 2, 1984 are included. It is hoped, where warranted, that individual laboratories have taken appropriate corrective action in their measurement process.

ABSTRACT

This report is a compilation of results received and evaluated for LRTAP interlaboratory study L-5. The report includes all laboratory specific appraisals that had been provided earlier (April 2, 1984) to laboratory heads and project managers. The study consisted of 10 samples of which six were natural waters derived from LRTAP watershed programs or precipitation networks. One sample was from Lake Superior and the other three were synthetic. Laboratory data sets were appraised for bias by the rank order method of Youden. Individual sample results were flagged if deviating significantly from interlaboratory median values. The parameters included Ca, Mg, Na, K, Cl, SO_4, acidity, total alkalinity, gran alkalinity, pH, specific conductance, colour, reactive silica and NO_3 plus NO_2. Included in this report is a brief comparison of bias and flag frequency for each participant in studies L-1, L-3, L-4 and L-5.

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INTRODUCTION

The long range transport of atmospheric pollutants (LRTAP) program involves many different laboratories that contribute data for various project objectives. If the data are to be merged or used for identifying year to year trends or for acid rain impact studies, then it is necessary that laboratories be defined as in control and comparable. This interlaboratory study addresses these issues. The merits and impact of interlaboratory studies are described elsewhere (1,2,3).

Background of Study

This study was organized during the summer and fall of 1983. It was distributed to client laboratories in December 1983 and had a January 31, 1984 deadline assigned. Not all participants reported on schedule. The appraisals in this report were provided earlier to each participant during the first week of April 1984 and reflect laboratory performance during that time frame: December 1983 to March 1984. All laboratories who exhibited bias or erratic results have hopefully taken internal action to review and correct their measurement process.

Release of Laboratory Codes

Laboratories that participated in this study are identified, by their affiliations, at the end of this report. The individual

results in Appendix I and the appraisals compiled in Appendix II have laboratories identified by their laboratory number. The key to these codes, although confidential, is available on a need to know basis. Users of data and program managers are encouraged to seek out the source of their data and openly discuss issues of quality with their client laboratories.

Design of the Study

The study comprized of 10 different water samples distributed to over 50 laboratories. The samples are described in Table 1. Several were recycled from an earlier study. Their inclusion has merit as they assist in verifying stability and allow individual laboratories who exhibited poor results to update and verify performance.

Table 1: Test Samples Used in Study L-5

Sample Number	Source of Water	Previous Use in Study L-1
1	Keji-Brown, Nova Scotia	
2	Montmorency, Quebec	L-4 (#5)
3	Lac LaFlamme, Quebec	
4	Moncton, New Brunswick	
5	Precipitation (Composite)	L-4 (#9)
6	Precipitation (Composite)	
7	Synthetic	
8	Synthetic	L-4 (#7)
9	Lake Superior, Ontario	L-4 (#10)
10	Synthetic	

Preparation of Samples

Test sample bottles for this study were 500 mL linear polyethylene. These were either new bottles or bottles recycled from earlier studies. All bottles were washed with chromerge, tap water rinsed and then thoroughly rinsed with distilled water. They were then filled with distilled deionized water and stored 1 week to 50 weeks before use.

Forty litre aliquots of stock samples (see Table 1) were obtained by syphoning from stock waters (100 to 200 litres) maintained in permanent storage at 4°C. The 40 litre substocks were mixed vigorously and 400 mL units serially transferred to the clean bottles. Samples so prepared were all stored at 4°C until distributed to the participants.

Evaluation of Data

Interlaboratory data sets were evaluated for bias by the nonparametric rank order method of Youden (4,7) which had been modified by Clark (2,5) to allow for computerized evaluation. A set of data is said to be biased when it exhibits a tendency to be higher or lower than some standard. The standard for these studies is the performance of all participating laboratories. For these studies there is about a 1 chance in 20 of deeming a laboratory set biased when it is not.

In addition to bias, results on each individual sample were evaluated by flagging results that deviated significantly from the interlaboratory medians. This process is described elsewhere (study L-1, L-2, and References 2 and 5). The criteria for flagging is given in Table 2.

To assist in evaluating data, analysts were requested to report all their calculated results and to use the codes W and T where appropriate. This format is described in study L-1 and L-2 and found in a recent ASTM Standard Practice (6).

RESULTS AND DISCUSSION

General

Laboratory results, brief method statements, bias and assigned flags are provided in Appendix I. Laboratories that were assigned bias are in most situations in error due to calibration. Flags assigned on individual samples reflect, in most cases, a lack of precision in the method applications. Those laboratories assigned a high frequency of bias (based on whole data sets) as well as a high percentage of results flagged have hopefully taken appropriate internal corrective action (8). The appraisals had been provided shortly after the completion of the study. A compilation of all appraisals is given in Appendix II.

Table 2: Summary of criteria used for flagging results*

Constituent	LLBAE				BAE				CEI			
	L-1	L-3	L-4	L-5	L-1	L-3	L-4	L-5	L-1	L-3	L-4	L-5
Ca	5	2.5	2.5	2.5	0.25	0.188	0.15	0.15	0.10	0.096	0.08	0.08
Mg	1.0	1.0	1.0	1.0	0.15	0.046	0.05	0.05	0.10	0.099	0.10	0.10
Na	3	0.5	0.50	0.50	0.4	0.2	0.20	0.20	0.10	0.15	0.14	0.14
K	0.5	0.50	0.20	0.20	0.15	0.13	0.05	0.05	0.10	0.108	0.16	0.16
Cl-1C	-	-	1.5	1.5	-	-	0.25	0.25	-	-	0.15	0.15
Cl-non 1C	-	-	1.5	1.5	-	-	0.25	0.25	-	-	0.15	0.15
Cl (Total)	5	1.5	1.5	1.5	0.50	0.26	0.25	0.25	0.05	0.178	0.15	0.15
SO_4-1C	-	-	2.0	2.0	-	-	0.76	0.76	-	-	0.20	0.20
SO_4-non 1C	-	-	2.0	2.0	-	-	0.76	0.76	-	-	0.20	0.20
SO_4 (Total)	5	6.0	2.0	2.0	0.5	0.746	0.76	0.76	0.10	0.168	0.20	0.20
Acidity	1.0	1.0	1.0	1.0	1.0	0.75	0.75	0.75	0.10	0.50	0.50	0.50
Total Alka	0	2.5	2.5	2.5	1.25	1.19	1.20	1.20	0.10	0.086	0.08	0.08
Gran. Alka	-	-	0.05	0.05	-	-	0.50	0.50	-	-	0.10	0.10
pH	7	0	0	0	0.25	0.25	0.25	0.25	0	0	0	0
Spec. Cond	0	50	50	50	2.5	2.82	2.8	2.8	0.05	0.078	0.08	0.08
Colour	5	5	5	5	5	2.03	2.2	2.6	0.10	0.182	0.18	0.20
Si	0.2	0.10	0.1	0.10	0.05	0.05	0.05	0.05	0.10	0.067	0.08	0.08
NO_3+NO_2	0.2	0.05	0.5	0.50	0.05	0.024	0.025	0.25	0.10	0.142	0.20	0.20
Ba	-		0.01	-	-		0.005	-	-		0.10	-
DOC	1.0	5.0	3.0	-	1.0	2.03	1.5	-	0.10	0.182	0.20	-

*Criteria cited for study L-3 above, differs slightly from that used when the initial appraisals were prepared in August 1983 and mailed to participants. The parameters involved are pH, silica, acidity and Na.

LLBAE = lower limit for use of basic acceptable error.

BAE = basic acceptable error.

CEI = concentration error increment.

Shortly after samples for this study were distributed, it became evident that one sample had been acidified with nitric acid. A letter was then sent to all analysts with a caution to expect high nitrate and a very low pH. When the study was completed and the data reviewed, it was decided to reject this sample and make all bias and flag evaluations on only the remaining nine samples. The data in Appendix I and the appraisals in Appendix II reflect this change. Some analysts noted, after the study was completed, that a very acidic sample can influence sensitivity in some methods. This influence, a memory effect, may have been responsible for a few high values for nitrate plus nitrite.

Flags and Bias

As with the previous studies a flagging technique was applied to identify individual laboratory results that deviated significantly from the interlab median values. A discussion on the process is found elsewhere (2, 7). The criteria used for this study was almost the same as that used in the two earlier studies L-3 and L-4. These criteria are summarized in Table 2. An example of how flags are assigned is found in Appendix III.

Bias is defined from whole data sets (all labs and samples) by the Youden rank-order technique described elsewhere (4, 5). The reader should note that assigning flags on sample results and discerning bias from whole data sets are two separate and distinctly

different procedures. The impact of flag and bias evaluations in this study is summarized in Table 3. This table had been provided to participants April 2, 1984 when the laboratory appraisals were distributed.

Comparison of Results to Earlier Studies

The interlaboratory median values found in Appendix I are summarized in Table 4. Several of these samples were recycled reference waters used earlier in study L-4. A comparison of results from study L-4 to those found in L-5 is given in Table 5. Overall the comparison is excellent and helps to verify the stability of the constituents.

OVERALL STUDY TO STUDY PERFORMANCE

General

Managers of projects, laboratory heads and analysts very often ask if their laboratory performance is comparable with their peers or if their performance is improving. Such issues are often raised after studies are completed or after new and improved quality control procedures (8) have been employed. The following discussion on study L-5, relative to earlier studies, is provided to address such questions.

Table 3. Summary of Performance (Study L-5) December'83 to March'84

Lab Code	Number of Parameters Analyzed	Bias		Flags		
		Number of Bias Statements	Percentage of Parameters Biased (%)	Number of Results	Number of Flags Assigned	Percentage of Results Flagged(%)
L002	12	1	8.3	107	7	6.5
L003	14	1	7.1	93	12	12.9
L004	12	4	33.0	108	26	24.1
L006	11	4	36.0	89	17	19.1
L007	5	1	20.0	40	12	30.0
L009	9	1	11.0	71	9	12.6
L010	13	2	15.8	87	9	10.3
L010B	1	0	0	8	0	0
L011	12	2	16.7	84	17	20.2
L012	1	0	0	9	0	0
L013	9	0	0	72	1	1.38
L014	11	0	0	87	16	18.4
L016	9	3	33.0	81	15	18.5
L018	4	2	50.0	34	9	26.5
L019	10	0	0	85	1	1.2
L020	13	0	0	103	11	10.7
L021	9	4	44.0	81	10	12.3
L022	13	5	38.5	95	32	33.7
L023	13	0	0	95	11	11.6
L024	13	0	0	101	7	6.9
L025	9	1	11.0	72	11	15.3
L027	13	1	7.7	100	17	17.0
L028	2	1	50.0	18	9	50.0
L029	12	2	16.7	97	6	6.2
L030	7	0	0	54	4	7.4
K031A	12	0	0	90	5	5.5
L031B	5	0	0	8	0	0
L032	16	3	18.7	128	29	22.6
L033	12	1	8.3	63	17	26.9
L042	10	4	40.0	90	38	42.2
L045	13	1	7.7	108	5	4.6
L046	13	4	30.3	107	25	23.4
L048	13	0	0	114	12	10.5
L049	13	2	15.4	101	30	29.7
L050	4	0	0	36	4	11.1
L053	10	0	0	90	1	1.0
L057	12	2	16.7	102	19	18.6
L058	12	0	0	102	8	7.8
L060	12	5	41.8	103	37	35.9
L061	11	0	0	33	2	6.0
L062	14	4	28.6	121	33	27.3
L063	14	2	14.3	128	33	25.8
L064	11	0	0	97	24	14.4
L066	10	0	0	86	12	13.9

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Table 4. Interlaboratory Median Values for Test Samples

Parameter	Median Values on Samples 1 to 10									
	1	2	3	4	5	6	7	8	9	10
Calcium mg Ca/L	.67	1.75	2.2	16.7	.99	1.5	26.2	.31	13.0	42.2
Magnesium mg Mg/L	.43	.46	.49	4.4	.21	.33	7.6	.07	2.7	9.3
Sodium mg Na/L	3.15	2.4	.99	3.02	.21	.30	4.1	.51	1.3	19.2
Potassium mg K/L	.28	.17	.16	.62	.12	.15	2.4	.32	.50	.90
Chloride mg Cl/L I.C.	5.11	3.2	.27	4.4	.64	.91	6.9	1.5	1.3	106.0
Chloride mg Cl/L non I.C.	5.0	3.0	.4	3.9	.67	.90	6.8	1.5	1.3	104.5
Chloride mg/Cl combined	5.1	3.2	.36	4.1	.64	.903	6.84	1.5	1.3	105.0
Sulfate mg SO_4/L I.C	2.92	3.45	3.49	16.1	4.9	5.4	19.3	.31	3.4	37.9
Sulfate mg SO_4/L non I.C.	3.10	4.5	3.6	13.1	4.9	5.4	19.2	.43	3.2	36.5
Sulfate mg SO_4/L combined	2.97	3.5	3.5	14.8	4.9	5.4	19.21	.32	3.3	37.4
Acidity mg $CaCo_3$/L	2.5	2.6	1.7	1402	4.6	4.5	1.2	1.5	1.6	1.8
Total Alkalinity mg $CaCO_3$/L	1.5	2.8	5.1	.25	.75	.75	82.0	1.0	41.0	1.45
Gran Alkalinity mg $CaCO_3$/L	.225	1.82	4.6	0.0	-2.7	-1.9	81.5	.15	40.7	-.02
pH	5.3	6.3	6.8	1.7	4.3	4.4	8.0	5.7	7.7	5.5
Specific Conductivity umho/cm	29.6	27.6	22.4	10950	35.6	36.5	222	8.1	94.0	446
Colour (Hazen Units)	20.0	37.5	10.0	45.0	5.0	2.5	2.5	2.0	2.5	4 2.5
Reactive Silica mg Si/L	.398	2.8	2.8	1.2	.041	.087	.56	.033	1.10	.012
Nitrate + Nitrite mg N/L	.010	.09	.099	398	.56	.76	.44	.009	.302	.03

*Note: Sample 4 was omitted from the data evaluation process.

Table 5. Comparison of Interlaboratory Median Values on Four Samples between Studies L-4 and L-5

Source and Study No.	Lake Superior		Bulk Rain		Montmorency		Synthetic	
Parameter	L4-10	L5-9	L4-9	L5-5	L4-5	L5-2	L4-7	L5-8
Calcium mg Ca/L	13.0	13.0	.97	.99	1.75	1.76	.30	.31
Magnesium mg Mg/L	2.7	2.7	.21	.21	.47	.46	.07	.07
Sodium mg Na/L	1.2	1.3	.20	.21	2.4	2.4	.52	.52
Potassium mg K/L	.50	.50	.12	.12	.17	.17	.32	.32
Chloride mg Cl/L	1.2	1.3	.60	.65	3.1	3.2	1.50	1.50
Sulfate mg SO_4/L	3.3	3.3	4.8	4.9	3.4	3.4	.38	.31
Acidity mg $CaCO_3$/L	1.0	1.6	4.4	4.6	2.49	2.6	1.6	1.5
Alkalinity mg $CaCO_3$/L	40.0	41.0	-	-	1.80	1.82	1.5	1.0
pH	7.7	7.7	4.3	4.3	6.25	6.3	5.6	5.7
Specific Conductivity umho/cm	93.0	94	33.9	35.6	27.6	27.6	7.8	8.1
Colour Hazen Units	4.0	2.5	4.0	5.0	35.0	37.5	30.0	2.0
Silica mg Si/L	1.10	1.10	.04	.04	3.0	2.8	.04	.033
Nitrate/Nitrite mg N/L	.30	.30	.56	.56	.10	.09	.009	.009

The approach taken involves a review and tabulation of the bias and flags assigned. These two items have been the central issue in the evaluation of LRTAP studies L-1 to L-5. Satisfactory performance in this peer group is recognized in a laboratory when whole lab data sets are not discerned as biased (2, 4, 5) and the study results are seldom flagged (2, 5). Poor performance is recognized when a lab is very frequently biased and very often flagged.

To discern the relative performance of a lab over four studies (L-1, L-3, L-4 and L-5), the approach taken in this report is a followup of that introduced in study L-4. The percent frequency of bias and percent flags are calculated with the formula given below.

$$\% \text{ Bias} = \frac{\text{Total No. of Bias Statements for a Lab}}{\text{No. of Parameters Analyzed}} \times 100$$

$$\% \text{ Flags} = \frac{\text{Total No. of Flags by a Lab}}{\text{Total No. of Rankable Results}} \times 100$$

A summary of the frequency of bias and of flags is given in Table 6. The results relate to only rankable data reported by each lab and applies to the following parameter group: Ca, Mg, Na, K, Cl, SO_4, total alkalinity, Gran alkalinity, acidity, pH, conductance, silica, colour and NO_3 + NO_2. A vast majority of laboratories measured 10 to 14 of these 14 parameters.

Table 6. Variation in % Bias and % Flags

Lab Code	% Bias (for parameter data set)				% Flags (on all ranked results)			
	L-1	L-3	L-4	L-5	L-1	L-3	L-4	L-5
L002	30.7	25.0	7.7	8.3	5.9	11.7	7.7	6.5
L003	25.0	8.3	0.0	7.1	14.7	7.6	10.9	12.9
L004A	45.5	27.3	27.3	33.0	16.7	21.0	22.1	24.1
L004B	-	-	27.3	-	-	-	32.7	-
L006	36.4	36.4	54.6	36.0	32.6	11.9	19.2	19.1
L007	50.0	44.4	-	20.0	33.6	46.3	-	30.0
L009	22.2	10.0	14.3	11.0	23.3	10.0	4.0	12.6
L010A	-	15.4	23.1	15.8	-	20.3	25.9	10.3
L010B	-	-	-	0.0	-	0	0	0.0
L011	41.7	23.1	36.4	16.7	11.8	20.8	21.6	20.2
L012	20.0	-	-	0.0	13.8	-	-	0.0
L013A	30.0	0.0	0.0	0.0	12.4	5.6	6.3	1.4
L013B	-	-	0.0	-	-	-	6.2	-
L014	16.7	16.7	10	0.0	12.0	17.0	17.7	18.4
L016	20.0	33.0	44.4	33.0	22.5	22.2	23.1	18.5
L018	-	-	-	50.0	-	-	-	26.5
L019	-	-	-	0.0	-	-	-	1.2
L020	33.3	27.3	0.0	0.0	17.9	12.6	13.6	10.7
L021A	45.4	556	-	-	40.3	44.2	-	-
L021B	33.0	-	44.4	44.0	43.1	-	25.3	12.3
L022	38.5	46.2	46.2	38.5	13.2	30.2	26.5	33.7
L023	30.8	0.0	7.7	0.0	24.8	12.0	6.0	11.6
L024	18.2	18.2	8.3	0.0	10.3	11.1	6.2	6.9
L025	-	15.4	0.0	11.0	-	12.8	11.0	15.3
L027	16.7	-	-	7.7	4.2	-	-	17.0
L028	-	-	-	50.0	-	-	-	50.0
L029	41.7	16.7	16.7	16.7	13.8	13.3	5.6	6.2
L030	-	-	33.0	0.0	-	-	9.4	9.4
L031A	7.1	8.3	16.7	0.0	1.8	7.0	14.1	5.5
L031B	-	-	-	0.0	-	-	-	0.0
L032	28.6	0.0	0.0	18.7	23.0	23.1	9.2	22.6
L033	-	23.1	9.1	8.3	-	38.7	19.7	26.9
L040	33.0	-	-	-	22.6	-	-	-
L041	-	16.7	-	-	-	3.4	-	-
L042	-	22.2	20.0	40.0	-	24.4	27.8	42.2
L044	-	33.3	44.4	-	-	32.2	36.8	-
L045	23.1	8.3	41.7	7.7	7.4	7.2	8.9	4.6
L046	-	38.5	15.4	30.3	-	24.2	17.2	23.4
L048	-	-	-	0.0	-	-	-	10.5
L049	-	-	-	15.4	-	-	-	29.7
L050	-	-	-	0.0	-	-	-	11.1
L053	11.1	-	22.2	0.0	2.1	-	6.1	1.0
L054	71.4	12.5	-	-	24.0	27.0	-	-
L056	66.7	30.0	-	-	63.1	42.7	-	-
L057	40.0	33.3	50.0	16.7	22.9	44.1	37.7	18.6
L058	0.0	8.3	27.3	0.0	0.5	8.9	10.7	7.8
L060	-	50.0	72.7	41.8	-	34.5	42.9	35.9
L061	-	-	11.0	0.0	-	-	8.2	6.0
L062	-	-	-	28.6	-	-	-	27.3
L063	-	-	-	14.3	-	-	-	25.8
L064	-	-	-	0.0	-	-	-	14.4
L066	-	-	-	0.0	-	-	-	13.9

A quick overview of results in Table 6 reveals some labs with a unique capability of having few, if any flags, and being frequently discerned without bias. Such labs are indeed satisfactory. On the other hand some labs are very frequently biased and have a rather large number of results flagged. These labs are considered poor in this peer group assessment. They are not very comparable and may need a review of their internal quality control strategies.

Single Study Performance

In a single study (e.g. 10 samples, 30 labs, 14 constituents), the separation of laboratory performance requires criteria. The following criteria are suggested:

Satisfactory if	% bias is < 15 %	and % flags	< 10%
Moderate if	% bias is > 15 or <35%	and % flags	> 10% or < 25%
Poor if	% bias is > 35%	and % flags	> 25%

The above criteria are but guidelines to allow a laboratory within a peer group to reflect its own performance relative to its peers.

Performance over Several Studies

The performance of a laboratory in one study is one matter. Continuity and improvements in performance over many studies is perhaps more important as it provides credibility to program data that are often merged or used in definition of environmental trends. The criteria suggested to define study to study performance is given below.

Satisfactory if	% bias + % flags	< 25%
Moderate if	% bias + % flags	> 25% or < 60%
Poor if	% bias + % flags	> 60%

Discussion on Performance

The decision to overview the performance of laboratories based on the occurrence of flags and bias in four studies has merit and is plausible for various reasons. For instance

- all participants represent a peer group with each lab having a similar capability in handling soft surface waters.
- all four studies (with the exception of study L-1) had a similar series of water samples.
- the criteria used to assign flags on the samples were virtually the same for all studies.
- almost all laboratories analyzed the 14 constituents under review.

The summation of percent bias and percent flags for each lab in each study is given in Table 7. Beside each lab is given a very brief statement of overall performance. This relative performance reflects these labs addressing the 10 to 14 constituents listed in Table 5. The criteria to assign satisfactory or poor is defined above.

A review of Table 7 reveals about 16 of the 52 laboratories as satisfactory and approximately eight laboratories as consistently poor. The majority of labs are moderate and reveal occasional bias and have about 1 in 4 or 5 results flagged. It is of interest to note that laboratories found as satisfactory include the large facilities that contribute the majority of data to the Federal-Provincial LRTAP program. This is encouraging.

Some caution is suggested in overreaction to the notation, poor performance. This term is technically correct and identifies laboratories whose frequency of bias and flags are somewhat extreme relative to those six to ten labs who are consistently without bias and are seldom if ever flagged. These labs labelled poor should review their internal control process and relate closely with their users of data. The users of data should recognize that if the overall designation is poor their labs may still have very good data on the constituents of interest. In this context, lab L028 is a good example. It provided data on only two parameters and was flagged and biased. Because of the nature of the in-lab analytical test and the lab protocol, a suitable blank correction was not made. Had it been

Table 7. Summary of Performance

Lab Code	% Bias + % Flags on LRTAP Studies*				Comments
	L-1	L-3	L-4	L-5	
L002	36.6	36.7	15.4	14.1	satisfactory and improving
L003	39.7	15.9	10.9	20.0	moderate to satisfactory
L004A	62.2	48.3	49.4	57.1	poor to moderate
L004B	-	-	60.0	-	poor
L006	68.0	47.3	73.8	55.1	poor
L007	83.6	90.7	-	50.0	poor to moderate
L009	45.5	20.0	18.3	23.6	satisfactory
L010A	-	35.7	49.0	26.1	moderate to satisfactory
L010B	-	-	-	0.0	-
L011	53.5	43.9	58.0	36.9	moderate
L012	33.8	-	-	0.0	moderate and improving
L013A	35.6	5.6	6.3	1.4	satisfactory and improving
L013B	-	-	6.2	-	-
L014	28.7	33.7	27.7	18.4	moderate and improving
L016	42.5	55.2	57.5	51.5	moderate (little change)
L018	-	-	-	76.5	poor
L019	-	-	-	1.2	satisfactory
L020	51.2	39.9	13.6	10.7	moderate to satisfactory (improving)
L021A	85.7	99.8	-	-	poor on two studies
L021B	76.1	-	69.7	56.3	poor to moderate
L022	51.7	76.4	72.7	72.2	poor
L023	55.6	12.0	13.7	11.6	satisfactory
L024	28.5	29.3	14.5	6.9	moderate to satisfactory (improving)
L025	-	28.2	11.0	26.3	satisfactory
L027	20.9	-	-	24.7	satisfactory
L028	-	-	-	100.0	poor (on two constituents)
L029	65.5	30.0	22.3	22.9	poor to satisfactory and improving
L030	-	-	42.4	7.4	moderate to satisfactory (improving)
L031A	8.9	15.3	30.8	5.5	satisfactory
L031B	-	-	-	0.0	satisfactory
L032	51.6	23.1	9.2	41.3	moderate to satisfactory (variable)
L033	-	61.8	28.8	35.2	poor to moderate
L040	55.6	-	-	-	moderate
L041	-	20.1	-	-	satisfactory (1 study)
L042	-	46.6	47.8	82.2	moderate to poor (needs attention)
L044	-	65.5	81.2	-	poor
L045	30.5	15.5	50.6	12.3	moderate to satisfactory (variable)
L046	-	62.7	32.6	53.7	poor to moderate
L048	-	-	-	10.5	satisfactory
L049	-	-	-	45.1	moderate
L050	-	-	-	11.1	satisfactory
L053	13.2	-	28.3	1.0	satisfactory
L054	95.4	39.5	-	-	poor to moderate
L056	129.8	72.7	-	-	poor
L057	62.9	77.4	87.1	35.3	poor to moderate
L058	0.5	17.2	38.0	7.8	satisfactory
L060	-	184.5	115.6	77.7	poor
L061	-	-	19.2	6.0	satisfactory
L062	-	-	-	55.9	moderate
L063	-	-	-	39.1	moderate
L064	-	-	-	14.4	satisfactory
L066	-	-	-	13.9	satisfactory

Note: * The column of data are the summation of % bias and % flags abstracted from Table 6.

possible, this lab would have appeared satisfactory. Another example is lab L061. This lab, for reasons of internal protocol, provided results on only three of the ten samples. The absent data did not allow for an assessment of bias. The data in Table 7 reflects only flags for study L-5. These examples suggest that users of data need to carefully relate with their client laboratories and use the comments in Table 7 as guidelines for discussions on quality issues relating to their data bases.

One highlight issue to comment on is the improvements that several participants have made between successive studies. This is encouraging and may reflect the success of this interlab program and on the constructive in-lab control efforts taken by laboratory managers and analysts.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the participants for the provision of their data, Mr. R. White and Dr. J. Clark of the International Joint Commission Great Lakes Regional Office (Windsor) for their computer programs and valuable assistance as well to Mrs. Karon Miles of the National Water Research Institute for her computer programming that made this study possible.

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6. (ASTM-D19), D4210-83, "Intralaboratory Quality Control Procedures and a Discussion Reporting Low-level Data, A Standard Practice", ASTM, 1916, Race St., Philadelphia, PA 19103.

7. Youden, W.J. and E.H. Steiner, "Statistical Manual of the Association of Official Analytical Chemists", AOAC, PO Box 540, Benjamin Franklin Station, Washington, DC, 20044 (1975).

8. "Guidelines for In-lab Quality Control for LRTAP Projects", A Report of the Ad-Hoc Work Group on Quality Control to the LRTAP Quality Assurance and Methods Subgroup of the Federal-Provincial Research and Monitoring Co-ordinating Committee. The Guidelines are available from the LRTAP Liaison Office, Atmospheric Environment Service, 4905 Dufferin Street, Downsview, Ontario M3H 5T4, Phone 416-667-4803/4885.

List of Previous Interlaboratory Studies

1. K.I. Aspila and S. Todd, "LRTAP Intercomparison Study L-1: Major Ions, Nutrients and Physical Properties in Water", March 1983.

2. K.I. Aspila and S. Todd, "LRTAP Intercomparison Study L-2: Trace Metals in Water", March 1983.

3. K.I. Aspila and S. Todd, "LRTAP Intercomparison Study L-3, Major Ions, Nutrients and Physical Properties in Water", January 1984.

4. K.I. Aspila and S. Todd, "LRTAP Intercomparison Study L-4, Major Ions, Nutrients and Physical Properties in Water", February 1984.

Copies of these reports are available from:

LRTAP Liaison Office
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4
Telephone: 416-667-4803/4885.

List of Participants in Study L-6

FEDERAL GOVERNMENT LABS

Environment Canada

Environmental Conservation Service:

Water Quality National Laboratory, Burlington, Ontario
Water Qaulity Branch, Atlantic Region, Moncton, N.B.
Water Quality Branch, Quebec Region, Longueuil, Quebec

Environmental Protection Service:

Atlantic Region, Dartmouth, Nova Scotia
Pacific Region, West Vancouver, B.C.

Atmospheric Environment Service:

Chemistry Laboratory, Downsview, Ontario

Canadian Forestry Service:

Great Lakes Forest Research Centre, Sault Ste. Marie, Ontario
Newfoundland Forest Research Centre, St. Johns, Nfld.
Laurentian Forest Research Centre, Ste. Foy, Quebec

Department of Fisheries and Oceans

Fresh Water Research Institute, Winnipeg, Manitoba
Quebec Region, Quebec, Quebec
Atlantic Region, St. Andrew's, New Brunswick
International Pacific Salmon Fisheries, Cultus Lake, B.C.

Agriculture Canada

Atlantic Region, Fredericton, New Brunswick

PROVINCIAL GOVERNMENT LABORATORIES

B.C. Ministry of Environment, Environmental Lab, Vancouver, B.C.
Alberta Environment Center, Vegreville, Alberta
Saskatchewan Research Council, Saskatoon, Saskatchewan
Manitoba Department of Environment, (Workplace Safety & Health), Winnipeg, Manitoba.
Ontario Ministry of Environment, Northwestern Regional Lab, (Thunder Bay, Ontario)
Ontario Ministry of Environment, Rexdale, Ontario
Quebec Ministry of Environment, Scientific Complex, (Ste. Foy, Quebec)
Environment New Brunswick, Fredericton, New Brunswick

UNIVERSITIES

Concordia University, Montreal, Quebec
Victoria General Hospital, Department of Pathology, Halifax, N.S.
Memorial University of Nfld., Department of Chemistry, St. John's, Nfld.

INDUSTRIAL LABORATORIES

Chemex, Calgary, Alberta
Ontario Hydro, Etobicoke, Ontario
Noranda Mines Ltd., Noranda, Quebec
K-F Laboratories, Fredericton, New Brunswick
National Research Institute, Ste.-Foy, Quebec
Barringer-Magenta, Rexdale, Ontario
Concord Scientific, Downsview, Ontario
Enviroclean, London, Ontario

UNITED STATES LABORATORIES

Illinois State Water Survey, Champaign, Illinois, U.S.A.
Rockwell International EMSC, New Bury Park, California, U.S.A.
Pacific Northwest Laboratory, Richland, Washington, U.S.A.
U.S. Geological Survey, National Water Quality Lab, Lakewood, Colorado
U.S. Geological Survey, National Water Quality Lab-Atlanta, Doraville, Georgia.

APPENDIX I: LABORATORY DATA

CONTENTS OF APPENDIX I

84/03/27

PARAMETER: 20091 CALCIUM MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5:MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.5000 BASIC ACCEPTABLE ERROR= .1500 CONCENTRATION ERROR INCREMENT= .0000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.71	25.50	1.78	15.00	2.32	29.00	.97	21.50	1.51	29.00	27.3	29.50
L003	.60	7.50		0.00	2.2	12.50	1.0	28.00	1.5	25.00	26.	12.00
L004	.6	7.50	1.8	17.50	2.3	27.50	.9	10.00	1.5	25.00	26.1	14.00
L006	.65	12.00		0.00	2.26	22.00	1.01	32.00	1.42	11.00	27.00	26.50
L009	.73	29.00		0.00	2.1	7.00	1.0	28.00	1.5	25.00	26.4	20.50
L010	.50 L	3.00		0.00	2.2	12.50	.90	10.00	1.4	8.50	26.4	20.50
L011	.70	23.50		0.00	2.36	30.50	.96	19.50	1.48	19.00	26.2	16.00
L013	.71	25.50		0.00	2.36	30.50	.97	21.50	1.49	20.50	27.1	28.00
L014	.78	31.00		0.00	2.20	12.50	1.19 VH	34.00	1.56	33.00	26.4	20.50
L016	.66	14.00	1.73	10.00	2.22	18.00	.95	17.50	1.46	17.50	26.70	24.00
L019	.69	21.50	1.86	21.00	2.39 H	33.00	.93	14.00	1.46	17.50	26.2	16.00
L020	.67	17.00		0.00	2.26	22.00	.90	10.00	1.37	4.50	26.9	25.00
L021	.61	9.00	1.64	4.00	2.06 L	4.00	.85	4.00	1.30 L	2.50	24.9	5.00
L022	.72	27.50		0.00	3.0 VH	34.00	1.0	28.00	1.5	25.00	29. H	35.00
L023	.66	14.00		0.00	3.45 VH	35.00	.90	10.00	1.38	6.00	28.2	33.00
L024	.52	4.00		0.00	2.21	16.50	.89	6.50	1.43	12.00	24.8	4.00
L025	.62	10.00		0.00	2.26	22.00	.99	24.00	1.52	30.00	25.8	10.00
L027	.80	32.50	1.60	3.00	2.10	7.00	.80 L	2.00	1.30 L	2.50	26.4	20.50
L029	.68	19.00	1.79	16.00	2.26	22.00	.96	19.50	1.49	20.50	25.5	7.00
L031A	.64	11.00		0.00	1.96 VL	1.00	.94	16.00	1.44	14.00	26.2	16.00
L032	.975 VH	34.00		0.00	2.29	25.50	1.29 VH	35.00	1.78 VH	36.00	27.7	31.00
L033	2. VH	35.00	1.4 VL	1.00	2. L	3.00	53. VH	36.00	1.4 VL	1.00	26.	12.00
L042	.54	6.00	1.45 VL	2.00	2.09	5.00	.82	3.00	1.40	8.50	25.6	8.00
L045	.67	17.00	1.77	13.50	2.26	22.00	1.00	28.00	1.53	31.00	26.22	18.00
L046	.80	32.50	1.76	12.00	2.14	9.00	.89	6.50	1.37	4.50	24.7	3.00
L048	.49 L	2.00	1.65	5.00	2.20	12.50	.93	14.00	1.44	14.00	25.7	9.00
L049	.7	23.50	1.7	7.50	2.2	12.50	1.0	28.00	1.5	25.00	27.	26.50
L053	.69	21.50	1.77	13.50	2.23	25.50	.98	23.00	1.50	25.00	27.3	29.50
L057	.67	17.00	1.71	9.00	2.23	19.00	.93	14.00	1.45	16.00	26.6	23.00
L058	.66	14.00	1.75	11.00	2.20	12.50	.95	17.50	1.44	14.00	25.4	6.00
L060	.74	30.00	1.82	19.00	2.38 H	32.00	1.04	33.00	1.60	34.00	28.4 H	34.00
L061		0.00		0.00		0.00	1.00	28.00	1.54	32.00		0.00
L062	.4 VL	1.00	1.7	7.50	2.1	7.00	.9	10.00	1.4	8.50	28.	32.00
L063	.53	5.00	1.66	6.00	1.97 VL	2.00	.88	5.00	1.40	8.50	22.0 VL	1.50
L064	.72	27.50	1.8	17.50	2.3	27.50	1.0	28.00	1.5	25.00	22. VL	1.50
L066	.682	20.00	1.83	20.00	2.21	16.50	.022T VL	1.00	1.72 VH	35.00	26.0	12.00
MEDIAN CONC.	.670		1.750		2.220		.955		1.470		26.220	

84/03/27

PARAMETER: 20091 CALCIUM MG/L

SAMPLE LAB NO	8 REPORTED VALUE	RANK	9 REPORTED VALUE	RANK	10 REPORTED VALUE	RANK
L002	.32	23.00	13.4	28.50	42.5	21.00
L003	.25	6.50	13.	19.50	42.	12.00
L004	.3	15.00	13.0	19.50	41.8	10.00
L006	.24	4.00	12.41	8.00	47.30 VH	34.00
L009	.33	31.50	11.9 L	3.00	37.8 L	1.00
L010	.30	15.00	12.8	14.50	41.6	9.00
L011	.32	23.00	12.6	9.50	42.4	19.50
L013	.31	19.00	12.8	14.50	42.1	14.50
L014	.46	34.00	12.8	14.50	42.2	17.00
L016	.29	11.50	13.26	25.00	50.69 VH	35.00
L019	.33	25.00	13.8	32.00	42.1	14.50
L020	.25	6.50	12.7	11.50	43.7	28.00
L021	.25	6.50	11.2 VL	2.00	38.4 L	3.00
L022	.35	28.50	14. H	33.00	47. H	33.00
L023	.31	19.00	13.0	19.50	42.4	19.50
L024	.15	1.00	13.36	27.00	42.2	17.00
L025	.30	15.00	12.9	17.00	42.6	22.00
L027	.30T	15.00	12.7	11.50	42.2	17.00
L029	.30	15.00	18.5 VH	35.00	42.8	25.00
L031A	.37	30.00	13.1	22.00	43.0	26.50
L032	.478 H	35.00	12.8	14.50	42.7	23.50
L033	1.H	0.00	12. L	5.00	42.	12.00
L042	.25	6.50	13.3	26.00	44.1	30.00
L045	.38	31.50	13.19	23.00	44.19	31.00
L046	.32	23.00	13.2	24.00	39.6	5.00
L048	.23	3.00	12.0 L	5.00	40.9	7.00
L049	.4	33.00	12.3	7.00	42.	12.00
L053	.31	19.00	13.6	30.50	42.7	23.50
L057	.28	10.00	13.4	28.50	41.5	8.00
L058	.29	11.50	12.6	9.50	39.3	4.00
L060	.35	28.50	14.2 H	34.00	46.6 H	32.00
L061	.315	21.00		0.00		0.00
L062	.2	2.00	13.	19.50	44.	29.00
L063	.27	9.00	1.13 VL	1.00	43.0	26.50
L064	.34	26.00	12. L	5.00	38. L	2.00
L066	.346	27.00	13.6	30.50	40.7	6.00
MEDIAN CONC.	.310		13.000		42.200	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	222.00	24.667	9			AAS
L003	123.00	15.375	8			FLAME AA
L004	145.00	16.222	9			20103L
L006	149.50	18.688	8	VH		FLAME-AA
L009	145.00	18.125	8	LL		
L010	93.00	11.625	8	L		ICAP-EXTRACT
L011	160.50	20.063	8			
L013	174.00	21.750	8			AA
L014	196.50	24.563	8	VH		FLAME AA
L016	172.50	19.167	9	VH		AAS
L019	194.50	21.611	9	H		CHROMAT. IONIQUE
L020	124.50	15.563	8			ICP
L021	40.00	4.444	9	LLVLL	BIASED LOW	AA
L022	244.00	30.500	8	VHHHH	BIASED HIGH	ICP
L023	155.00	19.500	8	VH		FLAME-AAS
L024	88.00	11.000	8			FLAME AAS
L025	150.00	18.750	8			FLAME-AAS
L027	111.00	12.333	9	LL		FLAME-AAS
L029	179.00	19.889	9	VH		
L031A	136.50	17.063	8	VL		ICAP
L032	234.50	29.313	8	VHVHVHH	BIASED HIGH	FLAME AA
L033	105.00	13.125	8	VHVLLVHVLL		AUTO AA
L042	95.00	10.556	9	VL		FLAME A.A.
L045	215.00	23.889	9			ICP
L046	119.50	13.278	9			AA-FLAME
L048	71.50	7.944	9	LL		FLAME-AAS
L049	175.00	19.444	9			FLAME-AAS
L053	211.00	23.444	9			FLAME A.A.
L057	144.50	16.056	9			
L058	100.00	11.111	9			FLAME-AAA
L060	276.50	30.722	9	HHHH	BIASED HIGH	ICAP
L061	81.00	27.000	3		INSUFFICIENT DATA	FLAME-AA
L062	116.50	12.944	9	VL		AA
L063	64.50	7.167	9	VLVLVL	BIASED LOW	AAS
L064	160.00	17.778	9	VLLL		ICP (PLASMA)
L066	168.00	18.667	9	VLVH		FLAME-AA

OVERALL AVERAGE RANK IS 17.634

CALCIUM

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L021	40.00	4.444	9	LLVLL	BIASED LOW	AA
L063	64.50	7.167	9	VLVLVL	BIASED LOW	AAS
L048	71.50	7.944	9	LL		FLAME-AAS
L042	95.00	10.556	9	VL		FLAME A.A.
L024	88.00	11.000	8			FLAME AAS
L058	100.00	11.111	9			FLAME-AAA
L010	93.00	11.625	8	L		ICAP-EXTRACT
L027	111.00	12.333	9	LL		FLAME-AAS
L062	116.50	12.944	9	VL		AA
L033	105.00	13.125	8	VHVLLVHVLL		AUTO AA
L046	119.50	13.278	9			AA-FLAME
L003	123.00	15.375	8			FLAME AA
L020	124.50	15.563	8			ICP
L057	144.50	16.056	9			
L004	146.00	16.222	9			2U103L
L031A	136.50	17.063	8	VL		ICAP
L064	160.00	17.778	9	VLLL		ICP (PLASMA)
L009	145.00	18.125	8	LL		
L066	168.00	18.667	9	VLVH		FLAME-AA
L006	149.50	18.688	8	VH		FLAME-AA
L025	150.00	18.750	8			FLAME-AAS
L016	172.50	19.167	9	VH		AAS
L049	175.00	19.444	9			FLAME-AAS
L023	156.00	19.500	8	VH		FLAME-AAS
L029	173.00	19.889	9	VH		
L011	160.50	20.063	8			
L019	194.50	21.611	9	H		CHROMAT. IONIQUE
L013	174.00	21.750	8			AA
L053	211.00	23.444	9			FLAME A.A.
L045	215.00	23.889	9			ICP
L014	195.50	24.563	8	VH		FLAME AA
L002	222.00	24.667	9			AAS
L061	81.00	27.000	3		INSUFFICIENT DATA	FLAME-AA
L032	234.50	29.313	8	VHVHVHH	BIASED HIGH	FLAME AA
L022	244.00	30.500	8	VHHHH	BIASED HIGH	ICP
L060	276.50	30.722	9	HHHH	BIASED HIGH	ICAP

OVERALL AVERAGE RANK IS 17.634

PARAMETER: 12091 MAGNESIUM MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5:MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= .0500 CONCENTRATION ERROR INCREMENT= .1000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.43	15.50	.45	7.00	.48	15.00	.20	13.00	.31	7.50	7.7	24.50
L003	.43	15.50		0.00	.47	10.50	.22	27.00	.39 H	34.00	7.6	19.00
L004	.4	5.00	.5	17.00	.5	22.00	.2	13.00	.3	5.00	7.4	10.50
L006	.49 H	30.50		0.00	.52	30.50	.24	34.00	.37	31.00	8.52 H	33.00
L009	.42	10.50		0.00	.47	10.50	.21	19.50	.32	12.50	7.5	15.00
L010	.40	5.00		0.00	.4 VL	1.00	.20	13.00	.30	5.00	7.5	15.00
L011	.43	15.50		0.00	.48	15.00	.20	13.00	.33	18.00	7.53	17.00
L013	.45	26.00		0.00	.51	28.00	.22	27.00	.34	23.00	7.6	19.00
L014	.42	10.50		0.00	.43 L	3.50	.21	19.50	.31	7.50	7.25	3.00
L016	.43	15.50	.46	10.00	.48	15.00	.19	7.00	.32	12.50	7.78	26.00
L019	.45	26.00	.49	15.00	.51	28.00	.21	19.50	.33	18.00	7.9	30.00
L020	.51 VH	33.00		0.00	.59 VH	34.00	.18	4.00	.28	2.00	7.46	13.00
L021	.44	20.50	.39 L	1.00	.41 VL	2.00	.20	13.00	.32	12.50	7.65	21.50
L022	.52 VH	34.00		0.00	.52	30.50	.22	27.00	.36	28.00	8.8 VH	34.00
L023	.460	28.50		0.00	.500	22.00	.215	23.00	.335	20.00	1.50 VL	1.00
L024	.40	5.00		0.00	.47	10.50	.18	4.00	.32	12.50	7.33	5.00
L025	.415	8.00		0.00	.500	22.00	.220	27.00	.345	25.00	7.40	10.50
L027	.44	20.50	.48	13.50	.50	22.00	.24	34.00	.36	28.00	7.4	10.50
L029	.44	20.50	.46	10.00	.48	15.00	.20	13.00	.34	23.00	7.85	29.00
L031A	.43	15.50		0.00	.46	7.00	.20	13.00	.32	12.50	7.66	23.00
L032	.449	24.00		0.00	.494	18.00	.231	32.00	.381 H	33.00	7.37	7.00
L033	1.W	0.00	1.W	0.00	1.W	0.00	15. VH	36.00	1.W	0.00	7.	2.00
L042	.38	1.00	.41	2.50	.47	10.50	.19	7.00	.32	12.50	7.65	21.50
L045	.45	28.50	.48	13.50	.50	22.00	.23	31.00	.35	26.00	8.04	31.00
L046	.42	10.50	.44	6.00	.46	7.00	.19	7.00	.32	12.50	7.40	10.50
L048	.39	2.00	.41	2.50	.43 L	3.50	.16	2.00	.26 L	1.00	7.3	4.00
L049	.4	5.00	.5	17.00	.5	22.00	.2	13.00	.3	5.00	7.6	19.00
L053	.45	26.00	.47	12.00	.51	28.00	.22	27.00	.34	23.00	7.82	28.00
L057	.42	10.50	.43	5.00	.44	5.00	.18	4.00	.29	3.00	7.36	6.00
L058	.43	15.50	.42	4.00	.46	7.00	.21	19.50	.33	18.00	7.7	24.50
L060	.50 H	32.00	.54 VH	20.00	.56 H	33.00	.24	34.00	.38	32.00	9.37 VH	35.00
L061		0.00		0.00		0.00	.212	22.00	.337	21.00		0.00
L062	.4	5.00	.5	17.00	.5	22.00	.2	13.00	.4 H	35.00	8.1	32.00
L063	.44	20.50	.46	10.00	.48	15.00	.22	27.00	.32	12.50	7.5	15.00
L064	.49 H	30.50	.51	19.00	.53	32.00	.22	27.00	.36	28.00	7.8	27.00
L066	.447	23.00	.454	8.00	.501	26.00	.004T VL	1.00	.364	30.00	7.39	8.00
MEDIAN CONC.	.430		.460		.487		.210		.330		7.600	

PARAMETER: 12091 MAGNESIUM MG/L 84/03/27

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.05	11.00	2.8	27.00	9.3	18.50
L003	.10	31.00	2.6	9.00	9.4	24.00
L004	.1	31.00	2.7	18.00	8.9	6.00
L005	.11	34.00	3.03 H	33.00	10.40 H	33.00
L009	.08	24.00	2.7	18.00	8.8	2.50
L010	.03 OT	3.00	2.6	9.00	9.0	9.50
L011	.05	11.00	2.60	9.00	9.00	9.50
L013	.07	20.00	2.7	18.00	9.1	13.50
L014	.10	31.00	2.50	4.50	8.86	4.00
L016	.05	11.00	2.61	11.00	9.93	31.00
L019	.07	20.00	2.8	27.00	9.5	26.00
L020	.06	11.00	2.58	7.00	8.97	7.00
L021	.05	4.50	2.7	18.00	9.3	18.50
L022	.06	11.00	3.0 H	32.00	11. VH	34.00
L023	.080	24.00	10.4 VH	35.00	10.1	32.00
L024	-.01 T VL	1.00	2.94 H	31.00	9.51	27.00
L025	.065	17.00	2.80	27.00	9.40	24.00
L027	.12 T H	35.00	2.66	13.00	9.1	13.50
L029	.06	11.00	2.69	14.00	9.36	21.50
L031A	.07	20.00	2.71	22.00	9.36	21.50
L032	.095	27.50	2.55	6.00	9.06	12.00
L033	1.H	0.00	2. VL	1.00	8. L	1.00
L042	.05	4.50	2.70	18.00	9.61	28.00
L045	.087	26.00	2.85	30.00	9.73	29.00
L046	.06	11.00	2.49	3.00	8.87	5.00
L048	.02	2.00	2.50	4.50	9.2	16.50
L049	.1	31.00	2.8	27.00	9.0	9.50
L053	.06	11.00	2.74	23.00	9.35	20.00
L057	.06	11.00	2.65	12.00	9.14	15.00
L058	.05	11.00	2.7	18.00	9.4	24.00
L060	.06	11.00	3.33 VH	34.00	11.4 VH	35.00
L061	.067	18.00		0.00		0.00
L062	.1	31.00	2.8	27.00	9.8	30.00
L063	.08	24.00	2.4 L	2.00	9.0	9.50
L064	.095	27.50	2.7	18.00	9.2	16.50
L066	.073	22.00	2.78	24.00	8.90	2.50
MEDIAN CONC.	.067		2.700		9.300	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L048	38.00	4.222	9	LL	BIASED LOW	FLAME-AAS
L010	60.50	7.563	8	VL	BIASED LOW	ICAP-EXTRACT
L057	71.50	7.944	9			
L046	72.50	8.056	9			AA-FLAME
L033	40.00	10.000	4	VHVLL	INSUFFICIENT DATA	AUTO AA
L014	83.50	10.438	8	L		FLAME AA
L042	105.50	11.722	9			FLAME A.A.
L024	96.00	12.000	8	VLH		FLAME AAS
L021	111.50	12.389	9	LVL		AA
L011	109.00	13.500	8			
L020	111.00	13.875	8	VHVH		ICP
L009	112.50	14.063	8			
L004	127.50	14.167	9			12102L
L063	135.50	15.056	9	L		AAS
L016	139.00	15.444	9			AAS
L002	139.00	15.444	9			AAS
L058	141.50	15.722	9			FLAME-AAA
L065	144.50	16.056	9	VL		FLAME-AA
L049	148.50	16.500	9			FLAME-AAS
L031A	134.50	16.813	8			ICAP
L029	157.00	17.444	9			
L032	159.50	19.938	8	H		FLAME AA
L025	160.50	20.063	8			FLAME-AAS
L061	61.00	20.333	3		INSUFFICIENT DATA	FLAME-AA
L027	190.00	21.111	9	H		FLAME-AAS
L003	170.00	21.250	8	H		FLAME AA
L013	174.50	21.813	8			AA
L053	198.00	22.000	9			FLAME A.A.
L023	185.50	23.188	8	VLVH		FLAME-AAS
L019	209.50	23.278	9			CHROMAT. IONIQUE
L062	212.00	23.556	9	H		AA
L064	225.50	25.056	9	H		ICP(PLASMA)
L045	237.00	26.333	9			ICP
L022	230.50	28.813	8	VHVHHVH	BIASED HIGH	ICP
L060	266.00	29.556	9	HVHHVHVHVH	BIASED HIGH	ICAP
L006	259.00	32.375	8	HHHH	BIASED HIGH	FLAME-AA

OVERALL AVERAGE RANK IS 17.445

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	139.00	15.444	9			AAS
L003	170.00	21.250	8	H		FLAME AA
L004	127.50	14.167	9			1210ZL
L006	259.00	32.375	8	HHHH	BIASED HIGH	FLAME-AA
L009	112.50	14.063	8			
L010	50.50	7.563	8	VL	BIASED LOW	ICAP-EXTRACT
L011	108.00	13.500	8			
L013	174.50	21.813	8			AA
L014	83.50	10.438	8	L		FLAME AA
L016	139.00	15.444	9			AAS
L019	203.50	23.278	9			CHROMAT. IONIQUE
L020	111.00	13.875	8	VHVH		ICP
L021	111.50	12.389	9	LVL		AA
L022	230.50	28.813	8	VHVHHVH	BIASED HIGH	ICP
L023	185.50	23.188	8	VLVH		FLAME-AAS
L024	96.00	12.000	8	VLH		FLAME AAS
L025	150.50	20.063	8			FLAME-AAS
L027	190.00	21.111	9	H		FLAME-AAS
L029	157.00	17.444	9			
L031A	134.50	16.813	8			ICAP
L032	159.50	19.938	8	H		FLAME AA
L033	40.00	10.000	4	VHVLL	INSUFFICIENT DATA	AUTO AA
L042	105.50	11.722	9			FLAME A.A.
L045	237.00	26.333	9			ICP
L046	72.50	8.056	9			AA-FLAME
L048	38.00	4.222	9	LL	BIASED LOW	FLAME-AAS
L049	148.50	16.500	9			FLAME-AAS
L053	198.00	22.000	9			FLAME A.A.
L057	71.50	7.944	9			
L058	141.50	15.722	9			FLAME-AAA
L060	266.00	29.556	9	HVHHVHVHVH	BIASED HIGH	ICAP
L061	61.00	20.333	3		INSUFFICIENT DATA	FLAME-AA
L062	212.00	23.556	9	H		AA
L063	135.50	15.056	9	L		AAS
L064	225.50	25.056	9	H		ICP(PLASMA)
L066	144.50	16.056	9	VL		FLAME-AA

OVERALL AVERAGE
RANK IS 17.445

84/03/27

PARAMETER: 11091 SODIUM MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5;MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .5000 BASIC ACCEPTABLE ERROR= .2000 CONCENTRATION ERROR INCREMENT= .1400
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	3.12	15.00	2.33	9.00	.94	8.50	.19	8.50	.27	6.00	4.02	14.00
L003	3.2	22.00		0.00	1.0	21.50	.3	30.00	.4	31.00	4.1	18.00
L004	2.9	4.00	2.2	1.00	.9	2.50	.1	3.00	.2	1.50	3.6	1.00
L006	3.12	15.00	2.28	4.00	.91	5.00	.23	22.50	.30	13.50	3.76	3.00
L009	2.9	4.00		0.00	.93	7.00	.21	16.00	.31	20.50	3.8	4.00
L010	3.0	8.50		0.00	1.0	21.50	.20	12.50	.30	13.50	4.0	10.50
L011	3.15	19.50		0.00	1.02	26.00	.26	26.50	.34	25.50	4.10	18.00
L013	3.32	26.00		0.00	.98	16.50	.19	8.50	.29	8.00	4.15	21.00
L014	2.96	7.00		0.00	1.00	21.50	.44 H	33.00	.48	33.50	3.94	6.50
L016	2.92	6.00	2.23	3.00	.94	8.50	.22	20.00	.29	8.00	3.68	2.00
L019	3.23	25.00	2.50	16.00	.97	12.50	.21	16.00	.31	20.50	4.1	18.00
L020	3.4	29.00		0.00	1.1	29.50	.3	30.00	.4	31.00	4.3	25.50
L021	3.48	31.00	2.65	19.00	1.19	33.00	.26	26.50	.38	29.00	4.60	32.00
L022	3.4	29.00		0.00	1.0	21.50	0.W	0.00	.21	1.50	4.3	25.50
L023	2.8	2.00		0.00	.90	2.50	.30	30.00	.37	27.00	4.2	22.00
L024	3.36	27.00		0.00	1.00	21.50	.22	20.00	.31	20.50	4.49	30.00
L025	3.15	19.50		0.00	.990	18.00	.245	24.00	.340	25.50	4.40	28.00
L027	3.05	10.00	2.35	10.00	.90	2.50	.10T	3.00	.25	3.50	4.0	10.50
L029	3.21	23.00	2.41	13.00	.97	12.50	.19	8.50	.29	8.00	4.10	18.00
L031A	3.13	17.00		0.00	.92	6.00	.20	12.50	.30	13.50	4.25	23.00
L032	3.08	11.00		0.00	.980	16.50	.247	25.00	.376	28.00	3.94	6.50
L033	3.	8.50	3. H	22.00	1.W	0.00	1.W	0.00	1.W	0.00	4.	10.50
L042	2.49 L	1.00	2.29	5.00	1.02	26.00	.15	5.00	.26	5.00	4.72	33.00
L045	3.1	12.50	2.3	7.00	.95	10.00	.17	6.00	.25	3.50	4.0	10.50
L046	3.86 H	34.00	2.76	21.00	1.11	32.00	.34	32.00	.48	33.50	4.59	31.00
L048	3.15	19.50	2.30	7.00	.97	12.50	.22	20.00	.32	23.50	4.0	10.50
L049	5.0 VH	35.00	2.5	16.00	1.1	29.50	.1	3.00	.3	13.50	4.4	28.00
L053	3.12	15.00	2.36	11.00	.97	12.50	.21	16.00	.30	13.50	4.00	10.50
L057	3.60	32.00	2.51	18.00	1.41 VH	34.00	1.32 VH	34.00	1.02 VH	35.00	4.83 H	35.00
L058	3.27	24.00	2.46	14.00	1.02	26.00	.28	28.00	.40	31.00	4.28	24.00
L060	3.82 H	33.00	2.72	20.00	1.10	29.50	.20	12.50	.32	23.50	4.75	34.00
L061		0.00		0.00		0.00	.214	18.00	.310	20.50		0.00
L062	2.9	4.00	2.4	12.00	1.0	21.50	.2	12.50	.3	13.50	4.1	18.00
L063	3.1	12.50	2.3	7.00	.90	2.50	.19	8.50	.30	13.50	3.9	5.00
L064	3.4	29.00	2.5	16.00	1.1	29.50	.23	22.50	.30	13.50	4.4	28.00
L066	3.15	19.50	2.22	2.00	.975	15.00	-.008T L	1.00	.303	18.00	4.04	15.00
MEDIAN CONC.	3.150		2.380		.985		.212		.303		4.100	

PARAMETER 11091 SODIUM MG/L 84/03/27

SAMPLE LAB NO	8 REPORTED VALUE	RANK	9 REPORTED VALUE	RANK	10 REPORTED VALUE	RANK
L002	.48	8.50	1.22	11.50	17.5	3.00
L003	.5	32.00	1.3	21.50	19.	15.00
L004	.4	2.50	1.1	2.50	18.1	7.00
L006	.53	22.50	1.25	16.00	20.38	31.00
L009	.50	13.50	1.1	2.50	17.8	5.00
L010	.5	13.50	1.2	8.00	18.8	12.50
L011	.51	18.00	1.26	18.00	19.0	15.00
L013	.52	19.50	1.24	14.00	18.7	10.00
L014	.59	30.00	1.23	13.00	18.7	10.00
L016	.44	4.00	1.09	1.00	19.80	28.00
L019	.53	22.50	1.25	16.00	19.7	26.50
L020	.6	32.00	1.4	31.00	19.2	19.00
L021	.58	28.50	1.55	33.00	19.5	22.50
L022	.4	2.50	1.3	21.50	21.	33.50
L023	.61	32.00	1.2	8.00	18.	6.00
L024	.56	27.00	1.34	26.50	19.3	21.00
L025	.55 D	25.50	1.35	28.00	19.2	19.00
L027	.45	5.50	1.2	8.00	18.8	12.50
L029	.50	13.50	1.19	5.00	18.7	10.00
L031A	.49	8.50	1.27	19.00	19.5	24.50
L032	.504	17.00	1.18	4.00	19.1	17.00
L033	1.8	0.00	2. VH	35.00	20.	29.50
L042	.43	10.00	1.32	25.00	20.8	32.00
L045	.45	5.50	1.2	8.00	19.0	15.00
L046	.67	34.00	1.37	29.00	19.2	19.00
L048	.53	22.50	1.31	24.00	19.5	22.50
L049	.5	13.50	1.4	31.00	21.	33.50
L053	.50	13.50	1.25	16.00	18.5	8.00
L057	1.27 VH	35.00	1.92 VH	34.00	19.7	26.50
L058	.58	28.50	1.34	26.50	19.6	24.50
L060	.55	25.50	1.40	31.00	22.8 H	35.00
L061	.168 VL	1.00		0.00		0.00
L062	.5	13.50	1.3	21.50	20.	29.50
L063	.47	7.00	1.2	8.00	17.4	2.00
L064	.33	22.50	1.3	21.50	17.	1.00
L065	.52 D	19.50	1.22	11.50	17.6	4.00
MEDIAN CONC.	.51 D		1.260		19.200	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	84.00	9.333	9			FES
L003	191.00	23.875	8			FLAME AE
L004	25.00	2.778	9		BIASED LOW	11105L
L006	132.50	14.722	9			FLAME-AA
L009	72.50	9.063	8			
L010	100.50	12.563	8			ICAP-EXTRACT
L011	166.50	20.813	8			
L013	123.50	15.438	8			IC
L014	154.50	19.313	8	H		FLAME AA
L016	80.50	8.944	9			AAS
L019	173.00	19.222	9			I.C.
L020	227.00	28.375	8			FLAME-PHOTO
L021	254.50	28.278	9		BIASED HIGH	IC
L022	135.00	19.286	7			FLAME-AA
L023	129.50	16.188	8			FLAME-AAS
L024	193.50	24.188	8			FLAME AAS
L025	187.50	23.438	8			FLAME-AAS
L027	65.50	7.278	9		BIASED LOW	FLAME-AAS
L029	111.50	12.389	9			
L031A	124.00	15.500	8			ICAP
L032	125.00	15.625	8			FLAME AA
L033	105.50	21.100	5	HVH	INSUFFICIENT DATA	AUTO FLAME
L042	142.00	15.778	9	L		FLAME A.A.
L045	78.00	8.667	9			FLAME-AA
L046	265.50	29.500	9	H	BIASED HIGH	AA-FLAME
L048	162.00	18.000	9			FLAME-EMM
L049	203.00	22.556	9	VH		FLAME-AAS
L053	116.00	12.889	9			FLAME A.A.
L057	283.50	31.500	9	VHVHVHHVHVH	BIASED HIGH	
L058	226.50	25.167	9			FLAME-AAA
L060	244.00	27.111	9	HH		AA
L061	39.50	13.167	3	VL	INSUFFICIENT DATA	FLAME-AA
L062	146.00	16.222	9			AA
L063	66.00	7.333	9		BIASED LOW	AAS
L064	183.50	20.389	9			IC DIONEX MODEL 10
L066	105.50	11.722	9	L		FLAME-AA

OVERALL AVERAGE RANK IS 17.410

LAB NO.	TOTAL RANK	AVERAGE RANK	NO OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L004	25.00	2.778	9		BIASED LOW	11105L
L027	65.50	7.278	9		BIASED LOW	FLAME-AAS
L063	66.00	7.333	9		BIASED LOW	AAS
L045	78.00	8.667	9			FLAME-AA
L016	80.50	8.944	9			AAS
L009	72.50	9.063	8			
L002	84.00	9.333	9			FES
L066	105.50	11.722	9	L		FLAME-AA
L029	111.50	12.389	9			
L010	100.50	12.563	8			ICAP-EXTRACT
L053	116.00	12.889	9			FLAME A.A.
L061	39.50	13.167	3	VL	INSUFFICIENT DATA	FLAME-AA
L006	132.50	14.722	9			FLAME-AA
L013	123.50	15.438	8			IC
L031A	124.00	15.500	8			ICAP
L032	125.00	15.625	8			FLAME AA
L042	142.00	15.778	9	L		FLAME A.A.
L023	125.50	16.188	8			FLAME-AAS
L062	146.00	16.222	9			AA
L048	162.00	18.000	9			FLAME-EMM
L019	173.00	19.222	9			I.C.
L022	135.00	19.286	7			FLAME-AA
L014	154.50	19.313	8	H		FLAME AA
L064	183.50	20.389	9			IC DIONEX MODEL 10
L011	166.50	20.813	8			
L033	105.50	21.100	5	HVH	INSUFFICIENT DATA	AUTO FLAME
L049	203.00	22.556	9	VH		FLAME-AAS
L025	197.50	23.438	8			FLAME-AAS
L003	191.00	23.875	8			FLAME AE
L024	193.50	24.188	8			FLAME AAS
L058	226.50	25.167	9			FLAME-AAA
L060	244.00	27.111	9	HH		AA
L021	254.50	28.278	9		BIASED HIGH	IC
L020	227.00	28.375	8			FLAME-PHOTO
L046	265.50	29.500	9	H	BIASED HIGH	AA-FLAME
L057	283.50	31.500	9	VHVHVHHVHVH	BIASED HIGH	

OVERALL AVERAGE RANK IS 17.410

SODIUM

84/03/27

PARAMETER: 19091 POTASSIUM MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5;MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .2000 BASIC ACCEPTABLE ERROR= .0500 CONCENTRATION ERROR INCREMENT= .1600
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.28	19.00	.16	8.00	.16	15.50	.11	12.50	.13	10.00	2.36	13.00
L003	.3	25.50		0.00	.2	27.00	.1	8.00	.2	28.00	2.4	17.50
L004	.2 L	3.50	.1 L	3.00	.1 L	5.00	.1	8.00	.1	5.50	2.2	3.00
L006	.17 VL	2.00	.09 VL	2.00	.09 L	2.00	.07	2.50	.08 L	2.00	2.21	5.00
L009	.28	19.00		0.00	.15	12.50	.12	17.50	.15	18.00	2.3	8.50
L010	.24	6.50		0.00	.14	9.50	.17	29.50	.14	12.50	2.44	20.00
L011	.32	28.50		0.00	.23	29.00	.29 VH	33.00	.24 VH	31.00	2.88 H	32.00
L013	.30	25.50		0.00	.19	25.00	.11	12.50	.14	12.50	2.58	26.00
L014	.25	8.50		0.00	.08 VL	1.00	.08	5.00	.06 VL	1.00	2.45	21.50
L016	.32	28.50	.17	10.00	.17	21.00	.13	23.00	.16	22.00	2.30	8.50
L019	.24	6.50	.15	7.00	.14	9.50	.11	12.50	.15	18.00	2.32	11.50
L020	.3	25.50		0.00	.1 L	5.00	.1	8.00	.1	5.50	2.4	17.50
L021	.29	22.50	.18	15.00	.18	23.50	.14	25.50	.17	23.50	2.76	31.00
L022	0.W	0.00		0.00	0.W	0.00	0.W	0.00	0.W	0.00	2.3	8.50
L023	.25	8.50		0.00	.16	15.50	.17	29.50	.17	23.50	2.4	17.50
L024	.22	5.00		0.00	.10	5.00	.07	2.50	.09 L	3.00	2.66	28.00
L025	.270	14.50		0.00	.260 VH	31.50	.125	21.50	.185	26.00	2.70	29.00
L027	.26	11.00	.12	4.00	.14	9.50	.12	17.50	.12	8.00	2.38	14.00
L029	.27	14.50	.17	10.00	.16	15.50	.12	17.50	.15	18.00	2.29	6.00
L031A	.25	11.00		0.00	.15	12.50	.12	17.50	.14	12.50	2.52	25.00
L032	.378 VH	30.00		0.00	.233 H	30.00	.161	28.00	.225 H	30.00	2.08	1.00
L033	.5 VH	33.00	.2W	0.00	.2W	0.00	.2W	0.00	.2W	0.00	2.2	3.00
L042	.29	22.50	.18	15.00	.17	21.00	.11	12.50	.12	8.00	2.73	30.00
L045	.28	19.00	.14	5.50	.14	9.50	.10	8.00	.12	8.00	2.39	15.00
L046	.28	19.00	.18	15.00	.16	15.50	.12	17.50	.15	18.00	2.46	23.50
L048	.272	16.00	.173	12.00	.169	19.00	.132	24.00	.151	21.00	2.32	11.50
L049	1.47 VH	34.00	.34 VH	21.00	.34 VH	33.00	.39 VH	34.00	.39 VH	33.00	3.84 VH	35.00
L053	.28	19.00	.18	15.00	.17	21.00	.12	17.50	.15	18.00	2.46	23.50
L057	.4 VH	31.00	.2	18.50	.2	27.00	.2 VH	31.00	.2	28.00	2.3	8.50
L058	.30	25.50	.16	15.00	.18	23.50	.14	25.50	.18	29.00	2.6	27.00
L060	.41 VH	32.00	.27 VH	20.00	.26 VH	31.50	.22 VH	32.00	.25 VH	32.00	3.50 VH	33.00
L061		0.00		0.00		0.00	.125	21.50	.518 VH	34.00		0.00
L062	.2 L	3.50	.2	18.50	.2	27.00	.1	8.00	.2	28.00	2.4	17.50
L063	.25	11.00	.14	5.50	.13	7.00	.15	27.00	.14	12.50	2.2	3.00
L064	.13 VL	1.00	.055 VL	1.00	.095 L	3.00	.074	4.00	.098 L	4.00	3.8 VH	34.00
L066	.261	13.00	.170	10.00	.166	18.00	.0057 VL	1.00	.144	15.00	2.45	21.50
MEDIAN CONC.	.280		.170		.160		.120		.150		2.400	

PARAMETER: 19091 POTASSIUM MG/L 84/03/27

SAMPLE LAB NO	8 REPORTED VALUE	RANK	9 REPORTED VALUE	RANK	10 REPORTED VALUE	RANK
L002	.34	25.50	.48	10.50	1.10 H	30.50
L003	.3	9.00	.5	18.00	.9	18.50
L004	.3	9.00	.4 L	3.00	.8	4.50
L006	.21 VL	1.00	.41	4.00	.76	2.00
L009	.33	21.00	.50	18.00	.88	13.00
L010	.30	9.00	.44	6.00	.81	6.00
L011	.38	32.00	.63 H	32.00	1.49 VH	33.00
L013	.35	27.50	.51	22.50	.91	23.00
L014	.29	3.50	.43	5.00	.86	10.00
L016	.35	29.50	.53	29.00	.93	26.00
L019	.29	3.50	.49	13.00	.79	3.00
L020	.3	9.00	.5	18.00	.9	18.50
L021	.35	27.50	.54	30.50	.83	8.00
L022	0.0	0.00	0.0	0.00	.4 VL	1.00
L023	.43 VH	33.50	.52	27.00	.90	18.50
L024	.31	15.00	.48	10.50	.93	26.00
L025	.360	29.50	.250 VL	1.00	1.10 H	30.50
L027	.30	9.00	.46	7.50	.82	7.00
L029	.32	17.50	.49	13.00	.85	9.00
L031A	.30	9.00	.50	18.00	.90	18.50
L032	.377	31.00	.511	24.00	.871	11.00
L033	.3	9.00	.5	18.00	.9	18.50
L042	.34	25.50	.52	27.00	.93	26.00
L045	.31	15.00	.49	13.00	.92	24.00
L046	.32	17.50	.51	22.50	.96	29.00
L048	.324	19.00	.476	9.00	.89	14.00
L049	.43 VH	33.50	.91 VH	34.00	2.24 VH	34.00
L053	.33	21.00	.52	27.00	.90	18.50
L057	.3	9.00	.5	18.00	.8	4.50
L058	.33	21.00	.54	30.50	.95	28.00
L060	.52 VH	35.00	.74 VH	33.00	1.30 VH	32.00
L061	.335	23.00		0.00		0.00
L062	.3	9.00	.5	18.00	.9	18.50
L063	.31	15.00	.46	7.50	.90	18.50
L064	.23 L	2.00	.39 L	2.00	2.3 VH	35.00
L066	.339	24.00	.517	25.00	.879	12.00
MEDIAN CONC.	.320		.500		.900	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	144.50	16.056	9	H		EES
L003	151.50	18.938	8			FLAME AE
L004	44.50	4.944	9	LLLL	BIASED LOW	19102L
L006	22.50	2.500	9	VLVLLLVL	BIASED LOW	FLAME-AA
L009	127.50	15.938	8			FLAME ATOMIC-EMISS
L010	99.00	12.375	8			
L011	250.50	31.313	8	HVHVHHHVH	BIASED HIGH	IC
L013	174.50	21.813	8			FLAME AA
L014	55.50	6.938	8	VLVL	BIASED LOW	AAS(E)
L016	197.50	21.944	9			CHROMAT. IONIQUE
L019	84.50	9.389	9			FLAME-PHOTO
L020	107.00	13.375	8	L		IC
L021	207.00	23.000	9			FLAME-AA
L022	9.50	4.750	2	VL	INSUFFICIENT DATA	FLAME-AAS
L023	173.50	21.688	8	VH		FLAME AAS
L024	95.00	11.875	8	LL		FLAME-AAS
L025	183.50	22.938	8	VHVLH		FLAME-AAS
L027	97.50	9.722	9			
L029	121.00	13.444	9			ICAP
L031A	124.00	15.500	8			FLAME AA
L032	185.00	23.125	8	VHHH		AUTO FLAME
L033	81.50	16.300	5	VH	INSUFFICIENT DATA	FLAME A.A.
L042	187.50	20.833	9			FLAME-AA
L045	117.00	13.000	9			AA-FLAME
L046	177.50	19.722	9			FLAME-EMM
L048	145.50	16.167	9			FLAME-AAS
L049	291.50	32.389	9	VHVHVHVHVHVHVHVHVH	BIASED HIGH	FLAME A.A.
L053	180.50	20.056	9			
L057	175.50	19.500	9	VHVH		FLAME-AAA
L058	221.00	24.556	9			AA
L060	280.50	31.167	9	VHVHVHVHVHVHVHVHVH	BIASED HIGH	FLAME-AA
L061	78.50	26.167	3	VH	INSUFFICIENT DATA	AA
L062	148.00	16.444	9	L		AAS
L063	107.00	11.889	9			IC DIONEX MODEL 10
L064	86.00	9.556	9	VLVLLLVHLLVH		FLAME-AA
L066	139.50	15.500	9	VL		

OVERALL AVERAGE RANK IS 17.159

LAB NO.	TOTAL RANK	AVERAGE RANK	NO OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L006	22.50	2.500	9	VLVLLLVL	BIASED LOW	FLAME-AA
L022	9.50	4.750	2	VL	INSUFFICIENT DATA	FLAME-AA
L004	44.50	4.944	9	LLLL	BIASED LOW	19102L
L014	55.50	6.938	8	VLVL	BIASED LOW	FLAME AA
L019	84.50	9.389	9			CHROMAT. IONIQUE
L064	85.00	9.556	9	VLVLLLVHLLVH		IC DIONEX MODEL 10
L027	87.50	9.722	9			FLAME-AAS
L024	95.00	11.875	8	LL		FLAME AAS
L063	107.00	11.889	9			AAS
L010	93.00	12.375	8			FLAME ATOMIC-EMISS
L045	117.00	13.000	9			FLAME-AA
L020	107.00	13.375	8	L		FLAME-PHOTO
L029	121.00	13.444	9			
L031A	124.00	15.500	8			ICAP
L066	139.50	15.500	9	VL		FLAME-AA
L009	127.50	15.938	8			
L002	144.50	16.056	9	H		FES
L048	145.50	16.167	9			FLAME-EMM
L033	81.50	16.300	5	VH	INSUFFICIENT DATA	AUTO FLAME
L062	148.00	16.444	9	L		AA
L003	151.50	18.938	8			FLAME AE
L057	175.50	19.500	9	VHVH		
L046	177.50	19.722	9			AA-FLAME
L053	180.50	20.056	9			FLAME A.A.
L042	187.50	20.833	9			FLAME A.A.
L023	173.50	21.688	8	VH		FLAME-AAS
L013	174.50	21.813	8			IC
L016	197.50	21.944	9			AAS(E)
L025	183.50	22.938	8	VHVLH		FLAME-AAS
L021	207.00	23.000	9			IC
L032	185.00	23.125	8	VHHH		FLAME AA
L058	221.00	24.556	9			FLAME-AAA
L061	78.50	26.167	3	VH	INSUFFICIENT DATA	FLAME-AA
L060	280.50	31.167	9	VHVHVHVHVHVHVHVHVH	BIASED HIGH	AA
L011	250.50	31.313	8	HVHVHHHVH	BIASED HIGH	
L049	291.50	32.389	9	VHVHVHVHVHVHVHVHVH	BIASED HIGH	FLAME-AAS

OVERALL AVERAGE RANK IS 17.159

POTASSIUM

84/03/27

PARAMETER: 17000 CHLORIDE IC MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5:MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000 BASIC ACCEPTABLE ERROR= .2500 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003	4.3	3.50		0.00	.5	18.00	.6	5.00	.8	1.00	6.1	1.00
L007	6.15 H	17.00		0.00	.32	14.00	.71	14.50	.91	12.00	8.10 H	17.00
L013	4.98	6.00		0.00	.25	4.50	.62	8.50	.88	7.50	6.87	10.00
L014	5.40	15.00		0.00	L.1	1.00	.30 L	1.00	.90	10.00	6.70	7.00
L019	5.0	7.00	3.2	7.00	.25	4.50	.63	10.00	.88	7.50	6.3	2.00
L020	4.97	9.00		0.00	.32	14.00	.78	17.00	.96	16.00	6.92	11.00
L021	6.05 H	16.00	3.50	10.00	.26	6.00	.64	11.00	.94	14.00	6.32	3.00
L022	7.5 VH	19.00		0.00	.5T	18.00	1.3 VH	19.00	4.8 VH	21.00	6.4	4.00
L025	5.05	9.00		0.00	.27	9.50	.81	18.00	.96	16.00	7.2	15.50
L028	12.6 VH	20.00	7.8 VH	12.00	1.2 VH	20.00	2.2 VH	20.00	2.8 VH	20.00	17.0 VH	20.00
L029	5.22	12.00	3.11	4.00	.264	7.00	.578	2.00	.905	11.00	7.17	14.00
L032	4.73	2.00		0.00	.27	9.50	.62	8.50	.84	4.00	6.68	6.00
L048	4.9	3.50	2.9	1.00	.27	9.50	.67	13.00	.81	2.50	6.8	8.50
L050	5.14	11.00	3.00	3.00	.32	14.00	.60	5.00	.85	5.50	8.90 VH	19.00
L058	5.3	14.00	3.2	7.00	.27	9.50	.60	5.00	.81	2.50	7.2	15.50
L060	5.07	10.00	2.96	2.00	.24	3.00	.60	5.00	.85	5.50	7.16	13.00
L061		0.00		0.00		0.00	.65	12.00	.93	13.00		0.00
L062	6.6 VH	18.00	3.7	11.00	.2	2.00	.6	5.00	1.0	19.00	8.7 VH	18.00
L063	5.24	13.00	3.41	9.00	.50	18.00	.73	16.00	.99	18.00	6.80	8.50
L064	4.6	1.00	3.2	7.00	.35	16.00	.71	14.50	.96	16.00	7.1	12.00
L066	5.01	8.00	3.16	5.00	.286	12.00		0.00	.896	9.00	6.67	5.00
MEDIAN CONC.	5.105		3.200		.270		.635		.905		6.895	

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003	1.3	3.00	1.2	4.50	93.	2.00
L007	1.50	11.00	1.25	9.00	123.4 H	16.00
L013	1.49	9.00	1.20	4.50	105.5	10.00
L014	1.50	11.00	1.30	12.00	125. H	17.00
L019	1.54	14.00	1.20	4.50	111.	14.00
L020	1.60	16.00	1.31	13.00	104.0	8.50
L021	1.64	19.50	1.36	16.00	99.8	3.00
L022	1.5	11.00	1.1	1.00	130. VH	18.00
L025	1.60	16.00	1.32	14.50	90.	1.00
L028	.2 VL	1.00	4.0 VH	20.00	155. VH	20.00
L029	1.53	13.00	1.26	10.50	107.	12.00
L032	1.14 L	2.00	1.19	2.00	101.	6.50
L048	1.39	4.00	1.2	4.50	106.	11.00
L050	1.45	6.00	1.22	7.00	101.	6.50
L058	1.44	5.00	1.32	14.50	104.	8.50
L060	1.47	7.00	1.23	8.00	116.	15.00
L061	1.54	19.50		0.00		0.00
L062	1.6	16.00	1.4	18.50	137. VH	19.00
L063	1.62	18.00	1.39	17.00	100.5	5.00
L064	1.7	21.00	1.4	18.50	110.	13.00
L066	1.49	8.00	1.26	10.50	99.9	4.00
MEDIAN CONC.	1.500		1.260		105.750	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L003	38.00	4.750	8		BIASED LOW	DIONEX
L007	110.50	13.813	8	HHH		IC
L013	60.00	7.500	8			I.C.
L014	74.00	9.250	8	LH		CHROMAT. IONIQUE
L019	70.50	7.833	9			DIONEX,I.C.
L020	100.50	12.563	8			
L021	98.50	10.944	9	H		ION CHROMATOGRAPHY
L022	111.00	13.875	8	VHVHVHVH		I.C.
L025	99.50	12.438	8		BIASED HIGH	MESCAN IC
L028	153.00	17.000	9	VHVHVHVHVHVHVLVHVH		DIONEX
L029	85.50	9.500	9			I.C.
L032	40.50	5.063	8	L		IC
L048	57.50	6.389	9			I.C.
L050	77.00	8.556	9	VH		IC
L058	81.50	9.056	9			IC
L060	68.50	7.611	9		INSUFFICIENT DATA	IC
L061	44.50	14.833	3			IC
L062	126.50	14.056	9	VHVHVH		IC DIONEX MODEL 10
L063	122.50	13.611	9			ION CHROM
L064	119.00	13.222	9			
L066	61.50	7.688	8			

OVERALL AVERAGE RANK IS 10.345

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L003	38.00	4.750	8		BIASED LOW	DIONEX
L032	40.50	5.063	8	L		DIONEX
L048	57.50	6.389	9			I.C.
L013	60.00	7.500	8			IC
L060	68.50	7.611	9			IC
L066	61.50	7.688	8			ION CHROM
L019	70.50	7.833	9			CHROMAT. IONIQUE
L050	77.00	8.556	9	VH		IC
L058	81.50	9.056	9			I.C.
L014	74.00	9.250	8	LH		I.C.
L029	85.50	9.500	9			
L021	98.50	10.944	9	H		
L025	99.50	12.438	8			I.C.
L020	100.50	12.563	8			DIONEX,I.C.
L064	119.00	13.222	9			IC DIONEX MODEL 10
L063	122.50	13.611	9			
L007	110.50	13.813	8	HHH		
L022	111.00	13.875	8	VHVHVHVH		ION CHROMATOGRAPHY
L062	126.50	14.056	9	VHVHVH		IC
L061	44.50	14.833	3		INSUFFICIENT DATA	IC
L028	153.00	17.000	9	VHVHVHVHVHVHVLVHVH	BIASED HIGH	MESCAN IC

OVERALL AVERAGE RANK IS 10.345

84/03/27

PARAMETER: 17001 CHLORIDE NON IC METHODS MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5; MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000 BASIC ACCEPTABLE ERROR= .2500 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	4.8	6.50	2.9	2.00	.4	14.00	.6	8.50	.8	4.00	6.5	6.00
L004	5.4	22.50	3.5	11.50	.2	2.00	.5	4.00	.8	4.00	7.1	22.00
L006	4.80	6.50		0.00	.38	11.00	.71	21.00	.93	16.00	8.26 H	25.00
L009	4.8	6.50		0.00	.36	8.00	.54	6.00	.84	7.00	6.7	9.50
L010	4.79	4.00		0.00	.36T	8.00	.64	13.00	.80	4.00	6.59	8.00
L011	5.00	11.50		0.00	.37	10.00	.60	8.50	.98	17.00	6.93	17.00
L016	5.15	15.00	3.30	7.50	.36	8.00	.61	11.00	.85	8.00	6.52	7.00
L020B	5.1	14.00		0.00	.4	14.00	.7	17.00	1.0	19.00	6.9	15.00
L022	6.9 VH	25.00		0.00	3.4 VH	24.00	1.0T H	22.00	4.5 VH	26.00	6.9	15.00
L023	4.0 L	1.00		0.00	.40	14.00	.70	17.00	.90	11.50	7.0	19.50
L024	5.0	11.50		0.00	.3	5.00	.6	8.50	.9	11.50	6.8	11.50
L027	4.99	9.00	2.96	3.00	.17	1.00	.49	2.00	.81	6.00	6.82	13.00
L031A	5.0	11.50		0.00	.3	5.00	.7	17.00	.9	11.50	7.0	19.50
L031B		0.00		0.00		0.00	.6	8.50	.9	11.50		0.00
L032	5.49	24.00		0.00	2.9647 VH	23.00	3.11 VH	26.00	3.29 VH	25.00	5.83	1.00
L033	5.	11.50	3.	4.00	1.W	0.00	1.W	0.00	1.W	0.00	6.	3.00
L042	4.50	2.00	2.85	1.00	.75 H	21.00	1.05 VH	23.00	1.10	22.00	7.70	24.00
L045	5.2	17.50	3.3	7.50	.4	14.00	.7	17.00	1.0	19.00	6.8	11.50
L046	5.4	22.50	3.6	13.00	.9 VH	22.00	1.5 VH	24.00	1.4 VH	24.00	7.3	23.00
L048	5.3	20.50	3.1	5.00	.3	5.00	.70	17.00	.9	11.50	6.7	9.50
L049	4.8	6.50	3.2	6.00	.5	18.00	.5	4.00	1.1	22.00	6.4	5.00
L053	5.2	17.50	3.4	9.50	.6	20.00	.7	17.00	.9	11.50	7.0	19.50
L057	4.7	3.00		0.00	.5T	18.00	.5T	4.00	.5 VL	1.00	5.9	2.00
L058	5.2	17.50	3.5	11.50	.25	3.00	.46	1.00	.76	2.00	6.1	4.00
L061		0.00		0.00		0.00	.63	12.00	.91	15.00		0.00
L062	5.3	20.50	3.8	14.00	.5	18.00	1.6 VH	25.00	1.1	22.00	6.9	15.00
L063	5.2	17.50	3.4	9.50	.4	14.00	.7	17.00	1.0	19.00	7.0	19.50
MEDIAN CONC.	5.000		3.300		.400		.670		.900		6.820	

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PARAMETER 17801 CHLORIDE NON IC METHODS MG/L

SAMPLE LAB NO	8 REPORTED VALUE	8 RANK	9 REPORTED VALUE	9 RANK	10 REPORTED VALUE	10 RANK
L002	1.3	3.00	1.2	6.50	106.2	17.00
L004	1.5	11.50	1.3	12.50	113.	21.50
L006	1.45	7.00	1.29	9.00	60.60 VL	3.00
L009	1.5	11.50	1.4	18.00	104.0	11.00
L010	1.35	4.00	1.23	8.00	101.	6.00
L011	1.61	21.00	1.39	16.00	1.05 VL	1.00
L016	1.55	16.00	1.30	12.50	110.50	20.00
L020B	1.6	18.50	1.2	6.50	104.5	13.00
L022	1.7	22.50	2.4 VH	23.00	128. H	24.00
L023	.15 VL	1.00	.12 VL	1.00	103.	9.00
L024	1.4	5.50	1.1	3.50	100.	5.00
L027	1.46	8.00	1.19	5.00	106.	16.00
L031A	1.5	11.50	1.3	12.50	105.	14.50
L031B		0.00		0.00		0.00
L032	7.38 VH	25.00	7.10 VH	24.00	99.0	4.00
L033	1.W	0.00	1.W	0.00	102.	7.50
L042	1.58	11.50	1.60 H	20.50	126. H	23.00
L045	1.6	18.50	1.3	12.50	104.	11.00
L046	1.7	22.50	1.6 H	20.50	113.	21.50
L048	1.4	5.50	1.3	12.50	102.	7.50
L049	1.6	18.50	1.1	3.50	105.	14.50
L053	1.5	11.50	1.4	18.00	104.	11.00
L057	.9 VL	2.00	.9 VL	2.00	38. VL	2.00
L058	1.5	11.50	1.3	12.50	131. VH	25.00
L061	1.53	15.00		0.00		0.00
L062	1.9 VH	24.00	2.0 VH	22.00	107.	18.00
L063	1.6	18.50	1.4	18.00	110.	19.00
MEDIAN CONC.	1.580		1.300		104.500	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	67.50	7.500	9			TECHNICON
L004	111.50	12.389	9			17203L
L006	98.50	12.313	8	HVL		AUTO ANALYZER
L009	77.50	9.688	8			
L010	55.00	6.875	8			THIOCYANATE-COMB.R
L011	102.00	12.750	8	VL		
L016	105.00	11.667	9			COLORIMETRIC
L020B	117.00	14.625	8			MERC-THIOBLUE
L022	181.50	22.688	8	VHVHHVHVHH	BIASED HIGH	AG TITRATION
L023	74.00	9.250	8	LVLVL		AUTO-THIOCYANATE
L024	62.00	7.750	8			COLOURIMETRIC
L027	63.00	7.000	9			COLORIMETRIC
L031A	103.00	12.875	8			TITRAGE CONDUCTIV
L031B	20.00	10.000	2		INSUFFICIENT DATA	RESINES
L032	152.00	19.000	8	VHVHVHVHVH		AUTO THIOCYANATE
L033	26.00	6.500	4		INSUFFICIENT DATA	AUTO SCN
L042	148.00	16.444	9	HVHHH		SPECIFIC ION.
L045	128.50	14.278	9			MERCURIC THIOCYAN
L046	193.00	21.444	9	VHVHVHH	BIASED HIGH	AUTOANALYZER
L048	94.00	10.444	9			TECHNICON
L049	98.00	10.889	9			HGINO3/2 TIT.
L053	135.50	15.056	9			TITRATION
L057	34.00	4.250	8	VLVLVLVL	BIASED LOW	
L058	88.10	9.778	9	VH		TECHNICON
L061	42.00	14.000	3		INSUFFICIENT DATA	TECHNICON AA II
L062	178.50	19.833	9	VHVHVH	BIASED HIGH	DESCAARTE ANALYSER
L063	152.00	16.889	9			FESCN DISCR.

OVERALL AVERAGE RANK IS 12.650

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L057	34.00	4.250	8	VLVLVLVL	BIASED LOW	
L033	26.00	6.500	4		INSUFFICIENT DATA	AUTO SCN
L010	55.00	6.875	8			THIOCYANATE-COMB.R
L027	63.00	7.000	9			COLORIMETRIC
L002	67.50	7.500	9			TECHNICON
L024	62.00	7.750	8			COLOURIMETRIC
L023	74.00	9.250	8	LVLVL		AUTO-THIOCYANATE
L009	77.50	9.688	8			
L058	88.00	9.778	9	VH		TECHNICON
L031B	20.00	10.000	2		INSUFFICIENT DATA	RESINES
L048	94.00	10.444	9			TECHNICON
L049	98.00	10.889	9			HG(NO3)2 TIT.
L016	105.00	11.667	9			COLORIMETRIC
L006	98.50	12.313	8	HVL		AUTO ANALYZER
L004	111.50	12.389	9			I7203L
L011	102.00	12.750	8	VL		
L031A	103.00	12.875	8			TITRAGE CONDUCTIV
L061	42.00	14.000	3		INSUFFICIENT DATA	TECHNICON AA II
L045	128.50	14.278	9			MERCURIC THIOCYAN
L020B	117.00	14.625	8			MERC-THIMOBLUE
L053	135.50	15.056	9			TITRATION
L042	148.00	16.444	9	HVHHH		SPECIFIC ION.
L063	152.00	16.889	9			FESCN DIS.R.
L032	152.00	19.000	8	VHVHVHVHVH		AUTO THIOCYANATE
L062	179.50	19.833	9	VHVHVH	BIASED HIGH	DESCAARTE ANALYSER
L046	193.00	21.444	9	VHVHVHH	BIASED HIGH	AUTOANALYZER
L022	181.50	22.688	8	VHVHHVHVHH	BIASED HIGH	AG TITRATION

OVERALL AVERAGE RANK IS 12.650

84/03/27

PARAMETER: 17092 CHLORIDE (ALL METHODS) MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5: MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000 BASIC ACCEPTABLE ERROR= .2500 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	4.9	8.50	2.9	2.50	.4	29.00	.6	12.50	.8	4.50	6.5	9.00
L003	4.9	11.50		0.00	.5	34.50	.6	12.50	.8	4.50	6.1	4.00
L004	5.4	36.00	3.5	20.50	.2	3.50	.5	4.00	.8	4.50	7.1	33.50
L006	4.80	8.50		0.00	.38	26.00	.71	34.00	.93	27.50	8.26 H	41.00
L007	6.15 H	40.00		0.00	.32	19.00	.71	34.00	.91	25.50	8.10 H	40.00
L009	4.8	8.50		0.00	.36	23.00	.54	7.00	.84	9.50	6.7	16.00
L010	4.79	5.50		0.00	.36T	23.00	.64	22.50	.80	4.50	6.59	11.00
L011	5.00	18.00		0.00	.37	25.00	.60	12.50	.98	33.00	6.93	28.00
L013	4.98	14.00		0.00	.25	6.50	.62	18.50	.88	14.50	6.87	23.00
L014	5.40	36.00		0.00	L.1 L	1.00	.30 L	1.00	.90	20.00	6.70	16.00
L016	5.15	26.00	3.30	14.50	.36	23.00	.61	17.00	.85	12.00	6.52	10.00
L019	5.0	18.00	3.2	12.00	.25	6.50	.63	20.50	.88	14.50	6.3	5.00
L020	4.97	13.00		0.00	.32	19.00	.78	37.00	.96	31.00	6.92	27.00
L020B	5.1	24.00		0.00	.4	29.00	.7	29.00	1.0	36.50	6.9	25.00
L021	6.05 H	39.00	3.50	20.50	.26	8.50	.64	22.50	.94	29.00	6.32	6.00
L022	7.5 VH	43.00		0.00	.5T	34.50	1.3 VH	41.00	4.8 VH	46.00	6.4	7.50
L022B	6.9 VH	42.00		0.00	3.4 VH	43.00	1.0T H	39.00	4.5 VH	45.00	6.9	25.00
L023	4.0 L	1.00		0.00	.40	29.00	.70	29.00	.90	20.00	7.0	30.50
L024	5.0	18.00		0.00	.3	16.00	.6	12.50	.9	20.00	6.8	19.50
L025	5.05	22.00		0.00	.27	12.00	.81	38.00	.96	31.00	7.2	37.00
L027	4.99	15.00	2.96	4.50	.17	2.00	.49	2.00	.81	7.50	6.82	22.00
L028	12.6 VH	44.00	7.8 VH	25.00	1.2 VH	41.00	2.2 VH	44.00	2.8 VH	43.00	17.0 VH	44.00
L029	5.22	30.00	3.11	9.00	.264	10.00	.578	8.00	.905	24.00	7.17	36.00
L031A	5.0	18.00		0.00	.3	16.00	.7	29.00	.9	20.00	7.0	30.50
L031B		0.00		0.00		0.00	.6	12.50	.9	20.00		0.00
L032	5.49	38.00		0.00	2.9647 VH	42.00	3.11 VH	45.00	3.29 VH	44.00	5.83	1.00
L032B	4.79	5.50		0.00	.27	12.00	.62	18.50	.84	9.50	6.68	14.00
L033	5.	18.00	3.	6.50	1.W	0.00	1.W	0.00	1.W	0.00	6.	3.00
L042	4.50	2.00	2.85	1.00	.75 VH	39.00	1.05 VH	40.00	1.10	40.00	7.70	39.00
L045	5.2	28.00	3.3	14.50	.4	29.00	.7	29.00	1.0	36.50	6.8	19.50
L046	5.4	36.00	3.6	22.00	.9 VH	40.00	1.5 VH	42.00	1.4 VH	42.00	7.3	38.00
L048	4.9	11.50	2.9	2.50	.27	12.00	.67	25.00	.81	7.50	6.8	19.50
L048B	5.3	33.50	3.1	8.00	.3	16.00	.70	29.00	.9	20.00	6.7	16.00
L049	4.8	8.50	3.2	12.00	.5	34.50	.5	4.00	1.1	40.00	6.4	7.50
L050	5.14	25.00	3.00	6.50	.32	19.00	.60	12.50	.85	12.00	8.90 VH	43.00
L053	5.2	28.00	3.4	17.50	.6	38.00	.7	29.00	.9	20.00	7.0	30.50
L057	4.7	4.00		0.00	.5T	34.50	.5T	4.00	.5 VL	1.00	5.9	2.00
L058	5.25	32.00	3.35	16.00	.260	8.50	.530	6.00	.785	2.00	6.65	12.00
L060	5.07	23.00	2.96	4.50	.24	5.00	.60	12.50	.85	12.00	7.16	35.00
L061		0.00		0.00		0.00	.65	24.00	.93	27.50		0.00
L061B		0.00		0.00		0.00	.63	20.50	.91	25.50		0.00
L062	5.5 VH	41.00	3.7	23.00	.2	3.50	.6	12.50	1.0	36.50	8.7 VH	42.00
L062B	5.3	33.50	3.8 H	24.00	.5	34.50	1.6 VH	43.00	1.1	40.00	6.9	25.00
L063	5.2	28.00	3.4	17.50	.4	29.00	.7	29.00	1.0	36.50	7.0	30.50
L063B	5.24	31.00	3.41	19.00	.50	34.50	.73	36.00	.99	34.00	6.80	19.50
L064	4.8	3.00	3.2	12.00	.35	21.00	.71	34.00	.96	31.00	7.1	33.50
L066	5.01	21.00	3.16	10.00	.286	14.00		0.00	.896	16.00	6.67	13.00
MEDIAN CONC.	5.060		3.200		.360		.640		.903		6.845	

PARAMETER: 17092 CHLORIDE (ALL METHODS) MG/L 84/03/27

SAMPLE LAB NO	8 REPORTED VALUE	8 RANK	9 REPORTED VALUE	9 RANK	10 REPORTED VALUE	10 RANK
L002	1.3	5.50	1.2	10.50	106.2	27.00
L003	1.3	5.50	1.2	10.50	93.	5.00
L004	1.5	21.50	1.3	23.50	113.	34.50
L006	1.45	11.50	1.29	20.00	60.60 VL	3.00
L007	1.50	21.50	1.25	17.00	123.4 H	38.00
L009	1.5	21.50	1.4	35.00	104.0	18.50
L010	1.35	7.00	1.23	15.50	101.	12.00
L011	1.61	37.00	1.39	31.50	1.05 VL	1.00
L013	1.49	17.00	1.20	10.50	105.5	24.00
L014	1.50	21.50	1.30	23.50	125. H	39.00
L016	1.53	29.00	1.30	23.50	110.50	32.00
L019	1.54	28.00	1.20	10.50	111.	33.00
L020	1.60	33.00	1.31	27.50	104.0	18.50
L020B	1.6	33.00	1.2	10.50	104.5	21.00
L021	1.64	39.50	1.36	30.00	99.8	7.00
L022	1.5	21.50	1.1	4.00	130. VH	42.00
L022B	1.7	42.00	2.4 VH	41.00	128. H	41.00
L023	.15 VL	1.00	.12 VL	1.00	103.	16.00
L024	1.4	9.50	1.1	4.00	100.	9.00
L025	1.50	33.00	1.32	29.00	90.	4.00
L027	1.46	13.00	1.19	6.50	106.	25.50
L028	.2 VL	2.00	4.0 VH	42.00	155. VH	44.00
L029	1.53	26.50	1.26	18.50	107.	28.50
L031A	1.5	21.50	1.3	23.50	105.	22.50
L031B		0.00		0.00		0.00
L032	7.38 VH	45.00	7.10 VH	43.00	99.0	6.00
L032B	1.14 L	4.00	1.19	6.50	101.	12.00
L033	1.H	0.00	1.W	0.00	102.	14.50
L042	1.50	21.50	1.60 H	38.50	126. H	40.00
L045	1.6	33.00	1.3	23.50	104.	18.50
L046	1.7	42.00	1.6 H	38.50	113.	34.50
L048	1.38	8.00	1.2	10.50	106.	25.50
L048B	1.4	9.50	1.3	23.50	102.	14.50
L049	1.6	33.00	1.1	4.00	105.	22.50
L050	1.45	11.50	1.22	14.00	101.	12.00
L053	1.5	21.50	1.4	35.00	104.	18.50
L057	.9 VL	3.00	.9 VL	2.00	38. VL	2.00
L058	1.470	14.50	1.310	27.50	117.5	37.00
L060	1.47	14.50	1.23	15.50	116.	36.00
L061	1.64	39.50		0.00		0.00
L061B	1.53	26.50		0.00		0.00
L062	1.6	33.00	1.4	35.00	137. VH	43.00
L062B	1.9 VH	44.00	2.0 VH	40.00	107.	28.50
L063	1.6	33.00	1.4	35.00	110.	30.50
L063B	1.62	38.00	1.39	31.50	100.5	10.00
L064	1.7	42.00	1.4	35.00	110.	30.50
L066	1.48	16.00	1.26	18.50	99.3	8.00
MEDIAN CONC.	1.500		1.300		115.000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	109.00	12.111	9			TECHNICON
L003	88.00	11.000	8			DIONEX
L004	181.50	20.167	9			17203L
L006	171.50	21.438	8	HVL		AUTO ANALYZER
L007	235.00	29.375	8	HHH		
L009	139.00	17.375	8			
L010	101.00	12.625	8			THIOCYAN -COMB.REA
L011	186.00	23.250	8	VL		
L013	128.00	16.000	8			IC
L014	158.00	19.750	8	LLH		I.C.
L016	187.00	20.778	9			COLORIMETRIC
L019	148.00	16.444	9			CHROMAT. IONIQUE
L020	206.00	25.750	8			I.C.
L020B	208.00	26.000	8			MERC. THIMOBLUE
L021	202.00	22.444	9	H		
L022	239.50	29.938	8	VHVHVHVH		ION CHROMATOGRAPHY
L022B	319.00	39.750	8	VHVHHVHVHH	BIASED HIGH	AG TITRATION
L023	127.50	15.938	8	LVLVL		AUTO-THIOCYANATE
L024	108.50	13.563	8			COLOURIMETRIC
L025	206.00	25.750	8			I.C.
L027	98.00	10.889	9			COLORIMETRIC
L028	329.00	36.556	9	VHVHVHVHVHVHVLVHVH	BIASED HIGH	WESCAN IC
L029	190.50	21.167	9			
L031A	181.00	22.625	8			TITRAGE CONDUCTIV
L031B	32.50	16.250	2		INSUFFICIENT DATA	RESINES
L032	264.00	33.000	8	VHVHVHVHVH		AUTO THIOCYANATE
L032B	82.00	10.250	8	L		DIONEX
L033	42.00	10.500	4		INSUFFICIENT DATA	AUTO SCN
L042	261.00	29.000	9	VHVHHH		SPECIFIC ION.
L045	231.50	25.722	9			MERCURIC THIOCYAN
L046	335.00	37.222	9	VHVHVHH	BIASED HIGH	AUTOANALYZER
L048	122.00	13.556	9			I.C.
L048B	170.00	18.889	9			TECHNICON
L049	166.00	18.444	9			HG(NO3)2 TIT.
L050	155.50	17.278	9	VH		IC
L053	238.00	26.444	9			TITRATION
L057	52.50	6.563	8	VLVLVLVL	BIASED LOW	
L058	155.50	17.278	9			I.C.
L060	158.00	17.556	9			IC
L061	91.00	30.333	3		INSUFFICIENT DATA	IC
L061B	72.50	24.167	3		INSUFFICIENT DATA	TECHNICON AA II
L062	269.50	29.944	9	VHVHVH		IC
L062B	312.50	34.722	9	HVHVHVH		DESCAARTE ANALYSER
L063	269.00	29.889	9			FESCN DISCR.
L063B	253.50	28.167	9			
L064	242.00	26.889	9			IC DIONEX MODEL 10
L066	115.50	14.563	8			ION CHROM

OVERALL AVERAGE RANK IS 22.000

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L057	52.50	6.563	8	VLVLVLVL	BIASED LOW	
L032B	82.00	10.250	8	L		DIONEX
L033	42.00	10.500	4		INSUFFICIENT DATA	AUTO SCN
L027	98.00	10.889	9			COLORIMETRIC
L003	88.00	11.000	8			DIONEX
L002	109.00	12.111	9			TECHNICON
L010	101.00	12.625	8			THIOCYAN -COMB.REA
L048	122.00	13.556	9			I.C.
L024	108.50	13.563	8			COLOURIMETRIC
L066	116.50	14.563	8			ION CHROM
L023	127.50	15.938	8	LVLVL		AUTO-THIOCYANATE
L013	128.00	16.000	8			IC
L031B	32.50	16.250	2		INSUFFICIENT DATA	RESINES
L019	148.00	16.444	9			CHROMAT. IONIQUE
-058	155.50	17.278	9			I.C.
L050	155.50	17.278	9	VH		IC
L009	139.00	17.375	8			
L060	158.00	17.556	9			IC
-049	166.00	18.444	9			HG(NO3)2 TIT.
L048B	170.00	18.889	9			TECHNICON
L014	158.00	19.750	8	LLH		I.C.
L004	181.50	20.167	9			17203L
-016	187.00	20.778	9			COLORIMETRIC
L029	190.50	21.167	9			
L006	171.50	21.438	8	HVL		AUTO ANALYZER
L021	202.00	22.444	9	H		
L031A	181.00	22.625	8			TITRAGE CONDUCTIV
L011	186.00	23.250	8	VL		
L061B	72.50	24.167	3		INSUFFICIENT DATA	TECHNICON AA II
L045	231.50	25.722	9			MERCURIC THIOCYAN
L020	206.00	25.750	8			I.C.
L025	206.00	25.750	8			I.C.
L020B	208.00	26.000	8			MERC. THIMOBLUE
L053	238.00	26.444	9			TITRATION
L064	242.00	26.889	9			IC DIONEX MODEL 10
L063B	253.50	28.167	9			
L042	261.00	29.000	9	VHVHHH		SPECIFIC ION.
-007	235.00	29.375	8	HHH		
L063	269.00	29.889	9			FESCN DISCR.
L022	239.50	29.938	8	VHVHVHVH		ION CHROMATOGRAPHY
L062	269.50	29.944	9	VHVHVH		IC
L061	91.00	30.333	3		INSUFFICIENT DATA	IC
L032	264.00	33.000	8	VHVHVHVHVH		AUTO THIOCYANATE
L062B	312.50	34.722	9	HVHVHVH		DESCAARTE ANALYSER
L028	329.00	36.556	9	VHVHVHVHVHVHVLVHVH	BIASED HIGH	WESCAN IC
L046	335.00	37.222	9	VHVHVHH	BIASED HIGH	AUTOANALYZER
L022B	318.00	39.750	8	VHVHHVHVHH	BIASED HIGH	AG TITRATION

OVERALL AVERAGE RANK IS 22.000

84/03/27

PARAMETER: 150 00 SULFATE, IC METHOD MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5: MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.0000 BASIC ACCEPTABLE ERROR= .7600 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003	2.7	3.00		0.00	3.4	6.00	4.9	11.00	5.4	13.50	19.	10.50
L007	2.83	12.00		0.00	3.48	11.50	5.38	22.00	5.38	11.00	16.8	2.00
L009	2.7	3.00		0.00	3.4	6.00	4.8	4.00	5.4	13.50	17.5	4.00
L013	2.97	15.00		0.00	3.49	13.50	4.81	5.50	5.14	3.00	19.4	15.00
L014	3.00	17.00		0.00	3.40	6.00	8.80 VH	24.00	8.50 VH	25.00	19.20	12.00
L019	2.95	14.00	3.48	9.00	3.67	21.00	4.76	3.00	5.20	6.50	19.3	13.50
L020	2.70	3.00		0.00	3.42	8.00	5.07	17.00	5.62	22.00	18.5	8.00
L021	3.02	18.00	3.68	13.00	3.58	22.00	5.23	21.00	5.78	24.00	21.87	24.00
L022	3.8	23.00		0.00	4.1	23.00	5.0	14.50	5.7	23.00	19.	10.50
L024	2.94	13.00		0.00	3.59	19.00	5.01	16.00	5.57	21.00	17.61	6.00
L025	3.25	20.00		0.00	3.55	18.00	4.90	11.00	5.40	13.50	20.5	22.50
L027	2.87	11.00	3.49	10.00	3.44	10.00	4.81	5.50	5.48	18.00	19.9	19.00
L028	3.4	21.00	3.5	11.50	3.5	16.00	5.2	20.00	5.5	19.50	20.5	22.50
L029	2.71	5.00	3.32	3.50	3.43	9.00	4.87	8.50	5.46	16.50	20.1	21.00
L032	3.24	19.00		0.00	3.48	11.50	4.95	13.00	5.18	5.00	16.68	1.00
L048	2.8	7.00	3.3	2.00	3.3	1.00	4.6	1.50	5.2	6.50	19.5	16.50
L050	2.95	9.50	3.46	8.00	3.49	13.50	6.61 H	23.00	5.17	4.00	19.3	13.50
L057	2.99	16.00	3.45	7.00	3.38	3.00	5.17	19.00	5.46	16.50	18.7	9.00
L058	2.8	7.00	3.5	11.50	3.5	16.00	4.9	11.00	4.7	1.00	17.6	5.00
L060	2.80	7.00	3.32	3.50	3.39	4.00	4.85	7.00	5.28	8.00	19.5	16.50
L061		0.00		0.00		0.00	4.87	8.50	5.34	10.00		0.00
L062	3.5	22.00	3.2	1.00	3.5	16.00	5.0	14.50	5.4	13.50	20.	20.00
L063	3.97 H	24.00	3.92	14.00	5.90 VH	24.00	5.16	18.00	5.50	19.50	18.3	7.00
L064	2.5	1.00	3.4	5.00	3.6	20.00	4.6	1.50	5.1	2.00	17.	3.00
L066	2.86	9.50	3.44	6.00	3.35	2.00		0.00	5.32	9.00	19.8	18.00
MEDIAN CONC.	2.915		3.455		3.485		4.925		5.400		19.250	

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003	.3	9.50	3.3	9.00	35.	3.00
L007	.48	22.00	3.42	19.50	37.5	9.00
L009	.31	13.00	3.3	9.00	37.0	7.00
L013	.32	15.50	3.18	3.00	37.8	11.00
L014	.40	20.50	3.20	4.00	36.9	6.00
L019	.27	3.50	3.41	17.50	37.9	12.00
L020	.30	9.50	3.11	2.00	36.3	4.00
L021	.32	15.50	5.06 VH	24.00	42.56	24.00
L022	.31	9.50	3.4	15.00	30.	1.00
L024	.37 T	18.00	3.24	5.00	38.41	18.00
L025	.30	9.50	3.35	12.50	40.0	21.50
L027	.20 T	1.50	3.26	6.00	38.0	14.00
L028	.5	23.00	3.4	15.00	38.3	17.00
L029	.315	14.00	3.41	17.50	37.6	10.00
L032	.30	9.50	3.07	1.00	31.7	2.00
L048	.40	20.50	3.3	9.00	38.0	14.00
L050	.54	25.00	3.42	19.50	37.3	8.00
L057	.33	19.00	3.45	21.00	36.8	5.00
L058	.3	9.50	3.5	22.00	40.	21.50
L060	.29	5.00	3.35	12.50	38.7	19.00
L061	.27	3.50		0.00		0.00
L062	.21	1.50	3.4	15.00	42.	23.00
L063	.35	17.00	3.83	23.00	38.2	16.00
L064	.53	24.00	3.3	9.00	39.	20.00
L066	.232	6.00	3.30	9.00	38.0	14.00
MEDIAN CONC.	.310		3.350		37.950	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L003	65.50	8.188	8			DIONEX
L007	109.00	13.625	8			
L009	59.50	7.438	8			IC
L013	81.50	10.188	8			I.C.
L014	114.50	14.313	8	VHVH		CHROMAT. IONIQUE
L019	100.00	11.111	9			I.C.
L020	73.50	9.188	8			
L021	185.50	20.611	9	VH	BIASED HIGH	ION CHROMATOGRAPHY
L022	119.50	14.938	8			I.C.
L024	116.00	14.500	8			
L025	128.50	16.063	8			WESCAN IC
L027	95.00	10.556	9			
L028	165.50	18.389	9			DIONEX
L029	105.00	11.667	9			I.C.
L032	62.00	7.750	8			I C
L048	78.00	8.667	9			
L050	124.00	13.778	9	H		I.C.
L057	115.50	12.833	9			IC
L058	104.50	11.611	9			IC
L060	82.50	9.167	9			IC
L061	22.00	7.333	3		INSUFFICIENT DATA	IC
L062	126.50	14.056	9			
L063	162.50	18.056	9	HVH		IC DIONEX MODEL 10
L064	85.50	9.500	9			ION CHROM.
L066	73.50	9.188	8			

OVERALL AVERAGE RANK IS 12.284

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L061	22.00	7.333	3		INSUFFICIENT DATA	IC
L009	59.50	7.438	8			DIONEX
L032	62.00	7.750	8			DIONEX
L003	65.50	8.188	8			I.C.
L048	78.00	8.667	9			IC
L060	82.50	9.167	9			I.C.
L020	73.50	9.188	8			ION CHROM.
L066	73.50	9.188	8			IC DIONEX MODEL 10
L064	85.50	9.500	9			IC
L013	81.50	10.188	8			
L027	95.00	10.556	9			CHROMAT. IONIQUE
L019	100.00	11.111	9			I.C.
L058	104.50	11.611	9			
L029	105.00	11.667	9			
L057	115.50	12.833	9			
L007	109.00	13.625	8			I C
L050	124.00	13.778	9	H		IC
L062	126.50	14.056	9			I.C.
L014	114.50	14.313	8	VHVH		
L024	116.00	14.500	8			ION CHROMATOGRAPHY
L022	119.50	14.938	8			I.C.
L025	128.50	16.063	8			
L063	162.50	18.056	9	HVH		WESCAN IC
L028	165.50	18.389	9			
L021	185.50	20.611	9	VH	BIASED HIGH	

OVERALL AVERAGE RANK IS 12.284

84/03/27

PARAMETER: 160011 SULFATE NON IC METHODS MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5:MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.0000 BASIC ACCEPTABLE ERROR= .7600 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	3.1	10.00	4.2	5.00	3.6	8.50	4.9	12.50	5.3	8.00	19.8	15.00
L003	2.8	5.50		0.00	3.2	3.50	4.3	4.00	5.0	4.00	19.	8.50
L004	3.4	15.00	4.7	7.00	3.9	14.50	5.4	20.00	5.5	14.50	21.3	18.00
L006	2.88	5.50		0.00	3.14	2.00	4.26	3.00	4.79	2.00	16.1	4.00
L010	3.4	15.00		0.00	3.6	8.50	5.0	15.50	5.5	14.50	13.8 L	1.00
L011	3.25	13.00		0.00	3.67	11.00	4.61	5.00	5.03	5.00	19.1	10.00
L016	2.97	7.00	4.50	6.00	3.25	5.00	5.03	17.00	5.44	13.00	15.99	3.00
L020B	3.1	10.00		0.00	3.8	13.00	4.8	8.50	5.4	11.50	19.4	13.00
L023	3.2	12.00		0.00	3.6	8.50	4.9	12.50	5.2	6.00	19.3	12.00
L031A	3.0	8.00		0.00	3.9	14.50	4.9	12.50	5.3	8.00	18.5	6.00
L031B		0.00		0.00		0.00	4.8	8.50	5.3	8.00		0.00
L032	3.41	17.00		0.00	3.79	12.00	4.73	7.00	5.53	16.00	19.21	11.00
L033	5.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00	20.	16.00
L042	2.47	2.00	7.41 VH	9.00	5.35 VH	18.00	9.88 VH	21.00	8.23 VH	21.00	27.2 VH	20.00
L045	2.6	3.50	3.6	3.00	3.5	6.00	4.7	6.00	4.9	3.00	19.7	14.00
L046	2.6	3.50	3.1 L	2.00	3.2	3.50	3.6	2.00	3.9 L	1.00	14. L	2.00
L048	3.4	15.00	4.9	8.00	4.0	16.00	5.3	19.00	5.9	19.00	21.0	17.00
L049	1.6 VL	1.00	2.4 VL	1.00	2.1 L	1.00	2.7 VL	1.00	7.0 H	20.00	23.	19.00
L053	3.1	10.00	3.8	4.00	3.6	8.50	4.9	12.50	5.6	17.00	18.8	7.00
L061		0.00		0.00		0.00	4.84	10.00	5.32	10.00		0.00
L062	5.2 VH	19.00	9.2 VH	10.50	5.3 VH	17.00	5.0	15.50	5.4	11.50	19.	8.50
L063	5.8 VH	18.00	9.2 VH	10.50	5.7 VH	19.00	5.1	18.00	5.8	18.00	17.	5.00
MEDIAN CONC.	3.180		4.500		3.600		4.900		5.400		19.155	

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.8	16.00	3.2	9.00	36.1	10.00
L003	.5	12.50	3.1	6.00	36.	8.50
L004	1.3 H	19.00	3.8	17.00	39.6	18.00
L006	.29	5.00	2.49	2.00	30.90	2.00
L010	.6T	14.50	3.2	9.00	35.9	7.00
L011	.46T	11.00	3.42	13.00	35.3	6.00
L016	.02	1.00	2.99	4.00	37.61	16.00
L020B	.4T	9.50	3.1	6.00	37.2	14.00
L023	.3	6.50	3.2	9.00	37.	12.50
L031A	.5	12.50	3.1	6.00	33.5	4.50
L031B		0.00		0.00		0.00
L032	1.297 H	18.00	3.41	12.00	36.94	11.00
L033	5.W	0.00	5.W	0.00	37.	12.50
L042	4.53 VH	20.00	6.59 VH	19.00	39.9	19.00
L045	.1T	2.00	3.6	14.50	33.5	4.50
L046	.2	3.50	2.7	3.00	27. L	1.00
L048	.6	14.50	3.8	17.00	39.3	17.00
L049	1.2 H	17.00	1.2 VL	1.00	40.	20.00
L053	.4	9.50	3.6	14.50	37.6	15.00
L061	.36	8.00		0.00		0.00
L062	.2T	3.50	3.3	11.00	36.	8.50
L063	.3	6.50	3.8	17.00	32.	3.00
MEDIAN CONC.	.430		3.200		36.520	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING.
L002	94.00	10.444	9			TECHNICON
L003	52.50	6.563	8			TECHNICON MTB
L004	143.00	15.889	9	H		16306L
L006	25.50	3.188	8		BIASED LOW	AUTO ANALYZER
L010	85.00	10.625	8	L		MTB-AUTO
L011	74.00	9.250	8			
L016	72.00	8.000	9			M.T.B
L020B	85.50	10.688	8			METHYL-THIMO
L023	79.00	9.875	8			AUTO. MTB
L031A	72.00	9.000	8			TECHNICON CALMAGIT
L031B	16.50	8.250	2		INSUFFICIENT DATA	RESINES
L032	104.00	13.000	8	H		AUTOMATED MTB
L033	28.50	14.250	2		INSUFFICIENT DATA	AUTO MTB
L042	149.00	16.556	9	VHVHVHVHVHVHVH	BIASED HIGH	GRAVIMETRIC
L045	56.50	6.278	9			U.V.-M.T.B.
L046	21.50	2.389	9	LLLL	BIASED LOW	AUTOANALYZER
L048	142.50	15.833	9			TECHNICON
L049	81.00	9.000	9	VLVLLVLHHVL		TURBIDIMETRIC
L053	98.00	10.889	9			COLORIMETRIC
L061	28.00	9.333	3		INSUFFICIENT DATA	TECHNICON AA II
L062	105.00	11.667	9	VHVHVH		TURBIDIMETRIC
L063	115.00	12.778	9	VHVHVH		AUTO-TURB.

OVERALL AVERAGE RANK IS 10.165

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L046	21.50	2.389	9	LLLL	BIASED LOW	AUTOANALYZER
L006	25.50	3.188	8		BIASED LOW	AUTO ANALYZER
L045	56.50	6.278	9			U.V.-M.T.B.
L003	52.50	6.563	8			TECHNICON MTB
L016	72.00	8.000	9			M.T.B
L031B	16.50	8.250	2		INSUFFICIENT DATA	RESINES
L031A	72.00	9.000	8			TECHNICON CALMAGIT
L049	81.00	9.000	9	VLVLLVLHHVL		TURBIDIMETRIC
L011	74.00	9.250	8			
L061	28.00	9.333	3		INSUFFICIENT DATA	TECHNICON AA II
L023	79.00	9.875	8			AUTO. MTB
L002	94.00	10.444	9			TECHNICON
L010	85.00	10.625	8	L		MTB-AUTO
L020B	85.50	10.688	8			METHYL-THIMO
L053	98.00	10.889	9			COLORIMETRIC
L062	105.00	11.667	9	VHVHVH		TURBIDIMETRIC
L063	115.00	12.778	9	VHVHVH		AUTO-TURB.
L032	104.00	13.000	8	H		AUTOMATED MTB
L033	28.50	14.250	2		INSUFFICIENT DATA	AUTO MTB
L048	142.50	15.833	9			TECHNICON
L004	143.00	15.889	9	H		16306L
L042	149.00	16.556	9	VHVHVHVHVHVHVH	BIASED HIGH	GRAVIMETRIC

OVERALL AVERAGE RANK IS 10.165

PARAMETER: 16092 SULFATE (ALL METHODS) MG/L 84/03/27

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.8	41.00	3.2	12.50	36.1	13.00
L003	.3	15.50	3.3	19.50	35.	8.00
L003B	.5	35.00	3.1	7.00	36.	11.50
L004	1.3 H	44.00	3.8	39.00	39.6	38.00
L006	.29	9.50	2.49	2.00	30.90	3.00
L007	.48	33.00	3.42	32.00	37.5	23.00
L009	.31	20.00	3.3	19.50	37.0	19.00
L010	.6T	39.50	3.2	12.50	35.9	10.00
L011	.46T	32.00	3.42	32.00	35.3	9.00
L013	.32	22.50	3.18	10.00	37.8	27.00
L014	.40	29.50	3.20	12.50	36.9	16.00
L016	.02	1.00	2.99	4.00	37.61	26.00
L019	.27	7.50	3.41	29.00	37.9	28.00
L020	.30	15.50	3.11	9.00	36.3	14.00
L020B	.4T	29.50	3.1	7.00	37.2	21.00
L021	.32	22.50	5.06 VH	42.00	42.56	44.00
L022	.3T	15.50	3.4	26.00	30.	2.00
L023	.3	15.50	3.2	12.50	37.	19.00
L024	.37T	26.00	3.24	15.00	38.41	34.00
L025	.30	15.50	3.35	23.50	40.0	41.00
L027	.20T	4.50	3.26	16.00	38.0	30.00
L028	.5	35.00	3.4	26.00	38.3	33.00
L029	.31S	21.00	3.41	29.00	37.6	24.50
L031A	.5	35.00	3.1	7.00	33.5	6.50
L031B		0.00		0.00		0.00
L032	1.297 H	43.00	3.41	29.00	36.94	17.00
L032B	.30	15.50	3.07	5.00	31.7	4.00
L033	5.W	0.00	5.W	0.00	37.	19.00
L042	4.53 VH	45.00	6.59 VH	43.00	39.9	39.00
L045	.1T	2.00	3.6	36.50	33.5	6.50
L046	.2	4.50	2.7	3.00	27. L	1.00
L048	.40	29.50	3.3	19.50	38.0	30.00
L048B	.5	39.50	3.8	39.00	39.3	37.00
L049	1.2 H	42.00	1.2 VL	1.00	40.	41.00
L050	.34	38.00	3.42	32.00	37.3	22.00
L053	.4	29.50	3.6	36.50	37.6	24.50
L057	.39	27.00	3.45	34.00	36.8	15.00
L058	.3	15.50	3.5	35.00	40.	41.00
L060	.29	9.50	3.35	23.50	38.7	35.00
L061	.27	7.50		0.00		0.00
L061B	.36	25.00		0.00		0.00
L062	.2T	4.50	3.3	19.50	36.	11.50
L062B	.2T	4.50	3.4	26.00	42.	43.00
L063	.3	15.50	3.8	39.00	32.	5.00
L063B	.35	24.00	3.83	41.00	38.2	32.00
L064	.53	37.00	3.3	19.50	39.	36.00
L066	.292	11.00	3.30	19.50	38.0	30.00
MEDIAN CONC.	.320		3.300		37.400	

PARAMETER: 16092 SULFATE (ALL METHODS) MG/L

84/03/27

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5: MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.0000 BASIC ACCEPTABLE ERROR= .7600 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	3.1	28.00	4.2	19.00	3.6	28.00	4.9	23.00	5.3	16.00	19.8	32.50
L003	2.7	7.00		0.00	3.4	11.00	4.9	23.00	5.4	24.50	19.	18.50
003B	2.8	12.00		0.00	3.2	3.50	4.3	4.00	5.0	5.00	19.	18.50
L004	3.4	35.50	4.7 H	21.00	3.9	36.50	5.4	42.00	5.5	33.50	21.3	41.00
L006	2.80	12.00		0.00	3.14	2.00	4.26	3.00	4.79	3.00	16.1	4.00
L007	2.89	18.00		0.00	3.48	16.50	5.38	41.00	5.38	21.00	16.0	6.00
L009	2.7	7.00		0.00	3.4	11.00	4.8	12.00	5.4	24.50	17.5	9.00
L010	3.4	35.50		0.00	3.6	28.00	5.0	29.50	5.5	33.50	13.8 L	1.00
L011	3.26	33.00		0.00	3.67	31.50	4.61	7.00	5.03	6.00	19.1	21.00
L013	2.97	21.50		0.00	3.49	18.50	4.81	14.50	5.14	8.00	19.4	27.50
L014	3.00	24.50		0.00	3.40	11.00	8.80 VH	44.00	8.50 VH	46.00	19.20	22.00
L016	2.97	21.50	4.50	20.00	3.25	5.00	5.03	33.00	5.44	28.00	15.99	3.00
L019	2.95	20.00	3.48	11.00	3.67	31.50	4.76	10.00	5.20	12.00	19.3	25.00
L020	2.70	7.00		0.00	3.42	13.00	5.07	34.00	5.62	39.00	18.5	13.50
L020B	3.1	28.00		0.00	3.9	35.00	4.8	12.00	5.4	24.50	19.4	27.50
L021	3.02	26.00	3.68	16.00	3.68	33.00	5.23	39.00	5.78	41.00	21.87	42.00
L022	3.8	40.00		0.00	4.1	39.00	5.0	29.50	5.7	40.00	19.	18.50
L023	3.2	30.00		0.00	3.6	28.00	4.9	23.00	5.2	12.00	19.3	25.00
L024	2.34	19.00		0.00	3.59	25.00	5.01	32.00	5.57	37.00	17.61	11.00
L025	3.25	32.00		0.00	3.55	24.00	4.90	23.00	5.40	24.50	20.5	38.50
L027	2.87	17.00	3.49	12.00	3.44	15.00	4.81	14.50	5.48	31.00	19.9	34.00
L028	3.4	35.50	3.5	13.50	3.9	21.50	5.2	38.00	5.5	33.50	20.5	38.50
L029	2.71	9.00	3.32	5.50	3.43	14.00	4.87	18.50	5.46	29.50	20.1	37.00
L031A	3.8	24.50		0.00	3.9	36.50	4.9	23.00	5.3	16.00	18.5	13.50
L031B		0.00		0.00		0.00	4.8	12.00	5.3	16.00		0.00
L032	3.41	38.00		0.00	3.79	34.00	4.73	9.00	5.53	36.00	19.21	23.00
L032B	3.24	31.00		0.00	3.48	16.50	4.95	27.00	5.18	10.00	16.68	5.00
L033	2.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00	20.	35.50
L042	2.47	2.00	7.41 VH	23.00	5.35 VH	41.00	9.88 VH	45.00	8.23 VH	45.00	27.2 VH	44.00
L045	2.8	4.00	3.6	15.00	3.5	21.50	4.7	0.00	4.9	4.00	19.7	31.00
L046	2.6	4.00	3.1	2.00	3.2	3.50	3.6	2.00	3.9 L	1.00	14. L	2.00
L048	2.8	12.00	3.3	4.00	3.3	6.00	4.6	5.50	5.2	12.00	19.5	29.50
L048B	3.4	35.50	4.9 H	22.00	4.0	38.00	5.3	40.00	5.9	43.00	21.0	40.00
L049	1.6 L	1.00	2.4 L	1.00	2.1 L	1.00	2.7 VL	1.00	7.0 H	44.00	23.	43.00
L050	2.85	15.50	3.46	10.00	3.49	18.50	6.61 H	43.00	5.17	9.00	19.3	25.00
L053	3.1	28.00	3.8	17.00	3.5	28.00	4.9	23.00	5.6	38.00	18.8	16.00
L057	2.93	23.00	3.45	9.00	3.38	8.00	5.17	37.00	5.46	29.50	18.7	15.00
L058	2.8	12.00	3.5	13.50	3.5	21.50	4.9	23.00	4.7	2.00	17.6	10.00
L060	2.83	12.00	3.32	5.50	3.39	9.00	4.85	17.00	5.28	14.00	19.5	29.50
L061		0.00		0.00		0.00	4.87	18.50	5.34	20.00		0.00
L061B		0.00		0.00		0.00	4.84	16.00	5.32	18.50		0.00
L062	6.2 VH	43.00	9.2 VH	24.50	5.3 VH	40.00	5.0	29.50	5.4	24.50	19.	18.50
L062B	3.5	39.00	3.2	3.00	3.5	21.50	5.0	29.50	5.4	24.50	20.	35.50
L063	5.8 VH	42.00	9.2 VH	24.50	5.7 VH	42.00	5.1	35.00	5.8	42.00	17.	7.50
L063B	3.97 H	41.00	3.92	18.00	5.90 VH	43.00	5.16	36.00	5.50	33.50	18.3	12.00
L064	2.5	4.00	3.4	7.00	3.6	28.00	4.6	5.50	5.1	7.00	17.	7.50
L066	2.86	15.50	3.44	8.00	3.35	7.00		0.00	5.32	18.50	19.8	32.50
MEDIAN CONC.	2.370		3.500		3.500		4.900		5.400		19.205	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	213.00	23.667	9			TECHNICON
L003	127.00	15.875	8			DIONEX
L003B	96.50	12.063	8			TECHNICON MTB
L004	330.50	36.722	9	HH	BIASED HIGH	16306L
L006	38.50	4.813	8		BIASED LOW	AUTO ANALYZER
L007	190.50	23.813	8			
L009	122.00	15.250	8			
L010	189.50	23.688	8	L		MTB-AUTO
L011	171.50	21.438	8			
L013	149.50	18.688	8			IC
L014	205.50	25.688	8	VHVH		I.C.
L016	141.50	15.722	9			M.T.B
L019	174.00	19.333	9			CHROMATOGRAPHIE IO
L020	145.00	18.125	8			I.C.
L020B	184.50	23.063	8			METHLY-THIMO
L021	305.50	33.944	9	VH		
L022	210.50	26.313	8			ION CHROMATOGRAPHY
L023	165.00	20.625	8			AUTO. MTB
L024	199.00	24.875	8			
L025	222.00	27.750	8			I.C.
L027	174.00	19.333	9			
L028	274.50	30.500	9			WESCAN IC
L029	181.00	20.889	9			
L031A	162.00	20.250	8			TECHNICON CALMAGIT
L031B	28.00	14.000	2		INSUFFICIENT DATA	RESINES
L032	229.00	28.625	8	H		AUTOMATED MTB
L032B	114.00	14.250	8			DIONEX
L033	54.50	27.250	2		INSUFFICIENT DATA	AUTO MTB
L042	327.00	36.333	9	VHVHVHVHVHVHVH	BIASED HIGH	GRAVIMETRIC
L045	128.50	14.278	9			U.V.-M.T.B.
L046	23.00	2.556	9	LLL	BIASED LOW	AUTOANALYZER
L048	148.00	16.444	9			I.C.
L048B	334.00	37.111	9	H	BIASED HIGH	TECHNICON
L049	175.00	19.444	9	LLLVLHHVL		TURBIDIMETRIC
L050	213.00	23.667	9	H		I.C.
L053	240.50	26.722	9			COLORIMETRIC
L057	197.50	21.944	9			
L058	173.50	19.278	9			I.C.
L060	155.00	17.222	9			IC
L061	46.00	15.333	3		INSUFFICIENT DATA	IC
L061B	59.50	19.833	3		INSUFFICIENT DATA	TECHNICON AA II
L062	215.50	23.944	9	VHVHVH		TURBIDIMETRIC
L062B	226.50	25.167	9			IC
L063	252.50	28.056	9	VHVHVH		AUTO-TURB.
L063B	280.50	31.167	9	HVH		
L064	151.50	16.833	9			IC DIONEX MODEL 10
L066	142.00	17.750	8			ION CHROM.

OVERALL AVERAGE RANK IS 21.942

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L010	5.00	2.500	2	LL	INSUFFICIENT DATA	POTENTIOMETRIC
L010B	97.00	12.125	8			TITRATION
L011	90.50	11.313	8	L		
L016	156.00	17.333	9	VHVHVHVHVHVHH	BIASED HIGH	TITRATION
L020	125.00	15.625	8	VHVHVH		GRANS-PLT.
L022	100.50	12.563	8	H		TITRATION PH 8.3
L023	59.00	7.375	8			POTENTIOMETRIC
L025	28.00	3.500	8	LVL	BIASED LOW	AUTO-TITR+N
L029	62.00	6.889	9	L		
L030	53.00	5.889	9			POTENTIOMETRIC
L032	26.00	3.250	8	VLVLL	BIASED LOW	GRANSPLOT TITRA
L033	0.00	0.000	0		INSUFFICIENT DATA	MANUAL TITRATION
L042	159.00	17.667	9	VHVHVHVHVHVHVHVH	BIASED HIGH	TO PH 8.3
L045	49.00	9.800	5		INSUFFICIENT DATA	AUTO PHENOLPHTHAL
L046	128.50	14.278	9	VH		
L049	28.00	14.000	2		INSUFFICIENT DATA	TO PH 8.3
L053	74.50	8.278	9			TITRATION
L057	90.50	10.056	9	H		
L060	113.50	12.611	9	HH		TITRATION
L062	6.00	1.000	6	VLVLLVLVLL	BIASED LOW	TITRATION
L063	110.00	12.222	9			EP TITR.
L064	100.00	12.500	8			GRAN TITRA(ACIDITY
L066	28.00	3.500	8	LL	BIASED LOW	TITRATION TO PH 8.

OVERALL AVERAGE
RANK IS 10.054

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L033	0.00	0.000	0		INSUFFICIENT DATA	MANUAL TITRATION
L062	6.00	1.000	6	VLVLLVLVLL	BIASED LOW	TITRATION
L010	5.00	2.500	2	LL	INSUFFICIENT DATA	POTENTIOMETRIC
L032	26.00	3.250	8	VLVLL	BIASED LOW	GRANSPLOT TITRA
L025	28.00	3.500	8	LVL	BIASED LOW	AUTO-TITR+N
L066	28.00	3.500	8	LL	BIASED LOW	TITRATION TO PH 8.
L030	53.00	5.889	9			POTENTIOMETRIC
L029	62.00	6.889	9	L		
L023	59.00	7.375	8			POTENTIOMETRIC
L053	74.50	8.278	9			TITRATION
L045	49.00	9.800	5		INSUFFICIENT DATA	AUTO PHENOLPHTHA.
L057	90.50	10.056	9	H		
L011	90.50	11.313	8	L		
L010B	97.00	12.125	8			TITRATION
L063	110.00	12.222	9			EP TITR.
L064	100.00	12.500	8			GRAN TITRA(ACIDITY
L022	100.50	12.563	8	H		TITRATION PH 8.3
L060	113.50	12.611	9	HH		TITRATION
L049	28.00	14.000	2		INSUFFICIENT DATA	TO PH 8.3
L046	128.50	14.278	9	VH		
L020	125.00	15.625	8	VHVHVH		GRANS-PLT.
L016	156.00	17.333	9	VHVHVHVHVHVHH	BIASED HIGH	TITRATION
L042	159.00	17.667	9	VHVHVHVHVHVHVHVH	BIASED HIGH	TO PH 8.3

OVERALL AVERAGE
RANK IS 10.054

84/03/27

PARAMETER: 01091 ACIDITY MGCO3/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5:MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= .7500 CONCENTRATION ERROR INCREMENT= .5000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L010	1.0W	0.00		0.00	1.0W	0.00	1.5 L	3.00	1.5 L	2.00	1.0W	0.00
L010B	3.0	16.00		0.00	2.0	11.50	4.5	10.50	4.5	12.50	2.0	13.00
L011	2.57	11.00		0.00	1.64	9.00	5.44	16.00	4.62	14.00	.21T L	3.00
L016	5.10 VH	19.00	5.60 VH	12.00	3.70 VH	16.00	10.00 VH	21.00	5.70	20.00	4.30 VH	17.00
L020	3.4	18.00		0.00	5.0 VH	18.00	5.1	14.50	5.2	18.00	3.9 VH	16.00
L022	2.	4.00		0.00	2.	11.50	7.	20.00	5.	16.00	.9T	7.00
L023	2.24	6.00		0.00	1.76	10.00	4.01	6.00	3.69	6.00	1.12	8.00
L025	2.03	5.00		0.00	.644	2.00	2.91	4.00	3.97	8.00	0. L	2.00
L029	2.71	14.00	2.15	4.00	1.53	8.00	3.29	5.00	3.65	5.00	.86T	6.00
L030	2.29	8.00	2.29	5.00	1.44	6.00	4.39	9.00	3.74	7.00	.48	4.00
L032	2.263	7.00		0.00	.8317	3.00	4.312	8.00	2.43	3.00	-1.6 VL	1.00
L033		0.00		0.00		0.00	5.W	0.00	5.W	0.00		0.00
L042	9.6 VH	20.00	5.2 VH	11.00	4.8 VH	17.00	12.5 VH	22.00	11.5 VH	22.00	1.6	11.00
L045	2.5	10.00		0.00		0.00	4.8	13.00	4.9	12.50		0.00
L046	3.2	17.00	3.1	8.00	2.4	13.00	4.7	12.00	5.5	19.00	2.6 VH	15.00
L049		0.00		0.00		0.00	6.	18.50	4.	9.50		0.00
L053	2.6	12.50	2.4	6.00	1.5	7.00	4.2	7.00	4.4	11.00	.5	5.00
L057	2.3	9.00	3.2	9.00	1.3	5.00	4.5	10.50	4.0	9.50	1.2	9.00
L060	1.8	3.00	2.0	3.00	3.0 H	15.00	6.0	18.50	6.0	21.00	2.2 H	14.00
L062	.16 VL	1.00	.10 VL	1.00	.10 L	1.00	.10 VL	1.00	.10 VL	1.00		0.00
L063	2.96	15.00	3.21	10.00	2.47	14.00	5.1	14.50	5.18	17.00	1.48	10.00
L064	2.6	12.50	2.9	7.00		0.00	5.6	17.00	4.9	15.00	1.0	12.00
L066	1.781	2.00	1.934	2.00	1.039	4.00	1.037 L	2.00	3.148	4.00		0.00
MEDIAN CONC.	2.535		2.650		1.700		4.600		4.450		1.200	

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L010	1.0W	0.00	1.0W	0.00	1.0W	0.00
L010B	2.0	14.00	2.0	11.50	1.5	8.00
L011	2.05	16.00	1.23	7.50	2.16	14.00
L016	3.10 VH	19.00	2.70 H	15.00	2.40	17.00
L020	1.5	10.50	4.0 VH	18.00	2.0	12.00
L022	2.	14.00	3. H	16.00	2.	12.00
L023	1.44	8.00	1.12	6.00	1.60	9.00
L025	.639	3.00	0. VL	2.00	.841	2.00
L029	1.49	9.00	.48T L	4.00	1.38	7.00
L030	1.02	4.00	.62	5.00	1.25	5.00
L032	.513A	2.00	-9.91 VL	1.00	.2728 L	1.00
L033		0.00		0.00		0.00
L042	5.8 VH	20.00	3.8 VH	17.00	7.7 VH	19.00
L045	1.5	10.50		0.00	1.1	3.00
L046	2.1	17.00	2.0	11.50	2.3	16.00
L049		0.00		0.00		0.00
L053	1.2	6.50	1.6	9.50	1.8	10.00
L057	1.2	6.50	2.6	14.00	3.0 H	18.00
L060	2.0	14.00	2.2	13.00	2.0	12.00
L062	.10 L	1.00		0.00		0.00
L063	2.47	18.00	1.23	7.50	1.11	4.00
L064	1.9	12.00	1.6	9.50	2.2	15.00
L066	1.035	5.00	.322 L	3.00	1.302	6.00
MEDIAN CONC.	1.300		1.600		1.800	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L046	23.00	2.556	9	LLL	BIASED LOW	AUTOANALYZER
L005	39.50	4.813	8		BIASED LOW	AUTO ANALYZER
L003B	96.50	12.063	8			TECHNICON MTB
L031B	28.00	14.000	2		INSUFFICIENT DATA	RESINES
L032B	114.00	14.250	8			DIONEX
L045	128.50	14.278	9			U.V.-M.T.B.
L009	122.00	15.250	8			
L061	46.00	15.333	3		INSUFFICIENT DATA	IC
L016	141.50	15.722	9			M.T.B
L003	127.00	15.875	8			DIONEX
L048	148.00	16.444	9			I.C.
L064	151.50	16.833	9			IC DIONEX MODEL 10
L060	155.00	17.222	9			IC
L066	142.00	17.750	8			ION CHROM.
L020	145.00	18.125	8			I.C.
L013	149.50	18.688	8			IC
L058	173.50	19.278	9			I.C.
L019	174.00	19.333	9			CHROMATOGRAPHIE IO
L027	174.00	19.333	9			
L049	175.00	19.444	9	LLL VLHHVL		TURBIDIMETRIC
L061B	53.50	19.833	3		INSUFFICIENT DATA	TECHNICON AA II
L031A	162.00	20.250	8			TECHNICON CALMAGIT
L023	165.00	20.625	8			AUTO. MTB
L029	188.00	20.889	9			
L011	171.50	21.438	8			
L057	197.50	21.944	9			
L020B	184.50	23.063	8			METHLY-THIMO
L050	213.00	23.667	9	H		I C
L002	213.00	23.667	9			TECHNICON
L010	189.50	23.688	8	L		MTB-AUTO
L007	190.50	23.813	8			
L062	215.50	23.944	9	VHVHVH		TURBIDIMETRIC
L024	199.00	24.875	8			
L062B	226.50	25.167	9			IC
L014	205.50	25.688	8	VHVH		I.C.
L022	210.50	26.313	8			ION CHROMATOGRAPHY
L053	240.50	26.722	9			COLORIMETRIC
L033	54.50	27.250	2		INSUFFICIENT DATA	AUTO MTB
L025	222.00	27.750	8			I.C.
L063	252.50	28.056	9	VHVHVH		AUTO-TURB.
L032	229.00	28.625	8	H		AUTOMATED MTB
L028	274.50	30.500	9			WESCAN IC
L063B	280.50	31.167	9	HVH		
L021	305.50	33.944	9	VH		
L042	327.00	36.333	9	VHVHVHVHVHVHVHV4	BIASED HIGH	GRAVIMETRIC
L004	330.50	36.722	9	HH	BIASED HIGH	16306L
L048B	334.00	37.111	9	H	BIASED HIGH	TECHNICON

OVERALL AVERAGE RANK IS 21.942

84/03/27

PARAMETER: 06192 TOTAL ALKALINITY MG CACO3/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5:MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.5000 BASIC ACCEPTABLE ERROR= 1.2000 CONCENTRATION ERROR INCREMENT= .0000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	1.5	13.00	2.1	7.00	5.1	14.00	1.9	8.00	1.9	8.00	85.8	22.00
L003		0.00		0.00		0.00		0.00		0.00	79.	4.50
L004	.5T	8.00	1.4 L	1.00	4.5	6.50	.5T	5.00	.5T	5.00	79.8	7.00
L006	0. L	2.00		0.00	4.79	9.00	0.	2.50	0.	2.00	80.5	9.00
L010	1.0W	0.00		0.00	4.0	2.00	1.0W	0.00	1.0W	0.00	79.0	4.50
L011	1.54	14.00		0.00	6.18	16.00	.10W	0.00	.10W	0.00	81.5	11.00
L016	0.00 L	2.00	1.52 L	2.00	3.95	1.00	0.00	2.50	0.00	2.00	81.26	10.00
L018	.40T	7.00	1.65	3.00	4.40	5.00		0.00		0.00	79.6	6.00
L022	.9T	10.00		0.00	7.3 VH	22.00	0.W	0.00	0.W	0.00	89.	26.00
L023	3.0 H	20.00		0.00	6.00	15.00	0.0	2.50	1.0	6.50	82.0	14.50
L024	1.59	15.00		0.00	6.22	17.00		0.00		0.00	81.72	12.00
L027	6.4 VH	22.00	5.7 VH	15.00	11.3 VH	25.00	.1W	0.00	.4T	4.00	83.0	19.00
L029	.80T	9.00	2.28	8.00	5.00	11.50	.4W	0.00	.4W	0.00	82.7	18.00
L030	1.70	17.00	3.82	13.00	6.73 H	20.00	.01W	0.00	.01W	0.00	86.1	24.00
L031A	.15 L	5.00		0.00	4.1	3.00	.1W	0.00	.1W	0.00	82.	14.50
L031B		0.00		0.00		0.00	.1W	0.00	.1W	0.00		0.00
L032	1.476	12.00		0.00	6.267	18.00	0.0	2.50	0.0	2.00	86.18	25.00
L033	5.W	0.00	5.W	0.00	7. H	21.00		0.00		0.00	84.	20.00
L042	19.4 VH	23.00	19.6 VH	17.00	21.4 VH	26.00	13.6 VH	10.00	14.6 VH	10.00	97.1 VH	27.00
L045	.05T L	4.00	1.9	5.00	4.7	8.00	0.0W	0.00	0.0W	0.00	74.9	1.00
L046	0.0 L	2.00	2.0	6.00	4.3	4.00		0.00		0.00	82.	14.50
L048	1.6	16.00	3.6	12.00	6.4	19.00	.8W	0.00	.8W	0.00	82.4	17.00
L049	2.	18.00	3.	11.00	5.	11.50		0.00		0.00	80.	8.00
L057	3.0 H	20.00	2.8	9.00	5.0	11.50	.2W	0.00	.2W	0.00	78.0	3.00
L060	.3	6.00	1.8	4.00	4.5	6.50	0.W	0.00	0.W	0.00	76.0	2.00
L062	1.W	0.00	8. VH	16.00	10. VH	24.00	1.T	6.50	1.W	0.00	86.	23.00
L063	3. H	20.00	5. VH	14.00	8. VH	23.00	3. VH	9.00	5. VH	9.00	85.	21.00
L064	1.T	11.00	2.9	10.00	5.0	11.50	1.T	6.50	1.T	6.50	82.	14.50
MEDIAN CONC.	1.476		2.800		5.050		.750		.750		82.000	

PARAMETER: 06192 TOTAL ALKALINITY MG CACO3/L 84/03/27

SAMPLE LAB NO	8 REPORTED VALUE	RANK	9 REPORTED VALUE	RANK	10 REPORTED VALUE	RANK
L002	2.5 H	17.00	40.7	13.00	2.2	16.00
L003		0.00	38.7	4.50		0.00
L004	.5T	6.00	39.6	9.00	.5T	6.50
L006	0.	1.00	39.9	10.00	0. L	1.00
L010	.5T	6.00	38.0	2.50	.5T	6.50
L011	.10W	0.00	40.4	11.50	.10W	0.00
L016	.63	9.00	41.05	16.00	.32	5.00
L018	.10T	2.00	39.45	8.00	.20T L	2.50
L022	3.3 VH	21.00	41.	14.50	2.6	17.00
L023	2.00	16.00	42.0	17.00	2.0	14.00
L024	1.83	15.00	42.35	20.00	1.65	12.00
L027	2.6 H	18.00	42.3	18.50	2.7 H	18.00
L029	.82T	10.00	40.4	11.50	1.24T	11.00
L030	1.87	14.00	43.0	22.50	1.83	13.00
L031A	.15	3.00	42.3	18.50	.1W	0.00
L031B		0.00		0.00		0.00
L032	2.993 VH	19.00	43.99	24.00	2.101	15.00
L033	5.W	0.00	43.	22.50	5.W	0.00
L042	15.5 VH	23.00	52.4 VH	27.00	15.5 VH	22.00
L045	0.0W	0.00	38.8	6.00	0.0W	0.00
L046	.5	6.00	38.7	4.50	.2 L	2.50
L048	1.2	13.00	42.4	21.00	2.8 H	19.00
L049	1.	11.50	38.	2.50	1.	9.50
L057	.6	8.00	41.0	14.50	.8	8.00
L060	.2	4.00	36.4 L	1.00	.3	4.00
L062	5. VH	22.00	44.	25.50	7. VH	21.00
L063	3. VH	20.00	44.	25.50	3. H	20.00
L064	1.T	11.50	39.	7.00	1.T	9.50
MEDIAN CONC.	1.000		41.000		1.445	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	118.00	13.111	9	H		TOT-CO2
L003	9.00	4.500	2		INSUFFICIENT DATA	ACID TITRATION
L004	54.00	6.000	9	L	BIASED LOW	10101L
L006	36.50	4.563	8	LL	BIASED LOW	TITROPROCESSOR
L010	21.50	4.300	5		INSUFFICIENT DATA	POTENTIOMETRIC TIT
L011	52.50	13.125	4		INSUFFICIENT DATA	
L016	49.50	5.500	9	LL	BIASED LOW	TITRATION
L018	33.50	4.786	7	L	BIASED LOW	POTENTIOMETRIC
L022	110.50	18.417	6	VHVH		TITRATION ;PH 4.8
L023	105.50	13.188	8	H		POTENTIOMETRIC
L024	91.00	15.167	6			TITRATION ;PH 4.5
L027	139.50	17.438	8	VHVHVHHH		TITRATION PH 4.5
L029	79.00	11.286	7			
L030	123.50	17.643	7	H		POTENTIOMETRIC
L031A	44.00	8.800	5	L	INSUFFICIENT DATA	TITRAGE CONDUCTIV
L031B	0.00	0.000	0		INSUFFICIENT DATA	RESINES
L032	117.50	14.688	8	VH		COMPUTERIZED TITRA
L033	63.50	21.167	3	H	INSUFFICIENT DATA	TITRIMETER
L042	185.00	20.556	9	VHVHVHVHVHVHVHVHVH	BIASED HIGH	TO PH 3.7
L045	24.00	4.800	5	L	INSUFFICIENT DATA	AUTO BROMOPHENOL
L046	39.50	5.643	7	LL	BIASED LOW	
L048	117.00	16.714	7	H		TITRATION
L049	72.00	10.286	7			TO PH 4.5
L057	74.00	10.571	7	H		
L060	27.50	3.929	7	L	BIASED LOW	TITRATION
L062	138.00	19.714	7	VHVHVHVH	BIASED HIGH	AUTOMATIC TITRATOR
L063	161.50	17.944	9	HVHVHVHVHVHH		EP TITR.
L064	88.00	9.778	9			METHOD 310.1

OVERALL AVERAGE RANK IS 11.757

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L031B	0.00	0.000	0		INSUFFICIENT DATA	RESINES
L060	27.50	3.929	7	L	BIASED LOW	TITRATION
L010	21.50	4.300	5		INSUFFICIENT DATA	POTENTIOMETRIC TIT
L003	9.00	4.500	2		INSUFFICIENT DATA	ACID TITRATION
L006	36.50	4.563	8	LL	BIASED LOW	TITROPROCESSOR
L018	33.50	4.786	7	L	BIASED LOW	POTENTIOMETRIC
L045	24.00	4.800	5	L	INSUFFICIENT DATA	AUTO BROMOPHENOL
L016	43.50	5.500	9	LL	BIASED LOW	TITRATION
L045	39.50	5.643	7	LL	BIASED LOW	
L004	54.00	6.000	9	L	BIASED LOW	10101L
L031A	44.00	8.800	5	L	INSUFFICIENT DATA	TITRAGE CONDUCTIV
L064	88.00	9.778	9			METHOD 310.1
L049	72.00	10.286	7			TO PH 4.5
L057	74.00	10.571	7	H		
L029	79.00	11.286	7			
L002	118.00	13.111	9	H		TOT-CO2
L011	52.50	13.125	4		INSUFFICIENT DATA	
L023	105.50	13.188	8	H		POTENTIOMETRIC
L032	117.50	14.688	8	VH		COMPUTERIZED TITRA
L024	31.00	15.167	6			TITRATION ;PH 4.5
L048	117.00	16.714	7	H		TITRATION
L027	139.50	17.438	8	VHVHVHHH		TITRATION PH 4.5
L030	123.50	17.643	7	H		POTENTIOMETRIC
L063	161.50	17.944	9	HVHVHVHVHVHH		EP TITR.
L022	110.50	18.417	6	VHVH		TITRATION ;PH 4.8
L062	139.00	19.714	7	VHVHVHVH	BIASED HIGH	AUTOMATIC TITRATOR
L042	185.00	20.556	9	VHVHVHVHVHVHVHVHVH	BIASED HIGH	TO PH 3.7
L033	63.50	21.167	3	H	INSUFFICIENT DATA	TITRIMETER

OVERALL AVERAGE RANK IS 11.757

LAB NO.	TOTAL RANK	AVERAGE RANK	NO OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L027	35.50	3.944	9			10110L
L004	36.00	4.000	9	VLVLVHVHVLVL		TITRATION TO PH 4.
L024	34.50	4.313	8		INSUFFICIENT DATA	
L019	18.00	4.500	4			COMPUTERIZED TITRA
L032	36.50	4.563	8	L		
L058	50.00	5.556	9	VLVL		METROHM
L014	49.50	6.188	8			POTENTIOMETRIC
L030	51.00	6.375	8			GRAN ANALY.TITRAT.
L018	58.00	6.444	9	VHVH		ACID TITRATION
L003	44.00	7.333	6	VLVH		GRAN TITRA.
L053	72.50	8.056	9			GRANS-PLT.
L020	71.50	8.938	8	VHVH		

OVERALL AVERAGE RANK IS 5.863

GRAND TITR ALK

84/03/27

PARAMETER: 06282 GRAND TITR ALK MG/LCACO3

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5: MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .0500 BASIC ACCEPTABLE ERROR= .5000 CONCENTRATION ERROR INCREMENT= .1000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003	.3	7.00		0.00	4.9	10.00	-17.8 VL	1.00	-2.1	4.00		0.00
L004	.02	3.00	.44 VL	1.00	1.07 VL	1.00	.01T VH	10.00	.01T VH	10.00	18.85 VL	1.00
L014	.15	5.00		0.00	4.70	8.00	-2.70	6.00	-1.90	6.50	81.5	6.00
L018	.62T	10.00	1.64	3.00	4.31	2.00	3.55T VH	11.00	2.49T VH	11.00	80.8	3.00
L019	.1W	0.00	2.0	6.00	4.4	4.00		0.00		0.00	81.2	4.00
L020	.3	7.00		0.00	5.1	11.50	0.0 VH	9.00	0.0 VH	9.00	82.1	8.00
L024	.07T	4.00		0.00	4.52	6.00	-2.84T	4.00	-2.03T	5.00	79.64	2.00
L027	-.15T	2.00	1.82	4.00	4.62	7.00	-2.6T	7.00	-2.19T	2.00	81.5	6.00
L030	.015W	0.00	1.88	5.00	4.88	9.00	-2.79	5.00	-2.12	3.00	84.46	11.00
L032	-.43 L	1.00		0.00	4.312	3.00	-2.9	3.00	-1.9	6.50	82.60	9.00
L053	.3	7.00	2.4	7.00	5.1	11.50	-2.2	8.00	-1.7	8.00	81.5	6.00
L058	.4	9.00	1.5	2.00	4.5	5.00	-3.5 VL	2.00	-2.7 VL	1.00	84.	10.00
MEDIAN CONC.	.225		1.820		4.570		-2.700		-1.900		81.500	

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003	1.1 VH	11.00		0.00	.4	11.00
L004	.03	2.00	9.35 VL	1.00	.01T	7.00
L014	.15	6.00	40.8	7.00	-.05	5.00
L018	.17T	7.00	39.44	2.00	.17T	9.00
L019	.1W	0.00	40.3	4.00	.1W	0.00
L020	.4	9.00	41.8	10.00	.1	8.00
L024	.14	5.00	40.45	5.00	-.08T	3.50
L027	-.05T	1.00	39.7	3.00	-.08T	3.50
L030	.12	3.00	41.2	9.00	-.02	6.00
L032	.13 00	4.00	40.87	8.00	-.09	2.00
L053	.4	9.00	40.7	6.00	.3	10.00
L058	.4	9.00	42.	11.00	-.5	1.00
MEDIAN CONC.	.150		40.700		-.020	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING
L003	44.00	7.333	6	VLVH
L004	36.00	4.000	9	VLVLVHVHVLVL
L014	49.50	6.188	8	
L018	58.00	6.444	9	VHVH
L019	18.00	4.500	4	
L020	71.50	8.938	8	VHVH
L024	34.50	4.313	8	
L027	35.50	3.944	9	
L030	51.00	6.375	8	
L032	35.50	4.563	8	L
L053	72.50	8.056	9	
L058	50.00	5.556	9	VLVL

OVERALL AVERAGE RANK IS 5.863

INSUFFICIENT DATA

METHOD CODING

ACID TITRATION
10110L
METROHM
GRAN ANALY.TITRAT.

GRANS-PLT.
TITRATION TO PH 4.

POTENTIOMETRIC
COMPUTERIZED TITRA
GRAN TITRA.

84/03/27

PARAMETER: 01092 PH PH UNITS

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5:MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0000 BASIC ACCEPTABLE ERROR= .2500 CONCENTRATION ERROR INCREMENT= 0.0000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	5.5	32.50	6.5 H	23.00	7.0	37.50	4.2	15.50	4.4	27.00	8.2	35.00
L003	5.3	17.50		0.00	5.8 VL	1.00	3.5 VL	1.00	4.4	27.00	6.6 VL	1.00
L004	5.2	12.00	5.8 VL	1.00	6.2 VL	3.00	4.1	9.50	4.2	4.00	8.0	20.00
L006	5.22	13.00		0.00	6.66	14.50	4.30	28.00	4.38	20.00	7.83	8.00
L007	5.33	25.00		0.00	7.08 H	39.00	4.31	30.00	4.44	35.00	8.32 H	39.00
L009	5.50	32.50		0.00	6.91	31.00	4.24	20.00	4.40	27.00	8.14	31.00
L010	4.5 VL	1.00		0.00	6.4 L	5.50	4.0	4.50	4.0 VL	1.00	7.9	11.00
L011	5.57	36.00		0.00	6.95	32.50	4.40	38.50	4.40	27.00	7.95	15.50
L012	5.08	6.50	6.35	18.00	6.63	11.00	4.21	18.00	4.45	36.00	8.01	22.00
L013	5.5	32.50		0.00	6.7	17.50	4.3	28.00	4.4	27.00	7.9	11.00
L014	5.38	24.00		0.00	6.56	8.00	4.02	8.00	4.12 L	2.50	8.12	30.00
L016	4.72 VL	2.00	5.30 L	3.00	6.40 L	5.50	4.00	4.50	4.30	12.00	7.70 L	3.50
L018	4.91 VL	4.00	5.98 L	4.00	6.19 VL	2.00	4.00	4.50	4.28	7.50	7.72 L	5.00
L019	5.31	19.50	6.36	19.00	6.87	28.00	4.23	19.00	4.32	17.00	8.02	23.50
L020	5.33	21.00		0.00	6.857	27.00	4.35	34.00	4.41	32.50	8.07	27.00
L021	5.5	32.50	6.5 H	23.00	7.0	37.50	4.4	38.50	4.4	27.00	8.0	20.00
L022	5.60 H	37.00		0.00	6.99	36.00	4.14	11.00	4.28	7.50	8.22	37.00
L023	5.35	23.00		0.00	6.95	32.50	4.00	4.50	4.55	41.00	8.15	32.00
L024	5.4	26.50		0.00	6.9	30.00	4.2	15.50	4.4	27.00	8.1	28.50
L025	4.89 VL	3.00		0.00	7.80 VH	40.00	4.38	36.00	4.25	5.00	8.42 VH	40.00
L027	5.70 VH	38.00	6.27	14.50	6.89	29.00	4.65 VH	40.00	4.57	42.00	8.00	20.00
L029	5.47	29.00	6.50 H	23.00	6.75	20.00	4.38	36.00	4.46	37.50	8.17	33.00
L030	5.31	19.50	6.27	14.50	6.79	23.00	4.28	26.00	4.41	32.50	8.02	23.50
L031A	5.23	14.00		0.00	6.72	19.00	4.33	31.00	4.39	21.50	8.06	25.50
L031B		0.00		0.00		0.00	4.34	32.50	4.40	27.00		0.00
L032	5.047 L	5.00		0.00	6.987	35.00	4.276	25.00	4.471	39.00	8.243	38.00
L033	5.1	8.00	6.3	17.00	6.7	17.50	4.2	15.50	4.3	12.00	8.2	35.00
L042	5.51	35.00	6.40	20.00	6.98	34.00	4.15	12.50	4.49	40.00	8.20	35.00
L045	5.13	9.00	6.06	5.00	6.48 L	7.00	4.01	7.00	4.12 L	2.50	7.67 L	2.00
L046	5.14	10.00	6.19	9.00	6.57	16.00	3.73 VL	2.00	4.31	16.00	7.95	15.50
L048	5.13	11.00	5.89 L	2.00	6.33 VL	4.00	4.25	21.50	4.37	18.50	7.90	11.00
L049	6.3 VH	40.00	6.2	10.50	6.6	9.50	4.1	9.50	4.3	12.00	7.9	11.00
L050	5.08	6.50	6.21	12.00	6.66	14.50	4.15	12.50	4.30	12.00	7.98	18.00
L053	5.44	28.00	6.24	13.00	6.84	26.00	4.34	32.50	4.42	34.00	8.06	25.50
L057	5.40	26.50	6.45	21.00	6.83	25.00	4.26	23.50	4.40	27.00	8.10	28.50
L058	5.34	22.00	6.29	16.00	6.76	21.00	4.26	23.50	4.26	6.00	7.92	14.00
L060	5.25	15.50	6.20	10.50	6.65	13.00	4.30	28.00	4.30	12.00	7.80	6.50
L061		0.00		0.00		0.00	4.38	36.00	4.46	37.50		0.00
L062	5.3	17.50	6.1	6.00	6.6	9.50	5.1 VH	42.00	4.3	12.00	7.7 L	3.50
L063	6.2 VH	39.00	6.5 H	25.00	6.8	24.00	4.2	15.50	4.3	12.00	7.9	11.00
L064	5.25	15.50	6.16	7.50	6.64	12.00	4.25	21.50	4.39	21.50	7.80	6.50
L066	5.49	30.00	6.16	7.50	6.77	22.00	5.05 VH	41.00	4.37	18.50	7.97	17.00
MEDIAN CONC.	5.320		6.240		6.755		4.250		4.390		8.000	

PARAMETER: 01092 PH PH UNITS 84/03/27

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	5.7	19.50	7.9	34.00	5.5	21.50
L003	5.8	31.50	6.3 VL	1.00	5.6	31.00
L004	5.3 VL	4.00	7.0 VL	2.00	5.2 L	4.50
L006	5.74	28.50	7.47	7.00	5.55	29.00
L007	5.71	21.00	8.00 H	38.00	5.41	13.50
L009	5.72	23.00	7.86	31.00	5.50	21.50
L010	5.2 VL	2.00	7.6	12.00	5.4	9.50
L011	5.78	30.00	7.71	19.50	5.49	19.50
L012	5.72	23.00	7.71	19.50	5.53	26.50
L013	5.6	12.50	7.6	12.00	5.6	31.00
L014	6.16 VH	38.00	7.94	36.00	5.72	35.00
L016	5.45 L	8.00	7.50	9.50	5.60	31.00
L018	5.33 VL	6.00	7.29 VL	3.00	5.25	6.00
L019	5.63	14.50	7.80	25.00	5.44	16.00
L020	5.73	25.50	7.84	29.00	5.49	19.50
L021	5.9	33.50	7.9	34.00	4.5 VL	1.00
L022	5.99 H	35.00	8.04 H	39.00	5.95 VH	36.00
L023	5.00 H	36.50	7.85	30.00	5.70	34.00
L024	5.7	19.50	7.9	34.00	5.4	9.50
L025	7.01 VH	40.00	8.20 VH	40.00	6.12 VH	37.00
L027	6.72 VH	39.00	7.72	22.00	6.28 VH	38.00
L029	5.68	17.00	7.81	27.00	5.65	33.00
L030	5.63	14.50	7.72	22.00	5.41	13.50
L031A	5.74	28.50	7.88	32.00	5.53	26.50
L031B		0.00		0.00		0.00
L032	5.738	27.00	7.956	37.00	5.535	28.00
L033	5.3 VL	4.00	7.8	25.00	5.1 VL	2.00
L042	5.73	25.50	7.83	28.00	5.51	23.00
L045	5.46	9.00	7.38 L	5.00	5.14 L	3.00
L046	5.69	18.00	7.70	17.50	5.52	24.50
L048	5.40 L	7.00	7.49	8.00	5.40	9.50
L049	5.6	12.50	7.5	9.50	5.4	9.50
L050	5.51	11.00	7.72	22.00	5.40	9.50
L053	5.67	16.00	7.69	16.00	5.46	17.00
L057	5.50	10.00	7.70	17.50	5.48	18.00
L058	3.73 VL	1.00	7.68	15.00	5.43	15.00
L060	5.30 VL	4.00	7.45 L	6.00	5.20 L	4.50
L061	5.80	31.50		0.00		0.00
L062	5.9	33.50	7.3 VL	4.00	6.3 VH	39.00
L063	7.1 VH	41.00	7.8	25.00	6.8 VH	40.00
L064	5.72	23.00	7.60	12.00	5.40	9.50
L066	5.00 H	36.50	7.67	14.00	5.52	24.50
MEDIAN CONC.	5.710		7.715		5.495	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	245.50	27.278	9	H		
L003	111.00	13.875	8	VLVLVLVL		
L004	60.00	6.667	9	VLVLVLVLL	BIASED LOW	10301L
L005	148.00	18.500	8			
L007	240.50	30.063	8	HHH		
L009	217.00	27.125	8			
L010	46.50	5.813	8	VLLVLVL	BIASED LOW	POTENTIOMETRIC
L011	218.50	27.313	8			
L012	180.50	20.056	9			PH METER
L013	171.50	21.438	8			ELECTRODE
L014	181.50	22.688	8	LVH		METER
L016	79.00	8.778	9	VLLLLL	BIASED LOW	
L018	42.00	4.667	9	VLLVLLVLVL	BIASED LOW	PH METER
L019	181.50	20.167	9			ELECROMETRIE
L020	215.50	26.938	8			ELECTROMETER
L021	247.00	27.444	9	HVL		
L022	238.50	29.813	8	HHHVH		ELECTRODE
L023	233.50	29.188	8	H		ELECTROMETRIC
L024	190.50	23.813	8			METER
L025	241.00	30.125	8	VLVHVHVHVHVH		COMB. ELECTRODE
L027	282.50	31.389	9	VHVHVHVH		METER
L029	255.50	28.389	9	H		
L030	189.00	21.000	9			POTENTIOMETRIC
L031A	198.00	24.750	8			ELECTROMETRIE
L031B	59.50	29.750	2		INSUFFICIENT DATA	RESINES
L032	234.00	29.250	8	L		INGOLD ELECTRODE
L033	135.00	15.111	9	VLVL		PH METER
L042	253.00	28.111	9			
L045	49.50	5.500	9	LLLLL	BIASED LOW	ELECTROMETRIC
L046	128.50	14.278	9	VL		
L048	92.50	10.278	9	LVLL		ELECTRODE
L049	124.00	13.778	9	VH		PH METER
L050	118.00	13.111	9			
L053	208.00	23.111	9			
L057	197.00	21.889	9			
L058	133.50	14.833	9	VL		
L060	100.00	11.111	9	VLLL		ELECTRODE
L061	105.00	35.000	3		INSUFFICIENT DATA	METER & ELECTRODE
L062	167.00	18.556	9	VHLVLVH		AUTOMATED PROBE
L063	232.50	25.833	9	VHHVHVH		GLASS
L064	129.00	14.333	9			CORNING N. 135
L066	211.00	23.444	9	VHH		PH METER

OVERALL AVERAGE RANK IS 20.263

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L018	42.00	4.667	9	VLLVLLVLVL	BIASED LOW	PH METER
L045	43.50	5.500	9	LLLLL	BIASED LOW	ELECTROMETRIC
L010	46.50	5.813	8	VLLVLVL	BIASED LOW	POTENTIOMETRIC
L004	60.00	6.667	9	VLVLVLVLL	BIASED LOW	10301L
L016	79.00	8.778	9	VLLLLL	BIASED LOW	
L048	92.50	10.278	9	LVLL		ELECTRODE
L060	100.00	11.111	9	VLLL		ELECTRODE
L050	118.00	13.111	9			
L049	124.00	13.778	9	VH		PH METER
L003	111.00	13.875	8	VLVLVLVL		
L046	128.50	14.278	9	VL		
L064	129.00	14.333	9			CORNING N. 135
L058	133.50	14.833	9	VL		
L033	136.00	15.111	9	VLVL		PH METER
L006	145.00	18.500	8			
L062	167.00	18.556	9	VHLVLVH		AUTOMATED PROBE
L012	180.50	20.056	9			PH METER
L019	181.50	20.167	9			ELECROMETRIE
L030	189.00	21.000	9			POTENTIOMETRIC
L013	171.50	21.438	8			ELECTRODE
L057	197.00	21.889	9			
L014	181.50	22.688	8	LVH		METER
L053	208.00	23.111	9			
L066	211.00	23.444	9	VHH		PH METER
L024	190.50	23.813	8			METER
L031A	198.00	24.750	8			ELECTROMETRIE
L063	232.50	25.833	9	VHHVHVH		GLASS
L020	215.50	26.938	8			ELECTROMETER
L009	217.00	27.125	8			
L002	245.50	27.278	9	H		
L011	218.50	27.313	8			
L021	247.00	27.444	9	HVL		
L042	253.00	28.111	9			
L029	255.50	28.389	9	H		
L023	235.50	29.188	8	H		ELECTROMETRIC
L032	234.00	29.250	8	L		INGOLD ELECTRODE
L031B	59.50	29.750	2		INSUFFICIENT DATA	RESINES
L022	238.50	29.813	8	HHHVH		ELECTRODE
L007	240.50	30.063	8	HHH		
L025	241.00	30.125	8	VLVHVHVHVHVH		COMB. ELECTRODE
L027	282.50	31.389	9	VHVHVHVH		METER
L061	105.00	35.000	3		INSUFFICIENT DATA	METER & ELECTRODE

OVERALL AVERAGE RANK IS 20.263

84/03/27

PARAMETER: 00392 SPECIFIC CONDUCTANCE UMHO/CM

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5:MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 50.0000 BASIC ACCEPTABLE ERROR= 2.0000 CONCENTRATION ERROR INCREMENT= .0000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	29.4	16.50	28.4	17.00	22.8	23.00	38.7 H	28.00	38.8	30.50	229.0	29.50
L003	29.	6.50		0.00	22.	12.50	35.	14.50	36.	13.50	222.	18.00
L004	31.	28.50	28.	13.50	22.	12.50	52. VH	35.00	52. VH	35.00	209.	5.00
L006	30.	23.50		0.00	23.	25.50	37.3	27.00	38.8	30.50	229.	29.50
L007	29.7	19.00		0.00	23.7	32.00	34.1	9.00	35.6	12.00	226.	21.00
L009	27.3	3.00		0.00	20.4	7.00	42.0 VH	33.00	35.5	11.00	214.	6.00
L010	31.0	28.50		0.00	22.4	18.50	35.8	19.00	37.5	26.00	227.	22.50
L011	28.5	9.00		0.00	23.5	31.00	33.5	8.00	33.6 L	7.00	228.	26.00
L013	30.1	26.00		0.00	22.6	21.50	34.8	12.00	37.7	28.00	225.	19.50
L014	30.	23.50		0.00	20.	4.00	30. VL	3.50	30. VL	4.50	220.	12.00
L018	27.7	4.00	25.0	3.50	20.3	6.00	36.5	20.00	34.0	8.00	221.0	16.00
L019	28.7	12.50	27.6	11.00	22.1	15.50	35.0	14.50	36.4	18.00	221.	16.00
L021	29.6	18.00	28.2	16.00	23.1	28.00	34.6	11.00	36.5	19.50	220.0	12.00
L022	26. L	2.00		0.00	20.	4.00	35.	14.50	35.	9.00	204. L	2.50
L023	29.6	10.50		0.00	22.3	17.00	35.3	17.00	36.3	17.00	221.	16.00
L024	29.2	15.00		0.00	22.6	21.50	37.1	26.00	37.6	27.00	228.	26.00
L025	32.0	31.50		0.00	20.5	8.50	35.5	18.00	36.2	16.00	220.	12.00
L027	29.8	20.50	28.6	18.00	23.2	29.50	40.6 VH	32.00	39.2	33.50	228.	26.00
L029	29.8	20.50	28.0	13.50	23.0	25.50	37.0	24.00	36.1	15.00	225.	19.50
L030	28.7	12.50	27.3	10.00	22.1	15.50	36.7	22.00	37.3	25.00	227.	22.50
L031A	28.6	10.50		0.00	20.5	8.50	34.3	10.00	37.0	23.00	215.	7.50
L032	32.0	31.50		0.00	24.0	33.00	40.5 VH	31.00	39.2	33.50	235.	34.00
L033	28.	6.50	26.	6.00	21.	10.00	37.	24.00	27. VL	2.00	232.	33.00
L042	30. VH	35.00	57. VH	21.00	43. VH	35.00	100. VH	36.00	100. VH	36.00	660. VH	35.00
L045	29.4	16.50	27.1	9.00	22.4	18.50	36.6	21.00	36.8	21.00	215.	7.50
L046	30.	23.50	25.	3.50	20.	4.00	30. VL	3.50	30. VL	4.50	175. VL	1.00
L048	30.2	27.00	28.7	19.00	23.2	29.50	39.1 H	29.00	38.9	32.00	228.	26.00
L049	34. VH	34.00	26.	6.00	22.	12.50	40. VH	30.00	38.	29.00	205. L	4.00
L057	32.	31.50	27.	8.00	22.	12.50	33.	6.00	37.	23.00	230.	31.50
L058	30.	23.50	28.	13.50	23.	25.50	44. VH	34.00	37.	23.00	218.	9.00
L060	24. VL	1.00	22. VL	1.00	18. VL	1.50	32. L	5.00	31. VL	6.00	204. L	2.50
L061		0.00		0.00		0.00	33.3	7.00	35.2	10.00		0.00
L062	28.	6.50	24. L	2.00	18. VL	1.50	37.	24.00	24. VL	1.00	228.	26.00
L063	32.	31.50	32. VH	20.00	27. VH	34.00	24. VL	2.00	28. VL	3.00	230.	31.50
L064	29.	14.00	28.	13.50	23.	25.50	35.	14.50	36.	13.50	220.	12.00
L066	28.0	6.50	26.0	6.00	22.5	20.00	1.75 VL	1.00	36.5	19.50	220.	12.00
MEDIAN CONC.	29.600		27.600		22.400		35.650		36.450		222.000	

PARAMETER: 00392 SPECIFIC CONDUCTANCE UMHO/CM 84/03/27

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	8.41	26.00	95.7	28.00	457.0	29.00
L003	7.8	10.00	92.	12.00	440.	12.50
L004	7.	5.50	89.	6.50	435.	9.00
L006	7.9	12.00	98.	32.00	450.	22.50
L007	9.3	31.00	89.	6.50	457.	29.00
L009	9.0	29.50	90.0	8.50	429.	5.00
L010	8.1	18.00	94.3	21.50	445.	17.00
L011	9.00	29.50	96.0	29.50	442.	15.00
L013	8.3	22.50	94.3	21.50	444.	16.00
L014	20. VH	35.00	90.	8.50	420.	4.00
L018	7.4	7.50	94.2	20.00	436.0	11.00
L019	7.7	9.00	94.	18.50	447.	19.50
L021	9.7	27.00	90.5	10.00	452.0	25.00
L022	7.	5.50	87. L	4.50	413.	3.00
L023	10.4	33.00	92.6	14.00	430.	6.00
L024	8.2	20.50	95.	26.00	441.	14.00
L025	8.0	16.00	92.5	13.00	435.	9.00
L027	8.78	28.00	94.7	23.00	455.	26.50
L029	7.9	12.00	95.	26.00	450.	22.50
L030	8.17	19.00	93.6	17.00	450.	22.50
L031A	6.8	4.00	95.	26.00	446.	18.00
L032	8.4	24.50	101. H	34.00	470.	34.00
L033	6.	2.50	96.	29.50	461.	31.50
L042	10.	32.00	270. VH	35.00	1300. VH	35.00
L045	7.91	14.00	94.8	24.00	435.	9.00
L046	10.W	0.00	75. VL	2.00	335. VL	2.00
L048	8.4	24.50	96.9	31.00	461.	31.50
L049	8.	16.00	87. L	4.50	280. VL	1.00
L057	8.2	20.50	94.	18.50	455.	26.50
L058	8.	16.00	93.	15.50	440.	12.50
L060	5. L	1.00	83. VL	3.00	450.	22.50
L061	7.4	7.50		0.00		0.00
L062	6.	2.50	91.	11.00	457.	29.00
L063	12. H	34.00	99.	33.00	447.	19.50
L064	8.3	22.50	93.	15.50	433.	7.00
L066	7.90	12.00	9.60 VL	1.00	465.	33.00
MEDIAN CONC.	8.100		94.000		446.000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	227.50	25.278	9	H		
L003	99.50	12.438	8			
L004	150.50	16.722	9	VHVH		02041L
L006	202.50	25.313	8			
L007	159.50	19.938	8			
L009	103.00	12.875	8	VH		
L010	171.00	21.375	8			RADIOMETER
L011	155.00	19.375	8	L		
L013	137.00	20.875	8			TEMP.COMPEN.CELL
L014	95.00	11.875	8	VLVLVH		METER
L018	96.00	10.667	9			CONDUCT BRIDGE
L019	134.50	14.944	9			CONDUCTIVIMETRIE
L021	166.50	18.500	9			
L022	45.00	5.625	8	LLL	BIASED LOW	CONDUCTIVITY CELL
L023	130.50	16.313	8			ELECTROMETRIC
L024	176.00	22.000	8			METER
L025	124.00	15.500	8			FLOW THROUGH CELL
L027	237.00	26.333	9	VH		METER
L029	179.50	19.833	9			
L030	166.00	18.444	9			CONDUCTIVITY METER
L031A	107.50	13.438	8			CONDUCTIVIMETRE
L032	255.50	31.938	8	VHH	BIASED HIGH	RADIOMETER
L033	145.00	16.111	9	VL		COND METER
L042	300.00	33.333	9	VHVHVHVHVHVHVHVH	BIASED HIGH	
L045	140.50	15.611	9			HACH METER
L046	44.00	5.500	8	VLVLVLVLVL	BIASED LOW	
L048	249.50	27.722	9	H		METER
L049	137.00	15.222	9	VHVHLLVL		METER
L057	178.00	19.778	9			
L058	172.50	19.167	9	VH		
L060	43.50	4.833	9	VLVLVLLVLLLVL	BIASED LOW	DIONEX.IC,DETECT
L061	24.50	8.167	3		INSUFFICIENT DATA	BRIDGE & CELL
L062	103.50	11.500	9	LVLVL		AUTOMATED PROBE
L063	208.50	23.167	9	VHVHVLVLH		AUTO
L064	138.00	15.333	9			
L066	111.00	12.333	9	VLVL		COND. METER

OVERALL AVERAGE RANK IS 17.634

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L060	43.50	4.833	9	VLVLVLLVLLLVL	BIASED LOW	DIONEX,IC,DECTECT
L046	44.00	5.500	8	VLVLVLVLVL	BIASED LOW	
L022	45.00	5.625	8	LLL	BIASED LOW	CONDUCTIVITY CELL
L061	24.50	8.167	3		INSUFFICIENT DATA	BRIDGE A CELL
L018	96.00	10.667	9			CONDUCT BRIDGE
L062	103.50	11.500	9	LVLVL		AUTOMATED PROBE
L014	95.00	11.875	8	VLVLVH		METER
L066	111.00	12.333	9	VLVL		COND. METER
L003	99.50	12.438	8			
L009	103.00	12.875	8	VH		
L031A	107.50	13.438	8			CONDUCTIVIMETRE
L019	134.50	14.944	9			CONDUCTIVIMETRIE
L049	137.00	15.222	9	VHVHLLVL		METER
L064	138.00	15.333	9			
L025	124.00	15.500	8			FLOW THROUGH CELL
L045	140.50	15.611	9			HACH METER
L033	145.00	16.111	9	VL		COND METER
L023	130.50	16.313	8			ELECTROMETRIC
L004	150.50	16.722	9	VHVH		02041L
L030	166.00	18.444	9			CONDUCTIVITY METER
L021	166.50	18.500	9			
L058	172.50	19.167	9	VH		
L011	155.00	19.375	8	L		
L057	178.00	19.778	9			
L029	178.50	19.833	9			
L007	159.50	19.938	8			
L013	157.00	20.875	8			TEMP.COMPEN.CELL
L010	171.00	21.375	8			RADIOMETER
L024	176.00	22.000	8			METER
L063	208.50	23.167	9	VHVHVLVLH		AUTO
L002	227.50	25.278	9	H		
L006	202.50	25.313	8			
L027	237.00	26.333	9	VH		METER
L048	249.50	27.722	9	H		METER
L032	255.50	31.938	8	VHH	BIASED HIGH	RADIOMETER
L042	300.00	33.333	9	VHVHVHVHVHVHVHVH	BIASED HIGH	

OVERALL AVERAGE
RANK IS 17.634

84/03/27.

84/03/27

PARAMETER: 00292 COLOUR HAZEN UNIT

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5: MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.0000 BASIC ACCEPTABLE ERROR= 2.6000 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	20.	10.50	40.	6.00	10.	7.00	5.	7.50	5.	7.50	5.	8.50
L003	10. VL	2.00		0.00	5. L	2.50	L5.	0.00	L5.	0.00	L5.	0.00
L004	29. VH	16.50	42.	7.50	23. VH	18.00	16. VH	11.00	12. VH.	11.00	16. VH	11.00
L010	20.	10.50		0.00	10.	7.00	5.W	0.00	5.W	0.00	5.W	0.00
L011	25.	14.00		0.00	15. H	13.00	5.	7.50	7.5 VH	10.00	7.5 VH	10.00
L022	15.	7.00		0.00	11.	11.00	4.T	5.00	2.T	4.50	2.T	3.50
L023	20.	10.50		0.00	15. H	13.00	5.W	0.00	5.W	0.00	5.W	0.00
L024	29. VH	16.50		0.00	22. VH	17.00	6.	10.00	.5T	3.00	3.	7.00
L027	27.7 H	15.00	48.3 H	9.00	15.2 H	15.00	3.00	4.00	7.40 VH	9.00	2.52	6.00
L030	22.	13.00	42.	7.50	15. H	13.00	1.W	0.00	1.W	0.00	1.W	0.00
L031A	15.	4.50		0.00	10.	7.00	2. L	2.00	2.	4.50	2.	3.50
L032	20.	10.50		0.00	10.	7.00	5.	7.50	0.	1.50	0.	1.50
L045	17.5	8.00	30.0	3.00	10.0	7.00	2.5	3.00	2.5T	6.00	2.5	5.00
L046	15.	4.50	35.	5.00	10.	7.00	5.W	0.00	5.W	0.00	5.W	0.00
L049	15.	4.50	30.	3.00	5.W L	1.00	5.W	0.00	5.W	0.00	5.W	0.00
L057	30. VH	18.00	50. H	10.00	18. VH	16.00	5.T	7.50	5.T	7.50	5.T	8.50
L058	15.	4.50	30.	3.00	10.	7.00	2.5W	0.00	2.5W	0.00	2.5W	0.00
L063	5. VL	1.00	20. VL	1.00	5. L	2.50	0. VL	1.00	0.	1.50	0.	1.50
MEDIAN CONC.	20.000		37.500		10.000		5.000		2.500		2.520	

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	5.	0.00	5.	3.00	5.	8.50
L003	L5.	0.00	L5.	0.00	L5.	0.00
L004	12. VH	9.00	0.T	1.50	8. VH	11.00
L010	5.W	0.00	5.W	0.00	5.W	0.00
L011	7.5 VH	8.00	7.5 VH	11.00	7.5 VH	10.00
L022	2.T	4.50	2.T	4.50	2.T	5.00
L023	5.W	0.00	5.W	0.00	5.W	0.00
L024	2.	4.50	2.	4.50	.3T	3.00
L027	1.63	3.00		0.00	1.40	4.00
L030	1.W	0.00	1.W	0.00	1.W	0.00
L031A	1.W	0.00	1.	3.00	1.W	0.00
L032	0.	1.50	5.	9.00	0.	1.50
L045	2.5T	6.00	2.5	6.50	2.5T	6.50
L046	5.W	0.00	5.W	0.00	5.W	0.00
L049	5.W	0.00	5.W	0.00	5.W	0.00
L057	5.T H	7.00	5.T	9.00	5.T	8.50
L058	2.5W	0.00	2.5	6.50	2.5	6.50
L063	0.	1.50	0.	1.50	0.	1.50
MEDIAN CONC.	2.000		2.500		2.500	

COLOUR

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	64.50	8.063	8		INSUFFICIENT DATA	
L003	4.50	2.250	2	VLL		02011L
L004	96.50	10.722	9	VHVHVHVHVHVHVH	INSUFFICIENT DATA	PT.CO VIS COMPAR
L010	17.50	8.750	2			
L011	83.50	10.438	8	HVHVHVHVHVH		COLORIMETRIC
L022	45.00	5.625	8		INSUFFICIENT DATA	VISUAL COMPARISON
L023	23.50	11.750	2	H		KALLIE SUMMERSON
L024	65.50	8.188	8	VHVH		KLETT SUMMERSON
L027	65.00	8.125	8	HHHVH	INSUFFICIENT DATA	COLORIMETRIC
L030	33.50	11.167	3	H		TECHNICON
L031A	24.50	4.083	5	L		COMPAROMETER
L032	40.00	5.000	8			VISUAL COMP.
L045	51.00	5.667	9		INSUFFICIENT DATA	COMPARATOR
L046	16.50	5.500	3		INSUFFICIENT DATA	COLOUR DISC
L049	8.50	2.833	3	L		
L057	92.00	10.222	9	VHHVHH	INSUFFICIENT DATA	
L058	27.50	5.500	5		BIASED LOW	HELLIGE
L063	13.00	1.444	9	VLVLLVL		

OVERALL AVERAGE RANK IS 7.018

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L063	13.00	1.444	9	VLVLLVL	BIASED LOW	HELLIGE
L003	4.50	2.250	2	VLL	INSUFFICIENT DATA	
L049	8.50	2.833	3	L	INSUFFICIENT DATA	COLOUR DISC
L031A	24.50	4.083	6	L		TECHNICON
L032	40.00	5.000	8			COMPAROMETER
L058	27.50	5.500	5		INSUFFICIENT DATA	
L046	16.50	5.500	3		INSUFFICIENT DATA	COMPARATOR
L022	45.00	5.625	8			COLORIMETRIC
L045	51.00	5.667	9			VISUAL COMP.
L002	64.50	8.063	8			KLETT SUMMERSON
L027	65.00	8.125	8	HHHVH		KALLIE SUMMERSON
L024	65.50	8.188	8	VHVH	INSUFFICIENT DATA	PT.CO VIS COMPAR
L010	17.50	8.750	2			
L057	92.00	10.222	9	VHHVHH		
L011	83.50	10.438	8	HVHVHVHVHVH		02011L
L004	96.50	10.722	9	VHVHVHVHVHVHVH	INSUFFICIENT DATA	COLORIMETRIC
L030	33.50	11.167	3	H	INSUFFICIENT DATA	VISUAL COMPARISON
L023	23.50	11.750	2	H		

OVERALL AVERAGE RANK IS 7.018

COLOUR

84/03/27

PARAMETER: 14092 REACTIVE SILICA MG SI/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5:MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .1000 BASIC ACCEPTABLE ERROR= .0500 CONCENTRATION ERROR INCREMENT= .0000
LABORATORIES YET TO REPORT: L001,L015,L017,L040,L043,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.36	5.00	2.73	3.00	2.58	4.00	.028	3.00	.079	4.00	.53	8.00
L003	.42	16.00		0.00	3.1 H	18.00	.05W	0.00	.09	11.00	.65 H	17.00
L006	.35	4.00		0.00	2.56	3.00	.03	5.00	.08	6.50	.45 L	1.00
L010	.40	12.50		0.00	2.8	11.00	.04T	7.50	.10	15.50	.60	15.50
L014	.398	10.00		0.00	2.91	13.00	.045	10.00	.098	13.00	.562	12.00
L020	.4	12.50		0.00	2.8	11.00	.05T	13.00	.09T	11.00	.6	15.50
L023	.42	16.00		0.00	2.90	16.00	.1W	0.00	.1	15.50	.56	10.50
L024	.4	12.50		0.00	2.5	5.50	.03T	5.00	.08T	6.50	.5	2.50
L027	.34	3.00	2.78	4.00	2.61	7.00	.05T	13.00	.06T	2.00	.51	5.50
L029	.334	2.00	2.84	7.00	2.65	8.00	.012	2.00	.074	3.00	.505	4.00
L031A	.40	12.50		0.00	2.85	14.00	.05	13.00	.10	15.50	.58	14.00
L032	.507 H	18.00		0.00	3.08 H	17.00	.0414	9.00	.083	9.00	.5675	13.00
L033	.37	7.00	2.8	5.50	2.7	9.00	.23W	0.00	.23W	0.00	.51	5.50
L045	.37	7.00	2.5	5.50	2.6	5.50	.05	13.00	.08	6.50	.53	8.00
L046	.07 VL	1.00	.45 VL	1.00	1.39 VL	1.00	.01W	1.00	.01W VL	1.00	.53	8.00
L048	.39	9.00	3.14 H	9.00	2.86	15.00	.05	13.00	.09	11.00	.56	10.50
L049	.64 VH	19.00	4.90 VH	10.00	4.60 VH	19.00	.07	16.00	.16 H	18.00	.92 VH	19.00
L060	.42	16.00	2.90	8.00	2.80	11.00	.03	5.00	.10	15.50	.68 H	18.00
L062	.37	7.00	2.7	2.00	2.5 L	2.00	.04	7.50	.08	6.50	.50	2.50
L063	1.2W	0.00	6.4 VH	11.00	5.8 VH	20.00	1.2W	0.00	1.2W	0.00	1.2W	0.00
MEDIAN CONC.	.398		2.800		2.800		.041		.087		.560	

SAMPLE	8		9		10	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.028	3.00	1.05	6.50	.01	2.50
L003	.05W	0.00	1.2	18.00	.05W	0.00
L006	.03	6.00	1.01	3.50		0.00
L010	.03T	6.00	1.1	11.00	.01T	2.50
L014	.044	11.00	1.11	13.00	L.01	0.00
L020	.05T	12.50	1.1	11.00	.05W	0.00
L023	.1W	0.00	1.17	17.00	.1W	0.00
L024	.03T	6.00	1.1	11.00	.01W	0.00
L027	.02W	0.00	1.01	3.50	.02W	0.00
L029	.015	2.00	1.04	5.00	-.017	1.00
L031A	.04	9.50	1.14	15.00	.01W	0.00
L032	.0553	14.00	1.16	16.00	.015	4.00
L033	.23W	0.00	1.06	8.00	.23W	0.00
L045	.03T	6.00	1.0	2.00	0.0W	0.00
L046	.01W	1.00	1.05	6.50	.01W	0.00
L048	.05	12.50	1.12	14.00	.01W	0.00
L049	.08	15.00	1.80 VH	19.00	.02W	0.00
L060	.03	6.00	1.08	9.00	.01W	0.00
L062	.04T	9.50	.99	1.00	.04T	5.00
L063	1.2W	0.00	2.3 VH	20.00	1.2W	0.00
MEDIAN CONC.	.030		1.100		.010	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	39.00	4.333	9		BIASED LOW	TECHNICON
L003	80.00	16.000	5	HH	INSUFFICIENT DATA	TECHNICON
L006	29.00	4.143	7	L	BIASED LOW	AUTO ANALYZER
L010	81.50	10.188	8			ICAP-EXTRACT
L014	82.00	11.714	7			AUTO.MOLY.BLUE
L020	86.50	12.357	7			MOLYB-ASCORB
L023	75.00	15.000	5		INSUFFICIENT DATA	AUTO.MOLY.SILICATE
L024	49.00	7.000	7			COLOURIMETRIC
L027	38.00	5.429	7			COLORIMETRIC
L029	34.00	3.778	9		BIASED LOW	
L031A	93.50	13.357	7			TECHNICON
L032	100.00	12.500	8	HH		AUTO HET.POLY BLUE
L033	35.00	7.000	5		INSUFFICIENT DATA	AUTO COLOR
L045	53.50	6.688	8			AUTOMATED-ASCORBIC
L046	20.50	2.563	8	VLVLVLVL	INSUFFICIENT DATA	AUTOANALYZER
L048	94.00	11.750	8	H		TECHNICON
L049	135.00	16.875	8	VHVHVHHVHVH	BIASED HIGH	COLOUR
L060	88.50	11.063	8	H		COLOURIMETRIC
L062	43.00	4.778	9	L	BIASED LOW	TECHNICON
L063	51.00	17.000	3	VHVHVH	INSUFFICIENT DATA	AUTO M004

OVERALL AVERAGE RANK IS 9.147

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L046	20.50	2.563	8	VLVLVLVL	INSUFFICIENT DATA	AUTOANALYZER
L029	34.00	3.778	9		BIASED LOW	
L006	29.00	4.143	7	L	BIASED LOW	AUTO ANALYZER
L002	39.00	4.333	9		BIASED LOW	TECHNICON
L062	43.00	4.778	9	L	BIASED LOW	TECHNICON
L027	38.00	5.429	7			COLORIMETRIC
L045	53.50	6.688	8			AUTOMATED-ASCORBIC
L033	35.00	7.000	5		INSUFFICIENT DATA	AUTO COLOR
L024	49.00	7.000	7			COLOURIMETRIC
L010	81.50	10.188	8			ICAP-EXTRACT
L060	88.50	11.063	8	H		COLOURIMETRIC
L014	82.00	11.714	7			AUTO.MOLY.BLUE
L048	94.00	11.750	8	H		TECHNICON
L020	86.50	12.357	7			MOLYB-ASCORB
L032	100.00	12.500	8	HH		AUTO HET.POLY BLUE
L031A	93.50	13.357	7			TECHNICON
L023	75.00	15.000	5		INSUFFICIENT DATA	AUTO.MOLY.SILICATE
L003	80.00	16.000	5	HH	INSUFFICIENT DATA	TECHNICON
L049	135.00	16.875	8	VHVHVHHVHVH	BIASED HIGH	COLOUR
L063	51.00	17.000	3	VHVHVH	INSUFFICIENT DATA	AUTO M004

OVERALL AVERAGE RANK IS 9.147

REACTIVE SILICA

PARAMETER: 07092 NITRATE + NITRITE MG N/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP INTERLAB STUDY NO. L5: MAJOR IONS IN WATER

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .5000 BASIC ACCEPTABLE ERROR= .0250 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L001, L015, L017, L040, L043, L051, L054, L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		5		6		7	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.008	11.00	.101	16.00	.093	16.50	.550	13.50	.997 VH	36.00	.494 VH	30.00
L003	.005W	0.00		0.00	.10	21.50	.53	5.00	.72	4.50	.40 VL	6.00
L004	.01T	16.50	.09	9.00	.09	8.00	.59	27.00	.79	26.50	.43	15.00
L006	.02	22.50		0.00	.09	8.00	.60 H	28.50	.76	18.00	.51 VH	32.50
L007	.08 VH	29.00		0.00	.14 VH	31.50	3.10 VH	36.00	.79	26.50	.46	26.00
L009	.036 H	25.00		0.00	.42 VH	35.00	2.7 VH	35.00	3.5 VH	37.00	1.9 VH	35.00
L010	.01T	16.50		0.00	.12	27.50	.57	22.50	.79	26.50	.45	22.50
L011	.003T	1.00		0.00	.098	16.50	.521 L	4.00	.726	8.00	.396 VL	3.00
L013	.043 H	27.00		0.00	.099	18.00	.554	16.00	.724	6.00	.426	13.00
L014	.005	3.50		0.00	.100	21.50	1.71 VH	34.00	.81	31.00	.45	22.50
L019	.007	8.00	.099	15.00	.097	15.00	.553	15.00	.759	15.50	.429	14.00
L020	.04 H	26.00		0.00	.15 VH	33.00	.58	25.50	.798	29.00	.44	18.00
L021	.007	8.00	.097	13.00	.102	25.00	.544	12.00	.736	9.00	.433	16.00
L022	.009	12.50		0.00	.092	11.00	.45 VL	1.50	.71	3.00	.41 L	9.50
L023	.02	22.50		0.00	.10	21.50	.54	8.00	.76	18.00	.47 H	28.00
L024	.01	16.50		0.00	.09	8.00	.57	22.50	.87 H	34.00	.44	18.00
L027	.009T	12.50	.088	9.00	.093	12.00	.559	17.00	.799	19.50	.417	11.00
L029	.010	16.50	.084	4.00	.050 VL	1.00	.520 L	3.00	.725	7.00	.398 VL	4.00
L030	.045 H	28.00	.105	17.00	.075	2.00	.542	11.00	.740	11.00	.400 VL	6.00
L031A	.005	3.50		0.00	.130 H	30.00	.56	18.50	.78	23.50	.360 VL	2.00
L031B		0.00		0.00		0.00	.55	13.50	.76	18.00		0.00
L032	.1607 VH	31.00		0.00	.2461 VH	34.00	.661 VH	32.00	.769	20.00	.460	26.00
L033	.022	24.00	.075	2.00	.082	5.00	.540	8.00	.720	4.50	.420	12.00
L045	.01	16.50	.09	9.00	.10	21.50	.60 H	28.50	.80	30.00	.44	18.00
L046	.015	21.00	.109	19.00	.108	26.00	.65 VH	30.00	.92 VH	35.00	.54 VH	34.00
L048	.004	2.00	.089	6.00	.096	14.00	.58	25.50	.83	32.00	.50 VH	31.00
L049	.007T	8.00	.08	3.00	.08	4.00	.45 VL	1.50	.63 VL	1.00	.46	26.00
L050	.011	20.00	.1078	18.00	.1232	29.00	.658 VH	31.00	.756	14.00	.406 L	8.00
L053	.007	8.00	.097	13.00	.094	13.00	.540	8.00	.740	11.00	.410 L	9.50
L057	.01W	0.00	.072	1.00	.077	3.00	.562	20.00	.754	13.00	.196 VL	1.00
L058	.05W	0.00	.09	9.00	.14 VH	31.50	.54	8.00	.65 L	2.00	.45	22.50
L060	.02W	0.00	.09	9.00	.10	21.50	.57	22.50	.77	21.00	.49 VH	29.00
L061		0.00		0.00		0.00	.57	22.50	.78	23.50		0.00
L062	.16 VH	30.00	.11	20.00	.09	8.00	.78 VH	33.00	.84 H	33.00	.45	22.50
L063	.007	8.00	.09	9.00	.09	8.00	.54	8.00	.74	11.00	.40 VL	6.00
L064	.01	16.50	.097	13.00	.12	27.50	.56	18.50	.79	26.50	.51 VH	32.50
L066	.006	5.00	.154 VH	21.00	.100	21.50		0.00	.774	22.00	.441	20.00
MEDIAN CONC.	.010		.090		.099		.560		.760		.440	

PARAMETER: 07092 NITRATE + NITRITE MG N/L 84/03/27

SAMPLE LAB NO	8 REPORTED VALUE	8 RANK	9 REPORTED VALUE	9 RANK	10 REPORTED VALUE	10 RANK
L002	.043 H	29.00	.327	29.00	.050	27.00
L003	.005W	0.00	.29	6.00	.03	11.00
L004	.02	27.00	.32	25.50	.05	27.00
L006	.01	18.00	.31	21.50	.03	11.00
L007	.06 VH	30.00	.33 H	31.00	.55 VH	32.00
L009	L.03	0.00	1.3 VH	35.00	.42 VH	31.00
L010	.01T	18.00	.32	25.50	.03	11.00
L011	.002T	2.00	.288	4.00	.033	18.00
L013	.013	24.00	.291	8.00	.031	15.00
L014	.009	15.00	.300	15.00	.030	11.00
L019	.003	3.00	.310	21.50	.030	11.00
L020	.02	27.00	.31	21.50	.06 H	29.00
L021	.007	12.00	.307	19.00	.032	16.50
L022	.005T	7.50	.27 L	2.00	.025	4.50
L023	.01	18.00	.29	6.00	.04	23.00
L024	.02	27.00	.30	15.00	.04	23.00
L027	.005T	7.50	.299	12.00	.019	3.00
L029	.008	14.00	.287	3.00	.032	16.50
L030	.005	7.50	.290	6.00	.025	4.50
L031A	.005	7.50	.300	15.00	.035	20.50
L031B		0.00		0.00		0.00
L032	.0013	1.00	.3252	28.00	.290 VH	30.00
L033	.005	7.50	.250 VL	1.00	.023	7.00
L045	.005T	7.50	.31	21.50	.03	11.00
L046	.004	4.00	.40 VH	34.00	.035	20.50
L048	.014	25.00	.33 H	31.00	.043	25.00
L049	.007T	12.00	.32	25.50	.05	27.00
L050	.011	22.00	.302	18.00	.007	1.00
L053	.011	22.00	.294	10.00	.034	19.00
L057	.01W	0.00	.293	9.00	.01W	0.00
L058	.05W	0.00	.32	25.50	9.0 VH	33.00
L060	.02W	0.00	.33 H	31.00	.04.	23.00
L061	.01	18.00		0.00		0.00
L062	.01T	18.00	.30	15.00	.01T	2.00
L063	.005W	0.00	.30	15.00	.026	6.00
L064	.011	22.00	.34 VH	33.00		0.00
L066	.007	12.00	.298	11.00	.030	11.00
MEDIAN CONC.	.010		.302		.032	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	208.00	23.111	9	VHVHH		TECHNICON
L003	54.00	9.000	6	VL		TECHNICON
L004	181.50	20.167	9			07112L
L006	150.00	20.000	8	HVH		AUTO ANALYZER
L007	242.00	30.250	8	VHVHVHVHHVH	BIASED HIGH	
L009	233.00	33.286	7	HVHVHVHVHVHVHVH	BIASED HIGH	NITRATE ONLY
L010	170.00	21.250	8			CU-CU REDUCTION CO
L011	56.50	7.063	8	LVL	BIASED LOW	
L013	127.00	15.875	8	H		IC
L014	153.50	19.188	8	VH		CO.RED.AUTO.ANAL.
L019	115.00	13.111	9			CHROMAT IONIQUE
L020	209.00	26.125	8	HVHH		RED-DIATOZ
L021	130.50	14.500	9			IC
L022	51.50	6.438	8	VLLL	BIASED LOW	AUTOMATED CADIUM R
L023	145.00	18.125	8	H		AUTO.CADMIUM REDUC
L024	164.00	20.500	8	H		COLOURIMETRIC
L027	95.50	10.611	9			COLORIMETRIC
L029	69.00	7.667	9	VLLVL	BIASED LOW	
L030	93.00	10.333	9	HVL		COLORIMETRIC
L031A	120.50	15.063	8	HVL		TECHNICON REDUCT.
L031B	31.50	15.750	2		INSUFFICIENT DATA	
L032	202.00	25.250	8	VHVHVHVH		AUTO CD. REDUCTION
L033	71.00	7.889	9	VL	BIASED LOW	AUTO CU REDN
L045	163.50	18.167	9	H		AUTOMATED CD-REDUC
L046	223.50	24.833	9	VHVHVHVH		AUTOANALYZER
L048	191.50	21.278	9	VHH		TECHNICON
L049	108.00	12.000	9	VLVL		AA HYDRAZINE-CUSO4
L050	161.00	17.889	9	VHL		IC
L053	113.50	12.611	9	L		CD-REDUCTION COLOR
L057	47.00	7.833	6	VL		
L058	131.50	18.786	7	VHLVH		I.C.
L060	157.00	22.429	7	VHH		IC
L061	54.00	21.333	3		INSUFFICIENT DATA	TECHNICON AA II
L062	181.50	20.167	9	VHVHH		DIS.ANAL.HYD.RED.
L063	71.00	8.875	8	VL		AUTO-CD-RED
L064	189.50	23.688	8	VHVH		IC(DIONEX) MODEL 10
L066	123.50	15.438	8	VH		ION CHROM.

OVERALL AVERAGE RANK IS 17.106

LAB NO.	TOTAL RANK	AVERAGE RANK	NO OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L022	51.50	6.438	8	VLLL	BIASED LOW	AUTOMATED CADIUM R
L011	56.50	7.063	8	LVL	BIASED LOW	
L029	69.00	7.667	9	VLLVL	BIASED LOW	
L057	47.00	7.833	6	VL		
L033	71.00	7.889	9	VL	BIASED LOW	AUTO CD REDN
L063	71.00	8.875	8	VL		AUTO-CD-RED
L003	54.00	9.000	6	VL		TECHNICON
L030	93.00	10.333	9	HVL		COLORIMETRIC
L027	95.50	10.611	9			COLORIMETRIC
L049	108.00	12.000	9	VLVL		AA HYDRAZINE-CUSO4
L053	113.50	12.611	9	L		CD-REDUCTION COLOR
L019	118.00	13.111	9			CHROMAT IONIQUE
L021	130.50	14.500	9			IC
L031A	120.50	15.063	8	HVL		TECHNICON REDUCT.
L066	123.50	15.438	8	VH		ION CHROM.
L031B	31.50	15.750	2		INSUFFICIENT DATA	
L013	127.00	15.875	8	H		IC
L050	161.00	17.889	9	VHL		IC
L023	145.00	18.125	8	H		AUTO.CADMIUM REDUC
L045	163.50	18.167	9	H		AUTOMATED CD-REDUC
L058	131.50	18.786	7	VHLVH		I.C.
L014	153.50	19.188	8	VH		CD.RED.AUTO.ANAL.
L006	160.00	20.000	8	HVH		AUTO ANALYZER
L004	181.50	20.167	9			07112L
L062	181.50	20.167	9	VHVHH		DIS.ANAL.HYD.RED.
L024	164.00	20.500	8	H		COLOURIMETRIC
L010	170.00	21.250	8			CD-CU REDUCTION CO
L048	191.50	21.278	9	VHH		TECHNICON
L061	64.00	21.333	3		INSUFFICIENT DATA	TECHNICON AA II
L060	157.00	22.429	7	VHH		IC
L002	208.00	23.111	9	VHVHH		TECHNICON
L064	189.50	23.688	8	VHVH		IC(DIONEX)MODEL 10
L046	223.50	24.833	9	VHVHVHVH		AUTOANALYZER
L032	202.00	25.250	8	VHVHVHVH		AUTO CD. REDUCTION
L020	209.00	26.125	8	HVHH		RED-DIATOZ
L007	242.00	30.250	8	VHVHVHVHHVH	BIASED HIGH	
L009	233.00	33.286	7	HVHVHVHVHVHVH	BIASED HIGH	NITRATE ONLY

OVERALL AVERAGE
RANK IS 17.106

APPENDIX II: LABORATORY APPRAISALS

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 02

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory, except for a high flag on sample No. 10

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: -

SULPHATE NON I.C.: Satisfactory

ACIDITY: No results reported

TOTAL ALKALINITY: Satisfactory, except for a high flag on sample No. 8

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory, except for a high flag on sample No. 2

SPECIFIC CONDUCTIVITY: Satisfactory, except for a high flag on sample No. 5

COLOUR: Satisfactory

REACTIVE SILICA: No results are flagged, however ranking indicates results are biased low

NITRATE + NITRITE: Samples 6 and 7 are flagged very high and flagged high on sample No. 8

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 03

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory, except for a high flag on sample No. 6

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: No samples are flagged, however results are ranked biased low

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: Satisfactory

ACIDITY: No results reported

TOTAL ALKALINITY: Satisfactory, however there is insufficient data to assess bias

GRAN TITRATION ALKALINITY: Flagged very high on sample No. 8 and very low on sample No. 5

pH: Samples 3, 5, 7, and 9 are all flagged very low

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: Sample No. 1 and 3 are flagged low; the remaining results are insufficient to assess bias

REACTIVE SILICA: Samples 3 and 7 are flagged high. Insufficient data to assess bias

NITRATE + NITRITE: Satisfactory, except for a low flag on sample No. 7

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 04

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: No results were flagged, however, ranking indicates results are biased low

POTASSIUM: Samples 1, 2, 3 and 9 are all flagged low; ranking indicates results are biased low

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Satisfactory

ACIDITY: No results reported

TOTAL ALKALINITY: Sample No. 2 is flagged low, ranking indicates results are biased low

GRAN TITRATION ALKALINITY: Samples 2, 3, 7 and 9 are flagged very low, samples 5 and 6 are flagged very high. Data appear to be erractic

pH: Flagged very low on samples 2, 3, 8, and 9, flagged low on sample 10. Ranking indicates results are biased low

SPECIFIC CONDUCTIVITY: Satisfactory, except for a very high flag on samples 5 and 6

COLOUR: Samples 1, 3, 5, 6, 7, 8, and 10 are all flagged very high

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Satisfactory

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 06

CALCIUM: Satisfactory, except for a very high flag on sample No. 10

MAGNESIUM: Samples 1, 7, 9 and 10 are flagged high. Ranking indicates results are biased high

SODIUM: Satisfactory

POTASSIUM: Samples 1, 2 and 8 are flagged very low and samples 3 and 6 are flagged low; ranking indicates results are biased low

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Sample 7 is flagged high and sample 10 is flagged very high

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: No results are flagged, however ranking indicates results are biased low

ACIDITY: No results reported

TOTAL ALKALINITY: Flagged low on samples 1 and 10; ranking indicates results are biased low

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: No results reported

REACTIVE SILICA: Sample 7 is flagged low; insufficient data to assess bias

NITRATE + NITRITE: Flagged high on sample 5 and very high on sample No. 7

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 07

CALCIUM: No results reported

MAGNESIUM: No results reported

SODIUM: No results reported

POTASSIUM: No results reported

CHLORIDE I.C.: Samples 1, 7 and 10 are flagged high

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: Flagged high on samples 3, 7, and 9

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Flagged very high on samples 1, 3, 5, 8, and 10; flagged high on sample No. 9. Ranking indicates results are biased high

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 09

CALCIUM: Flagged low on sample 9 and 10

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory, except for a very high flag on sample No. 5

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Samples 3, 5, 6, 7, 9, and 10 are flagged very high. Sample 1 is flagged high. Ranking indicates results are biased high

LO 09

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO10

CALCIUM: Satisfactory, except for a low flag on sample No. 1

MAGNESIUM: Sample 3 is flagged very low, ranking indicates results are biased low

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Sample No. 7 is flagged low, otherwise the results are satisfactory

ACIDITY: Samples 5 and 6 are flagged low. Insufficient data to assess bias

TOTAL ALKALINITY: Insufficient data to assess bias

GRAN TITRATION ALKALINITY: No results reported

pH: Samples 1, 6, and 8 are flagged very low and Sample 3 low

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: Insufficient data to assess bias

REACTIVE SILICA: Satisfactory

NITRATE + NITRITE: Satisfactory

LO 10

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 10B

CALCIUM: No results reported

MAGNESIUM: No results reported

SODIUM: No results reported

POTASSIUM: No results reported

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: No results reported

ACIDITY: Satisfactory

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: No results reported

SPECIFIC CONDUCTIVITY: No results reported

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: No results reported

LO 10B

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 11

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Samples 5, 6, and 10 are flagged very high and samples 3, 7, and 9 are flagged high; ranking indicates results are biased high

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory except for a very low flag on sample No. 10

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Satisfactory

ACIDITY: Satisfactory, except for a low flag on sample No. 7

TOTAL ALKALINITY: Insufficient data to assess bias

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory, except for a low flag on sample No. 6

COLOUR: Samples No. 3 is flagged high and samples 6, 7, 8, 9, and 10 are flagged very high

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Samples No. 7 is flagged very low and sample No. 5 is flagged low. Ranking indicates results are bised low

LO 11

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 12

CALCIUM: No results reported

MAGNESIUM: No results reported

SODIUM: No results reported

POTASSIUM: No results reported

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory

SPECIFIC CONDUCTIVITY: No results reported

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: No results reported

LO 12

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO13

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Satisfactory, except for a high flag on sample 1

LO 13

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 14

CALCIUM: Satisfactory, except for a very high flag on sample No. 5

MAGNESIUM: Satisfactory, except for a low flag on sample No. 3

SODIUM: Satisfactory, except for a high flag on sample No. 5

POTASSIUM: Samples 3 and 6 are flagged very low

CHLORIDE I.C.: Sample 10 is flagged high and sample No. 5 is flagged low

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Flagged very high on samples 5 and 6

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: Satisfactory

pH: Flagged very high on sample No. 8, low flag on sample No. 6

SPECIFIC CONDUCTIVITY: Sample No. 5 and 6 are flagged very low, and sample No. 8 is very high

COLOUR: No results reported

REACTIVE SILICA: Satisfactory

NITRATE + NITRITE: Satisfactory

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 16

CALCIUM: Satisfactory, except for a very high flag on sample 10

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Satisfactory

ACIDITY: Samples 1, 2, 3, 5, 7, and 8 flagged very high; Sample No. 9 flagged high, results are ranked biased high

TOTAL ALKALINITY: low flag on sample No. 1 and 2, overall ranking indicates results are biased low

GRAN TITRATION ALKALINITY: No results reported

pH: Flagged very low on sample No. 1, samples No. 2, 5, 7, and 8 are flagged low. Results are biased high

SPECIFIC CONDUCTIVITY: No results reported

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: No results reported

LO 16

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 18

CALCIUM: No results reported

MAGNESIUM: No results reported

SODIUM: No results reported

POTASSIUM: No results reported

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: Sample No. 10 is flagged low; ranking indicates results are biased low

GRAN TITRATION ALKALINITY: Samples 5 and 6 are flagged very high

pH: Samples 1, 3, 8, and 9 are flagged very low and samples 2 and 7 are flagged low; results are biased low

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: No results reported

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 19

CALCIUM: Satisfactory, except for a high flag on sample No. 3

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: Insufficient data to assess bias

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Satisfactory

LO 19

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 20

CALCIUM: Satisfactory

MAGNESIUM: Samples 1 and 3 are flagged very high

SODIUM: Satisfactory

POTASSIUM: Satisfactory, except for a low flag on sample 3

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: Satisfactory

ACIDITY: Samples 3, 7, and 9 are flagged very high

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: Samples 5 and 6 are flagged very high

pH: Satisfactory

SPECIFIC CONDUCTIVITY: No results reported

COLOUR: No results reported

REACTIVE SILICA: Satisfactory

NITRATE + NITRITE: Flagged high on samples 1 and 10, and very high on No. 3

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 21

CALCIUM: Flagged low on samples 3, 6 and 10 and very low on No. 9; ranking indicates data is biased low

MAGNESIUM: Sample No. 2 is flagged low and Sample No. 3 is flagged very low

SODIUM: No samples have been flagged, however data is biased high

POTASSIUM: Satisfactory

CHLORIDE I.C.: Satisfactory except for a high flag on sample No. 1

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Sample 9 is flagged very high; ranking indicates results are biased high

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: Sample 10 is flagged very low, sample 2 is flagged high

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Satisfactory

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 22

CALCIUM: Sample No. 3 is flagged very high and samples 7, 9, and 10 are high; ranking indicates results are biased high

MAGNESIUM: Samples 1, 7 and 10 are flagged very high and sample 9 is high. Ranking indicates results are biased high

SODIUM: Satisfactory

POTASSIUM: Flagged very low on sample 10; insufficient data to assess bias

CHLORIDE I.C.: Samples 1, 5, 6, and 10 are flagged very high

CHLORIDE NON I.C.: Samples 1, 3, 6, and 9 are flagged very high; samples 5 and 10 are flagged high, ranking indicates results are biased high

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: Satisfactory, except for a high flag on sample No. 9

TOTAL ALKALINITY: Sample 3 and 8 are flagged very high

GRAN TITRATION ALKALINITY: No results reported

pH: Samples 1, 8 and 9 are flagged high, sample 10 is flagged very high

SPECIFIC CONDUCTIVITY: Flagged low on sample 1, 7 and 9; ranking indicates results are biased low

COLOUR: Satisfactory

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Samples 7 and 9 are flagged low and sample 5 is flagged very low. Ranking indicates results are biased low

LO 22

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 23

CALCIUM: Satisfactory, except for a very high flag on sample 3

MAGNESIUM: Sample No. 7 is flagged very low and sample No. 9 is flagged high

SODIUM: Satisfactory

POTASSIUM: Satisfactory except for a very high flag on sample 8

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Samples 8 and 9 are flagged very low and sample 1 is flagged low

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Satisfactory

ACIDITY: Satisfactory

TOTAL ALKALINITY: Satisfactory - except for a high flag on sample No. 1

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory - except for a high flag on sample No. 8

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: Sample 3 is flagged high, insufficient data to assess bias

REACTIVE SILICA: Insufficient data to assess bias

NITRATE + NITRITE: Satisfactory, except for a high flag on sample 7

LO 23

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 24

CALCIUM: Satisfactory

MAGNESIUM: Sample No. 8 is flagged very low and Sample No. 9 is flagged high

SODIUM: Satisfactory

POTASSIUM: Flagged low on samples 3 and 6

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: Satisfactory

GRAN TITRATION ALKALINITY: Satisfactory

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: Sample 1 and 3 are flagged very high

REACTIVE SILICA: Satisfactory

NITRATE + NITRITE: Satisfactory, except for a high flag on sample 6

LO 24

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 25

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Flagged very high on sample 3 and very low on No. 9 and high on No. 10; data appear to be erratic

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: Sample 7 is flagged low and sample 9 very low. Ranking indicates results are biased low

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: Samples 3, 7, 8, 9, and 10 are flagged very high and No. 1 very low; results indicate data may be erratic

SPECIFIC CONDUCTIVITY: No results reported

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: No results reported

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 27

CALCIUM: Flagged low on samples 5 and 6

MAGNESIUM: Satisfactory, except for a high flag on sample No. 8

SODIUM: No results were flagged, however, ranking indicates results are biased low

POTASSIUM: Satisfactory

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: Samples 1, 2, and 3 are flagged very high and samples 8 and 10 flagged high

GRAN TITRATION ALKALINITY: Satisfactory

pH: Samples 1, 5, 8 and 10 are flagged very high

SPECIFIC CONDUCTIVITY: Satisfactory, except for a very high flag on Sample 5

COLOUR: Sample 1, 2 and 3 are flagged high. Sample No. 6 is very high

REACTIVE SILICA: Satisfactory

NITRATE + NITRITE: Satisfactory

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 28

CALCIUM: No results reported

MAGNESIUM: No results reported

SODIUM: No results reported

POTASSIUM: No results reported

CHLORIDE I.C.: Samples 1, 2, 3, 5, 6, 7, 9, and 10 are all flagged very high and Sample 8 is flagged very low. Ranking indicates results are biased high

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: No results reported

SPECIFIC CONDUCTIVITY: No results reported

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: No results reported

LO 28

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 29

CALCIUM: Satisfactory, except for a very high flag on sample No. 9

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: Satisfactory, except for a low flag on sample No. 9

TOTAL ALKALINITY: Satisfactory

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory, except for a slight high flag on No. 2

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: No results reported

REACTIVE SILICA: No results are flagged, however ranking indicates results are biased low

NITRATE + NITRITE: Flagged very low on No. 3 and 7 and low on No.5. Ranking indicates results are biased low

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 30

CALCIUM: No results reported

MAGNESIUM: No results reported

SODIUM: No results reported

POTASSIUM: No results reported

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: No results reported

ACIDITY: Satisfactory

TOTAL ALKALINITY: Satisfactory, except for a high flag on sample No. 3

GRAN TITRATION ALKALINITY: Satisfactory

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: Sample 3, flagged high; insufficient data to assess bias

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Flagged high on sample No. 1 and very low on sample No. 7

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 31A

CALCIUM: Satisfactory, except for a very low flag on sample No. 3

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Satisfactory

ACIDITY: No results reported

TOTAL ALKALINITY: Flagged low on sample No. 1; insufficient data to assess bias

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: Satisfactory, except for a low flag on sample No.5

REACTIVE SILICA: Satisfactory

NITRATE + NITRITE: Flagged high on sample No. 3 and very low on No. 7

LO 31A

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO31B

CALCIUM: No results reported

MAGNESIUM: No results reported

SODIUM: Satisfactory

POTASSIUM: No results reported

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory on the two results reported,

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: The two results reported are satisfactory,

ACIDITY: No results reported

TOTAL ALKALINITY: Insufficient data

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory on the two results reported. Insufficient data to assess bias

SPECIFIC CONDUCTIVITY: No results reported

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Satisfactory on the two results reported

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO32

CALCIUM: Samples 1, 5, and 6 are flagged very high, sample 8 is flagged high; results are biased high

MAGNESIUM: Satisfactory, except for a high flag on sample No. 6

SODIUM: Satisfactory

POTASSIUM: Sample 1 is flagged very high and sample 3 and 6 are flagged very high

CHLORIDE I.C.: Satisfactory, except for a high flag on sample No. 8

CHLORIDE NON I.C.: Samples 3, 5, 6, 8 and 9 are all flagged very high

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: Satifactory, except for a high flag on sample 8

ACIDITY: Flagged very low on samples 7 and 9, flagged low on No. 10; ranking indicates results are biased low

TOTAL ALKALINITY: Sample No. 8 is flagged very high

GRAN TITRATION ALKALINITY: Satisfactory, except for a low flag on sample No. 1

pH: Satisfactory, except for a low flag on sample No. 1

SPECIFIC CONDUCTIVITY: Sample 5 is flagged very high and No. 9 high, ranking indicates results are ranked biased high

COLOUR: Satisfactory

REACTIVE SILICA: Flagged high on samples 1 and 3

NITRATE + NITRITE: Flagged very high on samples 1, 3, 5 and 10

LO 32

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 33

CALCIUM: Samples 2 and 6 are flagged very low; samples 3 and 9 are flagged low; Samples 1 and 5 are flagged very high. Data appears to be erratic

MAGNESIUM: Sample No. 5 is flagged very high, No. 9 is very low and No. 10 flagged low. Data are arratic. There is insufficient data to assess bias.

SODIUM: Sample No. 2 is flagged high and No. 9 very high, however, there is insufficient data to assess bias

POTASSIUM: Sample 1 is flagged very high, There is insufficient data to assess bias

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Insufficient data to assess bias

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Insufficient data to access bias

ACIDITY: Insufficient data to assess bias

TOTAL ALKALINITY: Sample No. 3 is flagged high. There is insufficient data to assess bias

GRAN TITRATION ALKALINITY: No results reported

pH: Samples 8 and 10 are flagged very low

SPECIFIC CONDUCTIVITY: Satisfactory, except for a very low flag on sample No. 6

COLOUR: No results reported

REACTIVE SILICA: Insufficient data to assess bias

NITRATE + NITRITE: Sample No. 9 is flagged very low, ranking indicates results are biased low

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 42

CALCIUM: Satisfactory, except for a very low flag on sample No. 2

MAGNESIUM: Satisfactory

SODIUM: Satisfactory, except for a low flag on Sample No. 1

POTASSIUM: Satisfactory

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Sample 5 is flagged very high and Sample 3, 9 and 10 are very high

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Seven out of the nine samples reported are flagged very high; Ranking indicates results are bias high

ACIDITY: Eight out of the nine results reported are flagged very high, ranking indicates results are biased high

TOTAL ALKALINITY: Nine out of nine samples are flagged very high, ranking indicates results are biased high

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Eight out of nine samples are flagged very high, results are ranked biased high

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: No results reported

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 45

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Satisfactory

ACIDITY: Satisfactory on the 5 results reported

TOTAL ALKALINITY: Sample No. 1 is flagged low, insufficient data to assess bias

GRAN TITRATION ALKALINITY: No results reported

pH: 5 out of 9 reported results are flagged low, ranking inducates results are biased low

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: Satisfactory

REACTIVE SILICA: Satisfactory

NITRATE + NITRITE: Satisfactory, except for a high flag on sample No. 5

LO 45

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO46

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Satisfactory, except for a high flag on No. 1

POTASSIUM: Satisfactory

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Samples 3, 5, and 6 are flagged very high, sample 9 is flagged high, results are biased low

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Samples 2, 6, 7 and 10 are flagged low, ranking indicates results are biased low

ACIDITY: Satisfactory, except for a very high flag on sample No. 7

TOTAL ALKALINITY: Flagged low on samples 1 and 10, overall results are ranked biased low

GRAN TITRATION ALKALINITY: No results reported

pH: No results reported

SPECIFIC CONDUCTIVITY: Samples 5, 6, 7, 8, 9 and 10 are flagged very low. Results are ranked biased low.

COLOUR: Insufficient data to assess bias

REACTIVE SILICA: Samples 1, 2, 3 and 6 are all flagged very low, insufficient data to assess bias

NITRATE + NITRITE: Very high flag on samples 5, 6, 7, and 9

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 48

CALCIUM: Flagged low on sample 1 and 9

MAGNESIUM: Samples 3 and 6 are flagged low

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: Satisfactory

ACIDITY: No results reported

TOTAL ALKALINITY: Satisfactory, except for high flag on sample 10

GRAN TITRATION ALKALINITY: No results reported

pH: Sample 2 and 8 flagged low, Sample 3 flagged very low

SPECIFIC CONDUCTIVITY: Satisfactory, except for high result on sample 5

COLOUR: No results reported

REACTIVE SILICA: Satisfactory except for a high flag on sample No. 2

NITRATE + NITRITE: Very high flag on sample No. 7 and high flag on sample No. 9

LO 48

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS L049

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Satisfactory, except for a very high flag on sample 1

POTASSIUM: All nine samples have been flagged very high, ranking indicates results are bias high

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Samples 1, 2, 5, and 7 are flagged very low; samples 3 and 10 are low. Samples 6 and 8 are high, data appears to be erractic

ACIDITY: Insufficient data to assess bias

TOTAL ALKALINITY: Satisfactory

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory, except for a very high flag on sample No. 1

SPECIFIC CONDUCTIVITY: Satisfactory, except for a very high flag on sample No. 5

COLOUR: Sample No. 3 is flagged low, insufficient data to assess bias

REACTIVE SILICA: Samples 1, 2, 3, 7 and 9 are flagged very high and sample 6 is high. Ranking indicates results are biased low

NITRATE + NITRITE: Flagged very low on samples No. 5 and 6

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 50

CALCIUM: No results reported

MAGNESIUM: No results reported

SODIUM: No results reported

POTASSIUM: No results reported

CHLORIDE I.C.: Satisfactory, except for a very high flag on Sample No. 7

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory, except for a high flag on sample No. 5

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: No results reported

SPECIFIC CONDUCTIVITY: No results reported

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Very high flag on sample No. 5 and a low flag on No. 7

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO53

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: No results reported

SULPHATE NON I.C.: Satisfactory

ACIDITY: Satisfactory

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: Satisfactory

pH: Satisfactory

SPECIFIC CONDUCTIVITY: No results reported

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Satisfactory, except for a low flag on No. 7

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 57

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Sample No. 3, 5, 6, 8 and 9 all flagged very high, Sample 7 high, ranking indicates results are biased high

POTASSIUM: Samples 1 and 5 are flagged very high

CHLORIDE I.C.: No results reported

CHLORIDE NON I.C.: Samples 6, 8, 9, and 10 are all flagged very low; results are biased low

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: Satisfactory, high flags on Sample No. 10

TOTAL ALKALINITY: Flagged high on Sample No. 1

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: Sample No. 1 and 3 flagged very high and 2 and 8 flagged high

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Satisfactory, except for a very low flag on Sample No. 7

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 58

CALCIUM: Satisfactory

MAGNESIUM: Satisfactory

SODIUM: Satisfactory

POTASSIUM: Satisfactory

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: Satisfactory, except for a high flag on sample 10

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: No results reported

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory, except for a very low flag on sample No. 1

SPECIFIC CONDUCTIVITY: Satisfactory, except for a very high flag on sample No. 5

COLOUR: Insufficient data

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Flagged very high on sample 3 and 10 and low on sample No. 6

LO 58

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO60

CALCIUM: Flagged high on samples 3, 7, 9 and 10, overall ranking indicates results are biased high

MAGNESIUM: Samples 2, 7, 9, and 10 are flagged very high; samples 1 and 3 are flagged high, ranking indicates results are biased high

SODIUM: Samples 1 and 10 are flagged high

POTASSIUM: All 9 samples have been flagged very high, ranking indicates results are biased high

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: Flagged high on samples 3 and 7

TOTAL ALKALINITY: Flagged low on sample 9, ranking indicates results are biased low

GRAN TITRATION ALKALINITY: No results reported

pH: Sample No. 8 is flagged very high, Samples 9 and 10 are low

SPECIFIC CONDUCTIVITY: Samples 1, 2, 3, 6 and 9 are flagged very low. Samples 5, 7, and 8 are low. Results are biased low

COLOUR: No results reported

REACTIVE SILICA: Satisfactory, excpet for a high flag on sample No. 7

NITRATE + NITRITE: Flagged very high on sample 7, sample 9 is flagged high

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 61

CALCIUM: Insufficient data to assess bias; only 3 results reported

MAGNESIUM: Insufficient data to assess bias, however the 3 results reported are satisfactory

SODIUM: Sample No. 8 is very low, insufficient data to assess bias, only 2 results reported

POTASSIUM: Sample No. 6 is flagged very high, insufficient data to asses bias

CHLORIDE I.C.: Insufficient data reported to assess bias

CHLORIDE NON I.C.: Insufficient data to assess bias

SULPHATE I.C.: Insufficient data to assess bias

SULPHATE NON I.C.: Insufficient data to assess bias

ACIDITY: Insufficient data to assess bias

TOTAL ALKALINITY: Insufficient data to assess bias

GRAN TITRATION ALKALINITY: Insufficient data to assess bias

pH: Satisfactory on the 3 results reported, however there is insufficient data to assess bias

SPECIFIC CONDUCTIVITY: Insufficient data to assess bias

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Satisfactory on the 3 samples reported, insufficient data to assess bias

LO 61

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 62

CALCIUM: Satisfactory, except for a very low flag on sample No. 1

MAGNESIUM: Satisfactory, except for a high flag on sample No. 6

SODIUM: Satisfactory

POTASSIUM: Satisfactory, except for a low flag on sample No. 1

CHLORIDE I.C.: Samples 1, 7, and 10 are flagged very high

CHLORIDE NON I.C.: Samples 5, 8, and 9 are flagged very high, ranking indicates results are bias high

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: Flagged very high on samples 1, 2 and 3

ACIDITY: Flagged very low on samples 1, 2, 5 and 6. Flagged low on samples 3 and 8, ranking indicates bias low

TOTAL ALKALINITY: Flagged very high on samples 2, 3, 8 and 10. Ranking indicates bias high

GRAN TITRATION ALKALINITY: No results reported

pH: Flagged very high on 5 and 10. Flagged very low on 9 and low on No. 7, data are erratic

SPECIFIC CONDUCTIVITY: Samples 3 and 6 are flagged very low, sample 2 is low

COLOUR: No results reported

REACTIVE SILICA: Sample No. 3 is flagged low, ranking indicates results are bias low

NITRATE + NITRITE: Samples 1 and 5 are flagged very high, sample 6 is high

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 63

CALCIUM: Flagged very low on samples 3, 7, and 9. ranking indicates results are bias low

MAGNESIUM: Satisfactory, except for a low flag on sample No. 9

SODIUM: No samples are flagged, however, ranking indicates results are bias low

POTASSIUM: Satisfactory

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: Satisfactory

SULPHATE I.C.: Flagged high on sample 1 and very high on No. 3

SULPHATE NON I.C.: Flagged very high on samples 1, 2 and 3

ACIDITY: Satisfactory

TOTAL ALKALINITY: Flagged very high on samples 2, 3, 5, 6 and 8 and flagged high on 1 and 10

GRAN TITRATION ALKALINITY: No results reported

pH: Samples 1, 8 and 10 are flagged very high, sample 2 flagged high

SPECIFIC CONDUCTIVITY: Sample 2 and 3 are flagged very high, sample 5 and 6 very low and sample 8 is high. Data appears to be erratic

COLOUR: Sample 1, 2 and 5 flagged very low. Sample 3 flagged low

REACTIVE SILICA: Flagged very highon sample 2, 3 and 9; insufficient data to assess bias

NITRATE + NITRITE: Satisfactory, except for a low flag on No. 7

LO 63

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS LO 64

CALCIUM: Sample 7 is flagged very low and samples 9 and 10 low

MAGNESIUM: Satisfactory, except for a high flag on sample 1

SODIUM: Satisfactory

POTASSIUM: Samples 1 and 2 are flagged very low; samples 3, 6, 8 and 9 are low; Samples 7 and 10 are very high. Data are erratic.

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: Satisfactory

TOTAL ALKALINITY: Satisfactory

GRAN TITRATION ALKALINITY: No results reported

pH: Satisfactory

SPECIFIC CONDUCTIVITY: Satisfactory

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Very high flag on samples 7 and 9

ATTACHMENT 1
MARCH 19, 1984

YOUR LABORATORY NUMBER IS L066

CALCIUM: Sample No. 5 is flagged very low; sample No. 6 is flagged very high

MAGNESIUM: Satisfactory, except for a very low flag on sample No. 5

SODIUM: Satisfactory, except for a low flag on sample 5

POTASSIUM: Satisfactory, except for a very low flag on sample 5

CHLORIDE I.C.: Satisfactory

CHLORIDE NON I.C.: No results reported

SULPHATE I.C.: Satisfactory

SULPHATE NON I.C.: No results reported

ACIDITY: Flagged low on samples 5 and 9

TOTAL ALKALINITY: No results reported

GRAN TITRATION ALKALINITY: No results reported

pH: Flagged very high on sample 5 and high on sample 8

SPECIFIC CONDUCTIVITY: Flagged very low on samples 5 and 9

COLOUR: No results reported

REACTIVE SILICA: No results reported

NITRATE + NITRITE: Satisfactory, except for a very high flag on sample 2

APPENDIX III: GLOSSARY OF TERMS

Reference: 1983 ASTM Volume 11.01 water 1, Section II, pg D4210-83

GLOSSARY OF TERMS USED IN THE

EVALUATION OF INTERLABORATORY RESULTS

Satisfactory: Quite acceptable, "good results".

Erratic: A set of results for a given characteristic is deemed erratic when both high and low flags are assigned.

Out of Control: An analytical system is said to be out of control when it has demonstrated the ability to perform adequately and produces an extreme result or results. For an example, consider this set of results obtained by laboratory #3 on total phosphorus for Study #24.

Sample No.	Reported Value	Median	Difference
1	9	9.5	-.5
2	5	4.5	.5
3	2T	3	-1
4	8	8	0
5	2T	2.5	-.5
6	9	8	1
7	28	28	0
8	18	17	1
9	23	23.7	-.7
10	16	15	1
11	35	35.8	-.8
12	75	78.7	-3.8
13	58	59	-1
14	110	90	20

Given the excellent results obtained on samples 1 through 13, the result on sample 14 indicates that the analytical system was out of control.

Bias: A set of results is said to be biased when the set exhibits a tendency to be either higher or lower than some standard - the standard which has been used in the analysis of our studies thus far has been the performance of all other participating laboratories. The ranking procedure employed in testing for bias is described in W.J. Youden's paper, "Ranking Laboratories by Round-Robin Tests from Precision Measurement and Calibration, H.H. Ku, Editor, NBS Special Publication 300 - Volume 1, U.S. Government Printing Office, Washington, D.C., 1969. In this paper, Youden establishes the rationale for evaluating laboratories' performance by ranking results. In our use of the procedure there is about 1 chance in 20 of deeming a set of results biased when in fact it is not, that is, $\alpha = 0.05$.

W: A "W" code is used with a reported result when no measurement was possible due to no response of the instrument to the sample. The "W" is preceded by the smallest determinative division that can be used in the units used in reporting.

T: The "T" code is used with values between the Criterion of Detection and the "W" value. The Criterion of Detection is commonly thought of by many as the limit of detection.

Lower limit for Use of Basic Assceptable Error, Basic Acceptable Error; and Concentration Error Increment:

These terms define the acceptable difference from the median of results (target value) that is allowed without a result being

flagged either low or high. For a sample whose target value is at or below the lower limit for use of basic acceptable error the basic acceptable error is used to determine the range of acceptable deviations.

For example: Suppose that the lower limit for use of basic acceptable error has been set at 10 µg/L and the basic acceptable error is 1.0 µg/L, if a target (median) value for a sample is 5 µg/L, then any reported result within the range 5 ± 1.0 or 4.0 to 6.0 µg/L would be considered acceptable.

Since for almost all substances it appears that the variability of results increases in concentration, an allowance is made for the increased variability for those samples whose target values are above the lower limit for use of basic acceptable error. The allowance is added to the basic acceptable error, and it is calculated by multiplying the concentration error increment by the difference between he target value and the lower limit for use of basic acceptable error.

For example: If a target value for a sample is 21 µg/L, and the lower limit for use of basic acceptable error is 10 µg/L, the difference between them is 21 - 10 = 11 µg/L. Multiplying the difference by the concentration increment, 11 µg/L x 0.10, gives 1.1 µg/L to determine the acceptable difference 21.0 ± 2.1 or 18.9 to 23.1 µg/L would be considered acceptable and would not be flagged.

In general, the values chosen for the basic acceptable error and the concentration error increment are selected so that several of the participating laboratories will have demonstrated the ability to do the analyses satisfactorily. In a sense the values represent state of the art for analysis of the round robin samples.

Flag: A result is flagged high H when its value is greater than the median (target) value plus the acceptable difference but not greater than the median plus 1.5 times; a result greater than 1.5 times the acceptable difference is flagged with VH. Similarly, a result less than the median minus 1.5 times the acceptable difference is flagged L a lower result is flagged VL.

Acceptable Difference or Acceptable Deviation:

The absolute values of the maximum difference between a result and the target value which will not be flagged.