LRTAP INTERCOMPARISON STUDY L 4: MAJOR IONS, NUTRIENTS AND PHYSICAL PROPERTIES IN WATER

[redacted]

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EXECUTIVE SUMMARY

The Canadian LRTAP program (long range transport of atmospheric pollutants) involve 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 an interlaboratory study that addresses these issues.

The study consisted of 11 water samples and was distributed to 36 laboratories who were requested to analyze for 16 different constituents. Data provided was analyzed for bias by the rank order method of Youden. Results which deviated significantly from sample medians were flagged.

This report includes a description of the study, the evaluation process and a compilation of appraisals made on all laboratories. Included is a summary of the percentage bias and percentage of flags assigned to laboratories for three intercomparison studies. A few laboratories are consistantly satisfactory, a few reveal improvements and a few remain poor.

Highly coloured waters are known to influence colourmetric procedures for sulfate. This report describes the variation between the ion chromatographic results and the more traditional non IC results.

ABSTRACT

This report is a compilation of results received and evaluated for interlaboratory study L-4. The report includes all laboratory specific appraisals that had been provided to the respective laboratories on November 24, 1983. The study consisted of 11 different water samples distributed to over 35 laboratories. The report includes a brief description of the evaluation process, traceability of results on some samples recycled from earlier studies and a description of how highly coloured waters influence the sulfate measurements. The other constituents analyzed included Ca, Mg, Na, K, Cl, SO_4, acidity, alkalinity, pH, specific conductance, colour, silica, nitrate plus nitrite, barium and dissolved organic carbon.

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INTRODUCTION

The long range transport of atmospheric pollutants (LRTAP) program involves many different laboratories that contribute data for regional or national program objectives. If the data are to be merged or if they are to be used for trends or for impact studies then it is imperative that the laboratories be defined as in control and producing comparable studies. To address such issues an interlaboratory studies program was established. The merits and impact of such studies are described elsewhere (1,2,3).

SCOPE AND OBJECTIVES

This study was organized during the spring and summer of 1983. It was designed primarily to acquire information on the comparability of laboratories that produce analytical results for Federal-Provincial LRTAP programs. The samples selected (see below) were mainly natural-water typical of the eastern watershed program. Two natural precipitation samples and a few synthetic in-house reference waters were also included. The study was distributed August 3, 1983 and a deadline of September 5, 1983 was assigned.

The results were interpreted during October and November 1983 and laboratory specific appraisals (see Appendix II) were mailed

to the laboratories and their associated contact persons on November 24, 1983. The short turnaround time between reporting of results and the provision of appraisals allowed those laboratories with problems an opportunity to take corrective actions. These remedial actions are important and reflect the constructive impact of the interlaboratory studies program.

RELEASE OF LABORATORY CODES

Laboratories who participated in this study are identified at the end of this report. The individual laboratory results in Appendix I and the laboratory appraisals in Appendix II are identified by laboratory code numbers. The key to these codes, although confidential, are available on a need-to-know basis. In many cases the identification of laboratory codes are provided to pertinent contract authorities and program managers who are responsible for their specific projects. Users of data are encouraged to seek out the source of their data and laboratory codes and openly discuss issues on quality of data and documented performance with laboratory heads and project managers. This protocol has the potential for generating an atmosphere conducive to improving quality in the measurement process. In some cases the laboratory quality may exceed the requirements for data use, whereas in other cases laboratory data control is inadequate for effective and meaningful data use.

DESIGN OF STUDY

The study included 11 test samples of which seven were derived from various LRTAP field programs. The samples are described in Table 1. The sequence chosen intentionally included four highly-coloured soft waters since such waters would introduce restraints to the conventional colourimetric methods used for analysis of sulphate and chloride. Coloured water samples are not uncommon to the eastern watershed programs.

2 pcpn samples

TABLE 1: List of test samples*

Sample No.	Source of Water	Previous Use**
1	Nova Scotia (Pebblelogitch)	-
2	Nova Scotia (Atkins Brook)	-
3	Nova Scotia (Upper Mercy River)	
4	Nova Scotia (Mount Tom Brooks)	
5	Quebec (Montmorency)	L-3 (No.3,4)
6	In house reference (synthetic)	L-3 (No.8)
7	In house reference (")	
8	Rainfall (Burlington, Summer of 1982)	L-3 (No.7)
9	Rainfall	
10	Great Lakes (Lake Superior)	L-1 (No.11), L-3 (No.10), IJC-41 (No.9)
11	In house reference (synthetic)	

* All test samples were unfiltered and without preservatives.

** L-1 and L-3 are earlier LRTAP interlaboratory studies; IJC-41 was an International Joint Commission Interlaboratory Study No. 41 (August 1981).

Five water samples were also recycled from earlier interlaboratory studies. Their inclusion has merit since they provide additional information to demonstrate continuity in performance and verify sample stability.

PREPARATION OF SAMPLES

Test samples for this study were derived from 50 to 500 litre stock units maintained in permanent storage at 4°C. Forty-litre aliquots were removed by pumping. This substock was stirred vigorously and serially transferred to 500 mL bottles. All bottles, linear polyethylene, were previously washed with chromerge, tap water and then distilled water rinsed, filled with distilled water and stored 10 to 100 days prior to use. Each bottle was prerinsed with test sample prior to filling. Once prepared, the 40 sets of 11 test samples were stored at 4°C prior to distribution. The study was distributed August 3, 1983 and a deadline of September 5, 1983 was assigned. The majority of laboratories made their analyses during the month of September 1983.

Evaluation of Data

Interlaboratory data sets were evaluated for bias by the nonparametric method of Youden (4) which had been modified by Clark

(2,5) to allow for computerized evaluations. A set of data are said to be biased when the set exhibits a tendency to be higher or lower than some standard. The standard for these studies is the performance of all participating laboratories.

Results deviating from median values were flagged by the procedure developed by J. Clark and R. White (2,5). Medians as opposed to the average were used as estimators of target values since medians are less influenced by outliers (4,7). A summary of the criteria is given in Table 2.

To assist in evaluation of data participants were requested to report all calculated values for their measurement system. This included the reporting of all calculated results including negative values. This reporting process and associated coding of results with the letters W and T are described in a recent ASTM standard practice (6).

RESULTS AND DISCUSSIONS

General

Results reported by participants are found in Appendix I. Laboratory ranks (2,5,7) and flags (2,5) on individual samples are

identified, along with the existence of any bias for each set of laboratory results. An abbreviation of methods for laboratory analysis is also given. A summary of interlaboratory median values for each sample and parameter is given in Table 3. Appendix II contains the individual laboratory appraisals that were mailed to the various contact persons on November 24, 1983.

TABLE 2: Summary of criteria used for flagging results*

Constituent	LLBAE			BAE			CEI		
	L-1	L-3	L-4	L-1	L-3	L-4	L-1	L-3	L-4
Ca	5	2.5	2.5	0.25	0.188	0.15	0.10	0.96	0.08
Mg	1.0	1.0	1.0	0.15	0.046	0.05	0.10	0.099	0.10
Na	3	0.5	0.50	0.4	0.2	0.20	0.10	0.15	0.14
K	0.5	0.50	0.20	0.15	0.13	0.05	0.10	0.108	0.16
Cl-IC	-	-	1.5	-	-	0.25	-	-	0.15
Cl-non IC	-	-	1.5	-	-	0.25	-	-	0.15
Cl (Total)	5	1.5	1.5	0.50	0.26	0.25	0.05	0.178	0.15
SO_4-IC	-	-	2.0	-	-	0.76	-	-	0.20
SO_4-non IC	-	-	2.0	-	-	0.76	-	-	0.20
SO_4 (Total)	5	6.0	2.0	0.5	0.746	0.76	0.10	0.168	0.20
Acidity	1.0	1.0	1.0	1.0	0.75	0.75	0.10	0.50	0.50
Total Alka	10	2.5	2.5	1.25	1.19	1.20	0.10	0.086	0.08
Gran Alka	-	-	0.05	-	-	0.50	-	-	0.10
pH	7	0	0	0.25	0.25	0.25	0	0	0
Spec. Cond.	50	50	50	2.5	2.82	2.8	0.05	0.078	0.08
Colour	5	5	5	5	2.03	2.2	0.10	0.182	0.18
Si	0.2	0.10	0.1	0.05	0.05	0.05	0.10	0.067	0.08
NO_3+NO_2	0.2	0.05	0.5	0.05	0.024	0.025	0.10	0.142	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.

TABLE 3: Summary of interlab median values

Parameter / Sample Number	1	2	3	4	5	6	7	8	9	10	11
Calcium mg Ca/L	0.442	0.435	0.895	0.443	1.76	0.040	0.30	2.13	0.970	13.0	42.0
Magnesium mg Mg/L	0.390	0.310	0.440	0.310	0.470	0.700	0.070	0.605	0.210	2.70	9.10
Sodium mg Na/L	3.20	2.62	3.10	2.63	2.46	0.711	0.519	0.060	0.200	1.24	18.95
Potassium mg K/L	0.260	0.200	0.284	0.170	0.165	1.09	0.325	0.088	0.120	0.500	0.897
Chloride mg Cl/L	4.06	3.15	4.48	3.26	2.98	0.82	1.45	0.74	0.585	1.17	108.7
Chloride mg Cl/L non IC	4.24	3.65	4.62	3.20	3.17	0.90	1.50	0.80	0.60	1.20	102.5
Sulfate mg SO_4/L	2.65	1.75	7.10	1.98	3.47	3.025	0.330	5.21	4.80	3.2	37.0
Sulfate mg SO_4/L non IC	4.85	5.10	8.2	4.3	4.5	3.15	0.500	5.20	4.80	3.42	34.0
Acidity mg $CaCo_3$/L	6.47	7.55	8.26	6.07	2.49	2.47	1.61	1.65	4.43	1.0	1.45
Total Alkalinity mg $CaCo_3$/L	0.49	0.500	0.0	0.500	3.00	1.10	1.28	2.10	0.00	40.0	1.57
Gran Titration Alkalinity	-1.39	-1.66	-4.3	-1.2	1.80	-0.37	0.100	1.68	-2.5	39.9	0.02
pH	4.60	4.50	4.10	4.64	6.24	5.02	5.60	6.30	4.31	7.70	5.51
Specific Conductivity µmho/cm	32.2	30.8	59.0	28.9	27.6	18.6	7.87	26.8	33.9	93 2	434.0
Colour (Hazen units)	100	155	79	100	35	3.0	3.0	2.5	4.0	4.0	2.0
Reactive silica mg Si/L	0.90	1.30	0.810	1.50	3.00	0.008	0.040	0.130	0.040	1.10	0.010
Nitrate + Nitrite mg N/L	0.010	0.005	0.004	0.006	0.090	0.102	0.009	0.514	0.560	0.305	0.032
Barium mg Ba/L	0.028	0.021	0.020	0.021	0.008	0.003	0.001	0.003	0.001	0.010	0.001
Dissolved Organic Carbon	11.5	14.71	8.82	11.20	6.35	2.80	0.910	1.45	0.70	2.30	0.700

Sulfate and chloride results were separated into two data groups to isolate data by the ion chormatographic method from all non-IC methods. These two groups were processed separately. A third group of chloride and sulfate data found in Appendix I includes both IC and non-IC methods. The decision to treat IC and non-IC methods separately was necessary since coloured waters were recognized as influencing colorimetric measurements.

Flags and Bias

The flagging process and assessment of bias are two separate issues. Bias is evaluated on the whole laboratory data set (2,4, and 5) whereas flags are processed and defined on individual samples. The criteria for assigning flags was given in Table 2. The rationale for establishing limits on criteria are found elsewhere (2,5 and Study L-1). The impact of the criteria set for this study is summarized in Table 5. A summary of bias by parameter is given in Table 4.

For information value two figures are provided to illustrate the flagging criteria. Given in Figure 1 is the variation of the interlaboratory standard deviation of DOC as a function of the average values for test samples in this study. This example illustrates the BAE, LLBAE and CEI values cited in Appendix I. Not all consistuents have these variables this well defined. The imprecision for sodium

TABLE 4: Summary of bias by constituent for study L-4

Constituent	Number of Labs Reporting	Number of Labs Biased Low	Number of Labs Biased High	Total Labs Biased	Percentage of Laboratories Biased		
					Study L-4 September '83	Study L-3 June '83	Study L-1 December '82
Ca	31	2	2	4	13	25	37
Mg	31	4	2	6	19	19	26
Na	32	4	5	9	28	35	35
K	32	5	3	8	25	16	31
Cl-1C	11	2	0	2	18	-	-
Cl-non 1C	20	1	1	2	10	-	-
Cl (Total)	31	2	3	5	16	24	27
SO_4-1C	13	2	2	4	31	-	-
SO_4-non 1C	19	3	3	6	32	-	-
SO_4 (Total)	32	3	3	6	19	9	13
Acidity	17	3	2	5	29	31	50
Tot Alka.	21	2	1	3	14	31	39
Gran Alka	8	1	0	1	13	-	-
pH	31	6	2	8	26	20	32
Spec Cond	29	5	2	7	24	27	39
Colour	17	2	1	3	18	19	25
Si	15	3	2	5	33	22	31
NO_3+NO_2	29	3	4	7	24	16	29
Ba	8	2	1	3	38	-	-
DOC	14	4	0	4	29	-	30

P = poor
S = satisfactory
blank = moderate (between S & P)
see Table 6

TABLE 5: Variation in percent bias and percent flags between studies

Laboratory	Percent Bias (for Parameter Data Sets)			Percent Flags (on all ranked results)			Comments
	L-1	L-3	L-4	L-1	L-3	L-4	
	December'82	June'83	September'83	December'82	June'83	September'83	
L002	30.7	25	S? 7.7	S 5.9	11.7	S 7.7	improving
L003	25	S 8.3	S 0	14.7	S 7.6	S? 10.9	
L004 A	P 45.5	27.3	27.3	16.7	21	22.1	marginal
L004 B	–	–	27.3	–	–	P 32.73	poor
L006	P 36.4	P 36.4	P 54.6	P 32.6	11.9	19.2	needs improvements
L007	P 50	P 44.4	–	P 33.6	P 46.3	–	poor
L009	S? 22.2	S 10	S? 14.3	23.3	S 10	S 4.0	improving
L010 A/B	–	15.4	23.1	–	20.3	P 25.9	
L011	P 41.7	23.1	P 36.4	S? 11.8	20.8	21.6	
L012	20	–	–	13.8	–	–	
L013 A	30	S 0	S 0	12.4	S 5.6	S 6.3	improving
L014	16.7	16.7	S 10	12	17	17.7	
L016	20	33	P 44.4	22.5	22.2	13.1	
L020	33.3	27.3	S 0	17.9	12.6	13.6	
L021 A	P 45.4	P 55.6	–	P? 20.3	P 44.2	–	poor
L021 B	33	–	P 44.4	P 43.1	–	P 25.3	poor
L022	P 38.5	P 46.2	P 46.2	13.2	P 30.2	P 26.5	poor
L023	30.8	S 0	S 7.7	24.8	12	S 6	improving
L024	18.2	18.2	S 8.3	10.3	11.1	S 6.2	improving
L025	–	15.4	S 0	–	12.8	S? 11.0	
L027	16.7	–	–	S? 4.2	–	–	

not the same #s in L1 report

Continued...../

TABLE 5 (Cont'd):

Laboratory	Percent Bias (for Parameter Data Sets)			Percent Flags (on all ranked results)			Comments
	L-1	L-3	L-4	L-1	L-3	L-4	
	December'82	June'83	September'83	December'82	June'83	September'83	
L029	P 41.7	16.7	16.7	13.8	13.3	S 5.6	improving
L030	–	–	33.0	–	–	S 9.4	
L031 A	S 7.1	S 8.3	16.7	S 1.8	S 7.0	S? 14.1	
L031 B	–	–	–	–	–	–	
L032	28.6	S 0	S? –	23	23.1	S 9.2	
L033	–	23.1	S 9.1	–	P 38.7	19.7	
L040	33	–	–	22.6	–	–	
L041	–	16.7	–	–	S 3.4	–	
L042	–	22.2	20	–	24.4	P? 27.8	
L044	–	33.3	P 44.4	–	P 32.2	P 36.8	poor
L045	23.1	S 8.3	P 41.7	S 7.4	S 7.2	S 8.9	
L046	–	P 38.5	15.4	–	24.2	17.2	
L053	S 11.1	–	22.2	S 2.1	–	S 6.1	
L054	P 71.4	S 12.5	–	24	P 27	–	poor
L056	P 66.7	30	–	P 63.1	P 42.7	–	poor
L057	P 40	33.3	P 50	22.9	P 44.1	P 37.7	poor
L058	S 0	S 8.3	27.3	S 0.5	S 8.9	10.7	
L059	–	–	–	–	–	–	
L060	–	P 50	P 72.7	–	P 34.5	P 42.9	poor
L061	–	–	S 11.0	–	–	S 8.2	

Note: The above percentages were calculated using only the results for Ca, Mg, Na, K, Cl, SO_4, pH, $NO_3 + NO_2$, Si, alkalinity, colour, acidity and conductance.

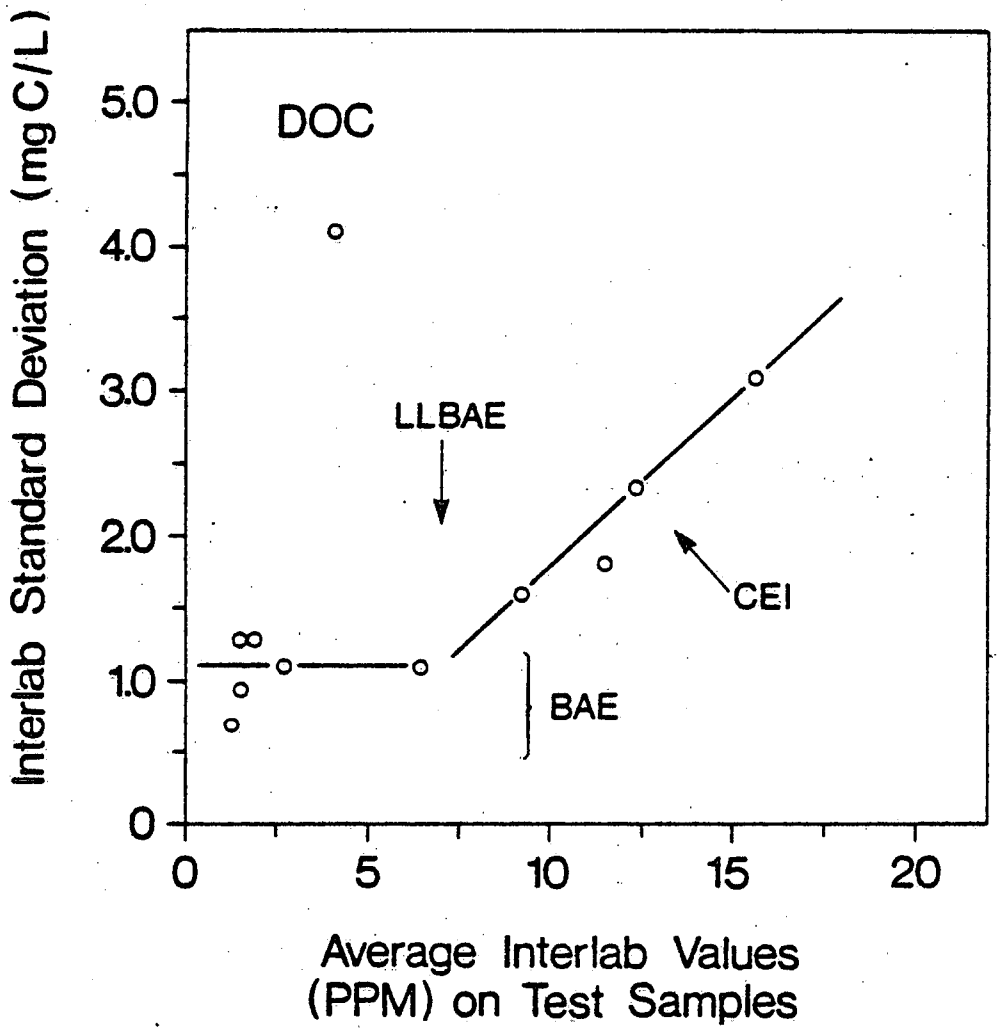

FIGURE 1: Variation of the interlaboratory standard deviations for DOC on the 11 test samples

(see Figure 2) appears as a simple linear relationship. The interlaboratory standard deviation is improved when laboratories declared as biased and individual results with very high or very low flags are removed.

Overall Laboratory Performance

With three similar interlaboratory studies completed the question has arisen as to how to identify the relative overall performance of a laboratory. One possible approach using the Youden bias assessment and the flagging process is to compare laboratories on their frequency of bias and on frequency of flagged results. Such a summary is found in Table 5.

Two separate issues are combined in Table 5. One is bias, defined from the study data sets and the other is flags, determined on results deviating from medians. Some laboratories exhibit a high frequency of bias and of flags. These are laboratories identified as "P" which on a peer group basis, may be considered as poor performers. On the other hand a few laboratories have few flags and are seldom biased. These laboratories "S" are rather satisfactory. Most other laboratories are somewhere between poor and satisfactory.

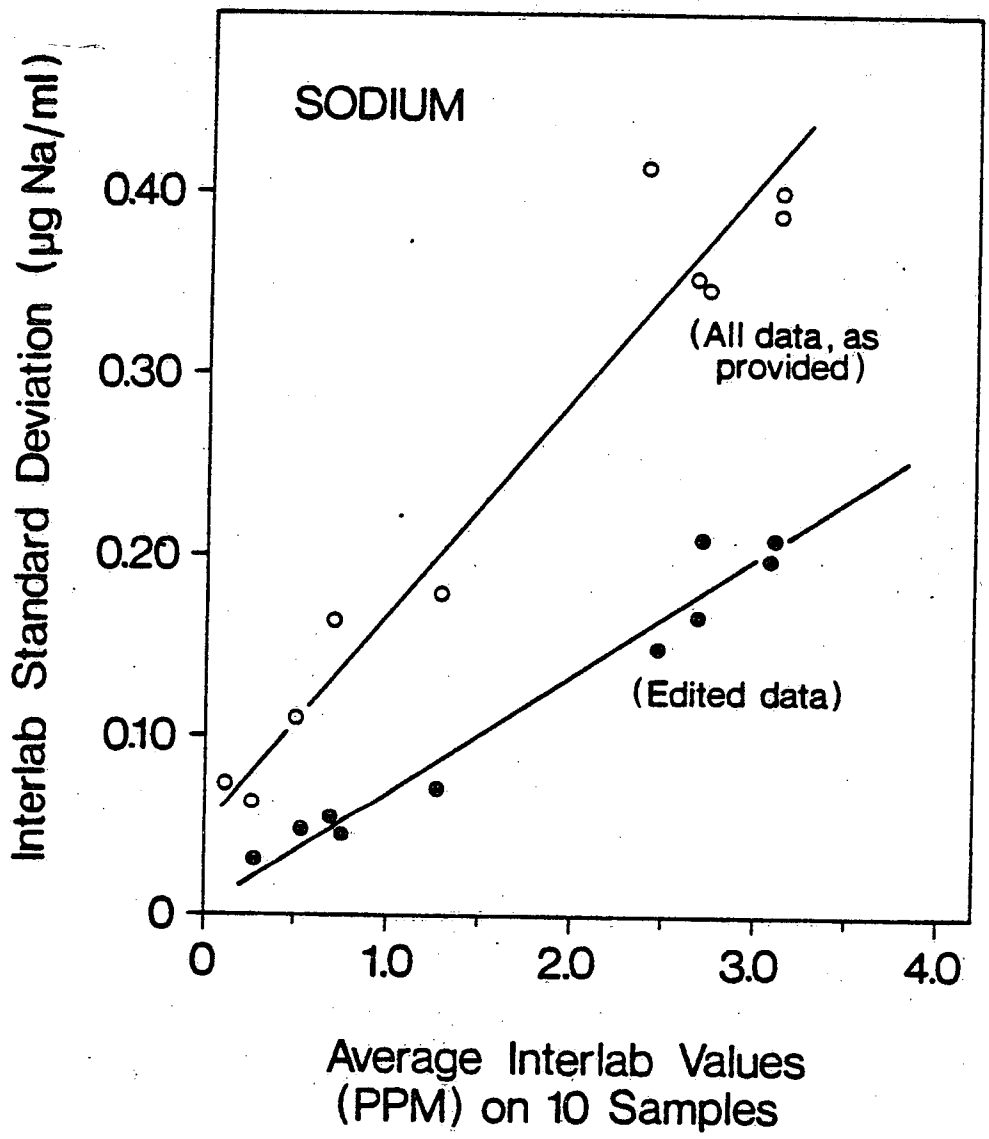

FIGURE 2: Variation of the interlaboratory standard deviations for sodium on test samples analyzed

To categorize laboratories "S" or "P" the following formula on overall study to study performance is proposed. Only three categories are suggested, satisfactory, moderate and poor. These are described below in Table 6.

TABLE 6: Proposed criteria to identify overall performance

Performance	Percent Bias (all parameters)	Percent Flags (all samples and parameters)
"S" Satisfactory	less than 15%	less than 10%
"T" Moderate	15 to 35%	10 to 25%
"P" Poor	greater than 35%	greater than 25%

Care should be taken on interpolating performance too rigorously. Several exceptions are possible. The first is that the above formula assumes each laboratory provided results on all constituents and all samples. A very small number of laboratories reported on only one sample. The second issue relates to priority parameters. The table summarizes percentage flags and bias on 13 parameters. A data user may see his laboratory as very poor overall but his priority constituents may all be very satisfactory. The third caution relates to bias versus flags. A laboratory with a very high frequency of bias but with few or no flags is one which overall is precisely inaccurate. This may be considered as satisfactory. A laboratory with bias but no flags will appear when the flagging criteria is perhaps too generous, the lab has a small systematic error and when the lab has a precise measurement system.

The identified bias is a correctable error (or deviation) and may mean only a small adjustment in calibration standards. On the other hand a laboratory with no bias but a high frequency of flags is simply imprecise or erratic. These laboratories, if consistent, may be a problem should their results be used to establish base lines or trends. Bias in these erratic laboratories is difficult to identify since their results are very imprecise and are ranked very high and very low.

The impact of applying the performance criteria is summarized below in Table 7. Approximately 25 percent of laboratories are satisfactory, 50 percent as moderate and 25 percent as poor.

TABLE 7: Impact of applying performance criteria

Performance Category	Study L-1 (December '82) Bias	Flags	Study L-3 (June '83) Bias	Flags	Study L-4 (September '83) Bias	Flags	Total	Percent
Satisfactory	3	5	9	7	11	11	46	26%
Moderate	15	18	16	15	11	13	88	48%
Poor	10	5	6	9	9	7	46	26%
	28 Labs		31 Labs		31 Labs			

Overall the performance codes (P and S) reveal a few pertinent patterns. For instance, laboratories L004, L007, L021,

L022, L044, L054, L056, L057 and L060 may have a need to review their internal control programs and perhaps consult with their data users. Laboratories L002, L009, L013, L023 L024 and L029 are revealing improvements from study to study. These improvements are possible reactions to the appraisals and a reflection of success of the interlaboratory studies program.

COMPARISON OF DATA TO EARLIER STUDIES

Several samples in this study were recycled from earlier studies. A comparison is given in Table 8 for medians obtained between studies L-3 and L-4. The comparison between medians is rather good. Not shown are data for Sample 11 (Study L-4) which agrees closely with earlier results from Study L-1 (Sample 15) and an early International Joint Commission Study No. 41. The inclusion of test samples recycled between studies provides additional evidence on sample stability and provides additional supporting evidence to laboratories who were judged again as biased or in erratic control.

SPECIFIC COMMENTS

Most parameters were rather well behaved and differences between laboratories are attributed to either a precision factor or a bias due to calibration standards. Three constituents are isolated for specific discussion.

TABLE 8: Comparison of median value between study L-3 and L-4

Sample Number	L-3	L-3	L-4	L-3	L-4	L-3	L-4	L-3	L-4	L-3	L-4
Parameter	#3	#4	#5	#8	#6	#7	#8	#5	#10	#10	#11
Calcium mg Ca/L	1.80	1.80	1.765	0.065	0.040	2.20	2.130	13.05	13.0	42.60	42.0
Magnesium mg Mg/L	0.470	0.468	0.470	0.727	0.700	0.620	0.605	2.710	2.700	9.300	9.100
Sodium mg Na/L	2.40	2.40	2.46	0.700	0.711	0.060	0.060	1.230	1.242	18.90	18.95
Potassium mg K/L	0.190	0.187	0.165	1.090	1.090	0.090	0.088	0.500	0.500	0.930	0.897
Chloride mg Cl/L	3.00	3.025	3.105	0.800	0.850	0.750	0.756	1.20	1.20	105.0	103.5
Sulfate mg SO_4/L	3.80	3.70	3.72	3.01	3.04	5.26	5.20	3.20	3.30	37.00	36.15
Acidity mg $CaCo_3$/L	2.495	2.41	2.50	2.45	2.47	2.20	1.65	1.12	1.00	1.40	1.45
Total Alkalinity mg $CaCo_3$/L	2.00	2.05	3.00	0.62	1.10	2.11	2.10	41.0	40.0	0.78	1.57
pH	6.30	6.315	6.24	5.095	5.02	6.39	6.30	7.70	7.70	5.575	5.51
Specific Conductivity µmho/cm	27.95	27.95	27.6	18.75	18.6	27.0	26.8	94.0	93.2	437.5	434
Colour (Hazen units)	37.5	37.5	35.0	2.50	3.3	2.50	2.5	5.00	4.0	2.50	2.0
Reactive silica mg Si/L	2.995	2.995	3.00	-0.002	0.008	0.130	0.130	1.100	1.100	-0.001	0.010
Nitrate + Nitrite mg N/L	0.099	0.097	0.090	0.105	0.102	0.515	0.514	0.297	0.305	0.034	0.032
Type of Sample	Montmorency (Natural)			Synthetic		Rainwater		Lake Superior		Synthetic	

pH:

This parameter has the potential for being measured precisely within a laboratory. However, on an interlaboratory basis the precision for pH is somewhat poor. The variation of interlaboratory precision is shown in Figure 3. Each individual point in Figure 3 is an interlaboratory standard deviation for the average pH value obtained on samples analyzed in three LRTAP studies (L-1, L-3, and L-4). The interesting observation to note is that the imprecision appears to increase between pH 4 and pH 7. The source of this variation may be attributed to sample (stability and ionic strength) or methods calibration (standardization).

Sulfate and Chloride:

Results for these two constituents were evaluated for bias and flags after separation of data into three method groups (refer to Appendix I). The median values for sulfate by the ion chromatographic (IC) method and the non-IC method are summarized in Table 9. These values were obtained from Appendix I. When graphically presented (see Figure 4) they reveal the influence of colour on the difference between the two method groups.

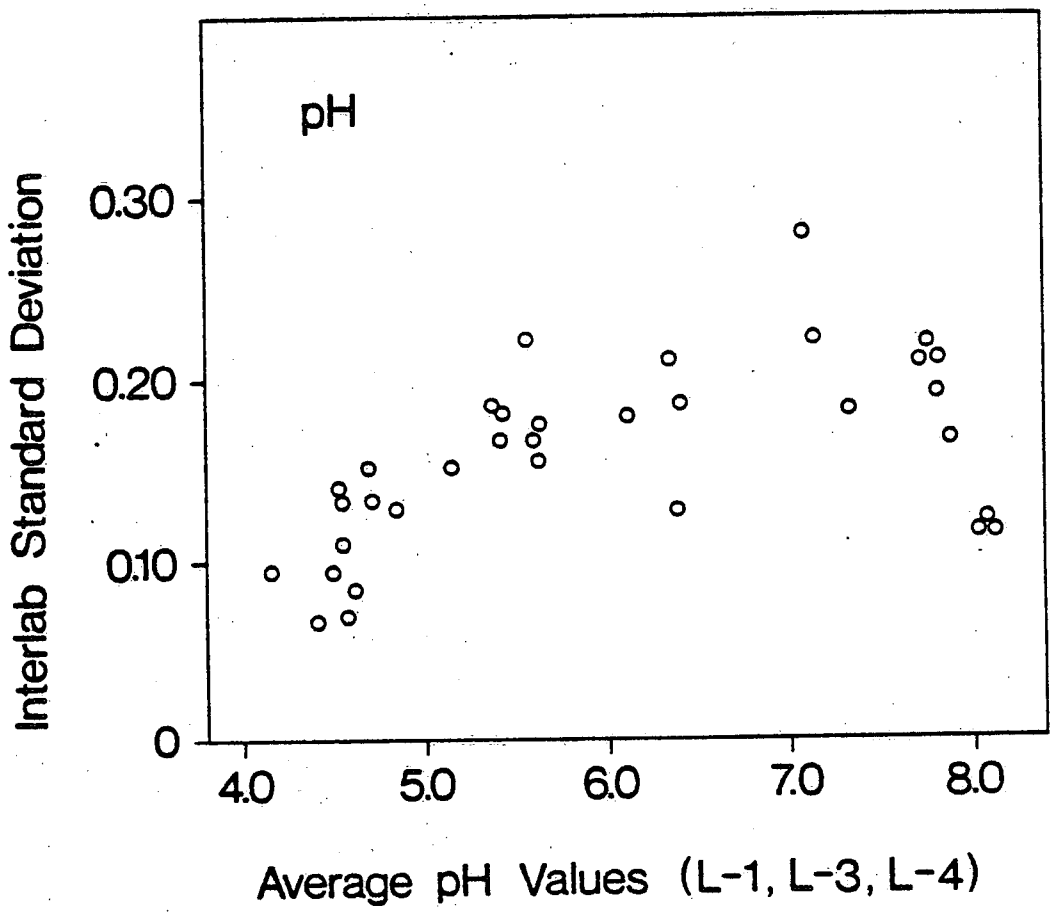

FIGURE 3: Variation of the interlaboratory standard deviation for pH as a function of average pH values for test samples in studies L-1, L-3 and L-4

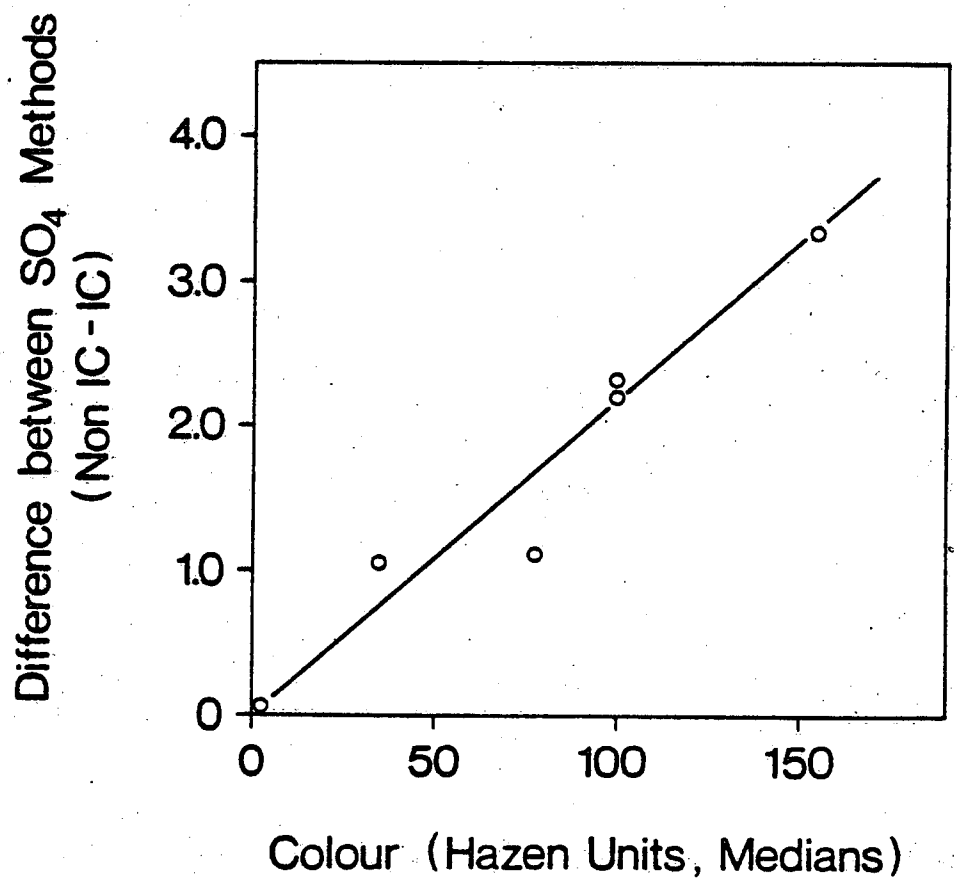

FIGURE 4: Non IC results minus IC results for SO_4 as a function of colour

TABLE 9: The influence of colour on sulphate measurements*

Sample	IC Results ($PPMSO_4$)	Non-IC Results ($PPMSO_4$)	Difference Between Methods	Median Colour Value
1	2.65	4.85	2.20	100
2	1.75	5.10	3.35	155
3	7.10	8.20	1.10	79
4	1.98	4.30	2.32	100
5	3.47	4.50	1.03	35
6	3.03	3.15	0.12	3
7	0.33	0.5	0.17	3
8	5.21	5.20	-0.01	2.5
9	4.8	4.8	0.0	4
10	3.2	3.42	-0.22	4
11	37	34	-	2

* Above results are median values from Appendix I.

A comparison of the interlaboratory statistics for chloride and sulfate is given in Table 10. The statistics $\bar{x}$ and S.D. are based on only the uncoded data from Appendix I, (e.g., it excludes W and T values). The highlight to note is the interlaboratory precision for the IC method is superior to the non-IC data set. This precision for IC may well impact in future assessments of environmental base lines for chloride and sulfate. The mean values between method data sets were compared using the Student "t" statistic and, as somewhat expected, the sulfate values for coloured waters are significantly different. No significant difference at the 95 percent level occurs for the IC and non-IC chloride data sets.

TABLE 10: Comparison of statistics for chloride and sulphate

Sample	Median Colour Value	Statistic	Chloride		Sulphate	
			IC Method	Non-IC Method	IC Method	Non-IC Method
1	100	$\bar{x}$	4.10	4.16	2.63	5.09
		S.D.	.286	.607	.23	1.76
		η	10	20	13	18
2	155	$\bar{x}$	3.11	3.48	1.69	5.03
		S.D	.125	.735	.169	2.22
		η	10	20	13	18
3	79	$\bar{x}$	4.47	4.46	6.96	8.38
		S.D	.216	.783	.85	1.64
		η	10	20	13	18
4	100	$\bar{x}$	3.25	3.39	1.94	4.15
		S.D	.117	.813	.214	1.31
		η	10	20	13	17
5	35	$\bar{x}$	2.99	3.22	3.46	4.36
		S.D	.148	.41	.186	.97
		η	10	19	13	17
6	3	$\bar{x}$	.818	.945	3.02	3.23
		S.D	.054	.289	.135	.506
		η	10	19	13	17
7	3	$\bar{x}$	1.56	1.52	.335	.731
		S.D	.323	.267	.087	.550
		η	19	29	11	12
8	2.5	$\bar{x}$	.723	.801	5.27	4.93
		S.D	.056	.261	.22	1.23
		η	10	20	13	18
9	4	$\bar{x}$	.562	.664	4.81	4.79
		S.D	.069	.174	.225	.869
		η	10	19	13	18
10	4	$\bar{x}$	1.16	1.45	3.21	3.43
		S.D	.085	.65	.118	1.13
		η	10	18	13	16
11	2	$\bar{x}$	104	103	37.1	33.0
		S.D	6.9	10.1	2.24	6.47
		η	10	18	13	17

$\bar{x}$ = average interlaboratory value.
S.D. = standard deviation.
η = number of results used to calculate $\bar{x}$.

GENERAL COMMENTS

1. Feedback from analysts was positive and helpful. Many expressed a sincere interest in these studies as they assist laboratories in verifying the success of their intra-laboratory quality control programs.

2. The report has introduced a possible criteria to allow for overall assessment on the performance of laboratories that contribute to LRTAP projects.

3. The measurement of sulfate in highly coloured waters by colourimetric methods produces significantly different values than the ion chromatagraphic method.

4. Upon reviewing study-to-study results, improvements are becoming apparent in some laboratories. Many laboratories are very average. A few laboratories exhibit major difficulties and are not comparable with their peer group. It is hoped that users of data, laboratory heads and program managers will interact and use study results such as these to assess and review their projects.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the participants for the provision of their data, Mr. R. White and Dr. John Clark of the International Joint Commission Great Lakes Regional office (Windsor) for their computer programs and valuable assistance, as well as Mrs. Karon Miles (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 on 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, P.O. 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 Groups 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, Telephone 416-667-4803/4885.

List of Participants

Federal Government Laboratories

Environment Canada

Environmental Conservation Service:
Water Quality Branch, Ontario Region, Burlington, Ontario
Water Quality Branch, Atlantic Region, Moncton, N.B.
Water Quality Branch, Quebec Region, Longueuil, Quebec

Environmental Protection Service:

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

Atmospheric Environment Service:

Ontario Region, Downsview, Ontario

Canadian Forestry Service:

Great Lakes Forest Research Centre, Sault Ste. Marie, Ontario
Newfoundland Forest Research Centre, St. John's, Nfld.

Department of Fisheries and Oceans

Fresh Water Research Institute, Winnipeg, Manitoba

Agriculture Canada

Atlantic Region, Fredericton, New Brunswick

Provincial Government Laboratories

B.C. Ministry of Environment, Environmental Laboratory, Vancouver, B.C.
Alberta Ministry of Environment, Environmental Laboratory, Vegreville, Alberta
Saskatchewan Research Council, Saskatoon, Saskatchewan

Provincial Government Laboratories (cont'd)

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Ontario Ministry of Environment, Rexdale, Ontario
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Industrial Laboratories

Ontario Hydro, Etobicoke, Ontario
Noranda Mines Ltd., Noranda, Quebec
K-F Laboratories, Fredericton, New Brunswick
Institut national de la recherche scientifique, Sainte-Foy, Québec
Barringer-Magenta, Rexdale, Ontario

United States Laboratories

Illinois State Water Survey, Champaign, Illinois, U.S.A.

List of Previous Interlaboratory Studies

1. K.I. Aspila and S. Todd, "LRTAP Intercomparison Study L-1: Major Ions, Nuitrients 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", 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

APPENDIX I

LABORATORY RESULTS FOR LRTAP INTERLAB STUDY L-4

CONTENTS OF APPENDIX I

PARAMETER: 20491 CALCIUM MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.5000 BASIC ACCEPTABLE ERROR= .1500 CONCENTRATION ERROR INCREMENT= .0800
LABORATORIES YET TO REPORT: L007,L043,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.38	2.50	.39	2.00	.83	6.50	.40	5.50	1.74	12.00	L.05	0.00
L003	.50	26.00	.40	5.00	.90	17.50	.4	5.50	1.7	9.50	.05	13.00
L004A	.4	6.50	.4	5.00	.9	17.50	.4	5.50	1.8	20.00		0.00
L004B	.4	6.50	.3	1.00	.7	2.00	.3	1.00	1.6 L	4.00		0.00
L006	.43	12.50	.43	14.50	.8J	3.00	.45	17.50	1.68	6.50	.07	16.50
L009	.46	19.50	.46	23.50	.91	22.00	.48	24.50	1.8	20.00	.05	13.00
L010	.5	26.00	.4	5.00	.9	17.50	.4	5.50	1.8	20.00	.1W	0.00
L011	.39	4.00	.42	11.50	.84	9.00	.52	29.00	1.78	17.50	.07	16.50
L013B	.43	12.50	.44	17.00	.92	24.00	.45	17.50	1.77	16.00	.03	8.00
L014	.93 VH	29.00	.44	17.00	.83	6.50	.44	14.00	1.76	14.50	.10	20.00
L016	.46	19.50	.43	14.50	.83	6.50	.42	9.50	1.68	6.50	0.00	1.00
L020	.38	2.50	.40	5.00	.92	24.00	.38	3.00	1.67	5.00	.01T	2.50
L021B	.42	10.00	.41	8.50	.33	6.50	.42	9.50	1.56 L	3.00	.01W	0.00
L022	.5	26.00	.5	27.00	1.J	29.00	.5	28.00	2.0 VH	29.00	.05T	10.50
L023	.44	14.50	.44	17.00	.88	13.50	.44	14.00	1.70	9.50	.02	5.00
L024	.49	23.00	.45	20.00	.89	13.50	.47	21.50	1.91	28.00	.04T	10.50
L025	.44	14.50	.45	20.00	.89	15.00	.44	14.00	1.78	17.50	.07	16.50
L029	.40	6.50	.42	11.50	.85	10.00	.42	9.50	1.74	12.00	.01W	0.00
L031A	.40	6.50	.41	8.50	.86	11.50	.42	9.50	1.74	12.00	.02W	0.00
L031B	.47	21.00	.52	28.00	.93	28.00	.48	24.50	1.81	22.00	.05	13.00
L032	.530	29.00	.544	29.00	.905	21.00	.446	16.00	1.87	26.00	.087	19.00
L033	1.W	0.00	1.W	0.00	1.W	0.00	1.W	0.00	1.W	0.00	1.W	0.00
L042	.42	10.00	.42	11.50	.81	4.00	.47	21.50	1.47 VL	2.00	.02	5.00
L044	.27 L	1.00	.40	5.00	.55 VL	1.00	.34	2.00	.99 VL	1.00		0.00
L045	.45	17.50	.45	20.00	.90	17.50	.46	19.00	1.86	25.00	.03	8.00
L046	.49	23.00	.49	26.00	.92	24.00	.48	24.50	1.76	14.50	.01	2.50
L053	.49	23.00	.48	25.00	.95	27.00	.49	27.00	1.90	27.00	.02	5.00
L057	2.0 VH	30.00	1.6 VH	30.00	1.6 VH	30.00	1.3 VH	30.00	2.6 VH	30.00	1.0 VH	21.00
L058	.45	17.50	.46	23.50	.86	11.50	.48	24.50	1.69	8.00	.07	16.50
L060	.42	10.00	.42	11.50	.33	26.00	.43	12.00	1.83	24.00	.03	8.00
L061	.444	16.00	.457	22.00	.902	20.00	.465	20.00	1.82	23.00		0.00
MEDIAN CONC.	.442		.435		.835		.443		1.765		.040	

2'

PARAMETER: 20091 CALCIUM MG/L 03/11/09 PAGE 2

SAMPLE LAB NO	7 REPORTED VALUE	7 RANK	8 REPORTED VALUE	8 RANK	9 REPORTED VALUE	9 RANK	10 REPORTED VALUE	10 RANK	11 REPORTED VALUE	11 RANK
-002	.26	6.00	2.15	18.00	.93	9.00	13.1	18.50	41.3	12.00
L003	.30	16.50	2.3 H	29.00	1.1	28.00	14. H	28.50	42.	16.00
L004A	.2	2.50	2.2	21.00	1.0	19.00	13.8	27.00	42.5	20.00
L004B	.1 L	1.00	2.0	7.50	.9	4.50	13.7	26.00	44.5	28.00
L006	.30	16.50	1.94 L	5.00	.91	6.00	10.97 VL	2.00	45.02	29.00
L009	.34	27.00	2.1	12.00	.97	15.50	12.5	9.50	39.2	5.00
L010	.3	16.50	2.11	12.00	.9	4.50	13.1	18.50	41.1	10.50
L011	.33	26.00	2.12	15.00	.93	9.00	12.4	8.00	36.4 VL	2.00
L013B	.30	16.50	2.13	16.50	.97	15.50	13.03	17.00	42.28	17.00
L014	.29	12.50	2.00	7.50	.88	2.00	12.1	5.00	38.1 L	3.00
L016	.27	8.00	2.05	9.00	.94	11.00	13.00	15.50	40.30	8.00
L020	.35	28.00	2.43 VH	30.00	1.04	26.00	12.7	11.00	42.8	21.50
L021B	.20	2.50	1.65 VL	2.00	.77 L	1.00	8.86 VL	1.00	35.0 VL	1.00
L022	.3	16.50	2.2	21.00	1.0	19.00	14.2 H	30.00	46.2 H	30.00
L023	.29	12.50	2.1	12.00	.96	14.00	13.4	23.50	43.4	26.00
L024	.36	29.00	2.19	19.00	1.14 H	29.00	13.66	25.00	42.88	23.00
L025	.28	10.50	2.21	23.00	1.01	22.50	12.8	12.50	41.8	15.00
L029	.27	8.00	2.11	14.00	.92	7.00	12.5	9.50	41.	9.00
L031A	.27	8.00	2.13	16.50	.95	12.50	13.4	23.50	42.8	21.50
L031B	.32	24.00	2.20	21.00	1.00	19.00	12.3	6.50	41.1	10.50
L032	.318	22.00	2.26	26.00	1.08	27.00	12.8	12.50	41.7	14.00
L033	1.H	0.00	1.W VL	1.00	1.W	0.00	12. L	4.00	43.	25.00
L042	.30	16.50	1.98	6.00	1.00	19.00	14.0 H	28.50	40.0	7.00
L044	.23	5.00	1.93 L	3.50	.93	9.00	11.49 VL	3.00	39.70	6.00
L045	.31	21.00	2.22	24.50	1.02	24.00	13.3	21.50	41.5	13.00
L046	.29	10.50	1.93 L	3.50	.89	3.00	12.3	6.50	38.5 L	4.00
L053	.32	24.00	2.23	29.00	1.03	25.00	13.2	20.00	42.9	24.00
L057	1.4 VH	30.00	3.4 VH	31.00	2.4 VH	30.00	12.9	14.00	43.7	27.00
L058	.32	24.00	2.07	10.00	.95	12.50	13.0	15.50	42.3	18.00
L060	.22	4.00	2.27	27.00	1.01	22.50	14.6 VH	31.00	47.9 VH	31.00
L061	.304	20.00	2.22	24.50	1.00	19.00	13.3	21.50	42.4	19.00
MEDIAN CONC.	.300		2.130		.970		13.000		42.000	

2

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	92.00	9.200	10			FLAME-ABS
L003	194.50	17.682	11	HH		FLAME-AAS
L004A	144.00	14.400	10			AAS
L004B	81.50	8.150	10	LLL		AAS
L006	129.00	11.727	11	LVL		AAS
L009	191.50	17.409	11			AAS
L010	136.00	13.600	10			ICP
L011	147.50	13.409	11	VL		FLAME-AAS
L013B	177.50	16.136	11			AAS
L014	131.00	11.909	11	VHL		AAS
L016	109.00	9.909	11			AAS
L020	159.50	14.409	11	VH		ICP
L021B	45.00	4.500	10	LVLLVLVL	BIASED LOW	AAS
L022	266.00	24.182	11	VHHH	BIASED HIGH	AAS
L023	161.50	14.682	11			ICP
L024	241.50	21.955	11	H		AAS
L025	181.00	16.455	11			AAS
L029	97.00	9.700	10			AAS
L031A	130.00	13.000	10			ICP
L031B	217.50	19.773	11			AAS
L032	240.50	21.864	11			AAS
L033	30.00	10.000	3	VLL		
L042	131.00	11.909	11	VLH		
L044	36.50	3.650	10	LVLVLLVL	BIASED LOW	AAS
L045	211.00	19.182	11			ICP
L046	142.00	12.909	11	LL		
L053	255.00	23.182	11			AAS
L057	303.00	27.545	11	VHVHVHVHVHVHVHVHVH	BIASED HIGH	AAS
L058	181.50	16.500	11			AAS
L060	207.00	18.818	11	VHVH		AAS
L061	205.00	20.500	10			AAS

OVERALL AVERAGE RANK IS 15.352

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L044	36.50	3.650	10	LVLVLLVL	BIASED LOW	AAS
L021B	45.00	4.500	10	LVLLVLVL	BIASED LOW	AAS
L004B	81.50	8.150	10	LLL		AAS
L002	92.00	9.200	10			FLAME-ABS
L029	97.00	9.700	10			AAS
L016	109.00	9.909	11			AAS
L033	30.00	10.000	3	VLL		
L006	129.00	11.727	11	LVL		AAS
L042	131.00	11.909	11	VLH		
L014	131.00	11.909	11	VHL		AAS
L046	142.00	12.909	11	LL		
L031A	130.00	13.000	10			ICP
L011	147.50	13.409	11	VL		FLAME-AAS
L010	136.00	13.600	10			ICP
L004A	144.00	14.400	10			AAS
L020	159.50	14.409	11	VH		ICP
L023	161.50	14.682	11			ICP
L013B	177.50	16.136	11			AAS
L025	181.00	16.455	11			AAS
L058	181.50	16.500	11			AAS
L009	191.50	17.409	11			AAS
L003	194.50	17.682	11	HH		FLAME-AAS
L060	207.00	18.818	11	VHVH		AAS
L045	211.00	19.182	11			ICP
L031B	217.50	19.773	11			AAS
L061	205.00	20.500	10			AAS
L032	240.50	21.864	11			AAS
L024	241.50	21.955	11	H		AAS
L053	255.00	23.182	11			AAS
L022	266.00	24.182	11	VHHH	BIASED HIGH	AAS
L057	303.00	27.545	11	VHVHVHVHVHVHVHVHVH	BIASED HIGH	AAS

OVERALL AVERAGE RANK IS 15.352

CALCIUM

PARAMETER: 12091 MAGNESIUM MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= .0500 CONCENTRATION ERROR INCREMENT= .1000
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.37	6.50	.32	14.00	.43	10.50	.31	14.00	.47	16.50	.73	19.
L003	.41	28.50	.30	7.50	.5 H	28.00	.3	7.00	.5	26.50	.7	14.
L004A	.4	22.00	.4 VH	29.00	.5 H	28.00	.4 VH	20.00	.5	26.50	.8 VH	29.
L004B	.3 VL	2.50	.2 VL	1.00	.4	3.00	.3	7.00	.4 L	4.00	.6 VL	3.
L006	.40	22.00	.34	27.00	.44	14.50	.33	23.50	.46	12.50	.67	7.
L009	.37	6.50	.31	14.00	.43	10.50	.31	14.00	.46	12.50	.67	7.
L010	.4	22.00	.3	7.50	.4	3.00	.3	7.00	.4 L	4.00	.7	14.
L011	.38	11.00	.31	14.00	.42	7.50	.31	14.00	.45	9.50	.68	9.
L013B	.39	15.50	.34	27.00	.48	25.00	.34	26.50	.51	29.00	.76 H	26.
L014	.39	15.50	.30	7.50	.42	7.50	.30	7.00	.43	7.00	.68	9.
L016	.39	15.50	.31	14.00	.43	10.50	.31	14.00	.44	8.00	.65	6.
L020	.37	6.50	.31	14.00	.43	26.00	.41 VH	29.00	.50	26.50	.76 H	26.
L021B	.35	4.00	.29	4.00	.40	3.00	.29	3.00	.42	6.00	.54 VL	1.
L022	.4	22.00	.3	7.50	.5 H	28.00	.3	7.00	.5	26.50	.7	14.
L023	.390	15.50	.325	23.00	.450	19.00	.325	22.00	.475	20.00	.62 VL	4.
L024	.39	15.50	.31	14.00	.44	14.50	.30	7.00	.46	12.50	.71	17.
L025	.405	27.00	.320	20.00	.460	23.50	.335	25.00	.470	16.50	1.88 VH	30.
L029	.33	11.00	.32	20.00	.44	14.50	.32	19.00	.47	16.50	.72	18.
L031A	.37	6.50	.34	7.50	.43	10.50	.30	7.00	.45	9.50	.69	11.
L031B	.40	22.00	.32	20.00	.45	19.00	.32	19.00	.48	22.00	.75	25.
L032	.372	9.00	.310	14.00	.415	6.00	.306	11.00	.473	19.00	.692	12.
L033	1.H	0.00	1.H	0.00	1.H	0.00	1.H	0.00	1.H	0.00	1.H	0.
L042	.38	11.00	.30	7.50	.44	14.50	.31	14.00	.40 L	4.00	.70	14.
L044	.30 VL	2.50	.25 L	3.00	.34 VL	1.00	.25 L	1.00	.36 VL	2.00	.56 VL	2.
L045	.41	28.50	.34	27.00	.48	23.50	.34	26.50	.48	22.00	.74	21.
L046	.40	22.00	.33	24.50	.45	19.00	.32	19.00	.47	16.50	.74	21.
L053	.40	22.00	.32	20.00	.45	19.00	.32	19.00	.48	22.00	.74	21.
L057	.29 VL	1.00	.23 VL	2.00	.41	5.00	.26	2.00	.35 VL	1.00	.64 L	5.
L058	.39	15.50	.32	20.00	.45	19.00	.32	19.00	.46	12.50	.74	21.
L060	.52 VH	30.00	.44 VH	30.00	.58 VH	30.00	.42 VH	30.00	.61 VH	30.00	.91 VH	29.
L061	.402	26.00	.330	24.50	.453	22.00	.330	23.50	.488	24.00	.741	24.
MEDIAN CONC.	.390		.310		.440		.310		.470		.700	

PARAMETER: 12091 MAGNESIUM MG/L

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
-002	.07	15.50	.62	19.00	.20	9.00	2.5	3.50	9.2	18.00
L003	.1T	25.50	.6	12.50	.2	9.00	2.6	8.50	9.5	26.50
L004A	.1	25.50	.7 VH	29.00	.2	9.00	2.8	24.00	8.9	8.00
L004B		0.00	.6	12.50	.2	9.00	2.6	8.50	8.9	8.00
L006	.09	23.00	.59	7.00	.23	25.50	3.17 VH	29.00	14.50 VH	31.00
L009	.03	20.50	.59	7.00	.21	17.50	5.2 VH	31.00	8.6	4.50
L010	.1H	0.00	.6	12.50	.2	9.00	2.6	8.50	8.9	8.00
L011	.06	7.00	.59	7.00	.20	9.00	2.60	8.50	8.60	4.50
L013B	.07	15.50	.65	27.00	.22	22.50	2.95 H	26.00	8.95	14.00
L014	.05	3.00	.58	5.00	.20	9.00	2.67	13.50	8.33	3.00
L016	.06	7.00	.60	12.50	.21	17.50	2.96 H	27.00	9.26	20.00
L020	.08	20.50	.63	23.50	.21	17.50	2.61	11.00	9.03	15.00
L021B	.05	3.00	.53 L	3.00	.19	3.00	2.64	12.00	8.75	6.00
L022	.1	25.50	.6	12.50	.2	9.00	3.0 H	28.00	10.4 VH	28.50
L023	.065	10.00	.54 L	4.00	.230	25.50	2.85	25.00	10.4 VH	28.50
L024	.13	25.50	.63	23.50	.24	29.00	2.74	20.00	9.45	23.50
L025	.070	15.50	.655	28.00	.230	25.50	2.72	19.00	9.50	26.50
L029	.06	7.00	.61	16.50	.20	9.00	2.70	15.50	8.36	11.00
L031A	.06	7.00	.60	12.50	.20	9.00	2.71	17.50	9.19	17.00
L031B	.07	15.50	.64	26.00	.22	22.50	2.75	21.00	9.45	23.50
L032	.080	20.50	.592	9.00	.233	28.00	2.53	5.50	9.00	13.50
L033	1.H	0.00	1.H	0.00	1.H	0.00	2. VL	1.00	9.	13.50
L042	.08	20.50	.61	16.50	.20	9.00	2.53	5.50	8.27	2.00
L044	.05	3.00	.48 VL	1.00	.16	2.00	2.11 VL	2.00	7.06 VL	1.00
L045	.07	15.50	.63	23.50	.23	25.50	2.79	23.00	9.47	25.00
L046	.066	11.00	.63	23.50	.21	17.50	2.67	13.50	8.97	12.00
L053	.06	7.00	.62	19.00	.21	17.50	2.71	17.50	9.25	19.00
L057	.01T L	1.00	.52 VL	2.00	.12 VL	1.00	2.5	3.50	9.1	16.00
L058	.07	15.50	.62	19.00	.21	17.50	2.7	15.50	9.3	21.50
L060	.11	28.00	.78 VH	30.00	.33 VH	30.00	3.53 VH	30.00	11.0 VH	30.00
L061	.068	12.00	.626	21.00	.213	21.00	2.76	22.00	9.3	21.50
MEDIAN CONC.	.070		.605		.210		2.700		9.100	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	145.50	13.227	11			FLAME-ABS
L003	194.00	17.636	11	H		FLAME-AAS
L004A	257.00	23.364	11	VHHVHVHVH		AAS
L004B	58.50	5.850	10	VLVLLVL	BIASED LOW	AAS
L006	222.50	20.227	11	VHVH		AAS
L009	145.50	13.227	11	VH		AAS
L010	96.00	9.600	10	L		ICP
L011	101.50	9.227	11			FLAME-AAS
L013B	250.50	22.773	11	HH		AAS
L014	87.50	7.955	11			AAS
L016	152.00	13.818	11	H		AAS
L020	216.00	19.636	11	VHH		ICP
L021B	48.00	4.364	11	VLL	BIASED LOW	AAS
L022	209.00	19.000	11	HHVH		AAS
L023	196.50	17.864	11	VLLVH		ICP
L024	202.00	18.364	11			AAS
L025	256.50	23.318	11	VH		AAS
L029	158.00	14.364	11			AAS
L031A	115.00	10.455	11			ICP
L031B	235.50	21.409	11			AAS
L032	147.50	13.409	11			AAS
L033	14.50	7.250	2	VL		
L042	119.00	10.818	11	L		
L044	20.50	1.864	11	VLLVLLVLVLVLVLVL	BIASED LOW	AAS
L045	261.50	23.773	11		BIASED HIGH	ICP
L046	200.00	18.182	11			
L053	203.50	18.500	11			AAS
L057	39.50	3.591	11	VLVLVLLLVLVL	BIASED LOW	AAS
L058	196.50	17.864	11			AAS
L060	327.00	29.727	11	VHVHVHVHVHVHVHVHVHVH	BIASED HIGH	AAS
L061	241.50	21.955	11			AAS

OVERALL AVERAGE
RANK IS 15.509

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L044	20.50	1.864	11	VLLVLLVLVLVLVLVL	BIASED LOW	AAS
L057	39.50	3.591	11	VLVLVLLLVLVL	BIASED LOW	AAS
L021B	43.00	4.364	11	VLL	BIASED LOW	AAS
L004B	58.50	5.850	10	VLVLLVL	BIASED LOW	AAS
L033	14.50	7.250	2	VL		
L014	87.50	7.955	11			AAS
L011	101.50	9.227	11			FLAME-AAS
L010	96.00	9.600	10	L		ICP
L031A	115.00	10.455	11			ICP
L042	119.00	10.818	11	L		
L009	145.50	13.227	11	VH		AAS
L002	145.50	13.227	11			FLAME-ABS
L032	147.50	13.409	11			AAS
L016	152.00	13.818	11	H		AAS
L029	158.00	14.364	11			AAS
L003	194.00	17.636	11	H		FLAME-AAS
L023	196.50	17.864	11	VLLVH		ICP
L058	196.50	17.864	11			AAS
L046	200.00	18.182	11			
L024	202.00	18.364	11			AAS
L053	203.50	18.500	11			AAS
L022	209.00	19.000	11	HHVH		AAS
L020	216.00	19.636	11	VHH		ICP
L006	222.50	20.227	11	VHVH		AAS
L031B	235.50	21.409	11			AAS
L061	241.50	21.955	11			AAS
L013B	250.50	22.773	11	HH		AAS
L025	256.50	23.318	11	VH		AAS
L004A	257.00	23.364	11	VHHVHVHVH		AAS
L045	261.50	23.773	11		BIASED HIGH	ICP
L060	327.00	29.727	11	VHVHVHVHVHVHVHVHVHVH	BIASED HIGH	AAS

OVERALL AVERAGE
RANK IS 15.509

PARAMETER: 11091 SODIUM MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .5000 BASIC ACCEPTABLE ERROR= .2000 CONCENTRATION ERROR INCREMENT= .1400
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	2.9	8.00	2.5	8.00	3.0	10.00	2.6	13.00	2.4	12.00	.7	11.50
L003	3.0	14.00	2.6	14.50	3.1	16.00	2.6	13.00	2.5	20.50	.7	11.50
L004A	2.6	4.00	2.2	3.50	2.6	3.50	2.3	5.00	2.1	4.00	.6	3.00
L004B	2.7	5.00	2.3	5.00	2.7	5.00	2.4	7.00	2.2	5.00	.8	27.50
L006	4.20 VH	32.00	3.90 VH	32.00	4.70 VH	32.00	3.70 VH	32.00	3.20 VH	32.00	.84	29.00
L009	3.1	20.00	2.7	19.50	3.2	22.00	2.6	13.00	2.5	20.50	.73	20.00
L010	3.0	14.00	2.6	14.50	3.0	10.00	2.6	13.00	2.4	12.00	.7	11.50
L011	2.43 L	1.00	2.02 L	1.00	2.60	3.50	2.06 L	1.00	1.82 L	1.00	.27 VL	1.00
L013A	2.9	8.00	2.54	11.50	3.17	18.00	2.65	17.50	2.41	14.00	.68	7.50
L013B	3.06	18.00	2.81	26.50	3.25	25.00	2.99	28.00	2.83	30.00	.72	17.00
L014	3.00	14.00	2.53	10.00	2.96	8.00	2.52	8.00	2.31	7.00	.69	9.00
L016	2.82	6.00	2.39	6.00	2.86	6.00	2.39	6.00	2.40	12.00	.64	5.50
L020	3.2	27.00	2.7	19.50	3.3	27.00	2.7	19.00	2.5	20.50	.8	27.50
L021B	4.15 VH	31.00	3.16 H	30.00	3.60	30.00	3.43 VH	31.00	2.99 H	31.00	.98 H	31.00
L022	3.0	14.00	2.6	14.50	3.1	16.00	2.6	13.00	2.5	20.50	.7	11.50
L023	3.21	28.00	2.77	24.00	3.40	29.00	2.76	23.00	2.55	27.00	.62	4.00
L024	3.09	19.00	2.65	17.00	3.21	23.00	2.73	22.00	2.54	25.50	.76	26.00
L025	3.12	22.00	2.73	22.00	3.18	19.50	2.93	27.00	2.54	25.50	.725	19.00
L029	3.12	22.00	2.72	21.00	3.27	26.00	2.78	25.00	2.49	17.00	.703	14.00
L031A	3.18	26.00	2.77	24.00	3.34	28.00	2.77	24.00	2.50	20.50	.74	22.50
L031B	3.60 H	30.00	2.69	18.00	3.05	12.00	2.65	17.50	2.42	15.00	.68	7.50
L032	2.46 L	2.00	2.20	3.50	2.55	1.00	2.23	4.00	2.35	8.00	.711	16.00
L033	3.	14.00	3.	29.00	3.	10.00	3.	29.00	2.	2.00	1. H	8.00
L042	2.91	10.00	2.54	11.50	3.07	13.50	2.54	9.00	2.38	10.00	.74	22.50
L044	3.13	24.00	2.82	28.00	3.23	24.00	2.72	20.50	2.52	24.00	.74	22.50
L045	2.9	8.00	2.5	8.00	2.9	7.00	2.2	3.00	2.3	6.00	.71	16.00
L046	3.17	25.00	2.77	24.00	3.18	19.50	2.80	26.00	2.59	28.00	.89	30.00
L053	3.04	17.00	2.60	14.50	3.10	16.00	2.61	16.00	2.43	16.00	.74	22.50
L057	2.96	11.00	2.50	8.00	3.07	13.50	2.55	10.00	2.36	9.00	.64	5.50
L058	2.50	3.00	2.16	2.00	2.57	2.00	2.17	2.00	2.04	3.00	.94	2.00
L060	3.50	29.00	3.30 H	31.00	3.80 H	31.00	3.20 H	30.00	2.80	29.00	.75	25.00
L061	3.12	22.00	2.81	26.50	3.19	21.00	2.72	20.50	2.50	20.50	.722	18.00
MEDIAN CONC.	3.020		2.625		3.100		2.630		2.460		.711	

PARAMETER: 11092 SODIUM MG/L

SAMPLE LAB NO	7 REPORTED VALUE	7 RANK	8 REPORTED VALUE	8 RANK	9 REPORTED VALUE	9 RANK	10 REPORTED VALUE	10 RANK	11 REPORTED VALUE	11 RANK
L002	.5	11.50	L.2	0.00	.2	13.00	1.2	10.00	18.4	8.00
L003	.5	11.50	.1W	0.00	.1	3.50	1.1	4.00	19.	17.00
L004A	.4	3.50		0.00	.1	3.50	1.1	4.00	18.1	3.00
L004B	.5	11.50		0.00	.2	13.00	1.2	10.00	17.9	3.00
006	.66	27.50	.14	20.50	.32	30.00	1.51	29.00	40.00 VH	32.00
L009	.50	11.50	.08	17.00	.20	13.00	1.3	21.50	18.5	9.50
L010	.5	11.50	.2W	0.00	.2	13.00	1.2	10.00	18.3	7.00
L011	.15 VL	1.00	.05W	0.00	.05T	1.00	.68 VL	1.00	13.0 VL	1.00
L013A	.48	7.50	.06	13.00	.18	8.50	1.21	13.00	18.8	13.50
L013B	.63	29.00		0.00	.22	21.50	1.31	23.00	22.25 H	28.00
L014	.51	15.00	.06	13.00	.21	17.00	1.18	6.00	18.5	9.50
L016	.42	5.00	.04	3.50	.17	6.50	1.10	4.00	19.55	21.00
L020	.6	26.00	.2	22.00	.2	13.00	1.4	26.50	18.9	15.50
L021B	.66	27.50	.06	13.00	.17	6.50	1.59 H	30.00	27.13 VH	31.00
L022	.5	11.50	.1T	19.00	.2	13.00	1.3	21.50	19.5	19.50
L023	.48	7.50	.05	8.50	.18	8.50	1.40	26.50	22.4 H	29.00
L024	.47	6.00	.08T	17.00	.28	28.00	1.27	17.50	19.7	22.00
L025	.520	18.00	.040	3.50	.215	19.00	1.27	17.50	19.1	18.00
L029	.523	20.00	.048	5.00	.212	18.00	1.242	16.00	19.9	19.50
L031A	.54	23.50	.08	17.00	.23	24.50	1.29	20.00	18.7	11.50
L031B	.52	18.00	.14	20.50	.20	13.00	1.20	10.00	18.7	11.50
L032	.519	16.00	.072	15.00	.224	23.00	1.39	25.00	18.2	5.50
L033	1.W	0.00	1.W	0.00	1.W	0.00	1.W	0.00	20.	24.00
L042	.53	21.00	.05	8.50	.22	21.50	1.24	14.50	20.5	25.00
L044	.54	23.50	.05	8.50	.25	27.00	1.35	24.00	21.15	27.00
L045	.57	25.00	.05	8.50	.24	26.00	1.2	10.00	19.9	23.00
L046	.73 H	30.00	.26	23.00	.36	31.00	1.50	28.00	23.1 H	30.00
L053	.52	18.00	.05	8.50	.23	24.50	1.28	19.00	18.8	13.50
L057	.40	3.50	.01	1.50	.08	2.00	1.19	7.00	18.2	5.50
L058	.38	2.00	.01	1.50	.13	5.00	.98	2.00	15.6 L	2.00
L060	.75 H	31.00	.30 H	24.00	.30	29.00	1.66 H	31.00	20.9	26.00
L061	.533	22.00	.050	8.50	.216	20.00	1.24	14.50	18.9	15.50
MEDIAN CONC.	.519		.060		.200		1.242		18.950	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	105.00	10.500	10			FLAME-EMM
L003	125.50	12.550	10			FLAME-AES
L004A	38.00	3.800	10		BIASED LOW	FES
L004B	92.00	9.200	10			AES
L006	328.00	29.818	11	VHVHVHVHVHVH	BIASED HIGH	FES
L009	187.50	17.045	11			AAS
L010	116.50	11.650	10			ICP
L011	12.50	1.250	10	LLLLVLVLVLVL	BIASED LOW	FLAME-AES
L013A	132.00	12.000	11			IC
L013B	246.00	24.600	10	H		AAS
L014	116.50	10.591	11			AAS
L016	81.50	7.409	11		BIASED LOW	AAS
L020	243.50	22.136	11			AES
L021B	292.00	26.545	11	VHHVHHHHVH	BIASED HIGH	AAS
L022	174.00	15.818	11			AES
L023	215.00	19.545	11	H		ICP
L024	223.00	20.273	11			AAS
L025	211.00	19.182	11			AAS
L029	203.50	18.500	11			AAS
L031A	241.50	21.955	11			ICP
L031B	173.00	15.727	11	H		AAS
L032	119.00	10.818	11	L		AAS
L033	108.00	18.000	6		INSUFFICIENT DATA	
L042	167.00	15.182	11			AAS
L044	253.00	23.000	11			ICP
L045	139.50	12.682	11			
L046	294.50	26.773	11	HH	BIASED HIGH	
L053	185.50	16.864	11			AAS
L057	76.50	6.955	11		BIASED LOW	AAS
L058	26.50	2.409	11	L	BIASED LOW	AAS
L060	316.00	28.727	11	HHHHHH	BIASED HIGH	AAS
L061	209.00	19.000	11			AAS

OVERALL AVERAGE RANK IS 16.035

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L011	12.50	1.250	10	LLLLVLVLVLVL	BIASED LOW	FLAME-AES
L058	26.50	2.409	11	L	BIASED LOW	AAS
L004A	38.00	3.800	10		BIASED LOW	FES
L057	76.50	6.955	11		BIASED LOW	AAS
L016	81.50	7.409	11		BIASED LOW	AAS
L004B	92.00	9.200	10			AES
L002	105.00	10.500	10			FLAME-EMM
L014	116.50	10.591	11			AAS
L032	119.00	10.818	11	L		AAS
L010	116.50	11.650	10			ICP
L013A	132.00	12.000	11			IC
L003	125.50	12.550	10			FLAME-AES
L045	139.50	12.682	11			ICP
L042	167.00	15.182	11			
L031B	173.00	15.727	11	H		AAS
L022	174.00	15.818	11			AES
L053	185.50	16.864	11			AAS
L009	187.50	17.045	11			AAS
L033	108.00	18.000	6		INSUFFICIENT DATA	
L029	203.50	18.500	11			AAS
L061	209.00	19.000	11			AAS
L025	211.00	19.182	11			AAS
L023	215.00	19.545	11	H		ICP
L024	223.00	20.273	11			AAS
L031A	241.50	21.955	11			ICP
L020	243.50	22.136	11			AES
L044	253.00	23.000	11			AAS
L013B	246.00	24.600	10	H		AAS
L021B	292.00	26.545	11	VHHVHHHHVH	BIASED HIGH	AAS
L046	294.50	26.773	11	HH	BIASED HIGH	
L060	316.00	28.727	11	HHHHHH	BIASED HIGH	AAS
L006	328.00	29.818	11	VHVHVHVHVHVH	BIASED HIGH	FES

OVERALL AVERAGE RANK IS 16.035

PARAMETER: 19091 POTASSIUM MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .2000 BASIC ACCEPTABLE ERROR= .0500 CONCENTRATION ERROR INCREMENT= .1600
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.25	9.50	.20	13.00	.23	14.50	.17	17.00	.17	20.00	1.07	12.00
L003	.4 VH	31.00	.3 VH	30.00	.3	24.00	.2	26.50	.2	28.00	1.	8.00
L004A	.2 L	2.00	.2	13.00	.2 L	2.50	.1 L	2.50	.1 L	3.00	1.0	8.00
L004B	.3	25.00	.2	13.00	.3	24.00	.2	26.50	.1 L	3.00	.9	2.00
L006	.33 H	29.00	.35 VH	31.00	.35 H	30.00	.23 H	25.00	.30 VH	31.00	1.21	28.00
L005	.27	20.00	.21	21.00	.30	24.00	.18	21.00	.18	24.50	1.1	19.00
L010	.253	13.00	.218	23.00	.289	18.00	.165	12.00	.169	17.00	1.12	22.00
L011	.34 H	30.00	.20	13.00	.34	29.00	.05W	0.00	.28 VH	30.00	1.26	30.00
L013A	.23	4.00	.12 VL	2.00	.22 L	4.50	.15	7.50	.18	24.50	1.15	26.00
L013B	.25	9.50	.20	13.00	.27	11.00	.16	10.00	.17	20.00	1.07	12.00
L014	.26	15.50	.24	27.50	.26	9.00	.16	10.00	.16	12.50	.97	5.00
L016	.25	9.50	.17	4.50	.25	7.00	.13	4.50	.13	7.00	1.02	11.00
L020	.3	25.00	.2	13.00	.3	24.00	.1 L	2.50	.1 L	3.00	2.1 VH	32.00
L021B	.23	4.00	.18	6.00	.26	9.00	.15	7.50	.15	9.00	1.27	31.00
L022	-.2T VL	1.00	-.3T VL	1.00	.2T L	2.50	-.2T VL	1.00	-.1T VL	1.00	.8 VL	1.00
L023	.26	15.50	.19	7.50	.26	9.00	.16	10.00	.16	12.50	1.0	8.00
L024	.27	20.00	.19	7.50	.29	20.00	.18	23.00	.17	20.00	1.14	24.00
L025	.250	9.50	.200	13.00	.290	14.50	.170	17.00	.165	16.00	.955	4.00
L029	.25	9.50	.20	13.00	.23	14.50	.17	17.00	.16	12.50	1.11	21.00
L031A	.28	22.50	.22	24.50	.30	24.00	.17	17.00	.17	20.00	1.14	24.00
L031B	.31	27.50	.24	27.50	.28	14.50	.18	23.00	.16	12.50	1.09	16.00
L032	.239	6.00	.201	13.00	.272	12.00	.169	13.00	.102 L	5.00	.978	6.00
L033	.2W	0.00	.2W	0.00	.2W L	1.00	.2W	0.00	.2W	0.00	1.1	19.00
L042	.28	22.50	.21	21.00	.23	20.00	.17	17.00	.16	12.50	1.12	22.50
L044	.26	15.50	.21	21.00	.31	27.00	.17	17.00	.17	20.00	1.09	16.00
L045	.23	4.00	.17	4.50	.22 L	4.50	.14	6.00	.14	8.00	1.00	9.50
L046	.25	9.50	.16	3.00	.24	6.00	.13	4.50	.12	6.00	.95	3.00
L053	.31	27.50	.23	26.00	.32	28.00	.20	26.50	.19	26.50	1.17	27.00
L057	.30	25.00	.20	13.00	.36 H	31.50	.17	17.00	.16	12.50	1.10	19.00
L058	.26	15.50	.22	24.50	.29	20.00	.20	26.50	.19	26.50	1.08	14.00
L060	.27	20.00	.29 VH	29.00	.36 H	31.50	.25 VH	30.00	.23 H	29.00	1.23	29.00
L061	.264	18.00	.218	19.00	.288	17.00	.174	21.00	.173	23.00	1.09	16.00
MEDIAN CONC.	.260		.200		.284		.170		.165		1.090	

PARAMETER: 19091 POTASSIUM MG/L

SAMPLE LAB NO	7 REPORTED VALUE	7 RANK	8 REPORTED VALUE	8 RANK	9 REPORTED VALUE	9 RANK	10 REPORTED VALUE	10 RANK	11 REPORTED VALUE	11 RANK
L002	.34	24.00	.09	17.50	.12	16.00	.47	12.00	.87	13.00
L003	.3	7.00	.6 VH	28.00	.3 VH	31.00	.08H VL	1.00	1.1 H	29.00
L004A	.3	7.00		0.00	.1	8.50	.4 L	3.50	.8	3.50
L004B	.3	7.00	.1	22.50	.1	8.50	.4 L	3.50	.9	17.50
L006	.52 VH	32.00	.2 VH	27.00	.23 VH	30.00	.75 VH	30.00	1.08 H	28.00
L009	.34	24.00	.09	17.50	.13	20.50	.52	23.00	.91	19.50
L010	.348	28.00	.084	12.00	.131	22.00	.525	25.00	.852	10.00
L011	.28	2.00	.05H	0.00	.05H L	1.50	.80 VH	31.00	1.84 VH	32.00
L013A	.29	3.00	.07	5.50	.09	5.00	.47	12.00	.91	19.50
L013B	.33	19.00	.08	9.00	.12	16.00	.49	14.50	.94	23.50
L014	.32	14.50	.08	9.00	.12	16.00	.49	14.50	.83	8.50
L016	.32	14.50	.02 L	3.00	.09	5.00	.45	8.00	.81	5.50
L020	.4 H	30.00	.1	22.50	.1	8.50	3.5 VH	32.00	.8	3.50
L021B	.33	19.00	.09	17.50	.12	16.00	.50	17.50	1.02	27.00
L022	.3	7.00	0.H	0.00	0.H VL	1.50	.1T VL	2.00	.5 VL	1.00
L023	.30	7.00	.08	9.00	.10	8.50	.45	8.00	.82	7.00
L024	.34	24.00	.09	17.50	.14	24.50	.53	26.50	.94	23.50
L025	.330	19.00	.085	13.50	.115	11.00	.470	12.00	.870	13.00
L029	.33	19.00	.08	9.00	.12	16.00	.50	17.50	.83	15.00
L031A	.34	24.00	.09	17.50	.15	27.00	.54	28.00	.93	22.00
L031B	.33	19.00	.08	9.00	.14	24.50	.50	17.50	.87	13.00
L032	.306	11.00	.01 VL	1.50	.130	20.50	.438	5.00	.761	2.00
L033	.3	7.00	.2H	0.00	.2H	0.00	.5	17.50	.9	17.50
L042	.34	24.00	.07	5.50	.12	16.00	.51	21.00	.92	21.00
L044	.31	12.00	.09	17.50	.12	16.00	.52	23.00	1.16 VH	30.00
L045	.27	1.00	.05	4.00	.1	24.50	.44	6.00	.86	11.00
L046	.30	7.00	.10	22.50	.09	5.00	.45	8.00	.83	8.50
L053	.36	29.00	.10	22.50	.14	24.50	.58	29.00	1.00	26.00
L057	.32	14.50	.01 VL	1.50	.05 L	3.00	.53	26.50	1.19 VH	31.00
L058	.32	14.50	.13	25.00	.13 H	29.00	.46	10.00	.81	5.50
L060	.41 H	31.00	.14 H	26.00	.16	28.00	.52	23.00	.95	25.00
L061	.347	27.00	.085	13.50	.118	12.00	.508	20.00	.894	16.00
MEDIAN CONC.	.325		.088		.120		.500		.897	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	169.00	15.364	11			AES
L003	244.00	22.182	11	VHVHVHVHVLH		FLAME-AES
L004A	54.00	5.400	10	LLLLL	BIASED LOW	FES
L004B	152.50	13.864	11	LL		AES
L006	325.00	29.545	11	HVHHHVHVHVHVHVHHH	BIASED HIGH	AES
L009	236.00	21.455	11			AAS
L010	202.50	18.409	11			FES
L011	198.50	22.056	9	HVHLVHVH		FLAME-AES
L013A	113.50	10.318	11	VLL		IC
L013B	158.00	14.364	11			AAS
L014	142.00	12.909	11			AAS
L016	79.50	7.227	11	L	BIASED LOW	AAS
L020	195.00	17.818	11	LLVHHVH		AES
L021B	163.50	14.864	11			AAS
L022	19.00	1.900	10	VLVLLVLVLVLVLVLVL	BIASED LOW	AES
L023	102.50	9.318	11			ICP
L024	231.00	21.000	11			AAS
L025	142.50	12.955	11			AAS
L029	164.00	14.909	11			AAS
L031A	251.00	22.818	11			ICP
L031B	204.00	18.545	11			AAS
L032	100.00	9.091	11	LVL		AAS
L033	62.00	12.400	5	L	INSUFFICIENT DATA	
L042	203.00	18.455	11			
L044	215.00	19.545	11	VH		AAS
L045	82.00	7.455	11	L	BIASED LOW	AAS
L046	83.00	7.545	11		BIASED LOW	
L053	292.50	26.591	11		BIASED HIGH	AAS
L057	194.50	17.682	11	HVLLVH		AES
L058	211.00	19.182	11	H		AAS
L060	301.50	27.409	11	VHHVHHHH	BIASED HIGH	AAS
L061	202.50	18.409	11			AAS

OVERALL AVERAGE RANK IS 16.067

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L022	19.00	1.900	10	VLVLLVLVLVLVLVLVL	BIASED LOW	AES
L004A	54.00	5.400	10	LLLLL	BIASED LOW	FES
L016	79.50	7.227	11	L	BIASED LOW	AAS
L045	82.00	7.455	11	L	BIASED LOW	AAS
L046	83.00	7.545	11		BIASED LOW	
L032	101.00	9.091	11	LVL		AAS
L023	102.50	9.318	11			ICP
L013A	113.50	10.318	11	VLL		IC
L033	62.00	12.400	5	L	INSUFFICIENT DATA	
L014	142.00	12.909	11			AAS
L025	142.50	12.955	11			AAS
L004B	152.50	13.864	11	LL		AES
L013B	158.00	14.364	11			AAS
L021B	163.50	14.864	11			AAS
L029	164.00	14.909	11			AAS
L002	169.00	15.364	11			AES
L057	194.50	17.682	11	HVLLVH		AES
L020	196.00	17.818	11	LLVHHVH		AES
L010	202.50	18.409	11			FES
L061	202.50	18.409	11			AAS
L042	203.00	18.455	11			
L031B	204.00	18.545	11			AAS
L058	211.00	19.182	11	H		AAS
L044	215.00	19.545	11	VH		AAS
L024	231.00	21.000	11			AAS
L009	236.00	21.455	11			AAS
L011	198.50	22.056	9	HVHLVHVH		FLAME-AES
L003	244.00	22.182	11	VHVHVHVHVLH		FLAME-AES
L031A	251.00	22.818	11			ICP
L053	292.50	26.591	11		BIASED HIGH	AAS
L060	301.50	27.409	11	VHHVHHHH	BIASED HIGH	AAS
L006	325.00	29.545	11	HVHHHVHVHVHVHVHHH	BIASED HIGH	AES

OVERALL AVERAGE RANK IS 16.067

POTASSIUM

PARAMETER: 17000 CHLORIDE IC MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000 BASIC ACCEPTABLE ERROR= .2500 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002B	4.09	7.00	3.29	10.00	4.61	8.00	3.37	9.00	3.25	10.00	.85	7.00
L013A	4.23	8.00	3.21	9.00	4.83	10.00	3.36	8.00	3.12	9.00	.81	4.50
L021B	4.06	5.00	3.16	6.00	4.72	9.00	3.38	10.00	3.09	8.00	.78	2.00
L022	4.7 H	10.00	3.0	3.00	4.2	2.00	3.2	4.50	2.8	1.00	.8	3.00
L025	4.35	9.00	3.20	8.00	4.40	4.00	3.20	4.50	2.90	4.00	.87	9.50
L029	4.03	4.00	3.17	7.00	4.56	7.00	3.33	7.00	3.05	6.00	.86	8.00
L032	3.796	2.00	2.927	2.00	4.264	3.00	3.080	1.50	2.888	3.00	.835	6.00
L044	3.87	3.00	3.07	4.00	4.46	5.00	3.17	3.00	2.92	5.00	.87	9.50
L060	3.74	1.00	2.92	1.00	4.19	1.00	3.08	1.50	2.81	2.00	.694	1.00
L061	4.07	6.00	3.14	5.00	4.50	6.00	3.32	6.00	3.08	7.00	.81	4.50
MEDIAN CONC.	4.065		3.150		4.480		3.260		2.985		.823	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002B	1.51	8.00	.74	5.00	.61	8.50	1.16	5.00	94.	1.00
L013A	1.49	7.00	.74	5.00	.59	6.00	1.19	6.00	105.7	7.00
L021B	1.41	4.00	.73	3.00	.54	3.00	1.12	3.50	118.6	10.00
L022	1.4	2.00	.6	1.00	.4	1.00	1.0	1.00	100.	3.00
L025	1.54	10.00	.78	10.00	.61	8.50	1.32	10.00	103.	4.00
L029	1.52	9.00	.76	8.50	.58	4.50	1.21	9.00	110.	9.00
L032	1.404	3.00	.752	7.00	.600	7.00	1.204	8.00	96.6	2.00
L044	1.46	6.00	.74	5.00	.58	4.50	1.20	7.00	104.45	5.00
L060	1.33	1.00	.653	2.00	.488	2.00	1.12	3.50	105.	6.00
L061	1.44	5.00	.76	8.50	.62	10.00	1.09	2.00	107.61	8.00
MEDIAN CONC.	1.450		.740		.585		1.175		104.725	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L002B	78.50	7.136	11		IC
L013A	79.50	7.227	11		IC
L021B	63.50	5.773	11		IC
L022	31.50	2.864	11	H BIASED LOW	IC
L025	81.50	7.409	11		IC
L029	79.00	7.182	11		IC
L032	44.50	4.045	11		IC
L044	57.00	5.182	11		IC
L060	22.00	2.000	11	BIASED LOW	
L061	68.00	6.182	11		IC

OVERALL AVERAGE RANK IS 5.500

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L060	22.00	2.000	11		BIASED LOW	
L022	31.50	2.864	11	M	BIASED LOW	IC
L032	44.50	4.045	11			IC
L044	57.00	5.182	11			IC
L021B	63.50	5.773	11			IC
L061	68.00	6.182	11			IC
L002B	78.50	7.136	11			IC
L029	79.00	7.182	11			IC
L013A	73.50	7.227	11			IC
L025	81.50	7.409	11			IC

OVERALL AVERAGE RANK IS 5.500

PARAMETER: 17001 CHLORIDE NON IC METHODS MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP NO.4 MAJOR IONS

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000 BASIC ACCEPTABLE ERROR= .2500 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	4.5	16.50	3.9	16.00	5.3	16.00	3.9	17.00	3.3	15.50	.8	5.00
L003	4.0	7.00	3.3 L	5.50	4.2	5.50	3.3	7.50	3.2	12.00	1.0	16.00
L004A	4.4	14.50	3.4	14.00	4.7	12.50	3.7	14.00	3.2	12.00	.8	5.00
L004B	4.9 H	19.00	3.3 H	13.00	5.2	17.50	3.2 H	13.00	3.6	19.50	.9	11.00
L006	4.27	12.00	3.77	12.00	4.57	10.00	3.67	13.00	3.11	8.00	.908	14.00
L010	3.2 H	20.00	3.7 VH	20.00	5.5 H	20.00	4.3 VH	19.00	3.5	17.00	.9	11.00
L011	3.82	4.00	2.93 L	4.00	4.36	7.00	3.21	6.00	2.32	3.00	.78	2.00
L014	3.9	5.00	3.0 L	5.50	4.2	5.50	3.3	7.50	3.1	7.00	.8	5.00
L016	3.80	3.00	1.98 VL	1.00	4.40	8.00	2.20 VL	2.50	3.00	5.00	1.00	16.00
L020	4.3	12.00	3.8	14.00	4.7	12.50	3.2	5.00	3.2	12.00	1.8 VH	19.00
L023	4.0	7.00	3.4	8.50	4.0	3.50	3.4	3.00	3.1	5.00	.8	5.00
L024	4.20	10.00	3.29	7.00	4.65	11.00	3.44	10.00	3.17	9.00	.84	5.00
L031A		0.00		0.00		0.00		0.00		0.00		0.00
L031B	4.1	9.00	3.4	8.50	4.5	9.00	3.5	11.00	3.3	15.00	1.0	16.00
L033	4.	7.00	.	17.00	4.	3.50	3.	4.00	3.	5.00	1.W	0.00
L042	3.60	2.00	2.3 VL	3.00	2.92 VL	2.00	1.18 VL	1.00	2.2 VL	2.00	.52 VL	1.00
L045	4.32	13.00	3.60	13.00	4.71	14.00	3.60	12.00	3.20	12.00	.90	11.00
L046	4.8	18.00	4.6 VH	19.00	5.2	17.50	3.8	15.50	4.4 VH	20.00	.9	11.00
L053	4.5	16.50	3.4	14.00	4.9	15.00	3.8	15.50	3.2	12.00	.9	11.00
L057	2.2 VL	1.00	2.2 VL	2.00	2.2 VL	1.00	2.2 VL	2.50	1.3W VL	1.00	1.6 VH	18.00
L058	4.4	14.50	3.7	11.00	5.3	19.00	4.9 VH	20.00	3.6	18.50	.8	5.00
MEDIAN CONC.	4.235		3.650		4.615		3.470		3.200		.900	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	1.4	5.50	.7	4.00	.6	7.50	1.2	8.50	>10.	0.00
L003	1.7	18.00	.9	16.50	.7	14.50	1.4	15.50	106.	14.00
L004A	1.5	10.00	.7	4.00	.6	7.50	1.2	8.50	102.5	9.50
L004B	1.6	15.00	.8	11.00	.7	13.50	1.3	12.50	100.0	4.00
L006	1.47	8.00	.869	14.00	.564	12.00	1.20	8.50	92.6	2.00
L010	1.6	15.00	.8	11.00	.7	14.50	1.4	15.50	69.3 VL	1.00
L011	1.37	4.00	.73	7.50	.50	7.50	1.12	3.00	102.	5.00
L014	1.0 VL	2.00	.8	11.00	.5	7.50	1.3	12.50	109.	15.00
L016	1.60	15.00	.92	19.00	.74	17.00	1.36	14.00	102.0	7.00
L020	1.6	15.00	.9	16.50	.8	18.00	4.0 VH	20.00	103.5	11.00
L023	1.2	5.50	.7	4.00	.6	7.50	1.2	8.50	102.	7.00
L024	1.53	12.00	.73	7.50	.51	3.00	1.19	4.50	112.	18.00
L031A		0.00	.7	4.00	.6	7.50		0.00		0.00
L031B	1.5	10.00	.9	16.50	.7	14.50	1.5 H	17.00	104.	12.50
L033	2. VH	19.00	1.W	0.00	1.W	0.00	1.W	1.50	110.	16.00
L042	1.13 L	3.00	.90	16.50	.32	11.00	1.64 VH	19.00	99.0	3.00
L045	1.44	7.00	.070 VL	2.00	.33	4.00	1.19	4.50	102.5	9.50
L046	2.6 VH	20.00	.8	11.00	1.3 VH	19.00	1.2	8.50	104.	12.50
L053	1.5	10.00	.9	11.00	.5	1.50	1.6 VH	18.00	102.	7.00
L057	1.0W VL	1.00	1.6 VH	20.00	1.0W	0.00	1.0W	1.50	111.	17.00
L058	1.6	15.00	.7	4.00	.5	1.50	1.2	8.50	122. H	19.00
MEDIAN CONC.	1.500		.800		.600		1.200		102.500	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	111.50	11.150	10			TECHNICON
L003	132.00	12.000	11	L		TECHNICON
L004A	111.50	10.136	11			TECHNICON
L004B	159.00	14.455	11	HHH		TECHNICON
L006	112.50	10.227	11			TECHNICON
L010	164.00	14.909	11	HVHHVHVL		COLOURIMETRIC
L011	53.00	4.818	11	L	BIASED LOW	TECHNICON
L014	83.50	7.591	11	LVL		
L016	107.50	9.773	11	VLVL		COLOURIMETRIC
L020	155.00	14.091	11	VHVH		COLOURIMETRIC
L023	70.50	6.409	11			TECHNICON
L024	100.00	9.091	11			TECHNICON
L031A	11.50	5.750	2			
L031B	139.50	12.682	11	H		TITRATION
L033	73.00	9.125	8	VH		
L042	63.50	5.773	11	VLVLVLVLVLLVH		
L045	99.00	8.909	11	VL		TECHNICON
L046	172.00	15.636	11	VHVHVHVH	BIASED HIGH	
L053	131.50	11.955	11	VH		TITRATION
L057	65.00	6.500	10	VLVLVLVLVLVHVLVH		TITRATION
L058	136.00	12.364	11	VHH		

OVERALL AVERAGE RANK IS 10.369

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L011	53.00	4.818	11	L	BIASED LOW	TECHNICON
L031A	11.50	5.750	2			
L042	63.50	5.773	11	VLVLVLVLVLLVH		
L023	70.50	6.409	11			TECHNICON
L057	65.00	6.500	10	VLVLVLVLVLVHVLVH		TITRATION
L014	83.50	7.591	11	LVL		
L045	99.00	8.909	11	VL		TECHNICON
L024	100.00	9.091	11			TECHNICON
L033	73.00	9.125	8	VH		
L016	107.50	9.773	11	VLVL		COLOURIMETRIC
L004A	111.50	10.136	11			TECHNICON
L006	112.50	10.227	11			TECHNICON
L002	111.50	11.150	10			TECHNICON
L053	131.50	11.955	11	VH		TITRATION
L003	132.00	12.000	11	L		TECHNICON
L058	136.00	12.364	11	VHH		
L031B	139.50	12.682	11	H		TITRATION
L020	155.00	14.091	11	VHVH		COLOURIMETRIC
L004B	159.00	14.455	11	HHH		TECHNICON
L010	164.00	14.909	11	HVHHVHVL		COLOURIMETRIC
L046	172.00	15.636	11	VHVHVHVH	BIASED HIGH	

OVERALL AVERAGE RANK IS 10.369

PARAMETER: 17092 CHLORIDE MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000 BASIC ACCEPTABLE ERROR= .2500 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	4.5	25.50	3.9 H	26.00	5.0	26.00	3.9 H	27.00	3.3	25.50	.8	7.50
L002B	4.09	15.00	3.29	16.50	4.61	18.00	3.37	17.00	3.25	24.00	.85	15.00
L003	4.0	10.00	3.0	9.00	4.2	7.00	3.3	12.50	3.2	21.00	1.0	26.00
L004A	4.4	23.50	3.8 H	24.00	4.7	20.50	3.7	24.00	3.2	21.00	.8	7.50
L004B	4.3 H	29.00	4.3 VH	29.00	5.2	27.50	4.2 VH	28.00	3.6 H	28.50	.9	21.00
L006	4.27	18.00	3.77 H	22.00	4.57	17.00	3.67	23.00	3.11	16.00	.908	24.00
L010	5.2 VH	30.00	4.7 VH	30.00	5.5 H	30.00	4.3 VH	29.00	3.5	27.00	.9	21.00
L011	3.82	6.00	2.98	6.00	4.36	10.00	3.21	11.00	2.92	7.50	.78	3.50
L013A	4.23	19.00	3.21	15.00	4.83	24.00	3.36	16.00	3.12	17.00	.81	11.50
L014	3.9	8.00	3.0	8.00	4.2	7.00	3.3	12.50	3.1	15.00	.8	7.50
L016	3.80	5.00	1.98 VL	1.00	4.40	11.50	2.20 VL	2.50	3.00	10.00	1.00	26.00
L020	4.3	20.00	3.3 H	24.00	4.7	20.50	3.2	9.00	3.2	21.00	1.8 VH	29.00
L021B	4.06	13.00	3.16	12.00	4.72	23.00	3.38	18.00	3.09	14.00	.78	3.50
L022	4.7	27.00	3.0	8.00	4.2	7.00	3.2	9.00	2.8	3.00	.8	7.50
L023	4.0	10.00	3.4	18.50	4.0	3.50	3.4	19.00	3.0	10.00	.8	7.50
L024	4.20	17.00	3.29	16.50	4.66	19.00	3.44	20.00	3.17	18.00	.84	14.00
L025	4.35	22.00	3.20	14.00	4.40	11.50	3.20	9.00	2.90	6.00	.87	17.50
L029	4.03	12.00	3.17	13.00	4.56	16.00	3.33	15.00	3.05	12.00	.86	16.00
L031A		0.00		0.00		0.00		0.00		0.00		0.00
L031B	4.1	16.00	3.4	18.50	4.5	14.50	3.5	21.00	3.3	25.50	1.0	26.00
L032	3.796	4.00	2.927	5.00	4.264	9.00	3.080	5.50	2.888	5.00	.835	13.00
L033	4.	10.00	4. H	27.00	4.	3.50	3.	4.00	3.	10.00	1.4 L	0.00
L042	3.60	2.00	2.34 VL	3.00	2.92 VL	2.00	1.18 VL	1.00	2.24 VL	2.00	.52 L	1.00
L044	3.87	7.00	3.07	10.00	4.46	13.00	3.17	7.00	2.92	7.50	.87	17.50
L045	4.32	21.00	3.66	20.00	4.71	22.00	3.60	22.00	3.20	21.00	.90	21.00
L046	4.8 H	28.00	4.6 VH	29.00	5.2	27.50	3.8	25.50	4.4 VH	30.00	.9	21.00
L053	4.5	25.50	3.8 H	24.00	4.9	25.00	3.8	25.50	3.2	21.00	.9	21.00
L057	2.2 VL	1.00	2.2 VL	2.00	2.2 VL	1.00	2.2 VL	2.50	1.0 H VL	1.00	1.6 VH	28.00
L058	4.4	23.50	3.7	21.00	5.3 H	29.00	4.9 VH	30.00	3.6 H	28.50	.8	7.50
L060	3.74	3.00	2.92	4.00	4.19	9.00	3.08	5.50	2.81	4.00	.694	2.00
L061	4.07	14.00	3.14	11.00	4.50	14.50	3.32	14.00	3.08	13.00	.81	11.50
MEDIAN CONC.	4.095		3.250		4.533		3.345		3.105		.850	

PARAMETER: 17092 CHLORIDE MG/L 83/11/29 PAGE 18.

SAMPLE LAB NO	7 REPORTED VALUE	7 RANK	8 REPORTED VALUE	8 RANK	9 REPORTED VALUE	9 RANK	10 REPORTED VALUE	10 RANK	11 REPORTED VALUE	11 RANK
L002	1.4	7.00	.7	6.50	.6	14.00	1.2	15.00	>10.	0.00
L002B	1.51	19.00	.74	13.00	.61	18.50	1.16	8.00	94.	3.00
L003	1.7	28.00	.9	26.50	.7	24.50	1.4	25.50	106.	21.00
L004A	1.5	17.00	.7	6.50	.6	14.00	1.2	15.00	102.5	12.50
L004B	1.6	25.00	.8	21.00	.7	24.50	1.3	21.50	100.0	6.50
L006	1.47	14.00	.869	24.00	.664	22.00	1.20	15.00	92.6	2.00
L010	1.6	25.00	.8	21.00	.7	24.50	1.4	25.50	69.3 VL	1.00
L011	1.37	5.00	.73	10.50	.60	14.00	1.12	6.00	101.	8.00
L013A	1.49	15.00	.74	13.00	.59	9.50	1.19	10.00	105.7	20.00
L014	1.0 VL	2.00	.8	21.00	.6	14.00	1.3	21.50	108.	23.00
L016	1.60	25.00	.92	29.00	.74	27.00	1.36	24.00	102.0	10.00
L020	1.6	25.00	.9	26.50	.8	28.00	4.0 VH	30.00	103.5	15.00
L021B	1.41	10.00	.70	6.50	.54	6.00	1.12	6.00	118.6	28.00
L022	1.4	7.00	.6	2.00	.4	1.00	1.0	1.00	100.	6.50
L023	1.4	7.00	.7	6.50	.6	14.00	1.2	15.00	102.	10.00
L024	1.53	21.00	.73	10.50	.51	5.00	1.19	10.00	112.	27.00
L025	1.54	22.00	.78	18.00	.61	18.50	1.32	23.00	103.	14.00
L029	1.52	20.00	.76	16.50	.58	7.50	1.21	20.00	110.	24.50
L031A	0.00		.7	6.50	.6	14.00		0.00		0.00
L031B	1.5	17.00	.9	26.50	.7	24.50	1.5 H	27.00	104.	16.50
L032	1.404	9.00	.752	15.00	.603	14.00	1.204	19.00	96.6	4.00
L033	2. VH	29.00	1.W	0.00	1.W	0.00	1.W	1.50	110.	24.50
L042	1.18 L	3.00	.90	26.50	.62	20.50	1.64 VH	29.00	99.0	5.00
L044	1.46	13.00	.74	13.00	.59	7.50	1.20	15.00	104.45	18.00
L045	1.44	11.50	.070 VL	1.00	.59	9.50	1.19	10.00	102.5	12.50
L046	2.6 VH	30.00	.8	21.00	1.3 VH	29.00	1.2	15.00	104.	16.50
L053	1.5	17.00	.8	21.00	.5	3.50	1.6 VH	28.00	102.	10.00
L057	1.0W VL	1.00	1.6 VH	30.00	1.0W	0.00	1.0W	1.50	111.	26.00
L058	1.6	25.00	.7	6.50	.5	3.50	1.2	15.00	121. H	29.00
L060	1.33	4.00	.653	3.00	.488	2.00	1.12	6.00	105.	19.00
L061	1.44	11.50	.76	16.50	.62	20.50	1.09	4.00	107.61	22.00
MEDIAN CONC.	1.495		.756		.600		1.200		103.500	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	180.00	18.000	10	HH		TECHNICON
L002B	167.00	15.182	11			IC
L003	210.00	19.091	11			TECHNICON
L004A	185.50	16.864	11	H		TECHNICON
L004B	260.50	23.682	11	HVHVHH	BIASED HIGH	TECHNICON
L006	197.00	17.909	11	H		TECHNICON
L010	264.00	24.000	11	VHVHHVHVL	BIASED HIGH	COLOURIMETRIC
L011	87.50	7.955	11			TECHNICON
L013A	170.00	15.455	11			IC
L014	139.50	12.682	11	VL		
L016	171.00	15.545	11	VLVL		COLOURIMETRIC
L020	248.00	22.545	11	HVHVH		COLOURIMETRIC
L021B	140.00	12.727	11			IC
L022	81.00	7.364	11		BIASED LOW	IC
L023	121.00	11.000	11			TECHNICON
L024	178.00	16.182	11			TECHNICON
L025	175.50	15.955	11			IC
L029	172.50	15.682	11			IC
L031A	20.50	10.250	2			
L031B	233.00	21.182	11	H		TITRATION
L032	102.50	9.318	11			IC
L033	119.50	13.688	9	HVH		TECHNICON
L042	95.00	8.636	11	VLVLVLVLLLVH		
L044	128.50	11.682	11			IC
L045	171.50	15.591	11	VL		TECHNICON
L046	272.50	24.773	11	HVHVHVHVH	BIASED HIGH	
L053	221.50	20.136	11	HVH		TITRATION
L057	94.00	9.400	10	VLVLVLVLVLVHVLVH		TITRATION
L058	218.50	19.864	11	HVHHH		
L060	57.50	5.227	11		BIASED LOW	
L061	152.50	13.864	11			IC

OVERALL AVERAGE RANK IS 15.367

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L060	57.50	5.227	11		BIASED LOW	
L022	81.00	7.364	11		BIASED LOW	IC
L011	87.50	7.955	11			TECHNICON
L042	95.00	8.636	11	VLVLVLVLLLVH		
L032	102.50	9.318	11			IC
L057	94.00	9.400	10	VLVLVLVLVLVHVLVH		TITRATION
L031A	23.50	10.250	2			
L023	121.00	11.000	11			TECHNICON
L044	128.50	11.682	11			IC
L014	139.50	12.682	11	VL		
L021B	140.00	12.727	11			IC
L033	109.50	13.688	8	HVH		TECHNICON
L061	152.50	13.864	11			IC
L002B	167.00	15.182	11			IC
L013A	170.00	15.455	11			IC
L016	171.00	15.545	11	VLVL		COLOURIMETRIC
L045	171.50	15.591	11	VL		TECHNICON
L029	172.50	15.682	11			IC
L025	175.50	15.955	11			IC
L024	178.00	16.182	11			TECHNICON
L004A	185.50	16.864	11	H		TECHNICON
L006	197.00	17.909	11	H		TECHNICON
L002	180.00	18.000	10	HH		TECHNICON
L003	210.00	19.091	11			TECHNICON
L058	218.50	19.864	11	HVHHH		
L053	221.50	20.136	11	HVH		TITRATION
L031B	233.00	21.182	11	H		TITRATION
L020	248.00	22.545	11	HVHVH		COLOURIMETRIC
L004B	260.50	23.682	11	HVHVHH	BIASED HIGH	TECHNICON
L010	264.00	24.000	11	VHVHHVHVL	BIASED HIGH	COLOURIMETRIC
L046	272.50	24.773	11	HVHVHVHVH	BIASED HIGH	

OVERALL AVERAGE RANK IS 15.367

CHLORIDE

PARAMETER: 16J00 SULFATE, IC METHOD MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.0000 BASIC ACCEPTABLE ERROR= .7600 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L037,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L0028	2.64	5.00	1.76	8.00	6.93	5.00	1.98	7.00	3.41	4.50	3.22	12.00
L003A	2.7	9.50	1.7	5.50	7.4	12.00	2.1	11.50	3.6	11.00	2.9	3.00
L013A	2.52	3.00	1.66	3.00	6.33	4.00	1.96	5.50	3.41	4.50	3.03	8.00
L021B	2.59	4.00	1.69	4.00	7.33	11.00	1.96	5.50	3.50	9.00	3.05	9.00
L022	3.0	13.00	1.8	12.00	7.1	7.00	2.1	11.50	3.5	9.00	2.8	1.00
L025	2.80	11.50	1.80	12.00	6.85	3.00	2.10	11.50	3.50	9.00	3.10	10.00
L029	2.48	2.00	1.62	2.00	6.76	2.00	1.93	4.00	3.14	1.00	3.00	5.00
L032	2.642	6.00	1.778	10.00	7.102	8.00	1.488	2.00	3.453	6.00	3.025	7.00
L044	2.65	7.00	1.77	9.00	7.11	9.00	2.03	8.00	3.47	7.00	2.96	4.00
L057	1.99	1.00	1.16	1.00	4.37 VL	1.00	1.47	1.00	3.17	2.00	2.85	2.00
L058	2.8	11.50	1.8	12.00	8.2	13.00	2.1	11.50	3.8	13.00	3.2	11.00
L060	2.66	8.00	1.70	5.50	7.03	6.00	1.91	3.00	3.38	3.00	3.01	6.00
L061	2.70	9.50	1.75	7.00	7.30	10.00	2.05	9.00	3.74	12.00	3.23	13.00
MEDIAN CONC.	2.650		1.750		7.100		1.980		3.470		3.025	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L0028	.34	9.00	5.22	8.00	4.35	10.00	3.21	6.50	35.	2.00
L003A	.4	11.00	5.1	3.00	4.8	8.00	3.2	5.00	37.	6.50
L013A	.35	10.00	5.13	4.00	4.53	1.50	3.21	6.50	36.3	4.00
L021B	.25	4.50	5.29	9.00	4.79	6.00	3.19	4.00	35.9	3.00
L022	0.W	1.50	5.3	10.00	4.9	8.00	3.3	11.00	38.	9.00
L025	.50	13.00	5.20	6.00	4.75	4.00	3.30	11.00	37.0	6.50
L029	.2W	1.50	5.01	1.00	4.53	1.50	3.04	2.00	36.6	5.00
L032	.302	6.00	5.454	11.00	4.853	11.00	3.257	8.00	31.76	1.00
L044	.44	12.00	5.18	5.00	4.80	8.00	3.29	9.00	37.63	8.00
L057	.33	7.50	5.03	2.00	4.57	3.00	2.93	1.00	39.0	12.00
L058	.2	3.00	5.8	13.00	5.3	13.00	3.3	11.00	41.	13.00
L060	.33	7.50	5.21	7.00	4.76	5.00	3.14	3.00	38.3	10.00
L061	.25	4.50	5.60	12.00	5.19	12.00	3.36	13.00	38.96	11.00
MEDIAN CONC.	.330		5.210		4.800		3.210		37.000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L0028	77.00	7.000	11			IC
L003A	86.00	7.818	11			IC
L013A	54.00	4.909	11			IC
L021B	69.00	6.273	11			IC
L022	93.00	8.455	11			IC
L025	97.50	8.864	11			IC
L029	27.00	2.455	11			IC
L032	75.00	6.909	11		BIASED LOW	IC
L044	86.00	7.818	11			IC
L057	33.50	3.045	11	VL		IC
L058	125.00	11.364	11		BIASED LOW	IC
L060	64.00	5.818	11		BIASED HIGH	IC
L061	113.00	10.273	11			IC
					BIASED HIGH	IC

OVERALL AVERAGE RANK IS 7.000

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L029	27.00	2.455	11		BIASED LOW	IC
L057	33.50	3.045	11	VL	BIASED LOW	IC
L013A	54.00	4.909	11			IC
L060	64.00	5.818	11			IC
L021B	69.00	6.273	11			IC
L032	76.00	6.909	11			IC
L002B	77.00	7.000	11			IC
L003A	86.00	7.818	11			IC
L044	86.00	7.818	11			IC
L022	93.00	8.455	11			IC
L025	97.50	8.864	11			IC
L061	113.00	10.273	11		BIASED HIGH	IC
L058	125.00	11.364	11		BIASED HIGH	IC

OVERALL AVERAGE RANK IS 7.000

PARAMETER: 16001 SULFATE NON IC METHODS MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.0000 BASIC ACCEPTABLE ERROR= .7600 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	6.0	14.00	6.9 H	16.00	9.5	14.00	5.8 H	16.00	5.3	15.00	3.6	14.00
L003B	4.5	7.00	4.6	7.00	7.5	4.00	3.8	6.50	3.7	3.50	2.7	2.00
L004A	6.4 H	15.00	6.0	12.00	8.2	9.50	5.0	12.50	4.6	12.50	3.2	10.50
L004B	5.6	13.00	5.9	11.00	8.[illegible]	11.00	5.0	12.50	4.6	12.50	3.3	12.50
L006	5.02	11.00	6.22	14.00	7.39	8.00	5.15	14.00	4.55	10.00	3.00	6.50
L010	7.1 VH	17.00	6.8 H	15.00	11.1 H	17.00	5.7 H	15.00	6.2 H	16.50	5.6 H	17.00
L011	5.45	12.00	6.02	13.00	9.10	13.00	4.93	11.00	4.58	11.00	3.15	9.00
L014	4.4	6.00	4.3	6.00	7.8	7.00	3.8	6.50	4.5	9.00	4.0	16.00
L016	3.96	5.00	3.89	5.00	9.74	15.00	2.96 L	5.00	4.00	6.50	3.11	8.00
L020	4.8	9.00	4.9	8.00	8.8	12.00	4.0	8.00	4.2	8.00	3.3	12.50
L023	4.6	8.00	5.2	10.00	7.6	5.50	4.3	9.50	3.8	5.00	3.2	10.50
L031A		0.00		0.00		0.00		0.00		0.00		0.00
L031B	2.3 VL	1.00	1.5 VL	2.00	6.5	2.00	1.8 VL	1.00	3.2 L	2.00	2.8	4.00
L033	10. VH	18.00	10. VH	18.00	10.	16.00	5.W	0.00	5.W	0.00	5.W	0.00
L042	3.53 L	3.00	1.03 VL	1.00	4.53 VL	1.00	2.80 L	4.00	2.26 VL	1.00	3.70	15.00
L045	2.9 L	2.00	2.2 VL	3.00	7.1	3.00	2.3 VL	2.00	4.8	14.00	2.7	2.00
L046	4.9	10.00	5.0	9.00	7.6	5.50	4.3	9.50	3.7	3.50	2.9	5.00
L053A	3.7	4.00	2.8 VL	4.00	8.2	9.50	2.6 L	3.00	4.0	6.50	3.0	6.50
L053B	6.6 H	16.00	7.3 VH	17.00	11.4 VH	18.00	6.3 VH	17.00	6.2 H	16.50	2.7	2.00
MEDIAN CONC.	4.850		5.100		8.200		4.300		4.500		3.150	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.9	11.00	6.0	17.00	5.5	16.00	3.9	14.00	>10.	0.00
L003B	.7	10.00	5.0	5.50	4.5	5.00	3.0	4.00	33.	7.00
L004A	1.0	12.00	4.8	4.00	4.5	5.00	3.6	12.00	32.4	5.00
L004B	1.1	13.00	5.0	5.50	4.7	8.00	3.5	10.50	26.4 L	3.00
L006	.469	6.00	5.0	7.00	4.83	13.00	2.90	3.00	31.0	4.00
L010	2.7 VH	14.00	7.2 H	13.00	7.2 VH	18.00	5.6 VH	15.50	39.1	16.00
L011	.34T	5.00	5.05	8.00	4.30	14.50	3.43	9.00	32.9	6.00
L014	.3	3.50	5.5	15.00	4.8	10.50	3.7	13.00	34.0	9.00
L016	0.00	1.00	2.22 VL	2.00	4.26	3.00	1.07 VL	1.00	25.00 L	2.00
L020	.6	9.00	5.2	10.50	4.9	14.50	3.4	7.00	36.	11.50
L023	.2	2.00	5.2	10.50	4.8	10.50	3.4	7.00	38.0	15.00
L031A		0.00	5.3	13.50	4.8	10.50		0.00		0.00
L031B	.2H	0.00	5.2	10.50	4.8	10.50	3.2	5.00	35.5	10.00
L033	5.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00	40.	17.00
L042		0.00	3.91	3.00	3.29 L	1.00		0.00	13.4 VL	1.00
L045	.3	3.50	5.2	10.50	4.6	7.00	3.5	10.50	33.5	8.00
L046	.5	7.50	1.9 VL	1.00	3.3 L	2.00	1.6 VL	2.00	36.	11.50
L053A	.1W	0.00	5.3	13.50	4.5	5.00	3.4	7.00	37.4	14.00
L053B	.5T	7.50	5.8	16.00	6.0	17.00	5.6 VH	15.50	37.2	13.00
MEDIAN CONC.	.500		5.200		4.800		3.415		34.000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	147.00	14.700	10	HH	BIASED HIGH	TECHNICON
L003B	61.50	5.591	11			TECHNICON
L004A	110.00	10.000	11	H		TECHNICON
L004B	112.50	10.227	11	L		TECHNICON
L006	96.50	8.773	11			TECHNICON
L010	179.00	16.273	11	VHHHHHHVHHVHVH	BIASED HIGH	COLOURIMETRIC
L011	111.50	10.136	11			TECHNICON
L014	101.50	9.227	11			
L016	53.50	4.864	11	LVLVLL	BIASED LOW	COLOURIMETRIC
L020	110.00	10.000	11			TECHNICON
L023	93.50	8.500	11			TECHNICON
L031A	24.00	12.000	2			
L031B	48.00	4.800	10	VLVLVLL	BIASED LOW	TECHNICON
L033	69.00	17.250	4	VHVH	INSUFFICIENT DATA	TECHNICON-HTB
L042	30.00	3.333	9	LVLVLLVLLVL	BIASED LOW	
L045	65.50	5.955	11	LVLVL		COLOURIMETRIC
L046	66.50	6.045	11	VLLVL		
L053A	73.00	7.300	10	VLL		COLOURIMETRIC
L053B	155.50	14.136	11	HVHVHVHHVH	BIASED HIGH	TURBIDIMETRIC

OVERALL AVERAGE RANK IS 9.085

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L042	30.00	3.333	9	LVLVLLVLLVL	BIASED LOW	
L031B	48.00	4.800	10	VLVLVLL	BIASED LOW	TECHNICON
L016	53.50	4.864	11	LVLVLL	BIASED LOW	COLOURIMETRIC
L003B	61.50	5.591	11			TECHNICON
L045	65.50	5.955	11	LVLVL		COLOURIMETRIC
L046	66.50	6.045	11	VLLVL		
L053A	73.00	7.300	10	VLL		COLOURIMETRIC
L023	93.50	8.500	11			TECHNICON
L006	96.50	8.773	11			TECHNICON
L014	101.50	9.227	11			
L004A	110.00	10.000	11	H		TECHNICON
L020	110.00	10.000	11			TECHNICON
L011	111.50	10.136	11			TECHNICON
L004B	112.50	10.227	11	L		TECHNICON
L031A	24.00	12.000	2			
L053B	155.50	14.136	11	HVHVHVHHVH	BIASED HIGH	TURBIDIMETRIC
L002	147.00	14.700	10	HH	BIASED HIGH	TECHNICON
L010	179.00	16.273	11	VHHHHHHVHHVHVH	BIASED HIGH	COLOURIMETRIC
L033	69.00	17.250	4	VHVH	INSUFFICIENT DATA	TECHNICON-HTB

OVERALL AVERAGE RANK IS 9.085

PARAMETER: 16392 SULFATE MG/L

MAJOR IONS LRTAP NO.4

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.0000 BASIC ACCEPTABLE ERROR= .7600 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L007,L043,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	5.0 VH	27.00	6.9 VH	29.00	9.5 H	27.00	5.8 VH	29.00	5.3 H	28.00	3.6	27.00
L002B	2.64	6.00	1.75	10.00	6.99	7.00	1.98	8.00	3.41	6.50	3.22	23.00
L003A	2.7	10.50	1.7	7.50	7.4	15.00	2.1	12.50	3.6	13.00	2.9	7.00
L003B	4.5	20.00	4.6 VH	20.00	7.5	16.00	3.8 VH	19.50	3.7	14.50	2.7	2.00
L004A	6.4 VH	28.00	6.0 VH	25.00	8.2	22.00	5.0 VH	25.50	4.6	25.50	3.2	21.00
L004B	5.6 VH	26.00	5.9 VH	24.00	8.4	24.00	5.0 VH	25.50	4.6	25.50	3.3	25.50
L006	5.02 H	24.00	6.22 VH	27.00	7.89	20.00	5.15 VH	27.00	4.55	23.00	3.00	11.00
L010	7.1 VH	30.00	6.8 VH	28.00	11.1 VH	30.00	5.7 VH	28.00	6.2 VH	29.50	4.6 VH	30.00
L011	5.45 VH	25.00	6.02 VH	26.00	9.10	26.00	4.93 VH	24.00	4.58	24.00	3.15	19.00
L013A	2.52	4.00	1.66	5.00	6.93	6.00	1.96	6.50	3.41	6.50	3.03	15.00
L014	4.4	19.00	4.3 VH	19.00	7.8	19.00	3.8 VH	19.50	4.5	22.00	4.0	29.00
L016	3.96	18.00	3.89 VH	18.00	9.74 H	28.00	2.96	18.00	4.00	19.50	3.11	18.00
L020	4.8 H	22.00	4.9 VH	21.00	8.8	25.00	4.0 VH	21.00	4.2	21.00	3.3	25.50
L021B	2.59	5.00	1.89	6.00	7.33	14.00	1.96	6.50	3.50	11.00	3.05	16.00
L022	3.0	15.00	1.8	14.00	7.1	9.50	2.1	12.50	3.5	11.00	2.8	4.50
L023	4.6 H	21.00	5.2 VH	23.00	7.6	17.50	4.3 VH	22.50	3.8	17.50	3.2	21.00
L025	2.80	12.50	1.80	14.00	6.85	5.00	2.10	12.50	3.50	11.00	3.10	17.00
L029	2.48	3.00	1.62	4.00	6.76	4.00	1.93	5.00	3.14	2.00	3.00	11.00
L031A		0.00		0.00		0.00		0.00		0.00		0.00
L031B	2.3 L	2.00	1.5	3.00	6.5	3.00	1.8	3.00	3.2	4.00	2.8	4.50
L032	2.642	7.00	1.778	12.00	7.102	11.00	1.488 L	2.00	3.453	8.00	3.025	14.00
L033	10. VH	31.00	10. VH	31.00	10. H	29.00	5.W	0.00	5.W	0.00	5.W	0.00
L042	3.50	16.00	1.03 L	1.00	4.53 VL	2.00	2.88	17.00	2.26 L	1.00	3.70	28.00
L044	2.65	8.00	1.77	11.00	7.11	12.00	2.03	9.00	3.47	9.00	2.96	9.00
L045	2.9	14.00	2.2	16.00	7.1	9.50	2.3	15.00	4.8	27.00	2.7	2.00
L046	4.9 H	23.00	5.0 VH	22.00	7.6	17.50	4.3 VH	22.50	3.7	14.50	2.9	7.50
L053A	3.7	17.00	2.8	17.00	8.2	22.00	2.6	16.00	4.0	19.50	3.0	11.00
L053B	6.6 VH	29.00	7.3 VH	30.00	11.4 VH	31.00	6.3 VH	30.00	6.2 VH	29.50	2.7	2.00
L057	1.99 L	1.00	1.16 L	2.00	4.37 VL	1.00	1.47 L	1.00	3.17	3.00	2.85	6.00
L058	2.8	12.50	1.8	14.00	8.2	22.00	2.1	12.50	3.9	17.50	3.2	21.00
L060	2.66	9.00	1.70	7.50	7.03	8.00	1.91	4.00	3.38	5.00	3.01	13.00
L061	2.70	10.50	1.75	9.00	7.30	13.00	2.05	10.00	3.74	16.00	3.23	24.00
MEDIAN CONC.	3.500		2.200		7.500		2.450		3.720		3.040	

PARAMETER: 16J 92 SULFATE MG/L

SAMPLE LAB NO	7 REPORTED VALUE	7 RANK	9 REPORTED VALUE	9 RANK	9 REPORTED VALUE	9 RANK	13 REPORTED VALUE	13 RANK	11 REPORTED VALUE	11 RANK
L002	.9	22.00	6.0	30.00	5.5	29.00	3.9	27.00	>10.	8.00
L002B	.3	11.50	5.22	20.00	4.35	22.00	3.21	11.50	35.	11.00
L003A	.4	14.00	5.1	11.00	4.8	18.00	3.2	9.50	37.	18.50
L003B	.7	21.00	5.0	5.50	4.5	5.00	3.0	5.00	33.	8.00
L004A	1.0	23.00	4.8	4.00	4.5	5.00	3.6	25.00	32.	6.00
L004B	1.1	24.00	5.3	5.50	4.7	11.00	3.5	23.50	26.4 L	3.00
L006	.469	16.00	5.04	9.00	4.83	24.00	2.90	3.00	31.0	4.00
L010	2.7 VH	25.00	7.2 H	31.00	7.2 VH	31.00	5.6 VH	28.50	39.1	28.00
L011	.34T	11.50	5.05	10.00	4.30	25.50	3.43	22.00	32.9	7.00
L013A	.35	13.00	5.13	12.00	4.53	7.50	3.21	11.50	36.3	16.00
L014	.3	6.50	5.5	26.00	4.9	18.00	3.7	26.00	34.0	10.00
L016	0.00	1.00	2.22 VL	2.00	4.26	3.00	1.07 VL	1.00	25.00 L	2.00
L020	.6	20.00	5.2	16.00	4.9	25.50	3.4	20.00	36.	14.50
L021B	.25	4.50	5.29	21.00	4.79	14.00	3.19	8.00	35.9	13.00
L022	0.W	0.00	5.3	23.00	4.8	18.00	3.3	16.00	38.	23.50
L023	.2	2.50	5.2	16.00	4.9	18.00	3.4	20.00	38.0	23.50
L025	.50	18.00	5.20	16.00	4.75	12.00	3.30	16.00	37.0	18.50
L029	.2W	0.00	5.01	7.00	4.53	7.50	3.04	6.00	36.6	17.00
L031A		0.00	5.3	23.00	4.3	18.00		0.00		0.00
L031B	.2W	0.00	5.2	16.00	4.8	18.00	3.2	9.50	35.5	12.00
L032	.302	8.00	5.454	25.00	4.859	23.00	3.257	13.00	31.76	5.00
L033	5.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00	40.	29.00
L042		0.00	3.91	3.00	3.29 L	1.00		0.00	13.4 VL	1.00
L044	.44	15.00	5.18	13.00	4.80	18.00	3.29	14.00	37.63	22.00
L045	.3	6.50	5.2	16.00	4.6	10.00	3.5	23.50	33.5	9.00
L046	.5	18.00	1.9 VL	1.00	3.3 L	2.00	1.6 VL	2.00	36.	14.50
L053A	.1W	0.00	5.3	23.00	4.5	5.00	3.4	20.00	37.4	21.00
L053B	.5T	18.00	5.8	28.50	6.0	30.00	5.6 VH	28.50	37.2	20.00
L057	.33	9.50	5.03	8.00	4.57	9.00	2.93	4.00	39.0	27.00
L058	.2	2.50	5.9	28.50	5.3	26.00	3.3	16.00	41.	30.00
L060	.33	9.50	5.21	19.00	4.76	13.00	3.14	7.00	38.3	25.00
L061	.25	4.50	5.60	27.00	5.19	27.00	3.36	18.00	38.96	26.00
MEDIAN CONC.	.350		5.200		4.800		3.300		36.150	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	275.00	27.500	10	VHVHHVHH	BIASED HIGH	TECHNICON
L002B	136.50	12.409	11			IC
L003A	137.00	12.455	11			IC
L003B	136.50	12.409	11	VHVH		TECHNICON
L004A	210.00	19.091	11	VHVHVH		TECHNICON
L004B	217.50	19.773	11	VHVHVHL		TECHNICON
L006	188.00	17.091	11	HVHVH		TECHNICON
L010	319.00	29.000	11	VHVHVHVHVHVHVHHVHVH	BIASED HIGH	COLOURIMETRIC
L011	220.00	20.000	11	VHVHVH		TECHNICON
L013A	103.00	9.364	11			IC
L014	214.00	19.455	11	VHVH		
L016	128.50	11.682	11	VHHVLVLL		COLOURIMETRIC
L020	231.50	21.045	11	HVHVH		TECHNICON
L021B	119.00	10.818	11			IC
L022	147.00	14.700	10			IC
L023	202.50	18.409	11	HVHVH		TECHNICON
L025	152.50	13.864	11			IC
L029	66.50	6.650	10		BIASED LOW	IC
L031A	41.00	20.500	2			
L031B	75.00	7.500	10	L	BIASED LOW	TECHNICON
L032	128.00	11.636	11	L		IC
L033	120.00	30.000	4	VHVHH	INSUFFICIENT DATA	TECHNICON-MTB
L042	70.00	7.778	9	LVLLLVL		
L044	140.00	12.727	11			IC
L045	148.50	13.500	11			COLOURIMETRIC
L046	144.50	13.136	11	HVHVHVLLVL		
L053A	171.50	17.150	10			COLOURIMETRIC
L053B	276.50	25.136	11	VHVHVHVHVHVH	BIASED HIGH	TURBIDIMETRIC
L057	71.50	6.500	11	LLVLL	BIASED LOW	IC
L058	204.50	18.591	11			IC
L060	120.00	10.909	11			IC
L061	185.00	16.818	11			IC

OVERALL AVERAGE
RANK IS 15.502

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L057	71.50	6.500	11	LLVLL	BIASED LOW	IC
L029	66.50	6.650	10		BIASED LOW	IC
L031B	75.00	7.500	10	L	BIASED LOW	TECHNICON
L042	70.00	7.778	9	LVLLLVL		
L013A	103.00	9.364	11			IC
L021B	119.00	10.818	11			IC
L060	120.00	10.909	11			IC
L032	128.00	11.636	11	L		IC
L016	128.50	11.682	11	VHHVLVLL		COLOURIMETRIC
L003B	136.50	12.409	11	VHVH		TECHNICON
L002B	136.50	12.409	11			IC
L003A	137.00	12.455	11			IC
L044	140.00	12.727	11			IC
L046	144.50	13.136	11	HVHVHVLLVL		
L045	148.50	13.500	11			COLOURIMETRIC
L025	152.50	13.864	11			IC
L022	147.00	14.700	10			IC
L061	185.00	16.818	11			IC
L006	188.00	17.091	11	HVHVH		TECHNICON
L053A	171.50	17.150	10			COLOURIMETRIC
L023	202.50	18.409	11	HVHVH		TECHNICON
L058	204.50	18.591	11			IC
L004A	210.00	19.091	11	VHVHVH		TECHNICON
L014	214.00	19.455	11	VHVH		
L004B	217.50	19.773	11	VHVHVHL		TECHNICON
L011	220.00	20.000	11	VHVHVH		TECHNICON
L031A	41.00	20.500	2			
L020	231.50	21.045	11	HVHVH		TECHNICON
L053B	276.50	25.136	11	VHVHVHVHVHVH	BIASED HIGH	TURBIDIMETRIC
L002	275.00	27.500	10	VHVHHVHH	BIASED HIGH	TECHNICON
L010	319.00	29.000	11	VHVHVHVHVHVHVHHVHVH	BIASED HIGH	COLOURIMETRIC
L033	120.00	30.000	4	VHVHH	INSUFFICIENT DATA	TECHNICON-MTB

OVERALL AVERAGE
RANK IS 15.502

PARAMETER: 01091 ACIDITY MGCO3/L

MAJOR IONS LRTAP NO.4

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= .7500 CONCENTRATION ERROR INCREMENT= .5000
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L010	7.5	15.00	8.0	11.50	9.0	13.00	6.5	12.00	3.0	14.00	3.0	14.00
L011	7.14	12.00	9.02	14.00	13.0 H	16.00	7.70	15.00	3.00	14.00	6.39 VH	16.00
L014	1.50 L	1.00	2.05 L	1.00	4.35	1.00	1.20 L	1.00	<.05 VL	1.00	.15 VL	1.00
L016	7.2	13.50	9.0	11.50	9.7	15.00	8.2	16.00	2.8	10.00	2.9	12.00
L020	7.2	13.50	7.6	9.00	8.2	8.00	6.3	10.00	2.3	11.00	2.4	7.00
L022	7.	11.00	8.	11.50	8.	6.00	6.	7.50	3.	14.00	2.	2.00
L023	5.68	5.00	7.14	5.00	7.79	4.00	5.52	5.00	2.27	5.00	1.79	3.00
L025	5.31	2.00	5.93	2.00	7.13	2.00	4.72	2.00	1.40	2.00	.710 L	2.00
L029	5.44	3.00	7.06	4.00	8.33	10.00	5.69	6.00	2.40	6.50	2.56	10.00
L030	5.83	6.00	6.69	3.00	7.82	5.00	5.16	3.00	1.86	3.00	1.90	4.00
L032	6.446	8.00	7.491	7.00	8.328	9.00	6.136	9.00	2.482	6.00	2.447	8.00
L033	5.H	0.00	5.H	0.00	5.H	0.00	5.H	0.00		0.00		0.00
L042	6.27	7.00	7.16	6.00	8.09	7.00	5.37	4.00	2.51	9.00	2.69	11.00
L046	5.5	4.00	15.0 VH	16.00	7.7	3.00	6.4	11.00	1.9	4.00	2.9	12.00
L053	5.8	10.00	7.5	8.00	8.6	12.00	6.0	7.50	2.4	6.50	2.2	6.00
L057	6.5	9.00	8.0	11.50	8.5	11.00	7.0	13.50	3.0	14.00	2.5	9.00
L060	8.4	16.00	9.4	15.00	9.6	14.00	7.0	13.50	3.0	14.00	4.0 H	15.00
MEDIAN CONC.	6.473		7.550		8.264		6.068		2.496		2.474	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L010	1.0	5.00	2.0	13.00	5.0	13.00	2.0 H	12.50	1.5	10.00
L011	2.82 H	16.00	2.07	15.00	6.58	14.00	.94T	7.00	2.25	14.00
L014	<.05 L	1.00	<.05 L	1.00	2.45	1.00	<.05 L	1.00	.10 L	1.00
L016	1.8	12.00	1.8	11.00	4.7	11.00	1.9 H	11.00	1.5	10.00
L020	1.4	7.00	1.6	7.00	4.6	10.00	2.1 H	14.00	1.3	5.50
L022	1.	5.00	1.	2.00	4.	5.00	1.	8.00	1.	2.00
L023	1.62	9.00	1.46	6.00	4.87	12.00	1.0H	0.00	1.30	5.50
L025	.700	2.00	1.23	3.00	3.40	2.00	.420	3.00	1.75	13.00
L029	1.90	13.00	1.65	8.00	4.36	8.00	.82	5.00	1.39	7.00
L030	.83	3.00	1.33	4.00	3.64	3.00	1.16	10.00	1.13	3.00
L032	1.745	11.00	1.653	9.00	3.393	4.00	.082 L	2.00	1.675	12.00
L033		0.00		0.00	5.H	0.00		0.00		0.00
L042	2.60	15.00	1.79	10.00	6.80	16.00	.90	6.00	2.51 H	16.00
L046	1.6	8.00	1.4	5.00	4.3	6.50	.6	4.00	1.2	4.00
L053	1.0	5.00	2.0	13.00	4.3	6.50	1.1	9.00	1.4	8.00
L057	1.7	10.00	2.0	13.00	4.5	9.00	2.0 H	12.50	1.5	10.00
L060	2.2	14.00	3.8 VH	16.00	6.6	15.00	2.4 VH	15.00	2.4	15.00
MEDIAN CONC.	1.610		1.652		4.430		1.000		1.450	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L010	133.00	12.091	11	H	
L011	153.00	13.909	11	HVHH	BIASED HIGH
L014	11.00	1.000	11	LLLVLVLLLLL	BIASED LOW
L016	133.50	12.136	11	H	
L020	102.00	9.273	11	H	
L022	77.00	7.000	11		
L023	59.50	5.950	10		
L025	35.00	3.182	11	L	BIASED LOW
L029	80.50	7.318	11		
L030	47.00	4.273	11		BIASED LOW
L032	87.00	7.909	11	L	
L033	0.00	0.000	0		
L042	107.00	9.727	11	H	
L046	78.00	7.091	11	VH	
L053	91.50	8.318	11		
L057	122.50	11.136	11	H	
L060	162.50	14.773	11	HVHVH	BIASED HIGH

OVERALL AVERAGE
RANK IS 8.457

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L033	0.00	0.000	0		
L014	11.00	1.000	11	LLLVLVLLLLL	BIASED LOW
L025	35.00	3.182	11	L	BIASED LOW
L030	47.00	4.273	11		BIASED LOW
L023	59.50	5.950	10		
L022	77.00	7.000	11		
L046	78.00	7.091	11	VH	
L029	80.50	7.318	11		
L032	87.00	7.909	11	L	
L053	91.50	8.318	11		
L020	102.00	9.273	11	H	
L042	107.00	9.727	11	H	
L057	122.50	11.136	11	H	
L010	133.00	12.091	11	H	
L016	133.50	12.136	11	H	
L011	153.00	13.909	11	HVHH	BIASED HIGH
L060	162.50	14.773	11	HVHVH	BIASED HIGH

OVERALL AVERAGE
RANK IS 8.457

PARAMETER: 06192 TOTAL ALKALINITY MG CACO3/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 2.5000 BASIC ACCEPTABLE ERROR= 1.2000 CONCENTRATION ERROR INCREMENT= .0800
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	L1.	0.00	L1.	0.00	L1.	0.00	L1.	0.00	1.9	3.50	L1.	0.00
L003B		0.00		0.00		0.00		0.00	1.9	3.50		0.00
L004A		0.00		0.00		0.00		0.00	2.2	8.00		0.00
L004B	.2	4.00		0.00		0.00	.5	5.00	3.3	12.00	1.4	8.00
L006	0.	1.50	0.	2.00	0.	2.50	0.	2.00	2.07	6.00	0.	1.50
L009	.73	5.00		0.00		0.00	.88	6.00	4.17	16.00	1.62	9.00
L010	1.0W	0.00	1.0W	0.00	1.0W	0.00	1.0W	0.00	1.0W	0.00	1.0W	0.00
L011	.10W	0.00	.10W	0.00	.10W	0.00	.17T	4.00	3.62	13.00	.10W	0.00
L014	<.05	0.00	<.05	0.00	<.05	0.00	<.05	0.00	2.00	5.00	<.05	0.00
L016	0.	1.50	0.	2.00	0.	2.50	0.	2.00	.95 VL	1.00	0.	1.50
L022	0.W	0.00	0.W	0.00	0.W	0.00	0.W	0.00	3.	9.50	.64T	4.00
L023	1.00	6.00	1.00	4.00	0.0	2.50	1.00	7.00	4.00	15.00	2.00	10.00
L024	.019	3.00	0.	2.00	0.	2.50	0.	2.00	3.22	11.00	.73	5.00
L029	.4W	0.00	.4W	0.00	.4W	0.00	.4W	0.00	3.69T	14.00	1.20T	7.00
L031A		0.00		0.00		0.00		0.00		0.00		0.00
L031B	.1W	0.00	.1W	0.00	.1W	0.00	.1W	0.00	2.1	7.00	.1	3.00
L033		0.00		0.00		0.00		0.00	5.W	0.00	5.W	0.00
L042	11.8 VH	8.00	10.6 VH	6.00	8.16	5.00	11.4 VH	9.00	14.3 VH	18.00	11.3 VH	12.00
L045	0.W	0.00	0.W	0.00	0.W	0.00	0.W	0.00	1.8	2.00	0.W	0.00
L057	1.0W	0.00	1.0W	0.00	1.0W	0.00	1.0W	0.00	3.0	9.50	1.0	6.00
L060	2.0 H	7.00	1.6	5.00	.2W	0.00	1.6	8.00	5.6 VH	17.00	2.6 H	11.00
MEDIAN CONC.	.495		.500		0.000		.500		3.000		1.100	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	L1.	0.00	1.3	6.00	L1.	0.00	38.3	5.00	L1.	0.00
L003B		0.00	2.2	11.00		0.00	38.7	6.00		0.00
L004A		0.00	1.8	5.00		0.00	40.0	10.50		0.00
L004B	1.9	11.00	3.7 H	17.00		0.00	63.1 VH	20.00	1.9	10.00
L006	.57	4.00	2.95	12.00	0.	2.50	39.86	9.00	.54	4.00
L009	1.83	10.00	3.41 H	16.00		0.00	44.3 H	17.00	1.85	9.00
L010	1.0W	0.00	2.0	8.50	1.0W	0.00	38.0	4.00	1.0W	0.00
L011	1.23T	7.00	.85T L	1.00	.10W	0.00	34.9 L	2.00	.21T L	2.00
L014	.10	2.50	1.60	3.00	<.05	0.00	39.73	8.00	<.05	0.00
L016	0. L	1.00	1.42	2.00	0.	2.50	36.31	3.00	0. L	1.00
L022	.64T	5.00	2.	8.50	0.W	0.00	40.	10.50	.64T	5.00
L023	2.00	12.00	4.00 VH	18.00	0.0	2.50	42.0	13.50	2.00	11.00
L024	1.16	6.00	3.17	15.00	0.	2.50	41.77	12.00	1.68	8.00
L029	1.29T	8.00	3.01T	14.00	.4W	0.00	41.95	14.00	1.57T	7.00
L031A		0.00	2.0	3.50	.1W	0.00		0.00		0.00
L031B	.1	2.50	2.0	8.50	.1W	0.00	41.8	13.00	.1W	0.00
L033	5.W	0.00	5.W	0.00		0.00	42.	15.50	5.W	0.00
L042	11.2 VH	14.00	13.3 VH	20.00	9.18	6.00	52.0 VH	19.00	11.6 VH	13.00
L045	0.W	0.00	1.7	4.00	0.W	0.00	39.2	7.00	.44	3.00
L057	1.5	9.00	3.4	13.00	1.0W	0.00	4.0 VL	1.00	1.5	6.00
L060	3.0 H	13.00	5.2 VH	19.00	.6	5.00	46.8 VH	18.00	3.2 H	12.00
MEDIAN CONC.	1.285		2.100		0.030		40.000		1.570	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	14.50	4.833	3			CO2-METHOD
L0038	20.50	6.833	3			TOT-ALKA
L004A	23.50	7.833	3			T
L0048	87.00	10.875	8	HVH	BIASED LOW	
L006	47.00	4.273	11			
L009	88.00	11.000	8	HH		
L010	12.50	6.250	2		INSUFFICIENT DATA	
L011	29.00	4.833	6	LLL	INSUFFICIENT DATA	
L014	18.50	4.625	4		BIASED LOW	
L016	20.00	1.818	11	VLLL	INSUFFICIENT DATA	
L022	42.50	7.083	6			
L023	103.50	9.409	11	VH		
L024	69.00	6.273	11		INSUFFICIENT DATA	
L029	64.00	10.667	6			
L031A	8.50	8.500	1		INSUFFICIENT DATA	TITRATION
L031B	34.00	6.800	5			
L033	15.50	15.500	1		BIASED HIGH	
L042	130.00	11.818	11	VHVHVHVHVHVHVHVHVH	INSUFFICIENT DATA	
L045	16.00	4.000	4		INSUFFICIENT DATA	
L057	44.50	7.417	6	VL		
L060	115.00	11.500	10	HVHHHVHVHH		

OVERALL AVERAGE RANK IS 7.656

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L016	20.00	1.818	11	VLLL	BIASED LOW	
L045	16.00	4.000	4		INSUFFICIENT DATA	
L006	47.00	4.273	11		BIASED LOW	
L014	18.50	4.625	4		INSUFFICIENT DATA	
L011	29.00	4.833	6	LLL	INSUFFICIENT DATA	
L002	14.50	4.833	3			CO2-METHOD
L010	12.50	6.250	2			
L024	69.00	6.273	11		INSUFFICIENT DATA	TITRATION
L031B	34.00	6.800	5			TOT-ALKA
L0038	20.50	6.833	3		INSUFFICIENT DATA	
L022	42.50	7.083	6		INSUFFICIENT DATA	
L057	44.50	7.417	6	VL		T
L004A	23.50	7.833	3			
L031A	8.50	8.500	1			
L023	103.50	9.409	11	VH	INSUFFICIENT DATA	
L029	64.00	10.667	6			
L0048	87.00	10.875	8	HVH		
L009	88.00	11.000	8	HH		
L060	115.00	11.500	10	HVHHHVHVHH		
L042	130.00	11.818	11	VHVHVHVHVHVHVHVHVH	BIASED HIGH	
L033	15.50	15.500	1			

OVERALL AVERAGE RANK IS 7.656

PARAMETER: 06282 GRAND TITR ALK MG/LCAC03

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .0500 BASIC ACCEPTABLE ERROR= .5000 CONCENTRATION ERROR INCREMENT= .1000
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003A	-.9	6.00	-1.5	5.50	-3.9	6.00	-1.0	7.00		0.00	-.3	5.00
L020	.01W	0.00	.01W	0.00	.01W	0.00	.01W	0.00	1.8	4.00	.01W	0.00
L024	-1.49T	3.00	-2.23T L	1.00	-5.37T VL	1.00	-1.53T	2.00	1.60	2.00	-.65T	1.00
L025	-2.21T VL	1.00	-1.98T	2.00	-4.32T	3.00	-1.20T	4.50	2.36	7.00	6.70 VH	6.00
L030	-1.29T	4.00	-1.66T	4.00	-4.37T	2.00	-1.21T	3.00	1.92	5.00	-.32T	4.00
L032	-1.2	5.00	-1.5	5.50	-4.3	4.00	-1.1	6.00	1.780	3.00	-.41	3.00
L046	-1.8T	2.00	-1.7T	3.00	0.W	0.00	-1.2T	4.50	1.4	1.00	-.6T	2.00
L058	1.W	0.00	-1. H	7.00	-4.	5.00	-2. VL	1.00	2.	6.00	1.W	0.00
MEDIAN CONC.	-1.390		-1.660		-4.310		-1.200		1.800		-.365	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003A	.1	4.00		0.00	-2.5	4.00		0.00	.6 H	7.00
L020	.2	6.00	2.8 VH	7.00	.01W	3.00	29.7 VL	1.00	.05	5.00
L024	-.12T	2.00	1.60	2.50	-2.76T	2.00	39.90	4.00	-.05T	2.00
L025	.13	5.00	1.68	4.00	-3.08T L	1.00	41.19	5.00	-.03T	3.00
L030	.03T	3.00	1.97	5.00	-2.61T	3.00	42.17	7.00	.02T	4.00
L032	-.13	1.00	-.09 VL	1.00	.554 VH	6.00	39.12	3.00	-.16	1.00
L046	.5	7.00	1.6	2.50	0.0W	0.00	38.9	2.00	.4	6.00
L058	1.W	0.00	2.	6.00	-2. H	5.00	42.	6.00	1.W	0.00
MEDIAN CONC.	.100		1.680		-2.555		39.900		.020	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L003A	44.50	5.563	8	H		GRAN-TITRA
L020	23.00	4.600	5	VHVL	INSUFFICIENT DATA	
L024	22.50	2.045	11	LVL	BIASED LOW	
L025	41.50	3.773	11	VLVHL		
L030	44.00	4.000	11			
L032	38.50	3.500	11	VLVH		
L046	30.00	3.333	9			
L058	36.00	5.143	7	HVLH		

OVERALL AVERAGE RANK IS 3.836

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L024	22.50	2.045	11	LVL	BIASED LOW	
L046	30.00	3.333	9			
L032	38.50	3.500	11	VLVH		
L025	41.50	3.773	11	VLVHL		
L030	44.00	4.000	11			
L020	23.00	4.600	5	VHVL	INSUFFICIENT DATA	
L058	36.00	5.143	7	HVLH		
L003A	44.50	5.563	8	H		GRAN-TITRA

OVERALL AVERAGE RANK IS 3.836

PARAMETER: 01192 PH PH UNITS

QUALITY ASSURANCE AND METHODS SECTION,
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LRTAP NO.4 MAJOR IONS

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.000 BASIC ACCEPTABLE ERROR= .250 CONCENTRATION ERROR INCREMENT= 0.0000
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L059
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	4.6	14.50	4.3	17.50	4.1	12.50	4.6	13.50	6.6 H	20.50	5.0	12.00
L003	4.7	26.00	4.2	17.50	4.2	27.00	4.7	24.00	6.[illegible]	17.50	5.0	12.00
L004A	4.7	26.00	4.6	17.50	4.1	12.50	4.8	33.00	6.[illegible]	17.50	5.1	24.50
L004B	5.5 VH	31.00	4.9 VH	31.00	4.3	31.00	5.5 VH	31.00	6.5 H	26.50	6.0 VH	30.00
L006	4.68	23.00	4.66	25.00	4.15	23.00	4.69	21.00	6.3[illegible]	10.00	5.08	13.50
L009	4.65	20.50	4.[illegible]	23.50	4.15	19.00	4.[illegible]	16.50	6.3[illegible]	17.00	5.00	12.00
L010	4.5	6.00	4.3	3.00	4.3	7.50	4.5	8.50	6.[illegible]	8.00	4.9	6.50
L011	4.65	20.50	4.6[illegible]	28.00	4.12	19.00	4.70	24.00	6.3[illegible] H	23.50	5.10	24.50
L013B	4.6	11.50	4.6	23.00	4.2	27.00	4.8	29.50	6.3	20.00	5.1	24.50
L014	4.60	11.50	4.[illegible]	8.50	3.93	5.00	4.60	3.50	6.1[illegible]	11.00	5.10	24.50
L016	4.45	2.00	4.[illegible]	3.50	4.1[illegible]	12.50	4.30 L	1.00	6.2[illegible]	14.00	4.8[illegible]	5.00
L020	4.67	22.00	4.54	23.00	4.1[illegible]	18.50	4.7	24.00	6.4[illegible]	25.00	5.03	17.50
L021B	4.7	26.00	4.5	17.50	4.2	27.00	4.7	24.00	6.3	20.00	5.1	24.50
L022	4.47	3.00	4.32	4.00	3.94	2.00	4.49	6.00	6.[illegible]	10.00	4.95	10.00
L023	4.70	26.00	4.6[illegible]	23.00	4.15	23.00	4.70	24.00	6.3[illegible]	20.00	5.13	24.50
L024	4.53	8.00	4.3[illegible]	9.00	3.94	2.00	4.48	5.00	6.47	9.00	4.81	4.00
L025	4.59	12.50	4.52	20.00	4.1[illegible]	21.00	4.9[illegible]	28.00	7.03 VH	30.00	6.47 VH	31.00
L029	4.44	1.00	4.37	2.00	3.35 L	1.00	4.38 L	2.00	5.97 L	1.00	4.80	3.00
L030	4.55	9.00	4.47	11.00	4.15	9.00	4.57	11.00	6.1[illegible]	14.50	4.9[illegible]	9.00
L031A	4.62	17.50	4.4[illegible]	14.00	4.1[illegible]	16.50	4.64	16.00	6.4[illegible]	13.50	5.02	15.00
L032	4.64	19.50	4.53	21.50	4.13	20.00	4.67	19.00	6.5 H	26.50	5.03	17.50
L033	4.5	8.00	4.3[illegible]	9.50	4.1[illegible]	7.00	4.5[illegible]	7.00	5.3 VL	2.00	4.9[illegible]	8.00
L042	4.71	28.50	4.5[illegible]	24.00	4.33	30.00	4.88	30.00	7.25 VH	31.00	5.09	21.00
L044	4.70	26.00	4.63	30.00	4.13	25.00	4.62	15.00	5.75 VL	1.00	5.13	29.00
L045	4.59	12.50	4.3[illegible]	5.00	3.93	5.00	4.50	8.00	5.39 L	3.00	4.93	3.00
L048	4.50	10.50	4.4[illegible]	12.00	4.2[illegible]	16.50	4.57	11.50	6.2[illegible]	17.00	5.02	15.00
L053	4.60	14.50	4.3[illegible]	14.00	4.11	12.50	4.9[illegible]	13.00	6.3[illegible]	20.00	5.02	15.00
L057	4.50	7.00	4.2 L	1.00	3.33	1.00	4.33	3.00	5.35 L	2.00	4.7[illegible] L	1.00
L058	4.7[illegible]	29.50	4.5[illegible]	20.00	4.3[illegible]	29.00	4.72	27.00	6.4[illegible]	23.50	5.11	28.00
L060	4.50	9.00	4.44	8.00	4.13	9.00	4.43	4.00	6.3[illegible]	7.00	4.73 L	2.00
L061	4.62	17.50	4.49	14.00	4.11	10.50	4.61	14.00	6.37	8.00	5.03	19.50
MEDIAN CONC.	4.600		4.500		4.110		4.560		6.200		5.020	

PARAMETER: 01352 PH PH UNITS

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	5.6	15.00	6.5	25.00	4.2	2.00	8.1 VH	30.00	5.9 H	27.00
L003	5.5	11.00	6.1	3.00	4.4	26.50	7.1 VL	2.00	5.9 VH	28.50
L004A	5.9 H	23.50	6.5	15.00	4.3	13.50	7.4 L	5.50	5.5	13.00
L004B	5.4 VH	32.00	6.7 VH	29.00	5.1 VH	31.00	7.7	16.00	6.5 VH	31.00
L006	5.63	19.00	6.54	17.50	4.33	26.50	7.77	18.00	5.51	16.00
L009	5.66	14.00	6.43	23.00	4.33	13.50	7.95	25.50	5.35	4.00
L010	5.4	6.00	6.0 L	5.50	4.3	13.50	7.5	9.00	5.3	13.00
L011	5.80	26.00	6.90 VH	30.00	4.30	13.50	7.95	25.50	5.65	22.50
L013B	5.4	6.00	6.4	20.50	4.4	26.50	7.8	20.50	5.4	6.50
L014	5.70	21.00	6.26	12.00	4.22	5.50	7.78	19.00	5.50 VH	28.50
L016	5.35	3.50	6.40	20.50	4.30	13.50	7.70	15.00	5.55	22.50
L020	5.91	27.00	6.49	25.00	4.38	22.50	8.04 H	29.00	5.66	24.50
L021B	5.75	25.00	6.3	13.00	4.4	26.50	7.7	16.00	5.5	13.00
L022	5.51	12.00	5.32 VL	3.00	4.25	10.00	7.26 VL	1.00	5.61	21.00
L023	5.60	15.00	6.3	15.00	4.32	20.00	7.60	20.50	5.43	8.50
L024	5.48	10.00	6.53	23.00	4.23	7.00	7.64	13.00	5.50	13.00
L025	6.35 VH	30.00	7.04 VH	31.00	4.33	22.50	8.12 VH	31.00	5.19 L	1.00
L029	5.35	3.50	6.22	10.00	4.22	5.50	7.63	12.00	5.48	9.00
L030	5.52	13.00	6.34	17.50	4.23	11.00	7.59	10.00	5.38	5.00
L031A	5.70	21.00	6.67 H	28.00	4.32	18.00	7.99 H	29.00	5.57	19.00
L032	5.70	21.00	5.66 VL	1.00	4.37	21.00	7.62	22.50	5.50	13.00
L033	5.4	6.00	5.7 VL	2.00	4.2	2.00	6.8 VL	1.00	5.2 L	2.00
L042	5.90 H	28.50	6.28	13.00	4.41	30.00	7.66	14.00	5.55	8.00
L044	5.62	17.00	6.00 L	5.50	4.33	26.50	7.40 L	3.50	5.70	26.00
L045	5.44	8.00	6.06	7.00	4.21	4.00	7.41 L	7.00	5.49	10.00
L046	5.45	9.00	6.35	19.00	4.20	2.00	7.69	24.00	5.56	18.00
L055	5.74	24.00	6.45	23.00	4.31	16.50	7.32	23.00	5.60	20.00
L057	5.23 L	1.00	5.23	11.00	4.23	8.00	7.46	3.00	5.66	24.50
L058	5.72	23.00	6.02 H	27.00	4.30	26.50	7.97 H	27.00	5.35	17.00
L060	5.25 L	2.00	6.15	9.00	4.35	9.00	7.60	11.00	5.25 L	3.00
L061	5.60	15.00	5.98 L	4.00	4.31	16.50	7.36 L	4.00	5.91 VH	30.00
MEDIAN CONC.	5.630		6.340		4.310		7.700		5.510	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L002	198.00	18.000	11	HVHH	
L003	193.00	17.545	11	VLVH	
L004A	199.00	18.091	11	HL	
L004B	313.50	28.955	11	VHVHVHHVHVHVHVHVH	BIASED HIGH
L006	224.50	20.409	11		
L009	203.00	18.455	11		
L010	84.50	7.682	11	L	BIASED LOW
L011	262.00	23.818	11	HVH	
L013B	222.50	20.227	11		
L014	157.50	14.318	11	VH	
L016	119.50	10.864	11	L	
L020	256.00	23.273	11	H	
L021B	234.50	21.318	11		
L022	85.00	7.727	11	VLVL	
L023	222.50	20.227	11		
L024	104.50	9.500	11		
L025	248.00	22.545	11	VHVHVHVHVHL	
L029	54.00	4.909	11	LLL	BIASED LOW
L030	117.00	10.636	11		
L031A	217.00	19.727	11	HH	
L032	202.00	18.364	11	HVL	
L033	52.00	4.727	11	VLVLVLL	BIASED LOW
L042	259.00	23.545	11	VHH	
L044	206.50	18.773	11	VLLL	
L045	77.50	7.045	11	LL	BIASED LOW
L046	154.50	14.045	11		
L053	200.00	18.182	11		
L057	70.50	6.409	11	LLLL	BIASED LOW
L058	283.50	25.773	11	HH	BIASED HIGH
L060	71.00	6.455	11	LLL	BIASED LOW
L061	159.00	14.455	11	LLVH	

OVERALL AVERAGE RANK IS 16.000

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L033	52.00	4.727	11	VLVLVLL	BIASED LOW
L029	54.00	4.909	11	LLL	BIASED LOW
L057	70.50	6.409	11	LLLL	BIASED LOW
L060	71.00	6.455	11	LLL	BIASED LOW
L045	77.50	7.045	11	LL	BIASED LOW
L010	84.50	7.682	11	L	BIASED LOW
L022	85.00	7.727	11	VLVL	
L024	104.50	9.500	11		
L030	117.00	10.636	11		
L016	119.50	10.864	11	L	
L046	154.50	14.045	11		
L014	157.50	14.318	11	VH	
L061	159.00	14.455	11	LLVH	
L003	193.00	17.545	11	VLVH	
L002	198.00	18.000	11	HVHH	
L004A	199.00	18.091	11	HL	
L053	200.00	18.182	11		
L032	202.00	18.364	11	HVL	
L009	203.00	18.455	11		
L044	206.50	18.773	11	VLLL	
L031A	217.00	19.727	11	HH	
L023	222.50	20.227	11		
L013B	222.50	20.227	11		
L006	224.50	20.409	11		
L021B	234.50	21.318	11		
L025	248.00	22.545	11	VHVHVHVHVHL	
L020	256.00	23.273	11	H	
L042	259.00	23.545	11	VHH	
L011	262.00	23.818	11	HVH	
L058	283.50	25.773	11	HH	BIASED HIGH
L004B	318.50	28.955	11	VHVHVHHVHVHVHVHVH	BIASED HIGH

OVERALL AVERAGE RANK IS 16.000

Ph

PARAMETER: 00392 SPECIFIC CONDUCTANCE UMHO/CM

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 50.0000 BASIC ACCEPTABLE ERROR= 2.8000 CONCENTRATION ERROR INCREMENT= .0800
LABORATORIES YET TO REPORT: L007,L043,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	31.3	9.00	29.6	7.00	56.9	10.00	26.9	5.00	26.2	7.00	18.0	7.50
L003	32.	13.50	31.	17.00	59.	14.50	28.	7.50	27.	10.00	19.	20.00
L004A	28.0 L	5.00	27.0 L	5.00	50.0 VL	6.00	24.5 VL	4.00	25.0	4.50	16.0	4.00
L004B	27. VL	3.00	25. VL	3.00	46. VL	3.00	96. VH	29.00	22. VL	3.00	15. L	3.00
L006	33.7	25.00	32.3	26.50	60.5	24.50	29.1	20.00	28.6	24.50	19.3	23.00
L009	33.6	23.50	32.0	24.00	60.8	27.00	29.7	22.50	28.6	24.50	19.5	24.50
L010	33.0	20.50	32.4	28.00	60.6	26.00	28.9	15.00	27.7	16.50	18.7	16.50
L011	31.5	11.00	29.8	8.00	60.0	21.00	28.2	11.00	28.5	23.00	18.6	13.50
L013A	33.6	23.50	31.1	19.00	58.5	12.00	28.6	14.00	28.8	26.00	19.6	26.00
L013B	38.3 VH	29.00	31.7	21.00	59.5	17.50	29.0	17.50	27.4	12.00	18.6	13.50
L014	30.	7.00	30.	9.50	30. VL	1.00	30.	26.50	30.	27.50	20.	27.50
L021B	25.1 VL	2.00	24.4 VL	2.00	46.2 VL	4.00	22.6 VL	2.00	21.4 VL	2.00	14.5 L	1.50
L022	29. L	6.00	29.	6.00	55. L	7.50	28.	7.50	26.	6.00	18.	7.50
L023	32.5	17.00	30.5	11.50	59.8	19.00	28.3	12.00	27.5	13.50	18.7	16.50
L024	30.7	8.00	32.3	26.50	59.5	17.50	29.3	21.00	27.7	16.50	18.8	18.00
L025	33.0	20.50	31.5	20.00	59.0	14.50	29.0	17.50	27.5	13.50	18.5	10.50
L029	31.4	10.00	30.8	14.00	60.5	24.50	28.5	13.00	27.9	18.00	18.6	13.50
L030	32.	13.50	31.	17.00	58.	11.00	30.	26.50	28.	20.00	18.	7.50
L031A	32.2	15.50	31.0	17.00	59.0	14.50	28.0	7.50	27.0	10.00	18.0	7.50
L032	32.2	15.50	30.8	14.00	59.	14.50	28.1	10.00	27.0	10.00	18.6	13.50
L033	33.	20.50	32.	24.00	62.	29.00	29.	17.50	28.	24.00	19.	20.00
L042	34.2	26.00	30.3	14.00	61.6	28.00	29.9	24.00	28.3	22.00	19.5	24.50
L044	26.0 VL	1.00	23.5 VL	1.00	45.2 VL	2.00	21.0 VL	1.00	20.5 VL	1.00	14.5 L	1.50
L045	32.9	18.00	31.8	22.00	60.2	23.00	29.7	22.50	27.6	15.00	19.1	22.00
L046	35.	27.00	30.	9.50	55. L	7.50	30.	26.50	30.	27.50	20.	27.50
L057	36. H	28.00	540. VH	29.00	60.	21.00	30.	26.50	31. H	29.00	21.	29.00
L058	33.	20.50	32.	24.00	60.	21.00	29.	17.50	28.	20.00	19.	20.00
L060	27.4 VL	4.00	25.5 VL	4.00	47.0 VL	5.00	23.6 VL	3.00	25.0	4.50	16.3	5.00
L061	31.9	12.00	30.5	11.50	55.3	9.00	28.0	7.50	26.7	8.00	18.5	10.50
MEDIAN CONC.	32.200		30.800		59.000		28.900		27.600		18.600	

PARAMETER 00392 SPECIFIC CONDUCTANCE UMHO/CM

SAMPLE LAB NO	7 REPORTED VALUE	7 RANK	8 REPORTED VALUE	8 RANK	9 REPORTED VALUE	9 RANK	10 REPORTED VALUE	10 RANK	11 REPORTED VALUE	11 RANK
L002	7.6	10.00	25.4	9.00	35.4	23.50	93.3	16.00	410.	6.00
L003	8.3	22.00	26.	11.50	33.	12.00	92.	12.00	428.	11.50
L004A	6.0	3.50	24.5	6.00	28.5 VL	6.00	88.0	7.00	338. VL	1.00
L004B	6.	3.50	22. VL	3.00	25. VL	1.00	80. VL	3.00	365. VL	4.00
L006	8.5	25.00	27.9	26.00	36.1	28.00	97.3	27.00	451.	27.00
L009	8.16	21.00	24.0	27.00	35.8	25.50	96.5	26.00	448.	23.00
L010	7.7	12.00	26.9	20.00	35.4	23.50	93.8	17.00	429.	13.00
L011	7.60	10.00	26.8	16.50	26.2 VL	2.00	96.0	24.50	434.	15.50
L013A	15.7 VH	27.00	34.0 VH	29.00	35.8	25.50	94.2	19.00	433.0	14.00
L013B	7.8	13.50	26.4	13.00	34.1	18.00	93.2	15.00	442.5	21.00
L014	<10.	0.00	30. H	28.00	30. L	8.00	100. H	29.00	450.	29.00
L021B	5.9	2.00	20.6 VL	2.00	27.4 VL	5.00	73.0 VL	2.00	349. VL	3.00
L022	8.	17.50	24.	4.00	32.	9.00	87.	6.00	411.	7.00
L023	7.47	7.00	26.8	16.50	35.3	22.00	91.5	10.50	434.	15.50
L024	8.05	20.00	26.8	16.50	34.7	20.00	93.0	13.50	428.	11.50
L025	7.80	13.50	26.8	16.50	32.4	10.00	93.0	13.50	435.	17.50
L029	8.40	23.50	27.1	24.00	33.9	15.00	95.0	22.00	437.	19.00
L030	8.	17.50	27.	22.00	33.	12.00	94.	18.00	450.	25.00
L031A	7.4	6.00	26.8	16.50	34.5	19.00	95.0	22.00	435.	17.50
L032	7.6	10.00	26.8	16.50	34.0	16.50	91.5	10.50	427.	10.00
L033	8.	17.50	27.	22.00	36.	27.00	95.	22.00	447.	22.00
L042	8.4	23.50	25.4	9.00	27.3 VL	4.00	98.5	28.00	462.	28.00
L044	5.8	1.00	20.0 VL	1.00	27.0 VL	3.00	70.5 VL	1.00	348.0 VL	2.00
L045	7.95	15.00	27.5	25.00	35.0	21.00	94.3	20.00	439.	20.00
L046	20. VH	28.00	25.	7.00	35. VH	29.00	90.	9.00	420.	9.00
L057	11.4 H	26.00	26.	11.50	33.	12.00	82. VL	4.00	390. L	5.00
L058	8.	17.50	27.	22.00	34.	16.50	96.	24.50	450.	25.00
L060	7.2	5.00	24.1	5.00	28.7 VL	7.00	83.6 VL	5.00	464.	29.00
L061	7.5	8.00	25.4	9.00	33.2	14.00	88.5	8.00	418.6	8.00
MEDIAN CONC.	7.875		26.800		33.900		93.200		434.000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L002	110.00	10.000	11		
L003	151.50	13.773	11		
L004A	52.00	4.727	11	LLVLVLVLVL	BIASED LOW
L004B	58.50	5.318	11	VLVLVLVHVLLVLVLVLVL	BIASED LOW
L006	276.50	25.136	11		BIASED HIGH
L009	268.50	24.409	11		BIASED HIGH
L010	208.00	18.909	11		
L011	156.00	14.182	11	VL	
L013A	235.00	21.364	11	VHVH	
L013B	191.00	17.364	11	VH	
L014	189.00	19.900	10	VLHLH	
L021B	27.50	2.500	11	VLVLVLVLVLLVLVLVLVL	BIASED LOW
L022	84.00	7.636	11	LL	
L023	161.00	14.636	11		
L024	189.00	17.182	11		
L025	167.50	15.227	11		
L029	196.50	17.864	11		
L030	190.10	17.273	11		
L031A	153.50	13.909	11		
L032	141.00	12.818	11		
L033	241.50	21.955	11		
L042	231.00	21.000	11	VL	
L044	15.50	1.409	11	VLVLVLVLVLLVLVLVLVL	BIASED LOW
L045	223.50	20.318	11		
L046	207.50	18.864	11	LVHVH	
L057	221.00	20.091	11	HVHHHVLL	
L058	228.50	20.773	11		
L060	76.50	6.955	11	VLVLVLVLVLVL	BIASED LOW
L061	105.50	9.591	11		

OVERALL AVERAGE RANK IS 14.956

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L044	15.50	1.409	11	VLVLVLVLVLLVLVL VL VL	BIASED LOW
L021B	27.50	2.500	11	VLVLVLVLVLLVLVL VL VL	BIASED LOW
L004A	52.00	4.727	11	LLVLVLVLVL	BIASED LOW
L004B	58.50	5.318	11	VLVLVLVHVLLVLVL VL VL	BIASED LOW
L060	76.50	6.955	11	VLVLVLVLVLVL	BIASED LOW
L022	84.00	7.636	11	LL	
L061	105.50	9.591	11		
L002	110.00	10.000	11		
L032	141.00	12.818	11		
003	151.50	13.773	11		
L031A	153.00	13.909	11		
L011	156.00	14.182	11	VL	
L023	161.00	14.636	11		
L025	167.50	15.227	11		
L024	189.00	17.182	11		
L030	190.00	17.273	11		
L013B	191.00	17.364	11	VH	
L029	196.50	17.864	11		
L046	217.50	18.864	11	LVH VH	
L014	189.00	13.900	10	VLHLH	
L010	218.00	19.909	11		
L057	221.00	20.091	11	HVHHHVLL	
L045	223.50	20.318	11		
L058	228.50	20.773	11		
L042	231.00	21.000	11	VL	
L013A	235.00	21.364	11	VHVH	
L033	241.50	21.955	11		BIASED HIGH
L009	268.50	24.409	11		BIASED HIGH
L006	276.50	25.136	11		

OVERALL AVERAGE RANK IS 14.956

SPECIFIC CONDUCTANCE

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PARAMETER: 00292 COLOUR HAZEN UNIT

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.0000 BASIC ACCEPTABLE ERROR= 2.2000 CONCENTRATION ERROR INCREMENT= .1800
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	100.	6.00	120. L	3.00	70.	4.50	80. L	3.50	30.	4.50	5.	6.00
L003	100.	6.00	180.	12.00	80.	9.00	100.	8.00	30.	4.50	L5.	0.00
L004A	120. H	10.00	165.	10.00	96. H	12.00	117.	11.00	38.	9.00	0. L	2.50
L004B	107.	9.00	155.	8.00	78.	7.00	96.	6.00	41.	12.00	0. L	2.50
L010	>100.	0.00	>100.	0.00	60. L	3.00	80. L	3.50	30.	4.50	5.W	0.00
L011	>120.	0.00	150.	6.50	>80.	0.00	>100.	0.00	>30.	0.00	>0.	0.00
L011B	<140.	0.00	150.	6.50	<100.	0.00	<120.	0.00	<40.	0.00	<5.	0.00
L022	75. L	1.00	103. VL	1.00	54. VL	1.00	69. VL	1.00	29.	1.50	-1.T VL	1.00
L023	>50.	0.00	>50.	0.00	>50.	0.00	>50.	0.00	35.	7.50	5.W	0.00
L024	144. VH	12.00	198. H	13.00	109. VH	13.00	131. VH	13.00	51. VH	15.00	3.	4.00
L025	121. H	11.00	175.	11.00	87.3	11.00	119.	12.00	44.4 H	13.00	.1W	0.00
L030	151. VH	13.00	213. VH	15.00	113. VH	14.00	132. VH	14.00	49. VH	14.00	.1W	0.00
L031A	78. L	2.00	120. L	3.00	56. L	2.00	72. L	2.00	29.	1.50	1.W	0.00
L045	100.	6.00	125. L	5.00	75.	6.00	100.	8.00	35.	7.50	5.T	6.00
L046	100.	6.00	200. VH	14.00	80.	9.00	100.	8.00	40.	10.50	5.W	0.00
L057	100.	6.00	160.	9.00	80.	9.00	110.	10.00	40.	10.50	5.T	6.00
L058	90.	3.00	120. L	3.00	70.	4.50	90.	5.00	30.	4.50	2.5W	0.00
MEDIAN CONC.	100.000		155.000		79.000		100.000		35.000		3.000	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	5.	6.00	5. H	9.00	5.	9.50	5.	8.50	5. H	8.00
L003	L5.	0.00	L5.	0.00	L5.	0.00	L5.	0.00	L5.	0.00
L004A	7. L	2.50	10. VH	11.00	20. VH	12.00	10. VH	11.00	0.	2.50
L004B	0. L	2.50	0. L	1.00	4.	6.00	0. VL	1.00	0.	2.50
L010	5.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00
L011	>0.	0.00	>0.	0.00	>0.	0.00	>0.	0.00	>0.	0.00
L011B	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00
L022	-1.T VL	1.00	1.	2.50	1. L	1.00	1. L	2.50	-1.T L	1.00
L023	5.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00	5.W	0.00
L024	3.	4.00	3.	7.00	4.	6.00	4.	5.50	1.	4.00
L025	.1W	0.00	1.78	4.00	1.48 L	2.00	1.78 L	4.00	.1W	0.00
L030	.1W	0.00	2.	5.00	4.	6.00	4.	5.50	2.	5.00
L031A	1.W	0.00	1.	2.50	2.	3.00	1. L	2.50	1.W	0.00
L045	5.T	6.00	5.T H	9.00	5.T	9.50	5.T	8.50	5.T H	8.00
L046	5.W	0.00	5.W	0.00	5.	9.50	5.W	0.00	5.W	0.00
L057	5.T	6.00	5. H	9.00	5.	9.50	5.	8.50	5.T H	8.00
L058	2.5W	0.00	2.5	6.00	2.5	4.00	5.	8.50	2.5	6.00
MEDIAN CONC.	3.000		2.500		4.000		4.000		2.000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L002	68.50	6.227	11	LLHH	
L003	39.50	7.900	5		INSUFFICIENT DATA
L004A	93.50	8.500	11	HHLLVHVHVH	
L004B	57.50	5.227	11	LLLVL	
L010	11.00	3.667	3	LL	
L011	6.50	6.500	1		
L011B	6.50	6.500	1		
L022	14.50	1.318	11	LVLVLVLVLVLLLL	BIASED LOW
L023	7.50	7.500	1		
L024	96.50	8.773	11	VHHVHVHVH	
L025	68.00	8.500	8	HHLL	
L030	91.50	10.167	9	VHVHVHVHVH	BIASED HIGH
L031A	18.50	2.313	8	LLLLL	BIASED LOW
L045	79.50	7.227	11	LHH	
L046	57.00	9.500	6	VH	INSUFFICIENT DATA
L057	91.50	8.318	11	HH	
L058	44.50	4.944	9	L	

OVERALL AVERAGE
RANK IS 6.656

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L022	14.50	1.318	11	LVLVLVLVLVLLLL	BIASED LOW
L031A	18.50	2.313	8	LLLLL	BIASED LOW
L010	11.00	3.667	3	LL	
L058	44.50	4.944	9	L	
L004B	57.50	5.227	11	LLLVL	
L002	68.50	6.227	11	LLHH	
L011B	6.50	6.500	1		
L011	6.50	6.500	1		
L045	79.50	7.227	11	LHH	
L023	7.50	7.500	1		
L003	39.50	7.900	5		INSUFFICIENT DATA
L057	91.50	8.318	11	HH	
L004A	93.50	8.500	11	HHLLVHVHVH	
L025	68.00	8.500	8	HHLL	
L024	96.50	8.773	11	VHHVHVHVH	
L046	57.00	9.500	6	VH	INSUFFICIENT DATA
L030	91.50	10.167	9	VHVHVHVHVH	BIASED HIGH

OVERALL AVERAGE
RANK IS 6.656

COLOUR

PARAMETER: 14092 REACTIVE SILICA MG SI/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .1000 BASIC ACCEPTABLE ERROR= .3500 CONCENTRATION ERROR INCREMENT= .0800
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.897	7.00	1.24	6.00	.81	7.50	1.45	4.50	2.83	4.50	.014	3.00
L003	.93	10.00	1.3	9.50	.84	11.00	1.5	8.50	3.0	8.50	.05W	0.00
L006	.8507	4.00	1.175	2.00	.7567	4.00	1.3959	2.00	2.787	2.00	.0024	2.00
L011	1.1 VH	15.00	1.5 H	15.00	1.0 VH	15.00	1.8 VH	15.00	3.6 VH	15.00	.5W	0.00
L020	.9	8.00	1.3	9.50	.8	6.00	1.5	8.50	3.0	8.50	.05W	0.00
L022	.7 VL	1.00	.9 VL	1.00	.6 VL	2.00	1.1 VL	1.00	2.2 VL	1.00	0.W	0.00
L023	1.0	13.00	1.4	13.50	.9	13.00	1.6	12.00	3.1	12.00	.1W	0.00
L024	.92	9.00	1.27	7.00	.82	9.00	1.49	7.00	2.83	4.50	.02W	0.00
L025	.84	2.50	1.23	5.00	.81	7.50	1.46	6.00	3.03	10.00	.02W	0.00
L029	.953	12.00	1.30	9.50	.841	12.00	1.53	10.00	3.04	11.00	.041	4.00
L031A	1.03 H	14.00	1.40	13.50	.93 H	14.00	1.68 H	13.00	3.36 H	14.00	.01W	0.00
L032	.949	11.00	1.359	12.00	.823	10.00	1.557	11.00	3.188	13.00	-.063T L	1.00
L033	.84	2.50	1.21	3.50	.75	3.00	1.45	4.50	2.94	7.00	.23W	0.00
L045	.88	5.50	1.21	3.50	.79	5.00	1.43	3.00	2.80	3.00	0.0W	0.00
L046	.88	5.50	1.3	9.50	.39 VL	1.00	1.7 H	14.00	2.9	6.00	.02W	0.00
MEDIAN CONC.	.900		1.300		.810		1.500		3.000		.008	

SAMPLE	7		8		9		13		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.056	9.00	.140	10.00	.0513	10.00	1.08	6.00	.009	2.00
L003	.05W	0.00	.1	2.00	.05W	0.00	1.1	7.50	.05W	0.00
L006	.038	4.00	.114	5.00	.030	3.00	1.011	2.00		0.00
L010	.5W	0.00	.5W	0.00	.5W	0.00	1.3 VH	14.50	.5W	0.00
L020	.05W	0.00	.14T	10.00	.05T	8.00	1.2	11.50	.05T	4.00
L022	.02T	2.50	.11	2.00	.05T	8.00	.9 VL	1.00	.01T	3.00
L023	.1W	0.00	.1	2.00	.1W	0.00	1.2	11.50	.1W	0.00
L024	.04T	5.50	.14	10.00	.04T	5.00	1.10	7.50	.02W	0.00
L025	.02W	0.00	.12	6.00	.02W	0.00	1.04	3.00	.02W	0.00
L029	.047	7.00	.135	8.00	.040	5.00	1.13	10.00	.002W	0.00
L031A	.05	8.00	.15	12.00	.05	8.00	1.22	13.00	.01W	0.00
L032	-.012 L	1.00	.71 VH	13.00	-.012T L	1.00	1.128	9.00	-.062 L	1.00
L033	.23W	0.00	.23W	0.00	.23W	0.00	1.07	5.00	.23W	0.00
L045	.02T	2.50	.11	4.00	.02T	2.00	1.09	4.00	0.0W	0.00
L046	.04	5.50	.13	7.00	.04	5.00	1.3 VH	14.50	.02W	0.00
MEDIAN CONC.	.040		.130		.040		1.100		.010	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	69.50	6.318	11			TECHNICON
L003	57.00	8.143	7			TECHNICON
L006	30.00	3.000	10		BIASED LOW	TECHNICON
L010	89.50	14.917	6	VHHVHVHVHVH	INSUFFICIENT DATA	
L020	74.00	8.222	9			
L022	22.50	2.250	10	VLVLVLVLVLVL	BIASED LOW	
L023	77.00	11.000	7		BIASED HIGH	
L024	64.50	7.167	9			TECHNICON
L025	40.00	5.714	7			TECHNICON
L029	88.50	8.850	10			TECHNICON
L031A	109.50	12.167	9	HHHH	BIASED HIGH	
L032	83.00	7.545	11	LLVHLL		
L033	25.50	4.250	6		INSUFFICIENT DATA	
L045	32.50	3.611	9		BIASED LOW	
L046	68.00	7.556	9	VLHVH		

OVERALL AVERAGE RANK IS 7.162

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L022	22.50	2.250	10	VLVLVLVLVLVL	BIASED LOW	
L006	30.00	3.000	10		BIASED LOW	TECHNICON
L045	32.50	3.611	9		BIASED LOW	
L033	25.50	4.250	6		INSUFFICIENT DATA	
L025	40.00	5.714	7			TECHNICON
L002	69.50	6.318	11			TECHNICON
L024	64.50	7.167	9			TECHNICON
L032	83.00	7.545	11	LLVHLL		
L046	68.00	7.556	9	VLHVH		TECHNICON
L003	57.00	8.143	7			
L020	74.00	8.222	9			TECHNICON
L029	88.50	8.850	10			
L023	77.00	11.000	7		BIASED HIGH	
L031A	109.50	12.167	9	HHHH	BIASED HIGH	
L010	89.50	14.917	6	VHHVHVHVHVH	INSUFFICIENT DATA	

OVERALL AVERAGE RANK IS 7.162

PARAMETER: 07092 NITRATE + NITRITE MG N/L

MAJOR IONS LRTAP NO.4

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .5000 BASIC ACCEPTABLE ERROR= .3250 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L002	.018	4.00	L.005	0.00	L.005	0.00	L.005	0.00	.089	9.50	.104	16.50
L002B	.01	11.00	L.01	0.00	L.01	0.00	.01	11.00	.08	5.50	.08	3.00
L003	.02	22.50	.005W	0.00	.005W	0.00	.02	13.00	.09	12.50	.1	11.50
L004A	.02	22.50		0.00	.01	12.50		0.00	.08	5.50	.09	5.00
L004B	.01	11.00	.01	12.50		0.00		0.00	.09	12.50	.10	11.50
L006	.002	2.00	0.0	2.00	0.0	2.00	0.0	2.00	.036 VL	1.00	.067 L	2.00
L010	.011	16.00	.01W	0.00	.01W	0.00	.01W	0.00	.097	18.00	.111	23.00
L011	.006	3.00	.002T	3.00	.001W	0.00	.0010W	0.00	.074	3.00	.086	4.00
L013A	.009	5.50		0.00	.003	6.00		0.00	.100	20.00	.104	16.50
L020	.01W	0.00	.01T	12.50	.01W	0.00	.01W	0.00	.09	12.50	.12	25.00
L021B	.012	17.00	.002W	0.00	.002W	0.00	.002W	0.00	.106	23.00	.115	24.00
L022	.01	11.00	.004T	6.50	.003T	6.00	.003T	4.50	.10	20.00	.10	11.50
L023	.01	11.00	.01W	0.00	.01W	0.00	.01W	0.00	.07	2.00	.10	11.50
L024	.015	19.00	.007T	10.00	.006T	11.00	.006T	8.00	.102	22.00	.105	18.50
L025	.015	19.00	.005T	9.50	.005T	9.50	.005T	6.50	.095	16.00	.095	6.50
L029	.016	21.00	.005	8.50	.002	3.00	.008	9.00	.089	9.50	.096	8.00
L030	.010	11.00	.003T	4.50	.003T	6.00	.002T	3.00	.100	20.00	.103	13.00
L031A		0.00		0.00		0.00		0.00		0.00		0.00
L031B	.010	11.00	.005W	0.00	.005	9.50	.005W	0.00	.095	16.00	.110	21.00
L032	-.007T	1.00	-.007T	1.00	-.007T	1.00	-.007T	1.00	.088	8.00	.105	18.50
L033	.05W	0.00	.05W	0.00	.05W	0.00	.05W	0.00	.05W	0.00	.05W VL	1.00
L044	.25 VH	26.00	<.01	0.00	<.01	0.00	<.01	0.00	.59 VH	27.00	.61 VH	28.00
L045	.010	11.00	.003T	4.50	.003T	6.00	.003T	4.50	.085	7.00	.095	6.50
L046	.015	19.00	.004	6.50	.003	6.00	.005	6.50	.078	4.00	.10	11.50
L053	.01	11.00	.01	12.50	.01T	12.50	.01T	11.00	.09	12.50	.11	21.00
L057	.01T	11.00	.01T	12.50	.08 VH	16.00	.01	11.00	.40 VH	26.00	.44 VH	27.00
L058	.009T	5.50	.005W	0.00	.005W	0.00	.005W	0.00	.095	16.00	.100	11.50
L060	.09 VH	25.00	.05 VH	16.00	.03 H	14.50	.01W	0.00	.14 VH	25.00	.14 VH	26.00
L061	.04 H	24.00	.03	15.00	.03 H	14.50	.03	14.00	.12 H	24.00	.11	21.00
MEDIAN CONC.	.010		.005		.004		.006		.090		.102	

PARAMETER 07092 NITRATE + NITRITE MG N/L

SAMPLE LAB NO	7 REPORTED VALUE	7 RANK	8 REPORTED VALUE	8 RANK	9 REPORTED VALUE	9 RANK	10 REPORTED VALUE	10 RANK	11 REPORTED VALUE	11 RANK
L002	.007	8.00	.463 VL	3.00	.523	5.00	.315	21.00	.034	15.00
L002a	L.01	0.00	.48 L	7.00	.53	7.50	.29	7.00	.01	2.00
L003	.01	16.50	.48 L	7.00	.53	7.50	.29	7.00	.04	19.00
L004A	.01	16.50	.47 VL	4.00	.51 L	2.00	.28 L	4.00	.03	8.00
L004B	.01	16.50	.50	11.50	.55	12.00	.30	12.50	.04	19.00
L006	0.0	2.00	.523	18.00	.569	20.00	.311	18.50	0.0 L	1.00
L010	.011	20.00	.626 VH	26.00	.692 VH	27.00	.366 VH	25.00	.044	21.00
L011	.002T	3.00	.517	16.00	.560	16.50	.298	10.00	.025	3.50
L013A	.012	21.00	.508	13.00	.555	13.00	.290	7.00	.031	12.50
L020	.03	24.50	.52	17.00	.56	16.50	.31	16.00	.04	19.00
L021B	.009	12.50	.514	15.00	.542	10.00	.310	16.00	.035	16.00
L022	.008	10.50	.90 VH	27.00	.56	16.50	.30	12.50	.03	8.00
L023	.01W	0.00	.45 VL	1.00	.57	21.50	.37 VH	26.00	.03	8.00
L024	.008T	10.50	.530	20.00	.574	23.00	.311	18.50	.033	14.00
L025	.005T	4.50	.510	14.00	.560	16.50	.300	12.50	.030	8.00
L029	.006	6.00	.479 L	5.00	.517 L	3.00	.278 L	3.00	.045	22.00
L030	.005	4.50	.486 L	10.00	.530	7.50	.295	9.00	.030	8.00
L031A		0.00	.57 VH	25.00	.59	25.00		0.00		0.00
L031B	.010	16.50	.53	20.00	.56	16.50	.320	22.50	.025	3.50
L032	-.007T	1.00	.533	22.00	.544	11.00	.313	20.00	.007W	0.00
L033	.05W	0.00	.50	11.50	.57	21.50	.30	12.50	.05W	0.00
L044	.02	22.50	2.42 VH	29.00	2.55 VH	29.00	1.48 VH	28.00	.38 VH	25.00
L045	.007T	8.00	.485 L	9.00	.530	7.50	.282	5.00	.03	8.00
L046	.009	12.50	.46 VL	2.00	.50 VL	1.00	.21 VL	1.00	.038	17.00
L053	.01	16.50	.48 L	7.00	.52 L	4.00	.27 L	2.00	.03	8.00
L057	.01T	16.50	2.19 VH	28.00	2.14 VH	28.00	1.24 VH	27.00	.16 VH	24.00
L058	.007T	8.00	.55 H	23.00	.58	24.00	.32	22.50	.031	12.50
L060	.03	24.50	.56 VH	24.00	.63 H	26.00	.33	24.00	.07 VH	23.00
L061	.02	22.50	.53	20.00	.56	16.50	.31	16.00	.97 VH	26.00
MEDIAN CONC.	.009		.514		.560		.305		.032	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L002	82.00	10.250	8	VL		TECHNICON
L002B	54.00	6.750	8	L		IC
L003	116.50	12.944	9	L		TECHNICON
L004A	80.00	8.889	9	VLLL		TECHNICON
L004B	119.00	13.222	9			TECHNICON
L006	70.50	6.409	11	VLLL	BIASED LOW	TECHNICON
L010	176.00	22.000	8	VHVHVH	BIASED HIGH	
L011	62.00	6.889	9		BIASED LOW	TECHNICON
L013A	114.50	12.722	9			IC
L020	143.00	17.875	8			
L021B	133.50	16.688	8			IC
L022	134.00	12.182	11	VH		TECHNICON
L023	81.00	11.571	7	VLVH		TECHNICON
L024	174.50	15.864	11			TECHNICON
L025	121.50	11.045	11			TECHNICON
L029	98.00	8.909	11	LLL		TECHNICON
L030	98.50	8.955	11	L		
L031A	50.00	25.000	2	VH		
L031B	136.50	15.167	9			TECHNICON
L032	84.50	8.450	10			IC
L033	46.50	11.625	4	VL	INSUFFICIENT DATA	
L044	214.50	26.813	8	VHVHVHVHVHVHVH	BIASED HIGH	
L045	77.00	7.000	11	L	BIASED LOW	
L046	87.00	7.909	11	VLVLVL		
L053	118.00	10.727	11	LLL		
L057	227.00	20.636	11	VHVHVHVHVHVHVH	BIASED HIGH	
L058	123.00	15.375	8	H		TECHNICON
L060	228.00	22.800	10	VHVHHVHVHVHHVH	BIASED HIGH	IC
L061	213.50	19.409	11	HHHVH		

OVERALL AVERAGE RANK IS 13.121

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L006	70.50	6.409	11	VLLL	BIASED LOW	TECHNICON
L002B	53.00	6.750	8	L		IC
L011	62.00	6.889	9		BIASED LOW	TECHNICON
L045	77.00	7.000	11	L	BIASED LOW	
L046	87.00	7.909	11	VLVLVL		
L032	84.50	8.450	10			IC
L004A	80.00	8.889	9	VLLL		TECHNICON
L029	98.00	8.909	11	LLL		TECHNICON
L030	98.50	8.955	11	L		
L002	82.00	10.250	8	VL		TECHNICON
L053	118.00	10.727	11	LLL		
L025	121.50	11.045	11			TECHNICON
L023	81.00	11.571	7	VLVH		TECHNICON
L033	46.50	11.625	4	VL	INSUFFICIENT DATA	
L022	134.00	12.182	11	VH		TECHNICON
L013A	114.50	12.722	9			IC
L003	116.50	12.944	9	L		TECHNICON
L004B	119.00	13.222	9			TECHNICON
L031B	136.50	15.167	9			TECHNICON
L058	123.00	15.375	8	H		TECHNICON
L024	174.50	15.864	11			TECHNICON
L021B	133.50	16.688	8			IC
L020	143.00	17.875	8			
L061	213.50	19.409	11	HHHVH		
L057	227.00	20.636	11	VHVHVHVHVHVHVH	BIASED HIGH	
L010	176.00	22.000	8	VHVHVH	BIASED HIGH	
L060	228.00	22.800	10	VHVHHVHVHVHHVH	BIASED HIGH	IC
L031A	50.00	25.000	2	VH		
L044	214.50	26.813	8	VHVHVHVHVHVHVH	BIASED HIGH	

OVERALL AVERAGE RANK IS 13.121

PARAMETER: 56091 BARIUM MG/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .0100 BASIC ACCEPTABLE ERROR= .0050 CONCENTRATION ERROR INCREMENT= .1000
LABORATORIES YET TO REPORT: L007,L040,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L010	.023	2.00	.021	3.50	.018	1.50	.019	1.50	.007	3.00	.001W	2.50
L011	.02 L	1.00	.02	1.50	.02	3.50	.02	3.00	.001W L	1.00	.001W	2.50
L022	.032	5.00	.025	6.00	.022	5.00	.024	5.00	.013	5.00	.008 M	5.00
L029	.08 VH	7.00	.07 VH	7.00	.06 VH	7.00	.06 VH	6.00	.02T VH	6.00	.02T VH	6.00
L031A	.04 VH	6.00	.02	1.50	.02	3.50	.02W	0.00	.02W	0.00	.02W	0.00
L031B	.1W	0.00	.1W	0.00	.1W	0.00	.1W	0.00	.1W	0.00	.1W	0.00
L045	.024	3.00	.021	3.50	.018	1.50	.019	1.50	.006	2.00	0.000W	2.50
L060	.028	4.00	.024	5.00	.023	6.00	.021	4.00	.009	4.00	.005W	2.50
MEDIAN CONC.	.028		.021		.020		.021		.008		.003	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L010	.001W	2.00	.003	2.50	.001	2.50	.009	2.50	.001W	1.50
L011	.001W	2.00	.001W	1.00	.001W	1.00	.01	4.00	.001W	1.50
L022	.003	4.00	.006	4.00	.014	4.00	.014	5.00	.007 M	4.00
L029	.02T VH	5.00	.03T VH	5.00	.02T VH	5.00	.11 VH	6.00	.27 VH	5.00
L031A	.02W	0.00	.02W	0.00	.02W	0.00	.02W	0.00	.02W	0.00
L031B	.1W	0.00	.1W	0.00	.1W	0.00	.1W	0.00	.1W	0.00
L045	0.000W	2.00	.003T	2.50	.001T	2.50	.009	2.50	.001T	3.00
L060	.005W	0.00	.005W	0.00	.005W	0.00	.008	1.00	.005W	0.00
MEDIAN CONC.	.001		.003		.001		.010		.001	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L010	25.00	2.273	11		BIASED LOW	
L011	22.00	2.000	11	LL	INSUFFICIENT DATA	
L022	52.00	4.727	11	HH		
L029	65.00	5.909	11	VHVHVHVHVHVHVHVHVHVHVH	BIASED HIGH	
L031A	11.00	3.667	3	VH		ICP
L031B	0.00	0.000	0			
L045	26.50	2.409	11		BIASED LOW	
L060	26.50	3.786	7		INSUFFICIENT DATA	

OVERALL AVERAGE RANK IS 3.508

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
L031B	0.00	0.000	0			
L011	22.00	2.000	11	LL	INSUFFICIENT DATA	
L010	25.00	2.273	11		BIASED LOW	
L045	26.50	2.409	11		BIASED LOW	
L031A	11.00	3.667	3	VH		ICP
L060	26.50	3.786	7		INSUFFICIENT DATA	
L022	52.00	4.727	11	HH		
L029	65.00	5.909	11	VHVHVHVHVHVHVHVHVHVHVH	BIASED HIGH	

OVERALL AVERAGE RANK IS 3.508

PARAMETER: 06002 DISOLVED ORG CARBON MG C/L

QUALITY ASSURANCE AND METHODS SECTION
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MAJOR IONS LRTAP NO.4

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 3.0000 BASIC ACCEPTABLE ERROR= 1.5000 CONCENTRATION ERROR INCREMENT= .2000
LABORATORIES YET TO REPORT: L007,L043,L041,L051,L054,L056
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	1		2		3		4		5		6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003	10.	1.50	13.	1.50	7.6	2.00	9.4	1.00	4.6	2.00	2.1	3.00
L004A	16.2 H	13.00	17.9	12.00	11.3	13.00	12.2	10.00	7.4	12.00	2.6	7.00
L004B	10.2	3.00	13.2	3.00	12.2 H	14.00	14.0	12.50	6.8	10.00	5.4 VH	14.00
L011	16.5 VH	14.00	22.5 VH	14.00	7.25	1.00	16.1 VH	14.00	7.58	14.00	3.25	10.00
L022	16. H	12.00	20. H	13.00	11.	11.00	14.	12.50	7.	11.00	3.	8.00
L023	14.0	11.00	16.0	9.50	10.0	10.00	11.5	9.00	6.5	8.00	3.5	11.00
L025	10.9	5.00	13.6	5.00	8.2	6.00	10.1	4.00	5.0	4.00	2.4	5.00
L029	13.25	10.00	17.72	11.00	11.28	12.00	13.07	11.00	7.52	13.00	3.58	12.00
L031A	10.3	4.00	13.4	4.00	7.9	4.00	9.9	2.50	5.0	4.00	2.2	4.00
L032	11.01	7.00	14.03	7.00	8.63	7.00	11.10	7.00	5.20	6.00	2.40	5.00
L033	10.0	1.50	13.0	1.50	7.7	3.00	9.9	2.50	4.5	1.00	1.8	2.00
L045	11.0	6.00	14.0	6.00	9.0	8.00	10.7	5.00	6.2	7.00	3.2	9.00
L053	12.4	9.00	15.4	8.00	9.3	9.00	11.3	8.00	6.6	9.00	4.8 H	13.00
L058	12.	8.00	16.	9.50	8.	5.00	11.	6.00	5.	4.00	1. L	1.00
MEDIAN CONC.	11.505		14.715		8.815		11.200		6.350		2.800	

SAMPLE	7		8		9		10		11	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
L003	.3	3.00	.6	4.00	.7	5.50	1.4	5.00	.1W	1.50
L004A		0.00		0.00		0.00	10.5 VH	12.00		0.00
L004B	2.2	10.00	2.8	11.00	2.5 H	10.00	13.3 VH	13.00	2.6 H	9.00
L011	.62	5.00	1.92	8.00	2.00	8.00	5.50 VH	10.00	1.00	7.00
L022	2.	9.00	2.	9.00	.5T	3.00	3.	8.00	.5T	4.00
L023	1.5	8.00	3.0 H	12.00	4.0 VH	11.00	7.0 VH	11.00	4.0 VH	10.00
L025	.21	2.00	.5	3.00	.4	2.00	1.3	3.50	.1T	3.00
L029	1.25	7.00	2.65	10.00	2.33 H	9.00	4.06 H	9.00	1.4	8.00
L031A	.2W	0.00	.4	2.00	.6	4.00	1.2	2.00	.2W	0.00
L032	-.044T	1.00	.645	5.00	.800	7.00	1.54	6.00	0.000W	1.50
L033	.4W	0.00	.4W	1.00	.4W	1.00	.6 L	1.00	.4W	0.00
L045	1.2	6.00	1.6	7.00		0.00	2.3	7.00	.8	6.00
L053	.4	4.00	1.3	6.00	.7	5.50	1.3	3.50	.6	5.00
L058	1.W	0.00	1.W	0.00	1.W	0.00	1.W	0.00	1.W	0.00
MEDIAN CONC.	.910		1.450		.700		2.300		.700	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L003	30.00	2.727	11		BIASED LOW
L004A	79.00	11.286	7	HVH	
L004B	109.50	9.955	11	HVHHVHH	
L011	105.00	9.545	11	VHVHVHVH	
L022	100.50	9.136	11	HH	
L023	110.50	10.045	11	HVHVHVH	
L025	43.00	3.909	11		BIASED LOW
L029	112.00	10.182	11	HH	
L031A	30.50	3.389	9		BIASED LOW
L032	60.00	5.455	11		
L033	14.50	1.611	9	L	BIASED LOW
L045	67.00	6.700	10		
L053	80.00	7.273	11	H	
L058	33.50	5.583	6	L	INSUFFICIENT DATA

OVERALL AVERAGE RANK IS 6.964

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
L033	14.50	1.611	9	L	BIASED LOW
L003	30.00	2.727	11		BIASED LOW
L031A	30.50	3.389	9		BIASED LOW
L025	43.00	3.909	11		BIASED LOW
L032	60.00	5.455	11		
L058	33.50	5.583	6	L	INSUFFICIENT DATA
L045	67.00	6.700	10		
L053	80.00	7.273	11	H	
L022	100.50	9.136	11	HH	
L011	105.00	9.545	11	VHVHVHVH	
L004B	109.50	9.955	11	HVHHVHH	
L023	110.50	10.045	11	HVHVHVH	
L029	112.00	10.162	11	HH	
L004A	79.00	11.286	7	HVH	

OVERALL AVERAGE RANK IS 6.964

APPENDIX II

TABULATION OF LABORATORY APPRAISALS

Attachment 1
November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L0 02

Calcium - Satisfactory

Magnesium - Satisfactory

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - (L002) non IC method, Satisfactory

Sulfate - L002A Technicon: Bias high, Two results flagged high
L002B I.C. satisfactory

Acidity - No results reported

Alkalinity (Total) - Satisfactory on the three samples ranked

Gran Total Alkalinity - No results reported

pH - Three results were flagged; two results were high and one result was very high

Specific Conductivity - Satisfactory

Colour - Samples #2,4 are flagged low and #8 and 11 are flagged high

Reactive Silica - Satisfactory

Nitrate/Nitrite - Satisfactory, except for a low result on sample #8
L002B - Satisfactory except for a low result on sample #8

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L003

Calcium - Two samples flagged high

Magnesium - Satisfactory, except for a high flag on one sample

Sodium - Satisfactory

Potassium - Six samples flagged. One high, four very high, one very low.

Chloride - L003 (Non IC method), satisfactory except for 1 result flagged H

Sulfate - L003A - I.C. satisfactory
L003B - bias low (non IC method)

Acidity - No results reported

Alkalinity (Total) - (L003B) - Satisfactory, on the three samples ranked

Gran Total Alkalinity - (L003A) - 1 result flagged high, otherwise results are satisfactory

pH - One result flagged very low and one flagged very high

Specific Conductivity - Satisfactory

Colour - Insufficient data

Reactive Silica - Satisfactory

Nitrate/Nitrite - Satisfactory, except for one result flagged low

Barium - No results reported

Dissolved Organic Carbon - Results are slightly bias low, even though no results were flagged

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L004A

Calcium - Satisfactory

Magnesium - Five samples flagged, one high, four very high

Sodium - Results are bias low, however no samples are flagged

Potassium - Results are bias low, 5 samples are flagged low

Chloride - (non IC method)

Sulfate - Satisfactory, except one sample is flagged high (non IC method)

Acidity - No results reported

Alkalinity (Total) - Satisfactory on the three samples ranked

Gran Total Alkalinity - No results reported

pH - One sample flagged high and one flagged low

Specific Conductivity - Results are ranked bias low; four results are flagged very low and two are just low

Colour - Seven samples are flagged; three are very high; two are high and two are very low

Reactive Silica - No results reported

Nitrate/Nitrite - Three results are flagged; two are low and one is very low

Barium - No results reported

Dissolved Organic Carbon - Two results are flagged; one is high and one is very high

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L0 04B -

Calcium - Satisfactory

Magnesium - One sample flagged low, three flagged very low; results are bias low

Sodium - Satisfactory

Potassium - Two results flagged low

Chloride - Three samples are flagged high (non IC method data set)

Sulfate - Satisfactory, except one sample is flagged low (non IC method)

Acidity - No results reported

Alkalinity (Total) - Two results are flagged, out of the eight ranked; one is high and one is very high

Gran Total Alkalinity - No results reported

pH - Eight samples are flagged very high, 1 result flagged high, overall ranking indicates results bias high

Specific Conductivity - Ten samples are flagged; ranking indicates results are bias low. ie: nine are very low and one low

Colour - Four samples are flagged; three are low and one is very low

Reactive Silica - No results reported

Nitrate/Nitrite - Satisfactory

Barium - No results reported

Dissolved Organic Carbon - Five results are flagged; three are high and two are very high

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L006

Calcium - One result flagged low and one flagged very low

Magnesium - two results flagged very high

Sodium - Six results are flagged very high; overall ranking indicates results are bias high

Potassium - Ten samples are flagged; four are high, six are very high Results are bias high

Chloride - Satisfactory (non IC method)

Sulfate - Satisfactory (non IC method)

Acidity - No results reported

Alkalinity (Total) - No results are flagged, however ranking indicates results are bias low

Gran Total Alkalinity - No results reported

pH - Satisfactory

Specific Conductivity - Results are ranked slightly bias high, even though no samples are flagged

Colour - No results reported

Reactive Silica - Results are bias low; no samples are flagged

Nitrate/Nitrite - Results are bias low; three samples are flagged, two are low and one is very low

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 9, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L007

Calcium	No results reported
Magnesium	
Sodium	
Potassium	
Chloride	
Sulfate	
Acidity	
Alkalinity (Total)	
Gran Total Alkalinity	
pH	
Specific Conductivity	
Colour	
Reactive Silica	
Nitrate/Nitrite	
Barium	
Dissolved Organic Carbon	

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L009

Calcium - Satisfactory

Magnesium - One result is flagged high

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - No results reported

Sulfate - No results reported

Acidity - No results reported

Alkalinity (Total) - No results reported

Gran Total Alkalinity - No results reported

pH - Satisfactory

Specific Conductivity - Results are slightly bias high; no samples are flagged

Colour - No results are reported

Reactive Silica - No results reported

Nitrate/Nitrite - No results reported

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L010

Calcium - Satisfactory

Magnesium - Satisfactory, except for one low result

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - Five results are flagged; one is very low, two are high and two are very high; results are erractic (non IC method)

Sulfate - Bias high, ten samples are flagged; five are high and five are very high (non IC method)

Acidity - Satisfactory, except for a high result on sample #10

Alkalinity (Total) - No results reported

Gran Total Alkalinity - No results reported

pH - satisfactory except for one low result

Specific Conductivity - Satisfactory

Colour - Two samples are flagged low (#3 and #4)

Reactive Silica - All six results ranked are flagged; five are very high and one is high

Nitrate/Nitrite - Three results are flagged very high, ranking indicates results are bias high

Barium - Results appear satisfactory, although data is bias low. This is because the range is low and the number of data sets is insufficient.

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L011
Total # of samples is 11

Calcium - One result is flagged very low

Magnesium - Satisfactory

Sodium - Ranking indicates results are bias low; four samples are flagged very low and four are just low

Potassium - One result is low, one is high and three are very high

Chloride - Ranking indicates results are bias low; one sample is flagged low (non IC method)

Sulfate - Satisfactory (non IC method)

Acidity - Ranking indicates results are bias high; two are flagged high and one very high

Alkalinity (Total) - Three results are flagged low out of the six that are ranked

Gran Total Alkalinity - No results reported

pH - Two flagged results; one is flagged high and one is flagged very high

Specific Conductivity - Satisfactory, except for a low result on sample #9

Colour - Satisfactory by both methods

Reactive Silica - No results reported

Nitrate/Nitrite - Ranking indicates results are bias low, however no results are flagged

Barium - Appears satisfactory, although bias low; This is because the concentration range is low and the number of data sets is insufficient

Dissolved Organic Carbon - Four results are flagged very high

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L013A

Calcium - No results reported

Magnesium - No results reported

Sodium - Satisfactory

Potassium - One sample was flagged low and one very low

Chloride - Satisfactory (IC method)

Sulfate - Satisfactory (IC method)

Acidity - No results reported

Alkalinity (Total) No results reported

Gran Total Alkalinity - No results reported

pH - No results reported

Specific Conductivity - Two results flagged very high; ie: samples #7, 8

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - Satisfactory

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L013B

Calcium - Satisfactory

Magnesium - Two results are flagged high

Sodium - Satisfactory, except for one result (#11) flagged high

Potassium - Satisfactory

Chloride - No results reported

Sulfate - No results reported

Acidity - No results reported

Alkalinity (Total) - No results reported

Gran Total Alkalinity - No results reported

pH - Satisfactory

Specific Conductivity - Satisfactory, except sample #1 is flagged very high

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - No results reported

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L014

Calcium - One result is flagged low and one flagged very high

Magnesium - Satisfactory

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - One sample flagged low and one sample flagged very low, non IC method

Sulfate - Satisfactory (non IC method)

Acidity - Nine samples are flagged; two are very low and seven are low. Ranking indicates samples are bias low

Alkalinity (Total) - Satisfactory for the four results ranked

Gran Total Alkalinity - No results reported

pH - Satisfactory, except for a high flag on sample #11

Specific Conductivity - One sample flagged very low; two flagged high and one flagged low

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - No results reported

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L016

Calcium - Satisfactory

Magnesium - Satisfactory, except for a high flag on one sample

Sodium - Results are slightly bias low; no samples were flagged

Potassium - Results are bias low, one result is flagged low

Chloride - Two samples are flagged very low (non IC method)

Sulfate - Ranking indicates results are bias low; two samples are flagged low and two are very low (non IC method)

Acidity - Satisfactory except one sample is flagged high; ie. #10

Alkalinity (Total) - Ranking indicates results are bias low; three results are flagged, two are low and one is very low

Gran Total Alkalinity - No results reported

pH - Satisfactory, except for one sample flagged low; ie. #4

Specific Conductivity - No results reported

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - No results reported

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is LO20

Calcium - One result is flagged very high

Magnesium - One result is flagged high and one very high

Sodium - Satisfactory

Potassium - Two results are flagged low, one high and two very high. Flags may not have occurred if data had been reported to more significant figures

Chloride - Two results are flagged very high (non IC method)

Sulfate - Satisfactory (non IC method)

Acidity - Satisfactory, except one sample was flagged high

Alkalinity (Total) - No results reported.

Gran Total Alkalinity - Two results of the five ranked are flagged. One is flagged very low and one very high

pH - Satisfactory, except for one sample flagged high

Specific Conductivity - No results reported

Colour - No results reported

Reactive Silica - Satisfactory

Nitrate/Nitrite - Satisfactory

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L021B

Calcium - Two results are flagged low and three very low

Magnesium - One result flagged low and one very low

Sodium - Ranking indicates results are bias high; three samples were flagged very high and four high

Potassium - Satisfactory

Chloride - Satisfactory (IC method)

Sulfate - Satisfactory (IC method)

Acidity - No results reported

Alkalinity (Total) - No results reported

Gran Total Alkalinity - No results reported

pH - Satisfactory

Specific Conductivity - Ranking indicates results are bias low, ten samples are flagged; nine are very low and one is low

Colour - No results reported

Reactive Silica - Ranking indicates results are bias low, six samples flagged very low

Nitrate/Nitrite - Satisfactory

Barium - No results reported

Dissolved Organic Carbon - No results reported

*Note: L021A - No results reported on any of the samples

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is LO 22

Calcium - Two results flagged high and one very high. Results are bias high

Magnesium - Two results are flagged high and one very high

Sodium - Satisfactory

Potassium - Nine samples flagged; one is low and eigh very low. Results are bias low

Chloride - One sample is flagged high, results are bias low (IC method)

Sulfate - Satisfactory (IC method)

Acidity - Satisfactory

Alkalinity (Total) - Satisfactory on the six results ranked

Gran Total Alkalinity - No results reported

pH - Two results flagged very low

Specific Conductivity - Satisfactory, except for two low results

Colour - Ranking indicates results are bias low; nine samples flagged five are very low, four are low

Reactive Silica - No results reported

Nitrate/Nitrite - One result flagged very high

Barium - Appears satisfactory. *Note: There really isn't enough data present to make this assessment properly

Dissolved Organic Carbon - Satisfactory, except for two results flagged high

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is LO23

Calcium - Satisfactory

Magnesium - One result is flagged low, one very low, and one very high

Sodium - Satisfactory, except for a high flag on one sample

Potassium - Satisfactory

Chloride - Satisfactory (non IC method)

Sulfate - Satisfactory (non IC method)

Acidity - Satisfactory

Alkalinity (Total) - Satisfactory, except for a very high flag on sample #8

Gran Total Alkalinity - No results reported

pH - Satisfactory

Specific Conductivity - Satisfactory

Colour - Satisfactory

Reactive Silica - Bias high on the seven samples ranked; no flagged results

Nitrate/Nitrite - Two results flagged, one very low and one very high

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is LO 24

Calcium - Satisfactory, except for a high flag on one sample

Magnesium - Satisfactory

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - Satisfactory (non IC method)

Sulfate - No results reported

Acidity - No results reported

Alkalinity (Total) - Satisfactory

Gran Total Alkalinity - Ranking indicates results are bias low. One result is low and one is very low

pH - Satisfactory

Specific Conductivity - Satisfactory

Colour - Five samples flagged; four are very high and one is high

Reactive Silica - Satisfactory

Nitrate/Nitrite - Satisfactory

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L025

Calcium - Satisfactory

Magnesium - One result is flagged very high

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - Satisfactory (IC method)

Sulfate - Satisfactory (IC method)

Acidity - Satisfactory, except a low flag on sample six

Alkalinity (Total) - No results reported

Gran Total Alkalinity - Two results flagged; one very low and one very high

pH - Six samples flagged; five very high, one low

Specific Conductivity - Satisfactory

Colour - Four samples flagged; two high and two low

Reactive Silica - Satisfactory

Nitrate/Nitrite - Three results flagged low

Barium - No results reported

Dissolved Organic Carbon - Results are slightly bias low; however no results are flagged

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L029

Calcium - Satisfactory

Magnesium - Satisfactory

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - Satisfactory (IC method)

Sulfate - Ranking indicates results are bias low; no results are flagged (IC method)

Acidity - Satisfactory

Alkalinity (Total) - Satisfactory on the six results ranked

Gran Total Alkalinity - No results reported

pH - Three results flagged low, overall ranking indicates results are bias low

Specific Conductivity - Satisfactory

Colour - No results reported

Reactive Silica - Satisfactory

Nitrate/Nitrite - Three results are flagged low

Barium - Eleven results flagged very high; results are bias high

Dissolved Organic Carbon - Two results flagged high

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L030

Calcium - No results reported

Magnesium - No results reported

Sodium - No results reported

Potassium - No results reported

Chloride - No results reported

Sulfate - No results reported

Acidity - Results are slightly bias low, no flagged samples

Alkalinity (Total) - No results reported

Gran Total Alkalinity - Satisfactory

pH - Satisfactory

Specific Conductivity - Satisfactory

Colour - Results are ranked bias high; five are flagged very high

Reactive Silica - No results reported

Nitrate/Nitrite - Satisfactory, except one result is flagged low

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L031A

Calcium - Satisfactory

Magnesium - Satisfactory

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - Satisfactory on the two results reported (non IC method)

Sulfate - Satisfactory on the two results reported (non IC method)

Acidity - No results reported

Alkalinity (Total) - Satisfactory on the one result

Gran Total Alkalinity - No results reported

pH - Satisfactory, except for a high flag on samples #8 and #10

Specific Conductivity - Satisfactory

Colour - Ranking indicates results are bias low; five samples are flagged low

Reactive Silica - Results rank bias high; four samples have high flags

Nitrate/Nitrite - Satisfactory, except for one result flagged high

Barium - Appears satisfactory. *Note: Limited data makes this assessment difficult.

Dissolved Organic Carbon - Results are slightly bias low; no samples are flagged

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L031B

Calcium - Satisfactory

Magnesium - Satisfactory

Sodium - Satisfactory, except for one high result

Potassium - Satisfactory

Chloride - Satisfactory, except for one high result (non IC method)

Sulfate - Four samples are flagged; one low and three very low. Ranking indicates results are bias low (non IC method)

Acidity - No results reported

Alkalinity (Total) - Satisfactory on all of the results ranked

Gran Total Alkalinity - No results reported

pH - No results reported

Specific Conductivity - No results reported

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - Satisfactory

Barium - Method insensitive, no results ranked

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is LO 32

Calcium - Satisfactory

Magnesium - Satisfactory

Sodium - Satisfactory, except for a low flag on one sample

Potassium - One result was flagged low and one very low

Chloride - Satisfactory (IC method)

Sulfate - Satisfactory (IC method)

Acidity - Satisfactory; except for a low result on #10

Alkalinity (Total) - No results reported

Gran Total Alkalinity - Satisfactory, except for a low result on sample #8

pH - One result flagged very low, and one result flagged high

Specific Conductivity - Satisfactory

Colour - No results reported

Reactive Silica - Five samples are flagged, four are low and one is very high

Nitrate/Nitrite - Satisfactory

Barium - No results reported

Dissolved Organic Carbon - Satisfactory, except for one result flagged low

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is LO 33

Calcium - Two results were flagged, one low and one very low.
*Note: Only three results were ranked

Magnesium - One result of the two results ranked is flagged very low

Sodium - Satisfactory on the six results ranked

Potassium - One result of the five results ranked is flagged low

Chloride - One very high flag out of eight ranked results (non IC method)

Sulfate - Two of the four results are flagged very high (non IC method)

Acidity - Insufficient data

Alkalinity (Total) - Satisfactory on the one result ranked

Gran Total Alkalinity - No results reported

pH - Four samples flagged; one low and three very low; results are bias low

Specific Conductivity - Satisfactory

Colour - No results reported

Reactive Silica - Satisfactory on the six results ranked

Nitrate/Nitrite - One result flagged very low out of the four results that got ranked

Barium - No results reported

Dissolved Organic Carbon - Results are ranked bias low; one result is also flagged low

November 9, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is LO 40

Calcium	No results reported
Magnesium	
Sodium	
Potassium	
Chloride	
Sulfate	
Acidity	
Alkalinity (Total)	
Gran Total Alkalinity	
pH	
Specific Conductivity	
Colour	
Reactive Silica	
Nitrate/Nitrite	
Barium	
Dissolved Organic Carbon	

November 9, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is LO 41

Calcium	No results reported
Magnesium	
Sodium	
Potassium	
Chloride	
Sulfate	
Acidity	
Alkalinity (Total)	
Gran Total Alkalinity	
pH	
Specific Conductivity	
Colour	
Reactive Silica	
Nitrate/Nitrite	
Barium	
Dissolved Organic Carbon	

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L042

Calcium - One result is flagged high and one very low

Magnesium - Satisfactory except one result was flagged low

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - Seven results flagged; one was low, five were very low, and one very high. Data appears to be erractic (non IC method)

Sulfate - Three results are flagged low and four very low. Results are bias low (non IC method)

Acidity - Satisfactory, except for one high result

Alkalinity (Total) - Results are biased very high. Nine results flagged very high

Gran Total Alkalinity - No results reported

pH - Two results flagged; one high and one very high

Specific Conductivity - Satisfactory, except for low result on sample #9

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - No results reported

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L044

Calcium - Two results flagged low and three very low. Results are bias low

Magnesium - Nine samples are flagged, two are low, seven are very low; results are bias low

Sodium - Satisfactory

Potassium - One result flagged very high

Chloride - Satisfactory (IC method)

Sulfate - Satisfactory (IC method)

Acidity - No results reported

Alkalinity (Total) - No results reported

Gran Total Alkalinity - No results reported

pH - Three results flagged; one very low and two low

Specific Conductivity - Ten samples are flagged, nine very low and one low; Ranking indicates bias low results

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - Seven samples flagged very high. Ranking indicates results are biased high

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L045

Calcium - Satisfactory

Magnesium - Results are slightly bias high

Sodium - Satisfactory

Potassium - One result is flagged low; results are slightly bias low

Chloride - One sample flagged very low (non IC method)

Sulfate - Two samples flagged very low and one flagged low (non IC method)

Acidity - No results reported

Alkalinity (Total) - Satisfactory on thefour results ranked

Gran Total Alkalinity - No results reported

pH - Two results flagged low; overall ranking indicates results are bias low

Specific Conductivity - Satisfactory

Colour - Three samples flagged, two high and one low

Reactive Silica - Ranking indicates results are bias low. No samples are flagged.

Nitrate/Nitrite - Results are bias low, one result is flagged low

Barium - Appears satisfactory

Dissolved Organic Carbon - Satisfactory

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L046

Calcium - Two results are flagged low

Magnesium - Satisfactory

Sodium - Two results are flagged high. Overall ranking indicates results are bias high

Potassium - Results are bias low, no flagged results

Chloride - Four results are flagged very high, ranking indicates high bias (non IC method)

Sulfate - Two results are flagged very low and one is flagged low (non IC method)

Acidity - Satisfactory, except for sample #2 is flagged very high

Alkalinity (Total) - No results reported

Gran Total Alkalinity - Satisfactory

pH - Satisfactory

Specific Conductivity - Two results are flagged very high; and one flagged low

Colour - Insufficient data, one sample flagged very high

Reactive Silica - One flagged very low, one result flagged high and one flagged very high

Nitrate/Nitrite - Three results flagged very low

Barium - No results reported

Dissolved Organic Carbon - No results reported

November 9, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L051

Calcium	No results reported
Magnesium	
Sodium	
Potassium	
Chloride	
Sulfate	
Acidity	
Alkalinity (Total)	
Gran Total Alkalinity	
pH	
Specific Conductivity	
Colour	
Reactive Silica	
Nitrate/Nitrite	
Barium	
Dissolved Organic Carbon	

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L053

Calcium - Satisfactory

Magnesium - Satisfactory

Sodium - Satisfactory

Potassium - Results have a sligh bias high, however no flagged results

Chloride - Satisfactory, except for one result flagged very high (non IC method)

Sulfate - L053A - one flagged low and one flagged very low (non IC method)
L053B - six results flagged; five very high and one high: Bias high (non IC method)

Acidity - Satisfactory

Alkalinity (Total) - No results reported

Gran Total Alkalinity - No results reported

pH - Satisfactory

Specific Conductivity - No results reported

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - Three results flagged low

Barium - No results reported

Dissolved Organic Carbon - Satisfactory, except for one result flagged high

Attachment I

November 9, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L054

Calcium	No results reported
Magnesium	
Sodium	
Potassium	
Chloride	
Sulfate	
Acidity	
Alkalinity (Total)	
Gran Total Alkalinity	
pH	
Specific Conductivity	
Colour	
Reactive Silica	
Nitrate/Nitrite	
Barium	
Dissolved Organic Carbon	

November 9, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is LO 56

Calcium	No results reported
Magnesium	
Sodium	
Potassium	
Chloride	
Sulfate	
Acidity	
Alkalinity (Total)	
Gran Total Alkalinity	
pH	
Specific Conductivity	
Colour	
Reactive Silica	
Nitrate/Nitrite	
Barium	
Dissolved Organic Carbon	

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L057

Calcium - Nine samples are flagged very high, results are bias high

Magnesium - Two results are flagged low and five very low; results are bias low

Sodium - Results are bias low, however no samples have been flagged

Potassium - One result is flagged very low, one low, one high and one very high Results appear to be erractic

Chloride - Six samples are flagged very low and two are flagged very high. Data appears to be erractic. (non IC method)

Sulfate - Results are bias low; one sample is flagged very low (IC method)

Acidity - Satisfactory, except for a high flag on #10

Alkalinity (Total) - One result flagged very low on the six results ranked

Gran Total Alkalinity - No results reported

pH - Four results are flagged low; ranking indicates samples are bias low

Specific Conductivity - Six samples flagged; one low, one very low, three high, and one very high. Results are erractic.

Colour - Satisfactory, except for two samples flagged high

Reactive Silica - No results reported

Nitrate/Nitrite - Seven samples flagged very high, ranking indicates samples are bias high

Barium - No results reported

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L058

Calcium - Satisfactory

Magnesium - Satisfactory

Sodium - One result flagged low, overall ranking indicates results are bias low

Potassium - Satisfactory, except for one result flagged high

Chloride - One result flagged high and one very high (non IC method)

Sulfate - Results are bias high, although no results are flagged (IC method)

Acidity - No results reported

Alkalinity (Total) - No results reported

Gran Total Alkalinity - One result flagged very low and two high

pH - Two results are flagged high, ranking indicates results are bias high

Specific Conductivity - Satisfactory

Colour - Satisfactory, except one sample is flagged low

Reactive Silica - No results reported

Nitrate/Nitrite - Satisfactory, except for one high result

Barium - No results reported

Dissolved Organic Carbon - Satisfactory, on the six results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L060

Calcium - Two results flagged very high

Magnesium - Ten results flagged very high, data is bias high

Sodium - Six results are flagged high, ranking indicates results are bias high

Potassium - Six results are flagged; four high and two very high. Data is bias high

Chloride - Results are bias low. (No flags) (IC method)

Sulfate - Satisfactory (IC method)

Acidity - Two results are flagged very high and one high; ranking indicates results are bias high

Alkalinity (Total) - Four results are flagged high and three are flagged very high

Gran Total Alkalinity - No results reported

pH - Three results are flagged low; ranking indicates results are bias low

Specific Conductivity - Six results are flagged very low, ranking indicates results are bias low

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - Two results flagged high and six results flagged very high. Ranking indicates results are bias high

Barium - Data appears satisfactory, however note, there weren't really enough labs participating

Dissolved Organic Carbon - No results reported

Attachment 1

November 7, 1983

LRTAP STUDY #L4

Appraisals

Your Laboratory Number is L061

Calcium - Satisfactory

Magnesium - Satisfactory

Sodium - Satisfactory

Potassium - Satisfactory

Chloride - Satisfactory (IC method)

Sulfate - Results are slightly bias high, no results are flagged (IC method)

Acidity - No results reported

Alkalinity (Total) - No results reported

Gran Total Alkalinity - No results reported

pH - One result flagged low, one result flagged very high

Specific Conductivity - Satisfactory

Colour - No results reported

Reactive Silica - No results reported

Nitrate/Nitrite - Three results are flagged high and one very high

Barium - No results reported

Dissolved Organic Carbon - No results reported