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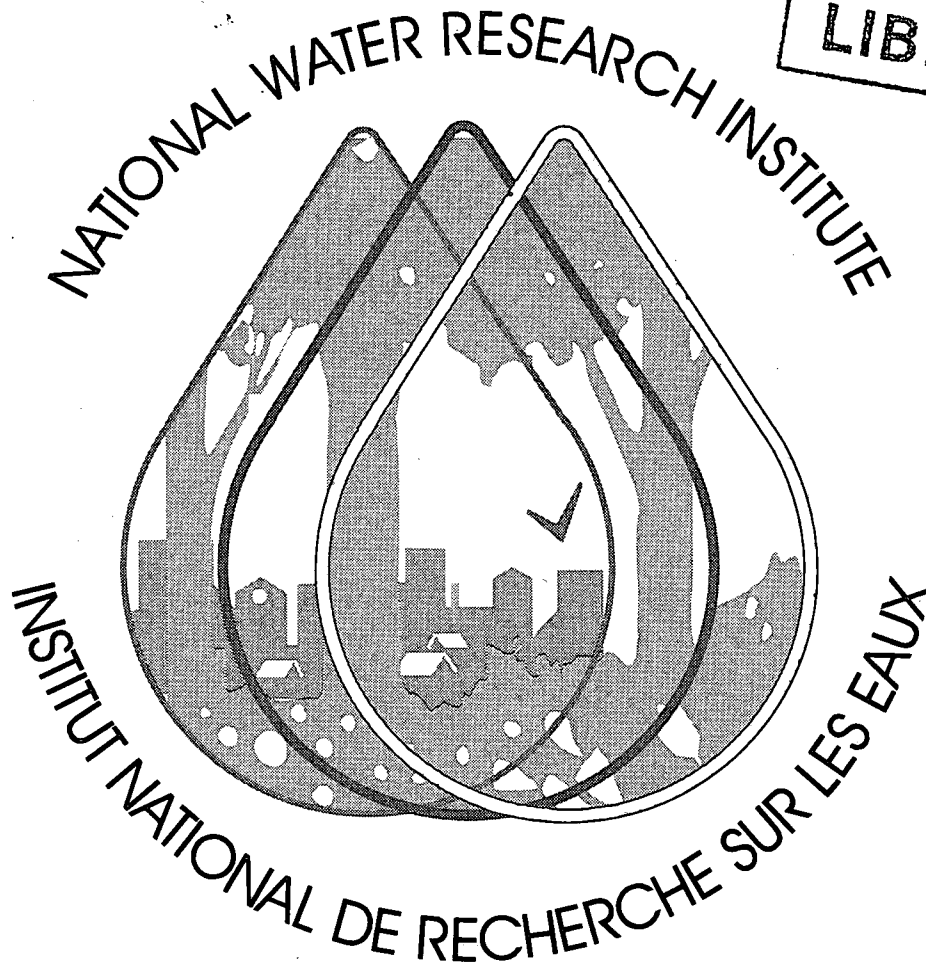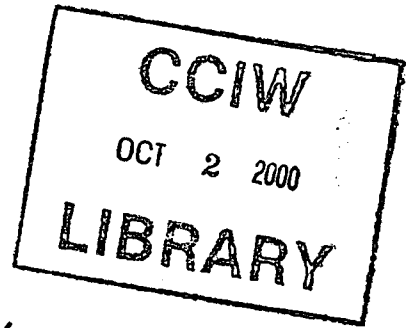
INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX

Ecosystem Interlaboratory QA Program
Study FP 73 - Rain and Soft Waters
(September & October 1998)

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December 14, 1998

<u>To</u>: Participants of the NWRI Ecosystem Interlaboratory Quality Assurance Program

<u>Re</u>: Final Report for NWRI Study FP 73 - Rain and Soft Waters Portion

Dear Participant:

We would like to thank you for your co-operation and prompt responses during this study. In return, it is the aim of the quality assurance group to give prompt evaluations, reports, and effective remedial assistance to all of the participants.

The Institute is pleased to distribute this final report to the FP participant laboratories. This report includes results and evaluations for a unique series of samples: Rain and Soft Waters. The evaluation of results includes an evaluation for systematic bias and precision. The flagging criteria, used to assess precision, are open to change. In order to improve our data assessments and the quality of your data, you may find that these criteria change from study to study. This would be evident in Table 3 - Summary of Study-to-Study Performance. A complete listing of all laboratory results is included so that each laboratory can compare its results and evaluations with other laboratories. For details concerning these evaluations please refer to the attached appendix, Glossary of Terms, or to the Research & Applications Branch QA Manual.

In the data summary tables you will find the tabulation of the degree of bias. It has been difficult to quantify and determine its significance at low values. *In this report we have calculated bias in two components which relate directly to the chemical measurement.* Laboratory heads are encouraged to discuss the attached report openly with those who manage their programs and those who use their laboratory data.

The laboratories listed in this report submitted their data with a confidential laboratory code. This confidentiality is fully respected by our staff. Access to these codes is possible through the relevant laboratories or program authorities.

Should you have any questions or comments regarding this study, please do not hesitate to contact us.

Yours truly,

Harry A.

Harry Alkema
QA Specialist
NLET/NWRI

Interlaboratory QA Studies & CRMs
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Attachment: Individual Laboratory Appraisal

Canada

National Water Research Institute
National Laboratory for Environmental Testing

Report no. NWRI-QA-98-04

Ecosystem Interlaboratory Quality Assurance Program
Study FP 73 - Final Report

September and October 1998

An Interlaboratory Quality Assurance Study
for Rain and Soft Waters*

by

H. Alkema

Environmental Standards and Reference Materials
Project Information & Quality Management
National Laboratory for Environmental Testing
National Water Research Institute
Burlington, Ontario

December 1998

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* companion studies: Major Ions/Total P; Report NWRI-QA-98-05, and Trace Metals; Report NWRI-QA-98-06

NWRI Interlaboratory Quality Assurance Studies
for
Acid Rain and Surface Waters

Major Ions and Nutrients, Trace Metals, Total Phosphorus, and Mercury

The Institute's interlaboratory quality assurance (QA) studies support a core group of government labs and their QA requirements of various environmental programs. These programs include: acid rain research, Great Lakes trans-boundary issues, and issues involving provincial watershed/ecosystem research, monitoring, and jurisdiction. The QA program also addresses health issues, such as, toxic metal (lead, manganese, and mercury) contamination of drinking water.

The QA studies are executed twice a year and accommodate environmental programs in both Canada and the United States of America. The US Environmental Protection Agency, US Geological Survey, and numerous university acid rain programs show a continued interest in this program. More than 200 laboratories are invited to participate on a voluntary basis in each study. Currently, some 60 of these labs participate in the various study matrixes. One study consists of five (5) series of ten (10) samples each and includes numerous parameters for analysis. The primary feature of these studies is to report the quality of data produced by the participating laboratories. Laboratory performance is ranked in terms of the number of biased parameters (systematic bias) and flagged results (precision measurement). The reports produced from the client data provide a powerful tool for the diagnosis of problematic analysis. Environmental programs and data users are therefore encouraged to have their labs participate as a means of quantifying laboratory performance and data quality.

As the NWRI studies run on a voluntary and cost recovery basis, laboratories and program managers express an ongoing interest in study design and sample requirements. The program is open to international participation and contractually specialized studies are available.

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Table 1   List of participating[†] laboratories in the acid rain and soft waters portion of interlaboratory study FP 73 (September & October 1998).

Adirondack Lakes Survey Corporation
Appalachian Laboratory
Chemex Environmental Services
CRD Water Department Laboratory
Entech Laboratories (Ontario)
Environment Canada - AES, CAPMoN Laboratory
Environment Canada - AES, Remote Regions Atmospheric Laboratory
Environment Canada - CWS, ECB, Environmental Quality Section
Environment Canada - ETC, AMD
Environment Canada - NHRI, WQL
Environment Canada - NWRI, NLET
Environment Canada - Pacific Environmental Science Centre
Environnement Canada - CSL, Laboratoire régional - Québec
Enviro-Test Laboratories
Fisheries and Oceans Canada - Freshwater Institute
Harvard School of Public Health
Illinois State Water Survey - Analytical Chemistry Unit
Laboratoire de Santé Publique du Québec
Maxxam Analytics
Ministère de l'Environnement et de la Faune du Québec - Laval
Ministère de l'Environnement et de la Faune du Québec - Sainte-Foy
Ministère de Ressources Naturelles du Québec - Sainte-Foy
Monroe County Environmental Health Laboratory
Natural Resources Canada - CFS, Atlantic Region
Natural Resources Canada - CFS, Ontario Region
New Brunswick Department of the Environment - ASL
Norwest Labs
Ontario Hydro Technologies
Ontario Ministry of Environment and Energy - Dorset
Ontario Ministry of Environment and Energy - Etobicoke
Ontario Ministry of Northern Development and Mines - Geosciences Laboratory
Pennsylvania State University - ERRI
Philip Analytical Services Corporation
State of Vermont - Department of Environmental Conservation Laboratory
University of Maine - Water Research Institute
University of Quebec
University of Virginia
US Environmental Protection Agency - Troy, NY
Wisconsin State Laboratory of Hygiene
Wisconsin State - Water Chemistry Program

[†] Laboratories select their routine parameters from the series of samples in this study.

Table 2   Laboratory Performance Scores for Study 0073

Rain & Soft Waters

	SYSTEMATIC BIAS			FLAGGED RESULTS			
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF BIAS & FLAGGED DATA % SCORE
F004	3	0	0.00	28	0	0.00	0.00
F017	9	0	0.00	81	0	0.00	0.00
F068	7	0	0.00	61	0	0.00	0.00
F036	14	0	0.00	138	1	0.72	0.36
F115	12	0	0.00	120	2	1.67	0.83
F122	4	0	0.00	36	1	2.78	1.39
F007	15	0	0.00	123	5	4.07	2.03
F009	9	0	0.00	84	4	4.76	2.38
F053	10	0	0.00	94	5	5.32	2.66
F118	4	0	0.00	40	4	10.00	5.00
F002	13	1	7.69	107	7	6.54	7.12
F113	15	0	0.00	150	22	14.67	7.33
F110	11	1	9.09	105	8	7.62	8.35
F133	11	1	9.09	105	8	7.62	8.35
F116	16	2	12.50	146	9	6.16	9.33
F003	17	2	11.76	142	10	7.04	9.40
F010	19	2	10.53	166	15	9.04	9.78
F026	17	2	11.76	168	15	8.93	10.35
F032	18	2	11.11	151	15	9.93	10.52
F071	13	1	7.69	130	19	14.62	11.15
F074	17	2	11.76	165	25	15.15	13.46
F014p	5	1	20.00	40	3	7.50	13.75
F012	9	1	11.11	79	15	18.99	15.05
F060	20	3	15.00	148	26	17.57	16.28
F042	16	3	18.75	151	22	14.57	16.66
F112	15	4	26.67	143	11	7.69	17.18
F107	17	2	11.76	164	38	23.17	17.47
F014	17	4	23.53	136	19	13.97	18.75
F094	19	3	15.79	151	37	24.50	20.15
F020	14	3	21.43	122	25	20.49	20.96
F109	10	2	20.00	100	22	22.00	21.00
F015	16	3	18.75	127	30	23.62	21.19
F049	11	3	27.27	98	18	18.37	22.82
F025	13	3	23.08	114	30	26.32	24.70
F037	13	3	23.08	122	34	27.87	25.47
F131	13	3	23.08	125	55	44.00	33.54
F145	19	3	15.79	151	79	52.32	34.05
F072	15	4	26.67	129	63	48.84	37.75
F139	8	5	62.50	60	56	93.33	77.92

Laboratory parameters are selected from:

Colour	Sp Cond	pH	DOC	Alk Gran	DIC
NO3	Na	Mg	SO4-IC	Cl-IC	K
Ca	Alk Infl	NO3 /2	NH4	TKN	Si
SO4	Cl	Alk E.Pt	Al	Gran Acid	

Table 3   SUMMARY OF STUDY-TO-STUDY PERFORMANCE

Rain & Soft Waters

LAB CODE	% BIASED PARAMETERS & FLAGGED RESULTS ON STUDIES										MEDIAN SCORE	COMMENTS
	0064	0065	0066	0067	0068	0069	0070	0071	0072	0073		
F002	13.7	11.9	11.8	20.6	14.1	3.2	10.4	2.7	6.4	7.1	11.1	SATISFACTORY
F003	18.1	6.9	14.6	8.9	4.3	7.1	2.6	13.5	7.5	9.4	8.2	SATISFACTORY
F004	1.2	7.1	1.0	19.7	-	3.5	4.1	18.1	15.2	0.0	4.1	GOOD
F007	-	23.3	13.9	13.8	12.3	11.8	9.2	0.0	9.5	2.0	11.8	SATISFACTORY
F009	20.0	21.5	6.5	-	14.0	16.0	2.9	21.7	5.9	2.4	14.0	MODERATE
F010	17.6	17.8	4.8	6.5	1.6	-	7.3	7.2	15.6	9.8	7.3	SATISFACTORY
F012	41.4	30.4	8.0	-	41.9	-	35.5	40.4	-	15.0	35.5	POOR
F014	7.0	16.2	5.3	10.5	8.7	18.1	6.0	21.7	23.2	20.1	13.4	MODERATE
F014p	-	-	-	-	-	-	-	-	-	16.8	-	-
F015	6.8	3.3	9.8	4.4	7.1	12.4	14.4	25.3	17.4	20.5	11.1	SATISFACTORY
F017	27.6	1.3	1.8	0.0	9.3	1.3	1.2	0.7	0.6	0.0	1.3	GOOD
F020	6.9	15.1	16.5	19.1	-	23.9	23.7	20.3	19.0	22.5	19.1	MODERATE
F025	-	-	-	-	-	-	22.9	27.9	8.9	24.7	23.8	MODERATE
F026	7.1	7.4	7.5	4.1	5.6	6.2	15.0	3.0	4.7	10.3	6.7	SATISFACTORY
F032	6.0	-	13.0	6.8	16.1	13.7	17.3	10.3	6.0	11.4	11.4	SATISFACTORY
F036	14.0	9.1	8.8	-	11.8	4.0	3.1	5.1	1.1	0.4	5.1	SATISFACTORY
F037	24.5	11.5	18.8	20.7	35.7	18.8	37.7	47.8	31.9	25.5	25.0	MODERATE
F042	6.2	4.4	10.1	14.1	7.7	-	7.3	23.0	6.5	16.7	7.7	SATISFACTORY
F049	-	-	13.1	4.5	-	-	-	15.0	-	22.8	14.0	MODERATE
F053	2.6	1.0	1.5	6.1	9.7	31.3	9.2	1.1	0.5	2.7	2.6	GOOD
F060	-	-	-	-	33.2	-	17.0	24.5	22.0	16.3	22.0	MODERATE
F068	12.5	0.8	0.0	1.2	14.1	0.0	1.6	16.1	4.8	0.0	1.4	GOOD
F071	20.5	16.2	36.9	24.9	11.4	18.7	-	27.9	37.3	11.2	20.5	MODERATE
F072	-	-	35.2	-	-	-	35.5	29.1	21.9	35.9	35.2	POOR
F074	15.0	13.8	-	-	15.3	-	-	13.4	26.8	13.5	14.4	MODERATE
F094	-	-	-	-	-	-	-	35.0	20.6	20.1	20.6	MODERATE
F107	6.0	17.8	18.8	21.4	-	7.0	27.1	13.9	19.4	17.5	17.8	MODERATE
F109	16.2	19.8	25.0	2.2	10.8	16.2	3.6	12.9	1.2	21.0	14.5	MODERATE
F110	3.6	2.8	5.6	9.7	-	-	8.2	5.8	4.2	8.4	5.7	SATISFACTORY
F112	12.0	20.2	9.7	23.2	-	11.7	12.6	6.4	10.3	17.2	12.0	SATISFACTORY
F113	-	-	-	-	-	-	-	18.5	6.5	7.3	7.3	SATISFACTORY
F115	10.0	-	2.9	1.8	-	0.4	-	0.0	-	0.8	1.3	GOOD
F116	22.5	5.4	12.9	18.6	7.3	7.6	-	10.7	-	9.3	10.0	SATISFACTORY
F118	48.1	52.8	5.7	4.1	3.8	42.0	87.2	5.2	1.3	5.0	5.4	SATISFACTORY
F122	3.9	0.0	2.8	1.4	2.6	3.9	4.2	6.1	37.3	1.4	3.4	GOOD
F131	-	-	-	-	40.9	26.5	-	25.9	-	33.5	30.0	POOR
F133	-	-	-	-	-	-	6.2	5.8	14.4	8.5	7.4	SATISFACTORY
F139	-	-	-	-	-	-	-	-	55.3	77.9	66.6	POOR
F145	-	-	-	-	-	-	-	-	-	33.0	-	-
INTERLAB MEDIAN	12.5	11.9	9.7	8.9	11.4	11.8	9.2	13.9	10.3	11.4		

STUDY DATES: 0064(10-MAY-1994), 0065(20-SEP-1994), 0066(15-JAN-1995), 0067(05-SEP-1995), 0068(01-MAR-1996), 0069(01-SEP-1996), 0070(03-MAR-1997), 0071(02-SEP-1997), 0072(02-MAR-1998), 0073(01-SEP-1998)

Table 4   Sample design for the rain and soft water portion

Sample Number	Sample Name	Source (Province/State)	Expected Conductance (µS/cm, 25°C)
FP73 SW-1	Bmoos-01	Big Moose Lake, Ontario	23.
FP73 SW-2	Rain-97	rainwater, Grimsby, Ontario	43.
FP73 SW-3	Trky-94	Turkey Lakes, Ontario	41.
FP73 SW-4	Beski-01	Beaver Skin River, Ontario	24.
FP73 SW-5	Super-04	L. Superior, diluted	7.4
FP73 SW-6	RainGR-16	rainwater, Grimsby, Ontario	8.9
FP73 SW-7	RainGR-11	rainwater, Grimsby, Ontario	13.
FP73 SW-8	Mersey-Mx	Mersey R. + rainwater	40.
FP73 SW-9	PHA-08	L. Superior, dilution + spike	32.
FP73 SW-10	Cobriel-Mx	Cobrielle L. NS, + rainwater	15.

Table 5   Summary of Interlaboratory Median Values for Rain and Soft Waters - Study 0073

PARAMETER		SAMPLE NUMBER					
		BMOOS-01 SAMPLE 1	RAIN-97 SAMPLE 2	TRKY-94 SAMPLE 3	BESKI-01 SAMPLE 4	SUPER-04 SAMPLE 5	RAINGR-16 SAMPLE 6
Acidity to pH 8.3	mg/L CaCO3	4.0500	4.1000	1.0985	2.0000	1.6000	1.7500
Alkalinity Gran Titn	mg/L CaCO3	0.1580	-1.6200	7.3400	0.0742	2.9100	0.0535
Alkalinity Gran Infl Extrap	mg/L	0.1150	-1.6900	7.3800	0.0700	3.1100	0.0200
Alkalinity Fixed End Pt pH 4.5	mg/L	1.8000	-	8.6000	1.6500	4.4000	1.5300
Aluminum	mg/L	0.2300	0.0300	0.0200	0.0147	0.0040	0.0080
Ammonia	mg/L N	0.0130	0.1830	0.3030	0.0040	0.0018	0.0930
Calcium	mg/L	1.9800	2.6200	4.6500	0.4007	0.9600	0.6100
Chloride Colour	mg/L	0.4925	0.6000	0.5020	4.3900	0.1200	0.1220
Chloride IC	mg/L	0.4460	0.5200	0.5240	4.3900	0.1010	0.1600
Colour	Hazen Unit	10.000	1.6000	5.6000	2.8000	0.8000	1.3000
Diss Inorg Carbon	mg/L C	0.3515	0.3480	1.8810	0.3300	0.9225	0.2900
Diss Organic Carbon	mg/L C	3.5345	0.7210	1.7000	0.9000	0.1500	0.2000
Magnesium	mg/L	0.3105	0.9225	0.8270	0.3980	0.2000	0.1765
Nitrate + Nitrite	mg/L N	0.4170	2.0630	0.8800	0.0740	0.0239	0.3135
Nitrate-IC	mg/L N	0.4100	2.0725	0.8700	0.0740	0.0220	0.3160
Potassium	mg/L	0.4100	0.1415	0.1960	0.2300	0.0400	0.0185
Reactive Silica	mg/L Si	1.9750	0.1095	0.7900	0.3780	0.0810	0.0220
Sodium	mg/L	0.5965	0.2675	0.5525	2.7000	0.0980	0.0670
Specific Conductance	uS/cm	23.500	43.900	40.800	24.200	7.4000	8.9000
Sulfate Colour	mg/L	5.8000	5.3000	6.1500	2.2775	0.2500	1.3200
Sulfate IC	mg/L	5.4950	5.2710	5.9150	2.2850	0.2400	1.3800
Total Kjeldahl N	mg/L N	0.2050	0.2600	0.4000	0.0565	0.0250	0.1250
pH	pH Units	5.3800	4.4900	7.0000	5.5100	6.6950	5.4700

PARAMETER		RAINGR-11 SAMPLE 7	MERSEY-MX SAMPLE 8	PHA-08 SAMPLE 9	COBRIEL-MX SAMPLE 10
Acidity to pH 8.3	mg/L CaCO3	1.9500	1.7000	4.4500	2.0000
Alkalinity Gran Titn	mg/L CaCO3	1.4900	3.6000	-2.3310	0.0245
Alkalinity Gran Infl Extrap	mg/L	1.5900	3.5000	-2.3300	0.0690
Alkalinity Fixed End Pt pH 4.5	mg/L	3.0000	5.0000	-	1.5600
Aluminum	mg/L	0.0030	0.0500	0.0010	0.0430
Ammonia	mg/L N	0.0020	0.0021	0.0040	0.1050
Calcium	mg/L	1.5100	3.5500	1.4200	0.3590
Chloride Colour	mg/L	0.1675	3.1500	0.1707	2.0500
Chloride IC	mg/L	0.1500	3.1200	0.1600	2.0300
Colour	Hazen Unit	0.8000	23.500	0.4000	5.0000
Diss Inorg Carbon	mg/L C	0.5850	0.9950	0.2000	0.3000
Diss Organic Carbon	mg/L C	0.2650	2.6000	0.2159	1.2000
Magnesium	mg/L	0.2700	0.9000	0.2900	0.2000
Nitrate + Nitrite	mg/L N	0.4800	0.8730	0.0350	0.0910
Nitrate-IC	mg/L N	0.4765	0.8600	0.0340	0.0920
Potassium	mg/L	0.0220	0.2500	0.0535	0.1235
Reactive Silica	mg/L Si	0.0410	1.2300	0.2200	0.3150
Sodium	mg/L	0.0560	1.7300	0.1420	1.3200
Specific Conductance	uS/cm	12.600	39.900	32.300	15.300
Sulfate Colour	mg/L	1.4925	5.0000	6.9500	1.8500
Sulfate IC	mg/L	1.5500	4.6950	6.9800	1.7200
Total Kjeldahl N	mg/L N	0.0250	0.1370	0.0335	0.1545
pH	pH Units	6.4260	6.6700	4.3500	5.3600

Appendix A

Glossary of Terms
Quantifying Bias in NWRI QA Studies

GLOSSARY OF TERMS

Used for the Evaluation of Interlaboratory Results

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

Bias: Results for a parameter are assessed to be biased by the procedure of Youden when they are consistently ranked to be either higher or lower than the median result. In these interlaboratory studies, for most parameters, a bias of greater than 5% is considered to be excessive. Biases of less than 5% are noted for caution and investigation.

Bias Blank: In the graph for bias % slope, the y-intercept for the laboratory results indicates a systematic blank of analysis. This is the second component of bias.

Bias % Slope: When laboratory results for a parameter are plotted against the target values, the slope as compared to the ideal results (no bias) is considered to be the major component of the degree of bias. For an explanation of Bias % Slope see the following explanation in "Quantifying Bias in NWRI QA Studies".

Erratic: Results for a parameter are evaluated as erratic when both high and low flags are assigned.

Flagged Result: A result is flagged when its value is beyond that of the median (target value) plus or minus the acceptable difference.

Isolated Outlier: A parameter analysis which performs satisfactorily but produces an extreme result. (formerly, 'out of control')

Satisfactory: Fully acceptable, 'good results'.

'W' or 'T' Code: A 'W' or 'T' code may be used with a reported result as described in ASTM. However, in the NWRI QA studies, these codes may result in flagging discrepancies. "Less than" values or negative results are also legitimate when reporting the results. Laboratories should use their usual data reporting protocols insofar as they are compatible with the other laboratories.

The following three terms define the acceptable differences from the median of results (**target value**) that is allowed without a result being flagged either low or high:

- **LLBAE:** Lower Limit for Use of Basic Acceptable Error,
- **BAE:** Basic Acceptable Error, and
- **CEI:** Concentration Error Increment.

In general, for the NWRI QA studies, the values chosen for the **basic acceptable error** and the **concentration error increment** are selected so that good precision may be inferred. Historically, for the Federal-Provincial QA Program, for moderate ranges, this has been achieved with the 10% Deviation Rule.

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

> For example: Suppose that the **lower limit for use of the basic acceptable error** has been set as 10 µg/L and the **basic acceptable error** is 1.0 µg/L, if a **target** (median) **value** for a sample is 5 µg/L, then any **reported result** within the range 5 ± 1.0 or 4.0 to 6.0 µg/L would be considered acceptable. The **BAE** would define the acceptable result within the 0-10 µg/L range.

For results above the **lower limit for use of basic acceptable error**, an allowance is made for the increased variability due to concentration. For almost all substances it appears that the variability of results increases with concentration. The allowance is added to the **basic acceptable error**. It is calculated by multiplying the **concentration error increment** (as a percentage) by the difference between the **target value** and the **lower limit for use of basic acceptable error**.

> For example: A **target value** for a sample may be 21 µg/L, the **BAE** is 1.0, the **LLBAE** is 10 µg/L and the **CEI** 0.1. The acceptable difference is calculated by the equation: (**Target - LLBAE**) x **CEI** + **BAE**. For the figures mentioned the answer would be (21 - 10) x 0.10 + 1.0 = 2.1. Thus the range 18.9 to 23.1 µg/L would be considered acceptable and would not be flagged.

The calculated acceptable difference is termed **1 criteria** or **crit**. This value and the value of three standard deviations (**3SD**) are both action criteria in the determination of flags. When the **reported value** is subtracted from the **target value**, the difference is then divided by the **1 criteria** value. This produces the number of **1 crit** deviations. The assigned flag depends upon what range this number falls into.

1 Criteria Deviations	Assigned Flag
1 - 1.5	L or H
1.5 - 3SD	VL or VH
> 3SD	EL or EH

In cases where the **3SD** value is lower than that of **1 crit**, only extreme flags (EL or EH) are assigned. A minimum of 6 results are needed for the calculation of **3SD**, otherwise, 2 criteria deviations are used.

References:

1. ASTM, 1983, Volume 11.01, Water 1, Section II, pp. D4210-83.
2. Ranking Laboratories by Round-Robin Tests, W.J. Youden, Precision Measurement and Calibration, H.H. Ku, Editor, NBS Special Publication 300-Volume 1, U.S. Government Printing Office, Washington, D.C., 1969.

June 1996

Quantifying Bias in NWRI QA Studies

Introduction

Systematic bias as part of the QA data assessment is a major element in quantifying data quality. It is important in qualifying the accuracy of data in a general sense, when the entire set of analysis data may be affected by factors such as calibration, instrument setup, chemical reagent efficiency and purity of blank solutions. The absence of bias is not only very important when assessing data accuracy, but also when merging data sets from different times or locations.

Degree of Bias

In the NWRI QA studies with 10 sample series, systematic bias[1] is assessed non-parametrically by the procedure of Youden. The degree of bias is important in these interlaboratory studies for two reasons. When the degree of bias is small, it should not fault a laboratory's performance. On the other hand, when the degree is higher, it should be quanitified and remedial action undertaken. The degree of bias may be parametrically quantified by two parameters taken from the parameter performance chart, as in figure 1. When bias is indicated by the procedure of Youden, the slope and intercept, give the degree of bias. Incidentally, a complication arises from the high precision of methodologies and instrumentation like ICPMS. A very high precision of analysis may lead to an assessment of very low bias, e.g. 2 or 3%.

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[1] Systematic bias is often identified with the comparison of data to a certified standard.

Parameter Performance Graph and Bias

The parameter performance graph, Figure 1, charts the laboratory results against the target values for a parameter. The ideal results, showing no bias and no deviating data, would fall on the 45° line labeled 'no bias (ideal)'. In this figure, the laboratory results have a very high degree of precision as indicated by the the correlation coefficient (R^2) of 0.9999. The slope of the regression line, as indicated by the equation was 0.9637 and as a percentage calculates to be -3.63%. This slope is one factor in evaluating the degree of bias.

The second contribution of bias, as indicated by the parameter performance graph, is the analysis blank. This blank value is given by the y-intercept, and in this case is indicated to be 0.0005 ppm. These two factors, slope and blank are considered to be the two important considerations in quantifying bias. Preliminary investigation indicates that the slope value is the most important factor and needs to be followed most closely. However, the blank may be contaminated (alternatively the standards) and become the larger factor of the two. The example in Figure 2 is a case in point.

Figure 2   Parameter Performance

y = 1.0523x - 0.0229
R^2 = 0.9951

Slope = + 5.23 %
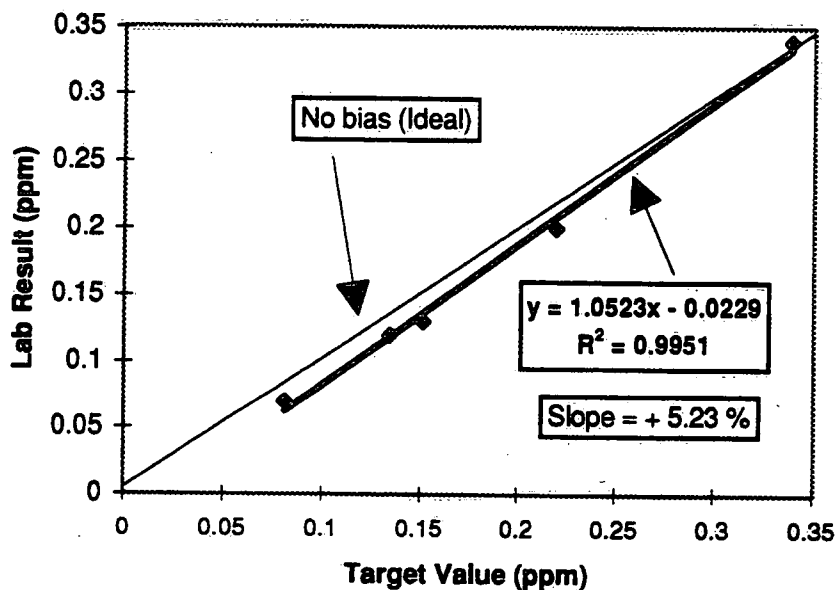
In this parameter performance graph, we have a worst case situation. The Youden bias for this parameter is indicated as 'biased low'. However, the graph for this parameter and laboratory indicates a positive slope of 5.23%. Upon examining the graph, the regression line indicates a considerably large negative intercept or blank value. In this case it is the blank value that needs to be investigated.

Conclusion

Systematic bias as indicated in the NWRI interlaboratory study by the procedure of Youden has two distinct components. The regression equation as given in the performance graph can quantify these two important factors. Whereas the slope factor may be the most significant of the two, the blank bias factor should also be indicated for the cases where it may be the larger and more meaningful of the two.

NWRI Ecosystem Interlaboratory QA Program

Bias Critical Values
Rain and Soft Waters

Parameter	%
Conductance	3
Colour	25
Acidity (to pH 8.3)	5
pH	5
DOC	5
DIC	5
Alkalinity (fixed end point)	3
Alkalinity (gran. inflec.)	3
Alkalinity (gran. titration)	3
Nitrate + Nitrite	5
Nitrate	5
Ammonia	7.5
TKN	10
Sodium	5
Magnesium	5
Silica	5
Sulfate (IC)	5
Sulfate (non-IC)	5
Chloride (IC)	5
Chloride (non-IC)	5
Potassium	5
Calcium	5
Aluminum	5

June 1996

Appendix B

Data & Evaluation Summary

PARAMETER: 00392 Specific Conductance uS/cm

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000   BASIC ACCEPTABLE ERROR= 1.2500   CONCENTRATION ERROR INCREMENT= 0.0300

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F002	24.6	31.00	43.4	16.50	39.6	8.00	23.7	9.00	7.17	9.00	8.62	11.00
F003	23.6	18.50	45.2	29.00	41.8	28.00	24.2	18.50	7.8	24.50	9.1	24.50
F004	23.8	20.00	44.9	26.00	41.4	23.00	24.4	23.00	7.58	21.00	8.92	19.00
F007	24.4	29.00	45.1	28.00	41.2	20.50	24.2	18.50	7.8	24.50	9.1	24.50
F009	24.	24.50	41.	4.00	42.	30.00	24.	13.50	8.	29.50	9.	21.50
F010	23.4	14.00	43.2	14.50	40.5	14.00	23.8	10.50	7.3	14.00	8.5	9.50
F014	24.0	24.50	42.8	12.00	41.7	26.50	24.6	25.00	7.59 EL	22.00	10.8 EH	33.00
F014p	22.5	6.00	41.6	6.00	38.7	4.00	23.0	4.50	5.96 EL	1.00	7.95	2.00
F015	22.	3.50	36. EL	1.50	39.	6.00	23.	4.50	7.	5.50	8.	4.00
F020	22.16	5.00	44.58	24.00	41.37	22.00	22.51	3.00	8.08	32.00	7.65	1.00
F025	24.1	27.00	47.1 H	32.50	42.2	31.00	25.0	30.50	7.86	27.00	9.28	28.00
F026	22.8	9.00	45.	27.00	41.5	24.00	24.8	28.00	7.27	12.00	9.18	27.00
F032	23.	10.50	43.2	14.50	39.2	7.00	23.6	8.00	6. EL	2.00	8.2	6.00
F036	22.6	7.50	42.	7.50	40.8	16.00	23.2	6.00	7.2	10.00	8.	4.00
F037	23.3	13.00	43.9	20.00	40.8	16.00	24.3	21.50	7.85	26.00	8.82	14.00
F042	22.	3.50	43.	13.00	40.	10.50	24.	13.50	7.	5.50	9.	21.50
F053	23.5	16.00	43.8	19.00	39.8	9.00	24.2	18.50	7.3	14.00	8.9	16.50
F060	24.	24.50	42.	7.50	41.	18.00	24.	13.50	7.	5.50	8.	4.00
F071	21.5 L	2.00	42.1	9.00	36.2 EL	2.00	21.9 L	1.00	7.08	8.00	8.37	8.00
F072	23.0	10.50	41.0	4.00	38.0 L	3.00	24.0	13.50	7.0	5.50	8.5	9.50
F074	24.	24.50	41.	4.00	40.	10.50	25.	30.50	8.	29.50	9.	21.50
F094	25.6 H	33.00	46.9 H	31.00	44.1 H	33.00	26.8 EH	33.00	8.8 EH	33.00	9.9	32.00
F107	23.08	12.00	42.75	11.00	38.85	5.00	23.57	7.00	7.38	16.00	8.85	15.00
F109	21.25 L	1.00	36.0 EL	1.50	35.8 EL	1.00	22.0 L	2.00	6.51	3.00	8.27	7.00
F110	23.5	16.00	44.5	23.00	41.7	26.50	24.6	25.00	7.6	23.00	8.9	16.50
F112	23.90	22.00	43.70	18.00	40.80	16.00	24.80	28.00	7.40	17.00	9.37	29.00
F113	23.86	21.00	42.27	10.00	40.11	12.00	24.14	16.00	7.228	11.00	8.804	13.00
F115	23.6	18.50	44.2	22.00	41.1	19.00	24.2	18.50	7.3	14.00	9.0	21.50
F116	24.5	30.00	45.9	30.00	41.9	29.00	24.8	28.00	7.49	18.00	9.15	26.00
F122	22.6	7.50	43.4	16.50	40.3	13.00	23.8	10.50	7.52	20.00	8.91	18.00
F131	25.4	32.00	47.1 H	32.50	43.7 H	32.00	26.0	32.00	7.9	28.00	9.5	31.00
F133	23.5	16.00	44.8	25.00	41.2	20.50	24.3	21.50	7.5	19.00	8.8	12.00
F145	24.3	28.00	44.1	21.00	41.6	25.00	24.6	25.00	8.03	31.00	9.38	30.00

MEDIAN	23.5000		43.4000		40.8000		24.2000		7.4000		8.9000	
1CRIT	1.9250		2.5220		2.4440		1.9460		1.4420		1.4870	
N	31		29		31		31		31		31	
MEAN	23.4355		43.4931		40.5816		24.0748		7.4109		8.8153	
3STDEV	2.5861		4.4497		4.3097		2.3314		1.3593		1.4176	

PARAMETER: 00392 Specific Conductance uS/cm

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F002	12.6	17.00	39.6	13.00	32.7	22.00	15.7	27.50
F003	12.9	24.00	39.6	13.00	32.9	25.00	15.3	18.50
F004	12.8	21.50	40.3	23.50	33.7	28.00	15.3	18.50
F007	12.8	21.50	40.3	23.50	34.	31.00	15.6	24.00
F009	13.	26.00	41.	29.00	32.	15.00	15.	10.00
F010	12.4	11.50	39.6	13.00	31.8	11.00	15.2	15.00
F014	12.7	19.00	39.9	16.50	32.5	19.00	15.7	27.50
F014p	11.8	5.00	38.0	3.50	31.1	9.00	14.4	6.00
F015	12.	7.50	38.	3.50	27. EL	1.50	14.	2.00
F020	11.53	3.00	41.18	30.00	33.72	29.00	14.46	7.00
F025	13.2	30.00	41.2	31.00	35.8 VH	33.00	15.8	30.00
F026	13.09	29.00	40.6	28.00	33.15	26.00	15.9	31.00
F032	11.2	1.00	39.	7.00	32.	15.00	14.	2.00
F036	12.	7.50	39.8	15.00	30.4	6.00	14.	2.00
F037	13.06	28.00	40.1	21.00	32.5	19.00	15.3	18.50
F042	12.	7.50	39.	7.00	32.	15.00	15.	10.00
F053	12.4	11.50	39.2	9.00	31.9	13.00	15.2	15.00
F060	13.	26.00	40.	19.00	31.	8.00	15.	10.00
F071	11.6	4.00	36.5 EL	2.00	29.0 VL	4.00	14.39	5.00
F072	12.0	7.50	39.0	7.00	27.0 EL	1.50	15.0	10.00
F074	13.	26.00	40.	19.00	28. VL	3.00	15.	10.00
F094	14.1	33.00	43.4 EH	33.00	33.8	30.00	16.4	33.00
F107	12.48	15.00	38.47	5.00	31.89	12.00	15.02	13.00
F109	11.22	2.00	35.4 EL	1.00	29.8 L	5.00	14.04	4.00
F110	12.8	21.50	40.4	26.00	32.8	23.50	15.2	15.00
F112	12.80	21.50	40.00	19.00	32.80	23.50	15.60	24.00
F113	12.44	14.00	39.43	10.00	33.21	27.00	15.41	21.00
F115	12.4	11.50	40.5	27.00	32.6	21.00	15.5	22.00
F116	12.6	17.00	40.3	23.50	32.3	17.00	15.7	27.50
F122	12.4	11.50	39.5	11.00	30.9	7.00	15.3	18.50
F131	13.5	32.00	42.2	32.00	34.8 H	32.00	16.3	32.00
F133	12.6	17.00	39.9	16.50	32.5	19.00	15.6	24.00
F145	13.3	31.00	40.3	23.50	31.2	10.00	15.7	27.50
MEDIAN	12.6000		39.9000		32.3000		15.3000	
1CRIT	1.5980		2.4170		2.1890		1.6790	
N	31		31		30		32	
MEAN	12.5297		39.7703		32.0990		15.1444	
3STDEV	1.6190		3.2120		4.3582		1.7872	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING				BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	164.00	16.400	10								Flow cell
F003	223.50	22.350	10								probe
F004	223.50	22.350	10								02041
F007	245.00	24.500	10								
F009	203.00	20.300	10								meter
F010	127.00	12.700	10								Conduct.meter
F014	225.00	22.500	10			EH					
F014p	47.00	4.700	10		EL			BIASED LOW*	-2.61	-0.6816	
F015	39.50	3.950	10	EL		EL		BIASED LOW	-11.33	0.5821	
F020	156.00	15.600	10								Radiometer
F025	300.00	30.000	10	H		VH		BIASED HIGH	6.50	-0.2890	Cond Meter
F026	241.00	24.100	10								CELL
F032	73.00	7.300	10	.	EL			BIASED LOW*	1.25	-1.2004	Electrode
F036	81.50	8.150	10								Electrode
F037	197.00	19.700	10								V.W.R.
F042	107.00	10.700	10								Cond. meter
F053	141.50	14.150	10								bridge and cell
F060	136.00	13.600	10								Conductance Meter
F071	45.00	4.500	10	L ELL	ELVL			BIASED LOW	-7.99	0.0178	Conductance meter
F072	72.00	7.200	10	L	EL			BIASED LOW	-7.02	0.3626	meter
F074	178.50	17.850	10		VL						Auto electrode
F094	324.00	32.400	10	H H H EHEH	EH			BIASED HIGH	6.42	0.5558	Conductivity Meter
F107	111.00	11.100	10								ELECTROPO
F109	27.50	2.750	10	L ELELL	ELL			BIASED LOW	-14.55	0.8130	meter
F110	216.00	21.600	10								YSI Meter 25C
F112	218.00	21.800	10								YSI METER
F113	155.00	15.500	10								meter - YSI 3200
F115	195.00	19.500	10								pipet cell; YSI
F116	246.00	24.600	10								YSI Model 32
F122	133.50	13.350	10								meter
F131	315.50	31.550	10	H H	H			BIASED HIGH	7.48	-0.0473	Conductivity meter
F133	190.50	19.050	10								COND. METER
F145	252.00	25.200	10								Conductivity meter

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   3.00

OVERALL AVERAGE
RANK IS   17.000

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F109	27.50	2.750	10	LELELLELL	BIASED LOW	-14.55	0.8130	meter
F015	39.50	3.950	10	ELEL	BIASED LOW	-11.33	0.5821	
F071	45.00	4.500	10	LELLELVL	BIASED LOW	-7.99	0.0178	Conductance meter
F014p	47.00	4.700	10	EL	BIASED LOW*	-2.61	-0.6816	
F072	72.00	7.200	10	LEL	BIASED LOW	-7.02	0.3626	meter
F032	73.00	7.300	10	EL	BIASED LOW*	1.25	-1.2004	Electrode
F036	81.50	8.150	10					Electrode
F042	107.00	10.700	10					Cond. meter
F107	111.00	11.100	10					ELECTROPO
F010	127.00	12.700	10					Conduct.meter
F122	133.50	13.350	10					meter
F060	136.00	13.600	10					Conductance Meter
F053	141.50	14.150	10					bridge and cell
F113	155.00	15.500	10					meter - YSI 3200
F020	156.00	15.600	10					Radiometer
F002	164.00	16.400	10					Flow cell
F074	178.50	17.850	10	VL				Auto electrode
F133	190.50	19.050	10					COND. METER
F115	195.00	19.500	10					pipet cell; YSI
F037	197.00	19.700	10					V.W.R.
F009	203.00	20.300	10					meter
F110	216.00	21.600	10					YSI Meter 25C
F112	218.00	21.800	10					YSI METER
F003	223.50	22.350	10					probe
F004	223.50	22.350	10					02041
F014	225.00	22.500	10	EH				
F026	241.00	24.100	10					CELL
F007	245.00	24.500	10					
F116	246.00	24.600	10					YSI Model 32
F145	252.00	25.200	10					Conductivity meter
F025	300.00	30.000	10	HVH	BIASED HIGH	6.50	-0.2890	Cond Meter
F131	315.50	31.550	10	HHH	BIASED HIGH	7.48	-0.0473	Conductivity meter
F094	324.00	32.400	10	HHHEHEHEH	BIASED HIGH	6.42	0.5558	Conductivity Meter

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
        PERCENT SLOPE USED FOR CAUTION COMPARISON=   3.00

OVERALL AVERAGE
RANK IS   17.000

Specific Conductance

PARAMETER: 00292 Colour   Hazen Unit

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 3.0000   BASIC ACCEPTABLE ERROR= 3.0000   CONCENTRATION ERROR INCREMENT= 0.1500

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F002	5.0 L	1.50	<5.0	0.00	5.0	5.00	<5.0	0.00	<5.0	0.00	<5.0	0.00
F003	10.0	8.00	.1.6	5.50	6.0	8.00	2.1	3.50	<0.5	0.00	<0.5	0.00
F007	12.	11.00	<4.	0.00	8.	11.00	<4.	0.00	<4.	0.00	<4.	0.00
F010	6.	3.00	<1.	0.00	3.	2.00	<1.	0.00	<1.	0.00	<1.	0.00
F014	5. L	1.50	0.	1.50	5.	5.00	5.	8.00	0.	1.50	0.	1.50
F032	10.2	10.00	1.	3.00	5.2	7.00	2.	2.00	0.2W	0.00	0.4T	3.00
F036	8.8	5.00	1.6	5.50	4.8	3.00	2.6	5.00	0.6T	3.00	0.6T	4.00
F042	10.	8.00	3.	7.50	7.	10.00	3.	6.00	1.	4.00	2.	5.00
F060	20. VH	14.00	3.	7.50	10. H	12.50	5.	8.00	3.	5.00	3.	6.00
F072	18. VH	13.00	9. EH	10.00	12. VH	14.00	10. EH	10.00	5. H	6.00	10. EH	8.00
F094	10.	8.00	<3.	0.00	5.	5.00	<3.	0.00	<3.	0.00	<3.	0.00
F116	7.5	4.00	0.	1.50	2.5	1.00	0.	1.00	0.	1.50	0.	1.50
F122	8.9	6.00	1.4T	4.00	6.2	9.00	2.1T	3.50	0.1W	0.00	0.3W	0.00
F145	15. H	12.00	5. H	9.00	10. H	12.50	5.	8.00	<5.	0.00	5. H	7.00
MEDIAN	10.0000		1.6000		5.6000		2.8000		0.8000		1.3000	
1CRIT	4.0500		3.0000		3.3900		3.0000		3.0000		3.0000	
N	11		7		12		8		3		5	
MEAN	10.5818		2.3714		6.2667		3.3500		1.5333		2.2000	
3STDEV	9.6669		3.8809		6.1400		3.9402		—		—	

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F002	<5.0	0.00	20.0	4.00	<5.0	0.00	<5.0	0.00
F003	0.8	4.50	20.5	6.00	<0.5	0.00	5.0	7.00
F007	<4.	0.00	27.	12.00	<4.	0.00	6.	11.00
F010	<1.	0.00	15. L	2.00	<1.	0.00	3.	2.00
F014	0.	1.50	10. EL	1.00	0.	2.00	5.	7.00
F032	0.6T	3.00	22.	7.00	0.2W	0.00	4.8	4.00
F036	0.8T	4.50	20.	4.00	0.4T	4.00	4.4	3.00
F042	1.	6.00	25.	9.00	0.	2.00	5.	7.00
F060	3.	7.00	35. EH	14.00	1.	6.00	10. VH	12.00
F072	8. EH	9.00	30. H	13.00	6. EH	7.00	12. EH	13.00
F094	<3.	0.00	25.	9.00	<3.	0.00	5.	7.00
F116	0.	1.50	20.0	4.00	0.	2.00	2.5	1.00
F122	0.5W	0.00	25.3	11.00	0.6T	5.00	5.1	10.00
F145	5. H	8.00	25.	9.00	<5.	0.00	5.	7.00
MEDIAN	0.8000		23.5000		0.4000		5.0000	
1CRIT	3.0000		6.0750		3.0000		3.3000	
N	6		12		6		11	
MEAN	1.8667		22.9000		0.3333		5.3000	
3STDEV	4.8580		11.6325		1.1314		4.9062	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	10.50	3.500	3	L	INSUFFICIENT DATA			AAII
F003	42.50	6.071	7					Spec
F007	45.00	11.250	4		INSUFFICIENT DATA			
F010	9.00	2.250	4	L	INSUFFICIENT DATA			Colorimetry
F014	30.50	3.050	10	L EL	BIASED LOW	-56.68	0.7559	
F032	39.00	4.875	8					Colourimetry
F036	41.00	4.100	10					Colourimetry
F042	64.50	6.450	10					Colorimetric
F060	92.00	9.200	10	VH H EH VH	BIASED HIGH	48.66	1.5992	Visual Comparison
F072	103.00	10.300	10	VHEHVHEHH EHEHH EHEH	BIASED HIGH*	1.10	6.7631	Visual Comp
F094	29.00	7.250	4		INSUFFICIENT DATA			Nephelometric
F116	19.00	1.900	10		BIASED LOW*	-11.16	-1.3517	Color Comparitor
F122	48.50	6.929	7					Spectro. 455nm
F145	72.50	9.062	8	H H H H H				VisuaComparison

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* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
        PERCENT SLOPE USED FOR CAUTION COMPARISON=    25.00
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OVERALL AVERAGE
RANK IS   6.152

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F116	19.00	1.900	10		BIASED LOW*	-11.16	-1.3517	Color Comparitor
F010	9.00	2.250	4	L	INSUFFICIENT DATA			Colorimetry
F014	30.50	3.050	10	LEL	BIASED LOW	-56.68	0.7559	
F002	10.50	3.500	3	L	INSUFFICIENT DATA			AAII
F036	41.00	4.100	10					Colourimetry
F032	39.00	4.875	8					Colourimetry
F003	42.50	6.071	7					Spec
F042	64.50	6.450	10					Colorimetric
F122	48.50	6.929	7					Spectro. 455nm
F094	29.00	7.250	4		INSUFFICIENT DATA			Nephelometric
F145	72.50	9.062	8	HHHHH				VisuaComparison
F060	92.00	9.200	10	VHHEHVH	BIASED HIGH	48.66	1.5992	Visual Comparison
F072	103.00	10.300	10	VHEHVHEHHEHEHHEHEH	BIASED HIGH*	1.10	6.7631	Visual Comp
F007	45.00	11.250	4		INSUFFICIENT DATA			

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* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
        PERCENT SLOPE USED FOR CAUTION COMPARISON=    25.00
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OVERALL AVERAGE
RANK IS   6.152

Colour

PARAMETER: 01092 pH   pH Units   NATIONAL WATER RESEARCH INSTITUTE
                                                                                         ENVIRONMENT CANADA
                                                                                         BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.5000   BASIC ACCEPTABLE ERROR= 0.2000   CONCENTRATION ERROR INCREMENT= 0.0000

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F002	5.28	7.00	4.48	14.50	6.67 VL	5.00	5.39	4.50	6.46 L	6.00	5.36	5.50
F003	5.38	17.50	4.52	22.50	7.05	21.00	5.54	20.50	6.79	24.50	5.53	21.00
F007	5.38	17.50	4.46	8.50	7.18	28.00	5.5	16.00	6.85	27.00	5.51	19.50
F009	5.42	21.50	4.34	4.00	6.88	10.00	5.45	10.50	6.52	9.00	5.37	7.00
F010	5.19	3.00	4.42	5.00	7.01	18.00	5.41	6.50	6.68	15.00	5.33	4.00
F014	5.34	13.00	4.50	19.00	7.20	30.00	5.50	16.00	6.73	20.00	5.40	9.00
F014p	5.42	21.50	4.53	24.50	7.18	28.00	5.54	20.50	6.87	29.00	5.55	23.50
F015	5.57	31.00	4.84 EH	33.00	6.97	14.00	5.85 VH	31.00	6.69	16.00	5.76 H	31.00
F017	5.29	8.00	4.49	17.00		0.00	5.43	8.00		0.00	5.44	14.00
F020	5.25	5.00	4.45	7.00	6.76 L	8.00	5.38	3.00	6.45 L	5.00	5.36	5.50
F025	4.63 EL	1.00	4.14 EL	2.00	5.92 EL	1.00	5.15 VL	2.00	5.76 EL	1.00	4.85 EL	1.00
F026	5.32	10.50	4.5	19.00	7.05	21.00	5.61	24.00	6.72	19.00	5.59	25.00
F032	5.42	21.50	4.48	14.50	7.18	28.00	5.63	25.50	6.94 H	30.00	5.61	26.50
F036	5.33	12.00	4.47	10.50	6.88	10.00	5.46	12.00	6.63	13.50	5.47	17.00
F037	5.59 H	32.00	4.62	29.50	6.98	15.00	5.74 H	30.00	6.76	21.50	5.75 H	30.00
F042	5.42	21.50	4.58	28.00	6.88	10.00	5.67	28.00	6.56	12.00	5.38	8.00
F053	5.35	14.50	4.51	21.00	7.13	25.00	5.51	18.00	6.83	26.00	5.49	18.00
F060	5.64 H	33.00	4.62	29.50	7.03	19.00	5.59	23.00	6.63	13.50	5.43	12.00
F071	5.55	30.00	4.52	22.50	6.92	12.00	5.66	27.00	6.52	9.00	5.41	10.00
F072	5.50	27.50	4.43	6.00	7.41 VH	31.00	6.07 EH	33.00	7.34 EH	32.00	5.80 VH	32.00
F074	5.49	26.00	4.69 H	32.00	7.45 VH	32.00	6.06 EH	32.00	7.09 VH	31.00	5.82 VH	33.00
F094	5.2	4.00	4.2 L	3.00	6.5 VL	3.00	5.5	16.00	6.4 L	4.00	5.3	3.00
F107	5.35	14.50	4.47	10.50	6.73 L	7.00	5.53	19.00	6.52	9.00	5.51	19.50
F109	5.408	19.00	4.562	27.00	6.961	13.00	5.445	9.00	6.544	11.00	5.546	22.00
F110	5.31	9.00	4.48	14.50	6.29 VL	2.00	5.39	4.50	6.18 VL	3.00	5.61	26.50
F112	5.442	25.00	4.472	12.00	7.103	24.00	5.487	13.00	6.706	18.00	5.469	16.00
F113	5.5	27.50	4.53	24.50	7.06	23.00	5.63	25.50	6.86	28.00	5.63	28.00
F115	5.36	16.00	4.48	14.50	7.00	16.50	5.49	14.00	6.76	21.50	5.45	15.00
F116	5.32	10.50	4.46	8.50	7.05	21.00	5.45	10.50	6.70	17.00	5.43	12.00
F122	5.43	24.00	4.54	26.00	7.14	26.00	5.69	29.00	6.78	23.00	5.64	29.00
F131	5.26	6.00	4.50	19.00	6.72 L	6.00	5.41	6.50	6.48 L	7.00	5.43	12.00
F133	5.52	29.00	4.63	31.00	7.00	16.50	5.57	22.00	6.79	24.50	5.55	23.50
F145	4.93 EL	2.00	4.11 EL	1.00	6.6 VL	4.00	5.06 VL	1.00	6.03 VL	2.00	4.9 EL	2.00
MEDIAN	5.3800		4.4900		7.0000		5.5000		6.6950		5.4700	
1CRIT	0.2000		0.2000		0.2000		0.2000		0.2000		0.2000	
N	31		31		30		31		30		31	
MEAN	5.3716		4.4863		6.9505		5.5375		6.6490		5.4840	
3STDEV	0.3884		0.3219		0.6875		0.4806		0.6448		0.4906	

PARAMETER: 01092 pH   pH Units

	7 = RAINGR-11		8 = MERSEY-MX		9 = PHA-08		10 = COBRIEL-MX	
SAMPLE	REPORTED		REPORTED		REPORTED		REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F002	6.24	6.00	6.4 L	4.00	4.34	13.00	5.28	7.00
F003	6.43	17.50	6.66	15.00	4.35	16.50	5.36	16.50
F007	6.55	28.00	6.8	27.00	4.33	11.00	5.4	22.50
F009	6.3	11.50	6.56	10.00	4.28	5.00	5.34	13.50
F010	6.32	13.00	6.60	12.00	4.31	7.00	5.26	4.50
F014	6.47	23.00	6.74	22.50	4.36	21.50	5.35	15.00
F014p	6.59	29.00	6.87	30.00	4.38	25.00	5.49	28.50
F015	6.51	25.00	6.70	19.00	4.43	29.50	5.74 EH	32.00
F017		0.00		0.00	4.39	27.00	5.36	16.50
F020	6.21 L	4.50	6.41 L	5.00	4.27	3.50	5.26	4.50
F025	5.51 EL	1.00	5.54 EL	1.00	4.18	2.00	5.02 EL	1.00
F026	6.44	19.50	6.78	26.00	4.37	24.00	5.40	22.50
F032	6.65 H	30.00	6.85	29.00	4.36	21.50	5.46	27.00
F036	6.35	14.00	6.57	11.00	4.35	16.50	5.43	25.00
F037	6.46	21.00	6.64	13.00	4.49	32.00	5.61 H	30.00
F042	6.26	8.00	6.48	6.50	4.43	29.50	5.33	11.00
F053	6.52	26.50	6.77	25.00	4.36	21.50	5.38	18.00
F060	6.30	11.50	6.73	21.00	4.35	16.50	5.29	8.00
F071	6.28	9.00	6.65	14.00	4.39	27.00	5.33	11.00
F072	7.44 EH	32.00	7.08 VH	31.00	4.27	3.50	5.88 EH	33.00
F074	6.82 VH	31.00	7.1 VH	32.00	4.52 EH	33.00	5.65 H	31.00
F094	6.1 VL	3.00	6.3 VL	3.00	4.1 EL	1.00	5.2	2.00
F107	6.29	10.00	6.54	9.00	4.33	11.00	5.39	19.00
F109	6.469	22.00	6.702	20.00	4.437	31.00	5.398	21.00
F110	6.00 VL	2.00	6.20 VL	2.00	4.31	7.00	5.27	6.00
F112	6.422	16.00	6.687	18.00	4.350	16.50	5.391	20.00
F113	6.49	24.00	6.82	28.00	4.36	21.50	5.44	26.00
F115	6.43	17.50	6.67	16.50	4.33	11.00	5.34	13.50
F116	6.38	15.00	6.67	16.50	4.32	9.00	5.33	11.00
F122	6.52	26.50	6.75	24.00	4.39	27.00	5.49	28.50
F131	6.25	7.00	6.48	6.50	4.35	16.50	5.31	9.00
F133	6.44	19.50	6.74	22.50	4.35	16.50	5.42	24.00
F145	6.21 L	4.50	6.53	8.00	4.31	7.00	5.25	3.00
MEDIAN	6.4260		6.6700		4.3500		5.3600	
1CRIT	0.2000		0.2000		0.2000		0.2000	
N	30		30		31		31	
MEAN	6.3900		6.6460		4.3493		5.3855	
3STDEV	0.4924		0.5315		0.1703		0.3490	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	72.50	7.250	10	VL L L	BIASED LOW	-11.36	0.5073	ph Meter
F003	192.50	19.250	10					pH Electrode
F007	205.00	20.500	10					
F009	102.00	10.200	10					Stirred
F010	88.00	8.800	10					Strirred electrode
F014	189.00	18.900	10					
F014p	259.50	25.950	10		BIASED HIGH	6.62	-0.2718	
F015	261.50	26.150	10	EH VH H EH	BIASED HIGH	-11.26	0.8175	Auto pH meter
F017	90.50	15.083	6					Electrometric
F020	51.00	5.100	10	L L L L	BIASED LOW	-8.16	0.3137	pH meter
F025	13.00	1.300	10	ELELELVLELELELEL EL	BIASED LOW	-34.24	1.2990	pH Meter
F026	210.50	21.050	10					ELECTRODE
F032	253.50	25.350	10	H H				Unstirred
F036	141.50	14.150	10					Unstirred
F037	254.00	25.400	10	H H H H				ACCUMET
F042	162.50	16.250	10					unstirred
F053	213.50	21.350	10					unstirred
F060	187.00	18.700	10	H				pH Meter
F071	171.50	17.150	10					Ionanalyzer
F072	261.00	26.100	10	VHEHEHVHEHVH EH	BIASED HIGH	25.24	-1.0592	stirred
F074	313.00	31.300	10	H VHEHVHVHVHVHEHH	BIASED HIGH	9.94	-0.2353	Auto - stirred
F094	42.00	4.200	10	L VL L VLVLEL	BIASED LOW	-7.93	0.2004	pH Meter
F107	128.50	12.850	10	L				ELECTROPO
F109	195.00	19.500	10					unstirred- auto
F110	76.50	7.650	10	VL VL VLVL	BIASED LOW	-26.03	1.2626	meter
F112	178.50	17.850	10					STIRRED
F113	256.00	25.600	10					unstirred
F115	156.00	15.600	10					unstirred; open
F116	131.00	13.100	10					Electrode
F122	263.00	26.300	10		BIASED HIGH*	1.62	0.0098	stirred
F131	95.50	9.550	10	L L				Stirred
F133	229.00	22.900	10					ELECTRODE
F145	34.50	3.450	10	ELELVLVLVLELL	BIASED LOW	-5.74	-0.0121	Electrometric

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS.
     PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   16.804

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F025	13.00	1.300	10	ELELELVLELELELELEL	BIASED LOW	-34.24	1.2990	pH Meter
F145	34.50	3.450	10	ELELVLVLVLELL	BIASED LOW	-5.74	-0.0121	Electrometric
F094	42.00	4.200	10	LVLLVLVLEL	BIASED LOW	-7.93	0.2004	pH Meter
F020	51.00	5.100	10	LLLL	BIASED LOW	-8.16	0.3137	pH meter
F002	72.50	7.250	10	VLLL	BIASED LOW	-11.36	0.5073	ph Meter
F110	76.50	7.650	10	VLVLVLVL	BIASED LOW	-26.03	1.2626	meter
F010	88.00	8.800	10					Strirred electrode
F131	95.50	9.550	10	LL				Stirred
F009	102.00	10.200	10					Stirred
F107	128.50	12.850	10	L				ELECTROPO
F116	131.00	13.100	10					Electrode
F036	141.50	14.150	10					Unstirred
F017	90.50	15.083	6					Electrometric
F115	156.00	15.600	10					unstirred; open
F042	162.50	16.250	10					unstirred
F071	171.50	17.150	10					Ionanalyzer
F112	178.50	17.850	10					STIRRED
F060	187.00	18.700	10	H				pH Meter
F014	189.00	18.900	10					
F003	192.50	19.250	10					pH Electrode
F109	195.00	19.500	10					unstirred- auto
F007	205.00	20.500	10					
F026	210.50	21.050	10					ELECTRODE
F053	213.50	21.350	10					unstirred
F133	229.00	22.900	10					ELECTRODE
F032	253.50	25.350	10	HH				Unstirred
F037	254.00	25.400	10	HHHH				ACCUMET
F113	256.00	25.600	10					unstirred
F014p	259.50	25.950	10		BIASED HIGH	6.62	-0.2718	
F072	261.00	26.100	10	VHEHEHVHEHVHEH	BIASED HIGH	25.24	-1.0592	stirred
F015	261.50	26.150	10	EHVHHEH	BIASED HIGH	-11.26	0.8175	Auto pH meter
F122	263.00	26.300	10		BIASED HIGH*	1.62	0.0098	stirred
F074	313.00	31.300	10	HVHEHVHVHVHVHEHH	BIASED HIGH	9.94	-0.2353	Auto - stirred

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   16.804

pH

PARAMETER: 01090 Acidity to pH 8.3   mg/L CaCO3

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000   BASIC ACCEPTABLE ERROR= 0.6000   CONCENTRATION ERROR INCREMENT= 0.1000

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F014	2.22 VL	1.00	2.52 VL	1.00	0.793	2.00	1.09 L	1.00	0.604 VL	2.00	1.01 L	1.00
F014p	2.65 VL	2.00	2.85 L	2.00	0.997	4.00	1.21 L	3.00	0.856 L	3.00	1.14	3.00
F015	4.	4.00	9. VH	8.00	1.2	5.00	2.	4.50	1.5	4.00	1.4	4.00
F020	8.08 EH	8.00	7.91 VH	7.00	0.79	1.00	2.65	8.00	4.13 EH	8.00	2.99 VH	7.00
F032	2.7 L	3.00	2.95 L	3.00	0.8	3.00	1.1 L	2.00	0.5 VL	1.00	1.1	2.00
F072	4.1	5.00	4.5	6.00	2.4 VH	7.00	2.6	7.00	1.8	6.00	2.4	6.00
F133	4.6	6.00	4.2	5.00	2.3 VH	6.00	2.3	6.00	1.7	5.00	2.1	5.00
F145	5. H	7.00	4.	4.00	2.8 VH	8.00	2.	4.50	2.	7.00	3. VH	8.00
MEDIAN	4.0500		4.1000		1.0985		2.0000		1.6000		1.7500	
1CRIT	0.9050		0.9100		0.6099		0.7000		0.6600		0.6750	
N	6		6		6		6		6		6	
MEAN	3.8417		4.4017		1.4150		1.8683		1.4100		1.8550	
3STDEV	2.6642		5.0550		2.0271		1.6341		1.5243		2.0977	

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F014	0.637 VL	2.00	0.826 L	1.00	3.06 L	2.00	1.10 L	1.00
F014p	0.833 VL	3.00	1.37	3.00	3.05 L	1.00	1.42	2.00
F015	1.8	4.00	1.4	4.00	7. VH	8.00	2.	4.50
F020	5.39 EH	8.00	3.38 VH	8.00	6.15 VH	7.00	2.92 H	8.00
F032	0.5 VL	1.00	1.2	2.00	3.1 L	3.00	1.45	3.00
F072	2.2	6.50	3.2 VH	7.00	4.9	5.00	2.6	7.00
F133	2.1	5.00	2.5 H	6.00	5.3	6.00	2.3	6.00
F145	2.2	6.50	2.	5.00	4.	4.00	2.	4.50
MEDIAN	1.9500		1.7000		4.4500		2.0000	
1CRIT	0.6950		0.6700		0.9450		0.7000	
N	6		6		6		6	
MEAN	1.6283		1.9450		4.4183		1.9617	
3STDEV	1.9445		2.1455		3.4131		1.2728	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F014	14.00	1.400	10	VLVL L VLL VLL L L				
F014p	26.00	2.600	10	VLL L L VL L				
F015	50.00	5.000	10	VH VH				
F020	70.00	7.000	10	EHVH EHVHEHVHVHH				Grain electron
F032	23.00	2.300	10	L L L VL VL L				Titration
F072	62.50	6.250	10	VH VH				Titrn
F133	56.00	5.600	10	VH H				TITRIMETRIC
F145	58.50	5.850	10	H VH VH				Titrimetric

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   4.500

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F014	14.00	1.400	10	VLVLLVLLVLLLL				
F032	23.00	2.300	10	LLLVLVLL				Titration
F014p	26.00	2.600	10	VLLLLVLL				
F015	50.00	5.000	10	VHVH				
F133	56.00	5.600	10	VHH				TITRIMETRIC
F145	58.50	5.850	10	HVHVH				Titrimetric
F072	62.50	6.250	10	VHVH				Titrn
F020	70.00	7.000	10	EHVHEHVHEHVHVHH				Grain electron

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   4.500

Acidity to pH 8.3

PARAMETER: 06193 Alkalinity Fixed End mg/L

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000   BASIC ACCEPTABLE ERROR= 0.5000   CONCENTRATION ERROR INCREMENT= 0.0500

| SAMPLE | 1 = BMOOS-01 | | 2 = RAIN-97 | | 3 = TRKY-94 | | 4 = BESKI-01 | | 5 = SUPER-04 | | 6 = RAINGR-16 | |
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F007	1.6	1.50	<0.4	0.00	8.6	6.00	1.5	3.00	4.4	5.50	1.5	4.00
F014	2.02	5.00	0.00	1.00	8.83	7.00	2.03	8.00	4.72	7.00	1.98	8.00
F014p	2.17	6.00	0.239	2.00	9.17	9.00	1.90	7.00	4.91	9.00	1.94	7.00
F015	<0.5 EL	0.00	<0.5	0.00	7.4 L	1.00	<0.5 EL	0.00	3.0 VL	2.00	<0.5 EL	0.00
F025	<0.5 EL	0.00	<0.5	0.00	8.29	5.00	0.62 EL	1.00	3.71 L	4.00	0.62 EL	1.00
F032	1.6	1.50	0.2W	0.00	9.	8.00	1.6	4.00	4.4	5.50	1.4	3.00
F036	1.8	4.00		0.00	9.2	10.00	1.75	6.00	4.8	8.00	1.7	6.00
F060	3. EH	7.00	<1.	0.00	8.	2.50	3. EH	9.00	5.	10.00	1. L	2.00
F094	<1. VL	0.00	<1.	0.00	8.	2.50	<1. L	0.00	3. VL	2.00	<1. L	0.00
F107	1.65	3.00	0.W	0.00	11.32 EH	11.00	1.65	5.00	6.74 EH	11.00	1.56	5.00
F145	<1. VL	0.00	<1.	0.00	8.2	4.00	1. L	2.00	3. VL	2.00	<1. L	0.00
MEDIAN OR *TARGET												
CONC.	1.8000		*0.0000		8.6000		1.6500		4.4000		1.5300	
1CRIT	0.5150		0.5000		0.8550		0.5075		0.6450		0.5015	
N	4		2		9		7		10		6	
MEAN	1.9100		0.1195		8.5878		1.6329		4.0940		1.5167	
3STDEV	-		-		1.3684		0.9228		2.3816		0.8621	

| SAMPLE | 7 = RAINGR-11 | | 8 = MERSEY-MX | | 9 = PHA-08 | | 10 = COBRIEL-MX | |
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F007	3.	5.50	5.1	7.00	<0.4	0.00	1.5	4.00
F014	3.52	11.00	5.28	8.00	0.00	1.50	1.96	8.00
F014p	3.47	10.00	5.61	10.00	0.00	1.50	1.91	7.00
F015	1.6 VL	1.00	3.6 VL	1.00	<0.5	0.00	<0.5 EL	0.00
F025	2.10 VL	3.00	4.33	4.00	<0.5	0.00	1.24	2.00
F032	3.	5.50	4.8	5.00	0.2W	0.00	1.4	3.00
F036	3.2	8.00	5.3	9.00		0.00	1.75	6.00
F060	3.	5.50	5.	6.00	<1.	0.00	2.	9.00
F094	2. VL	2.00	4. L	2.50	<1.	0.00	<1. L	0.00
F107	3.40	9.00	6.94 EH	11.00	0.W	0.00	1.56	5.00
F145	3.	5.50	4. L	2.50	<1.	0.00	1. L	1.00
MEDIAN OR *TARGET								
CONC.	3.0000		5.0000		*0.0000		1.5600	
1CRIT	0.5750		0.6750		0.5000		0.5030	
N	9		9		2		7	
MEAN	2.9078		4.8244		-		1.6171	
3STDEV	1.4678		1.6619		-		0.7412	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F007	36.50	4.562	8					
F014	64.50	6.450	10					
F014p	68.50	6.850	10					
F015	5.00	1.250	4	EL L ELVLELVLVL EL				
F025	20.00	2.857	7	EL ELL ELVL				
F032	35.50	4.438	8					Titration
F036	57.00	7.125	8					Titration
F060	51.00	6.375	8	EH EH L				Potentio Titrn
F094	9.00	2.250	4	VL L VLL VLL L				Autotitrator
F107	60.00	7.500	8	EH EH EH				ELECTROPO
F145	17.00	2.833	6	VL L VLL L L				Titrimetric

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   5.235

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F015	5.00	1.250	4	ELLELVLELVLVLEL				
F094	9.00	2.250	4	VLLVLLVLLL				Autotitrator
F145	17.00	2.833	6	VLLVLLLL				Titrimetric
F025	20.00	2.857	7	ELELLELVL				
F032	35.50	4.438	8					Titration
F007	36.50	4.562	8					
F060	51.00	6.375	8	EHEHL				Potentio Titrn
F014	64.50	6.450	10					
F014p	68.50	6.850	10					
F036	57.00	7.125	8					Titration
F107	60.00	7.500	8	EHEHEH				ELECTROPO

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   5.235

Alkalinity Fixed End Pt pH 4.5

PARAMETER: 06194 Alkalinity Gran Infl mg/L

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.5000   BASIC ACCEPTABLE ERROR= 0.3500   CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE	1 = BMOOS-01 REPORTED		2 = RAIN-97 REPORTED		3 = TRKY-94 REPORTED		4 = BESKI-01 REPORTED		5 = SUPER-04 REPORTED		6 = RAINGR-16 REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F003		0.00		0.00	7.6	7.00		0.00		0.00		0.00
F007	0.1	2.50	-1.68	4.00	7.15	1.00	0.07	3.00	2.94	1.00	0.	2.00
F010	0.1	2.50	<0.1	0.00	7.5	6.00	<0.1	0.00	3.2	5.50	<0.1	0.00
F020	<0.5	0.00	<0.5	0.00	9.03 EH	8.00	<0.5	0.00	3.60 H	7.00	<0.5	0.00
F026	0.2150	6.00	-1.720	2.00	7.185	2.00	-0.015	1.00	3.00	2.00	-0.0750	1.00
F036	0.13	4.00	-1.69	3.00	7.36	4.00	0.006	2.00	3.11	4.00	0.02	3.00
F074	0.0	1.00	-2.0	1.00	7.4	5.00	0.7 VH	5.00	3.2	5.50	0.4 H	5.00
F122	0.145	5.00	-1.61	5.00	7.28	3.00	0.085	4.00	3.08	3.00	0.166	4.00
MEDIAN OR *TARGET												
CONC.	0.1150		-1.6900		7.3800		0.0700		3.1100		*0.0200	
1CRIT	0.3500		0.3500		0.6440		0.3500		0.4305		0.3500	
N	4		3		6		3		5		3	
MEAN	0.1187		-1.6967		7.3875		0.0537		3.1180		0.0620	
3STDEV	-		-		0.4087		-		-		-	

SAMPLE	7 = RAINGR-11 REPORTED		8 = MERSEY-MX REPORTED		9 = PHA-08 REPORTED		10 = COBRIEL-MX REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F003		0.00	3.20	3.00		0.00		0.00
F007	1.51	2.00	3.48	4.00	-2.34	2.00	-0.04	2.00
F010	1.6	5.00	3.6	6.00	<0.1	0.00	<0.1	0.00
F020	2.86 EH	7.00	3.13	2.00	<0.5	0.00	<0.5	0.00
F026	1.130 L	1.00	2.725 VL	1.00	-2.25	4.00	-0.12	1.00
F036	1.57	3.00	3.52	5.00	-2.31	3.00	0.07	4.00
F074	2.0 H	6.00	3.9	7.00	-2.4	1.00	0.4	5.00
F122	1.59	4.00	4.84 EH	8.00		0.00	0.069	3.00
MEDIAN OR *TARGET								
CONC.	1.5900		3.5000		*-2.3300		0.0690	
1CRIT	0.3545		0.4500		0.3500		0.3500	
N	5		6		2		3	
MEAN	1.6540		3.4717		-2.3250		0.0330	
3STDEV	-		0.7677		-		-	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	10.00	5.000	2					titration
F007	23.50	2.350	10					
F010	25.00	5.000	5					Titrn - Cond.
F020	24.00	6.000	4	EH H EH				Grain electron
F026	21.00	2.100	10	L VL				TITRO
F036	35.00	3.500	10					Titrn
F074	41.50	4.150	10	VH H H				Automated Gran
F122	39.00	4.333	9	EH				pH 4.5/4.2

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   3.650

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F026	21.00	2.100	10	LVL				TITRO
F007	23.50	2.350	10					
F036	35.00	3.500	10					Titrn
F074	41.50	4.150	10	VHHH				Automated Gran
F122	39.00	4.333	9	EH				pH 4.5/4.2
F010	25.00	5.000	5					Titrn - Cond.
F003	10.00	5.000	2					titration
F020	24.00	6.000	4	EHHEH				Grain electron

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   3.650

Alkalinity Gran Infl Extrap

PARAMETER: 06282 Alkalinity Gran Titn mg/L CaCO3

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000   BASIC ACCEPTABLE ERROR= 0.3500   CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F002	0.1	4.50	-1.8	4.00	7.13	3.00	0.19	11.00	2.88	5.00	0.07	9.00
F003	0.10	4.50	-0.79 EH	12.00		0.00	0.05	5.00	2.80	1.00	0.05	6.00
F014	0.04	2.00	-1.99	2.00	7.35	7.00	-0.27	2.00	2.83	3.00	-0.26 EL	1.00
F014p	0.295	11.00	-1.77	5.00	7.48	10.00	-0.301 L	1.00	3.14	10.00	0.00	3.00
F042	0.125	6.00	-1.65	6.00	7.38	8.00	0.015	4.00	3.00	7.00	0.035	5.00
F074	0.0	1.00	-2.0 L	1.00	7.4	9.00	0.7 EH	12.00	3.2	12.00	0.4 EH	12.00
F110	0.27	10.00	-1.61	8.00	7.52	11.00	0.10	9.00	3.11	9.00	0.16	11.00
F112	0.191	7.00	-1.502	11.00	7.023	2.00	0.134	10.00	2.878	4.00	0.057	7.00
F113	0.313	12.00	-1.818	3.00	7.2375	4.00	-0.011	3.00	2.812	2.00	-0.112	2.00
F115	0.0950	3.00	-1.60	9.00	7.34	6.00	0.0585	6.00	3.18	11.00	0.0925	10.00
F116	0.25	9.00	-1.58	10.00	7.00	1.00	0.09	7.50	2.94	6.00	0.001	4.00
F131	0.22	8.00	-1.63	7.00	7.27	5.00	0.09	7.50	3.03	8.00	0.06	8.00
MEDIAN	0.1580		-1.6400		7.3400		0.0742		2.9700		0.0535	
1CRIT	0.3500		0.3500		0.6670		0.3500		0.4485		0.3500	
N	10		10		9		10		10		10	
MEAN	0.1686		-1.6950		7.2901		0.0446		2.9800		0.0413	
3STDEV	0.2497		0.4155		0.4029		0.3543		0.3772		0.2014	

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F002	1.46	3.50	3.85	10.00	-2.45	2.00	0.08	9.00
F003	1.9 H	11.00		0.00	-2.34	6.00	0.003	3.00
F014	1.28	1.00	3.51	3.00	-2.74 EL	1.00	-0.23	2.00
F014p	1.47	5.50	3.58	4.00	-2.09 EH	12.00	0.134	11.00
F042	1.51	7.00	3.60	6.50	-2.35	5.00	0.01	5.00
F074	2.0 EH	12.00	3.9	11.00	-2.4	4.00	0.4 EH	12.00
F110	1.59	10.00	3.77	9.00	-2.33	8.00	0.10	10.00
F112	1.368	2.00	3.636	8.00	-2.332	7.00	0.019	6.00
F113	1.567	9.00	3.5985	5.00	-2.4205	3.00	-0.368 EL	1.00
F115	1.47	5.50	3.38	1.00	-2.18	11.00	0.0585	8.00
F116	1.46	3.50	3.60	6.50	-2.28	9.00	0.009	4.00
F131	1.52	8.00	3.48	2.00	-2.23	10.00	0.03	7.00
MEDIAN	1.4900		3.6000		-2.3360		0.0245	
1CRIT	0.3745		0.4800		0.3500		0.3500	
N	10		9		10		10	
MEAN	1.5315		3.6249		-2.3313		0.0214	
3STDEV	0.4087		0.3317		0.2380		0.2807	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	61.00	6.100	10					titration
F003	48.50	6.062	8	EH H				
F014	24.00	2.400	10	EL EL	BIASED LOW	4.25	-0.2713	
F014p	72.50	7.250	10	L EH				ANC GRAN PLOT
F042	59.50	5.950	10					Automated Gran
F074	86.00	8.600	10	L EH EHEH EH				Gran
F110	95.00	9.500	10		BIASED HIGH*	1.87	0.0726	TITRATION
F112	64.00	6.400	10					Gran titration
F113	44.00	4.400	10	EL				2 point titr.
F115	70.50	7.050	10					Manual Titration
F116	60.50	6.050	10					7 pt. Potential
F131	70.50	7.050	10					

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
       PERCENT SLOPE USED FOR CAUTION COMPARISON=   3.00

OVERALL AVERAGE
RANK IS   6.407

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F014	24.00	2.400	10	ELEL	BIASED LOW	4.25	-0.2713	
F113	44.00	4.400	10	EL				Gran titration
F042	59.50	5.950	10					ANC GRAN PLOT
F116	60.50	6.050	10					Manual Titration
F003	48.50	6.062	8	EHH				
F002	61.00	6.100	10					titration
F112	64.00	6.400	10					TITRATION
F115	70.50	7.050	10					2 point titr.
F131	70.50	7.050	10					7 pt. Potential
F014p	72.50	7.250	10	LEH				
F074	86.00	8.600	10	LEHEHEHEH				Automated Gran
F110	95.00	9.500	10		BIASED HIGH*	1.87	0.0726	Gran

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
       PERCENT SLOPE USED FOR CAUTION COMPARISON=   3.00

OVERALL AVERAGE
RANK IS   6.407

Alkalinity Gran Titn

PARAMETER: 06002 Diss Organic Carbon mg/L C

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000   BASIC ACCEPTABLE ERROR= 0.5000   CONCENTRATION ERROR INCREMENT= 0.0750

SAMPLE	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
LAB NO												
F002	3.7	16.50	0.6	4.00	1.8	15.00	0.6 EL	1.50	<0.5	0.00	<0.5	0.00
F003	3.1	1.50	0.6	4.00	1.5	6.00	0.8	4.00	<0.1	0.00	<0.1	0.00
F007	3.31	4.00	0.66	6.00	1.48	5.00	0.84	6.50	<0.30	0.00	<0.30	0.00
F010	3.4	7.00	0.6	4.00	1.4	2.00	0.8	4.00	<0.2	0.00	<0.2	0.00
F014	3.7	16.50	<1.0	0.00	1.6	9.50	<1.0	0.00	<1.0	0.00	<1.0	0.00
F015	3.9	19.00	0.9	18.50	2.0	18.50	1.0	16.00	<0.5	0.00	<0.5	0.00
F026	3.407	8.00	0.721	11.00	1.428	4.00	0.868	8.00	0.135	6.00	0.1365	3.00
F032	3.1	1.50	0.5	2.00	1.4	2.00	0.8	4.00	0.1W	0.00	0.1W	0.00
F037	3.6235	14.00	0.7694	13.00	1.7499	13.00	0.9359	13.00	0.1702	8.00	0.2277	9.00
F042	3.30	3.00	0.70	8.00	1.60	9.50	0.90	10.00	0.10	2.50	0.20	7.00
F049	3.35	5.00	0.7	8.00	2.1	20.00	0.95	14.00	0.15	7.00	0.2	7.00
F060	3.8	18.00	0.9	18.50	2.0	18.50	1.1	18.50	<0.5	0.00	<0.5	0.00
F071	3.509	11.00	0.851	17.00	1.794	14.00	1.080	17.00	0.328	11.00	0.397	11.00
F072	3.36	6.00	0.43	1.00	3.05 EH	21.00	0.60 EL	1.50	0.59	12.00	0.48	12.00
F074	3.60	13.00	0.72	10.00	1.56	8.00	0.84	6.50	0.12	5.00	0.06	1.00
F094	3.5	10.00	0.7	8.00	1.4	2.00	0.9	10.00	<0.5	0.00	<0.5	0.00
F107	3.691	15.00	0.800	15.50	1.69	11.00	0.962	15.00	0.W	1.00	0.193	5.00
F112	3.56	12.00	0.77	14.00	1.71	12.00	0.91	12.00	0.11	4.00	0.14	4.00
F113	3.48	9.00	0.75	12.00	1.55	7.00	0.9	10.00	0.18	9.00	0.2	7.00
F116	3.94	20.00	0.95	20.00	1.91	17.00	1.19	20.00	0.30	10.00	0.34	10.00
F131	4.0	21.00	0.8	15.50	1.9	16.00	1.1	18.50	0.1	2.50	0.1	2.00
F145	7.4 EH	22.00	4.3 EH	21.00	5.8 EH	22.00	4.8 EH	21.00	4.4 EH	13.00	4.7 EH	13.00
MEDIAN	3.5345		0.7210		1.7000		0.9000		0.1500		0.2000	
1CRIT	0.6901		0.5000		0.5525		0.5000		0.5000		0.5000	
N	19		19		21		18		11		11	
MEAN	3.5858		0.7364		1.7439		0.9376		0.2076		0.2377	
3STDEV	0.6294		0.3405		1.0801		0.3370		0.4246		0.3380	

PARAMETER: 06002 Diss Organic Carbon mg/L C

	SAMPLE 7 = RAINGR-11		8 = MERSEY-MX		9 = PHA-08		10 = COBRIEL-MX	
	REPORTED		REPORTED		REPORTED		REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F002	<0.5	0.00	2.4	7.50	<0.5	0.00	0.9	2.00
F003	<0.1	0.00	2.3	4.00	0.2	4.00	1.1	7.50
F007	<0.30	0.00	2.4	7.50	<0.30	0.00	1.09	6.00
F010	<0.2	0.00	2.3	4.00	<0.2	0.00	<0.2 EL	0.00
F014	<1.0	0.00	2.5	9.50	<1.0	0.00	1.2	12.00
F015	0.5	13.00	2.7	15.00	<0.5	0.00	1.2	12.00
F026	0.145	3.00	2.253	2.00	0.2855	10.00	1.12	9.00
F032	0.1W	1.00	2.2	1.00	0.1W	0.00	1.	3.50
F037	0.2405	6.00	2.7029	16.00	0.2118	7.00	1.2462	14.00
F042	0.40	12.00	2.30	4.00	0.20	4.00	1.10	7.50
F049	0.25	7.00	2.85	19.00	0.2	4.00	1.25	15.50
F060	<0.5	0.00	2.8	17.00	<0.5	0.00	1.3	17.00
F071	0.369	11.00	2.675	14.00	0.417	12.00	1.332	18.00
F072	<0.40	0.00	<0.40 EL	0.00	3.30 EH	13.00	0.88	1.00
F074	0.12	2.00	2.64	13.00	0.06	1.00	1.20	12.00
F094	<0.5	0.00	2.5	9.50	<0.5	0.00	1.	3.50
F107	0.331	10.00	2.624	12.00	0.200	4.00	1.186	10.00
F112	0.28	8.00	2.60	11.00	0.22	8.00	1.25	15.50
F113	0.21	5.00	2.31	6.00	0.26	9.00	1.08	5.00
F116	0.29	9.00	2.81	18.00	0.33	11.00	1.34	19.00
F131	0.2	4.00	3.2	20.00	0.2	4.00	1.4	20.00
F145	3.3 EH	14.00	5.3 EH	21.00	4.6 EH	14.00	4.5 EH	21.00
MEDIAN	0.2650		2.6000		0.2159		1.2000	
1CRIT	0.5000		0.6200		0.5000		0.5150	
N	12		19		12		19	
MEAN	0.2780		2.5718		0.5020		1.1734	
3STDEV	0.3134		0.7200		2.5383		0.3793	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING		BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	46.50	7.750	6	EL					Shimadzu TOC
F003	31.00	4.429	7			BIASED LOW	-12.16	0.0072	UV - IR
F007	35.00	5.833	6						
F010	21.00	4.200	5		EL	BIASED LOW*	-2.43	-0.1452	Conduct. meter
F014	47.50	11.875	4			INSUFFICIENT DATA			
F015	112.00	16.000	7			BIASED HIGH*	4.37	0.1146	
F026	64.00	6.400	10						AA
F032	15.00	2.143	7			BIASED LOW	-9.80	-0.1072	Colourimetry
F037	113.00	11.300	10						PERSULFATE IR
F042	67.50	6.750	10						IR
F049	106.50	10.650	10						
F060	107.50	17.917	6			BIASED HIGH*	3.13	0.1519	Persulf/UV Color
F071	136.00	13.600	10						TOC analyzer
F072	67.50	8.438	8	EHEL	ELEH				Persulf, UV, OX
F074	71.50	7.150	10						Persulphate IR
F094	43.00	7.167	6						Infrared
F107	98.50	9.850	10						ELECTROPO
F112	100.50	10.050	10						DOHRMAN
F113	79.00	7.900	10						UV-persulfate
F116	154.00	15.400	10			BIASED HIGH	6.84	0.1128	Persulfate-IR
F131	123.50	12.350	10						UV persulfate
F145	182.00	18.200	10	EHEHEHEHEHEHEHEHEH		BIASED HIGH	-18.60	3.9750	Continuous Flow

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F032	15.00	2.143	7		BIASED LOW	-9.80	-0.1072	Colourimetry
F010	21.00	4.200	5	EL	BIASED LOW*	-2.43	-0.1452	Conduct. meter
F003	31.00	4.429	7		BIASED LOW	-12.16	0.0072	UV - IR
F007	35.00	5.833	6					
F026	64.00	6.400	10					AA
F042	67.50	6.750	10					IR
F074	71.50	7.150	10					Persulphate IR
F094	43.00	7.167	6					Infrared
F002	46.50	7.750	6	EL				Shimadzu TOC
F113	79.00	7.900	10					UV-persulfate
F072	67.50	8.438	8	EHELELEH				Persulf, UV, OX
F107	98.50	9.850	10					ELECTROPO
F112	100.50	10.050	10					DOHRMAN
F049	106.50	10.650	10					
F037	113.00	11.300	10					PERSULFATE IR
F014	47.50	11.875	4		INSUFFICIENT DATA			
F131	123.50	12.350	10					UV persulfate
F071	136.00	13.600	10					TOC analyzer
F116	154.00	15.400	10		BIASED HIGH	6.84	0.1128	Persulfate-IR
F015	112.00	16.000	7		BIASED HIGH*	4.37	0.1146	
F060	107.50	17.917	6		BIASED HIGH*	3.13	0.1519	Persulf/UV Color
F145	182.00	18.200	10	EHEHEHEHEHEHEHEHEH	BIASED HIGH	-18.60	3.9750	Continuous Flow

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      * NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
              PERCENT SLOPE USED FOR CAUTION COMPARISON=      5.00
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OVERALL AVERAGE
RANK IS   10.011

Diss Organic Carbon

PARAMETER: 06592 Diss Inorg Carbon   mg/L C

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.5000   BASIC ACCEPTABLE ERROR= 0.3000   CONCENTRATION ERROR INCREMENT= 0.0750

SAMPLE	1 = BMOOS-01 REPORTED		2 = RAIN-97 REPORTED		3 = TRKY-94 REPORTED		4 = BESKI-01 REPORTED		5 = SUPER-04 REPORTED		6 = RAINGR-16 REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F002	0.6	14.00	<0.5	0.00	1.7	3.50	<0.5	0.00	0.7	1.50	<0.5	0.00
F003	0.1	2.00	<0.1	0.00	1.7	3.50	0.1	2.00	0.8	3.50	<0.1	0.00
F007	<0.40	0.00	<0.40	0.00	1.79	6.00	<0.40	0.00	0.82	5.00	<0.40	0.00
F010	0.2	4.00	0.2	3.50	2.0	11.50	0.3	6.00	1.0	12.00	0.2	3.00
F015	<0.5	0.00	<0.5	0.00	2.0	11.50	<0.5	0.00	0.8	3.50	<0.5	0.00
F026	0.295	7.00	0.375	7.00	2.075	15.00	0.36	7.00	0.98	10.00	0.265	5.00
F032	0.2W	0.00	0.2W	0.00	1.6	2.00	0.2W	0.00	1.	12.00	0.2W	0.00
F036	0.46	10.00	0.4	9.50	2.02	13.00	0.54	12.00	1.18	17.00	0.46	10.00
F042	0.50	12.50	0.40	9.50	2.10	16.00	0.40	10.00	1.20	18.00	0.40	9.00
F049	0.25	6.00	0.2	3.50	1.85	9.00	0.2	4.00	0.85	7.00	0.25	4.00
F060	0.5	12.50	<0.5	0.00	1.8	7.50	<0.5	0.00	1.0	12.00	<0.5	0.00
F071	0.408	8.00	0.348	6.00	1.912	10.00	0.393	9.00	1.010	14.00	0.399	8.00
F074	0.12	3.00	0.12	2.00	2.04	14.00	0.12	3.00	0.84	6.00	0.12	2.00
F094	<0.5	0.00	<0.5	0.00	1.3 EL	1.00	<0.5	0.00	0.7	1.50	<0.5	0.00
F107	0.009 L	1.00	0.W	1.00	1.76	5.00	0.038	1.00	0.865	9.00	0.007	1.00
F112	0.41	9.00	0.38	8.00	2.13	17.00	0.37	8.00	1.17	15.50	0.39	7.00
F113	0.23	5.00	0.29	5.00	1.8	7.50	0.27	5.00	0.86	8.00	0.29	6.00
F116	0.48	11.00	0.47	11.00	2.29 H	18.00	0.45	11.00	1.17	15.50	0.50	11.00
F145	<0.5	0.00	<0.5	0.00	<0.5 EL	0.00	<0.5	0.00	<0.5 EL	0.00	<0.5	0.00
MEDIAN	0.3515		0.3480		1.8810		0.3300		0.9225		0.2900	
1CRIT	0.3000		0.3000		0.4036		0.3000		0.3317		0.3000	
N	12		9		16		10		15		9	
MEAN	0.3294		0.3014		1.8923		0.2963		0.9563		0.3082	
3STDEV	0.4253		0.2946		0.4749		0.3457		0.3953		0.3148	

PARAMETER: 06592 Diss Inorg Carbon   mg/L C

SAMPLE	7 = RAINGR-11 REPORTED		8 = MERSEY-MX REPORTED		9 = PHA-08 REPORTED		10 = COBRIEL-MX REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F002	0.6	9.50	0.9	4.00	<0.5	0.00	<0.5	0.00
F003	0.4	2.50	0.9	4.00	<0.1	0.00	<0.1	0.00
F007	0.52	6.00	0.9	4.00	<0.40	0.00	<0.40	0.00
F010	0.6	9.50	1.0	11.50	0.2	5.50	0.3	6.00
F015	<0.5	0.00	1.0	11.50	<0.5	0.00	<0.5	0.00
F026	0.535	7.00	0.96	7.50	0.17	4.00	0.18	3.00
F032	0.4T	2.50	1.	11.50	0.2W	0.00	0.2W	0.00
F036	0.7	12.50	1.18	15.00	0.44	11.00	0.5	11.00
F042	0.80	15.00	1.20	16.00	0.40	10.00	0.40	8.00
F049	0.5	5.00	0.95	6.00	0.15	3.00	0.2	4.00
F060	0.7	12.50	1.0	11.50	<0.5	0.00	<0.5	0.00
F071	0.699	11.00	1.13	14.00	0.336	7.00	0.359	7.00
F074	0.48	4.00	0.96	7.50	0.12	2.00	0.06	2.00
F094	<0.5	0.00	0.7	1.00	<0.5	0.00	<0.5	0.00
F107	0.369	1.00	0.876	2.00	0.W	1.00	0.014	1.00
F112	0.76	14.00	1.27	17.00	0.35	8.00	0.43	9.50
F113	0.57	8.00	0.99	9.00	0.2	5.50	0.26	5.00
F116	0.84	16.00	1.31	18.00	0.39	9.00	0.43	9.50
F145	<0.5	0.00	<0.5 EL	0.00	<0.5	0.00	<0.5	0.00
MEDIAN	0.5850		0.9950		0.2000		0.3000	
1CRIT	0.3064		0.3371		0.3000		0.3000	
N	14		16		9		9	
MEAN	0.5903		1.0135		0.2573		0.2910	
3STDEV	0.3674		0.3441		0.3119		0.3608	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	32.50	6.500	5					Shimadzu TOC
F003	17.50	2.917	6		BIASED LOW*	4.68	-0.2170	IR detection
F007	21.00	5.250	4		INSUFFICIENT DATA			
F010	72.50	7.250	10					Conduct. meter
F015	26.50	8.833	3		INSUFFICIENT DATA			
F026	72.50	7.250	10					AA
F032	28.00	7.000	4		INSUFFICIENT DATA			Colourimetry
F036	121.00	12.100	10		BIASED HIGH*	-0.29	0.1695	Colourimetry
F042	124.00	12.400	10		BIASED HIGH	8.29	0.1083	IR
F049	51.50	5.150	10					
F060	56.00	11.200	5					Automated Color
F071	94.00	9.400	10	.				TOC analyzer .
F074	45.50	4.550	10		BIASED LOW	21.22	-0.2539	IR Detection
F094	3.50	1.167	3	EL	INSUFFICIENT DATA			Infrared
F107	23.00	2.300	10	L	BIASED LOW	13.67	-0.3113	ELECTROPO
F112	113.00	11.300	10					DOHRMAN
F113	64.00	6.400	10					Phosphoric acid
F116	130.00	13.000	10	H	BIASED HIGH	16.63	0.1095	Persulfate-IR
F145	0.00	–	0	EL EL EL	INSUFFICIENT DATA			

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
    PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   7.829

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F145	0.00	–	0	ELELEL	INSUFFICIENT DATA			
F094	3.50	1.167	3	EL	INSUFFICIENT DATA			Infrared
F107	23.00	2.300	10	L	BIASED LOW	13.67	-0.3113	ELECTROPO
F003	17.50	2.917	6		BIASED LOW*	4.68	-0.2170	IR detection
F074	45.50	4.550	10		BIASED LOW	21.22	-0.2539	IR Detection
F049	51.50	5.150	10					
F007	21.00	5.250	4		INSUFFICIENT DATA			
F113	64.00	6.400	10					Phosphoric acid
F002	32.50	6.500	5					Shimadzu TOC
F032	28.00	7.000	4		INSUFFICIENT DATA			Colourimetry
F010	72.50	7.250	10					Conduct. meter
F026	72.50	7.250	10					AA
F015	26.50	8.833	3		INSUFFICIENT DATA			
F071	94.00	9.400	10					TOC analyzer
F060	56.00	11.200	5					Automated Color
F112	113.00	11.300	10					DOHRMAN
F036	121.00	12.100	10		BIASED HIGH*	-0.29	0.1695	Colourimetry
F042	124.00	12.400	10		BIASED HIGH	8.29	0.1083	IR
F116	130.00	13.000	10	H	BIASED HIGH	16.63	0.1095	Persulfate-IR

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
    PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   7.829

Diss Inorg Carbon

PARAMETER: 07093 Nitrate-IC   mg/L N

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0050   BASIC ACCEPTABLE ERROR= 0.0050   CONCENTRATION ERROR INCREMENT= 0.0800

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F002	0.42	20.50	2.08	16.00	0.87	14.50	0.07	8.50	0.02	6.50	0.32	19.50
F010	0.42	20.50	2.1	18.50	0.88	20.00	0.07	8.50	0.02	6.50	0.31	7.00
F012	0.41	13.00	2.09	17.00	0.8	2.00	0.07	8.50	0.02	6.50	0.31	7.00
F015	0.420	20.50	2.05	9.00	0.881	22.00	0.074	16.50	0.022	13.00	0.274 EL	1.00
F017	0.414	17.00	2.061	11.00	0.85	8.00	0.08	22.00	0.023	15.50	0.322	23.00
F020	0.404	6.50	2.25 H	25.00	0.91	25.00	0.075	18.50	0.025	19.00	0.32	19.50
F025	0.406	8.50	1.954	4.00	0.854	10.00	0.077	20.00	0.024	18.00	0.305	4.00
F032	0.45 H	26.00	2.03	8.00	0.93	28.00	0.09 VH	26.00	0.04T VH	23.00	0.34	26.50
F037	0.372 L	1.00	1.7906 EL	1.00	0.7953 L	1.00	0.0685	3.00	0.0239	17.00	0.2936	2.00
F042	0.41	13.00	2.07	14.00	0.84	5.50	0.08	22.00	0.0W	1.00	0.32	19.50
F049	0.44	25.00	2.17	24.00	0.91	25.00	0.07	8.50	0.02	6.50	0.34	26.50
F053	0.42	20.50	2.10	18.50	0.89	23.00	0.07	8.50	0.02	6.50	0.32	19.50
F060	0.406	8.50	1.94	2.50	0.862	13.00	0.074	16.50	0.022	13.00	0.315	13.50
F068	0.417	18.00	2.066	13.00	0.875	17.50	0.066	2.00		0.00	0.313	11.50
F071	0.424	24.00	2.328 H	27.00	0.927	27.00	0.069	4.00	0.018	2.00	0.328	25.00
F074	0.400	3.00	1.940	2.50	0.820	3.00	0.072	13.50	0.022	13.00	0.310	7.00
F094	0.408	10.00	1.98	6.00	0.874	16.00	0.072	13.50	0.021	11.00	0.313	11.50
F107	0.40	3.00	2.01	7.00	0.84	5.50	0.1 VH	27.00	0.05 VH	24.00	0.32	19.50
F109	0.4132	16.00	2.0644	12.00	0.8806	21.00	0.0822	24.00	0.033 VH	21.00	0.3168	16.00
F110	0.48 EH	27.00	2.35 VH	28.00	0.86	11.50	0.065	1.00	0.02	6.50	0.32	19.50
F112	0.41	13.00	2.06	10.00	0.87	14.50	0.07	8.50	0.02	6.50	0.31	7.00
F113	0.404	6.50	2.075	15.00	0.848	7.00	0.084 H	25.00	0.037 VH	22.00	0.315	13.50
F115	0.422	23.00	2.103	20.00	0.876	19.00	0.075	18.50	0.023	15.50	0.327	24.00
F116	0.403	5.00	2.13	22.50	0.853	9.00	0.073	15.00		0.00	0.312	10.00
F118	0.41	13.00	2.13	22.50	0.91	25.00	0.08	22.00	0.03T H	20.00	0.30	3.00
F131	0.530 EH	28.00	1.971	5.00	0.835	4.00	0.133 EH	28.00	0.090 EH	25.50	0.346 H	28.00
F133	0.41	13.00	2.12	21.00	0.86	11.50	0.07	8.50	0.02	6.50	0.31	7.00
F139	<0.01 EL	0.00	<0.01 EL	0.00	3.27 EH	29.00	0.38 EH	29.00	0.09 EH	25.50	1.40 EH	29.00
F145	0.4	3.00	2.29 H	26.00	0.875	17.50	0.07	8.50	0.275 EH	27.00	0.316	15.00
MEDIAN	0.4100		2.0725		0.8700		0.0730		0.0220		0.3160	
1CRIT	0.0374		0.1704		0.0742		0.0104		0.0064		0.0299	
N	26		26		27		27		25		27	
MEAN	0.4162		2.0832		0.8697		0.0772		0.0302		0.3175	
3STDEV	0.0515		0.2864		0.0906		0.0395		0.0575		0.0341	

PARAMETER: 07093 Nitrate-IC   mg/L N

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F002	0.48	19.00	0.81	2.00	0.03	6.50	0.09	6.00
F010	0.48	19.00	0.88	21.00	0.03	6.50	0.09	6.00
F012	0.45	2.00	0.84	5.50	0.03	6.50	0.09	6.00
F015	0.468	8.00	0.823	3.00	0.035	18.00	0.101	23.50
F017	0.479	16.00	0.856	10.00	0.034	15.00	0.101	23.50
F020	0.48	19.00	0.93	27.00	0.034	15.00	0.097	17.50
F025	0.467	7.00	0.860	14.00	0.036	21.00	0.098	19.00
F032	0.5	27.00	0.92	25.50	0.04T	23.50	0.1	20.50
F037	0.4367 EL	1.00	0.8067	1.00	0.0355	20.00	0.0893	1.00
F042	0.47	10.00	0.84	5.50	0.04	23.50	0.10	20.50
F049	0.51	28.00	0.92	25.50	0.03	6.50	0.113 VH	26.00
F053	0.49	23.50	0.90	23.50	0.03	6.50	0.09	6.00
F060	0.477	15.00	0.875	17.50	0.032	11.50	0.093	16.00
F068	0.476	14.00	0.875	17.50	0.028	1.00	0.092	14.50
F071	0.497	26.00	0.943 H	28.00	0.029	2.00	0.091	12.00
F074	0.460	3.50	0.830	4.00	0.033	13.00	0.091	12.00
F094	0.475	13.00	0.859	11.50	0.032	11.50	0.091	12.00
F107	0.47	10.00	0.85	8.50	0.07 VH	27.00	0.12 VH	27.00
F109	0.481	22.00	0.8765	19.00	0.04	23.50	0.1009	22.00
F110	0.46	3.50	0.86	14.00	0.03	6.50	0.09	6.00
F112	0.47	10.00	0.86	14.00	0.03	6.50	0.09	6.00
F113	0.471	12.00	0.859	11.50	0.047 VH	26.00	0.103	25.00
F115	0.490	23.50	0.886	22.00	0.034	15.00	0.097	17.50
F116	0.465	5.00	0.861	16.00	0.035	18.00	0.092	14.50
F118	0.48	19.00	0.90	23.50	0.04T	23.50	0.09	6.00
F131	0.491	25.00	0.845	7.00	0.098 EH	28.00	0.150 EH	28.00
F133	0.48	19.00	0.85	8.50	0.03	6.50	0.09	6.00
F139	<0.01 EL	0.00	3.30 EH	29.00	0.13 EH	29.00	0.37 EH	29.00
F145	0.466	6.00	0.879	20.00	0.035	18.00	0.09	6.00
MEDIAN	0.4765		0.8600		0.0340		0.0920	
1CRIT	0.0427		0.0734		0.0073		0.0120	
N	26		27		27		27	
MEAN	0.4759		0.8699		0.0378		0.0978	
3STDEV	0.0345		0.0961		0.0428		0.0378	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	119.00	11.900	10					IC
F010	133.50	13.350	10					IC
F012	74.00	7.400	10					IC
F015	134.50	13.450	10	EL				IC Anions
F017	161.00	16.100	10					I.C.
F020	192.00	19.200	10	H				IC
F025	125.50	12.550	10					IC
F032	234.00	23.400	10	H VHVH	BIASED HIGH*	-1.63	0.0299	Ion Chromatography
F037	48.00	4.800	10	L ELL EL	BIASED LOW	-13.12	0.0172	I.C. WATERS
F042	134.50	13.450	10					IC
F049	201.50	20.150	10	VH				
F053	156.00	15.600	10					IC
F060	127.00	12.700	10					IC
F068	109.00	12.111	9					IC, Dionex
F071	177.00	17.700	10	H H				Ion chromatograph
F074	74.50	7.450	10					AA
F094	116.00	11.600	10					IC
F107	158.50	15.850	10	VHVH VHVH				IC
F109	196.50	19.650	10	VH				Dionex
F110	123.50	12.350	10	EHVH				IC Dionex
F112	96.00	9.600	10					DIONEX IC
F113	163.50	16.350	10	H VH VH				IC - Dionex
F115	198.00	19.800	10					Dionex AS4A
F116	115.00	12.778	9					Dionex IC
F118	177.50	17.750	10	H				IC
F131	206.50	20.650	10	EH EHEHH EHEH				IC
F133	107.50	10.750	10					I.C.
F139	199.50	28.500	7	ELELEHEHEHEHELEHEHEH	BIASED HIGH	275.82	0.0600	I.C.
F145	147.00	14.700	10	H EH				IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   14.758

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F037	48.00	4.800	10	LELLEL	BIASED LOW	-13.12	0.0172	I.C. WATERS
F012	74.00	7.400	10					IC
F074	74.50	7.450	10					AA
F112	96.00	9.600	10					DIONEX IC
F133	107.50	10.750	10					I.C.
F094	116.00	11.600	10					IC
F002	119.00	11.900	10					IC
F068	109.00	12.111	9					IC, Dionex
F110	123.50	12.350	10	EHVH				IC Dionex
F025	125.50	12.550	10					IC
F060	127.00	12.700	10					IC
F116	115.00	12.778	9					Dionex IC
F010	133.50	13.350	10					IC
F042	134.50	13.450	10					IC
F015	134.50	13.450	10	EL				IC Anions
F145	147.00	14.700	10	HEH				IC
F053	156.00	15.600	10					IC .
F107	158.50	15.850	10	VHVHVHVH				IC
F017	161.00	16.100	10					I.C.
F113	163.50	16.350	10	HVHVH				IC - Dionex
F071	177.00	17.700	10	HH				Ion chromatograph
F118	177.50	17.750	10	H				IC
F020	192.00	19.200	10	H				IC
F109	196.50	19.650	10	VH				Dionex
F115	198.00	19.800	10					Dionex AS4A
F049	201.50	20.150	10	VH				
F131	206.50	20.650	10	EHEHEHHEHEH				IC
F032	234.00	23.400	10	HVHVH	BIASED HIGH*	-1.63	0.0299	Ion Chromatography
F139	199.50	28.500	7	ELELEHEHEHEHELEHEHEH	BIASED HIGH	275.82	0.0600	I.C.

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   14.758

Nitrate-IC

PARAMETER: 07092 Nitrate + Nitrite   mg/L N

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0050   BASIC ACCEPTABLE ERROR= 0.0050   CONCENTRATION ERROR INCREMENT= 0.0800

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F003	0.421	16.00	2.00	6.00	0.875	10.00	0.069	4.00	0.015 L	1.00	0.316	14.50
F004	0.426	17.50	2.09	16.50	0.878	12.00	0.076	15.00	0.023	7.50	0.326	22.00
F007	0.4	4.50	2.12	20.50	0.88	13.50	0.07	7.50	<0.04	0.00	0.31	8.00
F009	0.4	4.50	1.92	2.00	0.89	19.00	0.07	7.50	<0.05	0.00	0.31	8.00
F010	0.45	24.00	2.1	18.00	0.95	25.00	0.07	7.50	0.02	2.50	0.31	8.00
F014	0.44	23.00	2.01	7.50	0.90	22.00	0.10 EH	24.50	<0.05	0.00	0.34	25.00
F015	0.426	17.50	2.05	11.00	0.892	21.00	0.074	13.50	0.022	5.50	0.274 EL	2.00
F020	0.43	20.50	2.11	19.00	0.89	19.00	0.079	17.50	0.026	12.00	0.32	17.50
F025	0.411	10.00	1.954	4.00	0.862	7.00	0.077	16.00	0.024	10.00	0.305	5.00
F026	0.4095	8.00	2.0815	15.00	0.907	23.00	0.0825	21.00	0.0285	15.00	0.3135	13.00
F032	0.435	22.00	2.06	12.00	0.885	16.50	0.08	19.50	0.025	11.00	0.33	24.00
F036	0.428	19.00	2.07	14.00	0.88	13.50	0.084	22.00	0.028	14.00	0.328	23.00
F037	0.372 EL	1.00	1.7906 EL	1.00	0.7953 L	2.00	0.0685	3.00	0.0239	9.00	0.2936	3.00
F060	0.39	2.00	2.18	23.00	0.84	4.50	0.05 EL	1.00	<0.05	0.00	0.27 EL	1.00
F068	0.417	12.50	2.066	13.00	0.875	10.00	0.066	2.00		0.00	0.313	11.50
F071	0.418	14.00	2.037	10.00	0.885	16.50	0.079	17.50	0.027	13.00	0.323	21.00
F072	0.43	20.50	2.09	16.50	0.89	19.00	0.07	7.50	<0.050	0.00	0.32	17.50
F074	0.404	7.00	1.940	3.00	0.828	3.00	0.072	11.50	0.022	5.50	0.310	8.00
F094	0.413	11.00	1.98	5.00	0.882	15.00	0.072	11.50	0.021	4.00	0.313	11.50
F107	0.40	4.50	2.01	7.50	0.84	4.50	0.1 EH	24.50	0.05 EH	17.00	0.32	17.50
F113	0.417	12.50	2.014	9.00	0.874	8.00	0.074	13.50	0.023	7.50	0.322	20.00
F118	0.42	15.00	2.13	22.00	0.92	24.00	0.08	19.50	0.03T	16.00	0.30	4.00
F133	0.41	9.00	2.12	20.50	0.86	6.00	0.07	7.50	0.02	2.50	0.31	8.00
F139	<0.03 EL	0.00	<0.03 EL	0.00	0.75 EL	1.00	0.09 VH	23.00	<0.03	0.00	0.32	17.50
F145	0.4	4.50	2.29 EH	24.00	0.875	10.00	0.07	7.50	0.275 EH	18.00	0.316	14.50

	1 = BMOOS-01	2 = RAIN-97	3 = TRKY-94	4 = BESKI-01	5 = SUPER-04	6 = RAINGR-16
MEDIAN	0.4170	2.0630	0.8800	0.0740	0.0239	0.3135
1CRIT	0.0380	0.1696	0.0750	0.0105	0.0065	0.0297
N	22	22	23	22	16	23
MEAN	0.4157	2.0515	0.8741	0.0747	0.0258	0.3132
3STDEV	0.0388	0.1965	0.0799	0.0178	0.0207	0.0357

PARAMETER: 07092 Nitrate + Nitrite   mg/L N

SAMPLE	7 = RAINGR-11 REPORTED		8 = MERSEY-MX REPORTED		9 = PHA-08 REPORTED		10 = COBRIEL-MX REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F003	0.494	24.00	0.878	16.00	0.025 L	1.00	0.089	5.00
F004	0.493	23.00	0.885	20.00	0.035	10.50	0.098	21.00
F007	0.49	19.50	0.82	4.00	<0.04	0.00	0.08	3.00
F009	0.47	7.50	0.87	12.00	<0.05	0.00	0.09	9.50
F010	0.48	12.50	0.92	25.00	0.03	4.00	0.09	9.50
F014	0.49	19.50	0.90	23.00	0.06 EH	20.00	0.08	3.00
F015	0.468	6.00	0.829	5.00	0.035	10.50	0.101	23.00
F020	0.48	12.50	0.88	18.00	0.044 H	19.00	0.104 H	24.00
F025	0.467	5.00	0.860	10.00	0.036	14.00	0.098	21.00
F026	0.4825	15.00	0.883	19.00	0.0385	17.00	0.093	16.00
F032	0.49	19.50	0.895	21.00	0.035	10.50	0.095	17.50
F036	0.492	22.00	0.876	15.00	0.038	15.50	0.096	19.00
F037	0.4367 EL	1.00	0.8067	3.00	0.0355	13.00	0.0893	6.00
F060	0.44 EL	2.00	0.79 L	2.00	<0.05	0.00	0.07 EL	1.00
F068	0.476	10.00	0.875	14.00	0.028	2.00	0.092	15.00
F071	0.487	17.00	0.869	11.00	0.038	15.50	0.095	17.50
F072	0.49	19.50	0.90	23.00	<0.050	0.00	0.09	9.50
F074	0.460	3.00	0.831	6.00	0.033	7.50	0.091	13.50
F094	0.475	9.00	0.859	9.00	0.032	6.00	0.091	13.50
F107	0.47	7.50	0.85	7.50	0.07 EH	21.00	0.12 EH	25.00
F113	0.485	16.00	0.873	13.00	0.033	7.50	0.098	21.00
F118	0.48	12.50	0.90	23.00	0.04T	18.00	0.09	9.50
F133	0.48	12.50	0.85	7.50	0.03	4.00	0.09	9.50
F139	<0.03 EL	0.00	0.75 EL	1.00	0.03	4.00	0.08	3.00
F145	0.466	4.00	0.879	17.00	0.035	10.50	0.09	9.50
MEDIAN	0.4800		0.8730		0.0350		0.0910	
1CRIT	0.0430		0.0744		0.0074		0.0119	
N	22		23		19		23	
MEAN	0.4778		0.8634		0.0361		0.0918	
3STDEV	0.0375		0.0888		0.0204		0.0181	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	97.50	9.750	10	L L				Cd reduction
F004	165.00	16.500	10					07110
F007	80.50	10.062	8					
F009	70.00	8.750	8					TRAACS
F010	136.00	13.600	10					Colorimetry
F014	167.50	18.611	9	EH EH				
F015	115.00	11.500	10	EL				IC Anions
F020	179.00	17.900	10	H H				TrAACS
F025	102.00	10.200	10					IC
F026	162.00	16.200	10					AA
F032	173.50	17.350	10					Colourimetry
F036	177.00	17.700	10					Colourimetry
F037	42.00	4.200	10	ELELL EL	BIASED LOW	-12.89	0.0138	I.C. WATERS
F060	36.50	4.562	8	EL ELELL EL	BIASED LOW	6.49	-0.0623	Automated Color
F068	90.00	10.000	9					IC, Dionex
F071	153.00	15.300	10					Colorimetric
F072	133.00	16.625	8					Cd Redn
F074	68.00	6.800	10					AA
F094	95.50	9.550	10					IC, Colorimetry
F107	136.50	13.650	10	EHEH EHEH				IC
F113	128.00	12.800	10					FIA – Lachat 8000
F118	163.50	16.350	10					IC
F133	87.00	8.700	10					I.C.
F139	49.50	8.250	6	ELELELVH ELEL				I.C.
F145	119.50	11.950	10	EH EH				IC

OVERALL AVERAGE
RANK IS   12.403

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F037	42.00	4.200	10	ELELLEL	BIASED LOW	-12.89	0.0138	I.C. WATERS
F060	36.50	4.562	8	ELELELLEL	BIASED LOW	6.49	-0.0623	Automated Color
F074	68.00	6.800	10					AA
F139	49.50	8.250	6	ELELELVHELEL				I.C.
F133	87.00	8.700	10					I.C.
F009	70.00	8.750	8					TRAACS
F094	95.50	9.550	10					IC, Colorimetry
F003	97.50	9.750	10	LL				Cd reduction
F068	90.00	10.000	9					IC, Dionex
F007	80.50	10.062	8					
F025	102.00	10.200	10					IC
F015	115.00	11.500	10	EL				IC Anions
F145	119.50	11.950	10	EHEH				IC
F113	128.00	12.800	10					FIA – Lachat 8000
F010	136.00	13.600	10					Colorimetry
F107	136.50	13.650	10	EHEHEHEH				IC
F071	153.00	15.300	10					Colorimetric
F026	162.00	16.200	10					AA
F118	163.50	16.350	10					IC
F004	165.00	16.500	10					07110
F072	133.00	16.625	8					Cd Redn
F032	173.50	17.350	10					Colourimetry
F036	177.00	17.700	10					Colourimetry
F020	179.00	17.900	10	HH				TrAACS
F014	167.50	18.611	9	EHEH				

OVERALL AVERAGE
RANK IS   12.403

Nitrate + Nitrite

PARAMETER: 07192 Ammonia   mg/L N

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0060   BASIC ACCEPTABLE ERROR= 0.0060   CONCENTRATION ERROR INCREMENT= 0.1250

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F003	0.014	16.00	0.183	16.50	0.306	20.50	<0.005	0.00	<0.005	0.00	0.085	8.50
F004	0.013	11.50	0.170	6.50	0.267	5.00	0.005T	6.50	0.005W	0.00	0.086	10.50
F007	0.013	11.50	0.184	20.50	0.308	22.00	<0.010	0.00	<0.010	0.00	0.093	15.50
F010	<0.02	0.00	0.15 L	3.00	0.26	2.50	<0.02	0.00	<0.02	0.00	0.03 EL	1.00
F012	0.03 EH	24.00	0.12 EL	1.00	0.27	6.00	<0.01	0.00	<0.01	0.00	0.09	13.00
F014	0.016	20.50	0.178	10.00	0.29	8.00	<0.010	0.00	<0.010	0.00	0.095	20.00
F015	0.012	7.50	0.191	27.50	0.3	13.50	0.009	9.00	<0.005	0.00	0.088	12.00
F017	0.012	7.50	0.182	15.00	0.303	16.50	0.006W	0.00	0.006W	0.00	0.095	20.00
F020	0.012	7.50	0.179	11.00	0.303	16.50	<0.01	0.00	<0.01	0.00	0.093	15.50
F025	<0.01	0.00	0.152 L	4.00	0.252 L	1.00	<0.01	0.00	<0.01	0.00	0.074 L	3.50
F026	0.0143	19.00	0.1837	18.00	0.3058	19.00	0.0013	3.00	0.0015	4.00	0.0953	22.00
F032	0.014	16.00	0.184	20.50	0.306	20.50	0.002W	0.00	0.002W	0.00	0.096	23.50
F036	0.028 VH	23.00	0.184	20.50	0.316	25.00	0.005T	6.50	0.002T	5.50	0.094	18.00
F042	0.02W	0.00	0.23 EH	30.00	0.26	2.50	0.02W	0.00	0.02W	0.00	0.10	26.50
F049	0.013	11.50	0.183	16.50	0.317	26.00	0.008W	0.00	0.008W	0.00	0.096	23.50
F053	0.02W	0.00	0.17	6.50	0.295	9.50	0.02W	0.00	0.02W	0.00	0.085	8.50
F060	0.013	11.50	0.233 EH	31.00	0.357 H	30.00	<0.005	0.00	0.013 EH	8.00	0.133 EH	30.00
F068	0.014	16.00	0.191	27.50	0.314	24.00		0.00		0.00	0.100	26.50
F071	0.016	20.50	0.184	20.50	0.297	11.00	0.004	5.00	0.001	3.00	0.086	10.50
F072	0.01	3.00	0.19	25.00	0.31	23.00	<0.01	0.00	<0.01	0.00	0.10	26.50
F074	0.010	3.00	0.185	23.00	0.305	18.00	<0.005	0.00	<0.005	0.00	0.095	20.00
F094	0.012	7.50	0.18	12.50	0.302	15.00	<0.005	0.00	<0.005	0.00	<0.005 EL	0.00
F107	0.011	5.00	0.148 L	2.00	0.263	4.00	0.W	0.00	0.W	0.00	0.074 L	3.50
F109	0.0319 EH	25.00	0.2077	29.00	0.3277	28.00	0.008T	8.00	0.007T	7.00	0.1098	29.00
F112	0.01	3.00	0.19	25.00	0.33	29.00		0.00		0.00	0.10	26.50
F113	0.014	16.00	0.181	14.00	0.3	13.50	0.	2.00	0.	2.00	0.093	15.50
F115	0.009	1.00	0.177	8.50	0.295	9.50	-0.002 L	1.00	-0.002	1.00	0.084	7.00
F116		0.00	0.159	5.00	0.281	7.00		0.00		0.00	0.070 L	2.00
F118	0.014	16.00	0.180	12.50	0.299	12.00	0.002T	4.00	0.002T	5.50	0.093	15.50
F131	0.022 H	22.00	0.177	8.50	0.324	27.00	<0.02	0.00	<0.02	0.00	0.081	6.00
F145	<0.02	0.00	0.19	25.00	0.37 EH	31.00	<0.02	0.00	<0.02	0.00	0.08	5.00

MEDIAN	0.0130	0.1830	0.3030	0.0040	0.0018	0.0930
1CRIT	0.0069	0.0281	0.0431	0.0060	0.0060	0.0169
N	23	29	29	7	6	28
MEAN	0.0147	0.1808	0.3004	0.0036	0.0023	0.0904
3STDEV	0.0152	0.0476	0.0650	0.0075	0.0067	0.0268

PARAMETER: 07192 Ammonia   mg/L N

SAMPLE	7 = RAINGR-11 REPORTED		8 = MERSEY-MX REPORTED		9 = PHA-08 REPORTED		10 = COBRIEL-MX REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F003	<0.005	0.00	<0.005	0.00	<0.005	0.00	0.096	9.00
F004	0.005W	0.00	0.005T	8.00	0.005T	6.50	0.094	6.50
F007	<0.010	0.00	<0.010	0.00	<0.010	0.00	0.101	11.50
F010	<0.02	0.00	<0.02	0.00	<0.02	0.00	0.02 EL	1.00
F012	0.02 EH	8.00	<0.01	0.00	<0.01	0.00	0.1	10.00
F014	<0.010	0.00	<0.010	0.00	<0.010	0.00	0.105	17.00
F015	<0.005	0.00	<0.005	0.00	0.006	8.00	0.111	25.00
F017	0.006W	0.00	0.006W	0.00	0.006W	0.00	0.105	17.00
F020	<0.01	0.00	<0.01	0.00	<0.01	0.00	0.101	11.50
F025	<0.01	0.00	<0.01	0.00	<0.01	0.00	0.042 EL	2.00
F026	0.001	3.00	0.0021	6.00	0.0024	3.00	0.1050	19.00
F032	0.002W	0.00	0.002W	0.00	0.002W	0.00	0.104	14.00
F036	0.002T	4.50	0.002T	4.00	0.003T	4.50	0.116	27.00
F042	0.02W	0.00	0.05 EH	10.00	0.02W	0.00	0.14 VH	31.00
F049	0.008W	0.00	0.008W	0.00	0.008W	0.00	0.11	23.00
F053	0.02W	0.00	0.02W	0.00	0.02W	0.00	0.095	8.00
F060	<0.005	0.00	<0.005	0.00	<0.005	0.00	0.137 VH	30.00
F068		0.00		0.00		0.00	0.114	26.00
F071	0.002	4.50	0.002	4.00	0.005	6.50	0.104	14.00
F072	<0.01	0.00	<0.01	0.00	<0.01	0.00	0.11	23.00
F074	<0.005	0.00	<0.005	0.00	<0.005	0.00	0.105	17.00
F094	<0.005	0.00	<0.005	0.00	<0.005	0.00	0.108	21.00
F107	0.W	0.00	0.001	2.00	0.001	2.00	0.079 L	3.00
F109	0.01T H	7.00	0.02T VH	9.00	0.018T EH	10.00	0.135 VH	29.00
F112		0.00		0.00		0.00	0.11	23.00
F113	0.	2.00	0.003	7.00	0.003	4.50	0.104	14.00
F115	-0.002	1.00	-0.002	1.00	-0.002 EL	1.00	0.094	6.50
F116		0.00		0.00		0.00	0.08 L	4.00
F118	0.005T	6.00	0.002T	4.00	0.007T	9.00	0.106	20.00
F131	<0.02	0.00	<0.02	0.00	<0.02	0.00	0.125 H	28.00
F145	<0.02	0.00	<0.02	0.00	<0.02	0.00	0.09	5.00

MEDIAN	0.0020		0.0021		0.0040		0.1050	
1CRIT	0.0060		0.0060		0.0060		0.0184	
N	6		8		8		29	
MEAN	0.0033		0.0046		0.0041		0.1030	
3STDEV	0.0100		0.0177		0.0057		0.0514	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	70.50	14.100	5					Alkaline phenol
F004	61.00	7.625	8					07540
F007	81.00	16.200	5					
F010	7.50	1.875	4	L EL EL	INSUFFICIENT DATA			Colorimetry
F012	62.00	10.333	6	EHEL EH				Technicon
F014	75.50	15.100	5					
F015	102.50	14.643	7					Colorimetric
F017	76.00	15.200	5					Colourimetric
F020	62.00	12.400	5					TrAACS
F025	10.50	2.625	4	L L L EL	INSUFFICIENT DATA			IC
F026	116.00	11.600	10					AA
F032	94.50	18.900	5					Colourimetry
F036	138.50	13.850	10	VH				Colourimetry
F042	100.00	20.000	5	EH EH VH				Colorimetric
F049	100.50	20.100	5					
F053	32.50	8.125	4		INSUFFICIENT DATA			FIA, phenate
F060	140.50	23.417	6	EHH EHEH VH	BIASED HIGH	16.94	0.0115	Digestion - Color
F068	120.00	24.000	5		BIASED HIGH*	2.89	0.0032	IC, Dionex
F071	99.50	9.950	10					Colorimetric
F072	100.50	20.100	5					auto phenate
F074	81.00	16.200	5					Autoanalyzer
F094	56.00	14.000	4	EL L	INSUFFICIENT DATA			Colorimetry
F107	21.50	3.071	7	L L L	BIASED LOW	-13.95	-0.0040	COLOR
F109	181.00	18.100	10	EH H VHEHVH				FIA- phenate
F112	106.50	21.300	5		BIASED HIGH	9.60	-0.0048	TECHNICON
F113	90.50	9.050	10					FIA
F115	37.50	3.750	10	L EL	BIASED LOW*	-1.31	-0.0052	Auto. Colorimetric
F116	18.00	4.500	4	L L	INSUFFICIENT DATA			Colorimetric
F118	104.50	10.450	10					IC
F131	91.50	18.300	5	H H				IC
F145	66.00	16.500	4	EH	INSUFFICIENT DATA			Automated Phenate

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   7.50

OVERALL AVERAGE
RANK IS   12.979

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F010	7.50	1.875	4	LELEL	INSUFFICIENT DATA			Colorimetry
F025	10.50	2.625	4	LLLEL	INSUFFICIENT DATA			IC
F107	21.50	3.071	7	LLL	BIASED LOW	-13.95	-0.0040	COLOR
F115	37.50	3.750	10	LEL	BIASED LOW*	-1.31	-0.0052	Auto. Colorimetric
F116	18.00	4.500	4	LL	INSUFFICIENT DATA			Colorimetric
F004	61.00	7.625	8					07540
F053	32.50	8.125	4		INSUFFICIENT DATA			FIA, phenate
F113	90.50	9.050	10					FIA
F071	99.50	9.950	10					Colorimetric
F012	62.00	10.333	6	EHELEH				Technicon
F118	104.50	10.450	10					IC
F026	116.00	11.600	10					AA
F020	62.00	12.400	5					TrAACS
F036	138.50	13.850	10	VH				Colourimetry
F094	56.00	14.000	4	EL	INSUFFICIENT DATA			Colorimetry
F003	70.50	14.100	5					Alkaline phenol
F015	102.50	14.643	7					Colorimetric.
F014	75.50	15.100	5					
F017	76.00	15.200	5					Colourimetric
F074	81.00	16.200	5					Autoanalyzer
F007	81.00	16.200	5					
F145	66.00	16.500	4	EH	INSUFFICIENT DATA			Automated Phenate
F109	181.00	18.100	10	EHHVHEHVH				FIA- phenate
F131	91.50	18.300	5	HH				IC
F032	94.50	18.900	5					Colourimetry
F042	100.00	20.000	5	EHEHVH				Colorimetric
F072	100.50	20.100	5					auto phenate
F049	100.50	20.100	5					
F112	106.50	21.300	5		BIASED HIGH	9.60	-0.0048	TECHNICON
F060	140.50	23.417	6	EHHEHEHVH	BIASED HIGH	16.94	0.0115	Digestion - Color
F068	120.00	24.000	5		BIASED HIGH*	2.89	0.0032	IC, Dionex

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   7.50

OVERALL AVERAGE
RANK IS   12.979

Ammonia

PARAMETER: 07392 Total Kjeldahl N   mg/L N

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0250   BASIC ACCEPTABLE ERROR= 0.0250   CONCENTRATION ERROR INCREMENT= 0.1500

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F003	0.205	5.00	0.314	7.00	0.417	6.00	0.046	2.00	<0.014	0.00	0.101	2.00
F014	0.22	7.50	0.26	5.00	0.48	8.00	<0.20	0.00	<0.20	0.00	<0.20	0.00
F032	0.22	7.50	0.28	6.00	0.44	7.00	0.06T	4.00	0.04T	3.00	0.12	4.00
F060	0.13 L	2.00	0.23	4.00	0.37	3.50	<0.05	0.00	<0.05	0.00	0.15	7.00
F072	0.14 L	3.00	0.33 H	8.00	0.37	3.50	<0.10	0.00	<0.10	0.00	0.13	5.00
F074	0.141 L	4.00	0.085 VL	2.00	0.322	2.00	0.053	3.00	0.013	2.00	0.105	3.00
F094	0.21	6.00	0.19 L	3.00	0.4	5.00	0.09 H	5.00	<0.05	0.00	0.14	6.00
F107	0.03 EL	1.00	0.01 VL	1.00	0.244 EL	1.00	0.W	1.00	0.W	1.00	0.049 EL	1.00
F145	0.49 EH	9.00	0.64 EH	9.00	0.88 EH	9.00	0.36 EH	6.00	0.33 EH	4.00	0.45 EH	8.00
MEDIAN OR *TARGET CONC.	0.2050		0.2600		0.4000		0.0565		*0.0250		0.1250	
1CRIT	0.0520		0.0602		0.0813		0.0297		0.0252		0.0400	
N	7		7		7		4		2		6	
MEAN	0.1809		0.2413		0.3999		0.0622		0.0265		0.1243	
3STDEV	0.1153		0.2329		0.1442		-		-		0.0530	

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F003	<0.014	0.00	0.137	4.00	0.027	3.00	0.141	3.00
F014	<0.20	0.00	<0.20	0.00	<0.20	0.00	<0.20	0.00
F032	0.04T	2.00	0.18 H	5.00	0.04T	4.00	0.18	6.50
F060	<0.05	0.00	0.09 L	3.00	<0.05	0.00	0.15	4.00
F072	<0.10	0.00	<0.10	0.00	<0.10	0.00	0.12	2.00
F074	0.000	1.00	0.034 EL	2.00	0.012	2.00	0.159	5.00
F094	0.12 EH	3.00	0.25 EH	6.00	0.06 H	5.00	0.18	6.50
F107	0.W	0.00	0.W	1.00	0.W	1.00	0.055 EL	1.00
F145	0.29 EH	4.00	0.34 EH	7.00	0.27 EH	6.00	0.59 EH	8.00
MEDIAN OR *TARGET CONC.	*0.0250		0.1370		0.0335		0.1545	
1CRIT	0.0333		0.0418		0.0263		0.0444	
N	2		5		4		6	
MEAN	0.0800		0.1382		0.0347		0.1550	
3STDEV	-		-		-		0.0638	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK
F003	32.00	4.000	8				
F014	20.50	6.833	3				
F032	49.00	4.900	10	H			
F060	23.50	3.917	6	L L			
F072	21.50	4.300	5	L H			
F074	26.00	2.600	10	L VL EL			
F094	45.50	5.056	9	L H EHEHH			
F107	9.00	1.000	9	ELVLEL EL EL			
F145	70.00	7.000	10	EHEHEHEHEHEHEHEHEH			

METHOD CODING

Blk dig. phenol

Colourimetry
Digestion - Color
Nitroprusside
UV Dig. Auto
Colorimetry
COLOR
Auto

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   4.243

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK
F107	9.00	1.000	9	ELVLELELEL			
F074	26.00	2.600	10	LVLEL			
F060	23.50	3.917	6	LL			
F003	32.00	4.000	8				
F072	21.50	4.300	5	LH			
F032	49.00	4.900	10	H			
F094	45.50	5.056	9	LHEHEHH			
F014	20.50	6.833	3				
F145	70.00	7.000	10	EHEHEHEHEHEHEHEHEH			

METHOD CODING

COLOR
UV Dig. Auto
Digestion - Color
Blk dig. phenol
Nitroprusside
Colourimetry
Colorimetry

Auto

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   4.243

Total Kjeldahl N

PARAMETER: 11091 Sodium   mg/L   NATIONAL WATER RESEARCH INSTITUTE
                                                                              ENVIRONMENT CANADA
                                                                              BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.1000   BASIC ACCEPTABLE ERROR= 0.0400   CONCENTRATION ERROR INCREMENT= 0.0400

SAMPLE	1 = BMOOS-01 REPORTED		2 = RAIN-97 REPORTED		3 = TRKY-94 REPORTED		4 = BESKI-01 REPORTED		5 = SUPER-04 REPORTED		6 = RAINGR-16 REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F002	0.58	12.00	0.23	4.00	0.53	11.50	2.79	21.00	<0.05 EL	0.00	<0.05	0.00
F003	0.60	19.50	0.30	32.00	0.56	22.00	2.72	19.00	0.10	20.50	0.08	24.50
F007	0.632	30.00	0.279	25.00	0.607	33.00	2.1 EL	1.00	0.087	7.00	0.055	7.50
F009	0.56	10.00	0.26	14.00	0.53	11.50	2.64	14.00	0.09	9.50	0.06	10.50
F010	0.54	7.50	0.25	10.00	0.51	8.00	2.57	8.00	0.08	3.00	0.06	10.50
F012	0.61	24.50	0.28	26.50	0.57	26.50	2.81	26.00	0.1	20.50	0.07	19.00
F014	0.631	29.00	0.324 H	34.00	0.566	24.00	2.91 H	32.00	0.110	27.00	0.095	28.00
F015	0.5 VL	3.00	0.2 L	3.00	0.4 VL	3.00	2.6	10.50	<0.1	0.00	<0.1	0.00
F017	0.604	23.00	0.274	22.00	0.57	26.50	2.665	15.00	0.098	15.50	0.067	15.00
F020	0.59	15.50	0.26	14.00	0.56	22.00	2.89 H	31.00	0.09	9.50	0.06	10.50
F025	0.674 H	33.00	0.294	30.00	0.582	30.00	3.345 EH	35.00	0.132	29.00	0.086	26.00
F026	0.59	15.50	0.267	17.00	0.428 VL	4.00	2.793	22.00	0.098	15.50	0.067	15.00
F032	0.636	31.00	0.29	28.50	0.592	31.00	2.93 VH	34.00	0.104	25.00	0.074	21.50
F036	0.61	24.50	0.28	26.50	0.57	26.50	2.82	27.00	0.1	20.50	0.08	24.50
F037	0.582	13.50	0.29	28.50	0.543	15.00	2.499 L	3.00	0.184 EH	30.00	0.127 EH	29.00
F042	0.52 L	4.00	0.25	10.00	0.48 L	5.00	2.57	8.00	0.10	20.50	0.07	19.00
F049	0.535 L	6.00	0.245	8.00	0.515	9.00	2.51 L	5.00	0.085	6.00	0.055	7.50
F053	0.600	19.50	0.272	21.00	0.555	18.00	2.633	13.00	0.097	13.50	0.068	17.00
F060	<0.6	0.00	<0.6	0.00	<0.6	0.00	2.6	10.50	<0.6	0.00	<0.6	0.00
F068	0.627	27.00	0.275	23.00	0.57	26.50	2.809	25.00	0.097	13.50	0.067	15.00
F071	0.602	22.00	0.271	19.50	0.613 H	34.00	2.842	28.00	0.131	28.00	0.088	27.00
F072	0.54	7.50	0.24	6.50	0.54	14.00	2.8	23.50	0.05 EL	1.00	0.01 EL	1.00
F074	0.57	11.00	0.26	14.00	0.53	11.50	2.61	12.00	0.09	9.50	0.06	10.50
F094	0.6	19.50	0.3	32.00	0.6	32.00	2.8	23.50	0.1	20.50	<0.1	0.00
F107	0.70 VH	34.00	0.30	32.00	0.58	29.00	2.68	16.00	0.10	20.50	0.07	19.00
F109	0.5306 L	5.00	0.2361	5.00	0.4876 L	6.00	2.5034 L	4.00	0.0807	5.00	0.03T	2.00
F110	0.593	17.00	0.271	19.50	0.559	20.00	2.770	20.00	0.107	26.00	0.079	23.00
F112	0.55	9.00	0.24	6.50	0.49 L	7.00	2.57	8.00	0.08	3.00	0.05	4.50
F113	0.62	26.00	0.26	14.00	0.56	22.00	2.87 H	30.00	0.08	3.00	0.05	4.50
F115	0.582	13.50	0.268	18.00	0.550	16.50	2.698	17.00	0.096	12.00	0.066	13.00
F116	0.63	28.00	0.26	14.00	0.53	11.50	2.70	18.00	0.09	9.50	0.05	4.50
F131	0.649	32.00	0.276	24.00	0.556	19.00	2.927 VH	33.00	0.100	20.50	0.074	21.50
F133	0.60	19.50	0.25	10.00	0.55	16.50	2.85 H	29.00	0.10	20.50	0.05	4.50
F139	0.4476 VL	2.00	0.097 EL	2.00	0.3315 EL	2.00	2.172 EL	2.00	<0.01 EL	0.00	<0.01 EL	0.00
F145	0.443 EL	1.00	0.012 EL	1.00	0.238 EL	1.00	2.55 L	6.00	<0.1	0.00	<0.1	0.00
MEDIAN	0.5965		0.2675		0.5525		2.7000		0.0980		0.0670	
1CRIT	0.0599		0.0467		0.0581		0.1440		0.0400		0.0400	
N	32		32		32		33		28		27	
MEAN	0.5855		0.2602		0.5344		2.7000		0.0972		0.0660	
3STDEV	0.1391		0.1100		0.1727		0.4791		0.0374		0.0415	

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F002	<0.05	0.00	1.76	22.50	0.08 EL	1.00	1.32	18.50
F003	0.06	19.50	1.73	17.50	0.15	24.50	1.29	13.50
F007	0.043	4.00	1.73	17.50	0.136	11.00	1.37	25.50
F009	0.06	19.50	1.65	12.00	0.14	14.50	1.3	16.00
F010	0.05	8.00	1.63	10.50	0.13	9.00	1.23 L	10.00
F012	0.06	19.50	1.8	28.00	0.15	24.50	1.39	31.00
F014	0.075	25.00	1.88 H	33.00	0.152	28.00	1.43 H	34.00
F015	<0.1	0.00	1.7	15.00	0.1	2.50	1.2 L	6.50
F017	0.056	14.50	1.738	21.00	0.143	18.50	1.365	23.00
F020	0.05	8.00	1.89 VH	34.00	0.14	14.50	1.37	25.50
F025	0.080	27.00	2.205 EH	35.00	0.191 H	30.00	1.476 VH	35.00
F026	0.054	11.00	1.737	20.00	0.151	27.00	1.349	22.00
F032	0.078	26.00	1.87 H	31.00	0.15	24.50	1.42 H	33.00
F036	0.06	19.50	1.81	30.00	0.155	29.00	1.37	25.50
F037	0.118 EH	29.00	1.578 L	4.00	0.193 H	31.00	1.215 L	8.00
F042	0.06	19.50	1.63	10.50	0.14	14.50	1.22 L	9.00
F049	0.047	5.00	1.58 L	5.00	0.125	7.00	1.19 L	5.00
F053	0.056	14.50	1.615 L	9.00	0.142	17.00	1.280	12.00
F060	<0.6	0.00	1.7	15.00	<0.6	0.00	1.3	16.00
F068	0.055	12.50	1.799	26.00	0.149	22.00	1.378	28.00
F071	0.071	24.00	1.791	25.00	0.145	20.50	1.343	21.00
F072	0.01 EL	1.00	1.6 L	7.00	0.10	2.50	1.2 L	6.50
F074	0.06	19.50	1.67	13.00	0.14	14.50	1.25	11.00
F094	<0.1	0.00	1.8	28.00	0.2 EH	32.00	1.4	32.00
F107	0.05	8.00	1.61 L	8.00	0.13	9.00	1.29	13.50
F109	0.0564	16.00	1.5922 L	6.00	0.118	4.00	1.1789 VL	4.00
F110	0.068	23.00	1.760	22.50	0.138	12.00	1.320	18.50
F112	0.04	3.00	1.49 VL	3.00	0.12	5.50	1.17 VL	3.00
F113	0.03	2.00	1.77	24.00	0.12	5.50	1.37	25.50
F115	0.055	12.50	1.735	19.00	0.143	18.50	1.337	20.00
F116	0.05	8.00	1.70	15.00	0.13	9.00	1.30	16.00
F131	0.088	28.00	1.874 H	32.00	0.145	20.50	1.389	30.00
F133	0.05	8.00	1.80	28.00	0.15	24.50	1.38	29.00
F139	<0.01 EL	0.00	1.368 EL	1.00	<0.01 EL	0.00	0.992 EL	1.00
F145	<0.1	0.00	1.42 VL	2.00	<0.1	0.00	1.05 VL	2.00
MEDIAN	0.0560		1.7300		0.1410		1.3200	
1CRIT	0.0400		0.1052		0.0416		0.0888	
N	27		33		30		33	
MEAN	0.0579		1.7103		0.1405		1.3020	
3STDEV	0.0373		0.3320		0.0587		0.2599	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	90.50	12.929	7	EL EL				Flame Photoem
F003	212.50	21.250	10					ICP
F007	161.50	16.150	10	EL				
F009	131.50	13.150	10					ICP-MS
F010	84.50	8.450	10	L				ICP-OES
F012	246.00	24.600	10					ICPMS
F014	294.00	29.400	10	H H H H	BIASED HIGH	7.51	0.0079	ICP-MS
F015	43.50	6.214	7	VLL VL L	BIASED LOW*	-0.23	-0.0844	ICP
F017	194.00	19.400	10					AAF
F020	184.50	18.450	10	H VH				IC
F025	310.00	31.000	10	H EH EHH VH	BIASED HIGH	23.78	-0.0254	IC
F026	169.00	16.900	10	VL				FLAME AAS
F032	285.50	28.550	10	VH H H	BIASED HIGH	8.23	-0.0004	AAS
F036	253.50	25.350	10					AAS
F037	191.00	19.100	10	L EHEHEHL H L				ICP-MS
F042	120.00	12.000	10	L L L				Flame AA,AIR
F049	63.50	6.350	10	L L L L	BIASED LOW	-7.43	-0.0082	AA
F053	154.50	15.450	10	L	INSUFFICIENT DATA			ICP
F060	41.50	13.833	3					IC, Dionex
F068	218.50	21.850	10	H				Flame-AA
F071	249.00	24.900	10	ELELELL L	BIASED LOW*	2.13	-0.0599	flame emission
F072	70.50	7.050	10					AAS
F074	126.50	12.650	10	EH	BIASED HIGH*	2.98	0.0217	ICPMS
F094	219.50	27.438	8					ICP
F107	189.00	18.900	10	VH L				ICP
F109	57.00	5.700	10	L L L L VL	BIASED LOW	-7.13	-0.0178	Flame AAS
F110	201.50	20.150	10					AA2380 FLAME
F112	52.50	5.250	10	L VL VL	BIASED LOW	-6.90	-0.0209	FAAS - PE-5100
F113	156.50	15.650	10	H				Flame AA
F115	160.00	16.000	10					ICP
F116	133.50	13.350	10					IC
F131	260.50	26.050	10	VH H				ICP-MS
F133	189.50	18.950	10	H				ICP-OES
F139	10.00	1.667	6	VLELELELELELELELELEL	BIASED LOW	-15.27	-0.1107	ICP-AES
F145	13.00	2.167	6	ELELELL VL VL	BIASED LOW*	2.49	-0.2720	

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    * NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
            PERCENT SLOPE USED FOR CAUTION COMPARISON=    5.00
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OVERALL AVERAGE
RANK IS   16.936

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F139	10.00	1.667	6	VLELELELELELELELELEL	BIASED LOW	-15.27	-0.1107	ICP-OES
F145	13.00	2.167	6	ELELELLVLVL	BIASED LOW*	2.49	-0.2720	ICP-AES
F112	52.50	5.250	10	LVLVL	BIASED LOW	-6.90	-0.0209	AA2380 FLAME
F109	57.00	5.700	10	LLLLVL	BIASED LOW	-7.13	-0.0178	ICP
F015	43.50	6.214	7	VLLVLL	BIASED LOW*	-0.23	-0.0844	ICP
F049	63.50	6.350	10	LLLL	BIASED LOW	-7.43	-0.0082	
F072	70.50	7.050	10	ELELELLL	BIASED LOW*	2.13	-0.0599	
F010	84.50	8.450	10	L				flame emission
F042	120.00	12.000	10	LLL				ICP-OES
F074	126.50	12.650	10					Flame AA,AIR
F002	90.50	12.929	7	ELEL				AAS
F009	131.50	13.150	10					Flame Photoem
F116	133.50	13.350	10					ICP-MS
F060	41.50	13.833	3		INSUFFICIENT DATA			ICP
F053	154.50	15.450	10	L				ICP
F113	156.50	15.650	10	H				AA
F115	160.00	16.000	10					FAAS - PE-5100
F007	161.50	16.150	10	EL				Flame AA
F026	169.00	16.900	10	VL				
F020	184.50	18.450	10	HVH				FLAME AAS
F107	189.00	18.900	10	VHL				IC
F133	189.50	18.950	10	H				ICP
F037	191.00	19.100	10	LEHEHEHLHL				ICP-MS
F017	194.00	19.400	10					ICP-MS
F110	201.50	20.150	10					AAF
F003	212.50	21.250	10					Flame AAS
F068	218.50	21.850	10					ICP
F012	246.00	24.600	10					IC, Dionex
F071	249.00	24.900	10	H				ICPMS
F036	253.50	25.350	10					Flame-AA
F131	260.50	26.050	10	VHH				AAS
F094	219.50	27.438	8	EH	BIASED HIGH*	2.98	0.0217	IC
F032	285.50	28.550	10	VHHH	BIASED HIGH	8.23	-0.0004	ICPMS
F014	294.00	29.400	10	HHHH	BIASED HIGH	7.51	0.0079	AAS
F025	310.00	31.000	10	HEHEHHVH	BIASED HIGH	23.78	-0.0254	ICP-MS
								IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   16.936

Sodium

PARAMETER: 19091 Potassium   mg/L

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.1000   BASIC ACCEPTABLE ERROR= 0.0300   CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F002	0.40	13.00	0.13	9.50	0.18	10.00	0.21	8.50	<0.05	0.00	<0.05	0.00
F003	0.47 H	28.50	0.18 H	30.00	0.22	27.50	0.28 H	32.00	0.06	23.00	<0.06	0.00
F007	0.405	15.00	0.149	18.00	0.198	18.00	0.182 L	3.00	0.039	11.50	<0.02	0.00
F009	0.39	9.50	0.13	9.50	0.15 L	3.50	0.22	12.50	<0.05	0.00	<0.05	0.00
F010	0.35 L	4.50	0.13	9.50	0.17	6.50	0.21	8.50	0.03	5.50	0.01	3.50
F012	0.48 VH	31.00	0.12	6.00	0.18	10.00	0.26	28.50	<0.01	0.00	<0.01	0.00
F014	0.459 H	27.00	0.183 H	31.00	0.217	26.00	0.249	25.00	<0.050	0.00	<0.050	0.00
F015	0.3 VL	3.00	0.1 L	2.00	<0.1 EL	0.00	0.2	4.50	<0.1	0.00	<0.1	0.00
F017	0.42	24.00	0.154	22.50	0.207	24.00	0.242	23.00	0.044	19.00	0.021	15.00
F020	0.37	6.00	0.12	6.00	0.17	6.50	0.22	12.50	0.05	21.50	0.011	5.50
F025	0.413	18.00	0.120	6.00	0.173	8.00	0.209	6.00	0.009 L	1.00	0.011	5.50
F026	0.380	7.50	0.140	14.50	0.26 VH	31.00	0.219	11.00	0.034	9.00	0.017	9.50
F032	0.44	26.00	0.16	26.50	0.212	25.00	0.252	26.00	0.04	15.00	0.02	12.50
F036	0.415	20.00	0.15	20.00	0.19	14.00	0.235	18.00	0.035	10.00	0.015	7.00
F037	0.39	9.50	0.143	17.00	0.196	16.50	0.255	27.00	0.0233	3.00	<0.01	0.00
F042	0.38	7.50	0.13	9.50	0.18	10.00	0.21	8.50	0.02	2.00	0.00	1.00
F049	0.35 L	4.50	0.11	4.00	0.14 VL	2.00	0.18 L	2.00	0.04W	0.00	0.04W	0.00
F053	0.418	22.00	0.159	25.00	0.202	21.00	0.241	22.00	0.039	11.50	0.017	9.50
F060	<1.00	0.00	<1.00	0.00	<1.00	0.00	<1.00	0.00	<1.00	0.00	<1.00	0.00
F068	0.397	11.00	0.136	12.00	0.183	12.00	0.222	14.00	0.033	8.00		0.00
F071	0.415	20.00	0.154	22.50	0.204	22.50	0.248	24.00	0.046	20.00	0.025	16.00
F072	0.08 EL	1.00	0.10 L	2.00	0.13 VL	1.00	0.21	8.50	0.03	5.50	0.02	12.50
F074	0.41	17.00	0.16	26.50	0.20	19.50	0.24	20.50	0.04	15.00	0.03	17.50
F094	0.47 H	28.50	0.17	28.50	0.23	29.00	0.27 H	30.00	0.05	21.50	0.02	12.50
F107	0.48 VH	31.00	0.17	28.50	0.22	27.50	0.26	28.50	0.04	15.00	0.03	17.50
F110	0.420	24.00	0.155	24.00	0.204	22.50	0.240	20.50	0.040	15.00	<0.030	0.00
F112	0.40	13.00	0.14	14.50	0.19	14.00	0.23	16.00	0.03	5.50	0.01	3.50
F113	0.42	24.00	0.14	14.50	0.19	14.00	0.23	16.00	0.03	5.50	0.007	2.00
F115	0.407	16.00	0.150	20.00	0.196	16.50	0.238	19.00	0.043	18.00	0.016	8.00
F116	0.48 VH	31.00	0.14	14.50	0.20	19.50	0.23	16.00	0.04	15.00	0.02T	12.50
F131	0.486 VH	33.00	0.186 H	32.00	0.238 H	30.00	0.271 H	31.00	0.083 EH	24.00	0.081 EH	20.00
F133	0.40	13.00	0.15	20.00	0.15 L	3.50	0.20	4.50	<0.05	0.00	<0.05	0.00
F139	0.2443 EL	2.00	<0.1 L	0.00	<0.1 EL	0.00	<0.1 EL	0.00	<0.1	0.00	<0.1	0.00
F145	0.415	20.00	0.1 L	2.00	0.158 L	5.00	0.129 EL	1.00	0.115 EH	25.00	0.057 EH	19.00
MEDIAN	0.4100		0.1415		0.1960		0.2300		0.0400		0.0185	
1CRIT	0.0455		0.0321		0.0348		0.0365		0.0300		0.0300	
N	31		31		29		30		23		18	
MEAN	0.4061		0.1411		0.1913		0.2294		0.0400		0.0198	
3STDEV	0.1492		0.0653		0.0709		0.0702		0.0381		0.0330	

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F002	<0.05	0.00	0.22	7.00	<0.05	0.00	0.11	8.00
F003	0.06 EH	20.00	0.27	29.00	0.06	22.50	0.18 VH	31.00
F007	0.026	14.00	0.247	15.00	0.054	14.00	0.126	18.00
F009	<0.05	0.00	0.22	7.00	<0.05	0.00	0.12	14.00
F010	0.02	7.50	0.23	10.00	0.05	10.00	0.11	8.00
F012	<0.01	0.00	0.27	29.00	0.01 EL	1.00	0.11	8.00
F014	<0.050	0.00	0.263	24.00	<0.050	0.00	0.141	27.00
F015	<0.1	0.00	0.2 L	3.50	<0.1	0.00	0.1	4.00
F017	0.029	15.00	0.25	17.00	0.059	19.50	0.131	22.50
F020	0.03	17.50	0.24	13.00	0.05	10.00	0.12	14.00
F025	0.004	2.00	0.206 L	5.00	0.030	2.00	0.104	6.00
F026	0.021	10.00	0.224	9.00	0.053	12.50	0.122	16.00
F032	0.024	12.50	0.26	22.50	0.056	18.00	0.136	25.00
F036	0.02	7.50	0.25	17.00	0.05	10.00	0.125	17.00
F037	<0.01	0.00	0.265	25.50	0.0396	3.00	0.119	12.00
F042	0.01	3.50	0.22	7.00	0.04	5.50	0.10	4.00
F049	0.04W	0.00	0.19 VL	2.00	0.04W	0.00	0.07 VL	2.00
F053	0.024	12.50	0.256	20.00	0.055	16.00	0.130	20.00
F060	<1.00	0.00	<1.00	0.00	<1.00	0.00	<1.00	0.00
F068		0.00	0.239	11.00	0.055	16.00	0.113	10.00
F071	0.001	1.00	0.265	25.50	0.059	19.50	0.163 H	30.00
F072	0.03	17.50	0.20 L	3.50	0.04	5.50	0.9 EH	32.00
F074	0.03	17.50	0.26	22.50	0.06	22.50	0.14	26.00
F094	0.03	17.50	0.28	32.00	0.06	22.50	0.15	28.00
F107	0.02	7.50	0.24	13.00	0.04	5.50	0.03 EL	1.00
F110	<0.030	0.00	0.269	27.00	0.053	12.50	0.133	24.00
F112	0.01	3.50	0.24	13.00	0.04	5.50	0.12	14.00
F113	0.012	5.00	0.258	21.00	0.047	8.00	0.13	20.00
F115	0.022	11.00	0.253	19.00	0.055	16.00	0.131	22.50
F116	0.02T	7.50	0.27	29.00	0.06	22.50	0.13	20.00
F131	0.071 EH	21.00	0.278	31.00	0.093 EH	25.00	0.159 H	29.00
F133	<0.05	0.00	0.25	17.00	<0.05	0.00	0.10	4.00
F139	<0.1	0.00	<0.1 EL	0.00	<0.1	0.00	<0.1	0.00
F145	<0.1	0.00	0.143 EL	1.00	0.115 EH	26.00	0.115	11.00
MEDIAN	0.0220		0.2500		0.0535		0.1235	
1CRIT	0.0300		0.0375		0.0300		0.0312	
N	19		30		24		30	
MEAN	0.0233		0.2434		0.0524		0.1246	
3STDEV	0.0342		0.0708		0.0353		0.0635	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	56.00	9.333	6					Flame Photoem
F003	243.50	27.056	9	H H H EH VH	BIASED HIGH	7.41	0.0228	ICP
F007	126.50	14.056	9	L				
F009	56.00	9.333	6	L				ICP-MS
F010	73.50	7.350	10	L	BIASED LOW	-12.25	0.0007	ICP-OES
F012	113.50	16.214	7	VH EL				ICPMS
F014	160.00	26.667	6	H H	BIASED HIGH	6.81	0.0115	ICP-MS
F015	17.00	3.400	5	VLL EL L	BIASED LOW	-27.65	0.0129	ICP
F017	201.50	20.150	10					AAF
F020	112.50	11.250	10					IC
F025	59.50	5.950	10	L L	BIASED LOW*	2.11	-0.0237	IC
F026	130.00	13.000	10	VH				FLAME AAS
F032	209.00	20.900	10					AAS
F036	140.50	14.050	10					AAS
F037	113.50	14.188	8					ICP-MS
F042	58.50	5.850	10		BIASED LOW*	-3.69	-0.0140	Flame AA, AIR
F049	16.50	2.750	6	L VLL VL VL	BIASED LOW	-5.88	-0.0386	
F053	179.50	17.950	10					AA
F060	0.00	-	0		INSUFFICIENT DATA			ICP
F068	94.00	11.750	8					IC, Dionex
F071	201.00	20.100	10	H				Flame-AA
F072	89.00	8.900	10	ELL VL L EH				flame emission
F074	204.50	20.450	10					AAS
F094	250.00	25.000	10	H H	BIASED HIGH	13.98	0.0037	ICPMS
F107	175.00	17.500	10	VH EL				ICP
F110	169.50	21.188	8					Flame AAS
F112	102.50	10.250	10					AA2380 FLAME
F113	130.00	13.000	10					FAAS
F115	166.00	16.600	10					Flame AA
F116	187.50	18.750	10	VH				AA Flame
F131	276.00	27.600	10	VHH H H EHEHEH EHH	BIASED HIGH*	2.90	0.0418	IC
F133	62.00	10.333	6	L				I.C.
F139	2.00	2.000	1	ELL ELEL EL	INSUFFICIENT DATA			ICP-OES
F145	110.00	12.222	9	L L ELEHEH ELEH				ICP-AES

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   15.092

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F060	0.00	–	0		INSUFFICIENT DATA			ICP
F139	2.00	2.000	1	ELLELELEL	INSUFFICIENT DATA			ICP-OES
F049	16.50	2.750	6	LVLLVLVL	BIASED LOW	-5.88	-0.0386	
F015	17.00	3.400	5	VLLELL	BIASED LOW	-27.65	0.0129	ICP
F042	58.50	5.850	10		BIASED LOW*	-3.69	-0.0140	Flame AA, AIR
F025	59.50	5.950	10	LL	BIASED LOW*	2.11	-0.0237	IC
F010	73.50	7.350	10	L	BIASED LOW	-12.25	0.0007	ICP-OES
F072	89.00	8.900	10	ELLVLLEH				flame emission
F002	56.00	9.333	6					Flame Photoem
F009	56.00	9.333	6	L				ICP-MS
F112	102.50	10.250	10					AA2380 FLAME
F133	62.00	10.333	6	L				I.C.
F020	112.50	11.250	10					IC
F068	94.00	11.750	8					IC, Dionex
F145	110.00	12.222	9	LLELEHEHELEH				ICP-AES
F113	130.00	13.000	10					FAAS
F026	130.00	13.000	10	VH .				FLAME AAS
F036	140.50	14.050	10					AAS
F007	126.50	14.056	9	L				
F037	113.50	14.188	8					ICP-MS
F012	113.50	16.214	7	VHEL				ICPMS
F115	166.00	16.600	10					Flame AA
F107	175.00	17.500	10	VHEL				ICP
F053	179.50	17.950	10					AA
F116	187.50	18.750	10	VH				AA Flame
F071	201.00	20.100	10	H				Flame-AA
F017	201.50	20.150	10					AAF
F074	204.50	20.450	10					AAS
F032	209.00	20.900	10					AAS
F110	169.50	21.188	8					Flame AAS
F094	250.00	25.000	10	HH	BIASED HIGH	13.98	0.0037	ICPMS
F014	160.00	26.667	6	HH	BIASED HIGH	6.81	0.0115	ICP-MS
F003	243.50	27.056	9	HHHEHVH	BIASED HIGH	7.41	0.0228	ICP
F131	276.00	27.600	10	VHHHHEHEHEHEHH	BIASED HIGH*	2.90	0.0418	IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   15.092

Potassium

PARAMETER: 14092 Reactive Silica   mg/L Si

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0250   BASIC ACCEPTABLE ERROR= 0.0250   CONCENTRATION ERROR INCREMENT= 0.0600

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F003	1.91	4.00	0.103	8.00	0.724	3.00	0.350	5.00	0.093	16.00	0.019	6.00
F010	1.96	8.50	0.08	2.00	0.71 L	2.00	0.33 L	3.00	0.05 L	3.00	<0.02	0.00
F015	1.9	3.00	0.13	18.00	0.87 H	20.00	0.36	7.50	0.09	15.00	<0.05	0.00
F020	1.63 EL	1.00	0.092	3.00	0.693 L	1.00	0.312 L	2.00	0.075	7.00	<0.06	0.00
F026	2.0008	14.00	0.1215	17.00	0.7696	8.00	0.3812	15.00	0.0975	17.00	0.0313	8.00
F032	1.94	6.00	0.1	6.00	0.76	6.00	0.36	7.50	0.08T	9.00	0.02W	0.00
F037	1.914	5.00	0.104	9.00	0.764	7.00	0.357	6.00	0.0851	13.00	0.0181	5.00
F042	1.97	10.00	0.18 EH	20.00	0.79	11.00	0.39	17.50	0.13 VH	19.00	0.06 VH	11.00
F060	2.02	16.00	0.10	6.00	0.84	16.50	0.37	9.50	0.07	5.50	<0.05	0.00
F071	2.071	18.00	0.172 EH	19.00	0.856	18.00	0.437 H	21.00	0.141 EH	20.00	0.107 EH	12.00
F072	1.96	8.50	0.05 EL	1.00	0.75	4.00	0.30 VL	1.00	0.04 L	1.50	<0.01	0.00
F074	2.00	12.50	0.109	10.00	0.793	12.00	0.380	13.00	0.082	11.00	0.013	3.00
F094	2.	12.50	0.1	6.00	0.81	14.00	0.38	13.00	0.07	5.50	<0.05	0.00
F107	2.01	15.00	0.121	16.00	0.794	13.00	0.38	13.00	0.115 H	18.00	0.035	9.00
F109	2.04	17.00	0.11T	11.00	0.82	15.00	0.37	9.50	0.08T	9.00	0.04T	10.00
F112	2.20 VH	20.00	0.12	15.00	0.89 H	21.00	0.39	17.50	0.04 L	1.50		0.00
F113	1.95	7.00	0.115	14.00	0.781	10.00	0.382	16.00	0.088	14.00	0.018	4.00
F115	1.975	11.00	0.114	13.00	0.772	9.00	0.378	11.00	0.080	9.00	0.008	1.50
F116	2.23 VH	21.00	0.113	12.00	0.869 H	19.00	0.420	20.00	0.085	12.00	0.008T	1.50
F131	1.819 L	2.00	0.097	4.00	0.751	5.00	0.340	4.00	0.056	4.00	0.025	7.00
F145	2.19 VH	19.00	<0.01 EL	0.00	0.84	16.50	0.41	19.00	<0.01 EL	0.00	<0.01	0.00

MEDIAN	1.9750		0.1095		0.7900		0.3780		0.0810		0.0220	
1CRIT	0.1420		0.0301		0.0709		0.0462		0.0284		0.0250	
N	19		18		19		19		17		9	
MEAN	1.9910		0.1112		0.7928		0.3705		0.0839		0.0288	
3STDEV	0.2673		0.0566		0.1367		0.0759		0.0557		0.0417	

PARAMETER: 14092 Reactive Silica   mg/L Si

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F003	0.047	9.00	1.15	3.00	0.219	7.50	0.299	5.00
F010	<0.02	0.00	1.21	6.50	0.20	3.00	0.25 VL	1.00
F015	<0.05	0.00	1.23	10.50	0.22	11.50	0.33	14.50
F020	<0.06	0.00	1.03 EL	1.00	0.190	2.00	0.267 L	2.00
F026	0.0538	10.00	1.2380	12.00	0.2268	17.00	0.3205	13.00
F032	0.04T	5.00	1.22	8.00	0.22	11.50	0.3	6.00
F037	0.0405	6.00	1.167	4.00	0.223	16.00	0.289	4.00
F042	0.07 H	12.00	1.23	10.50	0.26 H	20.00	0.36 H	19.00
F060	<0.05	0.00	1.28	15.50	0.22	11.50	0.31	8.00
F071	0.097 EH	13.00	1.340 H	18.00	0.295 EH	21.00	0.386 VH	20.00
F072	<0.01 EL	0.00	1.17	5.00	0.15 EL	1.00	0.27 L	3.00
F074	0.035	3.00	1.260	14.00	0.219	7.50	0.320	12.00
F094	<0.05	0.00	1.3	17.00	0.22	11.50	0.35	17.00
F107	0.066	11.00	1.252	13.00	0.215	5.00	0.315	10.50
F109	0.03T	1.00	1.28	15.50	0.22	11.50	0.31	8.00
F112		0.00	1.38 VH	20.00	0.23	18.00	0.33	14.50
F113	0.042	8.00	1.21	6.50	0.217	6.00	0.315	10.50
F115	0.041	7.00	1.226	9.00	0.222	15.00	0.310	8.00
F116	0.033T	2.00	1.41 VH	21.00	0.237	19.00	0.350	17.00
F131	0.036	4.00	1.142	2.00	0.208	4.00	0.471 EH	21.00
F145	<0.01 EL	0.00	1.36 H	19.00	0.22	11.50	0.35	17.00
MEDIAN	0.0410		1.2300		0.2200		0.3150	
1CRIT	0.0260		0.0973		0.0367		0.0424	
N	11		19		19		19	
MEAN	0.0458		1.2445		0.2204		0.3201	
3STDEV	0.0354		0.1965		0.0409		0.0879	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	66.50	6.650	10					Colorimetric
F010	29.00	3.625	8	L L L VL	BIASED LOW*	0.98	-0.0448	Colorimetry
F015	100.00	12.500	8	H				ICP
F020	19.00	2.375	8	EL L L EL L	BIASED LOW	-17.34	0.0093	TrAACS
F026	131.00	13.100	10					AA
F032	65.00	7.222	9					Colourimetry
F037	75.00	7.500	10					ICP-MS
F042	150.00	15.000	10	EH VHVHH H H				Colorimetric
F060	88.50	11.062	8					ICP
F071	180.00	18.000	10	EH H EHEHEHH EHVH	BIASED HIGH*	1.95	0.0640	Colorimetric
F072	25.00	3.125	8	EL VLL EL ELL	BIASED LOW*	1.82	-0.0627	Molybdate
F074	98.00	9.800	10					Colour - FIA
F094	96.50	12.062	8					Colorimetry
F107	123.50	12.350	10	H				COLOR
F109	107.50	10.750	10					FIA- molybdate
F112	127.50	15.938	8	VH H L VH				TECHNICON
F113	96.00	9.600	10					FIA
F115	93.50	9.350	10					Auto. Colorimetric
F116	144.50	14.450	10	VH H VH				Colour
F131	57.00	5.700	10	L EH				ICP
F145	102.00	17.000	6	VHEL EL ELH	BIASED HIGH	11.64	-0.0182	Auto

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   10.340

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F020	19.00	2.375	8	ELLLELL	BIASED LOW	-17.34	0.0093	TrAACS
F072	25.00	3.125	8	ELVLLELELL	BIASED LOW*	1.82	-0.0627	Molybdate
F010	29.00	3.625	8	LLLVL	BIASED LOW*	0.98	-0.0448	Colorimetry
F131	57.00	5.700	10	LEH				ICP
F003	66.50	6.650	10					Colorimetric
F032	65.00	7.222	9					Colourimetry
F037	75.00	7.500	10					ICP-MS
F115	93.50	9.350	10					Auto. Colorimetric
F113	96.00	9.600	10					FIA
F074	98.00	9.800	10					Colour - FIA
F109	107.50	10.750	10					FIA- molybdate
F060	88.50	11.062	8					ICP
F094	96.50	12.062	8					Colorimetry
F107	123.50	12.350	10	H				COLOR
F015	100.00	12.500	8	H				ICP
F026	131.00	13.100	10					AA
F116	144.50	14.450	10	VHHVH				Colour
F042	150.00	15.000	10	EHVHVHHHH				Colorimetric
F112	127.50	15.938	8	VHHLVH				TECHNICON
F145	102.00	17.000	6	VHELELELH	BIASED HIGH	11.64	-0.0182	Auto
F071	180.00	18.000	10	EHHEHEHEHHEHVH	BIASED HIGH*	1.95	0.0640	Colorimetric

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   10.340

Reactive Silica

PARAMETER: 16000 Sulfate IC   mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.2500   BASIC ACCEPTABLE ERROR= 0.0500   CONCENTRATION ERROR INCREMENT= 0.0350

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F002	5.50	18.50	5.33	21.50	5.88	13.00	2.29	18.00	0.24	12.50	1.38	16.50
F009	5.7	31.00	5.45	31.00	6.07	26.00	2.28	16.50	0.26	21.50	1.38	16.50
F010	5.62	27.50	5.33	21.50	6.05	23.00	2.26	12.50	0.19	2.00	1.30	5.00
F012	5.35	6.50	5.43	30.00	6.34 VH	34.00	2.32	25.00	0.27	25.50	1.35	12.00
F014	5.57	24.50	5.27	16.00	5.94	19.00	2.19	5.00	0.265	23.00	1.20 VL	2.00
F015	5.5	18.50	5.4	29.00	5.7	5.00	2.3	20.00	<0.5	0.00	1.4	22.50
F017	5.438	11.00	5.286	19.00	5.838	12.00	2.256	11.00	0.243	17.00	1.406	24.00
F020	5.58	26.00	5.27	16.00	6.28 H	32.00	2.09 VL	2.00	0.22	6.00	1.24 VL	3.00
F025	5.38	8.00	5.22	12.00	5.79	10.00	2.25	10.00	0.240	12.50	1.33	7.50
F026	5.6372	29.00	5.3881	28.00	6.1018	29.00	2.2301	8.00	0.2358	8.00	1.3126	6.00
F032	5.45	13.00	4.8 VL	3.00	5.9	15.00	2.6 EH	33.00	0.25	19.00	1.35	12.00
F036	5.45	13.00	5.15	9.00	6.	22.00	2.3	20.00	0.25	19.00	1.35	12.00
F037	5.2544 L	3.00	4.8724 VL	5.00	5.6763	4.00	2.2368	9.00	<1.0	0.00	1.4161	27.00
F042	5.56	22.00	5.25	13.00	5.91	16.50	2.28	16.50	0.24	12.50	1.38	16.50
F049	5.87 VH	33.00	5.51 H	33.00	6.3 VH	33.00	2.44 H	31.00	0.25	19.00	1.45	30.00
F053	5.54	21.00	5.27	16.00	5.95	20.00	2.30	20.00	0.24	12.50	1.37	14.00
F060	5.49	17.00	5.34	23.00	5.91	16.50	2.34	27.00	0.24	12.50	1.41	25.50
F068	5.511	20.00	5.272	18.00	5.92	18.00	2.26	12.50	0.232	7.00	1.343	10.00
F071	5.474	16.00	5.138	8.00	5.768	8.00	2.189	4.00	0.206	5.00	1.293	4.00
F072	5.35	6.50	5.06	6.50	5.73	6.50	2.21	6.00	<0.5	0.00	1.41	25.50
F074	5.57	24.50	5.36	24.00	6.06	24.00	2.36	28.00	0.15 VL	1.00	1.42	28.00
F094	5.15 L	2.00	4.86 VL	4.00	5.58 L	3.00	2.1 VL	3.00	0.24	12.50	1.38	16.50
F107	5.27	4.00	5.06	6.50	5.73	6.50	2.32	25.00	0.54 EH	31.00	1.49 H	31.00
F109	5.3958	9.00	5.185	11.00	5.8868	14.00	2.2691	14.00	0.3207 VH	28.00	1.3871	19.00
F110	5.40	10.00	5.32	20.00	5.78	9.00	2.39	29.00	0.39 VH	29.00	1.50 H	32.00
F112	5.62	27.50	5.38	27.00	6.07	26.00	2.31	22.50	0.26	21.50	1.39	20.50
F113	5.335	5.00	0.532 EL	1.00	0.547 EL	1.00	4.353 EH	34.00	0.205	4.00	0.201 EL	1.00
F115	5.562	23.00	5.260	14.00	5.994	21.00	2.230	7.00	0.269	24.00	1.335	9.00
F116	5.45	13.00	5.37	25.50	5.82	11.00	2.27	15.00	0.32 VH	27.00	1.40	22.50
F118	5.84 H	32.00	5.50 H	32.00	6.24 H	31.00	2.32	25.00	0.27T	25.50	1.33	7.50
F131	5.462	15.00	5.165	10.00	6.110	30.00	2.404	30.00	0.519 EH	30.00	1.553 VH	33.00
F133	5.89 VH	34.00	6.30 EH	34.00	6.09	28.00	2.47 VH	32.00	0.24	12.50	1.60 EH	34.00
F139	4.74 EL	1.00	4.62 EL	2.00	5.27 EL	2.00	1.92 EL	1.00	0.24	12.50	1.43	29.00
F145	5.69	30.00	5.37	25.50	6.07	26.00	2.31	22.50	0.204	3.00	1.39	20.50

	1		2		3		4		5		6	
MEDIAN	5.4950		5.2710		5.9150		2.2850		0.2400		1.3800	
1CRIT	0.2336		0.2257		0.2483		0.1212		0.0500		0.0896	
N	32		32		32		32		29		32	
MEAN	5.4990		5.2340		5.9192		2.2930		0.2603		1.3774	
3STDEV	0.4618		0.6102		0.6250		0.2920		0.1867		0.2066	

PARAMETER: 16000 Sulfate IC   mg/L

SAMPLE	7 = RAINGR-11		8 = MERSEY-MX		9 = PHA-08		10 = COBRIEL-MX	
	REPORTED		REPORTED		REPORTED		REPORTED	
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F002	1.55	18.50	4.68	14.00	6.97	17.00	1.76	25.50
F009	1.53	10.50	4.73	21.50	7.1	24.00	1.72	16.50
F010	1.54	13.50	4.75	23.50	7.1	24.00	1.72	16.50
F012	1.58	24.50	4.87	31.00	7.22	31.00	1.68	9.00
F014	1.70 VH	32.00	4.71	20.00	7.04	21.00	1.60 L	2.00
F015	1.5	6.50	4.6	10.50	7.1	24.00	1.8	28.00
F017	1.566	23.00	4.6	10.50	7.033	20.00	1.734	20.00
F020	1.40 VL	3.00	4.97 H	33.00	7.18	28.00	1.61 L	3.00
F025	1.50	6.50	4.68	14.00	6.82	9.00	1.66	5.00
F026	1.5059	8.00	4.7659	26.00	7.0540	22.00	1.6666	7.00
F032	1.55	18.50	4.7	18.50	6.8	8.00	1.9 VH	32.00
F036	1.55	18.50	4.7	18.50	6.75	6.00	1.7	10.50
F037	1.6411	28.00	4.4312 L	4.00	6.4671 VL	3.00	1.7144	14.00
F042	1.54	13.50	4.73	21.50	6.94	15.00	1.74	22.00
F049	1.65 H	29.00	5. H	34.00	7.44 VH	32.00	1.85 H	30.00
F053	1.54	13.50	4.75	23.50	6.86	11.00	1.72	16.50
F060	1.56	21.50	4.68	14.00	6.99	18.00	1.74	22.00
F068	1.52	9.00	4.686	16.00	6.918	13.00	1.714	13.00
F071	1.465	4.00	4.550	8.00	6.850	10.00	1.676	8.00
F072	1.55	18.50	4.51	5.00	6.72	4.50	1.70	10.50
F074	1.72 VH	34.00	4.76	25.00	6.92	14.00	1.79	27.00
F094	1.58	24.50	4.36 VL	3.00	7.97 EH	33.00	1.73	19.00
F107	1.66 H	30.00	4.54	7.00	6.72	4.50	1.82	29.00
F109	1.5412	16.00	4.632	12.00	6.888	12.00	1.7004	12.00
F110	1.53	10.50	4.52	6.00	7.20	29.00	1.74	22.00
F112	1.69 H	31.00	4.81	28.00	7.21	30.00	1.76	25.50
F113	0.203 EL	1.00	3.042 EL	1.00	0.226 EL	1.00	1.983 EH	34.00
F115	1.485	5.00	4.690	17.00	7.008	19.00	1.665	6.00
F116	1.60	27.00	4.59	9.00	7.16	27.00	1.72	16.50
F118	1.54	13.50	4.82	29.50	6.95	16.00	1.65	4.00
F131	1.713 VH	33.00	4.797	27.00	6.771	7.00	1.872 H	31.00
F133	1.59	26.00	4.89	32.00	8.36 EH	34.00	1.95 VH	33.00
F139	1.29 EL	2.00	4.09 EL	2.00	6.21 VL	2.00	1.48 EL	1.00
F145	1.56	21.50	4.82	29.50	7.11	26.00	1.75	24.00
MEDIAN	1.5500		4.6950		6.9800		1.7200	
1CRIT	0.0955		0.2056		0.2855		0.1015	
N	32		32		32		32	
MEAN	1.5537		4.6691		6.9834		1.7360	
3STDEV	0.2463		0.4995		0.8699		0.2310	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	175.00	17.500	10					IC
F009	215.00	21.500	10					Dionex
F010	169.00	16.900	10					IC
F012	228.50	22.850	10	VH				IC
F014	164.50	16.450	10	VLVH L				
F015	164.00	18.222	9					IC Anions
F017	167.50	16.750	10					I.C.
F020	152.00	15.200	10	H VL VLVLH L				IC
F025	94.50	9.450	10					IC
F026	171.00	17.100	10					DIONEX I.C.
F032	172.00	17.200	10	VL EH VH				Ion Chromatography
F036	148.50	14.850	10					Ion Chromatography
F037	97.00	10.778	9	L VL L VL				I.C. WATERS
F042	169.00	16.900	10					IC
F049	304.00	30.400	10	VHH VHH H H VHH	BIASED HIGH	6.30	-0.0010	
F053	168.00	16.800	10					IC
F060	197.00	19.700	10					IC plus calcn
F068	136.50	13.650	10					IC, Dionex
F071	75.00	7.500	10		BIASED LOW*	-1.11	-0.0529	Ion chromatograph
F072	89.50	9.944	9					IC
F074	229.50	22.950	10	VL VH				Supressed IC
F094	120.50	12.050	10	L VLL VL VLEH				IC
F107	174.50	17.450	10	EHH H				IC
F109	147.00	14.700	10	VH				Dionex
F110	196.50	19.650	10	VHH				IC Dionex
F112	259.50	25.950	10	H				DIONEX IC
F113	83.00	8.300	10	ELELEH ELELELELEH				IC - Dionex
F115	145.00	14.500	10					Dionex AS4A
F116	193.50	19.350	10	VH				Dionex IC
F118	216.00	21.600	10	H H H				IC
F131	246.00	24.600	10	EHVHVH H				IC
F133	299.50	29.950	10	VHEH VH EH EHVH	BIASED HIGH	13.36	-0.0899	I.C.
F139	54.50	5.450	10	ELELELEL ELELVLEL	BIASED LOW	-12.24	0.0107	I.C.
F145	228.50	22.850	10					IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   17.362

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F139	54.50	5.450	10	ELELELELELELVLEL	BIASED LOW	-12.24	0.0107	I.C.
F071	75.00	7.500	10		BIASED LOW*	-1.11	-0.0529	Ion chromatograph
F113	83.00	8.300	10	ELELEHELELELELEH				IC - Dionex
F025	94.50	9.450	10					IC
F072	89.50	9.944	9					IC
F037	97.00	10.778	9	LVLLVL				I.C. WATERS
F094	120.50	12.050	10	LVLLVLVLEH				IC
F068	136.50	13.650	10					IC, Dionex
F115	145.00	14.500	10					Dionex AS4A
F109	147.00	14.700	10	VH				Dionex
F036	148.50	14.850	10					Ion Chromatography
F020	152.00	15.200	10	HVLVLVLHL				IC
F014	164.50	16.450	10	VLVHL				
F017	167.50	16.750	10					I.C.
F053	168.00	16.800	10					IC
F042	169.00	16.900	10					IC
F010	169.00	16.900	10					IC
F026	171.00	17.100	10					DIONEX I.C.
F032	172.00	17.200	10	VLEHVH				Ion Chromatography
F107	174.50	17.450	10	EHHH				IC
F002	175.00	17.500	10					IC
F015	164.00	18.222	9					IC Anions
F116	193.50	19.350	10	VH				Dionex IC
F110	196.50	19.650	10	VHH				IC Dionex
F060	197.00	19.700	10					IC plus calcn
F009	215.00	21.500	10					Dionex
F118	216.00	21.600	10	HHH				IC
F012	228.50	22.850	10	VH				IC
F145	228.50	22.850	10					IC
F074	229.50	22.950	10	VLVH				Supressed IC
F131	246.00	24.600	10	EHVHVHH				IC
F112	259.50	25.950	10	H				DIONEX IC
F133	299.50	29.950	10	VHEHVHEHEHVH	BIASED HIGH	13.36	-0.0899	I.C.
F049	304.00	30.400	10	VHHVHHHHVHH	BIASED HIGH	6.30	-0.0010	

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   17.362

Sulfate IC

PARAMETER: 16001 Sulfate   Colour   mg/L

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000   BASIC ACCEPTABLE ERROR= 0.3000   CONCENTRATION ERROR INCREMENT= 0.0800

| SAMPLE | 1 = BMOOS-01 REPORTED | | 2 = RAIN-97 REPORTED | | 3 = TRKY-94 REPORTED | | 4 = BESKI-01 REPORTED | | 5 = SUPER-04 REPORTED | | 6 = RAINGR-16 REPORTED | |
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F003	5.9	4.00	5.3	3.50	6.1	3.00	2.5	5.00	0.3	2.00	1.7 H	6.00
F007	5.2	1.00	4.8	1.00	5.6	1.00	2.	2.00	<0.8	0.00	0.9 L	1.00
F010	5.7	3.00	5.1	2.00	5.9	2.00	2.1	3.00	0.2	1.00	1.2	2.00
F026	6.115	6.00	5.43	6.00	6.395	6.00	2.455	4.00	0.425	3.00	1.34	4.00
F060	6.1	5.00	5.4	5.00	6.2	4.50	2.7 H	6.00	<0.3	0.00	1.5	5.00
F094	5.6	2.00	5.3	3.50	6.2	4.50	1.9	1.00	<0.5	0.00	1.3	3.00
MEDIAN OR *TARGET												
CONC.	5.8000		5.3000		6.1500		2.2775		*0.2500		1.3200	
1CRIT	0.6840		0.6440		0.7120		0.4022		0.3000		0.3256	
N	4		4		4		4		1		4	
MEAN	5.8250		5.2750		6.1000		2.2638		0.3000		1.3350	
3STDEV	-		-		-		-		-		-	

| SAMPLE | 7 = RAINGR-11 REPORTED | | 8 = MERSEY-MX REPORTED | | 9 = PHA-08 REPORTED | | 10 = COBRIEL-MX REPORTED | |
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F003	1.7	5.50	5.2	4.50	6.8	2.50	2.0	4.50
F007	1.1 L	1.00	4.6	1.00	6.4	1.00	1.4 L	1.00
F010	1.5	4.00	4.7	2.00	6.8	2.50	1.6	2.00
F026	1.485	3.00	5.435	6.00	7.245	5.00	2.02	6.00
F060	1.7	5.50	5.2	4.50	7.5	6.00	2.0	4.50
F094	1.4	2.00	4.8	3.00	7.1	4.00	1.7	3.00
MEDIAN OR *TARGET								
CONC.	1.4925		5.0000		6.9500		1.8500	
1CRIT	0.3394		0.6200		0.7760		0.3680	
N	3		4		4		4	
MEAN	1.4617		4.9750		6.9862		1.8250	
3STDEV	-		-		-		-	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	40.50	4.050	10	H				Colorimetric
F007	10.00	1.111	9	L L L				
F010	23.50	2.350	10					Colori.-calmagite
F026	49.00	4.900	10					AA
F060	46.00	5.111	9	H				ICP
F094	26.00	2.889	9					ICP

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   3.421

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F007	10.00	1.111	9	LLL				
F010	23.50	2.350	10					Colori.-calmagite
F094	26.00	2.889	9					ICP
F003	40.50	4.050	10	H				Colorimetric
F026	49.00	4.900	10					AA
F060	46.00	5.111	9	H				ICP

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   3.421

Sulfate   Colour

PARAMETER: 17000 Chloride IC   mg/L

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.2000   BASIC ACCEPTABLE ERROR= 0.0750   CONCENTRATION ERROR INCREMENT= 0.0350

| SAMPLE | 1 = BMOOS-01 REPORTED VALUE | RANK | 2 = RAIN-97 REPORTED VALUE | RANK | 3 = TRKY-94 REPORTED VALUE | RANK | 4 = BESKI-01 REPORTED VALUE | RANK | 5 = SUPER-04 REPORTED VALUE | RANK | 6 = RAINGR-16 REPORTED VALUE | RANK |
LAB NO												
F002	0.48	25.00	0.55	25.00	0.56	27.50	4.39	17.00	0.16	26.00	0.21	26.00
F009	0.42	5.00	0.49	2.00	0.49	5.00	4.28	9.00	0.11	20.00	0.23	28.50
F010	0.42	5.00	0.53	20.50	0.49	5.00	4.59	30.00	0.09	6.00	0.14	8.50
F012	0.63 EH	32.00	0.62 H	31.00	0.68 VH	31.00	4.56	29.00	0.1	13.00	0.23	28.50
F014	0.444	15.00	0.532	22.00	0.519	14.00	4.68 H	32.00	0.150	24.00	0.187	23.00
F015	0.45	18.50	0.51	10.00	0.53	19.50	4.4	19.00	0.1	13.00	0.13	4.00
F017	0.446	16.50	0.541	24.00	0.542	24.00	4.372	14.00	0.102	17.00	0.151	14.00
F020	0.42	5.00	0.50	4.00	0.49	5.00	4.61	31.00	0.10	13.00	0.12	1.50
F025	0.426	8.00	0.503	6.00	0.509	10.00	4.38	16.00	0.083	4.00	0.124	3.00
F026	0.4365	10.00	0.5226	18.00	0.4992	7.00	4.5334	28.00	0.0998	9.00	0.1640	18.00
F032	0.56 H	31.00	0.59	28.50	0.54	22.00	3.99 VL	4.00	0.11	20.00	0.15	11.50
F036	0.45	18.50	0.52	15.00	0.55	25.00	4.29	10.00	0.1	13.00	0.14	8.50
F037	0.3561 L	1.00	0.3152 EL	1.00	0.4778	2.00	4.394	18.00	<0.05	0.00	0.3297 VH	31.00
F042	0.47	23.00	0.56	26.50	0.56	27.50	4.53	27.00	0.15	24.00	0.18	21.50
F049	0.42	5.00	0.5	4.00	0.52	15.50	4.45	23.00	0.07	1.00	0.12	1.50
F053	0.44	13.00	0.52	15.00	0.52	15.50	4.43	21.00	0.10	13.00	0.15	11.50
F060	0.46	22.00	0.53	20.50	0.54	22.00	4.18	7.00	0.10	13.00	0.15	11.50
F068	0.446	16.50	0.504	7.00	0.524	17.00	4.470	25.00	0.100	13.00	0.138	6.00
F071	0.382	2.00	0.505	8.00	0.488	3.00	4.780 VH	33.00	0.098	8.00	0.139	7.00
F072	0.48	25.00	0.51	10.00	0.54	22.00	4.3	11.00	0.21 H	30.00	0.25 H	30.00
F074	0.49	28.00	0.59	28.50	0.56	27.50	3.85 VL	3.00	0.12	22.00	0.18	21.50
F094	0.44	13.00	0.52	15.00	0.51	11.50	4.44	22.00	0.08	2.50	0.17	19.50
F107	0.43	9.00	0.50	4.00	0.51	11.50	4.17	6.00	0.15	24.00	0.17	19.50
F109	0.4568	21.00	0.5228	19.00	0.5289	18.00	4.464	24.00	0.1678	27.00	0.201	25.00
F110	0.42	5.00	0.51	10.00	0.56	27.50	4.42	20.00	0.08	2.50	0.16	16.50
F112	0.44	13.00	0.52	15.00	0.53	19.50	4.50	26.00	0.09	6.00	0.16	16.50
F113	0.483	27.00	5.072 EH	33.00	5.745 EH	33.00	2.171 EL	1.00	0.27 EH	31.00	1.319 EH	33.00
F115	0.439	11.00	0.519	12.00	0.513	13.00	4.377	15.00	0.104	18.00	0.153	15.00
F116	0.501	29.00	0.540	23.00	0.474	1.00	4.23	8.00	0.090	6.00	0.134	5.00
F131	0.652 EH	33.00	0.711 EH	32.00	0.724 EH	32.00	4.016 VL	5.00	0.420 EH	32.00	0.446 EH	32.00
F133	0.52	30.00	0.52	15.00	0.50	8.00	4.34	12.00	0.11	20.00	0.15	11.50
F139	0.48	25.00	0.56	26.50	0.60	30.00	4.36	13.00	0.20 H	29.00	0.19	24.00
F145	0.452	20.00	0.6	30.00	0.503	9.00	3.7 EL	2.00	0.18 H	28.00	0.229	27.00
MEDIAN	0.4460		0.5200		0.5240		4.3900		0.1010		0.1600	
1CRIT	0.0836		0.0862		0.0863		0.2217		0.0750		0.0750	
N	31		31		31		31		30		30	
MEAN	0.4591		0.5371		0.5357		4.3450		0.1235		0.1845	
3STDEV	0.1386		0.1342		0.1545		0.6447		0.1327		0.1953	

PARAMETER: 17000 Chloride IC   mg/L

| SAMPLE | 7 = RAINGR-11 | | 8 = MERSEY-MX | | 9 = PHA-08 | | 10 = COBRIEL-MX | |
| | REPORTED | | REPORTED | | REPORTED | | REPORTED | |
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F002	0.21	28.00	3.12	17.50	0.21	28.50	2.04	18.00
F009	0.23 H	29.00	3.17	21.50	0.16	16.50	2.08	21.50
F010	0.14	8.50	3.29	29.50	0.14	5.50	2.14	27.50
F012	0.25 H	31.00	3.24	26.50	0.2	24.50	2.09	23.00
F014	0.196	24.00	3.12	17.50	0.179	19.00	2.02	16.00
F015	0.14	8.50	3.1	16.00	0.2	24.50	2.	14.50
F017	0.153	18.00	3.088	12.00	0.154	13.00	1.978	11.00
F020	0.13	5.00	3.63 EH	32.00	0.12	2.00	2.40 EH	33.00
F025	0.124	4.00	2.99	6.00	0.139	4.00	1.91	4.00
F026	0.1470	11.00	3.2474	28.00	0.1428	7.00	2.1775 H	31.00
F032	0.16	19.00	3.14	19.00	0.19	22.00	1.99	13.00
F036	0.15	14.50	3.09	14.50	0.15	11.00	2.08	21.50
F037	0.0685 L	1.00	3.0753	11.00	<0.05 L	0.00	1.9811	12.00
F042	0.20	25.50	3.22	24.50	0.20	24.50	2.12	25.00
F049	0.12	3.00	3.22	24.50	0.12	2.00	2.15	29.50
F053	0.15	14.50	3.15	20.00	0.15	11.00	2.03	17.00
F060	0.15	14.50	2.98	4.00	0.15	11.00	1.94	5.00
F068	0.142	10.00	3.219	23.00	0.147	8.50	2.140	27.50
F071	0.139	7.00	3.303 H	31.00	0.147	8.50	2.110	24.00
F072	0.24 H	30.00	3.0	7.00	0.24 H	30.00	1.90	3.00
F074	0.19	23.00	2.82 VL	1.00	0.20	24.50	1.97	8.00
F094	0.17	21.50	3.29	29.50	0.17	18.00	2.28 VH	32.00
F107	0.17	21.50	3.02	9.00	0.18	20.00	2.00	14.50
F109	0.2054	27.00	3.0891	13.00	0.2015	27.00	1.9711	9.00
F110	0.10	2.00	3.03	10.00	0.12	2.00	1.96	7.00
F112	0.15	14.50	3.09	14.50	0.14	5.50	2.15	29.50
F113	1.471 EH	33.00	4.517 EH	33.00	6.762 EH	32.00	1.633 EL	1.00
F115	0.150	14.50	3.170	21.50	0.157	14.50	2.045	19.00
F116	0.137	6.00	2.98	4.00	0.157	14.50	1.88 L	2.00
F131	0.437 EH	32.00	2.863 L	2.00	0.429 EH	31.00	1.972	10.00
F133	0.15	14.50	3.24	26.50	0.16	16.50	2.07	20.00
F139	0.20	25.50	2.98	4.00	0.21	28.50	1.95	6.00
F145	0.169	20.00	3.01	8.00	0.182	21.00	2.13	26.00
MEDIAN	0.1500		3.1200		0.1600		2.0300	
1CRIT	0.0750		0.1772		0.0750		0.1391	
N	31		31		31		31	
MEAN	0.1742		3.1340		0.1757		2.0405	
3STDEV	0.1791		0.4239		0.1648		0.2753	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	238.50	23.850	10					IC
F009	158.00	15.800	10	H				Dionex
F010	146.00	14.600	10					IC
F012	269.50	26.950	10	EHH VH H H	BIASED HIGH*	1.62	0.0811	IC
F014	206.50	20.650	10					
F015	147.50	14.750	10					IC Anions
F017	163.50	16.350	10					I.C.
F020	131.50	13.150	10	EH EH				IC
F025	65.00	6.500	10		BIASED LOW*	-1.24	-0.0269	IC
F026	167.00	16.700	10	H				DIONEX I.C.
F032	190.00	19.000	10	H VL				Ion Chromatography
F036	151.50	15.150	10					Ion Chromatography
F037	77.00	9.625	8	L EL VHL L				I.C. WATERS
F042	249.00	24.900	10					IC
F049	109.00	10.900	10					
F053	151.50	15.150	10					IC
F060	130.50	13.050	10					IC
F068	153.50	15.350	10					IC, Dionex
F071	131.50	13.150	10	VH H				Ion chromatograph
F072	198.00	19.800	10	H H H H				IC
F074	187.00	18.700	10	VL VL				Supressed IC
F094	184.50	18.450	10	VH				IC
F107	139.00	13.900	10					IC
F109	210.00	21.000	10					Dionex
F110	102.50	10.250	10					IC Dionex
F112	160.00	16.000	10					DIONEX IC
F113	257.00	25.700	10	EHEHELEHEHEHEHEHEL				IC - Dionex
F115	153.50	15.350	10					Dionex AS4A
F116	98.50	9.850	10	L				Dionex IC
F131	241.00	24.100	10	EHEHEHVLEHEHEHL EH				IC
F133	174.00	17.400	10					I.C.
F139	211.50	21.150	10	H				I.C.
F145	191.00	19.100	10	ELH				IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   16.902

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F025	65.00	6.500	10		BIASED LOW*	-1.24	-0.0269	IC
F037	77.00	9.625	8	LELVHLL				I.C. WATERS
F116	98.50	9.850	10	L				Dionex IC
F110	102.50	10.250	10					IC Dionex
F049	109.00	10.900	10					
F060	130.50	13.050	10					IC
F020	131.50	13.150	10	EHEH				IC
F071	131.50	13.150	10	VHH				Ion chromatograph
F107	139.00	13.900	10					IC
F010	146.00	14.600	10					IC
F015	147.50	14.750	10					IC Anions
F036	151.50	15.150	10					Ion Chromatography
F053	151.50	15.150	10					IC
F068	153.50	15.350	10					IC, Dionex
F115	153.50	15.350	10					Dionex AS4A
F009	158.00	15.800	10	H				Dionex
F112	160.00	16.000	10					DIONEX IC
F017	163.50	16.350	10					I.C.
F026	167.00	16.700	10	H				DIONEX I.C.
F133	174.00	17.400	10					I.C.
F094	184.50	18.450	10	VH				IC
F074	187.00	18.700	10	VLVL				Supressed IC
F032	190.00	19.000	10	HVL				Ion Chromatography
F145	191.00	19.100	10	ELH				IC
F072	198.00	19.800	10	HHHH				IC
F014	206.50	20.650	10	H				
F109	210.00	21.000	10					Dionex
F139	211.50	21.150	10	H				I.C.
F002	238.50	23.850	10					IC
F131	241.00	24.100	10	EHEHEHVLEHEHEHLEH				IC
F042	249.00	24.900	10					IC
F113	257.00	25.700	10	EHEHELEHEHEHEHEHEL				IC - Dionex
F012	269.50	26.950	10	EHHVHH	BIASED HIGH*	1.62	0.0811	IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   16.902

Chloride IC

PARAMETER: 17001 Chloride Colour   mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000   BASIC ACCEPTABLE ERROR= 0.3000   CONCENTRATION ERROR INCREMENT= 0.0800

SAMPLE / LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F003	0.59	5.00	0.63	4.00	0.64	5.00	4.39	4.00	0.14	3.00	0.19	4.00
F007	0.41	1.00	0.4	1.00	0.45	1.00	4.24	2.00	0.07	1.00	0.11	2.00
F010	0.5	4.00	0.6	3.00	0.5	2.00	4.4	5.00	0.1	2.00	0.1	1.00
F025	<0.5	0.00	<0.5	0.00	<0.5	0.00	3.7 L	1.00	<0.5	0.00	<0.5	0.00
F026	0.4925	3.00	0.5015	2.00	0.547	4.00	4.2745	3.00	0.1485	4.00	0.134	3.00
F060	<0.5	0.00	<0.5	0.00	<0.5	0.00	4.7	7.00	<0.5	0.00	<0.5	0.00
F145	0.459	2.00	0.663	5.00	0.502	3.00	4.42	6.00	<0.25	0.00	<0.25	0.00
MEDIAN	0.4925		0.6000		0.5020		4.3900		0.1200		0.1220	
1CRIT	0.3000		0.3000		0.3000		0.5712		0.3000		0.3000	
N	3		3		3		5		2		2	
MEAN	0.4838		0.5772		0.5163		4.3449		0.1200		0.1220	
3STDEV	-		-		-		-		-		-	

SAMPLE / LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F003	0.18	3.00	3.15	4.00	0.19	3.00	2.05	4.00
F007	0.09	1.00	2.99	3.00	0.12	1.00	1.86	3.00
F010	0.2	4.00	3.3	6.50	0.2	4.00	2.1	5.00
F025	<0.5	0.00	2.6 L	1.00	<0.5	0.00	1.7	2.00
F026	0.155	2.00	3.275	5.00	0.1515	2.00	2.102	6.00
F060	<0.5	0.00	3.3	6.50	<0.5	0.00	1.6 L	1.00
F145	<0.25	0.00	2.79	2.00	<0.25	0.00	2.19	7.00
MEDIAN	0.1675		3.1500		0.1707		2.0500	
1CRIT	0.3000		0.4720		0.3000		0.3840	
N	2		4		2		5	
MEAN	0.1675		3.0512		0.1707		1.9624	
3STDEV	-		-		-		-	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F003	39.00	3.900	10					Hg Thiocyanate
F007	16.00	1.600	10					
F010	36.50	3.650	10					Titration-conduct.
F025	4.00	1.333	3	L L				colour
F026	34.00	3.400	10					AA
F060	14.50	4.833	3	L				Automated Color
F145	25.00	4.167	6					Auto

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   3.250

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F025	4.00	1.333	3	LL				colour
F007	16.00	1.600	10					
F026	34.00	3.400	10					AA
F010	36.50	3.650	10					Titration-conduct.
F003	39.00	3.900	10					Hg Thiocyanate
F145	25.00	4.167	6					Auto
F060	14.50	4.833	3	L				Automated Color

NOTE: BIAS WAS NOT ASSESSED BECAUSE STATISTICS FOR FEWER THAN 10 LABS WERE AVAILABLE

OVERALL AVERAGE
RANK IS   3.250

Chloride Colour

PARAMETER: 20091 Calcium   mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.2500   BASIC ACCEPTABLE ERROR= 0.0750   CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE	1 = BMOOS-01		2 = RAIN-97		3 = TRKY-94		4 = BESKI-01		5 = SUPER-04		6 = RAINGR-16	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F002	1.96	13.50	2.68	22.00	4.73	20.00	0.40	12.50	0.89	8.50	0.58	8.50
F003	1.98	16.50	2.65	19.00	4.60	14.50	0.40	12.50	0.86	7.00	0.58	8.50
F007	2.07	29.00	2.75	28.50	4.9	32.00	0.422	26.00	0.972	21.00	0.621	24.00
F009	1.98	16.50	2.62	16.50	4.65	17.00	0.41	18.50	0.97	20.00	0.62	21.50
F010	2.11	31.00	2.82 H	31.00	4.84	30.00	0.45	29.50	1.01	29.50	0.64	29.00
F012	2.06	27.50	2.7	23.50	4.78	25.50	0.47	31.00	0.99	24.00	0.66	31.00
F014	1.94	11.50	2.53	9.00	4.64	16.00	0.397	8.00	0.951	15.00	0.609	16.00
F015	1.8 L	5.00	2.6	13.00	4.4	7.00	0.4	12.50	0.8 L	3.00	0.6	14.00
F017	1.999	20.00	2.725	27.00	4.738	21.00	0.412	20.50	1.001	27.00	0.631	26.00
F020	1.96	13.50	2.64	18.00	4.70	18.50	0.42	24.00	0.98	22.50	0.62	21.50
F025	2.08	30.00	2.75	28.50	4.88	31.00	0.424	27.00	1.03	32.00	0.634	27.00
F026	1.724 VL	2.00	2.34 L	4.00	2.032 EL	1.00	0.33	2.50	0.73 EL	1.00	0.452 EL	1.00
F032	1.98	16.50	2.6	13.00	4.78	25.50	0.42	24.00	1.	25.50	0.62	21.50
F036	1.98	16.50	2.6	13.00	4.78	25.50	0.42	24.00	1.	25.50	0.62	21.50
F037	1.863	7.00	2.478	7.00	4.416	8.00	0.331	4.00	0.892	10.00	0.549	4.00
F042	1.73 VL	3.00	2.17 EL	1.50	3.90 VL	3.00	0.33	2.50	0.81 L	4.00	0.48 EL	2.00
F049	2.03	25.50	2.72	25.50	4.82	29.00	0.44	28.00	1.02	31.00	0.63	25.00
F053	1.879	8.00	2.380 L	5.00	4.175 VL	5.00	0.385	7.00	0.924	13.00	0.589	10.00
F060	2.0	22.00	2.7	23.50	4.8	28.00	0.4	12.50	0.9	11.00	0.6	14.00
F072	1.11 EL	1.00	2.17 EL	1.50	3.60 EL	2.00	0.369	5.00	0.780 VL	2.00	0.575	7.00
F074	1.90	9.00	2.62	16.50	4.43	9.00	0.41	18.50	0.96	17.00	0.61	17.50
F094	2.06	27.50	2.72	25.50	4.78	25.50	0.45	29.50	1.01	29.50	0.65	30.00
F107	2.16 H	32.00	2.83 H	32.00	4.70	18.50	0.40	12.50	0.93	14.00	0.59	11.50
F109	1.904	10.00	2.519	8.00	4.599	13.00	0.315 L	1.00	0.903	12.00	0.540	3.00
F110	1.940	11.50	2.600	13.00	4.580	11.50	0.412	20.50	0.963	19.00	0.614	19.00
F112	1.82	6.00	2.46	6.00	4.36	6.00	0.37	6.00	0.89	8.50	0.56	5.00
F113	1.99	19.00	2.66	20.00	4.75	22.00	0.4	12.50	0.96	17.00	0.61	17.50
F115	2.028	24.00	2.666	21.00	4.774	23.00	0.417	22.00	1.004	28.00	0.638	28.00
F116	2.0	22.00	2.6	13.00	4.6	14.50	0.40	12.50	0.96	17.00	0.59	11.50
F131	2.192 H	33.00	2.794	30.00	5.471 EH	33.00	0.765 EH	33.00	1.697 EH	33.00	1.046 EH	33.00
F133	2.00	22.00	2.55	10.00	4.58	11.50	0.40	12.50	0.98	22.50	0.60	14.00
F139	1.749 L	4.00	2.241 VL	3.00	3.963 VL	4.00	0.4007	17.00	0.852	6.00	0.568	6.00
F145	2.03	25.50	2.84 H	33.00	4.47	10.00	0.618 EH	32.00	0.851	5.00	0.672	32.00
MEDIAN	1.9800		2.6200		4.6500		0.4007		0.9600		0.6100	
1CRIT	0.1615		0.1935		0.2950		0.0825		0.1105		0.0930	
N	31		30		31		31		31		31	
MEAN	1.9583		2.6181		4.5715		0.4099		0.9369		0.6032	
3STDEV	0.3206		0.4066		0.8993		0.1482		0.2040		0.1137	

PARAMETER: 20091 Calcium   mg/L

LAB NO	SAMPLE 7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F002	1.45	10.00	3.52	15.00	1.4	11.50	0.33	8.50
F003	1.42	8.00	3.51	14.00	1.41	15.00	0.33	8.50
F007	1.55	23.00	3.63	24.00	1.45	25.00	0.359	17.00
F009	1.52	18.00	3.54	16.00	1.43	19.50	0.36	19.50
F010	1.58	27.00	3.68	26.00	1.53	31.00	0.38	28.50
F012	1.66 H	31.00	3.72	29.00	1.51	30.00	0.39	30.00
F014	1.50	15.00	3.47	12.00	1.42	17.50	0.324	7.00
F015	1.4	7.00	3.4	10.00	1.4	11.50	0.3	4.50
F017	1.552	24.00	3.578	18.00	1.446	24.00	0.366	24.50
F020	1.53	19.00	3.55	17.00	1.43	19.50	0.37	26.50
F025	1.65 H	30.00	3.73	30.50	1.48	27.50	0.366	24.50
F026	1.167 VL	1.00	2.962 VL	2.00	1.227 L	2.00	0.213 EL	1.00
F032	1.54	21.00	3.68	26.00	1.44	22.00	0.36	19.50
F036	1.54	21.00	3.68	26.00	1.44	22.00	0.36	19.50
F037	1.474	12.00	3.366	9.00	1.42	17.50	0.279	3.00
F042	1.23 VL	2.00	3.17 VL	4.00	1.23 L	3.00	0.25 L	2.00
F049	1.64	29.00	3.61	23.00	1.5	29.00	0.37	26.50
F053	1.445	9.00	3.242 L	6.00	1.344	6.00	0.343	13.00
F060	1.5	15.00	3.7	28.00	1.4	11.50	0.4	31.00
F072	1.29 VL	3.00	2.35 EL	1.00	1.21 VL	1.00	0.317	6.00
F074	1.51	17.00	3.42	11.00	1.40	11.50	0.36	19.50
F094	1.6	28.00	3.73	30.50	1.48	27.50	0.38	28.50
F107	1.47	11.00	3.22 L	5.00	1.35	7.00	0.35	15.50
F109	4.731 EH	33.00	4.339 EH	33.00	1.411	16.00	0.411	32.00
F110	1.560	25.50	3.600	21.00	1.440	22.00	0.361	22.00
F112	1.39	6.00	3.29 L	7.00	1.30	5.00	0.30	4.50
F113	1.54	21.00	3.59	20.00	1.39	8.00	0.34	11.50
F115	1.560	25.50	3.601	22.00	1.465	26.00	0.364	23.00
F116	1.5	15.00	3.5	13.00	1.4	11.50	0.34	11.50
F131	2.176 EH	32.00	4.243 EH	32.00	1.649 VH	32.00	0.674 EH	33.00
F133	1.48	13.00	3.58	19.00	1.40	11.50	0.35	15.50
F139	1.322 L	4.00	2.967 VL	3.00	1.248 L	4.00	0.3454	14.00
F145	1.37 L	5.00	3.34	8.00	1.86 EH	33.00	0.338	10.00

MEDIAN	1.5100	3.5500	1.4200	0.3590
1CRIT	0.1380	0.2400	0.1335	0.0805
N	31	31	31	31
MEAN	1.5145	3.5103	1.4142	0.3482
3STDEV	0.4681	0.7322	0.2537	0.1003

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	130.00	13.000	10					Flame AA
F003	123.50	12.350	10					ICP
F007	249.50	24.950	10					
F009	183.00	18.300	10					ICP-MS
F010	292.50	29.250	10	H	BIASED HIGH*	3.89	0.0277	ICP-OES
F012	282.50	28.250	10	H	BIASED HIGH*	2.40	0.0447	ICPMS
F014	127.00	12.700	10					ICP-MS
F015	87.50	8.750	10	L L				ICP
F017	232.00	23.200	10					AAF
F020	200.00	20.000	10					ICP
F025	288.00	28.800	10	H	BIASED HIGH*	4.90	0.0079	IC
F026	17.50	1.750	10	VLL EL ELELVLVLL EL	BIASED LOW	-43.09	0.2898	FLAME AAS
F032	214.50	21.450	10					AAS
F036	214.50	21.450	10					AAS
F037	81.50	8.150	10					ICP-MS
F042	27.00	2.700	10	VLELVL L ELVLVLL L	BIASED LOW	-13.73	-0.0279	Flame AA, nitrous
F049	271.50	27.150	10		BIASED HIGH*	2.53	0.0263	
F053	82.00	8.200	10	L VL L				AA
F060	196.50	19.650	10					ICP
F072	29.50	2.950	10	ELELEL VL VLELVL	BIASED LOW	-28.19	0.0802	flame absorption
F074	146.50	14.650	10					AAS
F094	282.00	28.200	10		BIASED HIGH*	2.95	0.0267	ICPMS
F107	159.00	15.900	10	H H L				ICP
F109	161.00	16.100	10	L EHEH				ICP
F110	185.00	18.500	10					Flame AAS
F112	60.00	6.000	10	L	BIASED LOW	-6.06	-0.0226	AA2380 FLAME
F113	168.50	16.850	10					FAAS
F115	242.50	24.250	10					Flame AA
F116	141.50	14.150	10					ICP
F131	324.00	32.400	10	H EHEHEHEHEHEHVHEH	BIASED HIGH	7.24	0.3339	IC
F133	151.50	15.150	10					ICP-MS
F139	65.00	6.500	10	L VLVL L VLL	BIASED LOW	-16.61	0.0597	ICP-OES
F145	193.50	19.350	10	H EH L EH				ICP-AES

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
         PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   17.000

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F026	17.50	1.750	10	VLLELELELVLVLLEL	BIASED LOW	-43.09	0.2898	FLAME AAS
F042	27.00	2.700	10	VLELVLLELVLVLLL	BIASED LOW	-13.73	-0.0279	Flame AA, nitrous
F072	29.50	2.950	10	ELELELVLVLELVL	BIASED LOW	-28.19	0.0802	flame absorption
F112	60.00	6.000	10	L	BIASED LOW	-6.06	-0.0226	AA2380 FLAME
F139	65.00	6.500	10	LVLVLLVLL	BIASED LOW	-16.61	0.0597	ICP-OES
F037	81.50	8.150	10					ICP-MS
F053	82.00	8.200	10	LVLL				AA
F015	87.50	8.750	10	LL				ICP
F003	123.50	12.350	10					ICP
F014	127.00	12.700	10					ICP-MS
F002	130.00	13.000	10					Flame AA
F116	141.50	14.150	10					ICP
F074	146.50	14.650	10					AAS
F133	151.50	15.150	10					ICP-MS
F107	159.00	15.900	10	HHL				ICP
F109	161.00	16.100	10	LEHEH				ICP
F113	168.50	16.850	10					FAAS
F009	183.00	18.300	10					ICP-MS
F110	185.00	18.500	10					Flame AAS
F145	193.50	19.350	10	HEHLEH				ICP-AES
F060	196.50	19.650	10					ICP
F020	200.00	20.000	10					ICP
F032	214.50	21.450	10					AAS
F036	214.50	21.450	10					AAS
F017	232.00	23.200	10					AAF
F115	242.50	24.250	10					Flame AA
F007	249.50	24.950	10					
F049	271.50	27.150	10		BIASED HIGH*	2.53	0.0263	
F094	282.00	28.200	10		BIASED HIGH*	2.95	0.0267	ICPMS
F012	282.50	28.250	10	H	BIASED HIGH*	2.40	0.0447	ICPMS
F025	288.00	28.800	10	H	BIASED HIGH*	4.90	0.0079	IC
F010	292.50	29.250	10	H	BIASED HIGH*	3.89	0.0277	ICP-OES
F131	324.00	32.400	10	HEHEHEHEHEHEHVHEH	BIASED HIGH	7.24	0.3339	IC

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   17.000

Calcium

PARAMETER: 12091 Magnesium   mg/L

NATIONAL WATER RESEARCH INSTITUTE
ENVIRONMENT CANADA
BURLINGTON ONTARIO

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.1000   BASIC ACCEPTABLE ERROR= 0.0200   CONCENTRATION ERROR INCREMENT= 0.0500

SAMPLE LAB NO	1 = BMOOS-01 REPORTED VALUE	RANK	2 = RAIN-97 REPORTED VALUE	RANK	3 = TRKY-94 REPORTED VALUE	RANK	4 = BESKI-01 REPORTED VALUE	RANK	5 = SUPER-04 REPORTED VALUE	RANK	6 = RAINGR-16 REPORTED VALUE	RANK
F002	0.32	24.00	0.93	22.00	0.84	20.00	0.39	11.50	0.20	18.00	0.17	11.50
F003	0.304	13.00	0.913	15.00	0.817	14.00	0.380	5.50	0.177	3.00	0.160	4.50
F007	0.322	27.00	0.927	19.00	0.854	25.50	0.392	15.00	0.199	14.00	0.173	15.00
F009	0.31	16.00	0.86 L	3.00	0.79	5.50	0.39	11.50	0.2	18.00	0.17	11.50
F010	0.34	31.00	1.00 H	31.50	0.88	29.00	0.43	33.00	0.21	28.50	0.17	11.50
F012	0.32	24.00	0.93	22.00	0.85	23.50	0.41	27.00	0.2	18.00	0.19	27.50
F014	0.303	12.00	0.989 H	30.00	0.902 H	32.00	0.414	28.00	0.194	8.00	0.18	22.00
F015	0.3	6.00	1. H	31.50	0.8	7.50	0.4	22.50	0.2	18.00	0.173	15.00
F017	0.32	24.00	0.944	24.00	0.854	25.50	0.399	19.00	0.206	25.00	0.2	30.50
F020	0.33	29.00	0.96	27.00	0.89	31.00	0.40	22.50	0.21	28.50	0.18	22.00
F025	0.302	10.50	0.916	16.00	0.834	17.00	0.398	17.50	0.195	10.00	0.19	27.50
F026	0.297	2.00	0.879	5.00	0.788	4.00	0.364	2.00	0.184	4.00	0.169	9.50
F032	0.333	30.00	0.954	26.00	0.84	20.00	0.408	26.00	0.207	26.00	0.161	7.00
F036	0.315	20.00	0.925	18.00	0.84	20.00	0.395	16.00	0.205	23.50	0.193	29.00
F037	0.343 H	32.00	0.863	4.00	0.805	9.00	0.423	32.00	0.248 VH	32.00	0.18	22.00
F042	0.30	6.00	0.85 L	2.00	0.79	5.50	0.38	5.50	0.19	6.00	0.215 VH	33.00
F049	0.3	6.00	0.899	10.00	0.815	12.50	0.4	22.50	0.198	13.00	0.16	4.50
F053	0.302	10.50	0.880	6.00	0.782	3.00	0.382	8.00	0.195	10.00	0.175	17.00
F060	0.3	6.00	0.9	12.00	0.8	7.50	0.4	22.50	0.2	18.00	0.172	13.00
F071	0.325	28.00	0.946	25.00	0.880	29.00	0.415	29.00	0.214	31.00	0.2	30.50
F072	0.30	6.00	0.89	8.00	0.76 L	2.00	0.37	3.00	0.16 VL	2.00	0.188	26.00
F074	0.31	16.00	0.90	12.00	0.82	15.50	0.39	11.50	0.20	18.00	0.13 VL	2.00
F094	0.32	24.00	0.93	22.00	0.85	23.50	0.4	22.50	0.21	28.50	0.18	22.00
F107	0.36 EH	33.00	1.01 H	33.00	0.86	27.00	0.39	11.50	0.20	18.00	0.18	22.00
F109	0.305	14.00	0.898	9.00	0.812	10.50	0.380	5.50	0.195	10.00	0.169	9.50
F110	0.311	18.00	0.900	12.00	0.815	12.50	0.384	9.00	0.197	12.00	0.173	15.00
F112	0.32	24.00	0.97	29.00	0.88	29.00	0.42	31.00	0.21	28.50	0.18	22.00
F113	0.31	16.00	0.91	14.00	0.8351	18.00	0.38	5.50	0.19	6.00	0.16	4.50
F115	0.318	21.00	0.929	20.00	0.844	22.00	0.398	17.50	0.205	23.50	0.178	18.00
F116	0.30	6.00	0.92	17.00	0.82	15.50	0.40	22.50	0.19	6.00	0.16	4.50
F131	0.300	6.00	0.962	28.00	0.924 VH	33.00	0.470 EH	34.00	0.261 EH	33.00	0.214 VH	32.00
F133	0.312	19.00	0.886	7.00	0.812	10.50	0.391	14.00	0.202	22.00	0.168	8.00
F139	0.2201 EL	1.00	0.713 EL	1.00	0.647 EL	1.00	0.2765 EL	1.00	0.1108 EL	1.00	0.0922 EL	1.00
F145	0.399 EH	34.00	1.03 VH	34.00	0.929 VH	34.00	0.419	30.00	0.274 EH	34.00	0.279 EH	34.00
MEDIAN	0.3105		0.9225		0.8345		0.3980		0.2000		0.1765	
1CRIT	0.0305		0.0611		0.0567		0.0349		0.0250		0.0238	
N	32		32		32		32		32		32	
MEAN	0.3141		0.9241		0.8338		0.3966		0.2016		0.1772	
3STDEV	0.0442		0.1224		0.1114		0.0455		0.0517		0.0493	

PARAMETER: 12091 Magnesium   mg/L

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F002	0.27	16.00	0.90	19.50	0.30	25.50	0.19	7.50
F003	0.247	4.00	0.876	11.00	0.277	6.00	0.184	5.50
F007	0.271	19.00	0.914	28.00	0.29	17.50	0.197	14.00
F009	0.26	7.50	0.83 L	3.00	0.29	17.50	0.2	19.50
F010	0.29	28.00	0.95	32.50	0.32 H	32.00	0.22	30.50
F012	0.28	25.50	0.91	26.00	0.3	25.50	0.21	27.50
F014	0.280	25.50	0.902	23.00	0.292	21.00	0.194	11.00
F015	0.2 EL	2.00	0.9	19.50	0.2 EL	2.00	0.2	19.50
F017	0.278	23.00	0.9	19.50	0.298	23.00	0.206	25.00
F020	0.28	25.50	0.93	29.00	0.28	8.00	0.22	30.50
F025	0.262	9.00	0.879	13.00	0.285	13.50	0.200	19.50
F026	0.25	5.50	0.833 L	5.00	0.275	5.00	0.184	5.50
F032	0.296	29.00	0.9	19.50	0.305	28.00	0.209	26.00
F036	0.275	21.50	0.905	25.00	0.295	22.00	0.2	19.50
F037	0.31 H	31.00	0.94	31.00	0.332 H	33.00	0.243 EH	34.00
F042	0.25	5.50	0.85	6.00	0.27	3.50	0.19	7.50
F049	0.272	20.00	0.877	12.00	0.283	12.00	0.193	9.00
F053	0.263	10.00	0.832 L	4.00	0.282	11.00	0.194	11.00
F060	0.3 H	30.00	0.9	19.50	0.3	25.50	0.2	19.50
F071	0.269	13.00	0.937	30.00	0.312	31.00	0.214	29.00
F072	0.24 L	3.00	0.87	8.50	0.27	3.50	0.17 L	2.50
F074	0.27	16.00	0.89	15.50	0.29	17.50	0.20	19.50
F094	0.27	16.00	0.89	15.50	0.29	17.50	0.2	19.50
F107	0.27	16.00	0.82 L	2.00	0.28	8.00	0.17 L	2.50
F109	0.382 EH	34.00	0.912	27.00	0.286	15.00	0.194	11.00
F110	0.266	12.00	0.870	8.50	0.281	10.00	0.197	14.00
F112	0.28	25.50	0.95	32.50	0.31	30.00	0.21	27.50
F113	0.26	7.50	0.88	14.00	0.28	8.00	0.18	4.00
F115	0.275	21.50	0.903	24.00	0.291	20.00	0.201	24.00
F116	0.27	16.00	0.90	19.50	0.30	25.50	0.20	19.50
F131	0.321 VH	32.00	0.991 EH	34.00	0.306	29.00	0.238 VH	33.00
F133	0.264	11.00	0.871	10.00	0.285	13.50	0.197	14.00
F139	0.1711 EL	1.00	0.678 EL	1.00	0.1906 EL	1.00	0.1112 EL	1.00
F145	0.327 VH	33.00	0.866	7.00	0.39 EH	34.00	0.226 H	32.00
MEDIAN	0.2700		0.9000		0.2900		0.2000	
1CRIT	0.0285		0.0600		0.0295		0.0250	
N	32		32		32		32	
MEAN	0.2724		0.8902		0.2892		0.1996	
3STDEV	0.0697		0.0994		0.0635		0.0428	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F002	175.50	17.550	10					Flame AA
F003	81.50	8.150	10					ICP
F007	194.00	19.400	10					
F009	113.00	11.300	10	L L				ICP-MS
F010	303.50	30.350	10	H H	BIASED HIGH	5.99	0.0058	ICP-OES
F012	241.00	24.100	10					ICPMS
F014	205.50	20.550	10	H H				ICP-MS
F015	159.00	15.900	10	H EL EL				ICP
F017	230.00	23.000	10					AAF
F020	258.50	25.850	10					ICP
F025	135.50	13.550	10					IC
F026	45.00	4.500	10	L	BIASED LOW	-5.46	-0.0041	FLAME AAS
F032	259.50	25.950	10					AAS
F036	207.50	20.750	10					AAS
F037	271.00	27.100	10	H VHVHH H EH	BIASED HIGH	-8.73	0.0613	ICP-MS
F042	52.00	5.200	10	L	BIASED LOW	-6.46	0.0019	Flame AA, nitrous
F049	134.00	13.400	10					
F053	86.50	8.650	10	L				AA
F060	191.00	19.100	10	H				ICP
F071	271.00	27.100	10		BIASED HIGH*	3.37	0.0046	Flame-AA
F072	40.50	4.050	10	L VLVLL L	BIASED LOW*	-1.84	-0.0259	flame emission
F074	163.50	16.350	10					AAS
F094	211.00	21.100	10					ICPMS
F107	173.00	17.300	10	EHH L L				ICP
F109	145.50	14.550	10	EH				ICP
F110	123.00	12.300	10					Flame AAS
F112	279.00	27.900	10		BIASED HIGH	5.74	-0.0030	AA2380 FLAME
F113	97.50	9.750	10					FAAS - PE-5100
F115	211.50	21.150	10					Flame AA
F116	152.00	15.200	10					ICP
F131	294.00	29.400	10	VHEHEHVHVHEH VH	BIASED HIGH	5.26	0.0248	IC
F133	129.00	12.900	10					ICP-MS
F139	10.00	1.000	10	ELELELELELELELELELEL	BIASED LOW	-17.64	-0.0498	ICP-OES
F145	306.00	30.600	10	EHVHVH EHEHVH EHH	BIASED HIGH*	-2.46	0.0748	ICP-AES

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
         PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   17.500

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F139	10.00	1.000	10	ELELELELELELELELELEL	BIASED LOW	-17.64	-0.0498	ICP-OES
F072	40.50	4.050	10	LVLVLLL	BIASED LOW*	-1.84	-0.0259	flame emission
F026	45.00	4.500	10	L	BIASED LOW	-5.46	-0.0041	FLAME AAS
F042	52.00	5.200	10	L	BIASED LOW	-6.46	0.0019	Flame AA, nitrous
F003	81.50	8.150	10					ICP
F053	86.50	8.650	10	L				AA
F113	97.50	9.750	10					FAAS - PE-5100
F009	113.00	11.300	10	LL				ICP-MS
F110	123.00	12.300	10					Flame AAS
F133	129.00	12.900	10					ICP-MS
F049	134.00	13.400	10					
F025	135.50	13.550	10					IC
F109	145.50	14.550	10	EH				ICP
F116	152.00	15.200	10					ICP
F015	159.00	15.900	10	HELEL				ICP
F074	163.50	16.350	10					AAS
F107	173.00	17.300	10	EHHLL				ICP
F002	175.50	17.550	10					Flame AA
F060	191.00	19.100	10	H				ICP
F007	194.00	19.400	10					
F014	205.50	20.550	10	HH				ICP-MS
F036	207.50	20.750	10					AAS
F094	211.00	21.100	10					ICPMS
F115	211.50	21.150	10					Flame AA
F017	230.00	23.000	10					AAF
F012	241.00	24.100	10					ICPMS
F020	258.50	25.850	10					ICP
F032	259.50	25.950	10					AAS
F071	271.00	27.100	10		BIASED HIGH*	3.37	0.0046	Flame-AA
F037	271.00	27.100	10	HVHVHHHEH	BIASED HIGH	-8.73	0.0613	ICP-MS
F112	279.00	27.900	10		BIASED HIGH	5.74	-0.0030	AA2380 FLAME
F131	294.00	29.400	10	VHEHEHVHVHEHVH	BIASED HIGH	5.26	0.0248	IC
F010	303.50	30.350	10	HH	BIASED HIGH	5.99	0.0058	ICP-OES
F145	306.00	30.600	10	EHVHVHEHEHVHEHH	BIASED HIGH*	-2.46	0.0748	ICP-AES

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
      PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   17.500

Magnesium

PARAMETER: 13091 Aluminum   mg/L

NWRI Interlab QA for Rain Waters

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 0.0080   BASIC ACCEPTABLE ERROR= 0.0080   CONCENTRATION ERROR INCREMENT= 0.0800

| SAMPLE | 1 = BMOOS-01 | | 2 = RAIN-97 | | 3 = TRKY-94 | | 4 = BESKI-01 | | 5 = SUPER-04 | | 6 = RAINGR-16 | |
| | REPORTED | | REPORTED | | REPORTED | | REPORTED | | REPORTED | | REPORTED | |
LAB NO	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK	VALUE	RANK
F010	0.216	4.00	0.035	12.00	0.025	13.00	0.024 H	15.00	0.006	3.00	0.013	7.00
F012	0.19 VL	2.00	0.02 EL	1.00	0.01 L	1.00	0.01	1.50	<0.01	0.00	<0.01	0.00
F014	0.227	7.00	0.031	10.00	0.019	7.00	0.015	9.50	<0.001	0.00	0.008	5.50
F015	0.23	9.00	0.028	2.50	0.018	4.50	0.011	3.00	<0.002	0.00	0.006	2.00
F020	0.244	15.00	0.033	11.00	0.022	12.00	<0.02	0.00	<0.02	0.00	<0.02	0.00
F026	0.2358	12.00	0.0364	14.00	0.0259	14.00	0.0144	8.00	<0.005	0.00	0.0133	8.00
F037	0.246	16.00	0.0289	4.00	0.0179	3.00	0.0135	6.00	<0.001	0.00	0.0076	4.00
F042	0.23	9.00	0.03	7.50	0.02	10.00	0.02	13.00	0.001W	0.00	0.007W	0.00
F049	0.21	3.00	0.028	2.50	0.019	7.00	0.013	5.00	0.005W	0.00	0.005W	1.00
F060	0.182 VL	1.00	0.036	13.00	0.032 H	15.00	0.012	4.00	<0.008	0.00	<0.008	0.00
F072	0.330 EH	18.00	0.340 EH	17.00	0.220 EH	17.00	0.120 EH	16.00	<0.10	0.00	<0.10	0.00
F094	0.23	9.00	0.03	7.50	0.02	10.00	0.02	13.00	<0.01	0.00	<0.01	0.00
F107	0.26 H	17.00	0.04 H	16.00	0.02	10.00	0.01	1.50	0.W	1.00	0.008	5.50
F110	0.238	13.00	0.030	7.50	0.012	2.00	0.015	9.50	<0.010	0.00	0.016	9.00
F112	0.233	11.00	0.039	15.00	0.037 VH	16.00	0.019	11.00	0.004	2.00	0.142 EH	10.00
F116	0.220	6.00		0.00		0.00		0.00		0.00		0.00
F133	0.218	5.00	0.029	5.00	0.018	4.50	0.014	7.00	<0.001	0.00	0.007	3.00
F145	0.241	14.00	0.03	7.50	0.019	7.00	0.02	13.00	<0.03	0.00	<0.03	0.00
MEDIAN	0.2300		0.0300		0.0200		0.0147		0.0040		0.0080	
1CRIT	0.0258		0.0098		0.0090		0.0085		0.0080		0.0080	
N	16		15		15		13		1		8	
MEAN	0.2293		0.0323		0.0217		0.0162		0.0040		0.0099	
3STDEV	0.0476		0.0116		0.0179		0.0113		-		0.0103	

PARAMETER: 13091 Aluminum   mg/L

SAMPLE LAB NO	7 = RAINGR-11 REPORTED VALUE	RANK	8 = MERSEY-MX REPORTED VALUE	RANK	9 = PHA-08 REPORTED VALUE	RANK	10 = COBRIEL-MX REPORTED VALUE	RANK
F010	0.009	6.00	0.058	15.50	0.007	5.00	0.043	11.00
F012	<0.01	0.00	0.04	1.00	<0.01	0.00	0.03 L	2.00
F014	0.002	2.00	0.049	8.50	0.002	4.00	0.043	11.00
F015	<0.002	0.00	0.042	3.50	<0.002	0.00	0.034	4.00
F020	<0.02	0.00	0.051	12.00	<0.02	0.00	0.048	16.00
F026	0.0053	5.00	0.0512	13.00	<0.005	0.00	0.0477	15.00
F037	<0.001	0.00	0.0520	14.00	<0.001	0.00	0.0408	7.00
F042	0.003W	0.00	0.05	10.50	0.003W	0.00	0.04	6.00
F049	0.005W	0.00	0.048	7.00	0.005W	0.00	0.045	14.00
F060	<0.008	0.00	0.041	2.00	<0.008	0.00	0.032 L	3.00
F072	<0.10	0.00	0.89 EH	18.00	<0.10	0.00	0.47 EH	18.00
F094	<0.01	0.00	0.05	10.50	<0.01	0.00	0.07 EH	17.00
F107	0.001	1.00	0.045	5.50	0.001	2.50	0.042	8.00
F110	<0.010	0.00	0.058	15.50	<0.010	0.00	0.043	11.00
F112	0.003	3.50	0.060	17.00	0.000	1.00	0.043	11.00
F116		0.00	0.042T	3.50		0.00	0.043T	11.00
F133	0.003	3.50	0.049	8.50	0.001	2.50	0.039	5.00
F145	<0.03	0.00	0.045	5.50	<0.03	0.00	0.026 VL	1.00
MEDIAN	0.0030		0.0495		0.0010		0.0430	
1CRIT	0.0080		0.0113		0.0080		0.0108	
N	4		16		3		16	
MEAN	0.0033		0.0495		0.0013		0.0427	
3STDEV	-		0.0167		-		0.0258	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.SAMPLES RANKED	SUMMARY OF FLAGGING			BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F010	91.50	9.150	10	H						ICP-OES
F012	8.50	1.417	6	VLELL		L	BIASED LOW	-15.33	-0.0046	ICPMS
F014	64.50	7.167	9							ICP-MS
F015	28.50	4.071	7				BIASED LOW*	1.51	-0.0046	GFAA
F020	66.00	13.200	5				BIASED HIGH	5.66	0.0009	
F026	89.00	11.125	8							I.C.P.
F037	54.00	7.714	7							ICP-MS
F042	56.00	9.333	6							GFAAS
F049	39.50	5.643	7							
F060	38.00	6.333	6	VL H		L				ICP
F072	104.00	17.333	6	EHEHEHEH	EH	EH	BIASED HIGH	-89.37	0.3881	FAAS
F094	67.00	11.167	6			EH				ICPMS
F107	68.00	6.800	10	H H						ICP
F110	67.50	9.643	7							Furnace
F112	97.50	9.750	10	VH	EH					HGA 300 FURNACE
F116	20.50	6.833	3				INSUFFICIENT DATA			ICP
F133	44.00	4.889	9							ICP-MS
F145	48.00	8.000	6			VL				ICP-AES

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
      PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   8.219

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	BIAS % SLOPE	BIAS BLANK	METHOD CODING
F012	8.50	1.417	6	VLELLL	BIASED LOW	-15.33	-0.0046	ICPMS
F015	28.50	4.071	7		BIASED LOW*	1.51	-0.0046	GFAA
F133	44.00	4.889	9					ICP-MS
F049	39.50	5.643	7					
F060	38.00	6.333	6	VLHL				ICP
F107	68.00	6.800	10	HH				ICP
F116	20.50	6.833	3		INSUFFICIENT DATA			ICP
F014	64.50	7.167	9					ICP-MS
F037	54.00	7.714	7					ICP-MS
F145	48.00	8.000	6	VL				ICP-AES
F010	91.50	9.150	10	H				ICP-OES
F042	56.00	9.333	6					GFAAS
F110	67.50	9.643	7					Furnace
F112	97.50	9.750	10	VHEH				HGA 300 FURNACE
F026	89.00	11.125	8					I.C.P.
F094	67.00	11.167	6	EH				ICPMS
F020	66.00	13.200	5		BIASED HIGH	5.66	0.0009	
F072	104.00	17.333	6	EHEHEHEHEHEH	BIASED HIGH	-89.37	0.3881	FAAS

* NOTE: INDICATED BIAS STATEMENT IS FOR CAUTION ONLY AND NOT COUNTED IN STUDY STATISTICS
PERCENT SLOPE USED FOR CAUTION COMPARISON=   5.00

OVERALL AVERAGE
RANK IS   8.219

Aluminum

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