

NWRI CONTRIBUTION NO. 87-150

**Summary Report for Inter-regional Quality
Assurance Studies 144-155 (Sept 86-Aug 87)
for Inorganic Constituents in Surface
Waters.**

H. Alkema

Executive Summary IRQC 144-155

At the request of Water Quality Branch Headquarters, the inter-regional quality control (IRQC) program was initiated to assess comparability of inorganic analysis data generated by the four regional laboratories plus the national laboratory. A laboratory in Indian and Northern Affairs Canada has recently joined this QC program.

Twelve studies were distributed bi-monthly between September 1986 and August 1987. The studies dealt with the analysis of trace metals, major ions, nutrients and physical parameters in natural and spiked water samples.

In this annual report, data is presented and performance is evaluated for some 40 parameters involving about 100 analytical procedures.

Generally, analyses were performed very well, nevertheless, a number of key analyses were identified to be out of control and promptly brought to the attention of laboratory managers to help improve the quality of their data, and to help them to re-evaluate their internal quality control procedures.

ABSTRACT

This compiled report of twelve quality control studies (QC) evaluates the chemical analysis of surface waters for laboratories in the Federal Inter-Regional Quality Control (IRQC) program. This report, which covers the period from September 1986 to August 1987 (QC studies IR144 to IR155), describes the following: study design, treatment of data, performance indicators, and comments on individual laboratory performance.

A single bimonthly study consists of 4 or 5 standard reference samples of known values. Half of these samples are for trace metal analysis at two levels. For the other half of the samples the laboratories report on 25 major ion, nutrient and physical parameters. Altogether, 100 analysis methodologies and individual results are tabulated in the data summary. Since other laboratories in other QC programs analyse the same samples, all results are reported in the data summary so that statistical analyses are more accurately made.

Each monthly report, in conclusion, summarizes laboratory performance. Good performance (and compatibility) is indicated by the lack of flagged results. More than several flagged results indicates poorer performance. Results are flagged by two criteria: those that differ by more than 10% from a reference value, and those that are statistical outliers according to the Grubbs' outlier test.

Generally, analyses were performed well, nevertheless, a number of key analyses were identified to be out of control and promptly brought to the attention of laboratory managers. The laboratories in the IRQC program have usually shown prompt correction of problems when notified of them.

DISTRIBUTION - IROC

Mr. H. Agemian
Head, Scientific Services Section
National Water Quality Laboratory

Mr. G. Brun
Head, Analytical Services Section
Atlantic Region Water Quality Branch

Mr. W. Coedy
CIC, Water Laboratory
DIANA, NAP
Yellowknife, NWT

Ms. D. Duval
Head, Analytical Services Section
Quebec Region Water Quality Laboratory

Mr. M. Forbes
Head, Analytical Services Section
National Water Quality Laboratory

Mr. F. Mah
Head, Analytical Services Section
Pacific Region Water Quality Branch

Mr. J-G. Zakrevsky
Head, Analytical Services Section
Western Region Water Quality Branch

cc:

Dr. B.K. Afghan
Chief, NWQL, CCIW
Burlington, Ontario

Mr. D.H. Cullen
Chief, Water Quality Branch
Atlantic Region
Moncton, New Brunswick

Dr. W.E. Erlebach
Chief, Water Quality Branch
Pacific Region
Vancouver, B. C.

Mr. W.D. Gummer
Chief, Water Quality Branch
Western Region
Regina, Saskatchewan

Mr. L. Martel
Chief, Water Quality Branch
Quebec Region, Longueuil, P. Q.

Dr. J. Lawrence
Chief, Analytic Methods Division
NWRI, CCIW

Mr. A. S. Y. Chau
Head, QAMS
AMD, NWRI



Government
of Canada Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

TO
À

Distribution

FROM
DE

H. Alkema
Quality Assurance and Methods Section
National Water Research Institute
Burlington, Ontario.

SUBJECT
OBJET

Inter-regional Quality Control (IRQC) Program

H. Alkema/IWD-NWRI/336-4929/ha

SECURITY - CLASSIFICATION - DE SÉCURITÉ

OUR FILE/NOTRE RÉFÉRENCE

YOUR FILE/VOTRE RÉFÉRENCE

DATE

January 14, 1987.

I have enclosed the final report for IR 144-145.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A.

H. Alkema

SUMMARY REPORT

INTER-REGIONAL QUALITY ASSURANCE PROGRAM

STUDIES 144 AND 145

for September and October, 1986

**TRACE METALS, MAJOR IONS, NUTRIENTS
AND PHYSICAL PARAMETERS IN SPIKED SAMPLES**

by

H. Alkema

**Quality Assurance and Methods Section
National Water Research Institute
Burlington, Ontario**

January 1987

Introduction

As part of an on-going study, the Quality Assurance and Methods Section, N.W.R.I. in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the IRQC program. This report summarizes the most recent IRQC inter-laboratory quality control studies: IR 144 and 145, for the months September and October, 1986. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The levels were medium to high.

Study Design

Five water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining three were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the five samples:

IR 144 - Sample 1 - 125 ml, D/A * for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

IR 145 - Sample 3 - 1L, S/E * for trace metals (0.2% HNO₃)
Sample 4 - up to 1L, major ions, etc., stored at 4°C
Sample 5 - up to 1L, major ions, etc., stored at 4°C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were recorded on report sheets provided with the IR samples. Upon receipt of the Reporting Sheets, the results were tabulated for each parameter, first for each method reported, and then for all methods combined. These data, and the resulting statistics are presented in the Data Summary. (attached)

Preliminary data summaries, including problematic results, were sent October 31, and November 25, 1986. Each laboratory was given three weeks to notify us of any errors in data transcription or compilation.

Performance Indicators

In previous reports the mean has always been used as comparator for accuracy assessment. We now have "design values" for several reference waters (RMs) and certified reference waters (CRMs). These design values are used to test each reported result (whether few or many) for accuracy. Consequently, for stable parameters, the design values will be used as comparator for the ten percent warning circles, and the mean will be used for unstable parameters (perhaps due to biological activity).

Percentage deviations from the comparator are used as an indicator for the laboratory head to determine the extent of the discrepancies between the laboratory result and comparator as it applies to his procedures. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than 10% from the comparator is circled in the data tables and its value noted in the comments which follow. Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned 'HDL' and is labelled in the Data Summary.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

General Comments: A high coefficient of variation (incomparability) was observed for TKN in sample five, and for chloride in sample five. In this chloride analysis there was a bromide interference as sample 5 was synthetic. The analyses for these studies were very well done, as indicated by the low average anomalies per sample.

Individual laboratory deviations are listed below:

Lab 2 - high results for Silica: +18%, and +12%
- a high result for TN: -26%; and Zn by SE: -33%

Lab 3 - a low result for Cr by SE: -31%
- a high result for DOC: +13%

Lab 4 - high results for B: +100% (at low level); and +38% (R)
- an HDL for Ammonia

Lab 5 - a high result for DIC: +18%
- erratic results for DOC: -62% (R)*, and +26% (R)

Lab 7 - a high result for $\text{NO}_3 + \text{NO}_2$: +16%
- high results for Mg: +19% (R), and +19%

Lab 11 - a high result by SE for Zn: +27%
- results by DA for Cr: +50% (R); Cu: +20%; and Ni: -11%
- results for SO_4 : +17% (R), and -80% (R)
- high results for Amm: +72% (R); Mg: +11%, and +12%
- a low result for TKN: -27%
- high results for Turb: +100% at low level (2X)

WQB laboratories average number of deviations per sample was 0.8

* (R) = rejectable by Grubb's procedure for statistical calculation.

Appendix I

Definitions of Types of Metals Analysis

1. D/A - Direct Aspiration

Without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS) or Inductively Coupled (Argon) Plasma (ICAP or ICP). Standards should contain the acid equivalent of the sample.

2. S/E - Code for low level analysis.

Analysis is presently carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP.
3. Digestion of aqueous phase followed by ICAP.
4. Graphite tube (flameless) AAS.

Appendix II

Performance Indicators

1. Circled Results

Results are circled when a minor deviation from the comparator has occurred. (The comparator is the design value of the reference sample, or the mean in the case of a biologically active parameter). Circled results are in general greater than or less than 10% from the comparator. At very low levels of analytes or with parameters that are difficult to analyse, a greater deviation than 10% is allowed. Under these conditions, a result is circled when it is outside one standard deviation of the comparator. These circled results, though acceptable values, are a warning to laboratory managers that the parameter analysis should be investigated.

2. Rejectable Results

Each parameter is tested for the various laboratory results that are statistical outliers, results that were affected by non random causes (eg. a transcription error). These outlying results, calculated by the Grubb's procedure,* and indicated in the data tables with an 'R', are noncomparable with the data set for the parameter.

3. A High Co-efficient of Variation (HCV)

Occasionally there is a parameter with a very high relative standard deviation (RSD). When this HCV is not due to one or two outlying values, it indicates a high variability within the data set. The data in this data set is non-comparable. In such a case, the RSD for the parameter is circled in the data tables and the parameter's non-comparability is noted in the comments.

4. High Detection Limits (HDL)

Each laboratory determines its own detection limits according to its own requirements. When major differences of detection limits occur, the high detection limit is circled. An HDL indicates that low level analysis with an HDL may not be comparable with the analyses of the other laboratories.

* reference: Frank E. Grubbs, Technometrics, 1969, p 1.

DATA SUMMARY

PROVINCIAL GOVERNMENT

STUDY NO. IRI44 PP 49
SAMPLE = 1 SPIKED SAMPLE

DATE: 01/09/86

DUE DATE: 31/10/86 PAGE 1
TRACE METALS D/A / TN 3a UNICOM

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR144 PP 49 FP 9
 SAMPLE = 1 SPIKED SAMPLE.

LAB	DATE: 01/09/86			DUE DATE: 31/10/86			PAGE 2		
	27301 CO EXTRL ICAP DA MG/L	27311 CO EXTRL ICAP DA MG/L	27999 CO EXTRL COMBINED ICAP DA MG/L	28009 NI TOTAL COMBINED ICAP DA MG/L	28011 NI TOTAL 5X ICAP DA MG/L	28111 NI DISS ICAP DA MG/L	28311 NI EXTRL ICAP DA MG/L	28999 NICKEL COMBINED MG/L NI	29009 CU TOTAL ICAP DA MG/L
1	-	-	1.10	1.09	1.29	-	-	1.31	1.29
6	-	-	1.12	1.10	1.2	-	-	1.31	0.299
9	1.04	-	-	1.12	-	-	-	1.16	-
10	1.03	-	-	1.04	-	-	-	1.17	-
11	1.1	-	-	1.03	-	-	-	1.25	-
12	-	-	-	1.1	-	-	-	1.25	-
MEAN	1.0567	1.1200	1.1000	1.0686	1.2900	1.2000	1.1000	1.2333	1.2163
STD.	0.0379	-	-	0.0449	-	-	-	0.061	0.0713
REL.	3.6	-	-	4.2	-	-	-	8.6	5.9
DES.	-	-	-	1.064	-	-	-	1.235	-
LAB	29011 CU TOTAL 5X ICAP UG/L CU	29106 CU DISS AAS DA MG/L	29111 CU EXTRL ICAP DA MG/L	29306 CU EXTRL AAS DA MG/L	29311 CU EXTRL ICAP DA MG/L	29999 COPPER COMBINED ICAP CU MG/L	30009 ZINC TOTAL 5X ICAP UG/L ZN	30111 ZINC DISS AAS DA MG/L	30304 ZINC EXTRL AAS DA MG/L
1	-	-	-	0.30	0.295	-	-	-	-
2	-	0.28	-	0.28	0.25	0.29	0.330	0.31	0.32
3	-	-	-	0.28	0.28	-	-	-	-
6	-	-	-	0.29	0.25	0.28	-	-	-
9	-	-	0.286	-	-	0.29	-	-	-
10	-	-	0.350R	0.28	-	0.350	-	-	-
11	-	-	-	-	-	0.28	-	0.327	0.303
12	-	-	-	-	-	-	-	0.30	0.30
MEAN	2800	-	-	2853	2900	2725	2831	.3300	.3270
STD.	-	-	-	0.050	0.141	0.318	0.057	-	.3043
REL.	-	-	-	1.8	11.7	5.5	5.291	-	.0051
DES.	-	-	-	-	-	-	-	-	1.7
LAB	30311 ZN EXTRL ICAP DA MG/L	30999 ZINC COMBINED ICAP ZN	38001 SR TOTAL AAS DA MG/L	38111 SR DISS ICAP DA MG/L	38301 SR EXTRL ICAP DA MG/L	38999 STRONTIUM COMBINED MG/L SR	42009 MOL TOTAL 5X ICAP MG/L RO	42111 MOL DISS ICAP DA MG/L	42311 MOL EXTRL ICAP DA MG/L
1	-	0.314	0.330	-	-	0.487	-	-	-
2	0.28	0.314	0.22 R	0.22 R	0.50	0.487	0.50	4.0	4.60
3	-	0.310	-	-	0.45	-	-	-	-
6	-	0.310	-	-	0.50	-	0.50	-	4.51
9	-	0.327	-	-	-	-	0.45	-	4.56
10	-	0.327	-	-	-	-	-	-	3.5
11	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-
MEAN	2970	3104	-	4.750	5.000	4.870	4.833	4.6500	4.4900
STD.	8.1	0.152	-	7.4	-	6.0289	-	-	4.1572
REL.	-	4.9	-	-	-	-	-	-	4.6000
DES.	-	0.314	-	-	-	-	-	-	-

DATA SUMMARY

PRINCIPAL PROBLEMS OF THE PRAIRIE PROVINCES.

STUDY NO. **IR144** **PP 49**
SAMPLE = 1 **SPIKED SAMPLE.**

Date: 01/09/96

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR144 PP 49 FP 9 DATE: 01/09/86 DUE DATE: 31/10/86
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	STUDY NO.	IONIC BALANCE %	SUM OF CATIONS MEQ/L	00120 SUM OF ANTONS MEQ/L	02011 COLORANT REL UNIT	02021 COLOR VIS COMP REL UNIT	02023 COLOR SPECTROM ABS UNIT	02040 COLOR COMBINED REL UNIT	02041 CONDUCT SPEC/25C USE/CM	02060 CONDUCT COMBINED USE/CM	02073 TURBIDITY HACH JTU	02074 TURBIDITY NPLMTR NTU
1	2.02	5.97	5.62	-	-	-	-	-	615.0	615.0	0.2	-
2	2.08	5.75	5.622	5. -	L	5. -	L	5. -	614.0	614.0	0.04	-
3	1.94	-	-	5.622	5. -	5. -	L	5. -	613.0	613.0	0.10	-
4	0.66	5.98	5.90	5. -	L	5. -	L	5. -	583.0	583.0	0.16	-
5	2.6	6.0	5.7	5. -	-	-	-	-	600.0	600.0	-	-
6	-	-	-	5.60	5. -	5. -	L	5. -	631.0	631.0	0.16	-
7	0.95	5.71	5.69	-	-	-	-	-	614.0	614.0	-	-
8	-4.13	5.71	5.69	-	-	-	-	-	595.0	595.0	0.35	-
9	-1.39	5.999	5.835	-	-	-	-	-	600.0	600.0	0.2	-
10	2.05	5.968	5.729	-	-	-	-	-	620.0	620.0	-	-
11	-	-	-	0.0000	-	-	-	-	-	-	-	-
MEAN	1.1767	5.8780	5.7517	-	-	-	-	-	-	-	-	-
STD. DEV.	1.152	2.1469	2.1622	-	-	-	-	-	-	-	-	-
REL. STD.	179.8	2.5	2.8	-	-	-	-	-	-	-	-	-
DES. VAL.	-	-	-	-	-	-	-	-	-	-	-	-
1	02077 TURBIDITY HACH FZN UNIT	02090 TURBIDITY COMBINED JTU/NTU	05105 BORON AA CARM MG/L	05106 BORON AZOMETHI MG/L	05111 BORON F UG/L	05190 BORON F DA MG/L	06101 DOC/UV DIFF MG/L	06104 DOC UV MG/L	06107 DOC UV MG/L	06150 DOC UV COMBINED MG/L	06151 DOC UV COMBINED MG/L	-
2	-	-	0.2	-	-	-	-	-	-	-	-	-
3	-	0.08	-	-	-	-	-	-	-	-	-	-
4	-	0.04	0.07	-	-	-	-	-	-	-	-	-
5	-	0.16	-	-	-	-	-	-	-	-	-	-
6	-	0.16	-	-	-	-	-	-	-	-	-	-
7	-	0.35	-	-	0.05 L	0.03 L	-	-	-	-	-	-
8	-	-	-	-	-	0.03 L	-	-	-	-	-	-
9	-	-	-	-	-	0.03 L	-	-	-	-	-	-
10	-	-	0.41	0.41	-	-	-	-	-	-	-	-
11	-	-	-	-	-	0.01 L	0.01 L	15.	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	.4100	1.089	.0700	-	-	-	-	-	-	-	-	-
STD. DEV.	.4118	.1218	.0141	-	-	-	-	-	-	-	-	-
REL. STD.	64.5	64.5	64.5	-	-	-	-	-	-	-	-	-
DES. VAL.	.218	.218	.040	-	-	-	-	-	-	-	-	-

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 2 SPIKED SAMPLE.		DATE: 01/09/86		DUE DATE: 31/10/86		PAGE 5	
STUDY NO. IRI144 PP 49 FP 9						MAJOR IONS 4C.	
LAB	06152 DIC CO2 UV C MG/L C	06154 DIC AA CO2 PHEN MG/L C	06490 D1C COMBINED MG/L C	07010 TKN AUTAN MG/L N	07013 TKN TON EL MG/L N	07015 TKN DIG BERTHELT MG/L N	07018 TKN BLK INDOPHEN MG/L N
1	-	17.0	17.0	0.850	-	-	0.800
2	17.4	-	17.4	18.0	-	1.0	0.850
3	18.0	-	18.0	21.0	-	-	-
4	-	-	-	-	-	-	1.95
5	-	-	-	-	-	-	2.1
6	-	-	-	-	-	-	2.1
7	-	-	-	-	-	-	1.95
8	-	-	-	-	-	-	1.95
9	-	-	-	-	-	-	1.95
10	-	-	-	-	-	-	1.95
11	-	-	-	-	-	-	1.95
12	-	-	-	-	-	-	1.95
MEAN	17.7000	17.0000	18.4800	.8500	.6000	1.0000	.7100
STD. DEV.	2.4243	2.4	1.5975	-	-	-	-
REL. STD.	-	-	8.6	-	-	-	-
DES. VAL.	-	-	17.768	-	-	-	-
LAB	07110 NO3+NO2 AA2 CD MG/L N	07111 NO3+NO2 DIS SPEC MG/L N	07390 NO3+AA CD COMBINED MG/L N	07505 NH3 TOT AA BERT MG/L N	07506 NH3 TOT SPEC EL MG/L N	07557 NH3 DISS AA PHEN MG/L N	07590 AMMONIA COMBINED MG/L N
1	2.10	1.92	1.92	2.10	2.05	0.117	0.09
2	2.05	-	1.98	2.05	2.00	-	-
3	2.00	-	-	2.00	-	-	-
4	2.10	2.20	2.20	2.10	2.00	0.13	0.13
5	-	-	-	-	-	0.13	0.13
6	-	-	-	-	-	0.13	0.13
7	-	-	-	-	-	0.13	0.13
8	-	-	-	-	-	0.13	0.13
9	-	-	-	-	-	0.13	0.13
10	2.06	1.9	1.95	2.06	2.06	0.11	0.137
11	2.06	-	-	-	-	0.11	0.137
MEAN	2.0350	1.9200	2.0900	2.0217	.1170	.1000	.1323
STD. DEV.	2.0758	1.956	7.4	2.0952	14.1	.0040	.1250
REL. STD.	3.7	-	-	4.7	14.1	3.1	.0151
DES. VAL.	-	-	2.044	-	-	5.7	12.55

DATA SUMMARY

FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 2 STUDY NO. IR144 SPINE SAMPLE.

DATE: 01/09/86

DUE DATE: 31/10/86 PAGE 6

MAJOR IONS 4C.

DATA SUMMARY

PROVINCIAL PROGRAMS

STUDY NO. IR144 PP 49
SAMPLE = 2 SPIKED SAMPLE

DATE: 01/09/86

1

PAGE 7

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR144 PP 49
SAMPLE = 2 SPIKED SAMPLE.

DATE: 01/09/86

DUKE DATE: 31/10/86 PAGE 8

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR144 PP 49 FP 9 DATE: 01/09/86 DUE DATE: 31/10/86 PAGE 9
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	K DISS FLM PHOT MG/L	19103 K DISS AAS LI MG/L	19106 K DISS AAS LI MG/L	19107 K EXTRL HNO3 AA MG/L	19301 K EXTRL HNO3 ICAP MG/L	19990 PTASSIUM COMBINED MG/L K	20005 CA TOTAL ICAP MG/L	20005 CA DISS CALCD MG/L	20101 CA DISS TIT EDTA MG/L	20103 CA DISS AAS MG/L	20108 CA DISS AAS UF MG/L	20110 CA DISS AAS AUTO MG/L
1	15.5	-	-	-	-	15.5	-	-	-	-	-	25.
2	16.0	-	15.6	-	-	16.0	-	-	-	-	-	26.
3	16.6	-	-	-	-	16.6	-	-	-	-	-	-
4	-	-	-	-	-	16.8	-	-	-	-	-	-
5	-	-	-	-	-	17.5	-	-	-	-	-	-
6	-	-	-	-	-	17.5	-	-	-	-	-	-
7	-	-	-	-	-	17.5	-	-	-	-	-	-
8	-	-	-	-	-	17.5	-	-	-	-	-	-
9	-	-	-	-	-	17.5	-	-	-	-	-	-
10	-	-	-	-	-	17.5	-	-	-	-	-	-
11	-	-	-	-	-	17.5	-	-	-	-	-	-
12	16.5	-	17.	-	-	16.5	-	-	-	-	-	-
MEAN	16.1500	17.0000	15.6000	14.5000	16.1800	16.17941	26.3500	27.0000	27.8000	27.7000	25.8000	25.5000
STD.	3.5066	3.1	-	-	-	15.986	.8	-	-	6.6	-	2.8
REL.	-	-	-	-	-	-	-	-	-	-	-	-
DES.	-	-	-	-	-	-	-	-	-	-	-	-
VAL.	-	-	-	-	-	-	-	-	-	-	-	-

LAB	20111 CA DISS MG/L	20311 CA EXTRL HNO3 ICAP MG/L	20990 CALCIUM COMBINED MG/L Ca
1	-	-	25.
2	-	-	25.8
3	-	-	27.8
4	-	-	27.
5	-	-	27.8
6	-	-	26.5
7	-	-	26.4
8	-	-	-
9	-	-	-
10	-	-	-
11	25.5	-	29.
MEAN	25.5000	24.7000	27.8000
STD.	-	-	27.000
REL.	-	-	25.800
DES.	-	-	25.529
VAL.	-	-	-

DATA SUMMARY

PRAIRIE PROVINCES : INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 3 STUDY NO. = IR145 PP 50 SPIKED SAMPLE.

DATE: 01/10/86

DUE DATE: 31/10/86 PAGE 10
TRACE METALS S/E. (IN 0.2% HNO3)

LAB	13 6 B 9 10 11 12	MEAN STD. REL. STD. DES. VAL.	.0100 - - - - - - - - - - - - - - - .0110 - - -
23302 V EXT AAS MG/L	23311 V EXTRBL ICAP DA MG/L	0.010 - - - - - - - - - - - - - - - - - -	0.011 - - - - - - - - - - - - - - - - - -

LAB	250/L MN	TOTAL 5X UG/L	TCA MN	MN DISS AGS MG/L	G F MG/L
1	-	-	-	-	-
2	-	-	-	-	-
3	-	-	-	-	-
6	0.013	-	-	-	-
8	-	-	-	-	-
9	-	-	-	-	-
10	-	-	-	-	-
11	-	-	-	-	-
12	-	-	-	-	-
MEAN					
STD.					
DEV.					
STD.					
RES.					
VAL.					
DESI.					

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR145 PP 50 FP 10
SAMPLE = 3 SPIKED SAMPLE.

DATE: 01/10/86 DUE DATE: 31/10/86 PAGE 11
28009 (IN 0.2% HNO3)

LAB	26311 FE EXTRBL ICAP DA MG/L	26999 IRON COMBINED MG/L FE	27003 CO TOTAL AAS G F MG/L	27009 CO TOTAL ICAP DA MG/L	27011 CO TOTAL 5X ICAP UG/L CO	27107 CO DISS AAS G F MG/L	27111 CO DISS ICAP DA MG/L	27999 CO EXTRBL COMBINED MG/L CO	28007 NI TOTAL AAS G F MG/L	28009 NI TOTAL ICAP DA MG/L
1	-	-	-	0.012	-	-	-	-	0.012	-
2	0.030	0.028 0.029 0.032 0.032 0.032 0.029	-	-	0.009	-	-	0.010	0.009 0.011 0.009	0.017
3	0.03	-	0.011	-	-	-	0.009	-	0.012	-
6	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-
MEAN	0.0300	0.0300 0.0000 -1.0	0.0110	.0120	.0090	.0120	.0090	.0100	.0105 .0114 .0111	.0170
STD.	-	-	-	-	-	-	-	-	-	-
REL.	-	-	-	-	-	-	-	-	-	-
DES.	-	-	-	-	-	-	-	-	-	-

LAB	28011 NI EXTRBL ICAP DA MG/L NI	28107 CO DISS AAS G F MG/L	28302 NI EXTRBL AAS SE MG/L	28309 NI EXTRBL AAS G F MG/L	28311 NI EXTRBL ICAP DA MG/L	28999 NI EXTRBL COMBINED MG/L NI	29003 NI TOTAL AAS G F MG/L	29009 NI TOTAL ICAP DA MG/L	29011 NI TOTAL EXTRBL UG/L CU	29107 CO DISS AAS G F MG/L
1	-	-	-	-	0.013	-	-	0.014	-	-
3	0.010	-	-	-	-	0.012	-	-	0.010	-
6	-	-	-	0.012	-	-	-	-	-	-
8	-	-	0.009	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-
11	-	-	0.013	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-
MEAN	.0100	.0130	.0195	.0130	.0120	.0123	.0120	.0140	.0100	.0120
STD.	-	-	.0021	.0021	-	.0024	-	-	-	-
REL.	-	-	20.2	-	-	19.4	-	-	-	-
DES.	-	-	-	-	-	.014	-	-	-	-

LAB	29111 CO DISS ICAP DA MG/L	29305 CO EXTRBL AAS SE MG/L	29311 CO EXTRBL ICAP DA MG/L	29999 COPPER COMBINED MG/L CU	30003 ZN TOTAL AAS G F MG/L	30009 ZN TOTAL ICAP DA MG/L	30011 ZN DISS AAS G F MG/L	30107 ZN DISS ICAP DA MG/L	30304 ZN EXTRBL AAS DA MG/L	30305 ZN EXTRBL AAS SE MG/L
1	-	-	0.013	0.012	0.014	-	-	-	-	-
2	-	-	0.013	0.012	0.013	-	-	-	-	-
3	-	-	0.012	0.012	0.010	-	-	-	-	-
6	-	0.015	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	0.015	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-
MEAN	.0135	.0130	.0120	.0120	.0190	.0180	.0150	.0170	.0100	.0160
STD.	.0021	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
REL.	-	-	-	-	.013	-	.011	.018	-	.016
DES.	15.7	-1.0	-1.0	-1.0	11.3	-	-	-	-	-

DATA SUMMARY

PRAIRIE PROVINCES: INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR145 PP 50 FP 10 DATE: 01/10/86 DUE DATE: 31/10/86 PAGE 13
 SAMPLE = 3 SPIKED SAMPLE. TRACE METALS S/E. (IN 0.2% HNO₃)

LAB	56009 BA TOTAL MG/L	56011 BA TOTAL UG/L BA	56111 BA DISS ICAP DA MG/L	56311 BA EXTRB ICAP DA MG/L	56999 BARIUM COMBINED MG/L BA	82004 PB TOTAL AAS G F MG/L	82011 PB TOTAL ICAP UG/L PB	82104 PB DISS AAS G F MG/L	82302 PB EXTRB AAS G F MG/L	82309 PB EXTRB ICAP DA MG/L
1	0.023	-	-	-	0.023	-	-	-	0.011	-
2	-	-	0.025	-	0.023	0.025	-	0.005L	-	0.010
3	-	-	-	0.025	-	0.025	0.02	0.011	-	-
6	-	-	0.02	-	-	0.025	0.012	-	-	-
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-
MEAN	.0230	.0250	.0235	.0230	.0232	.0232	.0236	.0120	.0130	.0100
STD.	-	-	15.7	-	.025	.025	.025	-1.0	-	-
REL. VAL.	-	-	-	-	-	-	-	-	-	-
DES.	-	-	-	-	-	-	-	-	-	-

LAB	82999 LEAD COMBINED MG/L PB
2	0.011
3	0.011
6	0.005L
8	0.013
9	0.011
10	0.007
11	0.012
12	0.012
MEAN	.0110
STD.	.0019
REL. VAL.	17.4
DES.	.010

DATA SUMMARY

FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR145 PP 50
SAMPLE = 4 SPIKED SAMPLE.

DATE: 01/10/86

DUE DATE: 31/10/86 PAGE 14

LAB	00110 IONIC BALANC %	00120 SUM OF CATIONS MEQ/L	MEAN	STD. DEV.	STD. DEV.	STD. DEV.
123456789101112	1.01 -0.19 0.20 -0.24 -2.7 -5.4 2.57 0.94 -0.04	9.52 9.213 9.173 9.50 9.5 8.45 9.59 9.606 9.277	1722 3671 1374.5	1.1722 3.671 3.745	9.3143 9.3625 3.3	-

02011 COLOUR APPARENT REL UNIT	02021 COLOUR VIS COMP REL UNIT	02023 COLOUR SPECTROM ABS UNIT	02040 COLOUR COMBINED REL UNIT	02041 CONDUCT SPEC 25C USIE/CM	02060 CONDUCT COMBINED USIE/CM	02073 TURBIDITY HACH JTU	02074 TURBID NPLMTR NTU
-	-	-	-	-	-	-	-
5.	10.	5.	5.	5.	5.	5.	5.
-	-	-	-	-	-	-	-
5.	10.	5.	5.	5.	5.	5.	5.
-	-	-	-	-	-	-	-
9.	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
9.0000	-	7.3333	909.7909	909.7909	20.3259	20.3259	27.0652
-	-	26.5820	20.32	-	-	-	27.0652
7.0000	-	33.154	912.548	-	-	-	56.7
7.7386	-	-	-	-	-	-	56.7
7.1	-	-	-	-	-	-	-

DATA SUMMARY

THE CANADIAN GEOGRAPHICAL SURVEY
PROVINCIAL AND REGIONAL MAPS

STUDY NO. IRI45 PP 50
SAMPLE = 4 SPIKED SAMPLE.

DATE: 01/10/86

DUE DATE: 31/10/86 PAGE 15

DATA SUMMARY

PRINCIPAL PROVINCIAL AND FEDERAL-PROVINCIAL PROGRAMS

STUDY NO. IR145 PP 50
SAMPLE = 4 SPIKED SAMPLE.

DATE: 01/10/86

PAGE

1

LAB	09190 FLOURIDE COMBINED MG/L F	10101 ALKALINITY TITR'N MG/L CAC	10108 ALKALINITY POT TITAN MG/L CAC	10109 ALKALINITY POT TITAN MG/L CAC	10111 ALKALINITY TITR'PRO MG/L CAC	10112 ALKALINITY COND MG/L CAC	10190 ALKALINITY COMBINED MG/L CAC	10301 PH	10390 PH	10602 HARDNESS CALCD MG/L CAC	10603 HARDNESS TITR'N MG/L CAC
1	0.24	168.	-	-	-	-	168.	7.9	7.9	-	-
2	0.25	157.9	-	-	-	-	157.9	8.1	8.1	-	-
3	0.26	-	168.	-	-	-	169.	8.24	8.24	-	-
4	0.245	167.	-	-	-	-	168.	7.85	7.85	-	-
5	0.3	-	171.	-	-	-	167.	7.86	7.86	-	-
6	0.29	165.1	-	-	-	-	165.1	7.8	7.8	-	-
7	0.36	-	-	171.	-	-	167.	8.0	8.0	-	-
8	0.29	-	167.	-	-	-	167.	7.90	7.90	215.	-
9	0.27	-	166.	-	-	-	166.	7.98	7.98	235.	-
10	0.27	167.	-	-	-	-	171.	7.98	7.98	-	-
11	0.27	164.	-	-	-	-	164.	8.2	8.2	-	-
12	0.27	-	-	-	-	-	-	-	260.	-	-
									236.	-	-
MEAN	.2683	165.2857	166.0000	169.0000	169.0000	171.0000	166.7500	7.9755	238.2500	246.7333	
STD.	.0215	3.5788	2.2	2.8284	1.7	-	3.4859	1.461	14.7640	2.6102	
REL.	8.0	2.2	-	-	-	-	2.1	1.8	6.2	1.1	
DES.	.253	-	-	-	-	-	166.809	7.893	-	-	

DATA SUMMARY

INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS
PRAIRIE PROVINCES,

SAMPLE = 4 SPICKED SAMPLE.

DATE: 01/10/86

DATE: 31/10/86
MAJOR IONS 4C.

DUE DATE: 31/10/86 PAGE 17

LAB	10606 HARDNESS CALC'D MG/L CAC			10690 HARDNESS TOTAL COMBINED MG/L CAC			11005 SODIUM AAS F MG/L			11102 SODIUM AAS DA MG/L			11103 NADISS FL PH MG/L			11107 NADISS UF PH MG/L			11131 NHNO3 ICP MG/L			12005 MG TOTAL ICAP MG/L			12101 MG DISC'D MG/L			
	MEAN	STD.	DEV.	REF.	STD.	DEV.	MEAN	STD.	DEV.	MEAN	STD.	DEV.	MEAN	STD.	DEV.	MEAN	STD.	DEV.	MEAN	STD.	DEV.	MEAN	STD.	DEV.	MEAN	STD.	DEV.	
1	-	246.5	-	-	-	-	-	-	-	101.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	233.9	233.9	-	-	-	-	-	-	101.	-	-	-	98.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	-	244.2	-	-	-	-	-	-	-	-	-	-	100.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4	-	249.2	-	-	-	-	-	-	-	-	-	-	96.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5	-	235.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6	-	244.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	-	233.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	-	235.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9	-	260.	-	-	-	-	-	-	-	99.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	-	236.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	-	236.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	-	236.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
13	-	233.9	0.000	-	240.3600	104.5000	100.0000	100.0000	100.0000	99.7500	96.0000	96.0000	98.8000	91.7000	91.7000	99.5000	93.6274	93.6274	32.5000	32.5071	2.2	-	-	-	-	-	-	-
14	-	233.9	0.000	-	11.9898	.7071	1.4142	1.4142	1.4142	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
15	-	245.0	74.4	-	241.774	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
16	-	233.9	0.000	-	241.774	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
17	-	12106 MG DISS AS DA MG/L	-	-	12107 MG DISS AS AUTO MG/L	-	-	-	-	12111 MG HARDON CAL'D MG/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
18	-	30.5	-	-	-	-	-	-	-	31.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
19	-	37.0	-	-	-	-	-	-	-	31.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
20	-	35.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
21	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	31.5000	32.0000	-	-	28.9000	-	-	-	-	-	-	-	-	-	-	-	-	-	
22	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
23	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
24	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
25	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
26	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
27	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
28	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
29	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
32	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
33	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
34	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
35	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
36	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
37	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
38	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
39	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
41	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
42	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
43	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
44	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
45	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
46	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
47	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
48	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
49	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
50	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
51	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
52	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
53	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
54	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
55	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
56	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
57	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
58	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
59	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
60	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
61	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
62	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
63	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
64	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
65	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
66	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
67	-	36.000	30.5000	-	31.0000	31.6000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
68	-	31.4142	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
69	-	36.000	30.5000	-																								

DATA SUMMARY

FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IRI45 PP 50
SAMPLE = 4 SPIKED SAMPLE

DATE: 01/10/86

PAGE 18

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR145 PP 50 FP 1.0 DATE: 01/10/86 DUE DATE: 31/10/86
 SAMPLE = 4 SPIKED SAMPLE.

MAJOR IONS 4C.

LAB	19102 K DISS AAS MG/L	19103 K DISS FLM PHOT MG/L	19106 K DISS AAS LI MG/L	19107 K DISS UP FLM PHOT MG/L	K EXTRB HNO3 AA MG/L	19990 PTASSIUM COMBINED MG/L	20005 CA TOTAL ICAP MG/L	20100 CA DISS CALCD MG/L	20101 CA DISS TIT EDTA MG/L	20103 CA DISS AAS MG/L	20106 CA DISS AAS MG/L
1	-	-	7.9	-	-	7.9	-	-	-	-	-
2	-	-	8.0	-	7.86	8.0	-	-	-	-	-
3	-	-	8.2	-	-	8.2	-	-	-	-	-
5	-	12. 6.7	R	-	-	12. 7.00	R	-	46. 43.	-	43.4 46.
6	-	-	-	-	-	8.56	43.5	-	-	-	-
7	-	-	-	-	-	8.5	-	-	-	-	-
8	-	-	-	-	-	8.5	43.3	-	-	-	-
9	-	-	-	-	-	8.2	-	-	-	-	-
10	-	-	-	-	-	8.2	-	-	-	-	-
11	-	-	-	-	-	8.2	-	-	-	-	-
12	-	-	8.2	-	-	8.2	-	-	-	-	-
MEAN	8.7000	8.0750	8.5000	7.8600	7.0000	8.0920	43.4000	43.0000	46.9000	46.0000	43.4000
STD.	-	1.1500	-	-	-	1.4736	.1414	-	-	0.0000	-
REL.	-	1.9	-	-	-	5.9	.3	-	-	-	-
DES.	-	-	-	-	-	8.062	-	-	-	-1.0	-

LAB	20110 Ca DISS AAS AUTO MG/L	20111 Ca DISS ICAP MG/L	20311 Ca EXTRB HNO3 ICAP MG/L	20990 CALCIUM COMBINED MG/L
1	46. 44.	-	-	46.
2	35	-	-	44. 43.4
5	67	-	-	46.9
6	88	-	-	43.
9	10	-	38.3 R	46. 43.3
11	12	-	-	42.6
MEAN	45.0000	42.6000	43.4000	44.4700
STD.	1.4142	3.1	.1.5727	.1.5727
REL.	-	-	-	43.826
DES.	-	-	-	-
VAL.	-	-	-	-

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR145 PP 50 FP 10
SAMPLE = 5 SPIKED SAMPLE.

DATE: 01/10/86 DUE DATE: 31/10/86 PAGE 21

LAB	STUDY NO. DIC IR UV CO2 EV MG/L C	PP 50 CO2 PHEN MG/L C	FP 10 COMBINED MG/L C	DATE: 01/10/86 AUTAN MG/L N	07010 TKN AUTAN MG/L N	07013 TKN TONEL MG/L N	07015 TKN AMM-SALI MG/L N	07016 TKN BERTHELT MG/L N	07018 TKN INDOPHEN MG/L N	07021 TKN DIG BERT MG/L N	07090 TAN COMBINED MG/L N	07109 NO3+NO2 FAA HHD MG/L N	
1	06152 DIC IR UV CO2 EV MG/L C	06154 DIC AA CO2 PHEN MG/L C	06490 DTC COMBINED MG/L C	1.0 L 1.0 L	1.0 L 1.0 L	0.181 0.181	-	-	-	0.200 0.200	0.200 0.200	0.181 0.181	-
2	3.7	-	-	-	-	-	-	-	-	-	-	-	0.17
3	-	-	-	-	-	-	-	-	-	-	-	-	0.10 R
4	-	-	-	-	-	-	-	-	-	-	-	-	0.125
5	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	2.9000	-	3.1250	-	3.1250	-	.1810	.3100	.2000	.4000	.3300	.2000	.2702
STD. DEV.	9.8	-	13.4	-	13.4	-	-	-	-	-	-	.0392	.0318
REL. STD. DES.	-	-	-	-	-	-	-	-	-	-	-	.33.0	21.6
													HCU
LAB	07110 NO3+NO2 AA2 CD MG/L N	07111 NO3+NO2 DIS SPEC MG/L N	07112 NO3+NO2 UF AA CD MG/L N	07390 NITRATE COMBINED MG/L N	07505 NH3 TOT SPEC EL MG/L N	07506 NH3 DISS AA PHEN MG/L N	07555 NH3 DISS AA INDO MG/L N	07557 NH3 DISS AA EDTA MG/L N	07562 NH3 DISS COMBINED MG/L N	07590 AMMONIA COMBINED MG/L N	07601 TOTAL AA COMBINED MG/L N		
1	0.15	-	0.134	-	0.134	-	0.017	0.05 L	-	0.023	0.023	0.017	0.20
2	0.15	-	0.148	-	0.148	-	0.017	0.05 L	-	-	-	0.05 L	-
3	0.145	-	-	-	-	-	-	-	-	-	-	0.014	-
4	0.145	-	-	-	-	-	-	-	-	-	-	0.02	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-
7	0.15	-	0.17	-	0.17	-	0.0145	-	0.014	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-
11	8.16	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	1525	.0061	.1340	.1590	.1511	.0170	.0156	.0138	.0160	.0230	.0174	.0034	.2000
STD. DEV.	4.0	-	9.8	9.8	9.1	-	-	-	.0042	-	19.6	-	-
REL. STD. DES.	-	-	-	-	-	-	-	-	.0042	-	-	-	-

DATA SUMMARY

INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS
PRAIRIE PROVINCES, 1971

STUDY NO. IR145 PP 50
SAMPLE = 5 SPIKED SAMPLE.

DATE: 01/10/86 DUE DATE: 31/10/86 MAJOR IONS 4C

DUE DATE: 31/10/86 **PAGE** 22

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR145 PP 50 FP 10
SAMPLE = 5 SPIKED SAMPLE.

DATE: 01/10/86 DUE DATE: 31/10/86
PAGE 24

MAJOR IONS 4.C.

LAB	STLICA COMBINED MG/L	15101 PP FIL MG/L P	15403 T P AA SNCL2 MG/L P	15406 T P AA ASC MG/L P	15409 BLK AA ASC MG/L P	15413 TOTAL P AA SNCL2 MG/L P	15490 TOTAL P COMBINED MG/L P	16304 DISS AA BA MG/L	16306 DISS AA MTB MG/L	16307 DISS AAN MBUF MG/L	16309 DISS SO4 CISS MG/L
1	0.5	L HPLC	-	-	-	-	-	0.000	0.000	17.1	20.
2	0.49	-	-	-	0.003L	-	0.02 R	0.003L	-	-	-
3	0.5	-	-	-	-	-	-	0.02 R	20.	18.0	-
4	0.4	-	-	-	-	-	-	0.001L	0.001L	16.3	-
5	0.49	0.010L	0.05 L	0.004	-	-	-	0.010L	0.004	17.9	18.
6	0.48	-	-	-	-	-	-	0.05 L	-	3.5	-
7	0.5	-	-	-	-	-	-	-	-	R	-
8	0.49	-	-	-	-	-	-	-	-	-	-
9	0.48	-	-	-	-	-	-	-	-	-	-
10	0.49	-	-	-	-	-	-	-	-	-	-
11	0.48	-	-	-	-	-	-	-	-	-	-
12	0.5	-	-	-	-	-	-	-	-	-	-
MEAN	5.000	-	-	-	-	0.0000	-	0.020	18.5500	18.0200	17.9000
STD.	0.0210	-	-	-	-	-	-	0.028	14.14	1.342	1.414
REL.	4.2	-	-	-	-	-	-	-	-	-	.8
DES.	VAL:	-	-	-	-	-	-	-	-	-	-
LAB	16310 SO4 DISS AA CALM MG/L	16990 SUMMERED COMBINED MG/L SO4	17203 CL DISS AA FE MG/L	17204 CL DISS AA PITN MG/L	17205 CL DISS AA AG MG/L	17206 CL DISS AA MG/L	17207 CL DISS AA AG MG/L	17208 CL DISS AA MG/L	17209 CL DISS AA MG/L	17210 CL DISS AA MG/L	19005 CHLORIDE COMBINED MG/L CL
1	-	-	41.	-	-	-	-	39.8	16.8	-	-
2	-	-	17.1	-	-	-	-	-	-	-	-
3	-	-	16.6	-	-	-	-	-	-	-	-
4	-	-	18.0	-	-	-	-	-	-	-	-
5	-	-	20.0	-	-	-	-	-	-	-	-
6	-	-	17.9	40.8	34.	45.0	-	-	-	-	-
7	-	-	16.3	-	41.	-	-	-	-	-	-
8	-	-	18.3	-	-	-	-	-	-	-	-
9	-	-	16.5	-	-	-	-	-	-	-	-
10	16.5	-	17.9	-	-	38.	-	-	20.	-	-
11	-	-	-	-	-	-	-	-	16.	-	-
12	-	-	-	-	-	-	-	-	-	16.	-
MEAN	16.5000	17.8300	40.9000	34.0000	41.3333	39.8000	18.4000	16.0000	33.2400	2.9750	2.9800
STD.	DEV.	17.3183	0.1414	.3	8.5	-	12.3	-	13.1801	2.9354	1.2
REL.	VAL:	-	-	-	-	-	-	-	33.6	-	-
DES.	VAL:	-	-	-	-	-	-	-	-	-	-

HCW

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR145 PP 50 FP 10 DATE: 01/10/86 DUE DATE: 31/10/86 PAGE 25
 SAMPLE = 5 SPIKED SAMPLE MAJOR IONS 4C.

LAB	19103 AAS FLW PHOT MG/L	19106 AAS LI MG/L	19107 AAS UF FLW PHOT MG/L	19301 EXTRBL HN03 AA MG/L	19990 CALCIUM COMBINED MG/L	20005 ICAP MG/L	20100 CALCIUM CACL-D MG/L	20101 TITI MG/L	20103 AAS Diss MG/L	20108 AAS UF MG/L	20110 AAS AUTO MG/L
1	2.9	-	-	-	2.9	-	-	-	-	-	16.
2	2.8	-	-	2.88	-	2.88	-	-	-	-	15.
3	2.9	-	-	-	2.9	-	-	15.9	-	-	-
4	-	-	-	-	3.15	3.15	-	16.	-	-	-
5	-	-	-	-	-	2.95	15.8	-	-	-	-
6	-	-	-	-	-	3.1	-	-	-	-	-
7	-	-	-	-	-	3.0	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-
12	3.0	-	3.1	-	-	-	-	-	-	-	-
MEAN	2.9000	3.1000	2.8800	3.1500	2.9660	15.8500	16.0000	15.9000	16.0000	14.9000	15.5000
STD.	0.0816	-	-	-	0.1045	0.0707	-	-	0.4142	0.8	4.6
REL.	2.8	-	-	-	3.5	0.4	-	-	-	-	-
DES.	-	-	-	-	-	-	-	-	-	-	-

LAB	20311 AAS Diss MG/L	20311 EXTRBL HN03 ICAP MG/L	20990 CALCIUM COMBINED MG/L	20990 CALCIUM CACL-D MG/L	20990 TITI MG/L	20990 AAS Diss MG/L	20990 AAS UF MG/L	20990 AAS AUTO MG/L
1	-	-	-	16.	-	-	-	-
2	-	-	-	14.8	14.8	-	-	-
3	-	-	-	-	15.9	-	-	-
4	-	-	-	-	15.9	-	-	-
5	-	-	-	-	15.8	-	-	-
6	-	-	-	-	15.8	-	-	-
7	-	-	-	-	15.8	-	-	-
8	-	-	-	-	15.8	-	-	-
9	-	-	-	-	15.8	-	-	-
10	-	-	-	-	15.5	-	-	-
11	-	-	-	-	15.5	-	-	-
12	15.5	-	-	-	-	-	-	-
MEAN	15.5000	14.8000	15.6182	15.6600	14.2	-	-	-
STD.	-	-	-	-	-	-	-	-
REL.	-	-	-	-	-	-	-	-
DES.	-	-	-	-	-	-	-	-

DATES RECEIVED 1 86/09/24 2 86/11/04 3 86/11/14 7 86/09/07 11 86/11/19 4 86/11/24 9 86/11/12 12 86/11/12 14 86/11/03

10 86/11/12 11 86/10/23 11 86/11/12 12 86/11/12 14 86/11/03

DISTRIBUTION - IRQC

Mr. H. Agemian
Head, Scientific Services Section
National Water Quality Laboratory

Mr. G. Brun
Head, Analytical Services Section
Atlantic Region Water Quality Branch

Mr. W. Coedy
CIC, Water Laboratory
DIANA, NAP
Yellowknife, NWT

Ms. D. Duval
Head, Analytical Services Section
Quebec Region Water Quality Laboratory

Mr. M. Forbes
Head, Analytical Services Section
National Water Quality Laboratory

Mr. F. Mah
Head, Analytical Services Section
Pacific Region Water Quality Branch

Mr. J-G. Zakrevsky
Head, Analytical Services Section
Western Region Water Quality Branch

cc:

Dr. B.K. Afghan
Chief, NWQL, CCIW
Burlington, Ontario

Mr. D.H. Cullen
Chief, Water Quality Branch
Atlantic Region
Moncton, New Brunswick

Dr. W.E. Erlebach
Chief, Water Quality Branch
Pacific Region
Vancouver, B. C.

Mr. W.D. Gummer
Chief, Water Quality Branch
Western Region
Regina, Saskatchewan

Mr. L. Martel
Chief, Water Quality Branch
Quebec Region, Longueuil, P. Q.

Dr. J. Lawrence
Director
Research and Applications Br
NWRI, CCIW

Mr. A. S. Y. Chau
Project Chief
Quality Assurance Project
NWRI



Government
of Canada Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

TO
A

Distribution

FROM
DE

H. Alkema
Quality Assurance and Methods Section
National Water Research Institute
Burlington, Ontario.

SUBJECT
OBJET

Inter-regional Quality Control (IRQC) Program

H. Alkema/IWD-NWRI/336-4929/ha

SECURITY - CLASSIFICATION - DE SÉCURITÉ

OUR FILE / NOTRE RÉFÉRENCE

YOUR FILE / VOTRE RÉFÉRENCE

DATE

February 27, 1987.

I have enclosed the final report for IR 146-147.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A.

H. Alkema

SUMMARY REPORT

INTER-REGIONAL QUALITY ASSURANCE PROGRAM

STUDIES 146 AND 147

for November and December, 1986

**TRACE METALS, MAJOR IONS, NUTRIENTS
AND PHYSICAL PARAMETERS IN SPIKED SAMPLES**

by

H. Alkema

**Quality Assurance and Methods Section
National Water Research Institute
Burlington, Ontario**

February 1987

Introduction

As part of an on-going study, the Quality Assurance and Methods Section, N.W.R.I. in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the IRQC program. This report summarizes the most recent IRQC inter-laboratory quality control studies: IR 146 and 147, for the months November and December, 1986. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The levels were low.

Study Design

Five water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining three were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the five samples:

IR 146 - Sample 1 - 125 ml, D/A * for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

IR 147 - Sample 3 - 1L, S/E * for trace metals (0.2% HNO₃)
Sample 4 - up to 1L, major ions, etc., stored at 4°C
Sample 5 - up to 1L, major ions, etc., stored at 4°C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were recorded on report sheets provided with the IR samples. Upon receipt of the Reporting Sheets, the results were tabulated for each parameter, first for each method reported, and then for all methods combined. These data, and the resulting statistics are presented in the Data Summary. (attached)

Preliminary data summaries, including problematic results, were sent January 2, and January 30, 1987. Each laboratory was given three weeks to notify us of any errors in data transcription or compilation.

Performance Indicators

In previous reports the mean has always been used as comparator for accuracy assessment. We now have "design values" for several reference waters (RMs) and certified reference waters (CRMs). These design values are used to test each reported result (whether few or many) for accuracy. Consequently, for stable parameters, the design values will be used as comparator for the ten percent warning circles, and the mean will be used for unstable parameters (perhaps due to biological activity).

Percentage deviations from the comparator are used as an indicator for the laboratory head to determine the extent of the discrepancies between the laboratory result and comparator as it applies to his procedures. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than 10% from the comparator is circled in the data tables and its value noted in the comments which follow. Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned 'HDL' and is labelled in the Data Summary.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

General Comments: A high coefficient of variation (incomparability) was observed for TKN in sample five, and for Aluminum in sample three.

Individual laboratory deviations are listed below:

Lab 2 - a low result for Mn by DA: -13%

- a high result for K: +13%

- an HDL for Zn by SE

Lab 3 - a low result for Ba: -13%

- a high result for DOC: +1000% (R) and DIC: +33%

Lab 4 - low results for DIC: -11%, and -19%

- an HDL for Ammonia

Lab 5 - a high result for DIC: +18%, and +22%; for Alk: +11%
and Ca: +11%

- a low result for Mg: -14%

- an HDL for DOC

Lab 7 - no anomalies

Lab 11 - results by DA for Fe: +20%; Cu: -21%; and Zn: -120% (R)

- a high result for TKN: +90% (R) and 250% (R); Ca: -11%

and K: +76% (R) and +35%

- a low result for Cl: -35% (R)

WQB laboratories average number of deviations per sample was 0.9

* (R) = rejectable by Grubb's procedure for statistical calculation.

Appendix I

Definitions of Types of Metals Analysis

1. D/A - Direct Aspiration

Without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS) or Inductively Coupled (Argon) Plasma (ICAP or ICP). Standards should contain the acid equivalent of the sample.

2. S/E - Code for low level analysis.

Analysis is presently carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP.
3. Digestion of aqueous phase followed by ICAP.
4. Graphite tube (flameless) AAS.

Appendix II

Performance Indicators

1. Circled Results

Results are circled when a minor deviation from the comparator has occurred. (The comparator is the design value of the reference sample, or the mean in the case of a biologically active parameter). Circled results are in general greater than or less than 10% from the comparator. At very low levels of analytes or with parameters that are difficult to analyse, a greater deviation than 10% is allowed. Under these conditions, a result is circled when it is outside one standard deviation of the comparator. These circled results, though acceptable values, are a warning to laboratory managers that the parameter analysis should be investigated.

2. Rejectable Results

Each parameter is tested for the various laboratory results that are statistical outliers, results that were affected by non random causes (eg. a transcription error). These outlying results, calculated by the Grubbs's procedure,* and indicated in the data tables with an 'R', are noncomparable with the data set for the parameter.

3. A High Co-efficient of Variation (HCV)

Occasionally there is a parameter with a very high relative standard deviation (RSD). When this HCV is not due to one or two outlying values, it indicates a high variability within the data set. The data in this data set is non-comparable. In such a case, the RSD for the parameter is circled in the data tables and the parameter's non-comparability is noted in the comments.

4. High Detection Limits (HDL)

Each laboratory determines its own detection limits according to its own requirements. When major differences of detection limits occur, the high detection limit is circled. An HDL indicates that low level analysis with an HDL may not be comparable with the analyses of the other laboratories.

* reference: Frank E. Grubbs, Technometrics, 1969, p 1.

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR146	PP 51	FP 11	DATE: 01/11/86	DUE DATE: 31/12/86	
					TRACE METALS D/A. (IN 3% HNO3)	
SAMPLE = 1 SPIKED SAMPLE.						
LAB	13009 AL TOTAL 5X DISS ICAP DA MG/L	13302 AL EXTR AL ICAP DA MG/L	13306 AL UFAAS SE/OX/EP MG/L	13311 AL EXTR AL ICAP DA MG/L	13999 ALUMINUM COMBINED MG/L AL	23009 V TOTAL ICAP DA MG/L
1	- - - - -	- - - - -	0.511 - - - - -	- - - - -	0.511 0.485 - - - - -	23011 V DISS ICAP DA MG/L
2	0.50 - - - - -	0.50 - - - - -	- - - - -	0.506 - - - - -	0.502 - - - - -	- - - - -
3	- - - - -	0.502 - - - - -	- - - - -	- - - - -	0.50 - - - - -	0.45 - - - - -
6	- - - - -	0.5 - - - - -	- - - - -	- - - - -	0.50 - - - - -	- - - - -
9	- - - - -	0.55 - - - - -	- - - - -	- - - - -	0.55 - - - - -	- - - - -
10	- - - - -	0.43 - - - - -	- - - - -	- - - - -	0.43 - - - - -	- - - - -
12	- - - - -	- - - - -	- - - - -	- - - - -	0.43 - - - - -	- - - - -
MEAN	.5000	.4767	.5007	.5110	.5060	.4850
STD.						
REL.						
DES.						
VAL.		13.5	:2	-	-	-
LAB	24004 CR TOTAL CR AS G F MG/L	24009 CR TOTAL CR AS G F MG/L	24052 CR DISS AAS DA MG/L	24111 CR EXTR ICAP DA MG/L	24999 CHROMIUM COMBINED MG/L CR	25003 MN TOTAL ICAP DA MG/L
1	- - - - -	- - - - -	0.056 - - - - -	- - - - -	- - - - -	25011 MN DISS ICAP DA MG/L
2	- - - - -	- - - - -	0.052 - - - - -	- - - - -	0.057 - - - - -	- - - - -
3	- - - - -	- - - - -	- - - - -	- - - - -	0.056 - - - - -	- - - - -
6	- - - - -	- - - - -	- - - - -	- - - - -	0.057 - - - - -	- - - - -
9	0.043 - - - - -	- - - - -	- - - - -	- - - - -	0.052 - - - - -	- - - - -
10	- - - - -	- - - - -	- - - - -	- - - - -	0.053 - - - - -	- - - - -
11	- - - - -	- - - - -	- - - - -	- - - - -	0.054 - - - - -	- - - - -
12	- - - - -	- - - - -	- - - - -	0.050 - - - - -	0.048 R	- - - - -
MEAN	.0430	.0560	.0520	.0500	.0528	.0570
STD.						
REL.						
DES.						
VAL.						

STUDY NO.	IR146	PP 51	FP 11	DATE: 01/11/86	DUE DATE: 31/12/86	
					TRACE METALS D/A. (IN 3% HNO3)	
SAMPLE = 1 SPIKED SAMPLE.						
LAB	25311 MN EXTR ICAP DA MG/L	25999 MANGANESE COMBINED MG/L MN	26011 FE TOTAL ICAP DA MG/L FE	26104 FE DISS AAS DA MG/L	26304 FE EXTR ICAP DA MG/L	26999 IRON COMBINED MG/L FE
1	- - - - -	- - - - -	- - - - -	- - - - -	0.250 - - - - -	0.250 - - - - -
2	0.046 - - - - -	0.047 - - - - -	0.25 - - - - -	- - - - -	0.250 - - - - -	0.250 - - - - -
3	0.04 - - - - -	0.045 - - - - -	- - - - -	- - - - -	0.250 - - - - -	0.250 - - - - -
6	- - - - -	0.046 - - - - -	- - - - -	- - - - -	0.250 - - - - -	0.250 - - - - -
8	- - - - -	0.046 - - - - -	- - - - -	- - - - -	0.250 - - - - -	0.250 - - - - -
9	- - - - -	0.05 - - - - -	- - - - -	- - - - -	0.250 - - - - -	0.250 - - - - -
10	- - - - -	- - - - -	- - - - -	- - - - -	0.25 - - - - -	0.25 - - - - -
11	- - - - -	- - - - -	- - - - -	- - - - -	0.25 - - - - -	0.25 - - - - -
12	- - - - -	0.04 - - - - -	- - - - -	- - - - -	0.25 - - - - -	0.25 - - - - -
MEAN	.0430	.0441	.2500	.3020	.2333	.2533
STD.	.0042	.0038			.0058	.19
REL.						
DES.						
VAL.	9.9	8.5	-	-	6.5	11.5

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IRI46 PP 51
SAMPLE = 1 SPIKED SAMPLE.

DATE: 01/11/86

DUE DATE: 31/12/86 PAGE 2
TRACE METALS D/A. (IN 3% HNO₃)

LAB	38011 SR TOTAL ICAP DA MG/L	38111 SR DISS ICAP DA MG/L	38311 SR EXTRBL ICAP DA MG/L	38999 STRNTIUM COMBINED MG/L SR	42009 MO TOTAL ICAP MG/L	42111 MO DISS ICAP DA MG/L	42311 MO EXTRBL ICAP DA MG/L	42999 MOLYBNUM COMBINED MG/L MO
1	-	-	-	-	0.884	-	-	0.884
2	0.057	-	-	0.171	0.171	-	-	0.886
3	0.056	-	-	0.171	0.171	-	-	0.886
4	0.055	-	-	0.171	0.171	-	-	0.74
5	0.057	0.05 R	-	0.17	0.17	0.74	-	-
6	0.057	-	-	0.17	0.17	-	-	-
7	0.057	-	-	0.17	0.17	-	-	-
8	0.057	-	-	0.17	0.17	-	-	-
9	0.057	-	-	0.17	0.17	-	-	-
10	0.057	-	-	0.17	0.17	-	-	-
11	0.125 R	-	-	0.17	0.17	-	-	-
12	0.04 R	-	-	0.17	0.17	-	-	-
MEAN	0.0531	-	-	0.1710	0.1703	.8840	.8467	.8860
STD.	.0063	-	-	.0212	.0176	-	.0306	-
REL.	11.9	-	-	-	11.0	-	3.6	-
DES.	.056	-	-	-	.1170	-	-	-

DATA SUMMARY

PRairie Provinces, Inter-Regional and Federal-Provincial Quality Control Programs

STUDY NO. IR146 PP 51 FP 11 DATE: 01/11/86 DUE DATE: 31/12/86 PAGE 3
 SAMPLE = 1 SPIKED SAMPLE. TRACE METALS D/A /IN 34 UNOCA

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR146 PP 51 FP 11 DATE: 01/11/86
SAMPLE = 2 NATURAL SAMPLE.

DUE DATE: 31/12/86 PAGE 4

וְרָא יְהוָה

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR146 PP 51 FP 11 DATE: 01/11/86 DUE DATE: 31/12/86 PAGE 5
 SAMPLE = 2 NATURAL SAMPLE.

LAB	STUDY NO.	IR146	PP	51	FP	11	DATE:	01/11/86	DUE DATE:	31/12/86	PAGE	5	MAJOR IONS 4C.
1	06109	06150	06151	06152	06154	06159	06490	07010	07013	07015			TKN BLK AMM-SALT MG/L N
2	DOC UV CO ₂ NAOH	DOC C COMBINED MG/L C	DOC IR CO ₂ EV	DOC AA CO ₂ PHEN	DOC CO ₂ MAOH	DOC COMBINED MG/L C	AUTAN MG/L N	TKN EL MG/L N	TKN DIG BERTHELT MG/L N	TKN DIG BERTHELT MG/L N			
3	-	1.3	-	-	10.0	-	10.0	-	-	-			
4	-	1.7	-	-	10.0	-	10.0	-	-	-			
5	-	1.0	-	-	10.8	-	10.8	-	-	-			
6	0.90	12.0	-	-	-	-	12.0	-	-	-			
7	0.5	2.0	-	-	-	-	-	-	-	-			
8	0.5	2.5	-	-	-	-	-	-	-	-			
9	-	2.	10.	-	-	-	9.8	9.8	10.0	0.17 R			
10	-	-	-	-	-	-	-	-	-	0.20 L			
11	-	-	-	-	-	-	-	-	-	-			
12	-	-	-	-	-	-	-	-	-	-			
MEAN	.5000	1.4667	11.0000	9.4000	10.0000	9.8000	10.0857	.0650	-	-			
STD.	-	39.5788	11.4142	9.8485	9.0	-	-	-	-	-			
REL.	-	39.5	12.9	-	-	-	-	-	-	-			
DES.	-	1.252	-	-	-	-	-	-	-	-			
LAB	07018	07090	07109	07110	07111	07112	07390	07505	07506	NITRATE TOT NH3 SPEC EL MG/L N			NH3 DISS AA PHEN MG/L N
1	TKN BLK INDOOPHEN	TKN BLK DIG BERT	TKN COMBINED MG/L N	NO ₃ +NO ₂ AA HYD	NO ₃ +NO ₂ DIS SPEC	NO ₂ AA CD	COMBINED MG/L N	AA BERT MG/L N	AA BERT MG/L N				
2	-	-	-	0.060	-	0.284	-	0.284	-				
3	-	-	-	0.060	-	0.29	-	0.29	-				
4	-	-	-	0.065	-	0.29	-	0.29	-				
5	-	-	-	0.2 R	0.24	0.275	-	0.296	-				
6	-	-	-	0.20 L	0.24	0.28	-	0.25	0.25				
7	-	-	-	0.25	0.25	0.29	-	0.25	0.25				
8	-	-	-	0.255	0.255	0.30	-	0.25	0.25				
9	-	-	-	0.255	0.255	0.29	-	0.25	0.25				
10	-	-	-	0.255	0.255	0.30	-	0.25	0.25				
11	-	-	-	0.255	0.255	0.30	-	0.25	0.25				
12	0.06	0.06	0.06	0.06	0.06	0.06	-	0.25	0.25				
MEAN	.0600	.0600	.0600	.0617	.2617	.2875	.2840	.2730	.2783				
STD.	-	-	-	.0029	.0027	.0088	-	.0325	.0195				
REL.	-	-	-	4.7	9.8	3.1	-	11.9	7.304				
DES.	-	-	-	.090	.090	.090	-	-	-				

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR146 PP 51 FP 11 DATE: 01/11/86
SAMPLE = 2 NATURAL SAMPLE.
DUE DATE: 31/12/86
MAJOR IONS AC

DUE DATE: 31/12/86 PAGE 6

DATE: 01/11/86

Notes

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 2 **STUDY NO.** IR146 **DATE:** 01/11/86
NATURAL SAMPLE.

DUE DATE: 31/12/86 PAGE 7

LAB	10116 ALKINITY CO ₂ MG/L	10190 ALKINITY COMBINED MG/L CAC	10301 PH UNITS	10390 PH UNITS	10602 HARDNESS CALC'D MG/L CAC	10603 HARDNESS TTR'N MG/L CAC	10606 HARDNESS CALC'D MG/L CAC	10690 HARDNESS COMBINED MG/L CAC	11005 TOTAL ICAP MG/L	11102 SODIUM AS F MG/L	11103 NA FL PH MG/L
1	-	-	-	-	-	-	-	-	-	-	-
2	40.9	43.9	7.5	7.5	47.1	43.1	-	43.8	-	43.1	1.5
3	-	40.9	7.7	7.7	-	-	-	-	-	-	1.2
4	-	40.6	7.83	7.83	-	-	-	-	-	-	-
5	-	40.6	7.02	7.02	-	-	45.4	-	-	-	-
6	-	40.6	7.2	7.2	-	-	40.4	-	-	-	-
7	-	40.7	7.9	7.9	-	-	46.2	-	-	-	-
8	-	42.0	7.75	7.75	-	-	-	-	-	-	-
9	-	41.0	7.63	7.63	-	-	-	-	-	-	-
10	-	40.0	7.80	7.80	-	-	-	-	-	-	-
11	-	40.3	7.7	7.7	-	-	-	-	-	-	-
12	-	40.3	7.7	7.7	-	-	-	-	-	-	-
MEAN	40.9000	41.1818	7.6275	7.6275	45.1714	43.8000	44.6909	44.3300	1.0500	1.3000	
STD.	-	1.8154	3.2652	3.2652	5.2633	43.8667	42.4068	42.54	0.707	1.4141	
REL. STD.	-	4.4	3.5	3.5	5.0	3.724	7.7	7.4	6.7	10.9	
DES.	-	41.159	-	-	7.682	-	-	44.832	-	-	

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR146 PP 51 FP 11
 SAMPLE = 2 NATURAL SAMPLE.
 DATE: 01/11/86 DUE DATE: 31/12/86
 MAJOR IONS 4C.

LAB	CL DISS K MG/L	CL DISS TIT COND MG/L	17210 CHLORIDE COMBINED MG/L CL	17990 K TOTAL ICAP MG/L	19005 K DISS AAS MG/L	19102 K DISS AAS MG/L	19103 K DISS FLM PHOT MG/L	19106 K DISS AAS LI MG/L	19107 K DIS FLM PHOT MG/L	K EXTR HNO3 AA MG/L	19990 POTASSIUM COMBINED MG/L K
1	1.5	1.5	1.5	1.5	1.5	1.5	0.5	0.51	0.51	0.51	0.54
2	-	-	1.3	1.3	-	0.4	0.4	-	-	0.4	0.51
3	-	-	1.2	1.2	-	0.6	-	-	-	0.4	0.4
4	-	-	1.9	1.9	0.5	-	-	-	-	0.6	0.6
5	-	-	2.0	2.0	0.49	-	-	-	-	0.50	0.50
6	-	-	2.1	2.1	-	-	-	-	-	0.49	0.49
7	-	-	2.0	2.0	-	-	-	-	-	0.86 R	0.86 R
8	-	-	2.1	2.1	-	-	-	-	-	0.4	0.4
9	-	-	2.0	2.0	-	-	-	-	-	0.50	0.50
10	-	-	2.1	2.1	-	-	-	-	-	0.4	0.4
11	-	-	2.0	2.0	-	-	-	-	-	0.50	0.50
12	-	-	2.1	2.1	-	-	-	-	-	0.49	0.49
MEAN	1.5000	1.6000	2.0000	1.4900	1.4950	1.4971	1.4950	1.4973	1.4973	.5100	.5000
STD.	DEV.	8.1414	8.8	22.3348	22.5	1.4	28.3	1.0.9	1.0.9	-.5100	-.5000
REL.	STD.	-	-	1.258	-	-	-	-	-	-.488	13.5.488
DES.	VAL.	-	-	-	-	-	-	-	-	-	-
LAB	20005 CA TOTAL MG/L	20100 CA DISS MG/L	20101 CA DISS EDTA MG/L	20103 CA DISS AAS MG/L	20108 CA DISS AAS MG/L	20110 CA DISS AAS AUTO MG/L	20111 CA DISS ICP MG/L	20311 CA EXTR HNO3 ICP MG/L CA	20990 CALCIUM COMBINED MG/L	20990 CALCIUM COMBINED MG/L	20990 CALCIUM COMBINED MG/L
1	-	-	-	-	-	13.1	12.8	13.8	13.8	13.8	13.8
2	-	-	14.0	-	-	13.1	-	13.1	13.1	13.1	13.1
3	-	-	9.6 R	13.0	-	13.2	-	13.0	13.0	13.0	13.0
4	-	-	-	-	-	14.0	-	13.2	13.2	13.2	13.2
5	-	-	-	-	-	-	-	13.0	13.0	13.0	13.0
6	-	-	-	-	-	-	-	13.0	13.0	13.0	13.0
7	-	-	-	-	-	-	-	13.0	13.0	13.0	13.0
8	-	-	-	-	-	-	-	13.0	13.0	13.0	13.0
9	-	-	-	-	-	-	-	13.0	13.0	13.0	13.0
10	-	-	-	-	-	-	-	13.0	13.0	13.0	13.0
11	-	-	-	-	-	-	-	13.0	13.0	13.0	13.0
12	-	-	-	-	-	-	-	12.6	12.6	12.6	12.6
MEAN	13.1500	14.0000	13.6000	13.1000	12.9000	12.1414	12.6000	13.0000	13.2000	13.4643	13.5591
STD.	DEV.	1.2121	4.2	4.5657	4.2	1.1	1.1	1.1	1.1	1.1	1.1
REL.	STD.	-	-	-	-	-	-	-	-	-	-
DES.	VAL.	-	-	-	-	-	-	-	-	-	-

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP. 52
SAMPLE = 3 SPIKED SAMPLE.

DATE: 01/12/86

DUE DATE: 31/12/86 PAGE 10
TRACE METALS S/E: (IN 0.2% HNO3)

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52 FP 12 DATE: 01/12/86 DUE DATE: 31/12/86 PAGE 11
 SAMPLE = 3 SPIKED SAMPLE TRACE METALS S/E. (IN 0.2% HNO₃)

LAB	26305 FE EXTRBL AAS SE MG/L	26311 FE EXTRBL ICAP DA MG/L	26999 IRON COMBINED MG/L FE	27003 CO TOTAL AAS MG/L	27009 CO TOTAL ICAP DA MG/L	27011 CO TOTAL UG/L CO	27107 CO DISS AAS MG/L	27111 CO EXTRBL ICAP DA MG/L	27999 CO TOTAL COMBINED MG/L CO	28009 NI TOTAL ICAP DA MG/L
1	-	0.007	-	0.008	-	-	-	-	0.008	0.011
2	0.007	-	0.007	-	-	-	-	-	0.005	-
3	0.007	0.008	0.007	-	0.006	-	-	0.005	0.005	-
6	-	0.02 L	0.024 R	-	0.006	-	0.007 L	-	0.005 L	-
8	-	-	0.01 L	0.005	-	-	-	-	0.007 L	-
9	-	-	0.01 L	0.006	-	-	-	-	0.005 L	-
10	-	0.005	-	0.005	-	-	-	-	0.005	-
11	-	-	0.007	0.005	-	-	-	-	0.005	-
12	-	-	0.007	0.005	-	-	-	-	0.005	-
MEAN	.0063	.0080	.0064	.0050	.0080	.0060	.0050	.0070	.0050	.0110
STD.	.0012	-	.0009	-	-	-	-	-	.0060	-
REL.	18.2	-	14.0	-	-	-	-	-	.0013	-
DES.	-	-	.006	-	-	-	-	-	.005	-

LAB	28011 NI TOTAL 5X ICAP UG/L NI	28101 NI DISS AAS DA MG/L	28107 NI DISS AAS G F MG/L	28302 NI EXTRBL AAS SE MG/L	28309 NI EXTRBL AAS G F MG/L	28311 NI EXTRBL ICAP DA MG/L	28999 NICKEL COMBINED MG/L NI	29009 CU TOTAL ICAP DA MG/L	29011 CU TOTAL 5X ICAP UG/L CU	29106 CUDISS AAS DA MG/L
1	-	0.009	-	-	0.007	-	0.007	0.009	0.010	-
3	-	-	-	-	0.006	-	0.006	0.009	0.010	-
6	-	-	-	-	0.006	-	0.006	0.009	0.010	-
9	-	-	-	-	0.006	-	0.006	0.009	0.010	-
10	-	0.005	-	0.007	-	-	-	-	-	-
11	-	-	0.005	0.007	-	-	-	-	-	-
12	-	-	0.005	0.0070	.0060	.0070	.0060	.0073	.0090	.0060
MEAN	.0090	.0050	.0070	-	-	-	-	.0021	-	-
STD.	-	-	-	-	-	-	-	.007	-	-
REL.	-	-	-	-	-	-	-	-	-	-
DES.	-	-	-	-	-	-	-	-	-	-

LAB	29107 CU DISS AAS G F MG/L	29111 CU DISS ICAP DA MG/L	29305 CU EXTRBL AAS SE MG/L	29311 CU EXTRBL ICAP DA MG/L	29999 COPPER COMBINED MG/L	30009 ZINC TOTAL ICAP DA MG/L	30011 ZINC TOTAL 5X ICAP UG/L ZN	30104 ZNDISS AAS DA MG/L	30107 ZNDISS AAS G F MG/L	30304 ZNEXTBL AAS DA MG/L
1	-	-	-	-	0.007	-	0.009	0.009	-	-
2	-	0.006	-	0.006	0.004	-	0.007	0.009	-	-
3	-	-	-	-	0.01 L	-	0.01 L	-	-	-
6	-	-	-	-	-	-	0.007	-	-	-
8	-	0.01 L	-	-	-	-	0.008	-	-	-
9	-	0.01 L	-	-	-	-	0.006	-	-	-
10	-	-	-	-	-	-	0.006	-	-	-
11	0.006	-	0.008	-	0.01 L	-	0.008	0.016	0.016	0.01 L
12	0.006	-	0.007	-	-	-	0.006	0.016	0.016	0.01 L
MEAN	.0060	.0080	.0065	.0040	.0074	.0080	.0090	.0160	.0160	.0160
STD.	-	-	10.9	.007	21.8	-	.007	-	-	-
REL.	-	-	-	-	-	-	-	.006	.006	.006
DES.	-	-	-	-	-	-	-	.007	.007	.007

DATA SUMMARY

PRINTER'S MARK

SAMPLE = 3 STUDY NO. IR147 DATE: 01/12/86
SPiked SAMPLE

DUE DATE: 31/12/86 **PAGE** 12
TRACE METALS S/E. (IN 0.2% HNO₃)

LAB	30305 ZN EXTRBL AAS SE MG/L	30311 ZN EXTRBL ICAP DA MG/L	30999 ZINC COMBINED MG/L ZN	38011 SR TOTAL ICAP DA MG/L	38111 SR DISS ICAP DA MG/L	38311 SR EXTRBL ICAP DA MG/L	38999 STRNTIUM COMBINED MG/L SR	42009 MO TOTAL ICAP MG/L	42011 MO TOTAL ICAP UG/L MO	42102 MO DISS AAS SE MG/L	42111 MO DIS ICAP D MG/L
1	-	-	-	-	-	-	-	-	-	-	-
2	0.007	0.007	0.008	0.008	0.007	0.007	0.007	0.171	0.171	0.008	-
3	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-
8	-	0.01	L	0.009	0.009	0.009	0.009	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-
10	-	0.007	-	0.009	0.009	0.009	0.009	0.18	0.18	0.006	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	0.007	-	0.006	0.006	0.006	0.006	0.15	0.15	0.006	-
MEAN	0.0070	0.0070	0.0070	0.0077	0.0077	0.0077	0.0077	0.1710	0.1710	.0080	.0060
STD.	0.0000	0.0000	0.0000	0.0012	0.0012	0.0012	0.0012	0.0212	0.0212	-	-
REL.	-1.00	-1.00	-1.00	15.80	15.80	15.80	15.80	12.9	12.9	.9.2176	.0.0080
DES.	-	-	-	0.007	-	-	-	-	-	-	-

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52
SAMPLE = 3 SPIKED SAMPLE.

DATE: 01/12/86

DUE DATE: 31/12/86 PAGE 13
PAGE METALS 55

LAB	82311	82999	LEAD	
	PB EXPTBL	ICAP DA	COMINED	HDL
	MG/L		HG/L	PB
1	-	0.005	0.009	0.006
2	-	-	0.006	0.006
3	-	-	0.006	0.006
6	-	-	0.005	0.005
8	-	-	0.005	0.005
9	-	-	0.005	0.005
10	-	-	0.005	0.005
11	-	-	0.005	0.006
12	-	-	0.005	0.006
			MEAN	STD.
			DEV.	STD.
			REL.	DES.
				VAL.

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IRI47 PP 52 FP 12
SAMPLE = 4 NATURAL SAMPLE.

DATE: 01/12/86 DUE DATE: 31/12/86
MAJOR IONS 4C.

LAB	STUDY NO.	DOC UV	DOC C	DOC CO ₂ NAOH	DOC MG/L C	06150 COMBINED	06151 IR COMBUST	06152 AA CO ₂ EV	06154 AA CO ₂ PHEN	06159 DIC NAOH MG/L C	06490 DIC COMBINED MG/L C	07010 TKN AUTAN MG/L N	07013 TKN ION EL MG/L N	07015 TKN BERTHELT MG/L N	07016 TKN AMM-SALI MG/L N
1	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	.7000	1.6571	21.0000	16.4142	16.8385	18.5000	17.4000	18.3000	18.5000	17.4000	18.2857	.1080	-	-	-
STD.	.0000	.6754	6.7	6.7	11.3	-	-	-	-	-	12.2154	-	-	-	-
REL.	.0000	.6754	6.7	6.7	11.3	-	-	-	-	-	16.600	-	-	-	-
DES.	.0000	.6754	6.7	6.7	11.3	-	-	-	-	-	-	-	-	-	-
MEAN	.1100	.1200	0.120	0.120	0.108	-	-	-	-	-	-	-	-	-	-
STD.	.0000	.0064	0.064	0.064	0.054	-	-	-	-	-	-	-	-	-	-
REL.	.0000	.0064	0.064	0.064	0.054	-	-	-	-	-	-	-	-	-	-
DES.	.0000	.0064	0.064	0.064	0.054	-	-	-	-	-	-	-	-	-	-

PAGE 15

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52 FP 12
 SAMPLE = 4 NATURAL SAMPLE.

DATE: 01/12/86 DUE DATE: 31/12/86
 MAJOR IONS 4C.

LAB	NH ₃ DISS AA MG/L N	07562 NH ₃ DISS AA EDTA MG/L N	07590 AMMONIA COMBINED MG/L N	07601 TOTAL N AA UV MG/L N	07602 TOTAL N CALC-D MG/L N	07605 NITROGEN UV-AA HY MG/L N	07651 TOT N UV MG/L N	07655 TOT N F UV MG/L N	07690 TOTAL N COMBINED MG/L N	07790 TOT N DISS COMBINED MG/L N	09103 FLUORIDE DIS COLR MG/L
1	-	0.006	0.006	0.39	-	-	-	-	-	0.39	-
2	-	-	0.001L	-	-	-	0.44	0.431	-	0.44	-
3	-	-	0.05L	4PL	-	-	-	-	-	0.431	-
4	0.002	-	0.002	-	-	-	-	-	-	0.431	-
5	0.01L	-	0.01L	-	-	-	-	-	-	0.431	0.6
6	-	-	0.003L	-	-	-	-	-	-	-	-
8	-	-	0.015L	HDL	0.57 L	0.45	-	-	0.57 L	0.45	-
10	-	-	0.005L	-	0.47	-	-	-	0.47	-	-
12	-	-	-	-	-	-	-	-	-	-	-
MEAN	.0020	.0060	.0037	.3900	.4700	.4500	.4400	.4310	.4700	.4278	.6000
STD.	-	-	.0021	-	-	-	-	-	-	6.2	-
REL.	-	-	.568	-	-	-	-	-	-	6.424	-
DES.	-	-	.020	-	-	-	-	-	-	-	-

LAB	F DIS UF SPEC EL MG/L	09107 FLUOR F AUTOT AG/L	09108 F DISS SPEC EL MG/L	09110 F DISS PHOTON MG/L	09115 F DISS AA ALIZA MG/L	09190 FLOURIDE COMBINED MG/L F	10101 ALKALINITY TITR'N MG/L CAC	10108 ALKALINITY POT TITR MG/L CAC	10109 ALKALINITY POG TITR MG/L CAC	10111 ALKALINITY TITR'N MG/L CAC	10112 ALKALINITY TITR'N MG/L CAC
1	0.54	-	0.59	-	-	0.59	71.2	-	-	-	-
2	-	-	-	-	-	0.59	75.2	-	-	-	-
3	-	-	-	-	-	0.562	76.2	-	-	-	-
4	-	-	-	-	-	0.6	74.3	-	-	-	-
5	0.562	-	-	-	-	0.59	74.3	-	-	-	-
6	-	-	-	-	-	0.59	76.0	-	-	-	-
7	-	-	-	-	-	0.59	76.0	-	-	-	-
8	0.49	-	-	-	-	0.59	76.0	-	-	-	-
9	-	-	-	-	-	0.59	76.0	-	-	-	-
10	-	-	-	-	-	0.59	76.0	-	-	-	-
11	0.55	-	-	-	-	0.59	76.0	-	-	-	-
12	0.58	-	-	-	-	0.59	76.0	-	-	-	-
MEAN	.5444	.5900	.6000	.5900	.5692	.5714	.5692	.5692	.5692	.5692	.5692
STD.	.0339	-	-	-	.0347	.8679	.0347	.0347	.0347	.0347	.0347
REL.	6.2	-	-	-	6.1	2.5	6.1	6.1	6.1	6.1	6.1
DES.	-	-	-	-	-	.569	-	-	-	-	-

DATA SUMMARY

PRALINE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52 F
SAMPLE = 4 NATURAL SAMPLE.

DATE: 01/12/86

DUE DATE: 31/12/86 PAGE 17
MAJOR LONG 42

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52 FP 12
SAMPLE = 4 NATURAL SAMPLE.

DATE: 01/12/86 DUE DATE: 31/12/86 PAGE 18
MAJOR IONS 4.C.

LAB	12303 MG UF AAS AUTO MG/L	12311 MG EXTBL HNO3 ICP MG/L	12990 MGNESIUM COMBINED MG/L	14102 SILICA R ANSA AA MG/L	14105 SILICA R MOLY AA MG/L	14106 SILICA R MOLY UF MG/L	14190 SILICA COMBINED MG/L	15101 UV MG/L P	15406 UF MG/L P	15409 UF AA ASC MG/L P	15413 TOTAL P AA SNCL2 MG/L P
6.	-	-	6.4	2.14	-	-	2.18	2.14	-	-	-
1	-	-	6.3	-	-	2.2	-	2.2	-	-	0.010
2	-	-	6.09	-	-	-	-	-	0.009	-	-
3	-	-	6.8	-	-	-	-	-	-	-	-
4	-	-	6.55	-	-	2.0	-	2.0	-	-	-
5	-	-	6.99	-	-	2.1	-	2.1	0.010L	-	-
6	-	-	6.8	-	-	2.2	-	2.2	-	0.007	-
7	-	-	6.73	-	-	-	-	-	-	-	-
8	-	-	6.9	-	-	-	-	-	-	-	-
9	-	-	6.73	-	-	-	-	-	-	-	-
10	-	-	6.8	-	-	-	-	-	-	-	-
11	-	-	6.9	-	-	-	-	-	-	-	-
12	-	-	6.2	-	-	-	-	-	-	-	-
MEAN	6.0000	6.9900	6.5191	2.1700	2.1250	2.1800	2.1457	-	-	-	-
STD.	-	-	5.3445	2.0424	2.0957	-	2.0746	-	0.0080	-	.0085
REL.	-	-	5.3	2.0	4.5	-	3.5	-	17.7	-	.0021
DES.	-	-	6.612	-	-	-	2.110	-	-	-	25.0

LAB	15421 TP BLK DIG ASG MG/L P	15490 TOTAL P COMBINED MG/L P	16304 DISS AUTO MG/L	16307 DISS AA MBUF MG/L	16309 DISS AA CALM MG/L	16310 DISS AA CALM MG/L	16990 SUBSTATE COMBINED MG/L S04	17203 CL DISS AA PE MG/L	17204 CL DISS AA TITN MG/L	17206 CL DISS AA AG MG/L
1	-	-	0.006L	0.006L	30.-	-	-	30.-	24.-	-
2	-	-	0.010	28.8	-	28.3	-	28.3	-	-
3	-	-	0.009	-	-	-	-	-	-	-
4	-	-	0.02 R	28.	30.1	-	-	-	-	-
5	-	-	0.007	28.	29.8	-	-	-	-	-
6	-	-	0.007	29.5	-	-	-	-	-	-
7	-	-	0.010L	-	-	30.8	-	30.8	26.-	24.0
8	-	-	0.007	-	29.	-	-	29.0	-	-
9	-	-	0.007	-	30.1	-	-	30.1	-	-
10	-	-	0.010L	-	-	-	-	-	-	23.-
11	-	-	0.007	-	-	-	-	-	-	-
12	-	-	0.008	-	-	-	-	-	-	25.0
MEAN	-	28.4000	29.7500	28.3000	30.8000	29.0000	29.4000	23.7000	26.0000	23.7500
STD.	-	2.5657	1.5	-	-	-	2.8556	1.4243	-	.9574
REL.	-	2.0	-	-	-	-	2.9	1.8	-	4.0
DES.	-	-	1.5	-	-	-	29.874	-	-	-

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52 FP 12 DATE: 01/12/86
SAMPLE = 4 NATURAL SAMPLE.

DUE DATE: 31/12/86 PAGE 19

MAJOR IONS 4C.

17208 CL DISSS - 17209 CL DISSS 17210 CL DISSS 177990 CHLORINE 19005 X TOTAL 19102 X TOTAL 19103 X TOTAL 19106 X TOTAL 19107 X TOTAL 19301 -

LAB	MG/L	-	-	-	-	-	-
	MG/L						
COMBINED							

3.16
3.15
3.14
3.13
3.12
3.11
3.10
3.09
3.08
3.07
3.06
3.05
3.04
3.03
3.02
3.01
3.00

卷之三

3.3
3.25
3.2

MEAN	24.1000	STD.	25.5500	DEV.	23.0000

DES. VAL. 8
S. S. 24.085 .4 16.8 6.2

20005 20100 20101 20102 20103 20104

122

	VAL.	STD.	STD.	VAL.
1.9	-1.9799	-	-	-
6.5	-	-2.1213	-	-
3.0	-	-	-3.0000	-
1.5	-	-	-	-31.0000
3.0	-	-	-	-34.6949
1.5	-	-	-	-34.6949

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52 FP 12
 SAMPLE = 5 SPIKED SAMPLE.

DATE: 01/12/86 DUE DATE: 31/12/86 PAGE 20
 MAJOR IONS 4C.

LAB	STUDY NO. IONIC BALANC %	SAMPLE NO.	PP 52	FP 12	DATE: 01/12/86	DUE DATE: 31/12/86	PAGE 20	MAJOR IONS 4C.	
								00110 SUM OF CATIONS MEQ/L	00120 SUM OF ANIONS MEQ/L
1	0.90 -1.67 -1.79	1.68 1.491 1.518	1.65 1.542 1.574	5. L 5. L 5. L	- - -	- - -	5. L 5. L 5. L	175. 173. 176.9	0.2. 0.04. -
2	0.89 -3.2 -1.5	1.55 1.5 1.51	1.52 1.5 1.57	5. L 5. L 10.	- - -	- - 1.	5. L 5. L 1. L	174. 169. 159. 180. 173. 168.	0.06. 0.10. 0.20.
3	-1.97 -1.92 -1.95	1.51 1.54 1.50	1.57 1.61 1.500	- - -	- - -	- - 5. L	10. 1. L 5. L	169. 172. 170. 172.	0.04. 0.20. 0.2.
4	-0.07 -0.07	1.527 1.527	1.529 1.529	- -	- -	- 5.	1. L 5. L	172. 170.	-
5	MEAN STD. DEV. REL. DES.	1.5529 1.0653 4.2	1.5661 1.0483 3.1	5.0000 5.0000 100.0	- - -	- - 100.0	5.0000 5.0000 3.0	171.8250 175.2279 175.2279	0.0880 .0672 .0600
6	1.7529 -1.0	4.2	3.1	-	-	-	-	171.8250 175.2279 175.2279	.0000 .0000 .0
7	02077 TURBIDITY HACH FZN FZN UNIT	02090 TURBIDITY COMBINED JTU/NTU	05105 BORON AA CARM	05106 BORON AZOMETHI	05111 BORON F ICAP DA UG/L	05190 BORON COMBINED MG/L B	06009 TOC CO2 IR MG/L	06051 DOC CO2 IR MG/L	06104 DOC UV CO2 EV MG/L C
8	-	-	0.2	-	-	-	-	-	-
9	-	0.04	-	-	-	-	-	-	-
10	-	0.06	0.02 L	-	-	0.02 L	-	-	-
11	-	0.10	-	-	-	-	-	-	-
12	-	0.04	-	-	-	-	-	-	-
13	-	0.20	-	-	-	-	-	-	-
14	-	0.04	-	-	-	-	-	-	-
15	-	0.20	-	-	-	-	-	-	-
16	-	0.04	-	-	-	-	-	-	-
17	-	0.20	-	-	-	-	-	-	-
18	-	0.04	-	-	-	-	-	-	-
19	-	0.09	0.09	-	-	0.05 L	1.0 L	6.0	-
20	-	0.09	-	-	-	-	-	-	-
21	-	0.09	-	-	-	-	-	-	-
22	-	0.09	-	-	-	-	-	-	-
MEAN	0.0900	1.256	-	-	-	-	6.0000	-	.9500
STD.	DEV.	1.733	-	-	-	-	-	-	.4950
REL.	VAL.	58.4	-	-	-	-	-	-	52.1

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52 FP 12
SAMPLE = 5 SPIKED SAMPLE.

DATE: 01/12/86 DUE DATE: 31/12/86
PAGE 21 PAGE 21

LAB	DOC UV CO ₂ NAOH MG/L C	06109 DOC C COMBINED MG/L C	06151 DOC IR COMBUST MG/L C	06152 DOC IR UV CO ₂ EV MG/L C	06154 DOC AA CO ₂ PHEN MG/L C	06159 DOC CO ₂ NAOH MG/L C	06490 D _{IC} COMBINED MG/L C	07010 TKN AUTAN MG/L N	07013 TKN ION EL MG/L N	07016 TKN DIG BLK AMM SAL MG/L N
1	-	-	0.4 L	-	4.6	-	4.6	-	-	-
2	-	0.5 R	-	7.9	-	7.9	0.076	-	-	-
3	-	0.6 L	-	4.8	-	4.8	-	-	-	-
4	-	0.52 L	6.9	-	-	-	6.9	-	-	-
5	-	1.3 L	-	-	-	-	6.0	-	-	-
6	-	1.0 L	-	-	-	-	5.4	5.4	-	-
7	0.2 L	0.2 L	-	-	-	-	6.	0.10	-	-
8	-	1. L	6.	-	-	-	-	-	-	-
9	-	1. L	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-
MEAN	9500	6.4500	6.3500	4.6000	5.4000	5.9429	.0760	.1000	-	-
STD.	4950	9.9	2.1920	34.5	-	19.6	-	-	-	-
REL. DEV.	-	-	-	-	-	-	-	-	-	-
DES. VAL.	-	52.1	-	-	-	-	-	-	-	-

LAB	TKN BLK INDOPHEN MG/L N	07021 TKN COMBINED MG/L N	07109 NO ₃ +NO ₂ F AA HWD MG/L N	07110 NO ₃ +NO ₂ AA CD MG/L N	07111 NO ₃ +NO ₂ DIS SPEC MG/L N	07390 NITRATE COMBINED MG/L N	07505 NH ₃ TOT AA BERT MG/L N	07506 NH ₃ DISS AA PHEN MG/L N
1	0.050L	0.050L HDL	-	0.04	0.044	-	0.044	-
2	-	0.076	-	0.04	-	0.041	0.041	-
3	-	0.3 R	0.09 R	0.042	-	0.041	0.041	-
4	-	0.020L HDL?	-	0.05	-	0.04	0.042	-
5	-	-	0.040	-	-	0.04	0.043	-
6	-	0.10	-	0.05	-	0.05	0.05	-
7	0.07	0.07	-	0.05	-	-	0.05	-
8	-	-	-	-	-	-	0.05	-
9	-	-	-	-	-	-	0.05	-
10	-	-	-	-	-	-	0.05	-
11	-	-	-	-	-	-	0.05	-
12	0.07	-	-	-	-	-	0.05	-
MEAN	0.0700	0.0820	0.0350	0.0440	0.0405	1.7	1.37	0.057
STD.	-	0.0159	0.071	0.052	0.0007	-	-	-
REL. DEV.	-	19.4	20.2	11.7	-	-	-	-
DES. VAL.	-	-	-	-	-	-	-	-

KCU

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52
 SAMPLE = 5 SPIKED SAMPLE.

DATE: 01/12/86

DUE DATE: 31/12/86 PAGE 22
MAJOR LIONS AC

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52
SAMPLE = 5 SPIKED SAMPLE.

DATE: 01/12/86

DATE DATED: 31/12/86 PAGE 22

DATA SUMMARY

PRALINE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR147 PP 52
SAMPLE = 5 SPIKED SAMPLE.

DATE: 01/12/86

DATE DATE: 31/12/86 PAGE 24

DATA SUMMARY

THE PRAIRIE PROVINCES: INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 5 STUDY NO. IR147 PP 52 FP 12 DATE: 01/12/86 SPIKED SAMPLE:

DUE DATE: 31/12/86 PAGE 25

THE JOURNAL

LAB	20005	20100	20101	20103	20108	20110	20111	20311	20990
	CATOTAL CATB MG/L	CADISS CADISS MG/L	CATDISS CATEDISS MG/L	CASDISS CASOF MG/L	CASDISS CASOF MG/L	CASDISS CASOF MG/L	CADISS CASAUTO MG/L	CANO3TCP HG/L	CALCUM COMBINED HG/L CA

DATES RECEIVED 1 86/12/02 2 87/01/07 3 86/11/21
5 86/12/05 6 86/12/08 7 87/01/29
10 86/12/30 11 87/01/23 12 87/01/15

DISTRIBUTION - IRQC

Mr. H. Agemian
Head, Scientific Services Section
National Water Quality Laboratory

Mr. G. Brun
Head, Analytical Services Section
Atlantic Region Water Quality Branch

Mr. W. Coedy
CIC, Water Laboratory
DIANA, NAP
Yellowknife, NWT

Ms. D. Duval
Head, Analytical Services Section
Quebec Region Water Quality Laboratory

Mr. M. Forbes
Head, Analytical Services Section
National Water Quality Laboratory

Mr. F. Mah
Head, Analytical Services Section
Pacific Region Water Quality Branch

Mr. J-G. Zakrevsky
Head, Analytical Services Section
Western Region Water Quality Branch

cc:

Dr. B.K. Afghan
Chief, NWQL, CCIW
Burlington, Ontario

Mr. D.H. Cullen
Chief, Water Quality Branch
Atlantic Region
Moncton, New Brunswick

Dr. W.E. Erlebach
Chief, Water Quality Branch
Pacific Region
Vancouver, B. C.

Mr. W.D. Gummer
Chief, Water Quality Branch
Western Region
Regina, Saskatchewan

Mr. L. Martel
Chief, Water Quality Branch
Quebec Region, Longueuil, P. Q.

Dr. J. Lawrence
Director
Research and Applications Br
NWRI, CCIW

Mr. A. S. Y. Chau
Project Chief
Quality Assurance Project
NWRI



Government
of Canada Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

Distribution

FROM DE
H. Alkema
Quality Assurance Section
National Water Research Institute
Burlington, Ontario.

SUBJECT OBJET
Inter-regional Quality Control (IRQC) Program

H. Alkema/IWD-NWRI/336-4929/ha

SECURITY - CLASSIFICATION - DE SECURITE

OUR FILE/NOTRE RÉFÉRENCE

YOUR FILE/VOTRE RÉFÉRENCE

DATE

May 8, 1987.

I have enclosed the final report for IR 148-149.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A.

H. Alkema

SUMMARY REPORT

INTER-REGIONAL QUALITY ASSURANCE PROGRAM

STUDIES 148 AND 149

for January and February, 1987

**TRACE METALS, MAJOR IONS, NUTRIENTS
AND PHYSICAL PARAMETERS IN SURFACE WATERS**

by

H. Alkema

**Quality Assurance and Methods Section
National Water Research Institute
Burlington, Ontario**

May 1987

Introduction

As part of an on-going study, the Quality Assurance and Methods Section, N.W.R.I. in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the IRQC program. This report summarizes the most recent IRQC inter-laboratory quality control studies: IR 148 and 149, for the months January and February, 1987. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The levels were medium levels.

Study Design

Five water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining three were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the five samples:

IR 148 - Sample 1 - 125 ml, D/A * for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

IR 149 - Sample 3 - 1L, S/E * for trace metals (0.2% HNO₃)
Sample 4 - up to 1L, major ions, etc., stored at 4°C
Sample 5 - up to 1L, major ions, etc., stored at 4°C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were recorded on report sheets provided with the IR samples. Upon receipt of the Reporting Sheets, the results were tabulated for each parameter, first for each method reported, and then for all methods combined. These data, and the resulting statistics are presented in the Data Summary. (attached)

Preliminary data summaries, including problematic results, were sent February 27, and April 2, 1987. Each laboratory was given three weeks to notify us of any errors in data transcription or compilation.

Performance Indicators

In previous reports the mean has always been used as comparator for accuracy assessment. We now have "design values" for several reference waters (RMs) and certified reference waters (CRMs). These design values are used to test each reported result (whether few or many) for accuracy. Consequently, for stable parameters, the design values will be used as comparator for the ten percent warning circles, and the mean will be used for unstable parameters (perhaps due to biological activity).

Percentage deviations from the comparator are used as an indicator for the laboratory head to determine the extent of the discrepancies between the laboratory result and comparator as it applies to his procedures. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than 10% from the comparator is circled in the data tables and its value noted in the comments which follow. Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned 'HDL' and is labelled in the Data Summary.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

General Comments: A high coefficient of variation (incomparability) was observed for DOC in sample two, and for Fluoride in sample five.

Individual laboratory deviations are listed below:

Lab 2 - a high result by DA for Mn: +11%; Cd: +12%
- a high result for Boron; K: +11%; and pH: +12%

Lab 3 - a low result for pH: -16%

Lab 4 - a high result for B: +40%
- an HDL for Ammonia

Lab 5 - a high result for DIC: +17%; and for Alk: +41% (R)*

Lab 7 - a high result for $\text{NO}_3 + \text{NO}_2$: +14%
- a rejectable result for Turbidity

Lab 11 - a high result by DA for Ni: +12%; Zn: +21% (R);
Cd: +22%; and Cu: +84% (R)
- rejectable results for DOC: (3R)
- high results for Cl: +18% (R), & 23% (R); Ca: 13%, & 13%
K: +36%; $\text{NO}_3 + \text{NO}_2$: (R), & (R); Ammonia: (R)
- low results by SE for Cr: -19%; and Fe: -23%
- an HDL for Ammonia and T.P.

WQB laboratories average number of deviations per sample was 0.6

* (R) = rejectable by Grubb's procedure for statistical calculation.

Appendix I

Definitions of Types of Metals Analysis

1. D/A - Direct Aspiration

Without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS) or Inductively Coupled (Argon) Plasma (ICAP or ICP). Standards should contain the acid equivalent of the sample.

2. S/E - Code for low level analysis.

Analysis is presently carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP.
3. Digestion of aqueous phase followed by ICAP.
4. Graphite tube (flameless) AAS.

Appendix II

Performance Indicators

1. Circled Results

Results are circled when a minor deviation from the comparator has occurred. (The comparator is the design value of the reference sample, or the mean in the case of a biologically active parameter). Circled results are in general greater than or less than 10% from the comparator. At very low levels of analytes or with parameters that are difficult to analyse, a greater deviation than 10% is allowed. Under these conditions, a result is circled when it is outside one standard deviation of the comparator. These circled results, though acceptable values, are a warning to laboratory managers that the parameter analysis should be investigated.

2. Rejectable Results

Each parameter is tested for the various laboratory results that are statistical outliers, results that were affected by non random causes (eg. a transcription error). These outlying results, calculated by the Grubb's procedure,* and indicated in the data tables with an 'R', are noncomparable with the data set for the parameter.

3. A High Co-efficient of Variation (HCV)

Occasionally there is a parameter with a very high relative standard deviation (RSD). When this HCV is not due to one or two outlying values, it indicates a high variability within the data set. The data in this data set is non-comparable. In such a case, the RSD for the parameter is circled in the data tables and the parameter's non-comparability is noted in the comments.

4. High Detection Limits (HDL)

Each laboratory determines its own detection limits according to its own requirements. When major differences of detection limits occur, the high detection limit is circled. An HDL indicates that low level analysis with an HDL may not be comparable with the analyses of the other laboratories.

* reference: Frank E. Grubbs, Technometrics, 1969, p 1.

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR148	PP 53	FP 13	DATE:	01/01/87	DUE DATE:	PAGE 1	
							TRACE METALS (IN 3% HNO3)	
SAMPLE = 1 SPIKED SAMPLE.								
13009 AL TOTAL	13111 AL DISS ICAP DA MG/L	13302 AL EXTRL AAS G F MG/L	13304 AL EXTRL AAS G F MG/L	13311 AL EXTRL AAS G F MG/L	13999 ALUMINUM COMBINED MG/L AL	23009 V TOTAL ICAP DA MG/L	23111 V DISS ICAP DA MG/L	23301 V EXTRL AAS DA MG/L
12 0.992	-	-	1.1	-	0.992	0.949	-	-
3 1.06	-	1.05	-	1.05	1.105	-	-	-
6 0.98	-	1.1	-	-	1.106	-	-	0.938
9 1.05	-	-	-	-	1.105	-	-	-
10 0.94	-	-	-	-	0.96	-	-	-
14 -	-	0.397R	-	-	0.94	-	-	-
MEAN STD. DEV.	1.0260	0.0481	0.9833	1.0750	1.1000	1.0500	1.0315	0.753R
REL. STD. DES. VAL.	4.7	6.0	6.0	3.3	-	-	5.9	-
					-	-	1.018	-
13999 VANADIUM COMBINED MG/L VN	24004 CR TOTAL AAS G F MG/L	24009 CR TOTAL ICAP DA MG/L CR	24011 CR TOTAL ICAP DA MG/L	24111 CR DISS ICAP DA MG/L	24302 CR EXTRL AAS DA MG/L	24311 CR EXTRL ICAP DA MG/L	24999 CHROMIUM COMBINED MG/L CR	25003 MN TOTAL ICAP DA MG/L
13 0.949	-	0.104	-	-	-	0.102	0.104	25011 MN DISS ICAP DA MG/L
6 0.938	-	-	0.098	-	-	-	0.102	-
8 0.98	-	0.131R	-	0.097	-	-	0.102	-
9 0.95	-	-	-	0.095	0.100	-	0.102	-
10 0.90	-	-	-	-	-	-	0.102	-
11 -	-	-	-	-	-	-	0.102	-
12 0.92	-	-	-	0.095	0.11	-	0.105	-
14 -	-	0.753R	-	-	-	-	0.11	-
MEAN STD. DEV.	0.9395	-	0.0275	0.0980	0.057	0.071	0.1020	0.980
REL. STD. DES. VAL.	2.9	-	2.949	-	1.2	6.7	-	1.001
				-	-	-	5.198	-
				-	-	-	-	4.8

DATA SUMMARY

FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

DUE DATE: 27/02/87
 TRACE METALS D/A.
 (IN 3% HNO₃)
 PAGE 2

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR148	PP 53	FP 13	DATE:	01/01/87	DUE DATE:	27/02/87	PAGE	3
SAMPLE =	1	SPIKED SAMPLE.						(IN	3% HNO3)
29011 CU TOTAL 5X ICAP UG/L CU	29111 CU DISS ICAP DA MG/L	29306 CU EXTRBL AAS DA MG/L	29311 CU EXTRBL ICAP DA MG/L	29999 COPPER COMBINED MG/L CU	30009 ZN TOTAL ICAP MG/L	30011 ZN TOTAL 5X ICAP UG/L ZN	30304 ZN DISS ICAP DA MG/L	30311 ZN EXTRBL ICAP DA MG/L	30999 ZINC COMBINED MG/L ZN
12 0.10 68 0.104 0.096 0.095 10 11 12 14	- - - - - - - - -	- 0.10 0.105 0.101 - 0.190R 0.085R - - -	- 0.10 0.105 0.101 - 0.104 0.096 0.095 - 0.085R	- 0.107 0.105 0.101 - 0.104 0.190R 0.085R - 0.085R	0.108 - - - - - - - -	- - - - - - - - -	- 0.11 - - - 0.105 0.10 0.105 - 0.102	- 0.106 - - - 0.130R 0.102 - - -	0.108 0.11 - - - 0.098 - - -
MEAN STD. REL. DES. DEV. STD. REL. DES. VAL.	.1000 -.0049 5.0	.0983 -.0049 - - - - - -	.1000 -.0042 2.7 - - - - -	.1010 -.0042 4.2 .103 - - - -	.1080 -.0042 4.2 .103 - - - -	.1000 -.0029 2.8 - - - - -	.1033 -.0046 4.3 - - - - -	.1073 -.0046 4.3 - - - - -	.1029 -.0057 5.5 - - - - -
38011 SR TOTAL 5X ICAP DA MG/L	38111 SR DISS ICAP DA MG/L	38301 SR EXTRBL AAS DA MG/L	38311 SR EXTRBL ICAP DA MG/L	38999 STRONTIUM COMBINED MG/L SR	42009 MO TOTAL 5X ICAP MG/L	42011 MO TOTAL 5X ICAP UG/L MO	42111 MO DISS ICAP DA MG/L	42301 MO EXTRBL ICAP DA MG/L	42999 MOLYBNUM COMBINED MG/L MO
13 69 10 12 14 MEAN STD. REL. DES. DEV. STD. REL. DES. VAL.	- 0.34 0.38 - - - - - - - - - - - - -	- - 0.36 - - - - - - - - - - - - -	- 0.361 0.36 - - - - - - - - - - - - -	- 0.361 0.36 - - - - - - - - - - - - -	0.944 - 0.90 - - - - - - - - - - - - -	- 0.90 - - - - - - - - - - - - - -	- 0.96 0.91 0.94 - - - - - - - - - - - -	- 0.94 - - - - - - - - - - - - - -	0.944 0.941 0.90 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91 0.91
48009 CD TOTAL 5X ICAP DA MG/L	48011 CD TOTAL 5X ICAP UG/L CD	48111 CD DISS ICAP DA MG/L	48301 CD EXTRBL AAS DA MG/L	48999 CADMIUM COMBINED MG/L CD	56009 BA TOTAL 5X ICAP MG/L	56011 BA DISS ICAP DA MG/L	56111 BA EXTRBL ICAP DA MG/L	56301 BA EXTRBL ICAP DA MG/L	56311 BA EXTRBL ICAP DA MG/L
12 689 10 12 14 MEAN STD. REL. DES. DEV. STD. REL. DES. VAL.	0.096 - - - - - - - - - - - - - - -	- 0.095 - - - - - - - - - - - - - -	- 0.095 - - - - - - - - - - - - - -	- 0.096 - - - - - - - - - - - - - -	0.974 - 0.96 - - - - - - - - - - - - -	- 0.98 - - - - - - - - - - - - - -	- 1.00 - - - - - - - - - - - - - -	- 1.00 - - - - - - - - - - - - - -	- 0.968 - - - - - - - - - - - - - -
MEAN STD. REL. DES. DEV. STD. REL. DES. VAL.	.0960 -.0055 5.8	.0943 -.0055 17.8	.1005 -.0179 - - - - - -	.0960 -.0111 11.4 -.098	.9740 -.0057 - - - - - -	.9800 -.0231 2.4 - - - - -	.9733 -.0231 - - - - - -	1.0000 -.0000 - - - - - -	.9680 -.0000 - - - - - -

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR148	PP 53	FP 13	DATE:	01/01/87	DUE DATE:	27/02/87	PAGE	4
SAMPLE =	1	SPIKED SAMPLE.		TRACE METALS	D/A.	(IN 3% HNO3)			
				82009 PB TOTAL ICAP DA MG/L RA	82011 PB TOTAL ICAP DA MG/L PB	82111 PB DISS ICAP DA MG/L	82301 PB EXTRBL ICAP DA MG/L	82999 LEAD COMBINED MG/L PB	
1	0.974	0.467	-	-	-	0.51	-	0.467	
2	1.00	-	-	0.49	-	-	0.480	0.51	
6	0.98	-	-	-	0.48	-	0.458	0.480	
8	1.00	-	-	-	0.436	-	-	0.49	
9	0.96	-	-	-	0.49	0.520	-	0.458	
10	0.96	-	-	-	-	-	0.458	0.48	
11	0.96	-	-	-	-	-	-	0.436	
12	0.96	-	-	-	-	-	-	0.520	
14	-	-	-	-	-	0.005R	-	0.49	
MEAN	0.9790	0.4670	.4900	.4687	.5150	.4690	.4812		
STD.	0.0181	-	-	0.0287	0.0071	0.0156	0.0257		
REL. STD.	1.8	-	-	6.1	1.4	3.3	5.3		
DES. VAL.	0.995	-	-	-	-	-	.484		

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR148 PP 53 FP 13 DATE: 01/01/87
 SAMPLE = 2 SPIKED SAMPLE.
 DUE DATE: 27/02/87
 MAJOR IONS AC

DUE DATE: 27/02/87 PAGE 6

MAJOR IONS 4C.

MG/ 103/L 2 1/2/1981

- 18 -

卷之三

17.

- 30 -

卷之三

Digitized by srujanika@gmail.com

151

07109 07110 07111 07112

M3 ITF DIS SPEC AA2 CD MM AA F

卷之三

卷之三

-
-
0.362
-
0.37

0.33 - 0.33

ପ୍ରକାଶକ

- 0.38 -

11.0375 .0057

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR148 PP 53 FP 13 DATE: 01/01/87 DUE DATE: 27/02/87
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS AC

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR148 PP 53
SAMPLE = 2 SPIKED SAMPLE.

DATE: 01/01/87

DUE DATE: 27/02/87 PAGE 8

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR148 PP 53
SAMPLE = 2 SPIKED SAMPLE.

DATE: 01/01/87

DUE DATE: 27/02/87 PAGE 9

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR148 PP 53
SAMPLE = 2 SPIKED SAMPLE.

DATE: 01/01/87

DUE DATE: 27/02/87 PAGE 10

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR148	PP 53	FP 13	DATE:	01/01/87	DUE DATE:	27/02/87	MAJOR IONS	4C.
SAMPLE =	2	SPIKED SAMPLE.							
20110	CA DISS	20111	CA EXTRBL	20990	CALCIUM				
AAS AUTO	ICP	HNO3	ICP	COMBINED					
MG/L	MG/L	MG/L	CA	MG/L	CA				
1	28.	-	-	28.	28.				
2	-	-	-	-	27.2				
3	-	-	-	-	28.8				
4	-	-	-	-	29.1				
5	-	-	-	-	28.7	29.1			
6	-	-	-	-	-	29.1			
7	-	-	-	-	-	28.2	28.2		
8	-	-	-	-	-	-	28.2		
9	-	-	-	-	-	-	-	28.7	
10	-	-	-	-	-	-	-	29.9	
11	-	-	-	-	-	-	-	29.9	
12	-	-	-	-	-	-	-	29.9	
13	-	-	-	-	-	-	-	29.9	
14	-	-	-	-	-	-	-	29.9	
MEAN	28.0000	28.7000	29.1000		28.8833				
STD.	0.0000	-	-		1.1968				
REL.	-1.0	-	-		4.1				
STD.	-	-	-		28.303				
DES.	-	-	-						
VAL.	-	-	-						

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR149 PP 54
SAMPLE = 3 SPIKED SAMPLE.

DATE: 01/02/87

DUE DATE: 27/02/87 PAGE 12
TRACE METALS S/E. (IN 0.2% HNO₃)

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR149 PP 54 I
SAMPLE = 3 SPIKED SAMPLE.

DATE: 01/02/87

DUE DATE: 27/02/87 PAGE 13
TRACE METALS S/E. (IN 0.2% HNO₃)

DATA SUMMARY

PRALINE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR149 PP 54
SAMPLE = 3 SPIKED SAMPLE.

DATE: 01/02/87

DUE DATE: 27/02/87 PAGE 14
TRACE METALS S/E. (IN 0.2% HNO₃)

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR149 PP 54
SAMPLE = 3 SPIKED SAMPLE.

DATE: 01/02/87

DUE DATE: 27/02/87 PAGE 15
TRACE METALS S/E. (IN 0.2% HNO3)

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 3 STUDY NO. IRI49 PP 54 SPIKED SAMPLE.

DATE: 01/02/87

DUE DATE: 27/02/87 PAGE 16
TRACE METALS S/E. (IN 0.2% HNO3)

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 4 **STUDY NO.** **IR149** **PP 54** **FP 14** **DATE:** **01/02/87**

SYNTHETIC SAMPLE.

DATA SUMMARY

PRALINE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. **IR149** **PP 54** **FP**
SAMPLE = **4** **SYNTHETIC SAMPLE.**

DATE: 01/02/87

DUE DATE: 27/02/87 PAGE 19

	07112 NO3+NO2 UV AA MG/L N	07390 NITRATE COMBINED MG/L N	07505 NH3 TOT AA BERT MG/L N	07506 NH3 TOT SPEC EL MG/L N	07557 NH3 DISS AA INDO MG/L N	07563 NH3 DISS AA EDTA MG/L N	07590 AMMONIA COMBINED MG/L N	07601 TOTAL N AA UV MG/L N	07602 TOTAL CAFC'D MG/L N
1	-	-	-	-	-	-	-	-	-
2	0.017	0.05 L HDL	0.001L	0.05 L	0.002L	0.002L	0.002L	0.1 L	-
3	-	0.017	-	-	-	-	0.001L	-	-
4	-	0.032	-	-	-	-	0.05 L	-	-
5	0.04	0.04	-	-	-	-	-	-	-
6	-	0.02 L	-	-	-	-	-	-	-
7	-	0.02 L	-	-	-	-	-	-	-
8	-	0.02 L	-	-	-	-	-	-	-
9	-	0.02 L	-	-	-	-	-	-	-
10	-	0.02 L	-	-	-	-	-	-	-
11	-	0.02 L	-	-	-	-	-	-	-
12	-	0.02 L	-	-	-	-	-	-	-
13	-	0.02 L	-	-	-	-	-	-	-
14	-	0.02 L	-	-	-	-	-	-	-
MEAN	.0285	.0249	-	-	-	-	-	-	-
STD.	.0163	.0101	-	-	-	-	-	-	-
REL.	57.1	40.4	-	-	-	-	-	-	-
DES.	.026	.026	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
MEAN	.0300	.0400	.0410	-	-	-	.0370	-	.0300
STD.	-	-	-	-	-	-	.0061	-	.0053
REL.	-	-	-	-	-	-	16.4	-	.057
DES.	-	-	-	-	-	-	.053	-	.0700

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR149 PP 54 FP 14 DATE: 01/02/87 DUE DATE: 27/02/87 PAGE 20
 SAMPLE = 4 SYNTHETIC SAMPLE. MAJOR IONS 4C.

	STUDY NO.	IR149	PP 54	FP 14	DATE:	01/02/87	DUE DATE:	27/02/87	PAGE	20
SAMPLE =	4	SYNTHETIC SAMPLE.					MAJOR IONS	4C.		
09190	10101	10108	10109	10111	10112	10119	10301	10602	HARDNESS	10603
FLOURIDE	ALKALINITY	ALKALINITY	ALKALINITY	ALKALINITY	ALKALINITY	ALKALINITY	PH	CALC'D	TITR'N	MG/L CAC
COMBINED	TITR'N	POT TITR	POT TITR	TITR'N	TITR'N	COMBINED	COMBINED	MG/L CAC	MG/L CAC	MG/L CAC
MG/L CAC	MG/L CAC	MG/L CAC	MG/L CAC	MG/L CAC	MG/L CAC	MG/L CAC	UNITS	UNITS	UNITS	UNITS
1.2	0.05 L	5.9 L	-	-	0.6	5.5 L	5.5	5.5	144.0	-
3	0.05 L	0.9 L	-	-	-	0.9 L	6.7	6.7	-	-
4	0.01 L	0.10 L	0.5 L	-	-	0.6 L	5.72	5.72	-	-
5	0.05 L	0.10 L	0.1 L	-	20. L	0.5 L	5.36	5.36	-	-
6	0.05 L	0.1 L	-	-	-	0.1 L	5.3	5.3	-	-
7	0.05 L	-	-	3. -	-	1.0 L	5.80	5.80	-	-
8	0.05 L	-	-	-	-	-	5.50	5.50	-	-
9	0.07 L	0.5 L	-	-	-	-	5.50	5.50	-	-
10	0.03 L	0.5 L	-	-	-	-	5.59	5.59	-	-
11	0.03 L	0.4 L	-	-	-	-	5.59	5.59	-	-
12	0.12 R	0.4 L	-	-	-	-	5.59	5.59	-	-
13	0.0283	3.0000	3.0000	1.0000	.6000	.7625	5.6016	5.6016	147.7	147.7
14	56.6	122.5	122.5	-	-	128.3	3.9	3.9	147.75	147.75
MEAN	0.0500	3.674	3.0000	1.0000	-	128.3	3.9	3.9	147.75	147.75
STD.	0.0283	-	-	-	-	128.3	3.9	3.9	147.75	147.75
REL.	56.6	-	-	-	-	128.3	3.9	3.9	147.75	147.75
DES.	.045	-	-	-	-	128.3	3.9	3.9	147.75	147.75
MEAN	10606	10690	11005	11102	11103	11105	11107	11111	12005	12101
STD.	HARDNESS	HARDNESS	NA TOTAL	SODIUM	NA DISS	SODIUM	NA DISS	NA DISS	MG TOTAL	MG TOTAL
REL.	CALC'D	COMBINED	ICAP MG/L	AAS F	ICAP MG/L	AAS DA	ICAP MG/L	ICAP MG/L	ICAP MG/L	ICAP MG/L
DES.	MG/L CAC	MG/L CAC	MG/L CAC	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
1	141.	144.0	-	-	-	18.5	-	-	21.5	-
2	141.	144.0	-	-	-	19.2	-	19.1	19.2	-
3	141.	144.0	-	-	-	-	-	-	19.2	-
4	141.	144.0	-	-	-	-	-	-	19.2	-
5	141.	144.0	-	-	-	-	-	-	19.2	-
6	141.	144.0	-	-	-	-	-	-	19.2	-
7	141.	144.0	-	-	-	-	-	-	19.2	-
8	141.	144.0	-	-	-	-	-	-	19.2	-
9	141.	144.0	-	-	-	-	-	-	19.2	-
10	141.	144.0	-	-	-	-	-	-	19.2	-
11	141.	144.0	-	-	-	-	-	-	19.2	-
12	141.	144.0	-	-	-	-	-	-	19.2	-
13	141.	144.0	-	-	-	-	-	-	19.2	-
14	141.	144.0	-	-	-	-	-	-	19.2	-
MEAN	141.0000	148.0167	19.5500	20.0000	19.5250	18.9000	19.1000	18.9000	19.4636	19.4636
STD.	DEV:	141.0000	148.0167	19.5500	20.0000	19.5250	18.9000	19.1000	18.9000	19.4636
REL.	STD:	-	148.4953	2.5	1.0	5.4	-	-	3.6	3.6
DES.	VAL:	-	148.408	2.5	1.0	5.4	-	-	3.6	3.6

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 4 STUDY NO. = IR149 PP 54 FP
SYNTHETIC SAMPLE.

DATE: 01/02/87

DUE DATE: 27/02/87 PAGE 21
MAJOR IONS 4C.

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR149	PP 54	FP 14	DATE:	01/02/87	DUE DATE:	27/02/87	PAGE	23
SAMPLE =	4	SYNTHETIC SAMPLE.						MAJOR IONS 4C.	
20108	20110	CA DISS AAS AUTO	20111 CA DISS ICAP MG/L	20311 CA EXTRBL HNO3 ICP MG/L	20990 CALCIUM COMBINED MG/L CA				
1	-	43.	-	-	43.				
2	41.2	42.	-	-	42.				
3	-	-	-	-	41.2				
4	-	-	-	-	43.6				
5	-	-	-	-	42.				
6	-	-	-	-	43.2				
7	-	-	-	-	44.1				
8	-	-	-	-	44.1				
9	-	-	-	-	43.8				
10	-	-	-	-	43.4				
11	-	-	-	-	43.4				
12	-	-	-	-	43.7				
13	-	-	-	-	43.7				
14	-	-	-	-	43.7				
MEAN	41.2000	42.5000	43.4000	44.1000	43.5000				
STD.	DEV.	1.7071	-	-	1.6825				
REL.	STD.	1.7	-	-	3.9				
DES.	VAL.	-	-	-	42.459				

DATA SUMMARY

PRAIRIE PROVINCES: INTER-REGIONAL AND FEDERAL PROBLEMS

STUDY NO. IR149 PP 54 FP
SAMPLE = 5 SYNTHETIC SAMPLE.

DATE : 01/02/87

三
二
一

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR149 PP 54 FP 14			DATE: 01/02/87	DUE DATE: 27/02/87	PAGE 25
	SAMPLE = 5	SYNTHETIC SAMPLE.			MAJOR IONS 4C.	
06100 DOC MG/L C	06101 DOC IR/DIFF MG/L C	06104 DOC UV CO ₂ EV MG/L C	06107 DOC UV CO ₂ EV MG/L C	06109 DOC UV CO ₂ NAOH MG/L C	06150 DOC COMBINED MG/L C	06151 IR UV CO ₂ EV MG/L C
1 2 3 4 5 6 8 10 11 12 13 R 14	- - - - - - - - - - - - -	- - - - - - - - - - - - -	- - - - - - - - - - - - -	- - - - - - - - - - - - -	5.2 5.0 4.8 4.9 4.6 4.6 4.6 4.6 4.6 4.6 4.7 4.8 4.8	5.2 5.0 4.8 4.9 5.5 3.6 4.6 4.6 4.6 4.6 2.6 2.6 2.6
MEAN STD. REL. DES.	5.1000 5.657 11.1	4.7667 3.7528 3.2	5.1000 5.1414 2.8	4.6000 4.8667 6.7 4.680	3.1000 3.2440 22.8	3.4000 3.1000 2.5000 2.5000
DEV. STD. VAL.	-	-	-	-	-	4.1000 3.2833 18.8 3.125
07004 TKN AAs NTLPRUSS MG/L N	07013 TKN ION EL MG/L N	07015 TKN DIG BERNHOLDT MG/L N	07016 TKN BLK AMM-SALI MG/L N	07018 TKN BLK INDOPHEN MG/L N	07021 TKN DIG BER MG/L N	07090 NO ₃ +NO ₂ DISS AA MG/L N
1 2 4 5 6 8 9 10 11 12 13 R 14	- - - - - - - - - - - - -	- - - - - - - - - - - - -	- - - - - - - - - - - - -	- - - - - - - - - - - - -	0.180 0.7 R 0.20 0.20 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15	0.180 0.7 R 0.20 0.20 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
MEAN STD. REL. DES.	-	.2000	.2000	.1500	.1800	.1825 .0236 12.9 .270
DEV. STD. VAL.	-	-	-	-	-	.1350 .0050 3.7 -.6

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 5 STUDY NO. IR149 PP 54 FP 14 SYNTHETIC SAMPLE.

DATE: 01/02/87

DUE DATE: 27/02/87 PAGE 26

PAGE 26

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR149 PP 54 FP 14 DATE: 01/02/87
SAMPLE = 5 SYNTHETIC SAMPLE.
DUE DATE: 27/02/87
MATERIALS AC

DUE DATE: 27/02/87 PAGE 27

DATE: 01/02/87

STUDY NO. 5

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR149	PP	54	FP	14	DATE:	01/02/87	DUE DATE:	27/02/87	PAGE	28
SAMPLE -	5	SYNTHETIC SAMPLE.				MAJOR IONS AC.					
12102	MG DISS AAS DA MG/L	12106 MG OF AAS DA MG/L	12107 MG DISS AAS AUTO MG/L	12108 MG HARDN CALC D MG/L	12111 MG DISS ICAP MG/L	12303 MG OF AAS AUTO MG/L	12311 EXTRBL HNO3 ICP MG/L	12990 MCNESIUM COMBINED MG/L MG	14102 SILICA R ANSA AA MG/L	14105 SILICA R MOLY AA MG/L	14106 SILICA R MOLY UF MG/L
12355	-	-	4.9	-	-	5.	-	5.9 4.7	0.62	-	-
677	5.0	-	-	4.7	-	-	-	4.7 5.0	-	0.6	0.53
89	-	-	-	-	-	-	-	5.52	-	0.6	-
10	5.2	-	-	-	-	-	-	5.52 5.3	-	0.54	-
112	5.10	-	-	-	5.1	-	-	5.4 5.1	-	0.6	-
14	-	-	-	-	-	-	-	5.10	-	-	-
MEAN	5.1000	4.7000	4.9000	4.7000	5.1000	5.0000	5.5200	5.1183 5.151	.6100 .0141	.5850 .0300	.5300
STD.	2.000	-	-	-	-	-	-	5.124	5.1	-	-
REL.	STD:	DEV:	DEVS:	DEVS:	VAL:	VAL:	VAL:	VAL:	VAL:	VAL:	VAL:
14111	SILICA F ICAP DA MG/L	14190 SILICA COMBINED MG/L	15403 TP FTL ASCBC MG/L P	15406 TP UF AAS MG/L P	15409 TP BLK AA MG/L P	15413 TOTAL P AA SNCL2 MG/L P	15421 TP BLK DIG ASR MG/L P	15490 TOTAL P COMPIED MG/L	16304 DISS AA MTB MG/L	16306 DISS AA MTB MG/L	
12	0.62	-	-	-	-	-	-	0.006L	0.006L	17.5	16.
34	0.53	-	-	-	0.003L	-	0.001	-	0.001	-	-
55	0.6	-	-	-	-	-	-	0.003L	-	-	-
67	0.6	-	-	-	-	-	0.02 R	0.02 R	17.	16.6	
89	0.57	0.57	0.010L	0.010L	-	0.010	-	0.010	-	17.5	18.0
10	-	-	0.05 L	0.007 L	-	-	-	0.010 L	-	-	-
112	-	-	0.6	0.01 L	-	-	-	0.005 L	-	-	-
14	-	-	-	-	-	-	-	0.007 L	-	16.8	
MEAN	.5700	.5825	-	-	.0055	-	.0060	.0060	17.2500	17.3857	
STD.	STD:	DEV:	DEVS:	DEVS:	.0064	-	.0046	.0046	.002	.002	
REL.	STD:	DEV:	DEVS:	DEVS:	.580	-	.580	.580	2.0	7.1	

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IRI49 PP 54 FP 14 DATE: 01/02/87 DUE DATE: 27/02/87 PAGE 30
 SAMPLE = 5 SYNTHETIC SAMPLE. MAJOR IONS 4C.

	20108 CA DISS AAS UF MG/L	20110 CA DISS AAS AUTO MG/L	20111 CA DISS ICAP MG/L	20311 CA EXTRIBL HNO3 ICP MG/L	20990 CALCIUM COMBINED MG/L CA
1	-	16:	-	-	16:
2	14.6	-	-	-	15.4
3	-	-	-	-	15.4
4	-	-	-	16.1	16.1
5	-	-	-	-	15.8
6	-	-	-	-	15.4
7	-	-	-	-	16.1
8	-	-	-	-	15.4
9	-	-	-	-	15.4
10	-	-	-	-	16.1
11	-	-	-	-	15.4
12	-	-	15.2	-	16.4
13	-	-	-	-	15.2
14	-	-	-	-	16.4
MEAN	14.6000	15.5000	15.2000	16.1000	15.3583
STD. DEV.	-	4.7071	-	-	15.9020
REL. STD.	-	4.6	-	-	15.6118
DES. VAL.	-	-	-	-	-
DATES RECEIVED	1 87/02/11 5 87/04/06 10 87/03/03	2 87/03/04 6 87/02/24 11 87/02/24	3 87/02/26 7 87/03/17 12 87/03/12	3 87/03/10 8 87/03/26 14 87/02/16	4 87/02/12 9 87/03/09

DISTRIBUTION - IROC

Mr. H. Agemian
Head, Scientific Services Section
National Water Quality Laboratory

Mr. G. Brun
Head, Analytical Services Section
Atlantic Region Water Quality Branch

Mr. W. Coedy
CIC, Water Laboratory
INAC, NAP
Yellowknife, NWT

Ms. D. Duval
Head, Analytical Services Section
Quebec Region Water Quality Laboratory

Mr. F. Mah
Head, Analytical Services Section
Pacific Region Water Quality Branch

Mr. J-G. Zakrevsky
Head, Analytical Services Section
Western Region Water Quality Branch

cc:

Dr. B.K. Afghan
Chief, NWQL, CCIW
Burlington, Ontario

Mr. L. Martel
Chief, Water Quality Branch
Quebec Region, Longueuil, P. Q.

Mr. D.H. Cullen
Chief, Water Quality Branch
Atlantic Region
Moncton, New Brunswick

Mr. A. S. Y. Chau
Project Chief
Quality Assurance Project
NWRI, CCIW

Dr. W.E. Erlebach
Chief, Water Quality Branch
Pacific Region
Vancouver, B. C.

Mr. W.D. Gummer
Chief, Water Quality Branch
Western Region
Regina, Saskatchewan



Government
of Canada Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

A

Distribution

FROM
DE

H. Alkema
Quality Assurance Section
National Water Research Institute
Burlington, Ontario

H. Alkema\NWRI\336-4929\ha

SECURITY - CLASSIFICATION - DE SÉCURITÉ

OUR FILE/NOTRE RÉFÉRENCE

YOUR FILE/VOTRE RÉFÉRENCE

DATE

June 24, 1987

SUBJECT Inter-regional Quality Assurance Program (IRQC)
OBJET

I have enclosed the final report for IR 150-151.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A.

H. Alkema

SUMMARY REPORT

INTER-REGIONAL QUALITY ASSURANCE PROGRAM

STUDIES 150 AND 151

for March and April, 1987

**TRACE METALS, MAJOR IONS, NUTRIENTS
AND PHYSICAL PARAMETERS IN SPIKED SAMPLES**

by

H. Alkema

**Quality Assurance and Methods Section
National Water Research Institute
Burlington, Ontario**

June 1987

Introduction

As part of an on-going study, the Quality Assurance and Methods Section, N.W.R.I. in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the IR program. This report summarizes the most recent IR inter-laboratory quality control studies: IR 150 and 151, for the months April and May, 1987. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The levels were low for TM and high for MI.

Study Design

Five water samples were submitted to each laboratory for chemical analyses. Three samples were submitted for trace metals analysis, while the remaining two were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the five samples:

IR 150 - Sample 1 - 125 ml, D/A* for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

IR 151 - Sample 3 - 1L, S/E* for trace metals (0.2% HNO₃)
Sample 4 - up to 1L, major ions, etc., stored at 4°C
Sample 5 - 1L, S/E as sample 3

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were recorded on report sheets provided with the IR samples. Upon receipt of the Reporting Sheets, the results were tabulated for each parameter, first for each method reported, and then for all methods combined. These data, and the resulting statistics are presented in the Data Summary. (attached)

Preliminary data summaries, including problematic results, were sent May 1 or 12 and May 27. Each laboratory was given three weeks to notify us of any errors in data transcription or compilation.

Performance Indicators

In previous reports the mean has always been used as comparator for accuracy assessment. We now have "design values" for several reference waters (RMs) and certified reference waters (CRMs). These design values are used to test each reported result (whether few or many) for accuracy. Consequently, for stable parameters, the design values will be used as comparator for the ten percent warning circles, and the mean will be used for unstable parameters (perhaps due to biological activity).

Percentage deviations from the comparator are used as an indicator for the laboratory head to determine the extent of the discrepancies between the laboratory result and comparator as it applies to his procedures. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than 10% from the comparator is circled in the data tables and its value noted in the comments which follow. Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned 'HDL' and is labelled in the Data Summary.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

General Comments: A high coefficient of variation (incomparability) was observed for Ammonia in sample two, for Boron in samples two and four, and for low level Aluminum in samples three and five.

Individual laboratory deviations are listed below:

Lab 2 - a high result for Pb by DA: +13%

- high results for Mn by SE: +67%, & 64%

Lab 3 - a low result for Silica: -16%

- a high result for $\text{NO}_3 + \text{NO}_2$: +13%; Amm.: 130% (R)^{*}; & F: +17%

Lab 4 - high results for Boron

- low results for DIC: -24%, & -22%

- an HDL for Ammonia

Lab 5 - no anomalies

Lab 7 - high results for $\text{NO}_3 + \text{NO}_2$: +13%, & +33% (R)

Lab 11 - low results by DA for Cr (R); Fe: -20%; Ni: -20%;

Cu: -21%; Zn: -17%; Cd: -20%; and Pb: -20%

- a high result for Ca: +13%; Turb: (R) & (R);

- a result high: $\text{NO}_3 + \text{NO}_2$: +13%; low: F: -15%

IR laboratories average number of deviations per sample was 0.7.

* (R) = rejectable by Grubb's procedure for statistical calculation.

Appendix I

Definitions of Types of Metals Analysis

1. D/A - Direct Aspiration

Without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS) or Inductively Coupled (Argon) Plasma (ICAP or ICP). Standards should contain the acid equivalent of the sample.

2. S/E - Code for low level analysis.

Analysis is presently carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP.
3. Digestion of aqueous phase followed by ICAP.
4. Graphite tube (flameless) AAS.

Appendix II

Performance Indicators

1. Circled Results

Results are circled when a minor deviation from the comparator has occurred. (The comparator is the design value of the reference sample, or the mean in the case of a biologically active parameter). Circled results are in general greater than or less than 10% from the comparator. At very low levels of analytes or with parameters that are difficult to analyse, a greater deviation than 10% is allowed. Under these conditions, a result is circled when it is outside one standard deviation of the comparator. These circled results, though acceptable values, are a warning to laboratory managers that the parameter analysis should be investigated.

2. Rejectable Results

Each parameter is tested for the various laboratory results that are statistical outliers, results that were affected by non random causes (eg. a transcription error). These outlying results, calculated by the Grubb's procedure,* and indicated in the data tables with an 'R', are noncomparable with the data set for the parameter.

3. A High Co-efficient of Variation (HCV)

Occasionally there is a parameter with a very high relative standard deviation (RSD). When this HCV is not due to one or two outlying values, it indicates a high variability within the data set. The data in this data set is non-comparable. In such a case, the RSD for the parameter is circled in the data tables and the parameter's non-comparability is noted in the comments.

4. High Detection Limits (HDL)

Each laboratory determines its own detection limits according to its own requirements. When major differences of detection limits occur, the high detection limit is circled. An HDL indicates that low level analysis with an HDL may not be comparable with the analyses of the other laboratories.

* reference: Frank E. Grubbs, Technometrics, 1969, p 1.

DATA

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

DATA SUMMARY

DATA SHEET

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE NO. IR1150 PP 55 FP 15 DATE: 01/03/87
 SAMPLE = 1 SPIKED SAMPLE.

LAB	PB EXT AAS DA	PB EXT AAS SE	PB EXT AAS GP	ICP DA	LEAD COMMON
1	-	-	-	-	-
2	0.99	0.820	-	-	0.820
3	-	-	-	-	0.99
6	-	-	-	-	0.835
8	-	-	-	-	0.90
9	-	-	-	-	0.900
10	-	-	-	-	1.00
11	0.70	-	-	-	0.80
12	-	-	-	-	0.70
14	-	-	0.960	-	0.85
MEAN	.8450	.8200	.9600	.9000	.8755
STD DEV	.2051	-	-	-	.0936
REL STD	24.3	-	-	-	10.7
DES VAL	-	-	-	-	-

DUE DATE: 30/04/87

PAGE 3

(IN 3% HNO3)

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IRI150 PP 55 FP 15 DATE: 01/03/87 DUE DATE: 30/04/87 PAGE 5

SAMPLE = 2 SPIKED SAMPLE.

MAJOR IONS AC.

LAB	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC UP	07112 NO3+NO2 AA CD	07315 NO3 I C	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07506 NH3 TOT SPEC EL	07555 NH3 DIS AA PHEN	07557 NH3 DIS AA INDO	07562 NH3 DIS AA EDTA	07563 NH3 DIS AA INDO
1	0.60	-	-	-	-	0.56	0.60	-	-	-	-	0.017	-
2	-	-	0.57	-	0.555	0.56	0.56	-	-	-	-	-	-
3	-	-	0.55	-	-	0.555	0.555	0.006	0.05 L	-	-	-	-
4	-	-	0.555	-	-	0.555	0.555	-	-	-	-	-	-
5	-	0.54	-	-	0.64	-	0.64	-	-	-	0.006	-	-
6	-	-	0.60	-	-	0.57	0.57	-	-	0.007	-	-	-
7	-	-	0.44	-	-	0.57	0.57	-	-	0.02 L	-	-	-
8	-	-	0.57	-	-	-	0.59	-	-	-	-	-	-
9	-	-	0.59	-	0.57	-	0.57	0.02 L	-	-	-	0.006	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	.6000	.4900	.4900	.4707	.494	.5700	.5975	.5650	.5646	.0060	.0070	.0130	.0060
STD DEV	-	-	14.4	3.4	-	10.1	1.01	8.2461	-	-	-	.0170	-
REL STD	-	-	-	-	-	-	-	8.579	-	-	-	-	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-

LAB	07590 AMMONIA COMMON AA SUL	07601 T N UV CALC'D	07602 T N UV HY SUL	07605 T N DIS UV AA	07651 T N DIS UV EDTA	07655 T N DIS COMMON	07690 T N DIS COMMON	07790 T N DIS COMMON	09103 F DIS COL SP	09105 F DIS SP EL	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL
1	0.017	-	-	-	-	-	-	-	-	-	0.07	-	-
2	0.006	0.65	-	-	-	-	-	-	-	-	-	0.10	-
3	0.006 L	HDL	-	-	-	0.63	-	-	0.63	-	-	-	-
4	0.006	-	-	-	-	0.640	-	-	0.640	0.1	-	-	-
5	0.02	-	-	-	-	-	-	-	-	-	-	0.05 L	-
6	0.007	-	-	0.62 L	-	-	-	0.62 L	0.65	-	-	0.14	-
8	0.007	-	-	-	-	-	-	-	-	-	-	-	-
10	0.02 L	HDL	-	0.65	-	-	-	0.70	-	-	-	0.084	-
11	0.006 L	HDL	-	-	-	-	-	-	-	-	-	-	-
12	0.006 L	HDL	-	0.70	-	-	-	-	-	-	-	-	-
14	0.02 L	HDL	-	-	-	-	-	-	-	-	-	-	-
MEAN	-0.103	.6500	.7000	.6500	.6300	.6400	.7000	.6425	.1000	.0980	-	.0700	.1000
STD DEV	.0064	-	-	-	-	-	-	.0096	-	.0370	-	-	-
REL STD	62.0	-	-	-	-	-	-	1.5	.662	37.8	-	-	-
DES VAL	.014	-	-	-	-	-	-	.678	-	-	-	-	-
LAB	09115 F DIS AA ALIZ	09190 FLOURIDE COMMON	10101 ALKALINITY TITR'N	10108 ALKALINITY POT TIT	10111 ALKALINITY TIT PRO	10112 ALKALINITY CO2 IR	10116 ALKALINITY CO2 IR	10190 ALKALINITY COMMON	10301 PH COMMON	10390 PH COMMON	10602 HARDNS CALC'D	10603 HARDNS TITR'N	
1	-	-	0.07	68.	-	-	-	-	68.	8.0	8.0	266.3	-
2	-	-	0.10	64.8	-	-	-	-	64.8	8.0	8.0	256.3	-
3	-	-	0.05 L	HDL	65.8	-	-	-	66.3	7.85	7.85	-	-
4	-	-	0.05 L	65.9	-	-	-	-	65.8	8.07	8.07	-	-
5	-	-	0.1	-	71.	-	-	-	65.9	7.43	7.43	262.	-
6	-	-	0.14	66.2	-	-	-	-	71.7	7.5	7.5	264.	-
7	-	-	0.10	-	62.	-	-	-	66.2	8.1	8.1	261.3	-
8	0.10	-	0.07	-	66.0	-	-	-	66.0	7.90	7.90	257.	-
9	0.07	-	0.084	HDL	-	-	-	-	63.	7.85	7.85	255.	-
10	0.07	-	0.084	HDL	-	-	-	-	67.	7.9	7.9	290.	-
11	-	-	0.1	64.7	-	-	-	-	64.7	7.9	7.9	269.	-
12	-	-	0.27 R	69.8	-	-	-	-	69.8	8.03	8.03	266.	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	.0850	.0918	.66.5250	.62.0000	.68.5000	.66.3000	.63.0000	.73.9000	.66.1923	.7.8775	.7.8775	.264.9429	.265.0000
STD DEV	.0212	.0239	1.7094	-	3.5355	-	-	-	2.4541	.2.2101	.2.2101	.12.2158	.3.6056
REL STD	25.0	26.1	2.6	-	5.2	-	-	-	3.7	2.7	2.7	4.6	1.4
DES VAL	-	.082	-	-	-	-	-	-	65.325	-	-	.7.881	-

INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

DATA

四

DATE: 01/03/87

DATE DATED: 30/09/987

STUDY NO.	IR150	PP 55	PP 15	DATE:	01/03/87	DUE DATE:	30/04/87	MAJOR IONS	4C.
SAMPLE =	2	SPIKED SAMPLE							
LAB	10606 HARDNESS CALC'D COMMON	10690 HARDNESS NA Tot ICP	11005 NA F AAS	11102 NA DIS FL PH	11103 NA DIS FL PH	11105 NA DIS FL PH	11107 NA EXT ICP	11311 SODIUM COMMON	12005 MG TOT ICP
1	- 256.3	- 257.	- 262.	- 61.	- 62.5	- 59.5	- 58.5	- 62.5	- 59.5
2	- 256.3	- 257.	- 262.	- 61.	- 61.5	- 59.	- 58.5	- 61.5	- 58.5
3	- 257.	- 264.	- 269.0	- 60.	- 58.0	-	-	-	-
4	- 257.	- 255.	- 58.	-	-	-	-	-	-
5	- 257.	- 255.	- 58.	-	-	-	-	-	-
6	- 257.	- 255.	- 58.	-	-	-	-	-	-
7	- 257.	- 255.	- 58.	-	-	-	-	-	-
8	- 257.	- 255.	- 58.	-	-	-	-	-	-
9	- 257.	- 255.	- 58.	-	-	-	-	-	-
10	- 257.	- 255.	- 58.	-	-	-	-	-	-
11	- 257.	- 255.	- 58.	-	-	-	-	-	-
12	- 257.	- 255.	- 58.	-	-	-	-	-	-
13	- 257.	- 255.	- 58.	-	-	-	-	-	-
14	- 257.	- 255.	- 58.	-	-	-	-	-	-
MEAN	257.0000	264.5300	59.0000	61.6000	60.4500	58.0000	56.5000	59.8000	21.7500
STD DEV	- 10.3788	- 1.4142	- 1.9462	- 1.5416	- 2.6	-	-	- 2.2361	- 22.0000
REL STD	- 3.9	- 2.4	- 4.8	- 2.6	-	-	-	- 3.7	- 2.2502
DES VAL	- 260.723	-	-	-	-	-	-	- 59.361	- 10.6
LAB	12107 MG DIS AAS AUT	12111 MG HARDN MG DIS ICP	12303 MG UP AAS AUT	12311 MG EXT ICP	12990 ANSIA AA	14102 SILICA MOLY AA	14106 SILICA MOLY AA	14111 SILICA MOLY AA	14190 SILICA COMMON
1	- 21.	-	-	-	- 21.	- 14.65	-	-	- 14.65
2	- 21.	-	-	-	- 21.1	-	-	-	- 21.41
3	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
MEAN	21.0000	20.6000	22.3000	21.0000	22.6000	21.4833	14.9250	14.2250	12.4100
STD DEV	-	-	-	-	-	-	-	-	-
REL STD	-	-	-	-	-	-	-	-	-
DES VAL	-	-	-	-	-	-	-	-	-
LAB	15409 TPP BLK AA ASC	15413 TPP ACL AA SNCL	15421 TPP BLK DIG ASC	15490 TOT P COMMON	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 DIS I C	16310 SO4 DIS AA CALM	16990 SULFATE COMMON
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
MEAN	.0300	.0030	-	.0283	.0283	.0283	.0283	.0283	.0283
STD DEV	-	-	-	.0349	.0349	.0349	.0349	.0349	.0349
REL STD	-	-	-	.4950	.4950	.4950	.4950	.4950	.4950
DES VAL	-	-	-	.7	.7	.7	.7	.7	.7

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR150			RP 55			FP 15			DATE: 01/03/87			DUE DATE: 30/04/87			PAGE 7		
	SAMPLE = 2 SPIKED SAMPLE.												MAJOR IONS 4.C.					
LAB	CL DIS CL DIS AA AG	CL DIS CL DIS I C	CL DIS CL DIS TR CON	17209	17210	CHLORIDE	19005	K TOR	ICP	19102	K DIS K DIS AAS	19103	K DIS K DIS AAS LI	19107	19301	19990	20005	20100
1	-	-	-	189.2	190.	200.	-	-	-	17.9	-	-	-	-	17.9	-	-	-
2	-	-	-	-	-	190.	-	189.2	-	18.0	-	-	18.5	-	18.0	-	-	-
3	-	-	-	-	-	-	-	180.	-	18.9	-	-	-	-	18.5	-	-	-
5	-	-	-	-	-	-	-	-	-	17.9	-	-	-	-	18.9	-	-	-
6	-	-	-	-	-	-	-	-	-	18.85	-	-	-	-	17.5	18.85	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.5	18.85	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.5	18.85	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.5	18.85	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.5	18.85	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.5	18.85	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.5	18.85	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.5	18.85	-	-
MEAN	189.2000	198.0000	190.0000	191.6000	17.9000	17.9250	18.2000	18.0000	18.5000	17.5000	18.0409	18.5000	17.5000	17.5000	67.5000	69.0000	69.0000	69.0000
STD DEV	-	11.3137	-	7.4218	-	1.1414	1.3081	-	-	-	-	-	-	-	5.5335	6.7071	-	-
REL STD	-	5.7	-	3.9	-	.8	7.3	-	-	-	-	-	-	-	3.1	1.0	-	-
DES VAL	-	-	-	192.763	-	-	-	-	-	-	-	-	-	-	18.069	18.069	-	-
LAB	20101	20103	20108	20110	20111	20112	20113	20114	20115	20311	CA EXT	20990	CALCIUM	COMMON				
1	-	-	-	-	-	-	-	-	-	72.	-	-	-	-	72.	-	-	-
2	-	-	-	-	-	-	-	-	-	68.	-	-	-	-	68.	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68.0	-	-	-
5	-	70.9	-	-	-	-	-	-	-	-	-	-	-	-	70.9	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	69.	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68.4	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65.8	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68.	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67.	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67.	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67.	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	67.	-	-	-
MEAN	70.9000	72.7000	68.0000	70.0000	71.6000	65.8000	69.6091	-	-	-	-	-	-	-	-	-	-	-
STD DEV	-	6.0811	-	2.8284	-	4.0	-	-	-	-	-	-	-	-	3.1127	-	-	-
REL STD	-	8.4	-	-	-	-	-	-	-	-	-	-	-	-	4.5	-	-	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68.171	-	-	-

DATA JOURNAL

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 3 STUDY NO. IRI51 PP 56 PP 16 DATE: 01/04/87 DUE DATE: 30/04/87 PAGE 8

LAB		13004 AL TOT AAS GF	13009 AL DIS AAS GF	13105 AL DIS AAS GF	13111 AL EXT AAS SE	13302 AL EXT AAS GF	13305 AL EXT AAS SE	13999 COMMON AAS GF	23003 ALUMINUM AAS GF	23009 V EXT AAS GF	23011 V TOT 5x ICP	23102 V DIS AAS SE	23111 V DIS ICP DA	23999 VANADIUM COMMON
1	-	0.061	-	-	-	-	0.036	0.036	-	0.015	-	-	-	0.015
2	-	0.050	-	-	-	-	0.028	0.028	-	0.011	-	-	-	0.011
3	-	0.12 R	-	-	0.2 L	-	0.028	0.028	-	0.01	-	-	-	0.01
6	-	-	-	-	0.04	-	0.04 L	0.04 L	-	-	-	-	-	0.011
8	-	-	-	0.055	-	-	0.04	0.04	-	-	-	0.010	0.010	-
9	-	-	-	-	-	-	0.055	0.055	-	-	0.012	-	-	0.012
10	-	-	0.078	-	-	-	0.078	0.078	0.008	-	-	-	-	0.008
12	-	-	-	0.0555	.0400	-	0.0320	0.0483	.0080	.0150	.0105	.0120	.0105	.0110
14	-	0.0780	.0555	.0550	.0400	-	.0057	0.173	-	.0007	-	.0007	.0007	.0022
MEAN	STD DEV	0.0780	.0555	.0550	.0400	-	17.7	35.8	-	6.7	-	6.7	19.6	-
STD DEV	REL STD	-	0.078	-	-1.0	-	-	-	-	-	-	-	-	-
DES VAL	-	14.0	-	-	-	-	-	-	-	-	-	-	-	.011
<i>HCU</i>		<i>HCU</i>												
LAB	24004 CR TOT AAS GF	24009 CR TOT 5x ICP	24011 CR TOT 5x ICP	24056 CR DIS AAS GF	24111 CR DIS AAS DA	24302 CR EXT AAS DA	24999 CHROMIUM COMMON	25003 Manganese COMMON	25011 Mn TOT 5x ICP	25107 Mn DIS AAS GP	25111 Mn DIS ICP DA	25304 Mn EXT AAS DA	25306 Mn EXT AAS GP	
1	-	0.015	-	-	-	-	0.015	0.013	-	-	-	-	-	-
2	-	-	0.012	0.012	-	0.011	0.011	0.011	-	0.013	-	-	0.02	-
3	-	-	-	-	-	-	0.012	0.012	-	0.012	-	-	0.012	-
6	-	0.020 R	-	-	-	-	0.020 R	0.020 R	-	-	-	-	-	-
8	0.013	-	-	-	-	0.011	0.013	0.013	-	0.013	-	-	0.013	-
9	-	-	-	-	-	-	0.013	0.013	-	0.013	-	-	0.010	-
10	-	-	-	-	0.012	-	0.012	0.012	-	0.013	-	-	-	-
11	-	-	-	-	-	-	0.01 L	0.01 L	-	0.013	-	-	-	-
12	-	-	-	-	-	-	11.8	11.2	-	5.7	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	STD DEV	.0130	.0150	.0120	.0110	-	.0120	.0124	.0130	.0125	.0130	.0115	.0160	.0150
STD DEV	REL STD	-	-	-1.0	-	-	-	.0014	-	.0007	-	.0021	.0057	-
DES VAL	-	-	-	-	-	-	-	-	-	-	18.4	35.4	-	-
<i>MANGANESE</i>		<i>MANGANESE</i>												
LAB	25311 MN EXT ICP DA	25999 MANGANESE COMMON	26011 MN TOT 5x ICP	26107 FE DIS AAS GF	26111 FE DIS AAS SE	26305 FE EXT AAS GF	26311 FE EXT ICP DA	26999 IRON COMMON	27003 CO TOT AAS GF	27009 CO TOT 5x ICP	27011 CO TOT 5x ICP	27107 CO DIS AAS GP	27107 CO DIS AAS GP	
1	-	-	0.013	-	-	-	-	-	-	-	-	0.010	-	-
2	-	0.02	0.031	-	-	0.029	-	-	-	0.029	-	-	-	-
3	-	0.012	0.045	-	-	0.027	-	-	-	0.027	-	-	0.011	-
6	-	0.018	0.018	-	0.03	-	-	-	-	0.039	0.039	0.014	0.010	-
8	-	0.013	0.013	-	0.026	0.022	-	-	-	0.026	-	-	-	-
9	-	0.013	0.013	-	-	-	-	-	-	0.022	-	-	-	-
10	-	0.010	0.015	-	-	-	-	-	-	0.022	-	-	-	-
11	-	0.013	0.013	-	-	-	-	-	-	0.026	-	-	-	-
12	-	0.013	0.015	-	0.022	-	-	0.022	-	0.022	-	-	-	-
14	-	0.015	-	-	-	-	-	-	-	0.022	-	-	-	-
MEAN	STD DEV	.0180	.0140	.0380	.0220	-	.0280	.0260	.0390	.0220	.0291	.0140	.0100	.0100
STD DEV	REL STD	-	22.6	26.1	-	-	10.1	13.9	-	.0036	-	.0080	.0007	.0007
DES VAL	-	.012	-	-	-	-	-	-	-	-	-	27.6	6.7	-

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

DATA BIBLIOGRAPHY

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	SAMPLE #	SPIKED SAMPLE.			DATE: 01/04/87	DUE DATE: 30/04/87	PAGE 10 (IN 0.2% HNO3)
		IR151	PP 56	PP 16			
LAB	48003	48009	48011	48103	48111	48302	48309
	CD TOT	CD TOT	CD TOT	CD DIS	CD EXT	CD EXT	CADMIUM
	AAS GF	5X ICP	5X ICP	AAS GF	AAS SE	AAS GF	COMMON
	-	-	0.012	-	-	-	-
	2	-	-	0.011	-	0.011	0.024
	3	-	-	0.011	-	0.011	-
	6	-	-	0.011	-	0.011	0.022
	8	0.011	-	0.011	-	0.011	0.025
	9	-	-	-	-	0.011	-
	10	-	-	-	0.010	-	0.010
	11	-	-	-	0.011	-	0.011
	12	-	-	0.012	-	0.012	0.025
	14	-	-	-	-	-	-
MEAN	.0110	.0120	.0110	.0120	.0100	.0110	.0240
STD DEV	-	-	.0000	-	.0000	.0006	.0235
REL STD	-	-	-1.0	-	-	5.1	.0035
DES VAL	-	-	-	-	-	.011	9.3
LAB	82004	82011	82104	82302	82305	82309	82999
	PB TOT	PB TOT	PB DIS	PB EXT	PB EXT	PB EXT	LEAD
	AAS GF	5X ICP	AAS GF	AAS SE	AAS GF	AAS GF	COMMON
	-	-	-	0.011	-	-	-
	2	-	0.011	0.011	-	-	0.011
	3	-	0.008	-	-	-	0.012
	6	-	-	-	-	-	0.011
	8	0.011	-	-	-	0.014	0.008
	9	-	-	0.010	0.011	-	0.011
	11	-	-	-	-	-	0.014
	12	-	-	-	0.010	-	0.010
	14	-	-	-	-	-	0.010
MEAN	.0110	.0095	.0100	.0113	.0100	.0140	.0109
STD DEV	-	.0021	-	.0005	-	-	.0016
REL STD	-	22.3	-	4.4	-	-	14.8
DES VAL	-	-	-	-	-	-	.010

PRAIRIE PROVINCES. INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 4 SPiked SAMPLE
STUDY NO. IRI51 PP 56 FP 16 DATE: 01/04/87 DUE DATE: 30/04/87 PAGE 11

DATA SHEET

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IRI51 PP 56 PP 16 DATE: 01/04/87 DUE DATE: 30/04/87 PAGE 12

SAMPLE = 4 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC UP AA CD	07112 NO3+NO2 AA2 CD	07315 COMMON I C	07390 NITRATE AA BERT	07505 NH3 TOT SPEC EL	07555 NH3 DIS AA PHEN	07562 NH3 DIS AA EDTA	07563 NH3 DIS AA INDO
1	2.05	-	2.2	-	2.299	2.1	2.05	-	-	-	0.150
2	-	-	2.00	-	-	2.1	2.1	0.331R	0.15	-	-
3	-	-	1.875	-	-	-	1.875	-	-	0.149	-
4	-	1.96	-	-	2.70 R	-	-	-	-	0.15	-
5	-	1.62	2.20	-	-	2.00	-	-	0.14	-	-
6	-	-	2.3	-	-	-	2.00	-	0.135	-	-
7	-	-	2.025	2.0	-	-	2.025	0.12	-	-	0.135
8	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-
MEAN	2.0500	1.7900	2.1000	2.0000	2.2990	2.0500	2.0358	.1200	.1550	.1495	.1500
STD DEV	-	1.2404	1.589	-	-	3.07	1.856	-	.0071	.0035	-
REL STD	-	13.4	7.6	-	-	3.4	9.1	-	4.6	2.6	-
DES VAL	-	-	-	-	-	-	2.041	-	-	.5	-

LAB	07590 AMMONIA COMMON AA SUL	07601 T N UV CALC'D	07602 T N UV HY SUL	07605 T N UV UV AA	07651 T N DIS UV EDTA	07690 T N DIS COMMON	07790 T N DIS COL SP	09103 F DIS SP EL	09105 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL
1	0.150	2.7	-	-	-	-	-	2.7	-	-	1.13
2	0.150	2.7	-	-	-	-	-	2.7	-	-	1.3
3	0.150	-	-	-	2.20	2.59	-	2.20	-	-	-
4	0.149	-	-	-	-	-	-	2.59	1.1	1.16	-
5	0.15	-	-	-	-	3.00	-	1.16 R	-	-	1.06
6	0.14	-	-	3.00	1.16 R	-	-	-	-	-	-
7	0.135	-	-	-	-	-	-	-	-	-	-
8	0.16	-	-	-	-	-	-	-	-	-	-
9	0.135	-	-	2.71	-	-	2.71	-	-	-	-
10	0.12	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-
MEAN	.1432	2.7000	2.8550	-	2.2000	2.5900	2.8550	2.4967	1.1000	1.0525	1.0600
STD DEV	.0119	-	2.051	-	-	-	2.051	1.2627	-	.1005	-
REL STD	8.3	-	7.2	-	-	-	7.2	10.418	-	9.5	-
DES VAL	.065	-	-	-	-	-	2.997	-	-	-	-

LAB	09115 F DIS AA ALRZ	09190 FLOURIDE COMMON	10101 ALKALITY TITR'N	10108 ALKALITY POT TIT	10109 ALKALITY POT TIT	10111 ALKALITY TIT PRO	10112 ALKALITY CO2 IR	10190 ALKALITY CON	10301 PH COMMON	10390 PH COMMON	10602 HARDNESS CALC'D
1	1.13	84	-	-	-	-	-	84	8.1	8.1	201.4
2	1.0	77.0	-	-	81.2	-	-	77.0	8.1	8.1	192.5
3	1.3	-	80.0	-	-	84	-	81.2	7.96	7.96	-
4	1.06	79.7	-	-	-	82.0	-	80.0	8.03	8.03	-
5	1.1	-	79.3	-	-	-	-	79.7	7.60	7.60	198.1
6	1.16	1.10	-	84	-	-	-	84	7.7	7.7	200.1
7	1.10	1.15	-	78	-	82.0	-	82.0	8.1	8.1	201.3
8	1.15	1.15	80	-	-	-	-	82.0	8.00	8.00	206.4
9	1.10	1.16 R	84.9	-	-	79	-	79	7.97	7.97	-
10	1.15	1.15	80	-	-	-	-	80	7.8	7.8	195.1
11	1.11	1.12	80.3	-	-	-	-	80	8.0	8.0	205.1
12	-	-	78.3	-	-	-	-	78.3	8.10	8.10	205.1
13	-	-	-	-	-	-	-	84.9	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-
MEAN	1.1250	1.1050	80.4000	78.0000	83.0000	81.2000	79.0000	66.2000	80.5692	7.9550	7.9550
STD DEV	0.0354	0.0966	2.7045	-	1.4142	-	-	-	2.4951	2.1676	2.1676
REL STD	3.1	8.7	3.4	-	1.7	-	-	-	3.1	2.1	2.1
DES VAL	-	1.112	-	-	-	-	-	-	78.540	7.746	7.746

DATA

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

PAGE 13

DUE DATE: 30/04/87

DATE: 01/04/87

PAGE 13

STUDY NO. IRI151 PP 56 PP 16

SAMPLE = 4 SPIKED SAMPLE.

LAB	HARDNESS CALC'D	10606 HARDNESS COMMON ICP	11005 NA TOT AAS	11102 NA F AAS	11103 NA DIS FL PH	11105 NA DIS AAS DA	11107 NA UF FL PH	11311 NA EXT ICP	11990 COMMON ICP	12005 MG TOT ICP	12101 MG DIS CALC'D	12102 MG DIS AAS DA	12106 MG DIS AAS DA
1	-	201.	-	-	36.8	-	-	-	38.	-	-	-	-
2	195.	192.5	-	-	36.5	-	37.5	-	36.8	-	-	-	31.6
3	-	195.	198.	-	39.	-	36.5	-	37.5	-	-	-	-
4	-	200.	206.	4	-	-	-	-	39.	-	-	-	-
5	-	206.	205.	-	38.	-	-	-	36.5	-	-	-	-
6	-	195.	195.	-	34.5	-	-	-	36.1	36.1	-	-	-
7	-	205.	205.	-	36.	-	-	-	34.5	34.5	-	-	-
8	-	200.	-	43.7	-	37.0	-	-	36.	32.	-	-	-
9	-	-	-	-	-	-	-	-	37.0	37.0	-	-	-
10	-	-	-	-	-	-	-	-	43.7	43.7	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	195.0000	199.8900	36.2500	39.5667	37.5750	36.5000	37.5000	36.1000	37.6333	32.0000	32.0000	30.8333	31.6000
STD	4.8659	2.4749	2.4	3.8812	2.8098	-	-	-	2.2749	0.0000	-	3.7528	-
REL STD	-	6.8	6.8	9.8	2.2	-	-	-	6.0	-1.0	-	12.2	-
DES VAL	-	199.297	-	-	-	-	-	-	37.829	-	-	-	-

LAB	MG DIS AAS AUT	12108 MG HARDN CALC'D ICP	12111 MG DIS AAS AUT	12303 MG UF AAS AUT	12311 MG EXT ICP	12990 COMMON ANSAA	14102 MGNESIUM SILOICA MOLY AA	14105 SILOICA MOLY	14106 SILOICA MOLY AA	14190 SILICA ICP DA	15106 T P FIL UV ASC	15406 T P UP AA ASC	
1	-	31.	-	-	31.	-	31.	1.2	-	-	1.2	-	-
2	31.	-	-	-	-	-	31.6	1.22	-	-	1.22	-	-
3	-	-	-	-	-	-	31.6	-	1.13	-	1.13	-	0.003L
4	-	31.4	-	-	-	-	31.4	-	1.1	-	1.1	-	-
5	-	-	-	-	-	-	32.0	-	-	-	-	-	0.003
6	-	-	-	-	34.0	34.0	-	1.2	-	-	1.2	-	-
7	-	-	-	-	-	-	32.0	-	1.09	-	1.09	0.010L	-
8	-	-	-	-	-	-	33.0	-	-	-	1.2	-	0.003
9	-	-	-	-	-	-	32.0	-	-	-	-	-	0.01
10	-	-	-	32.0	-	-	32.0	-	-	-	-	-	-
11	-	-	-	-	-	-	33.0	-	-	-	-	-	-
12	-	-	-	-	-	-	32.0	-	-	-	-	-	-
13	-	-	-	-	-	-	26.3	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	0.0507	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL	-	-	-	1.8361	1.041	5.3	-	4.4	-	.0040
MEAN	31.0000	31.4000	32.0000	31.0000	34.0000	31.6250	1.2100	1.1475	1.1300	1.1800	1.1650	-	.0053
STD	DEV	REL STD	DES VAL</td										

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR151			PP 56			PP 16			DATE: 01/04/87			DUE DATE: 30/04/87			PAGE 14		
	SPIKED SAMPLE.												MAJOR IONS 4C.					
SAMPLE =	4																	
LAB	17208 CL DIS AA AG	17209 CL DIS I C	17210 CL DIS TIT CON	17990 CHLORIDE COMMON	19005 K TOT ICP	19102 K DIS AAS	19103 K DIS FLM PH	19106 K DIS AAS LI	19107 K EXT FLM PH	19301 HNO3 AA	19990 PTASSIUM COMMON	20005 CA TOT ICP	20100 CA DIS CALC'D					
1	-	-	-	59.	-	-	-	16.0	-	-	-	-	16.0	-	-	-	-	
2	58.8	57.	-	57.	-	58.8	-	15.8	-	-	-	-	15.8	-	-	-	-	
3	-	-	-	57.	-	-	-	16.6	-	-	-	-	16.5	-	-	-	-	
5	-	-	-	60.	-	-	17.	-	-	-	-	-	16.6	-	-	-	27.	
6	-	-	-	54.	-	-	16.65	-	-	-	-	-	16.65	-	-	-	-	
7	-	-	-	56.	-	-	-	-	-	-	-	-	16.0	-	-	-	-	
8	-	-	-	55.	-	17.	-	-	-	-	-	-	17.1	-	-	-	-	
9	-	58.	-	58.	-	15.3	-	-	-	-	-	-	15.3	-	-	-	-	
10	-	-	-	57.	-	-	-	-	-	-	-	-	16.1	-	-	-	-	
11	-	-	-	57.	-	-	-	16.	-	-	-	-	16.1	-	-	-	-	
12	-	-	-	49.4	-	-	22.0 R	-	-	-	-	-	22.0 R	-	-	-	-	
14	-	-	-	49.4	-	-	-	-	-	-	-	-	-	-	-	-	-	
MEAN	58.8000	56.0000	58.0000	56.5167	16.1500	16.8250	16.1250	16.0000	16.5000	16.0000	16.2682	26.0000	27.0000					
STD DEV	-	1.4142	-	2.7993	1.2021	1.2475	1.3403	-	-	-	-	-	5.274	-	-	-	-	
REL STD	-	2.5	-	5.0	7.4	1.5	2.1	-	-	-	-	-	3.2	-	-	-	-	
DES VAL	-	-	-	57.099	-	-	-	-	-	-	-	-	16.010	-	-	-	-	
LAB	20101 CA DIS EDTA	20103 CA DIS AAS	20108 CA DIS AAS UF	20110 CA DIS AAS AUT	20111 CA DIS ICP	20311 CA EXT ICP	20990 CALCIUM COMMON											
1	-	-	-	27.	-	-	-	-	-	-	-	-	27.	-	-	-	-	
2	-	-	26.0	-	26.	-	-	-	-	-	-	-	26.0	-	-	-	-	
3	27.6	-	-	-	-	-	-	-	-	-	-	-	27.6	-	-	-	-	
5	-	-	26.2	-	-	-	-	-	-	-	-	-	26.2	-	-	-	-	
6	-	-	-	-	-	-	-	-	-	-	-	-	26.6	-	-	-	-	
7	-	-	-	-	-	-	-	-	-	-	-	-	26.6	-	-	-	-	
8	-	-	-	-	-	-	-	-	-	-	-	-	26.6	-	-	-	-	
9	-	-	-	-	-	-	-	-	-	-	-	-	26.0	-	-	-	-	
10	-	-	28.	-	-	-	-	-	-	-	-	-	28.	-	-	-	-	
11	-	-	-	-	-	-	-	-	-	-	-	-	27.5	-	-	-	-	
12	-	-	19.2 R	-	-	-	-	-	-	-	-	-	27.5	-	-	-	-	
14	-	-	-	-	-	-	-	-	-	-	-	-	19.2 R	-	-	-	-	
MEAN	27.6000	27.1000	26.0000	26.5000	27.5000	26.6000	26.7182											
STD DEV	-	1.2728	-	1.7071	-	-	-	-	-	-	-	-	1.7441	-	-	-	-	
REL STD	-	4.7	-	2.7	-	-	-	-	-	-	-	-	2.8	-	-	-	-	
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	26.504	-	-	-	-	

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.		IR151		PP 56		PP 16		DATE: 01/04/87		DUE DATE: 30/04/87		PAGE 15	
SAMPLE = 5		SPIKED SAMPLE.								TRACE METALS S/E. (IN 0.2% HNO3)			
LAB	AL TOT AAS GF	13004	13009	13105	13111	13302	13305	13999	23003	23009	23011	23102	23111
	AL DIS ICP DA	AL DIS AAS GF	AL DIS ICP DA	AL DIS AAS GF	AL EXT AAS GF	AL EXT AAS GF	AL EXT AAS GF	COMMON	V EXT AAS GF	V TOT 5X ICP	V TOT 5X ICP	V DIS AAS SE	V DIS ICP DA
1	-	0.055	-	-	-	-	0.055	0.055	-	0.007	-	-	0.007
2	-	0.041	-	-	-	-	0.020	0.020	-	0.004	-	-	0.004
3	-	0.050	-	-	0.2	L	0.050	0.050	-	0.01 L	-	-	0.01 L HDL
6	-	-	-	-	0.03	-	0.03	0.03	-	-	-	0.006	0.006
8	-	-	-	0.036	-	-	0.036	0.036	-	-	0.005	0.005	-
9	-	-	-	-	-	-	0.048	0.048	-	-	0.006	0.006	-
10	-	-	-	-	-	-	-	-	-	-	-	-	0.003
12	-	0.048	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	.0480	.0487	.0360	.0300	.0375	.0405	.0030	.0030	.0070	.0040	.0060	.0055	.0052
STD	REL STD	.0071	-	.0000	.0247	.0132	-	-	-	-	.0007	.0016	.0015
DES VAL	-	14.6	-	-1.0	66.0	32.0	-	-	-	-	12.9	28.5	-
HCU													
LAB	CR TOT AAS GF	24009	24011	24056	24111	24302	24303	24999	25003	25011	25107	25111	25304
	CR DIS ICP DA	CR TOT 5X ICP	CR DIS AAS GF	CR DIS ICP DA	CR EXT AAS GF	CR EXT AAS GF	CR EXT AAS GF	CHROMIUM COMMON	MN TOT 5X ICP	MN TOT 5X ICP	MN DIS AAS GF	MN DIS ICP DA	MN EXT AAS DA
1	-	0.009	-	-	-	-	-	0.009	0.008L	-	-	-	-
2	-	-	0.006	-	-	-	-	0.007	0.007	-	-	-	0.006
3	-	-	0.004	-	-	-	-	0.004	0.008	-	-	-	-
6	-	0.008	-	-	-	-	-	0.007	0.007	-	-	-	-
8	-	0.007	-	-	0.007	-	0.008	-	0.007	-	-	0.006	-
9	-	-	-	-	-	0.008	-	0.008	-	-	-	0.003	-
10	-	-	-	-	-	0.008	-	0.008	-	-	0.006	-	-
11	-	-	-	-	-	0.01 L	-	0.01 L	-	-	0.006	-	-
12	-	-	-	-	-	-	-	-	-	-	0.006	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	.0075	.0090	.0050	.0080	.0070	.0080	.0070	.0073	.0015	.0055	.0060	.0045	.0080
STD	REL STD	.0007	-	.0014	.28.3	-	-	-	20.5	.0007	-	.0021	.0028
DES VAL	-	9.4	-	-	-	-	-	-	-	12.9	-	47.1	35.4
LAB	MN EXT AAS GF	25306	25311	25999	26011	26107	26111	26305	26306	26311	26999	27003	27009
	MN EXT ICP DA	AAS GF	MN EXT ICP DA	MANGANESE 5X ICP	FE TOT AAS GF	FE DIS AAS GF	FE DIS AAS GF	FE EXT AAS GF	FE EXT AAS GF	IRON COMMON	IRON COMMON	CO TOT AAS GF	CO TOT 5X ICP
1	-	-	-	0.008L	HDL	-	-	0.006	-	-	-	0.006	-
2	-	-	-	0.006	0.007	-	-	0.007	-	-	-	0.005	-
3	-	-	-	0.005	0.021R	-	-	0.007	-	-	-	0.004	-
6	-	-	0.020L	0.020L	-	0.01 L	-	0.020L	0.021R	-	-	-	-
8	-	-	-	0.006	0.003	-	0.006	-	0.01 L	0.021R	0.006	-	-
9	-	-	-	0.003	-	0.007	-	-	-	0.003	-	-	-
10	-	-	-	-	-	-	-	-	-	0.006	-	-	-
11	-	-	-	-	-	-	-	-	-	0.007	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	STD DEV	.0070	-	.0061	.0070	.0070	.0030	.0063	.0040	.0055	.0060	.0060	.0045
REL STD	REL STD	-	-	.0021	-	-	-	.0006	-	.0016	-	.0016	.0007
DES VAL	-	-	-	34.4	-	-	-	9.1	-	-	29.9	-	15.7

DATA SHEET

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO. IR151 PP 56 PP 16 DATE: 01/04/87

SAMPLE = 5 SPIKED SAMPLE.

DUE DATE: 30/04/87 PAGE 17

TRACE METALS: S/E. (IN 0.2% HNO3)

LAB	42999 MOLYBNUM COMMON	48003 CD TOT AS GF	48009 CD TOT 5X ICP	48011 CD DIS AAS GF	48103 CD TOT 5X ICP	48111 CD DIS ICP DA	48302 CD EXT AAS SE	48303 CD EXT AAS GF	48309 CADMIUM COMMON	48999 CD EXT AAS GF	56009 BA TOT 5X ICP	56011 BA TOT ICP DA
1	0.007	-	0.005	-	-	-	-	-	0.005	0.023	-	-
2	0.007	-	-	0.005	-	-	0.005	-	0.005	-	0.023	-
3	0.007	-	-	0.005	-	-	0.005	-	0.005	-	0.024	-
6	0.007	-	-	0.005	-	-	-	-	0.005	-	-	-
8	0.010L	0.005	-	-	-	-	-	-	0.005	-	-	0.024
9	0.008	-	-	-	-	0.004	-	-	0.005	-	-	0.02
10	0.008	-	-	-	-	-	0.005	-	0.004	-	-	-
11	0.007	-	-	-	-	-	-	-	0.005	-	-	-
12	0.007	-	-	-	-	-	-	-	0.005	-	-	-
14	0.1 L MDL	-	-	-	-	-	-	-	0.005	-	-	-
MEAN	.0072	.0050	.0050	.0050	.0050	.0040	.0040	.0050	.0049	.0230	.0235	.0220
STD DEV	.0004	-	-	.0000	-	-	.0000	-	.0003	-	.0007	.0028
REL STD	6.2	-	-	-1.0	-	-	-1.0	-	6.5	-	3.0	12.9
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-

LAB	56999 BARIUM COMMON	82004 PB TOT AS GF	82011 PB TOT 5X ICP	82104 PB DIS AAS GF	82202 PB EXT AAS SE	82305 PB EXT AAS GF	82309 LEAD COMMON
1	0.023	-	-	-	0.004	-	-
2	0.023	-	0.005	-	0.005	-	0.004
3	0.023	-	0.005L	-	0.005	-	0.005
6	0.024	-	-	-	-	-	0.005L
8	0.024	0.005	-	-	-	0.006	0.006
9	0.024	-	-	-	-	-	0.005
10	0.02	-	-	-	-	-	-
11	-	-	-	0.005	-	-	0.005
12	-	-	-	-	0.005	-	0.005
14	-	-	-	-	-	0.005	0.005
MEAN	.0228	.0050	.0050	.0050	.0048	.0050	.0060
STD DEV	.0016	-	-	.0005	-	-	.0050
REL STD	7.2	-	-	-	10.5	-	10.7
DES VAL	-	-	-	-	-	-	-

DATES RECEIVED 1 87/04/02 2 87/05/04 3 87/04/15 3 87/05/08 4 87/04/08
5 87/05/26 6 87/04/07 7 87/05/26 8 87/05/12 9 87/04/06
10 87/05/25 11 87/04/14 12 87/05/07 14 87/04/29NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT, THE EXCEPTIONS BEING:
COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN USIE/CM, TURBIDITY IN JTU OR NTU, NITROGEN
ANALYSES IN "N", ALKALINITY & HARDNESS IN CACO3, SILICA IN SIO2, AND SULFATE IN SO4.

DISTRIBUTION - IROC

Mr. H. Agemian
Head, Scientific Services Section
National Water Quality Laboratory

Mr. G. Brun
Head, Analytical Services Section
Atlantic Region Water Quality Branch

Ms. P. Thomson
A/CIC, Water Resources Laboratory
INAC, NAP
Yellowknife, NWT

Ms. D. Duval
Head, Analytical Services Section
Quebec Region Water Quality Laboratory

Mr. F. Mah
Head, Analytical Services Section
Pacific Region Water Quality Branch

Mr. J-G. Zakrevsky
Head, Analytical Services Section
Western Region Water Quality Branch

cc:

Dr. B.K. Afghan
Chief, NWQL, CCIW
Burlington, Ontario

Mr. L. Martel
Chief, Water Quality Branch
Quebec Region, Longueuil, P. Q.

Mr. D.H. Cullen
Chief, Water Quality Branch
Atlantic Region
Moncton, New Brunswick

Mr. A. S. Y. Chau
Project Chief
Quality Assurance Project
NWRI, CCIW

Dr. W.E. Erlebach
Chief, Water Quality Branch
Pacific Region
Vancouver, B. C.

Mr. W.D. Gummer
Chief, Water Quality Branch
Western Region
Regina, Saskatchewan



Government
of Canada Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

TO
À

Distribution

FROM
DE

H. Alkema
Quality Assurance Section
National Water Research Institute
Burlington, Ontario

SUBJECT
OBJET

Inter-regional Quality Assurance Program (IRQC)

H. Alkema\NWRI\336-4929\ha

SECURITY - CLASSIFICATION - DE SECURITÉ

OUR FILE/NOTRE RÉFÉRENCE

YOUR FILE/VOTRE RÉFÉRENCE

DATE

August 25, 1987

I have enclosed the final report for IR 151-153.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A.

H. Alkema

SUMMARY REPORT

INTER-REGIONAL QUALITY ASSURANCE PROGRAM

STUDIES 152 AND 153

for May and June, 1987

**TRACE METALS, MAJOR IONS, NUTRIENTS
AND PHYSICAL PARAMETERS IN SURFACE WATERS**

by

H. Alkema

**Quality Assurance Section
National Water Research Institute
Burlington, Ontario**

August 1987

Introduction

As part of an on-going study, the Quality Assurance Section, NWRI in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the IR program. This report summarizes the most recent IR interlaboratory quality control studies: IR 152 and 153, for the months May and June, 1987. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The levels were from low to high.

Study Design

Five water samples were submitted to each laboratory for chemical analyses. Three samples were submitted for trace metals analysis, while the remaining two were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the five samples:

IR 152 - Sample 1 - 125 ml, DA* for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

IR 153 - Sample 3 - 1L, SE* for trace metals (0.2% HNO₃)
Sample 4 - up to 1L, major ions, etc., stored at 4°C
Sample 5 - 125mL, DA as sample 1

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were recorded on report sheets provided with the IR samples. Upon receipt of the Reporting Sheets, the results were tabulated for each parameter, first for each method reported, and then for all methods combined. These data, and the resulting statistics are presented in the Data Summary. (attached)

Preliminary data summaries, including problematic results, were sent July 2 or 10 and July 30. Each laboratory was given three weeks to notify us of any errors in data transcription or compilation.

Performance Indicators

In previous reports the mean has always been used as comparator for accuracy assessment. We now have "design values" for several reference waters (RMs) and certified reference waters (CRMs). These design values are used to test each reported result (whether few or many) for accuracy. Consequently, for stable parameters, the design values will be used as comparator for the ten percent warning circles, and the mean will be used for unstable parameters (perhaps due to biological activity).

Percentage deviations from the comparator are used as an indicator for the laboratory head to determine the extent of the discrepancies between the laboratory result and comparator as it applies to his procedures. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than 10% from the comparator is circled in the data tables and its value noted in the comments which follow. Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned 'HDL' and is labelled in the Data Summary.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

General Comments: There was no high coefficient of variation (incomparability) observed for any parameter.

Individual laboratory deviations are listed below:

Lab 2 - no anomalies

Lab 3 - low results by SE for V: -12%; Fe: -19%; & Zn: -24%

Lab 4 - no anomalies

- an HDL for Ammonia

Lab 5 - low results for $\text{NO}_3 + \text{NO}_2$: -17% & -88%; K: -18%; TN: -57%
- a high result for pH: 11%

Lab 7 - results for $\text{NO}_3 + \text{NO}_2$: +23%; SO_4 : +46% (R); K: +56% (R)
- high results at low level for TP

Lab 11 - a high result by DA for Cr: +20%
- a low result for SO_4 : -39%
- a high result: $\text{NO}_3 + \text{NO}_2$: +17%; F: +39%; Cl: +23% (R);
and Turbidity (R)

IR laboratories average number of deviations per sample was 0.7.

* (R) = rejectable by Grubb's procedure for statistical calculation.

APPENDIX I

Definitions of Types of Metals Analysis

1. DA - Direct Aspiration

Without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS) or Inductively Coupled (Argon) Plasma (ICAP or ICP). Standards should contain the acid equivalent of the sample.

2. SE - Code for low level analysis

Analysis is carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP.
3. Digestion of aqueous phase and ICAP analysis.
4. Graphite tube (flameless) AAS.

APPENDIX II

Performance Indicators

1. Circled Results

Results are circled in the data tables when a minor deviation from the comparator has occurred. (The comparator is the design value of the reference sample, or the mean in the case of a biologically active sample.) Circled results are in general greater than or less than 10% from the comparator. At very low levels of analytes or with parameters that are difficult to analyse, a greater deviation than 10% is allowed. Under these conditions, a result is circled when it is outside one standard deviation of the comparator. These circled results, though acceptable values, are a warning to laboratory managers that the parameter analysis should be investigated.

2. Rejectable Results

Each laboratory result is statistically tested to see if it is outlying. Outlying results were caused by non random causes such as a faulty calibration or a transcription error. These outlying results, calculated by the Grubbs' procedure, and indicated in the data tables with an 'R', are noncomparable with the other data for the parameter.

3. A High Co-efficient of Variation (HCV)

Occasionally data for a parameter yields a very high relative standard deviation (RSD). When this HCV is not due to outlying values, it indicates a high variability within the data set. The data in this set is then noncomparable. In such a case, the RSD for the parameter is circled in the data tables and the parameter's noncomparability is noted in the comments.

4. High Detection Limits (HDL)

Each laboratory determines its own detection limits according to its own requirements. When major differences of detection limits occur, the result is flagged with 'HDL' in the data tables. An HDL indicates that low level analysis may not be comparable with the analyses of other laboratories.

* reference : Frank E. Grubbs, Technometrics, 1969, p. 1.

DATA ARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

SAMPLE = 1 STUDY NO. IR152 PP 57 FP 17 DATE: 01/05/87 DUE DATE: 30/06/87 PAGE 1

LAB	24009	24011	24111	24302	24311	24999	25003	25011	25111	25304	25311	25999
	CR TOT	CR TOT	CR DIS	CR EXT	CR EXT	CHROMIUM	MN TOT	MN TOT	MN DIS	MN EXT	MN EXT	MANGANESE
	5X ICP	5X ICP	ICP DA	AAS DA	ICP DA	COMMON	5X ICP	5X ICP	AAS DA	AAS DA	ICP DA	COMMON
1	-	-	-	-	-	0.112	0.103	-	-	-	-	-0.103
2	-	-	-	-	-	0.102	0.102	-	-	-	-	-0.103
3	-	-	-	-	-	0.11	0.11	-	-	-	-	-0.103
6	-	-	-	-	-	0.10	0.12	-	-	-	-	-0.12
8	-	-	-	-	-	0.091	0.091	-	-	-	-	-0.097
9	-	-	-	-	-	0.10	0.10	-	-	-	-	-0.097
10	-	-	-	-	-	0.10	0.10	-	-	-	-	-0.096
11	-	-	-	-	-	0.091	0.091	-	-	-	-	-0.096
14	-	-	-	-	-	0.082	0.082	-	-	-	-	-0.109
MEAN	.1120	.1100	.0955	.0910	.1020	.1030	.1200	.1090	.0965	.1015	.0950	.1023
STD DEV	-	-	.0064	.0127	-	.0121	-	.0121	.0067	.0021	.0071	.0091
REL STD	-	-	6.7	14.0	-	11.8	-	11.8	.7	2.1	7.4	8.9
DES VAL	-	-	-	-	-	.098	-	-	-	-	-	.098

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

SAMPLE = 1

PAGE 3

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IR152 PP 57 PP 17

PAGE 4

SAMPLE = 2

	STUDY NO.	IR152	PP 57	PP 17	SAMPLE = 2										PAGE 4	
					02011 00120 IONIC BALANC % CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPAREN	02021 COLOUR VIS COM	02033 COLOUR SPECTRO	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02072 TURBDTY HELLIGE	02073 TURBDTY HACH	02074 TURBDTY NPLMTRI	02077 TURBDTY HACH FZ
1	-2.06	0.95	0.99	-	-	-	-	-	5.	L	95.	95.	-	0.1	-	
2	-1.39	0.936	0.910	0.99	5.	L	-	-	5.	L	95.6	95.6	0.08	0.3	-	
3	-0.93	0.945	0.962	0.962	5.	L	5.	L	5.	L	95.5	95.5	0.11	0.11	-	
4	-0.70	0.947	0.934	0.934	5.	L	-	-	5.	L	91.0	91.0	0.10	0.20	0.21	
5	0.70	0.8	0.9	0.9	3.	L	-	-	3.	L	94.0	94.0	-	0.2	-	
6	5.9	0.95	0.96	0.96	5.	L	-	-	5.	L	100.	100.	-	0.2	0.12	
7	-0.6	1.00	0.967	0.967	5.	L	-	-	5.	L	97.8	97.8	-	-	-	
8	1.83	-	-	-	2.	-	2.	-	5.	L	92.	92.	-	-	-	
9	4.7	0.99	0.968	0.968	5.	L	-	-	5.	L	94.	94.	-	-	-	
10	-0.43	0.960	-	-	0.0	-	-	-	0.0	R	99.	99.	0.5	-	-	
11	-	-	-	-	-	-	-	-	78.2	R	78.2	R	0.1	-	-	
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MEAN	1.1667	9420	9434	3.2500	5.0000	2.0000	3.3333	95.0750	95.0750	1.0000	2150	2150	.1700	.1200		
STD DEV	2.6475	.0574	.0334	2.3629	72.7	-	-	2.0656	2.7860	2.860	-	1620	.0608	-	-	
REL STD	226.9	6.1	3.5	-	-	-	-	62.0	2.9	2.9	-	75.3	35.8	-	-	
DES VAL	-	-	-	-	-	-	-	3.829	-	94.046	-	-	-	-	-	
LAB	02090	05105	05106	BORON F AZOMETH	05111	BORON P ICP DA	05190 Boron COMMON	06008 TOC CO2 FLM	06052 TIC CO2 ?	06101 DOC IR /DIF	06104 DOC UV CO2 PHE	06107 DOC UV CO2 OH	06109 DOC UV CO2 PHE	06151 DIC IR COMBUST		
1	-	0.1	-	-	-	-	-	-	-	-	-	1.0	-	1.0	-	
2	0.08	-	0.04	-	-	-	-	-	-	-	1.3	-	-	-	-	
3	0.3	0.1	-	-	-	-	-	0.04	-	-	1.2	-	-	1.2	-	
4	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	0.21	-	-	-	0.05	L	0.01	0.01	-	-	-	-	-	-	-	
8	0.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
13	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MEAN	1.1836	0.0400	-	-	.0100	.0250	-	-	-	-	1.1500	1.1500	.9000	1.1500	10.8000	
STD DEV	1.1249	-	-	-	.0212	-	-	-	-	-	0.707	2.121	-	1.581	-	
REL STD	68.0	-	-	-	84.9	-	-	.035	-	-	6.1	18.4	-	14.4	-	
DES VAL	.1188	-	-	-	-	-	-	-	-	-	-	-	-	1.292	-	
LAB	06152	06154	06159	DIC AA CO2 OH	06490	TKN AA DIC COMMON	07004 TKN AA NITPRUS	07015 TKN DIG BERTHL	07016 TKN BLK AMK-SAL	07021 TKN BLK INDOPHE	07090 TKN DIG BER COMMON	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC		
1	-	-	9.9	-	9.9	-	-	-	-	-	0.070	0.070	-	-	0.230	
2	10.3	-	-	-	10.3	-	-	-	-	-	-	-	0.29	-	-	
3	9.8	-	-	-	9.8	-	-	-	-	-	-	-	0.30	-	-	
4	-	-	-	-	-	-	-	-	-	-	-	-	0.250	-	-	
5	-	-	-	-	-	-	-	-	-	-	-	-	0.31	-	-	
6	-	-	-	-	-	-	-	-	-	-	-	-	0.310	-	-	
7	-	-	-	-	-	-	-	-	-	-	-	-	0.35	-	-	
8	-	-	-	-	-	-	-	-	-	-	-	-	0.30	-	-	
9	-	-	-	-	-	-	-	-	-	-	-	-	0.29	-	-	
10	-	-	10.0	-	10.0	-	-	0.20	L	0.3	R	-	0.310	-	-	
11	-	-	-	-	-	-	-	-	-	-	-	-	0.35	-	-	
12	-	-	-	-	-	-	-	-	-	-	-	-	0.30	-	-	
13	-	-	-	-	-	-	-	-	-	-	-	-	0.29	-	-	
14	-	-	-	-	-	-	-	-	-	-	-	-	0.29	-	-	
MEAN	10.0500	9.9000	10.0000	10.1600	-	-	-	-	-	-	.0700	.0750	.2967	.3000	.2600	
STD DEV	3.3536	3.5	-	-	-	-	-	-	-	-	.0015	.0071	.3.9	1.07	.0424	
REL STD	-	-	-	-	-	-	-	-	-	-	-	-	1.63	-	-	
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	0.075	-	-	

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

SAMPLE = 2

PAGE 5

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

PAGE 7

SAMPLE = 2

STUDY NO. TR152 PP 57 FP 17

LAB	19102 K DIS AAS	19103 K DIS FLM PH	19106 K DIS AAS LI	19107 K DIS FLM PH	19301 K EXT HNO3 AA	19990 POTASSIUM COMMON	20005 CA TOT ICP	20100 CA DIS CALC'D	20101 CA DIS EDTA	20103 CA DIS AAS	20108 CA DIS AAS UF	20110 CA DIS ICP	20311 CA EXT
					-	0.5	-	-	0.49	-	-	-	-
1	-	0.49	-	-	0.46	-	0.49	-	-	-	-	-	-
2	-	0.4	-	-	-	-	0.46	-	-	-	-	-	-
3	0.5	-	-	-	-	-	0.4	-	-	-	-	-	-
4	0.47	-	-	-	-	-	0.47	-	-	-	-	-	-
5	-	-	-	-	-	-	0.47	-	-	-	-	-	-
6	-	-	-	-	-	-	0.47	-	-	-	-	-	-
7	-	-	-	-	-	-	0.47	-	-	-	-	-	-
8	-	-	-	-	-	-	0.47	-	-	-	-	-	-
9	-	-	-	-	-	-	0.47	-	-	-	-	-	-
10	-	-	-	-	-	-	0.48	-	-	-	-	-	-
11	-	-	-	-	-	-	0.5	-	-	-	-	-	-
12	-	0.449	0.5	-	-	-	0.5	-	-	-	-	-	-
13	-	-	-	-	-	-	0.449	-	-	-	-	-	-
14	-	-	-	-	-	-	0.449	-	-	-	-	-	-
MEAN	4730	4725	.5000	.4600	.4700	.4766	13.4000	12.8000	13.4000	13.3800	13.2000	13.0000	13.6000
STD DEV	0.256	0.486	-	-	-	.0300	1.414	-	-	4.5524	-	-	-
REL STD	5.4	10.3	-	-	-	6.3	1.1	-	-	4.1	-	-	-
DES VAL	-	-	-	-	-	.487	-.487	-	-	-	-1.0	-	-

20990
LAB
CALCIUM
COMMON

1	13
2	13
3	13.2
5	13.4
6	12.8
7	13.2
8	13.6
9	13.5
10	13.3
11	14.3
12	12.94
14	12.94

MEAN	13.2673
STD DEV	.3461
REL STD	2.6
DES VAL	12.626

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	SAMPLE = 3 SPIKED SAMPLE.			DATE: 01/06/87			DUE DATE: 30/06/87			PAGE 8		
	LAB	AL TOT 5X ICP	AL DIS AAS GF	AL EXT AAS GF	AL TOT 5X ICP	AL EXT AAS SE	AL EXT AAS OX	AL TOT 5X ICP	AL EXT AAS GF	AL TOT 5X ICP	AL EXT AAS SE	AL TOT 5X ICP
1	-	-	-	-	-	0.080	0.083	-	0.083	-	0.048	-
2	-	-	-	-	0.080	0.080	-	0.086	0.080	-	-	-
3	-	-	-	-	0.080	-	-	0.086	0.080	-	-	-
6	0.089	-	-	-	0.080	-	-	0.086	0.080	-	-	-
8	-	-	-	0.2	L	-	-	0.089	0.2 HDL	-	0.053	-
9	-	-	0.09	0.09	-	-	-	0.09	-	-	-	0.050
10	-	-	0.074	0.09	-	-	-	0.09	-	-	0.050	-
12	-	0.150R	-	-	-	-	-	0.074	-	-	0.050	-
14	-	-	-	-	-	-	-	0.150R	0.050	-	-	-
MEAN	.0890	-	.0740	.0900	-	.0800	.0830	.0860	.0837	.0500	.0530	.0500
STD DEV	-	-	-	.0000	-	.0000	-	-	.0062	-	-	.0000
REL STD	-	-	-	-1.0	-	-1.0	-	-	7.4	-	-	-1.0
DES VAL	-	-	-	-	-	-	-	-	.088	-	-	-
LAB	23301	23311	23999	24004	24009	24011	24056	24111	24302	24303	24311	24999
	V EXT AAS DA	V EXT AAS DA	V EXT AAS DA	CR TOT 5X ICP	CR TOT 5X ICP	CR TOT 5X ICP	CR DIS AAS GF	CR DIS AAS GF	CR DIS AAS DA	CR EXT AAS SE	CR EXT AAS SE	CHROMIUM COMMON
1	0.045	0.047	0.048	0.045	0.053	0.083	0.066	-	-	0.056	0.064	0.051
3	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	0.066	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	0.065	-	-	-
10	-	-	-	-	-	-	-	-	0.066	-	-	-
11	-	-	-	-	-	-	-	-	-	0.060	-	-
12	-	-	-	-	-	-	-	-	-	-	0.062	-
14	-	-	-	-	-	-	-	-	0.038	-	-	0.018
MEAN	.0450	-	.0470	.0494	.0024	.051	.0660	.0620	.0655	.0380	.0580	.0640
STD DEV	-	-	-	-	-	-	-	-	.0007	-	4.9	-
REL STD	-	-	-	-	-	-	-	-	1.1	-	-	-
DES VAL	-	-	-	-	-	-	-	-	-	4.9	-	.066
LAB	25011	25107	25111	25304	25305	25306	25311	25999	26011	26107	26304	26305
	MN TOT 5X ICP	MN DIS AAS GF	MN EXT AAS DA	MN EXT AAS SE	MN EXT AAS DA	MN EXT AAS GF	MN EXT AAS GF	MANGANESE COMMON	MANGANESE COMMON	FE TOT 5X ICP	FE DIS AAS GP	FE EXT AAS DA
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
6	0.050	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	.0500	-	.0500	.0510	.0014	.0500	.0470	-	.0495	.0500	.0650	.0780
STD DEV	-	-	-	-	-	-	-	-	.0007	.0014	.0050	.0028
REL STD	-	-	-	-	-	-	-	-	2.8	-	.0014	.0120
DES VAL	-	-	-	-	-	-	-	-	1.4	-	.0076	.0080

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IR153 PP 58 PP 18 SAMPLE = 3

LAB	FE EXT AAS GF	26311 PE EXT ICP DA	26999 IRON COMMON	27003 CO TOT AAS GF	27009 CO TOT 5X ICP	27011 CO TOT 5X ICP	27107 CO DIS AAS GF	27111 CO DIS ICP DA	27301 CO EXT AAS DA	27302 CO EXT AAS SE	27311 CO EXT ICP DA	27999 COBALT COMMON	28009 NI TOT 5X ICP	
1	-	-	0.082	0.086 <i>0.063</i>	-	0.068	-	-	-	-	-	0.068	0.063	-
2	-	-	0.082	0.082 <i>0.082</i>	-	-	0.061	-	-	-	0.060	0.060	-	-
3	-	-	0.08	0.08 <i>0.08</i>	0.080	-	-	0.082 <i>0.062</i>	-	-	-	0.061 <i>0.061</i>	-	-
4	-	-	0.08	0.08 <i>0.08</i>	-	-	-	-	-	-	-	0.062 <i>0.062</i>	-	-
5	-	-	0.076	0.076 <i>0.060</i>	-	-	-	0.062 <i>0.062</i>	-	0.064	-	0.064 <i>0.064</i>	-	-
6	-	-	0.076	0.076 <i>0.060</i>	-	-	-	0.062 <i>0.062</i>	-	-	-	0.064 <i>0.064</i>	-	-
7	-	-	0.076	0.076 <i>0.055</i>	-	-	-	0.060 <i>0.060</i>	-	0.083 <i>0.083</i>	-	0.060 <i>0.060</i>	-	-
8	-	-	0.076	0.076 <i>0.055</i>	-	-	-	0.060 <i>0.060</i>	-	0.083 <i>0.083</i>	-	0.060 <i>0.060</i>	-	-
9	-	-	0.076	0.076 <i>0.055</i>	-	-	-	0.060 <i>0.060</i>	-	0.083 <i>0.083</i>	-	0.060 <i>0.060</i>	-	-
10	-	-	0.076	0.076 <i>0.055</i>	-	-	-	0.060 <i>0.060</i>	-	0.083 <i>0.083</i>	-	0.060 <i>0.060</i>	-	-
11	-	-	0.076	0.076 <i>0.055</i>	-	-	-	0.060 <i>0.060</i>	-	0.083 <i>0.083</i>	-	0.060 <i>0.060</i>	-	-
12	-	-	0.076	0.076 <i>0.055</i>	-	-	-	0.060 <i>0.060</i>	-	0.083 <i>0.083</i>	-	0.060 <i>0.060</i>	-	-
13	-	-	0.076	0.076 <i>0.055</i>	-	-	-	0.060 <i>0.060</i>	-	0.083 <i>0.083</i>	-	0.060 <i>0.060</i>	-	-
14	0.055	-	0.076	0.076 <i>0.055</i>	-	-	-	0.060 <i>0.060</i>	-	0.083 <i>0.083</i>	-	0.060 <i>0.060</i>	-	-
MEAN	-	-	0.0810	0.0741	-	0.0800	-	0.0610	-	0.0710	-	0.0640	-	0.0630
STD DEV	-	-	0.0014	0.0105	-	0.0014	-	0.0014	-	0.0127	-	0.0030	-	0.0096
REL STD	-	-	1.7	14.2	-	1.7	-	1.78	-	17.9	-	-	-	14.0
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LAB	NI TOT 5X ICP	28107 NI DIS AAS GF	28111 NI DIS ICP DA	28301 NI EXT AAS DA	28302 NI EXT AAS SE	28309 NI EXT AAS GF	28311 NI EXT ICP DA	28999 NICKEL COMMON	29009 CU TOT 5X ICP	29011 CU TOT 5X ICP	29107 CU DIS AAS GF	29111 CU DIS ICP DA	29305 CU EXT AAS SE	
1	-	-	-	-	-	-	-	-	0.063	0.048	-	-	-	-
2	-	-	-	-	-	0.069	-	0.064	0.069	-	-	-	-	0.052
3	0.064	-	-	-	-	-	0.075	-	0.064	0.064	-	-	-	0.060
4	-	-	-	-	0.067	-	-	-	0.067	-	-	-	-	-
5	-	-	-	-	0.066	-	-	-	0.066	-	-	-	-	-
6	-	-	-	-	0.066	-	-	-	0.066	-	-	-	-	-
7	-	-	-	-	0.066	-	-	-	0.066	-	-	-	-	-
8	-	-	-	-	0.066	-	-	-	0.066	-	-	-	-	-
9	-	-	-	-	0.066	-	-	-	0.066	-	-	-	-	-
10	-	-	0.061	-	-	0.072	-	-	-	0.072	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	0.049	-	0.051
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	-	-	0.0610	0.0665	-	0.0720	-	0.0685	-	0.0640	-	0.0480	-	0.043
STD DEV	-	-	-	0.0007	-	1.1	-	1.0	-	-	-	0.0044	-	0.049
REL STD	-	-	-	-	-	-	-	-	-	-	-	0.066	-	0.057
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1
LAB	29308 CU EXT AAS GF	29311 CU EXT ICP DA	29999 COPPER COMMON	30009 ZN TOT 5X ICP	30011 ZN TOT 5X ICP	30107 ZN DIS AAS GF	30111 ZN DIS ICP DA	30304 ZN EXT AAS DA	30305 ZN EXT AAS SE	30311 ZN EXT ICP DA	30999 ZINC COMMON	38011 SR TOT ICP DA		
1	-	-	0.048	0.058	-	-	-	-	0.057	0.041	-	-	-	0.058
2	-	-	0.052	-	-	0.062	-	-	-	-	0.056	-	-	0.057
3	-	-	0.060	-	-	-	-	-	-	-	0.06	-	-	0.062
4	-	-	0.051	-	-	-	-	-	0.059	-	-	-	-	0.059
5	-	-	0.051	-	-	-	-	-	0.057	-	-	-	-	0.057
6	-	-	0.051	-	-	-	-	-	0.060	-	-	-	-	0.060
7	-	-	0.049	-	-	-	-	-	-	-	-	-	-	0.063
8	-	-	0.049	-	-	-	-	-	-	-	-	-	-	0.063
9	-	-	0.120R	-	-	-	-	-	-	-	-	-	-	0.063
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	0.120R	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	-	0.0495	0.0523	0.0580	-	0.0620	-	0.0600	-	0.0580	-	0.0570	-	0.0580
STD DEV	-	0.0007	0.042	-	-	-	-	-	2.4	-	2.3	-	4.9	10.7
REL STD	-	1.4	8.1	-	-	-	-	-	-	-	-	-	-	0.054
DES VAL	-	-	0.051	-	-	-	-	-	-	-	-	-	-	-

PAGE 9

DATA SUMMARY - FED-PROV & PPWB OC PROGRAMS

STUDY NO. IR153 PP 58 FP 18

PAGE 10

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

PAGE 13

SAMPLE = 4

STUDY NO. IR153 PP 58 FP 18

PAGE 11

STUDY NO. IR153 PP 58 PP 18

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IRI53 PP 58 FP 18 SAMPLE = 4

PAGE 12

LAB	NO ₃ +NO ₂ UF AA CD COMMON	07390 NITRATE NH ₃ TOT AA BERT	07505 NH ₃ TOT SPEC EL	07555 NH ₃ DIS AA PHEN	07557 NH ₃ DIS AA INDO	07562 NH ₃ DIS AA EDTA	07563 AMMONIA COMMON	07601 T N UV AA SUL	07602 T N UV CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA
1	-	0.024	-	-	-	0.002L	-	0.002L	0.1	L	-
2	0.032	0.032	0.001	0.05 L	-	0.002L	-	0.001	0.1	L	-
3	-	0.032	0.03	-	-	0.002L	-	0.002L	0.1	L	0.04
4	-	0.03	0.03	-	-	0.01 L	-	0.002L	0.05 L	HDL	-
5	-	0.01 L	0.01 L	-	-	0.005	-	0.005	0.01 L	-	-
6	-	0.02	-	-	-	0.010L	-	0.010L	0.03 L	HDL	-
7	-	0.02	-	-	-	0.03 L	-	0.005L	0.005 L	HDL	-
8	-	0.02	-	-	-	0.010L	-	0.005L	0.005 L	HDL	-
9	-	0.02	-	-	-	0.010L	-	0.005L	0.005 L	HDL	-
10	-	0.02	-	-	-	0.010L	-	0.005L	0.005 L	HDL	-
11	-	0.02	-	-	-	0.010L	-	0.005L	0.005 L	HDL	-
12	-	0.02	-	-	-	0.010L	-	0.005L	0.005 L	HDL	-
13	-	0.01 L	0.01 L	0.06 R	-	-	-	0.005R	0.005 R	-	-
14	-	0.01 L	0.01 L	0.06 R	-	-	-	0.005R	0.005 R	-	-
MEAN	.0320	.0254	.0010	-	.0050	-	-	.0030	-	.0600	.0400
STD DEV	-	.0105	-	-	-	-	-	.0028	-	-	-
REL STD	-	.41.3	-	-	-	-	-	.94.3	-	-	-
DES VAL	-	.026	-	-	-	-	-	.004	-	-	-

LAB	T N DIS UV EDTA COMMON	07690 TOT N DIS COMMON	07790 T N DIS COMMON	09103 F DIS COL SP	09105 F DIS SP EL	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL	09115 F DIS AA ALIZ	09190 FLUORIDE COMMON	10101 ALKALINTY TITR-N	10108 ALKALINTY POT TIT
1	-	-	0.1 L	-	-	0.05 L	-	0.05 L	-	0.05 L	5.	-
2	-	-	0.1 L	-	-	0.05 L	-	0.05 L	-	0.05 L	5.	-
3	-	-	0.04	-	-	0.05 L	-	0.05 L	-	0.05 L	5.	-
4	0.015	-	0.015	-	0.1 L	-	0.11	-	0.03	0.11	0.2	20. L
5	-	-	0.22 L	-	0.11	-	-	-	0.04	0.04	0.1	1.00 L
6	-	-	0.22 L	-	0.11	-	-	-	0.04	0.05 L	0.5	-
7	-	-	0.05	-	-	0.05 L	-	0.05 L	-	0.05 L	0.5	-
8	-	-	0.06	-	-	0.05 L	-	0.05 L	-	0.05 L	0.5	-
9	-	-	0.06	-	-	0.05 L	-	0.05 L	-	0.05 L	0.5	-
10	-	-	0.06	-	-	0.05 L	-	0.05 L	-	0.05 L	0.5	-
11	-	-	0.06	-	-	0.05 L	-	0.05 L	-	0.05 L	0.5	-
12	-	-	0.06	-	-	0.05 L	-	0.05 L	-	0.05 L	0.5	-
13	-	-	0.06	-	-	0.05 L	-	0.05 L	-	0.05 L	0.5	-
14	-	-	0.06	-	-	0.05 L	-	0.05 L	-	0.05 L	0.5	-
MEAN	.0150	.0600	.0350	-	.1100	-	-	.0350	.0600	.0436	.0667	1.0000
STD DEV	-	.0600	.0180	-	.1100	-	-	.0071	.0071	.046	.1155	-
REL STD	-	.053	.51.5	.055	-	-	-	.20.2	.20.2	.72.6	.173.2	-
DES VAL	-	.053	.51.5	.055	-	-	-	.20.2	.20.2	.72.6	.173.2	-
LAB	101110 ALKALINTY GRN TIT	101112 ALKALINTY TIT PRO	101116 ALKALINTY CO ₂ IR	101190 ALKALINTY COMMON	10301 PH COMMON	10390 PH COMMON	10602 HARDNESS CALC'D	10603 HARDNESS TITR-N	10690 HARDNESS CALC'D	11005 HARDNESS COMMON	11102 NA TOT ICP	11102 NA F AAS
1	0.1	0.2	-	5.1 L	5.8	5.4	147.5	-	-	147.5	-	-
2	-	-	1.0	0.1	5.4	5.5	-	-	144.	144.	-	-
3	-	-	-	0.0	5.5	5.5	-	-	-	-	-	-
4	-	-	-	0.5	5.5	5.5	-	-	147.0	147.0	-	-
5	-	-	-	20.1	5.40	5.40	-	-	147.0	147.0	-	-
6	-	-	-	20.2	5.3	5.3	-	-	150.3	150.3	-	-
7	-	-	-	1.00 L	5.55	5.55	-	-	150.3	150.3	-	-
8	-	-	-	1.0	5.55	5.55	-	-	150.3	150.3	-	-
9	-	-	-	0.1 L	5.52	5.52	-	-	150.3	150.3	-	-
10	-	-	-	0.5 L	5.3	5.3	-	-	150.3	150.3	-	-
11	-	-	-	0.5 L	5.7	5.4	-	-	150.3	150.3	-	-
12	-	-	-	0.0	5.4	5.4	-	-	150.3	150.3	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	.1000	.2000	-	.3833	5.5150	5.5150	149.7667	144.0000	149.4222	19.9000	19.2733	-
STD DEV	-	-	-	.4834	2.9586	2.9586	2.5423	2.17	2.6278	4.8485	4.31	-
REL STD	-	-	-	126.1	2.9	2.9	3.7	1.7	3.1	4.3	5.7	-
DES VAL	-	-	-	.814	5.479	5.479	5.479	5.479	5.479	148.4336	-	-

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

PAGE 13

SAMPLE = 4

STUDY NO. 1B153 pp 58 EP 18

LAB	NA DIS FL PH AAS DA	11105 NA UF FL PH AAS DA	11107 NA EXT ICP	11311 SODIUM COMMON	11990 MG TOT ICP	12005 MG DIS CALC'D	12101 MG DIS AAS DA	12102 MG UF AAS DA	12107 MG HARDN AAS AUT	12303 MG UF AAS AUT	12311 MG EXT ICP
1	1.2	18.7	-	-	18.7	-	-	-	9.5	-	-
2	3.5	19.0	-	19.2	-	19.7	-	9.1	-	9.4	-
3	6.7	-	19.3	-	19.0	-	10.7	9.4	-	-	11.0
4	8.9	-	-	-	20.5	20.5	-	-	-	-	-
5	10.	-	-	-	-	19.3	9.74	-	-	-	-
6	11.	-	-	-	-	18.1	-	9.7	-	-	-
7	12.	19.1	-	-	-	19.82	-	9.49	-	-	-
8	14.	-	-	-	-	1.2	-	1.6	-	-	-
MEAN	18.9500	19.3000	19.2000	20.5000	19.3683	9.8200	10.7000	9.5300	9.5000	9.4000	11.0000
STD DEV	3.7047	-	-	-	4.2	1.2	-	-	-	-	-
REL STD	3.7	-	-	-	-	19.132	-	-	-	-	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-
LAB	12990 MGNESIUM COMMON	14102 SILICA ANSAA	14105 SILICA MOLY AA	14106 SILICA MOLY	14111 SILICA COMMON	14190 SILICA UV ASC	15106 UV ASC	15406 TP UF AA SNCL	15409 TP BLK AA ASC	15413 TP ACL AA SNCL	15490 TP BLK DIG ASC
1	9.5	0.5 L	-	-	0.5 L	-	-	-	0.001	0.006L	0.006L
2	9.1	0.1 L	-	0.02 L	-	0.02 L	-	0.03L	-	0.001	0.001L
3	9.4	-	0.2 L	-	-	0.2 L	-	-	-	0.003L	0.003L
4	6.6	0.4	-	0.2 L	-	0.2 L	-	0.01L	0.01	0.002	0.002
5	7.8	9.4	-	0.2 L	-	0.2 L	-	0.001L	-	-	0.001L
6	9.9	11.0	-	0.01 L	-	0.01 L	0.010L	0.05 L	-	-	0.003L
7	10.	9.7	-	0.5 L	-	0.5 L	0.01 L	0.003L	-	-	0.008
8	11.	9.7	-	0.5 L	-	0.5 L	0.01 L	0.008	0.0100	0.015	0.0053
9	12.	9.4	-	-	-	-	-	-	47.1	-	0.0044
10	14.	9.49	-	-	-	-	-	-	-	-	84.3
MEAN	9.7209	-	-	-	-	-	-	-	-	-	0.004
STD DEV	6.6197	-	-	-	-	-	-	-	-	-	-
REL STD	6.4	-	-	-	-	-	-	-	-	-	-
DES VAL	9.434	-	-	-	-	-	-	-	-	-	-
LAB	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB	16309 SO4 DIS T C	16310 SO4 DIS AA CALM	16990 SULFATE COMMON	17203 CL DIS AA FE	17204 CL DIS AG TIT	17208 CL DIS AA AG	17209 CL DIS TIT CON	17210 CL DIS CHLORIDE COMMON
1	1.2	37.4	-	38.	-	106.	-	-	-	-	106.
2	3.5	-	35.5	-	37.	37.4	-	-	106.	105.9	-
3	6.6	-	38.4	-	-	35.5	-	-	104.	-	104.
4	7.7	-	40.2	-	-	38.4	-	110.	-	-	104.5
5	8.	-	40.	-	-	40.2	104.5	-	102.	-	102.
6	9.	-	-	-	39.	-	-	-	-	110.	-
7	10.	-	-	-	-	35.0	-	-	130.	R	105.
8	11.	-	-	-	-	-	-	-	105.	-	130. R
9	12.	34.	-	-	-	34.0	-	-	-	-	104.0
10	14.	36.8	-	-	39.1	36.8	-	-	-	-	104.0
MEAN	36.7000	37.9000	35.5000	38.1867	35.0000	37.4500	105.2500	110.0000	104.2500	105.9000	105.0000
STD DEV	2.9899	2.2970	3.1	2.0443	1.0607	2.0143	1.0607	1.07078	1.042426	1.042426	1.056727
REL STD	2.7	6.1	-	-	-	-	-	-	4.0	4.0	2.34307
DES VAL	-	-	-	-	-	2.5693	-	-	1.6	1.6	1.0

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IR153 PP 58 PP 18 SAMPLE = 4

LAB	K TOT ICP	19102 K DIS AAS	19103 K DIS FLM PH	19106 K DIS AAS LI	19107 K DIS FLM PH	19301 K EXT HNO3 AA	19990 PTASSIUM COMMON	20005 CA TOT ICP	20100 CA DIS CALC'D	20101 CA DIS EDTA	20103 CA DIS AAS	20108 CA DIS AAS UF
1	-	-	0.9	-	-	-	0.9	-	-	-	-	44.
2	-	-	0.92	-	0.92	-	0.92	-	-	-	-	43.
3	-	-	0.8	-	-	-	0.8	-	-	-	-	42.5
5	-	0.9	-	-	-	-	0.9	-	43.3	-	-	-
6	-	1.38 R	-	-	-	0.87	1.38 R	-	-	-	-	-
7	-	-	-	-	-	-	0.87	-	-	-	-	-
8	-	-	-	-	-	-	0.87	-	-	-	-	-
9	0.9	-	-	-	-	-	0.9	-	-	-	-	-
10	0.85	-	-	-	-	-	0.85	43.5	-	-	-	-
11	-	-	0.8	-	0.8	-	0.8	43.7	-	-	-	-
12	-	-	0.9	-	-	-	0.9	-	-	-	-	-
14	-	0.816	-	-	-	-	0.816	-	-	-	-	-
MEAN	-8750	-8580	-8800	-8000	-9200	-8700	-8705	43.6000	43.3000	42.2900	42.5000	43.5000
STD DEV	0.354	0.594	0.542	-	-	-	0.466	43.1414	-	-	-	-
REL STD	4.0	6.9	6.2	-	-	-	5.4	-	-	-	-	-
DES VAL	-	-	-	-	-	-	.3884	-	-	-	-	-

LAB 20311
Ca EXT
ICP
COMMON

1	-	44.	-
2	-	43.	-
3	-	42.5	-
5	-	43.3	-
6	-	43.	-
7	45.7	42.2	-
8	-	45.7	-
9	-	43.5	-
10	-	43.7	-
11	-	44.	-
14	-	40.67	-

MEAN 45.7000 43.2336
 STD DEV - 1.2585
 REL STD - 2.9
 DES VAL - 42.507

PAGE 14

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IR153 PP 58 PP 18 SAMPLE = 5

	LAB	AL TOT 5X ICP	13102	13111 AL DIS ICP DA	13302 AL EXT AAS GF	13311 AL EXT ICP DA	13999 ALUMINUM COMMON 5X ICP	23009 V TOT 5X ICP	23011 V TOT 5X ICP	23301 V EXT ICP DA	23311 V EXT ICP DA	23999 VANADIUM COMMON 5X ICP	24004 CR TOT AAS GF		
	1	2.97	-	-	-	-	2.8	2.77	2.84	2.84	-	-	2.31	-	
	2	-	-	-	-	-	2.84	-	3.0	3.0	-	-	2.35	-	
	3	-	3.0	-	-	-	2.6	-	2.6	-	-	-	2.35	-	
	4	-	-	-	-	-	2.80	-	2.80	-	-	-	2.40	0.28	
	5	-	-	-	-	-	2.60	-	2.60	-	-	-	2.40	-	
	6	-	-	-	-	-	2.53	-	2.53	-	-	-	2.33	-	
	7	-	-	-	-	-	2.53	-	2.53	-	-	-	2.33	-	
	8	-	-	-	-	-	2.53	-	2.53	-	-	-	2.33	-	
	9	-	-	-	-	-	2.53	-	2.53	-	-	-	2.33	-	
	10	-	-	-	-	-	2.53	-	2.53	-	-	-	2.33	-	
	11	-	-	-	-	-	2.53	-	2.53	-	-	-	2.33	-	
	12	-	-	-	-	-	2.53	-	2.53	-	-	-	2.33	-	
	13	-	-	-	-	-	2.53	-	2.53	-	-	-	2.33	-	
	14	-	-	-	-	-	2.53	-	2.53	-	-	-	2.33	-	
MEAN	2.9850	2.5300	-	-	-	-	-	-	-	-	-	-	-	-	
STD DEV	.0212	.0212	-	-	-	-	-	-	-	-	-	-	-	-	
REL STD	.7	.7	-	-	-	-	-	-	-	-	-	-	-	-	
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	LAB	CR TOT 5X ICP	24011	24111 CR DIS ICP DA	24302 CR EXT AAS DA	24311 CR EXT ICP DA	24999 CHROMIUM COMMON 5X ICP	25003 Manganese COMMON 5X ICP	25011 Mn TOT 5X ICP	25104 Mn DIS AAS DA	25111 Mn EXT ICP DA	25304 Mn EXT AAS DA	25311 MANGANESE COMMON	25999 MANGANESE COMMON	
	1	0.382	-	-	-	-	0.382	0.382	0.262	-	-	-	0.277	0.266	
	2	-	-	-	-	-	0.317	0.317	-	-	-	-	0.277	0.277	
	3	-	0.33	-	-	-	0.317	0.317	0.30	-	-	-	0.24	0.24	
	4	-	-	-	-	-	0.30	0.30	-	-	-	-	0.252	0.252	
	5	-	-	-	-	-	0.291	0.291	-	-	-	-	-	-	
	6	-	-	-	-	-	0.291	0.291	-	-	-	-	-	-	
	7	-	-	-	-	-	0.260	0.260	-	-	-	-	-	-	
	8	-	-	-	-	-	0.260	0.260	-	-	-	-	-	-	
	9	-	-	-	-	-	0.260	0.260	-	-	-	-	-	-	
	10	-	-	-	-	-	0.260	0.260	-	-	-	-	-	-	
	11	-	-	-	-	-	0.260	0.260	-	-	-	-	-	-	
	12	-	-	-	-	-	0.260	0.260	-	-	-	-	-	-	
	13	-	-	-	-	-	0.260	0.260	-	-	-	-	-	-	
	14	-	-	-	-	-	0.260	0.260	-	-	-	-	-	-	
MEAN	.3820	.3300	-	-	-	-	.3170	.3150	.2620	.3000	.2820	.2560	.2735	.2679	
STD DEV	-	.0064	-	-	-	-	.0707	.0410	.130	.299	-	.0057	.0049	.0187	
REL STD	-	.0064	-	-	-	-	.0707	.0410	.130	.299	-	.0057	.0049	.0187	
DES VAL	-	.0064	-	-	-	-	.0707	.0410	.130	.299	-	.0057	.0049	.0187	
	LAB	FE TOT 5X ICP	26011	26104 FE DIS AAS DA	26304 FE EXT AAS DA	26311 FE EXT ICP DA	26999 IRON COMMON 5X ICP	27009 CO TOT 5X ICP	27011 CO TOT 5X ICP	27111 CO EXT ICP DA	27311 CO EXT ICP DA	27999 COBALT COMMON	28009 NI TOT 5X ICP		
	1	-	-	-	-	-	1.1	1.1	1.1	1.1	-	-	1.14	1.29	
	2	-	-	-	-	-	1.11	1.13	1.11	1.11	-	-	1.08	1.08	
	3	-	1.2	-	-	-	1.13	1.13	1.01	1.01	-	-	1.13	1.13	
	4	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.10	1.10	
	5	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.028	1.028	
	6	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.12	1.12	
	7	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.10	1.10	
	8	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.12	1.12	
	9	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.12	1.12	
	10	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.12	1.12	
	11	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.12	1.12	
	12	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.12	1.12	
	13	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.12	1.12	
	14	-	-	-	-	-	1.085	1.085	1.085	1.085	-	-	1.12	1.12	
MEAN	1.2000	1.0530	-	-	-	-	1.1167	1.1167	1.0700	1.1400	1.2000	1.0640	1.1167	1.1123	
STD DEV	-	1.0530	-	-	-	-	1.0318	1.0318	1.0208	1.0849	1.0574	1.0509	1.0153	1.0497	
REL STD	-	1.0530	-	-	-	-	1.0318	1.0318	1.0208	1.0849	1.0574	1.0509	1.0153	1.0497	
DES VAL	-	1.0530	-	-	-	-	1.0318	1.0318	1.0208	1.0849	1.0574	1.0509	1.0153	1.0497	

PAGE 15

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IRI53 PP 58 PP 18 SAMPLE = 5

LAB	NI TOT 5X ICP	28111 NI DIS ICP DA	28301 NI EXT AAS DA	28311 NI EXT ICP DA	28999 NICKEL COMMON	29009 CU TOT 5X ICP	29011 CU TOT 5X ICP	29106 CU DIS AAS DA	29111 CU DIS ICP DA	29306 CU EXT AAS DA	29311 CU EXT ICP DA	29999 COPPER COMMON	30009 ZN TOT 5X ICP	
1	-	-	-	-	1.29	0.277	-	-	-	0.29	-	0.277	0.321	-
2	-	-	-	-	1.26	1.26	-	-	-	-	-	0.284	0.284	-
3	1.4	-	-	-	1.18	1.4	-	0.30	-	-	-	0.26	0.30	-
4	-	1.25	-	-	1.25	1.18	-	-	-	0.29	-	0.29	0.29	-
5	-	1.229	-	1.30	1.229	1.25	-	-	0.287	0.30	-	0.287	0.30	-
6	-	-	1.810R	-	1.810R	1.30	-	-	-	0.305	-	0.305	0.305	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	1.4000	1.2395	1.3000	1.2200	1.2727	0.2770	.3000	.3050	.2885	.2950	.2720	.2881	.3210	-
STD DEV	1.0148	1.2	-	0.5666	0.6883	-	-	-	.0021	.0071	.0170	.0137	-	-
REL STD	-	1.2	-	4.6	5.4	-	-	-	.7	.7	6.2	4.8	-	-
DES VAL	-	-	-	1.232	-	-	-	-	-	-	-	2.91	-	-
LAB	ZN TOT 5X ICP	ZN DIS AAS DA	ZN EXT ICP DA	ZN EXT AAS DA	ZINC COMMON	SR TOT ICP DA	SR TOT ICP DA	SR DIS AAS DA	SR EXT AAS DA	SR EXT ICP DA	STRNTIUM COMMON	MO TOT 5X ICP	42011 MO TOT 5X ICP	
1	-	-	-	-	0.32	0.324	-	0.321	-	-	-	-	4.62	-
2	-	-	-	-	0.29	0.29	0.22 R	0.22 R	-	-	0.493	0.493	5.1	-
3	0.35	-	-	0.31	-	0.31	-	0.31	0.51	0.44	-	0.51	-	-
4	-	-	0.310	0.33	-	0.33	-	0.33	-	-	-	0.44	-	-
5	-	-	0.318	-	0.318	-	0.318	-	-	-	-	-	-	-
6	-	-	-	-1.0	2.000	3.250	3.071	0.0240	0.163	0.100	0.4400	.4930	4.6200	5.1000
7	-	-	-	-	-	7.8	5.1	-	-	-	-	7.6	-	-
8	-	-	-	-	-	-	-	0.313	-	-	-	4.89	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	3.500	3.180	3.100	3.000	3.250	3.071	3.070	0.0240	0.163	0.100	0.4400	.4930	4.6200	5.1000
STD DEV	-	-	-	-1.0	2.0	7.8	5.1	-	-	-	-	-	-	-
REL STD	-	-	-	-	-	-	-	0.313	-	-	-	-	-	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LAB	MO DIS ICP DA	MO EXT AAS DA	MO EXT ICP DA	MOLYBNUM COMMON	CD TOT 5X ICP	48011 CD DIS AAS DA	48101 CD DIS ICP DA	48301 CD EXT AAS DA	48311 CD EXT ICP DA	CADMIUM COMMON	56009 BA TOT 5X ICP	56011 BA TOT 5X ICP		
1	-	-	-	-	4.62	0.230	-	-	-	0.24	-	0.230	2.49	-
2	-	-	4.55	4.55	-	0.27	-	-	-	0.231	-	0.231	2.7	-
3	-	-	-	4.60	-	-	-	0.24	-	-	-	0.23	-	-
4	4.60	-	4.53	-	4.60	-	-	0.24	-	0.23	-	0.23	-	-
5	4.53	-	-	-	4.53	-	-	0.24	-	0.23	-	0.23	-	-
6	-	-	-	-	-	-	-	0.24	-	0.24	-	0.24	-	-
7	-	-	-	-	-	-	-	0.24	-	0.24	-	0.24	-	-
8	-	-	-	-	-	-	-	0.24	-	0.24	-	0.24	-	-
9	-	-	-	-	-	-	-	0.24	-	0.24	-	0.24	-	-
10	4.60	-	4.53	-	4.60	-	-	0.24	-	0.24	-	0.24	-	-
11	4.53	-	-	-	4.53	-	-	0.24	-	0.24	-	0.24	-	-
12	-	-	-	-	-	-	-	0.24	-	0.24	-	0.24	-	-
13	-	-	-	-	-	-	-	0.24	-	0.24	-	0.24	-	-
14	-	-	2.33 R	-	2.33 R	-	-	0.285	-	0.26	-	0.26	-	-
MEAN	4.5650	4.5500	4.6890	4.6890	4.6890	2.300	.2700	.2850	.2320	.2433	.2310	.2456	2.4900	2.7000
STD DEV	0.0495	-	0.2376	-	0.2376	-	-	0.0113	.0153	6.3	0.0212	0.0212	-	-
REL STD	1.1	-	4.660	-	4.660	-	-	4.9	6.3	-	8.6	8.6	-	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-

PAGE 16

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

PAGE 17

STUDY NO.	IR153	PP 58	PP 18	SAMPLE = 5
LAB	56111 BA DIS ICP DA	56301 BA EXT AAS DA	56311 BA EXT ICP DA	56999 BARIUM COMMON
1	-	-	-	2.49
2	-	2.50	2.52	2.50
3	-	-	-	2.7
6	-	-	-	2.55
8	2.55	-	-	2.48
9	2.48	-	-	-
10	-	-	-	-
11	-	-	-	-
14	-	-	-	-
MEAN	2.5150	2.5000	2.5200	2.5440
STD DEV	2.0495	2.0	-	0.913
REL STD	-	-	-	3.6
DES VAL	-	-	-	2.541
DATES RECEIVED	1 87/06/25 5 87/07/06 10 87/07/06	2 87/06/22 6 87/06/25 11 87/06/25	3 87/06/22 7 87/06/25 12 87/07/06	3 87/07/06 8 87/06/22 9 87/07/13
				4 87/07/09 8 87/07/28 9 87/06/08

NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT, THE EXCEPTIONS BEING:
 COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN USIE/CM, TURBIDITY IN JTU OR NTU, NITROGEN
 ANALYSES IN "N", ALKALINITY & HARDNESS IN CACO₃, SILICA IN SIO₂, AND SULFATE IN SO₄.

DISTRIBUTION - IRQC

Mr. H. Agemian
Head, Scientific Services Section
National Water Quality Laboratory

Mr. G. Brun
Head, Analytical Services Section
Atlantic Region Water Quality Branch

Ms. P. Thomson
A/CIC, Water Resources Laboratory
INAC, NAP
Yellowknife, NWT

Ms. D. Duval
Head, Analytical Services Section
Quebec Region Water Quality Laboratory

Mr. F. Mah
Head, Analytical Services Section
Pacific Region Water Quality Branch

Mr. J-G. Zakrevsky
Head, Analytical Services Section
Western Region Water Quality Branch

cc:

Dr. B.K. Afghan
Chief, NWQL, CCIW
Burlington, Ontario

Mr. D.H. Cullen
Chief, Water Quality Branch
Atlantic Region
Moncton, New Brunswick

Dr. W.E. Erlebach
Chief, Water Quality Branch
Pacific Region
Vancouver, B. C.

Mr. W.D. Gummer
Chief, Water Quality Branch
Western Region
Regina, Saskatchewan

Mr. L. Martel
Chief, Water Quality Branch
Quebec Region, Longueuil, P. Q.

Mr. A. S. Y. Chau
Project Chief
Quality Assurance Project
NWRI, CCIW



Government
of Canada Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

H.Alkema\NWRI\336-4929\ha

SECURITY - CLASSIFICATION - DE SÉCURITÉ

OUR FILE/NOTRE RÉFÉRENCE

YOUR FILE/VOTRE RÉFÉRENCE

DATE

November 2, 1987

TO Distribution

FROM DE
H. Alkema
Quality Assurance Section
National Water Research Institute
Burlington, Ontario

SUBJECT
OBJET Inter-regional Quality Assurance Program (IRQC)

I have enclosed the final report for IR 154-155.

If you have any comments on this report, or any legitimate corrections to the data base, please do not hesitate to communicate them.

Harry A.

H. Alkema

SUMMARY REPORT

INTER-REGIONAL QUALITY ASSURANCE PROGRAM

STUDIES 154 AND 155

for July and August, 1987

**TRACE METALS, MAJOR IONS, NUTRIENTS
AND PHYSICAL PARAMETERS IN SURFACE WATERS**

by

H. Alkema

**Quality Assurance Section
National Water Research Institute
Burlington, Ontario**

November 1987

Introduction

As part of an on-going study, the Quality Assurance Section, NWRI in Burlington, Ontario, has been sending reference water samples bi-monthly to chemical laboratories participating in the IR program. This report summarizes the most recent IR interlaboratory quality control studies: IR 154 and 155, for the months July and August, 1987. These two studies dealt with trace metals, major ions, nutrients and physical parameters. The levels were from low to medium.

Study Design

Five water samples were submitted to each laboratory for chemical analyses. Two samples were submitted for trace metals analysis, while the remaining three were submitted for major ions, nutrients and some physical measurements. The following is a breakdown of the five samples:

IR 154 - Sample 1 - 125 ml, DA* for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

IR 155 - Sample 3 - 1L, SE* for trace metals (0.2% HNO₃)
Sample 4 - up to 1L, major ions, etc., stored at 4°C
Sample 5 - up to 1L, major ions, etc., stored at 4°C

* for definitions see Appendix 1

Treatment of Data

Each laboratory was asked to perform only those analyses which were routine to their particular laboratory, using the general methodology guidelines listed above. Results for these analyses were recorded on report sheets provided with the IR samples. Upon receipt of the Reporting Sheets, the results were tabulated for each parameter, first for each method reported, and then for all methods combined. These data, and the resulting statistics are presented in the Data Summary.
(attached)

Preliminary data summaries, including problematic results, were sent August 28 or September 1, and October 6. Each laboratory was given three weeks to notify us of any errors in data transcription or compilation.

Performance Indicators

In previous reports the mean has always been used as comparator for accuracy assessment. We now have "design values" for several reference waters (RMs) and certified reference waters (CRMs). These design values are used to test each reported result (whether few or many) for accuracy. Consequently, for stable parameters, the design values will be used as comparator for the ten percent warning circles, and the mean will be used for unstable parameters (perhaps due to biological activity).

Percentage deviations from the comparator are used as an indicator for the laboratory head to determine the extent of the discrepancies between the laboratory result and comparator as it applies to his procedures. However, please keep in mind that at low levels, high % deviations are often seen, and may be misleading if interpreted too strictly.

A result which deviates more than 10% from the comparator is circled in the data tables and its value noted in the comments which follow. Results reported with an "L" (less than) or flagged with an "R" (rejectable) are not used in the statistical calculations. Performance indicators are fully explained in Appendix II.

Comments on Laboratory Performance

Results accompanied with a 'less than' are difficult to appraise. If a design value or mean is significantly lower than the detection limit given by a particular laboratory, then that detection limit is too high. Such a result is assigned 'HDL' and is labelled in the Data Summary.

If, on the other hand, the detection limit reported is far lower than the mean or design value, then the use of 'less than' is clearly inadequate and the result is flagged low. The magnitude of the deviation from the mean in such a case is taken from the detection limit given.

General Comments: A high coefficient of variation (incomparability) was observed for TKN in sample two and for Ammonia in sample four.

Individual laboratory deviations are listed below:

Lab 2 - a high result for SiO_2 : +14%, & +14% (R)
- a low result for $\text{NO}_3 + \text{NO}_2$: -94% (R)
- an HDL for Mn by SE

Lab 3 - a high result for Ni by Da: +12%
- a low result for Cr by SE: -43%
- high results for $\text{NO}_3 + \text{NO}_2$: +15% (R), & +14%

Lab 4 - a high result for B at low level (R)

Lab 5 - a low result for Mg: -19%;
- a high result for Ca: +16%; and SO_4 : +11%

Lab 7 - a high result at low level for TP (R)

Lab 11 - a high result by DA for Zn: (R) (misplaced decimal?)
- a low result for K: -11%, & -12%
- a high result for Mg: 210% (R)
- erratic results for SO_4 : +23% (R), +18% (R), and -33% (R)

IR laboratories average number of deviations per sample was 0.6.

* (R) = rejectable by Grubb's procedure for statistical calculation.

APPENDIX I

Definitions of Types of Metals Analysis

1. DA - Direct Aspiration

Without sample pretreatment, samples are aspirated by Atomic Absorption Spectrophotometry (AAS) or Inductively Coupled (Argon) Plasma (ICAP or ICP). Standards should contain the acid equivalent of the sample.

2. SE - Code for low level analysis

Analysis is carried out by one of the following methods:

1. Solvent extraction sample concentration followed by AAS.
2. Digestion and concentration of aqueous phase followed by ICAP.
3. Digestion of aqueous phase and ICAP analysis.
4. Graphite tube (flameless) AAS.

APPENDIX II

Performance Indicators

1. Circled Results

Results are circled in the data tables when a minor deviation from the comparator has occurred. (The comparator is the design value of the reference sample, or the mean in the case of a biologically active sample.) Circled results are in general greater than or less than 10% from the comparator. At very low levels of analytes or with parameters that are difficult to analyse, a greater deviation than 10% is allowed. Under these conditions, a result is circled when it is outside one standard deviation of the comparator. These circled results, though acceptable values, are a warning to laboratory managers that the parameter analysis should be investigated.

2. Rejectable Results

Each laboratory result is statistically tested to see if it is outlying. Outlying results were caused by non random causes such as a faulty calibration or a transcription error. These outlying results, calculated by the Grubbs' procedure,* and indicated in the data tables with an 'R', are noncomparable with the other data for the parameter.

3. A High Co-efficient of Variation (HCV)

Occasionally data for a parameter yields a very high relative standard deviation (RSD). When this HCV is not due to outlying values, it indicates a high variability within the data set. The data in this set is then noncomparable. In such a case, the RSD for the parameter is circled in the data tables and the parameter's noncomparability is noted in the comments.

4. High Detection Limits (HDL)

Each laboratory determines its own detection limits according to its own requirements. When major differences of detection limits occur, the result is flagged with 'HDL' in the data tables. An HDL indicates that low level analysis may not be comparable with the analyses of other laboratories.

* reference : Frank E. Grubbs, Technometrics, 1969, p. 1.

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.	IR154	PP 59	PP 19	DATE:	DUE DATE: 31/08/87		PAGE 1	
					TRACE METALS		D/A.	(IN % HNO3)
SAMPLE 1 SPIKED SAMPLE.								
LAB	13009 AL TOT 5X ICP	13102 AL DIS AAS DA	13111 AL EXT AAS GF	13302 AL EXT ICP DA	13311 AL EXT ICP DA	23009 COMMON 5X ICP	23011 V TOT 5X ICP	23301 V EXT ICP DA
1	-	-	-	-	-	0.455	-	-
2	-	-	-	0.500	0.479	0.500	0.48	-
3	-	-	-	0.50	-	0.50	-	-
6	-	-	-	0.50	-	0.50	-	-
8	-	-	-	0.48	-	0.48	-	-
9	-	-	-	0.48	-	0.48	-	-
10	-	0.62	-	0.48	-	0.62	-	-
14	-	-	-	0.48	-	0.48	-	-
MEAN	.5000	.6200	.4900	.5000	.4790	.5143	.4550	-
STD DEV	-	-	.0141	-	-	.0472	-	-
REL STD	-	-	2.9	-1.0	-	9.21	-	-
DES VAL	-	-	2.9	-1.0	-	5.19	-	-
LAB	24009 CR TOT 5X ICP	24011 CR DIS ICP DA	24302 CR EXT AAS DA	24311 CR EXT ICP DA	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP	25011 MN DIS 5X ICP	25304 MN EXT AAS DA
1	0.050	-	-	-	0.050	0.047	-	-
2	-	-	-	-	0.054	0.054	-	-
3	-	0.046	-	-	0.054	0.045	-	-
6	-	-	0.054	-	0.054	-	-	-
8	-	-	0.046	-	0.054	-	-	-
9	-	-	0.046	-	0.046	-	-	-
10	-	-	0.046	-	0.046	-	-	-
11	-	-	0.03 R	-	0.03 R	-	-	-
14	-	-	0.03 R	-	0.03 R	-	-	-
MEAN	.0500	.0460	.0500	.0400	.0540	.0483	.0470	.0450
STD DEV	-	-	.0057	-	-	.0054	-	.0028
REL STD	-	-	11.3	-	-	11.2	-	6.3
DES VAL	-	-	11.3	-	-	5.55	-	2.9
LAB	25999 MANGANESE COMMON	26011 FE TOT 5X ICP	26104 FE DIS AAS DA	26304 FE EXT AAS DA	26311 IRON COMMON	26999 COMMON	27009 CO TOT 5X ICP	27011 CO EXT AAS DA
1	0.047	-	-	-	0.27	0.266	0.27	0.218
2	0.05	-	-	-	0.242	0.242	-	-
3	0.048	-	-	-	0.24	0.24	-	-
6	0.045	0.27	-	-	0.26	0.26	-	-
8	0.047	-	-	-	0.243	0.243	-	-
9	0.047	-	-	-	0.243	0.243	-	-
10	0.043	-	-	-	0.26	0.26	-	-
11	0.05	-	-	-	0.155R	0.155R	-	-
14	0.017R	-	-	-	0.155R	0.155R	-	-
MEAN	.0463	.2700	-	-	.2515	.2530	.2180	.2200
STD DEV	.0035	-	-	-	.0142	.0132	-	.0106
REL STD	7.5	-	-	-	5.5	5.3	-	4.8
DES VAL	.046	-	-	-	4.8	4.8	-	3.0

DATA SUMMARY = FED-PROV & PPWB QC PROGRAMS

STUDY NO.	SAMPLE 1			SAMPLE 2		
	IR154	PP 59	PP 19	IR154	PP 59	PP 19
LAB	28009 NI TOT 5X ICP	28011 NI TOT 5X ICP	28111 NI DIS ICP DA	28301 NI EXT AAS DA	28311 NI EXT ICP DA	28999 NICKEL COMMON
1	0.255	-	-	-	-	0.255
2	-	0.26	-	-	0.300	0.300
3	-	-	0.26	-	0.25	0.25
4	-	-	0.260	-	0.260	0.260
5	-	-	-	0.28	-	0.28
6	-	-	-	0.333R	-	0.333R
7	-	-	-	-	-	-
8	-	-	-	-	-	-
9	-	-	-	-	-	-
10	-	-	-	-	-	-
11	-	-	-	-	-	-
12	-	-	-	-	-	-
13	-	-	-	-	-	-
14	-	-	-	-	-	-
MEAN	.2550	.2600	.2600	.2800	.2750	.2654
STD DEV	-	-	.0000	-	.0175	.0175
REL STD DEV	-	-	-1.0	-	12.9	6.6
DES VAL	-	-	-	-	.267	-
LAB	30009 ZN TOT 5X ICP	30011 ZN TOT 5X ICP	30104 ZN DIS AAS DA	30304 ZN EXT AAS DA	30311 ZN EXT ICP DA	30999 ZINC COMMON
1	0.053	-	-	-	0.056	-
2	-	0.053	-	-	-	0.056
3	-	-	-	-	0.058	0.058
4	-	-	-	-	0.05	0.053
5	-	-	-	-	0.05	0.13
6	-	-	-	-	-	-
7	-	-	-	-	-	-
8	-	-	-	-	-	-
9	-	-	-	-	-	-
10	-	-	-	-	-	-
11	-	-	-	-	-	-
12	-	-	-	-	-	-
13	-	-	-	-	-	-
14	-	-	-	-	-	-
MEAN	.0530	.0450	.0530	.0560	.0540	.0526
STD DEV	-	-	.0042	-	.0057	.0042
REL STD DEV	-	-	8.0	-	10.5	8.0
DES VAL	-	-	-	-	-	.056
LAB	42011 MO TOT 5X ICP	42111 MO DIS ICP DA	42301 MO EXT AAS DA	42311 MO EXT ICP DA	48009 MOLYBNUM COMMON	48011 CD TOT 5X ICP
1	-	-	-	-	0.827	0.038
2	-	-	-	-	0.945	0.945
3	-	-	-	-	0.86	0.86
4	-	-	-	-	0.88	0.88
5	-	-	-	-	0.904	0.904
6	-	-	-	-	0.885R	0.885R
7	-	-	-	-	-	-
8	-	-	-	-	-	-
9	-	-	-	-	-	-
10	-	-	-	-	-	-
11	-	-	-	-	-	-
12	-	-	-	-	-	-
13	-	-	-	-	-	-
14	-	-	-	-	-	-
MEAN	.8600	.8920	.89170	.9450	.8832	.0446
STD DEV	-	-	-	-	5.1	-
REL STD DEV	-	-	-	-	-	.897
DES VAL	-	-	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IIR154 pp 59 FP 19

PAGE 3
SAMPLE

MEAN
STD
STDEV
STDERR
STDVAL

PAGE 3
SAMPLE

PAGE 3
SAMPLE

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IR154 PP 59 FP 19

SAMPLE 2

PAGE 4

LAB	00110 TURBIDIC BALANCE & CARBONS	00120 SUM OF ANIONS	00125 COLOUR APPAREN	02011 COLOUR VIS COM	02021 COLOUR SPECTRO	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02072 TURBDTY HELIQUE	02073 TURBDTY HACH	02074 TURBDTY NPLMTRI	02077 TURBDTY HACH FZ
1	-0.43	2.30	2.32	5. -	-	5. -	23.4.	23.4.	-	0.1	-	-
2	1.14	2.264	2.213	5. -	-	5. -	232.5	232.5	0.09	-	-	-
3	2.300	2.238	-	5. -	5. -	5. -	231.5	231.5	0.30	-	-	-
4	-	-	-	5. -	-	-	220.	220.	-	-	-	-
5	-4.3	2.4	2.37	6. -	-	6. -	224.8.	224.8.	0.31	0.08	-	-
6	-0.8	2.33	2.35	5. -	-	5. -	228.	228.	-	0.10	-	-
7	-3.95	2.51	2.35	-	-	3. -	230.	230.	-	0.1	-	-
8	1.95	2.35	2.337	5. -	-	-	223.	223.	-	-	-	-
9	0.27	2.350	2.337	5. -	5. -	5. -	220.	220.	-	-	-	-
10	-	-	-	0.0	-	0.0	229.	229.	-	0.2	-	-
11	-	-	-	0.0	-	0.0	216.0	216.0	0.1	-	-	-
12	-	-	-	0.0	-	0.0	-	-	-	-	-	-
13	-	-	-	0.0	-	0.0	-	-	-	-	-	-
14	-	-	-	0.0	-	0.0	-	-	-	-	-	-
MEAN	1.3788	2.3505	2.2869	4.0000	-	3.0000	227.9615	227.9615	-1.000	.0000	.0933	.1800
STD DEV	1.7673	2.0764	2.0661	2.7080	-	-	227.4025	227.4025	-	.1051	.0115	-
REL STD	128.2	3.3	2.9	67.7	-	-	62.875	3.7	-	52.6	12.4	-
DES VAL	-	-	-	-	-	5.216	-	227.904	-	-	-	-

LAB	02081 TURBDRY RATIO	02090 TURBDRY COMMON	05105 BORON AA CARM	05111 BORON TCP DA	05190 BORON COMMON	06008 TOC CO2	06052 TIC FLM	06100 DOC CO2	06101 DOC IR / DIR	06104 DOC UV CO2	06109 DOC UV CO2 PHE	
1	-	-	-	-	0.021	-	0.021	-	-	-	-	
2	-	-	-	-	-	-	-	-	-	-	-	
3	0.10	0.19	0.04	-	-	0.04	-	-	-	-	-	
4	-	0.10	-	-	-	-	-	-	-	-	-	
5	-	0.30	-	-	-	-	-	-	-	-	-	
6	-	0.08	-	-	-	-	-	-	-	-	-	
7	-	0.31	-	-	-	-	-	-	-	-	-	
8	-	0.10	-	-	-	-	-	-	-	-	-	
9	-	0.18	-	-	-	-	-	-	-	-	-	
10	-	0.18	-	-	-	-	-	-	-	-	-	
11	-	0.2	-	-	-	-	-	-	-	-	-	
12	-	0.1	-	-	-	-	-	-	-	-	-	
13	-	-	-	-	-	-	-	-	-	-	-	
14	-	-	-	-	-	-	-	-	-	-	-	
MEAN	1.000	1.509	0.400	0.0210	0.0300	0.303	-	15.4000	1.8400	-	1.6333	1.1000
STD DEV	-	1.0851	-	-	-	31.3	0.095	-	11.9	-	15.4	15.7
REL STD	-	56.4	-	-	-	31.3	0.029	-	-	-	-	-
DES VAL	-	186	-	-	-	-	-	-	-	-	-	-

LAB	06150 DOC COMMON	06151 DIC COMBUST	06152 DIC UV CO2 IR	06154 DIC AA CO2 PH	06159 DIC AA CO2 OH	06490 DIC AA COMMON	07004 TKN AA NITPRUS	07015 TKN DIG BERTHEL	07016 TKN BLK AMM-SAL	07018 TKN BLK INDOPHE	07090 TKN BLK DIG BER	07105 NO3+NO2 DIS AA COMMON
1	1.2	-	-	20.2	-	20.2	-	-	-	-	0.108	0.36
2	1.3	-	19.0	-	-	19.0	-	-	-	-	-	-
3	1.4	-	-	-	-	-	-	-	-	-	-	-
4	1.6	-	-	-	-	-	-	-	-	-	-	-
5	1.9	-	-	-	-	-	-	-	-	-	-	-
6	1.84	-	-	-	-	-	-	-	-	-	-	-
7	2.25	2.2	20.5	-	-	16.7	-	0.20	-	-	-	-
8	1.84	-	-	-	-	-	-	-	-	-	-	-
9	2.25	2.2	20.5	-	-	18.3	-	-	0.10	-	-	-
10	1.84	-	-	-	-	-	-	-	0.18	-	-	-
11	2.25	2.2	20.5	-	-	14.1	0.18	-	0.10	-	-	-
12	1.84	-	-	-	-	-	-	-	-	-	-	-
13	2.25	2.2	20.5	-	-	-	-	-	0.18	-	-	-
14	1.84	-	-	-	-	-	-	-	-	-	-	-
MEAN	1.5057	20.5000	19.0000	20.2000	18.3000	18.333	-	0.2000	.2000	.1000	.1080	.1576
STD DEV	3.015	-	-	-	-	-	-	-	-	-	-	.3600
REL STD	20.9	-	-	-	-	-	-	-	-	-	-	.31.5
DES VAL	1.720	-	-	-	-	-	-	-	-	-	-	.140

HCU

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IR154 PP 59 PP 19

SAMPLE 2

PAGE 5

LAB	07109 NO3+NO2 AA HWD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC UF AA CD	07112 NO3+NO2 DIS UF AA CD	07315 NO3 COMMON	07390 NITRATE COMMON	07505 NH3 TOT AA BERT	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN	07557 NH3 DIS AA INDO	07562 NH3 DIS AA EDTA	07563 NH3 DIS AA INDO	07590 AMMONIA COMMON
1	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
2	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
3	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
4	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
5	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
6	0.32	-	-	-	-	-	-	-	-	-	-	-	0.002L
7	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
8	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
9	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
10	0.335	-	-	-	-	-	-	-	-	-	-	-	0.002L
11	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
12	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
13	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
14	-	-	-	-	-	-	-	-	-	-	-	-	0.002L
MEAN	3275	3440	3600	3400	3400	3432	3438	3438	3438	3438	3438	3438	3438
STD	0106	0134	0134	0134	0134	0134	0134	0134	0134	0134	0134	0134	0134
REL STD	3.2	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-
LAB	07601 T N UV AA SUL	07602 T N UV CALC'D	07605 T N UV RY SUL	07651 T N DIS UV AA	07655 T N DIS UV EDTA	07690 T N DIS COMMON	07790 T N DIS COMMON	09103 F DIS COL ISP	09105 F DIS EL POT	09106 F DIS EL POT	09107 F DIS AUT POT	09108 F DIS SP EL	09115 F DIS AA ALIZ
1	-	-	-	-	-	-	-	-	-	-	-	-	-
2	0.41	-	-	-	-	-	-	-	-	-	-	-	-
3	0.417	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	4135	5050	5400	4200	4360	5050	4446	4446	4446	4446	4446	4446	4446
STD	0049	0636	12.6	-	-	12.6	12.2	12.2	12.2	12.2	12.2	12.2	12.2
REL STD	1.2	1.2	1.2	-	-	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-
LAB	09190 FLOURIDE COMMON	10101 ALKLN'TY TITR'N	10108 ALKLN'TY POT TIT	10109 ALKLN'TY TIT PRO	10111 ALKLN'TY TIT CON	10112 ALKLN'TY COMMON	10119 ALKLN'TY COMMON	10301 PH COMMON	10390 HARDNESS CALC'D	10602 HARDNESS TITR'N	10603 HARDNESS CALC'D	10606 HARDNESS CALC'D	10690 HARDNESS COMMON
1	0.09	81	75.01	-	-	-	-	81	8.2	8.2	8.2	8.2	100.0
2	0.07	-	-	-	-	-	-	79.1	7.75	7.75	7.75	7.75	100.0
3	0.08	-	-	-	-	-	-	-	-	-	-	-	101.
4	0.05 L	78.3	71.9	-	-	-	-	71.9	8.1	8.1	8.1	8.1	107.
5	0.1	-	-	-	-	-	-	-	82.	8.0	8.0	8.0	104.
6	0.1	81.8	-	82.	-	-	-	81.8	8.05	8.05	8.05	8.05	104.5
7	0.099	-	-	79.0	-	-	-	79.0	8.03	8.03	8.03	8.03	104.5
8	-	-	-	77.	-	-	-	77.	7.88	7.88	7.88	7.88	104.5
9	0.10	-	-	-	-	-	-	80	8.0	8.0	8.0	8.0	104.5
10	0.10	78	-	-	-	-	-	-	78	7.9	7.9	7.9	7.9
11	0.10 L	82.7	-	-	-	-	-	-	82.7	8.28	8.28	8.28	8.28
12	0.10 L	-	-	-	-	-	-	-	82.7	8.28	8.28	8.28	8.28
13	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	898	78.3013	77.0000	80.5000	79.1000	80.0000	78.7315	8.0115	8.0233	8.0233	8.0233	8.0233	105.1667
STD	0125	3.6082	4.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	1.5
REL STD	1.3	9	4.6	-	-	-	-	-	-	-	-	-	3.6780
DES VAL	0.086	-	-	-	-	-	-	-	78.916	78.916	78.916	78.916	103.025

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO.	IR154			PP 59			PP 19			SAMPLE 2			PAGE 6	
	LAB	11005 TOT ICP	11102 AAS F	11103 AAS FL PH	11105 NA DIS AAS DA	11107 NA UP FL PH	11311 NA EXT ICP	11990 SODIUM COMMON	12005 MG TOT ICP	12101 MG DIS CALC'D	12106 MG UP AAS DA	12107 MG DIS AAS AUT	12108 MG HARDN CALC'D	
1	1.2	-	-	5.3	-	-	5.3	-	-	-	7.1	-	7.3	
2	3.5	-	-	4.3	-	4.6	4.6	-	-	-	-	-	6.0	
3	6.7	-	-	4.6	-	4.5	4.5	-	-	-	-	-	-	
4	8.9	5.0	7.7	-	-	4.5	5.29	-	6.7	-	7.4	-	-	
5	10.1	4.57	-	-	-	-	-	-	7.61	-	-	-	-	
6	11.1	-	4.4	4.7	-	-	-	-	4.57	-	-	-	-	
7	12.1	-	5.24	5.24	-	-	-	5.24	-	-	8.0	-	-	
8	MEAN	4.7850	4.7890	4.6580	4.5000	4.6000	5.2900	4.7417	7.6050	8.7000	7.6600	7.3000	6.0000	
9	STD	6.4	3.041	8.4257	6.2	-	-	6.3199	6.0071	-	7.3079	-	-	
10	REL	DEV	6.4	8.4	6.2	-	-	6.7553	.1	-	4.0	-	-	
11	DES	VAL	-	-	-	-	-	4.553	-	-	-	-	-	
12	LAB	12303 NG UP AAS AUT	12311 MG EXT ICP	12990 MGNESIUM COMMON ANSA AA	14102 SILICA COMMON ANSA AA	14105 SILICA MOLY AA	14106 SILICA MOLY	14111 SILICA COMMON	14190 SILICA COMMON	15406 T P UP AA ASC	15409 T P BLK AA ASC	15413 T P ACL AA SNCL	15421 T P BLK DIG ASC	
13	1.2	8.	-	-	8.1	1.5	-	-	1.48	-	-	-	0.006L	
14	3.3	-	-	7.3	1.48	-	-	1.31	-	-	-	-	-	
15	5.6	-	-	6.0	-	-	-	1.3	-	-	0.003	-	-	
16	6.7	-	-	6.0	-	-	-	-	-	-	0.004	0.01 L	-	
17	8.8	-	8.30	7.40	-	1.4	-	-	1.43	-	-	0.002	-	-
18	9.9	-	-	7.61	-	1.33	-	-	1.43	-	-	-	-	-
19	10.1	-	-	8.0	-	1.7	R	-	1.33	0.010L	-	-	-	-
20	11.1	-	-	7.58	-	-	-	-	1.7 R	-	0.003L	-	-	
21	12.1	-	-	-	-	-	-	-	-	-	0.008L	-	-	
22	14.1	-	-	8.3000	7.5991	1.4900	1.3433	1.3100	1.4300	1.3929	-	-	-	
23	MEAN	8.0000	-	8.7043	1.0141	3.8	-	-	-	5.916	-	-	-	
24	STD	DEV	-	-	9.3	.9	-	-	-	5.916	-	-	-	
25	REL	STD	-	-	7.418	-	-	-	-	1.298	-	-	-	
26	DES	VAL	-	-	-	-	-	-	-	-	-	-	-	
27	LAB	15490 TOT PP COMMON	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB	16309 SO4 DIS F C	16310 SO4 DIS AA CALM	16990 SULFATE COMMON	17203 CL DIS AA PE	17204 CL DIS AG FIT	17206 CL DIS AA AG	17208 CL DIS I C	17210 CL DIS TIT CON	
28	1.2	0.006L	0.003	16.9	16.	-	16.6	-	16.	12.	-	-	-	
29	3.3	0.004	0.004	-	-	15.1	-	-	15.1	-	-	10.99	-	
30	4.4	0.003	-	-	17.7	-	-	-	17.7	-	-	12.1	-	
31	5.5	0.01 L	16.	-	-	-	-	-	17.7	-	12.0	-	-	
32	6.6	0.004	0.002	-	17.7	-	-	-	17.7	-	-	15.3 R	-	
33	7.7	0.002	-	15.	-	-	-	-	15.5	-	-	12.7	-	
34	8.8	0.010L	-	-	16.5	-	-	-	16.5	-	-	11.7	-	
35	9.9	0.010L	-	20.6	R	-	-	-	16.4	-	-	11.7	-	
36	10.1	0.003L	0.008L	-	16.6	-	-	15.4	-	-	15.4	-	-	
37	11.1	0.003	-	-	-	15.4	-	-	15.4	-	-	11.7	-	
38	12.1	0.003L	-	-	-	-	-	-	-	-	-	-	9.4	
39	13.1	0.008	3.9	16.4500	16.6000	15.1000	16.1667	16.4000	16.3000	12.0000	11.6000	10.9900	11.3000	
40	14.1	0.008	3.6364	16.1554	7.0	-	-	-	-	-	4.1	4.5568	11.7059	
41	15.1	0.003	-	-	-	-	-	-	-	-	-	4.8	16.321	

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

PAGE 7

STUDY NO. IR154 FP 59 FP 19

SAMPLE 2

LAB	STUDY NO.	CHLORIDE K TOT COMMON	19005 ICP	19102 K DIS AAS	19103 K DIS FLN PH	19106 K DIS AAS LI	19301 K EXT HNO3 AA	19990 PTASSIUM COMMON	20005 CA TOR ICP	20100 CA DIS CALC'D	20101 CA DIS EDTA	20103 CA DIS AAS	20108 CA DIS AAS UP
1	17990	11.8	-	-	3.1	-	-	3.1	-	-	-	-	-
2	10.99	-	-	-	3.1	-	3.18	3.18	-	-	-	-	-
3	12.1	-	-	3.6	3.2	-	-	3.2	-	-	-	-	28.7
4	12.0	-	-	3.18	-	-	-	3.6	-	-	-	-	-
5	12.3	R	-	3.3	-	-	-	3.3	-	-	-	-	-
6	12.3	-	-	3.27	-	-	-	3.3	-	-	-	-	-
7	12.3	-	-	3.27	-	-	-	3.3	-	-	-	-	-
8	12.3	-	-	3.27	-	-	-	3.3	-	-	-	-	-
9	11.7	-	-	3.00	3.1	-	2.8	3.27	-	-	-	-	-
10	11.7	-	-	3.00	-	-	-	3.27	-	-	-	-	-
11	11.7	-	-	3.00	-	-	-	3.27	-	-	-	-	-
12	11.7	-	-	3.00	-	-	-	3.27	-	-	-	-	-
13	11.7	-	-	3.00	-	-	-	3.27	-	-	-	-	-
14	11.7	-	-	3.00	-	-	-	3.27	-	-	-	-	-
MEAN	11.6991			3.2850	3.2600	3.1250	2.8000	3.1800	3.3000	3.1775	2.87000	32.9000	29.2667
STD DEV	1.9703			0.0212	0.079	0.0500	-	-	-	0.1930	0.2828	-	28.7005
REL STD	8.3			.6	9.4	1.6	-	-	-	6.1	1.0	-	8.4
DES VAL	11.876			-	-	-	-	-	-	3.158	-	-	-

LAB	STUDY NO.	CALCIUM COMMON	20311 CA EXT ICP	20990 CALCIUM COMMON	20110 CA AUT AAS	20311 CA EXT ICP	20990 CALCIUM COMMON	20110 CA AUT AAS	20311 CA EXT ICP	20990 CALCIUM COMMON	20110 CA AUT AAS	20311 CA EXT ICP	20990 CALCIUM COMMON
1	27.	-	-	27.	-	-	-	-	-	-	-	-	-
2	26.	-	-	28.	-	-	-	-	-	-	-	-	-
3	-	-	-	32.9	-	-	-	-	-	-	-	-	-
4	-	-	-	27.9	-	-	-	-	-	-	-	-	-
5	-	-	-	30.3	-	-	-	-	-	-	-	-	-
6	-	-	-	30.3	-	-	-	-	-	-	-	-	-
7	-	-	-	30.3	-	-	-	-	-	-	-	-	-
8	-	-	-	30.3	-	-	-	-	-	-	-	-	-
9	-	-	-	30.3	-	-	-	-	-	-	-	-	-
10	-	-	-	30.3	-	-	-	-	-	-	-	-	-
11	-	-	-	31.9	-	-	-	-	-	-	-	-	-
12	-	-	-	31.9	-	-	-	-	-	-	-	-	-
13	-	-	-	31.9	-	-	-	-	-	-	-	-	-
14	-	-	-	31.9	-	-	-	-	-	-	-	-	-
MEAN	27.5090			30.3000			29.0091			-	-	-	-
STD DEV	2.7071			-			1.9664			-	-	-	-
REL STD	2.6			-			6.8			-	-	-	-
DES VAL	-			-			28.369			-	-	-	-

DATA SUMMARY

PRAIRIE PROVINCES, INTER-REGIONAL AND FEDERAL-PROVINCIAL QUALITY CONTROL PROGRAMS

STUDY NO.		IR155		PP 60		FP 20		DATE: 01/08/87		DUE DATE: 31/08/87		PAGE 8	
SAMPLE 3		SPIKED SAMPLE.								TRACE METALS S/E.			
LAB	13009 AL TOT 5X ICP	13105 AL DIS AAS GF	13111 AL EXT AAS GF	13302 AL EXT AAS SE	13305 AL EXT AAS GF	13311 AL EXT ICP DA	13999 COMMON	23009 V TOT 5X ICP	23011 V TOT 5X ICP	23111 V DIS ICP DA	23302 V EXT AAS SE	23303 V EXT AAS GF	23311 V EXT ICP DA
1	-	-	-	-	-	-	0.015	0.018	0.015	-	-	-	-
2	0.036	-	-	-	0.02 L	-	0.016	0.0168	0.016	0.01 L	-	0.004	-
3	0.024	-	0.03	-	-	-	-	0.0168	0.016	0.007	-	-	-
4	-	0.016	-	-	-	-	-	0.016	0.016	-	-	-	-
5	-	0.048R	-	-	-	-	-	0.018B	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	0.0300	-	0.0160	-	0.0300	-	0.0155	0.0180	0.0228	0.0060	-	0.0060	.0040
STD DEV	0.0085	-	0.0085	-	0.007	-	4.6	-	38.2	23.6	-	0.0060	-
REL STD	28.3	-	-	-	-	-	-	-	-	-	-	-	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-
LAB	23999 VANADIUM COMMON	24004 CR TOT AAS GF	24009 CR TOT 5X ICP	24011 CR TOT 5X ICP	24052 CR DIS AAS DA	24056 CR DIS AAS GF	24111 CR DIS ICP DA	24303 CR EXT AAS SE	24311 CR EXT ICP DA	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP	25011 MN DIS 5X ICP	25107 AAS GF
1	0.004	-	0.007	-	0.007	-	-	-	0.004	0.006	0.007	0.008L	-
2	0.01 L	0.01 L	0.007	0.012R	-	-	-	-	-	0.007	0.007	0.006	-
3	-	-	-	-	-	-	-	-	-	0.007	0.007	0.006	-
4	-	-	-	-	-	-	-	-	-	0.005	0.005	0.005	-
5	-	-	-	-	-	-	-	-	-	0.008	0.008	0.006	-
6	-	-	-	-	-	-	-	-	-	0.007	0.007	0.006	-
7	-	-	-	-	-	-	-	-	-	0.005	0.005	0.005	-
8	-	-	-	-	-	-	-	-	-	0.008	0.008	0.007	-
9	-	-	-	-	-	-	-	-	-	0.007	0.007	0.006	-
10	-	-	-	-	-	-	-	-	-	0.007	0.007	0.006	-
11	-	-	-	-	-	-	-	-	-	0.005	0.005	0.005	-
12	-	-	-	-	-	-	-	-	-	0.008	0.008	0.007	-
13	-	-	-	-	-	-	-	-	-	0.007	0.007	0.006	-
14	-	-	-	-	-	-	-	-	-	0.005	0.005	0.005	-
MEAN	0.0056	-	0.0070	-	0.0070	-	0.0050	0.0080	0.0070	0.0060	0.0064	0.0064	0.0060
STD DEV	0.0011	-	0.0011	-	0.0070	-	-	-	-	21.7	21.7	21.7	-
REL STD	20.4	-	20.4	-	-	-	-	-	-	.0007	.0007	.0007	-
DES VAL	.005	-	-	-	-	-	-	-	-	-	-	-	-
LAB	25111 Mn DIS ICP DA	25304 Mn EXT AAS DA	25306 Mn EXT AAS GF	25311 Mn EXT ICP DA	25999 MANGANESE COMMON	26011 FE TOT 5X ICP	26107 FE DIS AAS GF	26111 FE DIS ICP DA	26305 FE EXT AAS SE	26306 FE EXT AAS GF	26311 FE EXT ICP DA	26999 IRON COMMON	27003 CO TOT AAS GF
1	-	-	0.01 L	-	-	0.005	0.005	0.008L	0.007	-	-	-	-
2	-	0.007	-	-	-	0.02 L	0.006	0.006	0.007	-	-	0.008	0.007
3	-	-	-	-	-	-	0.006	0.006	0.024R	-	-	0.024R	0.006
4	-	-	-	-	-	-	0.006	0.006	0.024R	-	-	0.024R	0.006
5	-	-	-	-	-	-	0.004	0.004	0.005	-	-	0.005	0.005
6	-	-	-	-	-	-	-	-	0.005	-	-	0.005	-
7	-	-	-	-	-	-	-	-	0.007	-	-	0.007	-
8	-	-	-	-	-	-	-	-	0.007	-	-	0.007	-
9	-	0.006	-	-	-	-	-	-	0.006	-	-	0.006	-
10	-	0.004	-	-	-	-	-	-	0.004	-	-	0.004	-
11	-	-	-	-	-	-	-	-	0.006	-	-	0.006	-
12	-	-	-	-	-	-	-	-	0.007	-	-	0.007	-
13	-	-	-	-	-	-	-	-	0.007	-	-	0.007	-
14	-	-	-	-	-	-	-	-	0.007	-	-	0.007	-
MEAN	0.0050	-	0.0070	-	0.0070	-	0.0050	0.0060	0.0070	0.0050	0.0050	0.0050	0.0050
STD DEV	0.0014	-	0.0014	-	0.0070	-	-	-	18.3	18.3	18.3	16.3	-
DES VAL	28.3	-	-	-	-	-	-	-	.0006	.0006	.0006	.0006	-

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO.	SAMPLE 1			SAMPLE 2			SAMPLE 3			SAMPLE 4		
	IR155	PP 60	PP 20	CO TOT 5X ICP	CO DIS AAS GF	CO TOT 5X ICP	CO EXT AAS DA	CO EXT AAS SE	CO EXT ICP DA	ZN TOT 5X ICP	ZN DIS AAS GF	ZN TOT 5X ICP
LAB	27009	27011	27107	27111	27301	27302	27311	27999	28009	28011	28111	28301
1	-	-	-	-	-	-	-	-	-	-	-	-
2	0.004	-	-	-	-	-	0.004	0.004	0.005	-	-	-
3	-	0.005	-	-	-	-	-	0.004	0.004	-	-	-
4	-	-	-	-	0.005	-	-	-	0.005	-	-	-
5	-	-	-	-	-	0.005	-	-	0.005	-	-	-
6	-	-	-	-	-	-	0.005	-	-	-	-	-
7	-	-	-	-	-	-	-	0.005	-	-	-	-
8	-	-	-	-	-	-	-	-	0.005	-	-	-
9	-	-	-	-	-	-	-	-	-	0.007	-	-
10	-	-	-	-	-	-	-	-	-	-	0.010L	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	0.045R
MEAN	.0040	.0050	.0050	.0050	.0050	.0050	.0040	.0049	.0060	.0070	.0070	-
STD DEV	-	-	-	-	-	-	-	.0007	.0014	-	-	-
REL STD	-	-	-	-	-	-	-	.005	.23.6	-	-	-
DES VAL	-	-	-	-	-	-	-	.005	-	-	-	-
LAB	28302	28309	28311	28999	29009	29011	29107	29111	29305	29308	29311	29999
1	-	-	-	NI EXT AAS GF	NI EXT AAS GF	NI EXT AAS GF	CU TOT 5X ICP	CU DIS AAS GF	CUE EXT AAS SE	CUE EXT AAS GF	CUE EXT ICP DA	ZN TOT 5X ICP
2	0.007	-	0.007	-	0.005	0.005	-	-	0.007	-	-	0.005
3	-	0.007	-	-	0.007	0.007	-	0.014R	-	-	0.006	-
4	-	-	-	-	0.007	0.007	-	-	-	-	0.007	-
5	-	-	-	-	-	0.010L HPL	-	-	-	-	0.007	-
6	-	-	-	-	-	-	0.007	-	-	-	0.007	-
7	-	-	-	-	-	-	0.007	-	-	-	0.007	-
8	-	-	-	-	-	-	0.007	-	-	-	0.007	-
9	-	-	-	-	-	-	0.007	-	-	-	0.009	-
10	-	0.007	-	-	-	-	-	0.006	-	-	0.005	-
11	-	-	-	-	-	-	-	-	-	-	0.006	-
12	-	-	-	-	-	-	-	-	-	-	0.005	-
13	-	-	-	-	-	-	-	-	-	-	0.005	-
14	-	-	-	-	-	-	-	-	-	-	0.005	-
MEAN	.0070	.0070	.0070	.0067	.0065	.0060	.0090	.0063	.0050	.0060	.0065	.0070
STD DEV	.0000	.0000	.0000	.0008	.0021	.0007	.0012	.0012	.0005	.0005	.0015	.0005
REL STD	-1.0	-	-	11.3	32.6	-	-	18.2	-	-	23.3	-
DES VAL	-	-	-	.007	-	-	-	-	-	-	.007	-
LAB	30011	30107	30111	30304	30305	30306	30311	30999	38011	38111	38311	38999
1	-	-	-	ZN EXT AAS DA	ZN EXT AAS DA	ZN EXT AAS SE	ZN EXT ICP DA	ZINC COMMON	SR TOT ICP DA	SR DIS AAS DA	SR EXT ICP DA	STRNTIUM COMMON
2	-	0.013R	-	-	-	0.01	0.007	-	0.007	-	-	-
3	-	-	-	-	-	-	-	0.01	0.01	-	-	-
4	-	-	-	-	0.008	-	-	0.013R	0.13	-	-	-
5	-	-	-	-	-	-	-	0.01	0.01	-	-	-
6	-	-	-	-	-	-	-	0.01	0.01	-	-	-
7	-	-	-	-	-	-	-	0.007	0.008	-	-	-
8	-	-	-	-	-	-	-	-	0.007	-	-	-
9	-	-	-	-	-	-	-	-	0.005	-	-	-
10	-	-	-	-	-	-	-	-	0.004	-	-	-
11	-	0.005	-	-	-	-	0.004	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	-	.0050	-	.0100	.0070	.0040	.0070	.0069	.1300	.1800	.1700	.1630
STD DEV	-	-	-	.0080	.0000	.0000	.0070	.0020	.28.5	.0020	-	.1608
REL STD	-	-	-	-	-	-	-	-	-1.0	-	-	.13.5
DES VAL	-	-	-	-	-	-	-	-	.007	-	-	.174

PAGE: 9

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. 1B155 pp 60 pp 20

SAMPLE 4

PAGE 11

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO.	TR155	PP 60	PP 20	SAMPLE 4				SAMPLE 4				SAMPLE 4			
				07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC UP AA	07112 NO3+NO2 CD	07315 NITRATE T C	07390 NH3 TOT AA BERT	07505 NH3 TOT AA SAL	07540 NH3 TOT AA SAL	07555 NH3 DIS AA PHEN	07557 NH3 DIS AA INDO	07562 NH3 DIS AA EDTA	07563 NH3 DIS AA INDO	07590 AMMONIA COMMON
1	-	-	-	0.57	-	-	0.591	-	-	-	-	-	-	0.002L	-
2	-	-	-	0.60	-	-	0.56	-	-	-	-	-	-	0.003	-
3	-	-	-	0.560	-	-	0.56	-	-	-	-	-	-	0.005	-
4	-	-	-	0.59	-	-	0.56	-	-	-	-	-	-	0.002	-
5	-	-	-	0.60	-	-	0.54	-	-	-	-	-	-	0.004	-
6	-	-	-	0.550	-	-	0.58	-	-	-	-	-	-	0.010	-
7	-	-	-	0.60	-	-	0.58	-	-	-	-	-	-	0.007	-
8	-	-	-	0.550	-	-	0.58	-	-	-	-	-	-	0.007	-
9	-	-	-	0.60	-	-	0.56	-	-	-	-	-	-	0.010	-
10	-	-	-	0.550	-	-	0.58	-	-	-	-	-	-	0.007	-
11	-	-	-	0.60	-	-	0.58	-	-	-	-	-	-	0.007	-
12	-	-	-	0.550	-	-	0.58	-	-	-	-	-	-	0.007	-
13	-	-	-	0.60	-	-	0.58	-	-	-	-	-	-	0.007	-
14	-	-	-	0.550	-	-	0.58	-	-	-	-	-	-	0.007	-
MEAN	5.700	5.860	5.800	5.755	.5400	.5284	.5217	.5030	.0100	.0070	.0125	.0106	.0125	.0084	.0058
STD	2.283	3.095	3.019	3.019	3.8	3.8	3.8	3.8	-	60.6	84.9	-	-	-	68.9
REL	5.0	3.3	3.3	3.3	-	-	-	-	-	-	-	-	-	-	AA
DES	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ALIZ
VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	HCU
LAB	07601	07602	07605	07651	T N DIS UV AA	T N DIS UV AA	T N DIS UV AA	T N DIS COMMON	07690	07790	09103	09105	09106	09107	09108
	T N UV CALC'D	T N UV SUL	T N UV SUL	T N UV SUL					T N DIS COMMON	P DIS COL SP	P DIS EL	P DIS EL	P DIS EL	P DIS EL	P DIS EL
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	0.62	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	0.605	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	6.125	7.550	7.400	7.000	-	-	-	-	-	-	-	-	-	-	-
STD	1.016	0.636	0.4	-	-	-	-	-	-	-	-	-	-	-	-
REL	1.7	8.4	8.4	-	-	-	-	-	-	-	-	-	-	-	-
DES	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LAB	09190	10101	10108	10109	ALKALITY POT TITR	ALKALITY POT TITR	ALKALITY POT TITR	ALKALITY POT TITR	10112	10110	10301	10390	10602	10603	10690
	FLOURIDE COMMON	ALKALITY TITR'N	ALKALITY TITR'N	ALKALITY TITR'N					ALKALITY POT TITR	ALKALITY POT TITR	ALKALITY POT TITR	ALKALITY POT TITR	ALKALITY POT TITR	ALKALITY POT TITR	ALKALITY POT TITR
1	-	0.09	68	-	-	-	-	-	-	-	-	-	-	-	-
2	-	0.07	63.1	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	0.05	65.0	-	-	-	-	-	-	-	-	-	-	-	-
6	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	68.9	-	-	-	-	-	-	-	-	-	-	-	-
8	-	0.082	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	66.1	-	-	-	-	-	-	-	-	-	-	-	-
12	-	0.10	L	65.3	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	70.4	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	0.853	66.6875	65.0000	67.5000	68.4000	64.0000	66.6077	7.8915	7.8915	2.3	2.3	2.3	2.3	2.3	2.3
STD	0.0137	2.2969	3.4	1.7071	1.0	-	2.0550	5.0963	5.0963	2.0	2.0	2.0	2.0	2.0	2.0
REL	16.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DES	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

PAGE 12

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO.	IR155			PP 60			PP 20			SAMPLE 4			PAGE 13		
	LAB	11005 NA FOR ICP	11102 NA F AAS	11103 NA DIS FL PH	11105 NA DIS AAS DA	11107 NA UP FL PH	11107 NA EXT ICP	11311 NA EXT ICP	11990 SODIUM COMMON	12005 MG ROT ICP	12101 MG DIS AAS DA	12102 MG UP AAS DA	12106 MG DIS AAS DA	12107 MG DIS AAS AUT	12108 MG HARDN CALC/D
1	12	-	-	58.3	-	-	-	58.3	-	-	-	20.5	-	21.4	-
2	13	-	-	56.3	-	58.4	-	58.4	-	-	-	-	-	-	21.1
3	15	-	-	60.0	-	-	-	60.0	-	22.	-	21.9	-	-	-
4	16	-	60.	-	56.4	-	-	59.5	-	-	-	-	-	-	-
5	17	-	-	-	-	-	-	59.5	60.	22.	-	-	-	-	-
6	18	60.	-	-	-	-	-	59.	59.5	-	-	-	-	-	-
7	19	59.	-	-	-	-	-	57.	57.	-	-	-	-	-	-
8	10	-	57.	-	61.0	-	-	61.0	-	-	-	67.	R	-	-
9	11	-	-	60.0	-	-	-	60.0	-	-	20.0	-	-	-	-
10	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	59.5000	59.0000	58.8250	58.4000	58.4000	59.5000	58.9667	21.8500	22.0000	20.9500	20.5000	21.4000	21.1000	21.1000	21.1000
STD DEV	1.2071	1.17321	2.9350	3.6	-	-	1.3898	21.2121	-	1.3435	-	-	-	-	-
REL STD	1.2	2.9	3.6	-	-	-	2.4	1.0	-	6.4	-	-	-	-	-
DES VAL	-	-	-	-	-	-	59.427	-	-	-	-	-	-	-	-
MEAN	12303	12311 MG EXT ICP	129990 MGNESIUM COMMON	14102 SILICA AISA AA	14105 SILICA HOLY AA	14106 SILICA HOLY	14111 SILICA COMMON	14190 SILICA ICP DA	15106 SPIL UV ASC	15406 UP AA ASC	15409 UP AA ASC	15413 ACL AA SNCL	15421 TP BLK DIG ASC	0.006L	-
STD DEV	1.2	22.	-	22.4	15.7	R	-	14.61	-	15.7	-	-	-	0.006	-
REL STD	1.2	23	-	20.5	-	-	-	14.0	-	14.0	-	0.003L	-	0.008	-
DES VAL	1.2	24	-	21.1	-	-	-	14.6	-	15.2	-	0.068R	0.04 R	0.004	-
MEAN	12455	12456	12457	12458	12459	12460	12461	12462	12463	12464	12465	12466	12467	12468	12469
STD DEV	1.2	25	26	27	28	29	30	31	32	33	34	35	36	37	38
REL STD	1.2	25	26	27	28	29	30	31	32	33	34	35	36	37	38
DES VAL	1.2	26	27	28	29	30	31	32	33	34	35	36	37	38	39
MEAN	22.0000	21.1000	21.3700	15.2000	14.4750	14.6100	15.2000	14.7014	-	-	-	-	-	0.0060	-
STD DEV	-	-	-	3.3	-	2.4	-	-	-	2.9	-	-	-	0.0020	-
REL STD	-	-	-	21.457	-	-	-	-	-	14.637	-	-	-	33.3	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	15490	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UP AA MTB	16309 SO4 DIS SI C	16310 SO4 DIS AA CALM	16990 SULFATE COMMON	17203 CL DIS AA PE	17204 CL DIS AG TIT	17206 CL DIS AA AG	17208 CL DIS AA AG	17209 CL DIS CI C	17210 CL DIS TIR CON	-	-
STD DEV	1.2	0.006L	0.006	79.3	71.	-	75.3	-	71.	185.	-	-	-	198.	-
REL STD	1.2	0.008	0.008	-	-	69.4	-	-	75.3	-	-	-	-	189.8	-
DES VAL	1.2	0.003L	0.003L	-	-	-	-	-	69.4	-	-	-	-	-	-
MEAN	15567	15568	15569	15570	15571	15572	15573	15574	15575	15576	15577	15578	15579	15580	15581
STD DEV	1.2	0.048R	0.068R	0.074	0.074	0.075	0.076	0.073	0.074	0.075	0.076	0.077	0.078	0.079	0.080
REL STD	1.2	0.048R	0.068R	0.074	0.074	0.075	0.076	0.073	0.074	0.075	0.076	0.077	0.078	0.079	0.080
DES VAL	1.2	0.010L	0.010L	0.010L	0.010L	0.010L	0.010L	0.010L	0.010L	0.010L	0.010L	0.010L	0.010L	0.010L	0.010L
MEAN	15611	15612	15613	15614	15615	15616	15617	15618	15619	15620	15621	15622	15623	15624	15625
STD DEV	1.2	0.003L	0.008L	-	-	72.	76.5	-	72.	188.	-	-	-	198.	-
REL STD	1.2	0.003L	0.008L	-	-	76.5	-	-	76.6	188.	-	-	-	202.	-
DES VAL	1.2	0.004	0.004	-	-	73.	-	-	73.	-	-	-	-	195.	-

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

PAGE 14

DATA SUMMARY - FED-PROV SPWB OC PROGRAMS

PAGE 15

DATA SUMMARY - FED-PROV & PDWR QC PROGRAMS

SCHOLY NO TB155 BB 60 FB 20

PAGE 16

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. 1R155 PP 60 PP 20

SAMPLE 5

PAGE 17

LAB	11005 NA TOT ICP	11102 NA P AAS	11103 NA DIS FL PH	11105 NA DIS AAS DA	11107 NA UF FL PH	11311 NA EXT ICP	11990 SODIUM COMMON	12005 MG TOT ICP	12101 MG DIS CALC'D	12106 MG UF AAS DA	12107 MG DIS AAS AUT	12108 MG HARDN CALC'D
1	-	-	14.6	-	14.9	-	14.6	-	-	-	6.4	-
2	-	-	15.0	-	14.5	-	15.7	-	9.7	R	6.6	-
3	-	-	-	-	-	-	14.5	-	-	-	6.3	-
4	-	-	-	-	-	-	15.7	-	-	-	-	7.1
5	-	-	-	-	-	-	15.7	-	-	-	-	-
6	-	-	-	-	-	-	15.5	-	-	-	-	-
7	-	-	-	-	-	-	15.5	-	-	-	-	-
8	-	-	-	-	-	-	15.5	-	-	-	-	-
9	-	-	-	-	-	-	15.2	-	-	-	-	-
10	-	-	-	-	-	-	13.8	-	-	-	-	-
11	-	-	-	-	-	-	13.8	-	-	-	-	-
12	-	-	-	-	-	-	13.8	-	-	-	-	-
13	-	-	-	-	-	-	13.8	-	-	-	-	-
14	-	-	-	-	-	-	13.8	-	-	-	-	-
MEAN	15.7500	14.2667	14.7000	14.5000	14.9000	15.7000	14.8500	6.8300	-	6.7767	6.4000	7.1000
STD DEV	2.3536	4.6429	3.6	3.6	-	-	4.6987	1.4	-	2.3	-	-
REL STD DES VAL	2.2	4.5	-	-	-	-	14.742	-	-	-	-	-
LAB	12303 Mg UP AAS AUT	12311 Mg EXT ICP	12990 MGNESIUM COMMON ANS A	14102 SILICA MOLY A	14105 SILICA MOLY A	14106 SILICA MOLY A	14111 SILICA COMMON	15106 TYP FIL UV ASC	15406 TYP FIL AA ASC	15413 TP BLK AA SNCL	15421 TP BLK DIG ASC	-
1	-	-	7.	2.5	-	-	2.5	-	-	-	-	-
2	-	-	6.4	2.31	-	-	2.13	-	-	-	-	-
3	-	-	6.3	-	-	-	2.1	-	-	-	-	-
4	-	-	7.1	R	-	-	2.1	-	-	-	-	-
5	-	-	6.6	-	-	-	2.1	-	-	-	-	-
6	-	-	7.07	6.07	2.3	-	2.15	-	-	-	-	-
7	-	-	6.76	6.76	2.1	-	2.15	2.1	0.010L	-	-	-
8	-	-	6.9	-	2.2	-	2.2	-	-	-	-	-
9	-	-	6.83	-	2.2	-	2.2	-	-	-	-	-
10	-	-	6.83	-	2.2	-	2.2	-	-	-	-	-
11	-	-	6.83	-	2.2	-	2.2	-	-	-	-	-
12	-	-	6.83	-	2.2	-	2.2	-	-	-	-	-
13	-	-	6.83	-	2.2	-	2.2	-	-	-	-	-
14	-	-	6.83	-	2.2	-	2.2	-	-	-	-	-
MEAN	7.0000	7.0700	6.7860	2.4050	2.1750	2.1300	2.1500	2.2238	-	0.0057	-	.0050
STD DEV	-	-	4.2735	5.6	4.4	-	-	6.1389	-	66.8	-	.0010
REL STD DES VAL	-	-	4.0518	6.518	-	-	-	2.160	-	-	-	20.0
LAB	15490 TOT P COMMON	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UP AA MTB	16309 SO4 DIS I C	16310 SO4 DIS AA CALM	16990 SULFATE COMMON	17203 CL DIS AA PE	17204 CL DIS AG FIT	17206 CL DIS AA AG	17208 CL DIS I C	17209 CL DIS TIT CON
1	0.006L	0.005	32.0	29.	29.9	-	29.	23.	-	-	-	23.6
2	0.005	0.004	-	29.3	-	-	29.3	-	-	-	-	21.87
3	0.004	-	-	-	-	-	33.0	-	-	-	-	-
4	0.004	-	-	33.0	-	-	33.0	-	-	-	-	-
5	0.01 L	0.01 L	28.	-	-	-	28.3	-	-	-	-	-
6	0.01 L	0.01 L	31.0	-	-	-	31.0	23.	-	-	-	-
7	0.006	0.006	30.	-	30.8	-	30.8	-	-	-	-	23.
8	0.006	0.006	-	-	-	-	30.8	-	-	-	-	-
9	0.010L	0.010L	30.	-	30.8	-	30.8	-	-	-	-	-
10	0.010L	0.010L	30.	-	30.8	-	30.8	-	-	-	-	-
11	0.010L	0.010L	30.	-	30.8	-	30.8	-	-	-	-	-
12	0.003	0.003	29.5	R	29.5	-	29.5	R	-	-	-	23.5
13	0.003	R	-	-	-	-	27.9	-	-	-	-	-
14	0.003	R	-	-	-	-	27.9	-	-	-	-	-
MEAN	30.053	30.000	30.5000	29.3000	29.5333	29.4844	30.0000	23.3500	26.0000	23.5000	21.8700	23.3000
STD DEV	0.0025	0.0024	1.5811	5.2	5.0	-	1.5824	2.4950	2.1	6.3	-	1.4243
REL STD DES VAL	4.6	9.4	-	-	-	-	5.3	2.1	-	29.635	-	1.8

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IR155 PP 60 FP 20 SAMPLE 5 PAGE 18

LAB	17990 CHLORIDE KTOT COMMON ICP	19005 KDIS AS	19102 KDIS AS	19103 KDIS PLM PH	19106 KDIS AAS/LI	19107 KDIS PLM PH	19301 KEXT HNO3 AA	19990 PTASSIUM COMMON	20005 CA TOT ICP	20100 CA DIS CALC'D	20101 CA DIS EDTA	20103 CA DIS AAS	20108 CA DIS AAS/DUF
1	23.6	-	-	3.1	-	-	3.17	-	3.1	-	-	-	-
2	21.87	-	-	3.1	-	-	3.17	-	3.17	-	-	-	-
3	25.5	-	-	3.6	-	-	3.1	-	3.1	-	-	-	-
4	26.5	-	-	3.18	-	-	3.1	-	3.18	-	-	-	-
5	23.7	-	-	3.18	-	-	3.2	-	3.2	-	-	-	-
6	23.	-	-	3.7	-	-	3.1	-	3.15	-	-	-	-
7	23.	-	-	3.35	-	-	2.8	-	3.24	-	-	-	-
8	23.	-	-	3.35	-	-	2.8	-	3.24	-	-	-	-
9	25.	-	-	3.12	-	-	3.1	-	3.16	-	-	-	-
10	22.	-	-	3.12	-	-	3.06	-	3.16	-	-	-	-
11	22.	-	-	3.12	-	-	3.06	-	3.16	-	-	-	-
12	36.5 R	-	-	3.12	-	-	3.06	-	3.16	-	-	-	-
13	23.6518	3.5250	3.2800	3.1000	2.8000	3.1700	3.2000	3.2050	3.2450	3.2450	3.2450	3.2450	32.2000
MEAN	23.6518	3.5250	3.2800	3.1000	2.8000	3.1700	3.2000	3.2050	3.2450	3.2450	3.2450	3.2450	32.2000
STD DEV	1.3399	0.2475	0.2835	0.0000	-1.0	-	-	-	0.707	0.707	0.707	0.707	0.707
REL STD	5.7	7.0	8.6	-	-	-	-	-	7.6	7.6	7.6	7.6	7.6
DES VAL	23.752	-	-	-	-	-	-	-	3.181	3.181	3.181	3.181	3.181

LAB	20110 CAS DIS AS AUT	20311 CAP EXT ICP	20990 CALCIUM COMMON	32.	31.	32.	31.	32.	31.	32.	31.	32.	31.
1	32.	-	-	32.	-	-	32.	-	-	-	-	-	-
2	31.	-	-	31.	-	-	31.	-	-	-	-	-	-
3	35.	-	-	32.	-	-	32.	-	-	-	-	-	-
4	6	-	-	29.2	-	-	29.2	-	-	-	-	-	-
5	7	-	-	31.4	-	-	31.4	-	-	-	-	-	-
6	8	-	-	32.9	-	-	32.9	-	-	-	-	-	-
7	9	-	-	32.9	-	-	32.9	-	-	-	-	-	-
8	10	-	-	32.5	-	-	32.5	-	-	-	-	-	-
9	11	-	-	32.4	-	-	32.4	-	-	-	-	-	-
10	12	-	-	32.4	-	-	32.4	-	-	-	-	-	-
11	13	-	-	32.4	-	-	32.4	-	-	-	-	-	-
12	14	-	-	32.4	-	-	32.4	-	-	-	-	-	-
MEAN	31.5000	32.9000	31.4545	-	-	-	-	-	-	-	-	-	-
STD DEV	2.7071	-	1.3171	-	-	-	-	-	-	-	-	-	-
REL STD	2.2	-	4.277	-	-	-	-	-	-	-	-	-	-
DES VAL	-	-	31.677	-	-	-	-	-	-	-	-	-	-

DATES RECEIVED 1 87/07/22 2 87/08/31 3 87/08/20 3 87/08/31 4 87/08/31
 5 87/10/02 6 87/07/31 7 87/10/02 8 87/09/24 9 87/09/03
 10 87/08/31 11 87/08/04 12 87/09/04 14 87/08/05

NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT IN USE/CN, TURBIDITY IN JTU OR NTU, NITROGEN CONDUCTIVITY IN USE/CN, SILICA IN SiO2, AND SULFATE IN SO4.
 COLOUR IN RELATIVE UNITS, HARDNESS IN CaCO3, SILICA IN SiO2, AND SULFATE IN SO4.