

NWRI CONTRIBUTION NO. 87-151

Summary Report for The Prairie Provinces
Quality Assurance Studies 49-60 (Sept 86-
Aug 87) for Inorganic Constituents in
Surface Waters.

H. Alkema

Executive Summary PPQC 49-60

Under the auspices of the Prairie Provinces Water Board, a quality assurance program was initiated for assessing and improving the comparability of water quality data generated by the Federal Water Quality Branch Saskatoon Laboratory (ECS) and the Alberta, Saskatchewan and Manitoba provincial laboratories.

In the first phase of this program, interlab studies are conducted bi-monthly on some 40 parameters involving about 100 analytical procedures.

Twelve studies were sent out in the period from September 1986 to August 1987. These studies dealt with analyses of trace metals, major ions, nutrients, and physical parameters in natural and spiked water samples. The reference water samples are typical of the surface waters found in the various regions.

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 Prairie Province Quality Control (PPQC) program. This report, which covers the period from September 1986 to August 1987 (QC studies PP 49 to PP 60), 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 PPQC program have usually shown prompt correction of problems when notified of them.

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MEMORANDUM

NOTE DE SERVICE

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

SECURITY - CLASSIFICATION - DE SÉCURITÉ
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DATE January 14, 1987.

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FROM
DE

SUBJECT
OBJET

Prairie Provinces Quality Control (PPQC) Program

I have enclosed the final report for PP 49-50.

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

PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAM

STUDIES 49 AND 50

for September and October, 1986

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

by

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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 PPWB program. This report summarizes the most recent PPWB inter-laboratory quality control studies: PP 49 and 50, 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:

PP 49 - Sample 1 - 125 ml, D/A * for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

PP 50 - 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 PP 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.

Individual laboratory deviations are listed below:

- Lab 1 - a high result for Al by SE: +27%; SO_4 : +12%;
and Alkalinity: +12%
 - a low result for DIC: -68% (at low level)
 - an HDL for Silica

- 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 6 - low results for Sr: -55% (R), and -55% (R)
 - a high result for Al by SE: +62% (R)
 - low results for Mo: -15% and -31%
 - low results by SE for Ni: -29%; Cu: -23%; and Pb: -50%
 - high results for TKN: +21%, +61% (R), and +48%
 - high results for T. P.: (R) (3X)
 - high results for K: +22% (R), +49% (R), and +31% (R)
 - erratic results for F: +19%, and -32%
 - high results for NO_3+NO_2 : +16% and +16%
 - a low result for Na: -18%
 - an HDL for Al by SE and Alkalinity

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

- Lab 8
- a high result for Cd by DA: +100% (R)
 - low results by DA for Cu: -14%, Zn: -11%, and Pb: -15% (R)
 - a low result for Hard.: -11%, K: -13%, Si: -25% and -18%
Ca: -13% (R), and Na: -13%
 - a high result for F: +15%, TKN: +21%, Turb: (R),
Alk.: +12%, and TP (R, at low level)
 - an HDL for Al by SE, MN by SE, and B

PPWB laboratories average number of deviations per sample was 2.8.

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. IR144 PP 49 FP 9 DATE: 01/09/86 DUE DATE: 31/10/86 PAGE 5

MAJOR IONS 4C.

SAMPLE = 2 SPIKED SAMPLE.

LAB	06152 DIC IR UV CO2EV MG/L C	06154 DIC AA CO2 PHEN MG/L C	06490 DI C COMBINED MG/L C	07010 TKN AUTAN MG/L N	07013 TKN ION EL MG/L N	07015 TKN DIC BERTHELT MG/L N	07016 TKN BLK AMM-SALI MG/L N	07018 TKN BLK INDOPHEN MG/L N	07021 TKN BLK DIG BERT MG/L N	07090 TKN COMBINED MG/L N	07109 NO3+NO2 F AA HYD MG/L N
1	17.4	17.0	17.0	0.850	-	-	-	-	0.800	0.800	-
3	18.0	-	17.4	-	-	-	-	-	-	0.850	-
4	-	-	18.0	-	-	-	-	-	-	-	-
5	-	-	21.0	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-
MEAN	17.7000	17.0000	18.4800	.8500	.6000	1.0000	1.0000	.7100	.8000	.8267	1.9833
STD. DEV.	2.4243	-	1.5975	-	-	-	-	-	-	19.21590	5.21041
REL. STD. DEV.	2.4	-	8.6	-	-	-	-	-	-	19.2	5.2
DES. VAL.	-	-	17.768	-	-	-	-	0.71	-	.855	-

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 AA BERT MG/L N	07506 NH3 TOT SPEC EL MG/L N	07555 NH3 DISS AA PHEN MG/L N	07557 NH3 DISS AA INDO 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
1	2.10	1.92	-	1.92	-	-	-	-	-	2.0	-
2	2.05	-	1.98	2.10	0.117	-	-	-	0.117	-	-
3	2.00	-	-	1.98	-	0.09	-	0.120	0.120	-	-
4	-	-	-	2.00	-	-	-	0.13	0.13	-	-
5	-	-	2.20	2.10	-	-	0.13	-	-	-	-
6	2.10	-	-	2.10	-	-	-	-	-	-	-
7	-	-	-	2.10	-	-	-	-	-	-	-
8	-	-	-	1.95	-	-	-	-	-	-	-
9	-	-	-	1.95	-	-	-	-	-	-	-
10	2.06	-	-	2.06	-	0.11	-	-	0.130	-	-
11	-	-	-	-	-	-	-	-	0.137	-	-
12	-	-	-	-	-	-	-	-	0.137	-	-
MEAN	2.0350	1.9200	2.0900	2.0217	.1170	.1000	.1323	.1250	.1205	2.0000	2.9350
STD. DEV.	3.70758	-	7.41556	4.70952	-	14.10141	3.10040	5.70071	12.50151	-	8.02333
REL. STD. DEV.	3.7	-	7.4	4.7	-	14.1	3.1	5.7	12.5	-	8.0
DES. VAL.	-	-	-	2.044	-	-	-	-	.055	-	-

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 7
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	10690 HARDNESS COMBINED MG/L CAC	11005 NA TOTAL ICAP MG/L	11102 SODIUM AAS F MG/L	11103 NA DISS FL PH MG/L	11105 SODIUM AAS DA MG/L	11107 NA EXTRL FL PH MG/L	11311 NA EXTRL HNO3 ICP MG/L	11990 SODIUM COMBINED MG/L NA	12005 MG TOTAL ICAP MG/L	12101 MG DISS CALC'D MG/L	12102 MG DISS AAS DA MG/L
1	198.5	-	-	37.0	-	-	-	37.0	-	-	-
2	192.5	-	-	38.0	-	-	-	38.0	-	-	-
3	187.9	-	-	38.5	36.8	-	-	38.8	-	-	-
5	194.	-	-	-	-	-	-	38.5	-	-	-
6	192.	-	37.	-	-	-	-	37.5	30.	-	-
7	203.9	-	-	-	-	-	34.7	37.5	-	-	37.5 R
8	192.	39.8	-	-	-	-	-	34.7	-	-	-
9	195.	36.8	-	-	-	-	-	39.8	-	-	-
10	220.	-	-	-	-	-	-	38.8	-	-	-
11	195.	-	38.	37.5	-	-	-	38.8	-	-	35.
12	195.	-	-	-	-	-	-	37.5	-	-	-
MEAN	197.0300	37.9000	37.5000	37.7500	37.5000	36.8000	34.7000	37.3455	32.2000	30.0000	35.0000
STD. DEV.	9.1145	1.5556	1.7071	1.6455	1.7	-	-	1.1317	.9	-	-
REL. STD. DEV.	4.6	4.1	1.9	1.7	-	-	-	3.0	9	-	-
DES. VAL.	199.759	-	-	-	-	-	-	37.909	-	-	-

LAB	12106 MG UF 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 UF AAS AUTO MG/L	12311 MG EXTRL HNO3 ICP MG/L	12990 MGNESIUM 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	14111 SILICA F ICAP DA MG/L
1	-	-	-	-	-	-	-	-	-	-	-
2	-	31.	-	-	33.	-	33.	1.1	-	-	-
3	30.0	-	-	-	-	31.0	1.13	-	-	-	-
5	-	-	30.3	-	-	30.3	-	1.1	1.10	-	-
6	-	-	-	-	-	30.3	-	-	-	-	-
7	-	-	-	-	-	31.6	-	1.1	-	-	1.13
8	-	-	-	-	-	31.6	-	1.1	-	-	-
9	-	-	-	-	-	32.4	-	1.11	-	-	-
10	-	-	-	-	-	32.4	-	1.1	-	-	-
11	-	-	-	32.0	-	32.0	-	1.1	-	-	-
12	-	-	-	-	-	32.0	-	1.1	-	-	-
MEAN	30.0000	31.0000	30.3000	32.0000	33.0000	31.6000	31.7300	1.1150	1.1025	1.1000	1.1300
STD. DEV.	-	-	-	-	-	-	1.5449	.0212	.0050	-	-
REL. STD. DEV.	-	-	-	-	-	-	4.9	1.9	.5	-	-
DES. VAL.	-	-	-	-	-	-	31.598	-	-	-	-

DATA SUMMARY

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

STUDY NO. IRI144 PP 49 FP 9 DATE: 01/09/86 DUE DATE: 31/10/86 PAGE 9
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	19103 K DISS FLM PHOT MG/L	19106 K DISS AAS LI MG/L	19107 K DIS UF FLM PHOT MG/L	19301 K EXTRL HN03 AA MG/L	19990 PTASSIUM COMBINED MG/L K	20005 CA TOTAL ICAP MG/L	20100 CA DISS CALC'D 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	-	-	-	15.6	-	-	27.8	-	25.8	-
4	-	-	-	-	17.3	-	27.	-	-	-	-
5	-	-	-	-	16.8	-	-	-	26.4	-	-
6	-	-	-	14.5	14.5	26.5	-	-	-	-	-
7	-	-	-	-	17.3	26.2	-	-	-	-	-
8	-	-	-	-	17.3	-	-	-	29.	-	-
9	-	-	-	-	16.5	-	-	-	-	-	-
10	-	17.	-	-	16.5	-	-	-	-	-	-
11	16.5	-	-	-	16.5	-	-	-	-	-	-
12	-	-	-	-	16.5	-	-	-	-	-	-
MEAN	16.1500	17.0000	15.6000	14.5000	16.1800	26.3500	27.0000	27.8000	27.7000	25.8000	25.5000
STD.	3.1	-	-	-	4.9	.2121	-	-	1.8385	-	2.8
REL.	-	-	-	-	15.986	.8	-	-	6.6	-	-
DES.	-	-	-	-	-	-	-	-	-	-	-

LAB	20111 CA DISS ICAP MG/L	20311 CA EXTRL HN03 ICP MG/L	20990 CALCIUM COMBINED MG/L CA
1	-	-	25.
2	-	-	26.8
3	-	-	27.8
4	-	-	27.
5	-	-	26.4
6	-	24.7	24.7
7	-	-	26.5
8	-	-	26.2
9	-	-	29.
10	25.5	-	25.5
11	-	-	-
12	-	-	-
MEAN	25.5000	24.7000	26.3545
STD.	-	-	1.4364
REL.	-	-	4.7
DES.	-	-	26.529

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 10
 SAMPLE = 3 SPIKED SAMPLE. TRACE METALS S/E. (IN 0.2% HNO3)

LAB	13009	13111	13302	13305	13306	13311	13999	23009	23011	23102	23111
	AL TOTAL	AL DISS	AL EXTBL	AL EXTBL	AL UF/AAS	AL EXTBL	ALUMINUM	V TOTAL	V TOTAL	V DISS	V DISS
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L AL	MG/L	UG/L V	MG/L	MG/L
1	-	-	-	0.037	0.047	-	0.047	0.013	-	-	-
2	-	-	-	0.038	-	0.040	0.037	-	-	-	-
3	-	-	-	-	-	-	0.038	-	0.01	-	-
6	0.06 R	-	0.2 L	-	-	-	0.06 R	-	-	-	-
9	-	0.04	-	-	-	-	0.04 L	-	-	-	0.012
10	-	0.05	-	0.04	-	-	0.04	-	-	-	0.016
12	-	-	-	-	-	-	0.04	-	-	0.013	-
MEAN	-	.0450	-	.0383	.0470	.0400	.0420	.0130	.0100	.0130	.0110
STD. DEV.	-	.0071	-	4.0	-	-	12.5	-	-	-	.0014
REL. DES. VAL.	-	15.7	-	-	-	-	.037	-	-	-	12.9

LAB	23302	23311	23999	24004	24009	24011	24056	24303	24311	24999	25003
	V EXTBL	V EXTBL	VANADIUM	CR TOTAL	CR TOTAL	CR TOTAL	CR DISS	CR EXTBL	CR EXTBL	CHROMIUM	MN TOTAL
	MG/L	MG/L	MG/L V	MG/L	MG/L	MG/L	MG/L G F	MG/L	MG/L	MG/L CR	MG/L
1	0.010	0.011	0.013	-	0.014	-	-	0.009	0.011	0.014	0.012
3	-	-	0.010	-	-	0.011	-	-	-	0.009	-
6	-	-	0.01	-	-	-	-	-	-	0.013	-
9	-	-	0.012	0.013	-	-	-	-	-	0.012	-
10	-	-	0.010	0.013	-	-	-	-	-	0.012	-
11	-	-	0.013	0.014	-	-	0.016	-	-	0.016	-
12	-	-	0.013	-	-	-	-	-	-	0.014	-
MEAN	.0100	.0110	.0113	.0130	.0140	.0110	.0160	.0090	.0110	.0128	.0120
STD. DEV.	-	-	.0015	.0008	-	-	-	-	-	.0021	-
REL. DES. VAL.	-	-	13.3	6.3	-	-	-	-	-	16.6	-

LAB	25011	25107	25111	25304	25311	25999	26003	26011	26107	26111	26305
	MN TOTAL	MN DISS	MN DISS	MN EXTBL	MN EXTBL	MANGNESE	FE TOTAL	5X ICAP	FE DISS	FE DISS	FE EXTBL
	UG/L MN	MG/L	MG/L DA	MG/L DA	MG/L	MG/L MN	MG/L	UG/L FE	MG/L	MG/L	MG/L
1	-	-	-	-	-	0.012	-	-	-	-	0.028
2	-	-	-	0.013	0.013	0.013	-	-	-	-	0.029
3	-	-	-	-	-	0.013	-	0.032	-	-	-
6	0.013	-	-	-	0.02 L	0.02 L HDL	-	-	-	0.03	-
9	-	-	0.013	-	-	0.013	-	-	-	0.032	-
10	-	-	0.012	-	-	0.012	-	-	-	-	-
11	-	-	-	-	-	0.012	0.029	-	-	-	-
12	-	0.012	-	-	-	0.012	-	-	0.040R	-	-
MEAN	.0130	.0120	.0125	.0115	.0130	.0121	.0290	.0320	-	.0310	.0285
STD. DEV.	-	-	.0007	.0021	-	.0011	-	-	-	.0014	.0007
REL. DES. VAL.	-	-	5.7	18.4	-	8.8	-	-	-	4.6	2.5

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 11
 SAMPLE = 3 SPIKED SAMPLE. TRACE METALS S/E. (IN 0.2% HNO3)

LAB	26311 FE EXTLBL 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 5X ICAP UG/L CO	27107 CO DISS AAS G F MG/L	27111 CO DISS ICAP DA MG/L	27311 CO EXTLBL ICAP DA MG/L	27999 COBALT COMBINED MG/L CO	28007 NI TOTAL AAS G F MG/L	28009 NI TOTAL ICAP DA MG/L
1	-	-	-	0.012	-	-	-	-	0.012	-	0.017
2	0.030	0.028	-	-	-	-	-	0.010	0.010	-	-
3	-	0.032	-	-	0.009	-	-	-	0.009	-	-
6	0.03	0.03	0.011	-	-	-	-	-	0.011	-	-
8	-	0.03	-	-	-	-	0.01 L	-	0.011 L	-	-
9	-	0.032	-	-	-	-	0.009	-	0.009	0.012	-
10	-	0.029	-	-	-	0.012	-	-	0.012	-	-
12	-	0.040	-	-	-	-	-	-	-	-	-
MEAN	0.0300	0.0300	0.0110	0.0120	0.0090	0.0120	0.0090	0.0100	0.0105	0.0120	0.0170
STD.	0.0000	0.0015	-	-	-	-	-	-	0.0014	-	-
REL.	-1.0	5.1	-	-	-	-	-	-	13.1	-	-
DES.	-	0.029	-	-	-	-	-	-	0.011	-	-

LAB	28011 NI TOTAL 5X ICAP UG/L NI	28107 NI DISS AAS G F MG/L	28111 NI DISS ICAP DA MG/L	28302 NI EXTLBL AAS SE MG/L	28309 NI EXTLBL AAS G F MG/L	28311 NI EXTLBL ICAP DA MG/L	28999 NICKEL COMBINED MG/L NI	29003 CO TOTAL AAS G F MG/L	29009 CO TOTAL ICAP MG/L	29011 CU TOTAL 5X ICAP UG/L CU	29107 CU DISS AAS G F MG/L
1	-	-	-	0.013	-	0.012	0.017	-	0.014	-	-
3	0.010	-	-	-	-	-	0.013	-	-	0.010	-
6	-	-	-	-	0.012	-	0.012	-	-	-	-
8	-	-	0.012	-	-	-	0.012	-	-	-	-
9	-	-	0.009	-	-	-	0.012	-	-	-	-
10	-	-	-	-	-	-	0.009	0.012	-	-	-
12	-	0.013	-	-	-	-	0.013	-	-	-	0.012
MEAN	0.0100	0.0130	0.0105	0.0130	0.0120	0.0120	0.0123	0.0120	0.0140	0.0100	0.0120
STD.	-	-	0.0021	-	-	-	0.0024	-	-	-	-
REL.	-	-	20.2	-	-	-	19.4	-	-	-	-
DES.	-	-	-	-	-	-	0.014	-	-	-	-

LAB	29111 CU DISS ICAP DA MG/L	29305 CU EXTLBL AAS SE MG/L	29311 CU EXTLBL ICAP DA MG/L	29999 COPPER COMBINED MG/L CU	30003 Zn TOTAL AAS G F MG/L	30009 Zn TOTAL ICAP MG/L	30011 Zn TOTAL 5X ICAP UG/L ZN	30107 Zn DISS AAS G F MG/L	30111 Zn DISS ICAP DA MG/L	30304 Zn TOTAL 5X ICAP MG/L	30305 Zn EXTLBL AAS SE MG/L
1	-	-	-	0.014	-	0.018	-	-	-	-	-
2	-	0.013	0.012	0.013	-	-	-	-	-	0.01	0.016
3	-	0.013	0.012	0.013	-	-	-	-	-	-	-
6	-	-	0.012	0.010	-	-	-	-	-	-	-
8	-	-	0.012	0.012	-	-	-	-	-	-	-
9	0.012	-	-	0.012	-	-	-	-	0.018	-	-
10	0.015	-	-	0.015	-	-	-	-	0.018	-	-
12	-	-	-	0.012	0.019	-	-	0.017	-	-	-
MEAN	0.0135	0.0130	0.0120	0.0126	0.0190	0.0180	0.0150	0.0170	0.0180	0.0100	0.0160
STD.	0.0021	0.0000	0.0000	0.0014	-	-	-	-	-	-	-
REL.	15.7	-1.0	-1.0	11.3	-	-	-	-	-	-	-
DES.	-	-	-	0.013	-	-	-	-	-	-	-

DATA SUMMARY

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

STUDY NO. IRI45 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 PB TOTAL SX ICAP MG/L	56011 PB TOTAL SX ICAP UG/L BA	56111 PB DISS ICAP DA MG/L	56311 PB EXTRL ICAP DA MG/L	56999 BARIUM COMBINED MG/L BA	82004 PB TOTAL AAS G F MG/L	82011 PB TOTAL SX ICAP UG/L PB	82104 PB DISS AAS G F MG/L	82302 PB EXTRL AAS SE MG/L	82309 PB EXTRL AAS G F MG/L	82311 PB EXTRL ICAP DA MG/L
1	0.023	-	-	-	0.023	-	-	-	0.011	-	-
2	-	-	-	0.023	0.022	-	-	-	0.011	-	0.010
3	-	0.025	-	-	0.025	-	0.005L	-	-	0.013	-
6	-	-	-	-	0.025	0.011	-	-	-	-	-
8	-	-	0.025	-	0.02	0.007	-	-	-	-	-
9	-	-	0.02	-	0.02	0.012	-	-	-	-	-
10	-	-	-	-	-	-	-	0.012	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-
MEAN	.0230	.0250	.0235	.0230	.0232	.0199	-	.0120	0.0110	.0130	.0100
STD. DEV.	-	15.7	.0035	-	.0020	26.5	-	-	0.0000	-	-
REL. STD. DEV.	-	-	-	-	8.8	-	-	-	-1.0	-	-
DES. VAL.	-	-	-	-	.025	-	-	-	-	-	-

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

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 15
 SAMPLE = 4 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	06152 DIC IR UV CO2EV MG/L C	06154 AA CO2 PHEN MG/L C	06490 D I C COMBINED MG/L C	07010 TKN AUTAN MG/L N	07013 TKN ION EL MG/L N	07015 TKN DIG BERTHELT MG/L N	07016 TKN BLK AMM-SALI MG/L N	07018 TKN BLK INDOPHEN MG/L N	07021 TKN BLK DIC BERT MG/L N	07090 TKN COMBINED MG/L N	07109 NO3+NO2 F AA HYD MG/L N
1	39.0	41.6	41.6	0.578	-	-	-	-	0.58	0.58	-
3	41.0	-	39.0	-	-	-	-	-	-	0.578	-
4	-	46.	41.0	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	0.60	0.9 R	-	-	0.60	1.52
8	-	-	-	-	-	-	-	-	-	-	1.0
9	-	-	-	-	0.50	-	-	-	-	0.50	1.30
10	-	-	-	-	-	-	-	0.53	-	0.53	-
11	-	-	42.	-	0.50	-	-	-	-	0.53	-
12	-	-	-	-	0.50	-	-	-	-	0.53	-
MEAN	40.0000	41.6000	41.9200	0.5780	0.5000	0.6000	-	0.5300	0.5800	0.5576	1.2733
STD.	1.4142	-	2.5558	-	-	-	-	-	0.0412	7.4	2610
REL.	3.5	-	6.1	-	-	-	-	-	7.4	7.49	20.5
DES.	VAL.	-	41.829	-	-	-	-	-	-	-	-

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 AA BERT MG/L N	07506 NH3 TOT SPEC EL MG/L N	07555 NH3 DISS AA PHEN MG/L N	07557 NH3 DISS AA INDO 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
1	1.35	1.18	-	1.18	-	-	-	-	-	1.5	-
3	1.35	-	1.331	1.35	-	-	-	-	-	-	-
4	1.31	-	1.331	1.35	0.005	0.05 L	-	-	0.005 L MDL	-	-
5	-	-	-	1.31	-	-	-	0.002L	0.002L	-	-
6	-	-	-	1.31	-	-	-	0.001	0.001	-	-
7	1.30	-	1.44	1.34	-	-	0.004	-	0.004	-	1.90
8	-	-	-	1.30	-	-	-	-	-	-	-
9	-	-	-	1.30	-	0.01 L	0.015	-	0.015	-	-
10	1.34	-	-	1.34	-	-	0.005L	-	0.005L	-	1.87
11	-	-	-	1.30	0.0050	-	0.0095	0.0100	0.0095	1.5000	1.8850
12	-	-	-	1.124	-	-	81.9	-	59.6	-	1.0212
MEAN	1.3250	1.1800	1.3855	1.3101	0.0050	-	0.0078	0.0100	0.0085	1.5000	1.8850
STD.	0.0243	-	0.0771	0.1275	-	-	9.7	-	0.0051	-	0.0212
REL.	1.8	-	5.6	9.7	-	-	81.9	-	59.6	-	1.1
DES.	VAL.	-	-	1.124	-	-	-	-	59.6	-	-

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 16
 SAMPLE = 4 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	07605 NITROGEN UV AA HY MG/L N	07651 TOT N F UV AA MG/L N	07655 TOT N F UV EDTA MG/L N	07690 TOTAL N COMBINED MG/L N	07790 T N DISS COMBINED MG/L N	09103 FLUORIDE DIS COLR MG/L	09105 F DIS UF SPEC EL MG/L	09107 FLUOR F AUTO POT MG/L	09108 F DISS SPEC EL MG/L	09110 F DISS PHOTOM MG/L	09115 F DISS AA ALIZA MG/L
1	-	-	-	-	1.5	-	0.25	0.24	-	-	-
2	-	-	-	-	1.73	-	-	-	0.26	-	-
3	-	1.73	1.74	-	1.74	-	0.245	-	-	-	-
4	-	-	-	-	-	0.3	-	-	-	-	-
5	-	-	-	1.90	-	-	0.29	-	-	-	-
6	-	-	-	-	1.60	-	0.27	-	-	-	-
8	-	-	-	1.87	-	-	0.27	-	-	-	0.36 R
10	1.60	-	-	-	-	-	-	-	-	0.29	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	1.87	-	-	0.27	-	-	-	-
MEAN	1.6000	1.7300	1.7400	1.8850	1.6425	0.3000	0.2650	0.2400	0.2600	0.2900	-
STD.	-	-	-	0.0212	0.1144	-	0.0180	-	-	-	-
REL.	-	-	-	1.1	7.0	-	6.8	-	-	-	-
DES.	-	-	-	1.990	1.629	-	-	-	-	-	-

LAB	09190 FLUORIDE COMBINED MG/L F	10101 ALKALINTY TOT N MG/L CAC	10108 ALKALINTY POT TITN MG/L CAC	10109 ALKALINTY POT TITN MG/L CAC	10111 ALKALINTY TITROPRO MG/L CAC	10112 ALKALINTY TIT COND MG/L CAC	10190 ALKALINTY COMBINED MG/L CAC	10301 PH UNITS	10390 PH COMBINED UNITS	10602 HARDNESS CALC'D MG/L CAC	10603 HARDNESS TITR N MG/L CAC
1	0.24	168.9	-	-	-	-	168.9	7.9	7.9	246.	-
2	0.25	157.9	-	-	-	-	157.9	8.24	8.24	237.5	-
3	0.26	168.	-	-	169.	-	169.	8.24	8.24	-	-
4	0.245	167.	-	171.	-	-	167.	7.86	7.86	-	247.
5	0.3	165.1	-	167.	-	-	165.1	7.8	7.8	-	244.
6	0.29	166.	-	167.	-	-	166.	8.0	8.0	-	249.2
8	0.36 R	-	166.	-	-	-	166.	7.90	7.90	215.	-
10	0.27	167.	-	-	-	-	167.	7.98	7.98	235.	-
11	0.27	164.	-	-	171.	-	164.	8.2	8.2	260.	-
12	0.27	164.	-	-	-	-	164.	8.2	8.2	236.	-
MEAN	0.2683	165.2857	166.0000	169.0000	171.0000	166.7500	166.809	7.9755	7.9755	238.2500	246.7333
STD.	0.0215	3.5788	-	-	-	2.4859	2.1	1.461	1.461	14.7640	2.6102
REL.	8.0	2.2	-	-	-	2.1	2.1	1.8	1.8	6.2	1.1
DES.	0.253	-	-	-	-	166.809	-	7.893	7.893	-	-

DATA SUMMARY

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

PAGE 19

STUDY NO. IR145 PP 50 FP 10 DATE: 01/10/86 DUE DATE: 31/10/86 MAJOR IONS 4C.

SAMPLE = 4 SPIKED SAMPLE.

LAB	19102 K DISS AAS MG/L	19103 K DISS FLM PHOT MG/L	19106 K DISS AAS LI MG/L	19107 K DISS UF FLM PHOT MG/L	19301 K EXTL HM03 AA MG/L	19990 PTASSIUM COMBINED MG/L K	20005 CA TOTAL ICAP MG/L	20100 CA DISS CALC'D MG/L	20101 CA DISS TIT EDTA MG/L	20103 CA DISS AAS MG/L	20108 CA DISS AAS UF MG/L
1	7.9	7.9	-	-	-	7.9	-	-	-	-	-
2	8.0	8.0	-	7.86	-	8.0	-	-	-	-	43.4
3	8.2	8.2	-	-	-	8.2	-	-	-	-	-
5	12.7 R	12.7	-	-	-	12.7 R	-	43.	46.9	46.	-
6	8.7	8.7	-	-	7.00	8.7	43.5	-	-	-	-
7	8.7	8.7	-	-	7.00	8.7	43.3	-	-	-	-
8	8.2	8.2	8.5	-	-	8.2	-	-	-	46.	-
9	8.7000	8.0750	8.5000	7.8600	7.0000	8.0920	43.4000	43.0000	46.9000	46.0000	43.4000
10	-	1.500	-	-	-	5.9	.1414	-	-	0.0000	-
11	-	1.9	-	-	-	8.062	.3	-	-	-1.0	-
12	-	-	-	-	-	-	-	-	-	-	-
MEAN											
STD.											
DEV.											
REL. STD.											
DES. VAL.											

LAB	20110 CA DISS AAS AUTO MG/L	20111 CA DISS ICAP MG/L	20311 CA EXTL HM03 ICP MG/L	20990 CALCIUM COMBINED MG/L CA
1	46.	-	-	46.
2	44.	-	-	44.4
3	-	-	-	43.4
5	-	-	-	46.9
6	-	-	-	43.
7	-	-	38.3 R	46.3 R
8	-	-	-	43.5
9	-	-	-	43.3
10	-	42.6	-	48.6
11	45.0000	42.6000	-	44.4700
12	1.4142	-	-	1.5727
MEAN				
STD.				
DEV.				
REL. STD.				
DES. VAL.				

DATA SUMMARY

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

STUDY NO. IRL145 PP 50 FP 10 DATE: 01/10/86 DUE DATE: 31/10/86 PAGE 21
 SAMPLE = 5 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	06152 DTC IR UV CO2EV MG/L C	06154 DTC AA CO2 PHEN MG/L C	06490 DTC COMBINED MG/L C	07010 TKN AUTAN MG/L N	07013 TKN ION EL MG/L N	07015 TKN DIG BERTHELT MG/L N	07016 TKN BLK AMM-SALI MG/L N	07018 TKN BLK INDOPHEN MG/L N	07021 TKN BLK DIG BERT MG/L N	07090 TKN COMBINED MG/L N	07109 NO3+NO2 F AA HYD MG/L N
1	2.7	1.0 L	1.0 L	0.181					0.200	0.200	
2	3.1		3.7							0.181	
3			3.7							0.20	0.17
4						0.20	0.4			0.4	
5										0.31	0.10 R
6					0.31			0.33		0.33	0.125
7			3.							0.33	
8			3.1250		0.3100	0.2000	0.4000	0.3300	0.2000	0.2702	0.1475
9	2.9000		13.4	0.1810						0.0892	0.0318
10	2.828									33.0	21.6
11	9.8										
12											
MEAN											
STD. DEV.											
REL. STD. DES.											
VAL.											

LAB	07110 NO3+NO2 AA2 CD MG/L N	07111 NO3+NO2 DIS. SPEC MG/L N	07112 NO3+NO2 UP AA CD 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	07555 NH3 DISS AA PHEN MG/L N	07557 NH3 DISS AA INDO MG/L N	07562 NH3 DISS AA EDTA MG/L N	07590 AMMONIA COMBINED MG/L N	07601 TOTAL N AA UV MG/L N
1	0.15	0.134		0.134					0.023	0.023	0.20
2	0.15		0.148	0.148	0.017	0.05 L				0.017	
3	0.145			0.145				0.014		0.05 L HDL	
4				0.145				0.02		0.014	
5			0.17	0.17			0.019			0.019	
6	0.15			0.15						0.015	
7	0.16			0.16		0.03 R				0.015	
8				0.16						0.015	
9				0.16						0.015	
10	0.1525	0.1340	0.1590	0.1511	0.0170		0.0160	0.0170	0.0230	0.0174	0.2000
11	0.0061		0.0156	0.0138			0.0026	0.0042		0.0034	
12	4.0		9.8	9.1			16.5	25.0		19.6	
MEAN											
STD. DEV.											
REL. STD. DES.											
VAL.											

MCU

DATA SUMMARY

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

STUDY NO. IR145 PP 50 FP 10 DATE: 01/10/86
 SAMPLE = 5 SPIKED SAMPLE.

DUE DATE: 31/10/86 PAGE 24
 MAJOR IONS 4C.

LAB 1	14190 SILICA COMBINED MG/L	0.54	15101 T P FIL MG/L P	-	15403 UF T P UF AA SNCL2 MG/L P	-	15409 T P BLK I P ASC MG/L P	-	15413 TOTAL P AA SNCL2 MG/L P	-	15490 TOTAL P COMBINED MG/L P	-	16304 SO4 DISS AUTO BA MG/L	17.1	16306 SO4 DISS AA MTB MG/L	20.	16307 SO4 DISS AAAN MBUF MG/L	16.6	16309 SO4 DISS I C MG/L	17.8
LAB 2	0.5 L HDL	0.49	-	-	-	-	-	-	0.000	-	0.000	-	-	-	-	-	-	-	-	
LAB 3	0.5	0.49	-	-	-	-	0.02 R	-	0.001L	-	0.003L	-	20.	-	18.0	-	-	-	-	
LAB 4	0.4	0.48	-	-	-	-	-	-	0.001L	-	0.010L ² Mol	-	-	-	17.9	-	-	-	18.	
LAB 5	0.5	0.5	-	-	-	0.05 L	-	-	0.004	-	0.004	-	-	-	3.5 R	-	-	-	-	
LAB 6	0.5000	0.0210	-	-	-	-	-	-	0.0000	-	0.0020	-	18.5500	18.0200	17.9	-	16.6000	17.9000	-	
LAB 7	4.2	4.2	-	-	-	-	-	-	-	-	141.4	-	11.1	7.3	17.9	-	-	-	1414	
LAB 8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
LAB 9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
LAB 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
LAB 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
LAB 12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
STD. DEV.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
REL. STD. DEV.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DES. VAL.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

LAB 1	16310 SO4 DISS AA CALM MG/L	16.5	16990 SULFATE COMBINED MG/L SO4	20.1	17203 CH DISS AA FE MG/L	41.	17204 CH DISS AA TITN MG/L	-	17206 CH DISS AA AG MG/L	-	17208 CH DISS UF AA AG MG/L	-	17210 CL DISS WYT COND MG/L	-	17990 CHLORIDE COMBINED MG/L CL	41.8	19005 K TOTAL VCAP MG/L	-	19102 K DISS AA S MG/L	-
LAB 2	-	-	17.1	-	-	-	-	-	-	-	39.8	-	-	-	16.8	-	-	-	-	
LAB 3	-	-	16.0	-	-	-	34.	-	45.0	-	-	-	-	-	39.8	-	-	-	-	
LAB 4	-	-	17.9	-	-	40.8	-	-	41.	-	-	-	-	-	45.0	-	-	-	-	
LAB 5	-	-	16.3	-	-	-	-	-	41.	-	-	-	-	-	34.8	-	-	-	-	
LAB 6	-	-	18.5	-	-	-	-	-	38.	-	-	-	-	-	40.8	-	-	-	-	
LAB 7	-	-	17.5 R	-	-	-	-	-	38.	-	-	-	-	-	41.	-	-	-	-	
LAB 8	-	-	17.9	-	-	-	-	-	38.	-	-	-	-	-	20.	-	-	-	-	
LAB 9	-	-	-	-	-	-	-	-	38.	-	-	-	-	-	16.	-	-	-	-	
LAB 10	-	-	-	-	-	-	-	-	38.	-	-	-	-	-	38.	-	-	-	-	
LAB 11	-	-	-	-	-	-	-	-	38.	-	-	-	-	-	38.	-	-	-	-	
LAB 12	-	-	-	-	-	-	-	-	38.	-	-	-	-	-	38.	-	-	-	-	
MEAN	-	-	-	-	-	-	-	-	41.3333	-	39.8000	-	16.0000	-	33.2400	-	2.9750	-	2.9800	
STD. DEV.	-	-	-	-	-	-	-	-	3.5119	-	12.2627	-	11.1801	-	11.1801	-	0.0354	-	1.2	
REL. STD. DEV.	-	-	-	-	-	-	-	-	8.5	-	12.3	-	12.3	-	33.6	-	1.2	-	1.2	
DES. VAL.	-	-	-	-	-	-	-	-	8.5	-	12.3	-	12.3	-	33.6	-	1.2	-	1.2	

MCU

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 K DISS FILM PHOT MG/L	19106 K DISS AAS LI MG/L	19107 K DISS UF FILM PHOT MG/L	19301 K EXTRL HNO3 AA MG/L	19990 PTASSIUM COMBINED MG/L K	20005 CA TOTAL ICAP MG/L	20100 CA DISS CALC'D MG/L	20101 CA DISS TWT EDTA MG/L	20103 CA DISS AAS MG/L	20108 CA DISS AAS UF MG/L	20110 CA DISS AAS AUTO MG/L
1	2.9	-	-	-	2.9	-	-	-	-	-	16.
2	2.8	-	-	-	2.8	-	-	-	-	-	15.
3	2.9	2.88	-	-	2.88	-	-	15.9	-	14.9	-
4	-	-	-	-	2.9	-	16.	-	-	-	-
5	-	-	-	-	3.15	-	-	-	15.0	-	-
6	-	-	-	-	2.98	-	-	-	-	-	-
7	-	-	-	-	3.15	-	-	-	-	-	-
8	-	-	-	-	2.95	15.9	-	-	-	-	-
9	-	-	-	-	3.1	15.8	-	-	-	-	-
10	3.0	3.1	-	-	3.0	-	-	-	17.	-	-
11	2.9000	3.1000	2.8800	3.1500	2.9660	15.8500	16.0000	15.9000	16.0000	14.9000	15.5000
STD.	.0816	-	-	-	.1045	.0707	-	-	1.4142	-	.7071
REL.	2.8	-	-	-	3.5	.4	-	-	8.8	-	4.6
DES.	VAL.	-	-	-	-	-	-	-	-	-	-

LAB	20111 CA DISS ICAP MG/L	20311 CA EXTRL HNO3 ICP MG/L	20990 CALCIUM COMBINED MG/L CA
1	-	-	16.
2	-	-	15.9
3	-	-	14.9
4	-	-	15.9
5	-	-	15.0
6	-	-	14.8
7	-	14.8	15.9
8	-	-	15.8
9	-	-	15.5
10	15.5	-	-
11	-	-	-
MEAN	15.5000	14.8000	15.6182
STD.	-	-	.6600
REL.	-	-	4.2
DES.	VAL.	-	-

DATES RECEIVED
 1 86/09/24 2 86/11/04 3 86/11/14 3 86/11/19 4 86/10/29
 5 86/12/15 6 86/10/07 7 86/09/17 8 86/11/24 9 86/11/03
 10 86/11/12 11 86/10/23 11 86/11/12 12 86/11/12

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MEMORANDUM

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DATE February 27, 1987.

SUBJECT
OBJET

Prairie Provinces Quality Control (PPQC) Program

I have enclosed the final report for PP 51-52.

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

PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAM

STUDIES 51 AND 52

for November and December, 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

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 PPWB program. This report summarizes the most recent PPWB inter-laboratory quality control studies: PP 51 and 52, for the months November and December, 1987. 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:

PP 51 - Sample 1 - 125 ml, D/A * for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4⁰C

PP 52 - Sample 3 - 1L, S/E * for trace metals (0.2% HNO₃)
Sample 4 - up to 1L, major ions, etc., stored at 4⁰C
Sample 5 - up to 1L, major ions, etc., stored at 4⁰C

* 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 PP 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 referenc 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 1 - a high result for by SE for Al: +105%; V: +80%; Co: +60%; Ni: +57%; and Pb: +50%
- a low result for DIC: -23%; and Mn by DA: -13%
 - a high result for Alk: +19%; Na: +13%; and K: +13%
 - an HDL for TKN and Mn by SE
- Lab 3 - a low result for Ba: -13%
- a high result for DOC: +1000%; and DIC: +33%
- Lab 4 - low results for DIC: -11% and -19%
- an HDL for Ammonia
- Lab 6 - low results for Sr: -60% (R), and -71% (R)
- a high result by SE for Al: +94%; Fe: +300% (R); and Cu: +43%
 - low results for Mo by DA: -18%
 - high results for TKN: +120% (R), +145% (R) and +120% (R)
 - high results for DOC: +50% and +63%; Alk: +19% (R); Hard: +11%; Mg: +42% (R); and Cu by DA: +15%
 - incomparable results for T. P.: (3R)
 - a low result for $\text{NO}_3 + \text{NO}_2$: -14%; Ca: -11% and -24% (R)
 - Na: -17%; K: -17% and -49% (R)
 - erratic results for Cl: -59% and +12%
 - an HDL for Pb by SE and SO_4

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

- Lab 8 - a low result by DA for Cr: -22%; Mn: -13%; Fe: -20%;
Ni: -15%; and Pb: -13%
- low results for SO₄: -19%; F: -14%; TKN: -76%
and NO₃+NO₂: -94%
 - a high result for Turb: +240% (R)
 - an HDL by SE for: Mn, Al, Zn, Fe; and B, TKN, and Cl

PPWB laboratories average number of deviations per sample was 2.8.

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. IR146 PP 51 FP 11 DATE: 01/11/86 DUE DATE: 31/12/86 PAGE 2
 SAMPLE = 1 SPIKED SAMPLE. TRACE METALS D/A. (IN 3% HNO3)

LAB	27301 CO EXTLBL AAS DA MG/L	27311 CO EXTLBL ICAP DA MG/L	27999 COBALT COMBINED MG/L CO	28009 NI TOTAL ICAP DA MG/L	28011 NI TOTAL 5X ICAP UG/L NI	28101 NI DISS AAS DA MG/L	28111 NI DISS ICAP DA MG/L	28311 NI EXTLBL ICAP DA MG/L	28999 NICKEL COMBINED MG/L NI	29009 CU TOTAL ICAP MG/L	29011 CU TOTAL 5X ICAP UG/L CU
1	-	0.231	0.225	0.266	-	-	-	0.272	0.266	0.048	-
2	-	-	0.231	-	0.25	-	-	0.272	0.256	-	-
3	0.22	-	0.22	-	-	-	-	0.23	0.25	-	0.054
6	-	-	0.23	-	-	-	0.27	-	0.23	-	-
8	-	-	0.21	-	-	0.262	0.24	-	0.24	-	-
9	-	-	0.23	-	-	-	0.24	-	0.24	-	-
10	-	-	0.23	-	-	-	0.24	-	0.24	-	-
11	0.2200	0.2310	0.2237	0.2660	0.2500	0.2620	0.2500	0.2510	0.2538	0.0480	0.0540
12	-	-	0.0076	-	0.0173	-	0.0173	0.0297	0.0159	-	-
MEAN	-	-	3.4	-	-	-	6.9	11.8	6.3	-	-
STD. DEV.	-	-	0.233	-	-	-	-	-	0.270	-	-
REL. STD. DES.	-	-	-	-	-	-	-	-	-	-	-

LAB	29106 CU DISS AAS DA MG/L	29111 CU DISS ICAP DA MG/L	29306 CU EXTLBL AAS DA MG/L	29311 CU EXTLBL ICAP DA MG/L	29999 COBALT COMBINED MG/L CU	30009 ZN TOTAL ICAP MG/L	30011 ZN TOTAL 5X ICAP UG/L ZN	30104 ZN DISS AAS DA MG/L	30111 ZN DISS ICAP DA MG/L	30304 ZN EXTLBL AAS DA MG/L	30311 ZN EXTLBL ICAP DA MG/L
1	-	-	0.05	-	0.048	0.057	-	-	-	0.06	-
2	-	-	0.043	0.044	0.05	-	-	-	-	-	0.056
3	-	-	-	0.05	0.054	-	0.055	-	-	-	0.05
6	-	0.046	-	-	0.046	-	-	-	0.057	-	-
8	0.037	0.043	-	-	0.043	-	-	0.125R	0.05	-	-
9	-	0.04	-	-	0.04	-	-	-	0.04	-	-
10	-	0.043	0.0465	0.0470	0.0457	-	-	-	0.0490	0.0600	0.0530
11	0.0370	0.0430	0.0049	0.0042	0.0054	0.0570	0.0550	-	0.0085	-	0.0042
12	-	7.0	10.6	9.0	11.8	-	-	17.4	17.4	-	8.0
MEAN	-	-	-	-	0.047	-	-	-	-	-	-
STD. DEV.	-	-	-	-	-	-	-	-	-	-	-
REL. STD. DES.	-	-	-	-	-	-	-	-	-	-	-

LAB	30999 ZINC COMBINED MG/L ZN	38011 SR TOTAL ICAP DA MG/L	38111 SR DISS ICAP DA MG/L	38311 SR EXTLBL ICAP DA MG/L	38999 STRONTIUM COMBINED MG/L SR	42009 MO TOTAL ICAP MG/L	42011 MO TOTAL 5X ICAP UG/L MO	42111 MO DISS ICAP DA MG/L	42311 MO EXTLBL ICAP DA MG/L	42999 MOLYBENUM COMBINED MG/L MO	48009 CD TOTAL ICAP DA MG/L
1	0.057	-	-	-	-	0.884	-	-	-	0.884	0.040
2	0.056	-	-	0.171	0.171	-	-	-	0.886	0.886	-
3	0.055	0.05 R	-	-	0.05 R	-	0.74	-	-	0.74	-
6	0.05	-	0.17	-	0.17	-	-	0.88	-	0.88	-
8	0.057	-	0.14	-	0.14	-	-	0.84	-	0.84	-
9	0.05	-	-	-	-	-	-	0.82	-	0.82	-
10	0.05	-	-	-	-	-	-	0.82	-	0.82	-
11	0.04	-	-	-	-	-	-	0.82	-	0.82	-
12	0.04	-	-	-	-	-	-	0.82	-	0.82	-
MEAN	0.0531	-	0.1550	0.1710	0.1603	0.8840	0.7400	0.8467	0.8860	0.8417	0.0400
STD. DEV.	0.0063	-	0.0212	0.0176	0.0176	0.0042	0.0306	0.0306	0.0306	0.0566	0.0042
REL. STD. DES.	11.9	-	13.7	11.0	11.0	0.48	4.2	3.6	3.5	6.7	10.0
DES. VAL.	0.056	-	-	-	0.170	-	-	-	-	0.907	-

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. MAJOR IONS 4C.

LAB	06109 DOC UV CO2, NaOH MG/L C	06150 D O C COMBINED MG/L C	06151 DIC IR COMBUST MG/L C	06152 DIC IR UV CO2EV MG/L C	06154 DIC AA CO2 PHEN MG/L C	06159 DIC CO2 NaOH MG/L C	06490 C D I COMBINED MG/L C	07010 TKN AUTAN MG/L N	07013 TKN ION EL MG/L N	07015 TKN DIG BERTHELT MG/L N	07016 TKN BLK ANN-SALI MG/L N
1	1.3	1.7	1.0	10.0	10.0	10.0	10.0	0.065	-	-	-
2	1.0	1.6	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
3	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
4	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
5	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
6	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
7	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
8	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
9	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
10	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
11	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
12	0.90	1.0	12.0	8.8	10.0	10.0	10.0	0.065	-	-	-
MEAN	0.5	2.0	10.0	9.8	9.8	9.8	10.0	0.17 R	0.20 L	0.2 R	
STD.	5000	1.4667	11.0000	9.4000	10.0000	9.8000	10.0857	0.0650	-	-	-
DEV.	-	1.4142	11.4142	9.4885	-	-	9.9512	-	-	-	-
REL.	-	39.5	12.9	9.0	-	-	9.4	-	-	-	-
SAT.	-	1.252	-	-	-	-	9.851	-	-	-	-
DES.	-	-	-	-	-	-	-	-	-	-	-
VAL.	-	-	-	-	-	-	-	-	-	-	-

LAB	07018 TKN BLK INDOPHEN MG/L N	07021 TKN BLK DIG BERT MG/L N	07090 TKN COMBINED MG/L N	07109 NO3+NO2 F AA HYD MG/L N	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 AA BERT MG/L N	07506 NH3 TOT SPEC EL MG/L N	07555 NH3 DISS AA PHEN MG/L N
1	0.060	0.060	0.060	0.29	0.29	0.284	0.296	0.284	-	-	-
2	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
3	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
4	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
5	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
6	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
7	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
8	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
9	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
10	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
11	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
12	0.060	0.060	0.065	0.29	0.29	0.296	0.296	0.296	0.001L	0.05 L	-
MEAN	0.06	0.0600	0.0617	0.2617	0.2875	0.2840	0.2730	0.2783	-	-	0.004
STD.	0.0600	0.0600	0.0257	0.0257	0.0088	0.0088	0.0325	0.0195	0.001L	0.010L	0.005L
DEV.	-	-	4.7	9.8	3.1	11.9	7.0	7.0	-	-	-
REL.	-	-	0.090	0.090	0.068	0.068	0.0325	0.0195	0.001L	0.010L	0.005L
SAT.	-	-	4.7	9.8	3.1	11.9	7.0	7.0	-	-	-
DES.	-	-	0.090	0.090	0.068	0.068	0.0325	0.0195	0.001L	0.010L	0.005L
VAL.	-	-	4.7	9.8	3.1	11.9	7.0	7.0	-	-	-

DATA SUMMARY

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

STUDY NO. IRI46 PP 51 FP 11 DATE: 01/11/86 DUE DATE: 31/12/86 PAGE 6
 SAMPLE = 2 NATURAL SAMPLE. MAJOR IONS 4C.

LAB	07557 NH3 DISS AA INDO MG/L N	07562 NH3 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 F UV AA MG/L N	07655 TOT N F UV EDTA MG/L N	07690 TOTAL N COMBINED MG/L N	07790 T N DISS COMBINED MG/L N	09103 FLUORIDE DIS COLR MG/L
1	-	0.004	0.004	-	-	-	-	-	-	-	-
2	-	-	0.001L	0.31	-	-	-	-	-	0.31	-
3	-	-	0.001L HDL	-	-	-	-	-	-	-	-
4	-	-	0.002L	-	-	-	0.33	-	-	0.33	-
5	0.002	-	0.002L	-	-	-	-	0.345	-	0.345	-
6	0.01 L	-	0.004	-	0.048L	-	-	-	0.048L	-	0.1 L
8	-	-	0.010L	-	0.35	0.32	-	-	0.35	0.32	-
12	-	-	0.005L	-	-	-	-	-	-	-	-
MEAN	.0020	.0040	.0033	.3100	.3500	.3200	.3300	.3450	.3500	.3263	-
STD.	-	-	.0012	-	-	-	-	-	-	.0143	-
REL.	-	-	34.6	-	-	-	-	-	-	4.6	-
DES.	-	-	.004	-	-	-	-	-	.370	.331	-

LAB	09105 F DISS UF SPEC EL MG/L	09107 FLOOR F AUTO POT MG/L	09108 F DISS SPEC EL MG/L	09110 F DISS PHOTOM MG/L	09115 F DISS AA ALIZA MG/L	09190 FLOURIDE COMBINED MG/L F	10101 ALKALINTY TITR N MG/L CAC	10108 ALKALINTY POT TITN MG/L CAC	10109 ALKALINTY POT TITN MG/L CAC	10111 ALKALINTY TITROPRO MG/L CAC	10112 ALKALINTY TIT COND MG/L CAC
1	0.05 L	0.05	-	-	-	0.05 L	43.9	-	-	-	-
2	-	-	0.04	-	-	0.04 L	38.9	-	-	43.2	-
3	-	-	-	-	-	0.04	-	-	-	-	-
4	0.05 L	-	-	-	-	0.05 L	40.6	-	-	-	-
5	-	-	-	-	-	0.1 L	45.6	-	49. R	-	-
6	0.05 L	-	-	-	-	0.1 L	40.7	-	42.0	-	-
8	-	-	-	-	-	0.05 L	-	41.	-	-	40.
10	0.06 L	-	-	0.05	0.1 L	0.05 L	-	-	-	-	-
11	0.1 L	-	-	-	-	0.06 L	40.3	-	-	-	-
12	-	-	-	-	-	0.1 L	-	-	-	-	-
MEAN	.0600	.0500	.0400	.0500	-	.0500	41.3000	41.0000	42.0000	43.2000	40.0000
STD.	-	-	-	-	-	.0082	2.2613	-	-	-	-
REL.	-	-	-	-	-	16.3	5.5	-	-	-	-
DES.	-	-	-	-	-	.051	-	-	-	-	-

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 7

SAMPLE = 2 NATURAL SAMPLE. MAJOR IONS 4C.

LAB	10116 ALKALINITY CO ₂ IR MG/L CAC	10190 ALKALINITY COMBINED MG/L CAC	10301 PH UNITS	10390 PH COMBINED UNITS	10602 HARDNESS CALC'D MG/L CAC	10603 HARDNESS TITRYN MG/L CAC	10606 HARDNESS CALC'D MG/L CAC	10690 HARDNESS COMBINED MG/L CAC	11005 NA TOTAL ICAP MG/L	11102 SODIUM AAS F MG/L	11103 NA DISS FL PH MG/L
1	-	43.9	7.5	7.5	47.1	-	-	47.1	-	-	1.5
2	-	38.9	7.7	7.7	43.1	-	-	43.1	-	-	1.2
3	40.9	40.9	7.83	7.83	-	-	43.8	43.8	-	-	-
4	-	40.6	7.8	7.8	-	-	-	-	-	-	-
5	-	45.6	7.02	7.02	-	45.4	-	45.4	-	-	-
6	-	45.6 R	7.2	7.2	-	40.2	-	40.2	-	-	1.2
7	-	40.7	7.9	7.9	-	46.2	-	46.2	1.4	-	-
8	-	42.0	7.75	7.75	44.8	-	-	44.8	1.26	-	-
9	-	41.	7.63	7.63	45.	-	-	45.	-	-	-
10	-	40.	7.80	7.80	49.	-	-	49.	-	-	-
11	-	40.3	7.7	7.7	42.3	-	-	42.3	-	1.1	1.3
12	-	-	7.7	7.7	42.3	-	-	42.3	-	1.1	1.3
MEAN	40.9000	41.1818	7.6275	7.6275	45.1714	43.8667	43.8000	44.6909	1.3300	1.0500	1.3000
STD.	-	1.8154	0.2652	0.2652	2.2633	3.3724	-	2.4068	0.0990	0.0707	1.1414
REL.	-	4.4	3.5	3.5	5.0	7.7	-	5.4	7.4	6.7	10.9
DES. VAL.	-	41.159	-	7.682	-	-	-	44.832	-	-	-

LAB	11105 SODIUM AAS DA MG/L	11107 NA UF FL PH MG/L	11311 NA EXTL HW3 ICP MG/L	11990 SODIUM COMBINED MG/L NA	12005 MG TOTAL ICAP MG/L	12101 MG DISS CALC'D MG/L	12102 MG DISS AAS DA MG/L	12106 MG UF AAS DA MG/L	12107 MG DISS AAS AUTO MG/L	12108 MG HARDN CALC'D MG/L	12111 MG DISS ICAP MG/L
1	-	-	-	1.5	-	-	-	-	-	-	-
2	-	1.33	-	1.33	-	-	-	-	-	-	-
3	-	-	-	1.2	-	-	-	2.7	2.7	-	-
4	-	-	-	1.2	-	-	-	-	-	-	-
5	-	-	-	1.3	-	3.9 R	-	-	-	2.5	-
6	1.3	-	1.23	1.23	-	-	2.8	-	-	-	-
7	-	-	-	1.4	2.9	-	-	-	-	-	-
8	-	-	-	1.26	2.82	-	-	-	-	-	-
9	-	-	-	1.3	-	-	3.0	-	-	-	-
10	-	-	-	1.3	-	-	-	-	-	-	-
11	-	-	-	1.3	-	-	-	-	-	-	-
12	-	-	-	1.3	-	-	-	-	-	-	-
MEAN	1.3000	1.3300	1.2300	1.2564	2.8600	-	2.9000	2.7000	2.7000	2.5000	2.7000
STD.	-	-	-	0.1365	0.0566	-	1.414	-	-	-	-
REL.	-	-	-	10.9	2.0	-	4.9	-	-	-	-
DES. VAL.	-	-	-	1.283	-	-	-	-	-	-	-

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 8
 SAMPLE = 2 NATURAL SAMPLE. MAJOR IONS 4C.

LAB	12303 MG UF AAS AUTO MG/L	12311 MG EXTL HNO3 ICP MG/L	12990 MAGNESIUM 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	14190 SILICA COMBINED MG/L	15101 T P FIL MG/L P	15406 T P UF AA ASC MG/L P	15409 T P BLK AA ASC MG/L P	15413 TOTAL P AA SNOI2 MG/L P
1	3.	-	3.7	2.5	-	-	2.5	-	-	-	-
2	-	-	2.7	2.44	-	2.40	2.44	-	-	-	0.004
3	-	-	2.5	-	-	-	2.4	-	-	-	-
4	-	-	2.8	-	2.4	-	-	-	0.003L	-	-
5	-	-	2.9	-	-	-	2.2	-	-	0.03 R	-
6	-	-	2.99	-	2.2	-	-	-	-	-	-
7	-	-	2.82	-	2.3	-	2.3	0.015R	-	-	0.003
8	-	-	3.0	-	-	-	-	-	-	-	-
9	-	-	2.7	-	2.4	-	2.4	-	0.003L	-	-
10	-	-	2.8110	2.4700	2.3250	2.4000	2.3771	-	-	-	0.0035
11	-	-	5.9	1.7	4.1	-	0.983	-	-	-	20.2
12	-	-	2.745	-	-	-	2.382	-	-	-	-
MEAN	3.0000	2.9900	2.8110	2.4700	2.3250	2.4000	2.3771	-	-	-	0.0035
STD. DEV.	-	-	1.651	0.424	0.957	-	4.1	-	-	-	20.2
REL. DES. VAL.	-	-	2.745	1.7	4.1	-	2.382	-	-	-	20.2

LAB	15421 T P BLK DIG ASC MG/L P	15490 TOTAL P COMBINED MG/L P	16304 SO4 DISS AUTO BA MG/L	16306 SO4 DISS AA MIB MG/L	16307 SO4 DISS AAN MBUF MG/L	16309 SO4 DISS I C MG/L	16310 SO4 DISS AA CALM MG/L	16990 SULFATE COMBINED MG/L SO4	17203 CL DISS UF AA FE MG/L	17204 CL DISS AC TITN MG/L	17206 CL DISS AA AG MG/L
1	0.006L	0.006L	3.1	-	-	-	-	3.1	1.5	-	-
2	-	0.004	-	-	3.1	-	-	3.1	-	-	-
3	-	0.003L	-	-	-	-	-	-	-	-	-
4	-	0.03 R	-	3.3	-	-	-	3.3	-	-	1.3
5	-	-	10. L	3.2	-	-	-	10. L HDL	1.2	2.	2.0 L
6	-	0.003	-	2.68	-	-	-	2.68	-	-	-
7	-	0.015R	-	3.2	-	3.	-	3.2	-	-	1.0
8	-	-	-	3.4	-	-	-	3.4	-	-	1.2
9	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-
11	-	0.0035	3.1000	3.1560	3.1000	3.0000	2.8000	3.0867	1.3500	2.0000	1.1667
12	-	0.007	-	2787	-	-	-	7.5304	2121	-	13.1
MEAN	-	20.2	3.1000	3.1560	3.1000	3.0000	2.8000	3.0867	1.3500	2.0000	1.1667
STD. DEV.	-	-	-	8.8	-	-	-	7.5304	2121	-	13.1
REL. DES. VAL.	-	-	-	8.8	-	-	-	7.5304	2121	-	13.1

DATA SUMMARY

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

STUDY NO. IR147 RP 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	26311	26999	27003	27009	27011	27107	27111	27311	27999	28009
	FE EXTLBL	FE EXTLBL	IRON	CO TOTAL	CO TOTAL	CO TOTAL	CO DISS	CO DISS	CO EXTLBL	COBALT	NI TOTAL
	AAS SE	ICAP DA	COMBINED	AAS G F	ICAP DA	5X ICAP	AAS G F	ICAP DA	ICAP DA	MG/L CO	ICAP DA
	MG/L	MG/L	MG/L FE	MG/L	MG/L	UG/L CO	MG/L	MG/L	MG/L	MG/L CO	MG/L
1	0.007	0.008	0.007	-	0.008	-	-	-	-	0.008	0.011
2	0.007	0.008	0.007	-	-	-	-	-	0.005	0.005	-
3	-	0.02 L	0.0248	-	0.006	-	-	-	-	0.005	-
6	-	-	0.01 L	HDL 0.005	-	-	-	-	-	0.005	-
8	-	-	0.01 L	-	-	-	-	0.01 L	-	0.005	-
9	-	-	0.006	-	-	-	-	0.007	-	0.005	-
10	0.005	-	0.007	-	-	-	-	-	-	0.005	-
11	-	-	0.007	-	-	-	0.005	-	-	-	-
12	-	-	0.007	-	-	-	-	-	-	-	-
MEAN	0.063	0.080	0.064	0.050	0.080	0.060	0.050	0.070	0.050	0.060	0.110
STD.	0.012	-	0.009	-	-	-	-	-	-	0.013	-
REL.	18.2	-	14.0	-	-	-	-	-	-	21.1	-
DES.	-	-	0.06	-	-	-	-	-	-	0.005	-

LAB	28011	28101	28107	28111	28302	28309	28311	28999	29009	29011	29106
	NI TOTAL	NI DISS	NI DISS	NI DISS	NI EXTLBL	NI EXTLBL	NI EXTLBL	NICKEL	CU TOTAL	CU TOTAL	CU DISS
	5X ICAP	AAS DA	AAS G F	ICAP DA	AAS SE	AAS G F	ICAP DA	COMBINED	SX ICAP	SX ICAP	AAS DA
	UG/L NI	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L NI	UG/L CU	UG/L CU	MG/L
1	-	-	-	-	-	-	-	0.011	0.009	-	-
3	0.009	-	-	-	0.007	0.006	0.006	0.007	-	0.010	-
6	-	-	-	-	-	-	-	0.009	-	-	-
8	-	-	-	0.01 L	-	-	-	0.006	-	-	-
9	-	-	-	0.006	-	-	-	0.01 L HDL	-	-	-
10	-	-	-	-	-	-	-	0.006	-	-	-
11	0.005	-	-	-	-	-	-	0.005	-	-	0.006
12	-	-	0.007	-	-	-	-	0.007	-	-	-
MEAN	0.090	0.050	0.070	0.060	0.070	0.060	0.060	0.073	0.090	0.100	0.060
STD.	-	-	-	-	-	-	-	0.021	-	-	-
REL.	-	-	-	-	-	-	-	28.3	-	-	-
DES.	-	-	-	-	-	-	-	0.007	-	-	-

LAB	29107	29111	29305	29311	29999	30009	30011	30104	30107	30111	30304
	CU DISS	CU DISS	CU EXTLBL	CU EXTLBL	COPPER	ZN TOTAL	ZN TOTAL	ZN DISS	ZN DISS	ZN DISS	ZN EXTLBL
	AAS G F	ICAP DA	AAS SE	ICAP DA	COMBINED	5X ICAP	5X ICAP	AAS DA	AAS G F	ICAP DA	AAS DA
	MG/L	MG/L	MG/L	MG/L	MG/L CU	MG/L	UG/L ZN	MG/L	MG/L	MG/L	MG/L
1	-	-	0.007	-	0.007	0.008	-	-	-	-	0.01 L
2	-	-	0.006	0.004	0.006	-	-	-	-	-	-
3	-	-	-	0.01 L	0.01 L	-	0.009	-	-	-	-
6	-	-	-	-	0.01 L	-	-	-	-	-	-
8	-	-	-	-	0.01 L	-	-	-	-	-	-
9	-	0.01 L	-	-	0.008	-	-	-	-	0.01 L	-
10	-	0.008	-	-	0.006	-	-	-	-	0.009	-
11	-	-	-	-	0.006	-	-	0.016	-	-	-
12	0.006	-	-	-	0.006	-	-	-	0.006	-	-
MEAN	0.060	0.080	0.065	0.040	0.074	0.080	0.090	0.160	0.060	0.090	-
STD.	-	-	0.007	-	0.016	-	-	-	-	-	-
REL.	-	-	10.9	-	21.8	-	-	-	-	-	-
DES.	-	-	0.07	-	0.07	-	-	-	-	-	-

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 13
 SAMPLE = 3 SPIKED SAMPLE. TRACE METALS S/E. (IN 0.2% HN03)

LAB	56009 BA TOTAL SX ICAP MG/L	56011 BA TOTAL SX ICAP UG/L BA	56111 BA DISS ICAP DA MG/L	56311 BA EXTBL ICAP DA MG/L	56999 BARIUM COMBINED MG/L BA	82004 PB TOTAL AAS G F MG/L	82011 PB TOTAL SX ICAP UG/L PB	82101 PB DISS AAS DA MG/L	82104 PB DISS AAS G F MG/L	82302 PB EXTBL AAS SE MG/L	82309 PB EXTBL AAS G F MG/L
1	0.022	-	-	-	0.022	-	-	-	-	0.009	-
2	-	-	-	0.022	0.022	-	-	-	-	0.006	-
3	-	0.025	-	-	0.025	-	0.01 L	-	-	0.006	-
6	-	-	-	-	-	-	-	-	-	-	-
8	-	-	0.02	-	0.02	0.005	-	-	-	-	0.006
9	-	-	0.02	-	0.02	0.002	-	-	-	-	-
10	-	-	-	-	-	-	-	0.005	0.006	-	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-
MEAN	0.0220	0.0250	0.0200	0.0220	0.0218	0.0035	-	0.0050	0.0060	0.0070	0.0060
STD.	-	-	0.0000	-	0.0020	0.0021	-	-	-	0.0017	-
REL.	-	-	-1.0	-	9.4	60.6	-	-	-	24.7	-
DES.	-	-	-	-	0.023	-	-	-	-	-	-

LAB	82311 PB EXTBL ICAP DA MG/L	82999 LEAD COMBINED MG/L PB
1	-	0.009
2	-	0.006
3	0.005	0.006
6	-	0.01 L HDL
8	-	0.006
9	-	0.005
10	-	0.002
11	-	0.005
12	-	0.006
MEAN	0.0050	0.0056
STD.	-	0.0019
REL.	-	34.2
DES.	-	0.006

DATA SUMMARY

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

STUDY NO. IRI47 PP 52 FP 12 DATE: 01/12/86 DUE DATE: 31/12/86 PAGE 15
 SAMPLE = 4 NATURAL SAMPLE. MAJOR IONS 4C.

LAB	06109 DOC UV CO2 NAOH MG/L C	06150 D O C COMBINED MG/L C	06151 DIC IR COMBUST MG/L C	06152 DIC IR UV CO2EV MG/L C	06154 DIC AA CO2 PHEN MG/L C	06159 DIC CO2 NAOH MG/L C	06490 D I C COMBINED MG/L C	07010 TKN AUTAN MG/L N	07013 TKN ION EL MG/L N	07015 TKN DIG BERTHELT MG/L N	07016 TKN BLK AMM-SALI MG/L N
1	1.2	1.2	1.2	17.6	18.5	18.5	0.108	-	-	-	-
2	1.2	1.2	1.2	15.6	-	15.6	-	-	-	-	-
3	1.2	1.2	1.2	17.6	-	17.6	-	-	-	-	-
4	1.2	1.2	1.2	17.6	-	17.6	-	-	-	-	-
5	1.2	1.2	1.2	17.6	-	17.6	-	-	-	-	-
6	1.2	1.2	1.2	17.6	-	17.6	-	-	-	-	-
8	0.7	0.7	0.7	17.4	17.4	17.4	0.108	0.20 L	0.20 L	0.20 L	0.3 R
10	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-
MEAN	.7000	1.6571	21.0000	16.3000	18.5000	17.4000	18.2857	1.080	-	-	-
STD.	-	40.8	1.4142	11.3	-	-	2.2154	-	-	-	-
REL. STD.	-	1.350	6.7	11.3	-	-	12.1	-	-	-	-
DES. VAL.	-	-	-	-	-	-	18.600	-	-	-	-

LAB	07018 TKN BLK INDOPHEN MG/L N	07021 TKN BLK DIG BERT MG/L N	07090 TKN COMBINED MG/L N	07109 NO3+NO2 F AA HYD MG/L N	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 AA BERT MG/L N	07506 NH3 TOT SPEC EL MG/L N	07555 NH3 DISS AA PHEN MG/L N
1	-	0.120	0.120	-	0.36	0.350	-	0.350	-	-	-
2	-	-	0.108	-	0.36	-	0.362	0.362	-	-	-
3	-	-	-	-	0.36	-	-	0.362	-	-	-
4	-	-	-	-	0.340	-	-	0.340	-	-	-
5	-	-	0.3 R	0.36	-	-	-	0.36	-	-	-
6	-	-	-	-	-	-	-	0.32	-	-	-
7	-	-	0.20 L HDL	-	0.37	-	-	0.32	-	-	-
8	-	-	-	0.02 L	0.36	-	-	0.32	-	-	-
9	-	-	-	0.310	0.36	-	-	0.32	-	-	-
10	0.11	-	0.43 R	-	0.36	-	-	0.36	-	-	-
11	-	-	-	-	0.36	-	-	0.36	-	-	-
12	-	-	-	-	0.36	-	-	0.36	-	-	-
MEAN	.1100	.1200	.1127	.3350	.3583	.3500	.3410	.3502	-	-	-
STD.	-	-	.0064	.0354	.0098	-	.0191	.3502	-	-	-
REL. STD.	-	-	5.7	10.6	2.7	-	8.7	5.5	-	-	-
DES. VAL.	-	-	.122	-	-	-	-	5.325	-	-	-

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 16
 SAMPLE = 4 NATURAL SAMPLE. MAJOR IONS 4C.

LAB	07557 NH3 DISS AA INDO MG/L N	07562 NH3 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 HV MG/L N	07651 TOT N F UV AA MG/L N	07655 TOT N F UV EDTA 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	-	-	-	-	-	-	-	-
2	-	-	0.001L	0.39	-	-	-	-	-	0.39	-
3	-	-	0.05 L HDL	-	-	-	-	-	-	-	-
4	-	-	0.002	-	-	-	-	-	-	0.44	-
5	-	-	0.01 L	-	-	0.44	-	0.431	-	0.431	-
6	0.002	-	0.003	-	-	-	-	-	-	-	-
8	-	-	0.015L HDL	-	0.57 L	-	-	-	0.57 L	-	0.6
10	-	-	0.005L	-	0.47	-	-	-	0.47	0.45	-
12	-	-	0.0037	-	-	-	-	-	-	-	-
MEAN	0.0020	0.0060	0.0021	0.3900	0.4700	0.4500	0.4400	0.4310	0.4700	0.4278	0.6000
STD.	-	-	56.8	-	-	-	-	-	-	6.2	-
REL.	-	-	0.020	-	-	-	-	-	-	6.2	-
DES.	-	-	0.020	-	-	-	-	-	-	6.24	-

LAB	09105 F DISS UF SPEC EL MG/L	09107 FLUOR F AUTO POT MG/L	09108 F DISS SPEC EL MG/L	09110 F DISS PHOTOM MG/L	09115 F DISS AA ALIZA MG/L	09190 FLOURIDE COMBINED MG/L F	10101 ALKALINTY TITR N MG/L CAC	10108 ALKALINTY POT TITN MG/L CAC	10109 ALKALINTY POT TITN MG/L CAC	10111 ALKALINTY AUTOPRO MG/L CAC	10112 ALKALINTY TIT COND MG/L CAC
1	-	0.59	-	-	-	0.59	77.2	-	-	-	-
2	0.54	-	0.59	-	-	0.54	71.2	-	-	78.3	-
3	-	-	-	-	-	0.59	75.2	-	-	-	-
4	0.562	-	-	-	-	0.562	76.2	-	-	-	-
5	-	-	-	-	-	0.6	74.3	-	77.	-	-
6	0.49	-	-	-	-	0.49	74.1	76.0	-	-	75.
7	-	-	-	-	-	0.59	74.1	-	-	-	-
8	-	-	-	-	-	0.59	74.1	-	-	-	-
9	-	-	-	-	-	0.59	74.1	-	-	-	-
10	0.55	-	-	0.60	-	0.55	74.1	-	-	-	-
11	0.58	-	-	-	-	0.58	74.1	-	-	-	-
12	-	-	-	-	-	0.58	74.1	-	-	-	-
MEAN	0.5444	0.5900	0.5900	0.6000	0.5900	0.5692	74.5714	76.0000	76.5000	78.3000	75.0000
STD.	0.0339	-	-	-	-	0.0347	1.8679	-	0.7071	-	-
REL.	6.2	-	-	-	-	6.1	2.5	-	0.9	-	-
DES.	-	-	-	-	-	5.69	-	-	-	-	-

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 17
 SAMPLE = 4 NATURAL SAMPLE. MAJOR IONS 4C.

LAB	10116 ALKALINITY CO2 IR MG/L CAC	10190 ALKALINITY COMBINED MG/L CAC	10301 PH UNITS	10390 PH COMBINED UNITS	10602 HARDNESS CALC'D MG/L CAC	10603 HARDNESS TITR/N MG/L CAC	10606 HARDNESS CALC'D MG/L CAC	10690 HARDNESS COMBINED MG/L CAC	11005 NA TOTAL ICAP MG/L	11102 SODIUM AAS F MG/L	11103 NA DISS FL PH MG/L
1	-	77.2	8.0	8.0	110.7	-	-	110.7	-	-	15.6
2	-	71.2	8.0	8.0	103.7	-	-	103.7	-	-	14.6
3	75.9	78.3	7.95	7.95	-	-	103.	-	-	-	-
4	-	75.2	8.02	8.02	-	-	-	-	-	-	-
5	-	76.2	7.53	7.53	-	108.	-	-	-	-	-
6	-	77.4	7.4	7.4	-	100.6	-	-	-	12.	15.0
7	-	74.3	8.00	8.00	106.	109.6	-	109.6	-	-	-
8	-	76.0	8.2	8.0	109.	-	-	109.	-	-	-
9	-	75.	8.04	8.04	110.	-	-	110.	16.2	-	-
10	-	74.1	7.9	7.9	102.	-	-	110.	-	-	-
11	-	-	8.0	8.0	-	-	-	102.	-	14.	-
12	-	-	-	-	-	-	-	-	-	-	-
MEAN	75.9000	75.3583	7.9200	7.9200	107.2429	105.8667	103.0000	106.4818	15.6000	13.0000	14.9500
STD.	-	1.8481	.2253	.2253	3.3535	5.1433	-	3.7107	3.657	1.4142	1.72517
REL.	-	2.5	2.8	2.8	3.1	4.9	-	3.5	3.6	10.9	1.7
DES.	-	75.591	-	7.791	-	-	-	108.378	-	-	-

LAB	11105 SODIUM AAS DA MG/L	11107 NA UF FL PH MG/L	11311 NA EXTRL MNO3 ICP MG/L	11990 SODIUM COMBINED MG/L NA	12005 MG TOTAL ICAP MG/L	12101 MG DISS CALC'D MG/L	12102 MG DISS AAS DA MG/L	12106 MG UF AAS DA MG/L	12107 MG DISS AAS AUTO MG/L	12108 MG HARDN CALC'D MG/L	12111 MG DISS ICAP MG/L
1	-	-	-	15.6	-	-	-	-	-	-	-
2	-	15.1	-	14.6	-	-	-	-	-	-	-
3	-	-	-	15.0	-	-	-	6.3	-	-	-
4	-	-	-	14.0	-	-	-	-	6.4	-	-
5	-	-	-	14.4	-	6.8	-	-	-	6.09	-
6	14.4	-	14.7	14.4	-	-	6.5	-	-	-	-
7	-	-	-	16.2	6.83	-	-	-	-	-	-
8	-	-	-	14.2	-	-	-	-	-	-	-
9	-	-	-	14.2	-	-	6.9	-	-	-	-
10	-	-	-	15.2	-	-	-	-	-	-	-
11	-	-	-	14.2	-	-	-	-	-	-	-
12	-	-	-	15.2	-	-	-	-	-	-	-
MEAN	14.4000	15.1000	14.7000	14.6545	6.7650	6.8000	6.7000	6.3000	6.4000	6.0900	6.2000
STD.	-	-	-	1.0192	.0495	-	4.2	-	-	-	-
REL.	-	-	-	7.0	.7	-	-	-	-	-	-
DES.	-	-	-	14.532	-	-	-	-	-	-	-

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 18
 SAMPLE = 4 NATURAL SAMPLE. MAJOR IONS 4C.

LAB	12303	12311	12990	14102	14105	14106	14190	15101	15406	15409	15413
	MG UF	MG EXTEL	MGNESIUM	SILICA R	SILICA R	SILICA R	SILICA R	UV T P FIL	T P UF	T P BLK	TOTAL P
	AA3 AUTO	HN03 ICP	COMBINED	ANSA AA	MOLV AA	MOLV UF	COMBINED	MG/L P	AA ASC	AA ASC	AA SNCL2
	MG/L	MG/L	MG	MG/L	MG/L	MG/L	MG/L	MG/L P	MG/L P	MG/L P	MG/L P
	6. -	-	6.4	2.2	-	-	2.2	-	-	-	-
	-	-	6.3	2.14	-	2.18	2.14	-	-	-	-
	-	-	-	-	-	-	2.18	-	-	-	0.010
	-	-	6.09	-	2.2	-	2.2	-	0.009	-	-
	-	-	6.5	-	-	-	-	-	-	0.02 R	-
	6.99	-	6.99	-	2.0	-	2.0	-	-	-	0.007
	-	-	6.8	-	2.1	-	2.1	0.010L	-	-	-
	-	-	6.73	-	2.2	-	2.1	-	-	-	-
	-	-	6.9	-	-	-	2.2	-	0.007	-	-
	-	-	6.2	-	-	-	-	-	-	-	-
MEAN	6.0000	6.9900	6.5191	2.1700	2.1250	2.1800	2.1457	-	0.0080	-	0.0085
STD.	-	-	5.3445	0.0424	0.0957	-	3.0746	-	0.0014	-	0.0021
DEV.	-	-	5.3	2.0	4.5	-	3.5	-	17.7	-	25.0
DES. VAL.	-	-	6.612	-	-	-	2.110	-	-	-	-

LAB	15421	15490	16304	16306	16307	16309	16310	16990	17203	17204	17206
	T P BLK	TOTAL P	SO4 DISS	SULFATE	CL DISS	CL DISS	CL DISS				
	DIG ASC	COMBINED	AUTO EA	AA MTB	AA MBUF	AA I C	AA CALM	COMBINED	UF AA FE	CH DISS	AA AG
	MG/L P	MG/L P	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L S04	MG/L	MG/L	MG/L
	0.006L	0.006L	28.8	30.	28.3	-	-	30.8	24.	-	-
	-	0.010	-	-	-	-	-	28.8	-	-	-
	-	0.009	-	30.1	-	-	-	28.5	-	-	-
	-	0.02 R	28.	29.8	-	-	-	30.1	-	-	24.0
	-	MBL?	-	29.5	-	-	-	29.8	23.4	26.	23.
	-	-	-	29.8	-	-	-	29.5	-	-	-
	-	-	-	29.5	-	30.8	29.0	30.8	-	-	-
	-	-	-	-	-	-	-	29.0	-	-	25.
	-	-	-	30.1	-	-	-	29.0	-	-	23.0
	-	-	-	-	-	-	-	30.1	-	-	23.0
MEAN	0.0083	18.2	28.4000	29.7500	28.3000	30.8000	29.0000	29.4000	23.7000	26.0000	23.7500
STD.	0.0015	0.0015	2.0	1.5	-	-	-	2.8556	1.8	-	4.0
DEV.	0.0015	0.0015	2.0	1.5	-	-	-	2.9	1.8	-	4.0
DES. VAL.	0.008	0.008	2.0	1.5	-	-	-	29.874	1.8	-	4.0

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 21
 SAMPLE = 5 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	06109 DOC UV CO2 NAOH MG/L C	06150 D O C COMBINED MG/L C	06151 DIC IR COMBUST MG/L C	06152 DIC IR UV CO2EV MG/L C	06154 DIC AA CO2 PHEN MG/L C	06159 DIC CO2 NAOH MG/L C	06490 D I C COMBINED MG/L C	07010 TKN AUTAN MG/L N	07013 TKN ION EL MG/L N	07015 TKN DIG BERTHELT MG/L N	07016 TKN BLK AMM-SALI MG/L N
1	-	0.4 L	-	-	4.6	-	4.6	-	-	-	-
2	-	0.3 R	-	7.9	-	-	7.9	-	-	-	-
3	-	0.6 R	-	4.8	-	-	4.8	0.076	-	-	-
4	-	0.52 L	6.9	-	-	-	6.9	-	-	-	-
5	-	1.3 L	-	-	-	-	-	-	-	-	-
6	-	1.0 L	-	-	-	5.4	6.0	-	-	0.020L	0.3 R
8	0.2 L	0.2 L	-	-	-	-	5.4	-	0.10	-	-
10	-	1. L	6.	-	-	-	6.	-	-	-	-
11	-	9500	6.4500	6.3500	4.6000	5.4000	5.9429	0.0760	1.000	-	-
12	-	4950	6.6364	2.1920	-	-	1.1660	-	-	-	-
MEAN	-	52.1	9.9	34.5	-	-	19.6	-	-	-	-
STD. DEV.	-	-	-	-	-	-	-	-	-	-	-
RET. VAL.	-	-	-	-	-	-	-	-	-	-	-
DES. VAL.	-	-	-	-	-	-	-	-	-	-	-

LAB	07018 TKN BLK INDOPHEN MG/L N	07021 TKN BLK DIG BERT MG/L N	07090 TKN COMBINED MG/L N	07109 NO3+NO2 F AA HYD MG/L N	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 AA BERT MG/L N	07506 NH3 TOT SPEC EL MG/L N	07555 NH3 DISS AA PHEN MG/L N
1	-	0.050L	0.050L HDL	-	0.04	0.044	-	0.044	-	-	-
2	-	-	-	-	0.04	-	0.041	0.04	-	-	-
3	-	-	-	-	0.04	-	-	0.041	-	-	-
4	-	-	-	-	0.042	-	-	0.04	0.001L	0.05 L	-
5	-	-	0.3 R	0.09 R	-	-	-	0.042	-	-	-
6	-	-	0.020L HDL?	-	0.05	-	0.04	0.04	-	-	-
7	-	-	-	-	-	-	-	0.04	-	-	-
8	-	-	-	-	-	-	-	0.04	-	-	-
9	-	-	-	-	-	-	-	0.04	-	-	-
10	-	-	0.10	0.03	-	-	-	0.04	-	-	0.002L
11	0.07	-	0.07	0.040	0.05	-	-	0.04	-	-	0.015
12	-	-	0.07	-	0.05	-	-	0.05	-	-	0.005L
MEAN	-	-	0.0820	0.0350	0.044	0.0440	0.0405	0.0417	-	-	0.0150
STD. DEV.	0.0700	-	0.0159	0.0071	0.0052	-	0.0007	0.0057	-	-	-
RET. VAL.	-	-	19.4	20.2	11.7	-	1.7	13.7	-	-	-
DES. VAL.	-	-	-	-	-	-	-	-	-	-	-

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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 25
 SAMPLE = 5 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	17208 CL DISS UF AA AG MG/L	17209 CL DISS Y C MG/L	17210 CL DISS TAT COND MG/L	17990 CHLORIDE COMBINED MG/L CL	19005 K TOTAL ICAP MG/L	19102 K DISS AAS MG/L	19103 K DISS FLM PHOT MG/L	19106 K DISS AAS LI MG/L	19107 K DISS UF FLM PHOT MG/L	19301 K EXTEL HNO3 AA MG/L	19990 POTASSIUM COMBINED MG/L K
1	-	17.1	-	17.1	-	-	1.2	-	-	-	1.2
2	17.1	-	-	17.1	-	-	1.2	-	1.20	-	1.20
3	-	-	-	17.1	-	-	1.1	-	-	-	1.1
4	-	-	-	16.1	-	0.6 R	-	-	-	-	1.2
5	-	-	-	19.5	-	1.2	-	-	-	-	1.2
6	-	-	-	17.5	-	-	-	-	-	-	1.4
7	-	-	-	18.	1.4	-	-	-	-	1.19	1.4
8	-	-	-	17.	1.16	-	-	-	-	-	1.6
9	-	-	16.	16.	-	-	-	1.6	-	-	1.6
10	-	-	-	16.3 R	-	-	1.2	-	-	-	1.2
11	-	-	-	17.0	1.2800	1.2000	1.1750	1.6000	1.2000	1.1900	1.2450
12	-	17.1000	16.0000	17.0100	1.2800	1.2000	1.0500	1.6000	1.2000	1.1900	1.458
MEAN	-	17.5500	16.0000	17.9171	1.2800	1.2000	1.1750	1.6000	1.2000	1.1900	1.2450
STD. DEV.	-	0.6364	-	5.4	13.3	-	4.3	-	-	-	11.7
REL. STD. DEV.	-	3.6	-	-	-	-	-	-	-	-	-
DES. VAL.	-	-	-	-	-	-	-	-	-	-	-

LAB	20005 CA TOTAL ICAP MG/L	20100 CA DISS CALC D MG/L	20101 CA DISS TAT EDTA MG/L	20103 CA DISS AAS MG/L	20108 CA DISS AAS UF MG/L	20110 CA DISS AAS AUTO MG/L	20111 CA DISS ICAP MG/L	20311 CA EXTEL HNO3 ICF MG/L	20990 CALCIUM COMBINED MG/L CA
1	-	-	-	-	-	15.5	-	-	15.5
2	-	-	-	-	13.6	13.5	-	-	13.6
3	-	-	14.7	-	-	-	-	-	14.7
4	-	12.8	-	13.8	-	-	13.4	-	12.8
5	-	-	-	-	-	-	-	-	13.8
6	-	-	-	-	-	-	-	-	13.4
7	-	-	-	-	-	-	-	-	14.1
8	14.3	-	-	-	-	-	-	-	14.1
9	-	-	-	15.	-	-	-	-	14.3
10	-	-	-	-	-	-	-	-	14.3
11	-	-	-	-	-	-	-	-	13.5
12	-	-	-	-	-	-	13.5	-	13.5
MEAN	14.2000	12.8000	14.7000	14.4000	13.6000	14.2500	13.5000	13.4000	13.9727
STD. DEV.	1.1414	-	-	5.8485	-	1.0607	-	-	7.129
REL. STD. DEV.	1.0	-	-	5.9	-	7.4	-	-	5.1
DES. VAL.	-	-	-	-	-	-	-	-	-

DATES RECEIVED
 1 86/12/02 2 87/01/07 3 86/11/21 3 87/01/08 4 86/11/27
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DATE

May 8, 1987.

SUBJECT
OBJET

Prairie Provinces Quality Control (PPQC) Program

I have enclosed the final report for PP 53-54.

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

PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAM

STUDIES 53 AND 54

for January and February, 1987

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

by

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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 PPWB program. This report summarizes the most recent PPWB inter-laboratory quality control studies: PP 53 and 54, 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:

- PP 53 - Sample 1 - 125 ml, D/A * for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

- PP 54 - 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 PP 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 1 - a high result for NO_3+NO_2 : +13%; Al by SE: +20%
 - a low result for Hard.: -15%
 - an HDL for NO_3+NO_2

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

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

- Lab 6 - a low result for Sr: -11%; pH: -12%; Na: -34% (R)*
 - a high result by SE for Al: +38%; Fe: +25%; Zn: +32%; and Pb: -24% (R)
 - a high result for K: +14% & +25%; Alk.: +16%; Mg: +13%
 - rejectable results for TKN: 3 (R); and T.P.: 2 (R)
 - a low result for Ca: -17%

- Lab 8 - results by DA for Cr: +34%; and Cd: -18%
 - a high result for DOC: +140% (R)
 - results by SE for Cr: +34%; Cu: +16%; and Co: +22%
 - an HDL for Al by SE and DOC

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

PPWB laboratories average number of deviations per sample was 1.4.

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. IRI48 PP 53 FP 13 DATE: 01/01/87 DUE DATE: 27/02/87 PAGE 2
 SAMPLE = 1 SPIKED SAMPLE. TRACE METALS D/A. (IN 3% HN03)

CONCENTRATION	25304 MN EXTBL AAS DA MG/L	25309 MN EXTBL AAS DA MG/L	25311 MN EXTBL ICAP DA MG/L	25999 MANGNESE COMBINED MG/L MN	26011 FE TOTAL 5X ICAP UG/L FE	26111 FE DISS ICAP DA MG/L	26304 FE EXTBL AAS DA MG/L	26311 FE EXTBL ICAP DA MG/L	26999 IRON COMBINED MG/L FE	27009 CO TOTAL ICAP DA MG/L	27011 CO TOTAL 5X ICAP UG/L CO
1	0.11	-	-	0.09B	-	-	0.49	-	0.49	-	-
2	0.107	-	0.096	0.107	-	-	0.514	0.496	0.514	-	-
3	-	-	0.093	0.10	0.51	-	-	0.46	-	-	-
6	-	-	-	0.099	-	0.50	-	-	-	-	0.30
8	-	-	-	0.09	-	0.47	-	-	-	-	-
9	-	-	-	0.095	-	0.49	0.530	-	-	-	-
10	-	0.089	-	0.089	-	-	0.263R	-	-	-	-
11	1.085	0.0890	0.0945	0.0979	0.5100	0.4867	0.5113	-	-	0.285	-
12	0.0021	-	0.0021	0.0071	-	0.0153	0.0201	0.4780	0.4955	0.2850	0.3000
14	-	-	2.2	7.3	-	3.1	3.9	5.3	4.7	-	-
MEAN				0.098					4.77		
STD. DEV.									0.263R		
REL. STD. DES. VAL.									0.499		

CONCENTRATION	27111 CO DISS ICAP DA MG/L	27301 CO EXTBL AAS DA MG/L	27311 CO EXTBL ICAP DA MG/L	27999 COBALT COMBINED MG/L CO	28009 NI TOTAL ICAP DA MG/L	28011 NI TOTAL 5X ICAP UG/L NI	28111 NI DISS ICAP DA MG/L	28301 NI EXTBL AAS DA MG/L	28311 NI EXTBL ICAP DA MG/L	28999 NICKEL COMBINED MG/L NI	29009 CU TOTAL ICAP MG/L
1	-	-	0.285	0.285	0.473	-	-	-	-	0.473	0.107
2	-	-	-	0.30	-	-	-	-	0.485	0.485	-
3	-	0.32	-	0.32	-	0.50	-	-	0.50	0.50	-
6	0.29	-	-	0.29	-	-	0.48	-	0.435	0.435	-
8	0.27	-	-	0.27	-	-	0.45	-	0.48	0.48	-
9	-	0.330	-	0.27	-	-	0.48	0.540	0.45	0.45	-
10	0.2767	0.3250	0.2850	0.330	0.4730	-	0.48	0.694R	0.540	0.540	-
11	0.0115	0.0071	0.0071	0.2938	0.4730	0.5000	0.4700	0.5400	0.485	0.485	0.1070
12	4.2	2.2	2.2	7.4	0.4730	3.7	3.7	7.7	0.435	0.435	-
14	-	-	-	7.296	-	-	-	-	4.600	4.600	-
MEAN									0.481		
STD. DEV.									0.316		
REL. STD. DES. VAL.									6.6		

DATA SUMMARY

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

STUDY NO. IRL48 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)

56999 BARIUM COMBINED MG/L BA	82009 PB TOTAL ICAP DA MG/L	82011 PB TOTAL 5X ICAP UG/L PB	82111 PB DISS ICAP DA MG/L	82301 PB EXTRL AAS DA MG/L	82311 PB EXTRL ICAP DA MG/L	82999 LEAD COMBINED MG/L PB
0.974	0.467	-	-	0.51	-	0.467
1.00	-	-	-	0.51	0.480	0.51
0.98	0.49	-	-	-	0.458	0.480
1.00	-	-	0.48	-	-	0.458
0.96	-	-	0.436	-	-	0.48
0.96	-	-	0.49	0.520	-	0.436
-	-	-	-	0.005R	-	0.520
-	-	-	-	-	-	0.49
MEAN .9790	.4670	.4900	.4687	0.005R	-	0.005R
STD. .0181	-	-	.0287	.5150	.4690	.4812
REL. 1.8	-	-	6.1	1.0071	.0156	.0257
DES. .995	-	-	6.1	1.4	3.3	5.3
						.484

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 5
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

00110 IONIC BALANC %	00120 SUM OF CATIONS MEQ/L	00125 SUM OF ANIONS MEQ/L	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	02072 TURBIDTY HELLIQE JTU	02073 TURBIDTY HACH JTU
0.21	2.35	2.36	5. L	-	-	5. L	234.	234.	-	-
0.94	2.266	2.223	5. L	-	-	5. L	230.6	230.6	-	0.1
-0.97	2.215	2.258	5. L	5. L	-	5. L	230.	230.	-	0.06
0.19	2.30	2.29	5. L	-	-	5. L	218.	218.	-	0.04
0.7	2.33	2.29	5. L	-	-	5. L	230.	230.	-	0.11
2.69	2.38	2.26	5. L	-	-	5. L	228.	228.	-	0.18
2.39	2.36	2.25	-	-	-	4. L	224.	224.	-	-
-0.55	2.315	2.237	-	-	4.	4.	223.	223.	-	-
1.68	2.332	2.255	-	5. L	-	5. L	220.	220.	-	-
1.9579	2.2948	2.2623	5.	5. L	-	5. L	228.	228.	0.5 R	-
1.2729	3.0835	1.9	3.6667	-	4.0000	3.7500	160. R	160. R	-	-
132.9	3.6	0.439	65.0	-	-	1.8930	227.3000	227.3000	-	0.980
MEAN						50.5	5.3350	5.3350	-	0.540
STD. DEV.						5.394	2.3	2.3	-	55.1
REL. DES. VAL.									-	

02074 TURBIDTY NPLMTRIC NTU	02077 TURBIDTY HACH FZN JTU UNIT	02090 TURBIDTY COMBINED JTU/NTU	05105 BORON AA CARM MG/L	05106 BORON F AZOMETHI MG/L	05111 BORON F ICAP DA UG/L	05190 BORON COMBINED MG/L B	06008 TOC CO2 FLM MG/L C	06009 TOC CO2 IR MG/L C	06051 TIC CO2 IR MG/L C	06052 TIC CO2 ? MG/L C
-	-	0.16	-	-	-	-	-	-	-	-
-	-	0.04	0.06	-	-	0.06	-	-	-	-
-	-	0.11	-	-	-	-	-	-	-	-
0.04	-	0.04	-	-	-	-	-	-	-	-
0.17	-	0.18	-	-	-	-	-	-	-	-
0.1	-	0.17	-	0.05 L	-	0.05 L	-	3.5	17.5	-
-	0.12	0.12	-	-	0.01	0.01	-	-	-	-
-	-	0.5 R	-	-	-	-	3.89	-	-	15.0
MEAN	0.1200	0.1022	0.0600	-	0.0100	0.0350	3.8900	3.5000	17.5000	15.0000
STD. DEV.	0.0651	0.0507	-	-	-	0.0354	-	-	-	-
REL. DES. VAL.	63.0	49.6	-	-	-	101.0	-	-	-	-
		202				0.028				

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 6
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

NO.	ANALYSIS	1	2	3	4	5	6	8	10	11	12	14	MEAN	DEV.	STD.	REP.	DES.	VAL.
06100	DOC	-	-	-	-	-	-	-	-	-	-	-	7.9	-	-	-	-	-
06101	DOC	-	-	-	-	-	-	-	-	-	-	-	4.2	-	-	-	-	-
06102	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.0	L	-	-	-	-
06103	DOC	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-
06104	DOC UV	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-
06105	CO2 EV	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06106	DOC UV	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-
06107	DOC UV	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-
06108	CO2 EV	-	-	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-
06109	DOC UV	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-	-	-
06110	CO2 NAOH	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-	-	-
06111	DOC UV	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-
06112	DOC UV	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-
06113	DOC UV	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-
06114	DOC UV	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06115	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06116	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06117	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06118	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06119	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06120	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06121	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06122	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06123	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06124	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06125	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06126	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06127	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06128	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06129	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06130	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06131	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06132	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06133	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06134	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06135	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06136	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06137	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06138	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06139	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06140	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06141	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06142	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06143	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06144	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06145	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06146	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06147	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06148	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06149	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06150	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06151	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06152	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06153	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06154	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06155	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06156	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06157	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06158	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06159	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06160	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06161	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06162	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06163	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06164	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06165	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06166	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06167	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06168	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06169	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06170	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06171	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06172	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06173	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06174	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06175	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06176	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06177	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06178	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06179	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06180	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06181	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06182	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06183	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06184	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06185	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06186	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06187	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06188	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06189	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
06190	IR /DIFF	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-

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 8
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

10101	10108	10109	10111	10112	10190	10301	10390	10602	10603	10606
ALKALINITY TITR IN MG/L CAC	ALKALINITY POT TITN MG/L CAC	ALKALINITY POT TITN MG/L CAC	ALKALINITY TITROPRO MG/L CAC	ALKALINITY TIT COND MG/L CAC	ALKALINITY COMBINED MG/L CAC	PH UNITS	PH COMBINED UNITS	HARDNESS CALC'D MG/L CAC	HARDNESS TITR'N MG/L CAC	HARDNESS CALC'D MG/L CAC
80.4	-	-	-	-	80.4	8.3	8.3	103.6	-	-
75.4	-	-	78.9	-	78.9	7.89	8.0	99.6	-	96.7
78.5	-	-	-	-	78.5	8.07	8.07	-	-	-
78.7	-	81.	-	-	78.7	7.24	7.24	-	101.	-
78.3	-	78.0	-	-	81.3	8.2	7.0	-	100.	-
-	79.	-	-	-	78.0	8.05	8.05	-	103.9	-
-	-	-	-	78.	79.	7.9	7.9	106.	-	-
79.5	-	-	-	-	78.	8.11	8.11	104.	-	-
77.5	-	-	-	-	78.	8.1	8.1	101.	-	-
83.51	-	-	-	-	77.5	8.1	8.1	110.	-	-
-	-	-	-	-	83.51	7.991	7.991	102.	-	-
78.8638	79.0000	79.5000	78.9000	78.0000	78.9085	7.9626	7.9626	103.7125	101.6333	96.7000
2.3063	2.1213	2.7	-	-	1.8991	3.5	3.5	3.2229	2.0257	-
2.9	-	-	-	-	2.4	3.5	3.5	3.1	2.0	-
-	-	-	-	-	78.908	-	7.909	-	-	-

MEAN
STD. DEV.
STD. ERR.
DES. VAL.

10690	11005	11102	11103	11105	11107	11311	11990	12005	12101	12102
HARDNESS COMBINED MG/L CAC	NA TOTAL ICAP MG/L	SODIUM AAS F MG/L	NA DISS FL PH MG/L	SODIUM AAS DA MG/L	NA UF FL PH MG/L	NA EXTB PH03 ICP MG/L	SODIUM COMBINED MG/L NA	MG TOTAL ICAP MG/L	MG DISS CALC'D MG/L	MG DISS AAS DA MG/L
103.6	-	-	5.4	-	-	-	5.4	-	-	-
96.7	-	-	4.6	-	4.6	-	4.4	-	-	-
101.	-	-	4.6	-	-	-	4.6	-	-	-
103.9	-	3.	-	4.5	-	-	4.6	-	6.8	-
106.	-	R	-	-	-	-	4.5	-	-	7.5
104.	-	-	-	-	-	4.44	4.44	-	-	-
101.	-	-	-	-	-	-	4.3	7.9	-	-
110.	-	-	-	-	-	-	4.3	7.4	-	-
102.	-	4.7	4.7	-	-	-	4.7	-	-	7.6
104.1	-	-	-	-	-	-	4.7	-	-	7.15
102.6083	4.5000	4.7000	4.6750	4.5000	4.6000	4.4400	4.5940	7.5500	6.8000	7.4167
3.4169	.2828	-	5.3	-	-	-	.1987	4.6	-	7.2363
3.3	6.3	-	-	-	-	-	4.3	4.6	-	3.2
103.296	-	-	-	-	-	-	4.549	-	-	-

MEAN
STD. DEV.
STD. ERR.
DES. VAL.

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 10
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

1	2	3	5	6	7	8	9	10	11	12	14
16309	16310	16990	17203	17204	17206	17208	17209	17210	17990	19005	
S04 DISS	S04 DISS	SULFATE	CL DISS	CL DISS	CL DISS	CL DISS	CL DISS	CL DISS	CHLORIDE	K TOTAL	
MG/L	MG/L	COMBINED	UF AA FE	AG TITN	AA AG	UF AA AG	I C	TIT COND	COMBINED	ICAP	
16.6	-	18.7	12.0	-	12.0	12.1	11.5	-	12.5	3.0	
-	-	17.4	-	-	-	-	-	-	11.5	3.4	
-	-	16.9	12.0	12.0	12.0	-	-	-	12.1	-	
-	-	16.6	-	-	-	-	-	-	12.0	-	
16.1	15.0	16.0	-	-	12.0	-	11.2	-	12.0	-	
-	-	15.0	-	-	-	-	-	-	12.0	-	
-	-	15.0	8.1 R	-	14.8 R	-	-	-	12.2	-	
-	-	16.7	-	-	11.8 R	-	-	-	12.2	-	
-	-	17.9	-	-	11.8 R	-	-	-	12.2	-	
16.3500	15.0000	16.6917	12.0000	12.0000	11.9333	12.1000	11.3500	12.0000	11.8600	3.2000	
2.2	-	5.9434	-1.0	-	1.0	-	1.9	-	2.2875	8.8	
DES: VAL.		16.267	-	-	-	-	-	-	11.878	-	

1	2	3	5	6	7	8	9	10	11	12	14
19102	19103	19106	19107	19301	19990	20005	20100	20101	20103	20108	
K DISS	K DISS	K DISS	K DIS UF	K EXTL	PTASSIUM	CA TOTAL	CA DISS	CA DISS	CA DISS	CA DISS	
AAS	LI	AAS LI	FLM PHOT	HNO3 AA	COMBINED	ICAP	CALC'D	TIT EDTA	AAS	AAS UF	
MG/L	MG/L	MG/L	MG/L	MG/L	MG/L K	MG/L	MG/L	MG/L	MG/L	MG/L	
-	3.5	-	3.18	-	3.1	-	-	-	-	-	
-	3.5	-	-	-	3.5	-	-	-	-	-	
3.6	3.2	-	-	-	3.2	-	29.0	28.8	-	27.2	
3.19	-	-	-	3.15	3.0	29.2	-	-	28.7	-	
-	-	-	-	-	3.15	-	-	-	-	-	
-	-	-	-	-	3.0	28.2	-	-	-	-	
-	3.1	3.0	-	-	3.0	-	-	-	32.0	-	
3.24	-	-	-	-	3.24	-	-	-	29.9	-	
3.3433	3.2250	3.0000	3.1800	3.1500	3.2217	28.6000	29.0000	28.8000	30.2000	27.2000	
6.7	5.9	-	-	-	5.8	2.0	-	-	1.6703	-	
DES: VAL.					3.149	-	-	-	5.5	-	

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 11
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

	20110 CA DISS AAS AUTO MG/L	20111 CA DISS ICAP MG/L	20311 CA EXTBL HNO3 ICP MG/L	20990 CALCIUM COMBINED MG/L CA
1	28.	-	-	28.
2	28.	-	-	28.
3	-	-	-	27.2
5	-	-	-	28.8
6	-	-	-	28.
7	-	-	-	28.7
8	-	-	29.1	29.1
9	-	-	-	29.2
10	-	-	-	28.2
11	-	-	-	28.7
12	-	-	-	28.9
14	-	28.7	-	28.9
MEAN	28.0000	28.7000	29.1000	28.8833
STD.	0.0000	-	-	1.1968
REL.	-1.0	-	-	4.1
DES.	-	-	-	28.303

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 16
 SAMPLE = 3 SPIKED SAMPLE. TRACE METALS S/E. (IN 0.2% HNO3)

CONCENTRATION	82305 PB EXTRL AAS G F MG/L	82309 PB EXTRL AAS G F MG/L	82999 LEAD COMBINED MG/L PB	56009 BA TOTAL 5X ICAP MG/L	56011 BA TOTAL 5X ICAP UG/L BA	56111 BA DISS ICAP DA MG/L	56999 BARIUM COMBINED MG/L BA	82004 PB TOTAL AAS G F MG/L	82011 PB TOTAL 5X ICAP UG/L PB	82104 PB DISS AAS G F MG/L	82111 PB DISS ICAP DA MG/L	82302 PB EXTRL AAS SE MG/L
1	-	-	0.061	0.021	-	-	0.021	-	-	-	-	0.061
2	-	0.049	0.070	-	0.020	-	0.020	-	-	-	-	0.070
3	-	0.051	-	0.027	0.027	-	0.027	-	0.067	-	-	0.065
6	0.047	0.054	-	-	-	-	-	-	0.050R	-	-	-
8	-	0.047	-	-	-	-	-	-	-	-	-	-
9	-	0.053	-	-	-	0.02	0.02	0.064	-	-	-	-
10	-	0.048	-	-	-	0.02	0.02	-	-	-	0.069	-
11	-	0.050	-	-	-	-	-	-	-	0.071	-	-
12	-	0.048	-	-	-	-	-	-	-	-	-	-
14	-	0.048	-	-	-	-	-	-	-	-	-	0.060
MEAN	0.0470	0.0500	0.0210	0.0235	0.0235	0.0200	0.0216	0.0640	0.0670	0.0710	0.0690	0.0640
DEV.	-	0.0024	-	0.0049	0.0049	0.0000	0.0030	-	-	-	-	0.0045
REL. STD. VAL.	-	4.8	-	21.1	21.1	-1.0	14.1	-	-	-	-	7.1
DES. VAL.	-	0.052	-	-	-	-	0.024	-	-	-	-	-

CONCENTRATION	82305 PB EXTRL AAS G F MG/L	82309 PB EXTRL AAS G F MG/L	82999 LEAD COMBINED MG/L PB
1	-	-	0.061
2	-	-	0.070
3	-	-	0.065
6	-	-	0.050R
8	-	0.069	0.069
9	-	-	0.064
10	-	-	0.069
11	-	-	0.060
12	-	-	0.071
14	0.0005R	-	0.005R
MEAN	-	0.0690	0.0661
DEV.	-	-	0.0042
REL. STD. VAL.	-	-	6.4
DES. VAL.	-	-	0.066

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 19
 SAMPLE = 4 SYNTHETIC SAMPLE. MAJOR IONS 4C.

NO	ANALYSIS	UNIT	1	2	3	4	5	6	7	8	9	10	11	12	14	MEAN	DEV.	STD.	REL.	DES.	VAL.
07112	NO3-N	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0285	0.0163	57.1	-	-	-
07390	NITRATE COMBINED	MG/L N	0.05 L	0.017	0.017	0.02	0.032	0.04	0.04	0.02 L	0.020	0.020	0.020	0.020	0.03	0.0249	0.0101	40.4	-	-	-
07505	NH3 TOT AA BERT	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.003	0.010L	-	-	-	-
07506	NH3 TOT SPEC EL	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.003	0.010L	-	-	-	-
07555	NH3 DISS AA PHEN	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0030	-	-	-	-	-
07557	NH3 DISS AA INDO	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07562	NH3 DISS AA EDTA	MG/L N	0.002L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07563	NH3 DISS AA INDO	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07590	AMMONIA COMBINED	MG/L N	0.002L	-	-	-	-	-	-	-	-	-	-	-	-	0.003	0.010L	MDL	-	-	-
07601	TOTAL N AA UV	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0030	-	-	-	-	-
07602	TOTAL N CALC'D	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0030	-	-	-	-	-

NO	ANALYSIS	UNIT	1	2	3	4	5	6	8	10	11	12	14	MEAN	DEV.	STD.	REL.	DES.	VAL.		
07605	NITROGEN UV AA HY	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0300	0.0400	-	-	-	-
07651	TOT N F UV AA	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-
07655	TOT N F UV EDTA	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.041	-	-	-	-	-
07690	TOTAL N COMBINED	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.041	-	-	-	-	-
07790	T N DISS COMBINED	MG/L N	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-
09103	FLUORIDE DIS COLR	MG/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1 L	-	-	-	-	-
09105	F DIS UF SPEC EL	MG/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05 L	-	-	-	-	-
09106	F DISS EL POT	MG/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05 L	-	-	-	-	-
09107	FLUOR F AUTO POT	MG/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05 L	-	-	-	-	-
09108	F DISS SPEC EL	MG/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01 L	-	-	-	-	-
09115	F DISS AA ALIZA	MG/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	-	-	-	-	-
09115	F DISS AA ALIZA	MG/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	-	-	-	-	-
MEAN	DEV.	STD.	REL.	DES.	VAL.											0.0300	0.0410	-	-	-	-
MEAN	DEV.	STD.	REL.	DES.	VAL.											0.0300	0.0370	16.4	0.061	0.057	0.0700

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 22
 SAMPLE = 4 SYNTHETIC SAMPLE. MAJOR IONS 4C.

16307 S04 UF AA MTB MG/L	16309 S04 DISS I C MG/L	16310 S04 DISS AA CALM MG/L	16990 SULFATE COMBINED MG/L S04	17203 CL DISS UF AA FE MG/L	17204 CL DISS AA WITHN MG/L	17206 CL DISS AA AG MG/L	17208 CL DISS UF AA AG MG/L	17209 CL DISS I C MG/L	17210 CL DISS TIT COND MG/L	17990 CHLORIDE COMBINED MG/L CL
34.9	38.9	-	37.9	106.	-	-	-	99.0	-	106.
-	-	-	34.9	-	-	-	101.8	-	-	99.0
-	-	-	37.8	-	-	96.5	-	-	-	101.8
-	-	-	35.0	104.0	104.	-	-	-	-	96.5
-	-	-	38.0	-	-	-	-	-	-	104.0
-	38.7	-	38.1	-	-	105.	-	103.	-	104.0
-	-	33.0	38.7	-	-	-	-	-	106.	105.
-	-	-	38.7	-	-	130. R	-	-	-	103.
-	-	-	37.1	89.1	-	105.	-	-	-	106.
-	-	-	41.4	-	-	-	-	-	-	130. R
34.9000	38.8000	33.0000	37.2417	99.7000	104.0000	102.1667	101.8000	101.0000	106.0000	101.7636
STD. DEV.	.1414	-	2.1832	9.2342	-	4.9075	-	2.8284	-	5.1389
REL. DES. VAL.	.4	-	5.9	9.3	-	4.8	-	2.8	-	5.0
	-	-	37.095	-	-	-	-	-	-	105.535

19005 K TOTAL ICAP 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 UF FLM PHOT MG/L	19301 K EXTRL HNO3 AA MG/L	19990 POTASSIUM COMBINED MG/L K	20005 CA TOTAL ICAP MG/L	20100 CA DISS CALC'D MG/L	20101 CA DISS TIT EDTA MG/L	20103 CA DISS AAS MG/L
-	-	0.9	-	-	-	0.9	-	-	-	-
-	-	0.83	-	0.88	-	0.83	-	-	-	-
-	-	0.8	-	-	-	0.88	-	-	-	-
-	1.1	-	-	-	-	0.8	-	42.	43.6	-
0.79	0.89	-	-	0.86	-	0.89	-	-	-	-
0.9	-	-	-	-	-	0.86	-	-	-	-
-	-	-	1.2	-	-	0.79	44.	-	-	43.2
-	0.943	0.9	-	-	-	0.9	43.8	-	-	-
-	-	-	-	-	-	0.943	-	-	-	48.
8450	.9777	.8575	1.2000	.8800	.8600	.9161	43.9000	42.0000	43.6000	43.7
STD. DEV.	.1092	.0506	-	-	-	.1198	.1414	2.8284	-	-
REL. DES. VAL.	11.2	5.9	-	-	-	13.1	.3	2.8	-	-
	-	-	-	-	-	.883	-	-	-	-

DATA SUMMARY

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

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

DATE: 01/02/87

DUE DATE: 27/02/87

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MAJOR IONS 4C.

00110 IONIC BALANC %	00120 SUM OF CATIONS MEQ/L	00125 SUM OF ANIONS MEQ/L	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	02072 TURBIDITY HELIGE JIU	02073 TURBIDITY HACH JIU
0.52	1.93	1.95	5.0 L	5.0 L	-	5.0 L	216.0	216.0	-	-
19.2	1.804	1.224	5.0 L	5.0 L	-	5.0 L	211.7	211.7	-	0.04
-0.80	1.777	1.806	5.0 L	5.0 L	-	5.0 L	215.0	215.0	-	0.04
-9.64	1.82	2.21	5.0 L	5.0 L	-	5.0 L	199.0	199.0	-	0.06
-2.2	1.84	1.92	5.0 L	5.0 L	-	5.0 L	216.0	216.0	-	-
-1.38	1.92	1.92	5.0 L	5.0 L	-	5.0 L	217.0	217.0	-	-
8.8	1.60	1.91	5.0 L	5.0 L	-	5.0 L	208.0	208.0	-	0.50 R
-0.61	1.879	1.796	5.0 L	5.0 L	-	5.0 L	205.0	205.0	-	-
-	1.854	-	5.0 L	5.0 L	-	5.0 L	210.0	210.0	-	-
-	-	-	5.0 L	5.0 L	-	5.0 L	147.0 R	147.0 R	0.4	-
2.3989	1.8124	1.8540	3.3333	3.3333	-	3.3333	210.0583	210.0583	.4000	.0450
8.3257	5.1008	14.3	2.8868	2.8868	-	2.8868	5.6877	5.6877	-	.0100
347.1	5.6	14.3	86.6	86.6	-	86.6	2.7	2.7	-	22.2
-	-	-	-	-	-	-	-	-	-	-
MEAN	2.3989	1.8540	3.3333	3.3333	-	3.3333	210.0583	210.0583	0.4	.0450
DEV.	8.3257	14.3	2.8868	2.8868	-	2.8868	5.6877	5.6877	.4000	.0100
STD.	347.1	14.3	86.6	86.6	-	86.6	2.7	2.7	-	22.2
DES. VAL.	-	-	-	-	-	-	-	-	-	-

02074 TURBIDITY NPLMTRIC NIU	02077 TURBIDITY HACH FZN FZN UNIT	02090 TURBIDITY COMBINED JIU/NIU	05105 BORON AA CARM MG/L	05106 BORON F AZOMETHI MG/L	05111 BORON F CAP DA UG/L	05190 BORON COMBINED MG/L B	06008 TOC CO2 FLM MG/L C	06009 TOC CO2 IR MG/L C	06051 TOC CO2 IR MG/L C	06052 TOC CO2 ? MG/L C
-	-	0.04	-	-	-	-	-	-	-	-
-	-	0.04	-	-	-	-	-	-	-	-
-	-	0.06	-	-	-	-	-	-	-	-
0.04	-	0.04	-	-	-	-	-	-	-	-
0.27	-	0.50 R	-	-	-	-	-	-	-	-
0.1	0.10	0.27	0.40	0.40	0.38	0.40	-	4.5	3.5	-
-	-	0.10	-	-	0.39	0.39	-	-	-	-
-	-	0.4	-	-	-	-	-	-	-	-
MEAN	0.1000	0.1211	0.5100	0.4000	0.3850	0.4200	8.81 R	4.5000	3.5000	0.5 R
STD.	0.1193	0.1279	0.0071	0.0071	1.8	0.606	-	-	-	-
REL.	87.3	105.6	1.8	1.8	1.8	14.4	-	-	-	-
DES. VAL.	-	0.154	-	-	-	0.378	-	-	-	-

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 27
 SAMPLE = 5 SYNTHETIC SAMPLE. MAJOR IONS 4C.

	09190 FLOURIDE COMBINED MG/L F	10101 ALKALINITY TITR. N MG/L CAC	10108 ALKALINITY POT TITN MG/L CAC	10109 ALKALINITY POT TITN MG/L CAC	10111 ALKALINITY TITROPRO MG/L CAC	10112 ALKALINITY TIT COND MG/L CAC	10190 ALKALINITY COMBINED MG/L CAC	10301 PH UNITS	10390 PH COMBINED UNITS	10602 HARDNESS CALC'D MG/L CAC	10603 HARDNESS TITR. N MG/L CAC
1	0.13	20.0	-	-	-	-	20.0	9.1	57.6	-	-
2	0.14	17.0	-	-	19.1	-	19.1	8.9	-	-	-
3	0.16	-	-	-	-	-	19.1	7.38	-	-	-
4	0.106	18.0 R	-	-	-	-	18.0	9.62	-	-	58.0
5	0.1	26.6 R	-	22.	-	-	26.6 R	9.19	-	-	56.0
6	0.10	17.8	-	-	-	-	17.8	8.1	-	-	59.0
7	-	-	-	20.0	-	-	20.0	8.9	-	-	-
8	0.20	-	17.	-	-	-	17.8	9.25	62.9	-	-
9	-	-	-	-	-	-	20.0	7.53	60.	-	-
10	0.14	17.9	-	-	20.	-	17.9	9.23	59.	-	-
11	0.19	21.13	-	-	-	-	21.13	9.2	58.7	-	-
12	-	-	-	-	-	-	-	9.456	61.95	-	-
14	-	-	-	-	-	-	-	8.8558	59.1438	-	57.6667
MEAN	.1407	18.4043	17.0000	21.0000	19.1000	20.0000	18.9108	8.8558	3.7758	57.6667	1.5275
STD. DEV.	0.370	1.5654	-	6.7	-	-	9.0	8.2	6.4	2.6	-
REL. DES. VAL.	26.3	8.5	-	-	-	-	18.900	8.2	6.4	2.6	-

HC-V

	10606 HARDNESS CALC'D MG/L CAC	10690 HARDNESS COMBINED MG/L CAC	11005 NA TOTAL ICAP MG/L	11102 SODIUM AAS F MG/L	11103 NA DISS FL PH MG/L	11105 SODIUM AAS DA MG/L	11107 NA UF FL PH MG/L	11311 NA EXTEBL HN03 ICP MG/L	11990 SODIUM COMBINED MG/L NA	12005 MG TOTAL YCAP MG/L	12101 MG DISS CALC'D MG/L
1	-	51.6	-	-	15.2	-	-	-	-	-	-
2	55.8	57.8	-	-	13.2	-	-	-	-	-	-
3	-	58.0	-	-	13.6	-	13.5	-	-	-	-
5	-	56.0	-	14.	-	-	-	-	-	-	5.8
6	-	59.0	-	-	-	13.3	-	-	-	-	-
7	-	62.9	-	-	-	-	-	-	-	-	-
8	-	60.	-	-	-	-	-	-	-	-	-
9	-	59.	13.9	-	-	-	-	-	5.3	-	-
10	-	60.	14.1	-	-	-	-	-	5.1	-	-
11	-	58.7	-	14.	-	-	-	-	-	-	-
12	-	61.95	-	-	13.7	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-
MEAN	55.8000	58.4258	14.0000	14.0000	13.8750	13.3000	13.5000	13.8000	5.2000	5.8000	-
STD. DEV.	-	3.2635	1.0	-0.0000	5.6	-	-	3.6	2.7	-	-
REL. DES. VAL.	-	59.690	-	-1.0	5.6	-	-	3.6	2.7	-	-

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 4C.

12102	12106	12107	12108	12111	12303	12311	12990	14102	14105	14106
MG DISS AAS DA MG/L	MG UF AAS DA MG/L	MG DISS AAS AUTO MG/L	MG HARDN CALC'D MG/L	MG DISS ICAP MG/L	MG UF AAS AUTO MG/L	MG EXTRL HNO3 ICP MG/L	MGNESIUM COMBINED MG/L MG	SILICA R AAS AA MG/L	SILICA R MOLY AA MG/L	SILICA R MOLY UF MG/L
-	-	4.9	-	-	5.	-	5.9	0.62	-	-
-	4.7	-	4.7	-	-	-	4.7	-	-	0.53
-	-	-	-	-	-	-	4.8	-	-	-
5.0	-	-	-	-	-	-	5.0	-	0.6	-
-	-	-	-	-	-	5.52	5.3	-	0.6	-
5.2	-	-	-	-	-	-	5.7	-	0.54	-
-	-	-	-	5.1	-	-	5.7	-	-	-
5.10	-	-	-	-	-	-	5.10	-	0.6	-
5.1000	4.7000	4.9000	4.7000	5.1000	5.0000	5.5200	5.1183	.6100	.5850	.5300
2.0	-	-	-	-	-	-	3.151	.0141	.0300	-
-	-	-	-	-	-	-	9.2	2.3	5.1	-
-	-	-	-	-	-	-	5.124	-	-	-

MEAN DEV.
STD. DEV.
REL. STD.
DES. VAL.

14111	14190	15106	15403	15406	15409	15413	15421	15490	16304	16306
SILICA F ICAP DA MG/L	SILICA COMBINED MG/L	T P FILL UV ASCBC MG/L P	T P UF AA SMC12 MG/L P	T P UF AA ASC MG/L P	T P BLK AA ASC MG/L P	TOTAL P AA SMC12 MG/L P	T P BLK DIG ASC MG/L P	TOTAL P COMBINED MG/L P	S04 DISS AUTO BA MG/L	S04 DISS AA MTB MG/L
-	0.6	-	-	-	-	-	-	0.006L	-	16.
-	0.62	-	-	-	-	0.001	-	0.001	17.5	-
-	0.53	-	-	0.003L	-	-	-	0.003L	-	-
-	0.6	-	-	-	0.02 R	-	-	0.02 R	-	16.6
-	-	-	-	-	-	-	-	0.010	17.	17.5
0.57	0.6	0.010L	0.05 L	-	-	0.010	-	0.010	-	18.0
-	0.54	-	-	-	-	-	-	0.010L MPL	-	17.
-	0.6	-	-	0.007	-	-	-	0.05 L MPL	-	16.8
-	-	-	-	0.01 L	-	-	-	0.01 L MPL	-	19.8
-	-	-	-	-	-	-	-	.0060	17.3500	17.3857
.5700	.5825	-	-	.0070	-	.0055	-	.0046	17.3536	17.2415
-	.0324	-	-	-	-	.0054	-	76.4	2.0	7.1
-	5.6	-	-	-	-	115.7	-	.002	-	-
-	.580	-	-	-	-	-	-	-	-	-

MEAN DEV.
STD. DEV.
REL. STD.
DES. VAL.

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
 MAJOR IONS 4C. PAGE 29

	16307 SO4 UF AA MTB MG/L	16309 SO4 DISS I C MG/L	16310 SO4 DISS AA CALM MG/L	16990 SULFATE COMBINED MG/L SO4	17203 CL DISS UF AA FE MG/L	17204 CL DISS AG FLIN MG/L	17206 CL DISS AA AG MG/L	17208 CL DISS UF AA AG MG/L	17209 CL DISS I C MG/L	17210 CL DISS TIT COND MG/L	17990 CHLORIDE COMBINED MG/L CL
1	16.8	17.5	-	16.5	41.	-	-	-	17.8	-	41.8
2	-	-	-	16.6	-	-	-	38.6	-	-	17.8
3	-	-	-	17.5	-	38.	47.0	-	-	-	38.6
4	-	-	-	18.0	42.0	-	-	-	-	-	47.0
5	-	16.5	-	16.0	-	-	42.	-	-	-	42.0
6	-	-	-	17.	-	-	-	-	16.8	-	42.0
7	-	-	-	17.8	37.5	-	55.	-	18.6	37.	42.0
8	-	-	-	19.8	-	-	-	-	-	-	37.
9	-	-	-	17.1250	40.1667	38.0000	48.0000	38.6000	17.7333	37.0000	35.9417
10	16.8000	17.0000	16.0000	1.0288	5.9	-	13.7	-	5.1	-	12.0439
11	-	4.2	-	17.830	-	-	-	-	-	-	33.5
12	-	-	-	-	-	-	-	-	-	-	33.240
14	-	-	-	-	-	-	-	-	-	-	-
MEAN	16.8000	17.0000	16.0000	17.1250	40.1667	38.0000	48.0000	38.6000	17.7333	37.0000	35.9417
STD. DEV.	-	4.2	-	6.0	5.9	-	13.7	-	5.1	-	12.0439
REL. DES. VAL.	-	-	-	17.830	-	-	-	-	-	-	33.5

	19005 K TOTAL ICAP 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 UF FLM PHOT MG/L	19301 K EXTRL HNO3 AA MG/L	19990 PTASSIUM COMBINED MG/L K	20005 CA TOTAL ICAP MG/L	20100 CA DISS CALC'D MG/L	20101 CA DISS TIT EDTA MG/L	20103 CA DISS AAS MG/L
1	-	-	2.8	-	-	-	2.8	-	-	-	-
2	-	-	2.9	-	2.90	-	2.9	-	-	-	-
3	-	-	2.9	-	-	-	2.9	-	-	-	-
4	-	3.0	-	-	-	-	3.0	13.	-	15.4	-
5	-	3.00	-	-	-	2.85	3.00	-	-	-	-
6	3.1	-	-	-	-	-	2.85	-	-	-	15.4
7	3.0	-	-	-	-	-	3.1	-	-	-	-
8	-	-	-	2.9	-	-	2.9	15.8	-	-	-
9	-	2.93	-	-	-	-	2.93	15.4	-	-	16.
10	3.0500	2.9767	2.8750	2.9000	2.9000	2.8500	2.9317	15.6000	13.0000	15.4000	16.4
11	2.3	1.4	1.7	1.9500	2.9000	2.8500	2.9805	1.8	-	-	15.9333
12	-	-	-	-	-	-	2.9666	1.8	-	-	3.2
14	-	-	-	-	-	-	-	-	-	-	3.240
MEAN	3.0500	2.9767	2.8750	2.9000	2.9000	2.8500	2.9317	15.6000	13.0000	15.4000	16.4
STD. DEV.	2.3	1.4	1.7	1.9500	2.9000	2.8500	2.9805	1.8	-	-	15.9333
REL. DES. VAL.	-	-	-	-	-	-	2.9666	1.8	-	-	3.2

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 30
 SAMPLE = 5 SYNTHETIC SAMPLE. MAJOR IONS 4C.

20108 CA DISS AAS UP MG/L	20110 CA DISS AAS AUTO MG/L	20111 CA DISS ICAP MG/L	20311 CA EXTL HNO3 ICP MG/L	20990 CALCIUM COMBINED MG/L CA
-	16.	-	-	15.
14.6	15.	-	-	14.6
-	-	-	-	15.4
-	-	-	-	15.4
-	-	16.1	-	15.4
-	-	-	-	15.1
-	-	-	-	15.8
-	-	-	-	15.4
-	15.2	-	-	16.2
-	-	-	-	15.2
-	-	-	-	16.4
14.6000	15.5000	16.1000	15.3583	
STD. DEV.	7071		3020	
REL. DES.	4.6		5.9	
			15.618	

DATES RECEIVED

1	87/02/11	2	87/03/04	3	87/02/26	3	87/03/10	4	87/02/12
5	87/04/06	6	87/02/24	7	87/03/17	8	87/03/26	9	87/03/09
10	87/03/03	11	87/02/24	12	87/03/12	14	87/02/16		

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MEMORANDUM

NOTE DE SERVICE

H.Alkema\NWRI\336-4929\ha

SECURITY - CLASSIFICATION - DE SÉCURITÉ
OUR FILE / NOTRE RÉFÉRENCE
YOUR FILE / VOTRE RÉFÉRENCE
DATE June 24, 1987

TO
A Distribution

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

SUBJECT
OBJET Prairie Provinces Quality Assurance Program (PPOC)

I have enclosed the final report for PP 55-56.

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

H. Alkema

SUMMARY REPORT

PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAM

STUDIES 55 AND 56

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 PP program. This report summarizes the most recent PP inter-laboratory quality control studies: PP 55 and 56, 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:

- PP 55 - Sample 1 - 125 ml, D/A* for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C
- PP 56 - 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 PP 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 sample two and four, and for low level Aluminum in samples three and five.

Individual laboratory deviations are listed below:

- Lab 1 = a high result for V by SE: +36%
- an HDL for low level Mn

- Lab 3 - a low result for Silica: -16%
- a high result for NO_3+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 6 - a low result for Cr by SE: -45%
- a high result for Al by SE: +210% (R); & Fe: +55%; & (R)
- an HDL for by SE for Al, Pb, & V; and T. P.

- Lab 8 - a high result for by SE for: Cr: +54% (R); Mn: +50%
- Fe: +34%; Co: +27%; Zn: +26%; Pb: +40% & Cu: +65% (R) & (R)
- a low result for DIC: -23%
- a high result for F: +71%; TKN: (R); & DOC: 15%, & 120% (R)
- an HDL by SE for Al, MN, & Fe and B

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

PPWB laboratories average number of deviations per sample was 1.2.

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.

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

STUDY NO. IR150 PP 55 FP 15 DATE: 01/03/87 DUE DATE: 30/04/87 PAGE 3
 SAMPLE = 1 SPIKED SAMPLE. TRACE METALS D/A. (IN 3% HNO3)

LAB	82301 PB EXT AAS DA	82302 PB EXT AAS SE	82305 PB EXT AAS GP	82311 PB EXT ICP DA	82999 LEAD COMMON
1	0.99	0.820	-	-	0.820
2	-	-	-	-	0.99
3	-	-	-	-	0.835
6	-	-	-	-	0.90
8	-	-	-	0.900	0.900
9	-	-	-	-	1.00
10	-	-	-	-	0.80
11	0.70	-	-	-	0.70
12	-	-	-	-	0.85
14	-	-	0.960	-	0.960
MEAN	.8450	.8200	.9600	.9000	.8755
STD DEV	.2051	-	-	-	.0936
REL STD	24.3	-	-	-	10.7
DES VAL	-	-	-	-	-

DATA JOURNAL

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

STUDY NO. IRI50 PP 55 FP 15 DATE: 01/03/87 DUE DATE: 30/04/87 PAGE 4
 SAMPLE = 2 SPIKED SAMPLE. MAJOR IONS 4C.

LAB	00110 IONIC BALANC	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPAREN	02021 COLOUR VIS COM	02023 COLOUR SPECTRO	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02072 TURBDY HELIGE	02073 TURBDY HACH	02074 TURBDY NPLMTRI	02077 TURBDY HACH PZ
1	0.18	8.47	8.50	-	-	-	-	901.	901.	-	0.1	-	-
2	-1.20	7.964	8.157	5.	L	-	5.	906.	906.	-	0.2	-	-
3	-0.16	8.147	8.173	5.	-	-	5.	910.4	910.4	-	0.2	-	-
4	-	-	-	-	5.0 L	-	5.0 L	914.	914.	-	0.08	-	-
5	2.69	8.39	7.95	5.	-	-	5.	842.	842.	-	0.06	-	-
6	1.2	8.4	8.2	9.	-	-	-	890.	890.	-	-	0.09	-
7	0.4	8.23	8.17	9.	-	-	9.	952.	952.	-	0.13	-	-
8	5.61	9.06	8.10	5.	L	-	5.	902.	902.	-	-	0.09	-
9	-2.2	8.23	8.6	-	-	3.	-	880.	880.	-	-	-	-
10	0.33	8.131	8.076	-	-	-	3.	880.	880.	-	-	0.1	-
11	-	8.426	8.276	-	L	-	-	940.	940.	-	0.2	-	1.0 R
12	0.9	-	-	5.	-	-	5.	930.	930.	-	-	-	-
14	-	-	-	-	-	-	5.	876.	876.	0.1	-	-	-
MEAN	.7753	8.3448	8.2202	6.0000	-	3.0000	5.4000	901.8000	901.8000	.1000	.1450	.0933	-
STD DEV	2.1488	.2972	.1952	2.0000	-	-	2.1909	29.3642	29.3642	-	.0644	.0058	-
REL STD	277.2	3.6	2.4	33.3	-	-	40.5	3.3	3.3	-	44.4	6.2	-
DES VAL	-	-	-	-	-	-	4.300	-	896.721	-	-	-	-

LAB	02090 TURBDY COMMON	05105 BORON AA-CARM	05106 BORON F AZOMETH	05107 BORON ICP DA	05111 BORON F ICP DA	05190 BORON COMMON	06008 TOC CO2 FLM	06009 TOC CO2 IR	06051 TIC CO2 IR	06052 TIC CO2 ?	06101 DOC IR/DIP	06104 DOC UV CO2 IR	06107 DOC UV CO2 PHE
1	0.1 L	-	-	0.007	-	0.007	-	-	-	-	-	-	1.1
2	0.2	-	-	-	-	-	-	-	-	-	-	-	1.4
3	0.08	-	-	-	-	0.09	-	-	-	-	-	1.1	-
4	0.06	0.09	-	-	-	-	-	-	-	-	-	1.3	-
5	0.09	-	-	-	-	-	-	-	-	-	-	1.7	-
6	0.13	-	-	-	-	-	-	-	-	-	-	-	-
7	0.09	-	0.05 L	-	0.02	0.05 L	-	4.4 R	12.2	-	-	-	-
10	0.1	-	-	-	-	-	-	-	-	-	-	-	-
11	1.0 R	-	-	-	-	-	-	-	-	-	1.	L	-
12	0.2	-	-	-	-	-	-	-	-	13.3	-	-	-
14	0.1	-	-	-	-	-	3.74 R	-	-	-	-	-	-
MEAN	.1250	.0900	-	.0070	.0200	.0390	-	-	12.2000	13.3000	-	1.3667	1.2500
STD DEV	.0546	-	-	-	-	.0446	-	-	-	-	-	.3055	.2121
REL STD	43.7	-	-	-	-	114.5	-	-	-	-	-	22.4	17.0
DES VAL	.175	-	-	-	-	.051	-	-	-	-	-	-	-

LAB	06109 DOC UV CO2 OH	06150 D O C COMMON	06151 DIC IR COMBUST	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 D I C COMMON	07004 TKN AA NITRUS	07015 TKN DIG BERTHEL	07016 TKN BLK AMN-SAL	07018 TKN BLK INDOPE	07021 TKN BLK DIG BER	07090 TKN COMMON
1	-	1.1	-	-	16.4	-	16.4	-	-	-	-	0.210	0.210
2	-	1.4	-	-	-	-	15.6	-	-	-	-	-	-
3	-	1.1	-	15.6	-	-	12.0	-	-	-	-	-	-
4	-	1.3	-	12.0	-	-	-	-	0.2	-	-	-	-
6	-	1.7	-	-	-	-	12.2	-	-	-	-	-	0.2
8	-	4.4 R	-	-	-	15.0	15.0	-	0.020R	-	-	-	0.020R
10	1.0	1.0	-	-	-	-	17.1	-	-	-	0.11	-	0.11
12	-	3.74 R	17.1	-	-	-	13.3	0.32 R	-	-	-	-	0.32 R
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	1.0000	1.2667	17.1000	13.8000	16.4000	15.0000	14.5143	-	.2000	.2000	.1100	.2100	.1733
STD DEV	-	.2582	-	2.5456	-	-	2.0334	-	-	-	-	-	.0551
REL STD	-	20.4	-	18.4	-	-	14.0	-	-	-	-	-	31.8
DES VAL	-	1.438	-	-	-	-	15.868	-	-	-	-	-	.162

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

MAJOR IONS 4C.

SAMPLE = 2 SPIKED SAMPLE.

LAB	07105 NO3+NO2 DIS AA	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC UF AA CD	07112 NO3+NO2 NO3 I C	07315 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	-	-	-	0.56	-	-	-	-	-	-
3	-	-	0.555	-	-	0.555	0.006	-	-	-	-	-
4	-	0.55	-	-	-	0.555	-	0.05 L	-	-	-	-
5	-	0.555	-	-	-	0.54	-	-	0.006	-	-	-
6	-	0.54	-	-	-	0.54	-	-	0.02	-	-	-
7	-	-	0.64	-	-	0.64	-	-	-	-	-	-
8	-	0.60	-	-	-	0.60	-	0.007	-	-	-	-
9	-	0.44	-	-	-	0.44	-	-	-	-	-	-
10	-	-	-	-	0.57	0.57	-	-	0.02 L	-	-	-
11	-	0.57	-	-	-	0.57	-	-	-	-	-	-
12	-	0.59	-	-	-	0.59	-	-	-	-	-	0.006
14	-	-	0.57	-	-	0.57	0.02 L	-	-	-	-	-
MEAN	.6000	.4900	.5725	.5700	.5975	.5646	.0060	-	.0070	.0130	.0170	.0060
STD DEV	.0707	.0194	.0601	.0601	.0071	.0461	-	-	-	.0099	-	-
REL STD	14.4	3.4	10.1	10.1	1.3	8.2	-	-	-	76.1	-	-
DES VAL	-	-	-	-	-	.579	-	-	-	-	-	-

LAB	07590 AMMONIA COMMON	07601 T N UV AA SUL	07602 T N CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA	07655 T N DIS UV EDTA	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	-	0.65	-	-	-	-	0.65	-	0.07	-	-	-
3	0.006	-	-	-	-	-	-	-	-	-	-	0.10
4	0.05 L	-	-	-	-	-	0.63	-	-	-	-	-
5	0.006	-	0.63	-	0.640	-	0.640	-	-	0.05 L	-	-
6	0.02	-	-	-	-	-	-	0.1	-	-	-	-
8	0.007	-	-	-	-	-	0.62 L	-	0.14	-	-	-
10	0.02 L	-	0.62 L	0.65	-	-	0.65	-	0.084	-	-	-
11	-	-	-	-	-	-	-	-	0.1 L	-	-	-
12	0.006	-	0.70	-	-	-	0.70	-	-	0.27 R	-	-
14	0.02 L	-	-	-	-	-	-	-	-	-	-	-
MEAN	.0103	.6500	.7000	.6500	.6300	.6400	.7000	.1000	.0980	-	.0700	.1000
STD DEV	.0064	-	-	-	-	-	.0096	-	.0370	-	-	-
REL STD	62.0	-	-	-	-	-	1.5	-	37.8	-	-	-
DES VAL	.014	-	-	-	-	-	.662	-	-	-	-	-

LAB	09115 F DIS AA ALIZ	09190 FLOURIDE COMMON	10101 ALKALNTY TITR N	10108 ALKALNTY POT TIT	10109 ALKALNTY POT TIT	10111 ALKALNTY TIT PRO	10112 ALKALNTY TIT CON	10116 ALKALNTY CO2 IR	10190 ALKALNTY COMMON	10301 PH	10390 PH COMMON	10602 HARDNESS CALC'D	10603 HARDNESS TITR N
1	-	0.07	68	-	-	-	-	-	68	8.0	8.0	266	-
2	-	0.07	64.8	-	-	-	-	64.8	64.8	8.0	8.0	256.3	-
3	-	0.10	-	-	66.3	-	-	66.3	66.3	8.0	8.0	-	-
4	-	-	65.8	-	-	-	-	65.8	65.8	8.07	8.07	-	-
5	-	0.05 L	65.9	-	-	-	-	65.9	65.9	7.43	7.43	262	-
6	-	0.1	66.2	71	-	-	-	71	71	7.5	7.5	264	-
7	-	-	66.2	-	-	-	-	66.2	66.2	8.1	8.1	261.3	-
8	-	0.14	-	66.0	-	-	-	66.0	66.0	7.90	7.90	257	-
9	0.10	0.07	-	-	-	-	-	62	62	7.85	7.85	255	-
10	0.07	0.084	67	-	-	-	63	63	63	7.9	7.9	290	-
11	-	0.1	64.7	-	-	-	-	64.7	64.7	7.9	7.9	269	-
12	-	0.27 R	69.8	-	-	-	-	69.8	69.8	8.03	8.03	-	-
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	.0239	5.2	-	-	3.7	2.4541	2.7	2.7	12.2158	3.6056
REL STD	25.0	26.1	2.6	-	5.2	-	-	3.7	3.7	2.7	2.7	4.6	1.4
DES VAL	-	.082	-	-	-	-	-	65.325	-	7.881	7.881	-	-

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

STUDY NO. IR150 PP 55 FP 15 DATE: 01/03/87 DUE DATE: 30/04/87 MAJOR IONS 4C.
 SAMPLE = 2 SPIKED SAMPLE.

LAB	10606 HARDNSS CALC'D	10690 HARDNESS COMMON	11005 NA TOT ICP	11102 NA F 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	12102 MG DIS AAS DA	12106 MG UF AAS DA
1	-	266.3	-	-	62.5	-	-	-	62.5	-	-	-	-
2	-	256.3	-	-	59.5	-	-	-	59.5	-	-	-	-
3	257.	257.	-	-	58.5	-	-	-	58.5	-	-	-	21.1
4	-	262.	-	-	61.5	-	-	-	61.5	-	-	-	-
5	-	264.	61.	-	-	-	-	-	61.5	22.	-	-	-
6	-	269.0	-	-	-	-	-	-	58.0	-	-	22.0	-
7	-	257.	-	-	-	58.0	-	56.5	56.5	-	-	-	-
8	-	255.	-	-	-	-	-	-	60.	-	-	-	-
9	-	290.	59.	-	-	-	-	-	21.5	-	-	-	-
10	-	269.	64.8	-	58.8	-	-	-	22.	-	-	23.	-
11	-	-	-	-	-	-	-	-	58.8	-	-	-	-
12	-	-	-	-	-	-	-	-	64.8	-	-	18.7	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	257.0000	264.5300	59.0000	61.6000	60.4500	58.0000	58.5000	56.5000	59.8000	21.7500	22.0000	21.2333	21.1000
STD DEV	-	10.3788	1.4142	2.9462	1.5416	-	-	-	2.2361	1.3536	-	2.2502	-
REL STD	-	3.9	2.4	4.8	2.6	-	-	-	3.7	1.6	-	10.6	-
DES VAL	-	260.723	-	-	-	-	-	-	59.361	-	-	-	-

LAB	12107 MG DIS AAS AUT	12108 MG HARDN CALC'D	12111 MG DIS ICP	12303 MG UF AAS AUT	12311 MG EXT ICP	12990 MGNESTIUM COMMON	14102 SILICA ANSA AA	14105 SILICA MOLY AA	14106 SILICA MOLY	14111 SILICA ICP DA	14190 SILICA COMMON	15106 T P FIL UV ASC	15406 T P UF AA ASC
1	-	-	-	21.	-	21.	15.2	-	-	-	15.2	-	-
2	21.	-	-	-	-	21.	14.65	-	-	-	14.65	-	-
3	-	-	-	-	-	21.1	-	-	12.41	-	12.41	-	-
4	-	-	-	-	-	20.6	-	14.3	-	-	14.3	-	0.003L
5	-	20.6	-	-	-	22.0	-	-	-	-	-	-	-
6	-	-	-	-	-	22.0	-	-	-	-	-	-	-
7	-	-	-	-	22.6	22.6	-	13.9	-	-	-	-	0.077
8	-	-	-	-	-	21.5	-	13.9	-	1.5 R	13.9	-	-
9	-	-	-	-	-	22.3	-	13.9	-	1.5 R	13.9	0.010L	-
10	-	-	-	-	-	23.	-	14.8	-	-	14.8	-	0.003
11	-	-	-	-	-	22.3	-	-	-	-	-	-	0.008L
12	-	-	-	-	-	18.7	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	21.0000	20.6000	22.3000	21.0000	22.6000	21.4833	14.9250	14.2250	12.4100	-	14.1657	-	.0400
STD DEV	-	-	-	-	-	1.1344	.3889	.4272	-	-	.9081	-	.0523
REL STD	-	-	-	-	-	5.3	2.6	3.0	-	-	6.4	-	130.8
DES VAL	-	-	-	-	-	21.452	-	-	-	-	14.712	-	-

LAB	15409 T P BLK AA ASC	15413 T P ACL AA SNCL	15421 T P BLK DIG ASC	15490 TOT P COMMON	16304 SO4 DIS AUTO BA	16306 SO4 DIS AA MTB	16307 SO4 UF AA MTB	16309 SO4 DIS I C	16310 SO4 DIS AA CALM	16990 SULFATE COMMON	17203 CL DIS AA FE	17204 CL DIS AG TIT	17206 CL DIS AA AG
1	-	-	0.006L	0.006L	72.7	70.	-	73.	-	70.	200.	-	-
2	-	-	-	-	-	-	70.5	-	-	73.	-	-	-
3	-	-	-	-	-	-	-	-	-	70.5	-	-	-
4	-	-	-	0.003L	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	73.0	-	-	-	73.0	-	-	180.
6	0.03	-	-	0.03	72.	76.0	-	-	-	72.	-	190.	-
7	-	-	-	0.007	-	73.	-	-	-	76.0	185.	-	185.
8	-	0.003	-	0.003	-	-	-	-	-	73.	-	-	-
9	-	-	-	-	-	-	-	73.	-	73.	-	-	-
10	-	-	-	0.010L	-	-	-	-	68.	73.	-	-	-
11	-	-	-	0.003	-	68.	-	-	68.	68.	-	-	201.
12	-	-	-	0.008L	-	72.0	-	-	72.0	72.0	-	-	193.
14	-	-	-	-	-	68.5	-	-	68.5	68.5	190.0	-	-
MEAN	-0.0300	-0.0030	-	-	72.3500	71.5000	70.5000	73.0000	68.0000	71.4167	191.6667	190.0000	189.7500
STD DEV	-	-	-	.0283	.4950	2.8431	-	.0000	-	2.4572	7.6376	-	9.2150
REL STD	-	-	-	.0349	.7	4.0	-	-1.0	-	3.4	4.0	-	4.9
DES VAL	-	-	-	123.6	-	-	-	-	-	70.770	-	-	-

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

STUDY NO. IR151 PP 56 FP 16

DATE: 01/04/87

DUE DATE: 30/04/87

PAGE 8

SAMPLE = 3 SPIKED SAMPLE.

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

LAB	13004	13009	13105	13111	13302	13305	13999	23003	23009	23011	23102	23111	23999
AL TOT	AL TOT	AL TOT	AL DIS	AL DIS	AL EXT	AL EXT	ALUMINUM	V EXT	V TOT	V TOT	V DIS	V DIS	VANADIUM
AAS GF	AAS GF	AAS GF	ICP DA	ICP DA	AAS GF	AAS SE	COMMON	AAS GF	5X ICP	5X ICP	AAS SE	ICP DA	COMMON
1	0.061	0.061	-	-	-	0.036	0.061	-	0.015	-	-	-	0.015
2	0.050	0.050	-	-	-	0.028	0.028	-	-	0.011	-	-	0.011
3	0.12 R	0.12 R	-	-	-	0.028	0.028	-	-	0.01	-	-	0.01
6	-	-	-	-	0.2 L	-	0.12 R	-	-	-	-	-	-
8	-	-	-	0.04	-	-	0.04	-	-	-	-	0.011	0.011
9	-	-	-	0.04	-	-	0.04	-	-	-	0.012	0.010	0.010
10	-	-	0.055	-	-	-	0.055	-	-	-	0.012	-	0.012
12	-	-	-	-	-	-	0.078	0.008	-	-	-	-	0.008
14	0.078	-	-	-	-	-	0.078	0.008	-	-	-	-	0.008
MEAN	0.0780	0.0555	0.0550	0.0400	-	0.0320	0.0483	0.0080	0.0150	0.0105	0.0120	0.0105	0.0110
STD DEV	0.0078	0.0078	0.0000	0.0000	-	0.0057	0.0173	0.0080	0.0007	0.0007	0.0022	0.0007	0.0022
REL STD	14.0	14.0	-1.0	-1.0	-	17.7	35.8	-	6.7	6.7	6.7	6.7	19.6
DES VAL	-	-	-	-	-	-	0.038	-	-	-	-	-	0.011

HCV

LAB	24004	24009	24011	24056	24111	24302	24999	25003	25011	25107	25111	25304	25306
CR TOT	CR TOT	CR TOT	CR DIS	CR DIS	CR DIS	CR EXT	CHROMIUM	MN TOT	MN TOT	MN DIS	MN DIS	MN EXT	MN EXT
AAS GF	AAS GF	AAS GF	AAS GF	AAS GF	ICP DA	AAS DA	COMMON	5X ICP	5X ICP	AAS GF	ICP DA	AAS DA	AAS GF
1	0.015	0.015	-	-	-	-	0.015	0.013	-	-	-	-	-
2	-	-	-	-	-	0.011	0.011	-	0.013	-	-	0.02	-
3	-	-	-	-	-	0.012	0.012	-	0.012	-	-	0.012	-
6	-	-	0.012	-	-	-	0.020R	-	-	-	-	-	-
8	0.020R	-	-	-	-	-	0.013	-	-	-	0.013	-	-
9	0.013	-	-	-	0.011	-	0.011	-	-	-	0.010	-	-
10	-	-	-	-	0.013	-	0.013	-	-	-	0.010	-	-
11	-	-	-	0.012	-	0.013	0.013	-	-	-	-	-	-
12	-	-	-	-	-	0.01 L	0.01 L	-	-	0.013	-	-	0.015
14	-	-	-	-	-	-	0.01 L	-	-	-	-	-	-
MEAN	0.0130	0.0150	0.0120	0.0120	0.0110	0.0120	0.0124	0.0130	0.0125	0.0130	0.0115	0.0160	0.0150
STD DEV	-	-	0.0000	0.0000	0.0014	0.0014	0.0014	0.0007	0.0007	0.0007	0.0021	0.0057	0.0057
REL STD	-	-	-1.0	-1.0	11.8	11.2	11.2	5.7	5.7	5.7	18.4	35.4	35.4
DES VAL	-	-	-	-	-	-	0.013	-	-	-	-	-	-

LAB	25311	25999	26011	26107	26111	26305	26306	26311	26999	27003	27009	27011	27107
MN EXT	MN EXT	MANGNESE	FE TOT	FE DIS	FE DIS	FE EXT	FE EXT	FE EXT	IRON	CO TOT	CO TOT	CO TOT	CO DIS
ICP DA	ICP DA	COMMON	5X ICP	AAS GF	ICP DA	AAS SE	AAS GF	ICP DA	COMMON	AAS GF	5X ICP	5X ICP	AAS GF
1	0.018	0.013	0.031	-	-	0.029	-	-	0.029	-	0.010	-	-
2	-	0.012	0.045	-	-	0.027	-	-	0.027	-	-	0.011	-
3	-	0.012	0.045	-	-	0.027	-	-	0.045	-	-	0.010	-
6	-	0.013	-	-	-	-	-	0.039	0.045	0.014	-	-	-
8	-	0.013	-	-	0.03	-	-	0.039	0.039	-	-	-	-
9	-	0.010	-	-	0.026	-	-	-	0.026	-	-	-	-
10	-	0.010	-	-	0.022	-	-	-	0.022	-	-	-	-
11	-	0.013	-	0.022	-	0.022	-	-	0.022	-	-	-	0.010
12	-	0.015	-	-	-	-	0.022	-	0.022	-	-	-	-
14	-	0.015	-	-	-	-	0.022	-	0.022	-	-	-	-
MEAN	0.0180	0.0140	0.0380	0.0220	0.0280	0.0260	0.0220	0.0390	0.0291	0.0140	0.0100	0.0105	0.0100
STD DEV	-	0.0032	0.0099	0.0028	0.0028	0.0036	0.0028	0.0028	0.0080	0.0007	0.0007	0.0007	0.0007
REL STD	-	22.6	26.1	10.1	10.1	13.9	10.1	13.9	27.6	6.7	6.7	6.7	6.7
DES VAL	-	0.012	-	-	-	-	-	-	0.029	-	-	-	-

DATA SUMMARY

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

STUDY NO. IR151 PP 56 FP 16 DATE: 01/04/87 DUE DATE: 30/04/87 PAGE 10
 SAMPLE = 3 SPIKED SAMPLE. TRACE METALS S/E. (IN 0.2% HNO3)

LAB	48003	48009	48011	48103	48111	48302	48303	48309	48999	56009	56011	56111	56999
1	CD TOT	CD TOT	CD TOT	CD DIS	CD EXT	CD EXT	CD EXT	CD EXT	CADMIUM	BA TOT	BA TOT	BA DIS	BARIUM
2	AAS GF	5X ICP	5X ICP	AAS GF	ICP DA	AAS SE	AAS GF	AAS GF	COMMON	5X ICP	5X ICP	ICP DA	COMMON
3	-	0.012	-	-	-	0.011	-	-	0.012	0.024	-	-	0.024
4	-	-	0.011	-	-	0.011	-	-	0.011	-	0.022	-	0.022
5	-	-	0.011	-	-	0.011	-	-	0.011	-	0.025	-	0.025
6	-	-	-	-	-	-	-	0.011	0.011	-	-	-	-
7	0.011	-	-	-	0.010	-	-	-	0.011	-	-	0.025	0.025
8	-	-	-	0.012	-	0.011	-	-	0.011	-	-	0.02	0.02
9	-	-	-	-	-	-	0.011	-	0.012	-	-	-	-
10	-	-	-	-	-	-	-	-	0.011	-	-	-	-
11	-	-	-	-	-	-	-	-	0.011	-	-	-	-
12	-	-	-	-	-	-	-	-	0.011	-	-	-	-
14	-	-	-	-	-	-	-	-	0.011	-	-	-	-
MEAN	-0.110	-0.120	-0.110	-0.120	-0.100	-0.110	-0.110	-0.110	-0.111	-0.240	-0.235	-0.225	-0.232
STD DEV	-	-	-	-	-	-	-	-	-	-	-	-	-
REL STD	-	-	-	-	-	-	-	-	-	-	-	-	-
DES VAL	-	-	-	-	-	-	-	-	5.1	9.0	15.7	9.3	9.3

LAB	82004	82011	82104	82302	82305	82309	82999
1	PB TOT	PB TOT	PB DIS	PB EXT	PB EXT	PB EXT	LEAD
2	AAS GF	5X ICP	AAS GF	AAS SE	AAS GF	AAS GF	COMMON
3	-	-	-	-	-	-	0.011
4	-	-	-	-	-	-	0.012
5	-	-	-	-	-	-	0.011
6	-	-	-	-	-	-	0.008
7	-	-	-	-	-	-	0.014
8	0.011	-	-	-	-	-	0.011
9	-	-	-	-	-	-	0.010
10	-	-	-	-	-	-	0.010
11	-	-	0.010	-	-	-	0.010
12	-	-	-	0.010	-	-	0.010
14	-	-	-	-	-	-	0.010
MEAN	-0.110	-0.095	-0.100	-0.113	-0.100	-0.140	-0.109
STD DEV	-	-	-	-	-	-	-
REL STD	-	-	-	-	-	-	-
DES VAL	-	22.3	-	4.4	-	-	14.8

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

STUDY NO. IR151 PP 56 FP 16 DATE: 01/04/87 DUE DATE: 30/04/87 PAGE 17
 SAMPLE = 5 SPIKED SAMPLE. TRACE METALS S/E. (IN 0.2% HNO3)

LAB	42999	48003	48009	48011	48103	48111	48302	48303	48309	48999	56009	56011	56111
1	MOLYBENUM COMMON	CD TOT AAS GF	CD TOT 5X ICP	CD TOT 5X ICP	CD DIS AAS GF	CD DIS ICP DA	CD EXT AAS SE	CD EXT AAS GF	CD EXT AAS GF	CADMIUM COMMON	BA TOT 5X ICP	BA TOT 5X ICP	BA DIS ICP DA
2	0.007	-	0.005	-	-	-	-	-	-	0.005	0.023	-	-
3	0.007	-	-	0.005	-	-	0.005	-	-	0.005	-	0.023	-
6	0.007	-	-	0.005	-	-	0.005	-	-	0.005	-	0.024	-
8	0.010L	0.005	-	-	-	-	-	-	0.005	0.005	-	-	-
10	0.008	-	-	-	-	0.004	-	-	-	0.005	-	-	0.024
11	0.007	-	-	-	0.005	-	-	-	-	0.005	-	-	0.02
12	0.1	L HPL	-	-	-	-	-	0.005	-	0.005	-	-	-
14	-	-	-	-	-	-	-	-	-	0.005	-	-	-
MEAN	0.072	0.0050	0.0050	0.0050	0.0050	0.0040	0.0050	0.0050	0.0050	0.049	0.230	0.235	0.220
STD DEV	0.004	-	-	0.0000	-	-	0.0000	-	-	0.0003	-	0.0007	0.0028
REL STD	6.2	-	-	-1.0	-	-	-1.0	-	-	6.5	-	3.0	12.9
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-

LAB	56999	82004	82011	82104	82302	82305	82309	82999
1	BARIUM COMMON	PB TOT AAS GF	PB TOT 5X ICP	PB DIS AAS GF	PB EXT AAS SE	PB EXT AAS GF	PB EXT AAS GF	LEAD COMMON
2	0.023	-	-	-	0.004	-	-	0.004
3	0.023	-	-	-	0.005	-	-	0.005
6	0.024	-	0.005L	-	0.005	-	-	0.005
8	0.024	0.005	-	-	-	0.006	-	0.005L
10	0.02	-	-	-	-	-	-	0.006
11	-	-	-	-	0.005	-	-	0.005
12	-	-	-	-	-	-	-	0.005
14	-	-	-	-	-	0.005	-	0.005
MEAN	0.028	0.0050	0.0050	0.0050	0.0048	0.0050	0.0060	0.050
STD DEV	0.0016	-	-	-	0.0005	-	-	0.0005
REL STD	7.2	-	-	-	10.5	-	-	10.7
DES VAL	-	-	-	-	-	-	-	-

DATE 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 87/04/29

NOTE: ALL CONCENTRATION UNITS ARE EXPRESSED IN MG/L OF EACH ELEMENT, THE EXCEPTIONS BEING: COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN US/CM, TURBIDITY IN JTU OR NTU, NITROGEN ANALYSES IN "N", ALKALINITY & HARDNESS IN CaCO3, SILICA IN SiO2, AND SULFATE IN SO4.

DISTRIBUTION - PPWB

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DATE August 25, 1987

SUBJECT / OBJET Prairie Provinces Quality Assurance Program (PPQC)

I have enclosed the final report for PP 57-58.

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

PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAM

STUDIES 57 AND 58

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 PP program. This report summarizes the most recent PP interlaboratory quality control studies: PP 57 and 58, for the months April and May, 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:

PP 57 - Sample 1 - 125 ml, DA* for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

PP 58 - 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 PP 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 parameters.

Individual laboratory deviations are listed below:

- Lab 1 - a low result for NO_3+NO_2 : -23%; & Pb by SE: -33%
 - a high result for Cr by DA: +26%
 - an HDL for SiO_2

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

- Lab 4 - no anomalies
 - an HDL Ammonia

- Lab 6 - low results for Sr: -55% (R); -52% (R); & -55% (R)
 - a high result for Al by DA: +18%; V: +16%, & +12%;
 - Mn: +22%, & 15%; Zn: +12%, +12%, & +15% (SE);
 - Cd: +12%, & +14%; Co: +13%; Pb: +12%
 - high results for TKN: (R) & (R); TP; and Mg: +13%
 - an HDL for Na, SO_4 , Cl, and Alkalinity

- Lab 8 - a high result for by SE for: Cr: +26%; Co: +19%;
 - Ni: +14%; and Pb: +23%
 - a high result for Mg: +15% & +17%; Cl (at low level);
 - and F: +139%
 - an HDL for Al by SE and TKN

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

PPWB laboratories average number of deviations per sample was 2.1.

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. IR152 PP 57 FP 17 DATE: 01/05/87 DUE DATE: 30/06/87 TRACE METALS D/A. (IN 3% HNO3) PAGE 1

SAMPLE = 1 SYNTHETIC SAMPLE.

LAB	13009	13102	13111	13302	13311	13999	23009	23011	23111	23301	23311	23999	24004
	AL TOT	AL DIS	AL EXT	AL EXT	AL EXT	ALUMINUM	V TOT	V TOT	V DIS	V EXT	V EXT	VANADIUM	CR TOT
	5X ICP	AAS DA	AAS GF	ICP DA	ICP DA	COMMON	5X ICP	5X ICP	ICP DA	AAS DA	ICP DA	COMMON	AAS GF
1	1.10	-	1.10	1.10	1.08	1.10	0.950	-	-	-	0.966	0.950	-
2	-	-	1.10	1.10	1.08	1.10	-	-	-	-	0.966	0.950	-
3	-	-	1.10	1.10	1.08	1.10	-	-	-	-	0.966	0.950	-
6	1.2	-	1.1	1.1	1.08	1.10	-	1.1	-	-	0.966	0.950	0.12
8	-	-	1.1	1.1	1.08	1.10	-	-	-	-	0.966	0.950	-
9	-	-	1.10	1.10	1.08	1.10	-	1.00	-	-	0.966	0.950	-
10	-	-	1.02	1.02	1.08	1.06	-	0.94	-	-	0.966	0.950	-
14	-	1.06	-	-	-	-	-	-	-	1.07	-	-	-
MEAN	1.1500	1.0600	1.1000	1.1000	1.0800	1.0975	0.9500	1.1000	0.9700	1.0700	0.9660	1.0043	0.1200
STD DEV	0.0707	-	0.0000	-	-	0.0506	-	-	0.0424	-	-	0.0564	-
REL STD	6.1	-	-1.0	-	-	4.6	-	-	4.4	-	-	6.6	-
DES VAL	-	-	-	-	-	1.019	-	-	-	-	-	0.948	-

LAB	24009	24011	24111	24302	24311	24999	25003	25011	25104	25111	25304	25311	25999
	CR TOT	CR TOT	CR DIS	CR EXT	CR EXT	CHROMIUM	MN TOT	MN TOT	MN DIS	MN DIS	MN EXT	MN EXT	MANGANESE
	5X ICP	5X ICP	ICP DA	ICP DA	ICP DA	COMMON	5X ICP	5X ICP	AAS DA	ICP DA	AAS DA	ICP DA	COMMON
1	0.112	-	-	-	-	0.112	0.103	-	-	-	0.10	0.103	0.103
2	-	-	-	-	0.102	0.102	-	-	-	-	0.103	0.100	0.10
3	-	0.11	-	-	-	0.11	-	0.12	-	-	0.103	0.100	0.10
6	-	-	-	-	-	0.12	-	-	-	-	0.103	0.100	0.10
8	-	-	-	-	-	0.10	-	-	-	0.097	0.09	0.09	0.097
9	-	-	0.10	-	-	0.10	-	-	-	0.096	0.09	0.09	0.096
10	-	-	0.091	-	-	0.091	-	-	-	-	0.09	0.09	0.096
11	-	-	-	0.10	-	0.10	-	-	-	-	0.09	0.09	0.096
14	-	-	-	0.082	-	0.082	-	-	0.109	-	0.10	0.10	0.109
MEAN	0.1120	0.1100	0.0955	0.0910	0.1020	0.1021	0.1030	0.1200	0.1090	0.0965	0.1015	0.0950	0.1023
STD DEV	-	-	0.0064	0.0127	-	0.0121	-	-	-	0.0007	0.0021	0.0071	0.0091
REL STD	-	-	6.7	14.0	-	11.8	-	-	-	0.7	2.1	7.4	8.9
DES VAL	-	-	-	-	-	0.098	-	-	-	-	-	-	0.098

LAB	26011	26104	26111	26304	26311	26999	27009	27011	27111	27301	27311	27999	28009
	FE TOT	FE DIS	FE DIS	FE EXT	FE EXT	IRON	CO TOT	CO TOT	CO DIS	CO EXT	CO EXT	COBALT	NI TOT
	5X ICP	AAS DA	ICP DA	ICP DA	ICP DA	COMMON	5X ICP	5X ICP	ICP DA	AAS DA	ICP DA	COMMON	5X ICP
1	-	-	-	-	-	0.50	0.306	-	-	-	-	0.306	0.484
2	-	-	-	0.50	0.500	0.533	-	-	-	-	0.295	0.295	-
3	-	-	-	0.533	0.500	0.56	-	-	-	-	0.295	0.295	-
6	0.56	-	-	0.56	0.45	0.45	-	0.33	-	0.32	-	0.33	-
8	-	-	-	0.45	0.45	0.51	-	-	-	-	-	0.30	-
9	-	-	0.51	-	-	0.484	-	-	0.30	-	-	0.30	-
10	-	-	0.484	-	-	0.52	-	-	0.277	-	-	0.277	-
11	-	-	-	0.52	-	0.52	-	-	0.31	-	-	0.31	-
14	-	0.545	-	0.52	-	0.545	-	-	0.317	-	-	0.317	-
MEAN	0.5600	0.5450	0.4970	0.5177	0.4750	0.5128	0.3060	0.3300	0.2885	0.3157	0.2950	0.3069	0.4840
STD DEV	-	-	0.0184	0.0166	0.0354	0.0352	-	-	0.0163	0.0051	-	0.0165	-
REL STD	-	-	3.7	3.2	7.4	6.9	-	-	5.6	1.6	-	5.4	-
DES VAL	-	-	-	-	-	0.498	-	-	-	-	-	0.296	-

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

LAB	07112 NO3+NO2 UP AA CD	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	07590 AMMONIA COMMON	07601 T N UV AA SUL	07602 T N CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA
1	0.230	0.230				0.002L		0.002L	0.31				
2	0.316	0.316	0.001L					0.001L					
3	0.250	0.250		0.05 L				0.05 L					0.33
4	0.37	0.37				0.01 L		0.01 L					
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
MEAN	0.3430	0.2997											
STD DEV	0.0382	0.0361											
REL STD	11.1	12.1											
DES VAL		0.302											

LAB	07655 T N DIS UV EDTA	07690 TOT N 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 FLOURIDE COMMON	10101 ALKALNTY TITR'N	10108 ALKALNTY POT TIT	10109 ALKALNTY POT TIT
1			0.31			0.05 L	0.05 L			0.05 L	43.2		
2			0.33					0.04		0.04	39.2		
3			0.333								40.3		
4											40.7		
5											39.8		44.
6				0.1 L									
7													
8		0.51 L								0.1 L	39.8		41.0
9			0.36					0.04 L		0.04 L		39.	
10													
11													
12		0.38									41.4		
13											40.4		
14											43.6		
MEAN	0.3330	0.3800	0.3333					0.0400	0.0400	0.0500	41.0000	39.0000	42.5000
STD DEV			0.0205							0.0173	1.5297		2.1213
REL STD			6.2							34.6	3.7		5.0
DES VAL		0.365	0.330							0.051			

LAB	10111 ALKALNTY TIT PRO	10112 ALKALNTY TIT CON	10116 ALKALNTY CO2 IR	10190 ALKALNTY COMMON	10301 PH	10390 PH COMMON	10602 HARDNESS CALC'D	10603 HARDNESS TITR'N	10606 HARDNESS CALC'D	10690 HARDNESS COMMON	11005 NA TOT ICP	11102 NA F AAS	11103 NA DIS FL PH
1				43.2	7.9	7.9	45.6			45.6			1.2
2			42.1	39.2	7.8	7.8	43.6			43.6			
3	42.6			42.1	7.73	7.73			44.1	44.1			
4				40.3	6.82	6.82							
5				40.7	7.9	7.9		44.3		44.3			1.2
6				39.8	7.75	7.75		44.4		44.4		1.1	
7				41.0	7.85	7.85	46.9	46.4		46.4			
8				39.2	7.85	7.85	45.	46.9		45.			
9				42.1	7.6	7.6	46.			46.			
10		42.1		40.4	7.8	7.8						1.1	
11				43.6	7.59	7.59						1.1	
12												1.43	
13													1.3
14													
MEAN	42.6000	42.1000	42.1000	41.2462	7.6600	7.6600	45.3000	44.9000	44.1000	45.0333	1.3650	1.2650	1.1750
STD DEV				1.6076	0.3190	0.3190	1.2369	1.3077	1.1630	2.6	14.0	18.4	10.7
REL STD				3.9	4.2	4.2	2.7	2.9	2.6	5.8	10.3	14.6	9.1
DES VAL				41.138						44.714			

DATA SUMMARY

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

STUDY NO. IRI53 PP 58 FP 18 DATE: 01/06/87 DUE DATE: 30/06/87 PAGE 8

SAMPLE = 3 SPIKED SAMPLE.

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

LAB	13009 AL TOT 5X ICP	13105 AL DIS AAS GF	13111 AL DIS ICP DA	13302 AL EXT AAS GF	13305 AL EXT AAS SE	13306 AL UP AAS OX	13311 AL EXT ICP DA	13999 ALUMINUM COMMON	23003 V EXT AAS GF	23009 V TOT 5X ICP	23011 V TOT 5X ICP	23102 V DIS AAS SE	23111 V DIS ICP DA
1	-	-	-	-	-	0.083	-	0.083	-	0.048	-	-	-
2	-	-	-	-	0.080	-	0.086	0.080	-	-	-	-	-
3	0.089	-	-	-	0.080	-	-	0.080	-	-	-	-	-
6	-	-	-	-	-	-	-	0.089	-	-	0.053	-	-
8	-	-	-	0.2 L	-	-	-	0.2 L HDL	-	-	-	-	-
9	-	-	0.09	-	-	-	-	0.09	-	-	-	-	0.050
10	-	-	0.09	-	-	-	-	0.09	-	-	-	-	0.050
12	-	0.074	-	-	-	-	-	0.074	-	-	-	0.050	-
14	-	0.150R	-	-	-	-	-	0.150R	0.050	-	-	-	-
MEAN	0.0890	0.0740	0.0900	-	0.0800	0.0830	0.0860	0.0837	0.0500	0.480	0.0530	0.0500	0.0500
STD DEV	-	-	0.0000	-	0.0000	-	-	0.0062	-	-	-	-	0.0000
REL STD	-	-	-1.0	-	-1.0	-	-	7.4	-	-	-	-	-1.0
DES VAL	-	-	-	-	-	-	-	0.088	-	-	-	-	-

LAB	23301 V EXT AAS DA	23311 V EXT ICP DA	23999 VANADIUM COMMON	24004 CR TOT AAS GF	24009 CR TOT 5X ICP	24011 CR TOT 5X ICP	24056 CR DIS AAS GF	24111 CR DIS ICP DA	24302 CR EXT AAS DA	24303 CR EXT AAS SE	24311 CR EXT ICP DA	24999 CHROMIUM COMMON	25003 MN TOT 5X ICP
1	0.045	0.047	0.048	-	0.066	-	-	-	-	0.056	0.064	0.066	0.051
3	-	-	0.053	0.083	0.066	-	-	-	-	-	-	0.056	-
6	-	-	-	-	-	-	-	-	-	-	-	0.066	-
8	-	-	-	-	-	-	-	-	-	-	-	0.066	-
10	-	-	0.050	-	-	-	-	0.065	-	-	-	0.066	-
11	-	-	0.050	-	-	-	-	0.066	-	-	-	0.066	-
12	-	-	0.050	-	-	-	0.082	-	-	0.060	-	0.060	-
14	-	-	0.050	-	-	-	-	-	0.038	-	-	0.038	-
MEAN	0.0450	0.0470	0.0494	0.0830	0.0660	0.0660	0.0820	0.0655	0.0380	0.0580	0.0640	0.0647	0.0510
STD DEV	-	-	0.0024	-	-	-	-	0.0007	-	0.0028	-	0.0135	-
REL STD	-	-	4.9	-	-	-	-	1.1	-	4.9	-	20.8	-
DES VAL	-	-	0.051	-	-	-	-	-	-	-	-	0.066	-

LAB	25011 MN TOT 5X ICP	25107 MN DIS AAS GF	25111 MN DIS ICP DA	25304 MN EXT AAS DA	25305 MN EXT AAS SE	25306 MN EXT AAS GF	25311 MN EXT ICP DA	25999 MANGNESE COMMON	26011 FE TOT 5X ICP	26107 FE DIS AAS GF	26111 FE DIS ICP DA	26304 FE EXT AAS DA	26305 FE EXT AAS SE
1	-	-	-	0.05	-	-	-	0.051	-	-	-	0.086	-
2	-	-	-	-	-	-	0.049	0.05	-	-	-	-	-
3	-	-	-	-	0.047	-	-	0.047	-	-	-	-	0.063
6	0.050	-	-	-	-	-	0.05	0.050	0.082	-	-	-	-
8	-	-	-	-	-	-	-	0.05	-	-	-	-	-
9	-	-	0.052	-	-	-	-	0.052	-	-	0.08	-	-
10	-	-	0.050	-	-	-	-	0.050	-	-	0.076	-	-
11	-	-	-	-	-	-	-	0.050	-	-	-	-	0.080
12	-	0.050	-	-	-	-	-	0.050	-	-	-	-	-
14	-	-	-	-	-	0.034R	-	0.034R	-	0.065	-	-	-
MEAN	0.0500	0.0500	0.0510	0.0500	0.0470	0.0495	0.0495	0.0500	0.0820	0.0650	0.0780	0.0860	0.0715
STD DEV	-	-	0.0014	-	-	0.0007	0.0007	0.0014	-	-	0.0028	-	0.0120
REL STD	-	-	2.8	-	-	1.4	1.4	2.8	-	-	3.6	-	16.8
DES VAL	-	-	-	-	-	-	-	0.050	-	-	-	-	-

DATA SUMMARY - FED-PRN & PPWB QC PROGRAMS

STUDY NO. IR153 PP 58 FP 18 SAMPLE = 3

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LAB	26306 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 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	-	-	0.086	-	0.068	-	-	-	-	-	-	0.068	0.063
2	-	-	0.063	-	-	-	-	-	-	-	0.060	0.060	-
3	-	0.082	0.082	-	-	0.061	-	-	-	-	-	0.061	-
6	-	0.08	0.08	0.080	-	-	-	-	-	-	-	0.080	-
8	-	-	0.08	-	-	-	-	0.08	-	-	-	0.08	-
9	-	-	0.076	-	-	-	-	0.062	-	0.064	-	0.062	-
10	-	-	0.080	-	-	-	-	-	-	-	-	0.064	-
11	-	-	0.082	-	-	-	0.060	-	-	-	-	0.060	-
12	-	-	0.082	-	-	-	-	-	-	-	-	0.060	-
14	0.055	-	0.055	-	-	-	-	-	0.083	-	-	0.083	-
MEAN	0.0550	0.0810	0.0741	0.0800	0.0680	0.0610	0.0600	0.0710	0.0830	0.0640	0.0600	0.0687	0.0630
STD DEV	-	0.0014	0.0105	-	-	-	-	0.0127	-	-	-	0.0096	-
REL STD	-	1.7	14.2	-	-	-	-	17.9	-	-	-	14.0	-
DES VAL	-	-	0.078	-	-	-	-	-	-	-	-	0.067	-

LAB	28011 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	-	-	-	0.052
2	-	-	-	-	0.069	-	0.064	0.069	-	-	-	-	0.060
6	0.064	-	-	-	-	0.075	-	0.064	-	0.051	-	-	-
8	-	-	-	-	-	-	-	0.075	-	-	-	-	-
9	-	-	0.067	-	-	-	-	0.067	-	-	-	0.051	-
10	-	-	0.066	-	-	-	-	0.066	-	-	-	0.059	-
11	-	-	-	-	-	-	-	0.068	-	-	-	-	-
12	-	0.061	-	-	-	-	-	0.061	-	-	0.049	-	0.051
14	-	-	-	0.072	-	-	-	0.072	-	-	-	-	-
MEAN	0.0640	0.0610	0.0665	0.0720	0.0685	0.0750	0.0640	0.0672	0.0480	0.0510	0.0490	0.0550	0.0543
STD DEV	-	-	0.0007	-	0.0007	-	0.0044	0.0044	-	-	-	0.0057	0.0049
REL STD	-	-	1.1	-	1.0	-	6.6	6.6	-	-	-	10.3	9.1
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	-

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	30306 ZN EXT AAS GF	30311 ZN EXT ICP DA	30999 ZINC COMMON	38011 SR TOT ICP DA
1	-	-	0.048	0.058	-	-	-	0.057	-	-	-	0.058	-
2	-	-	0.052	-	-	-	-	-	0.041	-	0.056	0.057	-
3	-	0.049	0.060	-	0.062	-	-	-	-	-	-	0.057	0.11 R
6	-	-	0.051	-	-	-	-	-	-	-	0.06	0.062	-
8	-	0.05	0.051	-	-	-	-	-	-	-	-	0.059	-
10	-	-	0.051	-	-	-	0.059	-	-	-	-	0.057	-
11	-	-	0.059	-	-	-	0.057	-	0.057	-	-	0.057	-
12	-	-	0.051	-	-	-	-	-	-	-	-	0.057	-
14	0.120R	-	0.049	-	-	0.060	-	-	-	0.063	-	0.060	-
MEAN	-	0.0495	0.0523	0.0580	0.0620	0.0600	0.0580	0.0570	0.0490	0.0630	0.0580	0.0574	-
STD DEV	-	0.0007	0.0042	-	-	-	0.0014	0.0014	0.0113	-	0.0028	0.0061	-
REL STD	-	1.4	8.1	-	-	-	2.4	2.4	23.1	-	4.9	10.7	-
DES VAL	-	-	0.051	-	-	-	-	-	-	-	-	0.054	-

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

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SAMPLE = 4

PP 58 PP 18

STUDY NO. IR153

LAB	19005 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 CALCID	20101 CA DIS EDTA	20103 CA DIS AAS	20108 CA DIS AAS UP	20110 CA DIS AAS AUT
1			0.9				0.9						44.
2			0.92		0.92		0.92					42.5	43.
3			0.8				0.8		43.3				
6		1.38 R					1.38 R				42.2		
7							0.87						
8							0.9						
9	0.9						0.85	43.5					
10	0.85						0.8	43.7					
11				0.8			0.8				44.		
12			0.9				0.9						
14		0.816					0.816				40.67		
MEAN	.8750	.8580	.8800	.8000	.9200	.8700	.8705	43.6000	43.0000	43.3000	42.2900	42.5000	43.5000
STD DEV	.0354	.0594	.0542				.0466	.1414			1.6668		1.7071
REL STD	4.0	6.9	6.2				5.4	.3			3.9		1.6
DES VAL							.884						

LAB	20311 CA EXT ICP	20990 CALCIUM COMMON
1		44.
2		43.
3		42.5
6		43.3
7		43.2
8	45.7	42.2
9		45.7
10		43.5
11		44.
14		40.67
MEAN	45.7000	43.2336
STD DEV		1.2585
REL STD		2.9
DES VAL		42.507

DATA SUMMARY - FED-PROV 5 PPWB QC PROGRAMS

LAB	13009	13102	13111	13302	13311	13999	23009	23011	23111	23301	23311	23999	24004
AL TOT	2.97	-	-	2.8	-	2.97	2.31	-	-	-	-	2.31	-
5X ICP	-	-	-	2.84	2.77	2.84	-	-	-	-	2.35	2.35	-
AL EXT	3.0	-	-	2.6	-	3.0	2.6	-	-	-	2.6	2.6	0.28
CR EXT	-	-	2.80	-	-	2.80	-	2.40	-	-	-	2.40	-
AAS GF	-	-	2.60	-	-	2.60	-	2.27	-	-	-	2.27	-
14	-	2.53	-	-	-	2.53	-	-	2.33	-	-	2.33	-
MEAN	2.9850	2.5300	2.7000	2.7467	2.7700	2.7675	2.3100	2.6000	2.3350	2.3300	2.3500	2.3767	2.800
STD DEV	.0212	-	.1414	4.7	-	1.752	-	-	3.9	-	-	1.176	-
REL STD	.7	-	5.2	-	-	6.3	-	-	-	-	-	4.9	-
DES VAL	-	-	-	-	-	2.668	-	-	-	-	-	2.318	-
LAB	24009	24011	24111	24302	24311	24999	25003	25011	25104	25111	25304	25311	25999
CR TOT	0.382	-	-	-	-	0.382	0.262	-	-	-	-	-	0.262
5X ICP	-	0.33	-	-	0.317	0.317	-	0.30	-	-	0.27	0.266	0.277
CR EXT	-	-	-	-	-	0.33	-	-	-	-	0.277	0.266	0.277
AAS DA	-	-	-	-	-	0.28	-	-	-	-	-	0.24	0.27
10	-	-	0.30	-	-	0.30	-	-	-	0.26	-	-	0.24
11	-	-	0.291	-	-	0.291	-	-	-	0.252	-	-	0.26
14	-	-	-	0.36	-	0.36	-	-	-	-	-	-	0.252
MEAN	.3820	.3300	.2955	.3100	.3170	.3150	.2620	.3000	.2820	.2560	.2735	.2530	.2679
STD DEV	-	-	.0064	.0707	-	.0410	-	-	-	.0057	.0049	.0184	.0187
REL STD	-	-	2.2	22.8	-	13.0	-	-	-	2.2	1.8	7.3	7.0
DES VAL	-	-	-	-	-	.299	-	-	-	-	-	-	.262
LAB	26011	26104	26111	26304	26311	26999	27009	27011	27111	27301	27311	27999	28009
FE TOT	-	-	-	-	-	-	1.14	-	-	-	-	1.14	1.29
5X ICP	1.2	-	-	1.11	1.13	1.11	-	1.2	-	-	1.08	1.08	-
FE EXT	-	-	-	-	1.01	1.21	-	-	-	-	1.13	1.13	-
AAS DA	-	-	-	-	1.01	1.01	-	-	1.10	1.13	1.10	1.10	-
10	-	-	1.13	-	-	1.13	-	1.10	1.028	1.12	1.10	1.10	-
11	-	-	1.085	-	-	1.085	-	1.12	1.10	1.10	1.10	1.10	-
14	-	1.053	-	1.14	-	1.14	-	1.10	-	-	-	-	-
MEAN	1.2000	1.0530	1.1075	1.1167	1.0700	1.1035	1.1400	1.2000	1.0640	1.1123	1.0800	1.1123	1.2900
STD DEV	-	-	.0318	.0208	.0849	.0574	-	-	4.8	.0153	-	.4597	-
REL STD	-	-	2.9	1.9	7.9	5.2	-	-	4.8	1.4	-	4.597	-
DES VAL	-	-	-	-	-	1.092	-	-	-	-	-	1.065	-

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO. IR153 PP 58 FP 18

SAMPLE = 5

LAB	56111 BA DIS ICP DA	56301 BA EXT AAS DA	56311 BA EXT ICP DA	56999 BARIUM COMMON	82011 PB TOT 5X ICP	82101 PB DIS AAS DA	82111 PB DIS ICP DA	82301 PB EXT AAS DA	82302 PB EXT AAS SE	82311 PB EXT ICP DA	82999 LEAD COMMON
1	-	-	-	2.49	-	-	-	-	1.24	-	1.24
2	-	2.50	2.52	2.50	-	-	-	1.3	-	1.32	1.3
3	-	-	-	2.7	1.5	-	-	-	-	1.32	1.32
6	-	-	-	-	-	-	-	-	-	-	1.5
8	2.55	-	-	2.55	-	-	1.4	-	-	1.26	1.26
9	2.48	-	-	2.48	-	-	1.30	-	-	-	1.4
10	-	-	-	-	-	-	1.30	-	-	-	1.30
11	-	-	-	-	-	-	-	1.43	-	-	1.43
14	-	-	-	-	-	1.283	-	-	-	-	1.283
MEAN	2.5150	2.5000	2.5200	2.5440	1.5000	1.2830	1.3500	1.3650	1.2400	1.2900	1.3370
STD DEV	0.0495	-	-	0.0913	-	-	5.2	6.7	-	3.3	0.8669
REL STD	2.0	-	-	3.6	-	-	5.2	6.7	-	3.3	6.5
DES VAL	-	-	-	2.541	-	-	-	-	-	-	1.337

DATES RECEIVED 1 87/06/25 2 87/06/22 3 87/07/06 3 87/07/09 4 87/06/22
 5 87/07/06 6 87/06/22 7 87/06/22 8 87/07/28 9 87/06/08
 10 87/07/06 11 87/06/25 12 87/07/06 14 87/07/13

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.

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MEMORANDUM

NOTE DE SERVICE

H. Alkema \NWRI\336-4929\ha

SECURITY - CLASSIFICATION - DE SÉCURITÉ

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DATE

November 2, 1987

Distribution

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

FROM
DE

SUBJECT
OBJET

Prairie Provinces Quality Assurance Program (PPOC)

I have enclosed the final report for PP 59-60.

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

PRAIRIE PROVINCES QUALITY ASSURANCE PROGRAM

STUDIES 59 AND 60

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 PP program. This report summarizes the most recent PP inter-laboratory quality control studies: PP 59 and 60, 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:

PP 59 - Sample 1 - 125 ml, DA* for trace metals (3% HNO₃)
Sample 2 - up to 1L, major ions etc., stored at 4°C

PP 60 - 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 PP 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 28 August or 1 September, and 6 October. 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 2, and for Ammonia in sample 4.

Individual laboratory deviations are listed below:

- Lab 1 - a low result for DOC: -21%
- a high result for Cu by DA: +21%; and SiO₂: 16%, & 16%
- an HDL for low level Mn
- Lab 3 - a high result for Ni by Da: +12%
- a low result for Cr by SE: -43%
- high results for NO₃+NO₂: +15% (R), & +14%
- Lab 4 - a high result for B at low level (R)
- Lab 6 - low results for Sr: -22%; & -25%
- a high result by SE for Al: +100% (R); Fe: +300% (R);
Cu: 100% (R); and Zn: +86% (R)
- high results for Mg: 17% & +49% (R); K: +14% & +13%;
Ammonia: +100%; and TP: (R) at low level
- an HDL for Ammonia, TP, and low level V, & Pb
- Lab 8 - a result for by DA for Cr: +56% (R); Mn: -13%; & Cu: +28%
- a result for by SE for Cr: +71%; and Cu: +186% (R)
- a high result for DOC: +42%; DIC: -15%; Na: +16%;
- Mg: +12%; and Cl: +29% (R)
- an HDL by SE for Al, Mn, Fe, Zn, and B

PPWB laboratories average number of deviations per sample was 1.7.

* (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 Inuctively 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 - FED-PROV & PPWB OC PROGRAMS

LAB	00110 IONIC BALANC	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPAREN	02021 COLOUR VIS COM	03023 COLOUR SPECTRO	03040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02072 TURBDTY HELLIGE	02073 TURBDTY HACH	02074 TURBDTY MPLMTRI	02077 TURBDTY HACH FZ
1	-0.43	2.30	2.32	5. L	-	-	5. L	234.	234.	-	0.09	-	-
2	1.14	2.264	2.213	5. L	-	-	5. L	232.5	232.5	-	0.30	-	-
3	1.3	2.300	2.238	5. L	5. L	-	5. L	231.	231.	-	0.31	0.08	-
4	-	-	-	-	-	-	-	220.	220.	-	-	-	-
5	4.3	2.4	2.37	6. L	-	-	6. L	248.	248.	-	0.10	-	-
6	-0.8	2.33	2.35	5. L	-	-	5. L	230.	230.	-	-	-	-
7	3.30	2.51	2.26	-	-	3.	3.	223.	223.	-	-	-	-
8	1.95	2.35	2.337	-	-	-	5. L	220.	220.	-	-	-	-
9	0.27	2.350	-	5. L	5. L	-	5. L	229.	229.	0.1	0.2	0.1	0.18
10	-	-	-	0.0	-	-	0.0	216.0	216.0	-	-	-	-
11	-	-	-	4.0000	-	3.0000	3.8000	227.9615	227.9615	1.000	2.000	0.933	1.800
12	1.3788	2.3505	2.2860	67.7	-	-	2.3875	8.4025	8.4025	-	1.051	0.115	-
13	1.7673	3.3	2.9	67.7	-	-	62.8	3.7	3.7	52.6	12.4	-	-
14	128.2	-	-	-	-	-	5.216	-	227.904	-	-	-	-
MEAN	1.3788	2.3505	2.2860	67.7	-	3.0000	3.8000	227.9615	227.9615	1.000	2.000	0.933	1.800
STD	1.7673	3.3	2.9	67.7	-	-	2.3875	8.4025	8.4025	-	1.051	0.115	-
REL	128.2	-	-	-	-	-	62.8	3.7	3.7	52.6	12.4	-	-
DES	-	-	-	-	-	-	5.216	-	227.904	-	-	-	-
VAL	-	-	-	-	-	-	-	-	-	-	-	-	-
LAB	02081 TURBDTY RATIO	02090 TURBDTY COMMON	05105 BORON AA CARM	05107 BORON ICP DA	05111 BORON F ICP DA	05190 BORON COMMON	06008 SOC CO2 FLM	06052 PIC CO2 ?	06100 DOC ?	06101 DOC IR /DIF	06104 DOC UV CO2 IR	06107 DOC UV CO2 PHE	06109 DOC UV CO2 OH
1	-	0.19	-	0.021	-	0.021	-	-	-	-	1.2	-	-
2	-	0.10	-	-	-	0.04	-	-	-	1.4	1.5	-	-
3	0.10	0.30	0.04	-	-	-	-	-	-	1.6	-	-	-
4	-	0.30	-	-	-	-	-	-	-	1.9	-	-	-
5	-	0.31	-	-	-	-	-	-	-	-	-	-	-
6	-	0.10	-	-	-	-	-	1.84	-	-	-	-	-
7	-	0.11	-	0.03	-	16.7	-	-	-	-	-	-	1.1
8	-	0.18	-	-	-	-	-	-	-	-	-	-	-
9	-	0.2	-	-	-	-	-	-	0.5 L	-	-	-	-
10	-	0.1	-	-	-	-	2.25 R	14.1	-	-	-	-	-
11	-	1.509	0.400	0.210	0.0300	0.0303	-	15.4000	1.8400	1.6333	1.3500	1.1000	-
12	1.000	0.851	-	-	-	31.3	-	1.8385	-	2.517	15.7	-	-
13	-	56.4	-	-	-	11.9	-	-	-	15.4	-	-	-
14	-	186	-	-	-	0.029	-	-	-	-	-	-	-
MEAN	1.000	1.509	0.400	0.210	0.0300	0.0303	-	15.4000	1.8400	1.6333	1.3500	1.1000	-
STD	-	0.851	-	-	-	31.3	-	1.8385	-	2.517	15.7	-	-
REL	-	56.4	-	-	-	11.9	-	-	-	15.4	-	-	-
DES	-	186	-	-	-	0.029	-	-	-	-	-	-	-
VAL	-	-	-	-	-	-	-	-	-	-	-	-	-
LAB	06150 DOC COMMON	06151 DIC IR COMBUST	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 DIC COMMON	07004 TKN AA NIFRUS	07015 TKN DIG BRETHEL	07016 TKN BLK AMM-SAL	07018 TKN BLK INDOPHE	07021 TKN BLK DIG BER	07090 TKN COMMON	07105 NO3+NO2 DIS AA
1	1.2	-	-	20.2	-	20.2	-	-	-	0.108	0.108	0.108	0.36
2	1.3	-	19.0	-	-	19.0	-	-	-	-	-	-	-
3	1.4	-	-	-	-	-	-	-	-	-	-	-	-
4	1.6	-	-	-	-	-	-	-	-	-	-	-	-
6	1.9	-	-	-	-	-	-	0.2	-	-	0.20	-	
8	1.84	-	-	-	18.3	16.7	-	-	-	-	-	-	
10	1.1	-	-	-	-	18.3	-	-	-	-	-	-	
12	0.5	20.5	-	-	-	20.5	0.18	-	0.10	-	0.10	-	
14	2.25 R	-	-	-	-	14.1	0.18	-	0.10	-	0.18	-	
MEAN	1.5057	20.5000	19.0000	20.2000	18.3000	18.1333	0.18	0.2000	0.2000	0.1000	0.1080	0.1576	0.3600
STD	0.3015	-	-	-	-	2.4072	-	-	-	-	-	0.497	-
REL	20.0	-	-	-	-	13.3	-	-	-	-	-	31.5	-
DES	1.720	-	-	-	-	19.658	-	-	-	-	-	1.140	-
VAL	-	-	-	-	-	-	-	-	-	-	-	-	-

HCU

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

LAB	07109 NO3+NO2 AA HYD	07110 NO3+NO2 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UP AA CD	07315 NO3 I C	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		0.33				0.36					0.002L		0.002L
2		0.35		0.399R		0.339R	0.001L						0.001L
3		0.350				0.330		0.005L		0.002L			0.005L
4	0.32					0.32							0.01 L HDL
5						0.34							0.005
6		0.35		0.34	0.34	0.34			0.005				0.010L
7						0.335						0.005L	0.010L
8	0.335	0.36				0.36	0.1 L						0.1 L HDL
9			0.36			0.36							0.005L
10		0.340	0.360	0.3400	0.3400	0.3432			0.0050				0.0050
11	0.0106	0.0134				0.0138							
12	3.2	3.9				4.0							0.12
14						0.335							
MEAN													
STD DEV													
REL STD													
DES VAL													

LAB	07601 T N UV AA SUL	07602 T N CALC'D	07605 T N UV HY SUL	07651 T N DIS UV AA	07655 T N DIS UV EDTA	07690 TOT N 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
1													
2	0.41						0.41			0.07			
3	0.417						0.417					0.08	
4							0.42						
5				0.42	0.436		0.42			0.05 L			
6							0.436	0.1	0.099				
8		0.55	0.54			0.55	0.54		0.10 L				0.10
10		0.46				0.46	0.54						
12													
MEAN													
STD DEV	0.4135	0.5050	0.5400	0.4200	0.4360	0.5050	0.446	0.1000	0.0990	0.0700	0.0900	0.0800	0.1000
REL STD	1.0049	0.0636				0.0542	12.2						
DES VAL	1.2	12.6				12.6	12.2						

LAB	09190 FLOURIDE COMMON	10101 ALKLNTY TITR'N	10108 ALKLNTY POT TIT	10109 ALKLNTY POT TIT	10111 ALKLNTY TIT PRO	10112 ALKLNTY TIT CON	10190 ALKLNTY COMMON	10301 PH	10390 PH COMMON	10602 HARDNSS CALC'D	10603 HARDNSS TITR'N	10606 HARDNSS CALC'D	10690 HARDNESS COMMON
1													
2	0.09	81					81.01	8.2	8.2	100.0			100.0
3	0.07	75.01			79.1		79.1	8.2	7.75	100.0		101.	101.0
4	0.08						71.9	8.2	7.75				
5	0.05 L	71.9					78.3	8.2	7.46		107.		107.
6	0.1	78.3					81.8	8.2	8.0		104.		104.5
7		81.8		82.			76.0	8.2	8.05		104.5		104.5
8	0.099	81.8		79.0			77.0	8.2	8.05				100.
10	0.10		77.			80.	80.	8.2	7.88				100.
11							77.7	8.2	7.88				
12	0.10 L	77.7					82.7	8.2	8.28				
14		82.7					82.7	8.2	8.28				
MEAN	0.0898	78.3013	77.0000	80.5000	79.1000	80.0000	78.7315	8.0115	8.0115	102.0000	105.1667	101.0000	102.9444
STD DEV	0.0125	3.6082		2.1213			3.0016	0.2233	0.2233	4.4721	1.6073		3.6780
REL STD	13.9	4.6		2.6			3.8	2.8	2.8	4.4	1.5		3.6
DES VAL	0.086						78.916						103.025

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

LAB	17990 CHLORIDE COMMON	19005 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 PFASSIUM COMMON	20005 CA TOT ICP	20100 CA DIS CALC'D	20101 CA DIS EDTA	20103 CA DIS AAS	20108 CA DIS AAS UP
1	12.8		3.1	3.1			3.1						
2	10.99		3.2	3.18			3.18				32.9		28.7
3	12.1		3.6				3.6			27.		28.9	
4	12.0		3.18				3.3						
5	15.4 R						3.3						
6	12.7	3.3					3.3	28.5					
7	13.0	3.27					3.27	28.9					
8	11.7						3.1						
9	11.7				2.8		3.00						
10	11.7		3.00				3.00						
11	11.7						3.1775	28.7000	27.0000	32.9000	29.2667	28.7000	
12	9.4		3.00	3.1250	2.8000	3.1800	3.3000	3.1775	28.7000	32.9000	29.2667	28.7000	
13	11.6991	3.2850	3.2600	3.0500				1.930	1.0		8.4		
14	11.9703	.0212	.3079	1.6				6.1					
MEAN	8.3	.6	9.4					3.158					
DEV	11.876												
STD													
REL													
DES													
VAL													

LAB	20110 CA DIS AAS AUT	20311 CA EXT ICP	20990 CALCIUM COMMON
1	27.		27.
2	28.		28.7
3			32.9
4			28.9
5			28.3
6		30.3	28.5
7			28.5
8			29.9
9			31.9
10			
11			
12			
13			
14			
MEAN	27.5000	30.3000	29.0091
DEV	2.7071		1.9664
STD	2.6		6.8
REL			28.369
DES			
VAL			

DATA SUMMARY

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

STUDY NO. IR155 PP 60 PP 20 DATE: 01/08/87 DUE DATE: 31/08/87 TRACE METALS S/E. (IN 0.2% HNO3) PAGE 8

SAMPLE 3 SPIKED SAMPLE.

LAB	13009	13105	13111	13302	13305	13311	13999	23009	23011	23111	23302	23303	23311
AL TOT				AL EXT	AL EXT	AL EXT	ALUMINUM	V TOT	V TOT	V DIS	V EXT	V TOT	V EXT
5X ICP				AAS GF	AAS SE	ICP DA	COMMON	5X ICP	5X ICP	ICP DA	AAS SE	AAS GF	ICP DA
1					0.015	0.018	0.015	0.005			0.004		0.004
2					0.016		0.012						
3	0.036			0.02 L			0.036R		0.01 L				
6							0.02 L						
8	0.024						0.024	0.007		0.006			
9							0.024						
10		0.016					0.016					0.006	
12		0.048R					0.048R						
14													
MEAN	0.0300	0.160	0.0300		0.0155	0.0180	0.0228	0.0060		0.0060	0.0040	0.0060	0.0040
STD DEV	0.0085				4.6		38.2	23.6					
REL STD	28.3						0.087	0.0014					
DES VAL							0.018						

LAB	23999	24004	24009	24011	24052	24056	24111	24303	24311	24999	25003	25011	25107
VANADIUM							CR DIS	CR EXT	CR EXT	CHROMIUM	MN TOT	MN TOT	MN DIS
COMMON							ICP DA	AAS SE	ICP DA	COMMON	5X ICP	5X ICP	AAS GF
1	0.005							0.004	0.006	0.007	0.008L		
2	0.004									0.007		0.006	
3	0.01 L									0.012R			
6				0.007									
8	0.007						0.007						
9	0.006												
10					0.005								0.006
11													
12													
14	0.006												
MEAN	0.0056	0.0070	0.0070	0.0070	0.0050	0.0080	0.0070	0.0040	0.0060	0.0064		0.0060	0.0060
STD DEV	0.0011									0.0014			
REL STD	20.4									21.7			
DES VAL	0.005									0.007			

LAB	25111	25304	25306	25311	25999	26011	26107	26111	26305	26306	26311	26999	27003
MN DIS							FE DIS	FE DIS	FE EXT	FE EXT	FE EXT	IRON	CO TOT
ICP DA							AAS GF	ICP DA	AAS SE	AAS GF	ICP DA	COMMON	AAS GF
1					0.008L				0.007			0.007	
2		0.01 L			0.01 L				0.007			0.007	
3		0.007			0.007				0.007			0.007	
6				0.005	0.006	0.024R						0.024R	
8				0.02 L	0.02 L			0.01 L			0.02 L	0.01 L	0.006
9	0.006				0.004			0.005				0.005	
10	0.004											0.007	
11												0.007	
12					0.006							0.005	
14					0.007					0.005		0.005	
MEAN	0.0050	0.0070	0.0070	0.0050	0.0060		0.0070	0.0050	0.0070	0.0050	0.0080	0.0063	0.0060
STD DEV	0.0014				0.0011				0.000	0.0050		0.0010	
REL STD	28.3				18.3				0.0	0.005		16.3	
DES VAL					0.006							0.006	

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

LAB	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	28107 NI DIS AAS GF	28111 NI DIS ICP DA	28301 NI TOT 5X ICP
1	0.004							0.004				
3		0.005				0.004		0.004				
6								0.005	0.007			
8								0.006				
9				0.01 L				0.01 L				
10				0.005				0.005			0.010L	
11								0.005				
12			0.005					0.005				
14								0.031R				
MEAN	0.0040	0.0050	0.0050	0.0050	0.0050	0.0040		0.0049	0.0070	0.0070		0.045R
STD DEV								0.0007	0.0014			
REL STD								14.2	23.6			
DES VAL								0.005				

LAB	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	29308 CU EXT AAS GF	29311 CU EXT ICP DA	29999 COPPER COMMON	30009 ZN TOT 5X ICP
1				0.005	0.005				0.007			0.005	0.007
2	0.007		0.007	0.007		0.014R			0.007		0.006	0.007	
3				0.007					0.007		0.02 R	0.007	
6		0.007		0.007					0.007			0.007	
8				0.007					0.007			0.007	
9				0.007	0.008				0.007			0.007	
10	0.007			0.010L				0.009	0.005			0.005	
11				0.007					0.005			0.005	
12				0.007		0.006			0.005			0.005	
14				0.045R					0.005			0.005	
MEAN	0.0070	0.0070	0.0070	0.0067	0.0065		0.0060	0.0090	0.0063	0.0050	0.0060	0.0065	0.0070
STD DEV	0.0000			0.0008	0.0021				0.0012			0.0015	
REL STD	-1.0			11.3	32.6				18.2			23.3	
DES VAL				0.007								0.007	

LAB	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	30306 ZN EXT AAS GF	30311 ZN EXT ICP DA	30999 ZINC COMMON	38011 SR TOT ICP DA	38111 SR DIS ICP DA	38311 SR EXT ICP DA	38999 STRONTIUM COMMON
1				0.01				0.007				0.163
2					0.007		0.007	0.007			0.163	0.163
3	0.013R						0.01 L	0.013R	0.13			0.13
6								0.01 L				0.18
8								0.01 L				0.17
9			0.01 L					0.008		0.17		
10		0.008	0.008					0.007				
11								0.005				
12								0.004				
14						0.004		0.004				
MEAN	0.0050	0.0080	0.0080	0.0100	0.0070	0.0040	0.0070	0.0069	0.1300	0.1700	0.1630	0.1608
STD DEV					0.0000			0.0020				0.0217
REL STD					-1.0			28.5				13.5
DES VAL								0.007				0.174

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

STUDY NO.	IR155	PP 60	FP 20	SAMPLE 3	PAGE 10					
LAB	42009	42102	42301	42311	48009	48011	48103	48111	48302	48303
	MO TOT	MO DIS	MO EXT	MO EXT	CD TOT	CD TOT	CD DIS	CD DIS	CD EXT	CD EXT
	5X ICP	AAS SE	AAS DA	ICP DA	5X ICP	5X ICP	AAS GF	ICP DA	AAS SE	AAS GF
1	0.005	-	-	-	0.005	-	-	-	0.005	-
2	-	-	-	-	0.005	-	-	-	0.005	-
3	-	-	-	-	0.007	-	-	-	-	-
6	0.007	-	-	0.005	-	0.006	-	-	-	0.005
8	-	-	-	-	0.006	-	-	0.005	-	-
10	-	0.008	-	-	0.008	-	0.005	-	0.005	-
11	-	-	-	-	0.1 L	-	-	-	-	-
12	-	-	-	-	0.1 L	-	-	-	-	0.002
14	-	-	-	-	0.063	-	-	-	-	0.002
MEAN	.0060	.0080	.0060	.0050	.0050	.0060	.0050	.0050	.0050	.0035
STD DEV	.0014	-	-	-	.0012	-	-	-	.0000	.0021
REL STD	23.6	-	-	-	19.1	-	-	-	-1.0	60.6
DES VAL	-	-	-	-	.007	-	-	-	-	-
LAB	48309	48999	56009	56111	56311	56999	82004	82011	82302	82305
	CD EXT	CADMIUM	BA TOT	BA DIS	BA EXT	BARIUM	PB TOT	PR TOT	PB EXT	PB EXT
	AAS GF	COMMON	5X ICP	ICP DA	ICP DA	COMMON	AAS GF	5X ICP	AAS SE	AAS GF
1	-	0.005	0.023	-	-	0.023	-	-	0.006	-
2	-	0.005	-	-	0.020	0.020	-	-	0.006	-
3	-	0.006	-	-	-	0.022	-	0.005L	0.006	-
6	0.005	-	-	-	-	-	-	-	-	-
8	-	0.005	-	-	-	0.02	0.005	-	-	-
10	-	0.005	-	0.02	-	0.02	-	-	-	-
11	-	0.005	-	0.02	-	-	-	-	0.007	-
12	-	0.005	-	-	-	-	-	-	-	-
14	-	0.005	-	-	-	-	-	-	-	0.005
MEAN	.0050	.0048	.0230	.0200	.0200	.0210	.0050	.0060	.0063	.0050
STD DEV	-	.0010	-	.0000	.0014	.0014	-	-	.0005	-
REL STD	-	21.5	-	-1.0	-	6.7	-	-	8.0	-
DES VAL	-	.005	-	-	-	.023	-	-	-	-
LAB	82309	82999	82311	82311	82999	82311	82311	82311	82311	82311
	PB EXT	LEAD	PB EXT	PB EXT	LEAD	PB EXT				
	AAS GF	COMMON	ICP DA	ICP DA	COMMON	ICP DA				
1	-	0.006	-	-	0.006	-	-	-	-	-
2	-	0.006	-	-	0.006	-	-	-	-	-
3	-	0.005L	-	-	0.005L	-	-	-	-	-
6	0.006	-	-	-	-	-	-	-	-	-
8	-	0.005	-	-	0.005	-	-	-	-	-
10	0.003	-	-	-	-	-	-	-	-	-
11	-	0.006	-	-	0.006	-	-	-	-	-
12	-	0.005	-	-	0.005	-	-	-	-	-
14	-	0.005	-	-	0.005	-	-	-	-	-
MEAN	.0045	.0056	.0060	.0060	.0056	.0056	.0060	.0060	.0063	.0050
STD DEV	.0021	.0011	-	-	.0011	.0011	-	-	.0005	-
REL STD	47.1	20.3	-	-	20.3	20.3	-	-	8.0	-
DES VAL	-	.006	-	-	.006	.006	-	-	-	-

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

LAB	00110 IONIC BALANC	00120 SUM OF CATIONS	00125 SUM OF ANIONS	02011 COLOUR APPAREN	02021 COLOUR VIS COM	02023 COLOUR SPECTRO	02040 COLOUR COMMON	02041 CONDUCT SPEC 25	02060 CONDUCT COMMON	02072 TURBDTY HELLIGE	02073 TURBDTY HACH	02074 TURBDTY NPLTRI	02077 TURBDTY HACH FZ
1	1.16	8.29	8.10	5. L	---	---	---	914.	914.	---	0.1	---	---
2	-2.68	8.069	8.513	5. L	---	---	5. L	914.5	914.5	---	0.08	---	---
3	-0.63	8.109	8.212	5. L	---	---	5. L	899.	899.	---	0.24	---	---
4	---	---	---	---	---	---	---	865.	865.	---	---	0.19	---
5	---	---	---	---	---	---	---	880.	880.	---	---	---	---
6	1.2	8.4	8.34	---	---	---	6. L	901.	901.	---	0.15	---	---
7	-0.9	8.18	8.49	5. L	---	---	5. L	908.	908.	---	---	0.14	---
8	-2.71	8.04	8.59	5. L	---	---	---	890.	890.	---	---	---	---
9	1.17	8.31	8.59	---	---	---	---	910.	910.	---	---	---	---
10	0.33	8.293	8.238	5. L	---	---	3. L	950.	950.	---	0.1	---	0.16
11	---	---	---	---	---	---	---	820.0	820.0	0.0	0.2	---	---
12	---	---	---	0.0	---	---	0.0	---	---	0.0	---	---	---
14	---	---	---	---	---	---	---	---	---	0.000	---	---	---
MEAN	1.3825	8.2114	8.3354	4.0000	---	3.0000	3.8000	903.6538	903.6538	0.0000	0.1540	---	---
STD DEV	1.6400	1.1305	2.1768	67.7	---	---	2.3875	38.9692	38.9692	---	0.669	---	---
REL STD	-1.0	1.6	2.1	67.7	---	---	62.8	4.3	4.3	---	43.5	---	---
DES VAL	---	---	---	---	---	---	4.575	897.557	897.557	---	---	---	---
LAB	02081 TURBDTY RATIO	02090 TURBDTY COMMON	05105 BORON AA CARM	05107 BORON ICP DA	05111 BORON F ICP DA	05190 BORON COMMON	06008 TOC CO2 FLM	06052 TIC CO2 ?	06100 DOC ?	06101 DOC IR /DIF	06104 DOC UV CO2 IR	06107 DOC UV CO2 PHE	06109 DOC UV CO2 OH
1	---	0.1	---	0.019	---	0.019	---	---	---	---	---	---	---
2	---	0.08	---	---	---	---	---	---	---	---	---	---	---
3	---	0.03	0.14 R	---	---	0.14 R	---	---	---	1.3	1.5	---	---
4	---	0.24	---	---	---	---	---	---	---	1.6	---	---	---
5	---	0.19	---	---	---	---	---	---	---	---	---	---	---
6	---	0.15	---	---	---	---	---	---	---	---	---	---	---
7	---	0.14	---	---	---	---	---	---	---	---	---	---	---
8	---	0.14	---	---	0.04	---	14.4	1.64	---	1.4	---	---	---
10	---	0.16	---	---	---	0.04	---	---	---	---	---	---	1.0
11	---	0.16	---	---	---	---	---	---	---	---	---	---	---
12	---	0.2	---	---	---	---	---	---	0.5 L	---	---	---	---
14	---	0.0	---	---	---	---	2.26 R	---	---	---	---	---	---
MEAN	0.0300	0.1264	---	0.0190	0.0400	0.295	---	1.6400	---	---	1.4333	1.3000	1.0000
STD DEV	---	0.0728	---	---	---	0.148	---	---	---	---	1528	21.8	---
REL STD	---	57.6	---	---	---	50.3	---	---	---	10.7	---	---	---
DES VAL	---	0.165	---	---	---	0.048	---	---	---	---	---	---	---
LAB	06150 DOC COMMON	06151 DIC IR CONBUST	06152 DIC UV CO2 IR	06154 DIC AA CO2 PHE	06159 DIC AA CO2 OH	06490 DIC C COMMON	07004 TKN AA NITPRUS	07015 TKN DIC BERTHEL	07016 TKN BLK ANN-SAL	07018 TKN BLK INDOPHE	07021 TKN BLK DIG BER	07090 TKN COMMON	07105 NO3+NO2 DIS AA
1	1.1	---	---	16.8	---	16.8	---	---	---	0.129	0.129	0.129	0.60
2	1.5	---	15.6	---	---	15.6	---	---	---	---	---	---	---
3	1.3	---	---	---	---	---	---	---	---	---	---	---	---
4	1.6	---	---	---	---	---	---	---	---	---	---	---	---
6	1.4	---	---	---	---	---	---	0.2	---	---	---	---	---
8	1.64	---	---	---	---	14.4	---	---	---	---	0.2	---	---
10	1.0	---	---	---	15.7	15.7	---	---	---	---	---	---	---
12	1.5	---	---	---	---	17.2	---	---	0.11	---	---	---	---
14	2.26 R	17.2	---	---	---	17.2	0.39	---	---	---	0.39	---	---
MEAN	1.3629	17.2000	15.6000	16.8000	15.7000	15.3000	0.3900	0.2000	0.2000	0.1100	0.1290	0.2058	0.6000
STD DEV	17.9	---	---	---	---	1.8526	---	---	---	---	---	---	---
REL STD	---	---	---	---	---	12.1	---	---	---	---	---	---	---
DES VAL	1.411	---	---	---	---	15.597	---	---	---	---	---	53.8	---

DATA SUMMARY - FED-PROV & PPWB OC PROGRAMS

LAB	17990 CHLORIDE COMMON	19005 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 UP
1	185.	-	-	18.0	-	-	-	18.0	-	-	-	-	-
2	189.8	-	-	16.3	-	-	-	16.3	-	-	-	-	68.6
3	182.	-	-	18.9	-	17.95	-	17.95	-	-	71.7	-	-
6	188.8	-	20.	-	-	-	-	18.9	69.	-	-	-	-
7	198.	-	17.96	-	-	-	-	20.96	-	-	-	67.8	-
8	202.	-	-	-	-	-	17.0	17.96	-	-	-	-	-
9	195.	19.5	-	-	-	-	-	17.0	-	-	-	-	-
10	180.	18.5	-	-	-	-	-	19.5	-	-	-	-	-
11	180.	18.5	-	-	19.	-	-	18.5	-	-	-	67.	-
12	191.	-	-	18.7	-	-	-	19.	-	-	-	-	-
14	173.0	-	17.0	-	-	-	-	18.7	-	-	-	67.5	-
MEAN	189.2167	18.7500	18.3200	17.9750	19.0000	17.9500	17.0000	18.1925	68.7500	69.0000	71.7000	67.4333	68.6000
STD	8.3889	3.3536	1.5321	1.1815	-	-	-	1.0444	1.0607	-	-	.4041	-
REL	4.4	1.9	8.4	6.6	-	-	-	5.7	1.5	-	-	.6	-
DES	593	-	-	-	-	-	-	18.065	-	-	-	-	-

LAB	20110 CA DIS AAS AUT	20311 CA EXT ICP	20990 CALCIUM COMMON
1	70.	-	70.
2	69.	-	69.6
3	-	-	71.7
6	-	-	69.
7	-	-	67.8
8	-	65.8	65.8
9	-	-	68.5
10	-	-	69.5
11	-	-	67.5
14	-	-	67.5
MEAN	69.5000	65.8000	68.5364
STD	1.7071	-	1.5895
REL	1.0	-	2.3
DES	VAL	-	367

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

LAB	07109 AA HYD	07110 AA2 CD	07111 NO3+NO2 DIS SPEC	07112 NO3+NO2 UP AA CD	07315 NO3 I C	07390 NITRATE COMMON	07505 NH3 TOT AA BEET	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	-	0.02 R	-	-	-	0.37	-	-	-	-	0.002L	-	0.002L
2	-	0.35	0.392	-	-	0.392	0.001L	-	-	-	-	-	0.001L
3	-	0.330	-	-	-	0.330	-	0.005L	-	-	-	-	0.005L
4	0.33	-	-	-	-	0.33	-	-	0.002L	-	-	-	0.002L
5	-	0.34	0.35	-	-	0.34	-	-	-	-	-	-	0.01
6	-	-	-	-	-	0.32	-	0.002L	-	-	-	-	0.002L
7	-	-	-	-	0.32	0.32	-	0.010L	-	-	-	-	0.010L HDL
8	0.315	0.32	-	-	-	0.315	-	-	-	-	-	0.005L	0.005L HDL
10	-	-	-	-	-	0.35	0.1 L	-	-	-	-	-	0.1 L HDL
12	-	3.225	3.500	3.710	3.200	3.425	-	-	-	0.0100	-	-	0.0100
MEAN	0.0106	0.129	-	0.297	-	0.234	-	-	-	-	-	-	-
STD	3.3	3.9	-	8.0	-	6.8	-	-	-	-	-	-	-
REL STD	-	-	-	-	-	-	-	-	-	-	-	-	-
DES VAL	-	-	-	-	-	-	-	-	-	-	-	-	0.014

LAB	07601 T N UV AA SUL	07602 T N UV CALC'D	07605 T N UV BY SUL	07651 T N DIS UV AA	07655 T N DIS UV EDTA	07690 TOT N 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
1	-	-	-	-	-	-	-	-	-	-	0.58	-	-
2	0.41	-	-	-	-	-	0.41	-	-	0.6	-	0.60	-
3	0.408	-	-	0.45	-	-	0.408	-	-	-	-	-	-
4	-	-	-	-	0.445	-	0.45	-	-	0.455	-	-	-
5	-	-	-	-	-	-	0.445	0.5	-	-	-	-	-
6	-	-	-	-	-	0.59	-	-	0.55	-	-	-	-
8	-	0.59	0.52	-	-	-	0.52	-	-	-	-	-	0.61
10	-	0.46	-	-	-	0.46	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	0.4090	0.5250	0.5200	0.4500	0.4450	0.5250	0.4456	0.5000	0.5500	0.5275	0.5800	0.6000	0.6100
STD	0.0014	0.0919	-	-	-	0.0919	0.0454	-	0.0000	0.1025	-	-	-
REL STD	0.3	17.5	-	-	-	17.5	10.2	-	-1.0	19.4	-	-	-
DES VAL	-	-	-	-	-	-	0.426	-	-	-	-	-	-

LAB	09190 FLOURIDE COMMON	10101 ALKALNTY TITR 'N	10108 ALKALNTY POT TIT	10109 ALKALNTY POT TIT	10111 ALKALNTY TIT PRO	10112 ALKALNTY TIT CON	10190 ALKALNTY COMMON	10301 PH	10390 PH COMMON	10602 HARDNESS CALC'D	10603 HARDNESS TITR 'N	10606 HARDNESS CALC'D	10690 HARDNESS COMMON
1	0.58	77.1	-	-	-	-	77.1	8.0	8.0	109.8	-	-	109.8
2	0.60	72.1	-	-	77.2	-	72.2	7.91	7.91	103.8	105.	-	103.8
3	0.60	74.6	-	-	-	-	74.6	7.91	7.91	-	-	-	106.
4	0.455	75.0	-	-	-	-	75.0	7.91	7.91	-	-	-	102.0
5	0.5	78.0	-	76.	-	-	76.0	7.9	7.9	102.0	-	-	102.0
6	0.55	78.0	-	76.0	-	-	78.0	8.15	8.15	112.4	-	-	112.4
7	0.55	78.0	-	76.0	-	-	76.0	7.99	7.99	110.4	-	-	110.4
8	0.61	-	74.	-	-	-	74.	7.99	7.99	111.	-	-	111.
9	0.61	-	74.	75.	-	-	75.	7.99	7.99	110.	-	-	110.
10	0.55	74.3	-	-	-	-	74.3	7.9	7.9	106.	-	-	106.
11	0.55	79.4	-	-	-	-	79.4	8.1	8.1	-	-	-	106.
12	0.55	79.4	-	-	-	-	79.4	8.15	8.15	-	-	-	106.
MEAN	0.5556	75.6750	74.0000	76.0000	77.2000	75.0000	75.6615	7.9469	7.9469	107.9600	108.1333	106.0000	107.8000
STD	0.0545	2.3230	-	0.0000	-	-	1.9035	0.1599	0.1599	2.9846	5.3715	-	3.4828
REL STD	9.8	3.1	-	-1.0	-	-	2.5	2.0	2.0	2.8	5.0	-	3.2
DES VAL	0.569	-	-	-	-	-	75.8000	-	-	-	-	-	107.335

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

LAB	11005	11102	11103	11105	11107	11311	11990	12005	12101	12102	12106	12107	12108
	NA TOT ICP	NA F AAS	NA DIS FL PH	NA DIS AAS DA	NA FL PH	NA EXT ICP	SODIUM COMMON	MG TOT ICP	MG DIS CALC'D	MG DIS AAS DA	MG UP AAS DA	MG DIS AAS' AUT	MG HARDN CALC'D
1			14.6		14.9		14.6				6.3	6.4	
2			14.6				14.9						
3			15.0		14.9		15.0		9.7 R				7.1
5		15					15.7			6.6			
7				14.5		15.7	14.5						
8							15.5	6.9					
9	16.5						16.5	6.76					
10	15.5						15.5						
11		14					14.2			6.9			
12			15.2				13.8						
14		13.8					13.8			6.83			
MEAN	15.7500	14.2667	14.7000	14.5000	14.9000	15.7000	14.8500	6.8300		6.7767	6.3000	6.4000	7.1000
STD DEV	2.2	4.5	3.6				4.9887	1.4		2.3570			
REL STD DEV													
DES VAL							14.742						

LAB	12303	12311	12990	14102	14105	14106	14111	14190	15106	15406	15409	15413	15421
	MG UP AAS AUT	MG EXT ICP	MNESIUM COMMON	SILICA ANSA AA	SILICA HOLY AA	SILICA HOLY	SILICA ICP DA	SILICA COMMON	UV ASC	T P UP AAS ASC	T P BLK AA ASC	T P ACL AA SNCL	T P BLK DIG ASC
1	7.		7.4	2.5				2.5					
2			6.3	2.31		2.13		2.13					
3			6.3					2.1		0.004		0.005	
4			7.1 R					2.1				0.004	
5			7.1 R					2.1					
6			6.6					2.3					
7			7.07					2.15					
8		7.07	6.9		2.1			2.1	0.010L		0.01 L		
9			6.9					2.1					
10			6.76					2.2					
11			6.9					2.2					
12			6.83					2.2		0.003 R			
14			6.83					2.2		0.003 R			
MEAN	7.0000	7.0700	6.7860	2.4050	2.1750	2.1300	2.1500	2.2338		.0057		.0050	
STD DEV			4.0	5.6	4.4			6.1389		66.8		20.0	
REL STD DEV													
DES VAL			6.518					2.160					

LAB	15490	16304	16306	16307	16309	16310	16990	17203	17204	17206	17208	17209	17210
	TOT P COMMON	SO4 DIS AUTO BA	SO4 DIS AA NTB	SO4 UP AA NTB	SO4 DIS I C	SO4 DIS AA CALM	SULFATE COMMON	CL DIS AA FE	CL DIS AG TIT	CL DIS AA AG	CL DIS AA AG	CL DIS I C	CL DIS TIT CON
1	0.006L		29.		29.9		29.0	23.				23.6	
2	0.005	32.0		29.3			32.0				21.87		
3	0.004						29.3						
4							33.0						
5			33.0				28.			25.5			
6	0.01 L	28.					31.0	23.7	26.				
7	0.006		30.				30.						
8			30.				30.8						
9					30.8		30.5						
10			20.5 R			29.5	29.5						
11	0.003 R		29.5				27.9						
12					27.9								
14					5.0								
MEAN	.0053	30.0000	30.5000	29.3000	29.5333	29.5000	30.0000	23.3500	26.0000	23.5000	21.8700	23.3000	25.0000
STD DEV	.0025	2.8284	1.5811	5.6	1.4844		1.5824	2.1		1.4720		1.8	
REL STD DEV	46.9	9.4	5.2		5.0		5.2	2.1		6.3		1.8	
DES VAL	.008						29.635						

DATA SUMMARY - FED-PROV & PPWB QC PROGRAMS

LAB	17990	19005	19102	19103	19106	19107	19301	19990	20005	20100	20101	20103	20108
	CHLORIDE COMMON	K TOT ICP	K DIS AAS	K DIS FLM PH	K DIS AAS LI	K DIS FLM PH	K EXT HNO3 AA	PTASSIUM COMMON	CA TOT ICP	CA DIS CALC'D	CA DIS EDTA	CA DIS AAS	CA DIS AAS UP
1	23.6	-	-	3.1	-	-	-	3.1	-	-	-	-	-
2	21.87	-	-	3.1	-	3.17	-	3.17	-	-	-	-	32.2
3	25.5	-	3.6	3.1	-	-	-	3.6	-	-	29.2	-	-
6	26.7	-	3.18	-	-	-	-	3.18	-	29.	-	31.4	-
7	23.	-	-	-	-	-	3.2	3.2	-	-	-	-	-
8	23.	3.7	-	-	-	-	-	3.7	32.5	-	-	-	-
9	25.	3.35	-	-	2.8	-	-	3.35	32.4	-	-	-	-
10	22.	-	-	-	-	-	-	2.8	-	-	-	31.	-
11	22.5	-	-	3.1	-	-	-	3.1	-	-	-	-	-
12	23.5	-	3.06	-	-	-	-	3.06	-	-	-	32.4	-
14	26.7 R	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	23.6518	3.5250	3.2800	3.1000	2.8000	3.1700	3.2000	3.2050	32.4500	29.0000	29.2000	31.6000	32.2000
STD	1.3399	7.0	8.635	-1.0	-	-	-	7.2437	.2	-	-	2.3	-
REL	5.7	-	-	-	-	-	-	7.6	-	-	-	-	-
DES	23.752	-	-	-	-	-	-	3.181	-	-	-	-	-
VAL	-	-	-	-	-	-	-	-	-	-	-	-	-

LAB	20110	20311	20900
	CA DIS AAS AUT	CA EXT ICP	CALCIUM COMMON
1	32.	-	32.
2	31.	-	31.2
3	-	-	29.2
6	-	-	29.
7	-	-	31.4
8	32.9	32.9	32.9
9	-	-	32.5
10	-	-	32.4
11	-	-	31.4
14	-	-	32.4
MEAN	31.5000	32.9000	31.4545
STD	2.2	-	1.3171
REL	-	-	4.2
DES	-	-	31.677
VAL	-	-	-

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. THE EXCEPTIONS BEING: COLOUR IN RELATIVE UNITS, CONDUCTIVITY IN USIE/CM, TURBIDITY IN JIU OR NEU, NITROGEN ANALYSES IN "N", ALKALINITY & HARDNESS IN CAOS, SILICA IN SIO2, AND SULFATE IN SO4.