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Ecosystems Interlaboratory QA Program,  
Study FP63 for Mercury, Arsenic, Selenium  
Antimony & Bismuth in Water (July & Aug 1993)

H. Alkema

Research and Applications Branch  
National Water Research Institute  
867 Lakeshore Rd, Burlington, ON  
Canada L7R 4A6

**RESEARCH & APPLICATIONS BRANCH**

**FINAL REPORT**

*REPORT NO. RAB-TN-93-24*

**ECOSYSTEMS INTERLABORATORY QUALITY ASSURANCE PROGRAM**

**FP/GLAP STUDY 63**

for July and August 1993

**An Interlaboratory Quality Assurance Study**

**for Mercury and Arsenic, Selenium, Antimony and Bismuth \***

by

**H. Alkema**

Quality Assurance Project  
Research & Applications Branch  
National Water Research Institute  
Burlington, Ontario

October 1993

\* the companion study (FP63) for Trace Metals is found in Report RAB-TN-93-23



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National Water Research Institute  
867 Lakeshore Road, P.O. Box 5050  
Burlington, Ontario  
L7R 4A6

Your file    *Voire référence*

Our file    *Notre référence*

6 October 1993

To: Participants & Managers in the:  
**Ecosystems Interlaboratory Quality Assurance Program**

Re: Final Report for FP/GLAP Study FP63 - Mercury & Hydride Portion

Dear Participant,

The Institute is pleased to distribute this final report to the FP/GLAP participant laboratories. This report includes results for two unique series of 10 samples which were analysed in January and February of this year. The evaluation of results is in the LRTAP style, giving an evaluation for systematic bias as well as for precision (flagged results). A complete listing of all laboratory results is included so that each laboratory can compare its results and evaluations with other laboratories. For details concerning the evaluations please refer to the attached Appendix A: Glossary of Terms, or to the Research & Applications Branch QA Manual.

We would like to thank all participants for their cooperation and prompt responses. In the future, now that all evaluation programs have been adapted to the FP/GLAP format, reports will be prompt.

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

Laboratory heads are encouraged to discuss the attached report openly with those who manage their programs and those who use their laboratory data. In addition, if any laboratory is experiencing difficulties or is reviewing a methodology, I can make a referral to a laboratory which has demonstrated good performance. Also, to assist in *improving* or *confirming accuracy* of analysis, our Institute is able to provide a wide variety of reference waters for a cost recovery fee.

Should you have any questions or comments regarding this study, please contact me - phone 905-336-4929 or fax 336-4989. (Please note that our area code is now 905.)

Yours truly,

H. Alkema  
QA Chemist, Ecosystems QA Pgm

Attachment: Individual Laboratory Appraisal

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Table 1

**ENVIRONMENT CANADA**  
National Water Research Institute

**Ecosystems Interlaboratory Quality Assurance Program**  
**PARTICIPATION LIST - Study FP/GLAP 63 (July & Aug '93)**

Alberta Environmental Centre  
ASL Analytical Service Lab Ltd.  
Barringer Laboratories Ltd.  
Can Test Ltd.  
Chemex Labs Alberta Inc.  
Chemical & Geological Laboratories Inc.  
City of Calgary  
Edmonton Public Works  
Environment Canada - Atlantic Region  
Environment Canada - Centre St. Laurent  
Environment Canada - NLET  
Environment Canada - Pacific & Yukon Region  
Environment Canada - Western & Northern Region  
Environment Canada - WQB, Western & Northern Region  
Environment Manitoba  
Environment New Brunswick  
Environmental Services Lab, NS  
Elemental Research Inc.  
Forestry Canada - Sault Ste Marie  
Geological Survey of Canada - Ottawa (I)  
Geological Survey of Canada - Ottawa (II)  
HBT Agra Ltd  
Illinois State Water Survey  
Indian & Northern Affairs Canada  
Laboratoire de Santé, Publique du Québec  
Ministère de l'Environnement du Québec - Laval  
Ministère de l'Environnement du Québec - Ste. Foy  
Ontario Ministry of Environment - Dorset  
Ontario Ministry of Environment - Etobicoke  
Ontario Ministry of Environment - Kingston  
Ontario Ministry of Environment - London  
Ontario Ministry of Environment - Thunder Bay  
PEI Agriculture  
Rockcliff Research Management Inc. (WTC)  
Saskatchewan Health  
Saskatchewan Research Council  
Sawyer Environmental Laboratory - University of Maine  
Shell Calgary Research Centre  
Sodexen Inc  
USEPA, Region 5 - Chicago  
Zenon Environmental Inc., BC

Table 2a

## COMPARISON OF LABORATORY PERFORMANCE (STUDY 0063)

## Mercury

LAB CODE	BIAS			FLAGS			SUM OF % BIAS AND % FLAGS SCORE
	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	
F002	1	0	0.00	6	0	0.00	0.00
F003	1	0	0.00	9	0	0.00	0.00
F008	1	0	0.00	10	0	0.00	0.00
F010	1	0	0.00	6	0	0.00	0.00
F032	1	0	0.00	10	0	0.00	0.00
F033	1	0	0.00	8	0	0.00	0.00
F035	1	0	0.00	6	0	0.00	0.00
F037	1	0	0.00	6	0	0.00	0.00
F038	1	0	0.00	7	0	0.00	0.00
F046	1	0	0.00	6	0	0.00	0.00
F044	1	0	0.00	10	1	10.00	10.00
F059	1	0	0.00	7	1	14.29	14.29
F011	1	0	0.00	10	2	20.00	20.00
F001	1	0	0.00	6	2	33.33	33.33
F020	1	0	0.00	9	4	44.44	44.44
F024	1	0	0.00	9	4	44.44	44.44
F023	1	0	0.00	10	8	80.00	80.00
F055	1	0	0.00	1	1	100.00	100.00
F058	1	1	100.00	10	3	30.00	130.00
F016	1	1	100.00	6	3	50.00	150.00
F047	1	1	100.00	6	3	50.00	150.00
F062	1	1	100.00	7	7	100.00	200.00

Table 2b

## COMPARISON OF LABORATORY PERFORMANCE (STUDY 0063)

## Hydrides - As, Se, Sb, &amp; Bi

LAB CODE	BIAS			FLAGS			SUM OF % BIAS AND % FLAGS SCORE
	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	
F002	1	0	0.00	10	0	0.00	0.00
F003	3	0	0.00	30	0	0.00	0.00
F033	3	0	0.00	30	0	0.00	0.00
F038	4	0	0.00	29	0	0.00	0.00
F024	4	0	0.00	29	3	10.34	10.34
F008	2	0	0.00	19	2	10.53	10.53
F010	2	0	0.00	18	3	16.67	16.67
F001	4	1	25.00	40	5	12.50	37.50
F044	4	2	50.00	40	0	0.00	50.00
F016	3	1	33.33	26	5	19.23	52.56
F020	3	1	33.33	25	7	28.00	61.33
F032	3	1	33.33	28	8	28.57	61.90
F023	4	1	25.00	16	6	37.50	62.50
F035	3	1	33.33	29	10	34.48	67.82
F047	4	3	75.00	40	6	15.00	90.00
F062	3	1	33.33	22	14	63.64	96.97
F055	4	2	50.00	27	16	59.26	109.26
F011	4	3	75.00	40	22	55.00	130.00
F046	4	2	50.00	27	24	88.89	138.89
F037	2	1	50.00	12	13	108.33	158.33
F030	3	3	100.00	24	16	66.67	166.67

Table 3a

Sample Design - FP/GLAP 63 - July '93

Mercury

Sample No.	Sample Name	Design Value
1	HG-01	0.000
2	HG-02	0.005
3	HG-04	0.019
4	HG-03	0.010
5	HG-06	0.17
6	HG-05	0.067
7	HG-07	0.27
8	HG-09	0.43
9	HG-08	0.33
10	HG-10	0.47



Table 3b

Sample Design - FP/GLAP 63 - July '93

Hydrides - As, Se, Sb & Bi

Sample No.	Sample Name	Design Value (As)	Design Value (Sb)	Design Value (Se)	Design Value (Bi)
1	HYD-01	0.89	0.48	0.37	0.26
2	HYD-02	1.11	0.84	0.71	0.68
3	HYD-03	1.97	1.12	0.91	0.84
4	HYD-03	1.47	1.32	1.19	1.36
5	HYD-04	2.61	1.52	1.57	1.62
6	HYD-05	4.03	2.32	2.77	3.04
7	HYD-07	2.91	3.06	3.85	2.44
8	HYD-08	3.69	3.48	3.23	3.80
9	HYD-09	4.79	4.16	2.99	3.32
10	HYD-10	5.35	4.68	4.35	4.84

Table 4a

SUMMARY OF INTERLABORATORY MEDIAN VALUES for Mercury - STUDY 63

PARAMETER		SAMPLE NUMBER						
		HG-1 SAMPLE 1	HG-2 SAMPLE 2	HG-4 SAMPLE 3	HG-3 SAMPLE 4	HG-6 SAMPLE 5	HG-5 SAMPLE 6	HG-7 SAMPLE 7
Mercury	ug/L	.0500	.0255	.0500	.0300	.1650	.0800	.1900

PARAMETER		HG-9	HG-8	HG-10
		SAMPLE 8	SAMPLE 9	SAMPLE 10
Mercury	ug/L	.3100	.3000	.3700

Table 4b

SUMMARY OF INTERLABORATORY MEDIAN VALUES for Hydrides - STUDY 63

PARAMETER		SAMPLE NUMBER						
		HYD-1 SAMPLE 1	HYD-2 SAMPLE 2	HYD-3 SAMPLE 3	HYD-4 SAMPLE 4	HYD-5 SAMPLE 5	HYD-6 SAMPLE 6	HYD-7 SAMPLE 7
Arsenic	ug/L	1.0000	1.1000	2.0000	1.7300	2.6000	3.8000	2.8000
Selenium	ug/L	.3850	.7150	.9200	1.0000	1.3000	2.7650	3.7830
Antimony	ug/L	.4400	.8000	1.0000	1.2000	1.4500	2.1000	2.8000
Bismuth	ug/L	.1400	.1700	.1850	.4355	1.0000	1.0000	.7000

PARAMETER		SAMPLE NUMBER		
		HYD-8 SAMPLE 8	HYD-9 SAMPLE 9	HYD-10 SAMPLE 10
Arsenic	ug/L	3.5000	4.5000	5.0000
Selenium	ug/L	3.0000	2.8785	4.0000
Antimony	ug/L	3.0000	3.6000	4.1000
Bismuth	ug/L	1.2000	1.3845	1.9445

## **Appendix A**

### **Glossary of Terms**

## GLOSSARY OF TERMS

Appendix A:

### Used for the Evaluation of Interlaboratory Results

- Satisfactory:** Quite acceptable, "good results".
- Erratic:** A set of results for a given characteristic is deemed erratic when both high and low flags are assigned.
- Out of Control:** An analytical system is said to be out of control when it has demonstrated the ability to perform adequately and produces an extreme result or results. For an example, consider a set of results obtained by laboratory on Vanadium in Study FP62:

---

Sample No.	Result	Median	Difference
1	0.21	0.2010	-0.009
2	0.13	0.1300	0.0
3	0.49	0.4800	-0.01
4	0.091	0.8505	0.7595
5	0.22	0.2065	-0.013
6	0.005	0.0050	0.0
7	0.002	0.0022	0.0002
8	0.016	0.0151	-0.0009
9	0.007	0.0069	-0.0001
10	0.012	0.0123	0.0003

---

Given the excellent results obtained on samples 1 through 10, the result on sample 4 indicates that the analytical system was out of control.

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

- W or T Code:** A "W" or "T" code is used with a reported result as also described in ASTM. The use of these codes is discouraged in the FP/GLAP context, as incorrect flagging of results can occur. "Less than" values are normally used when reporting FP/GLAP data.

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

These terms define the acceptable differences from median of results (target value) that is allowed without a result being flagged either low or high. For a sample whose target value is at or below the lower limit for use of basic acceptable error, the basic acceptable error is used to determine the range of acceptable deviations.

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

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

For example: If a target value for a sample is 21 µg/L, and the *lower limit for use of basic acceptable error* is 10 µg/L, the difference between them is  $21 - 10 = 11$  µg/L. Multiplying the difference by the *concentration error increment*, say 0.10, which gives  $11 \mu\text{g/L} \times 0.10$ , resulting in 1.1 µg/L to determine the acceptable difference  $21.0 \pm 2.1$ . Thus the range 18.9 to 23.1 µg/L would be considered acceptable and would not be flagged.

In general, for the FP/GLAP studies, the values chosen for the *basic acceptable error* and the *concentration error increment* are selected so that good precision may be inferred. Historically, for the FP QA Program, for moderate ranges, this has been achieved with the 10% Deviation Rule. To be consistent in the FP/GLAP studies, Performance Ratings with the LRTAP type evaluation program should generally remain the same; eg. Very Good = approximately 5% of data flagged. In a sense these evaluations represent state of the art for analysis of the Round-Robin samples.

**Flag:** A result is flagged high ("H") when its value is greater than the median (target value) plus the acceptable difference, (but not greater than the median plus 1.5 times). A result greater than 1.5 times the acceptable difference is flagged very high ("VH"). Similarly, a result lower than the median by the acceptable difference (but not minus 1.5 times the acceptable difference) is flagged low ("L"). A still lower result is flagged very low ("VL"). Extremely different values are those that deviate more than twice the acceptable difference from the median. These results are flagged - "EL" or "EH".

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

Sept, 1993

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

## **Appendix B**

### **Laboratory Results**

- 1) Mercury
- 2) Hydrides - Arsenic, Selenium,  
Antimony & Bismuth

PARAMETER: 80095 Mercury

ug /L

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BURLINGTON ONTARIO

## FP/GLAP INTERLAB STUDY 63 - Mercury

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .0500 BASIC ACCEPTABLE ERROR= .0500 CONCENTRATION ERROR INCREMENT= .1500

SAMPLE LAB NO	1		2		3		4		5		6	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	<.05	0.00	<.05	0.00	<.05	0.00	<.05	0.00	.16	8.00	.05	2.50
F002		0.00		0.00		0.00		0.00	.17	12.00	.07	5.50
F003	<.005	0.00	.005	1.00	.024	2.00	.016	2.00	.165	11.00	.078	9.00
F008	.05	5.50	.05	6.50	.05	8.00	.05	7.50	.18	14.00	.08	11.50
F010	<.1	0.00	<.1	0.00	<.1	0.00	<.1	0.00	.2	16.00	.1	17.00
F011	.05	5.50	.05	6.50	.06	10.00	.05	7.50	.20	16.00	.11	19.00
F016	<.03	0.00	<.03	0.00	<.03	0.00	<.03	0.00	.23	18.00	.08	11.50
F020	.36 EH	8.00	.12 VH	8.00	.10	11.00	<.05	0.00	.29 VH	19.00	.08	11.50
F023	.123 H	7.00	.038	5.00	.123 H	12.00	.123 VH	9.00	.292 VH	20.00	.038	1.00
F024	.02	4.00	<.02	0.00	.03	4.00	.03	6.00	.14	4.00	.08	11.50
F032	.01	3.00	.01	3.00	.03	4.00	.02	4.00	.16	8.00	.07	5.50
F033	.01W	0.00	.01W	0.00	.03T	4.00	.02T	4.00	.16	8.00	.07	5.50
F035	<.02	0.00	<.02	0.00	<.02	0.00	<.02	0.00	.10	2.50	.05	2.50
F037	<.1	0.00	<.1	0.00	<.1	0.00	<.1	0.00	.20	16.00	.10	17.00
F038	<.05	0.00	<.05	0.00	.05	8.00	<.05	0.00	.16	8.00	.09	15.00
F044	.007	2.00	.013	4.00	.033	6.00	.020	4.00	.175	13.00	.083	14.00
F046	<.05	0.00	<.05	0.00	<.05	0.00	<.05	0.00	.16	8.00	.07	5.50
F047	<.05	0.00	<.05	0.00	.05	8.00	<.05	0.00	.07 L	1.00	<.05	0.00
F055	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	1.0 EH	20.00
F058	.0009	1.00	.0068	2.00	.0222	1.00	.0134	1.00	.153	5.00	.073	8.00
F059	<.1	0.00	<.1	0.00	<.1	0.00	.3 EH	10.00	.1	2.50	.1	17.00
F062	.5 EH	9.00	<.5	0.00	.9 EH	13.00	.9 EH	11.00	1.0 EH	21.00	<.5	0.00
MEDIAN CONC.	.0500		.0255		.0500		.0300		.1650		.0800	

SAMPLE LAB NO	7		8		9		10	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.25	15.50	.46 VH	17.50	.33	14.00	.49 H	17.00
F002	.22	13.00	.27	4.50	.30	9.00	.36	8.50
F003	.165	5.00	.332	13.00	.282	5.00	.320	5.00
F008	.14	2.00	.29	6.50	.30	9.00	.38	12.00
F010	.2	11.50	.3	9.00	.3	9.00	.3	3.50
F011	.24	14.00	.40 H	15.00	.36	16.00	.47 H	16.00
F016	.25	15.50	.46 VH	17.50	.42 H	18.00	.51 H	18.00
F020	.33 VH	20.00	.29	6.50	.30	9.00	.36	8.50
F023	.292 H	18.00	.546 EH	20.00	.546 EH	20.00	.631 EH	21.00
F024	.30 VH	19.00	.51 EH	19.00	.44 VH	19.00	.60 EH	19.50
F032	.18	9.00	.31	11.00	.31	12.50	.33	6.00
F033	.16	3.50	.34	14.00	.29	6.00	.36	8.50
F035	.18	9.00	.30	9.00	.24	4.00	.42	15.00
F037	.16	3.50	.33	12.00	.38	17.00	.29	2.00
F038	.17	6.50	.25	3.00	.31	12.50	.36	8.50
F044	.251	17.00	.440 H	16.00	.337	15.00	.419	14.00
F046	.17	6.50	.27	4.50	.23	3.00	.37	11.00
F047	.18	9.00	.22 L	2.00	.2 L	1.00	.3	3.50
F055	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00
F058	.049 VL	1.00	.061 EL	1.00	.227	2.00	.092 EL	1.00
F059	.2	11.50	.3	9.00	.3	9.00	.4	13.00
F062	<.5	0.00	.9 EH	21.00	.6 EH	21.00	.6 EH	19.50
MEDIAN CONC.	.1900		.3100		.3000		.3700	



LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	METHOD CODING
F001	74.50	12.417	6			CV-AAS
F002	52.50	8.750	6			Cold Vap Auto
F003	53.00	5.889	9			CV-AAS
F008	82.50	8.250	10			CV-AAS
F010	66.00	11.000	6			-
F011	125.50	12.550	10			-
F016	98.50	16.417	6			CV-AAS
F020	101.50	11.278	9			CV-AAS, manual
F023	133.00	13.300	10			-
F024	106.00	11.778	9			CV-AAS
F032	66.00	6.600	10			CV-AAS, bath
F033	53.50	6.688	8			CV-AAS
F035	42.00	7.000	6			CV-AAS
F037	67.50	11.250	6			CV-AAS
F038	61.50	8.786	7			CV-AAS
F044	105.00	10.500	10			HYDRIDE-ICP-MS
F046	38.50	6.417	6			CV-AAS
F047	24.50	4.083	6			CVAA, ICPMS
F055	20.00	20.000	1			CV-AAS
F058	23.00	2.300	10			CV-AAS
F059	72.00	10.286	7			CV-AAS
F062	115.50	16.500	7			CV-AAS
OVERALL AVERAGE RANK IS		9.588				

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	METHOD CODING
F058	23.00	2.300	10	VLELEL	BIASED LOW	CV-AAS
F047	24.50	4.083	6	LLL	BIASED LOW	CVAA, ICPMS
F003	53.00	5.889	9			CV-AAS
F046	38.50	6.417	6			CV-AAS
F032	66.00	6.600	10			CV-AAS, bath
F033	53.50	6.688	8			CV-AAS
F035	42.00	7.000	6			CV-AAS
F008	82.50	8.250	10			CV-AAS
F002	52.50	8.750	6			Cold Vap Auto
F038	61.50	8.786	7			CV-AAS
F059	72.00	10.286	7	EH		CV-AAS
F044	105.00	10.500	10	H		HYDRIDE-ICP-MS
F010	66.00	11.000	6			-
F037	67.50	11.250	6			CV-AAS
F020	101.50	11.278	9			CV-AAS, manual
F024	106.00	11.778	9			CV-AAS
F001	74.50	12.417	6			CV-AAS
F011	125.50	12.550	10			-
F023	133.00	13.300	10			-
F016	98.50	16.417	6			BIASED HIGH
F062	115.50	16.500	7			BIASED HIGH
F055	20.00	20.000	1			INSUFFICIENT DATA
OVERALL AVERAGE RANK IS		9.588				

Mercury

PARAMETER: 33095 Arsenic

ug/L

RESEARCH AND APPLICATIONS BRANCH  
NATIONAL WATER RESEARCH INSTITUTE  
BURLINGTON ONTARIO

FP/GLAP INTERLAB STUDY 63 - Hydrides

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= .3300 CONCENTRATION ERROR INCREMENT= .1500

SAMPLE LAB NO	1		2		3		4		5		6	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.96	6.00	1.20	13.50	2.10	12.00	1.73	11.00	2.70	11.50	4.00	13.00
F002	1.0	9.50	1.2	13.50	2.0	8.50	1.7	9.00	2.6	9.50	3.8	10.50
F003	.9	4.50	1.1	10.00	1.8	3.00	1.6	7.00	2.5	8.00	3.4	5.00
F008	1.	9.50	1.	5.50	2.	8.50	2.	15.50	2. L	3.00	4.	13.00
F010	1.	9.50	1.	5.50	2.	8.50	2.	15.50	2. L	3.00	3. L	3.00
F011	1.3	16.50	1.7 VH	18.00	2.4	17.50	2.7 EH	20.00	3.4 H	19.00	4.2	17.50
F016	1.1	14.00	1.3	16.00	2.3	14.50	1.5 EH	5.50	2.7	11.50	3.8	10.50
F020	<1.	0.00	1.	5.50	2.	8.50	1.5	5.50	2.4	6.00	3.7	9.00
F023	.889	3.00	.968	2.00	1.907	5.00	1.12 L	2.00	2.38	5.00	3.24	4.00
F024	.9	4.50	1.0	5.50	2.3	14.50	2.0	15.50	2.8	13.50	4.1	15.50
F030	.8	1.00	.8	1.00	1.7	2.00	1.4	3.00	1.9 L	1.00	2.6 VL	2.00
F032	1.	9.50	1.	5.50	2.	8.50	2.	15.50	3.1	16.00	4.	13.00
F033	1.0T	9.50	1.1	10.00	2.3	14.50	1.7	9.00	3.1	17.00	4.1	15.50
F035	1.1	14.00	1.2	13.50	2.3	14.50	1.8	12.50	2.9	15.00	4.2	17.50
F037	2.08 EH	19.00	1.94 EH	19.00	3.03 EH	21.00	2.44 VH	19.00	3.82 VH	20.00	4.34	19.00
F038	1.1	14.00	1.2	13.50	2.0	8.50	1.7	9.00	2.6	9.50	3.6	7.50
F044	.86	2.00	1.00	5.50	1.84	4.00	1.49	4.00	2.45	7.00	3.54	6.00
F046	2. EH	18.00	2. EH	20.00	3. EH	20.00	3. EH	21.00	4. EH	21.00	5. VH	21.00
F047	1.3	16.50	1.4	17.00	2.5 H	19.00	2.1	18.00	3.3 H	18.00	4.4	20.00
F055	<1.0	0.00	<1.0	0.00	1.5 L	1.00	1.0 VL	1.00	2.0 L	3.00	2.2 EL	1.00
F062	1.0	9.50	1.1	10.00	2.4	17.50	1.8	12.50	2.8	13.50	3.6	7.50
MEDIAN CONC.	1.0000		1.1000		2.0000		1.7300		2.7000		3.8000	

SAMPLE LAB NO	7		8		9		10	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	2.75	9.00	3.60	12.00	4.60	12.00	5.22	13.00
F002	2.8	10.50	3.5	10.50	4.5	10.00	5.3	14.50
F003	2.5	3.50	3.1	5.50	4.2	6.50	4.8	7.50
F008	3.	14.50	4.	16.50	5.	16.00	6. H	18.00
F010	2. L	1.00	3.	3.00	4.	5.00	5.	10.50
F011	3.4 H	19.00	4.6 VH	20.00	5.0	16.00	7.2 EH	21.00
F016	2.7	7.50	3.3	8.00	4.5	10.00	4.6	4.50
F020	2.6	5.50	3.1	5.50	3.7	3.00	4.6	4.50
F023	2.80	10.50	3.08	4.00	3.94	4.00	4.33	3.00
F024	3.0	14.50	3.7	13.00	5.0	16.00	5.2	12.00
F030	2.1 L	2.00	2.3 VL	1.00	3.4 L	2.00	3.2 VL	1.00
F032	1.	14.50	4.	16.50	5.	16.00	5.	10.50
F033	1.3	17.50	3.9	15.00	4.8	13.00	5.3	14.50
F035	1.0	14.50	3.8	14.00	5.0	16.00	5.6	17.00
F037	3.67 H	20.00	4.40 H	19.00	5.32	20.00	6.08 H	19.00
F038	2.7	7.50	3.2	7.00	4.2	6.50	4.8	7.50
F044	2.60	5.50	3.33	9.00	4.24	8.00	4.90	9.00
F046	4. EH	21.00	5. EH	21.00	7. EH	21.00	7. EH	20.00
F047	3.3	17.50	4.2	18.00	5.1	19.00	5.4	16.00
F055	2.5	3.50	2.5 L	2.00	3.0 VL	1.00	3.5 VL	2.00
F062	2.9	12.00	3.5	10.50	4.5	10.00	4.7	6.00
MEDIAN CONC.	2.8000		3.5000		4.5000		5.0000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	METHOD CODING
F001	113.00	11.300	10			ICP-MS TO
F002	106.00	10.600	10			Boro-Hyd AAS
F003	60.50	6.050	10			HYD-ICP
F008	120.00	12.000	10			HYD
F010	64.50	6.450	10			-
F011	184.50	18.450	10			
F016	102.00	10.200	10	VH EHH H VH EH	BIASED HIGH	
F020	53.00	5.889	9			HV-AAS
F023	42.50	4.250	10	L	BIASED LOW	33008
F024	124.50	12.450	10			-
F030	16.00	1.600	10	L VLL VLL VL	BIASED LOW	HYD-AAS
F032	125.50	12.550	10			33004
F033	135.50	13.550	10			HYD-AAS
F035	148.50	14.850	10			-
F037	195.00	19.500	10	EHEHEHVH H H H	BIASED HIGH	HYD-AAS
F038	90.50	9.050	10			GF-AAS
F044	60.00	6.000	10			HV-AAS
F046	204.00	20.400	10	EHEHEHEHVHEHEHEHEH	BIASED HIGH	HYDRIDE-QTAAS
F047	179.00	17.900	10	H H	BIASED HIGH	GF-AAS
F055	14.50	1.813	8	L VLL EL L VLV	BIASED LOW	HYD-ICPMS
F062	109.00	10.900	10			HV-AAS
						HYDRIDE-AAS
OVERALL AVERAGE RANK IS		10.860				

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	METHOD CODING
F030	16.00	1.600	10	LVLVLLVL	BIASED LOW	33004
F055	14.50	1.813	8	LVLLELLVL	BIASED LOW	HV-AAS
F023	42.50	4.250	10	L	BIASED LOW	-
F020	53.00	5.889	9			33008
F044	60.00	6.000	10			HYDRIDE-QTAAS
F003	60.50	6.050	10			HYD-ICP
F010	64.50	6.450	10	LLL		-
F038	90.50	9.050	10			HV-AAS
F016	102.00	10.200	10			HV-AAS
F002	106.00	10.600	10			Boro-Hyd AAS
F062	109.00	10.900	10			HYDRIDE-AAS
F001	113.00	11.300	10			ICP-MS TO
F008	120.00	12.000	10	LH		HYD
F024	124.50	12.450	10			HYD-AAS
F032	125.50	12.550	10			HYD-AAS
F033	135.50	13.550	10			-
F035	148.50	14.850	10			HYD-AAS
F047	179.00	17.900	10	HH	BIASED HIGH	HYD-ICPMS
F011	184.50	18.450	10	VHEHHVHEH	BIASED HIGH	
F037	195.00	19.500	10	EHEHEHVHVVH	BIASED HIGH	
F046	204.00	20.400	10	EHEHEHEHVHEHEHEHEH	BIASED HIGH	GF-AAS
						GF-AAS
OVERALL AVERAGE RANK IS		10.860				

Arsenic

PARAMETER: 34095 Selenium

ug/L

RESEARCH AND APPLICATIONS BRANCH  
NATIONAL WATER RESEARCH INSTITUTE  
BURLINGTON ONTARIO

FP/GLAP INTERLAB STUDY 63 - Hydrides

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= .3300 CONCENTRATION ERROR INCREMENT= .1500

SAMPLE LAB NO	1		2		3		4		5		6	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.37	3.00	.73	7.00	.92	7.00	1.15	10.00	1.60	14.00	2.73	9.00
F003	.3	2.00	.6	5.00	.8	5.00	1.1	8.00	1.5	13.00	2.5	6.50
F008	<1.	0.00	1.	10.00	1.	9.50	1.	5.00	1.	3.50	3.	13.50
F010	<1.	0.00	<1.	0.00	1.	9.50	1.	5.00	1.	3.50	3.	13.50
F011	.5	6.00	1.9 EH	12.00	2.0 EH	13.00	2.0 EH	12.00	2.3 EH	17.00	4.3 EH	18.00
F016	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	1.0	3.50	2.0 L	1.50
F020	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	1.0	3.50	2.0 L	1.50
F023	<.05 L	0.00	<.05 EL	0.00	<.05 EL	0.00	<.05 EL	0.00	1.05	7.00	2.01 L	3.00
F024	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	1.0	3.50	2.8	11.00
F030	<.4	0.00	1.4	1.00	1.6	1.00	.8	1.00	1.3	10.00	2.3	4.50
F032	<1.	0.00	1.	10.00	1.	9.50	1.	5.00	2. VH	16.00	4. EH	16.50
F033	.4T	4.00	.5T	2.50	.7T	3.50	1.0T	5.00	1.3	10.00	2.8	11.00
F035	<.6	0.00	.9	8.00	1.1	12.00	1.6 VH	11.00	1.7 H	15.00	2.8	11.00
F037	<2.	0.00	<2.	0.00	<2.	0.00	<2.	0.00	<2.	0.00	<2. L	0.00
F038	<.5	0.00	.5	2.50	.7	3.50	1.0	5.00	1.3	10.00	2.5	6.50
F044	.411	5.00	.700	6.00	.864	6.00	1.112	9.00	1.472	12.00	2.667	8.00
F046	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	4. EH	16.50
F047	.28	1.00	.56	4.00	.68	2.00	.95	2.00	1.2	8.00	2.3	4.50
F055	<1.0	0.00	1.0	10.00	1.0	9.50	<1.0	0.00	1.0	3.50	3.5 H	15.00
F062	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0 EL	0.00
MEDIAN CONC.	.3850		.7150		.9200		1.0000		1.3000		2.7650	

SAMPLE LAB NO	7		8		9		10	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	3.80	12.00	3.02	13.00	2.93	11.00	4.28	17.00
F003	3.4	8.00	2.9	7.00	2.8	7.50	4.0	12.00
F008	4.	16.50	3.	10.00	3.	13.00	4.	12.00
F010	4.	16.50	3.	10.00	3.	13.00	4.	12.00
F011	4.9 H	19.00	4.4 EH	18.00	4.5 EH	18.00	6.5 EH	20.00
F016	3.2	7.00	2.7	4.50	1.9 VL	1.00	1.9 EL	2.00
F020	3.0 L	3.50	2.7	4.50	2.2 L	2.00	3.4	7.00
F023	3.11	6.00	2.49	1.00	2.42	4.00	3.46	8.00
F024	3.9	14.00	3.4	15.50	2.9	10.00	4.0	12.00
F030	3.0 L	3.50	2.6	2.50	2.5	5.50	3.3	5.50
F032	5. VH	20.00	4. VH	17.00	4. VH	17.00	6. EH	19.00
F033	3.8	12.00	3.0	10.00	2.8	7.50	4.1	15.00
F035	3.8	12.00	3.4	15.50	3.1	15.00	4.3	18.00
F037	2.45 VL	2.00	<2. VL	0.00	<2. L	0.00	2.38 EL	3.00
F038	3.6	9.00	2.8	6.00	2.5	5.50	3.8	9.00
F044	3.766	10.00	3.102	14.00	2.857	9.00	4.137	16.00
F046	4.	16.50	3.	10.00	3.	13.00	3. L	4.00
F047	3.1	5.00	3.	2.50	3.3	3.00	3.3	5.50
F055	4.0	16.50	3.0	10.00	3.5 H	16.00	4.0	12.00
F062	1.0 EL	1.00	<1.0 EL	0.00	<1.0 EL	0.00	1.6 EL	1.00
MEDIAN CONC.	3.7830		3.0000		2.8785		4.0000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	METHOD CODING
F001	103.00	10.300	10			HYD-AAS
F003	74.00	7.400	10			HYD-ICP
F008	93.00	10.333	9			HYD
F010	83.00	10.375	8			-
F011	153.00	15.300	10	EHEHEHEHEH EHEHEH	BIASED HIGH	
F016	19.50	3.250	6	L VLEL	BIASED LOW	HV-AAS
F020	22.00	3.667	6	L L L	BIASED LOW	GF-AAS
F023	29.00	4.833	6	L ELELEL L		-
F024	66.00	11.000	6			HYD-AAS
F030	34.50	3.833	9	L	BIASED LOW	34005
F032	130.00	14.444	9	VHEHVHVHVHEH	BIASED HIGH	HYD-AAS
F033	80.50	8.050	10			-
F035	117.50	13.056	9	VHH		HYD-AAS
F037	5.00	2.500	2	L VLVLL EL	INSUFFICIENT DATA	GF-AAS
F038	57.00	6.333	9			HV-AAS
F044	95.00	9.500	10			HYDRIDE-ICP-MS
F046	60.00	12.000	5	EH L		GF-AAS
F047	37.50	3.750	10		BIASED LOW	HYD-ICPMS
F055	92.50	11.563	8	H H		HV-AAS
F062	2.00	1.000	2	ELELELELEL	INSUFFICIENT DATA	HYDRIDE-AAS
OVERALL AVERAGE RANK IS				8.792		

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING	BIAS STATEMENT	METHOD CODING
F062	2.00	1.000	2	ELELELELEL	INSUFFICIENT DATA	HYDRIDE-AAS
F037	5.00	2.500	2	LVLVLEL	INSUFFICIENT DATA	GF-AAS
F016	19.50	3.250	6	LVLEL	BIASED LOW	HV-AAS
F020	22.00	3.667	6	LLL	BIASED LOW	GF-AAS
F047	37.50	3.750	10	L	BIASED LOW	HYD-ICPMS
F030	34.50	3.833	9	LELELEL	BIASED LOW	34005
F023	29.00	4.833	6			-
F038	57.00	6.333	9			HV-AAS
F003	74.00	7.400	10			HYD-ICP
F033	80.50	8.050	10			-
F044	95.00	9.500	10			HYDRIDE-ICP-MS
F001	103.00	10.300	10			HYD-AAS
F008	93.00	10.333	9			HYD
F010	83.00	10.375	8			-
F024	66.00	11.000	6			HYD-AAS
F055	92.50	11.563	8	HH		HV-AAS
F046	60.00	12.000	5	EHL		GF-AAS
F035	117.50	13.056	9	VHH	BIASED HIGH	HYD-AAS
F032	130.00	14.444	9	VHEHVHVHVHEH	BIASED HIGH	HYD-AAS
F011	153.00	15.300	10	EHEHEHEHEHEHEH		
OVERALL AVERAGE RANK IS				8.792		

Selenium

PARAMETER: 51095 Antimony

ug/L

RESEARCH AND APPLICATIONS BRANCH  
NATIONAL WATER RESEARCH INSTITUTE  
BURLINGTON ONTARIO

FP/GLAP INTERLAB STUDY 63 - Hydrides

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= .3300 CONCENTRATION ERROR INCREMENT= .1500

SAMPLE LAB NO	1		2		3		4		5		6	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.48	6.50	.76	5.00	1.11	8.00	1.33	10.00	1.52	10.00	2.30	12.00
F003	.3	2.50	.6	3.00	.7	2.00	1.2	6.00	1.5	8.50	2.0	6.00
F011	.3	2.50	.5	2.00	.9	3.50	.7 L	2.00	.9 L	3.00	1.3 VL	3.00
F020	1.1 EH	10.00	1.6 EH	12.00	1.6 VH	11.00	1.3	8.50	1.8	12.00	2.7 H	13.00
F023	<150.	0.00	<150.	0.00	<150.	0.00	<150.	0.00	<150.	0.00	<150.	0.00
F024	.8 H	9.00	.8	6.50	1.2	10.00	1.2	6.00	1.4	6.50	2.2	9.00
F030	<.2	0.00	<.2 VL	0.00	<.2 EL	0.00	<.2 EL	0.00	2.2 H	13.00	2.2 EL	1.00
F032	<1.	0.00	1.	10.50	1.	6.00	2.2 EH	12.50	2.2 H	13.00	2.2	6.00
F033	.4T	4.50	.8T	6.50	1.0	6.00	1.2	6.00	1.4	6.50	2.2	9.00
F038	.4	4.50	.7	4.00	.9	3.50	1.1	4.00	1.3	5.00	1.8	4.00
F044	.508	8.00	.836	9.00	1.131	9.00	1.338	11.00	1.531	11.00	2.279	11.00
F046	<1.	0.00	1.	10.50	2. EH	12.00	2. EH	12.50	3. EH	14.00	3. VH	14.00
F047	.48	6.50	.81	8.00	1.	6.00	1.3	8.50	1.5	8.50	2.2	9.00
F055	<1.0	0.00	<1.0	0.00	<1.0	0.00	1.0	3.00	1.0 L	4.00	2.0	6.00
F062	.2	1.00	.2 VL	1.00	.3 EL	1.00	.3 EL	1.00	.4 EL	2.00	.5 EL	2.00
MEDIAN CONC.	.4400		.8000		1.0000		1.2000		1.4500		2.1000	

SAMPLE LAB NO	7		8		9		10	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	3.00	11.50	3.38	10.00	4.07	12.00	4.86	12.00
F003	2.6	5.50	3.0	6.50	3.6	7.00	4.1	7.50
F011	1.8 VL	4.00	1.9 VL	4.00	2.4 VL	4.00	2.6 VL	3.00
F020	2.9	9.50	3.6	13.00	3.2	5.00	3.5	4.00
F023	<150.	0.00	<150.	0.00	<150.	0.00	<150.	0.00
F024	2.8	7.50	3.0	6.50	3.6	7.00	4.1	7.50
F030	.2 EL	1.00	.3 EL	1.00	.3 EL	1.00	<.2 EL	0.00
F032	3.	11.50	3.	6.50	4.	10.00	4.	5.50
F033	2.6	5.50	3.0	6.50	3.6	7.00	4.0	5.50
F038	2.9	9.50	3.4	11.00	4.1	13.00	4.4	10.00
F044	3.015	13.00	3.423	12.00	4.025	11.00	4.568	11.00
F046	4. EH	14.00	4. VH	14.00	5. VH	14.00	6. EH	13.00
F047	2.8	7.50	3.2	9.00	3.8	9.00	4.2	9.00
F055	1.5 EL	3.00	1.5 EL	3.00	1.5 EL	3.00	2.0 EL	2.00
F062	.8 EL	2.00	.9 EL	2.00	1.2 EL	2.00	1.3 EL	1.00
MEDIAN CONC.	2.8000		3.0000		3.6000		4.1000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING
F001	97.00	9.700	10	
F003	54.50	5.450	10	
F011	31.00	3.100	10	L L VLVLVLVLVL
F020	98.00	9.800	10	EHEVH H
F023	0.00	*****	0	
F024	75.50	7.550	10	H
F030	5.00	1.000	5	VLELELELELELELEL
F032	81.50	9.056	9	EHH
F033	63.00	6.300	10	
F038	68.50	6.850	10	
F044	106.00	10.600	10	
F046	118.00	13.111	9	EHEHEVHEHVHVEH
F047	81.00	8.100	10	
F055	24.00	3.429	7	L ELELELEL
F062	15.00	1.500	10	VLELELELELELELEL
OVERALL AVERAGE RANK IS		7.062		

BIAS STATEMENT	METHOD CODING
	HYD-AAS
	HYD-ICP
BIASED LOW	
	HYD-ICP
INSUFFICIENT DATA	-
	HYD-AAS
BIASED LOW	51003
	HYD-AAS
	-
	HV-AAS
BIASED HIGH	HYDRIDE-ICP-MS
BIASED HIGH	GF-AAS
	HYD-ICPMS
BIASED LOW	HY-AAS
BIASED LOW	HYDRIDE-AAS

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING
F023	0.00	*****	0	
F030	5.00	1.000	5	VLELELELELELELEL
F062	15.00	1.500	10	VLELELELELELELEL
F011	31.00	3.100	10	LLVLVLVLVLVL
F055	24.00	3.429	7	LELELELEL
F003	54.50	5.450	10	
F033	63.00	6.300	10	
F038	68.50	6.850	10	
F024	75.50	7.550	10	H
F047	81.00	8.100	10	
F032	81.50	9.056	9	EHH
F001	97.00	9.700	10	
F020	98.00	9.800	10	EHEVHH
F044	106.00	10.600	10	
F046	118.00	13.111	9	EHEHEVHEHVHVEH
OVERALL AVERAGE RANK IS		7.062		

BIAS STATEMENT	METHOD CODING
	INSUFFICIENT DATA
	-
BIASED LOW	51003
BIASED LOW	HYDRIDE-AAS
BIASED LOW	
BIASED LOW	HV-AAS
BIASED LOW	HYD-ICP
	-
	HV-AAS
	HYD-AAS
	HYD-ICPMS
	HYD-AAS
	HYD-AAS
	HYD-ICP
	HYD-ICP
BIASED HIGH	HYDRIDE-ICP-MS
BIASED HIGH	GF-AAS

Antimony

PARAMETER: 83095 Bismuth

ug/L

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FP/GLAP INTERLAB STUDY 63 - Hydrides

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 1.0000 BASIC ACCEPTABLE ERROR= .5000 CONCENTRATION ERROR INCREMENT= .1500

SAMPLE LAB NO	1		2		3		4		5		6	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.08	1.00	.07	1.00	.12	1.00	.20	1.00	.41 L	1.00	.28 L	1.00
F011	.2	5.00	.2	4.50	.25	5.00	.5	4.50	1.0	4.00	1.0	4.50
F016	.1	2.00	.2	4.50	.2	4.00	.5	4.50	1.2	5.00	1.1	6.00
F023	<250.	0.00	<250.	0.00	<250.	0.00	<250.	0.00	<250.	0.00	<250.	0.00
F024	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	<1.	0.00	1.2	7.00
F035	<100.	6.00	<100.	6.00	1.0 VH	6.00	1.1 H	6.00	1.3	6.00	2.1 EH	8.00
F038	.119	3.00	.115	2.00	.158	2.00	.371	3.00	.737	3.00	.800	3.00
F044	2. EH	7.00	<1.	0.00	<1.	0.00	<1.	0.00	2. VH	7.00	<1.	0.00
F046	.14	4.00	.14	3.00	.17	3.00	.31	2.00	.57	2.00	.42 L	2.00
F047	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	<1.0	0.00	1.0	4.50
F055												
MEDIAN CONC.	.1400		.1700		.1850		.4355		1.0000		1.0000	

SAMPLE LAB NO	7		8		9		10	
	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
F001	.20	1.00	.27 VL	1.00	.43 VL	1.00	.46 EL	1.00
F011	.7	4.00	1.2	4.00	1.5	5.00	2.0	5.00
F016	.9	5.00	1.6	5.00	2.0 H	6.00	2.7 H	6.00
F023	<250.	0.00	<250.	0.00	<250.	0.00	<250.	0.00
F024	<1.	0.00	<1.	0.00	2.4 VH	7.00	3.3 EH	7.00
F035	2.6 EH	7.00	3.2 EH	7.00	3.8 EH	8.00	4.2 EH	8.00
F038	<100.	0.00	<100.	0.00	<100.	0.00	<100.	0.00
F044	.594	3.00	.742	3.00	1.269	4.00	1.889	4.00
F046	<1.	0.00	2. VH	6.00	<1.	0.00	<1. L	0.00
F047	.29	2.00	.47 L	2.00	.62 L	2.00	.73 VL	2.00
F055	2.0 EH	6.00	<1.0	0.00	1.0	3.00	1.0 L	3.00
MEDIAN CONC.	.7000		1.2000		1.3845		1.9445	



LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING
F001	10.00	1.000	10	L L VLVLEL
F011	45.50	4.550	10	
F016	48.00	4.800	10	H H
F023	0.00	-	0	
F024	21.00	7.000	3	VHEH
F035	68.00	6.800	10	H VHH EHEHEHEHEH
F038	0.00	-	0	
F044	30.00	3.000	10	
F046	20.00	6.667	3	EH VH VH L
F047	24.00	2.400	10	L L L VL
F055	16.50	4.125	4	EH L

BIAS STATEMENT	METHOD CODING
BIASED LOW	ICP-MS TQ
	HV-AAS
INSUFFICIENT DATA	-
INSUFFICIENT DATA	HYD-AAS
BIASED HIGH	HYD-AAS
INSUFFICIENT DATA	ICP
BIASED LOW	ICP-MS
INSUFFICIENT DATA	GF-AAS
BIASED LOW	HYD-ICPMS
INSUFFICIENT DATA	HV-AAS

OVERALL AVERAGE RANK IS 4.043

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING
F023	0.00	-	0	
F038	0.00	-	0	
F001	10.00	1.000	10	LLVLVLEL
F047	24.00	2.400	10	LLLVL
F044	30.00	3.000	10	
F055	16.50	4.125	4	EHL
F011	45.50	4.550	10	
F016	48.00	4.800	10	HH
F046	20.00	6.667	3	EHVHVHL
F035	68.00	6.800	10	HVHHEHEHEHEHEH
F024	21.00	7.000	3	VHEH

BIAS STATEMENT	METHOD CODING
INSUFFICIENT DATA	-
INSUFFICIENT DATA	ICP
BIASED LOW	ICP-MS TQ
BIASED LOW	HYD-ICPMS
BIASED LOW	ICP-MS
INSUFFICIENT DATA	HV-AAS
	HV-AAS
INSUFFICIENT DATA	GF-AAS
BIASED HIGH	HYD-AAS
INSUFFICIENT DATA	HYD-AAS

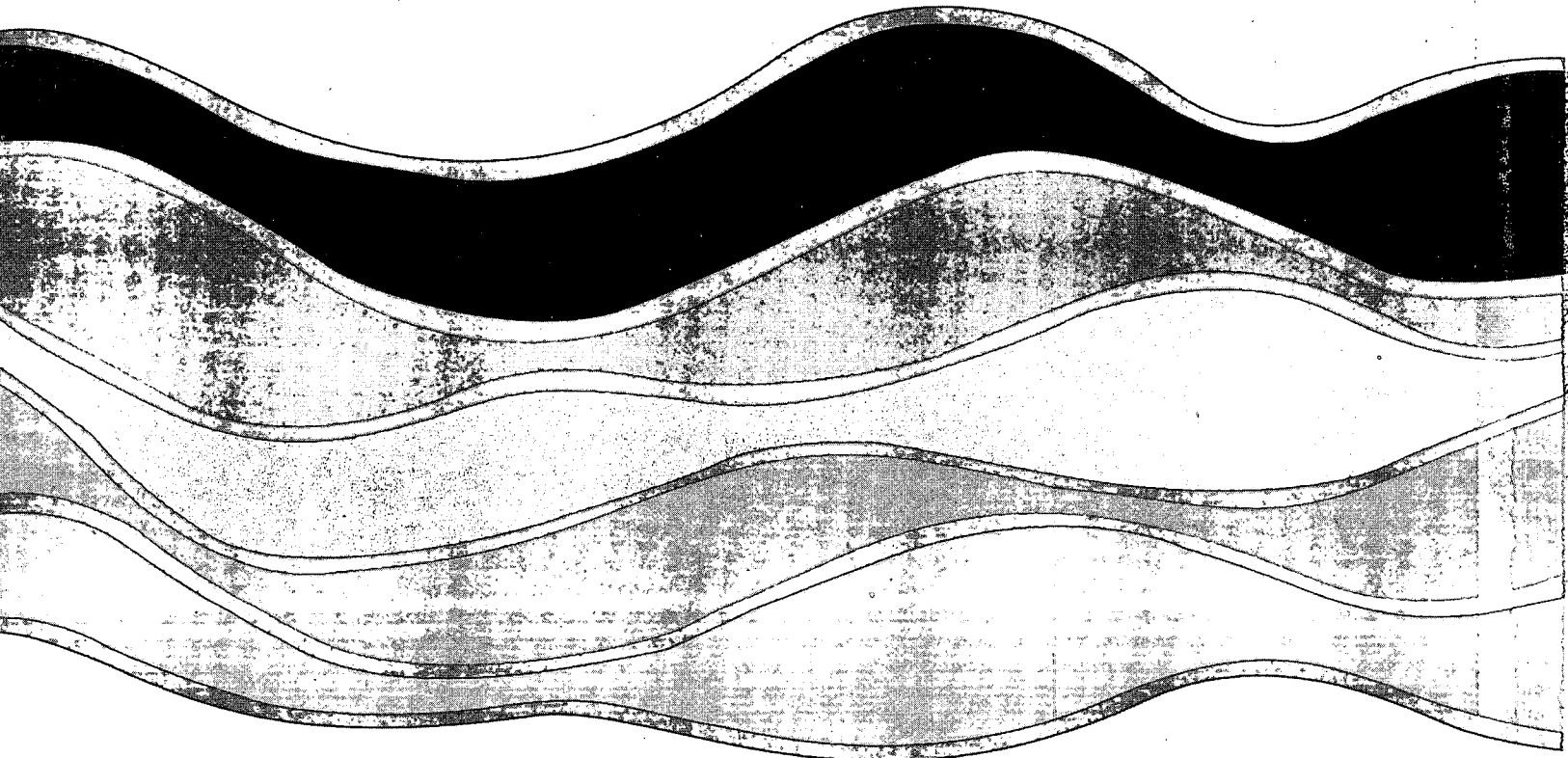
OVERALL AVERAGE RANK IS 4.043

Bismuth

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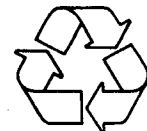


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