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Golder Associates

APR 1995 RECEIVED Validation Log In

April 14, 1995

Our ref: 943-1610.089.0400
94-1610/O/322

CH2M Hill
P.O. Box 1510
Richland, Washington 99352

ATTENTION: Ms. Jeanette Duncan

RE: TRANSMITTAL OF DATA VALIDATION FINAL SUMMARY REPORT
CONTRACT NO. MSH-SWV-315905

Dear Ms. Duncan:

This letter is to transmit the data validation summary for the following project:

Project Name

100 DR 1
Soil Washing Treatability Test Sampling

JUN 1996 RECEIVED EDMC

Please call if you have any questions.

Sincerely,

GOLDER ASSOCIATES INC.

Christina I. Jensen
Task Manager

Enclosures

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DATA VALIDATION SUMMARY REPORT - 100-DR-1 SOIL WASHING TREATABILITY TEST SAMPLING

Prepared for

Bechtel Hanford Inc.
Richland, Washington

Prepared by

Golder Associates Inc.
Redmond, Washington

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CONTENTS (Cont.)

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1.0 INTRODUCTION

This report presents a summary of data validation results on water samples collected for the 100-DR-1 Soil Washing Treatability Test Sampling task.

The analyses performed for this project consisted of:

- Inorganic Analytes;
- General Chemistry Parameters;
- Radiochemistry.

The laboratories used for the analyses were the Quanterra Environmental Services and the Lockheed Analytical Services laboratory.

As required by the contract and the WHC statement of work (WHC 1994), data validation was conducted using Westinghouse data validation procedures (WHC 1993a and 1993b), in which the sample results were validated to level D as specified in the data validation procedures. At the completion of validation and verification of each data package, a data validation summary was prepared and transmitted with the original documentation to Hanford Analytical Services (HAS) for inclusion in the project QA record. Table 1-1 provides information concerning the data packages which were validated and verified. Tables 1-2, 1-3, 1-4 and 1-5 provide a summary and explanation of all qualifiers applied to the validated inorganic, general chemistry, and radiochemistry results, respectively.

Four sections, including this introduction, comprise this report. Sections 2.0, 3.0, and 4.0 provide summaries of the validation of the inorganics, general chemistry, and radiochemistry parameters, respectively. Section 5.0 provides a list of references used to prepare this report and Appendixes A through E to this report include validated data summary tables.

1.1 CHEMICAL ANALYSES

Chemical analysis data consists of 1 water sample and 12 soil samples analyzed for chromium, and 5 water samples analyzed for total suspended solids. The chemical data and associated QC have been reviewed and validated to verify that reported sample results are acceptable for decision making purposes.

1.2 RADIOCHEMICAL ANALYSES

The radiochemical data consists of 5 water samples, 12 soil samples, and 3 samples of other media analyzed for radiochemical parameters. The radiochemical data and associated QC has been reviewed and validated to verify that reported sample results are acceptable for decision making purposes.

1.3 WESTINGHOUSE HANFORD GUIDANCE USED

Data validation was conducted using Westinghouse data validation procedures (WHC 1993a and 1993b).

1.4 MAJOR DEFICIENCIES

No major deficiencies were identified during the validation of the inorganic, general chemistry, and radiochemistry parameters.

1.5 GENERAL QUALITY TRENDS

The objectives of this project were to validate the samples against level D validation criteria specified in the validation procedures (WHC 1993a and 1993b). In addition, this report provides a summary of the data in terms of defined laboratory performance criteria and project-specific data quality objectives to assure the data is acceptable for use in the 100-DR-1 Soil Washing Treatability Test Sampling task. For purposes of this report, the validated results were reviewed against the following data quality indicators:

- Precision of laboratory and field duplicate measurements;
- Accuracy in terms of laboratory spikes, control samples, laboratory and field blanks and proper reporting;
- Representativeness in terms of field duplicate analyses;
- Completeness in terms of compliance with holding times, the percentage of valid measurements versus the total number of measurements performed and correctness of results; and
- Comparability in terms of field split samples and reporting units.

1.6 SAMPLES AND ANALYSES VALIDATED

Table 1-1 provides a cross-reference list of all samples validated including data package tracking numbers, sample numbers, sample dates, site and sample locations, sample type, and analyses performed.

Table 1-1. 100-DR-1 Soil Washing Treatability Tests, List of Samples Validated.

Data Package ID	HEIS No.	Sample Date	Location	Matrix	Sample Type	Validation Level	M	W	R
W0368-QES	B0DDB6	10-Jan-95	8	W		D		X	X
W0368-QES	B0DDD8	10-Jan-95	16	W		D		X	X
W0368-QES	B0DDF8	10-Jan-95	12	W		D		X*	X*
W0368-QES	B0DDG8	10-Jan-95	15	W		D		X*	X*
W0368-QES	B0DDH9	10-Jan-95	9	W		D		X	X
W0368-QES	B0DDL3	11-Jan-95	11	W	TRIP BLANK	D	X		X
W0368-QES	B0DDM0	09-Jan-95	1	S		D	X*		X*
W0368-QES	B0DDN3	10-Jan-95	3	S		D	X		X
W0368-QES	B0DDP3	10-Jan-95	4	S		D	X*		X*
W0368-QES	B0DDQ3	10-Jan-95	10	S		D	X		X
W0368-QES	B0DDR1	11-Jan-95	13	S		D	X*		X*
W0368-QES	B0DDS4	11-Jan-95	14	S		D	X*		X*
W0368-QES	B0DDX0	09-Jan-95	1	S	FIELD DUPLICATE	D	X		X
W0368-QES	B0DDX5	10-Jan-95	4	S	FIELD DUPLICATE	D	X		X
W0368-QES	B0DDX7	10-Jan-95	10	S	FIELD DUPLICATE	D	X		X
W0368-QES	B0DDY0	11-Jan-95	13	S	FIELD DUPLICATE	D	X		X
LK3629-LAS	B0DDY2	11-Jan-95	13	S	SPLIT	D	X		X
W0368-QES	B0DDY3	11-Jan-95	14	S	FIELD DUPLICATE	D	X		X
W0368-QES	B0DF10	11-Jan-95	5	O		D			X
W0368-QES	B0DF15	09-Jan-95	6	O		D			X
W0368-QES	B0DF27	10-Jan-95	7	O		D			X*

*Indicates sample results which were 100% recalculated.
M - metals
W - general chemistry
R - radiochemistry
S - soil matrices
W - water matrices
O - other matrices

Table 1-2. Glossary of Inorganic Data Reporting Qualifiers.

B - Indicates the constituent was analyzed for and detected. The concentration reported is less than the contract required detection limit (CRDL) but greater than the instrument detection limit (IDL). The associated data should be considered usable for decision making purposes.

U - Indicates the constituent was analyzed for and not detected. The concentration reported is the sample detection limit corrected for aliquot size, dilution and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for decision making purposes.

UJ - Indicates the constituent was analyzed for and not detected. Due to a minor quality control deficiency identified during data validation the concentration may not accurately reflect the sample detection limit. The associated data have been qualified as estimated but should be considered usable for decision making purposes.

BJ - Indicates the constituent was analyzed for and detected at a concentration less than the contract required detection limit (CRDL) but greater than the instrument detection limit (IDL). Due to a minor quality control deficiency identified during data validation the associated data have been qualified as estimated, but should be considered usable for decision making purposes.

J - Indicates the constituent was analyzed for and detected. Due to a minor quality control deficiency identified during data validation the associated data have been qualified as estimated, but should be considered usable for decision making purposes.

UR - Indicates the constituent was analyzed for and not detected. Due to a major quality control deficiency identified during data validation, the associated data have been qualified as unusable for decision making purposes.

R - Indicates the constituent was analyzed for and detected. Due to a major quality control deficiency identified during data validation, the associated data have been qualified as unusable for decision making purposes.

Table 1-3. Glossary of Radiochemistry Data Reporting Qualifiers.

U - Indicates the constituent was analyzed for, but was not detected at a concentration above the minimum detectable activity (MDA). The concentration reported is the sample result corrected for sample aliquot size, dilution factors and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for decision making purposes.

UJ - Indicates the constituent was analyzed for and was not detected at a concentration above the MDA. Due to a quality control deficiency identified during data validation, the result reported may not accurately reflect the sample concentration. The associated data should be considered usable for decision making purposes.

J - Indicates the constituent was analyzed for and detected. The concentration reported is qualified as estimated due to a quality control deficiency identified during data validation. The associated data should be considered usable for decision making purposes.

UR - Indicates the constituent was analyzed for and not detected. The concentration reported is qualified as unusable due to a quality control deficiency identified during data validation. The associated data should be considered unusable for decision making purposes.

R - Indicates the constituent was analyzed for and detected. The concentration reported is qualified as unusable due to a quality control deficiency identified during data validation. The associated data should be considered unusable for decision making purposes.

2.0 INORGANIC ANALYSIS DATA VALIDATION SUMMARY

2.1 SUMMARY

This section presents a summary of the inorganic data validation results and review against the WHC Statement of Work (WHC 1994). Table 1-1 shows the data package identification, sample identification, sample collection date, location and sample type. Appendix A provides a summary of all validated data results.

2.1.1 Sample Delivery Groups

Sample results from two inorganic data packages are included in this report:

Data Package ID	No. of Samples
W0368-QES	12
LK3629-LAS	1

2.1.2 All Samples Validated

Results for the data packages listed above were validated at the frequency specified in Section 1.0 with data qualifiers assigned as specified in the validation procedures.

2.1.3 Westinghouse Hanford Validation Guidance Used

Data validation was performed in accordance with Data Validation Procedures for Chemical Analyses (WHC 1993a).

2.1.4 Samples Analyzed According to CLP Protocols

This section provides a summary of the data in terms of defined laboratory performance criteria and project-specific data quality objectives to assure the data is acceptable for use in the 100-DR-1 Soil Washing Treatability Test Sampling task.

- **Precision.** All laboratory duplicate sample RPD results were acceptable.
- **Accuracy.** All spike sample recoveries were within specified control limits.
- **Representativeness.** Field duplicate RPD values were acceptable for all sample sets.
- **Completeness.** Overall, 13 samples were validated for inorganics with 13 results reported, all of which were deemed valid. This results in a completeness of 100% which meets normal work plan QAPjP objectives of 90%.

- **Comparability.** Field split RPD values were acceptable for all sample sets. All results were reported in common units (milligrams per kilogram, mg/Kg) facilitating comparison of the data.

2.1.5 Deficiencies Noted

There were no major or minor deficiencies identified during validation.

2.2 ANALYTICAL METHOD

The following paragraphs summarize the analytical requirements for the inorganics analyses.

2.2.1 Calibration

Compliance with equipment systems requirements demonstrates the analytical instrument was capable of producing acceptable quantitative results prior to the analysis of all samples. All initial and continuing calibration requirements were met.

2.2.2 Blanks

2.2.2.1 Laboratory Blanks. Laboratory method blanks were analyzed at the proper frequency and results were acceptable.

2.2.2.2 Field Blanks. Sample B0DDL3 was identified as a trip blank with no target analytes detected.

2.3 HOLDING TIMES

The holding time of six months for inorganics analysis was met for all samples.

2.4 ANALYTICAL ACCURACY

2.4.1 Spike Samples

The spike sample percent recoveries were all within specified control limits.

2.4.2 Laboratory Control Samples

All laboratory control sample percent recoveries were within the control limits for all data packages.

2.5 ANALYTICAL PRECISION

2.5.1 Laboratory Duplicates

The laboratory duplicate relative percent differences (RPDs) were within the specified control limits for all data packages.

2.5.2 ICP Serial dilution

The ICP serial dilution percent difference (%D) were acceptable for data package LK3629-LAS. An ICP serial dilution was not reported for data package W0368-QES. No qualification of the data was required.

2.5.3 Field Duplicates

A total of five samples were identified as field duplicates and were analyzed for chromium. Appendix B presents a summary of the primary and duplicate sample results and the calculated RPD values. All RPD values were compared to the specified control limits and were acceptable.

2.5.3 Field Splits

A total of one sample was identified as a field split and was analyzed for chromium. Appendix B presents a summary of the primary and field split sample results and the calculated RPD values. All RPD values were compared to the control limits and were acceptable.

2.6 GRAPHITE FURNACE PERFORMANCE

No graphite furnace analyses were performed.

2.7 SAMPLE RESULT QUANTITATION, VERIFICATION, AND REPORTED DETECTION LIMITS

All sample results were verified and recalculated against the raw data and were acceptable. Sample detection limits were calculated properly and were consistent with method detection limit requirements.

2.8 SYSTEM PERFORMANCE AND OVERALL ASSESSMENT

System performance was assessed by a review of the raw data with no indications of poor performance noted.

3.0 GENERAL CHEMISTRY ANALYSIS DATA VALIDATION SUMMARY

3.1 SUMMARY

This section presents a summary of the general chemistry data validation results and review against the WHC Statement of Work (WHC 1994). Table 1-1 shows the data package identification, sample identification, sample collection date, location and sample type. Appendix C provides a summary of all validated data results.

3.1.1 Sample Delivery Groups

Sample results from one general chemistry data package are included in this report:

Data Package ID	No. of Samples
WO368-QES	5

3.1.2 Samples Validated

Results for the data package listed above were validated at the frequency specified in Section 1.0 with data qualifiers assigned as specified in the validation procedures.

3.1.3 Westinghouse Hanford Validation Guidance Used

Data validation was performed in accordance with Data Validation Procedures for Chemical Analyses (WHC 1993a).

3.1.4 Samples Analyzed

This section provides a summary of the data in terms of defined laboratory performance criteria and project-specific data quality objectives to assure the data is acceptable for use in the 100-DR-1 Soil Washing Treatability Tests Sampling task.

- **Precision.** The laboratory duplicate sample RPD result was acceptable.
- **Accuracy.** The analytical method used does not require a matrix spike.

  The laboratory control sample result was within limits for the data package.
- **Representativeness.** No field duplicate samples were taken, therefore representativeness could not be assessed.

- **Completeness.** Overall, five water samples were validated for general chemistry with five results reported, all of which were deemed valid. This results in a completeness of 100 percent which meets normal work plan QAPjP objectives of 90 percent.

- **Comparability.** Samples were analyzed by similar methods and all results were reported in common units, facilitating comparison of the data.

3.1.5 Deficiencies Noted

There were no major or minor deficiencies identified requiring qualification of the data as either unusable or estimated.

3.2 ANALYTICAL METHOD

Performance of specific instrument quality assurance and quality control procedures, including deficiencies noted during the quality assurance review, are discussed below.

3.2.1 Initial and Continuing Calibration

Initial and continuing calibration requirements were met for all analyses in the data package.

3.2.2 Blanks

Laboratory method blanks were analyzed at the proper frequency and results were reported and verified as undetected for all general chemistry parameters.

3.3 HOLDING TIMES

The holding times for general chemistry parameters were met for all samples.

3.4 ANALYTICAL ACCURACY

3.4.1 Matrix Spike and Matrix Spike Duplicates

The analytical method used does not require a matrix spike.

3.4.2 Laboratory Control Samples

The laboratory control sample percent recovery was acceptable for the data package.

3.5 ANALYTICAL PRECISION

3.5.1 Laboratory Duplicates

The laboratory duplicate relative percent difference was within the specified control limits for the data package.

3.6 COMPOUND IDENTIFICATION

The compound identification and confirmation were acceptable for all validated samples.

3.7 SAMPLE RESULT QUANTITATION, VERIFICATION, AND REPORTED DETECTION LIMITS

All sample results were verified and recalculated against the raw data and were acceptable. Sample quantitation limits for all samples were calculated correctly and properly reported.

3.8 SYSTEM PERFORMANCE AND OVERALL ASSESSMENT

Overall assessment of the analytical methods and sample and QC results were satisfactory.

4.0 RADIOCHEMISTRY DATA VALIDATION SUMMARY

4.1 SUMMARY

This section presents a summary of the radiochemistry data validation results and review against the WHC Statement of Work (WHC 1994). Table 1-1 shows the data package identification, sample identification, sample collection date, location and sample type. Appendix D provides a summary of all validated data results and Appendix E provides a summary of the field QC results.

4.1.1 Sample Delivery Groups

Sample results from two radiochemistry data packages are included in this report:

Data Package ID	No. of Samples
LK3629-LAS	1
W0368-QES	19

4.1.2 Samples Validated

Results for the data packages listed above were validated at the frequency specified in Section 1.0 with data qualifiers assigned as specified in the validation procedures.

4.1.3 Westinghouse Hanford Validation Guidance Used

Data validation was performed in accordance with Data Validation Procedures for Radiochemical Analyses (WHC 1993b).

4.1.4 Samples Analyzed

This section provides a summary of the data in terms of defined laboratory performance criteria and project-specific data quality objectives to assure the data is acceptable for use in the 100-DR-1 Soil Washing Treatability Tests Sampling task.

- **Precision.** Laboratory duplicate RPD results were acceptable for all data packages with the exception of strontium-90 (see Section 4.4.1).

  Field duplicate RPD results were acceptable for all sample sets collected.

- **Accuracy.** Laboratory control sample results were acceptable for all data packages with the exception of gross alpha (see Section 4.3.1).

The analytical methods used did not require matrix spikes.

Tracer yields were acceptable for all samples analyzed with the exception of alpha spectrometry (see Section 4.3.3).

- **Representativeness.** Field duplicate RPDs were acceptable for all data packages.

  Field split sample RPDs were acceptable with the exception of gross beta and total strontium (see Section 4.4.3).

- **Completeness.** A total of 20 samples were validated for radiochemistry parameters with 247 results reported, all of which were deemed valid. This results in a completeness of 100 percent which meets normal work plan objectives of 90 percent.

- **Comparability.** Samples were analyzed by similar methods and all results were reported in common units, facilitating comparison of results.

4.1.5 Deficiencies Noted

There were no major deficiencies identified during validation which required qualification of the data as unusable. Minor deficiencies were identified requiring qualification of the data which are explained in greater detail below.

4.2 ANALYTICAL METHOD

The following paragraphs summarize the analytical requirements for the radiochemistry analyses.

4.2.1 Instrument Calibration

Initial and continuing calibration requirements were met for all analyses in all data packages.

4.2.2 Blanks

4.2.2.1 Method Blanks. Laboratory method blanks were analyzed at the proper frequency and results were reported and verified as undetected for all analyses.

4.2.2.2 Equipment Blanks. There were no equipment blank samples included in any of the data packages.

4.2.2.3 Trip Blanks. Sample B0DDL3 was identified as a trip blank with all results reported as nondetected.

4.2.3 Holding Times

Holding time requirements were met for all samples validated.

4.3 ANALYTICAL ACCURACY

4.3.1 Laboratory Control Samples

Laboratory control (blank spike) samples were analyzed at the required frequency and all results were within control limits with the exception of the following:

Data Package W0368-QES. Gross alpha for samples B0DDM0, B0DDN3, B0DDP3, B0DDQ3, B0DDR1, B0DDS4, B0DDX0, B0DDX5, B0DDX7, B0DDY0 and B0DDY3.

In accordance with validation procedures, sample results were qualified as estimated (J/UJ) for the indicated analyses.

4.3.2 Matrix Spikes

The analytical methods used did not require matrix spikes.

4.3.3 Chemical Yield

Chemical yields for carriers and tracers were acceptable for all analyses with the exception of the following:

Data Package W0368-QES. Alpha Spectrometry for samples B0DDP3 and B0DDQ3.

In accordance with the validation requirements, sample results were qualified as estimated (UJ) for the indicated analysis.

4.4 ANALYTICAL PRECISION

4.4.1 Laboratory Duplicates

Laboratory duplicate relative percent difference (RPD) values were acceptable with the exception of the following:

Data Package LK3629-LAS. Strontium-90 for sample B0DDY2.

In accordance with the validation requirements, sample results were qualified as estimated (J) for the indicated analysis.

4.4.2 Field Duplicates

Five sets of field duplicates were collected and Appendix F presents a summary of the primary and duplicate sample results and the calculated RPD values. All RPD values were acceptable.

4.4.3 Field Splits

One set of field splits was collected and Appendix E presents a summary of the primary and duplicate sample results and the calculated RPD values. All RPD values were acceptable with the following exception:

Sample set B0DDR1/B0DDY2: gross beta and total strontium.

In accordance with the validation requirements, qualification was not required.

4.5 SAMPLE RESULTS QUANTITATION, VERIFICATION AND REPORTED DETECTION LIMITS

All sample results were verified and confirmed against the raw data and correctly reported. Validated results were calculated using the proper detectors, efficiencies and background counts.

Minimum detectable activities (MDAs) met method detection limit requirements with the exception of the following:

Data Package LK3629-LAS. Cobalt-60, cesium-137, europium-152, -154, -155 and radium-226 for sample B0DDY2.

Data Package W0368-QES. Europium-154 and -155 for samples B0DDR1, B0DDX0, B0DDX7, B0DDY3, B0DDS4, B0DDM0, B0DF10, B0DF15 and B0DF27.

Europium-152 for samples B0DDQ3 and B0DDP3.

Europium-154 for sample B0DDQ3.

Europium-155 for sample B0DDY0.

Cobalt-60 for samples B0DF15 and B0DF27.

In accordance with validation procedures, qualification based on detection limits is not required.

4.6 SYSTEM PERFORMANCE AND OVERALL ASSESSMENT

System performance was assessed by a review of the raw data and no indications of poor performance were noted.

5.0 REFERENCES

WHC 1993a, Data Validation Procedures for Chemical Analyses, WHC-SD-EN-SPP-002, Rev. 2, 1993. Westinghouse Hanford Company, Richland, Washington.

WHC 1993b, Data Validation Procedures for Radiochemical Analyses, WHC-SD-EN-SPP-001, Rev. 1, 1993. Westinghouse Hanford Company, Richland, Washington.

WHC 1994, Environmental and Waste Characterization Analytical Data Validation, Statement of Work, MSH-SWV-315905, August 10, 1994, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

METALS VALIDATED DATA SUMMARY TABLES

	Samp#	BODDL3		BODDM0		BODDN3		BODDP3		BODDQ3		BODDR1	
	Date	1-11-95		1-9-95		1-10-95		1-10-95		1-10-95		1-11-95	
	Location	11		1		3		4		10		13	
	Depth	---		---		---		---		---		---	
	Type	WATER (UG/L)		SOIL		SOIL		SOIL		SOIL		SOIL	
	Comments	TRIP BLANK											
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
CHROMIUM	MG/KG	2.900	U	6.400		2.300		3.500		5.400		16.400	

The decimal places shown do not reflect the precision reported by the laboratory

	Samp#	B0DDS4		B0DDX0		B0DDX5		B0DDX7		B0DDY0		B0DDY2	
	Date	1-11-95		1-9-95		1-10-95		1-10-95		1-11-95		1-11-95	
	Location	14		1		4		10		13		13	
	Depth	---		---		---		---		---		---	
	Type	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	Comments			FIELD DUPLICATE		FIELD DUPLICATE		FIELD DUPLICATE		FIELD DUPLICATE		SPLIT	
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
CHROMIUM	MG/KG	23.100		7.400		2.300		5.400		19.600		14.400	

The decimal places shown do not reflect the precision reported by the laboratory

	Samp#	BODDY3	
	Date	1-11-95	
	Location	14	
	Depth	---	
	Type	SOIL	
	Comments	FIELD DUPLICATE	
Parameter	Units	Result	Q
CHROMIUM	MG/KG	22.900	

The decimal places shown do not reflect the precision reported by the laboratory

9613444.0524

APPENDIX B

METALS VALIDATED FIELD QUALITY CONTROL SAMPLE SUMMARY

Field Duplicate, mg/kg						
Sample Number		B0DDX0		B0DDM0		
Date		1/9/95		1/9/95		
Location		1		1		
Comments		Duplicate				
Parameter	CRDL	RESULT	Q	RESULT	Q	RPD
Chromium	10	7.4		6.4		14.5

Field Duplicate, mg/kg						
Sample Number		B0DDX7		B0DDQ3		
Date		1/10/95		1/10/95		
Location		10		10		
Comments		Duplicate				
Parameter	CRDL	RESULT	Q	RESULT	Q	RPD
Chromium	10	5.4		5.4		0

Field Duplicate, mg/kg						
Sample Number		B0DDY0		B0DDR1		
Date		1/11/95		1/11/95		
Location		13		13		
Comments		Duplicate				
Parameter	CRDL	RESULT	Q	RESULT	Q	RPD
Chromium	10	19.6		16.4		17.8

Field Split, mg/kg						
Sample Number		B0DDY2		B0DDR1		
Date		1/11/95		1/11/95		
Location		13		13		
Comments		Split				
Parameter	CRDL	RESULT	Q	RESULT	Q	RPD
Chromium	10	14.4		16.4		13

Field Duplicate, mg/kg						
Sample Number		B0DDY3		B0DDS4		
Date		1/11/95		1/11/95		
Location		14		14		
Comments		Duplicate				
Parameter	CRDL	RESULT	Q	RESULT	Q	RPD
Chromium	10	22.9		23.1		.9

Field Duplicate, mg/kg						
Sample Number		B0DDX5		B0DDP3		
Date		1/10/95		1/10/95		
Location		4		4		
Comments		Duplicate				
Parameter	CRDL	RESULT	Q	RESULT	Q	RPD
Chromium	10	2.3		3.5		41.4

APPENDIX C

GENERAL CHEMISTRY VALIDATED DATA SUMMARY TABLES

	Samp#	B0DDB6		B0DDD8		B0DDF8		B0DDG8		B0DDH9	
	Date	1-10-95		1-10-95		1-10-95		1-10-95		1-10-95	
	Location	8		16		12		15		9	
	Depth	---		---		---		---		---	
	Type	WATER		WATER		WATER		WATER		WATER	
	Comments										
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
TOTAL SUSPENDED SOLIDS	MG/L	14200.000		33.000		52.000		168.000		184.000	

The decimal places shown do not reflect the precision reported by the laboratory

APPENDIX D

RADIOCHEMISTRY VALIDATED DATA SUMMARY TABLES

Parameter	Samp#	B0DDX5		B0DDX7		B0DDY0		B0DDY2		B0DDY3		B0DF10	
	Date	1-10-95		1-10-95		1-11-95		1-11-95		1-11-95		1-11-95	
	Location	4		10		13		13		14		5	
	Depth	---		---		---		---		---		---	
	Type	SOIL		SOIL		SOIL		SOIL		SOIL		OTHER	
	Comments	FIELD DUPLICATE		FIELD DUPLICATE		FIELD DUPLICATE		SPLIT		FIELD DUPLICATE			
	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
GROSS ALPHA	pCi/G	6.080	J	5.430	J	8.780	J	15.200		14.500	J	---	
GROSS BETA	pCi/G	18.500		22.800		79.700		112.200		58.900		---	
COBALT-58	pCi/G	0.005	U	0.008	U	0.348		0.120	U	0.042	U	0.045	U
COBALT-60	pCi/G	0.034	U	0.032	U	3.350		3.170		1.930		0.099	
CESIUM-137	pCi/G	---		---		---		67.400		---		---	
CESIUM-137DA	pCi/G	3.950		6.350		70.900		---		53.300		9.760	
EUROPIUM-152	pCi/G	0.289		0.823		42.200		45.200		17.900		1.840	
EUROPIUM-154	pCi/G	0.029	U	0.049	U	3.410		3.360		1.120		0.165	
EUROPIUM-155	pCi/G	0.042	U	0.037	U	-0.058	U	0.080	U	0.075	U	-0.014	U
IRON-59	pCi/G	0.000	U	-0.099	U	-0.004	U	0.030	U	0.109	U	-0.049	U
POTASSIUM-40	pCi/G	8.760		9.050		16.300		---		14.500		9.520	
LEAD-212	pCi/G	---		---		---		1.050		---		---	
PLUTONIUM-238	pCi/G	-0.002	U	0.000	U	0.009	U	0.019	U	0.025	U	---	
PLUTONIUM-239/240	pCi/G	0.040		0.055	U	1.250		1.270		0.817		---	
RADIUM-224DA	pCi/G	0.419		0.360		1.010		---		1.230		0.466	
RADIUM-226	pCi/G	---		---		---		1.900	U	---		---	
RADIUM-226DA	pCi/G	0.419		0.291		---		---		---		0.393	
RADIUM-228DA	pCi/G	0.463		0.489		---		---		---		---	
STRONTIUM	pCi/G	0.788		0.891		3.880		1.930	J	4.760		---	
URANIUM-235	pCi/G	---		---		---		-0.570	U	---		---	

The decimal places shown do not reflect the precision reported by the laboratory

	Samp#	B0DDN3		B0DDP3		B0DDQ3		B0DDR1		B0DDS4		B0DDX0	
	Date	1-10-95		1-10-95		1-10-95		1-11-95		1-11-95		1-9-95	
	Location	3		4		10		13		14		1	
	Depth	---		---		---		---		---		---	
	Type	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
	Comments											FIELD DUPLICATE	
Parameter	Units	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
GROSS ALPHA	pCi/G	5.890	J	8.330	J	9.500	J	9.340	J	17.800	J	3.900	UJ
GROSS BETA	pCi/G	16.200		24.000		22.700		73.500		63.700		27.800	
COBALT-58	pCi/G	-0.002	U	-0.009	U	-0.032	U	0.179		0.106	U	-0.000	U
COBALT-60	pCi/G	0.005	U	0.013	U	0.053		3.110		1.920		0.321	
CESIUM-137	pCi/G	---		---		---		---		---		---	
CESIUM-137DA	pCi/G	0.524		4.020		6.410		66.300		50.200		10.800	
EUROPIUM-152	pCi/G	-0.013	U	0.247		0.713		39.300		17.100		3.710	
EUROPIUM-154	pCi/G	-0.078	U	-0.023	U	0.004	U	3.030		1.130		0.308	
EUROPIUM-155	pCi/G	0.044	U	0.021	U	-0.007	U	0.221	U	0.105	U	0.016	U
IRON-59	pCi/G	-0.038	U	0.078	U	-0.048	U	0.120	U	-0.102	U	0.016	U
POTASSIUM-40	pCi/G	14.000		9.840		3.620		15.000		13.000		7.690	
LEAD-212	pCi/G	---		---		---		---		---		---	
PLUTONIUM-238	pCi/G	-0.009	U	-0.009	UJ	-0.024	UJ	0.038	U	-0.007	U	0.018	U
PLUTONIUM-239/240	pCi/G	0.015	U	0.085	UJ	0.019	UJ	1.270		0.572		0.281	
RADIUM-224DA	pCi/G	0.725		0.531		0.373		---		0.948		0.498	
RADIUM-226	pCi/G	---		---		---		---		---		---	
RADIUM-226DA	pCi/G	0.646		0.352		---		---		0.830		0.488	
RADIUM-228DA	pCi/G	0.863		0.540		0.477		---		---		---	
STRONTIUM	pCi/G	0.712		0.993		0.830		4.300		3.280		1.140	
URANIUM-235	pCi/G	---		---		---		---		---		---	

The decimal places shown do not reflect the precision reported by the laboratory

Parameter	Samp# / Date / Location / Depth / Type / Comments	Units	B0DDD8 1-10-95 16 --- WATER		B0DDF8 1-10-95 12 --- WATER		B0DDG8 1-10-95 15 --- WATER		B0DDH9 1-10-95 9 --- WATER		B0DDL3 1-11-95 11 --- WATER TRIP BLANK		B0DDM0 1-9-95 1 --- SOIL (pCi/G)	
			Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
GROSS ALPHA		pCi/L	---		---		---		---		---		3.620	UJ
GROSS BETA		pCi/L	---		---		---		---		---		27.400	
COBALT-58		pCi/L	-2.930	U	1.650	U	-0.621	U	3.820	U	1.880	U	0.026	U
COBALT-60		pCi/L	-1.380	U	1.960	U	4.530	U	5.060	U	0.806	U	0.266	
CESIUM-137		pCi/G	---		---		---		---		---		---	
CESIUM-137DA		pCi/L	3.960	U	0.797	U	15.500		24.500		2.960	U	10.100	
EUROPIUM-152		pCi/L	-5.460	U	2.690	U	16.300	U	9.100	U	-1.860	U	3.100	
EUROPIUM-154		pCi/L	-4.470	U	15.000	U	-0.462	U	-19.400	U	3.810	U	0.292	
EUROPIUM-155		pCi/L	8.560	U	2.420	U	5.790	U	-7.760	U	-2.500	U	0.074	U
IRON-59		pCi/L	-9.780	U	1.610	U	-0.360	U	-5.370	U	-10.200	U	-0.006	U
POTASSIUM-40		pCi/L	---		---		---		---		---		9.020	
LEAD-212		pCi/G	---		---		---		---		---		---	
PLUTONIUM-238		pCi/L	---		---		---		---		---		-0.009	U
PLUTONIUM-239/240		pCi/L	---		---		---		---		---		0.156	
RADIUM-224DA		pCi/L	---		---		---		---		---		0.453	
RADIUM-226		pCi/G	---		---		---		---		---		---	
RADIUM-226DA		pCi/L	---		---		---		---		---		0.482	
RADIUM-228DA		pCi/L	---		---		---		---		---		0.436	
STRONTIUM		pCi/L	---		---		---		---		---		1.670	
URANIUM-235		pCi/G	---		---		---		---		---		---	

The decimal places shown do not reflect the precision reported by the laboratory

Parameter	Samp# / Date / Location / Depth / Type / Comments	Units	BODF15 1-9-95 6 --- OTHER Result	Q	BODF27 1-10-95 7 --- OTHER Result	Q
GROSS ALPHA		pCi/G	---		---	
GROSS BETA		pCi/G	---		---	
COBALT-58		pCi/G	0.003	U	0.017	U
COBALT-60		pCi/G	0.079		0.056	
CESIUM-137		pCi/G	---		---	
CESIUM-137DA		pCi/G	6.850		7.780	
EUROPIUM-152		pCi/G	1.130		1.000	
EUROPIUM-154		pCi/G	0.120	U	0.163	
EUROPIUM-155		pCi/G	-0.030	U	0.023	U
IRON-59		pCi/G	0.002	U	0.012	U
POTASSIUM-40		pCi/G	9.480		9.070	
LEAD-212		pCi/G	---		---	
PLUTONIUM-238		pCi/G	---		---	
PLUTONIUM-239/240		pCi/G	---		---	
RADIUM-224DA		pCi/G	0.454		0.654	
RADIUM-226		pCi/G	---		---	
RADIUM-226DA		pCi/G	0.463		0.451	
RADIUM-228DA		pCi/G	---		0.657	
STRONTIUM		pCi/G	---		---	
URANIUM-235		pCi/G	---		---	

The decimal places shown do not reflect the precision reported by the laboratory

APPENDIX E

RADIOCHEMISTRY VALIDATED FIELD QUALITY CONTROL SAMPLE SUMMARY

Field Duplicate, pCi/G						
Sample Number		B0DDX0		B0DDM0		
Date		1/9/95		1/9/95		
Location		1		1		
Comments		Duplicate				
Parameter	RDL	Result	Q	Result-1	Q-1	RPD
ALPHA	10	3.9	UJ	3.62	UJ	NC
BETA	15	27.8		27.4		1.4
CO-58		-0.00036	U	0.0259	U	NC
CO-60	0.05	0.321		0.266		18.7
CS-137DA	0.1	10.8		10.1		6.7
EU-152	0.1	3.71		3.1		17.9
EU-154	0.1	0.308		0.292		5.3
EU-155	0.1	0.0161	U	0.0736	U	NC
FE-59		0.0161	U	-0.00575	U	NC
K-40		7.69		9.02		15.9
PU-238	1	0.0176	U	-0.00891	U	NC
PU-239/40	1	0.281		0.156		57.2
RA-224DA		0.498		0.453		9.5
RA-226DA	0.1	0.488		0.482		1.2
RA-228DA	0.2	NR		0.436		NC
STRONTIUM	1	1.14		1.67		37.7

NC - not calculated
NR - not reported by the laboratory

Field Duplicate, pCi/L						
Sample Number		B0DDX7		B0DDQ3		
Date		1/10/95		1/10/95		
Location		10		10		
Comments		Duplicate				
Parameter	RDL	Result	Q	Result	Q	RPD
ALPHA	10	5.43	J	9.5	J	54.5
BETA	15	22.8		22.7		.4
CO-58		0.0079	U	-0.0317	U	NC
CO-60	0.05	0.0325	U	0.0529		200
CS-137DA	0.1	6.35		6.41		.9
EU-152	0.1	0.823		0.713		14.3
EU-154	0.1	0.049	U	0.00414	U	NC
EU-155	0.1	0.037	U	-0.00725	U	NC
FE-59		-0.0987	U	-0.0478	U	NC
K-40		9.05		3.62		85.7
PU-238	1	0	U	-0.024	UJ	NC
PU-239/40	1	0.0546	U	0.0192	UJ	NC
RA-224DA		0.36		0.373		3.5
RA-226DA	0.1	0.291		NR		NC
RA-228DA	0.2	0.489		0.477		2.5
STRONTIUM	1	0.891		0.83		7.1

NC - not calculated
NR - not reported by the laboratory

Field Duplicate, pCi/L						
Sample Number		B0DDY0		B0DDR1		
Date		1/11/95		1/11/95		
Location		13		13		
Comments		Duplicate				
Parameter	RDL	Result	Q	Result	Q	RPD
ALPHA	10	8.78	J	9.34	J	6.1
BETA	15	79.7		73.5		8.1
CO-58		0.348		0.179		64.1
CO-60	0.05	3.35		3.11		7.4
CS-137DA	0.1	70.9		66.3		6.7
EU-152	0.1	42.2		39.3		7.1
EU-154	0.1	3.41		3.03		11.8
EU-155	0.1	-0.0576	U	0.221	U	NC
FE-59		-0.00352	U	0.12	U	NC
K-40		16.3		15		8.3
PU-238	1	0.00897	U	0.0376	U	NC
PU-239/40	1	1.25		1.27		1.6
RA-224DA		1.01		NR		NC
STRONTIUM	1	3.88		4.3		10.3

NC - not calculated
NR - not reported by the laboratory

Field Split, pCi/L						
Sample Number		B0DDY2		B0DDR1		
Date		1/11/95		1/11/95		
Location		13		13		
Comments		Split				
Parameter	RDL	Result	Q	Result	Q	RPD
ALPHA	10	15.2		9.34	J	47.8
BETA	15	112.2		73.5		41.7
CO-58		0.12	U	0.179		200
CO-60	0.05	3.17		3.11		1.9
EU-152	0.1	45.2		39.3		14.0
EU-154	0.1	3.36		3.03		10.3
EU-155	0.1	0.08	U	0.221	U	NC
FE-59		0.03	U	0.12	U	NC
K-40		NR		15		NC
PB-212		1.05		NR		NC
PU-238	1	0.019	U	0.0376	U	NC
PU-239/40	1	1.27		1.27		0
RA-226	0.1	1.9	U	NR		NC
STRONTIUM	1	1.93	J	4.3		76.1
U-235		-0.57	U	NR		NC

NC - not calculated
NR - not reported by the laboratory

Field Duplicate, pCi/L						
Sample Number		B0DDY3		B0DDS4		
Date		1/11/95		1/11/95		
Location		14		14		
Comments		Duplicate				
Parameter	RDL	Result	Q	Result	Q	RPD
ALPHA	10	14.5	J	17.8	J	20.4
BETA	15	58.9		63.7		7.8
CO-58		0.0422	U	0.106	U	NC
CO-60	0.05	1.93		1.92		.5
CS-137DA	0.1	53.3		50.2		6.0
EU-152	0.1	17.9		17.1		4.6
EU-154	0.1	1.12		1.13		.9
EU-155	0.1	0.0746	U	0.105	U	NC
FE-59		0.109	U	-0.102	U	NC
K-40		14.5		13		10.9
PU-238	1	0.025	U	-0.0073	U	NC
PU-239/40	1	0.817		0.572		35.3
RA-224DA		1.23		0.948		25.9
RA-226DA	0.1	NR		0.83		NC
STRONTIUM	1	4.76		3.28		36.8

NC - not calculated
NR - not reported by the laboratory

Field Duplicate, pCi/L						
Sample Number		B0DDX5		B0DDP3		
Date		1/10/95		1/10/95		
Location		4		4		
Comments		Duplicate				
Parameter	RDL	Result	Q	Result	Q	RPD
ALPHA	10	6.08	J	8.33	J	31.2
BETA	15	18.5		24		25.9
CO-58		0.00451	U	-0.00887	U	NC
CO-60	0.05	0.0339	U	0.013	U	NC
CS-137DA	0.1	3.95		4.02		1.8
EU-152	0.1	0.289		0.247		15.7
EU-154	0.1	0.0289	U	-0.0235	U	NC
EU-155	0.1	0.0422	U	0.0213	U	NC
FE-59		0	U	0.0782	U	NC
K-40		8.76		9.84		11.6
PU-238	1	-0.00202	U	-0.00942	UJ	NC
PU-239/40	1	0.0403		0.0847	UJ	200
RA-224DA		0.419		0.531		23.6
RA-226DA	0.1	0.419		0.352		17.4
RA-228DA	0.2	0.463		0.54		15.4
STRONTIUM	1	0.788		0.993		23.0
NC - not calculated						