HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

HNPH-51-2-4-111

TO: RICHARD GORRELL **DATE:** MAY 1, 1992

FROM: ROY COHEN **COPIES:** D. A. SCHEIB

SUBJECT: INORGANIC DATA VALIDATION -TAL METALS AND CYANIDE
NWS-EARLE, EARLE, NEW JERSEY
ORTEK SDG E-RB-0310

SAMPLES:

10/SOIL/

E-S10-0006	E-SS12-0612
E-SS10-0612	E-SS12D-0612
E-S11-0006	E-S13-0006
E-SS11-0612	E-SS13-0612
E-S12-0006	E-RB-0310

Introduction:

Inorganic data from the Target Analyte List (TAL) metals analysis, as well as for cyanide analysis of ten soil samples were evaluated using the following parameters:

*	o	Data completeness
*	o	Holding times
*	o	Calibrations
*	o	Laboratory control sample results
	o	Laboratory and field blanks
	o	Matrix spike analysis results
*	o	Laboratory duplicates
*	o	Field duplicates
*	o	ICP interferences
*	o	Graphite furnace results
*	o	ICP serial dilution results
	o	Detection limits
*	o	Analyte quantitation
	o	Contract-required detection limit (CRDL) standards

Th symbol (*) indicates that all quality control criteria were met for this parameter. Documentation of compliance for these parameters is provided in Appendix C (Regional worksheets).

Problems affecting data quality are listed below, and the data spreadsheets presented in Appendix A (Qualified Analytical Results) summarize the validation qualifications.

Overview:

One field quality control blank (sample E-RB-0130) was included with this sample data set. This sample was analyzed and reported as a soil. One field duplicate pair (samples E-SS12-0612 and E-SS12D-0612_ was also included in this sample set.

The samples were collected by HALLIBURTON NUS Environmental Corporation on March 10, 1992 and analyzed by Ortek Laboratories under Naval Energy and Environmental Support Activity (NEESA) Level D Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted in accordance with the March 1990 Contract Laboratory Program (CLP) Statement of Work (SOW) analytical and reporting protocols.

Summary:

Aluminum, calcium, iron,. magnesium, and selenium were detected as contaminants in the laboratory calibration blanks. No data qualifications were made for aluminum, iron, and magnesium because all sample results were above the limit considered attributable to blank contamination. One result for calcium and all results for selenium have been rejected, coded [R(b)], because these values were within the validation action levels. The validation action levels are set at five times (5X) the maximum amount of contamination detected in the blanks. Sample results within these action levels are considered to be false positives.

Calcium, iron, sodium and zinc were detected in the associated rinsate blank. Several results for sodium have been rejected, coded [R(b)], because these values were within the (5X) validation action level range. No results for zinc have been rejected; all values were higher than the (5X) validation action level range.

The CRDL standard analysis percent recoveries (%R) were low for selenium for both analyses of this standard (51% and 49.5%). No results have been qualified because all positive values have already been rejected on the basis of blank contamination. A similar low matrix spike recovery (48.2%) suggests that the detection capability (of 1.0 ug/l) for selenium is questionable for this analysis.

The laboratory did not perform a method of standard additions (MSA) analysis for arsenic in one sample, where a low post-digestion spike recovery occurred. Therefore, the result reported for this analyte has been flagged as estimated [J(m)] to indicate possible inaccurate quantitation.

Significant differences were noted between the graphite furnace (GFAA) and ICP values for lead in four samples. Because the laboratory satisfactorily performed all the required QA/QC for the ICP analysis of lead,two valid sets of data exist for this analyte. For each of the four samples involved, the ICP results were greater than five times the ICP detection limit of 30 ug/l, and were at least twice as high as the GFAA result. Consequently, the results have been qualified as estimated [J(d)] on the attached data summary spreadsheets; sample inhomogeneity may account for the differences in the lead values.

No other problems were noted

The data for these analyses were reviewed with reference to the EPA "Functional Guidelines for Inorganic Validation" (July 1988) as amended for use within EPA Region II, and the NEESA document "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program". The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein was validated according to the agreed upon validation criteria as specified in the NEESA Guidelines, and the Quality Assurance Project Plan (QAPP)".

Roy Cohen

Roy Cohen

HALLIBURTON NUS Environmental Corporation
Data Validator

John Prepanondi, for

Debra. A. Scheib

HALLIBURTON NUS Environmental Corporation
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results.
2. Appendix B - Results as Reported by the Laboratory.
3. Appendix C - Regional Worksheets
4. Appendix D - Support Documentation

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

QUALIFICATION KEY :

U = Value is not detected as reported by the laboratory.

R(b) = Value is rejected because result is attributable to blank contamination, and is considered a false positive.

J(m) = Positive result is estimated because MSA analysis was not performed, and the graphite post-digestion spike recovery was below control limits.

J(d) = Positive result considered estimated because of significant differences between GFAA and ICP results

SITE: NWS EARLE
CASE NO: NWSO1
LABORATORY: ORTEK

INORGANIC SOILS (mg/kg)

Client ID:		E-RB-0310	E-S10-0006	E-SS10-0612	E-S11-0006	E-SS11-0612	E-S12-0006	E-SS12-0612
Lab ID:		123300	123291	123292	123293	123294	123295	123296
ANALYTE	IDL							
ALUMINUM	5.80	5.80 U	3960.00	3880.00	3330.00	4140.00	11000.00	3950.00
ANTIMONY	2.20	2.20 U	2.30 U	2.30 U	2.30 U	2.30	2.50	2.40 U
ARSENIC	0.20	0.20 U	9.10	12.20	11.20	12.60 J	15.20	9.00
BARIUM	1.20	1.20 U	7.60	2.50	9.30	1.80	26.70	2.40
BERYLLIUM	0.20	0.20 U	0.46	0.42	0.43	0.49	0.55	0.35
CADMIUM	0.40	0.40 U	0.43 U	0.42 U	0.42 U	0.42 U	0.45	0.43 U
CALCIUM	2.80	8.50	1340.00	422.00	202.00	25.20 R (b)	8770.00	799.00
CHROMIUM	1.00	1.00 U	50.40	61.20	49.40	58.30	64.90	50.00
COBALT	0.80	0.80 U	0.85 U	0.85	2.10	0.85	12.00	0.87
COPPER	0.40	0.40 U	3.20	1.10	13.80	1.90	61.20	2.30
IRON	3.00	8.40	12600.00	14100.00	13800.00	15100.00	30600.00	11300.00
LEAD	0.20	0.20 U	23.50 J (d)	3.80	4.20 J (d)	5.30	4.50 U	4.10
MAGNESIUM	4.80	4.80 U	851.00	816.00	676.00	789.00	8050.00	821.00
MANGANESE	0.20	0.20 U	19.50	2.30	20.50	2.70	200.00	5.40
MERCURY	0.10	0.10 U	0.15	0.11 U	0.11 U	0.11 U	0.88	0.11 U
NICKEL	1.40	1.40 U	2.00	1.50 U	4.50	2.40	25.90	1.50 U
POTASSIUM	153.00	153.00 U	1910.00	2390.00	1570.00	2370.00	2400.00	1850.00
SELENIUM	0.20	0.20 U	0.35 R (b)	0.30 R (b)	0.58 R (b)	0.40 R (b)	0.63 R (b)	0.29 R (b)
SILVER	0.60	0.60 U	0.64 U	0.64 U	0.63 U	0.64 U	0.68 U	0.65 U
SODIUM	6.60	34.00	20.50 R (b)	16.90 R (b)	19.10 R (b)	12.30 U	498.00	15.30 U
THALLIUM	0.40	0.40 U	0.44 U	0.44 U	0.43 U	0.42 U	0.46 U	0.43 U
VANADIUM	1.40	1.40 U	35.80	44.90	40.00	50.00	63.40	31.30
ZINC	0.60	1.20	16.00	10.90	20.10	11.10	57.70	9.30
CYANIDE	0.25	0.25 U	0.28 U	0.27 U	0.27 U	0.27 U	0.35	0.28 U
DILUTION FACTOR:		1.00	1.00	1.00	1.00	1.00	1.00	1.00
DATE SAMPLED:		3/10/92	3/10/92	3/10/92	3/10/92	3/10/92	3/10/92	3/10/92
ANALYSIS DATE:		3/13/92	3/13/92	3/13/92	3/13/92	3/13/92	3/13/92	3/13/92
PERCENT MOISTURE:		100	10.4	8.50	7.00	6.50	14.60	10.00

SITE: NWS EARLE
CASE NO: NWSO1
LABORATORY: ORTEK

INORGANIC SOILS (mg/kg)

Client ID:		E-SS12D-0612	E-S13-0006	E-SS13-0612
Lab ID:		123297	123298	123299
ANALYTE	IDL			
ALUMINUM	5.80	4220.00	5050.00	3220.00
ANTIMONY	2.20	2.40 U	2.50 U	2.50 U
ARSENIC	0.20	8.90	13.60	10.50
BARIUM	1.20	2.30	15.90	12.90
BERYLLIUM	0.20	0.40	0.46	0.54
CADMIUM	0.40	0.44 U	0.65 R (b)	0.45 U
CALCIUM	2.80	765.00	5820.00	985.00
CHROMIUM	1.00	53.20	46.40	35.00
COBALT	0.80	1.20	1.80	2.50
COPPER	0.40	2.60	4.60	22.10
IRON	3.00	11800.00	14600.00	13700.00
LEAD	0.20	3.30	10.10	12.50 J (d)
MAGNESIUM	4.80	897.00	1460.00	834.00
MANGANESE	0.20	5.30	55.60	49.90
MERCURY	0.10	0.10 U	0.10 U	0.11 U
NICKEL	1.40	1.90	4.40	5.90
POTASSIUM	153.00	2060.00	1840.00	1370.00
SELENIUM	0.20	0.24 R (b)	0.35 R (b)	1.90 R (b)
SILVER	0.60	0.66 U	0.67 U	0.68 U
SODIUM	6.60	17.00 R (b)	47.00 R (b)	65.30 R (b)
THALLIUM	0.40	0.44 U	0.44 U	0.45 U
VANADIUM	1.40	31.60	33.60	28.80
ZINC	0.60	9.80	32.50	13.10
CYANIDE	0.25	0.28 U	0.29 U	0.37
DILUTION FACTOR:		1.00	1.00	1.00
DATE SAMPLED:		3/10/92	3/10/92	3/10/92
ANALYSIS DATE:		3/13/92	3/13/92	3/13/92
PERCENT MOISTURE:		10.00	12.80	12.90

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APPENDIX B

RESULTS AS REPORTED BY THE LABORATORY

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

RB0310

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123300

Level (low/med): LOW Date Received: 03/11/92

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5.8	U		P
7440-36-0	Antimony	2.2	U		P
7440-38-2	Arsenic	0.20	U		F
7440-39-3	Barium	1.2	U		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.40	U		P
7440-70-2	Calcium	8.5	B		P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	0.80	U		P
7440-50-8	Copper	0.40	U		P
7439-89-6	Iron	8.4	B		P
7439-92-1	Lead	0.20	U		F
7439-95-4	Magnesium	4.8	U		P
7439-96-5	Manganese	0.20	U		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.4	U		P
7440-09-7	Potassium	153	U		P
7782-49-2	Selenium	0.20	U		F
7440-22-4	Silver	0.60	U		P
7440-23-5	Sodium	34.0	B		P
7440-28-0	Thallium	0.40	U		F
7440-62-2	Vanadium	1.4	U		P
7440-66-6	Zinc	1.2	B		P
	Cyanide				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

S10006

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123291

Level (low/med): LOW Date Received: 03/11/92

% Solids: 89.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3960			P
7440-36-0	Antimony	2.3	U		P
7440-38-2	Arsenic	9.1		N	F
7440-39-3	Barium	7.6	B		P
7440-41-7	Beryllium	0.46	B		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	1340			P
7440-47-3	Chromium	50.4			P
7440-48-4	Cobalt	0.85	U		P
7440-50-8	Copper	3.2	B		P
7439-89-6	Iron	12600			P
7439-92-1	Lead	23.5			F
7439-95-4	Magnesium	851	B		P
7439-96-5	Manganese	19.5			P
7439-97-6	Mercury	0.15			CV
7440-02-0	Nickel	2.0	B		P
7440-09-7	Potassium	1910			P
7782-49-2	Selenium	0.35	B	NW	F
7440-22-4	Silver	0.64	U		P
7440-23-5	Sodium	20.5	B		P
7440-28-0	Thallium	0.44	U		F
7440-62-2	Vanadium	35.8			P
7440-66-6	Zinc	16.0			P
	Cyanide				

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

S11006

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123293

Level (low/med): LOW Date Received: 03/11/92

% Solids: 93.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3330			P
7440-36-0	Antimony	2.3	U		P
7440-38-2	Arsenic	11.2		N	F
7440-39-3	Barium	9.3	B		P
7440-41-7	Beryllium	0.43	B		P
7440-43-9	Cadmium	0.42	U		P
7440-70-2	Calcium	202	B		P
7440-47-3	Chromium	49.4			P
7440-48-4	Cobalt	2.1	B		P
7440-50-8	Copper	13.8			P
7439-89-6	Iron	13800			P
7439-92-1	Lead	4.2			F
7439-95-4	Magnesium	676	B		P
7439-96-5	Manganese	20.5			P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	4.5	B		P
7440-09-7	Potassium	1570			P
7782-49-2	Selenium	0.58	B	NW	F
7440-22-4	Silver	0.63	U		P
7440-23-5	Sodium	19.1	B		P
7440-28-0	Thallium	0.43	U		F
7440-62-2	Vanadium	40.0			P
7440-66-6	Zinc	20.1			P
	Cyanide				

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

S12006

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123295

Level (low/med): LOW Date Received: 03/11/92

% Solids: 85.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11000			P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	15.2		N	F
7440-39-3	Barium	26.7	B		P
7440-41-7	Beryllium	0.55	B		P
7440-43-9	Cadmium	0.45	U		P
7440-70-2	Calcium	8770			P
7440-47-3	Chromium	64.9			P
7440-48-4	Cobalt	12.0			P
7440-50-8	Copper	61.2			P
7439-89-6	Iron	30600			P
7439-92-1	Lead	4.5			F
7439-95-4	Magnesium	8050			P
7439-96-5	Manganese	200			P
7439-97-6	Mercury	0.88			CV
7440-02-0	Nickel	25.9			P
7440-09-7	Potassium	2400			P
7782-49-2	Selenium	0.63	B	NW	F
7440-22-4	Silver	0.68	U		P
7440-23-5	Sodium	498	B		P
7440-28-0	Thallium	0.46	U		F
7440-62-2	Vanadium	63.4			P
7440-66-6	Zinc	57.7			P
	Cyanide				

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

S13006

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123298

Level (low/med): LOW Date Received: 03/11/92

% Solids: 87.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5050			P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	13.6		N	F
7440-39-3	Barium	15.9	B		P
7440-41-7	Beryllium	0.46	B		P
7440-43-9	Cadmium	0.65	B		P
7440-70-2	Calcium	5820			P
7440-47-3	Chromium	46.4			P
7440-48-4	Cobalt	1.8	B		P
7440-50-8	Copper	4.6	B		P
7439-89-6	Iron	14600			P
7439-92-1	Lead	10.1			F
7439-95-4	Magnesium	1460			P
7439-96-5	Manganese	55.6			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	4.4	B		P
7440-09-7	Potassium	1840			P
7782-49-2	Selenium	0.35	B	N	F
7440-22-4	Silver	0.67	U		P
7440-23-5	Sodium	47.0	B		P
7440-28-0	Thallium	0.44	U		F
7440-62-2	Vanadium	33.6			P
7440-66-6	Zinc	32.5			P
	Cyanide				

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS1012

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123292

Level (low/med): LOW Date Received: 03/11/92

% Solids: 91.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3880			P
7440-36-0	Antimony	2.3	U		P
7440-38-2	Arsenic	12.2		N	F
7440-39-3	Barium	2.5	B		P
7440-41-7	Beryllium	0.42	B		P
7440-43-9	Cadmium	0.42	U		P
7440-70-2	Calcium	422	B		P
7440-47-3	Chromium	61.2			P
7440-48-4	Cobalt	0.85	U		P
7440-50-8	Copper	1.1	B		P
7439-89-6	Iron	14100			P
7439-92-1	Lead	3.8			F
7439-95-4	Magnesium	816	B		P
7439-96-5	Manganese	2.3	B		P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	1.5	U		P
7440-09-7	Potassium	2390			P
7782-49-2	Selenium	0.30	B	N	F
7440-22-4	Silver	0.64	U		P
7440-23-5	Sodium	16.9	B		P
7440-28-0	Thallium	0.44	U		F
7440-62-2	Vanadium	44.9			P
7440-66-6	Zinc	10.9			P
	Cyanide				

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS1112

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123294

Level (low/med): LOW Date Received: 03/11/92

% Solids: 93.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4140			P
7440-36-0	Antimony	2.3	U		P
7440-38-2	Arsenic	12.6		N	F
7440-39-3	Barium	1.8	B		P
7440-41-7	Beryllium	0.49	B		P
7440-43-9	Cadmium	0.42	U		P
7440-70-2	Calcium	25.2	B		P
7440-47-3	Chromium	58.3			P
7440-48-4	Cobalt	0.85	B		P
7440-50-8	Copper	1.9	B		P
7439-89-6	Iron	15100			P
7439-92-1	Lead	5.3			F
7439-95-4	Magnesium	789	B		P
7439-96-5	Manganese	2.7	B		P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	2.4	B		P
7440-09-7	Potassium	2370			P
7782-49-2	Selenium	0.40	B	N	F
7440-22-4	Silver	0.64	U		P
7440-23-5	Sodium	12.3	U		P
7440-28-0	Thallium	0.42	U		F
7440-62-2	Vanadium	50.0			P
7440-66-6	Zinc	11.1			P
	Cyanide				

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS1212

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123296

Level (low/med): LOW Date Received: 03/11/92

% Solids: 89.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3950			P
7440-36-0	Antimony	2.4	U		P
7440-38-2	Arsenic	9.0		N	F
7440-39-3	Barium	2.4	B		P
7440-41-7	Beryllium	0.35	B		P
7440-43-9	Cadmium	0.43	U		P
7440-70-2	Calcium	799	B		P
7440-47-3	Chromium	50.0			P
7440-48-4	Cobalt	0.87	U		P
7440-50-8	Copper	2.3	B		P
7439-89-6	Iron	11300			P
7439-92-1	Lead	4.1			F
7439-95-4	Magnesium	821	B		P
7439-96-5	Manganese	5.4			P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	1.5	U		P
7440-09-7	Potassium	1850			P
7782-49-2	Selenium	0.29	B	NW	F
7440-22-4	Silver	0.65	U		P
7440-23-5	Sodium	15.3	B		P
7440-28-0	Thallium	0.43	U		F
7440-62-2	Vanadium	31.3			P
7440-66-6	Zinc	9.3			P
	Cyanide				

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS12D2

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123297

Level (low/med): LOW Date Received: 03/11/92

% Solids: 90.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4220			P
7440-36-0	Antimony	2.4	U		P
7440-38-2	Arsenic	8.9		N	F
7440-39-3	Barium	2.3	B		P
7440-41-7	Beryllium	0.40	B		P
7440-43-9	Cadmium	0.44	U		P
7440-70-2	Calcium	765	B		P
7440-47-3	Chromium	53.2			P
7440-48-4	Cobalt	1.2	B		P
7440-50-8	Copper	2.6	B		P
7439-89-6	Iron	11800			P
7439-92-1	Lead	3.3			F
7439-95-4	Magnesium	897	B		P
7439-96-5	Manganese	5.3			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.9	B		P
7440-09-7	Potassium	2060			P
7782-49-2	Selenium	0.24	B	NW	F
7440-22-4	Silver	0.66	U		P
7440-23-5	Sodium	17.0	B		P
7440-28-0	Thallium	0.44	U		F
7440-62-2	Vanadium	31.6			P
7440-66-6	Zinc	9.8			P
	Cyanide				

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS1312

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123299

Level (low/med): LOW Date Received: 03/11/92

% Solids: 87.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3220			P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	10.5		N	F
7440-39-3	Barium	12.9	B		P
7440-41-7	Beryllium	0.54	B		P
7440-43-9	Cadmium	0.45	U		P
7440-70-2	Calcium	985	B		P
7440-47-3	Chromium	35.0			P
7440-48-4	Cobalt	2.5	B		P
7440-50-8	Copper	22.1			P
7439-89-6	Iron	13700			P
7439-92-1	Lead	12.5			F
7439-95-4	Magnesium	834	B		P
7439-96-5	Manganese	49.9			P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	5.9	B		P
7440-09-7	Potassium	1370			P
7782-49-2	Selenium	1.9		N	F
7440-22-4	Silver	0.68	U		P
7440-23-5	Sodium	65.3	B		P
7440-28-0	Thallium	0.45	U		F
7440-62-2	Vanadium	28.8			P
7440-66-6	Zinc	13.1			P
	Cyanide				

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

AA CRDL Standard Source: BAKER

ICP CRDL Standard Source: IV

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum				400.0	395.84	99.0	404.91	101.2
Antimony				120.0	123.29	102.7	126.37	105.3
Arsenic	10.0	9.50	95.0					
Barium				400.0	407.80	102.0	411.64	102.9
Beryllium				10.0	10.11	101.1	10.31	103.1
Cadmium				10.0	11.76	117.6	11.81	118.1
Calcium					1.73		6.46	
Chromium				20.0	18.34	91.7	20.90	104.5
Cobalt				100.0	101.17	101.2	103.26	103.3
Copper				50.0	51.32	102.6	51.93	103.9
Iron				200.0	212.18	106.1	222.36	111.2
Lead	3.0	2.80	93.3	40.0	38.29	95.7	52.14	130.4
Magnesium					-4.87		2.04	
Manganese				30.0	29.73	99.1	30.44	101.5
Mercury	0.2	0.19	95.0					
Nickel				80.0	82.75	103.4	78.02	97.5
Potassium					-67.15		283.54	
Selenium	10.0	5.10	51.0					
Silver				20.0	22.36	111.8	23.34	116.7
Sodium					4.05		2.30	
Thallium	10.0	10.35	103.5					
Vanadium				100.0	101.95	102.0	101.28	101.3
Zinc				40.0	40.14	100.4	39.56	98.9

ok ok

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

AA CRDL Standard Source: BAKER

ICP CRDL Standard Source: IV

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium	10.0	4.95	49.5					
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

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3
BLANKS

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum	29.0	U	29.0	U	29.0	U	29.0	U	15.262	B	P
Antimony	11.0	U	11.0	U	-12.6	B	11.0	U	2.200	U	P
Arsenic	-1.8	B	-2.0	B	-2.0	B	-2.2	B	-0.430	B	F
Barium	6.0	U	6.0	U	6.0	U	6.0	U	1.200	U	P
Beryllium	1.0	U	1.0	U	1.0	U	1.0	U	0.200	U	P
Cadmium	2.0	U	2.0	U	3.0	B	2.0	U	0.400	U	P
Calcium	34.0	U	34.0	U	34.0	U	34.0	U	26.570	B	P
Chromium	5.0	U	5.0	U	5.0	U	5.0	U	1.000	U	P
Cobalt	4.0	U	4.0	U	4.0	U	4.0	U	0.800	U	P
Copper	2.0	U	2.0	U	2.0	U	2.0	U	0.400	U	P
Iron	34.3	B	48.4	B	55.4	B	32.0	B	5.992	B	P
Lead	1.0	U	-1.0	B	1.0	U	1.0	U	0.200	U	F
Magnesium	24.0	U	24.0	U	24.0	U	24.0	U	11.805	B	P
Manganese	1.0	U	1.0	U	1.0	U	1.0	U	0.200	U	P
Mercury	0.2	U	0.2	U	0.2	U	0.2	U	0.100	U	CV
Nickel	7.0	U	7.0	U	7.0	U	7.0	U	1.400	U	P
Potassium	767.0	U	767.0	U	767.0	U	767.0	U	153.400	U	P
Selenium	1.7	B	1.6	B	1.0	B	1.0	U	0.200	U	F
Silver	3.0	U	3.0	U	3.0	U	3.0	U	0.600	U	P
Sodium	58.0	U	58.0	U	58.0	U	58.0	U	11.600	U	P
Thallium	2.0	U	2.0	U	2.0	U	2.0	U	0.400	U	F
Vanadium	7.0	U	7.0	U	7.0	U	7.0	U	1.400	U	P
Zinc	4.0	U	4.0	U	4.0	U	4.0	U	0.800	U	P
Cyanide											

U.S. EPA - CLP

3
BLANKS

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum			29.0	U							P
Antimony			11.0	U							P
Arsenic			-2.0	B							F
Barium			6.0	U							P
Beryllium			1.0	U							P
Cadmium			2.0	B							P
Calcium			34.0	U							P
Chromium			5.0	U							P
Cobalt			4.0	U							P
Copper			2.0	U							P
Iron			28.4	B							P
Lead			1.0	U	-1.2	B					F
Magnesium			24.0	U							P
Manganese			1.0	U							P
Mercury											
Nickel			7.0	U							P
Potassium			767.0	U							P
Selenium			1.0	U							F
Silver			3.0	U							P
Sodium			58.0	U							P
Thallium			2.0	U							F
Vanadium			7.0	U							P
Zinc			4.0	U							P
Cyanide											

U.S. EPA - CLP

3
BLANKS

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron											
Lead											
Magnesium											
Manganese											
Mercury											
Nickel											
Potassium											
Selenium	1.0	U	1.0	U	1.0	U					F
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											

U.S. EPA - CLP

5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

SS1112S

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Level (low/med): LOW
% Solids for Sample: 93.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony	75-125	89.7450		2.3296	U	105.89	84.8		P
Arsenic	75-125	15.2669		12.6436		8.39	31.3	N	F *
Barium	75-125	405.7472		1.8081	B	423.57	95.4		P
Beryllium	75-125	10.5175		0.4906	B	10.59	94.7		P
Cadmium	75-125	10.9365		0.4236	U	10.59	103.3		P
Calcium									NR
Chromium	75-125	93.0439		58.3027		42.36	82.0		P
Cobalt	75-125	100.3429		0.8514	B	105.89	94.0		P
Copper	75-125	50.9357		1.8645	B	52.95	92.7		P
Iron									NR
Lead	75-125	9.4998		5.2523		4.19	101.4		F
Magnesium									NR
Manganese	75-125	101.6146		2.6972	B	105.89	93.4		P
Mercury	75-125	0.4889		0.1070	U	0.51	95.9		CV
Nickel	75-125	101.5408		2.4260	B	105.89	93.6		P
Potassium									NR
Selenium	75-125	1.4155		0.4024	B	2.10	48.2	N	F ⊙
Silver	75-125	10.2560		0.6354	U	10.59	96.8		P
Sodium									NR
Thallium	75-125	10.4960		0.4236	U	10.49	100.1		F
Vanadium	75-125	147.4462		49.9730		105.89	92.1		P
Zinc	75-125	110.7818		11.1449		105.89	94.1		P
Cyanide									NR

Comments: * Low As spike recovery due primarily to an acceptable level of sample inhomogeneity ; 15.27 − 8.39 = 6.88 ; RPD(6.88, 12.06 4) = 58 %
∴ no Action

⊙ all Selenium results rejected because of blank contamination ; No further action

FORM V (PART 1) - IN 3/90

000024

APPENDIX C

REGIONAL WORKSHEETS

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

RB0310

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123300

Level (low/med): LOW Date Received: 03/11/92

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.25	U		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

S10006

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RBO31O

Matrix (soil/water): SOIL Lab Sample ID: 123291

Level (low/med): LOW Date Received: 03/11/92

% Solids: 89.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.28	U		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

S11006

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RBO310

Matrix (soil/water): SOIL Lab Sample ID: 123293

Level (low/med): LOW Date Received: 03/11/92

% Solids: 93.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.27	U		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

S12006

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123295

Level (low/med): LOW Date Received: 03/11/92

% Solids: 85.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.35	B		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

S13006

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123298

Level (low/med): LOW Date Received: 03/11/92

% Solids: 87.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.29	U		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS1012

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123292

Level (low/med): LOW Date Received: 03/11/92

% Solids: 91.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.27	U		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS1112

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123294

Level (low/med): LOW Date Received: 03/11/92

% Solids: 93.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.27	U		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS1212

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123296

Level (low/med): LOW Date Received: 03/11/92

% Solids: 89.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.28	U		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS12D2

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RB0310

Matrix (soil/water): SOIL Lab Sample ID: 123297

Level (low/med): LOW Date Received: 03/11/92

% Solids: 90.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.28	U		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

SS1312

Lab Name: ORTEK Contract:

Lab Code: ORTEK Case No.: NWS01 SAS No.: SDG No.: RBO310

Matrix (soil/water): SOIL Lab Sample ID: 123299

Level (low/med): LOW Date Received: 03/11/92

% Solids: 87.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide	0.37	B		AS

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

APPENDIX D

SUPPORT DOCUMENTATION

SOP NO. HW-2

Evaluation of Metals Data for the Contract Laboratory Program (CLP)

based on

SOW. 7/88
REV. 2/89

Debs Master

(SOP Revision X)

PREPARED BY: Hanif Sheikh DATE: 2-16-90
Hanif Sheikh, Quality Assurance Chemist
Toxic and Hazardous Waste Section

CONCURRED BY: Louis Bevilacqua DATE: 2/16/90
Louis Bevilacqua, Section Chief
Toxic and Hazardous Waste Section

APPROVED BY: L Bevilacqua for (GFM) DATE: 2/16/90
Gerard F. McKenna, Chief
Monitoring Management Branch

MW501
RB0310

STANDARD OPERATING PROCEDURE

Title: Evaluation of Inorganic Data for the Contract Laboratory Program

Date: Feb. 1990
Number: HW-2
Revision: 10

1.0 Scope

1.1 This procedure is applicable to inorganic data obtained from contractor laboratories working for Hazardous Waste Site Contract Laboratory Program (CLP).

1.2 The data validation is based upon analytical and quality assurance requirements specified in Statement of Work (SOW) 7/88.

2.0 Responsibilities - Data reviewers will complete the following tasks as assigned by the D Review Coordinator:

2.1. For a total review:

2.1.1 Data Assessment - "Total Review-Inorganics" Checklist Appendix (A.1). The reviewer must answer every question on the checklist.

2.1.2 Data Assessment - Data Assessment Narrative (Appendix A.2) The answer on the checklist must match the action in the narrative (appendix A.2) and on Form I's. Do not use pencil to write the narrative.

2.1.3 Contract Non-Compliance - SMO Report (Appendix A.3) This report is to be completed only when a serious contract violation is encountered, or upon the request of the Data Review Manager or Deputy Project Officer (DPO). Forward 5 copies: one each for internal files, appropriate Regional DPO, Sample Management Office (SMO) and last two addresses of Mailing List for Data Reviewers (Appendix A.4). In other cases, all contract violations should be appended to end of Data Assessment Narrative (Sec. A.2.2).

2.1.4 Data Summary Sheet - Summary of Inorganic Quality Control Data (Appendix A.5). Enter in ink on Data Summary Sheet required QC values from Forms I through IX. Circ all values that require data qualification "Action".

2.1.5 CLP Data Assessment Summary Forms

2.1.5.1 Appendix A.6
Fill in the total number of analytes analyzed by different analyses and the number of analytes rejected or flagged as estimated due to corresponding quality control criteria. Place an "X" in boxes where analyses were not performed, or criteria do not apply.

2.1.5.2 Appendix A.7
Data reviewer is also required to fill out Inorganic Regional Data Assessment form (Appendix A.7) provided by EPA Headquarters. Codes listed on the form will be used to describe the Data Assessment Summary.

2.1.9 Filed Paperwork - Upon completion of review, the following are to be filed within M·B files:

a. Four copies of completed Data Assessment Narrative (Appendix A.2) each carrying Appendix A.7.
b. Telephone Record Log (copy)
c. SMO Report (copy Appendix A-3)
d. CLP Data Assessment Summary Form (Appendix A.6).
e. CLP Reanalysis Request/Approval Record (copy)

3.0 Data Completeness
Indicate incomplete data package on the computer tracking sheet located in M·B office. Authorized contractor personnel may contact the laboratory after discovery of an incomplete data package. If a laboratory will not return phone calls or does not respond to requests, notify M·B coordinator of Region II for resolution.

4.0 Rejection of Data - All values determined to be unacceptable on the Inorganic Analysis Data Sheet (Form I) must be lined over with a red pencil. As soon as any review criteria causes data to be rejected, that data can be eliminated from any further review or consideration.

5.0 Acceptance Criteria - In order that reviews be consistent among reviewers, acceptance criteria as stated in Appendix A.1 (pages 4-25) should be used. Additional guidance can be found in the National Inorganic Functional Guidelines of October 1, 1989.

6.0 SMO Contract Compliance Screening (CCS) - This is intended to aid reviewer in locating any problems, both corrected and uncorrected. However, the validation should be carried out even if CCS is not present. Resubmittals received from laboratory in response to CCS must be used by the reviewer.

7.0 Request for Reanalysis - Data reviewers must note all items of contract non-compliance within Data Assessment Narrative.If holding times and sample storage times have not been exceeded, DPO may request reanalysis if items of non-compliance are critical to data assessment. Requests are to be made on "CLP Re-Analysis Request/Approval Record".

8.0 Record of Communication - Provided by the Regional Sample Control Center (RSCC) to indicate which data packages have been received and are ready to be reviewed.

9.0 Rounding off numbers - The data reviewer will follow the standard practice.

2.1.6 Data Review Log: It is recommended that each data reviewer should maintain a log c reviews completed to include:
a. date of start of case review
b. date of completion of case review
c. site
d. case number
e. contract laboratory
f. number of samples
g. matrix
h. hours worked
i. reviewer's initials

2.1.7 Telephone Record Log - the data reviewer should enter the bare facts of inquiry, before initiating any phone conversation with CLP laboratory. After the case review has been completed, mail white copy of Telephone Record Log to the laboratory and pink copy to SMO. File yellow copy in the Telephone Record Log folder, and attach a xerox copy of the Telephone Record Log to the completed Data Assessment Narrative (Appendix A.2).

2.1.8 Forwarded Paperwork

2.1.8.1 Upon completion of review, the following are to be forwarded to the Regional Sample Control Center (RSCC) located in the Surveillance and Monitoring Branch:
a. data package
b. completed data assessment checklist (Appendix A.1,original)
c. SMO Contract Compliance Screening (CCS)
d. Data Summary Sheet (Appendix A.5) along with completed Data Assessment Narrative (Appendix A.2)
e. Record of Communication (copy)
f. CLP Reanalysis Request/Approval Record (original + 3 copies)
g. Appendix A.7 (original).

2.1.8.2 Forward 4 copies of completed Data Assessment Narrative (Appendix A.2) along with 2 copies of the Inorganic Data Assessment Form (Appendix A.7) and Telephone Record Log , if any,: one each for appropriate Regional DPO, Sample Management Office (SMO), and last two addressees of Mailing List for Data Reviewers (Appendix A.4) (the Inorganic Data Assessment form does not go to the last two addressees).

	YES	NO	N/A
A.1.6 Form I (Final Data) - Are all Form I's present and complete?	[✓]	—	—
ACTION: If no, prepare telephone record log and contact laboratory for submittal.			
Are correct units (ug/l for waters and mg/kg for soils) indicated on Form I's?	[✓]	—	—
Are soil sample results for each parameter corrected for percent solids?	[✓]	—	—
Are ~~EPA~~ client sample # s and corresponding laboratory sample ID # s the same as on the Cover Page, Form I's and in the raw data?	[✓]	—	—
Are computation/transcription errors less than 10% of reported values?	[✓]	—	—
Are all "less than IDL" values properly coded with "U"?	[✓]	—	—
Was a brief physical description of samples given on Form I's?	[✓]	—	—
Were the result qualifiers used correctly with final data?	[✓]	—	—
ACTION: If no for any of the above, prepare Telephone Record Log, and contract laboratory for corrected data.			
Were any samples diluted beyond requirements of contract?	—	[✓]	—
If yes, were dilutions noted on Form I's?	[ ]	—	✓
ACTION: If no, note under Contract-Problem/Non-Compliance of the "Data Assessment Narrative".			
A.1.7 Holding Times - (aqueous and soil samples)			
(Examine sample traffic reports and digestion/distillation logs.)			
Mercury analysis (28 days). . . . . exceeded?	—	[✓]	—
Cyanide distillation (14 days). . . . . exceeded?	—	[✓]	—

	YES	NO	N/A
A.1.1 Contract Compliance Screening Report (CCS) - Present?	[ ]		✓
ACTION: If no, contact RSCC.			
A.1.2 Record of Communication (from RSCC) - Present?	[ ]	--	✓
ACTION: If no, request from RSCC.			
A.1.3 Trip Report - Present and complete?	[ ]	--	✓
ACTION: If no, contact RSCC for trip report.			
A.1.4 ~~Sample Traffic Report~~ Chain of Custody - Present or on file?	[✓]	--	—
Legible?	[✓]	--	—
ACTION: If no, request from Regional Sample Control Center (RS[illegible]			
A.1.5 Cover Page - Present?	[✓]	--	—
Is cover page properly filled in and signed by the lab manager or the manager's designee?	[✓]	--	—
ACTION: If no, prepare Telephone Record Log, and contact laboratory.			
Do numbers of samples correspond to numbers on Record of Communication?	[✓]	—	—
Do sample numbers on cover page agree with sample numbers on:			
(a) ~~Traffic Report Sheet?~~ Chain of Custody *	[ ]	✓	—
(b) Form I's? *	[ ]	✓	—
ACTION: If no for any of the above, contact RSCC for clarification.			

* Lab shortened sample numbers to fit in software program used to generate forms.

	YES	NO	N/A
A.1.8.3 Are all raw data to support all sample analyses and QC operations present?	[✓]	--	—
Legible?	[✓]	--	—
Properly Labeled? (w/ lab ID)	[✓]	--	—

ACTION: If no for any of the above, write Telephone Record Log and contact laboratory. Flag metal data as estimated if pH of sample is greater than 2. Flag cyanide data as estimated if pH sample is less than 12.

A.1.9 Data Validation and Verification

A.1.9.1 Calibration

	YES	NO	N/A
A.1.9.1.1 Is record of at least 2 point calibration present for ICP analysis?	[✓]	--	—
Is record of 5 point calibration present for Hg analysis?	[✓]	--	—

ACTION: If no for any of the above, write in the Contract Problem/Non-Compliance section of the "Data Assessment Narrative".

	YES	NO	N/A
A.1.9.1.2 Is record of 4 point calibration present for:			
Flame AA?	[ ]	--	✓
Furnace AA?	[✓]	—	—
Cyanides?	[✓]	—	—

NOTE:
1. If less than 4 standards are measured in absorbance mode, then the remaining standards in concentration mode must be run immediately after calibration and be within ±10% of true value.
2. For all AA (except Hg) and Cyanide analyses, one calibration standard is at CRDL level. If not, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".

	YES	NO	N/A
Other Metals analysis (6 months). . . . exceeded?	—	[✓]	—

NOTE: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist.

ACTION: If yes, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was preserved properly.

A.1.8 Raw Data

A.1.8.1 Digestion Log* for flame AA/ICP (Form XIII) present?	[✓]	—	—
Digestion Log for furnace AA Form XIII present?	[✓]	—	—
Distillation Log for mercury Form XIII present?	[✓]	—	—
Distillation Log for cyanides Form XIII present?	[✓]	—	—
Are pH values (pH<2 for all metals, pH>12 for cyanide) present?	[✓]	—	—
*Weights, dilutions and volumes used to obtain values.			
Percent solids calculation present for soils/sediments?	[✓]	—	—
Are preparation dates present on Digestion Log?	[✓]	—	—
A.1.8.2 Measurement read out record present? ICP	[✓]	—	—
Flame AA	[ ]	—	✓
Furnace AA	[✓]	—	—
Mercury	[✓]	—	—
Cyanides	[✓]	—	—

YES NO N/A

ACTION: Flag as estimated (J) all positive data (not flagged with a "U") analyzed between a calibration standard with %R between 75-89% (65-79% for Hg; 70-84% for CN) or 111-125% (121-135% for Hg; 116-130% for CN) recovery and nearest good calibration standard. Qualify results <IDL as estimated (UJ), if the ICV or CCV %R is 75-89% (CN, 70-84% ; HG, 65-79%). Reject (red-line) as unacceptable data if recovery of the ICV or CCV is outside the range 75-125% (CN, 70-130%; Hg, 65-135%). Qualify five samples on either side of verification standard out of control limits.

Was continuing calibration performed every 10 samples or every 2 hours? [✓]

ACTION: If no, flag the excess samples (eleventh and up) data as estimated (J).

Was ICV for cyanides distilled? [✓]

ACTION: If no, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".

A.1.9.3 Form II B (CRDL Standards for AA and ICP) -

A.1.9.3.1 Was a CRDL standard (CRA) analyzed after initial calibration for all AA metals (except Hg)? [✓]

*Was a mid-range calib. verification standard distilled and analyzed for cyanide analysis? [✓]

Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run? [✓]
(Note: CRA for AL,Ba,Ca,Fe,Mg,Na,or K is not required.)

ACTION: If no for any of the above, flag as estimated all data falling within the affected ranges. The affected ranges are:

AA Analysis - **True Value ± CRDL
ICP Analysis - **True Value ± 2CRDL
CN Analysis - **True Value ± 0.5 x True Value.

* Find the results of mid-range standard in the raw data.
**True value of CRA, CRI or mid-range standard. Substitut IDL for CRDL when IDL > CRDL.

	YES	NO	N/A
ACTION: Flag associated data as estimated if standards are not within ±10% of true values (except CRDL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.			
A.1.9.1.3 Is correlation *coefficient less than 0.995 for:			
Mercury Analysis?	___	[✓]	___
Cyanide Analysis? (Not applicable to Titrimetric Method)	___	[✓]	___
Atomic Absorption Analysis?	___	[✓]	___
ACTION: If yes, flag the associated data as estimated.			
A.1.9.2 Form II A (Initial and Continuing Calibration Verification)-			
A.1.9.2.1 Present and complete for every metal and cyanide?	[✓]	--	___
Present and complete for AA and ICP when both are used for same analyte?	[✓]	--	___
ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.			
A.1.9.2.2 Circle all values on data summary sheet that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?			
Metals 90-110%	[✓]	___	___
Hg - 80-120%	[✓]	--	___
Cyanides 85-115%	[✓]	___	___

* The reviewer will calculate corr lation coefficient.

		YES	NO	N/A
A.1.9.4.2	Circle all calibration blank values on Data Summary Sheet that are above CRDL (or 2 x IDL when IDL > CRDL). Are all calibration blanks (when IDL<CRDL) less than or equal to Contract Required Detection Limits (CRDL)?	[✓]		
	Are all calibration blanks less than two times Instrument Detection Limit (when IDL>CRDL)?	[ ]		✓

ACTION: If no for any of the above, flag as estimated (J) all positive data less than or equal to calibration blank values analyzed between calibration blank with value over CRDL (or 2xIDL) and nearest good calibration blank. Flag five samples on either side of the calibration blank.

A.1.9.5 FORM III (Preparation Blank) -

(Note: The preparation blank for mercury is the same as the calibration blank.)

		YES	NO	N/A
A.1.9.5.1	Was one prep. blank analyzed for: each 20 samples?	[✓]		
	each batch?	[✓]		
	each matrix type?	[✓]		
	both AA and ICP when both are used for same analyte?	[✓]		

ACTION: If no for any of the above, flag as estimated (J) all associated positive data <10 x IDLs for which prep. blank was not analyzed.

NOTE: If only one blank was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

		YES	NO	N/A
A.1.9.5.2	Is concentration of prep. blank greater than CRDL when IDL is less than or equal to CRDL?		[✓]	
	If yes, is the concentration of the sample with the least concentrated analyte less than 10 times the prep. blank value?		[ ]	✓

		YES	NO	N/A
A.1.9.3.2	Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and for every four hours of ICP run?	[✓]		
	ACTION: If no, write in Contract Problem/Non-Compliance Section of the "Data Assessment Narrative".			
A.1.9.3.3	Circle all values on summary sheet that are outside acceptance windows.	✓ (See)		
	Are CRA and CRI standards within control limits: Metals 80 - 120%R?	[ ]	✓	
	Is mid-range standard within control limits: Cyanide 80 - 120%R?	[✓]		
	ACTION: Flag as estimated all data within the affected ranges if the recovery of the standard is between 50-79%; flag only positive data if the recovery is between 121-150%; reject (red line) all data if the recovery is less than 50%; reject only positive data if the recovery is greater than 150%.			
A.1.9.4	Form III (Initial and Continuing Calibration Blanks)			
A.1.9.4.1	Present and complete?	[✓]		
	For both AA and ICP when both are used for same analyte?	[✓]		
	Was an initial calibration blank analyzed?	[✓]		
	Was a continuing calibration blank analyzed after every 10 samples or every 2 hours (whichever is more frequent)?	[✓]		
	ACTION: If no, prepare Telephone Record Log, contact laboratory and write in the contract-problems/non-compliance section of the Data Assessment Narrative.			

		YES	NO	N/A
A.1.9.7	Form V A (Spiked Sample Recovery - Pre-Digestion/Pre-Distillation)- (Note: Not required for Ca, Mg, K, and Na (both matrices), Al, and Fe (soil only.)			
A.1.9.7.1	Present and complete for: each 20 samples?	[✓]	--	--
	each matrix type?	[✓]	--	--
	each conc. range (i.e. low, med high)?	[✓]	--	--
	For both AA and ICP when both are used for same analyte?	[✓]	--	--
	ACTION: If no for any of the above, flag as estimated (J) all positive data less than four times spiking level for which spiked sample was not analyzed.			
	NOTE: If one spiked sample was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).			
A.1.9.7.2	Was field blank used for spiked sample?	--	[✓]	--
	ACTION: If yes, flag all positive data less than 4 x spike added as estimated (J) for which field blank was used as spiked sample.			
	NOTE: Matrix spike analysis should be performed on a field blank when it is the only aqueous sample in SDG.			
A.1.9.7.3	Circle all values on Data Summary Sheet that are outside control limits (75% to 125%). Are all recoveries within control limits?	[__]	✓	--
	If no, is sample concentration greater than or equal to four times spike concentration?	[__]	✓	--
	ACTION: If yes, disregard spike recoveries for analytes whose concentrations are greater than or equal to four times spike added. If no, circle those analytes on Form V for which sample concentration is less than four times the spike concentration.			

		YES	NO	N/A
	ACTION: If yes, reject (red-line) all associated data greater than CRDL concentration but less than ten times the prep. blank value found in the raw data.			
A.1.9.5.3	Do concentrations of prep. blank fall below two times IDL when IDL is greater than CRDL?	[ ]		✓
	ACTION: If no, reject (red-line) all positive data that has a concentration less than 10 times the prep. blank value in the raw data.			
A.1.9.5.4	Is concentration of prep. blank below the negative CRDL?		[✓]	
	ACTION: If yes, reject (red-line) all associated data that has a concentration less than 10xCRDL.			
A.1.9.6	Form IV (ICP Interference Check Sample)			
A.1.9.6.1	Present and complete?	[✓]		
	(NOTE: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)			
	Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?	[✓]		
	ACTION: If no, flag as estimated (J) all samples for which AL, Ca, Fe, or Mg is higher than in ICS.			
A.1.8.6.2	Circle all values on Data Summary Sheet that are more than + 20% of true or established mean value. Are all Interference Check Sample results inside of control limits (+ 20%)?	[✓]		
	If no, is concentration of Al, Ca, Fe, or Mg lower than in ICS?	[ ]		✓
	ACTION: If no, flag as estimated (J) those positive results for which ICS recovery is between 121-150%; flag all sample results as estimated if ICS recovery falls within 50-79%; reject (red-line) those sample results for which ICS recovery is less than 50%; if ICS recovery is above 150%, reject positive results only (not flagged with a "U").			

		YES	NO	N/A
A.1.9.8	Form VI (Lab Duplicates)			
A.1.9.8.1	Present and complete for: each 20 samples?	[✓]	___	___
	each matrix type?	[✓]	___	___
	each concentration range (i.e. low, med., high)?	[✓]	___	___
	both AA and ICP when both are used for same analyte?	[✓]	___	___

ACTION: If no for any the above, flag as estimated (J) all data >CRDL* for which duplicate sample was not analyzed.

Note: 1. If one duplicate sample was analyzed for more than 20 samples, then first 20 samples do not have to be flagged as estimated.
2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in µg/L on wet weight basis and calculate RPD or Difference for each analyte.

A.1.9.8.2	Was field blank used for duplicate analysis?	___	[✓]	___

ACTION: If yes, flag all data >CRDL* as estimated (J) for which field blank was used as duplicate.

NOTE: Duplicate analysis should be performed on a field blank when it is the only aqueous sample in SDG.

A.1.9.8.3	Are all values within control limits (RPD 20% or difference < ±CRDL)?	[✓]	___	___
	If no, are all results outside the control limits flagged with an * on Form I's and VI?	[✓]	___	___

ACTION: If no, write in the Contract - Problems/Non-Compliance section of "Data Assessment Narrative".

NOTE: 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.

* Substitute IDL for CRDL when IDL > CRDL.

	YES	NO	N/A
Are results outside the control limits (75-125%) flagged with "N" on Form I's and Form VA?	[✓]		

ACTION: If no, write in the Contract - Problem/Non - Compliance section of "Data Assessment Narrative".

A.1.9.7.4 Aqueous

Are any spike recoveries:

(a) less than 30%?		[ ]	✓
(b) between 30-74%?		[ ]	✓
(c) between 126-150%?		[ ]	✓
(d) greater than 150%?		[ ]	✓

ACTION: If less than 30%, reject all associated aqueous data; if between 30-74%, flag all associated aqueous data as estimated (J); if between 126-150%, flag as estimated (J) all associated aqueous data not flagged with a "U"; if greater than 150%, reject (red-line) all associated aqueous data not flagged with a "U".

A.1.9.7.5 Soil/Sediment

Are any spike recoveries:

(a) less than 10%?		[✓]	
(b) between 10-74%?	✓	[ ]	
(c) between 126-200%?		[✓]	
(d) greater than 200%?		[✓]	

ACTION: If less than 10%, reject all associated data; if between 10-74%, flag all associated data as estimated; if between 126-200%, flag as estimated all associated data was not flagged with a "U"; if greater than 200%, reject all associated data not flagged with a "U".

no action for As ; all se results ⓡ

	YES	NO	N.A.
ACTION: If yes, flag the associated data as estimated.			
A.1.9.9 **Field Duplicates**			
A.1.9.9.1 Were field duplicates analyzed?	[✓]		
ACTION: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in ug/l on wet weight basis and calculate RPDs or Difference for each analyte.			
NOTE: 1. Do not calculate RPD when both values are less than IDL. 2. Flag all associated data only for field duplicate pair.			
A.1.9.9.2 Is any value for sample duplicate pair less than *CRDL and other value greater than or equal to 10 x *CRDL?		[✓]	
ACTION: If yes, flag the associated data as estimated.			
A.1.9.9.3 Aqueous			
Circle all values on Form VI for field duplicates that are: RPD > 50%, or Difference > ± CRDL*			
Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL?		[ ]	✓
Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL?		[ ]	✓
ACTION: If yes, flag the associated data as estimated.			

* Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

		YES	NO	N/A
	2. If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria.			
A.1.9.8.4	Is any value for sample duplicate pair less than CRDL* and other value greater than or equal to 10 x *CRDL?	___	[✓]	___
	ACTION: If yes, flag the associated data as estimated (J).			
A.1.9.8.5	Aqueous Circle all values on Data Summary Sheet that are: RPD > 50%, or Difference > ± CRDL*			
	Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL?	___	[ ]	✓
	Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL?	___	[ ]	✓
	ACTION: If yes, flag the associated data as estimated.			
A.1.9.8.6	Soil/Sediment Circle all values on Data Summary Sheet that are: RPD > 100%, or Difference > 2 x CRDL*	none		
	Is any RPD (where sample and duplicate are both greater than or equal to 5 times *CRDL) : > 100%?	___	[✓]	___
	Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x*CRDL) : > 2x*CRDL?	___	[✓]	___

* Substitute IDL for CRDL when IDL > CRDL.
** Use absolute values of sample and duplicate to calculate the difference.

	YES	NO	N/A
A.1.9.10.2 Aqueous LCS			
Circle all LCS values outside control limits (80 - 120%- except aqueous Ag and Sb).			
Is any LCS recovery: less than 50%?	___	[✓]	___
between 50% and 79%?	___	[✓]	___
between 121% and 150%?	___	[✓]	___
greater than 150%?	___	[✓]	___

ACTION: Less than 50%, reject (red-line) all data; between 50% and 79%, flag all associated data as estimated (J); between 121% and 150%, flag all positive (not flagged with a "U") results as estimated; greater than 150%, reject all positive results.

A.1.9.10.3 Solid LCS

NOTE: 1. If "Found" value of LCS is rejectable due to duplicate injections or analytical spike recovery criteria, regardless of LCS recovery, flag the associated data as estimated (J).
2. If IDL of an analyte is equal to or greater than true value of LCS, disregard the "Action" below even though LCS is out of control limits.

Is LCS "Found" value higher than the control limits on Form VII?	___	[✓]	___

ACTION: If yes, qualify all associated positive data as estimated.

Is LCS "Found" value lower than the Control limits on Form VII?	___	[✓]	___

ACTION: If yes, qualify all associated data as estimated.

	YES	NO	N/A

A.1.9.9.4 Soil/Sediment

Circle all values on Form VI for field duplicates that are:
RPD >100%, or

Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both greater than 5 times *CRDL) :

>100%? ___ [✓] ___

Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x *CRDL):

>2x *CRDL? ___ [✓] ___

ACTION: If yes, flag the associated data as estimated.

A.1.9.10 Form VII (Laboratory Control Sample) (Note: LCS - not required for aqueous Hg and cyanide analyses.)

A.1.9.10.1 Was one LCS prepared and analyzed for:

every 20 water samples? [✓] ___ ___

every 20 solid samples? [✓] ___ ___

both AA and ICP when both are used for same analyte? [✓] ___ ___

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory for submittal of results of LCS. Flag as estimated (J) all data for which LCS was not analyzed.

NOTE: If only one LCS was analyzed for more than 20 samples, then first 20 samples close to LCS do not have to be flagged as estimated.

* Substitute IDL for CRDL when IDL > CRDL.

**Use absolute values of sample and duplicate to calculate the difference.

		YES	NO	N/A
A.1.9.11	Form IX (ICP Serial Dilution) -			
	NOTE: Serial dilution analysis is required only for initial concentrations equal to or greater than 10 x IDL.			
A.1.9.11.1	Was Serial Dilution analysis performed for:			
	each 20 samples?	[✓]		
	each matrix type?	[✓]		
	each concentration range (i.e. low, med.)?	[✓]		
	ACTION: If no for any of the above, flag all positive data greater than or equal to 10xIDLs as estimated (J) for which Serial Dilution Analysis was not performed, and summarize the deficiency on the DPO report.			
A.1.9.11.2	Was field blank(s) used for Serial Dilution Analysis?		[✓]	
	ACTION: If yes, flag all associated data ≥ 10 x IDL as estimated (J).			
	NOTE: Serial dilution analysis should be performed on a field blank when it is the only aqueous sample in SDG.			
A.1.9.11.3	Are results outside control limit flagged with an "E" on Form I's and Form IX when initial concentration on Form IX is equal to 50 times IDL or greater.	[ ]		✓
	ACTION: If no, write in the contract-problem/non-compliance section of the "Data Assessment Narrative".			
A.1.9.11.4	Circle all values on Data Summary Sheet that are outside control limit for initial concentrations equal to or greater than 10 x IDLs only. Are any % difference values:			
	> 10%?		[✓]	
	≥ 100%?		[✓]	

		YES	NO	N/A
	ACTION: Flag as estimated (J) all associated equal to or greater than 10xIDLs for which percent difference is greater than 10% but less than 100%. Reject (red-line) all associated sample results equal to or greater than 10xIDLs for which PD is greater than or equal to 100%.			
A.1.9.12	Furnace Atomic Absorbtion (AA) QC Analysis			
A.1.9.12.1	Are duplicate injections present in furnace raw data (except during full Method of Standard Addition) for each sample analyzed by GFAA?	[✓]		
	ACTION: If no, reject the data on Form I's for which duplicate injections were not performed.			
A.1.9.12.2	Do the duplicate injection readings agree within 20% Relative Standard Deviation (RSD) or Coefficient of Variation (CV) for concentration greater than CRDL?	[✓]		
	Was a dilution analyzed for sample with post digestion spike recovery less than 40%?	[ ]		✓
	ACTION: If no for any of the above, flag all the associated data as estimated (J).			
A.1.9.12.3	Is *post digestion spike recovery less than 10% or greater than 150% for any result?		[✓]	
	ACTION: If yes, reject (red-line) the affected data if recovery is <10%; reject data not flagged with "U" if spike recovery is >150%.			
	NOTE: Reject the data only if the affected sample was not subsequently analyzed by Method of Standard Addition.			

Post digestion spike is not required on the pre-digestion spiked sample.

	YES	NO	N/A
NOTE: 1. If yes, prepare a list comparing differences between all dissolved (or inorganic) and total analytes. Compute the differences as a percent of the total analyte only when dissolved concentration is greater than CRDL as well as total concentration. 2. Apply the following questions only if inorganic (or dissolved) results are (i) above CRDL, and (ii) greater than total constituents. 3. At least one preparation blank, ICS, and LCS should be analyzed in each analytical run.			
A.1.9.14.2 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 10%?	___	[ ]	✓
A.1.9.14.3 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 50%?	___	[ ]	✓

ACTION: If more than 10%, flag both dissolved (or inorganic) and total values as estimated (J); if more than 50%, reject (red-line) the data for both values.

A.1.9.15 Form I to IX

A.1.9.15.1 Are all the Form I through Form IX labeled with:

Laboratory name?	[✓]	___	___
Case/SAS number?	[✓]	___	___
Client ~~EPA~~ sample No.?	[✓]	___	___
SDG No.?	[✓]	___	___
Contract No.?	[✓]	___	___
Correct units?	[✓]	___	___
Matrix?	[✓]	___	___

ACTION: If no for any of the above, note under contract problem/non-compliance section of the "Data Assessment Narrative".

		YES	NO	N/A
A.1.9.13	Form VIII (Method of Standard Addition Results)			
A.1.9.13.1	Present?	[✓]	__	__
	If no, is any Form I result coded with "S" or a "+"?	__	[✓]	__
	ACTION: If yes, write request on Telephone Record Log and contact laboratory for submittal of Form VIII.			
A.1.9.13.2	Is coefficient of correlation for MSA less than 0.990 for any sample?	__	[ ]	✓
	ACTION: If yes, reject (red-line) affected data.			
A.1.9.13.3	Was *MSA required for any sample but not performed?	✓	[ ]	__
	Is coefficient of correlation for MSA less than 0.995?	__	[ ]	✓
	Are MSA calculations outside the linear range of the calibration curve generated at the beginning of the analytical run?	__	[ ]	✓
	ACTION: If yes for any of the above, flag all the associated data as estimated (J). ✓			
A.1.9.13.4	Was proper quantitation procedure followed correctly as outlined in the SOW on page E-16 through E-17?	[__]	__	✓
	ACTION: If no, note exception under contract problem/ non-compliance of data assessment narrative, or prepare a separate list. no MSAs performed			
A.1.9.14	Dissolved/Total or Inorganic/Total Analytes -			
A.1.9.14.1	Were any analyses performed for dissolved as well as total analytes on the same sample(s).	__	[ ]	✓
	Were any analyses performed for inorganic as well as total (organic + inorganic) analytes on the same sample(s)?	__	[ ]	✓

* MSA is not required on LCS and prep. blank.

	YES	NO	N/A
A.1.9.17 Form X, XI, XII (Verification of Instrumental Parameters).			
A.1.9.17.1 Is verification report present for:			
Instrument Detection Limits (quarterly)?	[✓]		
ICP Interelement Correction Factors (annually)?	[✓]		
ICP Linear Ranges (quarterly)?	[✓]		
ACTION: If no, contact DPO of the lab.			
A.1.9.17.2 Form X (Instrument Detection Limits) - (Note: IDL is not required for Cyanide.)			
Are IDLs present for: all the analytes?	[✓]		
all the instruments used?	[✓]		
For both AA and ICP when both are used for same analyte? *	[ ]	✓	
ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.			
Is IDL greater than CRDL for any analyte?		[✓]	
If yes, is the concentration on Form I of the sample analyzed on the instrument whose IDL exceeds CRDL, greater than 5 x IDL?	[ ]		✓
ACTION: If no, flag as estimated all values less than five times IDL of the instrument whose IDL exceeds CRDL.			

* Pb reported only from GFAA - no ICP IDL was required.

	YES	NO	N/A
A.1.9.15.2 Do any computation/transcription errors exceed 10% of reported values on Forms I-IX for:			
(NOTE: Check all forms against raw data.)			
(a) all analytes analyzed by ICP?	___	[✓]	___
(b) all analytes analyzed by GFAA?	___	[✓]	___
(c) all analytes analyzed by AA Flame?	___	[___]	✓
(d) Mercury?	___	[✓]	___
(e) Cyanide?	___	[✓]	___

ACTION: If yes, prepare Telephone Log, contact laboratory for corrected data and correct errors with red pencil and initial.

A.1.9.16 Form I (Field Blank) -

Circle all field blank values on Data Summary Sheet that are greater than CRDL, 2 x IDL when IDL > CRDL.

Do concentrations of field blank(s) fall below CRDL (or 2 x IDL when IDL > CRDL) for all parameters of associated aqueous and soil samples?	[✓]	___	___
If no, was field blank value already rejected due to other QC criteria?	[___]	___	✓

ACTION: If no, reject (except field blank results) all associated positive sample data less than or equal to five times the field blank value. ✓

Title: Evaluation of Metals Data for the Contract Laboratory Program
Appendix A.2: Data Assessment Narrative

Date: Feb. 1990
Number: HW-2
Revision: 10

Case# NWS01 Site NWS Earle Matrix: Soil ✓
SDG# RB0310 Lab ORTEK Water ✓
Contractor HNUS Reviewer R. Cohen Other

A.2.1 The case description and exceptions, if any, are noted below with reason(s) for rejection or qualification as estimated value(s) J.

A.1.9.3.3 Se CRPL recoveries were low (=50%), however, all data have already been rejected because of blank contamination.

Blanks: Several results have been rejected because the levels for the following metals in these samples are less than 5X the highest blank result:

Calcium - SS1112
Selenium - all results except RB0310
Sodium - S10006, SS1012, S11006, SS1212, SS12D2, S13006, and SS1312.
Cadmium - S13006

Spikes: As recovery was 31%. However, an acceptable level of sample inhomogeneity (58%) can account for this low recovery. Therefore, no action was taken.

	YES	NO	N/A
A.1.9.17.3 Form XI (Linear Ranges)			
Was any sample result higher than high linear range of ICP.	___	[✓]	___
Was any sample result higher than the highest calibration standard for non-ICP parameters?	___	[✓]	___
If yes for any of the above, was the sample diluted to obtain the result on Form I?	[___]	___	✓
ACTION: If no, flag the result reported on Form I as estimated(J).			
A.1.9.18 Percent Solids of Sediments			
Is soil content in sediment(s) less than 50%?	___	[✓]	___
ACTION: If yes, qualify as estimated all data not previously rejected or flagged due to other QC criteria.			

A.2.1 (continuation)

A.2.1 (continuation) (Spikes)

The Se recovery was 48% - However, all positive results have been rejected due to blank contamination. This low value, along with the low CRDL recoveries may suggest a detection capability problem at 1ppb.

MSA: Sample S12006 required MSA for arsenic (post dig spike < 85%), but none was performed. ∴ Result flagged (J).

GFAA/ICP imprecision was noted for lead for samples S10006, & S11006, S12006 and S513/12. The ICP results were substantially higher. Both results have been flagged (J).

CONTRACT NON-COMPLIANCE
(SMD REPORT)

Regional Review of Uncontrolled Hazardous Waste
Site Contract Laboratory Data Package

CASE NO. NWS01

The hardcopied (laboratory name) ORTek
Inorganic data package received at Region II has been reviewed and the quality assurance ar
performance data summarized. The data reviewed included:
SMD Sample No.:

Conc. & Matrix: Low aqueous + soil

Contract No. WA87-K025,K026,K027(SOW787) requires that specific analytical work be done and that associated reports be provided by the contractor to the Regions, EMSL-LV, and SMD. Th general criteria used to determine the performance were based on an examination of:

- Data Completeness
- Matrix Spike Results
- Calibration Standards Results
- Duplicate Analysis Results
- Blank Analysis Results
- MSA Results

Items of non-compliance with the above contract are described below.

Comments: MSA not performed for As on spl S12006

RC
Review r's Initial

4/15/92
Date

A.2.2 Contract-Problems/Non-Compliance

* DU MSA performed for As on sample S12006. (PDS < 85%; sample result greater than 1/2 PDS value)

MB Reviewer: _____ Date: _____
Signature

Contractor Reviewer: Roy Cole Date: 4/15/92
Signature

Verified by: _____ Date: _____

APPENDIX A.5 SUMMARY OF INORGANICS QUALITY CONTROL DATA

LABORATORY: _____ CASE NO. _____ SOW NO. _____ SAMPLE TYPE/SDG: _____

SITE/STUDY DESCRIPTION: _____ SAMPLE NOS: _____

FIELD DUP. #'S: _____ LAB DUP. #'S: _____ Field Blank _____ MATRIX SPIKE #: _____

SERIAL DILUTION SAMPLE NO. _____ COMPLETION DATE: _____ REVIEWERS INITIALS: _____

	X		I	IIA				IIB		III				IV		V		VI	VII	IX	
ara-eter	Detection Limits UG/L		Field Blank	Calib. Ver. %R				CRDL Std Ver. % R		Calibration Blanks				PREP BLANK		ICP ICS % R		Matrix Spike	Lab Dup RPD Diff	LCS % R	Ser Dil % D
	CRDL	IDL		Init	Continued 1	2	3	Init	Fin	Init	Continued 1	2	3			Init	Fin				
Al	200																				
Sb	60																				
As	10																				
Ba	200																				
Be	5																				
Cd	5																				
Ca	5000																				
Cr	10																				
Co	50																				
Cu	25																				
Fe	100																				
Pb	3																				
Mg	5000																				
Mn	15																				
Hg	0.2																				
Ni	40																				
K	5000																				
Se	5																				
Ag	10																				
Na	5000																				
Tl	10																				
V	50																				
Zn	20																				
CN	10																				

See Support Documentation (Appendix I Forms) Inserted in Section 5

MAILING LIST FOR DATA REVIEWERS

1. USEPA Region I (ESD)
60 Westview Street
Lexington, MA 02173
Deb Szaro
(617) 861-4312
CT, ME, MA, NH, RI, VT
CAA, Resource Analysts, York, EJI, Skinner, TPA

2. USEPA Region II (ESD)
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Lisa Gatton Vidulich
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NJ, NY, PR, VI
Century, Chemtech, US Test, Nanco, ETC, Gadson, EMS, Galson, ICM

3. USEPA Region III (CRL)
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4. USEPA Region IV (ESD)
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5. USEPA Region V (ESD)
536 South Clark Street
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Pat Churilla
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IL, IN, MI, MN, OH, WI
NLE, TAI/ERG

6. USEPA Region VI (ESD)
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David Stockton
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ANACON, RADIAN, SPECS, ETS, Glocher Research, Inc., SPL Inc., SWRI, Allied, Key TX, EDRA

7. USEPA Region VII Laboratory
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9. USEPA Region IX (ESD)
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AZ, CA, HI, NV, American Samoa, Guam Trust Territories of Pacific Islands, Wake Island
ALI, CAL Weston, S-Cubed, IT-CA, Vegas

10. USEPA Region X Laboratory
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Gerald Muth
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Lauchs Testing Labs, Century Testing Labs (For VOA Only), Weyerhauser Co. Columbia Testing, Silver Valley

11. Carla Dempsey - (OS-230)
USEPA
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Washington, DC 20460
FTS 382-5746

12. Edward Kantor
USEPA
EMSL-LV
944 E. Harmon Avenue
BOX 93478
Las Vegas, NV 89119

13. Sample Management Office
Wear and Company
P.O. BOX 818
Alexandria, VA 22313

Title: Evaluation of Metals Data for the Contract Laboratory Program
Appendix A.7: CLP Data Assessment Checklist
Inorganic Analysis

Date: Feb. 1990
Number: HW-2
Revision: 10

INORGANIC REGIONAL DATA ASSESSMENT

Region ____

CASE NO. NWS01

SITE NWS-Earle

LABORATORY ORTek

NO. OF SAMPLES/ MATRIX 9 soils, 1 Rinse blk

SDG# RB0310

REVIEWER (IF NOT ESD) HMS

SOW# 3/90

REVIEWER'S NAME R. Cohen

DPO: ACTION ____ FYI ✓

COMPLETION DATE April

DATA ASSESSMENT SUMMARY

		ICP	AA	Hg	CYANIDE
1.	HOLDING TIMES	O	O	O	O
2.	CALIBRATIONS	O	O	O	O
3.	BLANKS	M	M	O	O
4.	ICS	O			
5.	LCS	O			
6.	DUPLICATE ANALYSIS	O	O	O	O
7.	MATRIX SPIKE	O	X	O	O
8.	MSA		∅		
9.	SERIAL DILUTION	O			
10.	SAMPLE VERIFICATION	O	O	O	O
11.	OTHER QC	O	X	O	O
12.	OVERALL ASSESSMENT	O	O	O	O

O = Data has no problems/or qualified due to minor problems.
M = Data qualified due to major problems.
Z = Data unacceptable.
X = Problems, but do not affect data.

ACTION ITEMS: Several results for Ca, Se + Na (B) due to blanks; low Se spike + CRDL std. recoveries

AREAS OF CONCERN: no MSA performed for As in one sample

NOTABLE PERFORMANCE:

CLP DATA ASSESSMENT SUMMARY FORM (INORGANICS)

Type of Review: Region 2 full Date: 4/28/92 Case #: NWS01

Site: NWS Earle Lab Name: Orytek

Reviewer's Initials: AC Number of Samples: 10

Analytes Rejected Due to Exceeding Review Criteria:*

	Holding Times	B) Qn)k- Calibration	Prep Blank	Field Blank	Inter-ferences	Spike Recovery	Duplicates Lab	Duplicates Field	Detection Limits	LCS	Serial Dilution	MSA	Total Analytes	Rejection
ICP		3												3
Flame AA														
Furnace AA		1												1
Mercury														
Total														
Other														

Analytes Flagged as Estimated (J) Due to Exceeding Criteria For:*

ICP														
Flame AA														
Furnace AA						0						1		
Mercury														
Total														
Other														

Note:
Asterisk (*) Indicates additional exceedances of review criteria.

Metals Se, Tl

IDLs 1, 2 ug/l

U = < IDL

NWS01

Graphite Furnace Spike Recovery Evaluation Form

Sample ID	Instr. Level Result ug/l	PDS Recovery %	Diluted Result ug/l	Diluted PDS Recovery %	MSA Result (if needed) ug/l	Final Result Reported mg/kg
RB0310	ND	102				.2 U
S10006	1.6	79				0.35 ✓ B
S11006	5.2	81	2.7 NO DILN	75		0.58 ✓
S12006	2.7	79				0.63 ✓
S13006	1.6	92				0.35 ✓
SS1012	1.4	89				0.30 ✓
SS1112	1.9	98				0.40 ✓
SS1112D	1.4	91.				0.30 ✓
SS1112Sp	6.7	—				48 %
SS1212	1.3	80				0.29 ✓ B
SS12D2	1.1	84				0.24 ✓
SS1312	8.3	95				1.9 ✓
						mg/kg
RB0310	ND	107				.4 U
S10006	ND	109				
S11006	ND	109				
S12006	ND	107				
S13006	ND	112				
SS1012	ND	112				
SS1112	ND	112				
SS1112D	ND	111				
SS1112S	50.0	—				100 %
SS1212	ND	106				U
SS12D2	ND	108				
SS1312	ND	112				

Se

Tl

Metals Pb, As

IDLs 1.1 ug/l

U = < IDL

NWS01

Graphit **Furnace** Spike Recovery Evaluation Form

Sample ID	Instr. Level Result ug/l	PDS Recovery %	Diluted Result ug/l	Diluted PDS Recovery %	MSA Result (if needed) ug/l	Final Result Reported mg/kg	ICP
RB0316	ND	110				.2 U	
S10006	104.1 hi	125 hi	53.8x2	95		23.5 ✓J	11.0
S11006	19.6	108				4.2 ✓J	102.
S12006	19.5	104				4.5 ✓J	52.
S13006	45.7	106				10.1 ✓	11.2
SS1012	15.9	123	NO DIL'N 17.4	107		3.8 ✓	6U
SS1112	24.8	107				5.3 ✓	7.5
SS1112D	29.8	104					7.3
SS1112 Sp	45.3	—				102 %	96 %
SS1212	19.2	90				4.1 ✓	6U
SS12D2	14.8	110				3.3 ✓	6.6 U
SS1312	56.2	104				12.5 ✓J	26.3
						mg/kg	
RB0310	ND	98				.2 U	
S10006	41.4	99				9.1 ✓	
S11006	51.9	95				11.2 ✓	
S12006	66.7	83 *	NO DIL'N 62.3	65 *		15.2 ✓J	
S13006	61.5	87				13.6 ✓	
SS1012	55.9	94.				12.2 ✓	
SS1112	59.7	88				12.6 ✓	
SS1112D	63.9	88				13.6 ✓	
SS1112S	72.8	—				31 %	
SS1212	42.0	95				9.0 ✓	
SS12D2	39.9	99				8.9 ✓	
SS1312	47.2	94.				10.5 ✓	
*	samples S12006 should have been re-analyzed by MSA					*	

Abs < ½ PDS Abs) Pb

D MSA ?? →

As

Pb approx. ICP IDL = 30 ug/l

Low As spike %R due primarily to sample inhomogeneity