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200-BP-1
GROUNDWATER ANALYSIS PROJECT

PARAMETERS OF INTEREST

DATA PACKAGE/REPORT No. 3

Revision 1

January 30, 1991

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Prepared by: B.M. Gillespie

FEB 1991
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DATA RECEIPT

Pacific Northwest Laboratory

(PNL Project #16772)

5/30/96 BD

INTRODUCTION

This data package contains the results obtained by Pacific Northwest Laboratory (PNL) staff in the characterization of samples for the 200-BP-1 Groundwater Analysis Project. The samples were submitted for analysis by Westinghouse Hanford Company (WHC) under the Technical Project Plan (TPP) 16772 and the Quality Assurance Project Plan (QAPjP) ALO-001. The analytical procedures required for analysis were defined in the Test Instructions (TI) prepared by the PNL 200-BP-1 Project Management Office in accordance with the TPP and the QAPjP ALO-001.

The samples (Table 1) were submitted with the appropriate WHC Chain of Custody (COC) and Sample Analysis Request Forms. The samples were delivered at refrigerated temperature to the 300 Area, 325 Building 200-BP-1 Sample Custodian.

The requested analyses for these samples were the parameters of interest in the WHC SOW. These parameters of interest are; nitrate, nitrite, phosphate, sulfate, cyanide, free cyanide, selenium, bismuth, total alpha, total beta, cesium-137, cobalt-60, ruthenium-106, plutonium-239/240, plutonium-238, strontium-90, technetium-99, total uranium activity, and tritium. Weight percent solid was also determined for soil samples. All data are corrected to dry weight except where otherwise stated. The quality control (QC) requirements for each sample are defined in the test instructions for each sample. The QC requirements outlined in the procedures and requested in the WHC SOW were followed. Sample duplicates, methods blank, matrix spikes and matrix spike duplicates were analyzed. All QC data that exist are included in this Data Package/Report.

The data in this package are reported in separate tables (Tables 2 through 14) for each analyte or method. Four appendices are provided; one for Test Instruction, one for Chain of Custody, Sample Analysis Request Forms and Sample Receipt Forms, one that contains the primary inorganic analytical data and one that contains the primary radiochemistry analytical data.

CERTIFICATION STATEMENT

I certify that this data package is in compliance with the terms and conditions of the TPP 16772 and QAPjP ALO-001 for completeness. Release of the data contained in this hard copy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Project Manager or the Project Manager's designee, as verified by the following signature.

B.M. Gillespie — 1-29-91

B. M. Gillespie
200-BP-1 Project Manager

Date

Quality Control

I certify that I have reviewed all data in this report/package for completeness of the QC data and for compliance with project QC requirements as defined in the TPP 16772 and the QAPjP ALO-001.

J L Daniel — 1/29/91

J. L. Daniel
PNL ACL Quality Representative

Date

TABLE 1: 200-BP-1 Sample Numbers

WHC Sample Number	PNL ALO Sample Number	Sample Type
299-E33-40-008	90-7060	Soil
299-E33-38-006.2	90-7061	Soil

TABLE 2:

WEIGHT PERCENT SOLIDS SUMMARY SHEET

SAMPLE ID#	PNL LOG#	SAMPLE WT %	DUPLICATE WT %	AVERAGE SOLIDS WT %
299-E33-40-008	90-7060	93.86	93.52	93.69
299-E33-38-006.2	90-7061	96.96	96.74	96.85

* Weight Percent Solids were determined following the method outlined in PNL-ALO-504.

ANION ANALYSIS RESULTS

The samples and their accompanying QC samples were prepared by procedure PNL-ALO-108, Aqueous Leach of Sludges, Soils, and Other Solid Samples for Anion Analysis. The sample solution was then analyzed by Ion Chromatography (IC) according to procedure PNL-ALO-212, Determination of Inorganic Anions by Ion Chromatography. This method is comparable to EPA method 300.0. The total analysis was performed in building 325 in the 300 area.

The data are listed in Table 3. Analyses are listed on four separate tables, a table for each analyte. The data are reported this way to allow review of sample data, duplicates, blanks, matrix spikes, RPD and % recoveries for samples of each analyte. Data results are reported as dry weight (i.e. converted from weight % solids).

The mean % spike recoveries (sample + spike, matrix duplicate spike and blank + spike) and their standard deviation (SD) for this set of data are as follows:

	REC	± SD (%)
NO2-N	96.3	1.9
NO3-N	94.1	3.1
PO4-P	83.6	3.6
SO4	84.1	11.2

Upon review of the nitrate and sulfate soil analysis of duplicates the Relative Percent Differences (RPD) of the duplicate values are:

	RPD
NO3-N	10.9
SO4	11.3

The values varied due to heterogeneity of sample matrix. The concentration of the other soil analytes was below the detection limits, therefore a RPD is not calculated.

The requested hold time maxiumum for water analysis of anions is 48 hours from sampling to the time of analysis. There are no hold times associated with the analysis of soils except that the analysis of anions be performed within 48 hours of the aqueous leach of the soils. All leaches of soils were analyzed within the requested hold time.

TABLE 3: ANION IC ANALYSIS DATA

NITRITE (NO2-N)

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	RPD	C5 BLANK (ug)	C3 SPIKE+SAMPLE ANALYSIS (mg/Kg)	C3 SPIKE ACTUAL (mg/Kg)	C6 DUP+SPIKE ANALYSIS (mg/Kg)	C6 SPIKE ACTUAL (mg/Kg)	% RECOVERIES C3 SAMPLE + SPIKE	% RECOVERIES C6 DUP+ SPIKE	% RECOVERIES C4 BLANK+ SPIKE
299-E33-38-006.2	90-7060	<0.2	<0.2	NA								
299-E33-40-008	90-7061	<0.2	<0.2	NA	<0.2	21.3	21.7	20.6	21.8	98.2	94.5	96.1

Detection Limit = 0.2 mg/Kg

Note: RPD (relative percent difference) only calculated when both sample and duplicate results are >DL.

Comments: If all spike recovery calculations are normalized relative to C4=100%, then % spike recoveries for C3 and C6 are 102.2% and 98.3%, respectively.

TABLE 3: ANION IC ANALYSIS DATA

NITRATE (NO3-N)

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	RPD	C5 BLANK (ug)	C3 SPIKE+SAMPLE ANALYSIS (mg/Kg)	C3 SPIKE ACTUAL (mg/Kg)	C6 DUP+SPIKE ANALYSIS (mg/Kg)	C6 SPIKE ACTUAL (mg/Kg)	% RECOVERIES C3 SAMPLE + SPIKE	% RECOVERIES C6 DUP+ SPIKE	% RECOVERIES C4 BLANK+ SPIKE
299-E33-38-006.2	90-7060	0.6	<0.2	NA								
299-E33-40-008	90-7061	0.9	1.0	10.9	<0.2	16.0	16.1	15.7	16.2	93.7	91.2	97.3

Detection Limit = 0.2 mg/Kg

Note: RPD only calculated when both sample and duplicate results are >DL.

Comments: If all spike recovery calculations are normalized relative to C4=100%, then % spike recoveries for C3 and C6 are 96.3% and 93.7%, respectively.

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TABLE 3: ANION IC ANALYSIS DATA

PHOSPHATE (PO4-P)

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	RPD	C5 BLANK (ug)	C3 SPIKE+SAMPLE ANALYSIS (mg/Kg)	C3 SPIKE ACTUAL (mg/Kg)	C6 DUP+SPIKE ANALYSIS (mg/Kg)	C6 SPIKE ACTUAL (mg/Kg)	% RECOVERIES C3 SAMPLE + SPIKE	% RECOVERIES C6 DUP+ SPIKE	% RECOVERIES C4 BLANK+ SPIKE
299-E33-38-006.2	90-7060	<0.6	<0.6	NA								
299-E33-40-008	90-7061	<0.6	<0.6	NA	<0.6	18.8	23.3	19.2	23.3	80.7	82.4	87.7

Detection Limit = 0.6 mg/Kg

Note: RPD only calculated when both sample and duplicate results are >DL.

Comments: If all spike recovery calculations are normalized relative to C4=100%, then % spike recoveries for C3 and C6 are 92.0% and 94.3%, respectively.

TABLE 3: ANION IC ANALYSIS DATA

SULFATE (SO4)

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	C1 SAMPLE (mg/Kg)	C2 SAMPLE DUP (mg/Kg)	RPD	C5 BLANK (ug)	C3 SPIKE+SAMPLE ANALYSIS (mg/Kg)	C3 SPIKE ACTUAL (mg/Kg)	C6 DUP+SPIKE ANALYSIS (mg/Kg)	C6 SPIKE ACTUAL (mg/Kg)	% RECOVERIES C3 SAMPLE + SPIKE	% RECOVERIES C6 DUP+ SPIKE	% RECOVERIES C4 BLANK+ SPIKE
299-E33-38-006.2	90-7060	6.3	<3.7	NA								
299-E33-40-008	90-7061	15.0	16.8	11.3	<3.7	71.7	71.3	70.9	71.5	78.3	76.9	97.0

Detection Limit = 3.7 mg/Kg

Note: RPD only calculated when both sample and duplicate results are >DL.

Comments: If all spike recovery calculations are normalized relative to C4=100%, then % spike recoveries for C3 and C6 are 80.7% and 79.3%, respectively.

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CYANIDE ANALYSIS RESULTS

The samples and their accompanying QC samples were prepared by procedure PNL-ALO-270, Total Cyanide in Waters, Solids or Sludges. The methodology is comparable to CLP SOW 788 Method 335.2 distillation and colorimetric technique for the analysis of cyanide. The analysis was performed in building 3720 in the 300 area.

The procedure, PNL-ALO-270, did not reflect the correct CLP standard preparation guidelines (section 7.3.2.1 and 7.4.2.1). The analysts made a deviation to the procedure and used the client requested method, CLP SOW (788), method 335.2, for the standard preparation (page D-76). An Interim Change Notice (ICN) to the procedure is in the process of being written.

The sample results were below the client required detection limits of 10 1 mg/Kg. Sample results are all below 2 ppm; therefore free cyanide analysis was not required.

Upon review of the sample spiked data results, the mean recovery is 97.0% with a standard deviation of 0.4%. The mean recovery of the Laboratory Control Standard is 90.5% with a standard deviation of 2.3%.

The general Environmental Protection Agency (EPA) hold time for total cyanide is 12 days. The hold time was inadvertently not met for one of the samples but was met for the other. There is no known impact on the results of the late analysis date as the cyanide concentrations are below the detection limits, and samples are preserved in basic media. The LCS standards were acquired from EPA in April of 1990 (six months prior to analysis) and are in basic media and produce satisfactory recoveries (mean of 97%); therefore the late analyses of the sample is unlikely to have any impact on the results.

TABLE 4: TOTAL CYANIDE ANALYSIS DATA

SOLID SAMPLES

SAMPLE ID#	PNL LOG#	G1 SAMPLE (mg/Kg)	G2 SAMPLE DUP (mg/Kg)	RPD	G5 BLANK (ug)	G3 SPIKE+SAMPLE (mg/Kg)	G3 SPIKE (mg/Kg)	G6 DUP SPIKE (mg/Kg)	G6 SPIKE (mg/Kg)	% RECOVERIES C3 SAMPLE + SPIKE	% RECOVERIES C6 BLANK+ SPIKE	% RECOVERIES LCS SAMPLE
299-E33-40-008	90-7060 (a)	<0.1	<0.1	NA	0.1	9.66	9.62	9.66	9.61	100.5	92.8	94.4
299-E33-38-006.2	90-7061	<0.1	<0.1	NA	<0.1	9.69	9.96			97.2		92.1

Detection limits for soil = 0.1-0.4 mg/Kg (theoretical)

(a) Hold time missed by 6 days.

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FREE CYANIDE ANALYSIS RESULTS

Total cyanide results were all below 2 ppm, therefore free cyanide analysis was not performed on the samples in this set.

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Table 5: Free Cyanide Analysis Data

No data necessary.

GRAPHITE FURNACE ATOMIC ABSORPTION ANALYSIS RESULTS

Samples and their accompanying QC samples were prepared following acid digestion by procedure PNL-ALO-101, Acid Digestion for Metal Analysis. The methodology is consistent with the CLP procedure for the acid digestion of waters and sediments. Digestates were then analyzed by graphite furnace atomic absorption (GFAAS) following procedure PNL-ALO-215, Selenium (Atomic Absorption, Furnace Method), for selenium and PNL-ALO-216, Bismuth (Atomic Absorption, Furnace Technique), for bismuth. Se and Bi analysis methodologies are consistent with CLP SOW 788 Method 270.2. Digestion of samples and analysis by GFAAS was conducted in building 325.

Analysis for Se and Bi was conducted on a Perkin-Elmer 5100/HGA 600 (not equipped with a Zeeman background correction device). The quarterly instrument detection limit (IDL) for Se was found to be 1.3 μg/L. The corresponding IDL for Bi was found to be 4.3 μg/L.

A preliminary analysis of the samples was performed to determine the dilution factor necessary to bring the concentration to mid-range in the calibration curve. All sample solutions were determined to have Se and Bi levels below the respective detection limits 3.25 μg/L and 10.75 μg/L. Detection limit was defined as 2.5 times the IDL.

The data are reported in Table 6 for selenium results and Table 7 for bismuth results. Each table has a summary results table followed by a batch results table for easy verification of control standards and quality control samples analyzed per batch.

Upon review of the data tables for selenium (Table 6A) and bismuth (Table 7A), the average recovery of selenium spike is 79.6% with a standard deviation of 33.5% (for samples with recoveries above 0%), the average recovery of bismuth spike is 89.9% with a standard deviation of 9.3% (for samples with recoveries above 5%). A precision determined from the duplicate sample analysis is not possible since the results are below detection limits.

The large bias and poor precision associated with the analysis of selenium in soil samples is attributed to the low concentrations of selenium and spike standard in the samples and matrix interference (of iron) in the

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determination in selenium analysis. A Zeeman background correction attachment is necessary for this matrix correction. The data in Tables 6 and 7 are flagged with appropriate CLP (as defined in CLP SOW 7/88, pages B-19 and 20) flags where necessary. ICB, CCB, ICV, CRA, etc. are as defined in the CLP SOW 7/88, section E.

The CLP SOW 788 specified hold time of 180 days was met as well as the contract required hold time of 120 days.

TABLE 6: SELENIUM ANALYSIS DATA

ACID EXTRACTABLE SELENIUM IN SAMPLES

SOLID SAMPLES

SAMPLE ID#	PNL LOG# (a)	B1 SAMPLE (ug/L)	Spike % Rec	B2 SAMPLE DUP (ug/L)	Spike % Rec	RPD (c)	B5 BLANK (ug/L)	B3 SPIKE+SAMPLE (ug/L)	B3 SPIKE (ug/L) (b)	B6 BLANK+SPIKE (ug/L)	B6 SPIKE (ug/L) (b)	% RECOVERIES B3 SAMPLE + SPIKE	% RECOVERIES B6 BLANK+ SPIKE	% RECOVERIES B4 LCS SAMPLE
699-55-55-050	90-5356	<1.3		<1.3			<1.3	<1.3	25.00	<1.3	25	0	0	106
699-55-55-050	90-5356-AS	4.8	119	4.4	116	8.7	11.0	6.8	10	7.3	10	122	123	
299-E33-40-008	90-7060	<1.3												
299-E33-40-008	90-7060	3.5	67											
299-E33-38-006.2	90-7061	<1.3												
299-E33-38-006.2	90-7061	3.2	75											

Instrument Detection Limit (IDL) for soil in solution = 1.3 ug/L = 0.1 mg/Kg (calculated using average sample size of 1.5 g)
Method Detection Limit (DL) for soils in solution = IDL x 2.5 = 3.25 ug/L = 0.22 mg/Kg (calculated using average sample size of 1.5 g)
Contract Required Detection Limit (CRDL) = 0.5 ug/g (0.5 mg/Kg)

(a) Analytical Spike (AS) = 10 ug/L
(b) Pre-digest spike = 25 ug/l for B3, B4 and B6
(c) RPD only calculated if both sample and duplicate are greater than detection limit.

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TABLE 6A: SELENIUM ANALYSIS DATA

SELENIUM BATCH SET SOIL DATA RESULTS

Lab log #	Soln. Conc. (ug/L)	Results (mg/Kg)	Duplicate RPD (e)	Spike (ug/L) (b,c)	Spike %Rec.	Standard %Rec.	CLP flags
ICB	-0.9						
ICV (a)	25.7			26.4		99	
CCB	-0.6						
CRA	4.8					96	
CCB	-1.2						
90-5356-B1	-7.2	<IDL					U
90-5356-B1-AS	4.8			10	119		W
90-5356-B2	-7.2	<IDL					U
90-5356-B2AS	4.4			10	116		W
90-5356-B3	-5.4	<IDL	N/A	25	0		E
90-5356-B3-AS	6.8			10	122		W
90-5356-B4 (d)	10.3	41.46				106	
90-5356-B4-AS	21.0			10	107		
90-5356-B5	-1.2	<IDL					
90-5356-B5-AS	11.0			10	122		W
90-5356-B6	-5.1	<IDL		25	0		E
90-5356-B6-AS	7.3			10	123		W
CCV	25.6			26.4		97	
CCB	0.2						
90-6704-B1(f)	-0.7	<IDL					U
90-6704-B1-AS(f)	3.4			10	41		
90-6707-B1(f)	-0.2	<IDL					U
90-6707-B1-AS(f)	3.7			10	39		E
90-6708-B1(f)	-0.2	<IDL					U
90-6708-B1-AS(f)	4.1			10	43		
90-6710-B1(f)	-0.7	<IDL					U
90-6710-B1-AS(f)	4.1			10	48		
90-6711-B1(f)	-0.2	<IDL					U
90-6711-B1-AS(f)	3.4			10	36		E
CCV	25.4			26.4		96	
CCB	0.5						
90-6712-B1(f)	-3.2	<IDL					U
90-6712-B1-AS(f)	4.4			10	76		W
90-6714-B1(f)	-2.7	<IDL					U
90-6714-B1-AS(f)	4.3			10	70		W
90-6715-B1(f)	-4.9	<IDL					U
90-6715-B1-AS(f)	2.0			10	70		W
90-7060-B1	-3.2	<IDL					U
90-7060-B1-AS	3.5			10	67		W
90-7061-B1	-4.3	<IDL					U
90-7061-B1-AS	3.2			10	75		W
CCV	25.6			26.4		96	
CCB	0.6						

(a) Used a dilution of ICF/ICV-2= 26.4 ug/L
(b) Analytical spike (AS) = 10 ug/L.
(c) Pre-digest spike = 25 ug/L. for B3, B6 and B7.
(d) B4 = LCS-0287 containing 39.2 mg/Kg Se
(e) RPD only calculated if both sample and duplicate are greater than detection limit.
(f) Samples not part of data set # 3

B1 = SAMPLE
B2 = SAMPLE DUPLICATE
B3 = SAMPLE + Se SPIKE
B4 = LAB. CONTROL STANDARD
B5 = PROCEDURAL BLANK
B6 = SAMPLE + Se SPIKE DUPLICATE
B7 = SPIKED PROCEDURAL BLANK

CRDL*: 0.5 ug/g
DL (IDL x 2.5): 3.25 ug/L
IDL: 1.3 ug/L

Sample I.D.	Lab. Log #	Sampling Date	Extraction Date	Analysis Date
299-E33-40-008	90-7060	11/13/90	12/06/90	12/07/90
299-E33-38-006.2	90-7061	11/17/90	12/06/90	12/07/90

*CRDL = Contract required detection limit

All samples diluted 1:10 to bring spike recoveries to greater than 40%.

TABLE 7: BISMUTH ANALYSIS DATA

ACID EXTRACTABLE BISMUTH IN SAMPLES

SOLID SAMPLES

SAMPLE ID#	PNL LOG# (a)	B1 SAMPLE (ug/L)	Spike % Rec	B2 SAMPLE DUP (ug/L)	Spike % Rec	RPD (c)	B5 BLANK (ug/L)	B3 SPIKE+SAMPLE (ug/L)	B3 SPIKE (ug/L) (b)	B6 BLANK+SPIKE (ug/L)	B6 SPIKE (ug/L) (b)	% RECOVERIES B3 SAMPLE + SPIKE	% RECOVERIES B6 BLANK+ SPIKE	% RECOVERIES B4 LCS (d) SAMPLE
699-55-55-050	90-5356	<4.3		<4.3			<4.3	<4.3	50	<4.3	50	4	4	89
699-55-55-050	90-5356-AS	18	87	13.5	65	28.6		21.2	20	16.9	20	96	74	
299-E33-40-008	90-7060	<4.3												
299-E33-40-008	90-7060	17.4	86											
299-E33-38-006.2	90-7061	<4.3												
299-E33-38-006.2	90-7061	17.2	87											

Instrument Detection Limit (IDL) for soil in solution = 4.3 ug/L = 0.3 mg/Kg (calculated using average sample size of 1.5 g)
Method Detection Limit (DL) for soils in solution = IDL x 2.5 = 10.75 ug/L = 0.72 mg/Kg (calculated using average sample size of 1.5 g)
Contract Required Detection Limit (CRDL) = 10 ug/g (10 mg/Kg)

(a) Analytical Spike (AS) = 20 ug/L
(b) Pre-digest spike = 50 ug/l
(c) RPD only calculated if both sample and duplicate are greater than detection limit.
(d) B4 = LCS-0287 + 40 ug Bi spike

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TABLE 7A: BISMUTH ANALYSIS DATA

BISMUTH BATCH SET SOIL DATA RESULTS

Lab log #	Soln. Conc. (ug/L)	Results (mg/Kg)	Duplicate RPD (e)	Spike (ug/L) (b,c)	Spike %Rec.	Standard %Rec.	CLP flags
ICB	0.5						
ICV (a)	24.8			25		99	
CCB	0.7						
CRA	9.0					90	
CCB	0.5						
90-5356-B1	-0.5	<IDL					U
90-5356-B1-AS	18.0			20	87		
90-5356-B2	0.5	<IDL					U
90-5356-B2AS	13.5			20	65		W
90-5356-B3	2.0	<IDL	N/A	50	4		E
90-5356-B3-AS	21.2			20	96		
90-5356-B4 (d)	11.9	35.7				89	
90-5356-B4-AS	31.5			20	98		
90-5356-B5	0.8	<IDL					
90-5356-B5-AS	18.4			20	88		
90-5356-B6	2.1	<IDL		50	4		E
90-5356-B6-AS	16.9			20	74		W
CCV	25.5			25		98	
CCB	0.2						
90-6704-B1(f)	0.0	<IDL					U
90-6704-B1-AS(f)	18.9			20	95		
90-6707-B1(f)	-0.1	<IDL					U
90-6707-B1-AS(f)	18.7			20	95		
90-6708-B1(f)	0.0	<IDL					U
90-6708-B1-AS(f)	19.1			20	96		
90-6710-B1(f)	-0.1	<IDL					U
90-6710-B1-AS(f)	18.9			20	95		
90-6711-B1(f)	-0.2	<IDL					U
90-6711-B1-AS(f)	19.2			20	97		
CCV	25.1			25		96	
CCB	-0.1						
90-6712-B1(f)	-0.2	<IDL					U
90-6712-B1-AS(f)	19.6			20	99		
90-6714-B1(f)	-0.2	<IDL					U
90-6714-B1-AS(f)	18.8			20	95		
90-6715-B1(f)	-0.2	<IDL					U
90-6715-B1-AS(f)	16.8			20	85		
90-7060-B1	0.2	<IDL					U
90-7060-B1-AS	17.4			20	86		
90-7061-B1	-0.2	<IDL					U
90-7061-B1-AS	17.2			20	87		
CCV	25.0			25		96	
CCB	2.3						

Notes:
(a) Used a dilution of ICV-2 = 26.4 ug/L
(b) Analytical spike (AS) = 20 ug/L.
(c) Pre-digest spike = 50 ug/L.
(d) B4 = LCS-0287+ 40 ug Bi spike
(e) RPD only calculated if both sample & duplicate a
(f) Samples not part of data set #2

B1 = SAMPLE
B2 = SAMPLE DUPLICATE
B3 = SAMPLE + Bi SPIKE
B4 = LAB. CONTROL STANDARD
B5 = PROCEDURAL BLANK
B6 = SAMPLE + Bi SPIKE DUPLICATE
B7 = SPIKED PROCEDURAL BLANK

CRDL* : 10 ug/g
DL (IDL x 2.5): 10.75 ug/L
IDL: 4.3 ug/L

Sample I.D.	Lab. Log #	Sampling Date	Extraction Date	Analysis Date
299-E33-40-008	90-7060	11/13/90	12/06/90	12/07/90
299-E33-38-006.2	90-7061	11/17/90	12/06/90	12/07/90

*CRDL = Contract required detection limit

All samples diluted 1:10 to bring spike recoveries to greater than 40%.

ICP-MS ANALYSIS RESULTS

The samples and their accompanying QC samples were prepared by procedure PNL-ALO-101, Acid Digestion for Metal Analysis. The methodology is consistent with CLP Inorganic acid digestion for metals. The sample solutions (1:100 dilutions) were then analyzed by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) Analysis, procedure PNL-ALO-280. The technetium analysis was performed in accordance with procedure PNL-ALO-281, ICP/MS Determination of 99-Tc and the uranium was analyzed in accordance with procedure PNL-ALO-282, Determination of Uranium Concentration/Isotopic Composition Using ICP/MS. The digestion of the samples was performed in 325 building and the analysis of the digestate was performed in building 3708 in the 300 area.

The concentrations of one Tc-99 result and the U result are near the sample matrix detection limits in these samples. A small interfering peak at mass/charge 99 was observed in preparation blanks and reagent blanks, thus limiting the lower level detection to 0.01 ppb (leacheate solution). Accurate uranium isotope ratios could not be calculated due to statistically insignificant count rates for the 234 and 236 isotopes. Consequently, at ^{238}U concentrations of <200 ppb, a total uranium activity was computed from the ^{238}U concentration and the half-life of this isotope, also being applied (assuming that ^{238}U activity amounts to 48.1% of natural uranium activity).

Quality assurance measures included the analysis of blind standards, duplicate analyses and analysis of spiked samples. Results for standards are given in the ^{99}Tc and U data tables (Table 8) and are in excellent agreement with standard values. Precision estimates based on duplicate analyses are difficult to determine due to the detection limit values given in most cases for these samples. An exception here is uranium in the soil samples, where duplicate values of 452 and 462 ng/g were obtained for sample 90-5356, indicating a 2% relative percent difference. This sample is a 200-BP-1 soil sample but is not a sample in this sample delivery group. It is in the report for QC purposes. Spike recoveries for ^{99}Tc ranged from 92% to 116% (mean of 107%) in the soils. A precision of ±13% and bias of +3% relative are deduced by this data for spike recoveries. Uranium recoveries were indeterminable in the soil samples since the inherent soil uranium contribution was well in excess of the spike amounts (3-5 times the instrument detection limits).

detection limits). Precision and accuracy will be determined when enough data is available for control charts.

No defined hold times were required for these analytes, although analyses were generally performed within 2-3 days of sample digestion.

TABLE 8: TECHNETIUM AND URANIUM DETERMINATIONS (SOILS)

Technetium-99 and Uranium Determinations by ICP - Mass Spec.

PNL sample I.D. Number (a)	VIAL ID NUMBER	DRY WEIGHT	DILUTION FACTOR (b)	ICP/MS Analysis No.	Tc-99, ng/ml leachate	Tc-99, ng/g soil (c,d)	Tc-99, ng/g spiked (d)	Tc-99, spike recovery, %	Tc-99, pCi/g, %dry soil	U, ng/ml leachate	U, ng/g soil (c,d)	U, ng/g spiked (d)	U, spike recovery, % (e)	U, pCi/g (total) dry soil (f)
90-7060-B1	17	1.6102	62.10	0c13r2	<0.01	<0.6			<1	10.41	680			0.5
90-7061-B1	18	1.2282	81.42	0c13r3	0.01	1.03			17	8.34	715			0.5
90-5356-B1 (h)	1	1.1900	84.03	0c13r5	0.01	1.15			19	5.11	452			0.3
90-5356-B2	2	1.2474	80.16	0c13r6	0.02	1.52			26	5.48	462			0.3
90-5356-B3	3	1.1879	84.18	0c13r8	0.05	4.72	4.16	114	N/A	5.17	458	4.18	N/A	N/A
90-5356-B4	4	1.8708	134.16	0c13r9,14	0.02	3.11			53	94.75	13381			9.3
90-5356-B5	6	N/A	100.00	0c13r11	<0.01	<1.0			N/A	0.06	7			N/A
90-5356-B6	7	1.1819	84.60	0c13r13	0.04	3.83	4.18	92	N/A	4.35	387	4.21	N/A	N/A
90-5356-B7	8	N/A	100.00	0c13r14	0.06	5.76	4.97	116	N/A	0.05 (g)	5	4.97	106	N/A
(i)														
Tc/U STD ppb	0.0494 / 0.497	N/A	N/A	0c13r4	0.05			101		0.59			119	
Tc/U STD ppb	0.0988 / 0.994	N/A	N/A	0c13r7	0.10			101		0.99			100	
Tc/U STD ppb	0.494 / 4.97	N/A	N/A	0c13r10	0.50			101		4.97			100	
Tc/U STD ppb	0.988 / 9.94	N/A	N/A	0c13r12	0.96			97		9.71			98	
							mean	100				mean	104	
							std. dev.	2				std. dev	10	

(a) Sample types:
B1 = sample
B2 = sample, duplicate
B3 = sample + Tc/U spike
B4 = laboratory control sample (ICF LCS-0287, no Tc or U data available)
B5 = procedural blank
B6 = sample + Tc/U spike, duplicate
B7 = blank + Tc/U spike

(b) units of mL/g dry soil except for -B5 and -B7 samples (blank/blank spike) units of mL
(c) leachate concentration corrected for internal standard dilution (x 5.00/4.75) and preparation dilution factor
(d) units of ng/g except -B5 and -B7 samples (blank/blank spike) units of ng
(e) not applicable - [U] in sample leachate >> [U] of added spike
(f) total uranium activity calculated using natural isotopic abundance for soil leachate [U] < 200 ppb: pCi = [U]*0.000336/0/481
(g) value corrected for blank contribution (0.06 ng/mL)
(h) Sample not in this sample delivery group but reported for QC purposes.
(i) Standards

GAMMA ENERGY ANALYSIS RESULTS

Two soil samples were received for Gamma Energy Analysis (GEA) in this sample delivery group. A duplicate soil and a matrix blank were analyzed per the Test Instructions received. The sample preparation and counting were performed in 329 building in the 300 area.

The samples were prepared for counting by following PNL-ALO-105. This procedure covers the preparation of both the solids and the liquids. The geometry used for the solids was the "large tuna can." Two hundred twenty grams of dried material were sealed into a "large tuna can." The results are corrected to dried weight as determined by this procedure.

The samples were then analyzed by gamma-ray spectroscopy to determine the quantites of Co-60, Ru-106, and Cs-137 present. This work was performed following PNL-ALO-464 and PNL-ALO-470. The soils were counted on two different detectors. This served as both a cross check on the data and supplied detection limit information on each system. The first system was Detector L which is a lithium-drifted germanium [Ge(Li)] detector. The second system was Detector I which is a coincidence-noncoincidence Ge(Li)-NaI(Tl) detector. This system was designed for improved sensitivity of single gamma-ray emitting radionuclides such as Cs-137.

Table 9 presents the measured values for Co-60, Ru-106, and Cs-137 in the soils. The detection limits quoted are calculated as if the isotope was present at a level that is 2.5 times the square root of twice the average background.

Table 9: Gamma Energy Analysis of Soils

Detector I

(Radionuclide activity in pCi/g)

Sample ID	LRB #	Date of Count	Weight g.	Co(60)	Ru(106)	Cs(137)
90-6710-L-1 (a)	53944-29-A	11-29-90	220.10	<0.012	<0.12	<0.0055
90-6710-L-2 (a)	53944-29-B	11-30-90	220.60	<0.0083	<0.078	<0.0038
90-6710-L-5 (b)	53944-34-A	11-16-90	220.00	<0.0033	<0.045	<0.0018
90-7060-L-1	53944-46-A	12-11-90	220.36	<0.012	<0.11	0.024 +/- 24%
90-7061-L-1	53944-47-A	12-12-90	220.46	<0.13	<0.12	0.107 +/- 6.4%

Detector L

(Radionuclide activity in pCi/g)

Sample ID	LRB #	Date of Count	Weight g.	Co(60)	Ru(106)	Cs(137)
90-6710-L-1 (a)	53944-29-A	11-26-90	220.10	<0.017	<0.16	<0.013
90-6710-L-2 (a)	53944-29-B	11-24-90	220.60	<0.012	<0.12	<0.0096
90-6710-L-5 (b)	53944-34-A	12-02-90	220.00	<0.012	<0.12	<0.0096
90-7060-L-1	53944-46-A	12-12-90	220.36	<0.019	<0.17	0.0361 +/- 14%
90-7061-L-1	53944-47-A	12-11-90	220.46	<0.023	<0.21	0.108 +/- 7.4%

(a) Sample not in sample delivery group but reported for QC purposes.

(b) Matrix blank is an empty Large Tuna Can. A mass of 220.0 g was assumed for calculation of detection limit activity.

The one sigma uncertainty is based on counting statistics.

L1 = SAMPLE
L2 = SAMPLE DUPLICATE
L5 = BLANK

Detection Limit (theoretical as defined in the QAPjP ALO-001)
Cs(137) - 0.01 pCi/g
Co(60) - 0.01 pCi/g
Ru(106) - 0.11 pCi/g

Note: All "<" values are detection limits associated with each "not detected" analysis.

TOTAL ALPHA ANALYSIS RESULTS

The samples and their accompanying QC samples were prepared by procedure PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. The digested samples were then processed by procedure PNL-ALO-460, Source Preparation for Gross Alpha Analysis, and the sources were counted in accordance with procedure PNL-ALO-461, Alpha Counting Procedure. The sample results for solids are reported per received sample weight (i.e. not corrected for wt % solids). Total alpha activity was calculated using a counting efficiency factor for Pu-239. The digestion, source preparation and counting were performed in building 329 in the 300 area.

A percent recovery (i.e. counting efficiency) versus total solids curve was prepared for the analysis of total alpha activity for soil samples. The PNL method in procedure, PNL-ALO-460, is consistent with that in SW 846, method 9310. This method requires the use of a counting efficiency versus total solids curve for the gross alpha analysis in water samples and also is an accepted method for gross alpha analysis of soil samples.

The blank spike had a recovery of 89%. The matrix spike and duplicate matrix spike resulted in recoveries of 87% and 64% after curve factor corrections. These recoveries, typical of gross alpha analysis of soil samples, are attributed to uneven distribution of solids on the counting disk. Upon review of the duplicate sample results (Table 10), the relative percent difference (RPD) is 6% and the RPD for the matrix spike and the matrix spike duplicate samples is 27%. Total alpha results and spike duplicate results are within the precision limits required by the client.

There are no defined hold times for total alpha analysis.

TABLE 10:

TOTAL ALPHA ANALYSIS DATA

	Sample #	Sample Type	Total Alpha (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
*	90-6708-A-1a	Soil	1.66	0.36	5.6			
*	90-6708-A-2a	Duplicate	1.57	0.36				
*	90-6710-A-1a	Soil	2.38	0.48				
*	90-6710-A-3a	Matrix Spike	15.40	1.02	27.3	14.92	0.14	87.3
*	90-6710-A-6a	Dup. Mat. Spi	11.70	0.79		14.60	0.14	63.8
	90-7060-A-1a	Soil	1.75	0.37				
	90-7061-A-1a	Soil	2.91	0.58				
*	90-6708-A-5a	Blank	ND<0.11 **					
*	90-6708-A-4a	Blank Spike	7.10	0.40		7.98	0.08	89.0
							mean	80.0
							std. dev.	14.1

* Sample not in sample delivery group but reported for QC purposes.

** Based on 0.9 g sample size.

Approximate detection Limit = 0.1 pCi/g

One sigma uncertainties are based on propagation of mass, volumetric and counting uncertainties.

ND = not detected

TOTAL BETA ANALYSIS RESULTS

The samples and their accompanying QC samples were prepared by procedure PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. The digested samples were then processed by procedure PNL-ALO-462, Source Preparation for Gross Beta Analysis, and the sources were counted in accordance with procedure PNL-ALO-463, Beta Counting Procedure. The sample results for solids are reported per received sample weight (i.e. not corrected for wt % solids). Total beta activity was calculated using a counting efficiency factor for Sr-90/Y-90. The digestion, source preparation and counting were performed in building 329 in the 300 area.

Upon review of the sample data, the average recovery of the matrix spike in soil is 53% and the blank spike recovery is 96%. The relative percent difference of the sample and duplicate is 4. Based on spike recoveries the method achieved an overall standard deviation of ± 25% with a bias of -33%. The precision and accuracy of these analyses are within the required limits of the Technical Project Plan.

There are no defined hold times for total beta analysis.

TABLE 11:

TOTAL BETA ANALYSIS DATA

Sample #	Sample Type	Total Beta (pCi/g)	+/- 1 sigma	RPD	Spike Conc. (pCi/g)	+/- 1 sigma	Spike % Rec.
* 90-6708-A-1a	Soil	1.20	0.12	4			
* 90-6708-A-2a	Duplicate	1.25	0.12				
* 90-6711-A-1a	Soil	0.87	0.09				
* 90-6711-A-3a	Matrix Spike	9.07	0.65	0	15.32	0.76	53.5
* 90-6711-A-6a	Dup. Mat. Spi	9.07	0.66		15.86	0.79	51.7
90-7060-A-1a	Soil	0.97	0.1				
90-7061-A-1a	Soil	0.88	0.27				
* 90-6708-A-5a	Blank	ND<0.10 **					
* 90-6708-A-4a	Blank Spike	15.79	1.06		16.39	0.82	96.3
						mean	67.2
						std. dev.	25.2

* Sample not in sample delivery group but reported for QC purposes.

** Based on 1.8 g. sample size.

Approximate detection Limit = 0.1 pCi/g

One sigma uncertainties are based on propagation of mass, volumetric and counting uncertainties.

ND = not detected

9613478.1175

PLUTONIUM ANALYSIS RESULTS

The samples and their accompanying QC samples were prepared by procedure PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. The digested samples were then processed by procedure PNL-ALO-466, Plutonium Separation; PNL-ALO-468, Electroplating; and PNL-ALO-469, Alpha Energy Analysis. An approximately 10 gram sample aliquot was digested for soils analysis. The sample results for solids is reported per received sample weight (i.e. not corrected for wt % solids). The digestion, source preparation and counting were performed in building 329 in the 300 area.

The samples were prepared using a Pu-242 tracer (no matrix spike samples were required to be analyzed). The plutonium analyses are calculated on the basis of their peaks ratioed to the Pu-242 tracer peak. The % recovery is monitored only as a means of determining that enough Pu was recovered for meaningful results. All samples, including duplicates in the sample delivery group showed no detectable activity for Pu-238 or Pu-239+240, therefore the relative percent difference for duplicate results cannot be calculated. The blank spike results is 96.6% suggesting a bias of -4%.

No hold times are defined for Plutonium analyses.

TABLE 12: Pu 238 AND Pu 239/240 DATA ANALYSIS

Batch 6

Program Sample ID	Sample Type	pCi/g Pu 238	+/- 1 sigma	pCi/g Pu 239+240	+/- 1 sigma	Spike pCi/g Pu 239	+/- 1 sigma	% Recovery
* 90-6712-A-1c	Soil	ND< 1.5E-03		ND< 7.0E-04				
* 90-6712-A-2c	Duplicate	< 2.0E-03		ND< 7.6E-04				
90-7060-A-1c	Soil	ND< 9.3E-04		< 4.2E-04				
90-7061-A-1c	Soil	ND< 1.2E-03		ND< 1.1E-03				
* 90-6711-A-5c	Blank	ND< 1.7E-03 **		ND< 8.2E-04 **				
* 90-6711-A-4c	Blank Spike	ND< 1.2E-03		1.15E+00	3.5E-02	1.19E+00	1.0E-02	96.6

The errors quoted (1 sigma) are the propogated error of individual measurements.

* Sample not a sample in sample delivery group but reported for QC purposes.

** Based on 10 g sample size.

Detection Limit (approximate)	Soils
Pu238	0.002 pCi/g
Pu239&240	0.001 pCi/g

NOTE: Lower detection limits can be obtained when using larger sample aliquots or longer count times.

ND = not detected

9615478.1177

STRONTIUM-90 ANALYSIS RESULTS

The samples and their accompanying QC samples were prepared by procedure PNL-ALO-106, Acid Digestion for Preparation of Samples for Radiochemical Analysis. The digested samples were then processed by procedure PNL-ALO-465, Strontium Separation and counted by PNL-ALO-463, Beta Counting. An approximately 10 gram sample aliquot was digested for soils analysis. The sample results are not corrected for Sr-89 activity; it is assumed that the samples have been in the field sufficient time to allow for all Sr-89 to decay away. The sample results for solids is reported per received sample weight (i.e. not corrected for wt % solids). The digestion, source preparation and counting were performed in building 329 in the 300 area.

Upon review of the sample data, the recovery of the spike in soil analyses is 86% suggesting a -14% bias. The relative percent difference of the soil sample analyzed in duplicate is 29%. This difference is attributed to heterogeneity of the samples.

No hold times are defined for Strontium-90 analyses.

TABLE 13: STRONTIUM-90 ANALYSIS RESULTS

Strontium-90 results not corrected for Strontium-89 that may be present.

Batch 8

Sample #	Sample Type	Sr-90 pCi/g	+/- 1 sigma	RPD	Spike Conc. pCi/g	+/- 1 sigma	Spike % Recovery	Normalized % Yield (1)
**90-6714-A-1b	Soil	0.107	0.021					
**90-6714-A-3b	Matrix Spike	42.8	4.44		49.7	2.5	85.9	
**90-6715-A-1b	Soil	0.084	0.019					
**90-6715-A-2b	Duplicate	0.063	0.017	28.6				
90-7060-A-1b	Soil	<0.060	0.031					
90-7061-A-1b	Soil	0.130	0.035					
**90-6714-A-5b	Blank	ND<0.051 *						
**90-6714-A-4b	Blank Spike	Used to determine batch yield						108

* Based on 10 g sample size.

** Sample not in sample delivery group but reported for QC purposes.

One sigma uncertainties are based on propagation of mass, volumetric and couting uncertainties.

Approximate detection limit for soils = 0.05 pCi/g

(1) All Sr-90 analyses are calculated on the basis of their ratio to the corresponding blank spike recovery (i.e. batch yield) which has been normalized to 100% chemical recovery.

ND = not detected

96134781179

TRITIUM ANALYSIS RESULTS

The samples and their accompanying QC samples were prepared by procedure PNL-ALO-441, Tritium Separation, and counted by PNL-ALO-443, Liquid Scintillation Counting. An approximately 5 gram sample aliquot was leached for soils analysis. After leaching and distilling, the aliquot control was equivalent to 0.1 grams. The sample results for solids is reported per received sample weight (i.e. not corrected for wt % solids). The leach, distillation and counting were performed in building 329 in the 300 area.

The methods blank spike was used to determine batch yield. No other methods blank spikes were analyzed.

The mean batch yield for soil analysis is 64%. All results and duplicates were below detectable activities, therefore relative percent differences and accuracy and precision results cannot be calculated.

No hold times are defined for Tritium analyses.

TABLE 14: TRITIUM ANALYSIS DATA

SOIL SAMPLES

Batch #4

Project Sample ID	Lab Sample ID	Sample Type	Tritium (pCi/g)	+/- 1 sigma	Spike Conc. (pCi/g)	+/- 1 sigma	Yield Factor (%)
**90-6704-K-1	90-6704	Soil	ND<18				
**90-6704-K-2	90-6704D	Duplicate	ND<23				
**90-6704-K-4	90-6704MS	Blank Spike	Used to determine batch yield				65.0
**90-6704-K-4	90-6704DMS	Blank Spike Duplicate	Used to determine batch yield				62.9
**90-6704-K-5	BL-6704	Blank	ND<12	*			
**90-6704-K-5	BL-6704D	Blank Duplicate	ND<12	*			
90-7060-K-1	90-7060	Soil	ND<18				
90-7061-K-1	90-7061	Soil	ND<19				
90-7061-K-5	BL-7061	Blank	ND<6.4	*			

Approximate detection Limit = 16 pCi/g (variations occur due to actual sample size)

* Based on 0.1 g sample size.

** Sample not in sample delivery group but reported for QC purposes.

ND = not detected

SAMPLE RECEIPT FORM

Delivered by: Steffler Date/Time: 11/12/90 14:47

Received by: Uric

Customer Sample Number(s): 299-E33-40-008

ALO Sample Number(s): 90-7060

1. Customer Chain-of-Custody Form: Present ✓ Absent ____

2. Additional Shipping Forms (list):
   RSR
   Request for Analysis

3. Custody Seals on Shipping and/or Sample Containers and their Conditions.

   Present ✓ Absent ____

   If Present, Condition: ____

4. Sample Tag(s) ID Numbers if not Recorded on the Chain-of-Custody Record or on Sample Vial.

   Notes: N/A

5. Condition of Shipping Container (Verify that ice still exists such that samples are at refrigerated temperature).
   ICED

6. Condition of Sample Vials.
   GOOD

7. Verification of Agreement or Nonagreement of Information on Receiving Documents.
   Agree

8. Resolution of Problems or Discrepancies.
   N/A

RETURN COMPLETED FORM TO PROJECT MANAGER

9613478.1183

Westinghouse Hanford Company	CHAIN OF CUSTODY

Company Contact W.S. THOMPSON Telephone 373-3818

Sample Collected by W.S. THOMPSON/R.Z. STEFFLER Date 11/12/90 Time 1315

Sample Locations 299-E33-40 WELLSITE

Ice Chest No. Epsilon #4 Field Logbook and Page No. WHC-N-287-2 pg 88-89

Remarks SAMPLE TO BE ANALYZED FOR 200-BP-1 PARAMETERS OF INTEREST (SEE STATEMENT OF WORK)

Bill of Lading No. N/A Offsite Property No. N/A

Method of Shipment HAND CARRY IN ASL SAMPLE VAN

Shipped to 325 PNL LAB (300 AREA)

Possible Sample Hazards None indicated by field instruments

Sample Identification

299-E33-40-008

1,2-liter, clear glass; soil; Parameters of Interest (200BP-1)

N/A

N/A

Chain of Possession

Relinquished by:	Received by:	Date/Time:
W.S. THOMPSON W.S. Thompson	R.Z. Steffler R.Z. Steffler	11/12/90 1351
R.Z. Steffler	M.W. [illegible]	11/12/90 1447

B01-003

A-6000-407 (04/90)

9613478.1184

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector W. S. THOMPSON / R. Z. STEFFLER Date Sampled 11/12/90 Time 1315 hours

Company Contact W. S. THOMPSON Telephone (509) 373-3818

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
299-E33-40-008			
	1, 2-Liter, clear glass;	soil;	Parameters of Interest - (200-BP-1) see statement of work

WST

Field Information** SAMPLE TO BE ANALYZED FOR 200-BP-1 PARAMETERS OF INTEREST - SEE STATEMENT OF WORK.

No hazards indicated by field instruments

Special Handling and/or Storage keep chilled on ice until receipt at lab.

PART II: LABORATORY SECTION

Received by M W Thr Title Group Leader Date 11/12/90

Analysis Required

*Indicate whether sample is soil, sludge, water, etc.

**Use back of page for additional information relative to sample location.

A-6000-406 (07/89)

B01-004

SAMPLE RECEIPT FORM

Delivered by: R. STOFFLER Date/Time: 11/16/90

Received by: J. ROBBINS / S. BARSOUM

Customer Sample Number(s): 299-E33-38-006.2

ALO Sample Number(s): 90-7061

1. Customer Chain-of-Custody Form: Present ✓ Absent ____

2. Additional Shipping Forms (list):

   COC

3. Custody Seals on Shipping and/or Sample Containers and their Conditions.

   Present ✓ Absent ____

   If Present, Condition: OK

4. Sample Tag(s) ID Numbers if not Recorded on the Chain-of-Custody Record or on Sample Vial.

   Notes: N/A

5. Condition of Shipping Container (Verify that ice still exists such that samples are at refrigerated temperature). AT REFRIG TEMP

   OK

6. Condition of Sample Vials.

   OK

7. Verification of Agreement or Nonagreement of Information on Receiving Documents.

   OK

8. Resolution of Problems or Discrepancies.

   N/A

RETURN COMPLETED FORM TO PROJECT MANAGER

9613478.1186

Westinghouse Hanford Company	CHAIN OF CUSTODY

Company Contact S.E. KOS Telephone 373-3381

Sample Collected by R. STEFFLER/S. KOS Date 11/16/90 Time 1103

Sample Locations 299-E33-38 WELLSITE ≈ 150' SOUTH OF 216 BY CRIBS

Ice Chest No. EPSILON #3 Field Logbook and Page No.

Remarks SAMPLE TO BE ANALYZED FOR 200-BP-1 PARAMETERS OF INTEREST (SEE STATEMENT OF WORK) FOR RI/FS

Bill of Lading No. NA Offsite Property No. NA

Method of Shipment HAND CARRY TO 325 PNL LAB IN ASL SAMPLE VAN

Shipped to 325 PNL LAB (300 AREA)

Possible Sample Hazards NONE INDICATED WITH FIELD INSTRUMENTS

Sample Identification

1) 299-E33-38-006.2

2 LITER, CLEAR GLASS, SOIL; ANALYSIS OF 200-BP-1 PARAMETERS OF INTEREST

N A

Chain of Possession

Relinquished by:	Received by:	Date/Time:
S.E. KOS S.E. Kos	R.J. Steffler	11/16/90 1200
R.J. Steffler	Jannette Robinson	11/16/90 1:36

B01-006

A-6000-407 (04/90)

9613478..1187

Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST

PART I: FIELD SECTION

Collector R. STEFFLER / S. KOS Date Sampled 11/16/90 Time 1103 hours

Company Contact S. KOS Telephone (509) 373-3381

Sample Number	Number and Type of Sample Containers	Type of Sample*	Analysis Requested
1) 299-E3	3-38-006.2		
	1, 2 LITER, CLEAR	GLASS, SOIL	ANALYSIS OF 200-BP-1 PARAMETERS OF INTEREST
		N	A

Field Information** SAMPLES TO BE ANALYZED FOR 200-BP-1 PARAMETERS OF INTEREST (SEE STATEMENT OF WORK)

Special Handling and/or Storage NO HAZARDS INDICATED WITH FIELD INSTRUMENTS

PART II: LABORATORY SECTION

Received by James Robbins Title Senior research scientist Date 11/16/90

Analysis Required

*Indicate whether sample is soil, sludge, water, etc.

**Use back of page for additional information relative to sample location.

A-6000-406 (07/89)

B01-007

 9613478.1188 Chain of Custody Number 200BP1-74

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7060	Sr/Pu/Tot Alpha/Tot. Beta/H3	299-E33-40-008

SENDER Simon BARSOUM — DATE 11/16/90

RECEIVER Sandra Fadeff — DATE 11/16/90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7060	H3	299-E33-40-008

SENDER Simon BARSOUM — DATE 11/16/90

RECEIVER Sandra Fadeff — DATE 11/16/90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
Copy - Sender
Copy - Receiver

Applicable Test Instruction

TI-200BP-1-25

B02-002

 9613478.1189 Chain of Custody Number 200BP1-75

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7060	GEA	299-E33-40-008

SENDER Simon Barsom — DATE 11/16/90

RECEIVER Sandra Fudeff — DATE 11/16/90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
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Applicable Test Instruction

TI-200BP-1-25

B02-003

 9613478.1190 Chain of Custody Number 200BP1-78

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7060	Cyanide	299-E33-40-008

SENDER Simon Barsoum — DATE 11/16/90

RECEIVER [illegible] — DATE 11/16/90

259

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
Copy - Sender
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Applicable Test Instruction

TI-200BP-1-25

B02-004

 9613478.1191 Chain of Custody Number 200BP1-79

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7060	Free Cyanide	299-E33-40-008

SENDER Simon Barsoum DATE 11/16/90

RECEIVER [illegible] DATE 11-16-90

26g

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
Copy - Sender
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Applicable Test Instruction

TI-200BP-1-25

B02-005

9613478.1192

Chain of Custody Number 200BP1-80

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7061	Sr/Pu/Tot Alpha/Tot Beta/H3	299-E33-38-006.2

SENDER [signature] DATE 11/26/90

RECEIVER [signature] DATE 11-26-90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
Copy - Sender
Copy - Receiver

Applicable Test Instruction

TI-200BP-1-26

B02-006

 9613478.1193 Chain of Custody Number 200BP1-81

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7061	GEA	299-E33-38-006.2

SENDER James Robbins DATE 11/26/90

RECEIVER M J Wyghoff DATE 11-26-90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
Copy - Sender
Copy - Receiver

Applicable Test Instruction

TI-200BP-1-26

B02-007

 9613478.1194 Chain of Custody Number 200BP1-84

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7061	CN	299-E33-38-006.2

SENDER [signature] DATE 11/26/90

RECEIVER [signature] DATE 11/26/90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
Copy - Sender
Copy - Receiver

Applicable Test Instruction

TI-200BP-1-26

B02-008

 9613478.1195 Chain of Custody Number 200BP1-85

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7061	Free CN	299-E33-38-006.2

SENDER [signature] DATE 11/26/90

RECEIVER [signature] DATE 11/26/90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
Copy - Sender
Copy - Receiver

Applicable Test Instruction

TI-200BP-1-26

B02-009

 9613478.1196 Chain of Custody Number 200BP1-86

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7060	Tc/U	299-E33-40-008

SENDER M W Ulm — DATE 12/10/90

RECEIVER D W Hoppenaal — DATE 12/10/90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7061	Tc/U	299-E33-38-006.2

SENDER M W Ulm — DATE 12/10/90

RECEIVER D W Hoppenaal — DATE 12/10/90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-5356	Tc/U	699-55-55-050

SENDER M W Ulm — DATE 12/10/90

RECEIVER D W Hoppenaal — DATE 12/10/90

Set #2

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
Copy - Sender
Copy - Receiver

Applicable Test Instruction
TI-200BP-1-25/26

B02-010

Chain of Custody Number 200BP1-90

ALO CHAIN OF CUSTODY

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION
90-7060	CN	299-E33-40-008

SENDER [signature] DATE 12/18/90

RECEIVER [signature] DATE 12/18/90

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

ALO SAMPLE NUMBER	ANALYSIS REQUESTED	SAMPLE DESCRIPTION

SENDER _____ DATE _____

RECEIVER _____ DATE _____

Original - Project Management Office
Copy - Sender
Copy - Receiver

Applicable Test Instruction

TI-200BP-1-27