

SEPTEMBER 14, 2015

**FINAL REPORT FOR ANALYSIS OF THE 100 K EAST  
BASIN BOREHOLE WASTE SITE; C8797, INTERVAL 4  
JULY 2015**

**Sample Group No. ATL-20151687 Rev. 0**

**Edward Soto**

Advanced Technologies and Laboratories International, Inc.

**Date Published**

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Prepared for:

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 09/14/2015  
E. Soto; ATL Project Coordinator

## 222-S LABORATORY

### FINAL REPORT FOR ANALYSIS OF THE 100 K EAST BASIN BOREHOLE WASTE SITE; C8797, INTERVAL 4

#### 1.0 INTRODUCTION

This final report presents the analytical results for one solid sample taken from the 100 K East Basin Characterization Borehole at C8797, Interval 4. The sample was analyzed in accordance with F15-027, *Sampling Authorization Form (SAF)*; ATL-MP-1011, *ATL Quality Assurance Project Plan for 222-S Laboratory (QAPP)*; SGW-54226, *Sampling Instruction for Supplementary Characterization of UPR-100-K-1 and 116-KE-3 Waste Sites (SGW)*; SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*; and the additional guidance given by the customer point of contact.

Because the 222-S Laboratory facility was designed to analyze hazardous and complex tank waste samples, most SW-846 test methods performed at the 222-S Laboratory contain deviations that are listed in an appendix in the analytical procedures. All other known deviations or variances from SW-846 are documented in this narrative. The following attachments are included in this report.

- Attachment 1 Data Summary Report
- Attachment 2 Analysis Date and Holding Time Report
- Attachment 3 Correspondence
- Attachment 4 Receipt Paperwork
- Attachment 5 Photograph

#### 2.0 SAMPLE RECEIPT

One sample was received at the 222-S Laboratory on August 5, 2015. The sample was received in good condition, with adequate paperwork, 13 days after sampling.

#### 3.0 ANALYTICAL RESULTS SUMMARY

The Data Summary Report (Attachment 1) presents the final analytical results for the requested analytes listed in the SAF and SGW.

The “Det Limit” column in Attachment 1 contains the method detection limit for inorganic analytes or minimum detectable activity for radionuclides.

In Attachment 1, the column labeled “A#” indicates the aliquot class or the method used for sample preparation before analysis. The aliquot classes are defined as follows:

- “A” indicates samples were prepared by SW-846 3050B acid digest.
- “E” indicates samples were prepared by a strong nitric acid digest.

- “Z” indicates samples were prepared by zirconium fusion digest.
- “WR” indicates samples were prepared by a water digest.

The “Qual Flags” column in Attachment 1 contains data qualifier flags from FEAD CP-15383, *Common Requirements of the Format for Electronic Analytical Data*, which are defined as follows:

- “U” for all results is used to indicate that the reported result was less than the calculated detection limit.
- “J” indicates the reported result should be considered an estimate because of increased uncertainty near the detection limit. The “J” flag is applied to sample concentrations that are greater than the MDL but less than the EQL or quantitation limit. For radionuclides, the “J” flag is applied to detected isotopes that have a counting uncertainty (Count Err %) greater than 30%.

Manual calculations using rounded results from the Data Summary Report (Attachment 1) or result calculation forms may differ slightly from the actual results derived from the raw data.

### **3.1 INORGANIC ANALYSES**

#### **3.1.1 Percent Water-Thermogravimetric Analysis**

The percent weight loss was measured using TGA. The % weight loss is reported as % water in Attachment 1 with the assumption that all weight loss below 250 °C was due to water loss. There were no notable issues, and all quality control (QC) requirements in the SGW and the QAPP were met.

#### **3.1.2 Inductively Coupled Plasma/Atomic Emission Spectroscopy**

The ICP/AES analysis was performed on an acid-digested aliquot of the solid sample. The analysis met the holding time requirement. This analysis was performed, with the clients permission, in lieu of SW-846 7196 for hexavalent chromium, which was requested in the SGW. (See SAF No. F15-027, Rev.01)

Chromium was detected in the preparation blank at a concentration level below the estimated quantitation limit and less than 20% of the sample result. Therefore, the results have not been flagged and the usability of the data was not affected.

All other QC requirements listed in the SGW and the QAPP were met.

#### **3.1.3 Inductively Coupled Plasma/Mass Spectroscopy**

The ICP/MS analysis was performed on acid-digested aliquots of the solid sample. Uranium isotopes  $^{233}\text{U}$ ,  $^{234}\text{U}$ ,  $^{235}\text{U}$ , and  $^{238}\text{U}$  were analyzed using this method.

The matrix spike recovery for  $^{235}\text{U}$  and  $^{238}\text{U}$  was below the 75-125% acceptance criteria. However, the sample was spiked at less than 25% of the sample concentration; therefore, this

criteria does not apply. The reporting limit requested in the SGW for  $^{233}\text{U}$  was not met. The results for the other isotopes were above the quantitation limit and therefore meet this requirement. All other QC requirements listed in the SGW and the QAPP were met.

For actinide analysis, direct is the most accurate type of calibration; however, standard material is not commercially available for all isotopes of interest. Concentrations of those isotopes without available standards are estimated based on the instrument's response to another isotope of the same element, which is known as "isotopic substitution" and is an indirect method of calibration. Direct calibration standards were used for  $^{235}\text{U}$  and  $^{238}\text{U}$ . Isotopic substitution calibrations were performed for  $^{233}\text{U}$  and  $^{234}\text{U}$  as listed in the table below.

**Table 1. Inductively Coupled Plasma/Mass Spectroscopy Standards and Spikes**

Standard Type	Isotopes
Direct calibration standards	$^{235}\text{U}$ , $^{238}\text{U}$
Matrix spike, laboratory control standard, and calibration verification standards	$^{235}\text{U}$ , $^{238}\text{U}$
Isotope substitution	$^{233}\text{U}$ ( $^{238}\text{U}$ ), $^{234}\text{U}$ ( $^{235}\text{U}$ )

## 3.2 RADIOCHEMISTRY ANALYSES

### 3.2.1 Gamma Energy Analysis

With the exception of  $^{137}\text{Cs}$ , which had a result above the quantitation limit, the reporting limits requested in the SGW could not be obtained. This was due the radiological activity of the sample, which restricted the aliquot size to approximately 10g. There were no other notable issues, and all other QC requirements in the SGW and the QAPP were met.

### 3.2.2 Strontium-89/90

The  $^{89/90}\text{Sr}$  analysis was performed on a strong acid-digested sample. The requested detection limit for  $^{89/90}\text{Sr}$  listed in the SGW was not met; however, the sample result was above the quantitation limit. All other QC requirements listed in the SGW and the QAPP were met.

### 3.2.3 Americium-241

The  $^{241}\text{Am}$  analysis was performed on a fusion-digested aliquot. All QC requirements listed in the SGW and the QAPP were met.

### 3.2.4 Plutonium-238 and Plutonium-239/240

The  $^{238}\text{Pu}$  and  $^{239/240}\text{Pu}$  analysis was performed on the fusion-digest. The required reporting limit for  $^{238}\text{Pu}$  and  $^{239/240}\text{Pu}$  listed in the SGW was not met; however, the sample results were above the quantitation limit. All other QC requirements in the SGW and the QAPP were met.

### 3.2.5 Technicium-99

The <sup>99</sup>Tc analysis by liquid scintillation counting (LSC) was performed on a strong acid-digested aliquot. All QC requirements in the SGW and the QAPP were met.

### 3.2.6 Carbon-14

The analysis of <sup>14</sup>C by LSC was performed on a direct subsample. There were no notable issues, and all QC requirements in the SGW and the QAPP were met.

### 3.2.7 Tritium

The analysis of <sup>3</sup>H by LSC was performed on a water-digested aliquot. There were no notable issues, and all QC requirements in the SGW and the QAPP were met.

### 3.2.8 Iodine-129

Analysis for <sup>129</sup>I by low energy gamma spectroscopy was performed on a direct subsample. The reporting limit listed in the SGW was not met. There were no other notable issues, and all other QC requirements in the SGW and the QAPP were met.

## 4.0 PROCEDURES

Table 2 lists the procedures used in preparation and analysis of the samples contained in this report.

**Table 2. Analytical Procedures**

Analysis	Preparation Method	Analysis Procedure
<b>Inorganic Analyses</b>		
Appearance	Direct	LA-519-151, Rev. L-2
TGA – Gravimetric/DSC	Direct	LA-514-115, Rev. H-1
ICP/AES – Metals	Acid digest – LA-505-163, Rev. I-2; SW-846 3050B	LA-505-174, Rev. B-4
ICP/MS – Actinides	Acid digest – LA-505-163, Rev. I-2; SW-846 3050B	LA-506-103, Rev. D-0
<b>Radiochemical Analyses</b>		
GEA	Acid digest – LA-544-101, Rev. I-2 Separation – LA-548-121, Rev. K-1	LA-508-167, Rev. B-2
<sup>89/90</sup> Sr	Separation – LA-220-103, Rev. L-1 Acid digest – LA-544-101, Rev. I-2	LA-508-124, Rev. 3-0
<sup>241</sup> Am	Separation – LA-543-102, Rev. A-1 Fusion digest – LA-549-141, Rev. 13-4	LA-508-168, Rev. B-1
<sup>238, 239/240</sup> Pu	Separation – LA-543-102, Rev. A-1 Fusion digest – LA-549-141, Rev. 13-4	LA-508-168, Rev. B-1
<sup>99</sup> Tc	Separation – LA-438-101, Rev. M-1 Acid digest – LA-544-101, Rev. I-2	LA-508-122, Rev. A-1

Analysis	Preparation Method	Analysis Procedure
<sup>14</sup> C – LCS	Separation – LA-348-104, Rev. K-3	LA-508-122, Rev. A-1
<sup>3</sup> H – LCS	Separation – LA-218-116, Rev. B-2 Water digest – LA-544-113, Rev. A-1	LA-508-122, Rev. A-1
<sup>129</sup> I	Separation- LA-378-104, Rev. I-1	LA-508-168, Rev. B-2

### 5.0 REFERENCES

- ATL-MP-1011, 2014, *ATL Quality Assurance Project Plan for 222-S Laboratory*, Rev. 12-4, Advanced Technologies and Laboratories International, Inc., Richland, Washington.
- F15-027, *Sampling Authorization Form*, 100-KE Characterization Boreholes - Soil, Rev. 1, CH2M Hill Plateau Remediation Company, Richland, Washington.
- FEAD CP-15383, *Common Requirements of the Format for Electronic Analytical Data*, Rev. 6, Fluor Hanford Inc., Richland, Washington.
- SGW-54226, 2013, *Sampling Instruction for Supplementary Characterization of UPR-100-K-1 and 116-KE-3 Waste Sites*, Rev. 0, U.S. Department of Energy, Richland Operation Office, Richland, Washington.
- SW-846, 1986, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, Third Edition, as amended, U.S. Environmental Protection Agency, Washington, D.C.

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Attachment 1

DATA SUMMARY REPORT

100 K East Basin Bore Holes  
 Data Summary Report

Sample Group: 20151687

SDG Number: 222S20151687

Customer Sample ID: B31VH4

Sample Portion: Acid Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S15M000233		A	7440-47-3	Chromium	ug/g	98.1	3.93E-03	9.82	9.45	9.63	3.85	93.6	0.202	n/a	
ICP/MS															
S15M000233		A	13968-55-3	Uranium-233	ug/g	n/a	<5.00E-05	<1.01E-02	9.76E-03	n/a	n/a	n/a	0.0101	n/a	U
S15M000233		A	13966-29-5	Uranium-234	ug/g	n/a	<5.40E-06	2.53E-03	1.05E-03	n/a	n/a	n/a	1.09E-03	n/a	
S15M000233		A	15117-96-1	Uranium-235	ug/g	102	<5.40E-06	0.233	0.186	0.210	22.6	-69400	1.09E-03	n/a	
S15M000233		A	U-238	Uranium-238	ug/g	102	<4.18E-05	32.5	25.6	29.0	23.7	-71300	8.43E-03	n/a	

Sample Portion: Env Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Env Sr-89/90 for Solids															
S15M000234		E	SR-89/90	Strontium-89/90	uCi/g	99.3	5.86E-06	0.0364	0.0385	0.0375	5.53	n/a	3.05E-06	0.504	
GEA															
S15M000234		E	10198-40-0	Cobalt-60	uCi/g	101	<1.90E-04	<1.32E-04	2.45E-04	n/a	n/a	n/a	1.32E-04	n/a	U
S15M000234		E	10045-97-3	Cesium-137	uCi/g	104	<2.31E-04	0.0351	0.0385	0.0368	9.13	n/a	1.69E-04	0.51	
S15M000234		E	14683-23-9	Europium-152	uCi/g	n/a	<4.19E-04	<4.09E-04	6.95E-04	n/a	n/a	n/a	4.09E-04	n/a	U
S15M000234		E	15585-10-1	Europium-154	uCi/g	n/a	<5.59E-04	<3.66E-04	6.75E-04	n/a	n/a	n/a	3.66E-04	n/a	U
S15M000234		E	14391-16-3	Europium-155	uCi/g	n/a	<3.10E-04	<3.36E-04	7.72E-04	n/a	n/a	n/a	3.36E-04	n/a	U
Technetium - Liq. Scint.															
S15M000234		E	14133-76-7	Technetium-99	uCi/g	95.0	<6.19E-06	<6.09E-06	6.45E-06	n/a	n/a	n/a	6.09E-06	n/a	U

Sample Portion: Parent

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
% Water by TGA															
S15M000228			%WATER	Percent water	%	97.5	n/a	10.6	9.35	9.95	12.2	n/a	0.0100	n/a	
Appearance of Sample															
S15M000228			VOL%SETS	Volume percent settled solids	%	n/a	n/a	0.0	n/a	n/a	n/a	n/a	n/a	n/a	
S15M000228			ORGVOL	Organic Volume Present	mL	n/a	n/a	0.0	n/a	n/a	n/a	n/a	n/a	n/a	
Carbon 14 by LSC															

NA = Not Analyzed, ND = Not Detectec

U - < Det Limit

100 K East Basin Bore Holes  
 Data Summary Report

Sample Group: 20151687

SDG Number: 222S20151687

Customer Sample ID: B31VH4

Sample Portion: Parent

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Carbon 14 by LSC															
S15M000228			14762-75-5	Carbon-14	uCi/g	102	<1.18E-06	2.19E-06	2.04E-06	2.12E-06	7.09	96.7	6.87E-07	39.389	
GEA Screen Short List															
S15M000228			14596-10-2	Americium-241	uCi/g	n/a	n/a	3.22E-03	n/a	n/a	n/a	n/a	1.10E-04	1.66	
S15M000228			10045-97-3	Cesium-137	uCi/g	n/a	n/a	0.0412	n/a	n/a	n/a	n/a	9.36E-05	0.47	
S15M000228			10198-40-0	Cobalt-60	uCi/g	n/a	n/a	<6.13E-05	n/a	n/a	n/a	n/a	6.13E-05	n/a	U
S15M000228			14683-23-9	Europium-152	uCi/g	n/a	n/a	<2.89E-04	n/a	n/a	n/a	n/a	2.89E-04	n/a	U
S15M000228			15585-10-1	Europium-154	uCi/g	n/a	n/a	<1.36E-04	n/a	n/a	n/a	n/a	1.36E-04	n/a	U
Iodine-129 for Solids Only															
S15M000228			15046-84-1	Iodine-129	uCi/g	99.2	<1.62E-05	<1.58E-05	8.50E-06	n/a	n/a	n/a	1.58E-05	n/a	U

Sample Portion: Water Digest Rad

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
TRITIUM by COLUMN															
S15M000237		W	10028-17-8	Tritium	uCi/g	91.7	<2.07E-05	<2.07E-05	2.09E-05	n/a	n/a	93.4	2.07E-05	n/a	U

Sample Portion: Zr Fusion Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Am241,Cm243 by TRU-Spec Resin															
S15M000238		Z	14596-10-2	Americium-241	uCi/g	111	<2.47E-05	3.21E-03	3.09E-03	3.15E-03	3.78	n/a	2.19E-05	2.41	
Pu238,239 by TRU-SPEC Resin															
S15M000238		Z	PU-239/240	Plutonium-239/240	uCi/g	111	3.38E-05	3.46E-03	2.99E-03	3.22E-03	14.6	n/a	2.82E-05	2.30	
S15M000238		Z	13981-16-3	Plutonium-238	uCi/g	n/a	<3.54E-05	5.02E-04	3.72E-04	4.37E-04	29.8	n/a	3.55E-05	6.53	

NA = Not Analyzed, ND = Not Detectec

U - < Det Limit

SEPTEMBER 14, 2015

Attachment 2

ANALYSIS DATE AND HOLDING TIME REPORT

SEPTEMBER 14, 2015

**ANALYSIS DATE AND HOLDING TIME REPORT**

Laboratory Sample ID	Customer Sample ID	Method	Prep Method	Sample Date Time	Received Date	Preparation Date	Analysis Date	Holding Time Missed
S15M000238	B31VH4	AEA Am-241	Fusion-Zr/Separation	07/23/2015 11:13	08/05/2015 11:30	08/07/2015 14:13	08/12/2015 11:53	No
S15M000228	B31VH4	LSC - Carbon-14	N/A	07/23/2015 11:13	08/05/2015 11:30	N/A	08/12/2015 18:05	No
S15M000234	B31VH4	GEA	Acid Digest, Solid	07/23/2015 11:13	08/05/2015 11:30	08/12/2015 21:19	08/13/2015 11:25	No
S15M000228	B31VH4	GEA Screen	N/A	07/23/2015 11:13	08/05/2015 11:30	N/A	08/06/2015 10:33	No
S15M000233	B31VH4	ICP/AES - SW846 6010C	SW846 3050B, Acid Digest	07/23/2015 11:13	08/05/2015 11:30	08/07/2015 09:20	08/11/2015 10:52	No
S15M000228	B31VH4	Iodine-129/GEA	N/A	07/23/2015 11:13	08/05/2015 11:30	N/A	08/11/2015 11:15	No
S15M000233	B31VH4	ICP/MS Actinides	SW846 3050B, Acid Digest	07/23/2015 11:13	08/05/2015 11:30	08/07/2015 09:20	08/18/2015 12:32	No
S15M000238	B31VH4	Plutonium	Fusion-Zr/Separation	07/23/2015 11:13	08/05/2015 11:30	08/07/2015 14:13	08/21/2015 10:48	No
S15M000234	B31VH4	GPC Strontium, Sr89/90	Acid Digest, Solid	07/23/2015 11:13	08/05/2015 11:30	08/12/2015 21:19	08/13/2015 14:00	No
S15M000234	B31VH4	ICP/MS Tc-99	SW-846 3050B, Acid Digest	07/23/2015 11:13	08/05/2015 11:30	08/12/2015 21:19	08/13/2015 16:00	No
S15M000228	B31VH4	% Water by TGA	N/A	07/23/2015 11:13	08/05/2015 11:30	N/A	08/18/2015 08:24	No
S15M000237	B31VH4	LCS - Tritium	Water Digest/Separation	07/23/2015 11:13	08/05/2015 11:30	08/07/2015 13:02	08/13/2015 14:30	No

SEPTEMBER 14, 2015

Attachment 3

CORRESPONDENCE

SEPTEMBER 14, 2015

**Soto, Edward**

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**From:** Soto, Edward  
**Sent:** Monday, March 02, 2015 10:49 AM  
**To:** Hermann, Randy M; Sumner, Laine C; Todak, David  
**Cc:** Ritenour, Gerald P  
**Subject:** FW: DRAFT for 100-KE Boreholes - Soil

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

In response to the DRAFT for F15-02 (100-KE Characterization Boreholes – Soil) the 222-S laboratory requesting these changes be made to the field sampling requirements:

- Moisture Content – D2216; due to ALARA concerns the laboratory may need to analyze percent water by Thermo-Gravimetric Analyzer (TGA). If sample activity is low enough 222S will perform a gravimetric similar to D2216 (105°C)
- 7196 Metals ICP Hexavalent Chromium; the laboratory currently does not analyze solid matrixes for hexavalent chromium.
- Actinides ICP/MS for Am-241 and I-129; the laboratory analyzes Am-241 by alpha energy analysis (AEA) and I-129 by gamma energy analysis (GEA/LEPD).
- AEA U-233/234, -235, -238; the laboratory analyzes U-233/234, -235, -238 by ICP/MS.

Additional information concerning the sampling event would help us to better evaluate the time needed to complete the analysis; the SAF estimates 30 samples, how many of these will be rad screening samples and what is the total of samples for analysis? With the exception of GEA Screens, the laboratory is planning on analyzing all samples in single batches and reporting them in one report, this will help control cost. Please let me know if you have any questions.

Thanks,

*Edward Soto*

Project Coordinator  
Advanced Technologies and Laboratories International, Inc.  
contractor to the Office of River Protection  
U.S. Department of Energy  
(509) 372-0666  
[edward\\_soto@rl.gov](mailto:edward_soto@rl.gov)

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**From:** Ayres, Doris E  
**Sent:** Friday, February 27, 2015 12:05 PM  
**To:** Prichard, Earl A; Hermann, Randy M; Baechler, Michael A; Heather Shaffer ([heather.shaffer@gel.com](mailto:heather.shaffer@gel.com)); Jayna Awalt ; 'SANDRA.SEGER@TESTAMERICAINC.COM'; Menjivar, Carolina E; Ritenour, Gerald P  
**Cc:** Todak, David; Sumner, Laine C  
**Subject:** DRAFT for 100-KE Boreholes - Soil

SEPTEMBER 14, 2015

Randy and Earl -

Please find attached the DRAFT for F15-02 (100-KE Characterization Boreholes - Soil). Please send all comments or questions to Laine Sumner and copy Dave Todak by COB Monday, March 2. Laine will be covering for Dave while he is out of the office for the next few weeks.

Labs please review what we have assigned to you and let us know if we have the proper method and proper volumes. Please provide your comments or questions to Laine by COB Monday, March 2 also.

Thanks

Doris

SEPTEMBER 14, 2015

**Soto, Edward**

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**From:** Hermann, Randy M  
**Sent:** Tuesday, March 10, 2015 1:33 PM  
**To:** Soto, Edward  
**Cc:** Hammons, Jennifer L; Wolfe, Bree A; Sumner, Laine C; Todak, David; West, Lori D; Hasson, John W  
**Subject:** FW: K Basin Bore Holes - Cost Estimate  
**Attachments:** FY14 CHPRC K-East Bore Holes.pdf; TE-SGRP-14-001-0.pdf

Ed,

I believe the e-mail that Dave sent out on 2-26-15 (below) was to serve as the LOI needed to create a new estimate which we will use to get you funded. Your assumption of 1 hedgehog at a time is correct and we have documentation from Barry Orth that our use is okay (I will send this to you next). Our plan is still to ship you 125mL bottles in the hedgehog as the initial sample from each of the 2 boreholes. Pending the rad screen results (GEA from the 125mL bottle) from those samples we will establish measurement points to be field verified below which we will be able to ship DOT. DOT shipments would come in a cooler, non-DOT in the hedgehog. The final TE is attached for your review. As for the road closure requirements that is shipping and transportation space which I will defer to Lori West and/or our shipper John Hasson. Lastly if we ship anything on a blue card they would be samples to the weather station for counting and then off-site commercially. The SAF should be coming over by the end of the week. Your folks can be present for packaging of the samples but our initially assumptions have not changed from the TE but like I said John or Lori can provide better insight on the road closure. Currently in our work documents we have a limit on the drill cuttings of 350mR @ 1' to stop. Feel free to contact me with any questions and please include Bree Wolfe on correspondence regarding the estimate. Thanks

Randy

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**From:** Todak, David  
**Sent:** Thursday, February 26, 2015 11:00 AM  
**To:** Ritenour, Gerald P  
**Cc:** Sumner, Laine C; Hermann, Randy M; Menjivar, Carolina E  
**Subject:** RE: K Basin Bore Holes - Cost Estimate

JR,

As planning for this project has advanced, we've refined our estimate of the number of samples expected to be sufficiently radioactive to require the unique capabilities of 222-S, and we expect much of the uncertainty regarding the contract for operation of 222-S has been resolved. We're getting ready to go to the field with the first borehole soon and need to get you guys some money to cover the anticipated samples that will be collected at the 116-KE-3 waste site. At this time we believe that will most likely include 4 samples requiring the full suite of analyses included in the previous cost estimate, broken into two batches. The first will be on a quick turn basis for one sample and the second for three samples on a 45 day turnaround. Additionally, we expect to be sending you approximately 5 samples for rad screening purposes with appropriately reduced analytical needs (GEA) and turnaround time (24 hour if possible). Could you please revisit your cost estimate (attached) to cover this subset of the total analytical needs of the project? I believe the training component of this estimate has already been completed, so that should no longer be a necessary element.

Also, I'll be out of the office for the next three weeks, having a couple more surgeries. Laine Sumner will be covering my workload during my absence, so I've copied her and Randy Hermann, the project lead, on this email. They'll be able to answer any questions you have and forward the final cost estimate on to our interface management person to get the

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funds transferred over to your side of the house. I will be here today and most of tomorrow if you have any immediate questions, but am confident Laine and Randy will be able to deal with anything after that.

Thanks,

**David Todak**

Office: (509) 376-6427

Cell: (509) 947-1305

CHPRC Sample Management Office

Project Coordinator for:

*Plutonium Finishing Plant*

*Soil and Groundwater Remediation Project - Drilling*

*Decommissioning, Waste, Fuels, and Remediation Services*

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**From:** Ritenour, Gerald P

**Sent:** Wednesday, July 16, 2014 4:38 PM

**To:** Todak, David

**Cc:** Kjarmo, Kevin J; Gonzalez, Cruz R

**Subject:** K Basin Bore Holes - Cost Estimate

David,

I'm told you are the project contact for this information, if not please let us know who should receive this. The attached estimate will cover analytical, sample receiving and handling, training for the Hedgehog II containers, analytical waste disposal, reporting, and sample return. The only major process not cover would be the disposal of sample residuals by WRPS, which would not apply if the samples are return. This cost estimate is based on SGW-54226 Rev.0 and discussion with Randy Herman and Chris Brock. Please let us know if you have any questions, need additional information, or would like to make changes.

Regards, JR

Gerald Ritenour

*ATL Analytical Operations*

*Advanced Technologies and Laboratories International, Inc.*

*Contractor to the Office of River Protection*

*U.S. Department of Energy*

(509) 372-2742 office

(509) 438-8837 cell

[gerald\\_p\\_ritenour@rl.gov](mailto:gerald_p_ritenour@rl.gov)

SEPTEMBER 14, 2015

**Soto, Edward**

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**From:** Soto, Edward  
**Sent:** Tuesday, March 03, 2015 1:30 PM  
**To:** Ayres, Doris E  
**Subject:** FW: Minimum vol for F15-027

To answer your question yes, 3 containers would be sufficient, from F15-027 looks like you are planning on sampling in 125 mL jars and if those jars we approximately 50% to 75% full that would ensure that we are able to complete all analysis and QC, of course this is always dependent on the matrix of the sample.

Thanks,

*Edward Soto*

Project Coordinator  
Advanced Technologies and Laboratories International, Inc.  
contractor to the Office of River Protection  
U.S. Department of Energy  
(509) 372-0666  
[edward\\_soto@rl.gov](mailto:edward_soto@rl.gov)

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**From:** Ayres, Doris E  
**Sent:** Tuesday, March 03, 2015 9:21 AM  
**To:** Heather Shaffer ([heather.shaffer@gel.com](mailto:heather.shaffer@gel.com)); 'SANDRA.SEGER@TESTAMERICAINC.COM'; Menjivar, Carolina E; Ritenour, Gerald P  
**Subject:** Minimum vol for F15-027

Can you give me the minimum volumes you would need to do the analyses outlined on F15-027 that I sent last Friday? Also will 3 containers work - one for percent moisture, one for chemical analyses and one for all radiochemistry analyses? Can you let me know by 3 p.m. today?

Thanks

**Doris Ayres, Scientist**  
**Sample Data Management & Reporting**  
**Contractor with CH2M HILL Plateau Remediation Company (CHPRC)**  
**Soil & Groundwater Project (S&GRP)**  
**MO277/Room B-108**  
**Phone: (509)-373-5582**  
**Cell: (509) 554-1633**  
**E-mail: [doris\\_e\\_ayres@rl.gov](mailto:doris_e_ayres@rl.gov)**



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**Soto, Edward**

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**From:** Prilucik, John R  
**Sent:** Tuesday, August 04, 2015 12:20 PM  
**To:** Soto, Edward  
**Cc:** Hansen, Daniel R  
**Subject:** FW: CHPRC Sample Disposal Estimate

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Ed:  
  
FYI...It appears we will need to have these samples returned to PRC when you complete their analyses. See information below.

**Thanks!**  
**John**

Washington River Protection Solutions,  
contractor to the United States Department of Energy

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**From:** Farinola, Elizabeth A  
**Sent:** Tuesday, August 04, 2015 11:04 AM  
**To:** Prilucik, John R  
**Cc:** O'Connell, Beverly I; Swenson, Douglas; Johnson, William W; Hardy, Don B  
**Subject:** CHPRC Sample Disposal Estimate

John,  
  
Bree Wolfe, PRC Interface Management notified me this morning, that they have decided that they do not need for us to dispose of the 9 soil samples from K Basin that they are having ATL analyze. Consequently, we will no longer need to create an estimate for this.  
  
PRC intends to bring in one sample today or tomorrow for analysis and the remaining 8 before September. I told her when all have been analyzed they will need to pick the samples up.

I will continue to track this to ensure that this occurs.

**Liz Farinola**  
**WRPS Interface Management**  
**373-9524**

*Washington River Protection Solutions LLC, contractor to the U.S. Department of Energy*



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Attachment 4

RECEIPT PAPERWORK

SEPTEMBER 14, 2015

<b>222-S</b>	<b>SAMPLE RECEIPT AND CHAIN OF CUSTODY VERIFICATION CHECKLIST</b>	ATS-LO-090-101 Rev <u>D.G.0</u>
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Date Samples Received: 8-5-15 Total Number of Samples: 1 Group #: 2015 1687  
 Sample Custodian: RT Steele RT Steele IH Technician: \_\_\_\_\_

**Sample Custodian to Complete:**

Action	Yes	No	N/A	Comments
RSR provided?	✓			
Verify GKI is complete			✓	<input checked="" type="checkbox"/> In Project File
Received from an alpha facility?		✓		<input type="checkbox"/> Contact PC for approval to release
Check that outer custody seal is intact, if present	✓			
Record cooler temperature in centigrade, as appropriate			✓	<input type="checkbox"/> Check if no cooler and/or no ice
Samples are intact and in good condition	✓			If No, provide comments below
RSA/COC provided and complete containing the following information?				
• Client name and client sample number	✓			
• Date and time of sampling	✓			
• Sampling location or origin	✓			
• Container type, size, and number	✓			
• Preservatives (if used) noted on the COC/RSA and sample bottles			✓	
• Analysis request is clear	✓			
• Signature of persons relinquishing and receiving samples	✓			
• Date and/or time of sample custody exchange	✓			
Verify that sample numbers on containers match the COC and/or RSA	✓			
Samples stored properly (e.g., refrigeration)	✓			

Notify the PC immediately if any problems are noted. Any "No" checked boxes require PC resolution. For WRPS samples, the initials block below is completed by the responsible WRPS PC.

Samples acceptable for release? yes PC/SC Initials RT Date 8-5-15

If No, comment on communication and resolution:

(1) 100 K EAST 100K-1

**Number of IH Samples Received:**

Aldehyde Screen: _____	Amines: _____	Ammonia: _____	Aromatic HC: _____	Asbestos: _____
Beryllium: _____	Be-Bulk: _____	Be-Filter: _____	Be-Wipe _____	1,3-Butadiene: _____
Formaldehyde: _____	Furans: _____	Mercury: _____	Methanol: _____	Nitrosamines: _____
Nitrous Oxide: _____	Pyridines: _____	SVOA: _____	VOA: _____	Other-IH: _____

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<b>COLLECTOR</b> E.L. Kauer/CHPRC	<b>COMPANY CONTACT</b> TODAK, D	<b>TELEPHONE NO.</b> 376-6427	<b>PROJECT COORDINATOR</b> TODAK, D	<b>PRICE CODE</b> 8C	<b>DATA TURNAROUND</b> 15 Days / 15 Days
<b>SAMPLING LOCATION</b> C8797, Interval 4	<b>PROJECT DESIGNATION</b> 100-KE Characterization Boreholes - Soil		<b>SAF NO.</b> F15-027	<b>AIR QUALITY</b> <input type="checkbox"/>	
<b>ICE CHEST NO.</b>	<b>FIELD LOGBOOK NO.</b> HNF-N-645 <u>3</u> <u>815</u>	<b>ACTUAL SAMPLE DEPTH</b> 24.1-26.5 FT	<b>COA</b> 303581	<b>METHOD OF SHIPMENT</b> FEDERAL EXPRESS	<b>ORIGINAL</b>
<b>SHIPPED TO</b> JLT 8/5/15 <del>GEL Laboratories, LLC</del> 222-S	<b>OFFSITE PROPERTY NO.</b>	<b>BILL OF LADING/AIR BILL NO.</b>			

<b>MATRIX*</b> A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	<b>POSSIBLE SAMPLE HAZARDS/ REMARKS</b> *Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	<b>PRESERVATION</b> None	<b>HOLDING TIME</b> None	<b>TYPE OF CONTAINER</b> P	<b>NO. OF CONTAINER(S)</b> 1	<b>VOLUME</b> 125mL	<b>SAMPLE ANALYSIS</b> SEE ITEM (1) IN SPECIAL INSTRUCTIONS
<b>SPECIAL HANDLING AND/OR STORAGE</b> <del>RADIOACTIVE TIE TO: B31VH3</del> JLT 8/5/15							

Grp: 20151687  
Sample: 515m000228

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B31VH4	SOIL	7-23-15	1113	✓

CHAIN OF POSSESSION	SIGN/ PRINT NAMES	SPECIAL INSTRUCTIONS
RELINQUISHED BY/REMOVED FROM E.L. Kauer/CHPRC	DATE/TIME JUL 23 2015 1330	RECEIVED BY/STORED IN SSV#2 JUL 23 2015 1330
RELINQUISHED BY/REMOVED FROM SSV#2	DATE/TIME 8-5-15 1000	RECEIVED BY/STORED IN E.L. Kauer/CHPRC 8-5-15 1000
RELINQUISHED BY/REMOVED FROM E.L. Kauer	DATE/TIME 8-5-15 1130	RECEIVED BY/STORED IN RTSteele RTSteele 8-5-15 1130
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN

\*\* The GKI associated with this SAF shall be provided to 222-S laboratory prior to sample receipt. TRV;-15-113  
(1) Moisture Content - D2216; 6010\_METALS\_ICP: COMMON {Chromium}; 7196\_CR6: COMMON; GAMMA\_GS: COMMON; C14\_LSC: COMMON; AMCMISO\_IE\_PRECIP\_AEA: COMMON; 1129\_SEP\_LEPS\_GS: COMMON; PUISO\_PLATE\_AEA: COMMON; SRTOT\_SEP\_PRECIP\_GPC: COMMON; TC99\_EIE\_LSC: COMMON; TRITIUM\_DIST\_LSC: COMMON; UISO\_IE\_PRECIP\_AEA: COMMON;

<b>LABORATORY SECTION</b>	<b>RECEIVED BY</b>	<b>TITLE</b>	<b>DATE/TIME</b>
<b>FINAL SAMPLE DISPOSITION</b>	<b>DISPOSAL METHOD</b>	<b>DISPOSED BY</b>	<b>DATE/TIME</b>

CHPRC RADIOACTIVE SHIPMENT RECORD										1. Page 1 of 1	
<b>2. SHIP FROM U.S. DEPT. OF ENERGY C/O</b> Company <u>CH2M Hill Plateau Remediation CO</u> Address <u>100K East Basin</u> City, State, Zip <u>Hanford Site, WA</u> Contact <u>Jennifer Hammons</u> Phone <u>509-942-3946</u>			<b>3. SHIP TO</b> <input checked="" type="checkbox"/> U.S. DEPT. OF ENERGY C/O Company <u>CH2M Hill Plateau Remediation CO</u> Address <u>222S Labs</u> City, State, Zip <u>Hanford Site, WA</u> Attention <u>Todd Steele</u> Phone <u>509-373-2951</u>				<b>4. SHIPMENT NUMBER</b> <u>QJ016</u>  <b>5. Emergency Transportation On-Call</b> Telephone / Name <u>1-509-373-0911</u>  Emergency Response Guide(s) <u>163</u>				
<b>6. Proper Shipping Name:</b> <u>UN2915</u> Radioactive Material, Type A package										PRI HAZ <u>7</u> SUB HAZ <u>N/A</u>	
7. No. Pkg.	Model Package	COC/Spec	Serial No.	Seal No.	Isotopes		C.S.I.	T.I.	Bq/Package	Gr. Wt. Kg.	
1	Viking	VPS-BXKT-001C	<u>010042</u>	<u>V001</u>	PU-238, PU-239, AM-241,		N/A	N/A	3.83e-5 TBq	26.5	
<b>8. Identify for Normal Form Only</b> Physical Form <u>Solid</u>  Chemical Form <u>Elemental</u>		<b>9.</b> <input type="checkbox"/> Highway Route Controlled Quantity <input type="checkbox"/> Exclusive Use Shipment with instructions <input type="checkbox"/> Placards Applied <u>Radioactive</u> <input checked="" type="checkbox"/> Fissile Excepted, Grams <u>.000474</u> <input checked="" type="checkbox"/> UN ID Marking <u>2915</u>			<b>10. LABELS APPLIED</b> <u>Radioactive White - I</u> N/A		<b>11. ADDITIONAL LABELS / MARKINGS</b> <u>U-235m</u>				
<b>HM</b> UN ID <u>2915</u> 6. Proper Shipping Name:										PRI HAZ <u>7</u> SUB HAZ <u>N/A</u>	
7. No. Pkg.	Model Package	COC/Spec	Serial No.	Seal No.	Isotopes		C.S.I.	T.I.	Bq/Package	Gr. Wt. Kg.	
<del>Empty form section</del>											
<b>8. Identify for Normal Form Only</b> Physical Form  Chemical Form		<b>9.</b> <input type="checkbox"/> Highway Route Controlled Quantity <input type="checkbox"/> Exclusive Use Shipment with instructions <input type="checkbox"/> Placards Applied <input type="checkbox"/> Fissile Excepted, Grams <input type="checkbox"/> UN ID Marking			<b>10. LABELS APPLIED</b>		<b>11. ADDITIONAL LABELS / MARKINGS</b>				
<b>HM</b> UN ID 6. Proper Shipping Name:										PRI HAZ SUB HAZ	
7. No. Pkg.	Model Package	COC/Spec	Serial No.	Seal No.	Isotopes		C.S.I.	T.I.	Bq/Package	Gr. Wt. Kg.	
<del>Empty form section</del>											
<b>8. Identify for Normal Form Only</b> Physical Form  Chemical Form		<b>9.</b> <input type="checkbox"/> Highway Route Controlled Quantity <input type="checkbox"/> Exclusive Use Shipment with instructions <input type="checkbox"/> Placards Applied <input type="checkbox"/> Fissile Excepted, Grams <input type="checkbox"/> UN ID Marking			<b>10. LABELS APPLIED</b>		<b>11. ADDITIONAL LABELS / MARKINGS</b>				
<b>HM</b> UN ID 6. Proper Shipping Name:										PRI HAZ SUB HAZ	
7. No. Pkg.	Model Package	COC/Spec	Serial No.	Seal No.	Isotopes		C.S.I.	T.I.	Bq/Package	Gr. Wt. Kg.	
<del>Empty form section</del>											
<b>8. Identify for Normal Form Only</b> Physical Form  Chemical Form		<b>9.</b> <input type="checkbox"/> Highway Route Controlled Quantity <input type="checkbox"/> Exclusive Use Shipment with instructions <input type="checkbox"/> Placards Applied <input type="checkbox"/> Fissile Excepted, Grams <input type="checkbox"/> UN ID Marking			<b>10. LABELS APPLIED</b>		<b>11. ADDITIONAL LABELS / MARKINGS</b>				
<b>12. Shipment DE-Ci:</b> <u>5.802e-5</u>					Shipment Totals	C.S.I.	T.I.	Bq/Package	Gr. Wt. Kg.		
						N/A	N/A	3.83e-5 TBq	26.5		
<b>13. Surface Dose Rate of Package</b> <input checked="" type="checkbox"/> <0.005 or _____ mSv/hr <0.5 or <u>40.1</u> mrem/hr (N+β γ)		<b>Dose Rate @ 1 Meter from Surface of Package</b> <input checked="" type="checkbox"/> <0.005 or _____ mSv/hr <0.5 or <u>40.1</u> mrem/hr (N+β γ)		<b>Smears of Outer Container</b> <input type="checkbox"/> <4.0 Bq (220 dpm) β γ/cm <sup>2</sup> <input type="checkbox"/> <0.4 Bq (22 dpm) α/cm <sup>2</sup> <input checked="" type="checkbox"/> <Tbl. 2-2 CHPRC-00073 Limits		<b>TRUCK LOAD OR EXCLUSIVE USE</b> Surface <input checked="" type="checkbox"/> <2 mSv/hr (200 mrem/hr) @ 2 meters <input checked="" type="checkbox"/> <0.1 mSv/hr (10 mrem/hr) @ Cab or sleeper <input checked="" type="checkbox"/> <0.02 mSv/hr (2 mrem/hr) (Using N+β γ)					
Additional Data and Instructions (inc. Readings on Internal Packaging)				Bldg. <u>D-12 CONEX</u> Survey No. <u>6W-150229</u> Date <u>8-5-15</u>							
<b>14. TRANSPORTER</b> Vehicle Number <u>G621247R</u> DRIVER SIGNATURE <u>[Signature]</u> PRINT NAME <u>ED Kauer</u>					<b>15. RECEIVER</b> RECEIVER SIGNATURE <u>[Signature]</u> PRINT NAME <u>RT Stahl</u> Date <u>8-5-15</u>						
<b>16. This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.</b>											
Certifier's Signature <u>[Signature]</u> Print Name <u>John Hassen</u>			On behalf of DOE-RL Date <u>8-5-15</u>			Organization <u>CHPRC</u>					

GENERATOR KNOWLEDGE INFORMATION

1. Chain of Custody Number NA CACN/COA NA Customer Identification Number NA

2. List generator knowledge or description of process that produced sample. Or list description of sample source: 100KE Boreholes

MSDS Available? [X] No [ ] Yes Hanford MSDS No. \_\_\_\_\_

3. List all waste codes and constituents associated with the waste or media that was sampled, regardless of CERCLA status.

a) Does the sample contain any of the following listed waste codes? By checking "unknown" the customer understands that no knowledge is available following a careful search.

List Federal Waste Code(s): List Constituent(s):
P Codes: [ ] Yes [X] No
U Codes: [ ] Yes [X] No
K Codes: [ ] Yes [X] No [ ] Unknown
F Codes: [ ] Yes [X] No [ ] Unknown

b) List applicable characteristic waste codes, flash point, pH, constituents, and concentrations as appropriate.

D001: [ ] FP <100°F [ ] FP ≥100 <140°F [ ] DOT Oxidizer [ ] Yes [X] No [ ] Unknown
D002: [ ] pH ≤2 [ ] pH ≥12.5 [ ] Solid Corrosive (WSC2) [ ] Yes [X] No [ ] Unknown
D003: [ ] Cyanide [ ] Sulfide [ ] Water Reactive [ ] Other (i.e., peroxide former, explosive, air reactive) [ ] Yes [X] No [ ] Unknown
D004-D043 (Identify applicable waste codes and concentrations): [X] Yes [ ] No [ ] Unknown

Potential for Chromium >5 mg/L TCLP <75 mg/L TCLP

c) If characteristic, list any known underlying hazardous constituents (UHCs) reasonably expected to be present, and their concentrations that may be present above the LDR treatment standard (40 CFR 268.48):

None

d) List any known Land Disposal Restrictions (LDR) subcategories, if applicable (40 CFR 268.40):

NA

e) List any applicable Washington State dangerous waste codes: (not required if federally regulated) (\*State mixture rule for ignitability)

WT01: [ ] Yes [X] No [ ] Unknown WP01: [ ] Yes [X] No [ ] Unknown
WT02: [ ] Yes [X] No [ ] Unknown WP02: [ ] Yes [X] No [ ] Unknown
W001: [ ] Yes [X] No [ ] Unknown WP03: [ ] Yes [X] No [ ] Unknown
List constituents and concentrations: F003\*: [ ] Yes [X] No [ ] Unknown

4. Is this material TSCA regulated for PCBs? [ ] Yes [X] No [ ] Unknown [ ] Analysis Requested

List concentration if applicable: \_\_\_\_\_

If yes, what is the source of the PCBs? (see TSCA PCB Hanford Site User Guide, DOE/RL-2001-50)

[ ] PCB Liquid Waste [ ] PCB Bulk Product Waste [ ] PCB Transformer ≥500 ppm [ ] Unknown
[ ] PCB Remediation Waste [ ] PCB R&D Waste [ ] PCB contaminated electrical equipment (capacitor/ballast) <500 ppm
[ ] PCB Spill Material [ ] PCB Item [ ] Other PCB Waste (list) \_\_\_\_\_

5. Is this material TRU? [ ] Yes [ ] No [X] Unknown

6. ACCURACY OF INFORMATION

Based on my inquiry of those individuals immediately responsible for obtaining this information, that to the best of my knowledge, the information entered in this document is true, accurate, and complete.

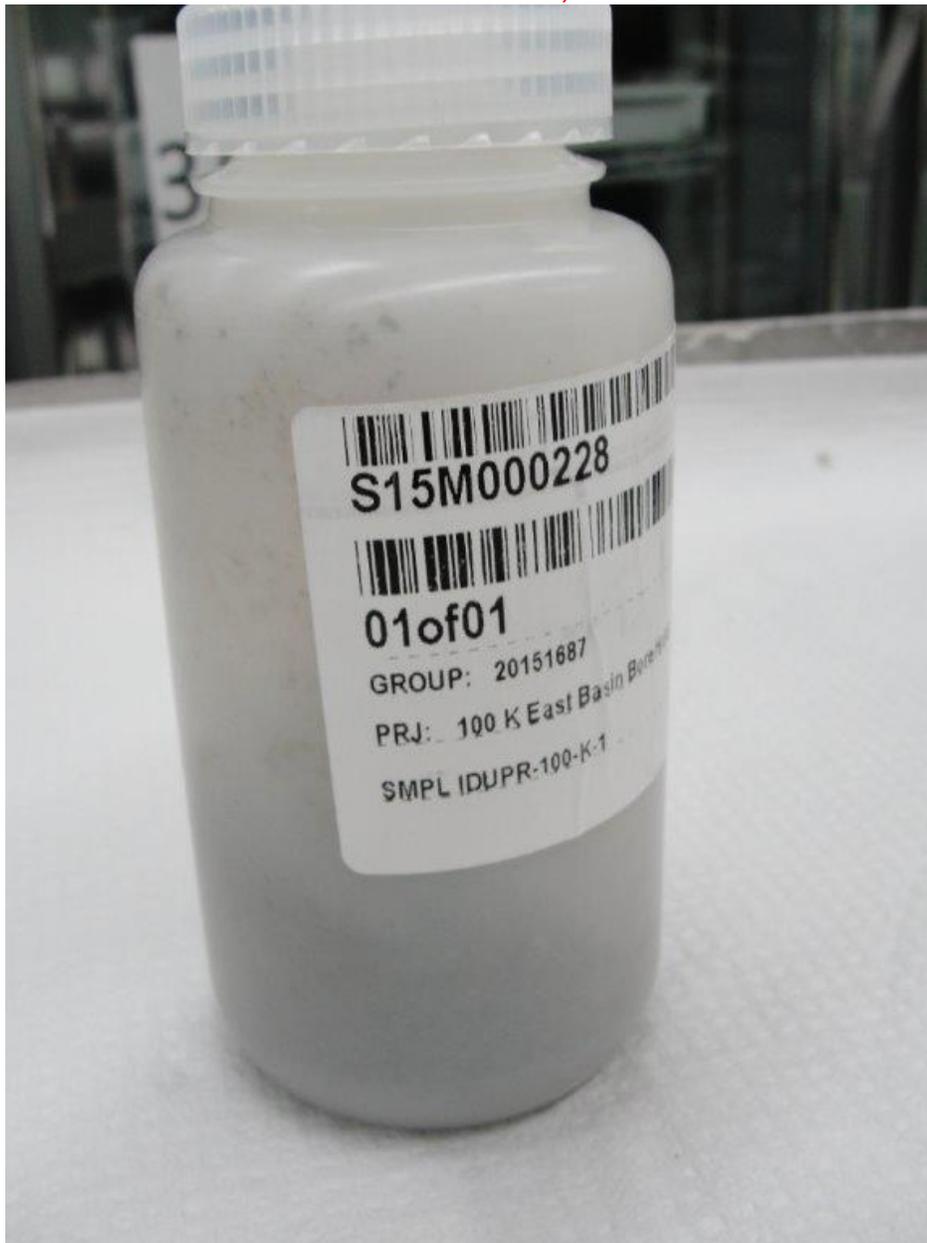
Print & Sign Bob Cathel Date 4/29/10

SEPTEMBER 14, 2015

Attachment 5

PHOTOGRAPH

SEPTEMBER 14, 2015



**UPR-100-K-1**

**B31VH4**