TETRA TECH

TECHNICAL MEMORANDUM

To:	Mary Beth Marks	From:	Aaron Orechwa P.E.
Company:	USDA Forest Service	Date:	August 24, 2015
Address:	10 East Babcock Ave Bozeman, MT 59715	Project No.:	114-560846A
Re:	Bluff F, Bluff G, and Bluff I 2015 Sampling Final Memo		

1.0 OVERVIEW

This technical memorandum serves as a data transmittal report for the environmental sampling conducted by Tetra Tech at the Riley Pass Abandoned Uranium Mine (Riley Pass) located in Harding County, South Dakota. Based on an initial review and evaluation of all of the waste characterization data at Riley Pass, it was concluded that additional sampling was warranted within certain areas of the following study areas: Bluff F, Bluff G, and Bluff I. The goal of this supplemental sampling was to obtain information of the soil concentrations of arsenic and radium-226 (Ra-226) to be used in the final reclamation design for each of these study areas. The field sampling efforts involved x-ray fluorescence (XRF) field surveys and gamma radiation surveys. Soil confirmation samples were collected to supplement the XRF field surveys. The field work at Riley Pass was performed July 13, 2015 through July 16, 2015. There was a total of 593 in situ XRF measurements were collected between Bluff F, Bluff G, and Bluff I. Additionally, over 16,000 gamma exposure rate measurements were collected at Bluff F and Bluff I.

2.0 METHODS

This section presents the sampling methods for the XRF field survey and the gamma radiation survey performed at Riley Pass in July 2015.

2.1 XRF Field Survey Methods

An in situ XRF field survey (XRF field survey) was performed at Bluff G, Bluff F, and Bluff I following the same sampling methods used in the 2012 Tronox Bluff waste characterization field efforts and following the *Tronox Bluffs Waste Characterization Sampling and Analysis Plan* (Tetra Tech 2012). The XRF field survey was performed on a systematic square grid with a 10 meter x 10 meter spacing. Arsenic measurements were collected at the pre-determined sampling locations using an XRF analyzer, specifically a Niton XRF Xl3t spectrum analyzer. This same analyzer was used in the development of the site-specific arsenic correlation (Tetra Tech 2013) that is currently being used for characterization and verification work at the site. Field engineers followed quality assurance and quality control (QA/QC) procedures for the XRF field survey and these methods and results are presented in Section 4.1 of this technical memorandum.

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Following EPA Method 6200, soil confirmation samples were collected at a frequency of one soil sample per every 20 in situ XRF measurements collected. The soil samples were submitted to ALS Laboratories in Fort Collins, Colorado and analyzed for total arsenic concentration using inductively coupled plasma-mass spectrometry (ICP-MS). Geospatial coordinates of the XRF measurement locations were collected in the field using a Trimble Juno Series GPS and differentially corrected using GPS Pathfinder Office using the GLENDIVEWTMT2006 (P055), MONTANA (ITRF00 (1997)-Derived from IGS08 (NEW)) station. The differential correction results for the final measurement locations are provided in Attachment A.

An XRF correlation study was performed by Tetra Tech in 2012 and the results are presented in the Tronox Bluffs Waste Characterization Report [WCR] (Tetra Tech 2013). A site-specific correlation was developed to estimate the ICP-MS based total arsenic concentrations in surface soils from the in-situ XRF field measurements. Equation 1 below was used to convert the in-situ XRF field measurements to laboratory estimated concentrations for arsenic:

Equation 1

$$[\mathrm{As_{Lab}}] = 10^{[0.352+0.891\log_{10}(\mathrm{As}_{XRF})]}$$

Where:

$[\boldsymbol{As_{lab}}]$ = Estimated laboratory total arsenic surface soil concentration (mg/kg)
$[\boldsymbol{As_{XRF}}]$ = In-situ XRF total arsenic surface soil measurement (ppm)

The results of the XRF field survey are presented in Section 3.1. A summary of the XRF field measurement sampling information is provided in Attachment A. A photographic log of the XRF soil confirmation sampling locations is presented in Attachment B. The final laboratory reports are presented in Attachment C. Scanned copies of the field logbook and associated field sampling sheets are provided in Attachment D.

2.2 Gamma Survey Methods

A gamma radiation survey was performed at Bluff F and Bluff I following the same procedures used in the 2012 Tronox Bluff waste characterization field efforts and following the *Tronox Bluffs Waste Characterization Sampling and Analysis Plan* (Tetra Tech 2012). These same procedures were also followed in the 2008 Non-Tronox Bluffs characterization work (MSE, 2009) and in all subsequent verification surveys that have been conducted at the site. The gamma radiation survey was performed using GPS-based mobile gamma detection systems following a pre-determined sampling grid with 5 meter transect widths, where terrain allowed. The radiation detection equipment used consisted of Ludlum model 44-10 2-inch x 2-inch Thallium-doped sodium-iodide [NaI(Tl)] gamma scintillators coupled to Ludlum 2350-1 data loggers. Gamma scanning speeds were consistently maintained at 1 mile per hour (mph) and gamma exposure rate measurements were collected in microroentgen per hour (µR/hr) along with GPS measurements recorded at a frequency of one per second using proprietary software. Field engineers followed QA/QC procedures for the gamma radiation survey and these results are presented in Section 4.2 of this technical memorandum.

A soil Ra-226 correlation study was performed by Tetra Tech in 2012 and the results were presented in the WCR (Tetra Tech 2013). A model was developed that estimates the Ra-226 concentration in surface soils from gamma radiation survey data. Tetra Tech used the same radiation instrumentation that was used in the soil correlation study; therefore, the same gamma-Ra-226 cleanup values apply. A gamma exposure rate of 76.5 µR/hr corresponds to a 30 pCi/g Ra-226 soil concentration. The model used to estimate Ra-226 surface soil concentration from gamma exposure rate can be expressed as shown in Equation 2 (Tetra Tech 2013):

Equation 2

$$[226_{Ra}] = 10^{[-1.979+1.835\log_{10}(\text{Gamma})]}$$

Where:

[^{226}Ra] = Estimated Ra-226 concentration (pCi/g)
[Gamma] = Measured gamma exposure rate (µR/hr

3.0 RESULTS

This section presents the results of the XRF field surveys and the gamma radiation surveys conducted at Riley Pass in July 2015. The QA/QC methods and results are summarized in Section 4.0.

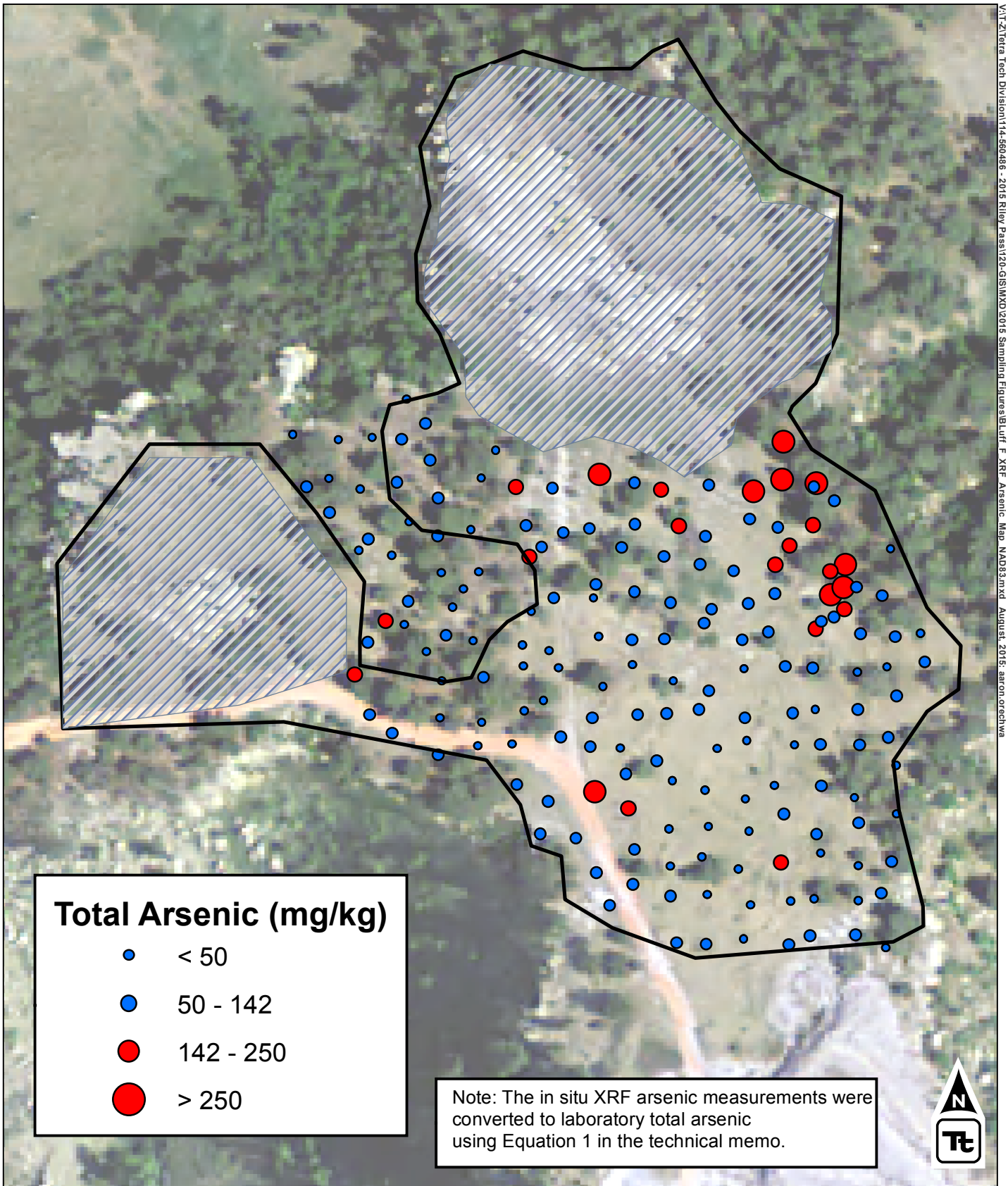
3.1 XRF Field Survey Results

The XRF field survey was performed between July 13, 2015 and July 16, 2015 following the methods outlined in Section 2.0. A total of 593 in situ XRF arsenic measurements were collected from Bluff F, Bluff G, and Bluff I on a systematic 10 meter by 10 meter square sampling grid. The in situ XRF measurements (ppm) were converted into laboratory equivalent total arsenic concentrations (mg/kg) using Equation 1. A total of 106 of the arsenic measurements exceeded the cutoff of 142 mg/kg between all of the study areas. Table 1 provides the summary statistics of the arsenic measurements from the three study areas. Soil confirmation samples were collected at a minimum frequency of one soil sample for every 20 in situ XRF measurements. For 593 in situ measurements a minimum of 30 soil samples are required to maintain this sampling frequency. A total of 31 soil confirmation samples were collected during the 2015 sample efforts. Section 3.3 provides an analysis of the decision error and data validation of the soil confirmation samples.

Table 1 Summary Statistics of Arsenic Measurements Collected at Bluff F, Bluff G, and Bluff I

Summary Statistic	Study Area			
	Bluff F	Bluff G	Bluff I	All
Number of Arsenic Measurements	181	171	241	593
Minimum (mg/kg)	7.94	24.4	12.7	7.9
Maximum (mg/kg)	704	1727	780	1727
Standard Deviation (mg/kg)	79.9	174	73.1	120
Median (mg/kg)	59.6	114	44.7	68.3
90th Percentile (mg/kg)	155	286	121	194
95th Percentile (mg/kg)	245	355	181	280
Arsenic Cleanup Value from 2013 WCR	**142 mg/kg**			
Points Exceeding Cleanup Value	**23**	**65**	**18**	**106**

Figure 1 provides a map showing the arsenic soil concentrations at Bluff F. Figure 2 provides a map showing the arsenic soil concentrations at Bluff G. Figure 3 provides a map showing the arsenic soil concentrations at Bluff I. Summary tables providing the geographic locations and sampling information for all of the measurements collected are provided in Attachment A.



FEET
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NAD_1983_STATEPLANE
SOUTH_DAKOTA
NORTH_FIPS_4001_FEET

Bluff F Boundary
Reclaimed Areas

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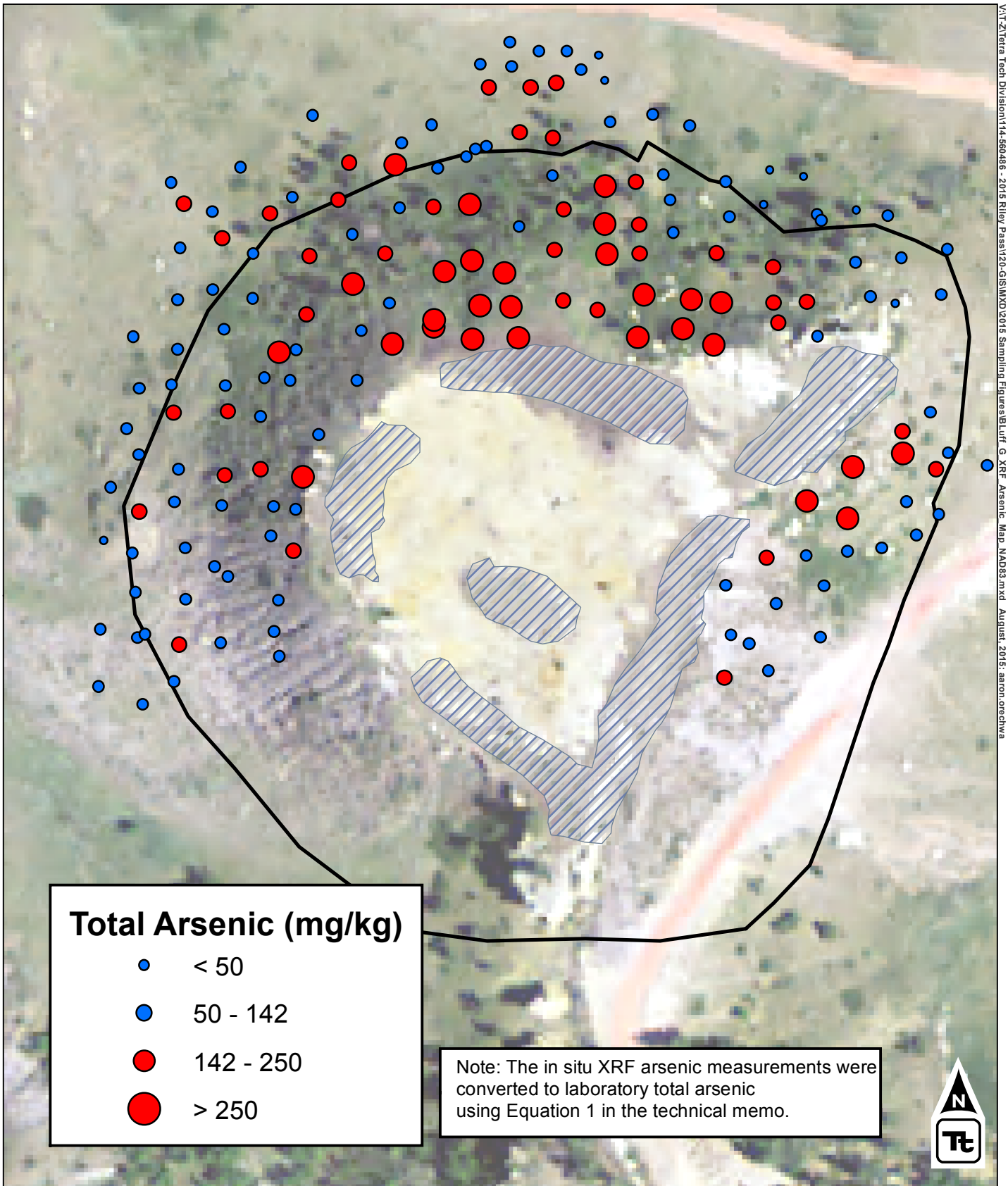
Title:
BLUFF F 2015 XRF SURVEY ARSENIC CONCENTRATION MAP

Location: HARDING COUNTY, SD

Project no.: 114-560486A

Date: AUGUST 2015

Figure:
Figure 1



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Bluff G Boundary
Reclaimed Areas

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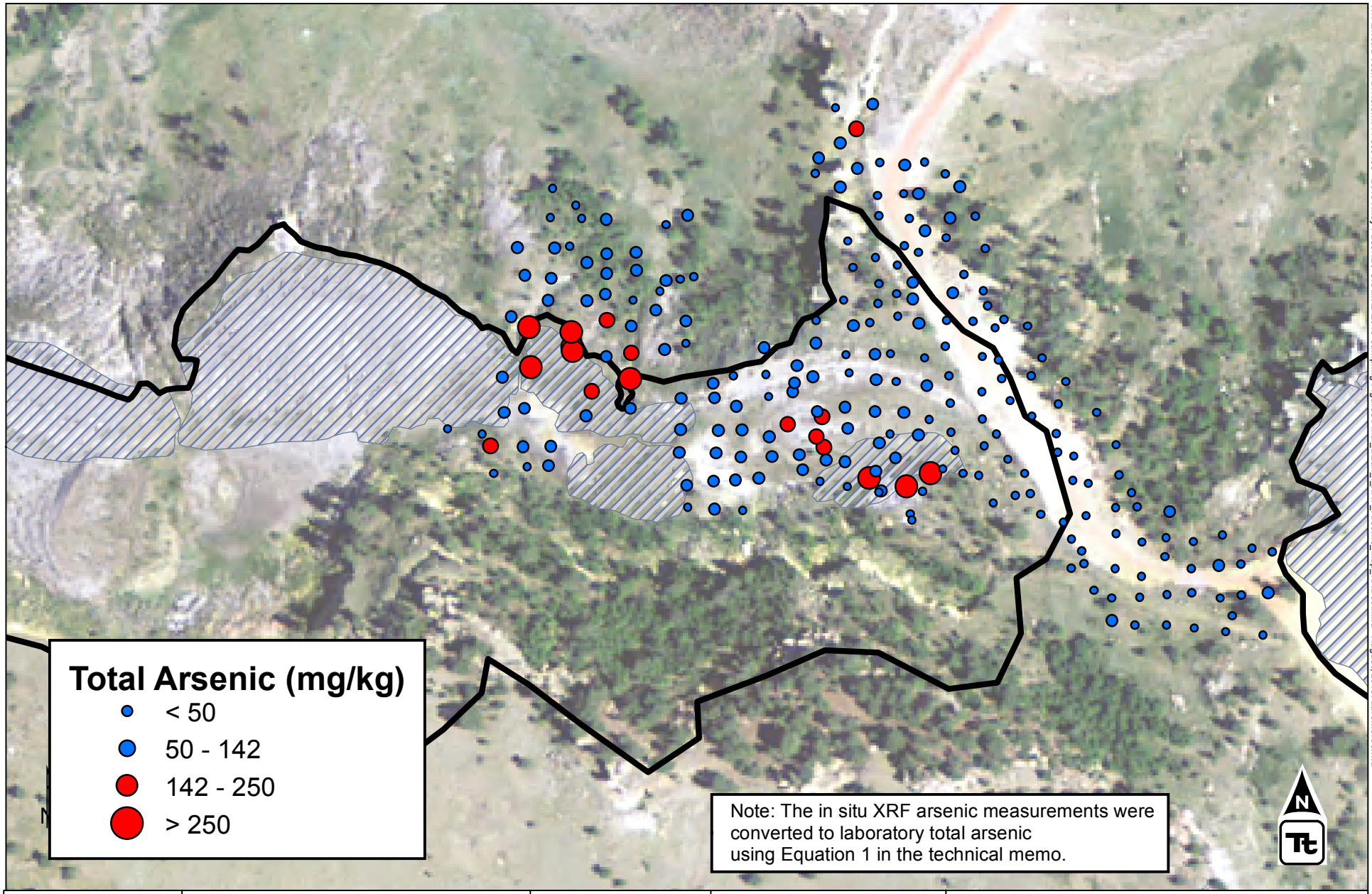
BLUFF G 2015 XRF SURVEY ARSENIC CONCENTRATION MAP

Location: HARDING COUNTY, SD

Project no.: 114-560486A

Date: AUGUST 2015

Figure: **Figure 2**



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SOUTH_DAKOTA
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Bluff I Boundary
Reclaimed Areas

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Title:
BLUFF I 2015 XRF SURVEY ARSENIC CONCENTRATION MAP

Location: HARDING COUNTY, SD

Project no.: 114-560486A

Date: AUGUST 2015

Figure: Figure 3

3.2 Gamma Survey Results

The gamma radiation survey was performed July 13, 2015 through July 16, 2015, following the methods outlined in Section 2.0. A total of 16,178 gamma exposure rate measurements were collected from Bluff F and Bluff I on a systematic 5 meter wide transect where possible (i.e. in some areas terrain prevented this level of coverage). Table 2 provides the summary statistics of the gamma radiation survey at the two study areas. No gamma survey was performed at Bluff G because there was already sufficient coverage of the study area.

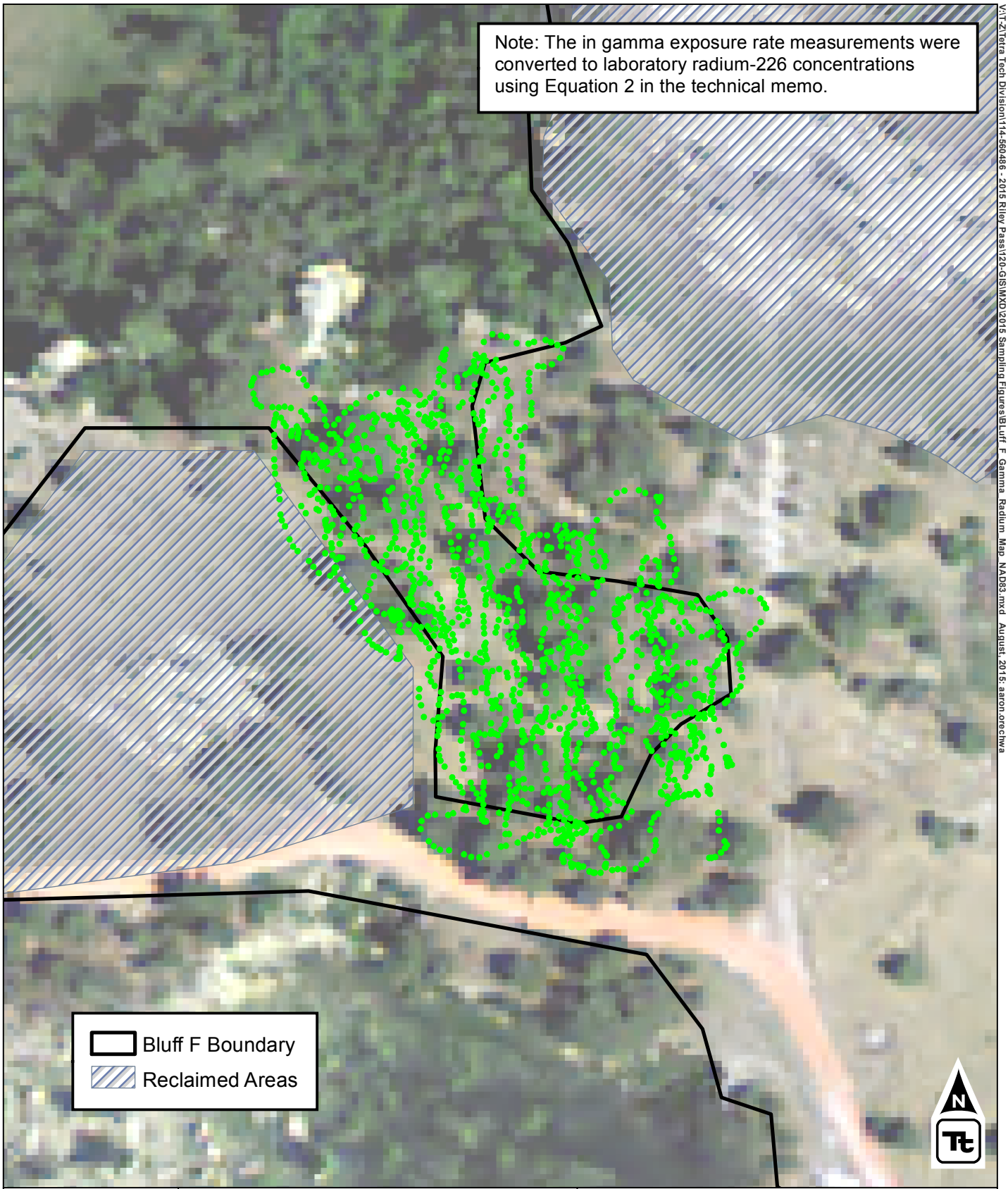
Table 2 Summary Statistics of Gamma Exposure Rates Collected at Bluff F and Bluff I

Summary Statistic	Study Area		
	Bluff F	Bluff I	All
Number of Gamma Measurements	1,645	14,533	16,178
Minimum (µR/hr)	18.1	12.4	12.4
Maximum (µR/hr)	59.6	282	282
Standard Deviation (µR/hr)	7.83	18.4	17.6
Median (µR/hr)	26.2	29.0	28.5
90th Percentile (µR/hr)	40.8	52.6	51.9
95th Percentile (µR/hr)	46.6	63.0	60.7

The gamma exposure rate measurements were converted into laboratory equivalent Ra-226 soil concentrations (pCi/g) using Equation 2. A total of 431 of the gamma data points exceeded the cutoff of 76.5 µR/hr (30 pCi/g). Table 3 provides the summary statistics of the gamma values converted to Ra-226 soil concentrations. Figure 4 and Figure 5 provide the Ra-226 soil concentration maps for Bluff F and Bluff I, respectively.

Table 3 Summary Statistics of Radium-226 Collected at Bluff F and Bluff I

Summary Statistic	Study Area		
	Bluff F	Bluff I	All
Number of Radium-226 Measurements	1,645	14,533	16,178
Minimum (pCi/g)	2.12	1.07	1.07
Maximum (pCi/g)	19.0	329	329
Standard Deviation (pCi/g)	2.95	11.1	10.6
Median (pCi/g)	4.20	5.05	4.91
90th Percentile (pCi/g)	9.47	15.1	14.7
95th Percentile (pCi/g)	12.1	21.0	19.7
Radium-226 Cleanup Value from 2013 WCR	30 pCi/g		
Points Exceeding Cleanup Value	0	431	431



V:\T-Z\Tetra Tech Division\114-560486 - 2015 Riley Pass\120-GIS\MXD\2015 Sampling Figures\Bluff F Gamma Radium Map NAD83.mxd August, 2015; aaron.orechwa

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NORTH_FIPS_4001_FEET

Radium-226 Soil Concentration (pCi/g)

< 30 | 30 - 50 | ≥ 50

Title:

BLUFF F 2015 GAMMA SURVEY RA-226 CONCENTRATION MAP

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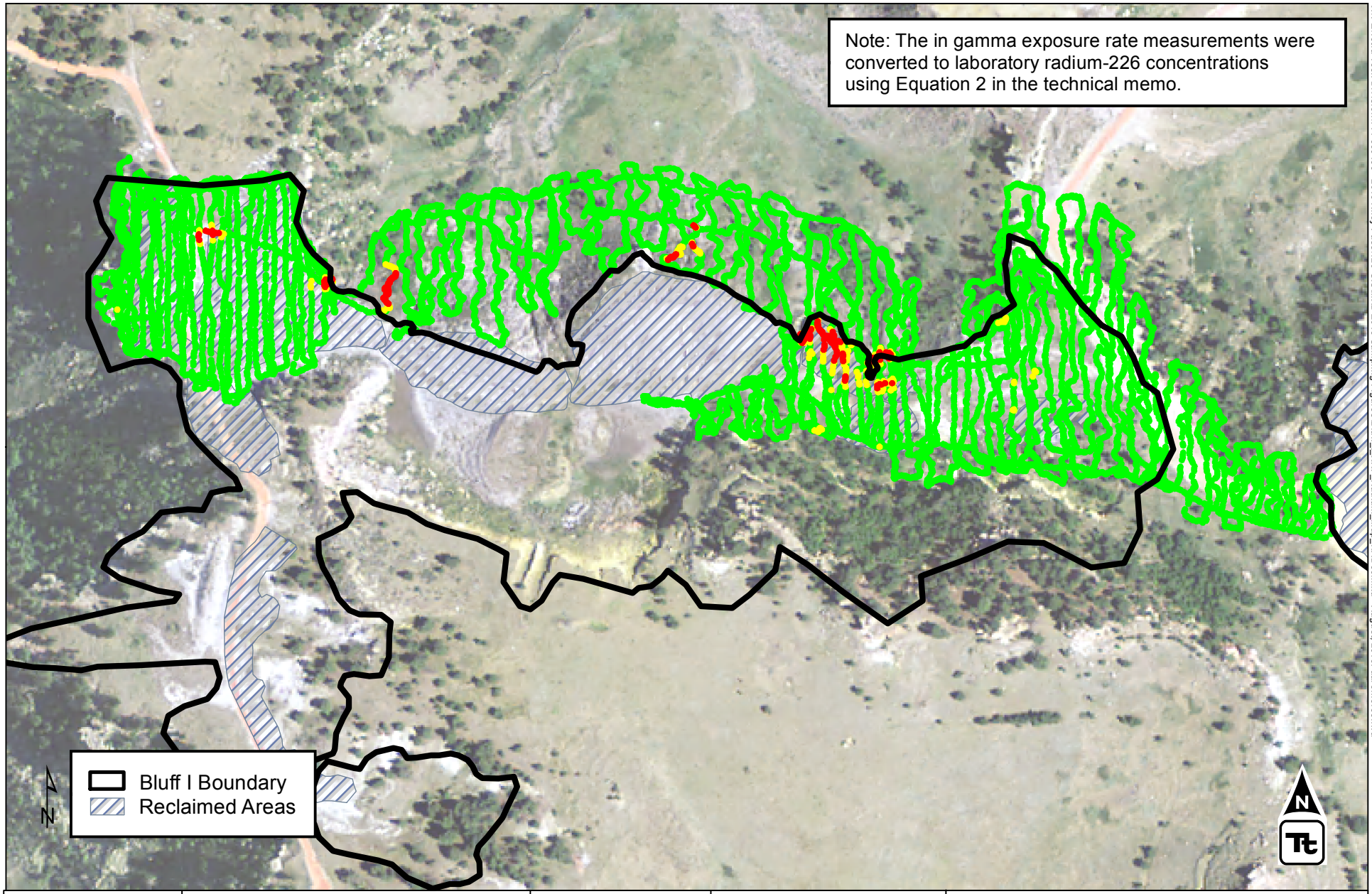
Location: HARDING COUNTY, SD

Project no.: 114-560486A

Date: AUGUST 2015

Figure: Figure 4



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NAD_1983_STATEPLANE
SOUTH_DAKOTA
NORTH_FIPS_4001_FEET

Radium-226 Soil Concentration (pCi/g)

< 30 | 30 - 50 | ≥ 50

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FOREST SERVICE
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Title:
BLUFF I 2015 GAMMA SURVEY RA-226 CONCENTRATION MAP

Location: HARDING COUNTY, SD

Project no.: 114-560486A

Date: AUGUST 2015

Figure: Figure 5

3.3 Data Validation

Following recommendations from the WCR (Tetra Tech 2013) the same model of XRF analyzer (*Niton XRF Xl3t spectrum analyzer*) was used for the July 2015 sampling efforts at Bluff F, Bluff G, and Bluff I. Per EPA Method 6200, soil confirmation samples were collected at 31 in situ XRF measurement locations and submitted for laboratory analysis of arsenic by ICP-MS. Table 4 summarizes the in situ XRF arsenic and laboratory reported arsenic concentrations collected within the three study areas.

Table 4 Summary Statistics of Radium-226 Collected at Bluff F and Bluff I

ID	Study Area	In situ XRF Arsenic (ppm)	Arsenic by ICP-MS (mg/kg)
FC-8	Bluff F	107	150
FF-8	Bluff F	39	140
FI-10	Bluff F	98	160
FJ-3	Bluff F	77	180
FK-4	Bluff F	126	230
FK-9	Bluff F	34	66
FL-15	Bluff F	45	62
FN-13	Bluff F	106	200
FP-8	Bluff F	20	100
GA-11	Bluff G	59	82
GC-9	Bluff G	149	180
GD-3	Bluff G	143	240
GE-6	Bluff G	101	140
GI-1	Bluff G	98	210
GI-6	Bluff G	1,731	1,200
GM-1	Bluff G	45	62
GM-4	Bluff G	188	600
GO-14	Bluff G	145	150
GR-10	Bluff G	270	300
IAA-16	Bluff I	26	17
IE-12	Bluff I	35	51
IF-8	Bluff I	353	410
IG-6	Bluff I	43	92
IH-10	Bluff I	50	40
IO-12	Bluff I	142	150
IP-2	Bluff I	44	53
IQ-9	Bluff I	39	43
IR-4	Bluff I	15	13
IS-6	Bluff I	38	45
IV-9	Bluff I	24	23
IX-13	Bluff I	32	41

A quantitative graphical analysis was performed comparing the ICP-MS laboratory reported arsenic concentrations and in-situ XRF data for the samples collected at Bluff F, Bluff G, and Bluff I. These data pairs were plotted on the existing logarithmic regression model (Equation 1) with the 95 percent prediction limits. Figure 6 shows the data pairs collected during the 2015 sample efforts. All of the values fall within the 95 percent prediction

limits of the correlation and there is general agreement between the in situ XRF measurements and the laboratory reported ICP-MS arsenic concentrations with the site-specific model provided in Equation 1.

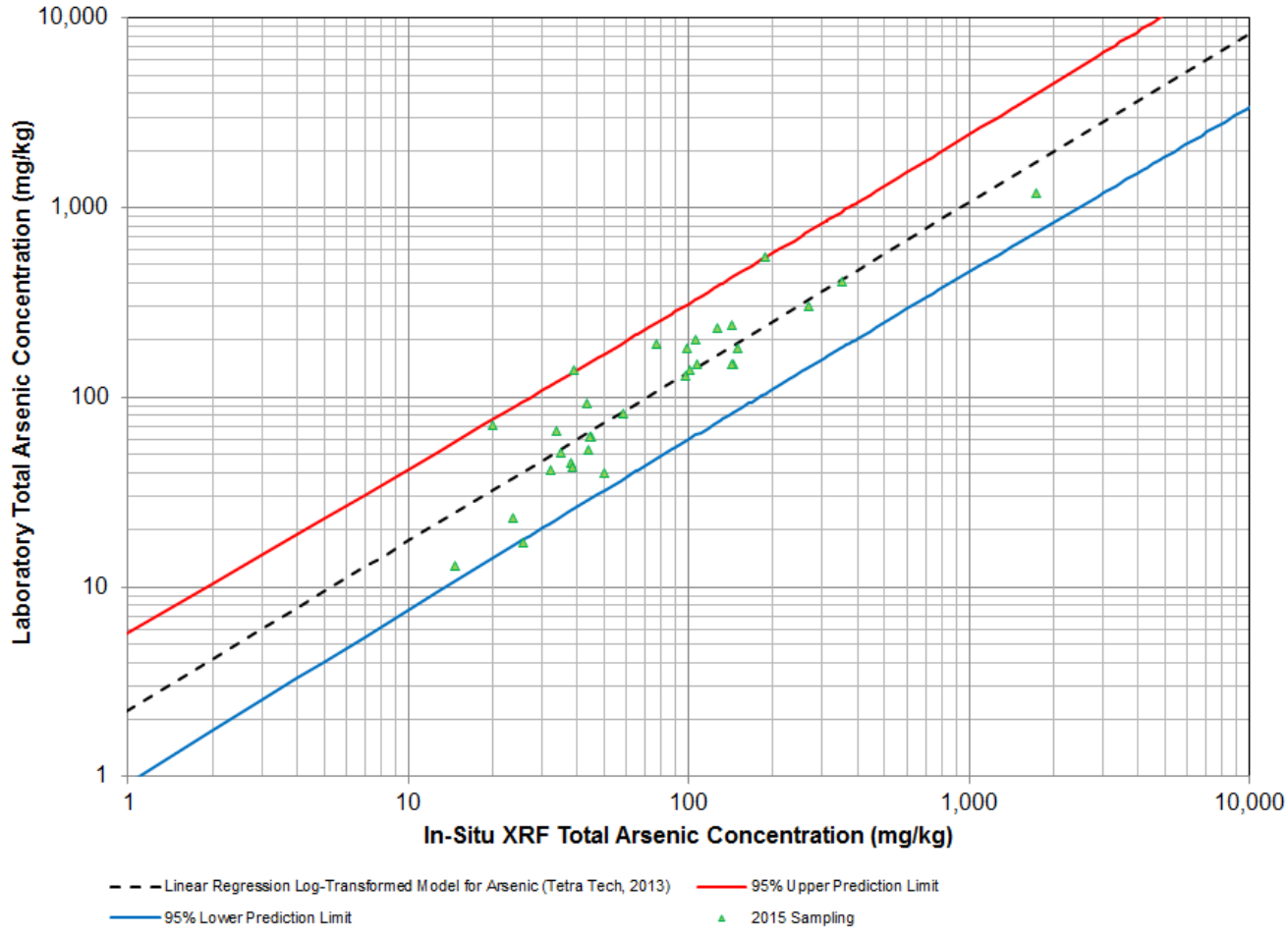

Figure 6 In Situ XRF Arsenic vs. Laboratory Reported ICP-MS Arsenic

An evaluation of decision error rates was performed to assess the effectiveness of the XRF instrument in decision making at the site. There are two types of decisions "true" and "false". A decision error can either be a "false positive" or a "false negative". A false positive decision error is where the XRF reading indicates the sample is below the action level but the laboratory reported ICP-MS concentration is above the action level. Similarly, a false negative decision error is where the XRF reading indicates the sample is above the action level and the laboratory reported ICP-MS concentration is below the action level. An analysis of the 31 data pairs was performed to assess the decision error rates from the 2015 XRF field survey.

Figure 7 provides a graph showing the decision error rates, the upper left box is the false positive box and any data pairs falling in this category are flagged as having a false positive decision error. Similarly, any data pairs falling within the lower right hand box are qualified as having a false negative error. The decision error rate analysis showed that two samples had false positive decision errors, see the red data points on Figure 7. The false positive decision error rate is 6.4 percent. The project goal is less than 10 percent for false decisions error rates. The false negative decision error is zero percent.

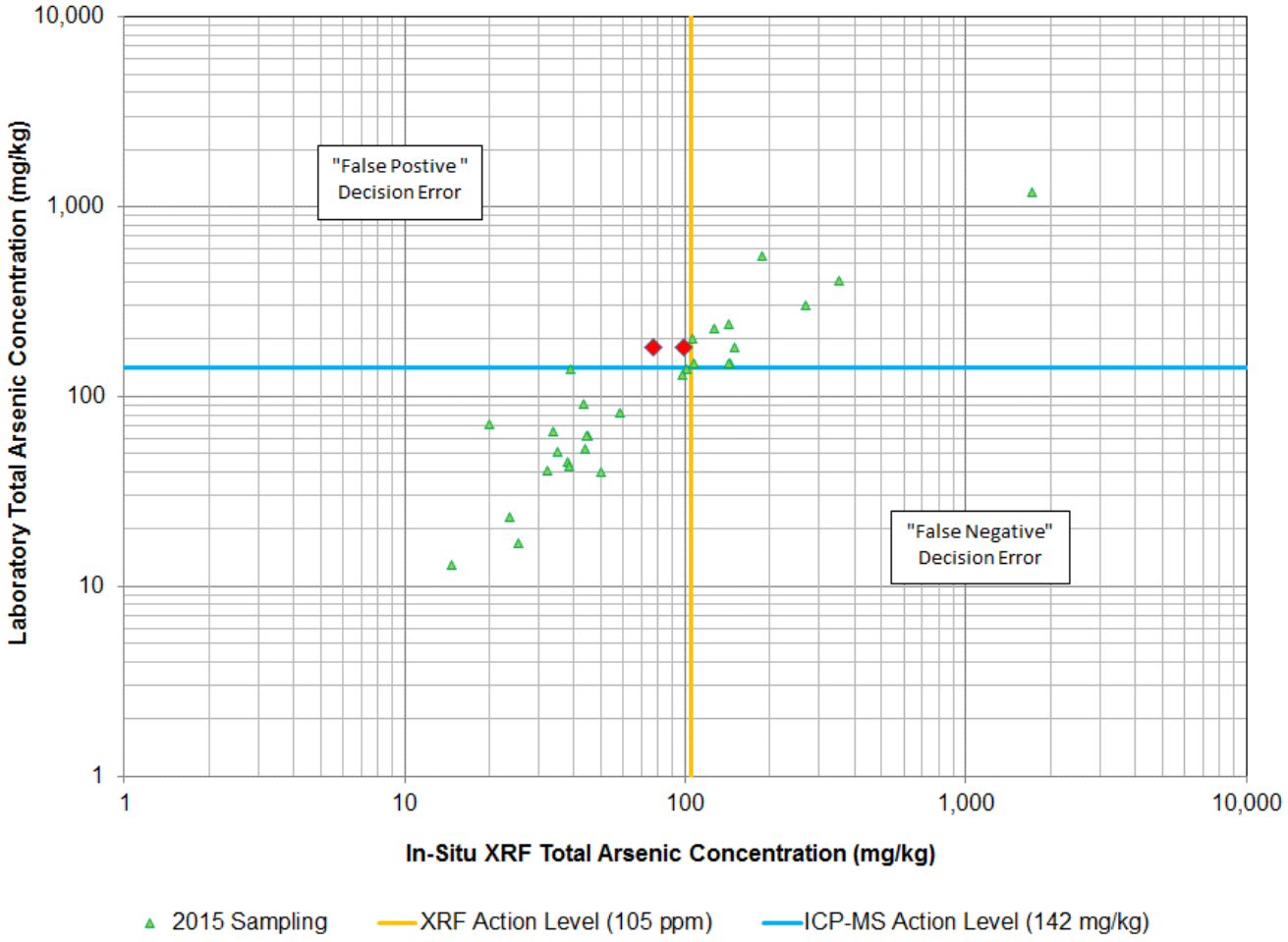

Figure 7 Arsenic Action Level Decision Error Rate Analysis

Overall, the XRF field survey results indicate that the 2013 correlation is efficient in reducing decision error rates and for estimating soil arsenic concentrations using an XRF analyzer at the Riley Pass site. The final laboratory reports are provided in Attachment C.

4.0 QUALITY ASSURANCE AND QUALITY CONTROL

4.1 XRF QA/QC Methods and Results

Generally, instrument precision is the least significant source of error in XRF analysis, and the operator-or application-related error is generally more significant and varies with each site and method used (EPA 2007). Some sources of interference can be minimized or controlled by the instrument operator, but others cannot. The methods and QA/QC program performed during the XRF field survey was designed to reduce operator- or application-error whenever possible based on the recommendations from EPA Method 6200 and from the Niton User's Manual. Three separate XRF analyzers of the same type were utilized for this field work. Specific QA/QC protocol was performed for each of these instruments which included energy calibration checks, daily calibration checks on NIST standards and method blanks, XRF field duplicates, and precision measurements. Additionally, all

of the instruments used during the survey were calibrated within the specified manufacture recommended time frame.

4.1.1 Energy Calibration Checks

Energy calibration checks were be performed once daily by field engineers before any measurements were initiated. All of the energy calibration checks fell within the manufacture accepted limits.

4.1.2 Daily Calibration Checks

Calibration checks were performed by field engineers before or after the XRF field survey was conducted each day. The daily calibration checks included method blanks and calibration verification checks. Field engineers logged the daily calibration checks for each instrument on field sheets. Scanned copies of these field sheets are included in Attachment D. All of the calibration checks met the project QC acceptance criteria.

4.1.3 XRF Field Replicate Samples

One XRF replicate sample was collected for every 20 in situ XRF measurements collected in the field. With the exception of two replicates, the replicate sample was collected at the same location where soil confirmation samples were collected. The same method for measuring the primary XRF measurement was used to measure the XRF replicate measurement. The project acceptance criterion for field duplicates is the relative percent difference (RPD) between the primary result and the duplicate result will be no greater than 50 percent. The equation for calculating the RPD for XRF field duplicates is as follows:

$$RPD = \frac{|S - D|}{\frac{(S + D)}{2}} \times 100$$

Where:

RPD = relative percent difference, non-detects are excluded
S = arsenic concentration of primary XRF measurement
D = arsenic concentration of duplicate XRF measurement

Table 5 and Table 6 provide the QC results and replicate sample IDs collected during the 2015 XRF field survey. A total of 32 replicate XRF measurements were collected during the XRF field survey. The RPD was calculated between the replicate and primary XRF measurement data pairs. The RPD ranged from between 0 percent to 27.2 percent with an average RPD of 9.6 percent. The XRF replicate QC analysis shows that the project QC acceptance criteria was achieved for all of the replicate measurements.

Table 5 XRF Replicate Quality Control Results (1 through 16)

QC Set	Sample Location	XRF S/N	In Situ XRF Measurement (ppm)	RPD
1	XRF-FP8	31177	20.1	22.7%
			25.2	
2	XRF-FN13	31177	106	3.1%
			103	
3	XRF-FL15	31177	45.2	0.2%
			45.3	
4	XRF-FK4	31177	126	7.1%
			118	
5	XRF-FK9	31177	34.0	12.5%
			38.5	
6	XRF-FJ3	31177	76.7	10.4%
			69.2	
7	XRF-FI10	31177	97.6	8.5%
			89.7	
8	XRF-FF8	31177	38.8	27.2%
			29.5	
9	XRF-FC8	31177	107	9.2%
			97.6	
10	XRF-GM4	31177	188	6.8%
			176	
11	XRF-GM1	31177	44.5	3.2%
			43.1	
12	XRF-GI1	31177	98.3	10.3%
			109	
13	XRF-GI6	31177	1,731	4.1%
			1,803	
14	XRF-IAA16	31177	25.5	8.2%
			27.7	
15	XRF-IX13	31177	32.0	4.2%
			30.7	
16	XRF-IV9	31177	23.6	4.1%
			22.7	

Table 6 XRF Replicate Quality Control Results (17 through 32)

QC Set	Sample Location	XRF S/N	In Situ XRF Measurement (ppm)	RPD
17	XRF-IS6	31177	38.2	18.2%
			45.9	
18	XRF-IR4	31177	14.6	12.9%
			16.6	
19	XRF-IQ9	31177	38.6	15.1%
			33.2	
20	XRF-IP2	31177	44.1	21.2%
			54.6	
21	XRF-IO12	31177	142	9.4%
			156	
22	XRF-IH10	31177	50.0	23.6%
			39.4	
23	XRF-IG6	31177	43.3	15.0%
			50.3	
24	XRF-IF8	31177	353	3.4%
			341	
25	XRF-IE12	31177	35.2	2.0%
			35.9	
26	XRF-GQ10	84208	308	8.9%
			282	
27	XRF-GP14	84208	72.2	2.2%
			70.6	
28	XRF-GO14	84208	145	11.1%
			162	
29	XRF-GA11	31094	58.7	12.7%
			51.7	
30	XRF-GC9	31094	149	5.3%
			141	
31	XRF-GD3	31094	143	4.0%
			149	
32	XRF-GE6	31094	101	0.0%
			101	

4.1.4 XRF Precision Analysis

A precision measurement was performed at a minimum of once per day for each instrument in use, which involves measurement of one sample location a minimum of seven times in replicate. The project QC acceptance criterion for precision measurement is that the relative standard deviation (RSD) must be less than 20 percent. Each precision sample included a minimum of seven measurements in replicate conducted in the field. The RSD of the sample mean is used to assess method precision. The RSD should not be greater than 20 percent for XRF data to be considered adequately precise. Only in situ measurements were collected for this sampling event. The equation for calculating RSD is as follows:

$$RSD = \frac{\sigma}{\mu} \times 100$$

Where:

RSD = relative standard deviation for the precision measurement for the analyte (arsenic)
σ = standard deviation of the concentration for the analyte (arsenic)
μ = mean concentration for the analyte (arsenic)

Three XRF analyzers were used for this project; however, two of the instruments (S/N# 84208 & S/N# 31094) were used only one day each and the third instrument was used all four days. Precision measurements were collected once per day for each instrument. All precision measurements involved a minimum of a 60 second shutter time. The precision error measurements for each instrument and the RSD calculations are provided in Table 7 through Table 12. The RSD measurement results ranged from between 3.29 percent to 7.79 percent. The XRF precision error QC analysis for the 2015 sampling meets the project QC acceptance criteria of an RSD less than 20 percent.

Table 7 XRF S/N# 84208 Precision Measurement Quality Control Results (1 of 1)

Date	Location	In Situ XRF Measurement (ppm)
7/14/2015	XRF-GP14	72.2
		70.6
		65.6
		68.4
		66.2
		67.4
		64.1
RSD Calculation	Standard Deviation, σ	2.84
	Mean Concentration, μ	67.8
	RSD	**4.19%**

Table 8 XRF S/N# 31094 Precision Measurement Quality Control Results (1 of 1)

Date	Location	In Situ XRF Measurement (ppm)
7/14/2015	XRF-GD3	143
		149
		158
		149
		146
		150
		154
RSD Calculation	Standard Deviation, σ	4.9
	Mean Concentration, µ	150
	RSD	**3.29%**

Table 9 XRF S/N# 31177 Precision Measurement Quality Control Results (1 of 4)

Date	Location	In Situ XRF Measurement (ppm)
7/13/2015	XRF-FN13	106
		103
		107
		100
		97
		99
		101
RSD Calculation	Standard Deviation, σ	3.7
	Mean Concentration, µ	102
	RSD	**3.60%**

Table 10 XRF S/N# 31177 Precision Measurement Quality Control Results (2 of 4)

Date	Location	In Situ XRF Measurement (ppm)
7/14/2015	XRF-GM1	45
		43
		42
		39
		38
		47
		40
RSD Calculation	Standard Deviation, σ	3.3
	Mean Concentration, μ	42
	RSD	**7.73%**

Table 11 XRF S/N# 31177 Precision Measurement Quality Control Results (3 of 4)

Date	Location	In Situ XRF Measurement (ppm)
7/15/2015	XRF-IV9	24
		23
		21
		24
		26
		21
		25
RSD Calculation	Standard Deviation, σ	1.7
	Mean Concentration, μ	23
	RSD	**7.42%**

Table 12 XRF S/N# 31177 Precision Measurement Quality Control Results (4 of 4)

Date	Location	In Situ XRF Measurement (ppm)
7/16/2015	XRF-IF8	353
		341
		360
		361
		340
		338
		294
RSD Calculation	Standard Deviation, σ	22.8
	Mean Concentration, μ	341
	RSD	**6.69%**

4.2 Gamma Radiation Survey QA/QC Methods and Results

This section presents the QA/QC methods and results for the gamma radiation survey that was performed by Tetra Tech in July 2015.

4.2.1 Gamma Radiation Survey Quality Assurance Methods

An important QA protocol includes instrument calibration. Calibration refers to the determination and adjustment of the instrument response in a particular radiation field of known intensity (NRC 2000). All of the radiation detection equipment employed during the field work was factory calibrated within the past 12 months. Data developed using any of the field-qualified instruments are then interchangeable, allowing instruments to be substituted if needed. Under the QA program, factory-calibrated instruments must also meet on-site field test criteria in the next subsection. Attachment E provides scanned copies of the factory calibration documentation for the two instruments that were used (MFG-6 and MFG-12).

4.2.2 Gamma Radiation Survey Quality Control Methods

The primary method for the gamma radiation survey QC program is the evaluation performance of calibration checks. Calibration checks are measurements to verify instrument performance repeated each time an instrument is used (NRC 2000); these checks are quantitative and were performed in the lab and in the field. The QC calibration checks that were performed as part of the gamma radiation survey included:

- **Daily Calibration Checks:** Background check, field strip check, and cesium-137 (Cs-137) source check measurements were conducted twice daily for the instruments that were used in the field. These measurements were collected in Bowman, North Dakota at a designated background location selected by the lead field engineer.

- **Pre-survey and Post-survey Calibration Checks:** Pre-survey and post-survey background and check source QC measurements were performed in the Tetra Tech office in Fort Collins, Colorado before and within one week after the conclusion of the gamma survey.

The following subsections present the results of both of these QC procedures that were followed as part of the July 2015 gamma radiation surveys.

4.2.2.1 Daily Calibration Checks

Each day before the gamma radiation survey, instrument comparison QC measurements were collected for all NaI detectors used to survey the site. These QC calibration checks included background checks, field strip checks, and Cs-137 source checks. These measurements were collected twice daily – before the gamma survey was initiated and at the conclusion of the survey for the day. Descriptions of each daily QC measurement procedure are as follows:

1. Background check measurements were collected at a designated location in Bowman, North Dakota consistent with the background gamma radiation for the site. A minimum of 10 background measurements were collected during each QC check.

2. Field strip check measurements were collected by scanning in a 10 meter line outward from the background measurement location. A minimum of 10 measurements were collected along the field strip check transect. The daily field strip check provides an indication of total measurement uncertainty from turbulent movement for each mobile system being used in the field. The same field strip was used throughout the project.

3. Source check measurements were collected at the same location as the background check measurement location by holding a Cs-137 source to the detector and performing a 60-second average analysis using the scanning software.

Calibration check results were plotted daily on control charts for field measurements. A control chart is a graphical plot of measurement results with respect to time and help monitor performance of the radiation detection instrumentation (NRC 2000). Figure 8 provides a control chart of the daily background calibration checks. Figure 9 provides a control chart of the daily background field strip calibration checks. Figure 10 provides a control chart of the daily Cs-137 source calibration checks.

For normally distributed data, 99 percent of all measurements are expected to fall within ±3 standard deviations from the mean. Daily count rate variations within these limits are functions of several possible variables, including exact placement of detector systems during daily checks, and recent variations in barometric pressure. Low detector count rates at very low background gamma exposure rates contribute significantly to variability in count rates. Differences in detector internal characteristics, including minor issues with the NaI detector crystal or optical interface variations in the photomultiplier tube, can also affect NaI detector readings. All of the daily calibration check readings collected during the gamma radiation survey met the project QC acceptance criteria.

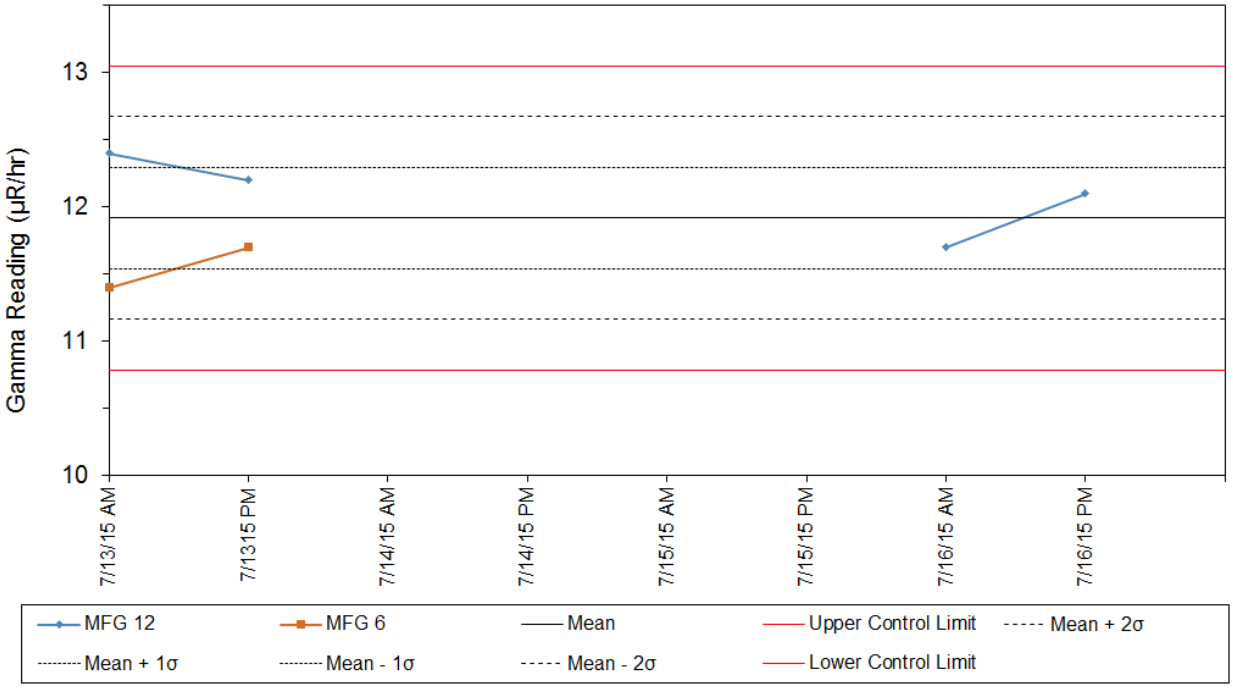

Figure 8 Daily Calibration Check Quality Control Chart – Background

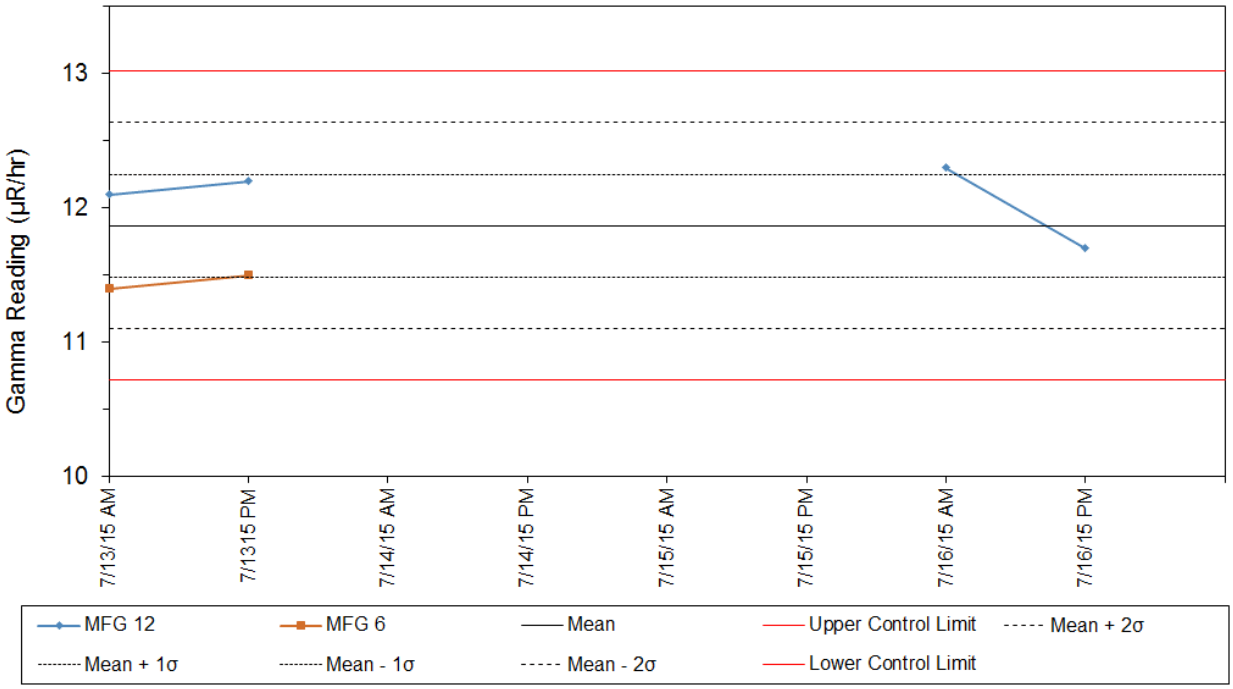

Figure 9 Daily Calibration Check Quality Control Chart – Field Strip

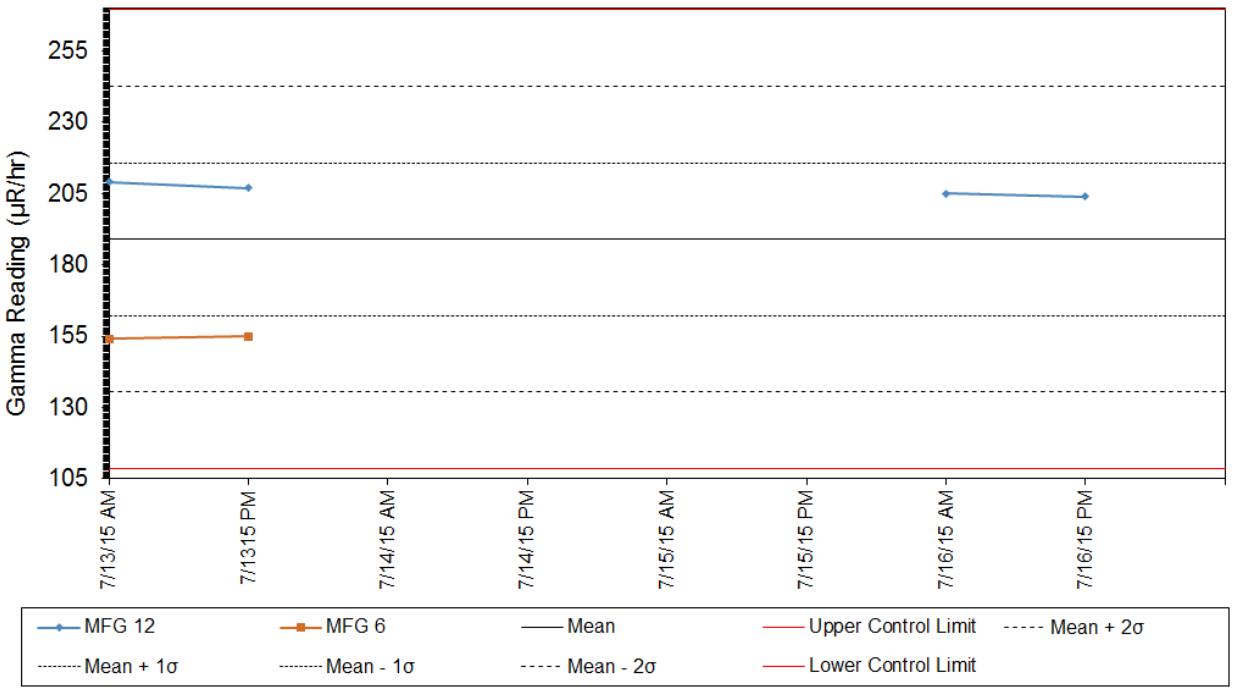

Figure 10 Daily Calibration Check Quality Control Chart – Cs-137 Source Check

4.2.2.2 Pre-Survey and Post-Survey Calibration Checks

Pre-survey and post-survey QC calibration check procedures were performed at an indoor location for each NaI detector that was used during the gamma radiation survey. The data collected during the pre-survey and post-survey was analyzed and compared with each other. A minimum of 1,000 background and Cs-137 source check measurements were collected during the pre-survey and the post-surveys. The purpose of the QC procedure is to quantify the consistency of gamma exposure readings between detectors over time. The results from the pre-survey and post-survey calibration checks were analyzed and compared with each other. The pre-survey and post-survey QC measurements were performed at the Tetra Tech radiation laboratory in Fort Collins, Colorado. The pre-survey measurements were performed in April 2015 and the post-survey measurements were performed in July 2015.

Table 13 and Table 14 present the results of the background pre-survey and post-survey background checks for the two detectors used. Table 15 and Table 16 present the results of the Cs-137 source pre-survey and post-survey background checks for the two detectors used. The RPD of the statistical parameters was calculated following the following equation:

$$RPD(\%) = \frac{|PRE - POST|}{\frac{(PRE + POST)}{2}} \times 100$$

where:

RPD = Relative percent difference
PRE = Pre-survey QC measurement (mean, median, standard deviation, or 95th percentile)
POST = Post-survey QC measurement (mean, median, standard deviation, or 95th percentile)

All of the data met the project QC acceptance criteria with an RPD of less than 10 percent for all of the statistical parameters. Figure 11 and Figure 13 present frequency histograms of the pre-survey and post-survey calibration check data for background and Cs-137 source checks, respectively. Figure 12 and Figure 14 present the pre-survey and post-survey calibration check data plotted on normal probability plots for background and Cs-137 source checks, respectively. All of the pre-survey and post-survey data are normally distributed and meet the project QC acceptance criteria.

Table 13 Instrument MFG-12 Pre-Survey and Post-Survey Background Check

Survey:	Pre-Survey	Post-Survey	Relative Percent Difference
Date:	Apr-15	Jul-15	
Detector ID:	MFG-12	MFG-12	
# of Readings	1,206	1,470	-
Mean	16.2	16.5	2.0%
Median	16.2	16.5	1.9%
Standard Deviation	0.84	0.88	5.1%
95th Percentile	17.6	18.0	2.4%
99th Percentile	18.3	18.8	2.7%

Table 14 Instrument MFG-6 Pre-Survey and Post-Survey Background Check

Survey:	Pre-Survey	Post-Survey	Relative Percent Difference
Date:	Apr-15	Jul-15	
Detector ID:	MFG-6	MFG-6	
# of Readings	3,114	1,002	-
Mean	15.8	16.1	2.0%
Median	15.8	16.1	2.0%
Standard Deviation	0.82	0.85	3.6%
95th Percentile	17.2	17.5	2.1%
99th Percentile	17.7	18.1	2.1%

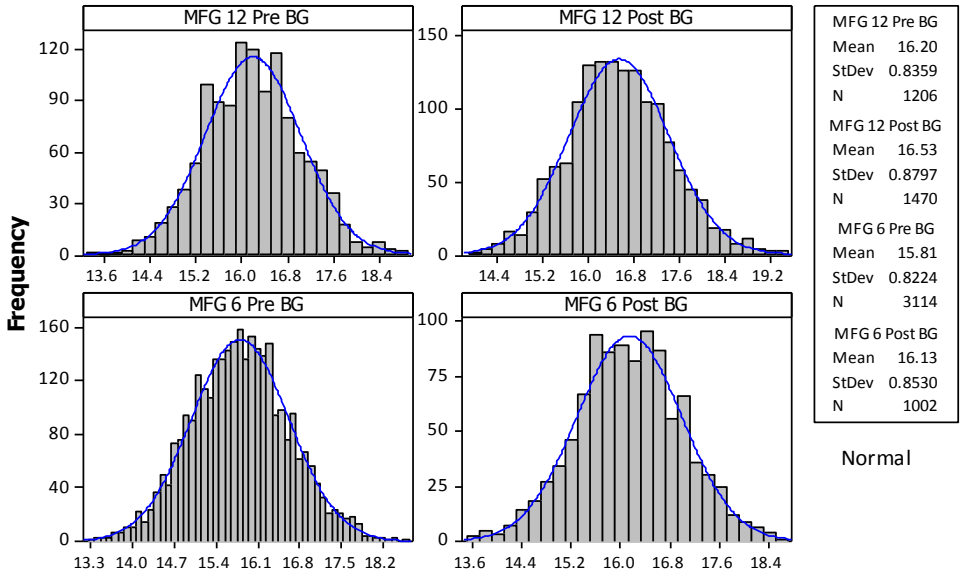

Figure 11 Frequency Histograms for Pre-Survey and Post-Survey Gamma Background Measurements

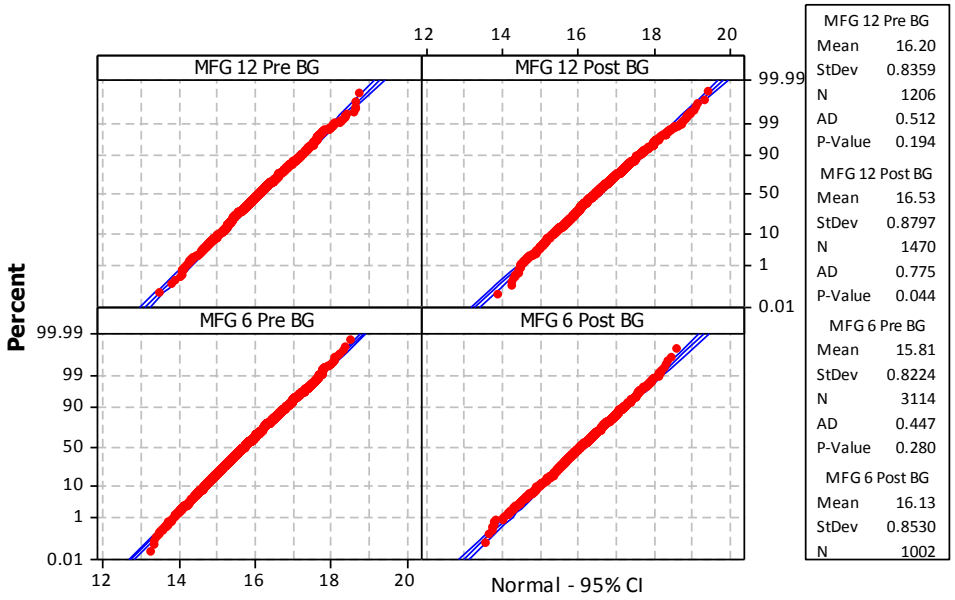

Figure 12 Normal Probability Plots for Pre-Survey and Post-Survey Instrument Background Measurements

Table 15 Instrument MFG-12 Pre-Survey and Post-Survey Cs-137 Source Check

Survey:	Pre-Survey	Post-Survey	Relative Percent Difference
Date:	Apr-15	Jul-15	
Detector ID:	MFG-12	MFG-12	
# of Readings	1,383	1,009	-
Mean	216	216	0.3%
Median	216	216	0.3%
Standard Deviation	3.19	3.02	5.6%
95th Percentile	222	220	0.6%
99th Percentile	224	223	0.4%

Table 16 Instrument MFG-6 Pre-Survey and Post-Survey Cs-137 Source Check

Survey:	Pre-Survey	Post-Survey	Relative Percent Difference
Date:	Apr-15	Jul-15	
Detector ID:	MFG-6	MFG-6	
# of Readings	1,476	1,011	n/a
Mean	167	166	1.55%
Median	167	166	1.72%
Standard Deviation	2.74	2.66	5.26%
95th Percentile	172	170	0.93%
99th Percentile	174	172	0.72%

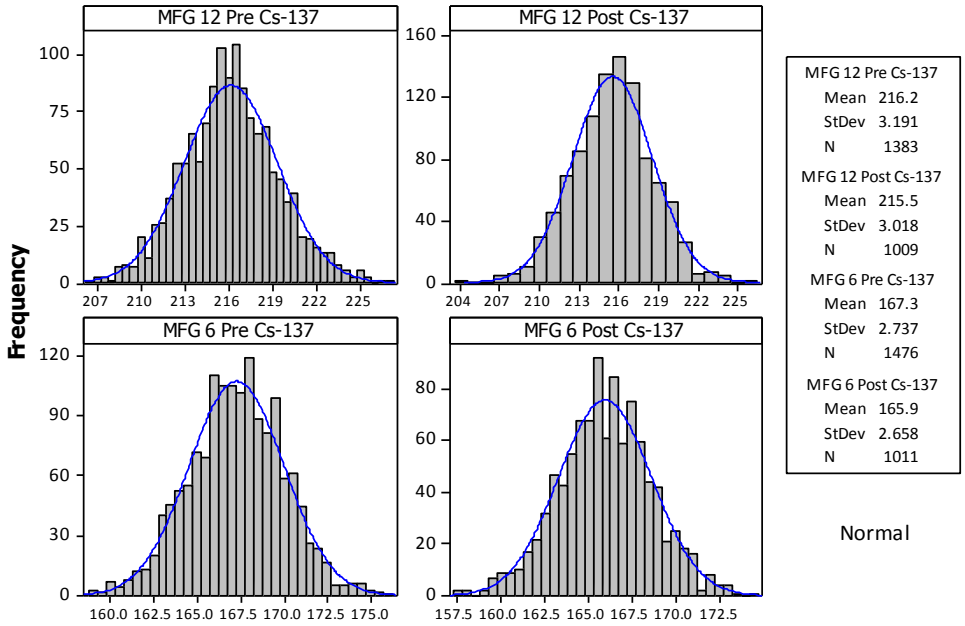

Figure 13 Frequency Histograms for Pre-Survey and Post-Survey Gamma Cs-137 Source Check Measurements

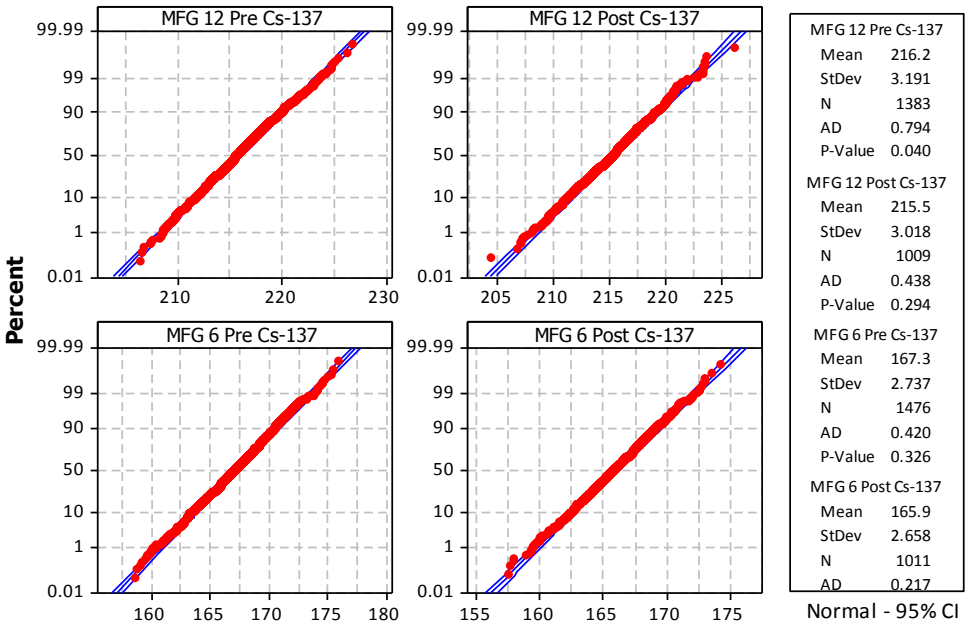

Figure 14 Normal Probability Plots for Pre-Survey and Post-Survey Instrument Cs-137 Source Measurements

4.3 Soil Confirmation Sampling QA/QC Methods and Results

Soil confirmation samples were collected during the 2015 sampling at Riley Pass. Two field duplicates and 31 primary samples were collected. A copy of the final laboratory report including the laboratory QC report is provided in Attachment C. No issues were found with the laboratory QC report. However, some of the initial measurements were redigested and reanalyzed for questionable results and a second laboratory report was generated that had similar results. The data from the second laboratory report was used for the data validation in Section 3.3, both of these laboratory reports are presented in Attachment C.

A data quality assessment was performed by Tetra Tech which included a quantitative evaluation of precision between the two primary and field duplicate sample data pairs. Precision can be defined by the amount of scatter or variance that occurs in repeated measurements of a particular analyte. The equation for precision acceptance and rejection for this project is based on the RPD between the primary and field duplicate samples. The RPD was calculated using the equation presented in Section 4.1.3.

Table 17 provides the QC results for the soil confirmation primary and field duplicate data sets. The RPD was 6.45 percent and 4.44 percent. The RPD results meet the project QC acceptance criteria of less than 30 percent; therefore, no data was flagged with qualifiers.

Table 17 Soil Confirmation Sample Quality Control Results

QC Set	Sample ID	Lab Sample Number	Sample Date	ICP-MS Arsenic (mg/kg)	RPD (%)
1	XRF-FI10-01	1507352-7	7/13/2015	160	**6.45%**
	XRF-FI10-02	1507352-8	7/13/2015	150	
2	XRF-IV9-01	1507352-23	7/13/2015	23	**4.44%**
	XRF-IV9-02	1507352-24	7/13/2015	22	

5.0 SUMMARY

XRF field surveys and gamma radiation surveys were performed by Tetra Tech field engineers in July 2015 at the Riley Pass study areas: Bluff F, Bluff G, and Bluff I. A total of 593 in situ XRF measurements and 31 soil confirmation samples were collected as part of the XRF field survey field efforts. Additionally, over 16,000 gamma exposure rate measurements were collected at Bluff F and Bluff I. A data validation analysis was performed on the XRF soil confirmation samples to compare the data pairs collected in July 2015 with the soil correlation established in the 2013 WCR. Overall, there was agreement with the existing site specific arsenic correlation. A detailed QA/QC program was followed for both the XRF field survey and the gamma radiation surveys. The results of the QC program indicated the program was successful and all the data met the project QC acceptance criteria. Tetra Tech has incorporated the information collected during the 2015 field sampling efforts into the project database and the Waste Evaluation Report status updates maps.

6.0 REFERENCES

Millennium Science and Engineering (MSE). 2009. Riley Pass Uranium Mines Site X-Ray Fluorescence (XRF) and Gamma Surveys Report, USDA Forest Service, Custer Gallatin National Forest (North Cave Hills), Riley Pass Uranium Mines Site (Mine Bluffs I, F, J, K, L & A), Harding County, South Dakota. MSE. 32p.

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U.S. Environmental Protection Agency (EPA). 2007. Field Portable XRF Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment. Method 6200. Washington, DC: EPA

U.S. Nuclear Regulatory Commission (NRC). 2000. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), (NUREG 1575, Revision 1). NRC. 360p.

ATTACHMENT A

SUMMARY OF XRF FIELD MEASUREMENTS

Table A - Bluff F XRF Field Measurements Sampling Information

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
FA-2	7/14/2015	11:43:19am	31177	25.8	40.7	748015.82998	1085414.21845	2.0
FA-3	7/14/2015	11:45:13am	31177	72.0	101.6	747970.21613	1085426.08319	1.6
FB-2	7/14/2015	11:40:52am	31177	6.8	12.4	748010.96969	1085454.14923	1.7
FB-3	7/14/2015	11:38:46am	31177	6.5	12.0	747977.39592	1085445.90228	1.9
FB-4	7/14/2015	11:36:34am	31177	41.8	62.6	747947.86838	1085446.41307	1.6
FC-2	7/14/2015	11:14:20am	31177	23.5	37.4	748013.25809	1085483.58065	1.6
FC-3	7/14/2015	11:16:25am	31177	19.8	32.1	747968.27434	1085472.95825	1.8
FC-4	7/14/2015	11:18:37am	31177	49.1	72.2	747924.39480	1085479.92330	2.1
FC-5	7/14/2015	11:20:03am	31177	26.1	41.2	747914.70234	1085471.77999	1.7
FC-6	7/14/2015	11:23:51am	31177	115.3	154.6	747853.03779	1085495.56578	1.7
FC-7	7/14/2015	11:25:42am	31177	57.4	83.0	747834.22595	1085479.54884	1.7
FC-8	7/14/2015	11:28:47am	31177	107.1	144.7	747805.91721	1085468.26984	1.5
FC-9	7/14/2015	11:33:18am	31177	61.3	88.0	747770.97563	1085481.41856	1.8
FD-1	7/14/2015	11:11:06am	31177	15.5	25.8	748046.46590	1085513.66434	1.7
FD-2	7/14/2015	11:06:46am	31177	38.7	58.4	748011.37459	1085509.28283	1.7
FD-3	7/14/2015	11:00:25am	31177	50.0	73.5	747974.14553	1085505.16285	1.8
FD-4	7/14/2015	10:58:30am	31177	12.6	21.4	747939.66731	1085515.92957	1.9
FD-5	7/14/2015	10:55:37am	31177	26.5	41.7	747910.45081	1085500.58965	1.8
FD-6	7/14/2015	10:53:07am	31177	32.7	50.3	747870.27383	1085515.00539	1.8
FD-7	7/14/2015	10:51:08am	31177	10.6	18.5	747849.64440	1085511.54439	1.9
FD-8	7/14/2015	10:48:34am	31177	4.6	8.7	747826.31135	1085530.96649	1.7
FD-9	7/14/2015	10:46:56am	31177	61.2	87.9	747754.94993	1085501.04235	1.6
FE-1	7/14/2015	10:21:31am	31177	46.3	68.6	748025.15331	1085529.92252	1.7
FE-10	7/14/2015	10:43:21am	31177	48.3	71.2	747736.18758	1085541.23042	1.7
FE-2	7/14/2015	10:24:55am	31177	41.5	62.2	747993.33195	1085533.83374	1.9
FE-3	7/14/2015	10:27:49am	31177	50.4	74.0	747960.30402	1085541.10269	2.1
FE-4	7/14/2015	10:29:56am	31177	36.6	55.6	747927.09459	1085540.60174	1.9
FE-5	7/14/2015	10:31:56am	31177	4.5	8.5	747894.92869	1085543.74434	2.0
FE-6	7/14/2015	10:34:50am	31177	32.3	49.8	747865.23142	1085553.54606	1.7
FE-7	7/14/2015	10:36:37am	31177	39.1	58.9	747840.42884	1085547.99763	1.7
FE-8	7/14/2015	10:38:33am	31177	6.0	11.2	747800.61703	1085544.29038	1.6
FE-9	7/14/2015	10:40:46am	31177	7.0	12.7	747768.25154	1085542.47234	1.6
FF-10	7/14/2015	09:55:46am	31177	24.7	39.1	747743.73406	1085575.88146	2.1
FF-2	7/14/2015	10:16:56am	31177	5.4	10.2	748001.93252	1085591.58688	2.8
FF-3	7/14/2015	10:14:44am	31177	8.9	15.8	747977.53121	1085579.03470	3.1
FF-4	7/14/2015	10:11:29am	31177	29.5	45.9	747932.67339	1085569.82336	1.9
FF-5	7/14/2015	10:09:06am	31177	23.4	37.4	747895.85589	1085576.53409	1.8
FF-6	7/14/2015	10:07:08am	31177	20.5	33.2	747881.00062	1085563.19542	2.1
FF-7	7/14/2015	10:04:56am	31177	26.5	41.8	747835.61735	1085571.61984	2.0
FF-8	7/14/2015	10:01:23am	31177	38.8	58.6	747803.74927	1085580.61824	1.8
FF-9	7/14/2015	09:57:38am	31177	9.2	16.3	747764.17349	1085579.36565	2.0
FG-10	7/14/2015	09:48:13am	31177	24.1	38.3	747745.62725	1085605.42456	1.7
FG-11	7/14/2015	09:50:03am	31177	33.9	51.9	747709.89187	1085609.77498	1.9
FG-3	7/14/2015	09:31:37am	31177	193.2	244.8	747969.74180	1085608.96420	1.9
FG-4	7/14/2015	09:34:28am	31177	68.3	96.9	747936.48492	1085617.75695	1.7
FG-5	7/14/2015	09:36:47am	31177	122.7	163.3	747908.69235	1085621.09728	1.8
FG-6	7/14/2015	09:38:43am	31177	29.2	45.5	747861.01576	1085622.42322	2.3
FG-7	7/14/2015	09:40:59am	31177	19.1	31.1	747832.02560	1085614.71574	1.9
FG-8	7/14/2015	09:43:18am	31177	8.0	14.3	747813.64801	1085615.36156	1.9

Table A - Bluff F XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
FG-9	7/14/2015	09:46:05am	31177	25.4	40.2	747774.76482	1085616.39926	1.7
FH-10	7/14/2015	09:12:57am	31177	46.1	68.3	747751.69645	1085647.98594	1.7
FH-11	7/14/2015	09:10:24am	31177	47.9	70.6	747695.61528	1085637.19542	1.8
FH-12	7/14/2015	09:09:03am	31177	48.8	71.8	747667.29551	1085630.59273	2.1
FH-3	7/14/2015	09:28:37am	31177	80.5	112.3	747968.94477	1085641.05934	1.7
FH-4	7/14/2015	09:26:40am	31177	62.7	89.9	747930.03073	1085650.41993	1.7
FH-5	7/14/2015	09:25:02am	31177	88.2	121.8	747917.25200	1085631.66750	1.8
FH-6	7/14/2015	09:22:22am	31177	40.9	61.4	747873.16779	1085642.19069	1.6
FH-7	7/14/2015	09:20:33am	31177	25.7	40.6	747827.05097	1085637.85243	1.7
FH-8	7/14/2015	09:17:23am	31177	32.1	49.4	747812.13947	1085646.08673	2.0
FH-9	7/14/2015	09:15:37am	31177	31.4	48.5	747783.66749	1085632.96049	1.8
FI-10	7/13/2015	06:42:18pm	31177	97.6	133.2	747743.16339	1085674.03588	1.6
FI-11	7/13/2015	06:51:00pm	31177	199.5	251.9	747703.56081	1085678.19363	1.6
FI-12	7/13/2015	06:53:16pm	31177	43.1	64.3	747663.07201	1085661.60567	1.7
FI-13	7/13/2015	06:55:21pm	31177	39.7	59.8	747633.39571	1085679.03557	1.6
FI-14	7/13/2015	06:57:43pm	31177	48.3	71.2	747604.39019	1085690.89649	1.7
FI-3	7/13/2015	06:26:21pm	31177	228.7	284.5	747980.97119	1085682.03834	1.7
FI-4	7/13/2015	06:28:44pm	31177	83.2	115.5	747933.38593	1085673.18237	1.7
FI-5	7/13/2015	06:30:35pm	31177	50.7	74.3	747884.77340	1085678.92926	2.2
FI-6	7/13/2015	06:32:32pm	31177	15.3	25.6	747872.86832	1085676.94751	1.7
FI-7	7/13/2015	06:34:19pm	31177	22.7	36.3	747839.39702	1085681.15910	1.6
FI-8	7/13/2015	06:36:20pm	31177	18.8	30.8	747795.77434	1085685.19131	2.0
FI-9	7/13/2015	06:38:28pm	31177	95.2	130.3	747768.32391	1085675.49532	1.9
FJ-10	7/13/2015	06:07:21pm	31177	20.4	33.0	747741.88111	1085700.07901	1.7
FJ-11	7/13/2015	06:05:22pm	31177	48.9	72.0	747719.48166	1085705.26205	1.7
FJ-12	7/13/2015	06:03:00pm	31177	115.6	154.9	747689.31712	1085707.24013	1.6
FJ-13	7/13/2015	06:01:19pm	31177	70.4	99.5	747653.50919	1085712.75494	1.7
FJ-14	7/13/2015	05:59:26pm	31177	33.0	50.7	747622.92421	1085711.02248	1.7
FJ-3	7/13/2015	06:20:35pm	31177	76.7	107.5	747973.74391	1085712.74016	1.9
FJ-4	7/13/2015	06:18:11pm	31177	36.7	55.7	747937.53377	1085713.06056	1.8
FJ-5	7/13/2015	06:16:22pm	31177	39.5	59.5	747917.09767	1085701.15705	1.8
FJ-6	7/13/2015	06:14:45pm	31177	33.3	51.1	747878.67752	1085712.75335	1.7
FJ-7	7/13/2015	06:13:11pm	31177	50.8	74.5	747836.44358	1085710.36552	1.8
FJ-8	7/13/2015	06:10:56pm	31177	30.1	46.7	747814.89733	1085710.52526	1.6
FJ-9	7/13/2015	06:09:06pm	31177	35.7	54.4	747770.96104	1085715.34689	1.7
FK-10	7/13/2015	04:52:09pm	31177	60.5	87.0	747730.71576	1085731.75289	1.7
FK-11	7/13/2015	04:54:30pm	31177	23.7	37.7	747713.52245	1085745.68991	1.5
FK-12	7/13/2015	04:56:52pm	31177	28.1	43.9	747671.62830	1085742.43670	1.5
FK-13	7/13/2015	04:58:36pm	31177	31.3	48.4	747638.79499	1085743.84868	1.5
FK-14	7/13/2015	05:01:04pm	31177	34.1	52.3	747612.90434	1085744.28499	1.3
FK-15	7/13/2015	05:03:36pm	31177	49.1	72.3	747571.80985	1085749.08604	1.5
FK-3	7/13/2015	04:26:25pm	31177	134.2	176.9	747967.24781	1085735.91790	1.5
FK-4	7/13/2015	04:29:02pm	31177	126.2	167.5	747936.12884	1085751.21474	1.5
FK-5	7/13/2015	04:36:18pm	31177	81.4	113.4	747909.16916	1085738.41372	1.6
FK-6	7/13/2015	04:39:12pm	31177	75.2	105.6	747869.05673	1085744.15017	1.5
FK-7	7/13/2015	04:41:18pm	31177	33.8	51.8	747837.35140	1085738.67988	1.6
FK-8	7/13/2015	04:43:30pm	31177	18.2	29.8	747800.54836	1085746.57977	1.6
FK-9	7/13/2015	04:45:00pm	31177	34.0	52.0	747772.20929	1085740.57139	1.6
FL-10	7/13/2015	04:06:11pm	31177	17.3	28.4	747741.61187	1085784.59976	1.6

Table A - Bluff F XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
FL-11	7/13/2015	04:03:59pm	31177	18.7	30.6	747705.47153	1085773.87099	1.5
FL-12	7/13/2015	04:02:01pm	31177	9.8	17.2	747673.41069	1085777.01622	1.9
FL-13	7/13/2015	03:59:31pm	31177	21.2	34.2	747647.11431	1085771.31130	1.6
FL-14	7/13/2015	03:57:20pm	31177	19.7	32.0	747613.87059	1085776.13795	1.6
FL-15	7/13/2015	03:13:18pm	31177	45.2	67.1	747570.73363	1085775.17111	1.6
FL-3	7/13/2015	04:23:18pm	31177	47.8	70.6	747971.83603	1085777.67038	1.8
FL-4	7/13/2015	04:21:03pm	31177	53.9	78.4	747926.92818	1085774.34666	1.7
FL-5	7/13/2015	04:18:34pm	31177	47.6	70.3	747902.36560	1085769.89979	1.6
FL-6	7/13/2015	04:15:27pm	31177	80.7	112.5	747863.00417	1085779.99848	2.0
FL-7	7/13/2015	04:13:05pm	31177	43.3	64.6	747851.03152	1085773.43114	1.7
FL-8	7/13/2015	04:11:03pm	31177	37.1	56.3	747791.71692	1085777.43046	1.7
FL-9	7/13/2015	04:08:18pm	31177	36.0	54.8	747775.94891	1085768.91258	1.6
FM-10	7/13/2015	02:45:05pm	31177	27.5	43.1	747748.45302	1085810.45469	1.5
FM-11	7/13/2015	02:47:26pm	31177	22.8	36.4	747697.55055	1085809.49331	1.5
FM-12	7/13/2015	02:50:00pm	31177	16.8	27.8	747669.57499	1085812.60682	1.6
FM-13	7/13/2015	02:53:14pm	31177	4.3	8.2	747636.51800	1085803.30358	1.5
FM-14	7/13/2015	02:55:13pm	31177	10.8	18.7	747604.79597	1085813.80391	1.5
FM-15	7/13/2015	02:57:38pm	31177	8.1	14.6	747575.33078	1085807.99122	1.6
FM-3	7/13/2015	02:25:38pm	31177	322.3	386.3	747966.21595	1085816.60697	1.7
FM-4	7/13/2015	02:29:00pm	31177	57.3	82.9	747941.81084	1085812.90511	1.5
FM-5	7/13/2015	02:31:52pm	31177	72.0	101.6	747896.70544	1085799.11118	1.6
FM-6	7/13/2015	02:34:19pm	31177	66.5	94.6	747868.26966	1085811.81159	1.9
FM-7	7/13/2015	02:36:51pm	31177	65.7	93.6	747836.31181	1085806.84404	1.5
FM-8	7/13/2015	02:39:23pm	31177	18.2	29.8	747811.16657	1085808.27138	1.4
FM-9	7/13/2015	02:42:32pm	31177	34.9	53.3	747768.25246	1085809.14321	1.9
FN-10	7/13/2015	01:55:54pm	31177	21.3	34.3	747744.50762	1085852.47002	1.6
FN-11	7/13/2015	01:53:10pm	31177	25.8	40.8	747709.31699	1085834.78894	1.5
FN-12	7/13/2015	01:51:24pm	31177	62.8	89.9	747684.41761	1085843.00645	1.6
FN-13	7/13/2015	01:39:23pm	31177	106.0	143.4	747642.01926	1085840.53832	1.6
FN-14	7/13/2015	01:37:23pm	31177	16.4	27.3	747608.46404	1085848.75523	1.6
FN-15	7/13/2015	01:34:23pm	31177	51.2	75.0	747570.47425	1085847.09789	1.6
FN-3	7/13/2015	02:14:48pm	31177	205.9	259.1	747976.42172	1085841.18136	1.6
FN-4	7/13/2015	02:13:10pm	31177	80.8	112.6	747934.91380	1085837.96338	1.7
FN-5	7/13/2015	02:07:57pm	31177	155.6	201.8	747902.01285	1085835.59894	2.4
FN-6	7/13/2015	02:05:38pm	31177	89.0	122.7	747876.82920	1085835.10694	1.7
FN-7	7/13/2015	02:02:07pm	31177	95.3	130.4	747843.62442	1085829.65921	1.8
FN-8	7/13/2015	02:00:02pm	31177	63.7	91.1	747813.22265	1085843.93979	1.6
FN-9	7/13/2015	01:57:53pm	31177	32.8	50.4	747772.56672	1085850.80052	1.6
FO-10	7/13/2015	11:25:18am	31177	50.5	74.1	747745.14897	1085874.70365	1.5
FO-11	7/13/2015	11:22:55am	31177	61.8	88.7	747708.80119	1085875.65611	1.4
FO-12	7/13/2015	11:20:11am	31177	48.4	71.3	747666.80551	1085871.69968	1.5
FO-13	7/13/2015	11:17:41am	31177	20.9	33.8	747650.16424	1085875.28434	1.4
FO-14	7/13/2015	11:14:53am	31177	27.6	43.2	747610.30231	1085869.31420	1.5
FO-15	7/13/2015	11:12:09am	31177	34.9	53.3	747578.28766	1085865.72133	1.5
FO-3	7/13/2015	11:49:24am	31177	271.7	331.7	747973.43499	1085871.19133	1.8
FO-4	7/13/2015	11:46:04am	31177	162.7	210.1	747936.80534	1085868.30442	2.2
FO-5	7/13/2015	11:43:46am	31177	114.8	154.0	747896.23658	1085883.53462	1.7
FO-6	7/13/2015	11:34:53am	31177	632.4	704.2	747875.63948	1085883.93882	1.5
FO-7	7/13/2015	11:32:10am	31177	108.1	146.0	747846.35729	1085870.81106	1.5

Table A - Bluff F XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
FO-8	7/13/2015	11:29:47am	31177	44.0	65.5	747812.14216	1085868.23747	1.5
FO-9	7/13/2015	11:27:26am	31177	25.7	40.6	747775.68338	1085870.46177	1.4
FP-10	7/13/2015	10:55:40am	31177	44.4	66.1	747744.58239	1085908.89937	1.5
FP-11	7/13/2015	10:58:48am	31177	22.0	35.4	747698.72045	1085904.80656	1.5
FP-12	7/13/2015	11:01:25am	31177	40.3	60.6	747676.67689	1085908.41079	1.5
FP-13	7/13/2015	11:04:29am	31177	23.1	36.9	747639.28903	1085907.67494	1.5
FP-14	7/13/2015	11:06:43am	31177	27.0	42.3	747608.76011	1085907.82849	1.6
FP-15	7/13/2015	11:08:50am	31177	40.3	60.6	747579.04845	1085905.31768	1.6
FP-4	7/13/2015	10:20:59am	31177	90.4	124.4	747958.08332	1085887.08493	2.3
FP-5	7/13/2015	10:24:03am	31177	266.0	325.5	747902.05104	1085896.71451	1.9
FP-6	7/13/2015	10:28:11am	31177	104.1	141.1	747882.35680	1085906.44131	1.6
FP-7	7/13/2015	10:41:00am	31177	45.9	68.1	747841.98638	1085909.95208	1.6
FP-8	7/13/2015	10:43:33am	31177	20.1	32.6	747808.61560	1085907.09656	1.6
FP-9	7/13/2015	10:54:09am	31177	57.1	82.6	747775.70168	1085907.64666	1.7
FQ-10	7/13/2015	09:49:45am	31177	33.2	51.0	747751.33362	1085934.13839	1.8
FQ-11	7/13/2015	09:46:56am	31177	5.7	10.5	747727.03919	1085940.86205	2.0
FQ-12	7/13/2015	09:44:18am	31177	11.9	20.4	747684.46031	1085941.35223	2.2
FQ-13	7/13/2015	09:40:04am	31177	95.8	131.1	747642.66354	1085936.88035	1.7
FQ-14	7/13/2015	09:36:27am	31177	32.9	50.5	747615.07460	1085927.80300	1.7
FQ-15	7/13/2015	09:32:56am	31177	20.2	32.7	747567.44276	1085931.85968	2.3
FQ-5	7/13/2015	10:13:27am	31177	4.1	7.9	747916.04122	1085936.14683	2.6
FQ-6	7/13/2015	10:09:56am	31177	62.4	89.4	747875.05930	1085928.60050	2.4
FQ-7	7/13/2015	10:06:55am	31177	64.9	92.6	747839.31685	1085939.96907	1.5
FQ-8	7/13/2015	09:54:53am	31177	26.0	41.1	747812.63369	1085932.92624	1.8
FQ-9	7/13/2015	09:52:14am	31177	34.5	52.7	747787.49079	1085941.11221	1.6
FR-7	7/13/2015	10:03:16am	31177	21.4	34.4	747842.13502	1085962.22265	2.0
FR-8	7/13/2015	09:57:19am	31177	39.5	59.6	747816.94420	1085966.01976	1.8
FSS-1	7/13/2015	10:30:54am	31177	203.4	256.3	747882.48713	1085894.98354	1.5
FSS-2	7/13/2015	10:34:56am	31177	124.0	164.9	747863.13621	1085895.48782	1.5
FSS-3	7/13/2015	11:37:12am	31177	73.3	103.2	747852.53910	1085875.47570	1.4
FSS-4	7/13/2015	11:41:05am	31177	59.7	85.9	747856.34952	1085886.79605	1.5
FSS-5	7/13/2015	11:53:18am	31177	51.9	75.9	747970.31988	1085869.28112	1.8
FSS-5	7/13/2015	02:10:40pm	31177	146.7	191.5	747918.80028	1085848.22117	1.5
FSS-7	7/13/2015	02:17:36pm	31177	247.4	305.2	748009.50856	1085842.35525	1.7

Table B - Bluff G XRF Field Measurements Sampling Information

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
GA-10	7/14/2015	01:52:03pm	31094	125.7	167.0	747861.42655	1086944.79081	8.1
GA-11	7/14/2015	01:45:05pm	31094	58.7	84.7	747829.34024	1086939.43726	9.8
GA-12	7/14/2015	01:41:49pm	31094	104.1	141.1	747798.97276	1086941.70976	9.3
GA-13	7/14/2015	01:38:41pm	31094	58.8	84.8	747766.53574	1086949.14923	10.3
GA-6	7/14/2015	02:04:55pm	31094	55.9	81.1	747996.33055	1086939.96983	6.9
GA-7	7/14/2015	02:01:43pm	31094	58.6	84.6	747956.33150	1086944.63511	3.5
GA-8	7/14/2015	01:58:48pm	31094	45.3	67.2	747925.50820	1086934.72619	4.0
GA-9	7/14/2015	01:55:51pm	31094	61.0	87.6	747905.38090	1086944.16237	7.1
GB-10	7/14/2015	02:33:03pm	31094	81.7	113.7	747868.66088	1086971.87014	6.1
GB-11	7/14/2015	02:36:40pm	31094	46.6	69.0	747833.20268	1086980.12050	4.2
GB-12	7/14/2015	02:40:24pm	31094	77.1	108.0	747793.22483	1086980.68650	4.0
GB-13	7/14/2015	02:43:46pm	31094	160.2	207.2	747758.48747	1086975.72275	3.4
GB-4	7/14/2015	02:12:39pm	31094	78.4	109.7	748065.24962	1086976.24366	7.0
GB-5	7/14/2015	02:16:10pm	31094	43.6	65.0	748025.02104	1086974.31791	7.0
GB-6	7/14/2015	02:19:31pm	31094	40.0	60.2	747986.79265	1086974.22724	8.3
GB-7	7/14/2015	02:21:56pm	31094	76.6	107.3	747959.14050	1086969.75903	3.7
GB-8	7/14/2015	02:24:45pm	31094	135.3	178.2	747937.69331	1086970.98016	4.1
GB-9	7/14/2015	02:29:40pm	31094	80.2	111.8	747894.04580	1086974.85866	4.0
GC-10	7/14/2015	03:02:52pm	31094	77.6	108.6	747865.91249	1087008.41512	6.6
GC-11	7/14/2015	02:58:57pm	31094	77.6	108.6	747818.84403	1087002.98883	3.2
GC-12	7/14/2015	02:54:25pm	31094	71.9	101.4	747811.20625	1087013.13211	4.2
GC-13	7/14/2015	02:50:26pm	31094	75.2	105.6	747759.91261	1087007.84115	6.2
GC-3	7/14/2015	03:38:39pm	31094	98.8	134.7	748092.96157	1087001.05159	4.1
GC-4	7/14/2015	03:35:15pm	31094	115.3	154.6	748072.47564	1087008.75603	4.0
GC-5	7/14/2015	03:29:40pm	31094	57.6	83.2	748032.59131	1087001.61268	4.6
GC-6	7/14/2015	03:26:02pm	84208	47.5	70.2	748002.14691	1087010.10629	4.1
GC-7	7/14/2015	03:22:18pm	84208	57.8	83.5	747958.39129	1087011.25650	3.8
GC-8	7/14/2015	03:17:20pm	84208	116.6	156.1	747938.67111	1087013.29663	6.9
GC-9	7/14/2015	03:06:07pm	84208	148.9	194.1	747889.18717	1087010.91909	5.4
GD-10	7/14/2015	04:26:34pm	84208	93.0	127.7	747865.16712	1087048.51585	6.7
GD-11	7/14/2015	04:31:38pm	84208	70.1	99.2	747842.52054	1087046.38358	3.4
GD-12	7/14/2015	04:37:03pm	84208	65.6	93.5	747792.84674	1087052.33787	3.5
GD-13	7/14/2015	04:40:57pm	84208	57.0	82.5	747768.68380	1087048.85007	3.4
GD-14	7/14/2015	04:49:30pm	84208	49.3	72.4	747749.52024	1087052.84343	3.4
GD-3	7/14/2015	03:47:03pm	84208	142.8	187.0	748091.53824	1087045.54874	4.3
GD-4	7/14/2015	04:03:16pm	84208	54.6	79.4	748060.47862	1087032.79930	3.5
GD-5	7/14/2015	04:07:22pm	84208	50.8	74.4	748026.01064	1087032.30480	3.4
GD-6	7/14/2015	04:11:33pm	84208	199.6	252.0	747984.41887	1087052.66485	7.4
GD-7	7/14/2015	04:14:56pm	84208	73.4	103.4	747964.67028	1087041.44876	3.4
GD-8	7/14/2015	04:18:57pm	84208	60.1	86.5	747934.86429	1087038.28510	3.9
GD-9	7/14/2015	04:22:46pm	84208	119.0	159.0	747894.15768	1087038.20277	3.3
GE-10	7/14/2015	05:06:41pm	84208	87.7	121.1	747863.17042	1087065.66274	4.7
GE-11	7/14/2015	05:00:36pm	84208	117.0	156.6	747830.85442	1087063.79076	6.2
GE-3	7/14/2015	06:18:04pm	84208	51.0	74.7	748104.25119	1087063.00612	8.9
GE-4	7/14/2015	06:21:48pm	84208	117.6	157.3	748058.69588	1087076.32068	4.7
GE-5	7/14/2015	06:25:49pm	84208	124.1	165.0	748013.58376	1087073.99647	4.6
GE-6	7/14/2015	06:28:35pm	84208	101.1	137.5	747986.35125	1087065.96682	4.9
GE-7	7/14/2015	06:36:35pm	84208	61.8	88.6	747962.56174	1087061.42995	4.3
GE-8	7/14/2015	05:20:49pm	84208	68.6	97.3	747920.86681	1087083.33729	3.4

Table B - Bluff G XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
GE-9	7/14/2015	05:16:39pm	84208	204.4	257.4	747888.10566	1087071.03418	3.6
GF-2	7/14/2015	06:14:04pm	84208	118.6	158.5	748131.11862	1087106.94159	4.8
GF-3	7/14/2015	06:00:22pm	84208	122.3	162.9	748101.90220	1087098.55690	4.0
GF-4	7/14/2015	05:57:02pm	84208	63.1	90.3	748075.42521	1087109.48866	8.0
GF-5	7/14/2015	05:46:27pm	84208	213.9	268.0	748037.24655	1087109.93392	7.7
GF-6	7/14/2015	05:42:15pm	84208	82.5	114.7	748001.16128	1087116.58585	3.6
GF-7	7/14/2015	05:38:07pm	84208	92.7	127.3	747962.62435	1087112.95760	6.5
GG-1	7/14/2015	06:16:16pm	84208	101.5	138.0	748146.41933	1087147.51254	3.3
GG-2	7/14/2015	06:12:41pm	84208	219.8	274.6	748129.17711	1087142.61417	6.1
GG-3	7/14/2015	06:09:46pm	84208	77.1	107.9	748096.17503	1087145.97700	3.5
GG-4	7/14/2015	06:06:30pm	84208	132.4	174.8	748060.67100	1087134.94851	3.7
GG-5	7/14/2015	06:03:38pm	84208	96.3	131.6	748022.17663	1087138.01136	3.2
GG-6	7/14/2015	05:59:36pm	84208	197.9	250.1	747991.00709	1087140.47141	3.7
GH-1	7/14/2015	06:22:11pm	84208	103.2	140.0	748160.15081	1087170.63805	4.0
GH-2	7/14/2015	06:25:15pm	84208	94.1	129.0	748126.83194	1087175.31214	4.2
GH-3	7/14/2015	06:29:01pm	84208	134.0	176.7	748096.87240	1087172.33089	3.3
GH-4	7/14/2015	06:34:33pm	84208	204.8	257.9	748046.70785	1087180.36030	3.3
GH-5	7/14/2015	06:36:35pm	84208	234.3	290.7	748009.53015	1087172.41892	3.0
GH-6	7/14/2015	06:39:47pm	84208	532.2	603.8	748003.93906	1087172.31219	3.1
GI-1	7/14/2015	06:29:03pm	84208	98.3	134.0	748141.54546	1087204.44632	8.5
GI-2	7/14/2015	06:38:33pm	84208	70.8	100.0	748135.68622	1087197.55787	3.6
GI-3	7/14/2015	06:43:51pm	84208	489.6	560.5	748098.61810	1087200.08243	8.4
GI-4	7/14/2015	06:48:54pm	84208	215.9	270.3	748055.11677	1087201.79019	8.5
GI-5	7/14/2015	06:53:51pm	84208	913.1	976.8	748020.60094	1087208.21023	4.9
GI-6	7/14/2015	-	84208	1731.0	1727.1	747994.29809	1087202.26072	-
GJ-1	7/14/2015	06:16:23pm	84208	116.3	155.8	748154.21280	1087238.55547	9.2
GJ-2	7/14/2015	06:10:48pm	84208	69.9	98.9	748143.50026	1087213.00230	5.2
GJ-3	7/14/2015	06:05:40pm	84208	75.9	106.4	748081.61966	1087238.21091	8.2
GJ-4	7/14/2015	06:00:03pm	84208	240.9	298.0	748045.58562	1087226.80934	4.2
GJ-5	7/14/2015	05:53:19pm	84208	317.0	380.6	748019.42421	1087232.20803	7.1
GJ-6	7/14/2015	05:48:27pm	84208	509.3	580.6	747995.34484	1087237.62408	3.5
GK-1	7/14/2015	05:12:23pm	84208	151.9	197.5	748149.98162	1087264.33551	3.8
GK-2	7/14/2015	05:21:27pm	31094	60.2	86.6	748120.80255	1087264.17265	5.6
GK-3	7/14/2015	05:28:57pm	31094	150.7	196.2	748094.76503	1087272.79816	6.5
GK-4	7/14/2015	05:35:05pm	31094	141.7	185.7	748063.40621	1087265.46926	3.3
GK-5	7/14/2015	05:41:18pm	31094	153.7	199.7	748024.43579	1087272.34447	3.3
GL-1	7/14/2015	05:06:04pm	31094	44.7	66.4	748162.33534	1087308.64158	3.5
GL-2	7/14/2015	04:58:37pm	31094	224.4	279.7	748112.85976	1087304.88995	7.0
GL-3	7/14/2015	04:50:07pm	31094	235.7	292.3	748083.52914	1087304.57146	4.1
GL-4	7/14/2015	04:43:54pm	31094	231.9	288.1	748060.26351	1087306.28128	3.6
GL-5	7/14/2015	04:36:27pm	31094	170.2	218.6	748017.16815	1087298.88783	3.3
GM-1	7/14/2015	04:22:10pm	31094	44.5	66.2	748168.28542	1087341.38982	2.9
GM-2	7/14/2015	03:58:20pm	31094	119.1	159.1	748116.04140	1087328.46391	4.8
GM-3	7/14/2015	03:53:29pm	31094	133.3	175.9	748082.88521	1087330.88584	5.7
GM-4	7/14/2015	03:47:07pm	31094	187.9	238.8	748060.73706	1087331.45990	3.7
GM-5	7/14/2015	03:24:52pm	31094	578.2	650.1	748028.89239	1087334.91927	4.3
GM-6	7/14/2015	03:12:50pm	31094	539.1	610.8	747995.72659	1087330.00857	3.2
GN-1	7/14/2015	01:44:22pm	31094	46.3	68.6	748159.67918	1087369.96117	3.7
GN-2	7/14/2015	01:53:41pm	31094	66.6	94.7	748121.44808	1087349.92787	4.4

Table B - Bluff G XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
GN-3	7/14/2015	02:38:48pm	31094	56.9	82.4	748102.10880	1087355.16442	3.3
GN-4	7/14/2015	02:45:55pm	31094	101.8	138.3	748077.09855	1087357.41612	3.5
GN-5	7/14/2015	02:55:36pm	31094	229.9	285.8	748024.93714	1087371.51350	4.2
GN-6	7/14/2015	03:04:25pm	31094	277.6	338.1	748002.30624	1087364.71679	3.8
GO-12	7/14/2015	05:13:41pm	31094	67.0	95.3	747804.11014	1087397.85025	5.6
GO-13	7/14/2015	05:10:22pm	31094	57.5	83.1	747765.81149	1087402.24178	3.2
GO-14	7/14/2015	05:01:48pm	31094	144.7	189.3	747732.81550	1087396.82078	8.0
GO-2	7/14/2015	05:30:27pm	31094	67.3	95.6	748116.46277	1087397.77926	2.6
GO-3	7/14/2015	05:27:38pm	31094	103.0	139.8	748089.26396	1087400.53632	2.5
GO-4	7/14/2015	05:24:55pm	31094	146.5	191.3	748060.87922	1087391.12735	3.5
GO-5	7/14/2015	05:21:28pm	31094	212.1	266.1	748022.52761	1087394.52207	5.3
GO-6	7/14/2015	05:18:18pm	31094	244.1	301.5	747990.20815	1087388.97307	5.6
GP-11	7/14/2015	04:29:39pm	31094	105.4	142.7	747825.55972	1087429.64144	3.5
GP-12	7/14/2015	04:39:29pm	31094	58.6	84.5	747790.19734	1087436.93808	2.6
GP-13	7/14/2015	04:42:52pm	31094	40.8	61.2	747759.31584	1087416.11264	3.7
GP-14	7/14/2015	04:47:25pm	31094	72.2	101.8	747738.19047	1087431.12697	3.2
GP-2	7/14/2015	04:08:15pm	31094	19.4	31.6	748125.53169	1087431.91952	5.2
GP-3	7/14/2015	04:11:30pm	31094	14.5	24.4	748098.63444	1087427.30022	5.8
GP-4	7/14/2015	04:15:13pm	31094	189.8	240.9	748050.20506	1087434.37513	4.5
GP-5	7/14/2015	04:19:04pm	31094	128.0	169.6	748022.61585	1087434.77570	4.2
GP-6	7/14/2015	04:24:22pm	31094	119.1	159.0	748007.13402	1087438.59246	2.7
GQ-10	7/14/2015	03:30:14pm	31094	308.2	371.2	747869.31095	1087460.62237	4.2
GQ-11	7/14/2015	03:24:18pm	31094	41.6	62.3	747827.32605	1087460.35722	4.2
GQ-12	7/14/2015	03:20:54pm	31094	50.1	73.5	747803.92102	1087474.03915	9.4
GQ-13	7/14/2015	03:18:21pm	31094	95.6	130.8	747764.06738	1087471.09349	3.4
GQ-2	7/14/2015	04:04:09pm	31094	18.4	30.1	748120.26519	1087458.19626	5.7
GQ-3	7/14/2015	03:58:50pm	31094	58.4	84.3	748090.91619	1087468.76632	7.1
GQ-4	7/14/2015	03:46:15pm	31094	32.9	50.6	748086.44034	1087471.84307	4.4
GQ-5	7/14/2015	03:41:35pm	31094	105.6	142.9	748023.40685	1087460.63299	7.8
GQ-6	7/14/2015	03:36:20pm	31094	68.7	97.4	747996.68839	1087468.95542	4.9
GR-10	7/14/2015	02:59:51pm	31094	269.7	329.6	747856.26304	1087492.48974	3.2
GR-11	7/14/2015	03:09:11pm	31094	91.6	125.9	747830.51607	1087492.08106	3.9
GR-3	7/14/2015	02:37:23pm	31094	29.4	45.8	748094.29736	1087498.85176	8.0
GR-4	7/14/2015	02:41:26pm	31094	37.8	57.2	748054.13972	1087498.35440	7.4
GR-5	7/14/2015	02:46:55pm	31094	69.8	98.9	748027.40428	1087509.68704	7.5
GR-9	7/14/2015	02:54:21pm	31094	206.4	259.6	747895.84008	1087496.07536	3.8
GS-10	7/14/2015	02:07:23pm	31094	72.8	102.6	747869.03195	1087537.77798	4.1
GS-3	7/14/2015	02:29:00pm	31094	52.3	76.4	748089.95612	1087523.19789	3.4
GS-4	7/14/2015	02:24:38pm	31094	50.2	73.7	748057.53169	1087533.68140	5.9
GS-5	7/14/2015	02:21:50pm	31177	21.7	34.8	748022.16319	1087528.82490	6.1
GS-8	7/14/2015	02:16:13pm	31177	159.4	206.3	747923.38557	1087534.52756	4.1
GS-9	7/14/2015	02:12:08pm	31177	230.0	286.0	747906.09939	1087535.00127	4.0
GSS-0	7/15/2015	11:54:27am	31177	51.0	74.7	747729.89734	1086971.48756	6.0
GSS-1	7/15/2015	11:50:36am	31177	45.1	67.0	747712.07824	1086947.47683	6.4
GSS-10	7/15/2015	11:01:05am	31177	152.6	198.4	748189.02641	1087247.08645	3.0
GSS-10A	7/15/2015	11:03:49am	31177	78.8	110.1	748205.13624	1087232.38400	2.2
GSS-11	7/15/2015	10:47:50am	31177	129.8	171.8	748192.70533	1087267.01744	2.6
GSS-11A	7/15/2015	10:51:06am	31177	38.3	57.8	748202.59321	1087286.17278	2.4
GSS-12	7/15/2015	10:45:12am	31177	27.6	43.3	748194.51552	1087304.66986	2.4

Table B - Bluff G XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
GSS-13	7/15/2015	10:43:02am	31177	19.1	31.2	748213.87066	1087299.55269	2.5
GSS-14	7/15/2015	10:54:24am	31177	35.3	53.8	748217.16821	1087275.37843	2.7
GSS-15	7/15/2015	10:58:16am	31177	40.1	60.3	748216.90291	1087253.79014	2.3
GSS-16	7/15/2015	11:10:46am	31177	67.6	96.0	748206.92955	1087208.31632	2.4
GSS-17	7/15/2015	10:27:45am	31177	87.9	121.4	747832.96712	1087518.35918	3.4
GSS-18	7/15/2015	10:30:30am	31177	74.0	104.1	747843.09724	1087545.44929	2.7
GSS-19	7/15/2015	10:36:29am	31177	93.1	127.8	747906.63235	1087569.89587	2.6
GSS-2	7/15/2015	11:57:32am	31177	85.7	118.6	747763.70029	1086943.25847	3.3
GSS-3	7/15/2015	11:42:44am	31177	67.2	95.6	747770.31618	1086914.54993	2.6
GSS-3A	7/15/2015	11:47:22am	31177	47.1	69.5	747726.04099	1086913.45709	7.1
GSS-4	7/15/2015	11:38:04am	31177	14.9	24.9	747838.87689	1086917.07850	2.8
GSS-5	7/15/2015	11:35:18am	31177	47.1	69.6	747880.28113	1086922.67389	2.6
GSS-6	7/15/2015	11:28:12am	31177	119.3	159.3	748099.23375	1086979.26072	3.6
GSS-6A	7/15/2015	11:31:07am	31177	79.6	111.1	748115.60379	1086969.54323	2.7
GSS-7	7/15/2015	11:25:38am	31177	70.7	99.9	748127.45596	1087023.06765	2.9
GSS-8	7/15/2015	11:21:27am	31177	78.5	109.8	748167.58728	1087078.66874	3.1
GSS-9	7/15/2015	11:07:29am	31177	107.1	144.7	748189.12602	1087215.16242	2.3
GSS-9A	7/15/2015	11:14:09am	31177	48.9	72.0	748224.00192	1087230.93639	2.6
GT-10	7/14/2015	02:03:12pm	31177	93.0	127.7	747859.35373	1087562.84219	3.4
GT-4	7/14/2015	01:49:17pm	31177	34.7	53.0	748064.11299	1087569.18801	3.7
GT-5	7/14/2015	01:51:44pm	31177	64.6	92.2	748028.81434	1087564.39538	3.4
GT-8	7/14/2015	01:55:10pm	31177	46.2	68.4	747938.07221	1087556.16987	3.7
GT-9	7/14/2015	01:58:41pm	31177	135.2	178.1	747894.07432	1087560.59088	4.7
GU-9	7/14/2015	01:43:11pm	31177	44.0	65.4	747896.91833	1087599.96514	4.4

Table C - Bluff I XRF Field Measurements Sampling Information

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
IA-11	7/16/2015	03:38:57pm	31177	17.3	28.5	747167.32476	1086776.24441	2.8
IAA-13	7/15/2015	11:10:02am	31177	18.8	30.6	747089.54630	1087612.00635	5.9
IAA-14	7/15/2015	11:13:28am	31177	21.0	33.9	747071.84068	1087618.47992	6.6
IAA-15	7/15/2015	11:17:02am	31177	22.8	36.5	747028.53328	1087624.69026	4.4
IAA-16	7/15/2015	11:33:29am	31177	25.5	40.3	746987.29746	1087623.86955	1.7
IAA-17	7/15/2015	11:39:02am	31177	18.9	30.9	746961.38551	1087621.88839	1.9
IAA-18	7/15/2015	11:41:12am	31177	20.6	33.3	746927.34649	1087615.47302	1.7
IB-11	7/16/2015	03:36:48pm	31177	18.6	30.4	747160.75680	1086818.16072	3.0
IBB-14	7/15/2015	11:06:38am	31177	34.6	52.9	747065.94573	1087658.74930	2.1
IBB-15	7/15/2015	11:03:23am	31177	17.0	28.1	747034.43812	1087654.08376	2.0
IBB-16	7/15/2015	11:00:29am	31177	24.4	38.7	747010.95710	1087652.43874	2.1
IBB-17	7/15/2015	10:58:23am	31177	26.8	42.1	746964.90862	1087655.04086	2.6
IBB-18	7/15/2015	10:52:15am	31177	20.6	33.3	746927.48942	1087654.48269	2.6
IC-10	7/16/2015	03:28:21pm	31177	52.8	77.1	747186.82042	1086845.20069	5.7
IC-11	7/16/2015	03:30:16pm	31177	149.6	194.9	747146.76621	1086828.42645	5.0
IC-12	7/16/2015	03:33:38pm	31177	19.3	31.4	747112.37669	1086832.01961	3.4
IC-9	7/16/2015	03:26:32pm	31177	81.7	113.7	747230.56372	1086842.63976	3.9
ICC-15	7/15/2015	10:43:32am	31177	21.8	35.0	747029.48161	1087687.58949	2.7
ICC-16	7/15/2015	10:45:35am	31177	21.6	34.8	746996.31292	1087684.61344	2.3
ICC-17	7/15/2015	10:47:30am	31177	18.7	30.5	746967.05249	1087685.34811	2.1
ICC-18	7/15/2015	10:49:18am	31177	18.7	30.6	746923.91606	1087688.69357	2.4
ID-10	7/16/2015	03:14:02pm	31177	76.0	106.6	747192.11334	1086869.72824	4.1
ID-11	7/16/2015	03:12:27pm	31177	51.9	75.9	747145.30914	1086868.07050	3.8
ID-12	7/16/2015	03:10:51pm	31177	26.6	41.9	747121.13811	1086873.36615	3.5
ID-4	7/16/2015	03:22:57pm	31177	50.7	74.3	747388.70653	1086861.09108	3.8
ID-5	7/16/2015	03:20:08pm	31177	74.4	104.6	747354.81608	1086870.26201	4.1
ID-6	7/16/2015	03:17:01pm	31177	35.3	53.9	747304.47788	1086853.64769	3.7
IDD-15	7/15/2015	10:41:16am	31177	22.2	35.6	747037.82308	1087723.11372	2.0
IDD-16	7/15/2015	10:39:20am	31177	34.1	52.1	747000.17276	1087718.51874	1.9
IDD-17	7/15/2015	10:37:36am	31177	17.5	28.7	746960.29577	1087720.04857	1.9
IDD-18	7/15/2015	10:35:32am	31177	31.7	48.9	746919.52821	1087727.04251	3.0
IE-11	7/16/2015	03:02:41pm	31177	51.8	75.7	747145.82850	1086902.12763	5.1
IE-12	7/16/2015	03:04:50pm	31177	35.2	53.7	747122.13975	1086899.64546	3.7
IE-2	7/16/2015	02:19:04pm	31177	23.1	36.8	747461.31668	1086904.56568	1.7
IE-3	7/16/2015	02:22:12pm	31177	16.7	27.7	747425.55286	1086901.45252	1.4
IE-4	7/16/2015	02:24:35pm	31177	57.7	83.4	747388.28642	1086906.76401	2.4
IE-5	7/16/2015	02:27:02pm	31177	74.8	105.1	747350.84618	1086902.99834	4.0
IE-6	7/16/2015	02:31:11pm	31177	38.3	57.9	747324.61602	1086899.11206	4.0
IE-7	7/16/2015	02:57:19pm	31177	198.2	250.5	747291.80108	1086875.57585	7.8
IEE-15	7/15/2015	10:27:20am	31177	18.0	29.5	747021.77056	1087758.85480	3.6
IEE-16	7/15/2015	10:29:18am	31177	23.3	37.2	747001.80136	1087745.01666	2.7
IEE-17	7/15/2015	10:31:15am	31177	22.8	36.4	746964.33501	1087745.67932	3.3
IEE-18	7/15/2015	10:33:38am	31177	25.0	39.6	746938.80652	1087734.47470	3.4
IF-2	7/16/2015	02:15:56pm	31177	11.5	19.8	747440.30717	1086932.66063	1.7
IF-3	7/16/2015	02:12:16pm	31177	13.0	22.1	747424.37064	1086939.77845	1.6
IF-4	7/16/2015	02:09:40pm	31177	18.1	29.7	747390.25799	1086924.92779	1.7
IF-5	7/16/2015	02:06:55pm	31177	34.8	53.2	747370.55877	1086946.13288	1.7
IF-6	7/16/2015	02:01:17pm	31177	56.8	82.3	747324.06500	1086945.93362	2.0
IF-7	7/16/2015	01:56:46pm	31177	211.5	265.4	747285.51413	1086927.28377	1.9

Table C - Bluff I XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
IF-8	7/16/2015	01:49:46pm	31177	352.6	418.4	747267.35475	1086928.51660	2.3
IF-8A	7/16/2015	01:43:12pm	31177	269.2	329.0	747262.36322	1086928.78081	1.4
IFF-16	7/15/2015	10:25:01am	31177	23.3	37.1	747016.80728	1087783.65095	3.2
IFF-17	7/15/2015	10:23:25am	31177	36.7	55.8	746967.08905	1087778.36325	3.1
IFF-18	7/15/2015	10:21:20am	31177	16.8	27.7	746915.58828	1087772.58945	3.2
IG-3	7/16/2015	01:07:20pm	31177	51.3	75.1	747423.50491	1086969.92079	2.0
IG-4	7/16/2015	01:10:45pm	31177	54.7	79.5	747381.14038	1086970.62404	2.3
IG-5	7/16/2015	01:12:52pm	31177	45.2	67.1	747356.87770	1086970.36371	3.7
IG-6	7/16/2015	01:15:04pm	31177	43.3	64.5	747331.34080	1086968.64765	1.5
IG-7	7/16/2015	01:29:53pm	31177	138.0	181.4	747299.75422	1086970.47153	3.6
IG-8	7/16/2015	01:33:19pm	31177	71.5	100.9	747255.24551	1086970.10742	5.7
IG-9	7/16/2015	01:36:57pm	31177	111.5	150.0	747213.32959	1086952.27525	2.8
IH-10	7/16/2015	12:40:12pm	31177	50.0	73.4	747192.24249	1086999.52556	5.0
IH-4	7/16/2015	01:04:24pm	31177	49.4	72.6	747382.76478	1087006.31178	3.1
IH-5	7/16/2015	01:02:28pm	31177	38.6	58.3	747360.79453	1087006.91793	3.1
IH-6	7/16/2015	12:59:49pm	31177	19.7	32.0	747324.16118	1087002.52851	4.3
IH-7	7/16/2015	12:56:59pm	31177	87.9	121.4	747292.43541	1087000.75891	4.4
IH-8	7/16/2015	12:54:04pm	31177	122.9	163.6	747259.70420	1087000.62724	5.5
IH-9	7/16/2015	12:51:26pm	31177	237.4	294.2	747227.98561	1086998.92910	3.4
II-4	7/16/2015	12:24:29pm	31177	30.0	46.5	747416.37304	1087042.95998	5.4
II-5	7/16/2015	12:26:51pm	31177	36.3	55.2	747348.35517	1087042.66403	5.9
II-6	7/16/2015	12:29:29pm	31177	23.0	36.8	747335.24278	1087035.77610	6.3
II-7	7/16/2015	12:31:52pm	31177	43.7	65.1	747312.13074	1087030.58812	9.7
II-8	7/16/2015	12:34:27pm	31177	34.8	53.2	747264.51080	1087041.10283	7.2
IJ-10	7/16/2015	11:09:56am	31177	52.2	76.3	747204.44526	1087061.23647	1.9
IJ-11	7/16/2015	11:08:05am	31177	53.5	78.0	747166.29411	1087060.75452	1.8
IJ-12	7/16/2015	11:05:25am	31177	70.5	99.7	747138.45713	1087058.84353	1.7
IJ-13	7/16/2015	11:02:56am	31177	75.1	105.4	747098.26464	1087068.38753	1.9
IJ-14	7/16/2015	11:00:44am	31177	16.8	27.8	747071.62346	1087069.19659	1.9
IJ-4	7/16/2015	12:22:11pm	31177	33.4	51.2	747427.99899	1087069.67355	1.5
IJ-5	7/16/2015	12:19:48pm	31177	13.5	22.8	747353.27697	1087076.41842	4.8
IJ-6	7/16/2015	12:17:24pm	31177	24.1	38.3	747349.97472	1087059.72111	1.9
IJ-7	7/16/2015	12:13:51pm	31177	35.6	54.3	747299.02444	1087067.03877	2.8
IJ-8	7/16/2015	12:11:22pm	31177	29.7	46.1	747271.33046	1087067.49544	2.9
IK-10	7/16/2015	10:43:08am	31177	38.6	58.3	747204.87108	1087102.30657	1.6
IK-11	7/16/2015	10:45:51am	31177	103.6	140.4	747165.53466	1087106.95124	1.5
IK-12	7/16/2015	10:47:58am	31177	95.0	130.1	747137.49508	1087104.01788	1.6
IK-13	7/16/2015	10:49:56am	31177	38.5	58.2	747102.93150	1087101.10784	1.6
IK-14	7/16/2015	10:52:10am	31177	44.0	65.5	747069.46630	1087102.21379	1.8
IK-9	7/16/2015	10:41:04am	31177	88.2	121.7	747222.90664	1087100.63650	1.9
IL-10	7/16/2015	10:35:21am	31177	39.6	59.7	747194.84462	1087128.84056	1.7
IL-11	7/16/2015	10:33:09am	31177	99.4	135.4	747165.90896	1087135.48362	1.5
IL-12	7/16/2015	10:30:48am	31177	95.6	130.8	747132.74969	1087134.49517	1.7
IL-13	7/16/2015	10:28:24am	31177	49.1	72.2	747104.91972	1087127.92860	2.6
IL-14	7/16/2015	10:26:03am	31177	13.4	22.8	747067.43296	1087136.42167	4.0
IL-9	7/16/2015	10:38:59am	31177	13.7	23.1	747232.00682	1087124.97245	1.6
IM-10	7/16/2015	10:14:19am	31177	30.6	47.4	747206.39282	1087168.54534	1.7
IM-11	7/16/2015	10:17:07am	31177	60.9	87.5	747157.76658	1087169.05790	1.8
IM-12	7/16/2015	10:19:51am	31177	56.6	82.0	747133.01074	1087172.22465	2.1

Table C - Bluff I XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
IM-13	7/16/2015	10:23:21am	31177	53.8	78.4	747107.18241	1087155.87981	3.2
IM-8	7/16/2015	10:08:48am	31177	85.7	118.6	747266.44209	1087162.94548	2.6
IM-9	7/16/2015	10:11:45am	31177	21.1	34.0	747233.75902	1087165.04223	2.2
IN-10	7/16/2015	10:00:44am	31177	43.2	64.5	747212.76233	1087197.53749	1.7
IN-11	7/16/2015	09:53:43am	31177	108.5	146.4	747172.44629	1087191.80622	1.6
IN-12	7/16/2015	09:51:32am	31177	63.7	91.0	747135.37043	1087205.74457	1.4
IN-13	7/16/2015	09:46:23am	31177	100.6	136.8	747116.95786	1087210.21599	1.4
IN-8	7/16/2015	10:03:08am	31177	37.6	56.9	747244.24478	1087203.06794	1.7
IN-9	7/16/2015	10:05:30am	31177	40.0	60.1	747223.19393	1087199.90602	2.0
IO-1	7/16/2015	09:12:27am	31177	58.1	84.0	747498.28844	1087229.75852	3.2
IO-10	7/16/2015	09:27:54am	31177	38.9	58.8	747188.32564	1087227.85560	2.1
IO-11	7/16/2015	09:30:07am	31177	140.6	184.5	747157.55118	1087226.51988	1.7
IO-12	7/16/2015	09:33:12am	31177	142.2	186.3	747144.78198	1087235.79102	1.6
IO-13	7/16/2015	09:41:25am	31177	19.5	31.8	747103.39441	1087231.11241	1.9
IO-2	7/16/2015	09:14:29am	31177	14.5	24.4	747479.37354	1087225.08639	3.0
IO-7	7/16/2015	09:20:02am	31177	18.6	30.4	747299.73252	1087225.94162	2.8
IO-8	7/16/2015	09:22:11am	31177	34.1	52.2	747272.10875	1087226.08483	3.4
IO-9	7/16/2015	09:24:50am	31177	46.7	69.1	747231.22700	1087222.09266	1.9
IP-1	7/16/2015	08:57:47am	31177	118.8	158.7	747533.97235	1087275.63843	4.6
IP-10	7/16/2015	08:28:46am	31177	63.8	91.2	747193.64516	1087261.85548	3.3
IP-11	7/16/2015	08:26:49am	31177	46.2	68.4	747167.41222	1087265.06255	2.9
IP-12	7/16/2015	08:20:36am	31177	68.0	96.5	747127.07585	1087261.87224	3.6
IP-13	7/16/2015	08:18:36am	31177	19.5	31.7	747096.34016	1087264.46668	3.1
IP-2	7/16/2015	08:50:49am	31177	44.1	65.6	747485.47932	1087276.79900	7.4
IP-3	7/16/2015	08:49:19am	31177	59.6	85.8	747462.66576	1087255.77844	7.3
IP-4	7/16/2015	08:42:54am	31177	24.5	38.8	747396.34918	1087264.78076	7.8
IP-5	7/16/2015	08:40:44am	31177	25.6	40.4	747364.55228	1087271.09798	5.8
IP-6	7/16/2015	08:38:24am	31177	26.5	41.7	747324.29113	1087260.05185	4.8
IP-7	7/16/2015	08:36:24am	31177	34.5	52.7	747293.14728	1087271.64285	6.3
IP-8	7/16/2015	08:33:04am	31177	29.6	46.1	747257.84886	1087262.55439	3.6
IP-9	7/16/2015	08:31:01am	31177	22.6	36.2	747235.69101	1087266.75913	3.8
IQ-1	7/15/2015	05:15:56pm	31177	27.4	42.9	747492.79185	1087304.13340	3.0
IQ-10	7/15/2015	05:44:51pm	31177	43.3	64.5	747188.42887	1087298.47674	3.9
IQ-11	7/15/2015	05:48:11pm	31177	63.2	90.5	747150.02986	1087303.49923	2.9
IQ-12	7/15/2015	05:50:15pm	31177	59.1	85.3	747115.18701	1087298.91441	3.2
IQ-13	7/15/2015	05:52:36pm	31177	64.8	92.5	747091.34427	1087305.54535	3.3
IQ-2	7/15/2015	05:17:43pm	31177	28.8	44.9	747452.37331	1087301.38421	3.4
IQ-3	7/15/2015	05:19:55pm	31177	11.2	19.4	747427.75095	1087302.68391	3.9
IQ-4	7/15/2015	05:27:13pm	31177	23.6	37.6	747376.36389	1087298.69515	3.4
IQ-5	7/15/2015	05:30:25pm	31177	13.9	23.4	747344.60754	1087303.05089	3.1
IQ-6	7/15/2015	05:32:29pm	31177	28.1	43.9	747320.33799	1087301.80348	4.7
IQ-7	7/15/2015	05:34:22pm	31177	32.4	49.9	747297.22136	1087291.64815	3.3
IQ-8	7/15/2015	05:37:39pm	31177	41.2	61.8	747258.45767	1087298.26440	2.8
IQ-9	7/15/2015	05:39:40pm	31177	38.6	58.3	747226.96115	1087299.66896	2.9
IR-1	7/15/2015	05:13:40pm	31177	50.7	74.4	747489.40961	1087334.54989	3.5
IR-10	7/15/2015	04:43:32pm	31177	38.8	58.6	747187.30941	1087333.27304	1.5
IR-11	7/15/2015	04:41:28pm	31177	24.4	38.8	747161.07425	1087316.71524	1.9
IR-12	7/15/2015	04:37:54pm	31177	62.0	88.9	747131.36089	1087323.16554	1.6
IR-13	7/15/2015	04:30:24pm	31177	252.7	311.0	747096.88315	1087336.84912	1.7

Table C - Bluff I XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
IR-2	7/15/2015	05:11:31pm	31177	25.4	40.1	747454.45579	1087333.50785	4.0
IR-3	7/15/2015	05:09:41pm	31177	31.9	49.2	747424.38545	1087340.32200	3.7
IR-4	7/15/2015	05:04:53pm	31177	14.6	24.5	747390.94706	1087333.71407	3.4
IR-5	7/15/2015	05:02:26pm	31177	27.7	43.3	747367.35513	1087325.39976	3.2
IR-6	7/15/2015	04:58:37pm	31177	26.2	41.3	747332.39972	1087324.25050	3.2
IR-7	7/15/2015	04:56:35pm	31177	24.1	38.3	747304.89074	1087326.35704	3.0
IR-8	7/15/2015	04:54:35pm	31177	27.5	43.0	747258.68587	1087317.10372	3.0
IR-9	7/15/2015	04:45:08pm	31177	29.9	46.5	747225.11554	1087324.00593	1.8
IS-1	7/15/2015	03:50:26pm	31177	28.7	44.7	747493.34576	1087358.93974	5.3
IS-10	7/15/2015	04:16:41pm	31177	20.4	33.0	747178.76971	1087364.63965	1.8
IS-11	7/15/2015	04:18:58pm	31177	42.9	64.0	747159.82377	1087351.04631	1.7
IS-12	7/15/2015	04:21:42pm	31177	709.4	780.1	747113.21527	1087366.02747	1.8
IS-13	7/15/2015	04:25:54pm	31177	20.1	32.6	747090.88437	1087356.32005	1.6
IS-2	7/15/2015	03:52:52pm	31177	58.8	84.8	747454.51539	1087351.13634	6.8
IS-3	7/15/2015	03:55:20pm	31177	39.7	59.8	747409.18462	1087359.42367	8.1
IS-4	7/15/2015	03:59:04pm	31177	22.5	36.0	747382.49004	1087351.32994	6.1
IS-5	7/15/2015	04:00:30pm	31177	56.1	81.3	747346.06471	1087344.69360	3.9
IS-6	7/15/2015	04:03:16pm	31177	38.2	57.8	747326.02302	1087344.31232	4.9
IS-7	7/15/2015	04:09:33pm	31177	47.3	69.8	747296.08683	1087351.80297	2.2
IS-8	7/15/2015	04:11:56pm	31177	28.8	44.9	747253.61907	1087358.78436	1.9
IS-9	7/15/2015	04:14:10pm	31177	60.5	87.0	747220.00410	1087361.82185	1.7
ISS-1	7/15/2015	04:24:22pm	31177	29.4	45.8	747118.39069	1087381.09074	2.0
ISS-10	7/16/2015	01:39:14pm	31177	65.7	93.6	747183.44789	1086944.99921	2.4
ISS-11	7/16/2015	02:59:30pm	31177	224.2	279.5	747242.50997	1086877.70660	7.8
ISS-2	7/15/2015	04:33:37pm	31177	11.6	20.0	747063.13453	1087341.06730	2.1
ISS-3	7/15/2015	04:34:39pm	31177	11.0	19.0	747055.73083	1087343.47860	1.8
ISS-4	7/15/2015	05:59:03pm	31177	216.6	271.1	747106.96396	1087291.01268	3.3
ISS-5	7/15/2015	06:00:39pm	31177	7.0	12.7	747089.71945	1087302.58124	3.0
ISS-5A	7/16/2015	09:00:03am	31177	84.3	116.9	747564.11627	1087295.49946	3.8
ISS-6	7/16/2015	09:03:55am	31177	17.9	29.4	747559.26346	1087250.16596	4.0
ISS-7	7/16/2015	09:06:52am	31177	54.8	79.7	747516.37827	1087255.43609	3.1
ISS-8	7/16/2015	09:44:05am	31177	61.2	87.9	747129.08525	1087238.64938	1.7
ISS-9	7/16/2015	09:58:04am	31177	132.8	175.3	747181.96621	1087233.61169	1.4
IT-1	7/15/2015	03:48:01pm	31177	28.7	44.7	747478.74267	1087384.11970	4.1
IT-10	7/15/2015	03:26:01pm	31177	18.3	30.0	747199.01236	1087390.29706	5.7
IT-11	7/15/2015	03:24:07pm	31177	23.6	37.5	747162.98186	1087391.19417	3.8
IT-12	7/15/2015	03:22:23pm	31177	21.6	34.8	747141.00637	1087396.08831	4.9
IT-13	7/15/2015	03:20:51pm	31177	21.1	34.0	747112.77552	1087405.85825	6.4
IT-2	7/15/2015	03:46:02pm	31177	52.3	76.4	747463.32315	1087401.60270	2.0
IT-3	7/15/2015	03:43:09pm	31177	56.2	81.4	747424.83881	1087390.10361	4.3
IT-4	7/15/2015	03:40:40pm	31177	26.8	42.1	747400.25730	1087385.34455	4.2
IT-5	7/15/2015	03:38:02pm	31177	15.4	25.7	747356.02731	1087406.61612	4.7
IT-6	7/15/2015	03:35:05pm	31177	35.3	53.9	747333.06635	1087393.52750	5.7
IT-7	7/15/2015	03:32:37pm	31177	13.4	22.7	747300.15066	1087385.50880	6.1
IT-8	7/15/2015	03:30:10pm	31177	30.4	47.1	747268.14376	1087383.98782	6.3
IT-9	7/15/2015	03:28:00pm	31177	22.7	36.3	747232.23197	1087388.19019	5.5
IU-10	7/15/2015	02:43:55pm	31177	24.9	39.5	747179.09764	1087429.59204	2.5
IU-11	7/15/2015	02:46:11pm	31177	24.0	38.2	747146.73026	1087431.55930	1.8
IU-12	7/15/2015	02:47:51pm	31177	20.1	32.5	747110.54378	1087425.09690	1.6

Table C - Bluff I XRF Field Measurements Sampling Information (Continued)

Sample ID	Sample Date	Sample Time	XRF Serial Number	In Situ XRF Measurement (ppm)	Converted Total Arsenic (mg/kg)	Northing (Feet)	Easting (feet)	Horizontal Precision (feet)
IU-13	7/15/2015	02:50:08pm	31177	18.6	30.4	747076.64997	1087443.13884	1.7
IU-3	7/15/2015	02:26:14pm	31177	24.7	39.1	747427.38187	1087420.72494	4.1
IU-4	7/15/2015	02:28:17pm	31177	22.9	36.6	747387.74203	1087432.64620	9.5
IU-5	7/15/2015	02:30:43pm	31177	20.1	32.6	747336.04275	1087430.52260	8.8
IU-6	7/15/2015	02:33:18pm	31177	22.1	35.4	747317.60172	1087435.68274	6.9
IU-7	7/15/2015	02:36:04pm	31177	17.5	28.9	747298.64407	1087417.78533	8.4
IU-8	7/15/2015	02:38:06pm	31177	13.7	23.2	747255.38293	1087429.77852	6.5
IU-9	7/15/2015	02:40:23pm	31177	17.6	28.9	747212.44385	1087428.76087	5.6
IV-10	7/15/2015	01:53:10pm	31177	13.0	22.0	747201.42858	1087463.31973	2.5
IV-11	7/15/2015	01:49:53pm	31177	19.8	32.2	747160.92813	1087446.56497	4.7
IV-12	7/15/2015	01:47:32pm	31177	22.3	35.7	747129.71204	1087460.53011	6.6
IV-13	7/15/2015	01:45:09pm	31177	22.7	36.3	747086.07732	1087469.39886	4.1
IV-6	7/15/2015	02:23:32pm	31177	25.2	39.9	747301.18857	1087455.46828	2.7
IV-7	7/15/2015	02:19:58pm	31177	12.2	21.0	747290.27631	1087445.07418	1.9
IV-8	7/15/2015	02:16:20pm	31177	11.8	20.3	747251.41809	1087448.86109	2.4
IV-9	7/15/2015	02:03:23pm	31177	23.6	37.6	747228.53894	1087452.73902	2.7
IW-10	7/15/2015	01:35:48pm	31177	22.0	35.3	747182.61695	1087490.19776	5.7
IW-11	7/15/2015	01:38:27pm	31177	24.2	38.4	747112.81223	1087480.95292	4.4
IW-12	7/15/2015	01:40:36pm	31177	25.4	40.1	747088.35280	1087488.01470	2.4
IW-13	7/15/2015	01:42:45pm	31177	19.8	32.2	747062.87142	1087500.82052	3.4
IW-7	7/15/2015	01:26:43pm	31177	17.7	29.1	747292.75583	1087484.82051	5.8
IW-8	7/15/2015	01:29:34pm	31177	17.9	29.3	747253.91903	1087502.30734	8.2
IW-9	7/15/2015	01:32:43pm	31177	20.3	32.9	747232.23168	1087489.26773	6.4
IX-10	7/15/2015	01:19:58pm	31177	19.3	31.4	747197.77707	1087522.55347	4.8
IX-11	7/15/2015	01:17:42pm	31177	12.4	21.1	747161.50437	1087519.54018	5.4
IX-12	7/15/2015	01:15:21pm	31177	22.3	35.7	747138.58640	1087521.35124	4.4
IX-13	7/15/2015	01:10:28pm	31177	32.0	49.4	747104.25148	1087540.11780	5.6
IX-14	7/15/2015	01:08:28pm	31177	18.7	30.5	747053.04514	1087528.22151	6.5
IX-15	7/15/2015	01:06:29pm	31177	23.6	37.6	747032.54972	1087538.52024	7.1
IX-16	7/15/2015	01:03:52pm	31177	18.3	30.0	746997.25573	1087537.93033	5.2
IX-9	7/15/2015	01:23:03pm	31177	13.8	23.4	747224.62309	1087531.32768	2.9
IY-11	7/15/2015	12:02:41pm	31177	21.6	34.8	747187.35720	1087568.89060	5.8
IY-12	7/15/2015	12:06:42pm	31177	25.9	40.8	747133.49946	1087541.39366	5.4
IY-13	7/15/2015	12:09:55pm	31177	20.1	32.6	747100.61957	1087558.75070	5.0
IY-14	7/15/2015	12:12:52pm	31177	28.1	44.0	747061.04160	1087555.96837	3.2
IY-15	7/15/2015	12:15:07pm	31177	19.2	31.3	747018.08988	1087550.66515	4.7
IY-16	7/15/2015	12:17:01pm	31177	16.7	27.6	747002.82719	1087553.71706	3.3
IY-17	7/15/2015	12:19:08pm	31177	23.6	37.7	746969.61203	1087565.48151	1.9
IZ-12	7/15/2015	11:59:19am	31177	29.8	46.3	747147.65626	1087592.68795	4.8
IZ-13	7/15/2015	11:56:55am	31177	14.6	24.5	747110.73181	1087596.33052	3.3
IZ-14	7/15/2015	11:52:34am	31177	26.2	41.3	747070.83227	1087592.40318	2.5
IZ-15	7/15/2015	11:49:54am	31177	24.8	39.3	747039.46322	1087592.85460	3.9
IZ-16	7/15/2015	11:47:38am	31177	18.6	30.3	746996.41197	1087591.79733	6.0
IZ-17	7/15/2015	11:45:33am	31177	19.1	31.1	746960.09884	1087587.13592	5.3
IZ-18	7/15/2015	11:43:28am	31177	34.5	52.7	746933.37917	1087587.65982	3.5

ATTACHMENT B
PHOTOGRAPHIC LOG

Sample ID: XRF-GN4-01

Sample ID: XRF-GM1-01

Sample ID: XRF-GM4-01

Sample ID: XRF-IR4-01

Sample ID: XRF-IQ9-01

Exposed Lignite Lense south of point IQ-13

Sample ID: XRF-IP3-01

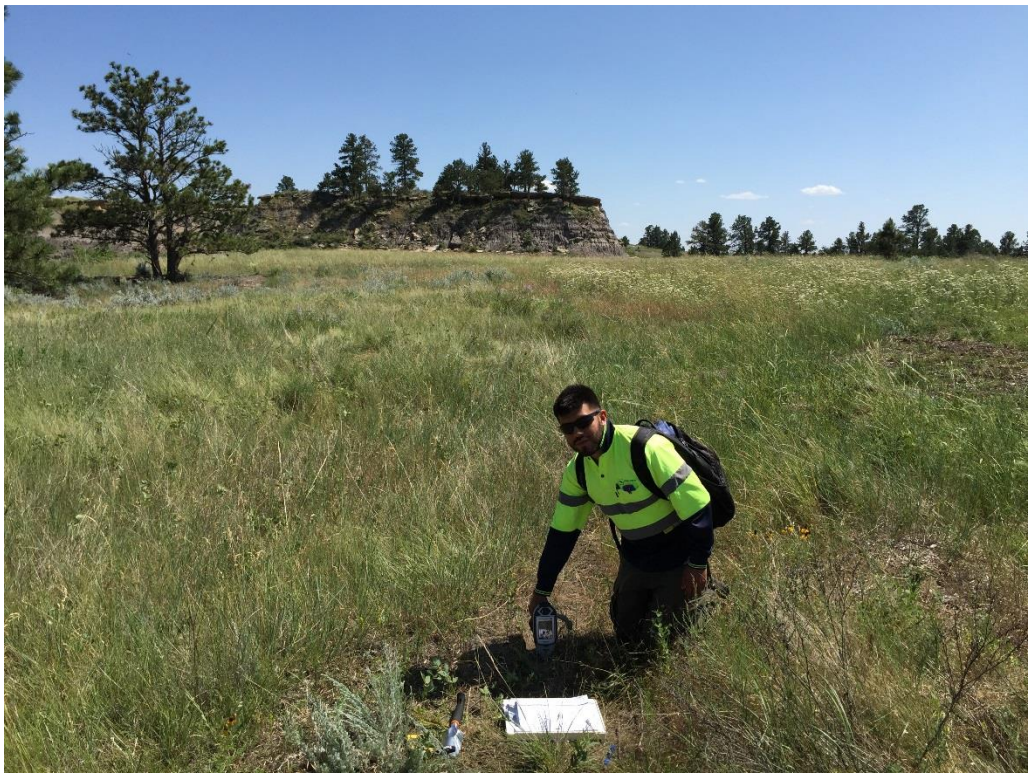
Sample ID: XRF-I012-01

Sample ID: XRF-IH4-01

Sample ID: XRF-G6-01

Sample ID: XRF-FSS02-01

Sample ID: XRF-FP8-01



Sample ID: XRF-FN13-01

Sample ID: XRF-FL15-01

Sample ID: XRF-FK4-01

Sample ID: XRF-FK9-01

Sample ID: XRF-FK10-01/02

Sample ID: XRF-FF8-01

Sample ID: XRF-FC8-01

Sample ID: XRF-GA11-01

Sample ID: XRF-GC9-01

Sample ID: XRF-GD3-01

Pile at Bluff F

Sample ID: XRF-FQ6-01

ATTACHMENT C

FINAL LABORATORY REPORT

Tuesday, August 04, 2015

Aaron Orechwa
Tetra Tech MM, Inc.
3801 Automation Way, Suite 100
Fort Collins, CO 80525

Re: ALS Workorder: 1507480
Project Name: Riley Pass
Project Number: 114-560486A

Dear Mr. Orechwa:

Seven soil samples were received from Tetra Tech MM, Inc., on 7/21/2015. The samples were scheduled for the following analysis:

Metals	pages 1-18

The results for these analyses are contained in the enclosed reports. These are a reanalysis of samples originally in SDG 1507352.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

Lance Steere, for

ALS Environmental
Amy R. Wolf
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1507480

Metals:
The samples were analyzed following SW-846, 3rd Edition procedures. Analysis by ICPMS followed method 6020A and the current revision of SOP 827.

All acceptance criteria were met.

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1507480
Client Name: Tetra Tech MM, Inc.
Client Project Name: Riley Pass
Client Project Number: 114-560486A
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
XRF-FP8-01	1507480-1		SOIL	13-Jul-15	11:43
XRF-FF8-01	1507480-10		SOIL	14-Jul-15	11:00
XRF-GM4-01	1507480-15		SOIL	14-Jul-15	16:32
XRF-IAA16-01	1507480-21		SOIL	15-Jul-15	12:38
XRF-FJ3-01	1507480-22		SOIL	13-Jul-15	19:18
XRF-FI10-01	1507480-23		SOIL	13-Jul-15	19:38
XRF-GI1-01	1507480-24		SOIL	14-Jul-15	19:28

TETRA TECH

CHAIN OF CUSTODY RECORD
REQUEST FOR ANALYSIS

~~1507352~~ 1507480

aw 7/28/15

Page 1 of 4

Tetra Tech, Inc.
3801 Automation Way #100
Fort Collins, CO 80525
(970) 223-9600 Fax (970) 223-7171

Client/ Project Name: Riley Pass

Project Number: 114-560486A

P.O. Number:

Send Results / Report To:
Aaron Orechwa
aaron.orechwa@tetratech.com
(see attached card)

Sampler (Print Name / Affiliation): Aaron Orechwa / Tetra Tech

Signature:

Delivery Method / Shipping Document Number: By hand

Tetra Tech Contact / Phone Number: 970-420-9395

Analysis Requested: Arsenic by 6020A

Preservative

Container Type and Size

Field Sample No./ Identification	Date	Time	Sample Matrix	Total No. of Cont.	Filt. Y	Filt. N	Remarks
1 XRF - FP8-01	7/13/15	1143	S	1		X	"FP8-01"
2 XRF - FN13-01	7/13/15	1440	S	1		X	
3 XRF - FL15-01	7/13/15	1612	S	1		X	
4 XRF - FK4-01	7/13/15	1727	S	1		X	
5 XRF - FK9-01	7/13/15	1743	S	1		X	
6 XRF - FJ3-01	7/13/15	1918	S	1		X	
7 XRF - FI10-01	7/13/15	1938	S	1		X	
8 XRF - FI10-02	7/13/15	1938	S	1		X	
9 XRF - GI6-01	7/14/15	2000	S	1		X	

aw 7/28/15

Relinquished by: (Print Name/Affiliation) Elissa Palmer
Signature: Elissa Palmer
Date: 7/21/15 Time: 8:45

Received by: (Print Name/Affiliation) Scott Malby / ALS FC
Signature:
Date: 7/21/15 Time: 0845

Relinquished by: (Print Name/Affiliation)
Signature:
Date: Time:

Received by: (Print Name/Affiliation)
Signature:
Date: Time:

Relinquished by: (Print Name/Affiliation)
Signature:
Date: Time:

Received for lab by: (Print Name)
Signature:
Date: Time:

Analytical Laboratory (Destination): ALS Fort Collins, CO

Condition/Temperature of Samples when Received:

Serial No.: Nº 000161

Matrix Codes: SW = Surface Water GW = Ground Water S = Soil/Sediment ___ = ___

White: Return to Tetra Tech Yellow: Laboratory Pink: Field Team

TETRA TECH

CHAIN OF CUSTODY RECORD
REQUEST FOR ANALYSIS

cw 7/28/15

~~1507352~~

1507480

Tetra Tech, Inc.
3801 Automation Way #100
Fort Collins, CO 80525
(970) 223-9600 Fax (970) 223-7171

Client/ Project Name: Riley Pass

Project Number: 114-560486 A

P.O. Number:

Send Results / Report To: Aaron Orechwa (see cord)

Sampler (Print Name / Affiliation): Aaron Orechwa / Tetra Tech

Signature:

Delivery Method / Shipping Document Number: By hand

Tetra Tech Contact / Phone Number: 970-420-4395

Analysis Requested: Arsenic by 6020A

Preservative

Container Type and Size

Field Sample No./ Identification	Date	Time	Sample Matrix	Total No. of Cont.	Filt. Y	Filt. N	Remarks
(10) XRF-FF8-01	7/14/15	1100	S	1		X	
(11) XRF-FC8-01	7/14/15	1229	S	1		X	
(12) XRF-GA11-01	7/14/15	1446	S	1		X	
(13) XRF-GR10-01	7/14/15	1605	S	1		X	
(14) XRF-GC9-01	7/14/15	1607	S	1		X	
(15) XRF-GM4-01	7/14/15	1632	S	1		X	
(16) XRF-GD3-01	7/14/15	1655	S	1		X	
(17) XRF-GM1-01	7/14/15	1715	S	1		X	
(18) XRF-GO14-01	7/14/15	1810	S	1		X	
(19) XRF-GI1-01	7/14/15	1928	S	1		X	
(20) XRF-GE6-01	7/14/15	1930	S	1		X	

Relinquished by: (Print Name/Affiliation) Elissa Palmer	Date: 7/21/15	Received by: (Print Name/Affiliation) Scott Marley / ALS FC	Date: 7/21/15	Analytical Laboratory (Destination): ALS Fort Collins, CO	
Signature: Elissa Palmer	Time: 8:45	Signature:	Time: 0845		
Relinquished by: (Print Name/Affiliation)	Date:	Received by: (Print Name/Affiliation)	Date:		
Signature:	Time:	Signature:	Time:		
Relinquished by: (Print Name/Affiliation)	Date:	Received for lab by: (Print Name)	Date:	Condition/Temperature of Samples when Received:	Serial No.: Nº 000162
Signature:	Time:	Signature:	Time:		

Matrix Codes: SW = Surface Water GW = Ground Water S = Soil/Sediment ___ = _____

White: Return to Tetra Tech Yellow: Laboratory Pink: Field Team

cw 7/28/15

TETRA TECH

CHAIN OF CUSTODY RECORD
REQUEST FOR ANALYSIS

aw 7/28/15
~~1507352~~
1507480

Tetra Tech, Inc.
3801 Automation Way #100
Fort Collins, CO 80525
(970) 223-9600 Fax (970) 223-7171

Client/ Project Name: Riley Pass

Project Number: 114-560486 A | P.O. Number:

Send Results / Report To: Aaron Orechwa (See Card)

Sampler (Print Name / Affiliation): Aaron Orechwa / Tetra Tech

Signature:

Delivery Method / Shipping Document Number:

Tetra Tech Contact / Phone Number:

Analysis Requested: Arsenic by 6020A; Preservative; Container Type and Size

Field Sample No./ Identification		Date	Time	Sample Matrix	Total No. of Cont.	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Remarks
XRF-IAA16-01	(21)	7/15/15	1238				X											
XRF-IX13-01	(22)	7/15/15	1417				X											
XRF-IV9-01	(23)	7/15/15	1507				X											
XRF-IV9-02	(24)	7/15/15	1507				X											
XRF-IS6-01	(25)	7/15/15	1707				X											
XRF-IR4-01	(26)	7/15/15	1810				X											
XRF-IQ9-01	(27)	7/15/15	1845				X											
XRF-IP2-01	(28)	7/16/15	0955				X											
XRF-IO12-01	(29)	7/16/15	1037				X											
XRF-IH10-01	(30)	7/16/15	1345				X											
XRF-IG6-01	(31)	7/16/15	1421				X											

aw 7/28/15

Relinquished by: (Print Name/Affiliation) Elissa Palmer	Date: 7/21/15	Received by: (Print Name/Affiliation) Scott McMurry / ALS FC	Date: 07/21/15
Signature: Elissa Palmer	Time: 8:45	Signature:	Time: 0845
Relinquished by: (Print Name/Affiliation)	Date:	Received by: (Print Name/Affiliation)	Date:
Signature:	Time:	Signature:	Time:
Relinquished by: (Print Name/Affiliation)	Date:	Received for lab by: (Print Name)	Date:
Signature:	Time:	Signature:	Time:

Analytical Laboratory (Destination): ALS Fort Collins, CO

Condition/Temperature of Samples when Received:

Serial No.: Nº 000163

Matrix Codes: SW = Surface Water GW = Ground Water S = Soil/Sediment ___ = _____

White: Return to Tetra Tech Yellow: Laboratory Pink: Field Team

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM 1507480

Client: Tetra tech Fc Workorder No: 1507352 aw 7/28/15

Project Manager: ARW Initials: SDM Date: 07-21-15

1. Does this project require any special handling in addition to standard ALS procedures?		YES	(NO)
2. Are custody seals on shipping containers intact?	(NONE)	YES	NO
3. Are Custody seals on sample containers intact?	(NONE)	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		(YES)	NO
5. Are the COC and bottle labels complete and legible?		(YES)	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were airbills / shipping documents present and/or removable?	(DROP OFF)	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	(N/A)	YES	NO
10. Is there sufficient sample for the requested analyses?		(YES)	NO
11. Were all samples placed in the proper containers for the requested analyses?		(YES)	NO
12. Are all samples within holding times for the requested analyses?		(YES)	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	(N/A)	YES	NO
16. Were the samples shipped on ice?		YES	(NO)
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	(NO)

Cooler #:	1							
Temperature (°C):	Amb							
No. of custody seals on cooler:	0							
DOT Survey/ Acceptance Information — External µR/hr reading:	N/A							
Background µR/hr reading:	12							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO (NA) (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

Relog of samples 1, 10, 15, and 21 for As by 6020A. aw 7/28/15

If applicable, was the client contacted? YES / NO / (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: Cindy 7/21/15

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Client:	Tetra Tech MM, Inc.	**Date:**	*04-Aug-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507480
Sample ID:	XRF-FP8-01	**Lab ID:**	1507480-1
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 11:43	**Percent Moisture:**	25.5

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/29/2015**		PrepBy: **CDR**
ARSENIC	**77**		**0.26**	**MG/KG**	10	0.042	7/30/2015 17:52

Client:	Tetra Tech MM, Inc.	**Date:**	*04-Aug-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507480
Sample ID:	XRF-FF8-01	**Lab ID:**	1507480-10
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 11:00	**Percent Moisture:**	8.6

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/29/2015**		PrepBy: **CDR**
ARSENIC	**71**		**0.21**	**MG/KG**	10	0.035	7/30/2015 17:55

Client:	Tetra Tech MM, Inc.	**Date:**	*04-Aug-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507480
Sample ID:	XRF-GM4-01	**Lab ID:**	1507480-15
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 16:32	**Percent Moisture:**	18.4

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/29/2015**		PrepBy: **CDR**
ARSENIC	**550**		**0.23**	**MG/KG**	10	0.037	7/30/2015 17:59

Client:	Tetra Tech MM, Inc.	**Date:**	*04-Aug-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507480
Sample ID:	XRF-IAA16-01	**Lab ID:**	1507480-21
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/15/2015 12:38	**Percent Moisture:**	1.3

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/29/2015**		PrepBy: **CDR**
ARSENIC	**17**		**0.18**	**MG/KG**	10	0.03	7/30/2015 18:02

Client:	Tetra Tech MM, Inc.	**Date:**	*04-Aug-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507480
Sample ID:	XRF-FJ3-01	**Lab ID:**	1507480-22
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 19:18	**Percent Moisture:**	15.0

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **8/3/2015**		PrepBy: **CDR**
ARSENIC	**190**		**0.23**	**MG/KG**	10	0.037	8/4/2015 13:26

Client:	Tetra Tech MM, Inc.	**Date:**	*04-Aug-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507480
Sample ID:	XRF-FI10-01	**Lab ID:**	1507480-23
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 19:38	**Percent Moisture:**	5.2

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **8/3/2015**		PrepBy: **CDR**
ARSENIC	**130**		**0.19**	**MG/KG**	10	0.032	8/4/2015 13:30

Client:	Tetra Tech MM, Inc.	**Date:**	*04-Aug-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507480
Sample ID:	XRF-GI1-01	**Lab ID:**	1507480-24
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 19:28	**Percent Moisture:**	9.1

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **8/3/2015**		PrepBy: **CDR**
ARSENIC	**180**		**0.2**	**MG/KG**	10	0.033	8/4/2015 13:49

Client:	Tetra Tech MM, Inc.	**Date:**	*04-Aug-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507480
Sample ID:	XRF-GI1-01	**Lab ID:**	1507480-24
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 19:28	**Percent Moisture:**	9.1

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Batch ID: **IP150729-1-3** Instrument ID: **ICPMS2** Method: **SW6020**

LCS Sample ID: **IM150729-1** Units: **MG/KG** Analysis Date: **7/30/2015 16:54**

Client ID: Run ID: **IM150730-10A5** Prep Date: **7/29/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	9.88	0.2	10		99	80-120				20	

MB Sample ID: **IP150729-1** Units: **MG/KG** Analysis Date: **7/30/2015 16:50**

Client ID: Run ID: **IM150730-10A5** Prep Date: **7/29/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	ND	0.2									

The following samples were analyzed in this batch:

1507480-1 1507480-10 1507480-15
1507480-21

QC BATCH REPORT

Batch ID: **IP150803-1-3** Instrument ID: **ICPMS2** Method: **SW6020**

LCS Sample ID: **IM150803-1** Units: **MG/KG** Analysis Date: **8/4/2015 13:05**
Client ID: Run ID: **IM150804-10A3** Prep Date: **8/3/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	10.2	0.2	10		102	80-120				20	

MB Sample ID: **IP150803-1** Units: **MG/KG** Analysis Date: **8/4/2015 12:59**
Client ID: Run ID: **IM150804-10A3** Prep Date: **8/3/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	0.14	0.2									J

The following samples were analyzed in this batch: 1507480-22 1507480-23 1507480-24

Monday, July 27, 2015

Aaron Orechwa
Tetra Tech MM, Inc.
3801 Automation Way, Suite 100
Fort Collins, CO 80525

Re: ALS Workorder: 1507352
Project Name: Riley Pass
Project Number: 114-560486A

Dear Mr. Orechwa:

Thirty three soil samples were received from Tetra Tech MM, Inc., on 7/21/2015. The samples were scheduled for the following analysis:

Metals

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Amy R. Wolf
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1507352

Metals:
The samples were analyzed following SW-846, 3rd Edition procedures. Analysis by ICPMS followed method 6020A and the current revision of SOP 827.

- A matrix spike and matrix spike duplicate were digested and analyzed with each batch. All acceptance criteria for accuracy were met. with the following exception:

Analyte	Sample ID
Arsenic	1507352-21MS

The native sample result is flagged for matrix spike failure and an analytical post spike was performed. The result of the spike was acceptable indicating that the matrix was not significantly affecting quantitation of this analyte.

- Matrix spike recoveries could not be evaluated for the following analyte:

Analyte	Sample ID
Arsenic	1507352-1

The concentration of this analyte in the native sample was greater than four times the concentration of matrix spike added during the digestion. When sample concentration is that much greater than the spike added, spike recoveries may not be accurate. The laboratory control sample indicates that the digestion and analysis were in control.

- A sample duplicate and matrix spike duplicate were digested and analyzed with each batch. All acceptance criteria for precision were met with the following exception:

Analyte	Sample ID
Arsenic	1507352-1D

The native sample result is flagged for duplicate failure.

All remaining acceptance criteria were met.

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1507352
Client Name: Tetra Tech MM, Inc.
Client Project Name: Riley Pass
Client Project Number: 114-560486A
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
XRF-FP8-01	1507352-1		SOIL	13-Jul-15	11:43
XRF-FN13-01	1507352-2		SOIL	13-Jul-15	14:40
XRF-FL15-01	1507352-3		SOIL	13-Jul-15	16:12
XRF-FK4-01	1507352-4		SOIL	13-Jul-15	17:27
XRF-FK9-01	1507352-5		SOIL	13-Jul-15	17:43
XRF-FJ3-01	1507352-6		SOIL	13-Jul-15	19:18
XRF-FI10-01	1507352-7		SOIL	13-Jul-15	19:38
XRF-FI10-02	1507352-8		SOIL	13-Jul-15	19:38
XRF-GI6-01	1507352-9		SOIL	14-Jul-15	20:00
XRF-FF8-01	1507352-10		SOIL	14-Jul-15	11:00
XRF-FC8-01	1507352-11		SOIL	14-Jul-15	12:29
XRF-GA11-01	1507352-12		SOIL	14-Jul-15	14:46
XRF-GR10-01	1507352-13		SOIL	14-Jul-15	16:05
XRF-GC9-01	1507352-14		SOIL	14-Jul-15	16:07
XRF-GM4-01	1507352-15		SOIL	14-Jul-15	16:32
XRF-GD3-01	1507352-16		SOIL	14-Jul-15	16:55
XRF-GM1-01	1507352-17		SOIL	14-Jul-15	17:15
XRF-GO14-01	1507352-18		SOIL	14-Jul-15	18:10
XRF-GI1-01	1507352-19		SOIL	14-Jul-15	19:28
XRF-GE6-01	1507352-20		SOIL	14-Jul-15	19:30
XRF-IAA16-01	1507352-21		SOIL	15-Jul-15	12:38
XRF-IX13-01	1507352-22		SOIL	15-Jul-15	14:17
XRF-IV9-01	1507352-23		SOIL	15-Jul-15	15:07
XRF-IV9-02	1507352-24		SOIL	15-Jul-15	15:07
XRF-IS6-01	1507352-25		SOIL	15-Jul-15	17:07
XRF-IR4-01	1507352-26		SOIL	15-Jul-15	18:10
XRF-IQ9-01	1507352-27		SOIL	15-Jul-15	18:45
XRF-IP2-01	1507352-28		SOIL	16-Jul-15	9:55
XRF-IO12-01	1507352-29		SOIL	16-Jul-15	10:37
XRF-IH10-01	1507352-30		SOIL	16-Jul-15	13:45

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1507352
Client Name: Tetra Tech MM, Inc.
Client Project Name: Riley Pass
Client Project Number: 114-560486A
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
XRF-IG6-01	1507352-31		SOIL	16-Jul-15	14:21
XRF-IF8-01	1507352-32		SOIL	16-Jul-15	14:55
XRF-IE12-01	1507352-33		SOIL	16-Jul-15	16:08

TETRA TECH

CHAIN OF CUSTODY RECORD
REQUEST FOR ANALYSIS

1507352

Tetra Tech, Inc.
3801 Automation Way #100
Fort Collins, CO 80525
(970) 223-9600 Fax (970) 223-7171

Client/ Project Name: Riley Pass

Project Number: 114-560486A

P.O. Number:

Send Results / Report To:
Aaron Orechwa
aaron.orechwa@tetratech.com
(see attached card)

Sampler (Print Name / Affiliation): Aaron Orechwa / Tetra Tech

Signature:

Delivery Method / Shipping Document Number: By hand

Tetra Tech Contact / Phone Number: 970-420-9395

Analysis Requested: Arsenic by 6020A; Preservative; Container Type and Size

Field Sample No./ Identification	Date	Time	Sample Matrix	Total No. of Cont.	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Remarks
① XRF - FP8-01	7/13/15	1143	S	1		X											"FP8-01"
② XRF - FN13-01	7/13/15	1440	S	1		X											
③ XRF - FL15-01	7/13/15	1612	S	1		X											
④ XRF - FK4-01	7/13/15	1727	S	1		X											
⑤ XRF - FK9-01	7/13/15	1743	S	1		X											
⑥ XRF - FJ3-01	7/13/15	1918	S	1		X											
⑦ XRF - FI10-01	7/13/15	1938	S	1		X											
⑧ XRF - FI10-02	7/13/15	1938	S	1		X											
⑨ XRF - GI6-01	7/14/15	2000	S	1		X											

Relinquished by: (Print Name/Affiliation)	Date:	Received by: (Print Name/Affiliation)	Date:	Analytical Laboratory (Destination):
Elissa Palmer Signature: Elissa Palmer	7/21/15 Time: 8:45	Scott Malloy / ALS FC Signature:	7/21/15 Time: 0845	ALS Fort Collins, CO
Relinquished by: (Print Name/Affiliation) Signature:	Date: Time:	Received by: (Print Name/Affiliation) Signature:	Date: Time:	
Relinquished by: (Print Name/Affiliation) Signature:	Date: Time:	Received for lab by: (Print Name) Signature:	Date: Time:	Condition/Temperature of Samples when Received:

Serial No.: Nº 000161

White: Return to Tetra Tech Yellow: Laboratory Pink: Field Team

Matrix Codes: SW = Surface Water GW = Ground Water S = Soil/Sediment ____ = _____

TETRA TECH

CHAIN OF CUSTODY RECORD
REQUEST FOR ANALYSIS

1507352

Tetra Tech, Inc.
3801 Automation Way #100
Fort Collins, CO 80525
(970) 223-9600 Fax (970) 223-7171

Client/ Project Name: Riley Pass

Project Number: 114-560486 A

P.O. Number:

Send Results / Report To: Aaron Orechwa (see cord)

Sampler (Print Name / Affiliation): Aaron Orechwa / Tetra Tech

Signature:

Delivery Method / Shipping Document Number: By hand

Tetra Tech Contact / Phone Number: 970-420-4395

Analysis Requested: Arsenic by 6020A

Preservative

Container Type and Size

Field Sample No./ Identification	Date	Time	Sample Matrix	Total No. of Cont.	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Remarks
(10) XRF-FF8-01	7/14/15	1100	S	1		X											
(11) XRF-FC8-01	7/14/15	1229	S	1		X											
(12) XRF-GA11-01	7/14/15	1446	S	1		X											
(13) XRF-GR10-01	7/14/15	1605	S	1		X											
(14) XRF-GC9-01	7/14/15	1607	S	1		X											
(15) XRF-GM4-01	7/14/15	1632	S	1		X											
(16) XRF-GD3-01	7/14/15	1655	S	1		X											
(17) XRF-GM1-01	7/14/15	1715	S	1		X											
(18) XRF-GO14-01	7/14/15	1810	S	1		X											
(19) XRF-GI1-01	7/14/15	1928	S	1		X											
(20) XRF-GE6-01	7/14/15	1930	S	1		X											

Relinquished by: (Print Name/Affiliation) Elissa Palmer	Date: 7/21/15	Received by: (Print Name/Affiliation) Scott Malloy / ALS FC	Date: 7/21/15	Analytical Laboratory (Destination): ALS Fort Collins, CO
Signature: Elissa Palmer	Time: 8:45	Signature:	Time: 0845	
Relinquished by: (Print Name/Affiliation)	Date:	Received by: (Print Name/Affiliation)	Date:	
Signature:	Time:	Signature:	Time:	
Relinquished by: (Print Name/Affiliation)	Date:	Received for lab by: (Print Name)	Date:	Condition/Temperature of Samples when Received:
Signature:	Time:	Signature:	Time:	Serial No.: Nº 000162

2 of 4

White: Return to Tetra Tech Yellow: Laboratory Pink: Field Team

Matrix Codes: SW = Surface Water GW = Ground Water S = Soil/Sediment

TETRA TECH

CHAIN OF CUSTODY RECORD
REQUEST FOR ANALYSIS

1507352

Tetra Tech, Inc.
3801 Automation Way #100
Fort Collins, CO 80525
(970) 223-9600 Fax (970) 223-7171

Client/ Project Name: Riley Pass

Project Number: 114-560486 # P.O. Number:

Send Results / Report To: Aaron Orechwa (See Card)

Sampler (Print Name / Affiliation): Aaron Orechwa / Tetra Tech

Signature:

Delivery Method / Shipping Document Number:

Tetra Tech Contact / Phone Number:

Analysis Requested: Arsenic by 6020A; Preservative; Container Type and Size

Field Sample No./ Identification		Date	Time	Sample Matrix	Total No. of Cont.	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Remarks
XRF-IAA16-01	(21)	7/15/15	1238				X											
XRF-IX13-01	(22)	7/15/15	1417				X											
XRF-IV9-01	(23)	7/15/15	1507				X											
XRF-IV9-02	(24)	7/15/15	1507				X											
XRF-IS6-01	(25)	7/15/15	1707				X											
XRF-IR4-01	(26)	7/15/15	1810				X											
XRF-IQ9-01	(27)	7/15/15	1845				X											
XRF-IP2-01	(28)	7/16/15	0955				X											
XRF-IO12-01	(29)	7/16/15	1037				X											
XRF-IH10-01	(30)	7/16/15	1345				X											
XRF-IG6-01	(31)	7/16/15	1421				X											

Relinquished by: (Print Name/Affiliation)	Date	Received by: (Print Name/Affiliation)	Date	Analytical Laboratory (Destination):
Elissa Palmer Signature: Elissa Palmer	7/21/15 Time: 8:45	Scott McKay / ALS FC Signature:	07/21/15 Time: 0845	ALS Fort Collins, CO
Relinquished by: (Print Name/Affiliation) Signature:	Date: Time:	Received by: (Print Name/Affiliation) Signature:	Date: Time:	
Relinquished by: (Print Name/Affiliation) Signature:	Date: Time:	Received for lab by: (Print Name) Signature:	Date: Time:	Condition/Temperature of Samples when Received:

Serial No.: Nº 000163

White: Return to Tetra Tech Yellow: Laboratory Pink: Field Team

Matrix Codes: SW = Surface Water GW = Ground Water S = Soil/Sediment ___ = ___

TETRA TECH

CHAIN OF CUSTODY RECORD
REQUEST FOR ANALYSIS

150 7352

Tetra Tech, Inc.
3801 Automation Way #100
Fort Collins, CO 80525
(970) 223-9600 Fax (970) 223-7171

Client/ Project Name: RILEY PASS

Project Number: 114-560486A

P.O. Number:

Send Results / Report To: Aaron Orechwa (see card)

Sampler (Print Name / Affiliation): Aaron Orechwa / Tetra Tech

Signature:

Delivery Method / Shipping Document Number: By hand

Tetra Tech Contact / Phone Number: 970-420-4395

Analysis Requested: Arsenic by 6020A; Preservative; Container Type and Size

Field Sample No./ Identification	Date	Time	Sample Matrix	Total No. of Cont.	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Filt. Y	Filt. N	Remarks
XRF-IF8-01 (32)	7/16/15	1455	S	1		X											
XRF-IE12-01 (33)	7/16/15	1608	S	1		X											

Relinquished by: (Print Name/Affiliation) Elissa Palmer Signature: Elissa Palmer	Date: 7/21/15 Time: 8:45	Received by: (Print Name/Affiliation) Scott Malloy / ALS FC Signature:	Date: 07-21-15 Time: 0840	Analytical Laboratory (Destination):
Relinquished by: (Print Name/Affiliation) Signature:	Date: Time:	Received by: (Print Name/Affiliation) Signature:	Date: Time:	
Relinquished by: (Print Name/Affiliation) Signature:	Date: Time:	Received for lab by: (Print Name) Signature:	Date: Time:	Condition/Temperature of Samples when Received:

Serial No.: Nº 000164

White: Return to Tetra Tech Yellow: Laboratory Pink: Field Team

Matrix Codes: SW = Surface Water GW = Ground Water S = Soil/Sediment ___ = _____

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Tetra tech Fc Workorder No: 1507352

Project Manager: AIW Initials: SDM Date: 07-21-15

1. Does this project require any special handling in addition to standard ALS procedures?		YES	(NO)
2. Are custody seals on shipping containers intact?	(NONE)	YES	NO
3. Are Custody seals on sample containers intact?	(NONE)	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		(YES)	NO
5. Are the COC and bottle labels complete and legible?		(YES)	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7. Were airbills / shipping documents present and/or removable?	(DROP OFF)	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	(N/A)	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	(N/A)	YES	NO
10. Is there sufficient sample for the requested analyses?		(YES)	NO
11. Were all samples placed in the proper containers for the requested analyses?		(YES)	NO
12. Are all samples within holding times for the requested analyses?		(YES)	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		(YES)	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	(N/A)	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	(N/A)	YES	NO
16. Were the samples shipped on ice?		YES	(NO)
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	YES	(NO)

Cooler #:	1								
Temperature (°C):	Amb								
No. of custody seals on cooler:	0								
DOT Survey/ Acceptance Information: External µR/hr reading:	N/A								
Background µR/hr reading:	12								

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES / NO** (NA) (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? **YES / NO** / (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: 7/21/15

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FP8-01	**Lab ID:**	1507352-1
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 11:43	**Percent Moisture:**	25.5

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**100**	*	**0.25**	**MG/KG**	10	0.041	7/23/2015 23:12

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FN13-01	**Lab ID:**	1507352-2
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 14:40	**Percent Moisture:**	5.8

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**200**		**0.2**	**MG/KG**	10	0.033	7/23/2015 23:33

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FL15-01	**Lab ID:**	1507352-3
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 16:12	**Percent Moisture:**	10.9

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**62**		**0.21**	**MG/KG**	10	0.035	7/23/2015 23:54

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FK4-01	**Lab ID:**	1507352-4
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 17:27	**Percent Moisture:**	11.6

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**230**		**0.22**	**MG/KG**	10	0.036	7/23/2015 23:57

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FK9-01	**Lab ID:**	1507352-5
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 17:43	**Percent Moisture:**	15.2

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**66**		**0.23**	**MG/KG**	10	0.037	7/24/2015 00:01

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FJ3-01	**Lab ID:**	1507352-6
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 19:18	**Percent Moisture:**	15.1

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**180**		**0.22**	**MG/KG**	10	0.036	7/24/2015 00:04

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FI10-01	**Lab ID:**	1507352-7
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 19:38	**Percent Moisture:**	5.2

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**160**		**0.2**	**MG/KG**	10	0.033	7/24/2015 00:08

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FI10-02	**Lab ID:**	1507352-8
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/13/2015 19:38	**Percent Moisture:**	5.2

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**150**		**0.2**	**MG/KG**	10	0.033	7/24/2015 00:11

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GI6-01	**Lab ID:**	1507352-9
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 20:00	**Percent Moisture:**	6.4

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**1200**		**2.1**	**MG/KG**	100	0.34	7/24/2015 14:24

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FF8-01	**Lab ID:**	1507352-10
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 11:00	**Percent Moisture:**	8.5

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**140**		**0.21**	**MG/KG**	10	0.034	7/24/2015 00:18

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-FC8-01	**Lab ID:**	1507352-11
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 12:29	**Percent Moisture:**	4.7

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**150**		**0.2**	**MG/KG**	10	0.032	7/24/2015 00:22

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GA11-01	**Lab ID:**	1507352-12
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 14:46	**Percent Moisture:**	0.9

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**82**		**0.2**	**MG/KG**	10	0.032	7/24/2015 00:42

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GR10-01	**Lab ID:**	1507352-13
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 16:05	**Percent Moisture:**	3.0

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**300**		**0.19**	**MG/KG**	10	0.031	7/24/2015 00:46

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GC9-01	**Lab ID:**	1507352-14
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 16:07	**Percent Moisture:**	4.0

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**180**		**0.2**	**MG/KG**	10	0.033	7/24/2015 00:49

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GM4-01	**Lab ID:**	1507352-15
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 16:32	**Percent Moisture:**	18.3

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**600**		**0.24**	**MG/KG**	10	0.039	7/24/2015 00:53

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GD3-01	**Lab ID:**	1507352-16
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 16:55	**Percent Moisture:**	3.3

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**240**		**0.19**	**MG/KG**	10	0.032	7/24/2015 00:56

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GM1-01	**Lab ID:**	1507352-17
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 17:15	**Percent Moisture:**	10.7

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**62**		**0.21**	**MG/KG**	10	0.035	7/24/2015 01:00

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GO14-01	**Lab ID:**	1507352-18
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 18:10	**Percent Moisture:**	2.7

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**150**		**0.2**	**MG/KG**	10	0.032	7/24/2015 01:03

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GI1-01	**Lab ID:**	1507352-19
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 19:28	**Percent Moisture:**	9.2

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**210**		**0.21**	**MG/KG**	10	0.035	7/24/2015 01:07

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-GE6-01	**Lab ID:**	1507352-20
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/14/2015 19:30	**Percent Moisture:**	6.0

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**140**		**0.2**	**MG/KG**	10	0.033	7/24/2015 01:10

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IAA16-01	**Lab ID:**	1507352-21
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/15/2015 12:38	**Percent Moisture:**	1.3

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**17**	N	**0.2**	**MG/KG**	10	0.032	7/24/2015 01:38

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IX13-01	**Lab ID:**	1507352-22
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/15/2015 14:17	**Percent Moisture:**	6.0

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**41**		**0.2**	**MG/KG**	10	0.032	7/24/2015 01:59

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IV9-01	**Lab ID:**	1507352-23
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/15/2015 15:07	**Percent Moisture:**	1.8

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**23**		**0.19**	**MG/KG**	10	0.031	7/24/2015 02:20

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IV9-02	**Lab ID:**	1507352-24
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/15/2015 15:07	**Percent Moisture:**	1.6

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**22**		**0.2**	**MG/KG**	10	0.032	7/24/2015 02:23

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IS6-01	**Lab ID:**	1507352-25
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/15/2015 17:07	**Percent Moisture:**	2.5

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**45**		**0.19**	**MG/KG**	10	0.031	7/24/2015 02:27

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IR4-01	**Lab ID:**	1507352-26
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/15/2015 18:10	**Percent Moisture:**	0.8

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**13**		**0.2**	**MG/KG**	10	0.032	7/24/2015 02:30

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IQ9-01	**Lab ID:**	1507352-27
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/15/2015 18:45	**Percent Moisture:**	4.1

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**43**		**0.19**	**MG/KG**	10	0.031	7/24/2015 02:34

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IP2-01	**Lab ID:**	1507352-28
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/16/2015 09:55	**Percent Moisture:**	2.8

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**53**		**0.2**	**MG/KG**	10	0.032	7/24/2015 02:37

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IO12-01	**Lab ID:**	1507352-29
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/16/2015 10:37	**Percent Moisture:**	14.8

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**150**		**0.22**	**MG/KG**	10	0.036	7/24/2015 02:41

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IH10-01	**Lab ID:**	1507352-30
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/16/2015 13:45	**Percent Moisture:**	2.2

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**40**		**0.2**	**MG/KG**	10	0.032	7/24/2015 02:44

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IG6-01	**Lab ID:**	1507352-31
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/16/2015 14:21	**Percent Moisture:**	2.5

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**92**		**0.19**	**MG/KG**	10	0.032	7/24/2015 02:48

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IF8-01	**Lab ID:**	1507352-32
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/16/2015 14:55	**Percent Moisture:**	2.9

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**410**		**0.19**	**MG/KG**	10	0.032	7/24/2015 03:09

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IE12-01	**Lab ID:**	1507352-33
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/16/2015 16:08	**Percent Moisture:**	5.6

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed
ICPMS METALS			**SW6020**		Prep Date: **7/22/2015**		PrepBy: **CDR**
ARSENIC	**51**		**0.2**	**MG/KG**	10	0.032	7/24/2015 03:12

Client:	Tetra Tech MM, Inc.	**Date:**	*27-Jul-15*
Project:	114-560486A Riley Pass	**Work Order:**	1507352
Sample ID:	XRF-IE12-01	**Lab ID:**	1507352-33
Legal Location:		**Matrix:**	SOIL
Collection Date:	7/16/2015 16:08	**Percent Moisture:**	5.6

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	MDL	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Batch ID: **IP150722-1-1** Instrument ID **ICPMS2** Method: **SW6020**

DUP Sample ID: **1507352-1** Units: **MG/KG** Analysis Date: **7/23/2015 23:19**

Client ID: **XRF-FP8-01** Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	78	0.249						100	28	20	*

LCS Sample ID: **IP150722-1** Units: **MG/KG** Analysis Date: **7/23/2015 23:08**

Client ID: Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	10.3	0.2	10		103	80-120				20	

MB Sample ID: **IP150722-1** Units: **MG/KG** Analysis Date: **7/23/2015 23:05**

Client ID: Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	ND	0.2									

MS Sample ID: **1507352-1** Units: **MG/KG** Analysis Date: **7/23/2015 23:22**

Client ID: **XRF-FP8-01** Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	86.8	0.25	12.5	100	-128	75-125				20	

MSD Sample ID: **1507352-1** Units: **MG/KG** Analysis Date: **7/23/2015 23:26**

Client ID: **XRF-FP8-01** Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	96.7	0.248	12.4	100	-50	75-125		86.8	11	20	

Client: Tetra Tech MM, Inc.
Work Order: 1507352
Project: 114-560486A Riley Pass

QC BATCH REPORT

Batch ID: **IP150722-2-1** Instrument ID **ICPMS2** Method: **SW6020**

DUP Sample ID: **1507352-21** Units: **MG/KG** Analysis Date: **7/24/2015 01:45**
Client ID: **XRF-IAA16-01** Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	15.7	0.195						17	5	20	

LCS Sample ID: **IP150722-2** Units: **MG/KG** Analysis Date: **7/24/2015 01:35**
Client ID: Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	10.3	0.2	10		103	80-120				20	

MB Sample ID: **IP150722-2** Units: **MG/KG** Analysis Date: **7/24/2015 01:31**
Client ID: Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	ND	0.2									

MS Sample ID: **1507352-21** Units: **MG/KG** Analysis Date: **7/24/2015 01:49**
Client ID: **XRF-IAA16-01** Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	29.2	0.195	9.77	17	130	75-125				20	N

MSD Sample ID: **1507352-21** Units: **MG/KG** Analysis Date: **7/24/2015 01:52**
Client ID: **XRF-IAA16-01** Run ID: **IM150723-11A6** Prep Date: **7/22/2015** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	25.6	0.196	9.79	17	93	75-125		29.2	13	20	

The following samples were analyzed in this batch:

1507352-1	1507352-2	1507352-3
1507352-4	1507352-5	1507352-6
1507352-7	1507352-8	1507352-10
1507352-11	1507352-12	1507352-13
1507352-14	1507352-15	1507352-16
1507352-17	1507352-18	1507352-19
1507352-20	1507352-21	1507352-22
1507352-23	1507352-24	1507352-25
1507352-26	1507352-27	1507352-28
1507352-29	1507352-30	1507352-31
1507352-32	1507352-33	

ATTACHMENT D

SCANNED COPIES OF FIELD DATA SHEETS AND FIELD LOGBOOK

114-560486A

2015 RILEY PASS

FIELD LOG BOOK

Forestry Suppliers, Inc.
1-800-647-5368
#49355 Level Book

TETRA TECH
3801 Automation Way
Suite 100
FORT COLLINS, CO 80525

114-560486A

RILEY PASS 2015 SAMPLING

MET AT TT IN FORT COLLINS

LEFT FORT COLLINS @ 1300

ARRIVE @ BOWMAN, ND

FIELD TEAM:

LEAD Aaron Orechwa

Jorge Gonzalez

Daniel Workman

END OF FIELD ENTRIES FOR THE DAY 7/12/15

114-560486A 7/13/15

PERFORMED QA/QC - XRF / GAMMA

FOR XRF QC - SEE FIELD SHEETS

XRF S/N 31177

MODEL XL 3t 600

SYSTEM CHECK QC:

TIME:	7000	1608
RES	179.7	179.0
TIME XRF	56.1	56.0

FIELD CONDITIONS

- 90°; SUNNY
- CLEAR SKIES
- LIGHT TO MODERATE WIND
- DRY

GAMMA SURVEY QC PERFORMED @ 0645 @ HOTEL IN BOWMAN, ND

MFG 6

TIME	BG	FS	Cs-137
0645	11.4	11.4	154
2100	11.7	11.5	155

MFG 12

TIME	BG	FS	Cs-137
0645	12.4	12.1	209
2100	12.2	12.2	207

END OF ENTRIES FOR 7 AGE

↓

114-560 486A 7/13/15

ARRIVED @ RP 1000 MT

* LATE ARRIVAL DUE TO KEY ISSUES *

HEALTH & SAFETY MEETING:

ALANA, TICKS, DEHYDRATION

SUN PROTECTION, WILDLIFE

WEATHER, ETC.

1015 - SPLIT INTO TWO TEAMS

- XRF at Bluff F
- Scan at Bluff F and Bluff I

AT 1015 DAN W. INITIATED SCAN AT BLUFF F.

AT 1015 AARON & JORGE INITIATED ~~&RAF~~ SURVEY AT BLUFF F

END OF FIELD ENTRIES FOR PAGE

114.560486A 7/13/15

XRF SURVEY NOTES

TRANSECT FQ/FR START 1034

- PHOTO COLLECTED @ FQ-15 SAMPLE MEASURED IN ROCK AREA OFF BLUFF SIDE (1034 MT)
- PHOTO TAKEN @ FQ-6 AT ROCK OUT CROP (1108 MT)
- FQ-5 SAMPLE AT SIDE OF BLUFF

END TRANSECT FQ/FR @ 1114

DAN W GAMMA SURVEY @ BLUFF / 1115

IN GENERAL, NATIVE CONDITIONS (SOIL) AND STRONG VEGETATION NOTED AT FQ and FR TRANSECTS

END OF FIELD ENTRIES FOR PAGE

114-560486A 7/13/15

XRF SURVEY NOTES

TRANSECT "FP" START @ 1119

- FP-5 - APPEARS TO BE NATIVE SOIL BUT NEAR PILE. EDS COLLECTED / PHOTO TAKEN ON PILE.
- ~~COLLECTED~~ ADDITIONAL SAMPLES FSS-1 & FSS-2 (Photos taken)
- SOIL SAMPLE @ FP-8 XRF-FP8-01
- XRF DUPLICATE @ FP-8
- OVERALL, STABLE VEGETATION AT FP. TWO PILES NOTED BETWEEN FP & FO BOTH PHOTOGRAPHED AND GPS'd

END OF FIELD ENTRIES FOR PAGE

114-560 486 A 7/13/15

XRF SURVEY NOTES

TRANSECT "FO" START 12:10

D FO-13 LOCATED SOUTH OF PILE(2) BASE

D FO-12 LOCATED NORTH OF PILE(2) BASE

D FO-8 LOCATED SOUTH OF PILE(1) BASE

D FO-6 LOCATION MOVED DUE TO BED ROCK OUT CROP TO NE CORNER OF PILE(1) N10 FT OFF.

D FO-3 WAS ELEVATED, COLLECTED ADDITIONAL SAMPLES FSS-3, -4, -5.

FSS-3 TOP OF PILE

FSS-4 TOP OF PILE

FSS-5 EDGE OF BLUFF

CONTAMINATION (>105 ppm As) NOTED ON TRANSECT "FO"; HOWEVER, THE AREAS WERE IN VERY SHALLOW LAYERS OF SOIL (2 INCH) OVER BED ROCK.

END OF ENTRIES FOR PAGE

114-560 486 A 7/13/15

XRF SURVEY NOTES

Met Tawni @ 1330-1400
LUNCH @ 1400

-TRANSECT "FN" START 1432

D SOIL SAMPLE/XRF DUPLICATES @ FN-13

D REPLICATE AT FN-13

DFN-7 SOUTH OF PILE GPS DIDN'T GO NEAR TREE

D ADDED FSS-6, -7

FSS-6 NEXT TO FN-5

FSS-7 ADDED PAST ROCK TO NORTH

- END TRANSECT "FN" @ 1513

TRANSECT "FM" START 1524

D FM-3 elevated As (322 ppm) 1" of ESS Soil layer

D ORGANIC SOIL COUGH AT FM-13 → FM-5

END TRANSECT "FM" @ 1556

END OF FIELD NOTES PER PAGE

114-560486A 7/13/15

XRF SURVEY NOTES

TRANSECT "FL" START 1612

D SOIL SAMPLE/XRF DUP @ FL-15

XRF-FL15-01 1612

D FL-7 MOVED NORTH PAST TO DENSE VEGETATION PATCH

D FL-3 NEAR EDGE OF GEO GRID.

END "FL" @ 1721

TRANSECT "FK" START 1725

D SOIL SAMPLE/XRF DUPLICATE @ FK-4 FK-9

XRF-FK4-01 1727

XRF-FK9-01 1743

END TRANSECT "FK" @ 1801

END OF FIELD ENTRIES FOR PAGE

114-560486A 7/13/15

XRF SURVEY NOTES

TRANSECT "FJ" START 1856

- SOIL SAMPLE/XRF DUP @ FJ-3
  XRF-FJ3-01 1918
- FJ-12 LOCATED IN WHITISH/CHALKY CLAY SEDIMENT
- PFJ-14 MOVED OFF ROAD

END TRANSECT "FJ" 1918

TRANSECT "FI" START 1924

PFI-3 Edge of Reclaimed area to North 15-20 ft

PFI-5 MOVED FROM ROCK AREA

- SOIL SAMPLE/XRF DUP @ FI-10
  XRF-FI0-01
  XRF-FI0-02 1938

"FI" END @ 1955

PFI-12, -13, -14 moved slightly

END OF FIELD ENTRIES FOR PAGE

114-560486 A 7/13/15

DAN W - LEFT SITE 1915
- ARRIVE BOWMAN 2000

AARON/JORGE - LEFT SITE @ 2000
- ARRIVE @ 2045

- PERFORMED QC @ 2100 (gamma)
- PERFORMED QC @ 2200-2230 (XRD)
→ FIELD RECON, CHARGE BATTERIES
DEBRIEF UNTIL 2300

END OF FIELD
ENTRIES FOR
7/13/15

114-560486A 7/14/15

GAMMA QC @ 0645 Bowman, ND

MFG-6

TIME	BG	FS	Cs-137
0645			

QC not performed, instrument not used

MFG-12

TIME	BG	FS	Cs137
0645	~~11.7~~	~~12.3~~	~~205~~
2300	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~

XRF QC PERFORMED:

- NIST CALIBRATION CHECKS
- METHOD BLANKS
- ENERGY CALIBRATION CHECKS.

SEE FIELD SHEETS FOR QC RESULTS.

END OF FIELD ENTRIES FOR PAGE

T14-560486 A 7/14/15

LEFT BOWMAN, ND @ 0715

ARRIVED BUFFALO, SD @ 0815

* RETRIEVAL OF USFS GATE KEYS

ARRIVED TO RILEY PASS N/1000

1000 - SPLIT INTO TWO TEAMS

▷ XRF SURVEY @ BLUFF F

▷ GAMMA SURVEY @ BLUFF I

▷ AT 1000, DAN W CONDUCTED GAMMA SURVEY @ BLUFF I

▷ AT 1000, AARON O + JORGE G CONDUCTED XRF SURVEY @ BLUFF F

XRF SURVEY STARTED AT TRANSECT 11FH11, WHERE PREVIOUSLY LEFT OFF ON 7/13/15.

END OF FIELD ENTRIES FOR PAGE

114-560486A 7/14/15

XRF SURVEY NOTES

- TRANSECT "FH" START @ 1006
  - FH-9 + FH-10 POSITIONS MOVED BECAUSE OF TREES
- END TRANSECT FH @ 1026

- TRANSECT "FG" START @ 1029
  - SAMPLE FG-3 LOCATED ~20 ft FROM RECLAIMED AREA
  - FG-9 - mostly organic/duff consistent material
  - FG-10 LOCATED OFF ROAD SLIGHTLY
- END TRANSECT "FG" @ 1048

END OF FIELD ENTRIES FOR PAGE

114-$60486A 7/14/15

XRF SURVEY NOTES

TRANSECT "FF" START @ 1054

DFF-9 GPS was entered incorrectly not "60". should be "9". Fix later.

DSoil SAMPLE/XRF DUPLICATE COLLECTED @ FF-8

XRF-FF8-01 1100

DFF-6, FF-3, F-2 NOT LOCATED OR RELOCATED BECAUSE OF DENSE TREES.

END FF @ 1116

TRANSECT "FE" START @ 1119

- FE-1 10-20 ft from bluff edge limited soil locations
- DFE-2 - located in trees
- FE-3 moved off bedrock
- FE-5 tree cover
- FE-6 dense bedrock area

END "FE" @ 1142

END OF FIELD ENTRIES FOR PAGE

119-560480H 7/14/15

XRF SURVEY NOTES

TRANSECT "FD" START @ 1145
- ORGANIC SOIL NOTED @ FD-4 (DUFF)
- DFD-9 located OFF ROAD

END TRANSECT @ 1208

TRANSECT "FC" START @ 1213
- DFC-5 located a tree
- DFC-6/8 is located at edge of reclaimed boundary
- Soil sample / XRF sample at FC-8
  - XRF-FC8-01
- DFC-9 located on edge of road before bluff edge.

END TRANSECT @ 1231

TRANSECT "FB" + "FA" START @ 1236
- DFB-2 - edge of bluff
- DFA-3 - moved off grid

END TRANSECTS @ 1244

Completed XRF survey at Bluff F @ 1245.

END OF FIELD ENTRIES PER PAGE

114-560486A 1/14/15

AFTER COMPLETING XRF SURVEY AT BLUFF F, BROKE INTO SEPARATE FIELD TEAMS AT BLUFF G.

TEAMS WERE DIVIDED AS FOLLOWS:

JOREE - TRANSECTS "GG" through "GN"

XRF S/N 31177

DAN - TRANSECTS "GI" through "GO"

[ALSO COMPLETED GG and GH

XRF S/N 84208

AARON - TRANSECTS "GA" through "GF"

XRF 31094

END OF ENTRIES FOR PAGE

114-560486A 7/14/15

JORGE XRF SURVEY NOTES

- GL-4 thick vegetation
- GL-5 extreme steepness
- XRF 31171 - Replicate at GM-1
- Soil Samples/XRF DUPLICATES at GM-1, GM-4
  - XRF - GM1-01
  - XRF - GM4-01
- GM-5 - high vegetation
- GM-5/GM-6 - both in gulley
- GN-2 moved from dense vegetation
- GN-4, GN-5, GN-6 - dense vegetation
- Soil Samples/XRF Duplicates at GI-1 + GI-6
  - XRF - GI1-01
  - XRF - GI6-01

Finished at 2000

END OF FIELD ENTRIES FOR PAGE

114-560486A

11/14/2

DAN'S XRF SURVEY NOTES

- GS-10 - moved from rock outcrop
- GR5 moved due to vegetation
- Soil Sample at GR2-10

XRF - GR10-01

- XRF Duplicate @ GQ-10 (below sandstone overhang)
- Precision Check at GP-14
- GO-6 - just off North side of bluff
- GO-12 top near reclaimed topsoil
- Soil Sample at GO-14

XRF - GO14-01

FINISH @ 1946

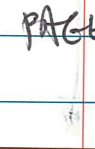
END OF FIELD ENTRIES FOR PAGE

114-560486A 7/14/15

Aaron's XRF Survey Notes

- Soil Sample / XRF Duplicate @ GA-11
  XRF-GA11-01 (in sandy gulley)
- Soil Sample / XRF Duplicate @ GC-9
  XRF-GC9-01
- Soil Sample / XRF Duplicate / Replicate @ GD-3
  XRF-GD3-01
- GD-6 moved from vegetation
- GD-11 thru GD-14 - steep / difficult terrain.
- GE-5 dense vegetation
- Soil Sample / XRF Duplicate @ GE-6
  XRF-GE6-01

END OF FIELD ENTRIES FOR PAGE



114-560486 A 7/14/15

FINISHED INITIAL XRF SURVEY AT BLUFF @ @ 2000

LEFT SITE @ 2030

DINNER 2100-2200 IN GLADSTONE

ARRIVED IN BOWMAN, ND 2237

CONDUCTED - XRF QC
- GAMMA QC
- GPS/XRF data post-processing

FINISHED WORK AT 2400

END OF FIELD ENTRIES FOR 7/14/15

114-580486A 7/15/15

0600-0800 Develop Stats Update Maps for Mary Beth (Ao).

0800 Team meeting - safety and plans for day. - Additional XRF @ Bluff G
- Additional Gamma survey at Bluff I

ARRIVE ON-SITE 1100 MT

XRF system checks:

SN # 31177 } 58.0 sec 175.8 cps
SN # 84208 }

▷ Aaron to do Supplemental Sampling at Bluff G

▷ Dan + Jorge sampling at Bluff I

END OF FIELD ENTRIES FOR PAGE

XRF Survey Notes (AO):

Added GSS-11A, 10A, 9A, 6A 3A, to delineate contamination at Bluff G

Collected GSS-19 to GSS-0 at Bluff G

Completed Bluff G at 1300 Left for Fort Collins.

XRF Survey @ Bluff I completed by Don + Jorge at 1915 - left side

---

END OF FIELD ENTRIES FOR DAY 7/15/15

114-5604864 7/16/15

0700 Gamma Survey System QC
Check on MFG-12 only.

MFG 12	BG	FS	Cs137
0700	11.7	12.3	205
1830	12.1	11.7	204

Arrive on Side @ 0840 (Jorge + Dan)

XRF System Check on 31177. (56 179)

0915 - Bluff I XRF survey

1215-1250 Lunch

1530 Battery Change/System Check

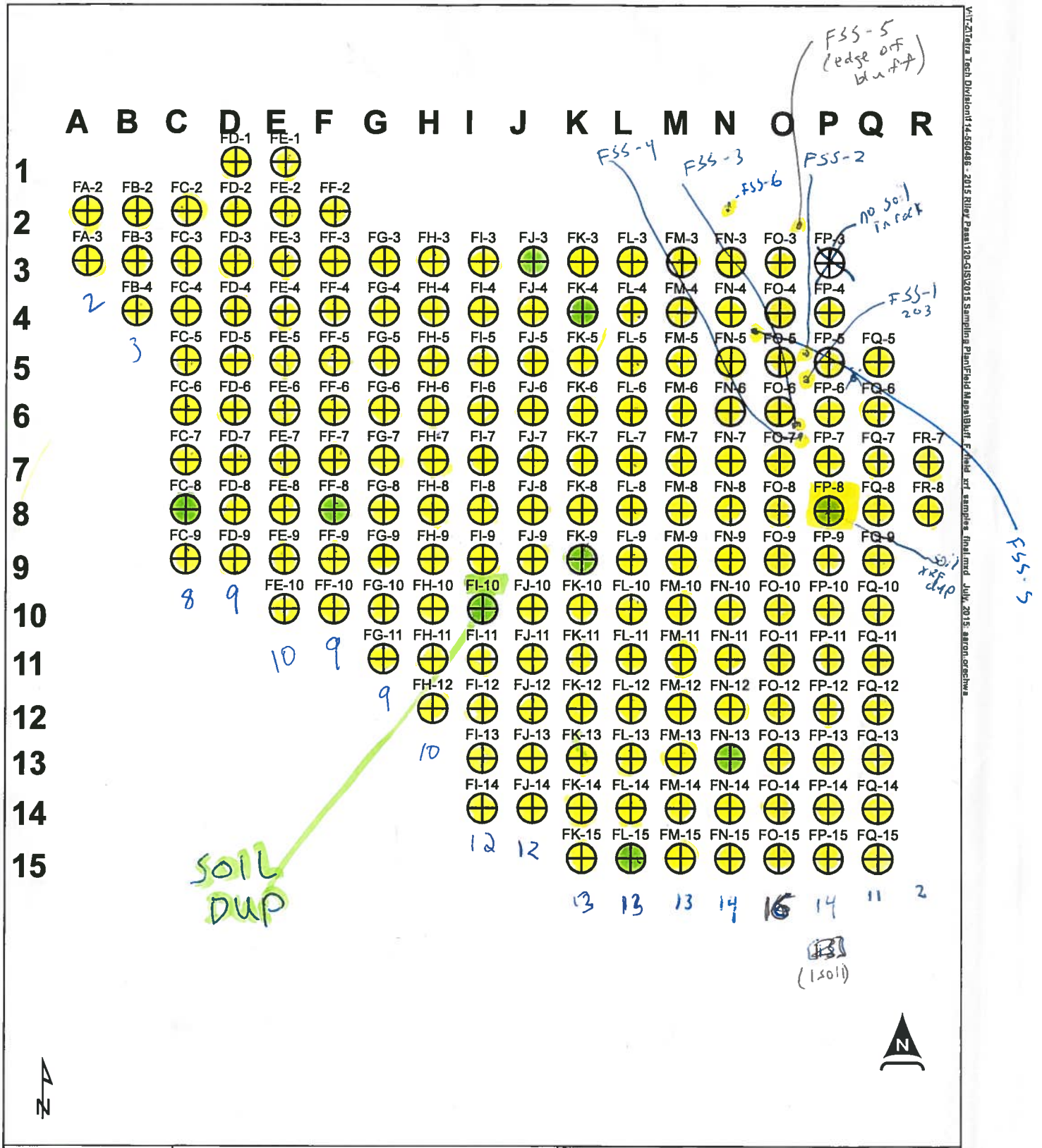
1700 XRF Survey complete

1700 Gamma Survey performed

1740 left Site

1830 Arrive @ hotel

END OF FIELD ENTRIES FOR 7/16/15



FEET
0 25 50

Bluff F Boundary

Proposed In Situ XRF Measurements

NAD_1983_STATEPLANE
SOUTH_DAKOTA
NORTH_FIPS_4001_FEET

Prepared for: UAS

Prepared by: TETRA TECH
3801 Automation Way Suite 100
Fort Collins, Colorado 80525
(970)223-9600 (970)223-7171 fax

Title:
BLUFF F
XRF FIELD MAP

Location: HARDING COUNTY, SD

Project no.: 114-560486

Date: JUNE 2015

Figure: Figure A

ORIGINAL

Sampler ID: AG/JG

XRF ID: 31177

Study Area: F

Field Conditions: 90°, sunny, windy

F1

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID	
Q	FQ-5	1085938.296	747904.8928	Y	7/13/15	~~1154~~ 1114	~~20~~ < LOD (4.1)	-	-	-	off hill
	FQ-6	1085938.296	747872.0844	Y		1108	62	-	-	-	rock outcrop photo 2
	FQ-7	1085938.296	747839.276	Y		1105	65	-	-	-	
	FQ-8	1085938.296	747806.4676	Y		1053	26	-	-	-	
	FQ-9	1085938.296	747773.6592	Y		1050	34	-	-	-	native
	FQ-10	1085938.296	747740.8508	Y		1049	33	-	-	-	native
	FQ-11	1085938.296	747708.0424	Y		1046	6	-	-	-	native
	FQ-12	1085938.296	747675.234			1043	12	-	-	-	native
	FQ-13	1085938.296	747642.4256	Y		1039	96	-	-	-	native
	FQ-14	1085938.296	747609.6172	Y		1038	33	-	-	-	native
	FQ-15	1085938.296	747576.8088	Y	7/13/15	1034	20	-	-	-	native, photo rocks

Some rock outcrop

Sampler ID: AO/JG

XRF ID: 31177

Study Area: F

Field Conditions: _____

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
R	FR-7	1085971.104	747839.276	Y	7/13/15	1101	21	-	-	-
	FR-8	1085971.104	747806.4676	Y	7/13/15	1057	40			

48 sec
1.6 sec

Native conditions, strong vegetation, east edge of Bluff F

Overall great vegetation along FP transect, 2 piles located in between FP and FP (GPS/photos)

Sampler ID: AO/SG
XRF ID: 31177

– 2 extra samples collected (XRF) FSS-1, FSS-2

Study Area: F
Field Conditions: clear, sunny, windy, 90°

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
	FP-3	1085905.487	747970.5096	Y	7/13/15	← NO	SAMPLE	COLLECTED →		
	FP-4	1085905.487	747937.7012			1119	90	← →		
	FP-5	1085905.487	747904.8978			1123	266	-	-	-
	FP-6	1085905.487	747872.0844			1126	104	-	-	-
	FP-7	1085905.487	747839.276			1138	46			
	FP-8	1085905.487	747806.4676			1143	FP-8D 20	FP-8D 25	Y	XRF-FP8-01
P	FP-9	1085905.487	747773.6592			1152	57	-	-	-
	FP-10	1085905.487	747740.8508			1154	44	-	-	-
	FP-11	1085905.487	747708.0424			1157	22	-	-	-
	FP-12	1085905.487	747675.234			1200	40	-	-	-
	FP-13	1085905.487	747642.4256			1202	23	-	-	-
	FP-14	1085905.487	747609.6172			1204	27	-	-	-
	FP-15	1085905.487	747576.8088			1207	40			

FSS-1 - - Y ↓ 1130 206 (!)
FSS-2 - - Y ↓ 1133 124

} extra off pile

OFF TARGET (?)

> Native, but near pile about 30 feet east collected EDS on pile photo of FP 5 & collected FSS-1 between pile and FP-5 Vegetation is good / stable

> photo (shows 2) is FSS-2 and Jose with pile

> Photo of FP-8 soil sample

— pile located near FP-11 - 30 ft. photos EDS

Shot FSS-3 after FO-6 reading. Directly on pile

FU

Sampler ID: Jorge

XRF ID: 3177

Study Area: F

Field Conditions: Same as FP/FQ/FR

TETRA TECH

took FSS-5 on edge of bluff
Photo

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID	
	FO-3	1085872.679	747970.5096	Y	7/13/15	1247	272	-	-	-	edge of bluff thin layer took FSS-5
	FO-4	1085872.679	747937.7012	↓	↓	1244	163	-	-	—	thin layer of soil almost rock
	FO-5	1085872.679	747904.8928			1241	115	-	-	-	moved because of tree
	FO-6	1085872.679	747872.0844			1233	632	-	-	-	FO 6 moved because bedrock, to NE corner of pile off 10 ft
	FO-7	1085872.679	747839.276			1230	108				located on pile 1 SW corner
	FO-8	1085872.679	747806.4676			1228	44	-	-	-	south of pile 1
O	FO-9	1085872.679	747773.6592			1225	26	-	-	-	
	FO-10	1085872.679	747740.8508			1223	50	-	-	-	
	FO-11	1085872.679	747708.0424			1222	62	-	-	-	
	FO-12	1085872.679	747675.234			1218	48	-	-	-	north of pile 2
	FO-13	1085872.679	747642.4256			1215	21	-	-	-	located at ~~north~~ south base of pile.
	FO-14	1085872.679	747609.6172			1213	28	-	-	-	
	FO-15	1085872.679	747576.8088	↓	↓	1210	35	-	-	-	
top of pile	FSS-3	-	-	-	-	1235	13				
base of pile	FSS-01					1239	60				

Contamination noted on FO transect, however, very thin layer on rock off pile. Pile appears to be low on outside soil.

(F-5)

FN transect native grasses.

Sampler ID: JG

XRF ID: S/N ~~31684~~

Study Area: BLUFF F

Field Conditions: sunny, 90°, windy, clear

31177

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
N	FN-3	1085839.871	747970.5096	Y	7/13/15	1513	206	-	-	Rock to north - FSS-7 added past rock
	FN-4	1085839.871	747937.7012			1511	81	-	-	-
	FN-5	1085839.871	747904.8528			1506	156	-	-	FSS-6 added next to FN-5 (photo)
	FN-6	1085839.871	747872.0044			1504	89	-	-	-
	FN-7	1085839.871	747839.276			1502	95	-	-	[tree] base of pile/south edge of pile
	FN-8	1085839.871	747806.4676			1458	64	-	-	-
	FN-9	1085839.871	747773.6592			1456	33	-	-	-
	FN-10	1085839.871	747740.8508			1454	21	-	-	-
	FN-11	1085839.871	747708.0424			1452	26	-	-	-
	FN-12	1085839.871	747675.234			1449	63	-	-	-
	FN-13	1085839.871	747642.4256			1440	106	103	Y	XRF-FN13-01 photo collected
	FN-14	1085839.871	747609.6172			1435	16	-	-	-
	FN-15	1085839.871	747576.8088			1432	51	-	-	-

REPLICATE

FN-13

① 106
② 103
⑤ 107
④ 100
⑤ 97
⑥ 99
⑦ 101

FSS-6 1508 147 - - -

FSS-7 247

(FB)

Sampler ID: AO/JG

XRF ID: 31177

Study Area: F

Field Conditions: 90°, sunny, windy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
M	FM-3	1085807.062	747970.5096	Y	7/13/15	1524	322	-	-	1" deep or less layer on bedrock
	FM-4	1085807.062	747937.7012			1527	57	-	-	
	FM-5	1085807.062	747904.8928			1529	72	-	-	-
	FM-6	1085807.062	747872.0844			1532	66	-	-	-
	FM-7	1085807.062	747839.276			1534	66	-	-	-
	FM-8	1085807.062	747806.4676			1537	18	-	-	-
	FM-9	1085807.062	747773.6592			1540	35	-	-	-
	FM-10	1085807.062	747740.8508			1543	28	-	-	-
	FM-11	1085807.062	747708.0424			1545	23	-	-	-
	FM-12	1085807.062	747675.234			1549	17	-	-	-
	FM-13	1085807.062	747642.4256			1551	<LOD (4.3)	-	-	↑ organic
	FM-14	1085807.062	747609.6172			1553	<LOD (10.8)	-	-	cover soil
	FM-15	1085807.062	747576.8088	↓	↓	1556	8	-	-	↓

F7

Sampler ID: AB/JG
XRF ID: 31177

Study Area: BLUFF F
Field Conditions: Sunny, 90°

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
	FL-3	1085774.254	747970.5096	Y	7/13/15	1721	48	-	-	-
	FL-4	1085774.254	747937.7012			1718	54	-	-	-
	FL-5	1085774.254	747904.8928			1716	48	-	-	-
	FL-6	1085774.254	747872.0844			1713	81	-	-	-
	FL-7	1085774.254	747839.276			1710	43	-	-	-
	FL-8	1085774.254	747806.4676			1708	37	-	-	-
L	FL-9	1085774.254	747773.6592			1706	36	-	-	-
	FL-10	1085774.254	747740.8508			1704	17	-	-	-
	FL-11	1085774.254	747708.0424			1702	19	-	-	-
	FL-12	1085774.254	747675.234			1700	10	-	-	-
	FL-13	1085774.254	747642.4256			1657	21	-	-	-
	FL-14	1085774.254	747609.6172			1655	20	-	-	-
	FL-15	1085774.254	747576.8088			1612	45	45	Y	XRF-FL15-01

charged battery at 1405

ca edge of geogrid

moved north because of vegetation patch

Located in a depression veg present, ~~state~~ cut test pit

FK

Sampler ID: QO/SG

XRF ID: 31177

Study Area: F

Field Conditions: 90°, sunny

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
K	FK-3	1085741.445	747970.5096	Y	7/13/15	1725	134	-	-	-
	FK-4	1085741.445	747937.7012			1727	FK-4D(1) ~~126~~ 107 (126) 1	(104) 2 FK-4D(2) ~~107~~ 118 3	-	XRF - FK4 - 01 - [Photo]
	FK-5	1085741.445	747904.8928			1734	81	-	-	-
	FK-6	1085741.445	747872.0844			1737	75	-	-	-
	FK-7	1085741.445	747839.276			1739	34	-	-	-
	FK-8	1085741.445	747806.4676			1741	18	-	-	-
	FK-9	1085741.445	747773.6592			1743	34	38		XRF - FK9 - 01 [Photo]
	FK-10	1085741.445	747740.8508			1749	60	-	-	-
	FK-11	1085741.445	747708.0424			1751	24	-	-	-
	FK-12	1085741.445	747675.234			1754	28	-	-	-
	FK-13	1085741.445	747642.4256			1756	31	-	-	-
	FK-14	1085741.445	747609.6172			1759	34	-	-	-
	FK-15	-	-			1801	49			

reshot because dup was off target, Note fix GPS

moved, because of tree pit debris

located in soil among rock crypt

located under tree

F9

Sampler ID: AD/JG

XRF ID: 31177

Study Area: Bluff F

Field Conditions: sunny, 90°, clear skies, windy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
	FJ-3	1085708.637	747970.5096	Y	7/13/15	1918	77	69	Yes	XRF-FJ3-01
	FJ-4	1085708.637	747937.7012			1916	37	-	-	-
	FJ-5	1085708.637	747904.8928			1914	39	-	-	-
	FJ-6	1085708.637	747872.0844			1912	33	-	-	-
	FJ-7	1085708.637	747839.276			1911	moved from 51 ← ROCK			(30 second cunt)
	FJ-8	1085708.637	747806.4676			1908	30	-	-	-
J	FJ-9	1085708.637	747773.6592			1906	36	-	-	-
	FJ-10	1085708.637	747740.8508			1905	20	-	-	-
	FJ-11	1085708.637	747708.0424			1903	49	-	-	-
	FJ-12	1085708.637	747675.234			1901	116	-	-	clay sediment white chalky; small 10' circle
	FJ-13	1085708.637	747642.4256			1859	70	-	-	-
	FJ-14	1085708.637	747609.6172	Y		1856	33	-	-	moved off road

FID

Sampler ID: AP/JC

XRF ID: 31177

Study Area: Bluff F

Field Conditions: sunny, clear, windy, 90°

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
	FI-3	1085675.829	747970.5096	Y	7/13/15	1924	229	-	-	Edge of reclaimed area within 10-15 ft,
	FI-4	1085675.829	747937.7012	↓	↓	1926	83	-	↓	
	FI-5	1085675.829	747904.8928			1928	51	-	-	more be cause of rock
	FI-6	1085675.829	747872.0844			1931	15	-	-	-
	FI-7	1085675.829	747839.276			1933	23	-	-	-
	FI-8	1085675.829	747806.4676			1935	19	-	-	-
	FI-9	1085675.829	747773.6592			1937	95	-	-	-
	FI-10	1085675.829	747740.8508			1938	98	90	Y [DUP]	XRF - FI9 - 01 XRF - FI9 - 02
	FI-11	1085675.829	747708.0424			1948	199	-	-	-
	FI-12	1085675.829	747675.234			1951	43	-	-	moved FI-12
	FI-13	1085675.829	747642.4256			1953	40	-	-	Near road in between bluff edge and road
	FI-14	1085675.829	747609.6172	↓	↓	1955	48	-	-	moved be cause of rock

SOIL DUP!!

left site @ 8pm!

Sampler ID: AO/JG

XRF ID: S/N 31177

Study Area: BLUFF F

Field Conditions: Sunny, clear skies, wind

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
H	FH-3	1085643.02	747970.5096	YES	7/14/15	1026	81	-	N	-
	FH-4	1085643.02	747937.7012	YES	7/14/15	1024	63	-	N	-
	FH-5	1085643.02	747904.8928	YES	7/14/15	1022	88	-	N	-
	FH-6	1085643.02	747872.0844	YES	7/14/15	1020	41	-	N	-
	FH-7	1085643.02	747839.276	YES	7/14/15	1018	26	-	N	-
	FH-8	1085643.02	747806.4676	YES	7/14/15	1016	32	-	N	-
	FH-9	1085643.02	747773.6592	YES	7/14/15	1013	31	-	N	-
	FH-10	1085643.02	747740.8508	YES	7/14/15	1011	46	-	N	-
	FH-11	1085643.02	747708.0424	YES	7/14/15	1008	48	-	N	-
	FH-12	1085643.02	747675.234	YES	7/14/15	1006	49	-	N	-

Sampler ID: AD/JG

XRF ID: S/N 31177

Study Area: BLUFF F

Field Conditions: SUNNY, CLEAR SKIES, WIND

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
G	FG-3	1085610.212	747970.5096	YES	7/14/15	1029	193	-	N	-
	FG-4	1085610.212	747937.7012	YES	7/14/15	1032	68	-	N	-
	FG-5	1085610.212	747904.8928	YES	7/14/15	1034	123	-	N	-
	FG-6	1085610.212	747872.0844	YES	7/14/15	1036	29	-	N	-
	FG-7	1085610.212	747839.276	YES	7/14/15	1039	19	-	N	-
	FG-8	1085610.212	747806.4676	YES	7/14/15	1042	8	-	N	-
	FG-9	1085610.212	747773.6592	YES	7/14/15	1044	25	-	N	-
	FG-10	1085610.212	747740.8508	YES	7/14/15	1046	24	-	N	-
	FG-11	1085610.212	747708.0424	YES	7/14/15	1048	34	-	N	-

Sampler ID: AO/JG

XRF ID: S/N 31177

Study Area: BLUFF F

Field Conditions: SUNNY, CLEAR, WINDY, 80-90°

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
F	FF-2	1085577.403	748003.318	YES	7/14/15	1116	<LOD (5.4)	-	NO	-
	FF-3	1085577.403	747970.5096	YES	7/14/15	1113	9	-	NO	-
	FF-4	1085577.403	747937.7012	YES	7/14/15	1110	29	-	NO	-
	FF-5	1085577.403	747904.8928	YES	7/14/15	1108	23	-	NO	-
	FF-6	1085577.403	747872.0844	YES	7/14/15	1105	21	-	NO	-
	FF-7	1085577.403	747839.276	YES	7/14/15	1103	27	-	NO	-
	FF-8	1085577.403	747806.4676	YES	7/14/15	1100	39	30	YES	XRF-FF8-01
	FF-9	1085577.403	747773.6592	YES	7/14/15	1057	9	-	NO	-
	FF-10	1085577.403	747740.8508	YES	7/14/15	1054	25	-	NO	-

Sampler ID: AO/JG

XRF ID: S/N 31177

Study Area: BLUFF F

Field Conditions: Sunny, clear, windy, 80°-90°

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
E	FE-1	1085544.595	748036.1264	YES	7/14/15	1119	46	-	NO	-
	FE-2	1085544.595	748003.318	YES	7/14/15	1123	41	-	NO	-
	FE-3	1085544.595	747970.5096	YES	7/14/15	1126	50	-	NO	-
	FE-4	1085544.595	747937.7012	YES	7/14/15	1128	37	-	NO	-
	FE-5	1085544.595	747904.8928	YES	7/14/15	1131	<LOD (4.5)	-	NO	-
	FE-6	1085544.595	747872.0844	YES	7/14/15	1133	32	-	NO	-
	FE-7	1085544.595	747839.276	YES	7/14/15	1135	39	-	NO	-
	FE-8	1085544.595	747806.4676	YES	7/14/15	1137	<LOD (6.0)	-	NO	-
	FE-9	1085544.595	747773.6592	YES	7/14/15	1140	7	-	NO	-
	FE-10	1085544.595	747740.8508	YES	7/14/15	1142	48	-	NO	-

Sampler ID: AO/SG
XRF ID: S/N 31177

Study Area: Bluff F
Field Conditions: Sunny, clear skies, 90°, windy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
D	FD-1	1085511.787	748036.1264	Yes	7/14/15	1208	15	-	-	
	FD-2	1085511.787	748003.318	Yes	7/14/15	1205	39	-	-	
	FD-3	1085511.787	747970.5096	Yes	7/14/15	1200	50	-	-	
	FD-4	1085511.787	747937.7012	Yes	7/14/15	1157	13	-	-	
	FD-5	1085511.787	747904.8928	Yes	7/14/15	1154	26	-	-	
	FD-6	1085511.787	747872.0844	Yes	7/14/15	1151	33	-	-	
	FD-7	1085511.787	747839.276	Yes	7/14/15	1150	11	-	-	
	FD-8	1085511.787	747806.4676	Yes	7/14/15	1146	<LOD (4.6)	-	-	
	FD-9	1085511.787	747773.6592	Yes	7/14/15	1145	61	-	-	

Sampler ID: AO/JG

XRF ID: S/N 31177

Study Area: BLUFF F

Field Conditions: Sunny, 90°, windy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
C	FC-2	1085478.978	748003.318	YES	7/14/15	1213	23	-	-	
	FC-3	1085478.978	747970.5096	YES	7/14/15	1215	20	-	-	
	FC-4	1085478.978	747937.7012	YES	7/14/15	1217	49	-	-	
	FC-5	1085478.978	747904.8928	YES	7/14/15	1219	26	-	-	
	FC-6	1085478.978	747872.0844	YES	7/14/15	1222	115	-	-	
	FC-7	1085478.978	747839.276	YES	7/14/15	1225	57	-	-	
	FC-8	1085478.978	747806.4676	YES	7/14/15	1229	107	98	YES	XRF-FC-8-01
	FC-9	1085478.978	747773.6592	YES	7/14/15	1231	61	-	-	

Sampler ID: AB/JG

XRF ID: S/N 31177

Study Area: Bluff F

Field Conditions: Sunny, 90°, strong winds

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
B	FB-2	1085446.17	748003.318	Yes	7/14/15	1239	<LOD (6.8)	-	-	-
	FB-3	1085446.17	747970.5096	Yes	7/14/15	1238	<LOD (6.5)	-	-	-
	FB-4	1085446.17	747937.7012	Yes	7/14/15	1236	42	-	-	-

Sampler ID: AO/SC

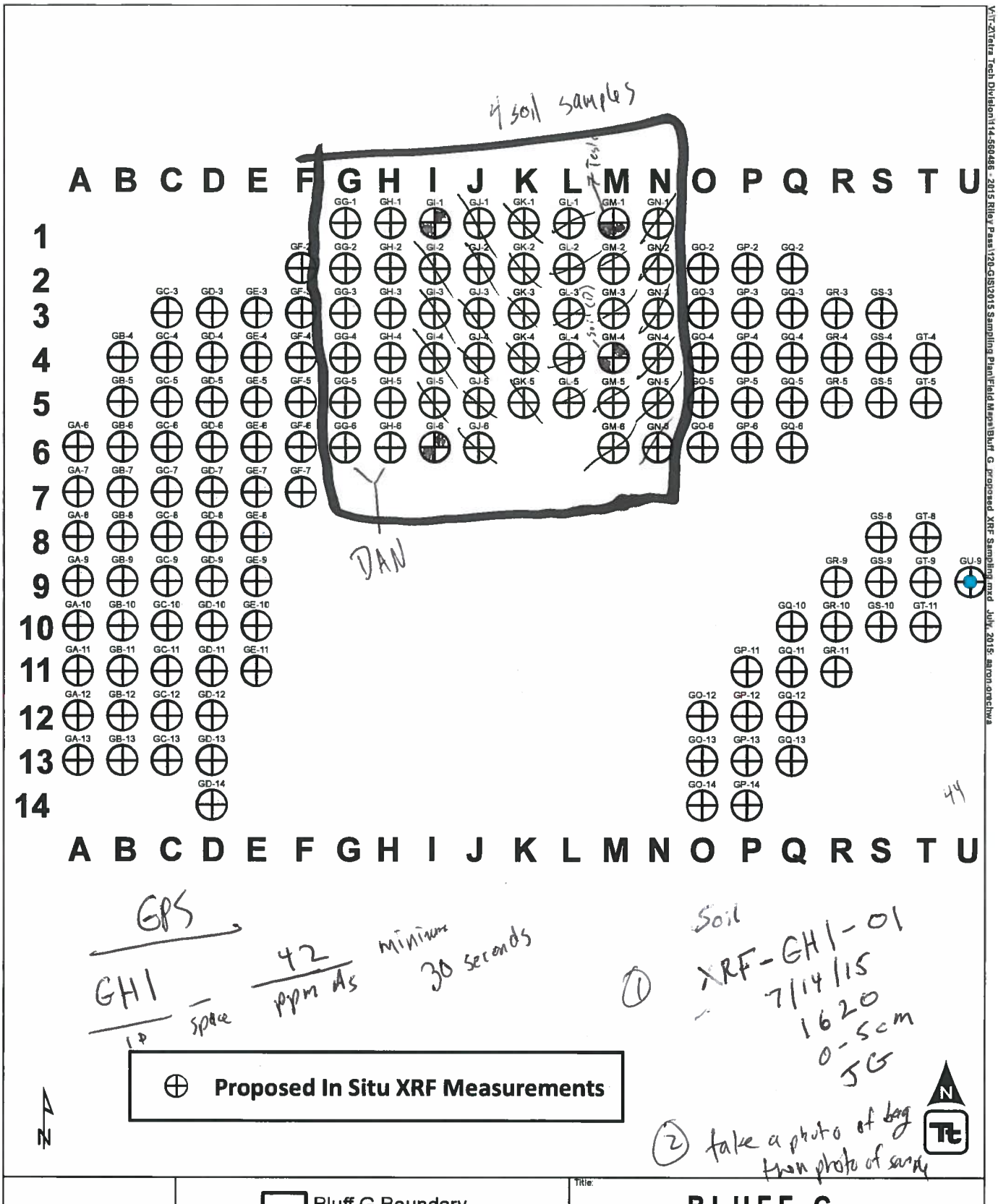
XRF ID: SN 31177

Study Area: Bluff F

Field Conditions: Sunny, 90°, windy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
A	FA-2	1085413.361	748003.318	YES	7/14/15	1249	96	-	-	-
	FA-3	1085413.361	747970.5096	YES	7/14/15	1244	72	-	-	-



Sampler ID: JG
XRF ID: 31173
Study Area:
Field Conditions: Sunny (light wind)

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
K	GK-1	1087267.878	748158.3401	–	7/14/15	18:15	152	–	–	–
	GK-2	1087267.878	748125.5317	–	7/14/15	18:20	60	–	–	–
	GK-3	1087267.878	748092.7233	–	7/14/15	18:28	151	–	–	–
	GK-4	1087267.878	748059.9149	–	7/14/15	18:34	142	–	–	–
	GK-5	1087267.878	748027.1065	–	7/14/15	18:40	154	–	–	–

Sampler ID: JG

XRF ID: 3177

Study Area: _____

Field Conditions: _____

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
L	GL-1	1087300.686	748158.3401	–	7/14/15 ~~12:36~~	18:06 ~~17:50~~	~~170~~ 45	–	N	~~Steep area~~ –
	GL-2	1087300.686	748125.5317	–	7/14/15	17:58	224	–	N	–
	GL-3	1087300.686	748092.7233	–	↑	17:49	236	–	N	–
	GL-4	1087300.686	748059.9149	–	7/14/15	~~18~~ 17:42	232	–	N	~~thick~~ vegetation – in center
	GL-5	1087300.686	748027.1065	–	7/14/15	17:35	170	–	N	steep area

Sampler ID: JG

XRF ID: 31177

Study Area: _____

Field Conditions: Sunny

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
M	GM-1	1087333.494	748158.3401	–	↑	17:15	45	43	Y	#3(42) 4(39) 5(38) 6(42) 7(40) XRF-GM1-01
	GM-2	1087333.494	748125.5317	–	↑	16:58	119	–	–	–
	GM-3	1087333.494	748092.7233	–	↑	16:52	133	~~133~~	–	–
	GM-4	1087333.494	748059.9149	–	7.14.15	16:32	188	176	Y	XRF-GM4-01
	GM-5	1087333.494	748027.1065	–	↑	16:24	578	–	–	– High vegetation Both in Gully
	GM-6	1087333.494	747994.2981	–	7.14.15	16:11	539	–	–	–

Sampler ID: JG
XRF ID: 31177
Study Area:
Field Conditions: Very Vegitated

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
N	GN-1	1087366.303	748158.3401	–	7/14/15	14:46	46	–	N	–
	GN-2	1087366.303	748125.5317	–	7/14/15	14:52	67	–	–	moved to the side due to vegitation
	GN-3	1087366.303	748092.7233	–	↓	14:58	57	–	–	GPS died (XX)
	GN-4	1087366.303	748059.9149	–	↓	15:47	~~102~~ 102	–	–	High vegetation
	GN-5	1087366.303	748027.1065	–	↓	15:55	230	–	–	↓
	GN-6	1087366.303	747994.2981	–	↓	16:03	278	–	–	↓

Sampler ID: JG

XRF ID: 31177

Study Area: _____

Field Conditions: Sunny (light wind)

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
J	GJ-1	1087235.069	748158.3401	–	7/14/15	19:16	116	–	–	–
	GJ-2	1087235.069	748125.5317	–	7/14/15	19:10	70	–	–	–
	GJ-3	1087235.069	748092.7233	–	7/14/15	19:05	76	–	–	–
	GJ-4	1087235.069	748059.9149	–	7/14/15	18:59	241	–	–	–
	GJ-5	1087235.069	748027.1065	–	↑	18:53	317	–	–	–
	GJ-6	1087235.069	747994.2981	–	7/14/15	18:48	509	–	–	Top of crest edge

Sampler ID: JG

XRF ID: 31177

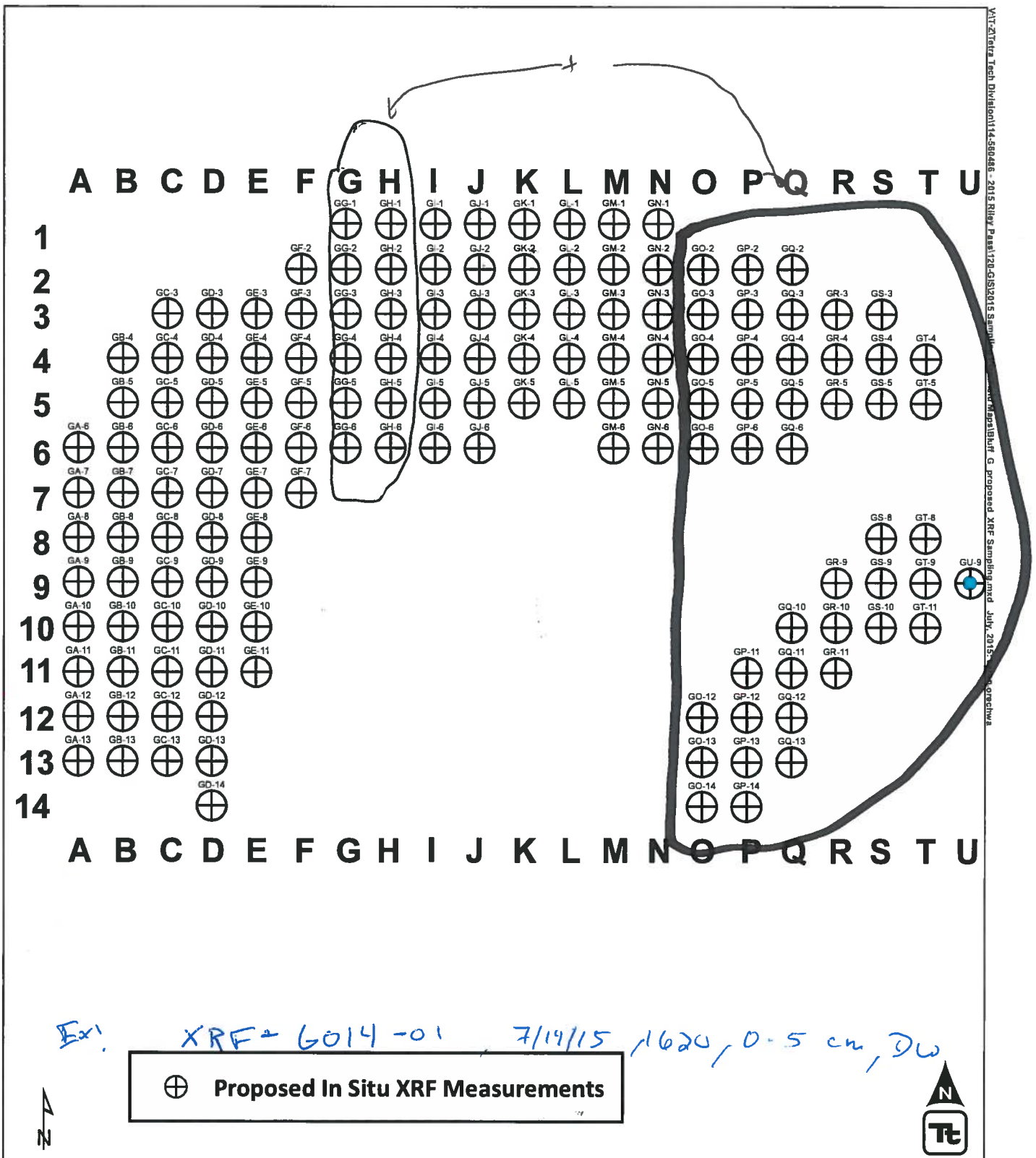
Study Area: _____

Field Conditions: slightly overcast

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
1	GI-1	1087202.261	748158.3401	–	7/14/15	19:28	98	109	Y	XRF-G11-01
	GI-2	1087202.261	748125.5317	–	↓	19:38	71	–	–	–
	GI-3	1087202.261	748092.7233	–	↓	19:43	490	–	–	–
	GI-4	1087202.261	748059.9149	–	↓	19:48	216	–	–	–
	GI-5	1087202.261	748027.1065	–	↓	19:53	913	–	–	–
	GI-6	1087202.261	747994.2981	–	↓	20:00	1737	1803	Y	XRF-G16-01

1731


A B C D E F G H I J K L M N O P Q R S T U
1 2 3 4 5 6 7 8 9 10 11 12 13 14
GA-6 GB-6 GC-6 GD-6 GE-6 GF-6 GG-6 GH-6 GI-6 GJ-6 GM-6 GN-6 GO-6 GP-6 GQ-6
GA-7 GB-7 GC-7 GD-7 GE-7 GF-7
GA-8 GB-8 GC-8 GD-8 GE-8
GA-9 GB-9 GC-9 GD-9 GE-9
GA-10 GB-10 GC-10 GD-10 GE-10
GA-11 GB-11 GC-11 GD-11 GE-11
GA-12 GB-12 GC-12 GD-12
GA-13 GB-13 GC-13 GD-13
GD-14
GF-2 GG-1 GH-1 GI-1 GJ-1 GK-1 GL-1 GM-1 GN-1
GF-3 GG-2 GH-2 GI-2 GJ-2 GK-2 GL-2 GM-2 GN-2 GO-2 GP-2 GQ-2
GB-4 GC-3 GD-3 GE-3 GG-3 GH-3 GI-3 GJ-3 GK-3 GL-3 GM-3 GN-3 GO-3 GP-3 GQ-3 GR-3 GS-3
GB-5 GC-4 GD-4 GE-4 GF-4 GG-4 GH-4 GI-4 GJ-4 GK-4 GL-4 GM-4 GN-4 GO-4 GP-4 GQ-4 GR-4 GS-4 GT-4
GC-5 GD-5 GE-5 GF-5 GG-5 GH-5 GI-5 GJ-5 GK-5 GL-5 GM-5 GN-5 GO-5 GP-5 GQ-5 GR-5 GS-5 GT-5
GS-8 GT-8
GR-9 GS-9 GT-9 GU-9
GQ-10 GR-10 GS-10 GT-11
GP-11 GQ-11 GR-11
GO-12 GP-12 GQ-12
GO-13 GP-13 GQ-13
GO-14 GP-14
Ex: XRF = 6014-01, 7/14/15, 1620, 0-5 cm, DW
Proposed In Situ XRF Measurements
N
FEET
0 50 100
Bluff G Boundary
Reclaimed Areas
NAD_1983_STATEPLANE SOUTH_DAKOTA NORTH_FIPS_4001_FEET
Prepared for:
Prepared by:
TETRA TECH
3801 Automation Way Suite 100
Fort Collins, Colorado 80525
(970)223-9600 (970)223-7171 fax
Title:
BLUFF G
XRF FIELD MAP
Location:
HARDING COUNTY, SD
Project no:
114-560486A
Date:
JUNE 2015
Figure:
Figure B

Sampler ID: ~~B~~ Daniel Workman Study Area: BLUFF 6

XRF ID: 84208 Field Conditions: _____

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
U	GU-9	1087595.962	747895.8729		7/14/~~2~~	~~8~~ 1448	44			

Sampler ID: Daniel Workman Study Area: BLUFF G

XRF ID: 84208 Field Conditions:

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
T	GT-4	1087563.153	748059.9149		7/14/15	1452	35	1452		
	GT-5	1087563.153	748027.1065			1456	65	1456		
	GT-8	1087563.153	747928.6813			1500	46			
	GT-9	1087563.153	747895.8729			1504	135			
	GT-~~11~~ 10	1087563.153	747863.0645			1508	93			

Sampler ID: Daniel Workman Study Area: BLUFF 6

XRF ID: 84208 Field Conditions:

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
S	GS-3	1087530.345	748092.7233		7/14/15	1534	52			
	GS-4	1087530.345	748059.9149			1530	50			
	GS-5	1087530.345	748027.1065			1526	22			
	GS-8	1087530.345	747928.6813			1521	159			
	GS-9	1087530.345	747895.8729			1517	230			
	GS-10	1087530.345	747863.0645			1513	73			Moved, rock outcrop

Sampler ID: Daniel Workman

XRF ID: 84208

Study Area: BLUFF 6

Field Conditions:

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
R	GR-3	1087497.536	748092.7233		7/14/15	1543	29			
	GR-4	1087497.536	748059.9149			1547	38			May be labeled GR-3 in XRF
	GR-5	1087497.536	748027.1065			1551	70			Moved slightly veg
	GR-9	1087497.536	747895.8729			1600	206			Accidentally hit trigger again-ignore and GR-9
	GR-10	1087497.536	747863.0645			1605	270		Y	XRF-GR10-01
	GR-11	1087497.536	747830.2561			1615	92			

Sampler ID: Daniel Workman Study Area: BLUFF G

XRF ID: 84208 Field Conditions:

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
Q	GQ-2	1087464.728	748125.5317		7/14/15	1707	18			
	GQ-3	1087464.728	748092.7233			1702	58			
	GQ-4	1087464.728	748059.9149			1650	33			
	GQ-5	1087464.728	748027.1065			1645	106			
	GQ-6	1087464.728	747994.2981			1640	69			
	GQ-10	1087464.728	747863.0645			1635	308	282		Below sandstone overhang
	GQ-11	1087464.728	747830.2561			1630	42			
	GQ-12	1087464.728	747797.4477			1626	50			
	GQ-13	1087464.728	747764.6393			1622	96			

Sampler ID: Daniel Workman Study Area: BLUFFG

XRF ID: 84208 Field Conditions:

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
	GP-2	1087431.92	748125.5317		7/14/15	1712	19			
	GP-3	1087431.92	748092.7233			1716	15			
	GP-4	1087431.92	748059.9149			1721	190			
	GP-5	1087431.92	748027.1065			1725	128			
P	GP-6	1087431.92	747994.2981			~~1740~~ 1730	~~105~~ 119	~~106~~ ~~96~~ 38 ~~76~~		
	GP-11	1087431.92	747830.2561			1740 ~~1740~~	105 ~~119~~			
	GP-12	1087431.92	747797.4477			1745	~~55~~ 59			
	GP-13	1087431.92	747764.6393			1750	91			
	GP-14	1087431.92	747731.8309			1800	72	72, 71, 66 68, 66, 67 64		Precision Check

Sampler ID: Daniel Workman Study Area: BLUFF 6

XRF ID: 84208 Field Conditions: 91° F, Partly Sunny

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
O	GO-2	1087399.111	748125.5317		7/14/15	1840	67			
	GO-3	1087399.111	748092.7233			1835	103			
	GO-4	1087399.111	748059.9149			1831	147			
	GO-5	1087399.111	748027.1065			1827	212			
	GO-6	1087399.111	747994.2981			1823	244			Just off N side of Bluff
	GO-12	1087399.111	747797.4477			1819	67			Top, just beside retaining top soil
	GO-13	1087399.111	747764.6393			1815	57			
	GO-14	1087399.111	747731.8309		↓	1810	145	162	Y	XRF-GO14-01

Sampler ID: DW

XRF ID: 84208

Study Area: Bluff G

Field Conditions: Sunny, 90°, clear, windy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
G	GG-1	1087136.644	748158.3401	YES	7/14/15	1922	102	-	-	-
	GG-2	1087136.644	748125.5317	YES	7/14/15	1919	220	-	-	-
	GG-3	1087136.644	748092.7233	YES	7/14/15	1915	77	-	-	-
	GG-4	1087136.644	748059.9149	YES	7/14/15	1911	132	-	-	-
	GG-5	1087136.644	748027.1065	YES	7/14/15	1909	96	-	-	-
	GG-6	1087136.644	747994.2981	YES	7/14/15	1905	198	-	-	-

Sampler ID: DW

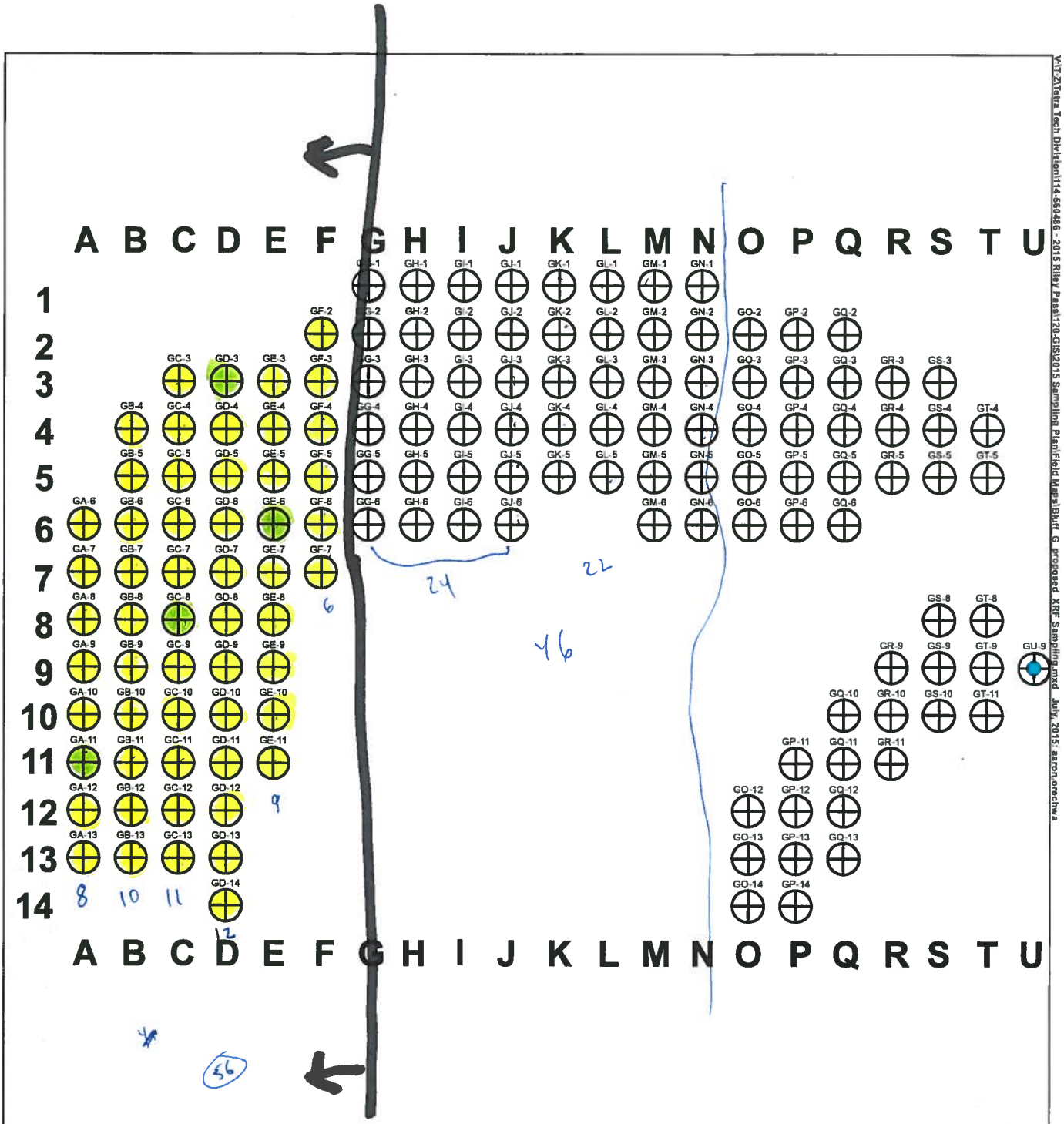
XRF ID: 84208

Study Area: Bluff G

Field Conditions: Sunny, 90°, windy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
H	GH-1	1087169.452	748158.3401	Yes	7/14/15	1928	103	-	-	-
	GH-2	1087169.452	748125.5317	Yes	7/14/15	1930	94	-	-	-
	GH-3	1087169.452	748092.7233	Yes	7/14/15	1935	134	-	-	-
	GH-4	1087169.452	748059.9149	Yes	7/14/15	1939	205	-	-	-
	GH-5	1087169.452	748027.1065	Yes	7/14/15	1943	234	-	-	-
	GH-6	1087169.452	747994.2981	Yes	7/14/15	1946	532	-	-	-



FEET
0 50 100

NAD_1983_STATEPLANE
SOUTH_DAKOTA
NORTH_FIPS_4001_FEET

Bluff G Boundary
Reclaimed Areas

Prepared for: USFS

Prepared by: TETRA TECH
3801 Automation Way Suite 100
Fort Collins, Colorado 80525
(970)223-9600 (970)223-7171 fax

Title:
BLUFF G
XRF FIELD MAP

Location: HARDING COUNTY, SD

Project no.: 114-560486A

Date: JUNE 2015

Figure: Figure B

Sampler ID: AO

XRF ID: 31094

Study Area: BLUFF G

Field Conditions: Cloudy, 90°

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
A	GA-6	1086939.794	747994.2981	Y	7/14/15	1504	56	-	-	-
	GA-7	1086939.794	747961.4897			1500	59	-	-	-
	GA-8	1086939.794	747928.6813			1458	45	-	-	-
	GA-9	1086939.794	747895.8729			1455	61	-	-	-
	GA-10	1086939.794	747863.0645			1451	126	-	-	-
	GA-11	1086939.794	747830.2561			1446	59	52	Y	XRF - GA11-01 in sand gully
	GA-12	1086939.794	747797.4477			1441	104	-	-	-
	GA-13	1086939.794	747764.6393			1438	59	-	-	-

Sampler ID: AO

XRF ID: 37094

Study Area: Bluff G

Field Conditions: partly Cloudy, 85°

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
B	GB-4	1086972.602	748059.9149	Y	7/14/15	1512	78	-	-	-
	GB-5	1086972.602	748027.1065			1515	44	-	-	-
	GB-6	1086972.602	747994.2981			1518	40	-	-	-
	GB-7	1086972.602	747961.4897			1520	77	-	-	-
	GB-8	1086972.602	747928.6813			1523	135	-	-	-
	GB-9	1086972.602	747895.8729			1528	80	-	-	-
	GB-10	1086972.602	747863.0645			1532	82	-	-	-
	GB-11	1086972.602	747830.2561			1536	47	-	-	-
	GB-12	1086972.602	747797.4477			1539	77	-	-	-
	GB-13	1086972.602	747764.6393			1543	160	-	-	-

Sampler ID: AO

XRF ID: 31094

Study Area: Bluff G

Field Conditions: 90° sunny

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
C	GC-3	1087005.41	748092.7233	Y	7/14/15	1638	99	-	-	-
	GC-4	1087005.41	748059.9149			1634	115	-	-	-
	GC-5	1087005.41	748027.1065			1629	58	-	-	-
	GC-6	1087005.41	747994.2981			1625	48	-	-	-
	GC-7	1087005.41	747961.4897			1621	58	-	-	-
	GC-8	1087005.41	747928.6813			1616	117	-	-	-
	GC-9	1087005.41	747895.8729			1609	149	141	Y	XRF-EC9-01
	GC-10	1087005.41	747863.0645			1602	78	-	-	-
	GC-11	1087005.41	747830.2561			1558	78	-	-	-
	GC-12	1087005.41	747797.4477			1553	72	-	-	-
	GC-13	1087005.41	747764.6393			1550	75	-	-	-

7/14/15
1655

XRF: S/N 31904

GD-3 Replicate

① 143 (primary)
② 149 (dup)
③ 158
④ 149
⑤ 146
⑥ 150
⑦ 154

All labeled GD-3 on XRF file

– EG + EH ON BACK –

Sampler ID: AO
XRF ID: 31094

Study Area: Bluff G
Field Conditions: 90° sunny

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
D	GD-3	1087038.219	748092.7233	Yes	7/14/15	1655	143	149		XRF-GD3-01 ~~XRF-GD3-02~~
	GD-4	1087038.219	748059.9149			1703	55	–	–	–
	GD-5	1087038.219	748027.1065			1706	51	–	–	–
	GD-6	1087038.219	747994.2981			1711	200	–	–	moved out of tense veg
	GD-7	1087038.219	747961.4897			1714	73	–	–	–
	GD-8	1087038.219	747928.6813			1718	60	–	–	–
	GD-9	1087038.219	747895.8729			1722	119	–	–	–
	GD-10	1087038.219	747863.0645			1725	93	–	–	–
	GD-11	1087038.219	747830.2561			1731	78	–	–	Difficult terrain
	GD-12	1087038.219	747797.4477			1736	66	–	–	"
	GD-13	1087038.219	747764.6393			1740	57	–	–	"
	GD-14	1087038.219	747731.8309			1748	49	–	–	"

Sampler ID: AO

XRF ID: 31094

Study Area: Bluff G

Field Conditions: 90° sunny

TETRA TECH

check after lab to compare < 142

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
E	GE-3	1087071.027	748092.7233	Y	7/19/15	1917	51			
	GE-4	1087071.027	748059.9149			1921	118			
	GE-5	1087071.027	748027.1065			1925	124			dense veg!
	GE-6	1087071.027	747994.2981			1930	101	101		XRF-GE6-01
	GE-7	1087071.027	747961.4897			1936	62	-	-	-
	GE-8	1087071.027	747928.6813			1820	69			
	GE-9	1087071.027	747895.8729			1815	204	-	-	-
	GE-10	1087071.027	747863.0645			1806	88	-	-	-
	GE-11	1087071.027	747830.2561			1800	117	-	-	-

Battery change at 1825

New Cal check

120s 172.1

time 56.2

Sampler ID: AO

XRF ID: 31094

Study Area: Bluff G

Field Conditions: 90° Sunny

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
F	GF-2	1087103.836	748125.5317	Yes	7/14/15	1913	119			
	GF-3	1087103.836	748092.7233			1900	122	-	-	-
	GF-4	1087103.836	748059.9149			1856	63	-	-	-
	GF-5	1087103.836	748027.1065			1848	214	-	-	-
	GF-6	1087103.836	747994.2981	-		1841	82	-	-	-
	GF-7	1087103.836	747961.4897			1837	93	-	-	-

Combined with GE transect

Sampler ID: DW, JG

XRF ID: 31177

Study Area: Bldg I

Field Conditions: 84°F, Sunny

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
A	IA-11	1086770.625	747163.0973	X	7/14/15	16:45	17	–	–	–
	IAA-13	1087623.644	747097.4805	–	7/15/15	12:15	19	–	–	–
	IAA-14	1087623.644	747064.6721	–	"	12:18	21	–	–	–
	IAA-15	1087623.644	747031.8637	–		12:21	23	–	–	–
	IAA-16	1087623.644	746999.0553	–		12:38	26	28	Y	XRF-IAA16-01
	IAA-17	1087623.644	746966.2469	–		12:42	19	–	–	–
	IAA-18	1087623.644	746933.4385	–	↓	12:45	21	–	–	–

Sampler ID: PW/JG

XRF ID: 31177

Study Area: BLUFF I

Field Conditions: SUNNY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
B	IB-11	1086803.434	747163.0973		7/16/15	1642	19	-	-	-
	IBB-14	1087656.452	747064.6721		7/15/15	1211	35	-	-	-
	IBB-15	1087656.452	747031.8637			1208	17	-	-	-
	IBB-16	1087656.452	746999.0553			1204	24	-	-	-
	IBB-17	1087656.452	746966.2469			1202	27	-	-	-
	IBB-18	1087656.452	746933.4385			1157	21	-	-	-

Sampler ID: DW / JG
XRF ID: 3477
Study Area: BLUFF I
Field Conditions: SUNNY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
C	IC-9	1086836.242	747228.7141		7/16/15	16:30	82			
	IC-10	1086836.242	747195.9057			16:32	53			
	IC-11	1086836.242	747163.0973			16:35	150			Blackish soil along roadway, below hill IC-12
	IC-12	1086836.242	747130.2889			16:40	19			
	ICC-15	1087689.26	747031.8637		7/16/15	11:48	22			
	ICC-16	1087689.26	746999.0553			11:50	22			
	ICC-17	1087689.26	746966.2469			11:52	19			MAYBE ID WRONG IN XRF
	ICC-18	1087689.26	746933.4385			11:54	19			

Sampler ID: DW/JG
XRF ID: 31177

Study Area: BLUFF I
Field Conditions: _____

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
D	ID-4	1086869.05	747392.7561		7/14/15	16:28	51	-	-	-
	ID-5	1086869.05	747359.9477			16:25	74	-	-	-
	ID-6	1086869.05	747327.1393			16:21	35	-	-	-
	ID-10	1086869.05	747195.9057			16:19	76	-	-	-
	ID-11	1086869.05	747163.0973			14:17	52	-	-	-
	ID-12	1086869.05	747130.2889			14:15	27	-	-	-
	IDD-15	1087722.069	747031.8637		7/15/16	1146	22	-	-	ERROR GPS = 23, should be 24
	IDD-16	1087722.069	746999.0553			1144	34	-	-	Below Road
	IDD-17	1087722.069	746966.2469			1142	17	-	-	Between ROAD
	IDD-18	1087722.069	746933.4385			1140	32	-	-	ABOVE ROAD

Sampler ID: DANIEL/JORGE Study Area: BLUFF-I

XRF ID: 31177 Field Conditions:

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
E	IE-2	1086901.859	747458.3729		7/10/15	15:24	23	–	–	–
	IE-3	1086901.859	747425.5645			15:26	17	–	–	–
	IE-4	1086901.859	747392.7561			15:30	58	–	–	–
	IE-5	1086901.859	747359.9477			15:32	75	–	–	–
	IE-6	1086901.859	747327.1393			15:35	38	–	–	GPS Batt died Lost on IE-6 May have lost point
	IE-7	1086901.859	747294.3309			16:02	198	–	–	–
	IE-11	1086901.859	747163.0973			16:06	52	–	–	–
	IE-12	1086901.859	747130.2889			16:08	35	36	–	X –
	IEE-15	1087754.877	747031.8637		7/15/15	1139	25	–	–	–
	IEE-16	1087754.877	746999.0553			1136	23	–	–	OTHR SIDE OF ROAD
	IEE-17	1087754.877	746966.2469			1134	23	–	–	Right off road
	IEE-18	1087754.877	746933.4385			1132	18	–	–	–

155-11 N of IE-7 1604 224

Sampler ID: DANIEL/JORGE Study Area: BLUFF E

XRF ID: 31177 Field Conditions: 84°F, SUNNY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
F	IF-2	1086934.667	747458.3729		7/16/15	1521	11			
	IF-3	1086934.667	747425.5645			15:17	13	-	-	-
	IF-4	1086934.667	747392.7561			15:13	18	-	-	-
	IF-5	1086934.667	747359.9477			15:10	35	-	-	-
	IF-6	1086934.667	747327.1393			15:06	57	-	-	-
	IF-7	1086934.667	747294.3309			15:00	212	-	-	-
	IF-8	1086934.667	747261.5225			~~14~~:55	353 ~~359~~	~~361~~, 353, 341 360, 361, 340 338, 294	Y	XRF-IF8-01 PRECISION TEST
	IFF-16	1087787.686	746999.0553		7/~~15~~16/15	1130	23	-	-	-
	IFF-17	1087787.686	746966.2469			1128	37	-	-	-
	IFF-18	1087787.686	746933.4385			1125	17	-	-	-

Sampler ID: DW/SG

XRF ID: 31177

Study Area: BLUFF I

Field Conditions: SUNNY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
G	IG-3	1086967.476	747425.5645		7/16/15	1413	51	—	—	—
	IG-4	1086967.476	747392.7561			1415	55	—	—	—
	IG-5	1086967.476	747359.9477			1417	45	—	—	—
	IG-6	1086967.476	747327.1393			1421	43	50	—	XRF-166-01
	IG-7	1086967.476	747294.3309			1435	138	—	—	—
	IG-8	1086967.476	747261.5225			1437	71	—	—	—
	IG-9	1086967.476	747228.7141			1441	111			
	155-10					1445	66			

8 of 16-9

Sampler ID: PW/JG
XRF ID: 3177

Study Area: BLUFF I
Field Conditions: SUNNY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
H	IH-4	1087000.284	747392.7561		7/14/15	1409 ~~1345~~	~~50~~ 49	39 ~~38~~	~~Y~~	~~XRF-IH4-01~~
	IH-5	1087000.284	747359.9477			~~1355~~ 1407	~~237~~ 39	–	–	–
	IH-6	1087000.284	747327.1393			1405	20	–	–	–
	IH-7	1087000.284	747294.3309			1402	88	–	–	–
	IH-8	1087000.284	747261.5225			1400	123	–	–	–
	IH-9	1087000.284	747228.7141			1355	237	–	–	Labeled IH-5 in GPS, but LOC is OK
	IH-10	1087000.284	747195.9057			1345	50	39 Ap	Y	XR4-IH10-01

labeled ~~IH-4~~-5 01 in ~~XRF~~ GPS

?

Sampler ID: DW/JG

XRF ID: 31177

Study Area: BLUFF I

Field Conditions: SUNNY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
1	II-4	1087033.092	747392.7561		7/16/15	1328	30	—	—	—
	II-5	1087033.092	747359.9477			1332	36	—		—
	II-6	1087033.092	747327.1393			1334	23	—	—	—
	II-7	1087033.092	747294.3309			1336	44	—	—	Accidental trigger fire on 2nd "II-6"
	II-8	1087033.092	747261.5225			1340	35	—	—	—

Sampler ID: DW & SG

XRF ID: 31177

Study Area: I

Field Conditions: Sunny

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
J	IJ-4	1087065.901	747392.7561	–	7/16/19	13:27 ~~12:05~~	33 ~~17~~	–	–	–
	IJ-5	1087065.901	747359.9477	–		~~13:07~~ 13:25	13 ~~75~~	–	–	–
	IJ-6	1087065.901	747327.1393			13:21	24	–	–	–
	IJ-7	1087065.901	747294.3309			13:18	36	–	–	–
	IJ-8	1087065.901	747261.5225			13:15	30	–	–	–
	IJ-10	1087065.901	747195.9057			12:15	52	–	–	–
	IJ-11	1087065.901	747163.0973			12:13 ~~12:10~~	~~53~~ 54	–	–	–
	IJ-12	1087065.901	747130.2889			12:10	71	–	–	–
	IJ-13	1087065.901	747097.4805			12:07	75	–	–	–
	IJ-14	1087065.901	747064.6721			12:05	17	–	–	–

Sampler ID: DW & JG

XRF ID: 31177

Study Area: I

Field Conditions: Sunny, wdy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
K	IK-9	1087098.709	747228.7141		7/16/15	11:45	88	—	—	—
	IK-10	1087098.709	747195.9057			11:48	39	—	—	—
	IK-11	1087098.709	747163.0973			11:50	104	—	—	—
	IK-12	1087098.709	747130.2889			11:53	95	—	—	—
	IK-13	1087098.709	747097.4805			11:54	39	—	—	—
	IK-14	1087098.709	747064.6721		↓	11:57	44	—	—	—

Sampler ID: DW, JG

XRF ID: 31177

Study Area: _____

Field Conditions: Sunny, light wind

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
L	IL-9	1087131.518	747228.7141	–	7/16/15	11:43	14	–	–	–
	IL-10	1087131.518	747195.9057			11:41	40	–	–	–
	IL-11	1087131.518	747163.0973			11:38	99	–	–	–
	IL-12	1087131.518	747130.2889			11:36	96	–	–	–
	IL-13	1087131.518	747097.4805			11:33	49	–	–	–
	IL-14	1087131.518	747064.6721			11:31	13	–	–	–

Sampler ID: DW & JG

XRF ID: 31177

Study Area: I

Field Conditions: Sunny, light Wind

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
M	IM-8	1087164.326	747261.5225	-	7/16/15	11:15	86	—	—	—
	IM-9	1087164.326	747228.7141			11:17	21	—	—	—
	IM-10	1087164.326	747195.9057			11:19	31	—	—	—
	IM-11	1087164.326	747163.0973			11:21	61	—	—	—
	IM-12	1087164.326	747130.2889			11:25	57	—	—	—
	IM-13	1087164.326	747097.4805		↓	11:28	54	—	—	—

Sampler ID: DU/JG

XRF ID: 31172

Study Area: I

Field Conditions: Sunny

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
N	IN-8	1087197.134	747261.5225		7/14/15	11:10	38	–	–	~~Point taken Due to~~ Points switched in GPS Unit.
	IN-9	1087197.134	747228.7141			11:08	40	–	–	
	IN-10	1087197.134	747195.9057			11:05	43	–	–	~~Dry~~ on Road edge
	IN-11	1087197.134	747163.0973			10:58	109	–	–	–
	IN-12	1087197.134	747130.2889			10:56	64	–	–	–
	IN-13	1087197.134	747097.4805	–		10:52 ~~52~~	101	–	–	–

ISS-9		11:02	133

first point shot in GPS didn't have As value so Delete.

Sampler ID: PW/JG
XRF ID: 31177

Study Area: BLUFF I
Field Conditions: SUNNY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
	IO-1	1087229.943	747491.1813	~	7/16/16	10:17	58	-	-	~
	IO-2	1087229.943	747458.3729	~		10:20	15	-	-	-
	IO-7	1087229.943	747294.3309	-		10:24	19	-	-	-
	IO-8	1087229.943	747261.5225	-		10:27	34	-	-	-
O	IO-9	1087229.943	747228.7141			10:30	47	-	-	-
	IO-10	1087229.943	747195.9057			10:33	39	-	-	-
	IO-11	1087229.943	747163.0973			10:35	141	-	-	-
	IO-12	1087229.943	747130.2889			10:37	142	156	Yes	XRF-IO12-01
	IO-13	1087229.943	747097.4805			10:45	20	-	-	~

Soil Bulk Section

*Entered 141 instead of 142 in GPS

I 55-8 is between IO-12 & IO-13

AS	61	Time	48

Sampler ID: DW/JG
XRF ID: 31177

Study Area: BLUFF I
Field Conditions: SUNNY,

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
	IP-1	1087262.751	747491.1813		7/19/16	1000	119	-	-	BLUFF G PARKING, PULL OF DIRECT UNDER BLUFF G
	IP-2	1087262.751	747458.3729			955	44	55	Y	XRF-IP2-01
	IP-3	1087262.751	747425.5645	Y		953	60	-	-	MOVED N, ROCK/CLIFF SEE PHOTO
	IP-4	1087262.751	747392.7561			948	24	-	-	-
	IP-5	1087262.751	747359.9477			946	26	-	-	-
	IP-6	1087262.751	747327.1393			944	26	-	-	-
P	IP-7	1087262.751	747294.3309			942	34	-	-	-
	IP-8	1087262.751	747261.5225			939	30	-	-	MARKED AS IP-8 in XRF
	IP-9	1087262.751	747228.7141			937	23	-	-	-
	IP-10	1087262.751	747195.9057			934	64	-	-	-
	IP-11	1087262.751	747163.0973			931	46	-	-	-
	IP-12	1087262.751	747130.2889			925	68	-	-	DUPLICATE ABANDONED, INCONSISTENT SOIL
	IP-13	1087262.751	747097.4805	-		923	20	-	-	-

ISS-5A
ISS-6
ISS-7

1005 84
1008 18
1018 55

- -

Sampler ID: DW
XRF ID: 31177

Study Area: BLUFF I
Field Conditions: CLOUDY BREEZY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
Q	IQ-1	1087295.56	747491.1813		7/15/15	1820	27	-	-	-
	IQ-2	1087295.56	747458.3729			1822	29	-	-	-
	IQ-3	1087295.56	747425.5645			1825	11	-	~~X~~	~~XRF-IQ3-01~~ -
	IQ-4	1087295.56	747392.7561			1830	24	-	-	-
	IQ-5	1087295.56	747359.9477			1835	14	-	-	-
	IQ-6	1087295.56	747327.1393			1837	28	-	-	-
	IQ-7	1087295.56	747294.3309			1840	32	-	-	-
	IQ-8	1087295.56	747261.5225			1842	41	-	-	-
	IQ-9	1087295.56	747228.7141			1845	39	33	-	XRF-IQ9-01
	IQ-10	1087295.56	747195.9057			1848	43	-	-	-
	IQ-11	1087295.56	747163.0973			1852	63	-	-	-
	IQ-12	1087295.56	747130.2889			1855	59	-	-	-
	IQ-13	1087295.56	747097.4805		↓	1858	65	-	-	EXPOSED LIGNITE VISIBLE IN LAYERS ON N-SIDE IQ-13

1700 217
1705 LOD < 7.0

155-4
155-5

Sampler ID: DW/JG
XRF ID: 31177

Study Area: BLUFF I
Field Conditions: CLOUDY BREEZY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
R	IR-1	1087328.368	747491.1813	-	7/15/25	~~1735~~ 1818	~~23~~ 51	-	-	-
	IR-2	1087328.368	747458.3729			1816	25	-	-	-
	IR-3	1087328.368	747425.5645			1815	32	-	-	-
	IR-4	1087328.368	747392.7561			1810	15	17	Y	XRF-IR4-01
	IR-5	1087328.368	747359.9477			1807	28	-	* -	-
	IR-6	1087328.368	747327.1393			1805	26	-	-	-
	IR-7	1087328.368	747294.3309			1802	24	-	-	-
	IR-8	1087328.368	747261.5225			1800	27	-	-	-
	IR-9	1087328.368	747228.7141			1750	30	-	-	-
	IR-10	1087328.368	747195.9057			1748	39	-	-	-
	IR-11	1087328.368	747163.0973			1745	24	-	-	-
	IR-12	1087328.368	747130.2889			1742	62	-	-	-
	IR-13	1087328.368	747097.4805			1735	253	-	-	-

155 - 2
155 - 3

1737 12
1740 ND
LOD 11.6

Sampler ID: DW/SG
XRF ID: 31177

Study Area: BLUFF I
Field Conditions: cloudy Breezy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
S	IS-1	1087361.176	747491.1813	-	7/15/15 ~~8455~~	1655	29	-	-	-
	IS-2	1087361.176	747458.3729	-	7/15/15	1658	59	-	-	-
	IS-3	1087361.176	747425.5645	-		1700	40	-	-	-
	IS-4	1087361.176	747392.7561	-		1703	22	-	-	-
	IS-5	1087361.176	747359.9477	-		1705	56	-		
	IS-6	1087361.176	747327.1393	-		1707	38	46	Y	XRF-IS6-01
	IS-7	1087361.176	747294.3309	-		1713	47	-	-	-
	IS-8	1087361.176	747261.5225	-		1716	29	-	-	-
	IS-9	1087361.176	747228.7141	-		1718	60	-	-	-
	IS-10	1087361.176	747195.9057			1720	20	-	-	-
	IS-11	1087361.176	747163.0973			1724	43	-	-	-
	IS-12	1087361.176	747130.2889			1726	709	-	-	-
	IS-13	1087361.176	747097.4805			1730	20	-	-	-

IS5-1

1728 29

Edge between Native & black/dark soil

Sampler ID: DW/JG
XRF ID: 31177

Study Area: BLUFF I
Field Conditions: Breezy, Cloudy

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
T	IT-1	1087393.985	747491.1813			1653	29	—	-	—
	IT-2	1087393.985	747458.3729			1650	52	-	—	—
	IT-3	1087393.985	747425.5645			1647	56	-	—	—
	IT-4	1087393.985	747392.7561			1645	27	-	-	—
	IT-5	1087393.985	747359.9477			1643	15	-	-	—
	IT-6	1087393.985	747327.1393			1640	35	<	—	—
	IT-7	1087393.985	747294.3309			1637	13	-	-	—
	IT-8	1087393.985	747261.5225			1635	30	-	-	—
	IT-9	1087393.985	747228.7141			1633	23	-	-	—
	IT-10	1087393.985	747195.9057			1631	18	-	-	—
	IT-11	1087393.985	747163.0973			1629	24	-	-	—
	IT-12	1087393.985	747130.2889			1627	22	-	-	—
	IT-13	1087393.985	747097.4805			1625	21	-	-	—

Sampler ID: DW/SG

XRF ID: 31177

Study Area: BLUFF I

Field Conditions: Thunderstorms building

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
U	IU-3	1087426.793	747425.5645	–	7/15/15	1530	25	–	–	–
	IU-4	1087426.793	747392.7561	–		1533	23	–	–	–
	IU-5	1087426.793	747359.9477	–		1536	20	–	–	–
	IU-6	1087426.793	747327.1393	–		1539	22	–	–	–
	IU-7	1087426.793	747294.3309	–		1541	18	–	–	–
	IU-8	1087426.793	747261.5225	–		1543	14	–	–	–
	IU-9	1087426.793	747228.7141	–		1545	18	–	–	–
	IU-10	1087426.793	747195.9057	–		1548	25	–	–	–
	IU-11	1087426.793	747163.0973	–		1551	24	–	–	–
	IU-12	1087426.793	747130.2889	–		1553	20	–	–	–
	IU-13	1087426.793	747097.4805	–	↓	1555	19	–	–	–

Sampler ID: DW/SG

XRF ID: 31177

Study Area: BLUFF I

Field Conditions: _____

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID	
V	IV-6	1087459.602	747327.1393	–	7/15/15	1528	25	–	–	–	
	IV-7	1087459.602	747294.3309	–		1524	12	–	–	–	
	IV-8	1087459.602	747261.5225	–		1521	12	–	–	–	
	IV-9	1087459.602	747228.7141	–		1507	24	23 (PR 24,23 21,24 26,21,25)	Y Dup	XRF-IV9-01 XRF-IV9-02	Precision check
	IV-10	1087459.602	747195.9057	–		1458	13	–	–	–	
	IV-11	1087459.602	747163.0973	–		1455	20	–	–	–	
	IV-12	1087459.602	747130.2889	–		1453	22	–	–	–	
	IV-13	1087459.602	747097.4805	–	↓	1451	23	–	–	–	

Sampler ID: DW/SG

XRF ID: 31177

Study Area: BLUFF 6

Field Conditions: _____

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
W	IW-7	1087492.41	747294.3309	~	7/15/15	1431	18	~	~	~
	IW-8	1087492.41	747261.5225	~		1434	18	~	~	~
	IW-9	1087492.41	747228.7141	~		1438	20	~	~	~
	IW-10	1087492.41	747195.9057	~		1441	22	~	~	~
	IW-11	1087492.41	747163.0973	~		1444	24	~	~	~
	IW-12	1087492.41	747130.2889	~		1447	25	~	~	~
	IW-13	1087492.41	747097.4805	~	↓	1450	20	~	~	~

Sampler ID: DW/JG
XRF ID: 31177

Study Area: BLUFF I
Field Conditions: 84 SUNNY

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
X	IX-9	1087525.218	747228.7141	–	7/15/15	1428	14	–	–	–
	IX-10	1087525.218	747195.9057	–		1425	19	–		
	IX-11	1087525.218	747163.0973	–		1422	12	–	–	–
	IX-12	1087525.218	747130.2889	–		1420	22	–	–	–
	IX-13	1087525.218	747097.4805	–		1417	32	31	Y	XRF-IX13-01
	IX-14	1087525.218	747064.6721	–		1414	19	–	–	–
	IX-15	1087525.218	747031.8637	–		1411	24	–	–	–
	IX-16	1087525.218	746999.0553	–		1408	18	–	–	–

Sampler ID: DANIEL / JORGE
XRF ID: 31177
Study Area: BLUFF I
Field Conditions: ~~94°F~~ Partly Sunny 84°F

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
Y	IY-11	1087558.027	747163.0973	–	7/15/15	13:07	22	–	–	–
	IY-12	1087558.027	747130.2889	–		13:11	26	–	–	Steep area with Rock/weak Rock
	IY-13	1087558.027	747097.4805	–		13:15	20	–	–	–
	IY-14	1087558.027	747064.6721	–		13:18	28	–	–	–
	IY-15	1087558.027	747031.8637	–		13:20	19	–	–	–
	IY-16	1087558.027	746999.0553	–		13:22	17	–	–	–
	IY-17	1087558.027	746966.2469	–		13:24	24	–	–	–

Sampler ID: DW JG

XRF ID: 31177

Study Area: BluH I

Field Conditions: 83°

TETRA TECH

Transect	XRF ID	Easting (ft)	Northing (ft)	New GPS (Y/N)	Date	Time	Arsenic (Primary XRF)	Arsenic (Dup XRF)	Soil ? (Y/N)	Soil ID
Z	IZ-12	1087590.835	747130.2889	–	7/15/15	13:04	30	–	–	–
	IZ-13	1087590.835	747097.4805	–		1300	~~25~~ 15	–	–	–
	IZ-14	1087590.835	747064.6721	–		12:57	26	–	–	–
	IZ-15	1087590.835	747031.8637	–		12:54	25	–	–	–
	IZ-16	1087590.835	746999.0553	–		12:52	19	–	–	–
	IZ-17	1087590.835	746966.2469	–		12:50	19	–	–	By the Road
	IZ-18	1087590.835	746933.4385	–	↓	12:48	34	–	–	–

TETRA TECH

Standard Reference Material XRF Calibration Check Sheet

SRM ID: **CCRMP TILL-4PP 180-646**

SRM Arsenic Concentration: **111 mg/kg**

Measurement #	XRF #31094	XRF #31177	XRF #84208
1		102	
2		106	
3		105	
4		101	
5		99	
6		103	
7		103	
8		100	
9		104	
10		101	
Average		102.4	
BLANK (SiO_2 -99.995%)		nd<	

Date	Time
7/13/15	22:00

Measurement #	XRF #31094	XRF #31177	XRF #84208
1	109	113	107
2	94	110	107
3	103	103	99
4	101	103	106
5	99	102	108
6	101	108	100
7	94	104	94
8	104	103	103
9	91	109	104
10	94	104	104
Average	99.0	105.9	103.2
BLANK (SiO_2 -99.995%)	nd<9.6	nd<11.5	nd<8.5

Date	Time
7/14/15	2230

TETRA TECH

Standard Reference Material XRF Calibration Check Sheet

SRM ID: **CCRMP TILL-4PP 180-646**

SRM Arsenic Concentration: **111 mg/kg**

Measurement #	XRF #31094	XRF #31177	XRF #84208
1	97	102	
2	105	95	
3	101	114	
4	103	100	
5	89	103	
6	104	99	
7	101	101	
8	103	108	
9	104	96	
10	98	99	
Average	100.5	101.7	
BLANK	nd	nd	nd

Date	Time
7/15/15	2110

Measurement #	XRF #31094	XRF #31177	XRF #84208
1		97	
2		107	
3		105	
4		107	
5		106	
6		110	
7		113	
8		109	
9		106	
10		99	
Average		105.9	
BLANK	nd	nd	nd

Date	Time
7/16/15	2005

ATTACHMENT E

SCANNED COPIES OF CALIBRATION DOCUMENTATION FOR RADIATION INSTRUMENTS

Designer and Manufacturer of Scientific and Industrial Instruments

MFG-6

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
501 Oak Street
325-235-5494
Sweetwater, TX 79556, U.S.A.

☐ 10744 Dutchtown Road
865-392-4601
Knoxville, TN 37932, U.S.A.

CUSTOMER TETRA TECH MFG, INC. ORDER NO. 20264693/419016

Mfg. Ludlum Measurements, Inc. Model 2350-1 Serial No. 152361

Cal. Date 31-Mar-15 Cal Due Date 31-Mar-16 Cal. Interval 1 Year Meterface N/A

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 35 % Alt 697.8 mm Hg

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical check
☑ F/S Resp. check
☑ Audio check
☑ Ratemeter Linearity check
☑ Data Log check
☑ Reset check
☑ Alarm Setting check
☑ Integrated Dose check
☑ Overload check
☑ Window Operation
☑ Battery check (Min. Volt) 4.4 VDC
☑ Recycle Mode check
☑ Scaler Readout check
☐ Input Sens. Linearity
Threshold Dial Ratio 100 = 10 mV

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.
☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

☑ HV Readout (2 points) Ref./Inst. 500 / 500 V Ref./Inst. 2000 / 2023 V

COMMENTS: *Firmware:* 37122N24 ~~23~~

Resolution for Cs137≈9.96% I/O Firmware: 37123N05

Calibrated with 39" cable.

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

	Probe Model	Serial #	High Voltage	Threshold	Units/ Time Base	Dead Time Correction Factor	Calibration Constant	Linearity ±10%*
Detector # 1	LMI44-10	PR121036	1000	100	4 / 2	1.404815E-05	5.565404E+10	✓
Detector # 2	LMI44-10	PR121036	1000	100	7 / 1	1.404814E-05	1.000000E+00	
Detector # 3	CS137/PK	662KEV	664	642	7 / 1	0.000000E+00	1.000000E+00	
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								

Units: 0 -- rad, 1 -- Gray, 2 -- rem, 3 -- Sv, 4 -- R, 5 -- C/Kg, 6 -- Disintegrations, 7 -- Counts, 8 -- Ci/cm sq., 9 -- Bq/cm sq.

Time Base: 0 -- Seconds, 1 -- Minutes, 2 -- Hours

* See attached detector documentation, if applica

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	400kcpm	40030 101	40030 100	400cpm	40 15	40 19
	40kcpm	3992 1	3992 1	40cpm	4 1	4 1
	4kcpm	400	400			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques
The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 S/N: ☐ 059 ☐ 2171CP ☐ 2261CP ☐ 720 ☐ 734 ☐ 781 ☐ 1131 ☐ 1616 ☐ 1696 ☐ 1909 ☐ 1916CP ☐ 5105 ☐ 5717CO
☐ 5719CO ☐ 60646 ☐ 70897 ☐ 73410 ☐ E552 ☐ G112 ☑ M565 ☐ S-394 ☐ S-1054 ☐ T10081 ☐ T10082 Neutron Am-241 Be S/N: ☐ T-304 Ra-226 S/N: ☐ Y982

☐ Alpha S/N ☐ Beta S/N ☐ Other

☑ m 500 S/N 289158 ☐ Ra-226 S/N Y982 ☑ Multimeter S/N 93870637

Calibrated By: [signature] Date 31-Mar-15

Reviewed By: [signature] Date 1 Apr 15

Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
501 Oak Street
325-235-5494
Sweetwater, TX 79556, U.S.A.

☐ 10744 Dutchtown Road
865-392-4601
Knoxville, TN 37932, U.S.A.

Model 2350 Bench Test Data

Customer TETRA TECH MFG, INC. Date 31-Mar-15 Order #. 20264693/419016

Model 2350-1 Serial No. 152361 Detector 44-10 Serial No. PR121036

Source Cs137 ~1.9 mCi

High Voltage 1000 V As Found 1000 V. Input 10.00 mV As Found 10 mV.

Cal. Constant 5.565404E+10 as found 5.565404E+10

Dead Time 1.404815E-05 as found 1.404815E-05

Alarm Setting: Ratemeter 1000000000.000000 as found 1.0 E+09

Scaler 1000000.000000 as found 1.0 E+06

Integrated dose 1000000000.0000 as found 1.0 E+09

Overload ☐ On ☑ Off as found ☐ On ☑ Off Window 1000 as found 1000

Detector Received: ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

Reference Point	"As Found" Readings: Meter Reading	After Adjustment Readings: Meter Reading
2000 µR/hr	1.92 mR/hr	1.92 mR/hr
1500	1.48	1.48
1000	1.00	1.00
500	492 µR/hr	492 µR/hr
300	193	193
150	144	144
100	96.5	96.5

Other

Signature Jeremy Thompson Date 31-Mar-15

Designer and Manufacturer
of
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LUDLUM MEASUREMENTS, INC.
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Sweetwater, TX 79556, U.S.A.

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Knoxville, TN 37932, U.S.A.

Bench Test Data For Detector

Detector 44-10 Serial No. PR121036

Customer TETRA TECH MFG, INC. Order #. 20264693/419016

Counter 2350-1 Serial No. 152361 Counter Input Sensitivity 10.00 mV

Count Time 6 Seconds Distance Source to Detector Surface

Other Cal Constant = 1.000000E+00 Dead Time = 1.404814E-05

High Voltage	Background	Isotope Am241 Size ~20.00 µCi	Isotope ____ Size ____	Isotope ____ Size ____	Isotope ____ Size ____
900	941	10080			
950	936	10005			
*1000	935	9996			
1050	905	10066			
1100	927	10049			
1150	950	10312			
1200	850	10262			
1250	920	10634			
1300	1209	11101			

Signature Jeremy Thompson Date 5.1.2015

Detector Setup Barcodes GENERATED: 3/31/2015 9:28:17 AM
Model 2350-1 Serial Number: 152361
Detector Setup Number: 1


H1000$E
Set High Voltage: 1000


W1000$WOFF$P
Set Window: 1000,OFF


F12$E
Set Scaler Count Time: 12


SB2$.
Set Readout Time Base: hours


SL1.404815E-05$V
Set Dead Time: 1.404815E-05


SC5.565404E+10$T
Set Calibration Constant: 5.565404E+10


*MLMI44-10$ *
Set High Detector Model: LMI44-10


NPR121036$+
Set High Detector Serial #: PR121036


J1.000000E+09$V
Set High Ratemeter Alarm: 1.000000E+09


K1000000$H
Set High Scaler Alarm: 1000000


P1.000000E+09$.
Set High Dose Alarm: 1.000000E+09


SP1$7

Save Parameters as: D1

T100$Q

Set Threshold: 100

O40.0$OOFF$6

Set Overload: 40.0,OFF

SU4$F

Set Readout Units: R

SM0$3

Set Readout Range Multiplier: Auto

SVD0$P

Set Display Mode: Normal

SVD1$Q

Set Display Mode: Parameters

SVD2$R

Set Display Mode: Detector

D1$A

Set Active Detector Setup: 1

Detector Setup Barcodes GENERATED: 3/31/2015 9:28:18 AM
Model 2350-1 Serial Number: 152361
Detector Setup Number: 2


H1000$E
Set High Voltage: 1000


W1000$WOFF$P
Set Window: 1000,OFF


F6$H
Set Scaler Count Time: 6


SB1$-
Set Readout Time Base: minutes


SL1.404814E-05$U
Set Dead Time: 1.404814E-05


SC1.000000E+00$0
Set Calibration Constant: 1.000000E+00


*MLMI44-10$ *
Set High Detector Model: LMI44-10


NPR121036$+
Set High Detector Serial #: PR121036


J1.000000E+09$V
Set High Ratemeter Alarm: 1.000000E+09


K1000000$H
Set High Scaler Alarm: 1000000


P1.000000E+09$.
Set High Dose Alarm: 1.000000E+09


SP2$8

Save Parameters as: D2

T100$Q

Set Threshold: 100

O40.0$OOFF$6

Set Overload: 40.0,OFF

SU7$I

Set Readout Units: c

SM0$3

Set Readout Range Multiplier: Auto

SVD0$P

Set Display Mode: Normal

SVD1$Q

Set Display Mode: Parameters

SVD2$R

Set Display Mode: Detector

D2$B

Set Active Detector Setup: 2

Detector Setup Barcodes GENERATED: 3/31/2015 9:28:19 AM
Model 2350-1 Serial Number: 152361
Detector Setup Number: 3


H664$T
Set High Voltage: 664


W40WONL
Set Window: 40,ON


F6$H
Set Scaler Count Time: 6


SB1$-
Set Readout Time Base: minutes


SL0.000000E+00$8
Set Dead Time: 0.000000E+00


SC1.000000E+00$0
Set Calibration Constant: 1.000000E+00


MCS137/PK$P
Set High Detector Model: CS137/PK


N662KEV$C
Set High Detector Serial #: 662KEV


J1.000000E+09$V
Set High Ratemeter Alarm: 1.000000E+09


K1000000$H
Set High Scaler Alarm: 1000000


P1.000000E+09$.
Set High Dose Alarm: 1.000000E+09


SP3$9

Save Parameters as: D3

T642$.
Set Threshold: 642

O40.0$OOFF$6
Set Overload: 40.0,OFF

SU7$I
Set Readout Units: c

SM0$3
Set Readout Range Multiplier: Auto

SVD0$P
Set Display Mode: Normal

SVD1$Q
Set Display Mode: Parameters

SVD2$R
Set Display Mode: Detector

D3$C
Set Active Detector Setup: 3

Detector Setup Checklist GENERATED: 3/31/2015 9:28:25 AM
Model 2350-1 Serial Number: 152361
Detector Setup Number: 1

The following list is stored as detector setup D1 in the Model 2350.

I have verified the list below has no discrepancies with the detector settings table: _____JS_____

Comments:

User ID	=
High Voltage	= 1000 volts
Threshold	= 100
Window	= 1000,OFF
Overload Current	= 40.0 micro amperes
Scaler Count Time	= 12 seconds
Readout Units	= R
Readout Time Base	= hours
Readout Range Multiplier	= Auto
Detector Dead Time	= 1.404815E-05
Detector Calibration Constant	= 5.565404E+10
Detector Model Number	= LMI44-10
Detector Serial Number	= PR121036
Ratemeter Alarm Setting	= 1.000000E+09
Scaler Alarm Setting	= 1000000
Integrated Dose Alarm Setting	= 1.000000E+09
Low Count Alarm Setting	= 0.000000E+00
Operating Batter Voltage	= 5.2 volts

Detector Setup Checklist GENERATED: 3/31/2015 9:28:26 AM
Model 2350-1 Serial Number: 152361
Detector Setup Number: 2

The following list is stored as detector setup D2 in the Model 2350.

I have verified the list below has no discrepancies with the detector settings table: JT

Comments:

User ID	=
High Voltage	= 1000 volts
Threshold	= 100
Window	= 1000,OFF
Overload Current	= 40.0 micro amperes
Scaler Count Time	= 6 seconds
Readout Units	= c
Readout Time Base	= minutes
Readout Range Multiplier	= Auto
Detector Dead Time	= 1.404814E-05
Detector Calibration Constant	= 1.000000E+00
Detector Model Number	= LMI44-10
Detector Serial Number	= PR121036
Ratemeter Alarm Setting	= 1.000000E+09
Scaler Alarm Setting	= 1000000
Integrated Dose Alarm Setting	= 1.000000E+09
Low Count Alarm Setting	= 0.000000E+00
Operating Batter Voltage	= 5.2 volts

Detector Setup Checklist GENERATED: 3/31/2015 9:28:26 AM
Model 2350-1 Serial Number: 152361
Detector Setup Number: 3

The following list is stored as detector setup D3 in the Model 2350.

I have verified the list below has no discrepancies with the detector settings table: JT

Comments:

User ID	=
High Voltage	= 664 volts
Threshold	= 642
Window	= 40,ON
Overload Current	= 40.0 micro amperes
Scaler Count Time	= 6 seconds
Readout Units	= c
Readout Time Base	= minutes
Readout Range Multiplier	= Auto
Detector Dead Time	= 0.000000E+00
Detector Calibration Constant	= 1.000000E+00
Detector Model Number	= CS137/PK
Detector Serial Number	= 662KEV
Ratemeter Alarm Setting	= 1.000000E+09
Scaler Alarm Setting	= 1000000
Integrated Dose Alarm Setting	= 1.000000E+09
Low Count Alarm Setting	= 0.000000E+00
Operating Batter Voltage	= 5.2 volts

Designer and Manufacturer of Scientific and Industrial Instruments

MFG-12

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
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Sweetwater, TX 79556, U.S.A.

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865-392-4601
Knoxville, TN 37932, U.S.A.

CUSTOMER TETRA TECH MFG, INC. ORDER NO. 20264693/419016

Mfg. Ludlum Measurements, Inc. Model 2350-1 Serial No. 134764

Cal. Date 31-Mar-15 Cal Due Date 31-Mar-16 Cal. Interval 1 Year Meterface N/A

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 35 % Alt 697.8 mm Hg

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical check
☑ F/S Resp. check
☑ Audio check
☑ Ratemeter Linearity check
☑ Data Log check
☑ Reset check
☑ Alarm Setting check
☑ Integrated Dose check
☑ Overload check
☑ Window Operation
☑ Battery check (Min. Volt) 4.4 VDC
☑ Recycle Mode check
☑ Scaler Readout check
☐ Input Sens. Linearity
Threshold Dial Ratio 100 = 10 mV

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.
☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

☑ HV Readout (2 points) Ref./Inst. 500 / 500 V Ref./Inst. 2000 / 2000 V

COMMENTS: *Firmware: 37122N21*

Resolution for Cs137≈9.66% I/O Firmware: 37123N05

Calibrated with 39" cable.

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

	Probe Model	Serial #	High Voltage	Threshold	Units/ Time Base	Dead Time Correction Factor	Calibration Constant	Linearity ±10%*
Detector # 1	LMI44-10	PR139484	900	100	4 / 2	1.382029E-05	5.535037E+10	✓
Detector # 2	LMI44-10	PR139484	900	100	7 / 1	1.382029E-05	1.000000E+00	
Detector # 3	CS137PK	662KEV	605	642	7 / 1	0.000000E+00	1.000000E+00	
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								

Units: 0 -- rad, 1 -- Gray, 2 -- rem, 3 -- Sv, 4 -- R, 5 -- C/Kg, 6 -- Disintegrations, 7 -- Counts, 8 -- Ci/cm sq., 9 -- Bq/cm sq.

Time Base: 0 -- Seconds, 1 -- Minutes, 2 -- Hours

* See attached detector documentation, if applica

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	400kcpm	40045 10	40045 10	400cpm	40 10	40 10
	40kcpm	3999 1	3999 1	40cpm	4 1	4 1
	4kcpm	400	400			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques.
The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 S/N ☐ 059 ☐ 2171CP ☐ 2261CP ☐ 720 ☐ 734 ☐ 781 ☐ 1131 ☐ 1616 ☐ 1696 ☐ 1909 ☐ 1916CP ☐ 5105 ☐ 5717CO ☐ 5719CO ☐ 60646 ☐ 70897 ☐ 73410 ☐ E552 ☐ G112 ☑ M565 ☐ S-394 ☐ S-1054 ☐ T10081 ☐ T10082 Neutron Am-241 Be S/N ☐ T-304 Ra-226 S/N: ☐ Y982

☐ Alpha S/N ☐ Beta S/N ☐ Other

☑ m 500 S/N 289158 ☐ Ra-226 S/N Y982 ☑ Multimeter S/N 93870637

Calibrated By: Jeremy Thompson Date 31-Mar-15

Reviewed By: Thad Ha Date 1 Apr 15

Designer and Manufacturer
of
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Instruments

LUDLUM MEASUREMENTS, INC.
501 Oak Street
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865-392-4601
Knoxville, TN 37932, U.S.A.

Model 2350 Bench Test Data

Customer TETRA TECH MFG, INC. Date 31-Mar-15 Order #. 20264693/419016

Model 2350-1 Serial No. 134764 Detector 44-10 Serial No. PR139484

Source Cs137 1.9mCi

High Voltage 900 V As Found 900 V. Input 10.00 mV As Found 10 mV.

Cal. Constant 5.535037E+10 as found 5.535037 E +10

Dead Time 1.382029E-05 as found 1.382029E-05

Alarm Setting: Ratemeter 1000000000.000000 as found 1.0 E +09

Scaler 1000000.000000 as found 1.0 E +06

Integrated dose 1000000000.0000 as found 1.0 E +09

Overload ☐ On ☑ Off as found ☐ On ☑ Off Window 1000 as found 1000

Detector Received: ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

Reference Point	"As Found" Readings: Meter Reading	After Adjustment Readings: Meter Reading
2000 mR/hr	1.98 mR/hr	1.98 mR/hr
1500	1.50	1.50
1000	1.02	1.02
500	501 mR/hr	501 mR/hr
200	197	197
150	146	146
100	97.3	97.3

Other

Signature Jeremy Thompson Date 31-Mar-15

Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
501 Oak Street
325-235-5494
Sweetwater, TX 79556, U.S.A.

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865-392-4601
Knoxville, TN 37932, U.S.A.

Bench Test Data For Detector

Detector 44-10 Serial No. PR139484

Customer TETRA TECH MFG, INC. Order #. 20264693/419016

Counter 2350-1 Serial No. 134764 Counter Input Sensitivity 10.00 mV

Count Time 6 Seconds Distance Source to Detector Surface

Other Cal Constant = 1.000000E+00 Dead Time = 1.382029E-05

High Voltage	Background	Isotope Am241 Size ≈0.11 μCi	Isotope ____ Size ____	Isotope ____ Size ____	Isotope ____ Size ____
800	795	12053			
850	939	12221			
900	791	12189			
950	948	12120			
1000	759	12372			
1050	832	12202			
1100	911	12496			
1150	1526	12631			

Signature Jeremy Thompson Date 31 MAR 15

Detector Setup Barcodes GENERATED: 3/31/2015 8:50:30 AM
Model 2350-1 Serial Number: 134764
Detector Setup Number: 1


H900$M
Set High Voltage: 900


W1000$WOFF$P
Set Window: 1000,OFF


F6$H
Set Scaler Count Time: 6


SB2$.
Set Readout Time Base: hours


SL1.382029E-05$X
Set Dead Time: 1.382029E-05


SC5.535037E+10$S
Set Calibration Constant: 5.535037E+10


*MLMI44-10$ *
Set High Detector Model: LMI44-10


NPR139484$E
Set High Detector Serial #: PR139484


J1.000000E+09$V
Set High Ratemeter Alarm: 1.000000E+09


K1000000$H
Set High Scaler Alarm: 1000000


P1.000000E+09$.
Set High Dose Alarm: 1.000000E+09


SP1$7

Save Parameters as: D1

T100$Q
Set Threshold: 100

O40.0$OOFF$6
Set Overload: 40.0,OFF

SU4$F
Set Readout Units: R

SM0$3
Set Readout Range Multiplier: Auto

SVD0$P
Set Display Mode: Normal

SVD1$Q
Set Display Mode: Parameters

SVD2$R
Set Display Mode: Detector

D1$A
Set Active Detector Setup: 1

Detector Setup Barcodes GENERATED: 3/31/2015 8:50:30 AM
Model 2350-1 Serial Number: 134764
Detector Setup Number: 2


H900$M
Set High Voltage: 900


W1000$WOFF$P
Set Window: 1000,OFF


F6$H
Set Scaler Count Time: 6


SB1$-
Set Readout Time Base: minutes


SL1.382029E-05$X
Set Dead Time: 1.382029E-05


SC1.000000E+00$0
Set Calibration Constant: 1.000000E+00


*MLMI44-10$ *
Set High Detector Model: LMI44-10


NPR139484$E
Set High Detector Serial #: PR139484


J1.000000E+09$V
Set High Ratemeter Alarm: 1.000000E+09


K1000000$H
Set High Scaler Alarm: 1000000


P1.000000E+09$.
Set High Dose Alarm: 1.000000E+09


SP2$8

Save Parameters as: D2

T100$Q
Set Threshold: 100

O40.0$OOFF$6
Set Overload: 40.0,OFF

SU7$I
Set Readout Units: c

SM0$3
Set Readout Range Multiplier: Auto

SVD0$P
Set Display Mode: Normal

SVD1$Q
Set Display Mode: Parameters

SVD2$R
Set Display Mode: Detector

D2$B
Set Active Detector Setup: 2

Detector Setup Barcodes GENERATED: 3/31/2015 8:50:31 AM
Model 2350-1 Serial Number: 134764
Detector Setup Number: 3


H605$O
Set High Voltage: 605


W40WONL
Set Window: 40,ON


F6$H
Set Scaler Count Time: 6


SB1$-
Set Readout Time Base: minutes


SL0.000000E+00$8
Set Dead Time: 0.000000E+00


SC1.000000E+00$0
Set Calibration Constant: 1.000000E+00


MCS137PK$S
Set High Detector Model: CS137PK


N662KEV$C
Set High Detector Serial #: 662KEV


J1.000000E+09$V
Set High Ratemeter Alarm: 1.000000E+09


K1000000$H
Set High Scaler Alarm: 1000000


P1.000000E+09$.
Set High Dose Alarm: 1.000000E+09


SP3$9

Save Parameters as: D3

T642$.
Set Threshold: 642

O40.0$OOFF$6
Set Overload: 40.0,OFF

SU7$I
Set Readout Units: c

SM0$3
Set Readout Range Multiplier: Auto

SVD0$P
Set Display Mode: Normal

SVD1$Q
Set Display Mode: Parameters

SVD2$R
Set Display Mode: Detector

D3$C
Set Active Detector Setup: 3

Detector Setup Checklist GENERATED: 3/31/2015 8:50:38 AM
Model 2350-1 Serial Number: 134764
Detector Setup Number: 1

The following list is stored as detector setup D1 in the Model 2350.

I have verified the list below has no discrepancies with the detector settings table: JT

Comments:

User ID	=
High Voltage	= 900 volts
Threshold	= 100
Window	= 1000,OFF
Overload Current	= 40.0 micro amperes
Scaler Count Time	= 6 seconds
Readout Units	= R
Readout Time Base	= hours
Readout Range Multiplier	= Auto
Detector Dead Time	= 1.382029E-05
Detector Calibration Constant	= 5.535037E+10
Detector Model Number	= LMI44-10
Detector Serial Number	= PR139484
Ratemeter Alarm Setting	= 1.000000E+09
Scaler Alarm Setting	= 1000000
Integrated Dose Alarm Setting	= 1.000000E+09
Low Count Alarm Setting	= 0.000000E+00
Operating Batter Voltage	= 6.0 volts

Detector Setup Checklist GENERATED: 3/31/2015 8:50:39 AM
Model 2350-1 Serial Number: 134764
Detector Setup Number: 2

The following list is stored as detector setup D2 in the Model 2350.

I have verified the list below has no discrepancies with the detector settings table: JT

Comments:

User ID	=
High Voltage	= 900 volts
Threshold	= 100
Window	= 1000,OFF
Overload Current	= 40.0 micro amperes
Scaler Count Time	= 6 seconds
Readout Units	= c
Readout Time Base	= minutes
Readout Range Multiplier	= Auto
Detector Dead Time	= 1.382029E-05
Detector Calibration Constant	= 1.000000E+00
Detector Model Number	= LMI44-10
Detector Serial Number	= PR139484
Ratemeter Alarm Setting	= 1.000000E+09
Scaler Alarm Setting	= 1000000
Integrated Dose Alarm Setting	= 1.000000E+09
Low Count Alarm Setting	= 0.000000E+00
Operating Batter Voltage	= 6.0 volts

Detector Setup Checklist GENERATED: 3/31/2015 8:50:39 AM
Model 2350-1 Serial Number: 134764
Detector Setup Number: 3

The following list is stored as detector setup D3 in the Model 2350.

I have verified the list below has no discrepancies with the detector settings table: JT

Comments:

User ID	=
High Voltage	= 605 volts
Threshold	= 642
Window	= 40,ON
Overload Current	= 40.0 micro amperes
Scaler Count Time	= 6 seconds
Readout Units	= c
Readout Time Base	= minutes
Readout Range Multiplier	= Auto
Detector Dead Time	= 0.000000E+00
Detector Calibration Constant	= 1.000000E+00
Detector Model Number	= CS137PK
Detector Serial Number	= 662KEV
Ratemeter Alarm Setting	= 1.000000E+09
Scaler Alarm Setting	= 1000000
Integrated Dose Alarm Setting	= 1.000000E+09
Low Count Alarm Setting	= 0.000000E+00
Operating Batter Voltage	= 6.0 volts