TETRA TECH

November 12, 2014

Mr. Doug Ferguson
On-Scene Coordinator
U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

Subject: **Removal Assessment Report**
Beta-Chem, Lenexa, Kansas
CERCLIS ID: KSN000705028
U.S. EPA Region 7 START 4, Contract No. EP-S7-13-06, Task Order No. 0060
Task Monitor: Doug Ferguson, On-Scene Coordinator

Dear Mr. Ferguson:

Tetra Tech, Inc. is submitting the attached Removal Assessment Report regarding the Beta-Chem site in Lenexa, Kansas. If you have any questions or comments, please contact the project manager at (816) 412-1777.

Sincerely,

Danny O'Connor
START Project Manager

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Enclosures

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REMOVAL ASSESSMENT REPORT

BETA-CHEM
LENEXA, KANSAS

CERCLIS ID: KSN000705028

Superfund Technical Assessment and Response Team (START) 4

Contract No. EP-S7-13-06, Task Order No. 0060

Prepared For:

U.S. Environmental Protection Agency
Region 7
11201 Renner Boulevard
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November 12, 2014

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CONTENTS

Section		Page
1.0	INTRODUCTION	1
2.0	BACKGROUND INFORMATION	2
2.1	SITE LOCATION AND DESCRIPTION	2
2.2	PREVIOUS INVESTIGATIONS	2
3.0	REMOVAL ASSESSMENT ACTIVITIES	4
3.1	ASSESSMENT OF INTERIOR SURFACES AND EQUIPMENT	4
3.2	ASSESSMENT OF EXTERIOR SURFACES	9
3.3	SOIL SAMPLING	10
3.4	AIR SAMPLING	10
3.5	ADJACENT BUILDING ASSESSMENT	10
4.0	ANALYTICAL DATA SUMMARY	12
4.1	EXTERIOR SURFACE SAMPLES	12
4.2	SURFACE SOIL SAMPLES	13
4.3	AIR SAMPLES	14
4.4	ADJACENT BUILDING ASSESSMENT	15
5.0	SUMMARY	17
5.1	REMOVAL CONSIDERATIONS	18
5.2	PRE-REMEDIAL CONSIDERATIONS	18
6.0	REFERENCES	19

CONTENTS (Continued)

APPENDICES

Appendix

A FIGURES

B PHOTOGRAPHIC DOCUMENTATION

C SITE LOGBOOK

D CHAIN-OF-CUSTODY RECORDS AND ANALYTICAL DATA PACKAGES

E DATA VALIDATION REPORT

TABLES

Table		Page
1	SUMMARY OF INTERIOR SURFACE DECONTAMINATION SURVEY	5
2	SUMMARY OF FUME HOOD ASSESSMENT	7
3	SUMMARY OF EQUIPMENT SURVEY	8
4	SUMMARY OF EXTERIOR SURFACE WIPE SAMPLE ANALYTICAL DATA	13
5	SUMMARY OF SOIL SAMPLE ANALYTICAL DATA	14
6	SUMMARY OF AIR FILTER ANALYTICAL DATA	15
7	SUMMARY OF WIPE SAMPLING AT 14412 WEST 100TH STREET	16

1.0 INTRODUCTION

The Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) was tasked by the U.S. Environmental Protection Agency (EPA) Region 7 Superfund Division to conduct a Removal Assessment of the Beta-Chem site in Lenexa, Kansas. The site is at 14410 West 100th Street in Lenexa, Kansas. During its operation, the Beta-Chem facility produced custom-manufactured, radiolabeled pharmaceutical compounds using carbon-14. Results of previous site investigations by EPA and the Kansas Department of Health and Environment (KDHE) indicated elevated levels of beta radiation attributed to carbon-14—on interior surfaces, in on-site chemical containers and equipment, and in exterior surface soils. Upon completion of an Integrated Assessment (IA) in February 2014, KDHE concluded that the site warranted a time-critical Removal Action (KDHE 2014). KDHE deferred the site to EPA Region 7 in accord with the Memorandum of Understanding (MOU) between EPA and the U.S. Nuclear Regulatory Commission (NRC) signed September 30, 2002, to establish a basic relationship between agencies regarding radiological decommissioning and decontamination of NRC-licensed sites (EPA 2002). The site has been listed in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database as KSN000705028.

The Removal Assessment focused on assessing the Beta-Chem site for radioactive impacts resulting from previous site use. The radiological assessment included (1) assessing interior surfaces and site equipment, (2) assessing exterior surfaces, (3) assessing site soils, (4) conducting indoor air sampling, and (5) conducting an assessment of the 14412 West 100th Street building. Concurrent with the Removal Assessment, a Removal Action occurred at the Beta-Chem site to characterize and dispose of hazardous chemicals. Removal Action activities will be documented in a separate report.

The Removal Assessment proceeded under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986. The project was assigned under START Contract No. EP-S7-13-06, Task Order No. 0060. Danny O'Connor was the START project manager for the Removal Assessment activities. The EPA On-Scene Coordinator (OSC) for the project was Doug Ferguson.

2.0 BACKGROUND INFORMATION

Section 2.0 specifies the site location, describes the site, and recounts previous investigations.

2.1 SITE LOCATION AND DESCRIPTION

The Beta-Chem facility is at 14410 West 100th Street in Lenexa, Kansas (see Appendix A, Figures 1 and 2). The site is within a portion of the Noon Industrial Park, a commercially zoned area approximately 0.25 mile south of the intersection of 95th Street and Santa Fe Trail Drive in Lenexa, Kansas. The site is in the south half of Section 4, Township 13 South, Range 24 East; geographic coordinates of its approximate center are 38.948188 degrees north latitude and 94.752511 degrees west longitude.

2.2 PREVIOUS INVESTIGATIONS

The Beta-Chem laboratory began operations in March 1993 after the KDHE Bureau of Air and Radiation (BAR) issued the facility a Radioactive Materials License. The following summarizes investigations at the site by KDHE and EPA from 2005 through 2014:

Site Inspection by KDHE Radiation Control Program (2005)

On September 20, 2005, the KDHE Radiation Control Program inspected the Beta-Chem laboratory. At the time, the Beta-Chem facility generated less than 25 kilograms (kg) of hazardous waste per month, and was licensed by KDHE to possess a maximum quantity of 10 Curies (Ci) of carbon-14. The inspection identified extensive radiological contamination within both controlled and uncontrolled areas, including but not limited to the office, bathroom, laboratory, and loading dock area of the facility. All radiological instruments discovered at the site lacked calibration sources and were contaminated (Tetra Tech EM Inc. 2005).

Emergency Response by EPA/START (2005)

On September 23, 2005, EPA and Tetra Tech START conducted an Emergency Response (ER) at the Beta-Chem laboratory in Lenexa, Kansas. During the ER, air monitoring detected radiation above background concentrations in controlled and uncontrolled areas. Tetra Tech START also inventoried chemical containers and generated photographic and video documentation (Tetra Tech EM Inc. 2005).

Site Reconnaissance and Evaluation by KDHE (2006)

During May 2006, KDHE conducted a Site Reconnaissance and Evaluation (SRE) at the Beta-Chem site that included an exterior survey of radiation, collection of three surface soil samples adjacent to the rear door of the facility, and collection of one soil surface sample at a background location. Results were as follows:

- The survey of exterior beta radiation activity identified an area of elevated activity near the rear door of the facility.
- Analytical results from soil samples indicated gross beta radiation concentrations ranging from 26.4 to 1,850 picocuries per gram (pCi/g). Two of the three samples collected at the rear of the facility exceeded the residential soil concentration established by the MOU between EPA and the NRC for carbon-14 of 46 pCi/g (KDHE 2006).

Integrated Assessment by KDHE (2014)

During February 2014, KDHE conducted an IA to assess potential releases of carbon-14 and other hazardous substances from the inactive Beta-Chem facility. The IA included review of historical information, examination of historical analytical data from soil and wipe samples, evaluation of the site according to Hazard Ranking System (HRS) guidance, and compilation of a comprehensive target survey. The IA concluded that the site qualified for a time-critical Removal Action consistent with the National Oil and Hazardous Pollution Contingency Plan (NCP) (KDHE 2014).

3.0 REMOVAL ASSESSMENT ACTIVITIES

Field work for the Removal Assessment occurred from May 5 to July 16, 2014. Photographs were taken to document site activities (see Appendix B). All site-related activities by START were recorded in a logbook (see Appendix C).

3.1 ASSESSMENT OF INTERIOR SURFACES AND EQUIPMENT

Assessment of Interior Surfaces

Interior surface assessment of the Beta-Chem site included quantifying removable and total contamination of various surface types. Figure 3 in Appendix A depicts the interior site layout of the Beta-Chem facility. EPA consulted with KDHE to establish Derived Concentration Guideline Levels (DCGL) for carbon-14 at the Beta-Chem site. In accord with previous KDHE site investigations, the DCGLs were established as 6,000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) for removable contamination and 60,000 dpm/100 cm^2 for total contamination. Interior surfaces of the Beta-Chem site were assessed by use of a Ludlum Model 2241 ratemeter (Ludlum 2241 ratemeter) with a Model 44-9 Geiger-Mueller (GM) pancake detector (Ludlum 44-9 detector). Ludlum Measurements, Inc. (Ludlum) lists the carbon-14 efficiency for the Ludlum 44-9 detector as 5 percent (%) (Ludlum 2014); however, using a 10 microCurie (μCi) carbon-14 check source, field personnel calculated an efficiency of 2.5 % for detectors used on site. By use of the following equation, a Ludlum 44-9 detector reading (184 cpm) that equates to the DCGL for total contamination (60,000 dpm/100 cm^2) was calculated:

$$\text{Detector Reading Corresponding to the DCGL} = \frac{\text{Detector Surface Area}}{100\ cm^2} \times \text{DCGL} \times \text{Detector Efficiency}$$

Where:

Detector Surface Area = The Ludlum 44-9 detector surface area (12.26 cm^2)
DCGL = 60,000 dpm/100 cm^2
Detector Efficiency = Field-calculated carbon-14 efficiency for the Ludlum 44-9 detector (2.5 %)

In some instances, wipe samples were collected and screened with a Ludlum 3030 Alpha/Beta Sample Counter (Ludlum 3030). Ludlum lists the carbon-14 efficiency for the Ludlum 3030 as 8 % (Ludlum 2014).

To determine the amount of removable vs fixed contamination, three surfaces were surveyed prior to and after application of solvents (wet wipes, vinegar, and alcohol) used in an attempt to decontaminate the surfaces. Crews initially took static readings from the surfaces using a Ludlum 44-9 detector. Next, crews

quantified removable contamination by collecting wipe samples and counting the samples using a Ludlum 3030. The amount of removable contamination (wipe samples) compared to total contamination (static readings) was a fraction of the total, suggesting that most contamination was fixed. In an effort to assess the potential effect of decontamination, multiple solvent types (wet wipes, vinegar, and alcohol) were applied, and the surfaces were reassessed. Those differences in the decontamination process had minimal to no effect on static radiation readings, although removable contamination readings were lowered noticeably. Static radiation readings exceeded the DCGL for total contamination (60,000 dpm/100 cm^2) in all instances. A summary of results from the decontamination process is in Table 1.

TABLE 1

SUMMARY OF INTERIOR SURFACE DECONTAMINATION SURVEY
BETA-CHEM, LENEXA, KANSAS

Assessed Location	Solvent Applied to Surface (Yes/No)	Ludlum 44-9 Static Reading (cpm)	Ludlum 44-9 Static Reading Conversion (dpm/100 cm^2)	Ludlum 3030 Wipe Reading* (cpm/100cm^2)		Ludlum 3030 β Reading Conversion* (dpm/100cm^2)
				α	β	
Fume hood sash	No	1,200	391,517	0	135	1,688
	Yes (wet wipe)	1,200	391,517	0	42	525
	Yes (vinegar)	1,200	391,517	-	-	-
	Yes(alcohol)	1,200	391,517	-	-	-
Exposed wooden beam	No	1,500	489,360	0	198	2,475
	Yes (wet wipe)	1,500	489,360	0	96	1,200
	Yes (vinegar)	1,200	391,517	-	-	-
	Yes (alcohol)	1,200	391,517	-	-	-
Floor below fume hood	No	2,600	848,224	0	403	5,038
	Yes (wet wipe)	2,600	848,224	0	33	413
	Yes (vinegar)	2,500	815,600	-	-	-
	Yes (alcohol)	2,500	815,600	-	-	-
	Yes (baking soda)	2,300	750,352	-	-	-

Notes:

*	Reported measurements include background radiation.
-	No sample collected
α	Alpha radiation
β	Beta radiation
cpm	Counts per minute
cpm/100cm^2	Counts per minute per 100 square centimeters
dpm/100 cm^2	Disintegrations per minute per 100 square centimeters
Ludlum 3030	Ludlum 3030 Alpha/Beta Sample Counter
Ludlum 44-9	Ludlum Model 44-9 Geiger-Mueller pancake detector

In addition to studying effects of decontaminating surfaces, crews screened a majority of surfaces to assess total contamination. During this portion of the survey, crews used a Ludlum 2241 ratemeter with a Ludlum 44-9 detector to take static readings. Items in the northwest portion of the laboratory with static radiation readings (total contamination) exceeding 184 cpm above background (60,000 dpm/100 cm^2) include but are not limited to: all four fume hoods (#1 - #4), a refrigerator, all exposed wood surfaces, all flooring, most wall board, ceiling tile, air supply and return vents, wall phones, handles on gas cylinders, an anaerobic incubator, a sink, countertops, faucet handles, glassware, equipment under the sink, and glassware drying panel knobs.

Items in the northeast portion of the laboratory with static radiation readings exceeding 184 cpm above background include but are not limited to: a semi-portable fume hood (#5), a fume hood (#6), a table supporting the semi-portable fume hood, interior walls, wall board, exposed wood, some compressed gas cylinder handles, buttons on equipment, exposed wood, all flooring, ceiling tiles, return and supply air ducts, shelves in flammable cabinets, lab clamps, glassware, cabinet handles, items within rolling drawers, cardboard box exteriors, the door leading into the laboratory, and trash under a desk.

Items in the south portion of the laboratory with static radiation readings exceeding 184 cpm above background include but are not limited to: chairs, ceiling tiles, flooring, and trash.

Static radiation readings exceeding 184 cpm above background were also recorded on a furnace in the loft above the laboratory.

The assessment and attempted decontamination of Beta-Chem fume hoods is summarized in Table 2.

TABLE 2

SUMMARY OF FUME HOOD ASSESSMENT
BETA-CHEM, LENEXA, KANSAS

Fume Hood Number	Location Assessed	Solvent Applied to Surface (Y/N)	Ludlum 44-9 Static Reading (cpm)	Ludlum 44-9 Static Reading Conversion (dpm/100cm²)	Ludlum 3030 Wipe Reading* (cpm/100 cm²)		Ludlum 3030 β Reading Conversion* (dpm/100cm²)
					α	β	
#1	Right sill	No	1,200	391,517	0	175	2,188
		Yes (wet wipes)	1,200	391,517	0	52	650
	Back panel	No	1,900	619,902	0	126	1,575
		Yes (wet wipes)	1,900	619,902	0	144	1,800
#2	Front sill	No	1,200	391,517	0	139	1,738
		Yes (wet wipes)	1,200	391,517	0	60	750
	Near light in hood	No	6,500	2,120,718	0	897	11,213
		Yes (wet wipes)	6,000	1,957,586	0	238	2,975
	Near nozzle	No	250	81,566	0	48	600
		Yes (wet wipes)	200	65,253	0	39	488
	Near nozzle (tape removed)	No	1,100	358,891	1	90	1,125
		Yes (wet wipes)	1,200	391,517	0	63	788
#3	PVC	No	3,000	978,793	0	1,551	19,388
		Yes (wet wipes)	2,800	913,540	0	333	4,163
	Right sill	No	3,500	1,141,925	0	180	2,250
		Yes (wet wipes)	5,000	1,631,321	0	51	638
	Right wall	No	220	71,778	0	39	488
		Yes (wet wipes)	250	81,566	0	45	563
	Right wall (under tape)	No	1,300	424,144	0	45	563
		Yes (wet wipes)	1,700	554,649	0	45	563
#4	Front sill	No	3,560	1,161,501	-	-	-
#5 (semi-portable)	Area of removed sticker	No	1,400	456,770	0	87	1,088
		Yes (wet wipes)	1,400	456,770	0	48	600
	Exhaust box	No	2,700	880,914	0	375	4,688
		Yes (wet wipes)	2,000	652,529	0	309	3,863
#6	Side wall	No	3,000	978,793	0	57	713
		Yes (wet wipes)	3,000	978,793	0	90	1,125

Notes:

*	Reported measurements include background radiation.
-	No sample collected
α	Alpha radiation
β	Beta radiation
cpm	Counts per minute
cpm/100cm²	Counts per minute per 100 square centimeters
dpm/100cm²	Disintegrations per minute per 100 square centimeters
Ludlum 3030	Ludlum 3030 Alpha/Beta Sample Counter
Ludlum 44-9	Ludlum Model 44-9 Geiger-Mueller pancake detector

Assessment of Equipment

To quantify carbon-14 contamination of equipment, EPA and START personnel used a Ludlum 2241 ratemeter and Ludlum 44-9 detector to take static readings. Wipe samples were collected from a majority of screening locations and counted by use of a Ludlum 3030. Wet wipes were used on some equipment surfaces to determine the effectiveness of decontamination. All static equipment readings exceeded the DCGL for total contamination. Table 3 summarizes the assessment of on-site equipment.

TABLE 3

SUMMARY OF EQUIPMENT SURVEY
BETA-CHEM, LENEXA, KANSAS

Equipment Item	Location Assessed	Decontaminated (Yes/No)	Ludlum 44-9 Static Reading (cpm)	Ludlum 44-9 Static Reading Conversion (dpm/100cm²)	Ludlum 3030 Wipe Reading* (cpm/100cm²)		Ludlum 3030 β Reading Conversion* (dpm/100cm²)
					α	β	
Packard Tri-Carb Liquid Scintillation Spectrometer (serial number 25206)	Handle	No	1,100	358,891	0	108	1,350
		Yes (wet wipes)	1,100	358,891	0	79	988
	On/Off buttons	No	850	277,325	0	612	7,650
		Yes (wet wipes)	600	195,759	0	204	2,550
	Exterior corner	No	1,100	358,891	0	184	2,300
		Yes (wet wipes)	1,000	326,264	0	112	1,400
BID System 100 Bioscan, Inc.	Instrument panel high voltage switch	No	2,300	750,408	0	46	575
		Yes (wet wipes)	1,900	619,902	-	-	-
	Top of instrument	No	700	228,385	-	-	-
	Sides	No	550	179,445	-	-	-
	Black valve in back	No	1,600	522,023	0	477	5,963
		Yes (wet wipes)	1,400	456,770	0	45	563
	IBM computer	No	650	212,072	0	1,312	16,400
		Yes (wet wipes)	400	130,506	0	61	763
	Instrument panel face	No	-	-	0	81	1,013
		Yes (wet wipes)	-	-	0	108	1,350
Varian 9050 Variable Wavelength UV-VIS Detector	Panel	No	700	228,385	0	363	4,538
		Yes (wet wipes)	700	228,385	0	139	1,738
	Top of instrument	No	550	179,445	0	60	750
		Yes (wet wipes)	500	163,132	0	40	500
	Lower panel	No	500	163,132	0	147	1,838
		Yes (wet wipes)	450	146,819	0	52	650
Canberra Radiomatic Flo-One Beta (Radio Chromatography Detector, Series A-100)	Side panels	No	850	277,325	0	64	800
		Yes (wet wipes)	1,000	326,264	0	45	563
	Top of lab alliance	No	600	195,759	0	162	2,025
		Yes (wet wipes)	700	228,385	0	36	450
	Radiomatic panel	No	1,000	326,264	0	93	1,163
		Yes (wet wipes)	900	293,638	0	58	725
	Black panel in back	No	300	97,879	0	126	1,575
		Yes (wet wipes)	350	114,192	1	51	638

TABLE 3 (Continued)

SUMMARY OF EQUIPMENT SURVEY
BETA-CHEM, LENEXA, KANSAS

Equipment Item	Location Assessed	Decontaminated (Yes/No)	Ludlum 44-9 Static Reading (cpm)	Ludlum 44-9 Static Reading Conversion (dpm/100cm²)	Ludlum 3030 Wipe Reading* (cpm/100cm²)		Ludlum 3030 β Reading Conversion* (dpm/100cm²)
					α	β	
Varian 3400 Gas Chromatograph	Panel	No	1,000	326,264	0	82	1,025
		Yes (wet wipes)	1,100	358,891	0	51	638
	Top	No	550	179,445	0	123	1,538
		Yes (wet wipes)	500	163,132	0	54	675
Buchler Digital Rotary Evaporator	Bottom glassware attachment	No	5,000	1,631,321	0	4,107	51,338
		Yes (wet wipes)	5,000	1,631,321	0	354	4,425
	Lower right knob	No	10,000	3,262,643	0	747	9,338
		Yes (wet wipes)	10,000	3,262,643	1	78	975
	Upper knob	No	8,000	2,610,114	0	370	4,625
		Yes (wet wipes)	6,000	1,957,586	0	78	975
Blue Radiation Meter GSM-110 (serial number 6134)	Display	No	1,100	358,891	0	111	1,388
		Yes (wet wipes)	1,100	358,891	0	45	563
Ludlum Model 3 with 44-9 Detector (serial number 229349)	Dial	No	300	97,879	0	157	1,963
		Yes (wet wipes)	300	97,879	0	48	600
WM B. Johnson Meter Model DIG-5 (serial number 329)	Switch	No	200	65,253	0	55	688
		Yes (wet wipes)	200	65,253	0	42	525

Notes:

*	Reported measurements include background radiation.
-	No sample collected
α	Alpha radiation
β	Beta radiation
cpm	Counts per minute
cpm/100cm²	Counts per minute per 100 square centimeters
dpm/100cm²	Disintegrations per minute per 100 square centimeters
Ludlum 3030	Ludlum 3030 Alpha/Beta Sample Counter
Ludlum 44-9	Ludlum Model 44-9 Geiger-Mueller pancake detector

In addition to the survey of equipment summarized in Table 3, a 20 μCi radium-226 check source was observed within the Packard Liquid Scintillation Counter in the northeast portion of the laboratory.

3.2 ASSESSMENT OF EXTERIOR SURFACES

On May 8, 2014, START collected five wipe samples from exterior surfaces of Beta-Chem. Exterior wipe samples included: three samples from exhaust stacks on the north exterior of the facility, a sample from the facility roof, and a sample from the north exterior wall. Samples were submitted to the University of Kansas Environment, Health, and Safety Program Radiation Safety Office (KU Radiation Laboratory) for analysis for carbon-14 via liquid scintillation counter.

3.3 SOIL SAMPLING

Soil sampling was conducted at the Beta-Chem site on May 9, 2014. Eighteen soil samples were collected northwest of the facility (see Appendix A, Figure 4). To ensure adequate site coverage, a triangular gridding system was used to establish 10 sample locations (G1-G10). A single aliquot was collected from 0 to 6 inches below ground surface (bgs) at each location and recorded in the site logbook. In addition, a Ludlum 2241 ratemeter and Ludlum 44-9 detector were used to scan surface soils to identify areas of elevated activity. Eight distinct areas were identified with readings distinguishable from background. A single aliquot sample was collected from 0 to 6 inches bgs at each of those locations (HS1-HS8).

Five soil samples were collected at a reference area (Electric Park) to quantify background carbon-14 concentrations in the site vicinity. Each reference area sample consisted of a single aliquot collected from 0 to 6 inches bgs. All soil samples were submitted to TestAmerica Laboratories, Inc., (TestAmerica) for analysis for carbon-14 via liquid scintillation counter.

3.4 AIR SAMPLING

During assessment and removal activities at the Beta-Chem site, EPA and START conducted air sampling to measure airborne concentrations of radioactive material. Air sampling proceeded by use of RADeCO® Model H-810 high-volume air samplers. Air samplers were positioned in high-traffic areas of the building and ran continuously during activities. Paper filter samples were collected each day from the samplers and analyzed for radiological contamination by use of a Ludlum 3030. Based on the measurements obtained from the filter samples, airborne carbon-14 concentrations did not exceed the EPA selected action level--the U.S. Nuclear Regulatory Commission (NRC) effluent air concentration action level of 3.0E-9 microCuries per milliliter (μCi/ml) listed in 10 CFR 20.

3.5 ADJACENT BUILDING ASSESSMENT

On July 16, 2014, the 14412 West 100th Street office building (Mar Tech, Inc.) was assessed for possible radioactive contamination (the Mar Tech, Inc. office shares its west wall with the Beta-Chem facility). The tenant expressed concern about possible spread of contamination from Beta-Chem via a water line break during winter 2013-2014. To assess gross radioactivity in the office, crews used a Ludlum 2241 ratemeter and Ludlum 44-9 detector to take measurements from various surfaces. The highest observed reading was 50 cpm above background from the northeast wall of the storage room. Wipe samples were collected at seven locations within the office, including the northeast wall. The samples were screened by use of a

Ludlum 3030, with beta radiation readings ranging from 27 to 57 cpm. The samples were also submitted to the KU Radiation Laboratory for analysis for carbon-14 via liquid scintillation counter.

4.0 ANALYTICAL DATA SUMMARY

During Removal Assessment activities, soil and wipe samples were submitted for laboratory analysis for carbon-14 via liquid scintillation counter. Two laboratories were used during the Removal Assessment: TestAmerica in Earth City, Missouri, and the KU Radiation Laboratory in Lawrence, Kansas. Analytical data packages and chain-of-custody documents are in Appendix D. After analytical data packages had been received, a Tetra Tech chemist completed a data validation report in accord with the EPA Region 7 documents titled Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (EPA 2010) and Chapter 8 of the Multi-Agency Radiological Laboratory Analytical Procedures Manual (MARLAP), 402-B-04-001A (EPA 2004). In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (Tetra Tech EM Inc. 2002) was referenced for data validation, along with evaluation of other criteria specified in the applicable methods. The data validation report concluded that overall data quality was acceptable, with no unusual qualifications added. All data were deemed usable as qualified for their intended purposes (see Appendix E). The following sections describe analytical results from Removal Assessment activities.

4.1 EXTERIOR SURFACE SAMPLES

Five wipe samples were collected from exterior surfaces of Beta-Chem during Removal Assessment activities. The wipe samples were submitted to the KU Radiation Laboratory for analysis for carbon-14 via liquid scintillation counter. Results were compared to the DCGL for removable contamination (6,000 dpm/100 cm^2).

Carbon-14 concentrations in the wipe samples ranged from 130 to 3,859 dpm/100 cm^2. No concentration exceeded the DCGL for removable contamination. Table 4 lists analytical data from exterior wipe samples.

TABLE 4

SUMMARY OF EXTERIOR SURFACE WIPE SAMPLE ANALYTICAL DATA
BETA-CHEM, LENEXA, KANSAS

Sample Name	Carbon-14 Laboratory Result ($dpm/100\ cm^2$)
Exterior Wall	144
Roof	130
West Stack	528
East Stack	137
West Stack #2	3,859

Notes:

$dpm/100\ cm^2$ Disintegrations per minute per 100 square centimeters

4.2 SURFACE SOIL SAMPLES

Eighteen surface soil samples (10 grid samples and 8 hot spot samples) were collected at Beta-Chem during Removal Assessment activities. In addition, five samples were collected from a reference area (Electric Park) to quantify background carbon-14 concentrations in the general site vicinity. Soil samples were submitted to TestAmerica in Earth City, Missouri, for analysis of carbon-14 via liquid scintillation counter. The MOU between the EPA and the NRC lists two consultation triggers for carbon-14: 46 pCi/g for residential soil and 123,000 pCi/g for industrial soil. The Beta-Chem site is within a commercially zoned area without nearby residences; therefore, the industrial soil consultation trigger was chosen for comparison.

Carbon-14 concentrations in soil samples collected at Beta-Chem ranged from 3.8 to 960 pCi/g. No reported carbon-14 concentration in soil samples collected at Beta-Chem exceeded the MOU consultation trigger for industrial soil. Carbon-14 concentrations in samples collected at the reference area ranged from 0.0362 to 0.510 pCi/g, with a mean of 0.296 pCi/g. Soil sample analytical data are summarized in Table 5.

TABLE 5

SUMMARY OF SOIL SAMPLE ANALYTICAL DATA
BETA-CHEM, LENEXA, KANSAS

Sample Name	Carbon-14 Laboratory Result (pCi/g)
Beta-Chem Samples	
G1	45.7
G2	9.08
G3	3.80
G4	27.8
G5	15.9
G6	223
G7	30.1
G8	21.6
G9	71.2
G10	7.03
HS1	119
HS2	438
HS3	960
HS4	23.8
HS5	361
HS6	120
HS7	55.6
HS8	42.8
Reference Area Samples	
BG-1	0.510
BG-2	0.254
BG-3	0.0362
BG-4	0.247
BG-5	0.432

Notes:

BG	Background sample
G	Grid sample
HS	Hot spot sample
pCi/g	picoCuries per gram

4.3 AIR SAMPLES

Thirty-six air filter samples were collected during Removal Assessment activities and counted with a Ludlum 3030. Eight filter samples were submitted to the KU Radiation Laboratory for confirmation analysis for carbon-14 via liquid scintillation counter. Based on laboratory data, airborne carbon-14 concentrations did not exceed 3.0E-9 µCi/ml, a conservative action level EPA had selected for the site that would result in an annual dose well under the 100 millirem (mrem) annual dose limit for members of the public. The airborne carbon-14 concentration of 3.0E-9 µCi/ml is listed in 10 *Code of Federal Regulations* (CFR) Part 20, Appendix B, Table 2, Column 1, and is equivalent to the carbon-14

concentration which, if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of 50 mrem. Table 6 summarizes analytical data from the air filter samples.

TABLE 6

SUMMARY OF AIR FILTER ANALYTICAL DATA
BETA-CHEM, LENEXA, KANSAS

Sample Name	Total Sample Volume (ft^3)	NRC Effluent Air Action Level* (µCi/ml)	Carbon-14 Laboratory Result (pCi)	Carbon-14 Converted Laboratory Result (µCi/ml)
AM5714	953	3.0E-9	138	5.11E-12
AM51214	807		264	1.16E-11
AM51414	931		523	1.98E-11
AM51614	1,105		344	1.10E-11
AM52214	557		4,380	2.78E-10
AM51314	713		493	2.44E-11
AM63014	1,061		113	3.76E-12
AM7814	1,086		175	5.69E-12

Notes:

*	Found in 10 *Code of Federal Regulations* Part 20, Appendix B, Table 2, Column 1.
ft^3	Cubic feet (of air)
NRC	U.S. Nuclear Regulatory Commission
pCi	picoCuries
µCi/ml	microCuries per milliliter

4.4 ADJACENT BUILDING ASSESSMENT

During the assessment of the Mar Tech, Inc. office building on July 16, 2014, seven wipe samples were collected from various interior surfaces. The samples were screened by use of a Ludlum 3030 and then submitted to the KU Radiation Laboratory for analysis. Table 7 lists results from field screening and laboratory analysis of wipe samples collected from the Mar Tech, Inc. office. No reported carbon-14 concentration exceeded the DCGL for removable contamination.

TABLE 7

SUMMARY OF WIPE SAMPLING AT 14412 WEST 100TH STREET BETA-CHEM, LENEXA, KANSAS

Sample Name	Carbon-14 Laboratory Results (dpm/100 cm²)
M-1	274
M-2	190
M-3	102
M-4	99
M-5	124
M-6	154
M-7	227

Notes:

dpm/100 cm^2 Disintegrations per minute per 100 square centimeters

5.0 SUMMARY

Tetra Tech START was tasked by EPA Region 7 to conduct a Removal Assessment at the Beta-Chem site at 14410 West 100th Street in Lenexa, Kansas. During its operation, the Beta-Chem facility had produced custom-manufactured, radiolabeled pharmaceutical compounds using carbon-14. Results of previous site investigations had indicated elevated levels of beta radiation attributed to carbon-14—on interior surfaces, in on-site chemical containers and equipment, and in exterior surface soils.

START's sampling activities for the Removal Assessment occurred from May 5 to July 16, 2014. The Removal Assessment focused on assessing the Beta-Chem site for radioactive impacts resulting from previous site use. The radiological assessment included: (1) assessing interior surfaces and site equipment, (2) assessing exterior surfaces, (3) assessing site soils, (4) conducting indoor air sampling, and (5) conducting an assessment of the 14412 West 100th Street building.

Crews assessed interior surfaces of the Beta-Chem site using a Ludlum 2241 ratemeter and Ludlum 44-9 detector. Items in the northwest portion of the laboratory with static radiation readings indicating carbon-14 exceeding the DCGL for total contamination (60,000 dpm/100 cm^2) include but are not limited to: all four fume hoods, a refrigerator, all exposed wood surfaces, all flooring, most wall board, ceiling tiles, air supply and return vents, wall phones, handles on gas cylinders, an anaerobic incubator, a sink, countertops, faucet handles, glassware, equipment under the sink, and glassware drying panel knobs. Items in the northeast portion of the laboratory with static radiation readings indicating carbon-14 exceeding the DCGL for total contamination include but are not limited to: a fume hood, a semi-portable fume hood, a table supporting the semi-portable fume hood, interior walls, wall board, exposed wood, some compressed gas cylinder handles, buttons on equipment, exposed wood, all flooring, ceiling tiles, return and supply air ducts, shelves in flammable cabinets, lab clamps, glassware, cabinet handles, items within rolling drawers, cardboard box exteriors, the door leading into the laboratory, and trash under a desk. Items in the south portion of the laboratory with static radiation readings indicating carbon-14 exceeding the DCGL for total contamination include but are not limited to: chairs, ceiling tiles, flooring, and trash. In addition, a furnace in the loft above the laboratory was identified with static radiation readings exceeding the DCGL for total contamination.

In addition to assessing interior surfaces, on-site equipment was assessed for carbon-14 using a Ludlum 2241 ratemeter and Ludlum 44-9 detector. All static equipment readings exceeded the DCGL for total contamination (see Table 3). In addition, a 20 μCi radium-226 check source was observed within the Packard Liquid Scintillation Counter in the northeast portion of the laboratory.

Five wipe samples were collected from exterior surfaces of Beta-Chem during Removal Assessment activities. The wipe samples were submitted to the KU Radiation Laboratory for analysis for carbon-14 via liquid scintillation counter. No reported carbon-14 concentration exceeded the DCGL for removable contamination (6,000 dpm/100 cm^2).

Eighteen surface soil samples were collected at Beta-Chem during Removal Assessment activities. Samples were submitted to TestAmerica for analysis of carbon-14 via liquid scintillation counter. No reported carbon-14 concentration in soil samples collected at Beta-Chem exceeded the MOU consultation trigger for industrial soil (123,000 pCi/g).

Indoor air sampling was conducted during site activities using RADeCO® Model H-810 high-volume air samplers. Paper filter samples were collected each day from the samplers and analyzed for radiological contamination by use of a Ludlum 3030. No measured or reported carbon-14 concentration exceeded the EPA selected action level.

On July 16, 2014, the 14412 West 100th Street office building (Mar Tech, Inc.) was assessed for possible radioactive contamination. Wipe samples were collected at seven locations within the office, including the northeast wall. The samples were screened by use of a Ludlum 3030. No measurements of concern were recorded. The wipe samples were sent to the KU Radiation Laboratory for analysis of carbon-14. No reported concentration exceeded the DCGL for removable contamination.

5.1 REMOVAL CONSIDERATIONS

Based on information obtained during this Removal Assessment and results of previous assessments conducted by KDHE, carbon-14 contamination on interior surfaces and site equipment exceeds the DCGL.

5.2 PRE-REMEDIAL CONSIDERATIONS

KDHE performed the following previous site investigations: a Site Inspection in September 2005, a SRE in May 2006, and an IA in February 2014. Based on the results of this assessment, no further pre-remedial investigation activities appear warranted.

6.0 REFERENCES

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2014. Model 44-9 Alpha, Beta, and Gamma Detector. On-line address: http://www.ludlums.com/multisites/medphys/images/stories/product_manuals/M44-9.pdf

Tetra Tech EM Inc.

2002. "Review of Data Packages from Subcontracted Laboratories." February.

2005. Emergency Response Report. Beta-Chem Lab Site. Lenexa, Kansas. October 20.

U.S. Environmental Protection Agency (EPA).

2002. Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission: Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites. September 30.

2004. *Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP).* July.

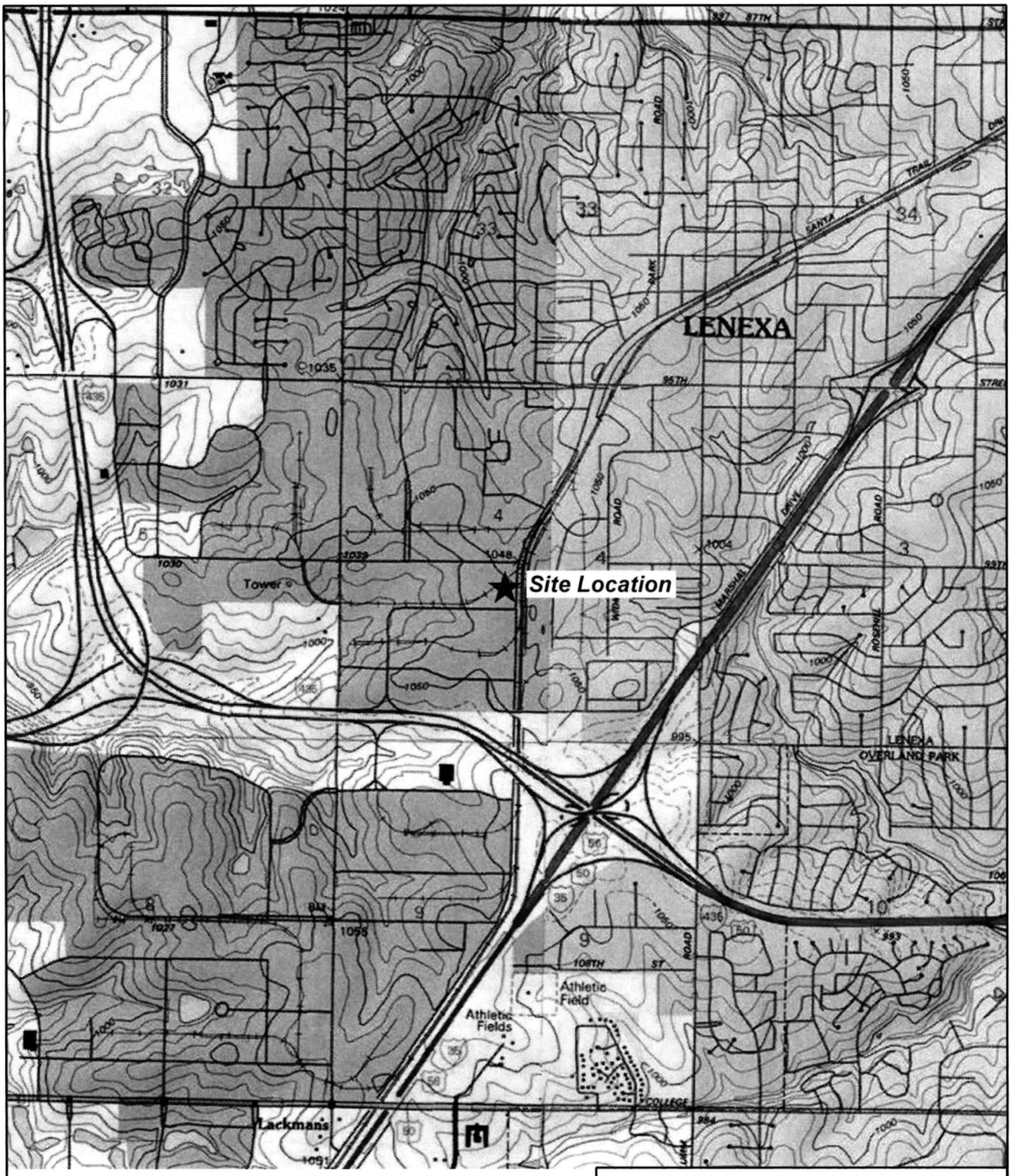
2010. *Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review.* January.

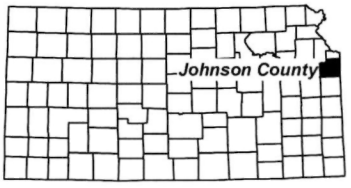
U.S. Nuclear Regulatory Commission (NRC).

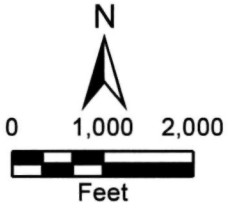
2014. Appendix B to Part 20-Annual Limits on Intake (ALIs) and Derived Air Concentration (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage. On-line address: http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/appb/Carbon-14.html

APPENDIX A

FIGURES







Source: USGS Lenexa, Kansas 7.5 Minute Topo Quad, 1991;
USGS Olathe, Kansas 7.5 Minute Topo Quad, 1991

Beta-Chem Site
Lenexa, Kansas

Figure 1
Site Location Map

TETRA TECH

Date: 08/10/14 | Drawn By: Clayton Hayes | Project No: X9025.14.0060.000

X:\G\90\25\0061\0\00\Projects\mxd\Figure1.mxd

Legend

Approximate facility boundary

N

0 50 100

Feet

Source: ESRI, ArcGIS Online Aerial Imagery, 2012

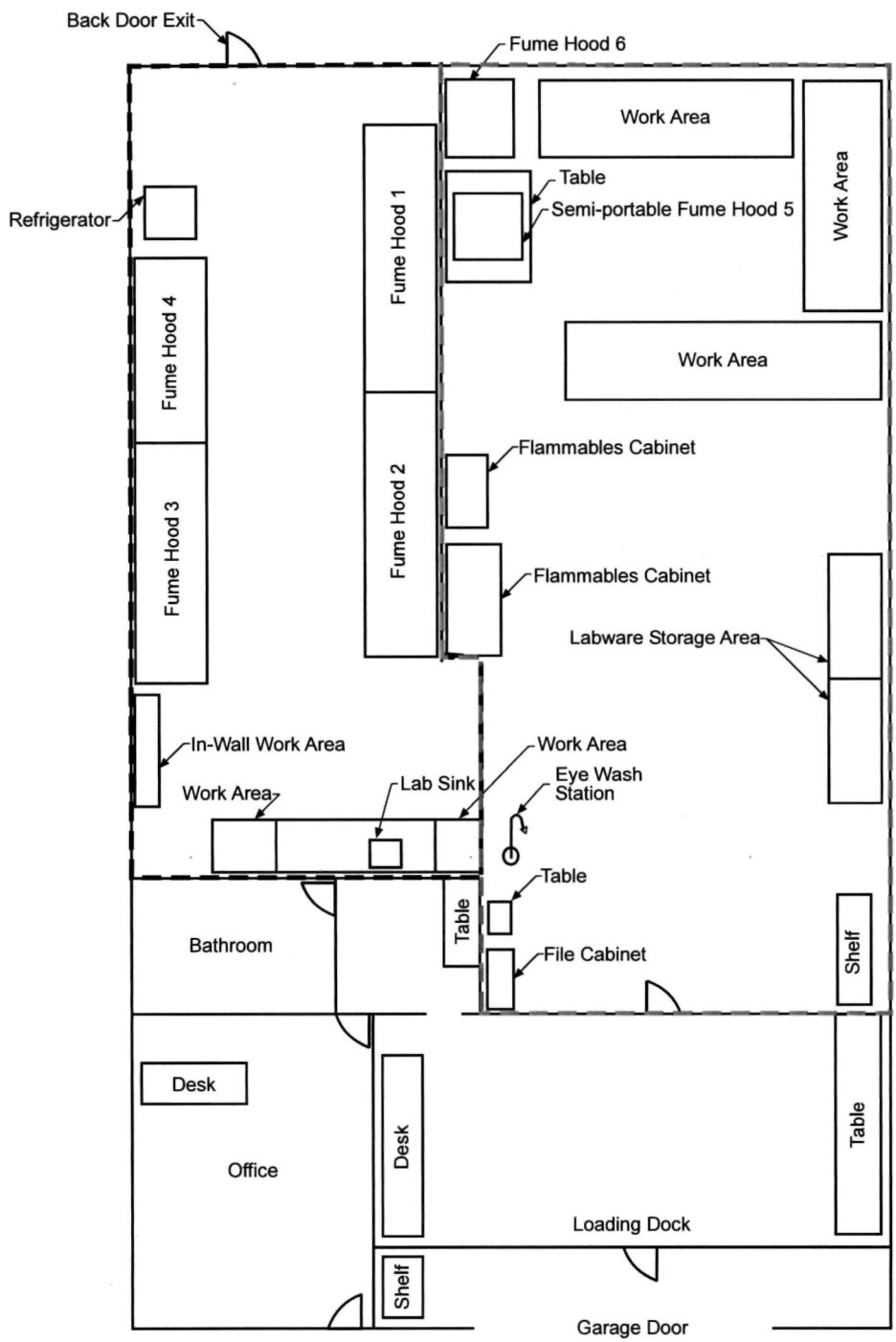
Beta-Chem Site
Lenexa, Kansas

Figure 2
Exterior Site Layout Map

TETRA TECH

Date: 08/10/14 Drawn By: Clayton Hayes Project No: X9025.14.0080.000

X:\G\9025\0061\0000\Projects\mxd\Figure2.mxd



Legend

- Northwest section of laboratory
- Northeast section of laboratory

Not to Scale

Beta-Chem Site
Lenexa, Kansas

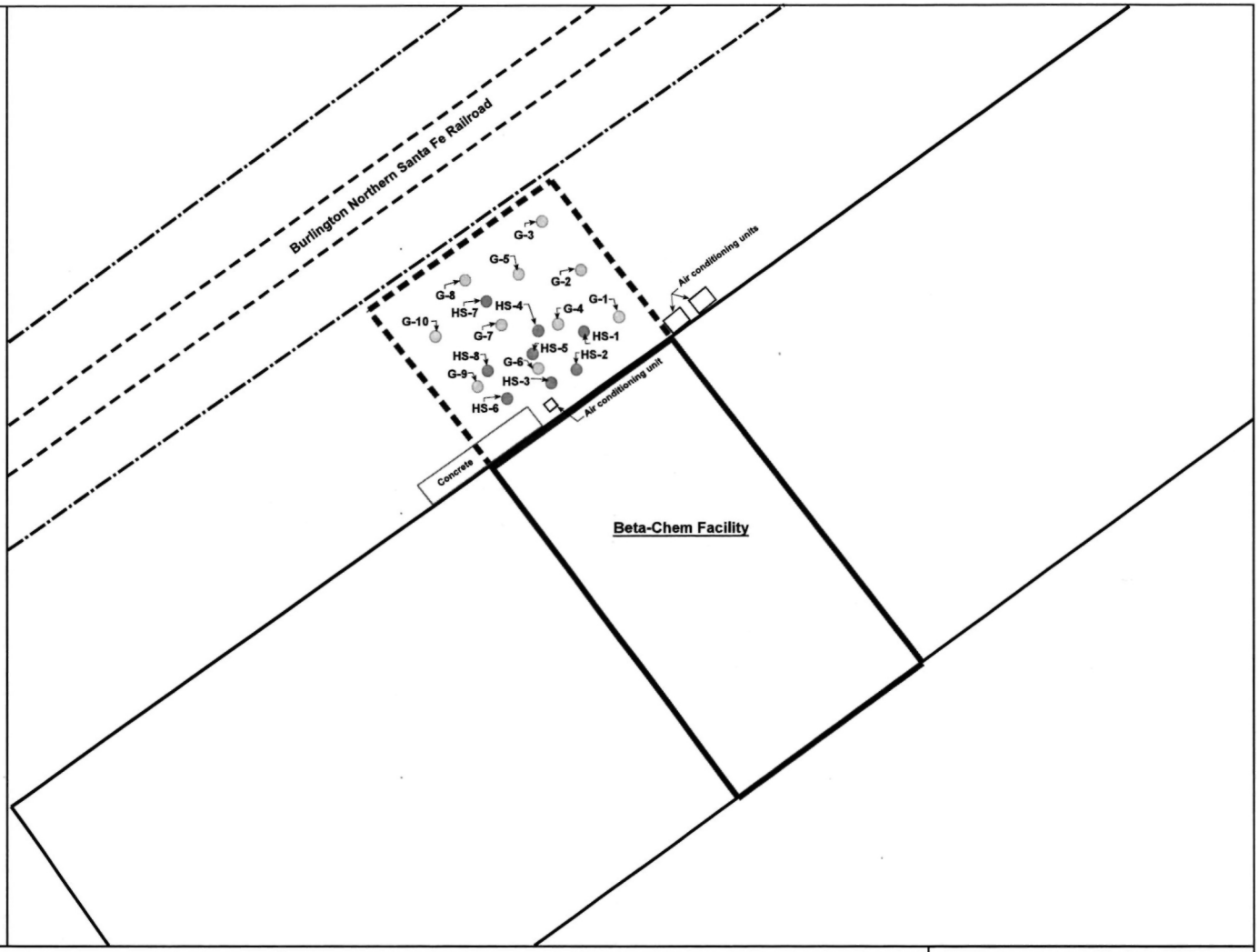
Figure 3
Interior Site Layout Map

TETRA TECH

Date: 08/10/14 | Drawn By: Clayton Hayes | Project No: X9025.14.0060.000

X:\G\9025\0061\000\FH10\Figure3.FH10

Sample Name	Carbon-14 Laboratory Result (pCi/g)
G1	45.7
G2	9.08
G3	3.8
G4	27.8
G5	15.9
G6	223
G7	30.1
G8	21.6
G9	71.2
G10	7.03
HS1	119
HS2	438
HS3	960
HS4	23.8
HS5	361
HS6	120
HS7	55.6
HS8	42.8



Legend

- Hot spot sample location
- Surface soil sample location
- Approximate railroad boundary
- Railroad
- Wall
- Approximate property boundary
- Approximate site location
- G Grid sample
- HS Hot spot sample
- pCi/g picoCuries per gram

Source: ESRI, ArcGIS Online, World Imagery, 2012

Not to Scale

Beta-Chem Site
Lenexa, Kansas

Figure 4
Soil Sample Summary Map

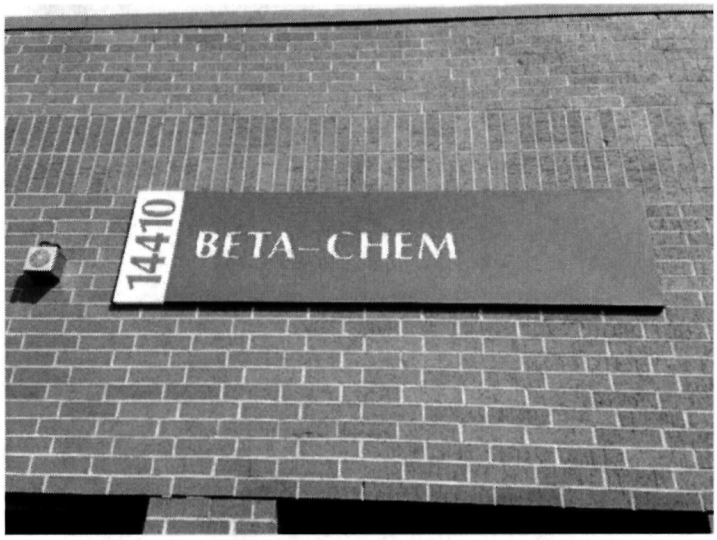
TETRA TECH

Date: 09/12/14 Drawn By: Clayton Hayes Project No: X9025.14.0060.000

APPENDIX B

PHOTOGRAPHIC DOCUMENTATION

Removal Assessment at the Beta-Chem Site
Lenexa, Kansas



TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows the Beta-Chem facility sign at 14410 West 100th Street in Lenexa, Kansas. The facility began operation in March 1993 and produced radio-pharmaceutical-synthesized compounds using carbon-14 as a dating mechanism.	1
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: North	PHOTOGRAPHER	Danny O'Connor	5/5/2014

TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows the front entrance to the Beta-Chem facility. Advisory signs were posted by the Kansas Department of Health and Environment (KDHE) to warn of the presence of radioactive material within the building.	2
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: North	PHOTOGRAPHER	Danny O'Connor	5/5/2014

Removal Assessment at the Beta-Chem Site
Lenexa, Kansas

TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows a RADeCO® Model H-810 high-volume air sampler. Air sampling was conducted daily to measure airborne concentrations of radioactive material.	3
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: NA	PHOTOGRAPHER	Danny O'Connor	5/5/2014

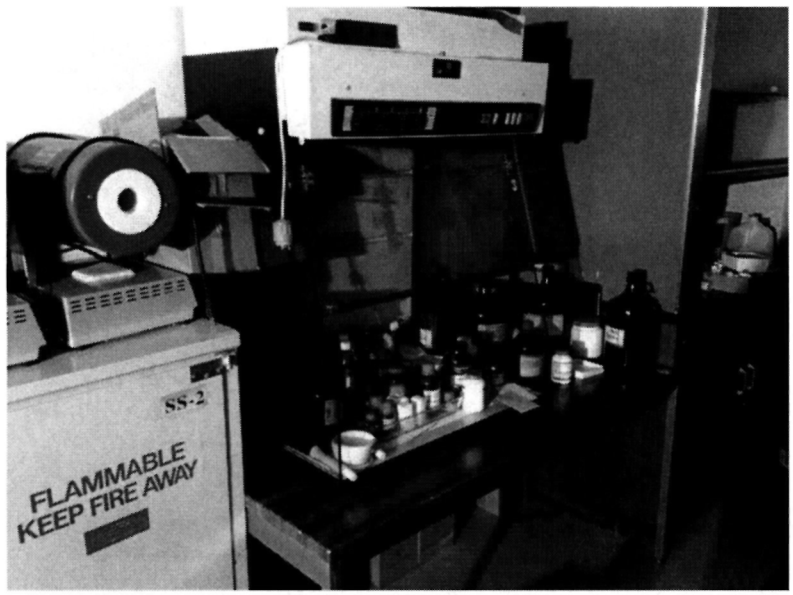
TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows Superfund Technical Assessment and Response Team (START) personnel working in an area designated as containing radiation.	4
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: NA	PHOTOGRAPHER	Danny O'Connor	5/12/2014

Removal Assessment at the Beta-Chem Site
Lenexa, Kansas

TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows a fume hood in the northwest section of the laboratory. This fume hood was assessed for total and removable contamination during the Removal Assessment.	5
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: NA	PHOTOGRAPHER	Chuck Hooper	5/9/2014

TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows a fume hood in the northwest portion of the laboratory. Carbon-14 contamination on all four fume hoods in this section of the laboratory exceeded the established Derived Concentration Guideline Level (DCGL) for total contamination.	6
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: NA	PHOTOGRAPHER	Danny O'Connor	5/5/2014

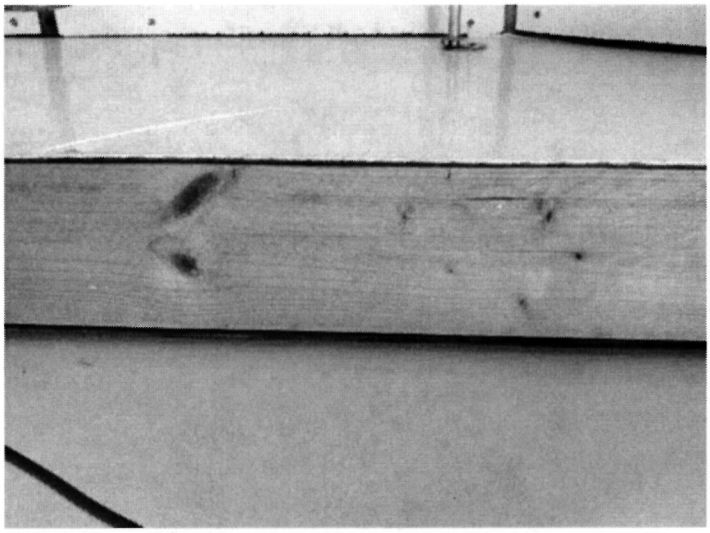
Removal Assessment at the Beta-Chem Site
Lenexa, Kansas



TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows the semi-portable fume hood in the northeast section of the laboratory. Total carbon-14 contamination on this fume hood exceeded the DCGL.	7
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: NA	PHOTOGRAPHER	Danny O'Connor	5/5/2014

TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows an area where a protective covering has been applied to surfaces inside a fume hood.	8
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: NA	PHOTOGRAPHER	Chuck Hooper	6/11/2014

Removal Assessment at the Beta-Chem Site
Lenexa, Kansas



TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows an exposed wood surface in the northwest section of the laboratory. Total carbon-14 contamination on this surface exceeded the DCGL.	9
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: NA	PHOTOGRAPHER	Chuck Hooper	5/9/2014

TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows four exhaust systems on the north exterior of the Beta-Chem facility. Wipe samples were collected from the exhaust vents and submitted for laboratory analysis for carbon-14 via liquid scintillation counter. Reported concentrations did not exceed the DCGL for removable contamination.	10
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: NA	PHOTOGRAPHER	Danny O'Connor	5/8/2014

Removal Assessment at the Beta-Chem Site
Lenexa, Kansas

TETRA TECH PROJECT NO. 103X9025140060	DESCRIPTION	This photograph shows the north exterior of the Beta-Chem facility. Eighteen surface soil samples were collected within this area and submitted for laboratory analysis for carbon-14 via liquid scintillation counter.	11
	CLIENT	U.S. Environmental Protection Agency Region 7	Date
Direction: North	PHOTOGRAPHER	Danny O'Connor	5/8/2014

APPENDIX C

SITE LOGBOOK

Rite in the Rain®
ALL-WEATHER
LEVEL
№ 311

Beta-Chem Removal Assessment
and Removal Action

X9025140060/0061

Log Book #1

5-5-14 Beta-Chem

0630 STM O'Connor arrives @ office, prep for days activities

0745 STM O'Connor, Bryant Merriman, + Nick Weiderholt depart for EPA Warehouse

0800 Arrive @ EPA Warehouse, load vehicle and discuss site with EPA Doug Ferguson

0954 Arrive on site, conduct daily tailgate meeting

- Initial plans to scope site and collect video/photos
- Inventory Chemical Containers
- Collect swipe samples

Collect background readings with Ludlum 2241 ratemeter with 44-9 detector

41, 38.6, 40, 36.7, 33.9, 40.3

Check with Cs-137 source

Collect beta radiation readings inside building Room C: ~150 c/m - Floor

Door Frame - 280 c/m

Fume hood backing >4.5 Kc/m

Fume hood: 872 c/m - bottle, 250-450 c/m in hood Floor >600 cpm

Rite in the Rain

5-5-14 Beta-Chem

Ludlum 642 - response check ok

Back 0 - α 43 β

1200 Lunch

1230 End lunch, continue labeling and inventorying containers

- Prep wipe samples for lab

	Sample Name	3030 Reading α/β	Unit
1430	G2 PVC Intake	0/2115	642
1435	G1 Hood Frame	0/588	642
1440	G1 Hydrogen Cylinder	0/237	642
1445	G1 Argon Cylinder	0/126	642
1450	Container 20	0/108	642
1455	Container 7R	0/93	642
1300	Container 19	0/48	642
1305	Container 16	0/36	642

1630 Stop Unit # 634 $V = 418.6 ft^3$ T = 2:59:22

1635 Stop Unit # 633 $V = 415.5 ft^3$ T = 3:02:45

1720 STMs O'Connor, Wiederholt, and Merriman arrive @ Tt office

1805 Ship 8 wipe samples

1815 End day

Danny O.
5-5-14

5-6-14 Beta-Chem

0800 STMs O'Connor and Weiderholt arrive on site, prep for days activities

Conduct daily tailgate meeting

Continue inventory of chemical containers

1030 STM Merriman arrives @ Tt office pick up supplies

1100 STM Merriman arrives on site

Continue inventory

1210 Lunch

Continue inventory of containers within Facility

- Find several C-14 sources
- Put C-14 sources in rad area
- Also find tritium source (CH_3)

Purchase 2 Fridges. Will transfer container from non-Functional Fridge to new Fridge. Several containers are marked as keep refridgerated

Complete inventory of containers in fridge

Collect readings from bottles (cap & labels) with 44-9, everything seems contaminated 7500 cpm

Rite in the Rain

5-6-14 Beta-Chem

Radeco # 633 V=1000ft^3 T=6:59:48

EPD readings - End day

STM O'Connor: 1.9

STM Merriman: 0.9

STM Weiderholt: ~~0.~~ 1.0

1730 End day

Danny O.
5-6-14

5-7-14 Beta-Chem

0745 STM O'Connor arrives on site, prep for days activities

EPD beginning readings

STM O'Connor (571927) 2.0 mrem

STM Merriman (571959) 0.9 mrem

STM Wiederholt (571952) 0.0 mrem

Planned activities: Complete inventory of chemical containers. Continue assessment of C-14 on exterior surfaces of containers. Assess container contents for C-14

0800 STM Wiederholt and Merriman on site

Conduct daily tailgate meeting

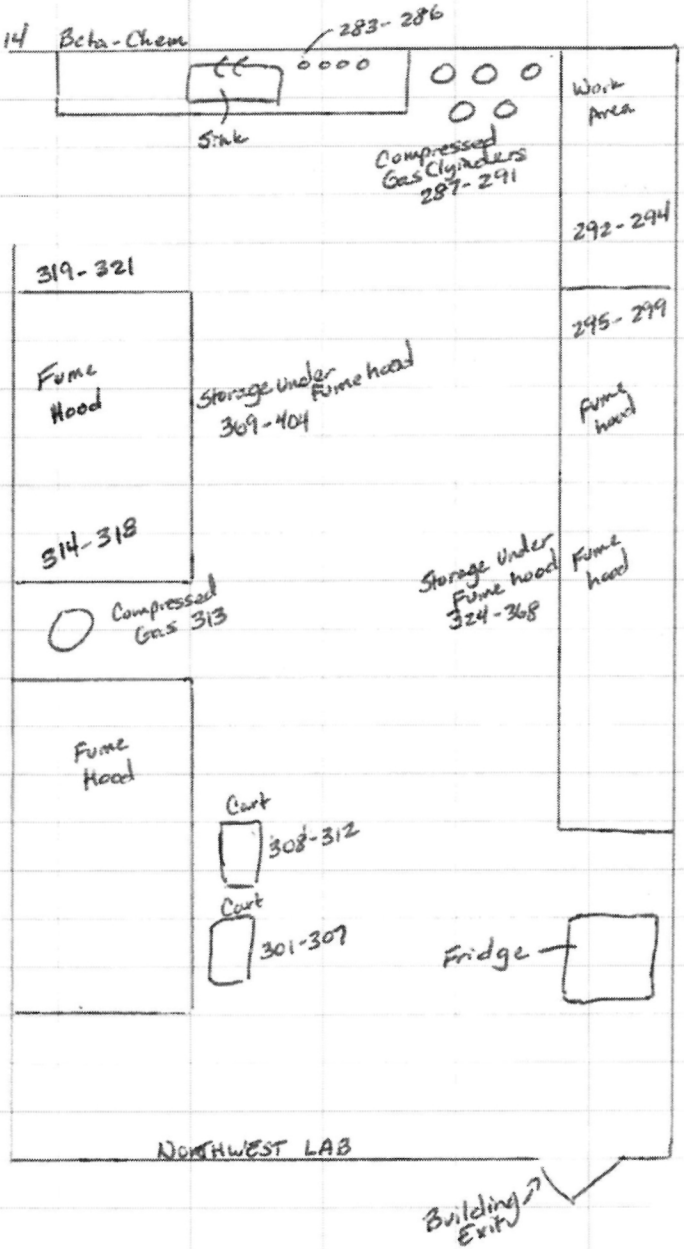
STM O'Connor transfers containes # from old refridgerator to two new minifridges

STM Wiederholt & Merriman continue inventory

- Speak with Mike Dammann with Southwest Research Institute about analysis of Carbon-14 via liquid scintillation of contents of containers. Will come up with 50 samples to provide for RFQ
- Speak with EPA NAREL John Griggs

Rite in the Rain

5-7-14 Beta-Chem



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Danny O.

Rite in the Rain

5-7-14

about site and plan for sampling

container contents

- Two possible Action Levels for container contents: 10CFR20 Appendix B

NRC release to sewer: 3E-4 µCi/ml

10% DL = 30 pCi/ml

NRC release to surface water: 3E-5 µCi/ml

10% DL = 3 pCi/ml

- Select 50 chemical containers for possible lab analysis

Container #		Contents	Room
5	(L)	Anhydrous Benzene - Flam liq	C
8	(L)	Hexane - Flam liq - ENV	C
23	(L)	Diisopropylamine - Corr - Flam Liq	E
28	(L)	Ethyl Acetate - Flam liq	E
41	(L)	Chloroform - Toxic	E
57	(L)	Dehydrated Alcohol - Flam	E
73	(L)	Toluene - Flam Liq	E
104	(L)	Ether - Flam Liq	E
336	(L)	Lactic Acid - Irritant	F
333	(L)	Sodium hypochlorite oxidizer 10-13%	F
310	(L)	Acetic Acid - Corrosive - Combustible	F
312	(S)	Magnesium Sulfate - Non Haz	F
305	(L)	2-Propanol - Flam	F

#		Contents	Haz	Room
320	(L)	Acetone - Flam Liq		F
369	(L)	Chloroform - Toxic		F
339	(L)	Phosphoric acid - Acid/Toxic		F
294	(L)	Dehydrated Alcohol		F
224	(S)	Aluminum Chloride - H_2O reac		E
151	(L)	Petroleum Ether * Flam		E
581	(S)	Silver Nitrite - Oxidizer		E

Email list to Mike Dammann list of chemicals

Contacts for dangerous goods shipping

David Brown - 619-525-7188

Michael Valerius 513-564-8355

Chris Tipton

Lawson Bailey 803-641-6326

Guy Cooley

STM O'Connor & Merriman collect samples from 20 containers identified for internal sampling

- EPA Hooper

#294 → β = BG BG = 60 cpm

#151 → β = BG

#57 → β = BG

#28 → β = BG

#23 → β = BG

Rite in the Rain

5-7-14 Beta-Chem

#8 → β = BG

#310 → β = 50 cpm over BG

#333 → β = 850 cpm over BG

#339 → β = BG

#369 → β = BG

#305 → β = BG

#5 → β = BG

#104 → β = BG

#336 → β = BG

#305 → β = BG

#37 → β = 50 cpm over BG

#73 → β = BG

#324 → β = BG

#581 → β = BG

#312 → β = BG

1634 Stop RADeCo air monitor #633 953 ft³

T = 7:39:55

1700 Depart site. End day

Danny O.

5-7-14

5-8-14 Beta-Chem

0730 STM O'Connor purchases ice & water

0740 Arrive on site, prep for days activities

RADeCo air Filter samples

Unit # 634 6/66 α/β

Unit # 633 7/84 α/β

C-14 DAC-Public is 15 cpm β per ft³

0750 STM Wiederholt on site

Conduct daily tailgate

Continue inventory of containers

0900 STM Merriman arrives on site

Container #780 readings with 44-9 pancake probe > 200 Kcpm

#639 > 150Kcpm

Segregate chemicals with elevated rad readings - Two C-14 sources observed

Receive lab results

- G2 PVC Intake 9,900 pCi
- G1 Hood Frame 3,400 pCi
- G1 Hydrogen Cyclinder 846 pCi
- G1 Argon Cyclinder 301 pCi
- Container 20 265 pCi
- Container 7R 209 pCi
- Container 19 35.3 pCi

Rite in the Rain

5-8-14 Beta-Chem

Container 16 → 18.6 pCi

Conversion Factor is 2.22 dpm/pCi

KDHE Linscence reg 6,000dpm/100cm²

(removable) → 2,700 pCi/100cm²

- Use 5.63 pCi/cpm conversion Factor for Ludlum 3030 reading (cpm) to pCi

Begin segregated chemicals by DOT Hazard class

1725 STM Merriman and Wiederholt depart site

1735 STM O'Connor departs site

1900 Work on inventory spreadsheet

2030 End day

Danny O.
5-8-14

5-9-14 Beta-Chem

0725 STM O'Connor arrives on site

Prep For days activities

0800 STM Wiederholt and Merriman arrive on site

EPD readings

STM O'Connor (571927) S: 2.3 mrem E:

STM Wiederholt (571952) S: 0.3 mrem E:

STM Merriman (571959) S: 0.2 mrem E:

- Will collect samples from unlabeled containers to HazCat

Crews begin collect samples in level B PPE

Will setup area outside the building to HazCat unknown samples

Prep supplies For soil sampling and contact TestAmerica lab in Earth City to confirm sample analysis as Carbon-14 via LSC, also confirm standard turnaround time

Discuss sampling with EPA Ferguson and KDHE Conley

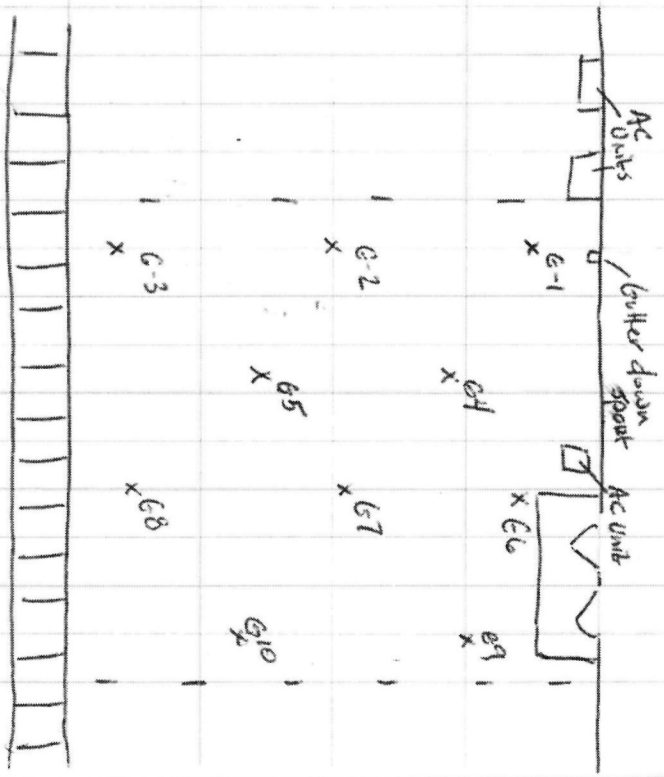
Sketch of soil sampling on next page

Rite in the Rain

5-9-14 Beta-Chem

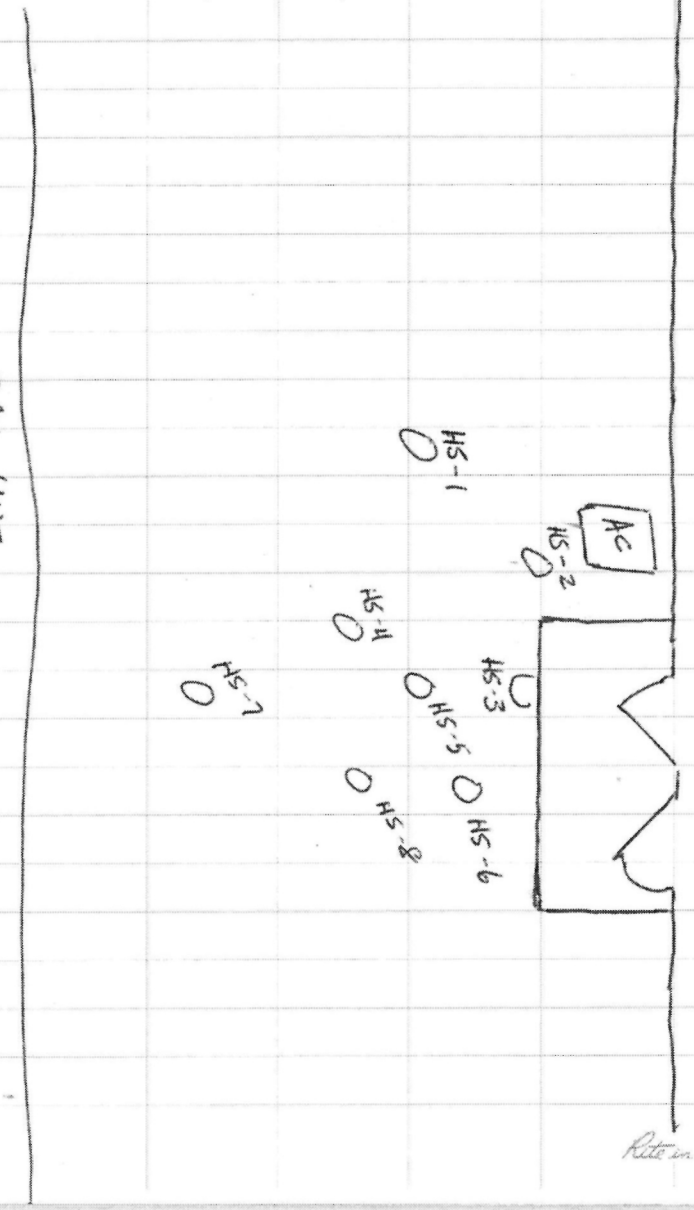
Begin screening exterior soils with 44-9 pancak probe

- Readings from concrete 160-200 cpm
- Kickplate ~300 cpm
- Soil adjacent to concrete pad > 100 cpm
- identify multiple areas of elevated activity
- Create grid to assess contamination from stacks



5-9-14 Beta-Chem

Sample Hot spots



Rite in the Rain

5-9-14 Beta-Chem

Screen Soil Samples with 3030

GPS + 3030 Readings

HS-1 → 38.94825, -94.752594

α: 0 β = 43 cpm

HS-2 → 38.94824, -94.7526

α: 0 β = 39 cpm

HS-3 → 38.94823, -94.7526

α: 0 β: 39 cpm

HS-4 → 38.94824, -94.7526

α 0 β 37 cpm

HS-5 → 38.94824, -94.7526

α 0 β 39 cpm

HS-6 → 38.94823, -94.75262

α 0 β 27 cpm

HS-7 → 38.94825, -94.75262

α 0 β 43

HS-8 → 38.94825, -94.75263

α 0 β 30 cpm

~~HS~~ G1 → 38.94828, -94.75254

α 0 β 35 cpm

G2 38.94829, -94.75255

α 0 β 48

G3 38.94831, -94.75257

α 1 β 52

5-9-14 Beta-Chem

G4 → 38.94827, -94.75257

α 0 β 37

G5 → 38.94829, -94.75259

α 0 β 33

G6 → 38.94826, -94.75258

α 0 β 37 cpm

G7 → 38.948269, -94.75259

α 0 β 51 cpm

G8 → 38.94828, -94.75262

α 0 β 35

G9 → 38.94824, -94.75262

α 0 β 27

G10 → 38.94827, -94.75264

α 0 β 36

Stop RADeCo # 633

V: 1178.1 ft³ T = 8:42:14

1740 Depart site

Danny O.

5-9-14

Rite in the Rain

5-12-14 Btn-chem

0730 STM O'Connor arrives on-site, prep for days activities

0750 STM Brown arrives on site

- Conduct site walk

Continue inventory of chemical containers

Field screen samples for Rad

#108 → BG

#109 → +1200 cpm

#823 → +140

#393 → +500

1200 Lunch

- Continue inventory of chemical containers
- Select 12 Flammable Liquids to Field screen with 44-9 probe

Containers

69	Methanol, Anhydrous	β : BG
46	Borane-tetrahydrofuran complex	β : BG
62	m-Xylene, anhydrous	β : BG
375	Cyclohexane	β : BG
90	Tetrahydrofuran, anhydrous	β : BG
73	Toluene	β : BG
392	Ethyl Alcohol	β : BG
36	Acetone	β : BG
34	Borane-tetrahydrofuran complex	β : BG

5-12-14

29	Ethyl Acetate	β : BG
140	Alcohol, Dehydrated	β : BG
~~305~~ 385	~~2-propanol~~ Pentane, anhydrous	β : 100 + BG
393	Ether, Anhydrous	β : 320 + BG

Container 393 was Anhydrous Ammonia with hand written label of "Hot Waste"

- Will attempt to send in the following samples for C-14 via Liquid scintillation counting: 393, 385, 69, 62, 375, 90, 73, 392, 29

1730 End day

5-13-14

Danny O.

Rite in the Rain

5-13-14 Beta-Chem

0800 STM Brown inventories containers
- HazCating unknown samples
- EPA Mike Davis attempts to locate PNU listed wastes
- Sampled unknowns
- STM O'Connor ships dangerous goods samples

Danny O.
5-13-14

5-14-14 Beta-Chem

0755 STM O'Connor arrives on site, prep for days activities
EPD Readings
STM O'Connor (571952): 0.0
STM Brown (571927): 0.0

0800 STM Brown arrives on site
Disposal company: 0.5 μCi/g or 500,000 pCi/g action level
- STM Brown continues HazCating
- FedEx Dangerous goods package not excepted from FedEx, STM O'Connor returns to office to correct issues
- Update inventory spreadsheet
Stop RADeCo Unit #
V=
T=

1700 End EPD
571952: 0.0
571927: 0.0

1740 STM O'Connor departs site

Danny O.
5-14-14

Rite in the Rain

5-15-14 Beta-Chem

0750 STM O'Connor arrives on site
Prep for days activities
EPA 571952:0.1
Check RADeCo sample from yesterday
α:3 β:276
STM Brown continues work HazCating
unknown chemicals
-Discuss package shipment with FedEx,
package was shipped to local KC
resident, coordinate with FedEx to
have package shipped to GEL
EPA Ferguson compiles list of like
Flammable Liquids for composite
sampling - Will field screen with 44-9

1230 Lunch

1300 Begin sampling 1st composite list
(comp-1) - Ethers
Containers: 31, 32, 37, 45, 77, 90, 91, 95, 104,
372, 380, 383, 389, 395, 396, 397, 401
*Container 389 is green dense liquid
Begin sampling Comp-2 Hexanes
Containers 8, 9, 76, 81, 82, 113, 154, 292,
368, 375, 385, 437
Container 303 is empty (can not sample)

5-15-14 Beta-Chem

Screen composite samples with 44-9
Pancake probe
Comp 1: 10 Kcpm
586,906 pCi/ml
Comp 2: 8.1 Kcpm
475394
Collect Comp-3 sample from Benzenes
Containers 5, 30, 62, 63, 73, 83, 293, 394,
398, 474, 49
Comp-3: BG
44-9 Pancake probe is getting contaminated
from exposure to rad contaminated
evaporating solvents. Heating detector is
the only way to sufficiently clean probe

1800 Depart site. End day

Danny O.
5-15-14

Rite in the Rain

5-16-14 Beta-Chem

0750 STM O'Connor arrives on site, prep for days activities

Update chemical spreadsheet

Collect Comp-4 sample from alcohols

Containers # 35, ~~46~~ D.O. 53, 57, 67, 84, 285, 299, 305, 315, 365, 374, 388, 392, 404

Unable to sample containers 548, 549, 550 due to contents being solidified

-STM Brown continues field screening unknows

-Screen comp 4 with 44-9 pancake probe Comp-4: Background

Screen other HazCated unknowns

Container #	44-9 reading cpm over BG
108	BG
111	BG
3	BG
284	BG
145	BG
616	50 Kcpm
656	
107	+30cpm
402	BG
113	BG

5-16-14 Beta-Chem

Container #	44-9 Reading (cpm
391	850
617	BG
296	+40 - needs further investigation
319	BG
104	BG
135	~BG
382	BG
98	BG
334	BG
41	BG
1053	BG
381	BG
1054	746 Kcpm

Attempt to weigh sample from #1054

Planchet - 3 grams, with sample 3.5 g

Sample is .5 grams

884	BG
294	BG
151	~BG
57	D.O. ~~3~~ 250
885	250

Rite in the Rain

5-16-14 Beta-Chem

Containers in RAD Fume Hood

1054, 639, 921, 883, 780, 847, 492, 922, 925

928, 923, 921, 927, 929, 66

~~4~~ 15 Containers marked as:

D.O.

- Potassium Cyanid (C-14) 500mCi
- Barium Carbonate 1Ci
- Barium Carbonate 1Ci/vial
- Barium Carbonate 500mCi/vial
  " " 284 µCi/mg
- Mesylate salt 58mCi/mmol
- Empty ~~50~~ 54mCi/mmol

Barium Carbonate 1Ci

" " 1Ci

" " 2000mCi/vial

- 4 steel containers with unknown marking
- Standard set C-14 10^5 dpm

1400 Stop RADeCo Unit #634

V= T=

1430 End EPD

571952: 0.3

571927: 0.3

Danny O.

5-16-14

6-5-14 Beta-Chem

0730 STM O'Connor arrives on-site, prep for days activities

- Prep for field screening samples for internal rad contamination

Container #	Onate	44-9 reading (+BG cpm)
BG - 60-80cpm		
154	L	BG
109	L	+ 250-300
311	L/sludge	BG
368	L	> 10 K cpm
656	S	~ 10-20/BG
847	S	+ 150 K
151	L	~ BG
305	L	~ BG
331	L	BG
360	L	BG
324	L	BG
391	L(thick)	+ 1000 cpm
319	L	BG
381	L	~ BG
37	L	BG
5	L	BG
581	S	BG
310	L	+ 20-30

Rite in the Rain

6-5-14 Beta-Chem

Container #	State	44-9 reading (+BG cpm)
939	L	BG
312	S	BG
28	L	BG
8	L	BG
988	L	BG
369	L	BG
339	L	BG
918	L	BG
999	L	BG
362	L	10 Kcpm

- Attempt to find and segregate rad hot samples
- Update spreadsheet

1630 End work on project

Danny O.
6-5-14

6-6-14 Beta-Chem

0800 STM O'Connor arrives on site. Prep for day activities

Dose Meter 571952: 0.8 mrem

- Coordinate with Dave Brown for Dangerous goods shipment
- Organize rad areas
- Send out update emails

1130 Depart for Tt office

Prep equipment & supplies for next week

Prep DG samples for shipment

Danny O.
6-6-14

Rite in the Rain

6-9-14 Beta Chem

0800 - Loading field supplies at office into rental vehicle. Brian Mohr going to EPA Cave to pick up more APR cartridges, pipettes, and tyveks.

0930 - STM Brown & Mohr onsite; unload field supplies in site office.

1000 - OSC Ferguson arrives onsite; unlock building. STMs Brown and Mohr begin inventorying remaining containers. Total inventory list up to 1108 containers

1200 - lunch

1245 - STMs Mohr & Brown begin hazcatting remaining unknowns.

~~1700~~ 1630 - Finish hazcatting unknowns

1700 - shutdown Rodeko Air filter which was started ~ 10:30 am.

~~sta~~ Tidy up and lockdown building.

1710 - depart for day

6-10-14 Beta Chem

~~0800~~ 0730 - STM Brown arrives onsite ER is onsite. Doug Ferguson, OSC gives safety briefing and tour of site to ER.

0800 - STM Mohr arrives

0830 - STMs & ER begin screening flammable liquids for radiation and compatability. All flammable liquids ~~that~~ screen > 1,000 cpm are segregated.

1330 - finish screening flammable liquids for radiation and compatability by placing small amount of each into 5-gallon bucket.

1350 - lunch

1445 - ER bulking compatable flammable liquids into 55-gal drum.

- continue organizing chemical containers

1715 - tidy up & lockdown Bldg.

1730 - depart for day

Rite in the Rain

5-21-14 Beta Chem

0800 STM Cosmo Canacari arrives on-site

~~0800~~ STM Merriman departs TT after picking up supplies

0830 STM Merriman arrives on-site. Site activities for today include inventory of new containers, identify hazardous class of materials and hazcat unknowns. OSC Ferguson on-site

1015 OSC Frey and EPA Hopper arrive on-site

1100 ~~EPA~~ Army Civil Support team on-site

1130 ~~1205~~ Lunch

1205 Return to site. Continue to inventory and hazcat

1530 Finish hazcat for the day. Continue to ~~ha~~ to collect inventory

1630 End of day

1645 START departs site.

5-21-14

5-22-14

805 STM Merriman arrives on-site. OSCs Ferguson and Mike Davis on site. Will continue to hazcat and inventory. Army Civil Support will be on-site to collect air samples.

810 STM Canacari on-site.

815 Army Civil Support on-site.

845 STM Merriman and OSC Davis go pick up supplies

1015 Begin to hazcat, Civil Support Team continues to collect samples.

1130 Lunch

1215 Continue to hazcat and inventory

1245 Army Civil Support Team not on-site.

1430 Continue to hazcat and inventory

1600 End of day.

5-22-14

Rite in the Rain

5-23-14 Beta Chem

0730 STM Canacari arrives on-site. Prep for the day.

0800 STM Merriman and OSC Ferguson arrive on-site. Will continue to haccat and inventory.

1030 OSCs Frey and Davis on-site. Kansas Fire Marshall on-site

1115 Fire Marshall departed site

B. Merriman
5-23-14

5-27-14 Beta-Chem

0710 STM O'Connor arrives @ TT, pick up supplies. Depart for site

0800 STM O'Connor arrives on site. Discuss site activities with EPA Doug Ferguson

- Waiting on quotes from disposal companies for chemicals & rad contaminated building materials. Will finish updating inventory spreadsheet and segregating chemicals

Weather: 85°F and sunny, 20% chance of thunderstorms

- Work to update spreadsheet

276 samples field screened

1200 Lunch

Continue updating spreadsheet

EPA Hooper works to screen lab instruments for gross beta activity

- Begin drafting an RFP for Radioactive Waster Broker services

- Will include assessment of internal & exterior rad contamination

1715 Depart site

Danny Q.
5-27-14

Rite in the Rain

5-28-14 Beta-Chem

0800 STM O'Connor arrives on site. Prep for days activities

- Continue working on spreadsheet
- Discuss rad broker options with Tt Ted Faile and EPA Ferguson
- Will write RFP for internal and external rad assessment

1200 Lunch

- Continue looking up chemical hazard classes and segregating

1700 Depart site

Danny O.
5-28-14

5-29-14 Beta-Chem

0730 STM O'Connor arrives @ Tt. Drop off START vehicle and supplies

0845 Arrive on site. Prep for days activities.

- Continue working on looking up unknown chemicals on spreadsheet
- EPA Ferguson works on segregation of chemicals by hazard class
- EPA Ferguson attempts to contact Lenexa City Parks Department to gain access to Electric Park to collect reference samples
- Attempt to contact Ameriphysics

1645 Depart site.

Danny O.
5-29-14

Rite in the Rain

5/30/14 Beta-Chem

0755 STM O'Connor arrives on site. Prep for days activities

- Update Task Order costs

TO 60: <$500 remaining

TO 61: $35,322.76 remaining

- EPA Ferguson gets permission to collect reference samples from electric park. Will collect samples today.

0840 Receive invoice from Test America for soil samples $1,440

Finish chemical lookup

- identify 29 containers requiring ~~fitt~~ screening

locate most bottles, some empty and some rad contaminated

- Prep soil sampling equipment

1200 Arrive @ Electric Park to collect reference samples

1205 BG1: 38.95930, -94.76922

44-9 reading 90-100 cpm

1211 BG-2: 38.95918, -94.76921

44-9 reading 100-110 cpm

1214 BG-3: 38.95901, -94.76923

44-9 readings: ~ 110 cpm

1217 BG-4: 38.95922, -94.76948

5/30/14 Beta - Chem

44-9 reading: 100-110 cpm

1220 BG-5: 38.95934, -94.76950

44-9 readings ~100 cpm

1300 Lunch

- Continue trying to locate unknown containers.

EPA Mahler and Hooper inventory rad containers

Danny O.

5-30-14

Rite in the Rain

6/11/14 Beta Chem

0800 STM Cox & Mohr arrive on-site, conduct daily Health & Safety meeting with OSC Ferguson

0900 STM Cox & Mohr attempt to classify hazard classes of samples on site

1200 Lunch

1230 STM Denny Cox leaves site; STM Cody McLauty arrives and offloads supplies

1300 Mohr & McLauty identify and locate flammable chemicals in fridge, then test them for radiation using pan-cake probe

1400 Mohr & McLauty attempt to classify hazard classes of samples on site

1730 Start departs site

6/11/14

6/12/14 Beta Chem

0700 - STM Mohr arrives @ ERA Warehouse to pick up supplies (TVA 1000 and calibration gases)

0745 STM Cody McLauty arrives @ site and continues attempting to identify and classify samples

0800 STM Mohr arrives on site and attempts to classify hazard classes of samples; ER begins draining compressed gas cylinders on site

1200 Lunch

1230 STM Mohr & McLauty continue to classify hazard classes of samples; Mohr and McLauty updated inventory and spreadsheet

1700 Clean up and lock down site

1730 End of Day

6/12/14

Rite in the Rain

6/13/14 Beta Chem
0700 arrived @ EPA Warehouse (STM Mohr) to pick up supplies for day's activities
0745 STM Mohr + STM Canacari arrive @ site
0800 OSC Ferguson arrives @ site, conducts Health and Safety meeting
0830 Made preparations to conduct field screening of samples, checking for radiation, ERs begin draining gas cylinders
0900 setup glove box and prepared to check samples for radiation inside box
1100 began checking samples in glove box for radiation
1230 Lunch
1300 Continued using glove box to check samples for radiation
1630 STM Mohr + Cancari leave site - End of Day
6/13/14

6-16-14 Beta-Chem
0720 STM O'Connor arrives @ Tt. Complete expense report. load vehicle
0815 Arrive @ Field site. Review site activities with EPA Ferguson
- Majority of Flammable liquids have been bulked into 55-gallon drum
- Crew will continue venting hydrogen and nitrogen tanks
STM O'Connor + EPA Ferguson locate remaining Flam Liqs
Complete compatability study. Following containers ready for bulking
26, 728, 422, 1112, 438, 1115, 1111, 39, 1114, 526, 501, 384, 437, 428, 94
- Field screening with 44-9 probe indicates elevated activity in container #459
1237 hydrogen tank #290 completely vented
#161, 978 acetylene tanks have also been vented
#162 compressed Nitrogen Tank
Identify more containers for Flam Bulking

Rite in the Rain

6-16-14 Beta-Chem

1065, 215, 40, 1069, 23, 729, 742

Segregate HazCated chemicals by Hazard class

1510 Conduct compatability study for bulking of Flammable Liquid

The Following containers were added to Flammable Liquids Drum

23, 742, 729, 711, 215, 476, 1074, 854, 690, 40, 29

1715 Depart site. End day

Danny O.
6-16-14

6-17-14 Beta-Chem

0725 STM O'Connor arrives on site, prep for days activities

Review Flammable Liquid data to confirm everything has been bulked

Find 45 chemicals listed as Flammable Liquids, attempt to find chemicals

1710 Depart site

Danny O.
6-17-14

Rite in the Rain

KS1407

Rite in the Rain®
ALL-WEATHER
LEVEL
№ 311

Beta-Chem Site
Removal Assessment + Removal Action
X9025140060/0061

Log Book #2

6-18-14 Beta-Chem

0735 STM O'Connor arrives on site, Prep for days activities

-Update Spreadsheet.

Empties: 171

Gas vented: 13

Flammable Liquids bulked: 133

Discuss possible contains to bulk with Flammable Liquids

Bulk- Container # 111, 436, 464, 471, 821

Container # 420 Screening with 44-9 probe indicates rad 1.4k cpm

1600 Collect sample from bulked Flammables for C-14 analysis via LSC

- Test America will be unable to process any liquid or solid haz waste samples from Beta-Chem site

1645 Depart site

1800 Work on identifying remaining unknowns

1845 End day

Danny O.
6-18-14

6-19-14 Beta-Chem

0740 STM O'Connor arrives @ TG office

- Prep Flammable Liquids sample for shipment

0930 Drop off sample @ FedEx

Discuss site Health and Safety with STM Denny Cox

- Suggestions
  - Move Rad containers into coolers
  - Post H & S items in field office
  - Discuss dose readings with EPA Hooper

1040 Depart for site

1105 Arrive on site, FBI on site to continue assessment and meet with EPA Ferguson

1230 Pick up coolers from Wal Mart

1300 Begin transfering rad sources and externally + internally contaminated containers to coolers

- Screen samples with unknown contamination

1530 Speak with University of Kansas Radiation office about having samples analyzed for carbon-14

Rite in the Rain

6-19-14 Beta - Chem

Lab can likely handle the samples @ little or no cost

Michael Lemon 785-864-2851

Discuss KU with EPA Ferguson

1700 Depart site

Danny O.
6-19-14

6-20-14 Beta-Chem

0735 STM O'Connor arrives on site, Prep for days activities

Review qoute from GEL for chemical analysis of bulked Flammables → $1,703.50

-Discuss bulking plan

-Will begin bulking chlorinated solvents and finish Flammables

Review containers removed from rad section yesterday

	Container #	
Flam	# 395	Tetrahydrofuran
Toxic/Comb	47	N,N-DimethylFormamide
Flam (55°F)	364	Acetonitrile
Flam	121	Ether
Flam	366	1,4-Dioxane

Check # 52 (Acetic Anhydride)

Look up container # 47, flash point = 136°F, will add to Flammable liquids

Bulk- Flammable liquids # 395, 366, 121, 364, 47

Prepare chlorinated solvents for bulking

Rite in the Rain

Container #

662 Octafluorotoluene

1069 Isobutyryl Chloride H_2O sensitive

41 Chloroform

309 α,α,α-Trifluorotoluene

308 Tetrabromomethane

977 3-Bromo-o-xylene

528 Benzoyl chloride

493 Phthaloyl dichloride H_2O sensitive

494 " H_2O sensitive"

377 Carbon tetrachloride

739 Titanium Chloride H_2O reactive

373 Chloroform

369 " "

390 Carbon tetrachloride

298 " "

363 Chloroform

738 Titanium Chloride H_2O reactive

316 Dichloromethane

295 "Di "

Bulk liquid chlorinated solvents

41, 295, 298, 309, 316, 363, 369, 373, 377, 390,

528, 662, 977

-ERRS crew preps to collect samples

From air/water reactive containers

6-20-14 Beta-Chem

Prep containers 234, 736, 110, 248

in Blast Cabinet 30-gallon

1400 Work on other project

Danny O.

6-20-14

Rite in the Rain

6-23-14 Beta-Chem

1030 STM O'Connor departs KC office for site

1055 Arrive on site, prep for days activities
- Prep sample containers for chemical analysis of bulked flammable liquids
Required analysis:
TCLP Metals, VOCs, SVOCs
pH
Flashpoint
PCBs
Total Halogens
BTUs
required volumes
TCLP analysis - 2 Liters
PCBs - 100 ml
Remaining analysis - 250-500 ml
Prep COC for KU analysis of Carbon-14 via LSC
EPA Ferguson delivers samples

1700 Provide STM Kumud with update of site

1730 End day

Danny O.
6-23-14

6-24-14 Beta-Chem

0700 STM O'Connor arrives on site, prep for days activities
ERRS crew has finished collecting samples from water/air reactive chemicals
- Prep samples for KU
- 45 total samples to deliver
Discuss bulking strategy with EPA Ferguson and ERRS crew

1230 ERRS crew bulks organic acids
Containers # 978, 340, 310, 332, 545, 336, 329
Bulk inorganic acids containers 324, 1116, ~~336~~ D.O. 991, 990, 339, 989, 335, 342, 108, 331, 338, 327, 328
Added containers # 330 & 204 to the bulked halogen group
Container #337 was going to be bulked with inorganic acids but it's a solid

1450 Depart for KC TT office
Work on preparing samples for shipment as dangerous goods

1800 End day on this project

Danny O.
6-24-14

Rite in the Rain

6-25-14 Beta-Chem

0730 STM O'Connor arrives on site, prep for days activities
ERRS to continue bulking chemicals and collecting samples for LSC
-Update Summary spreadsheet
ERRS collecting samples from halogens group for chemical analysis
Chemical and C-14 samples from organic and inorganic acids
Will ship Halogen group as UN 1992 Flammable Liquid NOS (Carbon Tetrachloride mixture)
ERRS crew bulks solid bases 211, 306, 264, 268, 179, 156, 157, 177, 245, 178, 317, 262, 624, 625, 611, 784

Danny O.
6-25-14

6/26/14 Beta-Chem

0730 STMs O'Connor & Kunud arrive on site. Review site work and Health and Safety
Discuss planned activities with EPA Ferguson

0900 ERRS crew begins sampling oxidizers Containers 832, 860, 837, 835, 834, 839, 838, 836, 840. All containers now empty

0940 Bulk sample #514 with halogens and #334 with organic acids
STM O'Connor departs site.

6-26-14 10:00 STM Pyakuryal oversees ERRS crew as they begin sampling oxidizers Containers 847, 803, 797, 686, 221, 841 (no sample – the container was empty), 594, 571, 220, 236, 572, 880, 581, 993, 566, 251, 833, 227, 254, 512, 559, 209, 256, 173, 296. All containers except 797✓, 221✓, 594✓, 236✓, 572✓, 581✓ 833, 227✓, 254✓, 512, 559✓, 209✓, 256✓, 173✓ and 296 were empty; those containers that were not empty were also sampled w/ wipes (wipe samples were collated).

Rite in the Rain

6-26-14

11:30 STM Pyakuryal gathered all samples to prepare the COC prior to lab submittal.

13:30 Samples were logged and properly labeled for delivery to the University of Kansas lab.

13:35 OSC Ferguson left the job site to deliver the samples in Lawrence (KU lab).

14:00 ERRS crew began sampling liquid oxidizer containers 333, 406, 411, 424, 425, 439, 440, 444, 450, 461, 469, and another container without a number.

16:00 STM Pyakuryal started the COC and requested the ERRS crew to place the liquid oxidizer samples collected in the afternoon in the fridge/refrigerator for delivery on Friday.

6-26-14

16:20 STM Pyakuryal and ERRS site Manager lock the trailer and turn off the generator before leaving the site.

6-26-14

Rite in the Rain

6-27-2014

7:30 STM PYAKURYAL arrives @ the site. ERRS Crew is ready to start sampling

07:40 OSC Ferguson informed START that toxics will be sampled.

08:00 Samples of Liquid oxidizers from 6/26/14 sampling event were labeled, preparing for delivery to KU labs. These samples were kept in the refrigirator overnight. COC was provided to OSC Ferguson with samples in a cooler.

08:30 Started sampling preperation for the toxics.

09:00 ERRS crew started sampling the toxics containers #s 27, 79, 142, 228, 235, 241, 259, 480, 484, 489, 491, 509, 515, 538, 547, 553, 627, 633, 670, 697, 707, 720, 749, 752 759, 779, 806, 814, 827, 831, and 877. In addition, wipe samples were collected from containers # 27, 79, 142, 228

6-27-2014

09:00 (Continued)
235, 241, 259, 480, 484, 489, 491, 509, 515, 538, 547, and 752.

10:50 Additional samples of toxics were collected from containers 24, 141, ~~674~~ 517, 583, 599, 674, and 1060. Wipe samples of containers 24, 141, 517, and 1060 were also collected.

11:45 Samples were labeled and COCs were filled out.

12:15 The samples were placed (kept) in the Beta-Chem office for delivery to KU labs on Monday, June 30, 2014. The ERRS crew left the site.

14:30 Completed field activities for the day and provided OSC Ferguson samples, COCs, and rest of the

Rite in the Rain

6-27-14

14:30 paperwork ready for samples delivery to KU labs on Monday, June 30, 2014.

STM Pyakuryal departs the site with OSC Ferguson.

Pyakuryal
6-27-14

6-30-14 Beta-Chem

0730 STM O'Connor arrives on site, prep for days activities

Finish preping samples for KU

-Review STMs Pyakuryal's notes from previous week

ERRS crew bulks containers 420, 462, 631, 447, 555, 421, 470, 427, and 444 with bulked halogens

Unable to bulk containers 413, 458, 435, 460, 409, 415, 407, 414, 453 because chemicals are air/water reactive

ERRS crew will sample these under Nitrogen

Containers # 467, 430 are solids - not bulked

Work on sampling chemicals for LSC

STM O'Connor prepares shipments of dangerous goods samples

-UN1992 Flammable liquid, toxic, N.O.S. (Carbon Tetrachloride mixture)

-UN 2920 Corrosive liquid, Flammable, N.O.S. (Acetic Acid mixture)

Rite in the Rain

6/30/14 Beta-Chem
D.O.

- UN 3262 Corrosive solid, basic, inorganic, NOS.
(Sodium hydroxide mixture)
-

1800 End day

Danny O.
6-30-14

7-1-14 Beta-Chem

0730 STM O'Connor arrives on site, prep for days activities.
ERRS crew continues sampling irritants & harmful solids
Receive preliminary Carbon-14 results from KU Rad lab
- Bulked 1A - 3,456 pCi/ml
- Bulked 0A - 4,042 pCi/ml
- Bulked CS- ND
Discuss unknown container with STM Pyakuryal, he thinks samples is from container # 444
STM O'Connor begins inventorying internally & externally C14 contaminated containers in rad section

1700 Depart site

Danny O.
7-1-14

Rite in the Rain

7-2-14 Beta-Chem

0730 STM O'Connor arrives on site, prep for days activities.

Continue labeling samples and filling out COCs for samples going to KU

- Bulked Halogen sample returned by FedEx. Cargo plane only sticker is expired, will fix and re send.

- Will order new labels from ULine

Continuing inventorying rad containers

HazCat containers # 362 & 459

362 - Not H_2O reactive, partially soluble/sinks pH=4 Non-flammable, not a sulfide

459 Insoluble/Floats pH=4 Non-Flam Not oxidizer or sulfide

End day

Danny O
7-2-14

7-7-14 Beta-Chem

~~0730~~ D.O. 0700 STM O'Connor arrives on site, prep For days activities

- locate remaining unbulked & unsampled containers

ERRS crew begins sampling containers

EPA Ferguson brought 55-gallon drum full of rad debris and containers

Inventory all containers H-1 → H-40

Several containers indicate they hold Carbon-14, readings with pancake probe read 1K → 999K cpm outside of glass

Readings outside glass may be from Bremsstrahlung

1700 End day

Danny O.
7-7-14

Rite in the Rain

7-8-14 Beta-Chem

0730 STM O'Connor arrives on site, prep for day

- ERRS crew continuing to sample remaining containers

Update spreadsheet with sampled containers & newly inventoried containers

1700 End day

Danny O.
7-8-14

7-9-14 Beta-Chem

STM Kumud Pyakuryal labels samples and fills out COCs

STM O'Connor working on BMAC site

Danny O.
7-9-14

Rite in the Rain

7-10-14 Beta-Chem

0720 STM O'Connor arrives @ Tt, pick up bulked C5 sample

0800 Arrive on site

ERRS crew has found most of the missing containers.

EPA Ferguson needs a summary of rad @ the Beta-Chem site - Due by August 1

Review remaining containers that need to be sampled. Update list

1040 ERRS crew purchase nitrogen for air/water reactive samples

Attempt to locate remaining containers and prep for sampling.

Sample Container #247 - very H_2O reactive

1700 Depart site. End day

Danny O.
7-10-14

7-11-14 Beta-Chem

0730 STM O'Connor arrives on site, prep for days activities

- Will attempt to find 15 remaining containers and check gas cylinder #354 (Methyl Amine)
- Will also continue labeling samples

ERRS crew preps poly drum for venting of Methyl Amine Container #354. Venting causes water to become very caustic, attempt neutralize with acetic acid & baking soda

~~Bulk Container #93 with organic acids halogens~~ D.O.

Container # 539, ~~1100~~ 1110, 1113 with halogens

Container # 93 D.O. is acetic acid not bromo acetic acid, will bulk with OA

Measurements $V = \pi h r^2$

OA -> 6" = h d = 9"

Halogens -> h = 5" d = 13 7/8"

IA -> h = 6" d = 8 5/8"

FI -> h = 16.5" d = 22"

SB -> h = 3.5" d = 8 5/8"

LB -> h = 1" d = 8 5/8"

1700 End day

Danny O.
7-11-14

Rite in the Rain

7-14-14 Beta-Chem

0720 STM O'Connor arrives on site, prep for days activities

- Continue working on labeling sample containers for lab analysis of C-14
- Update excel spreadsheet

Danny O.
7-14-14

7-15-14 Beta-Chem

0720 STM O'Connor arrives on site.
Continue labeling and organizing samples.
Add RADeCo samples to list going to KU for Carbon-14 analysis
ERRS beginning to get disposal cost summaries for bulked F1, IA, OA, 3B

0930 Depart site for Tt to work on BMAC Report

Danny O.
7-15-14

Rite in the Rain

7-16-14 Beta-Chem

0815 STM O'Connor arrives on site, prep for days activities

- ERRS crew transfers bulked chemicals to applicable DOT containers
- Bionomics will be picking up bulked FI, SB, LB, IA, OA

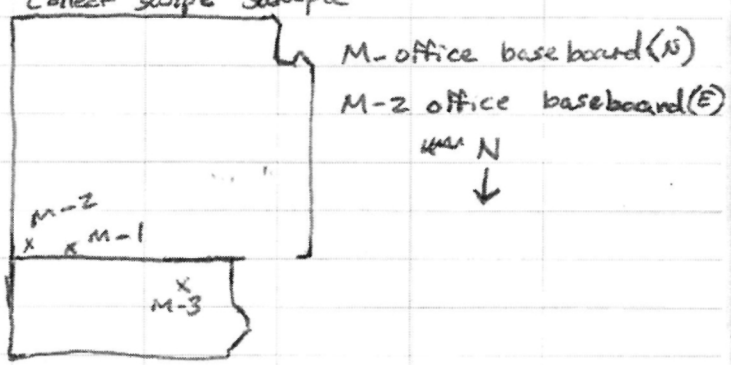
EPA Hooper & Ferguson ~~arrive on-s~~ and STM O'Connor assess 14412 Mar Tech, Inc

Conduct response check with

Readings

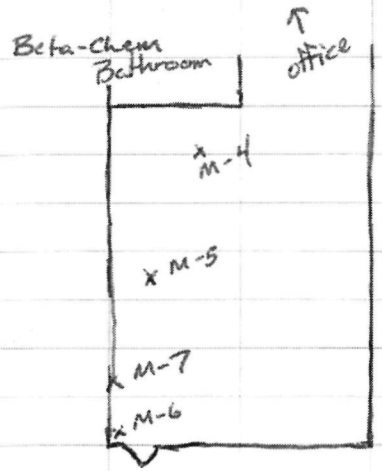
M-office-1: 35-55 cpm also

Collect swipe sample



M-3 - Bathroom Floor

M-4 - Storage SE Floor



M-~~3~~ 6 Storage NE Floor (D.O.)

M-4 Storage SE Floor

M-5 Storage E-Central

M-7 NE Storagewall Floor

Readings near M-6 peak @ 85 cpm

M-4 readings 30-50 cpm

M-5 readings 30-50 cpm

M-7 readings 30-50 cpm

Count samples with Ludlum 3030

Background α: 0 β: 39

M-1	α: 0 cpm	β: 27 cpm
M-2	0 cpm	~~27~~ 42 cpm (D.O.)
M-3	0 cpm	43 cpm
M-4	0 cpm	48 cpm
M-5	0 cpm	57 cpm
M-6	1 cpm	52 cpm
M-7	0 cpm	52 cpm

No readings of concern

1420 Bionomics picks up bulked chemicals.

Rite in the Rain

7-16-14 Beta-Chem

Bulked Flammables, inorganic acids, organic acids, solid bases, liquid bases, and halogens

Updated

Bulk CS(Halogens): 28

Empties: 475

Bulked Fl: 138

Bulked IA: 15

Bulked LB: 5

Bulked OA: 9

Bulked SB: 16

Vented: 14

1700 End day

Danny O.
7-16-14

7/21/14 Beta-Chem

0825 STM O'Connor arrives @ Tt, depart for site

0850 Arrive on site, EPA Ferguson works on checking to see which samples being sent to KU are water/Air reactive

- STM O'Connor works on rad assessment summary

1320 Depart site

Danny O.
7-21-14

Rite in the Rain

7/23/14 Beta-Chem

0750 STM O'Connor arrives on site. Continue work summarizing radiation assessment activities @ Beta-Chem site

1045 EPA Ferguson departs site for KU Radiation lab

Sample shipment includes 304 VOA vials with solid or liquid sample of container contents, 187 wipe samples, 8 air monitoring samples

Total Samples sent to KU lab to date

673 40-ml VOA Vials (Liquid/Solid Chemical)

353 wipe samples

8 Air monitoring samples (Filter Samples)

1,034 Total Samples

Danny O.
7-23-14

7-28-14 Beta-Chem

0745 STM O'Connor arrives on site, continue work on radiation summary report

- Radiation summary almost complete

need to confirm removable risk-based standard

Danny O.
7-28-14

Rite in the Rain

8-1-14 Beta-Chem

0750 STM O'Connor arrives on site. Review Containers in Air/Water Reactive Cart to determine Container # for sample that broke VOA lid and reacted
- Appears to be either container # 533 or 737
- After reviewing both containers it appears to # 533. Only remaining chemical is in bag.

1030 Depart for Tt office

Danny O.
8-1-14

8-14-14 Beta-Chem

0720 STM O'Connor arrives @ Tt office, Finish Removal Assessment report
Complete Report
Update Summary of Containers
Bulked and disposed of: 217
Vented Gases: 14
Empties: 200
Carbon-14 Sources: 17
Individual containers sampled with results
From KU: 401
Individual containers sampled awaiting results
From KU: 242
Remaining containers: 43
Total Containers Inventoried: 1134

0850 STM O'Connor arrives on site, deliver Removal Assessment Report to EPA Ferguson
- ERRS crew has been weighing and collecting measurements from containers with 44.9 detector
Will send 10% of wipe samples from Removal Assessment to TestAmerica for C-14 analysis.

Rite in the Rain

8-14-14

Count air monitoring samples

Run QC check on Ludlum 3030

Date	Volume	α/β
7-1-14	946 ft³	0/96
7-8-14	951.3 ft³	0/69
7-16-14	675.5 ft³	0/81
7-11-14	666.4 ft³	0/90
8-12-14	896.9 ft³	0/78
8-13-14	745.6 ft³	0/108

ERRS Roski works on putting together RFQ for disposal of individual containers

1600 STM O'Connor departs site. End day

Danny O.
8-14-14

8-15-14 Beta-Chem

0740 STM O'Connor arrives on site.

- Expect to receive laboratory results From KU today

Equation for converting Ludlum 44-9 reading to dpm/100 cm²

$$Y = \frac{Z}{\text{Detector Efficiency}} \times \frac{100\ cm^2}{12.26\ cm^2}$$

Where

Y = the detector reading converted to dpm/100 cm²

Z = the Ludlum 44-9 detector reading in cpm

Detector Efficiency is 2.5%.

- The efficiency changes to 2.0% when protective

0800 KU Michael Lemon confirms delivery of results by mid afternoon today

- Receive preliminary lab data From KU, update spreadsheet and discuss results with ERRS

- ERRS working on weighing containers

1130 Depart site

1400 Arrive back @ site

Continue inventorying containers

1530 Receive draft Final KU Report

1600 End day 8-15-14

Danny O.

Rite in the Rain

8-19-14

0710 STM O'Connor arrives @ Tt. Transfer R1 phone

0745 Arrive on Site. KCTV5 crew arrives @ industrial park. Inform EPA Ferguson

- STM O'Connor and ERRS Roski try to locate ~40 containers that may require additional sampling

Container ID #	Missing info	Comment	
175	No wipe sample	Collect WS	✓
176	" "	Collect WS	✓
193	" "	Collect WS	✓
198	No Chemical Sample	Collect Chemical Sample	✓
247	No Chemical/Wipe	Extremely Air/Water Reactive	
326	No wipe Sample	Collect WS	✓
424	No wipe Sample	In Fridge Collect WS	✓
433	" "	" "	✓
434	" "	Unable to Find Collect WS	✓
435	No Chemical Sample	In Fridge Reactive	
454	No wipe	" " Collect WS	✓
455	No wipe	" " Collect WS	✓
458	No Chemical	Empty	✓
467	No wipe	Empty	✓
496	" "	Collect WS	✓

Container ID	Missing info	Comment	
505	No wipe	Unable to Find Found sample data in KU Report	✓
510	No Chemical/Wipe	Unable to Find - In Fridge Peroxide, sample already collected	✓
522	No wipe	Collect WS	✓
568	No wipe	Empty	✓
587	No wipe	Collect WS	✓
588	No Chemical	Empty	✓
598	No Chemical	Unable to Find Empty	✓
604	No Chemical	Empty	✓
612	No wipe	Empty	✓
663	No wipe	Empty	✓
664	" "	Collect WS	✓
667	No wipe	Unable to Find Empty	✓
687	No wipe	Collect WS	✓
706	No Chemical	Empty	✓
725	No wipe	Unable to Find Empty	✓
732	No wipe	Collect WS	✓
738	No wipe	Unable to Find Empty	✓
739	No wipe	Collect WS	✓
769	No wipe	Collect WS	✓
846	No wipe/Chemical	Unable to Find Check road	
944	" "	Unable to Find Empty	✓
956	No wipe	Unable to Find Empty	✓
957	No wipe/Chemical	Unable to Find Empty	✓
960	No wipe	Unable to Find Empty	✓

Rite in the Rain

8-19-14 Beta-Chem

Container ID #			
961	No Wipe	Unable to find Empty	✓
963	No chemical/Wipe	Unable to find Empty	✓
996	No Chemical	Empty	✓
1117	No wipe	Empty	✓

Collect wipe samples from Gas Cylinders

Prep samples for laboratory

- Pace Analytical Scott Farris will come to site @ 1000 tommorrow with sample jars. Will Collect sample from water used to vent container # 354. Sample to be analyzed for TCLP Metals, VOC, SVOCs, pH, Flashpoint, Cyanide, Sulfides.

1630 Depart site. End day

Danny O.
8-~~20~~-14
19
D.O.

8-20-14 Beta-Chem

0730 STM O'Connor arrives on site. Review notes from yesterday and update inventory list

0845 Pace Analytical Courier arrives on site

0900 Collect samples from water used to vent container # 354

- Summary of containers we were not able to sample - Water reactive

Container ID	Contents	
247	Boron Tribromide	Very WR ~~not sent to KU~~ Sent to KU but not counted
389	Ether (Radioactive)	reported by KU as "invalid count"
407	Iodine Monochloride	reported by KU as "reactive, not counted"
410	Iodine Monochloride	" "
414	Trifluromethane sulfonic acid	KU reports as "reactive, sludge not valid Analysis"
417	Hydriodic Acid	"Fluid, but dark & precipitate"
435	Thionyl Chlorid	Water reactive, no chemical sample collected
444	Nitric Acid	KU reported as "no count"
460	Thionyl Bromide	KU reports as "Air reactive, no count"

Rite in the Rain

8-20-14 Beta-Chem

These water/air reactive chemicals can not be analyzed by KU, will screen chemicals in blast box under Nitrogen with 44-9 pancake probe to get an approximate reading

- Attempt to find container # 368

2 L Glass Amber Hexane*

- Attempt to Find Container 846 & 847

Locate both containers. Container in radioactive cooler is mislabeled, should be 846. May need to collect wipe sample

1530 Depart site

Danny O.
8-20-14

8-21-14 Beta-Chem

0730 STM O'Connor arrives on site.

- Will Finish collecting and preping remaining samples

Container 382 is empty, but some Sample remains from HazCating

Find container 368 (might be with Rad)

- With rad containers, collect WS

Find container 846, collect wipe sample

- Collect WS

Check two unlabeled containers in rad coolers

? Hexane : Ethyl Acetate 1L (50%) (368?) ✓

? No label 200ml (25%) - New container 1118

Find 650 (mesylate Salt) (no samples)

✓ Find 804 (Palladium 50g glass jar) (no samples) Mercury Chloride not Palladium

✓ Find 823 - 1L glass Unknown (Corr) E

824 - 5g glass LS-Aminohydrobromide (NH)

825 - 100g plastic Potassium nitrate (O)

✓ 852 - 25ml Semicarbazide (chemical, no wipe) E no hazCat

979 - 50ml glass Na_2CO_3 (no samples)

982 - 5ml glass Unknown (no samples)

✓ 1023 - 20ml glass Unknown (no samples) E

2 - 40ml VOA (No samples)

Rite in the Rain

8-21-14 Beta-Chem

Update radioactive source container inventory

Container	% Contents	
R-10	25%	
R-15	1%	
R-16	1%	
R-17	1%	Potassium Cyanide 500mCi
R-9	50%	

Sort through VOA samples, several bulked Flammables samples. Bulk samples into larger containers

- Organize chemicals numerically

Look For Following containers

- 308 100 g Glass Tetrabromomethane (Bulked CS?) ← Poll Samples
- 418 100 ml Glass Phosgene (Bulked CS?) RF
- 247 Boron Tribromide (need WS)
- 371 1L N,N-Dimethylacetamide (No Chemical) ✓
  Should be @ KU
- 406 250 ml Glass Bromine (No chemical) RF
- 411 250ml Glass Bromine (No C) LF
- 425 250 ml Glass Bromine (No Chemical) RF
- 431 1L Glass Tetrahydrofurfuryl Alcohol (No WS) RF
- 432 1L Glass N,N-Dimethylaniline (No WS) LF
- 459 100ml Glass Unknown Rad (No WS) RF
- 941 250g Clear Plastic Celite Filter Agent (No WS) ✓

8-21-14 Beta-Chem

- 700 4g Glass 1-Hydroxybenzotriazole (No CS) E

Will Find these containers tomorrow

1630 End day

Danny O.
8-21-14

Rite in the Rain

8-22-14 Beta-Chem

0780 STM O'Connor arrives on site
Attempt to Find containers identified From yesterday. Collect samples if necessary
-Check to see if 308 is H_2O reactive - No
Samples to collect
308 - CS + WS (Fumehood) ✓
418 - CS + WS (RF) ✓
247 - WS (Check F) ✓
406 - CS (RF)
411 - CS (LF)
425 - CS (RF)
431 - WS (~~RF~~) LF ✓
432 - WS (LF) ✓
459 - WS (RF) Can't Find

1030 Depart site to deliver samples to KU
1230 Return to site
1320 Depart site
1430 Finish updating spreadsheet. End day

Danny O.
8-22-14

8-25-14 Beta-Chem

0715 STM O'Connor arrives @ Tt. Transfer response phone
0800 Arrive @ Beta-Chem Field office. Prep for days activities
-Plan to search through KU samples brought back to site on Friday, will place back with original container
Containers with remaining issues
121 Water* - Needs HazCating if not empty (1L Glass)
- Cannot find, calling empty
196 SilicAR™ CC-4 - Look up hazard (500g Glass)
✓ ★ - Screen Sample (HazCat)
282 Unlabeled - Sample if not empty (White Bucket) ✓
✓ ★ - HazCat Sample
416 Unknown - Sample if not empty (250ml Glass)
★ - HazCat Sample
451 Unknown - Sample if not Empty (1L Glass)
✓ ★ - HazCat sample
483 6-ethyl-o-toluidine - Sample if not empty (100g Glass)
✓ ★ - HazCat sample
~~497~~ 500 Check chemical Name, check hazards (100g Glass)
- HazCat Sample 2-Dimethylaminoethanethiol hydrochloride, 95% NH (100ml Glass)
✓ 505 Check Name, plus hazards ✓
- ✓ Harmful, Flammable

Rite in the Rain

8-25-14

551 - Check name & hazard MT 25g Glass

✓ ★ - HazCat Sample

✓ 665 Confirm name & hazard - E 5g Glass

✓ 725 Now MT - Need name + hazard E 100ml Glass

★ - HazCat Sample

808 Confirm name + hazard MT 25g Glass methyl-s-t-3-hydroxyisobutyrate ✓

- Pharm Drug

843 Confirm name + hazard MT 10g Glass 3,4-bisdenzgloxbenzaldeh ✓

- Pharm Drug

~~845~~ 852 MT Confirm name + hazard 25ml Glass semicabazide

? ★ - HazCat Sample

857 MT, confirm name + hazard ✓ 10ml Glass o-tert-butyl

- Label says US Flammable. O-tert-butylhydroxyl

982 Unknown, sample? 5ml Glass Solid 5ml Glass Unknown HazCat MT? cumine hydrochloride

- Calling empty

Check Container 567 - NH

Samples to screen with 44-9 due to reactivity: 247, 389, 406, 407, 410, 411, 414, 417, 425, 435, 444, 460, 755, 973

752 - Insol., N H_2O. Comb. Not Ox. Not Sol. 7 (Non-Haz) Flash

665 - Insol. N H_2O. 7. Non Fl. Not. Not Sol. (Non-Haz)

551 - Insol. N H_2O. 6. No Fl. Not O. Not Sol. (Non-Haz)

451 - Insol. No H_2O. 6. No Fl. Not O. Not Sol. (Non-Haz)

282 - Insol. No H_2O. 6. No Fl. Not O. Not Sol. (Non-Haz)

483 - Insol. No H_2O. 6. No Fl. Not O. Not Sol. (Non-Haz)

196 - Sol. No H_2O. 6. No Fl. Not O. Not Sol. (Non-Haz)

Danny O. 8-25-14

APPENDIX D

CHAIN-OF-CUSTODY RECORDS AND ANALYTICAL DATA PACKAGES

CHAIN-OF-CUSTODY RECORD

TETRA TECH EM INC.
~~8030 Flint Street~~
~~Lenexa, Kansas 66214~~
~~(913) 894-2600~~

Date: 5-10-14
Page: 1 of 1
Project No: X9025140060
Shipment Method: FedEx
Number of Coolers Shipped: 1

Project Name: Beta-Chem
Project Manager: Danny O'Connor
Sampler: (Signature)

Turn-around Time Requested: Standard

Sample Number:	Date:	Time:	Carbon-14 via Liquid Scintillation Counter	Matrix Type	No. of Containers	Laboratory Comments:
G1	5-9-14	1530	X	S	1	
G2		1532				
G3		1534				
G4		1536				
G5		1538				
G6		1540				
G7		1542				
G8		1544				
G9		1546				
G10		1548				
HS-1		1600				
HS-2		1602				
HS-3		1604				
HS-4		1606				
HS-5		1608				
HS-6		1610				
HS-7		1612				
HS-8		1614				
~~HS~~						

Danny O.
5-10-14

Matrix: S = Soil M = Sediment W = Water A = Air
Preservatives: 1 = Ice 2 = HCl 3 = H_2SO_4 4 = NaOH 5 = HNO_3

Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:
Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:
Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:

White = Tetra Tech Yellow = Laboratory Pink = Return to Tetra Tech

CHAIN-OF-CUSTODY RECORD

TETRA TECH EM INC.
~~8030 Flint Street~~
~~Lenexa, Kansas 66214~~
~~(913) 894-2600~~

Date: 6-6-14
Page: 1 of 1
Project No: X9025140061
Shipment Method: FedEx
Number of Coolers Shipped: 1

Project Name: Beta-Chem
Project Manager: Danny O'Connor
Sampler: (Signature)

Turn-around Time Requested: Standard

Sample Number:	Date:	Time:	C-14 via Liquid Scintillation Counter									Matrix Type	No. of Containers	Laboratory Comments:
BG-1	5-30-14	1205	X									S	1	
BG-2	↓	1211	X									S	1	
BG-3		1214	X									S	1	
BG-4		1217	X									S	1	
BG-5		1220	X									S	1	

Analyses (Preservative)

Matrix: S = Soil M = Sediment W = Water A = Air
Preservatives: 1 = Ice 2 = HCl 3 = H_2SO_4 4 = NaOH 5 = HNO_3

Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:
Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:
Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:

White = Tetra Tech Yellow = Laboratory Pink = Return to Tetra Tech

CHAIN OF CUSTODY RECORD
ENVIRONMENTAL PROTECTION AGENCY REGION VII

ACTIVITY LEADER(Print)	NAME OF SURVEY OR ACTIVITY	DATE OF COLLECTION (DAY / MONTH / YEAR)	SHEET
Doug Ferguson	Beta-Chem	16 / 07 / 14	1 of 5

CONTENTS OF SHIPMENT

SAMPLE NUMBER	TYPE OF CONTAINERS: CUBITAINER	BOTTLE	BOTTLE	Swipe ~~BOTTLE~~	VOA SET (2 VIALS EA)	SAMPLED MEDIA: water	soil	sediment	dust	other	RECEIVING LABORATORY REMARKS/OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)
	NUMBERS OF CONTAINERS PER SAMPLE NUMBER										
M-1 office baseboard (N)				1							
M-2 office baseboard (E)											
M-3 Bathroom Floor											
M-4 Storage SE Floor											
M-5 Storage E-Central Floor											
M-6 Storage NE Floor											
M-7 NE Storage Wall											
Exterior Wall-North											
Roof											
West Stack											
East Stack											
West Stack#2											
H-11											
H-16											
H-17											
H-19											
H-24											
80-WS											
137-WS											
218-WS											
232-WS											
307-WS											
361-WS											
386-WS											

DESCRIPTION OF SHIPMENT	MODE OF SHIPMENT
____ PIECE(S) CONSISTING OF ____ BOX(ES)	____ COMMERCIAL CARRIER: ____
1 ICE CHEST(S): OTHER ____	____ COURIER
	X SAMPLER CONVEYED ____ (SHIPPING DOCUMENT NUMBER)

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
SEALED UNSEALED			Michael Lainer SEALED UNSEALED	
RELINQUISHED BY	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
SEALED UNSEALED			SEALED UNSEALED	
RELINQUISHED BY	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
SEALED UNSEALED			SEALED UNSEALED	

CHAIN OF CUSTODY RECORD
ENVIRONMENTAL PROTECTION AGENCY REGION VII

ACTIVITY LEADER(Print)	NAME OF SURVEY OR ACTIVITY	DATE OF COLLECTION (DAY / MONTH / YEAR)	SHEET
	Doug Ferguson Beta-Chem	13 / 07 / 14	10 of 11

CONTENTS OF SHIPMENT

SAMPLE NUMBER	TYPE OF CONTAINERS: CUBITAINER	BOTTLE	BOTTLE	BOTTLE	VOA SET (~~2 VIALS EA~~)	SAMPLED MEDIA: water	soil	sediment	dust	other Filter	RECEIVING LABORATORY REMARKS/OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)
	NUMBERS OF CONTAINERS PER SAMPLE NUMBER										
Container #452					1		X				
Container #456							X				
Container #451						X					
Container #457							X				
Container #463							X				
Container #465							X				
Container #466							X				
Container #468						X					
Container #540						X					
Container #582							X				
Container #590							X				
Container #688						X					
Container #755							X				
Container #1000						X					
Container #1105							X				
Container #1107							X				
Container #1010						X					
Container #1117							X				
Container #368						X					
AM5714										X	
AM51214											
AM51414											
AM51614											
AM52214											

DESCRIPTION OF SHIPMENT

_____ PIECE(S) CONSISTING OF _____ BOX(ES)

1 ICE CHEST(S): OTHER _____

MODE OF SHIPMENT

_____ COMMERCIAL CARRIER: _____

_____ COURIER

X SAMPLER CONVEYED

_____ (SHIPPING DOCUMENT NUMBER)

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
[signature] ☐ SEALED ☐ UNSEALED			Michael Lemon ☐ SEALED ☐ UNSEALED	
RELINQUISHED BY ☐ SEALED ☐ UNSEALED	DATE	TIME	RECEIVED BY ☐ SEALED ☐ UNSEALED	REASON FOR CHANGE OF CUSTODY
RELINQUISHED BY ☐ SEALED ☐ UNSEALED	DATE	TIME	RECEIVED BY ☐ SEALED ☐ UNSEALED	REASON FOR CHANGE OF CUSTODY

7-EPA-9262(Revised 5/85)

*U.S. GPO: 2002-756-917/40053

CHAIN OF CUSTODY RECORD
ENVIRONMENTAL PROTECTION AGENCY REGION VII

ACTIVITY LEADER(Print)	NAME OF SURVEY OR ACTIVITY	DATE OF COLLECTION (DAY / MONTH / YEAR)	SHEET
Doug Ferguson	Beta-Chem	15 / 07 / 14	11 of 11

CONTENTS OF SHIPMENT

SAMPLE NUMBER	TYPE OF CONTAINERS: Filter ~~CUBITAINER~~	BOTTLE	BOTTLE	BOTTLE	VOA SET (2 VIALS EA)	SAMPLED MEDIA: water	soil	sediment	dust	other	RECEIVING LABORATORY REMARKS/OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)
	NUMBERS OF CONTAINERS PER SAMPLE NUMBER										
AM51314	1									X	
AM63014	↓									↓	
AM7814	↓									↓	

Danny O. 7-16-14

DESCRIPTION OF SHIPMENT

____ PIECE(S) CONSISTING OF ____ BOX(ES)

1 ICE CHEST(S): OTHER ____

MODE OF SHIPMENT

____ COMMERCIAL CARRIER: ____

____ COURIER

X SAMPLER CONVEYED

(SHIPPING DOCUMENT NUMBER)

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
[signature] ☐ SEALED ☐ UNSEALED			Michael Lemay ☐ SEALED ☐ UNSEALED	
RELINQUISHED BY ☐ SEALED ☐ UNSEALED	DATE	TIME	RECEIVED BY ☐ SEALED ☐ UNSEALED	REASON FOR CHANGE OF CUSTODY
RELINQUISHED BY ☐ SEALED ☐ UNSEALED	DATE	TIME	RECEIVED BY ☐ SEALED ☐ UNSEALED	REASON FOR CHANGE OF CUSTODY

*U.S. GPO: 2002-756-917/40053

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-6650-1
Client Project/Site: Beta Chem site, Lenexa, KS

For:
Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Danny O'Connor

Authorized for release by:
5/29/2014 4:25:19 PM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

LINKS

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Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page 1
Table of Contents 2
Case Narrative 3
Chain of Custody 5
Receipt Checklists 6
Definitions/Glossary 7
Method Summary 8
Sample Summary 9
Client Sample Results 10
QC Sample Results 14
QC Association Summary 16

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: Beta Chem site, Lenexa, KS

Report Number: 160-6650-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 5/13/2014 9:15 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 19.0° C.

CARBON-14 BY LSC

Samples G1 (160-6650-1), G2 (160-6650-2), G3 (160-6650-3), G4 (160-6650-4), G5 (160-6650-5), G6 (160-6650-6), G7 (160-6650-7), G8 (160-6650-8), G9 (160-6650-9), G10 (160-6650-10), HS-1 (160-6650-11), HS-2 (160-6650-12), HS-3 (160-6650-13), HS-4 (160-6650-14), HS-5 (160-6650-15), HS-6 (160-6650-16), HS-7 (160-6650-17) and HS-8 (160-6650-18) were analyzed for Carbon-14 by LSC in accordance with EERF C-01. The samples were prepared on 05/16/2014 and 05/27/2014 and analyzed on 05/16/2014, 05/17/2014, 05/27/2014 and 05/28/2014.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 160-6650-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

CHAIN-OF-CUSTODY RECORD

TETRA TECH EM INC.
8030 Flint Street
Lenexa, Kansas 66214
(913) 894-2600

Date: 5-10-14
Page: 1 of 1
Project No: X9025140060
Shipment Method: FedEx
Number of Coolers Shipped: 1

Project Name: Beta-Chem
Project Manager: Danny O'Connor
Sampler: (Signature)

Turn-around Time Requested: Standard

Sample Number:	Date:	Time:	Carbon-14 Liquid Scintillation Counter	Matrix Type	No. of Containers	Laboratory Comments:
G1	5-9-14	1530	X	S	1	
G2		1532				
G3		1534				
G4		1536				
G5		1538				
G6		1540				
G7		1542				
G8		1544				
G9		1546				
G10		1548				
HS-1		1600				
HS-2		1602				
HS-3		1604				
HS-4		1606				
HS-5		1608				
HS-6		1610				
HS-7		1612				
HS-8		1614				
~~HS~~						

Danny O
5-10-14

160-6650 Chain of Custody

Matrix: S = Soil M = Sediment W = Water A = Air
Preservatives: 1 = Ice 2 = HCl 3 = H_2SO_4 4 = NaOH 5 = HNO_3

Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:
		5/13/14	0915
Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:
Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:

White = Tetra Tech Yellow = Laboratory Pink = Return to Tetra Tech

5/29/2014

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-6650-1

Login Number: 6650
List Number: 1
Creator: Daniels, Brian J

List Source: TestAmerica St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6650-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6650-1

Method	Method Description	Protocol	Laboratory
C-01-1	Carbon-14 (EERF C-01-1)	EERF	TAL SL

Protocol References:

EERF = EERF

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6650-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-6650-1	G1	Solid	05/09/14 15:30	05/13/14 09:15
160-6650-2	G2	Solid	05/09/14 15:32	05/13/14 09:15
160-6650-3	G3	Solid	05/09/14 15:34	05/13/14 09:15
160-6650-4	G4	Solid	05/09/14 15:36	05/13/14 09:15
160-6650-5	G5	Solid	05/09/14 15:38	05/13/14 09:15
160-6650-6	G6	Solid	05/09/14 15:40	05/13/14 09:15
160-6650-7	G7	Solid	05/09/14 15:42	05/13/14 09:15
160-6650-8	G8	Solid	05/09/14 15:44	05/13/14 09:15
160-6650-9	G9	Solid	05/09/14 15:46	05/13/14 09:15
160-6650-10	G10	Solid	05/09/14 15:48	05/13/14 09:15
160-6650-11	HS-1	Solid	05/09/14 16:00	05/13/14 09:15
160-6650-12	HS-2	Solid	05/09/14 16:02	05/13/14 09:15
160-6650-13	HS-3	Solid	05/09/14 16:04	05/13/14 09:15
160-6650-14	HS-4	Solid	05/09/14 16:06	05/13/14 09:15
160-6650-15	HS-5	Solid	05/09/14 16:08	05/13/14 09:15
160-6650-16	HS-6	Solid	05/09/14 16:10	05/13/14 09:15
160-6650-17	HS-7	Solid	05/09/14 16:12	05/13/14 09:15
160-6650-18	HS-8	Solid	05/09/14 16:14	05/13/14 09:15

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6650-1

Client Sample ID: G1

Lab Sample ID: 160-6650-1
Matrix: Solid

Date Collected: 05/09/14 15:30
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	45.7		1.99	5.32	5.00	1.07	pCi/g	05/16/14 07:58	05/16/14 19:21	1

Client Sample ID: G2

Lab Sample ID: 160-6650-2
Matrix: Solid

Date Collected: 05/09/14 15:32
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	9.08		1.03	1.42	5.00	1.04	pCi/g	05/16/14 07:58	05/16/14 20:31	1

Client Sample ID: G3

Lab Sample ID: 160-6650-3
Matrix: Solid

Date Collected: 05/09/14 15:34
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	3.80		0.840	0.935	5.00	1.09	pCi/g	05/16/14 07:58	05/16/14 21:06	1

Client Sample ID: G4

Lab Sample ID: 160-6650-4
Matrix: Solid

Date Collected: 05/09/14 15:36
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	27.8		1.60	3.40	5.00	1.06	pCi/g	05/16/14 07:58	05/16/14 21:41	1

Client Sample ID: G5

Lab Sample ID: 160-6650-5
Matrix: Solid

Date Collected: 05/09/14 15:38
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	15.9		1.27	2.13	5.00	1.06	pCi/g	05/16/14 07:58	05/16/14 22:16	1

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6650-1

Client Sample ID: G6

Lab Sample ID: 160-6650-6
Matrix: Solid

Date Collected: 05/09/14 15:40
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	223		4.26	24.5	5.00	1.09	pCi/g	05/16/14 07:58	05/16/14 22:51	1

Client Sample ID: G7

Lab Sample ID: 160-6650-7
Matrix: Solid

Date Collected: 05/09/14 15:42
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	30.1		1.65	3.65	5.00	1.06	pCi/g	05/16/14 07:58	05/17/14 00:01	1

Client Sample ID: G8

Lab Sample ID: 160-6650-8
Matrix: Solid

Date Collected: 05/09/14 15:44
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	21.6		1.44	2.74	5.00	1.08	pCi/g	05/16/14 07:58	05/17/14 00:36	1

Client Sample ID: G9

Lab Sample ID: 160-6650-9
Matrix: Solid

Date Collected: 05/09/14 15:46
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	71.2		3.03	8.27	5.00	1.59	pCi/g	05/27/14 09:23	05/27/14 20:43	1

Client Sample ID: G10

Lab Sample ID: 160-6650-10
Matrix: Solid

Date Collected: 05/09/14 15:48
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	7.03		1.28	1.49	5.00	1.57	pCi/g	05/27/14 09:23	05/27/14 21:31	1

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6650-1

Client Sample ID: HS-1

Lab Sample ID: 160-6650-11
Matrix: Solid

Date Collected: 05/09/14 16:00
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	119		3.84	13.4	5.00	1.58	pCi/g	05/27/14 09:23	05/27/14 21:55	1

Client Sample ID: HS-2

Lab Sample ID: 160-6650-12
Matrix: Solid

Date Collected: 05/09/14 16:02
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	438		7.30	47.9	5.00	1.61	pCi/g	05/27/14 09:23	05/27/14 22:19	1

Client Sample ID: HS-3

Lab Sample ID: 160-6650-13
Matrix: Solid

Date Collected: 05/09/14 16:04
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	960		14.5	105	5.00	1.94	pCi/g	05/27/14 09:23	05/27/14 22:43	1

Client Sample ID: HS-4

Lab Sample ID: 160-6650-14
Matrix: Solid

Date Collected: 05/09/14 16:06
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	23.8		1.92	3.20	5.00	1.60	pCi/g	05/27/14 09:23	05/27/14 22:57	1

Client Sample ID: HS-5

Lab Sample ID: 160-6650-15
Matrix: Solid

Date Collected: 05/09/14 16:08
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	361		6.61	39.5	5.00	1.60	pCi/g	05/27/14 09:23	05/27/14 23:21	1

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6650-1

Client Sample ID: HS-6

Lab Sample ID: 160-6650-16
Matrix: Solid

Date Collected: 05/09/14 16:10
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	120		3.86	13.5	5.00	1.58	pCi/g	05/27/14 09:23	05/27/14 23:45	1

Client Sample ID: HS-7

Lab Sample ID: 160-6650-17
Matrix: Solid

Date Collected: 05/09/14 16:12
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	55.6		2.73	6.60	5.00	1.61	pCi/g	05/27/14 09:23	05/28/14 00:09	1

Client Sample ID: HS-8

Lab Sample ID: 160-6650-18
Matrix: Solid

Date Collected: 05/09/14 16:14
Date Received: 05/13/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	42.8		2.44	5.23	5.00	1.61	pCi/g	05/27/14 09:23	05/28/14 00:34	1

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6650-1

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Lab Sample ID: MB 160-122581/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 122924 — **Prep Batch: 122581**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	0.3378	U	0.640	0.641	5.00	1.07	pCi/g	05/16/14 07:58	05/16/14 18:11	1

Lab Sample ID: LCS 160-122581/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 122924 — **Prep Batch: 122581**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Carbon-14	84.4	71.38		8.09	5.00	1.07	pCi/g	85	67 - 124

Lab Sample ID: 160-6650-6 MS — **Client Sample ID: G6**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 122924 — **Prep Batch: 122581**

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Carbon-14	223		83.6	320.9		35.0	5.00	1.08	pCi/g	117	29 - 128

Lab Sample ID: 160-6650-1 DU — **Client Sample ID: G1**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 122924 — **Prep Batch: 122581**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Carbon-14	45.7		45.25		5.28	5.00	1.08	pCi/g	0.04	1

Lab Sample ID: MB 160-123906/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 124118 — **Prep Batch: 123906**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	0.3829	U	0.931	0.932	5.00	1.58	pCi/g	05/27/14 09:23	05/27/14 19:55	1

Lab Sample ID: LCS 160-123906/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 124118 — **Prep Batch: 123906**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Carbon-14	84.4	83.41		9.58	5.00	1.59	pCi/g	99	67 - 124

Method: C-01-1 - Carbon-14 (EERF C-01-1) (Continued)

Lab Sample ID: 160-6650-18 MS
Matrix: Solid
Analysis Batch: 124118

Client Sample ID: HS-8
Prep Type: Total/NA
Prep Batch: 123906

Analyte	Sample Result	Sample Qual	Spike Added	MS Result	MS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Carbon-14	42.8		84.4	115.8		13.1	5.00	1.55	pCi/g	86	29 - 128

Lab Sample ID: 160-6650-9 DU
Matrix: Solid
Analysis Batch: 124118

Client Sample ID: G9
Prep Type: Total/NA
Prep Batch: 123906

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Carbon-14	71.2		66.74		7.79	5.00	1.58	pCi/g	0.28	1

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6650-1

Rad

Prep Batch: 122581

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-6650-1	G1	Total/NA	Solid	LSC_Dist_Susp	
160-6650-1 DU	G1	Total/NA	Solid	LSC_Dist_Susp	
160-6650-2	G2	Total/NA	Solid	LSC_Dist_Susp	
160-6650-3	G3	Total/NA	Solid	LSC_Dist_Susp	
160-6650-4	G4	Total/NA	Solid	LSC_Dist_Susp	
160-6650-5	G5	Total/NA	Solid	LSC_Dist_Susp	
160-6650-6	G6	Total/NA	Solid	LSC_Dist_Susp	
160-6650-6 MS	G6	Total/NA	Solid	LSC_Dist_Susp	
160-6650-7	G7	Total/NA	Solid	LSC_Dist_Susp	
160-6650-8	G8	Total/NA	Solid	LSC_Dist_Susp	
LCS 160-122581/2-A	Lab Control Sample	Total/NA	Solid	LSC_Dist_Susp	
MB 160-122581/1-A	Method Blank	Total/NA	Solid	LSC_Dist_Susp	

Prep Batch: 123906

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-6650-9	G9	Total/NA	Solid	LSC_Dist_Susp	
160-6650-9 DU	G9	Total/NA	Solid	LSC_Dist_Susp	
160-6650-10	G10	Total/NA	Solid	LSC_Dist_Susp	
160-6650-11	HS-1	Total/NA	Solid	LSC_Dist_Susp	
160-6650-12	HS-2	Total/NA	Solid	LSC_Dist_Susp	
160-6650-13	HS-3	Total/NA	Solid	LSC_Dist_Susp	
160-6650-14	HS-4	Total/NA	Solid	LSC_Dist_Susp	
160-6650-15	HS-5	Total/NA	Solid	LSC_Dist_Susp	
160-6650-16	HS-6	Total/NA	Solid	LSC_Dist_Susp	
160-6650-17	HS-7	Total/NA	Solid	LSC_Dist_Susp	
160-6650-18	HS-8	Total/NA	Solid	LSC_Dist_Susp	
160-6650-18 MS	HS-8	Total/NA	Solid	LSC_Dist_Susp	
LCS 160-123906/2-A	Lab Control Sample	Total/NA	Solid	LSC_Dist_Susp	
MB 160-123906/1-A	Method Blank	Total/NA	Solid	LSC_Dist_Susp	

TestAmerica

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-6999-1
Client Project/Site: Beta Chem site, Lenexa, KS

For:
Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Danny O'Connor

Authorized for release by:
6/24/2014 4:38:31 PM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page 1
Table of Contents 2
Case Narrative 3
Chain of Custody 5
Receipt Checklists 6
Definitions/Glossary 7
Method Summary 8
Sample Summary 9
Client Sample Results 10
QC Sample Results 11
QC Association Summary 12

Job ID: 160-6999-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: Beta Chem site, Lenexa, KS

Report Number: 160-6999-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 6/9/2014 9:15 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 21.1° C.

CARBON-14 BY LSC

Samples BG-1 (160-6999-1), BG-2 (160-6999-2), BG-3 (160-6999-3), BG-4 (160-6999-4) and BG-5 (160-6999-5) were analyzed for Carbon-14 by LSC in accordance with EERF C-01. The samples were prepared on 06/17/2014 and analyzed on 06/18/2014.

The carbon 14 soil samples are non-homogeneous. They ran "as received" and were not dried and ground. Sample contain small rocks, roots, and some samples are mud: BG-1 (160-6999-1), BG-2 (160-6999-2), BG-3 (160-6999-3), BG-4 (160-6999-4), BG-5 (160-6999-5).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 160-6999-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

CHAIN-OF-CUSTODY RECORD

TETRA TECH EM INC.
~~8000 Flint Street~~
~~Lenexa, Kansas 66214~~
~~(913) 894-2600~~

Date: 6-6-14
Page: 1 of 1
Project No: X9025140061
Shipment Method: FedEx
Number of Coolers Shipped: 1

4

Project Name: Beta-Chem
Project Manager: Danny O'Connor
Sampler: (Signature)

Sample Number:	Date:	Time:	C-14 in Liquid Scintillation Cocktail	Matrix Type	No. of Containers	Laboratory Comments:
BG-1	5-30-14	1205	X	S	1	
BG-2	↓	1211	X	S	1	
BG-3	↓	1214	X	S	1	
BG-4	↓	1217	X	S	1	
BG-5	↓	1220	X	S	1	

Analyses (Preservative)

Turn-around Time Requested: Standard

160-6999 Chain of Custody

Matrix: S = Soil M = Sediment W = Water A = Air
Preservatives: 1 = Ice 2 = HCl 3 = H_2SO_4 4 = NaOH 5 = HNO_3

Relinquished By: (Signature)	Received By: (Signature) Gil Clarke	Date: 6.9.14	Time: 0915
Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:
Relinquished By: (Signature)	Received By: (Signature)	Date:	Time:

White = Tetra Tech Yellow = Laboratory Pink = Return to Tetra Tech

6/24/2014

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-6999-1

Login Number: 6999
List Number: 1
Creator: Clarke, Jill C

List Source: TestAmerica St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6999-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6999-1

Method	Method Description	Protocol	Laboratory
C-01-1	Carbon-14 (EERF C-01-1)	EERF	TAL SL

Protocol References:

EERF = EERF

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6999-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-6999-1	BG-1	Solid	05/30/14 12:05	06/09/14 09:15
160-6999-2	BG-2	Solid	05/30/14 12:11	06/09/14 09:15
160-6999-3	BG-3	Solid	05/30/14 12:14	06/09/14 09:15
160-6999-4	BG-4	Solid	05/30/14 12:17	06/09/14 09:15
160-6999-5	BG-5	Solid	05/30/14 12:20	06/09/14 09:15

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6999-1

Client Sample ID: BG-1

Lab Sample ID: 160-6999-1
Matrix: Solid

Date Collected: 05/30/14 12:05
Date Received: 06/09/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	0.510	U	0.804	0.806	5.00	1.36	pCi/g	06/17/14 19:02	06/18/14 07:01	1

Client Sample ID: BG-2

Lab Sample ID: 160-6999-2
Matrix: Solid

Date Collected: 05/30/14 12:11
Date Received: 06/09/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	0.254	U	0.832	0.832	5.00	1.44	pCi/g	06/17/14 19:02	06/18/14 07:25	1

Client Sample ID: BG-3

Lab Sample ID: 160-6999-3
Matrix: Solid

Date Collected: 05/30/14 12:14
Date Received: 06/09/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	0.0362	U	0.721	0.721	5.00	1.27	pCi/g	06/17/14 19:02	06/18/14 07:49	1

Client Sample ID: BG-4

Lab Sample ID: 160-6999-4
Matrix: Solid

Date Collected: 05/30/14 12:17
Date Received: 06/09/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	0.247	U	0.811	0.811	5.00	1.40	pCi/g	06/17/14 19:02	06/18/14 08:13	1

Client Sample ID: BG-5

Lab Sample ID: 160-6999-5
Matrix: Solid

Date Collected: 05/30/14 12:20
Date Received: 06/09/14 09:15

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	0.432	U	0.818	0.819	5.00	1.38	pCi/g	06/17/14 19:02	06/18/14 08:37	1

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6999-1

Method: C-01-1 - Carbon-14 (EERF C-01-1)

Lab Sample ID: MB 160-127248/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 127418 — **Prep Batch: 127248**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Carbon-14	-0.2477	U	0.791	0.791	5.00	1.43	pCi/g	06/17/14 19:02	06/18/14 02:13	1

Lab Sample ID: LCS 160-127248/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 127418 — **Prep Batch: 127248**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Carbon-14	84.4	81.55		9.36	5.00	1.37	pCi/g	97	67 - 124

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: Beta Chem site, Lenexa, KS

TestAmerica Job ID: 160-6999-1

Rad

Prep Batch: 127248

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-6999-1	BG-1	Total/NA	Solid	LSC_Dist_Susp	
160-6999-2	BG-2	Total/NA	Solid	LSC_Dist_Susp	
160-6999-3	BG-3	Total/NA	Solid	LSC_Dist_Susp	
160-6999-4	BG-4	Total/NA	Solid	LSC_Dist_Susp	
160-6999-5	BG-5	Total/NA	Solid	LSC_Dist_Susp	
LCS 160-127248/2-A	Lab Control Sample	Total/NA	Solid	LSC_Dist_Susp	
MB 160-127248/1-A	Method Blank	Total/NA	Solid	LSC_Dist_Susp	

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Report of Analysis for Beta-Chem for C-14

Beckman LS6500 SN 7069785
NIST Traceable Standards

Notes:

Two staff members handled all samples.
All samples were handled with a new pair of gloves on fresh absorbent paper..
Duplicate samples were taken of all samples, but wipes.
Solid and liquid sample aliquots were placed in 20 ml vials. Wipe samples were placed in 7 ml vials.
Samples were counted in a calibrated Beckman 6500 Liquid Scintillation Counter – first for one minute and then dark adapted and counted for five minutes. Values are net cpm. (sample minus background)

June 23, 2014 Chain of Custody Record (Beginning with Bulked CS)

Samples: **2 liquid CS and FL, 19 solids received on June 23, 2014 at 13:45**
Samples Counted on June 24, 2014

ND – no measurable radiolabel C-14 contamination

789 aluminum powder	ND
243 copper powder	ND
271 iron powder	ND
249 Barium rods	ND
1055 lithium aluminum hydride	ND
851 sodium borohydride	ND
182 sodium borohydride	ND
213 phosphorous pentasulfide	ND
783 palladium	ND
760 3,4,-dichloro-propiophenone	ND
250 lithium	ND
597 tin (powder)	ND
556 sodium methoxide	ND
570 lithium aluminum hydride	ND
248 calcium hydride	ND
258 sodium hydride	ND
736 sodium hydride	ND
110 sodium methoxide	ND
234 sodium sticks	ND

Bulked FL (alcohols, aromatic, amines)	3448 dpm/ml	1553 pCi/g
Bulked CS (halogenated hydrocarbons)	682 dpm/ml	307 pCi/g

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Report of Analysis for Beta-Chem for C-14

Beckman LS6500 SN 7069785
NIST Traceable Standards

June 23, 2014 Chain of Custody Record (Beginning with 25)

Samples: **45 samples, solids – received June 24, 2014, at 1400**
Samples Counted on June 25, 2014

	807 sodium amide-WR, flammable, corrosive		
ND	226 phosphorous pentoxide-WR, corrosive		
ND	214 magnesium powder-flammable solid		
ND	504 chlorophenyl magnesium bromide-light sensitive, air sensitive, WR, flam		
ND	224 aluminum chloride-WR, corrosive		
190	207 lithium-corrosive, WR, flammable solid		
ND	844 lithium aluminum hydride-WR, flam solid,		
ND	1061 hexamethylene tetramine-flam solid		
ND	591 lithium aluminum chloride-WR, corrosive		
ND	25 sodium cyanoborohydride-WR, flam solid		
ND	217 magnesium-flam solid		
ND	274 zinc granules-flam solid		
ND	751 trimethyl borate-flam liquid, WR		
100	745 sodium ethoxide-flam solid, WR		
110	743 butyl lithium-WR, flam solid		
1000	731 butyl lithium-WR, flam solid		
300	658 methyl isothiocyanate-WR, flam liquid		
ND	477 sodium ethoxide-WR, flam		
ND	326 chlorosulfonic acid-WR, corrosive		
ND	242 barium rod-WR, flam, corrosive		
ND	119 sec-butyl lithium-air reactive, WR, flam, corrosive		
ND	34 borane tetrahydrofuran-WR, flam		
120	18 methyl magnesium bromide-WR. flam		
140	17 methyl magnesium bromide-WR, flam		
378	1019 unk screened non-hazardous	3775 dpm/ml	1700 pCi/g
90	1018 unk screened non-hazardous	905 dpm/ml	408 pCi/g
1600	1017 unk screened non-hazardous	15,975 dpm/ml	7196 pCi/g
1100	905 unk screened non-hazardous	10,680 dpm/ml	4810 pCi/g
720	903 unk screened non-hazardous	7160 dpm/ml	3225 pCi/g
200	892 unk screened non-hazardous	2005 dpm/ml	903 pCi/g

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ND	233 barium rod-WR, flam, corrosive		
ND	507 chloropropionyl chloride—flam, corrosive		
ND	169 barium rod-WR, flam, corrosive		
ND	494 pthaloyl dichloride-corrosive, toxic		
70	144 methyl magnesium bromide-WR, flam		
ND	493 pthaloyl dichloride-corrosive, toxic		
700	870 unk screened non-hazardous	6965 dpm/ml	3137 pCi/g
ND	771 acetyl chloride-WR, flam liquid, corrosive		
90	1001 unk screened non-hazardous	950 dpm/ml	428 pCi/g
ND	739 titanium (IV) chloride-WR, corrosive, flam		
700	887 unk screened non-hazardous	7075 dpm/ml	3186 pCi/g
1500	999 unk screened non-hazardous	15,905 dpm/ml	7164 pCi/g
ND	738 titanium (IV) chloride-WR, corrosive, flam		
110	765 acetyl chloride-WR, flam liquid, corrosive		
900	918 unk screened non-hazardous	9000 dpm/ml	4054 pCi/g

Note: Lithium, Magnesium, etc., all lead to high (5o to 98%) luminescence. These dpm/ml values are listed to the left and are likely not real. The dpm/ml, etc to the right are real counts and show no luminescence in its measurement.

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(785) 864-2851

Report of Analysis for Beta-Chem for C-14

Beckman LS6500 SN 7069785
NIST Traceable Standards

June 25, 2014 Chain of Custody Record (Beginning witih 1029)

Samples: 11 liquid, 71 wipes received on June 25, 2014
Samples counted on June 26

Ident #

1029	12768	dpm/ml	5752	pCi/g
1036	41987	dpm/ml	18913	pCi/g
1037	55913	dpm/ml	25186	pCi/g
1049	1976	dpm/ml	890	pCi/g
1052	1854	dpm/ml	8354	pCi/g
1065	6245	dpm/ml	2813	pCi/g
1069	81	dpm/ml	36	pCi/g
7	299	dpm/ml	135	pCi/g
46	4	dpm/ml	2	pCi/g
IA	7671	dpm/ml	3456	pCi/g
OA	8973	dpm/ml	4042	pCi/g

Wipe Smears – 6/25

Cont #	dpm/100cm^2		pCi/100cm^2	
17	35	dpm/100cm^2	16	pCi/100cm^2
18	50	dpm/100cm^2	23	pCi/100cm^2
25	192	dpm/100cm^2	87	pCi/100cm^2
34	598	dpm/100cm^2	269	pCi/100cm^2
110	9056	dpm/100cm^2	4079	pCi/100cm^2
119	2687	dpm/100cm^2	1210	pCi/100cm^2
144	1971	dpm/100cm^2	888	pCi/100cm^2
169	226	dpm/100cm^2	102	pCi/100cm^2
182	465	dpm/100cm^2	210	pCi/100cm^2
207	251	dpm/100cm^2	113	pCi/100cm^2
213	1230	dpm/100cm^2	554	pCi/100cm^2
214	1357	dpm/100cm^2	611	pCi/100cm^2
217	680	dpm/100cm^2	306	pCi/100cm^2

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224	4437	dpm/100cm^2	1999	pCi/100cm^2
226	1265	dpm/100cm^2	570	pCi/100cm^2
233	1578	dpm/100cm^2	711	pCi/100cm^2
234	606	dpm/100cm^2	272	pCi/100cm^2
242	575	dpm/100cm^2	259	pCi/100cm^2
243	226	dpm/100cm^2	102	pCi/100cm^2
248	1578	dpm/100cm^2	711	pCi/100cm^2
249	916	dpm/100cm^2	413	pCi/100cm^2
250	592	dpm/100cm^2	267	pCi/100cm^2
258	442	dpm/100cm^2	199	pCi/100cm^2
271	703	dpm/100cm^2	317	pCi/100cm^2
274	1465	dpm/100cm^2	660	pCi/100cm^2
477	275	dpm/100cm^2	124	pCi/100cm^2
493	65	dpm/100cm^2	29	pCi/100cm^2
494	214	dpm/100cm^2	96	pCi/100cm^2
504	260	dpm/100cm^2	117	pCi/100cm^2
507	176	dpm/100cm^2	79	pCi/100cm^2
533	181	dpm/100cm^2	82	pCi/100cm^2
556	762	dpm/100cm^2	343	pCi/100cm^2
570	103	dpm/100cm^2	46	pCi/100cm^2
590	4915	dpm/100cm^2	2214	pCi/100cm^2
591	153	dpm/100cm^2	69	pCi/100cm^2
597	66	dpm/100cm^2	30	pCi/100cm^2
658	1305	dpm/100cm^2	588	pCi/100cm^2
731	938	dpm/100cm^2	422	pCi/100cm^2
736	1140	dpm/100cm^2	514	pCi/100cm^2
737	211	dpm/100cm^2	95	pCi/100cm^2
743	734	dpm/100cm^2	331	pCi/100cm^2
745	387	dpm/100cm^2	174	pCi/100cm^2
751	209	dpm/100cm^2	94	pCi/100cm^2
760	295	dpm/100cm^2	133	pCi/100cm^2
765	248	dpm/100cm^2	112	pCi/100cm^2
771	158	dpm/100cm^2	71	pCi/100cm^2
783	274	dpm/100cm^2	123	pCi/100cm^2
789	464	dpm/100cm^2	209	pCi/100cm^2
807	466	dpm/100cm^2	210	pCi/100cm^2
844	359	dpm/100cm^2	162	pCi/100cm^2

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851	133	dpm/100cm^2	60	pCi/100cm^2
870	1065	dpm/100cm^2	480	pCi/100cm^2
887	168	dpm/100cm^2	76	pCi/100cm^2
892	202	dpm/100cm^2	91	pCi/100cm^2
903	266	dpm/100cm^2	120	pCi/100cm^2
905	80	dpm/100cm^2	36	pCi/100cm^2
918	761	dpm/100cm^2	342	pCi/100cm^2
999	95	dpm/100cm^2	43	pCi/100cm^2
1001	69	dpm/100cm^2	31	pCi/100cm^2
1017	69	dpm/100cm^2	31	pCi/100cm^2
1018	61	dpm/100cm^2	27	pCi/100cm^2
1019	46	dpm/100cm^2	21	pCi/100cm^2
1029	48	dpm/100cm^2	22	pCi/100cm^2
1036	34	dpm/100cm^2	15	pCi/100cm^2
1037	38	dpm/100cm^2	17	pCi/100cm^2
1049	53	dpm/100cm^2	24	pCi/100cm^2
1052	57	dpm/100cm^2	26	pCi/100cm^2
1055	6975	dpm/100cm^2	3142	pCi/100cm^2
1061	149	dpm/100cm^2	67	pCi/100cm^2
1065	103	dpm/100cm^2	46	pCi/100cm^2
1069	65	dpm/100cm^2	29	pCi/100cm^2

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Report of Analysis for Beta-Chem for C-14

Beckman LS6500 SN 7069785
NIST Traceable Standards

June 26, 2014 Chain of Custody Record (Beginning with Bulked Solid)

Samples: 34 solid, 17 wipes samples received on June 26, 2014
Samples counted on June 27

BSB	178	dpm/g	80	pCi/g	(Bulked Solid Base)
173	-2	dpm/g	<1	pCi/g	
209	9	dpm/g	4	pCi/g	
220	54	dpm/g	24	pCi/g	
221	52	dpm/g	23	pCi/g	
227	55	dpm/g	25	pCi/g	
236	57	dpm/g	25	pCi/g	
251	872	dpm/g	393	pCi/g	
254	0	dpm/g	<1	pCi/g	
256	0	dpm/g	<1	pCi/g	
296	1373	dpm/g	618	pCi/g	
512	0	dpm/g	<1	pCi/g	
559	92	dpm/g	41	pCi/g	
566	4	dpm/g	2	pCi/g	
571	18	dpm/g	8	pCi/g	
572	7	dpm/g	3	pCi/g	
581	3	dpm/g	1	pCi/g	
594	0	dpm/g	<1	pCi/g	
686	69	dpm/g	31	pCi/g	
797	29	dpm/g	13	pCi/g	
803	96	dpm/g	43	pCi/g	
832	0	dpm/g	<1	pCi/g	
833	2	dpm/g	1	pCi/g	
834	86	dpm/g	38	pCi/g	
835	14	dpm/g	6	pCi/g	
836	8	dpm/g	4	pCi/g	
837	10	dpm/g	4	pCi/g	
838	6	dpm/g	3	pCi/g	
839	6	dpm/g	3	pCi/g	

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Lawrence, KS 66047-3714
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840	-1	dpm/g	<1	pCi/g
847	40032	dpm/g	18032	pCi/g
860	9420	dpm/g	4243	pCi/g
880	112	dpm/g	51	pCi/g
993	182	dpm/g	82	pCi/g

Wipes

Cont #

7	3006	dpm/100cm^2	1354	pCi/100cm^2
46	94	dpm/100cm^2	42	pCi/100cm^2
173	446	dpm/100cm^2	201	pCi/100cm^2
209	458	dpm/100cm^2	206	pCi/100cm^2
221	201	dpm/100cm^2	91	pCi/100cm^2
227	1002	dpm/100cm^2	451	pCi/100cm^2
236	356	dpm/100cm^2	160	pCi/100cm^2
254	1005	dpm/100cm^2	452	pCi/100cm^2
256	882	dpm/100cm^2	397	pCi/100cm^2
296	4638	dpm/100cm^2	2089	pCi/100cm^2
512	462	dpm/100cm^2	208	pCi/100cm^2
559	272	dpm/100cm^2	122	pCi/100cm^2
572	1395	dpm/100cm^2	628	pCi/100cm^2
581	567	dpm/100cm^2	255	pCi/100cm^2
594	1530	dpm/100cm^2	689	pCi/100cm^2
797	1269	dpm/100cm^2	572	pCi/100cm^2
833	190	dpm/100cm^2	86	pCi/100cm^2

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Report of Analysis for Beta-Chem for C-14

Beckman LS6500 SN 7069785
NIST Traceable Standards

June 26, 2014 Chain of Custody Record (Beginning with 333)

Samples: 12 liquid, 11 wipes samples received on June 27, 2014
Samples counted on June 28

Samples 406, 411, and 425 were not counted. Very reactive red.

333	65525	dpm/ml	29516	pCi/g
424	289346	dpm/ ml	130336	pCi/g
439	536684	dpm/ml	241750	pCi/g
440	1500336	dpm/ml	675827	pCi/g
444	no count			
450	91	dpm/ml	42	pCi/g
461	21118	dpm/ml	9512	pCi/g
469	858093	dpm/ml	386528	pCi/g
UNC	2534242	dpm/ml	1141550	pCi/g

Wipe Samples – 6/26/2014
(333 with UNC and 333)
(wipe 424 was not found)

Ident #	dpm/100cm^2	pCi/100cm2		
333	46,764	dpm/100cm^2	21,065	pCi/100cm^2
406	32,486	dpm/100cm^2	14,633	pCi/100cm^2
411	36,739	dpm/100cm^2	16,549	pCi/100cm^2
425	48,717	dpm/100cm^2	21,944	pCi/100cm^2
439	369,903	dpm/100cm^2	166,623	pCi/100cm^2
440	105,532	dpm/100cm^2	47,537	pCi/100cm^2
444	206,629	dpm/100cm^2	93,076	pCi/100cm^2
458	8,760	dpm/100cm^2	3,946	pCi/100cm^2
469	108,024	dpm/100cm^2	48,659	pCi/100cm^2
424	missing wipe			

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Report of Analysis for Beta-Chem for C-14

Beckman LS6500 SN 7069785
NIST Traceable Standards

June 27, 2014 Chain of Custody Record Beginning with 27

Samples received June 30, 2014
11 solid
27 liquid
20 wipes

27
79
142
228
235
241
259
480
404
489
491
509
515
538
547
553
627
633
670
697
707
720
749
752

Wipes -

27	805	dpm/100cm^2
79	124	dpm/100cm^2

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142	473	dpm/100cm^2
228	1371	dpm/100cm^2
235	256	dpm/100cm^2
241	763	dpm/100cm^2
259	302	dpm/100cm^2
480	261	dpm/100cm^2
484	683	dpm/100cm^2
489	437	dpm/100cm^2
491	146	dpm/100cm^2
509	236	dpm/100cm^2
515	212	dpm/100cm^2
538	86	dpm/100cm^2
547	495	dpm/100cm^2
752	1944	dpm/100cm^2
24	49	dpm/100cm^2
141	219	dpm/100cm^2
517	1818	dpm/100cm^2
1060	142	dpm/100cm^2

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Report of Analysis for Beta-Chem for C-14

Beckman LS6500 SN 7069785
NIST Traceable Standards

July 2, 2014 Chain of Custody Record Beginning with 43

Samples received July 2, 2014
112 solid (s)
71 liquid (l)
72 wipes

43	l	21	dpm/ml	9	pCi/ml	
50	l	43	dpm/ml	19	pCi/ml	
147	l	55	dpm/ml	25	pCi/ml	
210	l	48	dpm/ml	22	pCi/ml	
222	l	5	dpm/ml	2	pCi/ml	
223	l	12	dpm/ml	5	pCi/ml	
225	s	198	dpm/g	89	pCi/g	
255	s	6	dpm/g	3	pCi/g	
263	s	7	dpm/g	3	pCi/g	
267	s	3	dpm/g	2	pCi/g	
275	s	43	dpm/g	19	pCi/g	
304	s	< bkg		ND	pCi/g	
318	l	2	dpm/ml	1	pCi/ml	
376	l	3	dpm/ml	2	pCi/ml	
387	l	122	dpm/ml	55	pCi/ml	
409	l	2040	dpm/ml	919	pCi/ml	
413	l	< bkg				lum
415	l	17111	dpm/ml	7707	pCi/ml	
455	l	<bkg	dpm/ml		pCi/ml	
436	s	33498	dpm/g	15089	pCi/g	
453	l	7251	dpm/ml		pCi/ml	
460	l					air reactive/only 50 ul of sample – no count
467	s	213	dpm/g	96	pCi/g	
473	s	6	dpm/g	3	pCi/g	
482	s	20	dpm/g	9	pCi/g	
488	s	14	dpm/g	6	pCi/g	

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499	s	< bkg	dpm/g		pCi/g	
174	s	5	dpm/g	2	pCi/g	
407	s					reactive not counted
414	l	reactive, sludge Not valid analysis				
508	s	3	dpm/g	2	pCi/g	
511	l	892	dpm/ml	402	pCi/ml	
513	s	3	dpm/g	2	pCi/g	
523	s	2	dpm/g	1	pCi/g	
525	s	8	dpm/g	4	pCi/g	
527	s	10	dpm/g	5	pCi/g	
534	s	6	dpm/g	3	pCi/g	
537	l	1233	dpm/ml	555	pCi/ml	
546	s	7	dpm/g	4	pCi/g	
563	s	3	dpm/g	2	pCi/g	
602	s	7	dpm/g	3	pCi/g	
603	s	2	dpm/g	1	pCi/g	
621	s	5	dpm/g	2	pCi/g	
640	l	415	dpm/ml	187	pCi/ml	
643	s	< bkg	dpm/g			
652	s	4	dpm/g	2	pCi/g	
660	s	12	dpm/g	6	pCi/g	
277	s	9	dpm/g	4	pCi/g	
713	s	167	dpm/g	75	pCi/g	
725	l	4589	dpm/ml	2067	pCi/ml	
733	s	13	dpm/g	6	pCi/g	
734	s	5	dpm/g	2	pCi/g	
743	s	6	dpm/g	3	pCi/g	
741	s	3	dpm/g	1	pCi/g	
746	s	6	dpm/g	3	pCi/g	
748	s	11	dpm/g	5	pCi/g	
756	s	61	dpm/g	27	pCi/g	lum/2
764	s	7	dpm/g	3	pCi/g	
772	s	<bkg	dpm/g			
775	s	7	dpm/g	3	pCi/g	
776	l	3154	dpm/ml	1421	pCi/ml	
777	s	2	dpm/g	1	pCi/g	
778	s	2	dpm/g	1	pCi/g	

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782	s	5	dpm/g	2	pCi/g	
787	s	12	dpm/g	6	pCi/g	
793	s	3	dpm/g	1	pCi/g	
495	s	4	dpm/g	2	pCi/g	
801	s	10	dpm/g	4	pCi/g	
802	s	3	dpm/g	1	pCi/g	
815	s	2	dpm/g	1	pCi/g	
818	l	ND				lum
980	l	ND				lum
1070	l	ND				lum
LB	l	8276	dpm/ml	3728	pCi/ml	
CS-2	l	3586	dpm/ml	1615	pCi/ml	
80	l	8	dpm/ml	4	pCi/ml	
137	l	6	dpm/ml	3	pCi/ml	
218	s	14	dpm/g	6	pCi/g	
232	s	<bkg	dpm/g			
307	l	780	dpm/ml	351	pCi/ml	
361	l	7	dpm/ml	3	pCi/ml	
386	l	1	dpm/ml	1	pCi/ml	
478	l	20	dpm/ml	9	pCi/ml	
479	l	7	dpm/ml	3	pCi/ml	
481	s	<bkg	dpm/g			
485	l	1826	dpm/ml	822	pCi/ml	
490	s	<bkg				
495	l	ND			lum	
498	s	4	dpm/g	2	pCi/g	
521	l	4633	dpm/ml	2086	pCi/ml	
532	l	10	dpm/ml	4	pCi/ml	
552	s	<bkg				
561	s	17	dpm/g	7	pCi/g	
575	s	<bkg				
578	s	<bkg				
587	s	6	dpm/g	3	pCi/g	
595	s	4	dpm/g	2	pCi/g	
612	s	16	dpm/g	7	pCi/g	
644	s	108	dpm/g	49	pCi/g	
645	s	<bkg				
648	s	15	dpm/g	7	pCi/g	
649	l	18	dpm/ml	8	pCi/ml	

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654	s	<bkg	dpm/g		pCi/g	
661	s	24	dpm/g	11	pCi/g	
664	l	70	dpm/ml	31	pCi/ml	
677	s	12	dpm/g	5	pCi/g	
693	s	20	dpm/g	9	pCi/g	
696	l	138	dpm/ml	62	pCi/ml	
699	l	4	dpm/ml	2	pCi/ml	
709	l	82	dpm/ml	37	pCi/ml	
719	l	<bkg				high quench – bkg cpm
735	s	<bkg				high quench – bkg cpm
744	l	<bkg				high quench – bkg cpm
730	l	121	dpm/ml	55	pCi/ml	
752	l	34	dpm/ml	15	pCi/ml	
758	l	3214	dpm/ml	1448	pCi/ml	
761	s	6	dpm/g	6	pCi/g	
767	l	178	dpm/ml	80	pCi/ml	
768	s	<bkg			pCi/g	
769	s	1	dpm/g	1	pCi/g	
781	s	59	dpm/g	26	pCi/g	
791	s	13	dpm/g	6	pCi/g	
796	l	ND				high quench
799	s	<bkg			pCi/g	
816	l	ND				high quench
828	s	<bkg			pCi/g	
829	l	ND				lum
830	l	48		21	pCi/ml	
984	l	<bkg				
1042	l	<bkg				lum

22	s	<bkg				
38	l	3	dpm/ml	1	pCi/ml	
184	s	2	dpm/g	1	pCi/g	
240	s	<bkg				
253	s	7	dpm/g	3	pCi/g	
260	s	1	dpm/g	1	pCi/g	
276	s	19	dpm/g	8	pCi/g	
37	l	3	dpm/ml	1	pCi/ml	
487	l	ND				high quench
496	l	ND				high quench
502	l	35	dpm/ml	16	pCi/ml	
516	s	<bkg				
524	s	5	dpm/g	3	pCi/g	

University of Kansas
2330 Crowell Drive / 137 Kurata
Lawrence, KS 66047-3714
(785) 864-2851

530	s	170	dpm/g	77	pCi/g	
562	s	4	dpm/g	2	pCi/g	
576	s	2	dpm/g	1	pCi/g	
600	s	6	dpm/g	3	pCi/g	
606	l	ND				invalid count / lsc no count
609	s	34	dpm/g	15	pCi/g	
637	s	15	dpm/g	7	pCi/g	
638	s	64	dpm/g	29	pCi/g	
687	s	84	dpm/g	38	pCi/g	
705	s	445	dpm/g	20	pCi/g	
750	l	773	dpm/ml	348	pCi/ml	
773	s	3	dpm/g	1	pCi/g	
800	s	14	dpm/g	6	pCi/g	
1057	s	10	dpm/g	5	pCi/g	
1058	s	6	dpm/g	3	pCi/g	
1062	s	3	dpm/g	1	pCi/g	
1066	s	9	dpm/g	4	pCi/g	

High Activity Samples – Separate Cooler

929	s
921	s
922	s
869	s
903	s
863	s
883	s
675	s
927	s
924	s
389	l
1054	
459	l
393	l
847	s
639	l
391	l
109	l
492	l

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(785) 864-2851

362	s
780	I
66	I
940	I

Wipe Samples – July 2, 2014, beginning with 22 on page 8 of 11

22	27	dpm/100 cm^2	12	pCi/100 cm^2
38	205	dpm/100 cm^2	92	pCi/100 cm^2
43	1009	dpm/100 cm^2	454	pCi/100 cm^2
50	665	dpm/100 cm^2	30	pCi/100 cm^2
147	689	dpm/100 cm^2	310	pCi/100 cm^2
174	1407	dpm/100 cm^2	634	pCi/100 cm^2
184	281	dpm/100 cm^2	127	pCi/100 cm^2
222	495	dpm/100 cm^2	223	pCi/100 cm^2
223	518	dpm/100 cm^2	233	pCi/100 cm^2
225	1266	dpm/100 cm^2	570	pCi/100 cm^2
240	98	dpm/100 cm^2	44	pCi/100 cm^2
253	1156	dpm/100 cm^2	521	pCi/100 cm^2
255	1524	dpm/100 cm^2	686	pCi/100 cm^2
260	230	dpm/100 cm^2	103	pCi/100 cm^2
263	406	dpm/100 cm^2	183	pCi/100 cm^2
267	600	dpm/100 cm^2	270	pCi/100 cm^2
276	263	dpm/100 cm^2	118	pCi/100 cm^2
304	951	dpm/100 cm^2	428	pCi/100 cm^2
376	661	dpm/100 cm^2	298	pCi/100 cm^2
318	973	dpm/100 cm^2	438	pCi/100 cm^2
371	92	dpm/100 cm^2	41	pCi/100 cm^2
387	815	dpm/100 cm^2	367	pCi/100 cm^2
407	26126	dpm/100 cm^2	11768	pCi/100 cm^2
415	24968	dpm/100 cm^2	11247	pCi/100 cm^2
435	96316	dpm/100 cm^2	43386	pCi/100 cm^2
453	42449	dpm/100 cm^2	19121	pCi/100 cm^2
460	118804	dpm/100 cm^2	53515	pCi/100 cm^2
473	695	dpm/100 cm^2	313	pCi/100 cm^2
488	1882	dpm/100 cm^2	850	pCi/100 cm^2
487	46	dpm/100 cm^2	21	pCi/100 cm^2

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488	477	dpm/100 cm^2	215	pCi/100 cm^2
494	269	dpm/100 cm^2	121	pCi/100 cm^2
499	615	dpm/100 cm^2	277	pCi/100 cm^2
518	351	dpm/100 cm^2	158	pCi/100 cm^2
511	368	dpm/100 cm^2	166	pCi/100 cm^2
513	1194	dpm/100 cm^2	538	pCi/100 cm^2
516	481	dpm/100 cm^2	217	pCi/100 cm^2
523	404	dpm/100 cm^2	182	pCi/100 cm^2
524	126	dpm/100 cm^2	57	pCi/100 cm^2
525	1404	dpm/100 cm^2	632	pCi/100 cm^2
527	1959	dpm/100 cm^2	882	pCi/100 cm^2
530	780	dpm/100 cm^2	352	pCi/100 cm^2
534	921	dpm/100 cm^2	415	pCi/100 cm^2
537	297	dpm/100 cm^2	133	pCi/100 cm^2
546	666	dpm/100 cm^2	300	pCi/100 cm^2
562	251	dpm/100 cm^2	113	pCi/100 cm^2
563	1596	dpm/100 cm^2	717	pCi/100 cm^2
576	501	dpm/100 cm^2	226	pCi/100 cm^2
733	729	dpm/100 cm^2	328	pCi/100 cm^2
734	1870	dpm/100 cm^2	842	pCi/100 cm^2
637	656	dpm/100 cm^2	295	pCi/100 cm^2
740	1913	dpm/100 cm^2	862	pCi/100 cm^2
741	8237	dpm/100 cm^2	3710	pCi/100 cm^2
643	1086	dpm/100 cm^2	489	pCi/100 cm^2
746	630	dpm/100 cm^2	284	pCi/100 cm^2
748	376	dpm/100 cm^2	169	pCi/100 cm^2
750	127	dpm/100 cm^2	57	pCi/100 cm^2
756	4827	dpm/100 cm^2	2174	pCi/100 cm^2
772	850	dpm/100 cm^2	383	pCi/100 cm^2
773	301	dpm/100 cm^2	136	pCi/100 cm^2
775	418	dpm/100 cm^2	188	pCi/100 cm^2
777	2517	dpm/100 cm^2	1133	pCi/100 cm^2
778	1506	dpm/100 cm^2	673	pCi/100 cm^2
782	1330	dpm/100 cm^2	599	pCi/100 cm^2
787	1119	dpm/100 cm^2	504	pCi/100 cm^2
793	745	dpm/100 cm^2	336	pCi/100 cm^2
795	1564	dpm/100 cm^2	7045	pCi/100 cm^2

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801	1358	dpm/100 cm^2	612	pCi/100 cm^2
1057	88	dpm/100 cm^2	40	pCi/100 cm^2
1068	77	dpm/100 cm^2	35	pCi/100 cm^2
1067	111	dpm/100 cm^2	50	pCi/100 cm^2
1066	20	dpm/100 cm^2	9	pCi/100 cm^2

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Report of Analysis for Beta-Chem for C-14

Beckman LS6500 SN 7069785
NIST Traceable Standards

July 24, 2014 Chain of Custody Record Beginning with 167

Samples received July 21, 2014

Solid 135
liquid 98
wipes 196

plus samples of 1 of 3 which are not marked l or s

360 unknown (corrosive/oxidizer)
1067 1-iodo-3-nitrobenzene (flammable solid)
10 ammonium persulfate (oxidizer)
52 acetic anhydride (water reactive)
247 boron tribromide (air and water reactive)
405 phosphorous oxychloride (water reactive)
408 boron tribromide (air and water reactive)
412 butyl lithium (water reactive)
423 cyclopropyl magnesium (water reactive)
441 borane-methyl sulfide complex (water reactive)
443 sec-butyl lithium 1.3M (water reactive)
445 chlorosulfonic acid (oxidizer)
449 Phosphorous oxychloride (water reactive)
456 butyl lithium (water reactive)
457 potassium tert-butoxide (water reactive)
466 methyl lithium (water reactive)
468 phosphorous tribromide (water reactive)
368 unknown (flammable/oxidizer)
557 sodium nitrate (oxidizer)
593 platinium (IV) oxide (oxidizer)
610 ammonium nitrate (oxidizer)

Box 1

167	s	46	dpm/g	21	pCi/g
170	s	24	dpm/g	11	pCi/g

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183	s	12	dpm/g	6	pCi/g	
188	s	42	dpm/g	19	pCi/g	
192	l	11	dpm/ml	5	pCi/ml	(polymerized but valid count)
197	l	36	dpm/ml	16	pCi/ml	
230	s	70	dpm/g	32	pCi/g	
270	s	<bkg	dpm/g			
402	l	6019	dpm/ml	2711	pCi/ml	402 unknown (flammable oxidizer)
430	s	107806	dpm/g	48561	pCi/g	(low quench and low lumex)
431	l	27	dpm/ml	12	pCi/ml	
432	l	15	dpm/ml	7	pCi/ml	
433	s	10840	dpm/g	4883	pCi/g	433 diazald (self-reactive)
434	l	39272	dpm/ml	17690	pCi/ml	
454	s	50	dpm/g	23	pCi/g	
472	s	<bkg	dpm/g			
478	s	<bkg	dpm/g			
503	s	21	dpm/g	9	pCi/g	
529	s	3	dpm/g	1	pCi/g	
543	l	130	dpm/ml	59	pCi/ml	
544	s	<bkg	dpm/g			
551	s	<bkg	dpm/g			
568	s	<bkg	dpm/g			
569	s	<bkg	dpm/g			
580	s	6	dpm/g	3	pCi/g	
628	s	112	dpm/g	51	pCi/g	
630	s	2	dpm/g	1	pCi/g	
632	s	332	dpm/g	150	pCi/g	
635	s	<bkg	dpm/g			
636	s	4	dpm/g	2	pCi/g	
663	l	188	dpm/ml	85	pCi/ml	
666	s	12	dpm/g	5	pCi/g	
669	l	343	dpm/ml	155	pCi/ml	
694	l	341	dpm/ml	154	pCi/ml	
698	l	23	dpm/ml	10	pCi/ml	
701	l	13	dpm/ml	6	pCi/ml	
717	s	7	dpm/g	3	pCi/g	
718	l	1159232	dpm/ml	522177	pCi/ml	? high quench, low lum) bright rose
721	s	1	dpm/g	1	pCi/g	
762	s	1	dpm/g	1	pCi/g	
763	s	<bkg	dpm/g			

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Lawrence, KS 66047-3714
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766	l	109	dpm/ml	49	pCi/ml	
808	l	12	dpm/ml	6	pCi/ml	
812	s	43	dpm/g	19	pCi/g	
852	s	15	dpm/g	7	pCi/g	
946	l	8	dpm/ml	4	pCi/ml	
975	l	<bkg	dpm/ml			
988	l	841	dpm/ml	379	pCi/ml	

Page 3 of 11

1063	s	38	dpm/g	17	pCi/g	
1081	l	8388	dpm/ml	3778	pCi/ml	1081 sulfuric acid/30% H2SO3(fuming)
1085	s	116	dpm/g	52	pCi/g	1085 potassium nitrate (oxidizer)
97	l	5123	dpm/ml	2308	pCi/ml	
159	s	3	dpm/g	2	pCi/g	
172	s	8	dpm/g	4	pCi/g	
175	s	4	dpm/g	2	pCi/g	
191	s	29	dpm/g	13	pCi/g	
194	s	34	dpm/g	15	pCi/g	
195	s	<bkg	dpm/g			
231	l	36	dpm/ml	16	pCi/ml	
257	s	28	dpm/g	13	pCi/g	
261	s	76	dpm/g	34	pCi/g	
269	s	92	dpm/g	41	pCi/g	
278	s	<bkg	dpm/g			
500	s	21	dpm/g	9	pCi/g	
505	l	22	dpm/ml	10	pCi/ml	
522	s	<bkg	dpm/g			
574	l	1	dpm/ml	1	pCi/ml	
667	s	4	dpm/g	2	pCi/g	
939	l	3001	dpm/ml	1352	pCi/ml	
947	l	<bkg	dpm.ml			
951	l	<bkg	dpm/ml			
956	l	2	dpm/ml	1	pCi/ml	

Page 4 of 11

1020	l	40756	dpm/ml	18359	pCi/ml
1021	l	572	dpm/ml	257	pCi/ml

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1022	l	6938	dpm/ml	3125	pCi/ml
1024	l	6348	dpm/ml	2860	pCi/ml
1025	l	10696	dpm/ml	4818	pCi/ml
1026	l	4851	dpm/ml	2185	pCi/ml
1027	l	5846	dpm/ml	2633	pCi/ml
1028	l	35084	dpm/ml	15804	pCi/ml
1030	l	25075	dpm/ml	11295	pCi/ml
1031	l	27268	dpm/ml	12283	pCi/ml
1032	l	5670	dpm/ml	2554	pCi/ml
1033	l	7010	dpm/ml	3158	pCi/ml
1034	l	500	dpm/ml	226	pCi/ml
1035	l	463	dpm/ml	209	pCi/ml
1050	l	2898	dpm/ml	1305	pCi/ml
1051	l	895	dpm/ml	403	pCi/ml
1075	l	8	dpm/ml	4	pCi/ml
1076	s	142	dpm/g	64	pCi/g
1079	s	3	dpm/g	1	pCi/g
1084	s	9	dpm/g	4	pCi/g
1090	l	1452	dpm/ml	654	pCi/ml

Page 5 of 11 – Box 3

6	s	2	dpm/g	1	pCi/g
11	s	15	dpm/g	7	pCi/g
13	l	5	dpm/ml	2	pCi/ml
85	l	5	dpm/ml	2	pCi/ml
86	l	2	dpm/ml	1	pCi/ml
87	l	4	dpm/ml	2	pCi/ml
145	s	5	dpm/g	2	pCi/g
158	s	7	dpm/g	3	pCi/g
138	l	<bkg	dpm/ml		
160	s	3	dpm/g	2	pCi/g
166	s	7	dpm/g	3	pCi/g
168	s	11	dpm/g	5	pCi/g
171	s	13	dpm/g	6	pCi/g
180	s	14	dpm/g	6	pCi/g
181	s	28	dpm/g	13	pCi/g
187	s	6	dpm/g	3	pCi/g
189	s	141	dpm/g	64	pCi/g

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190	s	<bkg	dpm/g		
193	s	11	dpm/g	5	pCi/g
196	s	<bkg	dpm/g		
200	s	4	dpm/g	2	pCi/g
201	s	<bkg	dpm/g		
203	s	<bkg	dpm/g		
205	s	60	dpm/g	28	pCi/g

Page 6 of 11

206	s	34	dpm/g	15	pCi/g
216	s	<bkg	dpm/g		
219	s	7	dpm/g	3	pCi/g
237	s	47	dpm/g	22	pCi/g
238	s	6	dpm/g	3	pCi/g
239	s	<bkg	dpm/g		
266	s	5	dpm/g	2	pCi/g
272	s	132	dpm/g	60	pCi/g
273	s	119	dpm/g	53	pCi/g
281	s	137	dpm/g	62	pCi/g
282	s	29	dpm/g	13	pCi/g
360	l	362		163	pCi/ml
483	l	146	dpm/ml	66	pCi/ml
486	s	17	dpm/g	8	pCi/g
497	s	<bkg	dpm/g		
519	l	75	dpm/ml	34	pCi/ml
531	s	41	dpm/g	19	pCi/g
542	s	523	dpm/g	236	pCi/g
554	s	<bkg	dpm/g		
564	s	2	dpm/g	1	pCi/g
567	s	<bkg	dpm/g		
577	s	6	dpm/g	3	pCi/g
584	s	3	dpm/g	1	pCi/g
589	s	26	dpm/g	12	pCi/g

Page 7 of 11

596	s	6	dpm/g	3	pCi/g
651	s	105	dpm/g	48	pCi/g
657	l	30	dpm/ml	14	pCi/ml

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672	l	144	dpm/ml	65	pCi/ml
681	s	66	dpm/g	30	pCi/g
682	s	6	dpm/g	3	pCi/g
683	s	5	dpm/g	2	pCi/g
691	s	436	dpm/g	197	pCi/g
711	s	5	dpm/g	2	pCi/g
703	l	2363	dpm/ml	1064	pCi/ml
708	s	4	dpm/g	2	pCi/g
714	s	19	dpm/g	9	pCi/g
722	s	90	dpm/g	41	pCi/g
723	s	5	dpm/g	2	pCi/g
843	s	5	dpm/g	2	pCi/g
857	s	32	dpm/g	15	pCi/g
885	s	5	dpm/g	2	pCi/g
945	l	15198	dpm/ml	6846	pCi/ml
952	l	<bkg	dpm/ml		
958	l	4	dpm/ml	2	pCi/ml
962	l	<bkg	dpm/ml		
964	l	2	dpm/ml	1	pCi/ml
966	l	8	dpm/ml	4	pCi/ml
968	l	4	dpm/ml	1	pCi/ml

Page 8 of 11

972	l	3	dpm/ml	1	pCi/ml
1098	l	3	dpm/ml	1	pCi/ml
1039	l	<bkg	dpm/ml		
153		<bkg			
1040	l	dpm/ml			
1041	l	dpm/ml			
1043	s				
1059	s				
1064	s				
1067	s				
1068	s				
1071	s				
1072	s				

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1073	s	
1080	s	
1086	s	
1087	l	dpm/ml
1088	l	dpm/ml
1089	l	dpm/ml

10	s	
14	l	dpm/ml
52	l	dpm/ml
64	l	dpm/ml
67	l	dpm/ml
165	s	

page 9 of 11

960	l	dpm/ml
961	l	dpm/ml
973	l	dpm/ml
1053	l	dpm/ml

Box 4

1	s
96	s
185	s
186	s
199	s
247	l
311	s
405	l
408	l
410	l
412	s
416	l
417	l
419	s
423	l
441	l
442	s
443	l
445	l
449	l

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452 s
456 s
451 l
457 s
463 s
465 s
466 s
468 l
540 l
582 s
590 s
688 l
755 s
1000 l
1105 s
1107 s
1010 l
1117 s
368 l

1 of 3

4
146
148
176
212
244
246
252
557
560
574
586
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593
604
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646

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651
659
665

692
712
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1007

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1008
1009
1011
1012
1013
1014
1015
1016

Wipe Samples – July 24, 2014, beginning with 6 pm 1of 4 and M-1 and 80 on 1 of 5)
(five minute counts)

6	81	dpm/100 cm^2	37	pCi/100 cm^2
85	3575	dpm/100 cm^2	1610	pCi/100 cm^2
86	613	dpm/100 cm^2	276	pCi/100 cm^2
87	725	dpm/100 cm^2	326	pCi/100 cm^2
97	1074	dpm/100 cm^2	483	pCi/100 cm^2
125	363	dpm/100 cm^2	164	pCi/100 cm^2
138	1031	dpm/100 cm^2	464	pCi/100 cm^2
145	4817	dpm/100 cm^2	2170	pCi/100 cm^2
146	681	dpm/100 cm^2	306	pCi/100 cm^2
148	320	dpm/100 cm^2	144	pCi/100 cm^2
053	790	dpm/100 cm^2	356	pCi/100 cm^2
058	475	dpm/100 cm^2	214	pCi/100 cm^2
159	269	dpm/100 cm^2	121	pCi/100 cm^2
160	109	dpm/100 cm^2	49	pCi/100 cm^2
166	80	dpm/100 cm^2	36	pCi/100 cm^2
168	934	dpm/100 cm^2	421	pCi/100 cm^2
170	6264	dpm/100 cm^2	2822	pCi/100 cm^2
172	318	dpm/100 cm^2	143	pCi/100 cm^2
180	543	dpm/100 cm^2	245	pCi/100 cm^2
181	280	dpm/100 cm^2	126	pCi/100 cm^2
187	1270	dpm/100 cm^2	572	pCi/100 cm^2
190	165	dpm/100 cm^2	74	pCi/100 cm^2
191	998	dpm/100 cm^2	450	pCi/100 cm^2
194	1023	dpm/100 cm^2	461	pCi/100 cm^2
195	106	dpm/100 cm^2	48	pCi/100 cm^2
196	1288	dpm/100 cm^2	580	pCi/100 cm^2

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197	137	dpm/100 cm^2	62	pCi/100 cm^2
200	333	dpm/100 cm^2	150	pCi/100 cm^2
201	94	dpm/100 cm^2	42	pCi/100 cm^2
203	127	dpm/100 cm^2	57	pCi/100 cm^2
205	588	dpm/100 cm^2	265	pCi/100 cm^2
206	980	dpm/100 cm^2	441	pCi/100 cm^2
212	402	dpm/100 cm^2	181	pCi/100 cm^2
216	1485	dpm/100 cm^2	669	pCi/100 cm^2
219	283	dpm/100 cm^2	127	pCi/100 cm^2
231	191	dpm/100 cm^2	86	pCi/100 cm^2
237	780	dpm/100 cm^2	351	pCi/100 cm^2
238	665	dpm/100 cm^2	300	pCi/100 cm^2
239	1333	dpm/100 cm^2	600	pCi/100 cm^2
244	932	dpm/100 cm^2	420	pCi/100 cm^2
246	452	dpm/100 cm^2	204	pCi/100 cm^2
252	1141	dpm/100 cm^2	514	pCi/100 cm^2
257	777	dpm/100 cm^2	350	pCi/100 cm^2
266	3381	dpm/100 cm^2	1523	pCi/100 cm^2
269	764	dpm/100 cm^2	344	pCi/100 cm^2
272	220	dpm/100 cm^2	99	pCi/100 cm^2
278	89	dpm/100 cm^2	40	pCi/100 cm^2
281	129	dpm/100 cm^2	58	pCi/100 cm^2
282	1245	dpm/100 cm^2	561	pCi/100 cm^2
312	117	dpm/100 cm^2	53	pCi/100 cm^2
360	2199	dpm/100 cm^2	991	pCi/100 cm^2
483	135	dpm/100 cm^2	61	pCi/100 cm^2
486	516	dpm/100 cm^2	232	pCi/100 cm^2
497	700	dpm/100 cm^2	315	pCi/100 cm^2
500	207	dpm/100 cm^2	93	pCi/100 cm^2
531	588	dpm/100 cm^2	265	pCi/100 cm^2
542	833	dpm/100 cm^2	375	pCi/100 cm^2
567	141	dpm/100 cm^2	64	pCi/100 cm^2
607	436	dpm/100 cm^2	196	pCi/100 cm^2
794	615	dpm/100 cm^2	277	pCi/100 cm^2
805	472	dpm/100 cm^2	213	pCi/100 cm^2
933	1730	dpm/100 cm^2	779	pCi/100 cm^2
939	1349	dpm/100 cm^2	695	pCi/100 cm^2
1053	25,082	dpm/100 cm^2	11,298	pCi/100 cm^2
1059	787	dpm/100 cm^2	355	pCi/100 cm^2
1064	251	dpm/100 cm^2	113	pCi/100 cm^2
1068	162	dpm/100 cm^2	73	pCi/100 cm^2
1071	345	dpm/100 cm^2	155	pCi/100 cm^2
1072	106	dpm/100 cm^2	47	pCi/100 cm^2

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1087	180	dpm/100 cm^2	81	pCi/100 cm^2
1088	174	dpm/100 cm^2	78	pCi/100 cm^2
Collidine		615 dpm/100 cm^2	277	pCi/100 cm^2
80	879	dpm/100 cm^2	396	pCi/100 cm^2
137	464	dpm/100 cm^2	209	pCi/100 cm^2
218	201	dpm/100 cm^2	91	pCi/100 cm^2
232	661	dpm/100 cm^2	297	pCi/100 cm^2
307	6758	dpm/100 cm^2	3044	pCi/100 cm^2
361	3830	dpm/100 cm^2	1725	pCi/100 cm^2
386	96	dpm/100 cm^2	43	pCi/100 cm^2
475	224	dpm/100 cm^2	101	pCi/100 cm^2
479	940	dpm/100 cm^2	423	pCi/100 cm^2
481	327	dpm/100 cm^2	147	pCi/100 cm^2
485	171	dpm/100 cm^2	77	pCi/100 cm^2
490	350	dpm/100 cm^2	158	pCi/100 cm^2
495	213	dpm/100 cm^2	96	pCi/100 cm^2
498	475	dpm/100 cm^2	214	pCi/100 cm^2
582	99	dpm/100 cm^2	45	pCi/100 cm^2
521	211	dpm/100 cm^2	95	pCi/100 cm^2
532	64	dpm/100 cm^2	29	pCi/100 cm^2
552	784	dpm/100 cm^2	558	pCi/100 cm^2
561	90	dpm/100 cm^2	41	pCi/100 cm^2
578	153	dpm/100 cm^2	69	pCi/100 cm^2
595	279	dpm/100 cm^2	125	pCi/100 cm^2
719	332	dpm/100 cm^2	150	pCi/100 cm^2
730	68	dpm/100 cm^2	31	pCi/100 cm^2
735	156	dpm/100 cm^2	70	pCi/100 cm^2
744	57	dpm/100 cm^2	26	pCi/100 cm^2
758	271	dpm/100 cm^2	122	pCi/100 cm^2
761	163	dpm/100 cm^2	74	pCi/100 cm^2
781	404	dpm/100 cm^2	182	pCi/100 cm^2
791	1264	dpm/100 cm^2	569	pCi/100 cm^2
796	118	dpm/100 cm^2	53	pCi/100 cm^2
799	22	dpm/100 cm^2	10	pCi/100 cm^2
828	113	dpm/100 cm^2	51	pCi/100 cm^2
66	13055	dpm/100 cm^2	5881	pCi/100 cm^2
109	5348	dpm/100 cm^2	2409	pCi/100 cm^2
362	4784	dpm/100 cm^2	2155	pCi/100 cm^2
389	20116	dpm/100 cm^2	9061	pCi/100 cm^2
391	2763	dpm/100 cm^2	1245	pCi/100 cm^2
398	4212	dpm/100 cm^2	1897	pCi/100 cm^2
492	86766	dpm/100 cm^2	39084	pCi/100 cm^2

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495	18610	dpm/100 cm^2	8383	pCi/100 cm^2
639	4106	dpm/100 cm^2	1850	pCi/100 cm^2
780	383324	dpm/100 cm^2	172668	pCi/100 cm^2
847	10306	dpm/100 cm^2	46423	pCi/100 cm^2
869	1980	dpm/100 cm^2	892	pCi/100 cm^2
1054	3925	dpm/100 cm^2	1768	pCi/100 cm^2
1	331	dpm/100 cm^2	149	pCi/100 cm^2
10	438	dpm/100 cm^2	197	pCi/100 cm^2
52	413	dpm/100 cm^2	186	pCi/100 cm^2
64	552	dpm/100 cm^2	249	pCi/100 cm^2
67	523	dpm/100 cm^2	236	pCi/100 cm^2
96	183	dpm/100 cm^2	83	pCi/100 cm^2
165	341	dpm/100 cm^2	154	pCi/100 cm^2
167	277	dpm/100 cm^2	125	pCi/100 cm^2
170	762	dpm/100 cm^2	343	pCi/100 cm^2
183	399	dpm/100 cm^2	179	pCi/100 cm^2
185	3548	dpm/100 cm^2	1598	pCi/100 cm^2
186	3608	dpm/100 cm^2	1625	pCi/100 cm^2
188	772	dpm/100 cm^2	348	pCi/100 cm^2
192	188	dpm/100 cm^2	85	pCi/100 cm^2
197	302	dpm/100 cm^2	136	pCi/100 cm^2
199	861	dpm/100 cm^2	388	pCi/100 cm^2
230	854	dpm/100 cm^2	385	pCi/100 cm^2
270	314	dpm/100 cm^2	141	pCi/100 cm^2
311	1082	dpm/100 cm^2	487	pCi/100 cm^2
402	1096	dpm/100 cm^2	494	pCi/100 cm^2
405	330300	dpm/100 cm^2	148783	pCi/100 cm^2
408	9661	dpm/100 cm^2	4352	pCi/100 cm^2
410	39138	dpm/100 cm^2	17630	pCi/100 cm^2
412	33376	dpm/100 cm^2	15034	pCi/100 cm^2
416	46046	dpm/100 cm^2	20741	pCi/100 cm^2
419	17803	dpm/100 cm^2	8019	pCi/100 cm^2
423	4211	dpm/100 cm^2	1897	pCi/100 cm^2
429	26230	dpm/100 cm^2	11815	pCi/100 cm^2
430	459629	dpm/100 cm^2	202986	pCi/100 cm^2
441	77150	dpm/100 cm^2	34752	pCi/100 cm^2
442	210690	dpm/100 cm^2	94905	pCi/100 cm^2
449	192408	dpm/100 cm^2	86670	pCi/100 cm^2
451	153822	dpm/100 cm^2	69289	pCi/100 cm^2
452	7268	dpm/100 cm^2	3274	pCi/100 cm^2
456	11669	dpm/100 cm^2	5256	pCi/100 cm^2
465	38197	dpm/100 cm^2	17206	pCi/100 cm^2

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(785) 864-2851

468	25936	dpm/100 cm^2	11277	pCi/100 cm^2	
473	1059	dpm/100 cm^2	477	pCi/100 cm^2	
478	493	dpm/100 cm^2	222	pCi/100 cm^2	
503	248	dpm/100 cm^2	157	pCi/100 cm^2	
529	609	dpm/100 cm^2	274	pCi/100 cm^2	
540	403	dpm/100 cm^2	181	pCi/100 cm^2	
543	691	dpm/100 cm^2	311	pCi/100 cm^2	
544	286	dpm/100 cm^2	129	pCi/100 cm^2	
580	702	dpm/100 cm^2	316	pCi/100 cm^2	
666	668	dpm/100 cm^2	301	pCi/100 cm^2	
717	495	dpm/100 cm^2	223	pCi/100 cm^2	
755	1028	dpm/100 cm^2	463	pCi/100 cm^2	
762	1752	dpm/100 cm^2	789	pCi/100 cm^2	
813	197	dpm/100 cm^2	89	pCi/100 cm^2	
988	56509	dpm/100 cm^2	25455	pCi/100 cm^2	
1063	292	dpm/100 cm^2	131	pCi/100 cm^2	
1085	284	dpm/100 cm^2	128	pCi/100 cm^2	
198	180	dpm/100 cm^2	81	pCi/100 cm^2	not on chain of custody

M-1 off base N	274	dpm/100 cm^2	123	pCi/100 cm^2
M-2 off base E	190	dpm/100 cm^2	86	pCi/100 cm^2
M-3 Bath Fl	102	dpm/100 cm^2	46	pCi/100 cm^2
M-4 St Sec Fl	99	dpm/100 cm^2	45	pCi/100 cm^2
M-5 St E CF	124	dpm/100 cm^2	56	pCi/100 cm^2
M-6 St Ne F	154	dpm/100 cm^2	69	pCi/100 cm^2
M-7 Ne stor W	227	dpm/100 cm^2	102	pCi/100 cm^2
Ex Wall	144	dpm/100 cm^2	65	pCi/100 cm^2
Roof	130	dpm/100 cm^2	59	pCi/100 cm^2
W Stack	528	dpm/100 cm^2	238	pCi/100 cm^2
E Stack	137	dpm/100 cm^2	62	pCi/100 cm^2
W Stack 2	3859	dpm/100 cm^2	174	pCi/100 cm^2
H-11	5674	dpm/100 cm^2	2556	pCi/100 cm^2
H-16	42151	dpm/100 cm^2	18987	pCi/100 cm^2
H-17	24084	dpm/100 cm^2	10849	pCi/100 cm^2
H-19	12457	dpm/100 cm^2	5611	pCi/100 cm^2
H-24	18006	dpm/100 cm^2	8111	pCi/100 cm^2

Air Filters (Sample information – time, vol, bkg cpm, count written on collection bag)
Count of filter recorded as dpm or pCi per volume of air.

Date	Time	Vol	bkg cpm	count

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(785) 864-2851

						ft^3	α/β	α/β	
AM5714	307	dpm /	138 pCi /	May 7	7:39:55	953.0	0/45	3/78	
AM51214	586	dpm /	264 pCi /	May 12	8:30	806.9	0/37	7/114	0/96
AM51414	1161	dpm /	523 pCi /	May 14	7:41.38	931.21	0/37	3/276	0/233
AM51614	764	dpm /	344 pCi /	May 16	8:26	1104.7	0/37	0/93	
AM52214	9724	dpm /	4380 pCi /	May 22	4:08:20	556.7	0/31	6/1176	
AM51314	1095	dpm /	493 pCi /	May 13	6:07:59	712.7	0/45	0/175	0/147
AM63014	251	dpm /	113 pCi /	June 30	7:59:28	1061.1	0/33	4/57	
AM7814	388	dpm /	175 pCi /	July 8	8:06:44	1086.6	0/43	1/94	

APPENDIX E

DATA VALIDATION REPORT

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	Beta Chem site
Laboratory:	TestAmerica Laboratories, St. Louis, Missouri
Data Reviewer:	Jessica Vickers, Tetra Tech, Inc. (Tetra Tech)
Review Date	August 11, 2014
Sample Delivery Group (SDG):	160-6650-1

Sample Numbers:
G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, HS-1, HS-2, HS-3, HS-4, HS-5, HS-6, HS-7, and HS-8

Matrix /Number of Samples: 18 Soil Samples

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review" (9240.1-51, January 2010) and Chapter 8 of "Multi-Agency Radiological Laboratory Analytical Procedures Manual (MARLAP, 402-B-04-001A, July 2004). In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project specific data package.

I, Jessica A. Vickers, certify that all data validation criteria outlined in the above referenced documents were assessed, and any qualifications made to the data were in accordance with those documents.

Jessica A. Vickers

August 11, 2014

Certified by Jessica A. Vickers, Chemist

Date

DATA VALIDATION QUALIFIERS

U	—	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	—	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	—	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and may be biased high.
J-	—	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and may be biased low.
UJ	—	The analyte was analyzed for, but was not detected above the reported sample quantitation limit, which is estimated.
R	—	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 160-6650-1 included eighteen (18) environmental soil samples collected on May 9, 2014. The samples were analyzed for the radioactive isotope of carbon (carbon-14) using a liquid scintillation counter (Method C-01-1) following the Department of Energy's Environmental Measurements Laboratory (EML) Procedures Manual HASL-300. The following summarizes the data validation that was performed.

RADIOLOGICAL ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

All samples were received by the laboratory and analyzed within the customary holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not used with radiological analyses. The laboratory duplicate and LCS results provided adequate data on precision and accuracy. No data were qualified.

III. Blanks

No measurable detections of carbon-14 were detected in the method blanks associated with this SDG. No data were qualified.

IV. Laboratory Control Sample (LCS)

Percent recoveries for the LCS analyses were within established control limits. No data were qualified.

V. Comments

The laboratory duplicate results were well within their quality control limits for relative error ratio (RER).

VI. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as qualified for their intended purposes.

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site:	Beta Chem site
Laboratory:	TestAmerica Laboratories, St. Louis, Missouri
Data Reviewer:	Jessica Vickers, Tetra Tech, Inc. (Tetra Tech)
Review Date	August 11, 2014
Sample Delivery Group (SDG):	160-6999-1

Sample Numbers:
BG-1, BG-2, BG-3, BG-4, and BG-5

Matrix /Number of Samples: 5 Background Soil Samples

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review" (9240.1-51, January 2010) and Chapter 8 of "Multi-Agency Radiological Laboratory Analytical Procedures Manual (MARLAP, 402-B-04-001A, July 2004). In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project specific data package.

I, Jessica A. Vickers, certify that all data validation criteria outlined in the above referenced documents were assessed, and any qualifications made to the data were in accordance with those documents.

Jessica A. Vickers

August 11, 2014

Certified by Jessica A. Vickers, Chemist

Date

DATA VALIDATION QUALIFIERS

U	—	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	—	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+	—	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and may be biased high.
J-	—	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample and may be biased low.
UJ	—	The analyte was analyzed for, but was not detected above the reported sample quantitation limit, which is estimated.
R	—	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 160-6999-1 included five (5) environmental soil samples collected on May 30, 2014. The samples were analyzed for the radioactive isotope of carbon (carbon-14) using liquid scintillation counter (Method C-01-1) following the Department of Energy's Environmental Measurements Laboratory (EML) Procedures Manual HASL-300. The following summarizes the data validation that was performed.

RADIOLOGICAL ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

All samples were received by the laboratory and analyzed within the customary holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not used with radiological analyses. The laboratory duplicate and LCS results provided adequate data on precision and accuracy. No data were qualified.

III. Blanks

No measurable detections of carbon-14 were detected in the method blank associated with this SDG. No data were qualified.

IV. Laboratory Control Sample (LCS)

Percent recoveries for the LCS analyses were within established control limits. No data were qualified.

V. Comments

All background sample results were non-detect.

VI. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as qualified for their intended purposes.