

**Old Church Rock Mine
Eastern Abandoned Uranium Mine Region**

**OCRM Removal Assessment
Appendix D
Soil Verification Report**

Response, Assessment, and Evaluation Services

Contract No. EP-S9-17-03

Task Order 0035

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ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms per liter
bgs	Below ground surface
COC	Chain of custody
DER	Duplicate error ratio
EB	Equipment blank
g	Gram
GEL	GEL Laboratories, LLC
HNO ₃	Nitric acid
ICPMS	Inductively Coupled Plasma Mass Spectrometry
ID	Identification
J	Estimated value
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LOD	Limit of detection
LOQ	Limit of quantitation
MARLAP	Multi-Agency Radiological Laboratory Analytical Protocols
MS	Matrix spike
MSD	Matrix spike duplicate
OCRM	Old Church Rock Mine
QA	Quality assurance
QC	Quality control
RAES	Response, Assessment, and Evaluation Services
RPD	Relative percent difference
SAP	Sampling and Analysis Plan
SWB	Surface water blank
Tetra Tech	Tetra Tech, Inc.
TPU	Total propagated uncertainty
U	Analyte not detected at concentration exceeding limit of detection
USEPA	U.S. Environmental Protection Agency



1.0 INTRODUCTION

Appendix D to the Old Church Rock Mine (OCRM) Removal Assessment Report (hereafter referred to as the main report) presents the soil verification methods applied during the 2022 field investigation soil sampling efforts at OCRM in New Mexico. Tetra Tech, Inc. (Tetra Tech) adhered to the procedures and methodologies regarding soil sampling in accordance with the U.S. Environmental Protection Agency (USEPA) approved Removal Assessment Sampling and Analysis Plan (SAP) (Tetra Tech 2022).

2.0 OVERVIEW OF SURFACE SOIL SAMPLING

This section overviews surface soil sampling activities during the OCRM removal assessment. Discrete surface soil sampling was part of the following investigations:

- Background Investigation
- Ion Exchange Building and Ponds Sampling
- Gamma-Guided Sampling

Discrete surface soil sampling proceeded according to the methods described in Section 4.1.2.2 of the SAP (Tetra Tech 2022), included in Attachment D1. Surface soil samples (250 grams [g] each) were collected by use of a hand trowel within 0 to 3 inches below ground surface (bgs) and placed into plastic ziploc sample bags. Each sample was labeled with a unique sample ID, date, time, and the sampler's name/initials.

Composite surface soil sampling was part of the gamma-radium correlation study, and conformed to the methodology in Section 4.1.2.4 of the SAP, included in Attachment D1. Composite surface soil samples were collected by use of a hand trowel within 0 to 3 inches bgs, and were homogenized in a stainless steel bowl to make a single composite sample of at least 250 g. Each single composite sample was put into a plastic ziploc sample bag and labeled with a unique sample ID, date, time, and the sampler's initials.

Table D1 summarizes surface soil sampling activities during the removal assessment, including dates of sampling and numbers of samples collected. Photographs of samples collected are in Appendix A to the main report.

Table D-1. Summary of Surface Soil Sampling Activities

Date	Investigation	Sample Type	Sampling and Analysis Plan Procedure Section	Number of Samples Collected	Number of Duplicates Collected
11/16/2022	Background Study Area	Grab	4.1.1.2	30	2
11/16/2022	Ion Exchange & Ponds	Grab	4.1.1.2	10	0
11/17/2022	Gamma-Guided	Grab	4.1.1.2	30	2
11/19/2022	Gamma-Radium Correlation	Composite	4.1.2.4	15	1

3.0 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

This sections presents the QA/QC methods applied during the removal assessment, and results.

3.1 DECONTAMINATION

Upon collection of a surface sample, the equipment used to collect the sample was decontaminated per the decontamination procedures in Section 4.5 of the OCRM Removal Assessment SAP (Tetra Tech 2022), which included the following steps:

1. Removal of gross contamination by use of a dry paper towel or a paper towel and distilled water as necessary.
2. Secondary decontamination by application of a Liquinox solution and paper towel or scrub brush.
3. Equipment drying with a clean paper towel or placement of the equipment on aluminum foil to allow air drying.

Rinsate/equipment blank (EB) samples were collected by running source water over the equipment into a liquid sample bottle containing nitric acid (HNO₃) preservative. A source water blank (SWB) also was collected by pouring source water directly into a similar liquid sample bottle containing HNO₃ preservative. EB and SWB samples were given unique sample IDs and submitted for laboratory analysis.

To demonstrate that decontamination efforts were successful in mitigating cross-contamination, results for copper, uranium, and vanadium from each EB sample were compared to SWB sample results. Table D2 summarizes the comparisons of results. No EB result exceeded an SWB result significantly, as all sample results were near the detection limit of the instrumentation.

Table D-2. EB/SWB Result Comparison

Sample ID	Type	Copper		Uranium		Vanadium	
		Result (µg/L)	Qualifier	Result (µg/L)	Qualifier	Result (µg/L)	Qualifier
SWB-01-111422	SWB	0.3	U	0.067	U	4.99	J
EB-01-111422	EB	0.3	U	0.067	U	4.35	J
EB-01-111522	EB	0.718	J	0.112	J	4.32	J
EB-01-111622	EB	0.751	J	0.067	U	3.3	U
EB-01-111722	EB	0.3	U	0.067	U	3.3	U
EB-02-111722	EB	0.406	B	0.067	U	3.3	U

Notes:

No common laboratory contaminant was detected at concentration exceeding its limit of quantitation (LOQ).

µg/L Micrograms per liter

B Target analyte was detected at concentration exceeding ½ its limit of detection (LOD) and exceeding 1/10 its concentration in any sample.

EB Equipment blank

J Indicates an estimated value. Result exceeded detection limit, but was less than the reporting limit—or analyte recovery in the matrix spike (MS) or matrix spike duplicate (MSD) was outside of specified acceptance criteria.

SWB Source water blank

U Target analyte not detected at concentration exceeding limit of detection.

3.2 DUPLICATES

Soil duplicates were collected at a minimum frequency of one per 20 soil samples. Of the 90 samples collected, five were duplicates. To assess accuracy of the sampling methods, relative percent differences (RPD) between results for a select number of analytes from each duplicate pair were determined to cover the three analytical methods applied:

- Copper (Cu) via SW6020B (Inductively Coupled Plasma Mass Spectrometry [ICPMS])
- Uranium (U) metal via SW6020B (ICPMS)
- Vanadium (V) via SW6020B (ICPMS)
- Radium (Ra)-226 via EH300 (Gamma Spectrometry)
- Potassium (K)-40 via EH300 (Gamma Spectrometry)
- U-238 via HASL 300 (Alpha Spectrometry) (Only one duplicate pair was analyzed via HASL 300.)

The highest RPD between two duplicate pairs was 17 percent.

Regarding radionuclides assessed via gamma or alpha spectrometry, the duplicate error ratio (DER) also was calculated. Per the Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) (2004), the DER was calculated according to the following relationship between primary and duplicate sample results:

$$DER = \frac{|C_{primary} - C_{duplicate}|}{2\sigma_{primary} + 2\sigma_{duplicate}}$$

where:

DER	Duplicate error ratio
$C_{primary}$	Analyte concentration in the primary sample
$C_{duplicate}$	Analyte concentration in the duplicate sample
$\sigma_{primary}$	Total propagated error of the primary sample
$\sigma_{duplicate}$	Total propagated error of the duplicate sample

Per MARLAP, a DER was acceptable if it did not exceed 2.13. Results with DERs above 2.13 percent resulted in “J” qualifications.

The highest DER between duplicate pairs was 0.22. No additional qualifiers were necessary.

Table D3 summarizes RPDs and DERs between the duplicate pairs.



Table D-3. Surface Soil Duplicate Error Analysis

Date	Primary ID	Duplicate ID	Analytical Method: SW6020B								
			Copper			Uranium			Vanadium		
			Primary (mg/kg)	Duplicate (mg/kg)	RPD	Primary (mg/kg)	Duplicate (mg/kg)	RPD	Primary (mg/kg)	Duplicate (mg/kg)	RPD
11/16/2022	OCRM-B02-SS10-01-111622	OCRM-B02-SS10-02-111622	14.7	14.2	3%	1.19	1.13	5%	26.7	26	3%
11/16/2022	OCRM-B02-SS20-01-111622	OCRM-B02-SS20-02-111622	11.8	11.2	5%	1.11	1.04	7%	23.8	23	3%
11/17/2022	OCRM-SS12-01-111722	OCRM-SS12-02-111722	4.89	5.34	9%	48.4	46.9	3%	29.3	30.5	4%
11/17/2022	OCRM-SS28-01-111722	OCRM-SS28-02-111722	5.6	5.76	3%	81.1	95.2	16%	62.9	65.3	4%
11/19/2022	OCRM-CORR01-01-111922	OCRM-CORR01-02-111922	11.9	11	8%	1.43	1.36	5%	19.5	19	3%

Date	Primary ID	Duplicate ID	Analytical Method: EH300						Analytical Method: EH300						Analytical Method: HASL 300					
			Radium-226						Potassium-40						Uranium-238					
			Primary (pCi/g)	Primary TPU (pCi/g)	Duplicate (pCi/g)	Duplicate TPU (pCi/g)	RPD	DER	Primary (pCi/g)	Primary TPU (pCi/g)	Duplicate (pCi/g)	Duplicate TPU (pCi/g)	RPD	DER	Primary	Primary TPU	Duplicate	Duplicate TPU	RPD	DER
11/16/2022	OCRM-B02-SS10-01-111622	OCRM-B02-SS10-02-111622	1.66	0.276	1.67	0.301	1%	0.01	20	2.77	20.1	2.81	1%	0.01	-	-	-	-	-	-
11/16/2022	OCRM-B02-SS20-01-111622	OCRM-B02-SS20-02-111622	1.13	0.263	1.34	0.222	17%	0.22	20.3	2.82	19.5	2.56	17%	0.07	-	-	-	-	-	-
11/17/2022	OCRM-SS12-01-111722	OCRM-SS12-02-111722	50.6	4.87	54.5	4.63	7%	0.21	18.7	3.5	17.5	3.35	7%	0.09	-	-	-	-	-	-
11/17/2022	OCRM-SS28-01-111722	OCRM-SS28-02-111722	201	17.3	196	16	3%	0.08	20.7	5.99	18.6	4.52	3%	0.10	-	-	-	-	-	-
11/19/2022	OCRM-CORR01-01-111922	OCRM-CORR01-02-111922	1.51	0.19	1.66	0.209	9%	0.19	22	2.38	21.8	2.37	9%	0.02	1.39 (pCi/g)	0.629 (pCi/g)	1.25 (pCi/g)	0.547 (pCi/g)	11%	0.06

Notes:
DER Duplicate error analysis
EH300 Gamma Spectrometry
HASL 300 Alpha Spectrometry
ID Identification
mg/kg Milligrams per kilogram
pCi/g Picocuries per gram
RPD Relative percent difference
SW6020B Inductively Coupled Plasma - Mass Spectrometry
TPU Total propagated uncertainty

3.3 CHAIN OF CUSTODY

Chain-of-custody (COC) forms were generated during the field investigation to trace each sample collected through analysis and final disposition while ensuring sample integrity—in conformance to the methodology described in Section 4.4.2 of the SAP. A summary of COCs is in Table D4. All COCs are in Attachment D2.

Table D-4. Summary of COC Forms

COC Number	Sample IDs
RAES35-0001	OCRM-B02-SS01-01-111622, OCRM-B02-SS02-01-111622, OCRM-B02-SS03-01-111622, OCRM-B02-SS04-01-111622, OCRM-B02-SS05-01-111622, OCRM-B02-SS06-01-111622, OCRM-B02-SS07-01-111622, OCRM-B02-SS08-01-111622, OCRM-B02-SS09-01-111622, OCRM-B02-SS10-01-111622, OCRM-B02-SS10-02-111622, OCRM-B02-SS11-01-111622, OCRM-B02-SS12-01-111622, OCRM-B02-SS13-01-111622, OCRM-B02-SS14-01-111622, OCRM-B02-SS15-01-111622, OCRM-B02-SS18-01-111622, OCRM-B02-SS19-01-111622, OCRM-B02-SS20-01-111622, OCRM-B02-SS20-02-111622
RAES35-0002	OCRM-B02-SS16-01-111622, OCRM-B02-SS17-01-111622, OCRM-B02-SS21-01-111622, OCRM-B02-SS22-01-111622, OCRM-B02-SS23-01-111622, OCRM-B02-SS24-01-111622, OCRM-B02-SS25-01-111622, OCRM-B02-SS26-01-111622, OCRM-B02-SS27-01-111622, OCRM-B02-SS28-01-111622, OCRM-B02-SS29-02-111622, OCRM-B02-SS30-01-111622, OCRM-SS3099-01-111622, OCRM-SS2738-01-111622, OCRM-SS2679-01-111622, OCRM-SS2217-01-111622
RAES35-0003	OCRM-SS2225-01-111622, OCRM-SS1804-01-111622, OCRM-SS02-01-111722, OCRM-SS05-01-111722, OCRM-SS06-01-111722, OCRM-SS07-01-111722, OCRM-SS08-01-111722, OCRM-SS09-01-111722, OCRM-SS10-01-111722, OCRM-SS11-01-111722, OCRM-SS12-01-111722, OCRM-SS12-02-111722, OCRM-SS13-01-111722, OCRM-SS16-01-111722, OCRM-SS18-01-111722, OCRM-SS20-01-111722, OCRM-SS23-01-111722, OCRM-SS25-01-111722, EB-01-111622
RAES35-0004	OCRM-SS19-01-111722, OCRM-SS21-01-111722, OCRM-SS24-01-111722, OCRM-SS26-01-111722, OCRM-SS27-01-111722, OCRM-SS28-01-111722, OCRM-SS28-02-111722, OCRM-SS29-01-111722, OCRM-SS30-01-111722, OCRM-SS31-01-111722, OCRM-SS32-01-111722, OCRM-SS34-01-111722, OCRM-SS35-01-111722, OCRM-SS36-01-111722, OCRM-RTSW-XS05-01-111822, EB-02-111722
RAES35-0005	OCRM-CORR01-01-111922, OCRM-CORR01-02-111922, OCRM-CORR02-01-111922, OCRM-CORR03-01-111922, OCRM-CORR04-01-111922, OCRM-CORR05-01-111922, OCRM-CORR06-01-111922, OCRM-CORR07-01-111922, OCRM-CORR08-01-111922, OCRM-CORR09-01-111922, OCRM-CORR10-01-111922, OCRM-CORR11-01-111922, OCRM-CORR12-01-111922, OCRM-CORR13-01-111922, OCRM-CORR14-01-111922, OCRM-CORR15-01-111922
RAES35-0006	OCRM-SS2975-01-111622, OCRM-SS3006-01-111622, OCRM-SS2946A-01-111622, OCRM-SS2946B-01-111622

Note:

COC Chain of custody

4.0 LABORATORY DATA VERIFICATION REPORTS

GEL Laboratories, LLC (GEL) was the USEPA-approved laboratory under the RAES contract to analyze soil samples. The Level IV data package GEL provided to Tetra Tech included the following data elements:

- COC form
- Sample preservation, storage, and holding times
- Method and field blank contamination
- Surrogate spikes
- Matrix spikes/matrix spike duplicates (MS/MSD)
- Laboratory control samples (LCS)/laboratory control sample duplicates (LCSD).

Each data element listed above was verified in all data packages received from GEL. GEL's report categorized each data element as "Useable," "Rejected," or "NA." A description of impacted data with specific samples and analytical parameters is provided when appropriate.

Results of the data element verification are summarized in Data Verification Reports, included as Attachment D3. None of the 12 Data Verification Reports was rejected.



5.0 REFERENCES

Tetra Tech, Inc (Tetra Tech). 2022. “Old Church Rock Mine Removal Assessment Sampling and Analysis Plan.” Response, Assessment, and Evaluation Services. Contract No. EP-S9-17-02. Task Order 0035.

U.S. Environmental Protection Agency (USEPA). 2004. *Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) Manual*. EPA 402-B-04-001A. July.

**ATTACHMENT D-1: OCRM REMOVAL ASSESSMENT SAP
EXCERPTS**

Each sample container will be labeled to ensure sample integrity from collection through analysis and final disposition. Labels will be written in indelible ink on labels provided by the laboratory. The label for the samples will include the following information:

- Sample name
- Sample collection date and time
- Sampler initials

Each sampling team will maintain a physical field logbook or collect notes on project-specific field forms or in electronic format. Logbooks will be used for any sampling activities that do not have a dedicated field form. Logbook entries will summarize field activities (SOP 024-2). Logbooks will be used to record all relevant sampling information in the event of malfunctioning digital data capture equipment.

4.4.2 Chain of Custody

Samples collected during the field investigation must be traceable from the point of collection through analysis and final disposition to ensure sample integrity. Sample integrity helps ensure the legal defensibility of the analytical data and subsequent conclusions. The project team will use standard USEPA procedures and software (such as Sampling and Laboratory Results Data Management Architecture [SCRIBE]) to identify, track, monitor, and maintain sample chain-of-custody records. Chain-of-custody records will establish the documentation necessary to trace sample possession from collection through analysis and final disposition. Each person retaining custody at any time throughout the sample history is responsible for maintaining proper documentation and control measures. A sample is under a person's custody if it:

- Is in that person's possession
- Is in that person's view after being in his or her possession
- Is in that person's possession and he or she places it in a secured location
- Is placed by that person in a designated secure area

Field staff will follow the sample and document control procedures, sample and evidence identification procedures, field records requirements and procedures, and chain-of-custody procedures outlined in the Contract Laboratory Program Guidance for Field Samplers (USEPA 2014). Samples will be packaged, screened for radioactivity, and labeled for shipment in compliance with U.S. Department of Transportation and International Air Transport Association dangerous goods regulations. Any additional requirements stipulated by the overnight carrier will be followed.

Chain-of-custody forms will be signed in ink by the samplers and the individual relinquishing custody. Field staff will then follow the sample packaging and shipment procedures summarized

below and captured in SOP 019-7 to ensure that samples arrive at the laboratory with the chain of custody intact.

- Immediately after samples are collected, sample containers will be labeled with the appropriate identifiers and clear tape will be placed over the labels to prevent smearing.
- Samples will be placed in the appropriate containers and then in a cooler. If sample preservation methods require the samples to be kept cool, the cooler will contain double sealed bags of ice and will be maintained at 4 degrees Celsius. The cooler will remain in a secured area or in view of the sampler until it is properly sealed for shipment to the laboratory. The only samples that require cooling will be samples collected for toxicity characteristic leaching procedure analysis because of mercury. No other samples require refrigeration.
- Before shipping, the chain-of-custody forms, airbills, and all other relevant documents will be completed. Chain-of-custody forms will be sealed in plastic bags and taped to the inside of the cooler lid. Cushioning material, such as bubble-wrap, will be placed in the cooler.
- A temperature blank consisting of a jar or vial containing water will be included in every cooler containing water samples that will be analyzed for mercury. Temperature blanks will be used by the laboratory to determine the cooler temperature at the time samples are received.
- The shipping cooler will then be sealed with tape and custody seals in a manner that will indicate whether the cooler was opened. The preferred procedure includes placing custody seals diagonally at opposite corners of the cooler. The custody seals will be covered with clear plastic tape or strapping tape.
- The outside surface of the shipping cooler will be cleaned and scanned to ensure that no field-related contamination is present on outside surfaces and that the overall activity measured and documented is appropriate for the handling and shipping method.

The field sampler is personally responsible for the care and custody of the samples until they are transferred to other field staff or dispatched to an overnight carrier or directly to a laboratory. As few people as possible should handle the samples to prevent loss, breakage, or potential contamination. When transferring possession of the samples, the individuals relinquishing and receiving the samples must sign, date, and note the time of transfer on the chain-of-custody form. Commercial carriers are not required to sign off on the chain-of-custody form as long as the form is sealed inside the sample cooler and the custody seals remain intact.

Custody procedures must be followed in the laboratory from sample receipt until the sample is discarded. The laboratory should designate a specific person as the sample custodian with an alternate designated to act in the custodian's absence. The custodian will receive incoming samples and indicate receipt by signing the accompanying custody forms and retaining copies of the signed forms as permanent records. Once the sample transfer process is complete, the laboratory is responsible for maintaining internal logbooks, laboratory tracking reports, and other records necessary to maintain custody throughout sample preparation and analysis.

The laboratory sample custodian will record pertinent information concerning the sample, including the persons delivering and receiving the sample, the date and time received, the method by which the sample was transmitted to the laboratory, the sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; or other relevant remarks), the sample identification number, and any unique laboratory identification number associated with the sample. This information should be entered into a computerized laboratory information management system.

The laboratory must provide a secure storage area restricted to authorized personnel for all samples. The custodian will ensure that samples that are heat or light sensitive, are radioactive, have other unusual physical characteristics, or require special handling are properly stored and maintained before analysis. Only the custodian can distribute samples to laboratory personnel authorized to conduct the required analyses. Laboratory analytical personnel are responsible for the care and custody of the sample when it is received. These personnel must be prepared to testify that the sample was in their custody at all times from the moment they received it from the custodian until the time that the analyses were completed.

At the completion of the sample analysis, any unused portion of the sample, together with identifying labels, must be returned to the custodian. The returned tagged sample should be retained in secure storage until the custodian receives permission to dispose of the sample. Sample disposal will occur only on the order of the laboratory director in consultation with USEPA or Tetra Tech, when it is certain that the information is no longer required, or when the samples have deteriorated. Likewise, tags and laboratory records will be maintained until the information is no longer required and final disposition is ordered by the laboratory director in consultation with USEPA or Tetra Tech.

4.5 DECONTAMINATION PROCEDURES

Non-disposable equipment used in the field will be decontaminated between samples in accordance with SOP 002-4 using wet decontamination procedures. The most commonly employed decontamination method for reusable equipment includes:

- Removal of gross contamination using a dry paper towel or a paper towel and distilled water as necessary
- Secondary decontamination using a Liquinox solution and paper towel or scrub brush
- Equipment drying with a clean paper towel or setting it out on aluminum foil to allow for air drying

Fluids generated during equipment decontamination will not need to be containerized and will be discharged directly to the surface within known contaminated areas to allow for evaporation. Personnel decontamination will proceed in accordance with the procedures outlined in the HASP and RPP contained in [Appendix A](#).

4. Place the sample into a labeled and decontaminated sample container and record the sample collection information on the soil sampling form. At a minimum, the label should include the sample location or sample number, date and time, and sampler(s) name or initials.
5. Before collecting any additional samples or leaving a sample location, sufficiently decontaminate the sampling and mixing equipment.
6. Before leaving the sample location, record the position using a GPS or mark it with pin flags and close off the sample opening(s) with bentonite and, if approved, excess sample material and surrounding materials will be returned to the dug hole to backfill.

4.1.2.3 X-Ray Fluorescence Field Surveys Methods

XRF surveys will be performed using Niton XL5 (or equivalent) instruments. The surveys will be conducted with a soil guard in place protecting the instrument's X-ray window from soil and debris. The XRF instruments will be set to a scan time of 60 seconds for the low filter, 0 seconds for the medium filter, and 60 seconds for the high filter. A summary of the XRF survey equipment is included in [Table 9](#). Surveys will be conducted every 100 meters along radial gamma surveys. XRF measurements will identify or confirm locations to collect laboratory soil samples in areas of high gamma exposure. XRF surveys may also be conducted to collect qualitative metals results in areas such as residences.

The following protocol will be used for XRF measurements:

1. Because measurement can be impacted by elevated soil moisture levels, field staff will stop XRF measurement during persistent precipitation events. Field staff will use professional judgment to resume measurements. If the soil is visibly moist and the soil moisture is estimated to be greater than 30 percent at 0 to 3 inches below ground surface (bgs), field staff will wait at least 8 hours and then confirm acceptable soil moisture before resuming work.
2. At each XRF measurement location, the soil will be cleared of surface debris and visually assessed for signs of moisture. XRF analysis requires no signs of visible moisture (USEPA 2017). The XRF analyzer will then be placed directly against the soil for measurement, and a single XRF measurement will be collected at each location. An additional measurement will be made at locations selected for field duplicate analysis, resulting in a total of two measurements at those locations. XRF measurements will be collected in accordance with USEPA SW-846 Method 6200.
3. Each XRF location will be named alphanumerically with a unique ID.

4.1.2.4 Gamma-Radium Correlation Study Method

Gamma count rates will be correlated to concentrations of Ra-226 in surface soil and sediment using the following method:

1. Following completion of the delineation of gamma radiation levels, the data will be analyzed to identify areas exhibiting gamma measurements that envelop likely future decision points, such as potential cleanup levels for Ra-226 in surface soils.

2. A minimum of 10 study plots will be established at OCRM. The nominal size of each plot will be 100 m² or less; to the extent possible, each correlation plot will be selected in an area with reasonably homogeneous gamma readings near the target radiation level (that is, exhibiting characteristics of a uniform, normal, or lognormal distribution).
3. A GPS-based gamma radiation survey will be performed in the 100 m² study plots using one of the same detectors (if possible), survey speed, and geometry as described in [Section 4.1.2.1](#). The transect spacing will be reduced to 1 meter in this case.
4. A composite surface soil or sediment sample will be collected in each study plot composed of nine grab samples collected from 0 to 3 inches bgs and homogenized and composited into a single sample in the field for laboratory analysis.
5. The gamma correlation samples will be submitted to a fixed laboratory for analysis of total metals (including total uranium) by USEPA SW-846 Method 6020 (inductively coupled plasma mass spectroscopy), radionuclides (uranium-238 [via protactinium-234m], thorium-232 [via actinium-228], Ra-226, and potassium-40) by USEPA Method 901.1 (gamma spectroscopy), and isotopic thorium and uranium by American Society for Testing and Materials International D3972 (alpha spectroscopy). A summary of laboratory analyses for the gamma-radium correlation study is included in [Table 10](#).
6. A regression analysis of the paired average gamma measurements and Ra-226 concentrations in each plot will be performed to develop a statistically valid relationship between the two parameters.
7. The gamma measurements obtained in the gamma radiation survey will be converted to predicted Ra-226 concentrations using the relationship determined above.
8. Maps of the predicted Ra-226 concentrations will be produced that include raw and grid-averaged estimates of Ra-226. In addition, validated and interpolated maps using geostatistical methods may be provided.

4.1.2.5 *Gamma-Exposure Rate Correlation Study Method*

In addition to the gamma radiation survey, a cross-calibration will be conducted with a HPIC exposure rate measurement system. Calibration with a HPIC is necessary because the NaI thallium-laced detector systems exhibit energy-dependent response characteristics normalized to the cesium-137 0.662 million electronvolt photon. This energy response is never truly constant, and any given instrument can read somewhat different from the true exposure or dose rate, depending on the makeup of the energy spectrum at a site and the energy spectrum of the radionuclide sources used to calibrate the instrument (NRC 1994). The true exposure rate total from all radionuclide and cosmic contributions will be checked independently with the HPIC. HPIC measurements will be strategically collected to span a large range of gamma survey results to allow for a robust correlation. A summary of exposure rate equipment is presented in [Table 11](#).

4.1.1.6 Site Mapping

During field tasks at OCRM, observations of site features will be recorded to be included in maps and reports. Areas of damaged fence lines will be noted for repair by a contractor.

4.1.2 Methodologies

The following subsections describe the field sampling methodologies to be used during the sampling events described in [Section 4.1.1](#).

4.1.2.1 Gamma Radiation Survey Methods

The gamma radiation surveys will be performed using Ludlum Model 44-10 (or equivalent) 2-inch by 2-inch NaI detectors coupled to Ludlum Model 2221 (or equivalent) ratemeters/scalers set in ratemeter mode. For this project, these detectors will be coupled with an Environmental Restoration Group, Inc. (ERG) Model 105 GPS (or equivalent). The ERG Model 105 GPS consists of a Juniper Mesa 2 field computer and sub-meter accurate geode GPS receiver (or equivalent). A summary of gamma radiation survey equipment is presented in [Table 8](#). The surveys will be conducted on foot at approximately 3 feet per second along 4-meter transects at ORCM. Higher-density gamma scan transects may be performed as determined in the field. BSAs and residential areas will be scanned with 2-meter transects. Correlation plots will be scanned with <1-meter transects and will be conducted with both collimated and uncollimated NaI detectors. The detectors will be positioned at 1 meter ags. Consistent with recommendations in NUREG-5849 (NRC 1992), the gamma measurements will be processed after they have been collected by (1) overlaying 100-m² grids across OCRM, (2) estimating the average of the gamma measurements within each grid, and (3) comparing these averages to ILs. Additional areas may be surveyed as step-outs if the grid-averaged gamma values are above ILs.

4.1.2.2 Soil and Sediment Sampling Methods

Surface soil and sediment samples will be collected across OCRM from locations determined by the highest gamma radiation levels measured during the gamma delineation survey. A total of forty 250-gram soil samples will be collected from a depth of 0 to 3 inches.

Soil samples will be collecting using the following steps:

1. Clear debris, loose brush, and any excess vegetation or rock from sample locations.
2. Using a decontaminated sampler, collect the soil sample to the prescribed depth for the sample. If the sampler encounters refusal (that is, the sampler cannot be advanced to full sample depth), adjust the sample location to another location as near as practical to achieve successful sample collection. If a sample cannot be collected at the location, note "Refusal" in the logbook or field form.
3. Confirm the sample is equally representative of the range of depth. If multiple soil samples are collected from the same location and depth interval to achieve sufficient sample mass for analysis, either submit all of the collected soil for analysis or, using a mixing bucket or bowl, homogenize the collected soil into a single representative sample of sufficient mass for laboratory analysis.

4. Place the sample into a labeled and decontaminated sample container and record the sample collection information on the soil sampling form. At a minimum, the label should include the sample location or sample number, date and time, and sampler(s) name or initials.
5. Before collecting any additional samples or leaving a sample location, sufficiently decontaminate the sampling and mixing equipment.
6. Before leaving the sample location, record the position using a GPS or mark it with pin flags and close off the sample opening(s) with bentonite and, if approved, excess sample material and surrounding materials will be returned to the dug hole to backfill.

4.1.2.3 X-Ray Fluorescence Field Surveys Methods

XRF surveys will be performed using Niton XL5 (or equivalent) instruments. The surveys will be conducted with a soil guard in place protecting the instrument's X-ray window from soil and debris. The XRF instruments will be set to a scan time of 60 seconds for the low filter, 0 seconds for the medium filter, and 60 seconds for the high filter. A summary of the XRF survey equipment is included in [Table 9](#). Surveys will be conducted every 100 meters along radial gamma surveys. XRF measurements will identify or confirm locations to collect laboratory soil samples in areas of high gamma exposure. XRF surveys may also be conducted to collect qualitative metals results in areas such as residences.

The following protocol will be used for XRF measurements:

1. Because measurement can be impacted by elevated soil moisture levels, field staff will stop XRF measurement during persistent precipitation events. Field staff will use professional judgment to resume measurements. If the soil is visibly moist and the soil moisture is estimated to be greater than 30 percent at 0 to 3 inches below ground surface (bgs), field staff will wait at least 8 hours and then confirm acceptable soil moisture before resuming work.
2. At each XRF measurement location, the soil will be cleared of surface debris and visually assessed for signs of moisture. XRF analysis requires no signs of visible moisture (USEPA 2017). The XRF analyzer will then be placed directly against the soil for measurement, and a single XRF measurement will be collected at each location. An additional measurement will be made at locations selected for field duplicate analysis, resulting in a total of two measurements at those locations. XRF measurements will be collected in accordance with USEPA SW-846 Method 6200.
3. Each XRF location will be named alphanumerically with a unique ID.

4.1.2.4 Gamma-Radium Correlation Study Method

Gamma count rates will be correlated to concentrations of Ra-226 in surface soil and sediment using the following method:

1. Following completion of the delineation of gamma radiation levels, the data will be analyzed to identify areas exhibiting gamma measurements that envelop likely future decision points, such as potential cleanup levels for Ra-226 in surface soils.

ATTACHMENT D-2: CHAIN-OF-CUSTODY FORMS

601828

Tetra Tech

1999 Harrison Street, Suite 500

Oakland, CA 94612

Date Shipped: 11/20/2022

CHAIN OF CUSTODY RECORD

Event: RAES TO 35 OCRM Removal Assessment

Contact Name: Mike Dahquist 510-302-6310

Project Code: 103Z5440035 03.06

No: RAES35-0001

Lab: GEL Laboratories LLC - Charleston

Lab Phone: 843-769-7379

PO: RAES-005, TO 35, BOA 1150779

Lab #	Sample #	Matrix	Sample Date	Sample Time	Analyses	Analytical Method	Container	MS/MSD
	OCRM-B02-SS01-01-111622	Soil	11/16/2022	10:34	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	Y
	OCRM-B02-SS02-01-111622	Soil	11/16/2022	10:42	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS03-01-111622	Soil	11/16/2022	10:48	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS04-01-111622	Soil	11/16/2022	10:53	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS05-01-111622	Soil	11/16/2022	10:58	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS10-01-111622	Soil	11/16/2022	11:05	Metals, Ra-226, K-40, Isotopic U, Isotopic Th	6020,901.1,ASTM 3972	1 quart bag	
	OCRM-B02-SS10-02-111622	Soil	11/16/2022	11:06	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS09-01-111622	Soil	11/16/2022	11:11	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS08-01-111622	Soil	11/16/2022	11:16	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS07-01-111622	Soil	11/16/2022	11:20	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS06-01-111622	Soil	11/16/2022	11:25	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS11-01-111622	Soil	11/16/2022	11:31	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS12-01-111622	Soil	11/16/2022	11:34	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS13-01-111622	Soil	11/16/2022	11:39	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS14-01-111622	Soil	11/16/2022	11:44	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS15-01-111622	Soil	11/16/2022	11:49	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS20-01-111622	Soil	11/16/2022	11:54	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS20-02-111622	Soil	11/16/2022	11:54	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS19-01-111622	Soil	11/16/2022	12:03	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS18-01-111622	Soil	11/16/2022	12:07	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	

Special Instructions: Use EDD NAUM v4.1. Send results to RAESANLY@tetrattech.com and marcus.quinlan@tetrattech.com. Please refer to PO for special instructions.

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1 Cooler 20 Soil Samples	Margaret Carolan Tetra Tech, Inc. <i>Margaret Carolan</i>	11/21/2022 12:00pm	<i>M. [Signature]</i> GEL	11-22-22 0930	

601838

Tetra Tech

1999 Harrison Street, Suite 500
Oakland, CA 94612

Date Shipped: 11/20/2022

CHAIN OF CUSTODY RECORD

Event: RAES TO 35 OCRM Removal Assessment

Contact Name: Mike Dahlquist 510-302-6310

Project Code: 103Z5440035 03.06

No: RAES35-0002

Lab: GEL Laboratories LLC - Charleston

Lab Phone: 843-769-7379

PO: RAES-005, TO 35, BOA 1150779

Lab #	Sample #	Matrix	Sample Date	Sample Time	Analyses	Analytical Method	Container	MS/MSD
	OCRM-B02-SS17-01-111622	Soil	11/16/2022	12:11	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS16-01-111622	Soil	11/16/2022	12:16	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS21-01-111622	Soil	11/16/2022	12:21	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS22-01-111622	Soil	11/16/2022	12:26	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS23-01-111622	Soil	11/16/2022	12:30	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS24-01-111622	Soil	11/16/2022	12:37	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	Y
	OCRM-B02-SS25-01-111622	Soil	11/16/2022	12:42	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS30-01-111622	Soil	11/16/2022	12:48	Metals, Ra-226, K-40, Isotopic U, Isotopic Th	6020,901.1,ASTM 3972	1 quart bag	
	OCRM-B02-SS29-01-111622	Soil	11/16/2022	12:53	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS28-01-111622	Soil	11/16/2022	12:57	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS27-01-111622	Soil	11/16/2022	13:01	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS26-01-111622	Soil	11/16/2022	13:06	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS25-01-111622	Soil	11/16/2022	13:06	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS24-01-111622	Soil	11/16/2022	13:06	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS23-01-111622	Soil	11/16/2022	13:06	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-B02-SS22-01-111622	Soil	11/16/2022	13:06	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS3099-01-111622	Soil	11/16/2022	15:03	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS2738-01-111622	Soil	11/16/2022	15:13	Metals, Ra-226, K-40, Isotopic U, Isotopic Th	6020,901.1,ASTM 3972	1 quart bag	
	OCRM-SS2679-01-111622	Soil	11/16/2022	15:21	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS2217-01-111622	Soil	11/16/2022	15:28	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	

Special Instructions: Use EDD NAUM v4.1. Send results to RAESANLY@tetratech.com and marcus.quinlan@tetratech.com. Please refer to PO for special instructions.

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1 cooler 16 soil samples	Margaret Carolan Tetra Tech, Inc. Margaret Carolan	11/21/2022 12:00 pm	M. [Signature] GEL	11-22-22 0930	

601842

Tetra Tech

1999 Harrison Street, Suite 500
Oakland, CA 94612
Date Shipped: 11/20/2022

CHAIN OF CUSTODY RECORD

Event: RAES TO 35 OCRM Removal Assessment
Contact Name: Mike Dahquist 510-302-6310
Project Code: 103Z5440035 03.06

No: RAES35-0003

Lab: GEL Laboratories LLC - Charleston
Lab Phone: 843-769-7379
PO: RAES-005, TO 35, BOA 1150779

Lab #	Sample #	Matrix	Sample Date	Sample Time	Analyses	Analytical Method	Container	MS/MSD
	OCRM-SS2225-01-111622	Soil	11/16/2022	15:35	Metals, Ra-226, K-40, Isotopic U, Isotopic Th	6020,901.1,ASTM 3972	1 quart bag	
	OCRM-SS1804-01-111622	Soil	11/16/2022	15:44	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	EB-01-111622	Water	11/16/2022	17:40	Metals, Ra-226, K-40	6020, 903.1	1x1L poly and 1x250mL HNO3 poly	
	OCRM-SS02-01-111722	Soil	11/17/2022	09:24	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS17-01-111722	Soil	11/17/2022	09:43	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS10-01-111722	Soil	11/17/2022	09:57	Metals, Ra-226, K-40, Isotopic U, Isotopic Th	6020,901.1,ASTM 3972	1 quart bag	
	OCRM-SS13-01-111722	Soil	11/17/2022	10:06	Metals, Ra-226, K-40,	6020, 901.1	1 quart bag	
	OCRM-SS11-01-111722	Soil	11/17/2022	10:17	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS09-01-111722	Soil	11/17/2022	10:27	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS06-01-111722	Soil	11/17/2022	10:41	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS05-01-111722	Soil	11/17/2022	10:49	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS07-01-111722	Soil	11/17/2022	10:59	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS08-01-111722	Soil	11/17/2022	11:08	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS12-01-111722	Soil	11/17/2022	11:21	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS12-02-111722	Soil	11/17/2022	11:21	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	Y
	OCRM-SS16-01-111722	Soil	11/17/2022	11:31	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS18-01-111722	Soil	11/17/2022	11:36	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS25-01-111722	Soil	11/17/2022	11:42	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS20-01-111722	Soil	11/17/2022	11:47	Metals, Ra-226, K-40, Isotopic U, Isotopic Th	6020,901.1,ASTM 3972	1 quart bag	
	OCRM-SS23-01-111722	Soil	11/17/2022	11:52	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	

Special Instructions: Use EDD NAUM v4.1. Send results to RAESANLY@tetratech.com and marcus.quinlan@tetratech.com. Please refer to PO for special instructions.

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1 cooler 20 samples	Margaret Carlson Tetra Tech Inc Margaret Carlson	11/21/2022 12:00 PM	M. [Signature] GEL	11-22-22 0930	

601849

Tetra Tech

1999 Harrison Street, Suite 500

Oakland, CA 94612

Date Shipped: 11/20/2022

CHAIN OF CUSTODY RECORD

Event: RAES TO 35 OCRM Removal Assessment

Contact Name: Mike Dahquist 510-302-6310

Project Code: 103Z5440035 03.06

No: RAES35-0004

Lab: GEL Laboratories LLC - Charleston

Lab Phone: 843-769-7379

PO: RAES-005, TO 35, BOA 1150779

Lab #	Sample #	Matrix	Sample Date	Sample Time	Analyses	Analytical Method	Container	MS/MSD
	OCRM-SS26-01-111722	Soil	11/17/2022	11:58	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS27-01-111722	Soil	11/17/2022	12:04	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS24-01-111722	Soil	11/17/2022	12:09	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS35-01-111722	Soil	11/17/2022	13:05	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS32-01-111722	Soil	11/17/2022	13:11	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS31-01-111722	Soil	11/17/2022	13:17	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS30-01-111722	Soil	11/17/2022	13:25	Metals, Ra-226, K-40, Isotopic U, Isotopic Th	6020,901.1,ASTM 3792	1 quart bag	
	OCRM-SS29-01-111722	Soil	11/17/2022	13:31	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS34-01-111722	Soil	11/17/2022	13:37	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS36-01-111722	Soil	11/17/2022	13:53	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS28-01-111722	Soil	11/17/2022	14:13	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS28-02-111722	Soil	11/17/2022	14:14	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS19-01-111722	Soil	11/17/2022	14:26	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	OCRM-SS21-01-111722	Soil	11/17/2022	14:38	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	
	EB-02-111722	Water	11/17/2022	18:35	Metals, Ra-226, K-40	6020, 903.1	1x1L poly and 1x250mL HNO3 poly	
	OCRM-RTSW-XS05-01-111822	Soil	11/18/2022	13:43	Metals, Ra-226, K-40	6020, 901.1	1 quart bag	Y

Special Instructions: Use EDD NAUM v4.1. Send results to RAESANLY@tetrattech.com and marcus.quinlan@tetrattech.com. Please refer to PO for special instructions.

SAMPLES TRANSFERRED FROM
CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1 cooler 16 samples	Margaret Carlson Tetra Tech Inc <i>Margaret Carlson</i>	11/21/2022 12:00pm	<i>M. [Signature]</i> GEL	11-22-22 0930	

1999 Harrison Street, Suite 500
Oakland, CA 94612
DateShipped: 12/5/2022

Event: RAES TO 35 OCRM Removal Assessment
Contact Name: Mike Dahlquist 510-302-6310
Project Code: 103Z5440035 03.05

Lab: GEL Laboratories LLC - Charleston
Lab Phone: 843-769-7379
PO: RAES-005, TO 35, BOA 1150779

[illegible]

Special Instructions: Use EDD NAUM v4.1. Send results to RAESANLY@tetrattech.com and marcus.quinlan@tetrattech.com. Please refer to PO for special instructions.

SAMPLES TRANSFERRED FROM	
CHAIN OF CUSTODY #	

[illegible]

**ATTACHMENT D-3: LABORATORY DATA VERIFICATION
REPORTS**

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 601828

Sample Designations/Names (ID): OCRM-B02-SS01-01-111622, OCRM-B02-SS02-01-111622, OCRM-B02-SS03-01-111622, OCRM-B02-SS04-01-111622, OCRM-B02-SS05-01-111622, OCRM-B02-SS10-01-111622, OCRM-B02-SS10-02-111622, OCRM-B02-SS09-01-111622, OCRM-B02-SS08-01-111622, OCRM-B02-SS07-01-111622, OCRM-B02-SS06-01-111622, OCRM-B02-SS11-01-111622, OCRM-B02-SS12-01-111622, OCRM-B02-SS13-01-111622, OCRM-B02-SS14-01-111622, OCRM-B02-SS15-01-111622, OCRM-B02-SS20-01-111622, OCRM-B02-SS20-02-111622, OCRM-B02-SS19-01-111622, and OCRM-B02-SS18-01-111622

Matrix: Soil
Analytical Parameters: Metals by EPA 6010D/6020B

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			Antimony was detected in preparation blank 1205253411, however, as this analyte was not detected in any associated field samples, no qualification of data was necessary.
Surrogate spikes			X	

Matrix spikes/matrix spike duplicates (MS/MSD)	X			Recoveries for molybdenum and vanadium are outside QC limits in MS/MSD for Metals by EPA 6020 that was prepared from sample OCRM-B02-SS01-01-111622. Laboratory flagged these analytes in all associated samples with an "N".
Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			All recoveries are within limits.
Other	X			Laboratory qualified results between MDL and PQL as estimated with a "B" flag.
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality. There may be high bias associated with vanadium and a low bias associated with molybdenum, however, the laboratory also noted possible matrix interference as contributing to the matrix spike failures.				

Notes:

LCS Laboratory control sample
 LCSD Laboratory control sample duplicate
 MDL Method detection limit
 MS Matrix spike
 MSD Matrix spike duplicate
 NA Not applicable
 PQL Practical quantitation limit
 QC Quality control
 SDG Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 601835

Sample Designations/Names (ID): OCRM-B02-SS01-01-111622, OCRM-B02-SS02-01-111622, OCRM-B02-SS03-01-111622, OCRM-B02-SS04-01-111622, OCRM-B02-SS05-01-111622, OCRM-B02-SS10-01-111622, OCRM-B02-SS10-02-111622, OCRM-B02-SS09-01-111622, OCRM-B02-SS08-01-111622, OCRM-B02-SS07-01-111622, OCRM-B02-SS06-01-111622, OCRM-B02-SS11-01-111622, OCRM-B02-SS12-01-111622, OCRM-B02-SS13-01-111622, OCRM-B02-SS14-01-111622, OCRM-B02-SS15-01-111622, OCRM-B02-SS20-01-111622, OCRM-B02-SS20-02-111622, OCRM-B02-SS19-01-111622, and OCRM-B02-SS18-01-111622

Matrix: Soil

Analytical Parameters: Gamma Spec by DOE HASL 300, 4.5.2.3/Ga-01-R
Alpha Spec by DOE EML HASL 300, U-02-RC Modified
Alpha Spec by DOE EML HASL 300, Th-01-RC Modified

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			Thorium-230 was detected in preparation blank 1205261131, however, the value was less than the RDL.
Surrogate spikes			X	
Matrix spikes/matrix spike duplicates (MS/MSD)			X	

Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			All recoveries are within limits.
Other	X			
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality.				

Notes:

LCS Laboratory control sample
 LCSD Laboratory control sample duplicate
 MS Matrix spike
 MSD Matrix spike duplicate
 NA Not applicable
 PQL Practical quantitation limit
 QC Quality control
 RDL Required detection limit
 SDG Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist
Date: 2/3/2023
Site Name/Job Number: RAES TO35 – Old Church Rock Mine
Laboratory: GEL
Data Package or SDG Number: 601838

Sample Designations/Names (ID): OCRM-B02-SS17-01-111622, OCRM-B02-SS16-01-111622, OCRM-B02-SS21-01-111622, OCRM-B02-SS22-01-111622, OCRM-B02-SS23-01-111622, OCRM-B02-SS24-01-111622, OCRM-B02-SS25-02-111622, OCRM-B02-SS30-01-111622, OCRM-B02-SS29-01-111622, OCRM-B02-SS28-01-111622, OCRM-B02-SS27-01-111622, OCRM-B02-SS26-01-111622, OCRM-SS3099-01-111622, OCRM-SS2738-01-111622, OCRM-SS2679-01-111622, and OCRM-SS2217-01-111622

Matrix: Soil
Analytical Parameters: Metals by EPA 6010D/6020B

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			
Surrogate spikes			X	
Matrix spikes/matrix spike duplicates (MS/MSD)	X			Recoveries for molybdenum are outside QC limits in MS/MSD for Metals by EPA 6020 that was prepared from sample OCRM-B02-SS17-01-111622. Laboratory flagged these analytes in all associated samples with an “N”.

Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			All recoveries are within limits.
Other	X			Laboratory qualified results between MDL and PQL as estimated with a “B” flag.
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality. There may be low bias associated with molybdenum, however, the laboratory also noted possible matrix interference as contributing to the matrix spike failures.				

Notes:

EPA United States Environmental Protection Agency
LCS Laboratory control sample
LCSD Laboratory control sample duplicate
MDL Method detection limit
MS Matrix spike
MSD Matrix spike duplicate
NA Not applicable
PQL Practical quantitation limit
QC Quality control
SDG Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 601840

Sample Designations/Names (ID): OCRM-B02-SS17-01-111622, OCRM-B02-SS16-01-111622, OCRM-B02-SS21-01-111622, OCRM-B02-SS22-01-111622, OCRM-B02-SS23-01-111622, OCRM-B02-SS24-01-111622, OCRM-B02-SS25-02-111622, OCRM-B02-SS30-01-111622, OCRM-B02-SS29-01-111622, OCRM-B02-SS28-01-111622, OCRM-B02-SS27-01-111622, OCRM-B02-SS26-01-111622, OCRM-SS3099-01-111622, OCRM-SS2738-01-111622, OCRM-SS2679-01-111622, and OCRM-SS2217-01-111622

Matrix: Soil

Analytical Parameters: Gamma Spec by DOE HASL 300, 4.5.2.3/Ga-01-R
Alpha Spec by DOE EML HASL 300, U-02-RC Modified
Alpha Spec by DOE EML HASL 300, Th-01-RC Modified

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			Thorium-230 was detected in preparation blank 1205261131, however, the value was less than the RDL.
Surrogate spikes			X	
Matrix spikes/matrix spike duplicates (MS/MSD)			X	

Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			All recoveries are within limits.
Other	X			
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality.				

Notes:

LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not applicable
PQL	Practical quantitation limit
QC	Quality control
RDL	Required detection limit
SDG	Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 601842

Sample Designations/Names (ID): OCRM-SS2225-01-111622, OCRM-SS1804-01-111622,
EB-01-111622, OCRM-SS02-01-111722, OCRM-SS17-01-111722, OCRM-SS10-01-111722,
OCRM-SS13-01-111722, OCRM-SS11-01-111722, OCRM-SS09-01-111722,
OCRM-SS06-01-111722, OCRM-SS05-01-111722, OCRM-SS07-01-111722,
OCRM-SS08-01-111722, OCRM-SS12-02-111722, OCRM-SS12-01-111722,
OCRM-SS16-01-111722, OCRM-SS18-01-111722, OCRM-SS25-01-111722
OCRM-SS20-01-111722, and OCRM-SS23-01-111722

Matrix: Soil
Analytical Parameters: Metals by EPA 6010D/6020B

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			Aluminum, barium, calcium, copper, iron, magnesium, and manganese were detected in equipment rinsate blank EB-01-111622, but these analytes were detected in associated samples at values greater than ten times their concentrations in the equipment blank.
Surrogate spikes			X	

Matrix spikes/matrix spike duplicates (MS/MSD)	X			Recoveries for chromium and lithium are outside QC limits in MS/MSD for Metals by EPA 6020 that was prepared from sample OCRM-SS2225-01-111622. Laboratory flagged these analytes in all associated samples with an “N”.
Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			All recoveries are within limits.
Other	X			Laboratory qualified results between MDL and PQL as estimated with a “B” flag.
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality. There may be high bias associated with chromium and lithium, however, the laboratory also noted possible matrix interference as contributing to the matrix spike failures.				

Notes:

EPA United States Environmental Protection Agency
LCS Laboratory control sample
LCSD Laboratory control sample duplicate
MDL Method detection limit
MS Matrix spike
MSD Matrix spike duplicate
NA Not applicable
PQL Practical quantitation limit
QC Quality control
SDG Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 601847

Sample Designations/Names (ID): OCRM-SS2225-01-111622, OCRM-SS1804-01-111622, EB-01-111622, OCRM-SS02-01-111722, OCRM-SS17-01-111722, OCRM-SS10-01-111722, OCRM-SS13-01-111722, OCRM-SS11-01-111722, OCRM-SS09-01-111722, OCRM-SS06-01-111722, OCRM-SS05-01-111722, OCRM-SS07-01-111722, OCRM-SS08-01-111722, OCRM-SS12-02-111722, OCRM-SS12-01-111722, OCRM-SS16-01-111722, OCRM-SS18-01-111722, OCRM-SS25-01-111722 OCRM-SS20-01-111722, and OCRM-SS23-01-111722

Matrix: Soil, Water (Equipment Blank)

Analytical Parameters: Gamma Spec by DOE HASL 300, 4.5.2.3/Ga-01-R
Alpha Spec by DOE EML HASL 300, U-02-RC Modified
Alpha Spec by DOE EML HASL 300, Th-01-RC Modified

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			Thorium-230 was detected in preparation blank 1205261131, however, the value was less than the RDL.
Surrogate spikes			X	
Matrix spikes/matrix spike duplicates (MS/MSD)			X	

Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			High RPD in duplicate samples for Thorium-230, Uranium 235/236, and Potassium-40; however, all relative error ratios were within QC limits.
Other	X			
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality.				

Notes:

LCS Laboratory control sample
 LCSD Laboratory control sample duplicate
 MS Matrix spike
 MSD Matrix spike duplicate
 NA Not applicable
 QC Quality control
 RDL Required detection limit
 RPD Relative percent difference
 SDG Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 601849

Sample Designations/Names (ID): OCRM-SS26-01-111722, OCRM-SS27-01-111722,
 OCRM-SS24-01-111722, OCRM-SS35-01-111722, OCRM-SS32-01-111722,
 OCRM-SS31-01-111722, OCRM-SS30-01-111722, OCRM-SS29-01-111722,
 OCRM-SS34-01-111722, OCRM-SS36-01-111722, OCRM-SS28-01-111722,
 OCRM-SS28-02-111722, OCRM-SS19-01-111722, OCRM-SS21-01-111722,
 EB-02-111722, and OCRM-RTSW-XS05-01-111822

Matrix: Soil, Water (Equipment Blank)

Analytical Parameters: Metals by EPA 6010D/6020B

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			Barium and copper were detected in equipment rinsate blank EB-02-111722, but these analytes were detected in associated samples at values greater than ten times their concentrations in the equipment blank.
Surrogate spikes			X	

Matrix spikes/matrix spike duplicates (MS/MSD)	X			Recoveries for selenium are outside QC limits in MS/MSD that was prepared from sample OCRM-SS26-01-111722. Laboratory flagged this analyte in all associated samples with an "N".
Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			
Other	X			Laboratory qualified results between MDL and PQL as estimated with a "B" flag.
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality. There may be low bias associated with selenium, however, the laboratory also noted possible matrix interference as contributing to the matrix spike failure.				

Notes:

EB Equipment blank
LCS Laboratory control sample
LCSD Laboratory control sample duplicate
MDL Method detection limit
MS Matrix spike
MSD Matrix spike duplicate
NA Not applicable
PQL Practical quantitation limit
QC Quality control
SDG Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 601851

Sample Designations/Names (ID): OCRM-SS26-01-111722, OCRM-SS27-01-111722,
 OCRM-SS24-01-111722, OCRM-SS35-01-111722, OCRM-SS32-01-111722,
 OCRM-SS31-01-111722, OCRM-SS30-01-111722, OCRM-SS29-01-111722,
 OCRM-SS34-01-111722, OCRM-SS36-01-111722, OCRM-SS28-01-111722,
 OCRM-SS28-02-111722, OCRM-SS19-01-111722, OCRM-SS21-01-111722,
 EB-02-111722, and OCRM-RTSW-XS05-01-111822

Matrix: Soil, Water (Equipment Blank)
Analytical Parameters: Gamma Spec by DOE HASL 300, 4.5.2.3/Ga-01-R
 Alpha Spec by DOE EML HASL 300, U-02-RC Modified
 Alpha Spec by DOE EML HASL 300, Th-01-RC Modified

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			
Surrogate spikes			X	
Matrix spikes/matrix spike duplicates (MS/MSD)			X	

Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			High RPD in duplicate sample OCRM-SS26-01-111722 for Potassium-40; however, relative error ratio was within QC limits.
Other	X			
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality.				

Notes:

LCS Laboratory control sample
 LCSD Laboratory control sample duplicate
 MS Matrix spike
 MSD Matrix spike duplicate
 NA Not applicable
 QC Quality control
 RPD Relative percent difference
 SDG Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 602061

Sample Designations/Names (ID): OCRM-CORR02-01-111922, OCRM-CORR01-02-111922, OCRM-CORR01-01-111922, OCRM-CORR03-01-111922, OCRM-CORR04-01-111922, OCRM-CORR05-01-111922, OCRM-CORR06-01-111922, OCRM-CORR07-01-111922, OCRM-CORR08-01-111922, OCRM-CORR09-01-111922, OCRM-CORR10-01-111922, OCRM-CORR11-01-111922, OCRM-CORR12-01-111922, OCRM-CORR13-01-111922, OCRM-CORR14-01-111922, and OCRM-CORR15-01-111922

Matrix: Soil
Analytical Parameters: Metals by EPA 6010D/6020B

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			
Surrogate spikes			X	

Matrix spikes/matrix spike duplicates (MS/MSD)	X			Recoveries for copper and molybdenum are outside QC limits in MS/MSD prepared from sample OCRM-CORR12-01-111922. Laboratory flagged these analytes in all associated samples with an "N".
Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			
Other	X			Laboratory qualified results between MDL and PQL as estimated with a "B" flag.
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality. There may be low bias associated with copper and molybdenum, however, the laboratory also noted possible matrix interference as contributing to the matrix spike failures.				

Notes:

LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
MDL	Method detection limit
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not applicable
PQL	Practical quantitation limit
QC	Quality control
SDG	Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 602063

Sample Designations/Names (ID): OCRM-CORR02-01-111922, OCRM-CORR01-02-111922, OCRM-CORR01-01-111922, OCRM-CORR03-01-111922, OCRM-CORR04-01-111922, OCRM-CORR05-01-111922, OCRM-CORR06-01-111922, OCRM-CORR07-01-111922, OCRM-CORR08-01-111922, OCRM-CORR09-01-111922, OCRM-CORR10-01-111922, OCRM-CORR11-01-111922, OCRM-CORR12-01-111922, OCRM-CORR13-01-111922, OCRM-CORR14-01-111922, and OCRM-CORR15-01-111922

Matrix: Soil

Analytical Parameters: Gamma Spec by DOE HASL 300, 4.5.2.3/Ga-01-R
Alpha Spec by DOE EML HASL 300, U-02-RC Modified
Alpha Spec by DOE EML HASL 300, Th-01-RC Modified

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			
Surrogate spikes			X	
Matrix spikes/matrix spike duplicates (MS/MSD)			X	

Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			High RPD in duplicate sample OCRM-CORR12-01-111922 for Potassium-40 and Thorium-232; however, all relative error ratios were within QC limits.
Other	X			
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality.				

Notes:

LCS Laboratory control sample
 LCSD Laboratory control sample duplicate
 MS Matrix spike
 MSD Matrix spike duplicate
 NA Not applicable
 QC Quality control
 RPD Relative percent difference
 SDG Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 603278

Sample Designations/Names (ID): OCRM-SS2975-01-111622, OCRM-SS3006-01-111622,
OCRM-SS2946A-01-111622, and OCRM-SS2946B-01-111622

Matrix: Soil

Analytical Parameters: Metals by EPA 6010D/6020B, PCBs by EPA 8082A

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			
Surrogate spikes	X			
Matrix spikes/matrix spike duplicates (MS/MSD)	X			Recoveries for chromium, uranium, vanadium and copper and RPDs for calcium are outside QC limits in MS/MSD prepared from sample OCRM-SS2946A-01-111622. Laboratory flagged these analytes in all associated samples with an “N”.
Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			

Other	X			Laboratory qualified results between MDL and PQL as estimated with a “B” flag.
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality. There may be high bias associated with chromium, uranium, vanadium, and copper, however, the laboratory also noted possible matrix interference as contributing to the matrix spike failures.				

Notes:

LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
MDL	Method detection limit
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not applicable
PQL	Practical quantitation limit
QC	Quality control
RPD	Relative percent difference
SDG	Sample delivery group

**LABORATORY
DATA VERIFICATION REPORT**

Prepared by: Mike Dahlquist

Date: 2/3/2023

Site Name/Job Number: RAES TO35 – Old Church Rock Mine

Laboratory: GEL

Data Package or SDG Number: 603279

Sample Designations/Names (ID): OCRM-SS2975-01-111622, OCRM-SS3006-01-111622,
OCRM-SS2946A-01-111622, and OCRM-SS2946B-01-111622

Matrix: Soil

Analytical Parameters: Gamma Spec by DOE HASL 300, 4.5.2.3/Ga-01-R
Alpha Spec by DOE EML HASL 300, U-02-RC Modified
Alpha Spec by DOE EML HASL 300, Th-01-RC Modified

Data Package Element	Usable	Rejected	NA	Description of Affected Data (note specific samples and analytical parameters affected)
Chain-of-custody form	X			
Data package completeness	X			
Sample preservation, storage, and holding times	X			
Method and field blank contamination	X			
Surrogate spikes			X	
Matrix spikes/matrix spike duplicates (MS/MSD)			X	
Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)	X			High RPD in duplicate sample OCRM-SS2946A-01-111622 for Uranium-238; however, all relative error ratios were within QC limits.

Other	X			
Summary: Aside from those noted above, there are no QC failures and the data can be considered of high quality.				

Notes:

LCS Laboratory control sample
 LCSD Laboratory control sample duplicate
 MS Matrix spike
 MSD Matrix spike duplicate
 NA Not applicable
 QC Quality control
 RPD Relative percent difference
 SDG Sample delivery group